Intake Diversion Dam Modification
Lower Yellowstone Project, Montana

Draft Supplement to the 2010 Final Environmental Assessment

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Prepared by Joint Lead Agencies:

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Bureau of Reclamation
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Executive Summary

The U.S. Army Corps of Engineers (Corps) and the Bureau of Reclamation (Reclamation) prepared this Draft Supplement to the April 2010 Final Environmental Assessment (EA) for the Intake Diversion Dam Modification Project. Reclamation and the Corps are joint lead agencies for preparation of the Supplemental EA.

The proposed federal action would modify Intake Diversion Dam to improve passage for endangered pallid sturgeon and other native fish in the lower Yellowstone River. Intake Diversion Dam has impeded upstream migration of pallid sturgeon and other native fish for more than 100 years. The best available science suggests that the diversion dam is a partial barrier to some fish species and is likely a total barrier to other fish species, such as pallid sturgeon. The proposed fish passage project is anticipated to play a major role in assisting in recovery of pallid sturgeon by providing access to an additional 165 miles of the Yellowstone River for migration, spawning and rearing.

The Intake Diversion Dam is used to divert water from the Yellowstone River into the Lower Yellowstone Project's main irrigation canal on the north side of the river at a location 18 miles downstream of Glendive, Montana. The irrigation canal system roughly parallels the Yellowstone River to its confluence with the Missouri River. The system conveys water to irrigate approximately 54,300 acres on about 398 farms along the canal system in Montana and North Dakota.

The U.S. Fish and Wildlife Service (Service) listed the pallid sturgeon as endangered under the Endangered Species Act (ESA) in 1990. Section 7(a)(1) of the ESA authorizes all federal agencies to use their resources for the conservation and recovery of federally listed species and the ecosystems upon which they depend, and Section 7(a)(2) requires federal agencies to consult with the Service to ensure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of any federally listed species or to modify designated critical habitat. The lower Yellowstone River has been identified by the Service as an area of priority for pallid sturgeon recovery because:

- the Yellowstone River, with its near natural hydrograph and associated temperature and sediment regimes, provides the best habitat in the upper Missouri River Basin;
- additional ecosystem and connectivity restoration efforts could further increase the amount of habitat available for larval drift in the Yellowstone River;
- the Yellowstone River provides 35-50% more area of slow current velocity habitat patches than the Missouri River during periods when larval drift occurs, which may result in slower larval drift rates than those modeled in the Missouri River;
- none of the irrigation diversion structures on the Yellowstone River (i.e. Cartersville or Intake Diversion dams) significantly trap sediment and alter the resultant seasonally high turbidity levels on the Yellowstone River, thereby potentially reducing predation of larvae; and
- the Yellowstone River requires no active river management for natural flows or temperature regime.

Reclamation constructed the Lower Yellowstone Project beginning in 1905 under the Reclamation Act/Newlands Act of 1902 (Public Law 161). As is the case for most authorized Reclamation projects, the long-term operation and maintenance of project facilities is the financial responsibility of the water users, which is the case for the Lower Yellowstone Project water users. Reclamation retains ownership of the Lower Yellowstone Project facilities, but the facilities are operated and maintained under a contract with the Lower Yellowstone Irrigation Districts (District) through the Board of Control of the Lower Yellowstone Project.

The Corps is a joint lead agency for the project because this proposed project is a Reasonable and Prudent Alternative (RPA) in the 2003 Missouri River Amended Biological Opinion. Section 3109 of the 2007 Water Resources Development Act authorizes the Corps to use funding from the Missouri River Recovery and Mitigation Program to assist Reclamation with design and construction of modifications to the Lower Yellowstone Project for the purpose of ecosystem restoration. The intent of ecosystem restoration is to partially or fully reestablish the attributes of a naturalistic, functioning, and self-regulating system (Engineer Regulation [ER] 1165-2-501, 30 Sep 99).

Proposed modifications for entrainment protection and fish passage were described and analyzed in the April 2010 Final Environmental Assessment[1] (hereafter referred to as the 2010 EA). In the April 26, 2010 Finding of No Significant Impact[2] (2010 FONSI), Reclamation and the Corps made a joint finding that an Environmental Impact Statement (EIS) was not required for the proposed project and decided to implement the proposed action to reduce entrainment and improve fish passage. The selected alternative to improve fish passage was the rock ramp alternative. In addition, installation of fish screens and new main canal headworks was chosen as the preferred alternative to reduce entrainment.

The modifications to reduce entrainment, construction of the new main canal headworks and installation of fish screens, began in October 2010 and have been completed. Irrigation deliveries using the new headworks began in April 2012. The second part of the proposed dam modifications to provide fish passage by installing a rock ramp is being reevaluated by the lead agencies, in coordination with the Service, Montana Fish, Wildlife and Parks (MFWP), Montana Department of Natural Resource Conservation, Montana Department of Environmental Quality, and the District. The reevaluation is necessary because of significant new information on the rock ramp design, pallid sturgeon movement, as well as the constructability and sustainability of the proposed rock ramp since the 2010 EA and FONSI were released.

Several fish passage alternatives were initially identified for further analysis based on previous studies of the Lower Yellowstone Project. Using input from cooperating agencies these alternatives were analyzed using screening criteria. As a result of the screening process, the number of alternatives was reduced to three, which are described in Chapter 2 and Appendix A.1. The alternatives evaluated are No Action (Continue Present Operation), 15% Bypass Channel and Rock Ramp.

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[1] Final Environmental Assessment, Intake Diversion Dam Modification, Lower Yellowstone Project, Montana, April 2010, U.S. Department of the Interior, Bureau of Reclamation and U.S. Army Corps of Engineers
[2] Finding of No Significant Impact, Intake Diversion Dam Modification, Lower Yellowstone Project, April 26, 2010

- No Action (Continue Present Operation) - Under this alternative, Reclamation would continue present operation of the dam and headworks to divert water from the Yellowstone River for irrigation purposes, as authorized. This means operating the irrigation project without any modifications to improve fish passage.

- Bypass Channel - The primary feature of this alternative would be constructing a bypass channel from the inlet of the existing high flow chute to just downstream of the existing dam and rubble field. It would also replace Intake Diversion Dam with a concrete weir to raise the surface elevation of the river in front of the proposed bypass channel as well as the irrigation headworks. The bypass channel is intended to improve fish passage and contribute to ecosystem restoration.

- Rock Ramp - The primary features of this alternative would be replacing Intake Diversion Dam with a concrete weir and boulder and cobble rock ramp. This would raise the surface elevation of the river upstream of the weir for diversion into the main canal, and be expected to improve fish passage and contribute to ecosystem restoration.

The potential impacts and benefits that may result from the proposed action and alternatives are described in Chapter 4. The actions to minimize effects of the proposed action are explained in Chapter 4 and compiled in Appendix I. There would be consequences if Reclamation decides to continue present operation of the Lower Yellowstone Project. In general, incidental take of pallid sturgeon at Intake Diversion Dam would continue. Permitting and minimization of incidental take of pallid sturgeon for operation of the Lower Yellowstone Project under No Action would require either a Board of Control-negotiated habitat conservation plan (HCP) under Section 10(a) of the ESA or completion of Section 7(a)(2) consultation by Reclamation. Either scenario to address incidental take would not diminish Reclamation's legal responsibility to comply with the ESA and correct the existing passage impacts caused by the Intake Diversion Dam.

Both action alternatives are intended to meet the purpose and need for the proposed action, which is to contribute to ecological restoration and improve passage for the endangered pallid sturgeon and other native fish up and downstream at Intake, Montana, opening up to 165 miles of the Yellowstone River for migration, spawning, and rearing.

Neither action alternative is expected to have long-term impacts on surface water quality. When compared to the Rock Ramp Alternative, the larger footprint of the Bypass Channel Alternative would result in more acres permanently affected in the channel migration zone (50 acres versus 26 acres). The larger footprint would also result in more lands, vegetation, and wildlife impacts, although it is expected that these impacts can be minimized or offset. Both action alternatives would have potentially adverse effects on historic properties, but measures would be taken to minimize such effects. The action alternatives are not expected to have more than slight positive effects on the regional economy. Lower operation and maintenance (O&M) costs under the Bypass Channel Alternative may slightly increase farm revenues, while increased O&M costs under the Rock Ramp Alternative may slightly decrease farm revenues. The Rock Ramp Alternative would result in closure and relocation of the boat ramp at Intake; the Bypass Channel Alternative would diminish access to a portion of Joes Island but the effects are expected to be limited. However, in general, recreation opportunities are expected to improve under both action alternatives in the long term. The action alternatives would both be expected to improve fish passage for pallid sturgeon and other native fish, and are not expected to result in any long-term adverse impacts to any threatened or endangered species, or species of special concern.

Reclamation and the Corps have identified the Bypass Channel as the preferred alternative. The agencies believe that in addition to consideration of the relative resource impacts, the more straight-forward construction, ability to withstand ice forces, and cost effectiveness of the Bypass Channel lead to a preference over the Rock Ramp Alternative. As such, the Bypass Channel Alternative is Reclamation's and the Corps' preferred alternative.

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List of Abbreviations and Acronyms

ACS	American Community Survey
AM	adaptive management
APE	area of potential effect
ADCP	Acoustic Doppler Current Profiler
BA	biological assessment
BiOp	biological opinion
BRT	biological review team
CBA	choosing by advantages
CEQ	Council on Environmental Quality
cfs	cubic feet per second
CE/ICA	cost effectiveness/incremental cost analysis
CFR	Code of Federal Regulations
CMZ	channel migration zone
CRREL	U.S. Army Cold Regions Research and Engineering Laboratory
CWA	Clean Water Act
DEQ	Department of Environmental Quality
DIDSON	Dual Frequency Identification Sonar
DNRC	Department of Natural Resources and Conservation
EA	Environmental Assessment
ER	Engineer Regulation
ERT	environmental review team
ESA	Endangered Species Act
EIS	Environmental Impact Statement
FAS	fishing access site
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FPCI	Fish Passage Connectivity Index
FWCA	Fish and Wildlife Coordination Act
fps	feet per second
GIS	Geographic Information System
GPS	Global Positioning System
HCP	habitat conservation plan
HEC-RAS	Hydrologic Engineering Center – River Analysis System
HU	habitat unit
HQUSACE	U.S. Army Corps of Engineers Headquarters
IDC	interest during construction
IMPLAN	Impact Analysis for Planning Model
ITA	Indian trust assets
IWR	Institute for Water Resources
LYIP	Lower Yellowstone Irrigation Project
MEPA	Montana Environmental Policy Act
MFWP	Montana Fish, Wildlife & Parks
MOA	memorandum of agreement
MOU	memorandum of understanding

MTNHP	Montana Natural Heritage Program
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NESP	Navigation and Ecosystem Sustainability Program
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NWI	National Wetlands Inventory
O&M	operations and maintenance
OHWM	ordinary high water mark
P&G	Principles & Guidelines
PEM	palustrine emergent
PEMC	palustrine emergent seasonally flooded
PFOA/C	palustrine forested temporarily to seasonally flooded
PGA	peak ground acceleration
R2UBG	riverine lower perennial unconsolidated bottom intermittently exposed
RBF	riverbank filtration
RPA	reasonable and prudent alternative
RO	Regional Office
RPMA	Recovery-Priority Management Area
SHPO	State Historic Preservation Office
U_{crit}	critical current velocities
UMRS	Upper Mississippi River System
USGS	U. S. Geological Survey
WRDA	Water Resources Development Act
WUS	Waters of the U.S.

1. Purpose and Need

1.1. Introduction

The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers (Corps), joint lead agencies under the National Environmental Policy Act (NEPA), are continuing evaluation of the proposed modifications to Intake Diversion Dam, a feature of the Lower Yellowstone Project. The proposed modifications are intended to reduce fish entrainment and provide improved fish passage. Those modifications were described and analyzed in the April 2010 Final Environmental Assessment[3] (hereafter referred to as the 2010 EA). In the April 26, 2010 Finding of No Significant Impact[4] (2010 FONSI), Reclamation and the Corps made a joint finding that an Environmental Impact Statement (EIS) was not required for the proposed project and decided to implement the proposed action to reduce entrainment and improve fish passage. The selected alternative to improve fish passage was the rock ramp alternative.

The modifications to reduce entrainment, construction of the new main canal headworks and installation of fish screens, began in October 2010 and have been completed. Irrigation deliveries using the new headworks began in April 2012. The second part of the proposed dam modifications to provide fish passage by installing a rock ramp is being reevaluated by the lead agencies, in coordination with the U.S. Fish and Wildlife Service (Service), Montana Fish, Wildlife and Parks, Montana Department of Environmental Quality, and the Lower Yellowstone Irrigation District (District). The reevaluation is necessary because significant changes are being proposed and new information has become available regarding the proposed rock ramp since the 2010 EA and FONSI was released.

Agencies prepare supplements to environmental documents such as an EA if there are substantial changes in the proposed action that are relevant to environmental concerns or there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts[5]. This Supplemental EA explains and addresses the changes, and includes new or updated information related to improving fish passage at Intake Diversion Dam. It describes and discloses the changes in potential effects that could result from other alternatives that have been considered to improve fish passage. This supplemental EA is tiered[6] to the 2010 EA in order to reduce paperwork and eliminate repetitive discussions; it adopts and combines information[7] from the 2010 EA. It also incorporates by reference[8] the relevant portions of that document, especially information pertaining to the need to improve fish passage. Incorporated material is cited and briefly described in this document. The topics described in the 2010 EA that have not changed and those elements of the modifications that have been completed, i.e. entrainment reduction, are not repeated in this supplemental EA. Further, the

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[3] Final Environmental Assessment, Intake Diversion Dam Modification, Lower Yellowstone Project, Montana, April 2010, U.S. Department of the Interior, Bureau of Reclamation and U.S. Army Corps of Engineers

[4] Finding of No Significant Impact, Intake Diversion Dam Modification, Lower Yellowstone Project, April 26, 2010

[5] 40 CFR Part 1502.9(c), Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA)

[6] 40 CFR Part 1502.20 and 1508.28

[7] 40 CFR Part 1500.4(n) and (o)

[8] 40 CFR Part 1502.21

document describes minor clarifications of information that have become available since the 2010 EA.

1.2. The Proposed Action (Improve Fish Passage)

The proposed action considered in this document is to identify and implement an alternative to improve fish passage at Intake Diversion Dam.

1.3. Purpose of and Need for the Proposed Action

The purpose of the proposed modifications to Intake Diversion Dam described in the 2010 EA was to reduce entrainment and improve fish passage for the endangered pallid sturgeon and other native fishes. This purpose remains unchanged; however, since the entrainment reduction portion of the project's purpose has been accomplished with completion of the new headworks and fish screens, the main purpose addressed in this EA is improving fish passage.

Both Reclamation and the Corps have general responsibility under section 7(a)(1) of the Endangered Species Act (ESA) to utilize their authorities to conserve and recover federally listed species and ecosystems upon which they depend. In addition, both agencies also need to avoid jeopardizing the pallid sturgeon in funding or carrying out any agency action per 7(a)(2) of the Act as described in the 2010 EA. Thus, the need for the proposed action is to improve fish passage because the existing diversion dam is an impediment to successful upstream and downstream movement of the endangered pallid sturgeon and other native fishes. The need for entrainment reduction has been satisfied with operation of the new headworks and screens (pending monitoring of its operation to assure its biological effectiveness). The other needs related to fish passage described in the 2010 EA continue to apply to the proposed action in this document: (1) to continue effective operation of the Lower Yellowstone Project and; (2) contribute to ecosystem restoration.

Meeting these needs through the proposed action is anticipated to play a major role in assisting in the recovery of pallid sturgeon in the Yellowstone River - Missouri River confluence area. This in turn would help both agencies meet their conservation, recovery and consultation responsibilities under ESA as well as provide both agencies a less constrained environment in which to carry out their authorized purposes, including Reclamation's continued operation of the Lower Yellowstone Project and the Corps' continued operation of the Missouri River mainstem projects.

1.4. Background Information

The lead federal agencies made a decision in April 2010 to proceed with the project and the Corps awarded a contract to construct the new headworks and fish screens in July 2010. The Corps also proceeded with activities needed to develop the final design of the rock ramp and issue a contract for its construction in 2011. The conceptual design level cost estimate for the rock ramp was approximately $18 million. In late 2010 and early 2011, the estimated costs for the conceptual rock ramp design increased dramatically. The primary reasons for the increased cost estimate included:

1. The amount of rock needed for the rock ramp significantly increased. The length of the rock ramp would need to be longer than originally considered in the conceptual designs and cost estimates. Input from the Biological Review Team (BRT) regarding the design criteria (principally flow velocity and water depth) indicated that the slope of the rock ramp should be 0.4%, which is more gradual than the 1% slope the Corps used during development of the conceptual design phase. The more gradual slope means the rock ramp would need to be longer, which means significantly more rock would be needed to extend the length of the ramp.

2. Additional rock would also be required for the rock ramp to provide more point-to-point rock contact in the structure of the ramp needed to maintain its stability given the wide range of flow and environmental conditions in the Yellowstone River.

3. The construction of the rock ramp would likely need to be conducted "in the dry" to ensure that careful placement of the rock is accomplished so that the ramp would be sufficiently stable to withstand the wide range of flow conditions. River diversions and dewatering would be needed which would increase costs.

4. The source of rock for the ramp had not been well-defined previously. Local rock sources would likely not have acceptable qualities for use in the ramp. Cost estimates to import rock from suitable sources would likely involve long haul distances. Hauling rock from distant sources would significantly increase costs.

As a result of this information it appeared that the estimated cost of the rock ramp could approach $90 million. The Corps and Reclamation, in coordination with the Service, considered the implications of this new information in early 2011. Under authority of the Water Resources Development Act of 2007 (WRDA 2007) and consistent with the joint agency decision in April 2010, the Corps had committed up to $40 million in Missouri River Recovery Program funding to the entire dam modification project. The potentially significant increase in the cost of the rock ramp, combined with the design and constructability issues described above, led the lead agencies to reconsider the decision to implement the rock ramp alternative for fish passage. In April 2011, the lead agencies determined that further evaluation of other alternatives for improving fish passage was needed to address the new/additional information and issues that had arisen since 2010. In addition to new cost information, new information regarding pallid sturgeon behavior also became available. Originally, because of uncertainties in pallid sturgeon movement, one of the requirements of the BRT's passage criteria was full river width passage. Since the long low gradient alternative, a previous version of the bypass channel, would not meet this criterion it was not carried forward in earlier analysis. Based on new technical information documenting pallid sturgeon use of side channels (McElroy et. al., 2012; Service, 2012), the BRT relaxed this criterion in 2011. The lead agencies believed there was merit in revisiting a bypass alternative that was previously considered but eliminated from detailed study. Through collaborative efforts, further information, and preliminary design reviews, the lead agencies and stakeholders supported further analysis of a bypass alternative. Changes to the project were substantive enough to trigger preparation of supplemental NEPA[9] prior to a joint lead agency decision regarding how to proceed with the fish passage portion of the project.

[9] 40 CFR 1502.9(c)

Reclamation, the Corps and the Service remain committed to improving fish passage. All three agencies believe it is prudent to revisit both the rock ramp design and other fish passage alternatives, especially a bypass channel alternative, to determine if there are ways to significantly reduce the cost and improve fish passage. See Appendix A.1 for a detailed description of all alternatives considered.

1.5. Nature of Decisions to be Made

Reclamation and the Corps will make the decision whether to proceed with the proposed federal action in a FONSI upon completion of this supplemental EA, in conjunction with the 2010 EA and other information, provided no significant issues are identified in the final supplemental EA. News releases and public service announcements will be distributed to the media announcing the availability of the FONSI. The document will be available on the Omaha District's public web site, and copies will be available upon request.

1.6. Purpose and Scope of the Supplemental EA

The purpose of the supplemental EA is to comply with NEPA and assist the agencies in determining whether the proposed action for improving fish passage, would have a significant impact on the human environment. If significant impacts are identified in the supplemental EA, then an EIS would be prepared. This document will also be used to inform decision makers and the public of proposed actions, reasonable alternatives considered, and their environmental impacts before final decisions are made. The supplemental EA addresses the key issues of pallid sturgeon protection and recovery, examines alternatives for fish passage, and evaluates the environmental impacts of each of the fish passage alternatives.

The scope of this supplemental EA is to identify, evaluate and address changes in the proposed action related to improving fish passage since completion of the 2010 EA; evaluate the effects of any new alternative(s) considered in detail in the supplemental EA, and disclose the direct, indirect and cumulative effects of the changes that are relevant to improving fish passage. It also describes minor clarifications of information that have become available since the 2010 EA.

1.7. Scoping, Issues and Public Involvement

The issues and resources potentially affected by and relevant to providing improved fish passage are similar to those identified during the scoping for the 2010 EA. Scoping for this supplemental EA identified the following issues and resources as being the most relevant to providing fish passage.

Aquatic communities
Federally listed species
Historic properties
Lands and vegetation
Geomorphology
Recreation
Social and economic conditions
Surface water quality
Wildlife

The affected environment (Chapter 3) and environmental consequences (Chapter 4) in this supplemental EA focus primarily on how changes in the proposed action for improving fish passage result in changes in potential effects. Reclamation and the Corps intend to conduct public involvement activities similar to what was done for the 2010 EA. A draft supplemental EA will be distributed for public review and comment prior to preparation of a final supplemental EA. Public meetings will be held to describe the proposed action and its effects and to receive public comments on the proposed action. Agency responses to comments received on the draft document will be included with the final supplemental EA. Partner agencies, including the Service, Montana Fish, Wildlife & Parks (MFWP), and Montana Department of Natural Resources (DNRC) reviewed the preliminary draft supplemental EA prior to its release to the public. A table of agency responses to their comments is located in Appendix L.

2. Alternatives

2.1. Introduction

This chapter describes alternatives developed to meet the purpose and need of the proposed action. Because entrainment protection has been achieved through the construction and operation of the new headworks and fish screens, the alternatives described in this chapter are limited to those that will improve fish passage in conjunction with the new facilities in place. The alternatives included for analysis are No Action, Bypass Channel and Rock Ramp. A thorough listing of history and detail regarding alternatives that were considered but not analyzed in detail is described in Appendix A.1 and a brief summary is provided later in this chapter. The costs of the alternatives described below are in 2012 dollars.

2.2. No Action (Continue Present Operation)

This alternative best fits the definition of a "no action" alternative described in the CEQ and Department of the Interior regulations (43 CFR 46.30). In this case, Reclamation would continue present operation of the dam and headworks to divert water from the Yellowstone River for irrigation purposes, as authorized. Under this scenario it is likely that Reclamation would be obligated to continue consultation with the Service under Section 7(a)(2) of the ESA, with fish passage being a requirement at Intake Diversion Dam. However, for purposes of the analysis contained in the 2010 EA, and further analysis conducted herein, the future without project condition consists of continued operation of Intake Diversion Dam without modification for improved fish passage. This no action provides a baseline from which to measure benefits and impacts of implementing fish passage improvement alternatives considered in this document.

Reclamation and the Corps selected the on-river headworks and associated removable rotating drum fish screens during the 2010 EA/FONSI process. Construction of the entrainment protection project began in the fall of 2010 and was completed and put into operation in April of 2012.

The new headworks structure (shown in Figure 2-1 with fish screens down) controls diversions of water into the canal and includes 12 removable rotating drum screens located in the river to minimize fish entrainment. The headworks structure supporting the screens measures 310 feet. Because screen design criteria specific to pallid sturgeon are lacking, the fish screens were constructed to meet salmonid criteria established by the Service and National Marine Fisheries Service. Each drum screen measures approximately 6.5 feet in diameter and 25.2 feet in length. Maximum approach velocity in front of the screen is designed at 0.4 feet per second, which will provide an even velocity distribution across the rotating screens. Water gravity flows through the cylindrical screens from the lower half of the water column, through the gates and into the canal.

Figure 2-1. New headworks and fish screens at Intake Dam with screens submerged

The removable rotating drums allow each screen unit to be adjusted on a track and be raised above the river when not in use to minimize damage from ice and debris flows. The screen cylinders rotate against fixed brushes to clean and remove debris that could impede flow through the screen and to remove fish and other aquatic organisms potentially impinged on the screens.

Under this No Action Alternative, it is assumed that rock would continue to be added to the existing timber crib diversion structure as needed to create the necessary water elevation for diversion of 1,374 cubic feet per second (cfs), acknowledging that authorization from the Corps of Engineers under Section 10 of the Rivers and Harbors Act would be required for this activity in the future. The top of the existing timber crib weir is at elevation 1,988 feet North American Vertical Datum of 1988 (NAVD 88).

The primary features of this alternative (see Figure 2-2) include the continued operation, maintenance and repair of the existing diversion dam and new screened headworks by the Lower Yellowstone Irrigation Project Joint Board (LYIP) of Control, as Reclamation’s authorized agent under the O&M transfer and repayment contracts Ilr-103 and Ilr-104. This would include the annual placement of 1-2 feet of rock on the crest of the dam, using the existing cableway, to replace rock moved by ice and high flow events. The trolley system is old and there is continual risk of failure, which would require repair /replacement by the LYIP in order to maintain required water surface elevations. Additionally, the operation and maintenance of the screened headworks, will occur as described in the original EA and in the Service concurrence letter dated March 7, 2012, to effectively minimize entrainment of fish from the Yellowstone River. Reclamation and the LYIP would most likely need to amend the existing O&M transfer contract to address operation and maintenance of the new headworks.

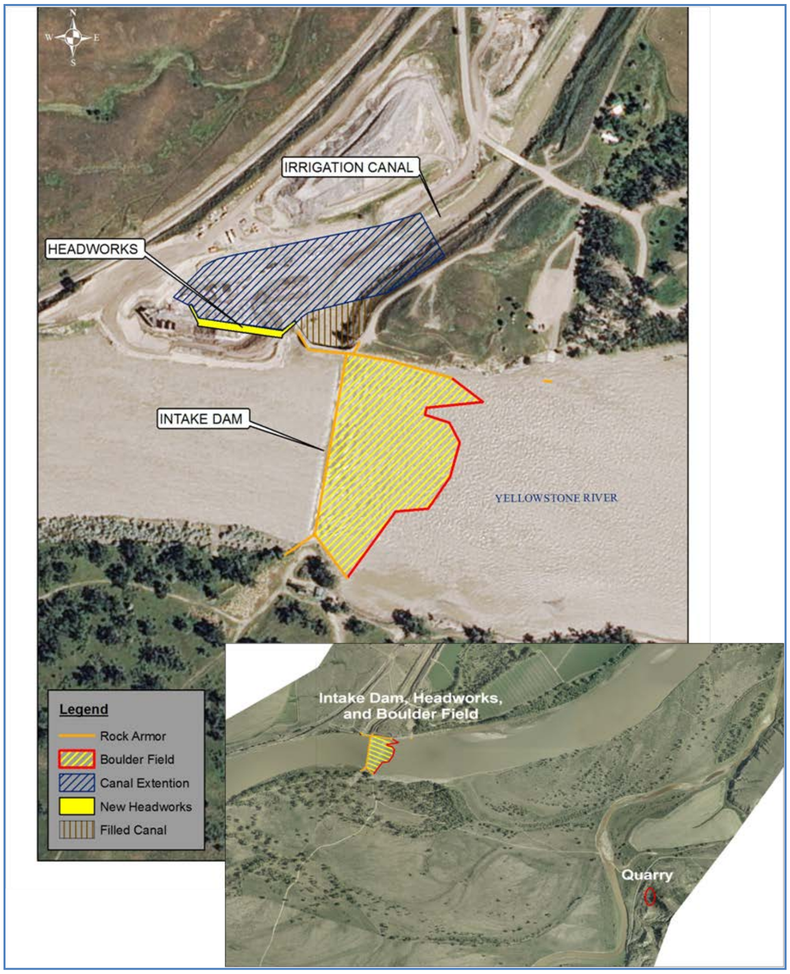

Figure 2-2. No action alternative

The annualized cost estimate for O&M of the existing diversion dam, newly constructed headworks and first mile of the canal is approximately $253,000, including: $121,000 for rock placement on the diversion dam; $92,000 for the headworks, $2,000 for the main canal, and $38,000 for diversion dam timber crib rehabilitation. Both the main canal and the dam would be repaired every 12 years on average.

The LYIP is responsible for diversion dam, headworks and canal O&M costs consistent with the authorizing legislation (Reclamation Act of June 17,1902, as amended; Water Conservation and Utilization Act of August 11, 1939, as amended), the current O&M contract between Reclamation and the LYIP, and Reclamation policy.

2.3. Bypass Channel Alternative (Preferred)

This alternative is intended to improve passage for pallid sturgeon around Intake Diversion Dam by means of a bypass channel. This alternative was originally conceived during the Value Planning Study process conducted by Reclamation and others (Reclamation, 2005) and was referred to as the long low gradient channel alternative. It was originally envisioned to take advantage of an existing side channel as a fish bypass. However, the use of the existing side channel in its entirety was not deemed feasible for fish passage due to fish attraction issues associated with the side channel's downstream entrance being nearly a mile downstream of the dam. In light of this fact, this initial concept recognized the need for such an alternative to place the entrance closer to Intake Diversion Dam. As such, one of the primary features of this current alternative would be the construction of a bypass channel from the upper end of the existing side channel, to just downstream of the existing diversion dam and associated rubble field. By locating the fish entrance to the bypass channel at the downstream end of the dam, fish are thought to be more likely to find the bypass channel and utilize it in their movement upstream. A concrete weir would be constructed in order to provide adequate water surface elevations for water diversion into the new bypass channel and delivery of irrigation water. The bypass channel is intended to improve fish passage and contribute to ecosystem restoration.

Features of this alternative would be located primarily on Joe's Island. This land was acquired by Reclamation during construction of the original Intake project and is still administered by Reclamation. All construction, staging and disposal would occur on Reclamation lands.

A primary feature of this alternative would be the construction of a bypass channel to divert approximately 15% of total river flows (see Figure 2-3). While the channel will typically divert 15% of the total flow from the main channel during typical spring and summer discharges, diversion percentages would vary from 10% at extreme low flows on the Yellowstone River to 17% at extreme high flows as indicated in Appendix A2 ((Engineering), Attachment 6, Appendix B, Table 3). This would require the excavation of approximately 1.2 million cubic yards of earthen material from Joe's Island as shown in figure 2.3. The proposed bypass channel alignment extends approximately 15,500 feet in length at a slope of approximately 0.0006 feet/feet (natural Yellowstone River slope is approximately 0.0004feet/feet to 0.0007 feet/feet). The channel cross section would have a bottom width of 40 feet, a top width of 150-250 feet, and side slopes varying from 1V:12H to 1V:3H. The upstream third of the channel is on the same alignment as the existing high flow chute.

The excavation would be accomplished by using scrapers for soils located above the water table and using large backhoes and trucks for materials below the water table. Initially a small pilot ditch would be excavated along the length of the new channel alignment. The excavation for the four rock structures would then be performed. Water encountered during this excavation would be pumped into the pilot ditch, where it would gravity flow to the river. Following completion of the rock structures, the remainder of the channel would be excavated and disposed of in the spoil area located on the south side of the new channel. The spoil pile would be approximately 60 acres in size and reach a height of approximately 12 feet and would be located outside the 100-year floodplain (Figure 2.4). Specific traffic and fill plans will be designed to avoid infilling of existing drainage ways within the waste pile area.

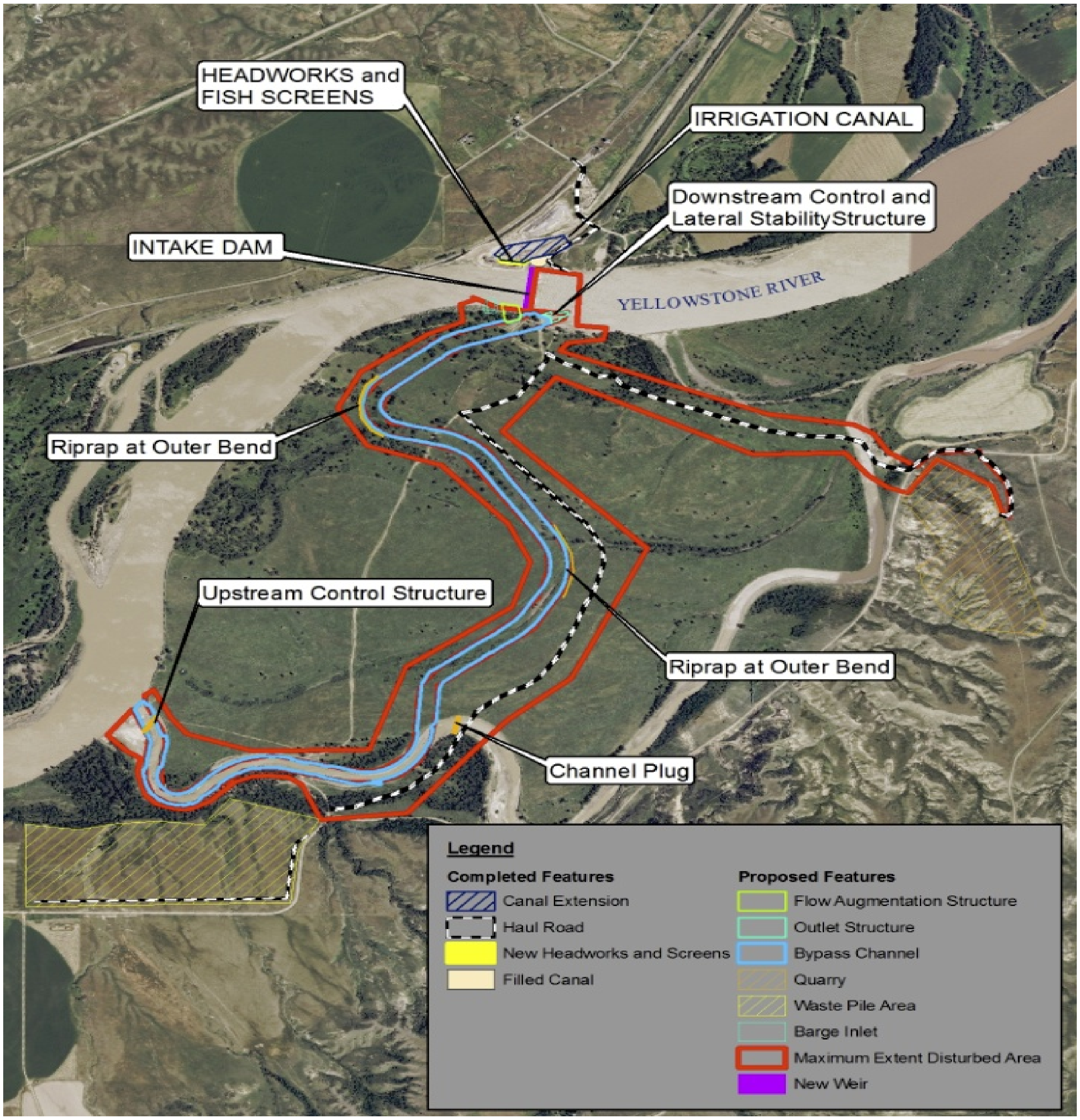

Figure 2-3. Bypass channel alternative

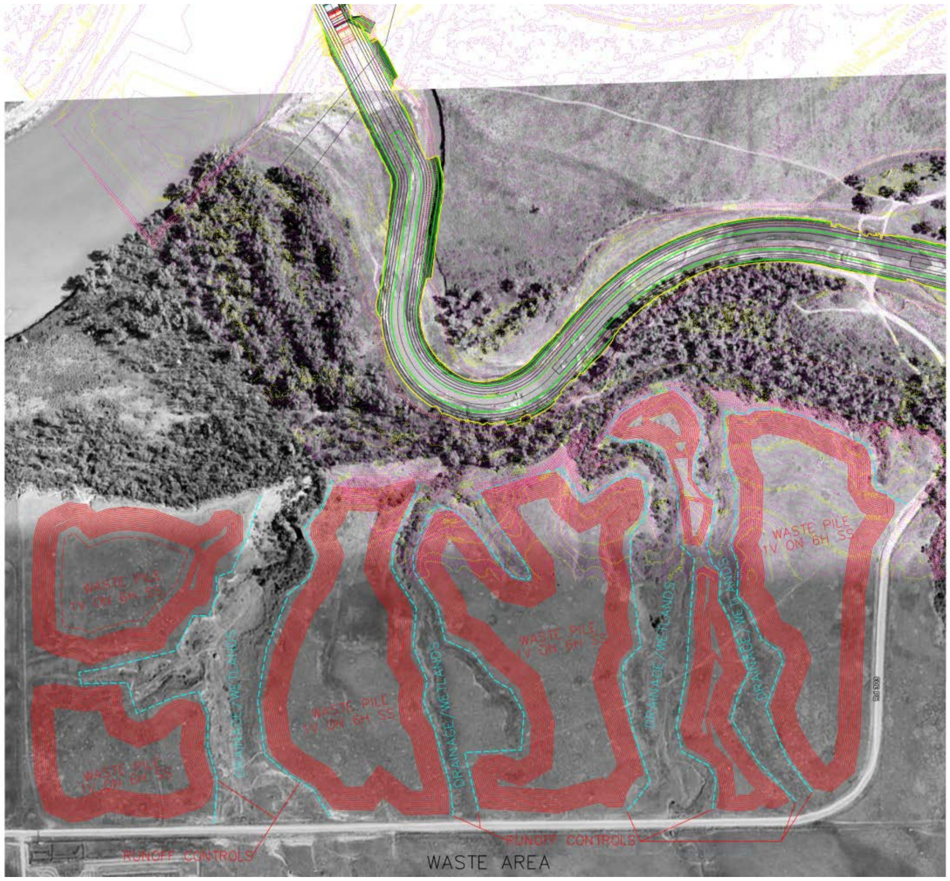

Figure 2-4. Waste area

This work would be protected by a cofferdam at the upstream entrance and downstream exit of the proposed bypass channel, which would be constructed early in the construction sequence. The cofferdams will consist of sheet piles driven below grade into the large alluvium material to prevent under seepage.

Grade control structures are included at the downstream (Figure 2-5) and upstream (Figure 2-6) ends of the bypass channel as well as at two intermediate locations to prevent excessive degradation that would impact passage success. The upstream end includes a 60-foot wide by 30-foot long (upstream to downstream) by 6-foot thick concrete sill necessary to prevent ice damage while the remaining grade control structures consist of riprap.

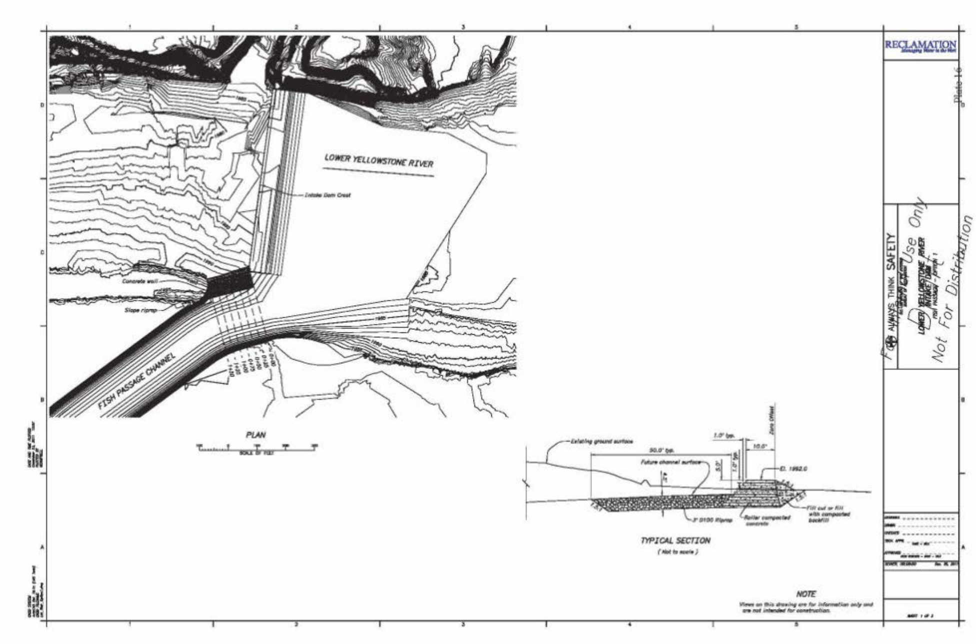

Figure 2-5. Downstream grade control structure

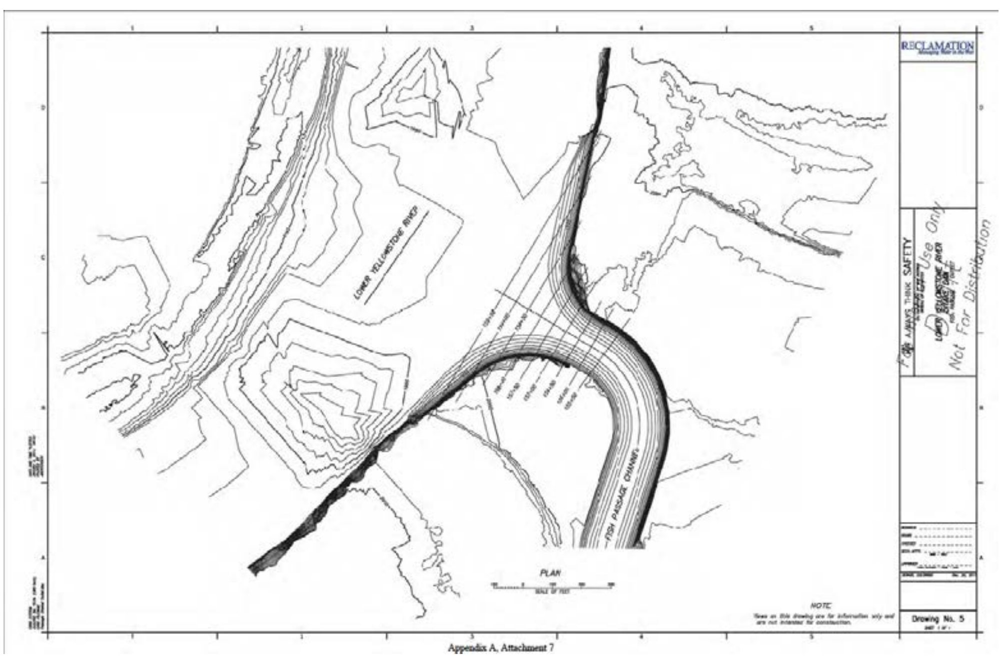

Figure 2-6. Upstream grade control structure

Two vertical control structures (riprap sills) are proposed for maintaining channel slope and allowing for early identification of channel movement (Figure 2.7). Similar to the upstream control structure, these would be over-excavated and backfilled with natural river rock to give the appearance of a seamless channel invert while providing stability during extreme events. A riprap sill is also proposed for the downstream end of the channel to maintain channel elevations.

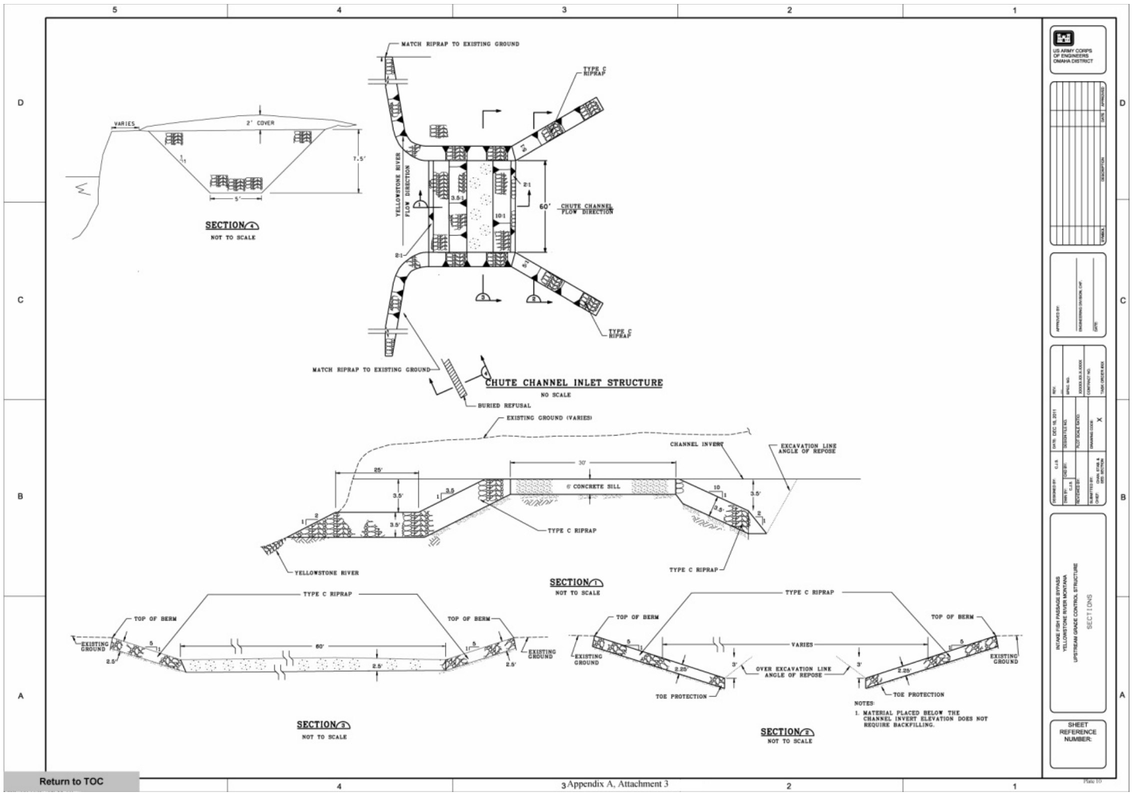

Figure 2-7. Vertical control structures

Additionally, bank riprap is proposed at two outside bends identified as having higher potential for failure to minimize the risk of losing the bypass channel planform. It was assumed that the portion of the historic high flow chute used for the bypass will be stable. It is possible that additional protection could be required in the future if assumptions about channel stability are proven incorrect and excessive channel migration or degradation begins to impact passage effectiveness. Approximately 65,000 tons of riprap would be required for the bypass channel.

Current modeling efforts indicate a degradational trend within the bypass channel. Modeling also shows that an increase in size of bypass bed material minimizes the expected degradation; therefore construction of an armor layer is proposed. The armor layer would consist of large gravel to cobbles, similar in size to the naturally occurring course channel material found on Yellowstone River point and mid-channel bars and similar to what would be expected to occur naturally over time. Approximately 64,000 tons of armor layer material (15,500 linear feet by 90-feet wide by 9-inch layer thickness) would be screened from the alluvial material excavated from the bypass channel and placed in the channel bottom to achieve final design grade.

Diversion of flow from the existing high flow channel into the constructed bypass channel will be facilitated by a channel diversion constructed approximately 1 mile downstream from the upstream end of the bypass. The conceptual design of the channel diversion would include a culvert sized to minimize impacts to fish passage in the existing high flow channel. The culvert would maintain a minimal amount of flow to the existing high flow channel and would be designed for overtopping during high flow events to take advantage of the high flow channel's current functionality and to reduce stress on the new channel. The culvert would be covered in riprap to maintain stability and resist erosion (see Figure 2-8).

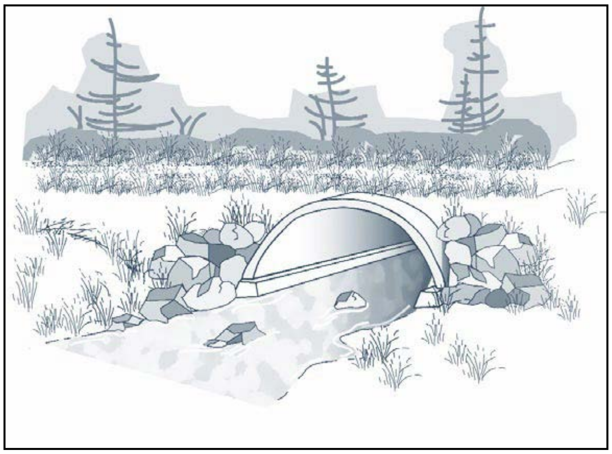

Figure 2-8. Channel diversion conceptual design

The various bypass alignments were developed based on length required to obtain the desired channel slope as well as to minimize excavation quantities. Four alignments are shown in Figure 2.9.

Alignments 1 and 3 have similar lengths (≈15,500 feet) and Alignment 2 is slightly shorter (≈13,500 feet). Alignment 3 was developed to maximize the use of historic channel scars and swales following a site visit in August 2011 and supersedes Alignment 1. Alignment 4 is 1.5 times longer than Alignment 3, representing a slope of 0.0004 feet/feet vs. the 0.0006 feet/feet slope of Alignment 3. Alignments 1 and 2 are shown only because they were discussed in the original concept evaluation (April 2011). The longest, Alignment 4, was only recently considered based on comments from the BRT pertaining to the pallid sturgeon's preferred substrate and the natural armor layer that would be expected to develop for the flatter slope.

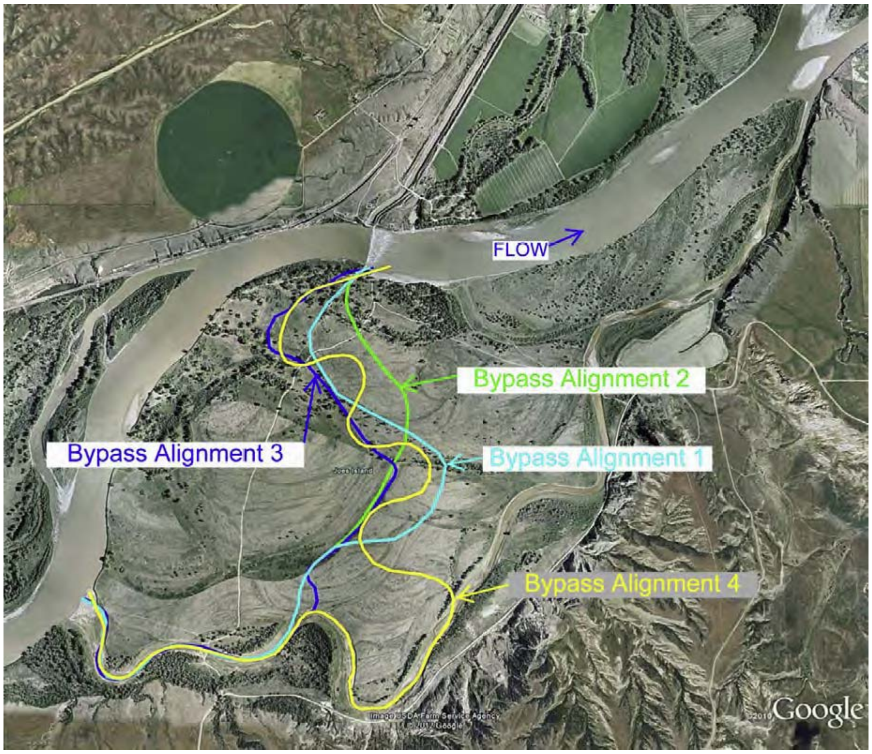

Figure 2-9. Bypass channel alignments

Hydraulic modeling was completed to evaluate the alternative alignments and channel cross section configurations. The proposed channel configuration, based on input from the Biological Review Team (BRT), utilizes Alignment 3. Channel depth ranges from 3-5 feet on the upstream end to nearly 20 feet towards the downstream end. The resultant flow split is approximately 15% of total Yellowstone River flows. Analysis of the flows splits is shown in Table 2-1.

The rock riprap needed during construction would be purchased from commercial sources. A new, raised concrete weir is proposed just upstream from the existing rock weir at elevation 1990.5 feet (NAVD 88) in order to provide sufficient water surface elevations to divert the appropriate flows through the bypass channel and maintain irrigation diversion. Construction of a new concrete weir would eliminate the need to repeatedly place rock along the crest of the existing dam in order to maintain head requirements for both the bypass channel and the new headworks. While head requirements could be met through yearly rock placement, a permanent structure provides for long-term sustainability of flows into the bypass channel. It also eliminates the concern as to whether continued displacement of rock from the crest of the dam by ice flows could adversely affect the entrance to the bypass channel. The new river-wide concrete weir would be constructed approximately 40 feet upstream of the existing dam (Figure 2.10).

Table 2-1. Bypass channel flow splits and configurations

Recurrence interval (annual, post-Yellowtail flows)	Total Yellowstone River discharge	**BASE** (existing right bank chute assuming new headworks with existing dam)		**10% Diversion**		**15% Diversion**		**30% Diversion**		**Long Alignment**	
	Flow Splits for Base and Alternatives										
	(cfs)	(cfs)	(%)	(cfs)	(%)	(cfs)	(%)	(cfs)	(%)	(cfs)	(%)
<2-yr	3000	0	0	220	7	310	10	890	30	273	9
<2-yr	7000	0	0	650	9	860	12	2220	32	755	11
<2-yr	15000	0	0	1550	10	2140	14	4770	32	1897	13
<2-yr	30000	790	3	3220	11	4510	15	9290	31	4019	13
2-yr	45300	2280	5	5180	11	7170	16	13720	30	6417	14
5-yr	60600	4050	7	7340	12	9900	16	18130	30	8937	15
10-yr	70100	5220	7	8770	13	11690	17	20780	30	10558	15
20-yr	78700	6090	8	9990	13	13210	17	23240	30	11919	15
50-yr	89400	7280	8	11540	13	14940	17	26260	29	13534	15
100-yr	97200	8090	8	12650	13	16280	17	28170	29	14815	15
500-yr	114000	9920	9	15570	14	19290	17	32490	29	17760	16

Pertinent Bypass Channel Parameters

	10% Diversion	**15% Diversion**	**30% Diversion**	**Long Alignment**
Alignment	3	3	3	4
Bypass Channel Length (ft)	15500	15500	15500	23250
Bypass Channel Longitudinal Slope	0.00060	0.00060	0.00060	0.00040
Bypass Channel Bottom Width	20	40	200	40
Bypass Channel Side Slopes	Vary from 1V:12H to 1V:3H			
Approximate Excavation Quantity (cubic yards)	800,000	1,200,000	2,600,000	1,700,000

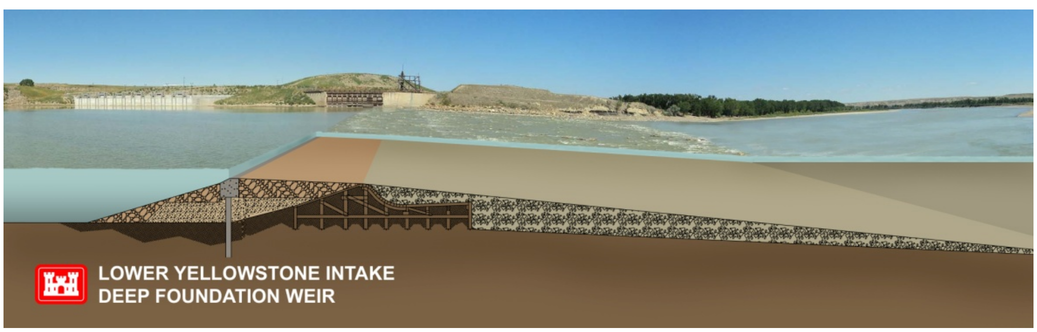

Figure 2-10. Weir rendering

The weir structure would consist of a cantilevered structural wall created by a deep foundation of either driven piles or drilled shafts with a concrete cap. Because of the river water level, if drilled shafts were used, the shafts would be cased (pipe piles cleaned out and filled with reinforced concrete). The piles or shafts would be spaced such that there would be gaps between them below the cap, but the backfill would be completely around them, and for purposes of retaining wall design, a bridge between them. The top of the structure would be a reinforced concrete cap to protect it and allow for a smooth crest surface for ice to pass over. Fill would be placed between the downstream side of the crest and the existing weir. Fill would also be placed upstream of the new weir structure and sloped to include rock protection. The weir crest may include at least one low-flow channel for fish passage. This would offer an array of depth-velocity habitat zones for fish migration under a wide range of flows, which are typical on the lower Yellowstone River. The channel(s) in the weir crest would be designed to provide fish passage during late summer and early fall low flows. It is likely that some maintenance of the rock field between the old and new weirs would be necessary over the long term. However, the riprap placed between weirs would not be subject to the same level of displacement experienced with the current weir since it will not be subject to direct impact from ice flows. An access road would be constructed along the north side of the river to allow access for heavy equipment during construction. Following completion, the road may be left in place for long-term O&M use. Existing access roads to Joe's Island would be improved as needed to allow access. Access by motor vehicle across the newly constructed bypass channel would be limited at most flows. For major O&M actions, temporary access would need to be built, work would have to be done when the chute is iced-over, or equipment would need to be brought in by way of boat or barge.

Construction of this alternative would likely take two to three years depending on funding. The preliminary cost estimate is $58.9 million, which includes: $21.2 million to excavate the bypass channel; $13.6 million for bank stabilization; $11.0 million for the concrete weir; and $6.2 million for adaptive management and monitoring. The remaining $6.9 million would include planning, engineering, design and construction management. Cost savings could occur if sufficient funding were made available to construct the project in one year. The preliminary cost estimate for O&M for the Bypass Channel Alternative would be $140,000 annually, including approximately $10,000 for repairs to concrete weir, $57,000 for bypass channel (including rock replacement), $10,000 for sediment removal in front of headworks, $2,000 for the main canal and $61,000 in administrative costs. Annual O&M of the newly constructed headworks and fish screens is approximately $92,000.00, therefore annual O&M for Phase I (entrainment protection) and Phase II (fish passage) of the project would be approximately $232,000.

Reclamation and the LYIP would most likely need to amend the existing O&M transfer contract to address operation and maintenance of the new headworks and bypass channel consistent with the authorizing legislation (Reclamation Act of June 17,1902, as amended; Water Conservation and Utilization Act of August 11, 1939, as amended) and Reclamation policy. Funding responsibility for O&M, monitoring, and any necessary adaptive management measures would depend on a number of factors including applicable laws, regulations, and policies; opportunities for cooperative funding; the nature of the activity; and likely other factors specific to a given O&M, monitoring or adaptive management measure.

2.4. Rock Ramp Alternative

The primary feature of this alternative would be replacement of the existing rock and timber crib structure at Intake Diversion Dam with a concrete weir and a shallow-sloped, un-grouted boulder and cobble rock ramp. The rock ramp would be designed to mimic natural river function and would lower velocities and turbulence so that migrating fish could pass over the dam, thereby improving fish passage and contribution to ecosystem restoration.

The replacement concrete weir would be located downstream of the new headworks to create sufficient water height to divert 1,374 cfs into the main canal. This concrete weir would replace the existing timber and rock-filled dam providing long-term durability lacking in the current structure. The concrete weir would be constructed as a cast-in-place reinforced concrete wedge spanning the entire width of the Yellowstone River channel. The upstream, sloping face of the concrete weir would be designed to withstand damage from blocks of ice moving up and over the dam in the spring. The historic headworks have been preserved in place and would serve as a weir abutment on the north (left) bank of the river, while a new concrete weir abutment would be constructed on the south (right) bank at the lateral extent of the new weir. It would anchor into adjacent ground (see Figure 2-11). The weir crest would vary in elevation, including at least one low-flow channel for fish passage. The variable crest would offer an array of depth-velocity habitat zones for fish migration under a wide range of flows, which are typical on the lower Yellowstone River. The channels in the weir crest would be designed to provide fish passage during late summer and early fall low flows and would be approximately 1 - 2 feet deep. The downstream side of the weir would tie directly into the rock ramp to provide a seamless transition and unimpeded fish passage as fish migrate upstream.

A rock ramp would be constructed downstream of the replacement weir by placing rock and fill material in the river channel to shape the ramp, followed by placement of rock riprap. The ramp would be constructed to provide flow characteristics consistent with BRT criteria for pallid sturgeon, so the endangered fish would have improved access to habitat upstream of the weir. A wide range of slopes have been evaluated to simulate performance and predict reliability of fish passage, as shown in Figure 2-12.

During optimization of a full width rock ramp alternative, hydraulic and physical modeling efforts focused primarily on meeting the swim criteria developed by the BRT as outlined in Appendix E. These criteria reflected the potential hydraulic needs of the pallid sturgeon to pass over the weir. Fourteen iterations of a rock ramp that spanned the width of the river were modeled. The first modeling effort used a 1-dimensional Hydrologic Engineering Center – River Analysis System (HEC-RAS) model to develop the initial configuration. Then a 2-dimensional ADH model was used to refine and optimize the preliminary design. The preliminary design, as presented in this amended EA, provides the best combination of depth and velocity results over a wide range of flow conditions. This conforms to the criteria set forth by the BRT while minimizing the footprint and fill in the river channel. Preliminary design refinement, which was on-going concurrent with the draft EA review, incorporated physical (1:20 scale) modeling of the diversion headworks and screens and the rock ramp.

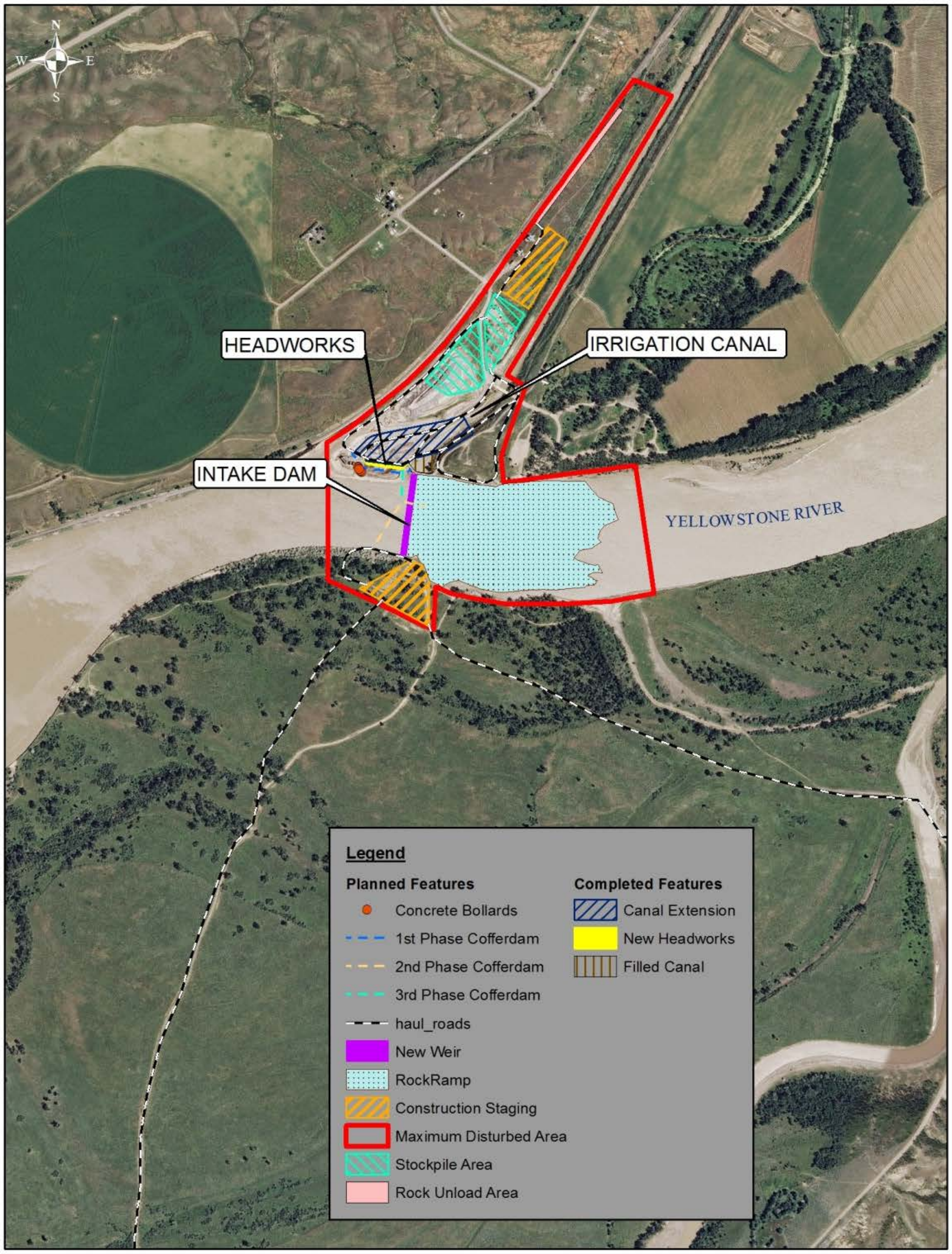

Figure 2-11. Rock ramp alternative

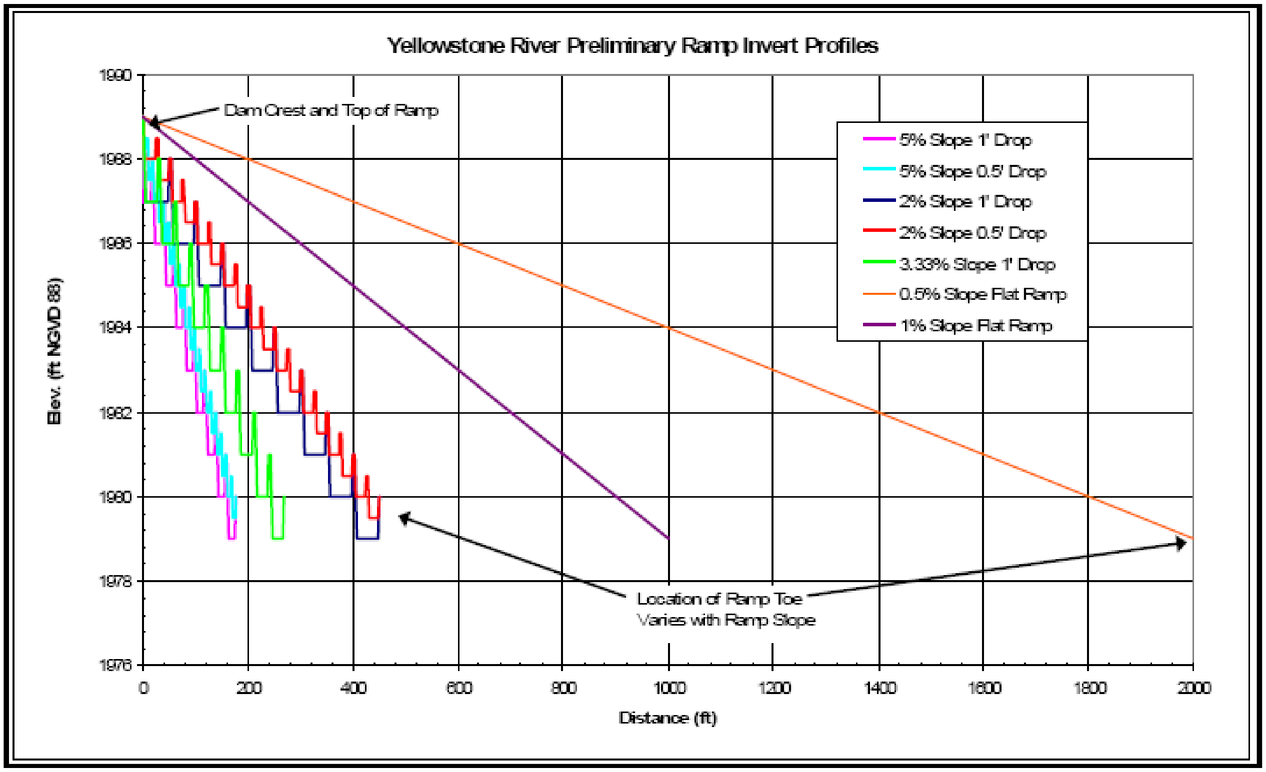

Figure 2-12. Range of ramp slopes evaluated for the rock ramp alternative

Because pallid sturgeon are sensitive to flow velocities and turbulence, the rock ramp would be constructed to be relatively flat (approximately 0.4% slope) over much of its width to keep flow velocities as low as possible. For comparison purposes, the natural slope of the lower Yellowstone River varies, but typically ranges from between .05% - .065%. The final configuration of the rock ramp would be optimized for pallid sturgeon passage using ongoing computer modeling. If selected, the Service's BRT would be consulted during design of this alternative, including but not limited to reviewing results and making recommendations on hydraulic modeling and final alternative design.

The new rock ramp would be constructed over the site of the existing Intake Diversion Dam, preserving most of the historic dam in place. Because the existing dam's rock field has washed downstream, part of the existing dam crest might be removed and rock moved to accommodate construction of a ramp. The rock ramp would include at least one low flow channel in conjunction with the low flow channel on the crest, which would allow fish migration during low flows. The rocks in the ramp would be sized to withstand high flows and ice jams and would range from 1 - 4 feet in diameter. The largest rocks would be placed near the crest to resist ice forces. Approximately 450,000 tons of rock riprap and 75,000 tons of fill material would be needed to construct the ramp. The rock would be purchased from existing commercial quarries. Staging areas identified in the original EA would be used for storage of the rock, which would be transported by truck or rail depending upon the source.

A temporary crossing would be constructed across the current main canal to prevent damage to the existing county bridge from heavy equipment use. The new crossing would use six, 10-feet by 10-feet box culverts with sufficient width and length to bridge the existing canal.

Depending on funding, it is anticipated that the overall construction would take three years and be conducted in three primary phases. During the first year a concrete weir would be constructed on the south half of the river using similar methods to placement of the weir in the bypass alternative. In year two, a cofferdam would be constructed extending from the old headworks, across the end of the concrete weir and return to the north bank below the area of rock ramp placement to allow construction to occur in the dry. After the north half of the concrete weir is in place, rock ramp construction would begin working from the north bank across the river in parallel segments. Construction of the remainder of the rock ramp would be the final phase of this alternative. It would be completed by working incrementally across the river from the north bank building sections of the ramp.

The preliminary cost estimate is $80.0 million, which includes: $60.3 million for the rock ramp, $10.6 million for the concrete weir; and $3.9 million for adaptive management and monitoring. The remaining $5.2 million would include planning, engineering, design and construction management. The preliminary cost estimate for O&M for the rock ramp alternative would be $201,000 annually, including approximately $10,000 for repairs to concrete weir, $128,000 for rock ramp (including rock replacement), $2,000 for the main canal and $61,000 in administrative costs. Annual O&M of the newly constructed headworks and fish screens is approximately $92,000.00, therefore annual O&M for Phase I (entrainment protection) and Phase II (fish passage) of the project would be approximately $293,000.

Reclamation and the LYIP would most likely need to amend the existing O&M transfer contract to address operation and maintenance of the new headworks and rock ramp consistent with the authorizing legislation (Reclamation Act of June 17,1902, as amended; Water Conservation and Utilization Act of August 11, 1939, as amended) and Reclamation policy. Funding responsibility for O&M, monitoring, and any necessary adaptive management measures would depend on a number of factors including applicable laws, regulations, and policies. Reclamation intends to work cooperatively with the state of Montana and LYIP to identify funding resources for monitoring and adaptive management to avoid significant adverse financial or other impacts to the LYIP.

2.5. Identification of the Preferred Alternative

Reclamation and the Corps considered several factors in determining the preferred alternative for improving fish passage. The natural resources, social, and economic impacts of each of the alternatives were considered, along with the following specific factors:

2.5.1 Purpose and Need

Both the Rock Ramp and Bypass Channel Alternatives are designed to meet the purpose and need for the proposed action of improving fish passage. The No Action Alternative would not meet the purpose and need.

2.5.2 Fish Passage Analysis

A Fish Passage Connectivity Index (FPCI) was used to evaluate the fish passage effectiveness of the three alternatives (see Appendix E). The following findings were important considerations in determining the preferred alternative:

- The Rock Ramp and Bypass Channel Alternatives produced much higher connectivity index scores than the No Action Alternative.
- The Rock Ramp Alternative had a higher connectivity index score overall than the Bypass Channel Alternative for all species with much higher connectivity index scores for walleye and paddlefish (strong swimmers) and moderately higher connectivity index scores for weaker swimming sturgeon.
- The connectivity index does not account for turbulence or the need for fish to swim at near burst speed levels for the length of the rock ramp which are important considerations for pallid sturgeon. These factors likely reduce actual passage success of the rock ramp.
- The connectivity index also does not account well for the relative magnitude of attraction flows which is a concern for the Bypass Channel Alternative where fish must find the channel entrance. Attraction flows are not an issue for the Rock Ramp Alternative.

2.5.3 Constructability

Construction of the bypass channel is considered more straightforward than construction of a rock ramp which would require working in the river when there is water present, using a lengthy cofferdam to dewater half the river channel for work, or diverting the entire river flow during construction.

2.5.4 Ice Forces

The substantial river ice forces in the vicinity of Intake Dam (see Appendix A2, Attachment 1A) create uncertainty for the sustainability of the rock ramp. There does not appear to be precedence for providing ice protection for an entire river channel as needed for the rock ramp. This reduces confidence that the rock ramp design would withstand the substantial ice forces at Intake and makes determining a suitable design to withstand the ice forces uncertain. Designing and maintaining the bypass channel to withstand ice forces is more straightforward and there is higher confidence in these designs.

2.5.5 Cost Effectiveness

The analysis presented in Appendix E indicates that the Bypass Channel Alternative is more cost effective at meeting the purpose and need than the Rock Ramp Alternative.

2.5.6 Pallid Side Channel Use

There is increasing information about pallid sturgeon use of side channels during spawning migrations, but the information is incomplete. The percentage of river flow in the bypass channel and the complex flows at the downstream entrance to the bypass channel create uncertainty about the ability of pallid sturgeon to locate and enter the bypass channel. The rock ramp would presumably be easier for pallids to locate and access.

2.5.7 Risk and Uncertainty

Each action alternative has risks and uncertainties. Some of these are mentioned above. Risks and uncertainties with potential for a significant consequence, whether the probability is high, moderate or low, is of particular concern to the agencies.

The following are risks/uncertainties resulting in potentially significant consequences identified for the Bypass Channel Alternative:

- Attraction Flow – Inadequate attraction flow or attraction flows that are disrupted by eddies or sheer flows.
- Length of Bypass Channel – There is no evidence of pallids using side-channels the length of the proposed bypass channel.
- Bypass Channel Flooding – The bypass channel would be located on a flood plain submerged during high runoff events. This could result in large volumes of debris and/or sediment in the bypass channel, or structural damage, significantly reducing or eliminating passage.

The following are risks/uncertainties resulting in potentially significant consequences for the Rock Ramp Alternative:

- Ice Damage/High Flows – Ice and high flows have the potential to damage, dislodge, and move strategically placed rocks and boulders on the rock ramp creating undesirable water velocities and flows, and resulting in impaired or loss of pallid sturgeon passage.
- Rock Ramp Avoidance – The rock ramp would be designed and constructed using the best available scientific information, but pallids may not use it resulting in lack of fish passage.

Potential options to address some of the potential high consequence results, likely include:

- Attraction Flows – If pallids fail to enter the bypass channel, it may be difficult to determine the cause, but attraction flow would likely initially be considered a reason. Designs will continue to be developed to address the complex flows at the bypass entrance that may disrupt bypass channel attraction flows. Augmentation flows are another option to address attraction concerns.

- Flooding/Ice Damage/High Flows – If events significantly damage or impair the bypass channel or rock ramp, reconstruction and repair would be necessary for continued compliance with ESA.
- Length of Bypass Channel/Rock Ramp Avoidance – If pallids fail to use the bypass channel or rock ramp, it may be difficult to determine the cause. Solutions may involve evaluating and implementing entirely new alternatives for fish passage to achieve compliance with ESA.

2.5.8 Preferred Alternative

There are no resource impacts that distinguish the Bypass Channel or Rock Ramp Alternative as having a distinct advantage over the other. The agencies believe that the more straight-forward construction, ability to withstand ice forces, and cost effectiveness advantages of the Bypass Channel lead to a preference over the Rock Ramp Alternative. As such, the Bypass Channel Alternative is Reclamation's and the Corps' preferred alternative.

2.6. Alternatives Considered but Not Analyzed in Detail

Appendix A.1 (Plan Formation) contains detailed information about alternative development for the 2010 EA as well as information related to alternative development for this Supplemental EA. A number of alternatives have been considered during the course of this project. Design improvements and alternatives continue to be assessed through project design processes, such as value engineering studies and the recent re-planning effort that was undertaken by Reclamation in July of 2013. Scoping comments on the Supplemental EA from cooperating agencies and others also identified a number of previously considered alternatives, as well as a few variations of alternatives.

2.6.1 Relocated Diversion Upstream Alternative

Construction of a new facility, including excavation of an additional canal, acquisition of real estate, working with the railroad, and other issues in combination with a rock ramp redundant to the Rock Ramp Alternative eliminated this alternative from further consideration.

2.6.2 Single Pumping Plant Alternative

Hydraulic modeling revealed that this alternative would be technically infeasible without a dam/weir to raise and divert water during low flow. Because the new dam/weir would be a fish passage impediment similar to the existing dam, a rock ramp would be needed to provide fish passage over it, making this alternative redundant with the Rock Ramp Alternative.

2.6.3 Multiple Pumping Stations Alternative

Because the irrigation canal system was designed for gravity flow of water primarily from a single water source at Intake, this alternative would require some restructuring of the lower Yellowstone Project canal system to accommodate a water supply from multiple points along the canal. Preliminary construction costs and annual O&M costs were both estimated to be greater than the Single Pumping Plant Alternative. Annual O&M costs associated with this alternative would be a substantial increase over the cost of the current water delivery system and most likely beyond the capacity of the irrigation districts (see Chapter 4, Social and Economic Conditions section). The O&M of this alternative would exceed all the other alternatives, as it would have the additional requirements of maintaining and operating new check structures in the main canal, increased sediment removal in the main canal, maintaining access roads to each pump site, removing sediment in the inlet channels from the river to the pumping stations, as well as from the sediment traps, maintaining pumps and pump motors, maintaining rock jetties in the river, and paying power costs. Power costs would be expected to be much greater than the Single Pumping Plant Alternative, which was estimated to be $315,000 per year.

2.6.4 Infiltration Gallery Alternative

Removing Intake Diversion Dam and constructing an infiltration gallery was eliminated from further consideration, because this alternative would require at least one and most likely multiple pumping plants, which makes it redundant with the Single Pumping Plant Alternative. In addition, the same reasons for eliminating the Single Pumping Plant Alternative would apply to the Infiltration Gallery Alternative. For example, power demand would be as high as or higher than the Single Pumping Plant Alternative, but unlike the Single Pumping Plant, back-flushing would also be required. Its only advantage over the Single Pumping Plant Alternative would be elimination of fish screens in a new headworks; however, excavation and construction of the infiltration gallery likely would be as costly and would disturb much more river channel than the Single Pumping Plant Alternative.

2.6.5 Relocated Main Channel Alternative

Relocating the main channel was an alternative considered in detail in the 2010 EA. The cost estimate for this alternative was $50 million, however many of the cost increases that were found in the earlier rock ramp alternative would apply here as well, therefore the cost estimate is expected to be considerably higher. Due to logistical incompatibility with Phase I of the project, which has already been constructed, this alternative has been eliminated from further detailed consideration and an updated cost estimate was not conducted.

2.6.6 Open Channel with Multiple Ranney Wells Alternative

This alternative was dropped because of the high cost to install the Ranney Well System and the high energy costs that would be placed upon the district. Concerns with service reliability, brownouts and power outages were also discussed. These issues could cause disruption in canal flows and affect operation of the whole system. It was determined that there were cheaper, potentially more effective alternatives remaining.

2.6.7 Rock Ramp with Reduced Weir Elevation Alternative

The lower ramp elevation was to help improve fish passage success at the same time reducing the cost of construction. Analysis was done at such a low level, engineers could not confidently say what impacts a lower rock ramp and weir elevation would have on fish passage as it pertained to velocities. Significant cost savings were not achieved in the preliminary estimate for this alternative.

2.6.8 Combination Rock Ramp and Weir Alternative

This alternative was dropped because it was very comparable in cost to the original rock ramp but only provided half the river passage. The original thought was if you cut the ramp width in half you could potentially cut the cost in half from the original rock ramp. Estimates from preliminary cost analysis did not validate this assumption. The primary factor this alternative did not prove to be cheaper was that in order to keep the water on the half rock ramp, a very large retaining wall would need to be constructed from the weir crest to the toe of the ramp. This increased costs back to the cost levels estimated for the original rock ramp design.

2.6.9 Island Alternative

This alternative was dropped because it was technically infeasible without constructing a weir/dam across the full width of the Yellowstone River. There were additional concerns regarding the river migrating away from the newly constructed headworks when the diversion dam was removed and that O&M cost would be considerable for the new dike system required on the outside bend of the river. It was also a concern that the hydraulics of this alternative would not allow the district to receive its full water right when the river flows dropped close to 3,000 cfs. Issues of sediment and fish entrainment were also discussed but not resolved.

3. Affected Environment

3.1. Introduction

The environment of the area to be affected by the alternatives is described in this chapter. The discussion focuses on the existing conditions of resources that could be affected by the proposed fish passage alternatives.

The existing conditions of resources potentially affected by the Intake Project, for the most part, have not changed since release of the 2010 EA. Existing condition descriptions will not be repeated here but can be found in the 2010 EA. The resources discussed in this chapter are limited to those where new information exists relevant to the fish passage alternatives and is necessary to provide context for the effects analysis in Chapter 4. The resources discussed in this chapter include:

- Aquatic communities
- Federally-listed species and state species of special concern
- Social and economic conditions
- Lands and vegetation
- Historic properties

3.2. Aquatic Community

In the 2010 EA, a literature search identified fish, mussels, and macroinvertebrates currently inhabiting areas that could be affected by the Intake Project. The lists of species were obtained from the MFWP website and other sources. Consideration was also given to the types of habitats and how these habitats might be impacted, either from construction or alterations that could occur through geomorphologic changes by any of the alternatives. The species lists have not changed since the original document but new information has been obtained through new or continued research on some of the species. The lists of species that can be currently found near the project area are in Chapter 3, "Aquatic Communities," in the 2010 EA.

3.2.1 Fish

Instream habitats of the lower Yellowstone River include main channel pools, runs, riffles, side channels, and backwaters. Most pools are 5 feet–10 feet in depth with some pools exceeding 18 ft during the summer flows. There are many islands and braided channels with associated backwaters, except in the reaches from Miles City to Cedar Creek and from Sidney to the confluence with the Missouri River. At the Intake site, the river is comprised of the main channel, Joe's Island, and a long side channel that carries flows seasonally, during the high water periods. Side channels are considered to be important habitat for young fish, for both rearing and winter habitat (Ragland, 1974; Ellis et al., 1979; Mesick, 1995). Preliminary data analysis on a study that has been undertaken since the drafting of the 2010 EA indicates that fish densities are greater in side channels than in the main channels during runoff (Reinhold, 2011).

Fifty-two species of fish have been recorded in the lower Yellowstone River (Montana Fisheries Information System, http://fwp.mt.gov/fishing/mFish/). Of these 52 species, 31 species are native to the lower Yellowstone River and 21 are species that have been introduced.

Intake Diversion Dam impedes upstream movement of fish to and from traditional spawning grounds, and the degree to which passage is prevented varies from species to species. It has been noted that stronger swimming fish such as walleye and sauger have been known to make it past the diversion dam (Helfrich et al., 1999), whereas weaker swimming fish such as pallid sturgeon have been unable to pass the dam for many years (Backes et al., 1994).

The Yellowstone River experienced extremely high flows in 2011. During the high flows, a considerable amount of rock was displaced from the diversion dam that created large notches along the crest. Monitoring by MFWP showed a significant increase in passage past the dam by many of the native species which is likely due to the displacement of rock (Backes, personal communication).

The large amount of rock displaced during 2011 resulted in the LYIP placing 1,493 cubic yards of new rock on the diversion dam to raise the water surface high enough to divert its full water right. A below-average water year occurred in 2012 so this placement of the rock is believed to have created additional passage problems. It is still unknown what effect the additional rock has had on passage at Intake.

Based on their physiology, shovelnose and pallid sturgeon are built to hold station and swim along the bottom of fast flowing rivers (body appression to flat, horizontal substrate), and have burst swimming speeds in currents between 15–25 feet per second (Hoover et al., 2011; Adams et al., 1999). Their body form however is likely not built for maintaining position in highly turbulent waters. Horizontal turbulence and vertical turbulence were tested by White and Mefford (2002) in pallid sturgeon fish passage studies. Although both types of turbulence ("eddies") were able to be negotiated, larger eddies tended to cause delays in upstream movement of the fish, with larger turbulence being most problematic. Helfrich et al. (1999) tagged 29 shovelnose sturgeon on the lower Yellowstone River. No tagged shovelnose sturgeon were recaptured upstream of any of the low-head diversions. Although pallid sturgeon were not used in their study, the similarities of shovelnose and pallid sturgeon suggests that neither of these closely related species may be adapted to negotiate turbulent water over large rock river bottom with high slopes. The U.S. Geological Survey (USGS) (2002) found shovelnose and pallid sturgeon have similar swimming abilities but found that shovelnose sturgeon are less motivated to move upstream. Radio telemetry studies have documented pallid sturgeon moving up to the Intake Diversion Dam, turning around, and moving downstream (Bramblett, 1996, Bramblett & White, 2001; Fuller et al., 2008) and extensive netting efforts up and downstream of the diversion suggest that it is a barrier to adult pallid sturgeon (Backes et al., 1994).

While most fish passage studies focus on the hydraulic constraints at dams (velocity, turbulence, etc.), some concern exists that metal construction material found within dams or fish passage structures could prevent passage for fish that have highly developed electro reception. The paddlefish is one such species. Gurgens et al. (2000) showed that in a laboratory, paddlefish exhibit an unambiguous avoidance behavior elicited by aluminum obstacles, and noted that such results may suggest that large metallic structural work within dams (such as locks and dams) have the potential to interfere with paddlefish migrations. Similar considerations would also apply to shovelnose and pallid sturgeon, which also possess a passive electrosense (Teeter et al., 1980) and migrate long distances. Intake Diversion Dam is known to have extensive amounts of metal in its structural make-up. While the notion of metal avoidance is often cited by fisheries biologists, very little in the way of actual field data are available. In an ongoing fish movement study on the Mississippi River between lock and dam 26 and lock and dam 24, tagged white bass, blue catfish and carp were shown to move freely through lock and dams, but tagged paddlefish did not (Garvey, personal communication, 2012).

The Intake Diversion has created issues in the past regarding entrainment of fish. Hiebert et al. (2000) estimated that about 500,000 fish of 36 species are annually entrained into the main canal at Intake Diversion, of which as many as 8% were sturgeon. Jaeger et al. (2005) estimated that 86% of the sauger that are entrained die, and up to 78% of annual non-fishing mortality of sauger in the lower Yellowstone River was related to entrainment into the main canal at Intake. Because the canal headworks at Intake have recently been rebuilt, and have incorporated removable rotating drum screens that meet screening criteria standards for minimizing entrainment, it is anticipated that entrainment is no longer a substantive issue. Reclamation is monitoring the effectiveness of the screens to confirm this and will continue entrainment monitoring in 2013 and 2014.

3.2.2 Mussels

Very little is known about mussel populations in Montana, but the best available data indicate that three native and three introduced mussels can be found in the Yellowstone River.

3.2.3 Macroinvertebrates

Macroinvertebrates of the lower Yellowstone River are very silt tolerant and very abundant. Seven species of caddisflies and seventeen species of mayflies can be found in large numbers near the Intake project area (Zelt et al., 1999; Newell, 1977). Also other true flies, mostly non-biting midges and seven species of stoneflies can be found but are not as abundant as the caddisflies and mayflies.

3.2.4 Aquatic Invasive Species

Very few aquatic invasive species have become established in the lower Yellowstone River. Whirling disease and iridovirus are two diseases of great concern in this stretch of the river. In 2005, Miles City State Fish Hatchery workers detected an extremely low level of whirling disease in samples taken from trout being kept at the hatchery, however this proved to be a false positive according to MFWP.

Iridovirus is of great concern for sturgeon species. Iridovirus can cause mortality in hatchery-reared sturgeon (Kurobe et al., 2011) and its effects to free-ranging sturgeon species in the Missouri and Yellowstone Rivers are still unknown. Iridovirus was recently documented in hatchery-rear pallid sturgeon at the Garrison Dam National Fish Hatchery Complex. These fish have been stocked in Recovery-Priority Management Areas (RPMAs) 1 and 2 in 2013 (R. Wilson, personal communication, April 8, 2013).

Mudsnails are found near the confluence of the Bighorn River, with eventual spread to the lower Yellowstone River likely. Common carp are present in the Yellowstone River both upstream and downstream of Intake Diversion Dam. Carp are strong swimmers and can probably pass upstream at Intake under most flows. Bighead carp, silver carp, black carp, and grass carp, collectively referred to as Asian carp, are invasive species that were either accidentally or intentionally introduced into the Mississippi River basin. They have subsequently become established within the lower Missouri River (Wanner & Klumb, 2009). Dams, while detrimental to many native migratory species, have provided some protection from Asian carp establishment in the upper Missouri River system. The Montana Aquatic Nuisance Species Management Plan (2002) acknowledges the fact that while they are not currently present, it is possible that Asian carp will eventually make their way up the river, and could impact native fish due to competition for habitat and food. However, like common carp, Asian carp are strong swimmers, and Intake Dam would likely not afford protection to the upper Yellowstone River should they become established below the dam.

3.3. Federally Listed Species and State Species of Special Concern

3.3.1 Introduction

Federal and state lists and Montana and North Dakota Natural Heritage Program databases were searched to determine if any of these species had been recorded in the Intake Project area. A literature search for life history information was completed for species recorded in the Intake Project area. State agencies with responsibilities for listed species and Service field offices were contacted for current information on locations, life histories, and current research information. Federally listed species or state species of concern likely to be in the Intake Project area are discussed below.

The Service, as required by the ESA, confirmed a list of federally-listed endangered, threatened and proposed species that are or may be present in the Intake Project area. The same species that were looked at in the 2010 EA were also considered under the new alternatives. Species status and biology can all be located in the 2010 EA. With the exception of the discussion below, all species biology and status has stayed the same.

In 2012, Reclamation completed a Biological Assessment (BA) on the operations and maintenance of the new headworks and associated fish screens. The 2012 BA list included the endangered pallid sturgeon, endangered interior least tern, endangered whooping crane, endangered black footed ferret, and the candidates greater sage-grouse and Sprague's pipit. The greater sage-grouse and Sprague's pipit were designated as candidates in 2010 (March and September, respectively) after having been petitioned for listing. Although the Service determined that the petition presented substantial information indicating that their listing was warranted, their listing was precluded by higher listing priorities (Service, 2010). Because neither species was designated as candidates during the 2010 EA or 2010 BA, neither was addressed (although the Sprague's pipit was discussed as a species of special concern in the 2010 EA). New information, where it is pertinent, has been added to this supplemental EA to include information regarding these newly designated candidate species. In addition, pertinent new information has been obtained on pallid sturgeon since the release of the 2010 EA and has also been included.

Pallid Sturgeon (Endangered)

Pallid sturgeon occupy the Missouri and Yellowstone Rivers in Montana and North Dakota. These sturgeon use the Missouri River year-round and the Yellowstone River primarily during spring and summer spawning. Klungle and Baxter (2005) estimated 158 wild adult pallid sturgeon inhabit RPMA 2. This includes the Missouri River from Fort Peck Dam to the headwaters of Lake Sakakawea and the Yellowstone River below Intake Diversion Dam (Service, 1993).

Several population estimates have been developed for the Fort Peck and Yellowstone River reaches (Krentz, 1995; Kapuscinski, 2003; Klungle & Baxter, 2005), with the most recently developed estimate showing 158 wild adults in 2004 (Klungle & Baxter, 2005). This estimate and current sampling efforts indicate the reproductive adults in the Yellowstone and Missouri Rivers remain very rare. Supplemental stocking of pallid sturgeon has been ongoing sporadically since 1998, with various numbers being stocked based on hatchery success for any given year (Service, 2006) in the upper Missouri River basin. Hatcheries involved with propagation of Missouri River pallid sturgeon stocked a combined 15,781 fingerling and yearling-sized pallid sturgeon during 2011, with approximately 4,000 of those being stocked in the RPMA 2, which includes the lower Yellowstone River and Missouri River between Fort Peck and Lake Sakakawea Reservoirs. Pallid sturgeon are stocked to ensure survival of the species in the short term and preserve existing genetics of the wild population. Monitoring data collected through the Pallid Sturgeon Population Assessment Program indicate that stocked pallid sturgeon are surviving, growing, and reaching a size and age that is capable of spawning. Recent survival estimates for hatchery fish stocked into the Missouri River show relatively high rates of survival (Hadley & Rotella, 2009; Steffensen et al., 2010) that are similar to other sturgeon species (Irelands et al., 2002).

Bramblett (1996) speculates that pallid sturgeon prefer the Yellowstone River over the Missouri River below Fort Peck, and that pallid sturgeon spawning occurs in the lower 6–9 river miles of the Yellowstone River (Bramblett & White, 2001; Fuller et al., 2008; Braaten, personal communication, 2011). Evidence includes higher numbers of ripe pallid sturgeon moving into the lower Yellowstone River compared to the Missouri River during spawning season and fish aggregating during the spawning season (late May and early June). Other more recent telemetry studies have also documented gravid pallid sturgeon moving up to the Intake Diversion Dam, turning around, and moving downstream (Bramblett & White, 2001; Fuller et al., 2008; Braaten, personal communication, 2011; Delonay et al., 2013). It is assumed that fish would likely have continued upstream had the barrier not been there. Extensive netting efforts up and downstream of the diversion suggest that it is a barrier to adult pallid sturgeon (Backes et al., 1994). There is recent evidence that pallid sturgeon have spawned in the Yellowstone River based on a single larval fish collected in 2012 (Braaten & Rhoten, personal communication, 2012). While spawning has been confirmed in the Yellowstone River, there is no evidence that any resulting young survived into adulthood and reproduced. During the 2011 spawning season, fewer telemetered fish than typical migrated up the Yellowstone River, likely as a consequence of high runoff in the Missouri River (Braaten, personal communication, 2013). This atypical run up the Missouri River resulted in the first documented naturally-reproduced pallid sturgeon above

Gavins Point Dam. A naturally-spawned pallid sturgeon was confirmed when a day old larvae was found in the Missouri River upstream of Wolf Point, Montana (Fuller, 2012).

The spawning strategy used by pallid sturgeon illustrates the importance of passage at Intake Diversion Dam. The lower Yellowstone River upstream of Intake contains some of the best remaining habitat thought to be important for successful spawning (Service, 2000a, 2003; USGS, 2007; Delonay et al., 2009). The near-natural hydrograph and associated temperature and sediment regimes characteristic of the Yellowstone River combine to provide one of the most natural habitats available to sturgeon (White & Bramblett, 1993).

Pallids in the Yellowstone River prefer sandy substrates and deep channels and select reaches with numerous islands (Bramblett & White, 2001). They primarily inhabit about a 70-mile stretch of river below Intake Diversion Dam. More recently radio-tagged hatchery-reared pallid sturgeon have been placed above the dam (Jaeger et al., 2005). Most of these fish stayed above the Intake Diversion Dam, but some were found in the main canal of the Lower Yellowstone Irrigation Project (Jaeger et al., 2004).

On the lower Yellowstone River, pallid sturgeon are presumed to utilize bluff pools and terrace pools as spawning habitats based on current knowledge of past use in the lower Yellowstone and Missouri Rivers (Jaeger et al., 2005). Bluff and terrace pools are unique geomorphic units associated with bedrock and boulder substrate. Table 3.1 shows the number and acreage of these pools in the Yellowstone River below Cartersville Diversion Dam, as defined by Jaeger et al. (2005). Suitable spawning habitat is much more prevalent above Intake. The ability to spawn as far upstream as habitat and conditions permit may be critical to development and survival of larval and immature fish and to survival, recruitment, and recovery of the species. Providing passage at Intake Diversion Dam would open approximately 165 miles of additional habitat in the Yellowstone River to pallid sturgeon, as well as providing access to the confluences of the Powder and Tongue Rivers.

Table 3-1. Summary of bluff pool and terrace pool habitats on the lower Yellowstone River

Reach	Bluff Pools		Terrace Pools	
	number	acres	number	acres
Below Intake Dam	8	342	4	125
Between Cartersville Dam and Intake Dam	17	1293	39	1764

Braaten et al. (2008) suggests larval drift distance presently available below Intake Diversion Dam is insufficient in length and settling habitat. Braaten et al. (2012) recently showed via a recapture study that pallid sturgeon originally released as free embryos and larvae can survive beyond the first year of life, indicating the importance and ability of the Missouri River to provide conditions that support survival, feeding, and growth of pallid sturgeon early life stages. Many of these released fish that survived would have been at or near the age when drifting slows or ceases (i.e. 11-17 days post-hatch), and so drift distance may not have played a major role in their survival, but clearly habitat conditions provided suitable conditions for their survival. This being the case, it could be expected that the Yellowstone River might likewise support habitat needs of pallid sturgeon. Without sufficient drift distances though, larvae could drift into the headwaters of Lake Sakakawea where it is thought that survival is unlikely.

Greater Sage Grouse (Candidate)

As their name implies, sage grouse are dependant year-round on sagebrush-grassland for survival. Historically, sage grouse occupied portions of 16 states and three Canadian provinces. Currently, the species is limited to 11 western states and two provinces, including Washington, Oregon, Idaho, Montana, North Dakota, South Dakota, Wyoming, Colorado, Utah, Nevada, and California. A 2004 status review estimated range wide populations between 100,000 to 500,000 individuals (Service, 2005).

In Montana, greater sage grouse inhabit roughly 27 million acres spanning 39 counties in the eastern half and southwestern corner of the state (Montana Sage Grouse Work Group, 2005). Grazing and agricultural development led to a 50% decrease in populations by the 1930s (Montana Natural Heritage Program (MTNHP), 2012). Evidence suggests that habitat fragmentation and destruction across much of the species' range has contributed to significant population declines over the past century. Other important factors in the species' decline include fire and invasive plant species. Statewide, sage grouse populations increased from the mid-1960s through 1973 and fluctuated slightly until peaking in 1984. Sage grouse populations again declined from 1991 through 1996 before increasing through 2001 to a level above 30 males per lek (Montana Sage Grouse Work Group, 2005). Population estimates from 2003 indicated approximately 27.7 males per lek (Montana Sage Grouse Work Group, 2005). If current trends persist, many local populations may disappear in the next several decades, with the remaining fragmented population vulnerable to extinction (Service, 2011).

Of the 27 million acres currently inhabited by sage grouse, MFWP refined these acres into 13 separate "core" sites, totaling 8.9 million acres (see ftp://ftp-fc.sc.egov.usda.gov/MT/www/technical/biology/SageGrouseStrategy/SageGrouseStudyMap.pdf). These core areas provide habitat for 75% of all known breeding sage grouse in Montana, and provide a target area for conservation efforts. According to the *Management Plan and Conservation Strategies for Sage Grouse in Montana* (Montana Sage Grouse Work Group, 2005), the following bulleted list provides a summary of seasonal habitats that are important to the survival of greater sage grouse:

- *Breeding Habitat*—Strutting grounds or "leks," where breeding actually occurs, are key activity areas and most often consist of clearings surrounded by sagebrush cover. Findings from research in central Montana reported a sagebrush canopy cover at feeding and loafing sites in the vicinity of leks of 20-50% with an average of 32%.
- *Nesting Habitat*— Sage grouse invariably prefer sagebrush for nesting cover, and quality of nesting cover directly influences nest success. Successful nesting requires concealment provided by a combination of shrub and residual grass cover. Sage grouse most frequently select nesting cover with a sagebrush canopy of 15-31%. Research findings in central Montana suggest that about two-thirds of nests occur within 2 miles of a lek.
- *Brood-Rearing Habitat*—Areas providing an abundance and diversity of succulent forbs, an important summer food source for young sage grouse, provide key brood-rearing habitat. Research in central Montana indicated that sage grouse broods prefer relatively open stands of sagebrush during summer, generally with a canopy ranging from 1-25%.

As palatability of forbs declines, sage grouse move to moist areas that still support succulent vegetation, including alfalfa fields, roadside ditches, and other moist sites. During summers of high precipitation, sage grouse in Montana may remain widely distributed throughout the entire summer due to the wide distribution of succulent forbs. Sage grouse in southwest Montana and eastern Idaho often move to intermountain valleys during late summer where forbs remain succulent through summer and early fall. Reported sagebrush canopy on these sites varied from 8.5-14%.

- *Winter Habitat*— Sage grouse generally select relatively tall and large expanses of dense sagebrush during winter. Wintering areas in central Montana included sagebrush stands on relatively flat sites with a 20% canopy and an average height of 10 inches. The importance of shrub height increases with snow depth. Thus, snow depth can limit the availability of wintering sites to sage grouse.

Sprague's Pipit (Candidate)

The Sprague's pipit is endemic to the mixed-grass prairies of the northern Great Plains, including breeding habitat in Minnesota, Montana, North Dakota and South Dakota as well as south-central Canada. Wintering occurs in Arizona, Texas, Oklahoma, Arkansas, Mississippi, Louisiana, and New Mexico. Long-term surveys have indicated a range wide population decline of 3.9% annually (Jones, 2010). Global population estimates have projected as many as 870,000 breeding birds, although this calculation is unverified with existing data and is likely a maximum estimate (Jones, 2010).

The breeding range extends through the north-central and eastern counties of Montana. Breeding in the southeastern and south-central counties was last reported in 1991 (Jones, 2010). Breeding population estimates range from as many as 400,000 in Alberta, Canada to as few as 3,000 in South Dakota (Jones, 2010). Generally, pipits prefer to breed in well-drained native grasslands with high plant species richness and diversity (Jones, 2010).

The principal causes for the declines in Sprague's pipit range and populations are habitat conversion (to seeded pasture, hayfield, and cropland) as well as overgrazing by livestock. In addition to the habitat losses from changes in land use, energy development, introduced plant species, nest predation and parasitism, drought, and fragmentation of grasslands are all threats that currently impact Sprague's pipit populations throughout their present range (Jones, 2010). Anecdotal accounts from early naturalists suggest that Sprague's pipits were one of the most common grassland songbirds in the northern Great Plains. Since its discovery, the Sprague's pipit has suffered greatly throughout its breeding range from conversion of short- and mid-grass prairie to agriculture (Jones, 2010).

Sprague's pipits are likely influenced by the size of grassland patches and the amount of grassland in the landscape. Pipits had a 50% probability of occurring on patches ≥ approximately 400 acres; pipits were absent from grassland patches <72 acres. The shape of the habitat is also important; sites with a smaller edge-to-area ratio had higher pipit abundance and were an important predictor of their occurrence. No consistent effect of patch size was found on nest success. Sprague's pipits rarely occur in cultivated lands and are uncommon on non-native planted pasturelands. They have not been documented to nest in cropland, in land in the

Conservation Reserve Program, or in dense nesting cover planted for waterfowl habitat (Jones, 2010).

The conversion, degradation, fragmentation, and loss of native prairie are the primary threats to Sprague's pipit populations. The once abundant grasslands of the Great Plains have been drastically reduced, altered, and fragmented by intensive agriculture, roads, tree plantings, encroachment by woody vegetation, invasion of exotic plants, and other human activities, including the removal of native grazers and a change in the natural fire regime. In the United States, about 60% of native mixed-grass prairies in Montana, North Dakota, and South Dakota have been converted to cropland. Grassland conversion has greatly reduced the quality and availability of suitable habitat for Sprague's pipits (Jones, 2010).

Fragmentation of native prairie has likely contributed to the decline of Sprague's pipit populations through a reduction in average patch size, increased isolation of habitat patches, and increase in the ratio of edge-to-interior in habitat and potentially, an increase in parasitism. In fragmented landscapes, habitat interior species such as Sprague's pipits may experience lower reproductive success when nesting near habitat edges, where they are more susceptible to nest predators and brood parasites (e.g., brown headed cowbird). Sprague's pipits, like many other grassland endemics, tend to prefer areas with <20% shrubs, and are negatively associated with trees on a local territory scale. Sprague's pipit abundance has also been inversely correlated with distance to cropland and to water (Jones, 2010).

Sprague's pipits may avoid roads and trails during the breeding season and the increased road densities associated with energy development may have negative effects on Sprague's pipit habitat. The type of road (e.g., secondary or tertiary, the presence of deep ditches on the sides, heavily graveled) and the level of traffic are the potential issues in determining the degree of effect roads and trails have on Sprague's pipit populations. In Saskatchewan, Sprague's pipits were significantly more abundant along trails (wheel ruts visually indistinct from surroundings) than along roadsides (fenced surfaced roads with adjacent ditches), which may be attributed to the reduction of suitable habitat associated with the road right-of-way. Sprague's pipit's avoidance of roads may also be due to the roadside habitat which tended to have non-native vegetation, dominated by smooth brome (*Bromus inermis*) (Jones, 2010).

Montana and North Dakota Species of Special Concern

This list has not changed from the 2010 EA. A complete list of species along with biology of each species can be found in the 2010 EA in Chapter 3, Federally-Listed and State-Listed Species of Special Concern section.

3.4. Lands and Vegetation

3.4.1 Introduction

- What lands and vegetation (wetlands, grasslands, woodlands, riparian areas, and noxious weeds) in the area could be affected by the alternatives?

Lands and vegetation include wetlands, grasslands, woodlands, riparian areas and noxious weed areas. The following discussion centers on habitat types within the Northwestern Great Plains Ecoregion in the Intake Project's area of potential effects in the Yellowstone River basin.

3.4.2 Methods

Prior to field verification, various Geographic Information System (GIS) layers were used to inventory lands and vegetation in potential construction zones for each action alternatives. The potential construction zone relates to the maximum extent of disturbance as depicted in figures in Chapter 2. Thus, the tables in this section identify acres of specific resource types that could be affected upon implementation of an alternative and are not meant to identify impacts themselves. A specific impacts analysis is provided in Chapter 4. The GIS layers were developed using state and federal agency land use databases.

A Waters of the U.S. (WUS) delineation and general field investigation was completed on August 16 and 17, 2012. The investigation was used to ground truth the GIS desktop analysis. Wetlands, grasslands, woodlands and riparian areas were quantified and mapped based on findings. See Appendix K for the results of this investigation. Additional details on baseline data and methodology are presented in the 2010 EA.

3.4.3 Existing Conditions

Wetlands

A diversity of wetland types were identified during the desktop investigation within the project area (National Wetland Inventory (NWI) Map, 2012), including riverine wetlands and palustrine wetlands. The field investigations confirmed the presence of these habitats. Wetlands most likely to be affected are those located within the riparian areas.

A seepage spring, wetlands, and intermittent waterway were identified near the western boundary of the waste pile site in a drainageway that connects to a side channel of the Yellowstone River. The side channel of the Yellowstone River had a gravel/cobble bed that was intermittently exposed and contained patchy emergent wetlands. Flow was not apparent during the investigation. It appears that the size of the wetlands in this area fluctuate based on the depth and velocity of flows through the side channel. Approximately 0.5 acres of palustrine emergent (PEM) wetlands were found within the Bypass Channel Alternative. Dominant vegetation in PEM wetlands consisted of buttercup, silverweed cinquefoil, smartweed, wild mint and sedges. Approximately 55 acres of riverine wetland were found within the Rock Ramp Alternative. Table 3.2 lists wetlands within the construction area footprint that were identified during the investigation for each alternative. Because each alternative could affect riverine wetlands, those acres are also identified in Table 3.2.

Table 3-2. Wetlands within the construction footprint of proposed action alternatives

Alternative	Palustrine (acres)	Riverine (acres)	Total Wetlands (acres)
Bypass Channel Alternative	0.5	20	20.5
Rock Ramp Alternative	0	55	55

Riparian Areas

In order to identify and evaluate potential impacts of the alternatives, riparian areas were defined by the MNHP who mapped wetland and riparian areas along the Yellowstone River using the *System for Mapping Riparian Areas in the Western United States* (Service, 1997). Mapped riparian types may not be jurisdictional wetlands but have vegetation affected by the hydrology of a nearby water body (river, stream, or lake). The field investigation confirmed that outside wetlands identified in the previous section, riparian areas were dominated by upland forbs, shrubs and grasses. Table 3.3 lists acres of riparian areas within the construction area footprint for each alternative.

Table 3-3. Riparian areas currently in construction footprint of alternatives

Alternatives	Riparian Acres			
	Emergent	Forested	Scrub-shrub	Total
Bypass Channel Alternative	0	63	7	70
Rock Ramp Alternative	0	5	0.1	5.1

Woodlands

The National Land Cover Database (NLCD) was utilized to identify non-riparian woodlands within the project area. Woodlands include areas with trees usually greater than 19 ft tall with a tree canopy covering 25-100%. Within the Intake Project area this includes deciduous and evergreen forests and shrubland. Deciduous woodlands are generally made up of cottonwood, green ash, Russian olive, and box elder trees. Although some of the deciduous woodland species are hydrophytic and could be found in wetlands, the herbaceous understory consisted of upland vegetation and no wetland hydrology or soil indicators were present in the forested areas. The evergreen forest consists mostly of juniper species and ponderosa pine. Shrublands are areas dominated by shrubs with a shrub canopy covering 25-100% of the area. In the Intake Project area this includes sagebrush communities dominated by silver sagebrush, common snowberry, chokecherry shrubland, buffaloberry shrubland, and some drier willow shrub areas.
Table 3.4 lists acres of wooded areas within the construction area footprint for each alternative.

Table 3-4. Woodlands currently in construction footprint of alternatives

Alternatives	Woodland Acres			
	Deciduous	Evergreen	Shrubland	Total
Bypass Channel Alternative	18	76	90	184
Rock Ramp Alternative	0	5	7	12

Grasslands

The grasslands in this ecoregion include crested wheatgrass, Japanese brome, leafy spurge, and bluebunch wheatgrass on the heavy, slowly permeable bottomlands and threadleaf sedge and needle and thread on the gravelly soils of hill slopes. Both little bluestem and buffalo grass are found along flat-bottomed channels. The NLCD was also utilized to identify acres of grassland in the project area and the field investigations confirmed map findings.

Table 3.5 lists acres of grasslands that are currently within the construction area footprint for each alternative.

Table 3-5. Grasslands currently in construction footprint of alternatives

Alternatives	Grassland Acres
Bypass Channel Alternative	321
Rock Ramp Alternative	21

Noxious and Invasive Plants

Currently 15 different noxious weeds infest counties in the Intake Project area (Table 3.6).

Table 3-6. Noxious weeds currently in counties in the Intake Project area

Noxious Weeds	MT Category	MT Dawson County[1]	MT Richland County	ND McKenzie County[2]
Absinth wormwood				X
Baby's breath				X
Black henbane				X
Canada thistle	2B	X	X	X
Common burdock				X
Common tansy	2B	X		
Dalmatian toadflax	2B	X	X	X
Diffuse knapweed				X
Dyer's woad	1B	X		
Field bindweed	2B	X	X	
Halogeton				X
Hoary cress (Whitetop)	2B	X	X	
Houndstongue	2B			X
Leafy spurge	2B	X	X	X
Musk thistle				X
Purple loosestrife	1B	X		X
Russian knapweed	2B	X	X	X
Russian Olive[3]	invasive	X	X	X
Saltcedar	2B	X	X	X
Spotted knapweed	2B	X	X	X
St. Johnswort		X		
Yellow toadflax	2B	X		X

[1]Data accessed (May 2012) through http://agr.mt.gov/agr/Programs/Weeds/PDF/weedList2010.pdf, http://www.eddmaps.org/, and http://plants.usda.gov/java/noxious?rptType=State&statefips=30. Montana Category 1B noxious weed species have limited presence in Montana. Montana Category 2A noxious weed species are common in isolated areas of Montana. Montana Category 2B noxious weed species are abundant in Montana and widespread in many counties.
[2]Data accessed (March 2012) through http://www.nd.gov/ndda/files/resource/CountyandCityListedNoxiousWeedsFeb2012.pdf and http://plants.usda.gov/java/noxious?rptType=State&statefips=38.
[3] Included based on Yellowstone River Conservation District Council Best Management Practice adopted June 21, 2007.

3.5. Social and Economic Conditions

3.5.1 Introduction

- What are the current social and economic conditions in the Intake Project area that could be affected by the proposed alternatives?

The social and economic affected area includes counties that have social and economic links to the region that would be directly impacted by the alternative actions. The affected area includes Dawson, McCone, Prairie, Richland, Roosevelt, and Wibaux Counties in Montana and McKenzie and Williams Counties in North Dakota. This section describes the current demographic, economic, and educational aspects of the regional economy from the U.S. Census Bureau, U.S. Department of Agriculture and Bureau of Labor Statistics but due to the recent oil and gas production, these numbers may be under-represented. Indicators of regional social and economic conditions include population, value of output, percentage output value by sector, household income, per capita income, labor force, and employment.

3.5.2 Method

An evaluation of social and economic conditions requires data on current baseline conditions from which the significance of economic impacts can be measured. Data were obtained from the U.S. Census Bureau, U.S. Department of Agriculture, and Bureau of Labor Statistics. Oil and gas information was obtained from the North Dakota Industrial Commission, Department of Mineral Resources, Oil and Gas Division and from the Montana Board of Oil and Gas Conservation.

3.5.3 Existing Conditions

Population

The eight-county impact area is rural in nature, with a total 2010 population of slightly over 61,800 people. The regional population has declined by 2.8% over the last 20 years. All of the counties except Williams County, North Dakota experienced a loss in population. The largest percentage decreases were in the three lowest population counties (McCone, Prairie, and Wibaux). The region as a whole experienced population growth from 2000 to 2010 due to growth in the North Dakota counties. County level population estimates are presented in Table 3.7.

The largest municipalities in the region are Williston, North Dakota, and Sidney and Glendive, Montana. Each of these communities experienced population growth over the 2000 to 2010 period. Williston and Glendive are the only two communities that have a larger population in 2010 than in 1990. Municipal population estimates are in Table 3.8.

Table 3-7. County level population estimates for the Intake Project area (U.S. Census Bureau, 2009a, 2009b, 2009c, 2009d)

COUNTIES	1990	2000	2007	2008	2010	PERCENTAGE CHANGE 1990 - 2010	2000 - 2010
Montana							
Dawson	9,505	9,059	8,558	8,490	8,966	-5.67	-1.03
McCone	2,276	1,977	1,724	1,676	1,734	-23.81	-12.29
Prairie	1,383	1,199	1,044	1,064	1,179	-14.75	-1.67
Richland	10,716	9,667	9,182	9,270	9,746	-9.05	-0.82
Roosevelt	10,999	10,620	10,148	10,089	10,425	-5.22	-1.84
Wibaux	1,191	1,068	898	866	1,017	-14.61	-4.77
North Dakota	6,383	5,737	5,617	5,674	6,360	-0.36	+10.86
McKenzie	21,129	19,761	19,540	19,846	22,398	+6.04	+13.35
Williams							
Study Area Total	**63,582**	**59,088**	**56,711**	**56,975**	61,825	**-2.76**	+4.63

Table 3-8. Study area county seat populations (U.S. Census Bureau, 2009a, 2009b, 2009c, 2009d)

COUNTY	1990	2000	2007	2010	PERCENTAGE CHANGE 1990 - 2010	2000 - 2010
Circle (McCone)	805	644	558	615	-23.60	+4.50
Glendive (Dawson)	4,802	4,729	4,615	4,935	+2.77	+4.36
Sidney (Richland)	5,217	4,774	4,746	5,191	-0.50	+8.73
Terry (Prairie)	659	611	534	605	-8.19	-0.98
Watford City (McKenzie, ND)	1,784	1,435	1,373	1,744	-2.24	+21.53
Wibaux (Wibaux)	628	567	481	589	-6.21	+3.88
Williston (Williams)	13,131	12,512	12,393	14,716	+12.07	+17.62
Wolf Point (Roosevelt)	2,880	2,663	2,525	2,621	-9.00	-1.58

The relatively small, shrinking population indicates a decline in economic activity needed to support the population, as well as a decrease in the potential labor supply, which may inhibit future long-term commercial activity. The most recent population data are available for 2007. As a result, the increase in population associated with the recent increase in oil and gas production is not reflected in Tables 3.7 and 3.8. However, unless oil and gas prices increase and remain high enough over the long term to support increased oil and gas production, the population increase associated with oil and gas production will be temporary and will not reverse the long-term downward trend.

Sectors of Economic Activity

The primary sectors of economic activity in the region include agriculture, recreation, transportation and utilities, government, wholesale and retail sales, and mineral extraction (Figure 3-1). Oil and natural gas production are the primary sources of mining revenues. Table 3.9 shows the percentages of total employment attributable to the primary sectors of activity in each county, as defined by the U.S. Department of Commerce, Bureau of the Census 2010 American Community Survey (ACS) five-year estimates. The five-year estimates are representative of conditions over the 2006 to 2010 time period. There are many more sectors that generate earnings other than those shown in Table 3.9, but these are relatively small compared to the primary sectors. Median earnings provided in the 2010 ACS for a 12-month period (to represent annual earnings) are presented in Table 3.10 to indicate the value of employment in each sector.

Figure 3-1. A major sector of economic activity in the region is agriculture

The transportation, warehousing, and utilities sector employment percentages are relatively low, however, earnings in this sector are consistently higher than for the other sectors. The transportation, utilities, mining, and government sectors are based on the availability of natural resources and infrastructure in the region and, therefore, represent a larger percentage of employment in the region. The wholesale, retail, and education/health care sectors represent population services which are driven by changes in population levels and income.

Agriculture

Agriculture is also an important sector of economic activity in the region, as indicated by Table 3.9. Income from farm related total receipts as reported in the 2007 Census of Agriculture totaled about $26.5 million in 2007 for the eight-county study region. Table 3.11 shows irrigated crop acreage for all sources of irrigation water for the three counties in which the Lower Yellowstone Project is located.

Table 3-9. Employment as a percentage of total employment for the years 2006 to 2010

COUNTY	AGRICULTURE, FORESTRY, FISHING AND HUNTING, MINING	TRANSPORTATION, WAREHOUSING, AND UTILITIES	ALL GOVERNMENT WORKERS	WHOLESALE AND RETAIL	EDUCATION, HEALTH CARE, SOCIAL ASSISTANCE
	(percentage)	(percentage)	(percentage)	(percentage)	(percentage)
Montana	16.4	14.5	18.4	12.6	26.4
Dawson	36.9	6.0	24.1	7.1	20.6
McCone	34.4	4.7	22.7	11.0	19.2
Prairie	21.0	6.5	12.5	15.2	19.6
Richland	13.4	4.0	43.8	14.3	30.6
Roosevelt	24.8	2.7	23.6	11.4	23.0
Wibaux					
North	25.4	3.8	20.4	9.1	20.7

Dakota	22.7	5.6	13.8	15.9	21.5
McKenzie					
Williams					

Source: 2006 – 2010 American Community Survey 5-year Estimates

Table 3-10. Median earnings per full time job over the past 12 months in 2010 dollars for the years 2006 to 2010

COUNTY	AGRICULTURE, FORESTRY, FISHING AND HUNTING	MINING	TRANSPORTATION, WAREHOUSING, AND UTILITIES	WHOLE-SALE	RETAIL	EDUCATION, HEALTH CARE, SOCIAL ASSISTANCE
Montana						
Dawson		$61,362				
McCone	$16,029	-	$54,597	$21,154	$22,917	$24,605
Prairie	$22,056	-	$19,375	$33,000	$20,938	$26,471
Richland	$16,818	$56,389	$22,813	-	$13,056	$21,250
Roosevelt	$21,453	$38,500	$52,037	$13,482	$17,619	$25,056
Wibaux	$41,616	$47,411	$55,833	$27,000	$26,050	$29,423
	$32,813		$59,375	-	$24,107	$25,917
North						
Dakota		$49,904				
McKenzie	$32,303	$65,338	$39,196	$55,833	$17,083	$28,262
Williams	$30,714		$34,318	$45,295	$18,057	$26,961

Source: 2006 – 2010 American Community Survey 5-year Estimates

Table 3-11. Irrigated crop acreage by county

COUNTY	SUGAR BEETS (2010)	HAY (2008)	WHEAT (2008)	BARLEY (2008)
Dawson (Montana)	1,700	6,600	-	2,600
McKenzie (North Dakota)	9,200	3,500	6,800	700
Richland (Montana)	12,600	15,400	15,900	16,100

Income and Poverty

An important economic measure of impacts associated with an action is the effect on income and related impacts on poverty rates. Frequently used measures of income include median household income and per capita income. Median household income is a good measure of the total available resources a household has to spend on goods and services as a total unit, although per capita income is a better measure of the economic resources available to each person for goods and services.

Large households may have greater income as a unit, but may be relatively poor in terms of providing goods and services for each individual; therefore, both measures of income provide important information. The poverty rate indicates the percentage of the population that falls below the official threshold of poverty. The poverty threshold varies according to household size and location. The poverty guideline used by the U.S. Department of Health and Human Services in 2011 for a family of four in the 48 contiguous states was $22,350. Median household income, per capita income, and the poverty rate for the study area are shown in Table 3.12 for each county and in Table 3.13 for the county seats. The source of data for Tables 3.12 and 3.13 is the 2006-2010 five-year ACS.

Table 3-12. Income and poverty data for study area counties for 2006 to 2010

COUNTY	MEDIAN HOUSEHOLD INCOME $	PER CAPITA INCOME $	PERSONS BELOW POVERTY %
Montana	**43,872**	**23,836**	**14.5**
Dawson	50,752	24,602	9.3
McCone	48,167	23,265	8.6
Prairie	34,896	21,296	16.9
Richland	52,516	26,888	13.5
Roosevelt	37,451	17,821	21.5
Wibaux	40,417	22,579	11.8
North Dakota	**46,781**	**25,803**	**12.3**
McKenzie	48,480	27,605	10.0
Williams	55,396	29,153	8.7

Table 3-13. Income and poverty data for study area counties for 2006 to 2010

CITY (COUNTY)	MEDIAN HOUSEHOLD INCOME $	PER CAPITA INCOME $	PERSONS BELOW POVERTY %
Circle (McCone)	30,417	17,833	8.5
Glendive (Dawson)	46,843	23,293	8.6
Sidney (Richland)	52,460	24,752	14.2
Terry (Prairie)	34,028	21,301	11.1
Watford City (McKenzie)	51,056	29,587	5.3
Wibaux (Wibaux)	32,132	17,381	16.5
Williston (Williams)	52,926	28,707	10.0
Wolf Point (Roosevelt)	40,819	16,492	20.6

As an overall region, the study area has relatively high income and low poverty rates compared to overall state averages with the exception of Prairie, Roosevelt, and Wibaux Counties in Montana. The data show that Prairie County, Montana, has the lowest median household income but that Roosevelt County, Montana has the lowest per capita income and the highest poverty rate of the study area counties. Wolf Point, Montana, which is the Roosevelt County Seat, also shows low income and a relatively high poverty rate. Prairie County, Montana has the second lowest per capita income and the second highest poverty rate of the study area counties. The two North Dakota counties have relatively high incomes and low poverty rates compared to the Montana counties in the study region.

Labor Force, Unemployment, Educational Attainment

Labor force, unemployment, and educational attainment are indicators of the number of workers potentially available to support current and future economic activity and the population's level of training to provide skilled labor for commercial activities. The small population of the study region limits the size of the available labor force. Large demands for labor would need to be supplied from outside the region. The study region provides about 3.34% of the total labor force of the state of Montana and 4% of the labor force of North Dakota. Labor force data are presented in Table 3.14.

Table 3-14. Labor force, unemployment, and educational attainment for 2006 to 2010

	LABOR	ANNUAL AVERAGE	HIGH SCHOOL DIPLOMA OR	BACHELORS

STATE/COUNTY	FORCE	UNEMPLOYMENT%	EQUIVALENT%	DEGREE %
Montana	**508,615**	**5.7**	**91.0**	**27.9**
Dawson	4,597	2.5	89.6	18.4
McCone	972	3.0	91.0	18.6
Prairie	538	1.1	85.3	13.4
Richland	5,363	4.2	84.9	16.6
Roosevelt	4,673	8.5	89.1	17.3
Wibaux	552	6.3	75.1	15.9
North Dakota	**370,984**	**3.6**	**89.4**	**26.3**
McKenzie	3,088	4.0	88.4	21.2
Williams	11,913	1.5	87.9	19.3

In addition, from 2006 to 2010 the unemployment rate in the study region was below the state averages for all counties except Roosevelt and Wibaux counties in Montana. Unemployment was 4.2% or less for each of the study region counties except for Roosevelt and Wibaux counties. This indicates that there are limited unemployed resources available in the region for expansion of commercial activities in the present. Unemployment rates for the study area are presented in Table 3.14.

Educational attainment is an indicator of the skill level of the labor force and the attractiveness of the area to businesses and industry considering expanding or locating in the area. This can influence the future labor force and income potential of the region. The percentage of the population 25 years of age or older with a high school diploma or the equivalent for each county and the percentage with a Bachelor's degree or higher is shown in Table 3.14.

The percentage of the population 25 years of age or older in each study area county that has a high school diploma or the equivalent ranges from 75.1% in Wibaux County to 91.0% in McCone County. This compares to 91.0% for all of Montana and 89.4% for all of North Dakota. The percentage of the population in the study area counties that have a Bachelor's degree or higher ranges from 13.4% in Prairie County to 21.2% in McKenzie County. This can be compared to 26.3% for all of North Dakota and 27.9% for all of Montana. The lower level of bachelor's degrees in the region may limit some employment opportunities to the current population.

3.6. Historic Properties

3.6.1 Introduction

- What types of historic properties (significant cultural resources) have been previously recorded in the area of potential effects?

This section presents an inventory of cultural resources in the area that could be affected by Intake Project alternatives. Cultural resources are the physical remains of a site, building, structure, object, district, or property of traditional religious and cultural importance to Native Americans. Historic properties are significant cultural resources that are either included on or have been determined eligible for listing on the National Register of Historic Places. Because some of the cultural resources have not been evaluated to determine if they are eligible for listing, the more generic term “cultural resources” is used in this discussion. The terms used in this section are defined in Figure 3-2.

Because the proposed Intake Project is a federal action, it must comply with federal legislation concerning historic properties, specifically Section 106 of the National Historic Preservation Act of 1966, as amended. Appendix G includes correspondence documenting consultation under this act.

Cultural Resource Terms

Archaeological Site – is physical evidence or remains of past human activity at a specific location. Prehistoric archaeological sites predate written records and historic archaeological sites generally are associated with European exploration and settlement of the area.

Architectural Site – is a building, which is a structure created to shelter any form of human activity (such as a house, barn, church, or hotel) or a structure, which is a work composed of interdependent and interrelated parts in a definite patter or organization (such as bridges, tunnels, canals, or fences).

Cultural Resource – The physical remains of a site, building, structure, object, district, or property of traditional religious and cultural importance to Native Americans.

Historic Property – Any prehistoric or historic site, building, structure, object, district, or property of traditional religious and cultural importance to Native Americans that is included on or has been determined eligible for listing on the National Register of Historic Places. Only historic properties are protected under the National Historic Preservation Act.

Isolated Find – is a location with fewer than five artifacts, which shows little potential for additional finds. Finds are generally not considered to qualify as historic properties.

National Register of Historic Places – A registry maintained by the Secretary of the Interior of sites, buildings, structures, objects, or districts or properties of traditional religious and cultural importance to Native Americans that have local, state, regional, or national historic or prehistoric significance.

Site Lead – is a site that was insufficiently recorded or reported by the public but not professionally verified. Site leads are generally not considered to qualify as historic properties without verification.

Figure 3-2. Cultural resource terms

3.6.2 Methods

The Lower Yellowstone Project was inventoried for cultural resources during the fall of 1996 and 1997 in anticipation of pending legislation to transfer title of the Lower Yellowstone Reclamation projects from Reclamation to the appropriate irrigation districts. The legislation did not pass; however, the University of North Dakota assisted by Renewable Technologies, Inc., completed an inventory of cultural resources under contract with Reclamation (Table 3.15).

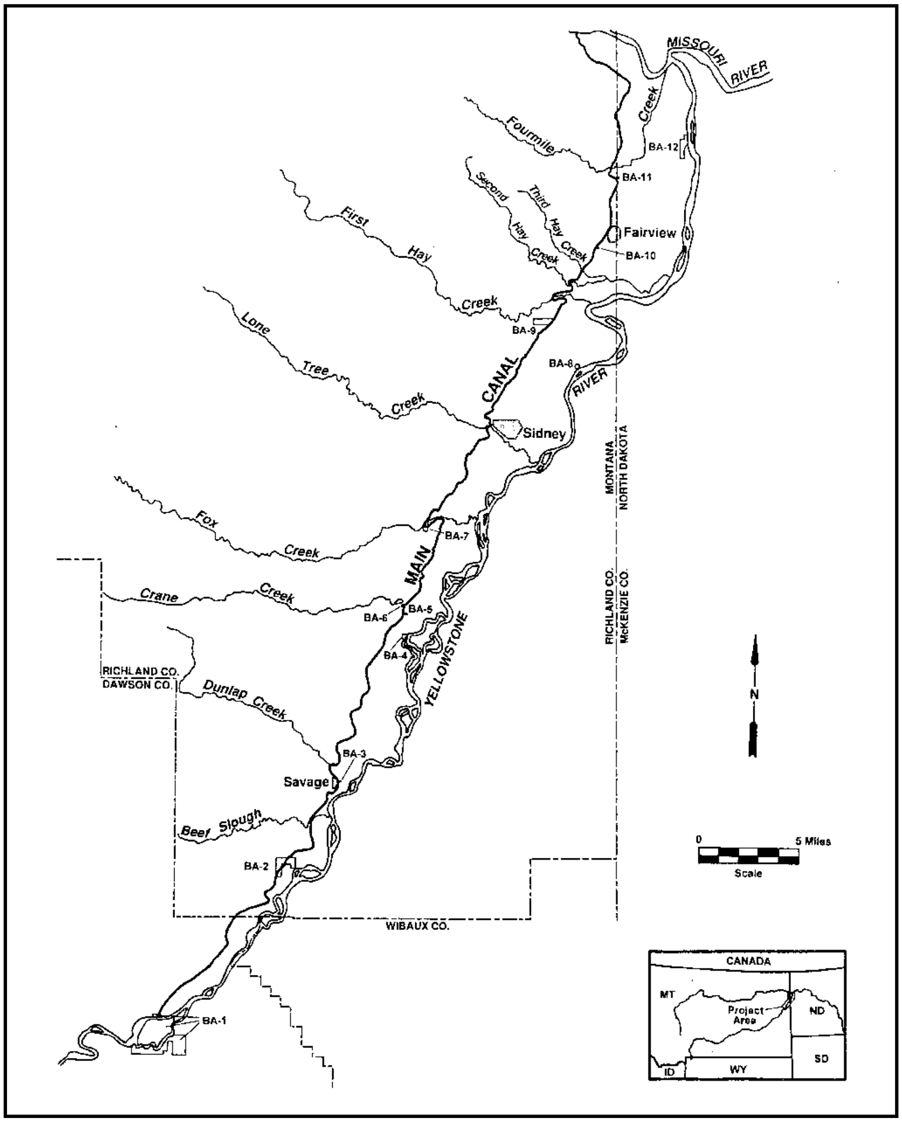

Figure 3-3. Lower Yellowstone Project main canal (Kordecki et al., 1991: 1.3)
Note: Areas marked with BA are survey blocks.

A search of records, called a Class I inventory, was completed to identify all previously recorded cultural resources in the Lower Yellowstone Project area. This was followed by an intensive pedestrian inventory (Class III) of selected areas to locate unrecorded resources (Figure 3.3). During the Class III inventory, the selected areas were walked, and cultural resources in these tracts were recorded. The Class III inventory covered most of the area of potential effects of the proposed Intake Project (see Figure 3.3 BA-1). In addition to the pedestrian survey, local residents were interviewed to find site leads, and county title records were searched to identify historic persons associated with any of the recorded historic archaeological sites or structures (Kordecki et al., 1999).

The northern portion of the quarry area presently used by the District will not be used as part of construction of either action alternative. It was surveyed in 1991 by Reclamation in advance of reactivation of the rock quarry used to construct Intake Diversion Dam (Coutant, 1991).

3.6.3 Existing Conditions

The cultural resources inventories located and recorded 15 cultural resources within or adjacent to the area of potential effects of the three alternatives described in Chapter 2. These are listed in Table 3.15. Of the 15 resources, 7 are significant and eligible for listing on the National Register of Historic Places, and the significance of 2 prehistoric archaeological sites have not been determined.

Table 3-15. Cultural resources located within the area of potential effects of the action and no action alternatives[10]

Site Number	Type	Description	National Register Eligibility
24DW287	Architectural structure	Lower Yellowstone main canal and headworks constructed in 1905-1909	Eligible for listing
24DW295	Prehistoric archaeological site	Scatter of stone tools, flaking debris, rock cairn, and fire-cracked rock	Unknown eligibility
24DW296	Historic and prehistoric archaeological site	Historic rock quarry used for construction of Intake Diversion Dam and two small flaking debris and fire-cracked rock scatters.	Eligible for listing
24DW298	Historic archaeological site	Depressions marking locations of former structures at Old Cameron and Brailey Sub-Camp occupied in 1906 by workers building the main canal.	Eligible for listing
24DW299	Historic archaeological site	Two depressions with metal scraps and wooden fence posts	Not eligible
24DW429	Prehistoric archaeological site	Lithic scatter	Recommended not eligible
24DW300	Historic archaeological site	Two sod rimmed dugout depressions with rusted wire, granite block, and concrete	Not eligible
24DW430	Prehistoric archaeological site	Late Plains Archaic campsite	Eligible
24DW431	Historic archaeological site	Three depressions and dump	Not eligible
24DW432	Prehistoric archaeological site	Lithic scatter of stone tools and flaking debris	Recommended not eligible
24DW433	Prehistoric archaeological site	Scatter of stone tools and flaking debris – possible stone tool workshop	Unknown eligibility
24DW434	Prehistoric archaeological site	Middle Plains Archaic artifact scatter	Eligible for listing
24DW435	Prehistoric archaeological site	Low density lithic scatter	Recommended not eligible
24DW436	Historic archaeological site	Possible homestead site, although no patent was ever issued	Not eligible due to lack of integrity
24DW437	Historic archaeological site	Log foundation of a former structure – possible attempt at homesteading	Not eligible due to lack of integrity
24DW438	Prehistoric archaeological site	Lithic scatter of stone tools and flaking debris	Recommended not eligible
24DW443	Architectural structure	Intake Diversion Dam built in 1906-1910, dike, cableway system and engineer's house, and abandoned power plant	Eligible for listing

[10] National Register of Historic Places eligibility based upon consensus determinations with the Montana State Historic Preservation Office.

Site Number	Type	Description	National Register Eligibility
24DW444	Historic archaeological site	Archaeological remains of two cabins	Not eligible due to lack of integrity
24DW447	Architectural buildings and historic archaeological site	Headworks Camp/Gate Tender Residence, garage, and outhouse	Eligible for listing

Historic Properties

Three of the cultural resources eligible for listing on the National Register of Historic Places (24DW287, 24DW443, and 24DW447) within the area of potential effects are architectural sites associated with the Lower Yellowstone Project. These include the main canal and headworks, Intake Diversion Dam, and the Headworks Camp and Gate Tender Residence. Another important site is Old Cameron and Brailey Sub-Camp (24DW298) that was occupied by workers building the main canal. Finally, the Lower Yellowstone Rock Quarry (24DW296) is the original source of rock used to build Intake Diversion Dam. It also has a prehistoric archaeological component. These five sites, along with other features of the Lower Yellowstone Project, are part of an historic district significant for its association with the broad pattern of federal reclamation efforts in the early twentieth century and agricultural development of the lower Yellowstone valley. When consulted by Reclamation, the Montana State Historic Preservation Office agreed these sites are significant under the National Historic Preservation Act (NHPA).

Based on consultation with the Montana State Historic Preservation Office (SHPO), two prehistoric archaeological sites in the area of potential effects are eligible for listing on the National Register of Historic Places. Site 24DW430 is an extensive scatter of stone tools, pieces of bone, and fire-cracked rock. It appears to be a campsite occupied during the Late Plains Archaic, a period dating to 3,000 to 1,500 years ago. Finally, the second (24DW434) is a multi-component campsite with prehistoric stone tools and pottery from the Middle Plains Archaic, which dates 5,000 to 3,000 years ago.

Site 24DW295, a scatter of stone tools, flaking debris, rock cairn, and fire-cracked rock; the prehistoric component of 24DW296; and a prehistoric stone tool workshop (24DW433) are of unknown significance and have been recommended for archaeological testing. Sites 24DW429, 24DW432, 24DW435 and 24DW438, are all lithic scatters which do not meet the criteria of eligibility under NHPA. SHPO concurrence with these recommended determinations will be requested before consultation is complete. The remaining six sites in Table 3.15 are ineligible due to lack of integrity or the ability to yield important information (Kordecki et al., 1999).

4. Environmental Consequences

4.1. Introduction

This chapter describes the anticipated beneficial and/or adverse impacts of the proposed action alternatives on the relevant environmental resources described in Chapter 3. The chapter evaluates direct, indirect, and cumulative effects and quantifies these effects whenever possible. Actions and commitments intended to minimize environmental impacts are also described.

Reclamation and the Corps believe the consequences of the No Action Alternative (Continue Present Operation) are adequately evaluated and disclosed in the 2010 EA. As such, information on the No Action Alternative is not repeated in this chapter.

Issues or resources described in Chapter 3 and analyzed in this chapter are:

- Geomorphology
- Surface water quality
- Aquatic communities
- Federally-listed species and state species of special concern
- Recreation
- Social and economic conditions
- Lands and vegetation
- Wildlife
- Historic properties (cultural resources)

The action alternatives' scope of effects for the following resources is very similar to the scope of effects evaluated in the 2010 EA for the Rock Ramp and Relocate Main Channel Alternatives. As such, the previously analyzed effects are incorporated by reference and the following resources have not been re-evaluated.

- Climate
- Air Quality
- Hydrology
- Lower Yellowstone Project irrigation districts
- Environmental justice
- Indian trust assets

4.2. Adaptive Management

Adaptive management (AM) is a strategy for addressing a changing and uncertain environment that relies on common sense and learning. Adaptive management draws upon theories from ecology, economics, social sciences, engineering, and other disciplines as well as on concepts such as social learning, operations research, economic values, and political differences with ecosystem monitoring, modeling, and science (National Research Council, 2004). Application of AM is intended to support actions when the scientific knowledge of their effects on ecosystems is unknown or limited (Holling, 1978). This does not mean that actions are delayed or postponed until there is agreement that enough has been learned about an ecosystem. Rather, AM provides a means to implement actions, monitor, and adjust management actions when new information becomes available.

The basic theme of AM is to continually evaluate project operations and effects and develop actions that respond to observed changes. This means that project managers must revisit objectives and develop a range of choices for how they would manage a project if changes occur. Managers must also use the information gained through monitoring and evaluation and apply it to future decisions. A key to successful implementation of any AM strategy is to involve stakeholders in the learning and evaluation processes.

For the purposes of the Intake Project, if an action alternative is selected for implementation, the Corps would be responsible for a 1 year warranty period to ensure the project physically performs as designed. Reclamation would use AM to maximize project success. The AM plan would be implemented to address project uncertainties through monitoring of responses to management actions, assess progress towards project objectives, and implement potential adjustments to maximize project performance.

For further information on AM see Appendix J for the Adaptive Management Plan.

4.3. Geomorphology

4.3.1 Introduction

- How would the fish passage alternatives affect the geomorphic characteristics of the lower Yellowstone River?

4.3.2 Methods

To evaluate effects to channel characteristics, the existing channel slope in the Intake Project area was compared to the designed slope of the action alternatives. Additional details on baseline data and methodology are presented in the 2010 EA.

4.3.3 Results

4.3.3.1 Short-Term and Long-Term Effects to Channel Characteristics

Bypass Channel Alternative

The Bypass Channel Alternative would not change the bed slope of the main channel of the Yellowstone River. The slope of the proposed bypass channel would be approximately 0.06%, compared to a slope of approximately 0.05% in the existing high flow chute. The proposed bypass channel slope compares favorably to 10 side channels within about 50 river miles with slopes ranging from 0.01% to 0.07% (Corps, 2010).

Rock Ramp Alternative
The Rock Ramp Alternative would decrease the slope near the existing dam crest and boulder field from an average of 2.0% (0.02 feet/feet) down to a maximum of 0.9% (0.009 feet/feet). The final design of the rock ramp likely would have a variable slope of 0.2% - 0.9% (0.002 feet/feet – 0.009feet/feet), but this slope would be based on physical modeling.

4.3.3.2 Short-Term and Long-Term Effects to the Channel Migration Zone

The channel migration zone (CMZ) of the Yellowstone River includes areas prone to lateral channel movement over the next 100 years (Thatcher et al., 2008). The CMZ is an important characteristic of the Yellowstone River and is an issue raised by resource agencies, therefore an analysis of impacts to the CMZ based on available information is included in this EA.

Most of the river corridor on Joe's Island is included in the historic migration zone. Thatcher et al. (2008) defines the historic migration zone as the combined portion of the river corridor that represents a zone of historic channel occupation over approximately the past 50 years. More information on the CMZ can be found in Chapters 3 and 4 of the Intake Final EA (2010).

Analysis of the CMZ shows how the alternatives could change the river corridor in the area directly affected by Intake Project features.

Bypass Channel Alternative
The Bypass Channel Alternative would affect a total of approximately 475 acres in the CMZ (both long and short term). Most of this area is classified as wetlands, and a discussion of wetland impacts is included in the wetlands section of this Supplemental EA. There would be 50 acres in the CMZ that would experience long-term effects from construction of the new channel. Figure 4.1 shows the permanent features in the CMZ. Approximately 425 acres in the CMZ would experience short-term effects from placement of temporary features such as haul roads, construction zones, and stockpiles needed to create the permanent features. Table 4.1 shows the number and types of acres in the CMZ that would be affected by features of this alternative.

In addition, the reduction in magnitude and frequency of flow in the existing high flow channel downstream from the channel diversion is not expected to have measurable impacts on the channel geomorphology. The area has remained relatively unchanged for at least 50 years.

Rock Ramp Alternative
This alternative would affect a total of 57 acres within the CMZ (Table 4.2). Much of this area is classified as wetlands, and a discussion of wetland impacts is included in the wetlands section in this Supplemental EA. Of these 57 acres, 32 would experience long-term effects from

construction of the new weir and rock ramp. The remaining 25 acres would experience short-term effects from placement of temporary features, such as construction zones and haul roads. Figure 4.2 shows the permanent features of the Rock Ramp Alternative in the CMZ, and Table 4.2 shows the numbers and types of acres affected by features of this alternative.

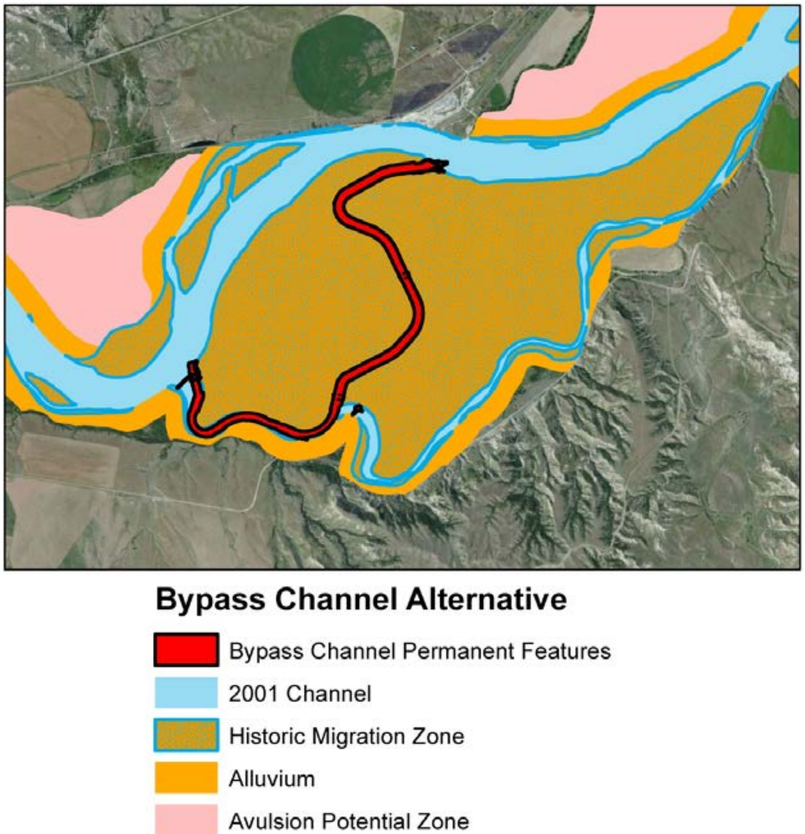

Figure 4-1. Bypass channel alternative permanent features within the channel migration zone

Table 4-1. Channel migration zone acres temporarily or permanently affected by the bypass channel alternative

Bypass Channel Alternative							
		Main Channel (acres)	Historic Migration Zone (acres)	Alluvium (acres)	Avulsion Potential Zone (acres)	Channel Migration Zone TOTAL (acres)
Permanent Features	New Channel & Dam	2	48	0	0	50
Tempo-rary Featur	Construction Zone	0	400	15	0	415

	Haul Roads	0	8	2	0	10
TOTAL Permanent		**2**	**48**	**0**	**0**	**50**
TOTAL Temporary		**0**	**408**	**17**	**0**	**425**

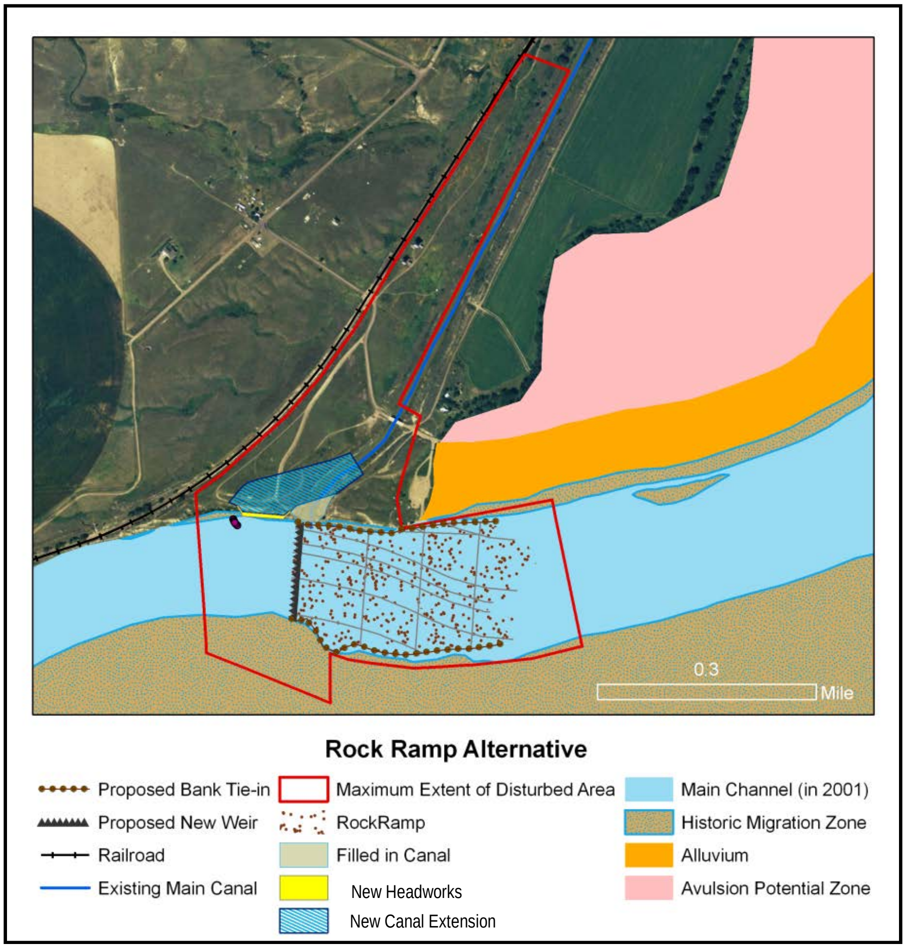

Figure 4-2. Rock ramp alternative permanent features within the channel migration zone

Table 4-2. Channel migration zone acres temporarily or permanently affected by the rock ramp alternative

Rock Ramp Alternative						
		Main Channel (acres)	Historic Migration Zone (acres)	Alluvium (acres)	Avulsion Potential Zone (acres)	Channel Migration Zone TOTAL (acres)
Permanent Features	New Weir & Rock Ramp	32	0	0	0	32
por ary Feat	Construction Zone	0	4	0	0	4

Rock Ramp Alternative						
		Main Channel (acres)	Historic Migration Zone (acres)	Alluvium (acres)	Avulsion Potential Zone (acres)	Channel Migration Zone TOTAL (acres)
	Haul Roads	1	18	2	0	21
TOTAL Permanent		**32**	**0**	**0**	**0**	**32**
TOTAL Temporary		**1**	**22**	**2**	**0**	**25**

Bypass Channel Alternative

The main construction-related feature of the Bypass Channel Alternative is excavation of approximately 1.2 million cubic yards of material. The bypass channel is approximately 15,500 feet in length, of which approximately the upper 1/3 is in the existing high flow channel. The remaining 2/3 crosses Joe's Island and rejoins the Yellowstone River just below the existing rock field. Depth of channel excavation ranges from about 4 feet in the upper reaches to nearly 20 feet towards the downstream end. The critical concept in upstream fish passage design is the location of the downstream fish entrance and the attraction flow (Larinier, 2001). The optimal location of the downstream fish entrance is that it is close enough to the weir that fish may locate it as they look for a barrier-free pathway once they encounter the obstruction.

Other features include rock riprap at two bends and vertical riprap control structures at the downstream end and at two locations in the channel (approximately 1/3 and 2/3 of the way up from the downstream end). The upstream entrance includes a concrete sill with riprap sills tied into the surrounding ground. The concrete and riprap structure at the upstream entrance is intended to prevent excessive flow through the bypass and to minimize the potential for the entire Yellowstone River to capture and relocate to the bypass channel. A concrete sill is proposed due to the extreme ice forces imposed on the upstream entrance of the bypass channel. The two downstream riprap sills are proposed for maintaining channel slope and allowing for early identification of channel movement. Similar to the upstream control structure, the downstream riprap sills would be over-excavated and backfilled with native river rock to give the appearance of a seamless channel invert while providing stability during extreme events. Also, a concrete sill and rip rap structure to maintain channel form, gradient, and location will be placed at the downstream fish entrance to the bypass channel.

4.3.3.3 Short-Term and Long-Term Effects of Channel Modifications

A new concrete weir is proposed just upstream from the existing rock weir with a surface elevation of 1990.5 feet (NAVD 88) to provide sufficient water surface elevations to divert the appropriate flows through the bypass channel and to maintain irrigation diversions. The top of the timber crib in the existing weir is at elevation 1988 feet (NAVD 88) with riprap material periodically placed on top by the LYIP. The crest of the new weir would be located approximately 40 ft upstream from the existing weir. The space between the existing crest and proposed crest would be partially filled with material excavated from the bypass channel with the remainder filled with riprap and seeded with native materials.

While the proposed bypass channel would divert more flow than the existing high flow channel, construction of the bypass channel is not expected to significantly alter the main channel's characteristics. Because the proposed bypass diverts sediment suspended within the top of the water column, it would not be expected to pass larger sediments. Analysis was completed to determine the maximum diversion without appreciably impacting sediment transport in the main channel. Sediment modeling using HEC-RAS indicates that diverting more than 15% of the total Yellowstone River flow increases the risk of sediment deposition in the main channel in front of the headworks.

The existing high flow channel downstream of the channel diversion would not be physically altered during construction, but flow downstream from the channel diversion would decrease in frequency and magnitude. Currently, the high flow channel begins flowing when total Yellowstone River discharges are above approximately 30,000 cfs (between 1 and 2-year discharge). The proposed channel diversion would pass some water through a low-level conduit at 30,000 cfs, but the discharge would be less than existing conditions. Once the Yellowstone River is flowing at 60,000 cfs (≈5-yr discharge), the channel diversion would be overtopped, allowing greater flow into the high flow channel below the diversion. As total Yellowstone River flows increase, discharge in the existing high flow channel below the channel diversion would approach existing flows.

Future design efforts on the channel diversion will optimize the flow split between the proposed bypass channel and the existing high flow channel downstream from the diversion to minimize adverse impacts to the high flow channel and existing native fish passage while maximizing benefits on the constructed bypass channel.

Rock Ramp Alternative

To construct the Rock Ramp Alternative, the existing boulder field would be moved and reworked. The new rock ramp would extend farther downstream than the existing boulder field and be built over the existing Intake Diversion Dam structure. A new weir would be constructed as well. The existing boat ramp would be removed and replaced at an undetermined location near the Intake Project area.

The Rock Ramp Alternative would add a total of 11 new structures in or next to the river channel and remove, bury, or replace 4 of them for a net gain of 7 structures. The total number of structures in the Rock Ramp Alternative is 12, because the existing headworks has been buried in place and acts as a bank stabilizing structure.

The estimated length of bank stabilizing features would increase from 1,643 linear feet to 4,542 linear feet. The existing boulder field covers approximately 6 acres of riverbed, and the new rock ramp structure would cover approximately 32 acres. The additional area of the new rock ramp structure would reduce slope and control water velocity to allow fish passage over the structure.

Table 4.3 summarizes the number of man-made structures in each alternative and the estimated sizes of those features.

Table 4-3. Comparison of bank stabilization features by alternative

Feature	Bypass Channel		Rock Ramp	
	# of Structures	Size (feet or acres)	# of Structures	Size (feet or acres)
Existing Headworks	1	285 feet[1]	1	285 feet[1]
New Headworks	1	440 feet	1	440 feet
Existing Dam	1	664 feet[2]	0[2]	0[2]
New Control Structure/Weir	1	664 feet	1	664 feet
Riprap	2	1400 feet	1	3153 feet
Existing Boulder Field	1	6 acres	0[2]	0[2]
Rock Ramp	0	0	1	32 acres
New Side Channel	1	9400 feet[3]	0	0
Rock Sills	4	200 feet	0	0
Total	**12**		**5**	

1 - Buried in place and remains as a bank stabilizing structure.
2 - Buried in place but does not contribute to bank stabilization.
3 - Excludes part of existing high flow channel that will be used for the bypass channel.

Cumulative Effects

To assess the cumulative effects of the proposed alternatives, a geographic information system (GIS) inventory of bank stabilizing structures (Natural Resources Conservation Service, 2003) was analyzed from Cartersville Dam to the confluence with the Missouri River. This was done to compare the number of features upstream to the next fish passage barrier in the context of the larger section of the lower Yellowstone River. The inventory of stabilization features in the lower Yellowstone River from Cartersville Dam to the confluence with the Missouri River indicates there are currently 131 features for a total length of 280,515 feet.

The Rock Ramp would result in a minor increase of 1.6% in the length of stabilization features on the lower Yellowstone River from Cartersville Dam to the confluence with the Missouri River. The Bypass Channel Alternative would require approximately half of the stabilization features needed for the Rock Ramp and would have less effect.

Actions to Minimize Effects (Appendix I)

River morphology will be monitored to assess potential changes to the stream channel resulting from construction of the selected alternative. The Environmental Review Team (ERT) will be consulted regarding specific measures to offset impacts if substantive changes are believed to have been caused by the Intake Project.

4.3.4 Summary

The Bypass Channel Alternative would have no short-term or long-term effect on main channel bed slope. This alternative would permanently affect 50 acres in the CMZ and add approximately 1,400 feet of bank stabilization structures in the Intake Project area. Short-term effects include temporary disturbance of 425 acres within the CMZ.

Long-term effects of the Rock Ramp Alternative consist of a reduction in the slope of the main channel in the area of the existing Intake Diversion Dam and associated features. This alternative would permanently affect 26 acres in the CMZ and increase the amount of bank stabilizing structures by 2,899 feet.

4.4. Surface Water Quality

4.4.1 Introduction

- How would fish passage alternatives affect water quality in the lower Yellowstone River?

4.4.2 Methods

Construction of either action alternative would disturb existing sediment, potentially releasing contaminants into the water column. Additionally, sediment could be mobilized due to altered hydraulic properties. To evaluate potential impacts associated with construction, sediment samples from sites upstream and downstream of Intake Dam were analyzed. Details of the sampling methods and results are described in the 2010 EA.

4.4.3 Results

4.4.3.1 Short-Term and Long-Term Effects of the Alternatives

Bypass Channel Alternative

Approximately 1.2 million cubic yards of soil would be excavated to construct the bypass channel using either mechanical excavation or hydraulic dredging. The material removed to construct the bypass consists of cohesive, fine-grained soils on top of coarse-grained soils in the lower part of the profile. Short term increases in turbidity are likely to result from the construction (excavation, dewatering, and transport), but best management practices, detailed by the contractor in its construction storm water management plan, will be used to control surface runoff. Most excavated materials will be placed within the waste pile located out of the floodplain (site shown in Figure 2.4). Erosion and runoff control measures will be utilized to prevent runoff from the construction site into drainages that lead to the river (see “Actions to Minimize Effects” section below). Approximately 5,000 cubic yards excavated from the bypass channel would be used to provide partial fill between the existing dam and the new weir. Work in the existing channel would temporarily increase turbidity during construction and would result in some sedimentation and siltation downstream. Construction-generated sediment deposited near the dam would likely be transported downstream during subsequent high flow events. Sediment would continue to erode and be transported from the new bypass channel until it stabilizes.

Because concentrations of nutrients and trace elements are similar in the sediment samples and the river water, no significant change in concentrations of these constituents is expected. It is unknown to what extent any sediment deposited upstream of the existing dam would be transported downstream in the new channel. However, sediment deposition upstream of Intake Dam is relatively minor and appears to be limited by frequent scouring during high flow events.

Because the Bypass Channel Alternative would not affect cumulative river flow quantity, point source discharges, or non-point source discharges after construction, all water quality effects would be temporary.

Rock Ramp Alternative

Construction of the rock ramp would disturb sediments in the existing river channel to a greater degree than the bypass alternative, but the amount of sediment transported downstream during construction would still be considered minor and short term.

Because concentrations of nutrients and trace elements are similar in the sediment samples and the river water, no substantial change in concentrations of these constituents is expected.

Because the Rock Ramp Alternative would not affect river flows, point source discharges, or non-point source discharges after construction, all water quality effects would be temporary.

Cumulative Effects

With implementation of actions to minimize effects, impacts of the action alternatives on water quality would be minor and temporary. No changes in beneficial uses or identified impairments would occur.

Actions to Minimize Effects (Appendix I)

- A water quality monitoring program will be established to ensure water quality standards are not violated during construction activities.
- Equipment for handling and conveying materials during construction shall be operated to prevent dumping or spilling the materials into wetlands and waterways.
- Discharges of dredged or fill material into waters of the U.S. will be carried out in compliance with provisions of Section 404 of the Clean Water Act and requirements contained in the Section 401 water quality certification.
- Erosion control measures will be employed to reduce wind and water erosion. Erosion and sediment controls will be monitored daily during construction for effectiveness, particularly after storm events, and the most effective techniques will be identified and employed.
- Silt barriers, fabric mats, or other effective means will be placed on slopes or other eroding areas to reduce sediment runoff into stream channels and wetlands until vegetation is re-established. This will be accomplished either before or as soon as practical after disturbance activities.
- Contamination of water at construction sites from spills of fuel, lubricants, and chemicals will be minimized by following safe storage and handling procedures in accordance with state laws and regulations.
- Hazardous materials will be handled and disposed of in accordance with a hazardous waste plan.
- Contractor will be required to have an approved construction storm water management plan to control runoff.

4.4.4 Summary

The Bypass Channel Alternative would cause temporary increases in turbidity and sedimentation during construction, but no long-term changes in water quality are anticipated. The Rock Ramp Alternative would likewise cause temporary increases in turbidity and sedimentation during construction. No long-term changes in water quality are anticipated as a result of any of the alternatives.

4.5. Aquatic Communities

4.5.1 Introduction

- How would the alternatives affect aquatic communities in the Intake Project area?

This section addresses aquatic communities that may be affected either by construction of bypass features or by subsequent changes in habitat conditions on the lower Yellowstone River. Intake Project construction may impact aquatic communities on either a temporary or permanent basis. Temporary impacts are associated with initial construction or temporary fixtures associated with construction after which habitats are expected to revert to previous conditions. Temporary impacts also could include short-term changes in flow or water quality that may affect aquatic communities. Permanent impacts are long-term impacts associated with construction of permanent facilities such as a new concrete weir, rock ramp or bypass channel.

4.5.2 Methods

To analyze the impacts of the proposed alternatives in the Yellowstone River, a literature search was conducted to identify fish, mussels, and macroinvertebrates currently inhabiting areas that could be affected by the Intake Project, followed by coordination with resource agencies to confirm presence/absence of species. Consideration was also given to the types of habitats and how those habitats might be impacted. Potential impacts were identified and related to the different aquatic communities.

To help in quantifying habitat-based benefits of improved fish passage at Intake Dam, the Fish Passage Connectivity Index (FPCI) was used. The FPCI was developed to evaluate ecosystem outputs of alternative measures for fish passage improvements on the Upper Mississippi River System (UMRS) for cost effectiveness and incremental analysis. The model was initially developed for use in the plan formulation process for the Navigation and Ecosystem Sustainability Program (NESP) for the Lock and Dam 22 fish passage improvement project. The model is applicable to fish passage improvement projects at other navigation dams and to other large rivers with appropriate modifications. The *Fish Passage Benefits Analysis – Intake Diversion Dam Fish Passage Project, Lower Yellowstone River, Intake, Montana* can be found in Appendix E, Attachment 1. Results of the modeling are utilized below to describe benefits of each alternative to fish passage. Although there is considerable uncertainty in the scientific community with regard to all the parameters that may affect fish passage, the modeling is used to provide an estimate of benefits and a relative comparison between alternatives.

4.5.3 Results

4.5.3.1 Short-Term and Long-Term Effects of the Alternatives

There is no change in the short and long-term effects disclosed in the 2010 EA for mussels, macroinvertebrates, and invasive aquatic species. In addition, short and long-term effects of the Bypass Alternative are anticipated to be similar to the Rock Ramp Alternative for these organisms. No additional analysis of effects related to these organisms is presented.

Fish
Improving passage at Intake would potentially open approximately 165 miles of additional habitat in the Yellowstone River to native fish currently impeded by the diversion structure. Additionally, successful fish passage at Intake would increase ecological connectivity and help maintain genetic diversity in populations of fish that might otherwise be isolated. Either fish passage alternative would likely promote a larger, more diverse and healthy fish population as a result of improved passage.

Table 4.4 presents the results of the FPCI modeling for each of the alternatives. There are many factors that play a role in the ability of fish passage alternatives to be successful and many uncertainties with regard to fish passage design requirements. Both action alternatives, while they produce similar results in the modeling, have positives and negatives regarding the ability to improve fish passage.

Bypass Channel Alternative
Strong swimming fish (e.g., adult sauger) currently pass upstream at Intake Dam under some flows. The Bypass Channel Alternative would be constructed to provide a range of lower flow velocities to accommodate weaker swimming fish such as pallid sturgeon and juvenile native fish. The Bypass Channel Alternative would not only increase the range of flows in which fish can pass, but it would provide passable flows in the bypass channel across all seasons, helping to accommodate early and late spawners that migrate outside of the spring/summer high flow window. There is concern that during low runoff years, velocities at the downstream bypass channel entrance may not be sufficient to attract migrating fish.

Flows within the bypass channel would have less turbulence than the rock ramp. Sturgeon appear to have difficulty negotiating turbulence in a large scale rock ramp model (White & Mefford, 2002). However, it is uncertain exactly what kind of shear flows or eddies may form near the downstream entrance to the bypass channel. Complex flow patterns at the downstream entrance to the bypass channel could affect the ability of some fish to locate the channel entrance and affect their ability to pass.

A large eddy currently develops at the proposed downstream entrance to the bypass channel at some flows. Montana FWP has expressed concerns that the eddy may limit the effectiveness of the bypass channel for fish passage. This situation is being modeled by the Corps and Reclamation to identify means to reduce the impact of eddies and other velocity barriers. While the FPCI model does consider water velocities and swimming abilities of fish, turbulence is not evaluated as a parameter in the FPCI benefits analysis, and therefore not considered in the model benefits output.

Table 4-4. Fish passage connectivity index model results for each alternative

		No Action		Bypass Channel		Rock Ramp	
Common Name	**Acres of Habitat, Intake to Cartersville**	**Є = Fish Passage Connectivity**	**Habitat Units (Є X acres)**	**Є = Fish Passage Connectivity**	**Habitat Units (Є X acres)**	**Є = Fish Passage Connectivity**	**Habitat Units (Є X acres)**
Shovelnose sturgeon	12637	0.13	1620	0.50	6318	0.60	7582
Paddlefish	12637	0.19	2388	0.50	6318	1.00	12637
Goldeye	10141	0.06	641	0.70	7099	0.60	6085
Smallmouth buffalo	17166	0.10	1766	0.70	12016	0.60	10299
Blue sucker	12637	0.08	1004	0.50	6318	0.60	7582
White sucker	12637	0.00	15	0.70	8846	0.60	7582
River carpsucker	10141	0.06	569	0.70	7099	0.20	2028
Shorthead redhorse	12637	0.06	798	0.70	8846	0.60	7582
Channel catfish	17166	0.06	996	0.70	12016	0.60	10299
Smallmouth bass	10141	0.07	662	0.70	7099	0.48	4868
Walleye	15818	0.03	448	0.50	7909	1.00	15818
Sauger	15818	0.04	691	0.50	7909	0.60	9491
Freshwater drum	17166	0.06	1109	0.70	12016	0.60	10299
Average Habitat Units			**978**		**8447**		**8627**

From a hydraulic standpoint, the proposed bypass channel will be fairly consistent with natural side channels in the Yellowstone River (Appendix A2, Attachment 6) and is intended to exhibit similar habitat conditions. Based on telemetry studies in the lower Missouri River and similar research conducted in 2011 on the Yellowstone River, it appears pallid sturgeon migrate in a characteristic manner, moving upstream primarily along the inside bends of the river and entering side channels located on inside bends (BRT, 2012). This pattern of behavior is consistent with that observed in reproductive pallid sturgeon tracked in the highly-modified, channelized lower Missouri River where it appears they optimize their allocation of energy by utilizing the energetically least-demanding migratory pathways (McElroy et. al., 2012). The bypass channel is intended to function much like a natural side channel, and as such, is likely to be utilized by many species of fish, including sturgeon. The angles between side channels and the main channel are being investigated with the intent to further replicate natural conditions and minimize shear flow barriers. The degree of naturalness of the bypass feature is also a variable not included in the FPCI modeling, and therefore not reflected as part of the model output.

One of the main uncertainties regarding partial flow fish passage designs revolves around flow attraction at the entrance to the bypass channel and the forces that are key to that attraction. Two parameters closely related to fish attraction include the percentage of flow captured by the particular design and the location of the passage feature. Both of these parameters are captured in the FPCI benefits modeling (Appendix E, Attachment 1); however, what constitutes an effective attraction flow and the cues fish use to determine viable and preferred pathways is not known.

The bypass channel is currently designed to carry approximately 15% of the total flow to keep sediment balance from becoming an issue at the new headworks (Appendix A2, Attachment 6). While Larinier (2000) suggests optimal fishway designs on large river systems should capture 10% of the total flow during low flow periods, or 1.5% of high flows, it was recommended by the BRT that at least 10% of the overall flow would be a minimum requirement for passage with 30% or more being desirable based on professional judgment. Thus, a 15% flow capture design for the bypass channel is not the most favorable bypass option from a biological perspective according to the BRT, but does aid in managing sedimentation issues. As such, it is considered a compromise for addressing the uncertainties of sedimentation and fish attraction flows.

The AM plan (Appendix J) describes the monitoring plan associated with improving fish passage and potential adjustments that could be made if the bypass channel does not perform as expected. One potential adjustment includes the construction of a flow augmentation structure located near the downstream entrance the bypass channel. Such a structure would increase flow at the bypass channel downstream entrance (up to 23% of main channel flow), presumably increasing its attractiveness to migrating fish. While this flow augmentation structure is currently considered an AM feature, it may be included in the final design should a determination be made that it is needed prior to construction.

Intake Dam will be raised by approximately one foot through construction of a new weir approximately 40 feet upstream of the existing structure and will continue to be a fish passage impediment in the bypass channel alternative. The existing dam would remain in place and be incorporated into the new structure through the placement of gravel and rockfill between the two structures. The increased height is required in order to ensure sufficient flows are present in the bypass channel for passage and into the headworks for irrigation. Concerns have been expressed that raising the diversion weir crest may further aggravate passage that the dam currently is able to accommodate because of changed hydraulic conditions caused by the weir, as well as the potential for exposed metal to impact sturgeon and paddlefish with highly developed electroreception.

Concern has also been raised that velocities across the top on the new weir will be too high to allow passage for some native species. The distance across the top of the proposed weir has been reduced considerably to address this issue. Hydraulic analyses indicate that flows will not appreciably change across the revised structure compared to the current diversion structure. While the total distance from the downstream and upstream ends of the structure will increase to some extent by moving the new weir upstream, depths across the dam face do not change from the existing condition. Although the potential for fish passage across the proposed structure will likely remain unchanged compared to the existing diversion structure, overall fish passage associated with this action alternative is anticipated to improve as a result of the new bypass channel. The ability of native fish to pass the new diversion structure either across the weir, through the bypass channel, or through the existing high flow channel will be monitored and addressed through AM.

As mentioned above, metal components utilized in construction can potentially affect the passage of electroreceptive fish by generating an electrical field. Intake currently has a large amount of metal components utilized in its original construction and maintenance, including

1x4-inch metal straps spaced every 24 inches across the weir. Any new construction at Intake is being planned in a way that will either minimize the use of exposed metal, or remove it after construction is completed. As such, the action alternatives are not considered to create additional passage issues for electroreceptive fish.

The proposed alignment of the bypass channel is designed to follow the upper mile of the existing high flow channel at which point the channel would diverge and flow toward the proposed weir location on the river. At the point of departure, a channel diversion would be constructed, effectively restricting flow to the existing high flow channel to keep most of the flow in the proposed bypass channel. The channel diversion would be designed to allow flows into the existing high flow channel through multiple pipes or culverts during low to normal flows (Yellowstone River discharge of 7,000 cfs or greater). Larger events would flow through these conduits and also overtop the diversion (Yellowstone River discharges greater than 60,000 cfs, or 20% annual exceedence probability).

Currently the existing high flow channel only begins to carry water at approximately 25,000 – 30,000 cfs (equaled or exceeded approximately 50% annually). As such, the hydrologic character of the channel is likely to change somewhat because it will carry more water during low to normal flows with up to 40 cfs diverted when Yellowstone River is flowing at 7,000 cfs or more. The channel would not convey flows greater than 40 cfs (as it currently does at Yellowstone River flows of greater than 25,000 cfs) until flows exceed 60,000 cfs. The new condition will result in a less stagnant condition in the side channel, especially during lower Yellowstone River flows. Therefore, it is anticipated that the existing high flow channel may provide better habitat for fish during low flows. Existing fish passage benefits provided by the current high flow channel should be improved by the bypass channel alternative. In addition, the new bypass channel is expected to function much like a high flow channel itself having many habitat characteristics of other side channels in the lower Yellowstone River. This combination should add additional habitat complexity to the site.

There is uncertainty as to the degree native fish other than pallid sturgeon will be able to pass either the proposed weir, the proposed bypass channel, or the existing high flow channel once that diversion is constructed. The ability of native fish to access the Yellowstone River upstream of Intake will be monitored and addressed through AM.

The Bypass Channel Alternative would result in the excavation of more material during construction than either the No Action alternative or the Rock Ramp alternative. Increases in sedimentation and turbidity during construction could cause temporary adverse effects on aquatic organisms particularly if it occurred during the spawning season. However, most fish species in the lower Yellowstone River are adapted to highly turbid water, so construction-related effects on fish populations would likely be minor and temporary.

Rock Ramp Alternative

The rock ramp would have lower velocities and greater depth than that over the existing dam and would likely improve fish passage over current conditions. The rock ramp would function as a long riffle, allowing passage and providing foraging and spawning habitat for a variety of fish species. However, the design of the rock ramp will have a greater slope, higher velocities, and greater amounts of turbulence than the Bypass Channel Alternative, as well as other riffles/rapids found in the lower Yellowstone River (see Appendix B). The proposed ramp also falls outside of the range of proportional low velocities [< 6 feet per second (fps)] observed in natural riffles.

Strong swimming fish (e.g., adult sauger) can currently pass upstream at Intake Dam under most flows. Nonetheless, the Rock Ramp Alternative would improve passage for these species by reducing velocities and increasing the range of flows and seasonal timeframes when fish can pass. The rock ramp design is very long (1,600 feet) in order to provide for a shallower slope necessary to reduce velocities. While the rock ramp modeling shows that a majority of the ramp might accommodate velocities in a range of most species' "burst" speed, there are limited areas where the ramp would provide resting areas along its path. Thus, passage may be problematic due to the length for which a fish must sustain a burst swimming speed as it passes across the entire rock ramp.

As mentioned earlier, one area of uncertainty in designing fish passage projects is designing the fishway such that a fish will be attracted to it and utilize it. Because the rock ramp alternative is designed to provide passage across the full width of the main channel, and is designed to carry the whole flow of the main channel, there would be very little risk in a fish being able to find the fish passage feature.

This alternative would result in more in-channel placement of fill material, but have less soil excavation than the bypass alternative. Increases in sedimentation and turbidity during construction could cause a temporary adverse effect on aquatic organisms particularly if they occurred during the spawning season. However, most fish species in the lower Yellowstone River are adapted to highly turbid water, so construction-related effects on fish populations would likely be minor and temporary.

Because this alternative is constrained to the main channel of the Yellowstone River, it will have minor impacts to aquatic habitats associated with Joe's Island.

Cumulative Effects
Improved fish passage at Intake would benefit aquatic communities, and these benefits would be magnified if similar projects are undertaken at other upstream irrigation intakes (e.g., Cartersville diversion). Adverse impacts to aquatic communities from the action alternatives would be relatively minor and temporary. There are no known or reasonably foreseeable actions that would elevate these minor impacts to greater magnitude.

Actions to Minimize Effects (Appendix I)

General

- All work in the river will be performed in a manner to minimize increased suspended solids and turbidity, which may degrade water quality and damage aquatic life outside the immediate area of operation.
- All areas along the bank disturbed by construction will be seeded with native vegetation to minimize erosion.

- All contractors will be required to inspect, clean and dry all machinery, equipment, materials and supplies to prevent spread on Aquatic Nuisance Species.

Fish

- To avoid potential impacts, coffer dam construction and in-stream heavy equipment activity will be coordinated with fishery experts from the Service, MFWP, Reclamation and the Corps to avoid and or minimize potential impacts.
- All pumps will have intakes screened with no greater than ¼-inch mesh when dewatering cofferdam areas in the river channel. Pumping will continue until water levels within the contained areas are suitable for salvage of juvenile or adult fish occupying these areas. Fish will be removed by methods approved by the Service and MFWP prior to final dewatering.
-

4.5.4 Summary

The Bypass Channel Alternative includes a new diversion structure in the Yellowstone River, a three-mile long bypass channel, and a culverted diversion in the high flow channel. The Rock Ramp Alternative involves the construction of a long, low-gradient ramp in the Yellowstone River. Both alternatives are intended to improve passage for pallid sturgeon and other native fish and provide access to additional aquatic habitat in the Yellowstone River; however, there is uncertainty as to how native fish will respond to the improvements and the subsequent degree to which they will pass. Reclamation will monitor the physical parameters associated with the bypass channel and/or rock ramp and whether native fish are passing upstream either over the proposed diversion structure or rock ramp, through the proposed bypass channel, or through the existing high flow channel and diversion structure. If no, or limited, passage is documented, Reclamation will propose measures to address the deficiency.

4.6. Federally-Listed Species and State Species of Special Concern

4.6.1 Introduction

- ➢ How would the Intake Project affect federally-listed species and state species of concern in the area of potential effects?

This project would implement an RPA issued to the Corps in the 2003 Amended Biological Opinion for the Missouri River Master Manual. Because the Service has already considered the biological effects of construction of a fish passage project at Intake during development of the RPA and determined it is an integral component to avoid jeopardy to pallid sturgeon, section 7 consultation for construction of an action alternative for this project has been completed. However, for the purposes of NEPA this EA discloses the potential effects and benefits of the project on listed and candidate species in the action area.

While Section 7 consultation for a fish passage project has been concluded, the operations of the Intake Project by Reclamation, including operation of the new headworks in conjunction with the implemented (selected) fish passage design, requires a separate but parallel Section 7 consultation. This parallel effort will likely require formal Section 7 consultation with the Service. The future BA on operations will be completed prior to the actual operation of the selected fish passage alternative. Section 7 consultation for the operation of the completed canal headworks and fish screens was completed in February 2012.

4.6.2 Methods

Analyses of impacts to resources (hydrology, geomorphology, surface water quality, and lands and vegetation) were used to analyze potential impacts to federally listed species and Montana species of special concern. The resource analyses took into account actions to minimize effects (see below and Appendix I). Additionally, federal and state lists and databases were searched to determine distribution and occurrence of these species within the Intake Project area (action area per ESA procedures). The federal list was confirmed in the May 12, 2009, coordination meeting with the Service. The Montana species of special concern were confirmed by the cooperating agencies after review of a preliminary draft of Chapter 3 of the 2010 EA and subsequent comments (see Chapter 5 for further information). The ESA species list was again updated by Reclamation in the 2012 consultation for operation of the headworks. No new species that may be present in the action area have been listed or proposed since the 2012 consultation.

Potential impacts to species in the Intake Project action area were assessed. Federally threatened and endangered species and species of special concern potentially in the Intake Project area are listed in Appendix F.

To further evaluate the differences in benefits between the two action alternatives, a hydraulic model was used (Corps, 2009) with the FPCI to determine benefits to fisheries (including sturgeon). Appendix A provides the details of this analysis, as well as the cost effectiveness and incremental cost analysis of the alternatives. The results of this analysis are captured above under the aquatic resources section, and are summarized below.

4.6.2.1 Short-Term and Long-Term Effects of the Alternatives

Bypass Channel Alternative

Federally-Listed Species: There are no impacts identified for the whooping crane, interior least tern, or black-footed ferret under this alternative. Whooping cranes are uncommon migrants in the Intake area and are not anticipated to be affected by the proposed action. Best management practices include periodic review of the Service's crane siting database and consulting with the Service if whooping cranes are sited within the project area. Interior least terns nest on exposed bars and feed in shallow water near bars and the shoreline. Best management practices include weekly visual surveys conducted from May 15 to August 15 at all potential least tern nesting areas within line of site of the construction area and restricting all construction and surface disturbing activities from May 15 to August 15 within 0.25 miles or the line of site of any active interior least tern nest. These actions will minimize any construction-related impact on interior least terns. Black-footed ferrets exclusively inhabit prairie dog towns. There are no known prairie dog colonies or towns on Joe's Island or in the immediate vicinity of the project area. We have concluded that this alternative “may affect, but is not likely to adversely affect” whooping cranes and interior least terns and would have no effect on black-footed ferrets.

The Bypass Channel Alternative uses the best available scientific information to identify physical parameters important to sturgeon use of secondary and high flow channels in the Yellowstone River. Two-dimensional modeling suggests that velocity parameters identified by the Service through the BRT may not be achievable at extremely low and high flows. Modeling suggests that other important physical parameters can be achieved in the bypass channel under most flow conditions. However, uncertainty remains whether pallid sturgeon will enter and travel the entire three-mile length of the bypass channel. The Corps and Reclamation will monitor the physical parameters of the bypass channel to document whether the channel conforms to the criteria developed by the BRT. The Corps will be responsible for the first year after construction to ensure the channel performs as designed and Reclamation will continue monitoring in the following years consistent with the Adaptive Management Plan (Appendix J).

A large eddy currently develops at the proposed downstream entrance to the bypass channel at some flows. The reverse flow associated with eddies may limit the effectiveness of the bypass channel if shearing flows deter pallid sturgeon from entering the channel. This eddy produces reverse flow in the river and creates a “curtain” of shear flow near the proposed downstream entrance to the bypass channel. Pallid sturgeon have been documented to avoid areas of high turbulence and shear flow (White & Mefford, 2002). The hydraulic conditions anticipated at the entrance to the bypass channel are being modeled by the Corps and Reclamation to identify alternative channel alignments and other means to reduce eddy development and other velocity barriers.

Implementation of actions to minimize effects (Appendix I) on pallid sturgeon would minimize short-term impacts of construction-related activity. Furthermore, the overall purpose of the project is to benefit pallid sturgeon recovery by improving fish passage and minimizing entrainment. There are many factors involved in the ability of fish passage alternatives to be successful and many uncertainties with regard to fish passage design requirements. Both action alternatives, while they have similar modeling results, have positives and negatives regarding the ability of each design to provide fish passage. The benefits of the bypass channel are slightly less favorable than those for the Rock Ramp Alternative. However, upon comparison of cost per benefit output, the bypass channel compares more favorably. The overall long-term effect of the bypass channel is anticipated to be highly beneficial to pallid sturgeon and more than offset minor short-term impacts caused by construction. Any potential short-term effects would be considered insignificant and discountable.

Incidental take of pallid sturgeon during construction was considered in the original 2003 amended Missouri River Biological Opinion. Based on the analysis and environmental commitments in the 2010 ESA consultation, EA, and FONSI, as well as the analysis in the current EA, it is not anticipated that incidental take in conjunction with fish passage construction will occur. Therefore, it has been concluded that construction of this alternative “may affect, but is not likely to adversely affect” the pallid sturgeon.

Sprague's pipits require large patches of continuous grassland and areas with little shrub or tree cover. Habitat segmentation (via roads, etc) is also thought to have led to declines in their populations. Segmentation has the effect of creating smaller and smaller habitat patches while also increasing habitat edges. Increased edges create vulnerabilities to nesting sites through exposure to increased predators and brood parasitism (Jones, 2010). Because the Intake site is already somewhat segmented, adjacent to several roads, and is mostly grassland interspersed with riparian and upland forested and shrub areas, the likelihood that Sprague's pipits would be found using the site is minimal. Implementation of a migratory bird management plan would minimize potential adverse impacts to Spague's pipit and other grassland nesting birds.

While the site does have some sagebrush, many of these same habitat attributes are likely to make the site minimally suitable for greater sage grouse as well. However hens with chicks are known to feed on succulent forbs and insects where cover is sufficiently tall to conceal broods and provide shade. Depending on availability of succulent vegetation availability within upland grassland and sagebrush habitats, hens may move with their broods to moister areas that provide an abundance of forbs and insects for food, and tall grass for hiding from predators. While nesting would be unlikely in the floodplain of the Yellowstone River, greater sage grouse could potentially occur in the area, particular in the later summer months when broods may be utilizing the moister riparian bottom areas. Upon completion of project construction, much more of the Joe's Island will be isolated and would be considered a benefit if grouse do utilize the area. Grassland areas affected by spoiling of channel material (particularly at the waste pile site) contain some silver sagebrush, as does the bottomland shrub areas. While silver sagebrush habitats are common in the surrounding areas, any habitats containing sagebrush that are affected by the project will be reestablished. This will help assure that negative impacts to habitats potentially utilized by greater sage grouse are only temporary.

State Species of Special Concern: Construction activities for the Bypass Channel Alternative would have a temporary effect on species of concern in the immediate vicinity of the construction area. Human activity and noise from equipment and machinery would disturb some species that are sensitive to this type of activity causing animals to move to other areas. A limited number of trees, shrubs, and vegetative cover would be eliminated at some sites during construction.

Construction activity in the river and adjacent bank would affect fish and aquatic invertebrates, but most of these species are mobile enough to move out of construction areas. Excavation of a new channel in the uplands on Joe's Island would not impact aquatic invertebrates and might provide new habitat as upland would be converted to riverine habitat. It should be noted that the new channel created by this alternative would allow passage of fish but the channel would not be allowed to migrate within the floodplain. This could limit the habitat structure of the new channel for fish and aquatic invertebrates.

The FPCI benefits analysis completed for this project accounted for several fish species of special concern. Species of special concern utilized in this analysis include the shovelnose sturgeon (as surrogate to pallid sturgeon), paddlefish, sauger, and blue sucker. Habitat loss and the presence of migratory barriers are largely related to all of these fish being listed as a species of special concern in the state of Montana, and these species provide a good indication of the benefits that result from improving fish passage at Intake. While the benefits are much higher for either action alternative when compared to no action, benefits associated with the rock ramp appear to be somewhat greater than benefits of the bypass channel. However, the cost per habitat unit of benefits is lower for the Bypass Channel Alternative.

In the 2010 EA, a table presented all the Montana State Species of Special Concern along with potential impacts to those species. These impacts have not changed since drafting the 2010 EA and can be found in Chapter 4 of that document. Reclamation will develop a migratory bird management plan to minimize potential adverse impacts on migratory birds and their breeding habitat.

Rock Ramp Alternative

Federally-Listed Species: The impacts identified for this alternative are the same as described above for the Bypass Channel Alternative, but are less because the size of this alternative's footprint is smaller. Best management practices are also the same for this alternative. The hydraulic analysis and FPCI evaluation (Appendix E) found that the Rock Ramp Alternative scores slightly higher and more favorably for pallid sturgeon than the Bypass Channel Alternative, but the cost per habitat unit is much more. Detailed description of the potential effects to pallid sturgeon from this alternative can be found in the 2010 EA and BA. Because construction occurs in the river for this alternative, we have concluded that this alternative "may affect, but is not likely to adversely affect" the whooping crane, least tern, or pallid sturgeon.

Black-footed ferrets exclusively inhabit prairie dog towns. There are no known prairie dog colonies or towns on Joe's Island or in the immediate vicinity of the project area, and we have concluded that this alternative would have no effect on black-footed ferrets.

Under the Rock Ramp Alternative, much less habitat area potentially considered suitable habitat for the Sprague's pipit or greater sage grouse would be impacted, as the construction of the project would be mainly confined to the river channel area. Access points and stockpile areas would be the only areas affected during construction. Implementation of a migratory bird management plan would minimize potential adverse to Spague's pipit and other grassland nesting birds.

Greater sage grouse are not common in the project area, however Joe's Island provides some areas of suitable habitat. Effects to Joe's Island would be temporary for this alternative and those areas disturbed would be restored. Any potential adverse effects to greater sage grouse would be temporary and minor.

State Species of Special Concern: Impacts to land areas adjacent to the river during fish passage construction would be minimal, thus impacts to species of concern are anticipated to be minimal.

Rock ramp placement could impact fish and aquatic invertebrates identified as species of special concern. Construction activity in the river and adjacent bank would affect fish and aquatic invertebrates, but most of these species are mobile enough to move out of construction areas. Actions to avoid and minimize these adverse impacts can be found in Appendix I. Even with actions to minimize effects in place there may be short-term minor effects to aquatic invertebrates in the immediate vicinity of construction activities. Overall, with actions to minimize effects in place, the long-term impact of construction activities on aquatic invertebrate assemblages would be minor. Because large, stable substrates such as boulders and cobbles support larger, more productive invertebrate populations than do unstable gravel and sand substrates, creating a rock ramp may result in minor improvements in the diversity of the aquatic invertebrate community.

Actions to minimize effects (Appendix I) would be incorporated into all the action alternatives to avoid potential adverse effects. Therefore, with these commitments, any potential adverse impacts would not result in a loss of individuals and are extremely unlikely to occur. Only minor impacts to Montana state species of special concern are anticipated.

Cumulative Effects

Impacts to federally-listed species and state species of special concern from the action alternatives would be relatively minor and temporary. Improved fish passage would benefit federally-listed fish species and state fish species of special concern, and these benefits would be magnified if similar projects are undertaken at other upstream irrigation intakes (e.g., Cartersville diversion). There are no known or reasonably foreseeable actions that would elevate these minor impacts to greater magnitude.

Actions to Minimize Effects (Appendix I)

Whooping Crane

- Reclamation will monitor the Service's whooping crane sighting reports to ensure that whooping cranes are not in the Intake Project area during construction. If any are sighted within the Intake Project area, Reclamation will consult with the Service regarding appropriate actions.

Interior Least Tern

- Visual surveys will be conducted weekly from May 15 to August 15 at all potential least tern nesting areas (sparsely vegetated sandbars) within line of site of the construction area.
- All surface-disturbing and construction activities will be restricted from May 15 to August 15 within 0.25 miles or the line of site of any active interior least tern nest.

Pallid Sturgeon

- A physical model will be constructed to provide additional velocity and turbulence data needed for final design.
- Reclamation and the Corps will consult with the BRT during the design of the selected alternative, including but not limited to reviewing results and making recommendations on the physical model, hydraulic modeling, and final alternative design.
- The construction activities will be monitored by a qualified fisheries biologist to avoid direct impacts to adult or juvenile pallid sturgeon. In-stream construction activities will cease if the fisheries monitor determines there is potential for direct harm or harassment of pallid sturgeon, until the potential for direct harm or harassment has passed. This will mainly be accomplished by coordination with MFWP regarding its observation of

movements of radio-tagged pallid sturgeon and other monitored native fish during the construction season.

- Any in-stream construction activity will be conducted during periods most likely to minimize the potential impact to the pallid sturgeon. The months to avoid and/or minimize impacts to pallid sturgeon are June and July.

Species of Special Concern

- Before every construction season, the ERT will meet with MFWP to determine procedures to minimize impacts to species of special concern. Surveys for species likely to occur in the Intake Project area may be required as some of these species could be potentially harmed by construction activities. Survey requirements will be coordinated with Montana Natural Heritage Program and MFWP prior to any construction activities. These species could require surveys: bald eagle, grasshopper sparrow, red-headed woodpecker, greater sage grouse, Sprague's pipit, Townsend's big-eared bat, nine-anther clover, pale-spiked lobelia, and silky-prairie clover.

4.6.3 Summary

It was determined that the Bypass Channel Alternative "may affect, but is not likely to adversely affect" pallid sturgeon, whooping cranes, and interior least terns and would have no effect on black-footed ferrets. Potential impacts to Sprague's pipit and greater sage grouse are anticipated to be temporary and minor. Likewise, it was determined that potential impacts to state-listed species are anticipated to be temporary and minor.

It was determined that the Rock Ramp Alternative "may affect, but is not likely to adversely affect" pallid sturgeon, whooping cranes, and interior least terns and would have no effect on black-footed ferrets. Potential impacts to Sprague's pipit and greater sage grouse are anticipated to be temporary and minor. Likewise, it was determined that potential impacts to state-listed species are anticipated to be temporary and minor.

4.7. Recreation

4.7.1 Introduction

- ➢ How would the Intake Project affect recreational opportunities, including camping, hunting, fishing, boating, concessions, swimming, picnicking, and day use at the Intake fishing access sites (FAS) and Joe's Island?

- ➢ How would the Intake Project affect the recreation infrastructure, including the campground, picnic/day use area and the boat ramp at Intake FAS and Joe's Island?

This section addresses recreational opportunities and associated recreation infrastructure that may be affected during and after Intake Project construction.
Construction activities may impact the quality of the recreational experience and or the physical environment on a temporary basis. These impacts are expected to be short-term, depending upon the alternative selected for implementation and the Intake Project construction schedule.

Construction would take approximately 2 ½ years for the Rock Ramp Alternative and 3 years for the Bypass Channel Alternative. Fishing and boating would not be restricted in the newly constructed bypass channel. Wakes from boating may cause minor erosion in the bypass channel, however it is expected to be minimal and not appreciably add to O&M costs. Potential wake damage to the bypass channel will be monitored through the AM process.

Some recreational opportunities and/or infrastructure may be lost for future use or enjoyment, although actions to minimize effects would offset these impacts (see Actions to Minimize Effects subsection and Appendix I).

4.7.2 Methods

The analysis took into consideration impacts to the physical environment as well as certain intrinsic values such as the quality of the view shed, sense of quiet and solitude, and access to water.

4.7.3 Results

4.7.3.1 Short-Term and Long-Term Effects of the Alternatives

Camping and Picnic/Day Use

Bypass Channel and Rock Ramp Alternatives: Neither alternative would physically impact the campground or picnic/day use area. Both alternatives would have some short-term impacts to recreational opportunities at the Intake FAS. During Intake Project construction noise, dust, and construction equipment could impact the sense of quiet and solitude traditionally experienced in these areas. Ease of access to the campground and picnic/day use area might be reduced during periods of heavy construction adjacent to the recreation areas or along the entrance road. These impacts could discourage recreational use of the campground or picnic/day use area. At times, due to construction need or for public health and safety, the recreational areas might be closed for limited periods of time.

The Rock Ramp Alternative would require closure of the existing boat ramp which could temporarily reduce recreational use of the campground or picnic/day use area. A new boat ramp would be constructed concurrent with construction of the ramp alternative, therefore long-term impacts are not expected (see "Actions to Minimize Effects" subsection and Appendix I).

Once the bypass channel is constructed, the short-term construction impacts to the campground and picnic/day use area noted above should be alleviated.

Once the Rock Ramp Alternative is constructed, the short-term construction impacts to the campground and picnic/day use area noted above should be alleviated. The river would flow in the same channel and the visual and audio aesthetics of the river should remain the same. There should be no long-term impacts to the campground or picnic/day use areas.

Both alternatives would impact the camping and picnicking/day use opportunities on Joe's Island during fish passage construction. There are no developed campgrounds or day use facilities on Joe's Island, but the area is used for primitive camping and picnicking. Short-term construction impacts due to either alternative may result in use of Joe's Island being restricted or temporarily prohibited. This could result in fewer visitations to the area.

The Bypass Channel Alternative would have a long-term impact to recreation on Joe's Island, as access to the dam from the south would be restricted due to the newly constructed bypass channel. This would result in reduced visitation to the area. There should be no long-term impacts to recreation at Joe's Island due to the Rock Ramp Alternative.

If either action alternative is constructed, roads that were constructed for fish passage construction purposes, if left in place, would improve access to Joe's Island.

Hunting

Bypass Channel and Rock Ramp Alternatives: Hunting is prohibited and would remain so at Intake FAS, during and after construction of either action alternative. During fish passage construction, hunters wishing to access the river by boat might experience short-term impacts when the boat ramp at the Intake FAS is temporarily closed, or if foot access is limited through the construction zone. This could result in fewer visits to the river by hunters; however, hunting access to the river is nominal during designated hunting seasons. Foot access restrictions to the river should be alleviated once the Intake Project is completed.

The Bypass Channel Alternative would not require closure of the boat ramp at the Intake FAS, and therefore would not impact visitation to the FAS.

Hunting on Joe's Island and access to downstream lands could be impacted on a short-term basis during construction of either alternative if the island is closed for safety purposes. Once the Intake Project is completed, it is likely that hunting restrictions would be lifted.

Once the Bypass Channel Alternative is constructed, Joe's Island would become bisected, and access across the bypass channel would be limited to boat traffic. This would be a long-term but minimal impact; hunting on Joe's Island only provides limited opportunities, and there are other hunting opportunities on block management lands and other public lands along the river.

If the Rock Ramp Alternative is constructed, hunting on Joe's Island should not be substantially changed.

Fishing

Bypass Channel and Rock Ramp Alternatives: During Intake Project construction, anglers using either side of the river (Intake FAS or Joe's Island) might experience short-term impacts when access to the river is temporarily restricted within the construction zone. Construction activities in the river would also restrict fishing opportunities temporarily. Fishing outside the construction zone would still be available. However, for the bypass channel, it is likely that fishing access to the face of the dam would permanently change due to the mouth of the bypass channel meeting the river right below the dam. This would not preclude fishing opportunities at the site, but would likely impact how closely bank fisherman could access the river near the dam face.

During Intake Project construction, snagging for paddlefish could be impacted. Intake Project construction activities may alter paddlefish behavior at the dam site discouraging paddlefish from concentrating below the dam. This may reduce the number of paddlefish snagged at the FAS. However, this could increase overall snagging opportunities in the Yellowstone River if more paddlefish migrate up river. Historically, the paddlefish season at Intake is closed when a designated number of paddlefish are snagged. This often occurs before the season's established closing date. Without the high numbers of paddlefish snagged at Intake, the yearly quota might not be filled as quickly, and the season might stay open longer affording anglers more days to snag paddlefish until the quota is either met or the season officially ends.

Once either action alternative is completed, paddlefish would be less inclined to congregate at the Intake FAS. This should reduce snagging opportunities at the FAS but should also increase snagging opportunities further up river. As discussed in the "Aquatic Communities" section, paddlefish may benefit from additional spawning areas up river, which could improve reproduction and increase populations.

As a byproduct of the recreational paddlefish fishery on the lower Yellowstone River, the Glendive Chamber of Commerce and Agriculture (Chamber of Commerce) administers the Yellowstone Caviar program. Before and after Intake Project construction, anglers would be able to donate roe from paddlefish snagged between Glendive and the Montana/North Dakota state line to the Chamber of Commerce, and the Chamber of Commerce would be able to accept and process the donated paddlefish roe into caviar. Intake Project construction should not reduce the number of paddlefish in the Yellowstone River or the quota for the number of paddlefish to be taken. However, during and after Intake Project construction the Yellowstone Caviar program could be impacted by a number of factors. Most of the donated roe comes from paddlefish that are currently snagged below the Intake Dam. Impacts from restricted angler access to the river or reduced numbers of paddlefish snagged at the FAS could result in less paddlefish roe donated to the program, unless the Chamber of Commerce maximizes its authorized opportunities to collect paddlefish snagged between Glendive and the North Dakota-Montana state line. Reduced donations would reduce income for the Chamber of Commerce.

Permanently closing the boat ramp under the Rock Ramp Alternative would result in long-term impacts to anglers wishing to access the river by launching boats at the Intake FAS. This could result in reduced visitation to the FAS, however the project proposes to construct a new boat ramp at or near the Intake FAS.

Boating

Bypass Channel and Rock Ramp Alternatives: Once construction activities begin, the boat ramp at Intake would be closed periodically and be closed completely under the Rock Ramp Alternative. Thus, the Rock Ramp Alternative would impact recreationists wishing to launch boats at Intake FAS for boating, fishing, or hunting activities on the river.

Boaters would have to travel greater distances to access a concrete boat ramp. The "water taxi" that operates during the paddlefish season would launch and be retrieved further downstream. There are two concrete boat ramps at the Elk Island FAS 20 miles downstream.

As noted above in the Hunting and Fishing sub-sections, any action that reduces access to the river could impact hunting and fishing activities at and around the FAS. A 20-mile upstream boat trip from Elk Island would be a difficult trip for most boaters. Reducing boat access to the river for fishing may also impact the Yellowstone Caviar program. Anglers cannot fish or snag for paddlefish or any other species from a boat within ¼ mile downstream of Intake Dam. However, this existing restriction does not prevent boaters from launching at Intake FAS and boating below the closed area to snag paddlefish.

The lack of a concrete boat ramp may result in fewer yearly visitors to the FAS until a new boat ramp is constructed at or near the Intake FAS (see Appendix I).

The Rock Ramp Alternative would change the grade of the dam at Intake FAS. A gentler slope with a higher river level over the dam could allow for greater boat traffic up river and down river of the FAS.

Under the Bypass Channel Alternative the boat ramp will remain unaffected and this alternative could result in use of the bypass channel that may provide easier access upstream than over the rock ramp.

Concession Operation and Sub-Contractors

Bypass Channel and Rock Ramp Alternatives: The concession and sub-contractors only operate during the paddlefish season. Both alternatives would have virtually the same short-term and long-term impacts to the concession operation and sub-contractors operating at the Intake FAS. Intake Project construction would not have a direct physical impact to the concession operation and sub-contractors. Those opportunities would remain.

During the paddlefish season, Intake Project construction noise, dust, and construction equipment could impact the sense of quiet and solitude traditionally experienced in these areas. Ease of access to the campground, picnic/day use area, and boat ramp might be reduced during periods of heavy construction activities adjacent to these areas or along the entrance road. These impacts could discourage use of the recreation areas, thereby potentially reducing income for the concessionaire. Any reduction in paddlefish snagging opportunities at the Intake FAS might impact the sub-contractors operating at the FAS. If the sub-contractors are paid by the number of paddlefish processed, a longer season would mean they would have to work more days; or, if the sub-contractors are paid by the hour or day, it would likely cost the Chamber of Commerce additional money.

Swimming and Ice Fishing

Bypass Channel and Rock Ramp Alternatives: Both alternatives would have virtually the same short-term impacts to swimming and ice fishing opportunities. Short-term impacts would include no river access within the construction zone; however, swimming is already discouraged downstream of the dam because of turbulence and other safety issues. These opportunities would still exist outside the construction zone and would be available upon Intake Project completion.

Cumulative Effects

With implementation of actions to minimize effects, the action alternatives would have minimal impacts to the recreation opportunities and infrastructure at the Intake FAS.

Actions to Minimize Effects (Appendix I)

- In order to minimize impacts to recreationists, the construction contractor will implement dust abatement activities on all dirt or gravel roads within or leading to the construction zone on both sides of the river.
- To allow access to recreation areas, the construction contractor will grade, on an as needed basis, all dirt or gravel roads within or leading to the construction zone, on both sides of the river, except in areas with historic properties.
- The construction contractor will use "flaggers" during periods of time when large volumes of vehicles cross the entrance road to the campground and picnic/day use area.
- The construction contractor, Reclamation, and the MFWP will meet to evaluate and coordinate closures at the FAS and Joe's Island to recreational use, including closure of construction zones to swimming, fishing, boating, hiking, camping, hunting, etc. within or on both sides of the river.
- During construction activities on the north side of the river, the construction contractor, Reclamation, and the FWP will identify a "portage" route around or through the construction zone to allow boaters to hand-carry or drag their boats past the construction zone.
- The construction contractor will clearly post and sign any areas within any designated construction zones. Signs will include warnings limiting or prohibiting certain recreational uses within the zone, such as swimming, fishing, boating, hiking, camping, etc. Signs will be posted upstream and downstream of the Intake Diversion Dam to warn boaters of construction activity.
- The MFWP will designate access corridors through the existing Intake FAS campground and picnic/day use area that could be used to access the river by foot or to launch boats under "primitive" conditions.

For the Rock Ramp Alternative, Reclamation and the MFWP will evaluate and the Corps will construct either:

- a new boat ramp at the existing Intake FAS, or
- a new boat ramp immediately adjacent to the existing Intake FAS, or

- a new boat ramp at a site near the existing Intake FAS on the west side of the Yellowstone River and accessible by Highway 16.

Reclamation and the MFWP will develop a public notification plan to include:
- signs on the road leading to the FAS or Joe's Island advising the public of closures or restrictions, and
- signs indicating the location of other recreation sites including campgrounds, picnic/day use areas and boat ramps.

4.7.4 Summary

In the short-term, the Rock Ramp Alternative would have the greatest impacts to the campground, day use area, and boat ramp, as those features are adjacent to the rock ramp construction area, however, both the Rock Ramp and Bypass Channel Alternatives will have some impacts to recreational opportunities such as camping, picnicking, boating, and fishing due to temporary closures, noise, dust, and restricted access to the river at certain times during construction.

In the long-term, the Rock Ramp Alternative would require closure and relocation of the boat ramp. Most fishing and boating opportunities on the river should improve after construction of either alternative. The Bypass Channel Alternative would limit access to areas adjacent to and upstream from the dam on Joe's Island having some impacts to recreation, but these impacts would be limited. Paddlefish snagging opportunities, which would continue, might be less plentiful at the Intake FAS and Joe's Island since paddlefish would likely not congregate to the same degree below the new rock ramp or may bypass the location through the Bypass Channel. However, paddlefish snagging opportunities should improve upstream.

4.8. Social and Economic Conditions

4.8.1 Introduction

➢ How would the alternatives affect the regional economy of the region?

This section addresses how the proposed alternatives may affect the regional economy. These impacts could occur as a result of operational changes that could affect the four irrigation districts in the Yellowstone project and activity in the region in three ways:
- short-term construction impacts,
- increase in long-term O&M costs, and
- short-term changes in recreation visitation and related expenditures due to construction.

It is assumed for the purposes of this analysis that cropping patterns, yields, and irrigation deliveries would be the same under the No Action (Continue Present Operation), Bypass Channel, and Rock Ramp Alternatives. Therefore, the economic impacts associated with irrigated production would all be the result of changes in water supply costs for each alternative. Recreation impacts would be related to decreases in the number of recreationists using Intake FAS during construction (see "Recreation" section).

4.8.2 Methods

The regional economic impacts from implementation of the Bypass Channel Alternative and the Rock Ramp Alternative were compared to continuation of current cost rates in order to evaluate the significance of each action alternative to the regional economy. The regional impacts from construction and O&M expenditures are analyzed using the IMPLAN (IMpact analysis for PLANing) model. IMPLAN version 3.0 is used to estimate regional impacts. The most recent available 2010 model year data are used with 2012 as the base year of analysis.

The IMPLAN model is based on national estimates of flows of commodities used by industries and commodities produced by industries. The flow of commodities to industry from producers and consumers, as well as consumption of the factors of production from outside the region, is represented within IMPLAN. These also account for the percentage of expenditures in each category within the region and expenditures that would flow outside the region.

In order to estimate the regional economic impacts associated with an alternative, estimates of changes in expenditures for goods and services were input into the IMPLAN model. The primary sectors used to categorized expenditures are sector 36, construction of other new nonresidential structures and sector 39, maintenance and repair construction of nonresidential structures. Estimating the impacts of construction and operation and maintenance activities requires estimates of these expenditures by expenditure category. The impacts associated with each of the alternatives are measured in terms of changes in industry output, employee compensation, and employment. Industry output is a measure of the value of industry's total production. Industry output is directly comparable to Gross Regional Product. Employee compensation represents wages and benefits paid to employees.

The impacts associated with payment of O&M costs associated with the Bypass Channel and Rock Ramp Alternatives were evaluated using farm budgets, which represent net revenues from irrigated agriculture. Farm budgets were developed using cropping patterns, input costs, crop yields and prices. A simplified approach based on the concept of farm payment capacity was used in this analysis to represent the net farm revenues available from irrigated acreage to pay increased operation, maintenance, replacement, and monitoring costs. Payment of increased O&M costs would lead to reduced disposable farm income.

4.8.3 Results

4.8.3.1 Short-Term and Long-Term Effects of the Alternatives

Rock Ramp and Bypass Channel Alternatives

Regional Economic Impacts: Both of the action alternatives would generate positive impacts to the regional economy. Any action that increases levels of spending tends to lead to increased value of output, employment, and income. The value of output represents the market value (as measured by price) of goods and services produced and sold in the region. Increased spending would increase economic activity, if the funds come from sources outside the study area or if spending comes from local sources that would otherwise not be spent in the region.

The short-term regional impacts are based on an estimated construction cost of $80.0 million for the Rock Ramp Alternative and $58.9 million for the Bypass Channel Alternative (see Chapter 2). These one-time maximum short-term impacts are shown in Table 4.5. These beneficial impacts represent additional regional economic activity from an action alternative that is constructed with federal funding over the construction period.

Table 4-5. One-time regional beneficial economic impacts from construction

Alternative	Construction cost (millions)	Value of output (millions)	Employee compensation (millions)	Employment
Rock Ramp	$80.0	$102.2	$39.2	750
Bypass Channel	$58.9	$73.0	$28.0	535

The IMPLAN model provides estimates of economic activity in the region of analysis, which can be used as a basis for evaluating the significance of regional impacts. The IMPLAN data indicate the gross regional product (the total value of goods and services produced in a region) for the eight-county study region was approximately $3.72 billion in 2010. Total personal income was about $2.9 billion for the region and total employment was about 48,000 in 2010. The regional impacts from construction of the alternatives can be compared to the 2010 estimates for the area to get a sense of the level of regional economic impacts from construction.

Table 4.6 shows the potential one-time impact of construction of the two action alternatives relative to gross regional product, income, and employment in the regional economy. The impacts are shown as percentages of totals in one year. Construction would have a positive impact in the very short-term, but the impact would be fairly small relative to the total regional economy.

Table 4-6. One-time regional economic impacts from construction as a percentage of gross regional product, income, and employment

Alternative	Estimated impacts as a percentage of 2010 gross regional product	Estimated impacts as a percentage of regional 2010 income	Estimated impacts as a percentage of regional 2010 employment
Rock Ramp	2.75%	1.35%	1.56%
Bypass Channel	1.96%	0.97%	1.12%

Regional economic impacts may also occur as a result of O&M expenditures associated with the Rock Ramp and Bypass Channel Alternatives as well as the No Action Alternative. No Action O&M costs have changed since the 2010 EA since part of the project has been implemented and are included as a baseline from which the other alternatives can be compared. Table 4.7 shows the O&M costs and regional impacts associated with each alternative. The impacts in Table 4.7 represent a very small percentage of the total value of output and employment in the economic region and represent the case where all O&M expenditures are additional expenditures within the region. It should be recognized that increased O&M expenditures could correspond with decreased spending on other goods and services, in which case the regional impacts would be less than indicated in table 4.7.

Table 4-7. Regional economic impacts associated with annual O&M costs for each alternative

Alternative	Annual O&M cost	Value of output	Employee compensation	Employment
Rock Ramp	$291,600	$2397,700	$167,000	3.1
Bypass Channel	$231,300	$315,400	$132,400	2.3
No Action	$252,400	$344,200	$144,500	2.5

If it is assumed that increased O&M expenditures lead to a proportional decrease in general consumer spending (such as reduced spending on food, general merchandize shopping, etc.) then the O&M expenditures associated with each of the alternatives would generate minor regional impacts. In other words, if the money spent for O&M ultimately leads to a decrease in spending that is currently occurring, then O&M expenditures would have a minor impact on the regional economy. Table 4.8 shows the impact of O&M costs for the Rock Ramp and Bypass Channel Alternatives assuming a proportionate decrease in other types of spending.

Table 4-8. Regional economic impacts associated with annual O&M costs for each alternative

Alternative	Value of output	Employee compensation	Employment
Rock Ramp	$232,800	$104,000	0.3
Bypass Channel	$1184,700	$82,500	0.2
No Action	$201,300	$90,000	0.2

Note: This table assumes O&M costs represent reduced expenditures elsewhere in the regional economy.

Effects of O&M Payments on Irrigation Districts: The increase in O&M costs associated with the Rock Ramp and Bypass Channel Alternatives would have a negative financial impact on the four irrigation districts. Impacts from changes in O&M payments were estimated previously at the regional level. However, distributional effects are not accounted for in the regional impact analysis. The impacts of increased O&M costs on the irrigation districts are evaluated by comparing the O&M costs per acre for each alternative with per acre net farm income.

If the current estimated annual No Action O&M costs of $252,400 are applied to approximately 58,400 acres reported in the Lower Yellowstone Irrigation Project crop reports, the cost would be $4.32 annually per irrigated acre. Applying O&M costs of $291,600 annually for the Rock Ramp Alternative results in a cost of $5.00 per irrigated acre. O&M costs of $231,300 annually for the Bypass Channel Alternative result in annual O&M costs of $3.96 per irrigated acre.

In order to evaluate the significance of the O&M expenditure impacts, a payment capacity type of approach is used to estimate the impact of additional O&M costs on net farm income. Payment capacity represents the residual net farm income available to irrigators to pay the costs associated with supplying irrigation water. A payment capacity study is the first step in the completion of an ability to pay analysis. A full scale payment capacity analysis was not completed as part of this EA because the primary purpose of this evaluation is to determine the significance of the economic impacts associated with the alternatives, rather than a precise estimate of the resources available for repayment. However, the analysis must be detailed enough to be able to determine the magnitude of impacts. It should be noted that since O&M costs associated with the Bypass Channel Alternative are less than for No Action, the Bypass Channel O&M impacts are beneficial relative to No Action.

A payment capacity study is based on the use of representative farm characteristics, representative crop yields, and representative input and crop prices. A 5-year time horizon is typically used for crop yields and prices. Representative farm characteristics refer to the fact that not all crops grown in an area and not all farm management practices must be included in a payment capacity analysis. However, the farm budget used in a payment capacity analysis must be reasonable for the region of analysis. The purpose of this analysis is to evaluate the impact of O&M costs associated with the action alternatives on net farm revenue.

Representative cropping patterns, crop prices, and yields. Representative irrigated cropping patterns for the four irrigation districts are based on the crop acreages reported by the Lower Yellowstone Irrigation Project Board of Control for 2007 and historical county level data obtained from U.S. Department of Agriculture National Agricultural Statistics Service. More recent district level cropping pattern data were not provided. Therefore, county level data for the eight counties included in the impact study area were used to determine if there appeared to be any significant trends in crops grown in the area. Irrigated crop acreages for 2007 for the study area are shown in Table 4.9, and the irrigated county crop acreages for 2003 to 2011 are presented in Table 4.10. Lower Yellowstone Districts #1 and #2 are evaluated as one unit because the Lower Yellowstone Irrigation Project Board of Control operates these districts as one with a common Montana water right. The percentages shown in Table 4.11 are representative of the crops actually produced in the area but do not exactly match the percentage of all crops grown in the districts.

Table 4-9. 2007 irrigated estimated crop acreage by irrigation district

District	Sugar beets	Hay	Wheat	Barley	Corn
Lower Yellowstone Districts #1 & #2	24,944	6,493	8,793	11,024	3,987
Intake Irrigation District	392	156	-	192	146
Savage Irrigation District	820	215	162	707	263

Table 4-10. Irrigated crop acreage in eight-county study area from 2003 to 2011

Crop	2003	2004	2005	2006	2007	2008	2009	2010	2011
Sugar beets	39,670	39,790	40,320	37,540	32,640	NA	21,000	30,000	29,900
Corn	18,300	12,400	12,400	15,000	26,200	21,800	15,400	14,200	10,500
Alfalfa*	30,000	31,500	24,500	20,000	28,000	12,000	20,172	22,469	16,099
Wheat*	28,100	24,700	20,900	18,400	22,800	28,500	NA	NA	NA

* Figures represent only Montana counties because North Dakota data were not available.

The county average acreage data indicate that sugar beets continue to be a dominant crop grown in the area. Corn and alfalfa appear to be decreasing as a percentage of total crops while wheat remained as a relatively high percentage. Irrigated barley acreage data were not available at the county level.

Table 4-11. Irrigated cropping percentage based on 2007 average crop acreage and county-level crop acreage trends

Irrigation District	Sugar beets	Hay	Wheat	Barley	Corn
Lower Yellowstone District #1 and #2	45%	10%	20%	15%	10%

Intake Irrigation District	40%	10%	20%	10%	20%
Savage Irrigation District	35%	15%	15%	20%	15%

Crop prices and yields are needed in order to estimate representative farm revenues. Crop prices for the most recent five years for which data are available were obtained at the state level for both Montana and North Dakota from the United States Department of Agriculture, National Agricultural Statistics Service. These prices are shown in Table 4.12.

The two-state average price was used to estimate gross farm revenues from irrigated production for each crop except corn. The two-state average was considered more representative of prices for the study area that includes both states. Montana prices were used for corn, because essentially all corn production in the area is in the Montana districts.

Table 4-12. State-level crop prices used to evaluate net farm income

Crop	2007	2008	2009	2010	2011	2007 to 2011 Average
Montana						
Barley (bushel)	$4.14	$5.78	$4.86	$4.08	$5.25	$4.82
Corn (bushel)	$4.76	$3.80	$4.23	$6.00	$6.40	$5.04
All Hay (ton)	$78.50	$116.00	$95.50	$80.00	$97.00	$93.40
Sugar beets (ton)	$39.10	$50.80	$53.40	$64.00	NA	$51.83
Sprung Wheat (bushel)	$7.60	$7.36	$5.72	$6.87	$8.40	$7.19
North Dakota						
Barley (bushel)	$3.91	$5.18	$3.85	$3.74	$5.55	$4.45
Corn (bushel)	$4.06	$3.74	$3.18	$5.01	$5.75	$4.35
All Hay (ton)	$57.00	$79.50	$54.50	$58.00	$66.00	$63.00
Sugar beets (ton)	$46.30	$51.00	$51.90	$69.90	NA	$54.78
Wheat (bushel)	$7.74	$7.31	$4.90	$6.78	$8.20	$6.99
Two state average						
Barley (bushel)	$4.03	$5.48	$4.36	$3.91	$5.40	$4.64
Corn (bushel)	$4.41	$3.77	$3.71	$5.51	$6.08	$4.69
All Hay (ton)	$67.75	$97.75	$75.00	$69.00	$81.50	$78.20
Sugar beets (ton)	$42.70	$50.90	$52.65	$66.95	NA	$53.30
Wheat (bushel)	$7.44	$7.33	$5.31	$6.83	$8.30	$7.04

Richland County yields were used to estimate agricultural production revenues due to limited irrigated acreage yield data available for McKenzie and Dawson Counties in the National Agricultural Statistics Service database. The price and yield data were used to estimate gross farm revenues for each of the four Lower Yellowstone Project irrigation districts. Crop yields are shown in Table 4.13.

Table 4-13. Crop yields used to estimate irrigated agricultural revenues

Year	Alfalfa (tons)	Barley (bushels)	Sugar beets (tons)	Wheat (bushels)	Corn (bushels)
2004	4.5	102	19.5	73.3	118.0
2005	4.7	93	21.2	67.5	115.0
2006	4.7	93	25.0	71.4	154.0
2007	4.7	92	24.0	58.9	136.0
2008	NA	84	24.3*	58.0	143.0

2009	NA	NA	26.7	63.9	153.0
2010	NA	NA	27.9	73.1	139.2
2011	NA	NA	25.2	NA	139.3
Most recent 5-year average	**4.56**	**92.8**	**25.6**	**65.1**	**142.1**

* Based on data from McKenzie County and Williams County, North Dakota. Montana sugar beet yield data are not available for 2008.

Representative Crop Production Costs: Representative irrigated agricultural production costs were estimated for alfalfa, barley, and wheat using North Dakota State University Extension Service farm management planning guides for western North Dakota. These planning guides represented center pivot irrigation practices, while the dominant irrigation practice in the study area is flood irrigation. Therefore, adjustments were needed to represent flood irrigation costs. Northern Colorado flood irrigation budgets were used as a basis for estimating irrigation labor hours for the study area. The average wage for irrigation labor was based on data from the May 2011 Bureau of Labor Statistics State Occupational Employment and Wage Estimates for agricultural labor related to crop production in Montana and North Dakota. The average wage was $11.93 for Montana and $11.52 for North Dakota, resulting in a simple average of $11.73 per hour for both states.

Sugar beet production costs were based primarily on information from the North Dakota State University Department of Agribusiness and Applied Economics report "Economic Contribution of the Sugar beet Industry in Minnesota, North Dakota, and Eastern Montana." The representative costs per acre are shown in Table 4.14. It should be noted that the costs presented in Table 4.14 do not include district irrigation assessments. Current and future District irrigation assessments are estimated to be $30 per irrigated acre, which was the rate as of 2009 for all four irrigation districts.

Table 4-14. Costs used to evaluate irrigated agricultural production based on 2011 estimates

Cost category	Seeded Alfalfa	Established Alfalfa	Barley	Sugar Beets[1]	Wheat	Corn
Variable Costs						
-Seed	$60.00	$0.00	$18.75	$73.20	$22.00	$89.60
-Chemicals	$19.70	$0.00	$13.50	$168.60	$34.75	$21.45
-Fertilizer	$43.67	$79.97	$95.41	$121.50	$138.20	$143.35
-Crop Insurance	$0.00	$0.00	$16.30	$0.00	$30.00	$36.00
-Fuel & Lubrication	$20.74	$26.76	$13.82	$84.80	$12.81	$19.18
-Repairs	$13.13	$14.34	$10.19	$53.50	$11.18	$15.45
-Labor, incl. irrigation labor	$23.46	$23.46	$12.90	$171.10	$12.90	$36.03
-Miscellaneous	$10.34	$11.83	$7.16	$55.20	$9.59	$38.14
Sum of variable costs	**$191.04**	**$156.36**	**$188.03**	**$727.90**	**$271.43**	**$399.20**
Fixed Costs						
-Overhead/Land Charge	$45.00	$45.00	$45.00	$63.10	$45.00	$45.00
-Machinery Depreciation	$86.13	$98.13	$62.33	$100.70	$58.16	$74.69
-Machinery Investment/Misc.	$62.92	$70.04	$44.64	$135.20	$45.84	$51.83
Sum of fixed costs	**$194.05**	**$213.17**	**$151.97**	**$299.00**	**$149.00**	**$171.52**
Sum of variable and fixed costs	**$385.09**	**$369.53**	**$340.00**	**$1,026.90**	**$420.43**	**$570.72**

[1] 2011 budget information was not available for sugar beets. In order to represent 2011 costs, 2007 data were used for sugar beets and updated to 2011 prices using the USDA prices paid indexes. Source: North Dakota State University Extension Service, Projected Budgets for Irrigated Crops, Western North Dakota – February 2011.

Gross crop revenue, variable and fixed costs of production, irrigation district assessments and the distribution of crops can be used to estimate net revenue from irrigated crop production. The production cost for alfalfa is based on a five-year rotation, seeding alfalfa every fifth year. The results are in Table 4.15.

Table 4-15. Net revenue per acre for lower Yellowstone irrigation districts

	Gross Revenue	Total Cost	District O&M cost	Net Revenue	Crop Distribution	Weighted Net Revenue
District #1 & #2						
Sugar beets	$1,364.50	$1,026.90	$30.00	$307.60	0.45	$138.42
Hay	$356.59	$372.64	$30.00	$-46.05	0.10	-$4.61
Wheat	$458.30	$420.43	$30.00	$7.87	0.20	$1.57
Barley	$430.59	$340.00	$30.00	$60.59	0.15	$9.09
Corn	$666.45	$570.72	$30.00	$65.73	0.10	$6.57
4.8.3.2 Average						***$151.04***
Intake ID						
Sugar beets	$1,364.50	$1,026.90	$30.00	$307.60	0.40	$123.04
Hay	$356.59	$372.64	$30.00	$-46.05	0.10	-$4.61
Wheat	$458.30	$420.43	$30.00	$7.87	0.20	$1.57
Barley	$430.59	$340.00	$30.00	$60.59	0.10	$6.06
Corn	$666.45	$570.72	$30.00	$65.73	0.20	$13.15
Average						***$139.21***
Savage ID						
Sugar beets	$1,364.50	$1,026.90	$30.00	$307.60	0.35	$107.66
Hay	$356.59	$372.64	$30.00	$-46.05	0.15	-$6.91
Wheat	$458.30	$420.43	$30.00	$7.87	0.15	$1.18
Barley	$430.59	$340.00	$30.00	$60.59	0.20	$12.12
Corn	$666.45	$570.72	$30.00	$65.73	0.15	$9.86
Average						***$123.91***

Multiplying the acreage for each district by the weighted net revenue per acre and summing the result leads to an estimated net revenue of $8.75 million annually or about $149.85 per acre. The average net revenue per acre for all four districts is considered representative for the entire Lower Yellowstone project. The payment capacity guidelines allow for a reasonable family farm income, which would include any dryland based farm revenues that would be part of the farm operation. The predominant dryland agricultural activity in the area is pastureland. The National Agricultural Statistics Service publication "North Dakota 2012 County Rents & Values" (March 2012) indicates the average 5-year 2007 to 2011 pasture rental rate was $9.20 per acre for McKenzie County and $8.70 per acre for Williams County. Rental rate data were not available for individual Montana counties. A pasture rental rate of $8.95 per acre was used to estimate dryland revenues. Assuming a farm operation would include 320 irrigated acres, 160 acres of rented pasture, and 20 acres for farmstead/waste, net revenues for a farm operation would be about $46,400 per farm operation.

Assuming additional O&M costs are passed on to irrigated crop production, No Action O&M costs would add about $1,400 in costs to each farm operation relative to current costs, the Rock Ramp Alternative would add about $1,600 in total costs prior to operation of the new headworks relative to current costs, and the Bypass Channel Alternative would add $1,270 in total costs prior to operation of the new headworks relative to current costs for each farm operation. Net farm revenues appear to be sufficient to pay the O&M costs associated with each alternative, but they would reduce net farm income by 2.74% to 3.45% depending on the alternative. Relative to No Action, the Bypass Channel Alternative actually reduces the adverse effects of O&M costs on net farm income. Annual net farm income is approximately $130 higher with the Bypass Channel Alternative relative to No Action while the Rock Ramp Alternative results in a reduction in net farm income of $200 annually. It should be noted that this analysis is based on an analysis of a representative operation, but that there may be individual operations with net revenues that are lower or higher than estimated above.

Cumulative Effects

Based on Reclamation's experience with Section 7 consultation and ESA compliance on other projects and facilities, the Service would likely require that improved fish passage be in place by a certain date. Failure to achieve compliance with ESA under No Action could result in curtailment of project water deliveries over the long term and adverse economic consequences. The Bypass Channel and Rock Ramp Alternatives would increase O&M costs, which would reduce the financial viability of the irrigation districts. Increased economic activity associated with construction and O&M activities would lead to potentially positive overall regional economic impacts and continued delivery of a reliable water supply.

4.8.4 Summary

Based on the expected continuation of current agricultural production or trends in production and recreation activities, as described in the Lower Yellowstone Irrigation District and Recreation sections, there are no significant regional economic impacts associated with changes in output in these two sectors. There would be short-term positive regional economic impacts (increased output, employee compensation, and employment) associated with initial construction of the proposed action alternatives. These short-term positive impacts could be relatively large in absolute terms if project costs inject federal funds into the region, but are small relative to the overall level of activity in the regional economy. Some positive regional impacts would also be expected in the long run at a much lower level due to O&M costs associated with each alternative, including the No Action Alternative. However, these short-term O&M impacts are likely to be insignificant compared to the size of the regional economy. Increased O&M costs associated with the Rock Ramp Alternative may reduce net farm income by 0.44% relative to No Action while net farm revenues may actually be 0.29% higher with the Bypass Channel Alternative compared to No Action. Farm revenues appear to be sufficient to pay the increased O&M costs associated with the Rock Ramp Alternative.

4.9. Lands and Vegetation

4.9.1 Introduction

- How would the fish passage alternatives affect lands and vegetation including wetlands, grasslands, woodlands, riparian areas and noxious weeds in the area of potential effects?

This section addresses lands and vegetation that may be affected by construction of fish passage features. Lands and vegetation include wetlands, grasslands, woodlands, riparian areas, and noxious weeds.

Construction may impact lands and vegetation on either a temporary or permanent basis. Temporary impacts generally are short term and associated with project construction. Following contouring and revegetation, the land is expected to revert to previous uses. Permanent impacts are long-term impacts typically associated with construction of permanent facilities. Permanent impacts could result in irretrievable commitment of resources. Some of the natural resources discussed above would be lost due to conversion to permanent facilities. Another way natural resources may be impacted is by fish passage features that could potentially influence hydrology in the Yellowstone River. For example, a change in river flows could lead to bank erosion and loss of land.

4.9.2 Methods

To analyze the impacts of the proposed Intake Project, land use databases developed by various state and federal agencies were used to inventory land cover types within the area of potential effects using GIS. The methods used to compile the inventory are explained in Chapter 3 of the 2010 EA.

4.9.3 Results

4.9.3.1 Short-Term and Long-Term Effects of the Alternatives

Wetlands

Bypass Channel Alternative: A total of 20.5 acres of palustrine and riverine wetlands are located within the construction area footprint and may be impacted during construction. Wetlands (Appendix K) would be avoided to the maximum extent possible. A majority of the impacts to wetlands would be temporary, and all permanent impacts would be mitigated on-site concurrent with project construction.

Temporary impacts to wetlands would result from the placement of box culverts on two haul roads on Joe’s Island, which would fill less than one acre of emergent wetlands and backwater channel. Following construction, haul roads and culverts would be removed and the area restored to pre-disturbed conditions.

This alternative is anticipated to permanently impact 13 acres of riverine habitat in the Yellowstone River and the high flow channel and about one-half acre of emergent wetland associated with the high flow channel. Permanent impacts to wetlands adjacent to the Yellowstone River and side channel would be limited to the construction of the weir upstream of the existing dam and excavation of the bypass channel. Weir construction would result in approximately one acre of fill being placed in the river directly upstream of the existing dam. It is anticipated that the low quality riverine habitat present at the existing dam area prior to the disturbance would redevelop following construction and would provide similar ecological benefits. The bypass channel construction would affect 11 acres of high flow channel habitat where the upper end of the bypass follows the existing high flow channel and one additional acre of high flow channel habitat where the channel diversion is constructed. In addition, less than one-half acre of emergent wetland associated with the high flow channel would likely be impacted. Due to fluctuating seasonal flows in the high flow channel, the emergent wetlands vary in size annually; therefore, the anticipated impact acreage is provided as an average.

Excavation of the bypass channel would create approximately 60 acres of new side channel habitat similar to other side channels on the Yellowstone River. The gently sloping banks of the bypass channel may encourage wetland vegetation to grow and may exceed any permanent wetland impacts associated with channel construction.

Based on the analysis above, impacts to wetland resources would be considered negligible as a result of implementing the Bypass Channel Alternative. As the project progresses and details are refined, opportunities to avoid and/or minimize impacts to wetland and riparian resources will continue to be evaluated and pursued. Unavoidable wetland impacts will be mitigated on-site to the extent practicable.

Rock Ramp Alternative: Approximately 55 acres of riverine habitat are located within the construction area footprint and could be impacted. Of these 55 acres, about 2 acres of riverine habitat are already impacted by the existing dam structure and rock that has been added to the top of the dam and subsequently displaced downstream. Replacing the diversion dam with a new concrete weir would not increase impacts, as compared to No Action Alternative (Continue Present Operation).

The addition of rock to build the ramp would impact about 32 acres of riverine habitat including the river bottom. After completion of the rock ramp, the riverine habitat would be converted to constructed river bottom habitat. The remaining 23 acres of riverine habitat in the construction area could be temporarily impacted during project construction activities (e.g. equipment movement). All temporary wetland impacts would be addressed by actions to minimize effects and mitigation implemented where necessary (Appendix I). Overall, with avoidance and mitigation measures, wetland impacts are considered to be minor.

Riparian Areas

Bypass Channel Alternative: This alternative would have the greatest potential impact to riparian habitat. A total of 70 acres of riparian habitat are located within the construction area footprint. Ten acres of existing riparian habitat will be impacted during excavation of the new channel. The construction of temporary access roads and other construction activities would impact approximately 3 acres of riparian shrub and forested riparian habitats. These impacts are considered temporary and would be restored upon completion of construction. The remaining riparian habitat within the construction area would be protected by actions to minimize effects

(Appendix I). All temporary and permanent impacts to riparian habitat are considered moderate and would be offset by avoidance and mitigation commitments.

Rock Ramp Alternative: Of the two action alternatives, this alternative would have the least impact to riparian habitat. Approximately 5 acres of riparian habitat are located within the construction footprint and could be impacted. All of these 5 acres would be temporarily impacted during project construction and staging activities. Temporary impacts would be addressed by actions to minimize effects (Appendix I). Overall, with implementation of avoidance and mitigation measures, riparian habitat impacts are considered to be minor.

Woodlands

Bypass Channel Alternative: This alternative would have the greatest impact to woodlands, shrublands, and evergreen/deciduous forested areas. This acreage does not include riparian habitat mentioned above. A total of 184 acres are located within the construction footprint. Permanent impacts of 26 acres would occur during bypass channel construction. The construction of temporary access roads and other construction activities would impact approximately 6 acres of woodlands. These impacts are expected to be temporary and restored upon completion of construction. Impacts to these woodland areas would be offset through avoidance, actions to minimize effects listed in Appendix I, and other mitigation measures. With avoidance and mitigation commitments in place, woodland impacts are considered to be minor.

Rock Ramp Alternative: This alternative would have the least potential to impact woodlands. Approximately 12 acres of woodlands are located within the construction footprint and could be impacted during project construction and staging activities. Impacts to these woodland areas would be offset through avoidance, actions to minimize effects outlined in Appendix I, and other mitigation measures. With these commitments in place, woodland impacts are considered to be minor.

Grasslands

Bypass Channel Alternative: This alternative would have the greatest impact to grasslands. A total of 321 acres of grasslands are located within the analysis area. Permanent impacts would include excavation of the new channel, which would result in the conversion of approximately 20 acres of grasslands. The placement of excavated material into the waste pile site would impact approximately 60 acres. In addition, other miscellaneous construction activities would temporarily impact minor amounts of grassland. Impacts to these grassland areas would be offset through actions to minimize effects listed in Appendix I and other mitigation measures. With these commitments in place, grassland impacts are considered to be minor.

Rock Ramp Alternative: This alternative would have fewer impacts to grasslands than the other alternative. Approximately 21 acres of grasslands are located within the construction footprint and would be impacted. All of these 21 acres would be temporarily impacted during project construction and staging activities. Impacts to these grasslands would be offset through the actions to minimize effects listed in Appendix I and restoration measures. With these commitments in place, grassland impacts would be minor.

Noxious Weeds

Bypass Channel Alternative: This alternative has the largest construction footprint, and there is a greater opportunity for this alternative to affect the spread of noxious weeds. Joe's Island has a large infestation of leafy spurge that could spread by construction activities. However, actions outline in Appendix I are anticipated to minimize the spread of noxious weeds.

Rock Ramp Alternative: This alternative has a relatively small overall footprint compared to the Bypass Channel Alternative. Ground disturbance associated with construction activities could provide a pathway for dispersal and establishment of invasive plants including salt cedar, although the risk would be lower than the Bypass Channel Alternative. Actions outlined in Appendix I are anticipated to minimize the spread of noxious weeds during and after construction.

Cumulative Effects

With implementation of actions to minimize effects (Appendix I) and other mitigation and restoration measures, the action alternatives would minimally impact lands and vegetation. Additionally, there are no known present or future projects that would make these resources especially vulnerable to incremental effects beyond current agricultural practices. Therefore, cumulative impacts to these resources in the Yellowstone River Basin would be minimal.

Actions to Minimize Effects

General

- An ERT consisting of biologists from Reclamation, the Corps, Service, and MFWP will play a role in oversight of actions to minimize effects for land and vegetation.
- Before every construction season, Reclamation and the Corps will meet with the Service and the appropriate state wildlife agencies to determine procedures to minimize impacts to lands and vegetation. A reconnaissance survey of construction easements will be conducted to identify and verify wetlands, grasslands, woodlands, and riparian areas subject to disturbance and/or destruction in the Intake Project area during construction activities. The ERT will be consulted, as necessary, to determine appropriate avoidance and/or protection measures. If adverse impacts cannot be avoided, appropriate procedures and requirements for minimizing or mitigating effects will be discussed with the ERT.
- Disturbance of vegetation will be minimized through construction site management (e.g., using previously disturbed areas and existing easements when feasible and designating limited equipment/materials storage yards and staging areas.) It will be limited to that which is absolutely necessary for construction of the Intake Project.
- All contactors will be required to inspect, clean and dry all machinery, equipment, materials and supplies to prevent spread on Aquatic Nuisance Species.
- All areas disturbed or newly created by the construction activity will be seeded with grasses and other vegetation indigenous to the area for protection against subsequent erosion and noxious weed establishment.
- All equipment tracks and tires working on Joe's Island or other noxious weed infested areas will be cleaned daily to reduce potential of transportation to an uninfested site.

- An integrated weed plan will be developed and approved by the ERT. It will identify best management practices to control the spread or introduction of any noxious weeds or plants. The weed plan will be implemented during and subsequent to construction.
- Erosion control measures will be employed where necessary to reduce wind and water erosion. Erosion and sediment controls will be monitored daily during construction for effectiveness and only effective techniques will be used.
- No permanent or temporary structures will be located in any floodplain, riparian area, wetland or stream that would interfere with floodwater movement, except for those described in Chapter 2 of the Intake Final EA.

Wetlands

- Prior to beginning construction through Conservation Reserve Program lands or program wetlands, the Natural Resources Conservation Service, Consolidated Farm Services Agency, and respective landowners will be consulted to ensure that landowner eligibility in farm subsidy programs (if applicable) will not be jeopardized and that Sodbuster or Swampbuster requirements will not be violated by construction.
- Waste material, topsoil, equipment, debris, excavated material, or other construction related materials will not be disposed of within 50 feet of any wetland, drainage channel, irrigation ditch, stream, or other aquatic systems.
- Where impacts cannot be avoided, and restoration of affected wetland habitats is necessary, wetland soils will be stockpiled for use when constructing new areas.
- Discharges of fill material associated with unavoidable impacts to wetlands or intermittent streams will be carried out in compliance with provisions of Sections 401 and 404 of the Clean Water Act and the nationwide and/or Intake Project-specific permit requirements of the Corps.
- Rock quarry materials will come from sites with no potential to impact wetlands or other protected resources.
- The ERT will play a role in oversight of actions to ensure compliance with Sections 401 and 404 of the Clean Water Act and will recommend actions to minimize effects to wetlands.

Grasslands

- Grasslands temporarily affected during construction will be restored with similar native species. Where existing native grasslands cannot be re-seeded in their current locations, procedures for appropriate restoration will be reviewed by the ERT.
- Disturbed native grassland will be reseeded with native species with the seed mix being determined by the ERT. Planted grasslands will be reseeded with a seed mixture appropriate for the site and watered, if necessary, until establishment. Reseeding may require mulching in order to be successful.
- Seed would be certified as cheatgrass and weed free and "blue tag;" this is especially important in areas where weedy or invasive species are already present. There are no seed lots that are free of all weeds; however, requests can be made to specify the type of weed that you would like excluded. The seed company will provide a letter of certification for the seed that would list any noxious weeds or other weed seeds in the lot of seed being provided. This information comes directly from the seed test analysis provided by certified seed testing labs. The seed used on the site can be guaranteed to be

cheatgrass free. It is recommended that the seed be tested independently, if necessary, to verify that there are no cheatgrass or noxious weed seeds present.

- Two methods of seeding should be utilized for reclamation areas. Seeds will either be drilled or broadcast based on the species being planted. Drill seeding is recommended for most grasses and large-seeded shrubs and forbs that need to be planted at least ¼ inch deep. Drill seeding is preferred for soil to seed contact, positive depth control, proper seeding rate (once calibrated), and minimum amount of seed usage. Broadcast seeding is recommended for very small and fluffy seeds that need to be planted 1/16 to 1/8 inches deep. Modern range drills may be capable of drill and broadcast seeding.
- Areas requiring re-vegetation will be seeded and mulched during the first appropriate season after redistribution of topsoil. If reseeding cannot be accomplished within 10 days of topsoil replacement, erosion control measures will be implemented to limit soil loss. Local native grass species would be used (mixture to be reviewed by the ERT).
- Seeding should take place the first appropriate season following topsoil replacement. Seeding between October 15 and April 15 is the most effective throughout Montana because late winter/early spring is the most reliable period for moist soil conditions. In general, fall seeding (between October 15 and when the frost line is deeper than four to six inches) in eastern Montana has been more successful than spring seeding. Some seed may require cold stratification to germinate. However, spring seeding may be considered if timing of construction warrants.
- To reduce erosion, water bars will be installed at specified intervals, depending upon soil type, grade, and terrain on disturbed slopes with grades of 6% or greater.
- Vegetation and soil removal will be accomplished in a manner that will prevent erosion and sedimentation.
- Noxious weeds will be controlled, as specified under state law, within the construction footprint during and following construction. Herbicides will be applied in accordance with labeled instructions and state, federal, and local regulations.
- Grass seeding will be monitored for at least three years. Where grasses do not become adequately established, areas will be reseeded with appropriate species.

Woodlands and Riparian Areas

- No disposal of waste material, topsoil, equipment, debris, excavated material, or other construction related materials will be done within 50 feet of any riparian area.
- Woodland and riparian areas will be avoided where practical when constructing permanent facilities.
- Woodland and riparian areas impacted by the Intake Project will be restored 2:1 with native species. Where existing woodland and riparian areas cannot be restored in original locations, then adjacent or nearby areas will be considered by the ERT.
- Native trees and shrubs will be restored with similar native species at a ratio of two trees or shrubs planted for each tree or shrub removed. Long-term success of plantings will be reviewed and approved by the ERT.
- Weed growth in tree planting areas will be controlled and tree plantings will be monitored for at least three years. Where plantings are not successful, they will be replanted with appropriate species.
- Where practicable, replanted riparian areas will be watered to ensure survival of planted vegetation. Long-term success of plantings will be reviewed and approved by the ERT.

4.9.4 Summary

The construction footprint for the Bypass Channel Alternative is larger thus impacts are greater. Actions to minimize effects (Appendix I) put in place and other restoration or mitigation measures would minimize or offset any potential impacts

4.10. Wildlife

4.10.1 Introduction

- How could the Intake Project affect wildlife including mammals, migratory birds, amphibians, and reptiles currently living in the Intake Project Area?

This section addresses the effects of alternatives on wildlife other than special status species (federally-listed species and state species of special concern). Most effects on wildlife can be identified by considering the effects on lands and vegetation.

Many species use trees and shrubs in woodlands as nest sites, roosts, or as cover (e.g. raptors and squirrels), and others consume parts of trees and shrubs as food. Other species, such as waterfowl, nest in emergent marshes and upland grasslands and other suitable sites. Riparian vegetation and grasslands provide food and shelter for some mammals and nesting birds. Amphibians and reptiles use terrestrial and aquatic habitats in and adjacent to the Yellowstone River.

4.10.2 Methods

The analysis of impacts on wildlife species considered changes in wildlife habitat represented by wetlands, woodlands, riparian areas, and grasslands. Impacts to wildlife include short-term disturbance and long-term loss of habitat from construction of project features.

Potential impacts to wildlife habitat, represented by wetlands, woodlands, riparian areas, and grasslands, are discussed in the Lands and Vegetation section above. Most wildlife populations are resilient and able to adapt to cycles of habitat abundance. Impacts to mammals, migratory birds, amphibians, and reptiles are discussed. However, a few species with small populations could experience impacts from temporary disturbances and loss of habitat. These species are evaluated in the Federally-Listed Species and State Species of Special Concern section above.

4.10.3 Results

4.10.3.1 Short-Term and Long-Term Effects of Alternatives

Bypass Channel Alternative

Mammals: Much of the area proposed for construction (including staging and stockpile areas) of the weir and bypass channel is relatively undisturbed. Vehicle access to Joe's Island is limited to a 20-mile gravel road. Current activities on the island include hunting, camping, and fishing.

Construction activities would have temporary (e.g., noise) and permanent (habitat conversion) effects on wildlife species and their habitats in the immediate vicinity of the construction area. Human activity and equipment noise would disturb some species sensitive to this activity. Those animals would be expected to move to other areas during construction.

The excavated bypass channel would cover approximately 73 acres and would affect wetlands, riparian areas, woodlands, and grasslands. However, construction of the bypass would isolate a portion of Joe's Island leading to less disturbance in the future. Actions to minimize effects (Appendix I) would be expected to offset most temporary or permanent impacts. Affected animals would be expected to return to restored habitats or areas minimally disturbed by construction. Impacts on mammals are expected to be minor after implementation of actions to minimize effects and restore disturbed habitats (Appendix I).

In addition to the channel construction, other areas that would be impacted from construction include the waste pile site and haul roads. These areas would be impacted during construction, but returned to conditions supporting existing habitat values. By following actions to minimize effects (Appendix I), methods to avoid resource impacts (Appendix I), and habitat restoration measures, long-term impacts are expected to be minor.

Birds: The excavated channel would convert approximately 73 acres of primarily riparian woodlands and grasslands on Joe's Island to riverine aquatic habitat. Most of the woodlands are relatively sparse with an open canopy and mixed herbaceous and shrub understory. The areas identified for stockpiling construction materials and placement of excavated material is primarily grassland habitat. While nesting birds may utilize these habitats, efforts will be made to avoid impacts by developing a migratory bird management plan to avoid and minimize impacts to nesting or migrating birds. The migratory bird management plan would include modifying habitat outside of the nesting season to discourage nesting activity, adjusting timing of construction, avoiding certain habitats at certain times of year, and/or bird surveys to identify where it is safe to proceed with construction without impacting nesting birds. Appendix I describes some methods to avoid resource impacts in greater detail. Reclamation and the Corps will work with the Service and MFWP to develop the migratory bird management plan following selection of an alternative.

Although construction of the bypass channel will have a direct effect on existing habitats, the bypass channel would isolate a portion of Joe's Island leading to less disturbance in the future. Given the actions to minimize effects and the relative abundance of riparian forest habitat along the lower Yellowstone River, adverse effects on breeding and migratory birds is expected to be minor. There would, however, be a lag time between planting of trees and shrubs and establishment of mature habitat where reestablishment is necessary. With similar habitat adjacent to the proposed project area, this impact would be minor.

Amphibians and Reptiles: The Bypass Channel Alternative construction activities would have a temporary effect on amphibians and reptile species located in the immediate vicinity of the construction area. However, slightly beneficial impacts to amphibians and reptiles will likely be realized as a result of increasing the amount of aquatic and wetland habitats available to them. This would include the creation of the new bypass channel as well as provide for the existing high flow channel to receive more water during low flows through the channel diversion. Currently the existing high flow channel only carries water during high flow events and can be dry in late summer, winter and early spring. In addition to the anticipated benefits, actions to minimize effects (Appendix I) would be implemented to offset any temporary or permanent impacts. Overall impacts to amphibian and reptiles are expected to be minor.

Rock Ramp Alternative

Mammals: Rock Ramp construction activities would have a temporary effect on wildlife species located in the immediate vicinity of the construction area. Human activity and equipment noise would disturb some species sensitive to this type of activity. Compared to the Bypass Channel Alternative, the impacts to trees, shrubs, and other vegetative cover are smaller. This is because most of the work is confined to the main channel of the river in the vicinity of the existing dam. Actions to minimize effects (Appendix I) including those listed under the natural resources section would be expected to offset any temporary or permanent impacts. Overall impacts on mammals would be negligible.

Birds: The rock ramp would be constructed in the main channel of the river and would have little or no effect on avian breeding or migratory habitat. Examination of aerial photographs did not reveal the presence of any sandbars within the footprint of the proposed rock ramp that would typically be exposed during the breeding season.

Construction activity would displace birds that are sensitive to disturbance. Staging and stockpile areas would be revegetated after construction, reestablishing any bird habitats on these areas that were lost during construction. Adverse effects on trees, shrubs, and native grasslands would be minimal. Overall impacts to birds would be expected to be minor.

Amphibians and Reptiles: Rock Ramp construction activities would have a temporary effect on amphibians and reptile species located in the immediate vicinity of the construction area, similar to the impacts described for the other action alternative. Actions to minimize effects (Appendix I) would be implemented to offset any temporary or permanent impacts. Overall impacts to amphibian and reptiles would be minor.

Cumulative Effects

Most impacts to wildlife from the action alternatives would be relatively minor and temporary. There are no known or reasonably foreseeable actions in the lower Yellowstone River corridor that would elevate these minor impacts to greater magnitudes.

Actions to Minimize Effects (Appendix I)

Mammals and Migratory Birds

- Before each construction season, the ERT will meet with MFWP to determine procedures for avoiding and minimizing impacts to nesting or migrating birds.
- Areas potentially hazardous to wildlife will be adequately protected (e.g., fenced, netted) to prevent access to wildlife.

- To protect wildlife and their habitats, Intake Project-related travel will be restricted to existing roads and Intake Project easements. No off-road travel will be allowed, except when approved through the ERT.
- Wildlife-proof fencing will be used on reclaimed areas, if it is determined that wildlife species and/or livestock are impeding successful vegetation establishment.

Amphibian and Reptiles

- All riverbank disturbance areas will be inventoried for potential turtle nesting habitat. If turtle nesting habitat or evidence of turtle nesting is found in construction areas, construction in these areas will be restricted during June and July, or mitigation measures approved by the ERT will be implemented.

4.11. Summary

With actions to minimize effects and restore affected habitats, impacts to mammals, amphibians, reptiles and migratory birds would be minor and temporary for both alternatives. Based upon the total construction footprint that includes construction and additional work areas, the Bypass Channel Alternative would have the largest potentially affected area (626 acres). The Rock Ramp Alternative would have a potentially affected area of 28 acres.

4.12. Historic Properties

4.12.1 Introduction

- ➢ Would the fish passage alternatives affect historic properties (significant cultural resources)?

Section 106 of the NHPA requires that federal agencies consider the effects of federal undertakings on historic properties. Historic properties are significant cultural resources; including sites, buildings, structures, objects, or districts, or properties of traditional religious and cultural importance to Native Americans; that are either included in or have been determined eligible for inclusion in the National Register of Historic Places. Only historic properties are protected by the NHPA and are evaluated in this section.

To evaluate the effects of a proposed undertaking on historic properties, federal agencies are required to consult with the appropriate SHPO, any tribe, or Tribal Historic Preservation Officer with a historic interest in the Intake Project's undertaking area of potential effects, and the interested public. Environmental documents prepared in compliance with NEPA can be used to examine and address these effects and as the basis for consultation.

4.12.2 Methods

Until consultation is concluded, the actual effects of the proposed Intake Project under Section 106 of the NHPA are undetermined. At this point consultation is in progress, so the discussion in this section is based upon the best available information that compares alternatives to each other.

As explained in the Historic Properties Section of Chapter 3, 19 cultural resources have been recorded within or near the area of potential effects of the proposed Intake Project, but only seven have been determined to be historic properties protected under NHPA. The effects of the proposed federal undertaking on those seven historic properties are discussed in this section.

To estimate direct effects, locations of the historic properties recorded by Kordecki et al. (1999) were plotted on a GIS layer, which was overlain with impact corridors for all three alternatives. In addition, direct impact areas outside of the Kordecki et al. (1999) survey but inside the area of potential effects were intensively inventoried and previously recorded sites were revisited and site forms updated (Snortland, 2009). Table 4.17 lists the historic properties located within the area of potential effects of each of the alternatives.

As the area of potential effect (APE) of the project has been expanded in the southwest portion of the project area (waste pile site), additional site evaluations will be needed Site 24DW429, a prehistoric lithic scatter, will need to be evaluated and its eligibility determined.

In addition, sites, 24DW432, 24DW435 and 24DW438, are all lithic scatters which do not meet the criteria of eligibility under NHPA. If these sites are determined to be within the APE, SHPO concurrence with these recommended determinations will be requested before consultation is complete.

4.12.3 Results

4.12.3.1 Short-Term and Long-Term Effects of the Alternatives

Before an action alternative is constructed, Reclamation would complete consultation with the Montana State Historic Preservation Officer and other interested parties, as appropriate, to assess the effects of the proposed Intake Project on the identified historic properties and resolve potential adverse effects under Section 106 of the National Historic Preservation Act. Analysis indicates that both alternatives would likely have an adverse effect(s) to historic properties. Indian tribes which may have an interest in particular sites will be included in consultations regarding evaluations, determinations of effect and any resolutions of adverse effect pertaining to those sites.

Avoidance is the preferred method of mitigating any adverse effects, as it would preserve the historic properties. However, should avoidance not be possible, actions to minimize effects would be developed in consultation with the Montana State Historic Preservation Officer, as appropriate. All of the properties that would be affected by action alternatives are historic structures or buildings associated with the Lower Yellowstone Irrigation Project.

Bypass Channel Alternative: This alternative would probably result in adverse effects to site 24DW443, Intake Diversion Dam and associated dike cableway tower, engineer's house and power plant. The construction of the new weir may be considered an adverse effect on the existing diversion dam and construction of the bypass channel may require removal of the south cableway tower and associated buildings and removal of some or all of the dike. Mitigation for adverse effects to this site resulting from the rock ramp alternative has been agreed upon in a

Memorandum of Agreement (MOA) among Reclamation, the Corps, SHPO and the District. Portions of this mitigation (documentation of the buildings and structures) have been completed. The parties to the MOA will determine in consultation whether any additional or different mitigation is warranted given the slightly different effects resulting from the bypass channel alternative.

Site 24DW430, a prehistoric archaeological site, lies within the proposed spoil disposal area south of Joe's Island. Placing spoil on top of the site may be considered an adverse effect. Widening or improving the access road to Joe's Island which passes through the site may also result in an adverse effect. The eastern edge of the spoil pile will be moved at least 100 meters west of the access road to avoid effects to 24DW430.

Rock Ramp Alternative: The main canal (24DW287) would be minimally affected by filling in a relatively small portion of the 71.6 mile-long canal. The historic headworks would be preserved in place beside the new headworks.

The Intake Diversion Dam (24DW443) and an associated dike and three buildings on Joe's Island would also be impacted. Except for minimal modification, the dam would be preserved in place and buried underneath the new rock ramp. Part of an historic dike would be damaged in the construction staging area on Joe's Island. The three buildings associated with the dam could be moved out of the staging area to protect them, but this would be an adverse effect under the NHPA.

The Headworks Camp and Gate Tender Residence (24DW447) (Figure 4-3) are in an area that would be excavated to extend the main canal upstream and build the new headworks. The house, garage, and outhouse could be relocated to nearby property and preserved. Historic archaeological features in the Headworks Camp would be destroyed by excavation of the main canal through the site and construction of the new headworks, although archaeological mitigation could preserve data and artifacts. Other actions to minimize effects are also possible.

Figure 4-3. Headworks gate tender's residence

Impacts to the Old Cameron and Bailey Sub-Camp (24DW298) could be avoided by fencing the historic property and monitoring construction activities in the area. The two prehistoric archaeological sites can be avoided during construction activities.

Cumulative Effects
No other projects within the area of potential effects have been identified that would affect historic properties.

Actions to Minimize Effects
Reclamation is presently consulting with the Montana State Historic Preservation Officer and other interested parties, as appropriate, regarding an MOA and data recovery plan. The Advisory Council on Historic Preservation is being notified of an adverse effects determination under the NHPA.

Reclamation proposes to implement the following actions to offset any adverse effects to historic properties:

- Engineering drawings and photographs of affected buildings and structures, if available, will be filed with the State Historic Preservation Office and the National Archives.
- If engineering drawings and photographs are not available, the buildings and structures will be recorded in accordance with the Historic American Buildings Survey and the Historic American Engineering Record, as appropriate.
- If practicable, historic buildings or structures that must be moved for construction will be returned to their original locations after construction of the Intake Project is completed. If that is not feasible, Reclamation will seek a party willing and able to adopt the historic structure or building with appropriate preservation covenants.
- Reclamation will develop and implement a data recovery plan in consultation with the Montana State Historic Preservation Officer, Advisory Council on Historic Preservation, and other interested parties, as appropriate, for mitigation of the Headworks Camp (24DW447).
- One or more signs will be installed at or near the Intake FAS to summarize the history of the Lower Yellowstone Irrigation Project.
- A fence will be installed around the Old Cameron and Bailey Sub-Camp (24DW298) to protect it from disturbance by unloading and storage of rock or other construction activities.
- All construction activities will avoid using the road through the late plains archaic campsite (24DW430).
- All gravel, fill, and rock materials will be obtained from a source approved by Reclamation to ensure compliance with Section 106 of the NHPA.
- Reclamation will continue consultation with the Montana State Historic Preservation Office on the preparation of a formal MOA stipulating the mitigation and treatment plan.

4.12.4 Summary

All alternatives could be considered to have potential adverse effects to historic properties under the NHPA. Under NEPA the actions to minimize effects listed above would offset any significant adverse effects and make the impacts insignificant. The Montana State Historic Preservation Officer, tribes, and other interested parties, as appropriate, would be consulted to complete a determination of effects and to identify appropriate actions to minimize effects. These actions to minimize effects would be carried out prior to initiating construction of the Intake Project to offset any adverse impacts.

5. Consultation and Coordination

This chapter describes public involvement activities, agency consultation and coordination, and acknowledges the people who have been involved with this NEPA process.

5.1. Public Involvement Program

Scoping is an important part of the NEPA process. It serves as the public's opportunity to provide input and direction to the Intake EA throughout its preparation. In 2008, Reclamation and the Corps began a public involvement program to provide the public, organizations, and government agencies with a variety of ways to learn about and participate in the Intake Project. Reclamation and the Corps developed a public involvement strategy that included:

- Holding three formal public scoping meetings
- Meeting with state and federal agencies
- Mailing scoping information to agencies, public, and tribes
- Forming a cooperating agency team
- Issuing news releases
- Posting information on the Montana Area Office Reclamation website

- Publishing and distributing a newsletter and *Public Scoping Summary Report, Intake Diversion Dam Modification, Lower Yellowstone Project, Montana, Environmental Impact Statement* (Reclamation & Corps, 2009)

5.2. Cooperating Agency Team

Reclamation and the Corps established a Cooperating Agency Team to facilitate communication among state and federal agencies. The team met frequently and exchanged information throughout the NEPA process. Cooperating agencies provided information based upon their special expertise or jurisdiction related to the Intake Project, assisted with analyses, and reviewed draft documents and analyses. The following organizations participated as cooperating agencies:

- Montana FWP
- Montana Department of Environmental Quality (DEQ)
- Montana Department of Natural Resources and Conservation (DNRC)
- LYIP
- Service

In addition to these agencies, the EPA, Natural Resource Conservation Service, The Nature Conservancy, and the USGS provided input during cooperating agency meetings (Table 5.1).

5.3. Biological Review Team

In 2006, the Service created a BRT of fisheries biologists and engineers with expertise in fish passage and pallid sturgeon to review preliminary alternatives. This team consisted of the following:

- George Jordan, Service
- Aaron Delonay, USGS
- Pat Braaten, USGS
- Brent Mefford, Reclamation
- Dale Lentz, Reclamation
- Mike Backes, MFWP (interim replacement for Jason Rhoten who replaced Matt Jaeger)

5.4. Meetings

From the early scoping of the project through development of the existing Supplemental EA, staff representing the joint lead agencies have met with staff from other state and federal agencies to gather information on resources, discuss potential impacts on the environment, and clarify procedures for compliance with laws, regulations, and policies. The purpose of these meetings, agencies involved, and meeting dates and locations are listed below in Table 5.1.

Table 5-1. Resource meeting topic, participants, dates, and locations

Topic	Participants	Date	Meeting Method – Location
EA process and team formation	Cooperating Agency Team	9/24/2008	Meeting – Billings, MT

Topic	Participants	Date	Meeting Method – Location
ESA issues	FWP, Service, Reclamation, Corps	10/22/2008	Meeting – Intake, MT
Defining No Action	Reclamation and Service	12/10/2008	Meeting – Billings MT
Success criteria related to comparing alternatives for incremental cost analysis	FWP, Service, Reclamation, Corps	12/18/2008	Conference call
Larval drift	FWP, Service, Reclamation, Corps, Upper Basin Pallid Sturgeon Workgroup	12/19/2008	Conference call
Alternatives and public scoping results	Cooperating Agency Team	1/29/2009	Meeting – Billings, MT
Pallid sturgeon	Service's BRT, Corps, Reclamation	2/17/2009 – 2/18/2009	Meeting – Billings, MT
ESA compliance and alternatives	Lower Yellowstone Irrigation District No 1 and 2, Savage Irrigation District, and Intake Irrigation District Water Users, Sidney Area Public	2/12/2009	Districts' Annual Meeting – Sidney, MT
Alternatives	Natural Resources Conservation Service (District Conservationists, Engineers, Region and State Employees)	2/19/2009	Meeting – Billings, MT
Draft EA chapters	Cooperating Agency Team	5/11/2009	Meeting – Billings, MT
NEPA and Section 404 of the Clean Water Act	EPA, Corps, Reclamation, Service	5/19/2009	Meeting – Denver, CO
Status of Intake and Reassessment of Alternatives	Cooperating Agency Team	12/13/2011	Meeting – Billings, MT
Interagency Technical Brief on Status	EPA, Corps, Reclamation, Service	4/20/2012	Webinar
Interagency Technical Brief on Design Status	Corps, Reclamation, Service, MT FWP, MT DNRC, LYIP	3/28/2013	Billings, MT
Intake Value Engineering Study	Corps, Reclamation, Service, MT FWP, LYIP	4/2/2013-4/4/2013	Omaha, NE
Interagency Executive Briefing	Corps, Reclamation, Service, MT FWP, MT DNRC	4/29/2013	Helena, MT
Technical Brief to	Corps, Reclamation, Service,	5/14/2013	Sydney, MT

Topic	Participants	Date	Meeting Method – Location
LYIP on Design Status	LYIP		
Intake Value Planning Study Meeting	Corps, Reclamation, Service, MT FWP, MT DNRC, LYIP	6/20/2013	Meeting- Billings, MT
Intake Value Planning Study Meeting	Corps, Reclamation, Service, MT FWP, MT DNRC, LYIP	6/27/2013	Meeting- Billings, MT
Intake Value Planning Study Meeting	Corps, Reclamation, Service, MT FWP, MT DNRC, LYIP	7/12/2013	Meeting- Billings, MT
Intake Value Planning Study Meeting	Corps, Reclamation, Service, MT FWP, MT DNRC, LYIP	7/19/2013	Meeting- Billings, MT
Interagency Technical Brief on Design Status	Corps, Reclamation, Service, MT FWP, MT DNRC, LYIP	9/27/2013	Meeting- Billings, MT

5.5. Endangered Species Act Consultation

In October of 2009, the Service sent a letter to the Corps to formally revise portions of the RPA in the Service's 2003 amended Missouri River BiOp to the Corps. The letter substituted a new RPA element at Intake Dam and irrigation headworks on the Yellowstone River, Montana, for one which was originally identified to be taken at Fort Peck Dam. Because the Service has already considered the biological effects of the construction of a fish passage project at Intake in the development of the RPA for the BiOp, and determined that it is an integral component to avoid jeopardy to listed species, Section 7 consultation for the construction of this project has been completed. Therefore, the Corps is not required to prepare a BA for the construction of this project.

It was agreed that a formal consultation process would continue on the operation of the Lower Yellowstone Project, including the proposed fish passage and entrainment structures, which would be evaluated in a separate BA. This second consultation would be completed prior to completion of construction of the new Intake Project. After Reclamation completes this EA evaluating construction of the Intake Project and a second BA on operation of that Intake Project, the Service will prepare a BiOp on operation of the new fish passage and screens. It will include an incidental take statement for any pallid sturgeon larvae and/or eggs that might be entrained even with screens installed in the new headworks.

5.6. Coordination and Compliance with Other Applicable Laws, Regulations, and Policies

Analysis and implementation of the Intake Project requires consistency, coordination, and compliance with multiple federal and state laws, regulations, executive orders, and policies. The following are applicable to the Intake Project.

5.6.1 Native American Consultation

Consultation with tribes is documented in Appendix H.

5.6.2 Archaeological Resource Protection Act of 1979

This act protects archaeological resources on federal and tribal lands and requires a permit to remove archaeological resources from these lands. Permits may be issued to educational or scientific institutions only if the removal would increase knowledge about archaeological resources. Compliance with this law would be accomplished through specific environmental commitments for all of the action alternatives (see “Historic Properties” section).

5.6.3 Clean Water Act of 1977 (as amended)

The Clean Water Act (CWA) is the principal law governing pollution control and water quality of navigable waterways of the United States. Section 402 of the act establishes a National Pollution Discharge Elimination System permitting program to regulate the point source discharge of pollutants into waters of the United States. Both Montana and North Dakota administer state-level programs pursuant to authority delegated by the EPA.

Section 404, administered by the Corps with oversight from EPA, is another permitting program that regulates activities of the placement of dredged or fill materials into waters of the United States. The Corps issues nationwide permits on a state, regional, or nationwide basis for similar activities that cause only minimal adverse environmental effects both individually and cumulatively. Individual permits may also be issued for specific activities on specific water bodies under Section 404.

Of specific note, the Corps does not issue itself a CWA permit to authorize Corps discharges of dredged or fill material into WUS, but does apply 404(b)1 analysis and other substantive requirements of the CWA and other environmental laws when developing a Civil Works project. In following ER 1105-2-100 and other pertinent planning regulations, the Corps applies the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G). Upon thorough development of a preferred alternative, the Corps will complete the 404(b)1 guidelines analysis for the Intake Project (see Appendix B). Montana State Water Quality Certification Permit (Section 401) would also be required.

Section 401, administered by the Montana DEQ, allows states to review and approve, condition, or deny all federal permits or licenses that might result in a discharge to state waters, including wetlands. States make their decisions to deny, certify, or condition permits or licenses primarily by ensuring the activity will comply with state water quality standards. In addition, states look at whether the activity will violate effluent limitations, new source performance standards, toxic pollutants, and other water resource requirements of state law or regulation. The Section 401 review allows for better consideration of state-specific concerns. A 401 Water Quality Certification would be obtained from Montana DEQ, if appropriate.

5.6.4 Floodplain Management Assessment

The floodplain management assessment is conducted in accordance with the National Flood Insurance Program (NFIP) as outlined in Title 44 of the Code of Federal Regulations (44 CFR). The proposed project modifications are compared to the effective Federal Emergency Management Agency (FEMA) floodplain data for the project area, which is located in Dawson County, to determine any adverse impacts.

According to FEMA documents, Dawson County, Montana participates in the NFIP and the Intake Dam is located on FEMA Map Panel 3001400009B, dated April 1978. The entire Yellowstone River floodplain is delineated as Zone A at this location, which by FEMA definition, indicates a geographical area shown on a Flood Hazard Boundary Map or a Flood Insurance Rate Map that reflects the severity or type of flooding in the area, for a 1% chance occurrence flood event. Current hydrologic analyses have focused on a 2.4-mile long bypass channel to direct frequent Yellowstone River flows around a new river channel headworks structure and empty into the river downstream from the dam. The proposed bypass channel is intended to improve fish passage along this reach of the river, as well as improve river conveyance, not only for the smaller, more frequent flood events, but also for infrequent flood events which exceed the historic channel capacity and flow within the overbank areas, defined by the steep river banks on either side of the floodplain.

Additional hydrologic analyses will be conducted in the future as the design of the bypass channel features are finalized. Current analyses indicate no impacts associated with the proposed design features. Of particular final design interest will be the state of Montana fish access area located on the downstream left bank of the diversion dam. This access area has associated camp pads and electricity which will be evaluated for potential impacts. The analysis will also address any increase in potential ice jams resulting in flooding.

5.6.5 Farmland Protection Policy Act of 1995

The purpose of this act is to ensure that impacts to prime or unique farmlands are considered in federal projects. It requires federal agencies to consider alternative actions that could lessen impacts and to ensure that their actions are compatible with state, local government, and private programs to protect prime and unique farmland. The Natural Resources Conservation Service is responsible for administering this act. Farmlands were considered in the Intake Project analysis using the key indicators of changes in farm acreage and production. Prime and unique farmlands would be protected to the extent possible during implementation of the Intake Project consistent with the act (see Chapter 4, “Lower Yellowstone Irrigation Project” section in 2010 EA).

5.6.6 Fish and Wildlife Coordination Act of 1958 (as amended)

The Fish and Wildlife Coordination Act (FWCA, 48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) provides a procedural framework for the orderly consideration of fish and wildlife conservation measures to be incorporated into federal projects and federally permitted or licensed water resource development projects. Agencies that construct, permit, or license projects impacting a water body must consult with the Service and the state agency having jurisdiction over fish and wildlife resources, FWP. Full consideration must be given to the recommendations made through this consultation process.

Section 2 states that fish and wildlife conservation shall receive equal consideration with other project purposes and will be coordinated with other features of water resource development projects. The FWCA specifically authorizes the Secretary of the Interior to prepare a report and provide recommendations on the fish and wildlife aspects of projects, including mitigation. The FWCA report provides input to preparation of draft environmental impact statements.

Reclamation normally appends FWCA reports to NEPA documents. However, both the Service and FWP are participating cooperating agencies and have been working closely with the Corps and Reclamation to initiate and implement studies, surveys, gather and analyze data and contribute to reports since 1994. This continuous input into the decision making process reduces the need for a technical 2(b) FWCA report to prevent or reduce the adverse impacts to fish and wildlife. Therefore, there will be no FWCA report issued. The final NEPA documents will provide preventive measures to avoid impacts and mitigation to offset impacts that are unavoidable.

5.6.7 Migratory Bird Treaty Act and Executive Order 13186 (January 2001)

Under the provisions of this act it is unlawful "by any means or manner to pursue, hunt, take, capture [or] kill" any migratory birds except as permitted by regulations issued by the Service. Migratory birds include all native birds in the United States with the exception of non-migratory species managed by states. The Service has defined "take" to mean "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture or collect" any migratory bird or any part, nest, or egg of any migratory bird (50 CFR Section 10.12). Executive Order (EO) 13186 requires that each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement, with the Service, measures that shall promote the conservation of migratory bird populations.

Project level compliance with this law would be accomplished through specific environmental commitments for all of the action alternatives (see Chapter 4, "Wildlife" section).

5.6.8 Native American Graves Protection and Repatriation Act (Public Law 101-601)

This act establishes federal policy with respect to Native American burials and graves located on federal or tribal lands. Federal agencies are required to consult with and obtain the concurrence of the appropriate tribes with respect to activities that may result in the disturbance and/or removal of burials and graves from federal lands or lands held in trust for a tribe. To ensure compliance with the Act, Reclamation would consult with the tribes if any unanticipated discoveries are made during the construction phase of the Intake Project. Project level compliance with this law would be accomplished through specific environmental commitments for all of the action alternatives (see Chapter 4, "Historic Properties" section).

5.6.9 National Historic Preservation Act of 1966 (as amended in 2006)

The act establishes protection of historic properties as federal policy in cooperation with states, tribes, local governments, and the public. Historic properties are those buildings, structures, sites, objects, and districts, or properties of traditional religious and cultural importance to Native Americans, determined to be eligible for inclusion in the National Register of Historic Places. Section 106 of the act requires federal agencies to consider the effects of proposed actions on historic properties and gives the Advisory Council on Historic Preservation an opportunity to comment. Reclamation is responsible for consultation with the SHPO and/or Tribal Historic Preservation Offices, tribes, applicants, interested parties, and local governments regarding federal undertakings. Compliance with this law would be accomplished through specific environmental commitments for all of the action alternatives (see Chapter 4, "Historic Properties" section).

5.6.10 Rivers and Harbors Appropriation Act of 1899

Under Section 10 of the act, the construction of any structure in or over any navigable water of the United States, the excavating from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. This Intake Project would be implemented with design measures deemed compatible with the act. However, Intake Project design features requiring recommendation and approval would be reviewed by the Corps for permitting consideration in compliance with the act.

5.6.11 Executive Order 13112 for Invasive Species

In 1999, an EO was issued to prevent the introduction of invasive species and to provide for their control. It directs federal agencies to identify applicable actions and to use programs and authorities to minimize the economic, ecological, and human health impacts caused by invasive species. To meet the intent of this order, the Intake Project includes environmental commitments to prevent and control the spread of invasive species (see Chapter 4, "Aquatic Communities" and "Lands and Vegetation" sections).

5.6.12 Executive Order 11988 Assessment

Executive Order 11988 (Floodplain Management) requires federal agencies to avoid developments on floodplains whenever possible or to minimize potential harm to the floodplains. The intent of the proposed project is to re-establish self-sustaining shallow water habitat for fish and wildlife along the Yellowstone River. In order to be compliant with Executive Order 11988, federal investment in the proposed project modifications must not result in any actions or activities which would adversely impact existing structures, and in particular, critical facilities such as hospitals, schools, power generating plants, etc. Review of the project location indicates no existing structures which could be adversely impacted.

5.6.13 Other Executive Orders

Executive Order 11990 (Protection of Wetlands) directs federal agencies to avoid destruction, loss, or degradation of wetlands. Executive Order 13007 (Indian Sacred Sites) orders federal agencies to accommodate Indian tribes' requirements for access to and ceremonial use of sacred sites on public lands and to avoid damaging the physical integrity of such sites. Executive Order 12898 (Environmental Justice) directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Compliance with these orders was considered in the development of action alternatives in this EA (see Chapter 4, "Lands and Vegetation" and "Historic Properties" sections).

5.6.14 State Water Rights

Montana waters belong to the state, with ownership on behalf of all state citizens. Because water belongs to the state, water rights holders do not own the water; they have a right to use the water within state guidelines. Water rights in Montana are guided by the prior appropriation doctrine, or first in time, first in right. A person's right to use a specific quantity of water depends on when the use first began. The first person to use water from a specific source established the first right, the second established a right to the remaining water and so on. Water rights holders are limited to the amount of water that can be beneficially used. Beneficial uses of water include agricultural purposes, domestic, fish and wildlife, industrial, mining, municipal, power, and recreational uses.

The Montana Water Use Act passed July 1, 1973, changed water rights administration by requiring a statewide adjudication process on all water right claims existing at that time. Adjudication is a judicial decision that determines the quantity and priority date of all existing water rights in a basin. It also established a permit system for obtaining water rights for new or additional water developments, created an authorization system for changing water rights and a centralized records system, and provided a system to reserve water for future consumptive uses and maintain minimum instream flows for water quality and fish and wildlife. Senate Bill 76 and House Bill 22 further defined the adjudication process and established a funding mechanism to complete statewide adjudication in 2015.

The Lower Yellowstone Irrigation District #1, Intake Irrigation District, Savage Irrigation District, and Reclamation hold the following unadjudicated water rights in the state of Montana totaling 1,374 cfs:

- 1,000 cfs Statement of Claim
- 300 cfs Statement of Claim
- 18 cfs Statement of Claim
- 42 cfs Statement of Claim
- 14 cfs Provisional Permit (Savage Irrigation District)

5.6.15 Montana Environmental Policy Act

State agencies on the Cooperating Agency Team provided input for compliance with the Montana Environmental Policy Act (MEPA). MEPA was passed in 1971 instituting a policy requiring state agencies to consider the environmental, social, cultural and economic impacts of proposals prior to project approval. The purpose of MEPA is to foster state government decisions that are informed, accountable, open to public participation, and balanced. MEPA gives a community the ability to provide input into decision making and helps resolve issues before they become a problem. No other law allows consideration of such issues. The agencies may adopt the Intake EA completed by the co-leads or complete further documentation as they see fit to comply with the MEPA process.

5.6.16 Stream Protection Act

Any agency or subdivision of federal, state, county, or city government proposing a project that may affect the bed or banks of any stream in Montana for any project including the construction of new facilities or the modification, operation, and maintenance of an existing facility that may affect the natural existing shape and form of any stream or its banks or tributaries must comply with this act. The purpose of the act is to protect and preserve fish and wildlife resources and to maintain streams and rivers in their natural or existing state. Their concerns regarding fish, wildlife, and riverine environments have been addressed in this document. A stream protection permit would be obtained for the Intake Project from the MFWP, the agency who administers the law, prior to construction.

5.6.17 Short-Term Water Quality Standards for Turbidity (318)

Any person, agency, or entity, both public and private, initiating construction activity that will cause short-term or temporary violations of state surface water quality standards for turbidity requires a state permit. The purpose of the permit is to provide a short-term water quality turbidity standard for construction activities, so that construction is carried out in accordance with conditions prescribed by the Montana DEQ, to protect water quality and to minimize sedimentation. Montana DEQ administers the permit, and its concerns regarding water quality, sedimentation, and the Intake Project have been addressed in this EA.

5.6.18 Montana Land-use License of Easement on Navigable Waters

Any entity proposing a project on lands below the low water mark of navigable waters requires a state license. Projects include the construction, placement, or modification of a structure or improvements in, over, below, or above a navigable stream. The purpose of the law is to protect riparian area and the navigable status of the water body and to provide for the beneficial use of state lands for public and private purposes in a manner that will provide revenues without harming the long-term capability of the land or restricting the original commercial navigability. The Montana DNRC administers the law, and its concerns have been addressed in chapter four Lands and Vegetation and Recreation sections in this EA.

5.6.19 Stormwater Discharge General Permits

Any person, agency, or entity, either public or private, proposing a construction, industrial, mining, or other defined activity that has a discharge of storm water into surface waters must obtain a permit. Under the authority of the Montana Water Quality Act, permit authorization is typically obtained under a Montana Pollutant Discharge Elimination System "General Permit." A permit is generally required for construction activity that will disturb one or more acres, including clearing, grading, and excavating activities.

The purpose of the law is to prevent degradation of surface waters from pollutants such as sediment, waste materials, industrial chemicals or materials, heavy metals, and petroleum products; to protect existing water quality, and to implement and monitor the effectiveness of Best Management Practices (erosion and sediment controls, etc.) used to reduce pollutant loads. The Montana DEQ administers the permit, and the agency's concerns regarding water quality, sedimentation, and the overall project have been addressed in Chapter 4, "Hydrology and Geomorphology," "Surface Water Quality," and "Lands and Vegetation" sections in this EA.

5.6.20 401 Water Quality Certification for Other Federal Permits & Licenses

Under Section 401 of the federal Clean Water Act, states and tribes can review and approve, condition, or deny all federal permits or licenses that might result in a discharge to state or tribal waters, including wetlands. The major federal licenses and permits subject to Section 401 are Section 402 and 404 permits (in non-delegated states), Federal Energy Regulatory Commission hydropower licenses, and Rivers and Harbors Act Section 9 and 10 permits. States and tribes may choose to waive their Section 401 certification authority.

States and tribes make their decisions to deny, certify, or condition permits or licenses primarily by ensuring the activity will comply with state water quality standards. In addition, states and tribes look at whether the activity will violate effluent limitations, new source performance standards, toxic pollutants, and other water resource requirements of state/tribal law or regulation. The Section 401 review allows for better consideration of state-specific concerns. Their concerns have been addressed in Chapter 4, "Surface Water Quality" and "Lands and Vegetation" sections in this EA.

5.7. List of Preparers

Reclamation and Corps staff responsible for preparation of this Supplemental EA include:

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5.8. Distribution List

5.8.1 Agencies and Contact Persons

The entities listed below will receive an Executive Summary of the Draft Supplemental EA and/or the Final Supplemental EA.

Elected Officials
Honorable Jon Tester - Senator
Honorable Steve Daines –
Honorable Max Baucus – Senator

Tribal Officials
Honorable Richard Brannan —
Chairman Northern Arapaho Tribe
Honorable A.T. Stafne —
Chairman Assiniboine and Sioux Tribes of Fort Peck
Honorable Willie Sharp, Jr. —
Chairman Blackfeet Tribe
Honorable Joe Brings Plenty —
Chairman Cheyenne River Sioux Tribe
Honorable John Houle —
Chairman Chippewa Cree Tribe of the Rocky Boys' Reservation
Honorable James Steele, Jr. —
Chairman Confederated Salish and Kootenai Tribes
Honorable Brandon Sazue
Chairman Crow Creek Sioux Tribe
Honorable Carl Venne —
Chairman Crow Nation
Honorable Ivan D. Posey —
Chairman Eastern Shoshone Tribe
Honorable Joshua Weston —
President Flandreau Santee Sioux Tribe
Honorable Julia Doney —
President Gros Ventre and Assiniboine Tribe of Fort Belknap
Honorable Arlan Whitebird –
Chairman Kickapoo Tribe of Kansas
Honorable Michael Jandreau —
Chairman Lower Brule Sioux Tribe
Honorable Richard Marcellais —
Chairman Turtle Mountain Band of Chippewa
Honorable Geri Small —
President Northern Cheyenne Tribal Council
Honorable Theresa B Two Bulls —
President Oglala Sioux Tribe
Honorable Mitchell Parker —
Chairman Omaha Tribe of Nebraska
Honorable Larry Wright, Jr. —
Chairman Ponca Tribe of Nebraska
Honorable Steve Oritz —
Chairman Prairie Band of Potawatomi Nation
Honorable Rodney M. Bordeaux —
President Rosebud Sioux Tribe

Honorable Twen Barton —
Chairperson Sac and Fox Nation of Missouri in Kansas and Nebraska
Honorable Roger Trudell —
Chairman Santee Sioux Nation
Honorable Michael I. Selvage, Sr. —
Chairman Sisseton-Wahpeton Sioux Tribe
Honorable Myra Pearson —
Chairperson Spirit Lake Sioux Tribe
Honorable Charles W. Murphy —
Chairman Standing Rock Sioux Tribe
Honorable Marcus Levings —
Chairman Three Affiliated Tribes
Honorable Walt Moran —
Chairman Trenton Service Area
Honorable Matthew Pilcher —
Chairman Winnebago Tribe of Nebraska
Honorable Leon Campbell —
Chairman Iowa Tribe of Kansas and Nebraska
Honorable Robert Cournoyer —
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Honorable Leroy Spang —
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Environmental Protection Agency
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Bureau of Land Management
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Agricultural Research Service
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Henry Johnson — Commissioner
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Mark Rehbein — Commissioner
Richland County Commission
Don Steppler — Commissioner
Richland County Commission
Peggy Newton — Administrator
Dawson County Conservation

District
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Dawson County Commission
Jim Skillestad — County Commissioner
Dawson County Commission
Bruce Smith — Agriculture and Community Development Dawson County Extension Office
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Adam Gartner — County Commissioner
Dawson County Commission

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Dawson County Economic Development Council
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City of Fairview
Kim Trangmoe — Glendive Chamber of Commerce and Agriculture

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Craig Sharpe — Executive Director
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Water User
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Hugo Asbeck — Lower Yellowstone Irrigation District #1
Walt Reichenbach — Lower Yellowstone Irrigation District #1
Don Steinbeisser — Lower Yellowstone
Mark Iversen — Chairman Lower Yellowstone Irrigation District #1
Philip Hurley — Lower Yellowstone Irrigation District #2
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Dan Rice — Intake Irrigation District
Steve Pust — Chairman Savage Irrigation District
Leeroy Schmierer — Savage Irrigation District
Mel Tombre — Savage Irrigation District
Richard Cayko — Chairman Lower Yellowstone Irrigation Board of Control
Matt Rosendale — Chairman Intake Irrigation District
Bud Groskinsky — Lower Yellowstone

Irrigation Board of Control
Roger Muggli ─ T&Y Irrigation District

Newspaper
Sidney Herald
Amanda Breitbach ─ Glendive Ranger-Review
Minot Daily News
Bismarck Tribune
Williston Herald
Miles City Star
Brett French ─ Billings Gazette
Great Falls Tribune
Emilie Boyles ─ News Director Montana East News
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Interested Party
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Yellowstone Caviar Project
DJS Farms LLC
Schueler Farm
American Foundation for Wildlife
GPJC
Headington Oil LP
F.F.A.
GPS Sidney Partners
MON-KOTA
Nabors Well Service
Savage Ag Vocation & Growth Endeavor Inc
Cross Petroleum Services
Steve E Park ─ Aparies Inc.
Turcotte Farms Inc.
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Pete Council
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Gary Cox
Robert Crandall
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Arne Degn
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Tim Denowh
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Howard Harmon
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Larry Harris
Clarence Hartle
Wade Hartle
Dave Haverkamp
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Harold Helland
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Robert Hernandez
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Goldie Hilliard
Richard Hobbs
Frances Hodson
Carol Hoeger
Kenneth Hoff
James Holst
Edith Holt
Dreamland Homes
R C Hord
Dwight Houchen
Terry Houchen
Jim Hovde
Steve Hudson
Eugene Hueth
Lyle Huff
William Huft
Roger Huizenga
Dale Hurley
Ralph Hurley
Richard Hurley
Rodney Hurley
Ronnie Hurley
Vess Hurley
Gloria Huse
John Hutter
Hugh Hutton
Darrell Hystad
Dale Iversen
Don Iversen
Kenneth Iversen
Marlow Iversen
Ruth Iversen
William Iversen
Albert Jackson
Gary Jackson
David Jacobsen
Henry Jaskot
Curtis Jensen
Harry Jensen
Ron Jensen
Michael Jepsen
Agnes Johnson
Arden Johnson
Craig Johnson
David Johnson
Don Johnson
Donald Johnson
Duane Johnson
Eldin Johnson
Ervin Johnson
Harry Johnson
Kirk Johnson
Kirk Johnson
Lloyd Johnson
Michael Johnson
Mike Johnson
Richard Johnson
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Scott Johnson
Warren Johnson
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