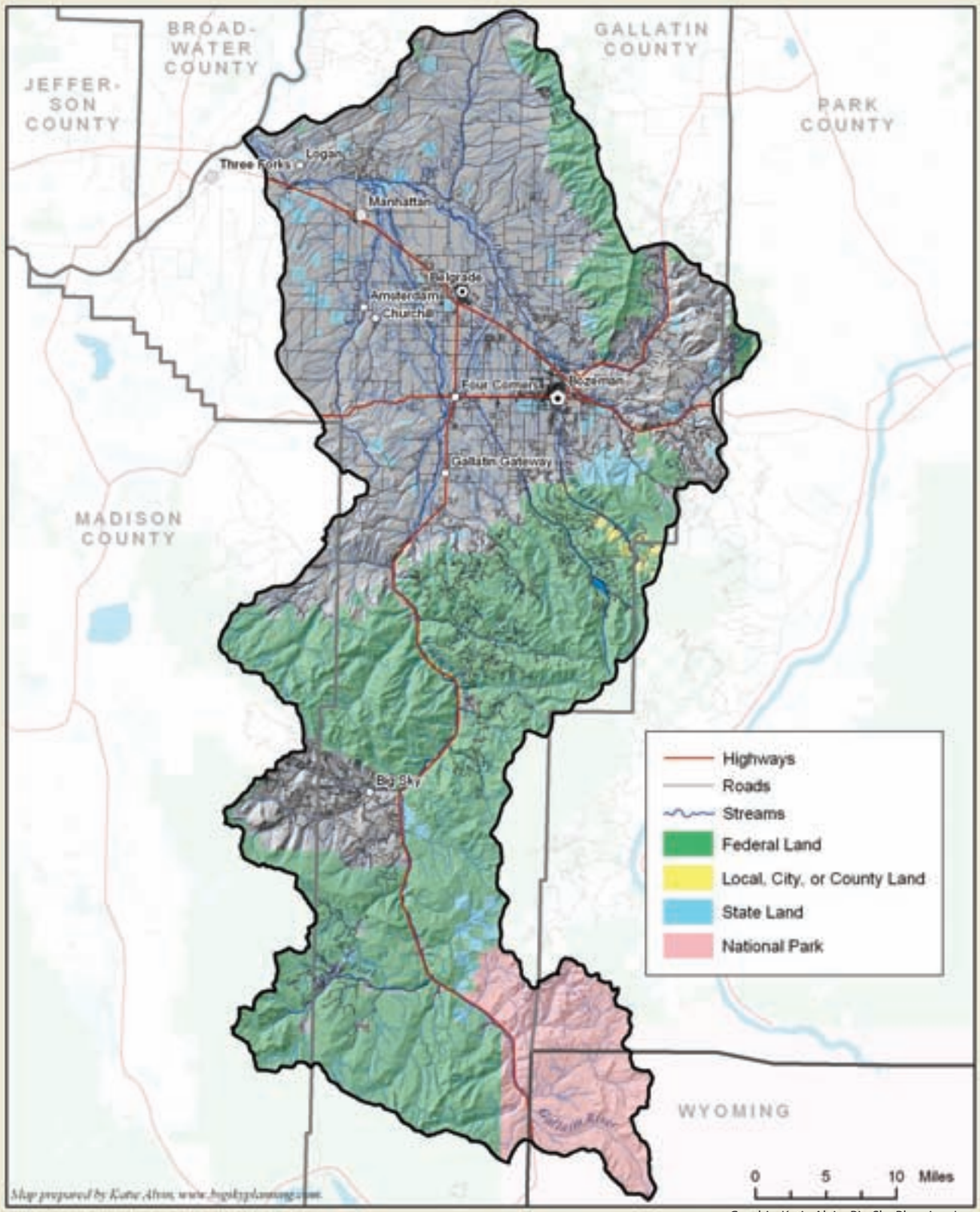
Gallatin Watershed Sourcebook:
A Resident's Guide

2nd Edition 2008

Blue Water Task Force
Gallatin Conservation District
Gallatin Local Water Quality District
Greater Gallatin Watershed Council
Montana Outdoor Science School
Montana Watercourse
USDA Natural Resources Conservation Service

The Gallatin River Watershed

Welcome to the Gallatin watershed. A watershed is the land area from which rainfall and snow melt drains into a single waterbody. Ridges of higher ground generally form the watershed boundary. The Gallatin watershed encompasses some 1,800 square miles.



Graphic: Katie Alvin, Big Sky Planning, Inc.

Gallatin Watershed Sourcebook: A Resident's Guide

A Reference Guide to Water Resources in the Gallatin Valley

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Acronyms Used in this Guide

AGAI - Association of Gallatin Agricultural Irrigators
BWTF - Blue Water Task Force
DNRC - Montana Department of Natural Resources and Conservation
EPA - U.S. Environmental Protection Agency
GCD - Gallatin Conservation District
GGWC - Greater Gallatin Watershed Council
GLWQD - Gallatin Local Water Quality District
MCA - Montana Code Annotated
MDEQ - Montana Department of Environmental Quality
MFWP - Montana Fish, Wildlife and Parks
MOSS - Montana Outdoor Science School
MSU - Montana State University
NRCS - U.S. Department of Agriculture, Natural Resources Conservation Service
TMDL - Total Maximum Daily Load
USDA - U.S. Department of Agriculture
USGS - U.S. Geological Survey
USFWS - U.S. Fish and Wildlife Service

Common Measures

1 cfs (cubic foot per second) = 7.48 gallons/second
= 448.8 gallons/minute
= 40 miner's inches
= 646,272 gallons/day
= 1.98 acre-feet/day

1 acre-foot = volume of water that covers an acre to a depth of 1 foot
= 43,560 cubic feet
= 325,851 gallons
supplies a family of 5 for 1 year

CHAPTER 1

You Live in a Very Special Place

Contributed by Steve Forest. Updates by Cassie Carter, MOSS

A Land Carved from Water

The Gallatin Valley of southwest Montana is shaped by and home to one of the most significant watersheds and river systems on North America. From its origins on the Yellowstone Plateau, the roof of the North American continent, the Gallatin River splits the twin ranges of the Madison and Gallatin. Descending in a torrent that the Shoshone called "Cut-tuh-o'-gwa" (swift water), the river slices through a canyon rimmed by the fossil remains of a lush tropical valley that existed some 50 million years ago. At the canyon's mouth, where the river still cuts at the canyon floor, the river bursts into a broad "new" valley. Gravel covering the valley was transported by water and the glaciers that sheared away rock to create high mountain parks, such as Hyalite meadows in the southern Gallatin Range. The valley is bounded to the west by the Madison Plateau, to the north by the Horseshoe Hills, which are ancient mountains filled with the fossils of trilobites, and to the east by the Bridger Mountains, a steep fold of younger sedimentary rock.

Photo: USDA-NRCS Dennis Loreth

Formed by ancient seas and the action of frozen and moving water, the valley continues to be shaped by the Gallatin River and its tributaries today. At the northwest end of the valley, the Gallatin River is joined by the Jefferson and Madison Rivers, forming the headwaters of the mighty Missouri River. In an average year, the Gallatin watershed's rivers and streams carry enough water to cover 1,200 square miles, an area the size of Rhode Island, a foot deep in water. Numerous springs are supported from abundant ground water sources. This water supports lush, water-loving vegetation, which in turn sustains vigorous populations of fish and wildlife.

Abundant wildlife in and along the Gallatin River first attracted prehistoric North American people to the region. Later, Blackfeet, Crow, Bannock, Nez Perce, and Shoshone Indians hunted and fought in the valley. In 1806 William Clark, one of the first white men to travel up the Gallatin River, wrote:

> *"a butiful [beautiful] navigable stream. Saw a large Gangue of Elk in the plains and Deer in the river bottoms...I saw several Antelope, common Deer, wolves, beaver, otter, Eagles, hawks, crows, wild gees, does, etc, etc....emence quantities of beaver... I proceeded on about two miles crossing those different channels all of which were dammed with beaver in such a manner as to render the passage impracticable... being swamped as I may say in this bottom of beaver."*

Yesterday's Promise

Later settlers to the Gallatin Valley not only had to cope with the challenges of removing the abundance of water described by Clark, but also with bringing water to the higher fertile ground. The first diversion of water in the valley is credited to the Penwell brothers northeast of Belgrade in 1864. In 1871, in what is regarded as one of the first mutual ditch-building efforts in Montana, settlers of the Middle Creek area formed the Upper Middle Creek Ditch Company. Other for-profit companies entered the water supply arena in the 1880s and 1890s, building the Farmers Canal and the High Line Canal, which served ranches on both sides of the main stem of the Gallatin. The last

large-scale effort to supply agricultural water to the valley was the construction of the Hyalite Reservoir, completed in 1950. Today, the Gallatin River is the source of water for three fourths of the irrigated land in the valley.

The Gallatin River has seen other use in the service of industry. Beginning in 1904, tie cutters working out of logging camps along the Taylor's Fork (a tributary stream of the Gallatin River) gathered logs behind retaining dams. The dams were broken in the spring, floating the logs on a flood of water to the Cooper Sawmill south of Central Park, between Belgrade and Manhattan. This practice was discontinued by 1907, due to a financial panic that destroyed the lumber industry from coast to coast. A scheme to dredge mine the Gallatin River from West Fork to the Yellowstone Park boundary failed through lack of investment in 1917. Proposals to dam the Gallatin River surfaced periodically beginning in the 1930s. The most serious of these proposals was to dam the river at the mouth of Spanish Creek. Strong opposition from recreational interests in the 1950s finally laid the issue to rest.

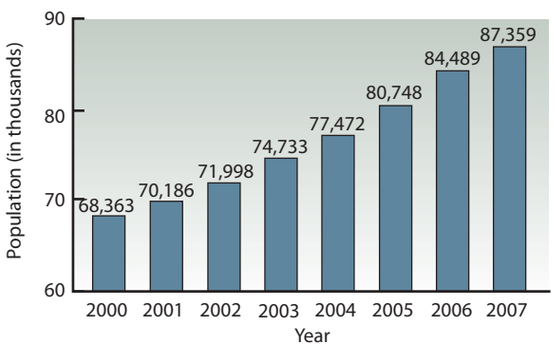
Photo: Gallatin County Historical Society

Log drive on the Gallatin River, ca. 1910.

Today's Challenge

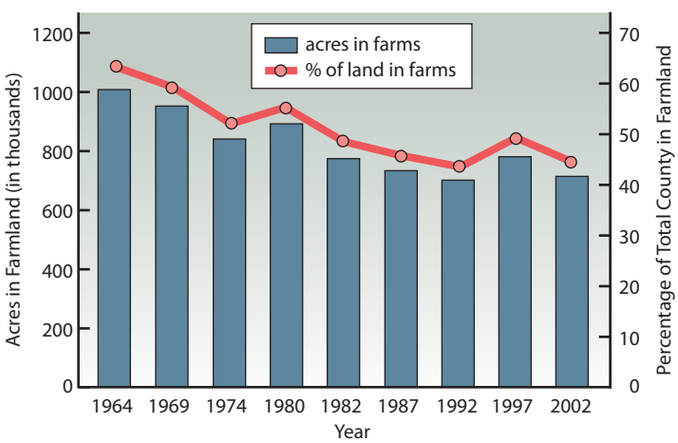
Water is one of our most important shared resources. Because water is dynamic, flowing in and out of the ecosystem with an abundance and quality that varies, it is one of our most challenging resources to manage.

In 1864, W.W. Alderson described the Gallatin Valley as "one of the most beautiful and picturesque valleys the eye ever beheld, abounding in springs of clear water." Others in the late 1800s echoed these sentiments, calling it "The Egypt," or "The Garden Spot of Montana." These descriptions are still largely fitting today. The valley is still fertile, and in spots, even lush. The water supplying this Eden with its life force is no less appreciated today than in former times. Abundant, renewable water from the Gallatin River and its tributaries shapes every aspect of our daily lives, whether it is used for farming, ranching, recreation, or household use.



Montana: April 1, 2000 to July 1, 2007 (CO-EST2007-01-30). Source: Population Division, U.S. Census Bureau. Release Date: March 20, 2008.

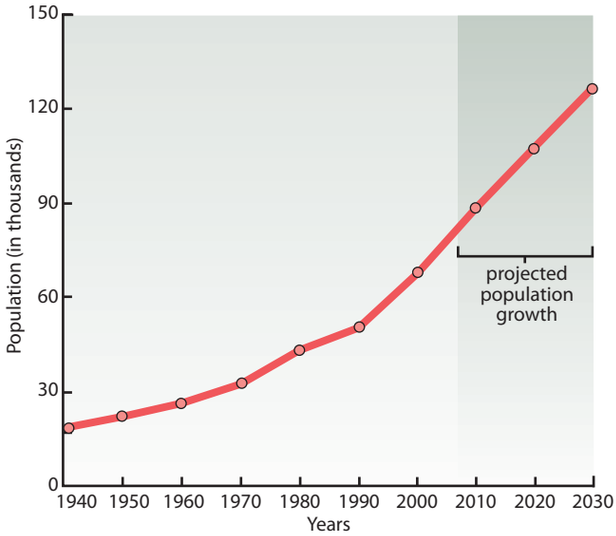
Gallatin County population growth, 2000-2007.



Source: U.S. Department of Agriculture, 2002 Census of Agriculture (Compiled by Census and Economic Information Center, Montana Department of Commerce).

Changing land use is affecting the quality and use of water in the Gallatin.

Actual and Projected Growth in Gallatin County, 1940-2030



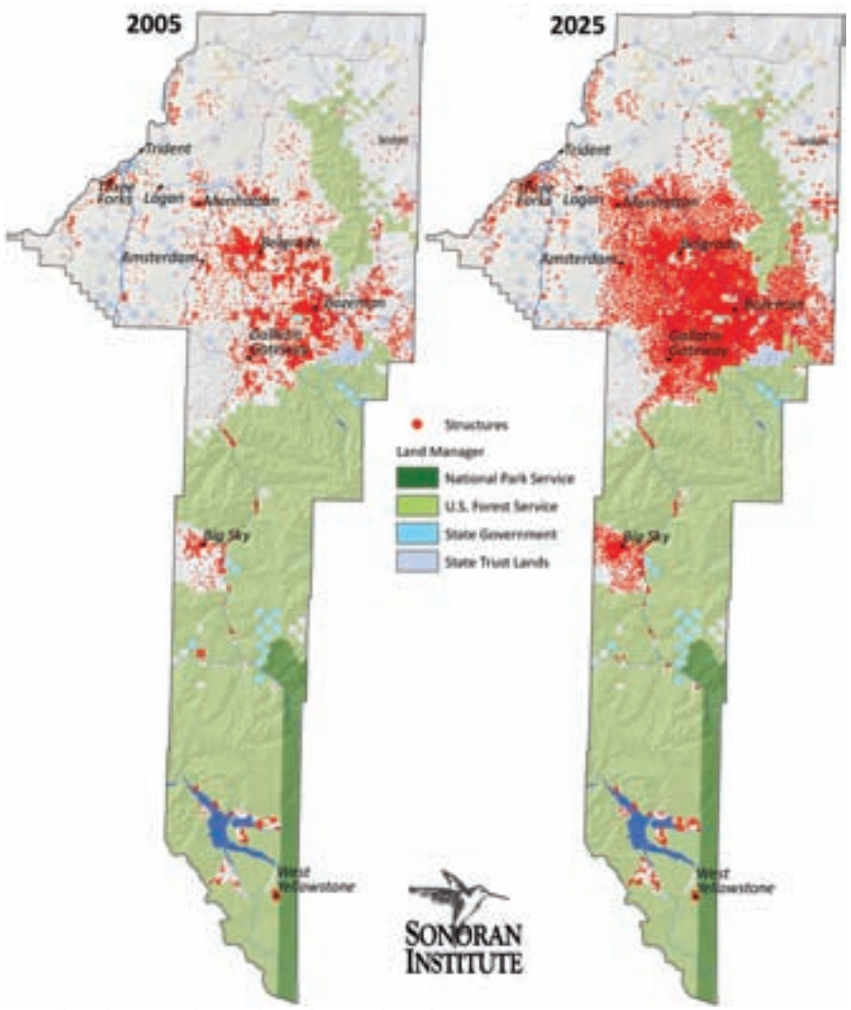
Sources: U.S. Bureau of the Census. Decennial censuses of population, 1890-2000 and NPA DataServices Inc., (2006 Regional Economic Projection Series).

Today's challenges for the watershed spring from a multitude of causes. Changes in land use, primarily the rapid and unprecedented growth of residential development, has the most significant impact on the watershed, placing increasing demands on our water resources. Between 2000 and 2007, the county's population grew 28.8%, faster than any county in Montana. If the trend continues, population is predicted to double by 2025 to 162,000 (Source: US Census Bureau). This will put new demands on the quantity of water available and present challenges for protecting and maintaing water quality. Protection of both surface and subsurface water is critical if we are to have the healthy environment that sustainable communities in the Gallatin watershed require.

Enjoying the Special Place Where We Live: Recreating in the Gallatin

Outdoor recreation is not only an essential component of our economy; it also shapes and defines our culture and community. The Gallatin watershed and surrounding landscape has provided places for people to fish, swim, boat and simply spend time alone or with family and friends since the earliest people inhabited this land. With more than 10 million visitors traveling to Montana each year and employing almost 50,000 people, our natural resources continue to serve as a significant asset. Fly fishing guides, rafting outfitters, innkeepers and sporting goods dealers are just a few of those directly employed in providing recreational services in the Gallatin. Because the Gallatin's riparian areas are so attractive to wildlife, they are also important areas for hunting and wildlife watching. As with the benefits provided by the Gallatin's water for drinking and raising crops, the value of these services is incalculable. While there will always be water around which to recreate, the quality of that experience will depend on how we manage and plan for future needs.

Gallatin County, MT



Actual and projected growth in the number of structures.

Recreating Responsibly

Responsible recreation around our waterways requires careful consideration and monitoring of our actions so as not to leave scars or pollute the water. The riparian corridor is a unique environment that can be rejuvenated by yearly flooding, erasing evidence of casual human use. Remember these are your waters. In the same way your house or car requires maintenance, waterways need to be maintained as well. Riparian corridors are often confined spaces with high densities of human traffic, particularly in the Gallatin where there are few stretches of "wild" rivers. These simple courtesies will limit abuse of rivers:

- **Garbage** – If you pack it in, pack it out. See someone else's garbage? Pick it up. Clean up fishing line that can ensnare and kill birds and other animals. Cigarette butts and plastic bottles are the two most common trash articles found in riparian systems. Tossing cigarette butts onto the landscape creates a fire hazard as well as a pollutant when they wash into the river during rainstorms.
- **Human waste** - In the event nature calls and no facilities are available, make sure you bury any human waste at least 6 inches below the soil, and hike at least 100 feet away from the river bank. Burn waste paper or carry it out in a closable plastic bag.
- **Camping/picnicking** – Use only designated camping/picnicking areas. Leave unspoiled areas looking unspoiled. Use an existing fire pan or fire ring, and leave a clean pit.
- **Soap and other chemicals** – Do not use in contact with any stream corridor. Rinse dishes away from the water's edge, preferably in an established campground.
- **Trails** – use existing trails to avoid erosion and damage to streambanks.

Ultimately, the well-being of the watershed and our ability to rely on it depend on people who live here. As stewards of this resource we have a responsibility to be informed, become involved, and make the investment of time and energy to ensure that our water resources are protected. This Sourcebook will guide guide you in the ways you can contribute to sustaining water resources in the Gallatin watershed.

Information & Resources

Bozeman Recreation Department (406) 587-4724

Thompson, C. 1993. *Floating and Recreating on Montana Rivers*, Thomas Printing, Kalispell, MT

USFWS, Fish Technology Center, 4050 Bridger Canyon Road – Annual Fishing Derby for young anglers (406) 587-9265

A Sampling of Recreational Opportunities in the Gallatin Watershed

- Kayaking
- Rafting
- Fishing
- Biking
- Horseback riding
- Rock and ice climbing
- Backpacking and hiking
- Skiing
- Snowshoeing
- Snowmobiling
- Bird watching
- Hunting
- Nature/wildlife photography

Montana's Stream Access Law

In general, the public is allowed recreational access to all river systems in Montana without regard to the ownership of the underlying land, up to the ordinary high-water mark (MCA 23-2-300 et seq.) This does not allow travel out of the water onto private land. While Montanans are entitled to use waters crossing private lands, it is in everyone's interest to obtain landowner permission first as a courtesy before using private lands, particularly on smaller streams.

Permitting

MFWP Headquarters, 1400 S. 19th Avenue, Bozeman - Hunting and fishing licenses.

Permits are not required to launch private watercraft in the Gallatin or East Gallatin Rivers. Boaters are not permitted to launch from private lands without permission.

CHAPTER 2

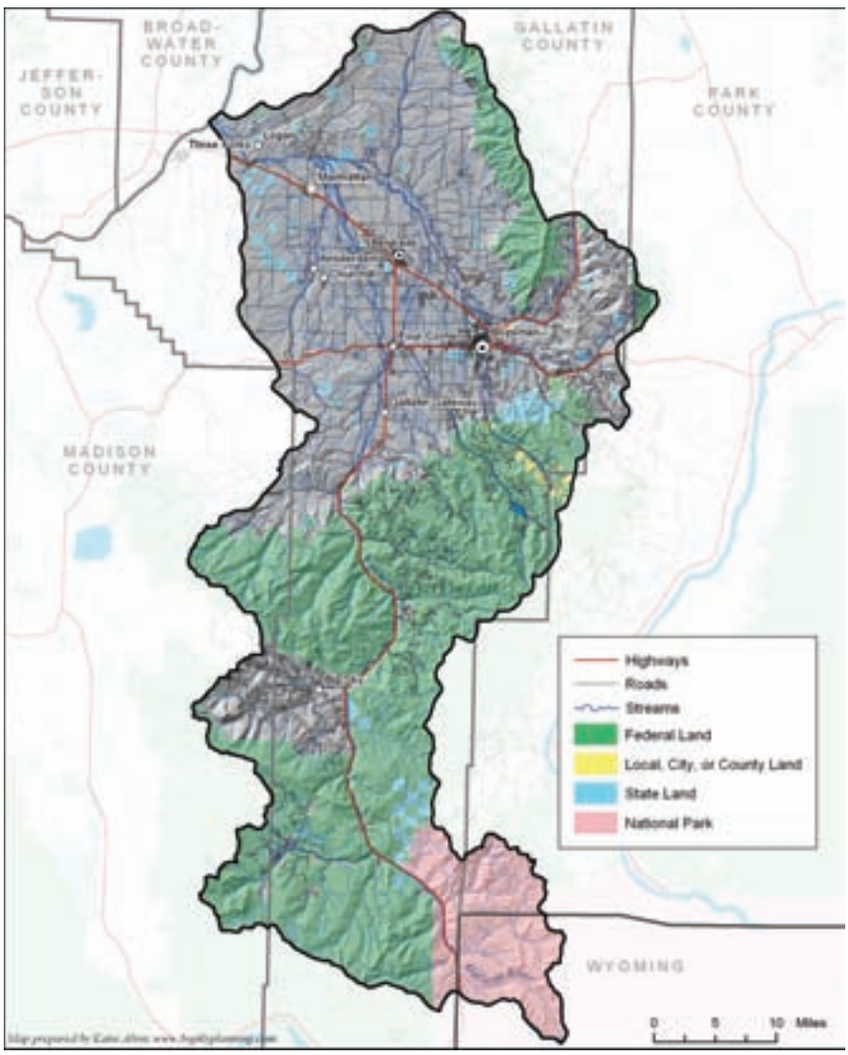
The Gallatin Watershed

Contributed by Steve Forrest. Updates by Tammy Crone, GLWQD and Cassie Carter, MOSS

What is the Gallatin Watershed?

Chances are that wherever you live in the Gallatin Valley, a stream, river, or irrigation ditch is less than a few hundred feet from your door. This abundance of free-flowing water gives the Gallatin Valley its unique character. A "watershed" includes the land that water flows over or under from its highest points on hilltops and mountains to its lowest points along streams, rivers or lakes. The Gallatin watershed is composed of the streams and underground water that flows to the Gallatin River. Nested within the Gallatin watershed are the smaller watersheds of its tributaries, such as the Taylor Fork watershed and the Bozeman Creek watershed. How each of us uses the soil, water, plants, and animals within the watershed affects what happens not only in our watershed but also in larger watersheds downstream. We are all part of the Gallatin watershed community.

The Gallatin River Watershed



Graphic: Katie Alvin, Big Sky Planning, Inc.

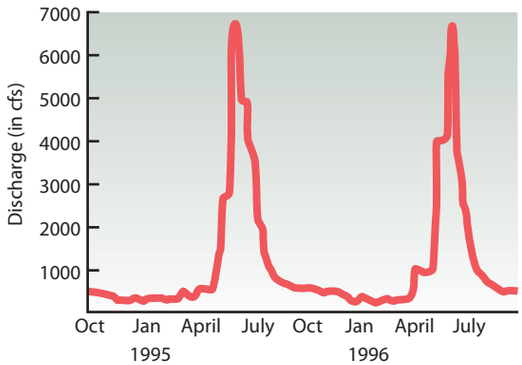
Sources of Water

The primary source of water for streams, springs, and wetlands in the Gallatin watershed comes in the form of mountain snowpack. The headwaters of the watershed, in the Gallatin and Madison Ranges, receive nearly 400 inches per year of snow on average. This equals approximately 67 inches of rain. In contrast, the lower watershed at Logan may receive fewer than 12 inches of rain per year–a near desert by comparison.

Geology and Soils

The main stem of the Gallatin River originates in the Madison and Gallatin Ranges. These mountains are composed primarily of "basement rocks" of gneiss and schist, covered in places by a thin layer of rocks formed from the sediments that sank to the bottom of an ancient shallow sea that covered Montana from 570 to 65 million years ago. The East Gallatin originates in the Bridger Range, which is also comprised of basement rocks overlain by younger sedimentary formations. Where the streams leave the mountains, the valley widens into a large basin filled with sediments, some more than 6,000 feet deep east of Bozeman Hot Springs. These sediments, laid

down during the Tertiary period (from 65 to 2.5 million years ago), vary in type, but are mostly rocks made from sand and silt. On top of these sediments are up to 150 feet of gravel, sand, silt, and clay washed from streams. These deposits are called alluvium. More recent alluvial deposits compose the next and last layer of fill, which covers half the valley. These deposits extend in large fans from the source streams where they break out of the mountains. The largest fan is at the base of the Gallatin Range south of Bozeman. This very recent or Quaternary alluvium is mostly comprised of pebbles and gravel. Its thickness ranges from 70 feet at Bozeman Hot Springs to 800 feet near Belgrade. The Quaternary alluvium that covers most of the central valley is important, because it is some of the most permeable material in the valley and the most reliable source of ground water.



USGS gaging station for the Gallatin River near Gallatin Gateway

A "hydrograph" shows changes in annual flows.

Soils in the watershed are a product of the rocks that form them. Coarse-textured rocks like gneiss, schist, and sandstone typically form gravelly and sandy soils, while sedimentary rocks like shale and limestone form clayey soils. Much of the stream sediment carried in the spring runoff comes from areas of fine-textured rocks and clay-rich soils. Many landslides and earthflows in the watershed are associated with fine-textured soils, and contribute high amounts of sediment to the Gallatin watershed. In contrast, soils formed from coarse-textured rocks usually allow passage of water at a high rate and are highly erodible. Valley soils are usually formed from either fine-textured sediments, wind-blown silt deposits, or stream alluvial deposits. Many soils in the central valley are saturated with water for much of the growing season. These "hydric" soils, unless drained, favor the kinds of water-loving plants that grow under conditions of reduced oxygen. Depending on where you live, management concerns may include high water tables, unstable or erosive stream banks, or shallow depths to sand and gravel, all of which can affect waters in the Gallatin watershed.

A Cross-Section of the Gallatin Watershed

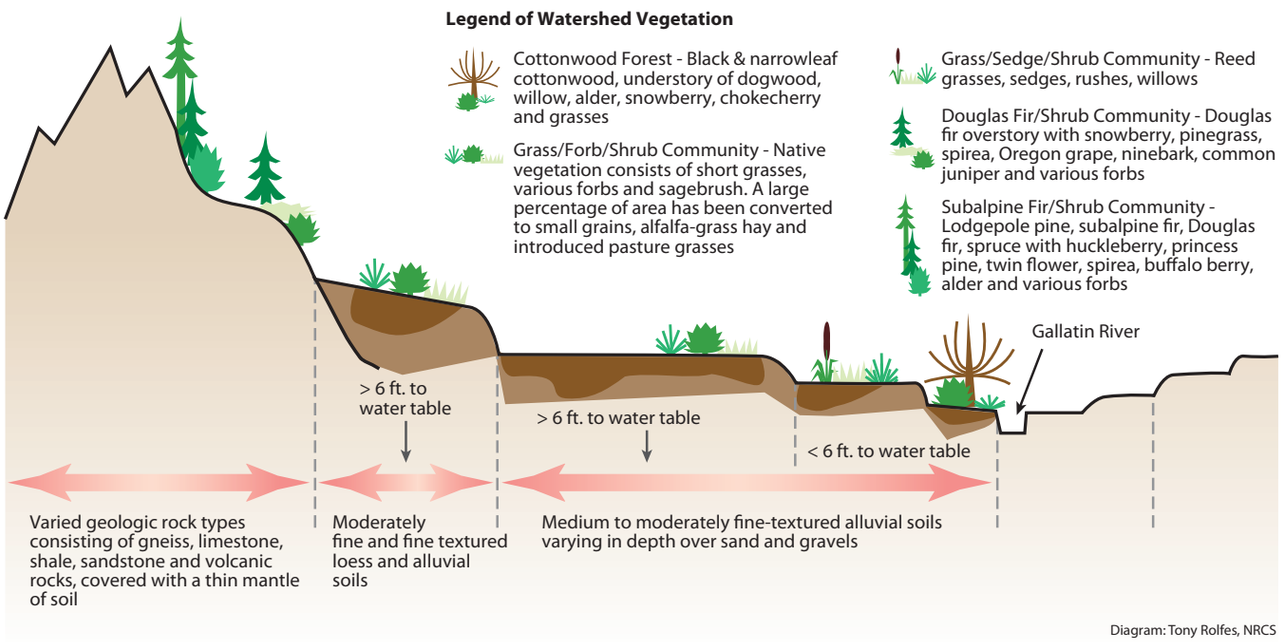
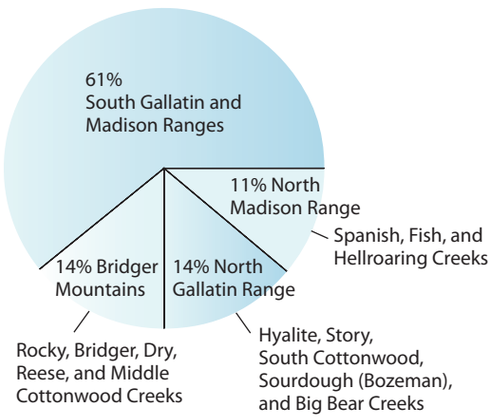


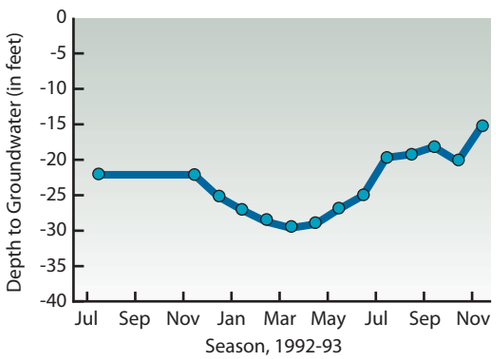
Diagram: Tony Rolfes, NRCS

Hydrology of the Watershed

All the ground water and surface water that exits the Gallatin watershed does so as surface water near the community of Logan. This is caused by a natural bedrock dam near Logan that crosses the river valley, constricting the aquifer system so that the ground water is pushed to the surface. Average annual surface water discharge at the USGS gaging station at Logan is about 773,000 acre-feet. Of this flow, about 240,000 acre-feet is attributed to ground water discharge.

Total Annual Yield of Water from the Tributaries of the Gallatin River





Source: Slagle 1995

Depth to ground water can vary throughout the season.

Surface Water

Water held as snowpack in the Bridger, Gallatin and Madison Ranges typically contributes to peak flows in lower watershed streams and rivers in May and June. A higher percentage of runoff from the Gallatin and Madison Ranges occurs later in the summer than from Bridger Mountain streams. Because of the combination of deeper snowpack and higher elevation (resulting in slower snowmelt), these mountain streams are more reliable sources for late-summer irrigation.

Ground Water

Ground water is an important source of water for drinking and irrigation in the Gallatin watershed. Valley fill deposits are the primary aquifer from which most of the drinking water supply is drawn in the valley. Ground water flow in the valley is generally from the east and southeast to the northwest, where the Gallatin River exits the valley at Logan. Depth to ground water varies from as close to the surface as 3 feet in the central portion of the valley to 460 feet in the Camp Creek Hills.

Ground water depth is greatly influenced by irrigation practices. Flood irrigation and leaky ditches can contribute to higher water tables during the growing season, after spring runoff has occurred. In years when less irrigation water is used, depth to ground water drops in areas traditionally irrigated. Ground water depth fluctuates seasonally as well, with the lowest depths usually occurring in January and February. Periods when ground water recharge occurs coincide with peak flows from surface water.

Ground Water - Surface Water Connection: One Resource

Concept of Base Flow

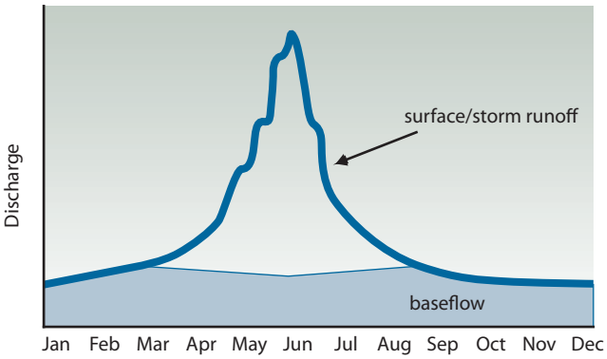
Rainfall and snow melt contribute to surface water flow in streams and rivers within the watershed. Perennial streams (flow year-round), and at times intermittent streams (only flows during certain seasons), also receive flow from discharging ground water. The ground water contribution to the surface water flows in streams and rivers is referred to as base flow.

A hydrograph showing the discharge of surface water in a river or stream can be analyzed to determine the relative contribution of precipitation, snowmelt runoff and ground water base flow to the total flow in the river or stream. For a typical river in the western United States, on average, about half of the annual flow is attributed to ground water base flow. During dry periods ground water contributes almost all of the flow to the river.

Locally, the Gallatin River is generally either behaving as a "losing river" meaning that water is leaking out of the river bed and recharging ground water, or as a "gaining river" meaning that ground water is discharging to the river.

Ground water pumping near the Gallatin River can "capture" ground water that would otherwise discharge to the river as ground water base flow. This ground water capture can result in deceased surface water flows.

Discharge as a Function of Time



Source: GLWQD

Hydrograph illustrating the relative contribution ground water, precipitation and snowmelt provide to a surface water body over a period of time.

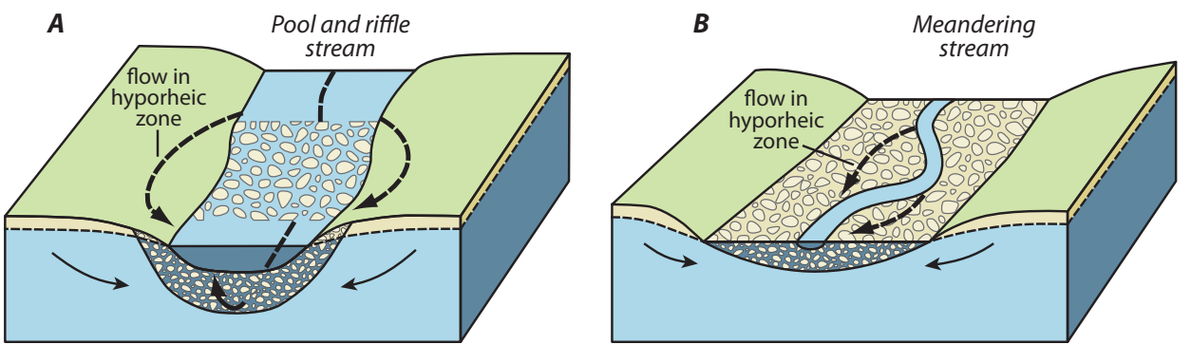
The Hyporheic Zone

Near stream channels, there are complex ground water and surface water interactions and flow patterns. This is due to meanders (bends or turns) in the stream, abrupt changes in stream gradient (slope or angle), and changes in streambed sediments. This transition zone between ground water and surface water is called the hyporheic zone, and it is an ecologically important component of streams and rivers. The width of the hyporheic zone can vary from just a few feet wider than the stream or river channel to almost two miles away! The hyporheic zone consists of a mix of ground water and surface water. This creates a unique environment for micro and macroinvertebrates (aquatic insects) which are an important food source for fish. The hyporheic zone provides these aquatic insects with a dry season refuge if the stream channel dries up, or a wet season refuge if stream flows are extremely fast.

Real-time hydrographs for the Gallatin River and the East Gallatin River are available from the USGS National Water Information System at http://waterdata.usgs.gov/nwis.

Changing Hydrology

When land historically irrigated by flood or sprinkler irrigation is replaced by urban and suburban development, the potential exists to significantly change the hydrologic landscape. This is because there is a loss of ground water recharge from the removal of irrigation on the land, and in most cases the urban and suburban development is accompanied by new ground water pumping. The net result of these changes can lead to: 1) declining ground water levels in old irrigated areas and 2) potential decreases in surface water flows due to the combined effect of the decrease in irrigation return flows and the new ground water pumping.



Source: Ground Water and Surface Water: A Single Resource. USGS Circular 1139, pg. 17.

Surface-water exchange with ground water in the hyporheic zone is associated with abrupt changes in streambed slope (A) and with stream meanders (B).

CHAPTER 3

Sensitive Areas in this Special Place

Contributed by Steve Forrest. Updates by Tammy Crone, GLWQD and Cassie Carter, MOSS

Riparian Areas

The surface waters of Montana provide 98 percent of the water used for growing food and feeding livestock. Although areas adjacent to rivers and streams make up less than 5 percent of the landscape, they contain 75 percent of our state's plant and animal diversity. Riparian areas are the green areas adjacent to rivers and streams. Healthy riparian areas usually contain a swath of lush growth of water-adapted plants. Healthy riparian areas are the key to maintaining healthy stream systems. Residents near these areas have the most immediate responsibility to protect this resource as activities closest to streams are more likely to have immediate effects on water quality. As stewards of the source waters for the Missouri River, we have an obligation to pass these waters on "unimpaired" to users downstream.

Photo: USDA-NRCS

Healthy riparian areas have a lush growth of vegetation.

Benefits of Streamside Vegetation

- Helps stabilize streambanks (reducing siltation and streambank movement).
- Helps slow water during peak flows.
- Provides important breeding habitat and cover for wildlife.
- Keeps water cooler in the summer for fisheries.
- Prevents ice damage in winter.
- Traps and filters runoff that may contain sediment or pollutants from adjacent lands.

Activities that might disturb the streambed or the adjacent riparian area require planning as it is likely you will need permits from one or more agencies administering regulations to protect these sensitive and important areas. Chapter 12 contains a guide to permitting. If you live in a riparian area, this means that you also live in a floodplain. In 2005, Gallatin County began requiring a 300-foot setback from the Gallatin and East Gallatin Rivers, and a 150-foot setback from all other surface waters for residential or commercial construction. Setbacks protect the riparian system from residential, commercial and agricultural activities. It also helps protect the landowner from flooding during spring snowmelt runoff and summer storms.

Any activity that occurs in or near a riparian area (cropping, concentrated livestock grazing, forestry, residential and commercial) can have significant negative impacts on water quality. There are local agencies and resources designed to work with landowners to mitigate the effects these activities may have on this important resource (See references at the end of this chapter).

Wetlands

Wetlands are important components of any watershed. Wetlands typically act as a sponge–absorbing excess spring runoff and releasing it over time, thereby reducing peak flood flows. They serve an important role in ground water recharge. Wetlands provide passive water quality treatment benefits to our watershed community, such as trapping sediments, removing nutrients from agricultural and urban runoff, and decomposing solids. Wetlands provide recreation and economic benefits, and opportunities for education as informal laboratories. Wetlands also provide habitat for wildlife and plants,

Photo: GLWQD

Wetlands provide homes for many species and provide water purification and retention benefits.

Photo: GLWQD

Filling of wetlands for residential and commercial land use is still occuring.

many of which are unique to wetlands. Up to 85 percent of Montana's threatened and endangered species rely on wetlands to meet all or part of their seasonal needs.

Historically, the benefits of the "ecological services" provided by wetlands was undervalued. As a result, many acres of wetlands have been filled or drained in the course of human activities. Research has been conducted to try and determine the economic benefit of wetlands. Compared to the cost of man-made systems built to do the same work, the benefits provided by wetlands at no cost can be substantial.

Functional Ecological Value of Wetlands and other Ecosystems

Ecosystem Type	Unit Value ($/ha/year)
Estuaries	$22,832
Wetlands	$14,785
Lakes and Rivers	$8,498
Forests	$969
Grasslands	$232

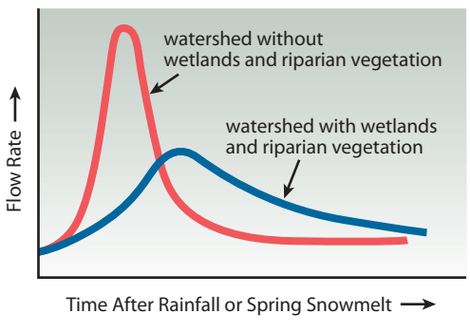
Source: Mitsch & Gosselink (2000)

In 2001, the GLWQD undertook a study to inventory the extent of the remaining wetlands and riparian areas in the Gallatin Valley. The inventory revealed only about 38% of the valley's original wetland and riparian habitat remained in 2001. Additionally, a pattern of human activities that have impacted wetlands and riparian areas emerged. In chronological order, beginning circa 1800 to the present, the following activities seem to be the most significant:

1. **Trapping of beaver and significant reductions in beaver populations.** The result was a decrease in wetlands, ponds and backwater areas.
2. **Agricultural development.** Wetland draining for grazing of wet meadows and clearing of riparian vegetation for increased grazing and hay production has had a negative impact. However, the construction of irrigation ditches and canals has created a significant number of linear riparian and wetland features.
3. **Construction of transportation corridors.** Roads and railroad beds have altered surface water flow patterns by damming surface water on the uphill side and reducing surface and subsurface flow on the downhill side.
4. **Urban and suburban development.** This has generally resulted in a decrease in wetland and riparian habitat due to the intensive land use changes within urban and suburban areas. Urban development associated with the growth of Bozeman appears to have had the largest impact. Much of the land area now occupied by the City of Bozeman may have originally been covered by wetlands.

Regulation to protect valuable wetland resources has been implemented at the federal level. "Jurisdictional wetlands" (those wetlands that may receive some protection under federal law) have the following characteristics:

- source of water at or near the surface that occurs with a frequency and duration that supports life in saturated soil conditions;
- the presence of distinctive (hydric) soils, which are poorly drained;
- the presence of distinctive, water-loving vegetation (hydrophytes) adapted to wet soils.



Source: Dunne and Leopold, Water in Environmental Planning.

Destruction of wetland and riparian vegetation results in poor retention of water, resulting in higher peak flood flows and shorter duration of productive flows.

Certain activities affecting jurisdictional wetlands are regulated by federal, state and local governments. Section 404 of the federal Clean Water Act gives the Army Corps of Engineers authority to issue a permit for discharging dredge or fill material into wetlands or for draining wetlands. Most activities involving wetland disturbance require a permit. *If you contemplate activities that may affect a wetland or are unsure whether a wetland is involved, first contact NRCS or a professional trained in wetland regulation for further information.* Gallatin County regulations prohibit subdivision within wetlands without prior Corps approval.

Floodplains

In the Gallatin, where few dams exist to alter natural flows, spring runoff typically results in flooding of valley streams and rivers. Flooding occurs regularly in the Bozeman area. Along the Gallatin and East Gallatin Rivers, floods occur nearly every year in some areas.

The floodplain is the low-lying area adjacent to a stream or river where water spreads out when it leaves its banks. Floodplain soils are often poorly drained, due to the nearness of the ground water table to the surface. Floodplains result from the continuous process of deposition of material and later cutting away of the surface material over time by the river's meandering. The floodplain may not be much wider than the river's channel where banks are steep. It may extend for many hundreds of feet from the channel in low-lying areas. Because of the deposited sediments and high water table, floodplains contain a high diversity of plants and animals.

What is a 100-Year Flood?

A 100-year flood is one that can be expected to occur once every 100 years (1% of the time), based on watershed records. However, just because a 100-year flood occurred last year does not mean that another 100-year flood couldn't occur next year. The likelihood is related to the magnitude of the flood, not the time that has passed between the 100-year flood events.

Photo: Scott Gillilan

Development in the floodplain impact public health and safety.

Photo: Scott Gillilan

Flooding is a natural process that occurs frequently in the Gallatin.

Flooding is a natural process. Floodplains dissipate the energy of spring torrents, reducing flood damage downstream and providing recharge areas for adjacent streams. However, runoff from a watershed can be greatly influenced by the kinds of plants and soils in the watershed. Vegetated stream banks reduce the likelihood of flooding. Where any streamside activity (i.e., timbering, grazing, or suburban/urban development) removes vegetation, flood events occur more often and with greater severity. Healthy floodplains are those where the activities occurring within the floodplain are benefited by or can adapt to occasional flooding, such as agriculture, recreation, and wildlife.

Floodplain management involves reducing the risk of damage to property from flooding, as well as maintaining the natural functions that floodplains provide. To this end, federal, state and local governments regulate certain activities that occur in floodplains. The Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP). The NFIP is the only source of flood insurance in the country. Floodplain delineations are the province of the DNRC Water Division.

If you are considering purchasing property, building a structure, or altering the landscape in any way near a stream or river, you should contact the Gallatin County or City of Bozeman Floodplain Administrator as there are restrictions on floodplain and floodway development.

Information & Resources

EPA, (800) 832-7828
http://www.epa.gov/owow/wetlands/

Flood insurance is available in Gallatin County through the NFIP. Contact your insurance agent for more information.

Floodplain Maps:

- Gallatin County Planning Department, (406) 582-3130
- City of Bozeman Planning & Community Development, (406) 582-2260

Gallatin Local Water Quality District, (406) 582-3148
www.gallatin.mt.gov/GLWQD

Gallatin Valley Land Trust - conservation easements for important biological and beneficial lands, (406) 587-8404

MDEQ

- *Montana Stream Management Guide for Landowners, Managers, and Stream Users,* 2006 Revised Edition, (406) 444-7425 (To request copies)
- Montana Wetlands Council, (406) 444-6652 http://www.deq.mt.gov/wqinfo/Wetlands/Index.asp

MFWP, Future Fisheries Improvement Program, (406) 444-2449

Montana Association of Conservation Districts, *A Guide to Stream Permitting in Montana*, 501 N. Sanders, Helena, MT 59601, (406) 443-5711 (To request copies)

Montana Land Reliance - conservation easements, (406) 443-7027 Helena Office

Montana Watercourse – *A Landowner's Guide to Montana Wetlands,* (406) 994-1910 (To request copies)

Montana Wetlands Legacy Partnership, (406) 994-7889
http://www.wetlandslegacy.org/

The Nature Conservancy - conservation easements, (406) 443-0303 Helena Office

Trust for Public Land – conservation easements, (406) 522-7450 Bozeman Office

US Fish and Wildlife Service

- National Wetland Inventory www.fws.gov/nwi
- Partners for Fish & Wildlife Program, (406) 727-7400 www.fws.gov/mountain-prairie/PFW/montana
- Montana FWP Future Fisheries Improvement Program www.Fwp.mt.gov/habitat/futurefisheries/default.html

USDA Natural Resources Conservation Service, (406) 587-6947

- Web Soil Survey http://soils.usda.gov/survey/
- Proper Functioning Condition (PFC) www.mt.nrcs.usda.gov/technical/ecs/water/pfc.html
- Riparian & Floodplain Management www.mt.nrcs.usda.gov/technical/ecs/water/setbacks.html
- Wetland Reserve Program, (406) 587-6795 www.mt.nrcs.usda.gov/programs/wrp/index.html
- Conservation Reserve Program, Gallatin Co. Farm Service Agency Service Center, (406) 522-4000 www.nrcs.usda.gov/programs/crp

CHAPTER 4

Plumbing the Gallatin: Water Supply and Distribution

Contributed by Scott Compton and Kerri Strasheim, DNRC

The Gallatin's landscape is a product not only of its great natural streams and springs, but also a result of the intricate network of water diverted, pumped and channeled around the valley. The "engineered watershed" helps to determine where people can live and which land is most productive.

Water Supply Overview

Overall, water supplies in the Gallatin watershed are good—providing enough water to meet the needs of the residents. Large quantities of ground water exist in the central valley, although some foothills areas have experienced declines in ground water levels at times. The latter is possibly due to effects of drought and an increased demand. Despite conversion of many areas in the valley from agricultural land to subdivisions, depth to ground water has not changed significantly from 1950 to the present. Increased depth to ground water would indicate depletion of the aquifer.

Photo: MT DNRC

Diversion Dam on Middle Creek.

Water supply depends on the yearly snowpack and rainfall. Low water years may cause surface water rights to be cut off sooner than usual and affect some crop production. On the other hand, Hyalite Reservoir is one of DNRC's most consistent water supplies in the state.

While supplies of water are physically available in the Gallatin, new water rights for certain consumptive uses are not legally available. The Gallatin is one of several rivers in the upper Missouri Basin closed to new withdrawals (see Chapter 5).

Consumptive Use:

A beneficial use of water that reduces supply, such as irrigation or municipal use.

Public and Domestic Water Supply

The largest system supplying water for household and commercial use in the Gallatin watershed is the Bozeman system. This system supplies around 38,000 full-time residents and 10,000 to 15,000 transient residents (commuters, visitors, etc.) (2008). As of 2008, the city has enough water to supply 50,000 full-time residents. With growth continuing, Bozeman continues to look into additional water supplies, such as a new reservoir in the Bozeman Creek drainage. Bozeman draws water from three sources: Bozeman Creek, Hyalite Creek (and Hyalite Reservoir), and Lyman Creek. The water from Bozeman and Hyalite Creeks is piped to a water treatment plant south of Bozeman. The Lyman Creek supply consists of a spring box water collection system supplying Lyman Creek Reservoir, located northeast of Bozeman. The quality of water from Lyman Creek is such that it receives only chlorination and fluoridation. The water is delivered to three water storage reservoirs (Sourdough, Hilltop, and Lyman Creek) and is supplied to the distribution system through two principal transmission systems. The distribution system consists of approximately 242 miles of water mains with around 10,000 service connections.

Bozeman, like many cities, has two separate urban drainage systems. The water that is used in homes and businesses is carried away by 194 miles of sewer mains and treated

before being discharged to the East Gallatin River. The daily flow of this system is in excess of 5 million gallons/day, with a current capacity of around 5.8 million gallons/day. An expansion planned for 2008/2009 will increase the capacity of the wastewater treatment plant to over 13 million gallons/day and treat for nutrients as well as conventional pollutants. Bozeman's wastewater treatment plant is a "tertiary" treatment facility, meaning that advanced processes are already used to effect greater removal of pollutants. An entirely separate system, the storm sewer, handles snow melt and rain runoff from streets. Most of this water is carried to detention areas to settle prior to discharge to ditches and streams. However, some older lines flow directly into creeks and ditches flowing to the East Gallatin River.

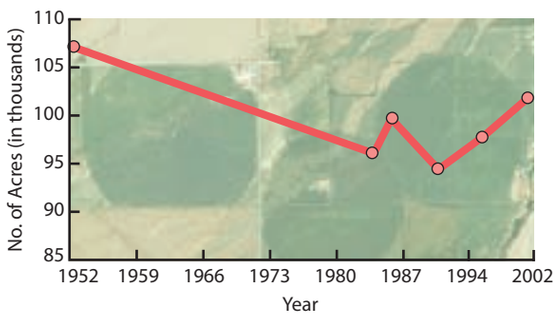
Belgrade is supplied by ground water from six wells. In 2006, 597 million gallons of ground water were pumped to supply the residents of Belgrade (estimated population for 2006 was 7,240 people). Storm water is released to the soil through percolation from a system of drains. Belgrade's wastewater sewage is settled in storage lagoons, aerated, and clarified, but does not receive advanced waste treatment. This is known as "secondary" treatment. Both Bozeman and Belgrade dispose of solid residues from the treatment process, known as biosolids, on land.

Manhattan, by comparison, receives its drinking water supply through both wells and a spring. Water from the spring is chlorinated, while the deep wells do not require chlorination. In 2008, Manhattan replaced their lagoon wastewater system, which provided limited treatment of wastewater that was finding its way to the Gallatin River, with a "tertiary" treatment facility. This updated facility removes most conventional pollutants to low levels and has a biological nutrient removal process to remove nitrogen and phosphorus compounds, key ingredients in polluting rivers and streams.

Big Sky, which isn't incorporated, is run as a county water and sewer district. Wells located at the Mountain Meadow, Lone Moose Meadows, Aspen Grove, and at the Meadow Village supplied 222 million gallons of water in 2007. Big Sky serves 4,000 single family equivalents and has 2,100 service accounts. Sewage is treated, stored, and land-disposed by spray irrigation.

Over 160 other "community" water systems (from a small trailer court to Rae Water and Sewer District) supply domestic water. Community wells are centralized private well systems that connect to multiple users. All of these systems are supplied by ground water. Individual wells supply domestic water for almost all rural households in the Gallatin watershed. As of February 2008, there were 13,100 wells on record in the watershed, of which approximately 60 percent had filed water rights.

Irrigated Acres in Gallatin County 1952-2002



Source: Slagle 1995; USDA Montana Agricultural Statistics 2002

Irrigation Water Supply

Many canals and ditches crisscross the valley, delivering water for irrigation. Most of the water taken from the main stem of the Gallatin River is diverted between the mouth of the canyon and Four Corners. These diversions have water rights that essentially capture the entire flow of the river until return flows recharge the lower Gallatin below Four Corners. However, cooperation between the court-appointed Water Commissioner and irrigators (represented by AGAI) work in partnership to keep the river from being dewatered, as it was historically.

Major Diversions from the Gallatin River

	Irrigated Acres	Cfs Diversion
Farmers' Canal	11,000	250
Lowline Canal	9,500	188
Highline Canal	12,000	170
West Gallatin Canal	8,000	150
Moreland Canal	1,600	125
Middle Creek Supply	5,300	122

Source: DNRC

In the Gallatin, most canals and ditches are privately owned (through ditch easements) and managed by local irrigators. One exception is the Middle Creek Water Users' Association, a non-profit corporation that manages some storage rights to Hyalite Reservoir, a state-owned project.

Reservoirs & Ponds - Water Storage

The largest reservoir in the watershed is Hyalite Reservoir, which stores some 10,100 acre-feet of water. This water storage facility is used for summer recreating as well as providing for the municipal water supply for the City of Bozeman. Most small reservoirs and ponds in the Gallatin have a recreation/fishing aspect to their use. Pond construction for recreation and aesthetic purposes by private landowners is increasing in the Gallatin valley. Some areas may not be ideal for pond development. If you are considering creating a pond or small reservoir on your property, contact the Montana Watercourse for a copy of their publication, "A Guidebook for Montana Ponds: What You Need to Know about Ponds and Alternatives".

Water for the Next Century

As the valley's population increases, the question of how to quench its growing thirst looms larger. The continually growing city of Bozeman will reach several milestones in the next few decades, exceeding the existing capacity of its water treatment and distribution infrastructure and, ultimately, the maximum reliable yield of its current water supply. Absent a change in efficiency or conservation measures, Bozeman will exceed its current water supplies by 2026. Bozeman continues to look into acquiring direct flow water rights as they become available, and the city is examining the feasibility of rebuilding a reservoir in the Bozeman Creek watershed that was breached in the 1980s. Conservation of water will no doubt play an increasingly larger role in determining Bozeman's water supply future, as will education, regulation, and changing rate structures.

While ground water appears to be plentiful in most areas, changes in land use may affect aquifer recharge and water quality. The biggest threat that growth may pose to ground water is the contamination from increased density of septic systems and from localized chemical spills.

Information & Resources

Ground Water Information Center, Montana Tech, (406) 496-4336
http://mbmggwic.mtech.edu/

DNRC Bozeman Regional Office, (406) 586-3136
http://dnrc.mt.gov/

U.S. Geological Survey, Helena, (406) 441-1319
http://mt.water.usgs.gov/

City of Bozeman, (406) 582-2300
http://www.bozeman.net/engineering/facility_plans.aspx
(facility plans for: sewer, drinking water, storm water)
http://www.bozemanwater.com/

A Guidebook for Montana Ponds: What You Need to Know About Ponds and Alternatives.
(406) 994-1910, mtwatercourse@montana.edu,
http://www.mtwatercourse.org/

CHAPTER 5

Water Rights

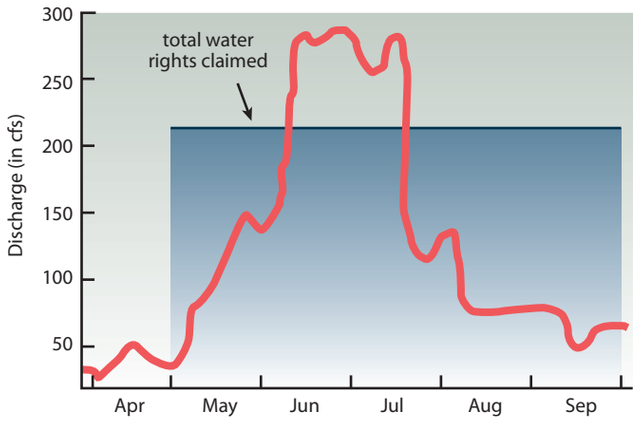
Contributed by Scott Compton and Kerri Strasheim, DNRC

Water Rights Overview—Prior Appropriation

The State of Montana owns all surface, underground, flood, and atmospheric waters within the state for the use of its people (Montana Constitution). Because all water is state owned, water rights holders do not own the water itself, just the right to use that water within state guidelines.

Borrowing from rules worked out in mining camps, most western states, Montana included, adopted the Doctrine of Prior Appropriation to manage water rights. This doctrine, more commonly known as "first in time, first in right," determines how water in a stream is to be allocated among the water users. The doctrine gives the priority right (or "senior" right) to divert water from a stream or river for a "beneficial use" to the person ("appropriator") who first puts the water to use. This priority system is used to settle disputes that typically arise in low-flow years, when more than one appropriator wishes to use the same limited supply of water.

How Water Rights Work



Source: Data from USGS, DNRC

Water Rights History

In 1973 Montana passed the Water Use Act, which reformed the water rights process. This act grandfathered in all previous historic water appropriations (a Statement of Claim describing the use had to have been filed in 1982), created a permitting process for new water rights, adopted a central records system to be managed by DNRC, and outlined a process to resolve water right disputes. In 1979, the law was amended to create a Water Court to "adjudicate" (finalize) claims for water use in the state. For administrative purposes, the state has been divided into 85 "basins," which reflect the boundaries of the watersheds involved. A temporary preliminary decree was issued for the Gallatin River watershed (Basin 41H) in 1985. Approximately 5,750 claims were filed for historical water rights in the Gallatin watershed.

Acquiring and Transferring Water Rights

A permit from DNRC is required before diverting, withdrawing, impounding, or distributing any surface water or ground water over a certain amount (presently 35 gallons per minute up to 10 acre-feet). Ground water uses for less than these amounts also require filing a form, a simpler process done as a notice of completion filed within 60 days after the water is put to use. Many personal ponds using ground water are small enough to fit under this limited-volume filing process. Currently, the upper Missouri Basin, including the Gallatin watershed, is closed to any new withdrawals of water for consumptive use (some exceptions exist for high spring flow, storage, municipal, domestic, or livestock use and ground water). This action was due to surface water being over appropriated.

Changes to some elements of an existing water right are possible following an application process with DNRC. The elements that can be changed are the point of diversion, the place of use, the purpose of use, or the place of storage. When land is sold or exchanged, title to appurtenant existing water rights is passed from the original appropriator to subsequent purchasers of the land benefited by the diverted water, unless severed

Resolving Water Rights Disputes

1. Talk is encouraged among users to attempt to resolve the issue.

2. If a person is wasting water, using water unlawfully, or preventing water from moving to another person having a prior right to use the water, notify the DNRC (MCA 85-2-114).

3. If the water right has been through a decree process, a petition to appoint a water commissioner (MCA 85-5-101) may be filed.

4. Fifteen percent of owners of water rights on a stream may petition the court to appoint a water mediator (MCA 85-5-110).

or reserved in the deed. DNRC uses land ownership information from the Department of Revenue to automate the ownership updates for the majority of water rights linked to property parcels in the Gallatin.

What if a Ditch Crosses My Property?

Appropriators of water may have easements to convey water across the property of others. If an irrigation ditch crosses your property, the owner of the ditch not only has a right to all of the water flowing in the ditch, but a right to access your property to maintain the ditch. These rights may be formal easements recorded at the courthouse, or they may exist as prescriptive rights acquired by historic use.

Can Water Rights Be Lost?

Water rights can be lost through abandonment if there is: (1) nonuse, and (2) intent to abandon. Once the adjudication process is complete, abandonment can occur if the right is not used according to its terms and conditions for a period of 10 years. Water transfers and water rights not used because the land is in a federal or state set-aside program are not considered abandoned.

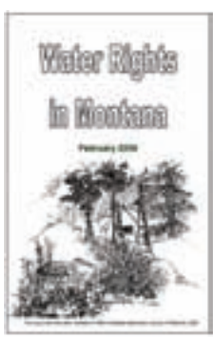
Maintaining Instream Flow

We generally think of the water in our streams as linked in one unbroken chain from a spring high in the mountains to the sea. Yet diversions from many of the Gallatin watershed's streams and the Gallatin River itself may reduce flows to a trickle in years when water is scarce. Dewatering is of considerable concern. We count on maintenance of adequate flows to dilute sediment and contaminated runoff from fields and towns, maintain cool temperatures for fish and other aquatic animals, and provide water for fishing, swimming, and boating.

In 1969 the Montana legislature authorized the Game and Fish Commission to file for unappropriated rights for some blue-ribbon fishing streams, including the Gallatin River, to maintain stream flows. The legislation that established these so-called "Murphy Rights" was repealed in 1973, but not before a claim was made on the main stem of the Gallatin River. The 1973 Montana Water Use Act included a new statutory process to create reserved water rights in the state. Claims for reserved rights on the Gallatin River were also made under this new law.

An appropriator may also lease (to MFWP or to another party) or convey an existing water right for an instream flow. Any conversion to an instream use requires a temporary change authorization from DNRC and must benefit fisheries.

Information & Resources



DNRC Bozeman Regional Office, (406) 586-3136 http://dnrc.mt.gov/

Montana Water Court, (406) 586-4364 (Bozeman Office) 1-800-624-3270 (toll free)
http://courts.mt.gov/water/

Natural Resources Information Sysytem (NRIS) at the State Library, Water Rights
http://nris.mt.gov/wis/data/waterrights.htm

Trout Unlimited, Montana Water Project, (406) 522-7291 (Bozeman Office)
A Buyer's Guide to Montana Water Rights

U.S. Geological Survey, Helena, (406) 441-1319 http://mt.water.usgs.gov/

Water Rights in Montana information booklet
http://dnrc.mt.gov/wrd/water_rts/wr_general_info/waterrights_in_montana.pdf

CHAPTER 6

Water Quality

Contributed by Tammy Crone, Gallatin Local Water Quality District

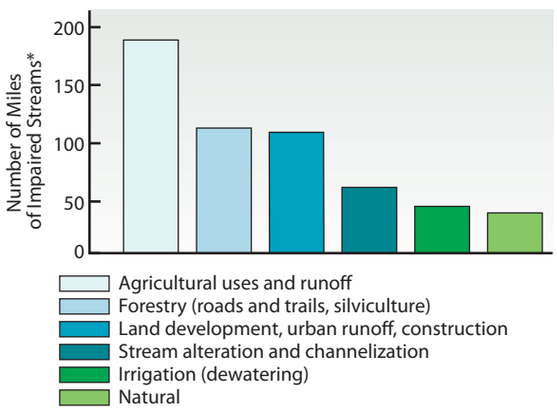
Surface and Ground Water Quality in the Gallatin Watershed

One common thread binding the Gallatin watershed's community together is the universal need for a sustainable supply of clean water. Our surface water and ground water are intimately connected. At any given time along an entire length of a stream or river, water is being exchanged with an important ground water aquifer. Because of this close connection between ground water and surface water, impacts on one can have impacts on the other. Virtually every type of land use in our watershed has some associated impact on the quality of our water resources.

Surface Water

Overall, surface water quality in the watershed is good. However, 22 streams and stream segments, totaling 320 stream miles, are classified by the MDEQ as "impaired" in the Gallatin watershed. Impaired means the stream or river is "not supporting" or only "partially supporting" one or more "beneficial uses", such as agricultural, industrial, aquatic life support, cold water fishery, recreational contact, and drinking water. These "beneficial uses" are defined by state water quality statutes (MCA 75-5-300 et seq.). The framework assuring water quality is complex and is embodied in the federal Clean Water Act, which serves as the model for Montana's Water Quality Act. Impairments may be due to single or combined land-uses along streams and rivers and are related to surface water quality and/or availability.

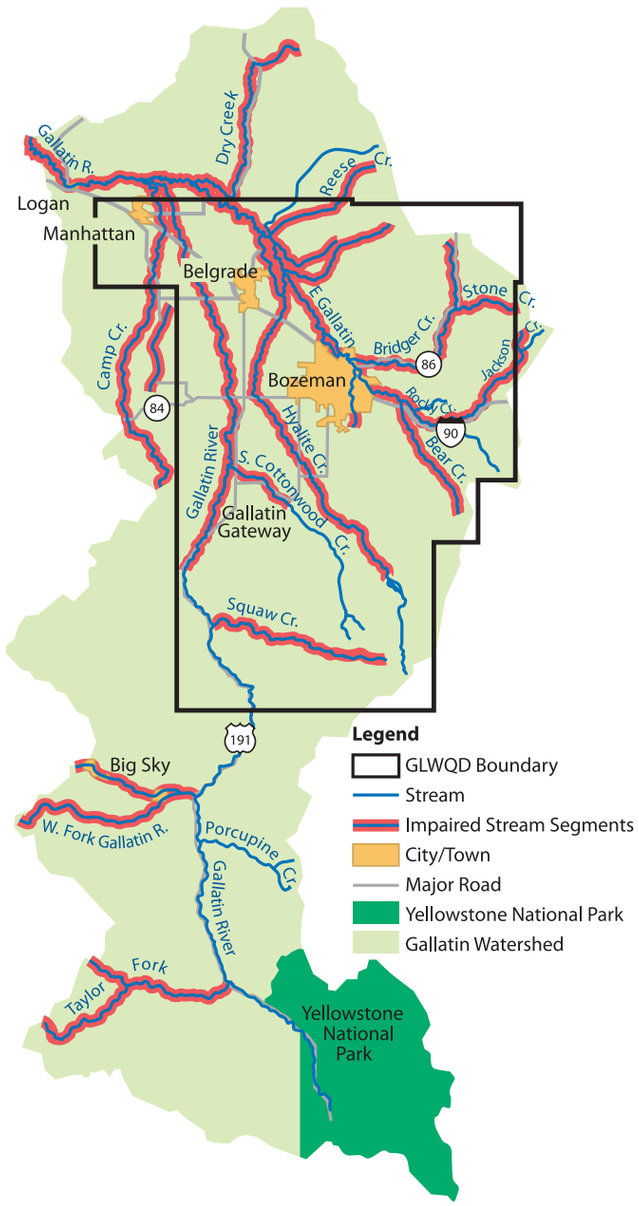
Most Common Sources of Stream Impairments in the Gallatin Watershed by Stream Miles



*Streams may be impaired by more than one source.

Sources: Adapted from MDEQ Clean Water Act Information Center, 2006 Water Quality Information. www.deq.mt.gov/CWAIC, accessed 1/24/2008. MDEQ 2006 Integrated 305(b)/303(d) Water Quality Report, Appendix H, Section 3.

Impaired Stream Segments in the Gallatin Watershed



Sources: GLWQD; MDEQ, 2008. Clean Water Act Information Center Database. Impaired Streams on 2006 Montana 303(d) List.

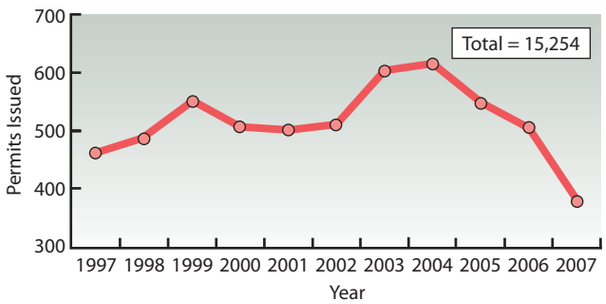
Scientists at the local and state level gather data on surface water quality, which is analyzed in the context of whether a stream or river will support any or all of the intended "beneficial uses". Physical contaminants such as sediment and chemicals (nutrients, metals) as well as biological indicators (aquatic insects, algae) are collected and analyzed to determine the health of a stream.

Ground Water

The common way to evaluate ground water quality is by comparison to federal and state drinking water standards. There are drinking water standards for chemicals like organic compounds, solvents, fuels, pesticides, metals, nitrate, dissolved minerals (salts), total coliform bacteria and E. coli bacteria.

Like surface water, ground water in Montana is classified based on its beneficial uses: domestic drinking, culinary and food processing, irrigation, drinking water for livestock and wildlife, commercial and industrial. These beneficial uses are classified into Class I, II, or III according to the Administrative Rules of Montana (ARM 17.30.1006). The classification scale is based upon how well water can conduct an electrical current and is an indirect measure of the presence of dissolved minerals in the water. Dissolved minerals can affect the taste and odor of water, cause staining of household fixtures, or other aesthetic nuisances. We commonly think of this as the "hardness" of our water. These dissolved minerals seldom, if ever, warrant treatment and will not adversely affect your health. Ground water in the Gallatin watershed ranges from low to moderate in "hardness" and is classified as Class I to Class II, making it "suitable" to "moderately suitable" for all of the beneficial uses.

New Septic Permits Approved in Gallatin County 1997 to 2007*

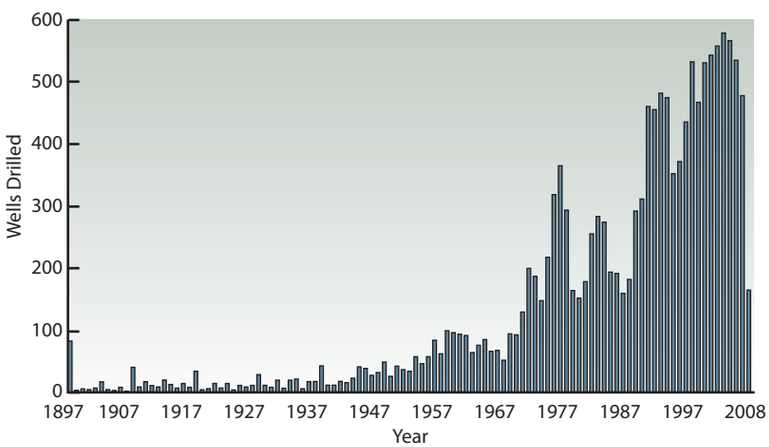


* Includes the West Yellowstone and Three Forks areas which are not in the Gallatin watershed, but are in Gallatin County.

Source: Gallatin City-County Health Department, 2008.

Overall, ground water quality in the Gallatin watershed is good and relatively free from regional impacts from harmful chemicals and other contamintants. However, like other developed areas in Montana, our watershed has its share of localized ground-water problems. There are over 170 leaking underground fuel storage tanks and 7 active state and federal Superfund ground-water contamination sites in the watershed, which are in various stages of clean-up. Two of those sites: Bozeman Solvent Site and Idaho Pole Site are designated as Controlled Ground Water Areas (CGWA) by the Montana DNRC. These CGWAs limit or prohibit the drilling of wells to protect public health and reduce the potential migration of the contaminants to other areas of the aquifer. More than 15,000 residential on-site septic systems are in use in rural and suburban areas of the watershed. These systems are sources for potential contamination to our ground water from bacteria, viruses, and nitrate which can adversely affect human health. Residents on private wells should test their water annually.

Number of New Wells Drilled in Gallatin County by Year



Source: Montana Bureau of Mines & Geology, Ground Water Information Center, accessed July 2008.

Nonpoint Source Pollution: Connecting Land Use with Water Quality

With growth and development come numerous and complicated challenges to protecting and maintaining good water quality for drinking water, aquatic life and other beneficial uses. The most dramatic change occurs as traditional farm and ranchlands are developed for residential, commercial and industrial uses. This change in land use is evident in the number of new wells drilled and new septic permits issued in rural areas of the county.

Nonpoint source (NPS) pollution is defined as pollution that originates from many diffuse sources and is difficult to measure directly. It is the result of improper land use management practices. When rainfall and snowmelt move over and through the ground, it picks up natural and human-made pollutants. These are carried to our rivers, lakes, wetlands and even ground water. Agricultural-related runoff was once considered the biggest contributor to NPS pollution problems. Now, as we continue to urbanize our rural areas, urban stormwater runoff is quickly becoming a major contributor. Also, as laboratory analytical equipment is able to detect contaminants at increasingly lower levels, the presence of pharmaceuticals and personal care products in our streams and aquifers is gaining more attention in the NPS pollution realm.

Types and Sources of NPS Pollutants

Type	Source
Excess fertilizers, herbicides and insecticides	Residential, agricultural areas
Oil, grease, toxic chemicals	Urban and suburban runoff (stormwater runoff)
Sediment	Improperly managed construction sites, crop and forest lands, eroding stream banks
Bacteria and nutrients	Septic systems, pet and livestock waste
Salt	Winter road salting, irrigation practices
Pharmaceuticals & personal care products	Septic systems, onsite wastewater facilities

Adapted from: U.S. EPA. http://www.epa.gov/owow/nps.qa.html. Accessed January 2008.

Photo: GLWQD

Sediment and other contaminants entering a storm drain during a rain event.

Stormwater Runoff

One of the biggest changes in land use that impacts water quality is the increase in impervious surfaces. An impervious surface is any surface that prevents water from infiltrating (soaking) into the ground. These include: parking lots, roads, sidewalks, driveways, roof tops, and even compacted soil. As water moves over these surfaces it picks up contaminants such as oil and grease from vehicles, sediment, road salt (deicer), etc., and transports them to storm drains and outfalls where these untreated contaminants directly enter our waterways. Rain and snowmelt events also create another problem: Flashy, increased stream velocities that contribute to eroding stream banks. These impacts can lead to significant declines in fish and other aquatic organisms living in the receiving waters. These organisms serve as surrogate indicators of water quality and landscape health.

Stormwater Runoff Management

Low impact development (LID) techniques are aimed at reducing frequency and intensity of stormwater runoff. Many of these techniques can be implemented by individual homeowners and land developers. Some common practices include:

- Pervious pavement
- Rain gardens
- Native landscaping
- Soil quality restoration
- Bioswales

Pharmaceuticals & Personal Care Products

Researchers all across the country are finding an emerging problem in the United States. Low levels of pharmaceuticals and personal care products (PPCPs) are entering streams and aquifers. PPCPs enter aquatic environments from wastewater treatment plants and on-site wastewater treatment systems (septic systems). While these treatment systems break down some pharmaceuticals into inactive forms, others may persist in the environment. The health effects, if any, to humans are not fully known. However, research has shown a detrimental effect on aquatic life, especially from a group of pharmaceuticals known as endocrine disrupting chemicals (EDCs). EDCs are hormones. When fish are exposed to them in the environment, it results in dramatic changes to their reproductive organs.

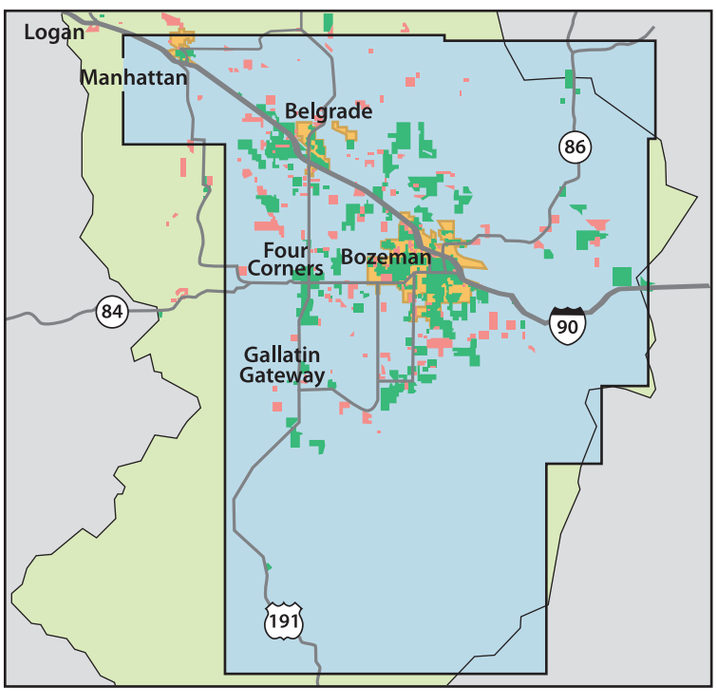
Land Management Options for Reducing Water Quality Impacts of NPS Pollution on Our Water Resources

NPS Problem	Suggested Best Land-Use Practice
Bacteria & Nutrients (fertilizers, herbicides, pesticides, yard waste, animal & pet waste, septic systems)	**Fertilizers, Pesticides, Herbicides:** • Reduce the amount used. • Follow proper application instructions. • Don't use prior to a rain event. **Yard, Animal & Pet Waste:** • Clean up after your pet. • Manage animal waste by keeping it away from wellheads and surface water bodies. • Leave grass clippings and leaf litter on your lawn to provide soil nutrients. • Do not rake grass clippings or leaves into the street. **Septic Systems:** • Have your system pumped on a regular basis.
Stormwater Runoff (oil, grease, salt, sediment, increased stream velocities)	• Install rain barrels to capture runoff from rooftops. • Properly maintain your vehicle. • Never pour anything down storm drains. • Eliminate bare soil areas by planting native plants and grasses in landscape areas. • Use pavers or stepping stones instead of concrete or asphalt where possible. • Refrain from using excessive amounts of salt or sand on streets and sidewalks.
Pharmaceuticals	• Dispose of at the Story Mill Convenience Station. Call 582-2273 for information. Do not put in the trash, or flush down the toilet.

How Can You Help?

Most human-caused ground and surface water problems can be solved by prevention, best land-use and waste management practices, and effective cleanup or elimination of existing pollution sources. If we all do our part, we can reduce NPS pollution and keep our water resources clean for our use as well as for future generations.

Gallatin Local Water Quality District Boundary



Source: GLWQD

Gallatin Local Water Quality District

The Gallatin Local Water Quality District (GLWQD) operates as a non-regulatory department of Gallatin County and is governed by a nine-member Board of Directors.

The GLWQD is located in the north central portion of the Gallatin watershed and covers the entire Gallatin Valley.

The GLWQD staff conducts on-going public education to increase awareness and understanding of the importance of protecting and improving water resources within the Gallatin watershed.

Legend
- Major Roads
- Major Subdivisions
- Minor Subdivisions
- Cities/Towns
- GLWQD Boundary
- Gallatin Watershed

Establishment and maintenance of a long-term water quality monitoring network is an ongoing project of the GLWQD. Work is conducted to establish baseline data and conduct long-term trend analyses on our water resources. Research activities centered around ground water and surface water are conducted, as needed, to complement education and data collection efforts, and assess local water resource issues. The GLWQD collects, compiles, and disseminates water resource data and information for the benefit of all citizens, organizations, groups and governmental agencies interested in water resources within the District. http://www.gallatin.mt.gov/GLWQD. (406) 582-3148.

Information & Resources

Blue Water Task Force–Big Sky
http://www.bluewatertaskforce.org/

DNRC, Water Resources Division–Bozeman Field Office, (406) 586-3136

EPA Region 8
http://www.epa.gov/region8/water/

Gallatin County
- Gallatin Local Water Quality District, (406) 582-3148
- Gallatin City - County Environmental Health Department, (406) 582-3120
- Gallatin County Extension, (406) 582-3280
- Gallatin County Farm Bureau, (406) 587-9574

Greater Gallatin Watershed Council
http://www.greatergallatin.org/

MDEQ
- Water Quality Programs
  http://www.deq.mt.gov/wqinfo/index.asp
- Enforcement Division, (406) 444-0379
- Water Protection Bureau, (406) 444-3080
- Water Quality Planning Bureau, (406) 444-6697
- State Drinking Water Revolving Fund, (406) 444-5324
- Nonpoint Source Program 319 Grant Information
  http://deq.mt.gov/wqinfo/nonpoint/Grants/319Grants.asp

Montana Bureau of Mines and Geology, (406) 496-4167
http://www.mbmggwic@mtech.edu/

Montana Water Center, (406) 994-6690
http://water.montana.edu/default.asp

Montana Watercourse, (406) 994-1910
http://www.mtwatercourse.org

MSU Extension Water Quality, (406) 994-6589
http://waterquality.montana.edu/

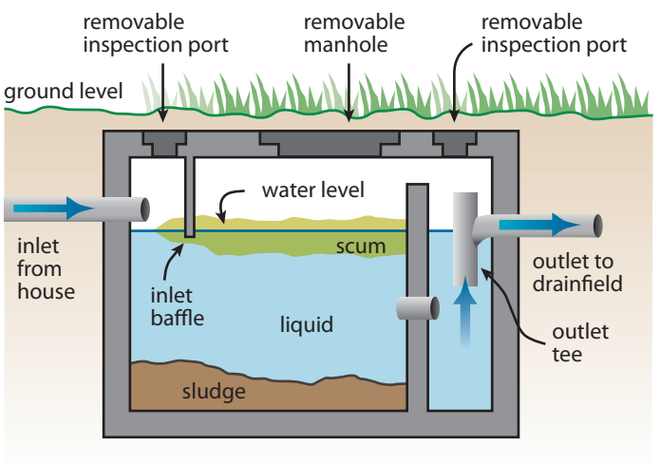
NRCS, Bozeman Field Office, (406) 522-4000
- Environmental Quality Incentives Program
  http://www.mt.nrcs.usda.gov/programs/eqip/
- Water Quality
  http://www.mt.nrcs.usda.gov/technical/ecs/water/
- Low Impact Development
  http://www.mt.nrcs.usda.gov/technical/ecs/water/lid

NRIS, Water Quality in Montana
http://nris.mt.gov/wis/data/waterquality.htm

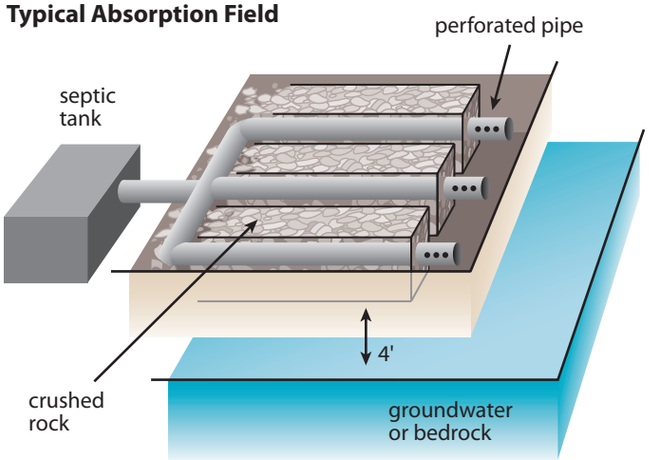
CHAPTER 7

Your Septic System

Contributed by Tim Roark and Craig Caes, Gallatin County Environmental Health Department



Typical Absorption Field



Septic systems are designed to break down and neutralize contaminants before they enter ground water or surface water systems. A properly designed, installed and maintained system is an essential link in maintaining water quality in the Gallatin watershed.

How Your System Works

The typical septic system consists of:

1. Septic tank, which separates, stores and begins to treat solid wastes.
2. Distribution system, which is generally a series of perforated drainpipes.
3. Drain field, or soil absorption system.

The soil absorption system receives effluent from the septic tank and filters and treats it by natural biochemical means before it enters the ground water.

Siting Septic Systems/Permitting

Because of its dependence on natural filtering and treatment, soil is the most important part of a septic system. Chemical processes and naturally occurring microbes in soil break down contaminants, while pathogens eventually perish in the inhospitable environment. If soils are too wet (hydric soils), oxygen is not available for organisms that break down waste. Gravelly soils allow water to pass through to surface or ground water too quickly, before breakdown of contaminants is complete. Clay soils may impede the rate at which water is filtered. In combination with household chemicals like water softeners, these soils can cause a system to fail. The Gallatin watershed has many areas of both hydric and gravelly soils, meaning that septic system design is not a "one size fits all' proposition. The design of a system is based on soil and site characteristics, including depth to ground water. Depending on where you live, soil and site characteristics may determine that a more sophisticated septic system is required. The design and sizing of any septic system in Gallatin County requires approval of the County Sanitarian. All septic systems are inspected to insure that they are properly installed. State and county regulations require that all soil absorption systems be located at least 100 feet from the 100-year flood plain and 100 feet from any surface water, as well as being located at least 100 feet from any existing well or spring.

Applications for state subdivision review and new local permits must also provide documentation to demonstrate that high quality state surface and ground water will not be degraded by the proposed development. Nondegradation rules define limitations for the amount of pollutants from wastewater systems, specifically nitrate and phosphorous, that could potentially enter nearby surface and ground water. The movement and pol-

Signs Your Septic System May Be Failing:

- Sewage backup in drains or toilets
- Sluggish drains
- Mushy ground or greener grass around septic system
- Outdoor odors
- Nitrates or bacteria in your drinking water
- Algae blooms in ponds adjacent to your home

lutant load of wastewater after it enters the ground is evaluated by developing a predicted mixing zone for the drainfield site. A mixing zone begins as the area under the drainfield receiving wastewater. Over time, depending on the ground water gradient or slope of the site, the mixing zone plumes through the soil deeper and away from the drainfield in a specific direction. Existing levels of nitrate in ground water and existing levels of phosphorous absorption capacity in soil must be obtained to determine if the site is suitable to receive the pollutant load from the wastewater without exceeding state limitations. Mixing zones are also prohibited within 100 feet of any nearby wells. Once approved, the nondegradation analysis requires developers, building contractors, and registered septic installers to follow strict adherence to the approved location and size of the wastewater system.

Photo: Alan English

Having your septic system pumped on a regular basis is an important element for maintaining a functioning system.

Common Causes of Septic System Failure

While many things can interfere with the operation of your septic system, by far the most important step you can take to prevent problems is to properly maintain your system. Your system requires two things to operate efficiently:

Proper bacterial action - the system is designed to accept normal household waste that contains the organisms necessary to promote digestion. Bacteria-killing products, like paint thinner, chemical drain cleaners, some water softening salts, paints, oils, acids and pesticides will destroy or inhibit the ability of your septic system to break down household waste.

Periodic pumping - sludge is the accumulation of solid material that cannot be further broken down by bacterial action and must be periodically pumped out. Failure to pump the system allows solids to overflow into the distribution system thereby clogging the drainfield. This not only can force a costly replacement of the system but may also result in sewage surfacing on the ground. While the frequency of pumping depends on the use of the system, the frequency of garbage disposal use, and the number of people using the system, generally a standard tank of 1,000 gallon capacity used by a family of four people should be pumped about every three years. Additives should not be added to your system to dissolve sludge. Several commercial septic pumping businesses operate in Gallatin County.

Knowing When to Pump Your Tank

If you are unsure whether you need to pump, locate your access or inspection ports and determine the following:

- Scum is less than 3 inches from the bottom of the baffle or top of outlet tee.
- Sludge is less than 12 inches from the bottom of the outlet tee.
- If the sludge and scum together take up more than half of the tank.

Information & Resources

MDEQ - design standards for septic systems, circular WQB, (406) 444-4969

MSU Extension Service - septic system guides; Montguides 9401, 9403, (406) 994-3451

MSU Extension Water Quality, (406) 994-6589

NRCS - soil maps, (406) 522-4000

NRCS - Web Soil Survey, (406) 587-6856 http://soils.usda.gov/survey/

CHAPTER 8

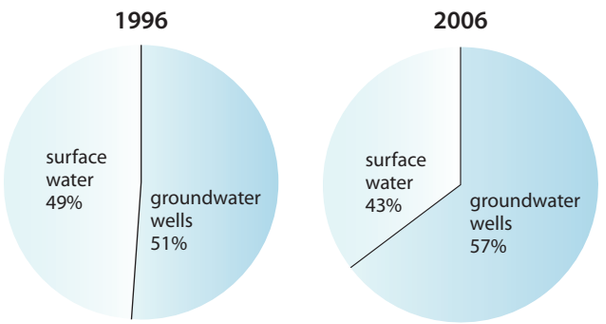
Protecting Your Well from Contamination

Contributed by Tammy Crone, Gallatin Local Water Quality District

Your drinking water resource is precious. In 1996, about 51 percent of Gallatin County's population relied on ground water as a source of drinking water. By 2006, that percentage had increased to 57% ground water. With more of the Gallatin watershed's population relying on ground water as their sole source of drinking water, it is important that we keep it clean. Ground water, like surface water, can be contaminated by naturally occurring chemicals and metals; discharges of human-derived industrial, household or agricultural chemicals; nutrients such as nitrogen (nitrate) and microorganisms (bacteria, viruses) from animal waste or septic systems; and fertilizers, pesticides and other household hazardous chemicals.

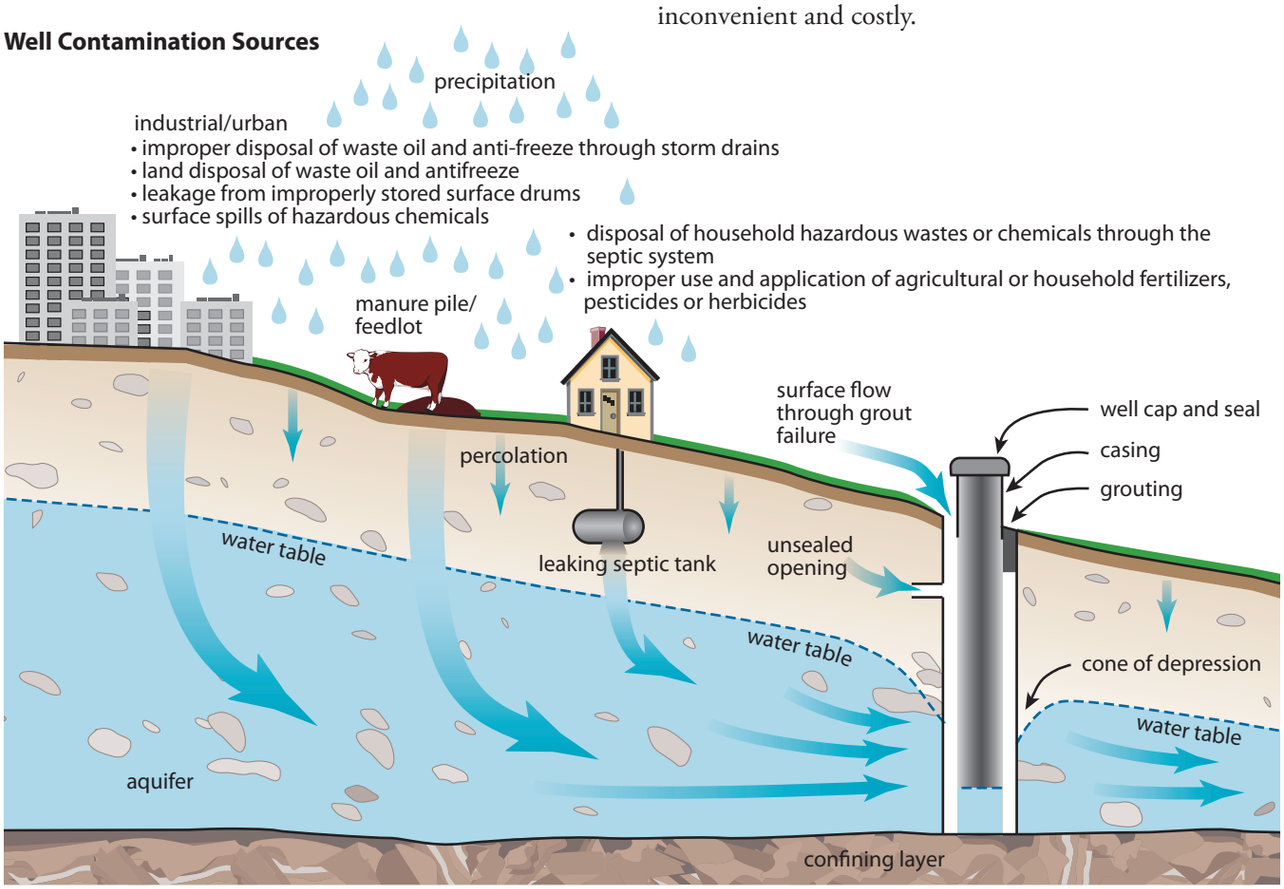
Well contamination can happen in two ways: (1) Percolation (or infiltration) of contaminants through the soil from the land surface near the well casing, and (2) contaminants can enter ground water directly through unsealed pipes, or poorly constructed or improperly abandoned wells. So, the key to protecting your drinking water well from contamination is prevention. Trying to clean up a well after it has become contaminated is inconvenient and costly.

Sources of Drinking Water



Source: US Census Bureau 2006 Population Estimate

Well Contamination Sources



Graphic: USDA-NRCS

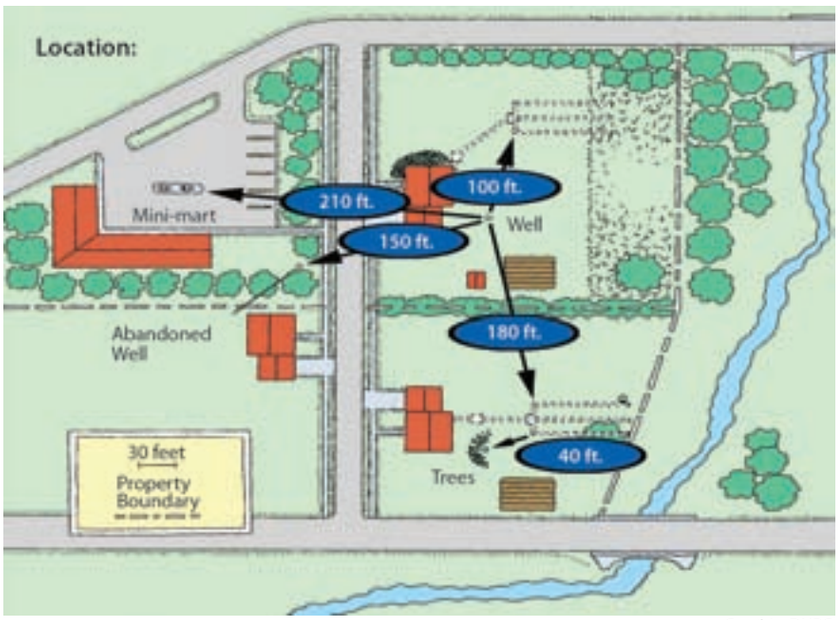
Wellhead Protection: A Proactive Approach

Wellhead protection (also known as source water protection) is a fundamental strategy for protecting your ground water resource by keeping potential sources of pollution away from your drinking water supply. This is done by identifying the proper site for new well construction, using common sense when managing land uses near your well, properly maintaining your well and septic system, and eliminating the potential for hazardous chemical discharges in the vicinity of your well by minimizing chemical use and eliminating chemical storage near your well.

New Well Site Selection Criteria

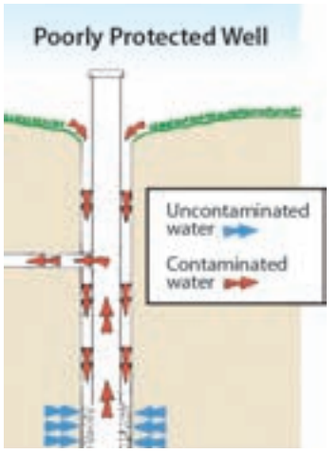
If you plan to drill a new well, proper site selection is very important in protecting your drinking water source. The following factors should be considered:

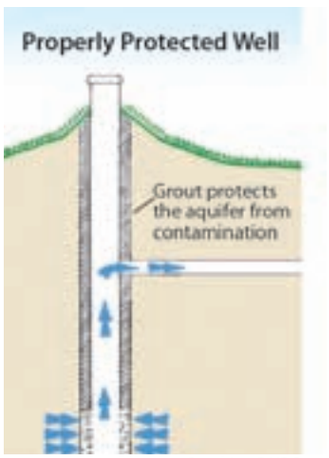
- Montana law requires that wells be located at least 100 feet upgradient from any septic drain field, including your neighbors'.
- In most subdivisions in Gallatin County, well and septic drainfield locations on individual lots are designated as a condition of final subdivision plat approval. Before you build or drill, review the final subdivision plat on file at the Gallatin County Courthouse to determine the recommended well site and whether minimum well depth requirements apply.
- Avoid placing your well downhill (downgradient) or within 100 feet from a livestock pen or barnyard, fuel tank or storage area for hazardous chemicals or within 500 feet of any liquid or solid waste structures associated with animal feeding operations. If you plan to board livestock (horses, cattle, sheep, etc.), locate the barn and corral at least 100 feet downgradient from your well.
- Shallow wells (60 feet or less) are more likely to be affected by contaminants than deeper wells. Generally, the deeper the well is, the less susceptible it will be to contamination if properly constructed and maintained.
- Wells must be located a ***minimum of 100 feet*** from surface waters. It is also recommended that this 100 foot setback be applied near irrigation canals.



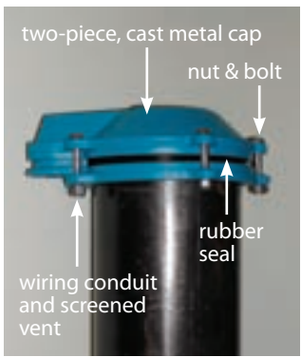
Graphic: DNRC

Do a site survey to identify any potential contaminant sources to your well.

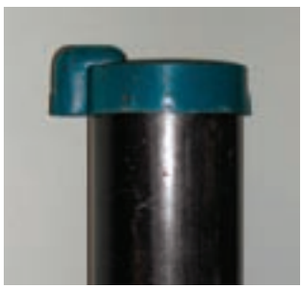




Graphics: DNRC



Sanitary well cap.



Non-sanitary well cap.

Photos: GLWQD

Remember, the greater the distance you can put between your well and potential contamination, the better. The GLWQD, DNRC, local well drillers or ground water professionals can assist you with identifying an appropriate well site.

Constructing Your Well

Employ a Montana licensed well driller. Consult with DNRC on current well construction standards and insure that proper compliance with those standards is maintained during well drilling:

- Well casing should extend at least 18 inches above the natural ground surface or at least 2 feet above the maximum 100-year flood level, whichever is greater.
- Well should be fitted with a sanitary (watertight) well cap upon completion.
- Well should be properly grouted to provide a layer of protection from land surface contamination.
- Wells designed to withdraw more than 35 gallons/minute, or greater than 10 acre-feet of water/year, require a water right permit from DNRC before construction.
- File a Notice of Completion with DNRC once your well has been completed and put to use. It is required by law.

The land-use and waste-disposal practices near your well can have a profound effect on your water quality. If you have an existing well, options for protecting your water may be limited to controlling potential contamination sources nearby.

Maintaining Your Well

- Test your water annually for bacteria, nitrates and other contaminants of concern. Also test if there is a change in your water's taste, odor, or appearance; after the well system is serviced; or after a flooding event.
- Annually, visually inspect the well casing, well cap and the ground surface around the well casing. Any holes or cracks found should be repaired immediately to prevent entry of dirt, surface water, insects or other contamination.
- Replace a non-sanitary well cap with a sanitary one.
- Some older wells are connected to household plumbing systems or livestock watering areas without backflow regulators. Backflow prevention devices should be installed to prevent this. Backflow can also occur through hoses connected to well hydrants. When filling an outside water container or chemical mixing tank, always maintain an air gap between the container and the fill hose. Otherwise, back-siphoning to the well and direct contamination of your drinking water may result.
- Have your septic system pumped regularly and operate it properly as recommended in Chapter 7.
- Hazardous materials (paint, oil, pesticides, household chemicals, etc.) should not be stored, mixed, or spilled near the well. Never dispose of these down the drain.
- Limit the use of lawn and garden chemicals. Excess product moves easily through the soil to ground water and contributes to high nitrate levels. Apply these chemicals sparingly and follow manufacturer's application instructions.
- When landscaping, avoid planting flowers, trees, and shrubs near your well since they will require watering and fertilizing.
- Hire a Montana licensed well driller for any well modification or unused well abandonment and closure.
- Don't pile snow, leaves, dirt or other materials next to or on top of your well.
- Keep your well records in a safe place (well log, maintenance records, water test results).

Water Testing: How Do I Know if My Well Water is Safe to Drink?

Periodic testing of your well water is important. It is the only way to determine if a water quality problem exists that may affect your health. It is also the only way to determine if the quality of your water has changed over time due to changes in land use either nearby or on-site. At a minimum, an annual test for nitrate and bacteria is recommended. Every five years, a domestic drinking water analysis is recommended. This includes the test for bacteria and nitrate as well as additional basic water quality characteristics.

When Should I Test My Water?

- Annually.
- Change in water's taste, odor or appearance.
- Pipes show signs of corrosion.
- Well system (pump, pressure tank, etc.) is serviced.
- After a flooding event.

Public Water Supplies

If you live in Belgrade, Bozeman or Manhattan, your water is provided by that city and is called a public water supply. Outside of these city limits, some subdivisions are provided water through one well source that is distributed to each residence and business. Other areas are serviced by a water and sewer district. These are also considered public water supplies. A public water supply is responsible for testing the water it provides on a regular basis. If problems are discovered, the residents are to be notified. Each year a public water supply is required to prepare and distribute a Consumer Confidence Report to those it serves. This report contains information on the source of your drinking water and the quality.

Individual Private Well

If you have a wellhead on your property, chances are you are the owner of a private well. This makes you a "private well water supply operator". There are no rules or regulations that obligate you to test your water or to maintain your distribution system. This also means that no one else is responsible for the quality of your drinking water. So, it is important that you test your water on an annual basis to ensure a clean and safe drinking water supply for you and your family. You will want to use a private or public laboratory that is certified for drinking water analysis. Contact the GLWQD or the Gallatin County Environmental Health Department for a listing of labs and to obtain the proper bottles for water testing. The GLWQD can also help you assess potential water quality problems, provide help and information on collecting water samples, and assist you in determining your wellhead protection needs.

Information & Resources

DNRC, Water Resources Division, (406) 586-3136

Gallatin City-County Environmental Health Department, (406) 582-3120

Gallatin Local Water Quality District, (406) 582-3148

MSU Extension, Water Quality, (406) 994-6589

CHAPTER 9

Handling Household Hazardous Waste and Electronic Waste

Contributed by Tammy Crone, Gallatin Local Water Quality District

HHW that is disposed of improperly can contaminate drinking water.

Unused or unwanted household chemicals are considered hazardous when they pose a threat to our environment and us.

Household Hazardous Waste

Many homes in the Gallatin watershed have cupboards and garages that contain some type of household chemical product. These products provide us with a convenience. Unfortunately, when they are not used up or disposed of properly, they pose a serious threat to the health of our families and our environment and are known as household hazardous waste (HHW). While each individual home in the watershed may have only small quantities of these household products, collectively, the amount of waste adds up quickly.

Disposal Problems

Improper disposal of HHW can contaminate our drinking water by seeping into ground water. It is best if you can actually use up the product. Even then, some containers of hazardous material require special disposal. It is never appropriate to dump or burn hazardous materials on your property, or dispose of products in the trash, on the ground, or down storm drains. People forget that storm drain systems eventually flow straight into local streams or rivers.

All wastewater treatment systems use biological processes to breakdown sewage. Household chemicals disposed of down the drain can disrupt this process. When this happens, some of these chemicals and untreated sewage may pass through the system and enter our surface waters, or seep into the soil and contaminate drinking water supplies.

Reducing the Risk

Sometimes, less toxic alternatives are not available, but you can improve the chances that these products will not harm our water resources by:

- **Purchasing only the right amount for the job.** If you buy more than you need, products will tend to accumulate, adding storage problems around the home to your list of concerns.

Recipes for a Cleaner Environment

Using some of these alternatives may require more effort and "elbow grease" than their commercial counterparts and some may not work as well or as quickly. But, by using less hazardous products, you'll be helping to protect our local environment and save money at the same time!

Glass Cleaner
¼ cup white vinegar
1 quart warm water

Vinyl Floor Cleaner
½ cup vinegar
1 gallon warm water

Tub/Tile Cleaner
Use baking soda and scrub with a scrubbing pad. Or, sprinkle baking soda on a wet sponge and add vinegar on top.

All-Purpose Cleaner
(Use for many cleaning jobs like countertops, floors, walls, rugs and upholstery)

1 tsp. Liquid soap
1 tsp. Borax
¼ cup vinegar (or squeeze of lemon)
1 quart warm water

Photo: GLWQD

Sorting and preparing HHW for proper disposal at the Gallatin HHW Event in 2004.

Photo: GLWQD

Paint bulking at the 2004 Gallatin HHW Event.

- **Looking for alternatives.** Often, non-toxic or less toxic alternatives are available. For example, a metal snake can replace drain cleaner. Some products contain less toxic components than others. There are even businesses in the area that sell non-toxic paints. Several Gallatin businesses specialize in "biological control" agents that take the place of some pesticides.
- **Following label instructions.** Most manufacturers are explicit about when, where and how to use their product and how to store it and dispose of the empty container. If these instructions are followed to the letter, the product should pose little threat to our environment.
- **Recycling products.** Several area businesses take products for recycling such as batteries, antifreeze, toner cartridges and used motor oil. Keeping HHW out of landfills extends landfill life and reduces ground water contamination potential.

HHW Disposal Options

HHW should be disposed of through specialized disposal facilities. Once collected, HHW is packaged for transport and taken to a regulated facility where it may either be incinerated or buried in a landfill specially designed for hazardous chemicals. So remember, HHW doesn't just go away.

Story Mill Convenience Station

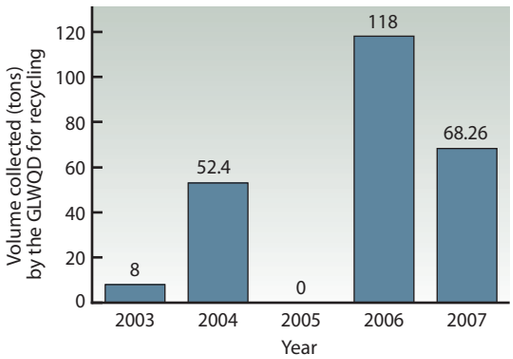
Located at the City of Bozeman Landfill site, the Story Mill Convenience Station accepts most HHW from City of Bozeman and County residents at no charge. Accepted materials include most household cleaners, acids, automotive products, used oil, contaminated fuels, lawn and garden chemicals, flourescent bulbs, batteries and pharmaceuticals. Materials are taken by appointment only and a registration form must be completed prior to bringing material to the station. For more information call 582-2273 or go to www.bozeman.net.

HHW Product	Contamination Concern	Disposal Option
Motor oil, oil filters, antifreeze	Improper disposal can contaminate water resources. Antifreeze contains ethylene glycol; poisonous to fish, wildlife, pets and people.	• City Shop Complex (5 gallon limit). Bozeman residents only. 582-2273 • Story Mill Convenience Station. 582-2273 • Speedy Lube. 438 N. 7th Ave. 586-2303
Herbicides and pesticides	Over-application; improper disposal can lead to contamination of water resources.	• Story Mill Convenience Station. 582-2273 • Large quantities? MT Dept. of Agriculture Pesticide Collection Program. (406) 444-5400
Latex paint	Liquid cannot be disposed of in landfill.	• Useable paint—Annual Latex Paint Swap. 586-7671 (Bozeman Recycling Coalition)
Oil-base paint	Improper disposal can contaminate water resources.	• Story Mill Convenience Station. 582-2273
Pharmaceuticals	Harmful to aquatic life. Unknown health risks to humans.	• Story Mill Convenience Station. 582-2273
Gas, minerals spirits, thinners	Improper disposal can contaminate water resources.	• Story Mill Convenience Station. 582-2273
Automotive batteries	Contain acids. Can contaminate water resources.	• Story Mill Convenience Station. 582-2273 • Most auto parts stores. Call ahead.
Mercury (flourescent and compact flourescent bulbs, thermometers)	Never place in trash! Do not break! Poisonous and harnful to fish, wildlife, pets, and people. Can contaminate water resources.	• Story Mill Convenience Station. 582-2273 • Owenhouse Ace Hardware. 587-5401
Chlorinated solvents (brake cleaners, spot removers, degreasers, paint strippers, aerosal lubricants)	Extremely toxic and persistent in the environment. Chlorine is added to make products more stable, making the substance slow to break down in the environment.	• Avoid buying or using products containing "chloro" in the name like trichloroethylene or perchloroethylene. • Story Mill Convenience Station. 582-2273

What to Do in Case of a Spill

Generally, never hose down a leak or spill. This will simply spread contamination. Use an absorbent material (like kitty litter) on the spill and dispose of the residue properly. If you have a spill that threatens to enter a storm drain or any surface water, or in case of an emergency, call 911. Both the Belgrade and Bozeman Fire Departments have hazardous materials teams able to respond.

E-Waste Recycling Trend for Gallatin County



Source: GLWQD

Electronic Waste

Outdated, unwanted and broken electronic equipment is known as electronic waste (e-waste). E-waste is considered hazardous because it contains heavy metals and other materials that can harm humans and the environment. With the rapid advances in computer electronic technology and the relatively low price of purchasing replacement electronics, items that break or are outdated are usually discarded rather than repaired or upgraded.

Contaminants and Environmental Concerns

Heavy metals, such as cadmium, lead, mercury and hexavalent chromium are used in the production of consumer electronics. These chemicals are persistent in the environment and accumulate in living organisms as they travel up the food chain. Lead is a major contaminant in computers; one monitor can contain up to 8 pounds.

Manufacturers use many different types of plastic in computers and other electronic equipment, making it a challenge to recycle. Recycling electronics is not very profitable and a large volume of e-waste is shipped to Asia where labor costs are very low and health and environmental regulations are less stringent to non-existent. This impacts the environment—polluting water supplies in other parts of the world.

E-Waste Disposal Options

Community collection events provide a great opportunity for the public to dispose of e-waste responsibly. These events are also labor-intensive and expensive. In Gallatin County, free e-waste collection events hosted by the GLWQD between 2003 and 2007 took in over 246 tons of electronics. The cost to conduct these events averaged $30,000 each year. Most collection events charge participants a fee to cover the transportation and recycling costs. Several local businesses and computer manufacturers offer recy-

Photo: GLWQD

Computers and other consumer electronics packaged for transport to a recycling facility at the 2006 Gallatin E-Waste Collection Event.

cling programs to consumers. The cost of these disposal options can be either a charge per item or shipping costs. Simply put, consumers should expect to pay some price for proper disposal of their e-waste since taking to the landfill or illegally dumping will be more costly in the long term to our environment and our health.

What Can You Do About E-Waste?

- **Reduce.** Consider extending the life of your computer or other electronic devices by upgrading features and fixing or replacing parts. Several computer businesses in the area offer these services.
- **Reuse & Donate.** Donate your *functioning* computer or electronic device to a charitable organization. Contact them first to see if it is something they can use, otherwise, you are just passing on your disposal problem to someone else.
- **Recycle/Demanufacture.** Contact the computer manufacturer or local retail outlet. Many have recycling, take-back or lease programs. They may even give you a discount on the purchase of your next system, if you return the old one to them.

HHW Information & Resources

City of Bozeman/Gallatin County Solid Waste Management District – Set-up appointment for HHW drop-off at the Story Mill Convenience Station. (406) 582-2273 www.bozeman.net/waste/solidwaste.aspx

Gallatin Local Water Quality District – (406) 582-3148 www.gallatin.mt.gov/GLWQD

MDEQ – (406) 444-4643 http://www.deq.mt.gov/Recycle/HouseholdHW.asp

Montana State University Extension Service, Pollution Prevention Program – 994-6948 http://www.montana.edu/wwwated/

Computer & Electronic Technology Disposal Information & Resources

Staples, Bozeman – (406) 582-4450, 586-1235

Office Depot, Bozeman – (406) 586-7129

MDEQ – Listing of computer recycling and e-waste disposal options. http://www.deq.mt.gov/Recycle/Electronics/index.asp

Gallatin Local Water Quality District – (406) 582-3148 www.gallatin.mt.gov/GLWQD

Items Considered to be Consumer Electronics

- Televisions and monitors
- Computers
- Computer peripherals (keyboards, mice, speakers)
- Audio/Stereo equipment
- VCRs and DVD players
- Video cameras
- Telephones, cellular phones and wireless devices
- Fax and copy machines
- Video game consoles
- Rechargeable batteries

CHAPTER 10

Big Sky Country Living: Backyards, Barnyards and Beyond

Contributed by Steve Forrest. Updates by Jennifer Mohler, Bridger Scientific, Inc.

For more information on what it means to live in Big Sky Country, check out the Code of the West at www.gallatin.mt.gov

Montanans are rightfully proud of their agricultural heritage. While the land base in the county is still primarily agricultural, the number of large farms and ranches has decreased as the population in the unincorporated parts of the county continues to grow. This means that many people living in rural parts of the county are relative newcomers. If you live near a farm or ranch, be aware that your proximity to farm and ranch operations requires special tolerance and additional obligations as a neighbor. Odors, dust, noise and slow-moving machinery are all facets of maintaining a robust agricultural economy. Being a good neighbor means respecting the land and the people who share the land.

Irrigation Canals

Is it a ditch or a stream?

Contact: Gallatin CD 522-4011.

Do I have a valid water right to the ditch that crosses my property?

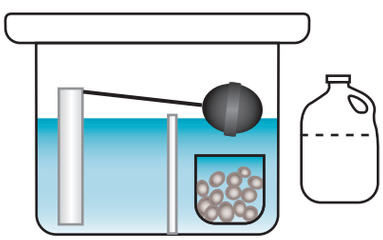
Contact: DNRC 586-3136 or AGAI at www.AGAIMT.com.

Irrigation canals (sometimes referred to as ditches) are an important part of our rural and urban landscape. Irrigation practices have important seasonal effects on ground water levels. Here are some aspects of features you should be aware of:

- High ground water tables and flooding during peak irrigation season is entirely likely on adjacent properties.
- Some canals are used seasonally, so dumping leaves, grass clippings or yard waste into the ditch may obstruct water flow and cause unintended flooding – perhaps on your own property!
- No water use out of a canal or ditch is allowed without a valid water right. This includes diverting water with pumps or dams, constructing ponds, or taking water in any way.
- Canals require routine maintenance. If a canal does cross your property, be aware that there is a conveyance or maintenance easement for the canal, and access for maintenance equipment to easily pass through must be maintained. So, construct fences accordingly. Also, do not plant trees or shrubs alongside the canal as they will likely be removed when canals are cleaned.

Community-Based Conservation

Expanding water and wastewater infrastructure to meet the needs of growing communities in the Gallatin is not only costly but also, ultimately, means greater demands will be placed on our ground and surface water. The more communities and individuals do to use water wisely, the less demand will be placed on the water we have.



Source: National Small Flows Clearinghouse

Reduce by 25 percent the amount of water flowing out of your toilet by placing a rock-filled plastic milk jug in your toilet tank.

Water Needs Comaprison

The amount of water required to support an animal unit (AU – a mother and young is 1 animal unit) of livestock, a family of five, and a suburban lawn and garden vary greatly and can be estimated by the following:

Species	Water Requirements
1 cow AU	5,500 gallons/year (0.17 acre feet/year)
1 horse AU	8,300 gallons/year
300 chickens	5,500 gallons/year
1 family (5 people)	325,851 gallons/year
half-acre lawn & garden	407,313 gallons/year

Using Water Efficiently

How we use water in our homes can have a tremendous impact on water resources. For example, 40% of indoor water usage goes to waste disposal through the toilet. A five-minute shower can use more than 40 gallons of water. Leakage through worn-out washers and faulty toilet tank valves accounts for up to 10% of all indoor residential water consumption. Conservatively, indoor leakage probably results in the loss of more than 200 million gallons of water per year in the Gallatin watershed, enough water to supply 613 families for a year.

Water consumption around the house can be reduced by installing water conserving fixtures and taking showers instead of baths. But the biggest gain in water conservation can be achieved by decreasing lawn sizes and using grasses and landscape plants adapted to our drier climate.

Xeriscaping: The Water-Efficient Landscape

Xeriscaping is the wise use of water through water-efficient landscaping. It integrates the principles of several conservation initiatives by reducing water, energy and chemical usage; enhancing wildlife habitat; managing invasive weeds; and promoting native plants. Many gardeners and landscapers have found that using adapted plants not only results in healthier lawns and gardens that use less water, but also requires less input of time and money. Talk to your local nursery about plants that will not only complement your home but will also thrive in our arid climate without heavy doses of water and fertilizer.

Incorporate xeriscaping into your landscape by:

- Planning ahead and designing comprehensively
- Improving soil with amendments to increase fertility and water holding capacity
- Reducing lawn areas
- Choosing appropriate plants and grouping them according to water/environmental needs
- Irrigating efficiently
- Using mulches. Bark, compost, and mulched leaves help reduce evaporation from the soil.

Practical Lawn Care

Choosing appropriate grasses for your lawn is the first step in water conservation. Desirable grasses have low water and fertility requirements, high resistance to insects and disease, and have rhizomatous root systems that help form a dense mat. Introduced species can be considered in augmenting native grasses due to ease of establishment and durability in high use areas. Attention to season of growth, root type, soil preference, drought tolerance, trampling resistance, and mowing tolerance will assist in making wise choices.

Grasses for Dryland Lawns

Native Cool Season: Western wheatgrass, thickspike wheatgrass, streambank wheatgrass, green needlegrass

Native Warm Season: Blue grama, buffalograss, sideoats grama

Introduced Species: Crested wheatgrass, sheep fescue, hard fescue, tall fescue, Canada bluegrass, Russian wildrye

Watering. Frequent watering may actually harm your lawn by promoting a shallow root system and increasing the susceptibility to fungal growth. Conversely, once-weekly, heavy watering encourages deeper roots, making the plants more drought tolerant. Lawns in our area typically only need about 1 inch of water a week. Annual lawn aeration increases the amount of water absorbed and retained. Because of the increased rate of evaporation, avoid lawn watering when it is windy or during hot parts of the day (typically after 10:00 a.m. through 5:00 p.m.). Maximum water conservation is achieved when lawns are irrigated separately from trees and shrubs. So, consider using drip irrigation for gardens and landscaping areas. Let your cool season grass go dormant – it is the natural cycle of grasses! Applying at least ½ inch of water every other week will keep roots active. A dormant cool season lawn will recover quickly in September when temperatures cool and rains return.

Pasture Irrigation

Identify what types of grasses you have in the pasture. They are often planted with introduced species that require additional water and fertilizer to keep them productive.

Mowing. Cutting grasses too low increases water demand and causes roots to die or deteriorate. Removing more than one-third of the grass blade in one cutting injures the root system.

Fertilizing. Over fertilizing does not improve plant growth, can damage grass roots, and harms water quality. Excess nitrogen and phosphorus are easily washed into surface waters, increasing nutrient loads that cause excess algae growth which depletes the oxygen

needed by other aquatic organisms. To reduce impacts to water resources and maintain a healthy lawn:

- Test your soil and fertilize only in the amounts needed and at the right time.
- Apply manure and fertilizer when plants are actively growing (don't apply on wet soils or frozen ground).
- Fertilize in the spring to feed the shoots and in the fall to feed the roots.

Pesticide Management. Surface and ground water can easily be polluted by improperly applied and stored pesticides. Insecticides kill insects by damaging the central nervous system and can have the same effect on fish and wildlife. Herbicides interfere with photosynthesis or alter plant growth. If improperly applied, herbicides can easily be transported by runoff or ground water, potentially harming non-target plants in other areas. Pesticide management tips include:

- Do not mix or dispose of lawn chemicals near wells or surface water.
- Don't spray in wetlands or riparian areas. Look into biological and mechanical control options for these areas.
- Avoid applying when wind speeds are >5 mph, during extreme temperatures, and when rain is in the forecast.
- Use only pesticide approved for the specific use intended. Read and follow label guidelines. Need assistance? Contact the Gallatin County Weed Control District.

Photo: Gallatin County Weed Control District

Weeds like spotted knapweed pose a threat to wildlife, livestock and native vegetation.

Noxious Weeds. Property owners are required by state law to control noxious weeds on their property (MCA 7-22-2116). Some 25 different weeds in Gallatin County warrant control and management. Management methods include: biological control, mowing, hand pulling, and herbicide spraying. Landowners contemplating activities that will disturb the land (such as road building) are reminded that a Noxious Weed Management and Revegetation Plan may be required from the Gallatin County Weed Control District.

Protecting Riparian Areas and Water Resources

As stewards of the land, we can greatly influence the present and future health and vitality of our land simply by the way we manage it. The need for a sustainable supply of clean water is universal, and every landowner whether urban, suburban, or rural, has an impact on water resources.

Managing Runoff from Homesites, Pastures and Fields

One of the most effective ways to maintaining water quality is putting space between human activities and streams and wetlands. Maintaining healthy riparian vegetation is the most effective way to trap sediment and pollution before it enters surface waters. Vegetative cover also provides erosion control and flood management benefits, as well as affording habitat for fish and wildlife. Depending on where you live and the size of the waterway, you should consider providing a buffer of one or more of the following types:

Riparian forest buffers. NRCS recommends forest buffers (trees and/or shrubs) adjacent to streams, lakes, ponds, and wetlands, where appropriate. Riparian buffers are tailored to the type stream channel and size of the active floodplain.

Filter strips. These grass strips or other permanent vegetation at the edge of a cropped field or animal confinement area are intended to catch sediment and runoff before it enters surface water.

Rain gardens. These are depressional areas in the landscape with perennial flowers and native vegetation that soak-up rainwater. They are strategically located to capture runoff from impervious surfaces (roofs, driveways, etc.), allowing it to filter into the ground instead of a storm drain.

Livestock Management

Livestock management or the lack of it can have a tremendous impact on the vitality of any riparian or wetland area on your property. It can have impacts on your downstream neighbors as well. When pastured in a stream corridor, animals can cause extensive damage to riparian areas (overgrazing, trampling, and streambank erosion) if left unmanaged. Manure from livestock can be washed or even deposited directly into the stream, allowing nutrients, bacteria and pathogens to enter waterways. To keep streambank vegetation healthy and restore degraded riparian areas:

- Develop off-stream water sources (troughs, etc.)
- Create water gaps and gravel pad crossings
- Manage the timing and duration of livestock use or consider excluding livestock from riparian areas with fencing
- Plant willows and other shrubs to control erosion and reestablish fish and wildlife habitat

Water Gap

A water gap is a controlled access point to a stream that limits the impact on the resource. The path to the gap should be gently sloped and stabilized with gravel and construction fabric. You may need a 310 permit to create a water gap, so contact the Gallatin CD if you are considering this.

Photo: USDA-NRCS

Pasture Management

For small acreage landowners with grazing animals, water determines what kind and how much forage is available for your animals. The number and kind of animals combined with land management practices determine your impact on water resources. A

What Is a Drylot?

A drylot is a part of your land that you sacrifice so the rest of your land can grow grass! Sacrifice areas or drylots allow landowners to keep animals off pastures to avoid overgrazing, soil compaction, and damage during wet weather.

Photo: Jennifer Mohler

Photo: Jennifer Mohler

Grass filter strips surrounding drylots help trap sediment and nutrients, resulting in cleaner water.

healthy stand of grass is your best defense against weeds and the best way to protect soil and water resources. Overgrazing can lead to unhealthy grass, weed infestations, soil compaction, and heavier parasite loads. Continuous overgrazing eventually kills your grass. To maintain healthy pastures:

- Identify what is growing on your land. Some grasses may not offer good forage, and many weeds are poisonous.
- Develop a rotational grazing system so that only a portion of the pasture is grazed at one time, allowing the remaining pasture areas to rest. This improves long-term production and reduces weed invasions.
- Pasture grasses should be 6-8 inches tall before putting animals out to graze. If not, you're overgrazing.
- Horses do not need to graze 24 hours a day (4-6 hours will meet the nutritional needs of the average horse).
- The biggest mistake landowners make is putting too many animals on too few acres. **If you have limited acreage, and/or dryland pastures, face the fact that your pastures will be used primarily for exercise and plan to feed hay year-round.**

You have a direct impact on your own water sources!

1 average horse produces:

40-50 pounds of manure per day or 16,500 pounds per year.

12 gallons of urine per day or 4,400 gallons of urine per year.

It can add up!

4 horses produce:

30 tons of manure per year and 17,500 gallons of urine per year. That's enough urine to fill a 15 x 30 foot swimming pool!

Manure Makes Mud

Research is clear on the negative effect of muddy conditions on animal health. Mud harbors bacteria, fungi, pathogens, and provides a breeding ground for insects. It results in slick, unsafe footing for the animals and the runoff is damaging to fish and streams by introducing excess sediment, nutrients, and pathogens. Manage animal waste properly by collecting and composting. Composting reduces volume, kills parasites and weed seeds, reduces odor, and provides slow-release fertilizer and soil amendment. Remember to locate manure piles and drylot (sacrifice) areas away from wells and streams – at least 150 feet.

Information & Resources

Creating Native Landscapes in the Northern Great Plains and Rocky Mountains. NRCS, www.mt. nrcs.usda.gov

Gallatin County Weed Control District. (406) 582-3265
http://www.gallatin.mt.gov/Public_Documents/gallatincomt_weed/weeddept

Montana Native Plant Society. http://www.umt.edu/mnps/

Montana State University Extension Catalog (Contains publications on land, water, weeds, soils, range management, pest management, fertilizers, etc.).
http://extn.msu.montana.edu/publications.asp

Protecting Water Resources on Small Acreages. 2008 Jennifer Mohler, Bridger Scientific, Inc. (406) 388-5668

Small acreage education and resources. Contact Gallatin Conservation District (406) 522-4011. http://www.gallatincd.mt.nacdnet.org

Small Acreage Pasture Management and Weed Education Classes. Contact Bridger Scientific, Inc. (406) 388-5668

Tips on Land & Water Management for Small Farms and Ranches in Montana. DNRC, (406) 444-6667

Zero Spread. Montana's Noxious Weed Awareness and Education Program.
http://www.weedawareness.org/

CHAPTER 11

Partners Protecting the Gallatin: Education and Citizen Involvement

Contributed by Steve Forrest. Updates provided by Frances Graham, MOSS

Water pours through every crevice of our daily lives like, well, water! While the importance of water to human life is paramount, we often assume that abundant supplies of clean water will always be available. This assumption is increasingly challenged by the reality of rising demands for supply, diverse threats of pollution, and the erratic, unpredictability of our climate. Locally, it is the responsibility of each of us to do our part to ensure that we pass on the legacy of abundant, clean water to future generations in our watershed and those downstream. Fortunately, many groups have organized to remind us of the values of our water and educate us about its role in shaping the landscape and the life dependent on it.

"A river, though, has so many things to say that it is hard to know what it says to each of us."

- Norman Maclean,
A River Runs Through It

The **Montana Watershed Coordination Council (MWCC)** serves as a statewide coordination network for Montana's natural resource agencies and private organizations and a forum for local watershed groups to help enhance, conserve, and protect natural resources and sustain the high quality of life in Montana for present and future generations. Locally, the Greater Gallatin Watershed Council participates in the statewide organization.

Photo: GLWQD

GGWC Fall Watershed Tour.

The **Greater Gallatin Watershed Council (GGWC)** is a locally-led, non-profit organization promoting conservation and enhancement of our water resources while supporting the traditions of agriculture, community, and recreation. GGWC grew out of the need to document the extent and quality of water resources and to facilitate the equitable allocation of those resources among competing demands. GGWC works to create a forum where all interests can be heard and contribute to the problem-solving effort. GGWC runs the Gallatin Stream Team, a volunteer water quality monitoring program that is approved by MDEQ. Residents of the Gallatin watershed are encouraged to get acquainted with their watershed home through public discussion, information-sharing, and hands-on participation. www.greatergallatin.org

Photo: GGWC

GGWC Stream Team volunteers learn how to use field equipment and sampling protocols for monitoring water quality on streams in their neighborhoods.

The **Blue Water Task Force** is a locally-led non-profit watershed group headquartered in Big Sky. The Task Force operates primarily in the upper watershed, covering the mountainous terrain upstream of the Gallatin Valley. The majority of the land in the upper watershed is publicly owned, which is unique compared to many watershed groups. Most of the privately owned and managed land is in and around Big Sky Resort, so the particular concerns of a developing community surrounded by a mountain environment are a focus of the Task Force. www.bluewatertaskforce.org

Photo: BWTF

Blue Water Task Force volunteers collect water samples on a winter day in Big Sky.

Photo: Gallatin CD

A "310 permit" project.

Photo: GLWQD

Learning about watersheds and land use practices with the Rolling Rivers Trailer at the Gallatin County Fair.

Photo: MOSS

Hands-on experience with stream ecology.

The **Gallatin Conservation District's** goal is to promote wise use of our natural resources and aid in the protection and preservation of our waterways. The District encompasses all portions of Gallatin County, except for the 1949 city limits of Belgrade and Bozeman. One of 58 conservation districts in Montana, the GCD administers the Natural Streambed and Land Preservation Act (S.B. 310) and issues "310 permits" for projects in perennial waterways in Gallatin County. The GCD works closely with NRCS providing assistance to landowners, sponsors natural resource and education grants, and provides education outreach to small acreage landowners. (406) 522-4011 http://gallatincd.mt.nacdnet.org

The **Gallatin Local Water Quality District** is a non-regulatory department of Gallatin County. Their purpose is to maintain a long-term water quality and quantity monitoring network for collecting scientific data on local water resources; assist citizen's with questions related to water issues and serve as a clearinghouse for water resource information; to foster stewardship and increase public awareness of water resource issues in the District; and to partner with local groups, organizations, and other governmental agencies to create a solid information network on water resource issues. (406) 582-3148 www.gallatin.mt.gov/GLWQD

Often partnering with the GGWC or Gallatin CD, the **Association of Agricultural Irrigators (AGAI)** works to protect the watershed. AGAI's mission is to be the guardian and advocate of the Gallatin River system and its historically decreed water rights. AGAI's goals are to: protect historically decreed water rights; stay current on local water issues regarding development; enhance/improve water conservation, "in stream" flows, and fish habitat; work on stewardship issues, weeds, erosion and water quality; and work to resolve irrigation and canal issues. www.agaimt.com

Simple Ways to Involve Yourself

- Call one of the organizations listed; ask how you can find out more about their projects and when they meet.
- Educate yourself. Be informed.
- Attend county commission and town council meetings. Get involved in the planning stages and voice your opinions on development along streams and wetlands.
- Write letters to city and county officials about your concerns.
- Attend a watershed group, Gallatin CD, GLWQD, or AGAI meeting and public events.
- Become a local volunteer water monitor with the Greater Gallatin Watershed Council.
- Vote.

Why Education Is Key to Success

Education can take on many forms – from a classroom setting to streamside water monitoring. Offering hands-on field experiences to both children and adults has proven to be effective in greater retention and learning. Providing citizens with knowledge and skills to understand their watershed promotes leadership and community collaboration. When an issue arises, problems can be more easily solved if everyone understands the complexities and interconnectedness of the issue. Oftentimes, we must improve environmental literacy, which in turn leads to a more aware citizenry that can make informed decisions. Following are groups or organizations which provide education to various audiences:

Educational Organizations

Montana Outdoor Science School. Dedicated to promoting an awareness, understanding and appreciation of the natural world through quality educational experiences. (406) 582-0526 www.outdoorscience.org

Montana State University Extension Service. Educational resource dedicated to providing research-based knowledge to strengthen the social, economic and environmental well-being of Montanans. (406) 994-1750 www.extn.msu.montana.edu

Montana Water Center. Advances water research, information, education, and problem-solving partnerships throughout Montana, and serves as a clearinghouse for Montana water information. (406) 994-6690 http://watercenter.montana.edu

Montana Watercourse. Facilitates formation of local watershed education groups; develops water information seminars and field trips through "Know Your Watershed" forums; operates the Montana Volunteer Water Monitoring Project; coordinates Montana Project WET and K12 workshops for educators. (406) 994-6671 www.mtwatercourse.org

Citizen Groups

Alternative Energy Resources Organization (AERO). Grassroots nonprofit organization dedicated to solutions that promote resource conservation and local economic vitality. (406) 443-7272 www.aeromt.org

American Wildlands. Regional organization working to restore and maintain the connections between key habitats for healthy populations of native fish and wildlife. (406) 586-8175 www.wildlands.org

Ducks Unlimited. Conserves, restores and manages wetlands and associated habitats for North America's waterfowl. www.ducks.org/states/22/index.html

Federation of Flyfishers. Dedicated to the betterment of the sport of fly fishing through Conservation, Restoration and Education. (406) 222-9369 www.fedflyfishers.org

Gallatin Valley Land Trust. Conserves southwest Montana's heritage of open landscapes, working farms and ranches, healthy rivers, and wildlife habitat; and creates trails to connect people, communities and the land. (406) 587-8404 www.gvlt.org

Greater Yellowstone Coalition. People protecting the lands, waters, and wildlife of the Greater Yellowstone Ecosystem, now and for future generations. (406) 586-1593 www.greateryellowstone.org

Montana Farm Bureau Federation. Programs and activities on behalf of Montana's farmers and ranchers at the state and county levels. (406) 587-3153 www.mtbf.org

Montana Land Reliance. Land trust that preserves and conserves private lands through conservation easements. (406) 443-7027 www.mtlandreliance.org

Montana Nature Conservancy. Works with landowners and communities to conserve important ranchland and wildlife habitat. (406) 443-0303 www.nature.org/wherewework/northamerica/states/montana/

Montana River Action Network. Leads the grassroots effort to preserve, protect, enhance, and restore Montana's rivers, lakes, and their watersheds for their natural, recreational, and cultural values. (406) 587-9181 www.montanariveraction.org

Montana Trout Unlimited. Conserve, protect, and restore Montana's world-class coldwater fisheries and their watersheds. (406) 522-7291 www.montanatu.org

Montana Wildlife Federation. Advocacy organization for big game and non-game species, habitat management using hunting, fishing, water quality, and public access issues. (406) 458-0227 www.montanawildlife.com

Sacajawea Audubon Society. Builds on an interest in birds to promote the conservation of our natural environment through enjoyment, education and action. www.sacajaweaaudubon.org

CHAPTER 12

Permitting and Regulation Guide

Contributed by Debbie Earl, Montana Watercourse

"Development along rivers and streams that destroys protective riparian areas is possibly the single most urgent ecosystem threat facing Montana today. Not only do these waterways and riparian areas provide fish and wildlife habitat, they also provide jobs and recreation."

– Governor Schweitzer
March 8, 2006

Letter to Directors at the Department of Environmental Quality, Department of Natural Resources and Conservation, and the Fish Wildlife and Parks

Regulations are necessary to protect one of Montana's most precious and limited resources. Below is a list of common permits needed with activities that affect water resources. Although it may take some time to obtain these permits, it is worth it in the long run. Additionally, fines for permit violations can be severe. In 2004, Montana witnessed the largest fine for unauthorized fill of wetlands, $1.8 million. In total over seven acres and several tributaries to the Gallatin were affected. The company in violation was also responsible for replacing the wetlands.

In an effort to facilitate the permitting process, one can use the Joint Application for the following permits: 310 Permit, Floodplain Permit, 404/Section 10, and 318 Authorization. Once the application is complete, photocopy it and put an ORIGINAL signature on each copy and send to the appropriate agency.

The joint application is titled, "Joint Application for Proposed Work in Streams, Lakes, and Wetlands in Montana" and can be accessed at http://www.dnrc.mt.gov/permits along with application instructions.

Table of Permits

Regulated Activity	Regulation	Length of Application Process & Fees (Approx.)	Governing Agency Information
Any activity that physically alters or modifies the bed or banks of a perennial stream, river or spring.	310 Permit	30-60 days	Gallatin Conservation District 522-4011 www.gallatincd.mt.nacdnet.org
Any activity (such as construction) that will cause unavoidable short-term violations of water quality standards.	318 Permit	30-60 days $150 fee	MT Department of Environmental Quality (406) 444-3080 www.mt.gov/wqinfo/othercert/otherwaterquality.asp
Any activity that might discharge into State or Tribal waters.	401 Water Quality Certification	60-90 days Fee varies by project	MT Department of Environmental Quality (406) 444-3080
Any activity that will result in the excavation, discharge, placement of dredged or fill material into lakes, ponds, rivers, streams, and wetlands.	404 Permit	45-120 days $0- $100 fee	U.S. Army Corps of Engineers (406) 441-1375
Installing an on-site wastewater treatment system	Septic Permit	30 days. Fee varies by project	Gallatin City-County Health Dept., Environmental Health Services 582-3120
Ponds that charge a fee for fishing or ponds for rearing and selling live fish or fish processing.	Commercial Fish Pond License	$10, must renew yearly. Surity bond required	MT Fish, Wildlife & Parks (406) 444-2449
Private fish pond that does not sell fish or fish eggs.	Non-Commercial Private Fish Pond License	$10, must renew every ten years.	MT Fish, Wildlife & Parks (406) 444-2449

Table of Permits

Regulated Activity	Regulation	Length of Application Process & Fees (Approx.)	Governing Agency Information
Construction, repair, or removal of a dam that impounds 50 acre-feet or more at the normal operating pool.	Downstream Hazard Evaluation Permit	60 days $125 fee	DNRC Dam Safety Program (406) 444-6613
Any new construction within a designated 100-year floodplain.	County Floodplain Permit	Up to 60 working days Fee varies	Gallatin County Planning Department (406) 582-3130 www.gallatin.mt.gov City of Bozeman Planning Department (406) 582-2260 www.bozeman.net
Land subject to being flooded by a flood of 100-year frequency A13, or land deemed to be subject to flooding by the City of Bozeman, shall not be subdivided or developed for building or residential purposes, or other uses that may increase or aggravate flood hazards to life, health or welfare, or that may be prohibited by state or local floodplain or floodway regulations.	City Floodplain Permit	60 days $100 fee	City of Bozeman Engineering Department (406) 582-2280 www.bozeman.net
Any person intending to acquire new or additional water rights, or change an existing water right.	Water Right Permit and Authorization to Change	Up to two years $200-$800	DNRC Water Rights Bureau (406) 444-6601
Ground water appropriation of 35 gallons per minute or less, but not exceeding 10 acre-feet per year.	Certificate of Water Right	File within 60 days of water being put to use $125 fee	DNRC Water Rights Bureau (406) 444-6601
Any discharges into surface water or ground water, including those related to construction, industry, mining, and gas activities.	Stormwater Montana Pollutant Discharge Elimination System Permit (MPDES)	Fees and processing time vary	MT Department of Environmental Quality (406) 444-3080
Any regulated activity which may impact wetlands as indicated on the Bozeman Area Wetland Map or discovered through the development review process, and verified through a site-specific wetlands boundary determination.	Wetland Regulations		City of Bozeman Planning Department & Bozeman Wetland Review Board (406) 582-2263 www.bozeman.net
New subdivision regulations require development be setback 300 feet from these major rivers: Gallatin, East Gallatin, West Gallatin, Jefferson, Missouri, Madison and 150 from all other watercourses. Watercourse mitigation plans required in order to reduce setbacks. For setbacks established through zoning ordinances contact planning department.	Setbacks	Fees are incorporated into subdivision application process. Processing time varies.	Gallatin County Planning Department (406) 582-3130 www.gallatin.mt.gov City of Bozeman Department of Planning and Community Development (406) 582-2260 www.bozeman.net
Swampbuster provisions of the 1985 Food Security Act may involve penalties for USDA program participants when wetlands are altered to make it possible to produce a commodity crop.	Wetlands	-	NRCS (406) 587-6998

* Contact the Gallatin County Planning Department for information on water and wastewater requirements for new subdivisions.

Additional Resources

A Guide to Developing near Gallatin County Waterways: Know the Rules. 2006. Greater Yellowston Coalition. http://www.greateryellowstone.org

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Montana Index of Environmental Permits. 2008. Montana Environmental Quality Council, Helena, MT (online at http://leg.mt.gov/content/publications/lepo/2008permitindex.pdf)

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Private Water Leasing: A Montana Approach. Trout Unlimited, Montana Water Project, Bozeman, MT

Slagle, S.E. 1995. *Records of water levels in monitoring wells in the Gallatin Valley, Southwestern Montana,* 1947-93. USGS Investigative Report 94-536, 41 pp.

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Winter, T.C., et al. 1999. *Ground Water and Surface Water: A Single Resource*. USGS Circular 1139, 79 pp.

Wolfe, M.E. 1996. *A Landowners Guide to Western Water Rights*. Roberts Rinehart Publishers, Boulder, CO.

Water Glossary

Aquifer: a sand, gravel or rock formation capable of storing or conveying water below the surface of the land.

Coliform bacteria: a group of bacteria predominantly inhabiting the intestines of man and animal but also found in soil. Coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms.

Cubic feet per second (cfs): a unit expressing rate of discharge, typically used in measuring stream flow. One cfs is equal to the discharge in a stream of a cross-section one foot wide and one foot deep, flowing with an average velocity of one foot per second.

Dewatered: natural flow of streams reduced due to withdrawals.

Erosivity: the capacity of a soil or land surface to be worn down or washed away by the action of water, ice or wind.

Floodplain: any normally dry land area that is susceptible to being inundated by water from any natural source.

Floodway: the channel of a river or stream and those parts of the adjacent floodplain adjoining the channel that are required to carry and discharge the base flood.

Ground water: water in porous materials beneath the ground surface.

Hydric soil: a soil that, in its undrained condition, is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth of water-loving plants.

Hydrograph: a record showing the changes in flow of a river over time.

Hyporheic Zone: transition zone between ground water and surface water. An ecologically important component of streams and rivers.

Instream flow: the water left in a stream to maintain the existing aquatic resources and associated wildlife and riparian habitat.

Irrigation return flow: irrigation water not consumed and returned to a surface or ground water supply.

Murphy Right: special instream flow water rights recognized in 1969 when an instream flow protection bill was passed by the Montana legislature to protect the unappropriated waters of 12 high-priority trout streams.

Nonpoint source: entry of a pollutant into a water body from widespread or diffuse sources with no definite point of entry. The source is not a readily discernible point like a discharge pipe.

Ordinary high-water mark: the line that water impresses on land by covering it for sufficient periods to cause physical characteristics that distinguish the area below the line from the area above it.

Permeable: the capacity of porous rock, sediment or soil to transmit water.

Riparian areas: land areas adjacent to water that are identified by the presence of vegetation requiring large amounts of water, normally available from a high water table. Common riparian vegetation includes sedges, willows, alders and/or cottonwoods.

Siltation: particles of soil smaller than sand but larger than clay particles that are washed into streams and may impair biological and physical processes.

Snowpack: the winter accumulation of snow.

Transmissivity: the rate at which water passes through an aquifer.

Tributary: a stream that contributes its water to another stream or body of water.

Water budget: the accounting of the inflows and outflows of water to and from a system.

Water table: the upper level of a saturated zone in an aquifer below the soil surface.

Watershed: The land area from which rainfall and snowmelt drains into a single waterbody. Ridges of higher ground generally form the watershed boundary.

Withdrawals: removing water from surface or ground water sources in order to use it elsewhere.

Contributors and Acknowledgments

Second Edition

Since the publication of the first edition of this Sourcebook, the Gallatin watershed has grown dramatically with new residents (from within and out of state) moving to this jewel of a watershed to enjoy the way of life and recreational opportunities our natural and cultural environment has to provide. With this change, the Gallatin Watershed Sourcebook: A Resident's Guide, needed to change too. A core group from the Gallatin Local Water Quality District, Gallatin County Environmental Health Department, Montana Outdoor Science School, Montana Watercourse, Montana Department of Natural Resources and Conservation, and the Natural Resources and Conservation Service, worked diligently to update the Sourcebook.

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First Edition

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