QUALITY ASSURANCE PLAN (QAP)¹

for

Kootenai River Nutrient Addition Project

(USEPA Permit No. ID-002829-1)

Permit Valid: June 2, 2006 – June 2, 2011

PROJECT IMPLEMENTATION ORGANIZATIONS:

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Idaho Department of Fish and Game
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Coeur d’ Alene, ID 83814
(208) 769-1414

PROJECT MANAGERS

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Kootenai Tribe of Idaho

Ryan Hardy
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Idaho Department of Fish and Game

LAB MANAGER

Steve Lazoff
Owner,
Aquatic Research Inc.

DOCUMENT PREPARED BY:

Kootenai Tribe of Idaho, Idaho Fish and Game,
Ward and Associates, and Cramer Fish Sciences.

¹ This document is formatted according to: EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5)
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GROUP 1: PROJECT MANAGEMENT ELEMENTS

1.0 Distribution List

The following individuals and agencies will receive approved copies (and subsequent revisions) of the approved Kootenai River Nutrient Addition Quality Assurance Plan (QAP).

<table>
<thead>
<tr>
<th>Individual</th>
<th>Agency - Position</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sue Ireland</td>
<td>KTOI, Fish and Wildlife Program Director</td>
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<td>Charlie Holderman</td>
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<td>(208) 769-1414</td>
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<td>David Domingo</td>
<td>EPA, QA manager</td>
<td>(206) 553-0531</td>
</tr>
<tr>
<td>June Bergquist and Robert Steed</td>
<td>ID DEQ</td>
<td>(208) 769-1422</td>
</tr>
</tbody>
</table>

1.1 Project/Task Organization

The Kootenai Tribe of Idaho (KTOI) and the Idaho Department of Fish and Game (IDFG) are the co-managing, lead agencies of the Kootenai River nutrient restoration effort experiment. The KTOI is the principle funding agency, through Bonneville Power Administration (BPA, project 199404900), also referred to as the Kootenai River Ecosystem Improvements Project. IDFG provides additional funding to the nutrient restoration project. Both IDFG and KTOI are responsible for site monitoring and maintenance, and water quality and biological monitoring for this project. Additionally KTOI and IDFG are responsible for data analyses and making a final recommendation regarding long-term nutrient addition as part of an overall ecosystem restoration strategy to ecological function and Kootenai River. The project organization and agency responsibilities are shown below (Figure 1).

The International Kootenai/y River Ecosystem Team (IKERT), an international group of scientists and resource managers, was formed and is coordinated through KTOI and IDFG. The team meets annually and provides oversight and guidance, and will help develop final recommendations regarding implementation of long-term nutrient addition in the Kootenai River.

The Environmental Protection Agency (EPA) and Idaho Department of Environmental Quality (ID DEQ) are responsible for overseeing and enforcing water quality regulations. David Domingo is the EPA Quality Assurance manager; June Bergquist is the contact person with ID DEQ. All water quality parameter testing is performed by Aquatic Research Inc. based in Seattle, WA, owned and operated by Steve Lazoff.
Figure 1. Organizational chart showing agencies, subcontractors and collaborators involved in Kootenai River nutrient restoration project and their roles.

1.2 Problem Definition/Background

The Kootenai River (spelled “Kootenay” in Canada) beings in Kootenay National Park in southeastern British Columbia and travels 485 miles before entering the Columbia River near Castlegar, B.C. The river flows through Montana and Idaho before returning to British Columbia (Figure 2); collectively, 70 percent of the watershed is in Canada, 23 percent in Montana, and about 7 percent is in Idaho (KRSBP 2004).

During the past century the Kootenai River ecosystem downstream of Libby Dam in Montana has been and continues to be modified, altered, and degraded. Much of the interconnected floodplain habitat was lost from the 1920s to 1950s due to dike building for agricultural flood control purposes. Over 90% of the natural floodplain and wetland habitats were lost to these activities relative to the 500 year floodplain area (Figure 3). These changes greatly reduced the availability of nutrients and organic matter needed to support biological productivity and biodiversity at all trophic levels.
Figure 2. The Kootenai River Basin Idaho, Montana, and British Columbia.
Figure 3. Wetlands loss in the Lower Kootenai River floodplain from Bonners Ferry to the Canadian Border (from EPA 2005).
However, for about a 20 year period (circa 1950-1970), an excess of nutrients (mainly phosphate) from a commercial phosphorus operation near St. Mary’s, B.C. occurred, likely masking the effect of lost productivity from wetlands for a short period. The total collapse of most fisheries occurred after the completion of Libby Dam in 1974 and the clean up of the St. Mary’s phosphorus operation. This caused oligotrophic and ultra-oligotrophic conditions in the regulated mainstem of the Kootenai River that have persisted until the present day (Figure 4; KRSBP 2004).

Figure 4. Phosphorus loading to Kootenay Lake before and after Libby Dam and pollution abatement. Research by the Idaho State University, KTOI, IDFG, provincial agencies of BC and the U.S. Army Corps of Engineers has confirmed the ultraoligotrophic status of the Kootenai River downstream from Libby Dam (Bonde and Bush 1975; Hamilton et al., Woods et al 1982; Ashley and Thompson; Ashley et al 1994, 1997; Snyder and Minshall, 1994, 1995, 1996; Snyder 2002). Water quality parameter and biological values from algae to fish typically resemble those from a 2nd or 3rd order mountain stream rather than the 6th order large river status of the Kootenai River. During the summer months, total phosphorus is generally less than 10 ug/l (with soluble reactive P undetectable, < 1 ug/l), monthly chlorophyll a concentrations less than 5 mg/m2, and macroinvertebrate densities less than 1,000 organisms per m2. Additionally rainbow and cutthroat trout densities, and fish condition factors for the most abundant species (including juvenile white sturgeon), lag well behind similar-sized regional rivers (Holderman and Hardy 2004).

1.3 Project/Task Description

The Kootenai River Ecosystem Project was designed to take a more holistic, multidisciplinary ecosystem-based approach to rehabilitating the post-development Kootenai River fisheries. Past fisheries management programs on the Kootenai River aimed at recovering a single species have generally failed to return these populations to historical levels due in part to addressing “symptoms” (e.g. population declines) rather than core ecosystem problems. Consistent with findings from past and ongoing studies, and with the guidance of the IKERT, the KTOI and IDFG propose experimental nutrient addition to stimulate bottom-up biological productivity in the Kootenai River in response to food web and fish population limitation depleted food web and annual downward trends in fish populations such as trout, kokanee, mountain whitefish, burbot, and white sturgeon. Specifically, these agencies propose to add controlled amounts of nitrogen
and phosphorus during the natural river growing season (June through September). The project will be implemented for a 5 year experimental period, starting in 2005 and ending in 2009. The International Kootenai/y River Ecosystem Restoration Team (IKERT) will review project water chemistry and biological data results yearly, and provide recommendations regarding long-term implementation of the project after the 5 year experimental period.

1.30 Project Details
The project goal is to restore ecosystem health and productivity required to support native fish populations by adding controlled amounts of liquid nutrients, urea ammonium nitrate (28-0-0) and ammonium polyphosphate (10-34-0).

Strictly metered amounts of currently limiting nutrients will be added by a gravity-fed system of tanks and outflow pipes at the treatment site (Figure 5). Once added to the river, the nutrients will be mixed by lateral and longitudinal river currents as determined by dye tracer experiments.

Figure 5. Schematic diagram showing the nutrient enrichment system.

The elevation of the tank site is 2000 ft while the river is 1822 ft. An emergency shutoff valve will be located approximately 5m below the tanks. Expected river flows were determined by looking at data from the Army Corps of Engineers gauge below Libby Dam. Kootenai River summer flow averages 315 m3/s (11,000 cfs). Proposed phosphorus (P) target concentrations for the 5 year experimental treatment are 1.5 (1st yr), 3 (2nd yr), and 4.0 (3rd, 4th, 5th yrs.) µg/L soluble...
reactive phosphorus (SRP). Nitrogen will be maintained at a 20-fold concentration relative to the P concentration (i.e. a 20:1 N:P ratio) during all treatment years. During most water years ambient nitrogen (i.e. nitrate) is adequate to maintain the 20:1 N:P ratio, however during some years we may need to add nitrate to meet that minimum ratio. For example, if ambient nitrate levels (NO3) are 50 µg/L and the treatment concentration for P is 4 µg/L, we will add 30 µg/L NO3 to the ambient level (50 µg/L) to reach an overall concentration of 80 µg/L nitrate.

1.31 Treatment Location
Based on nutrient spiraling theory and findings of other restoration programs in British Columbia and habitat and discharge characteristics of the Kootenai River, it is believed that the effective distance of the treatment will be approximately from the Montana border (rkm 276) downstream to Bonners Ferry (rkm 248; Vannote et al. 1980; Ken Ashley, BCMoE, personal communication). This is the rationale for a single treatment location design as opposed to multiple nutrient addition sites along the river. Furthermore, it is further assumed that additional benefits from indirect ecosystem functions such as increased organic matter and insect drift will be utilized by, and will benefit, fisheries in the lower river from Bonners Ferry downstream into Kootenay Lake, B.C. as mediated by nutrient delivery, biological uptake and fish migration.

1.32 Mixing Zone and Dilution of added Nutrients
The following mixing zone information is provided by Ward and Associates (2004), the project engineers. For the initial mixing, one must keep in mind that this will be a very low flow rate of nutrients into the river, and there will be extremely rapid dilution due to the size, velocity, and turbulent flow characteristics of the Kootenai River. The turbulence caused by the jet of fluid exiting the pipe does the initial mixing (dilution). Additional in-river mixing is caused by longitudinal and lateral river currents.

We expect the mixing of the nutrient plume to follow the same principles of dilution that apply to any liquid entering a river channel flow. Near the pipe outlet, the mixing is controlled by dilution that arises from the dissipation of jet energy, and further downstream, the mixing is controlled by the ambient turbulence in the river. In some cases there is an increase in mixing arising from the buoyancy of the liquid that is entering the river, but we have not included this factor in the present calculations.

In the immediate mixing zone (i.e. end of discharge pipe), dilution will occur rapidly over a short distance downstream of the pipe outlet, because of the small diameter of the plume (Figure 6). Using a standard equation for dilution from a simple jet, dilution by a factor of 30 times arises in the first 0.6 m (2 ft) distance downstream from the outlet. At this distance, a representative width for the plume is still small, about 0.033 m (about 0.1 ft).
Figure 6. Visual schematic of the river turbulence mixing the nutrient plume.

Ambient turbulence in the flowing river becomes important in mixing the plume at this point. Another standard equation (see Ward and Associates 2004 for equation references) is used to determine the width of the dispersing plume. The width is proportional to the square root of the river depth, and the square root of the distance downstream. By the time the plume has moved a short distance downstream (several meters), it is starting to fill the depth of the river, from the bottom to the surface. At approximately 9 m downstream, and assuming a channel depth of 3 m (10 ft) deep, the plume starts to surface. At this point, dilution of the original nutrient plume has reached 8,000 times, and, cumulative dilution has reached 240,000 times the original nutrient concentration.

The distance for complete mixing of the nutrient cloud across the river channel is hard to compute exactly, because of the irregular nature of the channel. For example the constriction and widening of the downstream reach where the Boulder Creek fan protrudes into the river (Figure 6) causes enhanced mixing because of turbulence and secondary currents. Complete nutrient mixing in the Kootenai River channel is expected at > 3 km downstream from the addition site depending on river discharge. Data from a dye tracer transverse and longitudinal mixing experiment in 2005 suggests under normal flow conditions, i.e. 315 m3/s (11,000 cfs), complete mixing of nutrients in the Kootenai River is achieved within 3 km of the discharge point (Ward and Associates 2005).
1.4 Quality Objectives and Criteria

A decision matrix was developed by KTOI and IDFG to assist with potential outcomes and possible management actions for the Kootenai River nutrient project after a 5 year experimental period ending in 2009 (Table 1). The anticipated range of outcomes ranges from no biological benefit (outcome A), to increased ecological benefit to targeted fish species (i.e. sturgeon, burbot and resident salmonids) indicated in outcome E below. Outcome A, would likely result in a discontinuation of nutrient additions, while outcome e would likely result in continued nitrification of the Kootenai River into the foreseeable future, after a full evaluation of the project’s results. Potential intermediate outcomes (B-D) would require increased scientific scrutiny and management evaluation as to whether to continue nutrient additions, with adjustments, or to discontinue the experiment.

Table 1. Potential outcomes and possible management actions, Kootenai River nutrient experiment (5 yr).

<table>
<thead>
<tr>
<th>Potential Outcomes</th>
<th>Trophic Level In Food Web</th>
<th>Management Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary Productivity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Algae)</td>
<td></td>
</tr>
<tr>
<td>Outcome A</td>
<td>No increase</td>
<td>No increase</td>
</tr>
<tr>
<td>Outcome B</td>
<td>Increases</td>
<td>No increase</td>
</tr>
<tr>
<td>Outcome C</td>
<td>Increases</td>
<td>Increases</td>
</tr>
<tr>
<td>Outcome D</td>
<td>Increases</td>
<td>Increases in non-target species only</td>
</tr>
<tr>
<td>Outcome E</td>
<td>Increases</td>
<td>Increases in target (and possibly non-target) species</td>
</tr>
</tbody>
</table>

1.5 Documents and Records

Annual and final project reports will be produced by IDFG and KTOI summarizing findings of the Kootenai River nutrient experiment. Additionally, Surface Water Monitoring Reporting (SWMR), and Discharge Monitoring Reports (DMR) will be done on a monthly basis during the nutrient application season by IDFG and KTOI and submitted to the USEPA, region 10 office in Seattle, WA. Copies of the SWMR’s and annual reports will be kept by KTOI, IDFG, and the BPA (annual and final reports). These reports will summarize river discharge and the amount of nutrient (N and P) added during the previous month. Subcontracted annual implementation reports that provide details of all in-season project activates, data, and outcomes will be provided to the KTOI, will be posted on the KTOI website (http://www.kootenai.org/main.html) and are currently available at: http://www.fishsciences.net/reports/index.php.
GROUP 2: DATA GENERATION AND ACQUISITION

2.0 Sample Process Design (Experimental Design)

2.00 Parameters Monitored and Sampling Frequency
As required by the NPDES permit obtained for this project (# ID-002829-1), the responsible agencies will monitor the following parameters: Total Phosphorus (TP), Total Nitrogen (TN), Nitrate + Nitrite (NO2-NO3), Total Ammonia (NH4), total organic carbon (TOC), pH, flow/discharge (CFS), and water temperature. The sampling frequency of the above parameters will be at least 1 sample per month during the nutrient application season, as required by the EPA NPDES permit. Current protocol, however, is 3 samples per week, at up to 13 sampling sites upstream and downstream from the nutrient addition site (Table 2; Figure 7 and Figure 8). This protocol may be modified after evaluation of project monitoring data. In addition to the NPDES required parameters, the KTOI and IDFG will also monitor the algal, macroinvertebrate, and fish communities spatially and temporally within the nutrified reach over the course of this experiment (for more details see Hardy and Holderman 2004).

Table 2. River kilometer locations (rkm) of Kootenai River Water Quality monitoring sites, and their distance from the nutrient injection site.

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Distance away (rkm)</th>
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</thead>
<tbody>
<tr>
<td>KRF 0</td>
<td>287, 11 upstream</td>
</tr>
<tr>
<td>KRF 1</td>
<td>277, 1 upstream</td>
</tr>
<tr>
<td>KRF 2</td>
<td>276, 0</td>
</tr>
<tr>
<td>KRF 3</td>
<td>275, 1 downstream</td>
</tr>
<tr>
<td>KRF 4</td>
<td>274, 2</td>
</tr>
<tr>
<td>KRF 5</td>
<td>273, 3</td>
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<td>KRF 6</td>
<td>272, 4</td>
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<td>267, 9</td>
</tr>
<tr>
<td>KRF 12</td>
<td>247.5, 28.5</td>
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</tbody>
</table>

2.1 Sampling Methods
Triplicate water samples will be collected every week at up to 13 sample sites (Table 2, Figure 7 and Figure 8) covering the effective reach of the nutrient additions; two of the sites will be upstream of the nutrient outflow and will serve as a control. All water samples will be collected using a Van-Don water sampler and placed in a 250-mL plastic bottle that has been pre-rinsed.
with de-ionized water. Each 250-mL sample is a composite of two water grabs taken from near the surface and two grabs at deeper depths. One composite sample will be taken at left- and right-banks, and at mid-channel to total 3 samples per site. Overall, up to 39 samples will be collected during each weekly sampling event. River temperature and discharge are acquired through the Leonia Bridge river gauge #12305000 managed by the U.S. Geological Survey (http://waterdata.usgs.gov/nwis/uv?12305000).

2.10 Maps and Site Descriptions

In addition to the 13 monthly sampled biomonitoring sites (Figure 1), there are and additional thirteen water quality sampling sites (Table 2). Two control sites are located upstream of the nutrient injections, one site 10 km upstream, and another site 1 km upstream (Table 2). Sample sites KRF 2-11 are spaced at 1 river km intervals starting at and proceeding downriver from the nutrient injection location (Figure 6). The most down river site, KRF12, is located at the City of Bonners Ferry water intake, at approximately rkm 247 ½. The KRF 12 site was requested by the City of Bonners Ferry to ensure water quality standards are not violated prior to entering the City’s secondary water supply system.

2.2 Sample Handling and Custody

All water samples will be immediately stored on ice in standard food-grade coolers the field. At the close of the field day, samples are shipped Fed-Ex overnight delivery to Aquatic Research Incorporated Laboratory (ARI, inc., Seattle, WA) for analysis.

2.3 Analytical Methods

Upon arrive at ARI, inc. water samples will be analyzed for total phosphorous (TP), total dissolved phosphorous (TDP), soluble reactive phosphorous (SRP), total nitrogen (TN), nitrite-nitrate, ammonia, and total organic carbon (TOC). Minimum detection limits for TP and TDP is 2.0 µg·L⁻¹, 1.0 µg·L⁻¹ SRP, 10.0 µg·L⁻¹ for nitrite + nitrate, 5.0 µg·L⁻¹ ammonia, and 0.250 mg·L⁻¹ for TOC.

Upon arrive at ARI, inc. water samples are analyzed for total phosphorous (TP), total dissolved phosphorous (TDP), soluble reactive phosphorous (SRP), total nitrogen (TN), nitrite-nitrate, ammonia, and total organic carbon (TOC). Minimum detection limits for TP and TDP is 2.0 µg·L⁻¹, 1.0 µg·L⁻¹ SRP, 10.0 µg·L⁻¹ for nitrite+nitrate, 5.0 µg·L⁻¹ ammonia, and 0.250 mg·L⁻¹ for TOC.

Processing begins on the samples at the time of receipt. Needed filtration and preservation is done when the samples are logged in to the laboratory information management system. Aquatic Research is certified by the states of Washington and California for this testing and periodically is subject to on-site audits.
Figure 7. Location of Kootenai River Nutrient Monitoring program sites KRF 0 and KRF 1, at rkm 287 and 277, respectively, in the Montana portion of the Kootenai River, 2006.
Figure 8. Location of Kootenai River Nutrient Monitoring program KRF sites 1 through 12, in the Idaho and Montana portions of the Kootenai River, 2006.
### 2.4 Quality Control

Calibration is done daily for the nutrients. Initial calibration verification (ICV) is analyzed at the beginning of the analytical run using a check standard that is from an independent source from the calibration standards. Preparation blanks are also analyzed. Calibration standards and blanks are carried through the same preparation as the samples. Duplicates and matrix spikes (separate digests for TP, TDP, and TN) are analyzed at a minimum of 5%. Continuing calibration verification (CCV) and continuing calibration blanks are analyzed periodically and at the end of each analytical run.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RL</th>
<th>ICV</th>
<th>BLANKS</th>
<th>DUPLICATES</th>
<th>SPIKE REC %</th>
<th>CCV</th>
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<tr>
<td>TP</td>
<td>.002</td>
<td>+/- 10%</td>
<td>&lt; +/- RL</td>
<td>&lt; 5 x RL +/- 40%</td>
<td>80 TO 120%</td>
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<td></td>
<td></td>
<td>&gt; 5 x RL +/- 20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDP</td>
<td>.002</td>
<td>+/- 10%</td>
<td>&lt; +/- RL</td>
<td>&lt; 5 x RL +/- 40%</td>
<td>80 TO 120%</td>
<td>+/- 10%</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>&gt; 5 x RL +/- 20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRP</td>
<td>.001</td>
<td>+/- 10%</td>
<td>&lt; +/- RL</td>
<td>&lt; 5 x RL +/- 40%</td>
<td>80 TO 120%</td>
<td>+/- 10%</td>
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<tr>
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<td>&gt; 5 x RL +/- 20%</td>
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<td>NH3</td>
<td>.005</td>
<td>+/- 10%</td>
<td>&lt; +/- RL</td>
<td>&lt; 5 x RL +/- 40%</td>
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<td>+/- 10%</td>
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<tr>
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<td></td>
<td></td>
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<td>&gt; 5 x RL +/- 20%</td>
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<tr>
<td>NO3+NO2</td>
<td>.010</td>
<td>+/- 10%</td>
<td>&lt; +/- RL</td>
<td>&lt; 5 x RL +/- 40%</td>
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<td>TOC</td>
<td>.250</td>
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<td>&lt; +/- RL</td>
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<td></td>
<td></td>
<td>&gt; 5 x RL +/- 20%</td>
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</table>

### 2.5 Instrument/ Equipment Testing, Inspection, and Maintenance

Analytical instrumentation is checked prior to each analytical run for necessary maintenance and serviced according to the manufacturer’s recommendations.
2.6 Instrument/ Equipment Calibration and Frequency

See Section 2.4

2.7 Laboratory Information

Aquatic Research Incorporated is the primary lab used located at:

3927 Aurora Avenue North, Seattle, WA 98103. Phone: (206) 632-2715
Fax: (206) 632-2417
2.8 References


2.9 Personnel Qualifications and Training

RYAN S. HARDY

EDUCATION:
- Received a Master of Science (MSc) degree in Biology from the University of New Brunswick, Canada; studying seasonal movements and early life ecology of endangered shortnose sturgeon (*Acipenser brevirostrum*) in the Saint John River System (10/2000).
- Received a Bachelor of Science (BSc) degree in Fisheries Resource Management from the University of Idaho (12/1997). Overall GPA: 3.77/4.0: *Magna Cum Laude*
- Received a Associate of Science (A.S.) degree in “Forestry, Fish, Wildlife, and Range Resources” from North Idaho College (5/1995). Overall GPA: 3.66/4.0

WORK EXPERIENCE:
- **Fishery Research Biologist:** (5/2002 - present) with the Idaho Dept of Fish and Game; duties: assigned to Kootenai River Ecosystem Rehabilitation Project, working cooperatively with Kootenai Tribe of Idaho (KTOI) to determine ways of increasing nutrients to stimulate fish production; large-scale biomonitoring or trophic levels. Often > 40 hrs/ week. Supervise two technician and one bio-aide. Supervisor: Vaughn Paragamian (reference section).
- **Fishery Biologist II (Assistant Area Management Biologist):** (2/2001- 5/2002) with the Alaska Dept of Fish and Game; duties: involved in the stock assessment and management of the commercial salmon gillnetting fleets, commercial herring sac roe gillnetting (with aerial monitoring of spawning locations), monitoring subsistence and personal use salmon fisheries, and aiding in the research and management of local pot shrimp fisheries that occur in the Petersburg-Wrangell management area. Often > 40 hrs/ week. Supervise one field office assistant and one seasonal technician. Supervisor: William Bergmann (reference section).
- **Wildlife Technician:** (10/2000 - 1/2001) with Idaho Dept. of Fish and Game; duties: managing wildlife check-stations, conducting wolverine trapping study, and assisting wildlife biologists with management activities in northern Idaho. 40hrs/week. Supervisor: Jim Hayden (reference section).
- **Fisheries Technician:** for the University of Idaho (9/1996-12/1997); duties: laboratory and field work assisting a graduate student study factors of predation on Chinook salmon smolts in northern Idaho’s Snake River Basin. 15-25hrs/week during school sessions and 40 hrs/week during the summer field season. Supervisor: David H Bennett.
- **Fisheries Bio-Aide:** four seasonal summer positions (4 months/year;1993 through 1996) with Idaho Dept. of Fish and Game; duties: assisting fisheries biologists with management activities in central and northern Idaho’s lakes and river systems. 40hrs/week. Supervisors: Jim Davis, Lance Nelson, Mark Liter and Tom Curet.

HONORS:
- Received: the “Employee of the Year” award for outstanding resource management activities, presented by the Idaho Dept. of Fish and Game (2005).
- Graduated “Magna Cum Laude” from the University of Idaho (BSc) (1997).
- Received: “Gem State Fly Fishers Scholarship” for academic achievement, presented by the University of Idaho (1996).
- Received: the “W. James Burns Award” for academic achievement in the Life Sciences, presented by North Idaho College (1993).
- Received: the “Wildlife Reservist of the Year” award for outstanding volunteer activities, presented by the Idaho Dept. of Fish and Game (1993).

PEER REVIEWED PAPERS:
Charles E. Holderman

**Education:** B.S. Fisheries Resources, University of Idaho, 1987

M.S. Aquatic Ecology (Entomology), University of Idaho, 1998

**Employment History: (Since 1990)**

Aquatic Biologist and Project Manager (March 1999 to Present: Kootenai Tribe of Idaho, Supervisor, Sue Ireland)

Aquatic Biologist and Project Manager with the Kootenai Tribe of Idaho’s Fish and Wildlife Dept, Bonners Ferry, Idaho. Duties include the daily management of the Tribe’s Ecosystem’s Improvement Project; oversight and direction of multi-trophic level and water quality monitoring program covering 14 sites on the Kootenai River; supervision of 2 technicians, 1 biologist, and a part-time secretary; developing and writing quarterly reports, yearly statement of work and budget, annual progress reports, and scientific research reports and findings; orally present project findings at local, regional and national symposiums, conferences, and work groups; organizing yearly International Kootenai River Ecosystem Restoration Team meetings; planning and oversight of large-scale ecosystem nutrient restoration experiment currently underway (start 2005) on the Kootenai River; co-operatively interact with other regional resource agencies to conduct field and lab experiments, coordinate and conduct yearly biomonitoring activities on the Kootenai River (water quality, algae, invertebrate and fish community sampling); and coordination and oversight of project sub-contractors (including development of sub-contract agreements).


Graduate assistant. Conducted research on several lotic ecosystems looking at interactions between underlying trophic levels and fish community dynamics. Thesis Title: “An evaluation of Benthic Insect-Fish Community relationships in Lapwai Creek, Idaho with emphasis on the Distribution, Abundance, and Diet of the Paiute Sculpin, Cottus beldingi.”.

**Fisheries Biologist** (Jan 1992 to Dec. 1994: USDA Forest Service, Umatilla NF, Fred Higginbotham)

**Fisheries Technician** (April 1991 to Nov. 1991) USDA Forest Service, Umatilla NF, Higginbotham)

**Wildlife Technician** (Oct. 1990 to April 1991) Blue Sky Wildlife Contractors, New Mexico, Dave Holdermann)

**Professional Affiliations**

- Member of North American Benthological Society (National Chapter, 1998-Present)
- Member of International Kootenay Ecosystem Restoration Team (IKERT, 1999-Present)
- Member of American Fisheries Society, various chapters and sections (1994-Present)
- Member Western Center for Aquatic Biomonitoring (EPA, Western Division)
- Member Northwest Aquatic Biomonitoring Workgroup (EPA, Region 10)

**Publications**


- Agency Reports and Professional fisheries/aquatic science abstracts (12)
Genevieve Hoyle  
6952 Oak Street  
Bonners Ferry, ID 83805  
(208) 267-5512  
genhoyle@yahoo.com  

Education:  
UNIVERSITY OF IDAHO, Moscow, ID 83844  
Master of Sciences degree (December 2003)  
Major: Fisheries Resources  
GPA of 3.84  

Thesis Title:  
Responses of Periphyton, Benthic Macroinvertebrates, and Juvenile White to Experimental Additions of Nitrogen and Phosphorus in the Kootenai River, Idaho  
IOWA STATE UNIVERSITY, Ames, IA 50010  
Bachelor of Science degree (May 1995)  
Major: Fisheries and Wildlife Biology  

Work  
KOOTENAI TRIBE OF IDAHO  
1/01 – present  

Experience:  
HCR Box 1269, Bonners Ferry, ID 83805  
(208) 267-3620 ext. 544  
Aquatic Biologist  
Supervisor: Charlie Holderman  

✓ Manage monthly field bio-monitoring sampling in the Kootenai River at designated sites from Montana to British Columbia; supervise two  
  Technicians; involves water chemistry analysis, benthic macroinvertebrate collection, and periphyton sampling.  
✓ Planned and implemented tributary sampling for burbot during the winter; involved hiring two technicians, maintaining three weirs, and performing stream surveys. Prepared and submitted final project summary.  
✓ Mesocosm project involves manipulating nitrogen and phosphorous concentrations in an in situ stream simulator, and evaluating the effects upon algae production, macroinvertebrate production, and water chemistry.  
✓ Set up and implemented a light extinction project as part of the mesocosm experiment; involved algae sampling at differing water depths, and measuring light levels (in PAR’s with a Licor meter) at different locations in the Kootenai River.  
✓ Prepare and present PowerPoint and poster presentations at symposia and annual meetings  
✓ Often perform stream surveys, invertebrate sampling, and water quality monitoring as needed to determine population density, numbers, species present, and habitat; press and age trout scales, and analyze water samples from Kootenai River tributaries.  
✓ Collect genetic samples during fisheries surveys.  
✓ Assist the KTOI hatchery department with kokanee plantings in the fall; involves digging constructed redds.  
✓ Involved with tributary restoration efforts; involves benthic periphyton, macroinvertebrate, water chemistry, and electrofishing surveys in four main Kootenai River tributaries; also perform tree planting and fencing when as necessary  

Reports and Publications:  