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Demeter Design

(Powder River Basin) Brownlee Reservoir Subbasin Watershed Assessment

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Introduction

The Powder River in northeast Oregon is a tributary of the Snake River that flows as part of the boundary between Oregon and Idaho. The Brownlee Reservoir is approximately 40 miles east of Baker City, Oregon. The Brownlee Reservoir Subbasin of the Powder Basin watershed totals 585,000 acres, 72% in Oregon, comprised of seven 5th field watersheds and a stream network over 1,000 miles long. In Oregon, 67% of the subbasin is managed by federal and state governments and 37% is in private ownership.

The watershed assessment is guided by a technical advisory committee of the Powder River Watershed Council, a 501(c)3 non-profit organization representing a diverse group of stakeholders committed to ensuring retention, restoration and enhancement of watershed health within the basin. The document synthesizes data from more than 20 basin watershed assessments.

Significant issues identified by the partners include modified flow regimes, passage barriers, sedimentation and bank erosion, and degraded fish habitat. In addition, some streams and tributaries have been listed by the Oregon Department of Environmental Quality(ODEQ) for dissolved oxygen, temperature, habitat modification, pH, toxics, alkalinity, ammonia, chloride, phosphate, phosphorus, sedimentation, and as water quality limited.

An outreach plan was developed to complement the assessment. It includes collaborating with local newspapers, partnering with multiple land management agencies, and holding outreach meetings.

Historical Conditions and Trend Assessment

Native American Use. An 1865 census indicated there were ~2,100 Native Americans in the Paiute Tribe in the Blue Mountain region. Their known land uses included hunting big game and fowl; fishing; and harvesting of seeds, fruits and tubers, including the Wada seed, which was an important food source. (Research: Oregon Historical Society, academic research, Confederated Tribes of Umatilla data.)

Stream Habitat. Much of the Snake River Canyon is shaped by the Bonneville Flood ~14,500 years ago, estimated to have discharged 380 cubic miles over several weeks. Most relevant is the recedence of the flood waters (150 feet deep several miles inland from the confluence of the Snake) and the deposition of large boulders. (Research: Environmental Protection Agency data, Oregon Department of Fish and Wildlife (ODFW) Aquatic Inventories (AQI) protocol)

Flora and Fauna.
Vegetation historically was dry brush and grasses in the lowlands and conifers in the uplands. Total open water has increased ~11,500 acres, mainly by three large hydroelectric dams. Additionally, ~22,000 acres were placed into agricultural production after 1938. There has been a loss of 21,000 acres of hardwoods and wetland/riparian shrubs, 2,000 acre conifer loss and 500 acre shrub-grassland loss. Juniper habitat has increased ~1,430 acres, likely as the result of fire regime change. (Research: Oregon Natural Heritage Program (ONHP), Oregon Gap Analysis Protocol, textbooks)
Fish Usage for salmonid production prior to 1850 in the Snake River Basin was estimated at 1.4 million chinook, 200,000 coho, 340,000 steelhead and 150,000 sockeye per year. Brownlee Subbasin is entirely upstream of the Hells Canyon Dam which does not pass fish. Attempts to transport juvenile salmon by trapping and hauling were unsuccessful and a hatchery program was begun to mitigate salmon mortality. The Hells Canyon Dam license recently expired; its new application proposes improved bull trout passage but no plans for other salmonids. (Research: Best available data)
Wildlife presumed to have been present historically includes 183 species of birds, 74 mammal species, 18 reptile species and 7 species of amphibians. (Research: ONHP, ODFW record)

Fire. Historically the fire return interval was ~20 years, but fire suppression has significantly altered this regime. There were no fires between 1910 and 1988, a 5,000-acre fire in 2006, and 1,000-acre fire in 2007. (Research: BLM, reference texts)

Channel Habitat Type Classifications

The physical parameters of the stream network in the subbasin include two small estuaries; nine low-gradient streams with flows from low to high; nine moderate-

gradient streams with flows from low to high; two headwater streams; an alluvial fan; a bedrock canyon.

Hydrology and Water Use

Land Use. Landuses include rangeland and pasture grazing, silviculture, hay and grass production, mining, rural residential, and hydroelectric power production from three dams: Hells Canyon Dam, Oxbow Dam, Brownlee Dam. Federal and private grazing allotments comprise over 227,000 acres of the watershed. (Research: Local knowledge, zoning data, agency data layers)

Water Rights. The largest individual water rights are for mining, although most are likely not used because currently there is limited mining. The most common water right use is irrigation, with hay the most common crop and stock watering the lowest usage type. Less common uses are domestic, road construction, wildlife and recreation. It is not possible to determine the change in the nature of the subbasin from pre-disturbance conditions but what can be determined is how water withdraw changed the nature of the hydrograph. (Research: Oregon Water Resources Department (OWRD) database, permits, summary statistics, metrics evaluations)

Riparian and Wetlands Assessment

Canopy Cover/Percent of Riparian Zone table shows that more than 65% of the subbasin is vegetated by grass with less than 25% canopy cover. About 26% of the area has 50% or more canopy cover. (Research: USGS land cover database, Oregon Wetland Geodatabase, Department of Geologic and Mineral Industries (DOGAMI) and USGS soil data, land use data, aerial photography)

Sediment Source Assessment

Potential sources of fine sediment into the stream network include sheet and gully erosion, landslides, roads that are hydrologically connected to the stream network (especially steep, unsurfaced roads) and unvegetated stream banks.
(Research: DOGAMI data, digital elevation models, land cover data, mapping, AQI protocol, aerial photography, past and present land uses)

Channel Modification Assessment

Barriers to passage include 20 dams, 21 culverts and a waterfall. Other modifications include channel diversions, irrigation canals, mining impacts, channel margin wetlands, modifications to flow, structures that impinge on the floodplain, dikes, levees, bank protection and diversion ditches, roads and railroad crossings. (Research: Historic photos, aerial photography, national hydrology dataset, ODFW database, local experts and officials, mapping, GIS data, FEMA floodplain maps)

Water Quality Assessment

Oxygen content of the water is reduced by a combination of wastes from sugar and potato processing plants, fertilizers that run off fields into the reservoir, and algae blooms. (Research: ODEQ list and water quality monitoring data)

Fish and Habitat Assessment

Native Fish. Salmonid production prior to 1850 in the Snake River Basin was estimated at 1.4 million chinook, 200,000 coho, 340,000 steelhead and 150,000 sockeye per year. Brownlee Subbasin is entirely upstream of the Hells Canyon Dam which does not pass fish. The Hells Canyon Dam license recently expired; its new application proposes improved bull trout passage but no plans for other salmonids. ODFW data does not concur with Streamnet, indicating that summer steelhead distribution ends at the Hells Canyon dam and that the estimated distribution of bull trout is much larger. A native redband trout population is known to be present. (Research: Oregon Natural Resources Information Program (ONRIP), Streamnet.org. T. Bailey comm.)

Non-native Fish. Forty-eight species of non-native fish are caught in the Brownlee Reservoir**.** Hatchery-raised steelhead are released by Idaho Power. ODFW releases rainbow trout in portions of Pine Creek. (Research: Data from ODFW, USFS, BLM, local experts, ONRIP, Brownlee Reservoir website)

Interaction. The majority of non-native fish are present in the slow-moving, warm waters of the reservoirs. Native populations of bull trout and redband are confined to faster, cold water portions of the stream network. (Research: GIS, literature review, state and local experts)

Hatcheries. (no information yet provided) (Research: ODFW, mapping)

Barriers to passage. There are forty-two barriers to passage. The Hells Canyon Dam blocks fish passage; summer steelhead distribution terminates immediately downstream of the dam. (Research: ODFW, local experts)

Aquatic Habitat. The limited number of surveys makes it impossible to generalize to overall watershed condition. (Research: Available reports, limited surveys)

Historic Fish Utilization. Information compiled on historic fish utilization was use to characterize changes; where possible, hypotheses were formulated.
(Research: Historic condition assessment)

Water Quality. The Brownlee Reservoir is currently listed as water quality impaired (Clean Water Act). High summer temperatures can impact fisheries either by direct mortality (from high temperatures) or by promoting bacterial or parasitic infections.
(Research: Water quality assessment information)

Watershed Condition Evaluation

Using the Computation Ecological Restoration Prioritization (CERP) tool.
This matrix allows updating as information becomes available, but caution must be taken because adding or editing data permanently changes the spreadsheet; the password is available on request. The tool consists of a Microsoft Excel workbook with three sheets: (1) DATA. Metric data was derived from existing GIS layers, summarized and scored, with the highest scores corresponding to preferable conditions. (2) WEIGHTS. Requires regular user input. (3) RANKS. Performs the prioritization/ranking. See full report for detailed instructions.

Monitoring Plan

Plan Goals. This chapter is intended to form the foundation for a multi-parameter, indefinite monitoring program for the Brownlee Reservoir Subbasin. Included are three monitoring types: status and trend, effectiveness monitoring, and project implementation components. The combination allows us to characterize current conditions and change over time of multiple natural resource populations, how our actions influence these populations and develop practical recommendations for future project implementation.

Data Gaps. A partial list of primary data gaps to date include: aquatic and riparian habitat, fisheries populations, fish passage, water quality (nutrients, temperature, sediment, bacteria), instream flow, road condition, wetland extent and function.

Existing Monitoring Programs.

Oregon Department of Fish and Wildlife. Physical habitat surveys, spawning surveys, fish habitat surveys.
Oregon Department of Environmental Quality. Biotic and physical habitat surveys.
Environmental Protection Agency. Stream, lake and wetland surveys.
United States Forest Service/Bureau of Land Management. Regular monitoring of the Brownlee Subbasin.
Idaho Power. Monitoring throughout the subbasin.

Specific Objectives. (Input requested from Tech Team)

SAMPLE DESIGN

EMAP provides the natural resource monitoring program. General Random Tessellation Stratified algorithm generates samples for population estimates. A rotating panel using four sets of panels that visit in a pattern of different years will be used as the basis to conduct status and trend monitoring.

FIELD PROTOCOLS

Wherever possible, the plan draws on established protocols.
Aquatic and Riparian Habitat. ODFW AQI surveys and regular revisits.
Fisheries Populations. Spawning and snorkel surveys.
Fish Passage. Habitat and fish surveys, FishXing and/or snorkel surveys.
Water Quality. Monitoring in accordance with DEQ WQ manual
Instream Flow. Stream gauges at mouths of major tributaries
Road Condition. USFS's Geomorphic Road Analysis & Inventory Package
Wetland Extent and Function. OWEB manual procedures
Project Effectiveness Monitoring. Washington SRFBoard, OWEB protocols

Analytical Protocols

An Access database will serve as data storage and analysis tool. Algorithms will support the generation of site-specific metrics.

QA/QC

Field Staff Training. Trained professionals or trained volunteers.
Field QA/QC. Experienced field crew leader to review data on a daily basis.
Analytical QA/QC. Lead analyst to review all field data.

Revisit QA/QC. 10% of sites to be revisited during same survey season.

Data Management

It is recommended that an established monitoring consultant maintain the Access database.