

## SECTION II

### II. LAND AND WATER RESOURCE INVENTORY

As required in Minnesota Rules Section 8410.0060, this section of the plan provides a general description and summary of the climate, geology, surficial topography, surface and ground water resource data, soils, land use, public utility services, water-based area land ownership, fish and wildlife habitat, unique features, scenic areas, and possible pollutant sources. This section also identifies where detailed information can be obtained for many of these topics. This information is provided to the extent necessary to provide guidance to the Commission in managing water resources and is not intended to be used for final design or construction within the Commission.

#### A. **PRECIPITATION / CLIMATE**

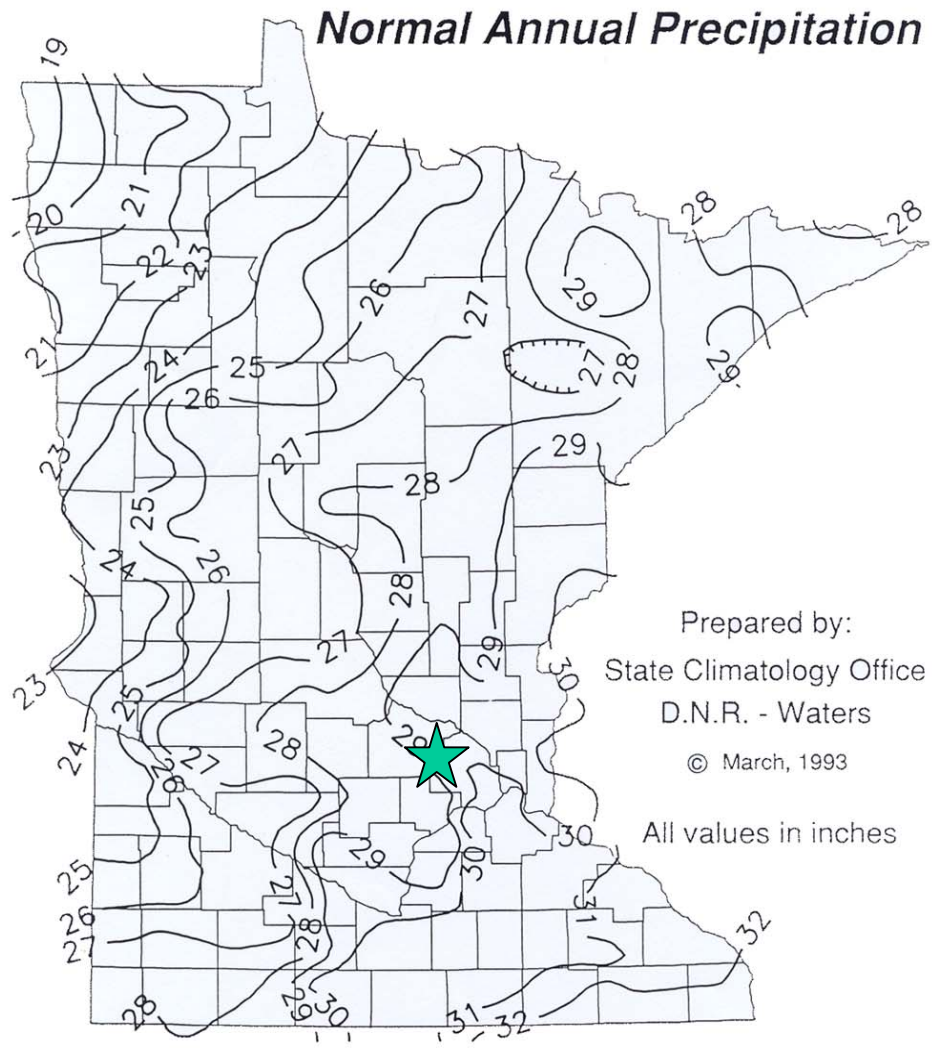
The present climate of the Elm Creek basin is temperate, characterized by wide variations in temperature, ample rainfall, and moderate snowfall. The average annual temperature is 44 degrees Fahrenheit, (7 degrees Celsius), with the extremes ranging from 112 degrees F. (44 degrees C.) to -37 degrees F. (-38 degrees C.). **Table II-1** shows the average monthly temperature, precipitation, and snowfall data. **Table II-2** shows the rainfall events within the area. **Figure II-1** shows the normal annual precipitation.

**TABLE II-1. AVERAGE MONTHLY TEMPERATURE, PRECIPITATION, AND SNOWFALL DATA FOR MINNEAPOLIS/ST. PAUL METROPOLITAN AREA**

<u>Month</u>	<u>Average Temp. F°</u>	<u>Precip. inches</u>	<u>Snowfall inches</u>
January	11.8	0.83	9.8
February	17.9	0.85	8.4
March	31	1.60	11.7
April	46.4	2.17	2.8
May	58.5	3.38	0.1
June	68.2	4.17	0
July	73.6	3.55	0
August	70.5	3.40	0
September	60.5	2.89	0
October	48.8	2.01	0.5
November	33.2	1.45	7.9
December	<u>17.9</u>	<u>0.94</u>	<u>9.3</u>
<b>Annual Average: 44.9</b>		<b>Total: 27.24</b>	<b>Total: 50.5</b>

Source: State Climatology Office for the Minneapolis/St. Paul Airport

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"Normal" is a 30 year average, 1961 to 1990.

**Figure II-1.** Annual Normal Precipitation within the State of Minnesota

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**TABLE II-2. RAINFALL/RUNOFF EVENTS FOR THE ELM CREEK WATERSHED**

EVENT FREQUENCY	EVENT DURATION	PROBABILITY OF OCCURRENCE IN ANY GIVEN YEAR	RAINFALL AMOUNT (INCHES)
1 - Year	24 - Hour	99%	2.4
2 - Year	24 - Hour	50%	2.8
5 - Year	24 - Hour	20%	3.5
10 - Year	24 - Hour	10%	4.2
25 - Year	24 - Hour	4%	4.7
50 - Year	24 - Hour	2%	5.3
100 - Year	24 - Hour	1%	5.9
25 - Year	10 - Day	4%	8.6
50 - Year	10 - Day	2%	9.8
100 - Year	10 - Day	1%	10.8
100 - Year	10 - Day Runoff	1%	7.2 (runoff)

Source: 24-hour rainfall values are from USWB TP 40; 10-day rainfall values are from USWB TP49; 10-day runoff values are from SCS TR60, Hydrology Guide for Minnesota

### **B. GEOLOGY**

The present topography of the Elm Creek watershed is a result of glaciation that ended approximately 10,000 to 12,000 years ago. Topography varies from nearly level to gently and moderately sloping. The highest elevations in the area rise to approximately elevations 1030-1050 feet near Rogers, in southern Corcoran, and in Medina. The lowest elevations at approximately 840-850 feet are located near the northern border of the watershed near the Crow and Mississippi Rivers. The topography of the watershed has been influenced by two major glacial events: the Superior Lobe and the Grantsburg Lobe.

The Superior Lobe began as an ice sheet over 20,000 years ago that advanced southwestward down a bedrock slope from the Lake Superior Region. It transported a load of red sandstone, black gabbro, and other rocks gathered near Lake Superior, plus granitic rocks from central Minnesota. The Lake Superior Lobe covered east and central Minnesota with a layer of ice and debris. The glacial process broke apart the sandstone and granite and ground it into particles ranging in size from microscopic silt to room-sized boulders. This ice floe finally halted just south of the Minnesota River in Scott and Dakota Counties and along the western edge of Hennepin County. The ice plugged the lower reaches of the Minnesota River from about Shakopee to Fort Snelling and the

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Mississippi to just north of Hastings. Thus, the earlier glacial and bedrock landscapes were buried under the Superior Lobe ice blanket. This formation is visible along the eastern boundary of the Elm Creek basin from Osseo to Medicine Lake.

Following the Superior Lobe, the Grantsburg Lobe moved into the region. Geologists estimate that about 15 to 20 thousand years ago the Grantsburg Lobe, hundreds of miles across at its widest front, moved down the western two-thirds of the state, following the bedrock lowlands along a route marked by the present day Minnesota River Valley. On its way from northwestern Minnesota and southern Manitoba, the Grantsburg Lobe picked up glacial deposits from earlier glacial ages. These earlier deposits consisted mainly of limestone, dolomite, and shale. As the ice moved across central Minnesota, it passed over and broke up granite rocks and combined with the limestone, dolomite and shale. Particles in this mixture range in size from cobbles to microscopic clay.

The ice was confined to the present day Minnesota River Valley by higher land relief on either side of the ice field. Near Mankato, the main lobe turned northward, projecting into a depressed landscape referred to by geologists as the Minneapolis lowlands. This is known as the Grantsburg Sublobe of Wisconsinan glaciation and extends over all but a small part of the Elm Creek Watershed. The Grantsburg till varies in thickness but is usually more than forty feet thick. Pockets of silt, sand or gravel can be found within the till, and in places of clayey, silty, or sandy sediments cover the till.

The landscape in the Elm Creek watershed is believed to have formed from a downwasting, stagnant ice field. Some believe a thick bed of till lay on the ice surface in the late stages of the glacial advances; and as the ice melted, the drift slumped and slid into lows, filling holes in the melting ice. The melting of the ice walls left the till deposited above what had been the former highs, the ice blocks melted and formed the lows which are now marshes and potholes.

Marshes and swamps in the Elm Creek watershed meander in elongated flowages through the hollows and are interconnected with shallow lakes and watercourses. Some are set off from the main drainage system in closed basins or are linked to the main system by lateral ditches. Water, rather than draining off the land, tends to collect in the network of marshes, ponds and lakes, resulting in low runoff and sedimentation. Only a small amount of water can be expected to move downward through this land to deep bedrock aquifers unless fractures in the glacial drift are present. The reason water moves downward into these soils slowly, at best, is because of its dense, tightly-packed clayey mass.

Additional information about the geology of the area can be obtained from the Minnesota Geologic Atlas for Hennepin County (1989) in the Water Resource Library. The atlas contains the following plates:

- C Data Base Map
- C Bedrock Geology
- C Surficial Geology
- C Depth to Bedrock and Bedrock Topography
- C Quaternary Hydrogeology

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- C Sensitivity of Groundwater Systems to Pollution
- C Geology and Well Construction
- C Geologic Resources

### C. SOILS

Soil information was obtained from the Hennepin County Soil Survey. Using this information, the hydrologic soil classification map was developed and is shown on **Figure II-2**. Additional information about individual soil types can be obtained in the Soil Survey. The soils within the watershed have been classified into four hydrologic soil groups, which are defined as follows:

**Group A** – These soils have high infiltration rates even when thoroughly wetted. The minimum infiltration rates range from 0.3 to 0.45 inches per hour. The maximum permeability rate ranges from 6 to 20 inches per hour. These soils consist chiefly of deep, well drained to excessively drained sands and gravel. These soils have a high rate of water transmission, therefore resulting in a low runoff potential.

**Group B** - These soils have moderate minimum infiltration rates ranging from 0.15 to 0.30 inches per hour when thoroughly wetted. The maximum permeability rate ranges from 2 to 6 inches per hour. These soils consist of deep moderately- well to well-drained soils with moderately fine to moderately coarse textures.

**Group C** – These soils have slow minimum infiltration rates ranging from 0.05 to 0.15 inches per hour when thoroughly wetted. The maximum permeability rate ranges from 0.2 to 2 inches per hour.

**Group D** - These soils have very slow minimum infiltration rates ranging from 0 to 0.05 inches per hour when thoroughly wetted. The maximum permeability rate ranges from 0.06 to 2 inches per hour. These soils are typically clay soils with high swelling potential, soils with a high permanent water table, soils with a clay layer at or near the surface, or shallow soils over nearly impervious material.

### D. LAND USE

Land use within the Elm Creek Watershed has been influenced by agricultural activities, rural residential, and higher density development pressure. Existing and projected land uses for areas within the Commission's boundaries are described in the member Cities' Comprehensive Plans, which are available from these Cities. The Cities have land use plans that include residential, commercial, and industrial development; designated park and open space areas; and public recreational areas. Land use mapping information is available from each City. The MUSA boundary directly impacts development in the watershed. The MUSA boundary is shown on **Figure II-3**.

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The Minnesota Land Cover Classification System (MLCCS) is also available from the DNR and incorporated by reference. The MLCCS is a vegetation oriented classification system designed to identify natural and cultural land cover types using standardized methodology. This method identifies land based on true land cover. This tool can be used for greenway identification, open space planning, natural resource inventories, and land use planning. There are some areas that have used MLCCS within the watershed. Available MLCCS data can be obtained from the DNR.

### E. SURFACE WATER RESOURCES

The information collected in this section outlines how surface water runoff is collected, managed, and discharged from the watershed.

#### 1. Hydrologic System

The Elm Creek Watershed contains several large depressions and drainageways. Water is generally directed from the south and west to the northeast via four main drainageways. These drainageways include Rush Creek, North Fork Rush Creek, Elm Creek, and Diamond Creek. These drainageways converge in the Elm Creek Regional Park and enter Hayden Lake. Water is eventually discharged near Mill Pond in Champlin to the Mississippi River.

**Figure II-4** outlines the major subwatershed boundaries tributary to lakes and streams within the Elm Creek Watershed. Portions of the Commission's hydrologic system have been analyzed by the member cities. These analyses can be found in the following documents:

- C City of Maple Grove Stormwater Management Plan
- C City of Plymouth Water Resource Management Plan
- C City of Champlin Comprehensive Surface Water Management Plan

#### 2. Wetland Inventory

The Hennepin Conservation District has completed wetland inventories for much of the Commission's area. These wetland inventories identify existing wetlands by the following categories:

- C Wetlands – unaltered hydrology
- C Wetlands – altered hydrology
- C Wetlands that no longer exist
- C Wetlands – potentially restorable

This inventory is shown on **Figure II-5** and is intended for information purposes only. Additional information is available from the member communities and the Water Resource Library. **Figure II-6a** shows the locations of DNR Public Waters and Wetlands and **Figure II-6b** shows the location of the public ditches.

#### 3. Water Quality

Water quality data for the Commission has been obtained from the STORET water quality database, which is available through the Minnesota Pollution Control Agency (MPCA). The MPCA storage and

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retrieval database is utilized by participating agencies to compile water quality testing data. This database is almost entirely used for the storage of water quality parameters. The Commission and Hennepin Parks have undertaken water quality monitoring for selected waterbodies and streams. **Appendix D** contains lake summaries completed by HCD.

**Figure II-7** shows the location of monitoring sites within the Commission that have been used in the past or are currently being used to collect water quality or quantity data. Additional information on water quality is available in the following reports:

- C Elm Creek Watershed Management Commission Annual Reports
- C Water Quality Management Plan (Hennepin Parks, 1999)
- C Metropolitan Council Regional Report on Water Quality of Metro Area Lakes (CAMP information)
- C Minnesota Pollution Control Agency Citizen Lake Monitoring Program reports.

Water quality information obtained from the MPCA (STORET), the HCD, and Hennepin Parks can be found in the Water Resource Library.

### F. GROUND WATER RESOURCES

Three major aquifers are located within the Commission's boundaries: the Prairie Du Chien-Jordan Aquifer, the Franconia-Ironton-Galesville Aquifer, and the Mt. Simon-Hinckley Aquifer. The lowest of the three aquifers is the Mt. Simon-Hinckley. It ranges in elevation from around 850 feet above sea level in the Maple Grove area and is characterized by Mt. Simon and Hinckley Sandstones. The Eau Claire Formation confines it from above. Above this, the Franconia-Ironton-Galesville Aquifer ranges in elevation from 850-900 feet above sea level. It is composed of the Franconia Formation and Ironton and Galesville Sandstones. The St. Lawrence Formation confines it in most areas. The upper most aquifer, the Prairie Du Chien-Jordan, ranges in elevation from 850-900 feet above sea level in this area. It is composed of Jordan Sandstone and the Prairie Du Chien Group. The Prairie Du Chien-Jordan aquifer is located in only a small portion of the watershed in Maple Grove.

Ground water quality can be affected by a variety of land use types. The identification of areas susceptible to ground water contamination is difficult due to the character (permeability and thickness) of the surficial material, depth to the piezometric surface, precipitation amount and duration, and other components of aquifer recharge. Detailed information can be obtained in the Hennepin County Geologic Atlas. The Hennepin County Geologic Atlas is incorporated by reference into this plan.

Within the watershed, there are several areas that are mapped as high to very highly sensitive to ground water pollution to the water table. One extensive area of very high sensitivity is located along the Crow and Mississippi Rivers along the western and northern boundaries of the watershed. Much of the Elm Creek corridor is also mapped as highly sensitive. Some smaller scattered areas of high to very high sensitivity are located surrounding several of the lake and wetland complexes and within the gravel pits in Maple Grove. The majority of the

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watershed is mapped as having low sensitivity to ground water pollution as it may affect the Prairie du Chien-Jordan aquifer, the primary source of ground water in Hennepin County.

A combination of municipal wells and individual wells serve the water supply needs for the member Cities. **Figure II-8** shows the location of the DNR Water Appropriations Permit sites. The MDNR water appropriation list is available in the Water Resource Library.

### G. POLLUTANT SOURCE LOCATIONS

Pollutant sources identified by the MPCA are incorporated in this document by reference. A complete list is included in the Water Resource Library. **Figure II-9** shows the locations of pollutant source sites within the watershed.

Pollutant source sites identified by the MPCA include leaksites (MPCA Leaking Underground Storage Tanks), information from the MPCA Master Entity System, Hazardous Waste Generators, and a list of registered storage tanks. The leaksite list contains active and inactive leaksites.

### H. WATER-BASED RECREATION AREAS

There are several park facility areas, public accesses, lakes, and adjacent areas in Elm Creek Watershed that offer passive and active recreation. These facilities include the following:

- C Elm Creek Regional Park Reserve
- C Crow-Hassan Regional Park
- C North Hennepin Regional Trail
- C Fish Lake Regional Park

**Figure II-10** shows the locations of these resources.

### I. FISH AND WILDLIFE HABITAT

Within the Elm Creek Watershed, there are many areas that provide fish and wildlife habitat. The studies that have been done within the watershed are outlined below:

- C The County Biological Survey has been completed by the DNR and this information is incorporated by reference and discussed below.
- C The Hennepin Conservation District has completed a wetland inventory for the Commission. This information is shown on **Figure II-5**.
- C The Hennepin Conservation District completed the French Lake-Diamond Lake Area Study: Report to the Department of Natural Resources Nongame Wildlife Program, June 2001. This report discusses the wildlife habitat associated with French and Diamond Lakes and is incorporated by reference into this Plan.

### J. UNIQUE FEATURES AND SCENIC AREAS

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The Elm Creek Watershed has many natural areas, water resources, and local parks. Some of these areas contain rare and endangered species and special habitats. Specific information about rare and endangered species can be obtained from the DNR Natural Heritage Database. Other unique and scenic areas are described briefly in this section.

### **Mississippi River**

The Mississippi River is classified as Recreational by the DNR from the Clearwater River between Stearns and Wright counties to the City of Champlin. The Recreational classification means that the river may have undergone diversion or impoundment in the past and that adjacent land may be developed, but that this land could be managed to enhance recreational activity. The stretch of the Mississippi River from Dayton to Hastings is also part of the National Park Service Mississippi River National River and Recreation Area.

### **County Biological Survey**

- C Hennepin Parks: The Crow-Hassan Park Reserve has been identified as containing a number of natural communities such as maple-basswood forests, oak forests, and lowland hardwood forests with some endangered plant and animal species.

Elm Creek Park Reserve contains numerous natural communities including maple-basswood forests, mixed hardwood swamps, and cattail marsh with endangered plant and animal species.

- C Hassan Township: A maple-basswood forest is located immediately east of the City of Rogers in Hassan Township. Hassan Township has completed a Natural Resource Inventory. Information about this inventory is available in the Water Resource Library.
- C City of Dayton: Diamond Lake and French Lakes are known colonial waterbird nesting sites. There is also significant wildlife habitat in the area between Diamond Lake and French Lake. There have been endangered animal species identified west of French Lake.
- C City of Champlin: Oak forests have been identified in the southwest corner of the City of Champlin. The Schmidt Wildlife Management Area is also located in Champlin. Endangered animal species have been sited at Mill Pond.
- C City of Maple Grove: Endangered animal species have been identified in and near Fish Lake. The Fish Lake Regional Park is located on the south side of Fish Lake. Maple Grove also contains a number of maple-basswood forest areas.
- C City of Corcoran: The City of Corcoran contains a tamarack swamp and maple-basswood forest areas. There have also been endangered animal species identified at a variety of locations in the City. The City has completed a Natural Resource Inventory and Management Plan that identifies natural plant communities and potential natural resource corridors with the North Rush Creek Corridor, the South Rush Creek Corridor, and the

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Maple/Basswood Forest Zone. Additional information about this study is available in the Water Resource Library.

- C City of Medina: Oak forest and wet meadow natural communities have been identified within the City of Medina.
- C City of Plymouth: Oak forest, maple-basswood forest, and lowland hardwood forest natural communities have been identified within the northwest corner of the City of Plymouth.

### **Rare and Endangered Species**

Information from the DNR's Natural Heritage Database regarding rare and endangered species that are known to occur within the watershed has been obtained. These features are listed below in **Table II-3**.

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<b>TABLE II-3. LIST OF RARE ANIMAL AND PLANT SPECIES WITHIN ONE MILE OF ELM CREEK WATERSHED</b>			
<b>COMMON NAME</b>	<b>SCIENTIFIC NAME</b>	<b>STATE STATUS</b>	<b>HABITAT</b>
<b><u>Birds</u></b>			
Acadian flycatcher	<i>Empidonax virescens</i>	Special Concern	Large tracts deciduous forest
Bald eagle	<i>Haliaeetus leucocephalus</i>	Special Concern	Tall trees, lakes and wetlands
Cerulean warbler	<i>Dendroica cerulea</i>	Special Concern	Large tracts deciduous forest
Common moorhen	<i>Gallinula chloropsis</i>	Special Concern	Emergent marsh
Henslow's sparrow	<i>Ammodramus henslowii</i>	Endangered	Grasslands
Loggerhead shrike	<i>Lanius ludovicianus</i>	Threatened	Grasslands with scattered shrubs and/or trees
Red-shouldered hawk	<i>Buteo lineatus</i>	Special Concern	Large tracts deciduous forest
Trumpeter swan	<i>Cygnus buccinator</i>	Threatened	Emergent marsh, small ponds and lakes
<b><u>Reptiles and Amphibians</u></b>			
Gopher snake	<i>Pituophis catenifer</i>	Special Concern	Grasslands on sandy soils
Blanding's turtle	<i>Emydoidea blandingii</i>	Threatened	Emergent marsh, ponds, and grasslands
<b><u>Fish</u></b>			
Pugnose shiner	<i>Notropis anogenus</i>	Special Concern	Vegetated shorelines of lakes and streams
<b><u>Plants</u></b>			
American ginseng	<i>Panax quinquefolius</i>	Special Concern	Deciduous forests

A map of the Minnesota County Biological Survey is available in the Water Resource Library.

### **K. FLOOD PROBLEM AREAS**

Flood problem areas have been identified within the watershed and are discussed in **Section IV**. The following reports/summaries are available in the Water Resource Library and address some of the problem areas in greater detail:

- C Flood Characteristics of Upland Storage Areas and Lakes (HCD)
- C Physical and Ecological Classification of Elm Creek and Its Tributaries (HCD)

### **L. EXISTING FLOOD INSURANCE STUDIES**

A Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) has been completed for the participating cities in the Commission. All the cities of the watershed, except for Rogers, are participating members in the National Flood Insurance Program. These reports identified the boundaries of the floodway and floodplain. Copies of these flood insurance studies and Flood Insurance Rate Maps are available from the member Cities.

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Two flood hazard studies have been completed for the watershed and the Commission has adopted the results of these studies as the flood coverage within those portions of the watershed included in these studies. The study completed in 1975 analyzed the Elm and Rush Creeks. The study completed in 1977 analyzed the North Fork Rush Creek. Information about these studies is included in **Appendix E**. The Commission also adopts the FEMA Maps and its amendments for those areas in the watershed that have not been analyzed in the studies referenced above. Additional information can be obtained in the Water Resource Library.