

## **Bear River Basin: Lower Bear-Malad Watershed**

### **Watershed Description**



Cutler Dam Outflow-Nancy Mesner, USU

The Lower Bear-Malad Watershed of the Bear River Basin has a drainage area of 3,200 km<sup>2</sup>. The large drainage of the Malad River encompasses the entire western edge of the Bear River drainage and accounts for nearly 90 percent of this entire watershed. This watershed also captures water from lands draining to the Bear River from below Cutler Reservoir. As the river leaves Cutler Reservoir, it travels southwest through a small, narrow canyon at the northern end of the Wellsville Mountains into the Great Salt Lake valley. The Bear River travels 105 kilometers from Cutler Reservoir to its final

destination, the Bear River Migratory Bird Refuge and Willard Bay, which ultimately drain into the Great Salt Lake. The highest point in the watershed is Box Elder Peak (2,900 meters) in the Wellsville Mountains. The lowest point is the Great Salt Lake (1280 meters).

### **Tributaries and Reservoirs**

The Malad River is the only major tributary to the Bear River in this watershed. It enters about 20 miles above the Bear River Migratory Bird Refuge. The Malad originates as the Little Malad River high in the Caribou National Forest in Idaho. As it travels towards the Bear River, it gathers waters from Deep Creek and Devil Creek, which enter the Malad River near Malad City, Idaho. A smaller tributary, Sulphur Creek, originates just north of the Bear River Migratory Bird Refuge and flows into the Malad River near Bear River City.

This watershed has 25 lakes, reservoirs, sloughs, and ponds. Storage reservoirs are located on the tributaries, not on the mainstem. Daniels Reservoir is on the Little Malad River in Idaho. It stores water for irrigation, serves as a fishery for rainbow and cutthroat trout and is used for motorized recreation and swimming. Mantua Reservoir is in the southeastern part of the watershed in Utah. It provides water storage for irrigation, hydroelectric power for Brigham City and recreation such as boating, water skiing, fishing and swimming. Water from this reservoir is transferred from the dam to a pipeline that carries the water to western Box Elder County where it is distributed for irrigation.

### **Climate**

The average precipitation in this watershed is 50 centimeters per year, the lowest in the entire basin. Annual precipitation ranges from 33 centimeters per year on the west side of Bear River Migratory Bird Refuge to as much as 150 centimeters per year in the mountains in the

southeastern portion of the watershed. Most of the precipitation falls as snow in the high elevations.

**Quick Fact:** This watershed has the greatest variation in local accumulations of precipitation of all the watersheds in the Bear River Basin.

This watershed is one of the warmest in the basin because most of it lies within the lower elevations of the Great Salt Lake drainage. Summer temperatures can be over 38°C in the valleys, while the mountains remain a cool 16°C. In January, low temperatures range from below freezing to 4°C.

### Land Management and Uses

About two-thirds of the land is privately owned. The US Forest Service and Bureau of Land Management each manage about one-tenth of the land. The states of Utah and Idaho and the US Fish and Wildlife Service manage smaller areas. About half of land in the watershed is used as rangeland and one-third is irrigated agricultural lands.



Bear River in Box Elder County- Nancy Mesner, USU

### Water Quantity

Flows leaving Cutler Reservoir average 42 cubic meters per second and increase to over 48 cubic meters per second at the lowest gaging station on the Bear River near Corrine, Utah. As in other parts of the basin, flows in the Bear River in this watershed vary due to seasonal and annual changes. The lowest recorded daily flow on the Bear River 0.7 cubic meters per second near Corrine in 2004. The highest flow is 405 cubic meters per second, recorded in 1984.



Great Salt Lake-Source Unknown

The Bear River is the largest tributary to feed into the Great Salt Lake. It delivers over half of the total surface water that flows into the Great Salt Lake every year. It is the largest tributary that connects to an inland sea in the United States.

There are several water diversions for irrigation and wildlife support in this watershed. The largest diversions go to the West Side Canal (235 million cubic meters per year) and to the Bear River Migratory Bird Refuge (105 million cubic

meters per year). In Box Elder County, Utah, 100 irrigation companies and private users work to deliver water from the Bear River to irrigate over 430 km<sup>2</sup>. The Bear River Canal Company alone maintains over 190 kilometers of canal and lateral lines in Box Elder County.

Currently, irrigation is the major use of water in the Lower Bear-Malad Watershed. However, the Utah Department of Natural Resources expects that water use will shift as agricultural land is increasingly converted to urban land in the future. Municipalities within the watershed are expected to reach or exceed the limits of their reliable system/source capacity within the next 20 years. Communities outside the Bear River Basin are expected to divert some of the water from the basin to address future demands. The Bear River Development Act ensures that additional development of waters of the Bear River and its tributaries in Utah will benefit communities outside the basin, including Weber, Davis and Salt Lake Counties. The plan is to connect the Bear River to Willard Bay via a pipeline or canal and construct a conveyance and treatment facility to deliver water from Willard Bay to the Wasatch Front. Developing new reservoirs or enlarging existing reservoirs within this watershed and other watersheds in the Bear River Basin is also possible.

## Water Quality

### Bear River

This reach of the Bear River has the poorest water quality in the entire drainage due to the cumulative upstream impacts. High levels of total dissolved solids (salts), sediments and phosphorus are the major identified water quality problems.

Below Cutler Reservoir, concentrations of sediment and phosphorus increase as the Bear travels south. In this watershed, the Malad River contributes nutrients and high concentrations of total dissolved solids, which it receives from thermal springs and human activities. Because of the high concentrations of phosphorus, the Utah Department of Environmental Quality (DEQ) has designated the entire reach of the Bear River between Cutler Reservoir and Great Salt Lake as impaired. As a result, a watershed plan (known as a Total Maximum Daily Load or TMDL) was completed and approved in 2002.



Bear River near Great Salt Lake-Nancy Mesner, USU

The primary sources of the pollutants are:

- Several large animal feeding operations
- Streambank erosion caused by natural processes, changes in in-stream flows and grazing on streambanks

. Other sources of pollutants are:

- Agricultural runoff that carries sediments, fertilizers, and animal wastes from agricultural lands
- Urban runoff
- Point source pollution

### Tributaries

Water quality at the headwaters of the Malad and other tributaries to the Bear is generally good. As these tributaries travel downstream, they pick up excess sediments and nutrients from agriculture, grazing and in-stream channel erosion. Tributaries to the Malad, such as the Little Malad River, Devil Creek and Deep Creek, contribute excess phosphorus and sediment to the river, causing the Idaho DEQ to designate the river as impaired. Sediment is also a problem in the Little Malad River.

Possible sources of sediment in this river include:

- Agriculture
- Livestock grazing
- In-stream channel erosion
- Streambank erosion.

### **Improvement Projects**

Several projects have been completed to improve water quality in this watershed:

- Vegetation restoration along the streambanks of the Bear River.
- Fencing off riparian areas to protect the fragile ecosystems along the waterways.
- Installing dikes, concrete basins, evaporation ponds and enclosed pipelines to help eliminate animal waste from entering the waterways.
- Fencing off springs, streams and rivers to prohibit livestock from grazing in the stream or on streambanks.

### **Vegetation and Wildlife**



Bear River Migratory Bird Refuge- Nancy Mesner, USU

Over one-third of the land cover within the Lower Bear-Malad Watershed is shrubland. Grassland and pastureland make up smaller areas. Forested mountains, such as the west side of the Wellsville Mountains and the National Forests near the headwaters of the Malad River, provide habitat for upland species including elk, deer many birds and small mammals.

Wetlands and other riparian areas provide the majority of the wildlife habitat in this watershed. At the northern tip of the Great Salt Lake, just 25 kilometers west of Brigham City is the Bear River Migratory Bird Refuge. This refuge includes 300

km<sup>2</sup> of marshes, uplands, mudflats and open water. The refuge attracts thousands of migratory ducks, swans, geese, shorebirds and other fowl. Since 1990, restoration efforts have tried to address the damage caused by the 1983 flood.

Prior to 1990, the Bear River provided habitat for nine different species of fishes, including Brown Trout, Green Sucker and Whitefish. By 1999, poor water quality decreased the number of species to only four (i.e., Carp, Channel Catfish, Walleye, and Gizzard Shad).

The Great Salt Lake has 40,000 km<sup>2</sup>, square miles of water habitat, including remote islands, shoreline and 1,600 km<sup>2</sup> acres of wetlands. Because the lake has no outlet, the salinity and level of the lake changes overtime. The variation affects the nutrient and habitat availability for various plants, invertebrates, reptiles, amphibians, mammals and birds that are dependent on the lake.

## People

This watershed encompasses parts of Box Elder County in Utah and Oneida County in Idaho. The largest municipalities in the Lower Bear-Malad Watershed are Malad City, Idaho, Tremonton, Utah, and Brigham City, Utah. The population in this watershed is about 47,000. One-third of the population is employed in manufacturing, one-fifth in government and one-tenth in agriculture and agriculture-related services. The Lower Bear-Malad Watershed is expected to grow considerably around existing towns along the I-15 corridor in Box Elder County, Utah. The Utah Governor's Office of Planning and Budget expects a 50% increase in population by 2020 and a 100% increase in population by 2050 in this region. As population growth and urban development occur, cropland will be converted to housing lots and commercial and industrial development.

## Recreation

There are numerous recreational opportunities in the Lower Bear-Malad Watershed. In the Idaho-portion of the watershed, the Caribou National Forest offers fishing, hiking, backpacking, hunting, horseback riding, camping, picnicking, off-road vehicle access and winter sports. The Wright Creek National Recreation Trail travels 20 kilometers through the Elkhorn Mountain Range from Summit Campground to Reed Canyon.



Wellsville Mountains- Kevin Kilpatrick

This scenic route is open for recreational use year-round. In the fall, it is open for deer hunting. Part of the Wellsville Mountains Wilderness Area is located on the eastern edge of this watershed. The best access to this wilderness area is from one of the three developed trailheads in Cache Valley, on the eastern side of the range. Access from the western side is quite rugged.

Wildlife viewing and hunting opportunities are offered at several waterfowl management areas and refuges, including Salt Creek Waterfowl Management Area and the Bear River Migratory Bird Refuge in Utah.

Boating and fishing are popular with both locals and visitors in the Lower Bear-Malad Watershed. Mantua Reservoir is a popular spot for water-based recreation.

### **Points of Interest**

Brigham City Tabernacle: This tabernacle was built on “Sagebrush Hill,” a site chosen in 1865 by Brigham Young. It took nearly fifteen years to build and was gutted by fire in 1896. It was rebuilt with a Gothic Revival tower and sixteen pinnacles. Free, guided tours are available June through September.

Corinne: “The Gentile Capital of Utah”: The town of Corinne, Utah was established in 1869. For its first decade it was known as “The Gentile Capital of Utah” because it was founded by a group of former U.S. Army officers and non-Mormon merchants from Salt Lake City. They established Corinne on the Union Pacific line, hoping to make it the primary transfer point for mines in Montana and elsewhere. Some historic buildings in the town reflect its past, including the small Methodist Church, which is on the National Register of Historic Places.

Crystal Hot Springs: Crystal Hot Springs is located about 20 kilometers north of Brigham City in the town of Honeyville. It is built around a natural hot springs. The area was used as a winter campsite by the Shoshone Indians of the region. Later, Chinese workers found the springs and built cedar tubs to capture the waters and provide soothing mineral baths after the development of the Pacific railroad. The first commercial development of the springs was in 1901, when it became known as Madsen Hot Springs. Today, the resort features water slides in addition to its traditional soaking pools.

Holmgren Historical Farm: This working family farm was homesteaded in 1898 under the Homestead Act. Its unusual layout includes hay storage and a dairy operation under the same roof, making it one of the more interesting buildings on the National Register of Historic Places. Since it was established, the farm has been in almost continuous use as a dairy production facility. The farm now hosts concerts, craft fairs and other events. It has a rose garden with 500 rose plants, herbs, and wild flowers.

Northwest Band of the Shoshone Nation: Utah and Southeastern Idaho were first settled by the Shoshone. Today, the Shoshone are especially well-known for their beadwork. Offices of the Northwest Band provide information on events and artisans in Brigham City.

### **Additional Information on this watershed:**

Bear River Heritage Area Website ([www.bearriverheritage.com](http://www.bearriverheritage.com))

Public Lands Information Center Website ([www.publiclands.org](http://www.publiclands.org))

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Utah Rivers Council: The Bear River ([http://www.utahrivers.org/the\\_bear\\_river.html](http://www.utahrivers.org/the_bear_river.html))

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