

# RESTORATION OF GRIZZLY BEAR AND WETLAND HABITATS AT THE ABANDONED SNAKE RIVER GRAVEL MINE, JOHN D. ROCKEFELLER, JR. MEMORIAL PARKWAY, WYOMING <sup>1</sup>

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**Abstract.** The project is located within the John D. Rockefeller, Jr. Memorial Parkway and approximately two miles south of the Yellowstone National Park. Gravel mining within the Snake River Floodplain had created four large pits, several small pits, waste piles, debris dumps, and caused severe environmental degradation to over sixty-five acres of pristine riparian habitat.

The entire project site was located within the Yellowstone grizzly Bear Recovery Area and was designated as a Management Situation I area. In addition, it had seven species of concern within the project area that were either protected by the Endangered Species Act or were under consideration of such protection.

The proposed actions to reclaim the site and restore wetlands were necessary to comply with the National Park Service policies, the Clean Water Act in accordance with the U. S. Army Corp of Engineers, the Environmental Protection Agency, and the Wyoming Department of Environmental Quality standards.

Special factors that were addressed during the design phase included the complex hydrology of the site, the need to protect existing Grizzly Bear and species of concern habitat, and to promote survivability of herbaceous plant species and natural willow establishment.

In order to reduce the impact to the Snake River, the reclamation grading plan included the reshaping of existing pits, creation of on-site channels, and construction of five on-site ponds. The final configuration of the ponds were constructed to reduce wave erosion, increase shoreline sinuosity, provide mini-environments for each specific herbaceous plant specie required, and duplicate the pattern of adjacent Snake River oxbows. A total of 602,000 wetland plants and 35,000 willow plugs were planted.

After over a decade since mining activities ceased, the damage to the Snake River Floodplain, wetlands, and riparian ecosystem has been reclaimed in accordance with NPS management policies, legislative mandates and approved park planning documents.

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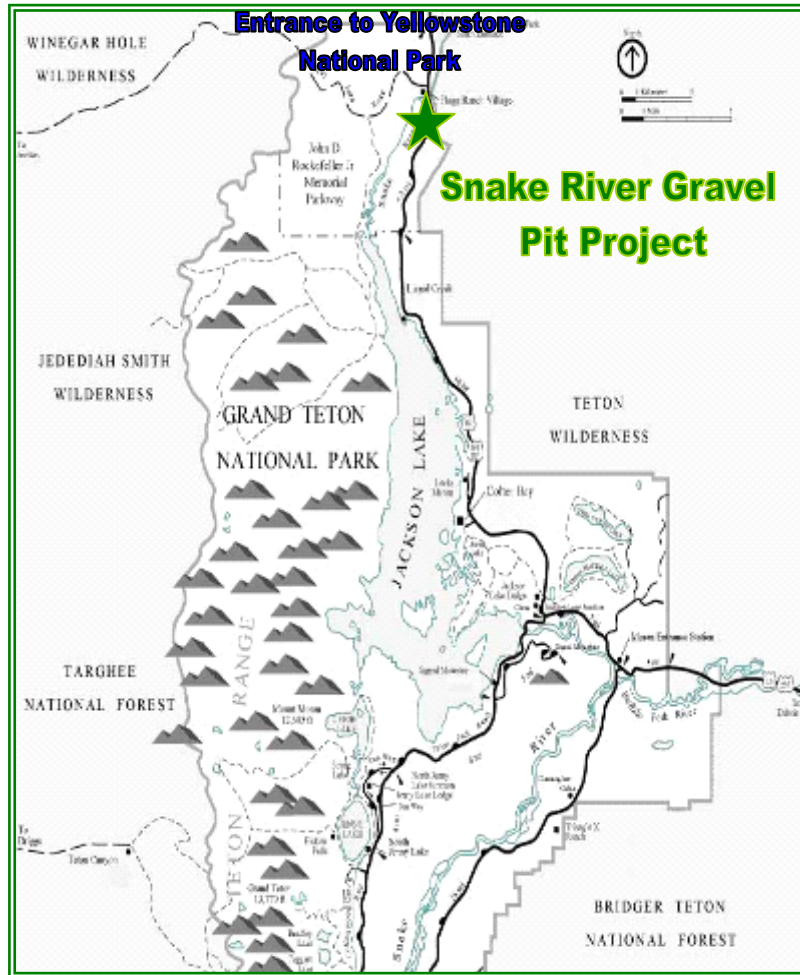
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## Introduction

The Snake River Gravel Mine Project is located within the Snake River Floodplain in John D. Rockefeller, Jr., Memorial Parkway approximately 0.85 miles southwest of the historic Flagg Ranch and 2.15 miles southwest of the Yellowstone National Park south entrance (See Fig. 1). Past mining activities have adversely affected wetlands, associated uplands, and threatened and endangered species.



Located at the heart of the Greater Yellowstone Ecosystem, the Rockefeller Parkway connects Grand Teton and Yellowstone National Parks. The late conservationist and philanthropist John D. Rockefeller, Jr. made significant contributions to several national parks including Grand Teton. In 1972 Congress dedicated a 24,000 acre parcel of land as John D. Rockefeller, Jr. Memorial Parkway to recognize his generosity and foresight. Statistical information provided by the NPS indicates that in 2002, a total of 1,138,215 people passed by the Snake River Gravel Mine site on their way to or from Yellowstone National Park.

According to the U.S. Environmental Protection Agency (EPA) document, “Aerial Photographic Analysis of the Flagg Ranch Gravel Mine, June 1994” approximately 55 acres have been disturbed by gravel mining activities within the Snake River Floodplain. An

additional 5-10 acres have been disturbed on the upland area between the floodplain and U.S. Highway 89/287 and is currently being used by the NPS as a temporary staging area and access.

The Snake River flows for 1,056 miles and drops from an elevation of 9,840 feet in Yellowstone National Park near the project site to just 340 feet where it meets the Columbia River near Pasco, WA. It is the largest river in Wyoming and the tenth longest river in the United States. The Snake's watershed embraces the largest chunk of unspoiled land outside of Alaska. Snake River country encompasses more than 100,000 square miles, an area larger than the state of Colorado. Transporting a volume of water 21/2 times greater than the water volume carried by the Colorado River, the Snake is truly a vast web of water embracing a diverse and critical habitat for many species.

The entire project site is located within the Yellowstone Grizzly Bear Recovery Area and is designated as a Management Situation I area. Management Situation I areas contain grizzly population centers and habitat components needed for the survival of the species. In addition, seven (7) species of concern that occur in the project area are either protected by the Endangered Species Act or are under consideration for such protection, including one (1) endangered species (whooping crane); three (3) threatened species (bald eagle, grizzly bear, and Ute ladies'-tresses); one (1) experimental population (gray wolf); one (1) species proposed as threatened (mountain plover); and one (1) species that is a candidate for listing (western boreal toad). An additional eight (8) species of special concern to the State of Wyoming, the U.S. Forest Service, and the Fish and Wildlife Service may occur in or near the project area. Although these species are not protected by the Endangered Species Act, National Park Service (NPS) policy required that the final designs consider potential impacts to these species.

Gravel mining within the Snake River Floodplain created four (4) large pits, several small pits, stockpiles, waste piles and debris dumps. No permanent facilities are on the site. Prior to reclamation, little native vegetation existed on-site and abundant exotic vegetation had established on the disturbed areas. Due to the 1988 forest fire within the Grand Teton and Yellowstone National Parks that burned most of the lodgepole pines obscuring the site from view, the site is now visible from U.S. Highway 89/287, a main corridor to the South Entrance of Yellowstone National Park, The site is also visible from the historic Flagg Ranch visitor areas across the Snake River.

### **Mining and Regulatory History**

Existing documents and published information indicate that mining began under an U.S. Forest Service permit issued in the 1950's. Management and administration of the pit was originally the responsibility of the U.S. Forest Service. The NPS took over administration of the pit in 1977 and continued to mine the site to obtain materials for construction and maintenance activities. The NPS discontinued using the site in 1992 after being notified by the U.S. Army Corps of Engineers (COE) that a required Clean Water Act (Section 404) permit had not been issued for mining activities. After issuing a cease and desist order, the COE designated the EPA as the lead enforcement agency to complete administrative, legal, and/or corrective action for the violation. The EPA requested information from the NPS regarding past mining activities including a delineation of present and historic wetlands as part of their investigation, the NPS complied with this request, however, the EPA was not satisfied with the NPS wetlands delineation. An interagency team of wetland experts from the NPS, COE, and EPA conducted a

second wetlands survey in 1993. The conclusions of this study paralleled the first wetland delineation.

In September 1994, the EPA concluded that the mining operation had been out of compliance at least since early 1986, if not 1982. The EPA stated that agencies that used the site since 1982 “have an obligation to reclaim the disturbed area and mitigate for the losses of wetlands and other aquatic values.” The EPA indicated that this could be accomplished according to the restoration planning process proposed by the NPS in 1993.

### **AML Eligibility Determination**

The sources of funding for this project are the Federal Lands Highway Program (FLHP), a part of the Highway Trust Fund, and the Abandoned Mine Land Program (AML) of the State of Wyoming. A “Reimbursable Agreement” between the Western Federal Lands Highway Division (WFLHD) and the AML was authorized where the WFLHD agreed to reimburse AML for construction work performed on only those portions of the project determined to be ineligible for AML funding. Lands and waters eligible for AML funding include those that were adversely affected by mining and processing practices prior to August 3, 1977.

To determine eligibility, an extensive review and analysis of the project and its immediate vicinity was conducted utilizing existing aerial photographs. Five (5) sets of aerial photographs from 1954 to 1993 were utilized for this review. The photographs were copied from the EPA document; “Aerial Photographic Analysis of the Flagg Ranch Gravel Mine” prepared by the EPA’s Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, at the request of the EPA’s Region 8 Water Management Division.

The results of the photo analysis were aided by a 1993 color infrared photograph (See Fig. 2) and annotated overlays prepared by the EPA. The annotated overlays depict alterations of the natural drainage system and vegetation cover of the Snake River Floodplain, and indicate the extent of mine development within the designated “Mine Perimeter” boundary. The annotations facilitated the Engineer’s viewing and understanding regarding the changes that took place before and after August 3, 1977.

The exact dates of mine related disturbances could not be determined. However, the Engineer was able to determine through review of available correspondence, documents, reports and aerial photos that portions of the Snake River Gravel Mine were disturbed prior to August 3, 1977 and are therefore eligible for AML funding. Results of the findings are presented in Tables 1 and Table 2.



**Table 1. Areas disturbed due to mine development**

<b>Photo Year</b>	<b>Disturbance (acres)</b>	<b>Pre-Law Disturbance (acres)</b>	<b>Post-Law Disturbance (acres)</b>	<b>Accumulated (acres)</b>
1954	2.95	2.95	0	2.95
1969	2.63	2.63	0	5.58
1969	16.43	16.43	0	22.01
1976	10.23	10.23	0	32.24
1986	28.44	0	28.44	60.68
1993	3.65	0	3.65	64.33
<b>TOTAL S</b>	<b>64.33</b>	<b>32.24</b>	<b>32.09</b>	<b>64.33</b>

**Table 2. Percent of total disturbance eligible for AML funding**

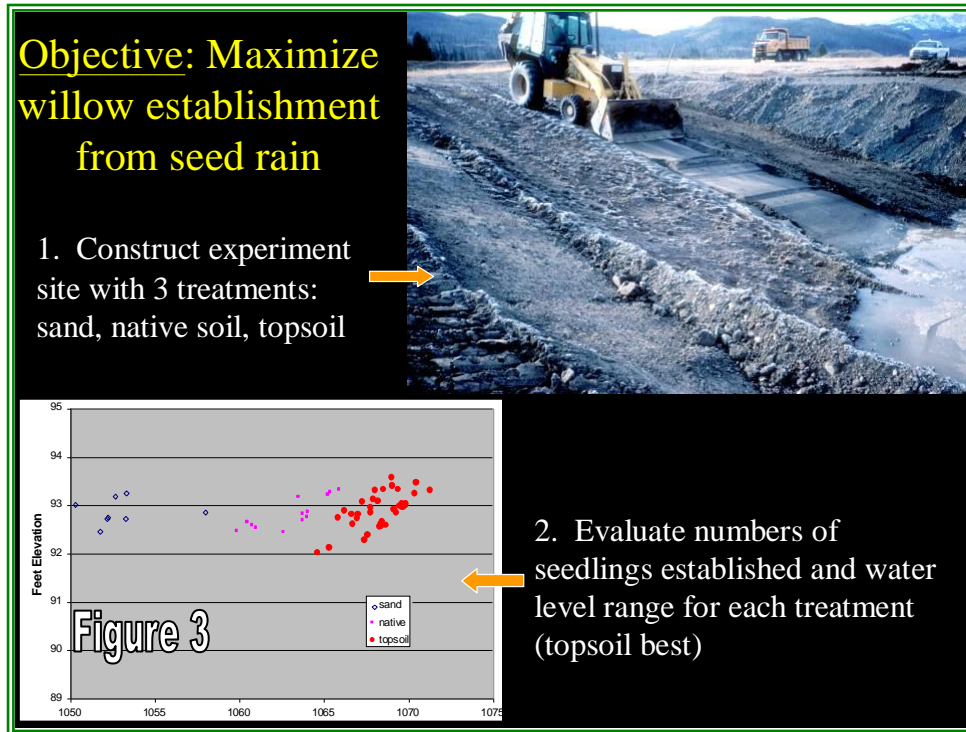
<b>Total Disturbance (acres)</b>	<b>Pre-Law Disturbance (%)</b>	<b>Post-Law Disturbance (%)</b>	<b>TOTALS (%)</b>
<b>64.33</b>	<b>50.12</b>	<b>49.88</b>	<b>100</b>

**Special Design Considerations**

Special factors that had to be addressed included the complex hydrology of the site, the need to protect existing western boreal toad breeding habitat, and appropriate use of topsoil that had been preserved during the mining process.

A unique aspect of the design was the use of field experiments to determine which herbaceous plant species would be used and to evaluate the potential for willow establishment from natural seed dispersal. Designing the site to promote survivability of herbaceous plant species and natural willow establishment was a primary goal of the project. Natural willow

establishment saves money as fewer willow stakes are required to be planted and ensures that the site will be a self-sustaining wetland-riparian ecosystem over the long term. Willow seed traps were constructed on-site that allowed monitors to evaluate distribution and abundance of seed dispersal across the site. Two experimental plots were also created to determine which combination of available soil types (sand, mine reject material, or topsoil) and water table elevations would optimize willow establishment from seed (See Figure 3). Experiment results guided development of final ground contours, pond shoreline sinuosity and placement of topsoil at critical elevations throughout the site.



The final design was based on extensive analysis of soil, vegetation, and hydrologic data collected over a period of several years within the mined area and in nearby undisturbed reference areas. Data from 24 ground water wells and six (6) staff gauges provided water level information that was critical to the wetland and riparian ecosystem design. The well data was analyzed over a period of five (5) years to determine the average potentiometric surface necessary to design the final ground contours. The potentiometric surface was converted to AutoCAD grid files and used to develop a potentiometric map. A comparison of the average potentiometric surface to the final design ground contours was performed to create a planting plan that maintains five (5) distinct planting zones above or below the potentiometric surface within the limits of disturbance. These planting zones included 1/ Upland Zone (1.5' and above), 2/ Willow Zone (0.7' to 1.5'), 3/ Upper Sedge Zone (-0.1' to 0.7'), 4/ Lower Sedge Zone (-1.3' to -0.1'), and 5/ Shallow-Open Water Zone (-3.3' to -1.3').

The Greater Yellowstone Ecosystem Amphibian Project (GYEAP) refers informally to monitoring and research efforts on the part of the Herpetology Laboratory at Idaho State University (ISU) in conjunction with a wide variety of partners. The Herpetology Lab began amphibian and reptile inventory work at and near the project area in the late 1980s. Since then,

several graduate students and associates of the ISU Herpetology Lab have been involved in several projects investigating occurrence and relative abundance of amphibians throughout the Yellowstone-Teton area. Providing information that supports conservation of amphibians is one of the main goals of the GYEAP. It is their belief that even modest consideration of amphibian and reptile habitat needs for management activities can often be very effective.

Western Boreal Toads were documented breeding and developing in Mine Pit 1 by members of the GYEAP in 1997. In addition, adult toads were observed along the western edge of Mine Pit 3. It was determined that the adult toads were also breeding in the undisturbed adjacent wetlands and utilized the upland communities just south of the project area. Boreal toads typically inhabit open meadows near ponds, streams, and lakes where they are active at night and dusk. The studies by members of the GYEAP determined that adult toads were laying their eggs in the shallow pit waters from March through May. Egg masses were present in the project area through July, tadpoles through August, and young toads through early September.

Special efforts were undertaken by the project design team to prepare contract specifications and develop reclamation grading plans that reduced the total impact to the Boreal Toad breeding habitat. Grading work near the eastern portion of Mine Pit 1 was delayed until after the third week of August to ensure the current year's breeding effort was not destroyed. Erosion control sediment fence and sediment traps were constructed along the perimeter of the breeding areas to reduce impacts caused during rain and storm events (See Fig. 4). Field Orders were prepared and implemented that authorized the Construction Manager to adjust grading plans within the project area during construction activities to save existing sparse to moderate stands of short, emergent vegetation within Mine Pit Nos. 1 and 3. In addition, a mandatory training meeting was conducted by the Grand Teton National Park Service prior to initiating grading work to educate the Contractor's construction crew concerning the sensitive nature of the site and its importance to Boreal Toads.



Figure 4

The Western Boreal Toad is one of the least common amphibians in the Teton-Yellowstone area and its numbers have steadily declined since the 1950s; in eastern Wyoming and Colorado,

it is considered a candidate species by the USFWS. Therefore, every established toad breeding site located in the project area was considered extremely important. During the summer of 2003, the GYEAP was excited to find through their continued research efforts that the main toad breeding area has been successfully protected during the extensive reclamation work, and that toads continue to breed at their former site. This effort took thought and commitment on the part of project design team and Construction Manager to protect the toad areas. The protection efforts are best summarized in the February 2004 correspondence submitted to the Engineer from Dr. Charles R. Peterson, Curator of Herpetology, Idaho State University, Idaho Museum of Natural History, "Thank you for incorporating specifications in your work plans and making sure that they were effective. We are aware of no other examples in the Yellowstone-Teton area where construction contractors took such an active interest in amphibians".

### **Reclamation**

The proposed actions to reclaim the site and restore wetlands was necessary to improve habitat values and to comply with NPS policies, including NPS77-1, *Wetland Protection*; Executive Order 11990, *Protection of Wetlands*, and the Clean Water Act in accordance with COE, EPA, and Wyoming Department of Environmental Quality (DEQ) standards and directives.

A combined \$1.3 million was received from the Federal Highways Administration, Western Federal Lands Highway Division and a partnership with the State of Wyoming, Abandoned Mine Lands Program (AML) to complete the investigation, design and reclamation of the project. In early 2002, project participants produced final design drawings and specifications for the construction bid documents specific to Phase I (grading) and Phase 2 (agronomics) of the project. A grading contractor was selected in June, and grading activities were performed from mid-July through October 2002.

The Department of Environmental Quality (DEQ) considered all waters associated with the Snake River and all of its tributary channels and associated wetlands as Class 1 surface waters. The DEQ concluded that, due to the hydrological connection between the Snake River and the project area by groundwater and potential surface water, any substantial, earth-moving activity within the project area would result in a surface or point source discharge into the Snake River. Therefore, it was necessary for the design team to obtain a DEQ National Pollutant Discharge Elimination System (NPDES) discharge permit and Clean Water Act Section 401 certification prior to performing grading activities. In order to reduce the impact to the Snake River, the reclamation grading plan included the reshaping of existing inundated pits, creation of on-site channels that permit flooding during wet periods, and construction of five (5) on-site ponds. The final alignment and configuration of the ponds were constructed to reduce wave erosion caused by prevailing winds, increase shoreline sinuosity, provide mini-environments for each specific herbaceous plant specie required, and duplicate the pattern of adjacent Snake River oxbows. The project area is located on an alluvial terrace of gravel and cobble within the Snake River floodplain that created stability problems for the contractor's heavy equipment when performing grading activities adjacent to existing pits (See Fig. 5).

Under the direction of the design team and the onsite Construction Manager, the grading contractor reshaped more than 350,000 cubic yards of mine reject material and topsoil into



approximately 55 acres of sedge meadows, willow flats, stream channels, oxbow ponds, and upland features.



Five species of wetland seeds were collected during the summer of 2002 from the nearby Snake River floodplain within 15 km of the Snake River Gravel Pit Project area. The collected seeds were stored at the Contractor's native plant nursery located in Ft. Lupton, CO, germinated and grown during the winter/spring 2003.

Species and quantity of wetland plants grown in 5.7 cubic inch cones included the spike rush, *Eleocharis palustris* (34,500); blister rush, *Carex vesicaria* (34,500); beaked sedge, *Carex utriculata* (176,000); water sedge, *Carex aquatilis* (200,100); and bluejoint grass, *Calamagrostis canadensis* (141,500) for a required total of 586,600 plants. The actual number planted by the Contractor was approximately 602,000 plants.

Live stem willow cuttings with buds were collected from seven (7) species during early May 2003 within the Snake River Floodplain. Willow species collected included *Salix boothii*, *S. wolfii*, *S. lemmonii*, *S. drummondiana*, *S. geyeriana*, *S. bebbiana*, and *S. lasiandra* for a required total of 35,000 plants. Stems were prepared measuring 24 inches in length and temporarily stored in one of the reshaped ponds until planted to a depth of 18 inches. Planting of both the herbaceous plugs and willow cuttings began during late May while the ground water table was high and completed by July 6<sup>th</sup>, a period of six weeks.

### **Summary**

After over a decade since mining activities ceased, the damage to the Snake River Floodplain, wetlands, and riparian ecosystem have been reclaimed in accordance with NPS management

policies, legislative mandates, and approved park planning documents. Native herbaceous plants and willows now flourish within the once destroyed floodplain.

The intent of the reclamation and the objectives to fulfill NPS, COE, and EPA requirements for restoring the past mining impacts and comply with the Clean Water Act was achieved by:

- o Restoring approximately 16.9 acres of willow dominated wetlands (transitional to uplands) around the designated willow areas, high water level of the ponds, and along recreated channel banks;
- o Restoring approximately 6.8 acres of herbaceous wet meadows in recreated channel bottoms and the upper edges of the pond shorelines;
- o Restoring approximately 4.1 acres of aquatic, emergent wetlands primarily within pond shallows;
- o Restoring approximately 14.9 acres of open water habitat; and
- o Restoring approximately 11.3 acres of native vegetation in upland areas throughout the site.

According to the USFWS, 80 percent of riverfront habitat along the Snake River has been permanently lost. Virtually 75 percent of the precious riparian habitat has been developed for housing tracts, ditched, levied, dammed, farmed and affected by over grazing. Unfortunately, the Snake River is not alone in human misuse. 90 percent of California's Central Valley riparian habitat has been lost. On the Missouri, 67 percent reduction in wetlands has occurred. 90 percent of the riparian values are gone from the Colorado River. Riparian ecosystems once covered 6% of North America, but today only 1.5 percent remains intact.

Finally, the success of the Snake River Gravel Pit Project is an indication that once damaged and considered lost riparian habitat can be reclaimed to its original, pristine condition.