

# V: NATURAL ENVIRONMENT

## Existing Conditions

### Introduction

Lewis and Clark County encompasses an area of approximately 3,513 square miles and ranges in elevation from 3,400 feet above mean sea level on the Missouri River, where it flows northward out of the County, to peaks more than 8,000 feet above mean sea level along the Continental Divide. More than 70 percent of the land is mountainous. More than a million years ago, the mountains of the Continental Divide, Big Belt Range, and the mountains around Lincoln were uplifted along large faults. Hot, molten rocks rose from beneath the earth and intruded into these rocks. The liquid rock solidified, and it formed granite that can be seen in the high mountains in the southwest portion of the County. Sedimentary rocks such as limestone and argillite make up most other mountainous terrain. These landforms and their associated water courses influence climate and the distribution of vegetation, wildlife and human development.

The overall climate of Lewis and Clark County, including the amount of precipitation, varies with elevation. The Helena Regional Airport, located in the semi-arid southern portion of the County, receives about 11 inches of rainfall annually. The mountains experience 60 inches or more. Peak river flows usually occur in late May or early June, as spring rains melt winter snow packs. Ice jams in the water courses may cause backwater flooding in late winter months. Flash floods from intense localized storms can occur in tributary watersheds from spring throughout the summer. Winters in Lewis and Clark County are generally sunny, cold, and windy, with frequent storm fronts. Summers are warm with cool nights brought on by air drainage into valley bottoms. The Helena Valley's average growing season is 134 days and is one of the longest in Montana. Higher elevation areas, such as the Blackfoot Headwaters, have an insufficient frost-free period to sustain cultivated crops.

### Air Quality

Montana allows any city or county to establish its own local air pollution control program. Seven counties currently operate local air pollution control programs that

include: Billings, Butte, Great Falls, Helena, the northern Flathead Valley, Libby, and Missoula. These local air pollution control programs have jurisdiction over most pollution sources within their boundaries. State government retains jurisdiction over larger pollution sources that have the potential to emit more than 250 tons per year of any regulated air pollutant or any facility that requires environmental impact statements (EIS).

Local air pollution control programs are responsible for ensuring good air quality in their communities and have proven themselves highly successful. Control strategies adopted by the local programs reflect the unique characteristics of their citizens and environment. Some of the roles assumed by local air programs include: developing local air quality rules that cannot be less stringent than state rules; permitting, regulating, and enforcing state and local air quality rules; conducting inspections of pollution sources; regulating open burning; regulating wood burning devices and issuing local air quality burning advisories; controlling the use and disposal of material on roads and in parking lots; controlling construction and demolition activities; assisting in the development of local State Implementation Plans; and responding to local complaints.

Many of Montana's local air quality programs play an important role in working with industries and residents to develop pollution control strategies for State Implementation Plans in areas that have exceeded pollution standards. These programs have been particularly successful in reducing particulate matter and carbon monoxide emissions.

When local air pollution control programs are determined to be inadequate, the Department of Environmental Quality (DEQ) asks the local program authorities to develop solutions. The federal government requires the state to assume authority over the program, if county authorities are unable to resolve the issues.

The greater Helena area experienced a noticeable increase in airborne particulates and a decrease in ambient air quality from the late 1970s to the mid 1980s. The decrease in air quality resulted in complaints from individuals and physicians concerned about increased upper respiratory problems. The sources of the increased particulates included vehicular emissions, vehicular travel on gravel-surfaced roads, and the use of wood burning devices for home heating.

The County Health Department conducted air sampling studies from 1980 to 1985. The study results showed that total suspended particulates, particularly during the winter months, were approaching the State's maximum allowable levels. Air pollution levels continued to increase to a point where the 1984-85 season had a 14-day stretch of "POOR" air quality days. When the County circulated a petition to see if residents were

interested in establishing an air pollution control program, signatures ran more than 3 to 1 in favor. The Board of County Commissioners enacted the Lewis and Clark County Clean Air Ordinance in June 1985, in conjunction with the State Board of Health and also established the Lewis and Clark Air Quality District (see Appendix E for map).

The purpose of the ordinance and the District is to protect and improve air quality in the greater Helena Valley. The Ordinance prohibits the operation of wood, coal or paper burning devices on defined "POOR" Air Quality days, during the monitoring season that extends from November 1 to March 1 of each year. "POOR" Air Quality is typically defined as particulate levels less than 10 micro-moeller (um) in size reach a concentration of 75 micrograms per cubic meter (ug/m3) or during a meteorological inversion. The Ordinance also prohibits the burning of coal as a solid fuel at any time, unless an exemption has been granted; allows for burning specified fuels in solid fuel heating devices; prohibits idling diesel or locomotive engines in excess of two (2) hours on "POOR" Air Quality days; and limits smoke from chimneys to an opacity reading of 40 percent or less at all times. The Ordinance does allow for low income exemptions to those eligible for low-income energy assistance. The low-income exemption must be applied for annually, and is valid until November 1 of the following year.

Table 5.1 presents the results of air quality monitoring conducted by the City/County Health Department from 1995 to 2003. In recent years, 1996 was the worst year for air quality, with nine days classified as poor; the Health Department issued 95 warning letters and 12 citations for air quality violations.

**Table 5.1**  
**Helena Valley Air Quality Days**

<b><u>Year</u></b>	<b><u>1995</u></b>	<b><u>1996</u></b>	<b><u>1997</u></b>	<b><u>1998</u></b>	<b><u>1999</u></b>	<b><u>2000</u></b>	<b><u>2001</u></b>	<b><u>2002</u></b>	<b><u>2003</u></b>
Good	101	94	111	111	120	117	120	120	120
Fair	12	21	9	9	0	3	0	0	0
Poor	7	9	0	1	0	0	0	0	0

The Health Department operates two air quality monitoring stations in the Helena Valley. A continuous reading monitoring station is located at the Lincoln School in Helena and an interval monitoring station is located at the Rossiter School in the northern portion of the Helena Valley.

Additional air quality monitoring stations are located in East Helena and the Lincoln town site, and are operated by the Montana Department of Environmental Quality. The stations located in East Helena monitor the airborne emissions associated with the operations of the East Helena Smelter (ceased operation in 2001).

## **Geology**

Lewis and Clark County includes two geologic environments. Approximately the northern half of the County is characterized by overlapping thrust faults in Paleozoic, Mesozoic and Precambrian sedimentary rock. The thrust zone, a part of the disturbed belt, occupies the mountainous northern part of the County and terminates abruptly on the east with the plains and the nearby Cretaceous sedimentary rocks. The southern part of the County includes broad, open folds in Precambrian sedimentary rocks of the Belt Supergroup, which exhibit effects of both low-grade burial metamorphism and igneous intrusion. The Boulder batholith and related outlying intrusions occur from the southern boundary northward to the Blackfoot River.

## **Slope Stability**

Slope failure occurs when the gravitational force of slope materials exceed resisting forces due to strength, friction, and cohesion of the supporting materials. Slope properties, such as steepness, layering, fracturing of materials, or lack of vegetation, can make them inherently susceptible to failure. Factors such as moisture, overloading, and undercutting, can make matters worse. These factors can occur naturally or induced by development activity.

Slope failures are distinguished by five types: Falls or free drops from steep cliffs; slides or movement of unconsolidated materials along slip surfaces of shear failure; slumps or movements of consolidated materials along the surface of shear failures; flows; and the slow or rapid fluid-like movement of soils and other unconsolidated materials. Very slow down-slope flow of soil is referred as creep. The average flow rate of materials can range from a fraction of an inch to 4 to 5 inches a week. Factors that influence creep include growing vegetation, freezing and thawing, and burrowing animals. Lateral spreads may occur on flat or gently sloping land due to liquefaction of underlying materials.

Hazards to development, public health, and safety are most prevalent in mountainous areas. Localized hazards may occur anywhere within the planning area. It is the responsibility of those who wish to develop their property to assess the degree of hazard in their selection of development sites. There are three variables related to slope stability that should be rated to determine the suitability of a particular site: slope, geologic materials, and landslide deposits. Based on these three variables, sites can generally be categorized as:

Stable -Areas having 0-5 percent slope that are not underlain by unconsolidated deposits.

Unstable -Areas of 0-5 percent slope that are underlain by moist unconsolidated materials or muds. Unstable due to settlement problems.

Generally Stable -Areas of 5-15 percent slope that are not underlain by landslide or unconsolidated materials.

Generally Stable to Marginally Stable -Areas of greater than 15 percent slope that are not underlain by landslide deposits or bedrock units susceptible to land sliding.

Moderately Unstable -Areas greater than 15 percent slope that are underlain by bedrock units susceptible to land sliding but not underlain by landslide deposits.

Unstable - Areas of any slope that are underlain by or immediately adjacent to landslide deposits.

## **Earthquakes**

The Montana Bureau of Mines and Geology indicates that earthquakes have been part of Montana almost since the beginning of written history. Geologic history of western Montana indicates that earthquakes accompanied the formation of the Rocky Mountains and will continue to be part of the mountainous region of western Montana (Stickney, 1993). Earthquakes cannot be predicted or avoided; precautions to reduce potential hazards, property loss, and injury are needed.

Lewis and Clark County is located in a zone of earthquake activity known as the Intermountain seismic belt. The zone extends from northwest Montana southward to southern Utah. The western half of Lewis and Clark County is in Seismic Zone 3, which

means that an earthquake can cause major damage. This area includes Helena, East Helena and Lincoln. The eastern half of the County, which includes Augusta and Wolf Creek, is in Seismic Zone 2, which means that an earthquake can produce moderate damage.

Numerous active fault lines have been identified throughout the County. Most earthquakes in Montana cannot be correlated to specific faults visible at the surface, except for those with magnitudes over 7.0. Small to moderate magnitude earthquakes occur at depths of three to ten miles below the surface on small, discontinuous faults.

Hidden faults were responsible for the worst earthquakes to hit the Helena area, including magnitude 6.3 and 6.0 tremors that struck on October 18 and 31, 1935. Four people were killed and property damage exceeded \$4 million. About sixty per cent of the buildings in Helena were damaged. Swarms of earthquakes hit the area, with more than 1800 tremors from October 4, 1935 to April 30, 1936. A computer simulation of a 6.3 earthquake today indicates that property damage in Helena would be nearly \$1 billion. Fatalities and injuries would depend upon the time of day the earthquake occurred.

Earthquakes are measured by two variables, magnitude and intensity. \* Lewis and Clark County is generally rated as having an intensity level of VIII. Damage is predicted to be slight in buildings designed specially for the seismic zone. Buildings not constructed to meet the standards for the seismic zone would experience considerable damage with partial collapse. Panel walls would be thrown out of frame structures. There would be destruction of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture would also be overturned. Sand and mud would be ejected from the ground in small amounts. There would also be changes in the static water levels in wells.

Energy is released during an earthquake by the rupturing of the earth's crust, causing cyclic waves to travel through the rock and soil mass. A phenomena referred to as

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\* The magnitude of an earthquake, as measured on the Richter scale, reflects the energy release of an earthquake. The intensity of an earthquake is gauged by the perceptions and reactions of observers as well as the types and amount of damage. The intensity of an earthquake is rated by the Modified Mercalli Scale. This scale ranks the intensity from I to XII. An earthquake rated as a I, would not be felt except by very few people under especially favorable circumstances. An intensity rating of XII on the other hand would result in total destruction. Seismic waves would be seen on the ground surface, lines of sight and level would be distorted and objects would be thrown upward into the air.

liquefaction also occurs if certain geologic and hydrogeologic conditions exist: There is a transformation of water-saturated sediments from a solid to a liquid state, as a consequence of increased soil pore water pressure.

Several conditions must be present for liquefaction to occur:

- The area must be in an active seismic zone subject to earthquakes greater than a magnitude of 5.0 (Lowe 1990).
- The area must be located where there is a shallow depth to groundwater.
- Unconsolidated sediments with sand and silt must be present.

A large majority of the Blackfoot River Valley is underlain by groundwater at depths less than 10 feet. Most valleys—including the Helena Valley, Silver Creek Valley, and Blackfoot River Valley—are filled with alluvial deposits that contain sand and silt. Conditions needed to create a liquefaction hazard may be present in these areas.

Detailed data on groundwater depth and geologic materials need to be collected to more accurately assess liquefaction susceptibility. Liquefaction susceptibility can be determined by the age of the deposit, percent sand and silt, degree of sediment sorting, and average thickness of the geological unit. This assessment was completed for the Helena Valley in 1987 (see Appendix E for map).

Age assessment of the deposit is important in determining liquefaction susceptibility: As the age increases, it is more likely the sediments will be cemented together or compacted, and less likely to liquefy. Based on a large volume of work conducted in the Helena and similarly formed valleys, it has been determined that sediment deposited more than 750,000 years ago are considered to have very low chance of liquefaction (Obermier et. al, 1990).

## **Radon**

Radon is a naturally occurring gas found in soils, surface, and groundwater. Prolonged exposure to elevated levels of radon gas has been identified as contributing to the development of lung cancer. Radon gas is produced by the radioactive decay of radium. It is colorless, odorless, and undetectable, except by specific testing. Radon can be found, in its highest concentrations, in soils and rock containing uranium, granite, shale phosphate, and pitchblende. Dry, porous and permeable soils, as well as fractured or faulted rock formations, transport radon freely. Wet, tight, clay soils, on the other hand, seem to inhibit radon transport.

The Environmental Protection Agency (EPA) and the Montana Occupational Health Bureau conducted numerous radon sampling studies throughout Montana in the late 1980s, including Lewis and Clark County. The studies were conducted in public buildings, including schools, private residences, and groundwater wells. Montana had the fifth highest percentage of homes with indoor radon concentrations exceeding the federal action level of 4 pCi/l (picocuries per liter of air measure of radioactivity). Lewis and Clark County was identified as being in potential radon Zone 1. Zone 1 (highest potential) designation means that homes have a predicted indoor screening level greater than 4 pCi/l. The potential for elevated radon potential varies widely within the county and even within neighborhoods. The only way the radon level can be determined is by testing.

Elevated radon concentrations are also found in groundwater. Groundwater from private wells or small community systems may contribute sufficient radon to elevate concentrations within a house. Concentrations of radon in groundwater vary by aquifer type. Higher concentrations are found in groundwater hosted by granitic or high-grade metamorphic bedrock aquifers. Lower concentrations are found in sedimentary alluvial aquifers.

## **Hydrology**

### **Surfacewater**

Montana's rivers, streams and lakes are a valuable resource. Not only do they provide natural beauty, they supply the water necessary for recreation, industry, agriculture, and aquatic life. Major watercourses—including the Missouri, Blackfoot, and Dearborn Rivers--have many uses and benefits, including irrigation, recreation, aesthetics, fisheries habitat, wildlife habitat, and the production of hydroelectric power. Lewis and Clark County crosses nine watersheds: The Middle and South Forks of the Flathead, Blackfoot, Upper Clark Fork, Sun, Smith, Upper Missouri/Dearborn, Upper Missouri, and Boulder Rivers. The watersheds are described below.

### **Blackfoot Watershed**

There are 52 rivers and streams and 276 lakes in the 2,345 square mile Blackfoot watershed. The Blackfoot River and its tributaries has been impacted by more than 100 years of mining, logging, and agricultural practices that have degraded water quality and



diminished fish habitat in this historically abundant trout fishery. The American Rivers conservation group listed the Blackfoot River as the tenth most endangered river in the U.S. in 1993. The river now benefits from the attention of the Blackfoot Challenge, a watershed group dedicated to managing the Blackfoot as a resource. The Blackfoot is also part of the Upper Clark Fork River Basin (see the section below on the Upper Clark Fork for more information).

### **Boulder Watershed**

The Boulder watershed consists of 750 square miles with ten rivers and streams and five lakes. The Boulder watershed is impacted by agriculture, resource extraction, mill tailings, road construction, silviculture, and other activities.

### **Middle Fork Flathead Watershed**

The 1137 square miles of this watershed include thirty-three rivers and streams, and 96 lakes. Potential sources of impairment include natural contamination sources and silviculture.

### **Smith Watershed**

The 1997 square miles of the Smith watershed are home to 42 lakes and 37 streams and rivers. Sources of potential impairment include agriculture, resource extraction, silviculture, channelization, placer mining, and other activities.

### **South Fork Flathead Watershed**

The 1684 square miles of this watershed contain ninety-nine lakes and 49 rivers and streams. Threats to water quality include dam construction, impoundment, and silviculture. The Flathead Basin Commission is directed in M.C.A. 75-7-302 to protect the existing high quality of the waters that flow from the Middle and South Forks of the Flathead River into Flathead Lake.

## **Sun Watershed**

There are 1981 square miles in the Sun watershed, with 19 rivers and streams and 210 lakes. Potential sources of water quality impairment include agriculture, flow modifications and regulation, animal holding and management areas, irrigated crop production, and natural sources.

## **Upper Clark Fork Watershed**

The Upper Clark Fork watershed encompasses 2,320 square miles with 46 rivers and streams, and 149 lakes. The Upper Clark Fork River suffers serious stream dewatering due to summer irrigation practices, resulting in increased impacts from wastewater discharges, elevated temperatures, nuisance algae growth, and lower dissolved oxygen which results in degraded fish habitat. In 1991, the Montana Legislature issued a moratorium on the issuance of more surface water rights until June, 1995. The Upper Clark Fork River Basin Management Plan (1994) listed several recommendations for the management of the river basin, including:

- Basin closure to the issuance of most new surface and groundwater use permits.
- Creation of an on-going water planning and management mechanism.
- Protection of existing water rights.
- Encourage the development of voluntary, local, non-point pollution control strategies.

The Upper Clark Fork River Basin Management Plan has been adopted into the Montana State Water Plan. 85-2-337 Montana Code Annotated creates the Upper Clark Ford River Basin Steering Committee and allows the Lewis and Clark Board of County Commissioners to appoint a member.

## **Upper Missouri Watershed**

The 3,363 square miles of the Upper Missouri watershed contains 42 lakes and 48 rivers and streams. This watershed is home to the majority of the County population, and is subject to growing development pressure. The Missouri River and Canyon Ferry, Holter, and Hauser Lakes are increasingly popular recreational sites. Holter and Canyon Ferry Lakes, as well as Lake Helena are seeing increasing land development, changing agricultural practices, and other activities that are altering their character.

Tenmile Creek is a stream targeted for total maximum daily load (TMDL) development. Possible threats to Tenmile, Prickly Pear, and other streams in this watershed include agricultural practices, municipal point source pollution, resource extraction, highway and road construction, streambank modification, mine tailings, dredge mining, placer mining and subsurface mining, among other activities. Tenmile Creek is a National Priority List Superfund site and is described in some detail elsewhere in this document.

### **Upper Missouri-Dearborn Watershed**

This 2,663 square mile watershed contains thirty-seven rivers and streams, and 139 lakes. Potential sources of impairment are agricultural practices, streambank modification, impoundments, silviculture, channelization, resource extraction, and subsurface mining. The Montana Legislature has closed the Upper Missouri Basin (along with several others such as the Upper Clark Fork) to future surface appropriations. More people are turning to groundwater to satisfy their needs as a result.

### **Montana Water Planning/Permits**

The Montana Water Plan notes that groundwater appropriations may adversely affect surface water flows or uses. The Water Plan recommends that watershed groups be formed to perform four functions with assistance from the Lewis and Clark Water Quality Protection District, Montana Bureau of Mines and Geology, Department of Environmental Quality, Department of Natural Resources and Conservation and the Conservation District. Those four functions are:

- Participate in local ground water planning.
- Perform a comprehensive evaluation of existing groundwater uses.
- Plan for future groundwater uses.
- Estimate the quantities of groundwater available to meet existing and future needs.

The Montana Water Plan further recommends that through the water grant process, attention be focused on programs that do the following:

- Protect public health.
- Protect groundwater and groundwater recharge

- Define the role of irrigation and wastewater treatment systems,
- Define the role of constructed wetlands in groundwater recharge and discharge, particularly where there is a potential connection to surface waters.

The complexities of maintaining habitats to sustain plant and animal populations, particularly fisheries habitat, are a challenging issue. Not only are the physical and chemical characteristics of the surface water important, but also best land use practices adjacent to the streams are essential. Land-use practices that help maintain soils, terrestrial vegetation, and stream channel stability are good for fish populations. Good stream habitat includes cool, clean, clear water flowing through deep pools, steep riffles, and log jams, as well as overhanging trees, bushes, and undercut banks.

Water quantity is critical to fisheries habitat. Water quantity controls the space available for fish and also controls food production. Water quality is also an important aspect of habitat. Many fish species have very narrow water temperature ranges in which they can live and reproduce. Water temperature also affects the amount of dissolved oxygen that water can hold (colder water is capable of holding more dissolved oxygen). Water also needs to be free from sediments, chemicals, and other substances. Sediments destroy the gravelly areas needed for fishery reproduction (Workman, 1994).

The Department of Environmental Quality (DEQ) is the state agency responsible for preserving and maintaining the quality of Montana's water supply. Development activities in or near streams are governed by the Montana Stream Protection Act (124 permit) and the Montana Natural Streambed and Land Preservation Act (310 permit). A 124 permit is required of all governmental agencies proposing projects that may affect the beds or banks of any stream in Montana. The purpose of the law is to preserve and protect fish and wildlife resources in their natural existing state. The Montana Department of Fish, Wildlife and Parks administers this law. A 310 permit is required of all private, non-governmental individuals or corporations that propose to work in or near a stream. The purpose of the law is to minimize soil erosion and sedimentation, maintain water quality and stream channel integrity, and prevent property damage to adjacent landowners. The Lewis and Clark County Conservation District and the Department of Natural Resources and Conservation administers this permit.

Pollution problems in Montana's waterways are nothing new. Montana's efforts during the 1970s and 1980s focused on limiting discharges from industrial and sewage treatment plants. While much progress has been made since then, water quality problems continue. To address them, the 1997 State Legislature passed House Bill 546, which established a Total Daily Maximum Loading (TMDL) program. The facilities and receiving waters are listed in table 5.2.

**Table 5.2**  
**Active Montana Pollution Discharge Elimination System (MPDES) Permits**  
**in Lewis and Clark County**

<u>Facility Name</u>	<u>Receiving Waters</u>	<u>Issue Date</u>
A.B. Cobb Ranch	Ford Cr. of the Sun R.	2/5/01
Air Liquide America Corp.	Prickly Pear Cr.	9/1/96
ASARCO	Blackfoot R.	3/5/03
ASARCO Inc. (East Helena)	Prickly Pear Cr.	11/1/96
ASARCO Inc.	Prickly Pear Cr.	6/1/93
ASARCO Inc. (Mike Horse)	Mike Horse/Beartrap Cr.;	7/1/97
	Blackfoot R.	
Basin Cr. Mining, Inc.	Grub/Monitor Cr.	4/1/94
Bouma Post Yards, Inc.	Flescher Lakes	12/3/92
Broken O Ranch	School Sect. Coulee to Sun R.	10/25/00
Building Materials Holding Corp.	Prickly Pear Cr.	---
East Helena, City of	Prickly Pear Cr.	5/01/97
Exxon—Helena Terminal	Prickly Pear Cr.	4/1/98
Gates of the Mountains, Inc.	---	---
Helena Regional Airport	---	---
Helena, City of	Prickly Pear Cr.	1/1/97
Helena, City of (WTP)	Prickly Pear Cr.	11/1/91
Helena, City of (WTP)	Ten Mile Cr.	2/1/95
Leland Den Boer	---	---
Lewis and Clark Co. Landfill	---	---
Liquid Air Corp.	Prickly Pear Cr.	10/22/92
Montana Gold and Sapphires, Inc.	Missouri R.	2/1/94
Montana Rail Link	---	---
Pacific Steel and Recycling	Ten Mile Cr.	---
PP&L Montana, llc.—Hauser Dam	Missouri R.	7/1/95
Seven Up Pete Joint Venture	Blackfoot R.	2/18/03
Seven Up Pete Joint Venture	Blackfoot R.	2/14/03
Steinbach Cattle Co.	---	7/27/89
UPS, Helena Center	---	---

Source: Montana Department of Environmental Quality, October 2003

Defined in a non-technical way, TMDL refers to a plan or strategy to return a water body to compliance with the water quality standards and therefore fully supporting of its designated uses. It could be called a "water quality improvement plan." Once a water body is back to fully supporting its designated uses, a water quality plan can help a community maintain the level of water quality.

The Monitoring and Data Management Bureau of the Department of Environmental Quality (DEQ) has responsibility under the Federal Clean Water Act and Montana Water Quality Act to monitor and assess the quality of Montana surface waters, and to identify impaired or threatened stream segments and lakes. Amendments to the Montana Water Quality Act (MCA 75-5-702, effective May, 1997) require DEQ to consider all currently available data when making water quality assessments, including information or data obtained from federal, state, and local agencies, private entities, or individuals with an interest in water quality protection.

DEQ sets limits known as Total Maximum Daily Loads (TMDLs) for each pollutant entering a body of water (see table 5.3). TMDLs are established for streams or lakes that fail to meet certain water quality standards, and describe the amount of each pollutant a water body can receive without violating water quality standards. DEQ considers future growth and development in establishing these limits, and then adds a margin of safety to its calculations. TMDLs take into account the pollution from all sources, including discharges from industrial plants and sewage treatment facilities, runoff from farms, forests and urban areas, and natural sources such as decaying organic matter or nutrients in soil. DEQ determines both the amount of a pollutant that enters the water naturally and the amount that enters the water from discharges and runoff. DEQ then balances the quantities of pollutants allowed from all sources so the total does not exceed the limits necessary to maintain water quality. Through these limits, DEQ can make sure the water remains (or becomes) safe for fishing, drinking, recreation, and aquatic life.

A TMDL approach for water bodies does not replace existing water pollution control programs or standard treatment technologies. It provides a framework for evaluating pollution control efforts, and provides for closer coordination of local, state, and federal efforts to guarantee that local water quality goals are met.

**Table 5.3: Water Bodies in Lewis and Clark County  
in Need of Total Maximum Daily Load Development (TMDL)**

<b>Water Body</b>	<b>Estimated length (miles)</b>	<b>TMDL Develop. Priority</b>	<b>Probable Impaired Uses</b>	<b>Probable Causes</b>	<b>Probable Sources</b>
Avalanche Gulch	14	low	aquatic life support cold water fishery -trout recreation swimmable	flow alterations other habitat alts.	agriculture placer mining resource extraction
Magpie Creek	11	low	aquatic life support cold water fishery -trout	flow alterations other habitat alts.	dredge mining resource extraction subsurface mining
Cave Gulch	5	low	agriculture aquatic life support cold water fishery -trout swimmable	flow alterations other habitat alts. siltation	resource extraction highway/road/bridge const. placer mining
Hellgate Creek	10	low	aquatic life support cold water fishery -trout	habitat alteration ph	mine tailings placer mining resource extraction subsurface mining
Missouri River	26	low	aquatic life support cold water fishery -trout drinking water supply recreation swimmable	flow alterations metals nutrients suspended solids	agriculture flow regulation/modifications irrigated crop production municipal point source natural sources non-irrigated crop production range land
Beaver Creek	16	low	aquatic life support cold water fishery -trout	other habitat alts. siltation	highway/road/bridge const. natural sources pasture land
Trout Creek	9	low	aquatic life support cold water fishery -trout	other habitat alts. siltation	agriculture pasture land streambank mod./destab.
Falls Gulch	3	low	aquatic life support cold water fishery -trout	metals	natural sources placer mining resource extraction

**Lewis and Clark County**  
**GROWTH POLICY**  
**Final: 2/15/04**

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Prickly Pear Creek	3	low	aquatic life support cold water fishery -trout recreation swimmable	nutrients suspended solids thermal modifications	agriculture irrigated crop production placer mining rangeland resource extraction
Tenmile Creek	22	high TMDL devel. in progress	aquatic life support cold water fishery -trout drinking water supply recreation swimmable	flow alterations metals habitat alteration siltation ph	agriculture harvesting, restoration, residue management highway/road/bridge const. irrigated crop production mine tailings resource extraction silviculture
Silver Creek	20	low	aquatic life support cold water fishery -trout drinking water supply recreation swimmable	flow alterations metals habitat alterations priority organics	agriculture dredge mining irrigated crop production mill tailings resource exaction subsurface mining
Sevenmile Creek	14	low	cold water fishery -trout	habitat alteration siltation	agriculture irrigated cropland resource extraction rangeland
Granite Creek	2	low	cold water fishery -trout	habitat alteration	agriculture natural sources rangeland
Prickly Pear Creek	35	low	agriculture aquatic life support cold water fishery -trout drinking water supply recreation swimmable	flow alterations metals nutrients habitat alterations siltation suspended solids unionized ammonia	agriculture dom. wastewater lagoons highway/road/bridge const. irrigated crop production municipal point source mine tailings pasture land placer mining resource extraction subsurface mining
Jennies Fork	3	low	aquatic life support cold water fishery -trout recreation swimmable	metals siltation	mill tailings resource extraction



**Lewis and Clark County**  
**GROWTH POLICY**  
**Final: 2/15/04**

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Skelly Gulch	7	low	aquatic life support cold water fishery -trout	siltation	highway/road/bridge const.
Virginia Creek	7	low	agriculture aquatic life support cold water fishery -trout drinking water supply	metals suspended solids	mill tailings resource extraction subsurface mining
Little Prickly Pear	35	low	aquatic life support cold water fishery -trout	flow alterations habitat alterations siltation	agriculture construction irrigated crop production
Fool Hen Creek	2	low	aquatic life support cold water fishery -trout	metals suspended solids	mill tailings subsurface mining resource extraction
Sheep Creek	5	low	aquatic life support cold water fishery –trout	siltation	resource extraction
Woodsiding Gulch	1	low	aquatic life support cold water fishery -trout swimmable	habitat alteration	highway/road/bridge const.

*(Source: Montana Department of Environmental Quality, 1998)*

## **Groundwater**

Groundwater is used by approximately 53 percent of Montana's population as a source of drinking water. Groundwater quality in Lewis and Clark County is generally good. Concentrations of dissolved substances may be higher in groundwater than in surface water, and in some instances can exceed the national secondary drinking water standards. In Lewis and Clark County, dissolved solids in groundwater range from 400 to 2000 mg/l.

Groundwater occurs in the sub-surface pore spaces, fractures, and voids in rocks, soil and sediment formations. Typically, groundwater is thought of in terms of aquifers with defined boundaries, but groundwater also includes shallow vagrant soil moisture that will rejoin surface and groundwater, or be taken up by the roots of plants.

Groundwater originates from water infiltrating the ground from snow, rain, and water courses. Groundwater tends to move from the highlands to low areas, where it is discharged to streams, used by plants, or evaporates. The movement, amount, and quality of groundwater at any location depends on the type of aquifer, climate, landform, and other natural features. Groundwater is also influenced by human activities, although to a lesser extent than surface water.

Aquifers in Lewis and Clark County are divided into four categories: bedrock, tertiary basin fill, glacial, and alluvial.

### **Overview of Aquifer Types**

**Bedrock Aquifers:** Bedrock is a term used to describe solid rock, which is often covered by soil or other uncompacted materials (e.g., sand, gravel and clay). Bedrock forms the core of mountainous areas and is present deep below younger deposits in valleys. The most common forms of bedrock found in Lewis and Clark County are: Precambrian age metasedimentary rock; Paleozoic and Mesozoic age marine and terrestrial sandstones, shales and carbonate rocks; and igneous rocks of various ages.

The water bearing capacities of bedrock formations depends on whether the rock is porous, fractured, or cavernous. The source of groundwater recharge in bedrock aquifers is largely infiltrating water from mountain snow pack and precipitation.

Precambrian metasedimentary rocks are typically highly compacted and nonporous; groundwater principally occurs in the fractures. These extremely old rocks include

maroon, pale green, and lavender hardened siltstones (argillites), sometimes visible in rock outcrops. Well yields are variable, but generally small, ranging from 1 to 35 gallons per minute.

The water bearing capacities of Paleozoic and Mesozoic age marine and terrestrial rocks are dependent on the type of rocks, degree of fracturing, geologic structure and topographic setting. Limestone and sandstone formations are typically moderate to good aquifers, while shales may yield little or no water. Well yields are variable, ranging from 5 to 100 g.p.m. Igneous rocks include volcanic rocks (molten rock that solidified at or near the surface) and plutonic rock (molten rock that solidified at depth). In plutonic rocks, such as granite, groundwater occurs principally within fractures. Well yields average as little as 2 to 5 g.p.m.

**Tertiary Basin Fill Aquifers:** During the Tertiary Age, mountainous areas were eroded and sediments accumulated in the valleys. The deposited sediments consist of uncompacted or poorly compacted clay, silt, sand and gravelly materials in horizontal or slightly tilted layers. They also include beds of volcanic ash. The water yield of the Tertiary fill sediments within basins generally range from 5 to 35 g.p.m. In some areas, a basin's thick, gravelly saturated sediments provide enough water to operate large sprinkler irrigation systems. Water enters the Tertiary sediments via seepage from streams, overlaying alluvial aquifers, precipitation, and irrigation activities. Water quality depends on the location and depth of wells, the type of sediment present, and the proximity to fresh water recharge sources. Water quality is typically fair to good for domestic and stock water purposes, but may be susceptible to degradation by human activities.

**Glacial Aquifers:** Many of the higher, more rugged mountainous areas of Lewis and Clark County, such as the Blackfoot Valley, were glaciated during the ice age. The glaciers carved large amounts of materials from the surrounding landscapes and transported it downhill. The deposits left by these glaciers are complicated mixtures of poorly sorted debris (glacial till), gravelly outwash and glacial lake sediments. The water bearing properties for glacial aquifers are as variable as the nature of their deposits.

**Alluvial Aquifers:** Alluvium consists of loosely compacted gravel, sand, silt, and clay deposited by streams. These sediments are present beneath the floodplains of streams and are layered and highly variable from one location to another within the floodplain.

Alluvial aquifers such as the Helena Valley Aquifer are excellent water sources and are the most extensively used type of aquifer. Water yields in the alluvial sediments can be very large, as much as 1,000 g.p.m. or more in a properly designed, large diameter well.

Groundwater in alluvial aquifers is hydraulically connected to streams, and water levels and movements are affected by stream conditions. The relationship between alluvial groundwater and streams can be complicated and vary both by location and time. Some stream reaches may gain water from adjacent alluvial aquifers, while other reaches may lose water. The relationship could shift due to natural or human induced conditions, including seasonal variations in precipitation and streamflow, irrigation activities, groundwater withdrawals, and wastewater treatment discharge. Because of the shallow nature of alluvial sediments, shallow water depths, and concentrated human populations in the valleys, alluvial aquifers may be susceptible to contamination.

### **Groundwater-Surfacewater Interaction**

Groundwater and surface water are components of the same hydrologic system, with complex interactions. Mixing groundwater with surface can have a significant effect on either body. Contamination of surface waters in the Missouri River, Blackfoot River, Tenmile Creek, and Prickly Pear Creek can be transmitted to the coarse, alluvial aquifers of the river valleys and the Helena Valley through seepage into the streambed, sometimes causing contamination of drinking water wells. In other cases, contamination can migrate from the aquifer to the surface water through springs and other sources.

Groundwater-surface water interaction can also affect aquifer recharge and streamflow volumes. Streams and lakes receiving recharge from aquifers that are being depleted may experience a reduction in available streamflow for irrigation, fisheries, and other uses.

Irrigation canals and irrigation water act as surface waters and--in some cases--provide aquifer recharge. Influences from Missouri River irrigation waters are evident in groundwater samples with high levels of arsenic in the Helena Valley, some elevated above the State of Montana health standard of 18 micrograms per liter (USGS 1997).

The federal Clean Water Action Plan recommends a watershed approach to evaluating and resolving potential surface and ground water quality problems. This approach recognizes that water moves through a hydrologic cycle, usually beginning with

precipitation, then moving through the ground as groundwater before emerging in streams, rivers, and lakes.

The watershed approach recognizes that the majority of water quality problems are caused by literally thousands of diffuse, non-point sources of polluted runoff, as well as point sources like sewage treatment systems. Threats to water quality in Lewis and Clark County vary and must be addressed individually in a manner that recognizes the unique nature of each watershed.

### **Groundwater in the Helena Valley**

The areas of Lincoln, Wolf Creek, Craig, and the Helena Valley are served by shallow, near surface, unconfined alluvial aquifers composed of coarse-grained deposits which may allow rapid infiltration of surface contaminants. Because the groundwater resources in the Helena Valley are the most important in the County in terms of the number of people they serve, this area is examined in more detail.

Groundwater in the Helena area is the sole source of drinking water for approximately 55 percent of the local population. The Helena Valley alluvial aquifer provides water through approximately 5000 domestic wells and 60 public water supplies. Planned conservation and protection of water supplies is the underlying element in maintaining this as a renewable resource.

The Helena Valley is a broad, oval-shaped, sediment-filled basin with its edges rising to pediments on the north, south, and southwest that sharply abut the surrounding mountains. The valley floor is relatively flat and slopes gently toward Lake Helena in the northeast part of the valley.

Surface deposits on at the southwest and northwest margins in the Helena Valley are of Quaternary age, poorly sorted, and contain boulder to cobble size gravels found in a matrix of sandy silts and clays. The broad plain that slopes toward Lake Helena is formed of alluvial deposits which lie on deformed and eroded Tertiary lake beds. The total depth of the valley-fill exceeds 6000 feet near the basin interior and thins toward the margins. The alluvial deposits are generally not cemented or compacted (USGS 1992)

The geologic materials that comprise the aquifer appear to be discontinuous, heterogeneous, alluvial, and lacustrine deposits, with isolated clay and silt lenses that are continuously saturated from the water table to a depth of at least 500 feet. Alluvial

deposits in the vicinity of Lake Helena are relatively well-sorted, fine-grained, and compact.

The Helena alluvial aquifer system has been the focus of several comprehensive studies. The U.S. Geological Survey reports include "Appraisal of the Quality of Groundwater in the Helena Valley, Montana" (USGS 1973); "Evaluation of Shallow Aquifers in the Helena Valley, Lewis and Clark County, Montana" (USGS 1980), and; "Hydrogeology of the Helena Valley-fill Aquifer System, West-central Montana" (USGS 1992). The 1992 study describes the valley-fill aquifer system as being "relatively susceptible to potential contamination from surface and near-surface sources."

The 1992 USGS study identified areas of recharge for the valley aquifer. Inflow from bedrock aquifers accounts for 46 percent of valley recharge, irrigation water infiltration accounts for 31 percent, infiltration from streams contributes 15 percent, and leakage from the Helena Valley irrigation canal accounts for 8 percent. There is an upward gradient in an area of within 4 miles of Lake Helena. The study identified a tendency for a downward gradient in most of the rest of the valley, and further indicated that areas with a downward gradient and vertical permeability were most susceptible to potential contamination.

A 1992 study performed by the United States Geological Survey [Briar, D.W. and Madison, J.P. Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana, Water-resources Investigations Report 92-4023] indicated a median nitrate concentration of 1.2 mg/L. The report—which was based on a study of 100 wells--stated that some correlation exists between septic system density and higher nitrate concentrations.

In a 1999 study, "Total maximum daily load development (TMDL) and assessment of wetland treatment of stormwater runoff for the City of Helena, Montana" (LCCWQPD/Drake and Hettinger), sampling of groundwater wells down gradient of a localized discharge zone of the Helena Valley alluvial aquifer in October of 1996 demonstrated the presence of PCP and Picloram. The study implies that contaminated surface water from city streets may find its way into the alluvial aquifer. This is born out by documented spills of cyanide (Mother Lode Film Processing Plant 1984) and diesel (Continental Pipeline 1984), as well as the above-cited correlation between the density of on-site wastewater treatment systems and increased nitrate concentrations in groundwater. Conservation and/or the creation of wetlands may enhance the removal of nitrates, phosphates, and toxic chemicals from urban runoff, while serving as important groundwater recharge sites; because of these benefits, wetlands should be incorporated into large area development. As the Helena area becomes urbanized,

more acres of streets, parking lots, roofs, and other impermeable surfaces intercept precipitation and preclude aquifer recharge.

Preliminary results of groundwater sampling conducted by the Water Quality Protection District in 2001 and 2002 demonstrate higher nitrate concentrations in shallow groundwater and decreasing concentration with depth. Sampling in two subdivisions (Cedar Hills and Griffin-Davis) provide preliminary data indicating nitrates at the downgradient edge of the subdivision have higher nitrate concentrations than at the upgradient edge. Further, nitrate concentrations in from five wells in both subdivisions have periodically exceeded the EPA drinking water limit (WQPD files).

Depth to groundwater in the Helena Valley ranges from less than one foot in some areas to 60 feet near the margins of the valley. Depth to groundwater is influenced by irrigation practices in the valley and by spring runoff. The Lewis and Clark County Water Quality Protection District and the Environmental Health Division have recorded fluctuations of up to ten (10) feet.

Groundwater is generally closer to the surface in the area near Lake Helena and along Tenmile Creek, Prickly Pear Creek, and Silver Creek. Because of variability in depth to groundwater, site specific monitoring is required by the Environmental Division of the Lewis and Clark County Health Department prior to permitting on-site wastewater treatment systems in some areas. General depths to groundwater in the Helena Valley are reported in the 1992 USGS study.

Current monitoring in the Helena Valley includes a cooperative static water level monitoring program between the LCCWQPD and the Montana Bureau of Mines and Geology (MBMG). This program is part of Montana's 20 Year Groundwater Assessment Program. Beginning in the summer of 2000, the LCCWQPD received a Department of Natural Resources and Conservation (DNRC) Renewable Resource Grant to install and monitor 30 dedicated monitoring wells in the Valley.

Potential threats to water quality in the Helena Valley aquifer include:

- Treated effluent from both the Helena Treatment Plant and the East Helena Lagoon enters the aquifer by infiltration from their outfall ditches into Prickly Pear Creek.
- Pesticides, herbicides, and fertilizers are used throughout the County by farmers, ranchers, the Lewis and Clark County Weed District, and many households.
- Waste oil spread on roads throughout the county is subject to seepage and run-off.
- Storm water run-off from municipal streets and subdivisions contains oils, grease, solvents, and chemicals that can enter the aquifer.
- Sand and gravel extraction operations in the Helena Valley expose and greatly reduce the protection of aquifer waters.
- Class 5 injection wells (dry sumps receiving liquid industrial and shop wastes) are located throughout Helena and the Helena Valley. They provide a direct pathway for harmful petroleum and chemical products to enter aquifer waters.
- The City of Helena landfill and the Scratchgravel landfill are being investigated as being the potential source of volatile organic contaminants that have found their way into the aquifer waters. Two other landfills, one southwest of East Helena and the other in the Valley center lie directly above aquifer waters and are not being monitored at this time.
- The Helena Airport has two hydrocarbon plumes from underground storage tanks that have leaked in the past. Although the tanks have been removed, groundwater in the vicinity is still contaminated. The conditions are being monitored continuously.
- There are seven sewage lagoons located throughout the Helena Valley that provide wastewater disposal facilities for institutions and subdivisions. The lagoons are in areas directly overlying aquifer waters.



- Continuing development requires the use of community or individual on-site wastewater treatment facilities which discharge treated effluent directly to the ground.
- Underground storage tanks are common in the City of Helena and surrounding area. As of August, 2002, there were 227 active underground storage tanks at 75 facilities in Lewis and Clark County. Within the Helena Valley there were 181 underground storage tanks at 58 facilities.
- Leaks and releases from fuel tanks and rail depots in the Helena area have been documented for years, including a 1974 Yellowstone Pipeline release of 10,000 gallon of diesel, the accidental release of 4,000 gallons of gas and diesel into inspection ports at Fort Harrison, and the leak of more than 100,000 gallons of diesel from Burlington Northern rail yards in 1981 and 1986.

### **Wastewater Protection Strategy:** **Protection of Groundwater and Surface Water**

Expansion of residential and industrial development into both the Helena Valley alluvial aquifer and the hydrologically sensitive bedrock areas is occurring increasing pressure on water supplies and exposing the aquifers to ever-increasing numbers of contaminant sources, most notably individual and community (decentralized) on-site wastewater treatment systems.

There are nine large wastewater treatment facilities that are treating approximately 45 percent of the 1.8 million gallons per day (mgd) of wastewater being generated in the Valley area. This leaves 1 mgd being treated by on-site wastewater systems overlying the Helena Valley alluvial aquifer. With the projected population growth of the Valley, by the year 2020 there will be approximately 1.7 mgd being treated by on-site systems.

Many of the soil types of the Valley and other alluvial aquifers are mapped by the Natural Resource Conservation Service (NRCS) as being severely limited for on-site wastewater treatment systems. This severe ranking is derived from the coarse porous nature of the soils, shallow groundwater, and the wetness of the soils. Many areas along the three major streams of the Valley are susceptible to flooding or are in the 100 year floodplain. Along the fringe areas of the Valley soils are shallow and directly overlie fractured bedrock. Careful siting and maintenance of on-site wastewater

treatment systems is required to avoid future environmental problems. (Note: soil type maps were completed in 1984, and certified in 2001.)

On-site wastewater treatment systems (as well as other onsite or alternative decentralized wastewater treatment systems) can be the most practical and cost-effective way to treat household wastewater, assuming they are properly installed and managed. Without proper management, however, systems can fail, polluting water resources and threatening public health. Systems need periodic maintenance, including tank pumping.

Lewis and Clark County began permitting on-site wastewater treatment systems in 1973 when the County adopted its first set of on-site wastewater regulations. Prior to 1973, developers were able to install on-site wastewater treatment systems that were not required to meet any type of minimum standards. The State of Montana adopted minimum standards for on-site wastewater treatment systems in 1993. As a result, the quality of systems being installed has improved dramatically.

Lewis and Clark County does not have a complete inventory of the number, type, and condition of on-site wastewater systems in the Helena Valley. Many of the on-site wastewater systems were installed prior to 1973, and a large number were installed prior to the adoption of the State minimum standards. Many older systems are in poor condition and malfunctioning; they may have had little or no maintenance, and may be contributing to groundwater degradation of the valley aquifer.

The Helena Area Wastewater Treatment (HAWT) Facility Plan, completed in June of 1998, notes that of the six lagoons in the valley, four do not meet current standards and may be in violation of the Clean Water Act and the Montana Water Quality Act. Discharge from lagoons to groundwater totals 0.46 million gallons per day (mgd). These systems also need to be reviewed and, if necessary, updated or repaired.

These conditions can be alleviated with the development of a local wastewater management program for on-site or decentralized systems. A management program would ensure that the systems are properly managed and provide effective treatment of domestic wastewater. In 1996, Congress requested the EPA to examine the benefits of on-site and decentralized wastewater system alternatives, versus centralized wastewater collection and treatment. In its response, EPA concluded that "adequately managed decentralized wastewater systems are a cost-effective and long-term option for meeting public health and water quality goals." EPA identified the following barriers to the successful implementation of onsite and decentralized systems:

- Lack of knowledge and public misconceptions.
- Legislative and regulatory constraints.
- Lack of management programs.
- Liability concerns and engineering fees.
- Financial constraints

The EPA Voluntary Management Standards Guidance Manual Draft notes that use of decentralized treatment is currently increasing. In Lewis and Clark County, approximately 50 percent of the total housing units are served by individual or shared (two household) systems. According to the EPA, failure rates of on-site systems across the country are unacceptably high due to inappropriate siting, design, and inadequate long-term maintenance. Failures include surface seepage, plumbing backups, nitrate contamination of groundwater and nutrient and pathogen contamination of surface waters.

Current management programs are limited to regulatory codes and their administration. They include performance that is free of plumbing backup or surfacing sewage, prescriptive siting, design and construction requirements, and regulatory review and approval. A weakness of this regulatory program is that satisfactory treatment is not a performance requirement and there is no continuous oversight and compliance enforcement.

Initial levels of management, such as the Helena Area Wastewater Treatment (HAWT) Facility Plan completed in June of 1998, provide the blueprint for comprehensive area-wide wastewater planning. The HAWT report recommends that "a detailed inventory of existing on-site system should be conducted to determine the number of systems, their age, and approximate location. . . ." The report goes on to state that "an ongoing inspection program should be developed to characterize the condition and performance of existing on-site wastewater treatment systems." The HAWT report adds that, "the formation of a valley wide maintenance district should be considered to finance the inventory and inspection programs...A more detailed assessment of the formation, organization and possible role of a maintenance district should be performed as an initial step to the development of a valley wastewater management strategy."

The need to identify and assess sources of pollution and their impacts are echoed by the HAWT study, the EPA's Draft Voluntary Management Standards Guidance Manual, the national Clean Water Action Plan, and Montana's own Water Plan. The EPA calls for standards for progressive levels of on-site management including coordinated planning and design, greater range of treatment options, early identification of

performance malfunctions, owner awareness of maintenance needs, and preventive maintenance routinely performed.

## **County Inventory of On-Site Wastewater Treatment Systems**

### **Introduction**

The Lewis and Clark County Environmental Health Division (EHD) received a Community Development Block Grant (CDBG) in July 2000 to conduct an inventory of on-site wastewater treatment systems and wells in designated areas of the County. The study, which was completed in April 2002, focused on the Helena Valley, Colorado Gulch, Wolf Creek, and Craig.

There is currently no mechanism in place to evaluate whether existing on-site wastewater treatment systems are operating and being maintained effectively. Concerns in the Helena Valley, in particular, include the following: seepage from lagoons; over-utilization of on-site wastewater treatment systems in marginal soils overlaying shallow groundwater; flood events; and increasing residential density. Historic natural background levels of nitrates in Helena Valley groundwater were 0.1 mg/l (Moreland and Leonard, 1980), while samples during the last five years have uncovered nitrate concentrations ranging between 1.0 and 17.0 mg/l. The maximum nitrate concentration for drinking water established by the federal Environmental Protection Agency (EPA) is 10 mg/l (MT DEQ).

A significant part of the research was a survey designed to determine specific information on individual properties in the study areas; assess the homeowner's knowledge of their septic system; and determine the level of maintenance that was occurring. Approximately 5,460 homes within the study area were visited by EHD staff; of these, 2,335 (43 percent) completed the survey. An additional source of data were interviews conducted with local septic pumping companies operating in and around the study area.

## **Summary of Results**

Some of the key results of the research include the following:

- 70 percent of the survey respondents indicated that a septic permit for their property had been issued prior to installation of the system (either a new or replacement system). According to the County septic system database, however, only 63 percent of the homes in the study area that are served by an on-site system had been issued a permit.
- Of the respondents who indicated they had no permit for their system (30 percent of those who responded), 21 percent indicated their systems were installed prior to 1973, when the County began its permit system; 43 percent were installed between 1973 and the time of the survey, when permits were required; and 37 percent didn't know when their system was installed, and there was no record of a permit being issued.
- According to interviews with employees of septic pumping companies working in the study area, approximately 20 percent of the systems are being maintained in any given year. Approximately 25 to 50 percent of their service calls resulted from a crisis situation, such as sewage backing up in the house or surfacing in the yard.
- Interviews with septic company employees indicate that approximately 50-60 percent of the systems are being maintained on a routine three to five year basis, 20-25 percent are being maintained on a crisis only basis, and 20-25 percent are not being maintained at all.
- According to the homeowner survey, 63 percent of the residences indicated that their septic tank had been installed or pumped within the last three years. Taking a slightly longer time-frame, 73 percent said their systems had been installed or pumped within the last five years. Lewis and Clark County recommends that tanks be pumped every three years; the EPA recommendation is three to five years.

In response to the information gathered through the interviews and surveys, the study made the following summary observation:

*From these results it is apparent that there is a considerable lack of knowledge by the homeowners about their on-site wastewater treatment systems... Failure*

*to properly maintain septic systems may cause the septic system to fail, which can have serious impacts on the property owner or the environment...The number of systems that are not being pumped or are only being pumped in a crisis is of concern and measures should be put in place to remedy this situation.*

### **Study Recommendations**

The study went on to make a number of recommendations on how to address the situation, as follows:

- Initiate a homeowner education program targeted at the first time homeowner or builder who would like to install an on-site waste-water treatment system. As an incentive, participation in the program would result in a reduction in the price of a permit.
- A second, more detailed homeowner education program would be developed, directed at homeowners with existing systems.
- Once the homeowner education programs were in place, work could begin on creating an on-site wastewater maintenance district or program aimed at ensuring routine maintenance of all systems. The program would require a two-year maintenance schedule for all systems utilizing a pump. Lack of proof of maintenance would be followed a notice of violation from the EHD.
- A fourth component of the long-term maintenance program would be mandatory inspections of on-site treatment systems at the time of a real estate sale or transfer. Mandatory inspections at the time of sale—which currently occur in many other states—would help protect buyers, sellers, and agents involved in the sale.

In addition to the above, the study identified specific problems related to on-site wastewater treatment systems in the following neighborhood areas (specific details can be obtained in the study):

- Sewell Subdivision
- Belair and Adjacent Area
- Dunbar Area
- Rimini

- East Helena Fill-in Area
- Townview/Douglass Circle Area
- Trerise/Lanning Area
- La Casa Grande
- Seaver Park
- Griffin-Davis Area
- Wolf Creek
- Craig

In January, 2002, the Lewis and Clark County Commission requested that EHD staff recommend specific areas requiring infrastructure improvements due to problems with existing septic and water systems. Utilizing data obtained in this study, staff recommended an initial focus on two areas: Dunbar and Bel-Air Sewell. Specific concerns that led to this recommendation included the following:

#### **Dunbar Area**

- Small lot sizes and little available space for replacement systems.
- Age of septic systems in use.
- Recorded nitrate levels as high as 15.1 mg/l in area.
- Presence of bacteria has shown up in water sample(s).
- Proximity to the Helena city limits makes this an attractive area for annexation to city infrastructure.

#### **Bel-Air/Sewell Area**

- Small lot sizes and little available space for replacement systems.
- Age of septic systems in use.
- Recorded nitrate levels as high as 4.59 mg/l in area.
- Presence of bacteria has shown up in water sample(s).
- High groundwater issues.
- Highly permeable soils in Bel-Air area have led to installation of non-standard systems.
- Floodplain issues in Sewell area.

## **The North Hills Controlled Groundwater Area**

On July 2, 2001, the Montana Department of Natural Resources (DNRC) received a petition (subsequently amended on July 30, 2001) requesting that the agency perform a comprehensive hydrogeologic study to analyze current and future availability of groundwater in a portion of the North Hills area, at the northern end of the Helena Valley. Additionally, the petitioners asked that the designated area be closed to further groundwater appropriation, with the exception of replacement wells drilled during the term of the study. Proponents of the petition argued, among other things, that groundwater withdrawals in the area are in excess of recharge, and that the situation was likely to worsen due to on-going growth.

Following a public scoping meeting and publication of a draft environmental assessment, a public hearing was held on April 24, 2002 to collect testimony. In August 2002, the DNRC responded to the petition by designating a temporary controlled groundwater area (CGA) for the North Hills. According to the DNRC proposal for decision,

*the evidence shows the public health, safety, or welfare of the groundwater users in the proposed CGA is of concern because of declining water levels and increasing nitrate levels. However, facts are insufficient at this time to require permanent corrective controls to be adopted on this basis.*

The proposed order from the DRNC Hearings Examiner reads as follows:

*A temporary controlled groundwater area is designated for the 52.5 square mile area within Sections 1-19, Township 11 North, Range 3 West; Sections 1-3, E1/2 4, E1/2 9, 10-15, 22-24, Township 11 North, Range 4 West; Sections 26-35, Township 12 North, Range 3 West; Sections 21-23, 25-28, E1/2 33, 34-36, Township 12 North, Range 4 West, Lewis and Clark County, Montana...The designation shall be in effect for two years from the date of the Final Order. At the end of two years the Department will decide to terminate, extend as is, or extend with modifications the temporary controlled groundwater area.*

*The purpose of the designation is for gathering information on aquifer fractures, faults, and characteristics; aquifer recharge; and aquifer withdrawals to determine if withdrawals exceed recharge (capacity of the aquifer); if new wells will impair or substantially interfere with other groundwater wells; and if there is a contaminant plume developing that will be affected by withdrawals. With this designation, all new uses of groundwater and replacement wells in the*



*designated area must obtain a new use permit or change authorization from the DNRC.*

*New groundwater appropriators and those seeking to drill replacement wells in the area must first apply to the Department's Helena Water Resource Regional Office and obtain a license for drilling and testing purposes conditioned to allow the applicant and DNRC to gather data and information necessary for completing the application for permit or change authorization. The license may be conditioned to require 5-day advance notice of drilling to the Department's hydrogeologist to ensure adequate logging of appropriate lithologic, water chemistry, water level, aquifer test, and well construction data.*

*Water users should consult and work with the DNRC and Water Quality Protection District (WQPD) in compiling, organizing, archiving, and interpreting area-wide information. If it appears that further study is necessary after the term of the temporary controlled groundwater area has expired, a new temporary area can be designated after notice and hearing as provided in 85-2-507, MSA. If at any time during the term of the temporary controlled groundwater area, information becomes available to show that withdrawals have, or are about to, exceed recharge, the temporary groundwater area can be designated permanent and modified to include appropriate controls after notice and hearing as provided in 85-2-507, MSA (DRNC, 2002).*

## **Montana Water Law**

Montana's legal framework for water rights is referred to as the "prior appropriation doctrine," which has two general rules: "First in time, first in right" and "use it or lose it."

"First in time, first in right" relates to the priority date of a water right. The earlier the priority date, the better the water right. A senior water right holder is entitled to use the full amount of his or her water right before any junior holder can use any water. The senior water right holder can take all of the available water in times of shortage. There is no requirement that the water be shared among the various users.

"Use it or lose it" refers to the requirement of beneficial use. A water right is not ownership of the water itself, but the right to use water beneficially. When water is no longer put to a beneficial use, it can be lost or abandoned. Typically, it takes ten years of non-use for the issue of abandonment to arise.

The Montana Legislature created a new type of water right referred to as a "water reservation" in 1973. A water reservation is available only to public entities such as conservation districts, municipalities, and state and federal agencies. Water reservations differ from traditional water rights in two ways. First, traditional water rights can only be acquired if water is diverted or impounded. Before 1973, water rights could not be acquired for in-stream flows. Water reservation, however, can be used for in-stream flows. In-stream flow water reservations have been issued to the Department of Fish, Wildlife and Parks (FWP), Department of Environmental Quality (DEQ), and the Environmental Protection Agency (EPA) to maintain fisheries and dilute pollution. Second, due to the requirement of beneficial use, traditional water rights had to be put to "use" within a reasonable time or were lost. Water reservations, on the other hand, can reserve water for future needs of irrigation districts, municipalities, and other public entities.

Since 1973, a person must apply to the DNRC for a water use permit, if over 35 gallons per minute are being used. The applicant must prove, among other things, that there is unappropriated water available, and the new use will not adversely affect existing water rights. Montana water law allows for changes to be made to existing water rights, and for rights to be separated from the land to which they were originally connected.

## **Drainage**

Drainage, like any other environmental ecosystem, (i.e., climate vegetation, wildlife) is a carefully balanced, dynamic process, which has evolved over time. Components such as soil texture, slope, drainage density, vegetation, and land use practices constantly interact and adjust to one another, maintaining an equilibrium. The major controlling drainage feature in Lewis and Clark County east of the Continental Divide is the Missouri River, into which a majority of all streams and water courses eventually flow.

Stormwater management is a time-related, space allocation challenge. Water cannot be compressed. If natural storage is reduced without appropriate compensatory measures by urbanization, floodplain encroachment, or other land use practices, then additional storm water storage space would be required at other locations.

The City of Helena is revising its Stormwater Drainage Master Plan, which was last updated in 1994. The Master Plan identifies four major stormwater drainage basins located in or immediately adjacent to the City. The basins include the following drainages: Davis Gulch; West Area; Bull Run, and; Last Chance Gulch. The initial stormwater drainage evaluations indicated that urbanization within Helena resulted in a

greater than seven-fold increase in the volume of stormwater runoff from its non-developed state. Increased volumes of stormwater runoff and construction across and within natural drainage paths can result in localized flooding, causing structural damage, traffic disruption, pavement deterioration, and other adverse impacts. Unlike older, urbanized portions of the City, the Bull Run area preserved natural drainages and historic flood paths. Conserving these paths helps prevent future drainage problems.

Lewis and Clark County does not have a formal storm water management plan. Stormwater drainage conditions and characteristics found throughout the County can be traced to varying natural history and subsequent land use patterns. Artificial drainage systems, which have evolved throughout the County, are the cumulative result of many years of uncoordinated efforts and neglect, resulting in gerrymandered drainages, unmentioned culverts and roadside ditches, and increasingly impervious surface areas. A storm water plan is becoming an increasingly important issue as the population grows and commercial development expands.

## **Floodplain**

Flooding is historically documented throughout Lewis and Clark County. Major floods occurred in June, 1975, May, 1981, and as recently as February, 1996, when a Presidential Disaster Declaration was declared. Major flooding occurred along the Blackfoot River in 1908, 1964, and 1975. The peak of the flood season is during May and June, which usually are the wettest months of the year. Flooding has typically been caused by heavy rainfall combined with snowmelt.

Floods are typically classified as 10, 50, 100 and 500-year events; this means that floods of a given size have a probability of occurring once during the designated period. Framed another way, during each of the periods above, there is a 10, 2, 1 and 0.2 percent chance, respectively, of a flood of a given size being equaled or exceeded during any year. The re-occurrence intervals above represent the long-term average period between floods of a specific magnitude. However, floods can and do occur at shorter intervals. It is possible, for example, to have several hundred-year floods in the same year, even though this is unlikely. The longer the time period being considered, the higher the probability that a major flood will occur. To help address the threat posed by floods, the County has adopted a 100-year floodplain ordinance.

The Federal Emergency Management Agency (FEMA) prepared detailed floodplain maps for portions of Lewis and Clark County in 1981; some of these were revised in 1985. Floodplain maps are available for the Helena Valley along Tenmile, Prickly Pear

and Silver Creeks; the Blackfoot River in Lincoln; Elk Creek in Augusta; and the Missouri River near Craig.

The floodway is the channel of a stream and adjacent bank areas that must be reserved in order to discharge a base flood without cumulatively increasing the water surface elevation more than one-half (1/2) foot. These areas are shown on FEMA maps as Zone A; development of permanent structures such as homes and businesses are prohibited. Placement of fill or culverts, excavation, storage of equipment or materials, and bridge construction require a Floodplain Development Permit, issued by the Lewis and Clark County Floodplain Coordinator.

The floodway fringe is the area of the floodplain outside the limits of floodway. These areas are referred to as Zone B on FEMA maps. Construction of permanent structures are possible within Zone B, but only after the issuance of a Floodplain Development Permit. The permit may require flood proofing or other mitigation measures. Residents are encouraged to purchase flood insurance; it generally takes 30 days to become effective.

## **Wetlands**

The United States Fish and Wildlife Service (USFWS) defines wetlands as:

*lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. For the purposes of definition, wetlands must have one or all of the following three attributes:*

- *At least periodically, the land supports predominately hydrophytes;*
- *The substrate is predominately undrained hydric soils; and*
- *The substrate is nonsoil and is saturated with water or covered by shallow water during the growing season each year.*

(Note: The term "hydrophyte" refers to any water loving plant. Classes of hydrophytes include floating plants like lotus, submergents such elodia, and emergents like cattail and hard-stem bulrush. The biological definition of hydric means characterized by an abundance of water.)

The USFWS's classification system groups wetlands into five ecological systems according to ecological characteristics. Three of these types of wetland groups--Riverine, Lacustrine, and Palustrine--are found within Lewis and Clark County. The Riverine system is limited to freshwater river and stream channels. It is mainly a freshwater, deepwater habitat system, but has nonpersistent marshes and aquatic beds along its banks. The Lacustrine system is also a deepwater habitat system that includes standing water bodies like lakes and deep ponds. The Palustrine system encompasses the vast majority of non-tidal wetlands, such as swamps and bogs.

Wetlands provide economic benefit, improve water quality, and support fish and wildlife. The most noticeable benefits of wetlands include flood and storm water damage protection, erosion control, water supply, groundwater recharge, scenic open space, and recreation.

Wetlands play a major role in the quality of the natural environment; however they are subject to both human and natural forces that may result in their degradation or loss. The major causes of wetland loss and degradation include the following:

- Drainage for crop production, timber production, and other activities.
- Filling for dredged spoil and other solid waste, road construction, and residential, commercial, and industrial development.
- Construction of flood control, water supply, irrigation, and storm water protection structures.
- Discharge of pesticides and other pollutants, nutrient loading from sewage, and agricultural runoff.
- Sedimentation from agricultural and development activity.
- Erosion and accretion.
- Mining of wetlands for sand, gravel, and other materials.

The primary federal regulatory program covering wetlands is Section 404 of the Clean Water Act. This program regulates discharges of dredge and fill materials into the waters of the United States, including most wetlands. The Section 404 program is administered jointly by the US Army Corp of Engineers and the Environmental Protection Agency (EPA). The US Fish and Wildlife Service (USFWS) is given an

advisory and commenting role in the 404 process. The Montana Department of Fish, Wildlife and Parks (FWP) and the Department of Environmental Quality (DEQ), Water Quality Bureau are the lead State agencies dealing with wetlands.

The Helena Wetlands Community Partnership has been working to gather information about Helena area wetlands since 1998. The Partnership includes members and volunteers from the County Water Quality Protection District, County Planning Department, County Information Technologies Services, the Montana Wetlands Trust, the Montana Audubon, USFWS, FWP, and wetland scientists. The Partnership, in conjunction with property owners, is currently identifying existing and historic wetlands sites that are suitable for preservation, enhancement, and restoration. The information being gathered will be linked with other water quality programs. The Partnership is also identifying various strategies and techniques to utilize wetlands as a means of consuming nutrients that remain from wastewater treatment and agricultural activities and to incorporate wetlands as part of stormwater management systems. They are also investigating methods to collect stormwater runoff and to divert gray water to maintain year round viability of local wetlands.

## **Vegetation**

Lewis and Clark County is predominantly coniferous forest, with areas of mountain grassland and shrub land scattered throughout. Ponderosa pine, Douglas-fir and Lodgepole pine are important tree species. Subalpine fir, Whitebark pine, Limber pine and Engelmann spruce are locally important. Rough fescue, Idaho fescue, bluebunch wheatgrass and big sagebrush are the dominant species in the mountain grassland and shrubland. Grasslands and shrub lands at lower elevations contain plant species from the adjacent intermountain basins. Patterns of plant communities reflect the occurrences of periodic wildfires.

Habitat types are considered to be the basic ecological subdivision of landscapes. Each is recognized by distinctive combinations of overstory and understory plants at climax growth. Each habitat type group is named for the dominant characteristic vegetation.

Habitat types are particularly useful in soil surveys of mountainous areas to assess the combined effects of aspect, slope, elevation, and soil properties on potential vegetation growth. The distribution of habitat types is important in evaluating potential timber and forage productivity, forest regeneration limitations, and wildlife habitat potential.

A brief description of the major habitat types found in Lewis and Clark County area are listed below:

**Lower mixed forest** is moderately extensive on low elevation mountain slopes, rolling uplands and southerly aspect breaklands. Elevation is mainly 3,500 to 5,000 feet, with elevations up to 7,000 feet on steep southerly aspect slopes. This habitat type contains forest stands that are mainly ponderosa pine or mixed Douglas-fir and ponderosa pine. Major habitat types are ponderosa pine/Idaho fescue, Douglas-fir/snowberry, Douglas-fir/Idaho fescue, Douglas-fir/rough fescue, and Douglas-fir/ pinegrass, kinnikinnick phase. Ponderosa pine/bluebunch wheatgrass and ponderosa pine/bitterbrush are less extensive.

**Upper mixed forest** is found extensively at 4,200 to 7,000 feet, and up to 7,500 feet on the southerly aspects and as low as 3,800 feet on steep northerly aspects. This habitat group type is commonly associated with soils underlain by limestone bedrock at elevations of 6,000 to 7,500 feet. This habitat type contains forest stands that are mainly above the cold limits of ponderosa pine, but are not too cold to support Douglas-fir. Habitat types are higher elevation habitat types in the Douglas-fir series and lower elevation habitat types in the subalpine fir series.

**Lower sub-alpine forest** is found extensively at 6,000 to 7,200 feet elevations. It is associated with moderately acid to neutral soils, and is not found on neutral to moderately alkaline soils underlain by limestone. Forest stands are mainly lodgepole pine. Douglas-fir is not common, although it is sometimes present on southerly aspect or lower elevation stands. Engelmann spruce and subalpine firs are sometime dominant in old growth stands.

**Upper sub-alpine forest** habitat type group is of minor extent on mountain ridges or glacial valleys. It is mainly found at elevations of 7,200 to 9,000 feet, but may be found at elevations as low as 6,000 feet on wind swept ridges. The forest stands are mainly mixed whitebark and lodgepole pine. Engelmann spruce and subalpine fir are sometime dominant in old growth stands. Limber pine is sometimes present on soils underlain by limestone or on windswept ridges.

**Wet forest** is found to a minor extent on stream floodplains, terraces, and glacial moraines at elevations of 4,000 to 7,000 feet. This habitat group type is found in soils with fluctuating water tables. Forest stands are often dominated by Engelmann spruce, but can contain subalpine fir and lodgepole pine.

**Mountain grassland and shrubland** are found at elevations of 4,000 to 7,500 feet. Dominant plant species found in this habitat type include rough fescue, Idaho fescue, and big sagebrush.

**Alpine meadows** are found on mountain ridges at elevations of 8,000 to 9,500 feet. These forb-rich grasslands are usually found above the timberline. Dominant grasses or grass-like plants include tufted hairgrass, Idaho fescue, rough fescue, and sedges.

**Wet shrubland and meadows** are found on soils with fluctuating water tables. Vegetation is predominately sedge grassland or willow, red alder or bog birch. Baltiz rush, red canary grass and Carex Spp. are the major habitat types in wet meadows. Willow, red alder, bog birch or red osier dogwood community types dominate wet shrub lands.

## **Rare, Threatened, or Sensitive Plant Species**

The Montana Natural Heritage Program identified twenty-three (23) plant species and three (3) plant associations that are considered to be rare or vulnerable to extinction in Lewis and Clark County. Most of the identified species are associated with wetlands or transitional wetland areas. Appendix G includes a table with the common names of the species and their current status.

## **Noxious Weeds**

Noxious weeds have infested Lewis and Clark County and the rest of Montana for decades. Until recently, noxious weeds have been perceived only as an agricultural concern, but as more development occurs and more people take advantage of Montana's outdoor recreational opportunities, noxious weeds have become more wide spread and costly to mitigate. Some of the negative impacts of this include degradation and loss of wildlife habitat and species diversity, decreases in property values, decreases in agricultural productivity, and possible water quality degradation.

The Montana Department of Agriculture defines a noxious weed as "any non-native plant that is harmful to agriculture, wildlife, forestry, recreation and other beneficial use of the land." The Department has declared 23 weeds as noxious, with two others on a state watch list, and two more on the County list. These weeds—which collectively



infect approximately eight million acres in Montana--are grouped and categorized according to their abundance throughout the state, and are identified in table 5.4.

**TABLE 5.4**  
**MONTANA'S NOXIOUS WEEDS**

**Category 1 Noxious Weeds** (Well established and generally widespread throughout the state.)

Canada Thistle	Sulfur (Erect) Cinquefoil	Whitetop
Spotted Knapweed	Common Tansy	St. Johnswort
Russian Knapweed	Ox-eye Daisy	Dalmatian Toadflax
Field Bindweed	Houndstongue	
Diffused Knapweed	Leafy Spurge	

**Category 2 Noxious Weeds** (Recently introduced into the state or are rapidly spreading from their current infestation sites.)

Dyers Woad	Purple Loosestrife	Tansy Ragwort
Meadow Hawkweed Complex	Orange Hawkweed	Tall buttercup
Tamarisk		

**Category 3 Noxious Weeds** (Found only in small, scattered, localized infestations.)

Yellow Starthistle	Common Crupina	Rush Skeletonweed
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**Watch List**

Scentless Chamomile	White Bryony
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**Lewis and Clark County List** (Adopted by resolution, in addition to the above.)

Tall Pepperweed	Canada Goldenrod
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(Source: Lewis & Clark Co. Weed Board)

The Montana Legislature passed the County Noxious Weed Control Act in 1985. The Act gives counties authority to more aggressively fight local weed infestation problems. If weeds are identified on-site, a weed management plan must be filed with the Lewis

and Clark Weed District, and approved by the Weed Board. The County applies a portion of the County property tax levies to weed control.

The most common methods of noxious weed management are prevention, chemical, and cultivation. Many weed infestations occur in areas inaccessible to control equipment. Environmental constraints such as shallow depth to ground water and the presence of surface water limit the use of herbicides. In addition, the cost of some herbicides application is prohibitive for use on rangelands, forest, and other areas of low economic return. Because of these reasons the State of Montana, in conjunction with several Universities, are attempting to establish "biological control or bio-control" of noxious weeds. Biological controls are defined as " the planned use of living organisms to reduce the vigor, reproductive capacity, density, or the effect of the noxious weeds". Under this definition, various approaches are being considered. They include the following:

- Introduction of insects.
- Augmentation of native bio-control agents (fungus, rusts, diseases, etc).
- Use of grazing systems in which livestock graze the noxious weeds.
- Use of competing vegetation.

The main goal of bio-control programs is to establish weed-attacking insects and pathogens so that native plant communities can begin to compete with non-native, noxious species of weeds. Weeds in bio-control areas are reduced to a level where they become part of the plant community and not a threat to it (Petroff, 1993).

Several of the bio-controls measures are being utilized in various areas of the County. Additional information on the availability and cost of these types of measure are available from the County Extension Agent and the Weed District.

Individual residential property owners may help combat the spread of noxious weeds by immediate revegetation of disturbed areas, annual application of approved herbicides in non-riparian areas in the spring of the year, and manual removal of weeds before the infestation becomes severe.

## **Wildfire Hazards**

In Lewis and Clark County, summer typically brings the fire season, the result of low rainfall, high temperatures, low humidity, and summer thunderstorms. Nevertheless,

major wildfires can occur at any time of the year. Varied topography, semi-arid climate, and numerous human-related sources of ignition make this possible. The 1988 Warm Springs Fire burned 32,700 acres in the Elkhorn Mountains, along with thirteen homes and cabins, as well as numerous outbuildings.

The summer of 2000 was another devastating fire season in Montana, one of the worst ever recorded. In the Helena area, fire suppression agencies averaged more than 150 wildland fire responses for the year, including lengthy involvement with conflagrations such as the Bucksnot (9,300 acres), Cave Gulch (29,270 acres), and Toston-Maudlow (81,000 acres) fires. According to information compiled by the Lee News Network, Montana experienced approximately 2,400 fires in 2000, affecting 950,000 acres, battled by 12,000 fire fighters. Nationally, only Idaho had more acres affected by wildfires in 2000.

In Montana, 86 primary residences, 133 outbuildings, and 2 commercial businesses were lost to wildfire in 2000. More than 2,000 people were forced to be evacuated from 23 different communities. Nationwide, approximately 1,000 structures and more than 470 homes were lost to wildfires in 2000. Throughout the country in the 1990s, the number of structures destroyed by wildfire increased six times over the previous decade's total, as increasing numbers of people moved to fire-prone areas.

The summer of 2003 brought another severe fire season to Montana and Lewis and Clark County. The Lincoln area, in particular, was especially hard hit, with two major fires in the vicinity (the Snow-Talon and Moose Wasson complexes).

In the wake of recent fire years, there was considerable discussion about what happened and why, with the following emerging as some of the key themes in Montana:

- Fire fighters did an incredible job overall: Not one life was lost in Montana directly because of the 2000 fires. Part of the challenge fire fighters faced in many areas was being in a position of trying to protect structures constructed in fire-prone areas, rather than aggressively fighting the actual fires. In some cases, poor access to property enhanced risk to firefighters trying to save buildings.
- The Internet proved to be the single most effective tool for getting up-to-date and constantly changing fire information to a large number of people. The State of Montana's web coverage of the fires was exceptional, particularly in respect to the changing nature of public lands closures.

- The fires precipitated a continuing political debate about how forests should be managed in the future to maintain their biological integrity and reduce fire risk.
- Most significantly for the purposes here, the 2000 fires, especially, generated an on-going discussion about the role land use planning, design, and vegetation management can play to minimize the danger posed by fire to residents, homes, and firefighters.

Since the mid-1960s, and particularly in the last 10 to 15 years, people have subdivided and developed wildlands throughout the County for residential, recreational, and commercial uses. Development has created many communities mixed with wildland vegetation, otherwise known as a Wildland Residential Interface. The Wildland Residential Interface is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (Society of American Foresters, July 1990). A Wildland Residential Interface exists anywhere that structures are located close to natural vegetation and where a fire can spread from vegetation to structures, or vice versa. A Wildland Residential Interface can vary from a large housing development adjacent to natural vegetation to a structure or structures surrounded by vegetation.

Wildfire disasters are common in many parts of the nation, and the problem is increasing. This can be corrected through comprehensive planning that includes housing development design, fuels management, and public education. The Tri-County Fire Council (Lewis and Clark, Jefferson, and Broadwater Counties) has been chartered to help homeowners survive a wildland residential interface fire. Much of the Council's efforts are directed toward educating homeowners about reducing and managing fuel buildup, building and maintaining adequate road systems, providing adequate water supplies, and the use of fire-resistant materials and designs for homes and outbuildings.

The Tri-County Fire Council developed a fire risk level map that assesses the wildfire potential for southern Lewis and Clark County, particularly around the Helena Valley. The map is based on an assessment of slope, vegetation, and other factors that create wildfire hazards. The map includes four wildfire risk levels--low, moderate, high, and severe. Most of the areas surrounding the Helena Valley have been mapped for their level of risk. The Birdseye and Austin areas are the exception, and require future mapping.

Fighting wildland fires in Lewis and Clark County is primarily the responsibility of the United States Forest Service (USFS) and the State Department of Natural Resources

and Conservation (DNRC). Additionally, local volunteer fire districts provide vital support. The Tri-County Fire Council, USFS, and DNRC have been instrumental in maximizing the efficiency of local fire districts in response to wildfires.

Suppressing wildland fires is costly, time-consuming, and often dangerous. Wildland fires occur unexpectedly and create an emergency in which firefighters race to minimize harm to valuable resources or property. Despite public expectations, when the combination of excessive fuel build-up, topography, extreme weather conditions, multiple ignitions, and extreme fire behavior occurs, it is impossible to immediately suppress every wildland fire. Firefighters' safety and their ability to contain and limit the spread of fires can only be ensured by preparing well ahead of time, thoroughly examining various scenarios for fire numbers and sizes, and developing contingency plans to cope with them.

The ability to plan for and suppress fires has been negatively impacted by the successes of the past. Almost one hundred years of fire suppression in the County, coupled with other resource management activities, has altered the landscape. Millions of acres of forests and rangelands are at extremely high risk for devastating fires to occur. Already we are seeing the effects through an increase in the number of fires and acres burned. In light of limited work forces and funding, it is critical that fire management agencies and local fire departments work together to arrive at common solutions and successful strategies.

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## **Wildlife**

Lewis and Clark County provides abundant and varied habitat for a large number of wildlife species. According to the Montana Natural Heritage Program approximately 22 species of fish, six species of amphibians, eight species of reptiles, 286 species of birds and 61 species of mammals utilize portions of the County for permanent or migratory habitat.

Large mammals include elk, moose, mule deer, antelope, and black bear. The threatened grizzly bear is found in the remote mountains of nearby high country wilderness, and along rivers and streams that flow eastward onto the plains of the Rocky Mountain Front. Small mammals include beaver, muskrat, yellow-bellied marmot, porcupine, skunk, mink, weasel, otter, and raccoon. Predators consist of coyote, mountain lion, lynx, bobcat, and badger.

Raptors include osprey, bald and golden eagle, prairie falcon, turkey vulture, and many others. Ground squirrels, voles, gophers, mice and small birds provide a substantial prey base. Upland game birds include blue, spruce, rough, and sharptail grouse as well as Hungarian partridge. Sandhill cranes and great blue herons nest in and migrate through the area. Waterfowl include mallard, teal, lesser scaup, merganser, Canada geese, and many others.

The fishing resource includes bull, cutthroat, rainbow, brown, and brook trout as well, as many illegally introduced species. Appendix G contains maps illustrating the ranges of various wildlife game species and sensitive species. Of the species found in the County, the US Fish and Wildlife Service and the U.S. Forest Service have identified the species listed in table 5.5 as being threatened, endangered or sensitive species.

**TABLE 5.5**  
**THREATENED, ENDANGERED and SENSITIVE SPECIES**

<b><u>SPECIES</u></b>	<b><u>STATUS</u></b>
Westlope Cutthroat Trout	Sensitive
Bull Trout	Endangered
Montana Arctic Grayling	Sensitive
Shorthead sculpin	Sensitive
Common Loon	Sensitive
Trumpeter Swan	Sensitive
Harlequin Duck	Sensitive
Bald Eagle	Threatened
Ferruginous Hawk	Sensitive
Peregrine Falcon	Endangered

Sharp-tailed Grouse	Sensitive
Whooping Crane	Endangered
Piping Plover	Threatened
Least Tern	Endangered
Mountain Plover	Sensitive
Flammulated Owl	Sensitive
Boreal Owl	Sensitive
Black-Backed Woodpecker	Sensitive
Western Big-eared Bat	Sensitive
Northern Bog Lemming	Sensitive
Gray Wolf	Endangered
Wolverine	Sensitive
Lynx	Sensitive
Grizzly Bear	Threatened
Yellowstone Cutthroat	Sensitive

*(Source: US Fish and Wildlife Service)*

As the human population of Lewis and Clark County continues to grow and associated development spreads to undeveloped portions of the County, wildlife and wildlife habitat will be impacted. Poorly planned development has the potential to degrade and fragment wildlife habitat and travel corridors, increasing wildlife/human conflicts. The Montana Department of Fish, Wildlife and Parks (FWP) reports an increasing number of complaints each year about "wildlife damage." The complaints include wildlife feeding on ornamental plants, collisions between vehicles and wildlife, and domestic pets that harass or prey on wildlife, or vice versa.

FWP has made recommendations for those wishing to develop and live in areas that provide wildlife habitat which would maximize open space; permit wildlife movement; minimize wildlife conflicts and maintain the natural setting and habitat. These recommendations include:

- Cluster development.
- Designated, undeveloped open space.
- Protection of wildlife movement corridors along ridgelines, stream corridors and riparian zones.
- Increased awareness, appreciation and tolerance for wildlife by property owner.

- Limited and judicious use of fencing. Provisions should be made to facilitate wildlife movement through developments.
- Restraint of domestic pets.
- Storing pet and livestock foods inside. When feeding pets or livestock, do not leaving excess outside overnight.
- Garbage should be stored inside and disposed of frequently. When trash and garbage is stored outside, even in closed containers, it attracts wildlife particularly bears and skunks.
- Use native plants for landscaping. Non-native plants are particularly prone to wildlife use.
- Fence or net gardens or learn to share with wildlife.  
(Source: FWP, Helena Area Resource Office (HARO), 2002.)

## **EPA National Priority List**

Currently Lewis and Clark County has two sites listed on the Environmental Protection Agency's National Priority List (NPL). The listed sites are the East Helena Smelter and the Upper Tenmile Creek Watershed. The NPL is a published list of hazardous waste sites in the U.S. eligible for extensive, long term, cleanup under the EPA's Superfund Program. Listing on the NPL makes a site eligible to receive federal funds for cleanup, while the EPA seeks to recover cleanup costs from identified responsible parties. Placing a site on the NPL also allows the EPA to use Superfund monies for clean-up when there are no responsible party who can pay for the work. The NPL designation allows the EPA to participate with other state and federal agencies in comprehensive cleanup activities.

### **East Helena Smelter**

The East Helena Lead Smelter is located on the southern border of the City of East Helena and has been in operation since 1888. The eighty-acre smelter site is still generally referred to as the ASARCO facility--formally known as the American Smelting and Refining Company—but is now owned by a parent company called Grupo Mexico. The smelter—which suspended operations in 2001—has historically recovered lead, zinc, and other metals from ores concentrates using pyrometallurgical processes. The smelting process resulted in the airborne release of heavy metals, which were deposited over East Helena and the surrounding areas.



Environmental studies conducted in 1969 and 1970 by the Montana Department of Health and Environmental Sciences (MDHES) and the US Environmental Protection Agency (EPA) found substantially elevated levels of arsenic, cadmium, and lead in vegetation and soils in the City of East Helena and the surrounding areas. Based on the findings of these studies, it was recommended that grazing should be restricted in some of the areas surrounding East Helena and that locally grown vegetables should be washed prior to consumption.

The Montana Department of Health and Environmental Sciences (MDHES) and the Center for Disease Control (CDC) combined efforts to conduct a childhood blood lead study in East Helena in 1975. The Center for Disease Control recommended a public health standard for childhood blood lead of 30 micrograms-per-deciliter (*ug/dl*). The blood lead concentrations for 40 of 90 children tested were above this level (Lewis and Clark County Health Department--LCCHD, 1991).

The CDC, MDHES and the LCCHD conducted a second blood lead study in 1983. The 1983 study examined the relationship between children's blood lead levels and environmental lead concentrations. More than 90 percent of all children living in the study area participated in the study. Sixty-six of the children living within one mile of the smelter had blood lead levels greater than 10 *ug/dl*. Thirty-three of the children had blood lead levels greater than 15 *ug/dl*, and one child was identified as having clinical symptoms of lead toxicity.

The Environmental Protection Agency listed East Helena on the National Priority List in September, 1984. The EPA and ASARCO entered into an agreement where the company conducted an investigation of site contamination. The Phase I Remedial Investigation was completed in 1987. The investigation found that lead concentrations in soils from both residential and public areas (e.g., parks and schools) were several times greater than normal background levels.

The EPA, the State of Montana and ASARCO signed an agreement to conduct additional investigations in 1988. A Comprehensive Remedial Investigation/ Feasibility Study and Endangerment Assessment for the East Helena site was submitted by ASARCO to the EPA in 1990. The report concluded lowering soil lead concentrations could reduce the child blood lead levels. In 1991, the EPA and ASARCO signed an Administrative Order of Consent to begin a residential soil removal. The agreement required that residential yards be remediated if soil lead concentrations were found to exceed 1,000 micrograms-per-kilogram (*mg/kg*).

The scope of the initial soil removal action included approximately 26 yards, one public park, and one public school. Yards were selected because of their potential risk to the community. Factors that were considered included high lead concentrations and close proximity to children. Excavated soils were replaced with clean top soil and sodded or seeded with grass in residential areas or covered with a gravel mix in non-residential areas.

Subsequent soil removal actions have occurred in residential yards, parks, road, alleys and road aprons with elevated lead concentrations. The neighborhood closest to the smelter was identified as the "Yellow Zone". Residences in the "Yellow Zone" were remediated in a lot-by-lot manner in 1993 and 1994. The yard remediation criterion was modified in 1996 to require soil lead concentrations greater than 1,000 mg/kg and a resident child under seven or a pregnant woman.

Since 1991, the removal action has resulted in the clean-up of 518 residential yards, 421 sections of adjacent alleys and road aprons, 32 commercial sites, 6 public parks, 4 parking lots, 3 day-care centers, 2 schools, 6,600 lineal feet of irrigation ditch, and a 45 acre site for the proposed K and R residential subdivision.

There are still several undeveloped lands surrounding residential areas of East Helena that exhibit elevated levels of lead and arsenic in the soils. These undeveloped lands include agricultural lands; areas adjacent to ditches and drainage channels; residential properties, one acre and larger; and railroad rights-of way. Decisions concerning the need for remediation in these areas are made on a case-by-case basis depending on the concentrations of contaminants, proximity to existing residential areas, development timing, and the potential for health based risks to the residents.

Residences with larger yards require special consideration. Typically these residences are surrounded by a maintained yard immediately surrounding the home and undeveloped or unimproved areas. Both the improved and unimproved areas of the yards may have elevated lead levels, but a child's risk of exposure would be higher in the maintained yard area because of the amount of time the child spends there. Remediation of larger yards is addressed on a case-by-case basis, and includes a site inspection, along with interviews with the residents. Based on soil lead concentrations and the estimated risk of exposure, the undeveloped portion of the yard may be remediated by tilling, excavation and replacement, or capping.

There continues to be a risk of recontamination of remediated properties when the soil cap is disturbed and lead-laden soil is brought to the surface. The Lead Abatement Education Program of the City/County Health Department is investigating mechanisms

to provide notification and tracking of remediated yards. Since the first yard remediation in 1991, five percent of the remediated yards were selected to participate in a long-term soil lead-monitoring program. (Now that the smelter operation is suspended, ASARCO has requested that the frequency for long-term monitoring be changed to every third year.) All long-term remediated sites have maintained relatively stable "background" lead concentrations.

### **Upper Tenmile Creek Watershed**

The Upper Tenmile Creek Watershed is located approximately 12 miles west of the City of Helena at the base of the Continental Divide. The City of Helena receives a majority of its drinking water from the upper portion of the watershed. Roughly 80 percent of the land in the watershed is managed by the Helena National Forest. The remaining 20 percent is in private ownership, originally obtained through the patenting of mining claims.

Hardrock mining began in the Upper Tenmile Creek Mining Area (Rimini Mining District) in the 1870's. Today the Upper Tenmile Creek area consists of abandoned and inactive hardrock mines that produced gold, lead, zinc, and copper from the 1870s to the 1920s. Today the water quality in the Upper Tenmile watershed has been degraded by the historic mining operations. The remains of many of the historic mines contain trace metals known to be hazardous to human health and the environment.

During the late 1980s to the mid 1990s, the Montana State Superfund Program and Abandoned Mine Reclamation (AMR) Program [[http://www.deq.state.mt.us/rem/mwc/priority/pdist15\\_1.asp](http://www.deq.state.mt.us/rem/mwc/priority/pdist15_1.asp)] conducted environmental sampling at several mine sites in the upper watershed including the Tenmile Mine (a.k.a. Bunker Hill), the Red Mountain Mine, and the Red Water Mine. The samples identified trace metals of human concern including: arsenic, cadmium, copper, lead, and zinc.

The AMR completed a site characterization of potentially hazardous mines throughout Montana in 1995. The AMR staff prioritized mine sites statewide for cleanup using a Hazards Ranking Model to assess the environmental sampling results and the proximity of the mines to drinking water sources and municipalities. Table 5.6 identifies the mines in the Upper Tenmile Creek watershed prioritized in the State survey. Ten of the historic mines in the upper watershed ranked in the top 52; three mines ranked within the top six.

**Table 5.6**  
**Abandoned Hardrock Mines Priority Site Status for the Upper Tenmile Watershed**

<b><u>Rank</u></b>	<b><u>Site Name</u></b>	<b><u>Ownership Status</u></b>
3	Red Mountain	Private
4	National Extension	Private
6	Red Water	Private
25	Peerless Jenny/King	Private
32	Valley Forge/ Susie	Private/Public
35	Armstrong	Public
39	Lower Tenmile Millsite	Private
42	Tenmile (Bunker Hill)	Private/Public
46	Upper Valley Forge	Private/Public
52	Monte Cristo	Private
79	Queensbury	Private
129	Beatrice	Public
184	Peter	Private
202	Monitor Creek Tailings	Private
236	Bear Gulch	Private

The AMR reclaimed four mine sites following the prioritization, including the Lower Tenmile, Little Lilly, Kelly, and Tenmile Minesites (Bunker Hill). A catastrophic blowout of the reclaimed Tenmile adit occurred in July of 1993. Heavy rains backed up behind the reclaimed adit, which released suddenly causing a landslide of mud and rock to enter Tenmile Creek above the Rimini town site. "Moderately high levels of arsenic and lead were found in the soil along the bank of Tenmile Creek, and heavy metals levels were temporarily raised in the creek following the landslide. A portion of the landslide, which was deposited in the floodplain, was removed in 1996.

Beginning in 1988, the open pit and cyanide heap leach Basin Creek Gold Mine operated on property located on the Continental Divide at the headwaters of Tenmile and Basin Creeks about 20 miles southwest of Helena. Mining ceased in 1991. In 1990 and 1995, the Basin Creek Mine storm water detention system breached resulting in the discharge of sediment-laden waters to the headwaters of Monitor Creek. During

the summer months of 1995, the Basin Creek Mine voluntarily removed 9,700 cubic yards of historic mine tailings from Monitor Creek. The tailings were at that time ranked as number 202 on the Priority Site Status Listing.

The Upper Tenmile Watershed Steering Group was organized in April, 1996 to raise awareness and interest in watershed issues among the watershed's residents, users and natural resource agencies. The group consisted of key stakeholders with interest in the watershed. Stakeholders included Lewis and Clark County, the U.S. Forest Service, City of Helena, Basin Creek Mine, Department of Fish, Wildlife and Parks, Lewis and Clark Conservation District, Department of Environmental Quality, Environmental Protection Agency, U.S. Geological Survey, and the residents and property owners of the town of Rimini. The group addressed many issues regarding watershed management, including the needed cleanup of abandoned hardrock mines and the development of a regional mine waste repository.

The U.S. Forest Service and the EPA proposed a plan to convert the Luttrell Pit and ancillary portions of the Basin Creek Mine into a mine waste repository in June, 1999. Approximately 3.8 million tons of rock had been removed from the pit by the time the mine ceased operation in 1990. The EPA's and the U.S. Forest Service proposal was to remove approximately 2.4 millions tons of mine wastes from the Upper Tenmile Creek, Basin Creek, High Ore Creek, Cataract Creek, and Telegraph Creek watersheds over a ten year period. In early fall 1999, the Environmental Protection Agency listed the Upper Tenmile Creek and the Basin Creek watersheds on the National Priority List. Cleanup work commenced immediately and continued through the end of the construction season. Work in the watersheds began again in the summer of 2000. The work will continue each construction season, until reclamation of the historic mines sites is complete.

The USGS released the "Hydrology of Helena Area Bedrock, West-Central Montana, 1993-1998" in 2000 (Thamke). The report presented generalized information about hydrology and geology of bedrock aquifers in the Helena area.

Efforts began to form a watershed group on the lower section of Tenmile Creek in 2001. A "Know Your Watershed" workshop was held May 4, 2002 and the workshop identified problems along the middle section of the stream that included elevated metals from the upper stretch, sedimentation and stream channelization, and dewatering. The result of the meeting was the formation of the Lower Tenmile Creek Watershed Group.

## **Natural Environment Issues, Goals, and Policies**

Lewis and Clark County recognizes that the condition of the natural environment and the health and quality of life enjoyed by the citizens of the County are integrally linked. Assuring that development does not occur in areas prone to natural disasters or areas with serious constraints is important. Preservation of natural resources--while managing economic and population growth--presents a challenge to the citizens of Lewis and Clark County. Noxious weeds also continue to threaten agricultural lands and natural vegetation, and have become an important issue in the County and elsewhere in Montana.

**ISSUE A**     **Development in environmentally critical areas, particularly in places identified at high risk for flooding or wildfires, has proven costly for residents, local government, and the natural environment.**

**Goal 1**       Encourage development in areas with few environmental hazards or development constraints to minimize degradation of the natural environment, and the loss of capital investment and life due to natural disasters.

**Policy 1.1**   Encourage development in areas that are relatively free of environmental problems (e.g., soils, slope, bedrock, high water table, and flood prone areas).

**Policy 1.2**   Discourage or prevent development that is incompatible with the designated 100-year floodplain. Prohibit development in designated floodways.

**Policy 1.3**   Prevent increased storm water runoff from new development from adversely impacting other properties.

**Policy 1.4**   Preserve existing natural drainages.

**Policy 1.5**   Preserve hazardous areas (e.g., subject to geologic and flood hazards) as open space wherever possible.

**Policy 1.6**   Systematically reduce the existing level of storm water damage. Diminish exposure of people and property to storm water runoff, and reduce flood hazard.

**Policy 1.7**   Improve the usefulness of flood-prone lands as active and passive recreational areas.

- Policy 1.8** Develop residential and commercial setback requirements along streams, rivers, lakes, and reservoirs to preserve water quality and other natural resources, viewsheds, and recreational uses.
- Policy 1.9** Discourage development within areas designated by the Tri-County Fire Working Group as "High to Severe" to "Severe" fire hazard risk, unless developed in a manner consistent with the "Fire Protection Guidelines for Wildland Residential Interface Development," and the design standards in the Lewis and Clark County Subdivision Regulations.
- Policy 2.0** Examine the cumulative effects of development on flood plains, flood ways, levels of flood activity, and potential property damage.
- ISSUE B** **Groundwater and surface water quality are threatened and need to be protected.**
- Goal 2** Preserve, protect, and improve water quantity and quality in Lewis and Clark County.
- Policy 2.1** Discourage development with on-site wastewater treatment systems in areas having inappropriate soils or high groundwater to help prevent contamination of groundwater supplies.
- Policy 2.2** Encourage feedlots and other intensive livestock operations to locate in areas with low potential for ground and surface water contamination.
- Policy 2.3** Conduct water quality protection projects for high priority threats to Lewis and Clark County water resources.
- Policy 2.4** Improve water quality by minimizing erosion and sedimentation problems. Promote best management practices for timber harvests, road, bridge, and building construction to avoid water pollution, soil erosion, and the spread of noxious weeds.
- Policy 2.5** Assess stormwater runoff diversion and collection systems for efficiency, impacts to natural systems, and flood prevention.
- Policy 2.6** Encourage development of wellhead protection zones in areas of existing or proposed source water use.
- Policy 2.7** Provide education regarding the source and distribution of water supplies, potential threats to the quality and quantity of drinking water, and pollution prevention methods.

**Policy 2.8** Coordinate watershed user groups to develop sound watershed management recommendations.

**Policy 2.9** Support the Water Quality Protection District in its efforts to carry out programs that further the intentions of this goal, including the identification and evaluation of existing groundwater issues and alternatives.

**Policy 2.10** Consider the interrelationship between surface water and groundwater in subdivisions, by requiring the identification of areas of recharge and discharge around new development occurring in the Helena Valley, and elsewhere whenever economically feasible.

**Policy 2.11** Implement a wastewater maintenance program (see implementation plans).

**Policy 2.12** Define the role on-site wastewater treatment systems play in groundwater and surface water interactions by performing an inventory of septic systems, and monitoring their impacts on water resources.

**Policy 2.13** Recognize the important role played by wetlands in watersheds regarding groundwater recharge, water storage, flood abatement, and water quality.

**Policy 2.14** Review the Helena Area Wastewater Treatment Facility Plan (HAWT), prioritizing and implementing realistic strategies.

**ISSUE C** **The quality of the County's wildlife habitat and open space may be threatened by development.**

**Goal 3** Maintain the quality of the County's critical wildlife habitat, wetlands, and open space.

**Policy 3.1** Identify and protect the natural wetland buffers along the County's rivers, lakes and streams.

**Policy 3.2** Identify and encourage preservation of critical wildlife habitat.

**ISSUE D** **The character and quality of Missouri River Corridor is impacted by increased development and recreational pressure.**

**Goal 4** Preserve, improve, and protect the Missouri River Corridor.



**Policy 4.1** Work cooperatively with local watershed groups, conservation districts, private landowners, and other entities involved with Missouri River issues.

**ISSUE E: Wetlands are critical areas that affect water quality, wildlife, and community aesthetics.**

**Goal 5** Preserve existing wetlands within the County, and restore historic wetlands where possible.

**Policy 5.1** Prohibit construction activities within delineated wetlands.

**Policy 5.2** Encourage subdivisions and other projects to avoid or reduce loss of wetland functions.

**Policy 5.3** Provide incentives to avoid impacts to wetlands.

**Policy 5.4** Develop effective land use controls to protect wetlands.

**Policy 5.5** Identify the location of historic wetlands. Work with landowners, developers, agencies and organizations to develop projects to restore historic wetlands.

**Policy 5.6** Integrate wetland conservation with other resources such as floodplains, groundwater, streams, and lakes.

**Policy 5.7** Adopt a wetlands rating system to reflect the relative function and value of wetlands in Lewis and Clark County.

**Policy 5.8** Continue to support the Helena Wetlands Partnership or similar efforts in identifying, inventorying, and mapping wetlands throughout Lewis and Clark County.

**Policy 5.9** Work with agencies or land trust organizations to obtain conservation easements that protect wetlands and riparian areas.

**ISSUE F**    **Noxious weeds continue to threaten agricultural lands and natural vegetation.**

**Goal 6**      Work cooperatively to reduce the impact of noxious weeds in the County.

**Policy 6.1**    Efficiently spend limited weed management funds according to an established set of priorities (see implementation plans).

**Policy 6.2**    Enhance the County's enforcement mechanism for weed violations, to promote good weed management.

**ISSUE G**    **Prehistoric and historic resources are critical features that affect our understanding of and connection to the land.**

**Goal 7**      Encourage protection of historic and prehistoric resources.

**Policy 7.1**    Inventory historic and prehistoric resources.

**Policy 7.2**    Consider the effect of development on historic and prehistoric resources.

**Policy 7.3**    Provide for the protection of historic and prehistoric resources with reasonable mitigation, including education about these resources.

**Policy 7.4**    Encourage transportation improvements that are compatible with cultural resources.