

ST. CROIX COUNTY

Wisconsin

Innovation Through Cooperation



All Hazard Mitigation Plan St. Croix County, Wisconsin 2013-2018

ST. CROIX COUNTY ALL HAZARD MITIGATION PLAN

PREPARED BY:

St. Croix County All Hazard Mitigation Plan Steering Committee
St. Croix County Emergency Management
St. Croix County communities

WITH ASSISTANCE BY:

West Central Wisconsin Regional Planning Commission

ADOPTED MARCH 5, 2013
BY THE ST. CROIX COUNTY BOARD OF SUPERVISORS



FEMA

MAR 26 2013

RECEIVED

MAR 29 2013

Name: _____

Ms. Roxanne Gray
State Hazard Mitigation Officer
Wisconsin Div. of Emergency Management
2400 Wright Street, P. O. Box 7865
Madison, WI 53707-7865

Dear Ms. Gray:

Thank you for submitting the adoption documentation for the St. Croix County Hazard Mitigation Plan. The plan was reviewed based on the local plan criteria contained in 44 CFR Part 201, as authorized by the Disaster Mitigation Act of 2000. St. Croix County met the required criteria for a multi-jurisdiction hazard mitigation plan and the plan is now approved for the county. Formal approval for the remaining participating jurisdictions is contingent upon the adoption of the plan by those communities.

The approval of this plan ensures continued availability of the full complement of Hazard Mitigation Assistance (HMA) Grants. All requests for funding, however, will be evaluated individually according to the specific eligibility and other requirements of the particular program under which the application is submitted.

We encourage the county to follow the plan's schedule for monitoring and updating the plan, and continue their efforts to implement the mitigation measures. The plan must be reviewed, revised as appropriate, resubmitted, and approved within five years in order to continue project grant eligibility.

Please pass on our congratulations to the county on completing this significant action. If you or the community have any questions, please contact Kirstin Kuenzi at (312) 408-4460.

Sincerely,

Christine Stack, Director
Mitigation Division



STATE OF WISCONSIN
DEPARTMENT OF MILITARY AFFAIRS
DIVISION OF EMERGENCY MANAGEMENT

Brian M. Satula
Administrator

Scott Walker
Governor

April 8, 2013

Ms. Kristen Sailer, Director
St. Croix County Emergency Management
1101 Carmichael Road
Hudson, WI 54016

Dear Kristen:

It gives me great pleasure to inform you that the *St. Croix County All Hazards Mitigation Plan 2012-2017* has been approved for the County by the Federal Emergency Management Agency. The plan complies with the requirements of the Disaster Mitigation Act of 2000. Formal approval for the remaining participating jurisdictions is contingent upon adoption of the plan by those communities. The County is eligible to apply for funding through the Hazard Mitigation Grant Program, the Pre-Disaster Mitigation Program, the Flood Mitigation Assistance Program, and the Repetitive Flood Claims Program through March 26, 2018, for projects identified in the Plan. Per the regulations, the Plan is required to be updated and resubmitted for approval every five years to maintain eligibility for mitigation funding.

With the FEMA Meets Requirements letter you also received the Local Mitigation Plan Review Tool which includes recommended revisions for the five-year update.

Congratulations on the approval of the plan! I also want to commend the County for its commitment to mitigation and reducing future disaster losses, and I look forward to working with you in the future.

If you have any questions, please call me at 608-242-3222 or Roxanne Gray at 608-242-3211.

Sincerely,

Katie Sommers
Disaster Response and Recovery Planner
Wisconsin Division of Emergency Management

Enclosure

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SECTION I. INTRODUCTION

A. PURPOSE OF THE PLAN

The St. Croix County All Hazard Mitigation Plan has been prepared as a result of the County's application for, and award of, Pre-Disaster Mitigation (PDM) Grant Program funds. These funds are disbursed by the Federal Emergency Management Agency (FEMA) through Wisconsin Emergency Management (WEM).

The primary focus of the Plan is to evaluate the County's potential exposure to natural disasters and identify appropriate mitigation strategies. St. Croix County decided to expand the scope of this planning effort to include additional man-made hazards, though this plan conforms with Federal all hazard mitigation planning requirements.

The Code of Federal Regulations states...

"The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

(44 CFR Part 201.6, pp 8851)

Development of the plan will help the County and its communities locate its areas of risk, assess the magnitude of the risk and vulnerability, and develop strategies for reducing the risk. Through this process, the County can address issues related to the protection of life, property, and critical services, and the reduction of costs associated with disaster relief and rescue efforts. Completion and approval of the plan will also continue to make St. Croix County and participating jurisdictions eligible to apply for future hazard mitigation project funds through FEMA.

B. PLANNING PROCESS

St. Croix County contracted with West Central Wisconsin Regional Planning Commission (WCWRPC) to update its all hazard mitigation plan previously adopted by St. Croix County in December 2007 and approved by FEMA in November 2008. This updated plan identifies strategies to mitigate the risks and vulnerabilities associated with hazards in the County, including its incorporated communities. Since FEMA requires plans be updated on a five-year cycle from the date of their approval, the former plan which is being updated will be referred to as the 2008 plan.

Development of the *St. Croix County All Hazard Mitigation Plan* was based on the planning requirements and guidance provided by FEMA¹ and WEM.² As such, the plan meets the requirements of the Disaster Mitigation Act of 2000. The plan's scope is inclusive of all of St. Croix County and is considered a multi-jurisdictional plan under Federal guidelines, with the

¹ Federal Emergency Management Agency, Hazard Mitigation Planning and Hazard Mitigation Grant Program, 44 CFR Parts 201 and 206 (Washington: Government Printing Office, February 26, 2002) 8844-8854.

² Wisconsin Emergency Management, Resource Guide to All Hazards Mitigation Planning in Wisconsin. April 2003.

exception of the Village of Spring Valley. Spring Valley primarily lies within Pierce County and has participated with Pierce County on hazard mitigation planning. However, the Village of Spring Valley was consulted during this plan update; and St. Croix County Emergency Support Services will continue to coordinate with the Village and Pierce County Emergency Management on hazard mitigation issues as required. The City of River Falls also lies partially within Pierce County. This plan covers that portion of River Falls which lies within St. Croix County.

When the new St. Croix County Emergency Management Coordinator was hired in 2010, she reviewed the 2008 plan for possible projects, gathered information for changes to the document, and applied for FEMA hazard mitigation grant funding for the plan update. To guide the plan's development, the County's local emergency planning committee (LEPC) agreed to serve as the steering committee for this planning effort, supplemented by additional individuals not formally on the LEPC but who regularly attend their meetings. As **Table 1** shows, the steering committee represents a range of interests and stakeholders from throughout St. Croix County. In addition to bringing insight on their respective roles, the committee members are also very knowledgeable of the issues and concerns of the County's residents. The committee was responsible for overseeing the development of the plan, providing input and review of information and materials, and reviewing and approving the release of the draft plan prior to the start of the adoption process.

Update of the plan began in December 2011. A total of four (4) steering committee meetings were held to discuss the plan's development, identify local hazard issues, formulate strategy recommendations, and review the draft plan. Additional correspondence, including a strategy alternatives and prioritization survey, was distributed to the committee via mail.

The general stages of plan development included: (1) initial data collection and development of the community profile; (2) review of the hazard risks and 2008 plan strategies by the steering committee and stakeholders; (3) community vulnerability and risk assessment; (4) development of the mitigation plan [goals, objectives, strategies, and action plan]; and (5) development of the plan maintenance and coordination strategy. This process is summarized in **Figure 1** at the end of this section. A summary of plan changes since the 2008 plan is provided in **Appendix M**, and includes a brief synopsis of how the steering committee reviewed and analyzed each section of the plan. Committee members also reviewed and discussed the full draft version of the plan during the planning process.

The mapping work as part of the community profile (**Section II**) and assessment of hazard conditions (**Section III**) was performed using the ArcGIS Geographic Information System, allowing greater manipulation and analysis due to the use of a consistent base map. Maps included in this plan are for general planning purposes only and do not constitute legal documents or formal surveys. The flood assessment methodology is further detailed in **Appendix B**.

Table 1. St. Croix County Hazard Mitigation Plan Steering Committee

Name	Title	Organization
Roger Larson	Supervisor	St. Croix County Board
Joe Hurtgen	Supervisor	St. Croix County Board
Andy Brinkman	Supervisor	St. Croix County Board
Ron Kiesler	Supervisor	St. Croix County Board
Dave Ostness	Supervisor	St. Croix County Board
Terry Anderson	Coordinator	St. Croix County Emergency Comm
Mary Ellen Bol	Industry	Phillips Plastics Corp
Doug Briggs	Police Chief	Village of Somerset
Jill Ellestad	Industry	Phillips Plastics Corp
Jeff Klatt	Patrol Captain	St. Croix County Sheriff's Dept
Mike Koscinski	Railroad Police	Union Pacific Railroad
Chuck Mehls	Emgy Mgmt Coord	City of New Richmond
Jan Nelson	Clerk	Village of Woodville
Margaret Ontl	Media	Hudson Star Observer
Tim Ramberg	Commissioner	St. Croix County Highway Dept
Kristen Sailer	Coordinator	St. Croix County Emgy Mgmt
Janet Smith	LEPC Secretary	St. Croix County Emgy Mgmt
Casey Swetlik	Director	St. Croix County Emgy Mgmt
Ed Thurman	Public Health	St. Croix County Public Health
Ruth Talford	Readiness Coordinator	St. Croix Valley Red Cross
Duana Bremer	Director	Salvation Army-Hudson
James Krizan	Highway Department	Commissioner's alternate
Patrick Thompson	County Administrator	Attends but not official member
Daryl Standafer	Chairman	County Board
Jon Aubart	Lieutenant	City of River Falls Police Department
Matt Melby	EMS Director	New Richmond Area Ambulance Service
Jim VanderWyst	Fire Chief	New Richmond Fire Department
Eric Nikolai	Volunteer	American Red Cross
Bob Olson	Volunteer	American Red Cross

A series of key stakeholder interviews, including both public and private sectors, was performed by WCWRPC staff to further complement the issue and strategy identification process. The St. Croix County Emergency Management Coordinator also frequently participated in these meetings. These interviews included discussions with emergency management personnel from adjacent counties. The majority of these interviews are listed in **Appendix C**, though additional correspondence, phone calls, and follow-up e-mails often took place. Additional input was received from local town, village, and city governments as described within **Section I.C.** below.

During the assessment of hazard conditions in the 2008 plan, a risk and vulnerability survey was completed by the steering committee. Based on the survey results, and with consideration of National Weather Service historical data, the LEPC/steering committee agreed upon the

following hazards to be the focus of the 2008 plan: tornados/high winds, winter storms/extreme cold, pandemic flu, hazardous materials incidents, thunderstorms, extreme heat/drought, flooding and nuclear accidents. The steering committee re-evaluated these hazard risks for this plan update and completed a second risk and vulnerability survey which yielded the following changes: extreme heat and targeted school violence were added as assessment sections, and brief analyses were added on long-term power loss and cyberattack threats.

With the guidance provided by these interviews, meetings, and the previously described planning steps, the steering committee discussed and reviewed the changes to each plan section since the 2008 plan and developed the updated goals and strategies. On September 6, 2012, the steering committee released the draft plan for public review and comment. On March 5, 2013, the County Board considered and adopted the *All Hazard Mitigation Plan* update at a duly called and noticed public meeting. A copy of the adopting resolution and related meeting minutes are included in **Appendix A**.

C. COMMUNITY INVOLVEMENT

The planning process included the following activities to encourage community input and involvement:

- **Steering Committee Meetings.** The four (4) steering committee meetings were properly noticed and open to the public. Local media outlets (i.e., radio, and newspapers) were copied on LEPC meeting agendas prior to the meetings. A meeting notice is also posted in the County courthouse. Agendas and minutes for the three meetings are included in **Appendix C**.
- **Key Stakeholder Interviews.** The key stakeholder interviews obtained input from many local public and private stakeholders who are also community members, including meetings with St. Croix Electric Cooperative and Xcel Energy.
- **Consideration of Related Plans.** Local comprehensive plans, ordinances, and other pertinent planning documents were reviewed by the planning consultant and discussed with the steering committee when available and pertinent. During stakeholder interviews and meetings with the cities and villages, participants were asked to identify and consider related plans and ordinances. The results of these discussions were integrated into the appropriate assessment section or recommended strategies which were reviewed by the steering committee, communities, and other stakeholders. A few examples of other planning efforts considered and integrated into this plan include the State Hazard Mitigation Plan, emergency and maintenance plans for various dams, and municipal comprehensive plans.
- **Town Government Meetings and Input.** On April 26, 2012, a presentation on the planning effort was made to the St. Croix County Towns Association. This was followed by a brief, customized survey to each town (see Appendix C) to obtain local input on hazard “hotspots,” vulnerabilities, and potential mitigation strategies. Once the steering committee developed the draft strategy recommendations, the draft strategies were sent to each town for review and comment.

- **Public Information and Plan Review Meeting.** On October 23, 2012, a public informational and plan review meeting was held to allow the public the opportunity to review and comment on the proposed plan update. Advertisement of this meeting included a notice in the local newspaper and posting in the standard places per County procedures and in accordance with State of Wisconsin law. Copies of the meeting notice, as well the draft plan strategies and other selected sections, were also sent to each municipality for comment. A copy of the meeting notice is included in **Appendix D**. After discussion at the fourth steering committee meeting and the public informational meeting, a potential strategy regarding creating a County Level B Hazardous Materials Response Team was removed from the plan.
- **Plan Adoption.** Following conditional approval of the plan by WEM, this all hazard mitigation plan was adopted via resolution by the St. Croix County Board, nine villages, and four cities in duly called and noticed public meetings. All resolutions are included in **Appendix A**.

D. MULTI-JURISDICTIONAL PLANNING APPROACH

The *St. Croix County All Hazard Mitigation Plan* is a multi-jurisdictional plan and encompasses all incorporated and unincorporated jurisdictions within St. Croix County, with the exception of the Village of Spring Valley which is covered under the Pierce County mitigation plan. All municipalities in St. Croix County with 100-year floodplains identified on Flood Insurance Rate Maps (FIRMs) are participants in good standing in the National Flood Insurance Program (NFIP).

All participating jurisdictions in St. Croix County were actively involved in the planning process through the following means:

- The steering committee included representation from different areas in the County and numerous organizations.
- A presentation on the planning effort was made to the St. Croix County Towns Association on 04/26/12. A customized risk assessment survey with hazard risk map was then mailed to each town to identify hazards and potential mitigation strategies. A sign-in sheet for this meeting and the survey form are included in Appendix C.
- A meeting was held with each participating village and city on the planning effort, and input was obtained on issues or potential strategies. Unique hazard-related issues or strategies for each community were identified. Sign-in sheets for these meetings and a description of how the community was invited to participate are included in Appendix C.
- Additional follow-up contacts were made with local jurisdictions, as needed. In August 2012, draft strategies were sent to each town, village, and city for further comment, accompanied by an invitation to the public informational meeting.

The following jurisdictions have adopted this plan update by resolution:

<u>Jurisdiction</u>	<u>Adoption Date</u>
St. Croix County (encompasses all unincorporated areas)	March 5, 2013
Village of Baldwin	May 8, 2013
Village of Deer Park	October 14, 2013
Village of Hammond	November 11, 2013
Village of North Hudson	May 7, 2013
Village of Roberts	April 8, 2013
Village of Somerset	October 22, 2013
Village of Star Prairie	May 1, 2013
Village of Wilson	June 9, 2014
Village of Woodville	June 11, 2013
City of Glenwood City	April 14, 2014
City of Hudson	August 19, 2013
City of New Richmond	April 8, 2013
City of River Falls	May 14, 2013

Adopting resolutions for all of the above jurisdictions are in **Appendix A**. St. Croix Electric Cooperative also actively participated in the plan's development and a letter of participation is included in **Appendix A**. The cooperative is potentially eligible for FEMA hazard mitigation grant funding much like a municipality. By participating in this plan's development, there is increased potential for the electric cooperative to pursue mitigation grant funding for projects within St. Croix County in the future.

Figure 1. St. Croix County All Hazard Mitigation Planning Process Diagram

Plan Initiation

scope: local decision to proceed, contract w/ WCWRPC
 County roles: mandate to proceed, establish steering committee
 RPC roles: facilitate process and pre-planning
 Cmte roles: initial meeting; discuss process and scope

Community Profiling

scope: data-collection phase (inventory, stats, uses, trends)
 local roles: assist w/ data collection, including existing plans
 RPC roles: data collection, analysis, & compilation
 Cmte roles: review and discuss findings; additional direction if needed
 other issues: identification of critical facilities; initial contacts

Hazard Identification

scope: update data and re-confirm key hazards
 local roles: assist w/ data collection (historical records on events)
 RPC roles: data collection (w/ NOAA data) & facilitation
 Cmte roles: review and confirm key hazards

Risk & Vulnerability Assessment

scope: identify risks (full history & trends), and vulnerabilities (estimate potential losses to assets)
 local roles: identify issues, concerns, and “hotspots”
 RPC roles: data collection, analysis, & facilitation
 Cmte roles: review and discuss findings; provide addition insights

Mitigation Planning

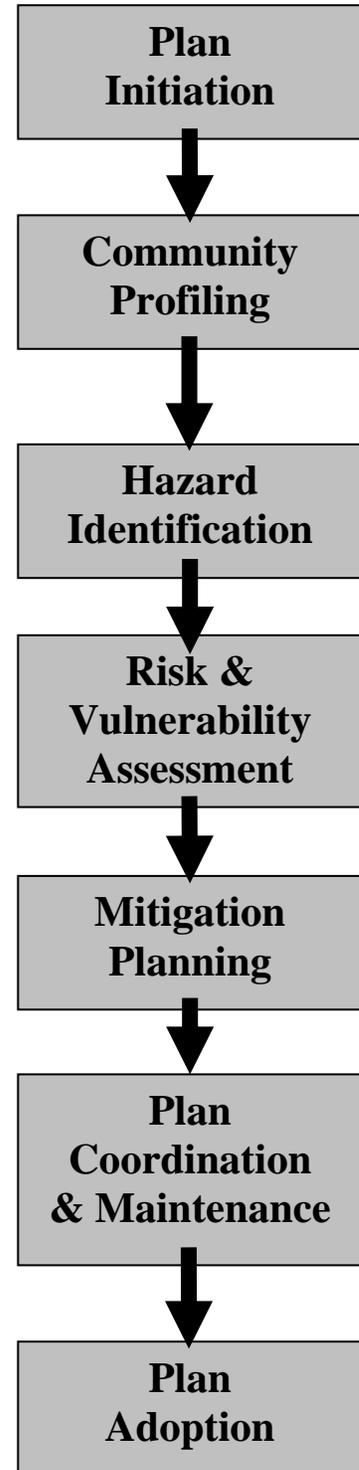
scope: goals, objectives, strategies, & action plan
 local roles: identify current activities and progress on 2008 plan
 RPC roles: facilitation, analysis & guidance on strategies
 Cmte roles: update goals; review and prioritize strategies
 other issues: cost-benefits analysis; resource/action plan

Plan Coordination & Maintenance

scope: relationship to other plans & future plan review/updates
 local roles: help identify links to other plans; vision for reviews
 RPC roles: facilitation & suggestions
 Cmte roles: review & modify/amend recommendations
 other issues: re-assess evaluation process

Plan Adoption

scope: Cmte review-> municip. review-> State pre-review -> public info meeting-> Cmte approval if amended-> County & local adoption-> formal State & FEMA approval
 local roles: facilitate public meetings, notifications, & adoption
 RPC roles: assist w/ public hearings & modifications to plan
 Cmte roles: consider public input & approve draft plan
 other issues: special mailings; media



SECTION II.

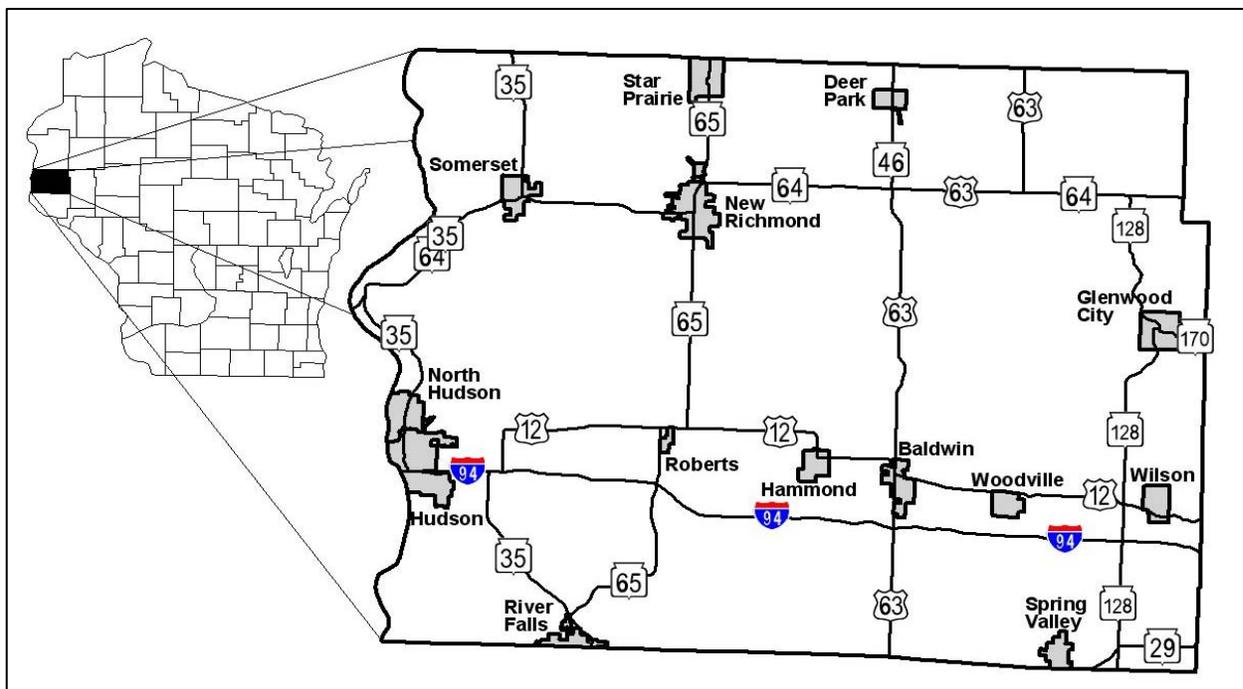
COMMUNITY PROFILE – ST. CROIX COUNTY

The community profile section of the plan provides background data of the general characteristics of St. Croix County. Included in this section are a description of natural and demographic characteristics, general development trends, and an inventory of critical facilities. Some demographic data from the 2010 Census was not yet available for this plan update.

A. GEOGRAPHIC LOCATION

St. Croix County is located in west-central Wisconsin (see **Figure 2**), and is separated from the State of Minnesota by the St. Croix River. The County has a total of 469,760 acres, or 736 square miles, of land, measuring approximately 25 miles north-to-south and 35 miles east-to-west. The County is bordered to the north by Polk County, to east by Dunn County, to the west

Figure 2. St. Croix County Geographical Location



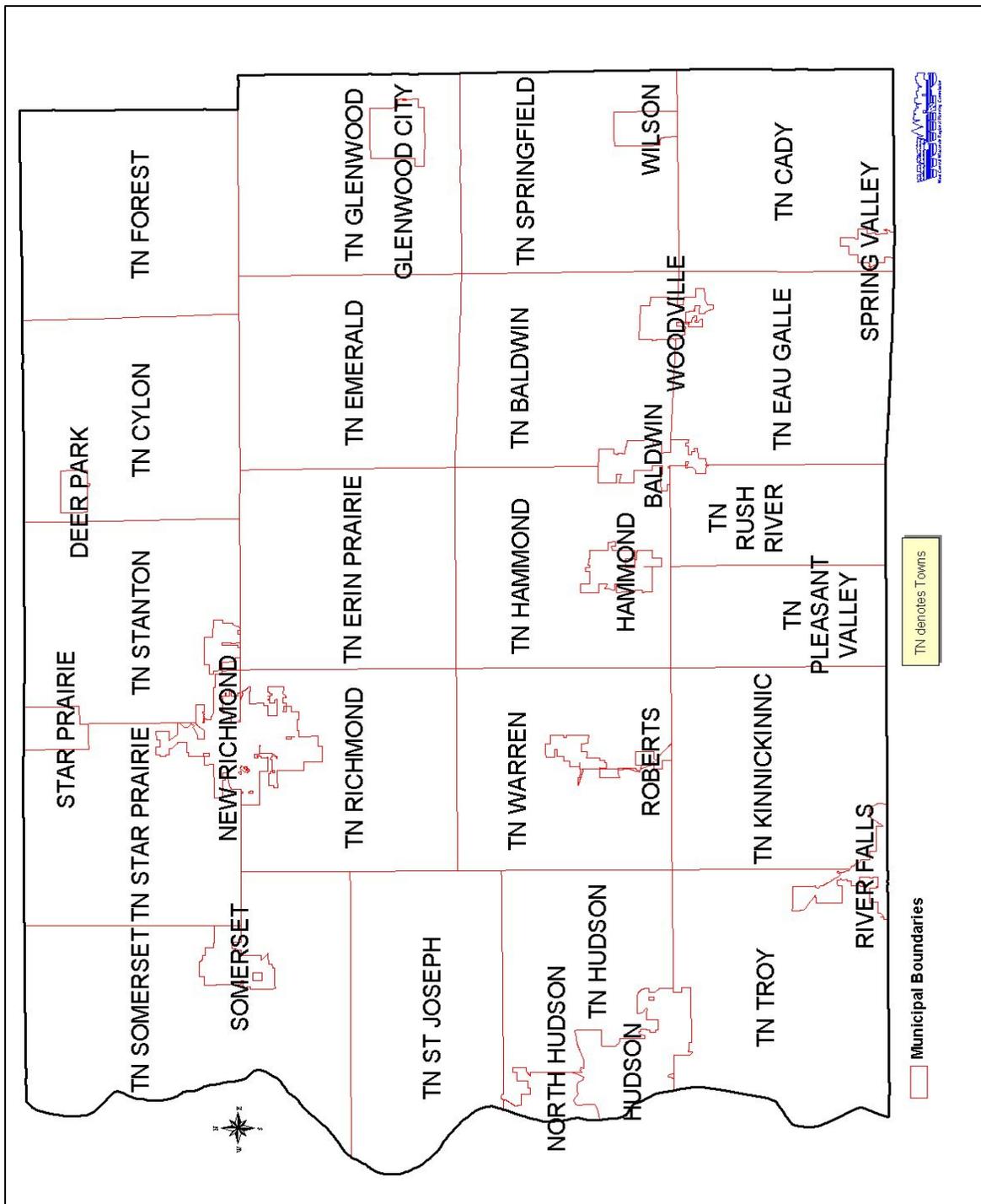
by Washington County (MN), and to the south by Pierce County.

The County is made up of 35 minor civil divisions, which include 21 towns, 10 villages, and 4 cities as shown in **Figure 3** on the following page. The largest portions of the City of River Falls and the Village of Spring Valley lie within Pierce County to the south. The largest city entirely located within St. Croix County—the City of Hudson—is the County seat.

St. Croix County is part of the Minneapolis-St. Paul Metropolitan Statistical Area and was, by far, the fastest growing county in Wisconsin during the previous decade.

Interstate 94, which bisects St. Croix County, is the primary transportation arterial between Minneapolis-St Paul and cities to the south and east, such as Eau Claire, Green Bay, Madison, Milwaukee, Rockford, and Chicago.

Figure 3. St. Croix County Civil Divisions



B. NATURAL FEATURES AND ENVIRONMENT

i. Watersheds

Shown in **Figure 4** are the watersheds that are wholly or partially located within St. Croix County. A watershed is an area of land that drains or “sheds” its water to a lake, river, stream, or wetland. Some watersheds encompass several hundred square miles, while others may be small, covering only a few square miles that drain into a lake. Watersheds are important to understand since the effects of natural and man-made activities in one area can have a direct impact on other areas. For example, runoff from a heavy rainfall upstream in a watershed will eventually reach the downstream part of the watershed.

Most surface waters of St. Croix County fall within two major drainage systems—the St. Croix River Basin and the Lower St. Croix River Basin. Surface waters in the western two-thirds of the County, including the Apple, Kinnickinnic, and Willow Rivers, fall within the St. Croix River Basin. The eastern third of the County, including the Hay and Eau Galle Rivers, are part of the Lower Chippewa River Basin. The remaining watershed basin area is the Rush River in the south-central part of the County which flows directly into the Mississippi River.

ii. Lakes, Rivers and Streams

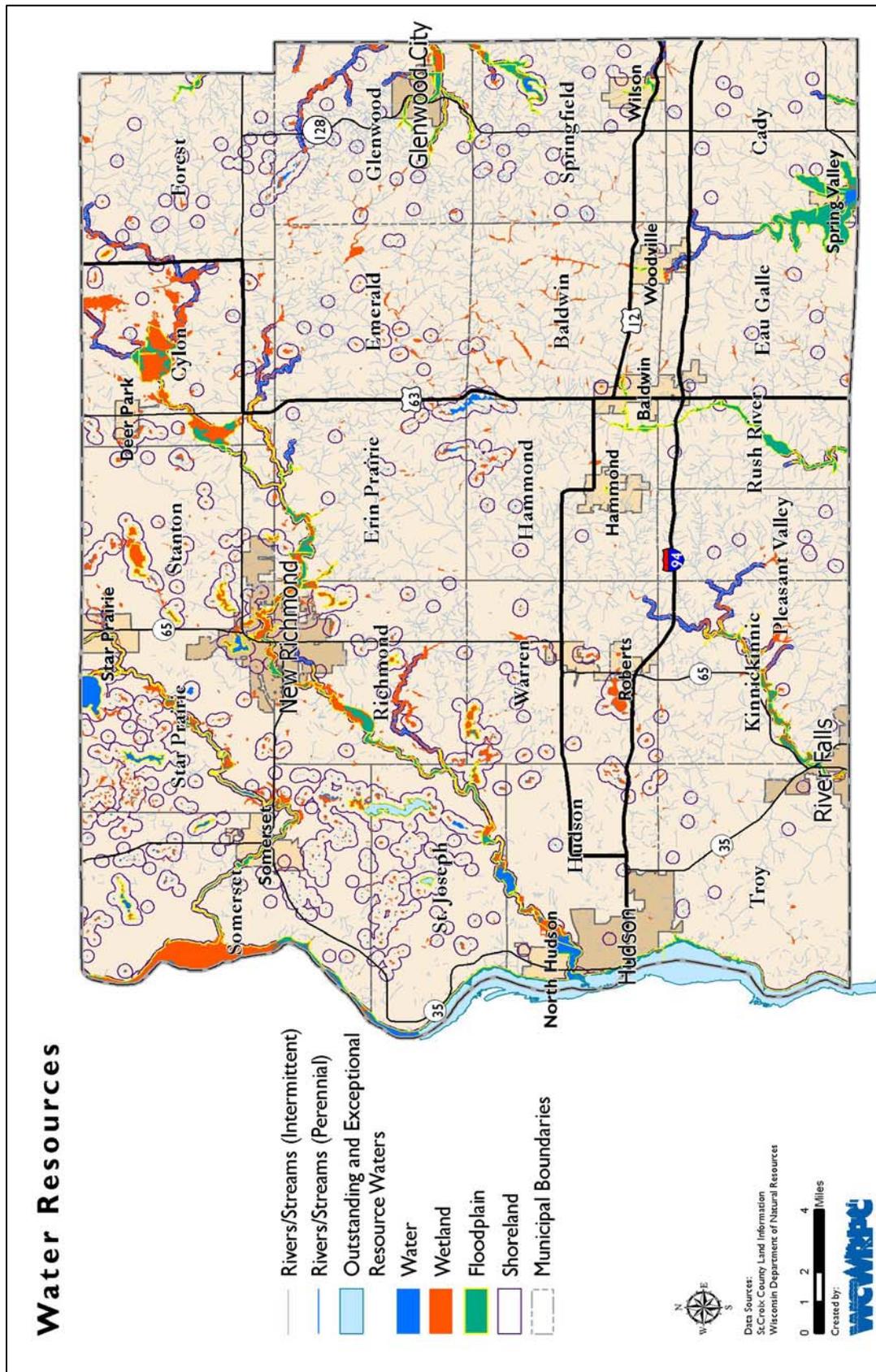
The lakes of St. Croix County, with the St. Croix River included, have a total surface area of approximately 9,598 acres or 15 square miles. The St. Croix River and its man-made lake (Lake St. Croix) is the largest surface water in St. Croix County. Approximately half of the 9,336-acre Lake St. Croix is located on the Wisconsin side of the state border with Minnesota. The St. Croix River is also notable since it has been designated by Congress as the Lower St. Croix National Scenic Riverway. With this designation, the National Park Service works with local jurisdictions to manage and protect this waterway.



At 416 acres, Bass Lake in the Towns of Somerset and St. Joseph is the largest inland surface water entirely within the County, though a considerable portion of the 1,107-acre Cedar Lake in the Town of Star Prairie is also in St. Croix County. Other lakes of considerable size include Little Falls Lake (172 acres), Lake Mallalieu (270 acres), Pine Lake (107 acres), and Squaw Lake (129 acres). A portion of the 150-acre Eau Galle Lake/Lake George is located in the Town of Cady. **Figure 5** shows the County’s surface waters. Cedar Lake, Bass Lake, Willow River, and St. Croix River in the western half of the County account for about 90% of the County’s surface water acreage.

The floodplain and flood hazard areas within the County associated with these water bodies are discussed later within **Section III. Assessment of Hazard Conditions** of this report. Regulatory tools guiding development in floodplain and shoreland areas are discussed in the current mitigation activities sub-section of **Section III**.

Figure 5. St. Croix County Surface Waters, Floodplains, and Wetlands



iii. Wetlands and Floodplains

Wetland areas within the watersheds can affect the water levels of rivers and creeks flowing through St. Croix County and perform an important flood storage function. Wetlands are defined by State Statute as “an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic (water-loving) vegetation and which has soils indicative of wet conditions.” Wetlands may be seasonal or permanent and are commonly referred to as swamps, marshes, or bogs. Wetland plants and soils have the capacity to store and filter pollutants, replenish groundwater supplies, store floodwaters, and maintain stream flows.

As Figure 5 shows, wetlands are most prevalent along the rivers and streams of the county. Large, contiguous areas of wetlands are found along Willow Creek and its tributaries, in particular within the Town of Cylon. Wetlands are also common along portions of the Apple River, Tiffany Creek, and the Kinnickinnic River. A large area of wetlands not entirely shown in Figure 5 is the many small islands and shallow backwaters of the St. Croix River along the western edge of the Town of Somerset. In all, St. Croix County has approximately 14,536 acres of wetlands which are 5 or more acres in size.

One sensitive land feature that most residents are aware of is the floodplain, which is the flood-prone land adjacent to water bodies. Floodplains can be desirable development areas due to the proximity to lakes, rivers, and streams, but pose problems by possibly putting residents and property at risk. Altering the floodplain landscape by filling or building levees, structures, or other hardscape (e.g., parking lots) can exacerbate flooding conditions. The filling of wetlands in flood-prone areas has also been proven to increase the likelihood of flooding. Development in floodplains can also affect the environmental quality of the waterway.

To better protect the residents throughout the state, and to minimize the loss of property, the State of Wisconsin, under Wisconsin Statute 87.30(1), requires counties, cities, and villages to adopt and enforce floodplain zoning. In addition, Wisconsin Administrative Code NR116, Floodplain Management Program, has been promulgated for the protection of property and public investments from the effects of flooding.

Development within the floodplain is usually assessed through the use of the FIRMs developed by FEMA. The floodplains have been identified for St. Croix County based on the FEMA flood insurance maps, as seen in Figure 5. It is important to remember that these maps are no substitute for site-specific analysis as natural and human changes in the landscape and the accuracy of the flood insurance maps have limited their reliability for identifying and designating floodplains in some cases.

iv. Topography

The topography of St. Croix County ranges from gently rolling to steep ridges along stream valleys (see **Figure 6**). Local relief in the County ranges from almost 1,300 feet in the eastern hill area down to 675 feet in the southwest. About 65% of the soils in St. Croix County are considered nearly level or gently sloping with only about 15% classified as moderately to very steep. Generally, the more rugged topography can be found in southern parts of the County and along the eastern edge, while the central part of the county is a gently undulating plain.

Topography is an important factor in determining flood risks and vulnerabilities. As Figure 6 shows, most surface waters drain to the south and west, toward the St. Croix and Mississippi River, with the exception of far eastern portions of the County, such as the areas surrounding Glenwood City and Wilson, which drain towards Dunn County to the east. Approximately 85% of the County is classified as uplands, which may be less prone to the vulnerabilities associated with large riverine flooding events, but where stormwater or flash flooding may be a more common problem. Stormwater erosion and flash flooding can be a significant concern for those areas with moderate to steep topography.

While not necessarily a topographic feature, closed depressions are common in St. Croix County. Closed depressions and the resulting kettles in the western and northwestern parts of the County were typically formed from the melt of glacial ice within buried glacial deposits. In the eastern parts of the County, closed depressions and the resulting sinkholes are common when limestone bedrock was eroded, which is referred to as karst development. Closed depressions will be discussed later in this report in the context of land subsidence and the increased vulnerability of groundwater contamination in such areas.

v. General Climate

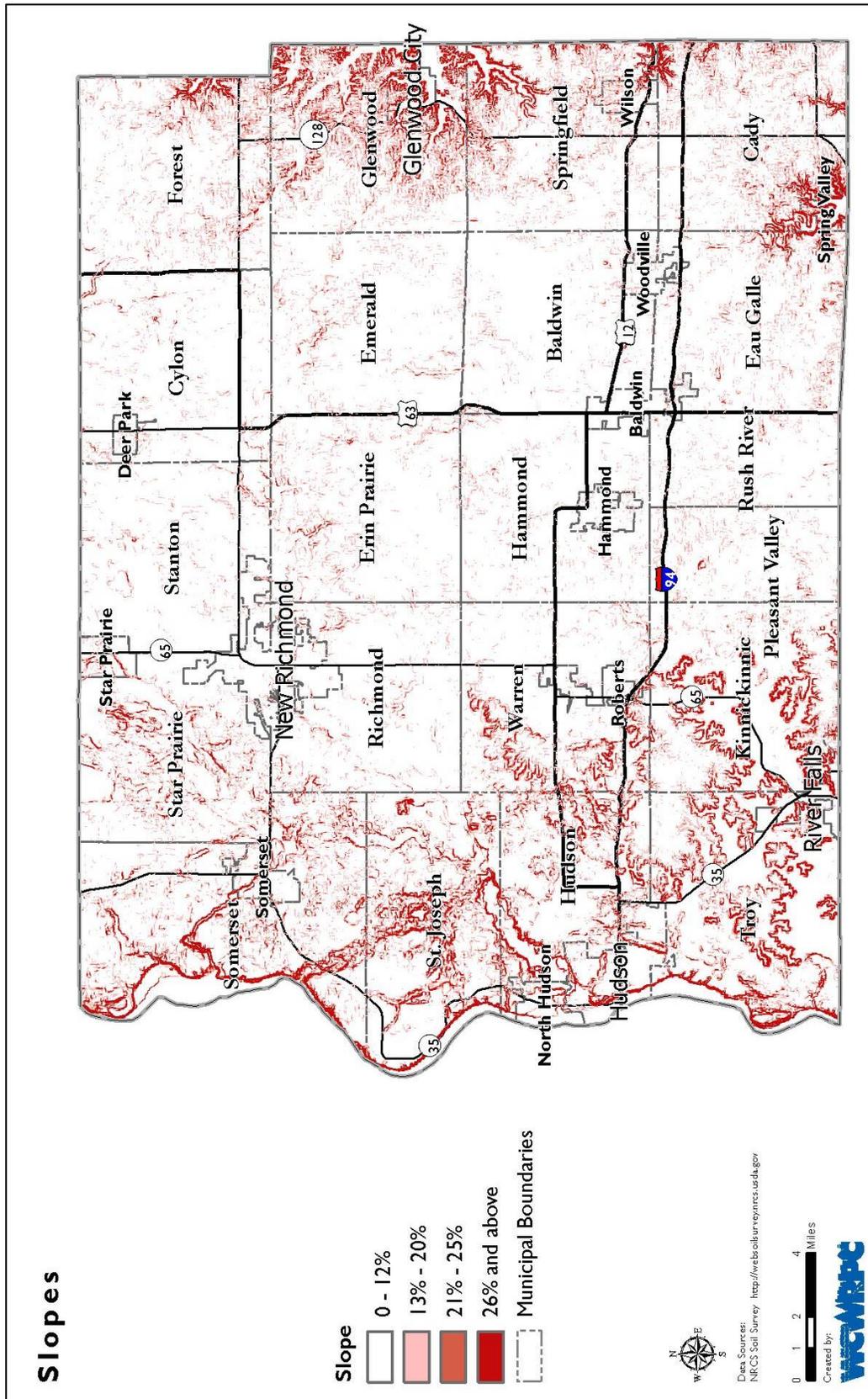
The climate of St. Croix County is classified as mid-latitude continental. Warm, humid summers and cold, snowy winters are the main characteristics. The average daily temperature ranges from a 5-degrees Fahrenheit minimum in January to an 84-degrees Fahrenheit maximum in July.

Annual precipitation averages 32 inches, with approximately 65% occurring as rain between the months of May through September. The heaviest rainfalls occur during the last three weeks of June. About once every two years, a portion of the County experiences 2.5 inches or more of rain in a 24-hour period. The possibility of a 7-day dry period during the summer is greatest in the last part of July.

Thunderstorms occur on an average of 40 days a year, with extremes ranging between 58 thunderstorms in one year down to 23 in another. Only 2 days a year on average experience hail, with an extreme range of 7 days in a year down to none. Seasonal snowfall has ranged from 15 inches in 1931 and 1958 up to 80 inches in 1951.

St. Croix County is susceptible to a range of natural hazards, including flooding. A description of these natural hazards, along with historical trends and current risks, is included in **Section III** of this report.

Figure 6. St. Croix County Slopes

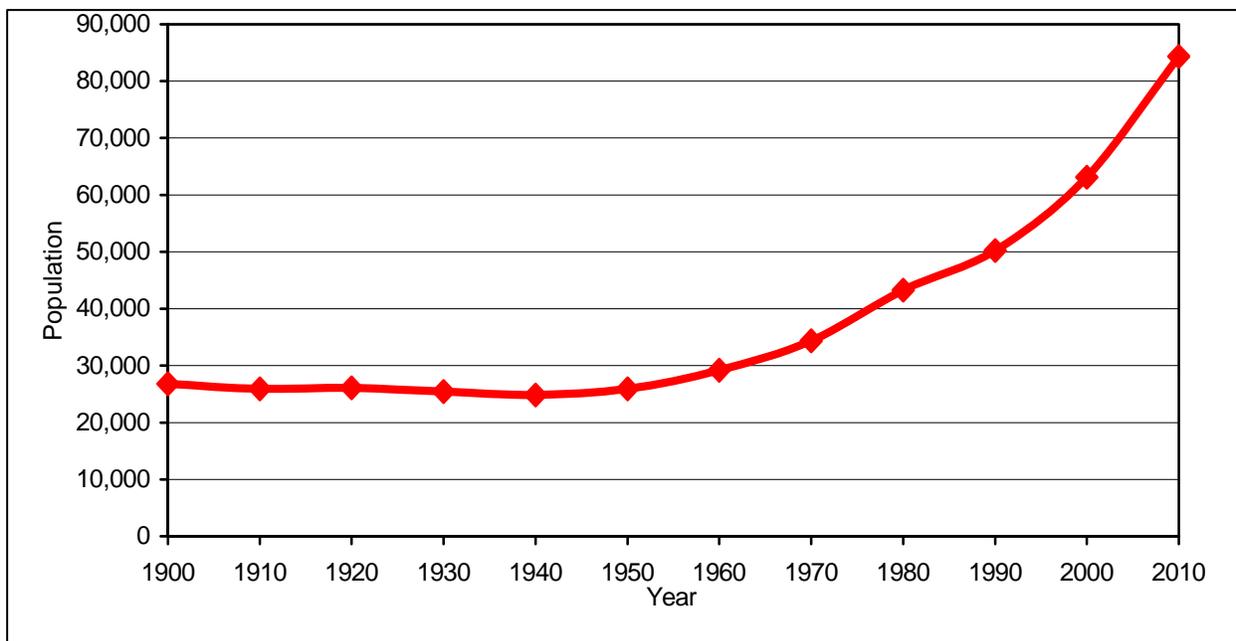


C. DEMOGRAPHIC AND ECONOMIC PROFILE

i. Population

Between 1900 and 1950, St. Croix County's population has remained fairly steady, with small declines in the decades of the 1900s, 1920s and 1930s, and small increases in the decades of the 1910s and 1940s. In the decades between 1940 and 1980, the county's population increased at an accelerating rate, ultimately resulting in the county's highest growth decade in the 1970s (26%). The population growth rate declined somewhat in the 1980s (16.2%) only to have the 1990s (25.7%) almost match the growth of the 1970s. Recently between 2000 and 2010, the County's population increased by 21,190 people, or 33.6 percent. (see **Figure 7**).

Figure 7. St. Croix County Historical Population – 1900 to 2010



source: U.S. Census Bureau; Wisconsin Department of Administration

Figure 8 on the following page shows the population change for St. Croix County communities between 1970 and 2010. The highest growth during this period occurred in the Towns of Hudson and Troy and the Cities of Hudson and New Richmond. The Towns of Somerset, St. Joseph, Star Prairie and Richmond, as well as the portion of River Falls within St. Croix County, the Villages of North Hudson and Baldwin also saw significant growth. The Towns of Forest, Stanton and the Village of Deer Park lost population overall during the period.

Figure 8. St. Croix County Population Change – 1970 to 2010

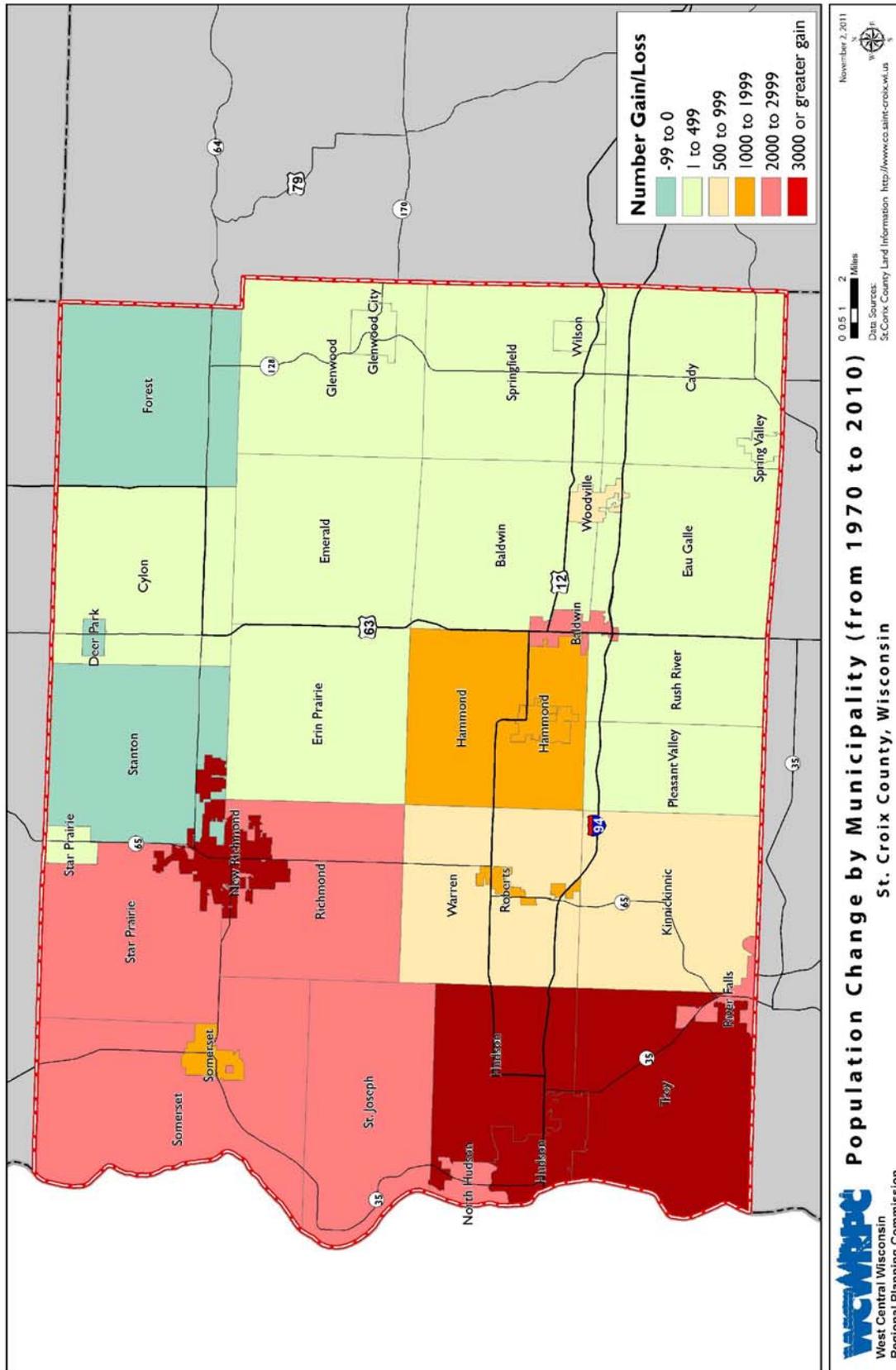


Table 2 below provides population trends for 1960 to 2010 by municipality.

Table 2. St. Croix County Population Trends – 1960 to 2010

	Year						Percent Change				
	1960	1970	1980	1990	2000	2010	'60-'70	'70-'80	'80-'90	'90-'00	'00-'10
Towns											
Baldwin	833	890	943	911	903	928	7%	6%	-3%	-1%	3%
Cady	762	670	724	643	710	821	-12%	8%	-11%	10%	16%
Cylon	614	620	717	639	629	683	1%	16%	-11%	-2%	9%
Eau Galle	717	720	897	756	882	1,139	0%	25%	-16%	17%	29%
Emerald	647	588	638	630	691	853	-9%	9%	-1%	10%	23%
Erin Prairie	499	516	661	647	658	688	3%	28%	-2%	2%	5%
Forest	674	649	631	614	590	629	-4%	-3%	-3%	-4%	7%
Glenwood	835	764	715	700	755	785	-9%	-6%	-2%	8%	4%
Hammond	773	764	822	819	947	2,102	-1%	8%	0%	16%	122%
Hudson	649	925	2,012	3,692	6,213	8,461	43%	118%	83%	68%	36%
Kinnickinnic	667	755	1,051	1,139	1,400	1,722	13%	39%	8%	23%	23%
Pleasant Valley	310	330	360	384	430	515	6%	9%	7%	12%	20%
Richmond	701	1,091	1,338	1,400	1,556	3,272	56%	23%	5%	11%	110%
Rush River	403	439	476	419	498	508	9%	8%	-12%	19%	2%
St. Joseph	1,068	1,357	2,180	2,657	3,436	3,842	27%	61%	22%	29%	12%
Somerset	976	1,185	1,833	1,975	2,644	4,036	21%	55%	8%	34%	53%
Springfield	814	811	816	772	808	932	0%	1%	-5%	5%	15%
Stanton	640	975	1,083	1,042	1,003	900	52%	11%	-4%	-4%	-10%
Star Prairie	1,015	1,390	1,900	2,098	2,944	3,504	37%	37%	10%	40%	19%
Troy	845	1,517	2,326	2,850	3,661	4,705	80%	53%	23%	28%	29%
Warren	614	622	897	1,008	1,320	1,591	1%	44%	12%	31%	21%
sub-total	15,056	17,578	23,020	25,795	32,678	42,616	17%	31%	12%	27%	30%
Villages											
Baldwin	1,184	1,399	1,620	2,022	2,667	3,957	18%	16%	25%	32%	48%
Deer Park	221	217	232	237	227	216	-2%	7%	2%	-4%	-5%
Hammond	645	768	991	1,097	1,153	1,922	19%	29%	11%	5%	67%
North Hudson	1,019	1,547	2,218	3,101	3,463	3,768	52%	43%	40%	12%	9%
Roberts	308	484	833	1,043	969	1,651	57%	72%	25%	-7%	70%
Somerset	729	778	860	1,065	1,556	2,635	7%	11%	24%	46%	69%
Spring Valley*	0	0	0	0	2	6	-	-	-	-	200%
Star Prairie	331	362	420	507	574	561	9%	16%	21%	13%	-2%
Wilson	140	130	155	163	176	184	-7%	19%	5%	8%	5%
Woodville	430	522	725	942	1,104	1,344	21%	39%	30%	17%	22%
sub-total	5,007	6,207	8,054	10,177	11,891	16,244	24%	30%	26%	17%	37%
Cities											
Glenwood City	835	822	950	1,026	1,183	1,242	-2%	16%	8%	15%	5%
Hudson	4,325	5,049	5,434	6,378	8,775	12,719	17%	8%	17%	38%	45%
New Richmond	3,316	3,707	4,306	5,106	6,310	8,375	12%	16%	19%	24%	33%
River Falls*	625	991	1,498	1,769	2,318	3,149	59%	51%	18%	31%	36%
sub-total	9,101	10,569	12,188	14,279	18,586	25,485	16%	15%	17%	30%	37%
Total	29,164	34,354	43,262	50,251	63,155	84,345	18%	26%	16%	26%	34%

source: U.S. Census Bureau

*Portion of River Falls and Spring Valley located in St. Croix County only.

From 2000 to 2010, the Town of Hammond had the highest rate of population growth as a percentage of its population in St. Croix County at 122 percent. The following communities also had significant population growth:

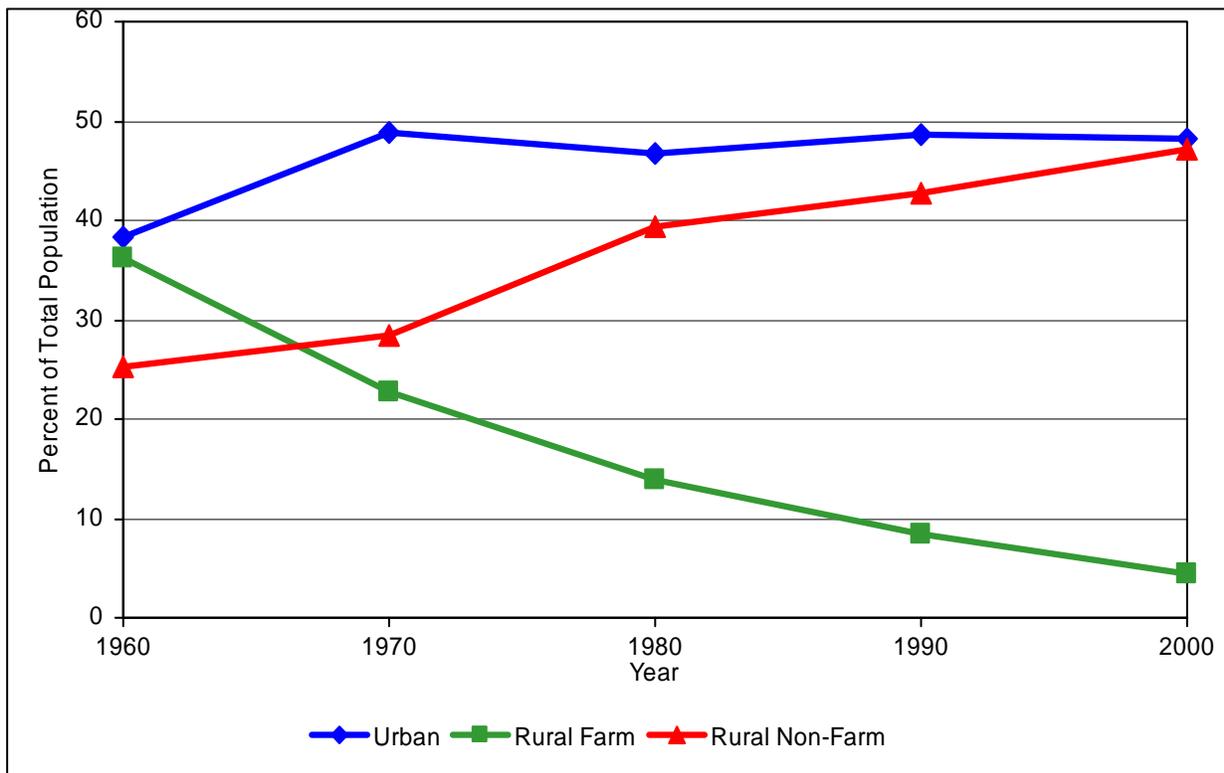
Town of Richmond	110%
Village of Roberts	70%
Village of Somerset	69%
Village of Hammond	67%
Town of Somerset	53%

Village of Baldwin	48%
City of Hudson	45%
Town of Hudson	36%
City of River Falls	36% (portion within St. Croix County)
City of New Richmond	33%

In terms of actual population increases, the Town and City of Hudson had the largest number of new residents, 2,248 and 3,944, respectively between 2000 and 2010. Two villages and one town — Deer Park, Star Prairie, and Stanton — saw population decreases between 2000 and 2010 of -5 percent, -2 percent, and -10 percent, respectively.

In the 1960s, the percentage urban or rural non-farm residents surpassed the percentage rural farm residents as shown in **Figure 9**. The number of rural farm residents continued to decrease, constituting only 4.5 percent of the County's population in 2000, a decrease of approximately 76.8 percent (or 9,530 farm residents) since 1960. Since 1980, the urban population has been increasing in its percentage of the total population indicating more people may be choosing city and small town life over rural living.

Figure 9. St. Croix County Population Distribution by Incorporated & Rural Residents –1960 to 2000



source: U.S. Census Bureau Assumes all farms located in unincorporated towns, so actual number of Town-Farms is lower than shown.

The 1970s and 1990s are the only recent decades in which the population increase in St. Croix County has been more from in-migration of new residents than natural increase. The natural increase rate for the 1990s was at a 50-year low for the county.

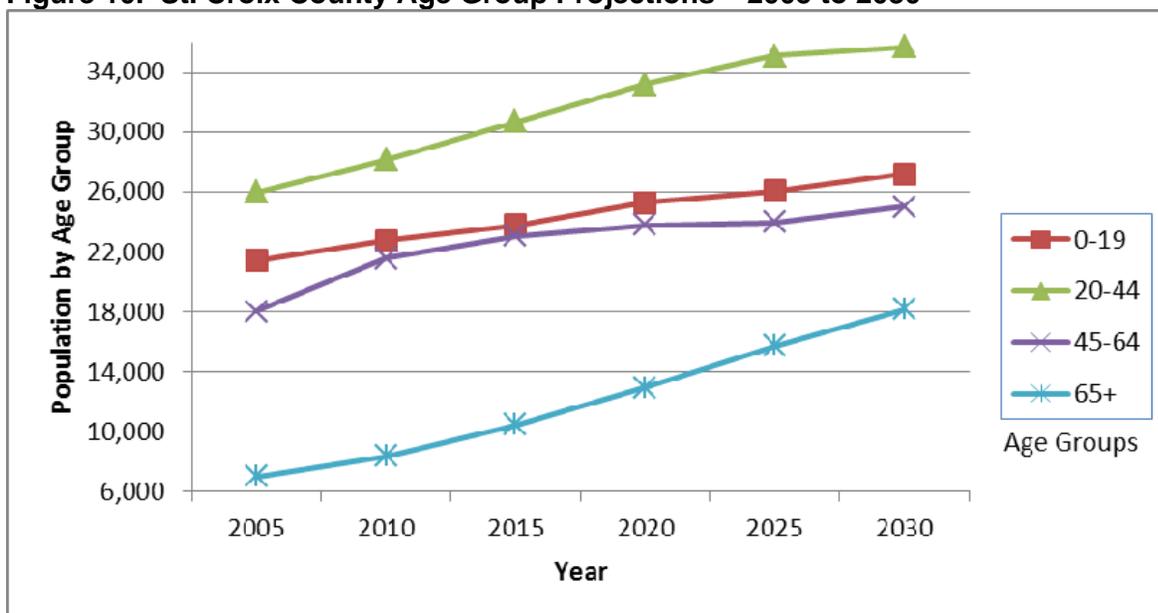
The average age of St. Croix County residents increased almost nine years from 1980 to 2010 to 36.7 years. Population increased in every age group between 2000 and 2010. The 60-64 age group more than doubled during this timeframe.

Overall, St. Croix County's population is relatively homogenous, with 95.9 percent of the population in the white, non-Hispanic ethnic group. 4.1 percent of the population (3,431 persons in 2010) identify as another race. During the past decades, the population in all racial groups increased, with the Asian and Hispanic or Latino groups increasing most to become the largest minority populations in St. Croix County. Language and cultural barriers can pose challenges to education and outreach on weather awareness, available shelters, agricultural best practices, regulations, etc.

As shown in **Table 3** on the following page, the Wisconsin Department of Administration (WisDOA)³ projects a 117.5 percent increase (+137,360 residents) in the St. Croix County population between 2000 and 2030. Like recent trends, the percentage increases are projected to be highest in many of the towns. The largest rates of increase are expected in the Towns of Hammond, Richmond, Hudson and Somerset, the Villages of Somerset, Hammond, Roberts, and Baldwin, and the Cities of Hudson and New Richmond.

Figure 10 below shows St. Croix County's projected population by age group, reflecting that the baby boomer generation is dramatically becoming a larger proportion of the County's population. Between 2005 and 2030, the number of residents ages 65 and over is projected to more than double. This trend has serious future implications for services, housing, and the labor force.

Figure 10. St. Croix County Age Group Projections – 2005 to 2030



source: Wisconsin Department of Administration, August 2008

³ The WisDOA population projections are, by State Statute, the official population projections for Wisconsin.

Table 3. St. Croix County Population Projections — 2000 to 2030

Municipality	Census 2000	Proj. 2005	Proj. 2010	Proj. 2015	Proj. 2020	Proj. 2025	Proj. 2030	% Change 2000-2030
Towns								
Baldwin	903	958	999	1,058	1,116	1,164	1,202	33.1
Cady	710	785	846	921	997	1,064	1,124	58.3
Cylon	629	671	696	735	772	803	826	31.3
Eau Galle	882	995	1,100	1,209	1,318	1,419	1,507	70.9
Emerald	691	781	851	939	1,027	1,109	1,182	71.1
Erin Prairie	658	672	691	723	754	777	793	20.5
Forest	590	627	651	687	722	750	773	31.0
Glenwood	755	856	931	1,026	1,121	1,210	1,287	70.5
Hammond	947	1,523	1,871	2,265	2,675	3,074	3,453	264.6
Hudson	6,213	7,533	8,941	10,533	12,178	13,767	15,259	145.6
Kinnickinnic	1,400	1,629	1,829	2,068	2,312	2,542	2,752	96.6
Pleasant Valley	430	480	523	579	634	684	730	69.8
Richmond	1,556	2,441	2,974	3,580	4,210	4,822	5,401	247.1
Rush River	498	526	560	604	649	688	721	44.8
St. Joseph	3,436	3,716	4,095	4,561	5,035	5,477	5,873	70.9
Somerset	2,644	3,252	3,750	4,334	4,936	5,513	6,048	128.7
Springfield	808	916	991	1,085	1,181	1,268	1,344	66.3
Stanton	1,003	1,014	1,033	1,062	1,087	1,101	1,105	10.2
Star Prairie	2,944	3,495	3,973	4,539	5,121	5,675	6,185	110.1
Troy	3,661	4,385	5,011	5,748	6,503	7,224	7,889	115.5
Warren	1,320	1,540	1,747	1,990	2,238	2,474	2,691	103.9
Subtotal:	32,678	38,795	44,063	50,246	56,586	62,605	68,145	108.5
Villages								
Baldwin	2,667	3,441	4,044	4,746	5,470	6,170	6,824	155.9
Deer Park	227	224	225	229	232	234	232	2.2
Hammond	1,153	1,649	1,951	2,300	2,661	3,009	3,337	189.4
North Hudson	3,463	3,693	3,988	4,374	4,763	5,120	5,432	56.9
Roberts	969	1,362	1,585	1,849	2,123	2,386	2,631	171.5
Somerset	1,556	2,204	2,681	3,225	3,790	4,339	4,860	212.3
Spring Valley*	574	634	693	768	842	912	974	69.7
Star Prairie	2	3	3	3	2	3	3	50.0
Wilson	176	194	209	229	249	267	282	60.2
Woodville	1,104	1,292	1,436	1,630	1,830	2,018	2,191	98.5
Subtotal:	11,891	14,696	16,815	19,353	21,962	24,458	26,766	125.1
Cities								
Glenwood City	1,183	1,227	1,303	1,405	1,506	1,597	1,672	41.3
Hudson	8,775	11,432	13,473	15,865	18,337	20,725	22,967	161.7
New Richmond	6,310	7,566	8,638	9,917	11,230	12,485	13,643	116.2
River Falls*	2,318	2,549	2,831	3,179	3,533	3,866	4,167	79.8
Subtotal:	18,586	22,774	26,245	30,366	34,606	38,673	42,449	128.4
St. Croix County	63,155	76,265	87,123	99,965	113,154	125,736	137,360	117.5

source: U.S. Census Bureau & Wisconsin Department of Administration, Demographic Services Center, October 2008.

*Portion of River Falls and Spring Valley located in St. Croix County only.

ii. Housing

As residential growth occurs in St. Croix County, so does the value of improvements which could potentially be vulnerable to hazard events. And the continued population growth in St. Croix County has created a corresponding demand for additional housing as shown in **Table 4** below. During the 1980s, population growth in the County was more than 16 percent, and the number of housing units increased nearly 24.1 percent. Housing growth still outpaced population growth in the 1990s, though the difference narrowed (i.e., +26% vs. +31.0%). In the 2000s, the trend continued with population growth increasing by 33.6 percent, while the number of housing units increased by more than 40 percent. These trends reflect, in part, decreasing household sizes.

Table 4. St. Croix County Housing Unit Change — 1980 to 2010

Year	Number of Housing Units	Numerical Change	Percent Change
1980	14,924	--	--
1990	18,519	+3,595	24.1
2000	24,263	+5,744	31.0
2010	33,983	+9,720	40.1

Source: 1980, 1990, 2000, & 2010 Census

Shown in **Table 5** are the housing unit projections for St. Croix County for the years 2000 through 2030 based on the previous population projections. However, local and national housing market changes during the last few years are not reflected in these projections.

Table 5. St. Croix County Housing Unit Forecast — 2000 to 2030

	2000 <i>Census</i>	2005 <i>Estimate</i>	2010 <i>Projection</i>	2015 <i>Projection</i>	2020 <i>Projection</i>	2025 <i>Projection</i>	2030 <i>Projection</i>
Population	63,155	76,265	87,123	99,965	113,154	125,736	137,360
Housing Units	23,410	28,506	32,970	38,126	43,517	48,709	53,975
Housing Unit Change		+21.8%	+15.7%	+15.6%	+14.1%	+11.9%	+10.8%

Source: U.S. Census, Wisconsin Department of Administration, 2008.

Of interest, 77.8% of all housing units in St. Croix County in 2010 were owner-occupied (not rented), compared to the State of Wisconsin average of 68.4%. In 2000, approximately 27.3% of the County's housing units were multi-unit or attached structures (e.g., duplexes, apartments), which is comparable to the State-wide average of 26.2%, with 52% of the County's multi-unit structures located within the City of Hudson, City of River Falls, and Village of North Hudson. However, during the planning process, numerous communities noted that slab-on-grade single-family and duplex construction was a popular form of new home construction. Combined with general population growth, the number and percentage of multi-unit housing structures in the County will likely increase in the future.

According to the 2000 Census, a total of 1,131 housing units (4.7% of all units) in St. Croix County were mobile homes, very comparable to the State of Wisconsin average of 4.4%. The majority of these mobile homes (or 57%) were located in unincorporated towns. Approximately

14.6% (or 165) of these mobile homes in 2000 were located within the Town of Star Prairie, and



Mobile Home Park in the Village of Roberts

12.8% (or 145) were located in the Village of Roberts, constituting 36% of its total housing stock. The average of 2.36 persons per occupied mobile home housing unit in 2000 was slightly lower than the overall average for all housing units in the County. By 2010, the number of mobile homes in the County had decreased to 1,007.

A number of communities in the western portions of the County noted that high land prices discourage the installation of new mobile homes. No housing units in St. Croix County were identified as being boats, RVs, vans, etc. According to the 2006-2010

American Community Survey Estimates, approximately 14% of the County's housing units were built in 1939 or earlier, with 47% of the housing units being built since 1990. Approximately 3.0%, or 1,007, of the housing units in St. Croix County are mobile homes.

In 2010, St. Croix County had only 460 seasonal or recreational housing units, which is relatively low compared to some other counties in the region. A notable regional trend is that many seasonal homes are being converted to year-round homes, especially as the boomer-generation retires. This trend has implications for local and emergency services, as the demand for services becomes year round.

Seasonal units are used or intended for use only during certain seasons (e.g., beach cottages and hunting cabins) or for weekend or occasional use throughout the year. Seasonal units may also include quarters used for seasonal workers such as loggers. In 2000, about 67 percent of all seasonal units in St. Croix County were concentrated in four towns and one city:

Town of Troy	75 units (4.1% of all units in the town)
Town of St. Joseph	68 units (4.5% of all units in the town)
Town of Star Prairie	66 units (4.7% of all units in the town)
City of Hudson	53 units (.94% of all units in the City)
Town of Somerset	45 units (3.0% of all units in the town)

iii. Economic Overview

Economic characteristics and growth influence land use and may present unique hazard mitigation and emergency response challenges. The extent to which economic activities are

vulnerable to hazard risks varies by the characteristics of the activity and the level of preparedness.

With its population growth, St. Croix County is also experiencing shifts in its economy with substantial employment increases in the finance, education, and trade/transportation sectors, and decreases in the agricultural sector over the last few decades. And with approximately 44% of all employed persons in St. Croix County commuting to the Minnesota counties of Washington, Ramsey, or Hennepin, the economic influences of the Minneapolis/St. Paul urban area on St. Croix County are enormous. The long-term impacts of the Stillwater bridge replacement are unknown but the new bridge is likely to further increase traffic and economic exchange and development in the northern part of County as well as tourism.

Table 6 shows the 2010 employment by industry for jobs provided in St. Croix County. As of 2010, none of largest manufacturers in St. Croix County had over 500 employees. Most of the largest manufacturers are located in one of the nine industrial parks located throughout the County. Employment in the services sector is high due in large part to the existence of the numerous schools and the Wisconsin Indianhead Technical College.

Table 6. St. Croix County Employment By Industry – 2010

<i>Industry Category</i>	<i>2010 employment</i>
Agriculture (derived from 2000 Census)	1,093
Goods Producing	
Construction, Natural Resources, & Mining	1,324
Manufacturing	5,338
Service Producing	
Trade, Transportation, & Utilities	5,711
Finance, Insurance & Real Estate	940
Education & Health Services	6,540
Leisure & Hospitality Services	3,521
Professional & Business Services	1,910
Other Services (includes information services)	1,213
Public Administration	1,394
Total	28,984

Source: Wisconsin Department of Workforce Development

Note: Employment represents the number of jobs provided by employers in the County and not the number of employed individuals in the County.

According to the 2006-2010 American Community Survey 5-Year Estimates, the 2010 median household income in the past 12 months (in 2010 inflation-adjusted dollars) in St. Croix County was \$67,446, significantly higher than the Wisconsin estimate of \$51,598 in 2010. However, per capita property taxes and housing values also tend to be higher than State of Wisconsin averages, influencing land-use and development patterns.

As will be discussed in the General Development Pattern section, the County experienced a twenty-one percent reduction in agricultural land from 1987 to 2010. Sustaining agricultural economic activity in the face of increasing agricultural land conversion to non-farm uses will be a challenge for these communities. Remaining farmers will always be at the mercy of the weather. The section on drought discusses the substantial economic risks and impacts of drought on the farming industry.

iv. Property Values

A disaster event can result in impacts to the natural environment, life and safety, the economy, structures, and personal property. This sub-section provides insight into the taxable improvements and personal property within St. Croix County.

According to the Wisconsin Department of Revenue, the aggregated assessed value for St. Croix County was over 8.0 billion.⁴ **Table 7** summarizes the 2010 Statement of Assessments for the County.

Table 7. St. Croix County Assessed Total Values— 2010
(not equalized)

Land	\$ 2,280,187,710
Improvements	\$ 5,626,955,750
Real Estate	\$ 7,907,143,460
Personal Prty	\$ 135,140,209
Aggregate	\$ 8,042,283,669

From 2003 to 2010, the County's total assessed value of improvements grew by almost \$3.1 billion (over 62% increase or +8.9% per year). **Table 8** further breaks down the 2010 assessed values by primary land uses:

Table 8. St. Croix County Assessed Value by Land Use – 2010

Use	Land Value	Improvements	Total
Residential	\$1,681,370,450	\$4,587,839,550	\$6,269,20,000
Commercial	307,595,000	736,851,700	1,044,446,700
Manufacturing	26,697,300	146,902,900	173,600,200
Agricultural	43,069,060	0	43,069,060
Undeveloped	59,056,000	0	59,056,000
Forest	81,681,400	0	81,681,400
Ag Forest	56,515,300	0	56,515,300
Other	24,203,200	155,361,600	179,564,800
Totals	\$2,280,187,710	\$5,626,955,750	\$7,907,143,460

source: Wisconsin Department of Revenue. 2010 Statement of Assessments.

Not included in the above values are tax-exempt properties. St. Croix County has over 16,000 acres of County, State, and Federal public resource lands, mostly forested, which are not included in the above figures. Governmental facilities and educational institutions constitute the largest portion of those existing improvements not included in Tables 7 and 8, though other facilities on tax-exempt lands owned by non-profit institutions (e.g., churches) are also not included.

⁴ Wisconsin Department of Revenue, Bureau of Equalization. 2010 Statement of Assessments. Unequalized assessed values are used to best represent the actual value of improvements. Not all assessed values were available for all categories.

v. Implications

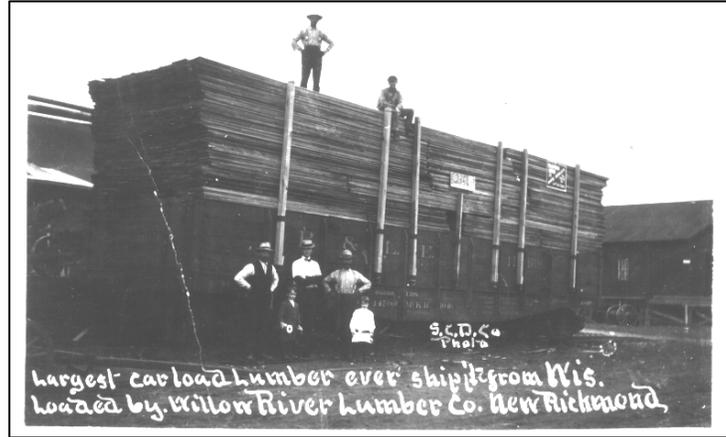
The following are implications of St. Croix County population, housing, economic and property value trends for emergency services and hazard mitigation:

1. Increases in population (and related housing and other development), also increases the vulnerabilities to hazard risks.
2. Increases in population and housing also results in increasing demand for emergency services, which is a special challenge during current governmental budgetary conditions.
3. With the largest percentages of growth occurring in rural areas, costs to provide services and emergency response times increase. In addition, communications and mitigating potential impacts are often more challenging (e.g., warning systems, public storm shelters).
4. The in-migration of new residents from outside the County may have differing expectations of emergency service levels, may not be aware of local emergency procedures or contacts, and may not have knowledge of local hazard risks or event history.
5. The County's aging population poses unique challenges for emergency preparedness and response services, such as sheltering-in-place and evacuation strategies. Large numbers of seniors reside in rural areas which may need special attention during a hazard event (e.g., transportation for dialysis during a winter storm, access to medicine).
6. There is significant geographic variability in the County's population and development trends. Emergency service's needs, mitigation priorities, and local resources will vary by community and area.
7. In some areas, there have been significant amounts of new slab-on-grade residential construction during the past decade, especially for duplexes and multi-family units. These housing units may not have access to a safe room or storm shelter. In contrast, there has been very little new mobile home development.
8. The long-term impacts of the Stillwater bridge replacement are unknown but the new bridge is likely to further increase traffic and economic exchange and development in the northern part of County as well as tourism. An increase of visitors to the County also increases the vulnerabilities to hazard risks.
9. St. Croix County has over \$5.6 billion improvements and over \$135 million of personal property within the County, not including tax-exempt properties. A disaster event could result in significant impacts to these structures and personal property.

D. GENERAL DEVELOPMENT PATTERN

St. Croix County is located in the Minneapolis-St. Paul Metropolitan Statistical Areas (MSA). The Census Bureau defines a Metropolitan Statistical Area (MSA) as a county or counties with a central city of at least 50,000 people, a total population over 100,000 people, and significant social and economic ties which exist between the central city and any outlying counties that are included. The County's location within this MSA, combined with its proximity to highway and rail arterials have greatly influenced the County's general development pattern.

The current land use in St. Croix County is historically linked to the use of the region's rivers and streams, as well as railroads, for transportation during its initial settlement. Early development primarily revolved around the fur trade and lumber industry, with villages and cities originally most often forming near the sites of sawmills and the rivers used for the transportation of furs and cut timber. Prior to the formation of the Minnesota territory in 1849, Hudson appeared on the verge of outstripping Minneapolis/St. Paul as a regional center of commerce due to Hudson's better river navigation at that time. In time, rail systems were developed which connected many of the villages and small hamlets in the County, improving the movement of goods and people for those communities which did not have river access.

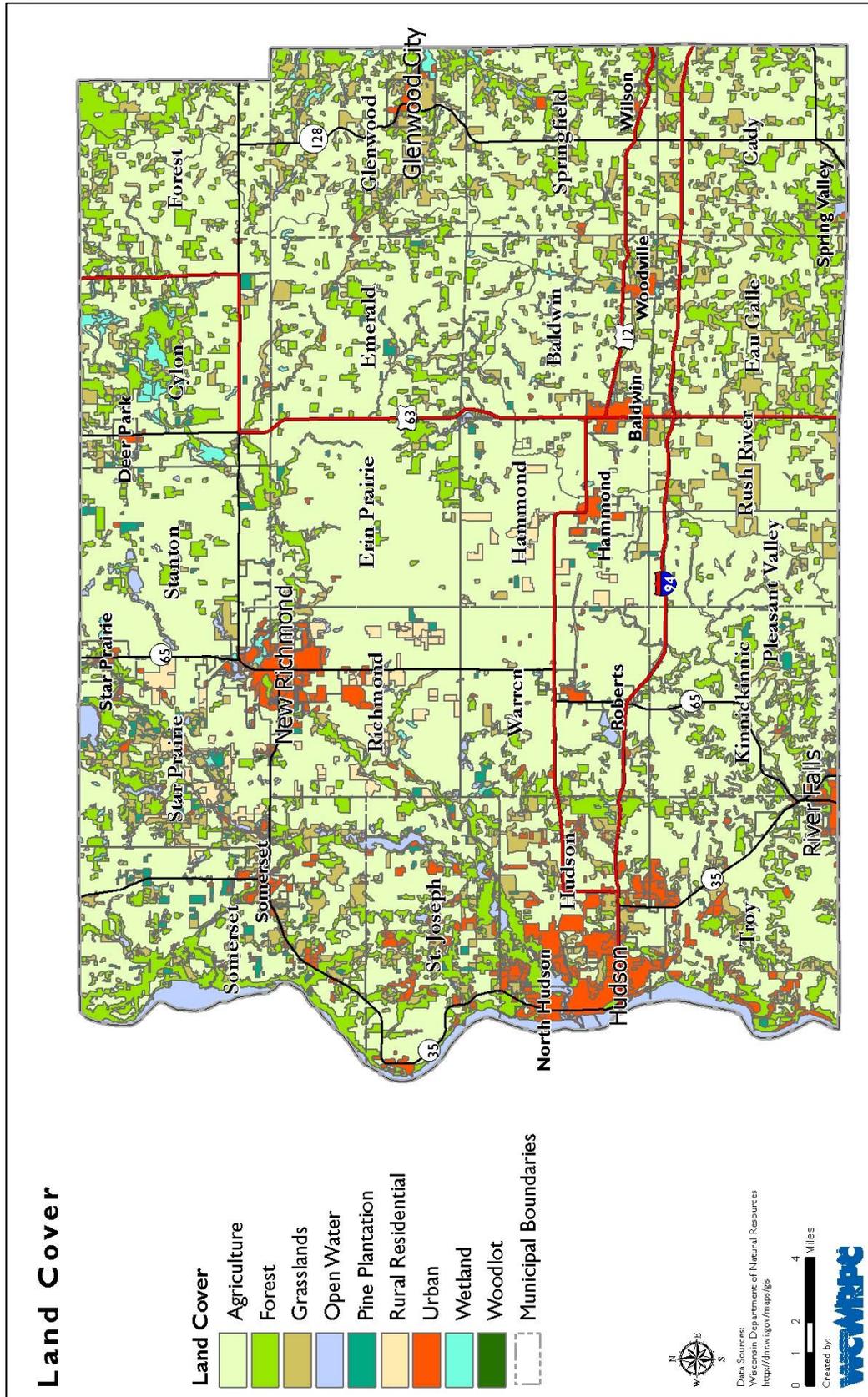


During the late 1880s and 1890s, as the lumber boom subsided, agriculture began to increase in importance. Immigrants and settlers began to acquire property in cut-over areas and made productive use of the fertile soils. By 1900, agriculture was the basic industry of St. Croix County, with most cities and villages becoming farm trade centers with creameries, flour mills, and other related services. The tourist trade in St. Croix County also began to grow in the late 19th and early 20th Centuries, as small resorts began to be developed along lakeshores for boating, fishing, and related recreation. This trend of shoreland development for recreational or seasonal use would continue until today.

In the last half of the 20th Century, agriculture began to decline as the primary economic activity in the County, while employment in manufacturing, services, retail trade, and commuter traffic to jobs outside the County increased. Concurrently, recreational use of the County's natural resources has continued to increase, offering both residents and visitors access to recreational trails, hunting lands, and surface waters for fishing, boating, and canoeing. And, based on anecdotal evidence, many of the shoreland homes once used as seasonal vacation cottages have now been remodeled, expanded, or replaced for year-round, permanent residence.

Figure 11 on the following page shows the general land cover in St. Croix County based on 1992-1993 satellite imagery. In 2010, the County had an overall population density of about 117 persons per square mile, much higher than the 87 persons per square mile for the State of Wisconsin. Based on State official population projections, the County's density is projected to increase to 190 persons per square mile by 2030, compared to 100 persons per square mile statewide. This growth and development inherently increases the vulnerabilities to hazard events and can impact natural drainage systems, resulting in increased stormwater runoff and flooding if not appropriately planned for.

Figure 11. St. Croix County Land Cover



The construction of the new U.S. Highway 64 bridge from Stillwater into the Town of St. Joseph, beginning in 2013, is expected to significantly contribute to new residential, commercial, and other development, in particular in the northwestern part of St. Croix County. Projecting this growth and managing its impacts is currently under analysis.

Residential Growth Trends

In 2010, the assessed residential acreage in the unincorporated areas of the County was 49,971 acres, or 94 percent of all assessed residential acreage in the County. From 1987 to 2010, assessed residential acreage in unincorporated areas increased by 130 percent (or by +28,282 acres).

The Towns of Hudson, Somerset, St. Joseph and Troy had significant residential acreage (7,947, 6,982, 6,520, and 5,531, respectively) in 2010. Indeed, these towns that border Minnesota account for 54 percent of the assessed residential acreage in St. Croix County as reflected in Figure 11. The Towns of Star Prairie (4,183 acres), Richmond (3,304 acres), Kinnickinnic (2,726), Warren (2,444) and Hammond (1,907) also had significant residential acreage in 2010. From 1987 to 2010 the Town of Hudson (4,327) had the greatest absolute increase in assessed residential acres, followed by the Towns of Somerset (4,180), St. Joseph (2,818), Richmond (2,526), Troy (2,517), and Star Prairie (2,475).

The Town of Emerald had the greatest increase (419 percent) of assessed residential acreage between 1987 and 2010, followed by the Towns of Hammond (342 percent), Richmond (367 percent), and Pleasant Valley (312 percent). These communities have grown in residential acreage at an average rate of just over 15 percent per year since 1987. Other towns that have at least tripled their residential acreage between 1987 and 2010 are Glenwood (274 percent) and Springfield (248 percent), and the Town of Kinnickinnic (200 percent). Other towns that have at least doubled their residential acreage during the same period are Erin Prairie (179 percent), Warren (167 percent), Star Prairie (145 percent), Rush River (138 percent), Forest (135 percent), Somerset (122 percent), Hudson (120 percent) and Cylon (120 percent); and the Town of Baldwin nearly has (97 percent).

The cities and villages in St. Croix County also saw dramatic growth in residential land. While the City of Glenwood City saw a twelvefold increase in assessed residential acreage between 1987 and 2010, the Village of Woodville (315 percent) more than quadrupled, and the Villages of Somerset (278 percent), Wilson (272 percent), Baldwin (252 percent), and North Hudson (244 percent) at least tripled theirs. The other cities and villages experienced modest increases in residential land or had reporting discrepancies during the period. There were notable gains for many incorporated communities between 1997 and 2010 that were reported.

Many of these towns experiencing high rates of residential growth have significant seasonal and year-round development on lakes/rivers or near natural areas. Such development has potential implications for hazard risks and emergency management (e.g., wildfire, flooding, power loss in wooded areas, access to structures for emergency vehicles, response times).

The recent national recession and housing market woes were also experienced in St. Croix County and significantly slowed the rate of residential growth. According to the U.S. Census

Bureau, building permits in the County decreased from 1,182 units in 2004 to 158 units in 2011. Growth trends are expected to rebound as the economy improves as reflected in the previous population projections.

Commercial and Industrial Properties

While unincorporated communities in St. Croix County have more commercial acreage than incorporated communities, there is fourteen times as much commercial assessed value in the cities and villages than in the towns. This indicates that commercial activity in cities and villages is more intensive and includes commercial uses much larger in scale than in the towns. However, the scattered local-serving, resource-based, and agricultural-related commercial enterprises in the rural areas serve a useful purpose in those communities. Yet, cities and villages will continue to provide more regional shopping goods.

While there are significant industrial activities in unincorporated areas, such as light fabricating and non-metallic resources extraction, industrial activity will continue to largely occur in the cities and villages where urban services are available.

Agricultural, Forestry, and Resource Lands

The most prevalent land use in St. Croix County is agriculture, with forests becoming more predominant in northern portions of the County (see Figure 11). In fact, more than half of the assessed land in the County is considered agricultural. However, the County experienced a twenty-one percent reduction in agricultural land from 1987 to 2010. Sustaining agricultural economic activity in the face of increasing agricultural land conversion to non-farm uses will be a challenge for these communities.

Not all the land converted from agriculture is being developed. It is likely that some of these farmlands are being converted to forest and open space due to programs like the Conservation Reserve Program. However, while assessed forested land increased by 30.1 percent in the County between 1987 and 1997, it slowed with an increase of 5.7 percent between 1997 and 2010. Even so, St. Croix County had approximately 51,798 acres of assessed forest lands in 2010, which is about 13 percent of all assessed acreage in the County. Productive forest land will continue to be an important part of St. Croix County's landscape and economy, not only for forest products but also for recreational opportunities.

There are significant publically owned natural resource and park lands in St. Croix County which are not assessed for tax purposes and not included in the previous figures, such as the Federal lands as part of the St. Croix National Scenic Riverway and the St. Croix Wetland Management District. St. Croix County owns over 16,000 acres of County forest and parks. Seven towns in particular have significant concentrations of these public lands: Cylon, Somerset, Stanton, St. Joseph, Hudson, Warren, and Richmond.

E. CRITICAL FACILITIES & EMERGENCY SERVICES

For this hazard mitigation planning effort, a critical facility is defined as either:

- (1) a facility in either the public or private sector that provides essential products or services to the general public, is otherwise necessary to preserve the welfare and quality of life in St. Croix County, or fulfills important public safety, emergency response and/or disaster recovery functions; or,
- (2) a high potential loss facility (e.g., nuclear plant, military installation, extreme hazardous materials plant) with possible substantial secondary impacts resulting from a hazards event. No high potential loss facilities were identified in St. Croix County.

The St. Croix County has been developing a G.I.S. geo-database of the critical facilities in the County. While substantial additions were made to this database during this planning effort, not all facilities are yet mapped. The primary critical facilities, as mapped in **Figure 12** on the following page, include:

- government buildings (40+; not mapped)
- Pre-K through 12 schools (22 mapped, not including Amish schools)
- licensed child care centers (79 not mapped)
- hospitals and primary clinics (3 hospitals mapped; 6 primary clinics unmapped)
- radio and cell towers (not mapped)
- law enforcement (17), fire (26), EMS/ambulance (19) and EOCs (2) (64 mapped)
- prisons and correctional facilities (3)
- long-term care facilities (nine nursing homes & 50 other assisted living facilities; not mapped)
- high voltage transmission lines, substations, and other regional utility lines (unmapped)
- community drinking water systems (12 wells mapped)
- solid waste facilities (9 mapped)

Not surprisingly, higher concentrations of facilities are located in the cities and villages. Some facilities, such as transmission lines and substations, were not mapped here for security reasons. Facilities with large amounts of hazardous materials, transportation systems, electric providers, and dams can also be considered critical facilities, but are discussed in greater detail within other sections of this plan. Additional information on many of the utilities and community facilities in St. Croix County can be found in the *St. Croix County Conditions and Trends Report* compiled by WCWRPC in November 2008.

The risk and vulnerability assessment (**Section III.B.**) further analyzes these critical facilities to determine potential impacts by a hazard event. For reference, the boundaries for Fire and Emergency Medical Services within St. Croix County are shown in **Figure 13**.

Figure 12. St. Croix County Critical Facilities

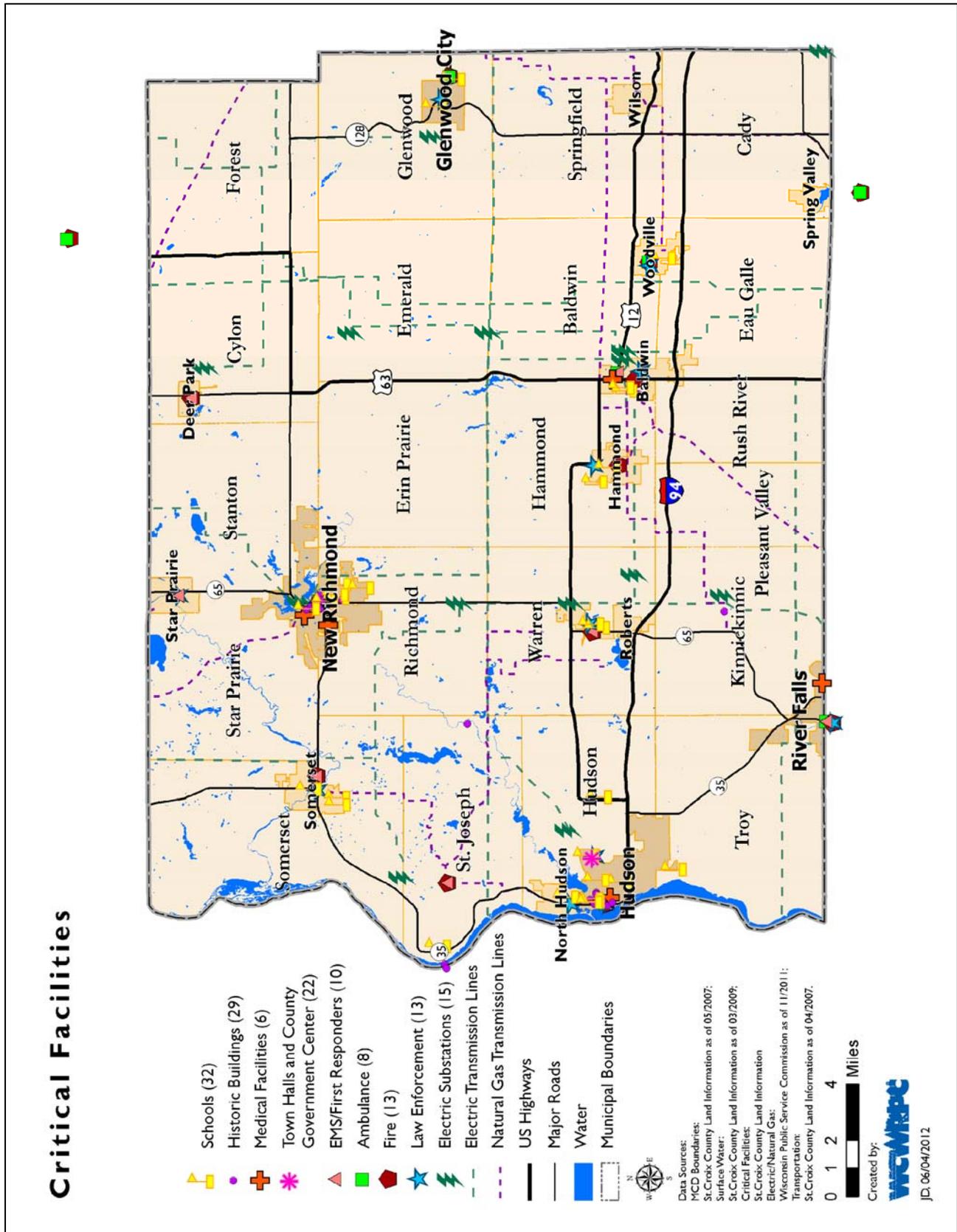
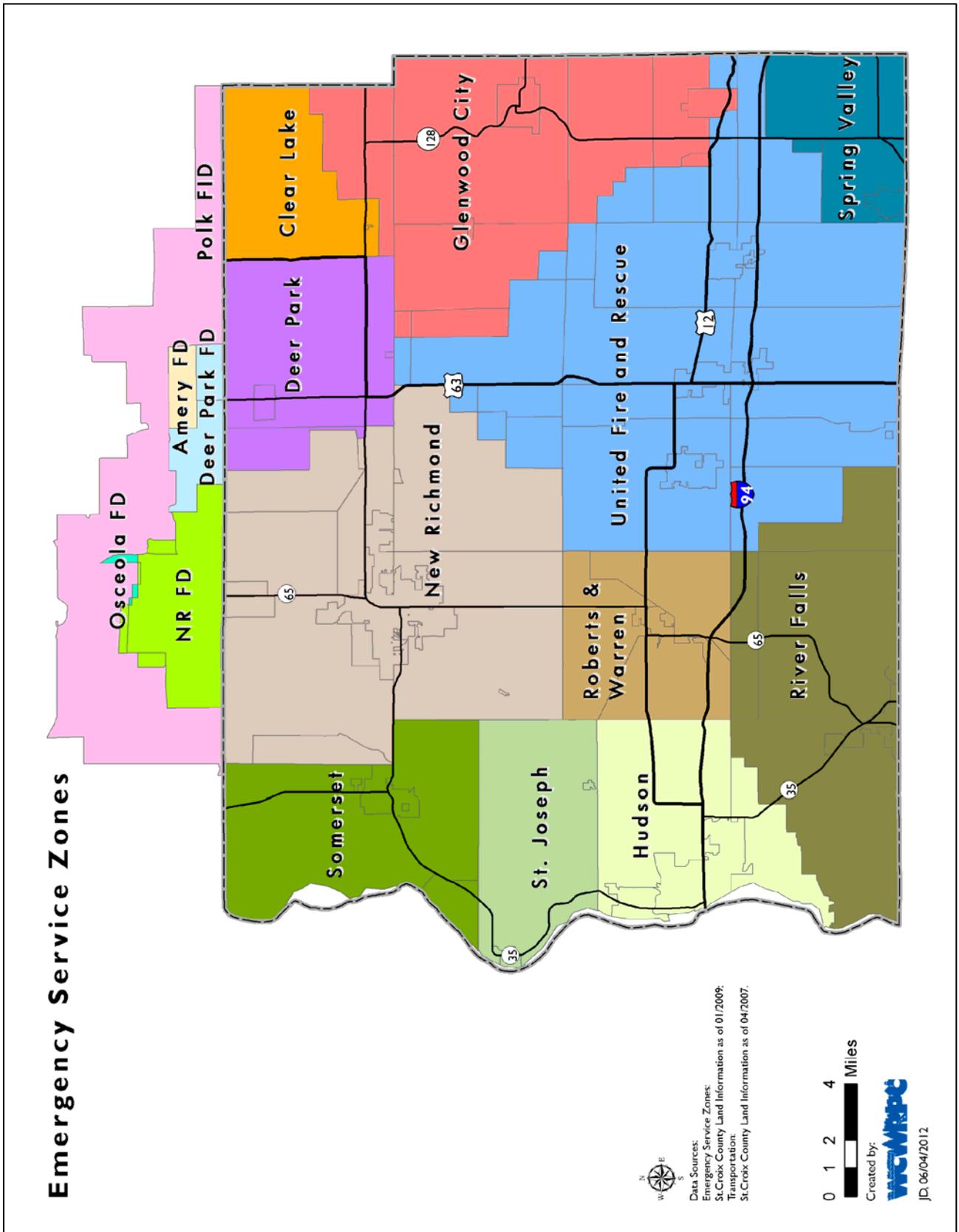


Figure 13. St. Croix County Fire and EMS Service Areas



F. HAZARDOUS MATERIAL STORAGE AND USE

Hazardous materials can present special risks to humans and the environment at the time of disaster, as well as necessitate special precautions and resources for post-disaster clean-up. As of Spring 2012, there were 87 Tier Two Reporting facilities and 29 active EHS Planning facilities located within St. Croix County. A Tier Two facility, by law (SARA Title III), is required to prepare or have available a Material Safety Data Sheet (MSDS) for a hazardous chemical present at the facility and must submit annual reports to WEM, St. Croix County Local Emergency Planning Committee (LEPC), and the local fire department. EHS (Extremely Hazardous Substances) facilities store and/or use one of over 300 chemicals with extremely toxic properties, and must also maintain the MSDS and prepare annual reports. EHS Planning facilities have extremely hazardous substances in such quantity (thresholds vary by chemical type) that an emergency plan must be prepared by the owner/operator to WEM and the LEPC.

The majority of these facilities are located within incorporated areas, with the largest concentration within the City of Hudson. For security reasons, the names, addresses, and types of chemicals at each of these facilities are not included within this report, but are on file at the St. Croix County Emergency Support Services Department for reference as needed. During steering committee meetings and the key informant interview process, no unique hazard vulnerabilities were identified for any of the Tier Two or EHS facilities.

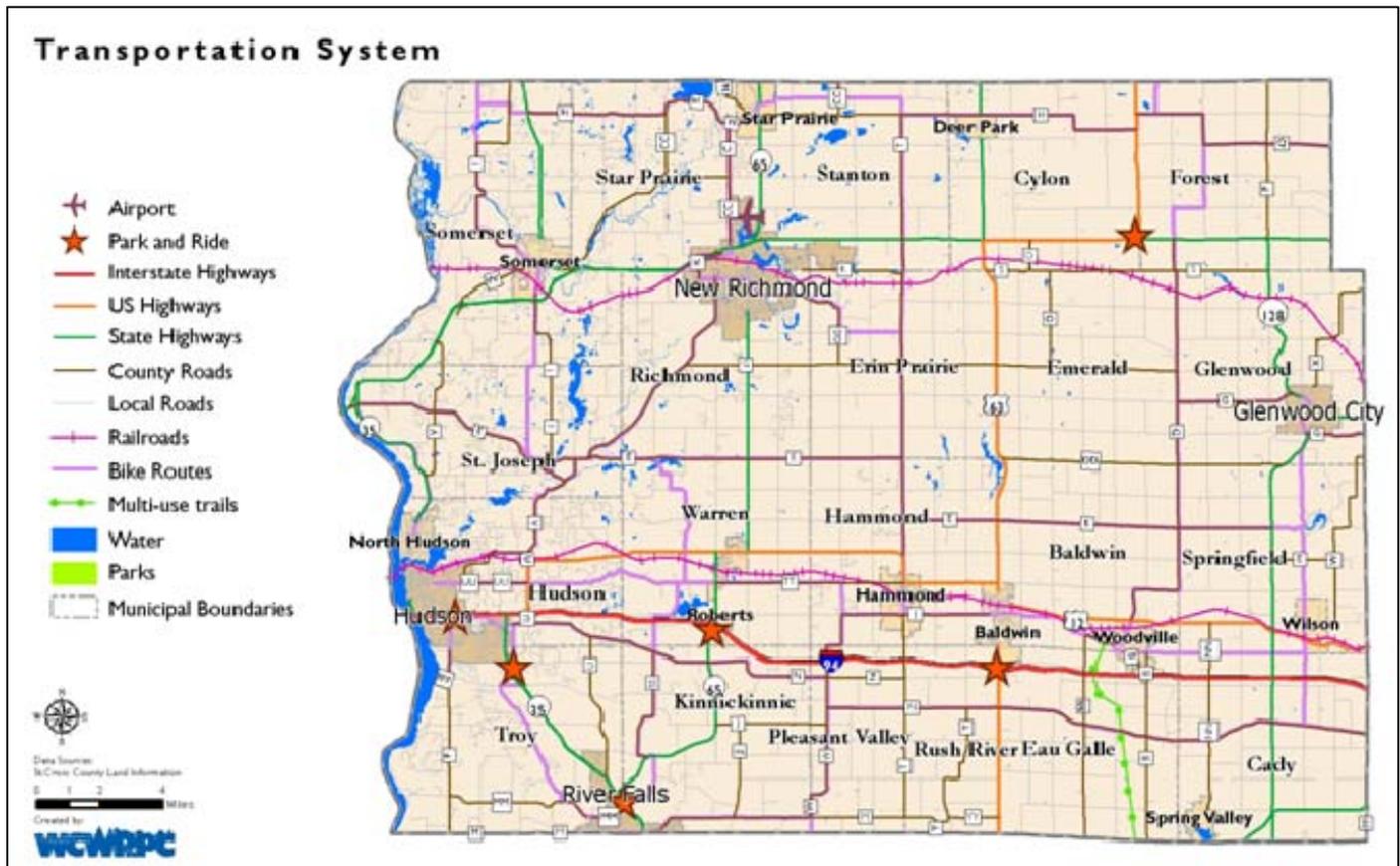
G. TRANSPORTATION SYSTEMS

Providing an uninterrupted transportation network is critical to St. Croix County given that residents often travel significant distances for services, critical facilities, and employment. The highway system serving St. Croix County links residents and businesses to the employment centers and services in Hudson, River Falls, New Richmond, and other area communities. In 2000, 44 percent of employed residents commuted to Minnesota with most going to the counties of Washington, Ramsey, and Hennepin. Increasing commuter traffic is expected to continue to rise and significantly influence growth and development in the County.

St. Croix County is directly on the Interstate 94 corridor, the principal arterial between Minneapolis-St. Paul and destinations to the east, such as Madison, Milwaukee and Chicago. Traffic on the Eau Claire-Hudson portion of the Interstate which runs through St. Croix County has been growing significantly. This stretch of Interstate 94 experiences traffic volumes of 40,000 to 80,000 vehicles a day and is the second most-traveled segment of interstate highway in the State of Wisconsin. By 2020, average daily traffic volumes at the I-94 bridge over the St. Croix River are projected to exceed 85,000 vehicles per day.

The County is also serviced by U.S. Highway 12, U.S. Highway 63, and seven State highways—STH 29, STH 35, STH 46, STH 64, STH 65, STH 128, and STH 170. These transportation routes and other transportation systems are shown on **Figure 14**.

Figure 14. St. Croix County Transportation System



source: St. Croix County Land Information

In all, the County is served by 1,925 miles of centerline roads under federal, state, county, and local municipal jurisdiction as of January 1, 2009, though these numbers are constantly changing due to growth and jurisdictional transfers. The road mileage in St. Croix County by ownership jurisdiction is summarized in **Table 9**.

**Table 9. Road Mileage (Centerline) by Jurisdiction – Jan 1, 2009
St. Croix County**

Jurisdiction	Miles	Percent of Total
Federal/State	204	10.6%
County	338	17.6%
Local Roads	1,383	71.8%
TOTAL	1,925	100.0%

Source: WisDOT, Wisconsin Information System for Local Roads, January 1, 2009.

The New Richmond Municipal Airport is the only public airport located in St. Croix County and is the fifth largest municipal airport in Wisconsin with two runways and averaging 122 flights per day. In the past 30 years, there have been four major crashes at the airport resulting in seven deaths, with one of the crashes occurring in a nearby residential neighborhood. A smaller private

airstrip located northwest of Baldwin is open from May through November, averages 38 flights per week, and is used heavily by parachutists during the summer months. The nearby Lake Elmo airport (approximately 10 miles from Hudson in Minnesota) or the Minneapolis-St. Paul International Airport provides the primary scheduled passenger and commercial air services for St. Croix County. The approximate locations of the New Richmond and Baldwin airports/airstrips are shown on Figure 14. The critical facilities section previously identified eight other smaller airstrips located in the County.

Two railroad lines also serve the County as shown on Figure 14. The Union Pacific (UP) Railroad operates the former Chicago-Northwestern mainline between Minneapolis-St. Paul and Chicago. This line serves the St. Croix County communities of Hudson, Roberts, Baldwin, Hammond, Woodville, and Wilson. The Wisconsin Central Limited (WCL) line to the north provides shipper connections in Minnesota for the communities of Somerset and New Richmond. No passenger rail service is currently available.

Other than for recreational purposes (e.g., hiking, biking, canoeing) or short commutes, other transportation systems are limited. A long-range bicycle plan for the County has been adopted which promotes the development of the bikeway system. Shared-ride taxi services are available within a five-mile radius of River Falls and in the New Richmond area. Special transportation services for the elderly and handicapped are coordinated through the St. Croix County Aging and Disability Resource Center. The demand for paratransit and public transit is expected to continue to grow as elderly and commuter populations increase.

The most significant transportation project receiving recent attention is the construction of a new Highway 63 bridge from Stillwater, Minnesota, to unincorporated Houlton, Wisconsin, about 8 miles north of Hudson. Construction of the new bridge is expected to begin in 2013 and take about three years to complete.⁵ The new bridge will replace the current Stillwater Lift Bridge managed by the Minnesota Department of Transportation. The current lift bridge serves about 17,000 vehicle trips in an average day and has been closed on numerous occasions due to flooding and ice damming.

⁵ <http://www.dot.state.mn.us/stcroixcrossing/>

H. HISTORIC PROPERTIES AND DISTRICTS

Historic structures, sites, and districts are sometimes targeted for hazard mitigation strategies due to their unique, often irreplaceable, social value. According to the National Register of Historic Places⁶, St. Croix County has a total of 30 historic properties and four historic districts, which have received Federal or State historic landmark designation. Fifteen of the 34 historic structures and the historic districts are located within the City of Hudson. **Table 10** lists the formally recognized locations of the places of historic significance within St. Croix County.

Table 10. St. Croix County Historic Properties

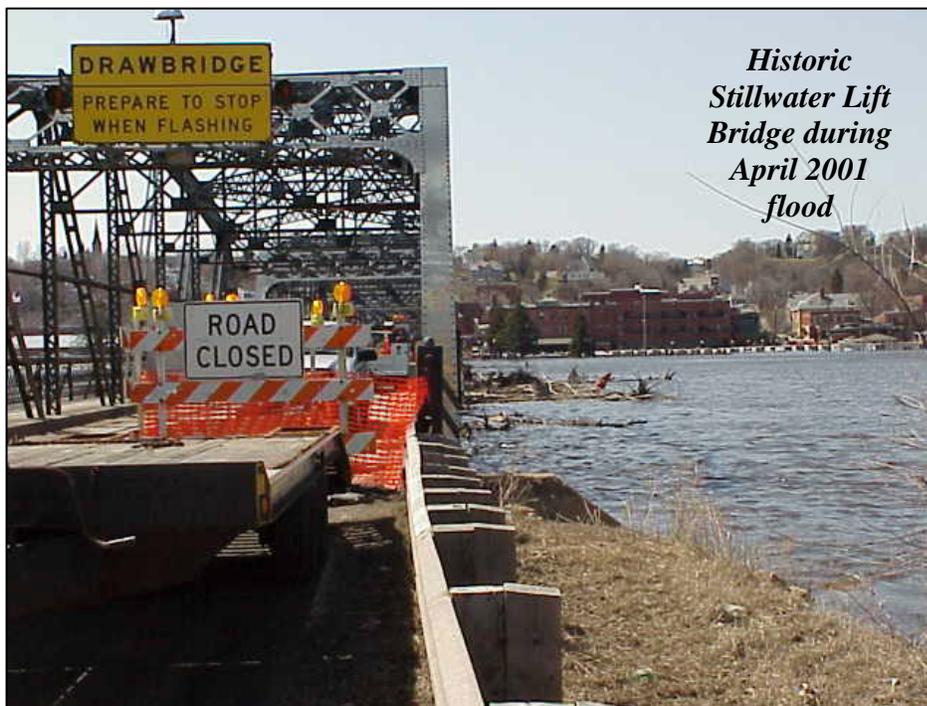
#	Historic Site	Address	City	Listed
1	Bell, Marcus Sears, Farm	1100 Heritage Dr.	New Richmond	1988
2	Bernd, William J., House	210 2 nd St.	New Richmond	1988
3	Bernd, William J., House	143 Arch Av.	New Richmond	1988
4	Chicago, St. Paul, Minneapolis & Omaha Railroad Car Shop Historic District	Bounded by: Gallahad Rd., Sommers, 4 th , & St. Croix streets	North Hudson	1984
5	Darling, Frederick L., House	617 3 rd St.	Hudson	1984
6	Dwelley, William, House	1002 4 th St.	Hudson	1984
7	Epley, Dr. Frank W., Office	137 3 rd St.	New Richmond	1988
8	First English Lutheran Church	354 3 rd St.	New Richmond	1988
9	Glover, Ezra, Jr., House	415 2 nd St.	New Richmond	1988
10	Hudson Public Library	304 Locust St	Hudson	1984
11	Humphrey, Herman L., House	803 Orange St.	Hudson	1984
12	Johnson, August, House	427 St. Croix St.	Hudson	1984
13	Johnson, Dr. Samuel C., House	405 Locust St.	Hudson	1984
14	Kell, William H., House	215 Green Ave.	New Richmond	1988
15	Kinnickinnic Church	WI J, jct. with WI JJ	Kinnickinnic	2000
16	Kriesel, Louis C. & Augusta, Farmstead	132 State Trunk Hwy 35/64	St. Joseph	2009
17	Lewis Farmhouse	Farm Dr.	Boardman	1982
18	Lewis-Williams House	101 3 rd St.	Hudson	1985
19	Merritt, Samuel T., House	904 7 th St.	Hudson	1984
20	Mielke, Joseph, House	326 Second St. W	New Richmond	1988
21	Moffat, John S., House	1004 3 rd St	Hudson	1974
22	New Richmond News Building	145 2 nd St.	New Richmond	1988
23	New Richmond West Side Historic District	Bounded by: Willow, Minnesota, W. 2 nd , S. Washington	New Richmond	1988
24	Opera Hall Block	516 2 nd St.	Hudson	1979
25	Phipps, William H., House	1005 3 rd St.	Hudson	1987
26	Second St. Commercial District	1 st , 2 nd , Walnut, & Locust	Hudson	1984

⁶ National Register of Historic Places database. <<http://nrhp.focus.nps.gov>>. November 22, 2011.

#	Historic Site	Address	City	Listed
27	Sixth St. Historic District	6 th St. between Myrtle & Vine St.	Hudson	1984
28	Soo Line Depot	120 High St.	New Richmond	1988
29	Soo Line High Bridge	Restricted	Somerset	1977
30	St. Croix County Courthouse	904 3 rd St.	Hudson	1982
31	Stillwater Bridge*	MN36/WI64 over St. Croix River	Houlton	1989
32	Thelen, John Nicholas & Hermina, House	1383 & 1405 Thelen Farm Trail	St. Joseph	2009
33	Thompson, Erick J., House	350 2 nd St.	New Richmond	1988
34	Williams, T.E., Block**	321 2 nd St.	Hudson	2009

source: National Register of Historic Places < <http://www.nationalregisterofhistoricplaces.com> >. November 22, 2011
 *National Register listing only. **State Register listing only.

The list includes four historic districts—2 in Hudson, 1 in New Richmond, 1 in North Hudson—which encompass numerous buildings. Two of the structures are bridges which could be particularly vulnerable to flooding and ice damming.



*Historic
Stillwater Lift
Bridge during
April 2001
flood*

By 2016, it is planned that travel on the Stillwater Lift Bridge will be limited to pedestrian and bicycle traffic once the four-lane, deck-tiered, steel arch bridge is constructed to the south. Though floods have closed the Lift Bridge in the past, the new bridge should not be prone to closure due to flooding, largely mitigating the impacts of flooding on this important

river crossing for vehicular traffic. However, floods and ice dams will likely continue to threaten the historic Lift Bridge.

Most of these historic buildings are very well constructed, and they continue to serve as an important vestige of St. Croix County's past. As will be discussed later in the hazard vulnerability assessment of this plan, these structures are generally not any more vulnerable to hazard risks (e.g., tornado, winter storms) than more recent construction.

The above list is not inclusive of all sites of historic and cultural significance, however. Additional structures undoubtedly qualify as National Register candidates. The Wisconsin Architecture & History Inventory (AHI) identifies over 1,500 buildings, structures, or objects in St. Croix County which illustrate Wisconsin's unique history. A detailed assessment of the vulnerability of each of these sites to hazard events is not currently available. Such sites are quite varied and include churches, cemeteries, homes, and barns, as well as archeological sites.

The historic properties of St. Croix County will be further considered during the vulnerability assessment of critical facilities as each hazard type is analyzed. Generally, the historic structures are very well constructed; and they continue to serve as an important vestige of St. Croix County's past.

SECTION III.

ASSESSMENT OF HAZARD CONDITIONS

In order to more effectively evaluate potential hazard mitigation alternatives and develop feasible strategies to address the risks associated with the identified hazards, the County must:

- identify the hazards which are thought to pose the greatest risk to the residents of the County;
- profile the extent and severity of past hazard events that have affected the County; and
- assess the vulnerability of the community to the risk of future hazard events.

A. HAZARD IDENTIFICATION

Although St. Croix County could potentially be at risk from a number of different hazards, this plan will attempt to narrow the scope of the hazards that will be addressed to those hazards that pose the most substantial risks.

i. Hazard Events Historical Summary

Since 1953, there have been six Presidential Declarations for a Major Disaster which included St. Croix County:

April 1965 – Tornados, severe storms, and flooding result in a declaration of 20 counties.

May 1969 – Spring flooding due to one of the greatest snow melts of the past century impacted large areas of Wisconsin.

July 1993 – Flooding and severe storms in Summer of 1993 resulted in a declaration for 47 counties. Statewide damages exceeded \$740 million.

July 1998 – Severe storms, straight-line winds, tornados, heavy rain and flooding from June 18 to June 30, resulted in a declaration of 14 counties.

April-July 2001 – Heavy snow cover rapidly melted in spring resulting in river flooding with additional flooding and other damage from severe thunderstorms, high winds, and tornados in late spring and early summer. Some counties experienced flash flooding in early August. A total of 32 counties were included in the declaration.

September 2002 – Severe storms, tornados and flooding occurred from September 2 to September 6 affecting 19 counties which resulted in a declaration.

While the above six catastrophic events were of sufficient severity to warrant major Federal assistance, there has also been one Presidential Emergency Declaration encompassing St. Croix County for the 1976 drought. During an emergency declaration, Federal assistance will supplement State and local efforts.

Yet, relying on disaster declarations as a measure of risk can be misleading. While a large amount of damage occurs during a declared disaster, the declaration area typically involves multiple counties and a sizable percentage of the damage can be limited to a certain area. For instance, the September 2002 disaster noted above included the Ladysmith tornado.

To assist in determining what hazards should be evaluated in the plan, National Climatic Data Center (NCDC) information from the National Weather Service (NWS) was used. This data describes past, reported weather events and the resulting deaths, injuries, and damages associated with each of these events. Data for a wide variety of events has been maintained, while some older data is only available for tornado and thunderstorm-related events.



During the period from January 1, 1993, through June 2010, St. Croix County has experienced 247 weather hazard events reported to the National Climatic Data Center, shown in **Table 11**.

**Table 11. Natural Hazard Events – 1993 through June 2011
St. Croix County (NCDC data only)**

Event	Number of Occurrences	Reports/ Year	Deaths	Injuries	Property Damage	Crop Damage
Extreme Heat	9	0.5	66	0	\$0	\$0
Drought	<i>no NOAA-NCDC reports; discussed later in this section</i>					
Flooding	10	0.6	0	0	\$13,054,675	\$0
Tornado/Funnel Cloud	14/10	0.8/0.6	0	0	\$6,122,956	\$76,743
Thunderstorm/Hail	104/87	5.8/4.8	1	8	\$110,538,387	\$10,990,323
Wildfire/Forest Fire	1	>0.1	0	0	\$768,094	\$768,094
Winter Storm/Extreme Cold	54/8	3.0/0.4	1	0	\$519,740	\$0
TOTAL	237	16.6	68	8	\$131,003,852	\$11,835,160

Sources: National Climatic Data Center (NCDC) <<http://www4.ncdc.noaa.gov/cgi-win/>>; Reports and data may be regional in scope for some events; some events/storms may have multiple reports. Damage estimates adjusted to 2012 dollars based on Consumer Price Index by U.S. Bureau of Labor Statistics

Table 11 shows that thunderstorms and winter storms are the most frequently occurring natural hazard events. The most damaging events since 1993, in terms of property, have also been from thunderstorm events, in particular from high winds.

However, looking farther back into history, tornados appear to have been the most devastating in terms damage and deaths since 1950 based on all available NCDC data. The estimated damage from all St. Croix County tornados since 1950 is nearly 155 million in 2010 dollars.

It should be noted that some event types in Table 11 are often related, such as a thunderstorm event could include high winds, hail, and flooding. Further, a single storm event can trigger multiple event reports for different communities within the County. Other times, an event (e.g., winter storm, thunderstorm, hail, tornado) may be regional in nature, so the damages may be reported for multiple counties.

The actual number of events and their impacts are likely significantly higher for many of the above hazards. For instance, a lightning event may not be reported unless there is related damage. And damages and expenses related to a natural hazard event often go unreported or are under-reported, in particular for smaller events where a disaster declaration has not occurred and crop damage which is fully covered by insurance. This data and its limitations are discussed in more detail for each hazard later in this document.

ii. Hazard Risk Assessment Surveys

At the November 11, 2006, Steering Committee meeting, the historical summary of hazard events was discussed with the members of the St. Croix County Emergency Management and Communications Committee. Committee members were then asked to participate in a hazard risk assessment survey. This survey was used to help prioritize the hazard risks and vulnerabilities of St. Croix County.

Identification of the hazards for inclusion in the survey was based on the hazards identified in the *Resource Guide to All Hazards Mitigation Planning in Wisconsin* prepared by WEM. This list was further amended based on the previous review of historical data for St. Croix County and discussion with the Steering Committee.

For each hazard, each Committee member was asked to assign a risk rating of 0 to 5 (0-none, 1-low/minimal, 3-moderate/substantial, 5-very high/extreme) to reflect their opinion of which hazards pose the greatest risks and vulnerabilities. For this survey and Plan, **risk** is defined as the probability and frequency of occurrence in the future. **Vulnerability** is defined as the seriousness and extent of an event's impacts, should the event occur. A composite overall average risk rating for each hazard was then calculated by totaling the average risk rating from each respondent and dividing by the total number of respondents.

Shown in **Table 12** is the summary of average risk and vulnerability ratings for each of the above hazards according to the Steering Committee. The results of the 2006 survey were used to help guide which hazards should be fully analyzed as part of the 2008 plan.

**Table 12. Overall Risk & Vulnerability Survey (2006)
St. Croix County**

Hazard	Overall Avg. Risk Rating	Overall Avg. Vulnerability Rating	Combined Score
Tornados & High Winds	3.67	4.00	7.67
Ice Storms & Sleet	3.78	3.67	7.45
Pandemic Flu	2.89	4.11	7.00
Heavy Snow & Blizzards	3.89	3.00	6.89
Hazardous Materials Spills	3.11	3.67	6.78
Thunderstorms, Hail, etc	3.56	3.11	6.67
Extreme Cold	3.67	2.89	6.56
Groundwater Contamination	2.78	3.44	6.22
Drought	2.78	3.11	5.89
River and Overbank Flooding	2.67	2.78	5.45
Nuclear Accident (IPZ)	1.56	3.89	5.45
Terrorism, Domestic	2.00	3.00	5.00
Stormwater and Overland Flooding	2.33	2.56	4.89
Extreme Heat	2.33	2.44	4.77
Terrorism, International	2.00	2.67	4.67
Dam Failure Flooding	1.67	3.00	4.67
Forest or Wild Fire	1.56	2.22	3.78
Landslides and Land Subsidence	1.22	1.78	3.00
Earthquakes	0.78	1.33	2.11

As part of this plan update in December 2011, the current St. Croix County Local Emergency Planning Committee reviewed the 2006 hazard risk assessment results and decided to update this survey. The updated survey process used an identical rating approach to the 2006 survey. A number of terrorism-related hazards were added to the list of hazards included in the survey.

The results of the updated 2012 risk and vulnerability survey are provided in **Table 13**. While the rankings are somewhat subjective, the survey does provide important insight into the relative disaster risks and vulnerabilities for St. Croix County. The largest relative change in comparing the 2006 and 2012 survey was the relative decrease for pandemic flu, in particular for its vulnerability rating by the Committee members. In 2006, Asian Bird Flu (H5N1) was receiving significant media coverage and a variety of related preparedness efforts were underway.

**Table 13. Overall Risk & Vulnerability Survey (2012)
St. Croix County**

Hazard	Risk	Vulnerability	Combined Score
Tornadoes and High Winds	3.25	4.08	7.33
Ice Storms and Sleet	3.75	3.17	6.92
Heavy Snow Storm and Blizzards	3.83	2.92	6.75
Thunderstorms, Lightning, Hail, etc	3.83	2.58	6.41
Extreme Cold	3.50	2.42	5.92
Hazardous Materials Spills	2.58	3.33	5.91
Groundwater Contamination	2.42	3.25	5.67
Long-Term Power Outage	2.17	3.25	5.42
Terrorism, Domestic (school related)	2.17	3.17	5.34
Extreme Heat	2.67	2.58	5.25
Nuclear Accident (IPZ)	1.50	3.58	5.08
Riverine or Overbank Flooding	2.25	2.67	4.92
Overland Flooding	2.17	2.75	4.92
Drought	2.42	2.25	4.67
Pandemic Flu	1.83	2.75	4.58
Terrorism, Domestic (non-school related)	1.75	2.67	4.42
Forest or Wild Fire	1.83	2.25	4.08
Dam Failure Flooding	1.42	2.42	3.84
Terrorism, International	1.00	2.08	3.08
Landslides or Land Subsidence	1.00	1.42	2.42
Earthquakes	0.33	1.92	2.25

iii. St. Croix County Hazards Prioritization

The purpose of reviewing the previous event summary and survey information is to identify those hazards posing the greatest threat to residents and property.

Based on the survey results, it was determined to add extreme heat and school-based terrorism to those hazards receiving a full assessment. Like in the 2008 plan, stormwater and overland flooding and dam failure flooding were integrated into a general flooding category which will be fully assessed.

Due to its multi-hazard nature, the Committee agreed to include long-term power outage as a brief, stand-alone section. After discussion, the Committee felt it was appropriate that the hazardous materials section focus on spill and accidental releases from point sources, while groundwater contamination is generally outside the plan's scope. After the survey's completion, the Committee requested that a brief section on cyberattack be added to the plan, with a focus on local governments and critical infrastructure. Also, since school-based terrorism is rather broad and ambiguous, the analysis later defines and focuses upon targeted school violence.

After a review of available data and consideration of the relationships between many of these hazards, the following hazards were identified by the steering committee to be the focus of the plan assessment, goals, and strategies:

- long-term power outage (brief, multi-hazard section)
- cyberattack (brief section)
- tornados
- winter storms and extreme cold (includes heavy snow/blizzards, and ice storms)
- thunderstorms (includes high winds, lightning, and hail)
- hazardous materials spills
- targeted school violence
- extreme heat
- nuclear accident
- flooding (includes riverine, stormwater, and dam failure flooding)
- drought
- pandemic flu

Of the above hazards, flooding, hazardous materials, targeted school violence, nuclear accident, cyberattack, and long-term power loss sometimes have geographic areas or locations of higher risk, as will be identified later in this section. **Most of the hazards could occur anywhere in St. Croix County and have no definable risk area**, making an event difficult to predict. Certain areas or populations may also be more prone to the risks and vulnerabilities associated with power outages.

iv. Other Natural Hazards of No Significant Risk

Although there are other hazards that could potentially impact the County, there are very few or no records of the following events occurring in St. Croix County in the NOAA database. In order to meet the comprehensive requirements for developing an all hazard mitigation plan, these other natural hazards are identified and described below. It is important to note that these hazard events may still pose some threat to the community, but they were considered by the steering committee as either: having a minimal chance of occurring, posing a minimal widespread risk to the safety of residents or property, or only offering very limited mitigation options.

Landslides

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on a steep slope is the primary reason for a landslide, there can be other contributing factors. Erosion by surface waters or excess weight from rain, snow or man-made structures may stress weak slopes to failure. Slope material that becomes saturated with water may develop a debris flow or mudflow.

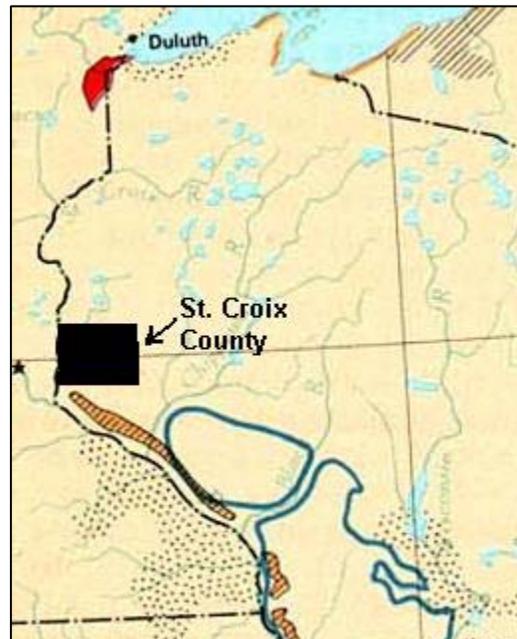
The USGS *Landslide Overview Map of the Conterminous United States*⁷ (excerpt for Wisconsin in **Figure 15**) identifies no large-scale landslide risks for the St. Croix County area.

According to the USGS topographic maps and U.S. Natural Resources Conservation Service soil maps for St. Croix County, there are 78,000 acres that potentially have a slope of 13 percent or greater representing 11.7 percent of the total St. Croix County land base. Of this, 13,815 acres (2.1% of St. Croix County) have slopes of 21 percent or greater. The majority of these steep slopes are located in the northern and western portions of the County. Additional localized and site-specific variations in topography and slope may exist. Past glacial activity has created some topography in St. Croix County that is scenic, but may also be sensitive to development in some areas.

While steeper areas exist, the area's soils pose more of a gradual erosion risk, rather than the sudden, large-scale movement of ground associated with landslide hazards. Stormwater runoff may create serious riverbank erosion and washouts concerns for some locations, which will be discussed in the flooding assessment. In comparison, the sudden, large-scale movement of ground which is characteristic of a landslide is not expected to occur in St. Croix County; and there are no records of large landslide events in the County.

Overall, the erosion which does occur has been largely mitigated through subdivision law, site plan review, forest management plans, agricultural practices, and erosion control plans for construction sites. However, during the planning process, some erosion problem areas associated with flooding or steep river banks were identified and will be discussed later in this report.

Figure 15. Landslide Hazards in Wisconsin



source: U.S. Geological Service. *Landslide Overview Map of the Conterminous United States*.

⁷ U.S. Geological Survey. *Landslide Overview Map of the Conterminous United States*. <http://landslides.usgs.gov/html_files/landslides/nationalmap/national.html>

Land Subsidence and Sinkholes

Land subsidence is an event in which a large area of the land surface collapses or settles. Common locations of subsidence are in areas having karst topography or in areas in which large quantities of groundwater have been withdrawn.

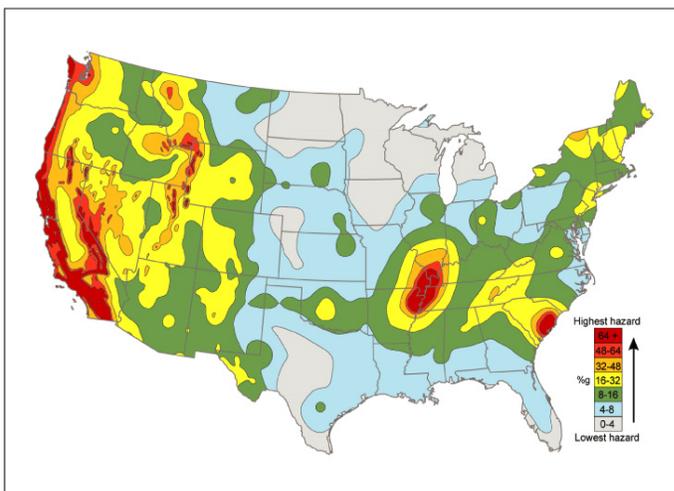
Closed depressions are common features in St. Croix County. They can be formed through karst topography which is particularly well developed in the eastern half of the County or through the kettle depressions remaining from glaciation which are not uncommon in the western and northwestern portions of the County. Karst development occurs from thick, soluble areas of underground limestone which dissolve over time, forming sinkholes. Kettles develop when large blocks of glacier ice are buried with glacial deposits and subsequently melt.

There are no records of substantial damage or injury from land subsidence within St. Croix County. The only damage event noted during the planning process was the reported opening of a sinkhole under a tractor during field work. However, closed depressions are considered environmentally sensitive features since the release of pollutants into or near a closed depression can reach groundwater immediately. As such, these closed depressions will be discussed further within the discussion of hazardous materials spills and groundwater contamination.

Earthquakes

According to the U.S. Geological Survey, there have been 19 earthquake events in Wisconsin, with none noted for west-central Wisconsin. Where readings are available, these events were relatively small, most being 3.0-3.8 on the Richter Scale in size and the largest being an intensity of 5, which may be strong enough to crack some plaster, but not cause serious damage. Due to the lack of recent events, some geologists question whether many of these events were true earthquakes, but rather quarry collapses, blasts, etc.

Figure 16. U.S. Geological Survey Earthquake Hazard-Shaking Map



source: U.S. Geological Survey. *Earthquake Hazard in the Heart of the Homeland*. <<http://pubs.usgs.gov/fs/fs-131-02/CUS hazard.html>>.

The nearest active earthquake fault outside of Wisconsin is the New Madrid Fault which has a seismic zone that stretches from northeast Arkansas to southern Illinois. As **Figure 16** shows, the St. Croix County area falls within the lowest earthquake hazard-shaking area, with the different colors representing the levels of horizontal shaking that have a 1-in-50 chance of being exceeded in a 50-year period.

Similarly, St. Croix County falls within a 0% g peak ground acceleration (PGA) zone as shown on the USGS PGA values map for the United States with a 10 percent chance of being exceeded over 50 years; St. Croix County is a

non-affected area.⁸

University of Wisconsin-River Falls students and geologists have studied an ancient major fault line which is located approximately 2 miles south of Hudson and extends north towards Willow River State Park and west towards Hastings, MN. Called the Hastings Fault, it has characteristics similar to the New Madrid Fault; but there has been no evidence of any motion on the Hastings Fault for the last 400 million years. While an earthquake along the Hastings Fault could be catastrophic, geologists estimate that no significant effects on this fault will likely occur within the next few millions years. As such, the earthquake threat to St. Croix County is considered very low.

Fog

Fog is low-level moisture that can reduce visibility. It can occur in isolated low-lying areas or be a widespread event that can cover several counties. In general, fog is often hazardous when the visibility is reduced to 1/4 mile or less. Thick fog reduces visibility, creating a hazard to motorists as well as to air traffic. Airports may close because of heavy fog. The intensity and duration of fog varies with the location and type of fog. Generally, strong winds tend to prevent fog formation. In St. Croix County, fog occurs infrequently and is typically a short-term weather event lasting only for portions of a day. The NCDC database has no dense fog event records which include St. Croix County.

Coastal Hazards (Hurricanes, Tsunamis, Tidalwaves, Waterspouts, etc.)

Coastal hazards can cause increases in tidal elevations (storm surges), high winds, and erosion caused by tropical cyclones (such as hurricanes) or the sudden displacement of water (such as tsunamis from earthquakes). St. Croix County is located in the upper Midwest, approximately 1,000 miles from the Atlantic Ocean, 1,200 miles from the Gulf of Mexico, and 2,000 miles from the Pacific Ocean. St. Croix County also has no very large inland lakes or seas within its boundaries. Such coastal hazards have no direct impact on St. Croix County, and only occasionally indirectly impact the County in the form of thunderstorms, which are discussed separately. There have been reported instances of waterspouts on Lake St. Croix, but these are not unique coastal hazards in the County, primarily being associated with tornados. For example, the 1899 New Richmond tornado was reported as a waterspout as it passed over Lake St. Croix.

Forest & Wild Fires

A wildfire is an uncontrollable fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed, spread quickly, and are usually signaled by dense smoke that may fill the area for miles around. Wildfires can be human-caused through arson, campfires, or other carelessness, or can be caused by natural events such as lightning. A wildfire occurring on forest or woodlands, typically outside the limits of incorporated villages and cities, is commonly referred to as a forest fire. Forest and wild fires can cause significant injury, death, damage to property, and loss of natural resources.

⁸ U.S. Geologic Service. Peak Acceleration (%g) with 10% Probability of Exceedance in 50 Years. map. <<http://geohazards.cr.usgs.gov/eq/pubmaps/US.pga.050.map.gif>> November 1996.

Land use, vegetation, amount of combustible materials present, and weather conditions (e.g., wind, low humidity, lack of precipitation) are the chief factors determining the number of fires and acres burned. Forest and wild fires are more likely when vegetation is dry from a winter with little snow cover, followed by a spring and summer with sparse rainfall. As development within forested areas increases, especially within pine plantation, so does the risk for forest fire.

There are no County Forest lands in St. Croix County and no large areas of pine forest. WISCLAND satellite data from 1992 can be used to generally classify vegetative land cover by canopy type. In 1992, approximately 19% of the County was in forest or forested wetlands. Over 94% of the forest land cover in St. Croix County was identified as being broad-leaved deciduous (e.g., aspen, oak, maple, birch), which has a relatively low vulnerability to forest fire. Only 4.4% of the forest land cover was coniferous softwoods, such as pines and spruces, which have a significantly higher vulnerability to forest fire. Less than 1% of the forest land cover was classified as mixed deciduous and coniferous. The coniferous and mixed forests of St. Croix County are scattered throughout the county with the largest contiguous block being approximately 94-acres in size along the St. Croix River in the Town of Troy. The far majority of the tracts of softwoods found in the County were less than 10 acres in size.

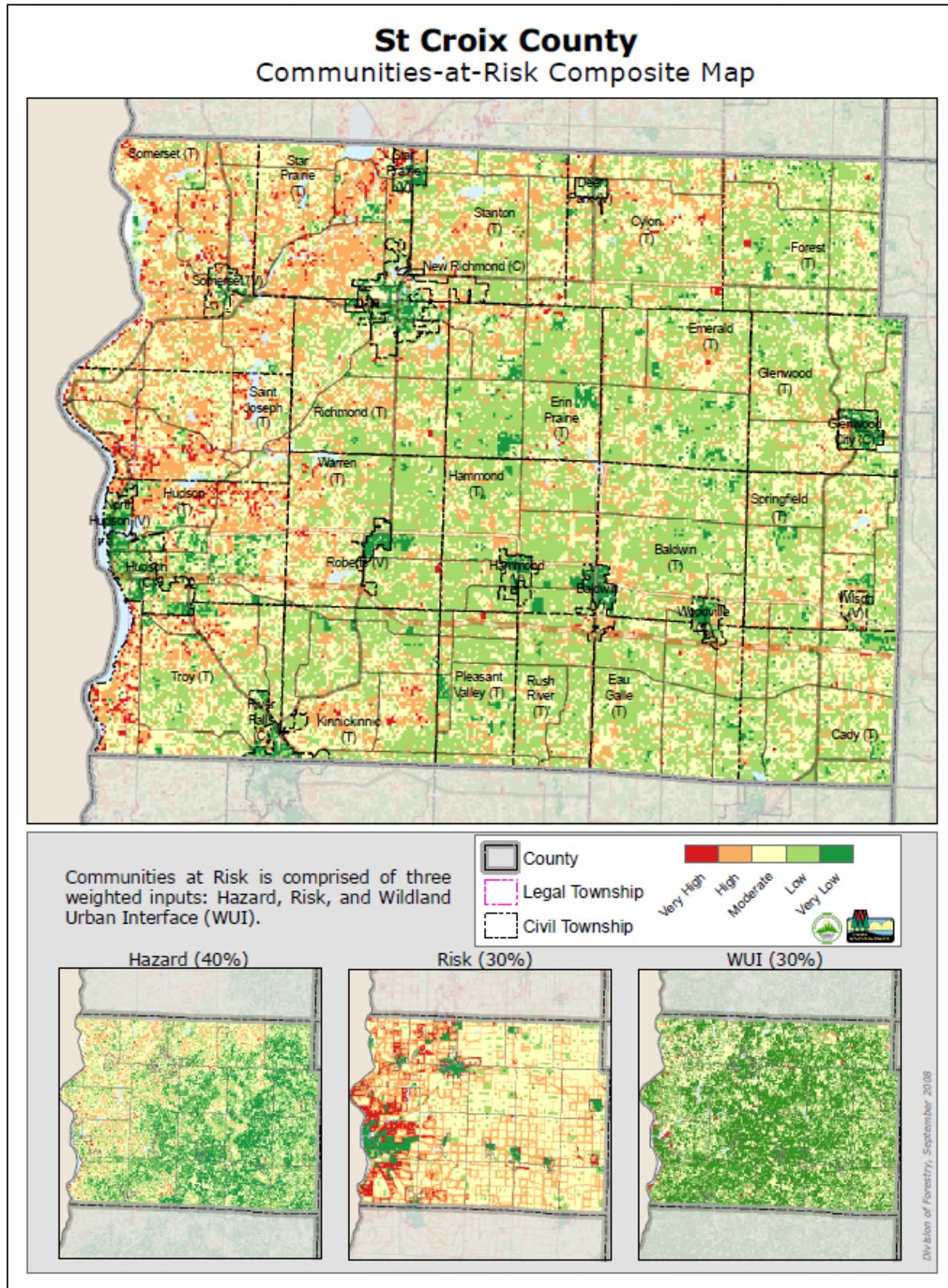
All of St. Croix County falls within the lowest forest fire level of protection (LOP 5) as assigned by the Wisconsin Department of Natural Resources (WDNR) based on fuel types and number of improved parcels (vulnerabilities). No part of St. Croix County is within a WDNR intensive fire protection area. As such, WDNR wildfire data for the county is very limited with the largest wildfires consisting of two events east of the Boardman area—a 152-acre fire cause by campfire at a party and an 81-acre fire purposely started with an incendiary.

Based on a 2008 WDNR analysis, the Towns of St. Joseph, Somerset, and Star Prairie were rated as communities-at-risk of wildfire due to land cover and risk (potential ignition) as shown in **Figure 17** on the following page. Three additional towns were identified as communities-of-concern.

As part of the WDNR's 2010 Wildland Fire Management Program Assessment, St. Croix County falls within their Western Prairie and St. Croix Moraines fire landscapes. Mitigation recommendations for these fire landscapes are limited to school fire prevention programs by local partners and statewide media prevention messages, with some additional local messages when the fire danger is elevated. Only limited, specific situations will be considered for additional mitigation efforts.

These findings are consistent with the perspectives of the Steering Committee which rated the forest and wild fire risks and vulnerabilities in St. Croix County as being relatively low at this time. As such, large forest and wild fires are considered not to be of significant risk to St. Croix County and its residents at this time and for the near future. However, related risks and vulnerabilities should be monitored since the level of risk and vulnerabilities could change with development patterns (e.g., subdivision development in pine plantation), vegetation changes (e.g., large plantings of pine forest), or climatic changes (e.g., lengthy periods of drought).

Figure 17. St. Croix County Wildfire Communities-at-Risk Composite Map



v. Possible Hazard Impacts of Climate Change

When analyzing hazard risks, it should be remembered that the assessment is largely based on past weather events and existing development trends. Projecting future risks and vulnerabilities is also subject to the influence of possible large-scale, longer-term climatic changes.

There is ongoing debate over the existence, causes, severity, and impacts of global climatic changes, such as global warming. According to the U.S. Environmental Protection Agency:

“According to the National Academy of Sciences, the Earth's surface temperature has risen by about 1 degree Fahrenheit in the past century, with accelerated warming during the past two decades. There is new and stronger evidence that most of the warming over the last 50 years is attributable to human activities.... Rising global temperatures are expected to raise sea level, and change precipitation and other local climate conditions. Changing regional climate could alter forests, crop yields, and water supplies. It could also affect human health, animals, and many types of ecosystems.... Most of the United States is expected to warm, although sulfates may limit warming in some areas. Scientists currently are unable to determine which parts of the United States will become wetter or drier, but there is likely to be an overall trend toward increased precipitation and evaporation, more intense rainstorms, and drier soils.”⁹

Regardless of the debate over the causes of climate change, there is clear evidence that Wisconsin's climate is indeed changing. The 2003 report entitled *Confronting Climate Change in the Great Lakes Region* published by the Union of Concerned Scientists and the Ecological Society of America projected that by 2030, summers in Wisconsin may resemble those in Illinois overall, in terms of temperature and rainfall. By 2100, the summer climate will generally resemble that of current-day Arkansas, and the winter will feel much like current-day Iowa.

To further document these climate changes and explore their impacts on our State, the Wisconsin Initiative on Climate Change Impacts (WICCI) was formed as a collaborative effort of the University of Wisconsin and the Wisconsin Department of Natural Resources.

The following are some of the key climatic trends being experienced in St. Croix County and Wisconsin according to the WICCI analysis (www.wicci.wisc.edu):

- St. Croix County's average temperatures are rising and are projected to continue to rise. **Figure 18** shows that the annual average temperature in St. Croix County has increased between 1.0° F and 2.0° F between 1950 and 2008. Between 1980 and 2055, annual average temperatures are projected to increase by about 6.5° F in the County.
- St. Croix County is experiencing more annual precipitation, and is expected to get wetter in the future, but there is significant seasonal and geographic variation to the precipitation. **Figure 19** shows that the annual average precipitation has increased in St. Croix County over the past fifty years overall, while **Figure 20** shows that changes in summer precipitation has varied in the County. Overall, WICCI projects St. Croix County's annual average precipitation to increase by 1.5 to 2.0 inches per year between 1980 and 2055.

⁹ U.S. Environmental Protection Agency. <http://yosemite.epa.gov/oar/globalwarming.nsf/content/impacts.html>

- Heavy precipitation events are expected to increase in St. Croix County. Currently, northern Wisconsin experiences heavy precipitation events of two or more inches about ten times per decade (once every year). **Figure 21** shows that St. Croix County is projected to experience about 2.0 to 2.5 more heavy precipitation events per decade by 2055, which is a 23 percent increase for one event about every ten months.

These climatic changes, should they continue, have significant natural hazard implications. Most of our existing best practices and infrastructure are based on historic events and do not fully accommodate these climatic trends.

Increased temperatures would result in more frequent heat waves and evaporation of surface waters. Increased precipitation and heavy precipitation events would potentially result in more flooding. And keep in mind the seasonality of these changes. More precipitation during the winter months increases the potential for heavy snows and ice storms. And higher temperatures during the summer months could result in more frequent agricultural droughts and increasing demand for irrigation.

Such changes in climate could have some positive natural hazard impacts. For instance, the winter season would be shorter overall with fewer days of extreme cold. But other problems may also be exacerbated, such as plant and animal diseases and infestations, Lyme disease, air quality changes, and decreasing water quantity.

Given the ongoing debate in the scientific community, it is not appropriate to debate the causes of climate change within this document. Regardless of the cause, it is important that St. Croix County officials and residents remain aware that the hazard trends presented in this report may change in the future; and, in some cases, the frequency and magnitudes of disaster events may intensify. Communities and residents should keep informed on climate change research and use their best judgment as to the most appropriate action and response. The WICCI webpage www.wicci.wisc.edu includes suggestions on how communities may prepare for and adapt to such changes.

Figure 18. Wisconsin Temperature Change

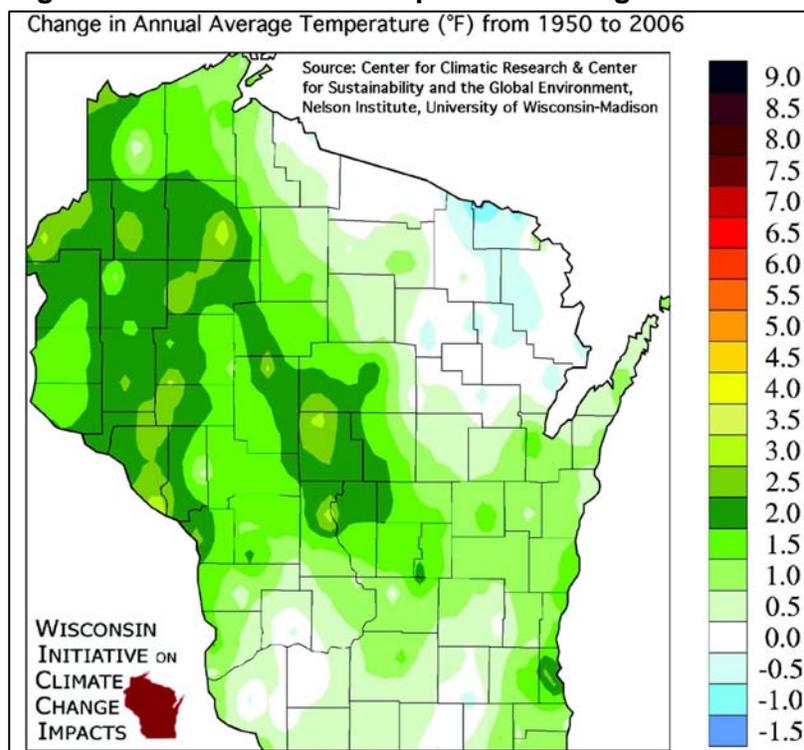


Figure 19. Wisconsin Precipitation Change

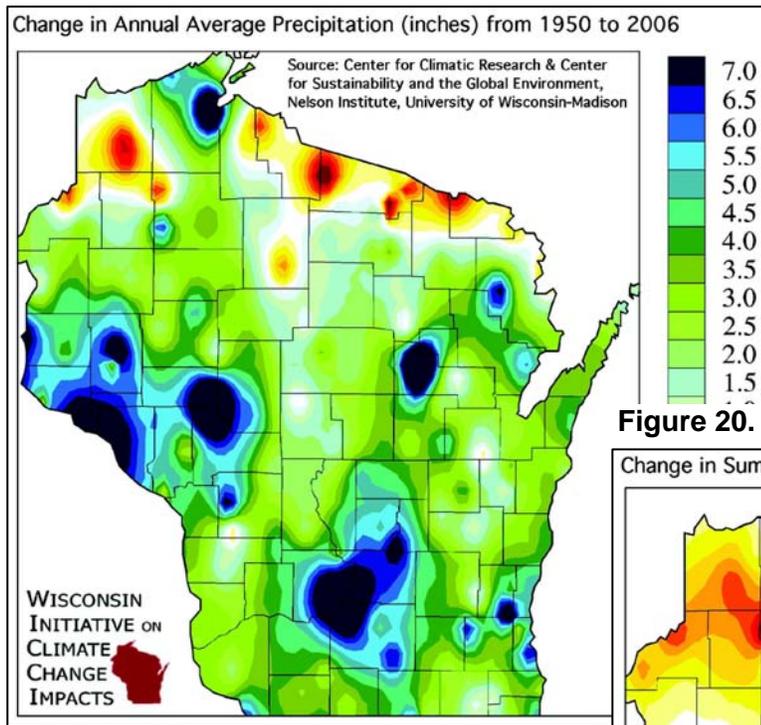


Figure 20. Wisc. Summer Precipitation Change

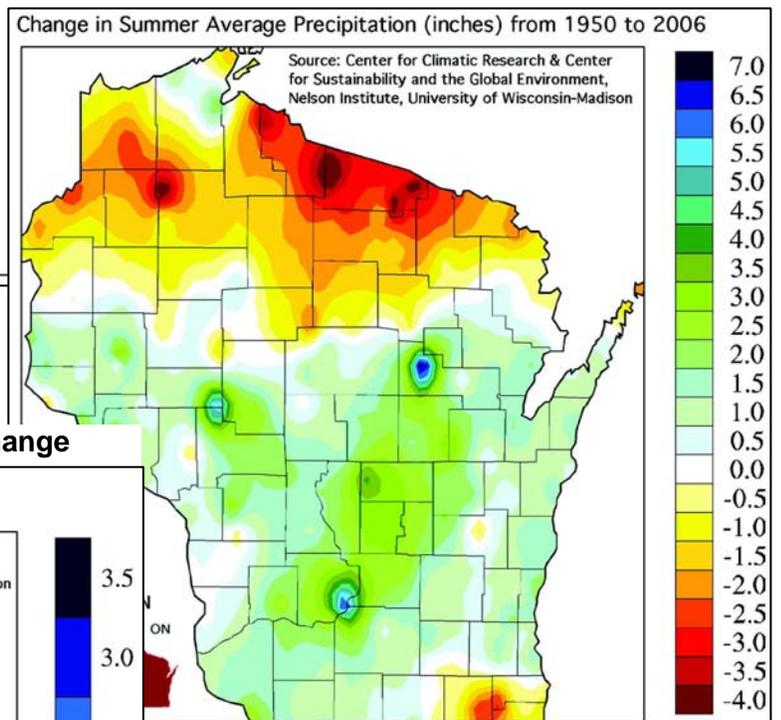
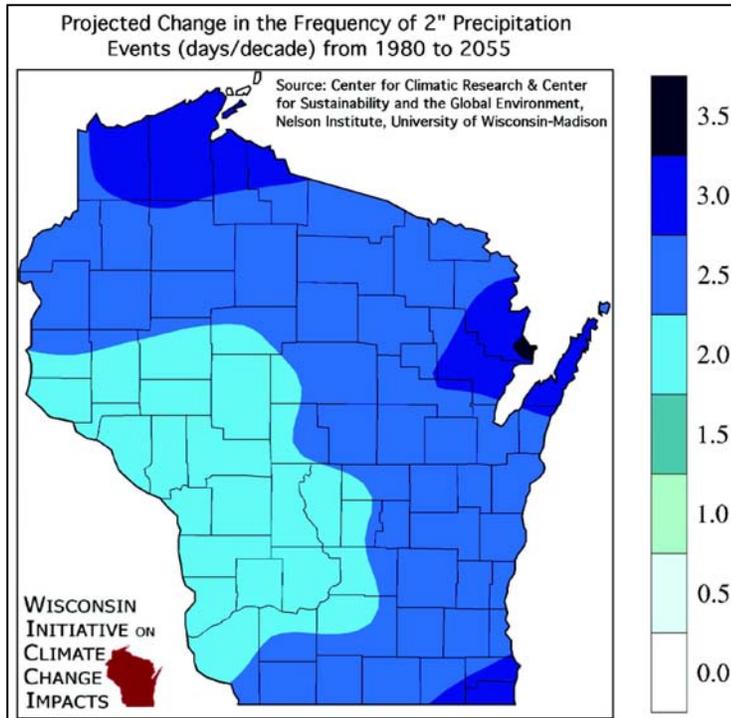


Figure 21. Wisc. Heavy Precipitation Change



B. RISK AND VULNERABILITY ASSESSMENT

This section is organized by the ten hazards identified previously as having the highest overall disaster threat to St. Croix County, with the addition of brief threat analysis for long-term power loss and cyberattack. For the purposes of this plan, some hazards have been grouped into related hazard topics in order to better organize and describe the extent of the potential risk and vulnerability.

The assessment for each of the seven hazards generally includes the following sub-sections:

- **Summary** of risks, vulnerabilities, and issues.
- **St. Croix County Public Health Hazard Vulnerability Assessment (HVA)** summary of probability, vulnerabilities, and capabilities rankings completed in 2012.
- **Risk Assessment** defines the hazard, identifies past events, and discusses the probability of reoccurrence.
- **Vulnerability Assessment** analyzes the potential impacts to people, property, and critical facilities. The vulnerability assessment for critical facilities is expanded upon in **Appendix E**.
- **Unique Jurisdictional Risks and Vulnerabilities** discusses the related hazard risks and vulnerabilities for participating cities and villages which are further expanded upon by the table and maps in **Appendix F**.

As noted previously, the majority of hazard threats facing St. Croix County typically do not have defined hazard areas. Most events facing County residents often affect large areas, or multiple counties, such as a drought or an ice storm.

Comments on the Special Threat Analysis: Long-Term Power Loss and Cyberattack

Long-Term Power Loss: Since multiple types of natural hazards could potentially result in long-term power loss in St. Croix County, the following pages provide a special, topical analysis. This approach allows additional attention to this critical threat, while avoiding undue repetition within the individual natural hazard assessments sub-sections (i.e., winter storms, tornados). Keeping with the scope of this plan, only power outages related to natural hazard events are explored, though many of the same vulnerabilities would be shared regardless of the cause.

Cyberattack: This threat was not originally part of the plan scope but was later added as a concern due to its potential devastating impacts on local governments and critical infrastructure. A brief threat analysis was added to this report and questions on cyberattack risks and vulnerabilities were asked during project meetings and surveys in order to generally assess current conditions, raise awareness of risks, and identify potential mitigation actions.

Special Threat Analysis – Long-Term Power Loss

Many of the highest-rated hazard events facing St. Croix County in Table 13 have the potential to cause an extended and widespread loss of electrical power. More specifically, above-ground power lines and transmission towers can be damaged by ice storms, heavy snows, tornados, and high straight-line winds. Elevated power lines in wooded areas have the greatest vulnerability. Such infrastructure can also be damaged by wildfire, lightning, and flooding, though the impacts are typically much more localized. Human action and equipment failure can also result in power loss.

Risk Assessment – Long-Term Power Loss

Three natural hazard threats pose the greatest power loss threat within St. Croix County: a large ice storm, possibly in conjunction with heavy/wet snow; the high winds associated with unstable summertime weather patterns; or high winds during a blizzard. However, it is large ice storms which often pose the greatest threats due to the potential to affect entire regions during times of year when the vulnerabilities due to the loss of power are at their highest.

From 1993 through June 2011, there have been six ice storm, glaze, and freezing rain events reported for St. Croix County, all occurring in the mid-1990s. Two of the events—January 1994 and January 1996—did have scattered power outages, but none of the events resulted in a large-scale, long-term power outage.

However, the risk of a long-term event is very real. For example, the March 1976 ice storm was one of the worst natural disasters to hit Wisconsin; St. Croix County was not one of the 22 counties which were part of this disaster declaration. Ice accumulations of up to five inches were reported, and high winds of 60 mph made the situation worse. Up to 100,000 people were without power at the height of this storm. Serious winter or ice storms in central Wisconsin also occurred in December 1904, February 1922, February 1936, and November 1943, though data on the impacts are limited.

In January 1998, an ice storm hit the Montreal area and left over four million residents without power. Some areas were without power for over three weeks. The January 2009 ice storm which hit Kentucky resulted in \$616 million in damages, 36 fatalities, and 700,000 customers without power at its peak; 50,000 customers were still without power after two weeks, and it took 38 days for full restoration.

The threat of extended power loss is not limited to large, regional, and multi-state winter storms. Smaller events can still have devastating and costly impacts on

multiple counties or more localized areas, such as the March 1962 event which struck the Eau Claire area, leaving many without electric or telephone service.

While the focus of power loss is often on ice storms due to their widespread nature, other natural events can also result in a sizable loss of power. In fact, high winds appear to be a more frequent cause of widespread loss of power due to a natural hazard event. In July 1991, a particularly violent and widespread straight-line wind (or derecho) lasted 17 hours and stretched from South Dakota to western Pennsylvania, including parts of Wisconsin. This event caused over \$100 million in damage and resulted in power loss to nearly one million customers. A similar event in May 1998 which blew through central Wisconsin resulted in at least \$500 million damage; and over two million people were without electrical power, some for over 10 days.

Other wind events have resulted in localized power losses in St. Croix County, though the long-term loss of power exceeding 48 hours is quite rare and most events have been limited to a relatively small number of customers in recent history.

One recent exception was the August 13, 2007 devastating storm during which high straight-line winds took down trees, electric power lines, and power poles throughout much of the St. Croix County area. Lightning strikes to electrical equipment also resulted in outages in some areas. Due to the severity and extent of the damages, some residents were without power for several days.



**Aftermath of the 2007 Storm
in the Town of Emerald**

photo courtesy of St. Croix Electric Cooperative

Since 2000, this is the only power outage event for which St. Croix Electric Cooperative requested mutual aid assistance from other electric cooperatives through the Restoration of Power during an Emergency (ROPE) system.

There are two primary electrical providers in St. Croix County:

St. Croix Electric Cooperative (serves approximately 74.4% of the County area)

Xcel Energy (serves approximately 18.2% of the County area)

Polk-Burnett Electric Cooperative (serves approximately 5.8% of the County area)

The remaining 1.6 percent of the County area is served by River Falls Municipal Utility, Pierce-Pepin Electric Cooperative Services, New Richmond Electric Utility, and Dunn Energy Cooperative.

While St. Croix County has not recently experienced a long-term power outage event, a look at the recent causes of power outages for St. Croix Electric Cooperative provides further insight into the potential risk. The numbers in **Table 14** are for all of St. Croix Electric Cooperative which includes some areas in adjacent counties, in particular within Pierce County to the south.

Table 14. St. Croix Electric Cooperative Power Outages • 2002-2006

Outage Cause	# of outages						# customers affected	# outage hours
	2002	2003	2004	2005	2006	Total		
Trees	61	33	48	70	26	238	8,817	29,927
Ice/Snow	12	1	2	0	2	17	798	1,933
Lightning	74	35	25	47	28	209	2,553	6,009
All Other	323	329	270	294	276	1,492	20,562	37,379
Total	470	398	345	411	332	1,956	32,730	75,248

source: St. Croix Electric Cooperative

The above table shows that a small percentage of outages—about twelve percent—were directly caused by weather, such as ice damage and lightning strikes. An additional twelve percent were tree-related, such as tree limbs falling upon power lines. Some of these tree-related outages are also related to weather, such as high winds, heavy snow, or ice. Within the “All Other” category in Table 14, some of the causes may also be weather-related, such as broken poles

For each year of 2002 through 2005, more customer hours were lost due to tree-related causes than any other source, slipping to #2 in 2006. Perhaps more notable is that while tree- and weather-related outages explained a combined 24 percent of the outages, they constituted 50 percent of the total customer hours without power. And

an average of 26 customers were impacted for each tree- and weather-related event, compared to an average of 13 customers for an “all other” event.

In summary, a widespread, long-term power outage event covering most or all of St. Croix County would be rare, but the potential does exist. Based on discussions with personnel from area electric providers, it is estimated that only about five or six long-term power outage events have likely impacted the region during the past century, but these have not approached the scale of the 1976 Wisconsin, 1998 Montreal, or 2009 Kentucky outages.

Vulnerability Assessment – Long-Term Power Loss

While rare, the impacts and costs of a long-term power outage event can be tremendous. Extended power loss in St. Croix County due to a storm event would likely involve many downed trees and power lines. Downed lines present safety hazards for residents, travelers, and emergency responders. Response can be further hampered by blocked roads from power lines and debris.

Replacement costs for power lines vary based on physical site conditions, but are approximated as follows:

Single Phase – Overhead:	\$52,000/mile
Single Phase – Underground:	\$52,000/mile
Three Phase – Overhead:	\$95,000/mile
Three Phase – Underground:	\$100,000/mile

St. Croix County has approximately 1,600 miles of electric lines, the majority of which is single phase. Approximately half of these lines (800 miles) are below ground which significantly reduces the chance of weather-related outages in the County. The remaining 800 miles of overhead lines remains very vulnerable however. Given the above replacement costs, the potential damages to overhead power lines from a severe storm event in St. Croix County could easily be in the millions. And with forest being the predominate land cover over approximately nineteen percent of St. Croix County (*see Section II.D.*), a significant portion of these overhead lines are even more at risk of damage due to falling trees or limbs.

St. Croix Electric Cooperative identified in two general areas as having the greatest risk of power loss. The largest area is along the St. Croix River in the Town of Troy which has significant residential growth located within forested areas. Shallow depth to bedrock has made burying of electric lines difficult and costly in much of this area.

Scenic protections along the St. Croix River, poor access, and resident apprehension also combine to make tree-trimming and removal in this area more challenging. As a result, the identified area has a history of power outage problems due to falling trees during high winds, ice storms, etc.

The second concern identified by the Cooperative is the single line feeding the siren and monitoring equipment at the Eau Galle Dam. Due to topography and access challenges, maintaining this line is difficult and it would also be very difficult to repair should it be damaged.



Xcel Energy and the other electric cooperatives providing service to parts of St. Croix County did report occasional outages from winds or ice, but did not identify any specific problem areas within the County. But power loss due to falling trees is not limited to the unincorporated areas. Residential neighborhoods with older trees or built within wooded areas of cities and villages are also vulnerable to outages.

However, during this planning effort, only one city and two villages identified specific neighborhoods which were particularly prone to lengthy electrical outages due to trees and branches falling upon overhead power lines during ice and wind storms. Outages are relatively frequent in the industrial park and technical college area of the City of New Richmond compared to other areas of the community. The Village of Baldwin reported that along U.S. Highway 12 and the northwest corner of the community were more prone to outages due to trees or branches falling on lines, but there is good tree-trimming overall. The Village of North Hudson identified that wind-related outages occur 2-3 times per year in the neighborhood near Village Hall.

Electrical providers in the County have buried some electric lines in at-risk areas. The loss of power due to falling limbs and trees has been further significantly mitigated through proactive, aggressive tree-trimming programs by the electric providers serving St. Croix County. But even with such efforts, many wooded areas are still at risk to power outages. Given recent experiences elsewhere, it is not unrealistic to imagine a significant portion of the County's population and facilities could be without power for one to three weeks should a 50- or 100-year event occur.

Following the 2009 Kentucky storm, 37 percent of affected customers were still without power after one week and seven percent were without power after two weeks. During the Kentucky event, carbon monoxide from improper generator use was the



picture from Mark Garland, Kentucky Div of Emgy Mgmt

largest cause of death. But it must be remembered that the potential impacts for St. Croix County could be much more severe—Kentucky’s temperature warmed well above freezing following their ice storm. In comparison, River Falls’ daily mean January temperature of 11.2°F¹⁰ could prove quite deadly should power be lost and transportation systems hindered for an extended time. This is discussed more in the winter storms assessment.

Long-term power outage (LTPO) planning has been receiving increased attention in Wisconsin during the past three years. Realizing the seriousness of this threat, area emergency management officials and other local stakeholders participated in a series of regional-level workshops and tabletop exercises in 2010 on this topic.

Based on these workshops and exercises, the following groups and critical facilities were identified as being especially vulnerable or important during a long-term power outage event:

- Independent Special Needs Populations
- Long-Term Care Facilities and Hospitals
- Municipal Utilities and Emergency Fuel
- Emergency Response Providers, Communications, & Operations Centers
- Emergency Shelters and Food Distribution Sites (i.e., schools)

Though quickly growing in some areas, St. Croix County still has large, relatively rural areas which pose challenges to public communication, response, and recovery, including the provision of services to independent populations who may have special needs during a LTPO event (e.g., dialysis, oxygen/ventilator, medicines).

¹⁰ National Climatic Data Center. River Falls Station Climatology, 1971-2000.
http://mrcc.sws.uiuc.edu/climate_midwest/historical/temp/wi/477226_tsum.html

Seniors living alone in rural areas are of special concern. In 2005, St. Croix County nearly had 7,500 residents ages 65 and over. This number is expected to more than double by 2030. The St. Croix County Aging and Disability Resource Center serves approximately 50,000 meals per year or between 4,000 to 4,200 meals each month. About half of these are home-delivered meals to clients, many of whom reside alone. County seniors take advantage of the remaining meals and additional services provided at one of the ten County meal sites, and may not be prepared for the loss of these services during an event. And use of the County's meal sites has been increasing.

As of April 2012, St. Croix County also had nine nursing homes, and fifty other licensed long-term care or assisted living facilities (i.e., residential care apartment complexes, adult family homes, CBRFs), most of which are believed to be without emergency power generation. During a LTPO event, most of these facilities would initially shelter-in-place, though medicine, equipment, and municipal water and sewer would become very serious concerns after the first 24-48 hours if power is not restored. The recent LTPO exercises have increased attention to these concerns.



Farmers with livestock also rely on electric power for milking, maintain barn temperatures, pumping water, etc. In discussing this issue with County, State and Federal officials who work closely with the agricultural community, there was a consensus that the majority of producers have access to a generator, though some smaller hobby farms may not. It was suggested that a list of potential emergency generator and fuel suppliers be developed should it be needed during an emergency.

The availability of emergency power generators for utilities, communications, shelters, emergency operations, fuel sources, and critical facilities is crucial to mitigating the potential impacts of a LTPO event. Further, demands may be high on limited fuel sources for response vehicles, electric crews, and power generators. Concern was also expressed during the planning process on how will emergency providers and clean-up crews coordinate and communicate should many of the communication towers be destroyed during an event. St. Croix Electric Cooperative also noted that GPS coordinates for some locations were inaccurate following the August 2007 event which can also add to confusion.

St. Croix County has not performed a formal countywide emergency power generator or emergency fuel survey. During the planning effort, multiple cities, villages, and towns identified needs related to electric power generators for emergencies:

- Town of Kinnickinnic (Town Hall)
- Village of Baldwin (EMS Building)
- Village of Deer Park (possibly Community Center)
- Village of Hammond (Village Hall)
- Village of Somerset (for water utility)
- Village of Star Prairie (Village Hall not wired & Fire Hall)
- Village of Wilson (utilities; Village Hall)
- Village of Woodville (portable, possibly Village Hall)
- City of New Richmond (possibly Ambulance building)

Many of the above municipal building perform an important emergency operations center role should disaster strike. In addition, the following plan participants identified additional potential generator needs:

- St. Croix Highway Department (trailer-able generator)
- Glenwood City School District
- Baldwin-Woodville School District

Due to the high demand for generators, WEM has not included emergency power generators on its priority list for hazard mitigation grant funding at this time, unless the generator is part of another eligible project (e.g., community safe room). Even less frequently common are agreements for emergency fueling should an event last multiple-days and exhaust local fuel supplies.

In short, a long-term, widespread power outage is one of the greatest natural hazard vulnerabilities facing St. Croix County. As the Kentucky experience shows, total costs in response and damages can be in the tens of millions or greater. And significant threats to life and safety exist due to downed lines, fire, improper generator use, loss of access to medical treatments, extreme cold, and loss of food and other utilities.

The lessons learned from the recent LTPO workshops and exercises have been integrated into a state-level report which is available at the WEM website. The recommendations of the State report were considered during this hazard mitigation planning effort and, when appropriate, have been integrated into the mitigation strategies found later in this document.

Special Threat Analysis – Cyberattack

This brief section considers some of the cyberattack risks and vulnerabilities facing governmental entities and critical infrastructure which may impact St. Croix County and its communities, businesses, and residents. For purposes of this report, **cyberattack** is defined as a malicious computer-to-computer attack through cyberspace that undermines the confidentiality, integrity, or availability of a computer (or network), data on that computer, or processes and systems controlled by that computer.

National Security Presidential Directive 54/Homeland Security Presidential Directive 23 (NSPD-54/HSPD23) defines **cyberspace** as the interdependent network of information technology infrastructures, and includes the Internet, telecommunications networks, computer systems, and embedded processors and controllers in critical industries. Common usage of the term also refers to the virtual environment of information and interaction between people.¹¹

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates cyberattack as a 70% risk over a ten-year period given its high probability (3); substantial vulnerability (2.3); and moderate emergency management capabilities (2.0). Computer failure was rated slightly lower as a 68% risk given its high probability (3); substantial vulnerability (2.2); and moderate available emergency management capabilities to deal with this threat (2.0).

Risk Assessment—Cyberattack

Threats to cyberspace, or cyberattacks, pose one of the most serious economic and national security challenges of the 21st Century for the United States. The December 2008 report by the Commission on Cybersecurity for the 44th Presidency states: “America’s failure to protect cyberspace is one of the most urgent national security problems facing the new administration.”¹² There are a growing number of individuals, such as terrorists and international criminal groups that are targeting U.S. critical infrastructure and government. These players have the ability to compromise, steal, change, or completely destroy information.¹³ As the Director of National Intelligence (DNI) recently testified before Congress, “the growing connectivity

¹¹ Cyberspace Policy Review, Assuring a Trusted and Resilient Information and Communications Infrastructure, U.S. White House.

¹² CSIS Commission on Cybersecurity for the 44th Presidency, Securing Cyberspace for the 44th Presidency, December 2008.

¹³ Director of National Intelligence, Annual Threat Assessment of the Intelligence Community for the Senate Armed Services Committee, Statement for the Record, March 10, 2009.

between information systems, the Internet, and other infrastructures creates opportunities for attackers to disrupt telecommunications, electrical power, energy pipelines, refineries, financial networks, and other critical infrastructures.”¹⁴

The growing sophistication of cyberattacks could cause serious problems, such as:

- **Failure of critical infrastructures.** CIA reports malicious activities against information technology systems have caused the disruption of electric power capabilities in many regions overseas, including a case that resulted in a multi-city power outage.¹⁵
- **Exploiting global financial services.** In November 2008, payment processors at an international bank were compromised, permitting fraudulent transactions at more than 130 automated teller machines in 49 cities within a 30-minute period.¹⁶ In another case, a U.S. retailer in 2007 experienced data breaches and loss of personally identifiable information that compromised 45 million credit and debit cards.¹⁷
- **Systemic loss of U.S. economic value.** Industry estimates of losses from intellectual property to data theft in 2008 range as high as \$1 trillion.¹⁸

Nationally, cyberattacks on the federal government's IT systems are increasing, rising 680 percent from 2006 to 2011, according to an official from the Government Accountability Office (GAO).¹⁹ Federal agencies reported 42,887 cyberattack incidents in 2011, compared with just 5,503 in 2006. The incidents reported by the agencies included unauthorized access to systems, improper use of computing resources, and the installation of malicious software, among others. An official with the GAO said the sources of the cyberattacks included criminal groups, hackers, terrorists, organizational insiders, and foreign nations. The GAO official warned,

“The magnitude of the threat is compounded by the ever-increasing sophistication of cyberattack techniques, such as attacks that may

¹⁴ Director of National Intelligence, Annual Threat Assessment of the Intelligence Community for the Senate Armed Services Committee, Statement for the Record, March 10, 2009.

¹⁵ www.sans.org/newsletters/newsbytes/newsbytes.php?vol=10&issue=5, CIA presentation, SANS SCADA Security Summit, January 16, 2008.

¹⁶ www.bankinfosecurity.com/article.php?art_id=1197, February 5, 2009.

¹⁷ www.infoworld.com/d/security-central/retailer-tjx/reports-massive-data-breach-952, January 17, 2007.

¹⁸ www.mcafee.com/us/about/press/corporate/2009/20090129_063500_j.html. See also <http://resources.mcafee.com/content/NAUnsecuredEconomiesReport>, McAfee, “Unsecured Economies: Protecting Vital Information”, January 2009. Projection based on survey by Purdue’s Center for Education and Research in Information Assurance and Security.

¹⁹ April 25, 2012 Infosecurity – (National) Cyberattacks on U.S. federal IT system soared 680% in five years, <http://www.infosecurity-magazine.com/view/25393/cyberattacks-on-us-federal-it-system-soared-680-in-five-years/>.

combine multiple techniques. Using these techniques, threat actors may target individuals, businesses, critical infrastructures, or government organizations.”²⁰

The federal government's IT systems continue to suffer from "significant weaknesses" in information security controls, he said. Eighteen of 24 major federal agencies have reported inadequate information security controls for financial reporting for fiscal year 2011, and general inspectors at 22 of these agencies identified information security as a major management challenge for their agency. He warned,

”Reported attacks and unintentional incidents involving federal, private, and infrastructure systems demonstrate that the impact of a serious attack could be significant, including loss of personal or sensitive information, disruption or destruction of critical infrastructure, and damage to national and economic security.”²¹

Issues of cyber-security are increasing. According to the Internet Crime Complaint Center:

- U.S. Losses = \$265 million in 2008
- U.S. Losses = \$560 million in 2009 (almost double)
- Online fraud grew 22% from 2008 to 2009
- Non-delivery = 20% of all complaints; ID theft = 14.1%
- 55% of the victims were aged 40 or older
- >50% of the criminals lived in California, Florida, New York, Texas, Washington, and the District of Columbia
- In 2010, Wisconsin ranked 23rd with 3,466 complaints. 25.8% were identity theft and 23.2% were non-delivery of merchandise. Total reported losses exceeded \$4.9 million.

But it is also important to keep these numbers in perspective. One commonly referenced survey (Ontrack Data International, 2002) estimates that 44 percent of data loss is from hardware malfunction and another 32 percent from human error. Only seven percent was reported to be from computer viruses.

²⁰ April 25, 2012 Infosecurity – (National) Cyberattacks on U.S. federal IT system soared 680% in five years, <http://www.infosecurity-magazine.com/view/25393/cyberattacks-on-us-federal-it-system-soared-680-in-five-years/>.

²¹ April 25, 2012 Infosecurity – (National) Cyberattacks on U.S. federal IT system soared 680% in five years, <http://www.infosecurity-magazine.com/view/25393/cyberattacks-on-us-federal-it-system-soared-680-in-five-years/>.

No data source was identified during the process which provides a history of attacks, impacts, and losses within the region. However, within west-central Wisconsin, a number of communities have experienced cyberattacks. For instance, Eau Claire County has been targeted twice. During the second attack in January 2010, overseas hackers acquired credentials through a computer virus which allowed the hackers to attempt to transfer nearly \$800,000 from the County's accounts. The County's financial institution helped thwart the robbery attempts in both cases, demonstrating the importance of security partnerships with those providing such services to municipalities. Eau Claire County has taken additional security steps to further help prevent such crimes. In April 2012, the City of Eau Claire's website was hacked and temporarily unavailable, but no computer systems were impacted.

More locally, only the City of Glenwood City reported experiencing a cyberattack during the planning process. In 2009, malicious keylogging software was used to track keystrokes on a City computer which allowed hackers to gain access to banking account information. Like the Eau Claire County cases, the theft was prevented by the bank. None of the town governments in St. Croix County responding to the hazard risks survey indicated that they have experienced a cyberattack.

Vulnerability Assessment—Cyberattack

All computers, networks, and many other computerized devices share general vulnerabilities to viruses, Trojans, malware, denial of service attacks, and data loss. But the primary vulnerabilities of public concern to cyberattack may also vary by those being attacked as summarized in **Table 15** below.

Table 15. Cyberattack Vulnerabilities by Attackee

Type of Attackee	Primary Vulnerabilities of Public Concern
Government	Access to confidential data to possibly steal, alter, or delete information. As was the case in Eau Claire County and Glenwood City, hackers may attempt to obtain access to bank accounts, financial information, etc. Website hacking and other disruption of public services.
Power Grid	Short- or long-term power outage.
Transportation	Disturbance of traffic signals resulting in confusion, traffic congestion and/or accidents.

Financial Institutions	Access to personal information (bank accounts) resulting in theft and/or identity theft. As more and more banking is performed on-line, financial institutions have been very proactive on cyber-security issues.
Schools Districts	Access to confidential data to possibly steal information or alter/delete it. Disruption of educational services. For public schools, cyber-security issues are frequently addressed in cooperation with CESA. Given that students are increasingly using computers and mobile devices in the classrooms, the risk of viruses, malware, etc., is high.

National Level of Preparedness

Nationally, the Department of Homeland Security National Cyber Security Division has a program called the Control Systems Security Program (CSSP) which works to reduce industrial control system risks within and across all critical infrastructure and key resource sectors by coordinating efforts among federal, state, local, and tribal governments, as well as industrial control systems owners, operators, and vendors.²² The program coordinates activities to reduce the likelihood of a successful cyberattack and attempts to reduce the severity of impacts from a successful cyberattack against critical infrastructure control systems through risk-mitigation activities. Further, the Department of Homeland Security’s United States Emergency Readiness Team (US-CERT) strives to improve the nation’s cybersecurity, coordinate information sharing, and manage cyberattack risks.²³ US-CERT partners with private and public sector critical infrastructure owners and operators to enhance cybersecurity.

Electric Cooperatives Level of Preparedness

As the previous sub-section described, cooperatives provide electric service to the majority of St. Croix County. Electric cooperatives have been working with the Department of Energy (DOE), the North American Electric Reliability Corporation (NERC), the Federal Energy Regulatory Commission (FERC), the U. S. Department of Homeland Security, the Obama administration, and the electric industry to strengthen cyber-security. In 2011, NERC performed an exercise called “GridEx” to identify any issues of cyber security and to encourage utilities and governments to work together on the issues. The test showed that most utilities have adequate response plans in place but need updated guidelines, more training, and better communication.²⁴

²² http://www.us-cert.gov/control_systems/

²³ <http://www.us-cert.gov/about-us/>

²⁴ Wisconsin Energy Cooperative News, Cyber Security Patrols Electric Co-ops Protecting Security of their Systems. June 2012.

State of Wisconsin Level of Preparedness

The State of Wisconsin's Cyber Incident Annex "discusses policies, organizations, actions, and responsibilities for a coordinated, multidisciplinary, broad-based approach to prepare for, respond to, and recover from cyber-related incidents".²⁵ The Annex:

"describes the framework for Wisconsin State Agencies to support local units of government during a cyber incident response. This support is coordinated with State and Federal agencies. Wisconsin is a "Home Rule" state and "the role of any state agency, including the Department of Military Affairs and the division, in an emergency declared under this chapter, is to assist local units of government and local law enforcement agencies in responding to a disaster or the imminent threat of a disaster."²⁶

The State of Wisconsin Department of Administration, Division of Enterprise Technology's Office of Security provides information to Wisconsin residents, educators, and businesses information on cyber risks and ways to stay protected online.

Local Level of Preparedness

The level of preparedness in terms of both policy and level of protection varies significantly among the governmental entities in St. Croix County. There has been no formal assessment of vulnerabilities and level of protection performed. But during this planning process, cities and villages were asked about their current policies and protections. For reasons of security, specifics are not included here. But, most importantly, not all communities back-up their data or have written computer security policies. Only a handful of communities frequently back-up their data off-site, which is also important for fire or other disaster events during which information can be destroyed.

St. Croix County's Emergency Preparedness Program Specialist estimates that over 95 percent of potential risks can be avoided if the following measures were taken by County and local governments to keep their computers safe:

- perform daily and a separate weekly data back-up

²⁵ Cyber Incident Annex—State of Wisconsin,
<http://emergencymanagement.wi.gov/planning/WERP/Annex%20Cyber%20Terrorism%20Incident%20RD.pdf>,
June 30, 2010.

²⁶ Cyber Incident Annex—State of Wisconsin,
<http://emergencymanagement.wi.gov/planning/WERP/Annex%20Cyber%20Terrorism%20Incident%20RD.pdf>,
June 30, 2010.

- keep the firewall on constantly
- set virus and malware detection to automatically update daily
- ensure that the Windows operating system is automatically updated
- migrate from Windows XP to Windows 7

There are additional actions and policies which can be taken to reduce cyberattack risks as discussed at an April 2011 Disaster Ready Chippewa Valley workshop, such as:

- use of hardware firewalls and how web servers are managed
- multi-factor authentication
- IDS/IPS real-time monitoring in both directions
- data and password encryption, including encrypted tunnels for transport
- password policies and procedures
- policies for the use of computer equipment, Internet, and downloading
- segregation of certain duties
- safeguarding and proper disposal of old equipment, including copiers
- safeguarding and proper disposal of paper reports
- training of staff in risks, guidelines, and security measures

Continuity planning is also important, though most governments in St. Croix County have not developed such plans. Continuity planning is the identification of strategies for the preservation and/or restoration of critical business function during or following a disaster or other disruption of service. Not only should data be frequently backed-up off site, but consider how this data is to be recovered following an event. Critical applications may be replicated in real time. Larger municipalities may need a secondary data and operations center and/or a back-up server. These systems should be test regularly. The business continuity planning template available at the Disaster Ready Chippewa Valley website (www.disasterreadychippewavalley.org) includes a section on data protection, storage, and recovery which may be helpful. Local governments should obtain technical assistance in addressing their risks, if needed.

In short, the risk of cyberattack continues to grow and the level of protection and preparedness among the communities in St. Croix County varies significantly. Some actions, such as offsite data back-up, also mitigate risks associated with fires, tornado, flooding, equipment failure, accidental data deletion, etc. During community meetings and the town surveys, many municipalities expressed interest in additional training on cyberattacks and data security.

i. Tornadoes

Tornadoes are typically linked with severe thunderstorm events. It is sometimes difficult to determine the difference between the impacts of a tornado versus very high winds. As such, the discussion in this subsection includes significant overlap with the thunderstorm assessment.



Summary—Tornadoes

Risk: Tornadoes have a high vulnerability, but somewhat lower frequency (1 every 1.3 years). The 1899 New Richmond Tornado is the 9th deadliest in U.S. history with 117 killed. More recent significant tornado events include the 1958 Colfax Tornado which caused over \$160 million in property damage, the 1982 tornado which damaged or destroyed 60 mobile homes in the Town of Star Prairie, and the 2005 tornado which damaged 38 residences in the Village of Hammond.

Vulnerabilities: Ranked by the steering committee as the #1 threat for St. Croix County. Electric power lines and all structures are vulnerable, especially large-span buildings, mobile homes, structures with large amounts of glass, and structures with substantial numbers of people (e.g., schools, hospitals). Increasing numbers of homes without safe rooms or basements. Crops and personal property are also at risk. St. Croix County ranked 8th in the State for tornado damage vulnerability (population and structural) with estimated annualized losses averaging between \$840,000 and \$4.3 million.

1. Many older mobile homes are not anchored or tied down. The 1982 tornado/high wind event in the Town of Star Prairie demonstrates the importance of anchoring.
2. Most mobile home parks and campgrounds do not have access to community safe rooms.²⁷ 57% of the mobile homes in the County were in unincorporated areas; in most cases, these are outside the range of alert warning sirens. Current County and most local regulations do not specifically require new mobile home parks to have a storm shelter or emergency plan, though such has been required through conditional use permitting in a few instances.
3. The following municipalities may be strong candidates for community safe room projects: Town of Somerset, the villages of Baldwin, Hammond, and Woodville, and the cities of Glenwood City, New Richmond, and River Falls. More public education on safe rooms, and a potential model safe room project, was suggested.

²⁷ “Public storm shelter” and “community safe room” are used interchangeably in this report. The former is more familiar with local residents, while the latter is the official name recognized by FEMA.

4. Events and locations at which large numbers of people gather were frequently identified as a concern. Potential community safe room projects were identified for the St. Croix County Fairgrounds in Glenwood City and Homestead Park. Similar facilities and campgrounds in the County also may have storm shelter needs. Some of these facilities, such as the Somerset concert grounds, also have limited access/egress which could be a challenge should quick evacuation be needed. The status and extent of existing emergency plans for such facilities varies.
5. Subject to funding, new alert warning sirens (or replacement of aging sirens) were identified needs or potential needs in a number of communities, including the towns of Hudson, Troy, Richmond, and St. Joseph, the villages of North Hudson and Wilson, and the City of River Falls. In some cases, additional analysis is needed to determine the number and appropriate siting for new sirens. Continued education on alert warning sirens was also identified as being important.
6. During meetings and interviews, some stakeholders and communities (e.g., River Falls, Town of Kinnickinnic) expressed interest in a NOAA all hazards weather radio project or expanded use of social media for weather warnings.

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates tornados as a 47% risk over a ten-year period given their high probability (3); moderate vulnerability (1.8); and substantial available emergency management capabilities to deal with this threat (1.3).

Risk Assessment—Tornados

The Hazard

Tornados are relatively short-lived local storms composed of an intense rotating column of air, extending from a thunderstorm cloud system. It is nearly always visible as a funnel, although its lower end does not necessarily touch the ground. Average winds in a tornado, although never accurately measured, are between 100 and 200 miles per hour; however, some tornados may have winds exceeding 300 miles per hour.

For reference, the following are the National Weather Service definitions of a tornado and funnel cloud:

Tornado - A violently rotating column of air that is touching the ground.

Funnel Cloud - A rapidly rotating column of air that does not touch the ground.

A tornado path averages four miles, but may reach up to 100 miles in length. Widths average 300 to 400 yards, but tornados have cut swaths a mile or more in width. Severe tornados, or groups of two or three funnels, can also travel together. On the average, tornados move between

25 and 45 miles per hour, but speeds over land of up to 70 mph have been reported. Tornadoes rarely last more than a couple of minutes over a single spot or more than 15 to 20 minutes in a ten-mile area, but their short periods of existence do not limit their potential devastation. Though similar in potential impact, high-wind events, straight-line winds, derechos, and downbursts are defined within the thunderstorms sub-section.

Shown in **Table 16** is the Enhanced Fujita (EF) Scale, recognized as the accepted tornado magnitude measurement rating and is based on damage estimates for a 3-second wind gust. The EF scale replaced the original Fujita scale in 2006 and takes into account 28 different damage indicators for a more accurate indication of tornado strength. The new EF scale does have higher wind speed thresholds, and a larger percentage of reported tornadoes will likely fall within the EF0 category. A lower percentage will fall in each of the higher categories. None of the tornadoes recorded on or before January 31, 2007, will be re-categorized.

**Table 16. Tornado Magnitude Measurement
Enhanced Fujita (EF) Scale**

Operational EF-Scale	Wind Speed (miles per hour)	Character of Damage	Relative Frequency (percent)
EF0 (GALE)	65-85	Minor or No Damage	53.5
EF1 (WEAK)	86-110	Moderate Damage	31.6
EF2 (STRONG)	111-135	Considerable Damage	10.7
EF3 (SEVERE)	136-165	Severe Damage	3.4
EF4 (DEVASTATING)	166-200	Devastating damage	0.7
EF5 (INCREDIBLE)	Over 200	Extreme damage	<0.1

Source: National Oceanic Atmospheric Administration (NOAA)

The following types of damage could be expected for each EF-Scale tornado:

- F0** Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees.
- F1** Peels surface off roofs; mobile homes badly damaged or overturned; moving autos pushed off roads; attached garages may be destroyed.
- F2** Roofs torn off well-constructed homes; mobile homes demolished; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
- F3** Entire stories of well-constructed homes destroyed; trains overturned; trees debarked.
- F4** Well-constructed houses leveled; cars thrown and large missiles generated.
- F5** Strong frame houses lifted off foundations and carried considerable distances; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.

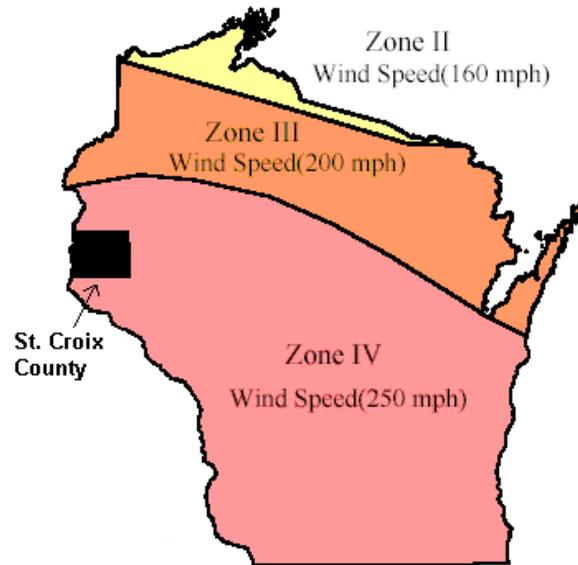
The destructive power of the tornado results primarily from its high wind velocities and sudden changes in pressure. Wind and pressure differentials probably account for 90 percent of tornado-caused damage. Tornadoes are generally associated with severe storm systems which are often accompanied by hail, torrential rain, flooding, and intense lightning.

Regional Trends

On the basis of 40 years of tornado history and more than 100 years of hurricane history, the United States has been divided into four zones that geographically reflect the number and strength of extreme windstorms. Zone IV has experienced the most and the strongest tornado activity with wind speeds of up to 250 mph, and includes all of St. Croix County (see **Figure 22**).

Wisconsin lies along the northern edge of the nation's maximum frequency belt for tornados (known as "tornado alley") which extends northeastward from Oklahoma into Iowa and then across to Michigan and Ohio. Generally, the frequency and severity of tornado events decreases as one travels north.

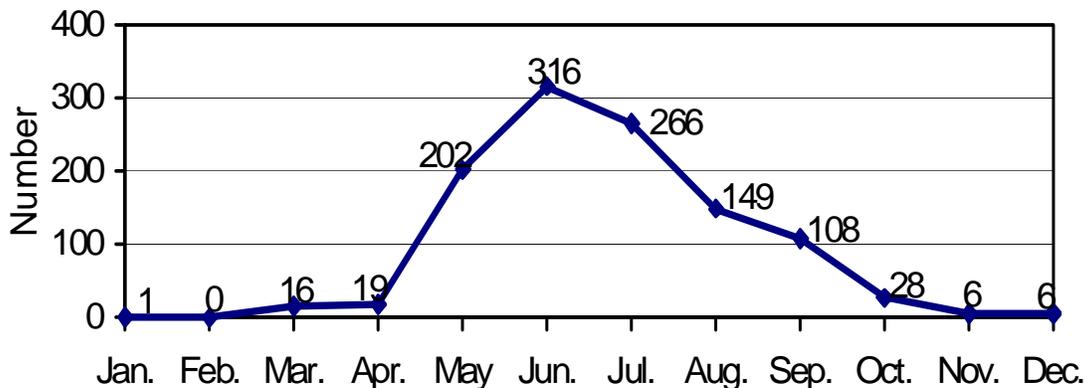
Figure 22. Design Wind Speed Map of Wisconsin



adapted from "Design Wind Speed" map from FEMA's "Taking Shelter from the Storms: Building a Saferoom in Your House"

Tornados have occurred in Wisconsin in every month except February, as shown in **Figure 23** below:

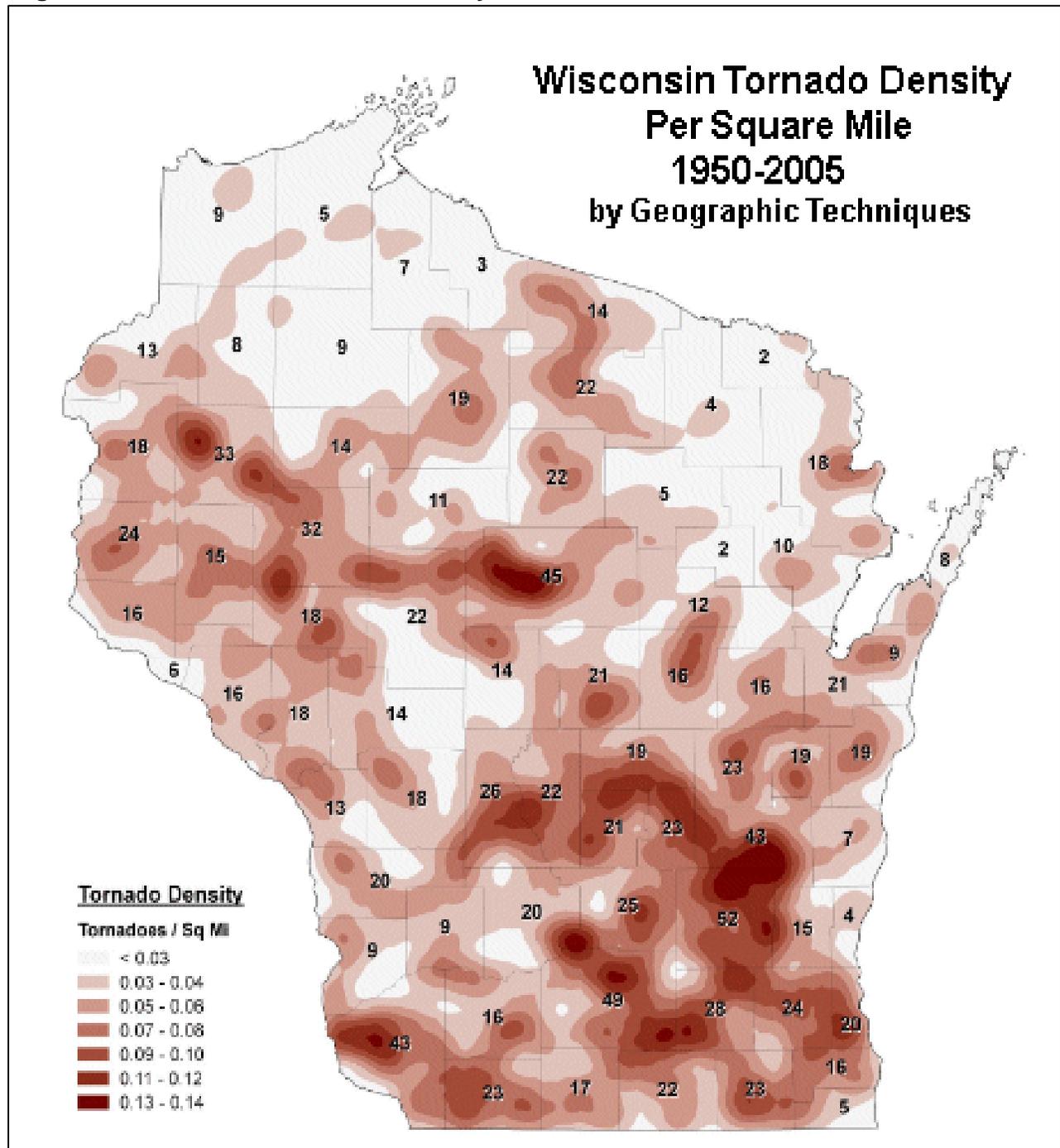
Figure 23. Wisconsin Tornado Events by Month • 1844 to 2001



Wisconsin's tornado season runs from the beginning of April through September. The most severe tornados typically occur during April, May, and June. Many tornados strike in late afternoon or early evening. However, tornados have occurred during other times of the day. Personal property damage, deaths, and injuries have and will continue to occur in Wisconsin.

Figure 24 below shows that the St. Croix County has been a tornado “hotspot” between 1950 and 2010 with 24 reported tornados. Only nine other counties had a higher number of tornado reports during this timeframe, including Barron County to the northeast and Chippewa County to the east.

Figure 24. Wisconsin Tornado Density • 1950 to 2005



The potential destructiveness of tornados remains fairly fresh in the minds of many St. Croix County residents due to two recent and substantial tornado events in the region. On June 18, 2001, an F3 tornado with a 27-mile path hit the Village of Siren approximately 40 miles to the north, resulting in three deaths, 16 injuries, 167 destroyed homes, and 280 damaged homes. More recently, 55 miles northeast of St. Croix County, an F3 tornado hit the City of Ladysmith on September 2, 2002, injuring 37 and resulting in over \$20 million in damage. Many long-time residents of the County and region also recall the devastating Colfax Tornado of 1958 which had a 32-mile path, caused at least 19 deaths, and resulted in severe damage. But for St. Croix County, and in particular the residents of the New Richmond area, a single tornado event over a hundred years ago remains a large part of local history.

1899 New Richmond Tornado

On June 12, 1899, the City of New Richmond had about 2,500 residents in addition to hundreds of tourists who had come to town to see the Gollmar Brothers Circus. After a harsh and cold winter, residents were enjoying the very warm day which was sunny for most of the afternoon. At about 4:30 P.M., a heavy rain with some hail fell, driving people temporarily indoors. But after the circus ended and the rain let up, people began to head home for the day. At 6:00 P.M., the streets were full of tourists, travelers, and residents.

Unknown to them, approximately 30 minutes earlier, a waterspout was seen on Lake St. Croix about 15 miles southwest of New Richmond. As the waterspout moved northeast and reached land, it became a tornado which destroyed farm buildings and killed three people in its path.

The tornado reached New Richmond about 6:00 P.M. with little or no warning. Many people took shelter in a dry goods store which was swept away and those in the shelter were pelted to death by flying bricks and timbers. Many outside were also killed from flying debris or were picked up and thrown. A 3,000 pound safe was later found a block from its original location.



Ruins of the New Richmond Methodist Church, 1899.

The Milwaukee Journal at that time estimated more than 500 structures were destroyed, most totally splintered and torn from their foundations, though another damage estimate states 230 buildings were destroyed. Regardless of the estimate, the entire City, except the extreme west end, was in ruins. Residents

were unable to fight resulting fires since the water facilities were gone. According to one observer, the fire was the "saddest and most horrible part of the whole affair." Messengers had to be used to request medical supplies and emergency assistance since telegraph and telecommunication lines had also been destroyed. And as night fell, rescuers worked by the light of the fires as they searched for those trapped, the injured, and the dead since the city's electrical power service was also in ruins. Many of the bodies found were burned beyond recognition and, in some cases, it was impossible to determine if the actual cause of death was directly due to the tornado or from the ensuing flames.

Official estimates determined that 117 people had been killed (114 within the city) and more than 200 injured, making the New Richmond tornado the ninth deadliest in U.S. history and the worst in Wisconsin history. Twenty-six families lost more than one individual, while six reported four or more deaths in the family. Over 400 animals were also killed. More than \$600,000 (over \$13 million in 2005 dollars) in damage claims were made, though it was believed that many people did not file claims, moved elsewhere, or there was no one left in the household to file a claim.

Despite these losses, most of the residents looked to the future; and the rebuilding process began promptly. Within five months' time, an estimated 100 new buildings had already been completed. After a temporary post office was set up, postal officials in Washington D.C., who were unaware of the tornado, demanded to know who had authorized a change in location for a federal building. It is reported that New Richmond's postmaster replied, "God Almighty." Today, the disaster and those lost are memorialized at Cyclone Memorial Park located on the west side of State Highway 65 South near the technical college in New Richmond.

Other Local Events

From 1950 through June 2011, there have been 31 tornado and ten funnel cloud events reported for St. Croix County as shown in **Table 17**. However, some events have likely gone unreported if not confirmed or the impacts were not significant, in particular for the funnel cloud events for which data was not been kept until 1993.

Tornado event data prior to 1970 appears sporadic and seems to indicate that the frequency of tornado events is on the rise, but this is not necessarily true; data in recent decades is much more robust as the number of reported events increase. As such, the risk analysis should focus primarily on those events occurring in recent years.

Since January 1993, there have been fourteen tornado and ten funnel cloud event reports for St. Croix County. This averages to one tornado event report approximately every 1.3 years and one funnel cloud report every 1.8 years, though one storm system can spawn multiple tornados or there can be multiple reports for a single tornado. The numbers of tornado reports are slightly higher compared to the 1970s and 1980s, which had a combined total of eight (or one report every 2.5 years).

**Table 17. Tornado Events – 1950 through June 2011
St. Croix County**

Location	Date	Time	Mag	Deaths	Injuries	Property Damage	Crop Damage
Tornado Events							
St. Croix County	5/10/1953	6:35 PM	F2	1	9	21,223,315	0
St. Croix County	8/15/1954	6:00 PM	F2	0	0	2,106,552	0
St. Croix County	5/24/1958	2:45 PM	F3	0	6	1,960,770	0
St. Croix County	6/4/1958	5:30 PM	F5	1	20	198,435,986	0
St. Croix County	6/22/1958	3:25 PM	F0	0	0	0	0
St. Croix County	10/9/1958	12:00 PM	F2	0	0	196,077	0
St. Croix County	9/2/1961	9:30 PM	F1	0	0	22,742	0
St. Croix County	7/28/1964	7:00 AM	F1	0	0	21,935	0
St. Croix County	7/3/1966	5:30 PM	F0	0	0	174,896	0
St. Croix County	6/4/1971	7:40 PM	F1	0	0	139,917	0
St. Croix County	6/12/1976	5:00 PM	F2	0	0	99,589	0
St. Croix County	7/30/1977	5:20 PM	F3	0	0	9,350,866	0
St. Croix County	7/15/1980	8:45 PM	F2	0	0	6,876,972	0
St. Croix County	7/24/1981	5:35 PM	F0	0	0	62,339	0
St. Croix County	8/7/1984	6:30 PM	F0	0	0	0	0
St. Croix County	5/29/1987	2:53 PM	F0	0	0	0	0
St. Croix County	7/6/1987	3:08 PM	F0	0	0	0	0
Woodville	5/30/1994	4:35 PM	F1	0	0	764,727	76,473
Somerset	6/5/1999	3:40 PM	F0	0	0	0	0
Hudson	7/26/2000	12:02 PM	F0	0	0	0	0
Emerald	6/11/2005	1:20 PM	F0	0	0	0	0
Hammond	6/11/2005	2:04 PM	F1	0	0	4,178,157	0
Cylon	6/11/2005	2:43 PM	F0	0	0	0	0
Roberts	9/23/2006	1:34 PM	F0	0	0	0	0
Somerset	5/25/2008	4:16 PM	F0	0	0	0	0
Burkhardt	8/8/2009	9:24 PM	F1	0	0	528,266	0
Hammond	8/8/2009	9:51 PM	F0	0	0	105,653	0
Burkhardt	8/19/2009	2:05 PM	F0	0	0	26,413	0
Emerald	8/19/2009	2:58 PM	F0	0	0	0	0
Forest	8/19/2009	3:11 PM	F0	0	0	0	0
Hammond	7/14/2010	9:54 AM	F1	0	0	519,740	0
Funnel Cloud Reports							
River Falls	8/23/1997	6:05 PM	N/A	0	0	0	0
River Falls	7/26/2000	11:40 AM	N/A	0	0	0	0
Wilson	9/5/2004	6:28 PM	N/A	0	0	0	0
Roberts	6/11/2005	6:18 PM	N/A	0	0	0	0
Northline	7/25/2008	14:43 PM	N/A	0	0	0	0
Hudson	8/8/2009	9:10 PM	N/A	0	0	0	0
Woodville	6/15/2010	2:25 PM	N/A	0	0	0	0

River Falls	7/14/2010	1:58 PM	N/A	0	0	0	0
River Falls	7/14/2010	6:50 PM	N/A	0	0	0	0
Hammond	7/14/2010	7:11 PM	N/A	0	0	0	0
41 reports				2	35	\$246,794,912	\$76,473

source: National Climatic Data Center (NCDC)

Damage estimates in 2012 dollars based on Consumer Price Index by U.S. Bureau of Labor Statistics

*original estimate

The tornado events reported in Table 17 have resulted in two deaths, thirty-five injuries, and almost \$247 million of estimated property damage in current dollars. Over \$76,000 in crop damage was reported. Though Barron County has had more reported tornados compared to St. Croix County, the number of resulting deaths, injuries, and total damages was significantly higher in St. Croix County.

All the tornados in Table 17 occurred during the months of May through October. The far majority of the events occurred between the hours of 2:00 PM and 10:00 PM, with only three events reported for the morning hours.

Of the two deaths and thirty-five injuries, one of the deaths and twenty of the injuries were the result of the June 4, 1958, Jim Falls tornado which resulted in over \$198 million in reported damages and was part of the same storm which produced the devastating Colfax tornado. The other deadly tornado occurred on May 10, 1953, resulting in one death and nine injuries and over \$21 million in property damages.

But it is important to keep in mind that data reports can vary significantly. For instance, Wisconsin Historical Society information estimates only \$43.7 million in property damage (*adjusted for inflation*) for the entire path of the June 1958 tornado which has been estimated at 32 miles long and up to 800 feet wide. Other events can go unreported to the National Weather Service and do not appear in the NCDC database.

As an example, the NCDC data does not include damage for the July 1982 which ripped through the Wall Street Trailer Court in the Town of Star Prairie and collapsed a radio tower. Local debate continues over whether this was a tornado or high straight-line wind, but the storm did receive national attention, such as the article on the following page from a Santa Fe newspaper. Of the 67 mobile homes, only six were anchored. These six, plus one other, survived the storm relatively intact. The other sixty homes were moved, damaged, or destroyed. Twenty-two park residents were injured.

The most recent local tornado event causing multi-millions in damages occurred in 2005 and damaged 38 Hammond area residences. In July 2010, another tornado would strike the Hammond area causing significant damage.

A-4 THE NEW MEXICAN Santa Fe, N.M., Wed., July 7, 1993

Thunderstorms, 100 mph winds batter Midwest

By The Associated Press
Winds gusting to 100 mph ripped roofs, felled trees and toppled power lines, blowing down trees and homes, and injured scores of people as thunderstorms and tornadoes roared across the north-central U.S. today.

The force of storms swept into Illinois early today, washing out roads with up to 3 inches of rain. Three people nearly drowned when they were swept down a stream near...

One man in Sioux Falls, S.D., was in critical condition with a chest injury, and another there was treated for minor injuries, according to police from Sioux Falls on Tuesday, officials said. At least...



A tractor shed and a silo and extensively damaged two barns and a barn shed in southern Iowa.

Winds gusting up to 100 mph blew down a transmission tower for radio station WIXK and damaged 60 trailers at the Wall Street Village trailer park in New Richmond, Wis., near the Minnesota state line. Some of the trailers were moved 100 feet or more off of their foundations.

At least a dozen forest fires were sparked over central Wisconsin but there were no reports of injury or property damage. Thunderstorms were scattered over central and southern Wisconsin into west-central Wisconsin and north-central Iowa following record high temperatures on Monday.

In Illinois, up to 3 inches of rain pelted Moline and Galesburg in about 90 minutes, authorities said. Two Galesburg police officers swallowed water and were reported in serious condition after reaching three boys who were swept down a street near...

Three roads and a bridge were washed out in Marshall County in northern Illinois, said sheriff's dispatcher John Otto.

The winds pushed a street sweeper about 100 feet into a line of parked cars and knocked over two semi-trailer trucks in the middle of a busy avenue in east...

Several power outages also were reported in the Chicago area as lightning struck utility lines on the city's South Side and...

The storms dumped more than 1 1/2 inches of rain in the Des Moines, Burlington and Cedar Rapids areas of Iowa. Flash flood watches were in effect through the night for some areas.

In Sioux Falls, 37 inches of rain fell in 8 minutes and had a dense covering of snow. The snow in some parts of the city...

At least three people were killed in the Chicago area as lightning struck utility lines on the city's South Side and...

The winds pushed a street sweeper about 100 feet into a line of parked cars and knocked over two semi-trailer trucks in the middle of a busy avenue in east...

Several power outages also were reported in the Chicago area as lightning struck utility lines on the city's South Side and...

Winds gusting up to 100 mph blew down a transmission tower for radio station WIXK and damaged 60 trailers at the Wall Street Village trailer park in New Richmond, Wis., near the Minnesota state line. Some of the trailers were moved 100 feet or more off of their foundations.

Relative Level of Risk

The St. Croix County plan steering committee rated tornadoes as the County's largest hazard threat. Based on the number of reports since 1993, it is **probable that a tornado will continue to touch down and be reported for St. Croix County once every one to two years on average.** Funnel clouds will continue to be reported at a similar rate, though they are likely more frequent in occurrence with many going unreported.

Although the improvement of technology has enabled meteorologists to better identify and predict the conditions that are favorable for tornado development, there is no precise way to predict the formation, location, and magnitude of a tornado. And, there is no predictable pattern that can be used to accurately predict future tornado events.

Vulnerability Assessment—Tornadoes & High Winds

Due to the potential impacts similar to those of tornadoes, high wind vulnerabilities are discussed within this section, though their risk assessment (e.g. history, frequency) is discussed with thunderstorms.

Potential Impacts

Tornadoes and high winds have no defined hazard area within St. Croix County. Due to the unpredictable nature of tornadoes and lack of specific hazard areas, the assessment of potential community impacts as a result of a tornado is difficult to quantify.

Tornadoes and high winds are capable of killing or injuring residents and damaging or destroying homes, businesses, public buildings, infrastructure, and natural resources. This destruction can occur as a result of high winds or by airborne debris that can be carried by the tornado. Tornadoes can uproot trees and topple power lines, impacting the supply of electrical service to local homes and businesses. Roadways can also be blocked by debris, and debris can accumulate in rivers or stormwater systems and contribute to washouts or flooding.

All above-ground structures are vulnerable to a tornado or strong high winds. As discussed previously, St. Croix County has nearly \$5.8 billion in assessed improvements and personal

property, most of which would be vulnerable during such events. This total does not include structures located on tax-exempt properties such as municipal buildings, churches, and certain utilities.

Further, damaged buildings may pose additional safety concerns due to structural instability, damage to electrical systems, or gas leaks. Specific data on the structural condition of buildings in St. Croix County is not available. In 2000, about 14 percent of the County's housing stock was built in 1939 or earlier, but this does not reflect condition and older structures are often more likely to have basements compared to new construction in some areas.

In addition to direct impacts to buildings, economic losses can be experienced when a business sustains direct damage from the event or when supporting infrastructure (e.g., utilities, services) are not available for extended periods. Such a business closure may be temporary, but could have large impacts on the local economy and related services, while some smaller or struggling business may fail.

Based on a review of the community and past tornado impacts, it was determined that the following general types of properties are especially vulnerable to tornado and high wind events:

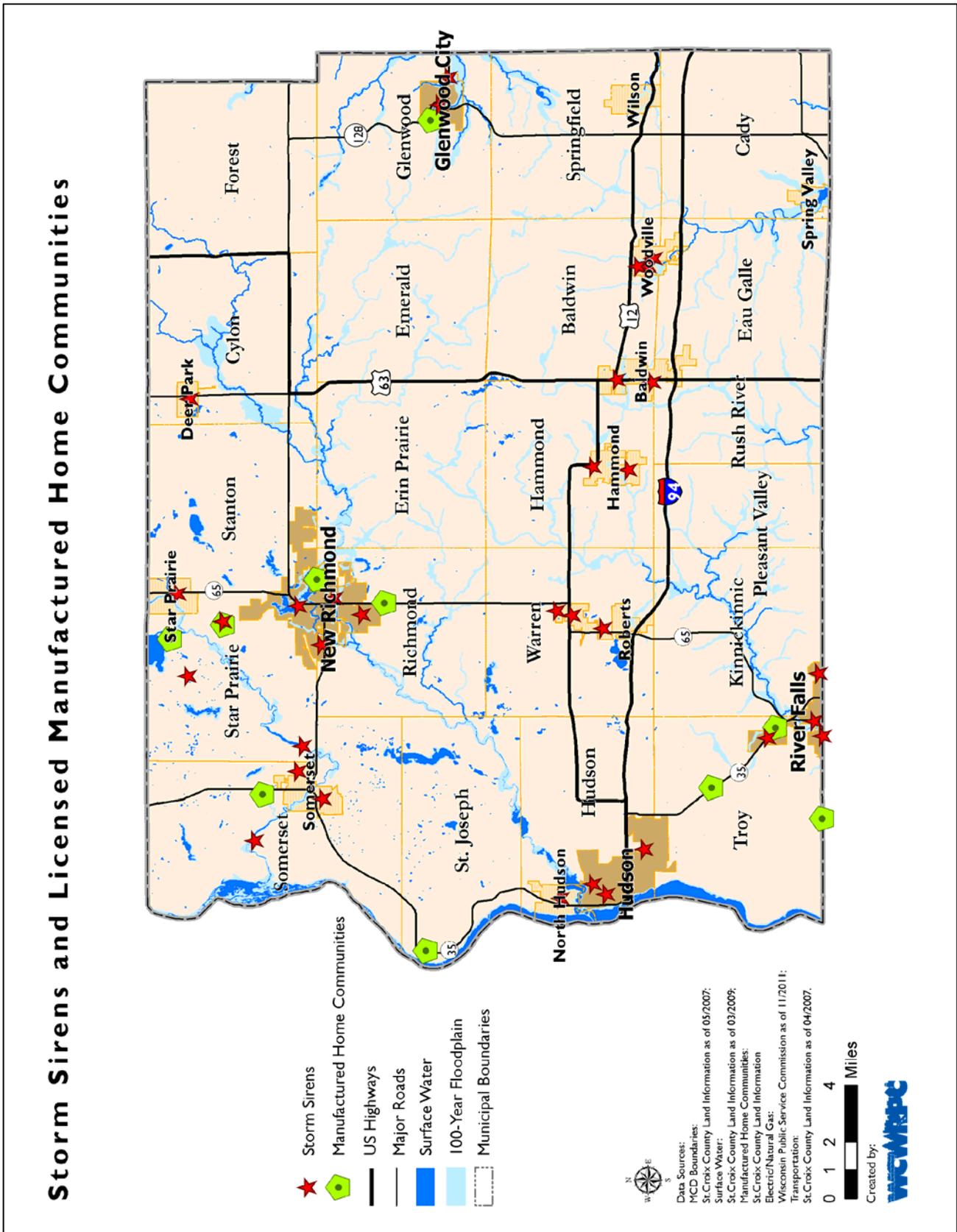
- Manufactured and mobile homes, especially those which are unanchored
- Homes with crawlspaces (elevated and more susceptible to lift)
- Buildings with large spans (e.g., airport hangars, pole barns, gyms, factories)
- Residents in slab-on-grade structures or with walk-out basements without access to a safe-room or storm shelter
- Campgrounds, trailers, and resort properties without storm shelters
- Above-ground power lines, especially in wooded areas
- Large gatherings (i.e., fairgrounds, concert grounds)
- Critical facilities and historic sites, due to their high value to the community

Mobile homes, in particular, are vulnerable to tornado and high wind events. According to the National Weather Service, between 1995 and 2002, there were 415 tornado fatalities in the United States. Forty-one percent (41%) of these fatalities occurred in mobile homes, which constitute just 7.5 percent of the nation's housing supply.

As discussed previously, St. Croix County had an estimated 1,007 mobile homes in 2010 constituting 3.0 percent of the total housing supply, below the State average of 3.9 percent. The largest numbers of mobile homes can be found in the unincorporated towns of Star Prairie, Troy, and Somerset, as well as in the villages of Roberts, Baldwin, and Woodville.

Figure 25 on the following is the distribution of the ten mobile home parks in St. Croix County. The majority of these parks are located in the unincorporated towns and outside of the range of sirens for weather warnings. Most are believed to not have convenient, quick access to safe rooms or storm shelter.

Figure 25. Alert Warning Sirens and Licensed Mobile Home Communities



Throughout most areas of the region, new mobile home development is minimal. In fact, the number of mobile homes has decreased since 2000. Other types of manufactured or pre-fabricated homes have become a preferred option of affordable housing. These units are typically well-secured to a permanent foundation, but usually lack a basement or safe room for a storm shelter. During the planning process, it was stated that large numbers of newer homes, apartments, condos, and other housing facilities in St. Croix County are/were being built slab-on-grade without a basement or crawlspace. Steering committee members noted that while a home with a walk-out basement may be partially underground, it may offer little protection during a tornado event.

Tents and trailers at campgrounds are particularly vulnerable to tornado and high wind events as was experienced nearby in the City of Cumberland (Barron County) during a Summer 2010 wind storm where injuries occurred. St. Croix County owns and operates one campground located near Glenwood City—the Glen Hills Park Campground which has 61 sites. A weather radio is monitored by on-site Park staff from 8 AM to 12 AM to alert campers, should it be needed. A large block shower building and the basement of a nearby golf course building are available for use as shelters. While it has no camping, Homestead Parklands in the Town of St. Joseph does get heavy use during the summer months and there is no community safe room available.



Siren, WI - June 2001 Tornado

Although the improvement of technology has enabled meteorologists to better identify and predict the conditions that are favorable for tornado development, there is no precise way to predict the formation, location, and magnitude of a tornado. And, as shown previously, there is no predictable pattern that can be used to anticipate future tornado events and their impacts. It is also sometimes difficult to distinguish between the damage caused by tornados and that of the hail, high winds, and thunderstorms which often accompany this hazard.

Additional property and crop damage due to high winds is very likely in the future, along with the potential for injury or death. In addition, the continuing changes in land-use and development patterns can influence the County's potential for future exposure to tornados. As discussed previously, St. Croix County is continuing to grow and develop. This creates an increasing exposure based on the number of residents and properties that could be at risk from future tornado events. There are no natural areas or environmental characteristics within St. Croix County which are uniquely vulnerable to tornados or high winds.

The *State of Wisconsin Hazard Mitigation Plan* provides projected average annual county loss estimates for tornado events based on past event history. The first tornado loss estimates in **Table 18** for St. Croix County were taken from the *State Hazard Mitigation Plan*.

Table 18. St. Croix County Tornado & Straight-Line Wind Loss Estimates for Residential Units

Tornado Loss Estimates (WEM)			
Avg. Damage per Tornado (1950-2010)	Annual Probability	Estimated Future Annual Loss (property)	Estimated Future Annual Loss (injury, death, & property)
\$1,221,129 (31 events)	.5082	\$620,574	\$840,000
Tornado Loss Estimates (WCWRPC)			
Avg. Damage per Tornado (1950-2010)	Annual Probability	Estimated Future Annual Loss (property)	Estimated Future Annual Loss (injury, death, & property)
\$7,961,126 (31 events)	.5082	\$4,045,844	\$4,265,270
Thunderstorm High Wind Loss Estimates (WCWRPC)			
Avg. Damage per T-Storm Wind (1950-2010)	Annual Probability	Estimated Future Annual Loss (property)	Estimated Future Annual Loss (injury, death, & property)
\$832,266 since 1993 (128 events)	2.098	\$1,746,094	\$1,845,355

Source: Wisconsin Emergency Management. State of Wisconsin Hazard Mitigation Plan. October 2011; National Climatic Data Center (NCDC); and WCWRPC

The first tornado loss estimates in Table 18 for St. Croix County were taken from the *State of Wisconsin Hazard Mitigation Plan 2011* based on past event history and provided in 2008 dollars. WCWRPC produced revised loss tornado loss estimates based on the events and damages reported in Table 17, which reflect significantly higher average damages, probabilities, and losses. Loss estimates for high winds were developed by WCWRPC using a similar approach and the NCDC data provided later in the *Thunderstorms* section.

The methodology used to develop the first tornado loss estimate is described in the *State of Wisconsin Hazard Mitigation Plan*. It incorporates the average damage per tornado, an annual probability of a tornado event, and average injuries and deaths per event based on historic data for 1950 through 2010, from the National Climatic Data Center (NCDC). On average, each injury was given a monetary value of \$51,000 per injury, while deaths were given a monetary value of \$5,800,000 per death based on FEMA guidance for benefit-cost calculations.

The WCWRPC estimation used a very similar approach based on the NCDC data provided in Tables 17 and 19, which were adjusted to 2012 dollars. WEM estimates for injuries and death were then added. The average high winds damage estimates are based on the 93 records since 1993, since high wind damage was not reported for earlier storms.

According to WEM, St. Croix County ranked 8th overall among Wisconsin's 72 counties for annual tornado damage risk based upon the above loss estimates. This reflects its relatively high annual probability and history of damage-producing events. Average total losses from tornado events in St. Croix County can be estimated between \$840,000 to \$4.3 million annually, with the understanding that damages may not be incurred every year. Average annual straight-line wind losses were projected at \$1.7 to \$1.9 million per year. But it must be kept in mind that the estimates in Table 18 are based on those events reported to the NCDC since 1950 and some damages and injuries likely have gone unreported. Crop and forest damages are also not included in the above numbers.

While few, if any, buildings can withstand the direct impact of a large-magnitude tornado, large-span structures can be particularly vulnerable to high winds. Data on the number of large-span structures in St. Croix County is not available, though some, such as school gymnasiums, are addressed in the critical facilities vulnerability assessment. Most of these large-span buildings tend to be large storage buildings, garages, or barns which are common throughout the County. Many of these are relatively inexpensive to construct and are used for storage or livestock. Of greater vulnerability, due to contents and risk of injury or death, are industries or big-box commercial buildings which have large-span structures. Most of these are located near or within the incorporated areas.

Did you know?

25% of businesses do not re-open following a major disaster.

– The Institute for Business & Home Safety

Agricultural-related damages include structures (e.g., barns), livestock, and crops. \$76,473 in tornado-related crop damage was reported since 1950 and \$10,990,323 in high-wind crop damage was reported. Based on the NCDC records, it is not certain if crop damage reports were tracked prior to 1993, or they may have been combined with other property damage. But historical documents and the testimony of participants during the process both agree that livestock barns and many other agricultural-related structures are quite vulnerable to high winds and tornados. There were no natural areas or environmental characteristics within St. Croix County which were identified as being uniquely vulnerable to tornados or high winds.

Large events and facilities which hold large numbers of people also pose significant vulnerabilities. This can include activities such as concerts and tubing near Somerset and events at the County Fairgrounds in Glenwood City. The County Fairgrounds has no public storm shelter available, which has been a problem in the past when severe weather forced some fairgoers to seek shelter in nearby businesses. During a peak time, up to 5,000 fairgoers may be in attendance. The Fairgrounds long-term plan includes a new multi-use building which may offer an opportunity to integrate a community safe room. The Somerset concert grounds and nearby campground offers no public storm shelter as well.

Continuing changes in land-use and development patterns will influence the County's potential for future exposure to tornados. As discussed previously, St. Croix County is continuing to grow and develop. This creates an increasing exposure to the number of residents and properties that are at risk from future tornado events.

Vulnerable Critical Facilities

All critical facilities are susceptible to being hit by a tornado. A more robust assessment of community assets (critical facilities) and their susceptibility to tornados and other hazard events is located in **Appendix E**. Above-ground electrical infrastructure is particularly vulnerable to tornados and high winds and was discussed previously in the *Special Threat Analysis—Long-Term Power Loss* section.

Though no critical facilities have been impacted by tornados in recent years, the vulnerability assessment did yield that tornados and high winds represent the highest vulnerability and risk to the critical facilities of St. Croix County. Schools were of special concern due to:

- large numbers of individuals present, including school-age children or when being used as a storm shelter in some communities
- most having large span areas, such as gyms and theaters, which are especially vulnerable to tornados and high winds



The inventory of critical facilities identifies 22 school facilities in St. Croix County which likely meet the above criteria. For instance, during the school district survey, the Somerset School District that their facilities had three school gyms and a commons area with large windows.

Long-term care and assisted-living facilities are also vulnerable due to the age and/or health of residents. Most of these facilities are also single-story structures for reasons of mobility and have a designated storm shelter area (e.g., interior hallway), instead of a basement. As of April 2012, St. Croix County had nine nursing homes and 50 other licensed long-term care or assisted living facilities (i.e., residential care apartment complexes, adult family homes, CBRFs).

Hospitals were also identified as being of significant concern due to their potentially vulnerable population, emergency response functions, and importance to the community. St. Croix County has three hospitals located in Baldwin (Baldwin Area Medical Center-25 beds), Hudson (Hudson Hospital-25 beds), and New Richmond (Westfields Hospital-25 beds). There are six additional clinics.

Unique Jurisdictional Risks or Vulnerabilities—Tornados & High Winds

During the planning process, each incorporated area was analyzed to provide insight into the extent of its vulnerabilities to tornados and high wind events. The extent of the vulnerabilities

identified by the communities was largely limited to recent events, mobile home parks, slab-on-grade construction, and public storm shelters as summarized in the *Unique Jurisdictional Risk or Vulnerabilities Table* in **Appendix F**. **Appendix H** summarizes current mitigation efforts for each incorporated community.

Tornados pose no risks or vulnerabilities unique to individual incorporated jurisdictions (villages and cities). Many communities noted that there have been tornado touchdowns in close proximity in recent years. The cities and villages reported that high straight-line winds are more common. Downed trees, roof damage, and scattered debris are the most commonly noted types of wind damage. Power loss due to downed trees is also fairly common in some of the older neighborhoods or residential areas built in former pine plantation.

Overall, the level of vulnerability to the cities and villages increases with development density, population density, type of development, and value of improvements. And as more growth and development occurs, this vulnerability also increases. As such, cities and villages are the highest vulnerability areas, as well as those areas with higher populations, larger numbers of housing units, and higher assessed value per square mile described previously in **Section II. Community Profile**.

As mentioned previously, the City of New Richmond has had the most significant tornado event, with the 1899 tornado destroying most of the structures in the community. Some communities, such as the Village of Wilson, experienced the high winds associated with the 1958 Colfax tornado, but no incorporated area in St. Croix County was directly impacted by this tornado. More recently in 2005, a tornado struck the Village of Hammond, resulting in damage to about 38 homes, but injuries or deaths were avoided. Village officials report that there were numerous lessons learned from this 2005 event which will further strengthen their response procedures if such an event should be repeated in the future.

Most communities have mobile homes or parks over 100 in the Village of Roberts. In fact, only about 32% of the existing mobile homes in St. Croix County are located in the incorporated cities and villages; the far majority of such homes are located in the unincorporated towns. There is little new mobile home park development occurring in most communities, especially in the west portions of the County where land prices are higher, which discourages such development. Some communities limit such development to mobile home parks, while others prohibit mobile homes altogether. Most newer mobile homes are anchored or tied down, while many others are not. Many communities did note that new slab, on-grade construction of homes, condos, or apartments without basements or crawlspaces has become very popular.

Three somewhat unique risks from tornados or high winds were identified for the incorporated communities. The City of Glenwood City noted concerns with the County Fairgrounds which was discussed previously. The Village of Somerset noted a similar concern with concerts and up to 15,000 recreational visitors in the area who are camping, fishing, inner-tubing, etc, on some summer days. A number of municipalities, such as the City of River Falls, noted the existence of some large-span industrial or commercial buildings which could also be more vulnerable during a tornado events, as well visitors to community parks.

The community safe room needs for each city and village are identified in Appendix H. Only the Village of Roberts and Village of Wilson offers a full-time safe room, though Wilson's Village Hall is rarely used. The bank in Deer Park is available, when it is open, and the community center is designated but is seldom used as a shelter. Based on initial community interest, the following municipalities may be strong candidates for community safe room projects: Town of Somerset, the villages of Baldwin, Hammond, and Woodville, and the cities of Glenwood City, New Richmond, and River Falls. Other communities may have interest in safe room projects, but these needs were not stated during the project.

The exact safe room needs vary by community. For instance, the City of New Richmond suggested that safe rooms were needed for two mobile home parks and that more public education on safe rooms (including a possible model safe room) was needed. The City of River Falls has prioritized the installation of safe rooms for its city parks. Glenwood City would coordinate safe room development with the Fairgrounds, while Woodville is interested in exploring a community safe room as part of its new fire hall.

Many communities do not require mobile homes to be anchored or tied down, unless the mobile homes are newer and fall under more recent installation codes. Most communities also do not specifically require mobile home parks to have safe rooms or an emergency operating plan, though these are sometimes required as part of a conditional use permit. The Village of Hammond has used this approach to require a shelter as part of a recent permit approval for a mobile home park expansion, but construction of the shelter has not yet begun.

Alert Warning Sirens

The public relies heavily on alert warning sirens for notification of potentially approaching storms or tornados. The existing sirens are all located in incorporated areas, except for two sirens in the Town of Star Prairie and two at the Xcel dams on the Apple River as shown previously in Figure 25. All of the sirens are triggered through the County Emergency Communications Center (dispatch), except for the sirens within the City of River Falls which are controlled by the City.

During this plan update, WCWRPC worked with cities and villages to identify and map the location of their sirens in G.I.S. format. This G.I.S. coverage is now available to St. Croix for additional analysis and to maintain as new sirens are added.

In addition, cities, villages, and towns were asked about sirens conditions and needs during the planning process. The cities and villages reported adequate coverage at this time, though one or two sirens were temporarily unavailable due to lightning strike, mechanical failure, etc. A number of cities and villages may need additional coverage in the future as growth occurs as noted in Appendix H. The Village of North Hudson reported that an older siren is prone to breaking down, the City of River Falls sirens are also aging, and the City of Hudson is contemplating re-activating a siren at the downtown fire station. The Village of Wilson has no siren due to cost concerns.

There are also unincorporated areas with significant population concentrations or growth areas

which may benefit from siren coverage. For those towns completing the town vulnerabilities survey, the towns of Hudson and Troy indicated that they may have siren needs. The towns of Richmond and St. Joseph were also identified during stakeholder interviews as possible locations for sirens in the foreseeable future. Hudson and Troy both noted that multiple sirens would be needed if full coverage is expected and a study would be required to best determine siren placement to maximize coverage.

During meetings and interviews, some stakeholders and communities (e.g., River Falls, Town of Kinnickinnic) expressed interest in a NOAA all hazards weather radio project or expanded use of social media for weather warnings.

ii. Winter Storms and Extreme Cold (including blizzards and ice storms)

Summary—Winter Storms

Risk: *Relatively frequent with 3 to 4 severe winter storms per year. Extreme cold events are less frequent with < 1 per year. Snow depths exceeded 20 inches in some areas during the December 2010 storm, collapsed some roofs, and had 2 associated area deaths.*



Vulnerabilities: *Primary risks are to utilities, travelers, crops, and larger span structures (e.g., barns, pole buildings, gyms). Winter storms can also be very costly to the County and its municipalities in terms of road plowing and post-storm clean-up. Power outages during extreme cold can pose significant vulnerabilities to residents and livestock. Ice-damming on lakes and rivers is not uncommon in some areas.*

1. Interstate 94 was the most frequently mentioned winter storm concern during the planning process, in particular at the Hudson bridge and “Knapp hill”. Traffic control gates have been installed at exits 1 & 4 on-ramps. Parking and stranded vehicles on exit ramps during storms has created snow removal problems. During extreme cold, there have also been problems with trucks running diesel “gelling up”.
2. Power outages due to heavy snow, winter winds, and ice were also a very frequently mentioned winter-related concern. A regional long-term power outage, especially during a period of extreme cold, is arguably the largest natural hazard threat facing west central Wisconsin. Refer to the long-term power outage sub-section for more discussion of this threat.
3. During the December 2010 winter storm, a number of area buildings collapsed, including a dog rescue shelter, a barn (resulting in livestock deaths), and a metal shed (resulting in a man’s death).
4. “Blow-ups” and damage to paved roadways due to freezing and thawing is a significant ongoing maintenance expense. This expense could potentially be reduced through more expensive approaches to construction, but it is at a higher initial construction cost.
5. During winter months, the social isolation of some elderly is exacerbated, especially in rural areas located farther from social services or other assistance. Some elderly have special medical equipment which is reliant on electrical power. Transportation for

pharmaceuticals and medical treatment (e.g., dialysis) can be delayed by winter storms. This topic was discussed in more detail within the long-term power outage sub-section.

6. During approximately one to two winter seasons every ten years, considerable winter kill occurs, affecting the alfalfa crop in particular. The crop losses have not been as serious as experienced in some adjacent counties. The severity can vary by local soil types, soil management practices, and the timing of the last cutting, with about a 50% chance of some “spotty” winter kill occurring in any given winter season.
7. Ice-damming was identified as a potential cause of concern or contributor to flooding at a number of locations. The Stillwater Lift Bridge, which is on the National Register of Historic Places, is one such location which has been threatened with serious damage due to ice-damming.

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates winter storms (including blizzards, extreme cold events, and ice storms) as a 47% risk over a ten-year period given their high probability (3); moderate vulnerability (1.8); and substantial available emergency management capabilities to deal with this threat (1.3).

Risk Assessment—Winter Storms

The Hazard

Winter storms can vary in size and strength and include heavy snowstorms, blizzards, freezing rain, sleet, ice storms, and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury such as frostbite and death.

A variety of weather phenomena and conditions can occur during winter storms. The following are National Weather Service-approved descriptions of winter storm elements:

<i>Heavy Snowfall:</i>	The accumulation of six or more inches of snow in a 12-hour period, or eight or more inches in a 24-hour period.
<i>Winter Storm:</i>	The occurrence of heavy snowfall accompanied by significant blowing snow, low wind chills, sleet, or freezing rain.
<i>Blizzard:</i>	The occurrence of sustained wind speeds in excess of 35 miles per hour accompanied by heavy snowfall or large amounts of blowing or drifting snow.
<i>Ice Storm:</i>	An occurrence where rain falls from a warm and moist upper layer(s) of the atmosphere to colder and dryer layer(s) at or near the ground, freezes upon contact with the ground, and accumulates on exposed surfaces.

Freezing Drizzle/Rain: The effect of drizzle or rain freezing upon impact on objects that have a temperature of 32° Fahrenheit or below.

Dangerously cold conditions can be the result of extremely cold temperatures or the combination of cold temperatures and high winds. The combination of cold temperature and wind creates a perceived temperature known as “wind chill.”

Wind chill is the apparent temperature that describes the combined effect of wind and air temperatures on exposed skin. When wind blows across the skin, it removes the insulating layer of warm air adjacent to the skin. When all factors are equal, the faster the wind blows, the greater the heat loss. As winds increase, heat is carried away from the body at a faster rate, driving down both the skin temperature and, eventually, the internal body temperature. Shown in **Table 19** are the calculated wind chill temperatures as a result of specified air temperatures and wind speed.

**Table 19. Wind Chill Table
(Wind Chill Values in Degrees Fahrenheit)**

Temperature (°F)	Wind Speed (MPH)								
	5	10	15	20	25	30	35	40	45
30	25	21	19	17	16	15	14	13	12
25	19	15	13	11	9	8	7	6	5
20	13	9	6	4	3	1	0	-1	-2
15	7	3	0	-2	-4	-5	-7	-8	-9
10	1	-4	-7	-9	-11	-12	-14	-15	-16
5	-5	-10	-13	-15	-17	-19	-21	-22	-23
0	-11	-16	-19	-22	-24	-26	-27	-29	-30
-5	-16	-22	-26	-29	-31	-33	-34	-36	-37
-10	-22	-28	-32	-35	-37	-39	-41	-43	-44
-15	-28	-35	-39	-42	-44	-46	-48	-50	-51
-20	-34	-41	-45	-48	-51	-53	-55	-57	-58

Source: National Weather Service

Regional Trends

Most winter storm events are typically regional in nature and are not limited to a localized area or county. However, levels of snowfall or ice accumulations can vary significantly over relatively short distances.

Much of the snowfall in Wisconsin occurs in small amounts of between one and three inches per occurrence. Heavy snowfalls that produce at least eight to ten inches of accumulation occur on average only five times per season. True blizzards are rare in Wisconsin. They are more likely to occur in northwestern Wisconsin than in southern portions of the State, even though heavy snowfalls are more frequent in the southeast. However, blizzard-like conditions can exist during heavy snowstorms when gusty winds cause the severe blowing and drifting of snow.

Both ice and sleet storms can occur at any time throughout the winter season from October into April. Early- and late-season ice and sleet storms are generally restricted to northern Wisconsin. Otherwise, the majority of these storms during the winter months occur in southern Wisconsin. In a typical winter season, there are 3 to 5 freezing rain events; and a major ice storm occurs on a frequency of about once every other year. If a half-inch of rain freezes on trees and utility wires, extensive damage can occur, especially if accompanied by high winds that compound the effects of the added weight of the ice. There are also between three to five instances of glazing (less than 1/4 inch of ice) throughout the State during a normal winter.

Local Events

From 1971 to 2000, the mean annual snowfall for St. Croix County has been 40 to 50 inches. According to the National Weather Service, the worst snow storms in the State of Wisconsin from 1881 to present which potentially included St. Croix County are:

- **March 2-4, 1881** - Southern / Central - Blizzard - 2 to 4 feet of snow. Drifts to 20 feet. Milwaukee reported 28.5 inches.
- **January 15, 1887** - Southern / Central - Snowstorm - 2 feet of snow. Huge drifts.
- **December 27-28, 1904** - Southern / Central - Heavy snow/ice. 26 inches of snow at Neillsville (Clark County).
- **January 30-February 1, 1915** - Southern / Central - Heavy snow / ice – severe glazing. 10 inches of snow in Milwaukee.
- **February 12-14, 1923** - Statewide - Blizzard - Heavy snow - severe drifting.
- **February 8-10, 1936** - Statewide - Blizzard - severe drifting.
- **November 6-8, 1943** - Statewide - Heavy snow / ice - 10 to 18 inches of snow. Roads blocked for several days.
- **January 28-30, 1947** - Southern / Central - Blizzard - 10 to 27 inches. Drifts to 15 feet. Roads blocked.
- **January 22-23, 1982** - North half - Blizzard - 10 to 20 inches. Superior had 19 inches.
- **November 30 - December 2, 1985** - Statewide (except southeast corner) - Widespread snows of 10 to 18 inches. Madison had about 10 inches.
- **October 31 - November 2, 1991** - Northwest / West Central - Blizzard - "Halloween Storm" - 15 to 30 inches, 6 to 10 foot drifts. 30 inches in Burnett, Douglas, Polk, and St. Croix counties.
- **January 26-27, 1996** - Statewide - Heavy snow - 6 to 18 inches. Localized amounts of 16 to 18 inches fell along a line from La Crosse to Green Bay.
- **March 13-14, 1997** - West Central / Northeast - Snowstorm - 12 to 28 inches. 28 inches at Wautoma in Waushara County.

Did You Know?

The State of Wisconsin 24-hour snowfall record of 26 inches was set in Neillsville in December 1904.

- **January 21-22, 2005** - Statewide - Blizzard (gusts to 50 mph) - 6 to 15 inches. Although winds gusted up to 50 mph in some areas and visibilities were reduced to less than 1/4 mile due to falling or blowing snow, many areas didn't experience these conditions for 3 hours or more to classify as a full blizzard. Nonetheless, heavy snow and very windy conditions created near white-out conditions especially in the south and east. The heaviest totals occurred near Lake Michigan due to additional lake effect, where some areas ended up near 15 inches.
- **March 18-19, 2005** – West-central – Winter Storm – 18 to 23 inches in a swath from southern Buffalo County to western Jackson County, with 12 to 15.6 inches in La Crosse County. The maximum of 23 inches occurred in northwestern Jackson County.
- **March 13-14, 2006** – West-central to North-central– Winter Storm – 17 to 32 inch swath from St. Croix County northeast to Iron County. Thundersnow enhanced the accumulations. Very poor visibility resulted from gusty winds around 30 mph and drifting resulted in hundreds of accidents. Locals said it was the worst storm since the 1980s.
- **February 23-26, 2007** – West-central (through southern and eastern Wisconsin) – Blizzard - Two-round storm, with one overnight the 23rd to 24th, and the second round overnight the 24th into the 25th. Leftover snow accumulations continued overnight the 25th into the 26th. In counties surrounding La Crosse, 8 to 15.6 inches (Galesville) fell in round one, while round two produced 6 to 12.5 inches (Sullivan NWS office) over the southern three-fourths of the State. The leftover snow added another 1 to 4 inches, except for 6 to 14 inches from New London into Door County. Many locations totaled 20 to 25 inches for this long-duration two-punch episode from around La Crosse to Port Washington and a small part of Door County. Gusty winds generated snow drifts up to 5 to 7 feet in height.
- **December 8-9, 2009** – Nearly statewide – Winter Storm – Large area experienced 12 inches or more. Madison area had 17 to 20 inches, 15 to 17 inches in the La Crosse area, 14 to 16 inches in the Green Bay area, and 16 to 28 inches in the Lake Superior snow-belt. The greatest amount of around 28 inches occurred in the Hurley, Iron County area.
- **Dec 10-12, 2010** – Nearly statewide – Winter Storm/blizzard – Large area of 6 to 23 inches. Maximum amounts of 16 to 23 inches in west-central to central Wisconsin. The 23 inches was measured in southwest Polk County. In the Eau Claire area 18 to 22 inches fell, while accumulations in La Crosse County ranged from 14 to 20.2 inches. Friendship, Adams Co., picked up 19.9 inches. There were reports of thundersnow. Northwest to north winds gusted to 30 to 50 mph with some whiteouts reported in exposed areas. Rain-snow-sleet mix southeast of a Janesville to Port Washington line limited accumulations to 1 to 5 inches in that part of the state.

The December 10-12, 2010, snow storm hit St. Croix County particularly hard and was frequently mentioned during community interviews. For the Twin Cities, this was the 5th largest snowstorm on record since 1891 and the largest snowstorm to hit the area since the 1991 Halloween Blizzard. Total snow depths in St. Croix County averaged 16 to 20 inches, with some areas over 20 inches. All roadways were effectively shut down. The County Highway Department had over 36 trucks and graders out plowing and post-storm clean-up wasn't entirely complete before then next storm on December 20-21 struck.

The 2010 storm also affected homeowners and snow loads collapsed some structures. In the City of Eau Claire, a number of carbon monoxide poisonings occurred, which could have been fatal, when heating vents were blocked by accumulating snow and the weight of the snow collapsed the Metrodome's roof in Minneapolis. Closer to home, the roof of a local dog rescue shelter collapsed as shown in the picture to the right. An area barn collapsed resulting in livestock deaths. And a rural River Falls man was killed when a metal shed collapsed. And a Woodville man using a snow blower was killed when he was hit by a snow plow.



Shown in **Table 20** is a listing of winter storm events, including winter storms, heavy snowfall, freezing rain/ice, blizzards, and periods of extreme cold, that have been recorded by the National Climatic Data Center for St. Croix County since 1993. Prior to 1993, winter storm data for St. Croix County was not available through the National Climatic Data Center.

**Table 20. Winter Storm Events – 1993 through June 2011
St. Croix County**

Location	Date	Time	Type	Deaths	Injuries	Property Damage
Statewide	1/13/1993	unknown	Heavy Snow	0	0	0
Regional	1/5/1994	12:00 PM	Heavy Snow	0	0	0
Statewide	1/13/1994	6:00 AM	Cold	0	0	0
Regional	1/26/1994	8:00 PM	Heavy Snow/ice Storm	0	0	0
Regional	11/27/1994	9:00 AM	Heavy Snow	0	0	0
Regional	2/10/1995	9:00 PM	Cold	0	0	0
Regional	11/26/1995	8:00 PM	Heavy Snow	0	0	0
Regional	12/6/1995	8:00 PM	Heavy Snow	0	0	0
Regional	12/13/1995	6:00 AM	Glaze	0	0	0
Regional	1/17/1996	9:00 PM	Ice Storm	0	0	0
Regional	1/18/1996	5:00 AM	Heavy Snow	0	0	0
Regional	1/31/1996	5:00 AM	Extreme Cold	0	0	0
Regional	2/1/1996	12:00 AM	Extreme Cold	1	0	0
Regional	2/8/1996	12:00 AM	Freezing Rain	0	0	0
Regional	3/24/1996	1:00 AM	Heavy Snow	0	0	0
Regional	11/15/1996	1:00 AM	Ice Storm	0	0	0
Regional	11/23/1996	12:00 AM	Heavy Snow	0	0	0
Regional	12/14/1996	4:00 PM	Heavy Snow	0	0	0
Regional	12/23/1996	9:00 AM	Heavy Snow	0	0	0
Regional	1/15/1997	5:00 PM	Extreme Windchill	0	0	0
Regional	3/13/1997	1:00 AM	Winter Storm	0	0	0

Regional	1/4/1998	5:00 PM	Ice Storm	0	0	0
Regional	1/11/1998	10:00 AM	Winter Storm	0	0	0
Regional	1/22/1999	3:00 AM	Winter Storm	0	0	0
Regional	3/8/1999	8:00 AM	Winter Storm	0	0	0
Regional	1/12/2000	10:00 AM	Heavy Snow	0	0	0
Regional	12/28/2000	2:00 AM	Winter Storm	0	0	0
Regional	1/29/2001	7:00 PM	Winter Storm	0	0	0
Regional	2/7/2001	7:00 AM	Heavy Snow	0	0	0
Regional	3/12/2001	12:00 AM	Heavy Snow	0	0	0
Regional	3/8/2002	6:00 PM	Winter Storm	0	0	0
Regional	3/14/2002	8:00 AM	Winter Storm	0	0	0
Regional	2/2/2003	8:00 PM	Winter Storm	0	0	0
Regional	12/9/2003	3:00 AM	Winter Storm	0	0	0
Regional	1/26/2004	12:00 AM	Winter Storm	0	0	0
Regional	2/1/2004	2:00 AM	Winter Storm	0	0	0
Regional	3/5/2004	12:00 AM	Winter Storm	0	0	0
Regional	8/21/2004	2:00 AM	Frost/freeze	0	0	0
Regional	1/1/2005	2:00 PM	Winter Storm	0	0	0
Regional	1/21/2005	2:00 PM	Winter Storm	0	0	0
Regional	2/19/2005	9:00 PM	Winter Storm	0	0	0
Regional	3/18/2005	6:00 AM	Winter Storm	0	0	0
Regional	3/12/2006	8:00 PM	Winter Storm	0	0	0
Regional	3/15/2006	10:00 PM	Winter Storm	0	0	0
Regional	2/24/2007	5:00 AM	Winter Storm	0	0	0
Regional	3/1/2007	12:00 AM	Winter Storm	0	0	0
Regional	12/1/2007	10:00 AM	Winter Storm	0	0	0
Regional	2/10/2008	2:00 AM	Cold/wind Chill	0	0	0
Regional	2/19/2008	6:00 PM	Cold/wind Chill	0	0	0
Regional	3/31/2008	9:30 AM	Heavy Snow	0	0	0
Regional	4/1/2008	12:00 AM	Heavy Snow	0	0	0
Regional	12/20/2008	6:00 PM	Winter Storm	0	0	0
Regional	12/30/2008	1:15 PM	Winter Storm	0	0	0
Regional	1/15/2009	12:00 AM	Cold/wind Chill	0	0	0
Regional	2/26/2009	1:00 PM	Winter Storm	0	0	0
Regional	10/12/2009	6:00 AM	Winter Weather	0	0	0
Regional	12/8/2009	12:00 PM	Winter Storm	0	0	0
Regional	12/23/2009	7:00 PM	Winter Storm	0	0	0
Regional	12/3/2010	3:00 PM	Winter Storm	0	0	0
Regional	12/10/2010	10:00 PM	Winter Storm	0	0	519,740
Regional	2/20/2011	10:00 AM	Winter Storm	0	0	0
Regional	3/22/2011	9:00 PM	Winter Storm	0	0	0
			62 events	1	0	\$519,740

source: National Climatic Data Center (NCDC)

Damage estimates in 2012 dollars based on Consumer Price Index by U.S. Bureau of Labor Statistics

Since 1993, St. Croix County has averaged three winter storm events and 0.4 extreme cold events per year, with a total of 62 reported events over the eighteen-year period. These events were further characterized by 15 heavy snowfall events, 31 winter storms (*mix of snow, ice, wind*), one heavy snow/ice storm, three ice storms, seven extreme wind chill or cold events, one winter weather event, one frost/freeze and three freezing rain or glaze events. All but three events on October 12, 2009, April 1, 2008, and August 21, 2004 occurred in the months of November through March.

All events reported were regional or statewide in nature, also affecting areas outside St. Croix County. The death associated with the above storms occurred in Eau Claire County due to exposure to extreme cold. Additional deaths and injuries as a result of traffic accidents, frost bite, collapsing roofs, etc., associated with these events have occurred, such as the December 2010 snow storm deaths described previously, but were not reported to the National Weather Service.

Drifting of snow on many of the roads of St. Croix County is common during winters when snow and high winds are present, though this has been less of a problem in recent years due to weather patterns and improved equipment. The effect of winter storms on Interstate 94 travel is of greater significance and was a very frequently mentioned concern during hazard mitigation planning meetings.

The I-94 segment between Eau Claire and Hudson is one of the most heavily traveled highways in the State of Wisconsin, second only to the stretch of I-94 in Kenosha County. Interstate traffic is also a mix of vehicle types; and travel often occurs at high speeds (65+ mph), which can be particularly dangerous during icy or white-out conditions. Winter storms often slow traffic; and about once every 25 years conditions are so bad that the Interstate closes, such as during the 1985 and 2010 storms. Conditions can be particularly hazardous due to high traffic volumes on the five or so miles of I-94 east of the Hudson (St. Croix River) Bridge on the west side of the County. The bridge can also become icy and poses some snow removal challenges. St. Croix County Highway Department also coordinates closely with Dunn County regarding ice and snow removal efforts for the very steep “Knapp Hill” on the eastern end of St. Croix County, which is the most frequently closed portion of I-94 in the region.

Two video cameras on I-94 have been installed at Carmichael and Roberts, which was a strategy identified in the previous plan. The Highway Department has suggested that automated message boards could be added at one or two key locations. During extreme cold, a reminder for truckers to switch fuels to prevent fuel gel-up could be given, which has caused some past problems. Traffic control gates have been installed at I-94 on-ramps at exits 1 & 4, with additional gates proposed for the future. Parking and stranded vehicles on exit ramps during storm events have been a challenge for snow removal and are a safety concern.

Other than Interstate 94, few other areas in the County were identified during interviews and surveys as being especially dangerous or uniquely prone to the drifting of snow or ice:

- 230th Avenue east of 40th Street in the Town of Somerset; Town officials suggest that reconstruction (e.g., ditches) would be needed to address.

- Highways 65 and CTH “H” in the Village of Star Prairie. The 5th Street hill can be particularly hazardous under icy conditions.
- Johnson Street in the Village of Wilson is prone to drifting.
- The City of Hudson has a number of hilly streets which can be hazardous when icy.
- Glen Meadows Lane in the City of Glenwood City is a particularly narrow road on a hill which has an accident history when a vehicle with five children slid off and was pinned on a tree, avoiding serious injury. Some recent improvements have been made.

Local officials report that road crews do a good job of maintaining the highways, roads, and streets in the County and intergovernmental coordination is very good. The Highway Department selectively uses snow fencing in some areas. No further actions regarding drifting or icy roads were noted.

Historically, other winter-related event impacts in St. Croix County in recent history have been primarily limited to scattered, short-term power outages and a limited number of areas potentially prone to ice damming. The four areas noted for ice damming concerns during the planning process were:

- Some ice damming possibly caused by the old structures remaining from the Huntington Dam in the Town of Star Prairie have caused concern for potential damage to the nearby bridge and county highway. However, the remaining structures of the Huntington Dam have been removed; and this seems to have largely mitigated the worst of the ice damming of the past.
- Also in the Town of Star Prairie, ice is frequently pushed up along the south shore of Cedar Lake building to heights of 10 to 15 feet, contributing to shoreland erosion, and threatening to damage adjacent homes.
- Ice-damming has occasionally also been a concern at the historic Stillwater Lift Bridge at the unincorporated community of Houlton in the Town of St. Joseph. Though it is expected that the bridge will be limited to recreational use within the next five years, it may continue to be vulnerable to the impacts of flooding and ice-damming.
- A bridge culvert in the Glenwood City has become plugged due to ice damming in the past causing flooding in the Syme Avenue neighborhood.

Relative Level of Risk

The plan steering committee ranked ice storms, heavy snow storms, and blizzards as the second highest hazard facing St. Croix County overall in terms of risk and vulnerability, with heavy snow/blizzards tied with thunderstorms in terms of risk (frequency). Extreme cold was ranked as a slightly lower risk and significantly lower in terms of vulnerabilities (impacts). This high ranking of winter-related hazards is primarily due to their frequency in the past and probability of reoccurrence, cost to communities, and the related health and safety vulnerabilities, such as travel. Recent long-term power outage planning efforts within the region, as discussed previously in this plan, further validated these concerns.

The reoccurrence of winter storm events for St. Croix County is expected to be consistent with recent trends, with three to four severe winter storm events, on average, occurring each year. Should Wisconsin's climate change as discussed previously, St. Croix County could experience warmer, shorter, and wetter winters overall, which could mean fewer extreme cold events, but with increased potential for heavy snow and ice storms.

Vulnerability Assessment—Winter Storms

Winter storms have no defined hazard area within St. Croix County, and as the data previously showed, most of these storms are regional in nature. Due to the irregular nature of these events and lack of specific hazard areas, the assessment of community impacts as a result of winter storms is difficult to quantify.

Winter storms pose a serious health and safety threat to area residents and can result in significant damage to property and infrastructure. Heavy snow or accumulated ice can: cause the structural collapse of buildings; down power lines, severely affecting electrical power distribution; cause accidents (e.g., traffic crashes, slipping/falling); or restrict mobility of emergency assistance or access to services. Most structures in St. Croix County were built to standards that considered snow loads and needed insulation.

In addition to the health risks directly related to exposure to cold temperatures, residents are also susceptible to other risks associated with extremely cold temperatures. For example, many homes could become too cold either due to a power failure or because the heating system isn't adequate for the weather. Water lines can break. When people begin to use space heaters, wood stoves, and fireplaces to stay warm, the risk of household fires increases, as well as the risk of carbon monoxide poisoning. There can be economic impacts from the closure of businesses due to lack of mobility or power loss, but these are almost always very short-term impacts.

Accidents and Exposure

According to the National Weather Service, approximately 70 percent of serious injuries resulting from winter storms are vehicle accidents, with prolonged exposure to the cold constituting another 25 percent. And it does not require a disaster event to incur traffic-related or exposure injuries during the winter months.

Prolonged exposure to the cold can cause frostbite or hypothermia and become life threatening. When exposed to cold temperatures or low wind chills, one's body begins to lose heat faster than it can be produced. The result is hypothermia or abnormally low body temperature. A body temperature that is too low can affect the brain, making the victim unable to think clearly or move well. This makes hypothermia particularly dangerous because a person may not know it is happening and won't be able to do anything about it. Hypothermia occurs most commonly at very cold temperatures, but can occur even at cool temperatures (above 40°F) if a person becomes chilled from rain, sweat, or submersion in cold water. Victims of hypothermia are most often elderly people with inadequate food, clothing, or heating; babies sleeping in cold bedrooms; children left unattended; adults under the influence of alcohol; mentally ill

individuals; and people who remain outdoors for long periods such as the homeless, hikers, hunters, etc.

Frostbite is an injury to the body that is caused by freezing. Frostbite causes a loss of feeling and color in affected areas. It most often affects the nose, ears, cheeks, chin, fingers, or toes. Frostbite can permanently damage the body, and severe cases can lead to amputation.

Long-Term Power Loss

Of great concern is the long-term loss of power due to ice storms, winds, and/or heavy snows, especially during extremely cold temperatures. Long-term power loss poses one of the greatest hazard vulnerabilities facing St. Croix County. This threat was discussed previously within the special analysis on long-term power loss.

During a period of power loss and extreme cold, warming shelters could be activated. No such shelters have been activated in the past and the County does not maintain a list of such shelters. During community meetings, many local officials looked to the Red Cross to provide such shelters, but some shelters may not have emergency power generators.

Winter Kill and Frost Impacts on Agricultural Crops

Winter crops are vulnerable to winter kill during periods of extreme cold without sufficient snow on the ground to help act as an insulator. Four inches of snow cover will allow up to a 20°F difference in temperature between the soil and air, and will prevent the premature breaking of dormancy during temporary warm spells. Some amount of winter kill is fairly frequent and can be expected almost annually; more substantial winter kill events can be expected to occur one or two seasons each decade on average (about a 10% to 20% chance per year) based on recent trends.

Alfalfa is especially vulnerable to winter kill, compared to other forage types. In 2002-2003, winter kill combined with drought during Summer 2004 to reduce feed for cattle and create significant hardships for some St. Croix County producers. At about \$1,500 of additional feed per mature cow for a year and with 76,000 head of cattle in the County, feed replacement costs can accumulate quickly. And since alfalfa is a relatively low-value crop, it is typically uninsured.

These additional costs can result in less of revenue to the individual producer and can be added costs to manufacturers (e.g., dairies, grocery stores, food processing) and consumers. Late fall alfalfa or hay cuttings can further contribute to winter kill since time is not allowed for adequate re- growth of ground cover which provides an additional insulating blanket. It is not uncommon for some farmers to take a late season alfalfa cutting in drought years. Periods of freezing and thawing in the spring can also contribute to frost heaving within certain types of soils, leading to additional crop damage.

While less frequent, early frosts can also severely impact agricultural crops. The most significant early frost in recent history transpired in September 1974. This severe frost event

occurred on multiple nights, included much of northern and western Wisconsin, and stretched as far south as Kansas.

from Wisconsin, State Journal, Sept. 10, 1974

Frosted Farmers Seek Federal Aid

By ROBERT C. BJORKLUND
State Journal Farm Editor

Farmers by the hundreds were turning to government disaster programs Monday for help after a costly frost emergency in western and northern Wisconsin.

The state's weekly crop summary was dominated by the tragic reports from nearly half of the state's counties that substantiate earlier farm loss estimates of corn and soybeans of more than \$100 million.

THE WISCONSIN Farmers Home Administration (FHA) office at Stevens Point has started receiving applications for special aid programs and Henry Zeeb, farmer program specialist, said that the drought, followed by the unusually early frost, "will be a tremendous economic loss to Wisconsin."

Wayne Danielson, Cadott, a dairyman and also a member of the State Board of Agriculture, said that agricultural officials in Chippewa County now estimate that only 10 per cent of the thousands of acres of corn planted for grain will yield mature corn.

In the words of a Jackson County farmer, "the roof fell in on us as hard frost took care of

both corn and soybeans and most everything else."

THE POLK County estimate is that more than 80 per cent of the corn and soybean crops were ruined.

Richard Webb, executive director of the Chippewa County Agricultural Stabilization and Conservation (ASC) office, said that as many as 1,600 of the county's 1,900 farms with a corn allocation will seek aid under the government's new "disaster payments" program.

The county boards in most of the frost-stricken counties are expected to have their counties designated as eligible for the emergency loan program, and thus eligible for 5 per cent interest loans.

TO BECOME eligible, the farmer must establish that he had a 10 per cent loss of his corn crop.

Webb said that up to 150 farmers a day are applying for disaster eligibility in Chippewa County.

"We're in rough shape up here and we've applied for the 5 per cent disaster loans and the emergency livestock feeding program," he said.

A Clark County farmer said

that in his area there were five straight nights of frost.

To the south and east of the frost line, the corn looks good, but Marvin Heiser, crop reporting specialist, said that it needs about three weeks of favorable weather to mature for grain.

"**ONLY 20** per cent of the corn intended for grain in Wisconsin has begun to dent, compared with 55 per cent last year and 50 per cent in the past 10 years," Heiser said.

Soil moisture is 50 per cent short in the state and 50 per cent adequate. The west and north central areas are the driest and the southwest, with the best corn in the United States, is in the best shape for moisture.

Bernard Chapman, of the Bloomington area in Grant County, said that much of his corn is dented and a frost won't hurt too much. However, the ears are not all filled out on the ends, indicating some pollination problems.

The big worry for many southwest Wisconsin farmers is root damage. There is a row or two in the fields where the corn is down either because the heavy rains after planting leached out the chemical protection or it was lost by erosion.

Combined with the impacts of a summer drought, the soybean and corn losses were near 100 percent in Chippewa, Dunn, and Eau Claire counties in 1974. In today's dollars, the total statewide crop losses as a result of the September frost were estimated at more than \$470 million.

And late frosts can also be a concern for different crops. In 2010, a late frost and snow in mid-May hit western Wisconsin while apple trees were blossoming. Production at some orchards in the region decreased by thirty to fifty percent. Cherry, grape, and strawberry crops were also impacted.

Overall, St. Croix County farmers are aware of the winter-related agricultural risks and most use best management practices to mitigate these risks. Some

small management changes, combined with improved seeds and plants, are resulting in crops which are more resilient to winter kill and frost.

Summary of Potential Vulnerabilities

Based on interviews, town surveys, and consideration of the previous analysis, it was determined that the following general types of facilities and community assets are most vulnerable to winter storm events:

- Residents and travelers
- Larger span structures, such as barns, pole buildings, and gyms
- Vulnerable populations, such as elderly (especially during extreme cold events)

- Above-ground power lines, especially in wooded areas
- Agricultural crops

Although the improvement of technology has enabled meteorologists to better forecast and track winter storms, there is no precise way to predict the location and severity of their associated risks. As shown in Table 20, there is no predictable pattern of occurrence, associated risk characteristics, and resulting damage that can be identified and used to make detailed projections on future winter storm events.

Overall, there is a very low vulnerability to most structures in St. Croix County due to winter storms, though roofs of some larger span structures and pole buildings did collapse under snow loads in December 2010. Some occasional roof damage due to ice damming or bursting of inadequately buried water lines can be expected, but such damage is almost always isolated, not officially reported, and/or remedied by the homeowner with an insurance claim. It is unfeasible to maintain a database accurately detailing the structural condition of all \$5.4 billion in assessed improvements in St. Croix County to determine which structures may be more vulnerable to the impacts of future winter storm events.

The continuing changes in land-use and development patterns can influence the County's potential for future exposure to winter storms. As discussed previously, St. Croix County is continuing to grow and develop. This creates an increasing exposure to the number of residents and properties that could be at risk from future winter storm or extreme cold events.

Vulnerable Critical Facilities

A more robust assessment of the community's assets (critical facilities) and their susceptibility to winter storms is located in **Appendix E**. The greatest winter storm-related vulnerability for St. Croix County's critical facilities is the widespread loss of electric power. The risks and vulnerabilities related to this threat, and the need for emergency power generation, was discussed previously (see *Special Threat Analysis – Long-Term Power Loss*). Numerous communities noted that the loss of power for long-term care facilities was of particular concern.

While there are few long-term physical impacts on roads from a disaster perspective, freezing and thawing of roadways can cause damage and "blow-ups" of pavement. More relevant to hazard mitigation, travel upon sidewalks, roads, and bridges is often hazardous under icy or heavy snow conditions as discussed previously. Behind power loss, Interstate 94 was the most frequently mentioned winter-related concern during the process due to the speeds and traffic volumes involved, as well as the icy conditions which can form at the Hudson bridge crossing and at "Knapp Hill". Poor road conditions can also impair the function of critical facilities (e.g., staffing at hospitals or schools) and increase emergency response time. Roads in shaded, wooded areas can be especially icy and hazardous.

Ice-damming is a winter or spring-melt phenomenon which is also related to flooding. Though infrequent, ice dams may occasionally contribute to flooding problems on rivers. Yet, most ice-damming problems have been limited to culverts, small bridges, and stormwater drainage systems.

Unique Jurisdictional Risks or Vulnerabilities—Winter Storms

Overall, winter storms pose no risks or vulnerabilities unique to individual jurisdictions. Winter storms and extreme cold events are typically large-area or regional events, occurring countywide. The level of vulnerability increases in areas of higher population, development density, and supportive infrastructure as described previously in **Section II. Community Profile**. Any notable differences between municipalities regarding the vulnerability of winter storm and extreme cold events are further discussed in the *Unique Jurisdictional Risk or Vulnerabilities Table* in **Appendix F**. Past road drifting and icing problem areas within the cities and villages were discussed previously in this sub-section.

Some of the incorporated communities reported occasional and scattered water line freeze-ups or breaks. Water-dripping programs are often used to mitigate potential damage. As budgets allow, older water lines potentially more prone to breaks are typically replaced and buried deeper as part of street projects. The Village of Roberts noted that mobile homes can be more vulnerable to the breakage of laterals at the meter since the water lines are sometimes less insulated than standard home construction.

The City of Glenwood City noted that icy damming has contributed to past flooding near Syme Avenue necessitating the evacuation of about fifteen homes in 2007 and causing damage to three structures. The Town of Troy noted that areas along the St. Croix River south of Beach Road can be very difficult to access during severe winter weather.

Loss of power due to the damage to overhead power lines was a larger winter-related concern for the cities and villages. The Village of Roberts reported that outages were more frequent in their Rolling Meadows neighborhood, while the City of New Richmond reported that outages were more frequent in their industrial park and technical college area. The *Special Threat Analysis – Long-Term Power Loss* previously discussed the availability of emergency power generation for municipalities and public utilities.

In addition, the continuing changes in land-use and development patterns can influence the County's potential for future exposure to winter storms. As discussed previously, St. Croix County is continuing to grow and develop. This creates an increasing exposure to the number of residents and property that could be at risk from future winter storm or extreme cold events. Although new development is managed to insure adequate protection services are provided, continued growth increases the overall land area capable of being impacted by hazard events. Overall, St. Croix County's villages, cities, and towns are well prepared to meet the challenges of cold weather and winter storms

iii. Thunderstorms and High Winds

Thunderstorms encompass lightning, heavy rains, high winds, and hail, and are intricately linked with some of the other hazards, such as tornados and flooding. Due to the similarities in impacts, the vulnerabilities associated with high winds are largely discussed as part of the previous tornado sub-section (III.B.ii.) and are not repeated here. Flooding as a result of heavy rains is analyzed as part of the next sub-section (III.B.iv.).

Summary—Thunderstorms

Risk: Thunderstorms are very frequent (5 to 6 event days per year), with high, straight-line winds causing the most damage. About 67 percent of thunderstorms have associated high winds and 46 percent have hail. Two thunderstorm-related deaths (1 from lightning) and eleven injuries have occurred since 1980. St. Croix and Oneida counties are the only Wisconsin counties to experience three 100+ mph thunderstorm wind events between 1970 and 2010; no county had more. Damages from the August 2007 wind storm exceeded \$38.7 million.

Vulnerabilities: Electric power lines and all structures are vulnerable, especially large-span buildings, mobile homes, structures with large amounts of glass, and structures with substantial numbers of people (e.g., schools, hospitals). Crops and personal property are also at risk, especially to high winds and hail. Persons at outdoor events are also particularly vulnerable.

1. Many of the risks, vulnerabilities, and issues related to high winds are the same as tornados which are identified in the previous section (e.g., power loss, structural damage, safe room needs, warning sirens). However, high wind events occur more frequently, but typically with less devastating potential.
2. Power loss was the most commonly noted thunderstorm concern by communities and is discussed previously in the long-term power outage section.
3. The concerts, camping, and tubing in the Somerset area and the fairgrounds in Glenwood City are the two thunderstorm vulnerabilities identified as being most unique in St. Croix County. One death and other injuries have occurred due to lightning at a Somerset concert.

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates thunderstorms as a 42% risk over a ten-year period given their high probability (3); moderate vulnerability (1.7); and substantial available emergency management capabilities to deal with this threat (1.1).

Risk Assessment—Thunderstorms

The Hazard

Thunderstorms are severe and violent forms of convection produced when warm, moist air is overrun by dry, cool air. As the warm air rises, thunderheads (cumuli-nimbus clouds) form which cause the strong winds, lightning, thunder, hail and rain associated with these storms. The National Weather Service definition of a severe thunderstorm is a thunderstorm event that produces any of the following: winds of 58 miles per hour or greater (often with gusts of 74 miles per hour or greater), hail 3/4 inch in diameter or greater, or a tornado.

The thunderheads formed may be a towering mass six miles or more across and 40,000 to 50,000 feet high. They may contain as much as 1.5 million tons of water and enormous amounts of energy that often are released in the form of high winds, excessive rains, and three violently destructive natural elements: lightning, hail, and tornados.²⁸

A thunderstorm often lasts no more than 30 minutes, as an individual thunderstorm cell frequently moves between 30 to 50 miles per hour. Strong frontal systems, though, may spawn more than one squall line composed of many individual thunderstorm cells. These fronts can often be tracked from west to east. Because thunderstorms may occur singly, in clusters, or as a portion of large storm lines, it is possible that several thunderstorms may affect a single area in the course of a few hours.

Lightning can strike anywhere. Lightning is formed from the build-up of an electrical charge in a cloud. When this charge is big enough, the air ionizes and a discharge occurs with another cloud, the ground, or the best conducting object. The resulting electric charge reaches temperatures higher than 50,000°F. This rapid heating and subsequent cooling causes the air to expand and contract, which results in thunder.

Hail is the accumulation of ice crystals due to warm, moist air rising rapidly into the freezing temperatures of the upper atmosphere. When frozen droplets accumulate enough weight, they fall as precipitation. Hail or sleet occurs when these frozen ice balls do not fully melt upon descent, and they can reach the size of softballs.

High winds are those winds of 58 miles per hour or greater. High winds can affect much larger areas than a tornado and occur for a longer period of time. More intense types of high winds are downbursts or straight-line winds.

Straight-line winds are often responsible for most of the wind damage associated with a thunderstorm. These winds are often confused with tornados because of similar damage and wind speeds. However, the strong and gusty winds associated with straight-line winds blow roughly in a straight line unlike the rotating winds of a tornado.

Downbursts (straight-line winds) are unrelated to tornados, but can have similar impacts and destructive power. A downburst is a strong, violent downdraft, initiated by rapidly descending rain and/or rain-cooled air beneath a thunderstorm. The result is an outburst of straight-line

²⁸ Tornados and high wind vulnerabilities (potential impacts) are discussed separately in Section III.B.ii.

winds on or near the ground in a single direction. They may last anywhere from a few minutes in a small scale micro-burst to periods of up to 20 minutes or longer, known as a macro-burst. Wind speeds in downbursts can reach 150 mph, which is similar to that of a strong tornado.

Downburst damage is often highly localized, typically covering 2.5 miles or less in width, and resembles that of tornados. A long-lived, widespread, and quickly travelling thunderstorm event producing numerous downbursts along its path is known as a **derecho**. The last major derecho event impacting Wisconsin in July 1995 included parts of nine states and one Canadian province. Damages in Minnesota alone from this event were estimated at over 5 million downed trees and exceeded \$30 million in 1995 dollars.²⁹ There are significant interactions between tornados and downbursts, and a tornado's path can also be affected by downbursts. Because of this, the path of a tornado can be very unpredictable.

High-wind risks and past events are discussed here due to their relationship to thunderstorms and the method of data collection by the National Climatic Data Center, though the destructive impacts and vulnerabilities related to thunderstorms with high, straight-line winds are at times difficult to distinguish from the concentrated cyclical winds of a tornado. Some local debate continues on whether the damage from one recent event in the region was the result of high, straight-line winds (as officially recorded) or a tornado. Further, tornado and thunderstorm/high wind events are very often related and part of the same storm cell, making it a challenge to distinguish the impacts. High wind impacts were discussed previously as part of the tornado vulnerability assessment.

Local Events

Thunderstorms are the most common natural hazard event for St. Croix County. Shown in **Table 21** is a listing of severe thunderstorms that have been reported to the National Climatic Data Center for St. Croix County since 1957. Data prior to 1980 is limited; more complete data is available since 1994.

Since January 1994, St. Croix County has experienced 191 severe thunderstorm, hail, and high-wind events of varying magnitude, for an average of approximately eleven to twelve severe thunderstorms reported each year. Table 21 also shows that thunderstorms can occur throughout the year, with the highest frequency during the months of May through August.

Many of the events reported in Table 21 are for the same storm cells recorded for different parts of the County; multiple reports within a single day for large storm cells are not uncommon. The 191 reported thunderstorms since January 1994 occurred on 94 unique dates for an average of 5.5 severe thunderstorm days per year. Prior to 1993, specific locations for storm events were not provided in the database.

²⁹ National Oceanic and Atmospheric Administration. *Derecho Series in July of 1995* webpage. <http://www.spc.noaa.gov/misc/AbtDerechos/casepages/jul1995derechopage.htm#2nd1995>.

Although the storms listed in Table 21 are classified as thunderstorms, each of these storms had its own unique characteristics and associated risks to residents and property in St. Croix County, such as high winds and hail. Other risks associated with thunderstorms that have been documented with these storms include the potential for excessive rains, leading to flash flooding and the potential to spawn tornados which is discussed in other sections.

**Table 21. Severe Thunderstorm Events (and associated hazards) – 1950 through 2011
St. Croix County**

Location	Date	Time	Type	Mag	Property Damage	Crop Damage
St. Croix County	7/12/1966	30	Tstm Wind	0 kts.	0	0
St. Croix County	6/8/1968	1930	Tstm Wind	0 kts.	0	0
St. Croix County	8/6/1968	940	Tstm Wind	60 kts.	0	0
St. Croix County	5/19/1975	1530	Hail	2.50 in.	0	0
St. Croix County	6/15/1976	5	Hail	1.00 in.	0	0
St. Croix County	9/8/1977	2315	Tstm Wind	0 kts.	0	0
St. Croix County	7/12/1978	2040	Hail	2.50 in.	0	0
St. Croix County	7/12/1978	2115	Hail	1.75 in.	0	0
St. Croix County	6/19/1979	2215	Tstm Wind	0 kts.	0	0
St. Croix County	7/11/1980	2030	Hail	3.00 in.	0	0
St. Croix County	7/11/1980	2030	Tstm Wind	69 kts.	0	0
St. Croix County	6/14/1981	500	Tstm Wind	0 kts.	0	0
St. Croix County	6/14/1981	1610	Tstm Wind	60 kts.	0	0
St. Croix County	7/6/1982	100	Tstm Wind	78 kts.	0	0
St. Croix County	7/19/1983	1530	Tstm Wind	0 kts.	0	0
St. Croix County	4/27/1984	1120	Tstm Wind	0 kts.	0	0
St. Croix County	7/14/1984	1600	Tstm Wind	0 kts.	0	0
St. Croix County	7/14/1984	1615	Tstm Wind	0 kts.	0	0
St. Croix County	10/16/1984	1945	Tstm Wind	0 kts.	0	0
St. Croix County	3/31/1986	1705	Hail	0.75 in.	0	0
St. Croix County	6/23/1986	1520	Tstm Wind	0 kts.	0	0
St. Croix County	6/23/1986	1535	Tstm Wind	0 kts.	0	0
St. Croix County	7/24/1986	1240	Tstm Wind	0 kts.	0	0
St. Croix County	7/27/1986	400	Tstm Wind	0 kts.	0	0
St. Croix County	7/27/1986	415	Tstm Wind	0 kts.	0	0
St. Croix County	7/27/1986	430	Tstm Wind	0 kts.	0	0
St. Croix County	8/16/1986	1949	Hail	0.75 in.	0	0
St. Croix County	6/28/1987	1640	Tstm Wind	0 kts.	0	0
St. Croix County	7/6/1987	1527	Tstm Wind	0 kts.	0	0
St. Croix County	7/23/1987	1310	Hail	1.00 in.	0	0
St. Croix County	7/23/1987	1330	Tstm Wind	70 kts.	0	0
St. Croix County	7/25/1987	2302	Hail	2.75 in.	0	0
St. Croix County	6/19/1988	1748	Hail	4.50 in.	0	0
St. Croix County	6/19/1988	1757	Tstm Wind	0 kts.	0	0

St. Croix County	8/7/1988	1815	Tstm Wind	0 kts.	0	0
St. Croix County	8/7/1988	1835	Tstm Wind	0 kts.	0	0
St. Croix County	5/29/1989	1359	Tstm Wind	0 kts.	0	0
St. Croix County	6/30/1989	1745	Tstm Wind	0 kts.	0	0
St. Croix County	6/2/1990	1300	Tstm Wind	56 kts.	0	0
St. Croix County	6/12/1990	1805	Tstm Wind	0 kts.	0	0
St. Croix County	8/26/1990	400	Tstm Wind	0 kts.	0	0
St. Croix County	4/7/1991	2010	Hail	1.75 in.	0	0
St. Croix County	5/28/1991	2230	Tstm Wind	0 kts.	0	0
St. Croix County	5/28/1991	2230	Tstm Wind	0 kts.	0	0
St. Croix County	5/28/1991	2245	Tstm Wind	0 kts.	0	0
St. Croix County	5/28/1991	2305	Tstm Wind	0 kts.	0	0
Burkhardt	4/26/1994	1100	Hail	0.75 in.	0	0
Baldwin	4/26/1994	1125	Hail	0.75 in.	0	0
Glenwood City	4/26/1994	1130	Hail	0.75 in.	0	0
Hudson	4/26/1994	1100	Thunderstorm Winds	0 kts.	0	0
Somerset	5/30/1994	1538	Hail	1.50 in.	0	0
Hudson	5/30/1994	1540	Thunderstorm Winds	0 kts.	76,473	7,647
Somerset	6/25/1994	1600	Thunderstorm Winds	0 kts.	0	76,473
Star Prairie	6/25/1994	1610	Thunderstorm Winds	0 kts.	764,727	76,473
River Falls	6/27/1994	1743	Hail	0.75 in.	0	0
Hudson	7/5/1994	430	Thunderstorm Winds	0 kts.	7,647	1,529
Star Prairie	6/25/1995	1515	Hail	0.75 in.	0	0
Star Prairie	6/25/1995	1515	Hail	0.75 in.	0	0
Burkhardt	6/25/1995	1600	Hail	0.75 in.	0	0
Burkhardt	6/25/1995	1600	Hail	0.75 in.	0	0
Deer Park	6/25/1995	1435	Thunderstorm Winds	50 kts.	0	0
Deer Park	6/25/1995	1435	Thunderstorm Winds	50 kts.	0	0
Hudson	6/26/1995	1520	Thunderstorm Winds	60 kts.	0	0
Regional	8/11/1995	800	Heavy Rain	N/A	0	0
Regional	8/11/1995	800	Heavy Rain	N/A	0	0
Maiden Rock	8/12/1995	2032	Thunderstorm Winds	0 kts.	0	0
Maiden Rock	8/12/1995	2032	Thunderstorm Winds	0 kts.	0	0
Hudson	5/17/1996	10:30 PM	Hail	1.75 in.	0	0
New Richmond	5/17/1996	10:45 PM	Hail	1.00 in.	0	0
Hudson	5/17/1996	10:30 PM	Tstm Wind	52 kts.	0	0
New Richmond	5/18/1996	10:45 PM	Hail	1.00 in.	0	0
Roberts	5/19/1996	1:05 AM	Tstm Wind	70 kts.	3,900,545	433,394
River Falls	5/19/1996	1:15 AM	Tstm Wind	70 kts.	0	0
New Richmond	5/19/1996	12:05 AM	Tstm Wind	52 kts.	0	0
Hudson	5/19/1996	12:55 AM	Tstm Wind	85 kts.	3,611,616	0
Baldwin	6/26/1996	12:09 PM	Hail	0.75 in.	0	0
River Falls	10/16/1996	6:59 PM	Hail	0.75 in.	0	0
Hammond	10/16/1996	7:30 PM	Hail	0.88 in.	0	0

Regional	10/29/1996	11:00 PM	High Wind	50 kts.	0	0
Baldwin	6/15/1997	2:15 PM	Hail	0.75 in.	0	0
River Falls	6/15/1997	2:15 PM	Hail	0.75 in.	0	0
New Richmond	6/28/1997	9:05 AM	Tstm Wind	55 kts.	0	0
Hudson	7/1/1997	7:42 PM	Tstm Wind	52 kts.	0	0
Woodville	3/29/1998	4:04 PM	Hail	0.75 in.	0	0
River Falls	5/30/1998	10:15 PM	Tstm Wind	75 kts.	173,823	0
Roberts	6/15/1998	6:48 PM	Hail	1.75 in.	0	0
Hudson	6/15/1998	7:10 PM	Hail	1.75 in.	0	0
Glenwood City	6/25/1998	1:26 AM	Tstm Wind	55 kts.	0	0
Hudson	6/26/1998	11:16 PM	Tstm Wind	56 kts.	0	0
Baldwin	6/5/1999	4:30 PM	Hail	1.75 in.	0	0
Deer Park	6/5/1999	4:30 PM	Tstm Wind	52 kts.	0	0
Deer Park	7/23/1999	1:28 AM	Tstm Wind	60 kts.	0	0
Hudson	7/23/1999	1:28 AM	Tstm Wind	60 kts.	0	0
River Falls	7/30/1999	5:52 PM	Hail	0.75 in.	0	0
Somerset	7/30/1999	5:15 PM	Tstm Wind	52 kts.	0	0
Somerset	7/30/1999	5:33 PM	Tstm Wind	50 kts.	0	0
New Richmond	7/30/1999	5:40 PM	Tstm Wind	50 kts.	0	0
Hudson	7/7/2000	10:50 AM	Hail	0.75 in.	0	0
River Falls	7/7/2000	10:30 AM	Tstm Wind	55 kts.	0	0
Somerset	7/7/2000	10:30 AM	Tstm Wind	55 kts.	0	0
North Hudson	8/7/2000	11:10 PM	Tstm Wind	50 kts.	0	0
Somerset	8/12/2000	10:35 PM	Lightning	N/A	0	0
Hudson	8/26/2000	1:00 AM	Tstm Wind	50 kts.	0	0
River Falls	8/26/2000	1:20 AM	Tstm Wind	50 kts.	0	0
Hudson	10/26/2000	5:14 PM	Hail	1.00 in.	0	0
River Falls	10/26/2000	5:33 PM	Hail	1.00 in.	0	0
Regional	4/7/2001	9:15 AM	High Wind	53 kts.	1,279,870	0
River Falls	5/1/2001	5:30 PM	Hail	1.25 in.	0	0
River Falls	5/1/2001	5:40 PM	Hail	1.75 in.	3,839,610	0
Baldwin	5/1/2001	6:04 PM	Hail	1.75 in.	0	0
River Falls	5/1/2001	5:40 PM	Tstm Wind	55 kts.	0	0
Hudson	5/6/2001	6:51 PM	Tstm Wind	60 kts.	0	0
New Richmond	6/11/2001	4:40 PM	Tstm Wind	52 kts.	0	0
Star Prairie	6/11/2001	5:38 PM	Tstm Wind	50 kts.	0	0
Glenwood City	6/11/2001	5:48 PM	Tstm Wind	52 kts.	0	0
Hammond	6/18/2001	5:45 AM	Hail	0.75 in.	0	0
Baldwin	6/18/2001	5:50 AM	Hail	1.00 in.	0	0
Somerset	7/17/2001	11:05 PM	Tstm Wind	50 kts.	0	0
Roberts	4/18/2002	3:30 AM	Hail	0.75 in.	0	0
Somerset	5/5/2002	5:39 PM	Hail	1.75 in.	0	0
Star Prairie	5/5/2002	5:53 PM	Hail	0.75 in.	0	0
New Richmond	5/5/2002	5:55 PM	Hail	1.75 in.	0	0

Glenwood City	5/5/2002	6:17 PM	Hail	1.75 in.	0	0
North Hudson	5/5/2002	6:30 PM	Hail	1.75 in.	0	0
Hudson	5/5/2002	6:40 PM	Hail	0.75 in.	0	0
Star Prairie	6/25/2002	7:15 PM	Hail	1.00 in.	0	0
Star Prairie	6/25/2002	7:15 PM	Tstm Wind	60 kts.	0	0
Glenwood City	6/25/2002	7:45 PM	Tstm Wind	50 kts.	0	0
Somerset	7/28/2002	6:10 PM	Tstm Wind	52 kts.	0	0
New Richmond	7/28/2002	6:25 PM	Tstm Wind	51 kts.	0	0
Deer Park	7/28/2002	6:28 PM	Tstm Wind	55 kts.	12,600	0
Hudson	9/1/2002	10:00 PM	Tstm Wind	55 kts.	0	0
Baldwin	9/1/2002	10:15 PM	Tstm Wind	55 kts.	0	0
Hudson	7/4/2003	3:05 AM	Tstm Wind	52 kts.	0	0
New Richmond	7/4/2003	3:20 AM	Tstm Wind	60 kts.	0	0
Roberts	7/4/2003	3:20 AM	Tstm Wind	55 kts.	0	0
Somerset	7/11/2003	4:41 PM	Hail	1.00 in.	0	0
River Falls	4/18/2004	1:05 AM	Hail	1.00 in.	0	0
Glenwood City	4/18/2004	1:46 AM	Hail	1.50 in.	0	0
Regional	4/18/2004	1:00 PM	High Wind	59 kts.	0	0
Hudson	5/9/2004	5:15 PM	Tstm Wind	50 kts.	0	0
New Richmond	5/9/2004	5:16 PM	Tstm Wind	50 kts.	0	0
Woodville	6/12/2004	7:51 PM	Hail	0.75 in.	0	0
Hudson	9/23/2004	1:40 PM	Tstm Wind	52 kts.	0	0
Hammond	10/29/2004	6:05 PM	Tstm Wind	55 kts.	0	0
Hammond	10/29/2004	6:05 PM	Tstm Wind	55 kts.	0	0
Emerald	10/30/2004	1:40 AM	Tstm Wind	52 kts.	0	0
Regional	12/12/2004	8:00 AM	Strong Wind	35 kts.	1,200	0
Houlton	6/5/2005	4:00 PM	Tstm Wind	50 kts.	0	0
Hudson	6/5/2005	4:07 PM	Tstm Wind	50 kts.	0	0
Somerset	6/7/2005	7:20 AM	Hail	0.75 in.	0	0
Somerset	6/7/2005	7:24 AM	Lightning	N/A	0	0
Glenwood City	6/8/2005	3:30 AM	Hail	0.75 in.	0	0
Hammond	6/8/2005	3:55 AM	Hail	0.88 in.	0	0
Hudson	6/8/2005	4:45 AM	Lightning	N/A	0	0
Roberts	6/20/2005	12:30 PM	Tstm Wind	52 kts.	0	0
River Falls	6/27/2005	6:50 PM	Tstm Wind	52 kts.	0	0
Glenwood City	6/29/2005	10:30 PM	Hail	0.88 in.	0	0
New Richmond	6/29/2005	10:05 PM	Tstm Wind	55 kts.	0	0
River Falls	7/8/2005	5:55 PM	Hail	1.50 in.	0	0
Somerset	7/23/2005	10:15 AM	Lightning	N/A	0	0
Roberts	7/23/2005	10:15 AM	Tstm Wind	52 kts.	0	0
Glenwood City	7/23/2005	10:35 AM	Tstm Wind	52 kts.	0	0
Burkhardt	8/8/2005	4:45 AM	Hail	0.75 in.	0	0
Roberts	8/9/2005	2:40 PM	Hail	1.75 in.	0	0
St. Croix County	9/12/2005	10:30 PM	Tstm Wind	52 kts.	0	0

Hudson	9/21/2005	9:00 PM	Tstm Wind	52 kts.	0	0
Somerset	5/29/2006	6:30 PM	Hail	0.88 in.	0	0
Somerset	7/24/2006	5:24 PM	Hail	0.75 in.	0	0
Hudson	8/24/2006	2:35 PM	Hail	0.75 in.	0	0
Roberts	8/24/2006	2:45 PM	Hail	1.00 in.	0	0
Roberts	8/24/2006	2:46 PM	Hail	1.00 in.	0	0
Roberts	8/24/2006	3:56 PM	Hail	1.75 in.	0	0
Emerald	10/3/2006	18:00 PM	Hail	0.75 in.	0	0
Hammond	5/23/2007	16:04 PM	Thunderstorm Wind	50 kts.	0	0
Hammond	6/7/2007	2:38 AM	Hail	1.25 in.	0	0
Hudson	6/20/2007	20:40 PM	Hail	0.75 in.	0	0
New Richmond	6/20/2007	20:43 PM	Hail	1.00 in.	0	0
River Falls	6/20/2007	20:57 PM	Hail	1.00 in.	0	0
New Richmond	7/8/2007	13:58 PM	Thunderstorm Wind	50 kts.	0	0
New Richmond	7/8/2007	14:00 PM	Thunderstorm Wind	52 kts.	0	0
New Richmond	7/8/2007	14:03 PM	Thunderstorm Wind	54 kts.	0	0
New Richmond	7/8/2007	14:05 PM	Thunderstorm Wind	52 kts.	0	0
Glenwood City	7/26/2007	15:50 PM	Thunderstorm Wind	52 kts.	0	0
Hudson	8/11/2007	2:57 AM	Thunderstorm Wind	55 kts.	0	0
Hammond	8/13/2007	20:55 PM	Hail	0.75 in.	0	0
New Richmond	8/13/2007	20:35 PM	Thunderstorm Wind	78 kts.	38,722,111	10,394,807
Wilson	8/13/2007	21:00 PM	Thunderstorm Wind	52 kts.	0	0
River Falls	8/13/2007	22:40 PM	Thunderstorm Wind	52 kts.	0	0
Hudson	8/28/2007	2:26 AM	Thunderstorm Wind	50 kts.	0	0
Woodville	9/20/2007	20:28 PM	Thunderstorm Wind	50 kts.	0	0
New Richmond	5/25/2008	17:00 PM	Hail	2.50 in.	0	0
Somerset	5/25/2008	17:00 PM	Hail	2.75 in.	0	0
Star Prairie	5/25/2008	17:00 PM	Hail	3.00 in.	0	0
Star Prairie	5/25/2008	17:02 PM	Hail	1.00 in.	0	0
New Richmond	5/25/2008	17:06 PM	Hail	1.00 in.	0	0
New Richmond	5/25/2008	17:06 PM	Hail	1.75 in.	0	0
Erin	5/25/2008	17:10 PM	Hail	0.75 in.	0	0
Cylon	5/25/2008	17:18 PM	Hail	2.00 in.	0	0
Emerald	5/25/2008	17:22 PM	Hail	2.50 in.	0	0
Glenwood City	5/25/2008	17:24 PM	Hail	1.75 in.	0	0
Glenwood City	5/25/2008	17:42 PM	Hail	0.75 in.	0	0
Star Prairie	5/25/2008	16:25 PM	Thunderstorm Wind	60 kts.	0	0
Deer Park	5/25/2008	16:40 PM	Thunderstorm Wind	55 kts.	0	0
Hammond	6/5/2008	17:15 PM	Thunderstorm Wind	52 kts.	0	0
Somerset	7/11/2008	19:55 PM	Thunderstorm Wind	54 kts.	0	0
Star Prairie	7/11/2008	20:00 PM	Thunderstorm Wind	52 kts.	0	0
Deer Park	7/11/2008	20:20 PM	Thunderstorm Wind	55 kts.	0	0
New Richmond	7/16/2008	10:35 AM	Hail	1.00 in.	0	0
New Richmond	7/16/2008	10:42 AM	Hail	1.00 in.	0	0

Roberts	7/19/2008	15:34 PM	Hail	0.75 in.	0	0
Hammond	7/19/2008	15:35 PM	Hail	1.00 in.	0	0
Baldwin	7/19/2008	15:47 PM	Hail	0.75 in.	0	0
Baldwin	7/19/2008	16:00 PM	Thunderstorm Wind	70 kts.	0	0
Northline	7/25/2008	14:45 PM	Thunderstorm Wind	60 kts.	0	0
River Falls	7/25/2008	15:15 PM	Thunderstorm Wind	52 kts.	0	0
Star Prairie	5/5/2009	1:34 PM	Hail	0.01 in.	0	0
River Falls	7/24/2009	7:50 AM	Hail	0.01 in.	0	0
River Falls	7/24/2009	8:00 AM	Hail	0.01 in.	0	0
Roberts	8/2/2009	11:23 PM	Hail	0.01 in.	0	0
Star Prairie	8/8/2009	7:40 AM	Hail	0.01 in.	0	0
Emerald	8/8/2009	10:05 AM	Hail	0.01 in.	0	0
New Richmond	8/8/2009	9:30 PM	Lightning	N/A	26,413	0
Hammond	6/6/2010	1:02 PM	Hail	0.01 in.	0	0
Hammond	7/11/2010	3:51 PM	Hail	0.01 in.	0	0
Baldwin	7/11/2010	5:31 PM	Hail	0.01 in.	0	0
Glenwood City	7/14/2010	7:00 AM	Heavy Rain	N/A	0	0
Woodville	7/14/2010	2:00 PM	Thunderstorm Wind	52 kts.	0	0
Baldwin	7/14/2010	2:20 PM	Thunderstorm Wind	61 kts.	0	0
Hersey	7/14/2010	7:22 PM	Thunderstorm Wind	52 kts.	0	0
New Richmond	7/17/2010	8:28 PM	Thunderstorm Wind	55 kts.	0	0
Glenwood City	8/10/2010	11:00 PM	Heavy Rain	N/A	0	0
River Falls	8/13/2010	5:13 PM	Hail	0.01 in.	0	0
Roberts	8/13/2010	4:45 AM	Lightning	N/A	41,579	0
Hudson	9/21/2010	12:52 AM	Thunderstorm Wind	52 kts.	0	0
Burkhardt	5/9/2011	7:00 AM	Lightning	N/A	100,767	0
Somerset	7/1/2011	7:45 PM	Thunderstorm Wind	52 kts.	0	0
237 events (191 since 1/1/1994)					\$52,558,981	\$10,990,323

Source: National Climatic Data Center (NCDC)

Damage estimates in 2010 dollars based on Consumer Price Index by U.S. Bureau of Labor Statistics

Of the 191 reported severe thunderstorm events recorded in Table 21 since January 1994, 128 had high winds associated with them, 87 included hail, seven were reported for lightning, and four were noted for heavy rains. According to the 2011 *State of Wisconsin Hazard Mitigation Plan*, between 1970 and 2010, St. Croix County has experienced eleven thunderstorm events with winds in excess of 74 mph (hurricane force winds) and three events with winds in excess of 100 mph. Oneida County also has experienced three 100+ mph wind events, and no other county in Wisconsin has experienced more.

Two deaths and eleven injuries associated with these storms were identified in the database since 1980. One death is associated with a May 1991 thunderstorm with high winds. A second death and two injuries are attributed to an August 12, 2000, storm. Another four injuries were attributed to two 2005 summer lightning storms. Since January 1994, damage was reported for fourteen events, with crop damage reported for six events. However, the NCDC database is not inclusive of all damage estimates from hazards in the County. Damages to buildings and crops,

as well as general debris clean-up costs, are often under-reported and no damage data for any thunderstorm event was estimated prior to 1993.

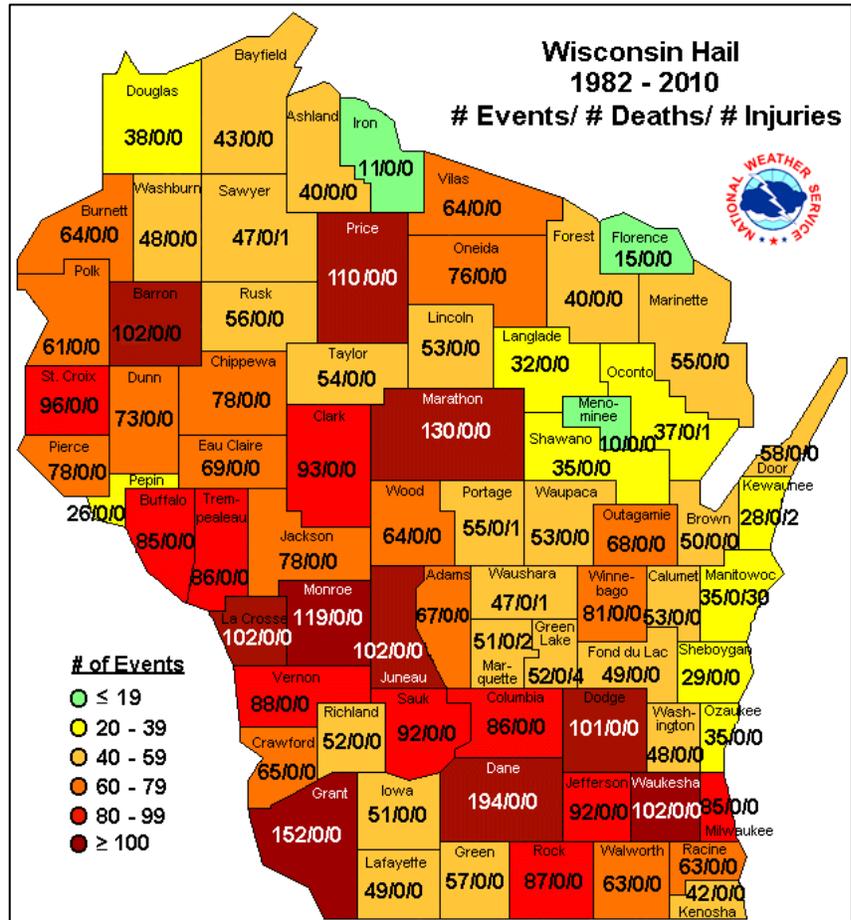
In terms of damage, the August 13, 2007, thunderstorm was the most significant in recent decades, with high winds (and micro-bursts) the primary cause of the damages. Over \$38.7 million in property damages and almost \$10.4 million in crop damages were reported (2012 dollars) throughout the County. The City of New Richmond reported a collapsed hangar at the airport, over 200 homes damaged, seven vehicles destroyed, and 40-50 vehicles damaged.

Infrastructure damage in New Richmond exceeded \$1.5 million, including one-half of the traffic signals damaged and heavy debris.

Compared to its neighbors in Wisconsin, St. Croix County has experienced more hail events in recent decades (see **Figure 26**). From 1982 to 2010, there have been 96 events reported for St. Croix County.

The National Weather Service is able to forecast and track thunderstorms that are capable of producing severe weather conditions such as high winds, hail, lightning, and possibly tornados. Although the improvement of technology has enabled meteorologists to better forecast and monitor thunderstorms, there is no precise way to make long-term predictions of location, severity, and associated risks. As shown in Table 21, there are no clear trends which can be used to make projections on the impacts of future thunderstorm events.

Figure 26. Reported Hail Events in Wisconsin



each year. Further, of the 365 days in the year, reports will be made for somewhere in the County on **five to six days each year** on average. The highest frequency of these events will occur during the months of May through August.

Vulnerability Assessment—Thunderstorms

Potential Impacts

Thunderstorms have no defined hazard area within St. Croix County. Due to the irregular nature of these events and lack of specific hazard areas, the impacts as a result of a thunderstorm are difficult to quantify. As Table 21 showed, most thunderstorm events occur with minimal negative impacts; and this trend will likely continue.

In general, thunderstorms, high winds, and associated hazards can cause damage to houses or property, uproot trees, and topple (or cause lightning damage to) above-ground power or telephone lines. Above-ground power lines are especially vulnerable in wooded areas with significant residential development, such as older neighborhoods and new subdivisions within pine plantation, where adjacent trees can be blown down onto the lines. Roadways can also be blocked by debris; and debris can accumulate in rivers or stormwater systems, contributing to washouts or flooding.

Note:

High wind vulnerability is further explored as part of the tornado sub-section.

Severe thunderstorms can cause injury or death from lightning, falling trees, downed power lines, and high-wind impacts. They may cause power outages, disrupt telephone service, and severely affect radio communications and surface/air transportation, which may seriously tax the emergency management capabilities of the affected municipalities. Stormwater and other flooding impacts are discussed separately as part of the flooding hazard assessment in Section III.B.viii.

Hail can cause injury and damage to buildings, personal property (vehicles), and crops. The most serious damage occurs when hailstones reach a diameter of 1.5 inches, which happens in less than half of all such storms. Hail and high winds can also cause significant damage to agricultural crops.

Lightning can result in injury, start fires, short-out electrical systems, spook livestock, cause widespread losses of power, and even cause death. Between 1995 and 2002, there were 364 deaths due to lightning in the United States. And in Wisconsin, insurance records show that annually, one out of every fifty farms is struck by lightning or has a fire which may be caused by lightning. Large outdoor gatherings can also be particularly vulnerable to lightning strikes that may result in injuries or death. This was certainly the case in August 2000 when one man died and others were injured at the Apple River Campground as part of the Ozzfest Music Festival near Somerset. This vulnerability underscores the importance of developing site-specific emergency procedures for these types of events, with particular emphasis on adequate early warning. Early warning of lightning hazards, combined with prudent protective actions, can greatly reduce the likelihood of lightning-related injuries and deaths.

Based on key informant interviews, past-event history, and a review of the community, it was determined that the following general types of facilities and community assets are most vulnerable to thunderstorm (non-flooding) events:

- Mobile homes, especially those unanchored (high winds)
- Large-span buildings and buildings with many windows (high winds, hail)
- Above-ground power lines, especially in wooded areas (high winds, lightning)
- Outdoor events where large numbers are gathered (high winds, lightning)
- Agricultural crops and barns (high winds, hail, lightning)

Overall, most thunderstorms result in minor damage to buildings and structures, though all improvements and structures are potentially vulnerable to varying degrees (see Section II.C.iv. Property Values). Older, deteriorating structures may be more vulnerable (14% of the County's housing stock was built before 1939), though the condition of a structure is not inherently linked to age. Some more common impacts include leaks and flooding basements during heavy rains; damage to personal property or windows due to hail; or wind damage to roofs, trees, etc. However, some high, straight-line wind events can achieve tornado or hurricane velocity with similar devastating effects. Please refer to the vulnerability assessment for tornados in the previous section for a more robust discussion of the potential vulnerabilities due to high winds.

Thunderstorm damage to structures and crops is typically remedied by the individual owner, utilizing insurance as needed, and is frequently not officially reported to the County Emergency Management Coordinator or other governmental entity.

The continuing changes in land-use and development patterns can influence the County's potential for future exposure to thunderstorms. As discussed in the community profile, St. Croix County is continuing to grow and develop. This creates an increasing exposure to the number of residents and properties that could be at risk from future events. Although new development is managed to ensure adequate protective services are provided and construction is governed by the most current building codes, continued growth increases the vulnerability to hazard events.

Vulnerable Critical Facilities

A more robust assessment of the community assets (critical facilities) and their susceptibility to thunderstorms is located in **Appendix E**. The vulnerability assessment shows that utilities and infrastructure, and, in particular, above-ground power and communication lines, have the greatest vulnerability to thunderstorm events from downed power lines and lightning strikes.

The impacts for high winds can be similar to those of tornado events, but high wind events occur more frequently. Like tornados, high winds and lightning can affect radio communications and antennas, potentially impacting weather warning systems and the coordination of emergency response providers. Power or communications outages as a result of thunderstorm events can indirectly affect the function of other critical facilities (e.g., hospitals, schools, government offices).

Risks and vulnerabilities associated with power outages are discussed previously in the *Special*

Threat Analysis—Long-Term Power Loss at the beginning of this chapter. Large-span buildings and airport hangars can be especially vulnerable to high winds. And buildings with large amounts of glass can also be at risk of wind-related damage or hail, such as the commons area at the Somerset school.

Unique Jurisdictional Risks or Vulnerabilities—Thunderstorms

A number of communities noted that serious high wind events occur about once every ten years with impacts typical of those mentioned previously (e.g., debris, roof damage, lightning strikes of equipment/towers, short-term power loss). Thunderstorms pose no risks or vulnerabilities unique to individual St. Croix County jurisdictions, with three exceptions as discussed in the *Unique Jurisdictional Risk or Vulnerabilities Table* in **Appendix F**:

- Village of Somerset (and surrounding area) – Concert attendees, campers, Apple River tubers, and the many others enjoying the outdoor recreational amenities of the area are particularly vulnerable to injury or death. Village officials reported that up to 15,000 visitors are in the area on a summer day with up to seven concerts a year. According to Village officials, there has been one death and six injuries due to lightning strikes
- Glenwood City – As discussed in the tornado section, the County Fairgrounds has vulnerabilities similar to those of the concerts in Somerset.
- The Village of Wilson has a number of old White Oak trees of special local significance which are vulnerable to high winds and lightning.

During community meetings on this project, power loss was the most frequently mentioned thunderstorm and high wind concern. The vulnerabilities related to high winds were largely covered previously as part of the tornado section or the LTPO section for electric outages.

iv. Hazardous Materials

Note: This plan only focuses on point sources of contaminants due to an accidental or malicious hazardous materials incident, such as a hazardous materials spill or a release from a leaking tank.

Summary—Hazardous Materials

Risk: High level of risk with 10-15 reported hazardous materials incidences per year on average, with 2-7 more serious spill events. Methamphetamine-related incidences have decreased dramatically since the 2008 plan. Three active Superfund sites in the CERCLIS database exist in the County, though none are on the NPL.

The BRRTS database has 751 records for the County between 1976 to present, of which 43% are still open. Since 2000, 26% of all records were for leaking underground storage tanks (LUST) or other environmental repair (ER) projects (e.g., dump sites, above ground tanks), while 61% were spills, which are typically cleaned up quickly.

There are three deep-well casing or well advisory areas in the County. An additional plume of contaminants in the Town of Star Prairie is also leaching from a second landfill, though no formal advisory area has been designated.

Vulnerabilities: As demonstrated by the deep well casing areas, groundwater is very vulnerable to contamination in the County. In addition, closed depressions created by karst can allow surface contaminants to quickly enter groundwater. Large fluctuations in groundwater height offer additional challenges. Truck traffic on Interstate 94, two rail lines, three natural gas transmission lines, and an oil pipeline running through the County are all potential sources of accidental release. The County also has 29 EHS planning facilities which handle large volumes of toxic materials.

1. There are three general deep well casing areas or well advisory areas in the County-- one in the Town of Star Prairie, a large area east of Hudson (Junkers-Nor Lake-Warren TCE), and the Town of Emerald area. Special requirements apply in these areas due to groundwater contamination of private wells.
2. Development in unincorporated areas on private wells continues at a high growth rate. Often, these are on former farmland or near active farmlands. However, initial well tests do not typically include many of the types of chemicals which could be found in contaminated groundwater. Further, most homeowners do not re-test their private wells regularly after initially permitted.
3. Many landowners and developers are unaware of the groundwater contamination risks,

well advisory areas, and related vulnerabilities in St. Croix County. No single, easy-to-find source is available with up-to-date information, especially for prospective home buyers not from the area. More public education is needed on how common closed depressions are in the County and how karst can further groundwater contamination. To the contrary, such depressions are sometimes used as convenient dumpsites or stormwater basins.

4. While the non-agricultural sources of contamination have historically been the primary contamination concerns, agricultural practices often use or produce hazardous materials (e.g., pesticides, herbicide, manure). High nitrates in groundwater have been found in the Town of Richmond. There are some manure storage facilities in the County which are no longer in use, but were never fully closed or properly abandoned. No rules exist requiring on-site placarding for hazardous materials at farms which can be a risk for responders.
5. Clean Sweep programming has been very effective at reducing improper disposal of hazardous materials, but funding cuts at the State level have reduced availability. Somewhat related, there are some risks to participants in the “Adopt-a-Highway” with regard to contact with hazardous materials.
6. As will be discussed in Section IV, the St. Croix County Land & Water Conservation Department has been testing 400-500 private wells annually; and there may be opportunities to improve this service (and save dollars overall) by subsidizing some mailing expenses.
7. St. Croix County does not have a County Level B Hazardous Materials Response Team, though all fire departments have been trained to the operations level.
8. An update is needed to the *An Introduction to Groundwater in St. Croix County* report completed in May 2006 by the UW-Extension and UW-Stevens Point.
9. The transport of hazardous materials via rail and truck, especially through residential neighborhoods, was the most frequently mentioned hazmat concern during community meetings. Based on past events, inter-agency communication is critical. Rail line representatives suggested mapping rail mile posts, bridges, and grade crossing identification numbers and explaining their importance to emergency providers and dispatch. Communities may also consider adoption of a rail emergency plan and procedures, then test these plans through exercises.

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates hazardous materials as a 42% risk over a ten-year period given their moderate probability (1.7); moderate vulnerability (1.9); and moderate available emergency management capabilities to deal with this threat (1.9).

Risk Assessment—Hazardous Materials

The Hazard

Hazardous materials and substances can present special risks to humans and the environment at the time of disaster, as well as pose substantial difficulties and necessitate special precautions for post-disaster clean-up.

There are many definitions and descriptive names being used for the term “hazardous material,” each of which depends on the nature of the problem being addressed. Unfortunately, there is no one list or definition that covers everything. The United States agencies involved, as well as state and local governments, have different purposes for regulating hazardous materials that, under certain circumstances, pose a risk to the public or the environment.

The following are some of these federal definitions:

Hazardous Materials

The United States Department of Transportation (DOT) uses the term “hazardous materials” which covers eight hazard classes, some of which have subcategories called classifications, and a ninth class covering other regulated materials (ORM). The DOT includes in its regulations hazardous substances and hazardous wastes, both of which are regulated by the Environmental Protection Agency (EPA), if their inherent properties would not otherwise be covered.

Hazardous Substances

The EPA uses the term “hazardous substance” for the chemicals which, if released into the environment above a certain amount, must be reported and, depending on the threat to the environment, federal involvement in handling the incident can be authorized. A list of the hazardous substances is published in 40 CFR Part 302, Table 302.4.

Extremely Hazardous Substances

The EPA uses the term “extremely hazardous substance” for the chemicals which must be reported to the appropriate authorities if released above the threshold reporting quantity. Each substance has a threshold reporting quantity. The list of extremely hazardous substances is identified in Title III of Superfund Amendments and Reauthorization Act (SARA) of 1986 (40 CFR Part 355).

Toxic Chemicals

The EPA uses the term “toxic chemical” for chemicals whose total emissions or releases must be reported annually by owners and operators of certain facilities that manufacture, process, or otherwise use a listed toxic chemical. The list of toxic chemicals is identified in Title III of SARA.

Hazardous Wastes

The EPA uses the term “hazardous wastes” for chemicals that are regulated under the Resource, Conservation and Recovery Act (40 CFR Part 261.33). Hazardous wastes in transportation are regulated by the DOT (49 CFR Parts 170 - 179).

Hazardous Chemicals

The United States Occupational Safety and Health Administration (OSHA) uses the term “hazardous chemical” to denote any chemical which is a physical hazard or a health hazard. Hazardous chemicals cover a broader group of chemicals than the other chemical lists. There is no list of hazardous chemicals, but they are any substance for which OSHA requires a facility to maintain a Material Safety Data Sheet.

Hazardous Substances

OSHA uses the term “hazardous substance” in 29 CFR Part 1910.120, which resulted from Title I of SARA and covers emergency response. OSHA uses the term differently than EPA. Hazardous substances, as used by OSHA, cover every chemical regulated by both DOT and EPA.³⁰

Originally, the United States Congress compiled a list of specific toxic chemicals (approximately 300) and chemical categories (approximately 20) based on two existing lists in use by the States of New Jersey and Maryland. The two states created their respective lists of chemicals using information such as toxicity, the amount produced or used in their state, or their professional judgment as to the potential hazards of the chemicals in the environment.

If there is sufficient evidence, chemicals may be added to or deleted from the list by the administrator of the EPA. The criteria that the EPA uses to define and evaluate toxic chemicals for addition to the list are specified in Title III of SARA and are listed below:

1. The chemical is expected to cause significant adverse acute human health effects at concentration levels which are likely to exist beyond the facility site boundaries as a result of a release. Acute (short-term) effects occur rapidly as a result of short-term exposure, usually to high concentrations of a chemical.
2. In humans, the chemicals are expected to cause cancer, birth defects, nervous system effects, gene mutations which can be passed on to the next generation, or other chronic (long-term) health effects associated with repeated exposure to a chemical over a long period of time.
3. The chemical is expected to cause significant and seriously adverse effects on the environment due to its toxicity, and/or its persistence (tendency to remain in an unchanged form, rather than breaking down into smaller chemical parts), and/or its tendency to bioaccumulate (to become increasingly concentrated in plant and animal tissue).

A solid waste may be a "listed hazardous waste" if it appears in one or more U.S. Environmental Protection Agency tables that list hazardous wastes. Other solid wastes are "characteristic hazardous wastes" because they exhibit any of the four hazardous waste characteristics: corrosiveness, reactivity, toxicity, or ability to ignite. If the waste is hazardous, then it must be managed in compliance with the applicable sections of NR 600-685, Wisconsin Administrative

³⁰ Ingham County Emergency Planning Committee, [Hazardous Materials Page](http://www.orcbs.msu.edu/AWARE/pamphlets/hazwaste/hazmatdef.html), <http://www.orcbs.msu.edu/AWARE/pamphlets/hazwaste/hazmatdef.html>, as of Feb 2004.

Code (DNR Pub SW-232). Within this Plan, we apply the term “hazardous materials” broadly to include....

...any substance or combination of substances (including wastes of a solid, liquid, gaseous, or semi-solid form) which, because of its quantity, concentration, physical chemical, or infectious characteristics, may cause or significantly contribute to an increase in mortality, or increase in serious irreversible or incapacitating illness, or pose a potential hazard to human health or the environment.

This definition encompasses the hazardous substances and wastes definitions provided previously, including those chemicals required to be reported under Title III of SARA, otherwise known as the Emergency Planning and Community Right-to-know Act (EPCRA). Companies across a wide range of industries (including chemical, mining, paper, oil and gas industries) that produce more than 25,000 pounds or handle more than 10,000 pounds of a listed toxic chemical must report it to the Toxics Release Inventory.

Given the hazard mitigation and disaster preparedness context of this planning effort, this plan only focuses on point sources of contaminants due to an accidental or malicious hazardous materials incident, such as a hazardous materials spill or a release from a leaking tank. Risks and impacts from non-point sources or potentially created during normal, permitted activities are not included in the plan scope.

One of the potential environmental impacts of a hazardous materials release or spill is groundwater contamination. Groundwater collects or flows beneath the Earth's surface, filling the porous spaces in soil, sediment, and rocks, and is the source of water for aquifers, springs, and wells. The degradation or pollution of groundwater quality due to some substance or toxin introduced or spilled onto the soil and making its way to the groundwater can pose health risk for those relying on local groundwater as a potable water supply.

National & Regional Trends

Under the Emergency Planning and Community Right-to-Know Act (EPCRA), there are approximately 7,000 facilities in Wisconsin that plan and report use/storage of certain potentially hazardous chemicals. The EPCRA Program requires communities to prepare for hazardous chemical releases through emergency planning and by maintaining hazardous chemical information that is submitted to them by the facilities covered under the law. This does not include practices which are exempt from such reporting, such as routine agricultural operations and retail gas stations.

According to the Wisconsin Department of Natural Resources, there are over 11,000 businesses, schools, and government institutions in Wisconsin that generate varying quantities of hazardous wastes each year. Overall, the number of hazardous waste generators and the quantity of hazardous waste that they generate are declining each year as everyone learns how much it costs to generate wastes and manage hazardous wastes according to the strict requirements that apply. The number of largest generators has been decreasing significantly in recent years while the number of very small generators has been increasing slowly. While much of the solvent-type

hazardous wastes that are generated in Wisconsin are recycled here, many other hazardous wastes are handled out of state.

Wisconsin has 178 active Superfund sites or sites which have been under consideration for Superfund status. A Superfund site is any land in the United States that has been contaminated by hazardous waste and identified by the Environmental Protection Agency (EPA) as a candidate for clean-up because it poses a risk to human health and/or the environment. There are tens of thousands of abandoned hazardous waste sites in our nation, and accidental releases occur daily. At the core of the Superfund program is a system of identification and prioritization that allows the most dangerous sites and releases to be addressed within the confines of limited Federal funding and human resources. The first step in the Superfund process is to identify abandoned or uncontrolled hazardous waste sites. All sites where releases or potential releases have been reported are listed in the Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). Those Superfund sites determined to pose the greatest risks to humans or the environment are identified on the Superfund National Priority List (NPL). Many of these NPL locations are former mining sites, hazardous/solid waste dumps, chemical/fuel companies, and industrial areas which produced military ammunition. Wisconsin has 38 sites on the National Priority List, and one site proposed according to the U.S. National Library of Medicine's ToxMap website.

Wisconsin also is home to approximately seventeen licensed hazardous waste management facilities, which have also been decreasing in number.³¹ Many of these facilities are privately operated, serving the needs of that particular facility's hazardous wastes. The commercial hazardous waste facilities in Wisconsin primarily focus on recycling of hazardous waste solvents and mercury, fuel blending of hazardous wastes for energy recovery, storage of hazardous wastes prior to the treatment at licensed hazardous waste facilities in other states, and treatment of hazardous wastes to facilitate disposal. There are no operating hazardous waste disposal facilities (i.e., landfills) in Wisconsin, but there are three incinerators (two private and one commercial) and two non-commercial open burning/open detonation facilities for reactive (explosive) hazardous wastes.

The use of chemicals and hazardous materials is part of daily life. As could be expected, the largest site-specific toxic releases in Wisconsin are at heavy industrial facilities, power plants, military installations, and paper/pulp mills. However, non-point pollution of surface and ground waters from agricultural run-off, contaminants in stormwater, and improper disposal of household chemicals (e.g., bleach, used motor oil, paints) can also cause environmental harm.

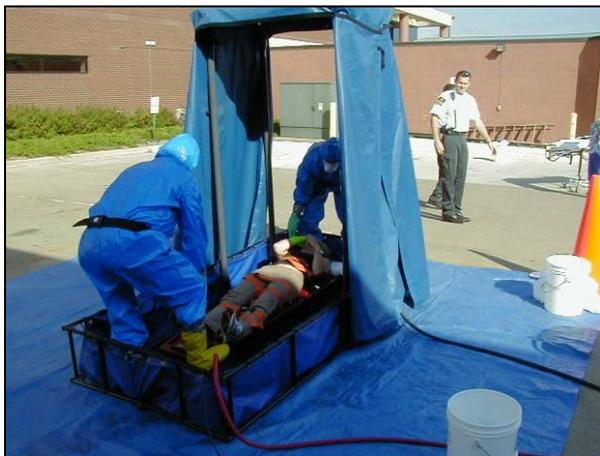
Nearly 58 percent of all spills in Wisconsin are petroleum-related; and 49 percent of all spills occur at industrial-related facilities, automotive-related facilities, or on the roadways.³² Spills at private properties account for nearly twelve percent of all spills. More than fourteen percent of spills each year in Wisconsin are contained and/or recovered before they impact the environment. Surface water spills account for more than fifteen percent, while spills to groundwater occur more than seven percent of the time.

³¹ Ibid.

³² Wisconsin Department of Resources. "Hazardous Substance Spills in Wisconsin". February 2010.

Sometimes, hazardous materials spills can be the result of natural hazard events. For instance, on June 7, 1980, a Chicago & Northwestern train derailed in Chippewa County due to a flash flood which washed out the tracks. Three cars of #6 fuel oil were torn open, and 86,000 gallons spilled. Containment dikes were built and most of the oil was recovered.

More significantly, the Wisconsin Central (now Canadian National) line which runs through Somerset, New Richmond, and northern parts of the County is the same line on which the 1996 Weyauwega derailment occurred in eastern Wisconsin. In March 1996, a train with seven cars of liquid petroleum gas, seven cars of propane, and two cars of sodium hydroxide derailed; and a fire ensued to the cars themselves as well as an adjacent feed mill. Approximately 2,300 people were evacuated sixteen days due to the fire and leaking chemicals, including all City of Weyauwega residents. Additional issues arose when many residents illegally began to re-enter the evacuation area to retrieve pets left behind.



WC WI Regional Response Team Practice Drill

Hazardous Materials Response Teams

St. Croix County does not have a County Level “B” Hazardous Materials Response Team, though all fire departments have been trained to the operations level. As needed, the West Central Wisconsin Regional Response Team, based in the Chippewa Falls and the Eau Claire Fire Departments, can be contacted for additional reconnaissance and research support. This Level A team can also be requested to respond to the most serious of spills and releases requiring the highest level of skin and respiratory protective gear. This includes all chemical, biological, or radiological emergencies requiring vapor-tight Level A gear with self-contained breathing apparatus.

Local Events – Superfund Sites

St. Croix County has three active Superfund properties listed in the EPA Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) database, none of which are on the National Priority List (NPL). There are 11 additional archived Superfund sites in the County for which no further Federal assessment, remediation, monitoring, or other activities are planned. The three active Superfund properties are:

- Rosen Metal Inc. (Baldwin) – This scrap metal and former battery site was partially cleaned-up in 1993-1996. Currently, no further remedial action is planned; and it has been referred to removal. Related to this property is the Lee Farm site nearby in the Town of Eau Galle where batteries from Rosen Metal were dumped. At this time, remediation is complete at the Lee Farm site; and a long-term groundwater monitoring program is in place.

- Baldwin Battery Site (Baldwin) – This site was added to the list on September 1, 2010, and has been designated a removal site only; and no site assessment work is needed at this time. Removal of lead-contaminated soils at the site is underway.
- Junkers Landfill (Hudson) – Remedial investigation and a feasibility study of the site were completed in 1996 and a final remedy selected. This site is part of a well-advisory area in which whole-house carbon filters are recommended for private residences. No further remedial action is planned, and it has been referred to removal.

The 2008 hazard mitigation plan included three other Superfund sites which are no longer on the active Superfund list, but have produced significant local groundwater concerns or have been referred to WDNR for remedy:

- New Richmond Landfill (License #2492) – This landfill operated from approximately 1975 through early 1992, at which time it was capped with two feet of final cover material and six inches of top soil. First reported to the EPA in 2002, the preliminary assessment states that this former municipal landfill northwest of the City has impacted private wells in the Town of Star Prairie with volatile organic compounds (VOCs), with some trace amounts found in wells farther north. A deep-well casing area was established for new private wells, and some wells have been replaced.



Though closed in 1975, this landfill in the Town of Star Prairie has released a plume of VOC contaminants resulting in a deep-well casing

Though an intergovernmental agreement, municipal water from New Richmond has been extended to about forty homes in a roughly six-square-mile area, while other residents have installed whole-house carbon filters.

- Seversen Salvage (Cady) – This is a 30-acre property with approximately 100 cubic yards of printed circuit boards and other scrap materials; lead contamination is a concern, but any contamination is believed to have been limited to the site. It was identified as a “removal only” site and a full site assessment was not performed. The site was referred from EPA to WisDNR for remedy.
- Town of Warren TCE (tetrachloroethylene) Site – This site was first reported to the EPA in 2004, and is part of the same well advisory area of the Junkers Landfill. According to the initial discovery, groundwater contamination by TCE has impacted several nearby private wells near the suspected source area. TCE contamination has been documented as far back as 1984. The suspected source is not known, but may be related to illegal dumping in the past. TCE is known to cause cancer and damage the nervous and immune

systems. Children and seniors are especially vulnerable to TCE's toxic effects. Additional remediation is planned for this site.

Local Events – Toxic Release Inventory (TRI) Sites

Facilities in certain industries which manufacture, process, or use significant amounts of toxic chemicals are required to annually report on their releases of these chemicals. More specifically, facilities with ten or more employees that process more than 25,000 pounds in aggregate, or use greater than 10,000 pounds of any toxic chemical in a given year are required to report releases each year to the Toxic Release Inventory (TRI) database. Releases include any toxic chemicals spilled, discharged, injected or otherwise released into the air, land, water, or underground.

As shown in **Table 22**, over the last decade, the number of facilities in St. Croix County reporting releases to the TRI database has decreased, perhaps reflecting the recent economic recession. Meanwhile, the total waste transferred (either sent or received) also appears to be decreasing.

Table 22. Reported Toxic Releases for St. Croix County – 1999 to 2010³³

Year	# of reporting facilities	Total Onsite Releases (lbs)	Total Waste (lbs) Transferred	# of facilities w/ over 10,000 lbs released
2000	8	121,538	270,252	4
2001	10	216,558	503,654	5
2002	9	167,497	258,122	6
2003	7	91,020	154,093	4
2004	7	62,385	159,279	2
2005	8	87,353	182,490	3
2006	6	105,685	217,868	3
2007	5	104,454	231,330	2
2008	4	92,291	236,735	2
2009	4	54,288	150,689	1
2010	4	34,373	110,236	1
average	6.4	99,183	220,757	2.8

During the timeframe of Table 22, the total amount of onsite releases varies and is not necessarily dependent on the total number of reporting facilities, but reflects the number of facilities releasing 10,000 or more pounds.

Table 22 also shows that the total amount of onsite releases peaked during in 2001 and has since slowly declined, overall. The reporting facilities are located throughout the County and not confined to a single area or closest to the higher population communities. In 2000 and 2001, Donaldson Co, Inc., in Baldwin, had the highest number of releases consisting of xylene, a common chemical found in petroleum which is often used as a solvent or cleaning agent. From 2002 to 2010, Foremost Farms USA Cooperative near Wilson had the largest number of total releases consisting of nitrates or nitric acid, but their releases have decreased considerably in

³³ EPA's TRIS database, search using www.rtknet.org, 8/1/11

recent years. Nitric acid releases via land treatment are a common by-product from the Cady Cheese Factory near Wilson. Other facilities with relatively substantial annual releases between 2000 and 2010 are the McMillan Electric Company in Woodville and Standex International Corporation in Hudson.

It must be stressed that some type of inappropriate action should not and cannot be insinuated or implied when a facility appears in the TRI database. In most, if not all, cases, the releases reported are in compliance with applicable regulations and are consistent with the appropriate management plans. The far majority of releases in the TRI database are not accidental spills, but could be considered part of normal business practice under current regulations. This information is provided to convey a greater sense of the risks of an accidental spill at a location using these substances or during transport.

Local Events – BRRTS Records

The Bureau for Remediation & Redevelopment Tracking System (BRRTS) keeps data on hazardous materials releases and the clean-up of contaminated sites and is maintained by the Wisconsin Department of Natural Resources. The BRRTS system categorizes these events by activity type. As shown in **Table 23** below, there are 751 BRRTS records for St. Croix County from 1976 to the present, of which 425 are closed.

Table 23. BRRTS Records for St. Croix County – 1976 to May 2012³⁴

Activity	1976-2012		2000-2012	
Environmental Repair (non-LUST)	64	8.5%	24	11.0%
General Property Information	13	1.7%	0	0.0%
Leaking Underground Storage Tanks	201	26.8%	32	14.7%
No Action Required Discharge	102	13.6%	26	11.9%
Spills	364	48.5%	132	60.6%
Abandoned Container	4	0.5%	4	1.8%
Liability Exemptions (VPLE)	1	0.1%	0	0.0%
Removed from Database	2	0.3%	0	0.0%
Totals	751	100.0%	218	100.0%

Since 1976, nearly half of the BRRTS reports were spills. **Spills** are locations where a clean-up is confirmed by laboratory analysis, generally within 60 to 90 days. The proportion of spills has increased to 60.6 percent of all reports since 2000, largely due to a significant decrease in the proportion of leaking underground storage tank reports in recent years.

While most records are associated with spills, two other activity types are particularly important—leaking underground storage tanks (LUSTs) and environmental repair (ERPs) sites. A **LUST** site has soil and/or groundwater contaminated with petroleum, which includes toxic and cancer-causing substances. However, given time, petroleum contamination naturally breaks down in the environment (biodegradation). Some LUST sites may emit potentially explosive vapors. **ERP** sites are sites other than LUSTs that have contaminated soil and/or groundwater.

³⁴ Wisconsin Department of Natural Resources, WDNR BRRTS on the Web, <http://botw.dnr.state.wi.us/botw/Welcome.do>

Examples include industrial spills (or dumping) that need long-term investigation, buried containers of hazardous substances, and closed landfills that have caused contamination. The ERP activities include petroleum contamination from above-ground (but not from underground) storage tanks. Unlike spills which are typically reported and cleaned up quickly, LUST and ERP sites many times are undiscovered or go unreported for long periods of time until after significant contamination occurs. For reference, the open Environmental Repair and LUST sites with locations provided by WDNR are shown on **Figure 27** later in this section.

Local Events – Recent Hazardous Materials Spills

Spills are defined as a discharge of a hazardous substance that may adversely impact, or threaten to impact, public health, welfare, or the environment. Spills are usually cleaned up quickly when reported, though many smaller spills likely go unreported. As discussed in the previous subsection, spills have been an increasing percentage of the hazardous materials incident activities in the County.

The largest, most recent spill occurred on February 27, 2012, when a gasoline tanker hauling 3,500 gallons of gas and diesel crashed on Interstate 94 just outside Roberts. The driver was killed in the fiery crash, and traffic was re-routed for about five hours. Response and coordination was good overall, though there was some communication challenges regarding traffic control between local responders on the scene and State Patrol.

Between 1996 to 2012, 60 hazardous materials spills in St. Croix County were reported to the Hazardous Substances Emergency Events Surveillance (HSEES) system through the Wisconsin Department of Health & Family Services as shown in **Table 24** on the following page. These spills were accidental or illegal in nature, as opposed to the majority of releases in the TRI database discussed previously in Table 24.

More of the spills occurred at fixed facilities (68 percent), rather than by transportation. All transportation-related releases were ground-based, with none involving train derailment or pipelines. All but ten of the spills occurred during daytime hours. 13 percent of the spills occurred in agricultural areas, and 45 percent occurred within ¼-mile of a residential area.

For those release records with an associated cause in the database, the highest number of these releases was due to equipment failure, at 38 percent. Operator error was the next most common cause at 31 percent. All three of the deliberate releases were meth related, though there have been no such reported spills since 2006.

A notable trend in the spills data is the number of methamphetamine-related releases in recent years. In 2003 and 2004, 65% of the reports were related to methamphetamine labs. All but two of the “meth” reports were at fixed facilities, and only one of the reports involved an actual release. Eleven of the 17 meth-related reports occurred at sites within ¼-mile of residential areas, and most of these reports involved more than one toxic chemical with ammonia being the predominant concern. There were no immediate injuries associated with these reports. Efforts to combat meth labs and meth addiction during the past decade have been having success, with the number of discovered labs in Wisconsin decreasing.

**Table 24. Reported Hazardous Materials Spills – 1996 through 2009³⁵
St. Croix County**

Year	# of Reports	Actual Release	Threatened Release	Fixed Facilities	Transportation Related
1996	3	3	0	3	0
1997	<i>no reports</i>				
1998	4	4	0	2	2
1999	5	5	0	2	3
2000	3	3	0	0	3
2001	5 (2)	3	2 (2)	4 (1)	1 (1)
2002	5 (1)	3	2 (1)	2 (1)	3
2003	13 (10)	3 (1)	10 (9)	11 (9)	2 (1)
2004	7 (3)	4	3 (3)	6 (3)	1
2005	1	1	0	1	0
2006	5 (1)	4 (1)	1	4 (1)	1
2007	2	1	1	2	0
2008	3	3	0	2	1
2009	4	4	0	2	2
Total	60 (17)	41	19	41	19

Overall, the number of accidental or illegal hazardous materials releases has stayed fairly consistent at about four to five reports per year, decreasing slightly in recent years, perhaps due to the absence of meth-related reports. But, as traffic volumes increase, population increases, and development occurs, it is also expected that the number of accidental hazardous materials incidents could also increase.

Local Events — Key Areas of Concern

As **Figure 27** on the following page shows, a hazardous materials spill or release can occur virtually anywhere in the County due to transportation accident, illegal dumping, improper handling, leaking storage tank, or other accident. Somewhat surprisingly, many of the spills sites are located in the unincorporated towns, rather than in the larger cities, which is of special concern due to the proximity to private wells.

³⁵ U.S. Dept. Health & Human Services, Agency for Toxic Substances & Disease Registry, HSEES database, http://www.atsdr.cdc.gov/HS/HSEES/Public_Use_Data.html. Not all events may have been reported.

To provide a sense of the number and distribution of potential brownfield and remediation sites in the County due to past hazardous materials dumping, storage tank leaks, or other such contamination requiring action, Figure 27 identifies the open LUST and Environmental Repair sites in the County and the three active Superfund sites³⁶. All of these sites have had some level of contamination to varying degrees, often limited to the site itself.

Figure 27 also shows the two general areas which the Wisconsin DNR has designated as deep-well casing areas due to groundwater contamination. These areas are actually four individual sub-areas, three of which are related to the previously mentioned Superfund sites in which Volatile Organic Compounds (VOCs) have caused significant groundwater contamination. Long-term exposure to VOCs can include cancer, liver damage, spasms, and impaired speech, hearing, and vision. Each of these areas has related requirements for private wells, such as increased testing and the installation of whole-house, point-of-entry, activated carbon filter treatment systems. In some cases, landowners have elected to use bottled water, while the extension of municipal water is being planned for the Town of Star Prairie area.

Also on Figure 27 is a very approximate potential impact area of a second plume of groundwater contamination in the Town of Star Prairie from a second, older landfill; it is uncertain if or how far this plume (and the other nearby plume) may have spread. Landfill license #310 is reported to have operated from approximately 1945 until it closed in 1975. In 1992, an Environmental Conditions Assessment was completed; and, based on the results of that assessment, one private well was replaced because of VOC contamination and the landfill was capped in 1994 with clay material. Since that time, Operation & Maintenance (O&M) continues at the site with scheduled water sampling from monitoring wells and private wells. This second plume has not been declared a deep-well casing area or other formally identified well advisory area. However, the Wisconsin Department of Natural Resources may require additional actions at this site in the future.

Figure 27 notes that a third well advisory area was established since the 2008 plan in the Town of Emerald area due to E. Coli, likely due to animal waste. In 2009, an Emerald household had become ill and the cause was not discovered until their well tested positive for E. coli contamination. And nitrates have been a problem with some wells in the Town of Richmond area. Such risks may grow as more residential development occurs on former farmlands or near existing farm operations. Old, abandoned manure storage facilities do occasionally fail. County Land & Water Conservation helps to remove one such facility every one to two years if funding is available. Manure and agricultural chemical run-off problems have occurred during heavy snow melts and rains, though such problems are becoming less frequent. Most agricultural fuel storage is now above ground and many farmers are keeping less chemical on site. St. Croix County Land & Water Conservation Department has an active private well testing program as described in Section IV.

³⁶ Geo-locations for LUST and Environmental Repair sites taken from the Wisconsin Department of Natural Resources Remediation and Redevelopment Sites Map as of June 1, 2007. Eleven additional sites are known but do not yet have an associated geo-location and are not shown.

Figure 27 also shows known closed depressions in each community. These potential vulnerabilities will be discussed further in the vulnerability assessment subsection.

For a more complete analysis of the County's groundwater, please reference the reported entitled *An Introduction to Groundwater in St. Croix County* completed in May 2006 by the UW-Extension and UW-Stevens Point. This report offers insight into a broader range of water quality measurements such as nitrates, triazine, arsenic, chloride, hardness, and pH, which were generally outside the scope of this mitigation planning effort which focuses only on potential point sources of contamination. But the May 2006 report is aging and an update is needed. Since the 2008 plan, a USGS-led groundwater modeling effort which includes St. Croix County was developed which lends additional insight into the characteristics of groundwater in the area, though it has been very difficult to calibrate on a larger scale.

During the planning effort, some local officials and steering committee members also recognized non-metallic mineral extraction and processing, particularly for silica frac sand, as a fast-growing industry which could have significant groundwater impacts in terms of quality and quantity.

Relative Level of Risk

The plan steering committee rated hazardous materials spills as a moderate risk (frequency), but having a much higher vulnerability (impact) should an event occur.

There is no area of St. Croix County which is immune to hazardous materials incidents, and such incidents will continue to occur. **Based on past trends, four to eight industries will report releases of hazardous substances into the environment in any given year as reported to the toxic release inventory (TRI).** Most of these releases are part of normal standard practice for the industry and in compliance with applicable regulations.

Approximately ten to fifteen hazardous materials spills will be reported in any given year in the County for the near future based on the BRRTS data, though the number of more significant spills will likely range between two to seven per year based on the HSEES data. Less common than in the past are the reported leaking underground storage tanks (LUSTs), which are expected to continue to range between two and three new reports per year based on the BRRTS data.

Of greatest concern are the environmental repair projects for contaminated sites other than LUSTs, such as illegal dumpsites, closed landfills, buried containers, or large industrial spills. Such sites have the greatest potential for environmental impact, as reflected by the Superfund sites already existing in the County. Environmental repair sites have the highest likelihood of requiring a long-term investigation and significant remediation measures. **Based on BRRTS data, new environmental repair sites will be reported for the County at an average of one to three per year, though not all will require significant remediation activities.**

For the communities of St. Croix County, the most commonly noted hazardous materials concern of local officials is the movement of such substances through communities via semi-truck or rail line. Though such a risk is possible, it cannot be reliably predicted and should not occur if rail lines are well maintained and accidents at rail crossings are avoided. Of all reported spills, approximately 32 percent were transportation related, so this is a significant risk. Based on past trends, one to three significant transportation-related spills can be expected to occur in any given year.

The level of risk is also influenced by the fast pace of growth in St. Croix County. As more growth occurs, there is an increase in the potential number of contamination sources. And, as the number of industries increases, there is an increase in the general use of hazardous materials in the County for domestic, institutional, and commercial purposes. Traffic volumes are also rising, which increases the potential for accidents involving vehicles carrying hazardous materials. Further, as additional private wells are installed, more residents are potentially vulnerable to groundwater contamination. It can be expected that the frequency of hazardous materials incidences and spills in the County will slowly increase as the County's population continues to rise and development occurs.

Vulnerability Assessment—Hazardous Materials

Potential Impacts

Hazardous substances and materials can have a wide variety of harmful impacts to people, property, and the environment. These substances can be in solid, liquid, gaseous, or semi-solid form, which can often be difficult to detect or contain if a release does occur. Impacts may be immediate, as in the case of fire, explosion, or physical harm to bystanders (e.g., fire, inhalation, chemical burns, radioactivity). And some impacts can be longer term, such as degraded water quality, illness among wildlife, corrosion, or increases in health problems (e.g., cancer, birth defects). The magnitude of the vulnerability zone and potential for fire or explosion also varies by substance type (e.g., gas vs. solid) and by environmental conditions (e.g., wind speeds, access to surface or groundwater, temperature). In extreme cases, contamination of buildings and soils can be at such levels as to make a property unusable or uninhabitable for lengthy periods. Evacuation of nearby residents may be needed. Recovery and clean-up costs can also vary widely depending on the type of hazardous material, amount released, and conditions at the site (e.g., soil type, temperature).

There are many available resources which discuss the potential impacts of the release of hazardous substances. One such source is the Agency for Toxic Substances and Disease Registry's Toxic Substances Web Portal (www.cdc.gov/Features/ToxicSubstances) which provides information about toxic chemicals and related health effects.

St. Croix County Hazardous Materials Storage & Use Facilities

According to St. Croix County Emergency Support Services, as of August 2011, there are 87 Tier Two reporting facilities and 29 active Extremely Hazardous Substances (EHS) planning

facilities within St. Croix County. These facilities represent significant potential sources for a hazardous materials incident, with the EHS facilities being the greater concern.

Tier-Two facility reports are submitted annually, by law (SARA Title III), for any facility that is required to prepare or have available a Material Safety Data Sheet (MSDS) for a hazardous chemical present at the facility. EHS (Extremely Hazardous Substances) facilities store and/or use one of over 300 chemicals with extremely toxic properties identified within Title III of SARA. In addition to the MSDS reporting requirements, EHS facilities must cooperate with St. Croix County Emergency Support Services and the Local Emergency Planning Committee (LEPC) to develop an emergency response plan.

The MSDS must identify any hazardous chemical present at the facility at or above 10,000 pounds at any given time or for each extremely hazardous substance (EHS) at or above 500 points (or the threshold planning quantity, whichever is less) at any given time. There are a number of exemptions from these reporting requirements, including retail gas stations, hazardous wastes regulated under the Resource Conservation and Recovery Act, substances used in routine agricultural operations by the end-user, tobacco products, wood products, food products regulated by the Food & Drug Administration, and hospitals.

The majority of the 29 EHS planning facilities were located in incorporated areas, assumingly with access to municipal water and sewer. Further, eighteen of the 29 are located in the City of Hudson. Eight of the 29 are associated with public water and wastewater treatment facilities. Based on a cursory review, the far majority of tier-two facilities were also located in incorporated areas. For reasons of security, maps showing the locations of these EHS and Tier Two facilities have not been included within this plan.

These facilities have no unique, inherent characteristics (e.g., location, type of construction) which make them any more vulnerable to the natural hazards covered within this plan when compared to other facilities, and thus were not individually analyzed. However, the hazardous nature of the chemicals and substances used or stored at these locations can pose unique vulnerabilities to local residents and the environment.

Multi-County Commodity Flow Study

During the planning process, areas and neighborhoods adjacent to the County's rail lines, Interstate 94, and major highways were the most frequently mentioned risk. In 2012, a *Multi-County Commodity Flow Study* was completed by Five Bugle Training & Consulting, LLC to attempt to provide insight into the types of hazardous materials moving through the region. For St. Croix County, the study identified the following example of incidents involving hazardous materials:

“St. Croix County experienced leaks/spills involving a barrel of an unknown corrosive material, another incident involving small amount of mercury, an LP tanker leaking and a Fed Ex truck leaking an unknown ‘milky substance’ and several fuel leaks. Haz Mat teams were not called to respond to these incidents.”

As part of the study, 49 hours were spent observing hazmat placards at a number of locations on Interstate 94 and other highways. Union Pacific reported fifteen different chemicals transported on their rail lines in 2010. The detailed results of this study are not published here for reasons of security.

Vulnerable Critical Facilities

As summarized in Appendix E, all critical facilities have some related vulnerability to the release of a hazardous or toxic substance. Three types of critical facilities, in particular, were identified as being most vulnerable to the impacts of hazardous materials releases:

- Community Wells, Private Wells, and Wastewater Treatment Systems
- Transportation Systems
- Critical Facilities located near hazardous materials tank farms, railroads, and major highways.

Wells and Wastewater Treatment Systems

Wells for potable drinking water are especially vulnerable to groundwater contamination, especially private ones which are typically tested less frequently than their public counterparts and do not have associated wellhead protection programs. Contamination may be from point sources (a spill or release) or may be more indirect, such as the application of atrazine pesticides over time within a wellhead draw area.

As of May 2006, St. Croix County had 151 public water systems which had at least 15 service connections or served an average of at least 25 individuals daily at least 60 days out of the year. Of these, 11 were municipal systems, with numerous communities planning to construct new wells in the future to keep up with the pace of growth. As the population increases in the County, the number of new private well permits each year has also been significantly increasing.

Wastewater treatment systems can also be impacted by the introduction of chemicals or hazardous materials. Dissolved oxygen levels can change, and the biological treatment of effluent can be impacted. Keeping a municipal treatment system balanced and operating efficiently can be a challenge, especially when there are sudden changes in the effluent entering the treatment plant. Related to wastewater treatment, the City of Hudson area falls within an areawide water quality management planning area. The City of Hudson and St. Croix County provide an advisory role to the WDNR on sewer hook-ups, sewer extensions, holding tanks, and encroachment upon environmentally sensitive areas (e.g., wetlands, floodplains, steep slopes) under the guidance of the *City of Hudson Sewer Service Plan*.

Transportation Systems

While transportation infrastructure may not be physically impacted by a hazardous materials spill, the use of the infrastructure and nearby land uses can be impacted. And, as discussed previously, a wide variety of chemicals move through and within St. Croix County via railroad and truck traffic. If a spill should occur, adjacent residents, travelers, buildings, water supplies, and ecosystems can be impacted. And as response and clean-up proceeds, these transportation routes may need to be temporarily closed and nearby homes, businesses, and structures evacuated.

As shown in Figure 27, rail lines pass through portions of most incorporated communities in the County, with the exceptions of Deer Park, Glenwood City, and River Falls. And, as discussed



Transportation-related hazardous materials spill near the Village of Roberts

previously in the review of regional events, the east-west line is connected to the same rail line which had a derailment in 1996, resulting in the evacuation of about 2,300 people in the Weyauwega area. Likewise, the Interstate 94 corridor travels through numerous incorporated and developing areas in the County. This is the second most heavily traveled segment of interstate highway in the State, with over 65,000 vehicles per day at its western end and increasing. It is also a regional truck route which moves significant amounts of hazardous materials. As traffic volumes increase on Interstate 94 and other roadways in the County, the potential for accidental

spills of hazardous materials increases. Extended closures of rail and highway systems can impact local businesses and delay emergency response.

Other Utilities and Services

Three natural gas pipelines also cross the County; these transport substances which can be hazardous. Northern Natural Gas operates two of the natural gas transmission lines (one each in the Town of Star Prairie area and Town of Pleasant Valley areas). A third natural gas transmission line owned by Viking Gas runs through the Town of Forest area. An oil pipeline owned by Williams Pipeline Company generally runs from the Hudson area southeast to the Town of Kinnickinnic, then east through the southern tied of towns in the County.

During the planning process, a number of communities identified natural gas lines, transfer stations, and gas tank farms as special hazardous materials risks. Continued planning with tank farm owners is advised to help mitigate risks. Many of these facilities have not been mapped for emergency planning purposes. The number of critical facilities located in proximity to these uses is not known and some facilities may not have robust emergency plans in place to quickly respond to a hazardous materials release.

It must be noted that law enforcement personnel and emergency response providers are also vulnerable to the potential impacts of toxic releases as they respond to an incident or situation. In 1999, two responders in nearby St. Croix County did receive respiratory injuries during a transportation-related hazardous materials incident.

An Unique Hazardous Materials Spill Vulnerability—Closed Depressions

The “Closed Depression Map of St. Croix County, Wisconsin” provides an excellent description of the phenomena of closed depressions in the County, as paraphrased in the *St. Croix County Development Management Plan* completed in 2000:

Closed depressions are common features in St. Croix County. They have formed through two quite different geological processes: karst development and glaciation. Karst development occurs in regions with highly soluble bedrock and results in distinctive landforms such as sinkholes. St. Croix County is covered by several rather thick, soluble carbonate units, and has particularly well developed karst, especially in the eastern half of the county. Glacial action can also result in topography marked by closed depressions known as kettles or kettleholes. Kettles develop when large blocks of glacier ice are buried within glacial deposits and subsequently melt. Many of the depressions in the western and northwestern portions of the county are kettles that developed in the St. Croix moraine after it was deposited during the Wisconsinan glaciation. - Baker, Hughes, Huffman and Nelson, Closed Depression Map of St. Croix County, Wisconsin, 1991

Closed depressions (or sinkholes) are significant groundwater contamination vulnerabilities since there are sometimes minimal soil layers between the bottom of the depressions and the bedrock underneath. Contaminants at the surface are not given the opportunity to be adequately filtered by soils, but, instead, are passed more directly from the surface to the groundwater aquifer. Given the nature of bedrock fractures and aquifers, contaminants can travel large distances in relatively short timeframes.

The karst topography more common in the eastern half of the County is more vulnerable to groundwater contamination since this is often in areas characterized by thin soils or surficial deposits. With the closed depressions or kettles created by glacial activity, more common in the western and northwestern parts of the County, there are typically greater amounts of soil layers between the depression and the bedrock to provide additional filtration of potential contaminants.

Most of the known closed depressions in St. Croix County are shown in Figure 27, though some are so small to be hardly noticeable on the map. Many others exist, but have not been discovered or formally mapped, since these depressions can be difficult to identify. On occasion, these depressions or sinkholes have been used for convenient dumping sites for a variety of potential contaminants, such as lead batteries. Closed depressions are also many times used as natural drainageways or stormwater ponds, though often without adequate buffer areas.

Unique Jurisdictional Risks or Vulnerabilities—Hazardous Materials

During meetings with local municipalities and key informant interviews, the following items related to hazardous materials were particularly noted regarding incorporated areas:

- 1) the transport of hazardous materials or unidentified chemicals by railroad and by truck, especially through residential areas.

- 2) the protection of groundwater and community wellhead zones of contribution;
- 3) the potential contamination of surface waters, especially from hazardous materials within floodplains or near surface waters; and,
- 4) most of the EHS planning facilities in the County are located in incorporated areas, with the largest number in the City of Hudson.

Appendix F reviews the hazardous materials issues and any unique concerns for the cities and villages, though the most important risks and vulnerabilities were covered previously. One unique threat not addressed elsewhere in this report is high radon reported for some basements in the Deer Park area, though this is not technically a hazardous materials spill. A mobile home park in the Town of Stanton just outside the City of New Richmond was identified as having significant problems with septic systems, likely related to high groundwater.

V. Targeted School Violence

Summary—Targeted School Violence

Risk: No targeted school violence deaths or injuries in St. Croix County, but increasing numbers nationally. 1-2 bomb threats or shooting complaints involving schools in St. Croix County each year. 55-65 potentially related 9-1-1 calls each year. Social media use and increasing population may contribute to increasing risk in future.

Vulnerabilities: St. Croix County has 28 schools with a 2011 enrollment of 14,219.

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates targeted school violence (active school shooter) as a 39% risk over a ten-year period given their moderate probability (2); substantial vulnerability (1.2); and moderate available emergency management capabilities to deal with this threat (2).

Risk Assessment—Targeted School Violence

The Hazard

Targeted school violence is defined by the U.S. Department of Education as “any incident where a current student or recent former student attacked someone at his or her school with lethal means (e.g. a gun or knife); and, where the student attacker purposely chose his or her school as the location of the attack.”³⁷ The Safe School Initiative examined incidents of “targeted violence” in school settings—school shootings and other school-based attacks where the school was deliberately selected as the location for the attack and was not simply a random site of opportunity. The term “targeted violence” evolved from the Secret Service’s five-year study of the behavior of individuals who have carried

Wisconsin State Statute 118

Health and Safety Requirements

Wisconsin State Statute 118 requires that schools conduct drills in the proper method of evacuation or other appropriate action in case of a **school safety incident** at least twice a year. The public and private school safety drill shall be based on the school safety plan. A school safety plan shall be created with the active participation of appropriate parties and shall include general guidelines specifying procedures for emergency prevention and mitigation, preparedness, response, and recovery. The plan shall also specify the process for reviewing the methods for conducting drills required to comply with the plan.

The school board or governing body of the private school shall determine which persons are required to receive school safety plan training and the frequency of the training. The training shall be based upon the school district's or private school's prioritized needs, risks, and vulnerabilities. Each school board and the governing body of each private school shall review the school safety plan at least once every 3 years after the plan goes into effect.

³⁷ Combating Targeted School Violence: Inside & Outside Attackers, 2007.

out, or attempted, lethal attacks on public officials or prominent individuals.

For purposes of this report, targeted school violence will include any incidents of targeted violence, as described above, brought forth by anyone whether or not connected with the targeted school. Targeted school violence includes:

- Active shooters—one or more subjects who participate in a random or systematic shooting spree with the intent to continuously harm or kill others.³⁸
- Bombs and/or bomb threats—any explosive device on or near school premises or a threat or a bomb, whether real or hoax, on or near school.
- Hostage situations—one or more subjects hold people against their will in order to hold off authorities, often threatening to harm the victims if approached. The hostage-taker(s) may issue demands, often including the release of the hostages.

This section does not include any community-wide threats such as a poisoned community water supply or community-wide natural disasters like tornados or floods.

National Trends

Table 25 identifies 74 national incidences of targeted school violence since the mid-1960s. Efforts were made to include all cases of targeted school violence in the United States since about the mid-1900s but there may be incidences that have been inadvertently left out.

All recorded violent episodes in Table 25 involved an active shooter. The frequency varied amongst the type of educational institutions. Universities had the most targeted school violence incidents (37.8 percent), followed by high schools (33.8 percent), middle schools (14.9 percent), colleges (6.8 percent), and elementary schools (6.8 percent). The average age of the assailant was 23; and in all but four cases, he was male.

Table 25. Targeted School Violence Incidents – 1966 through 2012³⁹
St. Croix County

Date	Age/sex of assailant	Location	Type of Violence	Type of education institution	# injured	# killed
Aug. 1, 1966	25/M	University of Texas-Austin	Active shooter	University	31	16
Jan. 17, 1969	21/M	University of California-Los Angeles	Active shooter	University	0	2
May 4, 1970	Ohio Nat'l Guard	Kent State University, OH	Active shooter	University	9	4
Dec. 30, 1974	17/M	Olean, NY	Active shooter	High School	11	3
July 12, 1976	37/M	California State University Fullerton	Active shooter	University	0	7
Feb. 22, 1978	15/M	Lansing, MI	Active shooter	High school	1	1

³⁸ Central Texas College Safety Policies and Procedures Manual. Revised 2010.

³⁹ San Francisco Chronicle, April 3, 2012 and U.S. News and World Report, February 15, 2008

Date	Age/sex of assailant	Location	Type of Violence	Type of education institution	# injured	# killed
Jan. 29, 1979	16/F	San Diego, CA	Active shooter	Elementary school	8	2
Oct. 23, 1985	14/F	Spanaway, WA	Active shooter/ suicide	Middle School	0	3
Aug. 12, 1986	29/M	New York Technical College, Brooklyn, NY	Active shooter	College	5	1
Jan. 17, 1989	24/M	Stockton, CA	Active shooter/ suicide	Elementary school	30	6
Nov. 1, 1991	28/M	University of Iowa, IA	Active shooter	University	2	5
May 1, 1992	20/M	Lindhurst High School in Olivehurst, CA	Active shooter	High school	10	4
March 23, 1994	19/M	Seattle, WA	Active shooter	High school	0	1
Feb. 2, 1996	14/M	Moses Lake, WA	Active shooter	Middle School	1	3
Aug. 15, 1996	36/M	San Diego State University, San Diego, CA	Active shooter	University	0	3
Feb. 19, 1997	16/M	Bethel, AK	Active shooter	High school	2	2
Oct. 1, 1997	16/M	Pearl, MS	Active shooter	High school	7	2
Dec. 1, 1997	14/M	Heath High School, West Paducah, KY	Active shooter	High school	5	3
Dec. 15, 1997	14/M	Stamps, AK	Active shooter	Middle school	2	0
March 24, 1998	11/M and 13/M	Jonesboro, AK	Active shooters	Middle school	10	5
April 24, 1998	15/M	Edinboro, PA	Active shooter	Middle school	0	1
May 19, 1998	18/M	Fayetteville, TN	Active shooter	High school	0	1
May 21, 1998	15/M	Springfield, OR	Active shooter	High school	20	2
June 15, 1998	14/M	Richmond, VA	Active shooter	Middle school	2	0
April 20, 1999	18/M and 17/M	Columbine High School, Littleton, CO	Active shooter	High school	23	15
Nov. 19, 1999	12/M	Deming, NM	Active shooter	Middle school	0	1
Feb. 29, 2000	6/M	Buell Elementary School in Mount Morris Township, MI	Active shooter	Elementary school	0	1
March 10, 2000	19/M	Beach High School, Savannah, GA	Active shooter	High school	0	2

Date	Age/sex of assailant	Location	Type of Violence	Type of education institution	# injured	# killed
May 26, 2000	13/M	Lake Worth, FL	Active shooter	Middle school	0	1
August 28, 2000	36/M	University of Arkansas, AK	Active shooter/suicide	University	0	2
March 5, 2001	15/M	Santana High School in Santee, CA	Active shooter	High school	13	2
Jan. 16, 2002	43/M	Appalachian School of Law, Grundy, VA	Active shooter	University	3	3
October 28, 2002	41/M	University of Arizona Nursing College	Active shooter/suicide	University	0	4
April 24, 2003	14/M	Red Lion Area Junior High School, PA	Active shooter/suicide	Middle school	0	2
Sept. 24, 2003	15/M	Rocori High School in Cold Spring, MN	Active shooter	High school	0	2
March 21, 2005	16/M	Red Lake Indian Reservation, MN	Active shooter/suicide	High school	0	8
Nov. 8, 2005	15/M	Campbell County High School, TN	Active shooter	High school	2	1
Sept. 2, 2006	49/M	Shepherd University, WV	Active shooter/suicide	University	0	3
Sept. 17, 2006	?/ M and ?/M	Duquesne University,	Active shooter	University	5	0
Sept. 27, 2006	53/M	Platte Canyon High School, Bailey, CO	Active shooter/suicide	High school	0	2
Sept. 29, 2006	15/M	Weston Schools, Cazenovia, WI	Active shooter	High school	0	1
Oct. 2, 2006	33/M	Amish schoolhouse, Lancaster County, PA	Active shooter/suicide	Elementary	6	6
April 2, 2007	41/M	University of Washington, WA	Active shooter/suicide	University	0	2
April 16, 2007	23/M	Virginia Tech, VA	Active shooter/suicide	University	25	33
Aug. 5, 2007	?/?	Mount Vernon School, Newark, NJ	Active shooter	Elementary/Middle school	1	3
Sept. 21, 2007	18/M	Delaware State University, DE	Active shooter	University	1	1
Sept. 30, 2007	20/M, 21/M, 21/M, and 22/F	University of Memphis, TN	Active shooter	University	0	1

Date	Age/sex of assailant	Location	Type of Violence	Type of education institution	# injured	# killed
Oct. 10, 2007	14/M	Success Tech Academy, Cleveland, OH	Active shooter/suicide	High school	4	1
Oct. 24, 2007	15/M	Saginaw, MI	Active shooter	Middle school	4	0
Dec. 13, 2007	23/M and 22/M	Louisiana State University, LA	Active shooter	University	0	2
Jan. 16, 2008	17/M	Crossroads Charter High School, Charlotte, NC	Active shooter	High school	1	0
Feb. 4, 2008	16/M	Memphis Hamilton High School, TN	Active shooter	High school	1	0
Feb. 7, 2008	56/M	Notre Dame Elementary School, Portsmouth, OH	Active shooter	Elementary	0	1
Feb. 8, 2008	23/F	Louisiana Technical College, Baton Rouge, LA	Active shooter/suicide	College	0	3
Feb. 11, 2008	17/M	Memphis, TN	Active shooter	High school	1	0
Feb. 12, 2008	14/M	Oxnard, CA	Active shooter	High school	0	1
Feb. 14, 2008	27/M	Northern Illinois University, Dekalb, IL	Active shooter/suicide	University	16	6
Oct. 26, 2008	19/M, 19/M, 20/M, 20/M	University of Central Arkansas, Conway, AK	Active shooter	University	1	2
April 10, 2009	28/M	Henry Ford Community College, Dearborn, MI	Active shooter/suicide	College	0	3
April 26, 2009	18/M	Hampton University, VA	Active shooter	University	3	0
May 1, 2009	29/M	Wesleyan University, Middletown, CT	Active shooter	University	0	1
Sept. 2, 2009	18/M, 18/M and 20/M	Skyline College, San Bruno, CA	Active shooter	College	1	0
Feb. 3, 2010	45/F	University of Alabama, AL	Active shooter	University	3	3
March 9, 2010	48/M	Ohio State University	Active shooter	University	1	2
Sept. 28, 2010	19/M	University of Texas at Austin	Active shooter	University	0	1
Oct. 3, 2010	23/M	Mid-Atlantic Christian University	Active shooter	University	0	1
Nov. 29, 2010	15/M	Marinette high School, WI	Active shooter	High school	0	1

Date	Age/sex of assailant	Location	Type of Violence	Type of education institution	# injured	# killed
Jan. 6, 2011	17/M	Millard South High School	Active shooter	High school	1	2
Feb. 6, 2011	22/M and 19/M	Youngstown State University, OH	Active shooter	University	11	1
April 6, 2011	34/M	Southern Union Community College, Opelika, AL	Active shooter	College	3	1
Nov. 15, 2011	UCPD	University of California-Berkeley	Suicide-by-cop	University	0	1
Dec. 8, 2011	22/M	Virginia Tech, Blaksburg, VA	Active shooter	University	0	2
Feb. 27, 2012	17/M	Chardon, Ohio	Active shooter	High school	1	3
April 2, 2012	43/M	Oikos University, Oakland, CA	Active shooter	University	3	10
Totals: 74 events	Average age: 23			university=28 college=5 high school=25 middle school=11 elementary school=5	290	221

source: San Francisco Chronicle, April 3, 2012 and U.S. News and World Report, February 15, 2008

The relative level of risk is very hard to predict, but, based on recent trends, it appears as though the number of targeted school violence cases will continue to occur nationwide at a rate of two to eight per year.

Local Events

To date, there have been no actual deaths/injuries from any targeted school violence incidents in St. Croix County. Incidents potentially related to targeted school violence have been reported in the last five years, though such reports are relatively rare. Between 2007 and 2011, there were a total of 3,721 9-1-1 calls from St. Croix County schools for numerous reasons. Of the 3,721, there were:

- three bomb threats (.08%)
- four domestic-related incidents (.11%)
- three shooting complaints (.08%)
- 242 suspicious activity complaints (6.5%) and
- 38 threat complaints (1.02%).

The majority of the calls, 3,431 (or 92.21%), were not related to targeted school violence. Of the incidents potentially related to targeted school violence, suspicious activity and threat complaints topped the list. Although there were no acts of violence associated with the suspicious activity or threat complaints, it is important to note them since any suspicious activity or threat complaints could potentially lead to an incident of targeted school violence. A complaint could

also have prevented an occurrence of violence. **Table 26** displays the schools where the 9-1-1 calls potentially related to targeted school violence originated from and the reason for the call.

Table 26. Select 9-1-1 Calls for St. Croix County Schools – 2007 through 2011

School	Location	Bomb Threat	Domestic-related	Shooting Complaint	Suspicious Activity Complaint	Threat
Baldwin High School	Baldwin				6	3
EP Rock Elementary School	Hudson				25	
Glenwood City High School	Glenwood City				5	
Hillside Elementary	New Richmond				6	
Houlton Elementary	Houlton				5	
Hudson High School	Hudson	3		1	42	10
Hudson Middle School	Hudson		2		16	9
Hudson Rivercrest Elementary	Hudson			1	7	
New Richmond Alternative Building	New Richmond				19	7
New Richmond Middle School	New Richmond				8	
New Richmond High School	New Richmond				4	2
North Hudson Elementary School	North Hudson				25	
Prairie Elementary School	Hudson				8	
Somerset Elementary	Somerset				6	
Somerset High School	Somerset				15	2
Somerset Middle School	Somerset				7	
St. Annes Catholic School	Somerset				7	
St. Croix Central Elementary School	Roberts		1		3	
St. Croix Central High School	Hammond		1		6	
St. Croix Central Middle School	Hammond				3	1
St. Mary's School	New Richmond				1	
St. Patrick's Catholic School	Hudson				2	
Viking Middle School	Woodville			1	4	
Willow River Elementary	Hudson				12	4
	Total	3	4	3	242	38

source: St. Croix County Emergency Support Services Department

Relative Level of Risk

The plan steering committee ranked school-related domestic terrorism as a moderate-to-low risk of occurring, but significant higher in terms of potential impacts. Based on the 9-1-1 calls from St. Croix County schools, **the number of targeted school violence cases (bomb threats and shooting complaints) is expected to continue at a rate of one to two per year.** The number of *potential* targeted school violence incidents based on 9-1-1 calls to the St. Croix County schools (including bomb threats, domestic-related incidents, shooting complaints, suspicious activity complaints, and threat complaints) will continue to occur at a rate of 55-65 per year.

There are a couple of things that could potentially influence the frequency of targeted school violence incidents:

1. Social media/internet access—information is passed to others quickly online and has resulted in copycat behavior (e.g. a bomb threat in a school resulting in a bomb threat in nearby school soon thereafter). Further, the internet provides a plethora of information, including instructions on how to carry out illegal activities, such as constructing a bomb. This wealth of information could give one the means to carry out a targeted school attack.
2. Population trends—St. Croix County is the fastest growing county in the State which means the population in schools is also increasing at a fast pace. This trend could cause tensions between existing and new residents.

Vulnerability Assessment— Targeted School Violence

Potential Impacts

A targeted school violence incident can have a variety of negative impacts on people and property. A targeted school violence incident can result in the injury or death of students, teachers, staff, or visitors to a school. It can cause damage to school property and buildings. It can also cause the school to close for an extended period of time.

Table 27 lists the 28 schools in St. Croix County and their corresponding 2011 enrollment. The table displays the school facilities physically located in St. Croix County. It does not address any facilities that are located outside of the County that might serve St. Croix County residents.

Table 27. St. Croix County Schools

School Name	2011 Enrollment
Baldwin-Woodville High	461
Greenfield Elementary	713
Viking Middle	461
Glenwood City Elementary	358
Glenwood City High	174
Glenwood City Middle	169
Transitional Skills Center	10
Houlton Elementary	232

School Name	2011 Enrollment
Hudson High	1,665
Hudson Middle	1,299
Hudson Prairie Elementary	505
North Hudson Elementary	344
River Crest Elementary	550
Rock Elementary	541
Willow River Elementary	428
New Richmond High	842
New Richmond Hillside Elementary	565
New Richmond Middle	667
New Richmond Paperjack Elementary	293
New Richmond Starr Elementary	537
NR4Kids Charter School	244
Saint Croix Central Elementary	718
Saint Croix Central High	402
Saint Croix Central Middle	417
Somerset Elementary	672
Somerset High	479
Somerset Middle	467
St. Croix Correctional Center	6
Total	14,219

source: Wisconsin Department of Public Instruction

During this project, a survey was distributed to the public and private school districts with school buildings in St. Croix County. Four public school districts and one private school responded. All of the respondents indicated that targeted school violence has been integrated into their school safety plans. All also reported that local law enforcement and fire departments provided input into their plans and are involved in periodic reviews, as well as plan exercises within the past three years. All have also implemented door number systems for emergency response and have provided these to County Emergency Communications and local emergency services, except for one which is currently undertaking this action. One school noted that “consultation and updates from outside sources are always appreciated, along with data indicating trends and potential proactive solutions to possible problems.”

Vulnerable Critical Facilities

Each of the schools is considered a critical facility because students are considered a vulnerable population, as described in Section II.E.

Unique Jurisdictional Risks or Vulnerabilities— Targeted School Violence

There are no unique city, village or town risks associated with targeted school violence. There may be risks unique to certain schools, but not to the local municipality. Some school districts fall within multiple municipality boundaries. This section focused on those schools, not the communities where they are located. During the planning process, local emergency services providers and school districts reported excellent working relationships, overall.



vi. Extreme Heat

Summary—Extreme Heat

Risk: During the past 50 years, extreme heat has resulted in more deaths in Wisconsin than any other natural hazard. St. Croix County experiences an extreme heat event once every 2 to 3 years on average, though multiple events may occur in a single year. An extreme heat event in the area lasts an average of 1 to 3 days. If climate change trends continue, the frequency and intensity of these events may increase.

Vulnerabilities: Most at risk are the elderly and persons on certain medications or with certain medical/health conditions. Persons of any age which over-exert themselves under extreme heat conditions are also at risk of illness or death. Persons in mobile homes or other metal structures without air conditioning are also particularly at risk. Extreme heat can also impact infrastructure (e.g., soften asphalt, mechanical failure) and increase the risk of explosion of hazardous materials and gases.

1. Education and public outreach will continue to be the primary means of ensuring that residents are aware of the related risks. Twenty-one cooling centers were identified in the County in July 2011. Some local officials were not aware that cooling centers had been identified.
2. No unique vulnerabilities or issues related to extreme heat in St. Croix County were identified during the planning process. *Long-term care facilities and nursing homes during times of power loss were the greatest concern identified by many local officials.*
3. According to Wisconsin Emergency Management, mitigation measures for extreme heat are not eligible for federal mitigation grant dollars at this time. Other options to mitigate extreme heat and the urban heat island effect are limited, not well-established, or may not be feasible at this time.
4. Extreme heat lowers milk production and can result in the death of livestock, especially those in confined spaces (e.g., turkey barns). If brownouts or power outages occur during a period of hot weather, fans or cooling sprinklers may discontinue operation in confined livestock units, resulting in large numbers of animal deaths. There have been instances of this occurring in the region.

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates extreme heat as a 38% risk over a ten-year period given its high probability (3); moderate vulnerability (1.5); and substantial available emergency management capabilities to deal with this threat (1).

Risk Assessment—Extreme Heat

The Hazard

In contrast to other natural hazard events, the occurrence and impacts of extreme heat are often more difficult to recognize. **Extreme heat** is the combination of very high temperatures and exceptionally humid conditions. The National Weather Service issues the following heat-related announcements and advisory warnings in order of severity:

Outlook Statement — Issued two to seven days in advance of when Heat Advisory or Excessive Heat Warning conditions are anticipated. Issued as a Hazardous Weather Outlook (HWO). Broadcasted on NOAA All Hazards Weather Radios, and posted on NWS websites (www.weather.gov).

Heat Advisory — Issued six to 24 hours in advance of any 24-hour period in which daytime heat index (HI) values of 100 degrees or more and/or when air temperatures are expected to be 95 degrees or higher. If four consecutive days of these conditions are expected, then the Excessive Heat Warning will be issued.

Excessive Heat Watch — Issued generally 12 to 48 hours in advance of any 24-hour period in which daytime heat index (HI) values are expected to be 105 degrees or higher and nighttime HI values will be 75 degrees or higher.

Excessive Heat Warning — Issued six to 24 hours in advance of any occurrence of a 48-hour period in which daytime heat index (HI) values are expected to be 105 degrees or higher and nighttime HI values will be 75 degrees or higher.

If such conditions persist for a prolonged period of time, it is called a **heat wave**. Excessive or extreme heat is typically a slowly evolving phenomenon that can catch many people by surprise. Unlike tornados or thunderstorms that normally develop and occur more quickly and with more observable characteristics, a heat wave typically builds slowly over time. Because of this creeping effect, it is important for forecasters and officials to be constantly aware of heat and humidity conditions in order to properly warn and protect citizens.

The combination of high temperatures and high relative humidity makes it difficult for the human body to dissipate heat through the skin and sweat glands. Sweating will not cool the human body unless the water is removed by evaporation. High relative humidity retards evaporation and, thus, inhibits the cooling process. The National Weather Service (NWS) uses the heat index as a measure of the combined effects of high temperatures and high relative humidity, as shown in **Table 28**.

Regional Trends

Heat is the number one weather-related killer in the United States and Wisconsin. From 1979 to 1999, excessive heat exposure caused 8,015 deaths in the United States. During this period, more people died from extreme heat than from hurricanes, lightning, tornados, floods, and earthquakes combined.

Table 28. Heat Index Table

NOAA's National Weather Service

Heat Index
Temperature (°F)

	80	82	84	86	88	90	92	94	96	98	100	102	104	106	118	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution
 Extreme Caution
 Danger
 External Danger

Source: National Weather Service

Although Wisconsin may not be thought of as a high risk area for deadly heat waves, every year, the State of Wisconsin experiences a period or series of periods in which the temperature and humidity produce a heat index which could be harmful to human health. Many of Wisconsin's record-setting temperatures were reported during the Dust Bowl years of the 1930s. The highest recorded Wisconsin temperature was 114°F recorded on July 13, 1936, in the Wisconsin Dells.

From 1982 to 2010, there were 211 deaths directly or indirectly attributed to heat in Wisconsin. The following are examples of recent heat wave events affecting Wisconsin:

- During the summer of 1995, two heat waves affected most of Wisconsin. Together, they resulted in 154 heat-related deaths and an estimated 300 to 400 heat-related illnesses. This makes the combined 1995 summer heat waves the biggest weather-related killers in Wisconsin for the past 50 years, far exceeding tornado deaths.
- In 1999, heat waves occurred on July 4th-5th, 23rd-25th, and 29th-31st. Collectively, these heat waves were directly and indirectly responsible for 20 deaths.
- Several heat waves from mid-July through early August 2001 claimed 15 fatalities across Wisconsin. Additionally, it is estimated that 300 or more individuals were treated at hospitals for heat-related conditions.

Extreme heat and droughts have no defined hazard area within St. Croix County and most times affect the entire County. Due to the irregular nature of these events and the lack of defined hazard areas, the assessment of community impacts as a result of extreme temperatures is difficult to quantify.

Local Events

From 1993 through July 2011, St. Croix County experienced nine extreme heat weather events, according to the NCDC database as shown in **Table 29**. The average event lasted 1.8 days, which is about two days shorter compared to an average heat wave event in southeastern Wisconsin.

While St. Croix County averages one event every two to three years, it is not uncommon to have multiple events reported in a single year. For instance, three of the ten reports occurred in the summer of 1995 and an additional three occurred in the summer of 2001. In addition, extreme heat events commonly last multiple days. All of the extreme heat events which included St. Croix County were reported in the months of June, July, or August, except for a record warmth event which occurred on October 12, 1995.

**Table 29. Extreme Heat Events in NCDC Database – 1993 through July 2011
St. Croix County**

Location	Date	Time	Type	Death	Injuries
Regional	6/17/1995	1:00 PM	Extreme Heat	9	0
Regional	7/13/1995	8:00 AM	Extreme Heat	57	0
Statewide	10/12/1995	2:00 PM	Record Warmth	0	0
Regional	7/23/1999	10:00 AM	Excessive Heat	0	0
Regional	7/29/1999	3:00 AM	Excessive Heat	0	0
Regional	7/31/2001	9:00 AM	Excessive Heat	0	0
Regional	8/1/2001	12:00 AM	Excessive Heat	0	0
Regional	8/4/2001	12:00 PM	Excessive Heat	0	0
Regional	7/18/2011	12:00 PM	Excessive Heat	0	0
			9 events	66	0

source: National Climatic Data Center (NCDC)

One extreme heat episode occurred on June 17, 1995, that claimed nine lives in Wisconsin. Less than one month later, on July 13, 1995, 57 lives were lost in another extreme heat incident. More recently, a heat wave struck Wisconsin on July 17-21, 2011, which was the most oppressive heat wave since 1995. During the 4.5 day stretch, maximum heat indices peaked in the 105°F to 115°F range over much of the State. Three fatalities in Wisconsin were directly attributed to this event. The heat wave was not as intense in St. Croix County compared to some areas of the State, and 21 cooling shelters were formally available in St. Croix County. However, this event did increase local awareness of extreme heat risks and vulnerabilities, and prompted the inclusion of this assessment subsection in the County's hazard mitigation plan update.

Relative Level of Risk

Extreme heat was identified as a moderate risk (frequency) and vulnerability (impact) for St. Croix County by the plan steering committee. Based on recent trends, **it is expected that a summer period will include at least one extreme heat event every two to three years on average.** Some of these summers will include multiple events, with a single event lasting one to three days on average. However, as discussed previously in the subsection on climate change, average temperatures in the region have been rising. If these trends continue, extreme heat events may also be increasing in frequency.

Vulnerability Assessment—Extreme Heat

Potential Impacts

Research findings strongly suggest that heat index values of 90 to 105 make sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity. Heat index values of 105 to 130 degrees make sunstroke, heat exhaustion, or heat cramps likely with prolonged exposure and/or physical activity.

Heat cramps are muscle spasms from the result of a large amount of salt and water, and generally ceases to be a problem after acclimatization. **Heat exhaustion** may cause dizziness, weakness, nausea, or fatigue from the depletion of body fluids, and may be accompanied by slightly to moderately elevated body temperatures. **Heatstroke** is when the body is unable to regulate and prevent a substantial rise in the body's core temperature. It is usually diagnosed when the body's temperature exceeds 105° F due to environmental temperatures. **Sunstroke** is a form of heatstroke brought about by excessive exposure to the sun. Heatstroke or sunstroke are considered medical emergencies and can be fatal.

Shown in **Table 30** are the potential dangers associated with heat index temperatures.

**Table 30. Apparent Temperature Heat Stress Index
(Dangers Associated with Heat Index Temperatures)**

Category	Apparent Temperature (Heat Index - °F)	Associated Dangers
Caution	80-90°F	Exercise more fatiguing than usual.
Extreme Caution	90-105°F	Heat cramps, exhaustion possible.
Danger	105-130°F	Heat exhaustion likely; heatstroke possible.
Extreme Danger	Greater than 130°F	Heatstroke or Sunstroke imminent.

Source: National Weather Service

The risk of heat-related injury or death is for individuals who are suffering from chronic illnesses and for those who are not acclimated to these conditions. Most health-related illnesses involve the elderly. However, people on certain medications, isolated individuals who live alone and seldom leave their home, infants and young children, persons with chronic heart or lung problems, overweight people, persons with disabilities, and people who work outside are also at greater risk during extreme heat events. Mobile homes, campers, pole buildings, and similar construction, if not air conditioned, can also become dangerous under extreme heat conditions.

Residents in larger cities and urbanized areas are also more at risk due to the urban heat island effect which can enhance heat and humidity. This was a factor in the large number of heat-related deaths in Milwaukee County in 1995. Concentrations of buildings can disrupt the cooling and moderating influences of winds. And large areas of concrete and asphalt retain heat. Large numbers of heat sources in urban areas are typically a secondary factor. This was a factor in the large number of heat-related deaths in Milwaukee County in 1995.

Any time the temperature and humidity combine to produce a heat index that could cause health concerns for humans, the National Weather Service will issue various statements on heat conditions. For example, the NWS issues “Heat Advisories” when it expects the daytime heat index to equal or exceed 105° for 3 hours or more and the nighttime heat index equals or exceeds 80° for any 24-hour period. The NWS issues “Excessive Heat Warnings” when it expects the daytime heat index to equal or exceed 115° for 3 hours or more and the nighttime heat index equals or exceeds 80° for any 24-hour period. The NWS may issue an "Excessive Heat Watch" 24 to 8 hours in advance of anticipated heat wave conditions.

Few options are available for a community to mitigate extreme heat. Cooling shelters or centers can be activated or identified for persons without air conditioning. The Red Cross and other service agencies may become involved if a longer-term, critical event occurs which impacts large numbers of people (extended power outage during very extreme heat). In July 2011, the following “cooling centers” were identified for public use, though the hours and days of availability were limited at many of these locations:

Baldwin Care Center	Knights of Columbus Hall (New Rich.)
Baldwin Public Library	Friday Memorial Library (New Rich.)
Deer Park Community Center	River Falls - Wellhaven Senior Living Apt.
Deer Park Public Library	Roberts Park Building
Glenwood City Community Center	Hazel Mackin Community Library (Roberts)
Glenwood City Public Library	Somerset Town Hall
Hammond -Westview Apartments	Somerset Public Library
Hammond Community Library	Pioneer Building (Lower level) (Woodville)
Family of Christ Lutheran Church (Houlton)	Woodville Community Library
Marie B. Blakeman Cmty Center (Hudson)	Christ Center Assembly of God (Hudson)
Hudson Area Library	

In the region, most efforts focus on educating the public to the risks, vulnerabilities, and how to prevent heat-related illness. St. Croix County Emergency Support Services distributes educational information via local media on steps to minimize the impacts of extreme heat. Local media often provides their own news coverage and educational outreach. In addition, the St. Croix County Aging and Disability Resource Center distributes educational information through its newsletter to the County’s elderly; and its meal delivery personnel help maintain watch over elderly clients who might be more at-risk of succumbing to the impacts of extreme heat.



ST. CROIX COUNTY
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Heat related information at the County's website, July 2012

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Welcome to Emergency Support Services

The Emergency Support Services Department was formed in 2010. This Department includes the Emergency Communications and Emergency Management Divisions.

Emergency Support Services is here to work with Local Municipalities, Businesses, Police, Fire and EMS units, the Sheriff's Department and local residents to help our communities prepare for emergencies, manage emergencies and recover from emergencies.

[Emergency Communications \(911\)](#)
The St. Croix County 9-1-1 Emergency Communications Center is an information processing agency with the primary function being to gather data and to dispatch appropriate emergency and non-emergency first responders or to disseminate information to relevant personnel, agencies, or the public.

[Emergency Management](#)
Emergency Management coordinates effective disaster response and recovery efforts in support of local governments. Through planning, training and exercising we prepare ourselves, our citizens and response personnel to minimize the loss of lives and property.



Click above image for information on dealing with excessive heat
[Click here for a list of cooling centers in St. Croix County](#)

[07/02/2012 STATE OFFICIALS ISSUE HEAT-RELATED PUBLIC HEALTH ADVISORY](#)

Visit www.ready.wi.gov for more information for you and your community

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Beyond educational efforts and activating cooling shelters, other mitigation alternatives are limited. A targeted air conditioning program, such as working with local suppliers to offer rebates, could be one alternative, but would be expensive. Some communities with significant urban heat islands have attempted to increase vegetative cover, reduce hardscape, or have considered policies to change the albedo (reflectivity) of pavement, roofs, and other surfaces. The impacts of these policies are often difficult to model and prove. For areas experiencing an increase in extreme heat events, another approach is adaptation which considers the type of vegetation being planted, the reuse of water supplies, scheduling of activities, etc.

Extreme heat also has impacts for agriculture. In July 2012, Green Bay-area dairy farmers were reporting up to a 33 percent reduction in milk production due to heat; and it can take months before animals recover.⁴⁰ Extreme heat within confined livestock buildings can also result in deaths, especially should power be lost. In nearby Barron County, some rural fire departments have been called out to provide water misting to help keep turkeys cool during the hottest of

⁴⁰ <http://www.wbay.com/story/19037284/2012/07/16/milk-production-takes-a-dip-with-extreme-heat>

temperatures. Extreme heat and drought can also result in the build-up of toxic gases within grain silos to lethal levels or result in fires or explosions.

Vulnerable Critical Facilities

Extreme heat events are regional in nature, and all critical facilities would be encompassed within the same event area. An assessment of St. Croix County community assets (critical facilities) and their susceptibility to extreme heat and other hazard events is located in **Appendix E**. The vulnerability of critical facilities to extreme heat generally falls into three categories:

- 1) **Infrastructure**—Certain types of infrastructure can be impacted directly or indirectly by extreme heat. Direct impacts can include disruption of biological processes at wastewater treatment facilities, the “softening” or buckling of roadways, increased mechanical failure, water quantity shortages (during times of drought), or the sagging of electrical transmission lines. Indirect impacts can include the power brownouts due to spiking demands for electricity. Rail lines are built with sufficient flexibility to accommodate the stresses related to most extreme heat, though buckling immediately in advance of fast moving trains can occur. During extreme heat events, train speeds may be reduced and additional track department patrols may be ordered.
- 2) **Services to Special Populations**—Many critical facilities, such as hospitals, long-term care facilities, and schools, provide services to at-risk or special populations. Special attention is needed to mitigate heat-related vulnerabilities to these populations.
- 3) **Hazardous Materials**—Certain chemicals, gases, and other hazardous materials can be impacted by extreme heat resulting in a release, fire, or explosion. Care must be used to properly store these materials during extreme heat events.

Unique Jurisdictional Risks or Vulnerabilities—Extreme Heat

During meetings with cities and villages, no unique risks or vulnerabilities related to extreme heat were identified. Many local officials were not aware if designated cooling shelters were available within their communities, but commonly suggested that their library could serve such a purpose. Nursing homes and long-term care facilities during periods of power outages were the most common and important extreme heat concern of local officials during interviews.

vii. Nuclear Accident

Summary—Nuclear Accident

Risk: Very low risk overall for St. Croix County, though the County is within the Ingestion Pathway Zone (IPZ) for the Prairie Island Nuclear Generating Plant. The Plant is highly regulated and designed with a series of barriers and safety systems. Three Mile Island in 1979 has been the only major accident at a commercial nuclear facility in the United States.



Vulnerabilities: Should an accidental release occur, direct radiation exposure or inhalation for persons in St. Croix County is very, very unlikely; such exposure would largely be limited to a 10-mile radius of the facility under most, if not all, circumstances. The primary and most likely vulnerability would be the transport of radioactively contaminated crops or dairy products from areas closer to the facility to processing facilities within the IPZ. A much less likely scenario is for the airborne contamination of soils and vegetation in St. Croix County, if weather and other conditions allow. Under such a circumstance, a general health advisory could be issued regarding food preparation practices or, in a worse case, a temporary agricultural hold may be placed on producers and/or processors of certain products.

1. Ingestion counties are required to participate in one-day exercises once every six years, compared to the exercises held every other year for counties within a portion of the 10-mile plume exposure pathway. Further, heightened security at the facility itself has limited opportunities for emergency management personnel to visit the site. WEM recognizes that more frequent training for ingestion counties is probably needed, but current staff resources limit the ability to increase the number of training sessions. There are so many IPZ counties in the Nation that FEMA is unable to monitor more frequently than the six-year schedule.
2. If an event should occur, even if it is a site emergency not anticipated to impact St. Croix County or other ingestion areas, misinformation and panic could ensue among the general public. The potential for miscommunication was evident during the January 2012 declared alert at the Prairie Island plant.
3. During the planning process, most local officials had little or no familiarity with the risks related to the Prairie Island plant, the County's location within the IPZ, and related policies and procedures.

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates nuclear accidents (fixed site and transport) as a 39% risk over a ten-year period given their moderate probability (2); substantial vulnerability (1.2); and available emergency management capabilities to deal with this threat (2).

Risk Assessment—Nuclear Accident

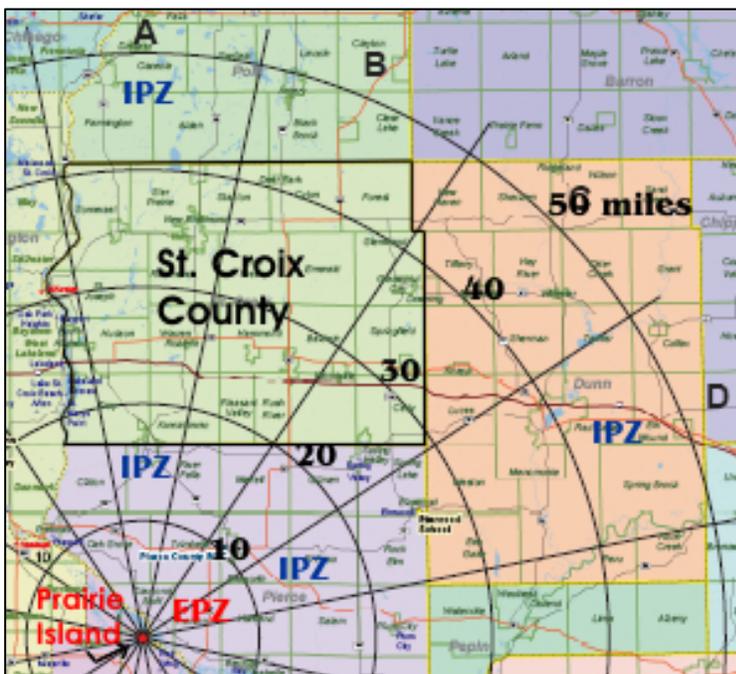
A nuclear accident category was added to the scope of the *St. Croix County All Hazard Mitigation Plan* given the County's proximity to the Prairie Island Nuclear Generating Facility near Red Wing, MN. Sources of information for this section of the plan include: WEM interviews, various hazard mitigation plans from other communities, Nuclear Management Company (NMC) interview and website, interview with the State Radiological Coordinator, Wikipedia, various FEMA fact sheets, and the *St. Croix County Emergency Operating Plan—Radiological Annex*.

The Hazard

In the context of this plan, a **nuclear accident** (or radiological hazard) is the uncontrolled release of a radioactive material from a fixed nuclear facility that can harm people or damage the environment.

Accidental radiological releases can occur anywhere radioactive materials are stored, used, or

Figure 28. Prairie Island Nuclear Generating Facility EPZ & IPZ



base map from State of Minnesota – Division of Homeland Security and Emergency Management

transported. Such a release may vary in scale, location, and potential damage. A small radioactive release may occur at a nuclear medicine or science facility, or a release could occur along the interstate or railroad tracks when a vehicle transporting radioactive material is involved in an accident. These events would likely be smaller in geographic scale and impact, with risks, vulnerabilities, and emergency response actions comparable, if not identical, to those of the chemical, biological, or other hazardous materials spills discussed in the previous subsection.

This section of the report focuses on the accidental radiological release from a fixed nuclear facility. **Fixed nuclear facilities** are complexes in which fissionable fuel is stored or

used for such functions as electrical power generation. St. Croix County has no fixed nuclear facilities within its boundaries. However, it is located within the 50-mile Ingestion Pathway Zone (IPZ) of the Prairie Island Nuclear Plant located to the south near Red Wing, MN as shown in **Figure 28**.

The **Ingestion Pathway Zone** (IPZ) is the potential pathway of radioactive materials to the public through consumption of radiological contaminated water, food crops, or dairy products. By law, this special emergency planning areas extends 50 miles in a radius from the Prairie Island Nuclear Plant. An accidental release at the Prairie Island Plant could disperse airborne radioactive particulates that could contaminate areas within 50 miles of the facility. This can potentially be a long-term problem for the IPZ, as contaminants could enter the soil and then be absorbed into plants which might enter the food chain of people and animals. If a release should occur, aggressive testing and monitoring of vegetation, water, milk, food products, and wildlife would take place within the IPZ to ensure radioactivity falls within safe levels as established by the Food and Drug Administration.

It is important to note that a nuclear plant cannot explode like a nuclear bomb. Nuclear plants do not have the right concentration of radioactive materials in sufficient quantities to produce a nuclear explosion. For St. Croix County, the primary hazard that the Prairie Island Nuclear Plant presents is a potential airborne release of radioactive materials which could contaminate the soil and food supply.

Historical Events

The only major accident at a commercial nuclear power plant in the United States occurred at Three Mile Island in Pennsylvania in 1979. Operator error and a minor mechanical malfunction combined to damage the nuclear reactor core. A serious release was avoided, although some radiation was detected up to 20 miles from the facility. Located approximately 200 miles from New York City, the Three Mile Island nuclear plant has now been shut down.

Likely the worst nuclear disaster in the world occurred at the Chernobyl Nuclear Power Plant near Pripyat, Ukraine, on April 26, 1986. An explosion at the plant and resulting dispersal of radioactive contamination required the evacuation and resettlement of over 336,000 people. Contamination was detected throughout much of Europe. In Sweden, contaminated milk was diluted with uncontaminated milk to dilute radioactivity to acceptable health levels.

Given Soviet cover-up attempts, it is difficult to determine the likely impacts. According to a 2005 report prepared by the Chernobyl Forum, there were fifty-six direct deaths (mostly accident workers) and as many as 9,000 people of the estimated 6.6 million most highly exposed may die of cancer.⁴¹ Other recent studies predict anywhere between 30,000 to 93,000 likely related fatalities in time. The soldiers and workers (called “liquidators”) sent in by the Soviet government for initial clean-up have had the highest rate of mortality and sickness, with an estimated 10% of the 600,000 deceased and 165,000 disabled, according to Union Chernobyl.

⁴¹ http://en.wikipedia.org/wiki/Chernobyl_accident from International Atomic Energy Agency Report *In Focus: Chernobyl*.

As of 2000, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) estimated that the number of thyroid cancer cases linked to the Chernobyl disaster has risen to about 1,800. A 2006 Physicians for Prevention of Nuclear Welfare report estimated over 10,000 people are affected with thyroid cancer, with 50,000 case expected, and attributed increases in deformities and newborn mortality rates in Europe to Chernobyl's radioactive discharge. Other studies allege similar links, such as heightened mortality in Sweden. While a 2006 study by the French Institute of Radioprotection and Nuclear Study could not identify a clear link between Chernobyl and cancer rates in France, it acknowledged that reported papillary thyroid cancer had tripled in the years following the event. Most of the long-term expected impacts have not yet occurred, so it is difficult to estimate and will be a challenge to measure the overall impacts.

A 30-kilometer (18.6 mile) exclusion zone was established around the Chernobyl site to prevent people from entering the most heavily contaminated area, except for scientific study, day tours, and operations of the Chernobyl facility. However, dozens of peasants and others either refused to be evacuated or illegally returned to the zone, for which authorities have now become reconciled after multiple attempts at expulsion. These individuals either deny or are resigned to the health risks and accept that available services are now very limited.

While a tragedy, the Chernobyl accident brought great attention to nuclear plant operations and safety, in particular to those plants within the former Soviet Union. Significant knowledge on the impacts of radioactive fallout on the environment and human populations has been gained, and measures to remediate the impacts are being studied and attempted. And flora and fauna within the exclusion zone has increased in diversity due to the reduction in human activity.

More recent, the impacts from the failure of the Fukushima I Nuclear Power Plant in Japan as a result of the 2011 earthquake and tsunami are still unclear; and the amount of radioactive material released is not yet fully known. There are opportunities to learn from the impacts of this release which may influence policy in many countries. Of the 104 active nuclear plants in the United States, the federal Nuclear Regulatory Commission ranked Prairie Island 95th in earthquake risk with a 1 in 333,333 chance of experiencing a catastrophic failure due to an earthquake.⁴²

Closer to home, the Prairie Island Nuclear Generating Plant owned by Xcel Energy, Inc. has had four "unusual events" and one declared alert, but no releases of radioactive material. An unusual event is the lowest of the four emergency classifications established by the Nuclear Regulatory Commission (NRC), and an alert is the second lowest.

The latest unusual event in March 2012 was due to a faulty reading. A brief suspension in fire suppression may also trigger an unusual event. The declared alert occurred in January 2012 when a plant worker reported a break in a pipe to a tank of industrial bleach. This event demonstrated the importance of controlling the public relations message to prevent undue panic or concern since the health and safety of the public was not threatened. The plant houses two pressurized water reactors totaling 1,100 megawatts of capacity. The units have been in

⁴² MSNBC.com. "What are the odds? US nuke plants ranked by quake risk.." 3/16/2011.

commercial operation since 1973 (Unit 1) and 1974 (Unit 2). In 1996, the Nuclear Energy Institute (NEI) rated Prairie Island among the best performing U.S. nuclear plant in two of three benchmarking studies. The NRC renewed Prairie Islands operating license for twenty years in 2011.

However, the plant is not without its detractors. The Minnesota Public Interest Research Group and Enformable NuclearNews notes on their websites that the Prairie Island facility has had safety violations in the past, problems with flood gates opening, a fire in an electrical box, and problems monitoring during an emergency safety shutdown in 2001.

Relative Level of Risk

The likelihood of a nuclear accident at the Prairie Island Nuclear Generating Plant which directly impacts St. Croix County is considered a **low risk**, as reflected by the steering committee's ranking of 1.5 on a 5.0 scale.

The Prairie Island Nuclear Generating Plant has many safeguards and systems to minimize the chances of an accident. A series of barriers and safety systems within the plant keeps radioactivity from normal operations inside. The building that contains radioactive fuel and the reactor has 3-1/2-foot-thick concrete and steel walls and thick concrete and steel flooring which act as a containment barrier and extend well below the ground. The reactor vessel, where fission takes place, is a thick steel cylinder that contains the fuel assemblies. All U.S. nuclear plants are conservatively designed and built with many safety systems and emergency back-ups. Procedures and emergency plans are also in place to minimize the potential impacts and extent of the release in the unlikely scenario should an accident occur.

The Plan Steering Committee rated the risk (potential frequency) of a nuclear accident at 1.50 on a scale of 0-to-5, with a much higher vulnerability (potential impact) of 3.58. Nuclear facilities in the United States are highly regulated and secured; and if the Prairie Island Nuclear Plant is well operated, well maintained, and well secured in the future, a nuclear accident at the Plant which impacts St. Croix County is not expected to occur.

Vulnerability Assessment—Nuclear Accident

Potential Impacts

The public is exposed daily to controlled and background radiation from a wide variety of sources, such as the natural environment (e.g., radon), cosmic rays, building materials, televisions, and diagnostic X-rays. Government regulations do not allow the public to be exposed to a radiation dose from a nuclear power generating facility of more than 100 millirem per year above natural background levels. For perspective, the average diagnostic x-ray exposes an individual to 40 millirem.

In addition to the size and type of release, four factors are very important in determining potential impacts if a release of radioactive material should occur:

- Meteorological Conditions
- Distance
- Shielding
- Time

Meteorological conditions would greatly determine where airborne contamination would settle and the concentration of that contamination. These influencing weather conditions include wind speed, wind direction, humidity/precipitation, and how high the contaminants are dispersed into the atmosphere (e.g., air pressure). It is possible that a sizable release could have no impact on St. Croix County, depending on the wind direction. And it would likely take many hours, if not days, before airborne radiological contaminants would fully settle.

The greater the distance between the source of radiation and a person, the less radiation received. The greater amount of heavy, dense material between the radiation source and a person can also provide protection. Shelter-in-place or remaining indoors with windows and doors closed can, in some cases, provide an adequate level of protection. And most radioactivity loses its strength and dissipates relatively quickly, especially when diluted with water (e.g., surface waters, rainfall, high humidity). Limiting one's time spent near the radiation source reduces the amount of radiation received. And in the case of an event, temporary, controlled reentry into a restricted area may be allowed to tend to livestock or other operations.

Given the distance of St. Croix County from Prairie Island, direct exposure of County residents to gamma radiation or inhaling radioactive materials from a plume released during an incident is very unlikely. The possible exception would be those County residents who work or travel within the area closer to the Prairie Island facility (e.g., Red Wing, Treasure Island Casino) at the time of a release. Under most circumstances, such direct exposure and impacts would primarily be limited to the area within the 10-mile plume exposure pathway (also called the Emergency Planning Zone).

For the 50-mile IPZ which includes St. Croix County, the radioactive contamination of soil thereby entering the food chain through crops or dairy products is the primary concern. The highest risk is contaminated food products (e.g., milk, crops) from the 10-mile EPZ being transported to dairies, processors, or producers within the 50-mile IPZ and mixing with uncontaminated product.

Less likely, but still possible, would be the contamination of soils and vegetation in St. Croix County from airborne contamination if certain weather conditions exist at the time of the release. This contamination would most likely be in low levels, not requiring evacuation or shelter. In some cases, a general health advisory may be issued recommending food preparation practices or other precautionary measures (e.g., carefully washing and peeling fruit before consumption).

But in a more severe and unlikely scenario, the low levels of contamination could be a more significant health concern over time. Evacuation would still not be required, but a **temporary agricultural hold** would be placed on producers in the contaminated area. Raw materials and food products may be withheld and isolated from the marketplace until sampling is completed and the product is determined to be safe for production or marketing. Producers may be required to not move or harvest commodity and specialty products (e.g., soils, grains, honey, berries).

One approach—"the solution to pollution through dilution"—would not be practiced in Wisconsin, especially in regards to dairy. Dairy is the highest priority since radioactive

contaminants can quickly move through cattle, children drink a lot of milk, and it can be easily mixed with uncontaminated product. And, if not carefully controlled, the risk of contamination could have long-term disastrous effects on milk marketing through out the State, soiling the reputation of the “Dairy State.” Under a temporary agricultural hold, there could be significant losses for agricultural producers in the area.

Under any circumstances, there would be negligible risk to groundwater within the IPZ. Contamination of the surface waters within St. Croix County is also deemed to be a very low risk given expected contamination levels, the potential for dilution, and the southerly flow of most surface waters. Wildlife could be a concern primarily within the 10-mile EPZ, though animal contamination levels and movements would be closely monitored and appropriate remedies or advisories made.

In the unlikely scenario of an accident, it is quite possible that some residents from areas closest to the Prairie Island facility may travel to or through St. Croix County as part of their evacuation. Up to 10,000 Pierce County persons live or work within the 10-mile plume exposure pathway emergency planning zone who may require evacuation if a general emergency occurs. St. Croix County may be asked to help provide assistance to some of these displaced persons.

Response Plans and Activities

A **general emergency** is the most serious level of potential nuclear accident emergency during which local, state, and federal emergency teams would make recommendations to public officials and take other actions to protect the public and facility workers. Less serious incidents may potentially occur at the site in which a **site area emergency** or alert is declared and an evacuation of the public for a limited area beyond the facility site may be ordered, perhaps as a precaution. An **unusual event** is the least serious emergency, typically involving a potential minor problem at the plant not involving the release of radiation which is handled by facility workers, but reported due to strict federal rules.

In the event of a site emergency, advisory announcements would be broadcast over local television and EAS radio stations. During a general emergency, additional warning systems will be activated in accordance with established procedures, including warning sirens and PA systems in those areas closest to the facility. It is expected that only in the case of a general emergency would there potentially be significant impacts upon St. Croix County residents, with the possible exception of any residents who work at or near the facility, or happen to be traveling near the facility (e.g., Red Wing, MN, Treasure Island Casino).

In accordance with the Federal Radiological Emergency Response Plan, the lead federal agency for most radiological incidents at nuclear generating stations is the Nuclear Regulatory



Commission (NRC). The NRC coordinates any federal assets that state and local emergency management agencies request, such as the Federal Radiological Monitoring and Assessment Center (FRMAC). State and local plans would also be activated, such as the policies and procedures defined in the *St. Croix County Emergency Operating Plan—Radiological Annex*.

FRMAC's team would be activated immediately to monitor, model, and assess the plume direction and anticipated contamination areas. Monitors attached to aircraft would provide real-time mapping of the movement of airborne particulates which would be further supplemented by on-the-ground monitoring. Within 10-12 hours, detailed maps of expected contamination areas would be available allowing further emergency response and action as needed.

Throughout this time, local officials will assist State and Federal agencies in disseminating information to the media, public, agricultural community, and food producers/distributors through general media, brochures, and direct contacts for the appropriate actions as warranted by the event. During the initial phases for St. Croix County, these could include general educational efforts, protective actions such as sheltering livestock, and sheltering-in-place. Each dairy and agricultural processor may need to be individually contacted if a temporary agricultural hold is issued.

After the initial monitoring and a firm model of the extent of the contamination is established, additional information would be issued, such as any needed health advisories, instructions regarding reentry, insurance procedures, and recovery operations (e.g., how to decontaminate animals, food, and property).

Monitoring of water, air, soils, wildlife, food products, and residents would continue for a lengthy time throughout the region. Local officials would also be needed to assist in monitoring, given their knowledge of the landscape and to help in accessing private lands, surface waters, and milk producers for testing.

Vulnerable Critical Facilities

There are no critical facilities in St. Croix County which are uniquely vulnerable to effects of a nuclear accident. If an event occurs, patient loads at hospitals and clinics may increase; and emergency management personnel and responders may be asked to assist with any evacuees from areas closer to the facility.

Unique Jurisdictional Risks or Vulnerabilities—Nuclear Accident

The incorporated communities of St. Croix County do not have any unique jurisdictional risks or vulnerabilities in the event of a nuclear accident at the Prairie Island facility. Again, distance from the plant would likely affect exposure, so those communities in the southwestern portion of the County (e.g., City of River Falls) may have the most risk of exposure in the County.

viii. Flooding (including dam failure, riverine, & overland flooding)

Summary—Flooding

Risk:

Significant flooding occurs about once every two years in the County. Riverine flooding occurs annually in some areas, with serious riverine flooding occurring about once every 5 years on average. More frequent overland and flash flooding



events occur in many areas of the County, in particular in the central and southern communities along and south of USH 12. The August 2010 floods reinforced this trend of increasing flash flood events. Some areas near lakes and ponds north of the Willow River have had past problems with flooding related to fluctuating groundwater levels, which increases surface water levels, especially at Bass Lake, Perch Lake, and in the Village of Deer Park.

As of February 2012, only 216 property owners in St. Croix County had flood insurance, though this is over a 50% increase since November 2010. There have been 41 NFIP claims on 24 properties in the County, with two repetitive loss properties (1978-2010). Flooding impacts on agricultural crops have been isolated and managed through insurance and good practices, though the losses can be substantial (over \$8 million in crop losses in 1993). Dam failure is a low risk, and no major dam failures have occurred in recent history.

Vulnerabilities: *The primary flood vulnerabilities are: structures within the floodplains; roads, culverts, and ditches due to flash flooding; and structures or improvements within a dam's shadow. Areas without sufficient natural flood storage are particularly vulnerable, and development can further contribute to localized stormwater flooding problems. Local, State, and Federal acquisition of floodplains and wetlands for parks and natural areas has significantly decreased flood vulnerabilities in the County.*

Overall, 557 structures in St. Croix County were identified as possibly being located in the 100-year floodplain (non-FIRM). Of these, 79% were residential. No industrial structures potentially in a floodplain were identified, though a number of critical facilities have had flooding problems in the past. Shoreland development pressure continues in many areas.

1. Detailed data regarding floodplains and improvements vulnerable to flooding is relatively limited for St. Croix County. No digital point data or detailed elevation data for any structures in the County is available. New FEMA FIRM maps were made effective in

2009, but accuracy remains a concern; and there are frequent Letters of Map Revision (LOMRs) issued. A LIDAR project is needed to obtain more accurate topographical information so that the accuracy of floodplains and dam shadows can be improved. These revised areas could then be integrated into the County's reverse-9-1-1 (CityWatch) system for emergency notification.

2. The Town of Star Prairie, City of New Richmond, and Village of North Hudson had the largest value of assessed improvements potentially located in the 100-year floodplain, though a number of communities had more structures than North Hudson. The City of New Richmond had the most NFIP claims, with four claims on four different properties. Notably, the worst flooding in the Hudson area occurs when flooding on the Mississippi River causes floodwaters to back-up the St. Croix River.
3. The Cove Road area in the Town of Troy is prone to river flooding and includes the County's only two repetitive loss structures. Many of the shoreland lots in this area are in high demand, which increases the challenge of identifying acceptable mitigation strategies. This shoreland area is also wooded, with steep banks and small ravines, which offers few flood storage areas and can be prone to stormwater runoff problems.
4. Fluctuating groundwater levels on Bass and Perch Lakes (seepage lakes) have contributed to a history of flooding problems resulting in the highest concentrations of NFIP insurance claims in the County. Opportunities may exist to mitigate some of these flooding concerns, while also contributing to local or County recreational goals. Groundwater and surface water levels are currently down, and a pump system installed at Bass Lake may have significantly mitigated the problem at that location. The Village of Deer Park has also had similar, serious flooding problems in the past which necessitated public improvements and the acquisition of a floodprone structure.
5. The central and southern parts of the County have more frequently experienced overland and flash flooding in recent years, though localized stormwater flooding events have occurred in areas throughout the County (e.g., Glenwood City, Star Prairie). Such flooding potential increases as development occurs, if not carefully considered and planned for. During the August 2010 flooding, many homeowners experienced basement flooding; and a need for more back-up prevention and related education for homeowners was identified as a critical need. So many road washouts occurred in 2010 that there were insufficient numbers of barricades available.
6. Areas of flooding concern were identified and mapped during the planning process. Detailed engineering analysis is not available for many concerns, limiting the ability to make specific mitigation recommendations (e.g., dredging, dikes, floodproofing) at this time. The area where Trout Brook Road crosses the Willow River is one such area where a hydraulic study would be beneficial, possibly as part of planned road or bridge improvements. Maintaining public lands and open space for floodwater retention continues to be an important mitigation tool in many areas, though shoreland and floodplain development pressure continues.

7. St. Croix County has eight high-hazard dams and one significant-hazard dam as rated or estimated by the WDNR. No critical issues regarding these dams were identified during the planning process. Emergency operating plans for these dams are maintained. Many downstream communities have been working on evacuation plans. The dam shadow for Glen Hills #10 along Beaver Creek extends into Dunn County and includes portions of the Village of Downing. More automated weather monitoring and warning equipment at the Glen Hills dams was suggested by County staff during the planning process. There have been some dam removals on the Willow River. At least one community is concerned about the impacts of these removals on flood control and requests more information or further study. Flooding on the St. Croix River can back-up over the Lower Power Dam at Lake Mallalieu causing flooding; one community has requested further analysis of potential solutions.

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates flooding and flash flooding as a 48% risk over a ten-year period given their high probability (3); moderate vulnerability (1.8); and substantial available emergency management capabilities to deal with this threat (1.3).

Risk Assessment--Flooding

The Hazard

Flooding is the only hazard with officially-defined hazard areas within St. Croix County. As such, flooding receives the greatest level of analysis within this plan.

Flooding is defined as a general condition of partial or complete inundation of normally dry land from the overflow of inland waters, or the unusual and rapid accumulation or runoff of surface waters from any source. Often, the amount of damage from flooding is directly related to land use. If the ground is saturated, stripped of vegetation, or paved, the amount of runoff increases and contributes to flooding. Additionally, debris carried by the flood can damage improvements and infrastructure, or can obstruct the flow of water and further add to flooding.

For St. Croix County, flooding can be further subdivided into three primary types: (1) lake or riverine flooding, (2) stormwater or overland flooding, and (3) flooding resulting from dam failure.

Lake or Riverine Flooding (Overbank) - Major floods in Wisconsin have, for the most part, been confined either to specific streams or to locations which receive intense rainfall in a short period of time. Flooding which occurs in the spring due to snow melt and/or prolonged periods of heavy rain is characterized by a slow buildup of flow and velocity in rivers, streams, or lakes over more than six hours and often over a period of days. This buildup continues until the river, stream, or lake overflows its banks for as long as a week or two, then slowly recedes. Generally,

the timing and location of this type of flooding is fairly predictable and allows ample time for evacuation of people and property.

Key Definition

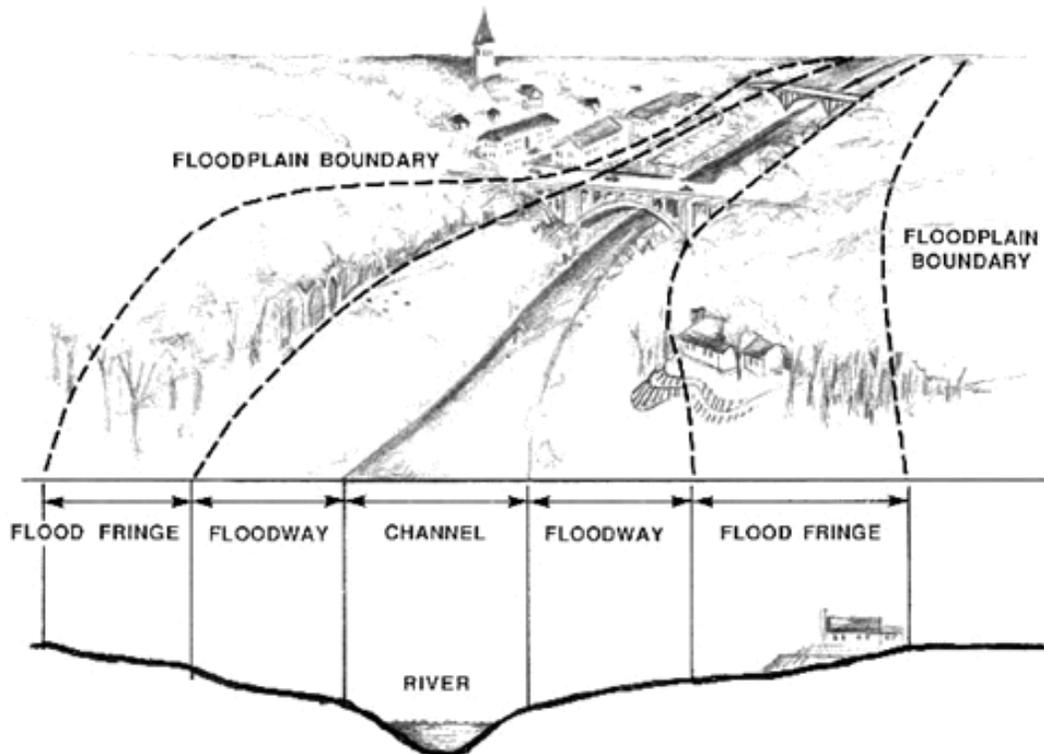
A 100-year flood has a 1% chance of being equaled or exceeded in any given year.

For regulatory purposes, the terms “100-year flood” and “floodplain” are commonly used. A **100-year flood**, often referred to as a **regional flood, special flood hazard area, or base flood**, is a flood that has a one percent chance of being equaled or exceeded in any given year. This can be misleading as a 100-year flood is not a flood that will occur once every 100 years. The 100-year flood, which is the standard used by most Federal and State agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management

and to determine the need for flood insurance.

A **floodplain** is that land which has been or may be covered by floodwater during a flood event and includes the floodway and floodfringe areas (see **Figure 29**). The **floodway** is the channel of a river or stream and those portions of the floodplain adjoining the channel required to carry the regional flood discharge. Since it is associated with moving water, the floodway is the most dangerous part of the floodplain. The **floodfringe** is the portion of the floodplain outside of the floodway, which is covered by flood water during the regional flood and is generally associated with the storage of water rather than flowing water. The floodfringe is also that part of the floodplain in which development may be allowed in some communities, subject to floodplain development standards.

Figure 29. Elements of a Floodplain



Source: Minnesota Department of Natural Resources.

The **regional flood elevation** is the elevation determined to be representative of large floods known to have occurred in Wisconsin or which may be expected to occur on a particular lake, river, or stream at a frequency of one percent during any given year. The **flood protection elevation** is an elevation which is 2 feet above the regional flood elevation as defined by the Wisconsin Department of Natural Resources. Development is sometimes allowed within the floodfringe if the structure is raised above the flood protection elevation. However, development in the flood fringe can decrease important floodwater storage; hydraulic analysis is often needed to ensure that the development will not result in increased flooding in adjacent areas or farther downstream.

Often, the term “floodplain” is used inappropriately by assuming that floodplains are limited to the 100-year floodplain boundary. This is not the case, and a floodplain can be identified for a 500-year flood or other such level of risk.

The 100-year floodplain is a guide for regulatory and insurance purposes. Floods greater than a 100-year regional flood event can and do occur. Nationwide, approximately 25 percent of all National Flood Insurance Program claims are for structures outside the 100-year floodplain. This is a surprisingly high number, since many homes or structures outside the 100-year floodplain do not have flood insurance; and flood insurance is typically not required by lending institutions for mortgages on structures not within the 100-year floodplain. But this demonstrates that most properties are at risk of flooding to some degree.

Generally, the 100-year floodplain should be considered the high flood-hazard risk area. The 100-year floodplains are shown as the “A” zones on the FEMA FIRMs. Nationwide, 26 percent of the 100-year floodplains experience or exceed a 100-year flood event within a typical 30-year mortgage period. The 500-year floodplains (the shaded “X” zones on the FIRM maps) are the medium-risk flood-hazard areas. The remaining unshaded “X” zones on the FIRM maps should be considered the low-risk flood-hazard areas.

Also, high-hazard flood areas can exist which are not shown on the FIRMs. And floodplains can change in hazard risk and size as development occurs or with other physical changes in the environment. Municipalities can take the initiative to have new flood risks added to the FIRM maps as a Letter Of Map Change (LOMC) or otherwise consider them during their planning and regulatory processes. Allowing inappropriately planned development to occur with knowledge of such potential hazards could be a source of potential liability for a community should a flood event occur which impacts the development.

Updated FIRMs for St. Croix County were made effective in March 16, 2009, and are available in a digital format (D-FIRMs). The accuracy of the D-FIRMs remains a concern for some local officials and residents. St. Croix County is interested in undertaking a light detection and ranging (LIDAR) remote-sensing project. A LIDAR project, once completed, would provide much improved topographical/contour data on which more accurate floodplain boundaries can be determined.

Overland Flooding (Overland) and Flash Flooding (Overbank or Overland) - The type of flooding which occurs primarily from surface runoff as a result of intense rainfall is referred to in this Plan as **overland flooding**, but is sometimes called stormwater flooding. These flooding events tend to strike quickly and end swiftly. If 6” of rain falls on 2,000 square feet of roof and concrete (about the size of a typical roof, driveway, and garage), 1,000 square feet of stormwater will runoff from that single home.

Flash flooding is more difficult to distinguish and can, in fact, be either riverine (overbank) or stormwater (overland) flooding. In this plan, flash flooding has been grouped with stormwater flooding due to its often unpredictable nature and the intense, rapid rise and velocity of the water levels. For prediction and warning purposes, floods are classified by the National Weather Service into two types: those that develop and crest over a period of approximately six hours or more, and those that crest more quickly. The former are referred to as "floods" and the latter as "flash floods." Like stormwater flooding, flash flooding is typically the result of intense rainfalls possibly in conjunction with already saturated soils, though very sudden snow melts can also contribute to stormwater or flash flooding.

Areas with steep slopes and narrow stream valleys are more vulnerable to stormwater and flash flooding, as the water can achieve high velocity in a short time. Developed areas with substantial impervious surfaces can further contribute to stormwater and flash flooding. Flash floods often occur in smaller watersheds, or are very localized, and are not necessarily reflected on most FEMA FIRMs. Flash flooding can also be the result of dam failure.

Dam Failure - According to the FEMA Federal Guidelines for Dam Safety, dam failure is defined as a:

“Catastrophic type of failure characterized by the sudden, rapid, and uncontrolled release of impounded water or the likelihood of such an uncontrolled release. It is recognized that there are lesser degrees of failure and that any malfunction or abnormality outside the design assumptions and parameters that adversely affect a dam's primary function of impounding water is properly considered a failure. These lesser degrees of failure can progressively lead to or heighten the risk of a catastrophic failure. They are, however, normally amenable to corrective action. (FEMA 148).”

Dam failure can occur from structural problems at the dam, hydrologic problems, malfunction of equipment, or human error in the monitoring or release of water. As such, dam failure can occur with little or no warning and on clear days with no rain, unlike the other types of flooding.

Older dams which have been poorly maintained have a larger potential of dam failure. Hydrologic problems may occur when there is heavy precipitation or snow melt, resulting in more water being impounded than by design or more than the spillway can handle, resulting in adjacent flooding, overtopping, or structural failure. A partial or complete failure of a dam can release great amounts of water, leading to loss of life and substantial damage downstream. A dam failure may lead to additional failures of other downstream dams. And the sudden,

prolonged disappearance of an impoundment due to dam failure can also have serious impacts on wildlife habitat, recreation, and tourism.

Flooding from Groundwater Fluctuations - Somewhat unique to some northern and northwestern portions of the County (e.g., Bass Lake, Perch Lake, Village of Deer Park) has been the serious flooding from groundwater fluctuations. These groundwater fluctuations can vary significantly, causing surface waters levels at lakes or ponds to increase or decrease 10-15+ feet over a period of 10-20 years. Such fluctuations can contribute to both overbank or overland flooding, as well as underground seepage into basements. And unique to this phenomena, these fluctuations in water levels often rises or falls very slowly resulting in flooding or near-flood conditions for years at a time.

Regional Trends

Low-lying areas of those Wisconsin counties that border the Wisconsin and Mississippi Rivers and many nearby tributaries, including the Chippewa River, are prone to riverine flooding. As development has increased, agricultural flooding in some areas has increased as well. Shoreline development has also increased both the risk and vulnerabilities to flooding. Since the 1960s, the number of homes along northern Wisconsin lakes has increased over 216 percent. Statewide, an estimated 250,000 structures lie within 100-year floodplains. Nationwide, floodplains have been slowly increasing in size due to increases in runoff and decreases in flood storage areas.

Flooding is the principal cause of damage in 28 of 35 Presidential Disaster Declarations in Wisconsin from 1971 through May 2012. From 1971 until 1993, the total flood damages in Wisconsin were estimated at \$300 million. In June 1993, flooding over large areas of the State, including in St. Croix County, resulted in an estimated \$352 million in damages from this single event. Even worse flooding damage was experienced in Wisconsin in June 2008 with damages estimated at roughly \$697 million.

There have been very few dam failures in Wisconsin that resulted in major damages or loss of life. The June 1993 flood event included the failure of an embankment associated with the Hatfield Dam on the Black River which contributed to flooding damage downstream in the City of Black River Falls. In June 2008, the Lake Delton Dam broke which resulted in mudslides which washed out a number of homes. Closer to home in 2002, a small privately owned dam in Osceola washed out and caused significant damage to a mobile home park. Many of Wisconsin's approximately 3,800 dams are small logging or milling dams built prior to 1900 and have little or no associated vulnerabilities. Between 1990 and 1995, more than 75 dam failures were documented in Wisconsin. Several of these incidents resulted in injuries and serious property damage, but no loss of life.

Local Events

Historically in St. Croix County, the most serious riverine flooding has been along the Willow and St. Croix Rivers. Older historical accounts highlight the larger riverine floods where dams are washed out or homes, farms, or streets were damaged. Between 1965 and 2011, St. Croix

County was part of five Presidential disaster declaration requests involving flooding: 1965, 1969, 1971, 1993, 1998, 2001, and 2002.

The 2006 *Somerset Hazard Analysis* provides an excellent overview of the primary St. Croix County flooding occurrences which we have further supplemented:

- Spring 1876 The Willow River flooded due to tremendous amounts of rain and melting snow, threatening New Richmond. (*New Richmond News, April 11, 1931*)
- December 1886 The Willow River flooded Hudson in a rare winter flood. (*New Richmond News, December 12, 2002*)
- April 1897 Floodwaters backing-up from the Mississippi River flooded Hudson. (*The Hudson Star Observer, 125th Anniversary Edition, June 21, 1979*)
- March 1928 A large flow of water along with some ice chunks damaged the Willow River dam located at Roller Mills in New Richmond. (*New Richmond News, March 28, 1928*)
- April 1934 A flood damaged much of the Roller Mills plant in New Richmond. (*New Richmond News, April 4, 1934*)
- Spring 1936 The Willow River flooded all over St. Croix County, washing out roads in both New Richmond and Star Prairie. (*New Richmond News, March 25, 1936*)
- April 1952 The St. Croix River stood at 689.48 feet above sea level, the highest level in recorded history up until then.
- Spring 1965 Heavy rainfall resulted in major flooding as the St. Croix River reached a record 694.07 feet above sea level. An emergency dike was erected in nearby Stillwater.
- April 1965 A dam on the Apple River crumbled to the pressure of a five foot high wall of water. (*New Richmond News, April 22, 1965*)
- Spring 1966 Major flooding again occurred on the St. Croix River (*A Century of Service – American National Red Cross – 1881-1981, published May 1981*)
- April 1967 The Willow River flooded the streets of New Richmond. (*New Richmond News, April 6, 1967*)
- April 1969 St. Croix River reached 692.32 feet above sea level. An estimated 3,000 people from Bayport and Afton, Minnesota were evacuated.
- Spring 1989 The Willow River flooded and washed into streets and homes of New Richmond. (*New Richmond News, March 30, 1989*)
- Spring 1997 Flooding on the St. Croix River required nearby Stillwater to create an emergency dike.
- April-May 2001 The St. Croix and nearby rivers were severely flooded. The Stillwater Lift Bridge was closed from April 10th into May. Debris accumulated at the Kennedy Mills Dam (Polk County) on the Apple River causing an adjacent embankment to collapse. An office building in Hudson was “engulfed” by the St. Croix River. (*National Weather Service*)

August 2001 Heavy rainfall caused flash flooding across much of St. Croix County. Water was several feet deep over many state and local roads. A few roads near Forest and Glenwood City washed out. Many roads were under water and damages were estimated at \$200,000. (*National Weather Service*)

The 2001 floods resulted in the greatest flood damage in the County since the flooding of the 1960's. Approximately \$160,000 in damage assistance requests were made under the Federal Disaster Declaration by St. Croix County governmental entities. Of this damage, 54% was related to the repair of road, shoulder, and culverts. Another 37% of the damage was to park and trail facilities in the City of Hudson, Village of Somerset, and at Troy Beach County Park, reflecting that local governments have mitigated potential flood damage by using many high-risk floodplains for outdoor recreational uses. It is believed that many local municipalities did not submit damage assistance requests for their local costs related to debris clean-up or relatively minor road repairs. And some facilities, such as the YMCA Camp, experienced significant damage but was not eligible for federal assistance.

August 2010 Heavy rains, described as a solid sheet of water, resulted in flooding and damages over much of St. Croix County with central and south-eastern parts of the County being especially hard hit. Up to eight inches of rain fell in a few hours and many residents stated the event was unlike anything they had seen in their lifetimes. The event significantly raised awareness of local flash flooding vulnerabilities. 95 locations on area roads, shoulders, and culverts were washed out, damaged or in need of repair, and there was insufficient barricades/signage to cover all locations. Livestock were swept downstream at one farm. Fifty percent of the roads in Woodville were impassible and the Village was effectively cut in half. Flooding occurred at the Woodville Village Hall and Fire Station.

In Baldwin, forty residents were evacuated including residents from the Comforts of Home assisted living facility. Over 75 Baldwin residents reported some degree of flood damage. Many County residents experienced basement flooding from storm water and sewer back-ups. Lightning strikes and flooding also damaged electrical lines and created two electrical fires, leaving many without electricity (or sump pumps). There was also significant damage to property and vehicles, including one police car in Woodville. A number of storm-related traffic accidents also occurred with six injuries. In all, 202 homeowners and renters reported



damages to St. Croix County Emergency Management with hopes of obtaining assistance. 94 families were assisted by Red Cross and 98 different sites received substantial damage.

Damages in 2010 exceeded those of 2001. Estimated damages filed with the State were \$3,779,398 in residential damage, \$321,101 in damages to businesses, and over \$1 million in road damage. \$444,246 in public-sector damages and expenses were submitted for Wisconsin Disaster Aid in 2010 and over \$333,000 in reimbursement was received. An even greater reimbursement Wisconsin Disaster Aid request was anticipated for 2011. Additional costs for road repairs were covered by Wisconsin Department of Transportation. And a Federal HUD Community Development Block Grant (CDBG-EAP) request for emergency assistance was submitted for \$691,500 in housing rehabilitation and/or replacement, \$908,315 in public facilities assistance, and \$25,000 in business assistance. More information and maps regarding the August 2010 flooding can be found in **Appendix G**.

The above flooding event list can be further supplemented using the National Climatic Data Center flood data available from 1993 to 2011 as shown in **Table 31** which identified ten flooding events on nine different dates in the County between 1993 and 2011.

**Table 31. Flood Events in NCDC Database – 1993 through 2011
St. Croix County**

Location	Date	Time	Type	Property Damage	Crop Damage
Regional	4/6/1997	6:00 AM	Flood	0	0
Regional	4/1/2001	12:00 PM	Flood	12,798,701	0
Regional	5/1/2001	12:00 AM	Flood	0	0
St. Croix County	8/1/2001	8:00 AM	Flash Flood	255,974	0
Hudson	6/25/2003	12:00 AM	Flash Flood	0	0
River Falls	7/8/2005	7:30 PM	Flash Flood	0	0
River Falls	10/4/2005	9:00 PM	Flash Flood	0	0
Baldwin	6/26/2010	11:30 PM	Flash Flood	0	0
Baldwin	8/11/2010	1:00 AM	Flash Flood	0	0
Woodville	8/11/2010	1:00 AM	Flash Flood	0	0
			10 events	\$13,054,675	\$0

source: National Climatic Data Center (NCDC)

Damage estimates in 2012 dollars based on Consumer Price Index by U.S. Bureau of Labor Statistics

It should be noted that the NCDC property damage total for the regional event occurring in April 2001 includes damages experienced outside the County. But for other events, damage estimates often go unreported or underreported in the NCDC database, especially if a Presidential Disaster is not declared.

For instance, the August 2010 event was not widespread, so total damages were not sufficient to meet the Federal thresholds for a Presidential Disaster Declaration and to obtain Federal assistance. Further, damages which are covered by private insurers or by Federal crop insurance are also many times not reported in the NCDC database.

Taken together, the previous information provides insight into flooding trends and concerns for St. Croix County which were further confirmed by local officials and other sources during the mitigation planning process:

- No deaths or serious injuries related to flooding events in St. Croix County were noted in the sources researched, though some likely occurred in the distant past.
- Historically, flooding on the Willow River, especially in the New Richmond area, has been a significant problem. However, improvements to the dams on the Willow River, including the Mill Pond Dam in New Richmond, have helped to mitigate these problems. Large areas of floodplain along the Willow River have also been acquired for public lands, also helping to mitigate potential flooding.



August 2010 Flooding in the Town of Rush River

- St. Croix River flooding is worst when flooding on the Mississippi River occurs and floodwaters back-up the St. Croix River. These floodwaters can sometimes overtop the Lake Mallalieu Dam between Hudson and North Hudson, causing flooding problems along the lakeshore, especially the north side. During planning meetings, options to address this concern through improvements at the dam were discussed, but no potential, feasible solutions were identified.
- Since the 1950s, St. Croix River flooding has had more serious impacts on the Minnesota side of the river, while many areas along the Wisconsin side of the river are protected from development through scenic easements, floodplain zoning, and public land ownership. In St. Croix County, North Hudson, Hudson, and the Town of Troy have been most acutely impacted, though the 100-year floodplains are relatively small in these communities and impacts are typically limited to certain areas or a small number of structures. Significant mitigation activities since the mid-1960s, such as the construction of dikes or installation of rip-rap, have mitigated some of the more serious St. Croix River flooding impacts in the County.
- In recent years, overland and flash flooding have been noted as a more significant concern, occurring every other year on average, with multiple events in some years. The

August 2010 flooding is one such example. And unlike riverine flooding, there is a greater chance of experiencing overland flooding during a non-spring month. Overland and flash flooding impacts are also not limited to floodplains, with significant damage typically occurring to local roads, shoulders, and culverts.

- Though overland and flash flooding can occur countywide, the most significant events and damage during the last decade have occurred in the central and southern parts of the County. The August 2010 event reinforced this trend.

Smaller, but still serious flash and overland flooding events occur more frequently and tend to be a more significant issue for improvements near the smaller streams and drainageways of the County which may not have areas available to retain flood waters. In recent years, these flash flood events have been reported annually, if not twice per year in some areas. Such flood events are largely the result of very heavy rains in a short period of time and can be relatively localized in impact. Damage to structures tend to be less per event than the larger riverine floods, but can place near-constant demands on local municipalities and landowners to maintain and improve local roads and properties to repair damages and mitigate potential future impacts.

One such “smaller” flash flood event was experienced in June 1993 due to heavy rains. This event is not reflected in either the NCDC database for St. Croix County or the *Somerset Hazard Analysis*, and St. Croix County did not experience the full force of this storm, compared to counties to the east. According to the “*Long Term Flood Recovery Plan*” completed by WCWCRPC in April 1994, over \$8.6 million in estimated direct damages (adjusted for inflation) to residential properties, agriculture, business, industry, and tourism occurred in St. Croix County as a result of the June 1993 flooding. This is a surprisingly high amount of damage, given that this storm event does not appear in the NCDC records for St. Croix County. However, for St. Croix County, almost 99% of this damage was due to crop losses, based on Wisconsin Department of Agriculture data.

The County has had no significant flooding due to dam failure since the mid-1960s. The Huntington Dam on in the Apple River in the Town of Star Prairie which had caused some problems in the past was removed in 1965. Washouts on older dams were not uncommon prior to 1970 (e.g., Upper Burkhardt Dam abt. 1920; Prairie Mills Dam abt. 1950s), but dams are much more closely regulated and monitored today. Based on interviews with Wisconsin DNR and local officials, all significant and high hazard dams in St. Croix County are in good structural conditional, with many undergoing structural improvements within the last 20 years. Failure of these dams should not occur.

Relative Level of Risk

The plan steering committee rated riverine or overbank flooding as a higher risk than overland flooding with similar impacts in terms of damage. Flooding in St. Croix County will continue to be a significant risk for residents and improvements. The drought for much of the past decade likely contributed to a reduction of recent flood events. A smaller overland or stormwater flood event can be expected to occur annually in some areas, with multiple events in a single year not uncommon. Such flash flooding can be expected to primarily result in basement flooding, washing out of road infrastructure, and contributing to soil and bank erosion. Those areas most

prone to the typical annual riverine flooding associated with snow melt are well known and potential damages have been largely mitigated.

Based on the past decade, it is likely that St. Croix County will continue to experience a serious, damage-causing flood event every two years on average. Some of these events may be localized in nature, only impacting a portion of the County. Flash flooding due to heavy rains will be the most frequent cause of flood damage in the County and can occur any time of the year. Based on the 2001 and 2010 flooding, the frequency and destruction of these events may be increasing.

If the dams within St. Croix County continue to be well maintained, flooding related to dam failure should not occur and is not expected. In fact, most of the smaller, privately owned dams would cause very minimal or no damage downstream if a failure should occur. The larger dams with significant- or high-hazard ratings were built to strict engineering standards, have related emergency plans, and are more closely monitored.

Vulnerability Assessment--Flooding

Flooding can be the most destructive of hazards, affecting large areas for long periods of times. Since flooding is tied to topography, a substantial amount of flood damage is the result of basement flooding, though floods can also move or destroy entire structures. Deaths and injury are relatively rare with river and lake flooding, since adequate warning time is usually available, though flash floods or dam failures can be very deadly as they may form very swiftly.

Floods can wash out roads, hindering the flow of traffic, and can cause havoc to water supply and wastewater treatment systems. Debris carried by flooding can result in direct damage to bridges, structures, or property; or this debris can obstruct the flow of water, causing additional flood damage. The resulting moisture build-up in the home (HVAC systems, carpeting, drywall, etc.) can cause additional, long-term health problems with mold and mildew once the floodwaters have retreated. Nearly half of all reported flood damage in Wisconsin in the 1990s was to crops, though obtaining accurate crop damage estimates at the County level is difficult.

Potential Development in Floodplains

The amount of impervious surfaces along lakes and rivers has grown tremendously in recent decades. However, stricter enforcement of floodplain zoning, shoreland ordinances, and a decrease in available shoreland properties has limited new floodplain development.

Data was not readily available to perform a comprehensive, detailed vulnerability assessment of flooding in St. Croix County. Instead, through the use of D-FIRM maps, G.I.S. parcel data, and orthophotography, those principal structures most likely located within a 100-year floodplain were identified. This information will be later supplemented in this section through the flooding “hotspots” map (Figure 32) to guide the development and prioritization of flood-related mitigation activities. A full description of the flood assessment methodology and related data challenges is included in **Appendix B**.

Figure 30 on the following page identifies the 100-year floodplains within St. Croix County. Areas of 100-year flood⁴³ were taken from the recently produced Digital Flood Insurance Rate Maps (D-FIRMs) which became effective in March 2009. Figure 30 also shows the location of principal structures potentially located partially or wholly within the 100-year floodplains of St. Croix County using the methodology discussed in Appendix B. Principal structures are those buildings located on a parcel within which the main use of the parcel takes place. For most parcels, the principal structure will be a home or commercial business, while ancillary structures (e.g., garages, barns, sheds) are not mapped.

Table 32, which follows Figure 30, provides a synopsis of those potentially floodprone principal structures by municipality. The assessed use and estimated value of improvements is based on 2011 tax data for those parcels associated with each of the principal structures identified in Figure 30.

In total, an estimated 557 principal structures have been identified as potentially being located within the 100-year floodplain in St. Croix County. This is a significant increase compared to the 2008 plan (395 structures), but this is more a reflection of the updated floodplain boundaries, rather than the result of new floodplain development.

Of the 557 potential floodplain structures, 79 percent are on parcels assessed as residential use and seven percent are on parcels assessed as commercial. No structures had industrial uses and 61 were in other uses, such as agricultural buildings. Four structures were public-sector owned and another twelve were private-sector exempt (e.g., churches) for which an estimated value of assessed improvement are not available. The improvements on the 541 non-exempt parcels had a 2011 estimated assessed value of \$75,221,000.

Over 63 percent of the principal structures potentially located in a 100-year floodplain were located in an unincorporated town. Further, over one-half of all structures were concentrated in seven communities—Town of Star Prairie (109), City of New Richmond (46), Town of St. Joseph (36), Town of Kinnickinnic (31), Village of Baldwin (31), Town of Richmond (28), and Village of North Hudson (23). But a comparison of the assessed improvements to number of structures shows that total vulnerability varies by the type of structures. For instance, the Village of North Hudson was seventh in terms of number of structures, but third in terms of estimated assessed value.

⁴³ Also commonly known as “Zone A or AE” when referring to FEMA FIRM maps.

Figure 30. St. Croix County Floodplains & Potential Floodplain Structures

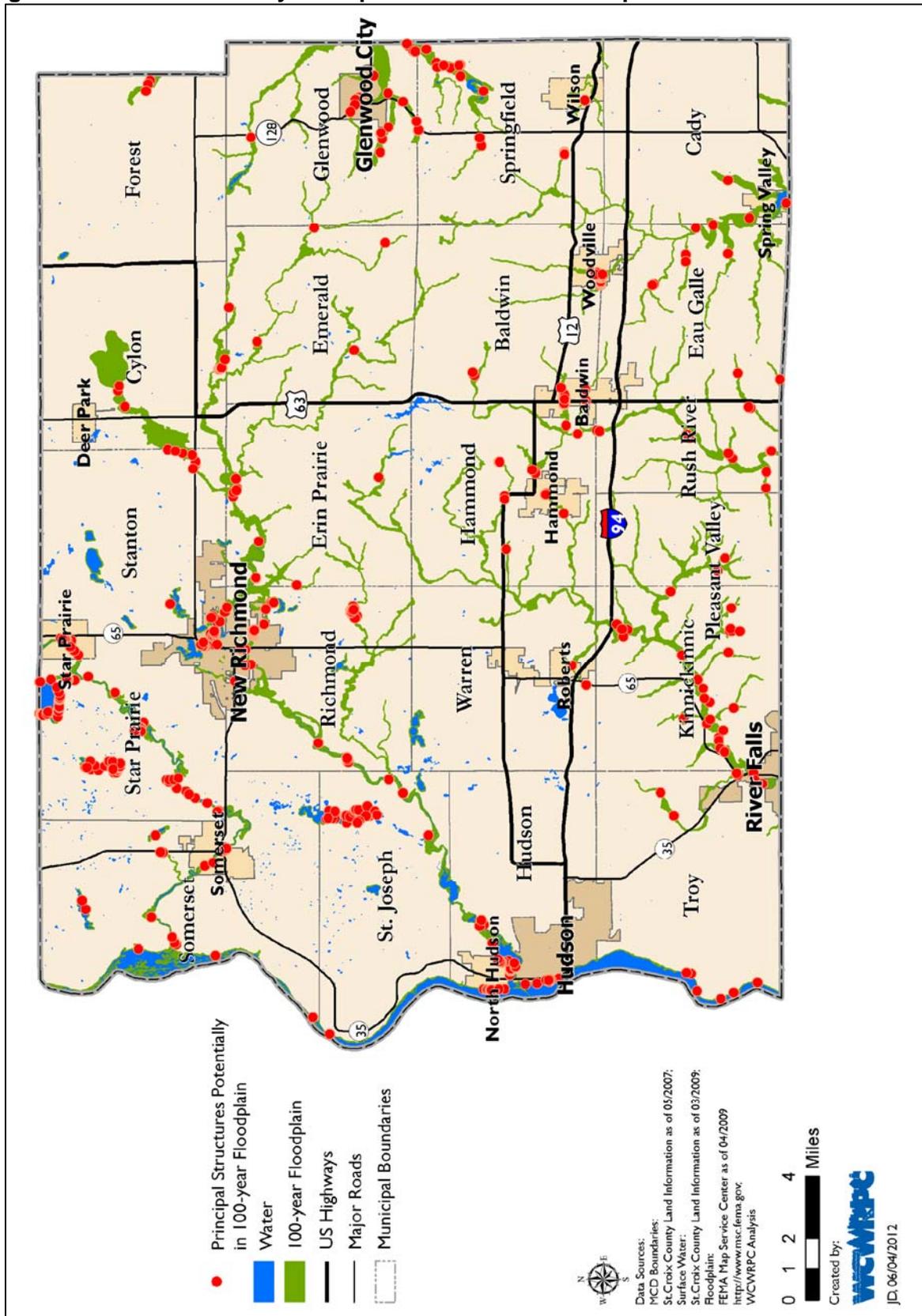


Table 32. Principal Structures Potentially in 100-Year Floodplain—2011

Municipality	Buildings by Primary Assessed Use							Est. Value of Assessed Improvements
	Residential	Commercial	Industrial	Other	Exempt (Federal, State, County)	Exempt (Other)	Total	
Towns								
Baldwin	1	0	0	1	0	0	2	462,400
Cady	1	0	0	1	0	0	2	253,100
Cylon	13	0	0	1	0	0	14	1,356,600
Eau Galle	7	0	0	2	0	0	9	1,464,000
Emerald	3	0	0	2	0	0	5	495,900
Erin Prairie	8	0	0	2	0	0	10	1,701,500
Forest	2	0	0	1	0	0	3	415,800
Glenwood	11	0	0	2	0	0	13	1,572,000
Hammond	6	1	0	2	0	1	10	816,500
Hudson	6	0	0	0	0	0	6	843,400
Kinnickinnic	24	0	0	6	0	1	31	5,085,900
Pleasant Valley	2	0	0	0	0	0	2	524,700
Richmond	28	0	0	0	0	0	28	5,432,100
Rush River	6	0	0	7	0	0	13	1,465,100
Somerset	8	1	0	3	1	1	14	1,318,000
Springfield	15	0	0	4	1	0	20	1,554,500
St. Joseph	35	0	0	1	0	0	36	4,908,300
Stanton	15	0	0	0	0	0	15	2,095,000
Star Prairie	99	6	0	1	0	3	109	13,818,200
Troy	7	2	0	2	0	0	11	1,271,900
Warren	0	1	0	0	0	0	1	150,000
Town Sub-Total:	297	11	0	38	2	6	354	\$47,004,900
Villages								
Baldwin	26	1	0	4	0	0	31	2,875,600
Deer Park	0	0	0	0	0	0	0	0
Hammond	2	0	0	0	0	2	4	182,900
North Hudson	23	0	0	0	0	0	23	6,167,600
Roberts	0	0	0	1	0	0	1	0
Somerset	2	2	0	2	0	0	6	323,100
Spring Valley	0	0	0	0	1	0	1	0
Star Prairie	13	0	0	2	0	0	15	1,305,900
Wilson	1	0	0	1	0	0	2	88,800
Woodville	27	0	0	2	0	3	32	3,354,100
Village Sub-Total:	94	3	0	12	1	5	115	\$14,298,000
Cities								
Glenwood City	6	8	0	1	1	1	17	2,376,600
Hudson	10	6	0	7	0	0	23	4,421,000
New Richmond	33	10	0	3	0	0	46	6,441,800
River Falls	1	1	0	0	0	0	2	678,700
City Sub-Total:	50	25	0	11	1	1	88	\$13,918,100
County Total:	441	39	0	61	4	12	557	\$75,221,000

PLEASE NOTE: The structures identified on Figure 30 and in Table 32 may not have had flooding problems in the past. To the contrary, the majority of these properties have no history of flooding and may not be vulnerable to flooding in the future. In some cases, due to topography at the building site or construction methods, the structure may actually be elevated higher than the adjacent 100-year floodplain. Some of these structures may have also received an approved Letter of Map Amendment (LOMA) or Letter of Map Revision (LOMR) which officially removed the structure or site from the 100-year floodplain.

Further, as discussed in Appendix B, for properties with multiple buildings and ancillary structures, the exact use and nature of each structure within the floodplain is not known and tax assessment data is only available at the parcel level, not for specific structures. And in some cases, an ancillary structure (e.g., barn, shed, boathouse) is located in the floodplain but is not reflected in Figure 30 or Table 32 since the principal structure on that parcel was located outside the delineated floodplain.

HAZUS Analysis of Flood Vulnerabilities

HAZUS is a natural hazard loss estimation software package which is used in conjunction with geographic information system (GIS) software to simulate potential losses due to flooding, earthquakes, and hurricanes. HAZUS is distributed free-of-charge through FEMA and is becoming the national standard for disaster modeling for these events.

In 2008, WEM prepared flooding analysis reports for each county in the State using the latest HAZUS software (HAZUS-MH) for a 100-year flood scenario. Based on this analysis, the scenario showed that St. Croix County flood damage would be experienced in scattered pockets. The higher loss areas are scattered, with concentrations in Glenwood City and along the St. Croix, Willow, and Apple Rivers, as shown in **Figure 31**.

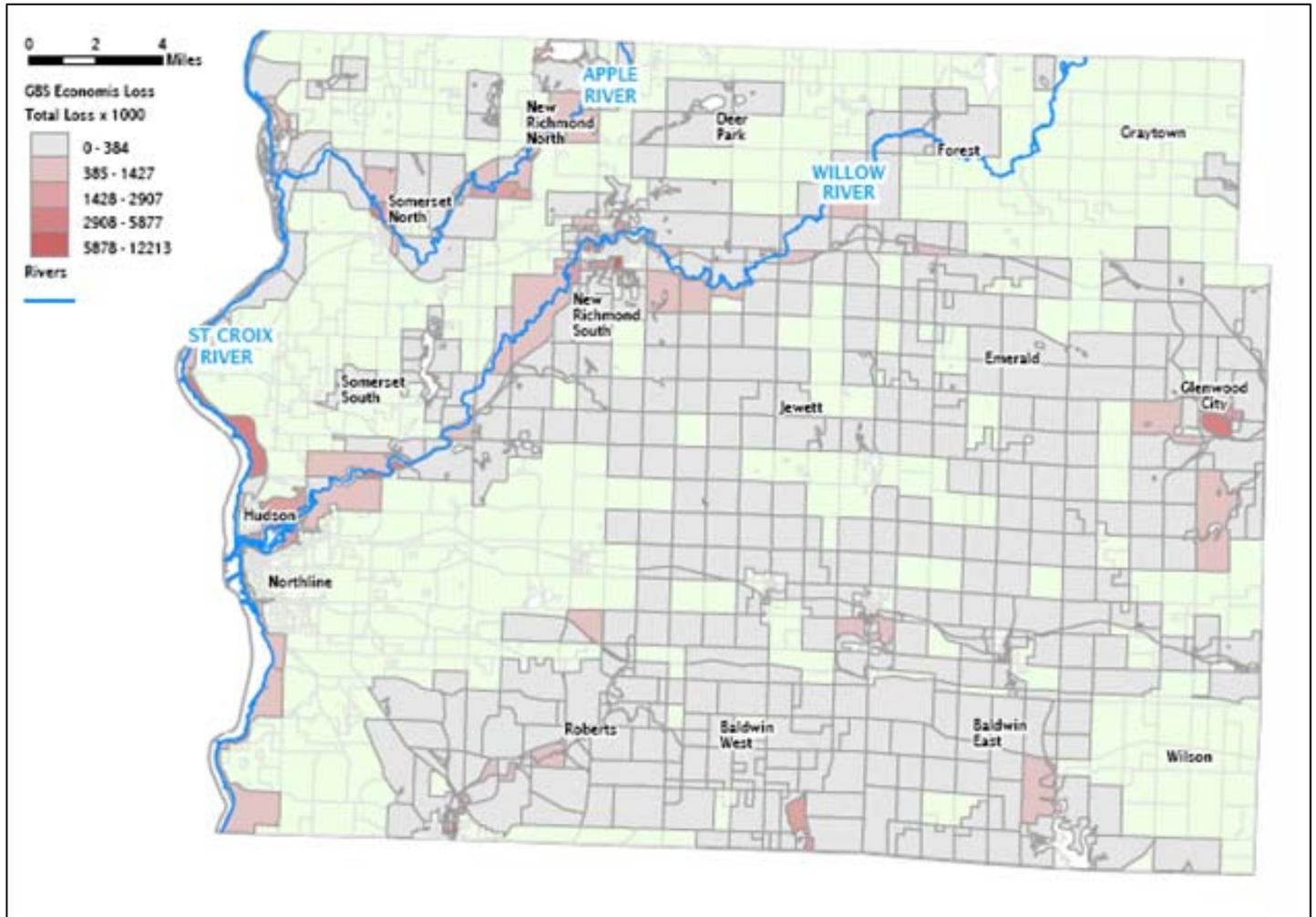
For a countywide 100-year flood, the HAZUS model estimates that 64 census blocks would experience losses exceeding \$1 million, which is relatively high for the region. An estimated 352 buildings (341 residential, 3 industrial, 8 commercial) would be damaged for total building losses of \$138.5 million and total economic losses of \$250 million. No critical facilities were damaged under the HAZUS scenario, though 1,007 households would be displaced and 1,386 people were estimated to need temporary shelter in a public shelter.

While the WEM-HAZUS scenario does attempt to consider flood depth and topography using the enhanced quick look (EQL) function, the analysis relies heavily on State and Federal data sources, such as census block information. The potential exists to supplement the HAZUS scenario with local data in the future, though this does require expertise and knowledge of the HAZUS-MH software package.

The estimated number of at-risk structures under the HAZUS scenario is lower than the 557 structures estimated in the previous section. Like the 2008 plan, the HAZUS methodology utilizes the previous versions of the FEMA floodplain maps and not the newly adopted D-FIRMS used in the previous section. The HAZUS methodology also relies on census block housing averages for building counts, rather than using orthophotography and parcel data to identify

individual structures. For rural areas in particular, the census blocks tend to be larger in size, while structures are often concentrated nearer to shoreland areas; losses will not be evenly distributed across a census block.

Figure 31. HAZUS 100-Year Flood Scenario

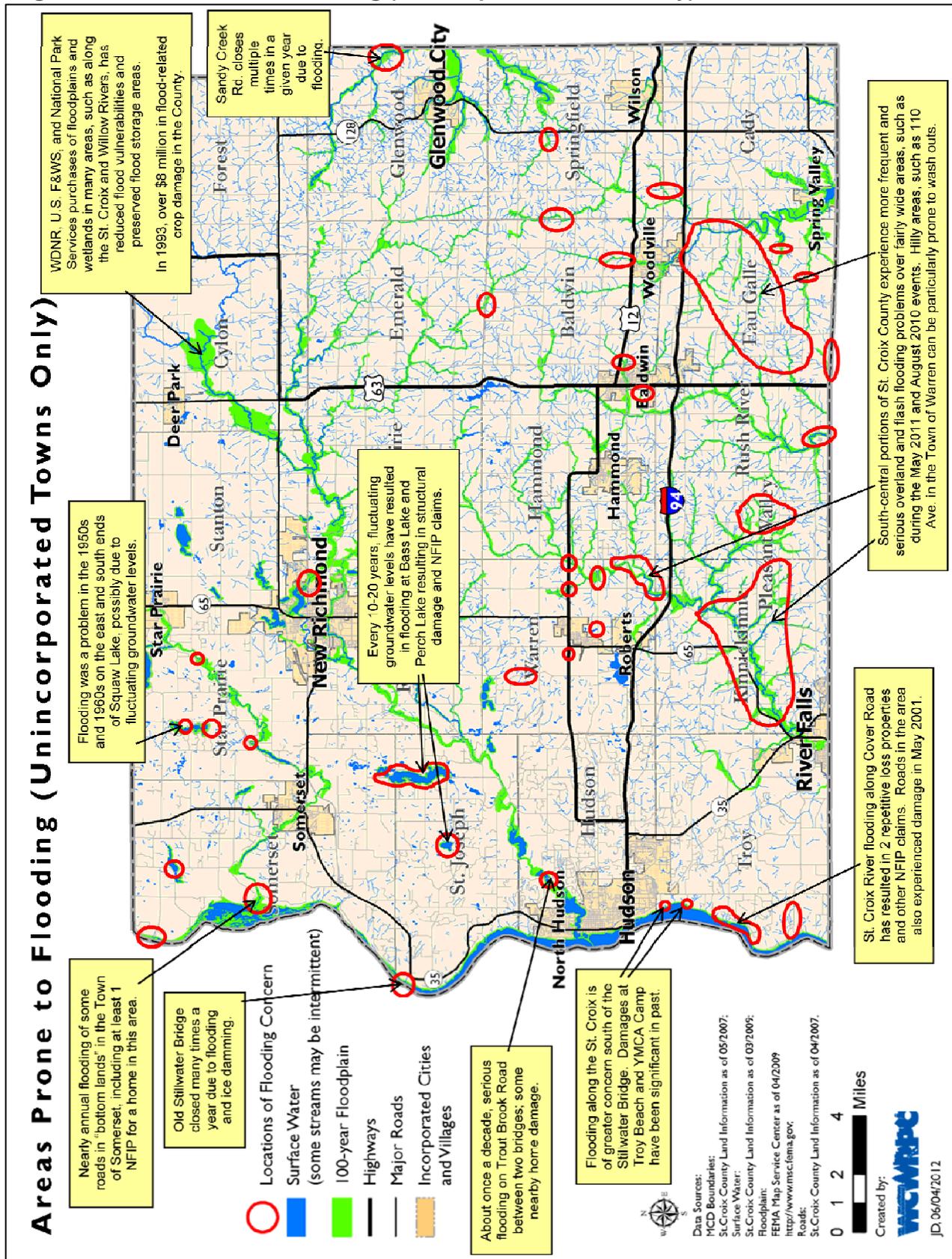


Floodprone Areas (Unincorporated Towns)

During the planning process, County staff and local officials identified a number of areas in unincorporated St. Croix County which are particularly prone to flooding as shown in **Figure 32**. Flooding concerns of villages and cities will be individually discussed later in this section.

This research yielded that riverine flooding over the past 25 years in unincorporated St. Croix County has typically been most frequent and severe along the St. Croix River, Willow River, and some lower-lying lands along the Apple River. Flash flooding and overland flooding is more frequent however and can occur countywide, though it has been a more significant problem in recent decades in central and southern portions of the County.

Figure 32. Areas Prone to Flooding (Unincorporated Towns Only)



In St. Croix County, riverine flooding has the largest potential to cause serious damage to many structures as part of a single event, though such events are very infrequent and there is typically time available to prepare for such an event to reduce potential damage (e.g., evacuation, sandbagging). More frequent overland or flash flooding typically results in less severe damage to structures overall, with flooding damage to basements, yards, and garages possible, but costly road damage is typical. However, the large amounts of damage during the August 2010 event shows that flash flooding can also be very destructive.

Somewhat unique to this area of Wisconsin are instances of flooding related to fluctuating ground water levels on seepage or spring-fed lakes, especially in the northern and western portions of the County (e.g., Deer Park, Bass Lake, Perch Lake). Flooding related to rising groundwater tends to be on a 10- to 20-year cycle and has also caused significant damage to structures, but its effects tend to be more localized in nature.

Some of the unique aspects of the areas identified as prone to flooding in Figure 32 are further described below:

- The Cove area along the St. Croix River in the Town of Troy experiences riverine flooding to various degrees almost annually during times of spring melt. During the past twenty-five years, the worst flood damage has occurred when flooding downstream on the Mississippi River caused floodwaters to back-up on the St. Croix River. The second highest concentration of National Flood Insurance Program (NFIP) claims in the County can be found in this area, as well as the County's only two repetitive loss properties.

The Cove neighborhood is an area of lakefront cottages, many of which have been renovated or replaced in recent years for bigger, year-round residences. In some cases, the steep, rugged topography in the area has limited home development to flatter sites closer to the river. Due to the high value of many of these homes and the prime location, the buyout and removal of floodprone homes in this area may not be a feasible alternative.

- Troy Beach County Park/YMCA Camp. Flooding of the beach area of the Troy Beach park and YMCA camp occurs approximately once every 3-5 years. Typically, debris must be cleared from the beaches or parking lots and some bank erosion occurs, but serious damage is rare. The more severe 2001 flood did cause some significant damage however. At Troy Beach, waves ripped off the roof to the bath house, while boats, deck supports, and other equipment were damaged at the YMCA Camp. Both facilities have minimal improvements in the floodplain and limit equipment storage in the high hazard floodplain during flood seasons. No mitigation efforts were identified at this time for these locations.
- The Houlton/Stillwater Lift Bridge over the St. Croix River has had major flooding problems in the past. Due to the low elevation of the bridge, debris can accumulate and ice-damming can occur on the upstream side, further contributing to problems and flood conditions. On occasion, conditions were such that a potential washout of the bridge was feared. In 2004, the bridge carried 16,700 vehicle trips in an average day. As discussed in the transportation subsection at the beginning of this report, a new bridge for vehicular traffic should be constructed in the next five years, largely mitigating this concern. However, the existing historic lift bridge will be retained for pedestrian and recreational use, and will still be vulnerable to flood and ice dam damage.

- Slowly fluctuating groundwater levels have historically been a flooding problem for homes at Bass Lake in the towns of St. Joseph and Somerset. At least fourteen NFIP claims have been made for six properties on Bass Lake, making it the highest concentration of claims in the County. Groundwater levels have historically cycled, reaching an all-time high in 1998, but are 4 to 5 feet lower now; levels have been as much as 10 to 15 feet lower in the past. In the 1990's, a lake rehabilitation district was established and an extensive pumping effort undertaken to reduce waters. Water levels retreated very soon thereafter, apparently not due to the pumping, itself. There has been some speculation that removal of dams on the Willow River in the late 1990s may have helped lower groundwater levels in the area. Drier weather conditions and normal groundwater cycles may have also contributed to the lower levels.
- Similar groundwater fluctuations have been worse in the past at the nearby, smaller Perch Lake in the Town of St. Joseph, though fewer homes have been impacted. Water levels have been 3' to 4' up the sides of cabins for years at a time. Up to three additional homes have become flooded or landlocked during flood conditions and one owner recently filled in their basement as a means of floodproofing. Unlike riverine flooding, the cause, trends, and solutions for these fluctuations are more difficult to determine. Though conditions at Perch Lake have temporarily improved, long-term water levels remain uncertain and some lakeshore structures remain floodprone. There may be potential to mitigate these concerns through acquisition of floodprone properties which would also allow for the relocation of the boat landing for much safer lake access.
- Trout Brook Road (or Rustic Road 13) where it crosses the Willow River bridge in the Town of Hudson overflows about once every decade. A small number of nearby homes are potentially in the floodplain, and there has been one NFIP claim from this area.. Additional analysis to reduce flooding potential is needed, possibly as part of planned road/bridge improvements.
- Portions of the lower Apple River in the Town of Somerset have been subject to seasonal riverine flooding in the past, but impacts to structures have not been significant overall and limited to one NFIP claim. A few roadways in the Town also have occasional riverine flooding problems.
- Historically, there has been flooding on the south and east ends of Squaw Lake in the Town of Star Prairie, but not since the 1950's and 1960's has this occurred. Significant residential lakeshore growth has occurred in the interim which could become a problem should flooding return. This flooding may be related to fluctuating groundwater levels.
- Flooding and ice-damming have been periodic problems for 1-2 homes along the Willow River in the Town of Richmond. The flooding has been the biggest concern just east of the City of New Richmond and just south of CTH "K". There has been 1 NFIP claim in this area in the past, and closure of the County Highway has been threatened. Dynamite has been used on occasion to break up the ice damming and reduce flooding potential.
- Included in the previous plan, but not shown on the map, is the area southeast of the City of New Richmond in the Town of Richmond, where development near Paperjack Creek has increased runoff and flooding concerns in the 140th and 150th Streets area. This area had the potential to impact homes should a serious flood occur, such as during a quick snow melt

combined with heavy spring rains. However, recent road and culvert improvements may have remedied this problem.

- It is not uncommon for Sandy Creek Road in the Town of Glenwood to experience floodwaters over the roadway multiple times in a single year from Sandy Creek.
- Southern parts of the County, such as in the Kinnickinnic and Rush River basins, have had high incidences of road and culvert washouts due to stormwater flooding, but such road and embankment damage is not limited to this area. Generally, there are fewer large public-owned flood storage areas in these river basins which may be contributing to these stormwater problems, as compared to the northern and western parts of the County.

It should be noted that many floodprone and high hazard floodplain areas are now in public parks, recreational uses, or wildlife lands and are not of significant concern. This not only reduces potential vulnerabilities by preventing floodplain development, but has reduced risk further downstream by providing flood storage areas which reduces the frequency or magnitude of flood events. The Wisconsin Department of Natural Resources, U.S. Fish & Wildlife, and National Park Services own significant amounts of floodplain land on the St. Croix and Willow Rivers. In addition, the Army Corps of Engineers owns large amounts of floodplain near along Lake George and the Eau Galle River. Many local municipalities and the County have also maintained floodprone properties for recreational uses, such as Troy Beach County Park and numerous community parks.

Projecting Future Flood Vulnerabilities

Three primary factors are key to projecting future flood vulnerabilities:

1) **Changes in Precipitation** - As the local events discussion showed, the recent flooding problems in St. Croix County have been primarily due to heavy rainfall events. Section III.A.v. previously discussed predicted climate changes for the region, including more precipitation during the winter months and more frequent heavy rainfall events. The projected increase in 2” rainfall events per decade would likewise increase flooding potential and may result in additional areas being at risk of flooding or considered 100-year floodplains in the future. No detailed modeling on the full impacts of such climate changes on St. Croix County surface waters has been performed.

2) **Changes in Flood Storage** – Overall, the floodplains and wetlands of St. Croix County are well protected. Encroachment of wetlands and new development often require the creation of new flood storage areas. Instead, the loss of flood storage will primarily be the accumulated loss or disruption of smaller stormwater storage areas, natural infiltration systems, and natural drainage systems. Every hardscape which is created (e.g., buildings, roads, parking lots), results in a change in potential stormwater or flood storage. This factor can be mitigated through stormwater management planning and mechanisms such as rain gardens, natural swales, rain barrels, pervious surfaces, and the creation and maintenance of flood storage areas.

3) **Floodplain Development** – While demand for shoreland living is high, new floodplain development is well regulated and rarely allowed. Minimal new floodplain development is

occurring, so the number of structures in Table 32 should not significantly increase over time unless the physical extent of the 100-year floodplain grows. The overall vulnerability of floodplain development is expected to increase as the market value of these structures increases and some older, seasonal structures are renovated as year-round retirement homes.

In short, floodplain development vulnerabilities are projected to increase in the future not as much from new development within the floodplain, but rather from increasing precipitation (and runoff), the increasing market value of existing structures, and the improvement of existing structures. No significant floodplain development is currently planned. Instead, the increasing flood vulnerability in St. Croix County will likely be from overland stormwater flooding as a result of additional heavy rainfall events and changes in natural stormwater storage and drainage patterns as new development occurs.

National Flood Insurance Program Claims and Repetitive Loss Properties

As of February 29, 2012, there were a total of 216 National Flood Insurance Program (NFIP) flood insurance policies in St. Croix County covering approximately \$45 million in property, including the City of River Falls. This was over a 50 percent increase in the number of claims since November 2010, likely reflecting an increased awareness of flood risks since the August 2010 event. Over 53 percent of these policies were for properties in the unincorporated towns. Of the incorporated communities, the City of New Richmond had the highest number of policies with 26, closely followed by Baldwin, North Hudson, and Hudson, with 20, 18, and 17 respectively.

The FEMA records of National Flooding Insurance Program (NFIP) claims for St. Croix County included 41 claims and \$460,220 paid for 1978 through November 2010. These numbers exclude River Falls and Spring Valley, since exact locations are unavailable and it is not possible to confirm which counties the claims are in. Nearly half of all claims are found in the unincorporated towns:

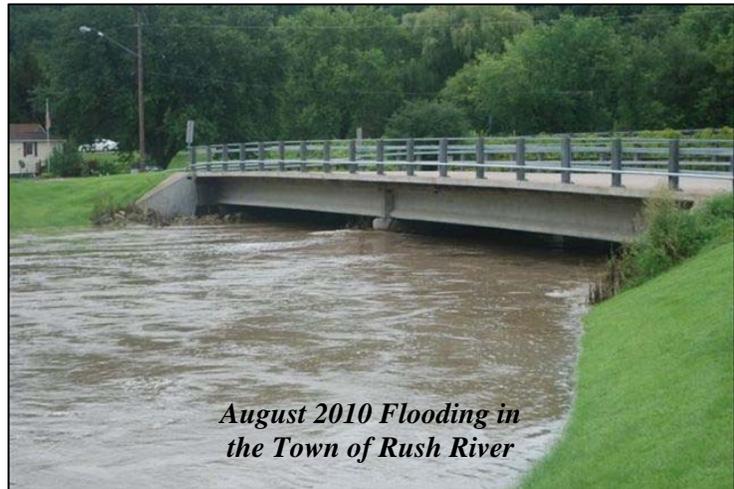
Unincorporated Towns:	23 claims	\$248,311
City of Hudson:	6 claims	\$198,350
City of New Richmond:	7 claims	\$ 13,241
Village of North Hudson:	1 claim	\$ 318
Village of Baldwin:	3 claims	\$ 0
Village of Woodville:	1 claims	\$ 0

Detailed claim information is no longer available, but based on information available in 2005, the largest concentration of these claims (14 claims on 6 properties) can be found in the Bass Lake area. The second highest concentration (7 claims on 4 properties) can be found in the Cove Road area of the Town of Troy on the St. Croix River, which includes the County's only two repetitive loss properties. For incorporated areas, the largest concentration (4 claims on 4 properties) is in the City of New Richmond along Riverside Drive on the north side of the Mill Pond.

Repetitive loss properties are those properties participating in the National Flood Insurance Program (NFIP) that have filed two or more claims of \$1,000 or more in a 10-year period. This list is regularly compiled by FEMA and made available to the Wisconsin Division of Emergency Management. Two properties in the County are on the repetitive loss properties list. Both properties are located along Cove Road in the Town of Troy and both had claims related to flooding in April 1997 and April 2001. One of the homes has had two building claim payments totaling \$31,866, about 18% of the total building value. The second home has had two building claim payments and a contents payment totaling \$45,302, about 35% of the total building value.

Critical Facilities in Floodplains

As the assessment in **Appendix E** discusses, the critical facilities identified as potentially being located in the 100-year floodplain are limited to infrastructure (e.g., roads, bridges, dams), one town hall (Star Prairie), three electric substations (1-Baldwin, 2-New Richmond), and the City of Hudson wastewater treatment plant. Three other buildings—Woodville Village Hall, Woodville Fire Station, and Hammond Village Hall—have experienced significant flash flooding in the past as well. However, keep in mind that not all of the critical facilities in the County have been mapped to allow for a comparison against the 100-year floodplain, though no other facilities were identified as experiencing flooding problems during interviews. Stormwater wash-outs and damage to roads, culverts, and bridge abutments have been the most common flood-related problems in the past for unincorporated St. Croix County.



Agricultural Flooding

Approximately 42 percent of reported damages from Wisconsin floods between 1993 and 2000 were from crop losses. The large crop losses in St. Croix County in 1993 demonstrate that this is a vulnerability which is often overlooked. Flooding can have additional agricultural impacts as well. Since many floodplains are used for forage, the loss of these crops (e.g. alfalfa) may require farmers to supplement feed for livestock. Due to the low value of forage and high insurance costs, most farmers do not have multi-peril crop insurance for forage crops. The remaining forage in flooded areas can be lower in quality, reducing milk production and complicating or reducing pregnancies and births. Feed and water quality problems which result in sick animals also increase veterinary costs. Agricultural flooding impacts can also be long-term and more difficult to quantify. The harvesting of crops in wet areas can compact soils, further reducing crop yields for years to come.

While crop damage due to flooding is occasionally experienced in some areas, statistics regarding crop losses in the past or future vulnerability due to flooding is not readily available.

These potential losses can vary depending on the type of crops planted, though it is common practice to often use such floodprone areas for hay, forestry, or pasture. And while prolonged flooded conditions are not common, periods of excessive soil wetness can delay spring planting and indirectly hinder yields by shortening the growing season. Standing water following heavy rains or prolonged wet periods is not limited to floodplains. Denitrification and oxygen depletion of crops can severely reduce yields or result in plant death after prolonged water logging.

Agricultural flooding does not require new or additional mitigation action by St. Croix County or its municipalities within the scope of this plan at this time. As will be discussed in Section IV, educational programming, management planning, and crop insurance exists to help mitigated these risks.

Unique Jurisdictional Risks or Vulnerabilities—Flooding

The number and value of structures potentially within the high-hazard floodplain areas of each incorporated community were previously discussed (see Figure 30 and Table 32). This subsection summarizes the specific flooding issues and areas of concern unique to each of the cities and villages in the County as further summarized in the table and maps in **Appendix F**. For most of these communities, overland, flash flooding has been of more significant concern in recent years rather than overbank flooding.

All communities with designated 100-year floodplains in St. Croix County are participants in the NFIP in good standing. The effective date of the current FIRMs for NFIP-mapped communities in St. Croix County was March 16, 2009, except for the Village of Spring Valley (11/16/11) and City of River Falls (11/16/11) which lie mostly within Pierce County. All applicable cities and villages have adopted the revised NFIP maps. The NFIP status and effective map dates of each community's initial Flood Hazard Boundary Map (FHBM) and initial FIRM are also noted.

Village of Baldwin (*NFIP participant; FHBM 5/10/74; initial FIRM 8/15/90*)

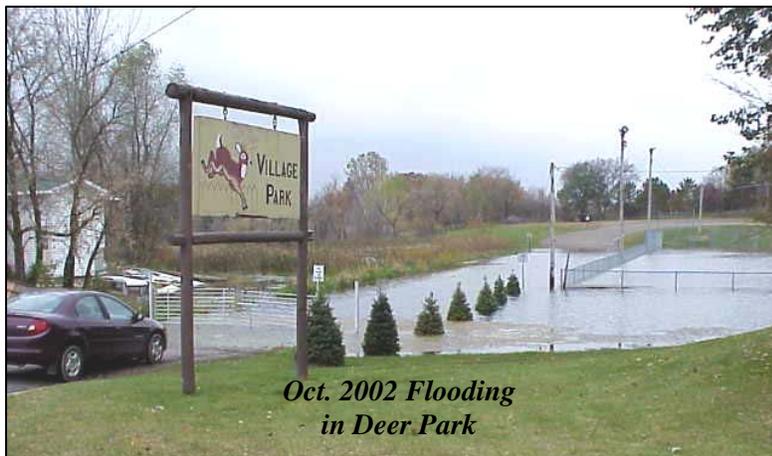
The Village has had three NFIP claims, but no claims paid. Flooding on a small tributary of the Rush River which bisects the Village causes closure of Highway 63 every 4 to 5 years, and the bridge was washed out in August 2010. It is hoped that improvements will help alleviate this flooding concern in the future. However, there are currently limited crossings of the creek in the Village, and none which provides an adequate detour for Highway 63 which has over 11,000 vehicle trips in an average day along this segment.

Dredging on the east end of the primary stream channel has helped to mitigate some flood potential. A majority of the homes within the 100-year floodplain within the Village are located within a mobile home park. It is uncertain if all of these homes are appropriately anchored. The Village has suggested that acquisition of some floodprone structures along the creek should be considered. A portion of one elementary school building is also close to the 100-year floodplain.

Stormwater improvements in recent years in the middle portion of the older Village center along the railroad tracks are believed to have remedied many of the past stormwater flooding concerns for that area. Further to the north along 8th Avenue, a newer home was built in an area which disrupted stormwater drainage patterns. The result was ponding nearby up to 3-4 feet deep at times which could be a potential safety concern for children in the neighborhood. But it was the August 2010 flash flooding which resulted in significant street and property damage to some neighborhoods which had not experienced such problems in the past. As discussed previously, basement flooding was fairly widespread and evacuations were needed, including the evacuation of an assisted living facility. Appendix G includes more information on this event, including a map of Baldwin identifying the flood damage areas.

Village of Deer Park (NFIP not applicable; no 100-year floodplain)

Though the Village of Deer Park does not have a FEMA-designated 100-year floodplain, it does have a significant flooding history. Groundwater levels fluctuate significantly, rising to flood levels every 10 to 15 years. As groundwater levels rise, springs and pond levels contribute to a general surface water flow to the south and southwest. A large pond on the east side of STH 46 rises about 15 more feet than its current level within one foot of the Highway level, though it has not resulted in the highway's closure since the highway was rebuilt. A home on the west side of the Highway was acquired and removed as part of past flood mitigation efforts. The ballpark



*Oct. 2002 Flooding
in Deer Park*

was also raised 3 to 4 feet. Some infiltration of septic lines during times of flooding has also been occurring just southeast of the ballfield. During flooding, 22nd Street has often been closed to flooding, but culvert improvements were recently made. An older drainageway through this area may offer an opportunity to shift drainage toward the Willow River to the south, rather than through the Village.

Village of Hammond (NFIP participant; FHBM 5/10/74; initial FIRM 7/16/87)

No FIRM elevations for Hammond have been determined. The Village of Hammond has very limited, unconnected areas of 100-year floodplain, which are largely stormwater storage areas during heavy rain and/or snowmelt events. Such natural storage areas are being incorporated into the Village's stormwater management plan currently under development. During the August 2010 flooding, a culvert under the highway failed; and Davis Street is being reconstructed to help prevent this in the future. A current flood mitigation strategy is to address overland flooding problems at the Village Hall. Heavy rains in June 2011 resulted in up to two feet of water in the parking lot and flooded the lower level.

Village of North Hudson (*NFIP participant; no FHBM; initial FIRM 8/22/75*)

Though the Village may have the largest number of potential high hazard floodplain properties of any municipality in the County, it has only had one NFIP claim at a home along the St. Croix River. Historically, flooding for the Village has been worst when floodwaters on the St. Croix River back-up due to flooding downstream on the Mississippi River.

During such times, floodwaters can back-up and overtop the Lake Mallalieu Dam, resulting in the flooding along the north shore of the Lake. Such was the case in 2001, when flooding damaged a roadway and liftstation along the Lake. Numerous structures along the lakeshore may be potentially located in the high hazard floodplain area. Sandbagging has been used in this area in the past.

Of more significant flooding concern to the Village are two areas along the St. Croix River. At Ferry Park, parkland and beach is being lost due to bank erosion and washouts. This can be very dangerous to children and beach-goers who may attempt to descend a bank which has become unstable due to flooding. Similarly, to the south at the Browns Beach area, flooding and wave action have caused washouts and bank erosion; a retaining wall has been undercut. In this location, a house perched near the top of the bank is at risk of damage or sliding down the bank should current trends continue without mitigation steps.

About four times a year during heavy rain events, stormwater runs from the north along STH 35 toward the center portion of the Village resulting in the closure of the Highway. Damage is primarily limited to yards, though some limited basement flooding may occur for a few homes. This stretch of STH 35 carries about 12,000 vehicle trips in an average day. Recent highway improvements have not remedied these problems.

Village of Roberts (*NFIP participant; initial FIRM 3/16/09*)

The Village of Roberts had no designated 100-year floodplain prior to March 2009. A relatively limited area of 100-year floodplain with no structures is identified in an area annexed fairly recently. No riverine or stormwater flooding concerns were noted for the Village.

Village of Somerset (*NFIP participant; FHBM 12/28/73; initial FIRM 6/1/87*)

No FIRM elevations for Somerset have been determined. The Village has had no NFIP claims or major riverine flooding impacts; most of the 100-year floodplain is within the Village park. A footbridge over the Apple River is frequently damaged and repaired due to flooding (e.g., 1993, 2001). Some scattered bank erosion along the River is occurring. The most significant stormwater flooding concerns are believed to be remedied, though new concerns can arise as development occurs. A drainage easement for a swale on the south side of the Village is desired for stormwater storage in anticipation of growth and increased stormwater flows.

Village of Spring Valley (*NFIP participant; FHBM 6/14/74; initial FIRM 3/15/84*)

Only two homes are located within the St. Croix County portion of the Village. The Village of Spring Valley is primarily covered under the *Pierce County All Hazard Mitigation Plan* which they have previously adopted. Most of that portion of the Village within St. Croix County is within the 100-year floodplain, the far majority of which is owned by the U.S. Army Corps of

Engineers. The Eau Galle Dam managed by the U.S. Army Corps of Engineers has largely mitigated the very serious flooding problems of the Village of the past, and has helped to maintain water levels on Lake George.

Village of Star Prairie *(NFIP participant; FHBM 12/28/73; initial FIRM 3/16/09)*

Much of the 100-year floodplain along the Apple River within the Village is maintained as a Village Park; there have been no NFIP claims. There has been some stormwater ponding in the Bridge Street-Jewell Street intersection area which has damaged streets and yards, but no structural damage has been reported to date. The Village is working to remedy this problem area. The Village did receive NFIP sanction status in 1974, so residents are not eligible for Federal flood insurance. The Village should work with the State Floodplain Coordinator to ensure this deficiency is addressed, potentially limited to submittal of an updated floodplain ordinance and adoption of the new FIRMs.

Village of Wilson *(NFIP participant; FHBM 8/30/74; initial FIRM 5/1/87)*

No structures are believed to be located within the 100-year floodplain of the Village and there have been no NFIP claims. The August 2010 flooding was the most significant flood event in the Village since 1939. A number of homes experienced basement flooding and a trailer home shifted from its foundation. Flood waters reach 10-12 feet as culverts and the railroad trestle, and accumulating debris, restricted flood flows. The bridge on Highway 12 was washed out. Local officials expressed concerns about flooding impacts on area rail bridges.

Village of Woodville *(NFIP participant; FHBM 5/24/74; initial FIRM 5/4/89)*

The high hazard floodplain areas along Eau Galle Creek are primarily forested or in Village Park. There was only one NFIP claim in the Village as of November 2010, which was not paid. The River Street bridge over the Creek can disrupt flow and must be kept free of debris to prevent potential flooding. Local officials also noted two areas of significant bank erosion due to flooding and wave action. The Village has adopted a stormwater management plan and in 2008 no significant stormwater flooding issues were noted. But since that time, the August 2010 flash flood washed out roads and sidewalks and caused damage to basements, buildings, and property, including a police car. Flooding occurred at Village Hall and the current Fire Station. The Village was effectively split in half which caused problems for response and the industrial/business park was essentially an island. Appendix G includes more information on this event, including a map of Woodville identifying the flood damage areas

City of Glenwood City *(NFIP participant; FHBM 5/14/76; initial FIRM 9/4/86)*

There are large areas of 100-year floodplain and dam shadow within the City, though there have been no NFIP claims and no significant flooding problems in recent history. Due to the small sizes of the streams and the hilly topography of the area, overland or flash flooding is likely a more significant concern. The City has maintained the stream channel which helps moderate water levels and mitigates potential flooding. Portions of the City are within the hydraulic shadows of three high hazard dams, though these are dry dams with little or no normal water storage. The most significant recent flooding issue has been the result of ice damming in the Syme Avenue area. Three structures experienced flooding in 2007 with fifteen households evacuated.

City of Hudson (*NFIP participant; no FHBM; initial FIRM 11/10/72*)

Like the Village of North Hudson, riverine flooding along the St. Croix River is most serious when floodwaters on the Mississippi River cause the St. Croix River to back-up. Local officials consider these floods, which occur 5 to 6 times every 20 years, to mostly be a nuisance. The nature of these riverine flooding events typically allows 12-15 days to prepare in advance of the flooding. Much of the City's 100-year floodplain is in City Park, and a combination of existing seawalls and temporary sandbagging are used to reduce potential flooding. Though about 23 structures, including six marina docks, may be located within the high hazard floodplain areas, there have only been six NFIP claims in the City.

Riverine flooding has impacted streets and 10 to 13 garages in an area of condominium units just south of Interstate 94 in the past, though the homes themselves are believed to be elevated above 100-year flood levels. Two of the City's NFIP claims have come from this general area. Farther north along the River, Buckeye Garage floods with 5 to 6 feet of water every 3 years, with nearby structures protected with sandbags. Portions of the City's wastewater treatment plant may be located within the 100-year floodplain, but no serious flooding history for the facility has occurred to date.



*April 2001 Flooding
in Hudson*

Perhaps more significantly, development in eastern portions of the City is increasing stormwater flows towards the St. Croix River to the west. The stormwater often travels through old drainageways, gaining in speed and intensity as it travels down the hill towards the river. Stormwater systems in older neighborhoods were not necessarily designed to handle such flows and are overwhelmed approximately two times per year. Basement and garage flooding in the Locust & 5th Streets neighborhood and the Nye & Aldrich Street neighborhood can be significant. On the south side of Interstate, significant amounts of stormwater runoff from large-span buildings and many parking lots flows towards the river and is captured in a large stormwater basin. Debris can block the normal flow of stormwater into and out of this basin, resulting in localized flooding concerns. The high rate of growth in the Hudson area will continue to require a high level of attention to stormwater management.

The dam shadows within the City for the Little Falls Dam on the Willow River and the St. Croix Hydro Dam on the St. Croix River are both very similar to, or do not exceed, the boundaries of the 100-year floodplains.

City of New Richmond (*NFIP participant; FHBM 12/28/73; initial FIRM 7/16/04*)

A significant number of structures around the Mill Pond may be located within the high hazard floodplain areas of the City. A portion of the historic district and a nearby historic home on the south side of the pond may also be within the 100-year floodplain. Seven NFIP claims has been made in the City, mostly for properties immediately north of the Mill Pond, though the City has not experienced major flooding since 1967. A seasonal home further down stream has had some flooding problems in the past. The new dam has greatly helped to mitigate potential flooding overall by allowing the drawdown of water levels.

In recent years, the most significant flooding concern has been occurring near the Armory along CTH “CC” which has impacted two homes in the past, but this has been addressed since the 2008 mitigation plan. Run-off due to development near Paperjack Creek in the 140th Street area had been reported in 2006 to be causing some flooding concerns for houses in this area, but this is largely within an adjacent town and was also hopefully remedied as part of recent road and culvert improvements. Also nearby in an adjacent town, ice damming and flooding has been a problem in the past along the Willow River just before it crosses CTH “K”, resulting in a past NFIP claim.

City of River Falls (*NFIP participant; FHBM 10/12/73; initial FIRM 12/15/82*)

The City of River Falls is primarily covered under the *Pierce County All Hazard Mitigation Plan* which it previously adopted. The Kinnickinnic River does flow through the St. Croix County portion of the City and there has been significant growth in recent years on the City’s north side. Though there has been some potential residential and commercial development in the high hazard floodplain areas of the St. Croix County portion of the City, there has been no known NFIP claims or notable flood event history in St. Croix County.

St. Croix County Dams—Vulnerability to Dam Failure

As of December 2010, St. Croix County had 53 existing dams in the WDNR dam database summarized in **Appendix I**. Of the 53 existing dams in St. Croix County, 37 are classified as small or were unclassified. In nearly all cases, if these smaller dams failed, the runoff and impacts downstream would hardly be noticed.

The dams of St. Croix County are shown in **Figure 33**, along with their Wisconsin Department of Natural Resources hazard ratings.⁴⁴ Hazard ratings are assigned by the WDNR based on the potential for loss of life or property damage should the dam fail. The dam hazard ratings are defined by FEMA as follows:

Low Hazard Dams assigned the low hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner’s property. Large low-hazard dams are inspected every ten

⁴⁴ Two existing small dams and five planned dams did not have locations in the WDNR G.I.S. database.

years by the Wisconsin DNR Dam Safety Engineer, and the spillway must be sized to accommodate a 100-year event.

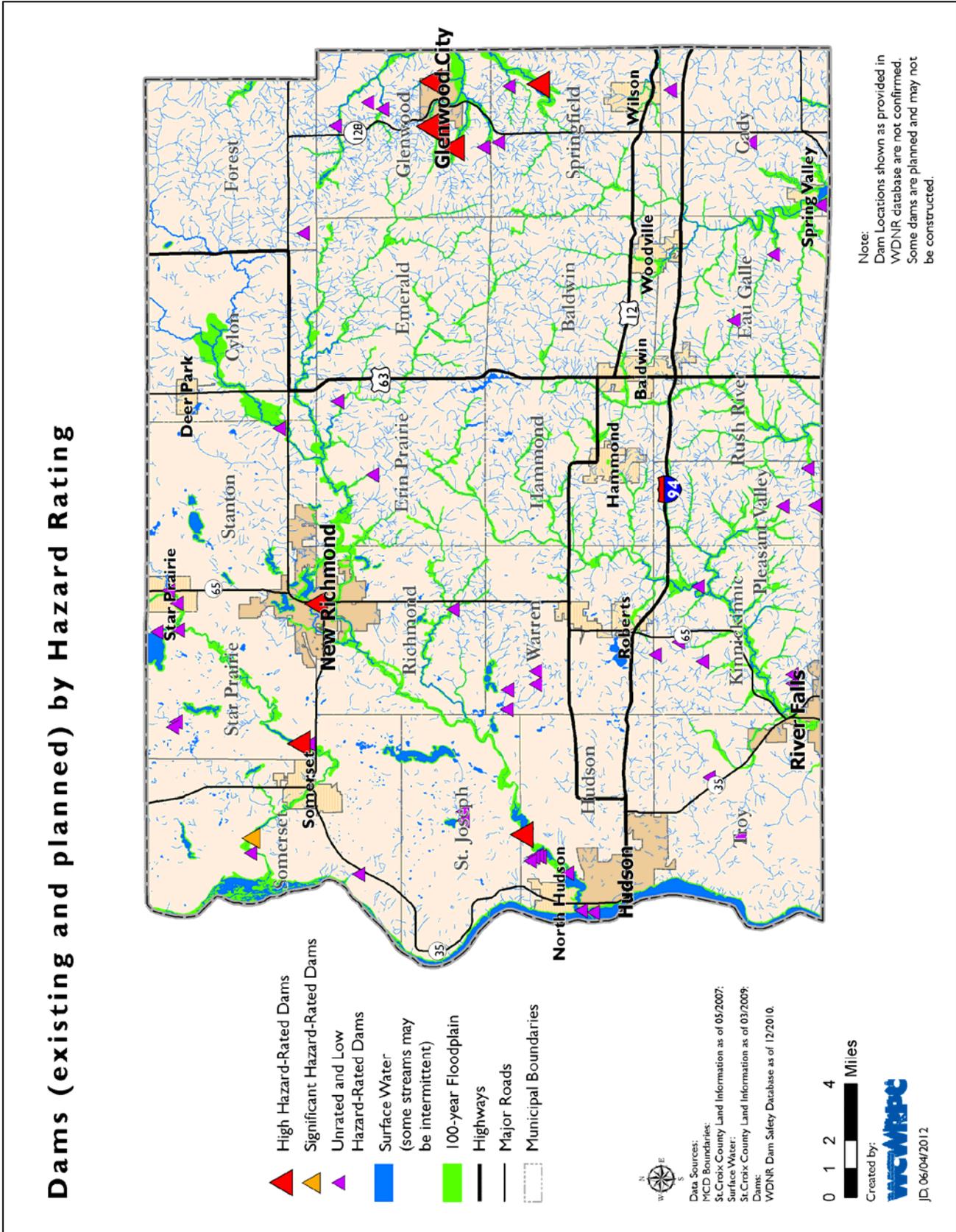
Significant Hazard Dams assigned the significant-hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant-hazard dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure. Large significant-hazard dams must be inspected every five years (5th year private engineer; 10th year WDNR Dam Safety Engineer), and the spillway must be sized to accommodate a 500-year event.

High Hazard Dams assigned the high-hazard potential classification are those where failure or mis-operation will probably cause loss of human life. Large, high-hazard dams must be inspected every two years (2nd, 4th, 6th, 8th years private engineer; 10th year WDNR Dam Safety Engineer), and the spillway must be sized to accommodate a 1,000-year event.

All large dams on navigable waters are required to have an Emergency Action Plan (EAP) and an Inspection, Operation, and Maintenance (IOM) Plan, along with a dam failure analysis which shows the hydraulic shadow and structures subject to potential flooding should a failure occurs. The EAP should be brief, with a focus on contact information, actions, and alerts (e.g., needed evacuations, road closings). The geographic scope of the analysis should extend downstream until the dam failure shadow converges with the 100-year floodplain. These analyses are used to determine the hazard rating. Floodplain zoning controls can then be put into place for the dam shadow. For dams without an analysis, an estimated hazard rating is given by the WDNR Dam Safety Engineer based on development and zoning controls downstream of the dam.

As listed in Appendix I, St. Croix County has 16 large dams. Seven of these large dams are rated or estimated to be low hazard due to lack of vulnerabilities downstream. Eight of the large dams have a high-hazard rating and one has a significant-hazard rating. No small dams have significant- or high-hazard or ratings. Of the eight high-hazard rated dams, five are owned by St. Croix County in the Glenwood Hills area and one each is owned by the City of New Richmond (Mill Pond Dam), Xcel Energy (Riverdale Dam), and Wisconsin Department of Natural Resources (Little Falls Dam).

Figure 33. St. Croix County Dams by Hazard Rating



High-Hazard Dams (8)

The high hazard dams represent the only high potential loss facilities within St. Croix County. Eight dams in St. Croix County have been given HIGH hazard ratings and all are large dams.

1) *Glen Hills #4*

Glen Hills #4 is a High Hazard Dry Dam on a tributary of Tiffany Creek. The inundation area, should a failure occur, would follow closely, but be slightly larger than the high hazard floodplain area, with a significant number of structures within the City of Glenwood City vulnerable. Flood waters would reach and inundate the mobile home park on the west side of the City in about 20 minutes with an incremental rise of about 4 feet. Flood waters would reach Oak Street downtown in about 50 minutes with a rise of 4.2 feet. Flooding equivalent to a 100-year flood may also be experienced in Downing in Dunn County.

2) *Glen Hills #5*

Glen Hills #5 is a High Hazard Dry Dam on a tributary of Tiffany Creek. The inundation areas for Dam #5 are very similar to those of #4 and, again, follow closely, but are slightly larger than the high hazard floodplain area. Flooding would be slightly less severe, with the incremental rise at Oak Street of 2.9 feet with a travel time of 55 minutes. Flooding equivalent to a 100-year flood may also be experienced in Downing in Dunn County.

3) *Glen Hills #6*

Glen Hills #6 is a High Hazard Dry Dam on a tributary of Tiffany Creek. Dam #6 is on the east side of the City of Glenwood City and would not inundate the larger areas of residential and downtown which would be vulnerable if failure at Dams #4 or #5 should occur. The inundation areas for Dam #6 closely follow, but are slightly larger than the high hazard floodplain area. Some local industry may be impacted. A portion of the High School may also be inundated by a failure with a travel time of flood water of 35 to 40 minutes from the dam to the school. Until floodwaters reach the large floodplain to the south, the incremental rise will typically be between 2.5 to 3.5 feet, rising higher in areas where floodwaters are constricted (e.g., STH 170 bridge). Flooding equivalent to a 100-year flood may also be experienced in Downing in Dunn County.

4) *Glen Hills #7*

Glen Hills #7 is a High Hazard Dry Dam on non-navigable Sandy Creek. Failure of Dam #7 would result in an inundation area much larger than the estimated 100-year floodplain which is not designated on FEMA FIRM maps. The potential number of structures directly impacted by a failure is very small.

5) *Glen Hills #10*

Glen Hills #10 is a High Hazard Dam with 1,471 acre feet reservoir under normal conditions on Beaver Creek to the south of Glenwood City. Five



Glen Hills Dam #10

residences are within the hydraulic shadow within St. Croix County. More structures within Dunn County are potentially located in the inundation area should a dam failure occur, including a significant portion of the Village of Downing. Flood waters due to a failure would reach Downing in 1.7 hours with an incremental rise of 7.5 feet, exceeding a 100-year flood event and likely resulting in serious damage within the Village.

6) *Little Falls*

Little Falls Dam is located in the Willow River State Park, approximately two miles up the Willow River from the City of Hudson and Village of North Hudson. Approximately 23 residences are within the dam shadow inundation area for Little Falls Dam as potential priorities for evacuation; the largest concentration of these homes is located in the Trout Brook Road area. Radio telemetry or other early warning link to the Lower Power Dam at Lake Mallalieu has been under discussion to automate opening of flood gates if needed.

7) *Riverdale*

The Riverdale Dam is located approximately 3 miles upstream of the Village of Somerset on the Willow River. The inundation area for the first 2 to 3 miles downstream of the dam, should a failure occur, is significantly larger than the high hazard floodplain area. Between five and eight structures may be located within this portion of the inundation area, with about four structures located within the first mile. Further down river, the inundation area significant narrows and closely follows the river channel and 100-year floodplain to the Apple River Fall Dam. Some seasonal cabins on the north side of the Village of Somerset may be within the inundation area. Under flood conditions, floodwaters would take one hour and five minutes for the start flooding on the southeast side of the Village of Somerset should a failure occur at the Riverdale Dam located 3.18 miles upstream. Peak flooding would occur in 1 hour 48 minutes at the Village. Floodwaters would reach the Apple River Falls Dam in 1.5 hours and peak about an hour later under flood conditions.

8) *New Richmond Mills*

The New Richmond Mills Dam located within the City of New Richmond on the Willow River was reconstructed in 1996, allowing greater control over water levels to help mitigate potential flooding. Two residential structures, one being a seasonal home, lie within the dam shadow according to the 1998 inundation map.

Significant-Hazard Dams (1)

One additional dam was given a SIGNIFICANT hazard rating by the WDNR:

1) *Apple River Falls (owned by Xcel Energy)*

The Apple River Falls Dam owned by Xcel Energy is highly regulated, inspected regularly, and has an emergency action plan on file with St. Croix County Emergency Support Services Department. The Apple River Falls Dam is located approximately 6.59 miles downstream of the Riverdale Dam and 2.32 miles upstream of the backwaters of the St. Croix River. The inundation area for a failure of the Apple River Falls Dam could be slightly larger than the 100-year floodplain for the first mile downstream, but would closely follow the 100-year floodplain boundary thereafter to the St. Croix River. The dam power plant itself is within the inundation area, as well as 5 to 6 structures closer to the mouth of the River where it joins with the St. Croix River. Should a failure occur, less time would be available for evacuation compared to the Riverdale Dam. Flood conditions would begin in 10-12 minutes at the

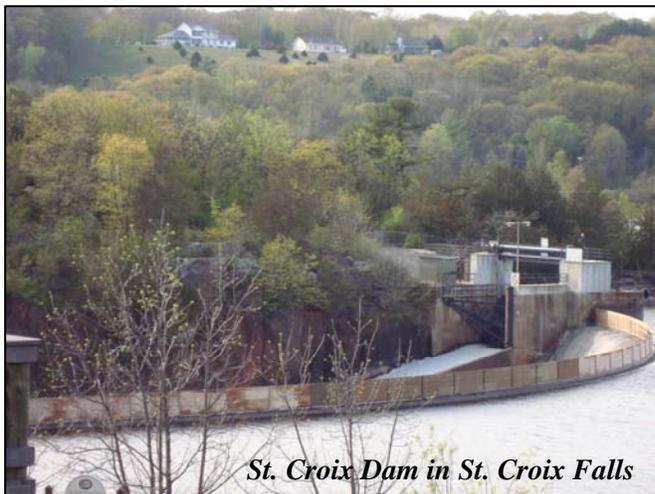
mouth of the Apple River and peak flooding would occur within 30 minutes, likely allowing less 10 minutes or less to evacuate the 5 to 6 structures just upstream of the confluence before flooding begins.

Other Dam Concerns or Notes

All ten Glenwood Hills Dams owned by the County are large dams and officially given a HIGH hazard rating, though a LOW rating is estimated for five of the dams, so they were no described previously. It may be possible to reduce the ratings of some of these dams with additional emergency planning, regulatory, or warning system efforts. County staff has suggested that additional automated, weather and water-level monitoring equipment be considered. Only Dam #10 has automated monitoring equipment.

Floodwaters on the St. Croix River can back-up over the Lower Power Dam at Lake Mallalieu on the Willow River causing flooding. This dam is in good repair, but the Village of North Hudson suggested additional study of options to prevent or reduce the potential for such “reverse topping” of the dam. The Lower Power Dam is co-owned by the Village, City of Hudson, and St. Croix County. No feasible solutions were immediately identified.

The Town of Hudson questioned whether recent dam removals on the Willow River has reduced flood control and may contribute to future flooding. Town officials have requested additional information, if available, or additional study of the impacts.



St. Croix Dam in St. Croix Falls

The largest dam potentially impacting St. Croix County should a failure occur is not actually located in the County. St. Croix Hydroelectric Dam at St. Croix Falls is owned by Xcel Energy, and is the only existing dam on the St. Croix River. As a power-producing dam, it is highly regulated under FERC licensing standards. In the very unlikely event of a failure at the St. Croix Dam, floodwater would take over four hours to reach St. Croix County allowing significant, though limited, time to evacuate and prepare. In comparing the dam hydraulic shadow analysis to the 100-

year floodplain maps for St. Croix County, the dam’s hydraulic shadow is very comparable to that of the 100-year floodplain of the County, being equal or less than the high hazard floodplain boundary in most instances.

Floodwaters from a failure of the St. Croix Dam, based on the dam inundation map, would reach the northern part of St. Croix County in 4.4 hours after the failure with an incremental rise in floodwaters of 4.6 feet. It would be nearly another 4 hours (8.3 hours total) before floodwater would reach Houlton with an incremental rise of 4.0 feet. This upper stretch of floodplain is relatively sparsely populated in large part due to significant amounts of Federal, State, and Boy

Scout camp lands, in addition to special development regulations, such as the National Scenic Riverway. As floodwaters travel south, a large area on the Minnesota side of the River in the Bayport area becomes a wide floodplain compared to the narrower floodplain of the Wisconsin side due to bluffs along the River. The result is a significant drop to only 1.9 feet in the incremental rise of floodwaters by the time they reach Lake Mallalieu 8.7 hours after the failure. And south of the Interstate 94 bridge, the inundation areas for dam failure are expected to be less than a 100-year flood event and are no longer mapped as part of the dam emergency action plan.

It is important to maintain up-to-date EAP Plans and IOM Plans for the large dams and the high- and significant-hazard dams. Emergency Action Plans with current contact information should be on-file with County Emergency Support Services Department and its Communications Center. Should new topographical information become available through a LIDAR project, mapping of dam shadows should be revisited for the high- and significant- hazard dams. This information can then be integrated into the CityWatch reverse 9-1-1 system, and considered as part of floodplain zoning and comprehensive planning efforts.

As documented previously, development and population growth in St. Croix County has been generally highest in those towns with significant surface waters. There continues to be development pressure along the shorelines of the County, including above and below dams. Overall, **the potential of damage-producing dam failure in St. Croix County is considered very low**, though the potential for damage and injury is high should failure of a larger dam occur. St. Croix County and its municipalities continue to work with the Wisconsin Department of Natural Resources to ensure proper maintenance of the dam facilities in the County and mitigate the potential vulnerabilities should failure occur.

ix. Drought

Summary—Drought

Risk: Over the longer-term, drought conditions have triggered a Governor's or Presidential declaration which included St. Croix County once every 5 to 10 years. But over the past 25 years, this frequency has increased to once every 3 to 5 years on average. Near-drought conditions or agricultural droughts impacting corn and beans in certain areas occur more frequently, but a formal disaster declaration is not always made. The amount of risk and potential drought impacts vary greatly by soil type.



Vulnerabilities: Drought vulnerabilities were rated as low-to-moderate overall, with good water quality and quantity over majority of County. Some private wells dried up during past droughts. However, agricultural crops have been the most substantially impacted in past droughts and livestock have great vulnerability to extreme heat. Large crop losses were experienced in 1988 and 2003. The 2007 market value of crops produced in the County was over \$142 million.

1. Drought impacts on crops can vary widely based on localized weather conditions, soil types, soil management practices, nutrient management, and crop types. Some of the sandier soils in the County can experience drought-like conditions almost annually. There is good multi-agency coordination and education in the County on drought, but due to high corn prices, some marginal lands are going into production and fence rows are being removed, which have moisture management and wind erosion implications.
2. Crop insurance mitigates most of the risk and the use of crop insurance is increasing, but specialty growers may not be fully insured. Other mitigation options are limited.
3. Some private wells have dried up during periods of drought in the past. Anecdotally, concerns have been expressed that high-capacity irrigation wells in north-central portions of the County may be lowering groundwater levels and affecting some private wells, though groundwater levels also have a history of significant variation throughout the area. The number of irrigation wells in the County has been increasing and groundwater use more than doubled from 1979 to 2005, but there is good recharge overall.

St. Croix County Public Health Hazard Vulnerability Assessment

The St. Croix County Public Health HVA rates drought as a 68% risk over a ten-year period given its high probability (3); moderate vulnerability (1.5); and limited available emergency management capabilities to deal with this threat (2.3).

Risk Assessment--Drought

The Hazard

A **drought** is an extended period of unusually dry weather which may be accompanied by extreme heat (temperatures which are ten or more degrees above the normal high temperature for the period). Drought conditions may vary from below normal precipitation for a few weeks to a severe lack of normal precipitation for multiple months.

There are two basic types of drought in Wisconsin—agricultural and hydraulic. **Agricultural drought** is a dry period of sufficient length and intensity that markedly reduces crop yields. **Hydraulic drought** is a dry period of sufficient length and intensity to affect lake and stream levels and the height of the groundwater table. These two types of drought may, but do not necessarily, occur at the same time. Soil types greatly influence agricultural drought risk. Some sandier, well-drained soils experience drought-like effects almost annually, and can experience the lowest yields when a true drought is declared.

Regional and Local Trends

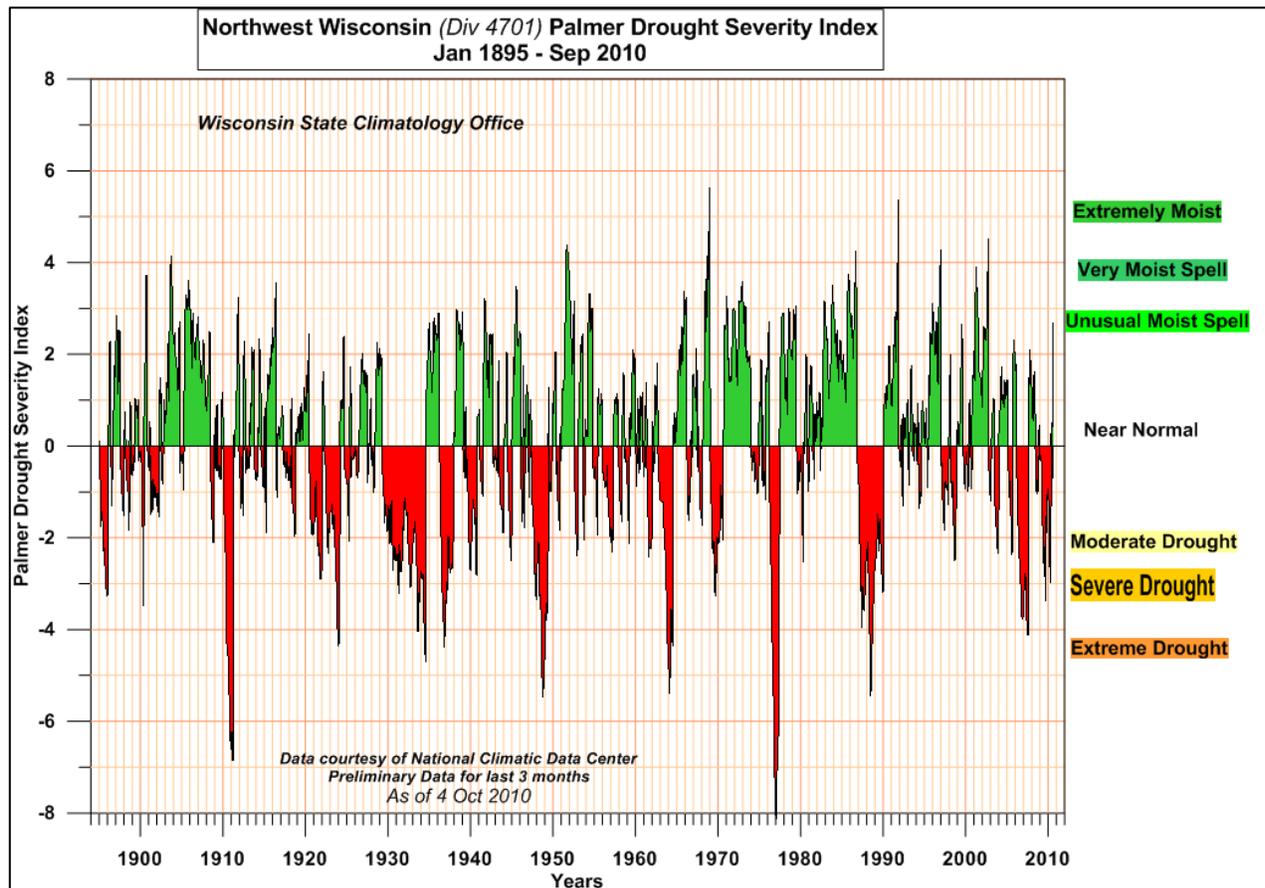
Drought is a relatively common phenomenon in Wisconsin and has occurred statewide in 1895, 1910, 1939, 1948, 1958, 1976-77, 1988-1989, 2003, 2005, 2006, 2007, and 2009. The drought of 1929-1934 (Dust Bowl Years) was probably the most significant in Wisconsin history, given its duration; some of areas of the State experienced drought effects until the early 1940s.

A Presidential Emergency Declaration was issued for the statewide drought in 1976-1977, during which agricultural losses in the State were estimated at about \$2.4 billion in today's dollars and some private wells in the County dried up. Point wells in certain areas of western Wisconsin also dried up during the drought of 1988-1989, and agricultural losses in the State were estimated at approximately \$2.5 billion.

Until recently, drought conditions have been significantly impacting corn and soybean yields in the County about once every ten years. However, northern Wisconsin has been experiencing ongoing drought conditions for much of the past decade as shown in **Figure 34**, with serious impacts to agricultural producers and hydraulic levels of surface and ground waters. As a result, the Governor has issued State of Emergency drought declarations, which included St. Croix County, during five of the last ten years (2003, 2005, 2006, 2007, and 2009).

Summer 2010 brought some significant relief from the region's drought conditions as a new record for the average statewide summer rainfall was established (18.65 inches). In June through September 2010, northwest Wisconsin experienced total monthly rainfall amounts of about 2 inches or more above the mean in each of these four months. Though the rainfall provided relief for agricultural crops, water levels in many surface waters remain below average and monthly rainfall amounts were still below average for six of the months of the year. But drought conditions would return for large areas of Wisconsin during 2012.

Figure 34. Northwest Wisconsin Drought Severity Index



As discussed previously, research from the Wisconsin Initiative on Climate Change Impacts⁴⁵ (WICCI) shows that annual precipitation in St. Croix County has increased significantly since 1950. During the summer months, average precipitation levels have changed little, with some areas experiencing slight increases and others experiencing decreases. Concurrently, St. Croix County's average annual temperatures for most of the County have increased 1.5°F to 2.0°F since 1950. WICCI has projected that St. Croix County's climate will continue to become wetter overall, with more precipitation during the winter months, and much higher temperatures.

Relative Level of Risk

Drought has become a frequent phenomenon over the past decade. **If weather patterns return to longer-term trends, drought conditions can be expected to occur once every five to ten years on average. But, based on the last twenty-five years, we can expect a drought year once every three to five years.** The frequency of drought events, especially agricultural drought, could be expected to increase under the projected scenarios provided by the Wisconsin Initiative on Climate Change Impacts.

⁴⁵ Wisconsin Initiative on Climate Change Impacts website: www.wicci.wisc.edu

Vulnerability Assessment—Drought

Snapshot of St. Croix County's Agricultural Economy

Drought can impact parts or all of St. Croix County's agricultural base. Almost 62 percent of all assessed lands in the County are agricultural. In 2007, the County ranked very high among all Wisconsin counties in a number of agricultural statistics:

#6	Horses and ponies	#12	Broilers and other meat-type chickens
#6	Turkeys	#14	Hogs and pigs
#9	Poultry and Eggs	#15	Corn for silage
#9	Aquaculture	#17	Corn for grain
#10	Oats for grain	#18	Nursery, greenhouse, floriculture, and sod
#12	Soybeans for beans		

In 2007, St. Croix County ranked 31st in the State of Wisconsin in the market value of agricultural products sold at \$142,521,000.

Other notable trends include:

- From 1987 to 2007, the County experienced a 27.5 percent reduction in assessed agricultural land (or -97,977 acres).
- The number of farms in St. Croix County decreased from 1,864 farms in 2002 to 1,808 farms in 2007.
- The average farm size increased by three acres from 2002 (166 ac.) to 2007 (171 ac.).
- Between 2002 and 2007, the number of farms that sell agricultural products to individuals for consumption (direct market farms) increased from 112 farms to 136 farms.
- In 2007, St. Croix County had 59,436 head of cattle and calves. The number of dairy farms has decreased 69.7 percent from 671 farms in 1987 to 203 farms in 2007.
- Over 77 percent (almost \$111 million) of the market value of products sold in 2007 were from livestock, poultry, and their products. At \$80,409,000 of market value, milk and other dairy products constituted 56 percent of the County's total agricultural product sold.
- Over \$32.2 million of the market value of products sold in 2007 were from crops including nurseries and greenhouses. Grains, oilseeds, dry beans, and dry peas account for over \$23.62 million.
- From 2002 to 2007, direct market farms in St. Croix County which sell products directly to individuals increased by 21 percent, with 136 farms in 2007 selling over \$797,000 in product.

Drought Vulnerabilities and Potential Impacts on Agriculture

It is very unlikely that any single hazard would endanger all livestock or crops, though large proportions could be at-risk from a prolonged, severe drought or the introduction of a new pest or disease. With milk production constituting a very large percentage of the total market value, yet being concentrated in an increasingly smaller number of farms, threats to this industry are particularly important.

Large-scale impacts to crops or livestock from a natural hazard can also have devastating impacts on the local economy, related industries (e.g., food processing), and related service providers. The state of the agricultural economy is tenuous for the local farmer, and a hazard event may result in farmers making fewer purchases or getting out of the business altogether. Our local, small town economies are already going through significant transitions with the decreasing number of farms. Additional farm losses would further impact local businesses (e.g., implement dealers, feed stores, granaries, food processing, banks, and general goods). To compensate for additional farm losses, the costs for such services may also be increased, or the local businesses may close, further burdening the remaining farmers in the area.

In general for Wisconsin, droughts have the greatest impact on agriculture. Even small droughts of limited duration can significantly reduce crop growth and yields, while making crops more susceptible to pests and diseases. More substantial events can decimate croplands and result in a total loss. Droughts also greatly increase the risk of forest fires and wildfires because of extreme dryness. The loss of vegetation due to drought can result in flooding, even from an average rainfall.

The vulnerability to agricultural drought is high for St. Croix County. Crop yields can dramatically decrease; and livestock, especially those kept in close quarters, can experience decreased milk production or even death. Since the severity of drought can vary, determining its financial impacts on crop and livestock operations is difficult.

Table 33 provides an example of how one recent, countywide drought impacted crop yields by comparing crop production for the 1988 drought year against the average production for 1980 through 2000.⁴⁶ Bushels per acre provides the best indicator, since it is not dependent on acres planted. For both grain corn and soybeans, there was nearly a 50-percent loss in bushels per acre yield for the 1988 drought year and total bushels produced were over five times lower in 1988 compared to the 1980 to 2000 period. Drought losses were so significant in 1988 that approximately 21 percent of the soybean acreage planted was not harvested, while over 67 percent of the grain corn acreage planted was never harvested.

⁴⁶ More recent data is available, but ethanol demands for corn beginning about 2007 resulted in significant increases in corn acreage being planted with potential related impacts to average yields as some marginal or formerly fallow lands were put into production. Utilizing older data largely avoids such concerns with grain corn, though the number of acres of soybeans harvest did vary significantly from 1980 to 2000.

Table 33. Comparison of Average Annual Soybean & Grain Corn Yields⁴⁷

Years	Bushels per Acre Yield		Total Bushels Produced		Est. Value Produced (based on 2010 prices)	
	Grain Corn	Soybeans	Grain Corn	Soybeans	Grain Corn	Soybeans
1988 Drought	54.5	18.5	2,345,000	237,000	\$12.5 mil.	\$2.7 mil.
1980 thru 2000 Avg	108.8	32.5	7,638,067	575,144	\$40.9 mil.	\$6.6 mil.

During the 2003 drought and related winter kill, soybean yields in St. Croix County were up to 48 percent lower and grain corn yields were up to 17 percent lower than the averages for 2000-2005 (excluding 2003).

Such losses are a significant financial hardship, especially for an industry that is struggling overall. In 2010, grain corn prices averaged \$5.35 per bushel and soybeans averaged \$11.40 per bushel.⁴⁸ Using 2010 prices, total grain corn and soybeans losses for 1988 are estimated at around \$28.4 million and \$3.9 million, respectively, for each of these crop types based on total bushels produced.

Typically, farmers will supplement feed before allowing a drop in milk production due to drought. Additional feed purchases could also vary based on drought severity and length, but \$1,500 of additional feed per mature cow is not unrealistic (\$1,500 x 60,000 head of cattle = \$90 million) resulting in many millions in required supplemental feed for St. Croix County farmers under a severe, single-season drought event. Drought conditions can also result in the build-up of nitrates in feed and silage to levels that are toxic to cattle. In recent years, there have been a small number of cattle deaths in the region due to nitrate toxicity. Extreme heat and drought can also result in the build-up of toxic gases within grain silos to lethal levels or result in fires or explosions. Extreme heat within large confined livestock buildings can also be a concern.

The far majority of local farmers understand and practices good management to reduce the vulnerabilities associated with drought conditions, but some knowingly take chances. Most farmers carry some type of crop insurance, especially in drought-prone areas, and crop insurance use has been on the rise. Most farmers also participate in Farm Service Agency programs which require multi-peril crop insurance and protect losses at average county yields. But such insurance is very expensive, and participation will often increase as the price received for the commodity increases. It is typically not cost-effective to insure low-value crops, such as alfalfa. And for many smaller specialty growers and community-supported agricultural operations, it is extremely cost prohibitive to carry crop insurance.

During the planning process, some fairly recent changes in agricultural practices were noted by those interviewed as possibly being reasons for concern. Due to high corn prices and larger equipment, more land is going into production. Some of the lands returning to production are droughty, sandier soils. In other cases, fence rows and tree lines are being removed, and road

⁴⁷ USDA-NASS, Agricultural Statistics Database, <<http://www.nass.usda.gov:81/ipedb/>>.

⁴⁸ http://www.nass.usda.gov/Statistics_by_State/Ag_Overview/AgOverview_WI.pdf

rights-of-ways are being encroached upon, which have implications for moisture management and wind erosion, as well as roadway safety.

Other Potential Drought Vulnerabilities

Drought conditions can stress forest vegetation, making it more vulnerable to certain pests and diseases, thereby increasing the potential for wildfires. Drought conditions can also dry up private wells and ponds, as well as impact surface and ground water levels. Private wells dried up within St. Croix County in 1976 and 1988/1989. Under such circumstances, wells may need to be re-drilled at significant cost; or a farmer whose livestock relied on a pond in the past may have to install a well and pump to provide water for stock.

Agricultural irrigation has been increasing in the County due to recent drought events, which does have the potential to further impact groundwater levels in some areas. The sizable aquaculture industry has also increased agricultural groundwater demands. As of May 2012, the Wisconsin DNR reports that 252 high-capacity wells have been permitted for St. Croix County, of which 145 are used for irrigation, 31 are municipal water supplies, and 32 are for industrial use.⁴⁹

As surface waters dry-up during period of drought, shoreline areas are more vulnerable to erosion, water temperatures can change, and contaminants and nutrients become concentrated which can further contribute to toxicity, eutrophication, and fish kills. Some of the longer-term consequences of rising temperatures and drier summers were discussed previously during the discussion on climate change, such as the loss of cold-water trout streams and further loss of surface waters through increasing evaporation.

Vulnerable Critical Facilities

No critical facilities or infrastructure are directly vulnerable to drought, with the exception of water supplies. Overall, private and community wells have excellent water quality and quantity to meet existing demand. Groundwater quantity in St. Croix County is good overall.

But, the demand for water is increasing. Between 1979 and 2005, it is estimated that water use in St. Croix County more than doubled from 6.2 million gallons per day to 15.8 million gallons per day.⁵⁰ Industry and agricultural irrigation are identified as the primary reasons for this increase. And when an extreme drought occurs (e.g., 1976, 1988), or if prolonged droughts continue to increase in frequency, it should be expected that some private wells may need replacing and water demands for irrigation would further increase.

⁴⁹ Wisconsin Department of Natural Resources *High Capacity Well Information* website.
<http://dnr.wi.gov/org/water/dwg/hicap.html>

⁵⁰ USGS and UW-Stevens Point-Wisconsin Center for Land Use Education.
<http://wi.water.usgs.gov/gwcomp/find/stcroix/index.html>

Unique Jurisdictional Risks or Vulnerabilities—Drought

During meetings with cities and villages, no unique risks or vulnerabilities related to drought were identified. Some communities institute watering bans or limits during drought periods. For instance, the City of River Falls adopted a year-round odd/even day watering schedule a number of years ago. No cities or villages reported fire protection concerns due to limited water quantity, though additional municipal wells will be needed as growth continues. A possible exception to the previous statement is that the water main providing water from the City of Hudson to the Village of North Hudson is in need of more capacity.

x. Pandemic Flu



Public Health
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Summary—Pandemic Flu

Risk: *Pandemic flu was rated by the Steering Committee as having a relatively low probability of occurrence, but higher than some parts of the State given the County's proximity to the Minneapolis-St. Paul urban area. H5N1 is more deadly, but no human cases reported to date in the U.S. H1N1 is less deadly, but some reports in Wisconsin and Minnesota. Viruses can mutate and increase in deadliness, spread more easily, or become more resistant to vaccines.*

Vulnerabilities: *As with risk, pandemic flu vulnerability depends on the type of virus. The vulnerability from H5N1 is high, with approximately 59% of the documented cases since 2003 resulting in death. A CDC study estimated a death rate among the U.S. Population of 0.03% to 0.09% should a pandemic outbreak occur. H1N1, while more widespread, has been less fatal. Depending on the virus, vaccines may not be available at the outbreak, while Tamiflu and other antivirals will likely be in short supply.*

1. Once the Points-of-Distribution (PODs) are finalized, educational outreach and training is needed to inform emergency personnel, local officials, and communities. A tabletop exercise or functional exercises is under consideration for 2013.
2. County and local departments and officials must continue to strive to understand respective roles as set forth in existing plans and policies. It is important not to assume that another department or agency will be available to perform a task and to have a general idea of the resources (e.g., staff, equipment) which each department can provide. During a large pandemic, the numbers of volunteers, staff, and agencies responding may be significantly lower due to quarantine, illness, or fear of contracting the virus.
3. Public panic could ensue should a public health emergency occur, such as a pandemic flu outbreak. Security and related enforcement could become a major issue at pharmaceutical distribution sites, area hospitals, and at other such locations.
4. The County Public Health Office has limited medical supplies which would be insufficient for a large-scale virus outbreak or mass disaster. It may take up to 48 hours before Federal assistance is available. Additional preparedness coordination between the County Public Health Office, the hospitals, and other health care providers in the County is recommended to identify how resources may be maximized.

5. Though the availability of vaccines and other resources will be similar, response differences exist between Minnesota and Wisconsin. The differences are primarily policy and procedural, such as how the vaccines will be distributed. This could be a source of confusion during an event given the County's location within the Twin Cities' media market.

St. Croix County Public Health Hazard Vulnerability Assessment

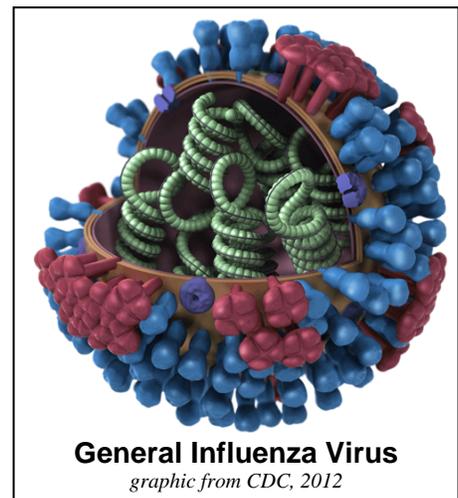
The St. Croix County Public Health HVA rates pandemic flu as a 35% risk over a ten-year period given its moderate probability (2); substantial vulnerability (2.5); and substantial available emergency management capabilities to deal with this threat (1.3).

Risk Assessment – Pandemic Flu

The Hazard

A **pandemic** is a global disease outbreak. An **influenza pandemic** occurs when a new influenza virus emerges for which there is little or no immunity in the human population, begins to cause serious illness, and then spreads easily person-to-person worldwide.

Pandemic flu was added to the plan's scope in 2006 largely due to Avian flu. **Avian (or bird) flu** is caused by influenza viruses that occur naturally among wild birds. The high-pathogenic H5N1 variant (Asian Bird Flu) is deadly to domestic fowl and can be transmitted from birds to humans. Though the H5N1 virus usually does not infect people, rare cases of human infection have been reported (less than 1,000 worldwide) as will be summarized later in this report. There is no human immunity and no commercial vaccine is available. However, clinical trials to develop a vaccine for H5N1 are underway and there has been substantial Federal funding for research on a variety of antiviral drugs and immune system boosters.



There is a low-pathogenic H5N1 variant (North American Bird Flu) which commonly occurs in wild birds. In most cases, it causes minor sickness or no noticeable signs of disease and is rarely fatal in birds. Unless otherwise specified, the avian flu or H5N1 referred to in this report refers to the more highly-pathogenic variant or Asian H5N1.

Since 2008, the H1N1 subtype of the Novel Influenza A virus (or **swine flu**) has been receiving particular attention. It is sometimes called swine flu since many of the genes in the virus are similar to such viruses that normally occur in swine in North America. However, H1N1 spreads from person-to-person much the same as regular influenza. Other Novel Influenza A variants exist (e.g, H3N2), which are also of concern.

U.S. Trends

Historically, the 20th century saw three large pandemics of influenza impacting the United States:

- 1918 influenza pandemic caused at least 675,000 U.S. deaths and up to 50 million deaths worldwide
- 1957 influenza pandemic caused at least 70,000 U.S. deaths and 1-2 million deaths worldwide
- 1968 influenza pandemic caused about 34,000 U.S. deaths and 700,000 deaths worldwide

H1N1 was declared a pandemic by the World Health Organization (WHO) in June 2009 and resulted in about 17,000 deaths worldwide before the pandemic was declared over in August 2010. During the H1N1 outbreak from April 2009 through March 2010, an estimated 43-88 million H1N1 cases and 192,000-398,000 H1N1-related hospitalizations were estimated to have occurred in the United States according to the Center for Disease Control (CDC).⁵¹ The CDC further estimated that 8,720 to 18,050 H1N1-related deaths occurred during the same timeframe. H1N1 in the United States continues to spread and there is some concern about the long-term effectiveness of current vaccines. During the 2010-2011 influenza season, five cases of Novel Influenza A viruses were reported in the United States, including one in Wisconsin and two in Minnesota; all patients full recovered from their illness.

What is the Current Distribution of Bird Flu (H5N1)?

To date, there has been no human-to-human transmission of bird flu. It is not considered a pandemic. Since 2003, there have been 601 human cases of bird flu reported worldwide of which 354 (59%) resulted in death. However, this death rate may be misleading, since it is uncertain how many individuals contracted the infection, were not diagnosed, then later recovered. Though receiving less attention in the media, this remains a very active pandemic with the number of cases reported in 2011 (62 cases) greater than the number of reports from 2003, 2004, 2008, and 2010.

H5N1 has spread from ten countries in 2006 to fifteen confirmed countries by 2012, with 485 additional cases and 274 more deaths. From 2003-2012, the following confirmed cases of H5N1 were reported to the World Health Organization:

Country	cases	deaths
Azerbaijan	8	5
Bangladesh	6	0
Cambodia	20	18
China	42	28
Djibouti	1	0
Egypt	166	59
Indonesia	188	156

⁵¹ U.S. Center for Disease Control. CDC Estimates of 2009 H1N1 Influence Cases, Hospitalizations, and Deaths in the United States, April 2009-March 13, 2010. http://www.cdc.gov/h1n1flu/estimates/April_March_13.htm

Iraq	3	2
Lao People's Democratic Republic	2	2
Myanmar	1	0
Nigeria	1	1
Pakistan	3	1
Thailand	25	17
Turkey	12	4
Vietnam	123	61
Total	601	354

Source: World Health Organization as of 4/5/12

The H5N1 virus has been found in wild birds or poultry throughout most of Asia and parts of Europe and Africa, but no migratory birds in North or South America to date have tested positive for the severe strain of avian flu (Asian H5N1).

In 1983-1984, approximately 17 million chickens, turkeys, and guinea fowl were euthanized in Virginia and Pennsylvania to contain and eradicate Asian H5N1. More recently in 2004, an Asian H5N1 outbreak among chickens in Texas was quickly eradicated. Less severe strains of avian influenza are routinely found and eliminated in U.S. poultry flocks, and a vaccine for poultry has been shown to be effective against the current S.E. Asian H5N1 virus. These successes demonstrate the ability of the USDA to work with states and local governments to contain such outbreaks.

Relative Level of Risk

The steering committee for this planning project rated the risk of future occurrence of pandemic flu in St. Croix County as relatively low with a score of 1.83 out of 5.0. Vulnerability and potential negative impacts should an event occur was ranked much higher at 2.73.

Currently, H5N1 is the most significant potential pandemic in terms of vulnerability, given the death rate if contracted. However, H5N1 is not the same as the Spanish Flu pandemic of 1918. While the H5N1 virus has the potential to mutate or change into a virus that can be transmitted from human to human, it has not done so to date. The risk of the risk of the H1N1-variant occurring in the County is likely higher, but its death rate has been much lower compared to H5N1.

The probability of mutation of H5N1 or another pandemic is unknown. As more people are infected, the opportunities for a strain to mutate into another strain which can be spread more easily. This demonstrates the importance of the research for a H5N1 vaccine in order to halt the spread of the current H5N1 virus as a means of decreasing the probability of mutation.

If mutation should occur, it is not certain if existing vaccines and medications will offer effective treatment, or how difficult it will be to produce a new vaccine. Flu viruses can also further mutate and become resistant to certain medications over time. It is also not certain how fast the mutated virus would spread.

Pandemic flu risks will likely always be slightly higher for St. Croix County compared to many of the more rural areas of Wisconsin, given the County's growing population and proximity to the Minneapolis-St. Paul urban center. In 2000, over 96% of the County's working residents commuted to their place of employment. About 81% commute outside their community, and 51% commute to a workplace outside of St. Croix County. And 39% (over 13,200 St. Croix County residents) commute to the Minnesota counties of Washington, Ramsey, and Hennepin.

Vulnerability Assessment – Pandemic Flu

As discussed earlier, of the 601 confirmed human H5N1 cases since 2003, 354 (or 59%) resulted in death. This death rate is likely inflated since there have probably been unreported cases where individuals have contracted the virus but recovered. Regardless, the death rate for this virus, if contracted, is quite high. It is uncertain whether a mutated version of virus would be as deadly. Other pandemics, such as H1N1, have been less deadly to date, though future pandemics could be even more deadly. For these reasons, preparedness at the local level must take an all-hazards approach, while continuing to monitor health reports.

The current annual flu shots do not offer protection against H5N1, as they do not target this strain, but do incorporate a vaccine against the H1N1 strain. If the H5N1 virus should become a human virus, it may take several months to develop a vaccine specific to the strain. However, it is possible that existing anti-viral drugs (e.g., Tamiflu) may be effective against a pandemic strain, though a vaccine would likely initially be in short supply.

If H5N1 changes into a human virus or other such pandemic occurs, it would likely have vast impacts on our society and economy. An initial panic among the public could occur, requiring additional security measures. A policy of social distancing would be recommended until the virus is controlled to limit the exposure and transfer of the virus. This policy includes closing schools and certain places of employment, as well as canceling large public or community events. Travel could be limited. Those potentially exposed to the virus, but not yet sick, could be quarantined.

Researchers at the Center for Disease Control and Prevention in Atlanta, GA, evaluated the potential impacts of a pandemic flu event which is summarized below:

“We estimated the possible effects of the next influenza pandemic in the United States and analyzed the economic impact of vaccine-based interventions. Using death rates, hospitalization data, and outpatient visits, we estimated 89,000 to 207,000 deaths; 314,000 to 734,000 hospitalizations; 18 to 42 million outpatient visits; and 20 to 47 million additional illnesses. Patients at high risk (15% of the population) would account for approximately 84% of all deaths. The estimated economic impact would be US \$71.3 to \$166.5 billion, excluding disruptions to commerce and society. At \$21 per vaccinee, we project a net savings to society if persons in all age groups are vaccinated. At \$62 per vaccinee and at gross attack rates of 25%, we project net losses if persons not at high risk for complications are vaccinated. Vaccinating 60% of the population would generate the highest

economic returns but may not be possible within the time required for vaccine effectiveness, especially if two doses of vaccine are required.”⁵²

The above numbers should be kept in perspective given the total U.S. population of over 288 million in 2000. These estimates have a death rate of between 0.03% and 0.09% of the U.S. population. Hospitalizations would be equivalent to 0.10% to 0.25% of the population, if no individual is hospitalized more than once.

For discussion purposes only, this could be further extrapolated based on St. Croix County’s population. Of the 84,345 County residents as of 2010, this would be equivalent to 25 to 75 deaths and 84 to 211 hospitalizations if the County is impacted similarly to the nation as a whole.

Current Mitigation and Planning Measures

International

Ever since SARS, there has been a higher level of awareness, cooperation, monitoring, and reporting among public health organizations around the world regarding the prospect of another large-scale disease or viral outbreak. Cooperation between national governments and the World Health Organization has improved tremendously, and public health ministries are on the alert for the first signs of an influenza pandemic.

Federal

A wealth of information on avian and pandemic flu can be found at <http://www.pandemicflu.gov/> which is managed by the U.S. Department of Health and Human Services. The Federal government has implemented numerous policies and initiatives regarding avian and pandemic flu, such as:

- In 2005, the *National Strategy for Pandemic Influenza* was issued which guides our Nation’s preparedness and response to an influenza pandemic.
- In 2006, the *Implementation Plan for the National Strategy* was issued which identifies more specific actions, sets expectations, and guides Federal agencies in the development of their own plans.
- Many Federal departments and agencies have established their own websites with information on pandemic flu plans, policies, resources, and updates on related activities.
- The USDA manages the Highly Pathogenic Avian Influenza Early Detection Data System (HEDDS) which monitors and provides data on the testing of migratory birds for avian flu under the Interagency Screening Plan.
- The USDA maintains trade restrictions on the importation of poultry and poultry products from countries affected by Asian H5N1.

⁵² Martin I. Meltzer, Nancy J. Cox, and Keiji Fukuda. “The Economic Impact of Pandemic Influenza in the United States: Priorities for Intervention”. Center for Disease Control and Prevention. Atlanta, GA. <http://www.cdc.gov/ncidod/EID/vol5no5/meltzer.htm>.

As a result of the major Mississippi Valley flooding of the 1990s, World Trade Center bombings of 2001, the 2005 Katrina Hurricane, SARS, and other natural disasters in recent decades, the Federal government has also been increasing emphasis on emergency planning and related funding in general. Efforts such as the National Incident Management System (NIMS) will be valuable, regardless of the disaster.

State of Wisconsin

Information on pandemic flu as it relates to Wisconsin can be found at the Wisconsin's Pandemic Flu Resource website (<http://pandemic.wisconsin.gov/>), including the following initiatives which have been developed or are being implemented:

- In March 2006, the State entered into a planning resolution with the U.S. DHHS which detailed shared and independent responsibilities.
- A Statewide Pandemic Readiness Summit was held in March 2006.
- *Wisconsin Pandemic Influenza Preparedness Plan*
- *Response to an Animal Influenza Emergency plan*
- *Wisconsin Emergency Human Services Response Plan*
- *Wisconsin Mass Clinic Plan*

Local and regional planning within the State of Wisconsin has been primarily through thirteen consortia representing different regions and the Tribal governments.

Local and Regional Activities

The Public Health Office within the St. Croix Department of Health and Human Services has been the primary coordinating entity on pandemic flu within the County, though available staff time to work on this topic is limited. St. Croix County's Public Health Office has developed a Public Health Emergency Plan specific to the County. A Special Populations Plan has also been developed. Much of this preparedness at the local level is not specific to pandemic flu, but is an all hazard approach. Development of a mortuary services plan is a recognized need.

All Public Health Office staff have been trained on NIMS and continues to work through the ICS training program, in addition to on-going discussions and brief training sessions as part of regular staff meetings. This repetition in training helps to increase confidence and familiarity in emergency policies and procedures if an event should occur. During the Summer of 2007, updates to both the Mass Clinic Plan and Pandemic Flu Plan portions of the County Public Health Emergency Plan were completed. Each portion has been tested locally through drills and general public education occurs during the flu season.

Updating preparedness plans is ongoing and the Public Health Office is currently working on the points of distribution (PODs) for vaccines should they be needed. Memoranda of Understanding and related plans are in place with St. Croix Central (Hammond) and New Richmond schools as mass clinic dispersing sites for pharmaceuticals. Once the PODs are identified, it is

recommended that additional exercises with all key players be held, along with related educational outreach for local officials.

A good local resource for pandemic information and coordination is the Western Wisconsin Public Health Readiness Consortium (WWHRPC), though St. Croix County is not a member. WWHRPC's purpose is to assist their members develop local capacity to effectively respond to all types of health emergencies including bioterrorism, infectious disease outbreaks, and natural disasters through networking, coordinating, standardizing, and centralizing resources and planning efforts among members. Additional information regarding WWHRPC can be found at their website: www.wrpphp.org.

Vulnerable Critical Facilities

Pandemic flu impacts would not be so much on the critical facilities themselves, but to the employees and users of those facilities. A virus has a higher potential to be spread quickly within facilities where many persons congregate or reside, such as schools and long-term care facilities. Schools and long-term care facilities also serve children and the elderly who may be vulnerable to virus impacts. Hospitals are also particularly vulnerable for these reasons, plus due to their role during an outbreak. Their services can quickly become overburdened during a large outbreak. Security for hospitals, clinics, PODs, and other shelters during an event was identified as a concern during the planning process.

Unique Jurisdictional Risks or Vulnerabilities—Pandemic Flu

There were no risks or vulnerabilities unique to the cities and villages identified. During meetings with city and village officials, most had limited familiarity with pandemic flu risks and plans, relying on County Public Health to take the lead on such matters. A number of communities had questions about the PODs, such as where they are to be located, who had access, what are the differences between the open and closed PODs, and is there adequate security available.

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SECTION IV. CURRENT MITIGATION ACTIVITIES

In the context of the hazards facing St. Croix County, it is important to consider the mitigation activities and strategies already implemented. St. Croix County and its municipalities have been proactive in mitigating the impacts of such hazards. The following section summarizes the current mitigation activities that are being carried out within the County and demonstrates a strong tradition of communication and inter-agency cooperation. **The focus of this section is on natural hazards, partnerships, and all hazard mitigation and preparedness activities.** Mitigation activities related to specific non-natural hazards, such as hazardous materials, school violence, nuclear accident, pandemics, and cyberattack, are discussed in their respective previous subsections.

Appendix H provides additional insight into recent or current mitigation activities for each of the participating cities and villages in the County, along with some of the related challenges for these communities. Section V discusses those mitigation activities completed for each of the strategy recommendations from the County's 2008 mitigation plan.

A. PLANNING AND REGULATORY ACTIVITIES

For a broad review of the various plans and land use policies in St. Croix County, please refer to the *Inventory of Plans, Programs, and Land Use Policies in West Central Wisconsin* compiled by WCWRPC in October 2008. More recent information can be obtained through the St. Croix County Planning and Zoning Department.

Comprehensive Planning

St. Croix County is in the process of developing its comprehensive plan but the majority of its municipalities have adopted comprehensive plans under Wisconsin Statute §66.1001. All incorporated cities and villages have adopted comprehensive plans in the last few years. These plans provide a vision for future development and identify strategies to help achieve this vision. Mitigating hazards and other emergency preparedness measures can be an important component of these plans, though such discussion within most plans has been typically limited to floodplain management and emergency services discussion to date. Some municipalities are actively revisiting their ordinances based on the recommendations of their comprehensive plans.

Building & Sanitary Permits

Building permits under the Uniform Dwelling Code are required for all new one- and two-family dwellings and are administered through the local city, village, or town. For three or more attached dwelling units and commercial structures, the Wisconsin Commercial Building Code (CBC) applies. The CBC is based on



models from the International Building Code, the International Mechanical Code, the International Energy Conservation Code, and the International Fuel Gas Code. Together, these codes offer building standards appropriate to Wisconsin which help to mitigate the impacts of weather events, such as design wind loads, snow loads, and plan review. However, the UDC does not cover dwellings built prior to June 1, 1980, accessory buildings, or mobile (or manufactured) homes. Local municipalities may choose to adopt construction and heating standards for older homes. Mobile home construction is subject to Federal standards, and new mobile homes must have foundations with tie-downs. Other County regulations require emergency plans for mobile home parks, though safe room or storm shelters are not currently required.

Towns can either enforce the Uniform Dwelling Code or opt for County enforcement. The villages and cities individually enforce the UDC within their respective communities. In addition, a Sanitary Permit through St. Croix County is also required for new private, on-site wastewater treatment systems (POWTS) Ordinance to ensure the proper siting, design, installation, inspection, and management of private sewage systems and non-plumbing sanitation systems. Cities, villages, and sewage districts maintain their own permitting requirements for connection to or extension of sanitary sewer systems.

Land Use Controls

At the county level, the ordinances described in this section are primarily enforced through the St. Croix County Planning and Zoning Department. Many cities, villages, and towns also enforce similar ordinances for their jurisdictions.

Zoning – Seventeen of the County’s 21 towns participate in County zoning. The Town of Hudson enforces its own zoning regulations, while the Towns of Cady and Forest remain unzoned. The St. Croix County Zoning Ordinance establishes the typical zoning districts such as exclusive agricultural, single-family residential, highway business, and forestry, as well as some basic standards for manufactured or mobile home parks. Community safe rooms or emergency operating plans are not currently required for County mobile/manufactured home parks, but such planning or shelters can be required as conditions of a special exception permit.

County zoning personnel are not aware of any new mobile home parks in St. Croix County within the last 25 years and current land values discourages such development in many western portions of the County. All of the cities and villages in St. Croix County have adopted and enforce their own zoning ordinances. At least ten of the town governments have adopted their own mobile home park ordinances more restrictive than the County standards.

Subdivision Regulations – The County’s subdivision regulations cover all unincorporated areas of the County and include a site plan review process, stormwater management requirements, and erosion controls. The regulations also provide some basic standards for private roads and the Department works with appropriate emergency services personnel as needed to ensure the safety of road design when regulated by the County. For instance, subdivisions with 30 or more lots are required to include a second road outlet, in part for safety reasons. For land divisions within well advisory areas (e.g., deep well casing areas), certified survey maps and subdivision plats must include disclosures before recording. And, as required on occasion in the past, special

studies can be required for the identification of closed depressions. In addition, many of the ten towns and all of the villages and cities have adopted their own local subdivision regulations.

Floodplain Ordinances – The State of Wisconsin, under Wisconsin Statute 87.30(1), requires counties, cities, and villages to adopt and enforce floodplain zoning. In addition, Wisconsin Administrative Code NR116, Floodplain Management Program, has been promulgated for the protection of property and public investments from the effects of flooding.

Development within the 100-year floodplain is determined through the use of the Digital Flood Insurance Rate Maps (D-FIRMs) developed by FEMA and modified through surveys as needed. The FIRM maps for St. Croix County were recently updated and became effective in March 2009. St. Croix County and those cities and villages with designated floodplains concurrently updated their floodplain ordinances to be consistent with the latest WDNR model at that time and adopted the new FIRM maps.

The existing St. Croix County Floodplain Zoning Ordinance applies to all unincorporated areas countywide. Based on the State of Wisconsin model, the County's ordinance includes policies and standards for the overall floodplain district, the floodway, the flood fringe, and for floodproofing. No mobile homes are allowed to be located in the floodplain. All permit applications are reviewed to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a floodprone area, all new construction and substantial improvements shall be designed or modified and adequately anchored to mitigate flooding impacts. Development pressure for construction in floodplains continues in some areas, but such development in the floodway is tightly regulated and enforcement of existing floodplain ordinances is improving. The County Code Administrator has been identified as the National Flood Insurance Program (NFIP) Coordinator for St. Croix County.

Shoreland Protections – *St. Croix County Code of Ordinances Land Use and Development—Chapter Chapter 17—Zoning, Subchapter III—Shoreland Zoning 17.25-17.35* regulates development within shoreland areas. Shorelands provide valuable habitat for both aquatic and terrestrial animals and vegetation, and also act as buffers and thus serve to protect water quality. However, shorelands are also considered prime residential building areas because of their scenic beauty. Recognizing this conflict, and in order to maintain the environmental, recreational, and economical quality of our water resources, the State of Wisconsin requires counties to adopt and enforce a shoreland ordinance.

As required by the State, shorelands are defined as:

- all land within 1,000 feet of the ordinary high water mark of a lake, pond or flowage; or
- all land within 300 feet of the ordinary high water mark of a river or stream or to the landward side of the floodplain, whichever is greater.

Each county must meet or exceed the minimum state standards for shoreland protection. The identified shoreland areas are based on the standards as defined in the St. Croix County Shoreland Ordinance. The ordinance establishes shoreland and wetland zoning districts in which

uses are restricted, setbacks required, and a land-use run-off rating established. This is an important stormwater management tool which also protects water quality.

Stormwater Management - Stormwater and water quality management is planned for and enforced at a variety of jurisdictional levels, including the County and local governments and private properties. These concepts are also incorporated into variety of different plans and permits, a few of which are noted here.

Chapter 13 of the St. Croix County Land Use and Development Code of Ordinances regulates land division in the county, including stormwater management, erosion and sediment control standards. This ordinance applies to all of the unincorporated towns, unless a town adopts their own ordinance which is at least as restrictive of the county ordinance. All of the cities and villages have adopted similar local land division ordinances. It is also not uncommon for communities to also include requirements related to stormwater management within zoning or land division ordinances.

Lower St. Croix National Scenic Riverway – The Lower St. Croix River has been identified by the State of Wisconsin as an important scenic and recreational waterway for the State and included the river in the National Wild and Scenic Rivers Act. Municipalities with a portion of their area with the Riverway must adopt zoning ordinances to minimize development impacts. The ordinances adopted by St. Croix County not only preserve the scenic and recreational value of the Riverway, but also offer important flood mitigation and erosion controls. However, the Riverway regulations can also limit flood mitigation alternatives which have an aesthetic impact.

St. Croix Planning and Zoning Department

Most of the previously mentioned planning and regulatory activities are managed through the County Planning & Zoning Department. This Department also manages the County's Clean Sweep Program which collects and disposes unwanted hazardous waste. This service enables agricultural producers, County residents, and many small businesses to safely dispose of unused hazardous chemicals and other potentially harmful items, helping to keep these potential contaminants out of wastewater systems and groundwater. However, due to budget cuts at the State level, the residential and business program has been scaled back to once a year, with option of taking materials to Washington County, MN. Pharmaceutical and agricultural clean sweep days are held once a year.

St. Croix County has established a land information office within their Planning and Zoning Department. Using geographical information systems (G.I.S.) technology, this office collects, develops, and distributes mapping information for St. Croix County, including maintaining the County's parcel maps. An online land information database is also now available.

St. Croix County Land and Water Conservation Department

St. Croix County has an active Land & Water Conservation Department responsible for a variety of educational and enforcement activities to protect the farmlands, waters, and natural resources of the County under the guidance of the *St. Croix County Land and Water Resource Management Plan*. These activities are carried out with support from other County, State, and

Federal agencies, such as WDNR, FSA, and NRCS, and in cooperation with local communities, residents, and interested stakeholders.

This Department provides water management planning for surface waters, works closely with lake districts and lake associations in the County, manages the conservation reserve enhancement program contracts, and performs a wide variety of other related activities. Many of their programs focus on mitigating the potential non-point sources of pollution or protecting flood storage areas through activities such as encouraging agricultural best practices (e.g., manure storage & spreading, grassed waterways, livestock siting), sinkhole treatment, streambank protections & stabilization, and well abandonment.

The Department conducts nutrient and pest management workshops to encourage landowners to apply nutrients and pesticides at the UW-Extension recommended rates and at specific time periods to improve surface and groundwater quality. Depending on available resources, the Department has been assisting with the removal of old abandoned manure storage facilities at a rate of about one to two per year.

The Land & Water Conservation Department also works in cooperation with UW-Extension to conduct a volunteer private drinking water program to allow for the tracking in changes in drinking water quality throughout the County. About 400-500 wells are tested annually and the Department compiles and analyzes the resulting test data. There may be opportunities to improve the effectiveness of the program, and possibly save money overall, but subsidizing the mailing costs so that testing requests can be made electronically.

B. PHYSICAL CONSTRUCTION ACTIVITIES

Natural hazard impacts, especially for flooding in St. Croix County, can potentially be mitigated through infrastructure improvements and other physical construction (or demolition) projects. Such activities can range from the construction of stormwater retention ponds to the installation of storm shelters to the removal of homes from flood-prone areas. These tend to be very costly projects for which grant dollars are often pursued or required, though some activities are less costly and can be temporary methods of hazard mitigation.

Road and Culvert Improvements

In St. Croix County, such improvements are often in response to a hazard event, such as those funding requests to FEMA for recovery from flooding in August 2010 summarized previously in the plan. Most of these projects tend to be road, culvert, and drainage system repairs or improvements to mitigate a stormwater/flash flooding hazard or over-the-road flooding. The County and many local municipalities replace culverts and make other road improvements as time and money allow. As noted previously in the flood assessment, many of the stormwater flooding “hotspots” identified in the 2008 plan have since been addressed and do not appear in this plan update. In case of a severe snowstorm or other hazard requiring closure of the Interstate, some on-ramps are now gated and the Highway Department does have a large, digital message board to direct travelers, however a second message board would be needed to cover both directions.

Floodplain Acquisition and Flood Control

The current emphasis for flood control in St. Croix County is on long-term solutions. This approach includes acquisition of floodprone areas, enforcement of floodplain zoning ordinances, land-use planning, and promotion of the sale of flood insurance.

The Wisconsin Department of Natural Resources has purchased large areas of shorelands, wetlands, and high water table along the Willow River in the Town of Cylon and near lakes in the Town of Stanton which preserves important flood storage areas while mitigating the potential for future floodplain development in that area. The U.S. Fish and Wildlife Service has similarly acquired properties near lakes and rivers in the County, such as along the Willow River, northeast of Bass Lake, and east of Boardman.



Many communities maintain floodprone areas as parks, such as in the Village of Somerset.

Numerous parks and public lands located along rivers and lakes throughout the county also play a flood mitigation role while offering recreational opportunities, such as Glen Hills County Park, Troy Beach County Park, Willow River State Park, and Eau Galle Recreation Area. In addition, many communities have also preserved high hazard floodplain areas for community parks (e.g., Baldwin, Deer Park, Hudson, North Hudson, Somerset, Star Prairie). If not for public ownership of some of these areas, flooding vulnerabilities in the County would certainly be worse, at a likely cost to taxpayers without the recreational benefits. And the protection of such flood storage areas also have environmental benefits, such as nesting habitat for wildlife and serving as natural filters to help protect water quality.

Of special note, WisDNR and the National Park Service have acquired large areas of floodplain along the St. Croix River and mouth of the Willow River in the Town of Somerset, which likely has done more to directly and indirectly mitigate flood vulnerabilities in the County than any other single action for the long-term by limiting development in these areas while offering flood storage to the benefit of communities and landowners down river, such as in North Hudson, Hudson, Town of St. Joseph, and the Town of Troy.

Flood Control by Dams

Some of the dams in St. Croix County play an important role in flood control, while a few of the largest dams are managed more for hydroelectric power generation, rather than flood control. Glenwood City residents, as well as residents further east in Boyceville and Downing in Dunn County all noted that the County-owned Glenwood Hills dams have greatly mitigated their past flooding problems. The Eau Galle Dam at Lake George has largely remedied the chronic flooding experienced in the Village of Spring Valley in the past.

Overall, the St. Croix County dams are in good repair and functioning well. Emergency Action Plans have been developed for the large and high-risk dams and are on file at the St. Croix County Emergency Support Services Department, St. Croix County Emergency Communications Center, St. Croix County Land and Water Conservation Department, and the Regional WEM Office. The plans for the County dams are updated annually. Included in the plans are the warning and evacuation procedures, contact information, areas of anticipated flooding if a failure should occur, and extensive mapping of the associated river systems. Additional information on the dams in St. Croix County can be found in the previous section assessing flooding and dam failure risks.

Other Infrastructure Activities

While most recent efforts across St. Croix County have focused on stormwater system improvements, ongoing maintenance of the County's infrastructure and properties is also required. Local utilities maintain aggressive tree-cutting programs to reduce the frequency of downed power lines, with some power lines being buried in areas prone to weather-related outages. Snow fencing is used in areas prone to drifting snow by the County Highway Department. A limited stock of sandbags is available in some communities (e.g., Town of Troy) to assist in flood containment. Since the last plan, St. Croix County, Wisconsin Department of Transportation, and Minnesota Department of Transportation have cooperated for the installation of monitoring cameras on I-94 in St. Croix County. This system allows monitoring by highway and law enforcement personnel of the pace of traffic flow, potential accidents, or changes in weather, as well as improving notification to travelers and the general public on any changing conditions.

C. EMERGENCY PREPAREDNESS AND COMMUNICATION ACTIVITIES

Flood Monitoring Systems

The flooding of area rivers and streams is typically a result of persistent heavy rainfall or significant snowmelt during the spring. During these conditions, the County utilizes a combination of resources to assist them in evaluating the potential flood conditions. Most notably, the National Weather Service observes, predicts, and provides warnings related to storm events and flooding, which are closely monitored by St. Croix County Emergency Support Services.

When conditions are favorable for a flash flood, the National Weather Service issues a warning alerting people to the potential through radio, television, and weather alert radios. Conditions are monitored by emergency service agencies. When conditions begin to threaten an area, residents are notified through press releases and press interviews. Law enforcement and other emergency service agencies also notify residents of the advancing flood using public address systems on emergency vehicles and through door-to-door contacts. Since flash flooding can occur quickly, people are alerted as early as possible of the flood potential so they are aware and watchful of changing conditions. The observations of law enforcement and fire agencies assist in determining the timing and need for evacuations.

When a disaster is imminent or does occur, the public is informed of changing conditions and predictions through an incident command system. Typically, there is not an urgent, immediate need to evacuate people quickly. Should it be determined that an area will be inundated by floodwaters, residents are notified by public service agencies that are monitoring conditions. People can evacuate with their own resources. Emergency service agencies ensure that notifications are received in the local area through announcements and door-to-door contacts as determined necessary.



Other Weather Warning Systems

Alert warning sirens in the County are triggered centrally by the St. Croix County Communications Center upon notification of a severe weather warning from the National Weather Service and as part of a monthly test. The status of alert warning sirens in St. Croix County was discussed previously in the tornado sub-section. Television, radio, and Internet are other primary ways local residents

receive weather warning information. The County Communications Center can override TV and cable TV shows with announcements as part of the emergency broadcast system,

St. Croix County Emergency Support Services has coordinated with County ARES/RACES and the National Weather Service in training and sponsoring a network of volunteer Skywarn Spotters which assist local law enforcement in watching and identifying potentially hazardous severe weather. Participation is very strong in St. Croix County with four such trainings in 2012.

Emergency Communications

The St. Croix County Emergency Communications Center provides the vital communications link between those needing emergency services and fire, law enforcement, and emergency medical services in the County. Information is received in the Center via telephone lines, from field sources via radio communications, and via the nationwide law enforcement teletype network. It also maintains both phone and intercom communications with Washington County, MN to the west. The Center provides additional support to the incident or emergency upon request by the first responders or law enforcement, and coordinates responses of additional agencies when necessary. The Center maintains numerous call lists with associated policies on both PC and hardcopy, some of which are used on a daily basis.

An enhanced 9-1-1-system is in operation for all of St. Croix County, along with a reverse-9-1-1 system call CityWatch which has been implemented since the 2008 plan. Efforts have been made to encourage cell phone owners to register under the CityWatch system. St. Croix County is fully narrowbanded for emergency services. County highway and many public works offices still rely on cell phones much of the time. There are gaps in communication (mostly cell phone and pagers) due to local topography and distances, particularly in the southeastern portion of the County, though 95+ percent of the county is covered and a portable repeater can be used if needed during an event. Though communications interoperability has been improving within Wisconsin, challenges still exist when speaking with Minnesota agencies.

Emergency Response and Operating Plans

St. Croix County has a strong, well-trained emergency response network of First Responders, Ambulance Providers, Fire Departments, and law enforcement personnel (local police, Sheriff's Department, State Patrol).

These in-the-field responders are further supported by the County Emergency Communications Center, County Emergency Support Services Department, and medical services (e.g., emergency rooms, hospitals, County Health Department). Certain types of disaster events may require specialized or additional assistance from other government or non-profit agencies during response and recovery (e.g., Salvation Army, Red Cross, USDA/FSA, WDNR, County Highway Department, local public works employees). Private sector businesses and service groups may also become involved in response and recovery, such as utility providers and community groups. A Community Emergency Response Team (CERT) of local citizens has been developed in the New Richmond area and the creation of addition teams is being promoted.

All cities and villages in the County, in addition to many of the towns, have emergency operating plans. Most of these plans are up-to-date, though it is an ongoing process of keeping these plans up-to-date. A quick comparison to the 2008 plan shows that there has been significant improvement in the last five years in updating these plans.

County Emergency Support Services has been encouraging compliance and familiarity with the National Incident Management System (NIMS) and Incident Command System (ICS) among the local governments and response agencies within the County. Overall, emergency personnel in the County are well trained and very familiar with these systems. During the planning process, it was suggested by a number of communities and stakeholders that additional effort is needed to encourage local elected officials and other key staff to also participate in basic ICS training, due in part to the turnover among elected officials. Public Informational Officer training was also mentioned more than once as a specific ICS-related need.

Emergency safety plans have been developed for the St. Croix County government buildings which identify appropriate action in case of severe weather. The County has developed a basic continuity of government plan, which it intends to revisit and expand upon. Most cities and villages have not developed a continuity plan, though some related policies or procedures may be found in their emergency operating plans or other such documents. Such planning is often limited to tornado exercises or fire drills, records storage, and information technology (e.g., back-up of computer data).

The St. Croix County Fairgrounds also has an emergency plan, though the lack of a storm shelter has not been remedied. The concert facility in Somerset also has an emergency plan, but has similar challenges with lack of storm shelters and evacuation. It is believed that individual emergency plans do not exist for most campgrounds or mobile home parks. Additional attention may also be needed for emergency planning at some other event sites also may need additional attention to emergency planning.

Incident Response Exercises and Training

St. Croix County periodically plans and coordinates disaster and mock event exercises with municipal emergency medical personnel, local hospitals, ambulances, police, County Sheriff's Office, and volunteers. School districts also coordinate with local responders to conduct drills and exercises as previously mentioned.

Hazardous materials spills related to Interstate 94 and rail lines were the most frequently mentioned exercise need during the planning process. The County has been particularly proactive in Hazardous Materials training, with one of the strongest programs in the region. All Fire Departments in St. Croix County have been trained to the operations level. In addition, the County participates in Federally required training involving the Prairie Island Nuclear Generating Facility every six years, due to the County's location within the Ingestion Pathway Zone.

D. EDUCATIONAL ACTIVITIES

The following is a synopsis of the many educational and public outreach activities regarding natural and all hazard risks and mitigation in St. Croix County. This description is not exhaustive or complete.

General Public Education on Hazard Risks

St. Croix County Emergency Support Services has a variety of materials available covering a wide range of hazard mitigation topics. This information is distributed to the public and businesses by use of displays, news media, radio, presentations to local groups, etc. Information and media packets are disseminated in conjunction with an associated season, with a substantial effort to educate the public on natural hazards made during Tornado and Severe Weather Awareness Week in April.

Outreach to Seniors and Special Needs Populations

The St. Croix County Aging and Disability Resource Center (ADRC), working cooperatively with County Emergency Support Services, prepare seniors and those with special needs for disaster events. Approximately 4,000 ADRC newsletters are distributed monthly with deliveries, at meal sites, and to clients, in addition to being available on-line. These newsletters have included articles such as preparing a home emergency kit and the vulnerabilities to extreme temperatures.

In the first quarter of 2011, the St. Croix County ADRC provided 5,921 meals at its ten meal sites and 8,323 home-delivered meals. On-site meals are provided in Baldwin, Deer Park, Glenwood, Hammond, Hudson, New Richmond, River Falls, Roberts, Somerset and Woodville; not all sites are owned by the County and it is uncertain if all sites have a designated storm shelter or safe room. About 50,000 meals are distributed annually. Some of these meal sites may become a valuable resource during post-event recovery. But during an emergency, meal availability may be disrupted.

When clients join the Nutrition Program, an assessment is made to identify any special vulnerabilities or needs, and emergency contact information is obtained. This database can be referred to during an emergency, but is not shared outside ADRC due to confidentiality. Further, in order to ensure satisfaction with the “meals-on-wheels” program and to provide additional nutritional support and education, the St. Croix County ADRC Outreach Coordinator conducts home visits with individuals served by the Home-Delivered Meals Program. The Outreach Coordinator and “meals-on-wheels” volunteers can play an important role during an emergency. Their familiarity and relationship with clients would be critical should emergency assistance to special populations be needed.

Educational Efforts Related to Agriculture

The St. Croix County University of Wisconsin-Extension Office, Farm Services Agency, and County Land & Water Conservation Department implement various educational efforts on mitigating the impacts of hazards upon agricultural operations. These efforts include pamphlets, press releases, presentations, web site, and one-on-one discussions with farmers. Some common educational themes include how to minimize the winter kill of alfalfa and crop residue management to prevent losses in times of drought. Participation in and demand for nutrient management planning assistance and manure management planning workshops has been high. The Extension Office often works through local agri-businesses for distribution of this information. Manure storage and spreading is well regulated and increasingly enforced by the State.

St. Croix County farmers may contact the St. Croix County University of Wisconsin-Extension Office, the St. Croix County Land & Water Conservation Department, and the Farm Services Agency Office for information and guidance related to drought. Various federal and state publications are available from these agencies on ground water movement, the hydrologic cycle, soil conservation, and irrigation methods. These agencies will also be the lead agencies in obtaining emergency food and water supplies for agricultural use.

In the event of a disaster which impacts agriculture and rural areas, staff from FSA, NRCS, County Land Conservation, and UW-Extension tour the affected areas and report back on percentages of losses, number of structures damaged, and an estimated size of the affected area to the State FSA office. As the evaluation continues, these offices will work with local code enforcement/inspectors and County Emergency Board consisting of representatives from UW-Extension, Natural Resource Conservation Service, USDA Rural Development, and County Support Services. The resulting reports are submitted to the Governor’s office for consideration of a Secretarial (USDA) or Presidential disaster declaration request. Beyond these damage assessment reports, the Federal and State agencies will assist the coordination of general clean-up and recovery, while County Land Conservation will focus on specific problems. Multi-peril crop insurance participation has been increasing and is a pre-requisite for FSA disaster assistance.

The Farm Services Agency administers the Supplemental Revenue Assistance Program (SURE) which provides benefits to producers that have crop losses for reasons beyond their control. If a Federal Disaster is declared, assistance is also available through the Emergency Conservation

Program (FSA) and the Emergency Watershed Protection Program (NRCS), the latter of which may include stormwater system repairs and bank stabilization.

These same agencies, in particular St. Croix County Land & Water Conservation, also work with local farmers and residents on education, monitoring, and projects to protect water quality and help prevent hazardous materials releases. These efforts are generally discussed previously in the hazardous materials sub-section and the Land & Water Conservation sub-section.

E. STRATEGIC PARTNERSHIPS

Based on past events locally and in the region, the residents of St. Croix County respond to the call for help in times of need, as reflected by the volunteer Skywarn Spotter network. And such cooperation does not stop at municipal or county lines. One of the strongest examples of collaboration in the County involving both the public, private, and non-profit sectors are the St. Croix County Local Emergency Planning Committee (LEPC) and the County Public Protection Committee. While the LEPC primarily focuses on the mandated review of hazardous materials facility plans, the Public Protection Committee meets monthly to discuss and address a wide-range of emergency management issues.

Police services fall under the statewide Wisconsin mutual aid agreement, with additional support and coordination through Wisconsin Emergency Management—Emergency Police Services in times of crisis. While some local fire departments have mutual aid agreements with neighboring departments, St. Croix County fire departments are working towards adoption of the Mutual Aid Box Alarm System (MABAS). MABAS is a national model which may be used for deploying fire, rescue, and emergency medical services personnel if assistance from other departments is needed. Since the 2008 plan, a countywide municipal utility agreement has been executed for public works support and equipment sharing among communities during times of need. Additional disaster support for mitigation and response is also available from other private and governmental sources.

West Central Wisconsin Regional Planning Commission (WCWRPC)

St. Croix County is a member of WCWRPC and three representatives from St. Croix County are members of the Commission's "board". WCWRPC provides community planning, economic development, and grantsmanship support for St. Croix County and local communities. This document represents the second hazard mitigation planning effort facilitated by WCWRPC on behalf of St. Croix County. During the past two years, WCWRPC also played a key coordinating role in the development and implementation of the Wisconsin long-term power outage preparedness effort which included participation by local stakeholders in St. Croix County.





ARES/RACES

ARES/RACES functions in St. Croix County are coordinated through the St. Croix County Amateur Radio Emergency Service (ARES) group. ARES/RACES (Radio Amateur Civil Emergency Service) groups are typically made up of residents who provide volunteer communication support using HAM radios in times of extraordinary need. During time of war, only RACES members may use amateur HAM radios. The ARES/RACES group's radios have the advantage of being operable on batteries and having a large broadcast area, though coverage challenges on the east side of the County still exist.

St. Croix County ARES/RACES works cooperatively with St. Croix County Emergency Support Services on emergency communications planning. Over 95% of the group is NIMS-certified. Memoranda of Understanding have also been executed between ARES/RACES and two local hospitals in an effort to coordinate emergency communications planning. It is important that ARES/RACES representatives are part of the formal St. Croix County Communications Center procedure and call list in times of emergency; some local officials may not fully understand the ARES/RACES role.

American Red Cross

St. Croix County is part of the St. Croix Valley Chapter of the American Red Cross which maintains its office in Bayport, MN. The local Red Cross chapter has an excellent working relationship with St. Croix County Emergency Support Services and



participates on the St. Croix County Local Emergency Planning Committee. Working with County Emergency Management and local communities, the Red Cross takes a lead role in the identification of emergency shelters (not storm shelters) in St. Croix County. Recruitment of local volunteers for Red Cross activities is ongoing. On-call volunteers are provided locally for the victims of emergencies through the Red Cross Disaster Action Teams (DAT). House fires are the most common emergency for which the Red Cross is contacted.



Salvation Army

The Salvation Army maintains a presence in St. Croix County at Grace Place in Somerset which provides transitional housing. During times of crisis, the Salvation Army provides a variety of services and support, including food, clothing, shelter, volunteer support, educational programming, counseling, and donation collection. The Salvation Army Grace Place's Social Services Director also participates on the St. Croix County Local Emergency Planning Committee.

Hospitals, Educational Institutions, and Other Private-Sector Organizations

Additional support for community preparedness, mitigation, response, and recovery is also available from other private and non-profit sources. For example, many public sector and emergency response agencies coordinate and work closely with private-sector businesses and non-profit entities for disaster preparedness and during an emergency, including health care providers, hazardous materials users, various utilities, religious organizations, and youth groups. St. Croix County Interfaith Caregivers are a valuable resource for supporting the County's seniors and adults with disabilities. Housing authorities, community action programs, and care facilities are other important partners.

Hospitals and many facilities are required to have emergency plans and certain protections in place by law. The Wisconsin Hospital Emergency Preparedness Program (WHEPP) has networked the hospitals and related agencies in the State to improve preparedness supplies, training, and plans, with alerts and patient tracking provided through the WI-Trac system. This is supplemented by support agreements between hospitals. Additional support for mitigation and response is available from the Federal and State government in times of need.

Like hospitals, most educational institutions are also required to have established safety and emergency procedures and policies. Non-public facilities and services, such as Xcel Energy, are incorporating the Incident Command System structure and into their emergency plans.

F. OTHER MITIGATION AND EMERGENCY MANAGEMENT CHALLENGES AND OPPORTUNITIES

The following additional issues address multiple hazard types or identify opportunities to improve hazard response and recovery:

1. Emergency vehicles have difficulty accessing some driveways due to width, height clearance, or grades. These problems are often localized in wooded areas, areas of waterfront development, and hilly areas. During the planning process, the Somerset Fire Department described these problems as being "critical" due largely to trees, shrubs, etc. This concern was echoed in a number of communities, including in the Town of Troy.
2. Emergency communications continues to improve. This planning effort increased awareness of the relatively new CityWatch autodialer system, and opportunities exist to continue to expand the use of this excellent tool. While the County is now narrowbanded, there are still some radio needs and gaps as noted in Appendix H. There may be benefits to promote standardization of public works communications equipment since many departments are using cell phones. There was also increased interest by County staff and at least one community in exploring the use of social media for emergency warnings and other such announcements. Another interviewee asked during the process, "are we prepared for the impacts if numerous cell and radio communications towers go down during an event?"

3. A countywide public works mutual aid agreement has been executed in St. Croix County since the 2008 mitigation plan. While this covers costs for equipment and personnel between St. Croix County communities, not all municipalities have standard rates for equipment use during an emergency. Some communities in Wisconsin have adopted the Wisconsin Department of Transportation standard equipment rates. This may place the community in a stronger position to negotiate should FEMA financial assistance be requested and rates provided in the FEMA Schedule of Equipment Rates are lower than your actual costs. For instance, Brookfield, Wisconsin, found that FEMA-specified equipment rates following as December 2000 snowstorm were about one-half of Brookfield's actual equipment costs.
4. Emergency management and hazard mitigation planning is often a low priority for communities, with the exception of maintaining basic fire, police, fire responder, and ambulance services. Local emergency response plans can quickly fall out of date due to turnover of local government officials and these plans (and associated maps, resident information, etc.) may not be readily available to local officials should a disaster occur. It is also fairly common that hazard mitigation and emergency response issues are not integrated into other local planning and regulatory efforts. Education and outreach to cities, villages, and towns on emergency management issues is an ongoing effort and challenge.
5. Similarly, the turnover in elected officials necessitates continued, periodic outreach to local officials on resources, public safety agencies, mitigation issues, and recent events. There were very large improvements in updating and maintaining city, village, and town emergency operations plans (EOPs) since the 2008 mitigation plan. One innovative example comes from the Town of Warren where each Town Board member has an iPod with a copy of the Towns EOP and emergency contacts. The communities, local emergency services, and County emergency management personnel should be commended for their emergency planning efforts.

Even with these improvements, a number of communities noted the need to develop or update their EOP. Some local officials may not be fully aware of their role or responsibilities during an event under State law. A number of towns stated that training for their local officials was needed on emergency operations planning and how the plan would be put into action. Public information officer (PIO) training was also mentioned as a need by a number of communities.

6. Many residents in unincorporated towns live outside of an alert warning siren coverage area. An alternative is a weather radio. Older radios currently in use may not have Specific Area Message Encoding (SAME) technology. Some communities expressed interest in NOAA weather radio projects.



7. During the planning process, it is noted that many elected officials, different agencies, private-sector entities, and even different County departments look to County Emergency and/or County Public Health for the direction, support, and services which will be needed during a disaster. The general public may also turn to highly visible sources of support, such as hospitals and law enforcement. Some of the expectations may be unreasonable. Partnering between different entities and private-public partnering are vital to emergency response and recovery. During the planning effort, a number of stakeholders expressed interest in strengthening their understanding of roles, relationships, and procedures during an event, so that they may develop or strengthen their own emergency plans. The need for additional planning related to volunteer management during an event was also noted. Additional discussion and/or tabletop-style exercises may be appropriate.

SECTION V. PROGRESS ON THE 2008 MITIGATION PLAN STRATEGIES

This section reviews the progress on each of the strategy recommendations from the *St. Croix County All Hazard Mitigation Plan* adopted and approved by FEMA in 2008. As discussed in the 2008 plan, the availability of resources and changing priorities affect implementation. For instance, some strategies were contingent on grant funding. The 2008 strategy list was comprehensive, and there was not an expectation that all strategies would be fully addressed within five years time.

Table 34 also includes a recommendation on how each strategy may be addressed in this plan update plan based on the input of the responsible parties identified in the 2008 plan and the steering committee. Later in this report, the recommendations in Table 34 are further considered and analyzed for feasibility by the steering committee.

Table 34. Progress on 2008 Plan Strategies

2008 Plan Strategy	Progress	Recommendation for Plan Update
Physical Infrastructure Strategies		
1. Pursue federal funding for a storm shelter/safe room initiative which subsidizes the installation of safe rooms or shelters for mobile homes and mobile home parks.	No action; no good opportunities to pursue.	Keep in plan. Add campgrounds.
2. Pursue the installation of warning sirens in areas of high residential density or growth which are currently outside siren coverage areas (e.g., portions of Towns of Troy, Hudson, Somerset, Star Prairie, peripheries of many incorporated areas). This may include campgrounds and mobile home parks in unincorporated areas. Numerous communities also expressed interest in replacing aging siren equipment or providing battery back-up.	Two sirens added in Town of Star Prairie and two being added at Xcel Dams on Apple River. Sirens proposed for Towns of Richmond, Troy, and St. Joseph.	Revise to reflect progress and to focus on new sirens for rural residential areas, campgrounds, and mobile home parks, if feasible.
3. Pursue grant funding for a manufactured/mobile home anchoring project which encourages the anchoring of older mobile homes.	None. No grant opportunities identified.	Include as part of Steering Cmte's alternatives to assess need and feasibility.
4. Continue to study and address stormwater flooding, road washout problems, and ice-damming as identified in the vulnerability assessment. (numerous projects)	Progress continuing to be made as roadways improved, larger culverts installed, etc. 2010 flooding identified additional areas of concern; some mitigation in response.	Update the map and description of "flooding hotspots" and keep in plan.

2008 Plan Strategy	Progress	Recommendation for Plan Update
5. Work with St. Croix Energy Cooperative to pursue hazard mitigation funding to replace aging power lines and an additional substation for the North Hudson area to further mitigate the potential of power outages and increase the dependability of power service.	Two substations now available. Areas prone to outages still exist (e.g., Town of Troy along St. Croix River) and concerns with above-ground service to a critical facilities.	Modify the strategy to focus on burying lines in areas prone to outages or for service to critical facilities.
6. Pursue hazard mitigation funding to acquire or relocate structures and properties most at risk of major flood damage when the opportunity arises and/or following a flood event in which significant damage occurs.	No action.	Keep in plan.
Planning & Policy Strategies		
7. Continue to enforce County floodplain regulations and related land-use ordinances to discourage future floodplain development, the storage of hazardous materials in floodplains, require dry land access for all new structures, limit development in dam shadows, and maintain natural flood storage areas.	Ongoing. Still a need to reinforce these concepts.	Keep in plan. Also consider a strategy to promote flood insurance.
8. Adopt County mobile home regulations which require new mobile home parks to identify per formal agreement a storm shelter or construct a new storm shelter for residents. Require new and encourage existing mobile home parks in unincorporated areas to have emergency plans which will be on-file with the County.	No new mobile home parks; very low demand. Changes in regulations not adopted.	Modify to include new and expanding parks, but not existing due to enforcement difficulties.
9. Continue to make emergency planning for pandemic flu a high priority for the County, such as identifying additional mass clinic locations and building a group of strong, certified, volunteers for distribution of pharmaceuticals. Utilize an all-hazards approach which maximizes resources (e.g., medical supplies, transportation) and addresses mortuary services as part of public health emergency plans regardless of hazard type.	Ongoing efforts, but limited staff time available to address. Special populations plan. Mortuary services plan needs updating. Distribution system needs more work. No longer part of the regional consortium. Using WeVolunteer Registry.	Reword with a focus on distribution, volunteers, plus quarantine portion of #10 below.
10. Continue pandemic flu planning and educational efforts related to social distancing and quarantine which will be critical to containment. Related security and enforcement issues shall be considered as part of mass clinic plans and related planning efforts.	Ongoing, in conjunction with “flu season” outreach. Some aspects becoming common practice.	Keep in plan. Move to educational strategies and integrate rest into strategy #9 above.
11. Continue annual review of the emergency action plans for the County dams and ensure that the contact and telephone calling lists are up-to-date. Whenever updated, send copies of the emergency action plan to the local municipalities to help keep residents informed. Copies of the Glen Hills Dam plans should be sent to Dunn County Emergency Management and the Village of Downing.	This is standard practice as stated in the EAPs of each dam. Contact information is updated annually.	Remove. But consider a strategy of adding residents and structures in dam shadows to the CityWatch system.

2008 Plan Strategy	Progress	Recommendation for Plan Update
12. Inventory the warning siren coverage areas of the County, along with the age and capabilities of the equipment (e.g., battery back-up). Use G.I.S. to compare with land uses and population density to recommend additional coverage areas.	Some of this data being collected as part of this plan update and some communities have coverage areas mapped.	Keep in plan.
13. Develop and maintain a resource directory for use in times of disaster by coordinating agencies (e.g., Department of Aging has transportation services). Such a directory could be expanded to include standard requirements for the sharing of equipment and billing rates.	ADRC and many departments have their own directories. Countywide public works mutual aid in place. A resource database is being developed. Using 2-1-1 system.	Continue to develop the database and consider adoption of WisDOT equipment billing rates, if not already adopted.
14. Provide support to the emergency planning efforts for the St. Croix County Fairgrounds to address the need for storm shelter(s), securing agreements with nearby property owners if needed. Similar planning efforts to protect non-resident visitors should be pursued for other facilities (e.g., Cedar Lake Speedway).	No shelter for Fairgrounds identified. Uncertain of extent of need, interest, or demand at other facilities at this time.	Reword and focus strategy. Work with Glenwood City on shelter alternatives for fairground. Remove remainder.
15. Conduct an inventory of the location, condition, anchoring, and emergency plans of mobile home parks in the County, including availability of shelters and warning systems. If a need is evident, pursue additional mitigation strategies (e.g., assistance program for anchoring; relocation from floodplains, emergency plans, sirens, shelter agreements).	No action.	Propose to steering committee as an alternative for consideration.
16. Continue to encourage coordination between Wisconsin and Minnesota so that related health emergency policies and procedures are consistent and compatible, such as the manner in which pharmaceuticals will be distributed if a pandemic flu outbreak should occur.	Improved, but policies differences still exist and coordination is essential. Differences may confuse media, residents, and businesses.	Keep in plan. Remove "such as...".
17. Develop partnerships among health agencies, local jurisdictions, non-profits, and other service providers to identify special needs populations who may be in need of special assistance or outreach in times of emergency. Make special effort to identify elderly in rural areas who may have less access to services or those in need of special medical assistances (e.g., dialysis).	Public Health Emergency Plan and Public Health Special Needs Plans in place. Good partnering. ARDC uses SAMS database to track clients, plus outreach through meal sites and meal-on-wheels.	Remove from plan.
18. In the future, the Land & Water Conservation Department will work with UW-Extension and the Center for Watershed Science and Education to update the May 2006 "An Introduction to Groundwater in St. Croix County" to include re-testing of the over 2,000 residential wells, as is possible, for comparison purposes.	Testing and analysis is ongoing. 400-500 wells voluntarily tested annually, with 3,200 wells tested to date.	Support for testing program needed. For instance, subsidizing mailing would be a net cost-savings.

2008 Plan Strategy	Progress	Recommendation for Plan Update
19. Work with UW-Extension and local electric providers to develop a portable back-up power generator loan program for agricultural operations in case of prolonged electrical failure.	None. Demand for full-time producers may be decreasing as there are fewer non-hobby farms. Likely that majority of dairies already have generators.	Remove. Suggest a strategy to identify emergency generator suppliers, rental stores, and emergency fuel suppliers.
20. As part of the next hazard mitigation plan update, pursue financial assistance to identify structural elevations, structure characteristics, and corresponding regional flood elevations for all structures in the 100-year floodplain and in dam shadows.	This plan update will include the most current information available, but concerns with the accuracy of the FIRM maps persist due to lack of needed elevation data in most areas.	Refocus this strategy on the need for LIDAR, then the analysis.
21. Continue building a CERT (Community Emergency Response Team) Unit by submitting grant requests to OJA and recruiting personnel.	New Richmond has established a CERT team, but uncertain of the interest, knowledge, or demand in other areas.	Integrate with strategy #30 below.
Communication Strategies		
22. Continue to involve the St. Croix County ARES/RACES group in emergency communication planning and mock event exercises in the County; further define their role during a disaster as part of established EOP procedures.	Participation has increased and the organization is stronger. Has a presence within the ICS.	Identified as a resource in previous section; remove as a strategy.
23. Increase preparedness of campgrounds and resorts to severe weather by: (a) promoting use of all hazards (weather) radios; (b) requiring the provision of emergency information to patrons; and (c) requiring new campgrounds or resorts to identify a severe weather shelter.	No significant action.	Keep in plan. For (b), encourage, not require. For (c), new and expanding.
24. Maintain the frequency of the practical, in-the-field exercises involving the coordination of communication between dispatch, field units, and other service providers.	This is standard practice.	Remove.
25. Continue to work with regional ARES/RACES groups and other counties to strengthen amateur radio communications in eastern St. Croix County, with Dunn County, and with communities to the east. This may be part of the statewide repeater network (WeComm, LTD) being development primarily for ARES/RACES groups.	Addressed. Co-located equipment with a tower in Dunn County.	Remove.
26. Continue to participate in the multi-county interoperability communication planning effort.	TCIP complete and continuing to meeting. Ongoing activity which is discussed in the previous section.	Remove.

2008 Plan Strategy	Progress	Recommendation for Plan Update
27. Strongly encourage the State of Wisconsin to work with St. Croix County and local communities to allow for mutual aid and other agreements with the State of Minnesota and its communities if emergency services can be improved, such as decreased response times.	State-to-state mutual aid agreement and related policy is in place. Some issues involving pandemics remain as addressed in a previous strategy.	Remove.
28. Work with Red Cross to address the existing recovery shelter weaknesses: some shelter agreements are out-of-date, most shelters do not have generators, and relationship between agencies which provide special needs shelters could be strengthened so contingency shelter sites and caregivers are identified.	Not identified as a concern during the plan update process. Coordination with Red Cross on cooling and warming shelters was identified as a more significant concern.	Remove. Propose alternative to Steering Cmte regarding cooling and warming shelters.
29. Continue to work toward Countywide compliance with the National Incident Management System for emergency service providers and municipalities in the County. Explore options to integrate NIMS into local emergency operating planning efforts if feasible.	Ongoing effort. Discussed in previous section. Some interest in specialized ICS/NIMS training expressed during the process.	Reword. Specialized or targeted ICS/NIMS training may be recommended.
Education & Preparedness Strategies		
30. During mock or tabletop exercises, increase emphasis on different agency roles, resources, and responsibilities during times of disaster, including the private and non-profit sectors (e.g., electric providers, Red Cross). Periodic coordination meetings should include voluntary organizations active in disaster (VOADs) from the area to continue to strengthen these relationships. Anticipate the roles and expectations of local community groups (e.g., church groups, schools) might also have in recovery.	Ongoing.	Focus on planning with COADs, VOADs, CERTs, etc. Explore public-private partnership organization?
31. Once every two years, County Emergency Management should give a special presentation to the Towns Association on the responsibilities of town officials in times of disaster, along with related policies and procedures. Presentation copies should also be mailed to each town clerk.	Ongoing. This is standard practice.	Remove.
32. More fully develop the County's emergency management webpage with valuable links and information for local communities, residents, farmers, and service providers.	Newly completed.	Refocus. Explore the use of social media for education, warnings, response, and recovery.
33. Continue with the County Land Conservation Department's pest and nutrient management workshops which have likely helped mitigate potential winter kill, agricultural-related stormwater flooding concerns, and help protect water quality.	Ongoing.	Update and keep. Include other partners.

2008 Plan Strategy	Progress	Recommendation for Plan Update
34. Continue public educational efforts regarding the County's warning siren system and promote the benefits of all hazards (weather) radios for private citizens, campgrounds, resorts, and businesses through local media and community events.	Ongoing. Has provided a Walmart discount for radios during one such effort.	Keep in plan.
35. Pursue grant funding for a safe room initiative to encourage the installation of safe rooms as part of slab-on-grade residential construction. The project will primarily be an educational initiative through local media and local developers, though small subsidies or rewards (e.g., weather radios, sponsor gifts) might be included if funding and support are available.	No action. Could consider a model safe room as part of a model home.	Refocus on educational effort with information targeted to realtors, builders, and communities where most slab-on-grade.
36. Work with local communities to increase public knowledge of available "Clean Sweep" programs and other methods of disposing of potentially hazardous wastes. Encourage additional State support to increase availability of these program when possible	Being scaled back to once a year due to budget limitations, with option of taking to Washington County, MN. Pharmaceutical and agricultural available annually.	Include agricultural. Offer to steering committee as an alternative.
37. Continue to increase public knowledge of groundwater contamination concern when opportunities exist, including for builders, realtors, and local government officials. Special attention should be given to closed depressions.	Ongoing challenge. Lack of awareness or understanding common.	Keep in plan and include farmers. Also, more mapping needed.
Multi-Jurisdictional Strategies		
38. MUNICIPALITIES (various or all) – Consider NIMS and evacuation planning as part of their local emergency operating planning efforts. Numerous incorporated communities need to review and update their local emergency operating plans. Community emergency plans should also address the offsite back-up or storage of official data and records.	Ongoing, with status varying by community.	Keep in plan. Consider business continuity planning and data back-up as a separate strategy.
39. MUNICIPALITIES (various or all) -- If deemed feasible and desirable by the community, amend local ordinances to require storm shelters or safe rooms for slab-on-grade residential construction, if another storm shelter option is not readily available.	No significant action noted. No interest among most communities interviewed to enact such regulations.	County could make model ordinance language available to municipalities to consider.
40. MUNICIPALITIES (various or all) -- Review, and amend if deemed necessary, local ordinances to require new mobile home parks to provide storm shelters for residents and maintain emergency plans for the parks which are provided to the municipality. Enforce such conditions.	No significant action noted. Similar to strategy #8.	Modify so it is parallel with strategy #8.
41. MUNICIPALITIES (all) -- Maintain communication between the communities and the County to take advantage of joint-bidding or coordinate grant efforts when opportunities arise.	Ongoing. Good communication between Emergency Management and municipalities.	Remove.

2008 Plan Strategy	Progress	Recommendation for Plan Update
42. MUNICIPALITIES (all) -- Continue to actively participate in mock event and tabletop disaster exercises and training sessions, realizing that while hazard risks and vulnerabilities are increasing, federal or state funding support for such exercises may be decreasing.	Ongoing.	Refocus on specific training needs as identified by the communities.
43. MUNICIPALITIES (various or all) -- During land-use, stormwater management, and comprehensive planning efforts, discourage development in 100-year floodplains and floodprone areas, encourage the preservation of natural flood storage areas, and maintain natural buffers around known kettles and closed depressions.	Inconsistently applied, especially for areas outside the 100-year floodplain. Uncertain of knowledge on closed depressions.	Keep in plan. Consider a county-level educational strategy with ties to flood insurance; integrate with strategy #7.
44. MUNICIPALITIES (various or all) -- Review or consider adoption of subdivision and/or road standards to address, as deemed necessary, adequate access for emergency vehicles, minimize stormwater flooding potential, adequate setbacks from high hazard infrastructures (e.g., railroads, I-94, natural gas transmission lines), and the burying of power lines for major subdivisions in wooded areas.	Varies by community, but most have similar standards or consider such during the site plan review process. Fire Departments and/or law enforcement are involved in review process as needed. For most communities, burying power lines at discretion of developer and utility provider.	Remove, since largely addressed or not a priority concern. Propose a strategy regarding backflow prevention policy and education.
45. MUNICIPALITIES (various) -- In communities experiencing significant development, create and adopt official maps which are integrated into comprehensive plans to preserve adequate street rights-of-ways for emergency vehicles while preventing or minimizing long dead-end roads.	According to a 2008 WCWRPC survey, nearly all cities and villages practice official mapping.	Integrate with strategy #44 as needed.
46. MUNICIPALITIES (all) -- Establish formal agreements between jurisdictions for the provision of public works mutual aid in times of emergency and disaster.	Countywide public works mutual aid enacted since previous plan.	Remove from plan, but suggest adoption of WisDOT equipment rates.
47. MUNICIPALITIES (various) -- As needed, identify storm shelters for residents or mobile home parks, execute formal agreements for shelter use, and use local media and park owners to help educate residents on availability. Needs or issues vary significantly by community.	No action. As stated, needs vary by community.	Focus the strategy on individual community needs and interests.
48. MUNICIPALITIES (various) -- Consider participation in the FEMA Community Rating System program for floodplain management which encourage flood mitigation activities while potentially reducing flood insurance premium rates. In particular, the communities of N. Hudson, Hudson, New Richmond, and Baldwin should consider participation due to existing potential 100-year floodplain development or history of NFIP claims.	No CRS communities to date. New Richmond has the largest number of NFIP policies (16 as of Nov. 2011). As such, the benefit-cost of pursuing CRS status for individual cities and villages is low.	Remove, but re-evaluate in future plan updates should the number of NFIP policies increase.

2008 Plan Strategy	Progress	Recommendation for Plan Update
49. MUNICIPALITIES (various) -- A follow-up field training drill should be scheduled with those communities (New Richmond, Hudson, Glenwood City to date) who have conducted a water contamination tabletop exercise. Key "water personnel" from these communities should have water sample collection training.	Training is continuing and sample collection conducted. This was not identified as an issue during the plan update.	Remove.
50. RIVER FALLS, SPRING VALLEY -- Continue with implementation of those applicable mitigation strategies identified in the Pierce County All Hazard Mitigation Plan.	Cooperation with Pierce County, River Falls, and Spring Valley continuing as needed or requested.	Keep in plan, but encompass the full emergency management cycle.
51. BALDWIN, NEW RICHMOND, RIVER FALLS, WILSON, WOODVILLE -- Explore the feasibility of new or additional warning sirens or updated siren systems. If funding becomes available, some additional communities may consider battery back-up for existing sirens.	Some new sirens have been added, such as in Woodville. Some needs continue to exist, including in some unincorporated towns.	Update based on city & village meetings, and potentially combine with a countywide strategy.
52. BALDWIN, HAMMOND, SOMERSET, STAR PRAIRIE, WILSON -- Update floodplain ordinances based on new State model, as needed.	FIRMS were updated and made effective in 2009. All cities and villages updated their floodplain ordinances at that time.	Remove.
53. BALDWIN, HUDSON, WILSON -- If funding or opportunities arise (e.g., GSA), acquire a back-up power generator for utilities should electrical power fail due to a hazard event.	Some progress, but emergency power generator needs and/or re-wiring of critical facilities to allow connection still exist.	Update and keep in plan.
54. BALDWIN, WILSON -- Consider establishing (Wilson) or continue with (Baldwin) tree or urban forestry programs to help protect trees of special value to the community from the effects of storms.	Baldwin program continuing. Not a strategy deemed to be a high mitigation priority during the plan update.	Remove.
55. BALDWIN -- Subject to further analysis, integrate a new vehicular bridge on 12th Avenue as an alternative crossing of the creek into local plans, transportation improvement plans, and capital budgets.	USH 63 improvements completed which mitigated the frequency of past flooding at the bridge. WisDOT indicated alternative crossing is likely unfeasible.	Remove.
56. BALDWIN -- As part of future stormwater management plan updates, identify options to address the significant stormwater ponding in the 8th Avenue and Lorkorst Street area.	No options identified. During plan update, Village stated this was naturally occurring and not getting worse.	Remove.
57. DEER PARK -- As part of future comprehensive planning, map flood hazard areas (as opposed to floodplains) in the Village to discourage development in those areas while preserving needed flood storage.	Addressed. Zoning is now used to discourage development in floodprone areas.	Remove.

2008 Plan Strategy	Progress	Recommendation for Plan Update
58. DEER PARK -- Replace septic lines near the ballpark to prevent future infiltration of floodwaters into the sewer system.	Completed. Replaced with solid PVC pipe and nearby home acquired with Fed assistance.	Remove.
59. DEER PARK -- If flooding problems for the Village continue or worsen, conduct an engineering study to investigate the feasibility of diverting drainage on the east side of the Village away from the Village and towards the south to the Willow River using older, natural drainageways when possible.	Continuing to be monitor, but not severe enough to date to warrant action.	Keep in plan.
60. HUDSON -- Continue with implementation of the City's stormwater management plan, including for those areas identified in the flood assessment and helping to prevent uncontrolled stormwater runoff into older neighborhoods.	Ongoing. Working with WDNR to address Small MS4 Stormwater Program requirements.	Refocus on any flooding hotspots or more specific flood mitigation needs.
61. GLENWOOD CITY -- Address any safety concerns along public portion of Glen Meadows Lane as capital budgets allow.	Widened and guard rail added. Some potential for washouts continue, but not a priority	Remove.
62. NEW RICHMOND -- Work with the Town of Stanton, County Health Department, and mobile home park owner/residents to address the septic system concerns within the mobile home park to the east of the City.	Still a problem area as discussed in the flood section.	Propose as a strategy alternative, though City's role is limited. Add Town.
63. NEW RICHMOND -- If feasible, integrate stormwater management components into the design of the new recreational park on the north side of the City to help alleviate the flooding problems of the Armory area.	Flooding in this area has been addressed and is no longer a problem.	Remove.
64. NEW RICHMOND AREA -- Communities and school districts in the Town of Star Prairie area should continue to work cooperatively to address the groundwater contamination issues related to the jointly owned landfill, including the efforts of the unincorporated entities to identify and secure grant funds. A boundary agreement between the Town and City is recommended as part of these discussions.	Boundary agreement between the Town and City being finalized. Water service from New Richmond expanded to some Town residents.	Combine with #65 into a single strategy and encourage ongoing monitoring with additional action as needed.
65. NEW RICHMOND, TOWN OF STAR PRAIRIE -- Continue to increase attention on the contamination plume from the older landfill in the Town of Star Prairie, and encourage a determination of whether further action is warranted, such as the establishment of an additional deep-well casing area.	Boundary agreement between the Town and City being finalized. Water service from New Richmond expanded to some Town residents.	Combine with #64 into a single strategy and encourage ongoing monitoring with additional action as needed.

2008 Plan Strategy	Progress	Recommendation for Plan Update
66. NORTH HUDSON -- As funding allows, resolve washouts and serious bank erosion at Ferry Landing Park and Brown Beach areas along the St. Croix River.	Erosion problem continuing to worsen. No significant actions since 2008 plan.	Keep in plan.
67. NORTH HUDSON -- Work with the WisDOT to address past stormwater problems as part of planned Highway 35 improvements.	Highway 35 improvements completed, but still flooding problems in the area.	Keep on Village "hazard map", but remove as a strategy until prescriptive remedy identified.
68. NORTH HUDSON -- Pursue project support for a floodplain and engineering analysis of the Riverside Drive area to better identify flooding vulnerabilities to homes and infrastructure and analyze mitigation options.	No analysis completed, but continues to be a concern.	Reword slightly, but keep in plan.
69. ROBERTS -- With updates of the Village Emergency Action Plan, review, and amend if deemed necessary, the policies and procedures related to the availability of the school as a public storm shelter.	Emergency Operating Plan recently updated and agreement for use of school as a storm shelter is in place.	Remove.
70. SOMERSET -- Continue efforts to acquire an easement or other property rights for use of the swale on the south side of the Village for stormwater drainage in accordance with approved stormwater management plans.	No change in status. Still a potential need.	Keep in plan.
71. STAR PRAIRIE -- In the future, construct an additional municipal well on the west side of the Village.	Still a future need, but adequate fire protection at the moment.	Keep on Village "hazard map", but remove as a strategy.
72. WOODVILLE -- Continue implementation of the Village stormwater management plan with potential improvements at the River Street Bridge over Eau Galle Creek in the future as funding allows.	Ongoing implementation of stormwater management plan and improvements. Significant flooding throughout the community in August 2010.	Refocus strategy on raising liftstations, flood insurance, and backflow prevention
73. WOODVILLE -- Work with the County Emergency Communication Office to analyze options to address the radio coverage challenges with the community.	Good with radios. Some gaps for Fire Deptment outside Village. Cell phone carriers differ than in Hudson area.	Remove. Integrate related concerns into a countywide strategy.
74. WOODVILLE -- Explore grant opportunities for the integration of a public storm shelter as part of the proposed new fire hall. If grant funding is not available, establish procedures for use of the Village Hall as a storm shelter.	No change and new fire hall not built.	Continue to consider all options.

SECTION VI.

MITIGATION GOALS AND STRATEGIES

St. Croix County will continue to proactively protect the health, safety, and welfare of the community by mitigating the negative human, economic, and environmental impacts of hazard events. This vision will be accomplished through planning, evaluation, communicating with stakeholders, and maintaining a strong, reliable infrastructure. This plan reflects the County's past, current, and ongoing commitment to hazard mitigation.

A. MITIGATION GOALS

The mitigation goals apply to all hazards. The goals are intended to provide direction to achieve the desired outcome and are to be used as guidelines by which mitigation activities are identified and impact is evaluated. The goals provide St. Croix County further direction for determining the future and reflect the needs of the County as identified through the assessment of hazard conditions and community profile.

The mitigation goals for this plan update reflect, and are consistent with, the proposed goals and objectives found in the working draft of the *St. Croix County Comprehensive Plan* as of July 2012, such as the following:

- Continue to conserve and protect floodplains and shorelands to protect their natural functions and prevent any negative impacts from development. Conserve, protect and restore wetlands and their natural functions.
- Promote information and education on the values of and threats to groundwater, surface water, land resources and scenic resources.
- Prevent the spread of pathogens and parasites and other contaminants that cause risk to human or animal health.
- Protect the county's public health, natural environment, groundwater and surface water resources, air, land and other natural resources through proper siting and regulation of private onsite wastewater disposal systems and stormwater management in accordance with town, county and state laws and regulations.
- Provide road maintenance, emergency services including sheriff's patrol and investigation, emergency management and dispatch, and related health and human services programs in a fair, cost-effective manner that meets the growing and changing needs of all residents.
- Design, site, and construct housing and residential developments in a manner which mitigates the potential impacts of man-made and natural hazards and other health and safety concerns.
- Maintain mutually beneficial relationships with local government entities, neighboring counties, State and Federal agencies, school districts and other quasi-governmental agencies serving county residents.

- Participate in intergovernmental discussions and maintain communication with adjacent and overlapping jurisdictions including school districts and emergency services on planning, development, and service-related issues.

With consideration of these guiding themes and after discussion, the steering committee amended the 2008 plan goals. The following are the 2012 *St. Croix County All Hazard Mitigation Plan* goals:

Goal One: Physical Development and Infrastructure

Build and maintain a strong, resilient infrastructure and limit damage to homes, structures, and other improvements from the impacts of hazard events when cost-effective opportunities exist.

Goal Two: Planning and Policy

Use empirical analysis to assess hazard vulnerabilities and to develop appropriate plans and policies which are complimentary whenever possible and implemented and enforced in an effective and uniform manner.

Goal Three: Communication and Coordination

Provide an effective hazard warning system and maximize available resources for emergency planning, response, and recovery, by strengthening intergovernmental coordination between communities, agencies, and other service providers.

Goal Four: Education and Training

Provide opportunities for the citizenry, private sector, local officials, and emergency personnel of St. Croix County to be aware of local hazard risks and vulnerabilities, along with current emergency plans and mitigation strategies to help make our communities safer and more resilient.

B. EVALUATION OF ALTERNATIVE MITIGATION STRATEGIES

A comprehensive range of alternatives was considered when developing strategies to meet the plan's vision and goals. A description of many of these alternative mitigation strategies is included in the Mitigation Toolbox in **Appendix J** which was used to help identify potential mitigation options.

The county-level strategy alternatives in **Appendix K** were evaluated based on community acceptance, administrative feasibility, costs, benefits, and other considerations. A wide variety of additional alternatives were considered during the various meetings and stakeholder interviews, but were not included in Appendix K because they were deemed unfeasible or of very low priority without additional analysis and consideration.

The strategies in Appendix K are organized by topic. Evaluating the alternatives and selecting the mitigation strategies for inclusion in this plan was a multi-step process:

- #1 Potential mitigation strategies to address the hazard risks and vulnerabilities analyzed in Section III were identified during the key stakeholder interview process, steering committee meetings, town surveys, and city and village meetings. **Many of the county-level strategy alternatives are multi-jurisdictional in nature and may be implemented in individual communities or countywide.** The strategies with the most potential were integrated into Appendix K. It is a lengthy list given the number of meetings conducted and the number of different hazards considered.
- #2 During stakeholder interviews, the 2008 plan strategies listed in Section V were reviewed, which yielded a recommendation for this plan update. These strategies were also integrated into Appendix K and a column added which indicates whether the strategy appeared in the 2008 plan, was significantly revised, or if it is new to this update
- #3 A survey with the alternative county-level strategies shown in Appendix K was distributed via mail to steering committee members. Committee members gave each strategy a priority of “high”, “medium”, “low”, or “exclude” based on costs vs. benefits, political acceptability, technical feasibility, etc. Average scores were then determined based on a 10-point scale to provide a relative priority and exclude the lowest scoring strategies. Members were also encouraged to write-in comments, such as barriers to implementation, which were incorporated into Appendix K. The survey results were discussed with County Emergency Support Services staff and analyzed further during the final steering committee meeting resulting in some additional changes.
- #4 For those strategies in Appendix K that are recommended for plan inclusion, key parties to be involved (or take a leadership role) in implementation were identified.
- #5 Multi-jurisdictional strategies unique to the cities and villages were identified during meetings with each participating community. These recommended strategies, along with a suggested priority, were mailed to the cities and villages for review in July 2012. The multi-jurisdictional strategies were then modified, amended, or excluded from the plan recommendations based on the comments received.
- #6 For priority projects recommended for implementation within the next five years, additional analysis and guidance was included in Section VI.D., including estimated costs

Note:

The priorities for the strategies in Appendix K were made in the context of this plan and the identified hazards facing St. Croix County.

A low priority should not necessarily be interpreted as having a lesser importance to St. Croix County overall.

A low priority or strategy not included in this plan should not be deferred if the need exists and resources are available.

if available. The steering committee analysis and community input referenced in Steps #3 and #5 were used to help determine priority. This new section allowed for additional analysis of the costs vs. benefits for the steering committee and communities, and it was further modified based on the additional input received.

- #7 Additional changes and “fine-tuning” to the recommended strategies and draft plan were made based on review of the draft plan by communities, local officials, key stakeholders, and the general public as part of the public informational meeting and adoption process.

C. RECOMMENDED MITIGATION STRATEGIES (ACTION PLAN)

Strategies are specific mitigation policies and projects selected based on their feasibility to assist the St. Croix County in attaining the plan goals. **It must be remembered that this is a St. Croix County plan, not a plan for the St. Croix County government.** While County government may take a lead role in implementation of many of the county-level strategies, this is not always the case. Collaboration and partnerships are essential to a safe, resilient community.

Some of the following recommendations have a strong emergency preparedness emphasis, but have been included for their importance in helping to mitigate the negative impacts of hazard events when they do occur. The recommended strategies are organized by topic, then further organized into the following sub-sections:

- **Recommended Policies:** Policies tend to be ongoing, decision-making or programmatic guidance. Policies strategies can often be funded or performed as part of normal operating budgets and do not require the identification of new or special funding or other resources.
- **Recommended Projects:** Projects typically have a focused, action-oriented outcome which is achievable within a certain time period. Since special funding or other resources are often needed for the implementation of projects, additional attention is given to these recommendations later in this report.

As mentioned previously, the last section (multi-jurisdictional strategies) identifies those recommended policies and projects for the participating cities and villages.

Appendix K also includes implementation guidance for each county-level strategy, including relative priority, key parties likely involved during implementation, and potential barriers. The relative priority (i.e., high, medium, low) is helpful in determining which projects to implement first from a mitigation perspective, but individual programs or communities may rate some of these strategies differently. As explained in Appendix K, the strategies were prioritized based on their importance to hazard mitigation, but some strategies have additional local benefits which may not have been considered. These priorities are also subject to change over time and new priorities may arise. To avoid too much emphasis on the prioritization, only the high priority strategies are denoted here.

i. Physical Development & Infrastructure Strategies

Recommended Projects

1. Continue to study and address overland flooding, flash flooding, road washout problems, and ice-damming in St. Croix County, including those areas of concern identified in the flood assessment. **(High Priority)**
2. Pursue hazard mitigation grant funding to acquire, relocate, or floodproof structures and properties most at risk of major flood damage when opportunities arise and/or following a flood event in which significant damage occurs. **(High Priority)** *related to continued NFIP compliance*
3. Pursue grant funding for safe room projects for mobile homes, mobile home parks, campgrounds, parks (e.g., Homestead Parklands), County Fairgrounds, and other event locations where no other adequate shelter exists. Coordinate with those municipalities who are also considering safe room projects.
4. Pursue additional automated weather and water-level monitoring equipment along rivers and at the Glenwood Hills Dams.
5. Continue to work with local electric power providers to bury electrical lines in areas prone to outages due to falling trees/limbs or high winds and for service to critical facilities. For areas prone to flooding, transformers or other such electric system components may require floodproofing, elevating, or relocation.
6. For rural areas without siren coverage, pursue the installation of weather warning sirens in areas of high residential growth, including campgrounds and mobile home parks. Coordinate with those cities and villages who are in need of siren replacement or additional siren coverage.
7. Pursue grant funds for dry hydrants for fire protection in areas of concentrated development where other water sources are not readily available.

Recommended Policies

8. Encourage all school buildings to have interior and exterior numbering door numbering and provide copies of floor plans (with door numbers) to local emergency responders and the County Emergency Communication Department.

ii. Planning & Policy Strategies

Recommended Projects

9. Implement a LIDAR mapping project which meets FEMA National Flood Insurance Program standards to obtain more accurate elevation data for the County. Work with WDNR and FEMA to revisit, and revise as needed, the FEMA D-FIRM floodplain maps for St. Croix County once the LIDAR data is available. **(High Priority)** *related to continued NFIP compliance*
10. Add residents and structures located within dam failure inundation areas to the CityWatch system.
11. Integrate railroad mile posts, key bridges, and grade crossing identification numbers into County emergency mapping systems and explain the importance of these additions to emergency, law enforcement, and dispatch personnel.
12. Conduct an inventory of the location, condition, anchoring, and emergency plans of mobile home parks in the County, including availability of shelters and warning systems, then pursue additional mitigation strategies as needed.
13. Inventory the warning siren coverage areas of the County, along with the age and capabilities of the equipment (e.g., battery back-up). Use G.I.S. to compare with land uses and population density to recommend additional coverage areas.
14. Continue development of the St. Croix County Continuity of Government Plan and encourage other local municipalities to consider similar continuity planning efforts for the recovery of essential business functions.
15. Conduct a survey of emergency power generator and fuel capability and needs for Emergency Operations Centers, communications towers, long-term care facilities, and other critical facilities. Develop a list of generator suppliers and develop a strategy to address gaps in supply if possible.

Recommended Policies

16. Encourage the county and municipalities to integrate hazard mitigation issues and strategies into their comprehensive plans and other related planning efforts, such as safe rooms, access/egress, flood management, transport of hazardous materials, and emergency planning. **(High Priority)**
17. Adopt County mobile home regulations which require new and expanding mobile home parks to identify per formal agreement a safe room/storm shelter or construct a safe room(s) for residents. Require new and encourage existing mobile home parks in unincorporated areas to have emergency plans which will be on-file with the County. **(High Priority)**

18. Continue to make emergency planning for pandemic flu a high priority for the County, with a focus on distribution of pharmaceuticals, volunteer resources, mass casualty/mortuary planning, and quarantine procedures. **(High Priority)**
19. Continue to encourage towns, villages, and cities to update and maintain emergency operations plans with current contact information. **(High Priority)**
20. Continue to enforce County floodplain regulations and related land-use ordinances to discourage future floodplain development, the storage of hazardous materials in floodplains, require dry land access for all new structures, limit development in dam shadows, and maintain natural flood storage areas. *related to continued NFIP compliance*
21. Encourage operators of major festival grounds to maintain current emergency action plans. Periodic meetings between County Emergency Management, local emergency services, and festival operators should be conducted to review plans and identify any issues requiring action or mitigation.
22. Continue to support and strengthen St. Croix County Land and Water Conservation Department's water quality monitoring, testing, and outreach efforts. Provide additional funding support for St. Croix County Land and Water Conservation Department's water quality testing program to cover mailing of testing materials.

iii. Communications & Coordination Strategies

Recommended Projects

23. Implement a NOAA All Hazards Radio project with particular focus on distributing radios (or discount vouchers) to mobile home residents, resorts, campgrounds, and/or critical facilities, to include general public education on alert warning sirens and all hazards radios. **(High Priority)**
24. Continue to pursue Mutual Aid Box Alarm System (MABAS) participation for fire, rescue, and emergency medical services (EMS) mutual aid in St. Croix County.
25. Formalize a volunteer network and donations management program for St. Croix County. Involve voluntary and community organizations active in disaster (COADs & VOADs) and community emergency response teams (CERTs) in related planning and training.

Recommended Policies

26. Encourage school districts to continue involving local emergency personnel in emergency plan updates, drills, and exercises. Consider the impacts of security measures on access/egress during an emergency. **(High Priority)**
27. Continue to conduct regular hazardous materials exercises with local communities with a particular focus on those chemicals commonly transported on Interstate 94 and by rail as identified in the commodity flow study. Test related systems and procedures. **(High Priority)**
28. Coordinate with Red Cross to formally designate and, when needed, advertise cooling and warming shelters for St. Croix County. **(High Priority)**
29. Continue to expand the use of the CityWatch reverse-9-1-1 system and inform other key stakeholders of its availability.
30. Continue to strengthen ties with Minnesota to address consistency and compatibility challenges with communication systems, health emergency policies, and other emergency procedures.
31. During mock or tabletop exercises, increase emphasis on different agency roles, resources, responsibilities, reporting, and central coordination during times of disaster, including utility providers, health and social services agencies, hospitals, municipalities, and non-profits.
32. Increase the involvement of State Highway Patrol in County event exercises involving roadways in an effort to improve communication and coordination within the incident command system.

iv. Education & Training Strategies

Recommended Projects

33. Increase resident and local official knowledge of flood risks in St. Croix County, flood insurance, and the typical limitations of homeowner's policies to cover flood damage. *related to continued NFIP compliance*
34. Implement a cyber-security and data back-up educational initiative for cities, villages, and town officials in St. Croix County.
35. Meet with private-sector and non-profit entities to discuss interest in developing a public-private partnership organization for community preparedness and resiliency.
36. Continue to develop a County resource database with an emphasis on ensuring resource availability during an event. Encourage municipalities to establish policies and standard billing rates for equipment used in response and recovery.

37. Establish a program to encourage farmers to install HazMat placards in a highly visible location for the storage of significant amounts of hazardous materials on site.
38. Implement a backflow prevention educational project, including education of the public and local officials and the sharing of model ordinance language.
39. Implement an educational initiative targeting realtors, builders, and the general public with informational materials to promote safe rooms for slab-on-grade construction without access to a public storm shelter. If opportunity arises, consider construction of a model safe room for educational purposes.

Recommended Policies

40. Further explore the use of social media for preparedness education, warning systems, and coordinating response and recovery.
41. Increase preparedness of campgrounds and resorts to severe weather by: (a) promoting use of all hazards (weather) radios; (b) encouraging the provision of emergency information to patrons; and (c) requiring new and expanding campgrounds or resorts to identify a severe weather shelter. **(High Priority; implement with radio project above)**
42. Encourage long-term care facilities (e.g., nursing homes) to share their emergency plans with local emergency response officials, in particular those sections which rely on public-sector assistance. **(High Priority)**
43. Work with local communities to increase public knowledge of available "Clean Sweep" programs and other methods of disposing of potentially hazardous wastes and agricultural chemicals. Encourage additional State support to increase availability of these programs. **(High Priority)**
44. Encourage local officials and key municipal/County staff to complete basic levels of Incident Command System (ICS) training. Advocate for Public Information Officer (PIO) training within the County and/or region for persons with a PIO role. **(High Priority)**
45. As deemed appropriate, incorporate hazard risks, preparedness ideas, warning systems, and informative links, into future updates of the *St. Croix County Rural Living Guide*.
46. Provide basic knowledge to local officials, local media, schools, and other critical facilities of the nuclear accident risks to St. Croix County and the related warning systems.
47. Continue with the County Land Conservation Department and UW-Extension nutrient management activities which have likely helped mitigate potential winter kill, reduce agricultural-related stormwater flooding concerns, and help protect water quality. Increase outreach and programming on farming practices related to wind erosion, crop production on marginal lands, and encroachment on public rights-of-way.

48. Increase resident and local official knowledge of flood risks in St. Croix County, flood insurance, and the typical limitations of homeowner’s policies to cover flood damage. Continue to increase awareness of alternatives to mitigate flash flooding, including erosion controls, vegetative buffers, permeable pavement, etc. *related to continued NFIP compliance*
49. Continue to increase public knowledge of groundwater contamination risks, areas of concern, and well construction standards at the time of sale and when other opportunities exist, with particular educational outreach to builders, realtors, farmers, and local government officials.
50. Continue pandemic flu educational efforts related to social distancing and quarantine which will be critical to containment. Increase local official awareness of related risks, procedures, points of distribution, and how Wisconsin policies may differ than those in Minnesota.

v. Multi-Jurisdictional Strategies

The priorities for the multi-jurisdictional strategies vary by community. **Implementation of these strategy recommendations are at the discretion of each community.** In some cases, St. Croix County Emergency Support Services Department may be able to provide guidance or coordinate a multi-jurisdictional project, but the responsibility and decision for putting these strategies into action lies with each community.

In addition, many of the county-level strategies listed previously are also multi-jurisdictional in nature and can be implemented at the community-level or countywide. This is particularly true for the majority of the communications, education, and training strategies. Instead of repeating each strategy in its entirety, the following summarizes which key county-level strategies are especially applicable to individual cities and villages. By adopting this plan, the cities and villages recognize and adopt the following mitigation measures:

County-Level Strategy Number	City and Village Relationship
1	All Incorporated Areas. Nearly all cities and villages identified flooding problem areas (see Appendix F), though the needs and solutions vary significantly.
2	Baldwin, Others as Needed. Only Baldwin specifically identified acquisition as a strategy at this time, though other communities may consider such actions in future. Woodville identified a need to floodproof liftstations.
3	Baldwin, Hammond, Woodville, Glenwood City, New Richmond, and River Falls. These communities expressed particular interest in community safe rooms and related education. Glenwood City to coordinate with Fairgrounds. River Falls has prioritized Hoffman Park for 2013, with additional parks in future.

5	New Richmond, River Falls. Both of these cities have municipal electric utilities which are eligible for mitigation grant dollars to bury electrical lines.
6	North Hudson, Wilson, and River Falls for reasons identified in Appendix H.
14, 16, 19	All Incorporated Areas. All cities and villages are encouraged to integrate hazard mitigation issues and strategies into their comprehensive plans, stormwater management plans, and other related planning efforts, maintain up-to-date emergency operations plans with current contact information, and consider development of continuity plans.
15	Baldwin, Deer Park, Hammond, Somerset, Star Prairie, Wilson, Woodville, and New Richmond identified possible generator needs for critical facilities. A number of communities (Baldwin, Glenwood City) expressed some interest in exploring emergency fuel agreements.
21	Glenwood City, Somerset, Others As Needed. Municipalities and their emergency services providers have a role in encouraging appropriate emergency planning for festivals, campgrounds, and other large events.
23	All Incorporated Areas. A number of communities, including River Falls, Roberts, and Town of Kinnickinnic , expressed interest in a NOAA All Hazards/Weather Radio project.
27, 31	All Incorporated Areas. All cities and villages are encouraged to continue participating in training and exercises and to test their EOPs based on local risks. Invite key stakeholders and resources from the community to participate.
34	All Incorporated Areas As Needed. The degree of cyber-preparedness varies by municipality and many expressed interest in learning more.
36	All Incorporated Areas As Needed. Consider adoption of Wisconsin Department of Transportation third-party billing rates for equipment use, or its own equipment rate schedule, by resolution or other administrative policy.
38	Baldwin, Woodville, Others As Needed. This strategy was suggested by Baldwin and Woodville officials, though many or all communities could benefit.
42	All Incorporated Areas. During city and village meetings, long-term care facilities were the most frequently mentioned private critical facility which may need assistance during a disaster.
44	All Incorporated Areas. Municipal staff and elected officials identified as having a first line, supervisory, or other key role during an emergency as identified in the community emergency operating plan should complete FEMA ICS 100, 200, and 700-A training which is available on-line. A number of cities and villages also expressed interest in Public Information Officer training.
48	All Incorporated Areas. A number of cities and villages identified the promotion of flood insurances as being particularly important in light of the August 2010 flooding.

The following additional mitigation strategies are also recommended for the cities and villages, but are not countywide:

MJ1. **ALL INCORPORATED AREAS, AS APPLICABLE** – Continue to enforce floodplain and stormwater regulations, maintain compliance with NFIP requirements, and

discourage the development of flood storage areas. If flooding or other emergency occurs, compile and document all damages and costs with pictures, testimony, invoices, etc., for potential future grant funding or reimbursement. *related to continued NFIP compliance*

- MJ2. **ALL INCORPORATED AREAS** - Continue to work with St. Croix County Emergency Support Services to ensure communications interoperability, strengthen wireless broadband connectivity for emergency response, and address how to best integrate local public works/utility personnel into the communications network. Some communities, such as **Baldwin** and **Glenwood City**, have specific communications needs as identified in Appendix H.
- MJ3. **ALL INCORPORATED AREAS** – Work with County Highway Department, Wisconsin Department of Transportation, and local businesses to discourage the transport of hazardous materials through residential areas when reasonable alternatives exist.
- MJ4. **DEER PARK, WOODVILLE** – As part of planning for new fire halls, investigate options for the incorporation of community safe rooms.
- MJ5. **DEER PARK** – If overland flooding problems for the Village continue or worsen, conduct an engineering study to investigate the most feasible alternative to diverting flood waters to the Willow River and implement as deemed appropriated.
- MJ6. **NORTH HUDSON** – As funding allows, resolve washouts and serious bank erosion at Ferry Landing Park and Brown Beach areas along the St. Croix River.
- MJ7. **SOMERSET** – Continue efforts to acquire an easement (or other rights) for use of the swale on the south side of the Village for stormwater drainage.
- MJ9. **RIVER FALLS, OTHERS AS NEEDED** – Prepare and publicize water usage regulations during drought.

D. IMPLEMENTATION OF PRIORITY PROJECTS

As discussed previously, Appendix K included implementation guidance for recommended county-level plan strategies, including relative priority, key parties, and potential barriers to implementation. This section focuses on the high-priority project recommendations. Projects typically have a focused, action-oriented outcome which is achievable within a certain time period. Since special funding or other resources are often needed for the implementation of projects, special attention to these strategies are provided here.

Implementing Priority Projects

The following provides guidance for the implementation of each of the priority projects and estimated costs if available. Many of these projects are eligible for FEMA Hazard Mitigation

Grant Program or FEM Pre-Disaster Mitigation Grant Program dollars. These funding sources can be very competitive, so (unless a major storm event occurs in the County) it is unlikely that multiple projects tapping into these two grant programs would be funded within a short-time period. A full cost-benefits review should be performed prior to implementation.

Project	Logistics	Potential Funding Sources	Other Guidance and Estimated Costs
<i>physical infrastructure & response priority projects</i>			
<p>1. Continue to study and address overland flooding, flash flooding, road washout problems, and ice-damming in St. Croix County, including those areas of concern identified in the flood assessment.</p>	<p><u>timeline:</u> on-going & varies by project; no firm deadlines</p> <p><u>lead party:</u> municipalities and Highway Department</p>	<p>Most are funded locally. If significant history of damage or critical risks to safety, may be eligible for FEMA mitigation dollars. Otherwise, CDBG, transportation dollars, or other grant funds may be available depending on the nature of the project and benefits.</p>	<p>Significant progress since 2008 plan</p> <p>Projects approached individually or by community.</p> <p>Costs will vary by project. Continue to integrate into Capital Improvement Plans and work schedules. Be certain to document all instances for flooding or flood damage.</p>
<p>2. Pursue hazard mitigation grant funding to acquire, relocate, or floodproof structures and properties most at risk of major flood damage when opportunities arise and/or following a flood event in which significant damage occurs.</p>	<p><u>timeline:</u> contingent on grant funding availability</p> <p><u>lead party:</u> municipalities, County Emgy Mgmt or key departments</p>	<p>If significant history of damage, may be eligible for FEMA mitigation dollars. Requires a benefit-cost analysis. Higher priority if NFIP claims in past.</p>	<p>Only two projects (both acquisitions) specifically identified during project at Perch Lake and in Baldwin, likely involving 1 home for each location. Costs per site likely in the \$100k to \$300k range.</p> <p>Woodville would elevate liftstations if funding available and feasible; related costs are not available at this time.</p>

<i>planning & policy priority projects</i>			
9. Implement a LIDAR mapping project which meets FEMA National Flood Insurance Program standards to obtain more accurate elevation data for the County. Work with WDNR and FEMA to revisit, and revise as needed, the FEMA D-FIRM floodplain maps for St. Croix County once the LIDAR data is available.	<u>timeline:</u> under discussion	Likely funded locally, unless WCWRPC or other State GIS agencies (WLIA, WROC, WLIP) is able to secure grant funding to help supplement these costs.	Based on a 2010 project in southern Wisconsin, costs would be \$200,000 to \$300,000 for LIDAR component.
	<u>lead party:</u> County Planning/Land Information, perhaps regional or State GIS agencies		
<i>communication & coordination priority projects</i>			
23. Implement a NOAA All Hazards Radio project with particular focus on distributing radios (or discount vouchers) to mobile home residents, resorts, campgrounds, and/or critical facilities, to include general public education on alert warning sirens and all hazards radios.	<u>timeline:</u> not an immediate priority; 2 to 5+ years	This would be eligible for FEMA mitigation grant funding.	Significant flexibility available for NOAA radio delivery; could partner with retailers or non-profits, offer discounts, or target certain groups or geographic areas.
	<u>lead party:</u> County Emgy Management		

E. ADDITIONAL IMPLEMENTATION GUIDANCE

Appendix L includes a synopsis of some commonly used hazard mitigation grant funding sources with a focus on natural hazards. Additional information on Federal grant funding can be found at www.cfda.gov. Some infrastructure improvements may also be funded locally through the establishment of a stormwater utility district or ordinance fee system, tax incremental financing (TIF), general obligation bonds, and developer contributions or exactions. Capital improvements planning can be a valuable tool to assist communities in the planning and prioritizing of major infrastructure investments and identifying the best financing approach.

Additional sources of financial support are also often available following a disaster event, such as U.S. Small Business Administration (SBA) loans for the repair or replacement of property. The U.S. Department of Agriculture, through its local Farm Service Agencies, provides disaster assistance for crop losses and livestock emergencies. Grant funding for additional emergency measures, such as the rehabilitation of flood control works, may be available through the U.S. Army Corps of Engineers. Non-natural hazards such as pandemics, school-based terrorism, nuclear accident, and hazardous materials spills typically have their own unique supportive services and funding resources which are not included in Appendix L. In the event of an impending or recent disaster, municipalities and the County Emergency Management

Coordinator are encouraged to contact WEM and the agencies identified in Appendix L for potential assistance, since available resources and related requirements frequently change and this list is not all-inclusive.

The prioritization of the strategies offers guidance in the implementation of this plan based on available resources and changing conditions. Appendix K also suggests key parties to be involved and potential barriers to implementation for the county-wide strategies. But with such challenges also come opportunities to form or strengthen strategic partnerships to share and leverage existing resources which is a primary theme within the plan goals.

Most policy strategies can utilize existing program budgets for implementation, though funding would be required for many of the recommended projects. Some of these policy strategies may involve the amendment of an ordinance or the institution of new procedures. Examples and model language for some of these strategies were compiled by WCWRPC and are available from St. Croix County Emergency Support Services or WCWRPC. This reference information does not constitute legal advice, but provides insight into similar activities by other communities which can be used at the discretion of St. Croix County municipalities. Further, due to the involvement of key officials and County departments during the planning process, the strategy recommendations are known to these stakeholders and can be integrated into, or coordinated with, other work programs and planning efforts.

Like many municipalities, St. Croix County and its communities are facing fiscal challenges and resources are limited. **The recommended strategies will be implemented as resources (e.g., funding, staffing) and other priorities allow.** Further, because of such limitations, there is not an expectation that all strategy recommendations will be fully implemented between now and the next update of this plan.

SECTION VII.

PLAN ADOPTION & MAINTENANCE PROCESS

A. PLAN COORDINATION

Many of the strategy recommendations in the previous section have relationships to other plans and policies for which coordination and consistency is vital. These related plans tend to fall within the following general categories:

- Local capital improvements plans and other budget documents. Most notable are infrastructure projects, such as those related to stormwater systems, water supplies, warning sirens, and communications equipment, which may be considered as part of local budgets. For instance, since the 2008 Plan, significant road and culvert improvements have been made in some areas which may have addressed past overland flooding concerns, such as improvements in the New Richmond area along 140th Street near Paperjack Creek and near the armory.
- Regulations, agreements, and related procedures (e.g., subdivision ordinances, official mapping, shelter agreements). These strategies are primarily identified in the policy strategies. Amendments can often be performed in concert with other ordinance updates. Some related actions may be accomplished procedurally without an ordinance amendment.
- Existing emergency operating or response plans. Many local municipalities need to update their emergency operating plans, and St. Croix County Emergency Support Services is taking the lead to encourage these updates. Many communities have made efforts since the last plan to create evacuation plans as well. County Emergency Support Services and other County offices will also work cooperatively with stakeholders regarding plans, procedures, and grant applications related to the issues identified within this plan.

To date, integrating the strategies and recommendations found in the 2008 hazard mitigation plan into local comprehensive plans has been inconsistent. Some planning consultants working with local communities are unfamiliar with the details of the hazard mitigation plan, and the State comprehensive planning law includes no specific reference to mitigation or resiliency planning. Further, mitigation planning is on a different schedule than comprehensive planning, with most comprehensive plans likely to be updated no more frequently than once per decade.

The *St. Croix County Conditions & Trends Report (CTR)* completed in November 2008 makes numerous references to the *St. Croix County All Hazard Mitigation Plan*, with specific discussion on topics such as stormwater/flash flooding and dam hazard ratings. The *CTR* was used during the development of the draft *St. Croix County Comprehensive Plan* which is expected to be completed in late 2012. The *CTR* was also widely used by numerous city, villages, and towns during their respective planning efforts.

While the mitigation plan was not specifically referenced in most participant comprehensive plans, some of the mitigation recommendations are included as comprehensive plan policies. Most communities with 100-year floodplains included strategies in their comprehensive plans to

discourage or not allow any floodplain development, and are implementing these policies through floodplain zoning. Stormwater management and emergency services are other common themes in many local comprehensive plans. Even so, greater effort is needed to ensure that the hazard mitigation plan is considered during other local planning efforts, and vice versa.

As the mitigation plan strategies reflect, WCWRPC and St. Croix County Emergency Support Services will continue to work with the St. Croix County Planning and Zoning Department and local municipalities to encourage coordination and consistency between comprehensive planning and the hazard mitigation plan, and provide instruction on how to incorporate mitigation strategies into their comprehensive plans and other planning mechanisms. And when made aware of local comprehensive planning efforts and updates, WCWRPC will contact municipalities to encourage them to consider the strategies found within the *St. Croix County Natural Hazards Mitigation Plan*, within periodic reminders through the WCWRPC newsletter which is e-mailed to most jurisdictions in the region.

As Sections IV and V showed, the hazard mitigation plan strategies have been integrated into additional local planning mechanisms. Many of the stormwater and flash flooding hotspots in the 2008 mitigation plan were addressed by including these projects in the transportation or capital improvement plans at the County or local level. As part of its work plan, St. Croix County Emergency Support Services continues to encourage and assist local jurisdictions in the update of their emergency operating plans; these plans often address mitigation policies or issues. And Section V showed that many mitigation strategies were integrated into work plans, ordinances, and project budgets, such as Deer Park's use of zoning to limit development in floodprone area, the installation of two alert warning sirens in the Town of Star Prairie, and the County's annual review of emergency action plans for dams.

Efforts were also made to identify, and integrate where possible, the results of the County's Public Health – Health Vulnerability Assessment (HVA). Though the HVA has a public health focus, it was able to use historic data from 2008 mitigation plan and this plan update previously included a brief summary of the HVA results for each of the primary hazards.

Since key County staff were actively involved in the development and update of the County mitigation plan, many of the mitigation strategies are based on staff recommendations and give confidence that a high level of coordination between these various planning efforts will continue.

Continued, active involvement of key County staff, local jurisdictions, and other stakeholders during hazard mitigation plan updates is critical to ensuring incorporation of mitigation strategies into other planning mechanisms.

B. PLAN MAINTENANCE

Since the adoption of the 2008 plan, reviews of the existing plan were primarily limited to a periodic internal review by the Emergency Management Coordinator. No special plan reviews or plan amendments were needed.

i. Plan Monitoring and Annual Plan Reviews

The *St. Croix County All Hazard Mitigation Plan* will be monitored by the Emergency Management Coordinator, including a semi-annual review of the progress on plan implementation. These reviews will be integrated into the County's Plan of Work to be provided to the WEM Regional Director.

Each year, starting in the first quarter of 2014, one review will be replaced by a more robust annual review to consider progress and determine if the plan has become obsolete, if conditions have changed within the County, or if new technologies/approaches to hazard mitigation have become available. St. Croix County, through its Emergency Management Coordinator, will complete this annual review, unless a plan update is already in progress.

The annual plan review should consider the following:

1. Any changing conditions impacting hazard risk or vulnerability.
2. Review of any new mandates, rules, etc, as well as any input from Wisconsin Emergency Management (WEM) and the Department of Homeland Security--Federal Emergency Management Agency (FEMA) regarding plan implementation.
3. Review of the plan's recommended strategies, emphasizing completed priority projects and their effectiveness, as well as priority projects yet to be completed and funding sources.
4. Coordination of plan strategies with other County or local planning mechanisms.
5. Potential new projects.
6. Any public or community input received on the plan and activities.

After this review, the Emergency Management Coordinator will provide a brief report to the St. Croix County Local Emergency Planning Committee (LEPC) or other appropriate committee on the progress towards the plan's strategies, as well as any critical changes or amendments being proposed. These meetings will be subject to the Wisconsin Open Meeting Law and properly noticed to allow for public involvement and comment. The Emergency Management Coordinator will have primary responsibility for establishing meeting dates, distributing related materials, and facilitating the meetings.

After completion of each annual review, the Committee will recommend any revisions or amendments to the plan, if necessary. The revisions will be forwarded to the County Board for their consideration and action. The Emergency Management Coordinator may also need to follow-up with participating jurisdictions and various County offices during this process.

ii. Special Plan Reviews (Post-Disaster or New Project)

Within six months following a significant disaster event as determined by the Emergency Management Coordinator, a special post-disaster review will occur, if needed. A municipality or the County may also request a special plan review for the consideration of a plan amendment to incorporate a new project which was not included in the original plan, perhaps due to unforeseen circumstances or an increased hazard risk.

Information regarding the recent disaster or new project will be collected by the Emergency Management Coordinator from local law enforcement personnel, fire department personnel, St. Croix County disaster response personnel, involved municipalities, WDNR, WEM and FEMA personnel, affected citizens, and any other relevant entity. This information will be provided to the LEPC or other appropriate committee for their review.

At a duly called and posted public meeting, the Committee will analyze factors which contributed to any impacts of the hazard risk, the likelihood of the event reoccurring, and any strategy alternatives. The Emergency Management Coordinator will have primary responsibility for establishing special plan review meeting dates, distributing related materials, and facilitating the meetings. The Emergency Management Coordinator will also advertise these special meetings to affected department heads, citizens, or community groups, so additional input and comment can be received. Special plan review meetings will be subject to the Wisconsin Open Meeting Law and properly noticed to allow for public involvement and comment.

The Committee may recommend revising or amending the existing plan. As appropriate, recommended changes to the plan will be forwarded to the County Board and the municipal contacts of the participating incorporated municipalities for their action and consideration.

iii. Plan Updates

Every five years, the Hazards Mitigation Plan will be comprehensively reviewed, current data collected, and fully updated, unless the requirement for a five-year update to maintain grant eligibility is changed, in which case the plan should be updated at least once every ten years. The next full plan update should be completed and adopted no later than December 2017. This planning effort should be robust and incorporate opportunities for public involvement to meet all requirements of 44 CFR Part 201.6 and/or any applicable requirements or regulations developed in the interim.

At that time, the Emergency Management Coordinator will propose a plan update steering committee and process for County Board approval. Plan update steering committee meetings will be subject to the Wisconsin Open Meeting Law and properly noticed to allow for public involvement and comment. It is recommended that the Public Health – Health Vulnerability Assessment and similar planning efforts be coordinated with future mitigation plan updates if opportunities arise. In the interim, efforts should continue to be made to address data weaknesses in the vulnerability assessment, most notably for the flood assessment as described in **Appendix B**.

C. PLAN ADOPTION

Each participating municipality, including St. Croix County, considered and adopted this plan in a duly posted and held public meeting.

<u>Jurisdiction</u>	<u>Adoption Date</u>
St. Croix County (encompasses all unincorporated areas)	March 5, 2013
Village of Baldwin	May 8, 2013
Village of Deer Park	October 14, 2013
Village of Hammond	November 11, 2013
Village of North Hudson	May 7, 2013
Village of Roberts	April 8, 2013
Village of Somerset	October 22, 2013
Village of Star Prairie	May 1, 2013
Village of Wilson	June 9, 2014
Village of Woodville	June 11, 2013
City of Glenwood City	April 14, 2014
City of Hudson	August 19, 2013
City of New Richmond	April 8, 2013
City of River Falls	May 14, 2013

Copies of the adopting resolutions are attached (see **Appendix A**). This approval process is described in detail in Section I.B at the beginning of this plan.

Following plan adoption, all participating jurisdictions will be provided with copies of the plan for monitoring, implementation, and coordination with other planning efforts. The plan will also be available for download at the St. Croix County Emergency Support Services and/or West Central Wisconsin Regional Planning Commission webpages for interested community members and jurisdictions.

APPENDIX A.

ADOPTING RESOLUTIONS
AND
LETTER OF PARTICIPATION

Resolution No. 8 (2013)
RESOLUTION ADOPTING THE ALL HAZARD MITIGATION
PLAN FOR ST. CROIX COUNTY

1 WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to
2 reduce or eliminate long-term risk to people and property from hazards and their effects; and
3

4 WHEREAS, St. Croix County has worked through its Local Emergency Planning Committee
5 and in cooperation with West Central Wisconsin Regional Planning Commission to update the *St. Croix*
6 *County All Hazard Mitigation Plan*, to assess the magnitude of hazard risks, and to develop strategies for
7 minimizing or reducing these risks; and
8

9 WHEREAS, St. Croix County Emergency Management provides emergency management
10 planning, coordination, response, and recovery support on behalf of all communities of St. Croix County;
11 and
12

13 WHEREAS, St. Croix County towns, villages, and cities participated in the planning process
14 through a presentation to the Town's Association, a Town hazard assessment survey, the review of the
15 draft strategies, various meetings, and other communication; and
16

17 WHEREAS, the planning meetings for this effort were open to the public, properly noticed in
18 accordance with Wisconsin's Open Meeting's Law, and included a special Public Informational Meeting
19 held on October 23, 2012; and
20

21 WHEREAS, adoption of the Plan by the County Board will make all incorporated and
22 unincorporated jurisdictions within St. Croix County eligible to apply for federal grant dollars for hazard
23 mitigation projects.
24

25 THEREFORE, be it resolved the St. Croix County Board adopts the *St. Croix County All*
26 *Hazard Mitigation Plan* as the official all hazard mitigation plan for the County with the intent of
27 implementing the plan recommendations as funding and resources allow.

Sponsored By: Public Protection Committee on February 8, 2013

STATE OF WISCONSIN
COUNTY OF ST. CROIX
I, Cindy Campbell, St. Croix
County Clerk, DO HEREBY CERTIFY that
the foregoing is a true and correct copy of
Ordinance #820 (2013)
adopted by the County Board of Supervisors
at their meeting held March 5, 2013
Cindy Campbell /A/C/
Cindy Campbell, St. Croix County Clerk

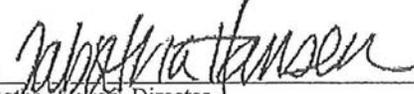
Legal – Fiscal – Administrative Approvals:

Legal Note: None

Fiscal Impact: Per Federal Statute 42 U.S.C. § 5165 mitigation planning as a condition of receipt of an increased Federal share for hazard mitigation measures under this law, a State, local or tribal government shall develop and submit for approval to the President a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the area under the jurisdiction of the government. In addition, the Division of Emergency Management would not be in compliance with annual plan of work and \$54,163 in Emergency Management Performance Grant (EMPG) funding may be lost for fiscal year 2013.


Don Gillen, Corporation Counsel

1/18/2013


Tabatha Rausen, Director

1/29/2013


Patrick Thompson, County Administrator

1/30/2013

St. Croix County Board of Supervisors Action:

Roll Call - Vote Requirement – Majority of Supervisors Present

RESULT: ADOPTED [14 TO 2]
MOVER: Roger Larson, Vice Chair
SECONDER: Andy Brinkman, Supervisor
AYES: Travis Schachtner, Agnes Ring, Tim Hood, Daryl Standafer, Buck Malick, Tom Hawksford, Dave Ostness, Roger Larson, Fred Horne, Andy Brinkman, David Peterson, Brian Hurtgen, Duane Russett, William Peavey
NAYS: Chris Kilber, Richard Ottino
ABSENT: Fred Yoerg, Ron Kiesler, Joe Hurtgen

This Resolution was ADOPTED by the St. Croix County Board of Supervisors on March 5, 2013

Cindy Campbell, County Clerk

Village of Baldwin
Resolution 2013-05

A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN
FOR THE VILLAGE OF BALDWIN

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

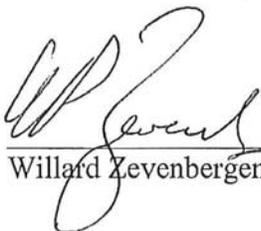
WHEREAS, the Village of Baldwin participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

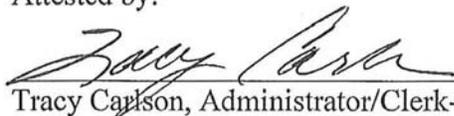
WHEREAS, adoption of the Plan by the Village Board will meet prerequisite requirements which enables the Village of Baldwin to apply for FEMA grant dollars for hazard mitigation projects;

NOW, THEREFORE BE IT RESOLVED, the Village Board adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the Village of Baldwin with the intent of implementing the plan recommendations as funding and resources allow.

Approved and dated this 8th day of May, 2013.


Willard Zevenbergen, Village President

Attested by:


Tracy Carlson, Administrator/Clerk-Treasurer

Voted for: 4
Voted Against: 0
Abstained: 0
Absent: 1

RESOLUTION

2013 - 02

**A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN
FOR THE VILLAGE OF DEER PARK**

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the Village of Deer Park participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

WHEREAS, adoption of the Plan by the Village Board will meet prerequisite requirements which enables the Village of Deer Park to apply for FEMA grant dollars for hazard mitigation projects;

NOW, THEREFORE BE IT RESOLVED, the Village Board adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the Village of Deer Park with the intent of implementing the plan recommendations as funding and resources allow.

Adopted, 10-7-2013

Dates and Signatures

Village President
Randy Clark

Date
10-14-2013

Village Clerk/Treas
Roland Thompson

10-14-2013

ATTACHMENT 6H

RESOLUTION

A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN FOR THE VILLAGE OF HAMMOND

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

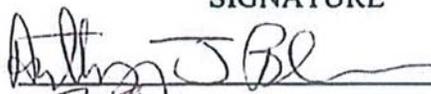
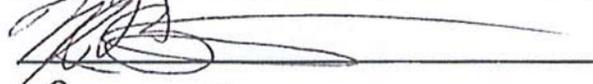
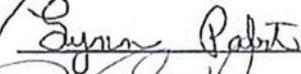
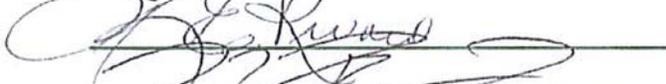
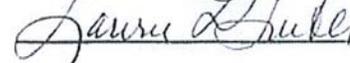
WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the Village of Hammond participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

WHEREAS, adoption of the Plan by the Village Board will meet prerequisite requirements which enables the Village of Hammond to apply for FEMA grant dollars for hazard mitigation projects;

NOW, THEREFORE BE IT RESOLVED, the Village Board adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the Village of Hammond with the intent of implementing the plan recommendations as funding and resources allow.

	SIGNATURE	DATE
Village President		<u>11-25-13</u>
Board Member		<u>25 Nov 13</u>
Board Member		<u>11-25-13</u>
Board Member		<u>11/25/13</u>
Board Member		<u>11/25/13</u>
Board Member		<u>11/25/13</u>
Board Member		<u>12/9/13</u>

RESOLUTION NUMBER 2013-05

RESOLUTION

RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN
FOR THE VILLAGE OF NORTH HUDSON

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the Village of North Hudson participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

WHEREAS, adoption of the Plan by the Village Board will meet prerequisite requirements which enables the Village of North Hudson to apply for FEMA grant dollars for hazard mitigation projects;

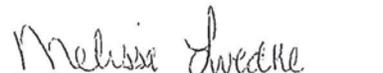
NOW, THEREFORE BE IT RESOLVED, the Village Board adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the Village of North Hudson with the intent of implementing the plan recommendations as funding and resources allow.

Adopted this 7th day of May, 2013.

Signed:


Stan Wekkin, President

Attested:


Melissa Luedke, Village Clerk

RESOLUTION NUMBER 2013-05 OF THE VILLAGE BOARD OF THE VILLAGE OF NORTH HUDSON, WISCONSIN

RESOLUTION – 2013-1R

**A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN
FOR THE VILLAGE OF ROBERTS**

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the Village of Roberts participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

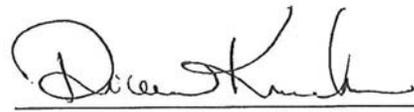
WHEREAS, adoption of the Plan by the Village Board will meet prerequisite requirements which enables the Village of Roberts to apply for FEMA grant dollars for hazard mitigation projects;

NOW, THEREFORE BE IT RESOLVED, the Village Board adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the Village of Roberts with the intent of implementing the plan recommendations as funding and resources allow.

Adopted April 8, 2013



Willard Moeri – Village President



Doreen Kruschke – Clerk/Treasurer

RESOLUTION 2013-08

**A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN
FOR THE VILLAGE OF SOMERSET**

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the Village of Somerset participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

WHEREAS, adoption of the Plan by the Village Board will meet prerequisite requirements which enables the Village of Somerset to apply for FEMA grant dollars for hazard mitigation projects;

NOW, THEREFORE BE IT RESOLVED, the Village Board adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the Village of Somerset with the intent of implementing the plan recommendations as funding and resources allow.

Dated this 22nd Day of October, 2013

By: 
Village President

Attest: 
Village Clerk

RESOLUTION NO. 2013-01

**A RESOLUTION
APPROVING AN ALL HAZARDS MITIGATION PLAN
FOR THE VILLAGE OF STAR PRAIRIE**

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the Village of Star Prairie participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

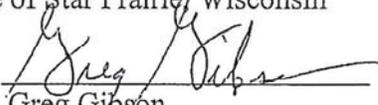
WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

WHEREAS, adoption of the Plan by the Village Board will meet prerequisite requirements which enables the Village of Star Prairie to apply for FEMA grant dollars for hazard mitigation projects;

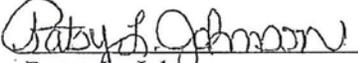
NOW, THEREFORE BE IT RESOLVED, the Village Board adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the Village of Star Prairie with the intent of implementing the plan recommendations as funding and resources allow.

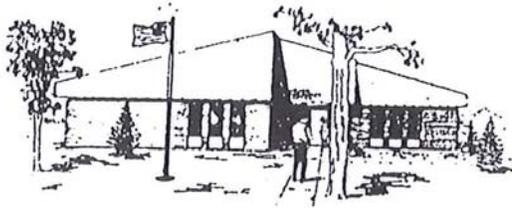
PASSED, ADOPTED AND APPROVED this 1st day of May, 2013.

Village of Star Prairie, Wisconsin

By: 
Name: Greg Gibson
Title: Village President

ATTEST:


Patsy L. Johnson
Village Clerk



VILLAGE OF WILSON

St. Croix County
440 Main Street
Wilson, Wisconsin 54027
Phone & Fax: 715/772-4402

RESOLUTION 01-2014

A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN FOR THE VILLAGE OF WILSON

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people and property from hazards and their effects; and,

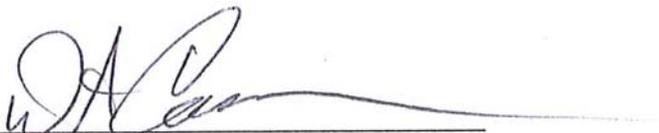
WHEREAS, St. Croix County worked through its Emergency Government & Communications Committee, with representation from local municipalities and emergency response providers, to develop the *St. Croix County All Hazards Mitigation Plan* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the Village of Wilson participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as participated in the review of draft plan documents; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management as meeting the requirements of the Federal Disaster Mitigation act of 200 and applicable Code of Federal Regulations; an,

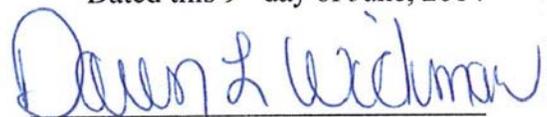
WHEREAS, adoption of the Plan by the Village Board will make the Village of Wilson eligible for federal grant dollars for hazard mitigation projects;

NOW, THEREFORE BE IT RESOLVED, the Village Board adopts the *St. Croix County All Hazards Mitigation Plan* as the official all hazards mitigation plan for the Village of Wilson with the intent of implementing the plan recommendations as funding and resources allow.



Village President

Dated this 9th day of June, 2014



Village Clerk
Village of Wilson, St. Croix County

RESOLUTION # 2013-02

**A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN
FOR THE VILLAGE OF WOODVILLE**

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the Village of Woodville participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

WHEREAS, adoption of the Plan by the Village Board will meet prerequisite requirements which enables the Village of Woodville to apply for FEMA grant dollars for hazard mitigation projects;

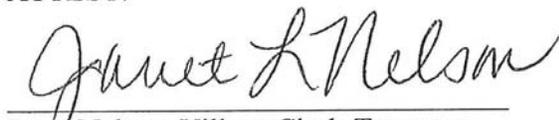
NOW, THEREFORE BE IT RESOLVED, the Village Board adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the Village of Woodville with the intent of implementing the plan recommendations as funding and resources allow.

Adopted this 11th day of June, 2013.



Barry Ketchum, Village President

ATTEST:



Janet Nelson, Village Clerk-Treasurer

RESOLUTION 2014-05

A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN FOR THE CITY OF GLENWOOD CITY

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the City of Glenwood City participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

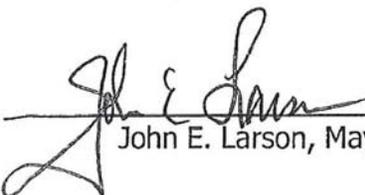
WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

WHEREAS, adoption of the Plan by the City Council will meet prerequisite requirements which enables the City of Glenwood City to apply for FEMA grant dollars for hazard mitigation projects;

NOW, THEREFORE BE IT RESOLVED, the City Council adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the City of Glenwood City with the intent of implementing the plan recommendations as funding and resources allow.

Adopted April 14, 2014

Ayes 6 Nays 0 Absent 0 Abstain 0

By:  _____
John E. Larson, Mayor

Attest:  _____
Shari Rosenow, Clerk-Treasurer

CITY OF HUDSON
RESOLUTION NO. 16-13

A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN
FOR THE CITY OF HUDSON

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the City of Hudson participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

WHEREAS, adoption of the Plan by the City of Hudson Common Council will meet prerequisite requirements which enables the City of Hudson to apply for FEMA grant dollars for hazard mitigation projects;

NOW, THEREFORE BE IT RESOLVED, the City of Hudson Common Council adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the City of Hudson with the intent of implementing the plan recommendations as funding and resources allow.

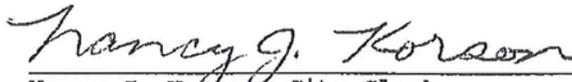
Dated at Hudson, Wisconsin, this 19th day of August, 2013.

APPROVED:



Alan D. Burchill, Mayor

ATTEST:



Nancy J. Korson, City Clerk

RESOLUTION #041302

A RESOLUTION APPROVING AN ALL HAZARDS MITIGATION PLAN
FOR THE CITY OF NEW RICHMOND

WHEREAS, hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure, and property from hazards and their effects; and,

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the *St. Croix County All Hazards Mitigation Plan, 2013-2018* to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and,

WHEREAS, the City of New Richmond participated in the planning process through a meeting with community representatives to identify hazard risks, vulnerabilities, and strategies unique to the community, as well as through the review of draft plan materials; and,

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and,

WHEREAS, adoption of the Plan by the City Council will meet prerequisite requirements which enables the City of New Richmond to apply for FEMA grant dollars for hazard mitigation projects;

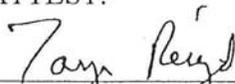
NOW, THEREFORE BE IT RESOLVED, the City Council adopts the *St. Croix County All Hazards Mitigation Plan, 2013-2018* as the official all hazards mitigation plan for the City of New Richmond with the intent of implementing the plan recommendations as funding and resources allow.

Passed and approved: April 8, 2013



Frederick Horne, Mayor

ATTEST:



Tanya Reigel, Clerk

RESOLUTION NO. 5720

RESOLUTION ADOPTING THE ST. CROIX COUNTY
HAZARD MITIGATION PLAN FOR THE CITY OF RIVER FALLS

WHEREAS, the Common Council of the City of River Falls recognizes that hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people, businesses, infrastructure and property from hazards and their effects; and

WHEREAS, St. Croix County, working through its Local Emergency Planning Committee, has updated and prepared the St. Croix County All Hazards Mitigation Plan, 2013-2018 to assess the magnitude of hazard risks and develop strategies for minimizing or reducing these risks; and

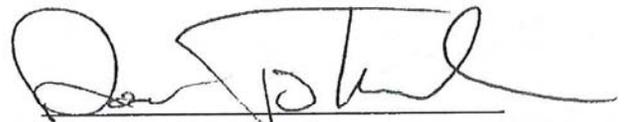
WHEREAS, the City of River Falls participated in the planning process through a representative on the St. Croix County Local Emergency Planning committee; and

WHEREAS, the Plan was reviewed and preliminarily approved by Wisconsin Emergency Management and FEMA as meeting the requirements of the Federal Disaster Mitigation Act of 2000 and applicable Code of Federal Regulations; and

WHEREAS, adoption of the Plan by the City Council will further meet prerequisite requirements which enables the City of River Falls to apply for FEMA grant dollars for hazard mitigation projects for that portion of the City which lies in St. Croix County;

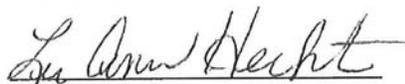
NOW, THEREFORE, BE IT RESOLVED that the Common Council of the City of River Falls hereby adopts the St. Croix County All Hazards Mitigation Plan, 2013-2018 in conjunction with the Pierce County All Hazards Mitigation Plan as the official all hazards mitigation plans for that portion of the City of River Falls which lies within St. Croix County.

Dated this 14th day of May, 2013.



Dan Toland, Mayor

ATTEST:



Lu Ann Hecht, City Clerk



A Touchstone Energy® Cooperative 
The power of human connections

July 3, 2013

Ms. Kristen Sailer, Emergency Management Coordinator
St. Croix County Emergency Support Services
1101 Carmichael Road
Hudson, WI 54016

RE: *St. Croix County All Hazards Mitigation Plan 2013-2018*

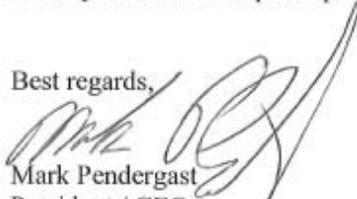
Dear Ms. Sailer:

St. Croix Electric Cooperative thanks St. Croix County and your office for providing us the opportunity to participate in the County's hazard mitigation plan update. In particular, we commend the County for its increased attention to the long-term power outage threat in the region due to ice storms, high winds, and other such weather-related events.

We have reviewed the plan and concur with the strategy recommendations pertaining to mitigation and preparedness for power outage events, such as the pursuit of grant funding to bury electric lines in areas most prone or at-risk of outages and to protect system components from flooding.

We look forward to working cooperatively with St. Croix County during implementation of the plan and future plan updates.

Best regards,


Mark Pendergast
President / CEO

APPENDIX B.

**FLOOD ASSESSMENT
METHODOLOGY**

St. Croix County Flood Assessment Methodology

Significant Changes Since the 2008 Hazard Mitigation Plan

1. The Flood Insurance Rate Maps (D-FIRM) for St. Croix County have been updated and are in digital format, thereby increasing accuracy and usability overall, though LIDAR or detailed topographical data was not available when the maps were being updated, so questions of accuracy still exist.

Remaining Flood Assessment Data Challenges

1. G.I.S. data for individual structures is not available for most of St. Croix County and no geographic database exists which identifies the characteristics of individual improvements and structures (e.g., basements, number of stories, base flood elevation) in the county.

As a result, the flood assessment methodology uses a top-down, “birds-eye” perspective which does not account for site-specific topographic variation. A structure might appear to be located within the 100-year floodplain on a map, but could it have been landscaped or otherwise elevated above the base flood elevation.

2. Assessed values for improvements and tax records are linked to the parcel database, but are not linked to building point data. Based on orthophotography, we are able to identify which buildings may potentially be located in a 100-year floodplain, but the use and value of each individual building are not available. Since our assessment information is for the entire parcel, this becomes a problem in cases where not all of the buildings within a single parcel are within or intersect the 100-year floodplain or in case where only a portion of a building may intersect the floodplain boundary.
3. Estimated values of improvements are not available for all parcels. Tax data does not include a value of improvements for municipal buildings (e.g., town halls, fire stations), public infrastructure (e.g., wastewater treatment plants, water towers), and other non-taxable structures (e.g., churches, public housing, electric cooperatives, non-profits).
4. St. Croix County does not have county-wide LIDAR, so the accuracy of D-FIRMs is still questionable in some areas. However, it is important to keep in mind that a serious flood could exceed the estimated 100-year limits, as well as being impacted by other factors which may change over time, such as reduced flood storage or increased stormwater runoff.
5. Related to #4, most designated 100-year floodplain areas in St. Croix County fall within Zone A which have no base flood elevations (BFEs) established, making it much more difficult to determine the actual vulnerability to individual structures.

Existing Conditions

St. Croix County has a large amount of river and lake shoreline and floodplain. Using available G.I.S. data, in January 2012, there were over 6,190 parcels with assessed improvements which lie within or intersect the 100-year floodplain. However, the methodology described below identified 557 likely principal structures which were potentially within the floodplain. Of these 930 structures, 16 structures were tax exempt, so it was not possible to obtain an assessed value for their associated improvements.

Flood Assessment Methodology

It is cost prohibitive to perform the detailed survey work of structural characteristics and attaching tax assessment data to the individual structures (versus parcel) necessary to make definitive conclusions in many cases. And structural footprint data is not available at time. However, it is critical to remember that the purpose of this assessment is to identify potential flooding risks to structures during a 100-year flood event for general mitigation planning. The assessment methodology used here is sufficient to identify those structures which may be most at risk of flood damage and those areas which may be a priority for flood mitigation activities.

For the assessment of riverine and lake flooding in St. Croix County the following methodology was used:

1. The D-FIRM G.I.S. shapefiles were used to identify the 100-year floodplain boundaries (shown by the green shading and blue line on the map below).



2. The G.I.S. parcel data provided by St. Croix County Land Information January 2012 was linked to the 2011 tax assessment data, thus providing information on municipality, assessed uses, and assessed values for those areas where parcel mapping was complete.

3. Those improved parcels which were within or intersected the 100-year were identified for guidance (shown as the yellow lines on the previous map). This made it easier to determine where improvements may potentially lie within the floodplain.
4. The principal structures were identified by visual inspection of 2010 orthophotography overlaid with the 100-year floodplain. Structures (e.g., garages, barns, boat houses) were excluded if it could be reasonably determined that they were not the principal structure on the parcel.

This approach was used to create a G.I.S. point data layer of all principal structures, taxable and exempt, which intersect or are contained within the 100-year floodplain (shown as the yellow dots on the previous map). As the previous map demonstrates, it can be difficult to determine if a building intersects the floodplain or if a building is the principal structure. The point file includes structures which partially intersect the floodplain. WCWRPC staff used their best judgment and buildings were marked if in doubt.

5. By overlaying the parcel and building point G.I.S. data, an estimated value of improvements for buildings potentially in the floodplain was identified. However, situations with multiple structures on a single parcel can be a challenge as noted previously. In such cases, the assessed value of all improvements was used, rather than attempting to further assign values to individual structures. In many cases, those ancillary structures on a parcel which are likely outside the 100-year floodplain boundary are still close enough to the boundary to potentially be vulnerable to flooding should a large event occur. For non-taxable parcels, improvement estimates are not available.

Though it has its weaknesses, this approach provides a good picture of which principal structures are most likely to be impacted by a 100-year flood in St. Croix County. However, this should not be relied upon as an accurate indicator of flood depth or damages during flood events since elevation, flood depth, and assessed value for each individual structure is not currently valued. Many of the structures likely have no recent flood history and may not have a significant vulnerability to a flood event.

6. For comparison, the St. Croix County HAZUS Risk Assessment distributed by Wisconsin Emergency Management in February 2009 is summarized in the plan.
7. Utilizing key informant interviews, discussions with local officials, a survey to each Town Board, and available records (e.g., NFIP flood insurance claims), floodprone areas and hotspots were also identified in the plan where infrastructure or improvements may be vulnerable to riverine or lake flooding.

Taken together, this approach provides an understanding of the overall flooding risks and vulnerabilities in St. Croix County, while providing insight into the distribution of potentially vulnerable structures within the county and the location of past flooding events.

APPENDIX C.

STAKEHOLDER INTERVIEW LIST

Prior to the scheduling of the city and village meetings, a letter of introduction regarding the effort and the project brochure was sent to each community. The planning consultant (West Central Wisconsin Regional Planning Commission) then telephoned the clerk or administrator of each city and village to schedule their assessment and strategy development meeting. Who attended the meetings on behalf of each city or village was at the discretion of the individual community. All community meetings were facilitated by the planning consultant, with assistance by the County Emergency Management Coordinator in most cases.

Most of the above meetings were informal and did not include a quorum of elected officials. As such, official minutes were typically not maintained or later approved. This was also a cost-savings measure since keeping official minutes for every meeting is time consuming and this was a plan update.

In addition to the stakeholder interview list, the following additional documentation is included in Appendix C for reference:

- sign-in sheet for Towns Association presentation
- town survey form
- sign-in sheets for meetings with the municipalities
- agendas and minutes for Plan Steering Committee (LEPC) meetings

St. Croix County Natural Hazards Mitigation Plan Key Stakeholder Interview List

The following constitute the key stakeholders who were interviewed and provide input during the development of the draft plan. Municipalities, the steering committee, and other stakeholders also provided additional input during the review of the draft plan strategies and plan adoption process.

Interviewee	Title/Notes	Date
Emergency Support Services (3 staff)	Initial coordination meeting on process, identify interviews, consensus on approach, etc.	11/10/11*
Steering Cmte Mtg #1	Introduction, process, NCDC summary, risks	12/1/11
Steering Cmte Risk Survey	Distributed via e-mail; results discussed at Meeting #2	Dec/Jan 2012
Steering Cmte Mtg #2	Risk prioritization survey results; scope	3/7/12
Steering Cmte Mtg #3	Review of key hazard assessment findings	6/6/12
Steering Cmte Strategy Alternatives Survey	Distributed via mail	June-July 2012
Steering Cmte Draft Plan Review	Distributed via mail	Aug-Sept 2012
Steering Cmte Mtg #4	Discuss draft plan and adoption process	9/6/12
Village of Baldwin	4 village attendees + County E.M.	3/26/12
Village of Deer Park	1 village attendee + County E.M.	4/24/12
Village of Hammond	2 village attendees	4/5/12
Village of N. Hudson	5 village attendees + County E.M.	3/23/12
Village of Roberts	4 village attendees + County E.M.	3/26/12
Village of Somerset	3 village attendees	4/5/12
Village of Spring Valley	Via phone and email	Various
Village of Star Prairie	4 village attendees	4/16/12
Village of Wilson	2 village attendees	4/26/12
Village of Woodville	3 village attendees + County E.M.	4/5/12
City of Glenwood City	3 city attendees + County E.M.	3/23/12
City of Hudson	8 city attendees	3/26/12
City of New Richmond	3 city attendees + County E.M.	4/11/12
City of River Falls	Via phone and email	Various*
County Towns Assoc.	28 attendees	4/26/12
Wendy Kramer	St. Croix County Public Health Officer	4/11/12*
Brad Beckman	Administrator, County Aging & Disability Resource Ctr	4/11/12*
Agriculture & Water Quality Meeting	Steve Pernsteiner, District Conservationist, NRCS Kristen Sailer, County E.M. Coordinator Bob Forrest, Director, FSA Farm Programs Kyle Kulow, Watershed Land Spc, County L&W Cons Tamara Wittmer, Urban Land Spc, County L&W Cons Steve Olson, Rural Land Spc, County L&W Cons Robert Heise, Direct, County L&W Conservation	4/16/12*
Lisa Olson-McDonald	WEM Regional Director	4/10/12
Teri Engelhart	WEM REP Section Supervisor	4/10/12

Planning & Zoning Meeting	Kevin Grabau, County Code Administrator Brett Budrow, County Land Information Mgr Ellen Denzer, Sr. Planner (now Director) Peter Kling, Interim P&Z Director Kristen Sailer, County E.M. Coordinator	3/7/12
Kristen Sailer	County Emergency Management Coordinator	3/23/12
Casey Swetlik	Director, County Emergency Support Services	3/23/12
County Highway Department Meeting	Tim Ramberg, Highway Commissioner Jim Krizan, Operations, County Hwy Dept. Randy Anderson, Patrol Superintendent, County Hwy Kristen Sailer, County E.M. Coordinator	April 2012
School District Surveys	Hazard surveys were mailed w/ a SASE to every public and private school district with a school building located in St. Croix County	May 2012
Fire Department Surveys	Hazard surveys were e-mail to every Fire Department in St. Croix County	April 2012
Joseph Behlen	Dam Safety Engineer, WDNR	3/8/12
Xcel Energy Meeting	Xcel Energy Kristen Sailer, County E.M. Coordinator	3/23/12
Gail Maier	President, St. Croix County Fairgrounds	6/22/12
Benjamin Black	Canadian National Railway	April/May '12
St. Croix Electric Cooperative Meeting	Mark Pendergast, President & CEO Rob Dooley, Line Superintendent	4/11/12
A number of additional brief contacts or outreach attempts were made during the process to additional potential stakeholders, such as emergency management offices of adjacent counties, area Red Cross and Salvation Army offices, CESA 11, and Dairyland Power Cooperative.		

* *Dates marked with an asterisk do not include additional mail, e-mail, and phone correspondence prior to or following the primary interview. In some cases, stakeholders reviewed draft plan sections and strategies and provided additional input.*

**4/26/12 ST. CROIX COUNTY TOWNS ASSOCIATION MEETING
SIGN-IN SHEET
(E-MAIL ADDRESS EXCLUDED)**

NAME	TOWN
MIKE TULLY Please Print	CADY
SCOTT BOLSTAD	St. Joseph
RICK COLBETH	Somerset
Ed Schachtner	Somerset
Jeri Koester	Somerset
Tom Wink	Emerald
Henry Huatgen	Emerald
Ken Peterson	Hammond
TIM RAMBERG	Hwy
DAVID NASER	Richmond
RICH LOCKERT	Richmond
CARU KUTSON	Richmond
DON SCHUMACHER	Rush River
DON L. JOHNSON	Baldwin
Jim Huatgen	Baldwin
Jim VAKER	Baldwin
Cheryl Puppe	Baldwin
Barbara Zimmerman	Baldwin
Kevin Derrick	Lylon
Randy Zemke	Lylon
Sue Warren	Troy
Jola Duggan	Kishwaukee
Axel Bowman	Kishwaukee
Dennis Duckworth	Eau Claire
Pete Kling (St. Croix Co. Planning & Zoning)	FOREST
JAT SECURET	WTA
Gregg Merrett	SEC EM
Kristen Sailer	WOWRAC
Chris Straight	

St. Croix County All Hazards Mitigation Plan Town Vulnerabilities and Strategies Survey

Formal action on this survey by the Town Board is not required. But we need and value your input. The survey may be completed by the Town Board, Plan Commission, Clerk, Maintenance Director, or other Town representative(s) knowledgeable on such matters in your town.

HAZARD VULNERABILITIES

- a. We all experience severe weather, but please describe any **CRITICAL**, **UNIQUE**, or **SIGNIFICANT** vulnerabilities or concerns for your town for each hazard type. Also, identify any vulnerable areas or “hotspots” on the enclosed town map. *An 11x17 town-specific map with 100-year floodplain overlaid upon an orthophoto was included with each survey.*
- b. If your community has no unique issues for a hazard, you may state “NONE” or leave the corresponding question blank. Even if your Town has no comments, we request that you still return the survey.

Flooding (i.e., river/lake flooding, stormwater/flash flooding, dam failure)	
Please describe any flooding concerns and generally identify any floodprone areas, structures, or roads on the enclosed town map:	
Flood analysis from 2008 Plan, which included the map on the last page of this survey ¹ :	
<i>Customized descriptive text added for each individual town prior to distribution.</i>	
Tornadoes/High Winds/Thunderstorms (including lightning, hail, heavy rain)	
Please describe and/or identify on your town map any unique tornado or thunderstorm vulnerabilities or concerns (e.g., areas or structures at significant risk to such damage, campgrounds or mobile home parks without storm shelters):	<p style="text-align: center;"># of Mobile Homes (2000 Census)</p> <p style="text-align: center;"><i># added prior to distribution</i></p>

¹ The 100-year floodplain identified in 2007 plan was updated in 2011. The analysis in this plan update will be based on the current floodplain boundary.

Winter Storms/Extreme Cold/Ice		
Please describe any <i>unique</i> vulnerabilities or concerns involving winter storms (e.g., vulnerable populations, areas of severe drifting snow). Identify on your town map if needed.		
Drought and Extreme Heat		
Please describe any <i>unique</i> vulnerabilities or concerns involving drought and extreme heat. The plan will cover agricultural impacts in general, but note if you have any specific concerns. Identify on your town map if needed.		
Hazardous Materials Spills		
Other than Interstate 94, major highways, and the railroads, please describe any <i>unique</i> vulnerabilities or concerns involving hazardous materials spills. Identify on your town map if needed.		
Miscellaneous Questions		
1. Has your Town government experienced a cyber-attack? If “yes”, please briefly describe:	YES	NO
2. Is more training needed on cyber-threats and data security for Town governments?		
3. Are you aware that St. Croix County lies within the Ingestion Pathway Zone (IPZ) for the Prairie Island Nuclear Generating Facility?		
4. Would your Town like more information on the IPZ and what it means?		
5. Does your Town have an up-to-date Emergency Operations Plan?		

PROPOSED MITIGATION ACTIVITIES

Please identify any strategies you would recommend for the mitigation plan update, especially activities which will help address an issue you noted previously or strategies for which grant funding may be needed in the future. Recommendations may be county-wide or town-specific. A few example activities are included for reference.

Construction and Engineering Recommendations

(examples: engineering studies, dam removal, levee repair, culvert/stormwater system improvements, relocation of floodprone structures, flood proofing, dry hydrants, emergency shelters, emergency power generator)

- 1.
- 2.

Communication Recommendations

(examples: intergovernmental cooperation, partnerships, warning/siren systems, communications networks, emergency siren, distribution of weather radios)

- 1.
- 2.

Planning and Regulatory Recommendations

(examples: special planning projects, amend building codes, shoreland protections, enforcement concerns, ensuring access for emergency vehicles, update Town emergency operating plan)

- 1.
- 2.

Education Recommendations

(examples: employee training, emergency response exercises, media packets, public educational efforts)

- 1.
- 2.

OTHER HAZARD CONCERNS OR POTENTIAL STRATEGIES

Identify any additional hazard concerns or strategies here:

REGARDING THE MAP ON THE FOLLOWING PAGE

This map was compiled as part of the 2008 *St. Croix County All Hazards Mitigation Plan*. The flooding “hotspots” shown were largely identified by the towns and the County Highway Department, with additional input from other stakeholders. **Note any changes to this map in the survey or on your town map.**

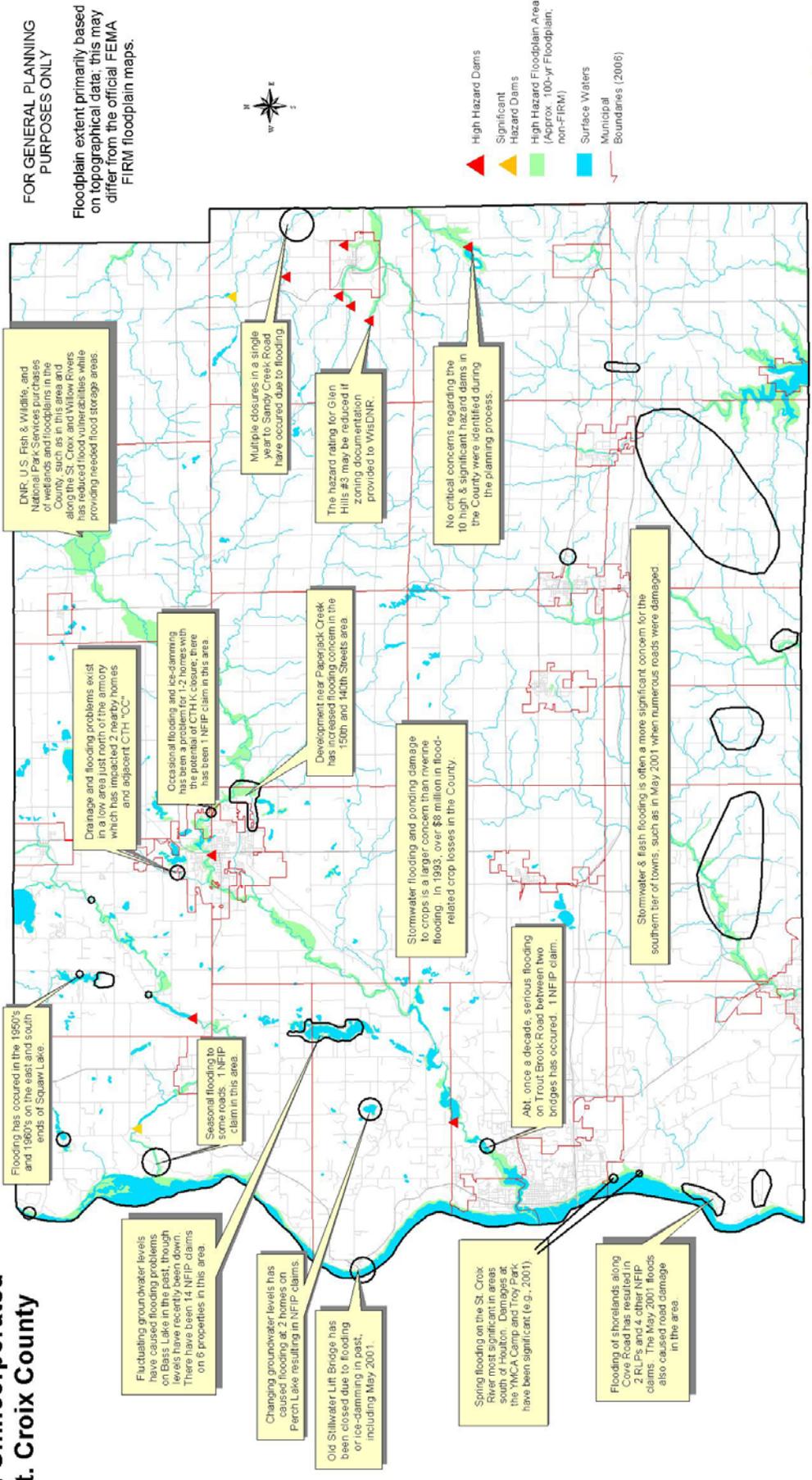
Thank you for your assistance!

Please return the completed survey in the enclosed self-addressed stamped envelope by May 31, 2012.

**Or mail to:
Chris Straight, Senior Planner
West Central Wisconsin Regional Planning Commission
800 Wisconsin Street
Banbury Place, Building D-2 Mail Box 9
Eau Claire, WI 54703**

Included w/
Town Survey;
from 2008 Plan

FIGURE 17.
Areas of Flooding Concern
in Unincorporated
St. Croix County



St. Croix County All Hazards Mitigation Plan Update - Document

Activity: Baldwin meeting

Date & Time: 3/26/12 8:30 AM - 10:00 AM

NAME	TITLE	*HRLY WAGE/SALARY	**BENEFITS
Craig Nelson	EMS / EMERGENCY MAN		
Zoe Carter	Adm/Com/Specs.		
John Traxler	DPO		
Wl Zevenbergen	Village Pres		
Kristen Sailer	SCC EM		

St. Croix County All Hazards Mitigation Plan

Activity: Deerpark Interview

Date & Time: 4/24 1 PM - 2:30 PM

NAME	TITLE
Robert Thompson	Village Clerk/Treas.
Kristen Sailer	St. Croix Co. EM

St. Croix County All Hazards Mitigation Plan U

Activity: North Hudson

Date & Time: 3/23 2:30 - 4:30

NAME	TITLE
Becky Milbrandt	Village Clerk
GEORGE KLEIN	Village PRESIDENT
MARK D. RICHERT	Police Chief
Mark Ekblad	Public Works Supt
Gloria Troester	Village Administrator
Kristen Sailer	SC EM

St. Croix County All Hazards Mitigation Plan

Activity: Village of Hammond

Date & Time: 4/5/12 8:30 AM - 9:30 AM

NAME	TITLE
JEAN PETERSON	Clerk
RICK COLTRAIN	POLICE CHIEF

St. Croix County All Hazards Mitigation Plan

Activity: Roberts Meeting

Date & Time: 3/26/12 10:30 - 12:00p

NAME	TITLE
Daniel Burgess	Chief of Police
John Bond	Director Public Works
Willard Moeri	Village President
Doreen Kraschke	Clerk/Treasurer

St. Croix County All Hazards Mitigation Plan

Activity: Meeting w/ Star Prairie

Date & Time: 4/16/12 1:30 - 2:45 PM

NAME	TITLE
Randy Lewis	maint. oper.
Steve Lewis	police chief
Doug Gibson	Village President
Bobby Johnson	Village Clerk-Treasurer

St. Croix County All Hazards Mitigation Plan Update - Document

Activity: Village of Wilson

Date & Time: 4/26/12 1 hour 4:30-5:30 PM

NAME	TITLE	*HRLY WAGE/SALARY	**BENEFITS
Steve Nielson	Director of Public Works	22.30	
Dawn Wickman	Clerk	10.00	
Kristen Sailer	St. Croix Co. EM		

St. Croix County All Hazards Mitigation Plan Update

Activity: Village of Woodville

Date & Time: 4/5/12 10AM - 11:30AM

NAME	TITLE	*HRLY WAGE/SALARY
Don Peterson	DPW	
Loei Hetfeld	Chief of Police	
Jan Nelson	Village Clerk/Treas	
Kristen Sailer	EM coordinator	

St. Croix County All Hazards Mitigation Plan Update - D

Activity: City of Glenwood City
 Date & Time: 3/23 10:30 - ~~11:00~~ 12:15

NAME	TITLE	*HRLY WAGE/SALARY	**E
Sharon Peterson	Clerk-Treasurer	19.94/hr	6.1
Doug Doornink	Public Works Director	19.23/hr	6.1
Robert Darwin	Chief of Police	21.13/hr	8.1
Kristen Sailer	EM Coordinator		

St. Croix County All Hazards Mitigation Plan Update -

Activity: City of Hudson
 Date & Time: 3/26/12 1 PM - 2:45 PM

NAME	TITLE	*HRLY WAGE/SALARY
Tom ZELI	Public Works Director	
Alfred Beckell	Mayor	
Eric Christensen	EMS Chief	
David Gray	Bldg. Insp.	
Denny Darnold	Community Development	
Marty Jensen	Chief of Police	
Dave Kampick	Fire Inspector/Marshal	
James Fryce	Hudson Water Utility Chief Plant Operator	
Kristen Sailer	SEC EM	

St. Croix County All Hazards Mitigation Plan Update - D

Activity: New Richmond Interview
 Date & Time: 4/11/12 10:05 AM - 11:30 AM

NAME	TITLE	*HRLY WAGE/SALARY	**E
Dennis Holtz	Wastewater Supt		
CHUCK MGHLS	EM. GOV'T DIRECTOR		
Dan Kaski	City Engineer		

NOTICE OF MEETING AND AGENDA
ST. CROIX COUNTY LOCAL EMERGENCY PLANNING COMMITTEE
DECEMBER 1, 2011 - 1:00 P.M.
ST. CROIX COUNTY GOVERNMENT CENTER, COMMUNITY ROOM
1101 CARMICHAEL ROAD, HUDSON, WISCONSIN

CALL TO ORDER

ROLL CALL

APPROVAL OF 09/08/2011 MINUTES

DATE OF NEXT MEETING

On e-mail to members make sure we inform ALL members we will not be providing copies of the attached information. Unless a request is made prior to the meeting

NEW BUSINESS

1. Membership Review
2. Sub-committee Appointments
3. Hazard Mitigation Plan Update – Chris Stewart, WCWRPC
4. County-wide Strategic Plan Update – Kristen Sailer
5. Recommendation from Planning subcommittee to approve Off-site Facility Plans
 - a. O'Reilly Auto Parts - Hudson
 - b. Hudson Wastewater Plant - Hudson
6. School Door Numbering System - Chuck Mehls
7. Hazmat training grants
8. Committee and Public Comments

ADJOURN

(Items may be taken in different order)

** Additions/Changes/Corrections

extract from 12/1/11 minutes...

**OFFICIAL
LOCAL EMERGENCY PLANNING COMMITTEE MINUTES
12/01/2011**

The St. Croix County (SCC) Local Emergency Planning Committee (LEPC) meeting was called to order by Chair Roger Larson at 1:00 P.M. and held at the SCC Government Center, Community Room in Hudson.

Roll Call by Janet Smith, a quorum was met

Present: Roger Larson (County Board), Kristen Sailer(SCC-EM), Ed Thurman (SCC-PH), Janet Smith (SCC-ESS), MaryEllen Bol (Phillips Plastics), Mike Koscinski (Union Pacific Railroad), Terry Andersen (SCC-EC), Jan Nelson (Woodville), Daryl Standafer (County Board), Chuck Mehls (New Richmond EM), David Ostness (Community Group), Jeff Klatt (Sheriff's Dept), Jill Ellestad (Phillips Plastics), Jon Aubart (River Falls PD), Tim Ramberg(SCC-HWY), Margret Ontl(Star-Observer).

Also Present: Ruth Talford, Bob Olson, Eric Nikolai (American Red Cross) and Duana Bremer (Salvation Army)

Absent: Doug Briggs(excused), Casey Swetlik(excused), Hendryk Sowa(excused), Fred Home, James Stauffer, Jim Vanderwyst, Joe Hurtgen, Karen Meyer, Robert Shearer, Steve Hermsen, Matt Melby

Minutes of 09/08/11 meeting were approved on a Nelson/Standafer motion. Motion carried unanimously.

Next Meeting – Wednesday, March 7, 2012 1:00 P.M. at the Government Center, Community Room

COUNTY WIDE ALL HAZARDS MITIGATION PLAN UPDATE: Sailer introduced Chris Straight from the West Central Wisconsin Regional Planning Commission (WCWRPC). St. Croix County has been awarded a grant from FEMA to update our existing All Hazard Mitigation plan. The last plan was adopted by full county board in December of 2007. The plan is required to be updated every five years. We have contracted with WCWPRC to help update the plan. The LEPC will act as the oversight/steering committee for the plan as it has in the past. This will be considered our first meeting of the Mitigation Plan steering committee.

Straight distributed to the members an outline of the Natural Hazards Mitigation Plan Update, Plan Update timeline along with information used to create the current plan and a brochure which will be distributed to key shareholders in the county. This plan will cover St. Croix County as well as unincorporated towns. City and Villages must adopt the plan in order to be included in the plan. Straight also distributed a sign in sheet for members of this committee to record the time spent and approximate hourly rate which will count toward the county grant match.

The committee reviewed what has been done in the past and what information we need to accomplish the update of the plan. A survey will be sent out to members to rate what the hazards should be addressed in the update and prioritizing the needs. The plan is due to the state by July 20, 2012. Straight will send out letters to stakeholders such as Red Cross, Salvation Army, city, towns, fire departments, businesses, etc. Public input can be captured by Open houses, by attending municipality meetings, public hearings and other methods were discussed.

A new survey will be sent out to determine the hazards we feel are most important and to be included in the plan. Next meeting will be at the March 7, 2012 LEPC meeting.

**NOTICE OF MEETING AND AGENDA
ST. CROIX COUNTY LOCAL EMERGENCY PLANNING COMMITTEE
MARCH 7, 2012 - 1:00 P.M.
ST. CROIX COUNTY GOVERNMENT CENTER, COMMUNITY ROOM
1101 CARMICHAEL ROAD, HUDSON, WISCONSIN**

CALL TO ORDER

ROLL CALL

APPROVAL OF 12/01/2011 MINUTES

DATE OF NEXT MEETING

NEW BUSINESS

1. Membership Review
2. Recommendation from Planning subcommittee to approve Off-site Facility Plans
 - a. County-wide Strategic Plan
 - b. GM Plant 30 - Hudson
 - c. Verizon (old MCI) – Hudson
 - d. Wastewater Plant – New Richmond
 - e. Ameritech – Houlton
 - f. Precision Ag – 4 Corners, New Richmond
 - g. Fleet Farm - Hudson
3. Hazmat training grants update
4. Hazard Mitigation Plan Steering Committee
 - a. Update of the St. Croix County All-Hazard Mitigation Plan provided by Chris Straight from WCWRPC
5. Committee and Public Comments

ADJOURN

(Items may be taken in different order)

** Additions/Changes/Corrections

extract from 3/7/12 minutes...

**LOCAL EMERGENCY PLANNING COMMITTEE MINUTES
03/07/2012**

The St. Croix County (SCC) Local Emergency Planning Committee (LEPC) meeting was called to order by Chair Roger Larson at 1:00 P.M. and held at the SCC Government Center, Community Room in Hudson.

Roll Call by Janet Smith, a quorum was met

Present: Roger Larson (County Board), Kristen Sailer(SCC-EM), Casey Swetlik (SCC-ESS), Karen Meyer, (County Board), Ed Thurman (SCC-PH), Janet Smith (SCC-ESS), Jill Ellestad (Phillips Plastics), Mike Koscinski (Union Pacific Railroad), Terry Andersen (SCC-EC), Jan Nelson (Woodville), Daryl Standafer (County Board), Chuck Mehls (New Richmond EM), David Ostness (Community Group), Jeff Klatt (Sheriff's Office), Jon Aubart (River Falls PD), James Krizan (SCC-HWY), Doug Briggs (Somerset PD), Margret Ontl(Star-Observer), Eric Nikolai (ARC), Bob Olson (ARC), Duana Bremer (Salvation Army)

Also Present: Patrick Thompson (SCC-ADMIN), Ray Morris (SCC-EM)

Absent: Fred Horne, Joe Hurtgen, Steve Hermsen, Robert Shearer, Hendryk Sowa, Jim Vanderwyst, Matt Melby, Ruth Talford, MaryEllen Bol (excused)

Minutes of 12/01/11 meeting were approved on a Ostness/Klatt motion. Motion carried unanimously.

Next Meeting – Wednesday, June 6, 2012 1:00 P.M. at the Government Center, Community Room

COUNTY WIDE ALL HAZARDS MITIGATION PLAN STEERING: Chris Straight from the West Central Wisconsin Regional Planning Commission (WCWRPC). Per federal law (Federal Mitigation Act 2000) the plan must encompass the natural hazards which are most at risk for the community. Last plan also included hazardous material spills, nuclear accident, and pandemic flu. For this plan a survey of the members was conducted in December. Straight handed out the results from the Hazards Risk & Vulnerability survey. Sailer suggested adding school related terrorism (Domestic) and Extreme Heat into the plan. Morris noted the absence of cyber terrorism in the survey. Discussion

Motion by Swetlik/Mehls that the Mitigation plan update incorporates the domestic terrorism (school related) and extreme heat threats. If funding is available, investigate local tangible benefits of possible inclusion of cyber terrorism into the mitigation plan. Motion carried unanimously.

Meetings with towns, cities and villages have begun. Meetings are also in progress with different stakeholders. Interviews are held via telephone or face to face. Interviews should be finished within the next 30 days. The interviews are conducted to determine changes/updates needed in the new mitigation plan.

Draft strategies and an amended survey will be sent to members and the results will be available for the June 6th meeting.

**NOTICE OF MEETING AND AGENDA
ST. CROIX COUNTY LOCAL EMERGENCY PLANNING COMMITTEE
JUNE 6, 2012 - 1:00 P.M.
ST. CROIX COUNTY GOVERNMENT CENTER, COMMUNITY ROOM
1101 CARMICHAEL ROAD, HUDSON, WISCONSIN**

CALL TO ORDER by Convener

ROLL CALL

APPROVAL OF 3/7/2012 MINUTES

DATE OF NEXT MEETING – Possibly THURSDAY, SEPTEMBER 6, 2012 1:00 P.M.

NEW BUSINESS

1. Election of Officers
 - a. Chair
 - b. Vice Chair
2. Designation by committee for the following positions:
 - a. Coordinator of Information
 - b. Community Emergency Coordinator
 - c. Compliance Inspector
3. Appointment of Secretary by Chair
4. Special presentation from Jeff Vogt, Roberts-Warren Fire on February, 2012 Semi-truck crash and explosion on I-94
5. Hazard Mitigation Plan Steering Committee
 - a. Update of the St. Croix County All-Hazard Mitigation Plan provided by Chris Straight from WCWRPC
6. Membership Review
7. Recommendation from Planning subcommittee to approve Off-site Facility Plans
 - a. Cardinal Health, Inc. – Hudson
 - b. City of Hudson Well Facilities #3 - #8
 - c. Wal-Mart Store #1365 - Hudson
8. Hazmat training grants update
9. Overview of the update process and review of County specific plans
10. Committee and Public Comments

ADJOURN

(Items may be taken in different order)

** Additions/Changes/Corrections

extract from 6/6/12 minutes...

LOCAL EMERGENCY PLANNING COMMITTEE MINUTES

06/06/2012

Draft

The St. Croix County (SCC) Local Emergency Planning Committee (LEPC) meeting was held on Thursday, June 6, 2012, at 1:00 P.M., at the St. Croix County Government Center, Community Room in Hudson.

The meeting was called to order by Convener Daryl Standafer

Roll Call was taken a quorum was met.

Members Present: Roger Larson (County Board), Daryl Standafer (County Board), Ron Kiesler (County Board), David Ostness (County Board), Casey Swetlik (SCC-ESS), Charlie Mehls (New Richmond EM), Ed Thurman (SCC-PH), Jan Nelson (Woodville Clerk), Janet Smith (SCC-ESS), Jeff Klatt (Sheriff's Office), Jon Aubart (River Falls PD), Matt Melby, (New Richmond Area Ambulance), Terry Andersen (SCC-EC), James Krizan (SCC-HWY), Margaret Ontl, (Hudson-Star Observer), Jill Ellestad (Phillips Plastics), Mary Ellen Bol (Phillips Plastics)

Absent: Joe Hurtgen and Andy Brinkman (excused) and Mike Koscinski (excused). Doug Briggs, Jim Vanderwyst, Ruth Talford, Eric Nikolai and Bob Olson (ARC), Duana Bremer (Salvation Army),

Also Present: Patrick Thompson (SCC-ADMIN), Jeff Vogt Roberts/Warren Fire Chief, Chris Straight ((WCWRPC).

Minutes of 03/03/11 meeting were approved and accepted. Next Meeting is Thursday, September 6, 2012

1. **Election of Officers:**

Convener Standafer opened the nominations for Chairperson. Motion by Jeff Klatt for Roger Larson. Motion by Kiesler nominating Dave Ostness. Nominations closed. Ballot vote: Larson is elected Chair of the LEPC Committee

Chair Larson opens nomination of Vice Chair. Motion by Aubart for Jeff Klatt. Ostness makes a motion to close nominations and cast a unanimous vote. Carried.

2. **Designation of Coordinator of Information, Community Emergency Coordinator and Compliance Inspector:** Motion by Klatt/Aubart to have the Emergency Support Services Director serve as the Coordinator of Information and Community Emergency Coordinator and have the State Emergency Management office serve as the Compliance Inspector. Carried

3. **Appointment of Secretary:** Motion by Jan Nelson 2nd by Andersen to have Smith continue as Secretary of the LEPC. Carried

4. **Presentation by Fire Chief Jeff Vogt:** Vogt presented the committee with photos and commentary on the I-94 Semi-truck crash and explosion on February 21, 2012. The trucker was carrying approx. 3500 gal of both gas and diesel fuel.

5. **Membership Review:** Swetlik reported the membership committee is taking suggestions for a Hospital representative and HAZMAT. Discussion on the LEPC By-laws regarding if a member misses 3 meetings in a 12 month period they forfeit their membership. Correspondence has been sent to current members who are reaching that threshold. Somerset Police Chief Doug Briggs has also indicated he will be looking for a replacement to serve on the LEPC. Swetlik suggests Roberts/Warren Fire Chief Jeff Vogt and Westfield's EM Betsy. Mehls/Ostness motion to contact Jeff and Betsy regarding membership. Carried.

6. **Hazard Mitigation Plan Steering Committee:** Chris Straight, from West Central Wisconsin Regional Planning Commission (WCWRPC) presented current status and information on the 2013 All Hazards Mitigation Plan. Discussion.

**NOTICE OF MEETING AND AGENDA
ST. CROIX COUNTY LOCAL EMERGENCY PLANNING COMMITTEE
SEPTEMBER 6, 2012 - 1:00 P.M.
GOVERNMENT CENTER, COMMUNITY ROOM
1101 CARMICHAEL ROAD, HUDSON, WISCONSIN**

CALL TO ORDER

ROLL CALL

APPROVAL OF 6/6/2012 MINUTES

DATE OF NEXT MEETING – DECEMBER 6, 2012

NEW BUSINESS

1. Recommendation from Planning subcommittee to approve Off-site Facility Plans
 - a. Cardinal Health, Inc. – Hudson
 - b. City of Hudson Well Facilities #3 - #8
 - c. Wal-Mart Store #1365 - Hudson
2. Review LEPC By-laws
3. Review LEPC Procedures for Review of Hazmat Response Expenditures
4. Special presentation from Bruce Fuerbringer on results from the Commodity Flow Study on Hazardous Materials transportation through St. Croix County. (15 minutes)
5. Hazard Mitigation Plan Steering Committee - Update of the St. Croix County All-Hazard Mitigation Plan provided by Chris Straight from WCWRPC (15 minutes)
6. Committee and Public Comments

ADJOURN

(Items may be taken in different order)

** Additions/Changes/Corrections

MINUTES
ST. CROIX COUNTY LOCAL EMERGENCY PLANNING COMMITTEE (LEPC)
SEPTEMBER 6, 2012 - 1:00 P.M., GOVERNMENT CENTER, COMMUNITY ROOM
1101 CARMICHAEL ROAD, HUDSON, WISCONSIN

Meeting was called to order by Chair Roger Larson at 1:00 PM

ROLL CALL

Present: Roger Larson, Daryl Standafer, Dave Ostness, Casey Swetlik, Ed Thurman, Jan Nelson, Janet Smith, Jon Aubart, Kristen Sailer, Matt Melby, Terry Andersen, Tim Ramberg, Margaret Ontl, Jill Ellestad, MaryEllen Bol, Mike Koscinski, Eric Nikolai, Bob Olson. Absent: Ron Kiesler (excused), Andy Brinkman, Joe Hurtgen, Chuck Mehls (excused), Doug Briggs, Jeff Klatt (excused), Jim Vanderwyst, Ruth Talford, Duana Bremer (excused). Others Present: Jason Winget (ARC), Chris Straight and Bruce Fuerbringer.

APPROVAL OF 6/6/2012 MINUTES

Minutes from the June 6, 2012 meeting were accepted.

DATE OF NEXT MEETING – DECEMBER 6, 2012

Meeting date of December 6, 2012 stands. Meeting time will remain at 1:00 PM.

NEW BUSINESS

Recommendation from Planning subcommittee to approve Off-site Facility Plans: Aubart reported the Planning subcommittee recommends approval of the Cardinal Health, Inc. – Hudson, City of Hudson Well Facilities #3 - #8 and Wal-Mart Store #1365 – Hudson, offsite facility plans. A Ostness/Melby motion was made. Carried.

Review of LEPC By-laws and Hazmat Response Expenditures:

Sailer explained the By-Laws and Hazmat Response Expenditures must be reviewed and updated if necessary per our grant requirements. A Sailer/Aubart motion to approve the By-Laws was made. Carried. A Sailer/Ostness motion was made to approve the Hazmat Reponse Expenditures. Carried

Commodity Flow Study on Hazardous Materials transportation through St. Croix County: Bruce Fuerbringer from Five Bugle Training & Consulting, L.L.C. presented the committee with the results of the Multi-County Commodity Flow Study. St. Croix, Chippewa, Eau Claire and Dunn LEPC's jointly received grant funds through the U.S. Department of Transportation and Hazardous Materials Emergency Preparedness (HMEP) Planning Sub-Grant to complete the study.

Hazard Mitigation Plan Steering Committee: Chris Straight from West Central Wisconsin Regional Planning Commission reported on the status of the plan. Plan is currently at the State being reviewed. Discussion on including a level B Hazmat team in the study. By consent Committee decided to remove the level B Hazmat team from the study. Straight is now needing time spent on the Plan from committee and municipal personnel to work on the in-kind matches.

Committee and Public Comments: A brief discussion on the full-scale exercise at the Baldwin/Woodville High School.

ADJOURN

Chair Larson adjourned the meeting at 2:04 PM.

APPENDIX D.

PUBLIC INFORMATIONAL MEETING NOTICE

10-16-2012)

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PUBLIC NOTICE

PLEASE TAKE NOTICE that there will be a public informational meeting on Tuesday, October 23, 2012, at 6:30 P.M. in the Community Room A # D213, St. Croix County Government Center, Lower Level, 1101 Carmichael Road, Hudson, Wisconsin, to discuss hazard mitigation planning efforts.

St. Croix County is in the process of updating the County's All Hazards Mitigation Plan which is a pre-requisite for certain FEMA grant funding. As part of the plan development process, the County is seeking input regarding the use of various activities to reduce or eliminate hazard risks to residents and property. A copy of the draft plan is available for review at the St. Croix County Emergency Management Office or is available for download at <http://www.wcovpc.org/Documents/documents.html>.

County residents are encouraged to attend. If you have any questions or comments on the draft plan, please contact Kristen Sailer, St. Croix County Emergency Management Coordinator at 715-381-4911.

Notice is hereby given that members of the County Board may be present at the foregoing meeting to gather information about a subject over which they have decision-making responsibility. This may constitute a meeting of the County Board, pursuant to State ex rel. Badke v. Greendale Village Bd., 173 Wis.2d.553,494 N.W.2d408 (1993), and must be noticed as such, although these governmental bodies will not take any formal action at this meeting.

Kristen Sailer
St. Croix County Emergency Management Coordinator

WNAJLP 2110-16B

PUBLIC HEARING NOTICE

APPENDIX E.

VULNERABILITY ASSESSMENT
FOR
CRITICAL FACILITIES

St. Croix County Natural Hazards Vulnerability Assessment for Critical Facilities

SCORE: 1 = Low, 2 = Medium, 3 = High

Critical Facility Type	Quantity (if avail)		Overbank Flooding		Overland/Fresh Flooding		Tornadoes		Thunderstorms/ High Winds		Winter Storms and Extreme Cold		Drought and Extreme Heat		Hazardous Materials Spills		Cyberattack		Total Score
	score	potential vulnerabilities	score	potential vulnerabilities	score	potential vulnerabilities	score	potential vulnerabilities	score	potential vulnerabilities	score	potential vulnerabilities	score	potential vulnerabilities	score	potential vulnerabilities	score	potential vulnerabilities	
Government Buildings (includes emergency services buildings, such as fire halls)	40+, in addition to 17 law enf, 26 fire stations, 19 EMS/ambul, & 1 prison exist.	1.5	No history of overbank flooding problems at any government building, except for some parks. The Star Prairie Town Hall is located close or within the 100-year floodplain. Not all governmental buildings mapped, so others floodplain or dam shadow structures may exist.	2.0	Woodville and Hammond have had flash flooding problems at the Village Halls and Woodville Fire Hall, but most communities reported no similar problems. This is ranked higher than in 2008 due to A ug 2010 flooding.	1.0	Many of these facilities do not have emergency power generation. Some vulnerability to pole buildings used for maintenance, storage, etc.	2.0	Loss of power due to high winds topping trees is the greatest risk frequently mentioned during the planning effort, including the event in 2010. Lightning strikes and related power surges also pose threats to utilities, communication equipment, etc.	2.0	Long-term power loss due to ice storm is the greatest vulnerability. Many of these facilities lack emergency power generation, which was a concern by many of the communities. Ranked higher than in 2008 due to generators needs.	1.0	None Known.	1.5	A hazardous materials evacuation of government buildings No direct vulnerabilities to government buildings risk and injuries have occurred in the past.	2.5	Cyberattack can disrupt the services provided at buildings, result in the loss of critical information, or result in theft, but is a lower risk of impacting the structures themselves. Glenwood City has experienced an attack.	13.5	
Utilities & Infrastructure (sewer, water, transportation, electric, telephone, etc.)	many linear above & below ground, 9 solid waste, 12 community wells, comm towers	2.0	Some roadways may occasionally be flooded or closed as noted in the text. 3 electric substations may be closed. Some wastewater treatment plan in floodplain, but protected and no flood history.	2.5	During heavy rains or rising groundwater levels, roads, culverts, bridge abutments, etc., have washed out and some roads closed. Some communities have problems with stormwater entering the wastewater system or backing-up into basements.	3.0	Loss of power due to high winds topping trees is the greatest risk frequently mentioned during the planning effort, including the event in 2010. Lightning strikes and related power surges also pose threats to utilities, communication equipment, etc.	3.0	Above ground infrastructure is very vulnerable. Ice and heavy snow can topple trees and take down power lines. Ice and snow can result in accidents and restrict travel. 194 frequently mentioned concern. Ice damming can threaten infrastructure.	1.5	Water quality/quantity can be impacted during prolonged droughts. Roads and raillines can be impacted by extreme heat. No major issues or concerns requiring related action were identified during the process.	3.0	History of contamination of water supplies, especially private wells, in the County. Many releases are transportation related (-94); a spill can close roadways and raillines.	2.0	A sophisticated, targeted cyberattack could compromise security or computerized control systems.	19.5			
Schools, Head Starts, and Day Cares	22 schools (not including Amish) + 79 child care facilities	1.5	Only a portion of Baldwin school campus identified as possibly being located in a 100 year floodplain. No schools reported flooding problems.	1.5	None known. May be more of a concern for children traveling to school.	2.0	High winds can have impacts similar to tornadoes. Large amounts of glass windows can be dangerous during hail storms. Lightning poses a threat during outside events.	1.5	Long-term power loss due to ice storm is the greatest winter-related vulnerability. Based on the school surveys, at least one school in the County lacks an emergency generator.	1.5	Cooling and extreme heat are a concern for children, staff, and computer servers. Many schools are not air conditioned.	2.0	A hazardous materials release may require evacuation of schools. A number of schools are located in relatively close proximity to highways and/or raillines.	2.5	Due to the number of computers and level of access by students, the risks for transfer of viruses, malware, etc. is high. The risk is lower for a targeted cyberattack originating outside of the school.	11.0			
Hospitals & Clinics	3 Hospitals & 6 Clinics	1.0	No hospitals or clinics believed to be located in 100-year floodplain.	1.0	None Known.	1.0	High winds can have impacts similar to tornadoes. Large amounts of glass windows can be dangerous during hail storms.	1.5	Long-term power loss for an extended period due to ice storm is the greatest vulnerability. Hospitals have back-up power generation capability.	1.0	Potential vulnerable population to extreme heat should air conditioning not be available.	2.0	A hazardous materials release may require evacuation or special sheltering.	1.5	No known issues, but hospitals and clinics maintain confidential records and operate computerized equipment with life-saving functions.	14.0			
Long-Term Care Facilities (CBRFs, assisted living, nursing care)	9 nursing homes & 50 other assisted living facilities	1.0	None Known.	1.0	None Known.	2.0	Some facilities may be vulnerable to power loss should the event occur during periods of cold or heat.	2.5	Potential vulnerable population. Uncertain if all facilities has emergency power generation and emergency fuel supply agreements.	1.5	Potential vulnerable population to extreme heat should air conditioning not be available.	2.0	A hazardous materials release may require evacuation or special sheltering.	1.5	No known unique concerns, but shares some risks similar to those of hospitals.	10.0			
Historic Buildings	30 historic properties & 4 historic districts on National Register	2.0	Concerns with potential flood damage to historic Stillwater Lift Bridge.	1.0	None Known.	1.5	High winds and heavy rains may cause damage to older structure, but no known issues.	1.0	Ice and snow loads can damage roofs, water lines, and structures which are not properly insulated.	1.0	None Known.	1.0	None Known.	1.0	None Known.	12.5			
Hazardous Chemical Use & Storage Facilities	87 Tier 2 & 29 EHS facilities	1.5	Only 1 EHS facility potential in a floodplain. Individual locations for Tier Two facilities not checked against floodplain maps, but no issues identified during the planning process.	1.0	Stormwater flooding has the potential to disperse hazardous chemicals resulting in soil and water contamination, but no critical or imminent threats identified during the planning process.	1.5	None Known.	1.0	None Known.	1.0	Some hazardous materials must be stored carefully and monitored due to potential reactions to extreme heat.	3.0	EHS and Tier 2 facilities, and transportation facilities, are a source of potential spills.	1.5	A sophisticated, targeted cyberattack could compromise security or computerized storage and climate control systems.	12.5			
Scoring Factors		10.5		10.0		15.5		12.0		8.5		14.5		12.5					

Historic Impacts: Has facilities of this classification within St. Croix County been impacted by this hazard type in the past?
Unique Vulnerabilities: Does a facility of this classification have unique vulnerabilities or risks associated with it in respect to the hazard type?
Relative Value: If a facility of this type was disabled due to a hazard, what is the value of a facility of this type?
Disruption of Critical Services: If a facility of this type was disabled due to a hazard, what would be the relative level of disruption to services most needed for disaster response and recovery?

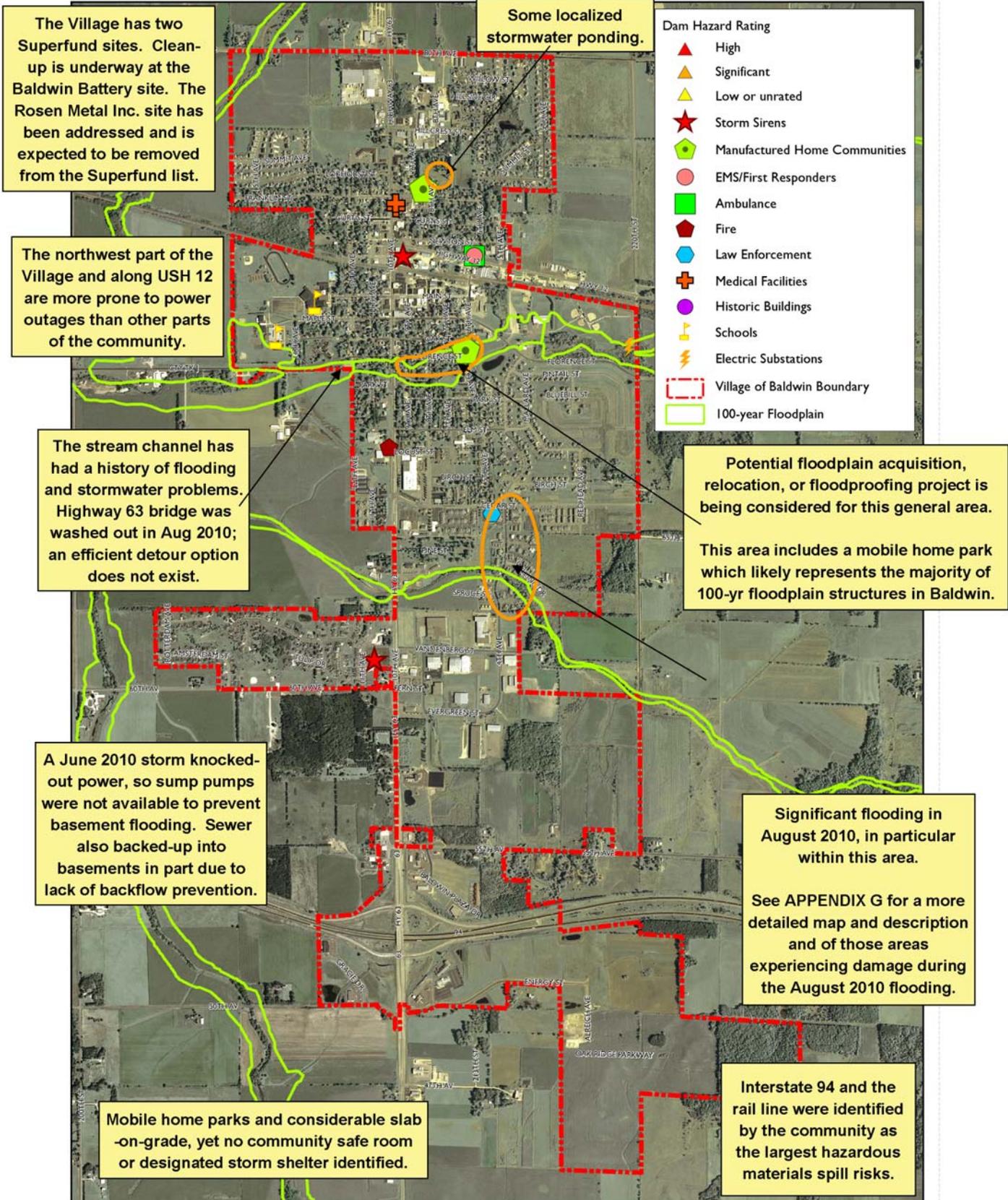
APPENDIX F.

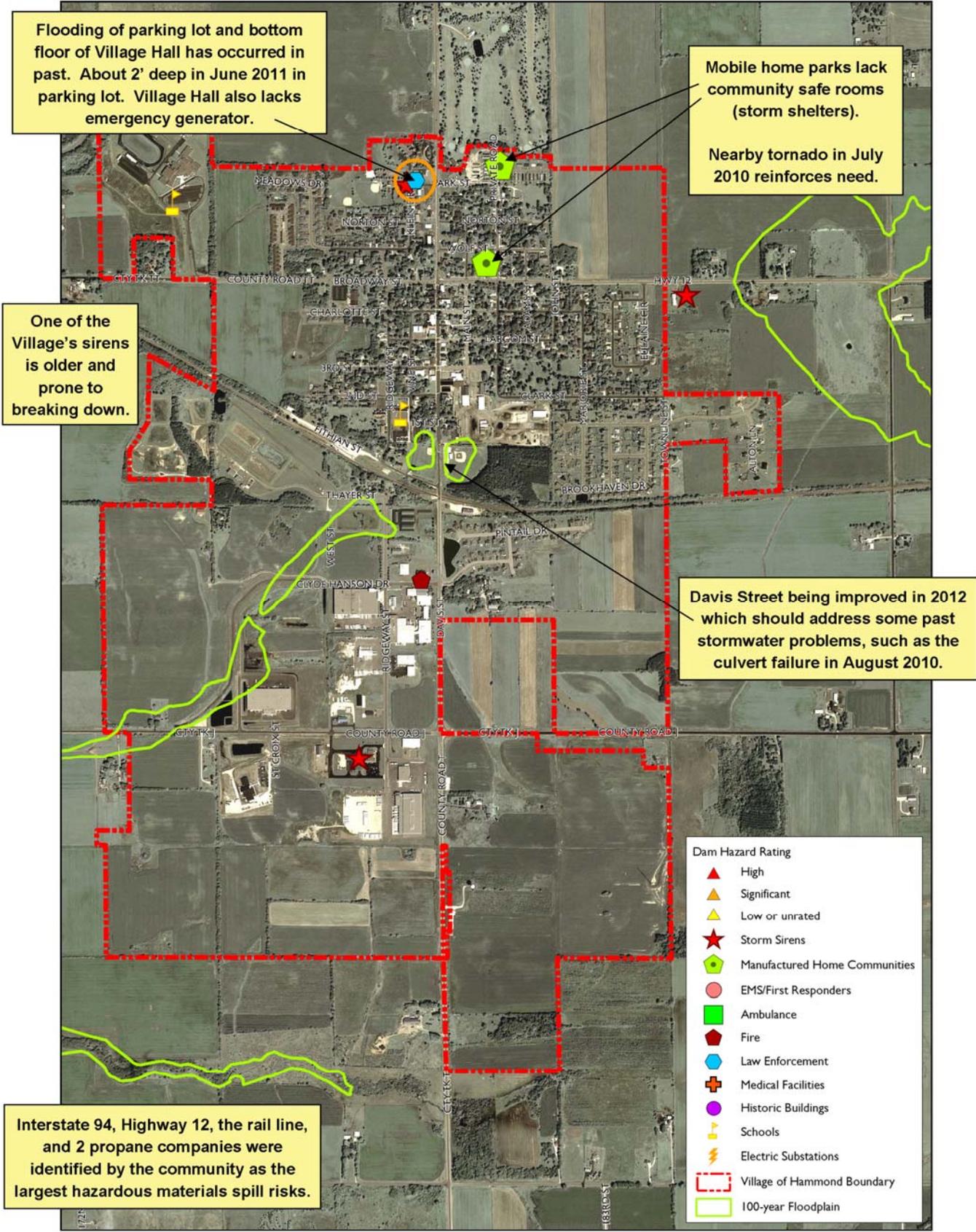
UNIQUE RISKS AND VULNERABILITIES BY INCORPORATED COMMUNITY

Unique Hazard Risks and Vulnerabilities by Incorporated Jurisdiction - St. Croix County

Municipality	Population (2010)	Long-Term Power Outage	Tornadoes, High Winds, and Thunderstorms	# mobile homes	Winter Storms and Extreme Cold	Riverine or Lake Flooding	Stormwater or Flash Flooding	Hazardous Materials Concerns	Cyber-Attack	Other Notes
Village of Baldwin	3,957	No history of events >12 hours, but all of USH 12 and NW corner of Village prone. No generator at EMS building.	No unique events, but significant new slab-on-grade, including multi-family houses have basements.	65	No unique issues.	3 NFIP claims. Some stream flooding every 4-6 years. 63 bridge washed out Aug 2010, though recently improved. Some floodplain blids may be acquisition candidates.	Two events in 2010 with significant damage to homes and sewer backlogs. 2-3' of water in Comforts of Home assisted living facility. See Appendix G.	194, railroad, and State Highway. Old Coop site being addressed. Less agr chemicals at Genex.	No history of attack.	Interested in agreements for emergency fuel. Interested in promoting more safe rooms or related ordinance options. No backflow prevention requirements.
Village of Deer Park	216	No event history or areas prone. May be generator need for Community Center/Meal Site.	No tornado history, but has been straight-line winds and hail abt. 1 every 10-15 years. \$25k damage to Village bldgs in 2008. Aht 90% houses have basements.	2	No unique issues.	No floodplain. But groundwaters rise abt every 10-15 years which increases pond height by 15+ feet. No highway closure since rebuilt. Dry run through Village.	Many past critical issues with groundwater (see left) have been mitigated. During events, significant pumping from basements hard on equipment. If works, consider pumping to Willow R.	Other than Highway, no significant concerns noted. LUST add old gas station remediated in past. Has been a problem with natural Radon in basements.	No history of attack.	During groundwater flooding, road to south closed. Significant mitigation has occurred on this issue including buyout of one home & property plus including the ballpark. New Fire Hall needed; existing insufficient for storage and training.
Village of Hammond	1,922	No event history. Need generator at Village Hall. Have fuel agreements for existing generators.	Tornado hit in 2005 and abt. 38 residences damaged w/ no injuries. Good lessons learned. 2 m.h. parks w/o shelters. Siren hit by lightning 2x in 2011. One serious straight-line wind every 10 yrs.	35	No unique issues	No NFIP claims; very limited floodplain which is largely a stormwater drainage system near school & under railroad tracks	Culvert under highway failed in Aug 2010; feeding davis St to resolve. Heavy rain can flow into Village Hall (June 2011) w/ up to 2' water in parking lot. Need to address.	USH 12, I-94, and railroad primary concerns, plus 2 propane companies.	No history of attack.	Working to enforce construction of a storm shelter which was required as part of permit for mobile home park expansion. Tornado in Town of Hammond in July, 2010 reinforces shelter need.
Village of North Hudson	3,768	No event history. Neighborhood near Village Hall has outages 2-3x/year; encourages Xcel to buy.	No unique event history, but tornadoes have been in area and Village hit w/ straightline winds (Aug 2008). Most homes w/ basements. Sally's Alley and Keystone Court may need shelter.	12	2010 & 2011 heavy snows, but no unique problems identified. No recent major water main breaks.	1 NFIP claim at house of St. Croix R. Shoreland bank erosion worsening & Browns Beach retaining wall undercut; 1 home at risk. Sally's Alley also a risk area and have sandbagged 1 home.	Abt. 4x per year, stormwater closes Hwy 35 for about an hour. Cars have stalled out. Village prepares if possible, but recent WDOT improvements did not resolve.	Natural gas line and railline are concerns. 2008 warehouse fire near near a concern due to beam used.	No history of attack.	Other than bank erosion, Village is concerned with overbank flooding from water backing up over dam into lake. No solid alternatives to address the issue through dam improvements identified during process.
Village of Roberts	1,651	No significant history, though outages more common in the Rolling Meadows area	Large trailer park, with shelter at nearby school; no event history	145	Occasional water line breaks under trailers, but nothing unique overall.	No NFIP claims, no floodplain structures, and no history of riverine flooding problems	No unique issues or notable event history	Railroad and Interstate 94 Cerex and local industry	No history, but open to training.	The large mobile home park; potential for hazardous materials spills; and need for continued training were the primary concerns identified by Village officials.
Village of Somerset	2,635	Used to be an issue, but has improved. Generator for water system needed.	No tornado events and most homes with basements; some newer slab-on-grade. 15,000 visitors in area on summer days, plus up to 7 concerts. 6 lightning injuries and 1 death.	0	Sporadic waterline freezing along Arnold Street, but no significant problems overall	No NFIP claims or major impacts; most of the floodplain in park. Lost the footbridge in 1993 and 2001. Xcel proactive on dam-related exercises.	Most concerns have been remediated. As development occurs, more drainage needed on south side. Need an easement for swale.	1985 fire fire, but no contamination found. Railroad and high pressure natural gas line. Bridge "cooked" during a line break.	No history. Strong protection of police records.	Concert grounds has limited access/egress, plus no storm shelter. Sewer and water lines hanging on bridge over the Apple River was noted as a potential concern. Many campers and rental properties; large transient population.
Village of Star Prairie	561	No unique issues or history. Village Hall is EOC, but not wired for generator. No generator at Fire Hall.	No tornado history; majority of homes have basements. Hail storm in 2010 and lightning strike at Village Shop in 2012.	1	No critical issues; 5th Street hill is steep and can be icy. Drilling on Highways 65 and "H".	No NFIP claims; most of floodplain in park; no structures impacted or mitigation needed.	Stormwater ponding of streets and yards just east of Village Hall, but no structures significantly impacted to date.	No unique issues or notable history, though truck traffic on State highway.	No history of attack.	Due to topography, radio communications can be interrupted "down the hill".
Village of Wilson	184	3 days in one event in early 2010. Part of village in Dec 2010 (heavy snow) and 1.5 days Aug 2010 (winds).	Tornado in area in 1956, but high winds in Aug 2007 (1 serious every 20 years). Increase in new slab-on-grade. No siren due to costs. Old White Oak trees of local significance.	4	One dead-end street prone to drifting. Power loss most significant concern.	No NFIP claims. 2010 storm shifted trailer off foundation and basement flooding. Flood waters 10'-12' and over guard rails due to restricted path & debris at RR trestle.	Flash flooding in 2010 storm, but similar in 1939 with more washouts. Concerns about undermining rail bridges. Bridge on USH 12 also washed out during event.	Railroad largest concern, especially given flood history, but also USH 12. 3 gas line hit w/ boring (had not been marked).	No history of attack.	Most significant LTPO history among communities; but commonly due to lines outside Village. Generator needed for water/sewer (WDRP has requested) and no connection at Village Hall; some concern with smaller culvert on USH 12 recently installed by WSDOT; but hasn't been fully "tested" by a serious storm event
Village of Woodville	1,344	No 24+ hour outages noted or areas prone. Need a portable generator for Village Hall/EOC.	No tornado history in Village, but high winds in Aug 2007. Increase in new slab-on-grade. Shelter at m.h. park, but no public shelter.	80	Hit hard by Dec 2010 storm, but no unique problems.	No NFIP claims; area adjacent to stream mostly park. Flood flows can be disrupted by bridge. Stream banks erosion in 2 areas related to past flooding.	Aug 2010 flash flood washed out roads & sidewalks and damaged buildings & property. More backflow prevention needed. See Appendix G.	Railroad and Interstate 94	No history of attack.	Officials believe actual floodplain smaller than areas mapped, but more floodplain insurance education needed. 2010 flooding "split town in half" and flooded Fire Hall, Village Hall, library, and clinic; industrial park an "island".
City of Glenwood City	1,242	No event history. Fuel concerns if outage last 3+ days.	No tornado history in Village. 1 mobile home park. Fairgrounds lacks shelter. Last straight-line winds in 1998: typical roof, siding and tree damage. Some lightning strikes of municipal level.	48	Scattered occasional line breaks. Some ice damming near Syme Ave caused flooding at 3 structures in 2007; 15 evacuated.	No NFIP claims. Large areas in dam shadows, though dams have largely mitigated flooding problems.	See ice damming concern under winter storms. Otherwise flash flooding has not been an issue if stream channel maintained.	State Highway through City, but no unique issues or history noted.	Experienced a key/logging attack in 2009, but thwarted by the bank before theft occurred.	Glen Meadow Lane a long, dead-end road which is narrow and can be icy. A vehicle with 5 children slid off previously.
City of Hudson	12,719	No unique concerns or history. Some trees have fallen on lines in 3rd and Vine area.	No tornado or t-storm history. Wind damage to trees, roofs, siding, etc. Most homes have basements, but increasing slab-on-grade, esp condos. Some large span. Lightning strikes to traffic signals in past.	9	Occasional water line breaks. 194 and Cumberland & Vine biggest concerns; on-ramp gates being added. Flowing policy for 2+ snowfalls.	6 NFIP claims. Back-flooding from Mississippi R. Sandbag 1 building. 5'-6" of water in Buckeye Garage every 3 years.	As development occurs, additional stormwater flows through older areas with flooding mostly limited to yards, basements, and garages	Natural gas transmission line; railroad and Interstate 94	No history of attack.	No vulnerabilities identified for historic structures. Flooding mostly a nuisance 5-6 times/20 years. South of I-94 at condos impacts 10-13 garages, but homes above 100-year floodplain.
City of New Richmond	8,375	Part of city w/o power for 2 days in 2007. Industrial park/college area prone. Ambulance may need generator.	1989 event ninth deadliest in U.S. 1 m.h. park w/ newer slab-on-grade, 2007 straight-line winds collapsed hanger, \$1.5 mil infrast damage, many vehicles, & >200 homes damaged.	35	No unique issues, though ice has impacted monitoring signal tower for utilities in past.	7 NFIP claims as of Nov 2010. New dam mitigated most issues w/ 2-3 homes in dam shadow.	Past flash flooding problems in arroyo and Paperjack Creek areas addressed. No concerns noted.	Railroad and truck traffic, along with Precision Ag largest concern. Also concerned with large # of agri irrigation wells and potential septic concerns of nearby m.h. park.	No history of attack.	City maintains a robust record of past events. 3 deaths have been associated with thunderstorms (1 lightning, 1 tree, and 1 responder heartattack). 1 additional lightning strike injury noted. Dam reconstructed in 1986.
City of River Falls (part)	3,149	75%-80% of power lines are underground. Pursuing a strategy to bury more.	Small m.h. park just outside city. Hoffman Park is prioritized for a community safe room (pursue haz mt grant) for public use DeStancis Park a future priority.	38	No unique issues or event history.	No NFIP claims w/in St. Croix County; 3 homes potentially located in floodplain.	No unique issues or event history.	Highway 35	No attack known.	The City of River Falls is covered under the Pierce County Hazard Mitigation Plan. Odd/even watering schedules year round.

Note: The Village of Spring Valley identified no critical concerns regarding that portion of their community within St. Croix County. Note: No significant issues or concerns unique to different cities and village were identified for extreme heat, drought, pandemic flu, nuclear accident, and school-based terrorism; refer to those sections for further discussion.





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|-------------------------------|--|
| Dam Hazard Rating | Law Enforcement |
| High | Medical Facilities |
| Significant | Historic Buildings |
| Low or unrated | Town Halls or County Government Center |
| Storm Sirens | Schools |
| Manufactured Home Communities | Electric Substations |
| EMS/First Responders | Village of North Hudson |
| Ambulance | 100-year Floodplain |
| Fire | |

Natural gas lines and rail line are primary hazardous materials spill concerns, though a 2009 warehouse fire and use of foam retardant near river also a concern.

Significant washouts and bank erosion at Brown's Beach and Ferry Park are safety concerns and threaten one structure.

Large number of long, dead-end roads and cul-de-sacs on east end of Village and into Town can be an access and evacuation concern.

Recent improvements did not resolve flash flooding on Highway 35 which closes about 4 times per year for a short period, but often stalls cars.

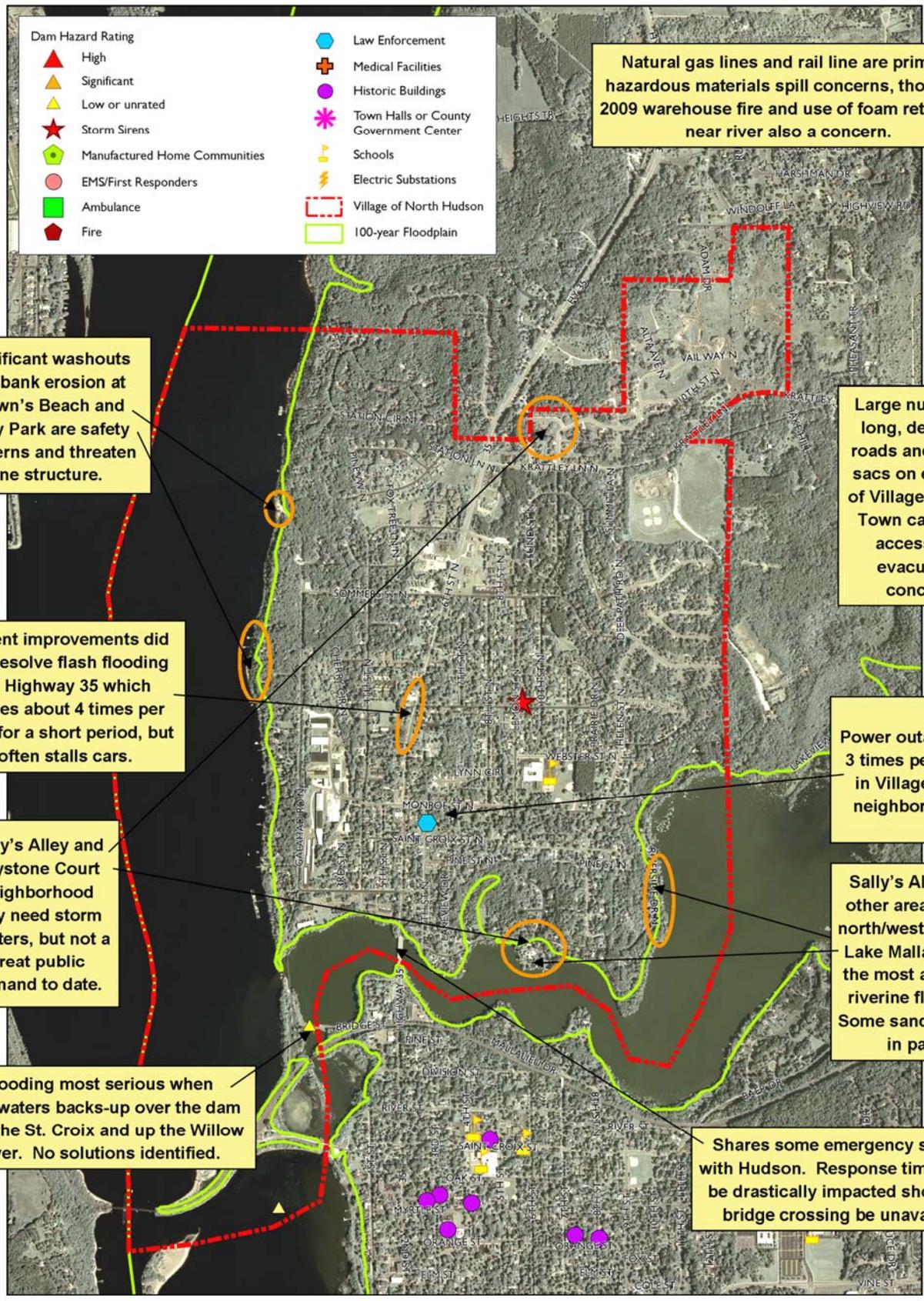
Power outages 2-3 times per year in Village Hall neighborhood

Sally's Alley and Keystone Court neighborhood may need storm shelters, but not a great public demand to date.

Sally's Alley and other areas along north/west shore of Lake Mallalieu are the most at-risk of riverine flooding. Some sandbagging in past.

Flooding most serious when floodwaters backs-up over the dam from the St. Croix and up the Willow River. No solutions identified.

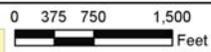
Shares some emergency services with Hudson. Response times would be drastically impacted should this bridge crossing be unavailable.



WCWRPC
West Central Wisconsin
Regional Planning Commission

Village of North Hudson
St. Croix County, WI

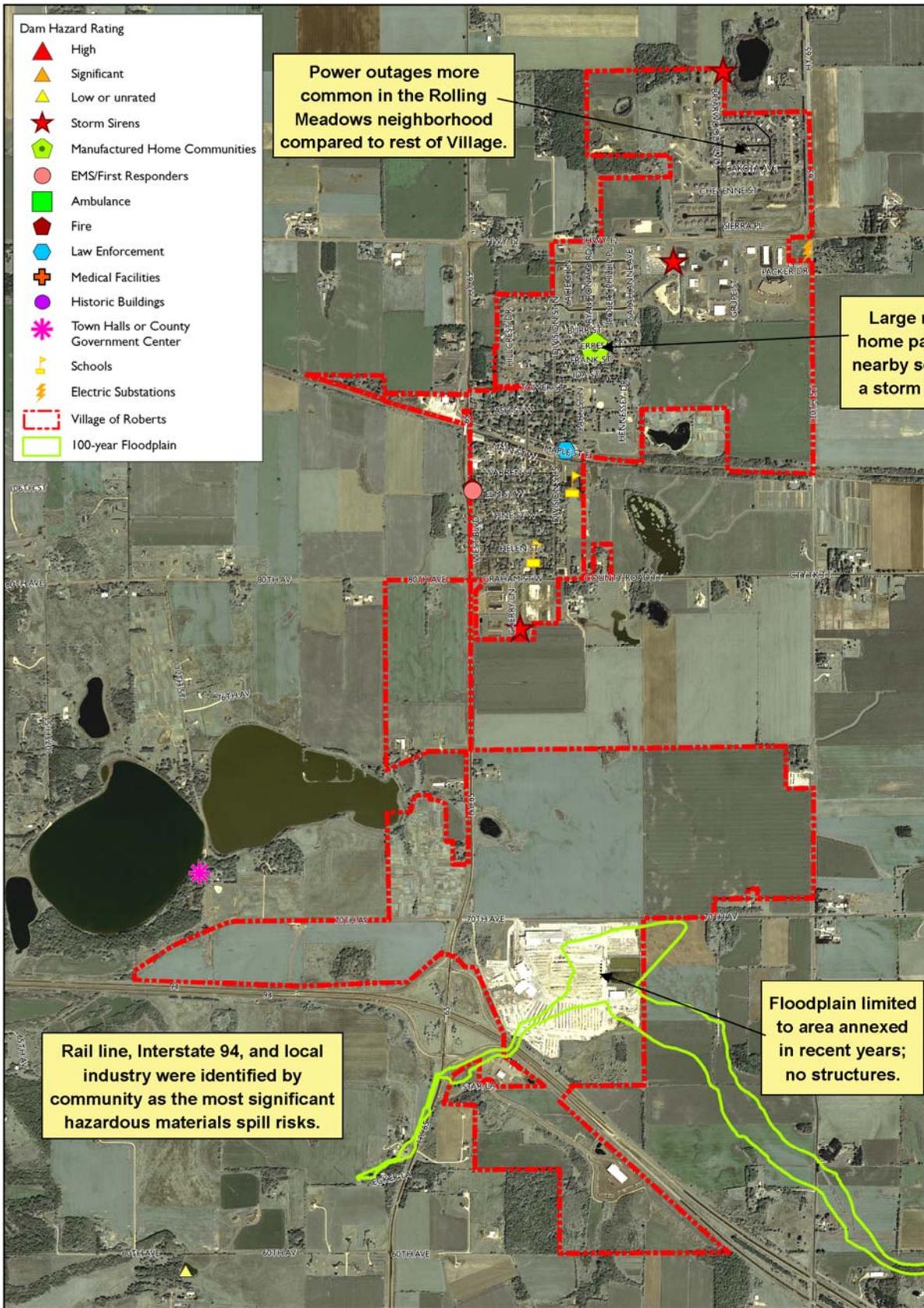
Note: This Map should be used for general mitigation planning purposes only. Floodplain boundaries may not have been adopted; this map does not constitute a legal survey and should not be used for flood determinations.



Data Sources:
Dams: WDNR Dam Safety Database as of 12/2010.
Sirens: WCWRPC as of 07/2012.
Critical Facilities: St. Croix County Land Information.
Electric Substations:
Wisconsin Public Service Commission as of 11/2011.
MCO Boundaries: St. Croix County Land Information as of 05/2007.
Surface Water: St. Croix County Land Information as of 03/2009.
Floodplain: FEMA Map Service Center as of 04/2009.
Cite: www.wisconsin.gov as of 3/31/12.



March 20, 2012





**West Central Wisconsin
Regional Planning Commission**

Village of Roberts

St. Croix County, WI

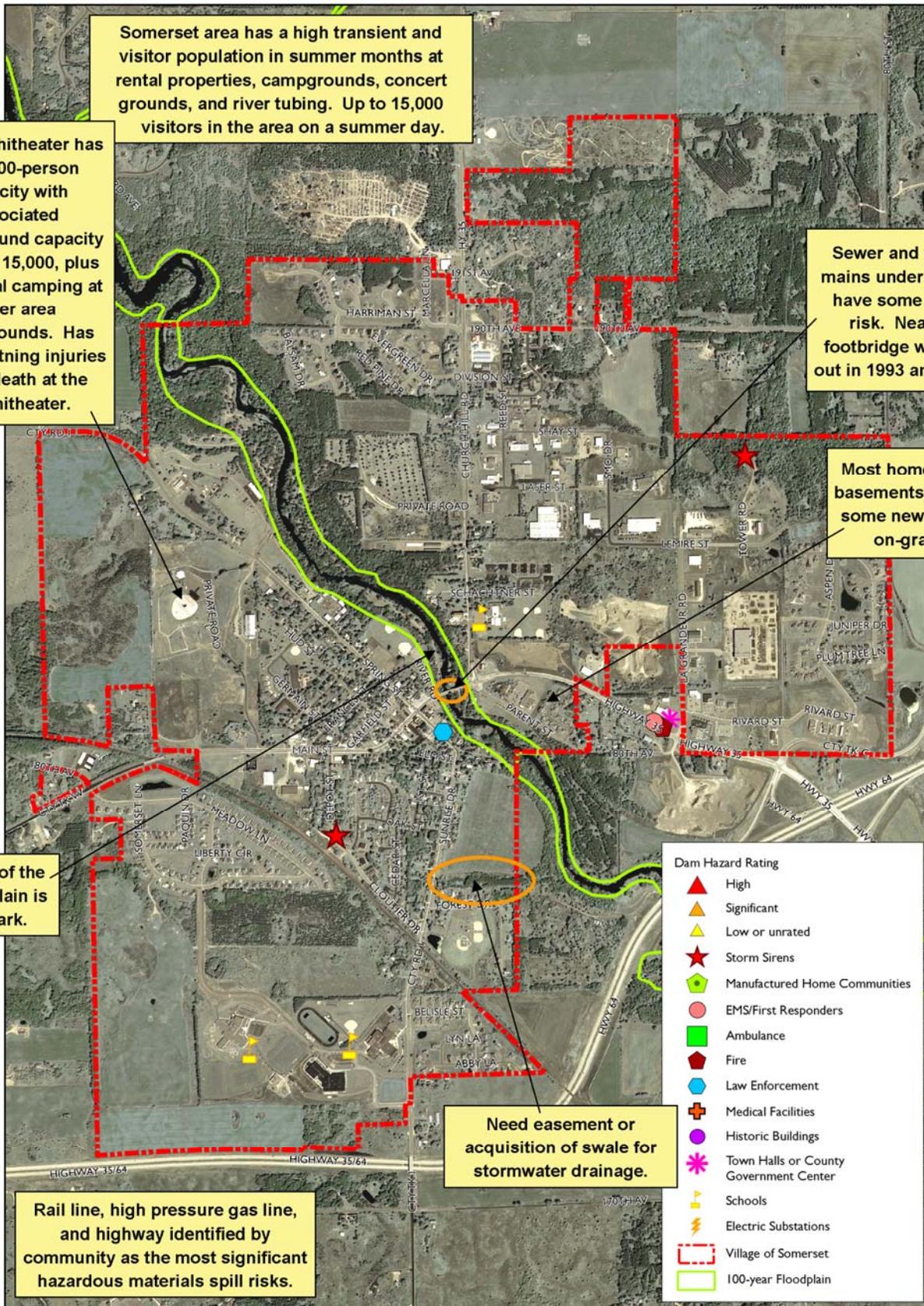
0 500 1,000 2,000 Feet

March 20, 2012



Note: This Map should be used for general mitigation planning purposes only. Floodplain boundaries may not have been adopted; this map does not constitute a legal survey and should not be used for flood determinations.

Data Sources:
 Dams: WCDNR Dam Safety Database as of 1/2010;
 Sirens: WCVRPC as of 07/2012;
 Critical Facilities: St. Croix County Land Information;
 Electric Substations:
 Wisconsin Public Service Commission as of 11/2011;
 MCD Boundaries: St. Croix County Land Information as of 05/2007;
 Surface Water: St. Croix County Land Information as of 03/2009;
 Floodplain FEMA Map Service Center as of 04/2009;
 Ortho: www.wisconsin.gov as of 2010.



5th Street hill can be icy and dangerous in winter. Some drift-prone areas on Highway 65 and County Highway "H".

Flooding and ponding of stormwater on streets and yards an ongoing problem in this area, though no structure damage to date.

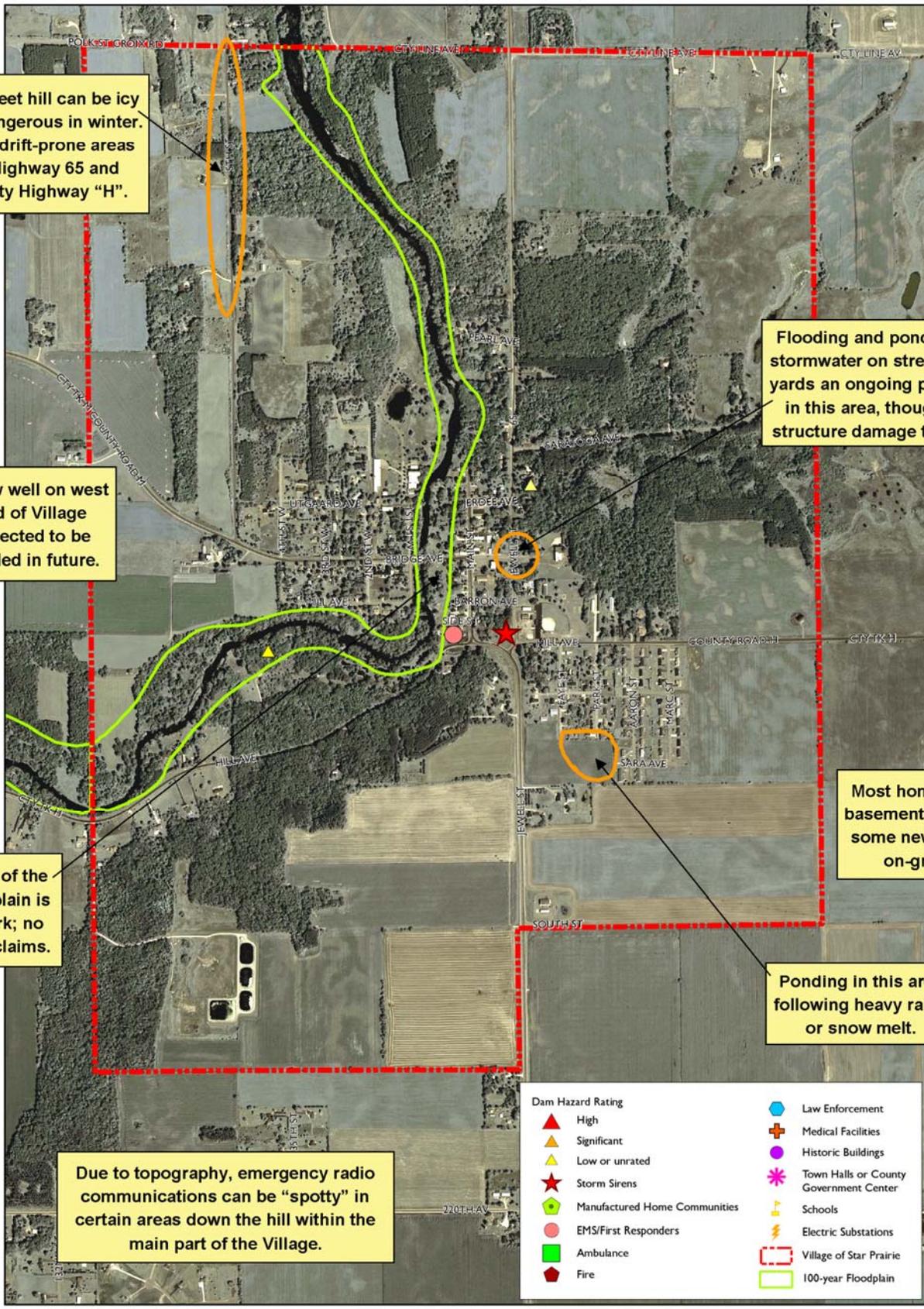
A new well on west end of Village expected to be needed in future.

Most homes have basements, though some newer slab-on-grade.

Much of the floodplain is in park; no NFIP claims.

Ponding in this area following heavy rains or snow melt.

Due to topography, emergency radio communications can be "spotty" in certain areas down the hill within the main part of the Village.

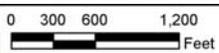


- | | |
|---------------------------------|--|
| Dam Hazard Rating | ● Law Enforcement |
| ▲ High | ⊕ Medical Facilities |
| ▲ Significant | ● Historic Buildings |
| ▲ Low or unrated | ★ Town Halls or County Government Center |
| ★ Storm Sirens | 🏫 Schools |
| 🏠 Manufactured Home Communities | ⚡ Electric Substations |
| ● EMS/First Responders | 🗺️ Village of Star Prairie |
| ■ Ambulance | 🟩 100-year Floodplain |
| 🔥 Fire | |

WCWRPC
West Central Wisconsin
Regional Planning Commission

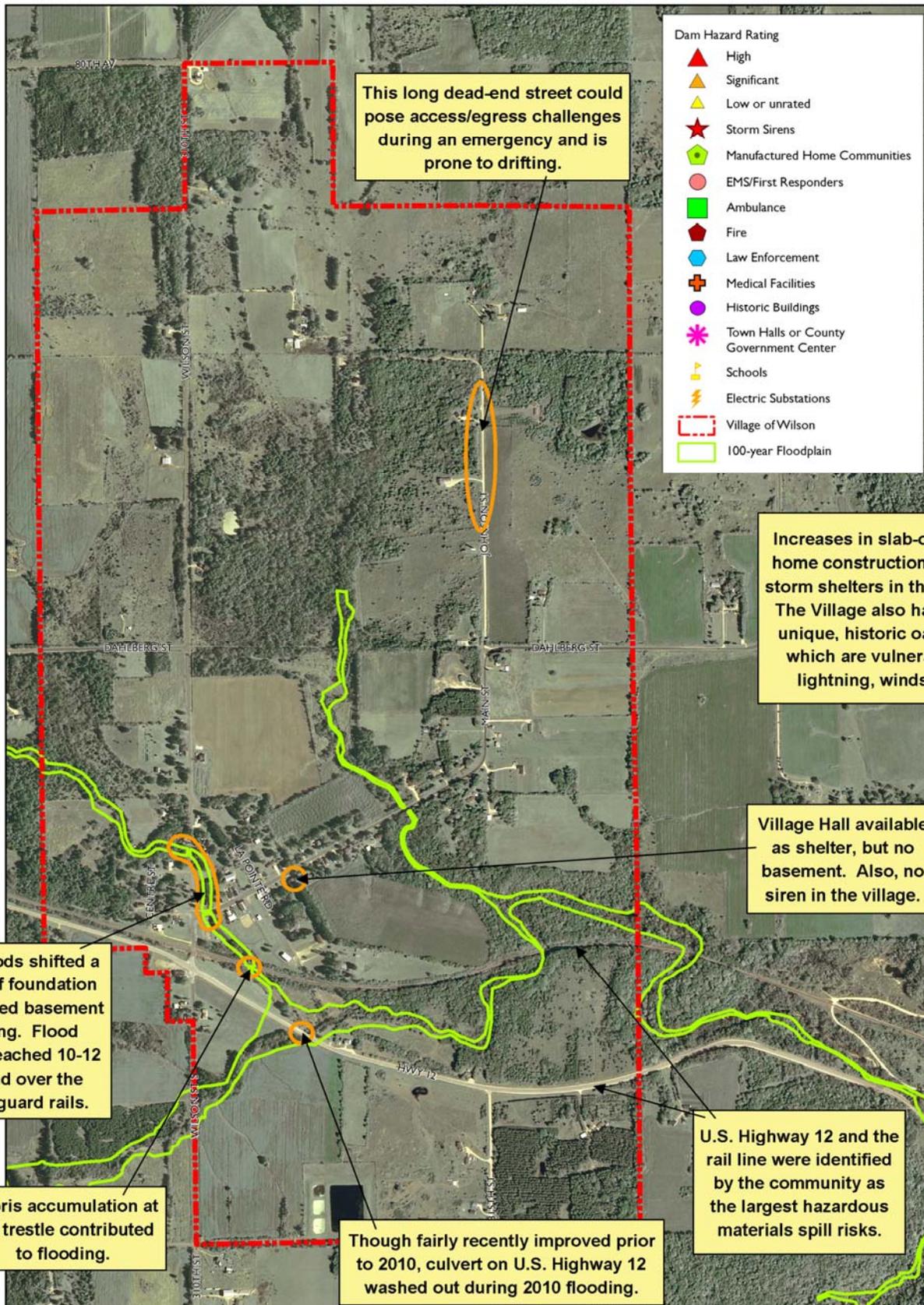
Village of Star Prairie
St. Croix County, WI

Note: This Map should be used for general mitigation planning purposes only. Floodplain boundaries may not have been adopted; this map does not constitute a legal survey and should not be used for flood determinations.



March 20, 2012
Data Sources:
Dams: WCDNR Dam Safety Database as of 12/2010;
Sirens: WCWRPC as of 07/2012;
Critical Facilities: St. Croix County Land Information;
Electric Substations:
Wisconsin Public Service Commission as of 11/2011;
MCD Boundaries: St. Croix County Land Information as of 05/2007;
Surface Water: St. Croix County Land Information as of 03/2009;
Floodplain: FEMA Map Service Center as of 04/2009;
Ortho: www.wisconsinview.org as of 2010.





Mobile home park has a shelter available on site.

This bridge can restrict the flow of floodwaters.

Significant flooding in August 2010, in particular within these area. The flooding effectively split the Village in half.

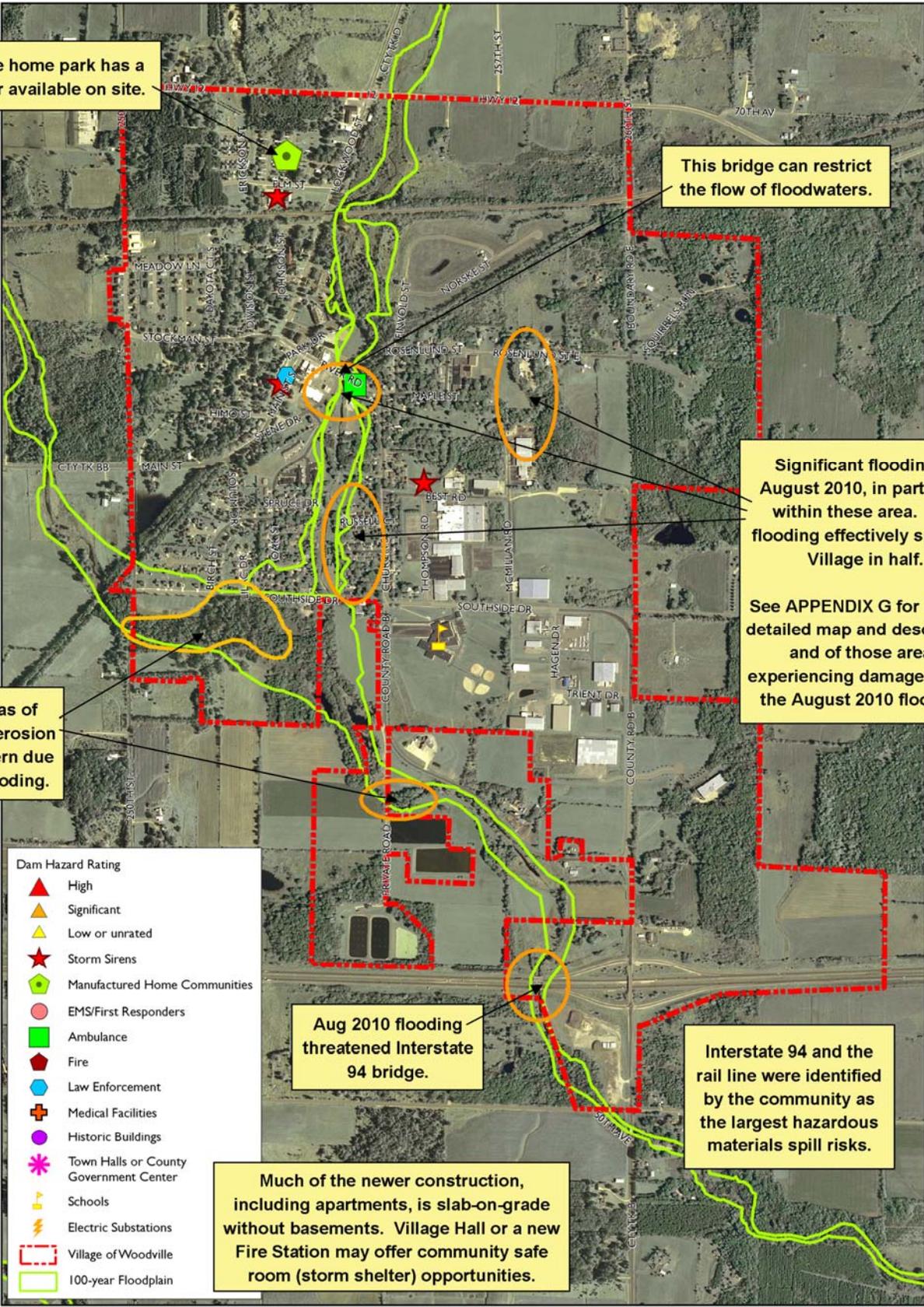
See APPENDIX G for a more detailed map and description and of those areas experiencing damage during the August 2010 flooding.

Areas of bank erosion concern due to flooding.

Aug 2010 flooding threatened Interstate 94 bridge.

Interstate 94 and the rail line were identified by the community as the largest hazardous materials spill risks.

Much of the newer construction, including apartments, is slab-on-grade without basements. Village Hall or a new Fire Station may offer community safe room (storm shelter) opportunities.

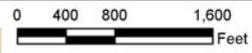


- Dam Hazard Rating**
- ▲ High
 - ▲ Significant
 - ▲ Low or unrated
 - ★ Storm Sirens
 - ⬢ Manufactured Home Communities
 - ⬢ EMS/First Responders
 - ⬢ Ambulance
 - ⬢ Fire
 - ⬢ Law Enforcement
 - ⬢ Medical Facilities
 - ⬢ Historic Buildings
 - ⬢ Town Halls or County Government Center
 - ⬢ Schools
 - ⬢ Electric Substations
 - ⬢ Village of Woodville
 - ⬢ 100-year Floodplain

WCVRPC
West Central Wisconsin
Regional Planning Commission

Village of Woodville
St. Croix County, WI

Note: This Map should be used for general mitigation planning purposes only. Floodplain boundaries may not have been adopted; this map does not constitute a legal survey and should not be used for flood determinations.



March 20, 2012



Data Sources:
Dams: WCVRPC Dam Safety Database as of 12/2010;
Sirens: WCVRPC as of 07/2012;
Critical Facilities: St. Croix County Land Information;
Electric Substations:
Wisconsin Public Service Commission as of 1/2011;
MCD Boundaries: St. Croix County Land Information as of 05/2007;
Surface Waters: St. Croix County Land Information as of 03/2009;
Floodplain: FEMA Map Service Center as of 04/2009;
Orsho: www.wisconsinrc.org as of 2010.

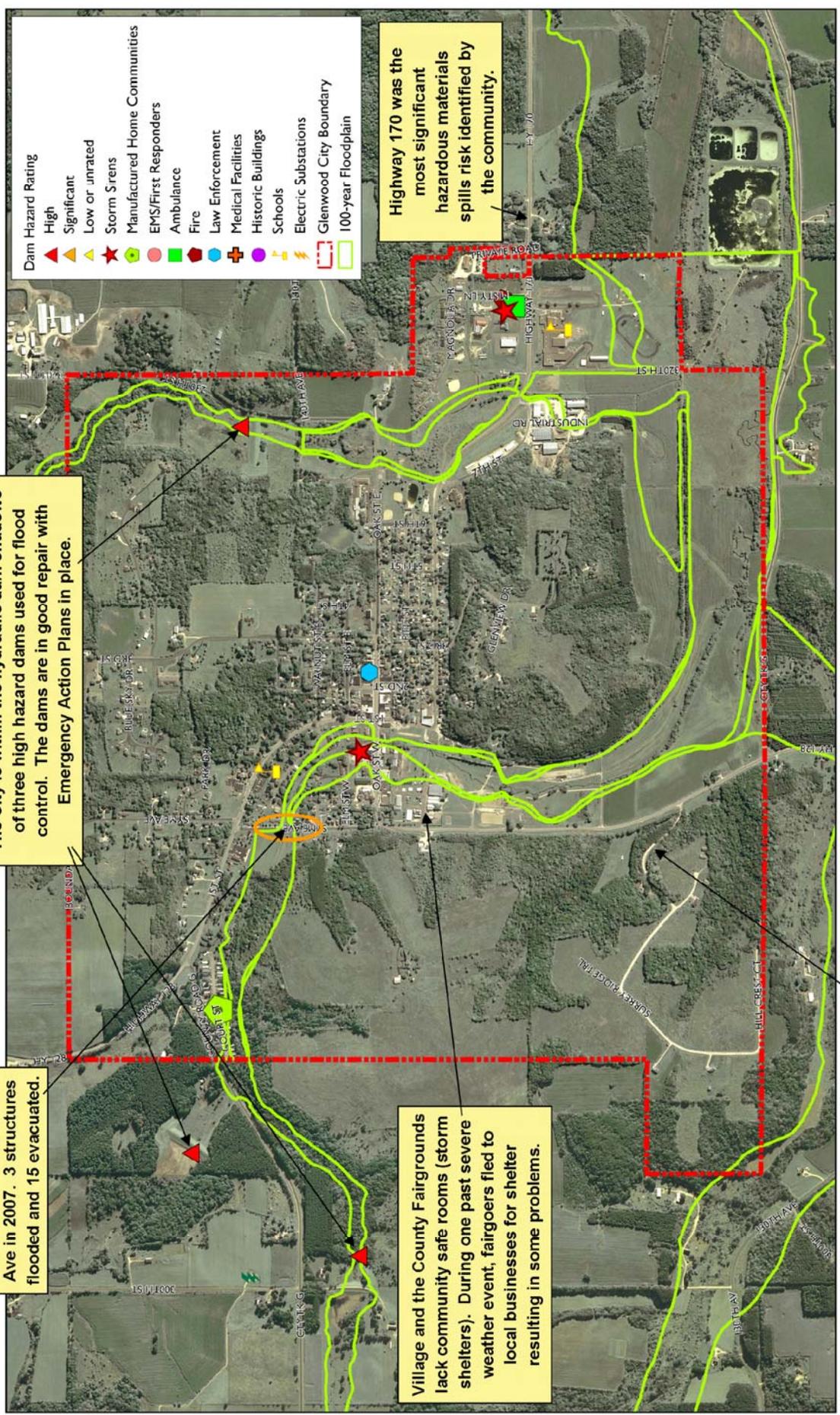
The City is within the hydraulic dam shadows of three high hazard dams used for flood control. The dams are in good repair with Emergency Action Plans in place.

Ice damming contributed to flooding along Syme Ave in 2007. 3 structures flooded and 15 evacuated.

Village and the County Fairgrounds lack community safe rooms (storm shelters). During one past severe weather event, fairgoers fled to local businesses for shelter resulting in some problems.

Highway 170 was the most significant hazardous materials spills risk identified by the community.

Glen Meadows Lane is a longer, dead-end road which is narrow and can be dangerous in icy conditions and has had washout problems in past.



- Dam Hazard Rating
- High
- Significant
- Low or unrated
- Storm Sirens
- Manufactured Home Communities
- EMS/First Responders
- Ambulance
- Fire
- Law Enforcement
- Medical Facilities
- Historic Buildings
- Schools
- Electric Substations
- Glenwood City Boundary
- 100-year Floodplain

July 27, 2012

**Glenwood City
St. Croix County, WI**

West Central Wisconsin
Regional Planning Commission

Note: This map should be used for general information only. It is not intended to be used for flood determinations. A legal survey should be used for flood determinations.

Scale: 0 600 1,200 2,400 Feet

Data Source: Data: Sales Database as of 1/2013 from WCAWPC as of 6/2013.
 County: St. Croix County, Wisconsin. Elevation: 1,000 feet. Service: Cassiniana as of 1/2011.
 Software: ArcGIS. County: St. Croix County, Wisconsin. Date: 6/2013.
 Author: West Central Wisconsin Regional Planning Commission as of 6/2013.
 Revision: 1.0. Page: 1 of 1. Contact: www.wcaawpc.com or 715.838.1111

No public storm shelters, but no significant public demand to date. Increasing slab-on-grade construction, especially condo units.

Stormwater flows towards the river from parking lots and other hardscape to east. Improved stormwater management (e.g., settling pond) has reduced past flooding concerns.

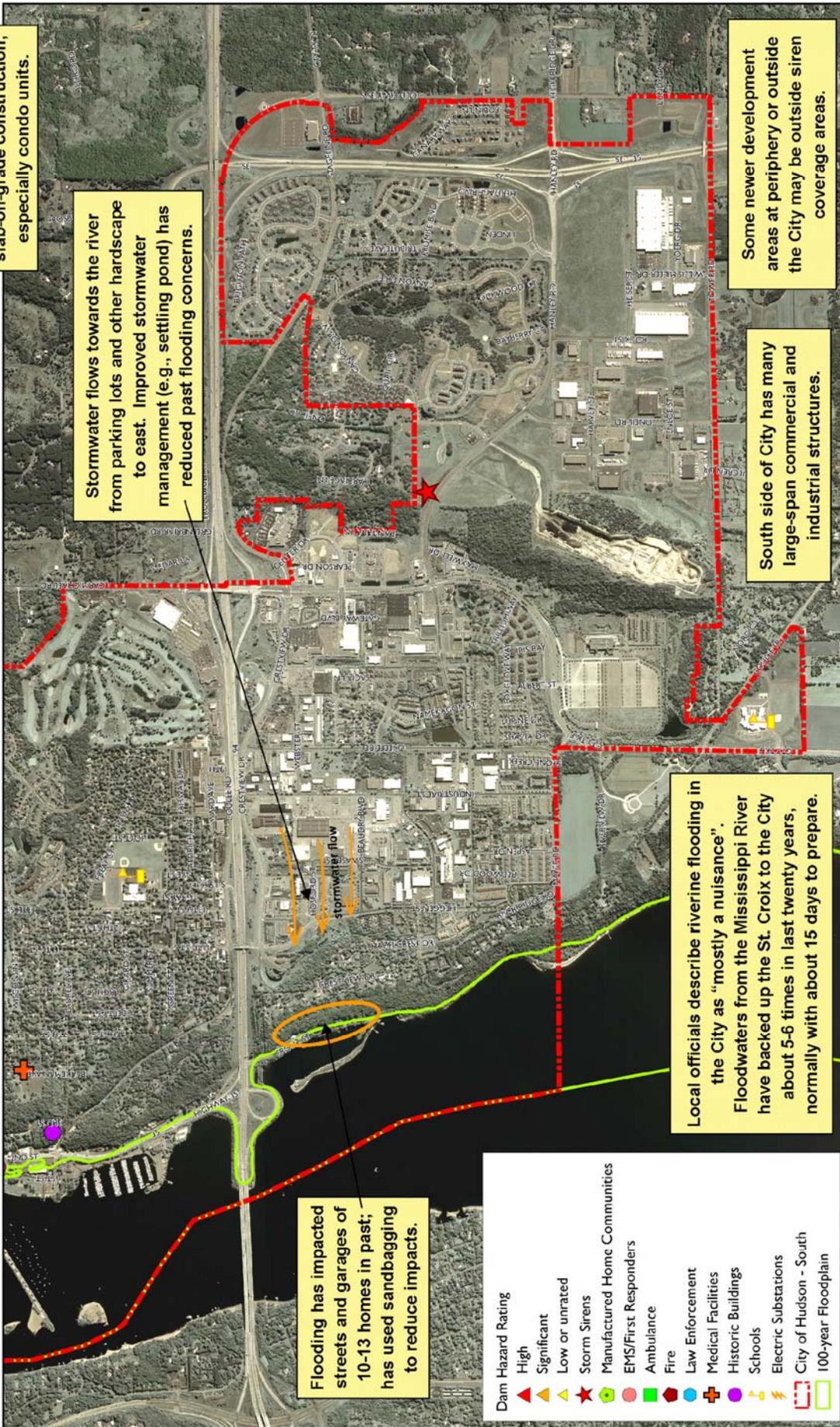
Some newer development areas at periphery or outside the City may be outside siren coverage areas.

South side of City has many large-span commercial and industrial structures.

Local officials describe riverine flooding in the City as "mostly a nuisance". Floodwaters from the Mississippi River have backed up the St. Croix to the City about 5-6 times in last twenty years, normally with about 15 days to prepare.

Flooding has impacted streets and garages of 10-13 homes in past; has used sandbagging to reduce impacts.

- Dam Hazard Rating
- High
- Significant
- Low or unrated
- Storm Sirens
- Manufactured Home Communities
- EMS/First Responders
- Ambulance
- Fire
- Law Enforcement
- Medical Facilities
- Historic Buildings
- Schools
- Electric Substations
- City of Hudson - South
- 100-year Floodplain



City of Hudson (South)

St. Croix County, WI

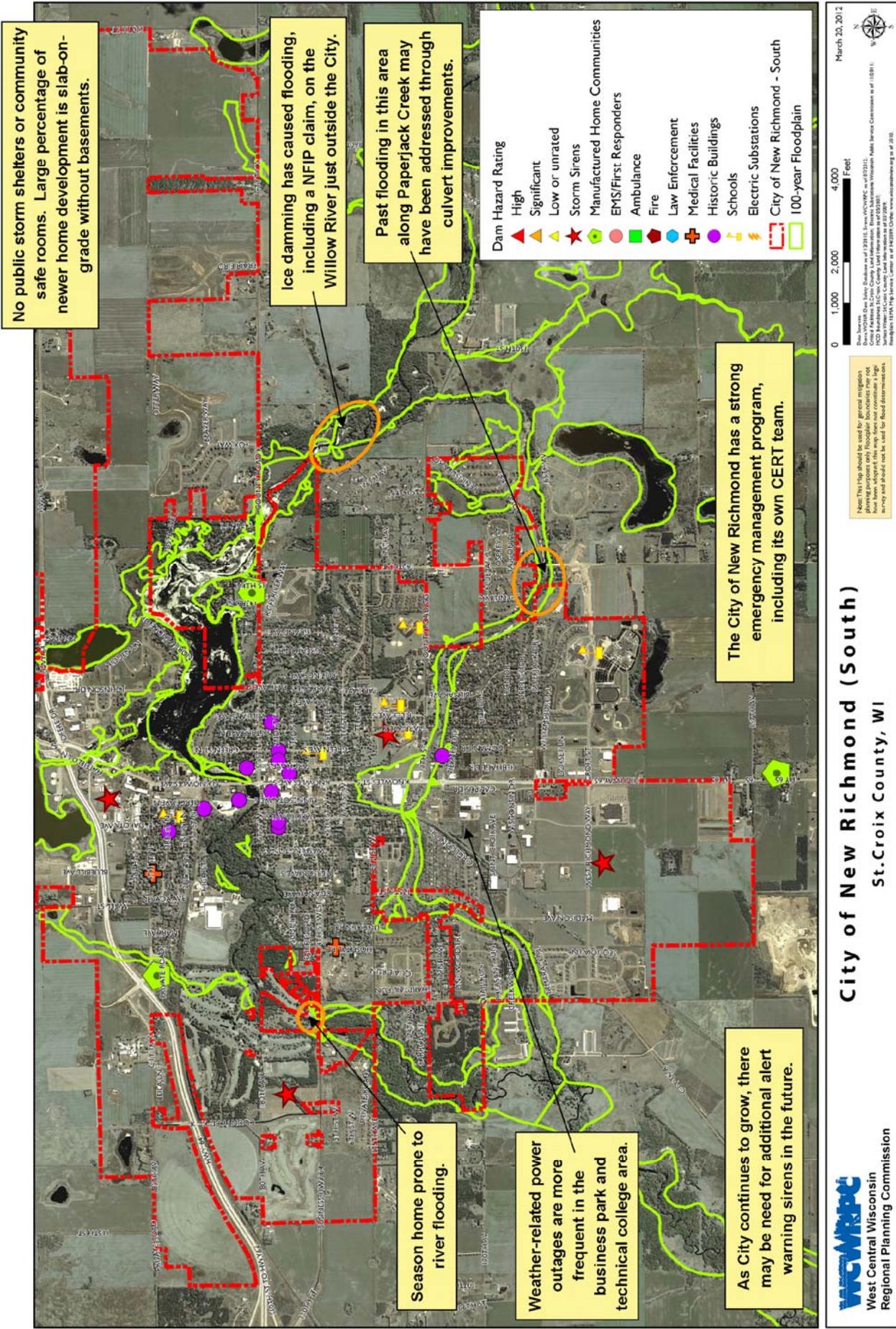


March 30, 2012

0 750 1,500 3,000 Feet

Notes: This Map should be used for general information planning purposes only. Floodplain boundaries may not have been adopted; this map does not constitute a legal survey and should not be used for flood determination.

Data Source:
 Data: USGS One Meter Contours as of 1/2010; USGS VDEM as of 1/2012;
 NCEP Reanalysis; St. Croix County Land Information as of 6/2008;
 Floodplain (FEMA) as of 1/2010; City of Hudson as of 1/2012.



City of New Richmond (South)
St. Croix County, WI

Note: This map should be used for general information planning purposes only. Floodplain boundaries may not have been adopted. This map does not constitute a legal survey and should not be used for flood determinations.

Scale: 0 1,000 2,000 4,000 Feet

March 20, 2012

APPENDIX G.

AUGUST 2010 FLOOD INFORMATION

THE FOLLOWING IS A VARIETY OF INFORMATION AND MAPS
SUMMARIZING THE IMPACTS OF THE AUGUST 2010 FLOODING.

Damage summary from CDBG-EAP grant application prepared by St. Croix County Emergency Support Services.

During the late hours of August 10th into the early morning of August 11th, 2010, areas across St. Croix County experienced a rainstorm of immense magnitude. Rainfall reports of 6” to 8” in a two hour period were reported throughout the region by local wastewater treatment plant gauges. Added to the already saturated ground from previous rainfall, major flooding occurred just after midnight throughout the region. Small creeks and dry-runs swelled and overflowed their banks. Water covered roads. Ground collapsed, mud slides occurred, roads were washed out, culverts undercut, and homes were extensively damaged. Roadways were closed making it impassible for emergency vehicles and residents. Sanitary sewer mains were inundated in a short time and sewer backed up into basements in the villages.

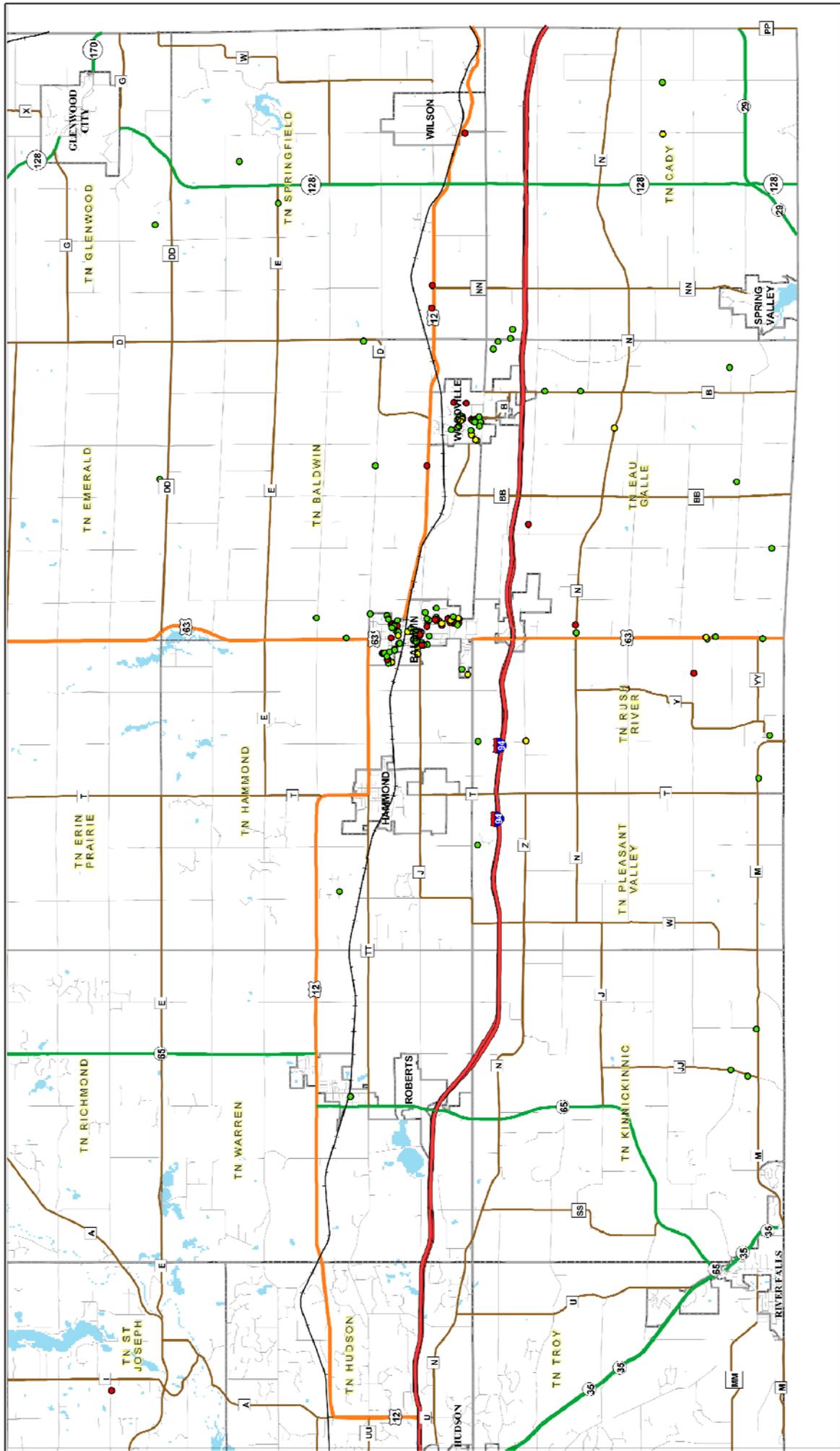
Please see damage reports in *Attachment E* and photographs in *Attachment F*. Reports from the Village of Baldwin, Village of Woodville, Village of Wilson, Town of Hammond, Town of Baldwin, Town of Springfield, Town of Rush River, Town of Eau Galle, and Town of Cady were received.

U.S. Highway 63, in the Village of Baldwin and south of the Village, was closed because of numerous washouts at bridge abutments and along the shoulders. Various village, town, and county roads—approximately 50 total—were closed due to road washouts and bridge closures.

In the Village of Baldwin, United Fire & Rescue evacuated a total of forty (40) persons, sixteen (16) of which were from the assisted living facility “Comforts of Home”. The fire station in the Village of Woodville had at least 6” of flood water throughout the building. A total of six (6) injuries were reported in the county, mainly due to vehicle accidents caused by roadway washouts.

Floodwaters and sewer backups caused extensive damage to area homes. The following types of damage were reported: structural damage, flooring, drywall, furnace, air conditioners, water heaters, driveway washouts, submerged private wells, sewer backups, and electrical systems. With the warm summer temperatures, mold was an immediate problem in these homes.

St. Croix County used their emergency system and contacted 3700 homes in 6 hours to warn them of the dangerous situation. Red Cross was called in immediately and United Way & St. Croix County began taking calls from homeowners. 202 homeowners and renters contacted the County. The homeowners were asked about the extent of damage and their income (to determine LMI status). The summary and estimate in Attachment E shows **only** those 45 homeowners that are LMI and the four rental units which have LMI renters. 94 families were assisted by Red Cross and 98 different sites received extensive damage (roads, homes, etc.).



St. Croix County Flood Damage
August 10, 2010

Legend
 Major
 Minor
 None
 Other

1 inch = 2,000 feet

DISCLAIMER: THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ST. CROIX COUNTY DOES NOT WARRANT THE ACCURACY OF THE INFORMATION ON THIS MAP. ST. CROIX COUNTY DOES NOT ACCEPT LIABILITY FOR DAMAGES OF ANY KIND, INCLUDING CONSEQUENTIAL DAMAGES, ARISING FROM THE USE OF THIS MAP.

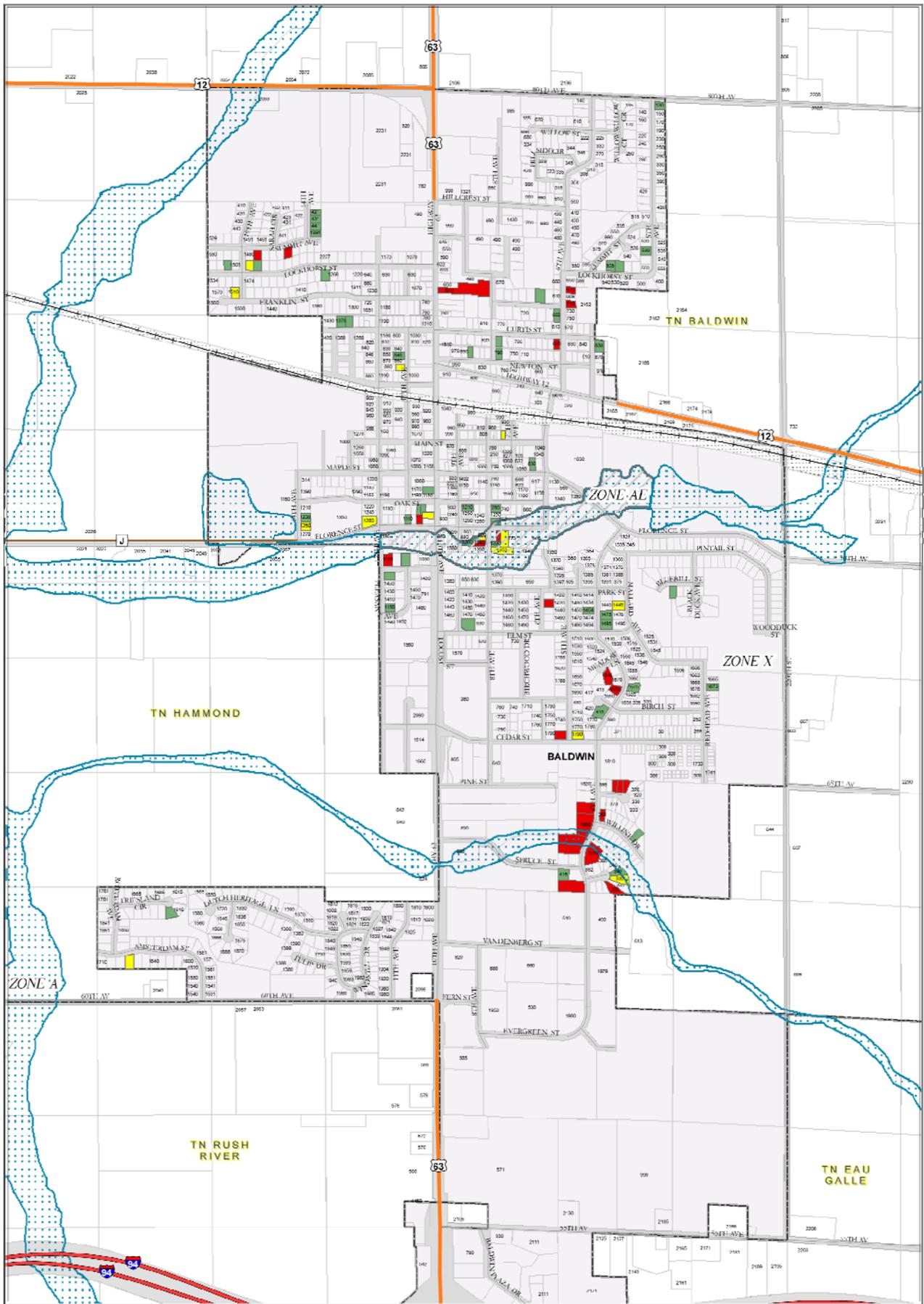
Summary of Wisconsin Disaster Assistance Request

		Wisconsin Emergency Management			County		
		Department of Military Affairs			St. Croix		
		County Application for Wisconsin Disaster Funding			WEM Region		
					West Central		
					Today's Date		
County Contact Name		Address	Phone	Incident Period	Type of Incident		
Kristen Sailer, Emergency Manager		1101 Carmichael Road, Hudson, WI 54016	715-381-4911	8/10-8/14/2010	Flash Flooding		
TVC (Town Village or City)	Jurisdiction Name	Damage Category			Total Damages (include all public assistance categories in this total)	Population (Use Last Census Information)	Ratio (Total Damages / Pop)
		A) Debris Removal	B) Protective Services	C) Road Systems			
County	St. Croix County	\$ 36,000.00	\$ 7,700.00	\$ 492,500.00	\$ 536,200.00	63,155	\$ 8.49
Village	Baldwin	\$ 11,100.00	\$ 22,500.00	\$ 75,000.00	\$ 108,600.00	2,667	\$ 40.72
Village	Hammond			\$ 25,000.00	\$ 25,000.00	1,153	\$ 21.68
Village	Wilson			\$ 30,000.00	\$ 30,000.00	176	\$ 170.45
Village	Woodville	\$ 14,000.00	\$ 10,000.00	\$ 81,843.00	\$ 105,843.00	1,104	\$ 95.87
Town	Baldwin			\$ 285,000.00	\$ 285,000.00	903	\$ 315.61
Town	Cady	\$ 4,800.00	\$ 1,050.00	\$ 31,000.00	\$ 36,850.00	710	\$ 51.90
Town	Cylon			\$ 5,000.00	\$ 5,000.00	629	\$ 7.95
Town	Eau Galle	\$ 1,000.00	\$ 3,600.00	\$ 226,300.00	\$ 230,900.00	882	\$ 261.79
Town	Emerald	\$ 1,000.00	\$ 1,000.00	\$ 8,000.00	\$ 10,000.00	691	\$ 14.47
Town	Erin Prairie			\$ 2,000.00	\$ 2,000.00	658	\$ 3.04
Town	Forest		\$ 500.00	\$ 15,000.00	\$ 15,500.00	590	\$ 26.27
Town	Glenwood	\$ 200.00	\$ 1,500.00		\$ 1,700.00	755	\$ 2.25
Town	Hammond			\$ 41,100.00	\$ 41,100.00	947	\$ 43.40
Town	Hudson	\$ 2,200.00		\$ 8,000.00	\$ 10,200.00	6,213	\$ 1.64
Town	Kinnickinnic		\$ 700.00	\$ 10,700.00	\$ 11,400.00	1,400	\$ 8.14
Town	Pleasant Valley			\$ 81,500.00	\$ 81,500.00	430	\$ 189.53
Town	Rush River			\$ 41,500.00	\$ 41,500.00	498	\$ 83.33
Town	Springfield		\$ 6,000.00	\$ 43,000.00	\$ 49,000.00	808	\$ 60.64
TOTALS		\$ 70,300.00	\$ 54,550.00	\$ 1,502,443.00	\$ 1,627,293.00		

Summary of CDBG-EAP Assistance Request

Jurisdiction/Entity	Roads		Debris Removal	Public Buildings	Public Utility Systems	Total*
	FDA Funds (DOT)*	CDBG Funds				
St. Croix County						
Highway	\$389,375	\$123,125	\$1,000	\$1,000		\$125,125
Floodwater Control Structures			\$35,000			\$35,000
Regional Fire Department						
United Fire & Rescue				\$9,000		\$9,000
Villages						
Baldwin	\$56,250	\$18,750	\$11,100	\$6,000	\$4,500	\$40,350
Hammond	\$18,750	\$6,250				\$6,250
Somerset					\$77,000	\$77,000
Wilson	\$0	\$30,000				\$30,000
Woodville	\$10,000	\$20,500	\$3,190	\$24,300	\$96,100	\$144,090
Towns						
Baldwin	\$0	\$285,000				\$285,000
Cady	\$18,000	\$13,000	\$4,800			\$17,800
Cylon	\$0	\$5,000				\$5,000
Eau Galle	\$169,725	\$56,575	\$1,000			\$57,575
Emerald	\$6,000	\$2,000	\$1,000			\$3,000
Erin Prairie	\$0	\$2,000				\$2,000
Forest	\$11,250	\$3,750				\$3,750
Glenwood			\$200			\$200
Hammond	\$30,825	\$10,275				\$10,275
Hudson	\$6,000	\$2,000	\$2,200			\$4,200
Kinnikinnic	\$0	\$10,700				\$10,700
Pleasant Valley	\$61,125	\$20,375				\$20,375
Rush River	\$31,125	\$10,375				\$10,375
Springfield	\$32,250	\$10,750				\$10,750
Warren	\$0	\$500				\$500
Totals	\$820,675	\$630,925	\$59,490	\$40,300	\$177,600	\$908,315

*Estimated FDA funding is not included in totals
 Estimates based on FEMA reporting and any additional updates available.



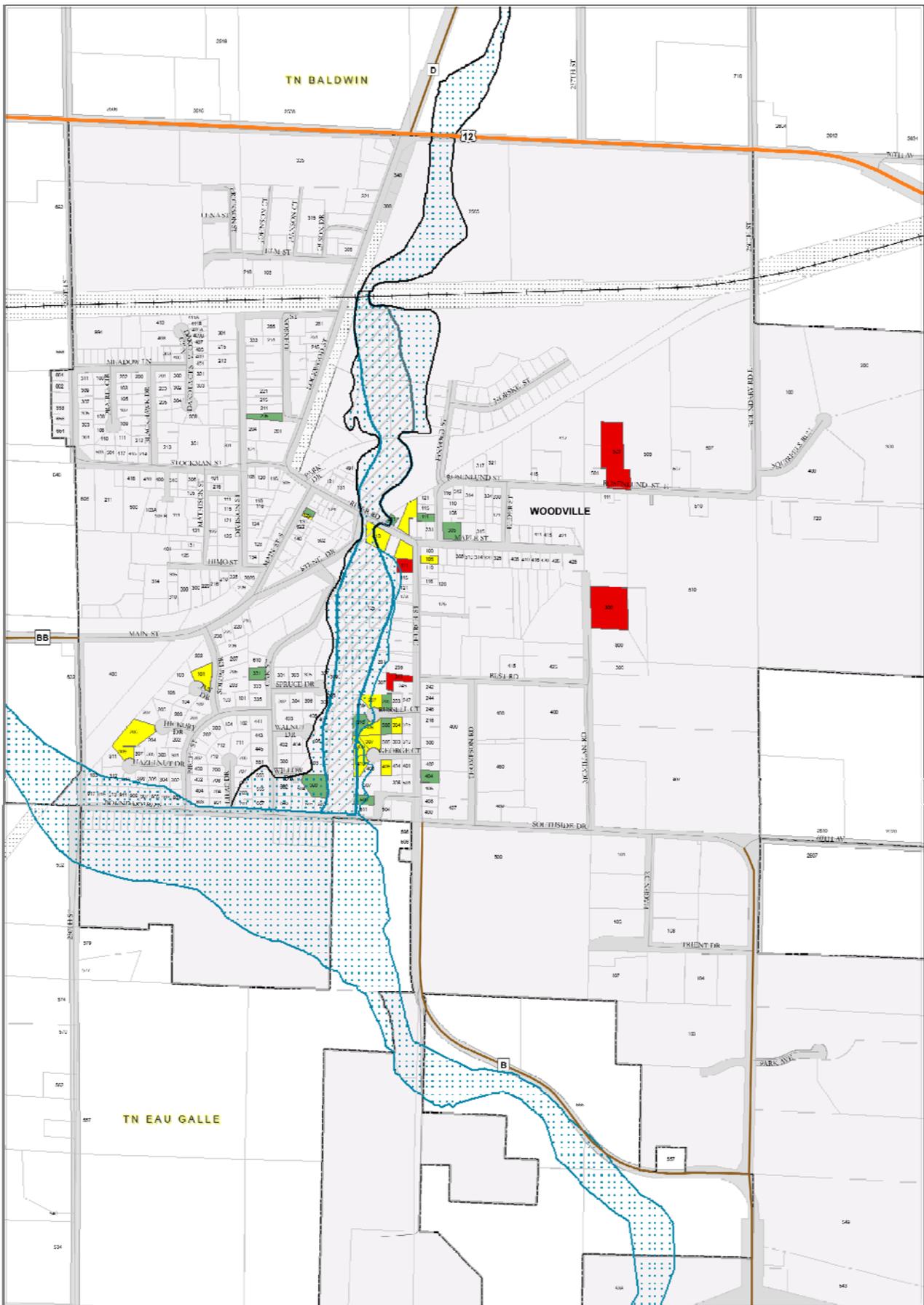
Legend	
■	Damage Affected
■	Damage Uninsured
■	Damage Insured
■	Damage Not Insured
■	Damage Not Insured - 100 Year
■	Damage Not Insured - 500 Year
■	Damage Not Insured - 100 Year
■	Damage Not Insured - 500 Year
■	Damage Not Insured - 100 Year
■	Damage Not Insured - 500 Year
■	Damage Not Insured - 100 Year
■	Damage Not Insured - 500 Year

Village of Baldwin Flood Damage August 10, 2010



DISCLAIMER:
 THESE DATA WERE PROVIDED BY THE VILLAGE OF BALDWIN. THE VILLAGE OF BALDWIN IS NOT RESPONSIBLE FOR THE ACCURACY OF THE DATA. THE VILLAGE OF BALDWIN IS NOT PROVIDING ANY WARRANTY FOR THE DATA. THE VILLAGE OF BALDWIN IS NOT PROVIDING ANY WARRANTY FOR THE DATA. THE VILLAGE OF BALDWIN IS NOT PROVIDING ANY WARRANTY FOR THE DATA.

Source: Dr. Chris Cooley Planning and Zoning Department, Land Information



Damage	FLOOD HAZARD AREAS
Attained	FLOOD ZONE, FLOODING
Destroyed	ZONE A - 100 Year
Minor	ZONE B - 100 Year
Minor	ZONE C - FLOODING - 100 Year
	ZONE D - 100 YR ANNUAL CHANCE FLOOD HAZARD
	ZONE E

Village of Woodville Flood Damage
August 10, 2010



DISCLAIMER NOTICE:
 THESE MAPS ARE NOT INSURANCE. THEY WERE COMPILED FROM
 THE PLANS AND RECORDS OF THE VILLAGE OF WOODVILLE. THE VILLAGE OF WOODVILLE
 OFFICIALS ARE NOT RESPONSIBLE FOR ANY DAMAGE TO PROPERTY OR PERSONS
 ARISING FROM THE USE OF THESE MAPS. THE VILLAGE OF WOODVILLE
 OFFICIALS ARE NOT RESPONSIBLE FOR ANY DAMAGE TO PROPERTY OR PERSONS
 ARISING FROM THE USE OF THESE MAPS. THEY SHOULD
 BE USED FOR INFORMATIONAL PURPOSES ONLY.

APPENDIX H.

HAZARD MITIGATION ACTIVITIES BY INCORPORATED JURISDICTION

Key Mitigation Activities for Incorporated Areas of St. Croix County

Municipality	Planning and Regulatory	Community Safe Room (Public Storm Shelter)	Floodplain Management and Mitigation	Emergency Operations Plan, ICS, and Training	Communication & Notification Systems/Sirens	Mutual aid, partnerships, and Other Activities and Notes
Village of Baldwin	In good shape with comp planning, subdivision regulations, etc. No formal Capital Improvements Plan (CIP).	No shelter and 3 m.h. parks and significant slab. Hospital as an option?	Floodplain ordinances recently updated countywide. Dredging and channel clean-up on east side. Stormwater mgmt ordinance in place.	EOP up-to-date. Good on training.	Additional if growth to east. Radio tuning issues w/ portables. P.W. relies on calls.	More infrastructure at Village Hall/EOC needed for radio communications (e.g., plug-ins). Interest in pursuing contracts for emergency fuel.
Village of Deer Park	Uses zoning to discourage development in area with springs and prone to flooding. No formal capital improvements plan (CIP). No cul-de-sacs allowed. Consults with fire and police.	Bank used when open. Community Center designated, but on slab. Neither being used.	Received Fed grant to acquire floodprone structure. Replaced sewer line which was infiltrated in past. Highway and ballpark raised. No floodplain.	2002 latest EOP update. Has disaster management plan with responsibilities and evacuation resource list. Cross-over between Fire Dept and elected officials.	One siren with good coverage. No other issues noted.	"Safe hall" available at the 8-plex. In good shape for mutual aid.
Village of Hammond	No specific issues or needs identified. Stormwater addressed during site plan review/subdivision ordinance. 5-year CIP.	None. Needed for m.h. park. Uses school during special events.	Improving Davis St. in 2012 to address some of the past problems.	EAP up to date and integrating some continuity of government planning. ICS for new board and training on PODs discussed as potential training needs.	3 sirens, but 1 is old and prone to breaking down. Battery backup on other 2. P.W. using cells.	Shelters for mobile home parks being required thru c.u. permitting, but difficulty enforcing. 2 m.h. parks w/o shelters. Significant time on evac. planning.
Village of North Hudson	Fire reviews site plans. 1,000' max. length and min. radii required. 5-year CIP for projects.	No public safe room, but most homes with basements and not a large demand to date.	Various slope repair and rip-rapping. Some stormwater improvements with street work, but still problem areas. Some sandbagging.	EOP up-to-date. No critical training needs identified.	New siren in Spring 2006, unincorporated area to east may need siren (developing)	Coordinates with Hudson on many issues and emergency services.
Village of Roberts	Comp plan generally addresses mitigation. No new mobile home parks allowed. Checks with police and fire during site planning.	School used as a community safe room. Use policies in place.	No floodplain and no further action needed.	EOP updated in 2011. ICS training for elected officials and PIO may be needed. No debris management plan.	3 sirens; may need additional coverage as development occurs.	Road requirements include max. length, turning radii, etc. Has had problems with pagers potentially triggering siren.
Village of Somerset	Has 5-year CIP. Police and fire consulted as needed. Uses state averages for billing rates.	No public storm shelter, but most homes have basements. Options for events/visitors limited.	Most floodprone area is a park; stormwater mgmt plan and ordinance being implement; primary issues addressed	EOP is up-to-date; includes some continuity of gov components. Local official could potentially need ICS training. Working through County on evacuation planning.	2 sirens; coverage okay. No other issues noted.	Semi-formal mutual aid with Minnesota. Concerns expressed over multi-state coordination; some efficiency available, but may not be legally/procedurally possible or formalized.
Village of Star Prairie	Road improvement plan may include stormwater projects. Mobile homes in parks only, but no shelter req'd.	No public storm shelter, but most homes have basements.	Floodplain is mostly parkland. No other recent activities noted.	EOP in good shape and no training needs identified.	1 siren; coverage currently good. Some communication problems "down the hill".	Village noted that new alert warning sirens have been installed in the Town of Star Prairie.
Village of Wilson	Comprehensive planning in progress. Has subdivision ordinance and engineers reviews for safety. Discourage cul-de-sacs. No formal CIP.	Village Hall available but no basement and not used.	No significant floodplain development, but flash flooding concerns. Addresses as needed. Concerns with USH 12 culvert sizing and rail bridges.	EOP up-to-date. Participates with Woodville on training.	No siren; cost concerns. No other comm issues noted.	Recently adopted the countywide public works agreement.
Village of Woodville	Has 5-year CIP. Fire official on Village Board. Access/egress, cul-de-sac length, etc. considered during site planning. Uses WisDOT billing rates.	No public shelter, though one at m.h. park. Village Hall or new Fire Station could be a shelter.	WDNR grant used to dredge and clean-up stream channel. Stormwater project list maintained. Backflow ordinance. Some rip-rapping and other enhancements.	Recently updated. Suggested that training needed on what exactly are local officials roles and responsibilities during an event.	3 sirens in good condition. Some communications problems noted.	Additional slab-on-grade residential construction in recent years. Fire Dept communication problems...can hear but cant reply. Cant "push to talk" for Public Works cells; different carriers than Hudson. More portables needed.
City of Glenwood City	Basic CIP and consults police/fire during plan review as needed. No new mobile homes allowed. Some concerns w/ long dead-end roads.	None, though fire hall and old Fairgrounds and has been a problem in past.	Dams has provided flood controls. City Police helps monitor.	EOP last updated in 1994. Suggested that EOP be update, then exercise. Related training may be needed.	2 sirens and squad car P.A. Public Works radios.	If cell service down, public works personnel cant communicate (need 3-4). City Hall lacks base station.
City of Hudson	Fire Dept consulted during site planning. 1000' max cul-de-sacs. Annual capital budget. Billing rates for labor and equipment established.	No public storm shelter, but no significant public demand to date.	Sandbagging used. Park beachhouse & marina buildings raised above 100-year level. Stormwater management plan. Back-up prevention valves required by ordinance.	EOP updated Fall 2011. Have held St. Croix R accident and mock tornado exercises recently. Have ICS 100 & 200; could use 300. Working on evac planning. No debris sites id'd.	3 sirens. Considering re-activating fire station siren. Cells for P.W. Comm challenges w/ Minn.	Mutual aid with Washington Co. MN. Fire mutual aid with four others. Working with parochial schools for emergency planning.
City of New Richmond	No new m.h. parks. Police and fire reviews plans as needed. Design standards for street length, turnarounds, etc. Some CIP and considering billing rates.	No full-time storm shelter; agreement with County building during events. Education and safe rooms needed.	Dam reconstructed in 1996 and provides flood control. Stormwater management planning and utility.	EOP up-to-date and debris sites id'd. Working on evac plan. Good on ICS. Rail and haz mat training, plus others. Communications exercise needed.	4 sirens & P.A. May be additional need in future w/ growth.	Own EOC and Emergency Management Director. Strong program and very aware of past events and current risks. Significant input into this plan update. CERT Team.
City of River Falls (part)	Design standards for new construction and subdivisions are adopted. Power lines must be buried in all new subdivisions.	No community safe rooms for general public in St. Croix Co portion of City. High priority for parks. UV-RF rec'd grant funding for two shelters.	Floodplain zoning enforcement and stormwater planning required. Erosion, sediment, and stormwater mgmt plans reviewed and updated regularly.	EOP in good shape and no training needs identified. PD, FD, EMS and Utility staff participate in weather spotter training when hired.	7 sirens total triggered by City, but aging. Some City Deps have NOAA radios. Promote more public use of NOAA radios.	City also covered under Pierce County hazard mitigation plan, but also a high degree of communication and coordination with St. Croix County. Most entry radios narrowed; PW & utilities in next 5 years.

NOTE: All cities and villages in St. Croix Co. have adopted Comprehensive Plans, though hazard mitigation is not directly addressed in most plans, except for references to floodplain mgmt and emergency services. NOTE: The status of police, fire, and public works mutual aid, as well as other strategic partners, is discussed in the plan text.

APPENDIX I.

ST. CROIX COUNTY DAM INVENTORY

St. Croix County Dams & Levees (as of December 2010)

Dam Official & Popular Name	Stream/Impoundment Name	Owner or Organization Name	Owner Type	Dam Size	Hazard Rating	Normal Storage (Acre Feet)	Maximum Storage (Acre Feet)
NEW RICHMOND MILLS	WILLOW	CITY OF NEW RICHMOND	CITY	LARGE	H	826	1500
LITTLE FALLS/UPPER POWER DAM	WILLOW	WI DNR - PARK MANAGER	DNR	LARGE	H	1342	1700
GLEN HILLS 1	TR POWER LINE CREEK	ST. CROIX COUNTY LCD	LCD	LARGE	H (est L)	28	150
GLEN HILLS 10	BEAVER CREEK	ST. CROIX COUNTY LCD	LCD	LARGE	H	1451	3845
GLEN HILLS 11	TR BEAVER CREEK	ST. CROIX COUNTY LCD	LCD	LARGE	H (est L)	32	344
GLEN HILLS 2	POWER LINE CREEK OFFSTREAM	ST. CROIX COUNTY LCD	LCD	LARGE	H (est L)	22	200
GLEN HILLS 3	BLUE CREEK	ST. CROIX COUNTY LCD	LCD	LARGE	H	30	274
GLEN HILLS 4	TR TIFFANY CREEK OFFSTREAM	ST. CROIX COUNTY LCD	LCD	LARGE	H	0	178
GLEN HILLS 5	TR TIFFANY CREEK OFFSTREAM	ST. CROIX COUNTY LCD	LCD	LARGE	H	0	184
GLEN HILLS 6	TR-TIFFANY CREEK	ST. CROIX COUNTY LCD	LCD	LARGE	H	0	191
GLEN HILLS 7	NON NAV TR SANDY CREEK	ST. CROIX COUNTY LCD	LCD	LARGE	H (est L)	0	490
GLEN HILLS 8	NON NAV TRIB SANDY CR	ST. CROIX COUNTY LCD	LCD	LARGE	H (est L)	43	470
LOWER POWER/ST. CROIX	WILLOW	ST. CROIX CO, ET AL	CO	LARGE	est. L	1388	3000
BORGSTROM-ERIN PRAIRIE TWN	TR WILLOW RIVER		PRIV	LARGE	est. L	22	230
APPLE RIVER FALLS	APPLE RIVER	XCEL ENERGY	UTIL	LARGE	est. S	520	680
RIVERDALE	APPLE	XCEL ENERGY	UTIL	LARGE	est. H	468	840
CEDAR LAKE	CEDAR CREEK/CEDAR LAKE OUTLET	CEDAR LAKE PROTECT & REH	LA	SMALL		1100	3300
CEDAR LAKE MILLING CO./NUTZMAN	CEDAR CREEK	JOHN NUTZMANN	PRIV	SMALL	est. L	7	10
BAUMGARTNER (planned)	TRIB TO RUSH RIVER		PRIV	SMALL	est. L	0.8	1.5
GRAHAM (planned)	TRIB TO APPLE RIVER		PRIV	SMALL	est. L	0.1	0.1
YORK (planned)	TRIB. TO APPLE RIVER	JOHN & GARY YORK	PRIV	SMALL	est. L	73.3	100
BAUER, DANIEL	TR-KINNICKINNIC RIVER	BAUER, DANIEL	PRIV	SMALL		1	2
BETHKE, CHRIS	TR-WILLOW RIVER	BETHKE, CHRIS	PRIV	SMALL		1	4
DAY, HERBERT	TR-HILLSIDE GULLY	DAY, HERBERT	PRIV	SMALL		1	2
DERRICK, LOREN	TR-TEN MILE CREEK	DERRICK, LOREN	PRIV	SMALL			
FABER, WALTER	TRIB LOUSY CREEK	FABER, WALTER	PRIV	SMALL		4	6
FREEMAN, DONALD	TR-RUSH RIVER	FREEMAN, DONALD	PRIV	SMALL		6	24
GARBE	TR-STREAM 11-4C	GARBE, CHARLES	PRIV	SMALL		1	2
GEIGER, GENE	TR-EAU GALLE RIVER	GEIGER, GENE	PRIV	SMALL		1	9
ICKLER, ROBERT	TR-KINNICKINNIC RIVER	ICKLER, ROBERT	PRIV	SMALL		2	6
LARSON, HARVEY	TRIB EAU GALLE RIVER	LARSON, HARVEY	PRIV	SMALL		5	15
LEBER/HENNESSEY SPRINGS CREEK 1	HENNESEY SPRING CREEK		PRIV	SMALL	est. L	0.7	2
LEBER/HENNESSEY SPRINGS CREEK 2	HENNESEY SPRING CREEK		PRIV	SMALL			
MARTINEK/EAGLE RIDGE 2	TR-WILLOW RIVER		PRIV	SMALL			
MARTINEK/EAGLE RIDGE 3	TR-WILLOW RIVER		PRIV	SMALL		1	1
MARTINEK/EAGLE RIDGE 4	TR-WILLOW RIVER		PRIV	SMALL		1	1
MARTINEK/EAGLE RIDGE 1	TR-WILLOW RIVER		PRIV	SMALL		1	2
MELLO, ROBERT L.	TRIB DRY DAM LAKE	MELLO, ROBERT L.	PRIV	SMALL		2	6
SCHUTTS, LEE	TR-WILSON CREEK	SCHUTTS, LEE	PRIV	SMALL		6	15
SWENSON, DUANE E.	TRIMBELLE RIVER	SWENSON, DUANE E.	PRIV	SMALL		4	14
TROUT BROOK/AIRY	WILLOW	ARTHUR KAEMMER	PRIV	SMALL	est. L		
VORWALD, RAYMOND	NO WATERWAY	VORWALD, RAYMOND	PRIV	SMALL		3	9
WILLIAMS/RICHTER	TR-KINNICKINNIC RIVER		PRIV	SMALL		2	9
PRAIRIE FLATS UNIT 1	UNNAMED TRIB TO SQUAW LAKE	US FISH & WILDLIFE SERVICE	USDI	SMALL		40	90
PRAIRIE FLATS UNIT 3	UNNAMED TRIB TO SQUAW LAKE	US FISH & WILDLIFE SERVICE	USDI	SMALL		15	30
WEBSTER (planned)	UNNAMED TRIB TO BOLEN CREEK			SMALL	est. L	0.4	1
DUNN, DOUGLAS	TR-KINNICKINNIC RIVER			SMALL		1	9
KNOPS, JOHN	TRIB SANDY CREEK			SMALL		4	15
MELBY, DR. NEAL A.	TR-DRY RUN CREEK			SMALL		1	3
NIELSEN, MERLE	TRIB KINNICKINNIC RIVER			SMALL		1	2
PETERSON, DARRELL	DRY RUN-TR-APPLE RIVER			SMALL			
ROBERTS JEFF/SNOWCREST	TR-ST.CROIX RIVER			SMALL		1	4
SMITH/SEIM	NO WATERWAY			SMALL		1	4
SULLWOLD/ERLER	TRIB DRY DAM LAKE			SMALL		2	4
WERT, DARREL	TRIB PERCH LAKE			SMALL		1	3
HUDSON NO. 1		CITY OF HUDSON	CITY	LEVEE			
HUDSON NO. 2		CITY OF HUDSON	CITY	LEVEE			
BAUER, DANIEL		BAUER, DANIEL	PRIV				
PAUL CASEY/SARATOGA SPRINGS			PRIV				

APPENDIX J

HAZARD MITIGATION TOOLBOX

MITIGATION TOOLBOX – ALTERNATIVE STRATEGIES

This section focuses on those natural hazards of greatest concern in west-central Wisconsin. A wide variety of possible mitigation tools exist to address these natural hazards. The most common of these mitigation strategies fall within six basic categories:

- I. Administrative and Regulatory Activities
- II. Structural Projects
- III. Education and Awareness Strategies
- IV. Natural Resources Protection
- V. Emergency Response and Recovery Services
- VI. Implementation Strategies

This appendix provides an overview of the alternative mitigation activities available to communities and community members for the typical weather-related natural hazards experienced in west-central Wisconsin, though many of these activities can also be used to mitigate the impacts of additional types of hazards (e.g., pests & infestation, forest fire). No such list of activities is complete, and new strategies are evolving as technology, laws, and impacts change. Many excellent bibliographies of mitigation guides and resource materials exist which provide additional detail on these alternative strategies. For additional information, three excellent starting points are:

Wisconsin Emergency Management. State of Wisconsin Hazard Mitigation Plan. July 2001.

Federal Emergency Management Agency. FEMA Web Site. <<http://www.fema.gov>>. In particular, see “Mitigation Ideas”, FEMA-R5, 9/02.

Schwab, Jim, et.al. Planning for Post-Disaster Recovery and Reconstruction. American Planning Association. Planning Advisory Service Report #483/484. December 1998.

I. ADMINISTRATIVE & REGULATORY ACTIVITIES

These type of activities can be implemented by local governments to protect new construction and expanding development from hazard risks. They fall within the five basic sub-categories listed below, along with the hazard types they would primarily address.

	Hazards Addressed				
	Tornado	Winter Storms	Thunderstorms	Flooding	Heat and Drought
Planning Activities	✓	✓	✓	✓✓	✓
Land-Use Controls	✓	✓	✓	✓✓	✓
Building Codes	✓✓	✓✓	✓✓	✓	✓
Special Plans & Studies	✓	✓	✓	✓✓	✓
Strategic Partnerships	✓	✓	✓	✓	✓

A. Planning Activities

Comprehensive and land-use planning can be important hazard mitigation tools, though natural hazard mitigation is often not a primary goal of such plans. In west-central Wisconsin, flooding and floodplain management typically receives the greatest attention in local land-use plans. Such plans often indicate areas appropriate for open space preservation or for low density development.

Other planning efforts which may incorporate hazard mitigation recommendations include:

- storm water management plans
- growth management plans
- policies regarding concurrency of infrastructure and development

- capital improvement planning
- floodplain management plans
- shoreland protection plans
- watershed district plans
- historic preservation plans
- wellhead protection plans
- farmland preservation plans
- various hazard analyses and emergency response plans

B. Land-Use Controls

Land-use controls are used to implement the plans and vision of a community. Of the land-use controls, zoning regulations are the most common. Zoning identifies appropriate uses for different areas of a municipality and regulates those uses. Again, within the region, flooding issues receive the most attention among the natural hazards, with regulations often discouraging development or high-density development within floodplains.

A wide-variety of land-use controls besides zoning are available to assist in mitigating hazards or their impacts, though some can require technical studies to administer. Some of these include:

- overlay zoning for high-hazard or hazard prone areas
- bonus or incentive zoning, allowing for the transfer of development credits
- performance zoning
- floating zones for areas recently impacted by a hazard
- density controls/down-zoning
- subdivision ordinances
- design review standards
- cul-de-sac & rights-of-way standards for snow removal and emergency vehicle access
- soil conservation and steep slope/hillside ordinances
- stormwater ordinance & impervious surface limits
- development moratorium or interim zoning to allow additional time to plan
- shoreland, floodplain, and wetland zoning, ordinances, or management regulations
- regulate fill, possibly performance based
- compensatory floodland storage (banking) to offset the effects of fill in flood-prone areas
- setback regulations, including vegetation setbacks in wildfire prone areas
- freeboard requirements in special flood hazard areas
- regulations for solid waste, landfills, and hazardous materials
- regulations for agricultural waste and septic systems

C. Building Codes

Building codes are one of the most important hazard mitigation tools, and can be used to address all natural hazards. When properly designed and constructed in an appropriate location, the average structure should rarely be seriously damaged by most of these natural forces.

Building codes can be created and modified to promote mitigation measures such as:

- fire-resistant building materials
- permanent foundations
- anchoring or tie-downs for mobile homes
- wind-resistant construction
- design standards of roofing systems for snow loads and high winds
- overhead sewers or ball-traps for basements to prevent sewer back-up
- stormwater gutters
- storm-shelters or safe-rooms for large capacity buildings
- special containment or monitoring for hazardous materials
- include insulation standards to help protect from extreme heat and cold, as well as improve energy efficiency

In addition to the adoption of such codes, methods of administration and enforcement may be modified to promote compliance. In lieu of regulatory action, educational efforts may also be undertaken to promote these hazard mitigating standards into new construction and existing buildings in the community. The Federal Emergency Management Agency and Institute for Business and Home Safety have many such standards and recommendations available at their respective websites.²

D. Special Plans and Studies

Once a problem or potential problem is identified, additional studies, surveys, or plans may be needed for a special planning area or for a specific issue. These can vary in both geographic scope and engineering requirements. A regional watershed or flood management plan may be required to address flooding issues which cross many different governmental boundaries. A neighborhood or industrial park may require stormwater or hydraulic studies to address localized flash flooding. A new home near a river may require a survey of elevations for a floodplain determination. Cost-benefits analysis could be performed before a local government agrees to a new project. Or, a special analysis of a school can be made to determine safe spots in case of a tornado warning.

II. Structural Projects

Structural projects are commonly the most expensive mitigation activities to undertake, and often have on-going maintenance costs. There are two basic types of structural projects—infrastructure improvements and building modifications.

	Hazards Addressed				
	Tornado	Winter Storms	Thunder-storms	Flooding	Heat and Drought
Infrastructure Improvement	✓	✓	✓	✓✓	✓
Modification of Buildings & Structures	✓✓	✓✓	✓✓	✓✓	✓

A. Infrastructure Improvements & Maintenance

The largest and most common structural projects are infrastructure improvements typically funded by public agencies, often with the assistance of federal or state grant funding. In west-central Wisconsin, the majority of these projects are undertaken to address flooding and stormwater concerns, though there are other improvements and maintenance efforts which address other natural hazards. The following are example infrastructure improvement and maintenance efforts:

- flood control works (construction, restoration/maintenance, or removal), such as:
 - dams, dam gates, and reservoirs
 - remote dam sensors
 - water level strategies for peak runoff events
 - levees, berms, floodwalls, & retaining walls
 - revetments & rip-rap
 - channel maintenance & dredging
 - agricultural dikes & drain tiles
 - diversions, surface channels, overflow weirs, tunnels
 - stormwater retention ponds/basins

- engineering, retrofitting, relocation, or new construction of roads, bridges & utilities, such as:
 - alternative routes of access and evacuation
 - sufficient access/egress for emergency vehicles
 - wells and wastewater plants relocated or protected, including associated monitoring wells
 - separation of stormwater and wastewater
 - assess and improve, as needed, electrical service reliability during winter or storm events

² FEMA Website--<http://www.fema.gov> and IBHS Website--<http://www.ibhs.org/>

- (e.g., encourage back-up power generation or bury power lines)
- evaluate and design water systems and wells to be less vulnerable to drought
- road height or hill cuts to prevent flooding or drifting of snow
- pruning of trees from power lines or clearing rights-of-way (prevent accidents, better snow removal)
- planting of trees to prevent drifting of snow
- improved road systems & signage/signalization to reduce accidents, including rail crossings, bridges, etc
- separation of transportation types (pedestrian, bicycle, truck routes)
- slope stabilization projects (compacting, vegetation, debris anchoring)
- fire breaks and debris clearing
- various monitoring systems (e.g., fire towers, weather stations, communication systems)

B. Modification of Buildings or Structures

Typically less expensive are modifications to individual structures and buildings. These changes are commonly made in response to building codes or other local regulations. Often, these projects are often funded by individual owners, though governmental agencies or insurance companies may have loan or grant programs available to assist. Some typically mentioned modification activities include:

- elevate structures above flood elevations
- structural retrofits for flood-proofing, such as defined wet areas)
- wind-proofing (bracing, storm shutters, shatter-resistant glass, etc)
- sewer back-up protection
- construction of flood barriers around structures
- security measures and escape routes
- identification or construction of a safe room or shelter (especially for public facilities and large complexes)
- electric generator for heating and cooling when normal power supply is not available

A more costly strategy is the acquisition, demolition, and/or relocation of flood-prone buildings, facilities, or entire neighborhoods. Typically, such a buy-out program is implemented by the local government, with the assistance of grant funds, and the resulting open space becomes parkland or an environmental corridor.

III. Education & Awareness Strategies

Education and awareness efforts aimed at community members, the private sector, and public officials can be some of those most effective mitigation strategies available. These efforts span all hazard types, even those hazards where other mitigation options may be limited. Some education and awareness strategies are relatively low cost to implement, with little or no new funding required.

	Hazards Addressed				
	Tornado	Winter Storms	Thunderstorms	Flooding	Heat and Drought
Public Education & Awareness Activities	✓✓	✓✓	✓✓	✓✓	✓✓

Education and awareness strategies can cover a variety of issues and topics, such as:

- hazard risks for the community and potential hazard impacts
- warning systems and terminology
- hazard insurance to protect belongings
- evacuation or location of shelters
- appropriate reaction to hazard events
- safety supplies or kits
- health and safety issues, such West Nile Virus
- agricultural educational efforts on drought, winter kill, and water quality issues
- how domestic practices may contribute to hazards

- permitting processes, including building and development regulations for realtors, builders, engineers, architects
- available technical assistance sources
- mitigation for business & industry leaders
- National Flood Insure Program participation
- required real estate disclosure of hazards
- formation of technical advisory committees
- drills or mock events
- modifying your home to be hazard resistant
- neighborhood or volunteer programs
- assisting with emergency
- driver safety programs
- household hazardous waste disposal

The implementation and delivery methods for these strategies can also vary greatly, including:

- face-to-face meetings
- direct mailings
- local media (television, radio, newspaper)
- informational flyers and self-help guides
- multi-media materials (CD-ROMs)
- World Wide Web
- identify a hazard information center
- information booths at events, fairs, etc
- presentations to schools, groups, etc
- pilot projects and demonstrations

Some of these activities may be required by law, such as the public noticing of government meetings or public participation during comprehensive planning efforts.

IV. Natural Resource Protection

Protecting a community's natural resources yields many positive social, environmental, health, and economic impacts, of which hazard mitigation is one. These protection strategies include the preservation of open space, the restoration of natural ecosystems, and the on-going management of a community's natural resources.

FEMA Insurance Program Activities

Communities must adopt & enforce a floodplain management ordinance to qualify for the NFIP.

CRS credited activities for rate reduction encompass a wide variety of mitigation activities, including:

Public Information Activities
 Elevation Certificate
 Map Determinations
 Outreach Projects
 Hazard Disclosure
 Flood Protection Library
 Flood Protection Assistance

Mapping & Regulatory Activities
 Additional Flood Data
 Open Space Preservation
 Higher Regulatory Standards
 Flood Data Maintenance
 Stormwater Management

Flood Damage Reduction Activities
 Repetitive Loss Projects
 Floodplain Management Planning
 Acquisition & Relocation
 Retrofitting
 Drainage System Maintenance

Flood Preparedness Activities
 Flood Warning Program
 Levee Safety
 Dam Safety

	Hazards Addressed				
	Tornado	Winter Storms	Thunderstorms	Flooding	Heat and Drought
Open Space Preservation			✓	✓✓	
Restoration Project			✓	✓✓	
Management Practices	✓	✓	✓	✓	✓

A. Open Space and Environmental Corridor Preservation

By limiting development in floodprone or hazard-prone areas, certain hazard impacts can be avoided before they occur. Open space can be maintained in agricultural uses, parks, environmental corridors, and often golf courses. Open space and environmental corridor preservation can also have other multiple benefits, such as protecting unique natural or cultural resources, maintaining or improving water quality, preserving productive farmland, and providing stormwater detention areas.

The most common tool to promote open space or to preserve an environmental corridor is through zoning regulations. However, there are additional tools available to promote open space:

- open space/environmental corridor preservation in local or regional planning efforts
- property acquisition
- transfer or purchase of development rights
- purchase options, such as right-of-first refusal or purchase & leaseback arrangements
- use of eminent domain for condemnation
- private or cooperative land trusts
- farmland preservation programs, including use or differential taxation and tax credits
- sediment or erosion controls

B. Restoration Projects

Similar to open space preservation, the restoration of natural areas can also help mitigate the impacts of flooding and stormwater. To address severely flood-prone areas with many repetitive loss properties, some communities have acquired the land and returned it to its natural form. Restorations project with potential positive hazard mitigation components include:

- stream corridor restoration
- shoreland, dune and beach restoration
- watershed management
- prairie restoration
- wetland restoration, preservation, & development regulations
- wetlands mitigation or “banking”
- environmental impact & carrying capacity review & ordinances

Often, these restoration projects occur in conjunction with a larger development project under the guidance of existing local or state regulations. For instance a community may identify an under-developed flood-prone area for restoration and stormwater detention. As development occurs in other areas of the community, the developers help share the financial burden of the restoration based on wetland impacts and stormwater created at the developing locations.

C. Management Practices

Community members and government officials utilize numerous natural resources management tools and best practices which have positive hazard mitigation impacts. Some examples are:

- forest and wild fire fuel reduction
- farmland preservation planning and soil conservation practices
- forest & vegetation management & projects
- urban forestry & landscape management

These management practices can impact most natural hazards to varying degrees. For instance, urban forestry and landscape management can be used to reduce stormwater run-off, improve water quality, reduce the impacts of the urban heat island effect, and help reduce local air and sound pollution. In rural areas, forest and vegetation management can help reduce the potential of large forest and wild fires, improve water quality, reduce the drifting of snow, and be an important soil conservation tool. Some of these practices may also be incorporated into local regulations.

V. Emergency Response & Recovery Services

Many of the tools & activities listed in this section may more appropriately fit within the scope of a post-disaster recovery & reconstruction plan, rather than a hazard mitigation plan. However, a prompt and organized response to a hazard warning or event can lessen the negative impacts associated with the event, and speed up the recovery process. The majority of these response strategies apply to multiple or all hazards.

	Hazards Addressed				
	Tornado	Winter Storms	Thunderstorms	Flooding	Heat and Drought
Planning Activities	✓✓	✓✓	✓✓	✓✓	✓✓
Communication Systems	✓✓	✓✓	✓✓	✓✓	✓
Resources	✓✓	✓✓	✓	✓✓	✓

A. Planning Activities

Emergency response and operations plans and policies can be comprehensive, specific to a hazard-type, or focus on addressing a particular impact. Most importantly, plans should be in place which identify roles, responsibilities, and authority when an event occurs, including any policies regarding emergency legislation. Such planning activities may include:

- evacuation procedures
- animal control
- general clearing, clean-up & refuse disposal
- disaster recovery plans
- security & protection against looting
- health issues (e.g., vaccinations for tetanus)
- emergency government plans

Additional planning and regulatory efforts may be required after an event occurs, and to help guide the redevelopment process, such as:

- development moratorium or interim zoning
- planning solutions for impacted historic buildings & sites
- re-occupancy permits
- emergency or temporary permitting for repairs
- emergency demolition
- evacuation procedures
- post-disaster evaluation & mitigation (lessons learned)
- post-disaster reconstruction land-use plans and priorities (opportunities)

B. Communication and Warning Systems

Hazard threat recognition & reporting is critical for effective hazard mitigation. Such warning systems may be electronic (e.g., dam monitors, weather radar, road ice sensors) or require human action (e.g., volunteer weather-watchers).

Once a potential or existing hazard is identified, it needs to be communicated effectively to those who may be impacted and to those who need to respond. Such warning systems may include sirens, television/radio, NOAA weather radios, automatic dialing systems, voice-activate radio, or public address systems.

If an event should occur, additional effective communication is needed between emergency response services in the field and the emergency operation center. Additional communication policies for post-disaster response may address media & public interaction and a point-of-contact with state emergency management officials.

C. Resources (Personnel, Financial, and Equipment)

Foremost, personnel need the training to identify a potential hazard, utilities the existing communication systems, and take appropriate action. A well-prepared community will have adopt emergency response procedures and plans

such as those previously discussed, and emergency personnel will be knowledgeable of these plans. As such, training is a very important hazard mitigation tool.

The following are some additional resource-related hazard mitigation strategies:

- purchase equipment or special vehicles (or related maintenance)
- maintenance or improvement to utilities & infrastructure to increase response effectiveness
- general clearing, clean-up & refuse disposal
- provide relief services for community members, such as:
 - special arrangements for payment of heating bills during severe winter storms
 - transportation to heating or cooling centers
 - emergency housing or shelters
 - public mortgage lending subsidies
 - damage assessment & accounting systems
 - restoration of utility services
 - business support
 - other specialists (e.g., environmental, agricultural, hazardous materials)

Related to strategic partnerships, some communities have established various agreement with other municipalities or the private sector for mutual support if a disaster should occur, in order to expedite the recovery process.

VI. Implementation Strategies

Implementation strategies are often not direct means of mitigating a hazard, but are important tools for assisting with the implementation of the various mitigation activities previously discussed. Implementation strategies call apply to all hazard types, and are equally important for pre-disaster mitigation and post-disaster response and recovery. This section overviews strategic partnerships and project financing as important implementation tools.

A. Strategic Partnerships

Strategic partnerships are very important in hazard preparedness, disaster response, and post-disaster recovery. Such partnerships may be between adjacent governmental entities, the private and public sectors, or even between community members themselves. These partnerships may involve formal contracts, mutual aid agreements, and memoranda of understanding, or may be a less formal sharing of information and training. Most common is the formation of partnerships for the sharing of resources, including technical skills, financial resources, equipment, and personnel. Some example strategic partnerships are:

- partnerships with universities and colleges for training programs or special studies
- establishment of public-private ad hoc task forces to address a critical issue
- sharing of data & information (e.g., GIS, maps, plans, ordinances, procedures)
- identification of community buildings to use a public storm, cooling, and heating shelters
- monitoring for potential hazards & related communication
- multi-agency training, drills, or mock events
- intergovernmental agreements for snow removal, fire, police, or other emergency services
- form a cooperative to increase buying power for special insurance
- intergovernmental agreements for regulatory oversight, inspections, monitoring, assessment, etc
- agreements to perform comprehensive planning or regional studies
- agreement regarding the provision and maintenance of infrastructure, dams, equipment, etc
- agreements covering disaster response and recovery services and resources (e.g., Red Cross)

Many of the existing strategic partnerships for hazard mitigation in St. Croix County are identified in **Section IV. Current Mitigation Activities** of the plan.

B. Project Financing & Fiscal Mechanisms

There are optional means of funding hazard mitigation measures, outside of the standard annual municipal or county budget cycle. Many communities are beginning to take a longer-term perspective on project financing and adopting capital improvements plans for all types of infrastructure improvements and heavy equipment purchases. This

approach allows a better perspective of the long-term needs and financial resources a community has available, enabling the exploration of alternative fiscal mechanisms such as:

- identification & procurement of grant funds (revenue)
- special assessment districts for special services or benefits (revenues, guide development)
- developer exactions, impact fees, development improvement taxes (revenue)
- user-fees (revenue)
- land dedications/exactions & TDRs (land)
- tax incentives--marginal cost pricing & differential assessment (primarily to guide development)
- tax increment financing (TIF) for infrastructure improvements (revenue)
- land transfer, development, gains taxes (versus speculation & profits for projects, create a land bank, etc)
- tax abatement, low-interest loans, subsidies, etc (incentives for mitigation or guide development)
- loans or tax-exempt bond financing
- special redevelopment funds
- strategic partnerships with non-profit groups for fund-raising activities (revenues, awareness)
- strategic partnerships to pool financial resources, possibly leveraging additional grant or private funds

APPENDIX K.

FEASIBILITY ANALYSIS
OF ALTERNATIVE
MITIGATION STRATEGIES

Analysis of Strategy Alternatives

Note: The alternative strategies were analyzed based on their importance and feasibility for the mitigation of hazard risks. Some strategies may be rated differently by the county or communities based on other criteria. As such, a strategy may be excluded or ranked low in this plan, but could be a high priority for the county overall. The Steering Committee provided a relative score for each county-wide strategy. The final prioritization of some strategies were changed after further discussion.

Strategy Alternatives - County-wide		2008, revised, or new	Prioritization/Score			If recommended, likely key parties to be involved.	Comments or Proposed Changes
			High (7.5-10)	Med (5-7.4)	Low or Exclude (0-4.9)		
Physical Development and Infrastructure Strategies							
1. Continue to study and address overland flooding, flash flooding, road washout problems, and ice-damming in St. Croix County, including those areas of concern identified in the flood assessment.	2008; slightly revised	9.10			Towns, Highway Dept., Cities and Villages	Strategy is generalized to allow flexibility in implementation. Progress is ongoing, but 2010 flooding identified additional areas of concern.	
2. Pursue hazard mitigation grant funding to acquire, relocate, or floodproof structures and properties most at risk of major flood damage when opportunities arise and/or following a flood event in which significant damage occurs.	2008; slightly revised	8.22			County Engy Mgmt, Planning & Zoning, municipalities, landowners	St. Croix County has two repetitive loss properties and at least 44 NFIP claims. Concentrations in the Bass Lake and "the Cove" areas. A number of potential acquisitions projects were identified during the planning process.	
3. Encourage all school buildings to have interior and exterior numbering door numbering and provide copies of floor plans (with door numbers) to local emergency responders and the County Emergency Communication Department.	new		6.66		School Districts, local emergency responders, County Engy Comm	In progress and completed for a number of the schools.	
4. Where feasible, continue to address snow drifting problem areas through snow fencing, plantings, or unharvested corn rows.	new			4.33		Some snow fencing used in recent years. WisDOT has instituted a program to pay farmers by the bushel to leave unharvested corn in locations prone to drifting, though high price of corn may impact participation. County Highway Department did not identify any critical drifting concerns, though some concerns on local roads.	
5. Pursue grant funding for a safe room initiative which subsidizes the installation of safe rooms or storm shelters for mobile homes, mobile home parks, campgrounds, and event locations where no other adequate shelter exists. Coordinate with those municipalities who are also considering safe room projects.	revised		6.55		County Emergency Management, local communities, m.h. park owners and residents	FEMA's definition of "safe room" includes larger, community safe rooms (storm shelters) and residential safe rooms for individual homes. This project would be contingent on available grant funding. Shelters may be part of a multi-use structure.	
6. Pursue grant funding for a community safe room project at Homestead Parklands. Combine with #5.	new		6.11		see #5	Steering Committee members recommended combining with #5 above.	
7. Coordinate with the St. Croix County Fairgrounds and the City of Glenwood City to address the need for a community safe room. Combine with #5.	revised		6.33		see #5	No storm shelter is available at the Fairgrounds and no public storm shelter available within the City has caused problems in past. During a peak day, up to 5,000 fair-goers may be in attendance. The Fairgrounds long-term plan includes a new multi-use building; there may be an opportunity to integrate a community safe room within this new building. Combine with #5 per Steering Cmte.	
8. Pursue additional automated weather and water-level monitoring equipment along rivers and at the Glenwood Hills Dams.	new		7.30		County Land Conservation	2010 Flood After Action Report suggests additional rain gauges are needed.	
9. Pursue grant funding for a manufactured/mobile home anchoring project which encourages the anchoring of older mobile homes.	2008			3.00	not recommended at this time	Newer mobile homes should be anchored/strapped down in accordance with building codes. Would be contingent on grant funding and home owner participation. Consensus is that should be homeowner and park management responsibility at this time.	

Strategy Alternatives - County-wide		2008, revised, or new		Prioritization/Score			If recommended, likely key parties to be involved.		Comments or Proposed Changes	
				High (7.5-10)	Med (5-7.4)	Low or Exclude (0-4.9)				
Physical Development and Infrastructure Strategies (cont.)										
10. Continue to work with local electric power providers to bury electrical lines in areas prone to outages due to falling trees/limbs or high winds and for service to critical facilities. For areas prone to flooding, transformers or other such electric system components may require floodproofing, elevating, or relocation.	revised		5.22		Electric providers, County Emergency Management	Eligible for mitigation dollars, if utility owned by municipality or cooperative. St. Croix Electric Cooperative identified two areas of particular concern: Town of Troy along the St. Croix River and service to the Eau Claire Dam monitoring/warning system. Mitigation of transformers suggests in 2010 Flood After Action Report.				
11. For rural areas without siren coverage, pursue the installation of weather warning sirens in areas of high residential growth, including campgrounds and mobile home parks. Coordinate with those cities and villages who are in need of siren replacement or additional siren coverage.	2008; slightly revised		6.66		Primarily the responsibility of the town, city, or village.	Grant funding for warning sirens has been very limited in the past and may not be available. Consider maintenance costs prior to moving forward.				
12. Pursue grant funds for dry hydrants for fire protection in areas of concentrated development where other water sources are not readily available.	new		5.88		Fire Departments	Grant funding may be available, though identifying matching funds a challenge for volunteer fire departments. Uncertain of the extent of the need in the County. Dry hydrants or other water sources for fire protection could also be required during subdivision plat review.				
Planning & Policy Strategies										
13. Continue to enforce County floodplain regulations and related land-use ordinances to discourage future floodplain development, the storage of hazardous materials in floodplains, require dry land access for all new structures, limit development in dam shadows, and maintain natural flood storage areas.	2008		7.77		County Planning and Zoning	Ongoing. This strategy reinforces existing policy and enforcement efforts.				
14. Implement a LIDAR mapping project which meets FEMA National Flood Insurance Program standards to obtain more accurate elevation data for the County. Work with WDNR and FEMA to revisit, and revise as needed, the FEMA D-FIRM floodplain maps for St. Croix County once the LIDAR data is available.	revised	9.55			County Planning and zoning; WDNR, FEMA	Questions of accuracy with the current D-FIRMs exist. LIDAR has the potential to greatly improve the accuracy. Additional structural data and analysis of flood vulnerabilities can be considered once floodplain map accuracy is improved. Map updates should incorporate any map amendments or revisions approved in the interim.				
15. Add residents and structures located within dam failure inundation areas to the CityWatch system.	new		6.00		County Emergency Management, Planning/GIS, dam owners	Emergency action plans for large dams is standard practice. Only high hazard and/or large dams may have dam failure/inundation areas mapped. Not all dam failure/inundation areas which have been mapped are currently be digitized in a GIS format.				
16. Analyze the flooding impacts (if any) of the dam removals on the Willow River, or distribute a summary of these findings to local officials if such an analysis has already been completed.	new		4.77		not recommended at this time	Suggested by the Town of Hudson who expressed concerns that the flood control capability along the Willow River may have been decreased with the dam removals.				
17. Integrate railroad mile posts, key bridges, and grade crossing identification numbers into County emergency mapping systems and explain the importance of these additions to emergency, law enforcement, and dispatch personnel.	new		5.88		County Emergency Management, Planning/GIS, rail roads	Second phase may require meetings with emergency personnel, but could be integrated with existing or planned meetings or trainings.				
18. Organize a meeting with City of Hudson, Village of North Hudson, St. Croix County, and other appropriate parties to discuss "back-flooding" over the Lake Mallalien Dam and access alternatives should the bridge be closed.	new		4.77		not recommended at this time	Feasible options to address the "back-flooding" may not be available, but multi-jurisdictional communication on the dam may be beneficial.				
19. Conduct an inventory of the location, condition, anchoring, and emergency plans of mobile home parks in the County, including availability of shelters and warning systems, then pursue additional mitigation strategies as needed.	2008; slightly revised		6.11		County Emergency Management, Planning/GIS, m.h. park owners	Location of mobile home parks is included in this plan. Only one is believed to have a community safe room on site.				

Strategy Alternatives - County-wide	2008, revised, or new	Priority (check one)			If recommended, likely key parties to be involved.	Comments, Proposed Changes, or Alternatives
		High (7.5-10)	Med (7.4)	Low or Exclude (0-4.9)		
Planning & Policy Strategies (cont.)						
20. Analyze and map areas in St. Croix County experiencing stream/river bank erosion for which rip-rap or other engineered solutions may be needed.	new			3.33	not recommended at this time	This has limited relationship to hazard mitigation planning and may be considered a strategy for other County planning efforts.
21. Encourage the county and municipalities to integrate hazard mitigation issues and strategies into their comprehensive plans and other related planning efforts, such as safe rooms, access/egress, flood management, transport of hazardous materials, and emergency planning.	new	8.77			County Planning & Zoning, Emergency Management, WCWRPC	No state requirement to address hazard mitigation as part of comprehensive planning, though this strategy is being strongly encouraged by FEMA and Wisconsin Emergency Management.
22. Adopt County mobile home regulations which require new and expanding mobile home parks to identify per formal agreement a safe room/storm shelter or construct a safe room(s) for residents. Require new and encourage existing mobile home parks in unincorporated areas to have emergency plans which will be on-file with the County.	2008	7.55			County Planning & Zoning	Not many new mobile home parks being constructed. If a rezoning is needed, this could potentially be required as part of a conditional use permit. Could be expanded to include emergency plans and notification procedures. "Expanding" changed from "existing" due to input during the planning process; hard to require of existing.
23. Inventory the warning siren coverage areas of the County, along with the age and capabilities of the equipment (e.g., battery back-up). Use GIS to compare with land uses and population density to recommend additional coverage areas.	2008		5.44		Primarily the responsibility of the town, city, or village.	Some siren coverage areas mapped. Not a high priority for the County at this time. To fully implement, County GIS and Emergency Communications would be involved.
24. Continue to make emergency planning for pandemic flu a high priority for the County, with a focus on distribution of pharmaceuticals, volunteer resources, mass casualty/mortuary planning, and quarantine procedures.	2008; slightly revised	7.55			County Public Health	Ongoing efforts, but limited staff time available. Using an all-hazards approach which maximizes resources (e.g., medical supplies, transportation). Special populations plan in place, but no mortuary services plan. Distribution system needs work. No longer part of the regional consortium. Using We Volunteer Registry.
25. Encourage operators of major festival grounds to maintain current emergency action plans. Periodic meetings between County Emergency Management, local emergency services, and festival operators should be conducted to review plans and identify any issues requiring action or mitigation.	new		6.22		County Planning & Zoning, Emergency Management, emergency services, festival operators	Could be accomplished as a condition of permitting (e.g., licensing, zoning condition use).
26. Continue to encourage towns, villages, and cities to update and maintain emergency operations plans with current contact information.	new	9.55			County Emergency Management	A number of communities acknowledged during the process that their EOPs required updating.
27. Continue development of the St. Croix County Continuity of Government Plan and encourage other local municipalities to consider similar continuity planning efforts for the recovery of essential business functions.	new		6.88		County Emergency Support Services Department	Past continuity effort by County being revisited. Many local officials during community meetings were not familiar with continuity planning, so some education on typical scope and value would be needed.
28. Implement a mapping project to identify areas where groundwater quality has been compromised and areas of heightened risk to groundwater contamination.	new			4.88	not recommended at this time	Closed depressions have been mapped, but this should be revisited and updated as needed. There is a general lack of understanding of the risks and areas of concern in the County.

Strategy Alternatives - County-wide	2008, or revised, or new	Priority (check one)			If recommended, likely key parties to be involved.	Comments, Proposed Changes, or Alternatives
		High (7.5-10)	Med (7.4)	Low or Exclude (0-4.9)		
Planning & Policy Strategies (cont.)						
29. Continue to support and strengthen St. Croix County Land and Water Conservation Department's water quality monitoring, testing, and outreach efforts.	revised		6.55		County Board, County Land & Water Conservation	Current volunteer testing program may need to be supplemented with additional monitoring in key locations. Coordinate with WDNR, University System, NRCS, etc.
30. Provide additional funding support for St. Croix County Land and Water Conservation Department's water quality testing program to cover mailing of testing materials. Combine with #29.	new		6.33		County Board, County Land & Water Conservation	Testing is ongoing with 400-500 wells voluntarily tested annually. Outreach may be improved, at a net cost-savings, if the mailing costs for the testing kits would be covered (at least initially) by the County, instead of requiring receipt of mailing payments by landowners.
31. Conduct a survey of emergency power generator and fuel capability and needs for Emergency Operations Centers, communications towers, long-term care facilities, and other critical facilities. Develop a strategy to address if possible.	new		6.55		Municipal emergency managers, County Emergency Management	A number of municipalities identified a need for emergency power generators or wiring improvements to allow for generator hook-up. Local officials frequently expressed concern or a lack of knowledge of generator and fuel availability for long-term care facilities (e.g., nursing homes, CBRFs). Not a current State hazard mitigation grant priority.
32. Develop a list of emergency power generator suppliers, rental stores, and emergency fuel supplies. Analyze for anticipated supplies and availability during a long-term power outage event. Combine with #31.	new/revise		5.22		see #31	This is an alternative to the portable generator loan program for farm operations suggested in the 2008 plan. After discussion, this strategy should be combined with #31 for the plan recommendation.
Communication & Coordination Strategies						
33. Implement a NOAA All Hazard Radio project with particular focus on distributing radios (or discount vouchers) to mobile home residents, resorts, campgrounds, and/or critical facilities, to include general public education on alert warning sirens and all hazards radios.	revised	8.33			County Emergency Management	A discount voucher program would allow for distribution through area businesses. Could partner with ARES/RACES, Boy Scout, or other service organizations with P.R., distribution, and assisting residents with programming. Strategy #61 integrated after ranking.
34. Continue to conduct regular hazardous materials exercises with local communities with a particular focus on those chemicals commonly transported on Interstate 94 and by rail as identified in the commodity flow study. Test related systems and procedures.	new	8.66			County Emergency Management; municipalities, emergency services	Educate response personnel on those chemicals most common and toxic identified in the commodity flow study. HazMat transport on I-94 and rail lines were frequently mentioned concerns during interviews.
35. Coordinate with Union Pacific and Canadian Northern rail officials to conduct a one-day Community Awareness & Emergency Response Training (CAER) event in St. Croix County.	new		4.00		not recommended at this time	After further discussion, it was recognized that a CAER event was conducted in St. Croix County in 2011. This is likely why it was ranked low as a need at this time.
36. Coordinate with Red Cross to formally designate and, when needed, advertise cooling and warming shelters for St. Croix County.	new	7.88			County Emergency Management; Red Cross	Inform municipalities of availability. Cooling shelters were identified in Summer 2011; many of these may also serve as warming shelters, but not all may have emergency power generators.

Strategy Alternatives - County-wide		2008, revised, or new	Priority (check one)			If recommended, likely key parties to be involved.	Comments, Proposed Changes, or Alternatives
			High (7.5-10)	Med (5-7.4)	Low or Exclude (0-4.9)		
Communication & Coordination Strategies (cont.)							
37. Work with the State Highway Patrol and Wisconsin Department of Transportation to enforce parking restrictions along Interstate 94 on-/off-ramps during severe weather events.	new			3.33	not recommended at this time	Current signage is adequate, but often ignored. But, generally, more important priorities for law enforcement during severe weather.	
38. Coordinate with Wisconsin Department of Transportation to explore the feasibility of message boards on Interstate 94 to remind truckers to switch fuels during periods of cold.	new			3.00	not recommended at this time	Low priority. Most truckers aware of the risks.	
39. Encourage school districts to continue involving local emergency personnel in emergency plan updates, drills, and exercises. Consider the impacts of security measures on access/egress during an emergency.	new		8.33		School Districts, local emergency responders, County Engy Comm	Supports continuing current practices.	
40. Once the narrowbanding transition is complete, conduct a Countywide exercises to test the new system and identify/address any remaining issues. Develop a recommended approach for Public Works radios.	new			4.77	not recommended at this time	Communications equipment for local public works personnel varies by community. Address as part of Tactical Communications Interoperability Plan (TCIP).	
41. Continue to expand the use of the City Watch reverse-911 system and inform other key stakeholders of its availability.	new			6.66	County Emergency Support Services, County GIS	In progress. Mentioned numerous times during interviews. May have value for municipalities, utilities, etc., but availability not yet widely known.	
42. Continue to pursue Mutual Aid Box Alarm System (MABAS) participation for fire, rescue, and emergency medical services (EMS) mutual aid in St. Croix County.	new			5.88	Fire Departments and EMS services	Steering committee comments included some agencies have not practiced multiple casualty incident procedures, EMS involvement is important, and "are we ready for MABAS?"	
43. Continue to strengthen ties with Minnesota to address consistency and compatibility challenges with communication systems, health emergency policies, and other emergency procedures.	2008; revised			7.11	Wisconsin, Minnesota, neighboring counties	Some challenges with communications exists. Since the County is in the Minneapolis media market, the differences between the states could confuse media, residents, and businesses.	
44. Continue to develop a County resource database with emphasis on ensuring availability during an event. Encourage municipalities to establish policies and standard billing rates for equipment used in response and recovery.	new			4.88	not recommended as a separate strategy at this time	Ongoing. ADRC and some departments have their own directories. 2-1-1 system in use. Some municipalities adopting Wisconsin DOT equipment billing rates as their own. Public works mutual aid also covers some of this.	
45. During mock or tabletop exercises, increase emphasis on different agency roles, resources, responsibilities, reporting, and central coordination during times of disaster, including utility providers, health and social services agencies, hospitals, municipalities, and non-profits.	2008			7.25	County Emergency Management; other stakeholders	During interviews, some service providers not typically involved in traditional TTXs were interested in learning more about their roles and how coordination work if they may be called upon to provide support or resources during a disaster.	
46. Formalize a volunteer network and donations management program for St. Croix County. Involve voluntary and community organizations active in disaster (COADs & VOADs) and community emergency response teams (CERTs) in related planning and training.	revised			6.13	COADs, VOADs, CERTs, County Emergency Support Services	Adapted from previous hazard plan and 2010 Flood After Action Report. Alternative strategies could include encouraging the formation of additional COADs and CERTs where needed and encouraging these entities to complete basic ICS training.	
47. Increase the involvement of State Highway Patrol in County event exercises involving roadways in an effort to improve communication and coordination within the incident command system.	new			6.13	State Highway Patrol, County Engy Mgmt, local emergency responders	Some problems exist per local testimony, but may be improved with continued communication.	

Strategy Alternatives - County-wide	2008, revised, or new	Priority (check one)			If recommended, likely key parties to be involved.	Comments, Proposed Changes, or Alternatives
		High (7.5-10)	Med (7.4)	Low or Exclude (0-4.9)		
Education & Training Strategies						
48. Increase awareness among public officials and residents of driveway access, grade, width/clearance, long-dead end roads, and turn-around issues for large emergency vehicles, especially in wooded and shoreland areas.	new			4.13	not recommended at this time	County and many towns have ordinances, but some issues in rural areas still exist. Could be combined with some other strategies. Model standards may need to be provided to some communities.
49. Further explore the use of social media for preparedness education, warning systems, and coordinating response and recovery.	revised	9.00			County Emergency Communications	
50. As deemed appropriate, incorporate hazard risks, preparedness ideas, warning systems, and informative links, into future updates of the <i>St. Croix County Rural Living Guide</i> .	new		5.63		County Emergency Management, Land Conserv., Guide preparers	Specific ideas mentioned include education on storm sirens activation, safe room options, weather radios, driveway design for emergency vehicle access, and groundwater quality issues/risks.
51. Increase preparedness of campgrounds and resorts to severe weather by: (a) promoting use of all hazards (weather) radios; (b) encouraging the provision of emergency information to patrons; and (c) requiring new and expanding campgrounds or resorts to identify a severe weather shelter.	2008; slightly revised	8.22			County Emergency Management, local communities, campground & resort owners	Slightly modified from a strategy in the 2008 plan. Related to Strategy #33 and could be implemented concurrently.
52. Provide basic knowledge to local officials, local media, schools, and other critical facilities of the nuclear accident risks to St. Croix County and the related warning systems.	new		7.11		Xcel, WEM, County Emergency Management	If a release should occur, the County's risks would likely be low, though public panic may ensue. Controlling the P.R. message will be critical.
53. Work with Wisconsin Emergency Management and Xcel Energy to develop an educational pilot project for nuclear accident focused on the risks to the ingestion pathway zone and potential impacts on the agricultural sector.	revised			4.11	not recommended at this time	A more "intensive" version of the 2008 strategy. Suggest implementation be delayed until more findings available from the Japan experience. Per survey results, most towns interested in more information on this topic. Cities and villages had limited knowledge on the topic as well.
54. Implement a cyber-security and data back-up educational initiative for cities, villages, and town officials in St. Croix County.	new		6.33		Under consideration. May be opportunities for a regional approach through WCWRPC.	The state of cyber-security varies widely by community. Educational effort could include topics such as use policies, basic security measures (hardware and software), backing-up data, data retrieval, systems imaging, insurance options, and testing.
55. Encourage long-term care facilities (e.g., nursing homes) to share their emergency plans with local emergency response officials, in particular those sections which rely on public-sector assistance.	new	9.11			County Emergency Management, ADRC, Public Health, care providers & their associations	County has 9 nursing homes and 50 assisted living facilities. Some private-sector businesses and facilities may make assumptions on the availability of public-sector resources for evacuation, emergency fuel, etc. Could be implemented through a range of outreach activities.
56. Encourage local officials and key municipal/County staff to complete basic levels of Incident Command System (ICS) training. Advocate for Public Information Officer (PIO) training within the County and/or region for persons with a PIO role.	revised	9.55			County Emergency Management, WEM	Ongoing process given turnover in elected officials and staff. Work plan is a basic course list by suggested position. Most introductory courses available online.
57. Meet with private-sector and non-profit entities to discuss interest in developing a public-private partnership organization for community preparedness and resiliency.	new		7.33		County Emergency Management, Private Sector, DRCV, WCWRPC, COADs	Private sector resources are critical during response and recovery to a large disaster. The group can also advocate for emergency preparedness and business continuity among the private sector. Disaster Ready Chippewa Valley may serve as one such model.
58. Continue to develop a County resource database for use in times of disaster be coordinating agencies. Encourage municipalities to establish policies and standard billing rates for equipment used in response and recovery.	new		5.77		Various County depts, Engy Comm Center, municipalities, 2-1-1	Ongoing. ADRC and some departments have their own directories. 2-1-1 system in use. Some municipalities adopting Wisconsin DOT equipment billing rates as their own. Public works mutual aid also covers some of this.

Strategy Alternatives - County-wide	2008, revised, or new	Priority (check one)			If recommended, likely key parties to be involved.	Comments, Proposed Changes, or Alternatives
		High (7.5-10)	Med (5-7.4)	Low or Exclude (0-4.9)		
59. Increase outreach and programming on farming practices related to wind erosion, crop production on marginal lands, and encroachment on public rights-of-way.	new		6.77		County Land Conservation, UW-Extension, NRCS	During interviews, the loss of tree and fence lines and increasing crop production on marginal lands were noted as wind erosion, water quality, and loss of flood storage concerns. R-O-W encroachment can lead to ditch erosion (and flooding), snow removal challenges, and loss of vision triangles.
60. Establish a program to encourage farmers to install HazMat placards in a highly visible location for the storage of significant amounts of hazardous materials on site.	new		6.22		County Land Conservation, UW-Extension, Ag Coops	Thresholds for amount of hazardous materials which necessitate a placard would need to be identified. Standards for the location of placards should also be included. Benefits fire departments.
61. Continue public educational efforts regarding the County's warning siren system and promote the benefits of all hazards (weather) radios for private citizens, campgrounds, resorts, and businesses through local media and community events. Combine with Strategy #33.	2008; revised slightly		6.50		see #33	Outreach to public is often in conjunction with severe weather awareness week each April. After further discussion, it was decided to include this educational component as part of the radio project in Strategy #33.
62. Continue with the County Land Conservation Department and UW-Extension nutrient management activities which have likely helped mitigate potential winter kill, reduce agricultural-related stormwater flooding concerns, and help protect water quality.	2008		6.11		County Land Conservation, UW-Extension	Ongoing, with support from NRCS and FSA.
63. Implement a backflow prevention educational project, including education of the public and local officials and the sharing of model ordinance language.	new		5.77		Local communities; lead not identified at this time	This was mentioned during multiple interviews with the cities and villages. If excluded from the County-level strategies, it will be proposed as a city/village strategy. Consulting with WEM on eligibility as a mitigation project.
64. Increase resident and local official knowledge of flood risks in St. Croix County, flood insurance, and the typical limitations of homeowner's policies to cover flood damage.	new		7.44		County Emergency Management, County Planning & Zoning, local municipalities, WDNR	Homeowner's policies typically do not cover flood damage. Abt. 25% of all NFIP insurance claims are for areas outside the 100-year floodplain. Many low value homes may have no insurance. May be eligible for mitigation grant funding.
65. Work with local communities to increase public knowledge of available "Clean Sweep" programs and other methods of disposing of potentially hazardous wastes and agricultural chemicals. Encourage additional State support to increase availability of these programs.	2008; slightly revised		8.22		County Land Conservation, local communities, County Board	Has been scaled back to once a year in County due to budget limitations, with option to take to Washington County, MN.
66. Continue to increase public knowledge of groundwater contamination risks, areas of concern, and well construction standards at the time of sale and when other opportunities exist, with particular educational outreach to builders, realtors, farmers, and local government officials.	2008; slightly revised		7.00		County Land Conservation; County Planning & Zoning, local communities	Special attention should be given to closed depressions, existing deep well casing areas, and nitrate prohibition areas.
67. Implement an educational initiative targeting realtors, builders, and the general public with informational materials to promote safe rooms for slab-on-grade construction without access to a public storm shelter. If opportunity arises, consider construction of a model safe room for educational purposes.	revised		7.44		County Planning & Zoning, local communities	May potentially be eligible for mitigation grant funding. May further target those communities where most slab-on-grade construction has been taking place. Model safe room as part of a model home could potentially be a separate strategy.
68. Continue pandemic flu educational efforts related to social distancing and quarantine which will be critical to containment. Increase local official awareness of related risks, procedures, points of distribution, and how Wisconsin policies may differ than those in Minnesota.	revised		6.22		County Public Health	Recognizes ongoing efforts in conjunction with "flu season" outreach; some aspects becoming common practice. Many local officials interviewed during planning process had little or no knowledge of County pandemic flu plans and policies.
69. Continue to expand educational efforts and partnerships regarding alternatives to mitigate stormwater and flash flooding run-off, such as erosion controls, rain gardens, natural vegetation buffers, permeable pavement, shoreland practices, and forest management in areas with steep slopes. Combine w/ #64.	new		6.44		see #64	Supports continuing current efforts. Has additional benefits of reducing non-point pollution and silt loading. After further discussion, it was decided to combine this strategy with #64 for the final plan recommendation.

APPENDIX L.

POTENTIAL STATE AND FEDERAL GRANT PROGRAMS FOR MITIGATION PROJECTS

Potential Federal and State Grant Programs for Hazard Mitigation

adapted and amended from: Wisconsin Emergency Management. *Resource Guide to All Hazards Mitigation Planning in Wisconsin*. April 2003. p19-20

This is a selection of more commonly used grant programs, but is not 100% complete.

These programs and requirements are subject to change. Contact these agencies for application materials, program changes, and additional potential funding sources not identified here.

#	Federal or State Agency and Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
1	Federal Emergency Management Agency, Hazard Mitigation Grant program (HGMP)	Wisconsin Emergency Management P.O. Box 7865 2400 Wright Street Street, Madison, WI 54707-7865	Flood proofing, acquisition and relocation of flood prone properties, elevation of flood prone properties, wind resistant or retrofit, storm water improvements, education and awareness, All Hazards Mitigation Planning efforts	Federal - 75% State - 12.5% Local - 12.5%	Local government must be in compliance with the National Flood Insurance Program to be eligible. Projects must be cost-effective, environmentally sound and solve a problem.	After a Presidential Disaster Declaration
2	Federal Emergency Management Agency, Pre-disaster Mitigation (PDM) Program	Wisconsin Emergency Management P.O. Box 7865 2400 Wright Street Street, Madison, WI 54707-7865	Grants can be used for management costs, information dissemination, planning, technical assistance and mitigation projects	Federal - 75% Local - 25%	Must have an approved hazard mitigation plan.	Typically, pre-applications due abt. July and application due abt. Sept.
3	Federal Emergency Management Agency, Flood Mitigation Assistance (FMA) Program	Wisconsin Emergency Management P.O. Box 7865 2400 Wright Street Street, Madison, WI 54707-7865	Acquisition, relocation, elevation and flood-proofing of flood-prone insured properties, flood mitigation planning	Federal - 75% Local - 25%	Repetitive loss properties given a high priority. Must have an approved hazard mitigation plan.	Typically, pre-applications due abt. July and application due abt. Sept.
4	Federal Emergency Management Agency, Public Assistance (PA) program	Wisconsin Emergency Management P.O. Box 7865 2400 Wright Street Street, Madison, WI 54707-7865	Repair of infrastructure damaged during a flood that results in a Presidential Disaster declaration. Cost effective mitigation measures may be eligible during the repair of damaged facilities	Federal - 75% State - 12.5% Local - 12.5%		After a Presidential Disaster Declaration
5	Economic Development Administration, Economic Adjustment Program (see CFDA 11.307)	United State Department of Commerce, Economic Development Administration, 111 North Canal Street, Suite 855, Chicago, IL 60606-7204 312-353-7148	Improvements and reconstruction of public facilities after a disaster or industry closing. Research studies designed to facilitate economic development.	Federal - 50%-70% Local - 30%-50%	Documenting economic distress, job impact and proposing a project that is consistent with a Comprehensive Economic Development Strategy are important funding selection criteria	Anytime
6	Economic Development Administration, Public Works and Development Facilities (see CFDA 11.300)	United State Department of Commerce, Economic Development Administration, 111 North Canal Street, Suite 855, Chicago, IL 60606-7204 312-353-7148	Water and sewer, industrial access roads, rail spurs, port improvements, technological and related infrastructure.	Federal - 50%-70% Local - 30%-50%	Documenting economic distress, job impact and proposing a project that is consistent with a Comprehensive Economic Development Strategy are important funding selection criteria	Anytime
7	Wisconsin Department of Commerce, Community Development Local Grant, Public Facilities Emergency Program	Wisconsin Department of Commerce, 201 West Washington Avenue, PO Box 7970, Madison, WI 53707-7970 608-266-8934	Repair of water, sewer, street, curb and gutter, police and fire stations	Federal - 75% Local - 25%	Available after a state and/or Presidential Disaster declaration. these funds can be used towards the local match to receive FEMA public assistance and HMGP funds	After a Disaster event
8	Wisconsin Department of Commerce, Community Development Block Grant, Public Facilities Program	Wisconsin Department of Commerce, 201 West Washington Avenue, PO Box 7970, Madison, WI 53707-7970 608-266-8934	Water, sewer, street, curb and gutter, libraries, fire stations and community centers	To receive maximum points \$1.5 of local match to every \$1 of state Community Development Block Grant	A community's economic distress score influences funding determination. These funds can be used as a local match to receive FEMA Public Assistance and HMGP funds.	Anytime
9	Wisconsin Department of Transportation (DOT), Flood Damage Aid	Wisconsin Department of Transportation, 4802 Sheboygan Avenue, Madison, WI 53707 608-267-5254	Replacement and improvement costs for major flood damage to a road or road structure under local jurisdiction. To help defray costs of repairing major flood damage to any public street, alley, or bridge not located on the State Trunk Highway System	State - 75% of replacement costs and 50% of improvement costs, reimbursed by local	Repairs or replacements can include resign to prevent or reduce future flood damage. If Federal Disaster Aid is received, community is ineligible for State Federal Disaster Aid.	Applicant must submit final costs within 2 years following flood damage
10	Wisconsin Department of Transportation (DOT), Transportation Enhancement funds	Wisconsin Department of Transportation, 4802 Sheboygan Avenue, Madison, WI 53707 608-267-5254	Activities that "enhance" the surface transportation infrastructure "above and beyond" basic highway projects, can include: landscaping and scenic beautification, acquisition of scenic easements, and scenic or historic sites.	Federal - 80% Local - 20%	Can provide scenic vista and runoff areas, parking and landscaping along flood-prone riverways. Can acquire flood-prone areas along roads for green corridors. Food damage reduction potential is not the primary purpose of the program.	Even-numbered years. Application forms available in January. Must be submitted by April. Funds granted competitively.
11	Wisconsin Department of Commerce, Division of Housing and Community Development CDBG - Emergency Assistance Program	Wisconsin Department of Commerce, 201 West Washington Avenue, PO Box 7970, Madison, WI 53707-7970 608-267-3682	Assists local governments in response to a natural or manmade disaster. Can be used to address damage to housing, public infrastructure, businesses, community buildings, etc.	Varies, depending upon whether the community is already an entitlement community for CDBG funding.	Must give preference to households at or below 80% of the county median income.	After a disaster event.

12	Wisconsin Housing and Economic Development Agency Temporary Housing Grants	WHEDA 201 W. Washington Ave, Ste. 700 Madison WI, 53703 608-266-7884 800-334-6873	WHEDA has provided grant support to communities in the past following a disaster event for housing needs.	contact WHEDA for more information	contact WHEDA for more information	After a disaster event.
13	Wisconsin Department of Natural Resources, River Protection Grant Program	Wisconsin Department of Natural Resources, 101 S. Webster Street, PO Box 7921, Madison, WI 53707-7921 608-266-7555	River organization development, education, special river study needs to help protect rivers, water quality, habitat, etc.	State - 75% maximum Local - 25%	\$10,000 maximum grant Local gov'ts and non-profit organizations may apply.	1-May
14	Wisconsin Department of Natural Resources, River Protection Grant	Wisconsin Department of Natural Resources, 101 S. Webster Street, PO Box 7921, Madison, WI 53707-7921 608-266-7555	Purchase of land or easements, restoration of in-stream or shoreland habitat	State - 75% maximum Local - 25%	\$50,000 maximum grant, adoption of outdoor recreation plan required	May 1
15	Wisconsin Department of Natural Resources, Lake Planning Grant	Wisconsin Department of Natural Resources, 101 S. Webster Street, PO Box 7921, Madison, WI 53707-7921 608-266-7555	Water quality studies, land use analysis, ordinance analysis, planning recommendations	State - 75% maximum Local - 25%	\$10,000 maximum per grant, but can receive up to \$50,000 in total grants	February 1 and August 1
16	Wisconsin Department of Natural Resources, Lake Protection Grant	Wisconsin Department of Natural Resources, 101 S. Webster Street, PO Box 7921, Madison, WI 53707-7921 608-266-7555	Projects to protect and improve water quality and their ecosystems.	State - 75% maximum, not to exceed \$200,000 Local - 25%	Acquisition of land and easements also eligible	May 1
17	Wisconsin Department of Natural Resources, Urban Rivers Grant Program	Wisconsin Department of Natural Resources, 101 S. Webster Street, PO Box 7921, Madison, WI 53707-7921 608-266-7555	Land acquisition and revitalization of urban water fronts	State - 50% Local - 50%	Project must be part of adopted outdoor recreation plan	May 1
18	Wisconsin Department of Natural Resources, Aids for the Acquisition and Development of Local Parks (ADLP)	Wisconsin Department of Natural Resources, 101 S. Webster Street, PO Box 7921, Madison, WI 53707-7921 608-266-7555	Acquisition and development of public outdoor recreation areas	State - 50% Local - 50%		May 1
19	Wisconsin Department of Natural Resources, Acquisition of Urban Green Space	Wisconsin Department of Natural Resources, 101 S. Webster Street, PO Box 7921, Madison, WI 53707-7921 608-266-7555	Funding the protection of natural spaces in proximity to urban development	State - 50% Local - 50%	Protect land with scenic, ecological or natural values in urban areas from development	May 1
20	Wisconsin Department of Natural Resources, Land and Water Conservation Fund - Federal Program Administered by State DNR	Wisconsin Department of Natural Resources, 101 S. Webster Street, PO Box 7921, Madison, WI 53707-7921 608-266-7555	Acquisition and development of outdoor parks and non-commercial recreation facilities	Federal - 50% Local - 50%	Funding comes from U.S. Department of Interior, project must be part of an adopted outdoor recreation plan	May 1
21	Wisconsin Department of Natural Resources, Municipal Flood Control Project	Wisconsin Department of Natural Resources, 101 S. Webster Street, PO Box 7921, Madison, WI 53707-7921 608-266-7555	Acquisition, flood proofing, wetland-floodplain restoration, storm water projects, flood insurance studies, and floodplain mapping.	State - 70% Local - 30%	Maximum grant cannot exceed 20% of funding available. Cities, villages, towns, and metropolitan sewer districts are eligible.	15-Mar
22	Wisconsin Department of Administration, Comprehensive Planning Program	Wisconsin Department of Administration Comprehensive Planning Program 101 E. Wilson Street, 9th Floor Madison WI, 53703 608-267-3369	Cost sharing in preparation of a community comprehensive plan as defined under State Statute.	Varies depending on community size and number of municipalities participating in the application.	Land use decisions must be consistent with comprehensive plan per State Statute. Comp plans may also include guidance, projects, and policies regarding hazard mitigation.	November 1
23	Wisconsin Emergency Management, Domestic Preparedness Equipment Grant Program	Wisconsin Emergency Management, 2400 Wright Street, Madison, WI 54707-7865 608-242-3232	Some equipment purchased for terrorism readiness may also have valuable emergency response use to mitigate impacts should an event occur.			
24	Wisconsin Department of Natural Resources, Targeted Runoff Management (TRM) Grant Program		Develop stormwater management facilities to control non-point source pollution, primarily in urban or developing areas.	May be able to leverage with Wisconsin DOT funds.		
25	U.S. Army Corp of Engineers Section 14-Emergency Streambank and Shoreline Protection	regional contact: Detroit District 477 Michigan Avenue Detroit, Michigan 48226 313-226-6764	Provide bank protection of highways, bridges, essential public works, and critical facilities endangered by flood-caused erosion.	Federal - 75% Local - 25%	Must meet U.S. Army Corps of Engineers economic feasibility and other criteria Maximum \$500,000 per project.	

26	U.S. Army Corp of Engineers Section 22-Water Resources Planning Grant	regional contact: Detroit District 477 Michigan Avenue Detroit, Michigan 48226 313-226-6764		Federal - 50% Local - 50%	Must meet U.S. Army Corps of Engineers economic feasibility and other criteria
27	U.S. Army Corps of Engineers Section 205-Small Flood Control Projects (CFDA 12.106)	regional contact: Detroit District 477 Michigan Avenue Detroit, Michigan 48226 313-226-6764	Provision of specialized services through projects not specifically authorized by Congress.	First \$100,000 is federally funded, with remainder split 50% Federal/50% Local.	Must meet U.S. Army Corps of Engineers economic feasibility and other criteria Maximum \$7 million per project, though this may change.
28	U.S. Army Corps of Engineers Section 208-Clearing Channels for Flood Prevention (CFDA 12.108)	regional contact: Detroit District 477 Michigan Avenue Detroit, Michigan 48226 313-226-6764	Provision of specialized services. Non-federal sponsor must provide all lands, easements, and rights-of-way.	Federal - 75% Local - 25%	Must meet U.S. Army Corps of Engineers economic feasibility and other criteria Maximum \$500,000 per project.
29	U.S. Department of Agriculture, Farm Service Agency Emergency Conservation Program (ECP)	contact local Farm Service Agency	Perform emergency conservation measures to control wind erosion on farmlands and rehabilitate farmlands damaged by natural disasters; includes water conservation	Cost-sharing determined by County committees, following USDA guidelines.	Farm operator or landlord/owner in a disaster area or impacted by drought. following a natural disaster event; eligibility determined by county FSA cmte
30	U.S. Department of Agriculture, Natural Resources Conservation Service, Watershed Protection and Flood Prevention	Wisconsin Natural Resources Conservation Service - NW Area 1304 N. Hillcrest Altoona, WI 54720 715-832-6547	Project grants and technical assistance to protect and utilize land and water resources in small watersheds. Emphasizes interdisciplinary planning teams.	Varies depending on nature of the project. Federal funding may be incorporated within other State Programs; check with WisDNR.	Agricultural related enterprises must account for at least 20% of the total benefits.
31	U.S. Department of Agriculture, Natural Resources Conservation Service, Emergency Watershed Protect - Floodplain Easement	Wisconsin Natural Resources Conservation Service - NW Area 1304 N. Hillcrest Altoona, WI 54720 715-832-6547	Purchase floodplain easements as an emergency measure in floodplain areas which are impaired or have a history of repetitive flooding	Easement compensation varies by site and location. NRCS pays 100% of restoration costs.	Voluntary program to restore floodplain functions. Easements are permanent. Easement compensation based on offer, rate cap, and area market. Sign-up period is in March.
32	U.S. Department of Agriculture - Rural Development, Housing & Community Facilities Programs	Rural Development Business & Community Programs 4949 Kirschling Court Stevens Point, WI 54481 Phone: 715-345-7610	Has been used for a wide variety of projects, including early warning systems, sirens, fire equipment, EMS buildings, shelters, radios, etc. Additional USDA programs available for larger projects.	Varies by community size, local household incomes, and funding availability	Counties and small communities; must work with USDA Rural Development officials from beginning of the project
33	Wisconsin Department of Natural Resources, Forest Fire Protection (FPP) Grant	FFP Grant Manager Department of Natural Resources P.O. Box 7921 Madison, WI 53707-7921 (608) 267-0848	Equipment, training, prevention materials, communication equipment, mapping/rural numbering systems, ATVs, dry hydrants	For individual fire depts: min. \$750; max. \$10,000 For County Fire Assoc: min. \$5,000; max. \$25,000	Fire departments and County Fire Associations varies; usually May, June or July
34	U.S. Homeland Security Assistance to Firefighters Grant Program	U.S. Dept. of Homeland Security 800 K Street NW Washington DC 20472-3620 1-866-274-0960	For Fire Departments and EMS organizations to enhance fire-related capabilities.	Varies by population served, but 5% - 10% for small communities	Applicants serving less than 500,000 population may not receive over \$1 mil in funding.
35	U.S. Department of Interior Rural Fire Assistance Outreach	U.S. Dept of Interior check up-to-date application materials for contact info.	Training, personal protective equipment, basic gear, limited communications equipment, basic tools, and other activities.	Minimum 10% local match.	Max. award of \$20,000 per fiscal year. Need to serve DOI lands.
36	U.S. Department of Homeland Security, Emergency Operations Centers (CFDA 97.052)	Department of Homeland Security 245 Murray Drive, SW. Washington, DC 20528 202-282-8000	Improve local capabilities to respond to emergencies and disasters	Phase 1 for assessment Phase 2 requires a 50% nonfederal cost share.	Local governments can be sub-grantees under the State.
37	Federal Emergency Management Agency, Interoperable Communications Equipment (CFDA 97.055)		Explore uses of equipment and technologies to increase the interoperability among fire services, law enforcement, and emergency medical services.	Funding is discretionary. Max. Federal share is \$6 million. 25% nonfederal cost-share.	Local governments are nominated by the State to submit an application. Contact FEMA headquarters.

APPENDIX M.

SUMMARY OF PLAN CHANGES SINCE THE 2008 COUNTY PLAN

The 2012 *St. Croix County Natural Hazards Mitigation Plan* was a complete review and update of the 2008 plan. This section highlights the major changes since the 2008 plan by section, including a brief description of how the steering committee reviewed and analyzed each section. In addition, between the third and fourth meetings of the steering committee, a draft plan was distributed to all committee members for review and comment on any sections.

Section I. Introduction

- A project brochure was developed and distributed to encourage participation.
- Stakeholder interviews included review of the 2008 plan recommendations.
- Town surveys were much more customized for each town in this plan and incorporated aspects of the 2008 plan to encourage input. A blank town survey was included in Appendix C.
- A brief discussion was added as part of Section I.D. on how other plans, studies, etc., were considered and incorporated as part of the planning process.
- Sign-in sheets for the community meetings were included in Appendix C. Also added to Appendix C are the agendas and minutes for the steering committee meetings.
- The plan update recognizes that the Village of Spring Valley and City of River Falls lie primarily in Pierce County and participates in the Pierce County mitigation planning, except for the portion of River Falls located in St. Croix County which is addressed within this plan update as well.
- Steering Committee Analysis & Review: The planning process, which is summarized in Section I, was the focus of the first plan steering committee meeting, including a review of the process used during the 2008 plan and recommended changes for the plan update.

Section II. Community Profile

- Demographics and other data was updated. An expanded discussion of demographic trends and their potential relationship to emergency response and hazard mitigation planning was included.
- Steering Committee Analysis & Review: The highlights of the community profile were reviewed and discussed during the third plan steering committee meeting. Particular attention was paid to the analysis of demographic and development trends, and their implications for mitigation and emergency response.

Section III. Assessment of Hazard Conditions

- The steering committee amended and re-took the risk prioritizations survey. The hazards selected for assessment were amended. Extreme heat was added as its own section and targeted school violence was added.
- NCDC statistics and other data was updated and further supplemented for many risks. An introductory summary of risks, vulnerabilities, and some key issues was added for each risk sub-section.
- Issues, risks, needs, and concerns for each of the hazard risks based on meetings and stakeholder input were integrated into the different sub-sections.
- A brief summary of the results from the County's Public Health Hazard Vulnerability Assessment (HVA) was incorporated within each of the primary hazards addressed within the plan.

- A brief section on possible hazard impacts of climate change was added.
- Special threat analyses regarding Long-Term Power Loss and Cyberattack were added as separate sub-sections, given their importance and relationship to multiple hazards.
- A more complete list of local/regional winter storm events was added.
- Enhanced Fujita Scale was integrated into the report.
- The discussion of historical tornado events was expanded.
- Alert warning siren locations were mapped and an expanded discussion included.
- Wisconsin Emergency Management data and vulnerability assessment for tornadoes and high wind events was integrated into the report.
- Wisconsin Emergency Management data on hail events was integrated into the report, along with a discussion of recent hail, thunderstorm, and hail events in the county.
- Additional attention given to defining the flood hazard.
- A more complete review of local flooding events was added with particular emphasis on the August 2010 event.
- The flood assessment, as described in Appendix B, took advantage of new D-FIRM maps and parcel mapping to identify potential development and vulnerabilities in floodplain areas.
- Wisconsin Emergency Management HAZUS analysis of flood vulnerabilities was integrated into the report for comparison.
- A new section was added to the flood analysis on projecting future flood vulnerabilities.
- NFIP status of each municipality noted.
- Updated information on hazardous materials was added, with an attempt to focus on accidental or malicious spills in particular.
- Steering Committee Analysis & Review: An overview of NCEM data and other hazard trends were analyzed and discussed by the committee during their first meeting, including a review of the results of the hazard survey performed as part of the 2008 plan. The committee decided to amend and re-take the survey, with the results integrated into this plan. As noted previously, some changes in scope were made. The analysis of the results of the full assessment and interview process were the focus of the steering committee's third meeting.

Section IV. Current Mitigation Activities

- Updated current activities, then draft sections provided to different stakeholders for review.
- Steering Committee Analysis & Review: Current mitigation activities were briefly discussed as part of the third steering committee meeting, and were reviewed as part of the draft plan.

Section V. Progress on the 2008 Mitigation Plan Strategies

- New section of plan. During stakeholder interviews, lead parties for each strategy from the 2008 plan were asked to provide an update on progress which was integrated into the table.
- All strategies from the 2008 plan were reviewed for potential inclusion as 2012 recommendations and any suggested modifications.
- Steering Committee Analysis & Review: Progress on some of the key 2008 plan strategies were briefly discussed as part of the third steering committee meetings, and the full section was reviewed as part of the draft plan.

Section VI. Mitigation Goals and Strategies

- Steering committee reviewed and updated the plan goals at their third meeting.
- The mitigation strategies were generally organized into projects and policies.
- The feasibility analysis in Appendix J provides the relative priority scores given by the steering committee. Comments and barriers to implementation from the steering committee and other stakeholders related to each strategy were also included.
- For the highest rated projects, a special implementation section was added which provides both focus, cost estimates (if available), and guidance. It is expected that this approach may help increase interest levels and use of the plan following adoption.
- **Steering Committee Analysis & Review:** Plan goals were reviewed and discussed as part of the second steering committee meeting. In June 2012, a strategy alternatives survey was distributed via mail to all steering committee members. The survey results yielded relative priority of the alternatives, barriers to implementation, and guided the selection of which strategies would be recommended in the final plan. The draft plan, with recommended strategies based on the survey results, was reviewed by committee members in August and September 2012. At its fourth meeting, the steering committee discussed and considered potential changes and additions to the plan, including the recommended strategies.

Section VII. Plan Adoption & Maintenance Process

- Plan coordination updated based on new strategy recommendations with additional emphasis on relationship to comprehensive planning.
- **Steering Committee Analysis & Review:** The plan adoption and maintenance process was identified by the Emergency Management Coordinator, then reviewed by the steering committee as part of the draft plan review with comments considered at its third meeting.

Changes that Address Reviewer Comments on 2008 Plan

The following plan changes were made to address WEM or FEMA reviewer comments on the 2008 plan:

1. **Discuss whether other local plans were reviewed and incorporated into the plan.** This is primarily addressed in the Current Mitigation Activities section (Section IV), during the discussion of the Mitigation Goals (Section VI.A.), and the Plan Coordination section (Section VII.A.), as well as in Appendix G. Greater emphasis was placed on plan coordination during this plan update and other County and local plans and ordinances were considered.
2. **Include types and number of existing buildings, infrastructure, and critical facilities located in the identified hazard areas.** Section II.E. identifies the critical facilities in St. Croix County based on best available data. Flooding was the only hazard within the plan's scope with a unique, identifiable hazard area. The flood assessment (Section III.B.viii.) identifies the number of structures, general type of structure (if available), and critical facilities (if available) which are potentially located within the 100-year floodplain.
3. **Describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the hazard areas.** There is no countywide growth model available to project types and number of future buildings and

infrastructure with great accuracy. To address this comment, the demographic profile and general development pattern sub-sections of Section II provide an overview of county development trends, population projections, and related implications. Each hazard which is analyzed included an estimate of future risk. For flooding, the HAZUS analysis was incorporated and a special sub-section on projecting future flood vulnerabilities was added.

3. **Calculate potential dollar losses for all hazards.** More effort was made to calculate or project potential losses for St. Croix County. Potential losses were discussed for the following hazards: long-term power outages, tornados, high winds, flooding, and drought.
4. **Use historic data, GIS, average home values, or other methodology to estimate potential losses to vulnerable structures for each hazard and describe the methodology used.** For most hazards, all structures in St. Croix County are potentially vulnerable, so the property values discussion in Section II.C. applies. More detailed analysis is included regarding potential structural losses for the flooding section, but the methodology (as described in Appendix B) is not significantly different than the process used in 2008.
5. **Discuss zoning and land use in the County and each jurisdiction.** General development trends in the county are discussed in Section II.D. The status of zoning, comprehensive planning, and other land use regulations are discussed in Section IV. An aerial photo with hazard risks is included for each city and village in Appendix F. Together with the demographic and economic profile, the reader is provided sufficient insight into the land use trends in St. Croix County for mitigation planning purposes.
6. **Include a table showing the community, date they joined NFIP, current flood ordinance, and current map date.** Though not in table form, this information was incorporated into Section III.B.viii.
7. **Make a list or notation in the table that identified those actions associated with NFIP compliance.** Those strategies in Section VI.C. related to NFIP compliance are noted.
8. **Elaborate on continued public participation.** Section VII.B. includes a description on continued public participation in plan monitoring. Section VII.C. notes that the final plan will be distributed to all participating jurisdictions as well as being available for download.