NATURAL RESOURCES

Natural and physical features/attributes of the City of Alexandria are simultaneously a bountiful resource and a factor limiting development/redevelopment. Natural Resources in and around Alexandria provide the foundation for maintaining a healthy environment, high quality of life and growing sustainably. Alexandria's natural resources are one of its greatest assets. Preserving and improving on natural resources will not only continue to provide a base for recreation, but will also help to support the local economy by providing high quality resources from which to draw. Because of increasing affluence and people's growing desire to vacation and reside in areas such as Alexandria with high scenic amenities, it is imperative that Alexandria plan for the protection of its natural resources.

Within Chapter 3 of this plan (Demographic Trends and Assumptions), it is noted that Alexandria is projected to increase 30.3% in population throughout the course of the next two decades. Much of this growth can be attributed to Alexandria's natural amenities. Efforts should be directed toward wetlands and water resources, soils and geology, topography and drainage, wildlife and rare species, natural scenery, forests and native plant communities. The concept of sustainable development should provide direction. Sustainable development can be seen as *"development that maintains or enhances economic opportunity and community well-being while protecting and restoring the natural environment upon which people and economies depend. Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs."* (Minnesota Legislature, 1996.) The perspective of sustainability calls upon us to invest our time and energy in efforts which simultaneously strengthen the environmental, economic and social dimensions of any issue.

This Chapter provides background information on the City of Alexandria's physical profile that is intended to assist in guiding growth and preserving natural resources. This Chapter includes:

1. A Physical Profile including information on area, climate, topography, waters, watershed, groundwater, vegetation, rare species and soil conditions;

2. Natural Resource Objectives; and

3. Natural Resource Policies/Recommendations.

I. PHYSICAL SETTING

A. Size

The 2000 Census identifies 9.36 square miles of land area within Alexandria of which 8.89 is square miles of land and 0.47 square miles is water. Since the 2000 Census the City has acquired 2,786.37 additional acres through annexation.

B. Climate

The climate of Alexandria and surrounding region is characterized by warm, humid summers with severe local storms and occasional tornadoes. Historical tornado activity is slightly below the Minnesota state average and 19% lower than the overall U.S. average. Noteworthy events include:

- 6/18/1964, a category 3 (max. wind speeds 158-206 mph) tornado 12.7 miles away from the Alexandria city center injured 13 people and caused between $50,000 and $500,000 in damages.

- 6/13/2001, a category 3 tornado 20.0 miles away from the city center injured 3 people and caused $5 million in damages.

The winter seasons are generally cold and relatively dry. The average 30 year annual precipitation for the years 1961 to 1990 have been 27 to 28 inches of water based on data from the State Climatology Office, Division of Waters, Minnesota Department of Natural Resources. Nearly two thirds of Minnesota's annual precipitation falls during the growing season of May through September or 17 to 18 inches of precipitation. The normal precipitation during the months of April through October has been 22 to 23 inches. During late December, January, and early February, temperatures frequently remain below zero. Frost in Minnesota takes place as early as September and ends as late as May. Soil freeze occurs in Minnesota during the late fall and early winter months.

II. LAND RESOURCES

A. Ecologic Framework

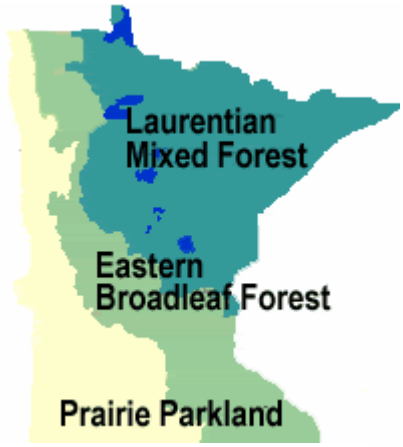
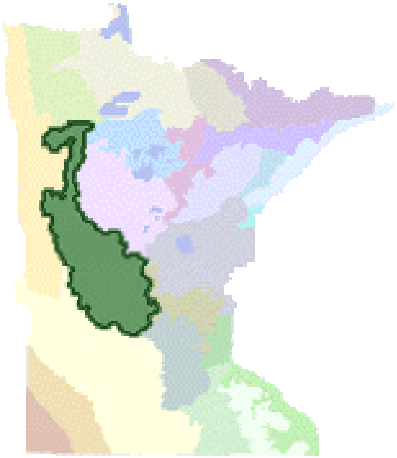


Figure 4-1
Minnesota Ecological Regions

Source: MNDNR

Minnesota includes three of North America's ecological regions or biomes which represent major climate zones which converge: prairie parkland, deciduous forest and coniferous forest. The Ecological Classification System (ECS) is a nationwide system developed to manage natural resources on a sustainable basis. This system integrates climatic, geologic, hydrologic, topographic, soil and vegetation data. Alexandria is included within the Eastern Broadleaf Forest province. This province bridges the transition zone between prairie to the west and true forest to the east. Major landforms include lake plains, outwash plains, end moraines, ground moraines, and drumlin fields.

Figure 4-2
Alexandria Moraine Complex
(Hardwood Hills)



Sections within this province are further defined by the origin of glacial deposits, regional elevation, distribution of plants and regional climate. Minnesota has ten sub-ecological sections and Alexandria lies within the Minnesota and NE Iowa Morainal division. The Alexandria Moraine Complex forms the western and southern boundary of this subsection. The eastern boundary was developed using general landform boundaries and the separation of northern hardwoods presettlement vegetation and dominantly coniferous or aspen-birch presettlement vegetation.

Steep slopes, high hills and lakes formed in glacial end moraines and outwash plains characterize this subsection. Presettlement vegetation included maple-basswood forests interspersed by oak savannas, tallgrass prairies, and oak forests. Much of this region is currently farmed. Tourism is predominant around the lakes.

B. Topography and Drainage

Map 4-1 located at the close of this Chapter illustrates topography within the City of Alexandria ands adjacent lakes areas. The area features gentle fluctuations in elevation from about 1,350 feet to 1,480 feet above sea level. Mild variations in the City's topography allow for a diverse array of development possibilities and options. The highest areas of the community are on the east and west sides along Lake Latoka and Lake Victoria, respectively. These areas generally are of unique value to the community and function best if allowed to exist in a natural state or exist with limitation on development such that they will not be urbanized or irrevocably altered.

C. Soils

Many of the environmental decisions about using a resource are based on the kind of soil and the ability of the soil to support that resource use. The characteristics of the soils in the Alexandria area are examined in order to make proper decisions on the use of the land and to protect the natural environment. Existing soils in the City have been principally responsible for the area's overall development pattern and may impose limitations or increased sensitivity to future urban development/redevelopment.

An illustration of soils (Map 4-2) within the City of Alexandria is included following this Chapter and is reflective of USGS datum. Soil surveys provided by USGS provide information about erosion rates, depth to groundwater, surface and subsurface (to 5 feet) soil texture, engineering interpretations and suitability for activities such as private sewage treatment, building limitations, and nonmetallic mining sites to name few. This information is invaluable in making water and land resource management decisions.

Soils with identical or near identical profiles are grouped into a soil series, normally named for a geographical feature where it was first described. Each series has the same characteristics, regardless of where it is subsequently found. Soil associations, which are described on a general county soils map, are a distinct pattern of soil series in defined proportions. Soil association maps provide an overview of the soils at a county level. These maps can help identify where high runoff or erosion could be expected, or where areas of high or low agricultural potential are likely to be located. These maps are not adequate for detailed planning and site selection of structures or roads. There are four general soil associations in the City and surrounding annexation areas: Arvilla-Sverdrup Association; Waukon-Gonvick; Waukon-Flom Association and Nebis-Beltrami Association.

Table 4-1 reflects a summary of data included in the Douglas County Soil Surveys as illustrated on the "General Soils Map" for the County.

Table 4-1
General Soil Associations

Soil Association	Characteristics
Arvilla-Sverdrup *(Dominant soil association type in the area)*	Usually found in nearly level to rolling areas and contains potholes, wetlands and lakes. These soils are by nature well to excessively well drained. The texture of the surface ranges from sandy loams to loam sands over sandy or gravelly material, making it known as a source for gravel.
Waukon-Gonvick *(Western half of the City and as well as the western half of*	Well drained and moderately well drained, nearly level to hilly soils formed in loamy glacial till. Texture of the surface is usually black loam over clay loam. Prone to erosion.

Alexandria Township)

Waukon-Flom *(Southwest corner of City)*	Nearly level to steep sites which contain depressions, potholes and lakes. Drainage is variable from moderately well to poorly drained. Flom soils occupy drainageways and slightly depressed areas. Waukon soils occupy the more rolling areas. The soils are loamy in texture. Surface runoff, erosion and wetness may be management concerns.
Nebis-Beltrami *(Carlos Township)*	Nearly level to steep slopes. Contains numerous potholes and wetlands. Nebish soils are well-drained with loamy surfaces and sandy loam to clay loam subsurfaces. Recreational and wildlife habitat uses are potential long-term uses for this soil complex.

The Douglas County Soil Survey reveals most surface soils within the City consist of loam with surface soils of black loam and subsoils of brown sandy to clay loam which are, by nature, relatively level, poorly and moderately drained. Runoff, erosion and wetness are the main limitations in use and management concerns.

D. Vegetation and Rare Species

The original vegetation is Alexandria was highly variable with three types of dominant vegetation patterns. The western and northern part of the Alexandria area consisted of large stands of oaks. In the oak openings, vegetation consisted of poplar, basswood, hard maple, cottonwood and spruce. The western area consisted mainly of northern hardwoods like hard maple, white oak, bur oak, ironwood, birch, ash and elm. The region's southern portion consisted of prairies, marshes and other grasslands. Today these natural forests and prairie grasses are found in areas that are typically not well suited for either agricultural or urban uses. A review of statewide Biological Survey (MCBS) data reveals no significant sensitive features within the planning area extent.

III. SURFACE WATER RESOURCES

A. Watershed

The term 'watershed' refers to the entire physical area or basin drained by a distinct stream or riverine system. Gravity and topography are the two major factors that define a watershed. Watersheds help review authorities to evaluate the quality and quantity of local water resources. Alexandria is contained within the Long Prairie River Watershed District (LPRWD).

According to data from the Minnesota Land Management Information Center (LMIC), the LPRWD consists of approximately 892 square miles in the central part of the Upper Mississippi River Basin. The watershed includes all or parts of Cass, Douglas, Morrison, Becker, Otter Tail, and Todd Counties. Water management organizations in the watershed include state agencies and the local counties. The LPRWD has approximately 606 total river miles. The other major rivers in the watershed include the Crow Wing River, Eagle Creek, Moran Creek, Spruce Creek and Turtle Creek. Communities located in the watershed include Eagle Bend, Clarissa, Browerville, Miltona, Garfield, Carlos, Alexandria and Long Prairie. The watershed contains approximately 329 lakes with a total acreage of 40,140. Major lakes in the watershed include Fish Trap Lake, Lake Carlos, Lake Ida, Lake Miltona and Lake Shamineau.

B. Lakes, Rivers and Streams

The Alexandria areas lakes provide scenic beauty, sources of recreation and environmental function to its residents and visitors. Alexandria is unique in the sense that most of Douglas County's deep-water lakes virtually surround the City of Alexandria including Lake Carlos, Le Homme Dieu, Geneva, Darling and Latoka.

Shorelands in Douglas County have been divided into three lake categories for purposes of shoreland management, Natural Environment Lakes, Recreational Development Lakes, and General Development Lakes. Natural environment lakes are generally small, often shallow lakes with limited capacities for assimilating the impacts of development and recreational use. They often have adjacent lands with substantial constraints for development such as highwater tables, exposed bedrock, and unsuitable soils. These lakes, particularly in rural areas, usually do not have much existing development or recreational use. Recreational development lakes are generally medium-sized lakes of varying depths and shapes with a variety of landform, soil, and ground water situations on the lands around them. They often are characterized by moderate levels of recreational use and existing development. Development consists mainly of seasonal and year-round residences and recreationally-oriented commercial uses. Many of these lakes have capacities for accommodating additional development and use. General development lakes are generally large, deep lakes or lakes of varying sizes and depths with high levels and mixes of existing development. These lakes often are extensively used for recreation and, except for the very large lakes, are heavily developed around the shore. Second and third tiers of development are fairly common. The larger examples in this class can accommodate additional development and use.

Table 4-2 below identifies water bodies within the City's current corporate limits and future annexation areas along with their corresponding DNR classification.

Table 4-2
Surface Water

Waterbody/ID	Surface Water Classification
Lake Connie 21-379	Natural Environment
Lake Agnes 21005300	Recreational Development
Lake Burgen 21004900	Recreational Development
Lake Geneva 21005200	General Development
Lake Henry 21005100	General Development
Lake Victoria 21005400	General Development
Lake Winona 21008100	General Development
Phase III & IV Annexation (2009 to 2014)	
Lake Darling 21008000	General Development
Lake Le Homme Dieu 21005600	General Development

Currently, nearly 8% of the study area's total land area is comprised of surface waters. Map 4-3 located at the end of this Chapter is reflective of the public water inventory and national wetland inventory for areas within the City of Alexandria and future annexation areas. In addition, several protected wetlands exist within and in close proximity to the corporate limits. Surface waters classified by the Minnesota Department of Natural Resources (MNDNR) are subject to shoreland regulations. The 1000-foot shoreland buffer is illustrated on Map 4-4, adjacent to lakes in the Alexandria lakes area.

Clearly, the Alexandria area lakes are an important resource to the community, arguably the centerpiece for the community and region. Lakes in the City support a high quality of life for area residents and provide thousands of people with a range of recreational opportunities and economic gains.

The MNDNR has compiled extensive data on the majority of lakes within the State including: lake surveys, lake depth maps, lake water quality data and lake water clarity data (from the Pollution Control Agency), satellite-based water clarity information (from the University of Minnesota), lake notes and fish consumption advice (from the Department of Health).

None of the lakes were included on the MNDNR, Division of Ecological Services *Notice of Waters Identified and Designated as Infested Waters* list published in April of 2006 which cites those lakes infested with Eurasian water milfoil, spiny water flea, zebra mussels, ruffe, white perch or round goby.

The Clean Water Act requires states to publish, every two years, an updated list of streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the 303(d) list, is based on violations of water quality standards and is organized by river basin. A TMDL study identifies both point and nonpoint sources of each pollutant that fails to meet water quality standards. Water quality sampling and computer modeling determine how much each pollutant source must reduce its contribution to assure the water quality standard is met. In the Comprehensive Plan study area, the following lakes were listed on the most recent TMDL approved in 2006 with the affected uses shown respectively: Lake Victoria (aquatic consumption/Mercury); Lake Winona (aquatic recreation/excess nutrients); Lake Burgen (aquatic consumption/Mercury) and Lake Le Homme Dieu (aquatic consumption/Mercury). The Minnesota Pollution Control Agency (MPCA) is the state agency responsible for protecting Minnesota's water quality. The TMDL process involves four phases: 1) assessment and listing, 2) TMDL study, 3) implementation plan development and implementation, and 4) effectiveness monitoring. The TMDL study is a written plan that analyzes the problem and determines how water quality standards will be attained. A TMDL study identifies both point and non-point sources of each pollutant that fails to meet water quality standards.

Lake Winona was identified as being an impaired water due to excess nutrients. The project time frame is expected is from January 2006 to January 2009. Following the determination of excess nutrient impairment for Lake Winona as measured by in-lake concentrations of phosphorus, chlorophyll a and water clarity, a TMDL plan will be prepared that will result in an allocation of nutrients allowed for mall sources within the watershed of Lake Winona.

The shoreline within the City along the Lakes and annexation areas has been almost entirely developed with year-round homes creating the potential to negatively impact the Lakes. Development on lakeshores has been shown to increase nutrient levels and increase shoreline erosion which lead to an increase in algae blooms and suspended solids, thereby decreasing water clarity and degrading habitat. Efforts should be made to monitor development related activities the contribute most to degradation of the lake(s) which include removing aquatic and terrestrial vegetation along the shore, increasing impervious surfaces, nitrogen and phosphorus fertilizers, using rip-rap and other harmful landscaping practices and compacting the soils.

C. Wetlands

Wetlands have historically been regarded as obstacles to development rather than areas of intrinsic value. However, it is now generally accepted that wetlands are valuable for storing essential surface waters, stabilizing surface waters to minimize the danger of droughts of floods and supporting wildlife habitat. Wetlands are also the primary method of recharging aquifers ensuring a continued water supply. Wetlands cleanse and purify surface water by removing nutrients and other contaminants from storm water runoff.

Wetlands are also illustrated on Map 4-3. The source for these data is the National Wetland Inventory (NWI). Wetlands represent approximately 12.4% of the surface in the study area.

A number of Palustrine and Lacustrine wetlands are present within the City, particularly in the southern portion of the City. The wetlands that exist are primarily shrub swamps, with some marshy wetlands and basin wetlands.

The Army Corps of Engineers and the Department of Natural Resources are ultimately responsible for the overall protection of wetlands, however the Douglas County Soil and Water District is the local governmental unit responsible for implementing wetland protection measures and administers the Wetland Conservation Act (WCA) on behalf of the City.

D. Flood Plains

In 1969, the Minnesota Legislature enacted the State Flood Plain Management Act (Minnesota Statutes, Chapter 103F). This Act stresses the need for a comprehensive approach to solving flood problems by emphasizing nonstructural measures, such as floodplain zoning regulations, flood insurance, floodproofing and flood warning and response planning. By law, Minnesota floodprone communities are required to: 1) adopt floodplain management regulations when adequate technical information is available to identity floodplain areas, and 2) to enroll and maintain eligibility in the NFIP so that people may insure themselves from future losses through the purchase of flood insurance. The Department of Natural Resources (DNR) is the state agency with the overall responsibility for implementation of the State Flood Plain Management Act. The floodplain areas within the planning area are shown on Map 4-4, located at the close of this Chapter. The City does not participate on the NFIP as there has not been a demonstrated benefit to the residents or the City. The City does regulate floodplain areas through a locally established floodplain ordinance (Section 10.18 of the City Code) which was originally adopted in 1983 and subsequently amended in 1990. There are areas of similarity and overlap between the local ordinance and the NFIP regulations. Residents are still able to purchase flood insurance through local agents, however they are not able to participate in the NFIP. All water control structures in the City's Floodplain District are under the jurisdiction of the Joint Floodwater Control Board, a multi-jurisdictional organization including the City of Alexandria, Douglas County, Alexandria Township, LaGrand Township and the Alexandria Lakes Area Sanitary District.

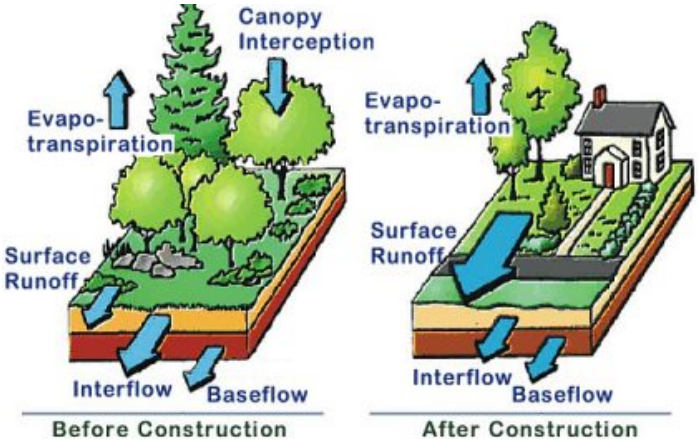
Most of the flooding problems within Alexandria related to deficient drainage in the older portions of the City due to an old storm sewer system. These flood problems will be greatly alleviated by a storm sewer/street reconstruction project slated for 2008-2009 using funds generated by the City's stormwater utility. The presence of culverts, bridges and other water controls structures also has a significant influence on flood control. The City does have a comprehensive inventory of their respective flow control structures and facilities.

E. Local Hydrologic Cycle

Groundwater and surface water are both part of the "hydrologic cycle". Development has a profound influence on the quality of waters. To start, development dramatically alters the local hydrologic cycle (see Figure 4-3 below). The hydrology of a site changes during the initial clearing and grading that occur during construction. Trees, meadow grasses, and agricultural crops that intercept and absorb

rainfall are removed and natural depressions that temporarily pond water are graded to a uniform slope. Cleared and graded sites erode, are often severely compacted, and can no longer prevent rainfall from being rapidly converted into stormwater runoff.

Figure 4-3
Local Hydrologic Cycle



Source: MNDNR

The situation worsens after construction. Roof tops, roads, parking lots, driveways and other impervious surfaces no longer allow rainfall to soak into the ground. Consequently, most rainfall is converted directly to runoff. The increase in stormwater can be too much for the existing natural drainage system to handle. As a result, the natural drainage system is often altered to rapidly collect runoff and quickly convey it away (using curb and gutter, enclosed storm sewers, and lined channels). The stormwater runoff is subsequently discharged to downstream waters.

Water Quality is affected by the accumulation of trash, oil and rubber from cars, fertilizers and pesticides applied to lawns, sediment from bare or poorly vegetated ground and other pollutants entering streams, rivers and the Lakes. Inflow of sediment can cloud water, blocking sunlight from submerged plants. Sediment also settles to the bottom of streams, clogging the gravel beds used by fish for laying their eggs. Nutrients, such as phosphorus and nitrogen, from fertilizers enter the water and promote unusually rapid algae growth. As this algae dies, its decomposition reduces or eliminates oxygen needed by fish, shellfish, and other aquatic life for survival.

The City requires proposed development maintain compliance with Minnesota Pollution Control Agency standards and local stormwater/erosion control ordinances/procedures.

IV. GROUND WATER RESOURCES

A. Geologic Framework

Over 9,500 years ago, glaciers covered the Alexandria area. As they receded they left a thick drift blanket of silt, sand, clay and rocks. This blanket also known as a ground moraine ranges from 300 to 600 feet in depth and forms an undulating surface with many closed depressions holding water in lakes, wetlands and ponds. Perhaps the most visible remnant of the glacial period is the chain of lakes located in the Alexandria area.

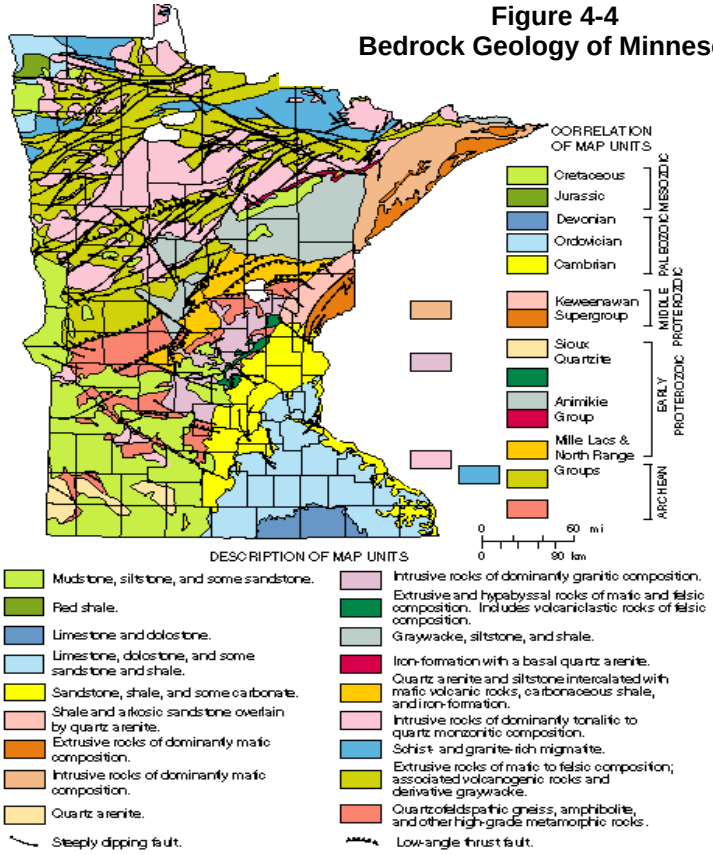
In addition to the chain of lakes and localized topography, the glaciations of the Quaternary period left behind buried sand and gravel areas below ground level. The deposits range in depth from 10 to 110

feet and form areas of generally low relief. Theses deposits are often the location of groundwater used for domestic purposes.

Subsurface geology and groundwater are important considerations for all communities as they are the source of potable (i.e. drinkable) water. Hydrogeology is the study of the interrelation of subsurface geology and water. Because the consequences of human actions and forces at work above ground have a direct impact upon our ground water resources it is important to consider hydrogeologic resources.

As shown in Figure 4-4, geologic conditions very greatly in different parts of Minnesota.

Figure 4-4
Bedrock Geology of Minnesota



Source: Minnesota Geological Survey

Hydro geologic conditions also determine how sensitive ground water may be to contamination by chemicals and pollutants introduced at ground level. Sensitivity to pollution is described in terms of the length of time it takes for a drop of water to cycle from absorption into the ground to discharge (removal) from an aquifer. The pollution sensitivity of an aquifer is assumed to be inversely proportional to the time of travel: shorter cycle times may indicate a higher sensitivity, longer cycle times may represent a greater travel time and increased geologic protection. Contaminants are assumed to travel at the same rate as water.

There are four pollution sensitivity categories: Very High, High, Moderate, and Low. The pollution sensitivity of an aquifer is assumed to be inversely proportional to the time of travel. Very High sensitivity indicates that water moving downward from the surface may reach the ground-water system within hours to months leaving little time to respond to and prevent aquifer contamination.

Low sensitivity where it takes decades to centuries for the cycle to be complete may allow enough time for a surface contamination source to be investigated and corrected before serious ground-water pollution develops. It is important to note higher pollution sensitivity categories do not mean water quality has been or will be degraded and low sensitivity does not guarantee that ground water is or will remain uncontaminated. Alexandria's soil properties do not contribute to a high pollution sensitivity category as the soil properties are loam over loam. The loam is a balanced mixture of salt, sand and clay.

The groundwater in the area is generally thought to be good in quality and free from pesticide nutrient contamination. Pesticides and fertilizers have been detected in some wells, but the extent of contamination is not well known and can be controlled with known management practices.

The Minnesota Pollution Control Agency reports a large number of confirmed instances (75) of leaking underground storage tanks (LUST) since 1982. Many files on the sites have been closed as of the drafting of this Plan. Detailed information related to each site and contamination can be obtained from the MPCA.

Alexandria draws its water from a groundwater source using seven wells which draw from a glacial drift aquifer at depths of greater than 82 feet below the surface. In December of 1998 the City of Alexandria was notified by the Department of Health that they were required to prepare and submit a "Wellhead Protection Plan". Wellhead Protection Plan (WHP) is a program intended to prevent contaminants from entering wells used by public water supply systems. Alexandria Light & Power staff and other community members formed a team to complete the wellhead plan and to implement the strategies developed in the plan. The WHP findings showed that the aquifer can provide an adequate yield for the City's use. Even though the potential for contamination exists the strategies in the plan along with the aeration/filtration at the treatment facility and constant monitoring of the water quality insure the safety and adequacy of the supply well into the future. A map of the wellhead protection area follows this Chapter as Map 4-5.

V. AIR, NOISE AND LIGHT POLLUTION

The air quality is also an important and sometimes forgotten issue of importance for communities; air pollution is increasingly a regional and global problem. Pollutants can blow in from cities hundreds of miles away. An air toxic monitoring study was completed by the MPCA (Alexandria test site) from 1996 to 1997 and measured 73 air toxics. The average concentrations of the air toxics were compared to health benchmarks. Overall the Alexandria test site rated healthy quality of air. The only compounds which exceeded benchmarks in Alexandria were carbon tetrachloride and formaldehyde which are each contributors to cancer. Most production of carbon tetrachloride was banned in 1997 and levels have been decreasing since. A representative of MPCA[1] indicated that levels of carbon tetrachloride would be expected to be below the 1997 reading. Formaldehyde was above benchmarks at all locations Statewide and continue to be at all monitoring locations. Protection and encouragement of trees within the community can aid in maintaining high air quality.

Residents have historically indicated that they wished to retain the small town atmosphere of the community. They value the peace and tranquility of City and the Lakes. Visual pollution from light and noise pollution detract from the small town atmosphere. Lighting should not detract from the views of the lake at night and blinking, flashing and bright lights are a nuisance and can easily be controlled through modern advances in lighting which reduce glare and concentrate lighting on-site. Not only can good lighting design and devices control light pollution, they also are more cost efficient and energy efficient. Furthermore, commercial and industrial lighting should not detract from residential uses. Noise ordinances can ensure that noises do not cause nuisances to residents as well.

[1] *(Kari Schwerin Palmer, Environmental Outcomes, MPCA, personal communication, July 2005)*

VII. ARCHEOLOGICAL RESOURCES

The history of a City helps a community define its sense of "place". Historic patterns of development, to a large measure, dictate where a community will grow in the future. History also gives us a window to view the lives of our forbearers and a mirror to reflect their images in our own endeavors.

As time progresses, Alexandria may face the loss of more and more of one of its truly non-renewable resources. These resources are the archaeological and historic sites that give the City's modern day residents a tie to the past. Many of these cultural resources are being purposefully demolished or destroyed while others face the natural elements and slowly erode away, some without any knowledge. One threat to these resources is that their significance, or even their existence, is largely unknown. Development, redevelopment, or failure to maintain these sites can diminish or destroy historic and archaeological resources. However, widespread knowledge of archaeological sites can increase the likelihood that they will be disturbed or vandalized. Encroaching development and modernization require the need for preservation of archaeologically and historically significant sites. Because the known, or suspected, historic resources may have no significant relationship to current or likely future uses or activities in Alexandria, it is questionable if they will play a role in determining or affecting the City's character. However, State guidelines call for municipalities to review construction or other ground disturbing activity within prehistoric archaeological sensitive and historic sensitive areas.

Alexandria lies within the Central Lakes Deciduous Archeological Region of the State and also in an area where there is a medium to high probability of archeological site existence. Site potential is based upon statistical relationships between known sites and environmental factors. Information obtained from the Office of the State Archaeologist (OSA), State Historic Preservation Office (SHPO), and MnDOT indicate the presence of some archaeological sites, however, locations have not been verified and are rather schematic. Prehistoric burial mounds do exist in the study area and should be mapped for planning purposes only and not widespread distribution. Late Middle Prehistoric period pottery is found in numerous small sites in lakeshore settings throughout this region. Development along areas along the lakes may warrant review and appropriate coordination with the State Historic Preservation Office (SHPO) as to area sensitivity. For further reference, data is available in the records of SHPO.

VIII. DEVELOPMENT CONSTRAINTS

A review of several natural features has been reviewed in this Chapter. It should be noted that several of the natural features identified in this Chapter, including but not limited to lakes, soils, wetlands, flood prone areas, potential archeological sites and regionally significant ecological areas, will present constraints to future development. Several of these significant natural features/areas exist in the proposed growth area of the City. Following the close of this Chapter is a map (Map 4-6) illustrating potential constraints to development. The boundaries on the map are a compilation of floodplain areas, National Wetland Inventory areas, areas of steep slope (based upon Douglas County Soil Surveys) and DNR Public Waters Inventory data. Field verification was not done to determine wetland existence. It should be noted that further review of these and sites identified is required prior to development. This map is intended to provide a general overview.

IX. NATURAL RESOURCES OBJECTIVES AND RECOMMENDATIONS

Objective: To the extent possible establish a balance between promoting, protecting, enhancing and preserving natural and physical features (including, but not limited to, woodlands, wetlands, soils, steep slopes, surface waters, groundwater) while managing requests for development and redevelopment.

Policy/Recommendations:

1. Encourage efforts to preserve wildlife species including preservation of natural habitat areas and pre-settlement (native) vegetative communities where feasible.

2. Encourage the use of natural resource data/studies for planning and review of development and redevelopment such as soils, topography, groundwater etc.

3. Continue ensuring compliance with approved subdivision grading/drainage plans are maintained. Compliance checks/certifications upon site grading completion, at the time of building permit issuance and immediately prior to issuance of a certificate of occupancy should be considered.

4. Carefully regulate development in areas adjacent to shorelands, wetlands and floodprone areas to preserve these as attractive amenities.

5. Encourage development to conform to the natural limitations presented by topography, soils or other natural conditions.

6. Identify and protect significant scenic areas, open spaces, historic or archaeological sites. Emphasize proper management of open space areas in order to preserve trees, wildlife, pre-settlement (native) landscape communities, floodplain, water quality and similar environmentally sensitive features.

Objective: Protect the quality and use of surface water through support and coordination with the County SWCD, Lake Associations and state and federal agencies.

Policy/Recommendations:

1. Encourage and promote land use practices to protect and improve surface water resources.

2. Require appropriate erosion controls during construction and enforce through a developer's agreement and onsite inspections.

3. Establish a priority listing of water areas to monitor surface water quality and quantity.

4. Complete a detailed inventory of stormwater infrastructure along with other information to develop a hydrologic flow model for management purposes.

5. Evaluate the impact of stormwater runoff on surface water in the City and respective growth areas and determine and develop a Citywide Surface Water Management Plan or proactive implementation of watershed management tools developed by the County SWCD, as amended or updated.

6. Enforce existing regulations and develop programs and new regulations where necessary to protect surface water.

7. Support the coordination of planning and implementation efforts between the SWCD, Lake Associations and Land & Resource Management Offices as well as state and federal agencies.

Objective: Protect and preserve groundwater supply and quality through support and coordination with County SWCD, Lake Associations and state and federal agencies.

Policy/Recommendations:

1. Protect ground resource from contamination through the continued implementation of the Wellhead Protection Plan and other programs.

2. Identify geologically sensitive areas in the City and define the limits and recharge areas of aquifers.

Objective: Protect air quality in the City to comply with MPCA standards.

Policy/Recommendations:

1. Review performance standards within the Zoning Ordinance to ensure that they adequately control dust and wind erosion related to land use and development activities.

Objective: Preserve the environment as a sustainable resource to insure both present and future generations a good quality of life.

Policy/Recommendations:

1. Coordinate plans and work with all agencies responsible for the protection and restoration of our environment.

2. Administer and support the state environmental review program (EAW, EIS, AUAR).

3. Initiate plans to correct any and all abuses and preserve areas critical to the City's way of life (Area Lakes).

4. Develop an enforcement program that properly enforces the City's regulations including stormwater violations.

5. Encourage tree planting on private property within the City and encourage continued enforcement of standards of the tree preservation and replacement ordinance to protect valuable trees in areas which will be developed in the future.

6. Examine specific requirements for environmental protection that may be incorporated into the City's Subdivision regulations such as identification of subdivision landscaping standards and identification of existing trees of a substantial size as part of the preliminary plat required data.

Objective: Educate the community about its natural resource assets and encourage them to think about their use and impact on the natural resources of the community and greater areas.

Policy/Recommendations:

1. Maintain a current list of persons to contact at various local, state and federal agencies which are responsible for protecting the environment.

2. Distribute new information relating to environmental regulations to all policy makers and elected officials as it becomes available.

3. Promote environmental stewardship including reducing, recovering and recycling waste materials.

4. Maintain data that reflects the economic benefits of clean water to the local economy.

5. Attend annual meetings of lake associations and the SWCD to share information on surface water issues and to gain better insights on surface water issues.

6. Update and/or develop streamlined City permitting procedures including but not limited to applications, checklists, fees, and inspections.

7. Provide developers and owners with technical assistance in applying Best Management Practices for stormwater management on road and land development projects.

8. Seek opportunities, such as conferences and publications to learn about emerging issues regarding the environment and provide training for elected and appointed officials to assist them in dealing with the complexities of environmental issues.

Objective: Every effort shall be made to identify and protect prehistoric and historic sites which meet national, state, or local criteria for historic designation from destruction or harmful alteration.

Policy/Recommendations:

1. SHPO should be referred to for all land use proposals where a possible impact to a historic or archaeological site has been identified.

2. Applicants with land use proposals that contain areas identified as being archaeologically sensitive should be required to conduct an investigation of the area's archaeological significance. The scale and location of the proposal will determine if such an investigation will be required.