Swan River National Wildlife Refuge
Wetland Restoration Project

Environmental Assessment

Prepared for

U.S. Fish and Wildlife Service

Western Montana National Wildlife Refuge Complex
922 Bootlegger Trail
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Acronyms and Abbreviations

BA	Biological Assessment
BMP	Best Management Practice
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
DNRC	Department of Natural Resources and Conservation
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FLAP	Federal Lands Access Program
FONSI	Finding of No Significant Impact
MAP-21	Moving Ahead for Progress in the 21st Century Act
MEPA	Montana Environmental Policy Act
MFWP	Montana Fish, Wildlife & Parks
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
RDG	River Design Group, Inc.
Refuge	Swan River National Wildlife Refuge
SHPO	State Historic Preservation Office
Service	U.S. Fish and Wildlife Service
SVC	Swan Valley Connections
WPA	Waterfowl Production Area

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1 Executive Summary

The National Environmental Policy Act of 1969 (NEPA) requires that all projects carried out by a federal agency, or which involve federal funding, require a federal permit, or occur on federal land must consider the effects of their actions on the quality of the human environment. NEPA established a mandate for federal agencies to consider the potential environmental consequences of their proposals, document the analysis in determining these consequences, and make this information available to the public for comment prior to implementation. This Environmental Assessment (EA) is part of the NEPA process. The proposed project, the purposes and need, and potential environmental effects of three alternatives are detailed and analyzed in this EA document.

An EA is prepared to determine whether a proposed action has the potential to significantly affect the quality of the human environment (40 CFR§1508). General steps for an EA are as follows:

- Conduct a fact-finding and issue-discovery (scoping) process to define the project;
- Select alternatives for consideration;
- Prepare an EA (this document);
- Circulate the EA for review and public comment; and
- Prepare a Finding of No Significant Impact (FONSI) if the EA reveals no potential to significantly affect the quality of the human environment; or prepare an Environmental Impact Statement if there is a potential to significantly affect the quality of the human environment.

Decisions made concerning this project are ultimately the responsibility of the U.S. Fish and Wildlife Service, as well as other local, state and federal agencies, and the public.

The Proposed Action Alternatives would implement goals, objectives, and strategies outlined in the Benton Lake National Wildlife Refuge Complex Comprehensive Conservation Plan (USFWS 2012) within Swan River National Wildlife Refuge (Refuge), located in the Swan Valley approximately 36 miles southeast of Kalispell, Montana. Management efforts focus on supporting and restoring ecological processes, including natural communities and the dynamics of the ecosystems of the northern Great Plains and northern Rocky Mountains (USFWS 2012).

Natural wetland hydrology at the Refuge has been impacted by human alterations to the ecosystem. Prior to establishment of the Refuge in 1973, an extensive network of ditches was excavated throughout the Refuge to drain hydrology from the wetland to Swan Lake. Restoration of wetland hydrology as detailed in the two Proposed Action Alternatives will include partial or whole fill of the primary ditch network, removal of existing berms and flood levees, and improving visitor experience and public use.

2 Purpose and Need for Action

2.1 Refuge Complex Background

The United States Fish and Wildlife Service (Service) manages the Western Montana National Wildlife Refuge Complex (Refuge Complex) encompassing 276,346 acres in northwestern and north-central Montana. The Refuge Complex spans both sides of the Continental Divide and holds a collection of diverse landscapes from wetlands and mixed grass prairie in the east, to forests, intermountain grasslands, rivers, and lakes in the west. The Refuge Complex oversees the management of seven refuges, three wetland management districts containing 34 waterfowl production areas, three conservation areas, and administers 263 easements within the National Wildlife Refuge System.

The National Wildlife Refuge System Improvement Act of 1997 requires that a Comprehensive Conservation Plan (CCP) be developed for every refuge in the National Wildlife Refuge System by 2012. In 2012, USFWS completed a CCP describing how the Refuge Complex will be managed to fulfill its congressionally designated purposes (USFWS 2012).

The CCP provides a foundation for managing the Refuge Complex and specifies the necessary actions to achieve the vision and purposes of the Refuge Complex. The CCP is intended to be used as a working guide for programs and activities throughout the Refuge Complex through 2027. Broad-based goals of the CCP included the following:

- **Landscape Conservation Goal** – Actively pursue and continue to foster relationships within the Service, other agencies, organizations, and private partners to protect, preserve, manage, and restore the functionality of the diverse ecosystems within the working landscape of the Refuge Complex.
- **Habitat Goal** – Actively conserve, restore, and manage upland and wetland habitats across the northern prairies and intermountain valleys of the Refuge Complex, through management strategies that perpetuate the integrity of ecological communities.
- **Wildlife Goal** – Support diverse and sustainable continental, regional, and local populations of migratory birds, native fish, species of concern, and other indigenous wildlife of the northern prairies and intermountain valleys of northern Montana.
- **Cultural Resource Goal** – Identify and evaluate the cultural resources of the Refuge Complex and protect those that are determined to be significant.
- **Visitor Services Goal** – Provide opportunities for visitors of all abilities to enjoy wildlife-dependent recreation on Service-owned lands and increase knowledge and appreciation for the Refuge Complex's ecological communities and the mission of the National Wildlife Refuge System.
- **Administration Goal** – Provide facilities, strategically allocate staff, and effectively use and develop funding sources, partnerships, and volunteer opportunities to maintain the long-term integrity of habitats and wildlife resources of the refuge complex.
- **Visitor and Employee Safety and Resource Protection Goal** – Provide for the safety, security, and protection of visitors, employees, natural and cultural resources, and facilities throughout the Refuge Complex.

The goals, objectives, and strategies proposed in the CCP are intended to support the purposes for which each refuge, district, and conservation area was established. Objectives and strategies are further described at: https://www.fws.gov/mountain-prairie/refuges/completedPlanPDFs_A-E/bnl_ccpfinal_all.pdf.

The purpose of the Swan River National Wildlife Refuge (Refuge) is for "use as an inviolate sanctuary, or for any other management purposes, for migratory birds" (Migratory Bird Conservation Act) (USFWS 2012).

The Refuge is located in Lake County, Montana, approximately 36 miles southeast of Kalispell, Montana in Swan Valley (Figure 2-1). The Refuge was established in 1973 at the request of Montana Senator Lee Metcalf under the authority of the Migratory Bird Conservation Act. Encompassing 1,979 acres, the Refuge is managed primarily for migratory birds and provides important year-round habitat for diverse waterfowl and bird species as well as large and small mammals (USFWS 2020). It consists of expansive and diverse herbaceous, shrub, and forested wetland habitat on the south of Swan Lake and is surrounded on the east and west by Flathead National Forest system lands.

An additional 319 acres to the southwest of the Refuge was incorporated to Refuge Complex land in July 2018. This area is designated as a Waterfowl Production Area (WPA) (Cruz WPA). The Refuge and Cruz WPA, encompassing a total of 2,298 acres, is the project area for this EA (Figure 2-1). Furthermore, a parcel located to the north of Bog Road which is under US Forest Service (USFS) ownership would be affected by the restoration project, as would private land at the northwest corner of the Refuge (Inset on Figure 2-1).

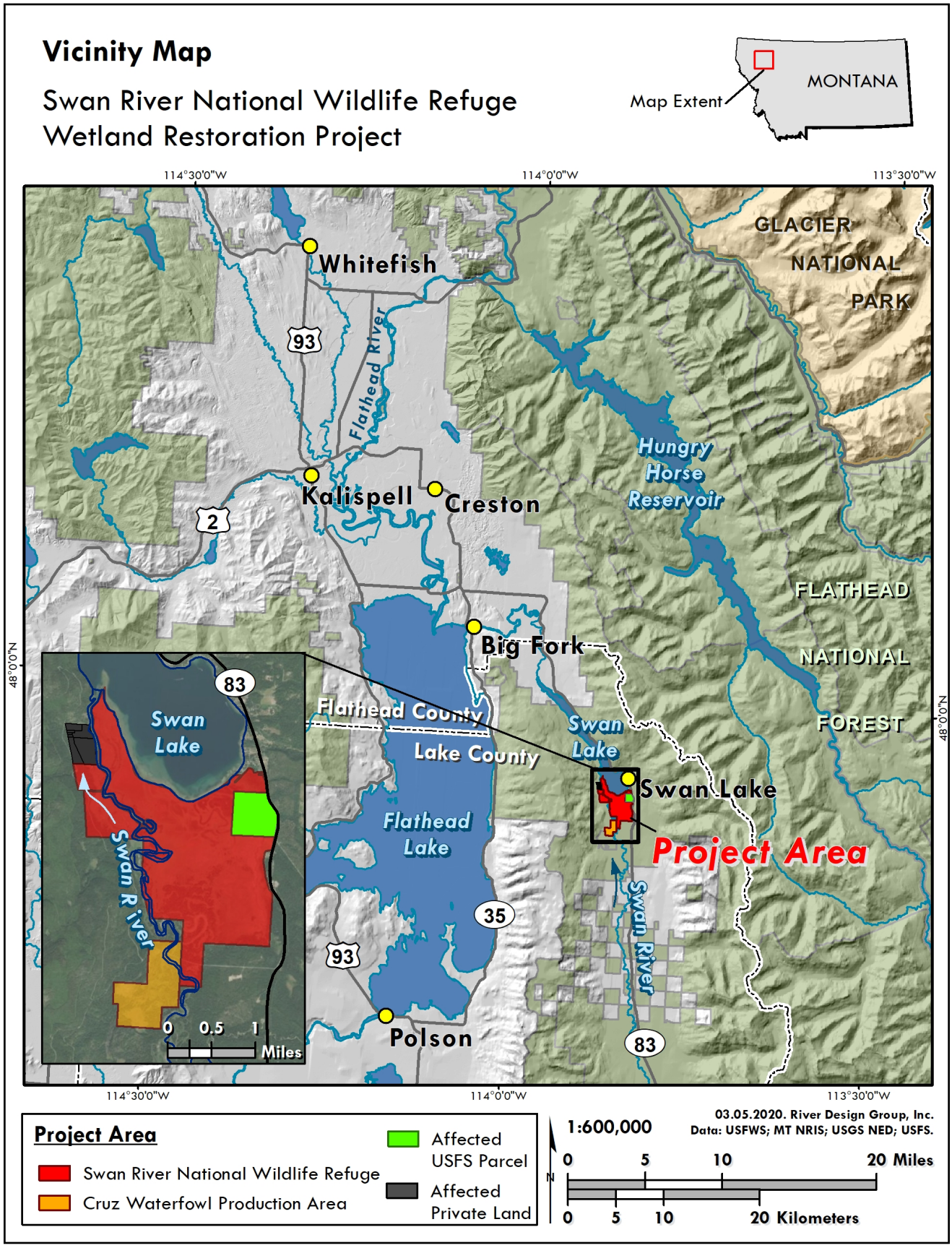

Figure 2-1. Swan River National Wildlife Refuge project vicinity map.

2.2 Purpose and Need for Action

Natural wetland hydrology at the Refuge is impacted by human alterations to the ecosystem. Prior to establishment as a Refuge, the land was under private ownership. Most of the valley bottom and wetland areas were managed as a muskrat farm by the Montana Muskrat Company, and by agricultural and ranching development. An extensive network of ditches was excavated throughout the area to drain wetland hydrology from the wetland north to Swan Lake. Ditch spoils were side cast alongside the large ditches. Several levees were also constructed on the Swan River on the western boundary of the Refuge to restrict overbank flow from the river to Refuge land, and one large levee was built on the southern shoreline of Swan Lake, likely a remnant of the muskrat farm of the late 1920's. The ditches and levees have extensively altered and continue to modify the natural wetland hydrology of the Refuge. The changes to wetland hydrology, combined with the spread of invasive reed canarygrass, have resulted in a striking departure from the natural vegetation communities and habitat that likely existed prior to the turn of the 19th century.

In 2017, the Service completed an assessment to evaluate wetland restoration potential at the Refuge. Objectives were to identify opportunities for restoration of wetland hydrology, and to determine the impacts of restoration actions on existing plant communities and wetland habitat. Long term goals are the restoration of wetland hydrology and wetland vegetation to the Refuge by reversing the actions by which the wetlands were originally drained. Currently, wetland drain ditches intercept and collect both groundwater and surface water and transfer it downslope to Swan Lake. The resulting lowered groundwater table has enabled the spread and dominance of invasive reed canarygrass (*Phalaris arundinacea*) which has displaced natively occurring wetland vegetation throughout much of the Refuge.

By converting ditch flow to flow across the ground surface through filling and/or plugging of the ditches in strategic locations, water inundation will permeate through wetland soils and recharge wetlands. It is also expected that this groundwater level increase will result in a shift from invasive reed canarygrass-dominated wetlands to habitat dominated by desirable native wetland sedges, rushes, and horsetails, especially in northern Refuge locations. The provision of self-sustaining Refuge wetland ecology with natural hydrologic and soil forming processes will ensure the long-term success of the restoration project (NRCS 2011).

2.3 Decision to be Made by the Responsible Official

The decision to be made by the responsible official, the Regional Director, Assistant Regional Director, or Regional Chief of the National Wildlife Refuge System, will be to authorize the restoration and improvements in the Refuge as proposed, vary the design to meet the purpose and need, or to defer any action at this time. Authorization of this project would require that designs meet all USFWS standards and applicable laws, and that necessary permits and approvals are obtained from the U.S. Army Corps of Engineers, Montana Department of Environmental Quality, Montana Department of Fish, Wildlife & Parks, Service, Montana State Historic Preservation Office, and Lake County Planning Department.

3 Alternatives

This section provides a description of the three alternatives being considered, which include the following:

- **Alternative A (No Action)**, where no restoration actions would occur at the Refuge;
- **Alternative B (Proposed Action)**. The Purpose and Need for Action, including addressing main recommendations of the CCP, would be satisfied; and
- **Alternative C**, which would expand upon Alternative B (Proposed Action) with a more comprehensive return of the landscape to pre-disturbance condition.

3.1 Alternatives Development Process

The Service developed the restoration alternatives following a thorough analysis of the altered landscape, which culminated in a Wetland Restoration Assessment Report (RDG 2018). Throughout the development process, various scenarios for wetland restoration were evaluated and two Proposed Action Alternatives were established. These proposed actions would restore wetland hydrology and recharge groundwater tables at the Refuge, allow a passive restoration of wetland vegetation and habitat to occur, and would satisfy the restoration objectives outlined in the CCP.

High-resolution Light Detection and Ranging (LiDAR) elevation data was acquired in October 2013 (WSI 2013), and the surface generated from that data was utilized to inventory all wetland drainage ditches and levees. On-site collection of bathymetric data for the deepest ditches that held water during the LiDAR flight supplemented the dataset. In addition, a groundwater and surface water monitoring network was installed in August 2017, and one year of water level monitoring data was analyzed to better understand wetland hydrology at the Refuge.

The LiDAR data surface coupled with ditch bathymetry was used to calculate the volume of material that would be needed to fill the ditches. Analysis of the LiDAR data also yielded the volume of earthen material in ditch spoil berms and levees that would be available on-site for ditch fills. Further, the evaluation of water surface slopes was integral to defining which ditch fills would produce the desired outcome of wetland hydrology restoration.

In addition, an analysis of how the restoration of wetland hydrology is likely to affect existing vegetation communities was conducted utilizing high-definition vegetation mapping (SVC 2016), LiDAR data, and field ground-truthing of vegetation and elevation data. As is further detailed in Section 4, wetland hydrology restoration actions have a high probability of reducing the cover of invasive reed canarygrass, especially in the northern portion of the Refuge where water tables are high throughout the growing season.

3.2 Alternative A (No Action)

The CCP recommends actions to achieve the vision and purpose of the Refuge Complex including the Swan River National Wildlife Refuge. The broad-based goals, as presented in Section 2.1, would be partially achieved through ongoing management activities at the Refuge.

Under the Alternative A (No Action), no restoration actions would occur, and existing wetlands would remain in degraded conditions and the proliferation of invasive plant communities would continue to displace desirable native Refuge wetland vegetation. Existing drainage ditches would not be reclaimed, existing flood levees would remain in place, and no improvements to public use facilities would occur. The No Action Alternative does not address the deficiencies identified in the Purpose and Need for Action, nor would it meet the recommendations of the CCP.

3.3 Alternative B (Proposed Action)

Alternative B (Proposed Action) would address the management actions described in the CCP, including:

- Addressing habitat needs for wildlife with management priority directed towards species most impacted by degraded conditions

including resident and migratory waterfowl and bird species;

- Restoring wetlands, including wetland hydrology and vegetation, to likely conditions had habitat degradation not occurred; and
- Enhancing compatible public use, especially priority wildlife-dependent uses.

One of the primary goals of the CCP was to ensure compatible public uses would be enhanced or expanded including opportunities for hunting, fishing, wildlife observation, wildlife photography, interpretation, and environmental education. The Alternative B (Proposed Action) restores wetland habitat for wildlife, which also benefits the wildlife-dependent compatible public uses at the Refuge. Furthermore, Alternative B (Proposed Action) addresses safety, public access, and maintenance issues associated with the existing Refuge access road from Highway 83 and the parking and turnaround area by the existing interpretive kiosk.

Specific actions included under the Alternative B (Proposed Action) are described in the following sections. Wetland hydrology at the Refuge can be restored by reversing the actions that have caused both localized and Refuge-wide impacts. Strategically filling the ditch network, as well as leveling the levees that were constructed to prevent Swan River and Swan Lake overbank flows out of the Refuge during flood events, will have a positive effect on wetland hydrology and groundwater recharge. While it is difficult to determine how the presence of the ditch and levee network has influenced Refuge hydrology over time, it is known that during summer dry seasons, and for drier-than-average years, the interception of groundwater and surface water by ditches and its conveyance downslope to Swan Lake has had a significant drying effect throughout Refuge land, especially for the southern half of the Refuge.

All applicable laws and regulations will be followed and permits obtained prior to the beginning of construction activities, including compliance with Section 404 of the Clean Water Act. Please refer to Section 6.2 for details.

3.3.1 Site Access and Parking Area Improvement

To facilitate the entrance and exit of construction equipment and large trucks during project implementation, the existing Refuge access from Highway 83 would be temporarily improved to a 60-foot turning radius. A total of 305 cubic yards of pit-run fill material and 30 cubic yards of ¾-inch crushed gravel for the finished travel surface would be placed adjacent to the highway. Following construction activity, the finished top surface of the approach would be reduced back to the original 30-foot turning radius, regrading of fill material would occur on the slope, and the slope would be topsoiled and seeded.

In addition, the existing parking and turnaround area adjacent to the interpretive kiosk would be improved to a 60-foot turnaround radius. Construction of this improvement would necessitate the import of 130 cubic yards of pit-run fill material as a base, and 100 cubic yards of ¾-inch crushed gravel to top the travel surface. This improvement would be kept in place following restoration project implementation, providing for better Refuge parking and turnaround area for visitors.

3.3.2 Filling Drainage Ditches

Approximately 4,960 feet (0.94 miles) of drainage ditches would be filled to elevate the water table and improve the overall functions and values of existing wetlands. While the total length of drainage ditches at the Refuge is 15.7 miles, most ditches are minor and do not currently affect wetland hydrology (RDG 2018). The two most prevalent ditches at the Refuge, Primary 1 and Primary 4, convey water downslope and are selected to be partially filled under Alternative B (Proposed Action) (Figure 3-1).

Additionally, the entire length of the Primary 1 and Primary 4 ditches would not be filled, as the volume of material available in existing ditch spoil berms and levees on-site is less than what is required to completely fill the ditches. Figure 3-1 highlights the patchy distribution of fills along Primary 1 and Primary 4 ditches. While these ditch fills or plugs do not

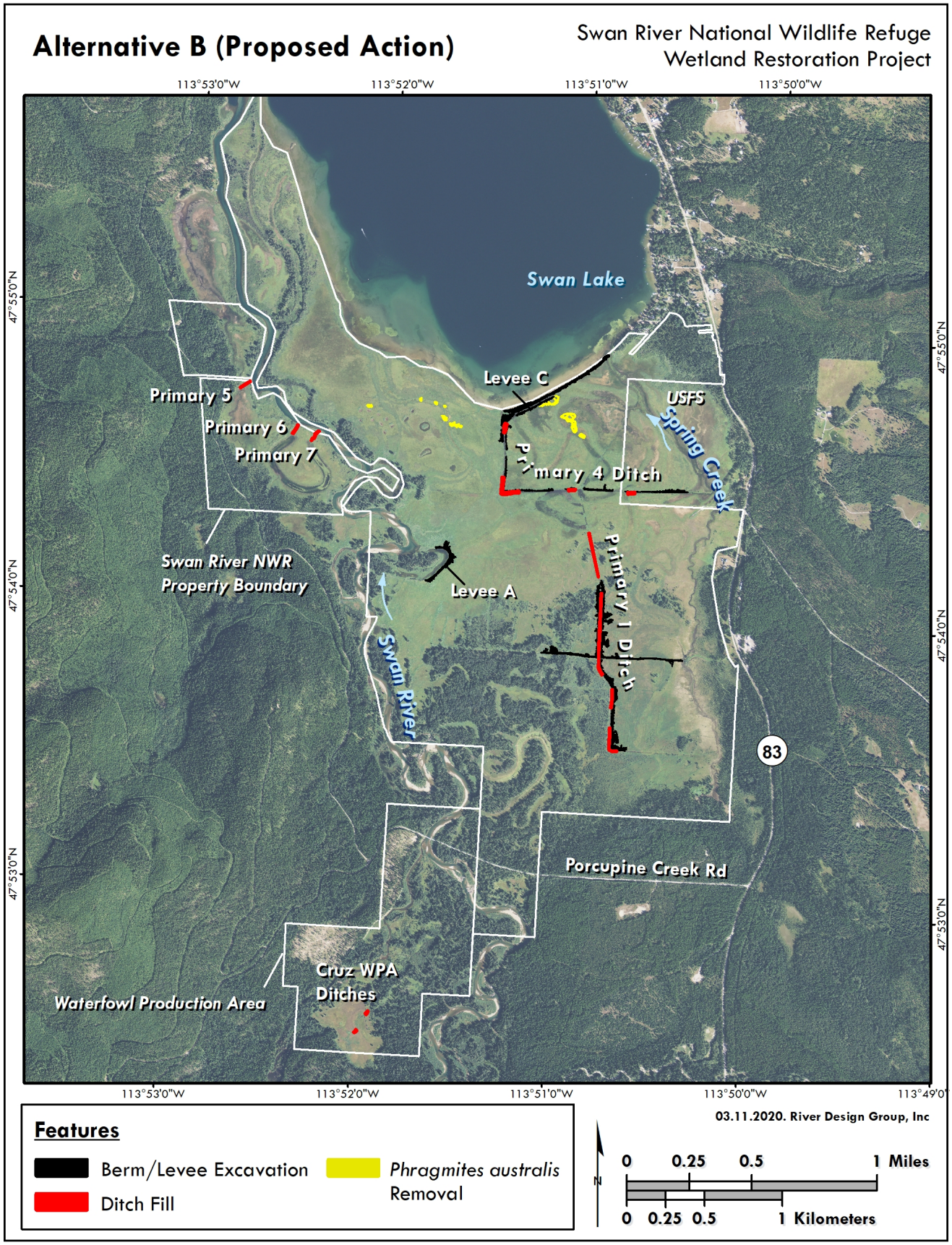

Figure 3-1. Alternative B (Proposed Action).

completely return the landscape to the condition it was prior to original ditch excavation, they are as effective as complete fills in stopping the flow of water downslope and restoring wetland hydrology to the Refuge.

Prior to excavation of ditch spoil berm piles and levees, and fill placement in ditches, existing high-quality sods and topsoil would be salvaged and temporarily stockpiled. Following placement and compaction of fill, topsoil and sod mats would be placed to stabilize raw fill and control erosion. Some existing ditches would be converted to open water wetlands or shaped into shallow seasonal wetlands aligned with the natural topography of the surrounding ground. The estimated number of acres that would be restored or enhanced as a result of this action is summarized under Section 4.

In addition to ditch fill with native material found within ditch spoil berms and levees, import of pit-run fill material, logs, and non-woven geotextile fabric would be necessary to build temporary access roads for construction equipment. A total of 5.4 miles of temporary access roads would be needed to perform the restoration work. Dry access roads total 24,705 linear feet, which include tops of berms and levees that would be leveled to improve drivability. 3,030 linear feet of constructed temporary access roads would be necessary where equipment would cross saturated ground at the Refuge, and would include placement of 40,900 square feet of non-woven geotextile fabric and 1,365 cubic yards of pit-run fill material to provide a stable travel surface. Constructed temporary access roads would be fully removed after project completion, including removal of fabric and pit-run material, and seeded with a native seed mix.

Finally, a total of 860 linear feet of ditch plug access roads would be constructed over open water ditches to facilitate travel over specified ditch crossing areas. A stacked log deck would be placed over the ditch surface as a base, followed by placement of non-woven geotextile fabric over the log deck to establish a base for fill. Imported pit-run fill material would be placed over the fabric to create a smooth travel surface. After construction is complete, the temporary road surface would be reclaimed by removing and disposing of the fabric. Pit-run fill material would be placed back on top of the logs and the ditch plug access road would be transformed to a permanent ditch plug feature. Wetland sod mats would be placed on top of plugs, matching adjacent finished ground elevations. An average of 800 log pieces (12- 24 inches in diameter, and 15-20 feet in length) would be permanently buried in the ditch plugs. Approximately 380 cubic yards of pit-run fill material would also be permanently buried, and 11,610 square feet of fabric material would be temporarily placed and wholly removed following construction.

3.3.3 Excavation to Generate Fill Material

Drainage ditches would be filled by utilizing all available ditch spoil berm and earthen levee material available for excavation on-site, which totals 25,090 cubic yards. Minor berms or levees with too high of a cost-benefit ratio are excluded from the Proposed Action.

Most of the material to be used for ditch fills is located on berms directly adjacent to the ditches, as they are the original ditch spoil berms where the material from ditch excavation was placed. These locations include berms along Primary 1 and Primary 4 ditches, and a berm oriented parallel to Primary 4 (Figure 3-1). Ditches specified as Primary 5, Primary 6, and Primary 7 to the west of Swan River, and two located in the Cruz WPA, would be filled to the greatest extent possible using only what is present directly adjacent to them in spoil berms.

Two levees, one on an old oxbow meander of the Swan River (Levee A), and one along a portion of the southern shore of Swan Lake (Levee C) would be leveled under Alternative B (Proposed Action) (Figure 3-1). Removal of these levees serves two purposes: 1) to allow overbank flooding of the Swan River and Swan Lake and improve wetland hydrology at the Refuge, and 2) to generate earthen fill material for ditch fill actions.

3.3.4 Wetland Vegetation Restoration

Most wetland vegetation restoration that would occur under Alternative B (Proposed Action) would be passive, i.e. the increase in groundwater level due to ditch fills especially in the northern half of the Refuge would drown out invasive reed canarygrass and favor the spread of desirable native wetland vegetation. However, another more invasive wetland grass species has been documented at the Refuge. European common reed grass (*Phragmites australis* ssp*. australis*) is a Priority 1A Noxious Weed. The ranking indicates that only a very limited distribution of the species is currently present in Montana and eradication is required when the species is encountered.

A few isolated patches totaling 2.71 acres of European common reed grass monoculture is present at the Refuge, and it is identified for physical and chemical removal (Figure 3-1). A 0.90-acre patch along the south shore of Swan Lake adjacent to Levee C would be physically removed during levee removal activity. The sod mat would be stripped at least 2 feet beneath the soil surface, and the entire above- and below-ground biomass of the grass would be flipped upside down and buried in the ditch fill. The other patches totaling 1.82 acres, which are located in wetland interiors, would be chemically removed with multiple herbicide treatments utilizing backpack sprayers.

3.4 Alternative C

Under Alternative C, all actions described under Section 3.3 Alternative B (Proposed Action) would be implemented. This includes construction of the site access improvement and parking area turnaround improvement, construction of temporary access roads, fill of drainage ditches, generation of fill material through excavation of spoil berms and levees, passive restoration of wetland vegetation, and physical and chemical removal of European common reed grass.

In addition, Alternative C would fill the entire length of the two main ditches at the Refuge which currently collect and convey water from the Refuge interior north and into Swan Lake (Primary 1 and Primary 4, Figure 3-2). This additional action would address not only groundwater levels at the Refuge, but also revert the landscape back to a more natural state. Total length of the two ditches is 2.70 miles, and a total volume of 76,840 cubic yards of earthen material is needed for the ditch fills. As detailed in Section 3.3 above, on-site material volume available in ditch spoil berms and levees is 25,090 cubic yards. A deficit of 51,750 cubic yards exists and would need to be sourced from elsewhere, as described in Section 3.4.1 below.

3.4.1 Excavation to Generate Fill Material

To address the deficit of 51,750 cubic yards of fill material needed to fill the entire length of Primary 1 and Primary 4 ditches, an approximate 10-acre area of reed canarygrass monoculture would be excavated to an average depth of 4.5 feet below the root zone of the invasive grass species (Fill Generation Area on Figure 3-2). While the primary purpose of this excavation would be to generate fill material, a large area of reed canarygrass monoculture would be physically removed and replaced with a topographically diverse open water, emergent, and scrub-shrub wetland complex. The reed canarygrass above- and below-ground biomass would be disposed of in a repository location. Once the reed canarygrass rootmass is scraped from the surface, the top six inches of topsoil would be excavated, stockpiled, and placed over bare ground as growth media once wetland excavation is complete. Most of the excavation material would be trucked north and would be used to fill the Primary 4 ditch.

A topographically heterogenous wetland area would be created. The variable-depth wetland feature would support emergent and scrub-shrub wetland habitat and the deepest portions would sustain open water wetland habitat. A diverse native planting plan would be implemented, including planting hydrophytic herbaceous species plugs in shallow emergent wetland areas and wetland and riparian shrubs in slightly higher elevations. Herbaceous and woody species planting would be supplemented by a robust native grass and forb seeding effort.

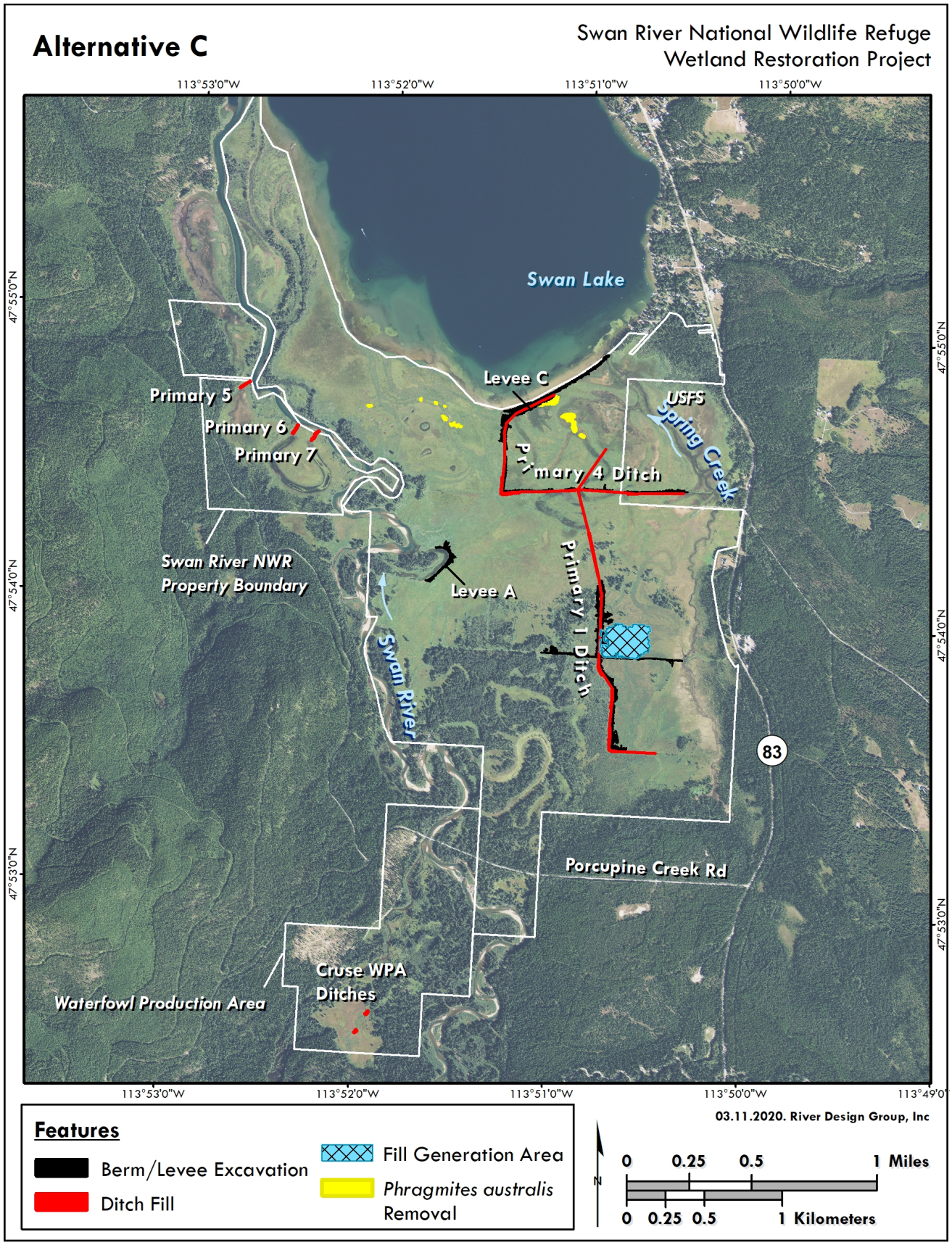

Figure 3-2. Proposed Action Alternative C.

The objective of wetland restoration in both Alternative B (Proposed Action) and Alternative C is to restore wetland hydrology of Swan River National Wildlife Refuge to a condition it would have been had habitat degradation, specifically wetland ditching and draining, not occurred. This restoration of wetland hydrology and elevation of groundwater tables would also passively restore wetland vegetation at the Refuge to a more natural state than currently exists.

4 Affected Environment and Environmental Consequences

This section describes the affected environment at the Refuge, and presents the environmental consequences of the Alternative A (No Action), the Alternative B (Proposed Action), and the Alternative C. Consequences from implementation of alternatives are grouped in the following three categories:

- **No/Negligible impact:** The alternative has no or a negligible impact on the environmental resource, and implementation of the alternative would not significantly alter the existing condition of the resource.
- **Adverse impact:** The alternative has a negative effect on the environmental resource, and implementation of the alternative would degrade the existing condition of the resource.
- **Beneficial effect:** The alternative has a positive effect on the environmental resource. The resource would be enhanced or would benefit from the implementation of the alternative.

In addition, adverse impacts and beneficial effects can further be described as minor, moderate, or major. Minor adverse impacts would affect the resource in a minor capacity, and mitigation would likely not be necessary as the resource would be expected to recover from the impact and permanent losses would not occur. Moderate adverse impacts on an environmental resource would likely require some mitigation measures to compensate for negative impacts or losses to the resource. While some recovery is expected, the resource would not return to the pre-alternative implementation condition without intervention. Lastly, a major adverse impact to an environmental resource would require mitigation measures as recovery of the resource would not occur without intervention and permanent losses to the resource would be expected.

4.1 Air Quality

4.1.1 Existing Conditions

The project area is located in Montana Airshed 2 as defined by the Montana/Idaho Airshed Group. Air quality is regulated by Lake County, and mostly involves the regulation of slash burn activity as it relates to air quality. Ambient air quality is not currently measured at the Refuge. It is expected that low ambient concentrations of particulate pollutant would occur in this area based on nearby uses, including traffic on Highway 83 and slash burning by adjacent land management agencies. Wildfires in the vicinity of the Refuge, when they occur, are the most damaging to air quality. The methods used to analyze the potential effects of the Proposed Action Alternatives on air quality mostly include the timing and duration of construction activity.

4.1.2 Effects of Alternative A (No Action) on Air Quality

Under Alternative A (No Action), existing air quality would remain unchanged and there would be no additional impacts to air quality. Wildfire and natural resource management activities on the Refuge and adjacent lands that affect air quality would continue.

4.1.3 Effects of Alternative B (Proposed Action) on Air Quality

Under Alternative B (Proposed Action), construction activities would increase airborne particulates but levels are not anticipated to exceed air quality standards. An increase in pollutant emissions is expected as a result of heavy equipment activity. The construction-related emissions would be temporary and localized with levels not anticipated to exceed air quality standards. Work would be performed during established work hours to minimize any direct and

indirect effects on neighboring properties or visitors to the Refuge.

4.1.4 Effects of Alternative C on Air Quality

Construction activity would also increase airborne particulates during Alternative C implementation. Depending on implementation methodology, the overall construction period would be longer, or additional machinery would be utilized, for Alternative C than what would be needed for Alternative B implementation. However, all construction-related impacts would be temporary and localized, and no mitigation would be necessary.

4.2 Wetlands

4.2.1 Existing Conditions

Wetland mapping was accomplished through interpretation of detailed vegetation community mapping completed by Swan Valley Connections in 2016, as well as wetland delineation field work by River Design Group (RDG) in 2019 and 2020. Most refuge area was assessed on foot by Swan Valley Connections, and a remote sensing effort complemented the field effort. Vegetation was classified to the National Vegetation Classification Standard (NVCS) alliance level. Pertinent information on hydrology was noted and included in the vegetation database. Vegetation alliances were grouped into categories based on lifeform (grassland, marsh, riparian shrubland, and forest alliances), and each category was listed in order of increasing hydrology (SVC 2016). Wetland or upland status was then assigned by RDG based on dominant vegetation and hydrologic conditions, and verified by analysis of wetland delineation field data. Where an alliance can represent either upland or wetland conditions, those mapped polygons were individually assessed and split into upland or wetland components.

Wetland environments at the Refuge are expansive. Wetlands total 1,331 acres, and are classified as Emergent, Scrub-Shrub, Forested, and Open Water Wetlands. A total of 81 acres of Riverine Waters of the U.S. were also mapped withing the Refuge boundary, and includes both the Swan River channel within its banks which flows south to north at the west of the Refuge, and the Spring Creek channel to the east of the Refuge. Wetlands mapped within the restoration area at Cruz WPA total 20 acres of emergent wetland habitat. US Forest Service (USFS) land adjacent to the Refuge and Cruz WPA contains 119 acres of emergent wetlands, 14 acres of forested wetlands, and 10 acres of Riverine Waters of the U.S. (Spring Creek).

Table 4.1 provides a summary of the wetland environments mapped within the Refuge, Cruz WPA, and on USFS land adjacent to the Refuge and Cruz WPA.

Table 4-1. Existing wetlands and Waters of the U.S. within the Refuge, restoration area within Cruz WPA, and affected USFS land adjacent to Refuge and Cruz WPA.

Wetland Classification	Refuge Acres	Cruz WPA Acres	USFS Acres
Emergent	1,071	18	119
Scrub-shrub	99	0	0
Forested	146	0	14
Open Water	15	0	0
Total Wetlands	**1,331**	**18**	**133**
Riverine (Waters of the U.S.)	71	0	10
Total Wetlands & Waters of the U.S.	**1,402**	**18**	**143**

All wetlands are classified in the Palustrine system, which includes freshwater wetlands dominated by hydrophytic plant species, and pond areas less than 20 acres in size with a maximum water depth of 6.6 feet (Cowardin et al. 1979). Open water wetlands at the Refuge consist of abandoned oxbow meanders of Swan River at the western and southern portion of the Refuge. While other open water areas exist in the interior of the Refuge especially during high water years in spring snowmelt conditions, these environments include a rooted herbaceous vegetation community and are classified as emergent wetlands.

Much of the emergent wetlands at the Refuge and adjacent USFS land are defined by Marsh Vegetation Alliances (SVC 2016). These environments are dominated by native sedge, rush, horsetail, cattail, or pond lily vegetation, and wetland hydrology is

vernally or perennially available for plant uptake. A total of 856 acres of marsh wetlands exist at the Refuge. Dominant species in these environments include Buxbaum's sedge (*Carex buxbaumii*), beaked sedge (*Carex utriculata*), water sedge (*Carex aquatilis*), woollyfruit sedge (*Carex lasiocarpa*), western inflated sedge (*Carex vesicaria*), water horsetail (*Equisetum fluviatile*), broadleaf cattail (*Typha latifolia*), Rocky Mountain pond lily (*Nuphar polysepala*), and hardstem bulrush (*Schoenoplectus americanus*).

Other emergent wetland area at the Refuge includes grassland alliances which are dominated by hydrophytic grass species. The most common grass species present at the Refuge, invasive reed canarygrass, is present in monoculture on 311 acres of Refuge land. Not all reed canarygrass monocultures are wetlands, however, as the invasive grass species often colonizes drier sites adjacent to wetland areas. In addition to monocultures of reed canarygrass, the invasive species is also present in some proportion on 64% of other Refuge area. Other hydrophytic grass species present on Refuge wetlands include bluejoint reedgrass (*Calamagrostis canadensis*), and the highly invasive European common reed grass, a Priority 1 noxious weed species in Montana.

Scrub-shrub wetlands are dominated by willow (*Salix spp*.), alder (*Alnus spp*.), or birch (*Betula spp.*). Drummond's willow, sandbar willow, and Sitka willow (*Salix drummondiana*, *S. exigua*, *S. sitchensis*) are present in dominant cover mostly in riparian habitats along the Swan River (SVC 2016). Thinleaf alder (*Alnus incana*) wetland communities occupy areas to the east of Spring Creek as well as low-lying areas around Primary 1 ditch. In addition, bog birch (*Betula pumila*) occurs in dominant cover in an alkaline fen environment and is associated with peatlands on the southeast of the Refuge (SVC 2016).

Hydric soil is present throughout Refuge wetlands. Thick peat accumulations can occur in the northern (downstream) portion of the Refuge depending on location, however silty and loamy soil material is also abundant, and where present, includes a high percentage of redoximorphic (redox) features and/or depleted soils which are highly indicative of wetland soils. In addition, wetland hydrology is present during the growing season at most northerly (downstream) locations on Refuge land. Wetland hydrology has, however, been altered since the early 1900s, and the existing wetland drainage ditch and levee network exerts a significant drying effect especially at southerly locations. Currently, ditches intercept and collect groundwater and surface water and move it downslope to Swan Lake.

A groundwater and surface water monitoring network was installed on the Refuge in 2017, and one year of data was used to inform the restoration design. Although 2018 is characterized as a relatively high-water year, analysis of the data suggests that most locations in the northern half of the Refuge lowlands experience high water tables and soil saturation in the upper portion of soil profiles for most of the growing season during most years (Figure 4-1).

Figure 4-1. Refuge conditions on May 28, 2018. View is looking north from Bog Road.

The highest groundwater retention at the Refuge for the 2017-2018 year of record was in July when the hydrograph of the Swan River dropped sharply, which demonstrates how the expansive Refuge wetlands act as a sponge, absorbing water and helping to control flooding downstream.

4.2.2 Effects of Alternative A (No Action) on Wetlands

Under the No Action Alternative, no additional impacts or effects to wetlands would occur in the Project Area. Wetland environments would continue to be negatively impacted by the existing wetland ditch and levee network. Ditches would continue to collect and carry groundwater and surface water from Refuge wetlands downstream to Swan Lake, and from the ditched wetlands at Cruz WPA to the north. The altered wetland hydrology resulting from the preservation of all wetland ditches and drains would result in continuation of the current wetland hydrology regime, which includes significantly lower water tables than would be present had anthropogenic alterations to the system not occurred, especially in the southern portions of the Refuge. In addition, reed canarygrass populations would continue to dominate Refuge wetland vegetation communities.

4.2.3 Effects of Alternative B (Proposed Action) on Wetlands

Implementation of Alternative B (Proposed Action) would have a major beneficial effect on Project Area wetlands. Placement of strategic ditch fills on the two main ditches at the Refuge that currently collect and convey hydrology out of wetlands and into Swan Lake would result in large-scale wetland hydrology restoration. Furthermore, placement of strategic ditch fills to the west of Swan River and at Cruz WPA would have additional benefits to private land to the north (downstream) of the Refuge and to the WPA. A total of 4,960 feet (0.94 miles) of ditches would be filled under Alternative B (Proposed Action), 160 feet of which would be on USFS land. Ditches would be filled utilizing native material on-site, with the exception of 860 feet of ditch plug access road construction which would necessitate the burial of roughly 800 imported log pieces and 380 cubic yards of imported pit-run fill material. The burial of imported logs and pit-run material would have no adverse impacts to Refuge wetlands and would result in beneficial effects as described below.

The effect of Alternative B (Proposed Action) is a groundwater level increase to approximately 655 acres within and in the vicinity of the Refuge (Table 4-2 and Figure 4-2). Most (87%) of the groundwater increase is projected to occur on Refuge land, while 45 acres of private land would also benefit from increased hydrology downstream of the Primary 5 ditch fill at the northwest corner of the Refuge. USFS land would also benefit from restoration actions, with 33 acres of increased groundwater area adjacent to Refuge land (north of Bog Road) and 2 acres adjacent to (south of) Cruz WPA land. Increased groundwater is expected on 8 acres at Cruz WPA.

Table 4-2. Area of beneficial effect to wetlands.

Impact Area	Acres of groundwater level increase	Acres of Reed Canarygrass Reduction
Swan River NWR	567	371
Cruz WPA	8	0
US Forest Service	35	23
Private Land	45	0
Total Area (Acres)	655	394

Along with the increase in groundwater level, it is projected that invasive reed canarygrass dominance would be reduced on approximately 394 acres of wetland, in favor of desirable native wetland vegetation. The vast majority (94%) of reed canarygrass reduction would occur on Refuge land, and 6% would occur on USFS land north of Bog Road (Table 4-2 and Figure 4-2). Furthermore, in addition to restoration of groundwater levels and wetland vegetation on land already classified as wetlands, Palustrine Emergent Wetlands are projected to increase in area by 57 acres, with an overall increase in wetlands from 1,482 to 1,539 acres occurring on Refuge and USFS lands.

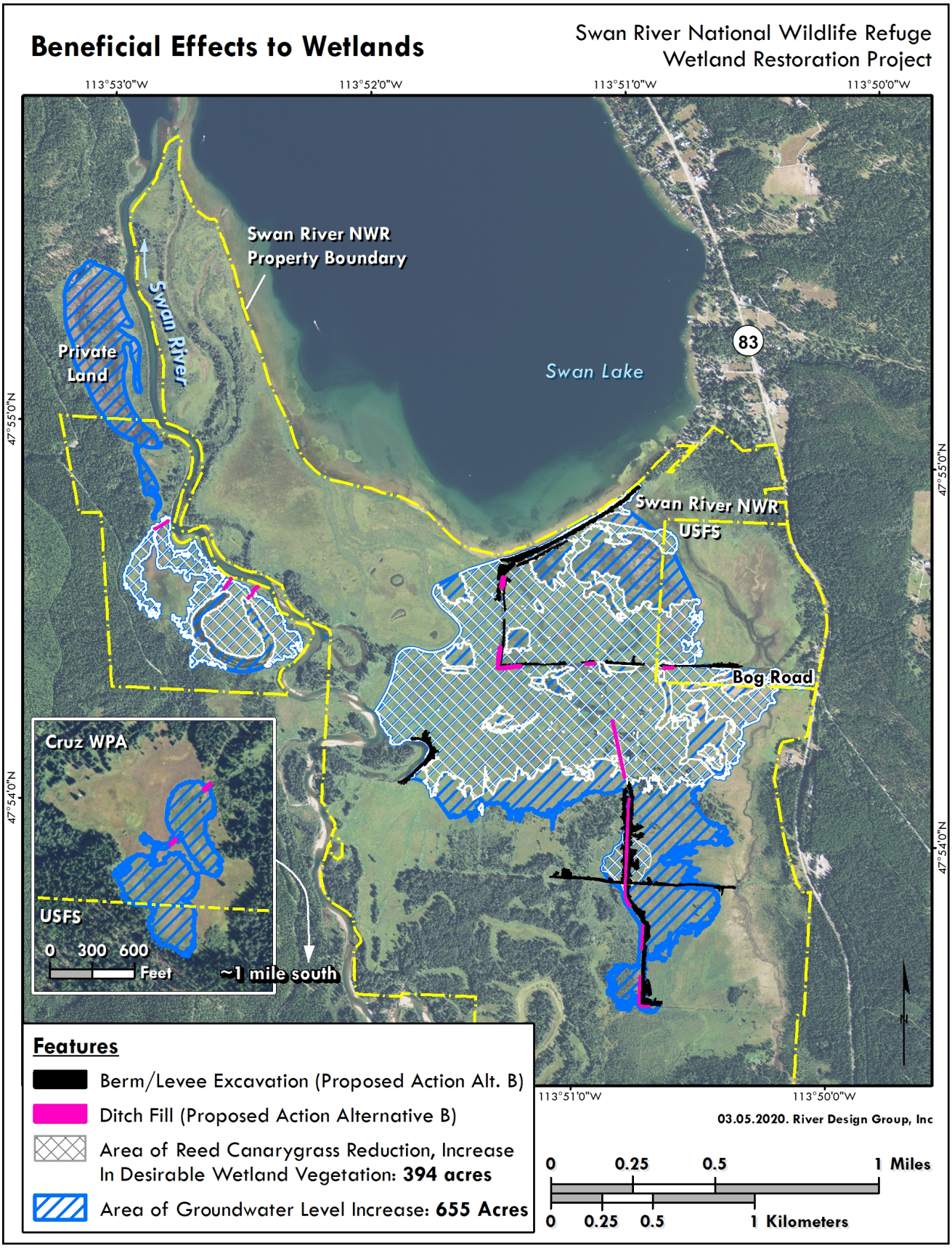

Figure 4-2. Effect of Alternative B (Proposed Action) on wetland hydrology and vegetation.

Restoration of wetland hydrology would occur mostly to existing wetland area at the Refuge as well as the Forest Service parcel and private land to the northwest of the Refuge (Figure 4-2), although most of the wetlands currently exist in a degraded state with artificially lowered groundwater tables and a prevalence of invasive reed canarygrass. Restoration of wetland hydrology would also occur in areas that are currently upland, but prior to human modifications were likely wetlands. While the recharge of groundwater tables will have an impact to these uplands, it is unclear how long a full conversion to wetland would take following implementation of Alternative B (Proposed Action).

Minor temporary adverse impacts to existing wetlands would occur in association with drainage ditch fill placement and associated excavation of berms and levees to generate fill material. Currently, drainage ditches which would be intermittently filled under this Alternative B (Proposed Action) are riverine features with either a gravel/sand/silt bottom at the upstream end, and with rooted emergent hydrophytes or rooted aquatic vegetation in the downstream end of the ditches near Swan Lake. While the placement of fill material would impact these wetlands, a full recovery is expected to occur with time as wetland hydrology is restored, soils are inundated or saturated for a long enough period of time for hydric soil indicators to develop in the upper portion of soil, and wetland vegetation is re-established on fill material surfaces.

In addition, all available wetland and grass sod as well as topsoil would be stripped from berms prior to fill placement, stockpiled during construction, and positioned on top of ditch fills and excavated berms, accelerating wetland recovery. Berms and levees which are currently upland features would be converted to wetlands, and a permanent loss to wetlands through drainage ditch filling would not occur.

Temporary access roads would be established throughout the Refuge to access construction areas, including at levee removal, berm removal, and ditch fill areas. A total of 5.4 miles of temporary access roads (0.30 miles of which occur on USFS land) would be built on existing berm locations which would be wholly removed as the berms are excavated to grade, and only temporary minor adverse impacts to existing wetlands would occur from this activity. However, a moderate adverse effect to existing Refuge wetlands would occur as a result of construction and use of a temporary access route to Levee A (Figure 3-1) and hauling earthen material from Levee A approximately 3,000 feet east to Primary 1 to use as ditch fill. This moderate adverse impact would be mitigated by a complete removal of the constructed road, roughening of the surface, and re-seeding. Moreover, a minor adverse impact to 0.08 acres of emergent wetlands (water sedge-Northwest Territory sedge-tufted hairgrass herbaceous alliance) would occur with the construction of the permanent parking area turnaround improvement. The 0.08 acres of wetland would be permanently converted to uplands, however the adverse impact is classified as minor due to the small disturbance footprint.

Overall, the structure and function of wetlands at the Refuge would significantly benefit from implementation of Alternative B (Proposed Action). The total area and biodiversity of wetlands would increase, as would floodwater attenuation and storage, and the filtration of nutrients, sediment, and pollutants in the system.

4.2.4 Effects of Alternative C on Wetlands

Implementation of Alternative C would have a major beneficial effect on Refuge wetlands. Increases to groundwater tables and a subsequent passive reduction of invasive reed canarygrass in favor of desirable native wetland vegetation would mirror effects of Alternative B (Proposed Action) implementation. In addition, Alternative C would expand upon the Alternative B wetland restoration by completely filling the two primary ditches at the Refuge and actively restoring a 10-acre area which is currently a reed-canarygrass monoculture to a structurally and functionally diverse open water, emergent, and scrub-shrub wetland complex. Total ditch fill under Alternative C is 2.70 miles, 0.25 miles of which occur on USFS land to the north of Bog Road.

Temporary minor adverse impacts to wetland resources are expected from construction and use of most of the temporary access routes within the Refuge, and no mitigation other than what is already planned for the finished grade surface of berms is necessary. In addition, and similar to impacts from Alternative B (Proposed Action), moderate adverse impacts would occur due to the construction and use of a temporary access route to Levee A, including wetland soil compaction as material is hauled from Levee A approximately 3,000 feet east to Primary 1. This moderate adverse impact would be mitigated by the complete removal of the access route, surface roughening and native seed application. Finally, the permanent conversion of 0.08 acres of emergent wetlands to uplands to accommodate the improvement of the parking area turnaround at the Refuge is a minor adverse impact because of size.

4.3 Stream Channels and Fisheries

4.3.1 Existing Conditions

The perennially flowing Swan River drains 729 mi^2 in a long south-to-north oriented watershed, with the Mission Mountain Range to the west, and the Swan Range to the east. Swan River winds south to north for 70 miles from its headwaters in the Mission Mountains before discharging into Swan Lake. Following the narrow 9-mile long lake, Swan River meanders for another 14 miles before emptying into Flathead Lake at Bigfork, Montana. At the Refuge, the Swan River watershed comprises 81% of its total watershed area.

Swan River is located on the western portion of the Refuge, and on the east side, the perennial Spring Creek exerts a dominant influence on wetlands across its approximate 300- to 500-foot wide floodplain area. In addition, two perennial streams, Stopher Creek and Lime Creek, contribute surface water hydrology to wetlands on the west of Swan River, and to the northwest corner of the Refuge. Finally, Gildart Creek flows through Cruz WPA and contributes streamflow to Swan River at the northern end of the WPA.

Swan River supports a multitude of fish populations, including native and nonnative species. Native species include bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), mountain whitefish (*Prosopium williamsoni*), suckers (*Catostomus spp.*), sculpin (*Cottoidea spp.*), and northern pikeminnow (*Ptychocheilus oregonensis*) (SVC 2019). Nonnative fish species have been legally and illegally introduced to the system beginning in the late 1800's, including rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), lake trout (*Salvelinus namaycush*), golden trout (*Oncorhynchus mykiss aguabonita)*, and Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri)*, kokanee salmon (*Oncorhynchus nerka)*, northern pike (*Esox Lucius)*, and walleye (*Sander vitreus)* (SVC 2019).

Spring Creek on the east of the Refuge, and Stopher Creek and Lime Creek on the west (west of Swan River) also support fish populations. Spring Creek supports fish at least in the downstream reach of creek, north of Bog Road, as the reach has high connectivity with Swan Lake. In the upstream reaches, Spring Creek is a groundwater-fed, isolated creek. Fish are also a likely component of Lime Creek and Stopher Creek to the west of the Refuge.

The two main ditches at the Refuge, Primary 1 and Primary 4, are human-made straight, incised channels that flow north to Swan Lake. They originate within the Refuge and were built for the sole purpose of draining Refuge wetlands. RDG has observed fish fry and fingerlings in the upstream portion of the Primary 1 ditch which has some sand and gravel substrate, however the species was unidentified.

4.3.2 Effects of Alternative A (No Action) on Stream Channels and Fisheries

Stream channels and fisheries at the Refuge would not be impacted by the No Action Alternative. Aquatic habitat would remain undisturbed. Swan River depth, cover, and water volume would remain in its current state, providing habitat for the wide diversity of native and nonnative fish species. Ditch channels would remain unaffected, and fish utilizing these human-made channels would remain undisturbed.

4.3.3 Effects of Alternative B (Proposed Action) on Stream Channels and Fisheries

Implementation of Alternative B (Proposed Action) would have a minor beneficial effect on stream channels and fisheries at the Refuge. The intermittent fill of the primary ditches which currently convey water out of Refuge wetlands and into Swan Lake would, over time, result in more water flowing into Spring Creek at the east of the Refuge, as well as Swan River to the west of the Refuge, which would be beneficial to any fish populations that utilize the aquatic habitat of both channels. In addition, the Swan River would have more access to its floodplain during high flows as a result of elimination of Levee A, which is currently located on an oxbow meander bend of the river and activated during high flows. This increased floodplain connectivity would result in increased attenuation of flood flows in Refuge wetlands, and the retention of sediment in wetlands rather than in the channel. The long-term decrease in sediment contribution to Swan Lake has the potential to be beneficial especially to the adfluvial population of bull trout that is present in Swan Lake. Stopher Creek and Lime Creek would be unaffected by Alternative B (Proposed Action).

The fill of a portion of the Primary 1 and Primary 4 ditches would result in a major adverse impact to the aquatic habitat in the ditches, as the aquatic resource would be removed from the Refuge. Any fish currently utilizing these ditches would likely become stranded in the Refuge interior or would move downstream and into Swan Lake. Compared to fishery present in Swan River and likely present in Spring Creek, however, fish habitat in the straight, human-made ditches is marginal and highly degraded.

4.3.4 Effects of Alternative C on Stream Channels and Fisheries

A minor beneficial effect to stream channels and fisheries is expected from implementation of Alternative C. This effect is similar to the effect of implementation of Alternative B (Proposed Action), as the excavation of the additional 10-acre wetland complex, and full fill of Primary 1 and Primary 4 ditches, does not impact natural stream channels and fisheries more or less than Alternative B. The full fill of the Primary 1 and Primary 4 ditches, is, however, expected to adversely affect any fish currently utilizing the ditch environments for habitat. Fish that would not move downstream into Swan Lake would be eradicated under Alternative C. To mitigate mortality to fish, the Service would consult with Montana Fish, Wildlife & Parks to determine appropriate mitigations including backpack electrofishing and netting to remove any fish stranded in the ditch environments.

4.4 Floodplains

4.4.1 Existing Conditions

The portion of the Refuge adjacent to Swan Lake is mapped as a detailed flood study area (Zone AE) with a base flood elevation of 3078.0 feet (NAVD88). Approximately 3000 feet south of the Swan Lake, the Swan River is mapped as an approximate study area (Zone A) without a base flood elevation. The large ditches that collect and convey groundwater and surface water north into Swan Lake (Primary 1 and Primary 4 ditches) are channels that are incised and disconnected from surrounding land. These floodplains are activated at high flows in the north (downstream) portions of the ditches, and it is likely that in southerly portions where land elevations relative to ditch bottoms are much higher compared to the north, floodplains of ditches are not activated even during extreme flood events.

The Swan River floodplain environment through the Refuge is bracketed on much of its shoreline by both natural and human-made levees. The floodplain, however, remains connected in large portions of the river at the Refuge, especially in the downstream portion. One large levee, Levee A, constricts overbank flow of the Swan River, even though this levee is located on an old oxbow meander and is only activated during high flow events. Additionally, a large levee on the southern shore of Swan Lake, Levee C, restricts some flood flow from Swan Lake into Refuge land.

Furthermore, Spring Creek is connected to its floodplain environment, and anthropogenic alterations to the Refuge have had a minimal impact, if any, to Spring Creek floodplain function.

4.4.2 Effects of Alternative A (No Action) on Floodplains

Under the No Action Alternative, floodplain extent, structure, and function would not be impacted. The two large ditches (Primary 1 and Primary 4) would continue to incise and further disconnect from surrounding land. The floodplain of Swan River would continue to be negatively impacted by Levee A, and the floodplain of Spring Creek would remain fully functional.

4.4.3 Effects of Alternative B (Proposed Action) on Floodplains

Alternative B (Proposed Action) would have a moderate beneficial effect on the Swan River floodplain in the Refuge, as the large Levee A would be removed, and Swan River would be able to access its floodplain environment unimpeded by the levee. The removal of Levee C from the southern shore of Swan Lake would also result in an increase to Swan Lake floodplain activation. Floodplains play an important role in stream shading, flood water dissipation, sediment settling and storage, and excess nutrient filtration. The implementation of Alternative B (Proposed Action) would ensure a natural, dynamic, and complex relationship between Swan River, Swan Lake, and floodplain environments at the Refuge, improving aquatic and riparian habitat as well as water quality.

The installation of ditch plugs on Primary 1 and Primary 4 ditches would convert ditch flow to overland surface flow and to groundwater. Most of the land surrounding the ditches, which are currently disconnected floodplain environments, would be converted to wetlands with time or would have increased groundwater tables.

4.4.4 Effects of Alternative C on Floodplains

Implementation of Alternative C would have a moderate beneficial effect to the Swan River floodplain surrounding Levee A, and to the Swan Lake floodplain surrounding Levee C. All effects to floodplains would be identical to effects from implementation of Alternative B (Proposed Action) (Section 4.4.3).

4.5 Water Quality and Beneficial Uses

4.5.1 Existing Conditions

The Montana Department of Environmental Quality classifies the Swan River as B-1. Waters classified B-1 are to be maintained suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. Water quality in Swan River and Spring Creek is presumed high as both waterbodies are not listed as impaired waterbodies by the State of Montana.

Swan Lake water use classification is A-1. Waters classified A-1 are to be maintained suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities. Water quality is maintained as suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. Swan Lake also appears on the State of Montana's list of impaired waters and is impaired for nitrogen, total phosphorus, total sediment, oxygen demand, and sedimentation/siltation. Impairment sources include forest roads (road construction and use), highways, roads, bridges, and infrastructure (new construction). Beneficial uses including agriculture, drinking water, and contact recreation are fully supported, whereas aquatic life is threatened.

4.5.2 Effects of Alternative A (No Action) on Water Quality and Beneficial Uses

The No Action Alternative would have no effect on water quality and beneficial uses associated with Swan Lake, Swan River, and Spring Creek.

4.5.3 Effects of Alternative B (Proposed Action) on Water Quality and Beneficial Uses

Implementation of the Alternative B (Proposed Action) would have a major beneficial effect on water quality and beneficial uses at the Refuge. Increases to Swan River floodplain and Refuge wetland area would improve flood water retention, sediment storage, and nutrient cycling, resulting in improved water quality in Swan River and Swan Lake.

4.5.4 Effects of Alternative C on Water Quality and Beneficial Uses

Implementation of Alternative C would have a major beneficial effect on water quality and beneficial uses at the Refuge, to a similar degree as Alternative B. Floodplain reconnection would improve flood water retention, sediment storage, and nutrient cycling, resulting in improved water quality in Swan River and Swan Lake. The addition of a 10-acre wetland complex would provide additional buffering capacity of Refuge wetlands, potentially improving Swan Lake water quality. All effects to water quality and beneficial uses would be identical to effects from implementation of Alternative B (Proposed Action) (Section 4.5.3).

4.6 Geology

4.6.1 Existing Conditions

The geology of the Refuge is characterized by Alluvium, and the surrounding area by the Belt Supergroup. Fault lines are not present in the Refuge vicinity. The sedimentary Belt Supergroup rock formations were deposited during the Mesoproterozoic Era between 1,470 and 1,400 million years ago in the Precambrian Eon (Evans et al. 2000). One of the largest, deepest, and most exposed ancient rock formations on earth's surface, the basin was exposed by the continental plate collision and uplift that formed the Rocky Mountain chain around 80 million years ago. The Piegan Formation of the Belt Supergroup is located directly to the west of the Refuge.

The meandering and migrating path of the Swan River has shaped Swan Valley, and deposits of alluvium characterize the entirety of project area geology. Swan River is currently located on the western edge of the Refuge, however ancient meander scrolls and channel pathways are evident throughout the Refuge interior.

4.6.2 Effects of Alternative A (No Action) on Geology

The No Action Alternative would have no impact on the geology of the Refuge.

4.6.3 Effects of Alternative B (Proposed Action) on Geology

Implementation of Alternative B (Proposed Action) would have negligible impacts on Refuge geology. Removal of human-made berms and levees, and restoration of Refuge wetland hydrology, would result in a negligible impact to alluvial deposits, however all excavated material would be re-distributed on Refuge land in ditch fills. Similarly, temporary access road construction would disturb alluvial deposits, however the effects would be minimal. Other actions of the Alternative B (Proposed Action) would have no effect on underlying geology.

4.6.4 Effects of Alternative C on Geology

In addition to what is described in Section 4.6.3, implementation of Alternative C would have a moderate adverse impact to alluvial deposits in the 10-acre area which would be excavated to generate fill material, and restored to an open water, emergent, and scrub-shrub wetland complex. These adverse impacts would be mitigated, however, by a re-distribution of the alluvial sediments to ditches and subsequent settling, and no alluvium would be transported off of Refuge land.

4.7 Soils

4.7.1 Existing Conditions

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) has mapped four major soil units within the project area at the Refuge. Much

of the valley bottom surrounding the current location of Swan River consists of Soil Unit 10-3: Aquepts, stream bottoms. It occurs on floodplains with parent material of alluvium. A typical profile includes gravelly loam and very gravelly sandy loam down to 18 inches beneath the soil surface, and extremely gravelly sand from 18 to 60 inches. Frequency of flooding is occasional, and depth to water table is more than 80 inches (NRCS 2019).

Other notable mapped soil units within the Refuge include Map Unit 12: Borosaprists, depressions; 14-2: Glossic Cryoboralfs, lacustrine substratum; and 14-3: Aquepts, lacustrine substratum. Parent material of the Borosaprists is organic matter, it occurs on terraces, floodplains, and moraines, and depth to water table is more than 80 inches. A typical profile includes muck in the upper portion of the soil. For Glossc Cryoboralfs, parent material is lacustrine deposits and it occurs on floodplains and moraines. Depth to water table is more than 80 inches. Finally, the Aquepts are defined as occurring on floodplains, moraines, and terraces, and parent material is lacustrine deposits. Depth to water table is more than 80 inches and no flooding is specified. A typical profile includes silt loam from the surface to 60 inches beneath the soil surface (NRCS 2019).

None of the Soil Map Units are rated as hydric, all are described with a water table greater than 80 inches deep, and frequency of flooding or ponding is occasional to none. Based on groundwater data collected by RDG and observations of flooding, the NRCS Soil Map Unit descriptions do not adequately describe the hydrologic conditions at the Refuge.

4.7.2 Effects of Alternative A (No Action) on Soils

The No Action Alternative would have no impact on project area soils.

4.7.3 Effects of Alternative B (Proposed Action) on Soils

Implementation of Alternative B (Proposed Action) would have a moderate but temporary adverse impact to Refuge soils. Soil disturbance would occur with all berm and levee excavation and ditch fills. Total disturbance would be to 25,090 cubic yards of soil. This disturbance would be mitigated by the re-distribution of all soil within Refuge land. Furthermore, all soil in ditch fills would be topped with stockpiled wetland and grass sod, reducing erosion on newly placed ditch fills. Soil compaction that would occur with temporary access road construction and use, which totals approximately 3,000 linear feet of road, would be mitigated by road reclamation following project completion. This mitigation includes roughening the soil surface and re-seeding with native grass species.

4.7.4 Effects of Alternative C on Soils

In addition to impacts discussed in Section 4.7.3, additional temporary impacts to soils would occur from implementation of Alternative C. Excavation of the additional 10-acre wetland complex to generate fill material would disturb 51,750 cubic yards of soil. This major adverse impact would be mitigated through the complete re-distribution of soils within Refuge land, in the two major ditches that would be entirely filled under this Alternative C. The excavated area would be revegetated with native species where it is not open water, and would include grass seed broadcast over all bare ground surfaces as well as shrub planting in locations to establish a scrub-shrub wetland vegetation community where relative elevations are appropriate and shrub communities are sustainable. All soil disturbance would be mitigated during and immediately after project construction, and soils are expected to fully recover from excavation, fill, and compaction within five years following Alternative C implementation.

4.8 Vegetation

4.8.1 Existing Conditions

Vegetation and Land Cover patterns for the United States are detailed in GAP/LANDFIRE National Terrestrial Ecosystem data, which focuses on overall habitat identification (GAP 2011). Refuge land to the south is within the Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland

ecosystem. This system defines riparian areas in the Northern Rocky Mountain region and is often associated with forested landscapes. The ecosystem classification applies to southern regions at the Refuge, with a dominance of black cottonwood (*Populus balsamifera ssp. trichocarpa*), and other species such as paper birch (*Betula papyrifera*) and Engelmann spruce (*Picea engelmannii*).

Northern Refuge portions are defined as Rocky Mountain Alpine-Montane Wet Meadow and North American Arid West Emergent Marsh. The wet meadow ecosystem occurs on very low-gradient wet sites with surface and subsurface flows, and the Emergent Marsh is often associated with fringes around lakes and frequently/continually flooded (GAP 2011). The Arid West ecosystem classification is misapplied to the Refuge area, as the entirety of Western Montana is in the Rocky Mountain Range and Forest Region (NRCS 2006).

The project area occupies the lowland valley that is surrounded by Northern Rocky Mountain Dry-Mesic and Mesic Montane Mixed Conifer Forest. Dominant forest overstory vegetation includes ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), western larch (*Larix occidentalis*), and Douglas fir (*Pseudotsuga menziesii*). Black cottonwood (*Populus trichocarpa*), quaking aspen (*Populus tremuloides*), and willow species also occur in and in the vicinity of riparian areas. Common forest understory composition includes kinnikinnick (*Arctostaphylos uva-ursi*) and creeping Oregon-grape (*Berberis repens*), as well as grasses and shrubs also present in the surrounding grassland ecosystem.

Vegetation at the Refuge was mapped in detail by Swan Valley Connections in 2016, for the 1,979-acre Refuge area that does not include the 319-acre Cruz WPA. Mapped wetland vegetation is described in Section 4.2.1 of this report. Other vegetation communities include riparian and upland shrubland and forest.

Reed canarygrass is the most pervasive plant mapped at the Refuge. Reed canarygrass is especially invasive in wetland environments but can also thrive in drier communities, and it has formed monocultures in many locations within the Refuge. It spreads by underground rhizomes as well as by seed, and outcompetes desirable native wetland vegetation for light, water, and nutrients. At the portion of the Refuge with detailed vegetation mapping, a total of 311 acres were documented as reed canarygrass monoculture communities (*Phalaris arundinacea* Native and Semi-native Herbaceous Alliance). Most of the monoculture area is in the southern portion of the Refuge which has a significant reduction in hydrology resulting from the active wetland drain ditch (Primary 1). In addition to monoculture populations, Reed canarygrass is present in some percentage on 820 acres of Refuge land mapped by Swan Valley Connections. Vegetation communities with greater than 50% absolute cover of reed canarygrass occupy 396 acres, and 424 acres includes communities with less than 50% cover of the invasive grass.

In addition to the wetland vegetation described in Section 4.2.1 of this report, upland grassland, shrubland, and forest is present at the Refuge. Upland grasslands occur on highly disturbed dry sites, and dominant species include the common pasture grasses Kentucky bluegrass (*Poa pratensis*) and redtop (*Agrostis stolonifera*). A large percentage of other nonnative species also occurs on these upland grasslands, including Timothy grass (*Phleum pratense*), Canada thistle (*Cirsium arvense*) and oxeye daisy (*Leucanthemum vulgare*).

Riparian and upland shrubland alliances at the Refuge are dominated by Bebb's willow (*Salix bebbiana*) and black hawthorn (*Crataegus douglasii*). The dominant upland forest type present on upland slopes west of Swan River is a mixed coniferous/deciduous upland forest alliance, with a dominance of western larch (*Larix occidentalis*), Engelmann spruce, paper birch, grand fir (*Abies grandis*), western red cedar (*Thuja plicata*), and lodgepole pine (*Pinus contorta*) (SVC 2016). Riparian forest at the Refuge is comprised mostly of black cottonwood, quaking aspen, paper birch, Engelmann spruce, and lodgepole pine.

4.8.2 Effects of Alternative A (No Action) on Vegetation

The No Action Alternative would have no impact on vegetation at the Refuge. Wetland vegetation would continue to have major adverse impact from the existing drainage ditch network, which draws water out of wetlands and keeps a portion of historical wetland area as upland. The invasive reed canarygrass would continue to occupy 820 acres of Refuge land in some percentage, including 311 acres of monoculture reed canarygrass grasslands. The highly invasive European common reed grass, a Priority 1A Noxious Weed in Montana, would continue to thrive on a total of 2.71 acres in a patchy distribution to the south of Swan Lake, and would continue to expand and displace native wetland vegetation.

4.8.3 Effects of Alternative B (Proposed Action) on Vegetation

Implementation of Alternative B (Proposed Action) would have a major beneficial effect on wetland vegetation on Refuge land as described in Section 4.2.3. Reed canarygrass would be reduced on 371 acres of Refuge land and 23 acres of USFS land in favor of desirable native wetland vegetation including sedge, rush, cattail, and horsetail communities. A total of 655 acres (567 acres of Refuge, 45 acres of Private, 35 acres of USFS, and 8 acres of Cruz WPA land) would have increased groundwater levels due to plugging of the main ditches that collect groundwater and convey if out of the Refuge, and vegetation communities throughout these areas would have increased water availability for plant uptake.

A major adverse impact would occur to vegetation currently present on ditch spoil berms and levees which would be removed under the Alternative B (Proposed Action). Vegetation in these locations is comprised almost exclusively by reed canarygrass, and black hawthorn trees are also present on the berms along the Primary 4 ditch. A total of 15.77 acres of reed canarygrass monoculture community would be impacted. 12.27 acres of the invasive grass would be entirely eliminated, and 3.50 acres of the grass sod would be stockpiled and used to top ditch fills to combat soil erosion.

A total of 2.96 acres of marsh vegetation would also be impacted around the berm removals and from construction of the temporary access road to Levee A. High-quality wetland sod adjacent to the berms would be removed, stockpiled, and placed on top of bare ground surfaces. An additional 0.08 acres of permanent impact to marsh vegetation would occur with the construction of the parking area turnaround improvement.

The temporary impact arising from construction and use of the temporary access route to Levee A is expected to be fully remediated through road reclamation following construction activity. In addition, approximately 50 black hawthorn trees would be removed from the Primary 4 ditch berm and 12 from Levee A (total of 0.24 acres of impact). Some wood would be utilized in ditch plugs that would also serve as access routes across ditches for construction equipment. In addition, 0.37 acres of impact would occur to the Mixed Coniferous/Deciduous Riparian Forest Alliance, which includes 0.07 acres of adverse impact from the construction of the site access improvement along Highway 83.

Finally, 2.71 acres of European common reed grass would be eliminated from Refuge land with physical or chemical means depending on location. While this removal is a major adverse effect to the Priority 1A Noxious Weed species, it is a major beneficial effect to native wetland sedges, rushes, cattail, and horsetails as the desirable wetland vegetation is expected to re-colonize the locations where European common reed grass is removed.

4.8.4 Effects of Alternative C on Vegetation

In addition to all impacts described in Section 4.8.3, implementation of the Alternative C would have a major adverse impact to approximately 10 acres of a reed canarygrass monoculture vegetation community. This additional area would be excavated to an average depth of 4.5 feet but would include varying topography and would be planted with desirable native herbaceous wetland plants and

riparian shrubs where applicable. A major beneficial effect to Refuge vegetation would therefore occur, as the 10-acre invasive reed canarygrass monoculture area would be converted into a desirable wetland and riparian species habitat with an open water component.

4.9 Waterfowl

4.9.1 Existing Conditions

Waterfowl often use open water and emergent wetland environments for breeding, migration, and wintering habitat, and are dependent on a wide range of environmental conditions to fulfill habitat requirements. Necessary to successful wetland utilization by waterfowl is the availability of high-quality wetland habitat, which includes a diversity of plant species available for forage and cover, a variety of standing water depths, and the absence of disturbance. Some waterfowl nest in upland areas adjacent to wetland habitat, thus the availability of high-quality upland habitat is also essential for many species (Fredrickson and Reid 1988).

Much of the wetlands at the Refuge are degraded due to wetland ditching and draining and invasive reed canarygrass invasion. Reed canarygrass is a much less desirable species for waterfowl habitat than wetland sedges, rushes, and horsetails, as the invasive grass often crowds habitat, reduces open space, and is not preferred forage. Even with the large-scale habitat modifications and disturbance, however, waterfowl actively utilize wetland and riparian habitats at the Refuge. 23 species of waterfowl have been documented at the Refuge. Common species include mallard (*Anas platyrhynchos*), cinnamon teal (*Anas cyanoptera*), blue-winged teal (*Anas discors*), common goldeneye (*Bucephala clangula*), wood duck (*Aix sponsa*), ring-necked duck (*Aythya collaris*), bufflehead (*Bucephala albeola*), common merganser (*Mergus merganser*), and lesser scaup (*Aythya affinis*) (USFWS 2019).

4.9.2 Effects of Alternative A (No Action) on Waterfowl

The No Action Alternative would have no effects on waterfowl at the Refuge. Wetlands would continue to be impacted by wetland drainage ditches and lowered groundwater tables. Wetland habitat available for waterfowl breeding, migration, and wintering would persist in a degraded state with a thriving invasive reed canarygrass community throughout much of the wetland area.

4.9.3 Effects of Alternative B (Proposed Action) on Waterfowl

Implementation of Alternative B (Proposed Action) would have a major beneficial effect on waterfowl populations at the Refuge. With the implementation of restoration actions including drainage ditch filling and berm and levee removals, a general rise in groundwater levels would reduce reed canarygrass occurrence and expand wetland area. Over time, emergent wetland habitat has the potential to increase from a total area of 1,097 acres to 1,200 acres at the Refuge. Wetlands would be allowed to recover naturally following groundwater table increases, and the time to wetland recovery would depend especially on the restored hydrologic regime and future climate conditions. While open water wetland areas with emergent fringe environments are often preferred by waterfowl species, emergent wetlands provide important forage and breeding grounds for many marsh birds. In addition, construction activity for implementation of Alternative B (Proposed Action) would occur after waterfowl breeding and nesting season with minimal adverse impacts due to disturbance or nest destruction.

4.9.4 Effects of Alternative C on Waterfowl

In addition to the beneficial effects described above in Section 4.9.3, implementation of Alternative C would have an additional major beneficial effect to waterfowl populations at the Refuge. The 10-acre wetland complex that would be excavated in an existing reed canarygrass upland would include open water component(s), both shallow and deep

emergent wetlands, and scrub-shrub wetland/riparian habitat. Deep emergent wetlands are usually inundated by six inches to three or more feet of standing water during the growing season (Shaw and Fredine 1971), providing inundated habitat with ample food sources for waterfowl to utilize. Project construction would occur after waterfowl breeding and nesting season, with minimal adverse impacts from disturbance.

4.10 Species of Concern, Threatened and Endangered Species and Critical Habitat

4.10.1 Existing Conditions

A few plant and animal species which are on the Montana Species of Concern List and/or on the Federal List of Endangered and Threatened Plants or Animals are found at the Refuge. Montana species of concern are native species of plants or animals classified as at-risk due to declining populations in Montana (MT NHP and MT FWP 2015). Designation as a species of concern is based on the Montana status rank and is not a regulatory classification (MT NHP and MT FWP 2015).

Water howellia (*Howellia aquatilis*) is a wetland plant which occurs in one distinct location in an abandoned Swan River oxbow at the south of the Refuge. It was removed from the Federal List of Endangered and Threatened Plants, effective July 16, 2021 (USFWS 2021). The species is a Montana Species of Concern and is restricted in Montana to depressional wetlands in Swan Valley and is vulnerable to invasion of reed canarygrass to its habitat (MT NHP 2020).

Three animal species that occur in the vicinity of the Refuge and that may utilize the Refuge for migratory habitat at minimum, are listed as both Montana species of concern and ESA threatened species. These include grizzly bear (*Ursus arctos*), Canada lynx (*Lynx canadensis*), and bull trout (*Salvelinus confluentus*). Grizzly bears have been documented to utilize Refuge land. Bull trout and the Montana native species of concern westslope cutthroat trout have been documented in Swan River and Swan Lake.

Critical habitat for grizzly bear has not been specified. Designated critical habitat for Canada lynx exists to the west of the Refuge in the mountainous coniferous forest. In addition, Swan River and Swan Lake are designated as critical habitat for bull trout.

A Special Status species, the bald eagle (*Haliaeetus leucocephalus*), is also present at the Refuge. The bald eagle has legal protection but is not otherwise a Montana Species of Concern or a federally listed species, however it is protected under the Bald and Golden Eagle Protection Act of 1940. In addition, it is highly likely that the golden eagle (*Aquila chrysaetos*) also utilizes forested environments at the Refuge.

Appendix C of this document includes the Intra-Service Section 7 Biological Evaluation and concurrence.

4.10.2 Effects of Alternative A (No Action) on Species of Concern, Threatened and Endangered Species and Critical Habitat

Under the No Action Alternative, no habitat restoration actions would occur, and therefore no impacts to species of concern, critical habitat, or ESA listed threatened species would occur within the Refuge.

4.10.3 Effects of Alternative B (Proposed Action) on Species of Concern, Threatened and Endangered Species and Critical Habitat

Implementation of Alternative B (Proposed Action) would have no effect on water howellia as the species is only found in one location far removed from any construction activity or project impact area.

Implementation of Alternative B (Proposed Action) may affect but is not likely to adversely affect grizzly bear, Canada lynx, and/or bull trout. Temporary impacts from construction activities may create minor disturbance to grizzly bears and Canada Lynx. These effects will be short-lived and will end with the completion of construction. In addition, measures will be implemented to reduce the potential for animal-human conflicts. Storage and disposal of food, refuse,

construction materials, petroleum products, human waste and other possible attractants in an animal conscious manner would be a requirement in any construction contract at the site, to reduce the potential for impacts to large mammals. However, the long-term beneficial effects to wetland and riparian habitats from Alternative B (Proposed Action) implementation could benefit grizzly bear and Canada lynx populations.

Alternative B (Proposed Action) would have no impact on Canada lynx designated critical habitat which is located to the west of the Refuge. In the intermountain west, preferred Canada lynx habitat is spruce-subalpine fir and lodgepole pine forests at elevations above 4,000 ft. amsl (Ulev 2007). At the direct impact area of Alternative B (Proposed Action) at the Refuge, elevations do not exceed 3,071 ft. amsl and the area includes mainly marshes, wet meadows, and riparian woodland and shrubland.

Similarly, Alternative B (Proposed Action) may affect but is not likely to adversely affect bull trout. While direct construction impact areas are adjacent to both Swan Lake (a portion of the southern shoreline) and Swan River (oxbow meander not on the mainstem, and two small ditches which flow into the mainstem at the northwest of the Refuge), best management practices (BMPs) would be employed during construction to reduce siltation in both the lake and river, including installation of sediment fence and filter fabric where necessary. During active levee removal and ditch filling at the southern shoreline of Swan Lake, some sediment delivery to the lake is expected, however would be minimized with BMPs. In addition, habitat suitability for bull trout is low as near-shore bathymetry on the south shore of Swan lake is shallow, with approximately a 10-foot gradual drop in bathymetric elevation over the first 1,000 feet lakeward from the shore. Elevations continue to drop at the same slope for another 1,000 feet other than a few irregularities, before transitioning sharply to the depths greater than 40 feet (GPS Nautical Charts 2021). While bull trout are noted to generally orient towards the bottom of large lakes, they may use shallow areas given that temperatures do not exceed 59°F (Carnefix 2002), thus a small portion of bull trout habitat in Swan Lake may be temporarily affected by project-related construction activity.

Critical bull trout habitat in Swan River is not expected to be impacted by the project. While a large levee is proposed for removal on an oxbow meander of the river, the oxbow has been disconnected from the mainstem and is not activated except for during flood flows. Construction work would occur in the fall when river stage is low. Furthermore, while small ditch fills are prescribed for two ditches which flow into Swan River at the northwest corner of the Refuge, the scale of the ditch fills and BMPs would severely limit active sediment delivery to the river.

Negligible impact from implementation of Alternative C is expected for westslope cutthroat trout, a Montana Species of Concern, with similar justification for the finding as for bull trout described above. Finally, improved wetland and riparian habitat conditions would result in a moderate beneficial effect to bald eagle and their habitat.

4.10.4 Effects of Alternative C on Species of Concern, Threatened and Endangered Species and Critical Habitat

Implementation of Alternative C would have the same impacts to Montana Species of Concern and Threatened Species and critical habitat as Alternative B, and no additional negative impacts or beneficial effects are expected.

4.11 Historic and Archaeological Resources

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to consider the effects of undertakings on historic properties. In accordance with the implementing regulations for Section 106 (36 CFR Part 800), the agency must first determine whether a given undertaking has a potential to effect historic properties. “Effect” is defined in the regulations as “…alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register” (36

CFR Part 800.16(i)). The term "historic properties" refers to those cultural resources which are included in or eligible for inclusion in the National Register of Historic Places (NRHP). In the case that a proposed undertaking has the potential to effect historic properties (as opposed to no potential to cause effects), those resources must be identified and evaluated for NHRP eligibility. Subsequently, a determination of effect should be assessed with regard to the anticipated effects of the proposed undertaking. Possible determinations of effect under Section 106 are defined as:

- No Potential to Cause Effects (36 CFR Part 800.3(a)(1)): "If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under section 106 or this part";
- No Historic Properties Affected (36 CFR Part 800.4(d)(1)): "…no historic properties present or there are historic properties present but the undertaking will have no effect upon them as defined in 36 CFR Part 800.16(i)…";
- Adverse Effect to Historic Properties (36 CFR Part 800.5(a)(1)): "An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association"; or
- No Adverse Effect to Historic Properties (36 CFR Part 800.5(b)): "…the undertaking's effects do not meet the criteria of [adverse effect]…or the undertaking is modified or conditions are imposed…to avoid adverse effects."

It is in accordance with these definitions of "effect" to historic properties, as outlined in 36 CFR Part 800, that the effects of Alternatives A, B, and C are considered on historic and archaeological resources for the purposes of the current assessment.

4.11.1 Existing Conditions

A file search of Montana State Historic Preservation Office (SHPO) cultural resources records was completed by SHPO personnel at the request of the USFWS Zone Archaeologist on September 3, 2020 for T25N R18W Sections 21, 22, 23, 26, 27, 35 and T24N R18W Section 2. File search results indicate that 18 projects have been previously conducted within the totality of the sections containing the current Proposed Action Alternatives (SHPO 2020a). Two of these previous projects have been located at least partially within the area of potential impact encompassed by the current proposed restoration of wetland hydrology on Refuge land; these include a 1953 symposium consisting of a descriptive overview of nine archaeological sites across the greater Flathead Lake region (LA 6 13769), and a 2011 historic structure inventory and evaluation of a homestead/muskrat farm complex (LA 6 32609). Six sites (five dating to the historic period, and one dating to the precontact period) have been previously recorded within the totality of the sections containing the current Proposed Action Alternative (SHPO 2020b). Two of these sites may be located at least partially within the area of potential impact encompassed by the current proposed restoration of wetland hydrology on the Refuge. These sites include a surficial precontact seasonal campsite (24LA6) which apparently lacks stratified deposits and is considered unevaluated for the NRHP, and a historic homestead and possible muskrat farm (24LA0279) which has been concurrence-determined not eligible for the NRHP. Additionally, according to one report dating to 1953 (LA 6 13769), a previously unrecorded but possible historic railroad spur is noted to occur just south of the southern end of Swan Lake and its associated Levee C. The same report also mentions a previously unrecorded but possible historic concrete dam on Spring Creek (also referred to as Bond Creek) near its mouth on the southeast side of Swan Lake. Both possible historic resources would likely fall within the area of potential impact encompassed by the current proposed restoration of wetland hydrology on Refuge land.

General Land Office (GLO) survey plats were referenced for T25N R18W Sections 21, 22, 23, 26, 27,

35 and T24N R18W Section 2. Within T25N R18W, two original surveys, respectively dating to circa 1912 and circa 1940 (GLO 1912, 1940), depict five individual Homestead Entry Surveys containing buildings that are located at least partially within the area of potential impact encompassed by the current proposed restoration of wetland hydrology on the Refuge (Table 4-3).

Additionally, both historic and modern versions of the 7.5' Swan Lake, MT topographic quadrangle (1965, 1994) depict the occurrence of a building of unknown origin and function in the approximate center of T25N R18W Section 26.

Table 4-3. Homestead Entry Surveys within Proposed Action Alternative impact areas.

Homestead Entry Survey Number	Legal Description (Township, Range, Section)	Dates of Survey Approval/Acceptance	Number of Associated Buildings/Structures Depicted on Plat	Associated Accession Number
109	T25N, R18W, S26,27	1915/1916	2	559603
194	T25N, R18W, S26,27	1915/1916	3	559604
195	T25N, R18W, S22	1918/1918	2	763275
265	T25N, R18W, S23	1915/1916	3	637089
1067	T25N, R18W, S21,22	1922/1922	1	905596

Further, based what appear to be on at least partial depictions on the aforementioned 7.5' Swan Lake, MT topographic quadrangles (1965, 1994), as well as general knowledge of and mapping by LiDAR in association with the current undertaking, a network of historic drainage ditches and levees (which would be subject to modification under Proposed Action Alternative B and Alternative C) are known to occur within the area of potential impact encompassed by the current proposed restoration of wetland hydrology on Refuge land. A search of the Montana Department of Natural Resources & Conservation (DNRC) Water Right Query System for T25N R18W Sections 21, 22, 23, 26, 27, 35 and T24N R18W Section 2 was subsequently completed on October 6, 2020. The search returned over a hundred water rights results for diversions and places of use within the legal locations encompassing Proposed Action Alternative B and Alternative C. These include 24 individual historic water rights (i.e. greater than 50 years in age) which may or may not be relevant to the respective Alternatives, depending on the nature of the water right and/or its specific location on the landscape (DNRC 2020a, 2020b, 2020c, 2020d). It is possible that at least some of the historic water rights may have associated infrastructure (for example: ditches, dams or dikes, manmade levees, headgates, culverts, etc.) persisting on the landscape.

4.11.2 Effects of Alternative A (No Action) on Historic and Archaeological Resources

Under the No Action Alternative, no ground disturbance or other modifications to existing environmental conditions would take place. In accordance with the implementing regulations for Section 106 of the NHPA, the Service has therefore determined that implementation of the No Action Alternative would have no potential to effect historic properties (36 CFR Part 800.3(a)(1)).

4.11.3 Effects of Alternative B (Proposed Action) on Historic and Archaeological Resources

Implementation of Alternative B (Proposed Action) would have the potential to effect historic properties, as numerous historic and archaeological resources are known or suspected to occur within areas of proposed ground disturbance and/or inundation in association with the restoration of wetland hydrology on the Refuge. This could include those historic

properties associated with both the precontact period (within upland areas outside of the floodplain) and historic period (within the floodplain as well as within upland areas outside of the floodplain). As such, prior to implementation of Alternative B (Proposed Action) and in accordance with Section 106 of the NHPA and its implementing regulations (36 CFR Part 800), attempts would be made to identify or relocate all known and suspected precontact and historic resources within the area to be impacted by the proposed undertaking (as detailed in Section 4.11.1 above); this would be accomplished to the extent feasible based upon the potential persistence of these resources on the landscape. Further, a Class III intensive survey would be completed in areas where ground-disturbing activities (including those associated with site access improvements and levee modifications) or new, non-historic inundation are proposed within upland environments potentially adjoining but otherwise outside of the modern, active floodplain. This would include any potentially natural levees and any non-inundated, exposed areas along the southern shoreline of Swan Lake. The purpose of the Class III intensive survey would be to identify any as yet unknown precontact and/or historic resources. The historic significance and NRHP eligibility of all identified or relocated precontact and historic resources would be evaluated, and effects of the proposed undertaking on historic properties subsequently assessed. Consultation with the Montana SHPO, Tribes, and other interested stakeholders would be pursued as applicable based on the determination of Project effect.

Under Alternative B (Proposed Action), the potential for occurrence of intact, undisturbed precontact archaeological deposits is anticipated to be very low within areas of proposed ground disturbance and/or inundation on the floodplain itself. This is due to substantial natural and manmade previous disturbances related to a variety of factors, including the location of the proposed undertaking largely within the modern, active floodplain of the Swan River and Spring and Gildart Creeks. In particular, many correlated natural previous disturbances have likely occurred in association with fluvial and alluvial processes, to include flooding, erosion, and channel migration (as indicated by the widespread presence of abandoned oxbow channels). This is reinforced by the dominance of alluvium across the area, frequently characterized by entisols of more recent age (see Sections 4.6 and 4.7 for additional details), and the presence of hydric soil throughout Refuge wetlands (see Section 4.2.1 for additional details). Further, manmade disturbance has resulted in substantial modification of and alteration to the greater landscape in the form of construction of the existing network of drainage ditches and levees related to past homesteading and agricultural activities. Additional factors considered include a historic water table which was likely substantially higher, along with the associated degree of saturation and surface inundation in areas that are currently upland but were likely formerly wetlands (especially in the southern portions of the Refuge) prior to anthropogenic alterations to the natural hydrology (see Section 4.2 for additional details). In accordance with the implementing regulations for Section 106 of the NHPA, the Service has therefore determined that within the floodplain, implementation of Alternative B (Proposed Action) would have no potential to effect historic properties (36 CFR Part 800.3(a)(1)) associated with the precontact period.

4.11.4 Effects of Alternative C on Historic and Archaeological Resources

Based on the parallels between implementation of Alternative C (with a slightly larger cumulative area of proposed ground disturbance and inundation within the floodplain) and Alternative B (Proposed Action), effects of Alternative C on historic and archaeological resources would be comparable to those under Alternative B (Proposed Action), as would the process for compliance with NHPA Section 106 (discussed in Section 4.11.3 above).

4.12 Recreation

4.12.1 Existing Conditions

The Refuge is currently open to a variety of recreational uses including hunting, fishing and boating, wildlife observation and photography, interpretation, hiking, cross-country skiing and

snowshoeing. Waterfowl hunting is permitted on Refuge land north of Bog Road following Montana State Regulations. In 2019, the USFWS also expanded hunting opportunities on the entire Refuge to big game, including elk, mule deer, and white-tailed deer, for archery-only hunting in the fall in line with Montana State Regulations. Moose and bear are currently excluded from hunting, however black bear archery-only hunting is a proposed addition in 2020-2021. Fishing is allowed per State of Montana Regulations on Swan River, Swan Lake, and Spring Creek north of Bog Road. Boating is also permitted on Swan River and Swan Lake, and the Swan River through the entirety of the Refuge is classified as a 'No-Wake Zone' (USFWS 2013).

The Refuge is open to skiing, snowshoeing, and hiking, however horseback riding is not permitted. Wildlife viewing and photography are encouraged Refuge activities. An interpretive kiosk at the parking area at the east of Bog Road provides visitors with information about the Refuge, ecology of the site, and wildlife habitat, and is open year-round.

4.12.2 Effects of Alternative A (No Action) on Recreation

Recreational opportunities would not be affected under the No Action Alternative. The Refuge would continue to serve the public with opportunities for hunting, fishing, boating, wildlife observation and photography, interpretation, hiking, cross-country skiing, and snowshoeing.

4.12.3 Effects of Alternative B (Proposed Action) on Recreation

Implementation of Alternative B (Proposed Action) would result in minor to major beneficial effects, as well as temporary moderate adverse impacts on recreation. Wildlife observation and photography opportunities would increase as a result of increased wildlife utilizing restored wetland and riparian habitat. For wetland-dependent wildlife species, especially marsh birds and other waterfowl, this shift to preferred forage from reed canarygrass adds to habitat appeal, which in turn contributes to wildlife viewing and photography opportunities. The wetland restoration project would also provide a unique educational opportunity to observe, document, and study the restoration and rehabilitation of previously degraded wetland habitat.

Temporary moderate adverse impacts to hunting and other recreation would occur, resulting from decreased access through Refuge lands during restoration construction activities. These impacts would occur during a portion of one year, as the duration of Alternative B (Proposed Action) implementation is likely to be July through November, depending on specific hydrological conditions of the year. The main entrance to the Refuge and the interpretive kiosk would be closed to the public during highway turnoff improvement construction as well as during import of pit run material to be used for temporary access road construction. In addition, the majority of Refuge land would be closed for all recreation including hunting during the entirety of project construction, as heavy machinery would be used for berm and levee removals and ditch filling activities, and public safety would be prioritized.

Overall hunting area would remain unchanged over the long term, however an increase in waterfowl numbers is expected following Alternative B (Proposed Action) implementation, leading to a major beneficial impact to waterfowl hunting. Big-game hunting is expected to remain unchanged, as are fishing opportunities.

4.12.4 Effects of Alternative C on Recreation

Implementation of Alternative C would result in minor to major beneficial effects, as well as temporary moderate adverse impacts on recreation. Beneficial effects are the same as described for Alternative B (Proposed Action), and temporary moderate adverse impacts would be extended in time, as Alternative C implementation is likely to take more time than Alternative B implementation.

4.13 Invasive and Nonnative Plants and Animals

4.13.1 Existing Conditions

The Refuge contains many nonnative plants, some of which are invasive and/or on the Montana noxious weed inventory list. Most of the nonnative plant species are commonly found in pastures, hayfields, and roadsides in Montana; their presence is not surprising given the history of land use and land modifications at the Refuge and vicinity, and proximity of the Refuge to a state highway.

A noxious weed inventory was completed on roughly 30 acres at the Refuge and 48 acres at Cruz WPA in 2019, and the inventory was targeted to areas with the most vehicle or foot traffic such that the list is likely comprehensive for the project area. Inventoried noxious weed species include Bull thistle (*Cirsium vulgare*), common mullein (*Verbascum Thapsus*), common tansy (*Tanacetum vulgare*), houndstongue (*Cynoglossum officinale*), meadow hawkweed (*Pilosella caespitosa*), orange hawkweed (*Hieracium aurantiacum*), oxeye daisy (*Leucanthemum vulgare*), spotted knapweed (*Centaurea maculosa*), St. John's wort (*Hypericum perforatum*), sulfur cinquefoil (*Potentilla recta*), yellow toadflax (*Linaria vulgaris*), and yellow flag iris (*Iris pseudacorus*).

Many other invasive or nonnative plants that are not noxious weed species are present throughout the project area at the Refuge. Garden bird's-foot-trefoil (*Lotus corniculatus*), field sowthistle (*Sonchus arvensis*), cleavers (*Galium aparine*), common dandelion (*Taraxacum officinale*), creeping bentgrass (*Agrostis stolonifera*), Kentucky bluegrass (*Poa pratensis*), quackgrass (*Elymus repens*), smooth brome (*Bromus inermis*), and reed canarygrass are some of the nonnative plants found throughout the project area. Most are commonly found in pastures and disturbed areas in Montana. Most of the grass species were likely introduced as pasture grasses for cattle feed during ranching operations at the Refuge. Reed canarygrass is especially prominent at the Refuge as discussed in Section 4.8: Vegetation.

Nonnative animal species present at the Refuge include rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), lake trout (*Salvelinus namaycush*), kokanee salmon (*Oncorhynchus nerka)*, northern pike (*Esox Lucius)*, and walleye (*Sander vitreus)* (SVC 2019). Golden trout (*Oncorhynchus mykiss aguabonita)*, and Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri)* are also present in high-elevation lakes within the Swan River watershed but are likely not present at the Refuge. Nonnative bird species that may be present at the Refuge include European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), and Eurasian collared dove (*Streptopelia decaocto*). A very large black slug, the chocolate arion (*Arion rufus*) has also been documented at the Refuge. All above fish and bird species are exotic to Montana but are not considered invasive species.

4.13.2 Effects of Alternative A (No Action) on Invasive and Nonnative Plants and Animals

Implementation of the No Action Alternative would have no additional effects on invasive and nonnative plant and animal species. Reed canarygrass and the Priority 1A Noxious Weed European common reed grass would continue to expand their ranges and displace native desirable wetland and riparian plant species.

4.13.3 Effects of Alternative B (Proposed Action) on Invasive and Nonnative Plants and Animals

Implementation of Alternative B (Proposed Action) would have a major adverse impact as well as a minor beneficial effect to nonnative and invasive plants. Nonnative fish and bird species are likely to not be impacted. As described in Section 4.8.3, nonnative invasive reed canarygrass would be reduced on approximately 394 acres of Refuge land in favor of desirable native wetland vegetation including sedge, rush, cattail, and horsetail communities. This reed canarygrass reduction would occur through passive restoration of desirable native wetland plant communities from increases to groundwater levels that would result from intermittent ditch fills. In

addition, an elimination of European common reed grass from the Refuge would occur with Alternative B (Proposed Action) implementation.

Construction of temporary access roads throughout the Refuge especially where imported fill is needed has the capacity to introduce additional invasive plant species to the Refuge, as any access roads would serve as transportation vectors for seeds. This minor beneficial effect to weed populations, and adverse impact to the environment, would be mitigated through inspection and cleaning of all construction equipment prior to entering Refuge land, and only importing certified weed-free pit run material. Weed monitoring along access routes is encouraged throughout and following construction activity.

4.13.4 Effects of Alternative C on Invasive and Nonnative Plants and Animals

As described in Section 4.8.4 of this report, implementation of Alternative C would have a major adverse impact to the invasive reed canarygrass population in a 10-acre excavation area in addition to the impacts described for Alternative B (Proposed Action) in Section 4.13.3. The excavation of the additional 10-acre reed canarygrass monoculture area would physically reduce reed canarygrass occurrence on 10 acres of Refuge land and would be replaced by desirable native wetland and riparian plants. Nonnative animals would remain unaffected.

4.14 Transportation

4.14.1 Existing Conditions

No major transportation corridors are present on Refuge land. The main access to the Refuge is from State Highway 83 on the east. Southern portions of the Refuge are also accessible from Porcupine Creek Road and National Forest Road 9718, and neither are major transportation corridors to high recreational use areas.

4.14.2 Effects of Alternative A (No Action) on Transportation

The No Action Alternative would have no impact on transportation, and access to the Refuge would remain unchanged.

4.14.3 Effects of Alternative B (Proposed Action) on Transportation

Implementation of Alternative B (Proposed Action) would have no impact on transportation.

4.14.4 Effects of Alternative C on Transportation

Implementation of Alternative C would have no impact on transportation.

4.15 Economics

4.15.1 Existing Conditions

The Refuge is a destination outdoor recreation area for a variety of recreational uses including hunting, fishing and boating, wildlife observation and photography, interpretation, hiking, cross-country skiing and snowshoeing. Hunting and fishing state licenses are required on Refuge land, which brings in-state and out-of-state funds to the conservation programs. In addition, while visiting the Refuge for recreation, users will likely stop at the nearby towns of Swan Lake, Big Fork, and Seeley Lake, and spend money on lodging, gas, supplies, and restaurant patronage.

4.15.2 Effects of Alternative A (No Action) on Economics

Under the No Action Alternative, no effect on economics would occur. Wetlands would persist in a degraded state.

4.15.3 Effects of Alternative B (Proposed Action) on Economics

Implementation of Alternative B (Proposed Action) would have a moderate beneficial effect on economics. Goals established in the CCP would be attained, including a major goal of providing quality

wildlife-dependent recreational and educational opportunities for persons of all abilities to learn, understand, and enjoy the Intermountain ecosystem of northwestern Montana; its associated fish, wildlife and plants of the Refuge; and the National Wildlife Refuge System in a safe and compatible manner (USFWS 2005).

With implementation of Alternative B (Proposed Action), the Refuge has a high probability of attracting increased recreational use from locals as well as non-locals, increasing inputs to local economies. The actions would increase recreational opportunities for all users and visitors to the Refuge. Economic activity both during and after construction would generate revenues for the local and regional economy through lodging, bar and restaurant activity, purchases of hunting and fishing supplies, gas, and hunting and fishing licenses. In addition, implementation activities of Alternative B (Proposed Action) would directly benefit the local economy by providing jobs to local contractors over a one-season construction period.

4.15.4 Effects of Alternative C on Economics

Implementation of Alternative C would have a moderate beneficial effect on economics, the same as what is described in Section 4.15.3 above.

4.16 Visual Aesthetics

4.16.1 Existing Conditions

The Refuge contains expansive and diverse herbaceous, shrub, and forested wetland, riparian, and upland habitat, and depending on location, is visually stunning. It is surrounded by National Forest Land to the east, west, and south, and although State Highway 83 is in close proximity on the east, it does not detract from the scenery. Swan River meanders on the west of the Refuge, Spring Creek is on the east, and the two stream channels and their floodplains provide complexity to the visual appeal of the Refuge. The Spring Creek headwaters area is especially scenic, and a bog birch fen wetland adds to its appeal. Scrub-shrub and emergent wetlands associated with Spring Creek, as well as an Engelmann spruce swamp forest alliance at the very northeast portion of the Refuge, provide some of the most scenic and undisturbed habitat present at the Refuge (SVC 2016).

The existing ditch, berm, and levee network present at the Refuge detracts from visual aesthetics especially in interior portions, as does the dominance of reed canarygrass throughout Refuge land. From the interpretive kiosk at the main entrance, the main berm along the Primary 4 ditch stands out as an unnatural feature on the landscape. Further travel by foot to the Refuge interior yields views of the deep linear ditches and spoil berms side cast alongside them. Furthermore, the dominance of reed canarygrass reduces plant biodiversity and restricts habitat use by waterfowl and other wildlife, which further diminished visual aesthetics.

4.16.2 Effects of Alternative A (No Action) on Visual Aesthetics

The No Action Alternative would have no additional impacts on visual aesthetics at the Refuge. The existing ditch, berm, and levee network, along with dominance of reed canarygrass, would continue to affect visual aesthetics.

4.16.3 Effects of Alternative B (Proposed Action) on Visual Aesthetics

Implementation of Alternative B (Proposed Action) would have a major beneficial effect on visual aesthetics at the Refuge. All berms would be leveled and no longer visible from Refuge viewing locations. Removal of the two levees would also add to aesthetics when Refuge land is viewed from Swan Lake and Swan River.

The most noticeable change over time would be the reduction in reed canarygrass cover once groundwater levels are restored. A gradual shift in dominance from reed canarygrass to desirable native wetland vegetation is expected to occur over 394 acres of Refuge area. This large-scale change in the vegetation community provides benefits to the visual appeal of Refuge vegetation as well as visual aesthetics of increased wildlife utilization of Refuge habitat.

A moderate to major adverse effect to visual aesthetics at the Refuge is expected, however, during the construction period of project implementation. Earthwork and material hauling utilizing large machinery within the Refuge would detract from visual appeal, however this adverse effect is temporary and would be eliminated once project implementation is complete and machinery is mobilized offsite.

4.16.4 Effects of Alternative C on Visual Aesthetics

Implementation of Alternative C would have a major beneficial effect on visual aesthetics at the Refuge. In addition to what is described in Section 4.16.3, Alternative C would not only address groundwater levels but would also revert the landscape back to a more natural state. A total of 2.70 miles of deep, linear ditches would be entirely filled and eliminated from the Refuge. The additional 10-acre area that would be excavated to generate on-site fill material would be changed from an unattractive reed canarygrass monoculture to a structurally complex open water, emergent, and scrub-shrub wetland community, further adding to the visual appeal of Refuge land.

Moderate to major adverse impacts to visual aesthetics would occur during the construction period, however these impacts would be temporary and confined to the construction season.

5 Summary and Cumulative Effects

This section provides a description of the cumulative effects of Alternative A (No Action), Alternative B (Proposed Action), and Alternative C. Cumulative effects are defined as those which result "from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

Previous sections of this Environmental Assessment described the effective scale for evaluating cumulative effects associated with Alternative A (No Action), Alternative B (Proposed Action), and Alternative C. Although the majority of cumulative impacts from these past and future actions are beneficial to the Refuge and its resources, implementation of either Alternative B (Proposed Action) or Alternative C would result in minor and moderate temporary impacts to air quality, soils, invasive and nonnative plants, recreational opportunities, wetlands, channels and fisheries, and cultural and historic resources. These impacts are individually minor or temporarily moderate but are not expected to be collectively major or significant because the actions are separated in both time and space.

Wetland resources would benefit significantly from implementation of either Proposed Action Alternative. Table 5-1 summarizes beneficial effects and negative impacts for the Alternative A (No Action), Alternative B (Proposed Action), and Alternative C.

Table 5-1. Summary and cumulative effects analysis by alternative.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C
Air Quality	No impact on air quality.	Temporary minor adverse impacts on air quality. Construction activity would result in minor and temporary adverse impacts on air quality, as increases in airborne dust would occur.	Temporary minor to moderate adverse impacts on air quality. Construction activity would result in minor to moderate and temporary adverse impacts on air quality, as increases in airborne dust would occur.
Wetlands	No additional impact on wetlands. Wetlands would continue to persist in a degraded state, influenced by altered hydrology resulting from wetland drainage ditches and dominance of invasive reed canarygrass.	Major beneficial effects and temporary minor adverse impacts on wetlands. Major beneficial effects would occur with restoration of wetland hydrology and wetland vegetation. 655 acres are projected to benefit from a groundwater level increase, and 394 acres of reed canarygrass reduction would occur in favor of desirable native wetland vegetation over time. Overall wetland area would increase by 57 acres. Minor and temporary adverse impacts to wetlands would occur with berm and levee removals and drainage ditch fill placement, however a full recovery is expected with time as wetland hydrology is restored and a permanent loss to wetlands in drainage ditches is not expected. Permanent adverse impact would occur to 0.08 acres of emergent wetlands within the parking area turnaround improvement footprint.	Major beneficial effects and temporary minor adverse impacts on wetlands. Major beneficial effects would occur with restoration of wetland hydrology and wetland vegetation. 655 acres are projected to benefit from a groundwater level increase, and 394 acres of reed canarygrass reduction would occur in favor of desirable native wetland vegetation over time. Ten acres of reed canarygrass monoculture would be immediately converted to an open water, emergent, and scrub shrub wetland complex. Overall wetland area would increase by 57 acres. Minor and temporary adverse impacts to wetlands would occur with berm and levee removals and drainage ditch fill placement, however a full recovery is expected with time as wetland hydrology is restored and a permanent loss to wetlands in drainage ditches is not expected. A permanent adverse impact would occur to 0.08 acres of emergent wetlands within the parking area turnaround improvement footprint.
Stream Channels and Fisheries	No impact on stream channels and fisheries.	Minor beneficial effect to major adverse impact. Beneficial effect to Spring Creek and Swan River through increased hydrology following recharge of Refuge wetland hydrology. Increased connectivity of Swan River floodplain due to removal of large levee on oxbow meander. Major adverse impact to two deep ditches with perennial flow, likely effect of fish stranding in the Refuge interior.	Minor beneficial effect to major adverse impact. Beneficial effect to Spring Creek and Swan River through increased hydrology following recharge of Refuge wetland hydrology. Increased connectivity of Swan River floodplain due to removal of large levee on oxbow meander. Major adverse impact to two deep ditches with perennial flow; complete ditch fills would result in elimination of the aquatic resource of the ditches and fish eradication.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C
Floodplains	No additional impact on floodplains. Swan River would continue to be negatively impacted by Levee A, floodplain of Spring Creek would remain fully functional, and the two large ditches would continue to incise and further disconnect from surrounding land area.	Moderate beneficial effect on Swan River and Swan Lake floodplain. Disconnected floodplains of ditches that would be intermittently filled would be converted to wetlands or would have increased groundwater tables.	Moderate beneficial effect on Swan River and Swan Lake floodplain. Disconnected floodplains of ditches that would be completely filled would be converted to wetlands or would have increased groundwater tables.
Water Quality and Beneficial Uses	No impact on water quality and beneficial uses.	Major beneficial effect on water quality and beneficial uses. Expansion of floodplain and wetland area would improve flood water retention, sediment storage and nutrient cycling, resulting in water quality improvements to Swan River and Swan Lake.	Major beneficial effect on water quality and beneficial uses. Expansion of floodplain and wetland area would improve flood water retention, sediment storage and nutrient cycling, resulting in water quality improvements to Swan River and Swan Lake.
Geology	No impact on geology.	Negligible impacts on geology. Alluvial deposits would be disturbed however all excavated material would be re-distributed on Refuge land. Temporary access road construction would temporarily disturb alluvial deposits.	Negligible to moderate adverse impact on geology. Alluvial deposits would be disturbed however all excavated material would be re-distributed on Refuge land. Temporary access road construction would temporarily disturb alluvial deposits. Moderate adverse impact to a 10-acre area as it is excavated and converted to a wetland complex and mitigated by the complete re-distribution of the alluvial deposits on Refuge land.
Soils	No impact on soils.	Moderate adverse impacts on soils. Soil disturbance would occur with all berm and levee excavation and ditch fills, totaling 25,090 cubic yards of soil. Mitigated by re-distribution of all soils within Refuge land, and either planting sod or broadcast seeding over bare ground surfaces to reduce erosion. Soil compaction would occur with temporary access road construction and mitigated by road reclamation following project implementation.	Moderate to major adverse impacts on soils. Soil disturbance would occur with all berm and levee excavation, excavation of 10-acre wetland complex, and ditch fills, totaling 76,840 cubic yards of soil. Mitigated by re-distribution of all soils within Refuge land, and either planting sod or broadcast seeding over bare ground surfaces to reduce erosion. Soil compaction would occur with temporary access road construction and mitigated by road reclamation following project implementation.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C
Vegetation	No additional impact on vegetation. Wetland vegetation would continue to be adversely impacted by lowered groundwater tables and dominance of invasive reed canarygrass.	Major beneficial effects and major adverse impacts on vegetation. A major beneficial effect to wetland and riparian vegetation would occur as increased groundwater would be available for plant uptake. A major adverse impact to invasive reed canarygrass would occur over time as groundwater levels are restored. A major adverse impact to vegetation currently present on ditch spoil berms, levees, and access and parking turnaround improvement areas would also occur, however would be mitigated by sod stockpiling and re-use on top of ditch fills to combat erosion. Black hawthorn trees present on berms and levees would be eliminated (0.24 acres of impact). Priority 1A Noxious Weed species European common reed grass would be eliminated (2.71 acres of impact).	Major beneficial effects and major adverse impacts on vegetation. A major beneficial effect to wetland and riparian vegetation would occur as increased groundwater would be available for plant uptake. A major adverse impact to invasive reed canarygrass would occur over time as groundwater levels are restored, and also would occur immediately in the 10-acre reed canarygrass monoculture area to be excavated. A major adverse impact to vegetation currently present on ditch spoil berms, levees, and access and parking turnaround improvement areas would occur, however would be mitigated by sod stockpiling and re-use on top of ditch fills to combat erosion. Black hawthorn trees present on berms and levees would be eliminated (0.24 acres of impact). Priority 1A Noxious Weed species European common reed grass would be eliminated (2.71 acres of impact).
Waterfowl	No additional impact on waterfowl.	Major beneficial effects on waterfowl. Wetland area would be restored, reed canarygrass would be reduced in favor of more desirable forage and resting habitat for waterfowl.	Major beneficial effects on waterfowl. Wetland area would be restored, reed canarygrass would be reduced in favor of more desirable forage and resting habitat for waterfowl. Additional wetland area would be physically created with open water, shallow and deep emergent wetlands, and scrub-shrub wetland/riparian habitat, increasing desirable habitat for waterfowl in an area that is currently unusable.
Species of Concern, Threatened and Endangered Species and Critical Habitat	No impact on species of concern, threatened and endangered species and critical habitat.	No impact on water howellia. May affect by not likely to adversely affect Grizzly bear, Canada lynx, bull trout. Temporary impacts from construction activities for grizzly bear and Canada lynx would be mitigated by implementation of measures to reduce human-bear/lynx conflict. No impact on Canada lynx critical habitat. Negligible impact on bull trout and westslope cutthroat trout in Swan River and Swan Lake. Moderate beneficial effect on bald eagle habitat from improved wetland and riparian habitat.	No impact on water howellia. May affect by not likely to adversely affect Grizzly bear, Canada lynx, bull trout. Temporary impacts from construction activities for grizzly bear and Canada lynx would be mitigated by implementation of measures to reduce human-bear/lynx conflict. No impact on Canada lynx critical habitat. Negligible impact on bull trout and westslope cutthroat trout in Swan River and Swan Lake. Moderate beneficial effect on bald eagle habitat from improved wetland and riparian habitat.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C
Historical and Archaeological Resources	No potential to affect historic properties	Potential to effect historic properties associated with the precontact period (upland only) and historic period (floodplain and upland); no potential to effect historic properties associated with the precontact period within the floodplain. In accordance with Section 106 of the NHPA and its implementing regulations (36 CFR Part 800), attempts would be made to identify or relocate all known and suspected precontact and historic resources (as discussed in Section 4.11.1) within the area to be impacted by the proposed undertaking where exists a potential to effect historic properties (as discussed in Section 4.11.3). Further, a Class III intensive survey would be completed in areas where ground-disturbing activities or new, non-historic inundation are proposed within upland environments potentially adjoining but otherwise outside of the modern, active floodplain. The purpose of the Class III intensive survey would be to identify any as yet unknown precontact and/or historic resources. The historic significance and NRHP eligibility of all identified or relocated precontact and historic resources would be evaluated, and effects of the proposed undertaking on historic properties subsequently assessed. Consultation with the Montana SHPO, Tribes, and other interested stakeholders would be pursued as applicable based on the determination of Project effect, prior to implementation of Alternative B (Proposed Action).	Potential effects and the associated NHPA Section 106 compliance process would be comparable to Alternative B (Proposed Action).

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C
Recreation	No impact on recreation. The Refuge would continue to serve the public with opportunities for hunting, fishing, boating, wildlife observation, photography, interpretation, hiking, cross-country skiing, and snowshoeing.	Minor to major beneficial effects, and temporary moderate adverse impacts on recreation. Major beneficial effects include increased wildlife observation and photography opportunities, increased educational opportunities to study ecological restoration in action, increased waterfowl hunting, as wetland and habitat is restored. Temporary moderate adverse impacts from access closure related to construction activity.	Minor to major beneficial effects, and temporary moderate adverse impacts on recreation. Major beneficial effects include increased wildlife observation and photography opportunities, increased educational opportunities to study ecological restoration in action, increased waterfowl hunting, as wetland and habitat is restored. Temporary moderate adverse impacts from access closure related to construction activity, which would be longer than under Alternative B (Proposed Action).
Invasive and Nonnative Plants and Animals	No impact on invasive and nonnative plants and animals. Reed canarygrass and the Priority 1A Noxious Weed European common reed grass would continue to expand their ranges and displace native desirable wetland and riparian plant species.	Major adverse impact and minor beneficial effect to nonnative and invasive plants. Major adverse impact to reed canarygrass, as the invasive species would be reduced on 394 acres. Complete elimination of invasive European common reed grass would occur. These major adverse impacts to invasive plants are major beneficial effects to desirable native plant species communities. Construction of temporary access roads would result in a minor beneficial effect to invasive weeds (minor adverse impact to native vegetation) and would be mitigated through inspection and cleaning of construction equipment and monitoring. Nonnative animal species would not be impacted.	Major adverse impact and minor beneficial effect to nonnative and invasive plants. Major adverse impact to reed canarygrass, as the invasive species would be reduced on 394 acres. Additional adverse impact of 10 acres of reed canarygrass monoculture as the invasive grass is physically removed. Complete elimination of invasive European common reed grass would occur. These major adverse impacts to invasive plants are major beneficial effects to desirable native plant species communities. Construction of temporary access roads would result in a minor beneficial effect to invasive weeds (minor adverse impact to native vegetation), and would be mitigated through inspection and cleaning of construction equipment and monitoring. Nonnative animal species would not be impacted.
Transportation	No impact on transportation.	No impact on transportation.	No impact on transportation.
Economics	No impact on economics.	Moderate beneficial effect on economics as increased opportunities for recreation would result in an increased number of visitors to Lake County. Increased expenditures are projected on lodging, bar and restaurant activity, purchases of hunting and fishing supplies, gas, and hunting and fishing licenses.	Moderate beneficial effect on economics as increased opportunities for recreation would result in an increased number of visitors to Lake County. Increased expenditures are projected on lodging, bar and restaurant activity, purchases of hunting supplies, gas, and hunting licenses.

Resource	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C
Visual Aesthetics	No additional impact on visual aesthetics. The existing ditch, berm, and levee network, along with dominance of reed canarygrass, would continue to affect visual aesthetics.	Major beneficial effects and temporary moderate adverse impacts on visual aesthetics. Beneficial effects would occur from removal of human-made berms and levees throughout Refuge and USFS land. Wetland restoration actions would benefit visual aesthetics by providing natural views of the landscape, including a major reduction in invasive reed canarygrass landscape through time, and encouraging increased wildlife use of the Refuge, benefitting wildlife viewing opportunities. Temporary moderate adverse impacts would occur with construction activities. Visual aesthetics are expected to fully recover from construction-related impacts.	Major beneficial effects and temporary moderate adverse impacts on visual aesthetics. Beneficial effects would occur from removal of human-made berms and levees throughout Refuge and USFS land. A major beneficial effect would also occur with the complete removal of 2.70 miles of deep, linear ditches, and return of the landscape to a more natural pre-human disturbance condition. Wetland restoration actions would benefit visual aesthetics by providing natural views of the landscape, including a major reduction in invasive reed canarygrass landscape through time and immediately on 10 acres, and encouraging increased wildlife use of the Refuge, benefitting wildlife viewing opportunities. Temporary moderate adverse impacts would occur with construction activities. Visual aesthetics are expected to fully recover from construction-related impacts.

6 Consultation, Coordination, and Signatures

6.1 List of Preparers

The following personnel were consulted during the development of this EA:

- Benjamin Gilles, Project Leader,
  Western Montana National Wildlife Refuge Complex
- Jim Lange, Refuge Manager,
  Swan River National Wildlife Refuge
- Robert Johnson, Refuge Manager,
  Benton Lake National Wildlife Refuge
- Greg Neudecker, State Coordinator,
  Montana Partners for Fish and Wildlife Program
- Bernardo Garza, NEPA and Hunting & Sport Fishing Coordinator,
  National Wildlife Refuge System, US Fish and Wildlife Service
- Dean Vaughan, Biologist,
  USFWS Partners for Fish & Wildlife Program
- Kevin Ertl, Refuge Manager,
  Western Montana National Wildlife Refuge Complex
- Allison Parrish, Zone Archaeologist,
  MT/UT/WY
  USFWS, Mountain-Prairie Region
- Luke Lamar, Conservation Director,
  Swan Valley Connections
- Selita Ammondt, GISP, Wetland Ecologist,
  River Design Group, Inc.
- Nathan Wyatt, PE, Engineer of Record,
  River Design Group, Inc.
- John Muhlfeld, Principal Hydrologist,
  River Design Group, Inc.

6.2 Pertinent Laws, Executive Orders, and Regulations

National Environmental Policy Act of 1969, as amended: The National Environmental Policy Act (NEPA) requires federal agencies to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions.

Executive Order 11990: Protection of Wetlands: In furtherance of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq.*), in order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practical alternative.

Executive Order 11988: Floodplain Management: Requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

Endangered Species Act of 1973: Provides for the conservation of the ecosystem upon which endangered species and threatened species depend and provides a program for the conservation of such endangered species and threatened species.

Fish and Wildlife Act of 1956: Under this act, the Secretary of the Interior is authorized to take such steps required for the development, management, conservation and protection of fish and wildlife resources including but not limited to research, development of existing facilities, and acquisition by purchase of exchange of land and water.

National Wildlife Refuge Administrative Act of 1966: Defines the National Wildlife Refuge System, and authorizes the Secretary of the Interior to permit any use of an area provided such use is compatible with the major purpose for which the refuge was established.

National Wildlife Refuge Improvement Act of 1997: Expands on NWRS Administration Act of 1966 by providing organic legislation for the National Wildlife Refuge System, and significant additional guidance on management and public use of the Refuge System.

Archaeological Resource Protection Act of 1970: Protects irreplaceable archaeological resources on Federal lands which are 100 years or older.

National Historic Preservation Act of 1966: Authorizes the National Register of Historic Places, establishes the Advisory Council on Historic Preservation, and grants power to the Council to review Federal undertakings that affect historic properties.

Title 50 of the Code of Federal Regulations: Implements numerous laws and executive orders concerning wildlife, including administration of National Wildlife Refuges.

Montana Stream Protection Act (SPA 124 Permit): Any agency or subdivision of federal, state, county, or city government proposing a project that may affect the bed and banks of any stream in Montana. The purpose of the law is to protect and preserve fish and wildlife resources. The law is administered by the Montana Department of Fish, Wildlife and Parks.

Federal Clean Water Act (404 Permit): Any person, agency, or entity, either public or private, proposing a project that will result in the discharge of placement of dredged or fill material into waters of the United States. "Waters of the United States" include lakes, rivers, streams, wetlands, and other aquatic sites. The purpose of the law is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The U.S. Army Corps of Engineers has regulatory review and enforcement functions under the law.

Short-term Water Quality Standard for Turbidity (318 Authorization): 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. The purpose of the law is to provide a short-term water quality turbidity standard for construction activities, to protect water quality, and to minimize sedimentation. The law is administered by the Montana Department of Environmental Quality.

6.3 Public Outreach

Public Notice of the draft EA was made available from April 12, 2021 through May 14, 2021 for a 30-day public comment period. A public open house was held on April 14, 2021 on a virtual platform and at least 29 people were in attendance. Thirty comments were received on the draft EA. Appendix A of the final EA (this document) contains each comment and the written responses to each from the Service.

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Appendix A

Public Scoping Comments and US Fish and Wildlife Service Responses

Comment 1:

Concern that a complete archaeological inventory should be completed before disturbing any ground in the project area due to historical use of the project area for hunting by Native American Tribes. The FWS should contact tribes with ancestral interest in the project area before implementation due to evidence of archaeological resources on the site and some parts of the project area may have once been inhabited by tribal members.

Response 1:

In accordance with Section 106 of the National Historic Preservation Act (NHPA), FWS has made a reasonable and good faith effort to identify historic properties within the defined Area of Potential Effect (APE), and will consider the effects of the proposed undertaking on those historic properties. The Service consulted with the Montana State Historic Preservation Office (SHPO) and provided information to all Tribes with ancestral ties to and/or historical interests in the area.

Archaeological sites and cultural materials which occur on Federal lands are protected under Federal law. In particular, it would be a violation of the Archaeological Resources Protection Act (ARPA) of 1979 to "excavate, remove, damage, or otherwise alter or deface, or attempt to excavate, remove, damage, or otherwise alter or deface any archaeological resource located on public lands" outside the purview of an ARPA permit. It's further noted that any archaeological investigations occurring on Department of the Interior (DOI) property, to include survey, testing, excavation, and collection, must be conducted pursuant to the approval of an "Application for Permit for Archaeological Investigations" (Form DI-1926, Rev. 04/2018), under the authority of ARPA (16 U.S.C. 470aa-mm; 43 CFR 7), the Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225; 54 U.S.C. 320301-320303; 43 CFR 3), and other Federal statutes (such as The National Wildlife Refuge System Administration Act); activities of this nature conducted without a valid permit are thus in violation of the aforementioned statutes. If an individual has knowledge regarding the location of archaeological sites and/or cultural materials on the Refuge, they are encouraged to contact the Refuge Manager, Montana Zone Archaeologist, and/or Regional Historic Preservation Officer (RHPO) to disclose that information, along with any particular concerns they may have regarding potential impacts of the current proposed action or alternatives on those resources.

Comment 2:

Concern on whether the FWS assessment of Historic and Archaeological Resources (HAR) include also those resources on National Forest (USFS) system lands and if those findings are shared with the USFS?.

Response 2:

Our assessment of HAR and the NHPA Section 106 compliance process include those resources on USFS system lands within the defined APE and the findings on USFS Forest system land have been shared with the USFS Archeologist.

Comment 3:

Concern that the EA states that a 60-ft turning radius will be constructed at the junction of the Bog Road and Highway 83 and at the kiosk, and that it does not disclose whether this may require widening that road, to which width, the impact that this action on forested areas and the animals that nest therein, and whether the improved access road increases visitation to the refuge.

Response 3:

Bog road will not be widened from Highway 83 to the kiosk. The improvements will include temporarily increasing the entrance radii from 30 ft to 60 ft to accommodate access for construction equipment; and permanently increasing the parking area radii from 30 ft to 60 ft. Following construction activity, the finished top surface of the intersection of Bog Road and Highway 83 will be reduced back to a 30-foot turning radius, regrading of fill material will occur on the slope, and the slope will be topsoiled and seeded.

The improvements may increase visitation to the Refuge in the long run, especially as the project will gain attention in the vicinity of Swan Lake. The Refuge Recreation Act of 1962 encourages wildlife-oriented recreation given that such uses do not interfere with the primary purpose of the Refuge. The few trees that will need to be removed adjacent to the highway to allow placement of additional road material will not have a significant impact on avian habitat.

Comment 4:

Request to provide the number of acres (for both action alternatives) of USFS system lands (both parcels) that will have increased water levels, acres of reduced coverage of nonnative canary grass, the conversion of upland land acreage to wetlands (if any), lengths of ditches to be filled in, lengths of berms to be removed, and lengths of temporary roads.

Response 4:

The information requested is in the following table.

Metrics	USFS Parcel north of Bog Road	USFS Parcel south of Cruz WPA*	Total
Increased groundwater level area	32.2 acres	2.0 acres	34.2 acres
Reduction in reed canarygrass cover area	22.7 acres	0	22.7 acres
Conversion of upland to wetland area	0.9 acres	0	0.9 acres
Ditch fill/plug length	505 feet	0	505 feet
Berm excavation length	1,340 feet	0	1,340 feet
Temporary roads length	1,135 feet	0	1,135 feet

*No direct construction activity will occur on the USFS parcel to the south of Cruz WPA. However, plugging the wetland drainage ditches on the Cruz WPA property will result in an increase in groundwater level on 2.02 acres of meadow on USFS land. Reed canarygrass populations in that area are unlikely to be affected by the groundwater level increase as threshold inundation level/duration for reed canarygrass reduction are unlikely to be met, at least in the short term. These metrics are the same for both action alternatives.

Comment 5:

Request for information on the season during which the restoration activities would take place.

Response 5:

Work at the project site within the Swan River NWR will occur during the fall months while the water table is at its lowest. Construction would ideally begin during the summer and completed in late fall. The project will be implemented between July 1, 2022 and December 30, 2022.

Comment 6:

Reminder that in order to comply with the Flathead National Forest Plan, no fuel storage or refilling should take place within 300 feet of wetlands and project equipment must be inspected for and cleaned of invasive plant species prior to work on USFS system lands.

Response 6:

All refueling will occur within FWS lands. On Sheet 3.1, the project's Final Design Planset Specifications specifies that:

All equipment shall be washed prior to mobilization to the site to minimize the introduction of foreign materials and fluids to the project site. All equipment shall be free of oil, hydraulic fluid, and diesel fuel leaks. To prevent invasion of noxious weeds or the spread of whirling disease spores, all equipment shall be power washed or cleaned to remove mud and soil prior to mobilization into the project area. It will be the contractor's responsibility to ensure that adequate measures have been taken.

All equipment shall be inspected at a state of Montana Fish, Wildlife & Parks aquatic invasive species inspection station prior to mobilization to the project area. Inspection forms and certifications shall be submitted to the construction manager.

Equipment shall be in a well-maintained condition to minimize the likelihood of a fluid leak. If a fluid leak does occur, the construction manager shall be notified immediately, and all work ceased until the leak has been rectified. At all times during the construction phase, fluid spill containment equipment shall be present on-site and ready for deployment should an accidental spill occur.

Comment 7:

Request for further information on the look of the new entrance to Bog Road from Highway 83, and comment that it will attract traffic, be unsightly, and cause resource damage. Question if the entrance could be restored to the minimum footprint necessary to accommodate visitor access to the parking area after the restoration project is completed.

Response 7:

Following construction activity, the finished top surface of the approach will be reduced back to the original 30-foot turning radius, regrading of fill material will occur on the slope, and the slope will be topsoiled and seeded.

Comment 8:

Recommendation that in the area where Stopher, Lime and Yew Creeks flow into the largest Swan River marsh estuary the old manmade rock dike spanning from the west forested uplands to the river also be breached or removed to avoid a blow out just south of the existing rock dike during spring high water runoff. This could create the river itself to re-channel through the old oxbow marsh to the south. This breach hydrology would regain historical flows north through both Refuge and private land marshland back into the river at its natural outlet east of Yew Creek and recharge the marsh estuary, would increase water levels, decrease reed canarygrass, and improve nesting waterfowl habitat in the largest natural marsh west of the Swan River.

Response 8:

We understand the concern with the rock dike, and while it would be more cost effective and sensible to use that material to fill the ditch, the rock dike is a historic feature and recreationalists use it to access Swan River from USFS Road 9745 with canoes and other boats. There is a natural spillway on the rock dike that is at elevation 3072.5 feet amsl. The Swan River bank just south of the rock dike is at 3074.5 feet. Based on the difference in elevation and the current flow path that exists over the rock dike, it is unlikely that the Swan River bank would blow out during spring high water runoff. In addition, ground elevations remain between 3072 and 3073 feet for 150 feet downstream of the rock dike along the flow path, and it is unclear how long it would take for a channel to form through this 150 feet of higher ground if the rock dike were to be breached. We appreciate that you are in favor of wetland hydrology restoration and improvement of the waterfowl habitat on your private marshland, and while we did consider removing or breaching the rock dike, because of the historical nature of the feature and recreational use it is currently not feasible. When the ditches are filled the natural spillway on the rock dike will provide some increased hydrology, especially temporally, to the marshland to the north of the dike.

Comment 9:

Comment in opposition to excavating any areas not part of the original ditch spoils in order to fill ditches as it would promote habitat destruction and permanently convert a new area. It is possible these areas still have an intact original soil profile and native plant roots could still exist in that profile.

Response 9:

Thank you for your comment.

Comment 10:

Comment opposing election of Alternative C.

Response 10:

Thank you for your comment.

Comment 11:

Comment that the delisting proposal of the water howellia has not been finalized and an impact analysis of the project's effects on this species must be prepared, and that post delisting there must be a monitoring plan in place describing frequency and duration of monitoring, methodology, potential sampling regimes, defines what potential triggers will be evaluated to address the need for additional monitoring, outlines reporting requirements and procedures, and proposes a schedule for implementing the post delisting monitoring plan. The EA does not include or reference the components of that plan.

Response 11:

The Service announced on June 15, 2021 the delisting of the water howellia. However, we have analyzed impacts from this project on this plant species. We invite you to read the next answer for an analysis of water howellia impacts from this project.

Following delisting of the species, the USFWS at a federal level will implement a five-year post-delisting monitoring plan. The draft post-delisting monitoring plan is available for public review on http://www.regulations.gov under Docket No. FWS-R6-ES-2018-0045.

The EA does not include or reference the components of that plan as water howellia will not be affected with this project, and the post-delisting monitoring of the species will be conducted in accordance with the plan and separate from this restoration project.

Comment 12:

Comment indicating that water howellia ponds need to have an annual cycle of filling with water in spring and drying up in summer or autumn. Since the project seeks to restore natural hydrology, impacts to howellia must be analyzed, including those near oxbow ponds. In 1992, a study of the hydrology of the oxbow howellia ponds was prepared for the Nature Conservancy. (Hydrogeology of the Swan River Oxbow Preserve Area, Lake County, Montana by Robert C. Anderson).

Response 12:

We invite you to read our answer to the previous comment and to see Figure 4-2 on Page 15 of the Draft EA. Based on the topography and groundwater well monitoring data, the area of groundwater level increase is 740 feet away from the population of water howellia in the oxbow wetland and impacts to water howellia are not expected.

Furthermore, according to Federal law “Most land management activities that could disturb vegetation surrounding water howellia occurrences on State and Federal land are now prohibited. Land management activities that could disturb vegetation within 300 feet of water howellia occurrences on USFS lands in Montana and California are typically not allowed because of standards and guidelines to protect the plant included in USFS Forest Plans” (USFS 1995, in Federal Register V. 84, Number 194, October 7, 2019).

The oxbow pond area where water howellia occurs is 740 feet away from the projected groundwater level increase area at the Refuge, 1,200 feet away from any construction activity, and we maintain that water howellia will not be impacted by this project.

Comment 13:

Comment requesting a copy of the USFWS 2016 vegetative community survey to the local Forest Service Botanist to confirm that Refuge actions on National Forest system lands will not affect species of conservation concern.

Response 13:

We provided the requested survey to the USFS on May 19, 2021.

Comment 14:

Comment requesting clarification that the USFWS assessment includes consultation on all species protected by Endangered Species Act (bull trout, Canada lynx, grizzly bear, whitebark pine, Howellia aquatilis and meltwater stonefly) on the Refuge and on USNF system lands.

Response 14:

The latest Intra-Service Section 7 Consultation that the Refuge has carried out with its Ecological Services counterparts in Montana includes consultation on all federally listed and candidate species that encompass the area of the National Forest Service lands affected by the project. We encourage you to read our response to Comment 11 for further information about the water howellia.

Comment 15:

Comment providing information on the history of the project site and how human activities modified the hydrology with its consequences on the local fauna, and expressing that this project's activities will inevitably introduce more exotic plants to the project area.

Response 15:

While the restoration actions will not fully restore the wetlands to pre-1900 conditions, removal of the man-made levees and berms and fill of the wetland drainage ditches with the original ditch spoil berm material will restore groundwater hydrology to pre-disturbance conditions. This will, over time, result in reduction of invasive reed canarygrass in favor of desirable wetland vegetation. Reversing the actions of past wetland ditching and draining efforts will result in a self-sustaining resilient ecosystem with a natural hydrologic regime and soil forming processes, a trajectory towards natural and dynamic vegetation succession, and the provision of habitat for wetland-dependent wildlife species.

Species that have become accustomed to the altered environment at the Refuge will be disturbed in the short-term during and following construction but are likely to adapt and adjust to the restored conditions just as they did when the area of the Refuge was originally altered.

Those carrying out the project will inspect their machinery to ensure it will be weed-free. The introduction of noxious weeds and other exotic plants from machinery will be closely monitored the year after construction and actions to eradicate species will be taken if necessary.

Comment 16:

Comment providing information from a previous study of the project area where it states that: "In spite of springtime overbank flooding being common on this reach of the Swan River, the oxbow pond does not appear to be affected. The Porcupine Creek Road berm and a man-made levee along the river north of the Porcupine Creek Road prevent this overbank flooding from inundating the Preserve and oxbow pond."

Response 16:

Porcupine Creek Road and the berm along it will not be affected. There appears to be a man-made levee along Swan River approximately 2,200 feet downstream of the Porcupine Creek Road bridge that would influence overbank flooding into the oxbow pond, and that levee is not proposed to be removed.

Comment 17:

Comment indicating that the EA should investigate whether this is Levee A and what the impacts of removing that levee will have on the oxbow pond.

Response 17:

Levee A is 6,600 feet downstream of the oxbow pond, and its removal will not have any effect on the oxbow pond and the water howellia in it. We encourage you to read our response to Comment 11 as well.

Comment 18:

Comment expressing that this project has the potential to introduce new weeds and/or spread existing weeds on the Refuge and requesting to know where the certified weed free pit run will come from and why the gravel is not required to be weed free. Finally requesting information on what invasive plant species monitoring will be carried out.

Response 18:

The ability of noxious weeds to survive and propagate is very low within the proposed high groundwater conditions in the interior of the Refuge, however monitoring for weeds will occur the year following construction. Weed spread will be closely monitored in the highway access and parking area improvement locations the year following construction activity, as these areas are uplands.

Pit run material will come from a nearby source to be determined by the contractor. Gravel will only be used to top the Highway 83 access improvement and parking area expansion; gravel is not commonly certified as weed free because of the nature of the rock and how it is processed.

Weed monitoring over all construction surfaces will occur the year following construction.

Comment 19:

Comment expressing that restoring wetland hydrology would be nice that that the project is unnecessary, and that the amount of disturbance from access roads, digging out ditches, importing fill with dump trucks, running heavy equipment through the site, widening the bog road, spreading more weeds, compacting soils, is not worth the risk.

Response 19:

The vast majority (87%) of access roads will be the tops of the existing berms and levees which will be leveled to surrounding wetland elevations as part of the restoration project (total of 24,705 feet). Fill of the wetland drainage ditches will occur with the on-site material excavated from the existing berms and levees. The only fill that will be imported to the site is pit-run material that is necessary where machinery will traverse over ditches (860 feet), and where one temporary access route needs to be established to access and haul Levee A material east to the ditch (3,030 feet). The material on that temporary access route will be removed following construction and placed in the ditch as a ditch plug.

The heavy equipment necessary for project construction will be confined to the tops of the existing berms and levees, as well as the one temporary access route to/from Levee A.

Bog Road will not be widened, only the turning radius from the highway will be temporarily widened and the parking area turning radius will be permanently improved. Weed spread will be monitored closely in these locations as well as in the interior of the Refuge. The weed spread concern in the interior of the Refuge is mitigated

by the fact that finished ground elevations will be at wetland level and noxious weeds that we are concerned about with machinery are mostly upland species.

While soil compaction will inevitably occur on the access roads, only one route will be established through existing wetlands. Especially with the restored wetland hydrology, soil compaction from machinery is expected to revert to previous conditions in the years following construction.

Comment 20:

Comment requesting a description of the native seed mix intended for restoration on USFS system lands for approval by the USFS.

Response 20:

A native seed mix will be used on USFS lands to the north of Bog Road, on approximately 0.12 acres. Native species will include the following:

- Slender wheatgrass (*Elymus trachycaulus*)
- Bluejoint reedgrass (*Calamagrostis canadensis*)
- Tufted hairgrass (*Deschampsia caespitosa*)
- Meadow barley (*Hordeum brachyantherum*)

Comment 21:

Comment recommending to identify fishes stranded by the project's implementation and work with Montana Fish, Wildlife and Parks to deal appropriately with them.

Response 21:

We consulted the Montana Fish, Wildlife & Parks Region 1 Fisheries Biologist and he replied that that any fish found will not likely be species of concern and recommending proceeding with the project without salvaging fish from the historic ditch. The biologist further stated that the amount of time and effort to conduct such a salvage would not have an appreciable effect on the fish populations of Swan Lake."

Comment 22:

Comment expressing that importing pit-run fill materials for the improved Bog Road highway turn off and turnaround area could introduce new noxious weeds and that the draft EA should consider this. Recommendation to plan to survey and treat the following year as needed.

Response 22:

There is a possibility for noxious weed introductions in the highway turnoff and parking improvement areas. Monitoring and treatment of weeds will occur the year after construction.

Swan River NWR is monitored and treated annually by the USFWS's Invasive Species Strike Team for noxious weeds. The Restoration Project Area will be added to the Strike Team annual monitoring responsibilities.

Comment 23:

Comment expressing that the effects of hydrology on and the resiliency of reed canarygrass were not sufficiently analyzed nor discussed in the EA. Would like to see further discussion regarding the effects of the hydrologic alterations on year-round water table levels throughout the project area, and a justification on how these changes should be sufficient to reduce or eliminate reed canarygrass.

Response 23:

Thank you for your comment and the information you provided for our consideration. Please refer to Appendix E, Swan River National Wildlife Refuge Wetland Restoration Assessment (2018), which includes an assessment of how the proposed restoration actions are likely to affect the existing vegetation at the Refuge. The only control Refuge managers have on the water table is the elimination of the wetland drainage ditches such that they do not collect and convey groundwater and surface water downstream and out of Refuge wetlands. While targets could be set for groundwater elevations to emulate a year-round hydrologic regime, it is not recommended because there is only one feasible action to restore the hydrology. It is unclear how the proposed alterations will affect the temporal hydrologic flow and water table. What is apparent is that by eliminating ditch flow though strategically plugging the main ditches that collect and convey water out of Refuge wetlands, the hydrology that was previously lost from the system will be retained in the wetlands. As outlined in Appendix E, we can expect that reed canarygrass can be reduced especially in northly locations, where a conservatively estimated 1-foot rise in groundwater level as a result of this project is expected to cause reed canarygrass to be effectively drowned out. Evidence for this effect can be seen in vegetation transects in northerly locations near Swan Lake, where a 1-foot drop in surface elevation corresponded with an elimination of reed canarygrass from the vegetation community relative to adjacent areas that were 1-foot higher and had 60-100% cover of reed canarygrass (Figures 3-9 and 3-10 on Page 22 of Appendix E). In those locations, during the 2018 water year the ground was continuously inundated with water between January 1 and August 1; between August 1 and September 1 the water table was within 12 inches of the soil surface. Conversely, the mixed coniferous and deciduous riparian forest mapped at the south of the Refuge is currently too dry for reed canarygrass dominance for the most part. Here, a ground elevation drop of one foot often coincides with an increase in reed canarygrass, and it can be expected that with a 1-foot elevation of the groundwater table in these areas, a subsequent increase in reed canarygrass will occur. However, the structurally diverse mixed coniferous and deciduous forest canopy, with both a woody species overstory and understory, should offset some of the increases to reed canarygrass habitat, as light penetration to the ground is reduced.

Comment 24:

Comment that restoration projects should include post-project monitoring to evaluate project success and provide a mechanism for adaptive management based on monitoring results when necessary, and that the EA does not adequately address these. It should be critically important to the USFWS to evaluate how the proposed surficial changes actually change hydrologic flow, change vegetation composition, and change canopy cover of reed canarygrass and common reedgrass (Phalaris australis).

A monitoring plan should include at a minimum:

1. Continued water table measurements throughout the year for at least 5 years.

2. Remapping of vegetation when vegetation changes from the altered hydrologic regime would be expected (perhaps in 3-4 years) and repeated when a new equilibrium is reached regarding vegetation communities.

3. Annual assessment of changes in reed canarygrass and common reedgrass cover and extent over time (minimum 5 years).

Response 24:

Project monitoring will include the following:

- Continued water table measurements for a minimum of 5 years.

- Re-mapping of vegetation communities 5 years following construction, using a combination of remotely-sensed data (high-resolution Unmanned Aerial Systems (drone) orthophotos) and ground-sampling/ground-truthing representative vegetation communities.

Adaptive management is part of the overall Refuge management plan and will include weed control and assessment of the stability of the ditch plugs. The only portion of the hydrology that managers can control is whether or not the wetland drainage ditches function to drain hydrology out of the wetlands.

Comment 25:

Comment expressing disagreement that Phragmites australis is more invasive than reed canarygrass in this environment.

Response 25:

Thank you for your comment.

Comment 26:

Comment expressing skepticism that flipping sod of rhizomatous species upside down is an effective way to kill plants or that there is research proving that this method is effective. If that sod is used in the ditch fill, care must be taken to bury it very deep.

Response 26:

We agree, simply flipping the sod of the rhizomatous grass species upside down will not kill the grass, as the shoots would change direction and grow through the sod. The sod mat will be excavated, flipped, and buried in the deepest part of the ditch that we will be filling. At the location where we are proposing to bury the sod in the ditch, the ditch is the largest and deepest ditch on the Refuge, and the sod buried in it will be continuously under the groundwater table. Our presentation had not made this clear.

Comment 27:

Comment mentioning the importance of beavers to the wetland ecosystem of the lower Swan Valley wetlands and inquiring if their trapping is disallowed and posted as such in the Refuge.

Response 27:

Trapping is a prohibited activity on Swan River NWR. This regulation is listed on our Public Use Brochure under Prohibited Activities. Brochures are typical available at Kiosks and information boxes located on the Refuge. The Complex has recently hired a new Federal Law Enforcement Officer. Part of his Responsibilities include Swan River NWR.

Comment 28:

Comment expressing shock upon discovering that, prior to the conclusion of the public comment period, a $1 million grant was secured to carry out the project this summer (2021). [See: https://flatheadbeacon.com/2021/05/03/swan-river-national-wildlife-refuge-receives-1mgrant-for-wetland-restoration/] as this would seem to imply that public review period and NEPA process were not followed and the process was pre-decisional.

Response 28:

The Service follows CEQ as well as USFWS NEPA implementation guidelines to ensure compliance with the letter and the intent of this and other environmental protection laws. The public review and comment period set for this project was intended to request and gather comments, opinions and information provided by the public. The information and opinions gathered in this way are important for this project and valued for the Service. All comments received have been reviewed and analyzed by the Service. Whenever new and substantive information comes to light, the Service uses it to inform its decisions and improve its environmental decision documents. This EA was helped and updated based on various substantive comments received during the public review period. The Service is often constrained by critical timing on grant applications and the need to plan ahead and schedule possible field work in order to not miss key windows of opportunity to accomplish necessary work. The grant application was submitted while the EA was still being developed due to existing, external grant application schedules, and not because any final decision had been made by the Service regarding this project. Missing key application deadlines would have meant a year-long delay in the implementation of this project. Nevertheless, this project was not approved prior to the release of the draft EA and the completion of the public comment and the Service's review of public comments. Furthermore, the project implementation timeline has been pushed back to the summer/fall of 2022.

Comment 29:

Comment providing an excerpt from a symposium on Archaeological Sites in the Flathead Lake Region, Montana from Montana State University in 1953, containing information at An Archaeological Site at Swan Lake (Site 24LA6) in the refuge area, and asking to enter it into the administrative record for the Swan River National Wildlife Refuge Wetland Restoration Project.

Response 29:

The information provided by the commentator has been entered it into the Administrative Record for this project.

Comment 30:

Comment expressing agreement with the purpose and need of the project to restore the natural hydrology to benefit native plant communities, wildlife resources and water quality in Swan Lake itself.

Response 30:

Thank you for your comment.

- End of public comments and responses –

Appendix B

Finding of No Significant Impact

FINDING OF NO SIGNIFICANT IMPACT
AND DECISION FOR SWAN RIVER NATIONAL WILDLIFE REFUGE
WETLAND RESTORATION PROJECT

SWAN RIVER NATIONAL WILDLIFE REFUGE
LAKE COUNTY, MONTANA

The U.S. Fish and Wildlife Service (FWS), National Wildlife Refuge System (NWRS) is proposing to restore wetland habitat on Swan Lake National Wildlife Refuge. The restoration project proposal area encompasses 2,298 acres of land on Swan River NWR and Cruz Waterfowl Production Area (WPA), and would additionally affect approximately 143 acres of U.S. Forest Service land and 45 acres of private property. This wetland restoration project is in accordance with the refuge's Comprehensive Conservation Plan (CCP). However, the USFWS must still examine the potential effects of the restoration project on Refuge and surrounding lands, and has written an Environmental Assessment (EA) to analyze possible environmental consequences of this action.

Selected Action

Alternative B—Proposed Action Alternative:
Under this Alternative, the FWS will restore wetland habitat for wildlife and enhance public use opportunities on Swan River National Wildlife Refuge by restoring wetland hydrology through the strategic fill of wetland drainage ditches, generating fill material through excavation of all earthen material remaining on-site within original drainage ditch spoil berms and levees, passively restoring wetland vegetation, incorporating the physical and chemical removal of European common reed grass, and improving the parking area turnaround at the interpretive kiosk at the main entrance of the Refuge. Construction of temporary access roads will be necessary for project implementation, and all temporary access roads will be fully reclaimed following completion of the project.

This alternative was selected over the other alternatives because:
Alternative B will best address the management actions described in the CCP, including: addressing habitat needs for wildlife, restoring wetlands, and enhancing compatible public use.

Other Alternatives Considered and Analyzed

Alternative A—No Action Alternative:
Under this Alternative, no restoration actions would occur, and existing wetlands would remain in degraded conditions and the proliferation of invasive plant communities would continue to displace desirable native Refuge wetland vegetation. Existing wetland drainage ditches would not be reclaimed, existing flood levees would remain in place, and no improvements to public use facilities would occur.

This alternative was not selected, because:
The No Action Alternative does not address the deficiencies identified in the Purpose and Need for Action, nor would it meet the recommendations of the CCP.

Alternative C:
Under this Alternative, all actions described under Alternative B would be implemented. Additionally, the FWS would fill the entire length of the two main ditches at the Refuge to revert the landscape back to a more natural state. Since the original wetland drainage ditch excavation and levee construction, ditch spoil berm and levee material has eroded away, and not enough material remains to completely fill the two main ditches. The additional fill material needed to completely fill the two main ditches would be generated through the excavation of an additional wetland area.

This alternative was not selected, because:
Alternative C would result in the same restoration of wetland hydrology and habitat as Alternative B, the Proposed Action Alternative, but with significantly more cost and disturbance to the Refuge. Restoration objectives can be achieved through strategically plugging the two main ditches that currently convey water out of Refuge wetlands with all available on-site earthen material in ditch spoil berms and levees (Alternative B). Alternative C has a low Benefit-Cost ratio; the added benefit of completely filling the main wetland drainage ditches is outweighed by the environmental cost of excavating a new wetland area with additional short-term disturbance to habitat, and the monetary cost associated with the additional earthwork and revegetation efforts.

Summary of Effects of the Selected Action
An EA was prepared in compliance with the National Environmental Policy Act (NEPA) to provide decision-making framework that 1) explored a reasonable range of alternatives to meet project objectives; 2) evaluated potential issues and impacts to the refuge, resources and values; and, 3) identified mitigation measures to lessen the degree or extent of these impacts. The EA evaluated the effects associated with each Alternative. It is incorporated as part of this finding.

Implementation of the agency's decision would be expected to result in environmental, social, and economic effects including: major beneficial impacts on wetlands, water quality, waterfowl and recreation; major adverse impacts to nonnative and invasive plants; both adverse and beneficial impacts to stream channels, fisheries, and vegetation; and moderate adverse impacts to soil.

Measures to mitigate and/or minimize adverse effects have been incorporated into the selected action. These measures include: re-distribution of soils within Refuge land, planting sod or broadcast seeding over bare ground surfaces to reduce erosion, temporary access road reclamation following project implementation to mitigate soil compaction, elimination of black hawthorn trees present on berms and levees, elimination of European common reed grass, identification or relocation of all known and suspected pre-contact and historic resources within the impacted area, completion of a Class III intensive survey in areas where ground-disturbing activities or new, non-historic inundation are proposed within upland environments potentially adjoining but otherwise outside of the modern, active floodplain, and consultation with the Montana SHPO, Tribes, and other interested stakeholders as applicable based on the determination of Project effect.

Other effects and mitigation measures of the selected action are described in detail in the EA.

While refuges by their nature are unique areas protected for conservation of fish, wildlife and habitat, the proposed action will not have a significant impact on refuge resources and uses for several reasons:

- The action will result in beneficial impacts to the human environment, including the biodiversity and ecological integrity of the refuge, as well as the wildlife-dependent recreational opportunities and socioeconomics of the local economy, with only negligible adverse impacts to the human environment as discussed above.
- The adverse direct and indirect effects of the proposed action on air, water, soil, habitat, wildlife, aesthetic/visual resources, and wilderness values are, overall, expected to be minor and short-term. The benefits to long-term ecosystem health that these efforts will accomplish far outweigh any of the short-term adverse impacts discussed in this document.
- Planned mitigation measures will contribute to the reduction and elimination of adverse impacts to the analyzed resources.
- The action is not in an ecologically sensitive area.
- The action will not impact any threatened or endangered species; or any Federally-designated critical habitat.
- The action will not impact any cultural or historical resources.
- The action will not impact any wilderness areas.
- There is no scientific controversy over the impacts of this action and the impacts of the proposed action are relatively certain.
- The proposal is not expected to have any significant adverse effects on wetlands and floodplains, pursuant to Executive Orders 11990 and 11988.

Public Review

The proposal has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include: Montana Department of Fish, Wildlife and Parks, Swan Valley Connections, River Design Group Inc., Montana State Historic Preservation Office, Confederated Salish and Kootenai Tribes, Confederated Tribes of the Colville Reservation, Kootenai Tribe of Idaho, Fort Belknap Indian Community, Apache Tribe of Oklahoma, U.S. Forest Service, U.S. Army Corps of Engineers-Helena Regulatory Office, Lake County Planning Department, Montana Department of Transportation, Montana Department of Environmental Quality, FWS Ecological Services Office, Montana Department of Natural Resources and Conservations, and The Southwestern Crown Collaborative.

Public Notice of the EA was made available from April 12, 2021 through May 14, 2021 for a 30 day public comment period. Thirty comments were received on the draft EA. Appendix A of the final EA contains each comment and the written responses to each from the FWS.

Finding of No Significant Impact

Based upon a review and evaluation of the information contained in the EA as well as other documents and actions of record affiliated with this proposal, the FWS has determined that the proposal to implement the wetland restoration project on the Swan River NWR does not constitute a major Federal action significantly affecting the quality of the human environment under the meaning of section 102 (2) (c) of the National Environmental Policy Act of 1969 (as amended). As such, an environmental impact statement is not required.

Decision

The FWS has decided to begin wetland habitat restoration by reestablishing natural wetland hydrology and reversing the actions by which the wetlands were originally drained through the filling of ditches and removal of berms and levees. The project will be implemented between July 1, 2022 and December 30, 2022.

The action is consistent with applicable laws and policies.

STACY ARMITAGE

Digitally signed by STACY ARMITAGE
Date: 2021.10.06 09:25:31 -06'00'

_____ _____

Title Date

Appendix C

Intra-Service Section 7 Biological Evaluation

Intra-Service Section 7 Biological Evaluation Form - Region 6

Originating Person: Robert F. Johnson Jr. Date Submitted: 02/01/2021

Telephone Number: 406-727-7400X226

I. Service Program and Geographic Area or Station Name:
Swan River NWR and adjacent Forest Service lands in the project area.

II. Flexible Funding Program (e.g. Joint Venture, etc) if applicable: NAWCA Grant and Kerr Dam Mitigation Funding

III. Location: Swan River NWR is located 36 miles southeast of Kalispell on the south shore of Swan Lake in Lake County, Montana. The 1,979 acre Refuge includes parts of Sections 21, 22, 23, 26, and 27 T25N R18W. The 319 acre Cruz WPA is located just south of the Refuge in Section 34

IV. Species/Critical Habitat: Grizzly bear, bull trout, Canada lynx, and water howellia

V. Project Description:
This project involves the restoration of wetland hydrology and wetland vegetation on Swan River Refuge by filling approximately 4,960 feet of ditches. Six hundred fifty-five acres will benefit from a groundwater level increase and 394 acres of the invasive plant, reed canarygrass would be eliminated in favor of desirable wetland vegetation. The overall wetland areas on the refuge would increase by 57 acres and water quality improvements would occur in Swan River and Swan Lake. In addition a twenty acre wetland on the Cruz WPA will be restored.

VI. Biological Justification:
Prior to establishment of the Swan River NWR Refuge in 1973, the land was in private ownership. In the late 1800's ditches and dikes were constructed to improve grazing and haying opportunities which significantly altered the natural hydrology. In the early 1900's the Refuge was used as a muskrat farm and additional negative impacts to the natural hydrology occurred.

VII. Determination of Effects:

(A) Description of Effects:
This project will have no effect on water howellia since the species is only found in one location that will not be impacted by construction activity. Temporary impacts from construction activities may create minor disturbance to grizzly bears and Canada Lynx. These effects will be short-lived and will end with the completion of construction. Bull trout are not likely to be impacted from construction activity (Swan River National Wildlife Refuge Wetland Restoration Project Environmental Assessment, Prepared by River Design Group, 236 Wisconsin Ave, Whitefish, MT 59937, December 2020).

(B) Determination: Determine the anticipated effects of the proposed project on species and critical habitats listed in item IV. Check all applicable boxes and list the species (or attach a list) associated with each determination**.**

	Determination
No Effect: This determination is appropriate when the proposed project will not directly or indirectly affect (neither negatively nor beneficially) individuals of listed/proposed/candidate species or designated/proposed	X Water Howellia

critical habitat of such species. **No concurrence from ESFO required.**

May Affect but Not Likely to Adversely Affect: This determination is appropriate when the proposed project is likely to cause insignificant, discountable, or wholly beneficial effects to individuals of listed species and/or designated critical habitat. **Concurrence from ESFO required.**

X

Grizzly Bear, Bull Trout
Canada Lynx

May Affect and Likely to Adversely Affect: This determination is appropriate when the proposed project is likely to adversely impact individuals of listed species and/or designated critical habitat. **Formal consultation with ESFO required.**

_____

May Affect and Likely to Adversely Affect but the proposed action is for the purpose of endangered or threatened species recovery and falls under Region 6's Programmatic Consultation on Service-initiated Recovery Actions: This determination is appropriate when adverse effects are likely but the project is designed to assist with recovery of listed species and/or designated critical habitat. **Concurrence from the ESFO that the project is covered by the programmatic consultation is required.**

_____

May affect but Not Likely to Jeopardize candidate or proposed species/critical habitat: This determination is appropriate when the proposed project may affect, but is not expected to jeopardize the continued existence of a species proposed for listing or a candidate species, or adversely modify an area proposed for designation as critical habitat. **Concurrence from ESFO optional.**

_____

Likely to Jeopardize candidate or proposed species/critical habitat: This determination is appropriate when the proposed project is reasonably expected to jeopardize the continued existence of a species proposed for listing or a candidate species, or adversely modify an area proposed for designation as critical habitat. **Conferencing with ESFO required.**

_____

Signature ROBERT JOHNSON Digitally signed by ROBERT JOHNSON Date: 2021.02.01 13:56:45 -07'00' Date _____

Reviewing Ecological Services Office Evaluation (check all that apply):

A. Concurrence X-Yes **Nonconcurrence _____**

Explanation for nonconcurrence:

B. Formal consultation required _____
List species or critical habitat unit

C. Effects are addressed in the Programmatic Consultation on R6's Recovery Program – no further consultation needed _____

D. Conference required _____
List species or critical habitat unit

Name of Reviewing ES Office Montana Ecological Services Office

Signature Ben Conard, Deputy Office Supervisor Date 02/01/2021

Revised 1/2012

Appendix D

Approved Project Permits

All required regulatory permits have been approved for the Swan River NWR Wetland Restoration Project, and are provided here in Appendix D. In addition, all agencies have been notified of an extended construction period that will conclude on December 31, 2022 and have authorized permit extensions even if it is not expressly stated in the following permit documents.

1. Section 404: Clean Water Act
   Department of the Army Corps of Engineers, Omaha District; Helena Regulatory Office
   USACE File Number: NOW-2020-01639-MTH
   - Nationwide Permit 27
   - Nationwide Permit 33
   - Nationwide Permit 39

2. 318 Authorization: Short-Term Water Quality Standard for Turbidity
   Montana Department of Environmental Quality
   Authorization No. MTB006721

3. SPA 124: Montana Stream Protection Act
   Montana Fish, Wildlife & Parks
   SPA No. USFWS-R1-26-2021

4. Floodplain Development Permit
   Lake County Planning Department
   FLD 21-03

5. Lakeshore Construction Permit
   Lake County Planning Department
   SHR 21-67S

6. Montana State Historic Preservation Office: Concurrence
   Montana Historical Society
   Phase I and Phase II Concurrence: 19.MT.BNL.006

7. US Forest Service Letter of Authorization
   National Forest system lands activity authorization
   File Code: 2600

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
HELENA REGULATORY OFFICE
10 WEST 15TH STREET, SUITE 2200
HELENA, MONTANA 59626

REPLY TO
ATTENTION OF

July 2, 2021

Subject: Swan River National Wildlife Refuge Wetland Restoration - Swan Lake;
USACE No. **NWO-2020-01639-MTH**

U.S. Fish & Wildlife Services
Attn: Mr. Jim Lange
922 Bootlegger Trail
Great Falls, Montana 59404

Dear Mr. Lange:

We are responding to your request for Nationwide Permit (NWP) verification for the above-mentioned project. The project is located at the Swan River National Wildlife Refuge at Latitude 47.903301°, Longitude -113.847174°, on the Swan River, within Sections 21, 22, 23, 26, 27, and 34, Township 25 N, Range 18 W, as well as within Section 2, Township 24 N, Range 18 W, near Swan Lake, Lake County, Montana.

Specifically, you requested authorization for the following work in waters of the U.S.:

Work Item	Description
a.	Temporarily impact 17.45 acres of emergent wetland, 0.24 acre of scrub-shrub wetland, 0.39 acre of forested wetland, and 0.04 acre of open water wetland for berm cut and ditch fill. Additionally, permanently change 1.34-acres of ditch and 7.68 upland acres to new additional emergent wetland acres. Temporary and permanent impacts will occur throughout the project area in a series of berm cuts and ditch fills as follows: Primary 4 & Levee C: Approximately 8,700 cubic yards (CY) of berm cut will be used to fill-in the adjacent ditch with 11,020 CY of material from the berm cut with additional berm cut material from Levee A and Primary 2. Primary 5: Approximately 250 CY of berm cut will be used to fill-in the adjacent ditch. Primary 6: Approximately 95 CY of berm cut will be used to fill-in the adjacent ditch. Primary 7: Approximately 300 CY of berm cut will be used to fill-in the adjacent ditch. Levee A: Cut approximately 3,180 CY of berm material for use as additional fill material in Segment 4, Levee C, and Primary 1.

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	Primary 1: Approximately 7,660 CY of berm cut will be used to fill-in the adjacent ditch with 12,890 CY of material from the berm cut with additional berm cut material from Levee A and Primary 2. Primary 2: Cut approximately 4,370 CY of berm material for use as additional fill in Segment 4, Levee C, and Primary 1. Primary 8: Approximately 415 CY of berm cut will be used to fill-in the adjacent ditch. Primary 9: Approximately 120 CY of berm cut will be used to fill-in the adjacent ditch. Ditch Plug Access Roads: Temporarily impact a total of approximately 0.24 acre of wetland through placement of logs, 11,610 SF of non-woven geotextile fabric, 380 CY of pit-run material, and 10,320 SF of 8-inch thick wetland sod. The non-woven geotextile fabric will be removed after construction is complete. The pit-run gravel will be allowed to fill in the gaps between the logs and create a base for the wetland sod mats to fill in the plug.
b.	Road Improvement: Permanently impact 0.0101 acre of forested wetlands along Highway 83 for site access improvement through placement of 305 CY of pit-run material and 30 CY of 0.75-inch crush gravel.
c.	Parking Turn Around: Permanently impact 0.0877 acre of palustrine emergent wetland for parking area expansion through placement of 130 CY of pit-run material and 100 CY of 0.75-inch crushed gravel.
d.	Temporary Access Roads: Temporarily impact a total of approximately 0.94 acre of wetland for multiple temporary construction access roads through placement of 40,090 SF of non-woven geotextile fabric, and 1,345 CY of pit-run material. All fabric will be removed from the project site upon project completion and the pit-run material will be re-used in the ditch plug access roads.
e.	The work will be completed as detailed in the joint application received on March 18, 2021, submitted by Ms. Selita Ammondt, River Design Group, Inc., on behalf of the applicant.

Under the authority of Section 404 of the Clean Water Act (CWA), DA permits are required for the discharge of fill material into waters of the U.S. Waters of the U.S. include the area below the ordinary highwater mark of stream channels and lakes, or ponds connected to the tributary system, and wetlands adjacent to these waters. Isolated waters and wetlands, as well as man-made channels, may be waters of the U.S. in certain circumstances, which must be determined on a case-by-case basis.

Based on the information you provided, the proposed activities:

1. Temporarily affecting approximately 18.12 acres of wetland and permanently affecting approximately 1.34-acres of unnamed ditch are authorized by NWP 27 Aquatic Habitat Restoration, Establishment, and Enhancement Activities found in the January 6, 2017, Federal Register (82 FR 1860), Reissuance of Nationwide Permits;

2. Temporarily affecting approximately 0.94 acre of wetland are authorized by NWP 33 Temporary Construction, Access, and Dewatering found in the January 6, 2017, Federal Register (82 FR 1860), Reissuance of Nationwide Permits;

3. Permanently affecting approximately 0.0978 acres of wetland, are authorized by NWP 39 Commercial and Institutional Developments found in the January 13, 2021, Federal Register (86 FR 2744), Reissuance and Modification of Nationwide Permits.

Enclosed are fact sheets that fully describe these NWPs and list the General and Regional Conditions that must be adhered to for these authorizations to remain valid. Please note that deviations from the original plans and specifications of your project could require additional authorization from this office.

In addition to conditions referenced above, the following special conditions apply:

1. To assure success of the restored and created waters of the United States, you shall monitor the completed work in accordance with the monitoring plan submitted on your behalf by River Design Group, titled “Swan River National Wildlife Refuge Wetland Restoration Project – NW Permit 27 Guidance Document”. Monitoring may be discontinued when you have been notified in writing by USACE that the success criteria outlined in the above-referenced document have been met. Corrective actions and further monitoring may be required if the success criteria have not been met.

2. You shall submit monitoring reports detailing the success of the project in terms of the approved success criteria after the third and fifth growing season. Additionally, a minimum of 27.35 acres of wetlands must be present within the project area at the end of the monitoring period. Monitoring reports must be received at this office no later than November 30, of the third and fifth year following completion of construction activities. If the project does not fully meet all success criteria corrective actions and further monitoring may be required.

3. Following completion of construction, temporary fill must be entirely removed to an area that has no waters of the U.S. and the affected areas must be restored to pre-construction elevations.

You are responsible for ensuring that all work is performed in accordance with the terms and conditions of the NWPs. If a contractor or other authorized representative will be conducting work on your behalf it is strongly recommended that they be provided a copy of this letter and the enclosed conditions. Failure to comply with the General and Regional Conditions of these NWPs, or the project-specific special conditions of this

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authorization, may result in the suspension or revocation of your authorization and may be subject to appropriate enforcement action.

The Montana Department of Environmental Quality has provided the enclosed CWA Section 401 water quality certification for these NWPs which includes General Conditions, all of which must be complied with for that certification to remain valid. This does not eliminate the need to obtain other permits that may be required by that agency.

This verification for NWP 27 and NWP 33 is valid until March 18, 2022 and the verification for NWP 39 is valid until March 14, 2026, when the existing NWPs are scheduled to be modified, reissued, or revoked. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant NWP is modified, reissued or revoked, you will have twelve (12) months from the date of the modification, reissuance or revocation of the NWP to complete the activity under the present terms and conditions unless discretionary authority has been exercised on a case-by-case basis to modify, suspend, or revoke the authorization in accordance with 33 CFR 330.4(e) and 33 CFR 330.5 (c) or (d). Project specific special conditions listed in this letter continue to remain in effect after the NWP verification expires unless the district engineer removes those conditions. Activities completed under the authorization of an NWP which was in effect at the time the activity was completed continue to be authorized by that NWP.

In compliance with General Condition 30, we have enclosed a "compliance certification" form, which must be signed and returned within 30 days of completion of the project, including any required mitigation. Your signature on this form certifies that you have completed the work in accordance with the terms and conditions of the NWPs.

The Omaha District, Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete our Customer Service Survey found on our website at: https://regulatory.ops.usace.army.mil/customer-service-survey/. If you do not have Internet access, you may call and request a paper copy of the survey that you can complete and return to us by mail or fax.

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Please refer to identification number **NWO-2020-01639-MTH** in any correspondence concerning this project. If you have any questions, please contact Jerin Borrego at 10 W 15th Street, Suite 2200, Helena, MT 59626, by email at *Jerin.E.Borrego@usace.army.mil*, or telephone at 406-417-1370.

Sincerely,

Date: 2021.07.02 09:44:09 -06'00'

Sage L. Joyce
Montana Section Chief

Six Enclosures:
1. Compliance Certification
2. 2017 NWP 27 Aquatic Habitat Restoration, Establishment, and Enhancement Activities Fact Sheet with Regional Conditions
3. 2017 NWP 33 Temporary Construction, Access, and Dewatering Fact Sheet with Regional Conditions
4. 2021 NWP 39 Commercial and Institutional Developments Fact Sheet with Regional Conditions
5. 2017 Montana DEQ CWA Section 401 Water Quality Certification
6. 2021 Montana DEQ CWA Section 401 Water Quality Certification

cc with enclosures:

Ms. Selita Ammondt, River Design Group, via email sammondt@riverdesigngroup.net

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COMPLIANCE CERTIFICATION

USACE File Number: NWO-2020-01639-MTH

Permit Type: NWP 27, NWP 33, NWP 39

Name of Permittee: Jim Lange, USFWS

County: Lake County, Montana

Date of Issuance: July 2, 2021

Project Manager: Jerin Borrego

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to Montana.Reg@usace.army.mil or to the following address:

US Army Corps of Engineers
Omaha District
Helena Regulatory Office
10 W 15th Street, Suite 2200
Helena, Montana 59626

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with the conditions of this permit, you are subject to permit suspension, modification, or revocation.

- -

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

_____
Signature of Permittee

_____
Date

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DEQ
Montana Department
of Environmental Quality

April 13, 2021

Jim Lange
U.S. Fish & Wildlife Service
922 Bootlegger Trail
Great Falls, MT 59404

RE: Authorization No. **MTB006721** Short Term Water Quality Standard for Turbidity Related to Construction Activity Pursuant to 75-5-318, MCA
VALID April 13, 2021 through April 13, 2022

Dear Mr. Lange:

The Montana Department of Environmental Quality Water Protection Bureau has completed our review of your application regarding the Swan River National Wildlife Refuge Wetland Restoration Project, Lake County, Montana. This activity herewith is qualified for a temporary surface water quality turbidity standard if it is carried out in accordance with the following conditions:

(1) Construction activities in or near the watercourse are to be limited to the minimum area necessary, and conducted so as to minimize increases in suspended solids and turbidity which may degrade water quality and damage aquatic life outside the immediate area of operation,

(2) The use of machinery in the watercourse shall be avoided unless absolutely necessary. To prevent leaks of petroleum products into waterways, no defective equipment shall be operated in the watercourse or adjacent areas capable of contributing surface flow to the watercourse,

(3) Precautions shall be taken to prevent spillage of any petroleum products, chemicals or other deleterious material in or near the watercourse, and no equipment shall be fueled or serviced in adjacent areas capable of contributing surface flow to the watercourse,

(4) All disturbed areas on the streambank and adjacent areas created by the construction activity shall be protected with temporary erosion control during construction activities. These areas shall be reclaimed with appropriate erosion control measures and revegetated to provide long-term erosion control,

(5) Any excess material generated from this project must be disposed of above the ordinary high-water mark, not classified as a wetland, and in a position not to cause pollution to State waters,

(6) Clearing of vegetation will be limited to that which is absolutely necessary for construction of the project,

(7) The use of asphalt or petroleum-based products as riprap is strictly prohibited. Its use as fill material is also prohibited if it is placed in a location where it is likely to cause pollution of State waters,

(8) This authorization does not authorize a point source surface water discharge. A MPDES permit is required for said discharge, and

(9) The applicant must conduct all activities in full and complete compliance with all terms and conditions of any permit for this activity issued pursuant to the Montana Natural Streambed and Land Preservation Act (310 permit) or the Montana Stream Protection Act (124 permit), and any valid Memorandum of Agreement and Authorization (MAA) negotiated for this activity.

This authorization is valid for the period noted. No authorization is valid for more than a one-year period of time.

Any violations of the conditions of this authorization may be subject to an enforcement action pursuant to the applicable provisions of the Montana Water Quality Act.

This authorization is granted pursuant to 75-5-318, MCA, and only applies to the activity described by your application. Any modification of the activity described in your application which may result in additional turbidity in the stream must receive prior approval from the Department. You may contact me at (406) 444-5546.

Sincerely,

Jon Kenning, Chief
Water Protection Bureau
Water Quality Division

cc: Selita Ammondt, River Design Group, Inc.
Lake County Conservation District

1420 E. 6th Avenue
P.O. Box 200701
Helena, MT 59620-0701

Jim Lange, Project Manager
US Fish and Wildlife Service
922 Bootlegger Trail
Great Falls, Montana 59404

SPA No. USFWS-R1-26-2021
Swan River National Wildlife Refuge
Swan River

Dear Mr. Renenger,

Montana Fish, Wildlife & Parks (FWP) has reviewed USFWS's SPA 124 Application for construction activities related to USFWS's Swan River National Wildlife Refuge Wetland Restoration Project which includes 15' of bank treatment on the Swan River near Swan Lake. The proposed work is authorized in accordance with the Montana Stream Protection Act (SPA) provided the following General and Special conditions listed below are met:

General Conditions:

- Adhere to the general provisions listed in Subsection 208.03.3 of the 2014 edition of the MDT Standard Specifications for Road and Bridge Construction.
- Comply with all the conditions as included in the Preconstruction SPA 124 authorization and the STREAM PROTECTION AUTHORIZATION 124 special provision in the contract bid package.
- Execute the work as described in the Temporary Facilities Joint Application provided to FWP. Deviations from the work as described in the Temporary Facilities Joint Application require FWP approval prior to initiating the work to amend the original application.

Special Conditions:

- None.

The authorization is valid for two years from the date of issuance.

If you have any questions, please contact me at 444-3175 and reference **SPA No.** USFWS-R1-26-2021.

Sincerely,

Jonathan Ferree
SPA 124 Program Manager
Montana Fish, Wildlife & Parks

Copy: FWP Region 1 – Leo Rosenthal

FLOODPLAIN DEVELOPMENT PERMIT

Permit #: FLD 21-03 Issued in: LAKE COUNTY, MONTANA

1. Issued to:
   Name: U.S. Fish Wildlife Service, Jim Lange
   Address: 922 Bootlegger Trail City/State/Zip: Great Falls, MT 59404

2. Project Location:
   Name of stream/water body at location of activity: Swan Lake/River
   Location: Portions of Sections 21, 22, 23, 26, 27, and 34 of T25N, R18W, and a portion of Section 2, T24N, R18W
   Project Address: 23999 MT Hwy 83, Bigfork, MT 59911
   Geocode: 15-3585-23-4-01-01-0000, et al.

3. The proposed development is in the:
   ____Floodway, ____Flood Fringe, _____X_____100-year Floodplain without a Floodway, __X__Floodplain with no base flood elevations

4. The jurisdictional Base Flood Elevation (BFE) on a portion of the project site is 3077.6 feet NAVD 88, the remainder of the project is located within an approximate A zone without an established BFE. (Source documents: FEMA Flood Insurance Study: Lake County, MT; Revised February 6, 2013; Flood Insurance Study Number 30047CV000A; FIRM panels: 0200C ,0225C, and 0405C).

5. Description:
   Restoration of an area where previously ditches were excavated to drain the land and levees were constructed to restrict bank overflow, making the land more suitable for agricultural activities and a muskrat farm. The approved project includes filling existing ditches, removing existing man-made levees, planting native vegetation, and making improvements to the public access and parking area. Fill material from onsite berms and levees will be used to fill the ditches balancing approx. 25,090 cubic yards of material excavated and 25,090 cubic yards used for backfill. The net volume of imported fill is estimated at 2,160 cubic yards of pit-run/gravel and approximately 800 logs to be used for highway access and parking area improvements, as well as for temporary roads and to be permanently buried in ditch plug access road locations.

6. Action Taken:
   X The proposed development is in conformance with the applicable floodplain management standards. A conditional approval is granted. Conditions and terms are attached.

7. The conditions and terms associated with this project are on file at the Lake County Planning Department.

The permit is valid for **two years** from the date of issuance. If the project cannot be completed within two years, please contact the Lake County Planning Department regarding whether or not an extension will be allowed.

Issued this 20th day of September, 2021

Expiration:
September 20, 2023

Jacob Feistner,
Floodplain Administrator

LAKE COUNTY PLANNING DEPARTMENT
106 FOURTH AVENUE EAST
POLSON, MT 59860-2133

PH: 406-883-7235 FAX: 406-883-7205
E-MAIL: planning@lakemt.gov

September 20, 2021

U.S. Fish and Wildlife Service
Attn: Jim Lange
922 Bootlegger Trail
Great Falls, MT 59404

Landowner: U.S. Fish and Wildlife Service, Jim Lange
Flathead National Forest

Re: Approval of Floodplain Development Permit # FLD 21-03

Dear Mr. Lange,

Lake County has approved Floodplain Development Permit # FLD 21-03. The property is legally described as portions of Sections 21, 22, 23, 26, 27, and 34 of T25N, R18W, and a portion of Section 2, T24N, R18W. The permit is being issued for a **2-year period** and has been enclosed with this correspondence along with the laminated permit for posting at the project site. The permit is associated with the above-referenced property only and is subject to the following conditions and terms, the plans on file at the Lake County Planning Department, the standards contained in the floodplain management regulations, and the following conditions and terms:

Conditions & Terms:

1. The permitted project includes the following activities within the area designated as the 100-year floodplain of Swan Lake/River: Restoration of an area where previously ditches were excavated to drain the land and levees were constructed to restrict bank overflow, making the land more suitable for agricultural activities and a muskrat farm. The approved project includes filling existing ditches, removing existing man-made levees, planting native vegetation, and making improvements to the public access and parking area. Fill material from onsite berms and levees will be used to fill the ditches balancing approx. 25,090 cubic yards of material excavated and 25,090 cubic yards used for backfill. The net volume of imported fill is estimated at 2,160 cubic yards of pit-run/gravel and approximately 800 logs to be used for highway access and parking area improvements, as well as for temporary roads and to be permanently buried in ditch plug access road locations.

2. This permit is issued in conjunction with Lake County lakeshore construction permit #SHR 21-67S.

3. The granting of this permit does not affect any other type of approval required by any other statute or ordinance of the state, any political subdivision, or the United States, but is an added requirement. This Floodplain Development Permit shall be valid when any and all other necessary permits are in place.

4. All development and use of the properties shall be in accordance with these conditions, the approved plans on file at the Lake County Planning Department, except as modified by these

conditions, and any general requirements to meet the standards contained in the Lake County Floodplain Management Regulations. Any additional construction or change of use will require additional review and approval from Lake County.

5. The project shall fully adhere to the Lake County Floodplain Management Regulations and the Floodplain Development Permit issued by the Lake County Floodplain Administrator.

6. No additional dredging or adding of fill materials is permitted within the FEMA recognized 100-year floodplain without additional floodplain permit approval from Lake County.

7. Existing vegetation shall be retained to the extent possible. The erosion protection for fill slopes exposed to velocities of four feet per second and less may consist of vegetative cover consisting of grasses or similar undergrowth. Slopes exposed to velocities greater than four feet per second shall be protected by armoring with stone or rock.

8. Best Management Practices (BMPs) shall be utilized in order to prevent silt and other debris from entering Swan Lake/River and/or impacting the 100-year floodplain. Any debris that inadvertently enters Swan Lake/River or the floodplain shall be removed that same day.

9. The project shall maintain the carrying capacity of the watercourse and must be designed and constructed to ensure that the flood hazard on other properties is not increased. The project shall not increase velocity or erosion upstream, downstream, across from, or adjacent to the site.

10. The project shall be designed and maintained to withstand a base flood once the project is mature, or within 5 years of project completions, or other time as required by the Floodplain Administrator. Once vegetation is mature and is established, it should not require substantial yearly maintenance after the initial period.

11. Any material excavated during demolition and construction and not used as suitable fill on-site shall be permanently disposed of outside the 100-year floodplain boundary.

12. The access road must provide safe vehicular access during times of flooding up to the base flood for ordinary and emergency service vehicles.

13. The landowner shall notify all subsequent property owners and their agents and potential buyers of the Floodplain Development Permit issued on the property and that such property is located within a 100-year Floodplain.

14. Lake County reserves the right to revoke this permit and order removal if the permittee, their heirs, successors or assigns violates any condition of approval.

15. The permitting shall not be construed as assurance that the proposed development is structurally sound, that the development will withstand environmental forces acting upon it, or that it will accomplish its intended purposes.

16. Lake County and its respective members shall not be responsible or liable for any defects or discrepancies in any plans or specifications submitted, revised or approved under this review, nor any defects or discrepancies in construction pursuant to such plans and specifications.

17. The property owner is responsible to ensure that all measures necessary are undertaken to ensure the proposed activities occur within the property boundaries or are permitted via a recorded

easement and do not negatively impact easements or adjacent properties. Lake County is not responsible or liable for any portion of the proposed plans that do not occur within the applicant's property boundaries, or impact easements or neighboring properties. In addition, it is the applicants' responsibility to comply with private contracts, agreements, covenants, conditions, and restrictions.

18. Lake County is not responsible for any flood damage that may occur to the property.

19. Lake County is not responsible for any flood insurance requirements or insurance rates that may result from development of the subject property.

20. In accepting the permit and commencing the permitted activities, the applicant understands that all conditions of the permit must be met, and all other applicable regulatory permits have been obtained. The applicants shall allow on-site inspections by the Lake County Floodplain Administrator and/or the designated agents as needed during or after construction to determine compliance with this permit.

21. **Once the project is completed, the applicant shall contact the Lake County Planning Department (Phone: 406-883-7235) to arrange for a final inspection of the completed project.**

22. The permittees shall visibly post the laminated version of the permit on the project site during construction and should retain a copy of the permit for their records.

23. The permit is valid for **two years** from the date of issuance. If the project cannot be completed within two years, please contact the Lake County Planning Department regarding whether or not an extension will be allowed.

If you have any questions regarding the permit or the Lake County Floodplain Management Regulations, please contact the Planning Department at (406) 883-7235.

Sincerely,

Jacob Feistner
Floodplain Administrator

Cc. Traci Sears, CFM
Montana DNRC – Helena
1424 9th Ave.
Helena, MT 59620 (e-mail only)

FEMA Region VIII
DFC, Bldg. 710A
Denver, CO 80225

Flathead National Forest
Attn: Christopher Dowling
200 Ranger Station Road
Bigfork, MT 59911

River Design Group, Inc.
Attn: Selita Ammondt
263 Wisconsin Ave.
Whitefish, MT 59937

FLOODPLAIN DEVELOPMENT PERMIT

Permit #: FLD 21-03 Issued in: LAKE COUNTY, MONTANA

1. Issued to:
   Name: U.S. Fish Wildlife Service, Jim Lange
   Address: 922 Bootlegger Trail City/State/Zip: Great Falls, MT 59404

2. Project Location:
   Name of stream/water body at location of activity: Swan Lake/River
   Location: Portions of Sections 21, 22, 23, 26, 27, and 34 of T25N, R18W, and a portion of Section 2, T24N, R18W
   Project Address: 23999 MT Hwy 83, Bigfork, MT 59911
   Geocode: 15-3585-23-4-01-01-0000, et al.

3. The proposed development is in the:
   ____Floodway, ____Flood Fringe, ____X____100-year Floodplain without a Floodway, __X__Floodplain with no base flood elevations

4. The jurisdictional Base Flood Elevation (BFE) on a portion of the project site is 3077.6 feet NAVD 88, the remainder of the project is located within an approximate A zone without an established BFE. (Source documents: FEMA Flood Insurance Study: Lake County, MT; Revised February 6, 2013; Flood Insurance Study Number 30047CV000A; FIRM panels: 0200C ,0225C, and 0405C).

5. Description:
   Restoration of an area where previously ditches were excavated to drain the land and levees were constructed to restrict bank overflow, making the land more suitable for agricultural activities and a muskrat farm. The approved project includes filling existing ditches, removing existing man-made levees, planting native vegetation, and making improvements to the public access and parking area. Fill material from onsite berms and levees will be used to fill the ditches balancing approx. 25,090 cubic yards of material excavated and 25,090 cubic yards used for backfill. The net volume of imported fill is estimated at 2,160 cubic yards of pit-run/gravel and approximately 800 logs to be used for highway access and parking area improvements, as well as for temporary roads and to be permanently buried in ditch plug access road locations.

6. Action Taken:
   X The proposed development is in conformance with the applicable floodplain management standards. A conditional approval is granted. Conditions and terms are attached.

7. Conditions & Terms:
   1. The permitted project includes the following activities within the area designated as the 100-year floodplain of Swan Lake/River: Restoration of an area where previously ditches were excavated to drain the land and levees were constructed to restrict bank overflow, making the land more suitable for agricultural activities and a muskrat farm. The approved project includes filling existing ditches, removing existing man-made levees, planting native vegetation, and making improvements to the public access and parking area. Fill material from onsite berms and levees will be used to fill the ditches balancing approx. 25,090 cubic yards of material excavated and 25,090 cubic yards used for backfill. The net volume of imported fill is estimated at 2,160 cubic yards of pit-run/gravel and approximately 800 logs to be used for highway access and parking area improvements, as well as for temporary roads and to be permanently buried in ditch plug access road locations.

2. This permit is issued in conjunction with Lake County lakeshore construction permit #SHR 21-67S.

3. The granting of this permit does not affect any other type of approval required by any other statute or ordinance of the state, any political subdivision, or the United States, but is an added requirement. This Floodplain Development Permit shall be valid when any and all other necessary permits are in place.

4. All development and use of the properties shall be in accordance with these conditions, the approved plans on file at the Lake County Planning Department, except as modified by these conditions, and any general requirements to meet the standards contained in the Lake County Floodplain Management Regulations. Any additional construction or change of use will require additional review and approval from Lake County.

5. The project shall fully adhere to the Lake County Floodplain Management Regulations and the Floodplain Development Permit issued by the Lake County Floodplain Administrator.

6. No additional dredging or adding of fill materials is permitted within the FEMA recognized 100-year floodplain without additional floodplain permit approval from Lake County.

7. Existing vegetation shall be retained to the extent possible. The erosion protection for fill slopes exposed to velocities of four feet per second and less may consist of vegetative cover consisting of grasses or similar undergrowth. Slopes exposed to velocities greater than four feet per second shall be protected by armoring with stone or rock.

8. Best Management Practices (BMPs) shall be utilized in order to prevent silt and other debris from entering Swan Lake/River and/or impacting the 100-year floodplain. Any debris that inadvertently enters Swan Lake/River or the floodplain shall be removed that same day.

9. The project shall maintain the carrying capacity of the watercourse and must be designed and constructed to ensure that the flood hazard on other properties is not increased. The project shall not increase velocity or erosion upstream, downstream, across from, or adjacent to the site.

10. The project shall be designed and maintained to withstand a base flood once the project is mature, or within 5 years of project completions, or other time as required by the Floodplain Administrator. Once vegetation is mature and is established, it should not require substantial yearly maintenance after the initial period.

11. Any material excavated during demolition and construction and not used as suitable fill on-site shall be permanently disposed of outside the 100-year floodplain boundary.

12. The access road must provide safe vehicular access during times of flooding up to the base flood for ordinary and emergency service vehicles.

13. The landowner shall notify all subsequent property owners and their agents and potential buyers of the Floodplain Development Permit issued on the property and that such property is located within a 100-year Floodplain.

14. Lake County reserves the right to revoke this permit and order removal if the permittee, their heirs, successors or assigns violates any condition of approval.

15. The permitting shall not be construed as assurance that the proposed development is structurally sound, that the development will withstand environmental forces acting upon it, or that it will accomplish its intended purposes.

16. Lake County and its respective members shall not be responsible or liable for any defects or discrepancies in any plans or specifications submitted, revised or approved under this review, nor any defects or discrepancies in construction pursuant to such plans and specifications.

17. The property owner is responsible to ensure that all measures necessary are undertaken to ensure the proposed activities occur within the property boundaries or are permitted via a recorded easement and do not negatively impact easements or adjacent properties. Lake County is not responsible or liable for any portion of the proposed plans that do not occur within the applicant's property boundaries, or impact easements or neighboring properties. In addition, it is the applicants' responsibility to comply with private contracts, agreements, covenants, conditions, and restrictions.

18. Lake County is not responsible for any flood damage that may occur to the property.

19. Lake County is not responsible for any flood insurance requirements or insurance rates that may result from development of the subject property.

20. In accepting the permit and commencing the permitted activities, the applicant understands that all conditions of the permit must be met, and all other applicable regulatory permits have been obtained. The applicants shall allow on-site inspections by the Lake County Floodplain Administrator and/or the designated agents as needed during or after construction to determine compliance with this permit.

21. **Once the project is completed, the applicant shall contact the Lake County Planning Department (Phone: 406-883-7235) to arrange for a final inspection of the completed project.**

22. The permittees shall visibly post the laminated version of the permit on the project site during construction and should retain a copy of the permit for their records.

23. The permit is valid for **two years** from the date of issuance. If the project cannot be completed within two years, please contact the Lake County Planning Department regarding whether or not an extension will be allowed.

Issued this 20th day of September, 2021

Jacob Feistner
Floodplain Administrator

FLOODPLAIN DEVELOPMENT PERMIT
STAFF REPORT

Floodplain Development Permit Number: FLD 21-03

Owner/Applicant: U.S. Fish and Wildlife Service, Jim Lange
Flathead National Forest

Date Application Received: 3-18-2021 Date of Site Visit: 4-26-2021

Agents: River Design Group, Inc.

BACKGROUND

Location and Legal Description:

According to FIRM Panels 0200C, 0225C, and 0405C (Flood Insurance Study Number 30047CV000A), effective February 6, 2013, the proposed project is located within the FEMA-recognized floodplain of Swan Lake/River. FEMA recognizes the base flood elevation (BFE) of Swan Lake as 3077.6 feet NAVD 88, the remainder of the project is located within an approximate A zone without an established BFE.

The property is located at 23999 MT Hwy 83, Bigfork, MT 59911, and is legally described as portions of Sections 21, 22, 23, 26, 27, and 34 of T25N, R18W, and a portion of Section 2, T24N, R18W.

Existing Land Use: The existing land use of this property is as the Swan River National Wildlife Refuge.

Adjacent Land Uses: Properties in the general vicinity are either undeveloped forest lands or principally used for single family residential purposes.

OTHER PERMITS

1. 404 Permit # NWO-2020-01639-MTH
2. DEQ authorization # MTB006721
3. SPA 124 # USFWS-R1-26-2021
4. Lake County Lakeshore Construction Permit SHR 21-67S

REVIEW AND FINDINGS OF FACT

The permitted project includes the following activities within the area designated as the 100-year floodplain of Swan Lake/River: Restoration of an area where previously ditches were excavated to drain the land and levees were constructed to restrict bank overflow, making the land more suitable for agricultural activities and a muskrat farm. The approved project includes filling existing ditches, removing existing man-made levees, planting native vegetation, and making improvements to the public access and parking area. Fill material from onsite berms and levees will be used to fill the ditches balancing approx. 25,090 cubic yards of material excavated and 25,090 cubic yards used for backfill. The net volume of imported fill is estimated at 2,160 cubic yards of pit-run/gravel and approximately 800 logs to be used for highway access and parking area improvements, as well as for temporary roads and to be permanently buried in ditch plug access road locations.

A. The proposed establishment, alteration or substantial improvement of the artificial obstruction, as permitted, meets the requirements of these regulations:

A professional engineer, has reviewed the proposal and information submitted with the application and found that it appears to meet the requirements of the 2013 Lake County Floodplain Management Regulations.

B. Additional Factors:

1. The danger to life and property from backwater or diverted flow caused by the obstruction:

The engineer for the project states that the development will not adversely affect surrounding land owners upstream, across stream, or adjacent to the proposed project area. The proposed project is intended to restore wetland habitat by reversing the actions through which wetlands were drained prior to the National Wildlife Refuge establishment in 1973. The engineer has stated that surface water flood elevations in Swan Lake/River will not increase as a result of the project, no structures in the vicinity will be impacted, and the floodplain structures can withstand a one-percent chance flood. Temporary erosion and sedimentation will be minimized through the use of temporary sediment fences and areas disturbed will be sodded or seeded following construction. If these measures are taken danger to life and property should be mitigated.

2. The danger that the obstruction will be swept downstream to the injury of others:

The engineer for the project states that the structures proposed for this project will be constructed with natural materials that are naturally erosion resistant given the minimal slopes to which they will be graded. Temporary erosion and sedimentation will be minimized through the use of temporary sediment fences and areas disturbed will be sodded or seeded following construction. Increased groundwater levels are not anticipated to impact surface water flood elevations to the river or lake. The work is designed to be self-mitigating with regard to flood risk and no structures located within the vicinity will be impacted. The floodplain structures are also designed to withstand a one-percent chance flood. There should not be any danger of the obstruction being swept downstream to the injury of others.

3. The availability of alternative locations:

Due to the project being intended to restore wetland habitat by reversing the actions through which wetlands were drained prior to the National Wildlife Refuge establishment in 1973, there were no alternative locations. The project would logically take place where the historical drainage had taken place, within the natural wetland area and floodplain.

4. The construction or alteration of the obstruction in such a manner as to lessen the danger:

The work is designed to be self-mitigating with regard to flood risk and no structures located within the vicinity will be impacted. The floodplain structures are designed to withstand a one-percent chance flood. The engineer for the project states that the structures proposed for this project will be constructed with natural materials that are naturally erosion resistant given the minimal slopes to which they will be graded. Temporary erosion and sedimentation will be minimized through the use of temporary sediment fences and areas disturbed will be sodded or seeded following construction.

Any potential dangers resulting from the proposed work in regard to the floodplain appear to have been lessened.

5. **The permanence of the obstruction:**

   The floodplain structures are designed to withstand a one-percent chance flood and be permanent. The work is designed to be self-mitigating with regard to flood and the floodplain structures will be constructed with natural materials that are naturally erosion resistant given the minimal slopes to which they will be graded. The proposed obstructions are designed and intended to be a permanent reversal of historical wetland drainage and mitigation restoring the wildlife refuge to its previous natural wetland conditions.

6. **The anticipated development in the foreseeable future of the area in which may be affected by the obstruction:**

   The proposed work and increased groundwater levels are not anticipated to impact surface water flood elevations to the river or lake. The work is designed to be self-mitigating with regard to flood risk and no structures located within the vicinity will be impacted. Any potential erosion will be minimized through the use of temporary sediment fences and areas disturbed will be sodded or seeded following construction. The floodplain structures are also designed to withstand a one-percent chance flood. There should not be any adverse impacts to any anticipated development in the foreseeable future.

7. **Such other factors as are in harmony with the purposes of these regulations, the Montana Floodplain and Floodway Management Act, and the accompanying Administrative Rules of Montana:**

   The proposed development mitigates for potential impacts to health, safety and property in times of flooding, and is therefore in harmony with the purposes of these regulations, the Floodplain and Floodway Management Act and the accompanying Administrative Rules of Montana.

Date: September 20, 2021

Jacob Feistner,
Floodplain Administrator

LAKE COUNTY
LAKESHORE CONSTRUCTION PERMIT

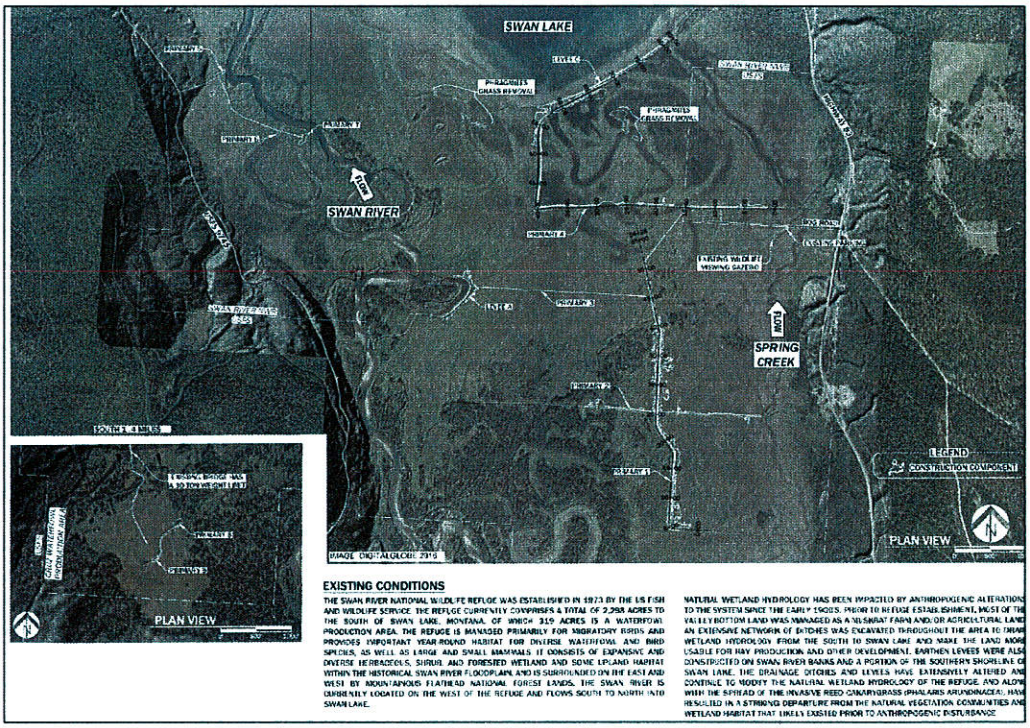
SHR 21-67S	9/20/2021	9/20/2023
PERMIT NO.	EFFECTIVE DATE	EXPIRATION DATE

Issued in accordance with the Lake County Lakeshore Protection Regulations

FOR:

- **Wetland restoration associated with the Swan River National Wildlife Refuge**
- **Re-vegetation of disturbed areas**
- **Installation of BMPs**

This permit is being issued in association with Floodplain Development Permit #FLD 21-03, as well as approvals from Army Corps of Engineers, DEQ, and MTFWP.



The proposed improvements may not be located on the applicant's property per surveys of record. Lake County and the applicant acknowledge that there are jurisdictional and/or ownership questions regarding the premises the applicant seeks to complete or modify improvements upon. Applicant releases Lake County from any liability regarding these issues, and this permit is issued with this condition and understanding.

Permit approval is strictly limited to the approved design and all conditions of approval on file at the Lake County Planning Department. Questions or concerns about this project should be directed to the Planning Department at (406) 883-7235.

This permit is associated with property described as: portions of Sections 21, 22, 23, 26, 27, and 34 of T25N, R18W, and a portion of Section 2, T24N, R18W

Issued to:

USFWS

William D Barron

William Barron, Chairman
Lake County Commissioner

LAKESHORE CONSTRUCTION PERMIT

LAKE COUNTY, MONTANA

OWNER NAME: U.S. Fish and Wildlife Service, Jim Lange
OWNER ADDRESS: 922 Bootlegger Trail, Great Falls, MT 59404

AGENT NAME: River Design Group, Inc., Attn: Selita Ammondt
AGENT ADDRESS: 263 Wisconsin Ave., Whitefish, MT 59937

1) Application Number: SHR 21-67S Review Period Begins: 5-17-2021

2) Application: __X__Granted __ Denied

CONDITIONS OF APPROVAL:

1. This permit allows for:
   - Wetland restoration associated with the Swan River National Wildlife Refuge
   - Re-vegetation of disturbed areas
   - Installation of BMPs

   within the Lakeshore Protection Zone on or adjacent to property legally described as portions of Sections 21, 22, 23, 26, 27, and 34 of T25N, R18W, and a portion of Section 2, T24N, R18W *(The Lakeshore Protection Zone is the lake, the lakebed, and the land area located within twenty horizontal feet of the high-water elevation).*

2. This permit is being issued in association with Floodplain Development Permit #FLD 21-03, as well as approval from Army Corps of Engineers, DEQ, and MTFWP.

3. As proposed, work shall be conducted when the lake is at low pool.

4. Vehicles, excavators, and other machinery shall not be placed into the waters of the lake at any time during the construction process. Operation of motorized vehicles on the lakebed is allowed for the purposes of this project. Motorized vehicles shall be operated in such a way to minimize disturbance of the lakebed. No skidding of motorized vehicles onto the lakebed is allowed at any time.

5. Lakebed materials such as clays, silts, sands, or gravels shall not be excavated and utilized as fill material in/on the lakebed.

6. Existing vegetation shall be retained to the extent possible. Prior to completing the project, reseeding and/or revegetation of exposed areas shall occur as necessary.

7. Any debris removed from the lakeshore area shall be removed entirely from the Lakeshore Protection Zone and deposited in a location that prevents entry of the material into the lake.

8. No stockpiling of materials is allowed within the Lakeshore Protection Zone.

9. Burning of weeds, grass, shrubs, brush, trees, construction waste, or similar materials on the lakebed or lakeshore is prohibited.

10. The project must incorporate all necessary means to prevent pollution of the lake, including erosion, sedimentation and storm runoff controls. Best Management Practices shall be utilized in order to

prevent silt and other debris from entering the lake. Any debris that inadvertently enters the lake shall be removed that same day.

11. This permit shall not be construed as assurance that the project is structurally sound, that the project will withstand environmental forces acting upon it, or that it will accomplish its intended purposes.

12. The issuance of this permit strictly limits construction to the authorized plans, to the conditions of approval on file in the office of the County Commissioners, and to the 'General Construction Requirements' of Section 5-2 of the Lake County Lakeshore Protection Regulations.

13. The issuance of this permit allows the applicant to construct the subject project only within the riparian boundary of his property and this permit shall not be construed as verification that the subject project is within said riparian boundary.

14. Any work beyond what is specified on this permit will require additional permits and approval by the Board of County Commissioners. This permit is issued under the authority of the Lake County Lakeshore Protection Regulations (July 2001) and 75-7-201 to 75-7-217 M.C.A.

15. The permit is valid for **two years** from the date of issuance. If the project cannot be completed within two years, please contact the Lake County Planning Department regarding whether or not an extension will be allowed.

16. Once the project is completed, the applicant shall contact the Lake County Planning Department (Phone: 406-883-7235) to arrange for a final inspection of the completed project.

William D Barron 09/20/2021

William Barron, Chairman Date

Steve Stanley, Commissioner Date

Gale Decker 09.20.2021

Gale Decker, Commissioner Date

LAKESHORE CONSTRUCTION APPLICATION

LAKE COUNTY, MONTANA
STAFF REPORT

Application No. 21-67S

Applicant: Selita Ammondt *for* USFWS Date Application Received: March 18, 2021

Date of Site Visit: 4-26-2021

Staff Analysis
Application Adequate for Review Purposes: Yes X No __

Date Application Accepted for Review: May 17, 2021

Project Description:

- Wetland restoration associated with the Swan River National Wildlife Refuge
- Re-vegetation of disturbed areas
- Installation of BMPs

Staff Notes: The permitted project includes portions of the following project that fall within the lakeshore protection zone of Swan Lake: Restoration of an area where previously ditches were excavated to drain the land and levees were constructed to restrict bank overflow, making the land more suitable for agricultural activities and a muskrat farm. The approved project includes filling existing ditches, removing existing man-made levees, planting native vegetation, and making improvements to the public access and parking area. Fill material from onsite berms and levees will be used to fill the ditches balancing approx. 25,090 cubic yards of material excavated and 25,090 cubic yards used for backfill. The net volume of imported fill is estimated at 2,160 cubic yards of pit-run/gravel and approximately 800 logs to be used for highway access and parking area improvements, as well as for temporary roads and to be permanently buried in ditch plug access road locations. This approval is for a two-year period.

Compliance with General Construction Requirements: Yes X No__
Compliance with Design Standards: Yes X No__
Recommended Project Modifications: None
Any Variances Necessary: Yes__ No X

Staff Recommendation
Application Complies with Criteria for Issuance of a Permit: Yes X No__
Application Requires Planning Board Review: Yes__ No X

Attachments:
l. Copy of Approved Plans
2. Final Action by County Commissioners

Date: September 20, 2021

Jacob Feistner, Planning Director

Big Sky. Big Land. Big History.
Montana
Historical Society

Historic Preservation
Museum
Outreach & Interpretation
Publications
Research Center

June 10, 2021

Allison Parrish
Fish and Wildlife Service
4050 Bridger Canyon Road
Bozeman, MT 59715

Re: Swan River NWR Wetland Restoration – Phase I
19.MT.BNL.006
Lake County, Montana

Dear Ms. Parrish:

Thank you for the letter and cultural resources report (received June 9, 2021) regarding the Swan River NWR Wetland Restoration – Phase I project in Lake County, Montana. We concur that cultural resources 24LA0338, 24LA0339, 24LA0340, and 24LA0341 are Not Eligible for the National Register of Historic Places.

We also concur that Phase I of the Swan River NWR Wetland Restoration will have No Effect on Historic Properties. We look forward to continuing consultation on Phase II.

If you have any questions or concerns, do not hesitate to contact me at (406)444-0388 or JBush2@mt.gov. Thank you for consulting with us.

Sincerely,

Jessica Bush

Jessica Bush, M.A.
State Archaeologist, Deputy SHPO
Montana State Historic Preservation Office

225 North Roberts Street
P.O. Box 201201
Helena, MT 59620-1201
(406) 444-2694
(406) 444-2696 FAX
montanahistoricalsociety.org

File: FWS – 2021 – 2021060909

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Montana
Historical Society

Historic Preservation
Museum
Outreach & Interpretation
Publications
Research Center

June 21, 2021

Allison Parrish
Fish and Wildlife Service
4050 Bridger Canyon Road
Bozeman, MT 59715

Re: Swan River NWR Wetland Restoration – Phase II, 19.MT.BNL.006

Dear Ms. Parrish:

Thank you for your letter (received June 21, 2021) regarding the Wetland Restoration at the Swan River National Wildlife Refuge, Phase III of the undertaking. We concur that 24LA0342 and 24LA0343 are Not Eligible for the National Register of Historic Places. Furthermore, we concur on your determination of No Effect on Historic Properties for Phase II of this project.

If you have any questions or concerns, do not hesitate to contact me at (406) 444-7719 or Laura.Evilsizer@MT.gov. Thank you for consulting with us.

Sincerely,

Laura Evilsizer

Laura Evilsizer, M.A.
Review and Compliance Officer
Montana State Historic Preservation Office

FILE: FWS – 2021 - 2021062101

225 North Roberts Street
P.O. Box 201201
Helena, MT 59620-1201
(406) 444-2694
(406) 444-2696 FAX
montanahistoricalsociety.org

USDA United States Department of Agriculture | Forest Service | Swan Lake Ranger District | 200 Ranger Station Road Bigfork, MT 59911 (406) 837-7500 Fax (406) 837-7503

File Code: 2600

Date: June 15, 2021

The US Fish and Wildlife Service (USFWS) prepared an Environmental Assessment (EA) for the Swan River National Wildlife Refuge Wetland Restoration Project. The purpose of the project is to restore the natural wetland hydrology, reduce invasive reed canary grass, benefit native plant communities, and improve visitor access and safety. A small portion of this project is situated on National Forest system lands.

The EA analyzes a no action and two action alternatives: alternative B and alternative C. Both action alternatives are similar. Alternative C expands the amount of restoration proposed on the Wildlife Refuge beyond Alternative B. The amount of activity on National Forest system lands is essentially the same between alternatives. The activities on National Forest system lands are in Table 1 below.

Table 1. Activities on NF system lands affected by the USFWS Wetland Restoration Project.

Metrics	USFS Parcel north of Bog Road	USFS Parcel south of Cruz WPA
Increased groundwater level	32.2 acres	2.0 acres
Reduction in reed canarygrass cover	22.7 acres	0
Conversion of upland to wetland	0.9 acres	0
Ditch fill/plug length	505 feet	0
Berm excavation length	1,340 feet	0
Temporary Road length	1,135 feet	0

This activity does not require a special use authorization. This activity is exempted as noted in 36 CFR 251.50(e)(2): *The proposed use is regulated by a State agency or another Federal agency in a manner that is adequate to protect National Forest System lands and resources and to avoid conflict with National Forest System programs or operations.*

The USFWS engaged the Forest Service early in the project and coordinated with Forest specialists. My staff and I reviewed the proposed activities, draft analysis, and prepared a list of questions, requests, and Flathead National Forest Land Management Plan (Forest Plan; USDA 2018) requirements on May 3, 2021.

Forest Service concerns were addressed to my satisfaction in a reply letter on May 19, 2021 from River Design Group (consultant), and also in a meeting with USFWS refuge managers that same day. The reply letter clarified/confirmed the following:

- Activity acres on National Forest system lands,
- Described the native seed mix composition,

- Confirmed consultation for Endangered Species Act was completed for NF system lands,
- Provided Historical and Archaeological findings and State Historic Preservation Office concurrence for NF system lands, and
- Provided a copy of botanical surveys.

The USFWS committed to prohibiting fuel storage and refilling on National Forest riparian management zones and cleaning equipment for invasive species prior to work.

I consulted with staff to understand impacts of this project on wildlife resources, soil resources, aquatic resources, botanical resources, heritage resources, vegetation and fuels management. All indicated the EA and reply letter to the Forest Service fullfill provisions to adequately protect National Forest system lands and resources and is in compliance with the Forest Plan.

Therefore, I conclude this project does not need any further review or a Special Use Authorization. The US Fish and Wildlife Service may proceed with proposed activities analyzed under the Swan River National Wildlife Refuge Wetland Restoration Environmental Assessment on National Forest system lands.

CHRISTOPHER DOWLING
Swan Lake District Ranger

Appendix E

Swan River National Wildlife Refuge
Wetland Restoration Assessment

Swan River National Wildlife Refuge
Wetland Restoration Assessment

Prepared for:

U.S. Fish and Wildlife Service

Upsata Lake Office

196 Lower Lake Side Lane

Ovando, MT 59854

RDG RIVER DESIGN GROUP

www.riverdesigngroup.com

Cover: Swan River NWR from Bog Road looking north, photo taken May 28, 2018. S. Ammondt.

Swan River National Wildlife Refuge
Wetland Restoration Assessment

Prepared for

U.S. Fish and Wildlife Service

Greg Neudecker
Montana Partners for Fish and Wildlife Program
Upsata Lake Office
196 Lower lake Side Lane
Ovando, MT 59854

Prepared by

River Design Group, Inc.

236 Wisconsin Avenue
Whitefish, MT 59937
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October 2018

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1 Introduction

1.1 Project Site Overview

Swan River National Wildlife Refuge (Refuge) was established in 1973 by the U.S. Fish and Wildlife Service (USFWS). The 1,977-acre Refuge is managed primarily for migratory birds and provides important year-round habitat for diverse waterfowl and bird species as well as large and small mammals (USFWS 2015). It consists of expansive and diverse herbaceous, shrub, and forested wetland habitat on the south of Swan Lake in northwest Montana, surrounded on the east and west by Flathead National Forest system lands (Figure 1-1).

The Swan River drains 729 mi^2 in a long south-to-north oriented watershed, with the Mission Mountain Range to the west, and the Swan Range to the east (Figure 1-2). Swan River winds for 70 miles from its headwaters in the Mission Mountains before discharging into Swan Lake. Following the narrow 9-mile long lake, Swan River meanders for another 14 miles before emptying into Flathead Lake at Bigfork, Montana. At the Refuge, the Swan River watershed comprises 81% of its total watershed area.

1.2 Swan River NWR Wetlands

Refuge wetlands persist in the Swan River valley bottom upslope of Swan Lake, largely due to endosaturation where groundwater creates saturated conditions, rather than episaturation. Swan River and Swan Lake, however, exert influence on wetland hydrology especially with flood events during spring snowmelt and peak runoff. In addition, two perennial streams, Stopher Creek and Lime Creek, contribute surface water hydrology to wetlands on the west of Swan River, on the northwest corner of the Refuge (Figure 1-2). On the east side of the Refuge, the perennial Spring Creek exerts a dominant influence on wetlands across its approximate 300- to 500-foot wide floodplain area and is also fed by groundwater. Wetland meadows associated with Spring Creek contain the most natural vegetation and are often cited as the most picturesque (Swan Valley Connections 2016).

Other than the localized influence of Spring Creek hydrology and the surface water components listed above, Refuge wetlands are classified in the hydrogeomorphic wetland classification system as slope wetlands with a very slight elevation gradient, and horizontal unidirectional hydrodynamics (NRCS 2011). Especially in the northern (downslope) third of the wetland complex it is nearly a flat landscape. Groundwater discharge is the dominant water source, and water loss occurs by subsurface saturation, some surface flow, as well as evapotranspiration (NRCS 2008).

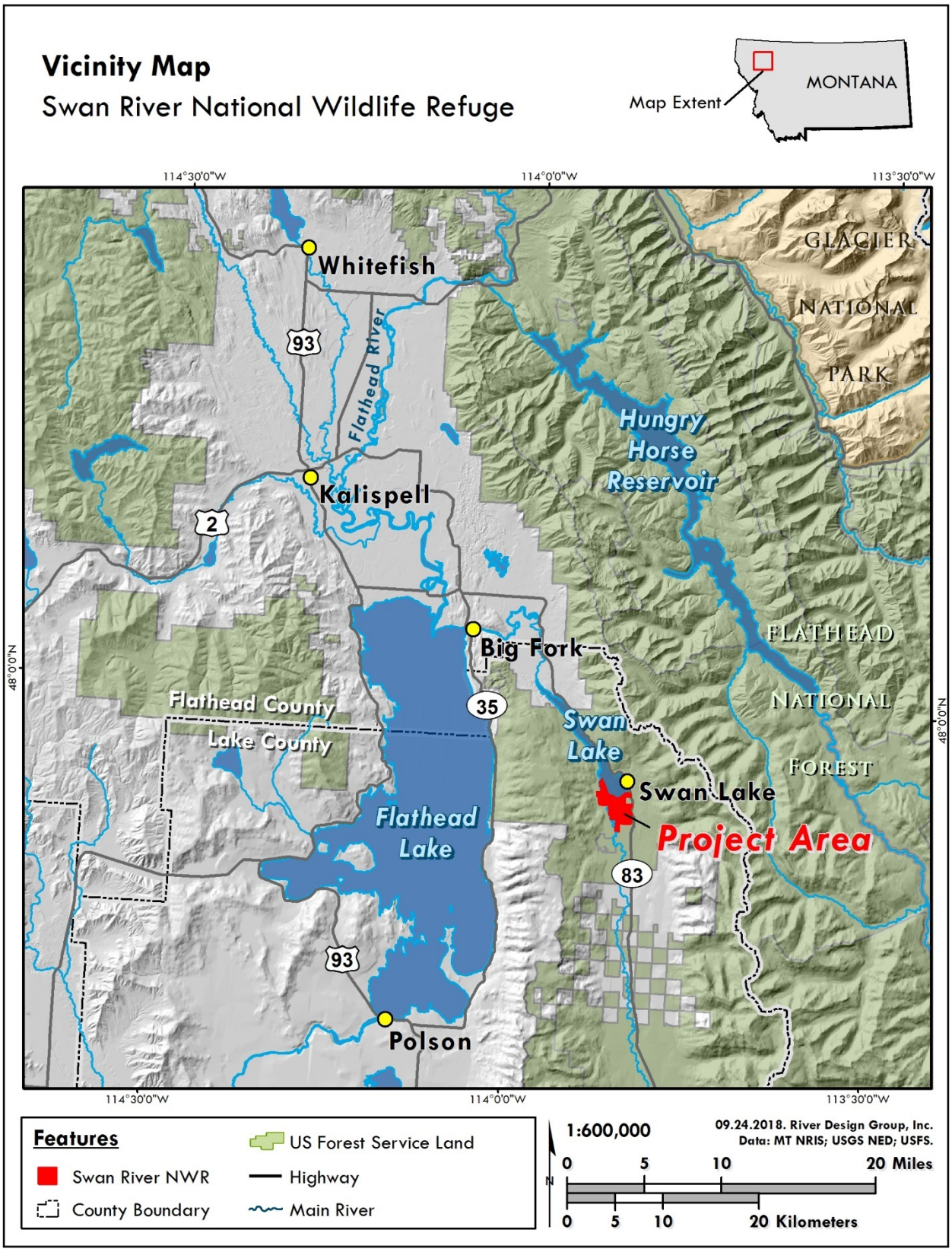

Figure 1-1. Project area vicinity map.

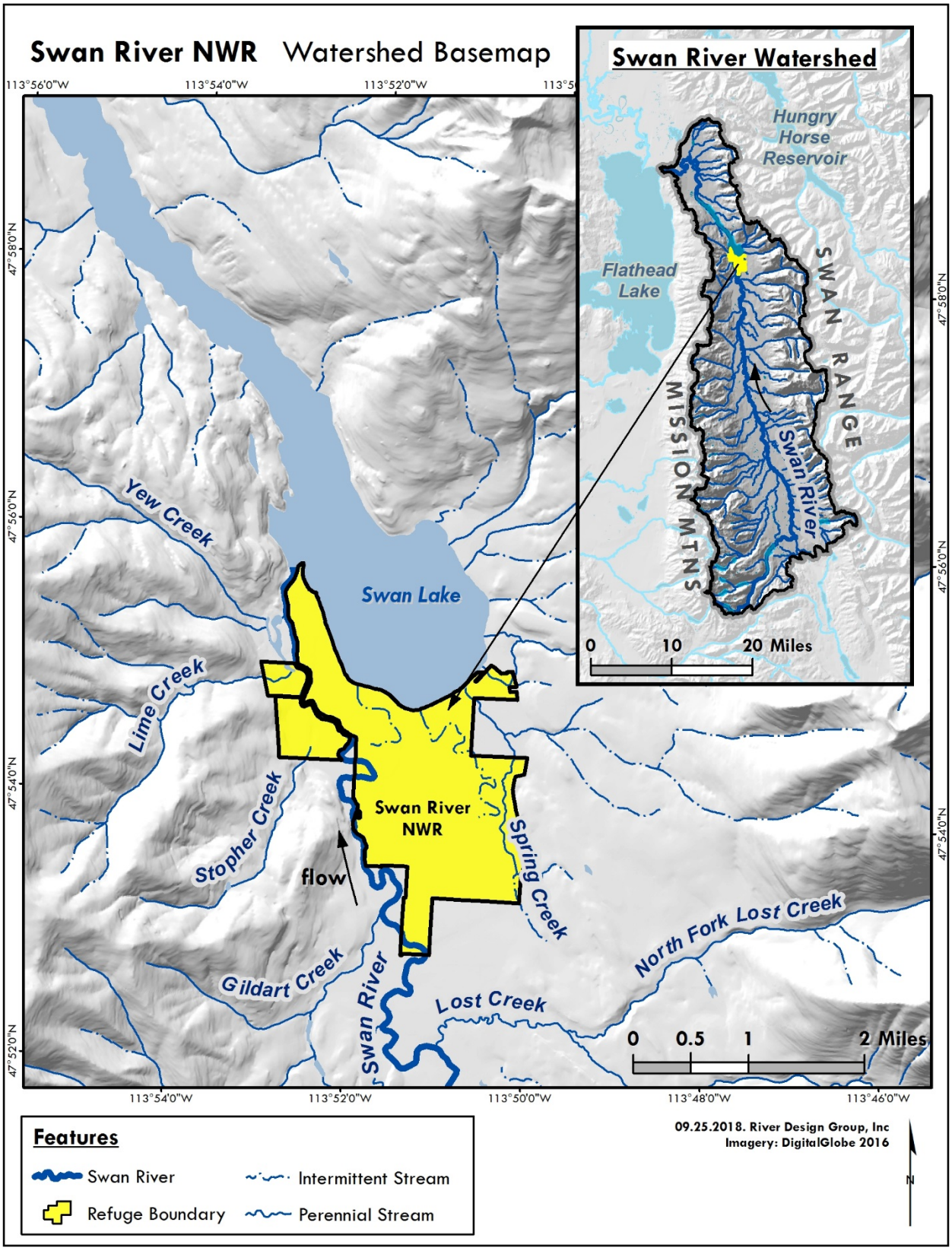

Figure 1-2. Swan River watershed basemap.

Refuge wetlands consist of herbaceous grassland, herbaceous marsh, scrub-shrub, and forest vegetation alliances, which in combination comprise 1,367.6 acres, or 69% of total Refuge area. Most wetland area (63%) consists of Herbaceous Marsh, followed by Herbaceous Reed Canarygrass wetland (25%), Scrub-Shrub wetland (8%), and Forested wetland (4%) (Table 1-1) (Swan Valley Connections 2016). A 2.7-acre non-native invasive *Phragmites australis* ssp. *australis* wetland is located along the southern shore of Swan Lake (Figure 1-3, right). This area should be prioritized for physical and/or chemical removal, as the grass species is an extremely invasive Priority 1A noxious weed and is very rarely found in Montana (MT Field Guide 2018).

Table 1-1. Refuge wetland vegetation types.[1]

Type	Acres	Proportion of Wetland (%)
Herbaceous: Marsh	855.9	63
Herbaceous: Reed Canarygrass	339.9	25
Herbaceous: *Phragmites australis*	2.7	0.2
Scrub-Shrub	110.6	8
Forested	58.5	4
Total	**1,367.6**	**100**

[1] Wetland estimates are based on Swan Valley Connections (2016) vegetation mapping, and do not necessarily represent jurisdictional wetland boundaries.

Figure 1-3. Herbaceous marsh wetland dominated by native sedge (*Carex* spp.) (left), and invasive *Phragmites* wetland on south shore of Swan Lake (right).

Reed canarygrass (*Phalaris arundinacea*) is also a highly invasive grass species that is tolerant of high water tables, and often outcompetes and crowds out other desirable herbaceous and woody vegetation. The Herbaceous: Reed Canarygrass alliance defines areas with 100% cover of the invasive grass, however 64% of the other Refuge wetland area also has some proportion of reed canarygrass present.

1.3 Purpose and Need for Action

Natural wetland hydrology at the Refuge is impacted by human alterations to the ecosystem. Prior to establishment as a Refuge, most of the valley bottom and wetland areas were managed as a muskrat farm by the Montana Muskrat Company, and by agricultural and ranching development. An extensive network of ditches was excavated throughout the area in an attempt to drain wetland hydrology from the south to Swan Lake. Ditch spoil berms are present along many of the large ditches. A few levees were also constructed on Swan River on the western boundary of the Refuge to restrict overbank flow from the river to Refuge land, and one large levee is located on the southern shoreline of Swan Lake, likely a remnant of the muskrat farm of the late 1920's. These ditches and levees have extensively altered and continue to modify the natural wetland hydrology of the Refuge. The changes to wetland hydrology, combined with the spread of the invasive reed canarygrass, have resulted in a striking departure from the natural vegetation communities and habitat that likely existed prior to the turn of the 19th century.

River Design Group (RDG) was retained by USFWS to assess wetland restoration potential at the Refuge. Objectives were to identify opportunities for restoration of wetland hydrology, and to determine the likely impact of restoration actions on existing plant communities and wetland habitat. The long-term goal is the restoration of wetland hydrology to the Refuge, by reversing the actions by which the wetlands were originally drained. Currently, ditches intercept and collect groundwater and surface water and move it downslope to Swan Lake. By converting ditch flow to flow across the ground surface through filling and/or plugging the ditches in strategic locations, water inundation will permeate through wetland soils and recharge the wetlands. The provision of self-sustaining Refuge wetland ecology with natural hydrologic and soil forming processes will ensure the long-term success of the restoration project (NRCS 2011).

Remote sensing analysis for this assessment was completed in the winter of 2017/18, fieldwork occurred at the end of August 2018, and this report along with Appendix A serve as the final deliverables of the assessment.

1.4 Document Organization

This document is organized into the following sections and appendices:

- ***Section 1 Introduction*** describes the project area, purpose, and objectives;
- ***Section 2 Methods*** defines the methodology used to complete the assessment;
- ***Section 3 Restoration Assessment Results*** presents the results, identifies various options for restoration implementation, and details the likely effect of restoration actions on existing vegetation communities.
- ***Section 4 Design and Implementation Considerations*** describes next steps needed for execution of the restoration plan, including additional design needs, construction feasibility and construction phasing options; and
- ***Appendix A – Cartographic Map Set*** provides maps of all ditches and levees at the Refuge, the preferred restoration plan, and the surface water and groundwater monitoring network.

2 Methods

2.1 Groundwater and Surface Water Monitoring

A network of ten monitoring wells was installed at the Refuge in August 2017 (Figure 3-2). Designed to collect water elevation measurements at regular intervals, data from the loggers will be used to assess existing pre-restoration water table conditions, as well as determine how restoration actions change those conditions through time, once implemented. Five loggers were installed as groundwater monitoring wells, and five loggers were installed as surface water monitoring sites. Benchmarks (5/8-inch x 24-inch rebar with a 2-inch aluminum cap stamped "Hydro - Monument RDG INC.") were installed at each site in the field.

Groundwater monitoring wells are 10-foot long pipes, consisting of 4-inch diameter Schedule 40 PVC, with a nominal slot size of 0.020-inches and ASTM F-481A standard 2 pitch threaded flush joint ends. Top caps are 4-inch diameter schedule 40 PVC and are not permanently attached. To prevent the ingress of soil, sand, and other foreign materials into the monitoring well pipe, a filter sock was installed on the outside of the slotted pipe. The pipe was installed in a hole 6 feet below ground elevation, and two 50-pound bags of coarse sand was poured around the pipe to further prevent siltation within the pipe. For the in-channel/lake locations, a pipe 4 to 5 feet in length was installed and mounted to an 8-foot long metal T-Post that was driven to a logical depth and fastened to it using at least two large diameter zinc plated worm-drive hose clamps.

The Water Level Data Loggers (ONSET Water Level Data Logger-Model U20L-01) installed in each well are currently programmed to record two times a day, at noon and at midnight. Battery changes should occur every 5 years. Software used to process the data is HOBOware PRO. One year of data was downloaded from each logger in August 2018. One surface water data logger was lost (SW-4), due to high water and shear forces on the bank of Swan River. All other loggers were in good condition at the time of data download.

2.2 Ditch and Levee Network Identification

Wetland restoration potential at the Refuge was assessed primarily through remote sensing analysis of Light Detection and Ranging (LiDAR) data. High-resolution elevation data was acquired with a Leica ALS960 LiDAR sensor mounted in an aircraft, in October 2013 (WSI 2013). Following automated and manual data processing with software, it resulted in both first return points which represent the top of vegetation canopy, if present, and points classified as occurring on the ground. Average LiDAR first return point densities are 0.94 points/ft^2, and ground point densities are 0.15 points/ft^2 (WSI 2013). Ground points were then merged into a terrain data model in a Geographic Information System (GIS) environment and exported into raster datasets for analysis. Ground points were also defined as a surface in the Computer Aided Drafting (CAD) environment.

Both GIS and CAD were utilized to identify and define the existing ditch and levee network present at the Refuge.

All ditches identified at the Refuge were categorized into three categories: Priority 1, Priority 2, and Priority 3 ditches (Figure 2-1). Priority 1 ditches include the main ditch flowing south to north and three others occurring perpendicular to it, as well as three small ditch outflows to the Swan River located to the west of the river. The Primary ditch network consists of the deepest ditches excavated at the Refuge, which collect and route groundwater from Refuge lowlands to Swan Lake. Numerous secondary (Priority 2) and tertiary (Priority 3) ditches are also present and were divided into five hydrologic zones for project planning purposes in this assessment (Zones A-E, Appendix A, Sheet 1.2).

Lengths were calculated for all categories of ditches, and the volume of material needed to fill each of the Priority 1 and Priority 2 ditches was assessed. Analysis of LiDAR ground surface data of Priority 1 ditches yielded water surface returns, as the LiDAR is not water penetrating. Fieldwork performed in August 2018 included collecting bathymetric cross-sections at regular intervals with survey-grade GPS for Priority 1 ditches with significant water surface returns. Volume of earthwork needed to fill all Priority 2 ditches was estimated using average cross-sectional dimensions derived from LiDAR. Priority 3 ditches exist as very slight linear surface indentations, mostly within six inches to one foot deep. These linear features are considered to not affect wetland hydrology and are excluded from volumetric calculations.

Three artificial levees were identified at the Refuge. Two are on old oxbow meander bends on the Swan River, and one levee is near the southern shore of Swan Lake, on the northeast portion of the Refuge. The volume of material gained from leveling the three levees is detailed in Section 3.2.1 of this report.

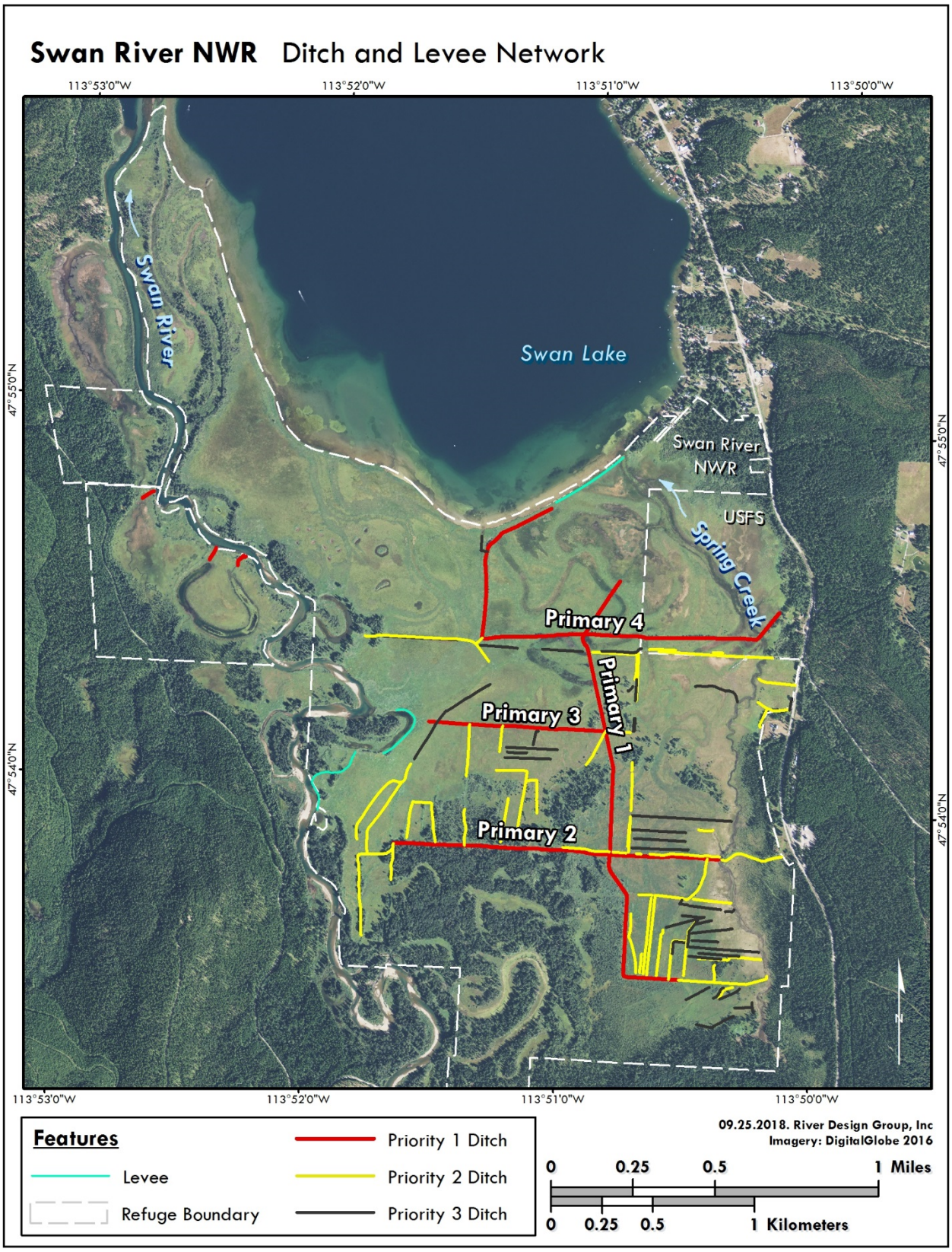

Figure 2-1. Refuge ditch and levee network.

2.3 Vegetation Analysis

An analysis of how restoration of wetland hydrology at the Refuge is likely to affect existing vegetation communities was conducted utilizing high-definition vegetation mapping (Swan Valley Connections 2016), LiDAR data, and field ground-truthing. Fourteen vegetation transect profiles were extracted from the LiDAR ground surface data and matched with vegetation community definitions (Figure 3-7). Vegetation profile locations were selected to represent areas where a strong desirable vegetation community exists with minimal reed canarygrass and is surrounded by areas with greater than 50% reed canarygrass cover. The proportion of reed canarygrass present within the desirable wetland vegetation communities was analyzed in detail, as the invasive grass species has spread to almost all of the Refuge wetland area with varying proportions. Where applicable, ground-truthing of vegetation data occurred during the field effort in August 2018, and the proportion of reed canarygrass present was defined in further detail across some representative profiles.

While the exact effects of groundwater level increases to existing vegetation is difficult to establish, the analysis of relative elevations at which different native communities occur, and the proportion of reed canarygrass present in those communities, can provide a likely post-restoration scenario if groundwater elevations are successfully raised. In addition, a cursory analysis of the groundwater data collected over the past year yields insight into current groundwater levels present at varying vegetation communities.

3 Restoration Assessment Results

3.1 Wetland Hydrology

With the prevalence of wetland vegetation and hydric conditions throughout much of the Refuge, it is expected that water is and has been available for wetland plant growth through much of the growing season in the recent past, even with the presence of the ditch and levee network. The interception and conveyance downslope of wetland hydrology through ditches has, however, shifted hydrological conditions to favor the growth and spread of invasive reed canarygrass, especially in the southern portion of the Refuge, south of Bog Road. The availability of water within 12 inches of the soil surface during the growing season is critical for hydrophytic vegetation and hydric soil development. Analysis of one year of water elevation data demonstrates that groundwater availability varies based on location within the Refuge, and that during high spring snowmelt and runoff years, the northern half of the Refuge is inundated to coincide with the water surface elevation of Swan Lake.

3.1.1 Surface Water Elevation Data

Figure 3-1 displays surface water elevation data collected from September 1, 2017 through September 10, 2018. Shades of black indicate loggers on Spring Creek, and shades of blue are loggers at the mouth of Swan Lake and at the southern tip of Swan lake. Logger locations are displayed in Figure 3-2.

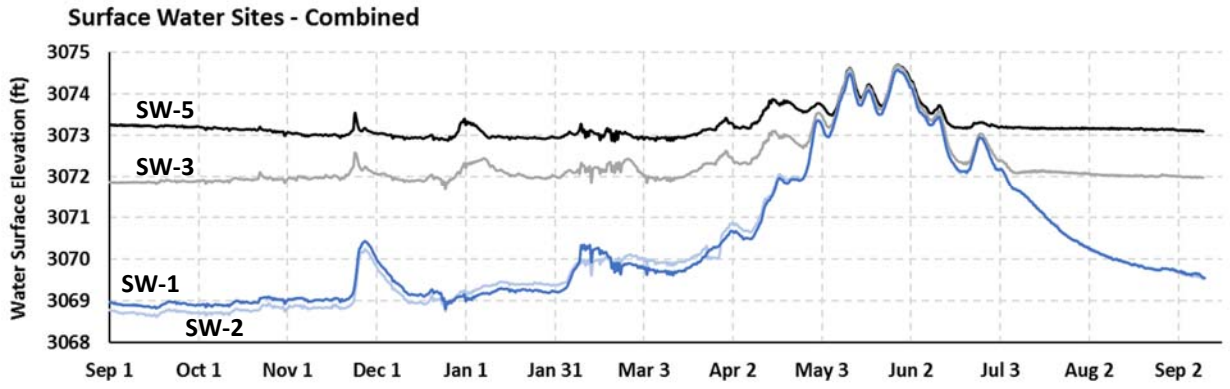

Figure 3-1. Water surface elevation data for surface water data loggers, September 01, 2017 – September 10, 2018.

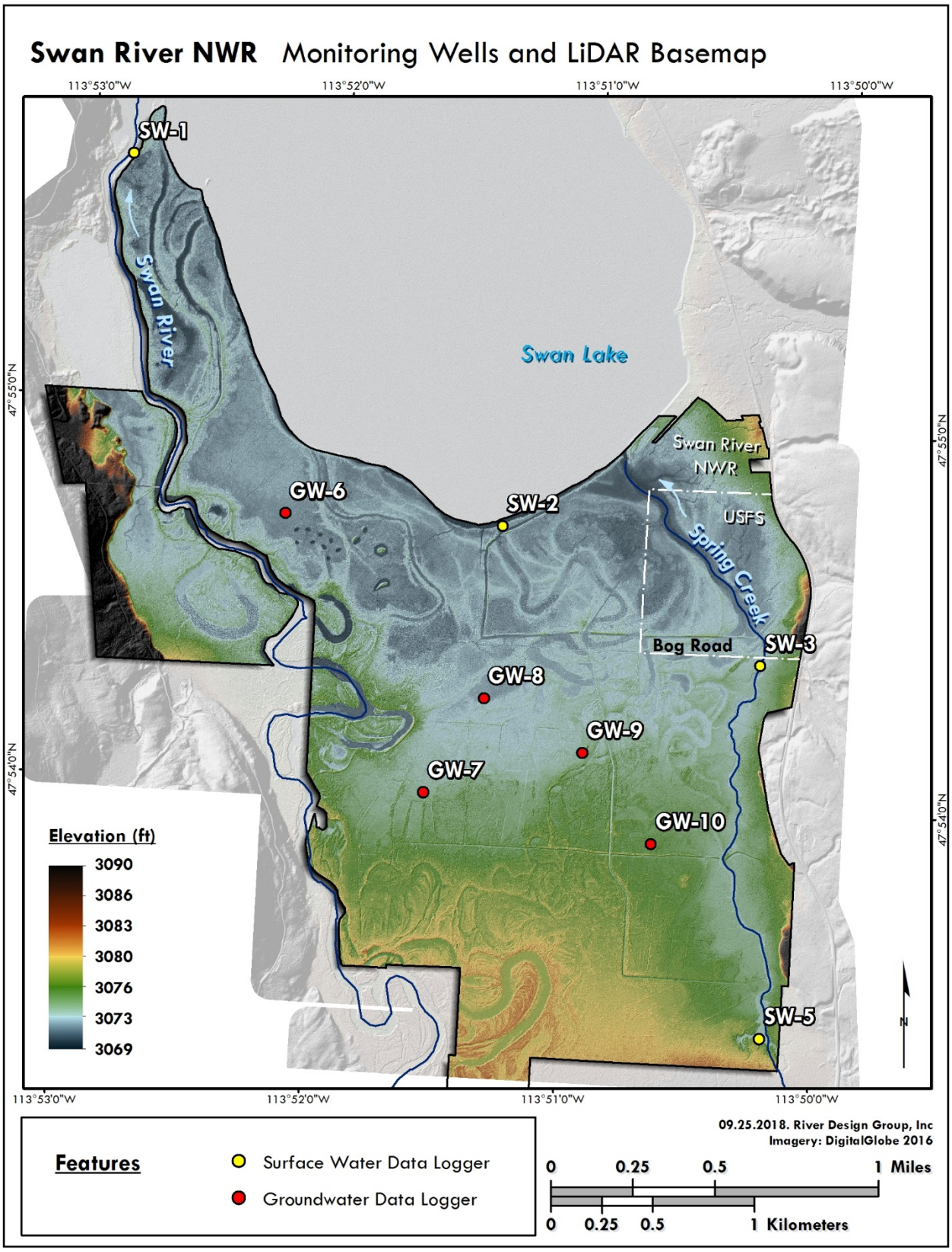

Figure 3-2. Locations of water surface elevation data loggers installed in August 2017.

Two data loggers were installed on the perennial Spring Creek, which flows from its headwaters near the southeast corner of the Refuge, and discharges into Swan Lake towards the northeast end of the Refuge. Adjusting for the 1.8-foot elevation difference between logger SW-5 (headwaters) and SW-3 (just south of Bog Road), the water surface elevation was 0.4 feet higher at the downstream location than at the headwaters on September 1, 2017. Without any surface water runoff from the mountainous terrain to the east, it is implied that the difference in water surface is due to groundwater inputs. By December, that difference doubles, and SW-3 is 0.8 feet higher than the headwaters.

This difference remains fairly constant through fall and winter, but at the beginning of May 2018, which marked the beginning of spring snowmelt and peak runoff for the year, water surface elevations sharply converge, and water surface elevation is the same downstream and upstream despite the 1.8-foot elevation difference between the sites. This is indicative of the Refuge flooding that occurred between early May and mid-July 2018 (Figure 3-3).

Figure 3-3. Refuge conditions on May 28, 2018. View is looking north from Bog Road.

Logger SW-1 is installed at the mouth of Swan River within the Swan Lake backwater influence, and SW-2 is in Swan Lake at its southern tip. Water surface elevations are nearly identical, as expected, and serves as a check of data accuracy. United States Geological Survey (USGS) Streamflow Gaging Station 123700 Swan River at Bigfork tracks well with SW-1 and SW-2, and Figure 3-4 displays daily discharge data for the USGS gage, dating back to September 2012. As shown, the 2018 water year has seen the highest and most prolonged spring runoff discharge in at least the past 6 years.

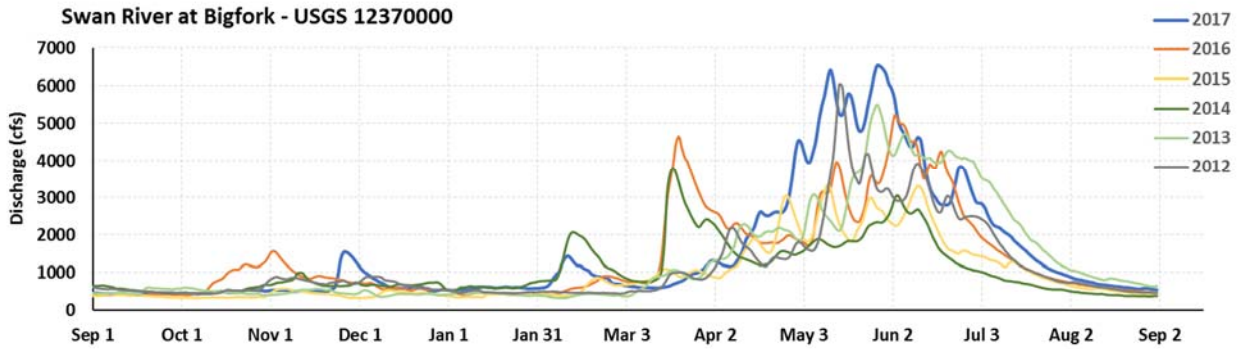

Figure 3-4. USGS Streamflow Gaging Station 1237000, displaying 6 years of discharge data. Dates in the legend refer to the beginning of the period of record.

3.1.2 Groundwater Elevation Data

The five groundwater monitoring wells demonstrate a marked difference in groundwater elevation relative to the ground surface, depending on location (Figure 3-5). As expected due to elevation, GW-9 and GW-10 display the lowest water tables. The magnitude of change throughout the year for groundwater levels at GW-9 is, however, higher than for GW-10. Groundwater at GW-10 is two feet below the surface on September 1, begins to rise and tracks with the other loggers, but ceases to express above the ground surface. Of the installed monitoring wells, GW-10 is the only well where maximum groundwater elevations do not exceed the ground surface.

In contrast, GW-8 in the middle interior of the Refuge shows the highest overall groundwater elevations throughout the year of record, which is somewhat surprising as GW-6 is located furthest north near Swan Lake. From the beginning of May through the end of June 2018, both GW-6 and GW-8 converge with the water surface elevation of Swan Lake, which highlights the prolonged flooding of the Refuge in Spring 2018. Logger GW-7 displays around average groundwater elevations for all five sites. Interestingly, it shows the highest relative groundwater retention for all sites in July when the hydrograph drops sharply.

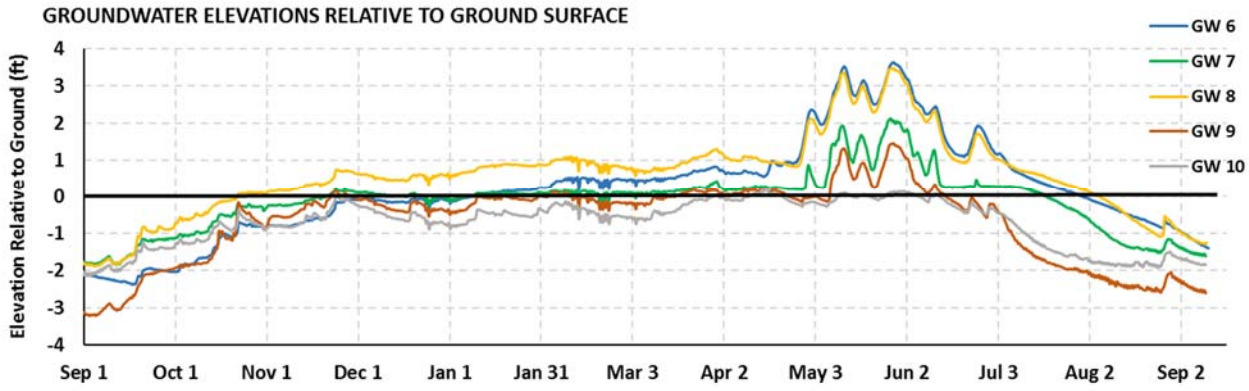

Figure 3-5. Elevation of groundwater compared with ground surface, for all five groundwater monitoring well locations, September 01, 2017 – September 10, 2018.

3.2 Restoration of Wetland Hydrology

Wetland hydrology at the Refuge can be restored by reversing the actions that have caused both localized and large-scale wetland draining. Common methods of wetland draining in the early- and mid-1900's include both underground drainage tiling and surface ditch excavation. Underground tiling is not known to have occurred on Refuge wetlands, however a large network of surface drainage ditches has been identified across Refuge lands (Figure 2-1). Filling and/or

strategically plugging the ditches, as well as leveling the levees that were built to keep Swan River and Swan Lake overbank flow out of the Refuge during flood events, will have a positive effect on wetland hydrology and groundwater recharge. While it is difficult to determine how the presence of the ditch and levee network has influenced Refuge hydrology over time, it is known that especially during summer dry seasons, and for drier-than-average years, the interception of groundwater and surface water by ditches and its conveyance downslope to Swan Lake has had a significant drying effect throughout Refuge land, especially for the southern half of the Refuge.

3.2.1 Ditch and Levee Network

Table 3-1 presents a summary of all diches inventoried at the Refuge. Ditches were placed in the following three categories based on their depth and probability of significantly affecting wetland hydrology:

- ***Priority 1*** ditches comprise the primary ditch network (Primary 1-4). These excavations are large enough to hold water even in dry seasons, and Primary 1 and 4 convey water downslope. Also included are three small ditches on the west of Swan River (Primary 5-7);
- ***Priority 2*** ditches have a smaller footprint, are generally one to two feet deep, and did not have standing water during either the field effort (August 2018) or the LiDAR acquisition (October 2013); and
- ***Priority 3*** ditches are barely defined in the LiDAR surface, were mostly undetectable on the ground, and do not appear to influence current wetland hydrology. Volumes of fill material was not calculated.

Table 3-1. Swan River NWR ditch network.

Type	ID	Length (ft)	Complete Fill Volume (cy)
Priority 1	Primary 1	6,600	24,444
	Primary 2	5,600	20,741
	Primary 3	3,200	11,852
	Primary 4	7,073	52,393
	Primary 5	200	280
	Primary 6	200	178
	Primary 7	230	419
	Total Priority 1	**23,103**	**110,307**
Priority 2		33,504	6,825
Priority 3		21,551	-
	Total All	**82,991**	**117,132**

A total of 4.38 miles of Priority 1 ditches were identified in this assessment. Primary 1 and Primary 4 are of highest priority, as these ditches were actively flowing in late August 2018, effectively draining Refuge wetlands. Primary 1 flows south to north through the Refuge, and Primary 4, which flows east to west just north of Bog Road, turns north and flows to Swan Lake. Total volume of fill material required to fully fill Primary 1 and Primary 4 is 76,837 cubic yards (cy). Ditch spoil berms are present along much of the ditch length on one or both sides of the ditches. The volume of material on just Primary 1 and Primary 4 is 10,885 cy, leaving a deficit of 65,952 cy of material needed to fill the entire area of the two ditches.

Three small ditches are located to the northwest of the Refuge and drain directly into the Swan River. Material needed to fill these ditches is 877 cy, which can be gained from the adjacent spoil berms and from the interior of the wetland area or uplands in the vicinity. Fill of these ditches requires minimal earthwork for maximum inundation, and should be prioritized along with the fill/plugs of Primary 1 and Primary 4 ditches.

Total length of all Priority 2 ditches is 6.35 miles, and the volume of material needed to completely fill them is approximately 6,825 cy. Some Priority 2 ditches have associated spoil berms, but most are eroded such that availability for ditch fills is minimal. Finally, total length of Priority 3 ditches is 4.08 miles. A volumetric analysis was not completed for this ditch category, as the excavations are minimal (mostly two to six inches deep) and do not affect wetland hydrology.

Three levees were identified at the project area (Table 3-2). Levees A and B are along old meander bends of the Swan River and can provide 3,504 cy of material to fill ditches. Removal of these levees would allow overbank Swan River flood flows to inundate the western portion of the Refuge at those locations. Levee C is a 2,640-feet long levee along the southern border of Swan Lake, and likely inhibits some water flow from Swan Lake into Refuge lands at the north. Removal of Levee C would generate 4,425 cy of fill that could be used to fill the end of ditch Primary 4. All excavation volumes presented in tables and maps are adjusted from neatline with a factor of 0.80 to compensate for compaction and loss.

Table 3-2. Swan River NWR levees.

ID	Length (ft)	Excavation Volume (cy)
Levee A	1,134	2,544
Levee B	1,363	960
Levee C	2,640	4,424
	Total	7,928

3.2.2 Restoration Options

The whole or partial fill of some of the Primary ditch network, and the complete removal of the three levees, is recommended to restore wetland hydrology at the Refuge and create conditions where the prevalence of reed canarygrass can be lessened. The original spoil berms associated with Primary diches have settled, mineralized, and eroded, such that additional material needs to be generated to entirely fill the Primary ditch network. This material can be sourced from the interior of wetlands, and concurrently create open water wetland habitat for waterfowl, as well as shallow to deep emergent wetland habitat. Additionally, ditch fill material should be at least 50% mineral soil, to provide stability until organic soil formation processes can begin again (NRCS 2011). Fill should be placed at a minimum of 10% over ground level to account for settling (Thomson and Luthin 2004).

Because of prolonged high water tables and organic soils especially on the northern half of the Refuge, care should be taken to not disturb interior wetlands with machinery that could create linear depressions, and unnecessarily disturb high-value wetlands and vegetation. The best option for fill generation if needed is east of the intersection of Primary 1 and Primary 2 ditches. Here, the largest contiguous monotypic reed canarygrass grasslands persists. As is discussed in Section 3.3 Vegetation Analysis, a groundwater level increase of one or two feet in this area is unlikely to shift the dominance of reed canarygrass to a desirable wetland vegetation community. A groundwater level increase, however, combined with physical removal of the reed canarygrass and underground rhizomes to a depth of two to three feet, coupled with a desirable species seeding effort, could result in a more favorable vegetation community and would generate the necessary material to entirely fill the Primary ditch network.

Placement of strategic ditch plugs and fills on Priority 1 ditches, however, presents the same opportunity for restoration of wetland hydrology as complete ditch fills. Further, the slope analysis of Priority 1 ditches reveals that only Primary 1 and Primary 4 convey water downslope. Primary 2 and Primary 3 are deep ditches that collect and hold water, but do not convey it downslope and out of wetlands. In addition, the combination of minimal depth and flat slope of Priority 2 and Priority 3 ditches does not warrant ditch fills in the secondary and tertiary ditches for the sole purpose of wetland hydrology restoration. Some of the ditch spoil berms of Priority 2 ditches however, as well as Primary 2 and 3, contain a higher percentage of reed canarygrass than surrounding lowlands. The removal of those berms may reduce local occurrence of the invasive grass, improve aesthetics, and possibly remove pathways for predators that would not usually traverse wetlands (Thomson and Luthin 2004) especially in high flow years.

Table 3-3 identifies the volume of material available from the removal of all main ditch spoil berms and levees. Sheet 1.8 in Appendix A identifies the proposed locations of ditch plugs/fills along Primary 1 and Primary 4, using all available material. Material from Levee and A and Levee

B would be hauled to the east to fill Primary 1, and material from Levee C would be hauled southwest to fill the end of Primary 4.

Table 3-3. On-site material available for ditch plugs/fills (adjusted for compaction/loss).

ID	Excavation Volume (cy)
Primary 1	6,124
Primary 2	4,149
Primary 4	4,761
Levee A	2,544
Levee B	960
Levee C	4,424
Total	22,962

While the exact effect of plugging and filling ditches which convey water downslope and out of wetlands is difficult to determine, a one- to two-foot rise in groundwater levels in the northern half of the Refuge is not unreasonable. In the southern half where groundwater is generally lower, ditch plugs and fills will stop water conveyance downslope, but is unlikely to result in surface flow across the wetland except in very localized areas.

3.3 Vegetation Assessment

A primary objective of this wetland restoration assessment is to determine how proposed restoration actions are likely to affect the existing vegetation at the Refuge. Throughout the entirety of Refuge wetlands, save very few locations of the highest elevation and lowest elevation, the highly invasive reed canarygrass exists in some proportion within desirable, non-invasive wetland vegetation communities, and approximately 25% of Refuge wetlands consist of reed canarygrass in monoculture. Wetland hydrology restoration actions have a high probability of reducing the cover of the invasive grass, especially in the northern portion of the Refuge where water tables are high throughout the growing season.

Reed canarygrass is a highly aggressive, invasive grass species that reproduces both through the spread of countless small seeds and underground rhizomes. Once established, reed canarygrass successfully outcompetes the vast majority of other species for light, water, nutrients, and space. The top 12 inches of the soil profile becomes a thick, dense mat of roots and rhizomes, and the above-ground biomass can easily reach heights of seven feet (Figure 3-6). The invasive grass has become ubiquitous throughout riparian and wetland areas in northwest U.S. Its eradication is unrealistic, however active and passive management techniques can reduce local prevalence, percent cover of the invasive grass, and seed sources. Management of available groundwater can be an effective tool to manage reed canarygrass. It is a Facultative-Wetland hydrophytic plant species, meaning that it tolerates both wetland and upland conditions but prefers saturated

conditions. Flooding for long periods of time during the growing season, or conversely, drying for long periods of time have been shown to decrease reed canarygrass cover.

A good example of the efficiency of a groundwater level increase in reducing reed canarygrass cover is the restoration of the McGregor Meadows Waterfowl Production Area (WPA) managed by USFWS, near Marion, MT. Restoration included plugging ditches, raising two streams to floodplain elevation and restoring groundwater levels in the previously ditched wetland environment. The restoration resulted in large-scale conversion of reed canarygrass-dominated wetlands to desirable native sedge communities. Six years following restoration project construction at the WPA, the wetland meadow complex was largely free of reed canarygrass. Wetlands without reed canarygrass increased from 42 acres to 264 acres (529%), with a 68% total reduction of the invasive grass. A similar reduction in reed canarygrass cover in favor of native sedge, horsetail, and bulrush communities can be expected for the norther portion of the Swan River National Wildlife Refuge with the restoration of wetland hydrology, although uncertainty is a component of any wetland restoration project of this magnitude.

Figure 3-6. Monotypic reed canarygrass grasslands at Swan River NWR.

3.3.1 Existing Vegetation Analysis

Vegetation transects were analyzed throughout Refuge wetlands (Figure 3-7). Transects located in wetlands to the north provided the best examples of vegetation communities with and without reed canarygrass along a longitudinal gradient (Transects 10 through 14). Here, stunning native horsetail and sedge communities are flanked by reed canarygrass on higher elevations. Vegetation Transects 1 through 9 represent locations where the vegetation is more mixed, and field verification produced very few areas without reed canarygrass. Groundwater elevations in these locations are consistently one foot below that of sites to the north throughout the year, and in spring and summer can be up to 3.5 feet lower than sites to the north.

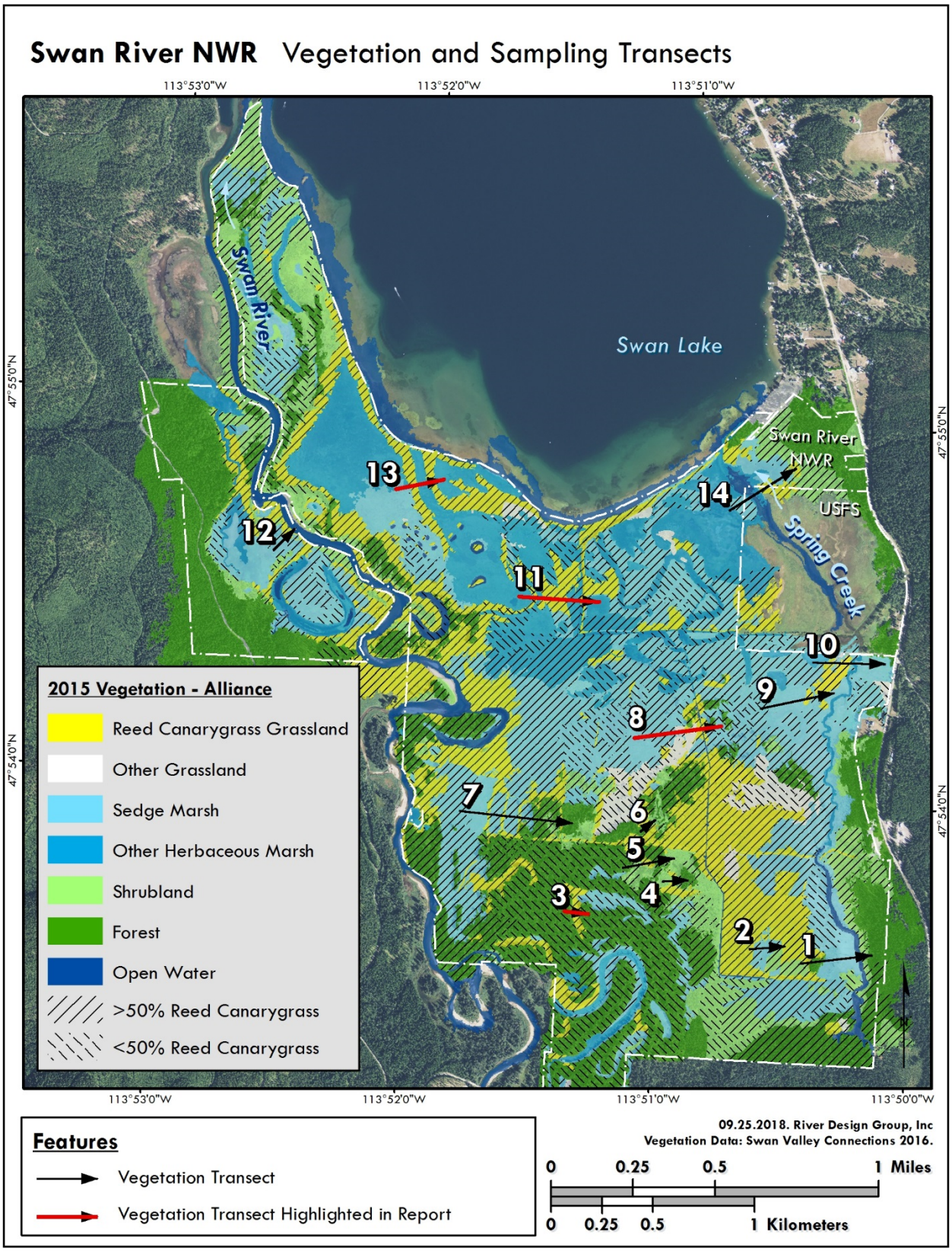

Figure 3-7. Refuge vegetation (Swan Valley Connections 2016) and vegetation sampling transect locations.

Figure 3-8 highlights Vegetation Profile 11. Reed canarygrass is present in monotypic cover between 3072 and 3073 feet in elevation, horsetail and sedge communities without reed canarygrass occupy elevations largely below 3071.6 feet, and a vegetation community comprised of a mixture of 60% reed canarygrass and 40% horsetail is present at or near 3072 feet. On average for this transect, reed canarygrass monocultures occupy elevations one foot higher than desirable native wetland vegetation without any of the invasive grass.

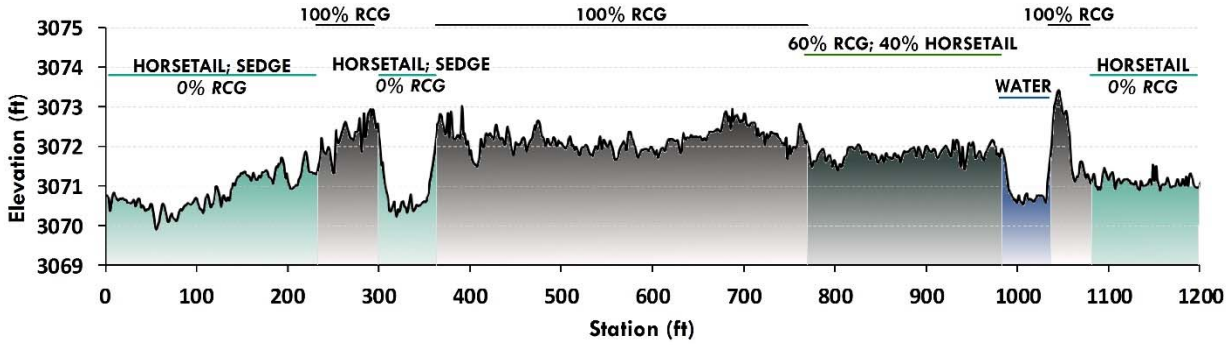

Figure 3-8. Vegetation Transect 11, with vegetation community composition; West to east orientation.

Groundwater monitoring loggers GW-6 and GW-8 provide the best analog for water table conditions at the lowest vegetation community in Profile 11. In 2018, between 0.1 and 1.0 feet of inundation was likely present on the surface of the horsetail and sedge communities between January and May, changing to up to 3.5 feet in May, between 3 and 1 feet in June, then descending to the ground surface by the beginning of August. Thus, in the 2018 growing season, the horsetail/sedge communities were under at least one foot of water while the reed canarygrass monocultures likely persisted without inundation except for in May and June.

Vegetation Transect 13 shows the same pattern as above (Figure 3-9). Horsetail and sedge communities with 0% of reed canarygrass occupy sites that are 0.5 and 1.0 feet below monocultures of the invasive grass. The photo in Figure 3-9 is of the horsetail community between station 360 and 500.

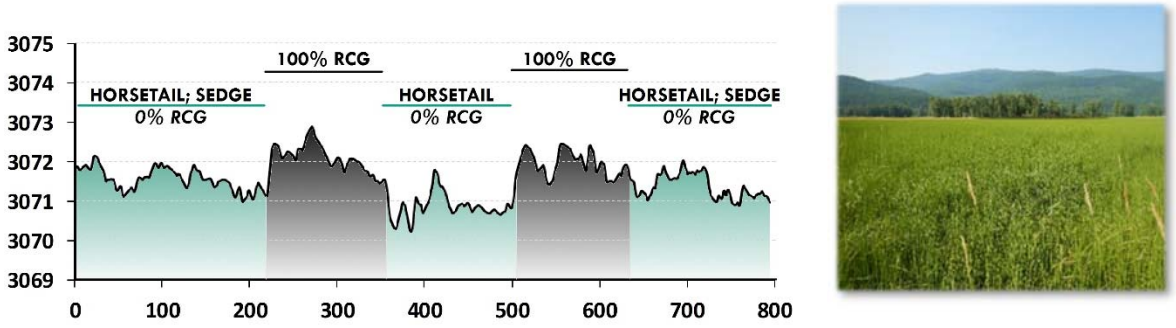

Figure 3-9. Vegetation Transect 13; West to east orientation (left). Horsetail community (right).

Vegetation transects in the middle and southern portions of the Refuge are more mixed with reed canarygrass and desirable species. Here, the effects of wetland ditching are more pronounced, and along with the elevation difference of the Refuge, result in a lower groundwater table compared with ground surface than at the north of the Refuge. Vegetation Transect 8 (Figure 3-10) is representative of this condition, where only the first 230 feet are free of reed canarygrass, and an elevation increase of three to six inches is correlated with an increase from 0% to 60% of the invasive grass.

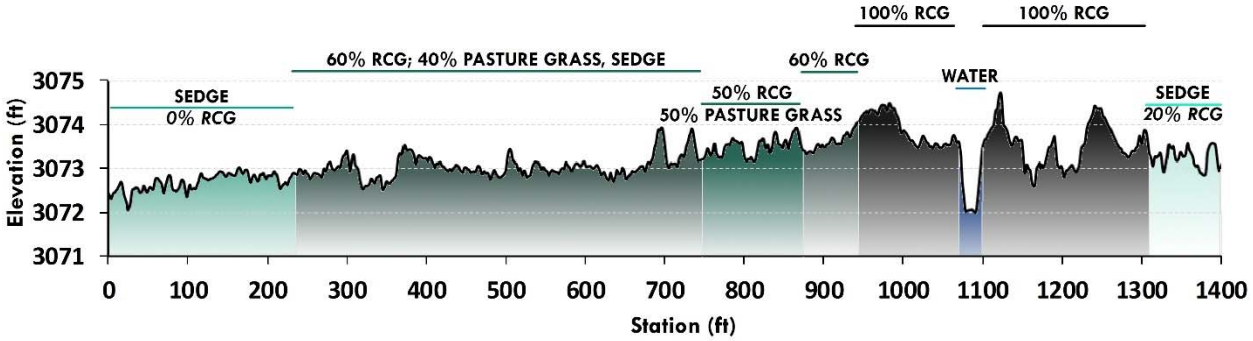

Figure 3-10. Vegetation Transect 8, west to east orientation.

The prevalence or absence of reed canarygrass throughout Refuge wetlands is likely due to a combination of the amount and duration of inundation during the growing season, and species-specific attributes. The native sedges *Carex nebrascensis* and *Carex utriculata* are dominant in a few locations where reed canarygrass is not. Of the native sedges in Montana, these species are two of the largest and hardiest, are often found in monoculture, and in combination with high water tables may have the best growth form attributes to compete with reed canarygrass out of all the native sedges and rushes present at the Refuge.

In contrast, in fully inundated horsetail communities in northern Refuge locations, the absence of reed canarygrass is due entirely to the high-water table and inundation through most of the growing season, even in dryer years than 2018. Horsetail lacks the above-ground and below-ground vigor that is necessarily a component of any scale of successful competition with reed canarygrass, although at the Refuge, horsetail stems can reach four feet in height (Figure 3-11).

Figure 3-11. Monotypic horsetail communities in northern Refuge locations, inundated by two feet of water in late August 2018, and surrounded by one to two feet higher elevations dominated by reed canarygrass.

Conversely, the mixed coniferous and deciduous riparian forest mapped to the south of the Refuge is largely too dry for reed canarygrass dominance. Here, an elevation drop of one foot often coincides with a drastic reed canagrass increase. Figure 3-12 displays Transect 3, with only 5% reed canarygrass present in the understory of the diverse riparian forest, and 100% cover of reed canarygrass in a small depressional area. Furthermore, a structurally and functionally diverse forest or shrub canopy can preclude invasive grass establishment, as available niche space is filled and light penetration to the ground surface is minimal.

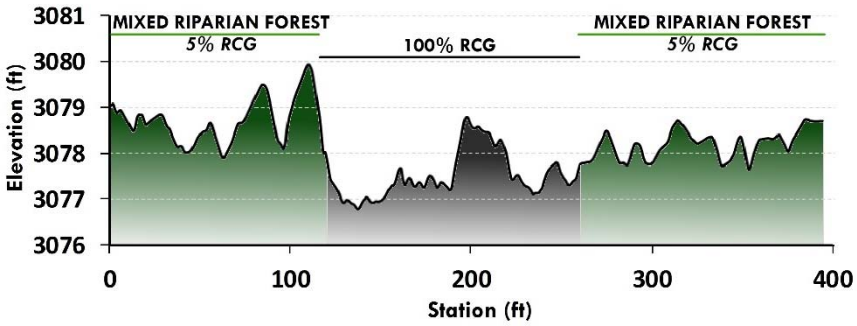

Figure 3-12. Vegetation Transect 3, west to east orientation.

3.3.2 Restoration Impact to Existing Vegetation

A groundwater level increase of one to two feet can be expected for Refuge wetland areas in northerly locations once the main ditches that convey water downslope are prevented from functioning. In southerly locations, groundwater levels are currently 1 to 3.5 feet lower than in the north depending on the time of year, and ditch fills are likely to cause only localized increases to groundwater elevations around the plugged ditches.

Vegetation in the north is very likely to respond favorably to a groundwater elevation increase. Currently, a 1-foot surface elevation increase generally corresponds to a dramatic shift from desirable wetland communities such as native sedges and horsetail to a reed canarygrass monoculture. If a 1-foot groundwater level increase is maintained for these locations, it is expected that a majority of reed canarygrass monocultures would shift to a dominance of desirable wetland vegetation, and that areas with some proportion of reed canarygrass mixed with desirable species would lose the invasive grass component completely with time. Figure 3-13 highlights a 490-acre area with mostly greater than 50% cover of reed canarygrass, that is estimated to convert to desirable wetland vegetation with implementation of restoration actions.

Desirable native wetland vegetation will also be affected by the groundwater level increase resulting from implementation of the restoration plan. Some drier herbaceous marsh vegetation alliances such as *Carex limosa-Carex buxbaumii-Triglochin maritima* may convert to a wetter *Carex aquatilis-Carex utriculata* type with time. These types of shifts to native sedge communities occur naturally with changes to hydrologic regimes. In the above example, a similar underground and above-ground vegetative structure is present for both alliances, although the latter *Carex aquatilis-Carex utriculata* sedge mass is generally larger and hardier than the drier type. These native sedges in general provide a foundation for the food web for both terrestrial and aquatic animals, and a shift from one native sedge species to another is suitable with regards to Refuge wetland ecosystem structure and function.

On the other end of the hydrologic spectrum, some riparian shrub and forest vegetation communities to the south may be affected if restoration actions impact groundwater levels in those locations. A rise in groundwater level may result in conditions that favor the spread of reed canarygrass to drier riparian forests. However, this change to a more favorable environment for reed canarygrass is likely to be mitigated through a diverse canopy cover and low light availability at the ground surface, which can limit the success of reed canarygrass.

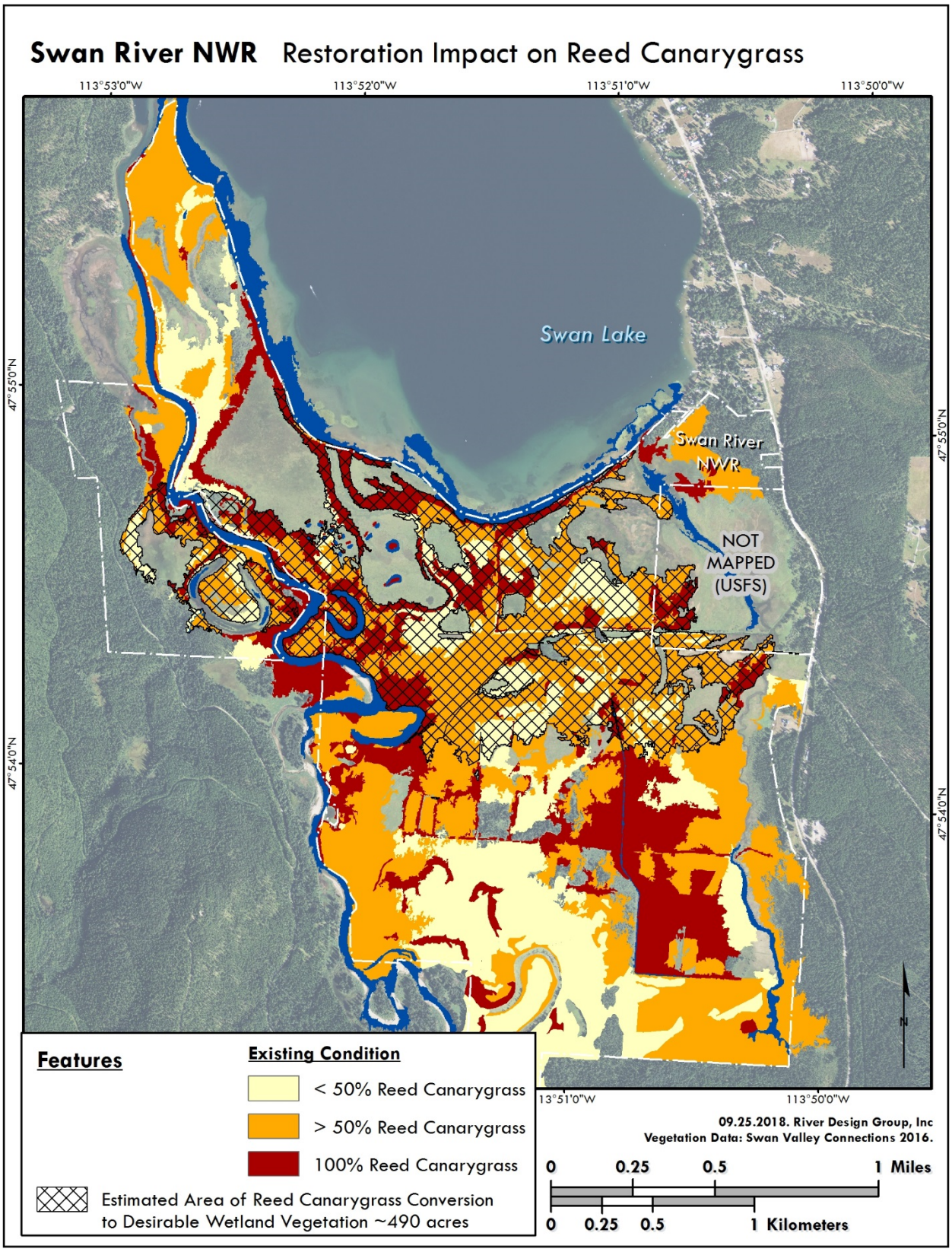

Figure 3-13. Estimated area of reed canarygrass reduction and conversion to desirable wetland vegetation.

4 Design and Implementation Considerations

The objectives of this assessment were twofold: 1) to identify opportunities for restoration of wetland hydrology at the Refuge, and 2) to determine the impact of restoration actions on existing plant communities. To further the results of this assessment into a construction-ready design plan, additional items to address include USFWS and stakeholder consensus on the plan of action, identification of construction phasing options and sequencing, project access and feasibility for equipment, and identification of performance expectations. An on-site visit with contractors may be warranted to discuss construction feasibility and sequencing, as well as project phasing options.

Implementation of the Swan River National Wildlife Refuge Wetland Restoration Project poses minimal risk; however, some degree of uncertainty is inherently present in any ecological restoration project. Private land is not affected with the exception of the very northwest portion, infrastructure is not threatened, and the technical risk associated with geomorphic and biological responses to restored wetland hydrology is low. For example, failure of one ditch plug is unlikely to cause conditions that would threaten overall project integrity. Moreover, reducing the dominance of the invasive reed canarygrass in favor of desirable native wetland vegetation has numerous benefits not only for terrestrial and aquatic wildlife habitat suitability and ecology, but for aesthetics and public perception of Refuge land management as well. Reversing the actions of past wetland ditching and draining efforts will result in a self-sustaining resilient ecosystem with a natural hydrologic regime and soil forming processes, a trajectory towards natural and dynamic vegetation succession, and the provision of habitat heterogeneity for wetland-dependent wildlife species.

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