APPENDIX K

MONITORING PLAN

ENGINEERING APPENDIX K
MONITORING PLAN

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1.0 BACKGROUND

The purpose of the Upper Salmon River at Challis (USRC) project is to restore the riparian function of the flood plain and river habitat and the geomorphic function of the channel where possible. This generally means a channel with more stable, vegetated banks and more diverse in-stream habitat for salmonids.

The 12-mile reach of the Salmon River from the Highway 93 bridge south of Challis, Idaho, to Bruno's Bridge north of Challis, is dominantly affected by past channel alteration work, such as riprapping, dikes, irrigation water diversion, construction of homes on the flood plain, and livestock grazing. Other activities occurring upstream, in addition to those mentioned, include mining, timber harvesting, and construction of roads. These activities have indirect and cumulative effects downstream along the entire length of the river.

The stream and habitat improvement measures proposed for the project would help to increase overall fish production in the Upper Salmon River drainage. The project would specifically benefit Endangered Species Act (ESA) listed steelhead, and to a lesser extent, chinook salmon, by improving a variety of vital habitat components necessary for salmonid survival in this reach of the Upper Salmon River drainage. These measures would also improve the overall functioning of the local ecosystem by allowing riverflows back into previously blocked side channels in order to mimic more closely a naturally functioning flood plain, which brings with it a whole host of environmental benefits to both aquatic and terrestrial species of fish, wildlife, and plants.

The proposed project would improve flood plain and natural channel functions, stream stabilization, water quality, and associated aquatic and riparian biological processes by:

- Adding culverts or weirs to create secondary channel habitat.
- Adding barbs and willow plantings for bank erosion protection.
- Lowering existing dikes or adding culverts or weirs to increase flood frequency.
- Fencing with conservation easements that provide managed grazing or vegetative plantings and excluded grazing to improve riparian habitat.

Up to 1 percent of the total construction cost could be allocated for monitoring. Up to 3 percent of the total project cost could be used for continuing construction. Distribution of these costs is presented in section 5 of this appendix, Monitoring and Continuing Construction Costs.

2.0 PURPOSE

The purpose of this project performance monitoring plan is to assess the effectiveness of the restoration features on aquatic and terrestrial resources and to modify the restoration features to make them more effective after learning how they react to the ever-changing river. Monitoring would focus on the effects to aquatic and terrestrial habitat. Monitoring may also identify the need for adaptive management on various structures.

Results obtained through monitoring would enable the U.S. Army Corps of Engineers (Corps) and the local sponsor, the Custer County Soil and Water Conservation District (sponsor) through coordination with local agencies, regulatory authorities, landowners, and other interests, to make informed decisions concerning management of the project to achieve planned performance goals. The monitoring plan would also build an information base to support future restoration decisions regarding the design and performance of the restoration measures. As knowledge is gained on how the river reacts to various restoration tools, efficiencies in design and construction would likely be found.

3.0 MONITORING RESPONSIBILITY

The overall responsibility for monitoring at the USRC project lies with the project sponsor and the Custer County Soil and Water Conservation District.

It is anticipated that an USRC restoration project monitoring team would be established. The team would include biologists and scientists representing the Corps, Idaho Department of Fish and Game, the Custer County Soil and Water Conservation District, Bureau of Land Management, Natural Resources Conservation Service, University of Idaho, interested tribes, the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration (NOAA) Fisheries, and possibly others. All of these groups would have participated in planning and implementing the project to some extent.

The team would implement this monitoring plan, coordinate monitoring tasks, ensure that monitoring is completed, and collectively prepare a monitoring report for each year of monitoring, and a final report at the end of project monitoring. The team would assign, by consensus, individual monitoring tasks to be conducted or overseen by individuals of the team. Individuals responsible for any given task would also be responsible for preparing the report section for that task. The Corps is able to cost share the project monitoring if the cost does not exceed 1 percent of the total project cost and does not exceed 5 years.

3.1 Monitoring Procedures

Monitoring procedures in this plan include the monitoring necessary to determine the environmental benefits of the project (*i.e.*, project performance monitoring).

Project performance monitoring would document fish and wildlife habitat conditions at construction sites before and after construction and would assess the long-term changes in terrestrial and aquatic habitat. Assessment of the stability and function of restoration tools and techniques would take place as part of planning and design during the continuing construction phase. Knowledge gained from the monitoring and assessments would provide the basis for managed grazing decisions, continuing construction, and restoration requirements at future sites.

Using the riverine habitat classifications and estimated acres of habitat improvement for each property that is described in the Habitat Benefits Summary Table in appendix E of the environmental assessment, measure or estimate actual number of acres of habitat enhanced after project completion. Use the following procedures to estimate the condition and trend of the terrestrial and/or aquatic habitat that was targeted for improvement on each site.

3.2 Terrestrial Resource Monitoring Procedures

Monitoring of terrestrial resources would focus on the effects of the restoration project on riparian vegetation and wildlife habitat. Two suggested methods are presented here.

- Air Photos: At the beginning of the construction period aerial photographs or satellite imagery would be collected for the entire 12-mile reach of the river. Similar photos would be collected periodically until the monitoring phase is completed. The photos/imagery collected after project completion would be analyzed and compared to photos taken before the project. If air photos or satellite imagery are used, new images should be taken 2 to 5 years after the completion of all the projects. If special flights for air photography were prohibitive due to budget constraints, an alternative would be to take photos of some project sites from hills or bluffs along the river.

- Vegetation Transects or Plots: The second method would monitor terrestrial resources by using vegetation transects, which would be established at each restoration site following construction, and then periodically, as determined by the monitoring team.

3.2.1 Air Photo Interpretation and the Habitat Evaluation Procedure. Air photos (or satellite imagery) may be used to delineate cover types and map them for future monitoring activities. The photos would also be used to aid in estimating the quantity and quality of the riparian habitat that is improved by the project.

Habitat Evaluation Procedure (HEP) models for yellow warbler and song sparrow could be used to measure habitat changes and improvements. These models work well for riparian vegetation. The HEP is a process that measures habitat of a specific wildlife species (such as yellow warbler) to determine a measure of quality. The measure of quality is termed the habitat suitability index (HSI). The HSI is multiplied by the area of habitat used by a particular wildlife species to determine the number of habitat units.

If HEP models are used for monitoring, the following general steps should be taken.

- Vegetation cover types would be mapped and measured over all of the work sites. Palustrine forest and palustrine scrub cover types would be singled out for use in the HEP.

- Field parameters (*i.e.*, species composition, density, *etc.*) would be measured at all proposed work sites during the first summer after project completion.

- Fieldwork would use the methodology described for yellow warbler and song sparrow in the HSI model. Habitat suitability indices would be calculated for all palustrine forest and scrub-shrub habitats. Habitat units would be calculated by multiplying the HSI value by the area of habitat.

- The acreages used in the HSI calculations would be taken from the Habitat Benefits Summary Table located in appendix E (Economics) of the environmental assessment. The habitat at each of the work sites is classified into four riverine plus riparian categories, and an another category called “remote riverine + wetlands.”

- Baseline conditions for proposed future sites would be observed over several years to be used as a control to document natural fluctuations.

3.2.2 Vegetation Transects or Plots. Vegetation transects or plots would be used to monitor for signs of vegetative succession toward shrub wetland (dominated by willow and alder) and forested wetland (dominated by cottonwood and aspen) ecotypes. The transects or plots would depict trends and site-specific changes by the changes in cover, species composition, age class, frequency, and condition of the plants. Data collected from the vegetation transects/plots would be used in the HEP process previously mentioned.

Line intercept transects are commonly used to measure shrub or tree cover, species composition, density, height, and frequency. Line intercept is most appropriate for sampling shrubs and trees with well-defined, dense crowns. The technique is not suitable for measuring cover in communities in which vegetative types are intermingled and plant boundaries are indistinct.

Line intercept transect sites should be randomly selected if the study area is large and the shrub/tree communities are homogeneous. If the study area consists of communities that have widely diverse structural components (*i.e.,* species composition, density, and plant height), it may be preferable to select representative sites in proportion to the amount of the area occupied by each. Aerial photographs can be used to detect differences in plant densities and distributions. Transects may be randomly or systematically located at a site but must be spaced far enough apart to prevent sampling overlap. Line transect length varies but is generally from 10 to 100 meters long (35 to 350 feet). A 15-meter (49.21-foot) transect line is sufficient for sampling areas with an estimated 15 to 60 percent canopy cover or more, whereas a line of 30 to 100 meters (98.42 to 328.1 feet) should be used to sample very sparsely vegetated areas (1 to 14 percent canopy cover).

Line point transects are often used to measure understory vegetation, such as grasses and forbs. These transects are normally between 30 and 46 meters (100 and 150 feet) long where vegetative cover is from 35 to 60 percent, such as in a riparian community. In sagebrush/grass or desert/grass communities, where vegetative cover is 5 to 15 percent, transects may be up to one-fourth mile long.

The transect should be long enough to sample the plant community, but it should not connect two different vegetation types, such as riparian and sagebrush/grass.

Line point transects may be randomly or systematically located along a compass bearing or another route that can be duplicated in the future. Plants, litter, and bare ground or rock are recorded at measured or paced intervals along the transect line. A wire loop, 1 inch in diameter or a notch in the toe of a boot, are often used to mark the point to be recorded.

Many short transect lines are preferable to a few long lines. Chambers and Brown (1983) stated that a minimum of 5 to 10 transect lines is required for an adequate sample. It is suggested that at least twenty 15-meter (50-foot) transect lines be sampled on a site of 40 hectare (100 acres).

Plots may be used for monitoring shrub and tree habitats, as well as grasses and forbs. Several plot sizes are commonly used. Plots of one-tenth acre are frequently used to sample trees and shrubs, because they are convenient to use and data is easy to analyze.

Plots of 0.96, 9.6, and 96 square feet are commonly used to sample forbs and grasses depending on the density of the vegetation to be sampled. The smaller plot sizes are used for dense, continuous vegetation. These plot sizes are used, because they convert grams of vegetation easily into pounds per acre of forage. Circular plots are frequently used, but they may also be square or rectangular. Plots should be randomly located along a fixed compass bearing for statistical integrity and convenience. Smaller plots may be combined with vegetative cover estimates and photographs to quickly record plant succession. These types of plots should be permanently marked in order to make statistically sound estimates of vegetative condition and trend over time.

Baseline vegetation data would be collected before work is started at each project site or within 1 year of the completion of each project as part of the project construction effort. There should be more than one transect located within the immediate vicinity of each project site and at least one transect located outside the project vicinity to serve as a reference site. Permanent vegetation transects or plots are not necessary, but permanent photographic points may be established if the sponsor or a contributing agency expresses a need. Whether permanent plots or transects are used or not, one photo should be taken from the beginning end of every transect looking toward the other end. Two additional photos should be taken at the beginning end of the transect, offset to the left and right of the transect by approximately 15 degrees. Transects would be measured and recorded during the same summer month (*e.g.*, August) each year.

3.3 Aquatic Resources

Monitoring of aquatic habitat would also be conducted following construction at each site. Aquatic resources monitoring would identify effects of restoration efforts upon migration, rearing and spawning habitat for spring/summer chinook salmon, steelhead, migration habitat for sockeye salmon, and overwintering habitat for bull trout. Baseline aquatic data should be collected before the project or immediately after completion if in-water work is designed to improve the habitat for fish in the main channel of the river or in existing side channels.

The habitat condition for each species of fish mentioned above would be estimated for each site following construction and periodically until all of the sites have been completed. Other techniques may be used to determine presence or absence of ESA listed salmonids, such as screw traps, snorkel surveys, and angler creel surveys.

Future habitat measurements and surveys would be conducted periodically to assess the effectiveness of the restoration tools toward maintaining and improving migration, rearing and spawning habitat for chinook salmon and steelhead, and presence of overwintering habitat for bull trout. Snorkel surveys are recommended in rearing habitat that is improved or created. All survey points would include photo documentation.

Habitat evaluation methods, such as Hankin and Reeves stream survey method, may be used to estimate the quantity and quality of the mains stem and side channel habitat available for adults and juveniles in the selected monitoring sites. The evaluation of the habitat types and attributes being considered (such as large woody debris, riparian vegetation, cobble size and embeddedness, *etc.*) would allow for a determination of habitat benefits gained through this project. Data gathered in this evaluation would be incorporated into the project performance reports.

3.3.1 Temperature Monitoring. Baseline temperature data is provided for some of the project area in Scott King's thesis (see appendix M in the environmental assessment). At least nine stations are recommended for temperature monitoring on the five project work sites (see table 4-1, section 4). Onsite investigation may determine the need for more or fewer monitoring stations.

4.0 MONITORING REQUIREMENTS BY PROJECT SITE

The following table depicts the minimum recommended monitoring necessary to measure the degree of improvement at each project site for terrestrial and aquatic resources.

Table 4-1 Site specific monitoring for the Upper Salmon River at Challis Project.

Project Site 1/	Approximate Location Within the Project Site	Photos Y/N	Vegetation Transects Or Plots Y/N	Rearing Habitat Temperature, Or Passage Y/N	Snorkle Count Juvenile Salmonids Y/N
<u>Highway 93 Bridge</u> Riv2 - 5ac. RR/W-6ac.	Riparian zone along the old side channel.	Y	Y	N	N
	Aquatic habitat in the side channel after it is connected to the river.	N	N	Y (all three)	Y
	Main river channel above & below project site.	N	N	Y (Temp.)	Y
<u>Dunfee Slough</u> Riv3- 4ac. Riv4-11ac. RR/W-59ac.	Side channel & ponds.	Y	N	Y (all three)	Y
	Riparian zone along side channel & ponds.	Y	Y	N	N
	Main river channel below project site.	N	N	Y (Temp.)	Y
<u>One-Mile Island</u> Riv3-14ac. Riv4-11ac. RR/W-59ac.	Riparian zone along side channel & island.	Y	Y	N	N
	Main river channel along & below project site.	N	N	Y (Rearing & Temp.)	Y
<u>Hot Springs</u> Riv1- 43ac. Riv4-13ac. RR/W – 154 ac.	East, west, and main channel of Hot Springs Creek and channel through old pond.	N	N	Y (all three)	Y
	Riparian zone along all three channels of Hot Springs Creek & new channel through old pond.	Y	Y	N	N
	The new wetland, the channels in and out of it, & riparian zone around it.	Y	Y	Y (Temp. & fish exclusion)	Y (for fish exclusion)
<u>Pennal Gulch</u> Riv3-17 ac. RR/W- 91ac.	New side channel around wetland & existing channel.	Y	N	Y (all three)	Y
	Riparian zone along new & existing side channels & side channel from levee breech at Sportsman's Access.	Y	Y	N	N
	Main channel of river below project site.	N	N	Y (temp. & rearing)	Y

1/ Riv1, Riv2, Riv3, Riv4, and RR/W refer to the five riparian habitat classifications listed in the Habitat Benefits Summary Table in appendix E (Economics) in the environmental assessment. The acre figures are the estimates from that table.

4.1 Reporting

Results of the project performance monitoring would be documented and presented in project performance reports. These reports would be completed in the same years the aerial photography and analysis are done, approximately every 4 years. The reports would document monitoring efforts and results for all of the restoration sites including a comparison to the previous report's findings.

The team, identified in section 3, Monitoring Responsibility, would collectively prepare a monitoring report for each year of monitoring, and a final report at the end of project monitoring. This report preparation would consist of preparing individual report sections.

An individual agency and staff member or contractor would be selected and assigned to synthesize the monitoring report. This synthesis would consist of developing a format for the report that each section must follow. The sections would be combined into a coherent single report. Based on the adequacy of site biological responses, conditions, functions and processes (as described in the restoration goal for each monitoring task), develop/recommend adaptive management measures as part of each annual report and the final report. The synthesized report would be presented to the project monitoring team.

4.2 Use of Report

The intent of monitoring this project and of reporting the monitoring results clearly includes an educational function. The report and its findings should increase our collective knowledge about restoration of lower river/estuarine ecosystems. It should also be made readily available to other restoration groups and used to guide future restoration projects.

The USRC restoration project monitoring team would use the report recommendations to guide adaptive management at the project site. Upon implementation, adaptive management measures would then be incorporated into the monitoring plan for the following years, in order to assess the success of these measures.

The monitoring team would encourage member agencies to use the report to guide future habitat restoration and grazing management plan decisions.

5.0 MONITORING AND CONTINUING CONSTRUCTION COSTS

The cost of the project performance monitoring would be shared between the Corps and the sponsor. The Corps is limited to spending 1 percent of the total project cost. Total cost for the monitoring program is estimated at $74,000 and is distributed over the construction period as designated in the Microcomputer-Aided Cost Estimating System (MCACES) cost estimate (appendix L).

Continuing construction is a fine-tuning of the restoration features. Continuing construction would take place over a period of several years following construction at each site. It is expected that as more sites are constructed, more would be learned, and less continuing construction would be required. The cost of continuing construction would be shared between the Corps and the sponsor. The Corps is limited to spending 3 percent of the total construction cost. Total cost for continuing construction is estimated at $222,000 and is distributed over the construction period as designated in the MCACES cost estimate

6.0 LITERATURE CITED

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