Biological Assessment

Operation & Maintenance of the St. Mary Unit of the Milk River Project

Milk River Project – St. Mary Unit, Montana

Missouri Basin Region

Montana Area Office

LOCATION:
Glacier County, Montana

U.S. Department of the Interior **April 2020**

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Introduction

The United States Department of the Interior, Bureau of Reclamation (Reclamation), Montana Area Office (MTAO) has prepared this Biological Assessment (BA) to assess the effects of the continued operation and maintenance (O&M) of the Milk River Project (Project), St. Mary Unit, on bull trout (*Salvelinus confluentus*) and other federally listed species that may be found in the Action Area. Lake Sherburne Dam and Reservoir, Swiftcurrent Creek Dike, the St. Mary Diversion Dam and Headworks, St. Mary Canal and appurtenant structures are collectively referred to as the St. Mary Unit of the Project. This BA is part of the consultation process with the U.S. Fish and Wildlife Service (Service) in accordance with Section 7(a)(2) of the Endangered Species Act of 1973 (16 U.S.C. §§1531-1544), as amended (ESA). The Proposed Action described in this document is the continued operations and maintenance (O&M) of the St. Mary Unit of the Project. This includes annual water diversions for irrigation purposes along the lower Milk River valley in northcentral Montana.

Purpose of the Proposed Action

The purpose of the Proposed Action is to continue O&M at the St. Mary Unit.

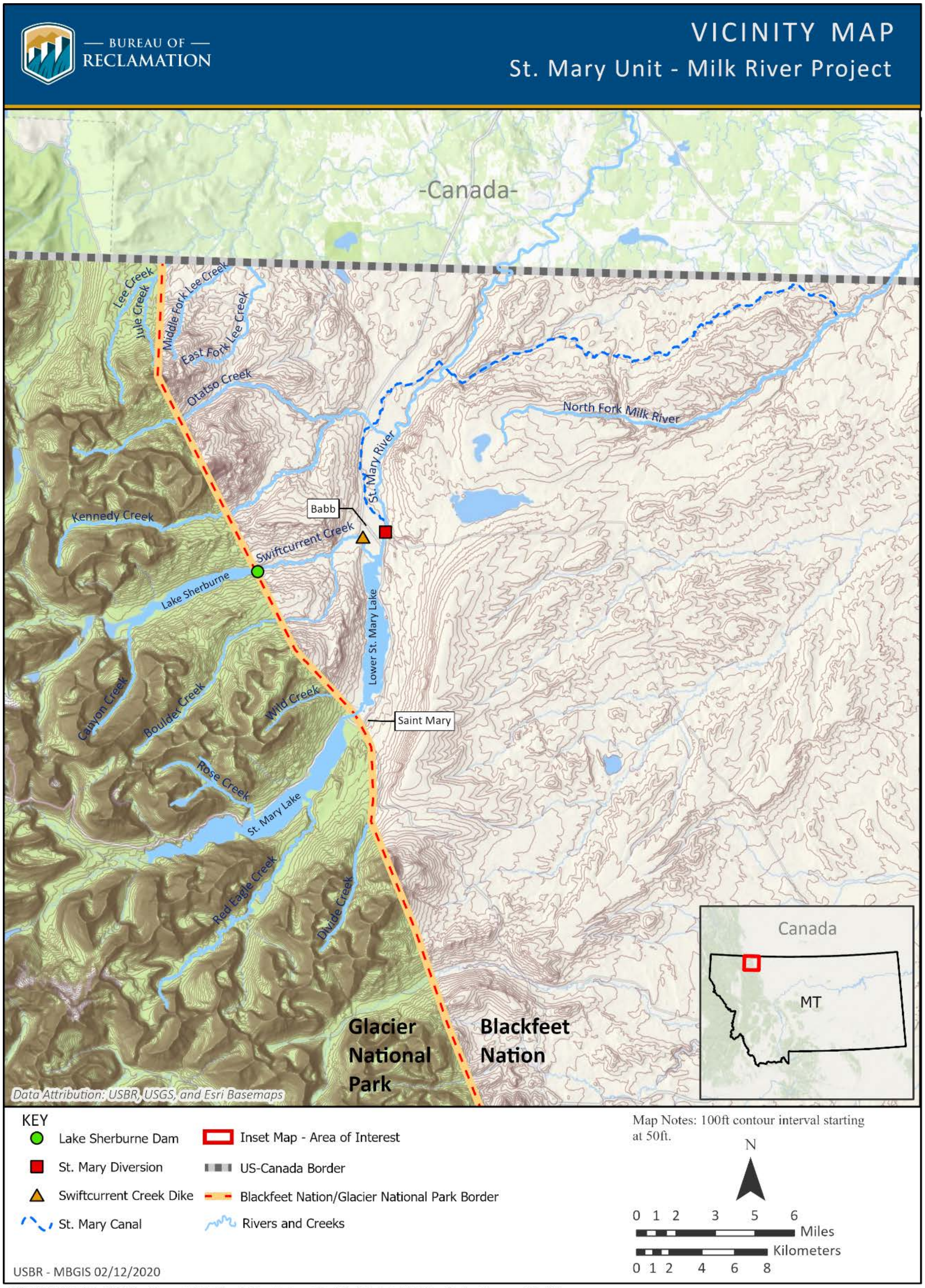
Need for the Proposed Action

The need for the Proposed Action is to continue the delivery of water to Project water users and other legally mandated water obligations in compliance with the ESA. The Proposed Action is the continued annual O&M at the St. Mary Unit – including Lake Sherburne Dam and Reservoir, Swiftcurrent Creek Dike, Saint Mary Diversion Dam and Headworks, and the St. Mary Canal and appurtenant structures in compliance with the ESA. Figure 1, Vicinity Map shows the features of the St. Mary Unit. Continued O&M is needed to ensure that the U.S. utilizes its share of the St. Mary River Basin water under the Boundary Waters Treaty (BWT) of 1909 and the 1921 Order of the International Joint Commission (IJC). Discontinued operation of the St. Mary Unit also has indirect water supply impacts to Canada in the Milk River Basin under the BWT. Further, maintenance is needed to ensure that all components of the St. Mary Unit are operable to facilitate the continued delivery of contracted irrigation water. Water diverted to the St. Mary Canal irrigates approximately 110,000 acres (44,515 ha) on eight irrigation districts (Fort Belknap, Alfalfa Valley, Zurich, Paradise Valley, Harlem, Malta, Dodson, and Glasgow), individual river pumpers, as well as to communities along the Milk River (Havre, Chinook, Hill County, and the Fort Belknap Agency) and the Bowdoin National Wildlife Refuge.

Action Area

The "Action Area" is defined as all areas directly or indirectly affected by the Federal action. Specifically, the area where the physical, biological, and chemical components of land, air, and water will be modified or affected by an action directly, or those occurring later in time and may include consequences outside the immediate area involved in the action (50 CFR §402.2). Effects of the action are all consequences to the listed species that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action.

Figure 1. St Mary Unit Milk River Project Vicinity Map

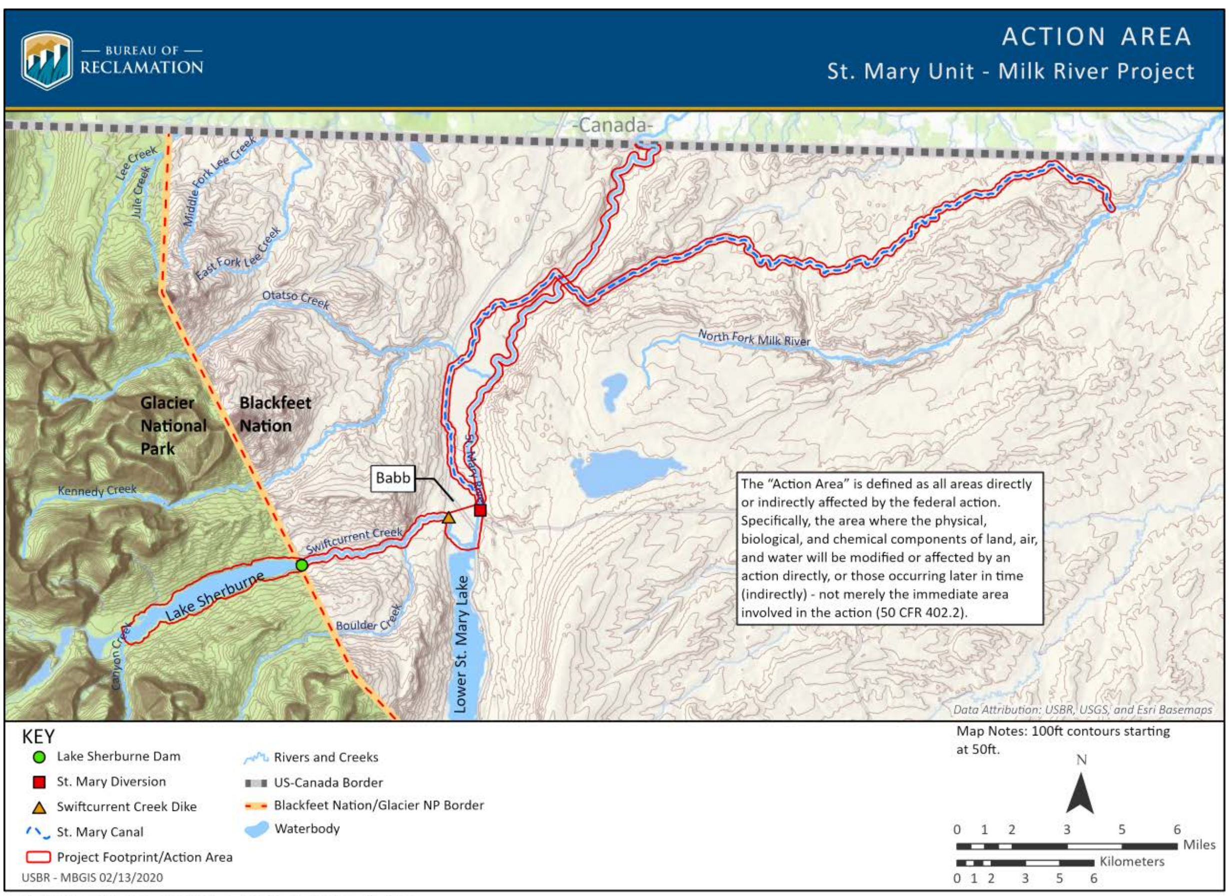


The Action Area was derived by taking a comprehensive view of factors related to Project operations of the St. Mary's Unit. Factors considered include:

- The St. Mary Diversion Dam is a seasonal barrier to upstream and downstream migration of bull trout and other native fishes.
- During the annual diversion period (irrigation season) the unscreened St. Mary Canal entrains a variety of fish species.
- During the non-irrigation period, while Lake Sherburne Dam is closed for refilling of the reservoir, Swiftcurrent Creek is dewatered from the dam to the Boulder Creek confluence.
- Water diversion decreases water quantity and habitats in the St. Mary River below the Diversion Dam.
- Authorizations, responsibilities, and obligations.

The project footprint defines the limits of areas where direct actions would be necessary for the successful operation of the St. Mary Unit of the Project. The Action Area extends beyond the Project footprint to where modifications to the land, water, or air may occur or be perceived (either directly or indirectly), the Action Area for this consultation is defined as follows and shown in Figure 2.

Figure 2. Action Area Map



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Noise and disturbance associated with O&M activities have the potential to extend approximately 500 feet outward from the project footprint. Consequently, the area of direct effects has a radius of 500 feet in all directions from the project footprint, encompassing access points and sediment/hydraulic zones of effect. The Action Area is the area considered for potential consequences to all listed species (terrestrial and aquatic). Areas subject to effects of the O&M activities may occur later in time and may include consequences occurring outside the immediate area (project footprint) involved in the action. Theses distances are established with the confidence that they include all areas of conceivable impact associated with continuing O&M (Proposed Action) at the St. Mary Unit.

The St. Mary Unit lies within the crossroads of the Great Plains and Northern Rocky Mountain ecosystems in Glacier County in northwest Montana. This area provides a vast array of physical and biological features which include, but are not limited to hydrologic characteristics, soil types, geological features, vegetation types, species richness, and other features. Elevations in the Action Area range from 4,800-feet at the western end of Lake Sherburne Reservoir to 4,400-feet at the northeastern most extent of the St Mary Canal, to 4,100-feet at the St Mary and North Fork Milk rivers where they cross the international boundary.

In this case, Project O&M activities at the St. Mary Unit lie within the St Mary River basin. For the purposes of this BA the Action Area affected by Project O&M includes Lake Sherburne Reservoir and Dam, Swiftcurrent Creek, Swiftcurrent Creek Dike, the northern most end of Lower St. Mary Lake, St. Mary Diversion Dam and Headworks, the St. Mary Canal, the St. Mary River downstream to the international boundary with Canada.

Within the St. Mary Unit, Lake Sherburne Reservoir, located in Glacier National Park (GNP), stores water behind Lake Sherburne Dam (1st component of the St Mary Unit), and its outflow forms Swiftcurrent Creek. Swiftcurrent Creek Dike, located just downstream from the Swiftcurrent and Boulder Creek confluence, directs the collective flow into Lower St. Mary Lake near its outlet, which forms the St. Mary River. The river carries the water approximately .75-mile (~1 km) downstream to the St. Mary Diversion Dam and Headworks (2nd component) where it is either diverted into the St. Mary Canal system (3rd component) and transferred to the North Fork Milk River or it is allowed to pass the St. Mary Diversion Dam, continuing downstream to Canada.

Background

The Project operations are guided by various authorizations, responsibilities, and obligations. These include:

Milk River Project

The Project was conditionally approved on March 14, 1903 by the Secretary of the Interior under the Reclamation Act (1902 Public Law 57–161). Authorizing legislation is an important consideration in Reclamation projects because it states the authorized project purpose and determines the use of storage water and the limits within which a federal facility can be operated. Reclamation retains ownership of all Project facilities and performs OM&R of the St. Mary Unit facilities. Milk River Project water users pay majority of the costs (73.96-percent) for the St. Mary Unit facilities.

In 1905 Congress authorized construction of the St. Mary Unit which comprises the upper extent of the Project. Between 1906 and 1924, Reclamation built several water-control and delivery structures in the St. Mary River basin as part of the St. Mary Unit. The Milk River is used as a conveyance so that the United States (U.S.) share of the St. Mary River can be utilized for irrigation in the lower portion of the Milk River basin in northcentral Montana. Key to the success of the Project is a treaty between Canada and the U.S. that would ensure the unrestricted passage of the combined water of the St. Mary and Milk Rivers through Canada. Streamflow is divided between Canada and the U.S., in accordance with the 1909 BWT and IJC 1921 Order.

Boundary Waters Treaty & 1921 Order

The division of the waters of the St. Mary River, including its tributaries, is governed by the BWT which specifies the proportion of the natural flow to which each country is entitled. The subsequent Order of the IJC dated October 4, 1921, gives general procedural guidelines for determining natural flow. This Order is still in effect, although the actual computation procedures have evolved through a process of cooperative consultation between the United States Geological Survey (USGS) and what is now the Water Survey of Canada (WSC), Environment and Climate Change Canada (USGS and WSC 2017).

Canada's share of the St. Mary River (a tributary of the Saskatchewan River in Alberta, Canada) at the international boundary, as stipulated by the IJC 1921 Order, is three-fourths of the natural flow when the flow is 666 cubic feet per second (cfs) or less during the irrigation season (April 1 to October 31). Flow in excess of that quantity is divided equally between Canada and the U.S. The flow is divided equally between the two countries during the non-irrigation season (November 1 to March 31).

To comply with the IJC 1921 Order, representatives of both countries make twice-monthly computations of the daily natural flow of the St. Mary River to determine the flow apportionment during the irrigation season. These 15- or 16-day periods are termed "division periods," serving to provide an opportunity of each country to respond to varying use and flow conditions. For example, if use by the U.S. is in excess of its share during a division period, then a surplus of an equivalent volume of water is normally delivered to Canada at the earliest opportunity (Ethridge and Pietroniro, 2013).

Tribal Trust and Water Rights

The majority of the St. Mary Unit is located entirely within the boundaries of the Blackfeet Reservation. The U.S. has a trust responsibility to protect tribal trust resources. In general, the trust responsibility requires the U.S. to protect tribal fishing, gathering, hunting, and water rights, which are held in trust for the benefit of the tribes. Reclamation is obligated to ensure that Project operations do not interfere with tribal rights. Reclamation must, pursuant to its trust responsibility and consistent with its other legal obligations, prevent activities under its control that would adversely affect those rights.

Fort Belknap Indian Reservation Compact (2001)

A compact between the State, the U.S, and the tribes of the Fort Belknap Indian Reservation was ratified in 2001 by the Montana State Legislature. This compact quantifies water rights for domestic, livestock and irrigation use, as well as emergency use for public health and safety. Negotiations continue on a Federal bill which must be approved by the U.S. Congress. A bill was introduced to Congress in 2011 and again in 2020 that would ratify the compact.

The Blackfeet Water Compact and Settlement Act (2016)

The Blackfeet Water Compact and Settlement Act is an agreement between the Blackfeet Nation, the U.S., and the State of Montana that confirms and establishes the Tribe's water rights and confirms the jurisdiction and authority to manage those rights. The Blackfeet Tribe is allocated 5,000-acre feet of water from the St Mary Unit.

Contracts and Water Rights

The Project supplies water to irrigation districts, individual irrigators, and communities pursuant to contracts with Reclamation, subject to the availability of water. Water diverted to the St. Mary Canal irrigates approximately 110,000 acres (44,515 ha) on eight irrigation districts (Fort Belknap, Alfalfa Valley, Zurich, Paradise Valley, Harlem, Malta, Dodson, and Glasgow), individual river pumpers, as well as to communities along the Milk River (Havre, Chinook, Hill County, and the Fort Belknap Agency) and the Bowdoin National Wildlife Refuge. This water is used for irrigation water, drinking water, recreation, wildlife habitat, and is considered the "Lifeline of the Highline." The St Mary Unit transports water for the benefit of all residents and water users along the Milk River in northern Montana and is critical for the well-being of the communities.

The enforceable priority date for this Reclamation owned water right is May 29, 1912. The water made available by this water right (40T 40955-00 General Abstract) is diverted to storage and is subsequently used through contracts with third parties or is used for incidental, non-consumptive purposes at the reservoir. The water stored in Lake Sherburne Reservoir has historically been used for irrigation, fish and wildlife, recreation, municipal, industrial, stock, domestic, and lawn and garden purposes by the Milk River Project. The current water right is 850 cfs.

Proposed Action

Reclamation proposes to continue O&M of the St. Mary Unit to allow continued diversions through the main Canal for use by the Project in northcentral Montana. This BA will cover a period of 5 years. Five years is a reasonable amount of time to further develop, plan, and identify funding strategies for new facilities. The Proposed Action would allow for continued viable and effective operation of the St. Mary Unit. This would only include O&M of Lake Sherburne Dam and Reservoir, Swiftcurrent Creek Dike, St. Mary Diversion Dam and Headworks, St. Mary Canal and appurtenant structures. Water right 40T-40955-00, is held by Reclamation for 850 cfs for beneficial use by irrigation districts, individual users, and municipal use within the Milk River Project area.

This BA does not address major O&M actions that may occur within Lake Sherburne Reservoir that may require draw-down to dead pool. These major actions typically occur every 10-15 years. In addition, any other unforeseen major actions not included in this BA would require additional review and potential ESA consultation. If either situation should arise, Reclamation would prepare a project specific BA and initiate consultation with the Service for that action in accordance with the ESA and implementing regulations.

Continued O&M of the St. Mary Unit includes existing measures to minimize fish stranding through fish salvage in Swiftcurrent Creek to its confluence with Boulder Creek. In addition, yearly bull trout monitoring would continue during this time period. The components of the action, continued O&M, are described in the narrative below along with an outline of site-specific details of O&M for each of the facilities.

Operations and Maintenance

Operational decisions for Lake Sherburne Reservoir and diversions through the St. Mary Canal are dependent on demands for project purposes. The 1909 BWT and the 1921 Order between the U.S. and Canada determine the measurement and apportionment of water based on, weather conditions, forecasted water supply conditions in the St. Mary and Milk River basins, storage conditions in Lake Sherburne Reservoir and other Project facilities; including Fresno Reservoir and Nelson Reservoir.

The startup date for initial releases from Lake Sherburne Dam/Reservoir are based on St. Mary Canal diversion needs, flood control considerations, and BWT accounting. Typical annual releases can start as early as March 1; however, there are no restrictions preventing releases earlier than March 1. The early releases maintain adequate storage space in Lake Sherburne Reservoir to control the snowmelt runoff and can also provide water for St. Mary Canal diversions or provide Canada with its entitled share of St. Mary River water.

Once releases from Lake Sherburne Reservoir are initiated for the season, the minimum release is approximately 25 cfs which is the minimum gate opening of the river outlet works. Release changes are generally limited to 150 cfs per day but can be greater if needed for such reasons as controlling the rate of fill of Lake Sherburne Reservoir. For release changes greater than 75 cfs, the change is separated into two changes for the day.

Typical startup of the St. Mary Diversion Dam consists of closing the sluicegates before spring runoff begins, usually late February or early March. This is typically several weeks before the headworks are opened, which is required because the sluicegates do not have hydraulics to shut the gates; too much flow in the river can make it so the gates won't shut and seal under their own weight. The headworks is typically opened in March to begin "watering up" the canal and remove ice within the canal. Although unusual, headworks can be opened as early as March 1.

During the irrigation season, releases from Lake Sherburne Reservoir and flows through the St. Mary Canal will typically follow the hydrographs in Figure 5 and Figure 9, respectively. However, special operations may be required outside the typical hydrograph due to unforeseen circumstances, such as weather events or other special requirements for project purposes or as determined between the U.S. and Canada.

At the end of the irrigation season or once storage levels in Lake Sherburne Reservoir are low or St. Mary Canal diversions are shut off for the season, releases from the reservoir begin shut down procedures and are eventually shut off unless additional water is needed based on the BWT. Releases for Lake Sherburne Dam are gradually reduced before being shut off for the fall and winter. This fall closure procedure usually begins in September depending on hydrologic conditions, but full gate closure can occur as late as Oct. 31. To reduce the incidence of fish "stranding", Lake

Sherburne Dam releases are stepped down from the current gate opening (varies year to year) by at least 75 cfs per day (typically more) until the desired gate opening of approximately 25 cfs (minimum gate opening) is achieved. Reclamation attempts to step down flows as quick as possible until the minimum gate opening is reached. This approach saves water, triggers fish to leave the stilling basin area, and reduces attraction flows in a faster manner at the Swiftcurrent/Boulder confluence. For release changes greater than 75 cfs, the change is separated into two changes for the day. This separated gate change typically occurs several hours apart, but within the same workday. Release changes are generally limited to 150 cfs per day but can be greater if needed for such reasons as severe weather (safety). The minimum gate opening of 25 cfs is held for 3-5 days (depending on water conditions) before being shut off completely at the end of the season to encourage the volitional downstream movement (exodus) of fish.

After the releases are discontinued for the fall, Reclamation in cooperation with the Service salvage and relocate any stranded bull trout found in Swiftcurrent Creek. The stream section where generally trout are stranded is from the Lake Sherburne Dam outlet works and stilling basin down to the confluence of Boulder Creek. Stranding in isolated pools along the dewatered stretch of Swiftcurrent Creek after the annual fall shut-down regularly resulted in the harm and death of bull trout and other native fishes. In an attempt to reduce this loss, beginning in 2003, fish salvage operations were conducted along the 3-mile reach of Swiftcurrent Creek between the dam and its confluence with Boulder Creek. In some years fish salvage was not performed because either early ice-cover prevented it or seepage from the dam outlet, streambank accretion or frequent local precipitation provided enough flow to allow for volitional retreat of fish before the onset of freeze-up. Reclamation's more recent practice of "staging down" releases from Lake Sherburne Dam and shutting down earlier when allowed has helped reduce the incidence of stranding. Reclamation in cooperation with the Service continue to salvage bull trout below Lake Sherburne Dam in Swiftcurrent Creek. Bull trout are captured and relocated (salvaged) downstream to the nearest suitable and connected habitat in Boulder Creek. Boulder Creek flows are normally high enough natural flow to allow trout to migrate up or downstream.

Continued O&M of the St. Mary Unit will generally include:

1) Start-up Inspection of St. Mary Unit Facilities:

1. Prior to start up a full inspection of the system is required. The main assessments are:
   A. Lake Sherburne Reservoir ice build-up and fluid levels for the operating system of the gates.

      The gates are defined as:

      1) Guard gates - the furthermost upstream gates in the reservoir. They operate either fully open or fully shut. During water season = fully open. Off season = fully shut

      2) Regulating gates - these gates are used to regulate the controlled release of water from Lake Sherburne Dam are located immediately downstream of the guard gate within the penstock. These gates safely operate down to 25 cfs at Lake Sherburne Dam; anything less and it may cause cavitation that could damage the structure.

      3) Storm gates - these gates are located at the outlet of the dam and are not used for regulating water flow, rather they are lowered at the end of the season to prevent windblown snow and ice buildup in the penstock. These gates are fully raised

during water operations and lowered below the stilling basin water level during the non-operating season (winter).

B. St. Mary Diversion Dam ice build-up.

C. St. Mary Canal is inspected for snow and ice levels in the canal and siphons.

2) **Annual Operations and Maintenance Requirements for the System:**

1) Lake Sherburne Dam and Reservoir:

A. *Spring startup*

1) Storm gates are chipped out of the ice and pulled.
2) The regulating gates are closed and then the guard gates are opened and hung.
3) One regulating gate is opened to minimum gate opening, followed by second gate a day or two later.
4) Following initial gate opening operators drive the length of Swiftcurrent Creek to monitor ice conditions.
5) Once Swiftcurrent Creek is free of ice, releases are increased based on operational needs.

B. *Fall shut down*

1) Staging down of Lake Sherburne Dam to 25 cfs for a minimum of three days to allow for outmigration of fish.
2) The regulating gates are closed, followed by closing the guard gates, then the regulating gates are opened back up to allow seepage to bypass.
3) The storm gates are lowered to the water level in the conduit to prevent ice build-up in the conduit.
4) Fish Salvage in Swiftcurrent Creek below Lake Sherburne Dam to rescue stranded fish in the outlet structure and from isolated pools.
5) The stilling basin downstream is cleaned out of gravels using a long reach excavator from the bank following fish salvage.

C. *Maintenance*

1) Riprap and concrete repairs of the upstream face of Lake Sherburne Dam.
2) Concrete repair of the spillway and outlet works at Lake Sherburne Dam.

2) St. Mary Diversion Dam and Headworks

A. *Spring startup*

1) Ice build-up around the sluicegates is removed via spud bar from either atop the dam or within the river, depending on conditions.
2) Diversion Dam sluicegates are lowered, usually late February or early March.
3) Headworks gates are opened, and releases are slowly increased over the course of several days until water reaches the North Fork Milk River.

B. *Fall shut down*

1) Headworks are shut down slowly (over several days) to prevent canal damage.
2) Any large woody debris is removed from in front of the sluiceway gates and headworks with hooks from atop the dam or chainsaws in the river.

3) Sluiceway gates are opened.

C. *Maintenance*

1) Concrete repairs on the diversion dam.
2) Gate repairs at the headworks and on the sluiceway.
3) Concrete repairs of the headworks.

3. St. Mary Canal

A. *Spring startup* (timing dependent on severity/snowpack conditions of the previous winter)

1) If heavy snow fall has occurred, trenching of the canal through the snow is required.
2) Cleanout of each C-10 gate (canal drains) is completed and each gate is closed
3) Ice above the drop structures is cleaned out as needed.
4) Drain valves at St. Mary and Halls Coulee siphons are closed.
5) Headworks are opened and water is followed to the various structures, with equipment ready to remove ice buildups.
6) Conveyance of diverted water (600-650 cfs) through the St. Mary Canal.

B. *Fall shut down*

1) Drain valves at St. Mary and Halls Coulee siphons are opened.
2) C-10 gates (canal drains) are opened.
3) Canal is inspected for damage once water has drained out of the system.
4) Focus is given on the siphons, landslides, and drop structures.
5) Maintenance of the canal structures is completed as needed.

C. *Maintenance*

1) Vegetation control along the canal.
2) Landslide and embankment repairs along the canal.
3) Concrete repair at Kennedy Creek siphon.
4) Concrete repair at St. Mary and Halls Coulee siphons.
5) Repair of the steel siphons (including; welding repairs, expansion joint repairs, section replacement etc.).
6) Concrete repair or replacement of the drop structures.

4. Swiftcurrent Creek Dike

A. Yearly - Inspection of the Swiftcurrent Creek Dike for damage.
B. As needed - repair dike due to flooding or structural damage.

7) Weed and Vegetation Removal

- Woody vegetation is removed regularly from around the structures and dam. Weed control along the canal and at the dams is accomplished through an agreement with Glacier County.
- Woody vegetation is removed via mechanical means (clippers, hand saws, chainsaws).
- Weeds are removed via chemical means in accordance with Montana noxious weed control laws.

Description of the St. Mary Unit

With the exception of the Lake Sherburne Reservoir, which extends 6.4 miles (10 km) GNP, the St. Mary Unit is located entirely within the boundaries of the Blackfeet Reservation in Glacier County, Montana. Lake Sherburne Dam, Swiftcurrent Creek Dike, and the St. Mary Diversion Facilities (Diversion Dam, Headworks and Canal) are all situated east of GNP and south of the Canadian Border.

The St. Mary Unit, as part of the overall Milk River Project was authorized as an irrigation project in 1905. The costs to operate and maintain the St Mary Unit facilities are borne primarily by irrigators within the Project through an assessment of irrigated lands at 73.96%. Conversely, Reclamation funds the remaining 26.04% of costs that are federally funded (non-reimbursable). Reclamation regulates releases from Lake Sherburne Dam, and withdrawals from the St. Mary River at the St. Mary Diversion Dam. The USGS and WSC and perform daily accounting of flows and diversions, in accordance with apportionment procedures under the 1909 BWT and the IJC 1921 Order.

The St. Mary Unit facilities have been in operation for over 100 years with only minor repairs and improvements. The facilities are at the end of their expected service life and require replacement.

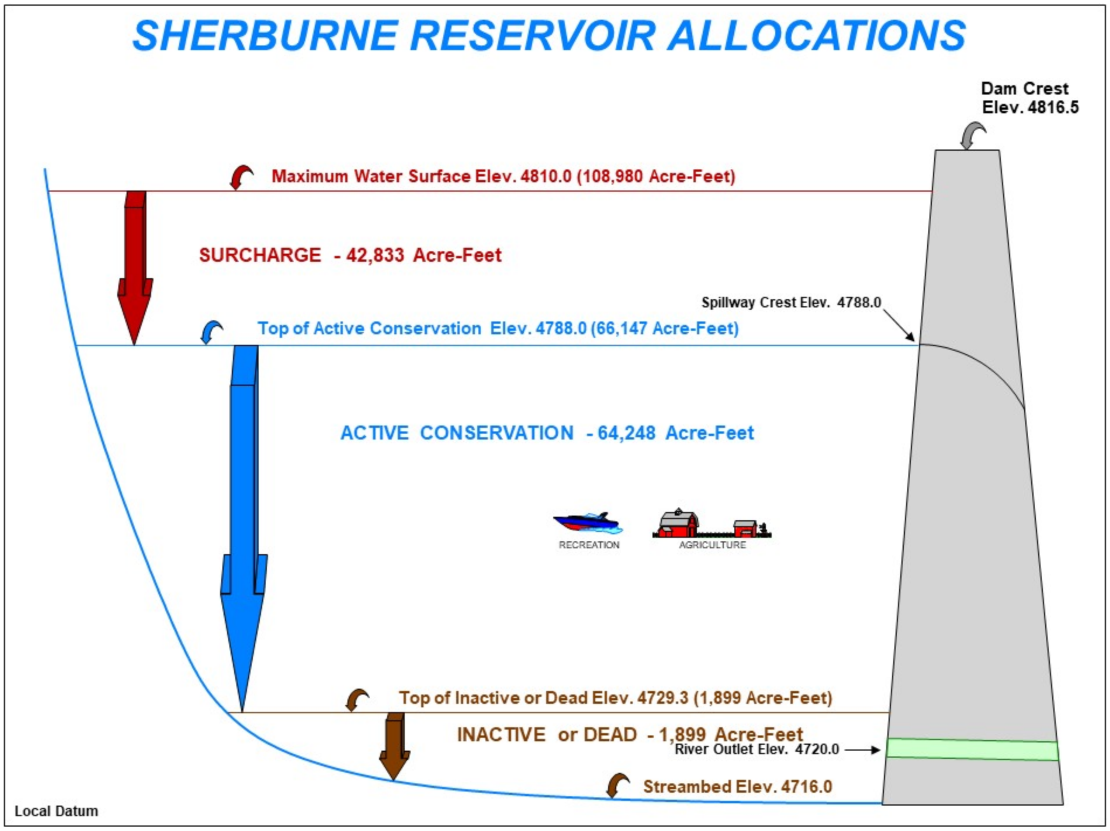
Lake Sherburne Dam and Reservoir

Lake Sherburne Reservoir was formed from Sherburne Lakes and impounds Swiftcurrent Creek as it flows out of GNP. Swiftcurrent and Canyon Creeks (Cracker Lake) feed the reservoir. The reservoir supports a diverse, self-sustaining fishery which includes introduced rainbow trout and brook trout, as well as native bull trout, mountain whitefish, burbot, northern pike, and longnose suckers.

Lake Sherburne Reservoir, the only storage reservoir in the St. Mary River basin in the U.S., is used to store a portion of the U.S. share of water for diversion to the Milk River. This water, after passing through Canada, is utilized by the U.S. in the lower Milk River valley in northcentral Montana.

The drainage area above Lake Sherburne Dam is 63.7 square miles (102 km^2) and basin elevations range over 9,000 feet (2,743 m) at the Continental Divide. The basin perimeter has steep bedrock slopes and the lower elevations are timber-covered valleys. Lake Sherburne Reservoir is around 6.4-miles (10 km) in length and around 0.5-miles in width (Reclamation TSC 2005).

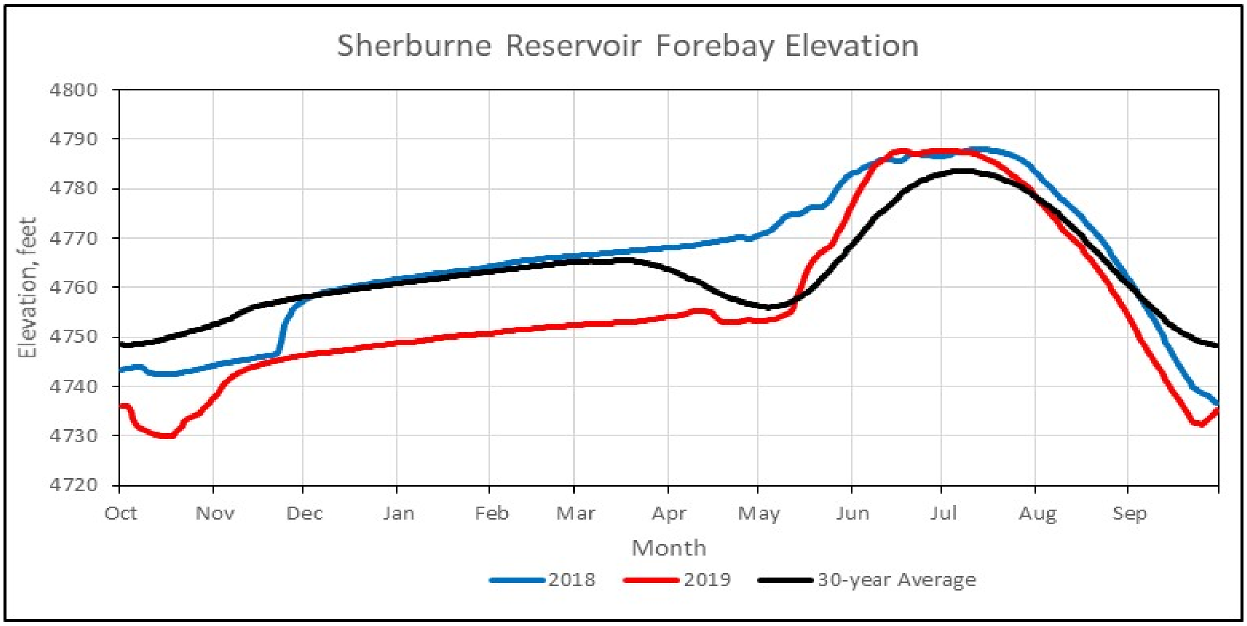
Figure 3. Lake Sherburne Reservoir Allocations



Lake Sherburne Dam (Figure 3) is a compacted earth-filled dam standing 107-feet (32 m) in height above its foundation with a crest length of 1,086-feet (331 m). The reservoir water surface is controlled by the operation of two 4- by 5-foot high-pressure gates, which permit a discharge of 2,100 cfs (59 m^2) at an elevation of 4,788-feet (1,459 m). At water surface elevations above 4,788-feet (1,459 m), uncontrolled water flows over the crest of the overflow spillway and the discharge through the outlet works in addition to water flow regulated through the headgates.

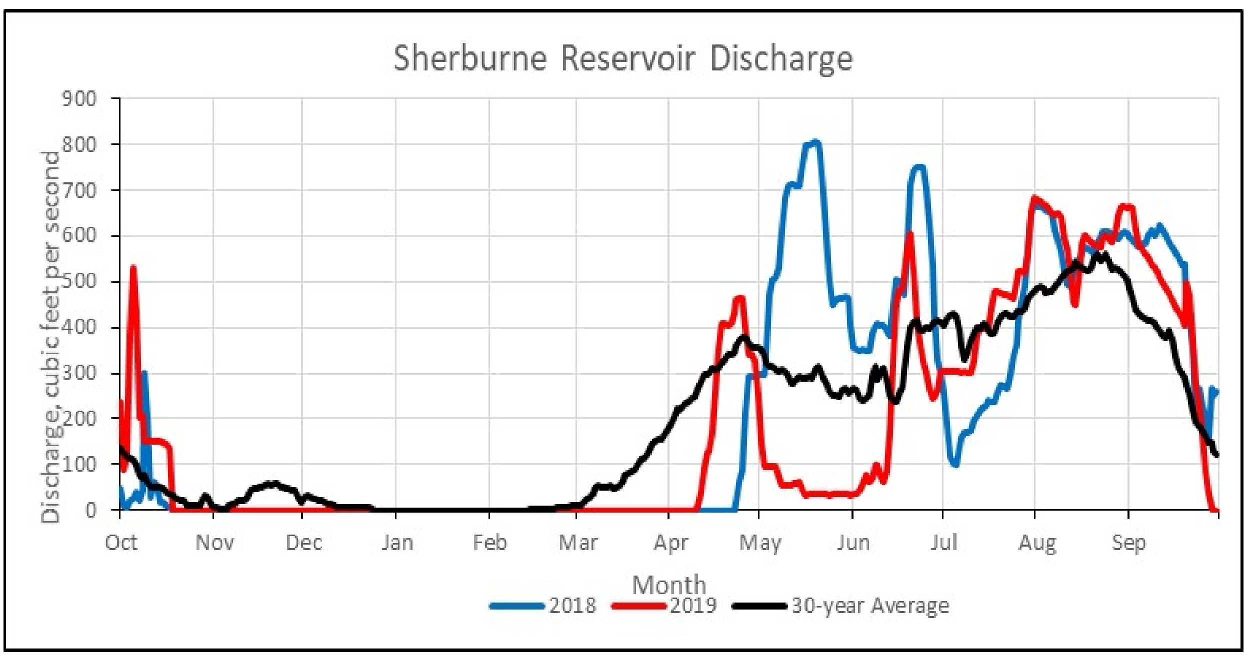
Maximum discharge through the outlet works conduit at an elevation of 4,809-feet (1,465 m) is 4,200-cfs. Due to cavitation and the potential structural damage to the dam outlet that is associated with small releases, safe minimum sustained discharge from the dam is 25 cfs. Maintenance can occur at water levels of approximately 4736.0 feet or less. The minimum drawdown elevation of Lake Sherburne Reservoir is 4729.3 feet and storage at this elevation is 1,899 acre-feet (Figure 3). The water level in Lake Sherburne Reservoir has dropped to levels lower than 4736.0 feet during seven of the last 20 years due to low water supply (C. Jordan, personal conversation).

Figure 4. Lake Sherburne Reservoir Forebay Elevation



During the non-irrigation season Lake Sherburne Reservoir captures runoff events and allows water managers to release that water during different times of year (ie lower spring flows and higher summer and fall flows). Figures 4 and 5 depict Lake Sherburne Reservoir forebay elevations and discharge, respectively, based on 2018 and 2019 data compared to the 30-year average.

Figure 5. Lake Sherburne Reservoir Discharge



Swiftcurrent Creek Dike

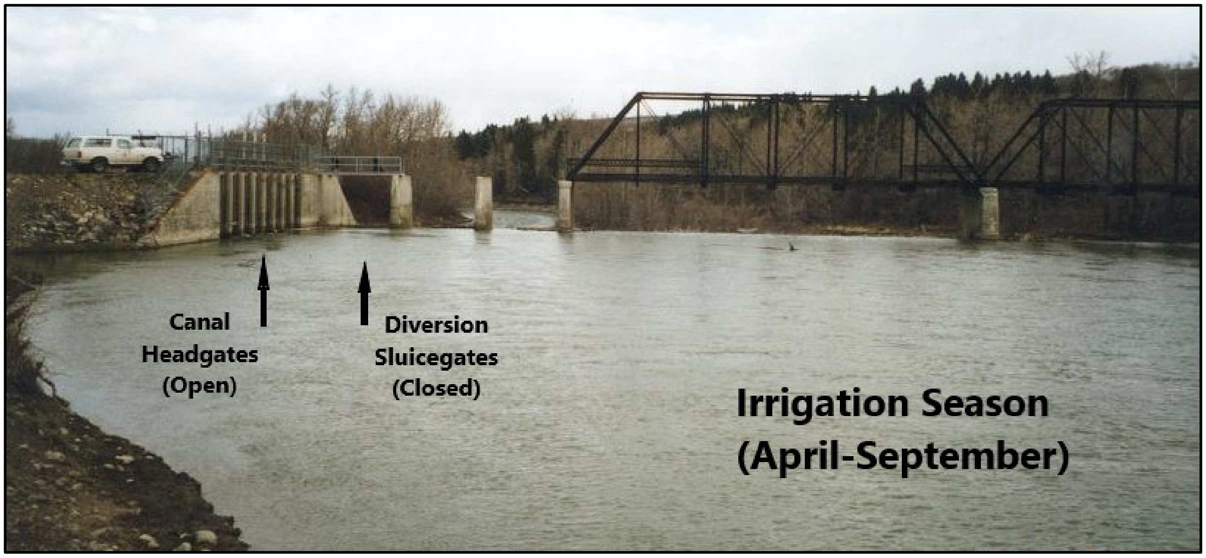
Swiftcurrent Creek Dike is an earth and rock structure with a timber crib core. The dike is 13-feet (4 m) high and 4,800-feet (1,463 m) long at the crest and is situated along the north side of the Swiftcurrent Creek beginning 1.2 miles (2 km) downstream from the Swiftcurrent and Boulder creek confluence. Swiftcurrent Creek Dike is a non-overflow earth dike requiring neither spillway nor headworks. The dike was constructed in 1915 by Reclamation to divert all flows from Swiftcurrent Creek and Boulder Creek into Lower St. Mary Lake (rather than the St. Mary River). Prior to construction of the Swiftcurrent Creek Dike, the combined flow of these two creeks historically created and flowed across a large alluvial fan (now occupied by the town of Babb, Highway 89, and other development) into the St. Mary River downstream of the present day location of the St. Mary Diversion Dam and canal headworks.

St. Mary Diversion Dam and Headworks

The St. Mary Diversion Dam and headworks (Figures 6 and 7) were constructed in 1915. The purpose of the St. Mary Diversion Dam is to divert water from the St. Mary River into the St. Mary Canal. The St. Mary diversion works, located on the St. Mary River 0.75 mile (~1 km) downstream from Lower St. Mary Lake, consist of a 6-foot high (~2 m) concrete buttress weir. The eastern portion of the dam has a crest length of 190-feet (58 m). The western portion of the dam includes a six-bay, three-sluiceway segment with a total width of 56-feet (17 m).

Figure 6. St. Mary Diversion Dam Non-Irrigation Season

Figure 7.- St. Mary Diversion Dam Irrigation Season



St. Mary Canal

The 29-mile (47 km) St. Mary Canal was constructed between 1907 and 1915 (Figure 8). The unlined canal was designed to convey 850 cfs (24 m^3) at a flow depth of 9-feet (2.75 m). The canal begins at the diversion dam on the west side of St. Mary River and crosses the river 9.5-miles (15 km) downstream through a two-barrel steel-plate siphon (Kennedy Creek). The siphons are 90-inches (2.3 m) in diameter and 3,600-feet (1 km) in length. Eight miles down the canal is another two-barrel siphon that is 78-inches (2 m) in diameter and 1,450-feet (~0.5 km) long that conveys water across Hall's Coulee. A series of five large concrete drop structures at the lower end of the canal provide an elevation decrease of 214-feet (65 m) where the water is then discharged into the North Fork Milk River.

Figure 8. St. Mary Canal Headworks

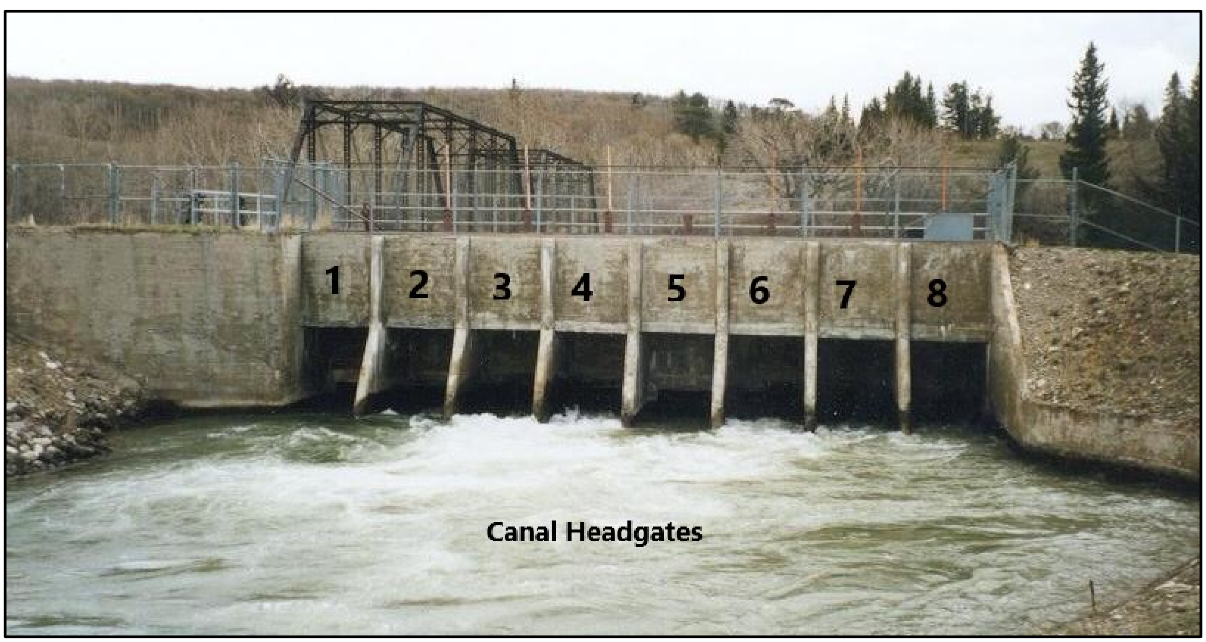
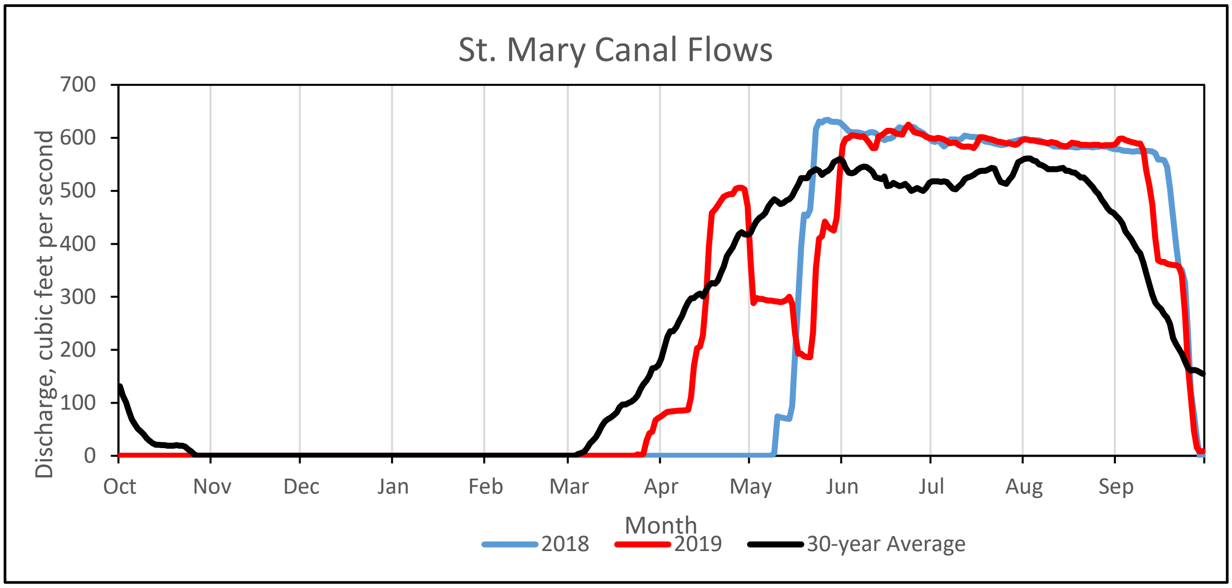


Figure 9. St. Mary Canal Flows



As shown in Figure 9, the canal is dry from November to March. As the irrigation season commences flows are ramped up beginning in March; by mid-May flows through the canal reach a discharge rate of 600-650 cfs. By mid-September flows begin to decrease in the canal and by mid-October the canal is dewatered for the winter months.

Environmental Baseline

The environmental baseline refers to the condition of the listed species or its designated critical habitat in the Action Area, without the consequences to the listed species or designated critical habitat caused by the Proposed Action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Future actions and their potential effects are not included in the environmental baseline

The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline. The current condition is a culmination of past and current events that have changed the overall landscape and natural systems in the area of the St. Mary Unit. This section provides a snapshot of potential impacts to ESA-listed species and their habitats and ecosystems, resulting from alterations that have occurred throughout the last 100 years (as described below). This includes impacts resulting from the continued O&M (Proposed Action), which are consistent with historic operations of the St. Mary Unit.

Past and Current Activities Within the Action Area

Changes to the ecosystem conditions have occurred within the Action Area over the past 100-years that can be attributed to both direct and indirect human impacts, and naturally occurring events. Some of these activities occurred prior to and concurrent with the construction of the St. Mary Unit and some continue today. In assessing the range of variability of the Action Area, the following provides an overview of past and current activities and their impacts.

Bull Trout

The historic distribution of native fishes in the St. Mary River drainage was delimited by the many natural, year-round barriers to fish movement (Mogen and Kaeding 2005a). Waters that were upstream from such barriers and historically barren of fish included the entire upper Red Eagle, Swiftcurrent, Kennedy and Otatso Creek watersheds, and the headwaters of the St. Mary River itself.

Stocking of nonnative fishes in the St. Mary River drainage began in the 1890s and continued in GNP until the mid-twentieth century. Such stocking continues today in some reservation waters, mainly in isolated lakes and ponds. Nonnative fishes that have established self-sustaining populations at various locations in the drainage include brook trout, as well as rainbow trout (*O. mykiss*), Yellowstone cutthroat trout (*O. clarki bouvieri*), and especially the genetic intergrades (i.e. "hybrids") among those two fishes and westslope cutthroat trout.

Land-use practices that may impair bull trout habitat are limited in the St. Mary River drainage in Montana. Within GNP, no extant land-use activities are known to adversely affect bull trout. On the Blackfeet Reservation, land-use practices that may adversely affect bull trout primarily consist of livestock grazing and timber harvest. Although both practices occur in limited areas, timber harvest is extensive in some parts of the Lee Creek drainage.

Bull trout are among the most thermally sensitive coldwater fish species with upper water temperature tolerances and optimal growth temperatures among the lowest of any North American salmonid (Selong et al. 2001). Maintenance of clean, cold and connected habitats is critical to bull trout persistence across their range. Climate change predictions for the Great Plains include continued warming temperatures that could increase the number of hot days in summer and result in warmer winters with less snowpack and more rainfall (Shafer 2014). Increasing stream temperatures and reduced or highly variable runoff from year to year could have implications for bull trout growth, survival, spawning and migrations in the St. Mary River watershed. While much of the bull trout habitat in the St. Mary watershed is secure and protected within the boundaries of pristine GNP, the increased melting of mountain glaciers and permanent snowfields in GNP will diminish the quantity and quality of these cold-water habitats, especially during late-season when adult migratory bull trout ascend the mountain streams for spawning purposes. Several important St. Mary spawning tributaries already experience seasonal low-flow (often subsurface) conditions that preclude upstream (and downstream) passage. Additionally, adult spawning, juvenile rearing and redd (egg depositions) security will likely be adversely impacted if climate change results in an increased frequency and severity of late-season storms (i.e., heavy rain and rain-on-snow events). Redd surveys conducted after extreme high-runoff events typically find lower redd abundance with most redds showing significant signs of erosion or complete destruction. Over time, in the face of a warming climate, St. Mary bull trout populations thought to be secure may be placed at higher risk.

Since 1997, bull trout in the Action Area have been the subject of numerous research efforts that include monitoring and evaluation studies in effort to address habitat, demographics, and threats from nonnative fishes. There are certain risks associated with fish handling and salvage activities. Injuries could include stress, bruising, and tissue damage. Transport of fish could also lead to those same results. Injury or mortality that may occur because of electrofishing, netting, tagging, and direct handling are regulated by the Service's scientific permit program (ESA Section 10(a)(1)(A)).

The Blackfeet Reservation

The Blackfeet Reservation was first established in 1855 by the Lame Bull Treaty and it originally included the eastern area of GNP up to the Continental Divide. The Blackfeet Reservation lies along the eastern slope of the Rocky Mountains and the Canada border, and is the eastern gateway to GNP. The Reservation encompasses 1.5 million acres, (6,070 km^2) and is located in Glacier and Pondera Counties. Livestock, grain and forage production (agriculture), oil and gas production, fishing, and forest industries (logging) all play a major part in the local economy (Blackfeet ARMP 2019).

The Blackfeet Reservation contains one of the greatest concentrations of riparian and wetland habitat, supporting one of the most diverse wildlife areas in the State of MT. Riparian and wetland habitats are critical wildlife migratory and year-round dispersal corridors and are crucial for wildlife range expansion and seasonal dispersal patterns. Species such as grizzly bears use riparian areas as seasonal migration and dispersal corridors between the mountains and the plains. Major wildlife corridors within the Blackfeet Reservation include points along U.S. Highway 89 and U.S. Highway 2 that bisect riparian and upland wildlife travel corridors (Luna et al. 2016).

Glacier National Park

Glacier National Park was established on May 11, 1910, and encompasses over 1-million acres (4,000 km^2), which includes portions of two mountain ranges, over 130 lakes, glaciers and waterfalls, a diversity of plant and animal species, and dense coniferous forests interspersed with alpine meadows. GNP is managed for its wild character and for the integrity of its natural heritage. Within GNP, a unique point called Triple Divide Peak brings together three major drainages where water flows into three oceans. This is the point where the two continental divides of North America converge.

The region that became GNP was first inhabited by Native Americans, dominated by the Blackfeet on the east side of the Continental Divide. Under pressure, the Blackfeet ceded the mountainous parts of their treaty lands in 1895 to the federal government; it later became part of GNP. Soon after the establishment of the park, a number of hotels and chalets were constructed at Many Glacier. The number of visitors to GNP in the year 2018 was 2.97 million (Statista 2020).

Land Use

Two unincorporated communities; Babb and St. Mary, MT (both located within the Blackfeet Reservation), provide access to GNP during the tourism season. The Many Glacier road is accessed through Babb, and parallels Swiftcurrent Creek and Lake Sherburne Reservoir. At St. Mary, the Going to-the-Sun Road provides access to GNP as it travels along the northwest shore of the Upper St. Mary Lake. U.S. Highway 89 travels north along the east shore of Lower St. Mary Lake. All roadways experience a large influx of traffic during the tourism season. Associated activities include:

- Management of roads and transportation corridors.
- Periodic dredging and diking of the stream channel to reduce bedload along lower Divide Creek, associated with maintenance of residential development in Saint Mary and the GNP compound conducted by the Park Service.
- Trespass livestock grazing primarily along lower reaches of Kennedy, Otatso, and Lee creeks.

St. Mary Unit of the Milk River Project

American proposals for diverting the more bountiful and reliable waters of the St. Mary River to irrigate the arable lower Milk River basin originated as early as the 1870s, but no action was taken until a survey was conducted in 1891 (IJC 2020). Congress authorized the Milk River Project for irrigation in 1903; it's one of Reclamation's first authorized projects and consists of the following construction and O&M in the Action Area:

- St. Mary Unit construction began on July 27, 1906.
- St. Mary Diversion Dam and Swiftcurrent Creek Dike were completed in 1915.
- St. Mary Canal was constructed from 1907-1915.
- Lake Sherburne Dam was completed in 1921.
- Ongoing O&M 1906-current.

The St. Mary Diversion Dam is located across the St. Mary River and impedes upstream and downstream fish passage. The diversion dam blocks passage during irrigation season when water is forced across the entire weir crest. During the non-irrigation season the sluicegates are lifted and fish passage occurs. This likely has effect on bull trout during the spawning migration period (April-July) when they cannot move upstream past this barrier. The St Mary Canal and headworks entrain fish species while diversions are occurring during the irrigation season (typically March to October).

The actual design of the diversion itself, including the locations of the canal headgates and dam sluice gates, influences the diversity, size and number of fish being entrained in the canal. The headgates and sluice gates are both situated at the west side of the diversion dam. Their locations, in conjunction with a retaining wall running perpendicular to the dam, maintain a deep pool directly in front of the gates, the deepest habitat in the immediate area (Figure 8). The channeling of the river through the headgates during the irrigation season and through the sluice gates during the non-irrigation period creates a consistent and unnaturally strong draw on that side of the river. As a result of nearly 100 years of project operation the current has maintained a deep channel, or thalweg, along the western bank of the river which continues upstream from the diversion. This channel leads directly to the unscreened canal and provides a preferred corridor for bottom-oriented fishes, even during the irrigation season when the sluice gates are lowered, and the entire streambed is inundated. Swiftcurrent Creek also enters from the west, only a short distance upstream from the diversion. Swiftcurrent Creek and especially its largest tributary, Boulder Creek, provide important spawning and juvenile rearing habitat for numerous fish species inhabiting the lake and river (Mogen and Kaeding 2005a and 2005b). Post-spawning adults and juvenile emigrants moving downstream to the St. Mary River from Swiftcurrent Creek must pass by the diversion making them vulnerable to entrainment.

The St. Mary Diversion is atypical in that it regularly diverts a larger proportion of water than what remains as instream flow. This is possible since the allocation is stored water released from Lake Sherburne Dam upstream, and therefore is not natural river flow for that time of year. Throughout most the irrigation season, the St. Mary Canal is held at its highest possible discharge (600-650 cfs) to accommodate the demand for water on the irrigated plains of the Milk River Basin. Whereas flow in the canal is held relatively constant, river discharge fluctuates considerably however, with run-off peaks as high as several thousand cfs to base-flows often less than 100 cfs (Figure 11, below).

The Swiftcurrent Creek Dike was constructed along the lower reach of Swiftcurrent Creek to channel water into Lower St. Mary Lake, upstream from the point of diversion, to allow water released from Lake Sherburne Reservoir to be diverted into the St. Mary Canal. This changed the hydraulics of Boulder and Swiftcurrent creeks. Swiftcurrent Creek discharges downstream from Lake Sherburne Dam and is often highest during the irrigation season. As a result, the combined sediment loads of Swiftcurrent and Boulder Creeks are deposited into the northern end of Lower St. Mary Lake near the lake's outlet. Rerouting Swiftcurrent and Boulder Creeks into lower St. Mary Lake has also had an impact to water quality and the thermal regime (warmer summer water temperature) in Swiftcurrent Creek and downstream in the St. Mary River. Routing both creeks through the lake has reduced the amount of sediment and nutrients that would have otherwise ended up in the St. Mary River. This has likely had an impact on the migratory bull trout in the St. Mary River. Instead of migrating upstream and finding the entrance to Swiftcurrent and/or Boulder Creeks they now enter St. Mary Lake to find an entrance to upstream spawning areas. This has likely caused some fish to stop spawning in Boulder Creek.

Lake Sherburne Dam is located across Swiftcurrent Creek and impounds water in Lake Sherburne Reservoir. The dam is a complete upstream barrier to bull trout and other native fish. However, prior to the construction of Lake Sherburne Dam there were several natural lakes and landslides in the same area that likely prevented upstream passage in Swiftcurrent Creek. There is however a sustaining population of bull trout upstream of Lake Sherburne Dam within Canyon Creek. Cracker Lake flows to Canyon Creek, which then flows north before entering upper Lake Sherburne. The Cracker Lake simple core area \Canyon Creek provides the only accessible spawning habitat for bull trout inhabiting the reservoir. In this lowermost reach, diminishing streamflow due to downwelling and channel bifurcation may impede fish passage during late-summer, low-pool levels in Sherburne Reservoir in some years.

The physical presence and the operation of Lake Sherburne Dam has changed the hydraulics of Swiftcurrent Creek and the St. Mary River. The dam and reservoir capture runoff events and allow water managers to release that water during different times of year (i.e. lower spring flows and higher summer and fall flows). This has likely reduced the number of habitat forming flows in Swiftcurrent Creek and the St Mary River. Lake Sherburne Dam/Reservoir also captures a large amount of sediment and woody debris each year that would have otherwise ended up in the St. Mary River. This has likely reduced habitat complexity in downstream river reaches and important headwater spawning and rearing (SR) habitat in the tributaries and a portion of the foraging, migrating, and overwintering (FMO) habitats.

Operation of Lake Sherburne Dam determines streamflow in Swiftcurrent Creek downstream from the dam. The accounting procedures associated with the BWT allow the U.S. to accrue a water-debt on the St. Mary River during the early part of the irrigation season. In exchange, Canada is allowed to accrue a debt on the Milk River in later part of the irrigation season. At the end of the season, any remaining water-debt on the St. Mary that was not offset by the Milk River debt is typically repaid to Canada through augmented releases from Lake Sherburne Reservoir to Canada. During the non- irrigation months and after all water-debt is repaid to Canada, Lake Sherburne Dam is completely closed to allow for refilling of the reservoir, leaving Swiftcurrent Creek between the dam and the Boulder Creek confluence devoid of flow, although small isolated pools remain.

Hydrology/ Drainage/ Diversion

The watershed is fed by Blackfoot and Jackson Glaciers of the Saint Mary Valley and Grinnell and Swiftcurrent Glaciers in the Many Glacier Valley, permanent snowfields, annual snowpack, and rainfall and precipitation. Headwater streams, alpine and subalpine lakes and a complex network of glacial groundwater from both valleys feed streams feeding into the Saint Mary River, Upper Saint Mary Lake, Swiftcurrent Lake, and Lake Sherburne Reservoir.

The St. Mary River rises in GNP, flowing northeast through the Blackfeet Reservation in Montana to its confluence with Oldman River near Lethbridge, Alberta, a tributary to the South Saskatchewan River which ultimately dumps into Hudson Bay in northcentral Canada. Midway through its Montana course the River makes its way over the St. Mary Diversion Dam, where a portion of the water is seasonally (approximately April through September) diverted into the St. Mary Canal. Here, the diverted water travels 29-miles (~47 km) through the canal, siphons and drop structures and across the northern Great Plains before dumping into the North Fork Milk River.

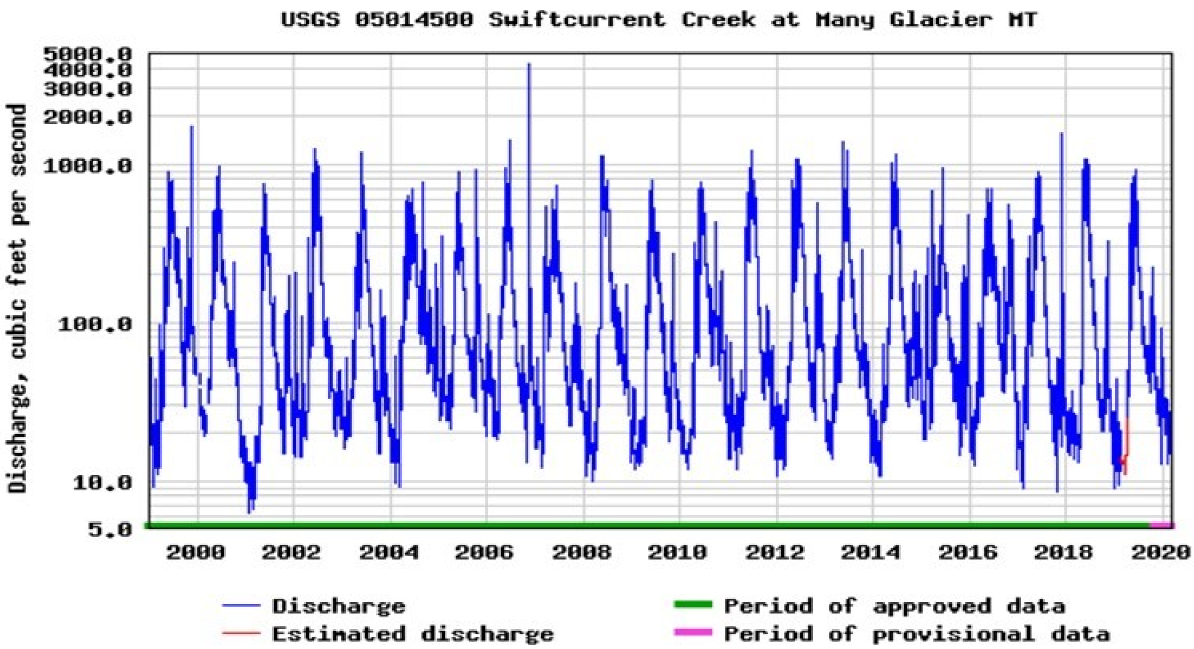
The mainstem St. Mary Drainage can be divided into two distinctly different habitat types. Aside from the many tributaries and the 1.25 mile (2-km) stretch of river between St. Mary and Lower St. Mary lakes, the upper 19 miles (30 km) of the drainage is primarily large lake habitat; while the downstream portion is mostly continuous river.

The North Fork Milk River originates in the foothills of the Rocky Mountains on the Blackfeet Reservation, flowing northeasterly into Canada near the Del Bonita Border Station on the Blackfeet Reservation at the Western Crossing of the international boundary. Shortly before entering Canada the North Fork Milk River receives up to 650 cfs from the St. Mary Canal. After reaching Canada, the North Fork Milk River, which conveys imported water from the St. Mary Canal, joins with the Milk River main stem. The Milk River then flows through southern Alberta, Canada, before turning south and re-entering the U.S. at the Eastern Crossing of the international boundary just upstream of Fresno Reservoir. Thereafter, the River flows in an easterly direction for 490 river miles until joining the Missouri River near Fort Peck, Montana.

Runoff in the upper Swiftcurrent Creek Basin, a tributary to the St. Mary River, is stored behind Lake Sherburne Dam. Operation of Lake Sherburne Dam determines streamflow in Swiftcurrent Creek downstream from the dam. During the non-irrigation period, while Lake Sherburne Dam is closed for refilling of the reservoir, Swiftcurrent Creek is dewatered from the dam to the Boulder Creek confluence.

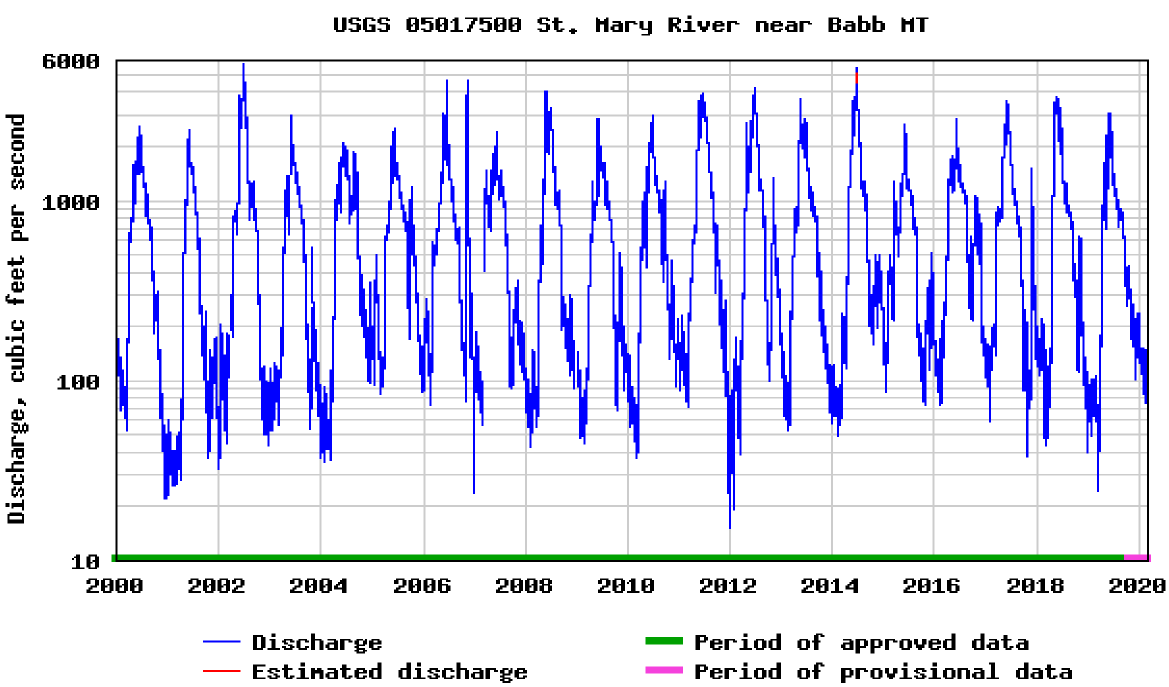
The planned use of a river and its channel depends on knowledge of its hydrograph, data on its discharge or water level over time. These data, collected over as many years as possible, provide a basis for estimating the maximum and minimum as well as seasonal changes in runoff levels.

Figure 10. Swiftcurrent Creek Annual Flow 1999-2020



The USGS hydrographs below show the annual flow, including highs and lows, for upper Swiftcurrent Creek above Lake Sherburne Reservoir and the St. Mary River at Babb since the time of bull trout listing (1999). Impoundment of water for irrigation changes the natural hydrograph, as depicted, by regulating the amount of water that is stored and discharged during regular intervals (irrigation season).

Figure 11. St. Mary River Annual Flow 1999-2020



The Project functions to store and transport water for irrigation and municipal needs throughout Montana's Milk River Valley. As a result, water discharge in the lower St. Mary River is heavily regulated, which often results in seasonal flow regimes that are different compared to those with which native aquatic species coevolved. The river has a fairly regular and dependable flow during the summer irrigation period because of its source in the high elevations of GNP. Winter flows are sustained by a ground-water base flow.

Climate Change

The historic climate of the region is typical of the northern Great Plains, with wide variations in temperature from season to season. Summers are cooler and wetter in the higher elevations of the western part of the region near GNP where snow is reported in every month of the year. In the northern Great Plains, the timing and quantity of both precipitation and runoff have important consequences for water supplies, agricultural activities, and energy production. Overall, climate projections suggest that the number of heavy precipitation events (events with greater than 1-inch per day of rainfall) is projected to increase. Moving forward, the magnitude of year-to-year variability overshadows the small projected average decrease in streamflow (Conant et al. 2018).

A study on climate change specific to the St. Mary and Milk River Systems in Montana (Reclamation TSC 2010) downscaled climate projections over the study region suggesting the St. Mary -Milk River basins are likely to follow a warming trend in the future. The results indicate an earlier runoff regime in most of the sub-basins of the St. Mary and Milk River basins. The predicted mean monthly flows generally indicate the potential for increased flows from January through May and decreased flows from June through December. Similar results have been presented by the Montana Department of Natural Resources and Conservation (DNRC 2015) in their State Water Plan that identifies an overall decline in snowpack in western North America and an increased percentage of precipitation falling as rain. This could lead to earlier and lower levels of runoff for both the St. Mary River and the North Fork Milk River because the majority of runoff in the basin is a result of snowmelt runoff. However, increased spring precipitation observed in recent years has also tended to maintain overall annual discharges.

Flooding

Damaging floods occurred in the St. Mary River drainage in 1964 and 1975. The 1964 flood produced extremely high runoff in the upper reaches of the drainage, depositing heavy sediment loads in major stream channels. The road between Babb and Many Glacier was blocked by slides and gravel deposits and was washed out opposite the mouth of Boulder Creek. Kennedy Creek washed out a bridge on U.S. Highway 89 and a section of the St. Mary Canal (USGS 1967). The 1975 flood event affected much of the same area as the 1964 flood. Channel erosion in the higher mountain streams appeared equal to the flood of 1964. It is probable that the stream channels were not fully stabilized from the 1964 flood event, thus smaller flood magnitudes were sufficient to start new erosion and sedimentation (USGS 1976).

Fire History

Three significant fires occurred within the St. Mary River drainage over the past 20-years:

- Fox Creek Fire (2002) burned several thousand acres in the St. Mary and Milk River drainages.

- Red Eagle Fire (2006) burned 34,000 acres in GNP and on the Blackfeet Reservation, which included a large proportion of the forested area of the Divide Mountain watershed.
- Reynolds Creek Fire (2015) burned 5,000-acres within GNP.

Riparian wetlands and streams occurring on toe-slopes were affected by post-fire sedimentation (Luna et al 2016). Logging occurred on the Blackfeet Reservation following the Red Eagle and Fox Creek fires. Although the fires occurred outside the identified Action Area, they are included to provide context to the altered landscape in the general area, and because of the possibility of alteration to species habitat.

State, Tribal, and Private Actions

State, Tribal, and private actions that are reasonably certain to occur, are ongoing, or have recently been constructed in the Action Area include:

- Tribal timber sale/harvest on boulder ridge (south side of Swiftcurrent Creek and downstream of Lake Sherburne Dam).
- A State road improvement/repair project from Babb to Many Glacier is scheduled for 2020-2021.
- Natural resource extraction (oil and gas) and exploration has occurred in the project area, notably downstream from the St. Mary siphon and adjacent to the diversion works.
- Bison enclosure fences have recently been constructed on private lands adjacent to the St. Mary Canal and St. Mary siphons, near Spider Lake, and within the general project area. The fences create wildlife migration barriers that affects grizzly bears and all ungulates in the Action Area (T. Tabor, personal conversation).

Summary

Each of the above events may have affected the species addressed in this assessment, both directly or indirectly by habitat alteration or displacement. Naturally occurring events such as flooding and fires have altered vegetation and landscapes. Landscape scale patterns have been altered through human manipulation by logging, livestock grazing, road construction and maintenance, fire suppression, utility corridors, and housing developments. Increased noise, human disturbance, and human presence occurs in the Action Area from past and ongoing activities.

Consultation History

In 1997, Reclamation began, and continues to fund several St. Mary River Bull Trout research studies through an interagency agreement with the Service. Further, Reclamation has had many conversations and meetings with the Service's Ecological Service Office over the years. This coordination and collaboration have proven valuable since bull trout were listed as a threatened species across their entire range in the coterminous U.S. in 1999.

Reclamation worked closely with the Service to identify areas where minor changes in operations might help to minimize the impacts of project activities on native fish and aquatic ecosystems. One positive outcome of this collaboration was the planned coordination of the fall shut-down schedule of Lake Sherburne Dam which has helped considerably with the issue of stranding of bull trout and other native fish in isolated pools below the dam after shut-down.

Another product of collaboration is fish salvage below Lake Sherburne Dam in Swiftcurrent Creek. In most years (some years aren't practical), following the shut-down of the Lake Sherburne Dam, Service and Reclamation biologists rescue stranded fish by electrofishing and seining in the outlet structure of the dam and from isolated pools along the dewatered reach of Swiftcurrent Creek below the dam. Rescued fish are released downstream below the Boulder Creek confluence where adequate flows exist year-round.

Listed Species

The Endangered Species Act (ESA) sets out a comprehensive program for the protection of threatened and endangered species and their habitats. Section 7 (a)(2) of the ESA requires Federal agencies to consult with the Service on any Federal action that may affect listed species (50 CFR § 402.12; 16 USC § 1536 (a)(2)). This BA is prepared in accordance with those legal requirements. The following input was used to determine which listed species should be considered for inclusion in this BA:

- ESA-listed species distribution maps and literature review of species life-history requirements and habitat use.
- Discussions with Federal and Tribal agencies.
- Information for Planning and Consultation (IPAC) online system (IPAC USFWS 2020).
- Montana Natural Heritage Program (2020).

According to the Service's December 12, 2019 Endangered (E), Threatened (T), Proposed (P), Candidate (C) and designated Critical Habitat (CH) for Montana counties, seven applicable species may occur within Glacier County, MT (Table 1), five of which are listed "Threatened" species (bull trout, grizzly bear, Canada lynx, western glacier stonefly, and lednian meltwater stonefly). Only bull trout, grizzly bear, Canada lynx, and wolverine have the potential to occur in the Action Area and only those species will be addressed hereafter in this assessment (evaluated species). The remaining species, those with no potential to occur within the Action Area (western glacier stonefly, meltwater lednian stonefly, and whitebark pine), will not be addressed as the Proposed Action will not affect them. Lastly, bull trout critical habitat does not occur in the Action Area and will also not be addressed.

Table 1. ESA Species List

Common Name Scientific Name	Status	Potential to Occur	Critical Habitat[1]	Rationale for Exclusion[2]	Habitat Description and Range in the Action Area
Bull Trout *Salvelinus confluentis*	T	YES	NO[1]		Bull trout spawn in the fall after temps drop below 48◦ F, in streams with cold water, clean gravel and cobble substrate, and gentle slopes. Spawning areas are associated with cold water springs or where flow is influenced by groundwater. Present in the Action Area.
Grizzly Bear *Ursus arctos horribilis*	T	YES	NO		Grizzly bears can be found in woodlands, forests, alpine meadows, and prairies. In many habitats they prefer riparian areas along rivers and streams. The Action Area provides moderate suitability. Grizzly bears are known to occur in the Action Area.
Canada Lynx *Lynx canadensis*	T	YES	YES[1]		Lynx prefer moist coniferous habitat above 4,000 feet in elevation. Moderate to low suitability in the Action Area.
Western Glacier Stonefly *Zapada glacier*	T	NO	NO	ELE, ODR, HAB	Meltwater habitat for western glacier stonefly is supplied by glaciers and rock glaciers, as well as 1) Seasonal snow, (2) perennial snow, (3) alpine springs, (4) ice masses. The Action Area is unsuitable habitat. No occurrences are known in the Action Area.
Meltwater Lednian Stonefly *Lednia tumana*	T	NO	NO	ELE, ODR, HAB	Meltwater habitat for meltwater lednian stonefly is supplied by glaciers and rock glaciers, as well as: (1) Seasonal snow, (2) perennial snow, (3) alpine springs, (4) ice masses. The Action Area is unsuitable habitat. No occurrences are known in the Action Area.
Wolverine *Gulo gulo luscus*	P	YES	NO		Wolverine utilize a range including alpine areas, rugged topography, remoteness, with diverse ungulate populations.

Common Name Scientific Name	Status	Potential to Occur	Critical Habitat[1]	Rationale for Exclusion[2]	Habitat Description and Range in the Action Area
					The Action Area provides moderate to low suitability.
Whitebark Pine *Pinus albicaulis*	C	NO	NO	ELE, ODR, HAB	The Action Area is outside of the predicted suitable habitat model. Native to subalpine and timberline zones. The Action Area does not contain suitable habitat.

[1] In October 2004, a final rule for bull trout critical habitat was published in the Federal Register. The only designated critical habitat in MT was in the St. Mary River drainage. The Blackfeet Tribe opposed the critical habitat designation. The final critical habitat rule was remanded by the Service and a revised final rule was re-published in the Federal Register in October 2010 (75 FR 200, 2010). All Tribal lands on the Blackfeet Reservation were excluded.

[1] The Federal Register Notice for Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary; Final Rule (FR 79- 177, 2014). All Tribal lands on the Blackfeet Reservation were excluded.

[2] Exclusion Rationale Codes: **ODR**=outside distributional range of the species; **HAB=** no habitat is present in the Action Area; and, **ELE=**outside of elevational range of species.

Species Assessments

This section defines the current status of listed species, habitat requirements, distribution within the Action Area, and provides a platform to assess the effects of the Proposed Action under consultation with the Service.

Bull Trout (*Salvelinus confluentus*)

Bull trout (*Salvelinus confluentus*) was listed as a threatened species in 1999 (64 FR 58910 – BT USFWS 1999) throughout its historic range in the coterminous U.S. The final determination was based on the combined effects of habitat degradation (fragmentation and alterations associated with dewatering, road construction and maintenance, mining, and grazing); the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment (process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species.

When the St. Mary Unit bull trout were listed as "threatened" under the ESA, the Service acknowledged (BT USFWS 1999) that historic information on these fish was largely anecdotal and that definitive, contemporary information was insufficient. Specifically, the abundance of these bull trout was "unknown," and the fish were assumed to be "isolated and fragmented by irrigation dams and diversions." In addition, the entrainment of bull trout in the St. Mary Canal was assumed to be a threat to the population, as were the blockage of instream fish movements by the diversion dam and the seasonal dewatering of Swiftcurrent Creek downstream from Lake Sherburne Dam. Finally, because introduced, nonnative brook trout had established reproducing populations in the drainage, these fish were assumed to be a hybridization threat to the bull trout (BT USFWS 1999).

U.S. Fish and Wildlife Service Recovery Plan

The Bull Trout Recovery Plan (USFWS 2015) states that bull trout are generally "stable" throughout their range (species status neither improved nor declined), with some core area populations decreasing, some stable, and some increasing. Since the listing of bull trout, there has been very little change in the general distribution of bull trout in the coterminous U.S., and no known, occupied bull trout core areas have been extirpated.

The Service may initiate an assessment of whether recovery has been achieved and delisting is warranted when the following have been accomplished in each recovery unit; specifically for the St. Mary Recovery Unit, all primary threats are effectively managed in all existing core areas, representing all existing local populations. Four main actions are identified in the Service's 2015 St Mary Recovery Unit Implementation Plan (RUIP USFWS 2105). The strategy for recovery of bull trout in the St. Mary Unit includes:

1. Address habitat threats.
2. Address demographic threats.
3. Address nonnative fishes.
4. Research, monitoring, and evaluation.

Habitat Requirements

Bull trout appear to have the most specific habitat requirement of all the North American salmonids with distribution and abundance controlled by key habitat characteristics that include water temperature, turbidity, flow, stream size, channel form and stability, substrate composition, cover complexity, and connectivity (Oliver 1979; Pratt 1984; Fraley and Shepard 1989; Goetz 1989; Rieman and McIntyre 1993; Jakober 1995; Selong et al. 2001). Clean cold water is a critical habitat element for this species which has among the lowest upper water temperature tolerance and optimal growth temperature of any North American salmonid (Selong et al. 2001). Although often occurring in larger rivers, they reproduce entirely in cold-water tributaries (primarily second- to fourth-order streams) where spawning is generally associated with seasonally declining water temperatures in the late-summer and early fall – typically the coldest streams in the watershed (Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1993). Stream temperatures that decline to between 48°F (9°C) and 41°F (5°C) are considered important to initiation of bull trout spawning (McPhail and Murray 1979; Fraley and Shepard 1989). Spawning is typically concentrated in reaches with cold water springs or strong intra-gravel flow exchange (groundwater upwelling and downwelling), where flow and temperature may be more stable (Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1993; Rieman et al. 1997; Boag and Hvenegaard 1997; Baxter and Hauer 2000). Water temperatures above 59°F (15°C) are believed to negatively influence bull trout distribution and may partially explain the generally patchy distribution of this species within a watershed (Fraley and Shepard 1989).

Preferred spawning habitat often consists of low-gradient reaches within high-gradient streams that have clean unconsolidated gravel-cobble substrates with considerable groundwater influence (Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1993; Mogen 2012). Increases in fine sediment in spawning streams have been shown to reduce egg survival and emergence as well as limit juvenile abundance by reducing intra-gravel flow and the amount of interstitial spaces available for overwinter habitat (Fraley and Shepard 1989; Pratt 1992; Thurow 1997; Bonneau and Scarnecchia 1998). Side-channels, margins and pools with complex forms of cover including unembedded cobble-boulder substrates, large woody debris, and undercut banks (Oliver 1979; Fraley and Shepard 1989; Goetz 1989; Pratt 1992; Thurow 1997) and beaver ponds (Jakober 1995 and Mogen 2012) are important habitat features for all life-history stages of bull trout.

Connectivity – an unimpeded fluvial connection between critical seasonal habitat types and/or local subpopulations – appears to be the single, most-important habitat component for bull trout persistence (Rieman and McIntyre 1993, Rieman and Allendorff 2001). The ability to migrate is crucial for both life-history forms, whether it be simple connections between wintering, spawning and rearing habitats for resident fish inhabiting individual streams or corridors for migratory fish on a basin-wide scale. Unimpeded corridors may also allow migratory fish to augment or reestablish local subpopulations that may be depressed or extirpated – a key component of "meta-population" theory, a mechanism where maintaining an interacting network of subpopulations reduces risk because the simultaneous loss of all subpopulations is unlikely (Rieman and McIntyre 1993). Migratory corridors also allow individuals from local subpopulations to interbreed, facilitating gene flow among the different subpopulations.

Life History and Behavior

Like most inland salmonids bull trout have been broadly characterized into two distinct life-history forms – non-migratory (resident) and migratory (Rieman and McIntyre 1993). Resident bull trout spend their entire lives within small tributaries where they rear as juveniles and spawn as adults, whereas migratory forms (fluvial and adfluvial) spawn in small tributary streams before migrating back to larger, more productive habitats in rivers (fluvial) or lakes (adfluvial). Both non-migratory and migratory bull trout may occur in a single drainage (Fitch 1997, Jakober et al. 1998, Mogen and Kaeding 2005a) and it is unknown whether those life-history forms represent heritable (i.e., genetically based) traits, conditional behaviors whose individual expressions are dependent upon the variety of accessible aquatic habitats (i.e., phenotypic plasticity), or a combination of those factors (Rieman and McIntyre 1993, McCart 1997, Nelson et al. 2002; see also Northcote 1992, and Jonsson and Jonsson 1993). Within the non-migratory form, McCart (1997) distinguished the "resident" type from the "isolated" type, which occurs upstream from a natural or man-made physical barrier (e.g., waterfall or dam) that prevents the return of fish that move downstream. The resident type is not confined by such barriers.

Regardless of life-history, spawning generally occurs between September and early November (McPhail and Murray 1979; Fraley and Shepard 1989; Fox et al. 1996; Clayton 1998), but as early as August in some areas (Goetz 1989; Riehle 1993). The eggs overwinter in the gravel substrate, incubating until the following spring when the newly hatched fry emerge from early April through May (Pratt 1992; Ratliff and Howell 1992). After hatching, juvenile migratory bull trout rear in natal streams for 2-4 years before moving to larger downstream habitats to mature (Bjornn 1961; McPhail and Murray 1979; Oliver 1979; Fraley and Shepard 1989, Mogen and Kaeding 2003), which typically occurs in two pulses (spring and fall; Downs et al. 2006; Mogen et al. 2011).

Bull trout usually reach maturity in 4 to 7 years and can live to age 12 or more (Fraley and Shepard 1989; for reviews, see Goetz 1989; Rieman and McIntyre 1993; USFWS 1999). Mogen and Kaeding (2003) captured numerous age-5 and older, post-spawn, migratory bull trout in weirs operated at mouths of several spawning tributaries indicating sexual maturity at those ages in the St. Mary system. Size and age of maturity vary substantially depending on life-history strategy and diet. Growth of resident fish is typically slower than migratory fish, especially in later years of life when the migratory form becomes almost exclusively piscivorous in more productive habitats. Resident bull trout tend to be smaller at maturity (4-12 inches/150-300 mm) and less fecund, whereas adult migratory fish commonly reach lengths greater than 23 inches (600 mm) (Pratt 1985; Fraley and Shepard 1989; and (Goetz 1989). The largest fish recorded in the St. Mary drainage was captured in Boulder Creek in 2016 and measured 32-inches (821 mm) total length.

The feeding habits of bull trout are primarily a function of size and life history. Like the young of other inland salmonids, juvenile bull trout (and most resident bull trout) are opportunistic feeders that mainly prey on a number of macroinvertebrate organisms, including insects and small fish. Adult migratory bull trout, however, feed almost exclusively on fish (Fraley and Shepard 1989; Goetz 1989; Donald and Alger 1993; Rieman and McIntyre 1993). Large bull trout are piscivorous, meaning they're fish predators.

Scientific Investigations in the Action Area

The following biological information was provided by an extensive, Reclamation-funded, scientific investigation (1997-current) conducted by the Service and Reclamation, on the status of the contemporary bull trout population inhabiting the St. Mary River drainage, Montana. The studies (best available science) described in this BA: 1) determine key characteristics of bull trout populations in the St. Mary River drainage in Montana, including locations of spawning areas, relative sizes, trends and genomes of spawning stocks, and the extent that bull trout move among tributaries; 2) identified factors that may unduly limit the populations; and 3) recommended management actions to eliminate or ameliorate the effects of those factors. Much of this data has not been published, although two of these scientific investigations are available in the following professional journals (hereby incorporated by reference):

> *Mogen, J.T. and Kaeding, L.R. 2005a. Identification and Characterization of Migratory and Nonmigratory Bull Trout Populations in the St. Mary River drainage, Montana. Transactions of the American Fisheries Society, 134: 841-852. Doi:10.1577/T04-143.1*
>
> *Mogen, J.T., and Kaeding L.R.. 2005b. Large-scale, seasonal movements of radiotagged, adult Bull Trout in the St. Mary River drainage, Montana and Alberta. Northwest Science79:246-253.*

In addition, Appendix A- St. Mary Bull Trout (*Salvelinus confluentus*) Species Accounts and Status of the Species in the Action Area (Mogen 2020 unpublished report) provides a summary of data collected from 1997- 2019. Table 2 lists all bull trout-related reports completed since 1997 in the Action Area.

Table 2. Bull Trout Research, Monitoring, and Evaluations at the St. Mary Unit

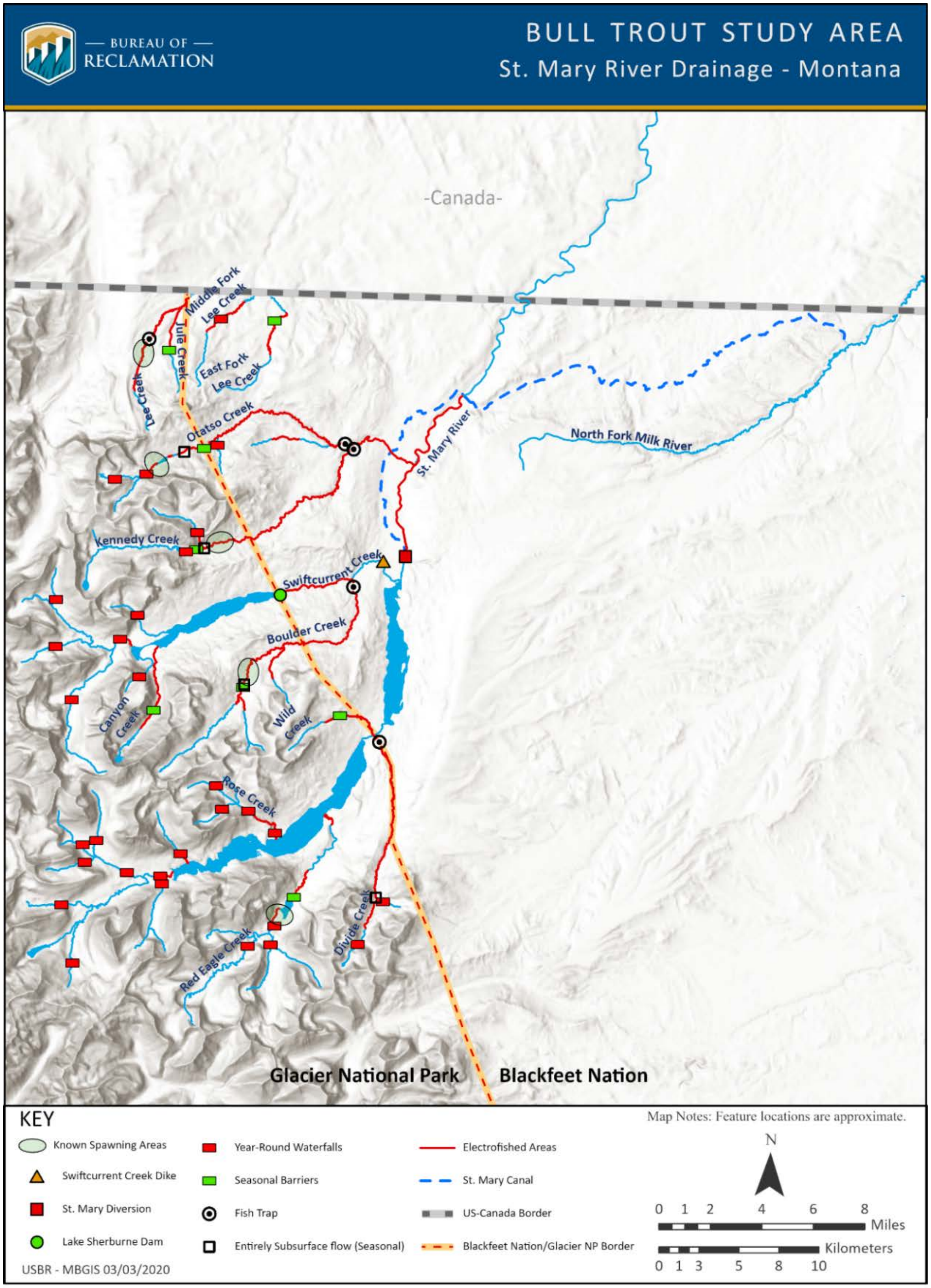
Date	Annual Reports	Author
April 1998	Bull Trout (*Salvelinus confluentus*) in the Saint Mary River Drainage of Montana	USFWS - Mogen, J.T and Kaeding L.R
February 1999	Bull Trout (*Salvelinus confluentus*) Investigations in the Saint Mary River Drainage of Montana	USFWS - Mogen, J.T and Kaeding L.R
June 2000	Ecology of Bull Trout (*Salvelinus confluentus*) in the Saint Mary River Drainage	USFWS - Mogen, J.T and Kaeding L.R
June 2001	Population Biology of Bull Trout (*Salvelinus confluentus*) in the Saint Mary River Drainage	USFWS - Mogen, J.T and Kaeding L.R
July 2002	The "Threatened" Bull Trout (*Salvelinus confluentus*) in the St. Mary River Drainage, Montana and Alberta	USFWS - Mogen, J.T and Kaeding L.R
October 2003	Bull Trout (*Salvelinus confluentus*) in the St. Mary River Drainage, Montana and Alberta	USFWS - Mogen, J.T and Kaeding L.R
May 2004	Bull Trout (*Salvelinus confluentus*) Use of Tributaries of the Saint Mary River, Montana	USFWS - Mogen, J.T and Kaeding L.R
October 2005	Bull Trout (*Salvelinus confluentus*) in the Saint Mary River Drainage of Montana	USFWS - Mogen, J.T and Kaeding L.R
December 2006	Investigations of Bull Trout (*Salvelinus confluentus*) in the St. Mary River Drainage, Montana	USFWS - Mogen, J.T and Kaeding L.R
December 2007	Investigations of Bull Trout (*Salvelinus confluentus*) in the St. Mary River Drainage, Montana, Update	USFWS - Mogen, J.T and Kaeding L.R

June 2008	Investigations of Bull Trout (*Salvelinus confluentus*) in the St. Mary River Drainage, Montana, Update	USFWS - Mogen, J.T and Kaeding L.R
July 2009	Investigations of Bull Trout (*Salvelinus confluentus*) in the St. Mary River Drainage, Montana, Update	USFWS - Mogen, J.T and Kaeding L.R
June 2010	Investigations of Bull Trout (*Salvelinus confluentus*) in the St. Mary River Drainage, Montana, Update	USFWS - Mogen, J.T and Kaeding L.R
May 2011	Investigations of Bull Trout (*Salvelinus confluentus*) in the St. Mary River Drainage, Montana, Update	USFWS - Mogen, J.T
March 2012	Investigations of Bull Trout (*Salvelinus confluentus*) in the St. Mary River Drainage, Montana, Update	USFWS - Mogen, J.T
February 2020	St. Mary Bull Trout Working Draft Summary 1997-2019	USFWS - Mogen, J.T
February 2020	St. Mary Bull Trout (*Salvelinus confluentus*), Species Accounts and Status of the Species in the Action Area, St. Mary Unit - Milk River Project, Reclamation	USFWS - Mogen, J.T
	Special Study Reports	
January 2007	Provisional USFWS recommendations for winter releases from Lake Sherburne Dam	USFWS - Mogen, J.T and Kaeding L.R
April 2009	Genetic Analysis of Bull Trout in the St. Mary River System, Montana	USFWS - DeHann, Diggs, VonBargen, Mogen, and Kaeding
April 2010	Relation between Streamflow of Swiftcurrent Creek, Montana, and Geometry of Passage for Bull Trout (*Salvelinus confluentus*)	USFWS - Mogen, J.T and Kaeding L.R
April 2011	Fish Entrainment at the St. Mary Diversion, Montana - With a Review of the Impacts of Project Operations on Bull Trout and other Native Fishes	Mogen, J. (USFWS) and E. Best, J. Sechrist and C. Hueth – (USBR TSC)
April 2014	Genetic Analysis of Bull Trout in the St. Mary River System, MT, Additional Analyses for FY2013	USFWS - DeHann, Adams, Mogen
June 2016	Bull Trout Status and Characteristics Baseline Data Compilation, Milk River Project, St. Mary River, Montana	Kaeding, L.R.

Reclamation has made a continuing effort since 1997 to address scientific uncertainty, through research, monitoring, and evaluation efforts we now have a better understanding of habitat threats/needs specific to the St. Mary River Recovery Unit, and the extent and effects of introduced species. We now understand:

- Stocking of nonnative fishes in the St. Mary River drainage within GNP can be detriment to bull trout and other fish. Genetic data of bull trout provided no evidence of interbreeding between bull trout and brook trout; however, competition still exists between the species. This practice no longer occurs; however, stocking continues today in some reservation waters, mainly in isolated lakes and ponds.
- Key characteristics of bull trout populations in the St. Mary River drainage in Montana, including locations of spawning areas, relative sizes, trends and genomes of spawning stocks, and the extent that bull trout move among tributaries.
- Factors (entrainment or migration barriers) that effect bull trout populations in the St. Mary Recovery Unit.

Figure 12. Bull Trout Study Area - St. Mary River Drainage, Montana



Tagged Bull Trout Studies

To assess the degree of fish movement among the various St. Mary tributaries, passive integrated transponder tags (PIT) were injected into the dorsal musculature (directly below and parallel to the dorsal fin) of most bull trout ≥ 200 mm TL captured during the study. In 2015 that minimum tagging size was reduced to 100 mm TL in several streams in an effort to bolster the number of young fish carrying tags for a recently initiated juvenile emigration study. That study utilizes PIT-detection stations established at the outlet of important spawning streams (currently only Boulder Creek) that continually scan for PIT-tagged fish as they enter and exit the stream. Findings from that study will not be reported until the analysis is complete.

Altogether, 4,673 bull trout received tags (3,776 bull trout ≥ 200 mm TL), of which 4,451 (95%) had been caught by electrofishing and 222 (5%) in traps (Appendix A-Figure 1). On the basis of captured fish that already had excised adipose fins (i.e., a secondary mark applied at time of tagging), 855 of the tagged bull trout (840 bull trout ≥ 200 mm TL and 15 bull trout < 200 mm TL) were recaptured (23.7% and 2.9%, respectively) in subsequent years and tags were retained in 820 (96.0%) of those fish. Of the 1169 total recaptures of those 855 fish, most (88%) recapture events occurred in the creek where the fish had been originally tagged, although there were 141 instances of bull trout movements between creeks (Appendix A-Table 2). Such movements occurred among all bull trout inhabited streams except Lee, Canyon, Rose and Red Eagle creeks (Red Eagle was only surveyed once, 2009).

Radio Telemetry Studies

Between 1998 and 2003, 42 adult bull trout (434-763 mm TL) captured in tributaries at the traps or while electrofishing were surgically implanted with radio transmitters and tracked to determine bull trout spawning and wintering areas and the large-scale, seasonal movements between those habitats within the St. Mary drainage in Montana and Alberta (Mogen and Kaeding 2003 and 2005b). Forty (95%) of the 42 radiotagged bull trout were contacted one or more times after their release, and 11 (26%) were subsequently recaptured by electrofishing or in traps.

Altogether, active searches conducted from the ground and aircraft during winter and early spring (December-April) found 22 individual tagged fish distributed in the St. Mary River between the mouth of Lee Creek (Alberta) and Lower St. Mary Lake (MT) (Appendix A-Figure 7). Many of these were located in multiple winters and at different locations. During this period 17 were found wintering in the river in Alberta (5 Boulder, 9 Kennedy, 2 Otatso, and 1 Lee Creek fish) and at least 19 in Montana (8 Boulder, 6 Kennedy, 5 Otatso fish). Four Boulder fish wintered in Lower St. Mary Lake and seven Boulder Creek fish attempted to winter in Swiftcurrent. Four of the bull trout attempted to winter in the dry stretch of Swiftcurrent, upstream from Boulder. One of those survived by wintering inside the dam itself and another survived by wintering in the deep outlet pool immediately below the dam. The other two, however, died in isolated pools downstream that froze solid over the winter. Three others wintered downstream from the Boulder confluence, where minimal survival flows are provided throughout winter by Boulder Creek. Only five radiotagged fish (4 in Kennedy and 1 in Boulder) were found in creeks during winter. Maximum stream distance between contact locations for individual fish (median, 25.5 km; range, 1-91 km) was not associated with fish length or weight when tagged.

Redd Counts

Principal bull trout spawning areas were located in Boulder and Kennedy creeks in 1997, where annual late-October redd counts are conducted each year (Appendix A- Figure 1). Over the 23 years of counts, (Appendix A–Figure 9) redd abundance has averaged 40.2 (range 12-66) in Boulder and 15.1 (range 0-37) in Kennedy. Beginning in 2011, GNP fisheries personnel conducted annual October bull trout redd counts in Lee Creek upstream from the highway bridge. Based on those counts, redd numbers averaged 14.0 (range 5-31; Appendix A-Figure 7) among the eight years of record (2011-2018; unpublished data, GNP- NPS).

Spawning areas were 1.5 miles (2.5-km) long in Boulder and 1 mile (1.5 km) long in Kennedy and occurred in areas of probable groundwater upwelling, just downstream from the regions of entirely subsurface flow. Redds were often associated with nearby undercut banks, root wads, debris jams, or beaver dams and were constructed in substrates that appeared to range from fine gravel (~10-mm diameter) to small cobble (< 150-mm diameter). Bull trout were occasionally observed spawning in upper Otatso Creek (upstream from Slide Lakes) during electrofishing in late-August, but no formal surveys have been conducted there.

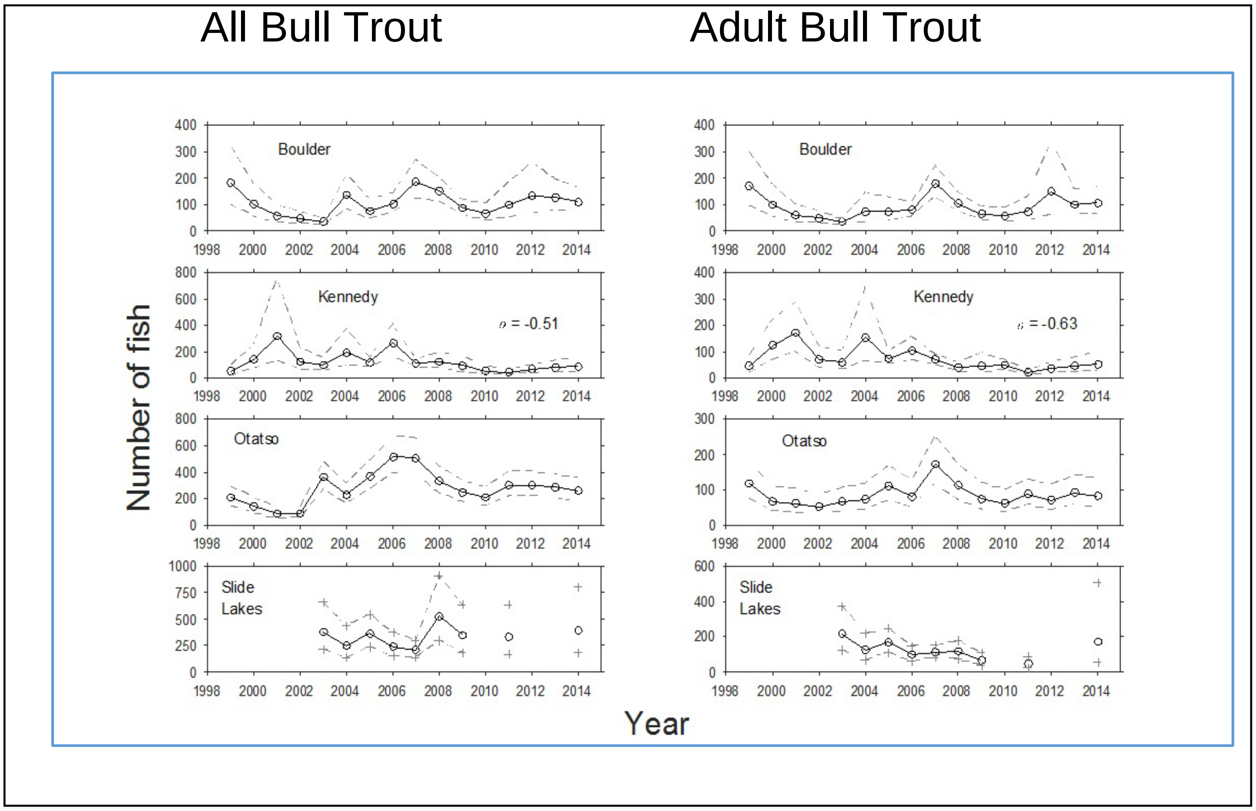
Population Estimates

Mogen and Kaeding (2005a) used tagging and recapture-event data from trapping to estimate size of the adult (i.e. ≥ 300 mm TL) migratory bull trout population in each creek. However, because of the limitations of the various population-estimation models they used and because the estimation was performed early in the study (1997-2000 data) with limited data, statistically significant estimates of adult population size could only be obtained for Kennedy Creek (105 fish; asymmetric 95% confidence interval 88 to 168) and Otatso Creek (49 fish; 43 to 84 fish). Those estimates represent the total number of adult migratory bull trout that were available for capture at any time during the study (Williams et al. 2002). Nevertheless, population estimates for Kennedy Creek and Otatso Creek were several times larger than the mean number (25 ±13 and 15 ±4, respectively) of adult bull trout caught in traps in those streams, indicating annual trap counts significantly underestimate adult migratory population size.

More-recent bull trout population estimates derived from analysis of all tagging data collected during tributary surveys (trapping and electrofishing) during 1997-2013 were provided by Kaeding (2016). Those analyses provided definitive indices of bull trout population size and indicated tributary migratory populations comprising the St. Mary River Complex Core Area (i.e., Boulder, Kennedy, Otatso and Lee creeks) were broadly stable throughout the study period, with the exception of Kennedy Creek, which showed a decreasing temporal population trend across much of the period for adult and juvenile bull trout and annual redd counts. Bull trout population estimates derived from statistical analyses of capture-recapture data for Boulder, Kennedy and Otatso creeks and for the Slide Lakes are shown (Figure 13). Too few data years precluded population estimation for the remaining creek populations.

Figure 13 shows trends in the estimated number (open circles) of all bull trout (i.e., ≥ 200 mm TL) and adult bull trout (≥ 299 mm TL) in four creek reaches, St. Mary River drainage, 1998–2014. Dashed lines or plus signs above and below the open circles indicate the upper and lower bounds of the 95% confidence interval for the estimate. Spearman's rank correlation coefficient(*p*) is given for the two statistically significant trends (Kaeding 2016).

Figure 13- Bull Trout Trends in the Study Area



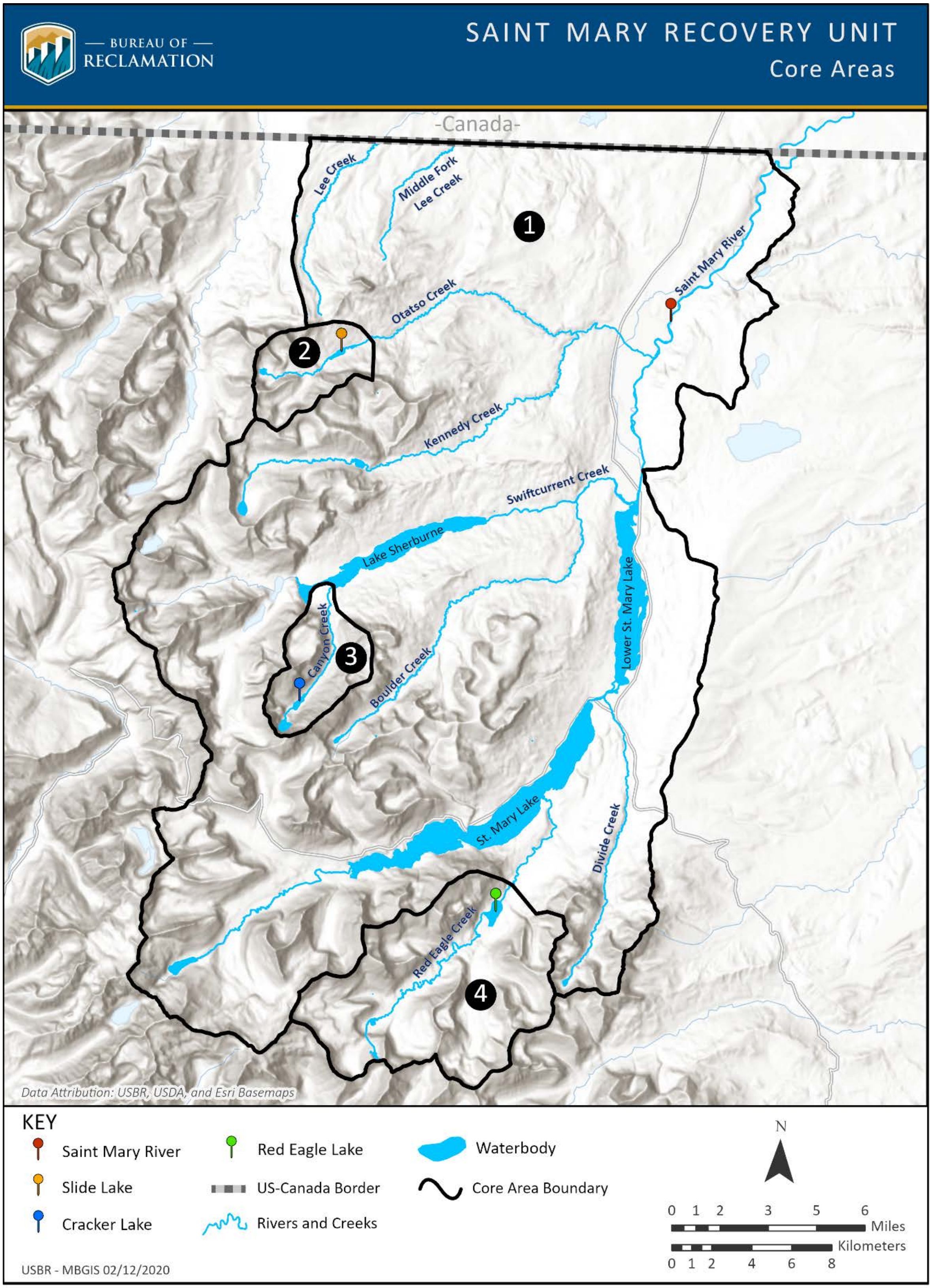
Range-wide Distribution and Abundance

Within the coterminous U.S., bull trout currently occur in the Columbia River and Snake River basins in Washington, Oregon, Montana, Idaho, and Nevada; Puget Sound and Olympic Peninsula watersheds in Washington; the Upper Oldman watersheds (St. Mary, Belly and Waterton river basins) in Montana; and the Klamath River basin of south-central Oregon. At the time of their coterminous U.S. listing in 1999, bull trout, although still widely distributed, were estimated to have been extirpated from approximately 60 percent of their historical range (USFWS 2015).

Historic Distribution in the Action Area

The historic distribution of native fishes in the St. Mary River drainage was delimited by the many natural, year-round barriers to fish movement. Waters that were upstream from such barriers and historically barren of fish included the entire upper Red Eagle, Swiftcurrent, Kennedy and Otatso Creek watersheds, and the headwaters of the St. Mary River itself (Figure 11). Among the fishes indigenous to the drainage, bull trout, westslope cutthroat trout, and mountain whitefish (*Prosopium williamsoni*) are believed to have occurred in all of the streams and lakes to which they had access, including the Slide Lakes, while lake trout inhabited only St. Mary and Lower St. Mary lakes (Brown 1971). Nowhere else in the contiguous U.S. are bull trout naturally sympatric with lake trout (Donald and Alger 1993).

Figure 14. St. Mary Recovery Unit Core Areas



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St. Mary Recovery Unit

Based on biological information collected since 1997, today we know that within the St. Mary drainage (Figure's 12 and 14), bull trout are widely distributed and often locally abundant throughout the basin upstream from St. Mary Reservoir, Alberta, including the river and all major lakes (7) and tributaries (10) to which bull trout had historical access (Mogen and Kaeding 2005a and 2005b; Mogen 2012). The watershed and the bull trout population are linked to downstream aquatic resources in southern Alberta, Canada; the U.S. portion includes headwater SR habitat in the tributaries and a portion of the FMO habitat in the mainstem of the St. Mary River and St. Mary Lakes (Mogen and Kaeding 2001).

The St. Mary Recovery Unit comprises four core areas, however only one (St. Mary River) is a complex core area with five described local bull trout populations (Divide, Boulder, Kennedy, Otatso, and Lee Creeks). Roughly half of the linear extent of available FMO habitat in the mainstem St. Mary system (between St. Mary Falls at the upstream end and the downstream Canadian border) is comprised of St. Mary and Lower St. Mary Lakes, with the remainder in the St. Mary River. The other three core areas (Slide Lakes, Cracker Lake, and Red Eagle Lake) are simple core areas. Slide Lakes and Cracker Lake occur upstream of seasonal or permanent barriers and are comprised of genetically isolated single, local, bull trout populations, wholly within GNP, MT. In the case of Red Eagle Lake, physical isolation does not occur, but consistent with other lakes in the adjacent Columbia Headwaters Recovery Unit, there is likely some degree of spatial separation from downstream St. Mary Lake.

St. Mary River Complex Core Area

The St. Mary River complex core area (Figure 14, above) is comprised of Boulder, Divide, Lee, Kennedy, and Otatso Creeks. Bull trout in the Saint Mary River complex core area are migratory and exhibit both the fluvial (stream-dwelling) and adfluvial (lake-dwelling) life history forms, residing in the St. Mary River (in both Montana and Alberta) and the two large St. Mary lakes in Montana (St. Mary Lake and Lower St. Mary Lake), respectively (Mogen and Kaeding 2005a, 2005b). The Action Area for this assessment lies within the central portion of the St. Mary River Complex Core Area.

Summary Status of Bull Trout in the St. Mary Recovery Unit

The following information summarizes the extensive biological investigations conducted since 1997 by the Service to better characterize the existing bull trout populations inhabiting the St. Mary River drainage. These studies were aimed at determining the abundance of spawning adults, the locations of spawning areas, and the extent of bull trout movement within the drainage.

Summer electrofishing surveys (Appendix A- Figure 2) confirmed bull trout are widely distributed and often abundant in St. Mary River tributaries (Mogen 2020 unpublished report). Moreover, the species remained in all of the waters that it historically inhabited in the drainage in Montana. The occurrence of age-0 bull trout indicated recent spawning and reproduction in each creek in which the species was commonly found and annual reproduction was indicated by multiple age-classes of young fish.

The occurrence of redds revealed bull trout spawning areas in Boulder, Kennedy, and Lee creeks, as well as above the Slide Lakes in upper Otatso Creek. Recaptures of tagged fish revealed bull trout movements among most creeks, as well as both upstream and downstream movements over the St. Mary Diversion Dam, the rockslide that forms the Slide Lakes, and the lower fall on Otatso Creek (Park Line Falls).

Although both migratory and non-migratory bull trout remain in the St. Mary River drainage, migratory fish were most obvious because they were caught in traps or moved between creeks (Mogen and Kaeding 2003 and 2005a). Resident (i.e., non-migratory) bull trout also occurred in several creeks but were less conspicuous than migratory fish.

Within the St. Mary drainage, upstream spawning migrations from downstream wintering habitats in the river to natal-tributary staging and spawning habitats may exceed 55 miles (90 km) in distance and generally begin in late April and extend through July (Mogen and Kaeding 2005b, Mogen 2012). However, those bull trout making short migrations from headwater lakes (i.e. Red Eagle, Slide, and Cracker lakes) to inlet spawning habitat likely delay upstream movement until stream temperatures and flows become more preferred around peak spawning time. Spawning typically occurs from late August to late October (Mogen and Kaeding 2003 and 2005a) and is immediately followed by the out-migration of post-spawn migratory adults.

Genetic analysis of the St. Mary bull trout has shown that although bull trout regularly move throughout the St. Mary system and among the different spawning tributaries, the significant levels of genetic variation among all spawning populations suggest that fidelity to natal spawning areas is high, gene flow among tributary populations is low, and that each tributary contains a genetically distinct local spawning population (Mogen 2020 unpublished report).

In summary, bull trout in the St. Mary River drainage, Montana are more common than previously believed and may be more common than in many other regions of the species' natural range. Both migratory and non-migratory bull trout populations were identified, however, migratory fish were most conspicuous because they were caught in traps operated near creek mouths or showed movement between creeks. Scarcity of age-4 bull trout in trap samples from Boulder, Kennedy, and Otatso creeks suggested most migratory, age-4 fish were immature (sub-adult) and inhabited either the St. Mary lakes or St. Mary River during that stage of life. Conversely, abundance of age-4 bull trout in electrofishing samples was primary evidence of non-migratory (resident) populations in some creeks (Canyon and Otatso, and to a lesser extent, Lee, Kennedy and Divide creeks). The occurrence of age-0 bull trout in electrofishing samples indicated recent spawning and reproduction in at least six creeks, Boulder, Canyon, Kennedy, Otatso (upper reaches), Lee and Red Eagle, and annual reproduction was indicated by multiple age-classes of young bull trout. In contrast, at least until recent years, Divide Creek's bull trout spawning population was small, as indicated by the capture of only two adult fish in the trap and only occasional encounters with sub-adult and adult fish while electrofishing. Although no obvious explanation for the scarcity of that spawning population exists, the small population size and widely varying reproductive success among years probably explained the missing year-classes and low abundance of young bull trout in the creek.

Status of Bull Trout in the Action Area

The Action Area occurs within the central portion of the St. Mary River Complex Core Area. Within the St. Mary River Complex Core Area (Figure 14) Project O&M activities may take place at facilities located at Lake Sherburne Reservoir and Dam, Swiftcurrent Creek (fish salvage), Swiftcurrent Creek Dike, the northern most end of Lower St. Mary Lake, St. Mary Diversion Dam and Headworks, and the St. Mary Canal and appurtenant structures.

In 2002-2006 (Table 3 and 5) a study was conducted to determine the loss (magnitude and species composition) of fish from the St. Mary River into the St. Mary Canal (Appendix A-Figure 1) and to document the timing (diel and seasonal) of patterns associated with entrainment using a fish entrainment monitoring system over a five-year period (Mogen et al. 2011). Once entrained, the fish either reside in the canal during the irrigation season or are transferred to the North Fork Milk River via the canal. Although a few of the fish that remain in the canal may overwinter in one of the many pools that exist along its length, most are believed to perish once the canal is dewatered at the end of the diversion period. Because of the high velocities through the canal headgates during operation and the closed position of the gates during the non-irrigation season, the headgates act as a barrier, preventing the return of entrained fish to the river.

During the non-irrigation period (typically October-March), the St. Mary Diversion Dam sluicegates are raised, and the river is free to flow through the gates with no impoundment. However, during the irrigation season the gates are lowered creating an upstream impoundment and a 6-foot (2-m) high barrier to the upstream migration of fish. The canal headgates are located directly upstream from the diversion dam and are only opened during the irrigation season. Therefore, only those fish moving downstream past the canal headgates during the irrigation season are vulnerable to canal entrainment. The exception is occasional successful passage (jumping) over the diversion dam by migratory adult bull trout (BLT) during their upstream spawning migration. This rare, but documented occurrence lands the fish near the opened canal headworks making them susceptible to entrainment as well (Mogen and Kaeding 2005b).

Table 3. 2002-2006 Bull Trout Entrainment Study

Species	2002	2003	2004	2005	2006	Total
Bull Trout (BLT)	5	19	14	72	97	207
Cutthroat x Rainbow Trout	42	50	65	54	52	263
Brook Trout	0	0	0	1	1	2
Lake Trout	0	3	1	0	1	5
Mountain Whitefish	6	1306	179	253	90	1834
Lake Whitefish	2	24	0	41	0	67
Burbot	93	2895	217	59	30	3294
Northern Pike	4	4	2	2	6	18
Suckers	124	664	621	953	418	2780
Trout-perch	18	63	18	11	10	120
Longnose Dace	115	553	105	281	57	1111
Mottled, Spoonhead	16	73	63	68	26	246
Lake Chub	0	0	0	4	0	4
Pearl Dace	4	17	5	3	0	29
Totals	**429**	**5671**	**1290**	**1802**	**788**	**9980**

Entrainment netting at the St. Mary Diversion collected 9,980 total fish in 2,421 hours of sampling during 2002-2006. Of the 207-bull trout caught in nets placed on canal gates across five consecutive years (2002–2006), 98% were age 2 or age 3, of these captured during the study, most were juveniles (104-228 mm), three were sub-adult (357-393 mm) and two were adults (465 and 554 mm).

Extrapolation estimates of annual entrainment loss in the St. Mary Canal were estimated for a typical six-month (4,380 hours) irrigation season. Catch rates (fish/hr) were calculated from the total number of fish captured in 2,421 hours of netting during the diversion periods of 2002-2006. The portion of the total diverted volume that was filtered by the nets ranged from .57 to .80 percent and is reflected in the estimates (i.e. low and high) of annual loss (Table 4).

Table 4. Annual Loss Calculations

Low	High
$\frac{0.086 \text{ (catch rate)} \times 4{,}380 \text{ (irrigation hours)}}{.80 \text{ (flow)}} = 471$	$\frac{0.086 \text{ (catch rate)} \times 4{,}380 \text{ (irrigation hours)}}{.57 \text{ (flow)}} = 661$

The estimated total annual loss of fish to entrainment in the unscreened canal ranged from roughly 22,570 (low) to 31,670 (high) individuals (all species combined). Table 5 shows total numbers of fish collected by species and year in entrainment nets at the St. Mary Diversion, St. Mary River, Montana, 2002-2006.

Table 5. Estimates of Annual Entrainment in the St. Mary Canal 2002-2006

Species	Total Catch	Catch Rate	Low	High
Bull Trout (BLT)	207	0.086	471	661
Cutthroat x Rainbow Trout	263	0.109	597	838
Brook Trout	2	0.001	6	8
Lake Trout	5	0.002	11	15
Mountain Whitefish	1,834	0.758	4,150	5,825
Lake Whitefish	67	0.028	153	215
Burbot	3,294	1.361	7,452	10,458
Northern Pike	18	0.007	38	54
Suckers (Longnose, Mountain, White)	2,780	1.148	6,285	8,822
Trout-perch	120	0.050	274	384
Longnose Dace	1,111	0.459	2,513	3,527
Sculpin	246	0.102	559	784
Lake Chub	4	0.002	11	15
Pearl Dace	29	0.012	66	92
All Fish Combined	**9,980**	**4.122**	**22,570**	**31,670**

Lake Sherburne Surveys -- Gillnets deployed in Lake Sherburne Reservoir in October 2006 captured a combined 112 fish: 71 mountain whitefish (187−372 mm TL), 30 longnose suckers (177−574 mm TL), 10 northern pike (362−1070 mm TL), and 1 brook trout (229 mm TL); no bull trout were captured. Among the seven gillnet sets (5 evening, 2 morning), soak times ranged from 1 to 14 hours (mean, 8 hrs. 43 min; total, 61 hrs. 10 min).

Consequences of the Action - Bull Trout

The Action Area is centrally located within the St. Mary River complex core area. Bull trout in the Action Area could be found anywhere in the St Mary complex core area. Research has indicated that bull trout move throughout the complex core area. Since bull trout are a migratory fish species, it is known that movement occurs throughout the St. Mary Recovery Unit. Proposed Actions have the potential to affect those fish that are moving through the system concurrently with O&M activities, as well as during yearly bull trout monitoring studies.

The continued O&M of the St. Mary Unit includes annual startup (Spring) inspections of all facilities of the St. Mary Unit. This assessment determines the existing condition (i.e. damage over winter) prior to the start of the irrigation season. Facilities are shut down and winterized at the end of the irrigation season (Fall) and fish salvage occurs in Swiftcurrent Creek down to the Boulder Creek confluence prior to any in stream work. Activities and potential effects to bull trout at each of the St. Mary Unit facilities are described as follows:

Lake Sherburne Dam and Reservoir

Aside from repairing any incidental damage, spring startup includes ice removal from around the storm gates at Lake Sherburne Dam. Once this is completed, the regulating gates are closed, and guard gates are opened and hung in position. In the fall, at the end of the irrigation season the regulating gates are closed, followed by the guard gates, then the regulating gates are re-opened to allow seepage to bypass. The stilling basin downstream of the dam is mechanically cleared of gravels each fall following fish salvage in Swiftcurrent Creek. Repairs at Lake Sherburne Dam and Reservoir may include riprap and concrete repairs of the upstream face of the dam, and concrete repair of the spillway and outlet works at the reservoir following fish salvage in Swiftcurrent Creek.

The vast majority of inflow into Lake Sherburne Reservoir is provided by Swiftcurrent and Canyon Creeks. The water is collected in the reservoir as the dam outlet remains closed during the six-month, non-diversion period.

Bull trout are known to occur in Lake Sherburne Reservoir and upstream in Canyon Creek. Canyon Creek supports a robust population of resident bull trout throughout its length as well as in its headwater source, Cracker Lake. Canyon Creek provides spawning and juvenile rearing habitats for its resident population as well as the migratory bull trout that reside downstream in Sherburne Reservoir. Reservoir fluctuations from standard reservoir operations (annual filling and drawdown) and occasionally scheduled dam maintenance (~every 10-years) likely produce conditions at the inlet of Canyon Creek that could potentially limit passage. At its mouth, Canyon Creek flows across a large well-developed, deep-sediment delta. Depending on Canyon Creek flow, reservoir levels and conditions on the delta, this occasional disconnect between the stream and reservoir likely causes bull trout entrapment in the reservoir and may help explain the limited (occasional) observance of large migratory bull trout in the stream during surveys. This occasional disconnect may cause problems for post-spawn adults returning to the reservoir and juveniles emigrating from the stream.

During the non-irrigation period, while Lake Sherburne Dam is closed for refilling of the reservoir, Swiftcurrent Creek is dewatered from the dam to the Boulder Creek confluence resulting in loss of aquatic habitat and stranding of bull trout and other aquatic organisms, including bull trout forage species. Reclamation has worked to shut down operations earlier in the season (~October 1) to avoid stranding of migratory bull trout leaving Boulder Creek after they spawn (Sept.-Oct.), as well as the staging down of Lake Sherburne Dam outlet flows (as opposed to fully closing the dam all at once) to allow for volitional outmigration of fish when possible. Since 2003, the Service, Reclamation, and the Blackfeet Tribe have worked cooperatively to rescue stranded fish by electrofishing and seining in the outlet structure of Lake Sherburne Dam and from isolated pools along the dewatered reach of Swiftcurrent Creek. In 2008, shutdown of Lake Sherburne Dam was conducted early for repairs to the dam with no stage down to allow fish to move out of the system. Because of this numbers of bull trout salvaged that year were considerably higher than those years of staged down operations. Rescued fish are released downstream below the Boulder Creek confluence where adequate flows exist year-round. Swiftcurrent Creek is not overwintering habitat. Preferred winter habitat occurs downstream in Lower St. Mary Lake and the St. Mary River.

Table 6. Swiftcurrent Creek Fish Salvage 2003-2016

Year	**2003**	**2006**	**2007**	**2008**	**2009**	**2010**	**2012**	**2014**	**2015**	**2016**	**TOTAL**
Date	Sept 18	Sept 27	Sept 10	Sept 15&17	Oct 5	Sept 27	Oct 22	Sept 27	Oct 21	Oct 21	
Bull Trout	9	5	2	33	8	9	1	9	0	0	**76**

The Proposed Action (continued O&M), fall irrigation season shut-down of Lake Sherburne Dam will impact bull trout in Swiftcurrent Creek for a distance of approximately two-miles downstream from the stilling basin of Lake Sherburne Dam to the confluence of Boulder Creek. However, fall shutdown "staged down" procedures are part of the Proposed Action and have been effective in triggering bull trout to vacate the area as flows decrease. Conversely, water is allowed to collect in Lake Sherburne Reservoir, gates are closed, and fish passage does not occur at this time (Oct.-March).

Potential impacts to bull trout are expected to be related to fish handling (Swiftcurrent Creek Salvage), flow reductions resulting in potential stranding of fish that are missed during salvage, reduced prey species, and potential mortality if pools completely freeze prior to salvage. Reduced flows could affect bull trout by disconnecting deep pools within Swiftcurrent Creek thereby limiting their ability to move between pools and exposing them to increased predation.

Effects associated with fish handling/salvage activities include stress, tissue damage, bruising, exposure to chemicals, and infection from wounds. Transporting fish causes stress and may also expose fish to possible infections. Fish salvage efforts will occur in Swiftcurrent Creek following the reduction of flow and gradual staging down of Lake Sherburne Dam and Reservoir. Efforts will be concentrated in the stilling basin and pools downstream in Swiftcurrent Creek. Bull trout captured will be relocated to downstream of the confluence of Boulder Creek, the nearest suitable and connected habitat.

Recent operational history indicates that the combination of the staging down of releases from Lake Sherburne Reservoir combined with fish salvage efforts would reduce the number of bull trout stranded in pools in Swiftcurrent Creek at the time of shutdown, despite the potential harm through fish handling. During annual Swiftcurrent Creek fish salvage, all stranded bull trout located are salvaged or attempted to be salvaged (some are able to avoid salvage). There may be years when some fish are missed. All captured / salvaged fish are relocated downstream in Boulder Creek. Based on the number of fish salvaged since 2007 when operational procedures for fall shut down changed, Reclamation anticipates no more than ten adult bull trout would be stranded per year over the next five years. Reclamation will salvage all bull trout captured.

Repairs would be made to Swiftcurrent Creek Dike as needed, due to flooding or structural damage. Most years, there is no maintenance that occurs on Swiftcurrent Creek Dike and routine maintenance will occur outside of migration times. This would occur after fall shut down or in the spring prior to start-up. Depending on the nature and extent of the repairs, it is possible that sediment and turbidity would result in Swiftcurrent Creek, or further down in Lower St. Mary Lake where accumulated sediment already exists.

In summary, effects of O&M to bull trout at Lake Sherburne Dam and Reservoir are:

- The outlet works at Lake Sherburne Dam and Reservoir retain water after seasonal shutdown. There is a chance that bull trout would be present. During fall shutdown (staged down) and prior to winter O&M activities Reclamation and the Service would salvage all stranded bull trout found in the outlet works and stilling basin.
- Lake Sherburne Reservoir fills during the non-irrigation season. This winter storage period reduces flows in Swiftcurrent Creek and other downstream streams and rivers. Reclamation through the operational change and "staged-down" release from Lake Sherburne Dam (opposed to sudden stoppage of flow) has encouraged bull trout to move downstream and away from Lake Sherburne Dam reducing the incidence of stranding.
- Canyon Creek's hydrograph and flows have created a large well-developed, deep sediment delta with braided stream channel. This braided stream channel begins above the high-water mark of Lake Sherburne Reservoir and continues as the reservoir recedes through normal operations. The inherent flow conditions in Canyon Creek and the channel braiding may impede fish movement regardless of reservoir levels.
- Bull trout capture and relocation (salvage) downstream to the nearest suitable and connected habitat in Boulder Creek would save fish; salvage is considered a benefit by keeping reproductive adults in the population.

St. Mary Diversion Dam and Headworks

In preparation for irrigation diversions the sluicegates on the St. Mary Diversion Dam are lowered (late February – early March) to begin checking water and creating head for irrigation diversions. The sluicegates are maintained in place until the end of irrigation season, typically October.

The location of the St. Mary Diversion is the division point between large lake habitat upstream and river habitat downstream. At this point water flowing along the east bank originates from Lower St. Mary Lake, whereas water flowing along the west bank primarily originates from the cooler more turbid inflows of Swiftcurrent Creek. Mixing of water from the two systems rarely occurs in the short distance between the confluence and the St Mary Diversion Dam. Bull trout tend to prefer the coolest and most substantial flow, which in this case is the same flow being diverted into the canal (Mogen et al 2011).

The St. Mary Diversion Dam regularly diverts a larger proportion of water than what remains in the St Mary River. This is possible since the diverted allocation is actually stored water released from Lake Sherburne Dam upstream and is not natural river flow for that time of year. The St. Mary

Canal flow is relatively constant to accommodate the demand for water during the irrigation season. River flow fluctuates considerably however, with run-off peaks as high as several thousand cfs to a low of less than 100 cfs. Generally, the proportion of fish entrained is similar to the proportion of water being diverted and the risk of entrainment increases as the relative proportion of diverted water increases.

The St. Mary Diversion Dam is a seasonal barrier from late February through October to upstream and downstream migrating bull trout and other fish species. Although results from both radio telemetry and conventional tag- recapture techniques (Mogen and Kaeding 2003 and 2005b) showed upstream and downstream movements of bull trout past the diversion dam. Movements likely occurred when the sluicegates were open between October and March; even though velocities through the sluicegates may be high. Nevertheless, data also suggested that the upstream passage of some bull trout appeared to be impeded by the dam, particularly during pre-spawning movements when the dam was closed for the irrigation season. The data does not indicate how many bull trout approach the dam and how many bull trout do not successfully pass. Based on limited data, it is assumed that most bull trout are not able to pass the diversion dam during the irrigation season, which would affect the ability to reach upstream spawning habitat. It is unknown if bull trout that do not pass the diversion dam travel to an alternate tributary for spawning. Since it is known that some adults do not pass the diversion dam it is assumed that some juveniles also do not pass. It is assumed that when the sluicegates are open the majority of the adult bull trout are allowed to pass.

The canal headwork gates are initially opened in March or April depending on water conditions, allowing a minimal flow of water through the canal to water-up and identify maintenance needs. Canal flows are incrementally increased over the course of 5-10 days to allow canal banks to reach equilibrium. A gradual increase of water in the canal is diverted until desired flows are reached and operating capacity and headgates are set. The diversion of water into the main canal typically spans from March to October. The canal headgates are unscreened for fish species. Fish entrainment has the potential to occur throughout the diversion season.

From 2002-2006 Reclamation conducted an entrainment study to determine the loss (magnitude and species composition) of fish from the St. Mary River into the St. Mary Canal and to document the timing (diel and seasonal) of patterns associated with entrainment using a fish entrainment monitoring system over a five-year period (Mogen et al. 2011). To determine entrainment rates, entrainment nets (fyke-type) were positioned behind four of the eight gates used to divert water into the Main Canal. The systematic sampling schedule included operating the nets for at least one week (4-day sampling period) during each of the five periods of interest (early-, peak-, late-runoff, and mid- and late- summer flows). Netting was typically conducted at least one week monthly; however, high flows and associated debris problems sometimes prevented netting operations.

On several occasions, netting time was lost while nets were cleared of snags, branches and other large debris or while repairing (sewing) damaged nets. Also, debris loading reduced the survival of fish in the nets, especially juveniles. Small fish often suffered impingement and/or suffocation caused by the build-up of small debris (leaves, twigs, garbage) in the nets. Although more frequent cleaning of nets during sampling periods helped reduce debris build-up and associated fish mortality, it also decreased the duration of sampling (soak time) important to the investigations.

Over the five-year study, entrainment netting through four of the gates at the St. Mary Diversion headworks collected 9,980 fish (all species) in 2,421 hours. Of the 9,980-total fish, 207 were bull trout (98% were age 2 or age 3). Of the 207 total bull trout captured during the study, 202 were juveniles (104-228 mm), three were sub-adult (357-393 mm) and two were adults (465 and 554 mm).

Bull trout catch rates varied widely throughout the year and between years sampled. On average, the highest bull trout entrainment rates occurred in the spring (April - May) with increasing river temperatures and discharge prior to peak runoff (Mogen et al. 2011, Kaeding 2016). This coincides with the outmigration of juvenile bull trout out of tributary streams. During the spring (April – May), catch rates for bull trout averaged about 0.21 (118 BLT; 560 hrs) fish per hour compared to around 0.05 (89 BLT; 1,861 hrs) fish per hour for the remainder of the irrigation season. Mogen el al. (2011) also noted diel fluctuations, with bull trout entrainment generally increasing in the afternoon and peaking during periods of darkness.

Because not all gates were monitored, uncertainty in calculating actual volume of water filtered, and inconsistent effort between years due to logistical challenges, the entrainment rates were extrapolated to estimate a total annual entrainment range. Based on catch rates, estimates of total annual loss of fish to entrainment at the St. Mary Diversion was made for a typical six-month (4,380 hour) diversion period. Since only a portion of the total diverted flow was actually filtered by the nets, only a range of estimates (low and high) of total fish loss was calculated. The first (low estimate) assumed the catch rate was calculated from diverting 80 percent of the flow, while the second (high estimate) assumed calculations based on diverting 57 percent of the flow. Mogen et al. (2011) estimated that the total annual bull trout losses ranged from approximately 471 to 661 individuals per year.

In 2015, Reclamation in an effort to summarize the existing bull trout data collected from 1997 – 2013 contracted with Lynn Keading a former Service fisheries scientist. As part of Kaeding's work to summarize all the collected data, Kaeding was also requested to reanalyze the entrainment data because it's difficult to make decisions on small sample sizes. Therefore, Keading (2016) reanalyzed the entrainment data that was collected from 2002 – 2006 using statistical models to redefine entrainment estimates as well as look at population level effects.

Entrainment rates are typically presented as fish loss per unit volume of diverted flow. However, Kaeding (2016) noted that the overall catch of bull trout during the 2002 – 2006 entrainment study was too small and the sampling efforts within years and months were too varied to estimate annual entrainment rates this way. To determine annual entrainment rates Kaeding (2016) used Monte Carlo simulation techniques (probability of different outcomes in a process that cannot easily be predicted due to random variables). This method accounts for the considerable variation in capture probabilities across space (nets) and time (hours of the day, months).

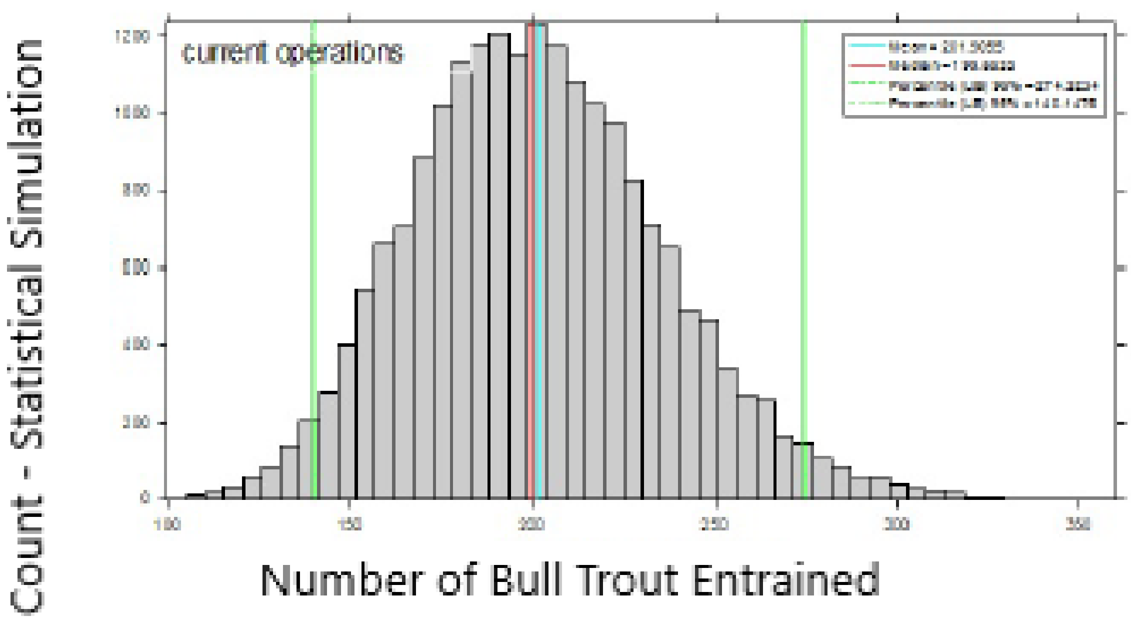
The four nets caught 207 bull trout during 21,064 hours of netting (net hours) across six months (April-Sept.) and five years (2002-2006). If each of those nets been continuously operated during those times, the total net hours for the four nets would have been about (4 nets x 6 months x 30 days/month x 24 hours/day x 5 years) = 86,400 net hours. Therefore, the actual sample time was about one quarter (25%) of the total possible net hours during the study. However, you can't simply take the 207 caught bull trout and multiply by 4. The only way that would be true is if bull trout catch rates were exactly the same among nets, hours of the day, and months or a constant catch rate throughout the season. We know that is not an accurate account. The actual 207 bull trout catch rate was clumped, especially at night and during the spring (Kaeding, personal communication 2020). This is where and why Kaeding used the Monte Carlo simulation.

The 207-bull trout caught during the 2002-2006 sample period were just part of the sample. Equally important, the sample data tell us how the bull trout catch varied among nets, hours of the day, and months. In many hours of the day and months, most net hours caught no bull trout. In contrast, when bull trout were caught, a few catches had notable numbers of bull trout. Therefore, the probability of catching zero bull trout was high while the probability of catching one or more bull trout was very small (overall, 0.0098 BLT per net hour) (Kaeding, personal communication 2020).

The Monte Carlo simulation technique takes those probabilities into account when estimating the total annual entrainment loss. Monte Carlo allows us to account for the considerable variation in capture probabilities across space (nets) and time (hours of the day, months).

After analyzing the data using the Monte Carlo technique, Kaeding (2016) estimated a mean of 202 bull trout (median 95% prediction interval, 140 – 274 fish) were entrained annually under current operations (Figure 15). This number accounted for the widely variable entrainment rates throughout the year as well as the diel fluctuations that also affected entrainment rates. Keep in mind, the 207 bull trout entrained is a real number that represents the total bull trout caught over a 5 year period; the 202 bull trout entrained annually is an estimate based on the fish data in that overall sample (not just the 207 bull trout, but all the fish data; and in particular - the capture probabilities, that constitute a "sampling occasion" in that sample). (Kaeding, personal communication 2020).

Figure 15. Predicted Total-Annual Entrainment of Bull Trout Under Current Operations



Additionally, Kaeding pooled the 207-bull trout that were captured during the Mogen (2011) entrainment study and looked at the population level effect, specifically the Boulder Creek population. Based on stochastic projection and assumptions based on data collected from other recovery units of those young fish surviving to older ages (based on annual survival probabilities) the 124 netted age-2, and 78 age-3 juvenile bull trout, collectively, 2.1–8.5 (95% prediction bounds) of them would have lived to age 6 had they remained in the river (Figure 16). Also, under this hypothetical scenario; it was assumed that half of the five older bull trout would have also survived;

therefore, the bull trout spawning stock of Boulder Creek could have been annually reduced by as many as 11 fish (i.e., 8.5 + 2.5) when 207 bull trout with an age frequency like that of the empirical sample were entrained (Kaeding 2016). Keep in mind, this was a hypothetical scenario and estimated that the entrainment of 207 bull trout could account for 6-22% mortality of the Boulder Creek spawning stock.

Research indicates the majority of entrained bull trout fish would be juvenile fish that out-migrate out of tributary streams each spring and summer. This would continue to impact a small percentage of the spawning population. However as noted in Kaeding (2016), this level of entrainment has been occurring for nearly a century and the spawning stock (Boulder Creek) population has sustained by this population, likely due to their compensatory reserve (capacity for density-dependent population effects to offset variations in mortality levels).

Figure 16 represents the age frequency of the 207-bull trout caught in entrainment nets, St. Mary Canal, 2002–2006, and of the 246-bull trout caught in the Boulder Creek trap, 1997–2000.

Figure 16. Age Frequency Bull Trout Caught in Entrainment Nets and Boulder Creek Trap

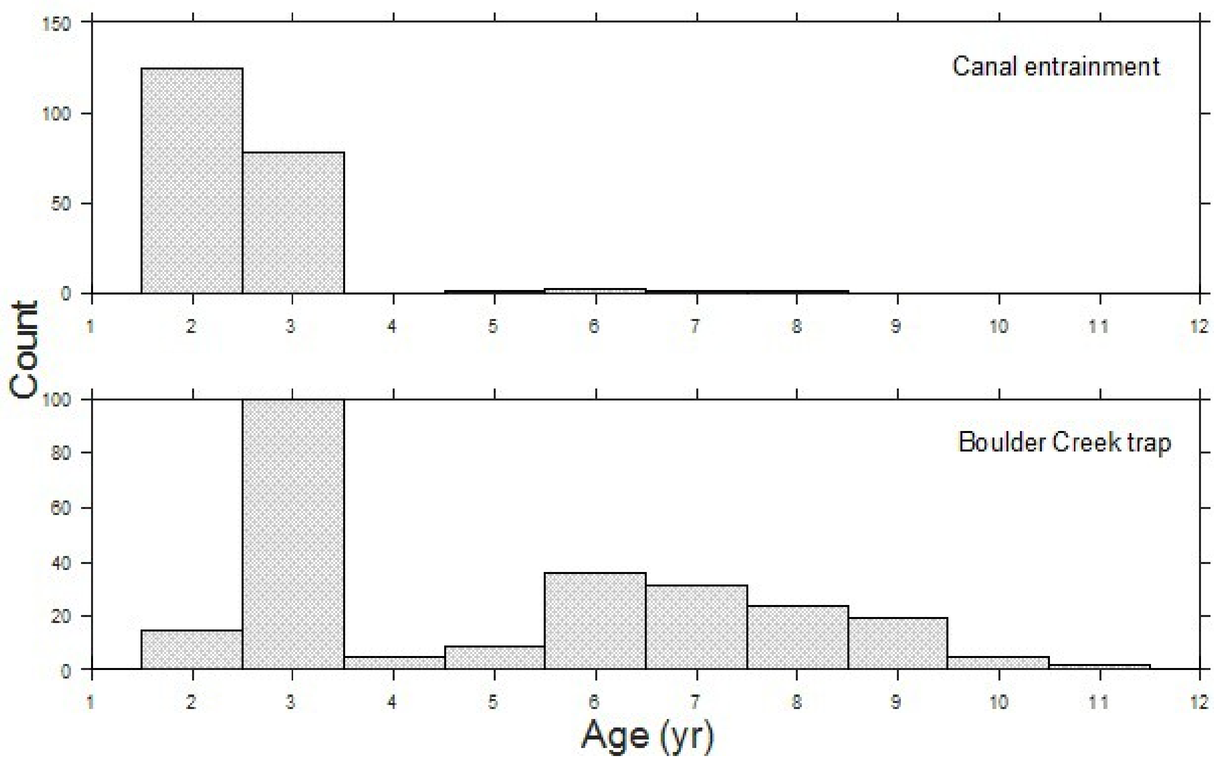


Figure 17. Predicted Number of Entrained Bull Trout

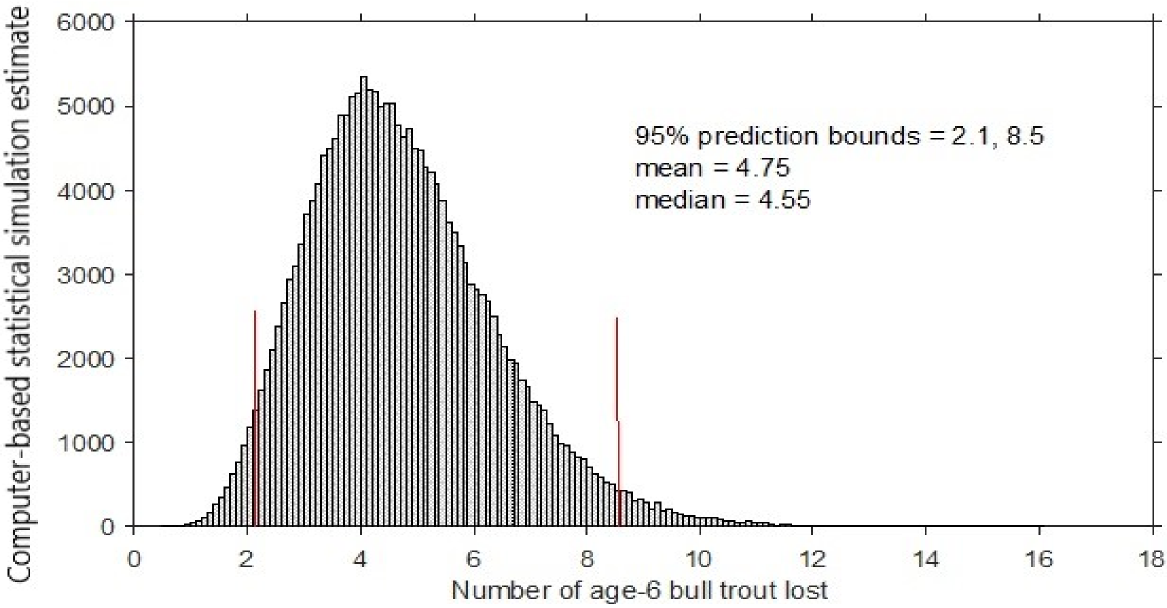


Figure 17 is a histogram of the predicted number of the entrained age-2 and age-3 bull trout that would have survived to age 6, had they remained in the St. Mary River

Shutdown of the Diversion Dam and headworks is in reverse sequence, with the headgates closed incrementally to allow the water to drain from canal and then the sluicegates will be raised. During the non-irrigation season the St. Mary River water is allowed to pass through the sluiceway unimpeded. Repairs at the diversion dam and headworks may include concrete repairs of the diversion dam, gate repairs at the headworks and on the sluiceway, and concrete repairs of the headworks. During the non-irrigation season passage is possible due to the removal of the sluicegates and entrainment no longer occurs.

Our assessment of the possible effect of entrainment losses on the bull trout population was mainly hypothetical because of uncertainties in the parameters affecting the population's dynamics. The best entrainment data available shows that 207 bull trout were entrained over the course of a five-year period (2002 - 2006) with inconsistencies among the years. This is a loss to the bull trout population that has been occurring since the St Mary Unit has been in operation. There is a lot we don't know on the population effects of entrainment and total mortality. To understand this better, Kaeding (2016) noted that; ideally, such studies would be conducted under an experimental framework, which, for example, would allow for the measured entrainment and loss of bull trout from the population over a period of years, followed by a similar period of no entrainment loss.

In summary, effects of O&M to bull trout at the St. Mary Diversion Dam and Headworks are:

- Potential harm to bull trout if ice removal from around the sluicegates is accomplished from directly in the river channel, causing disturbance, and slight amounts of turbidity.

- Upstream passage of pre-spawning adult bull trout is partially blocked (some fish can jump the diversion under certain conditions, while others cannot) causing harm during irrigation season, impacting upstream populations.
- Bull trout can move upstream and downstream past the diversion dam during the non-irrigation season primarily through the sluicegates. At times, velocities through the sluicegates can be a hinderance to upstream passage.
- Of the 207-bull trout captured over the course of 5 years during the entrainment study, most were juveniles (104-228 mm), three were sub-adult (357-393 mm) and two were adults (465 and 554 mm). It's been estimated that 471-661 bull trout are entrained annually. Regardless of age, these fish were lost to the population after being entrained.

St. Mary Canal

Spring opening of the canal is dependent on the severity/snowpack conditions of the previous winter. If there is an abundance of snow the canal must be trenched with heavy equipment to allow water passage. Cleanout of each of the C-10 gates (canal drains) is completed and each gate is closed. All the siphons are inspected, and the drain valves are closed. Regular monitoring occurs to safeguard against ice removal once the headworks are opened and water has started flowing in the canal. Again, the opposite procedures occur upon fall shutdown of the canal. Repairs at the canal may include vegetation control along the canal, landslide repairs along the canal, concrete repairs at Kennedy Creek siphon, concrete repairs at St. Mary and Hall's Coulee Siphons, repairs of the steel siphons (including; welding repairs, expansion joint repairs, section replacement etc.), and concrete repairs or replacement of the drop structures.

Diversion to the canal causes entrainment of bull trout and other aquatic organisms, including bull trout forage species (these effects have been analyzed and discussed above). Once entrained, the fish either reside in the canal during the irrigation season or are transferred to the North Fork Milk River via the canal. Although a few of the fish that remain in the canal may overwinter in one of the many pools that exist along its length, most are believed to perish once the canal is dewatered at the end of the diversion period. Because of the high velocities through the canal headgates during operation and the closed position of the gates during the non-irrigation season, the headgates act as a barrier, preventing the return of entrained fish to the river.

At the end of the irrigation season or once storage levels in Lake Sherburne Reservoir are low or St. Mary Canal diversions are shut off for the season, releases from the reservoir are shut off unless additional water is needed based on the BWT.

In summary, effects of O&M to bull trout at the St. Mary Canal are:

- A few of the fish that remain in the canal may overwinter in one of the many pools that exist along its length, most are believed to perish once the canal is dewatered at the end of the diversion period. Because of the high velocities through the canal headgates during operation and the closed position of the gates during the non-irrigation season, the headgates act as a barrier, preventing the return of entrained fish to the river. All entrained bull trout in the St. Mary main canal are considered lost to the system, therefore there would be no additional effects from O&M activities occurring in the canal.

Weed and Vegetation Removal

The St. Mary Unit minimizes the use of herbicides to control weeds under an Integrated Pest Management Plan (IPMP) required by Reclamation policy. Approval of the IPMP requires the use of Environmental Protection Agency-registered pesticides in accordance with product labeling. Noxious weed control is provided by Glacier County, in accordance with the IPMP and Montana noxious weed laws. The majority of noxious weed control is along the canal. The control of woody plants is accomplished by mechanical means. There are no direct effects to bull trout as a result of these actions. Indirect effects would include human presence.

Minimization Measures

Reclamation is committed to minimizing the impact of incidental take of bull trout resulting from the Project and will investigate and potentially implement minimization measures for both the current 2020 irrigation season and a longer-term period of 2-5 years. Immediate minimization measures are measures that are intended to be implemented during the 2020 irrigation season. Reclamation will organize a dual-agency team (Reclamation and the Service) of engineers and biologists to identify potential tangible minimization measures that can be reasonably implemented during the 2020 irrigation season. The intent of these minimization measures is to minimize the effect and extent of bull trout entrainment. These measures or options still need to be evaluated, they could include, but are not limited to, canal salvage (e.g., netting and electrofishing), the installation of lights at the headworks, and/or other method to discourage the entrainment of bull trout.

Longer term minimization measures spanning a 2-5-year timeframe will require more detailed investigation and analysis. Depending on the measure, these types of options would likely not be implemented until the 2021 irrigation season at the earliest. Reclamation is committed to convening a dual-agency team (Reclamation and the Service) of engineers and biologists by June 1, 2020 and strongly committed to developing classes or concepts of alternatives for the 2-5-year timeframe. The alternatives will be evaluated with the main objective of minimizing the impact of incidental take of bull trout resulting from the Project. Potential minimization measures would include a menu of options to reduce impacts to bull trout related to the St Mary Unit. When considering minimization measures, Reclamation will consider impacts to the operation and safety of the Project, costs to water users, and the actual effectiveness of proposed measures.

Additional minimization measures include:

- Removal of the St. Mary Diversion Dam sluicegates shortly after headgates to the St Mary Canal are closed for the season. Reclamation will attempt to remove the sluice gates within one week of diversions being stopped.
- Prior to any Lake Sherburne Dam downstream outlet works or stilling basin maintenance activities occurring; Reclamation will attempt to conduct bull trout salvage activities to minimize the effect and extent of incidental take.
- Installation of additional PIT detection stations near the St Mary headworks and canal to provide further knowledge on the number of bull trout being entrained. This information would be used by the dual-agency team (as described in the paragraphs above) to further develop minimization measures to reduce the effects of entrainment. These additional PIT

stations would be installed over the next two years and would be located at sites decided upon by the dual-agency team.

- Lake Sherburne Dam fall shutdown procedure with a "staged down" approach and fish salvage to reduce the impact to bull trout. Both of these items are currently listed in the proposed action and Reclamation will continue to implement.

Effects Determination – Bull Trout

The continued O&M (Proposed Action) at the St. Mary Unit **may affect, likely to adversely affect bull trout**.

Rationale:

- The outlet works at Lake Sherburne Dam and Reservoir retain water after seasonal shutdown. There is a chance that bull trout would be present. During fall shutdown and prior to winter O&M activities Reclamation and the Service would salvage stranded bull trout.
- Reclamation through the operational change and "staged-down" release from Lake Sherburne Dam (opposed to sudden stoppage of flow) has encouraged bull trout to move downstream and away from Lake Sherburne Dam reducing the incidence of stranding.
- Bull trout capture and relocation downstream to the nearest suitable and connected habitat in Boulder Creek would save fish. Salvaged bull trout are being handled, but salvage is considered a benefit by keeping reproductive adults in the population.
- Canyon Creek's hydrograph and flows have created a large well-developed, deep sediment delta with braided stream channel. This braided stream channel begins above the high water mark of Lake Sherburne Reservoir and continues as the reservoir recedes through normal operations. The inherent flow conditions in Canyon Creek and the channel braiding may impede fish movement regardless of reservoir levels.
- Potential harm to bull trout if ice removal from around the sluicegates is accomplished from directly in the river channel, causing disturbance, and slight amounts of turbidity.
- Upstream passage of pre-spawning adult bull trout is partially blocked (some fish can jump the diversion under certain conditions, while others cannot) during irrigation season, impacting upstream populations.
- Of the 207-bull trout captured over the course of 5 years during the entrainment study, most were juveniles (104-228 mm), three were sub-adult (357-393 mm) and two were adults (465 and 554 mm). It's been estimated that 471-661 bull trout are entrained annually.
- A few of the fish that remain in the canal may overwinter in one of the many pools that exist along its length, most are believed to perish once the canal is dewatered at the end of the diversion period. Because of the high velocities through the canal headgates during operation and the closed position of the gates during the non-irrigation season, the headgates act as a barrier, preventing the return of entrained fish to the river. All entrained bull trout in the St. Mary main canal are considered lost to the system, therefore there would be no additional effects from O&M activities occurring in the canal.

Terrestrial Species

The grizzly bear, Canada lynx, and wolverine are terrestrial mammals that may occupy the Action Area. As noted previously, the St. Mary Unit lies within the crossroads of the Great Plains and Northern Rocky Mountain ecosystems, providing a vast array of physical and biological features. Topography, hydrography, soils, climate, and disturbance largely dictate vegetative patterns that produce habitat for terrestrial wildlife. Areas of complex habitat diversity, as found in the Action Area provide for greater wildlife species diversity and tend to be more resilient to disturbance. Habitat diversity facilitates wildlife movement between varying conditions that are necessary for the support of various life-cycle stages.

Grizzly Bear (*Ursus arctos horribilis*), Threatened

The grizzly bear (*Ursus arctos horribilis*) was listed as a threatened species in 1975 (40 FR 31736) in the conterminous 48 States. A Recovery Plan was approved in 1982 and identified five ecosystems with known populations. They are the Northern Continental Divide, Greater Yellowstone, Cabinet /Yaak in Montana, and the Selkirk (Idaho and Washington), and Northern Cascades (Washington). The Bitterroot in Idaho represents a sixth possible population.

The Action Area lies within the Northern Continental Divide Ecosystem (NCDE). The NCDE specific Grizzly Bear Recovery Plan was most recently updated in 2018 (Supplement: Habitat-based Recovery Criteria for the Northern Continental Divide Ecosystem). Critical Habitat has not been designated, instead, the Interagency Grizzly Bear Committee (IGBC) issued habitat management guidelines within all occupied grizzly bear habitat (GB USFWS 2011).

At the time the grizzly bear was listed (1975) the Service identified habitat destruction, modification, and range curtailment as major contributing factors leading to the listing as a threatened species. Causes were listed as increased trail and road construction, recreational use, livestock grazing, human caused mortality, and lack of population/genetic analysis. Since 1975, habitat protection measures have focused primarily on providing secure habitat for bears to minimize the opportunity for human caused mortality. Implementation of management efforts across Federal, State, and Tribal lands were developed to aid in recovery and conservation and reduce threats to bears.

General Species Information

Grizzly bears are long-lived, opportunistic omnivores whose food and space requirements vary depending on a host of environmental and behavioral factors and on the variation in the experience and knowledge of each individual bear. Grizzly bear home ranges overlap and change seasonally, annually, and with reproductive status (GB USFWS 2018).

The grizzly has a broad range of habitat tolerance. Contiguous, relatively undisturbed mountainous habitat with a high level of topographic and vegetative diversity is characteristic of most areas where the species can be found (GB USFWS 1993). Grizzly bear density and the number of bears that can live in an ecosystem depends on the overall habitat productivity, quality and quantity of food sources, and the level and types of human activities present (Recovery Plan 2018). Large roadless areas are ideal as year-round grizzly habitat, although transient bears are known to wander into human populated areas. The search for food has a prime influence on grizzly bear movements.

Generally, grizzly bears den by late October to mid-November and emerge in March to mid-April; typically spending 5 to 6 months a year in dens. Females with young are usually the first to enter dens and the last to emerge in the spring, while males usually are the last to enter and the first to emerge in the spring (Dood, et al. 2006). In general, grizzly habitat requirements are determined by large spatial needs for omnivorous foraging, winter denning, and security cover. Basic Habitat Requirements:

- Grizzly bears den by late October to mid-November and emerge in mid-March to Late April.
- Hiding cover for grizzly bears is vegetation that provides visual screening capable of obstructing 90% of an adult grizzly bear from view at 200 feet.
- Grizzly bears are opportunistic omnivores that can survive in a variety of habitats and utilize a range of foods. Major food sources utilized by bears include a variety of vegetative foods, insects, ungulates, and various berries.

Numerous studies and reports (best available science at the time of publication) have been prepared that address the status of the grizzly bear within the NCDE since 1975. Therefore, history and basic biology of the grizzly bear will not be discussed in depth in this BA.

Recovery Plan and Conservation Strategy

The first Grizzly Bear Recovery Plan was approved in 1982, then in 1993 habitat-based recovery for the NCDE population of grizzly bears was approved. Supplements to the Recovery Plan were approved in 1997, 1999, and 2018 (GB USFWS 2018). The development of the Conservation Strategy began in 2009 and subsequentially updated to reflect new information and provide measurable objectives (NCDE Subcommittee 2018).

The 2019 Conservation Strategy for the Grizzly Bear in the NCDE was updated based on population modeling with updated vital rates in order to establish survival and mortality thresholds. The Conservation Strategy does not go into effect until the NCDE grizzly population has been delisted from the ESA; however, it provides more updated guidance on grizzly bear management with refined objectives.

The revised objectives provide for a consistent method of monitoring bear populations within the Demographic Monitoring Area (DMA). Information from the 2018 NCDE Grizzly Bear Population Monitoring Team Annual Report (NCDE Subcommittee 2018) was utilized to estimate population trends. Objectives and results are as follows:

- Objective 1: Maintain a well-distributed grizzly bear population within the DMA.
- Results:
  - Occupancy threshold met: The 2018 annual grizzly bear monitoring report for the NCDE verified presence of reproductive females within 18 of 23 BMUs (78%) and within 7 of 7 supplementary BMUs (100%). For the 6-year period 2013–2018, all BMUs

were occupied by females with offspring, thus exceeding the objective of 21 of 23 BMUs occupied.

- Occupancy threshold met: Using all verified grizzly bear locations during 2009–2018, the estimated area of occupied range for the NCDE grizzly bear population is approximately 24,600 mi^2 (63,800 km^2) of which 36% occurred outside of the DMA. Using the same methods to estimate occupied range during previous years, the current distribution represents a 42% increase from 2004 and a 25% increase from 2010.

- Objective 2: Manage independent female survival and independent male and female mortalities from all sources to support a 90% or greater estimated probability that the grizzly bear population within the DMA remains above 800 bears, considering the uncertainty associated with all demographic parameters.
- Results:
  - Independent female survival threshold: For the 6-year period 2013–2018, an annual survival rate was estimated to be 0.93 for independent females within the DMA, which meets the minimum threshold rate of 0.93
  - Independent female mortality threshold: During 2013–2018, the 6-year average of total reported and unreported (TRU) mortalities for independent females within the DMA was 15, which falls below the maximum threshold of 22.
  - Independent male mortality threshold: The 6-year average for independent males was 20, falling below the maximum threshold of 28.

- Objective 3 -Monitor demographic and genetic connectivity among population.
- Results:
  - Zone 1 Occupancy Units (OU) were demarcated using established political boundaries (i.e., State/tribal boundaries and Montana Fish Wildlife & Parks regional boundaries) and the boundaries of the two Demographic Connectivity Areas (PCA and Zone 1). Similarly, all OUs were occupied during the last six years, exceeding the objective of 6 of 7 OUs occupied. Full occupancy of the PCA has been documented each year since 2010 and full occupancy of Zone 1 has been documented each year since 2013(NCDE Subcommittee 2018).
  - There are several verified reports of grizzly bears outside of the known occupied range of the NCDE and GYE populations between 2009-2018.

Summary of findings: Using a six-year running tally, the threshold of 21 of 23 BMUs occupied was met each year beginning in 2006, and the threshold of six of seven OUs was met each year since 2009. Full occupancy of all 23 BMUs has been documented each year since 2010, and full occupancy of all seven OUs has been documented each year since 2013 (NCDE Subcommittee 2019). Grizzly bears are well documented throughout the NCDE recovery zone. Based on documented conflicts and mortalities, it is known that grizzly bear range has expanded outside the recovery zone boundaries to the east of the NCDE.

The NCDE contains substantial acreage of inventoried roadless areas. These roadless areas, as well as certain other lands that have little or no permanent human presence or road development, are well distributed throughout the NCDE. Inventoried roadless areas contribute to secure habitat for grizzly bears.

Population Status and Distribution in the Action Area

The environmental baseline for grizzly bears is limited to the Action Area and how the effects of past and ongoing human and natural factors provide a fixed point, or "snapshot" of the current condition of the species. As noted previously, naturally occurring events such as flooding, and fires have altered the vegetation and landscape in the Action Area. Human manipulation caused by the original construction of the St. Mary Unit directly changed the landscape of the Action Area. This coupled with adjacent activities at GNP, the Blackfeet Reservation, and private development have changed habitat conditions for grizzly bears.

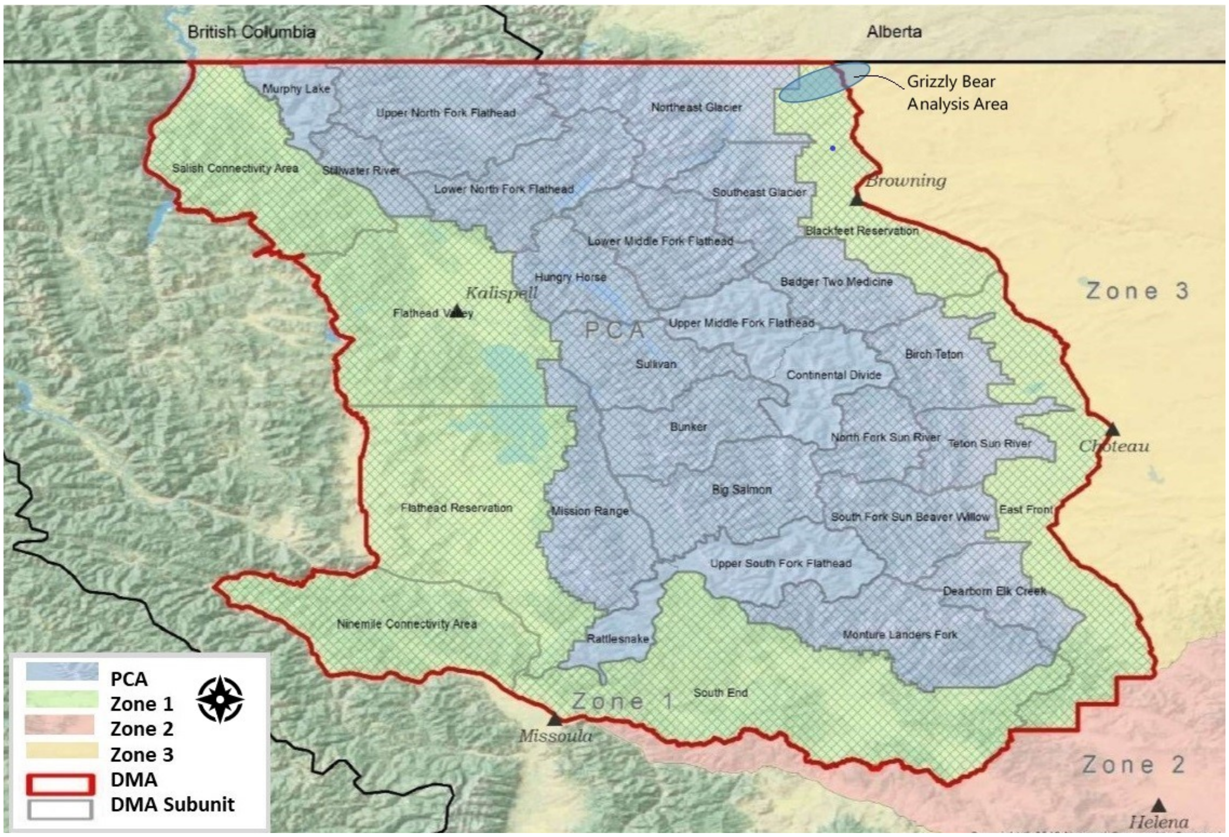
The analysis area for grizzly bear consists of rugged mountain topography shaped by glaciation (GNP); the mountains abruptly transition to short-grass prairie and savanna habitats (Blackfeet Reservation). The St. Mary Unit (Action Area) is located within the transition zone, thus providing a variety of habitat types. Grizzly bears are well distributed throughout the NCDE and this population is contiguous with grizzly bears in Canada resulting in high genetic diversity.

- NCDE- Northern Continental Divide Ecosystem; one of five ecosystems that support populations of grizzly bears.
- PCA-Primary Conservation Area /Recovery Zone; the area in each grizzly bear ecosystem within the population and habitat criteria for achievement of recovery is measured.
- BMU- Bear Management Unit is an area large enough to meet the yearlong habitat needs of both male and female grizzly bears.
- BMU Subunits represent the approximate size of a female grizzly bear's annual home range, used for localized population analysis.
- DMA- Demographic Monitoring Area; an area established to monitor the population trend of grizzly bears, consists of the PCA, plus Zone 1. Three zones are identified as follows:
    - Zone 1: Green -Buffer zone around the PCA, and within the DMA.
    - Zone 2: Pink -Area of potential genetic connectivity between the NCDE and the Greater Yellowstone Ecosystem (GYE) population of grizzly bears.
    - Zone 3: Orange -Area occupied by bears but does not provide habitat linkage to other populations.

For purposes of this BA, the Northeast Glacier Bear Management Unit (BMU), the northern extent of zone's 1 and 3 from St. Mary, Montana to the Canadian border population of grizzly bears will be examined. The Northeast Glacier BMU is located within the NCDE primary conservation area (PCA). Furthermore, Lake Sherburne Reservoir, Lake Sherburne Dam, and the St. Mary Diversion facilities are located within the PCA for grizzly bears. The St. Mary Canal extends across Zone 1, and a portion of Zone 3.

Outside of the recovery zone, most of Zone 1 and parts of Zones 2 and 3 are occupied by grizzly bears (NCDE Subcommittee 2019). Both males and females are becoming increasingly common along streams and in shrubby draws to the east of the recovery zone boundary along the Rocky Mountain Front. Three female grizzly bear dens have been documented in short-grass prairie habitat along the eastern front of the Rocky Mountains (R. D. Mace & Roberts, 2014 in Costello et al. 2016).

Figure 18. Grizzly Bear Monitoring Areas



The PCA represents the core habitat for grizzly bears in the NCDE and is expected to support the highest densities of bears. It is managed as a source area where the objectives are continual occupancy by grizzly bears and maintenance of habitat conditions that are compatible with long-term population stability. It is mostly comprised of public land (85%) and is the area where the most conservative habitat protections apply. This core habitat is defined as an area of the PCA that is more than 0.31 miles (500 meters) from a route open to wheeled motorized use during the grizzly bear non-denning season(April 1- November 15), or a gated route, and that is greater than or equal to 2,500 acres (3.91 mi2 , 10.12 km2) in size. According to this definition there is 'secure core habitat' for grizzlies adjacent to the Action Area.

The Grizzly Bear Monitoring Team was established in 2004 as part of the Conservation Strategy to better understand the population trend of bears in the NCDE. Population size during 2004 was estimated to be 765 bears (Kendall et al. 2009). As of 2018, the population was estimated to be 1,029 grizzly bears (USFWS 2018). Grizzly bears are well distributed throughout the PCA and occur within Zone 1 surrounding the PCA (Costello et al. 2016). Zone 1 experiences occupancy by grizzly bears but at lower densities than within the PCA. There are documented accounts of grizzly bears within all zones of the Action Area (Figure 19-Table 7) (MTNHP 2019).

Figure 19. Grizzly Bear Status in the Action Area

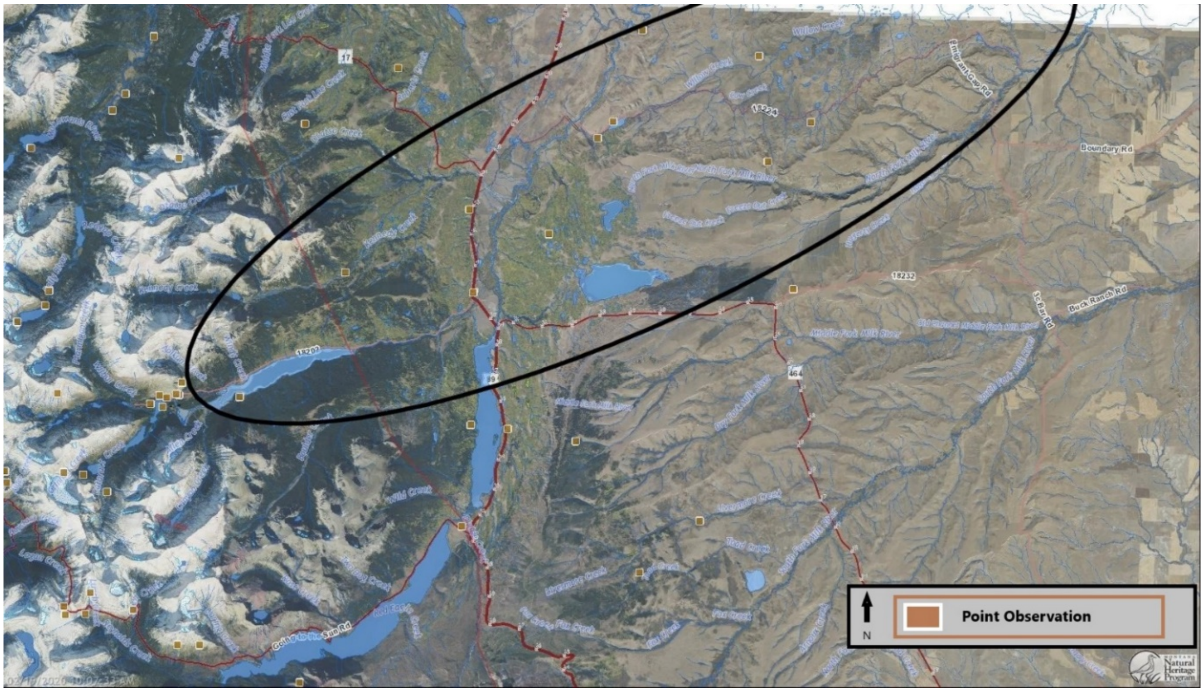


Table 7. Recorded Grizzly Bear Observations

Grizzly Bear Sightings in the NDCE	Grizzly Bear Sightings* in the Action Area		
In 2018 the Service estimated, a population of approximately 1029 bears occurs within the NCDE. A total of 1380 observations have been catalogued by MTNHP in and around this area observations include animals, animal sign, and harvest reports). The dates of these observations are summarized for this entire region as follows:	**Date**	**Location**	**Sex**
	9-16-1971	Hudson Bay Divide	M
	7-01-1973	Yellow Mtn/Kennedy Creek	M
	9-01-1973	Yellow Mtn/Kennedy Creek	F
	9-18-1974	Yellow Mtn/Kennedy Creek	M
	9-20-1974	Duck Lake	M
1970-2019	9-20-1993	Spider Lake	M
Pre-1970 = 105 observations	4-27-1994	Lake Sherburne	U
1970s = 218 observations	1-01-1998	Babb	F
1980s = 216 observations	8-3-1998	North of Babb	M
1990s = 444 observations	9-09-1998	Hall Coulee	M
2000s = 299 observations	9-09-1998	Hall Coulee – NE of Duck Lake	M
2010s = 98 observations (current to July 2019)	10-14-1998	Spider Lake	F
Total =1,380	4-11-2000	Babb	M

*This includes only those sightings that were officially reported and recorded in the MTNHP database. It is likely that many grizzly bear sightings on the Blackfeet Reservation are not recorded or reported.

Consequences of the Action- Grizzly Bears

Upon emergence from the den, bears move considerable distances from high, snow-covered elevations to lower elevations to reach palatable, emerging vegetation on avalanche chutes, or to feed on winter-killed or weakened ungulates on foothill winter ranges. This type of movement often occurs on the Rocky Mountain front region of Montana. Such movement of bears to lower elevations often takes them near areas of human habitation and may increase the incidence of human/bear conflicts. It is likely that bears would emerge and move to lower elevations as operations at the St. Mary Unit are starting each spring.

Temperature and precipitation influence a wide array of natural processes. These processes in turn affect the vegetation and animal species that comprise the diets of grizzly bears, which ultimately provide an important measure of habitat quality. Human activities and landscape features also influence grizzly bear habitat quality, including forest and road management, development, recreation, and agricultural and livestock management. Collectively these natural and anthropogenic influences will spatially shift through time as temperature and precipitation change and human populations grow and expand their footprint (Ransom et al. 2018).

The likely period that bears would be disturbed by O&M activities would be March through November. Grizzly bears are known to seasonally use the riparian corridor associated with both the St. Mary Canal and the St. Mary River. Grizzly bears could occur in the Action Area during the required O&M activities, such as removal of brush, trees and shrubs from canal embankments.

Direct effects of the continued O&M at the St. Mary Unit would include disturbance to any bears that may be in the vicinity of project related activities, and avoidance of those areas during O&M activities. It is assumed that sights and sounds, including vehicles, equipment, and personnel would be perceptible to bears that may be within the Action Area, causing them to leave. Avoidance would be reasonably certain to occur as a result of O&M activities.

Indirect effects of the continued O&M at the St. Mary Unit include the overlap of human /grizzly bear habitat. Grizzly bears generally avoid humans; the occupied habitat of the two species has relatively little overlap at the landscape scale; however, humans travel, recreate, introduce non-native species, develop and harvest resources in grizzly bear habitat.

Reclamation staff regularly accesses the St. Mary Unit to adjust gate settings and complete other required O&M activities (Proposed Actions). It is known that anthropogenic food, garbage, and other attractants associated with resource management activities increase the risk of grizzly bear mortality. Reclamation is bear aware and follows mandatory food storage requirements.

Cumulative effects would include current non-Federal actions such as recreational activities, state and county road maintenance, utility corridor maintenance, grazing and timber removal on tribal lands. Large scale bison fencing on private lands has the potential to create wildlife migration barriers that effect grizzlies and ungulates in the Action Area (T. Tabor, personal conversation). These activities on private lands are expected to continue whether or not continued O&M activities occur.

Effects Determination – Grizzly Bear

The continued O&M (Proposed Action) at the St. Mary Unit **may affect but is not likely to adversely affect** grizzly bear.

Rationale:

- Impacts on grizzly bear will not be sufficient to preclude both the survival and recovery of the population as a whole.
- Baseline conditions of the habitat and connectivity will be maintained. Vegetation control/removal would be limited to within the footprint of the St. Mary Unit. There would be no change to the ecological system that would result in long-term habitat alteration.
- There is no anticipated harm of grizzly bear as a result of O&M actions within the footprint of the St. Mary Unit.
- Associated O&M activities (long term) are located within the PCA, Zone 1, and Zone 2 for grizzly bears. It is likely that a bear could be found within these areas.
- Noise and disturbance associated with O&M activities have the potential to extend 500-feet outward from the project footprint. At this distance it is likely that grizzly bears in the area would perceive the noise and likely leave the area.
- No new permanent roads or structures would be constructed or removed within the footprint of the St. Mary Unit. There will be no expansion of the current St. Mary Unit footprint.
- O&M activities would be consistent with SOPs for the St. Mary Unit. There would be no change in land use.
- O&M activities would comply with Reclamation Policies, Directives, and Standards, as well as State of Montana laws, and Tribal regulations.

Conservation Measures

To ensure there are no adverse effects to grizzly bears all Reclamation staff and contractors would be required to comply with the Blackfeet Nation, Fish and Wildlife Code Chapter 4 – Bears (Blackfeet Code 2018), and Administrative Rules of Montana, Rule 12.8.806 Food Storage.

Canada Lynx (*Lynx canadensis*)-Threatened

The Canada lynx (*Lynx canadensis*), was listed as a threatened species in 2000 (65 FR 16052) for the contiguous U.S. Distinct Population Segment (DPS). The Service concluded that the population was threatened by human alteration of forests, low numbers as a result of past overexploitation, expansion of the range of competitors and elevated levels of human access into lynx habitat. Critical habitat for the species was designated in 2006 and revised in 2014. The 2014 Final Rule (79 FR 177) excluded all Tribal lands on the Blackfeet Reservation from critical habitat designation. However, adjacent lands within GNP are included as critical habitat for the Canada lynx.

General Species Information

Basic biology of the Canada lynx will not be discussed in full detail in this BA. Rather, the effects of the Proposed Action as they relate to essential behaviors/requirements of the lynx such as habitat connectivity, home range, known occupancy, the available habitat that may support them within or near the Action Area, and critical habitat will be examined. For basic information on the lynx, refer to the following sources of information:

Canada lynx critical habitat: https://www.fws.gov/mountain-prairie/es/species/mammals/lynx/criticalhabitat.htm

The Service, Mountain Prairie Region at: https://www.fws.gov/mountain-prairie/es/canadalynx.php

Montana Field Guide: http://fieldguide.mt.gov/speciesDetail.aspx?elcode=AMAJH03010

Montana Natural Heritage Map Viewer: http://mtnhp.org/mapviewer/

Recovery Plan and Conservation Strategy

The 2013 Lynx Conservation Assessment and Strategy identify a number of human-caused influences that could affect lynx and lynx habitat (Interagency Lynx Biology Team 2013). These actions include a first "tier" of climate change, vegetation management, wildland fire, and habitat fragmentation, and a second tier that includes incidental trapping, recreation, mineral/energy exploration and development, illegal shooting, forest/backcountry roads and trails, and domestic livestock grazing (Interagency Lynx Biology Team 2013). Within the Action Area the risk factors are climate change, habitat fragmentation, recreation, mineral/energy exploration and development, illegal shooting, backcountry roads and trails, and domestic livestock grazing.

Population Status and Distribution in the Action Area

The Action Area, for purposes of analyzing effects to lynx, located on the east side of the Continental Divide consists of rugged mountain topography shaped by glaciation (GNP); the mountains abruptly transition to short-grass prairie and savanna habitats (Blackfeet Reservation). The St. Mary Unit is located within the transition zone, thus providing a variety of habitat types. The upper confines of the St. Mary Unit, above Lake Sherburne Reservoir provides some habitat, and lynx are known to use this area.

The population that occurs in the Action Area is within Unit 3- Northwestern Montana/Northeastern Idaho (USFWS 2005) core area, Rocky Mountain Front section (M332C): This section is located east of the Continental Divide in Montana. Climate is cold, with severe chinook winds and dramatic winter temperature fluctuations. Elevations within Unit 3 range from 5,500 – 8,500 feet (1,680 – 2,600 m); falling within the desired elevation zone (Ruediger et al. 2000). Subalpine fir forests are the primary vegetation, and intermixed Engelmann spruce and moist Douglas-fir habitat types where lodgepole pine is a major seral species are secondary vegetation that may contribute to lynx habitat (Ruediger et al. 2000).

Currently, this unit is thought to be capable of supporting 200-300 resident lynx. How the current population compares to historical conditions is uncertain, but there is no evidence that this unit historically supported a larger resident population or a substantially broader distribution of habitat capable of doing so. Lynx habitats in this unit are naturally patchy and fragmented due to topography and elevational and moisture (aspect) constraints (USFWS 2017 SSA).

Canada Lynx avoid large openings but often hunt along edges in areas of dense cover (Ruediger et al. 2000). When inactive or birthing, they occupy dens typically in hollow trees, under stumps, or in thick brush. Den sites tend to be in mature or old-growth stands with a high density of logs (Koehler 1990, Koehler and Brittell 1990). Canada Lynx require cover for stalking and security, and usually do not cross openings wider than 109 yards (100 m) (Koehler and Brittell 1990).

Home ranges of the lynx vary in size, depending on the gender of the animal, abundance of prey, season, and the density of the lynx population in a given area. Lynx density, home range size, dispersal patterns, reproductive parameters, and survival rates are strongly correlated to snowshoe hare abundance (Ruediger et al. 2000)

Risk factors specific to the Northern Rockies that may affect lynx productivity include timber management, fire suppression, livestock grazing, recreational use. Factors affecting mortality include incidental trapping, predator control, predation (mountain lions, wolves), competition (coyotes), and vehicle collisions. Risk factors that impede movement include travel ways and development – private land development, especially along road corridors in mountain valleys, may fragment habitat and impede movement by lynx (Ruediger et al. 2000). Large-scale risk factors to lynx include fragmentation and degradation of refugia, movement and dispersal across shrub-steppe habitats (periodical occurrence), and habitat egradation by non-native plant species (Ruediger et al. 2000).

Climate change is identified as a potential stressor to Canada lynx and snowshoe hare populations and their habitats. Climate change is largely based on uncertainties, assumptions, and projections. Based on climate_model projections for Montana, we can anticipate temperatures to increase up to 2 degrees 2 degrees in the next 50-years and an increase of over 10 degrees in the next 100 years (Whitlock, et al. 2017).

Figure 20. Canada Lynx Status in the Action Area

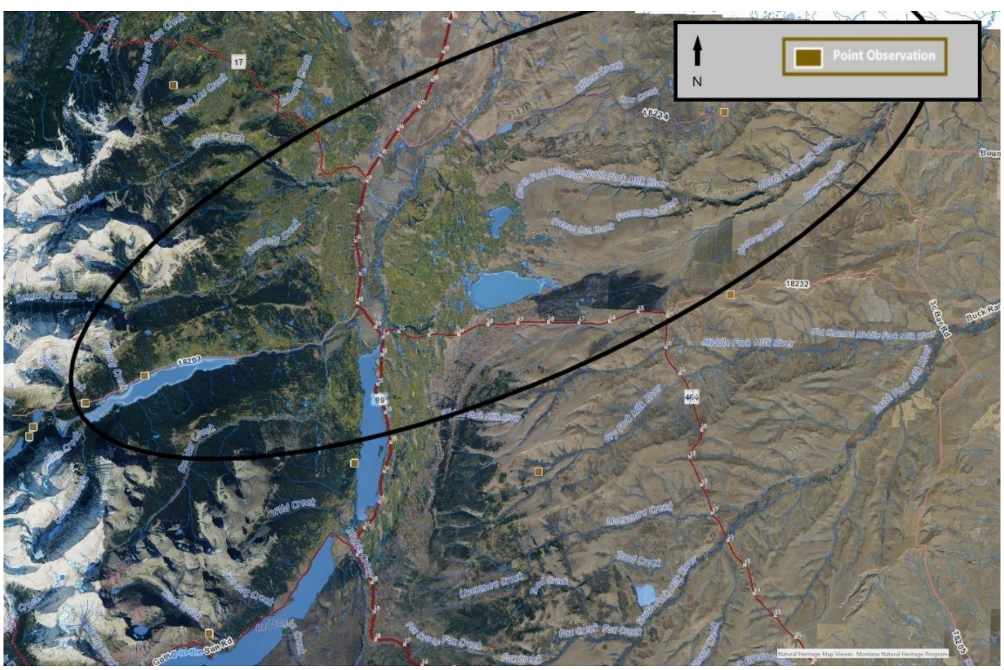


Figure 20 shows locations where Canada lynx have been observed in the Action Area; Table 8 provides a description of those observations.

Table 8. Canada Lynx Observations in the Action Area

Date	Location	Count	Sex
12-01-1984	Hudson Bay Divide	1	Undetermined
3-12-1996	Many Glacier Rd.	2	Undetermined
10-14-2000	Many Glacier Rd	1	Undetermined

* Information retrieved from Montana Natural Heritage Program- includes only recorded sightings.

Critical Habitat

Primary constituent elements (PCEs) of critical habitat are those specific elements of the physical or biological features that provide for a species' life history processes and are essential to the conservation of the species. The PCE identified in the Federal Register (79 FR 54782) specific to lynx in the contiguous U.S. is:

1. Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:
    a. Presence of snowshoe hares (*Lepus americanus*) and their preferred habitat conditions.
    b. Winter snow conditions that are generally deep and fluffy for extended periods of time.
    c. Sites for denning that have abundant coarse woody debris.
    d. Matrix habitat that occurs between patches of boreal forest at the scale of a lynx home range, such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Consequences of the Action – Canada Lynx

Lynx sightings have been recorded in the Action Area, primarily near Lake Sherburne Reservoir at higher elevations. It is likely that lynx utilized this area prior to the dam construction and inundation and continue to use it in current times, under current conditions. However, due to the limited presence of lynx in the Action Area, their wide-ranging nature, and Proposed Actions taking place in areas of regular human presence (GNP), disturbance and avoidance is not expected to be significant.

Although the proposed activities would be contained within an area of existing development and human presence, the level of noise disturbance associated with these activities would be slightly elevated in comparison to the existing impacts (no human presence). Long-term use of the St. Mary Unit and surrounding area including human activity levels and types of activities would remain the same as they have been for 100 years. As a result, there would be no change to lynx denning activities or habitats across the landscape in relation to the long-term use of the St. Mary Unit facilities.

Indirect effects to Canada lynx include human presence (GNP visitors)- including noise and visual harassment, change in species competition (competition for snowshoe hare), and other activities that would include external stressors to Canada lynx.

Cumulative effects would include current non-Federal actions such as recreational activities, state and county road maintenance, utility corridor maintenance, grazing and timber removal on tribal lands, and various other uses of private land that are expected to continue whether or not continued O&M activities occur. Timber harvest or habitat manipulations could occur on tribal lands, but this is a minor portion of the cumulative effects area.

Effects Determination – Canada Lynx

The Continued O&M (Proposed Action) at the St. Mary Unit would have **no effect** on Canada lynx.

Rationale:

- There is no anticipated harm of Canada lynx as a result of O&M actions within the footprint of the St. Mary Unit.
- Baseline conditions of the habitat and connectivity will be maintained.
- Direct, indirect, and cumulative effects of the continued O&M would be discountable.
- Areas currently capable of providing foraging habitat are not proposed for any type of treatment or removal of vegetation.
- The continued O& M would not result in changes to ecological systems resulting in altered predator/prey relationship
- There are very few actual lynx occurrence records in the Action Area – the majority of which are at the western most end of Lake Sherburne Reservoir where O&M activities do not occur.
- The continued O&M at the St. Mary Unit would not increase the Project footprint or human presence in the Action Area.

Effects Determination Critical Habitat

The continued O&M (Proposed Action) at the St. Mary Unit would have **no effect** on Canada lynx critical habitat.

Rationale:

- There would be no destruction or adverse modification to critical habitat for lynx.
- There would be no direct or indirect alteration of critical habitat for the lynx.
- PCEs of critical habitat for lynx would not be affected by continued O&M at the St. Mary Unit.
- No new construction or major modifications are proposed in the Action Area, therefore there would be no additional fragmentation of habitat or degradation of refugia.
- The only vegetation removal in the Action Area pertains to areas around St. Mary Unit facilities where this action has occurred over the past 100 years. The type of vegetation that

is removed does not provide levels or type of habitat required by lynx. In addition, this type of vegetation would not support snowshoe hare populations.

Wolverine (*Gulo gulo luscus*)- Proposed

The Wolverine (*Gulo gulo luscus*) was proposed for listing as a threatened species in 2013 (79 FR 156) for the North American DPS occurring in the contiguous U.S. This decision was largely based on projected climate change. Since the proposed listing there has been much scientific disagreement regarding the sufficiency or accuracy of the available data relevant to the decision. In 2014 the Service determined that wolverine does not warrant protection under the ESA and that future effects of climate change on species are uncertain. In 2016 The United States District Court for the District of Montana overturned the decision to withdraw the 2014 proposal to list the wolverine as threatened, remanding the decision back to the Service for further consideration.

The 2013 Draft Recovery Outline for the North American Wolverine DPS provides an interim strategy to guide conservation and recovery of the species. Currently there is not critical habitat designation for the wolverine. Recovery needs for the wolverine DPS include:

1. Monitoring of wolverine presence, numbers, and genetic health range-wide at a scale informative to management.
2. Reducing human-caused mortality of wolverines.
3. Working cooperatively to facilitate continued wolverine expansion in occupied areas, and expansion to isolated areas of suitable habitat.
4. Continued research into possible human impacts to wolverines and their habitat to ensure that human activities remain non-threatening.

Since the wolverine is a proposed (threatened) species for Federal listing, there is no Recovery Plan to direct management actions or set goals and objectives. As a result, the wolverine does not meet the statutory definition of either a “threatened species” or an “endangered species” and does not warrant protection under the ESA. Despite this an evaluation of effects will be made for wolverine in the Action Area.

General Species Information

Wolverines are wide-ranging carnivores that use a variety of habitats across elevational gradients including non-forested habitats in alpine and subalpine zones (Hahr 2001). They require a lot of space; the availability and distribution of food is likely the primary factor in determining wolverine movements and home range size. Wolverines travel long distances over rough terrain and deep snow, and adult males generally cover greater distances than females. Home ranges of wolverines are very large, but vary greatly depending on availability of food, gender, age, and differences in habitat. These home range sizes are large for mammals of the size of wolverines and may indicate that wolverines occupy a relatively unproductive niche (Wolverine USFWS 2019).

Wolverine are relatively secretive species that have proven difficult to study because they occur at low densities, are primarily nocturnal, have inconspicuous mating behavior, leave little sign, and avoid hum an activity (Zielinski and Kucera 1995).

This BA will not include a detailed description of the ecology and habitat requirements of the wolverine. What will be addressed is how the Proposed Actions may affect wolverine home range, suitable habitat, and connectivity. For basic information on basic ecology and habitat requirements, refer to the following sources of information:

Montana Field Guide: http://fieldguide.mt.gov/speciesDetail.aspx?elcode=AMAJF03010

Natural Heritage Map Viewer: http://mtnhp.org/mapviewer

The Service, Mountain Prairie Region: https://www.fws.gov/mountain-prairie/es/wolverine.php

Population Status and Distribution in the Action Area

The Action Area, for purposes of analyzing effects to wolverine, located on the east side of the Continental Divide consists of rugged mountain topography shaped by glaciation (GNP); the mountains abruptly transition to short-grass prairie and savanna habitats (Blackfeet Reservation). The St. Mary Unit is located within the transition zone, thus providing a variety of habitat types. The upper confines of the St. Mary Unit, above Lake Sherburne Reservoir provides some habitat, and wolverine are known to use this area.

Wolverines move to lower elevations during the winter where they search for carrion in ungulate winter ranges, such as the area of indirect effects. Den sites are typically located under deep snow, usually on high elevation talus slopes in sparsely forested areas with boulders, rock caves, and downed woody debris (Copeland and Yates 2008), which would also occur outside the area of direct effects.

Wolverines prefer alpine tundra and coniferous mountain forests. Habitats with rugged, roadless, isolated wilderness conditions are most preferred, and the availability of spring snow cover are essential (Foresman 2012). Home ranges of wolverines can be large and may disperse across vast areas. Reported home ranges of wolverines in Montana averaging from 39 square miles for females with young to 163 square miles for adult males (Ruggiero et al. 1994).

Inman (2013) estimated the current population and carrying capacity for wolverines in the NCDE area to be 51 wolverines, with a 95% confidence interval of 41-143 individuals. Wolverines are rare species wherever they occur because they exist in low density populations and are seldom observed, even by people who spend considerable time in their habitat (Wolverine USFWS 2013).

A 2001 study (Hahr 2001) showed that wolverine detections on the east side of the Continental Divide were well distributed from north to south in nearly every major drainage. Wolverine were detected outside of GNP on the Blackfeet Reservation on several occasions. Snow tracking indicated that wolverines on the east side of GNP moved freely across the park boundary and were often located near ungulate winter ranges. Wolverine were frequently located at lower elevations on the east side and often in or adjacent to developed areas (hotels, campgrounds, and ranger stations that receive little to no human use in winter months) (Hahr 2001). The lack of human presence in GNP in winter may be an important factor influencing the movements of wide-ranging carnivores like wolverines. Wolverines in GNP were often detected in open habitats such as burns, meadows, frozen lakes, and shrubfields (Hahr 2001).

Overall, the primary threat to wolverines in North America is from habitat and range loss due to climate warming. Climate changes are predicted to reduce wolverine habitat and range by 23% over the next 30 years and 63% over the next 75 years, rendering remaining wolverine habitat smaller and more fragmented. Other threats include accidental harvest, i.e., trapping; inadequate regulatory mechanisms to protect against human recreational disturbance, infrastructure developments, transportation corridors, and loss of genetic diversity due to small effective population sizes (Wolverine USFWS 2016).

Wolverines are not common, but are known to occur within the Action Area (Figure 21, Table 9), primarily at the uppermost end of Lake Sherburne Reservoir where O&M activities do not occur. As indicated by Figure 20, wolverine do venture into the area, but evidence suggests they prefer the higher elevation isolated areas.

Figure 21. Wolverine Observations in the Action Area

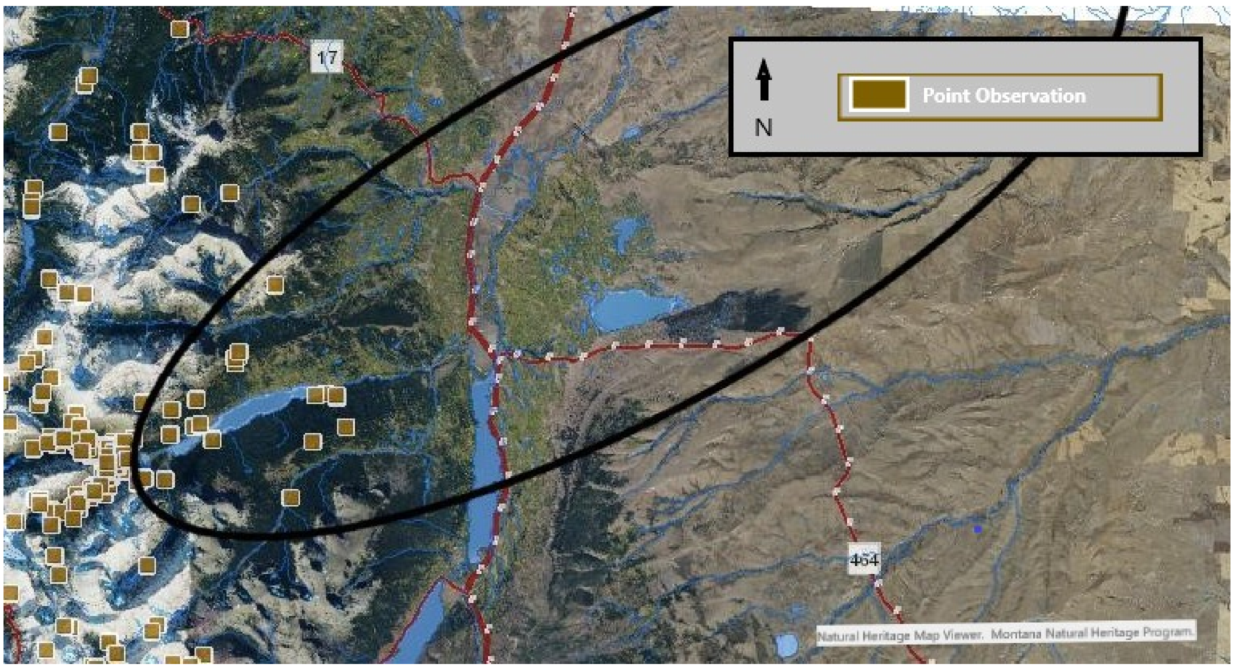


Table 9. Wolverine Observations in the Action Area

Date	Location*	Sex
1-25-2010	Many Glacier Road	Undetermined
3-11-2000	Many Glacier Road	Undetermined
2-29-2000	SW Shore Lake Sherburne Reservoir	Undetermined
2-04-2000	Lake Sherburne Reservoir (SE shore)	Undetermined
3-27-2000	Lake Sherburne Reservoir (SE shore)	Undetermined
2-05-2001	Boulder Ridge (SE of Sherburne Dam)	Undetermined
2-10-2001	Boulder Ridge (SE of Sherburne Dam)	Undetermined

* Information retrieved from Montana Natural Heritage Program (MTNHP)

Direct and Indirect Effects - Wolverine

While wolverines have been documented in the area, they are not common. Any use by wolverine would likely be in the area of indirect effects (upper extents of Swiftcurrent Creek down to Lake Sherburne Reservoir). Continued O&M activities would not directly or indirectly contribute in any significant way to the greatest threat to wolverines, climate warming.

Cumulative effects would include current non-federal actions such as recreational activities and various uses of private land that are expected to continue whether or not Proposed Actions occur. Timber harvest or habitat manipulations could occur on tribal lands. The Many Glacier road repair project (2020-2021) has the potential to disturb wolverine during the two operational seasons. There are no other readily foreseeable future non-federal actions that would affect wolverine or their habitat.

Effects Determination – Wolverine

The continued O&M (Proposed Action) is **not likely to jeopardize the continued existence** of the proposed wolverine.

Rationale:

- There is no anticipated harm to wolverine, as a result of O&M actions within the footprint of the St. Mary Unit. O&M activities would occur as they have over the past 100 years.
- Baseline conditions of the habitat and connectivity will be maintained.
- Any sights or sounds perceived as a result of O&M activities would likely cause wolverine(s) to leave the area.
- No new permanent roads or facilities would be constructed
- There are few actual wolverine occurrence records in the Action Area – those that are recorded are primarily at the west end of Lake Sherburne Reservoir where O&M activities do not occur.

Cumulative Effects

Cumulative effects under the ESA are defined as "…those effects of future State, or private activities, not involving Federal activities that are reasonably certain to occur within the Action Area of the Federal action subject to consultation" 50 CFR §402.02. Future Federal activities that are not inter-related or interdependent to the proposed action are not considered because they would be subject to separate future consultation under the ESA.

Other actions that are State, Tribal, and private actions that are reasonably certain to occur, are ongoing, or have recently been constructed in the Action Area include:

- Tribal timber sale/harvest on Boulder Ridge (south side of Swiftcurrent Creek and downstream of Lake Sherburne Dam).

- Many Glacier road state improvement/repair project (Babb to Many Glacier) is scheduled for 2020-2021.
- Natural resource (oil and gas) extraction and exploration has occurred in the project area, notably downstream from the St. Mary siphon and adjacent to the St. Mary diversion works.
- Extensive bison enclosure fences have been recently constructed on private lands adjacent to the St. Mary Canal and St. Mary siphons, near Spider Lake, and within the general project area. The fences create wildlife migration barriers that affects grizzlies and all ungulates in the Action Area (T. Tabor, personal conversation).

All the above activities have the potential to increase erosion, sedimentation, fragmentation, directly remove available habitat, and spread noxious weeds. Streamside livestock grazing and extensive logging in the Middle Fork Lee Creek drainage result in large silt loads and substantial creek turbidity.

The Action Area is located partially within GNP. The Many Glacier road traverses the Action Area on the north side of Lake Sherburne Reservoir. This area is known for the recreational activities it provides for visitors. Because of this, motorized use is expected to increase in the future. In addition, other impacts from high levels of non-motorized recreation (camping, hiking, snowshoeing, and cross-country skiing) are all expected to continue to occur and increase in the future within the Action Area that may impact wildlife species and their habitats. Each of these activities has the potential to impact wildlife species directly, indirectly, and cumulatively through short and long-term disturbance.

The Blackfeet Nation relies on agriculture, logging (timber harvest), and natural resource extraction to provide economic stimulus. The undertaking of these activities involves road building, pipelines, utilities, and other linear developments that have the potential to fragment habitats and migration corridors. Terrestrial habitats would continue to be minimally disturbed through removal of natural vegetation, fencing of wildlife corridors, and ongoing development. Timber harvest can be both beneficial and negative, on one hand activities reduce the risk of uncontrolled wildfire that may destroy habitat, while on the other hand may directly remove habitat.

Overall, the proposed project when combined with other future reasonably certain to occur activities would have only a negligible cumulative effect on listed wildlife species.

Effects Analysis Summary

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR § 402.17). Reclamation has reviewed the Action Area settings, life history, habitat information, and environmental baseline for each of the Federally listed species to evaluate potential effects.

The Service has identified three potential conclusions regarding analyses for impacts on listed species or designated critical habitat:

- **No effect**- the appropriate conclusion when the action agency determines its proposed action will not affect listed species or critical habitat, or
- **May affect, but is not likely to adversely affect**- the appropriate conclusion when effects on listed species are expected to be discountable, or insignificant or completely beneficial.
  - **Beneficial effects** are contemporaneous positive effects without any adverse effects to the species.
  - **Insignificant effects** relate to the size of the impact and should never reach the scale where take occurs
  - **Discountable effects** are those extremely unlikely to occur.
- **May affect, likely to adversely affect**- the appropriate conclusion if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial.

Table 10 summarizes the determination of effects for listed and proposed species in the St. Mary Unit O&M Action Area.

Table 10. ESA Determination of Effects

Common Name	Scientific Name	Determination of Effects
Bull Trout (T)	*Salvelinus confluentis*	May affect, likely to adversely affect
Grizzly Bear (T)	*Ursus arctos horribilis*	May affect, but not likely to adversely affect
Canada Lynx (T)	*Lynx canadensis*	No effect
Canada Lynx (T)	Critical habitat	No effect
Wolverine (P)	*Gulo gulo luscus*	Not likely to jeopardize the continued existence

Summary of Effects

This section summarizes the individual O&M elements of the St. Mary Unit and the consequences to listed species from continued O&M actions identified in the description of the action, as well as the future O&M activities. The primary species that could be affected by the proposed project is bull trout and is discussed in most detail. The terrestrial species with potential to be present in the Action Area are grizzly bear, Canada lynx, and wolverine. There are commonalities between species on the potential effects, thus Table 11 summarizes the potential effects for all terrestrial species together as a group. The specific effects to each species are included in their respective sections above.

Table 11. Summary of Potential Effects to ESA Listed Species

Element of O&M	Bull Trout	Terrestrial Species
Stressor	**Response / Effect**	**Response / Effect**
Lake Sherburne Dam and Reservoir		
Spring Start up • Storm gates are cleared of ice • Regulating gates are closed	Entrainment of fish Loss of upstream lake habitat	Avoidance Potential displacement Alarm

Element of O&M Stressor	Bull Trout Response / Effect	Terrestrial Species Response / Effect
• Guard gates are opened and hung • Regulating gate is opened • Monitor ice conditions on Swiftcurrent	Fish passage and fluvial connection occurs.	Startle
<u>**Fall Shut down**</u> • Regulating gates are closed (staged down) • Guard gates are closed • Storm gates are lowered • Stilling basin cleaned via excavator • Swiftcurrent Creek fish Salvage	Swiftcurrent Creek flow reduction, stranding, suffocation. Harm or harassment of fish Fish passage (exodus) occurs Sedimentation	Avoidance Potential displacement Alarm Startle
<u>**Maintenance**</u> • Cleanout of Intake at Lake Sherburne Reservoir -maintenance of trashrack and guard gates. • Rip-rap and concrete repairs upstream face of Lake Sherburne Dam. • Concrete repair spillway and outlet works at Lake Sherburne Dam.	Stranding Sedimentation Harm or harassment of fish	Avoidance Potential displacement Alarm Startle
St Mary Diversion Dam and Canal Headworks		
<u>**Spring Start up**</u> • Remove ice around sluicegates • Lower sluicegates • Open canal headwork gates • Water flows increased to North Fork Milk River via Canal	Potential direct physical harm or harassment of fish Fish Entrainment Loss of downstream river habitats. Potential effect to forage species that bull trout rely upon.	Avoidance Potential displacement Alarm Startle
<u>**Fall Shut down**</u> • Sluicegates are opened • Headworks slowly shutdown over a few days • Large woody debris is removed	Physical harm or harassment of fish Sediment Entrainment	Avoidance Potential displacement Alarm Startle
<u>**Maintenance**</u> • Concrete repairs on the St. Mary Diversion Dam. • Gate repairs at the headworks and the sluiceway. • Concrete repairs of the headworks.	Sedimentation	Avoidance Potential displacement Alarm Startle
St. Mary Canal		

Element of O&M	Bull Trout	Terrestrial Species
Stressor	**Response / Effect**	**Response / Effect**
<u>Spring Start up</u> • Trenching Canal (if necessary) • Cleanout C-10 gates • Waste/cleanout gates closed • Clean ice above drops • Close valves at siphons • Headworks opened • Ice removal if needed	Only potential impact to fish would be if working in Kennedy Creek at the Kennedy Crossing. Canal does not provide sustainable habitat for bull trout. Once bull trout enter the canal they are essentially lost from the population.	Avoidance Potential displacement Alarm Startle Areas adjacent to the canal provide foraging habitat for terrestrial species
<u>Fall Shut down</u> • Headworks closed • Drain valves at the siphons opened • C-10 gates are opened • Canal, siphons, and drops are inspected for damage	Potential for direct physical harm or harassment of fish at or near the canal headworks	Avoidance Potential displacement Alarm Startle Areas adjacent to the canal provide foraging habitat for terrestrial species
<u>Maintenance</u> • Woody vegetation removal (mechanical: clippers, hand saws, chainsaws) • Weed control along canal • Landslide repairs along the canal. • Concrete repairs at Kennedy Creek siphon. • Concrete repairs at St. Mary and Halls Coulee Siphons. • Repairs of the steel siphons (including; welding repairs, expansion joint repairs, section replacement etc.). • Concrete repairs or replacement of the drop structures.	Once bull trout enter the canal they are essentially lost from the population. The canal does not provide habitat for bull trout.	Avoidance Potential displacement Alarm Startle Areas adjacent to the canal provide foraging habitat for terrestrial species

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