Saginaw County

Local Hazard Mitigation Plan

INTRODUCTION

Saginaw County is vulnerable to a wide range of natural, technological and human-related hazards. The intent of this document is to (1) educate local policy makers and emergency service organizations to the hazards of the area, and (2) provide a comprehensive reference document for planning and mitigation activities.

Managing these many varied threats, and protecting life and property, are the challenges faced by emergency management officials at all levels of government. In order to attain an effective emergency management capability to mitigate, prepare for, respond to, and recover from all types of hazards, an understanding of the multitude of hazards that confront the County must first be obtained. The first step in the process of building an effective emergency management capability is the preparation of a hazard analysis that provides an understanding of those threats.

When coupled with relevant land use and demographic information, a hazard analysis becomes a powerful planning tool that enables emergency management officials to set priorities and goals for resource allocation and mitigation and preparedness activities.

In Saginaw County, the Office of Emergency Management is the coordinating agency for all emergency management activities. The office is responsible for continually monitoring and updating the Saginaw County Emergency Action Guidelines, as well as many other disaster related activities.

Questions and comments concerning this document should be addressed to the Saginaw County Office of Emergency Management, 111 S. Michigan Avenue, Saginaw, Michigan 48602, (989) 790-5434, FAX (989) 792-6852 or e-mail: tgenovese@saginawcounty.com.

Document Overview

The intent of the Saginaw County Hazard Mitigation Plan is to protect the safety and economic investment of Saginaw County residents and businesses by reducing the impacts of natural and technological hazards through initiation planning and implementation strategies. The Plan serves as the hub of hazard mitigations activities and actions within the Saginaw County network.

The Plan itself is fueled by requirements resulting for the Disaster Mitigation Act (DMA) of 2000 for hazard mitigation planning. This plan document is required to become eligible for hazard mitigation grant program funds in the future.

This plan provides an outline towards continuous, proactive reduction of vulnerability to hazards which results in repetitive and potentially severe social, economic and physical damage. The intent of this document is to be the Saginaw County Playbook of Hazard Mitigation concepts in routing governmental and business function and management practices.

The Board's perspective in examining this topic places emphasis on hazards which would results in threats to public health and safety of citizens as well as to the economic and physical well being of Saginaw County. This would include issues such as floods, tornadoes, wind and winter storms, as well as hazardous materials incidents to name a few.

Hazard mitigation planning is any action taken before, during, or after a disaster, to permanently eliminate or reduce the long term risk to human life, and property from natural and technological hazards. It is a cornerstone element and responsibility of emergency management, along with preparedness, response, and recovery.

So the intent of this planning document is to reduce the impact of hazards on people and property and through the coordination of resources and authorities not contribute to increasing the severity of its impact.

The primary responsibility in the county to formulate and carry out the action items outlined in this plan is the Saginaw County Emergency Management Office which functions as a county department and therefore, must report to the Saginaw County Board of Commissioners. Just as important however, for the success of this activity will be inclusion of cities, villages, and township government and state agencies in integrating the hazard information in their individual operations planning. This would include but not be limited to including hazard mitigation planning into their respective comprehensive planning and capital improvements planning and adopt zoning regulations that will minimize effects of hazards.

As a result the county be prepared for disaster with quick effective response when it occur. The transition into the recovery process should minimize damage as well as improve preparedness of the community for the next incident. When successful, mitigation lessens the impact that succeeding incidents will remain incidents and not become disasters.

CONSTRUCTION/FORMAT OF THE SAGINAW PLAN

The Saginaw County Hazard Mitigation Plan includes text, tables, charts and maps that support discussions involving a hazard analysis that takes under consideration the Saginaw community profile including hazard identification with risk and vulnerability assessment.

Further, the document discussion of community goals and objectives leads to dialogue as to alternatives for solving problems and prioritization of alternatives and reasonable mitigation strategies.

The Saginaw Process: Steps to Hazard Planning

The steps process of developing a plan of action unique to the community its designed for requires a series of local analysis that includes the following in rational sequence listed A local profile that identifies hazards and risks specific to community and ranks the top one's in likelihood and importance. After the ranking the following steps could lead to a document of community importance.

- Identification of goals
- Discuss alternative avenues of addressing problem solving
- Decide on the criteria of evaluation
- Discuss and outline alternatives
- Produce and implement plan document

SAGINAW COUNTY PROFILE

For a period extending over four years between 1831 and 1835, the district known as the County of Saginaw formed a township attached to Oakland County for judicial purposes.

The Legislative Council of the Territory ordained that - "all that part of the country lying with the limits of the County of Sagana here fore set off and established as the County of Saginaw, be and the same hereby be set off into a separate township and the name thereof shall be Sagana. The first township meeting to be held in such township shall be held at the Fort of Sagana, on the first Monday in April, which will be in the year 1831."

This act was approved July 12, 1830, and came into force in 1831, when Gardner D. Williams was elected supervisor.

The name Saginaw is derived from the language of the Chippewa Indians and means "Land of the Sauks." The warlike Sauks inhabited the entire Saginaw Valley. However, around the year 1520, the Chippewas invaded the territory in great force, and in a series of battles, the Sauks were virtually annihilated. The bloodiest of these battles was fought on what has since been known as Skull Island in the Saginaw River and on a bluff on the Flint River about a mile from the present Village of Flushing.

SAGINAW BECOMES A COUNTY

The boundaries of the County of Saginaw were set by proclamation of Governor Cass on September 10, 1822. These boundaries were subsequently changed by an act of the Legislative Council, approved March 2, 1831.

During 1834, the question of conferring on the township of Saginaw the status of a county was discussed and a resolution of the Council passed to the effect - "That the County of Saginaw shall be organized when this act takes effect." This act of organization was approved January 28, 1835, and put into force the second Monday of February 1835.

Saginaw County now contains three cities, 27 townships and five incorporated villages. The County is home to two airports, MBS International Airport and Harry Browne Airport. Both airports service the private and public aviation needs for the County. The population of the County, according to the Federal Census of 2000, is 210,039, of which the City of Saginaw has 61,799. The County of Saginaw contains 85,506 housing units.

Saginaw County has thousands of acres of rich fertile soil. It is one of the leading producers of sugar beets and beans in the nation. The top employers of the County include Delphi Saginaw Steering Systems, General Motors Power Train Division, St. Mary's Medical Center, Covenant HealthCare, Delphi Chassis Systems, Saginaw City School District, AT&T, and Hemlock Semiconductor Corporation.

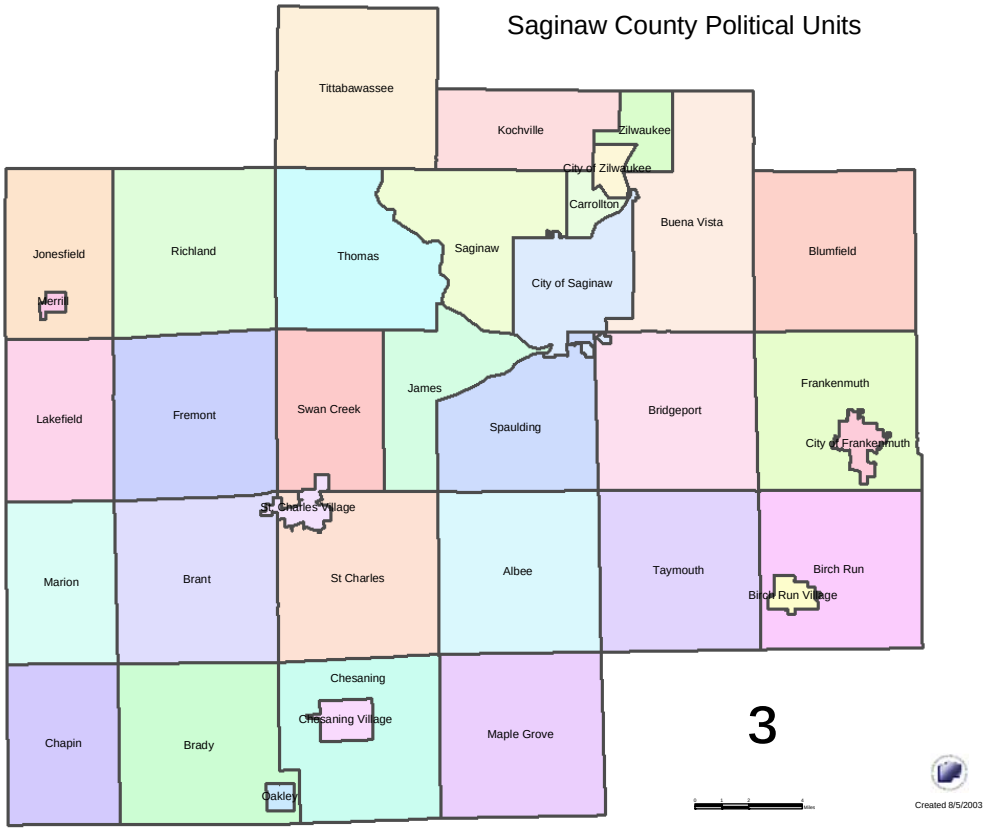
Saginaw County has 13 Public School Districts that offer K-12, encompassing 14 high schools, 16 middle schools, and 50 elementary schools. There are also seven public school academies with an enrollment of 1,760. There are seven non-public high schools. Total enrollment for public schools is 34,246 with non-public schools providing an additional 7,500 students. Saginaw County has a vocational training center called the Saginaw Career Complex, and continuing educational services are offered in most school districts having day and evening enrollment. The Saginaw Intermediate School District maintains Hartley Outdoor Education Center, the Transitions Center, and Melvin G. Millet Learning Center. Saginaw Valley State University, Central Michigan University, Delta College, a community college, and Davenport University, a business college, operate within Saginaw County’s boundaries.

The County has an annual average temperature of 45.8° F., an annual rainfall of 30.0 inches, and an average snowfall of 40 inches. There are, on average, 33 annual thunderstorms, the hottest month is July with 71.6°, and the coldest months are January and February with an average temperature of 23.6°

The County & all its parts

THE CITIES AND TOWNSHIPS

Saginaw County consists of 27 townships, 3 cities (Frankenmuth, Saginaw and Zilwaukee) and 5 villages (Birch Run, Chesaning, Merrill, Oakley and St. Charles). These political jurisdictions are illustrated on the map appearing below. Information appears on the following pages for each of the component jurisdictions of the county.



Courtesy of Saginaw County Geographic Information Services

ALBEE TOWNSHIP Albee Township Community Center
10645 East (M-13) Rd, Burt, MI 48417

Mailing Address: Use Clerks
Phone No.: (989) 770-4844
FAX: (989) 770-5001
Office Hours: Tues. 12-5, Thurs. & Sat. 9-1
SUPERVISOR: Leon Turnwald (D) 3395 W Birch Run Rd, Burt, MI 48417
CLERK: Thomas Gasser (D) 10639 Bishop Rd, St. Charles, MI 48655

BIRCH RUN TOWNSHIP Township Office: 8425 Main St., Box 152
Birch Run MI 48415

Mailing Address: Same as office
Phone No.: (989) 624-9773; FAX: (989) 624-1177
www.birchruntownship.com
Office Hours: Mon. - Fri. 9 - 5
SUPERVISOR: Earl R. Schlegel (R) 9455 S Gera Rd, Birch Run, MI 48415
CLERK: Amy Cook (R) 7190 E Burt Rd, Birch Run, MI 48415

BLUMFIELD TOWNSHIP Township Office: 1175 Vassar Rd
Reese, MI 48757

Mailing Address: Use Clerks
Phone No.: (989) 868-9512; FAX: (989) 868-9519
No Regular Office Hours - Leave brief message on voice mail
SUPERVISOR: Charles Kern (NP) 1502 N Block Rd, Reese, MI 48757
CLERK: Lisa Roethlisberger (R) 1175 Vassar Rd., Reese, MI 48757

BRADY TOWNSHIP Township Office: 16020 Peet Rd.
Oakley, MI 48649

Mailing Address: Use Clerks
FAX: (989) 845-4300
SUPERVISOR: Ron Gasper (NP) 16172 Baldwin Rd, Chesaning, MI 48616
CLERK: Beverly Wenzlick (NP) 15735 Baldwin Rd, Chesaning, MI 48616

BRANT TOWNSHIP Township Office: S. Hemlock & Brant Rds
Brant, MI 48614

Mailing Address: Use Clerks
Phone No.: (989) 585-3448; FAX: (989) 585-3886
SUPERVISOR: Judy Schlitts (R) 10210 S Brennan Rd, Brant, MI 48614
CLERK: Theresa Schroeder (R) 9812 S Hemlock Rd, St. Charles, MI 48655

BRIDGEPORT TOWNSHIP Township Office: 6206 Dixie Hwy, PO Box 319
Bridgeport, MI 48722

Phone No.: (989) 777-0940; FAX: (989) 777-4802
Office Hours: Mon. - Fri. 8 – 5
SUPERVISOR: Patrick Gilles (D) 6800 Dixie Hwy, Bridgeport, MI 48722
CLERK: Barbara A. Montgomery (D) 1601 Prueter, Saginaw, MI 48601

BUENA VISTA TOWNSHIP Township Office: 1160 S Outer Dr
Saginaw, MI 48601

Phone No.: (989) 754-6536; FAX: (989) 754-5930
Office Hours: Mon. - Fri. 8 – 5
SUPERVISOR: Dwayne A. Parker (D) 1401 N Outer Dr, Saginaw, MI 48601
CLERK: Patricia Watkins (D) 4646 S Michelle, Saginaw, MI 48601

CARROLLTON TOWNSHIP Township Office: 1645 Mapleridge
Saginaw, MI 48604

Phone No.: (989) 754-4611; FAX: (989) 754-5705
Office Hours: Mon. - Fri. 8 – 5
SUPERVISOR: Marvin Kozara (D) 915 Atlanta, Saginaw, MI 48604
CLERK: Jerry W. Fritz (D) 3363 Terry St, Saginaw, MI 48604

CHAPIN TOWNSHIP Township Office: 21481W Peet Rd
Henderson, MI 48841

Mailing Address: Use Clerks Address
Phone No.: Use Clerk's No.: (989) 661-2327; FAX: 661-4418
No Regular Office Hours, Contact Person Desired
SUPERVISOR: Robb C. Maynard (R) 19650 Fenmore Rd, Elsie, MI 48831
CLERK: Virginia J. Leckenby (R) 19131 Ridge Rd, Henderson, MI 48841

CHESANING TOWNSHIP Township Office: 1025 W Brady St
Chesaning, MI 48616

Phone No.: (989) 845-2341; FAX: (989) 845-5555
Office Hours: Mon. 9 - 5; Tues. & Fri. 9 - 2
SUPERVISOR: Robert Corrin (D) 429 S Chapman St, Chesaning, MI 48616
CLERK: Sue Emmendorfer (NP) 1025 W Brady St, Chesaning, MI 48616

FRANKENMUTH TOWNSHIP Township Office: 218 W Genesee St
Frankenmuth, MI 48734

Fax: (989) 652-3795
Mailing Address: P.O. Box 245
SUPERVISOR: Tim Hildner (R) 3763 S Gera Rd, Frankenmuth, MI 48734
CLERK: Paul F. Bergdolt (R) 11170 Roedel Rd, Frankenmuth, MI 48734

FREMONT TOWNSHIP Township Office: 5980 E Hemlock Rd
St Charles, MI 48655

Mailing Address: Use Clerks
Phone No.: (989) 642-2884; FAX: (989) 642-5162
No Regular Office Hours, Contact Clerk at 642-5162
SUPERVISOR: Donald LaClair (R) 17600 McKay Rd, St. Charles, MI 48655
CLERK: Patricia J. Wesener (R) 16901 Palomino Dr, Hemlock, MI 48626

JAMES TOWNSHIP Township Office: 6060 Swan Creek Rd
Saginaw, MI 48609

Mailing Address: Use Clerks
Phone No.: (989) 781-1353; FAX: (989) 781-9086
Office Hours: Tues. & Thurs. 11 – 4
SUPERVISOR: Gerald Wieneke (R) 2255 Weigl Rd, Saginaw, MI 48609
CLERK: Roger L. Lichon (R) 2590 Sierra Dr, Saginaw, MI 48609

JONESFIELD TOWNSHIP Township Office: 217 Eddy
Merrill, MI 48637

Mailing Address: Use Clerks
Phone No.: (989) 643-7707; FAX: (989) 643-7707
Office Hours: No regular hours, leave name, number & brief message
SUPERVISOR: Larry P. Fleming (R) 22469 Frost Rd, Merrill, MI 48637
CLERK: Rochelle Siler (R) 21420 O'Hara Rd, Merrill, MI 48637-9740

KOCHVILLE TOWNSHIP Township Office: 5851 Mackinaw Rd
Saginaw, MI 48604

Phone No.: (989) 792-7596; FAX: (989) 793-7498
Office Hours: Mon. - Fri. 8 - 12 & 12:30 - 4:30
SUPERVISOR: Patricia Bourdow (D) 6370 N Michigan Rd, Saginaw, MI 48604
CLERK: Sheila Hill (D) 5243 Lawndale Rd, Saginaw, MI 48604

LAKEFIELD TOWNSHIP Township Office: 21050 Lakefield Rd
Merrill, MI 48637

Mailing Address: Use Clerks
Phone No.: (989) 643-5343
SUPERVISOR: Terry T. Crevia (R) 19095 Nelson Rd, St. Charles, MI 48655
CLERK: Barbara Reist (R) 20225 Nelson Rd, Merrill, MI 48637

MAPLE GROVE TOWNSHIP Township Office: 17010 Lincoln Rd
New Lothrop, MI 48460

Phone No.: (989) 845-6155; FAX: (989) 845-3554
Office Hours: Mon. & Thurs. 12 Noon to 5:00 p.m.
SUPERVISOR: Kevin M. Krupp (D) 6352 Ditch Rd, Chesaning, MI 48616
CLERK: Richard Maxa (D) 4200 Volkmer Rd., Chesaning, MI 48616

MARION TOWNSHIP Township Office: 10925 S Merrill Rd
Brant, MI 48614

Mailing Address: Use Clerks
No Regular Office Hours, Contact Clerk for Appointment (989) 643-5635
SUPERVISOR: Audrey Reikowski (NP) 20684 Ithaca Rd, Brant, MI 48614
CLERK: Ruby Kienitz (D) 11530 S Fenmore Rd, Brant, MI 48614

RICHLAND TOWNSHIP Township Office: 1180 N Hemlock Rd
Hemlock, MI 48626

Phone No.: (989) 642-2097; FAX: (989) 642-5882
www.richlandtownship.com
Office Hours: Mon. - Fri. 8 - 5
SUPERVISOR: Joel F. Wardin (R) 2260 N. Fordney Rd, Hemlock, MI 48626
CLERK: Kevin J. Kreger (R) 1180 N Hemlock Rd, Hemlock, MI 48626

SAGINAW TOWNSHIP Township Office: 4980 Shattuck Rd
Saginaw, MI 48603

Phone No.: (989) 791-9800; FAX: (989) 797-5360
www.saginawtownship.org
Office Hours: Mon. - Fri. 8 – 5
SUPERVISOR: Timothy J. Braun (D) 4273 S. Wayside, Saginaw, MI 48603
CLERK: Shirley M. Wazny (R) 1640 Linden Pl, Saginaw, MI 48603

SPAULDING TOWNSHIP Township Office: 5025 East Rd
Saginaw, MI 48601

Phone No.: (989) 777-0950; (989) 777-1522
Office Hours: Mon. - Fri. 9 – 5
SUPERVISOR: John A. Tagget (R) 6335 Cole, Saginaw, MI 48601
CLERK: Richard E. Leach (R) 2375 W. Moore, Saginaw, MI 48601

ST CHARLES TOWNSHIP Township Office: 1003 N Saginaw St
St. Charles, MI 48655

Phone No.: (989) 865-9010; FAX: (989) 865-9099
Office Hours: Tues & Wed 8 - 12 & 1-5; Thurs. 8 – 12
SUPERVISOR: Larry J. Mahoney (R) 12905 Mahoney Rd, St. Charles, MI 48655
CLERK: Elaine K. Rolando (D) 8191 Beaver Rd, St. Charles, MI 48655

SWAN CREEK TOWNSHIP Township Office: 11415 Lakefield Rd
P.O. Box 176
St Charles, MI 48655

Phone No.: (989) 865-6251; FAX: (989) 865-7941
SUPERVISOR: Roland G. Niederstadt (D) 11190 Roosevelt Rd, Saginaw, MI 48609
CLERK: Ronald G. Blaine (D) 10745 Spencer, St Charles, MI 48655

TAYMOUTH TOWNSHIP Township Office: 4343 E Birch Run Rd
P.O. Box 387
Birch Run, MI 48415

Phone No.: (989) 624-4159; FAX: (989) 624-5466
Office Hours: Mon. - Fri. 8 – 5; Closed 12 - 1 daily
SUPERVISOR: Douglas E. James (D) 5277 E. Burt Rd, Birch Run, MI 48415
CLERK: Gail Basner (D) 12850 Marshall Rd, Birch Run, MI 48415

THOMAS TOWNSHIP Township Office: 249 N Miller Rd
Saginaw, MI 48609

Phone No.: (989) 781-0150; FAX: (989) 781-0290
www.thomastwp.org
Office Hours: Mon. - Fri. 8 – 5
SUPERVISOR: Robert A. Weise(R) 9135 Greenway Ct K-163, Saginaw, MI 48609
CLERK: Edward Brosofski (R) 1689 Horseshoe, Saginaw, MI 48609

TITTABAWASSEE TOWNSHIP Township Office: 145 S Second St
P.O. Box 158
Freeland, MI 48623

Phone No.: (989) 695-9512; FAX: (989) 695-5060
Office Hours: Mon. - Fri. 7:30 – 4:30
SUPERVISOR: Kenneth Kasper (R) 7555 Midland Rd, Freeland, MI 48623
CLERK: Robert D. DuCharme (D) 5585 N. River Rd, Freeland, MI 48623

ZILWAUKEE TOWNSHIP Township Office: 6189 Sherman Rd
Saginaw, MI 48604

Mailing Address: Use Clerks
Phone No.: (989) 753-6036; FAX: (989) 753-6036
No Regular Office Hours, Contact Clerk
SUPERVISOR: David Bradt (D) 7600 Melbourne Rd, Saginaw, MI 48604
CLERK: Patricia Bradt (R) 7600 Melbourne Rd, Saginaw, MI 48604

CITY OF FRANKENMUTH 240 W. Genesee St
Frankenmuth, MI 48734

Phone No.: (989) 652-9901; FAX: (989) 652-3451
www.frankenmuthcity.com
Office Hours: Mon. - Fri. 8:30 – 5
MAYOR: Gary C. Rupprecht
CITY MANAGER: Charles Graham

CITY OF SAGINAW 1315 S Washington Ave
Saginaw, MI 48601

Phone No: (989) 759-1480; FAX: (989) 759-1447
www.saginaw-mi.com
Office Hours: Mon. - Fri. 8 – 5
MAYOR: Joyce Seals
CITY MANAGER: Darnell Earley

CITY OF ZILWAUKEE 319 Tittabawassee Rd
Saginaw, MI 48604

Phone No.: (989) 755-0931; FAX: (989) 755-2202
Office Hours: Mon. - Fri. 8 - 5
MAYOR: Eugene C. Jolin
CITY ADMINISTRATOR: Patricia Hascall

VILLAGE OF BIRCH RUN P. O. Box 371
Birch Run, MI 48415

Phone No.: (989) 624-5711; FAX: (989) 624-9681
COUNCIL PRESIDENT: Marianne D. Nelson
VILLAGE MANAGER: Paul T. Moore

VILLAGE OF CHESANING
1100 W. Broad St
Chesaning, MI 48616

Phone No.: (989) 845-3800; FAX: (989) 845-2277
COUNCIL PRESIDENT: Douglas E. Corwin, Jr.,
VILLAGE MANAGER: Marlene Schultz

VILLAGE OF MERRILL
148 W. Saginaw St
Merrill, MI 48637

Phone No: (989) 643-5660; FAX: (989) 643-5445
COUNCIL PRESIDENT: David S. Novak

VILLAGE OF OAKLEY
201 Parshall
Oakley, MI 48649

Phone No.: (989) 845-2222
COUNCIL PRESIDENT: Douglas Shindorf

VILLAGE OF ST. CHARLES
110 Spruce St
St. Charles, MI 48655

Phone No.: (989) 865-8287; FAX: (989) 865-6480
www.stmi.com
Office Hours: Mon-Fri 8 a.m. to 5 p.m.
COUNCIL PRESIDENT: Ray Cornford
VILLAGE MANAGER: Hal Mead

Community Profile

The Hazard Mitigation Plan describes the physical and social factors that shape Saginaw County, and that may affect the County's vulnerability to both natural and technological hazards.

Social Factors

Political Jurisdictions and Planning Areas

Saginaw County contains 35 units of local government: 27 townships, 3 cities, and 5 villages (***Figure 2-1***). Each of these jurisdictions has local decision-making authority for governmental functions such as land use planning, zoning, building codes, and other areas that can have a major bearing on hazard mitigation efforts.

For county-level planning purposes, Saginaw County has been divided into a Metropolitan Area and an Out County Area ***Figure 2-2***). The Metro Area includes the Cities of Saginaw and Zilwaukee, and 10 adjacent townships. The Out County Area includes the City of Frankenmuth, all 5 villages in the County, and the remaining 17 townships.

The following descriptions of social and economic characteristics include data for the Metropolitan and Out County areas, as well as the county as a whole.

Population Characteristics

Population trends for 1950 to 2000 for the County, Metro Area, and the Out County Area are shown in Table 2-1. Figure 2-1 also portrays these trends for an even longer period, back to 1900. Saginaw County has shown a net gain in population of about 37 percent for the 1950 to 2000 period. In terms of more recent trends, the County population has declined by over 18,000 people (about 8%) since 1980. However, during 1990 to 2000, the county-wide loss was only about 1%. For comparison, the State of Michigan's population grew by 56% during 1950 to 2000, and the state gained 6% over 1990 to 2000.

The Metropolitan Area has grown by about 24% over the long-term period. However, the Metro Area also lost about 2% of its population during 1990 to 2000. Much of the population decline that has occurred in the Metro Area can be attributed to the City of Saginaw. Since 1960, the City has lost about 37% of its population, or over 36,000 residents. Despite these losses, the Metro Area still contains about 75% of the County's population, and over 29% of the County population resides in the City of Saginaw.

The Out County Area has shown the greatest rate of growth over the past 50 years. During 1950 to 2000, this part of the County grew by almost 95%, meaning that the population nearly doubled. The Out County Area also grew by 2% during 1990 to 2000,

when the Metro Area and the County as a whole both lost population. However, the Out County Area still contains only about 25% of the County population.

Table 2-1
Saginaw County Population Trends

Unit	1950 Census	1960 Census	1970 Census	1980 Census	1990 Census	2000 Census	% Change 1990—2000	% Change 1950—2000
Metro Area	126,117	156,317	176,830	176,946	159,539	156,699	- 1.8%	24.2%
Out County Area	27,398	34,375	42,913	51,113	52,307	53,340	2.0%	94.7%
Saginaw County	153,515	190,752	219,743	228,059	211,946	210,039	- 0.9%	36.8%
Michigan	6,372,009	7,823,194	8,881,826	9,262,678	9,295,297	9,938,444	6.9%	56.0%

Age and Gender Distribution

The median age of County residents has increased significantly between 1970 and 2000, rising from 24.8 years in 1970 to 36.3 years in 2000. The increasing median age is due primarily to the declining rate of births and also can be compared to the national statistics showing the baby boom generation moving into the 45-64 age group.

Figure 2-2 illustrates the age distribution of Saginaw County populations 1970-2000. It is important to note the increase in numbers of persons over 65 years old. Over 13% of the Saginaw County population was over 65 in 2000 compared to 12% in 1990. The 45-64 age group made up 23% of the Saginaw County population in 2000. The 25-44 age group comprised over 27% of the Saginaw County population in 2000.

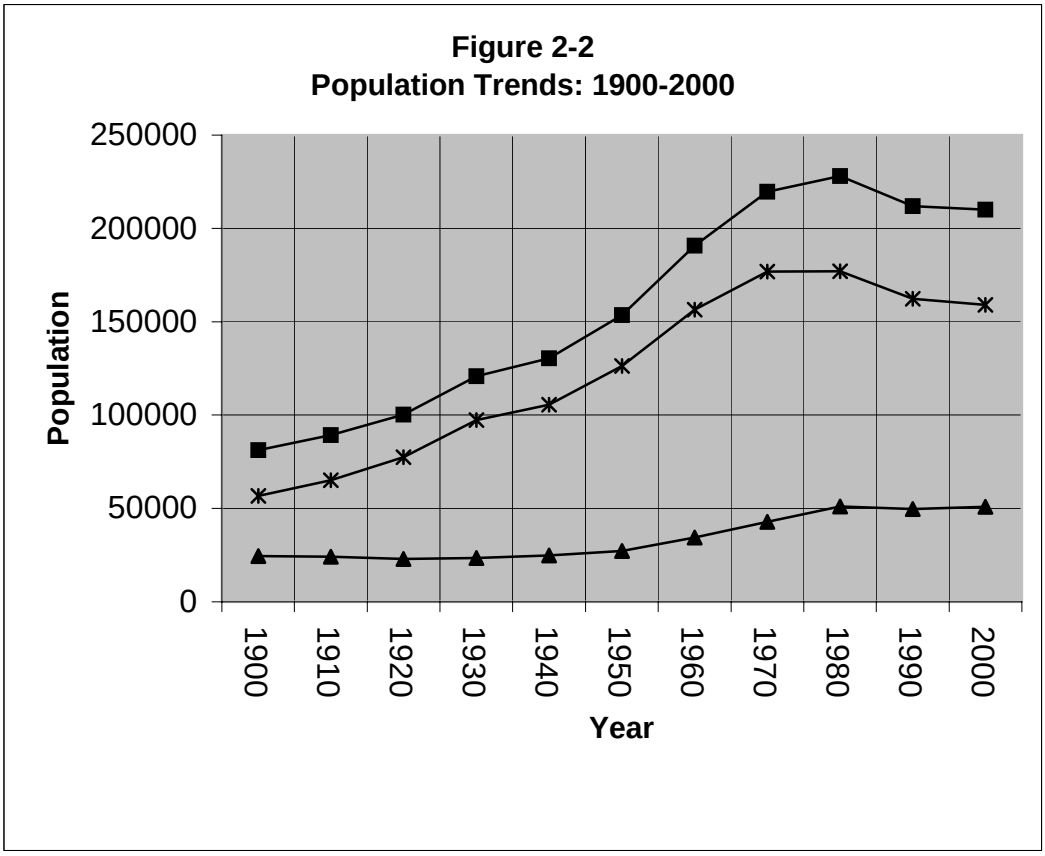


Figure 2-2
Population Trends: 1900-2000
250000
200000
150000
100000
50000
0
Population
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Year

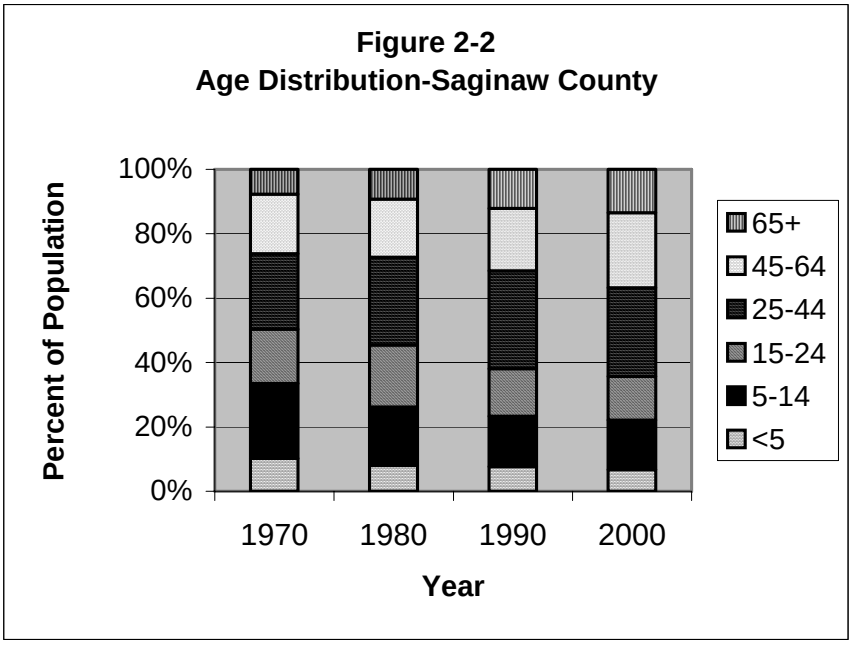
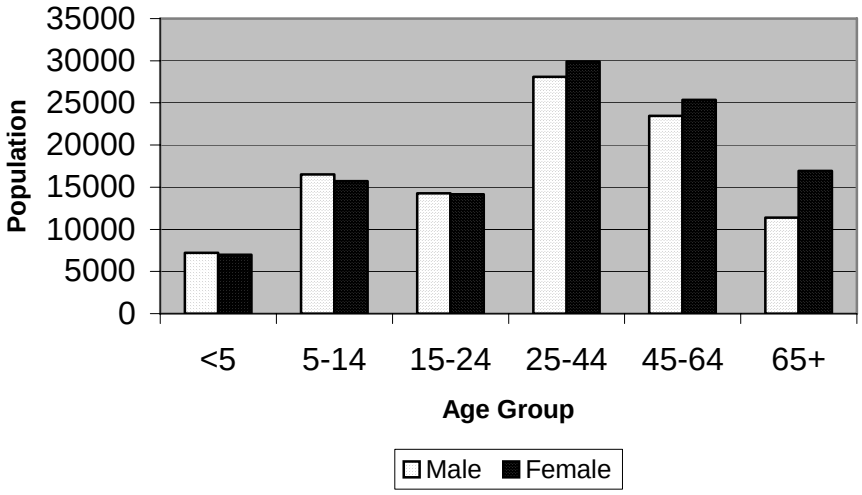


Figure 2-2
Age Distribution-Saginaw County
100%
80%
60%
40%
20%
0%
Percent of Population
1970
1980
1990
2000
Year
65+
45-64
25-44
15-24
5-14
<5

In terms of gender, females made up a slightly greater proportion of the population (51.9%) than males (48.1%) in 2000. Figure 2-3 shows gender distribution of the County population by age group.

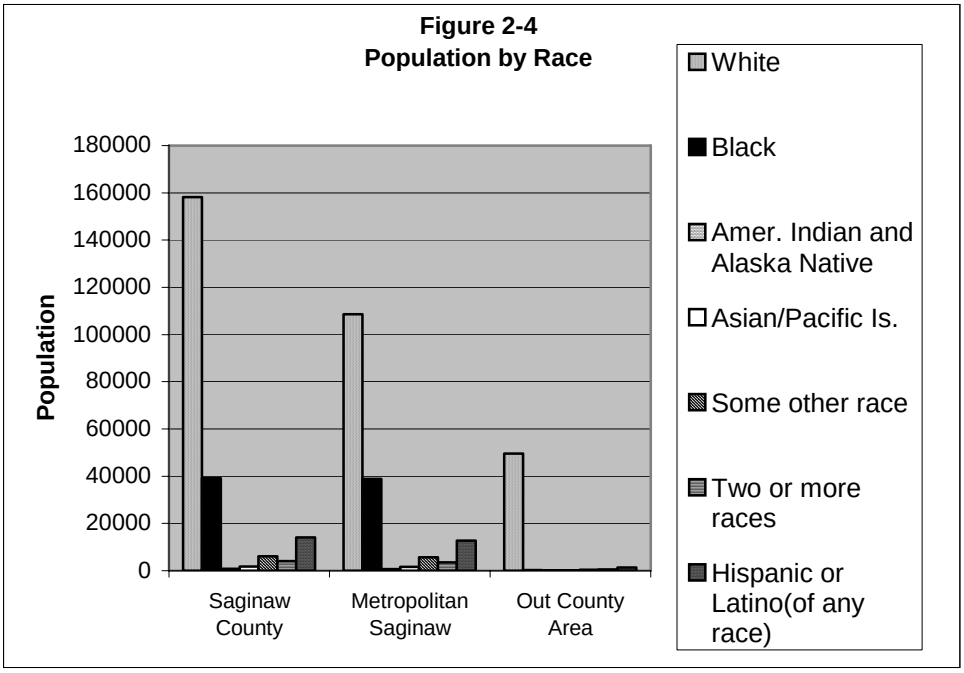
Figure 2-3
Gender Distribution: 2000



Racial Diversity

As Figure 2-4 illustrates, Metropolitan Saginaw is a racially diverse community with significant Black (24.5%) and Hispanic (8%) populations. These racial and ethnic groups are concentrated in the center of the Metropolitan Saginaw Area (e.g., the City of Saginaw and Bridgeport, Buena Vista, Carrollton, Saginaw, and Tittabawassee Townships). In recent years, increasing numbers of minority families have moved into suburban areas. Very few minorities, however, live in the Out County Area.

Figure 2-4
Population by Race



Persons with Disabilities

A total of 71,944 people in Saginaw County had some type of disability according to 2000 Census data (Table 2-3). This information may have some significance for hazard mitigation planning because it indicates populations who may require special assistance in moving to shelters or otherwise responding to hazards when such actions are required. The disability figures were recorded in the following categories: sensory, physical, mental, self-care, go-outside-home, and employment.

Table 2-3

Disability Type	Sensory (severe vision or hearing impairment)	Physical (walking, climbing, carrying, reaching etc.)	Mental (learning, remembering, concentrating)	Self-Care (bathing, dressing, getting around home)	Going Outside the Home (go out to shop or visit doctor)	Employment (working at a job)
Number of Persons	**7,727**	**18,460**	**11,121**	**6,000**	**14,012**	**14,624**

Income

Income and poverty levels for Saginaw County residents are shown in Table 2-x. Figures for the entire State have been included for comparison. Although County household and family income levels have grown from 1990 to 2000, they are still $6,000 to $7,000 less than the State averages. Poverty levels in the County have also declined from 1990 to 2000, but they are still higher than the statewide level.

Table 2-4
Local Income & Poverty Levels (2000)

Geographic Area	Median Household Income		Median Family Income		% of All Persons Below Poverty Level	
	1990	2000	1990	2000	1990	2000
Saginaw County	$27,980	$38,637	$33,391	$46,494	17.2%	13.9%
State of Michigan	$31,020	$44,667	Not Reported	$53,457	12.8%	10.5%

Source: U.S. Census Bureau

Housing

An adequate supply of sound housing is important to every community. However, information on locations and types of housing can have special implications for hazard mitigation planning. For example, knowledge of the locations of high-density housing developments may be important to emergency planning personnel. Certain types of housing, such as mobile homes, present special challenges to mitigation planning for hazards such as tornadoes and other severe weather events.

Selected housing characteristics for Saginaw County, along with comparable figures for the state, are shown in Table 2-x. This information indicates that there has been modest growth in the total number of housing units (in contrast to the slight population loss) from 1990 to 2000. Almost 74% of the housing units are occupied by the owners (as opposed to renters), a figure that matches the state average. The County median housing value of $85,200 is over $30,000 less than the state median, a statistic that supports the idea that housing is more affordable in the Saginaw Valley in comparison to other markets. However, the median value varies considerably from one community to another, ranging from a low of $35,400 to a high of $146,200.

The structural characteristics of the County's housing units are summarized in Table 2-x. This information shows that detached, single-family homes are by far the predominant type of housing. However, there are also nearly 12,000 multiple-family housing structures in the County. The majority of these (about 73% of the total) are concentrated in both Saginaw Charter Township and the City of Saginaw. However, there are also significant numbers of multi-family units in other townships within the urbanized area, including Bridgeport, Thomas and Buena Vista, and in secondary population centers in the out-county area, such as the City of Frankenmuth.

Table 2-x
Selected Housing Characteristics

Unit Of Government	2000 Total Housing Units	% Change in Housing Units 1990 –2000	Median Value of Housing (2000)	Percent Owner-Occupied (2000)
Saginaw County	85,505	4.4%	$85,200	73.8%
State of Michigan	4,234,279	10.0%	$115,600	73.8%

Table 2-x
Structural Characteristics of Housing

Subject	Number of Units	Percent of Total
Total Housing Units	85,505	100.0%
Units in Structure		
1-unit, detached	63,472	74.2%
1-unit, attached	2,120	2.5%
2 units	4,117	4.8%
3 or 4 units	2,790	3.3%
5 to 9 units	3,332	3.9%
10 to 19 units	2,712	3.2%
20 or more units	3,012	3.5%
Mobile Home	3,925	4.6%

Source: U.S. Census Bureau, Census 2000

As Table 2-x also shows, there is a significant number of mobile homes in the County, representing about 4.6% of the total housing stock. While many of these are located on individual lots in various locations, especially in the more rural areas, there are also several large mobile home parks in the County that contain significant numbers of mobile homes at high densities. The mobile home parks are discussed further in the "critical facilities" portion of this chapter.

Employment

The major employment categories for Saginaw County residents are shown in Table 2-x. This information shows some diversity of the local work force, with no single category completely dominating employment in the area.

The top employment category is education, health and social services (22.5% of total employment), closely followed by manufacturing (20.4%), and then retail trade (14.3%), arts, entertainment, recreation, accommodation, and food services (8.7%), professional and related (5.9%), and construction (5.7% of the total). Taken together, these categories represent nearly 78% of all employment by County residents. Other major employment types in the County include finance, insurance and real estate; other services; transportation, warehousing and utilities; and public administration.

Saginaw County's largest private sector employers are listed in Table 2-x.

Table 2-x
Saginaw County
Employment by Type of Industry (2000

Employment Category	Number of Employees	% of All Employed Persons
Manufacturing	18,598	20.4%
Educational, health & social services	20,488	22.5%
Retail Trade	13,057	14.3%
Construction	5,227	5.7%
Transportation, warehousing & utilities	3,112	3.4%
Arts, entertainment, recreation, accommodation & food services	7,928	8.7%
Professional & related	5,344	5.9%
Other services	4,526	5.0%
Finance, insurance, real estate	4,089	4.5%
Agriculture, forestry, mining	833	0.9%
Public administration	2,918	3.2%
Wholesale trade	2,651	2.9%
Information	2,342	2.6%

Source: **U.S. Census Bureau, Census 2000.**

Table 2-x
Top 25 Private Employers in Saginaw County

Rank	Employer Name	Type of Business	Employees
1	Delphi	Automotive	6,800
2	Covenant HealthCare	Medical	4,129
3	General Motors Powertrain	Automotive	2,637
4	Saint Mary's	Medical	2,460
5	SBC	Communication	1,273
6	Frankenmuth Bavarian Inn	Restaurant & Hotel	1,000
7	H.E. Services	Engineering	750
8	Meijer	Department Store	600
9	Zehnder's of Frankenmuth	Restaurant	600
10	Frankenmuth Mutual Insurance	Insurance	525
11	Means Industries	Automotive Stampings	489
12	Dow Corning/Hemlock Semiconductor	R & D Health Care Materials, Polycrystalline Silicon	489
13	Consumers Energy	Energy	450
14	Eaton Corporation	Motor Vehicle Parts	395
15	Michigan Sugar	Beet Sugar	350
16	Duro-Last Roofing	Roofing Materials	325
17	Hehr Companies	Glass Products	325
18	XO Communications	Internet Provider	320
19	Morley Companies	Meetings, Interactive Services & Travel	300
20	The Saginaw News	Newspaper Publishing	265
21	Citizens Bank	Banking, Finance	252
22	Saginaw Control & Engineering	Electronic Controls	215
23	Dixie Cut Stone & Marble	Patio Blocks & Landscape Stone	190
24	Merrill Tool	Machining	180
25	Nash Finch	Wholesale Grocery Supplier	180

Source: **Saginaw Future Inc, 2004**

Physical Factors

This section provides a profile of Saginaw County's major physical resources. The area's physical factors can have major influences on both the community's vulnerability to certain hazards and its ability to mitigate disasters that may occur. Physical factors include both natural features and the built environment, such as the transportation system and other public infrastructure, topography, soils, watercourses, and development patterns.

Transportation System

Automobiles and trucks are the primary modes of transportation in Saginaw County, as in most of the rest of the United States. The I-75 expressway is the single most important transportation facility in the area, linking Saginaw to Detroit and the Mackinaw Bridge. Much of the region's current economic activity and its future prospects are highly dependent on access via I-75 to the rest of the world.

Access to other communities, for both passengers and freight, is mainly provided by the state trunkline (highway) network, which includes three freeways and ten state highways within Saginaw County. These facilities provide good access to the rest of Michigan.

Circulation of people and goods within the County is also dependent on the road network. Freeways and state highways are supplemented by a grid of county roads and municipal streets. The road network is also the basis for public and quasi-public transit systems, which are available in the City of Saginaw and a few of the adjacent townships. The roadway system also serves commercial vehicles that provide for the local distribution of goods.

MBS International Airport, located near Freeland in Tittabawassee Township, is owned and operated by a partnership of Midland, Bay, and Saginaw Counties. Two passenger airlines presently serve the airport. MBS also serves as a base for air freight and general aviation. Elsewhere in the County, general aviation airports are located in Frankenmuth, Chesaning and Buena Vista Townships.

Several rail carriers operate in the County for the shipment of agricultural products, chemicals, automobile parts, and other materials. Port facilities on the Saginaw River are used to transport bulk goods such as agricultural commodities, sand, stone, and salt.

Topography and Surface Features

The physical characteristics of Saginaw County were defined by prehistoric glaciation which last visited the Saginaw Valley about 12,000 years ago. As the glaciers retreated they helped to define the terrain, the composition of soils, and drainage patterns that persist to this time.

The topography of Saginaw County can best be described simply as flat. There is only about a 150-foot difference between the highest and lowest elevations over its 810 square

miles. Generally, the lower elevations exist at the Shiawassee Flats, near the center of the County, and follow the Saginaw River northerly towards the Saginaw Bay. The highest elevations are on a former beach ridge formed by a post-glacial lake in the southwestern corner of the County. Most of the visible relief in Saginaw County's topography is along riverbanks and in scattered sand ridges and low glacial moraines.

Drainage and Water Features

Due to its low elevation in the heart of the Saginaw Valley, the confluence of the Saginaw River and several of its tributaries is located in Saginaw County. The Tittabawassee, Cass, Shiawassee and Flint Rivers are the most important of the tributaries; both branches of the Bad River, Swan Creek, Beaver Creek, Misteguay Creek, and Cheboyganing Creek, however, also are significant. Numerous small streams and many drains, maintained by the Saginaw County Drain Commissioner, also are located in the County.

Climate

Saginaw County's climate is described as continental in nature. This means that local temperatures are subject to greater extremes than coastal locations at similar latitudes. Although the climate is influenced by the Great Lakes, this influence is reduced by the inland location of the County. The most noticeable lake influence occurs when the prevailing westerly winds bring increased cloudiness during the fall and winter months. This moderates temperatures during cold outbreaks.

Day-to-day weather is controlled largely by the movement of pressure systems across the nation. As a result, Saginaw County seldom experiences prolonged periods of hot and humid weather in summer or extreme cold during the winter. Temperature extremes range from a recorded high of 111°F to a low of 21°F below zero. Summers are dominated by moderately warm temperatures with an average of eleven (11) days exceeding the 90°F mark.

Saginaw County's average snowfall is almost forty-two (41.6) inches, representative of most other locations in central lower Michigan. Although it is much lower than the snowbelt areas of western and northern Michigan, the local snow depth usually permits participation in winter sports. Over eighty-five (85) percent of the minimum temperatures from November through March are below 32°F.

Soils

Soils in Saginaw County reflect glaciation and its aftermath. The County's soils represent a relatively unconsolidated variety of soil types. Since these soils were either deposited on the bottom of post-glacial lakes, or piled up by wave action at lakeshores, they are generally fine grained and of low permeability. The soil varieties are differentiated by consistency, fertility, moisture content, texture, and color. Saginaw County's soils range from loose sand to heavy clays. Loamy soils occupy thirty-three (33%) percent of the land area, heavier clayey soils about fifteen (15%) percent and sandy loam soils about

twenty (20%) percent. Light sandy soils also cover about thirty-two (32%) percent of the County. Heavier soils tend to be dominant in the north and northeastern portions of the County, while lighter soils are dominant in the south and southwestern areas. Loams and heavier soils are utilized as productive farmland. Most of the lighter soils host wooded, scrubby, or open fields.

Wildlife and Aquatic Biota

The wildlife of Saginaw County occupies the various environments of forests, farmlands, wetlands and surface waters. It includes a variety of birds, mammals, reptiles, amphibians and fish. In terms of the maintenance of natural habitats and native animals, the areas that are of greatest significance are the state and federal regional reserves: the Shiawassee National Wildlife Refuge, the Shiawassee State Game Area, the Crow Island State Game Area and the Gratiot-Saginaw State Game Area.

Mammals found in Saginaw County include white-tailed deer, red fox, raccoon, opossum, cottontail rabbits, skunk, red squirrel, fox squirrel and a number of small rodents. Birds include the common sparrow, starling, cowbirds, robins, hawks and all other species found in the region. Game birds include ring-neck pheasants, a variety of ducks, Canada geese, swans, ruffed grouse, woodcock and bob-white quail. Some mammal and bird species are making a comeback in Saginaw County, specifically, river otters and bald eagles.

Due to water pollution problems, local rivers have a heavier concentration of rough fish including carp, suckers and crappies. However, as noted previously, water quality improvements have enabled many game fish species to expand their populations. These include walleye, smallmouth bass, white bass, several varieties of panfish, pike, perch and salmon.

Land Use and Development Patterns

The land use pattern in Saginaw County reflects a blending of urban activity in the heart of the Metropolitan Saginaw Area and agricultural fields, small towns and undeveloped land on the periphery of Metropolitan Saginaw and in the Out County Area. Suburbanization is continuing to alter the more rural landscape found on the periphery of the metropolitan area and beyond. For example, the Village of Birch Run and environs has the potential to become very urban due to the continued expansion of the outlet mall and the other commercial enterprises it spawns. In contrast to this phenomena, just over thirty (30%) percent of the acreage of Saginaw County is now, or once was, enrolled in the Farmland and Open Space Preservation Act (PA 116). Although the effectiveness of this act, due to certain changes in the collection of property taxes, is no longer certain, it does convey the interest some Saginaw County residents have for agricultural land preservation.

Public Water and Sewer

In Saginaw County, sewer systems for the collection and treatment of wastewater serve major portions of the Metropolitan Area, particularly the urbanized areas. This includes the Cities of Saginaw and Zilwaukee, and major portions of the townships of Saginaw, Bridgeport, Buena Vista, Carrollton, James, Kochville, Thomas, Spaulding, and Tittabawassee. In the Out County (rural) areas, sewer service is generally limited to the incorporated municipalities, including the City of Frankenmuth and the villages of Birch Run, Chesaning, Oakley, St. Charles, and Merrill. The unincorporated village of Hemlock in Richland Township is also served by public sewer.

Municipal water is supplied to communities in the Metropolitan Area and beyond through the City of Saginaw's Water System. The City's system functions on a regional basis to provide potable water in the urbanized areas as well as portions of the outlying areas, including Swan Creek, Richland, and Birch Run Townships. The Village of Merrill and Jonesfield Township have been jointly pursuing the development of a water system that would serve the village and portions of the township.

The GIS Mapping portion of this document displays the counties placement of the following:

Flood Hazard Areas

Mobile Home Parks

SARA III Facilities

EDUCATIONAL & SOCIAL CHARACTERISTICS OF COUNTY RESIDENTS

According to the 2000 Census for Saginaw County 58,489 of the county's residents were enrolled in some type of educational institution. The K-12 population was 43,311 including non-public and charter schools. Of significant interest in the County's educational makeup are the 270 disabled children that are schooled at the Millet Learning Center in Bridgeport. Continuing education for the county's 25 and older population has been on the increase as of the current census 81.6% of the county residents are high school graduates and 15.9% of the population has a bachelor's degree or higher. The mitigation plans for the townships listed on the following page that maintain school districts should reflect the number of persons on a given school day in each jurisdiction. The exceptions to this would be the highly tourist populated communities of Birch Run and Frankenmuth; these communities need to anticipate the influx of tourists as well as the students into their boundaries. In addition, the County is home to several festivals throughout the year, which can temporarily increase the population statistics and must be noted in mitigation preparedness and response strategies.

Another significant fact of the populations make up for Saginaw County is that 49.2 % of the aging population is the prime caregiver for their grandchildren. Of the total population 3,982 of the grandparents have one or more grandchildren under eighteen year's old living with them.

The county also has a significant number of disabled adults living within its boundaries. Of the 65 and older population 43.7% (11,867) are disabled. There are an additional 19.6% (22,552) of the county residents 25 to 64 years old that are disabled. Of these disabled residents 951 live in nursing care facilities. In addition, the county is the regions medical center with 1,700 hospital patient beds.

School District	Enrollment
Birch Run	**1,872**
Bridgeport – Spaulding Community	**1,874**
Buena Vista	**1,046**
Carrollton	**1,417**
Chesaning Union	**1,891**
Frankenmuth	**1,257**
Freeland Community	**1,748**
Hemlock	**1,414**
Merrill Community	**846**
City of Saginaw	**9,678**
Saginaw Township Community	**5,026**
St. Charles Community	**1,168**
Swan Valley	**1,753**

Source: Saginaw Intermediate School District

In addition, to the K-12 system Saginaw County is home to three secondary educational facilities. Saginaw Valley State University is a fully credited four-year university with approximately 9,800 students and faculty. Delta College is a two-year community college with approximately 10,700 students and faculty, and Davenport University is a business college with an average of 700 students and faculty. Only Saginaw Valley State University provides on-site student housing with about 2,200 students of their 9,600 who utilize the on-site housing. The other facilities are commuter schools.

ECONOMIC AND LABOR FORCE CHARACTERISTICS OF COUNTY RESIDENTS

According to the 2000 U.S. Census, Saginaw County has a population of 160,074 that is 16 years of age or older. There are 98,602 (61.6%) of this population segment gainfully employed. Of this group 57.3% are female. Earlier in this document, it was noted that Saginaw County has a significant number of young families moving into the county. Another factor that could hamper an evacuation is the high number of families with children under 6 years old where both parents are employed. For Saginaw County, the number of families with children under 6 is 16,293; of that number, 10,939 (67.1%) have both parents employed. With both parents employed, the children in these families would likely be placed into temporary care (day-care) facilities. Thus, in the event of a disaster, parents seeking access to their child may create a sense of panic and may provide an additional obstacle for emergency planning.

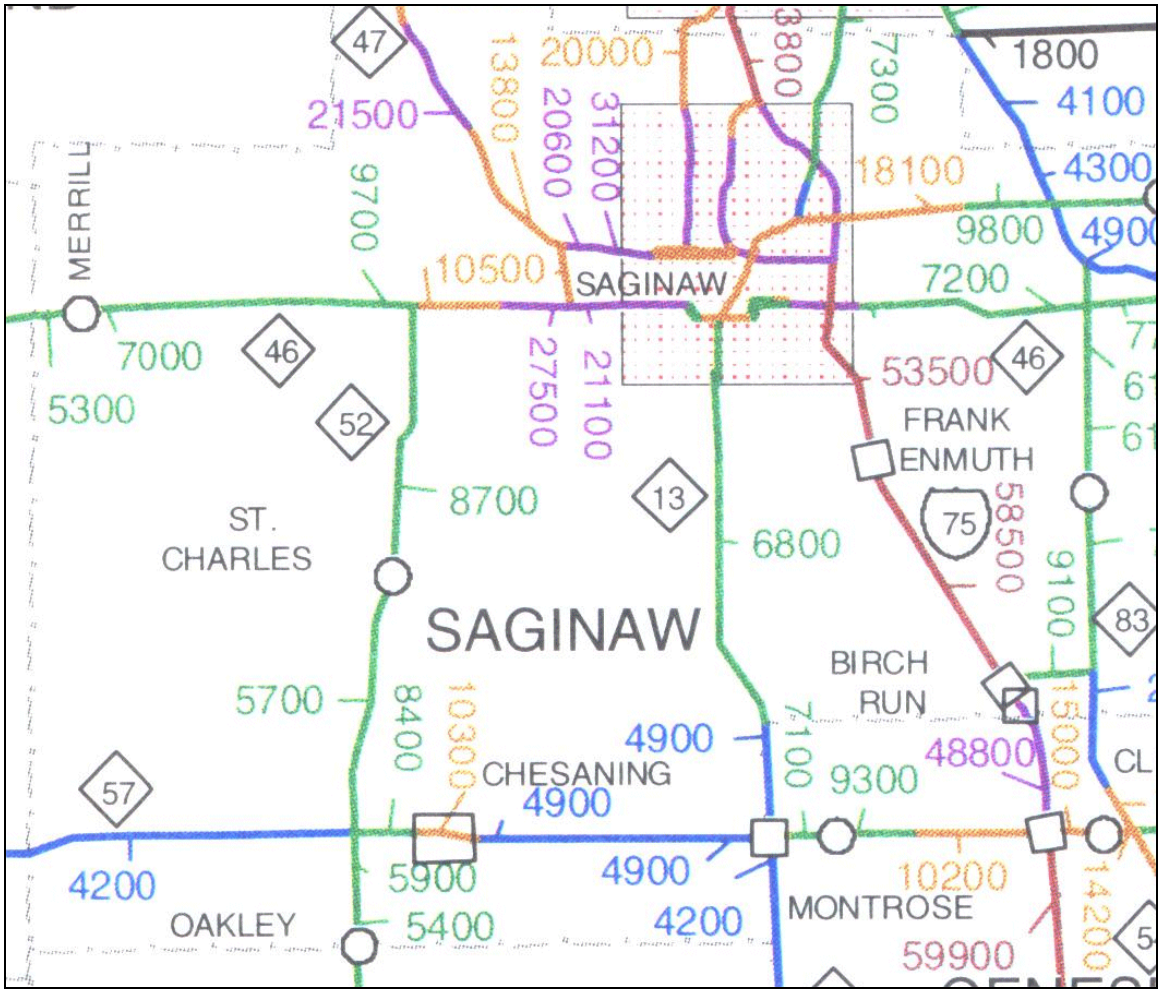
The top three industries that employ the majority of Saginaw County's workforce are: the Educational, health and social services industry with 20,488 employees (22.5%), the Manufacturing industry with 18,598 employees (20.4%), and the Retail trade industry with 13,057 employees (14.3%). The following table illustrates the types of occupations that make up the Saginaw County workforce.

Occupation	Number	Percent
Management, professional	24,893	**27.3%**
Service occupations	16,319	**17.9%**
Sales and office occupation	24,710	**27.1%**
Farming, fishing & forestry occupations	332	**0.4%**
Construction, extraction & maintenance occupations	8,446	**9.3%**
Production, transportation & material moving occupations	16,413	**18.0%**

Source: U.S. Census Bureau, Census of Labor & Economic Characteristics

SAGINAW COUNTY IN MOTION

Saginaw County is accessible via Michigan and Interstate highways. From North to South Saginaw County is traveled via Interstate 75. In addition, to the major Interstate the county can be on (Michigan Highways) M-46, M-13, M-81, M-57, M-52, and M-83. Saginaw County is also has a CSX switching yard in the City of Saginaw where three major rail-lines juncture. Also, along the Saginaw River (which is one of only five rivers in the world that flow northward) there is an industrial shipping port at Carrollton, which serves the stone and gravel industry as well as the agricultural community. In addition, to the shipping port the Saginaw River is the confluence point of five tributary rivers that flow from southwestern portion of Saginaw County toward the Saginaw Bay. The point at which these tributaries join is known as Greenpoint. Below is a map that indicates the Average Daily Traffic counts for Saginaw County.



Courtesy of: Michigan Department of Transportation

CRITICAL FACILITIES, MUNICIPAL SERVICES, AND PUBLIC SAFETY

There are a number of medical facilities within Saginaw County. The two major hospitals are St. Mary's Medical Center and Covenant Medical Center; these systems have several satellite facilities throughout the county servicing a variety of medical arenas. In addition to the medical facilities, Saginaw County has a Mobile Medical Response (MMR) Center. The MMR facility provides emergency medical transportation to 90% of Saginaw County with seventy-five emergency response rigs on duty. There are also a dozen nursing home facilities; earlier in this document, nursing home care was sited as a potential evacuation hazard.

Medical Facility	Number of Patient Beds
Covenant Medical – Cooper Campus	700
St. Mary's Ambulatory Care	
St. Mary's Medical Facility	268
HealthSource Saginaw	319
Veteran's Administration Hospital	155
Synergy Medical	1,000
Combined Nursing Home Facilities	1,064

Some information on the number of households receiving water, sewer, and heating gas utility services has already been provided in the section on Population and Housing Characteristics. Following is some more information on other important services provided in the county.

Saginaw County Municipal Services:

Utilities:	Consumers Energy 2400Weiss Street Saginaw, MI
Telecommunications:	AT&T 309 S. Washington Avenue Saginaw, MI
Licensed Landfills:	Waste Management (People's Landfill, Inc.) 4143 East Rathburn Road Birch Run, MI

Public Safety – Saginaw County has thirteen municipal law enforcement agencies within the county. In addition to the municipality services, the Saginaw County Sheriff's Department has 24-hour road patrol strategically placed throughout the County. The Michigan State Police operate a patrol post with a Crime Lab in the southern end of Saginaw County. In total, there are approximately 300 full-time law enforcement officers in Saginaw County.

If severe weather threatens the county, NOAA Weather Radio is available as a means of warning citizens. Saginaw County also has a Severe Weather Siren Warning System, which reaches the majority of the County's residents. There are extensive tests preformed on this system monthly. In addition to the local siren system, Saginaw County is the only county in Michigan to have a cable television interrupt system available for disaster warning as well as the Emergency Alert System via radio, cable television and local network television. When necessary, people or places with special needs or vulnerabilities are notified by a paging system regarding possible hazards. The list of places contacted includes nursing homes, hospitals and schools. Each of these institutions has its own plan to enact when severe weather is expected. An amateur radio network is also utilized to ensure that people can be reached even if telecommunications systems are not functional. Included in the message relay chains are door-to-door notifications via the local police and fire personnel.

Fire Services - There is only one completely full-time fire department in Saginaw County; it is the City of Saginaw Fire Department. The City of Saginaw has four firehouses that maintain round the clock manned coverage. There are twenty-one municipalities with fire service. The majority is completely volunteer based however; a few departments have paid positions. Some of the fire departments cover more than one township. The Department of Natural Resources (DNR) is responsible for fire protection on the Shiawassee National Wildlife Refuge and it works closely with local fire fighters whenever the danger of woodland and urban fires is elevated. Additionally, all departments have entered into mutual aid agreements for response anywhere in the County. Saginaw County also has two fully suited Hazmat Teams (City of Saginaw and Saginaw Township) that work mutually when necessary.

Emergency Medical Services – Almost 90% of Saginaw County's emergency medical services is provided by the Mobile Medical Response (MMR), a non-profit corporation. The MMR team provides both emergency and non-emergency pre-hospital care and medical transportation. MMR also provides several other services: MedConnection, a 24-hour Nurse Call Center, MainStreet Messenger Personal Help Alarms, membership programs covering insurance deductibles, and an EMS training facility offering MFR, EMT and Paramedic training. The only privately owned emergency transportation service in the County is Valley Ambulance, which covers the Chesaning area. Both ambulance services can be accessed by the 9-1-1 communications system which covers all of Saginaw County. The emergency communications system has just recently added a non-life threatening contact system which can be accessed by dialing 3-1-1. 3-1-1 enables callers to reach an emergency dispatcher on a non-urgent basis.

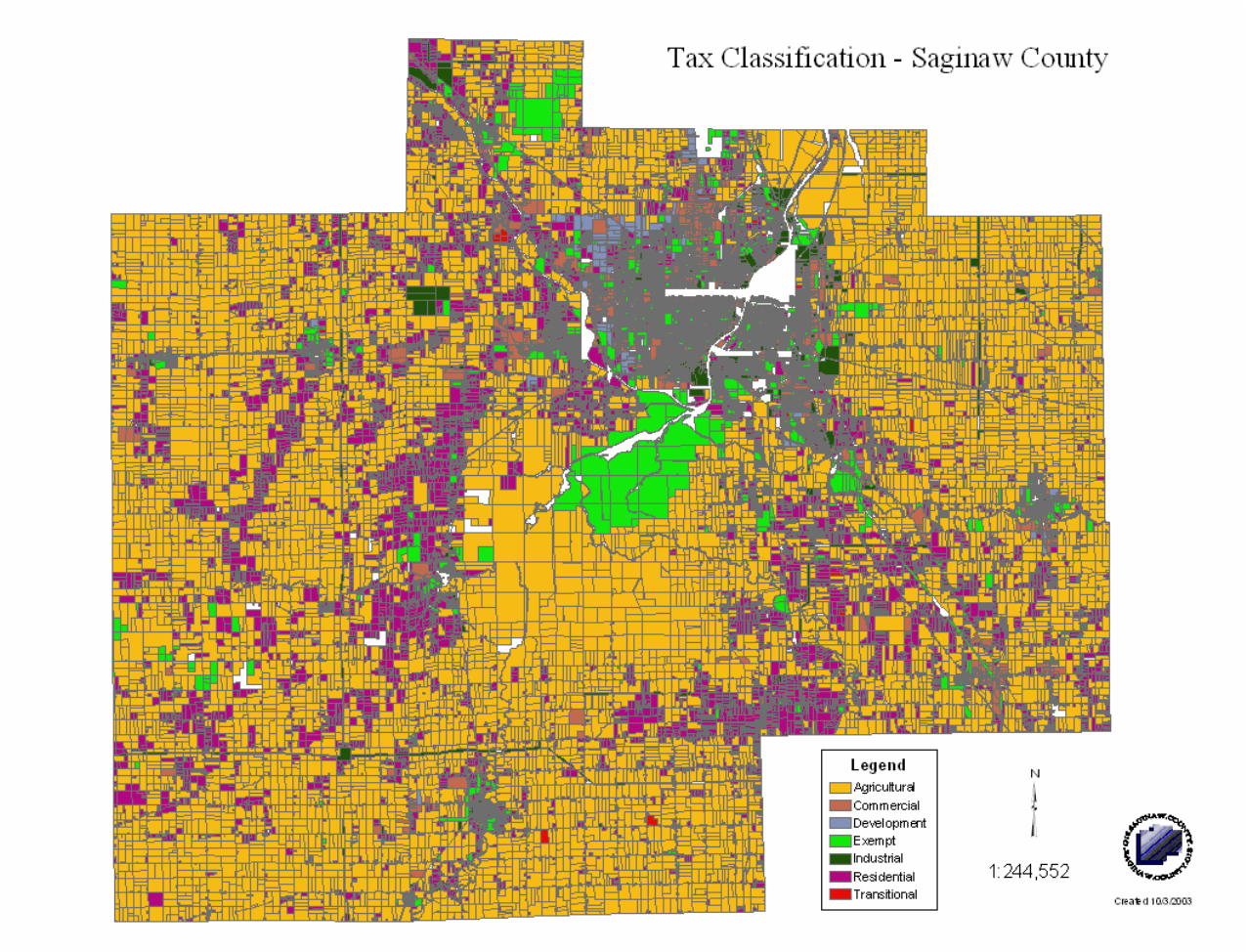
Special Events – Saginaw County's tourism plays an important role in the economy of the County. The county ranks third among the state's 83 counties based on overnight visitor expenditures. AAA of Michigan lists Frankenmuth as Michigan's most-visited tourist attraction. The Prime Outlets in Birch Run has an average yearly visitation of six million visitors. A number of annual special events in the County create significant population explosions based on the aforementioned reasons. Of the special events/festivals held in the County of few of the highest attended are the *Chesaning Showboat* (avg. attendance 28,826 people), *Zehnder's Snowfest* (avg. attendance 150,000 people during the week-long event), *Frankenmuth Autofest* (avg. attendance 110,000 people during the three-day event), *WKCQ Country Music Fest* (avg. attendance 85,000 people) and the *Saginaw Fireworks* (avg. attendance 100,000 people).

Saginaw County Special Events	***Date***
Zehnders Snowfest	January 23-28, 2008
WKCQ Country Music Fest	June 21, 2008
Saginaw Fireworks	July 4, 2004
Chesaning Showboat	July 12-19, 2008
Frankenmuth Autofest	September 5-7, 2008

SAGINAW COUNTY LAND USE, PLANNING, FINANCE, CLIMATE AND ENVIRONMENT

No detailed and comprehensive land use map of Saginaw County is currently available. However, approximate land uses in the County, based on information gathered by the County Treasurer's Office and the Saginaw Area Geographic Information Services Authority (SAGA), are illustrated below.

Land Use Map: This land use map was generated using the tax classification information provided by the Saginaw County Treasurer's Office and compiled by SAGA. The heavy agricultural base is spread throughout the county with scattered pockets of industrial and residential properties outside of the core urban area surrounding the City of Saginaw.

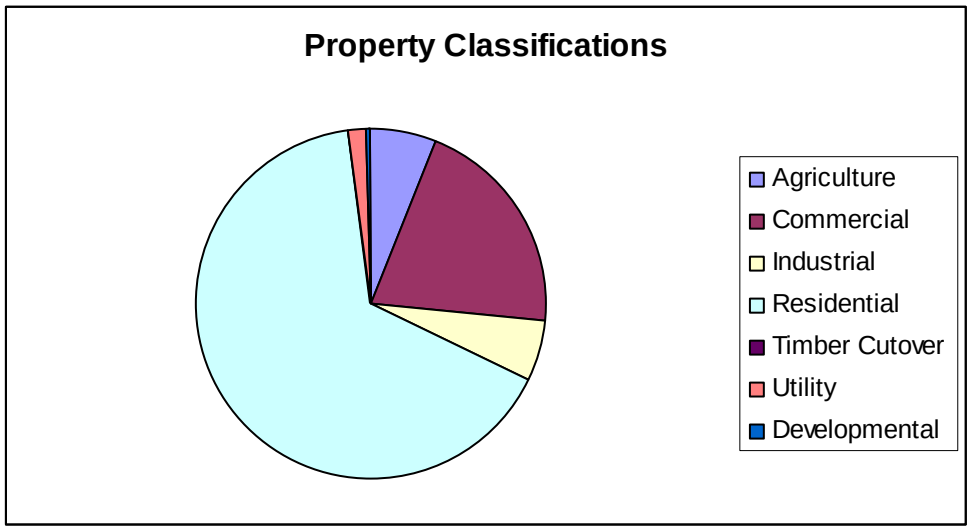


Source: Saginaw County Geographic Information Systems

The chart below illustrates the percentage of land in each property classification countywide. It may be useful to deduce that County tax revenues, which are based on real and personal property taxes, follow a similar pattern.

Agricultural property accounted for 6.02% of County land use; commercial property accounted for 20.04%; industrial property made up 5.23%; residential property accounted for 64.17%; utility property accounted for 1.71%; and developmental properties accounted for 0.20% of the tax base.

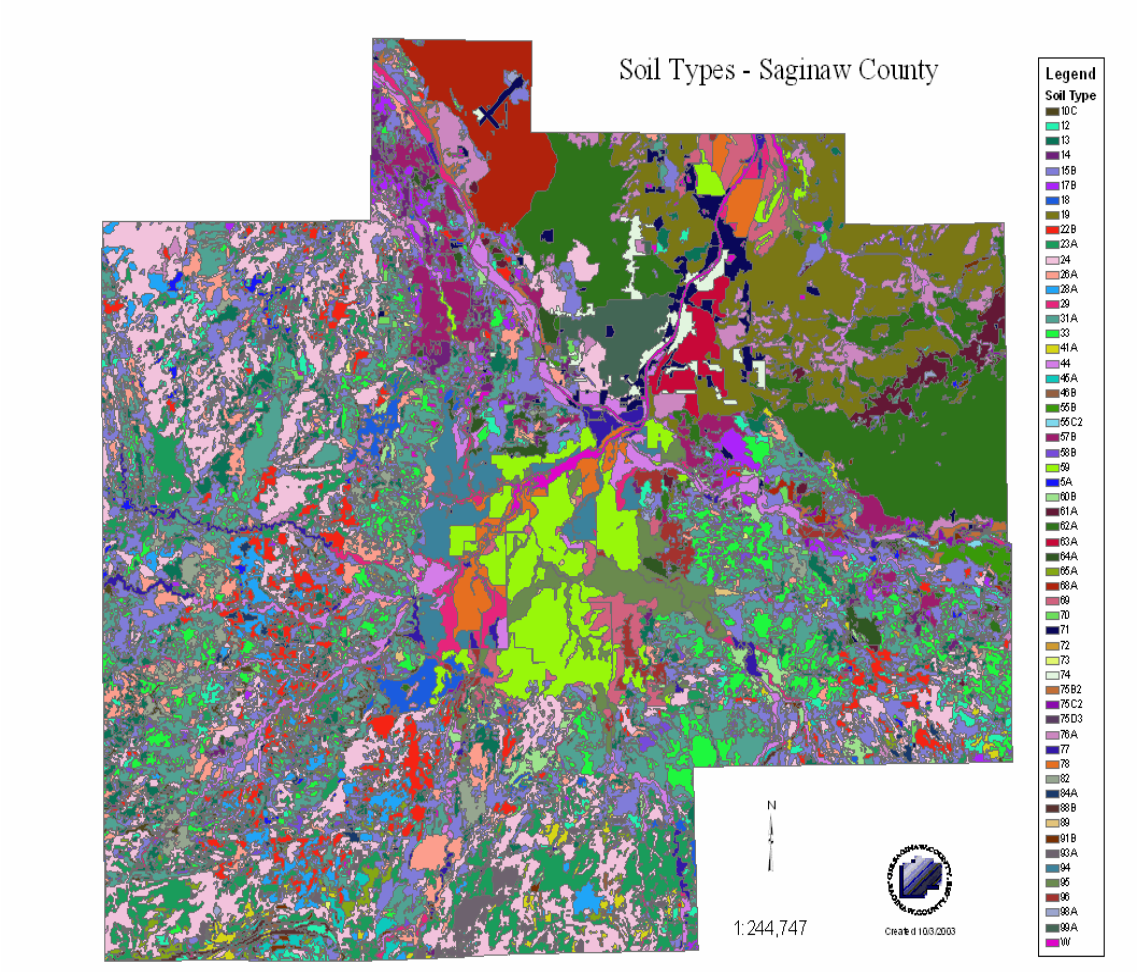
County Property Classifications



Source: Saginaw County 2007 Equalization Report

IT'S SAGINAW COUNTY

Saginaw County has a rich history of agricultural significance; even today the area is rich in agricultural industry. Saginaw Valley farmers raise corn, navy beans, sugar beets, and wheat as their most productive cash crops. The Saginaw Valley is home to Star of the West Milling Company, one of only five mills in the country that processes red wheat. Most of this processed wheat is used in industrial baking for such companies as Sara Lee, Kellogg's and McDonald's. The Saginaw Valley is also home to Michigan Sugar and its sugar beet processing plant. Some of the richest exports come from the Saginaw Valley and are transported all over the world. The average length of the growing season in Saginaw County is a very short 128 days. The average temperature during this growing season is 66° from May until September. The average rainfall for the Saginaw Valley is twenty-nine inches with an additional thirty-six inches of snowfall precipitation. The following map illustrates the soil types of Saginaw County.



Hazard Assessment
Hazard Summary Description And Rankings

Hazard Ranking Methodology

A draft hazard ranking for Saginaw County was completed using a three step process. The first step was the selection of evaluation criteria, the second step was assigning relative weights to each of the rating criteria, and the third step was assigning point values to each of the selected criteria for each of the hazards. The evaluation criteria were selected by determining what aspects of the hazards were of greatest concern to the community.

Each of the evaluation criteria was then assigned a "weight" (percentage value)to express the level of importance each of the criteria will have in ranking hazards. The sum of the weights of all of the evaluation criteria must equal 100%. The selected evaluation factors and their relative weights are described below:

Likelihood of Occurrence (30%)
Likelihood of occurrence measures the frequency with which a particular hazard occurs. The more frequently a hazard event occurs, the more potential there is for damage and negative impact on a community.

Potential for Property Damage (10%)
The capacity to cause property damage refers to the destructive capacity of the hazard. The destructive capacity of some hazard events, such as floods and tornadoes, is often immediate and readily apparent.

Percent of Population Affected (10%)
This evaluation factor refers to the relative number of people who would be likely to be affected by a particular hazard.

Potential Death or Injury (30%)
This factor refers to the number of casualties (deaths and injuries) that can be expected if a particular hazard event occurs.

Potential Economic Impacts (20%)
Economic effects are the monetary losses incurred from a hazard event, and include both public and private damage. Direct physical damage costs, as well as indirect impact costs such as lost business and tax revenue, are included as part of the total monetary losses.

To evaluate the hazards, point values of 1 – 10 were assigned to each hazard for each of the evaluation factors. The results of this step are shown in ***Table 1, Hazard Assessment Ranking.*** Next, the point values were multiplied by the weighting factor (percentage) that was assigned for each evaluation factor. Finally, the weighted values were added together to obtain a total score for each hazard. The hazards were then ranked in descending order according to their total scores. The results of this scoring process along with the hazard rankings are shown in ***Table 2, Hazard Scores & Ranking***.

Table 1. Saginaw County
Hazard Assessment Ranking

Hazard	Likelihood of occurrence	Potential property damage	Percent of population affected	Potential death or injury	Potential Economic impacts	score
Civil disturbance	3	7	3	7	5	5
Drought	6	2	6	0	9	4.4
Earthquakes	1	1	1	0	9	4.4
Extreme temperatures	6	1	8	4	3	4.5
Scrap tire fires	3	2	1	1	2	1.9
Structural fires	7	7	4	6	6	6.2
Wildfires	6	4	2	1	2	3.l
Dam failures	3	3	1	1	2	2
flooding	9	8	4	1	7	5.6
Inclement weather (severe winds, thunderstorms, hail, lightning, snow storm, ice storm)	9	9	9	5	5	7
Hazmat fixed site incident	5	1	4	7	5	5.1
Hazmat transportation Incident	6	4	4	7	7	6.1
Infrastructure failures	9	7	7	2	3	5.3
Nuclear attack	1	1	1	2	1	1.3
Nuclear power plant accident	1	0	2	0	1	0.7
Oil & gas well accidents	2	4	2	2	4	2.6
Pipeline accidents	6	4	3	4	2	4.1
Public health emergencies	7	1	8	6	3	5.4
Terrorism/sabotage/WMD	2	4	1	7	2	3.6
Subsidence	1	1	1	1	0	0.8
Tornadoes	4	8	3	8	9	6.5
Transportation accidents	6	6	6	6	2	5.2

Table 2. Saginaw County
Hazard Scores & Ranking

Hazard	Likelihood of occurrence (30%)	Potential property damage (10%)	Percent of population affected (10%)	Potential death or injury (30%)	Potential economic impacts (20%)	Score Total	Rank
Inclement Weather (severe winds, thunderstorms, hail, lightning, snow storm, ice storm)	2.7	0.9	0.9	1.5	1	7	**1**
Tornado	1.2	0.8	0.3	2.4	1.8	6.5	**2**
Structural fires	2.1	0.7	0.4	1.8	1.2	6.2	**3**
Hazmat transportation.	1.8	0.4	0.4	2.1	1.4	6.1	**4**
Incident flooding	2.7	0.8	0.4	0.3	1.4	5.6	**5**
Public Health Emergencies	2.1	0.1	0.8	1.8	0.6	5.4	**6**
Infrastructure failures	2.7	0.7	0.7	0.6	0.6	5.3	**7**
Transportation accidents	1.8	0.6	0.6	1.8	0.4	5.2	**8**
Hazmat fixed site incident	1.5	0.1	0.4	2.1	1	5.1	**9**
Civil disturbance	0.9	0.7	0.3	2.1	1	5	**10**
Extreme temperatures	1.8	0.1	0.8	1.2	0.6	4.5	**11**
Drought	1.8	0.2	0.6	0	1.8	4.4	**12**
Pipeline accidents	1.8	0.4	0.3	1.2	0.4	4.1	**13**
Terrorism/sabotage/WMD	0.6	0.4	0.1	2.1	0.4	3.6	**14**
Wildfires	1.8	0.4	0.2	0.3	0.4	3.1	**15**
Oil & gas well accidents	0.6	0.4	0.2	0.6	0.8	2.6	**16**
Dam failures	0.9	0.3	0.1	0.3	0.4	2	**17**
Scrap tire fires	0.9	0.2	0.1	0.3	0.4	1.9	**18**
Nuclear attack	0.3	0.1	0.1	0.6	0.2	1.3	**19**
Subsidence	0.3	0.1	0.1	0.3	0	0.8	**20**
Nuclear power plant accident	0.3	0	0.2	0	0.2	0.7	**21**
Earthquakes	0.3	0.1	0.1	0	0	0.5	**22**

Hazard Number 1: Inclement Weather

(Thunderstorms, Hail, Lightning Wind, Snow, Ice)

These weather hazards are all combined under the "inclement weather" category because of their connectivity.

a) Thunderstorms

Severe thunderstorms are weather systems accompanied by strong winds, lightning, heavy rain, and possibly hail and tornados.

Hazard Description

Inclement weather is ranked as the number one hazard in Saginaw County, and thunderstorms are part of that weather picture. Severe thunderstorms can occur at any time in Michigan, although they are most frequent during the warm spring and summer months from May through September. The potential thunderstorm threat is often measured by the number of "thunderstorm days" – defined as days in which thunderstorms are observed. Michigan is, on average, subject to 30-40 thunderstorm days per year. The National Weather Service (NWS) in Michigan has further refined that statewide average figure and found that the southern two tiers of countries of the Lower Peninsula (roughly the area south of Interstate 94) is subject to 40-60 thunderstorm days per year. The Lower Peninsula, in general, is subject to approximately 40 thunderstorm days per year, while the Upper Peninsula average is closer to 30 thunderstorm days per year. Thunderstorms form when a shallow layer of warm, moist air is overrun by a deeper layer of cool, dry air. Cumulonimbus clouds, frequently called "thunderheads", are formed in these conditions. These clouds are often enormous (up to six miles or more across and 40,000 to 50,000 feet high) and may contain tremendous amounts of water and energy. That energy is often released in the form of high winds, excessive rains, lightning, and possibly hail and tornados. Thunderstorms are typically short-lived (often lasting no more than 30-40 minutes) and fast moving (30-50 miles per hour). Strong frontal systems, however, may spawn one squall line after another composed of many individual thunderstorm cells. Other sections in this document address specific thunderstorm-related hazards such as hail, lightning, and tornados.

b) Hail

A condition where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth.

Hazard Description

Hail is another product of the strong thunderstorms that frequently move across the state. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Sometimes, strong winds occurring at high altitudes in the thunderstorms can blow the hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened. Most hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have occurred with the most severe thunderstorms. Hail is formed when strong updrafts within the storm carry water droplets above the freezing level, where they remain suspended and continue to grow larger until their weight can no longer be supported by the winds. They finally fall to the ground,

battering crops, denting autos, and injuring wildlife and people. Large hail is a characteristic of severe thunderstorms, and it may precede the occurrence of a tornado.

c) Lightning

Lightning is the discharge of electricity from within a thunderstorm.

Hazard Description

Lightning is a random and unpredictable product of a thunderstorm's tremendous energy. The energy in the storm produces an intense electrical field similar to a giant battery, with the positive charge concentrated at the top and the negative charge concentrated at the bottom. Lightning strikes when a thunderstorm's electrical potential (the difference between its positive and negative charges) becomes great enough to overcome the resistance of the surrounding air. Bridging that difference, lightning can jump from cloud to cloud, cloud to ground, or even from the cloud to the air surrounding the thunderstorm. Lightning strikes can generate current levels of 30,000 to 40,000 amperes, with air temperatures often superheated to higher than 50,000 degrees Fahrenheit (hotter than the surface of the sun) and speeds approaching one-third the speed of light. Globally, there are about 2,000 thunderstorms occurring at any given time, and those thunderstorms cause approximately 100 lightning strikes to earth each second. In the United States, approximately 100,000 thunderstorms occur each year, and every one of those storms generates lightning. It is not uncommon for a single thunderstorm to produce hundreds or even thousands of lightning strikes. However, to the majority of the general public, lightning is perceived as a minor hazard. That perception lingers despite the fact that lightning damages many structures and kills and injures more people in the United States per year, on average, than tornadoes or hurricanes. Many lightning deaths and injuries could be avoided if people would have more respect for the threat lightning presents to their safety. Lightning deaths are usually caused by the electrical force shocking the heart into cardiac arrest or throwing the heartbeat out of its usual rhythm. Lightning can also cut off breathing by paralyzing the chest muscles or damaging the respiratory center in the brain stem. It takes only about one-hundredth of an ampere of electric current to stop the human heartbeat or send it into ventricular fibrillation. Lightning can also cause severe skin burns that can lead to death if complications from infection set in. Statistics compiled by the National Oceanic and Atmospheric Administration (NOAA) and the National Lightning Safety Institute (NLSI) for the period 1959-1994 revealed the following about lightning fatalities, injuries and damage in the United States:

Location of Lightning Strikes

40% are at unspecified locations
27% occur in open fields and recreation areas (not golf courses)
14% occur to someone under a tree (not on golf course)
8% are water-related (boating, fishing, swimming, etc.)
5% are golf-related (on golf course or under tree on golf course)
3% are related to heavy equipment and machinery
2.4% are telephone-related
6% are radio, transmitter and antenna-related

Gender of Victims

84% are male; 16% are female

Months of Most Strikes

July (30%); August (22%); June (21%)

d) Severe Winds

Severe winds are winds of 58 miles per hour or greater

Hazard Description

Severe winds spawned by thunderstorms or other storm events have had devastating effects on Michigan in terms of loss of life, injuries and property damage. According to data compiled by the National Weather Service for the period 1970-1996, Michigan experienced over 8,300 severe wind events (does not include tornadoes), which resulted in 98 deaths and millions of dollars in damage. It is important to note that the high number of severe wind events is due in part to the fact that the data was compiled by county; thus, multi-county storms are counted more than once. Severe wind events are characterized by wind velocities of 58 miles per hour or greater, with gusts sometimes exceeding 74
miles per hour (hurricane velocity). tree or caught by a downed utility line.

e) Snow and Ice storms

A period of rapid accumulation of snow often accompanied by high winds, cold temperatures, and low visibility.

Hazard Description

As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall in relatively short distances. The annual mean accumulation ranges from 30 to 170 inches of snow. The highest accumulations are in the northern and western parts of the Upper Peninsula. In Lower Michigan, the highest snowfall accumulations occur near Lake Michigan and in the higher elevations of northern Lower Michigan. Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds (35 miles per hour or greater) bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles that are windblown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. Just the cost of clearing the snow can be enormous. Most of the severe winter weather events that occur in Michigan have their origin as Canadian and Arctic cold fronts that move across the state from the west or northwest. Michigan is susceptible to moderate snowfall and extreme cold, averaging 90-180 days per year below freezing in the Lower Peninsula, and over 180 days below freezing in most of the Upper Peninsula. Saginaw County also has to deal with ice and sleet storms. Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is similar to hail only smaller and can be easily identified as frozen rain drops (ice pellets), which bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. When electric lines are downed, households may be without power for several days, resulting in significant economic loss and disruption of essential services in affected communities.

Hazard Number 2: Tornados

An intense rotating column of wind that extends from the base of a severe thunderstorm to the ground.

Hazard Description

Tornados in Michigan are most frequent in the spring and early summer when warm, moist air from the Gulf of Mexico collides with cold air from the Polar Regions to generate severe thunderstorms. These thunderstorms often produce the violently rotating columns of wind that are called tornados. Michigan lies at the northeastern edge of the nation's primary tornado belt, which extends from Texas and Oklahoma through Missouri, Illinois, Indiana, and Ohio. Most of a tornado's destructive force is exerted by the powerful winds that knock down walls and lift roofs from buildings in the storm's path. The violently rotating winds then carry debris aloft that can be blown through the air, becoming dangerous missiles. A tornado may have winds up to 300 miles per hour and an interior air pressure that is 10-20% below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles, but tracks much longer than that – even up to 200 miles – have been reported. Tornado path widths are generally less than one-quarter mile wide.

Tornado Intensity

Tornado intensity is measured on the Fujita Scale, which examines the damage caused by a tornado on homes, commercial buildings, and other man-made structures.

Magnitude Description Wind Speeds
F0 =Gale Tornado 42-72 m.p.h.
F1 =Moderate Tornado 73-112 m.p.h.
F2=Significant Tornado 113-157 m.p.h.
F3= Severe Tornado 158-206 m.p.h.
F4 =Devastating Tornado 207-260 m.p.h.
F5 =Incredible Tornado 261-318 m.p.h.

The Fujita Scale rates the intensity of a tornado based on damage caused, not by its size. It is important to remember that the size of a tornado is not necessarily an indication of its intensity. Large tornados can be weak, and small tornados can be extremely strong, and vice versa. It is very difficult to judge the intensity and power of a tornado while it is occurring. Generally, that can only be done after the tornado has passed, using the Fujita Scale as the measuring stick. According to the National Weather Service (NWS), since 1950, the vast majority of tornados that occurred in the United States (approximately 74%) were classified as weak tornados (F0 or F1 intensity). approximately 25% were classified as strong tornados (F2 or F3 intensity), and only 1% was classified as violent tornados (F4 or F5 intensity). Unfortunately, those violent tornados, while few in number, caused 67% of all tornado-related deaths nationally. Strong tornados accounted for another 29% of tornado-related deaths, while weak tornados caused only 4% of tornado-related deaths. If the data prior to 1950 is examined, the percentage of deaths attributable to violent tornados climbs drastically. That is largely due to the fact that tornado forecasting and awareness programs were not yet established. As a result, it was not uncommon for death tolls from a single tornado to reach several hundred. Typically, tornados last only a few minutes on the ground, but those few minutes can result in tremendous damage and devastation. Historically, tornados have resulted in tremendous loss of life, with the mean national annual death toll being 111 persons. Property damage from tornados is in the hundreds of millions of dollars every year.

Hazard Number 3: Structure Fires

A fire, of any origin, that ignites one or more structures, causing loss of life and/or property.

Hazard description

Structure fires are ranked as the number three hazard in Saginaw County. Structure fires are often referred to as the "universal hazard" because they occur in virtually every community. The highest risk is during winter months, when wood stoves and faulty heaters are used. Each year in the United States, fires result in approximately 5,000 deaths and 25,000 injuries requiring medical treatment. According to some sources, structure fires cause more loss of life and property damage than all types of natural disasters combined. Direct property losses due to fire exceed $9,000,000,000.00 per year – and much of that figure is the result of structure fire. Ironically, while the United States has made great strides in lessening deaths and injuries caused by other types of disasters, the problem of structure fires is worse in this Country than in many other industrialized countries (even those with a more densely developed population pattern). The United States Centers for Disease Control (CDC) Figures indicate that fire-associated mortality rates in the United States are approximately 2-3 times greater than those in many other developed countries.

Hazard Number 4: Hazardous Materials Incidents during Transportation

An uncontrolled release of hazardous materials during transport capable of posing a risk to life, health, safety, property or the environment.

Hazard Description

Hazardous materials incidents during transportation are ranked as the number four Hazard in Saginaw County. As a result of the extensive use of chemicals in our society, all Modes of transportation – highway, rail, air, marine, and pipeline – are carrying thousands of hazardous materials shipments on a daily basis through local communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people. Pipeline transportation accident issues are addressed in the "Oil or Natural Gas Well/Pipeline Accidents" section of this document. Refer to that section for information on those particular hazards. Michigan has had numerous hazardous material transportation incidents that affected the immediate vicinity of an accident site or a small portion of the surrounding community. Those types of incidents, while problematic for the affected community, are fairly commonplace. They are effectively dealt with by local and state emergency responders and hazardous material response teams. Larger incidents, however, pose a whole new set of problems and concerns for the affected community. Large-scale or serious hazardous material transportation incidents that involve a widespread release of harmful material (or have the potential for such a release) can adversely impact the life, safety and/or health and well-being of those in the immediate vicinity of the accident site, as well as those who come in contact with the spill or airborne plume. In addition, damage to property and the environment can be severe as well. Statistics show almost all hazardous

material transportation incidents are the result of an accident or other human error. Rarely are they caused simply by mechanical failure of the carrying vessel. Being surrounded by the Great Lakes, one of the most dangerous hazardous material transportation accident scenarios that could occur in Michigan would be a spill or release of oil, petroleum or other harmful materials into one of the lakes from a marine cargo vessel. Such an incident, if it involved a large quantity of material, could cause environmental contamination of unprecedented proportions. Fortunately, the Great Lakes states, working in partnership with oil and petroleum companies and other private industries, have taken significant steps to ensure that a spill of significant magnitude is not likely to occur on the Great Lakes. Heating fuel and motor fuel account for approximately 98% of all the hazardous materials that are being transported on today's roadways. The remaining 2% includes all other hazardous materials. Anhydrous ammonia is sprayed on farm fields, and is also used for air conditioning and refrigeration purposes. This would also be an extremely dangerous hazardous material if a release occurred during transportation.

Saginaw County Perspective:
Saginaw County has had numerous small-scale hazardous material transportation incidents that required a response by local fire departments and hazardous material teams, and many required the implementation of evacuation and other protective actions. As a major manufacturer, user and transporter of hazardous materials, Saginaw County remains vulnerable to the threat of a serious hazardous material transportation incident at any point in time. Also, Saginaw County is criss-crossed by major interstate routes and State trunk line roads, all of which are used by commercial traffic that may be transporting hazardous materials. To get an estimate of how many trucks may be carrying hazardous materials on these roads, MDOT's 2003 commercial traffic counts were used as a baseline. These counts are Average Daily Traffic (ADT) counts for major routes

Hazard Number 5: Flooding

The overflowing of rivers, streams, drains and lakes due to excessive rainfall, rapid snowmelt or ice.

Hazard Description
Flooding of land adjoining the normal course of a stream or river has been a natural occurrence since the beginning of time. If these floodplain areas were left in their natural state, flooding would not cause significant damage. Development has increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via a natural drainage basin, now quickly runs off streets, parking lots, and rooftops, and through man-made channels and pipes. Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption to emergency services, and result in fatalities. People may be stranded in their homes for several days without power or heat, or they may be unable to reach their homes at all. Long-term collateral dangers include the outbreak of disease, widespread animal death, broken sewer lines causing water supply pollution downed power lines, broken gas lines, fires, and the release of hazardous materials. Flood-prone areas are found throughout the state, as every lake, river, stream and county drain has a floodplain. The type of development that exists within the floodplain will determine whether or not flooding will cause damage. The Michigan Department of Environmental Quality estimates that about 6% of Michigan's land is flood-prone, which includes about 200,000 buildings in those areas. Floodplain areas are identified based on hydrological and topographical surveys, as well as, soil studies and land cover characteristics. The result of

this research is a statistical model that indicates an area vulnerable to the “100-year” flood. The term "100-year flood" is often used incorrectly and can be misleading. It does not refer to a certain flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1% chance of being equaled or exceeded each year. So actually, the 100-year flood could occur more than once in a relatively short period of time. It is also referred to as the "1% annual chance flood." 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. The 100-year flood only has a 1% chance of occurring in any given year, but structures located in the flood hazard area have a 26% chance of suffering flood damage during the term of a 30-year mortgage. This means a home in the mapped flood hazard area is five times more likely to be damaged by flood than to have a major fire. The southern half of the Lower Peninsula contains the areas with the most flood damage potential. The primary flooding sources include the Great Lakes and connecting waters (Detroit River, St. Clair River, and St. Mary’s River), thousands of miles of rivers and streams, and hundreds of inland lakes. Michigan is divided into 63 major watersheds. All of these watersheds experience flooding, although the following watersheds have experienced the most extensive flooding problems or have significant damage potential: 1) Clinton River; 2) Ecorse River; 3) Grand River; 4) Huron River; 5) Kalamazoo River; 6) Muskegon River; 7) Saginaw River; 8) Rifle River; 9) River Raisin; 10) Rouge River; 11) St. Joseph River; and 12) Whitefish River. The flooding is not restricted to the main
branches of these rivers. Most river line flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on watercourses with smaller drainage areas. Oftentimes, flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. This type of flooding is becoming increasingly prevalent in Michigan, as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the tremendous flow of water that often accompanies storm events. Typically, the result is water backing up into basements, which damages mechanical systems and can create serious public health and safety concerns.

Hazard Number 6: Public Health Emergency

A widespread and/or severe epidemic, incident of contamination, or other situation that resents a danger to or otherwise negatively impacts the general health and well being of the public.

Hazard Description

Public health emergencies are ranked as the number six hazard in Saginaw County. Public health emergencies can take many forms – disease epidemics, large-scale incidents of food or water contamination, extended periods without adequate water and sewer services, harmful exposure to chemical, radiological or biological agents, and large-scale infestations of disease-carrying insects or rodents – to name just a few. Public health emergencies can occur as primary events by themselves, or they may be secondary events to another disaster or emergency such as a flood, tornado, or a hazardous materials incident. The common

characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people. Public health emergencies can be statewide, regional, or localized in scope and magnitude. Perhaps the greatest emerging public health hazard would be the intentional release of a radiological, chemical or biological agent to adversely impact a large number of people. Such a release would most likely be an act of terrorism aimed at the government or a specific organization or segment of the population. Fortunately, to date, Michigan has not yet experienced such a release aimed at mass destruction. However, it is probably only a matter of time before an incident of that nature and magnitude does occur. If and when it does, the public health implications – under the right set of circumstances – could be staggering.

County Perspective:
Like the rest of the United States and the world, Saginaw County has had serious outbreaks of diseases like smallpox, mumps, and influenza. It has been many years since the county has had to deal with diseases like polio, which gripped the country in the '50s. Saginaw County is susceptible to health emergencies such as the recent Severe Acute Respiratory Syndrome (SARS) outbreak in nearby Canada, the West Nile Virus, and the meningitis outbreaks that occur sporadically on local college campuses.

Hazard Number 7: Infrastructure Failure

The failure of critical public or private utility infrastructure resulting in a temporary loss of essential functions and/or services.

Hazard Description
Infrastructure failure is ranked as the number seven hazard in Saginaw County. Michigan's citizens are dependent on the public and private utility infrastructure to provide essential life supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet interrelated systems fail due to disaster or other cause, even for a short period of time, it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can die in their homes if immediate mitigative action is not taken. When the water or wastewater treatment systems in a community are inoperable, serious public health problems arise that must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or capacity overload, serious flooding can occur. These are just some examples of the types of infrastructure failures that can occur, and all of these situations can lead to disastrous public health and safety consequences if immediate mitigative actions are not taken. Typically, it is the most vulnerable members of society (i.e., the elderly, children, impoverished individuals, and people in poor health) that are the most heavily impacted by an infrastructure failure. If the failure involves more than one system, or is large enough in scope and magnitude, whole communities and possibly even regions can be severely impacted. Refer to the "Dam Failure" and "Oil or Natural Gas Well/Pipeline Accidents" sections for more information on those particular types of infrastructure failure

Hazard Number 8: Transportation Accident (Bus, Airplane, Train)

A crash or accident involving an air, land or water-based commercial passenger carrier resulting in death or serious injury.

Hazard Description
Transportation accidents are ranked as the number eight hazard in Saginaw County. In terms of commercial passenger transportation service, Michigan has approximately: 1) 19 airports that offer commercial air passenger service; 2) 130 certified intercity passenger bus carriers providing service to 220 communities; 3) 72 local bus transit systems serving 85 million passengers; 4) 19 marine passenger ferry services; and 5) 3 intercity rail passenger routes operating on 568 miles of track, along 3 corridors, serving 22 communities. Air Transportation Accidents There are four circumstances that can result in an air transportation accident: 1) an airliner colliding with another aircraft in the air; 2) an airliner crashing while in the cruise phase of a flight due to mechanical problems, sabotage, or other cause; 3) an airliner crashing while in the takeoff or landing phase of a flight; or 4) two or more airlines colliding with one another on the ground during staging or taxi operations. When responding to any of these types of air transportation accidents, emergency personnel may be confronted with a number of problems, such as: 1) suppressing fires; 2) rescuing and providing emergency first aid for survivors; 3) establishing mortuary facilities for victims; 4) detecting the presence of explosive or radioactive materials; 5) providing crash site security, crowd and traffic control, and protection of evidence.

Land transportation accident in Michigan could involve a commercial intercity passenger bus, a local public transit bus, a school bus, or an intercity passenger train. Although these modes of land transportation have a good safety record, accidents do occur. Typically, bus accidents are caused by the bus slipping off the roadway in inclement weather, or colliding with another vehicle. Intercity passenger train accidents usually involve a collision with a vehicle attempting to cross the railroad tracks before the train arrives at the crossing. Unless the train accident results in a major derailment, serious injuries are usually kept to a minimum. Bus accidents, on the other hand, can be quite serious, especially if the bus has tipped over. Numerous injuries are a very real possibility
in these types of situations.

Hazard Number 9: Hazardous Materials Incidents at Fixed Sites

An uncontrolled release of hazardous materials from a fixed site capable of posing risk to life, health, safety, property, or the environment.

Hazard Description
Hazardous materials incidents at fixed sites are ranked as the number nine hazard in Saginaw County. Over the past few decades, new technologies have developed at a stunning pace. As a result, hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other facilities in our communities. Hazardous materials are materials or substances which, because of their chemical, physical, or biological nature, pose a potential risk to life, health, property, or the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gasses. Hazardous materials are highly regulated by federal and state agencies to reduce risk to the general public and the environment. Despite precautions taken to ensure careful handling during the manufacture, transport, storage, use, and disposal of these materials, accidental releases do occur. Often, these releases can cause severe harm to people or the environment if proper mitigative action is not immediately taken. Most releases are the result of human error. Occasionally, releases can be attributed to natural causes, such as a flood that washes away barrels of chemicals stored at a site. However, those situations are the exception rather than

the rule. In 1986, the President signed into law the Superfund Amendments and Reauthorization Act (SARA). Included under Title III of SARA was the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), commonly known as SARA Title III. SARA Title III is meant to encourage and support emergency planning efforts at the State and local levels and to provide the public and local units of government with information concerning potential chemical hazards present in their communities.
Determining if a facility is subject to emergency planning requirements is straightforward. The Environmental Protection Agency (EPA) publishes a list of Extremely Hazardous Substances (EHS). For each EHS, the list identifies and describes the chemical, and includes a number called a Threshold Planning Quantity (TPQ). The TPQ, expressed in pounds, is the key number. If a facility has within its boundaries an amount of an EHS equal to or in excess of its TPQ, then Section 302 of SARA Title III requires that the facility is subject to emergency planning requirements and must notify both the State Emergency
Response Commission (SERC) and the Local Emergency Management Office of this fact. The facility must also identify an emergency response coordinator who works with the Local Emergency Management Office on developing and implementing the local emergency plan at the facility. This regulation applies even if the chemical is on site for only a day. There are no exemptions for emergency planning notification.

Hazard Number 10: Civil Disturbance

A public demonstration or gathering, or a prison uprising, that results in a disruption of essential functions; rioting, looting, arson or other unlawful behavior.

Hazard Description

Civil disturbance is ranked the number ten hazard in Saginaw County. Large-scale civil disturbances rarely occur, but when they do they are usually an offshoot or result of one or more of the following events: 1) labor disputes where there is a high degree of animosity between the participating parties; 2) high profile/controversial judicial proceedings; 3) the implementation of controversial laws or other governmental actions; 4) resource shortages caused by a catastrophic event; 5) disagreements between special interest groups over a particular issue or cause; or 6) a perceived unjust death or injury to a person held in high esteem or regard by a particular segment of society. Prison uprisings are normally the result of perceived injustice by inmates regarding facility rules, operating policies and/or living conditions, or insurrections started by rival groups or gangs within the facility. Saginaw County has experienced many labor strikes over the years, and rallies concerning jobs and politics.

Hazard Number 11: Extreme Temperatures

Prolonged periods of very high or very low temperatures, often accompanied by other Extreme meteorological conditions.

Hazard Description

Extreme temperatures are ranked as the number eleven hazard in Saginaw County. This county is susceptible to both extreme heat and extreme cold. It is not uncommon to have a 40-degree swing in temperature within a 24-hour period. Prolonged periods of extreme temperatures, whether extreme summer heat or extreme winter cold, can pose severe and

often life-threatening problems for Michigan's citizens. Although they are radically different in terms of initiating conditions, the two hazards share a commonality in that they both primarily affect the most vulnerable segments of the population – the elderly, children, impoverished individuals, and people in poor health.

Extreme Summer Heat

Extreme summer weather is characterized by a combination of very high temperatures and exceptionally humid conditions. When persisting over a long period of time, this phenomenon is commonly called a heat wave. The major threats of extreme summer heat are heatstroke (a major medical emergency), and heat exhaustion. Heatstroke often results in high body temperatures, and the victim may be delirious, comatose, or fall into a stupor. Rapid cooling is essential to preventing permanent neurological damage or death. Heat exhaustion is a less severe condition than heatstroke, although it can still cause severe problems such as dizziness, weakness and fatigue. Heat exhaustion if often the result of fluid imbalance due to increased perspiration in response to the intense heat. Treatment generally consists of restoring fluids and staying indoors in a cooler environment until the body returns to normal. Other, less serious risks associated with extreme summer heat are often exercise-related and include heat syncope (a loss of consciousness by persons not acclimated to hot weather), and heat cramps (an imbalance of fluids that occurs when people unaccustomed to heat exercise outdoors).

Because the combined effects of high temperatures and high humidity are more intense in urban centers, heatstroke and heat exhaustion are a greater problem in cities than in suburban or rural areas. Nationwide, approximately 200 deaths a year are directly attributable to extreme heat. Extreme summer heat is also hazardous to livestock and agricultural crops, and it can cause water shortages, exacerbate fire hazards, and prompt excessive demands for energy. Roads, bridges, railroad tracks and other infrastructure are susceptible to damage from extreme heat. Air conditioning is probably the most effective measure for mitigating the effects on extreme summer heat on people. Unfortunately, many of those most vulnerable to this hazard do not live or work in air conditioned environments, especially in major urban centers where the vulnerability is highest. The use of fans to move air may help some, but recent research indicates that increased air movement may actually exacerbate heat stress in many individuals.

Extreme Winter Cold

Like heat waves, periods of prolonged, unusually cold weather can result in a significant number of temperature-related deaths. Each year in the United States, approximately 700 people die as a result of severe cold temperature-related causes. This is substantially higher than the average of 200 heat-related deaths each year. It should be noted that a significant number of cold-related deaths are not the direct result of “freezing” conditions. Rather, many deaths are the result of illnesses and diseases that are negatively impacted by severe cold weather, such as stroke, heart disease and pneumonia. It could convincingly be argued that, were it not for the extreme cold temperatures, death in many cases would not have occurred at the time it did from the illness or disease alone. Hypothermia (the unintentional lowering of core body temperature), and frostbite (damage from tissue being frozen) are probably the two conditions most closely associated with cold temperature-related injury and death. Hypothermia is usually the result of over-exposure to the cold, and is generally thought to be clinically significant when core body temperature reaches 95 degrees or less. As body temperature drops, the victim may slip in and out of consciousness, and appear confused or disoriented. Treatment normally involves re-warming the victim, although there is some

controversy in the medical community as to exactly how that should be done. Frostbite rarely results in death, but in extreme cases it can result in amputation of the affected body tissue. Hypothermia usually occurs in one of two sets of circumstances. One situation involves hypothermia associated with prolonged exposure to cold while participating in outdoor sports such as skiing, hiking, or camping. Most victims of this form of hypothermia tend to be young, generally healthy individuals who may lack experience in dealing with extreme cold temperatures. The second situation involves a particularly vulnerable person who is subjected to only a moderate, indoor cold stress. A common example would be that of an elderly person living in an inadequately heated home. In such circumstances, hypothermia may not occur until days or perhaps weeks after the cold stress begins. The special vulnerability of elderly persons to hypothermia has become readily apparent. Over half of the approximately 700 persons who die each year due to cold exposure are 60 years of age or older, even though this age group only represents about 20% of the country's population. This remarkable statistic may be due, in part, to the fact that elderly persons appear to perceive cold less well than younger persons and may voluntarily set thermostats to relatively low temperatures. In addition, high energy costs and the relative poverty among some elderly people may discourage their setting thermostats high enough to maintain adequate warmth. Because many elderly people live alone and do not have regular visitors, the cold conditions may persist for several days or weeks, thus allowing hypothermia to set in. Babies and very young children are also very vulnerable to hypothermia. In addition, statistics indicate that death due to cold is more frequent among males than females in virtually all age groups. Part of that may be explained by differences in risk factors, and part may be due to different rates of cold exposure between the sexes.

Hazard Number 12: Drought

A water shortage caused by a deficiency of rainfall, generally lasting for an extended period of time.

Hazard Description

Drought is a normal part of the climate of Michigan and of virtually all other climates around the world – including areas with high and low average rainfall. Drought differs from normal arid conditions found in low rainfall areas in that aridity is a permanent characteristic of that type of climate. Drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. The severity of a drought depends not only on its location, duration, and geographical extent, but also on the water supply demands made by human activities and vegetation. This multi-faceted nature of the hazard makes it difficult to define a drought and assess when and where one is likely to occur. Drought differs from other natural hazards in several ways. First, it is difficult to determine the exact beginning and end of a drought, since its effects may accumulate slowly and linger even after the event is generally thought of as being over. Second, the lack of a clear-cut definition of drought often makes it difficult to determine whether one actually exists, and if it does, its degree of severity. Third, drought impacts are often less obvious than other natural hazards, and they are typically spread over a much larger geographic area. Fourth, due primarily to the aforementioned reasons, most communities do not have in place any contingency plans for addressing drought. This lack of pre-planning can greatly hinder a community's response capability when a drought does occur. Droughts can cause many severe impacts on communities and regions, including: 1) water shortages for human consumption, industrial, business and agricultural uses, power generation, recreation and navigation; 2) a drop in the quantity and quality of agricultural

crops; 3) decline of water quality in lakes, streams and other natural bodies of water; 4) malnourishment of wildlife and livestock; 5) increase in wildfires and wildfire-related losses

Hazard Number 13: Oil and Natural Gas Pipeline Accidents

An uncontrolled release of oil or natural gas, or the poisonous by-product hydrogen sulfide, from a pipeline.

Hazard Description

Accidents from oil and natural gas pipelines are ranked as the number thirteen hazard in Saginaw County. Gas and oil in Michigan is imported by five interstate pipeline companies that have access to the major natural gas producing regions in North America. Michigan cycles more natural gas through its storage system than any other state. Michigan's gas and petroleum networks are highly developed and extensive, representing every sector of the two industries – from wells and production facilities, to cross-country transmission pipelines that bring the products to market, to storage facilities, and finally to local distribution systems. Even though pipelines are by far the safest form of transportation for these products, the threat of fires, explosions, ruptures, and spills nevertheless exists. Petroleum and natural gas pipelines can leak or erupt and cause property damage, environmental contamination, injuries, and even loss of life. The vast majority of pipeline accidents that occur in Michigan are caused by third party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations. In addition to these hazards, many of Michigan's oil and gas wells contain extremely poisonous hydrogen sulfide (H_2S) gas. Hydrogen sulfide is a naturally occurring gas mixed with natural gas or dissolved in the oil or brine and released upon exposure to atmospheric conditions. Over 1,300 wells in Michigan have been identified as having H_2S levels exceeding 300 parts per million (ppm). At concentrations of 700 ppm, as little as one breath of hydrogen sulfide can be deadly. Although hydrogen sulfide can be detected by a "rotten egg" odor in concentrations from .03 ppm to 150 ppm, larger concentrations paralyze a person's olfactory nerves so that odor is no longer an indicator of the hazard. Within humans, small concentrations can cause coughing, nausea, severe headaches, irritation of mucous membranes, vertigo, and loss of consciousness. Hydrogen sulfide forms explosive mixtures with air at temperatures of 500 degrees Fahrenheit or above, and is dangerously reactive with powerful oxidizing materials. Hydrogen sulfide can also cause the failure of high-strength steels and other metals. This requires that all company and government responders be familiar not only with emergency procedures for the site, but also with the kinds of materials that are safe for use in sour gas response.

Hazard Number 14: Terrorism

An intentional unlawful use of force, violence or subversion against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives.

Hazard Description

Terrorism is ranked as the number fourteenth hazard in Saginaw County. In today's world, terrorism can take on many forms, although civilian bombings, assassination and extortion are probably the methods with which we are most familiar. Internationally, such acts have,

unfortunately, become quite commonplace, as various religious, ethnic, and nationalistic groups have attempted to alter and dictate political agendas, seek revenge for perceived past wrongdoing, or intentionally disrupt the political, social and economic infrastructure of individual businesses, units of government, or nations. The Middle East, in particular, and parts of Europe have been hard hit by acts of terrorism over the past several decades. Parts of Asia and South America have also experienced a high level of activity. Tragically, with the events of September 11th, terrorism has now occurred on our own soil. Equally alarming is the rapid increase in the scope and magnitude of terrorism methods and threats, which now include: 1) nuclear, chemical and biological weapons; 2) information warfare; 3) ethnic/religious/gender intimidation (hate crimes); 4) state and local militia groups that advocate the overthrow of our government; 5) eco-extremism, designed to destroy or disrupt specific research or resource related activities; and 6) widespread and organized narcotics (and other contraband) smuggling and distribution organizations. Just as the methods and potential instigators have increased, so too have the potential targets of terrorism. As recent events across the country have shown, virtually any Deaths

Hazard Number 15: Wildfires

An uncontrolled fire in grasslands, brush lands or forested areas.

Hazard Description

Wildfires are ranked as the number fifteen hazard in Saginaw County. Forests cover approximately 49% (18.2 million acres) of Michigan's total land base. These vast forests provide Michigan with the largest state owned forest system in the United States. In addition, Michigan has the fifth largest timberland acreage, with 4.2 million acres of softwoods and 13.1 million acres of hardwoods. That vast forest cover is a boon for both industry and recreation. However, it also makes many areas of Michigan highly vulnerable to wildfires. Although Michigan's landscape has been shaped by wildfire, the nature and scope of the wildfire threat has changed. Because Michigan's landscape has changed substantially over the last several decades due to wild land development, the potential danger from wildfires has become more severe. Increased development in and around rural forested areas (a 63% increase in the number of rural homes during the 1980s) has increased the potential for loss of life and property from wildfires. There are simply not enough fire suppression forces available in rural areas to protect every structure from wildfire. Contrary to popular belief, lightning strikes are **not** the primary cause of wildfires in Michigan. Today, only about 2% of all wildfires in Michigan are caused by lightning strikes; the rest are caused by human activity. Outdoor burning is the leading cause of wildfires in Michigan. Most Michigan wildfires occur close to where people live and recreate, which puts both people and property at risk. The immediate danger from wildfires is the destruction of timber, property, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area.

Hazard Number 16: Oil and Natural Gas Well Accidents

An uncontrolled release of oil or natural gas, or the poisonous by-product hydrogen sulfide, from production wells.

Hazard Description

Accidents from oil and natural gas wells are ranked as the number sixteenth hazard in Saginaw County. Oil and natural gas are produced from fields scattered across 61 counties in the Lower Peninsula. Since 1925, over 41,000 oil and natural gas wells have been drilled in

Michigan, of which roughly half have produced oil and gas. To date, Michigan wells have produced approximately 1.2 billion barrels of crude oil and 3.6 trillion cubic feet of gas. The petroleum and natural gas industry is highly regulated and has a fine safety record, but the threat of accidental releases, fires and explosions still exists.

Michigan is both a major consumer and producer of natural gas and petroleum products. According to the Michigan Public Service Commission (MPSC), approximately 25% of the natural gas consumed in Michigan is produced within the state. The remaining 75% is imported by five interstate pipeline companies that have access to the major natural gas producing regions in North America. Michigan cycles more natural gas through its storage system than any other state. Michigan ranks 11th in the nation in production of natural gas, and ranks 6th in consumption at 937.2 billion cubic feet. Michigan's petroleum product consumption in 1997 was 189 million barrels, ranking it 10th nationally. These figures underscore the fact that vast quantities of petroleum and natural gas are extracted from, transported through, and stored in the state, making many areas vulnerable to petroleum and natural gas emergencies. Michigan's gas and petroleum networks are highly developed and extensive.

Hazard number 17: Dam Failure

The collapse or failure of an impoundment resulting in downstream flooding.

Hazard Description

Dam failures are ranked as the number seventeenth hazard in Saginaw County. A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Dam failures occur not only during flood events, which may cause overtopping of a dam, but also as a result of poor operation, lack of maintenance and repair, and vandalism. Such failures can be catastrophic because they occur unexpectedly, with no time for evacuation. The Michigan Department of Environmental Quality (MDEQ) has documented approximately 263 dam failures throughout Michigan. There are over 2,400 dams in the state of Michigan and about 935 of them are regulated by Part 315 of the Dam Safety Program. Dams are regulated when they are over 6 feet in height, and when over 5 acres are impounded during the design flood. (a flood that does not exceed the magnitude of the discharge for the design frequency.) Permits are required for construction and repair of regulated dams. Inspection reports are also required every three to five years for dams based on their hazard potential rating. The hazard potential rating is determined by the Dam Safety Program, and is based on an assessment of the potential for loss of life, property damage, and environmental damage in the area downstream of a dam in the event of dam failure or failure of appurtenant works. Hazard potential rating is not based upon the structural or hydraulic condition of the dam. The definitions for the hazard classification as specified in the state's Dam Safety Statute, Part 315, Dam Safety, of Act 451, P.A. 1994 are as follows:

"Low hazard potential dam" means a dam located in an area where failure may cause damage limited to agriculture, uninhabited buildings, structures, or township or county roads, where environmental degradation would be minimal, and where danger to individuals is slight or nonexistent.

"Significant hazard potential dam" means a dam located in an area where its failure may cause damage limited to isolated inhabited homes, agricultural buildings, structures, secondary highways, short line railroads, or public utilities, where environmental degradation may be significant, or where danger to individuals exists.

"High hazard potential dam" means a dam located in an area where a failure may cause serious damage to inhabited homes, agricultural buildings, campgrounds, recreational facilities, industrial or commercial buildings, public utilities, main highways, or Class I carrier railroads, or where environmental degradation would be significant, or where danger to individuals exists with the potential for loss of life.

Part 315 of the Dam Safety Program also requires that dam owners prepare and keep current, Emergency Action Plans (EAP) for all high hazard and significant hazard potential dams. An EAP is a plan developed by the owner that establishes notification procedures for its departments, public off-site authorities, and other agencies of the emergency actions to be taken before and following an impending or actual dam failure. After the events of September 11th, it became evident that dams could be attractive targets to terrorists. Dam failures could not only cause enormous loss of life and property and infrastructure damage, but could have residual long-lasting social, economic, and public health impacts

Hazard Number 18: Scrap Tire Fires

A large fire that burns scrap tires which are being stored for recycling or re-use.

Hazard Description

Scrap tire fires are ranked the number eighteenth hazard in Saginaw County. With the disposal of an estimated 250 million vehicle tires annually in the United States, management of scrap tires has become a major economic and environmental issue. Michigan generates some 7.5 to 9 million scrap tires each year. Although responsible means of disposal have become more common, tire dumps of the last forty years present environmental and safety hazards that will last into the foreseeable future. The estimated 296,500 scrap tires in Saginaw County is an alarm for severe emergencies and disaster. The State of Michigan has identified a total in excess of 15 million scrap tires in disposal sites scattered around the state. (Note: some estimates place the number at closer to 30 million scrap tires.) Issues pertaining to the management of scrap tire disposal sites are difficult and diverse. Whole tires are difficult to landfill because they tend to float to the surface, and are banned by many licensed landfills due to associated problems. In addition, scrap tires are breeding grounds for mosquitoes, which can reproduce at 4,000 times their natural rate in a scrap tire disposal site. From an emergency management perspective, the most serious problem that scrap tire disposal sites pose is that they can be a tremendous fire hazard if not properly designed and managed.

Hazard Number 19: Nuclear Attack

Any large-scale hostile action taken against the United States which involves nuclear weapons and results in destruction of military and/or civilian targets.

Hazard Description

Nuclear attack is ranked the number nineteenth hazard in Saginaw County. The United States is vulnerable to a number of national security threats from external, hostile forces. National security threats include nuclear attack, chemical and biological warfare, and terrorism. The potential for damage resulting from a national security emergency ranges from the relatively localized damage caused by a terrorist attack using weapons of mass

destruction, to the catastrophic devastation that could be expected following a full-scale nuclear attack. World events in recent years have greatly changed the nature of the nuclear attack threat against the United States. The breakup of and establishment of democratic forms of government in the former Soviet Union and other Soviet-Bloc nations in Eastern Europe has essentially ended the "Cold War" that shaped and influenced world politics since the late 1940s. That tremendous turn of events has, for all intents and purposes, reduced the need for the United States and former Soviet states to maintain huge stockpiles of nuclear weapons. The reduction in nuclear weapons stockpiles that has occurred over the past few years in both countries has diminished the threat of a full-scale, massive nuclear attack that would threaten the very existence of the world as we know it. However, while the threat of attack is diminished, it is still a possibility due to the large number of nuclear weapons still in existence in present-day Russia and throughout the rest of the world. Even though an International Nuclear Non-Proliferation Treaty is in place, several countries are thought to be actively pursuing the development of nuclear weapons. In addition, internal instability and strife within Russia and some of its neighboring weapons systems remain on high alert, which increases the risk of an accidental nuclear launch that could spawn a nuclear counter-attack. Given the state of Russia's aging nuclear technical systems, that scenario is not out of the realm of possibility. Although the nature and scope of an attack at this time would likely be reduced from previous possibilities, the potential impact on the country would still be devastating.

Despite the fact that it is based on a fully-armed and functional Soviet Union as an adversary, the Federal Emergency Management Agency (FEMA) attack planning guidance provided in the document "Nuclear Attack Planning Base 1990" (NAPB-90) remains the basis for the population protection strategy adopted for Michigan. This strategy is incorporated in the Michigan Emergency Management Plan (MEMP) and most local Emergency Operations Plans (EOP). The NAPB report identifies potential aiming points or target areas throughout the United States. These targets were categorized into seven classifications: 1) commercial power plants; 2) chemical facilities; 3) counterforce military installations; 4) other military bases; 5) military support industries; 6) refineries; and 7) political targets. The potential size, or yield, and the height of burst were postulated for each target. The State of Michigan has 25 target areas. In addition, four target areas near the Ohio and Indiana borders directly affect Michigan jurisdictions. The NAPB report was an attempt by FEMA to develop a risk assessment of a potential attack upon the United States. Targets are identified using specific criteria, part of which involved the target's importance to counter attack measures. For this reason, not all chemical facilities, for example, are included. Further, designation as a target area does not imply that all targets will be affected equally. The NAPB-90 planning base is, by design, a worse case nuclear scenario. Even though the situation in the former Soviet Union and its neighboring countries has changed dramatically, the NAPB report still contains some valid assumptions about a potential nuclear attack upon the United States.

Hazard Number 20: Subsidence (Sinkholes)

The lowering or collapse of the land surface caused by natural or human induced activities that erode or remove subsurface support.

Hazard Description

Subsidence is ranked as the number twenty hazard in Saginaw County. Subsidence can be caused by a variety of natural or human-induced activities. Natural subsidence occurs when the ground collapses into underground cavities produced by the solution of limestone or other

soluble materials by groundwater. Human-induced subsidence is caused principally by groundwater withdrawal, drainage of organic soils, and underground mining. In the United States, these activities have caused nearly 17,000 square miles of surface subsidence, with groundwater withdrawal (10,000 square miles of subsidence) being the primary culprit. In addition, approximately 18% of the Unites States land surface is underlain by cavernous limestone, gypsum, salt, or marble, making the surface of these areas susceptible to sinkholes. Generally, subsidence poses a greater risk to property than to life. Nationally, the average annual damage from all types of subsidence is conservatively estimated to be at least $125 million.

In Michigan, the primary cause of subsidence is underground mining. Although mine subsidence is not as significant a hazard in Michigan as in other parts of the country, many areas in Michigan are potentially vulnerable to mine subsidence hazards. Mine subsidence is a geologic hazard that can strike with little or no warning and can result in very costly damage. Mine subsidence occurs when the ground surface collapses into underground mined areas. In addition, the collapse of improperly stabilized mine openings is also a form of subsidence. Mine subsidence generally affects very few people, unlike other natural hazards that may impact a large number of people. Mine subsidence can cause damage to buildings, disrupt underground utilities, and be a potential threat to human life. In extreme cases, mine subsidence can literally swallow whole buildings or sections of ground into sinkholes, endangering anyone that may be present at that site. Mine subsidence may take years to manifest. Examples of collapses occurring 100 years after mines were abandoned have been documented in several areas of the country.

Hazard Number 21: Nuclear Power Plant Accidents

An actual or potential release of radioactive material at a commercial nuclear power plant or other nuclear facility, in sufficient quantity to constitute a threat to the health and safety of the off-site population.

Hazard Description

Nuclear power plant accidents are ranked as hazard number twenty one in Saginaw County. Though the construction and operation of nuclear power plants are closely monitored and regulated by the Nuclear Regulatory Commission (NRC), accidents at these plants are considered a possibility and appropriate on-site and off-site emergency planning is conducted. An accident could result in the release of potentially dangerous levels of radioactive materials into the environment that could affect the health and safety of the public living near the nuclear power plant. A nuclear power plant accident might involve both a release of air borne radioactive materials and radioactive contaminate of the environment around the plant. The degree and area of environmental contamination could vary greatly depending on the type and amount of radioactivity and weather conditions. Response to a nuclear power plant accident requires specialized personnel who have been trained to handle radioactive materials safely, who have specialized equipment to detect and monitor radiation, and who are trained in personal radiation exposure control.

Saginaw County Perspective:

Nuclear power plant accidents are not considered a threat in Saginaw County, due to the fact that none exist in the county. The closest one is about 125 miles away from Saginaw. It is the Fermi 2 Nuclear Power Station located in Newport, Michigan. There are also two other nuclear power plant facilities operating in Michigan. These are the Cook Nuclear Plant, which is located north of Bridgman along Lake Michigan, and the Palisades Nuclear Plant near

South Haven. Michigan's fourth nuclear facility, Big Rock Point, was located near Charlevoix, but stopped generating electricity in 1997. The facility was scheduled to be turned into a "Greenfield" area in 2004.

Hazard Number 22: Earthquake

A shaking or trembling of the crust of the earth caused by the breaking and shifting of rock beneath the surface.

Hazard Description

Earthquakes are ranked as number twenty two in Saginaw County. Earthquakes range in intensity from slight tremors to great shocks. They may last a few seconds to several minutes, or come as a series of tremors over a period of several days. The energy of an earthquake is released in seismic waves. Earthquakes usually occur without warning. In some instances, advance warnings of unusual geophysical events may be issued. However, scientists cannot yet predict exactly when or where an earthquake will occur. Earthquakes tend to strike repeatedly along fault lines, which are formed where large plates of the earth's crust below the surface constantly push and move against one another. Risk maps have been produced which show areas where an earthquake is more likely to occur. Earthquake monitoring is conducted by the United States Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), and universities throughout the country. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Most casualties result from falling objects and debris. Disruption of communication systems, and damage to electric power lines, gas, sewer and water mains can be expected. Water supplies can become contaminated by seepage around water mains. Damage to roadways and other transportation systems may create food and other resource shortages if transportation is interrupted. In addition, earthquakes may trigger other emergency situations such as fires and hazardous material spills, thereby compounding the situation.

Saginaw County Perspective:

Earthquakes are not considered a threat because the nearest recorded fault line is no closer than the lower third of the state, and there is no record of an earthquake in Saginaw County. Also, Michigan is only ranked number 36 out of 50 states.

STRATAGIES SUMMARY'S

WITH INDIVIDUAL FOCUS

UNIQUE TO EACH OF

SAGINAW COUNTY TOP RANKED

HAZARD EVENTS

MITIGATION STRATGIES FOR INCLEMENT WEATHER SEVERE WINDS, THUNDERSTORMS, HAIL LIGHTING, SNOW AND ICE STORM

- Increased weather radio coverage both AM & FM
- Emergency generators for police and fire departments, special needs facilities and community shelters
- Routine and aggressive local tree trimming activities
- Increase the public awareness regarding these weather events, and where to look for assistance in weather emergencies
- Stand by power for water plans, pump stations and booster pumping stations
- Interoperability of radio system between all key agencies and organization

MITIGATION STRATEGIES FOR TORNADOS

- Insure appropriate wind engineering measures and construction techniques used to strengthen public and private structures against severe wind damage is in place
- Proper anchoring of manufactured homes
- Establish safe and appropriate locations for temporary debris disposal sites

MITIGATION STRATEGIES FOR STRCTURE FIRES

- Regular and progressive fire department training
- Fast response training, with emphases on the less senior employees
- Review and update fire department equipment as necessary
- Public education on fire safety
- Enforce existing codes
- Interoperability of radio systems between all key agencies and organization

MITIGATION STRATGIES FOR HAZARD MITIGATION TRANPORTATION

- Train, plan and prepare for hazardous material incidents along roadway and railways
- Insure compliance with the enforcement of USDOT and MMOT regulation regarding hazardous materials transport
- Create evacuation plans and insure active steps are taken to inform the community of such
- Train, equip and prepare local hazardous materials emergency response teams and search and resolve teams
- Local zoning practice to locate schools, nursing homes and other facilities away from major hazardous material transportation routes
- Interoperability of radio system between all key agencies and organizations

MITIGATION STRATEGIES FOR FLOODING

- Map all floodplains
- Identify all structures in the floodplain
- Encourage removal of existing mobile home parks from floodplains
- Adopt and enforce land use regulation to prevent development in floodplains
- Review and update disaster response plan regularly
- Insure all key agencies have generous amounts of emergency generators
- Interoperability of radio systems between all key agencies and organizations

MITIGATION STRATEGIES FOR PUBLIC HEALTH EMERGENCIES

- Development of community risk assessment tools, and plans regarding specific strategies to implement should need arise
- Develop emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, recreation areas, and other appropriate sites
- Establish and participate in avenues of collaboration with revelant community agencies to insure information and resulting in a "same page" atmosphere of responding to an incident
- Interoperability of radio system between all key agencies and organizations

MITIGATION STRATEGIES FOR INFRASTRCUTRE FAILURE

- Regularly identify deficiencies in infrastructures
- Emergency generators
- Shelters
- Emergency water supply
- Maintain and repair infrastructure as necessary
- Review/update disaster response plan regularly
- Interoperability of radio systems between all key agencies and organization

MITIGATION STRATEGIES FOR TRANSPORTATION ACCIDENTS

- Ongoing training directed at first responder
- Enforcement safety regulations
- Safety training for transit, airplane and train operators
- Update disaster response plan as necessary
- Interoperability of radio system between all key agencies and organizations

MITIGATION STRATGEIES FOR HAZARD MITIGATION FIXED SITE INCIDENT

- Development of a through community risk and threat assessment that identifies potential emergencies
- Encourage residents to develop a family disaster plan
- Implement school safety programs

- Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, recreation areas and other appropriate sites
- Interoperability of radio systems between all key agencies and organizations

MITIGATION STRATEGIES FOR CIVIL DISTRUBUNANCE EMERGENCIES

- Development of a through community risk and threat assessment that identifies potential vulnerabilities
- Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, creations areas, and other appropriate sites
- Establish avenues of reporting information preventing incidents
- Interoperability of radio systems between all key agencies and organizations

MITIGATION STRATEGIES FOR EXTREME TEMPERATURES

- Ample and available emergency generators
- Community shelter sites published
- Public information on safety during extreme temperatures
- Interoperability of radio systems between all key agencies and organization

MITIGATION STRATEGIES FOR DROUGHT

- Ample water supply
- Water rationing if conditions demand
- Public information and education regarding water conservation
- Interoperability of radio systems between all key agencies and organizations

MITGATION STRATEGIES FOR WILDFIRES

- Enforce local ordinances that require born permits for outdoor burning
- Ongoing training and exercises for response personnel
- Mutual aid arrangements with neighboring communities
- Interoperability of radio systems between all key agencies and organizations

PRESIDENTIAL DECLARATIONS* 1974-2004 (11)
5/20-24 /04 Flooding Major Disaster
12/11-31/00 Blizzard& Snowstorm Snow Emergency
5/31/98 Thunderstorms & high winds Major Disaster
7/2/97 Tornadoes & flooding Major Disaster
6/21-7/1/96 Rainstorms, flooding & tornado Major Disaster
9/10-19/86 Flooding Major Disaster.
9/5-6/85 Flooding Major Disaster
1/26-27/78 Blizzard, snowstorm Statewide Emergency
3/20/76 3/2-7/76 Ice storm, Tornado Major Disaster
8/20/75- 9/6/75 Rainstorms, high winds, flooding Major Disaster
4/18-30/75 Flooding, rain, tornadoes Major Disaster

GOVERNOR'S DECLARATIONS* 1977-2005 (10)
9/7/2005 Katrina Assistance
12/9/2000 Blizzard, snow storm disaster
6/3/98 6/4/98 6/5/98 Thunderstorms and High winds Disaster
7/3/97 7/6/97 Village of Chesaning (Saginaw Co.) Tornado Disaster
6/21/96 6/26/96 Rainstorms, flooding Disaster
10/28/86 9/15/86 9/12/86 Flooding Heavy Rains Disaster
2/21/86 Great Lakes flooding & wave action Disaster
9/10/85 Heavy rain, flooding Disaster
4/13/85 Great Lakes flooding & wave action Disaster

MAPS

Miscellaneous Emergency Response Facilities

Countywide Law Enforcement

100 Year Flood Plain

Hydropgraphy & Bridges

Water & Sewage Treatment Plants

City of Saginaw Sirens

Hospitals, EMS & Mobile Home Parks

Nursing Homes

Countywide Schools

Countywide Fire Districts

Fire Stations & Departments

Repetitive Loss Properties

SARA Title 3 Sites

City of Saginaw Churches

Church Owned Properties