



**UPPER COLUMBIA WHITE STURGEON RECOVERY INITIATIVE
PROJECT PLANS 2006-07**

November 15, 2005

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INTRODUCTION

The following document describes work proposed under the Upper Columbia White Sturgeon Recovery Initiative (UCWSRI) for fiscal year 2006-07. Projects are listed according to the Technical Working Group's assessment of projects constituting the Core Program, and Priorities 1 and 2. A Project Ranking sheet accompanies these project descriptions. Projected costs for both the Technical Working Group and Community Working Group activities are not yet fully known. However, once finalized, these will be shared with potential sponsoring organizations for their review and consideration for support.

CORE PROGRAM

Hatchery Operations and Maintenance - Canada

Recovery Measure: 3.1

Location: Kootenay Sturgeon Hatchery (Fort Steele)

Cost: \$321,000

Duration: Ongoing

Contact: Bryan Ludwig

Description: Use of conservation fish culture is a key component of the recovery process for Upper Columbia white sturgeon. During 2001 and 2002, Hill Creek Hatchery was successfully developed and operated as a pilot facility. In 2003 operations moved to the Kootenay Sturgeon Hatchery, where the facility is expected to reside over the long term. Releases have occurred in various locations between HLK Dam and the Canada-US border annually since 2002. Although the scope and nature of longer-term hatchery operations are reviewed annually, this work is seen as one of the highest priorities by the Technical Working Group. This project covers ongoing operations and maintenance costs for all fish culture operations, exclusive of PIT tagging, tag purchase, biological support and broodstock collection. The CBFWCP has funded this project in the past and the Program will be reviewing the proposal to fund the work again, to a maximum of \$200,000. In past FFSBC has covered the unfunded portion (~\$121,000). This portion includes costs for project management, facilities maintenance, operation and maintenance of fish transport vehicles.

Hatchery Operations and Maintenance - US

Recovery Measure: 3.7

Location: to be determined

Cost: US \$?

Duration: Ongoing

Contact: Deanne Pavlik/Jason McLellan

Description: In 2003, aquaculture efforts began in Washington State to establish a failsafe facility to raise Canadian hatchery juveniles. The Columbia Basin Hatchery (CBH) at Moses Lake was selected as the best short term option due to favourable, natural water temperatures of 14-15 °C, which are optimal for juvenile white sturgeon growth. Subsequently, 2,000 juvenile white sturgeon transferred from the 2003 brood year transferred from Canadian facilities to CBH, where 1,800 were eventually PIT tagged and released in May, 2004 at Kettle Falls (Marcus Flats), North Gorge and

Northport. A similar program was implemented using the 2004 brood, with nearly 4,000 sub-yearling/yearling fish released. Releases of similar magnitude are expected from the 2005 brood. The program for 2006-07 remains somewhat uncertain at this time, pending the outcome of hatchery site selection and feasibility studies currently underway. However, at a minimum, a program similar to that conducted the previous 3 years will be implemented again.

US Hatchery Feasibility Assessment

Recovery Measure: 3.7

Location: US-Canada border to Grand Coulee Dam

Cost: US \$?

Duration: Year 3 of ?

Contact: Deanne Pavlik/Jason McLellan

Description: Conservation fish culture is a key component of the recovery process for Upper Columbia white sturgeon. During 2001-02, Hill Creek Hatchery was successfully developed as a pilot facility. However, a close examination of costs and logistics has resulted in the move of those facilities to Kootenay Sturgeon Hatchery, near Fort Steele, BC. Despite improvements, there is concern about the need for additional facilities to meet the needs of the recovery program's sturgeon culture requirements over the longer term. Particular concerns include the need for a fail-safe facility and the desire to have additional fish culture work conducted on the US side of the border. This project will see development of a permanent sturgeon conservation hatchery facility in the U.S. to complement the existing program in Canada. At the time this proposal was being written, a contract to assist with this planning was underway. Once complete, these facilities would replace pilot operations currently underway at the Columbia Basin Hatchery.

Broodstock Collection - Canada

Recovery Measure: 3.1

Location: Keenleyside Dam to Waneta Eddy

Cost: \$50,000

Duration: Ongoing

Contact: Colin Spence

Description: A conservation aquaculture program has been implemented to produce juvenile sturgeon for research purposes and to ensure the long-term survival of the population. From 2001 to 2004, broodstock for this program have been successfully collected in the area between Keenleyside Dam and the US border to provide adults for captive breeding. As part of this program, sturgeon will be sampled to collect information on age structure, growth rates, and population size and the opportunity will be used to implant sonic/radio tags on adults as part of adult assessment work. In 2004 and 2005, tests of capture timing on spawning success clearly pointed to later time of capture as the best approach. Further refinement of the program will be undertaken in 2006 with details to be developed over the winter. FFSBC provides 35 man-days, travel and vehicles as *in kind* support for the project (~\$12,000).

Broodstock Collection - US

Recovery Measure: 3.1

Location: Border Eddy – Marcus Flats

Cost: US \$?

Duration: Ongoing

Contact: Jason McLellan

Description: This project mirrors similar activity in Canada. Broodstock targets have yet to be set for culture activities in the US, and facilities to hold and spawn the fish are slated for completion over the winter. However, the program is moving forward with the expectation that broodstock collection will be undertaken in spring, 2006. Targets for the program have yet to be set and will be addressed through Technical Working Group discussions. A revised conservation aquaculture and stocking plan is planned for the future, once better estimates of juvenile survival become available.

PIT Tag Purchase - Canada and US

Recovery Measure: 3.5

Location: HLK Dam to Grand Coulee Dam

Cost: \$36,000 Canada and \$12,750 U.S.

Duration: Ongoing

Contact: Laird Siemens and Jason McLellan

Description: At present, assessments relating to out-planting of hatchery reared white sturgeon require that all stocked fish are marked. All fish released to date have been marked with PIT tags, as well as scute removal. This practice is expected to continue indefinitely; this task involves the purchase of these tags only. PIT tags (134.2 kHz, ISO compliant) are purchased through BPA as part of larger purchase, ensuring the lowest possible price. Current per tag costs are \$2.55 U.S. Total tag requirements each year are presently 12,000 for Canada and 5,000 for U.S. hatchery releases. Associated application and scute marking costs are covered under another budget item.

PIT Tagging and Scute Marking of Hatchery Fish - Canada and US

Recovery Measure: 3.5

Location: HLK Dam to Grand Coulee Dam

Cost: CDN \$5,000 (Canadian portion only) + US \$? (US portion only)

Duration: Ongoing

Contact: Laird Siemens and Jason McLellan

Description: This project is to cover staff costs associated with PIT tagging and scute marking of all hatchery juveniles prior to release, an essential practice expected to be ongoing for the next several years.

Transboundary Reach Juvenile Monitoring - Canada and US

Recovery Measure: 8.5

Location: Keenleyside Dam to Kettle Falls

Cost: CDN\$100,000 (Canadian portion only) + US\$? (US portion only)

Duration: Year 4 of 10+

Contact: Karen Bray/Gary Birch, Mike Hildebrand (Golder Associates), Jason McLellan, Matt Howell

Description: Juvenile sampling has begun to provide background data on locations and age classes of young fish in the transboundary reach of the Columbia River (Keenleyside Dam to Kettle Falls). Reliable methods suited to establishment of a long term indexing program have been developed (D-ring nets, tangle nets, boat electrofishing, set lining and underwater videography). Methods implemented in the first few years of the program (beginning in 2001) have been refined, and now focus on obtaining an annual index of juvenile distribution, growth, survival and habitat preference. The work also provides annual assessment of natural recruitment. Over the longer term, detection

of specific year classes may point to favorable environmental conditions that could be applied in recovery efforts.

A key component of the program is the integration and coordination of juvenile indexing programs on both sides of the border. Study plans are developed on an annual basis by each of the research teams conducting the Canadian and US indexing programs and provided to the Technical Working Group for review in February of each study year. Coordination of the Canada and US indexing programs will be accomplished through frequent communication between respective researchers, the development of standardized catch and habitat forms, and cross-border visits to evaluate juvenile rearing habitat conditions in each area and to ensure comparable sample techniques are used.

Another key element of this research is development of survival estimates for juvenile fish. A Golder Associates contract in Canada is presently investigating the potential to use a remote PIT tag detection and data logging system. If this is successful, the system will be deployed at strategic locations where high densities of juveniles are found. Improved survival estimates will assist in assessments of the population's trajectory, and in the development of an updated aquaculture/stocking plan.

This program is now entering the 6th year of operations. Technical Working Group discussions have suggested a need for review of the project at this time. This will be conducted early in the year, focusing on the project's objectives, progress and future direction. Considerations of the study area, methods and frequency of evaluation (i.e. is annual assessment required?) will be included.

Sturgeon Mortality Investigations

Recovery Measure: 2.2

Location: Revelstoke Dam to Grand Coulee Dam

Cost: \$2,000

Duration: Ongoing

Contact: Colin Spence, Karen Bray

Description: Control of direct mortality is critical to meeting short and medium term white sturgeon recovery objectives. The status of the Upper Columbia population is currently too tenuous to support any additional anthropogenic mortality sources. Even a small increase in adult mortality would jeopardise recovery. Sturgeon mortalities are periodically observed in the upper Columbia River and the public is being encouraged report carcasses to the BC Ministry of Water, Land, and Air Protection, BC Hydro or the Washington Department of Fish and Wildlife. In this project, funding will be allocated to investigate these reports in an attempt to ascertain the cause of mortality and to obtain appropriate samples to take advantage of the opportunity to learn from the tissues of these fish.

Communications and Public Outreach

Recovery Measure: 9.0

Location: Columbia River in BC, and across the border into the United States

Cost: \$10,000

Duration: Ongoing

Contact: Sue Heaton (BC Hydro); Bill Green

Description: The base level cost for this activity varies, depending on funding obtained from sponsor organizations. This project has been split between the Core Program (\$10,000) and Priority 1 Program (\$10,000) to reflect the annual need for at least modest support in this area. Support from CWG/TWG Support and Facilitation contractor to assist in the co-ordination and delivery of communications projects is a necessity for this project to be possible. Priority areas to be addressed in 2006-07 include:

- Assist in creating an UCWSRI public information meeting or symposium as part of celebrations planned in Castlegar in October 2006;
- Assist in the development of an Annual Report under guidance of the Technical Working Group (Technical Working Group);
- Support e.g., travel, expenses, transportation of sturgeon model, CWG members outreach costs to attend public juvenile release event, Canada and BC Rivers Day events, etc.;
- Maintenance of initiative web site: www.uppercolumbiastrugeon.org;
- Co-ordinate a sponsor recognition policy for the UCWSRI to enact effective 2004-2005 for initiative partners who contribute financially or through in-kind means towards the program;
- Develop and implement measures to evaluate the level of success of the various awareness and education activities undertaken;
- Review and provide guidance on new communications materials i.e., news releases, advertisements, brochures, reports, display material, etc.;
- Develop and distribute 'Recovery' newsletter - up to two issues per fiscal;
- Prepare and deliver advertisements about the Initiative and outreach events; and,
- Production, development, and maintenance of various outreach and informational tools i.e., outreach presentations, promotional items (as funding is available) for posters, still and motion image collections about white sturgeon (CD, VHS, electronic file), magnets, tattoos, decals, bookmarks, fish rules, fish facts, t-shirts, ball caps, display panels etc.
- Build working relationships with US transboundary counterparts to ensure understanding and support of the Initiative.

Data Management and Coordination

Recovery Measure: 10.3

Location: Nelson

Cost: \$5,000

Duration: Ongoing

Contact: Colin Spence, Karen Bray

Description: Large numbers of fish are being sampled and tagged in this recovery effort. Given these numbers, the length of time over which recovery efforts will take place, and the number of different agencies/consultants involved in the program, a co-ordinated approach to data management and reporting will be required. In 2003, a contract was awarded to Golder Associates to undertake this project, on an ongoing basis, in conjunction with other work. The project includes a comprehensive fish tag database in which all marked fish and subsequent recaptures of these fish are tracked. Data entry, database maintenance, and consolidation of existing databases are funded with this work, and web-based alternatives for maintaining and accessing this information are being made available.

PRIORITY 1 PROJECTS

Recovery Implementation Coordinator – Canada and US

Recovery Measure: 10.2

Location: Revelstoke

Cost: \$40,000 (Canada); US costs to be determined

Duration: Ongoing

Contact: Gary Birch; Technical Working Group Co-chairs

Description: In 2002, the Upper Columbia White Sturgeon Recovery Initiative made arrangements to secure the services of an Implementation Co-ordinator to assist with delivery of the program. In Canada, the position was filled through secondment of Karen Bray from the Columbia Basin Fish and Wildlife Compensation Program (CBFWCP) with costs covering her salary, associated travel, and miscellaneous disbursements. In 2006-07, the budget reflects the Technical Working Group's recommendation for a half time co-ordinator to reduce Canadian co-chair workloads with the BC Hydro WUP implementation. Work under the Columbia WUP may begin in September 2006. A similar approach is being considered in Washington as well, with the role of the co-ordinator and costs to be determined.

TWG and CWG Facilitation/Committee Support

Recovery Measure: 10.1

Location: office and committee exercise

Cost: \$15,000

Duration: Ongoing

Contact: Bill Green, Steve McAdam

Description: This project involves a service contract to provide facilitation of 2 meetings a year for the Technical Working Group and Community Working Group, including meetings, meeting notes, agendas, administrative support for the Committee Chairs. Budget includes fees, meeting expenses, and travel. In 2005-06, this contract was awarded to Birchland Heights Enterprises.

Technical Advisory Support

Recovery Measure: 8; 10.1

Location: Castlegar

Cost: \$15,000

Duration: Ongoing

Contact: Larry Hildebrand

Description: The Columbia Power Corporation provides funds to support the participation of Larry Hildebrand on the Technical Working Group. Larry's involvement in the UCWSRI as a well respected sturgeon expert is essential and should continue indefinitely.

Annual Report/Conference

Recovery Measure: 9.4

Location: office

Cost: \$15,000

Duration: Ongoing

Contact: TWG and CWG Co-chairs

Description: A short annual report describing the Recovery Initiative's progress over the previous year has been completed each year since 2002-03. The report includes brief descriptions of projects, results, and reports available, partners in the initiative, financial contributions, and a forecast of future year's work. For the coming year, plans call for the program results to be presented to the public. This will be undertaken as part of the Castlegar symposium, "*Columbia Basin – a Cultural Environment and an Environmental Culture*", October 19-22,, 2006. Although the Upper Columbia White Sturgeon Recovery Initiative will be the focus of this forum, sturgeon experts involved in recovery efforts elsewhere such as the Kootenai and Nechako rivers, will be invited to attend. A formal record of the year's activities within the UCWSRI will be produced in the form of proceedings from the symposium.

Communications and Public Outreach

Recovery Measure: 9.0

Location: Columbia River in BC, and across the border into the United States

Cost: \$10,000

Duration: Ongoing

Contact: Sue Heaton (BC Hydro); CWG Co-chairs

Description: The base level cost for this activity varies, depending on funding obtained from sponsor organizations. This project has been split between the Core Program (\$10,000) and Priority 1 Program (\$10,000) to reflect the annual need for at least modest support in this area. Support from CWG/TWG Support and Facilitation contractor to assist in the co-ordination and delivery of communications projects is a necessity for this project to be possible. Priority areas to be addressed in 2005-06 have been outlined under the Core Program description.

US CWG Development

Recovery Measure: 9.1; 9.2; 10.1

Location: US

Cost: US costs to be determined

Duration: Ongoing

Contact: Deanne Pavlik

Description: This project is to continue to support a U.S. Community Working Group to complement a similar group in Canada, comprised of regulatory agencies, tribes, public representation, and industrial stakeholders with an interest in sturgeon recovery. This group seeks funding, provides local and traditional knowledge, provides advice on potential social and economic impacts of proposed recovery measures, and communicates issues and findings to their respective constituents.

Population Substructure Analysis

Recovery Measure: 8.8

Location: office

Cost: \$5,000

Duration: Year 3 of 3

Contact: Steve McAdam; Karen Bray

Description: Phase I of the analysis has just been completed and identifies 3 groups of white sturgeon in the Canadian Upper Columbia River based both on genetic analysis and capture location. These findings indicate that genetic differentiation was present prior to dam construction.

This may have implications both to our understanding of recruitment failure, the hatchery program, and the measures taken to restore recruitment. For example, such sub structuring, if it continues to be maintained would likely decrease the effective population size and heighten the level of conservation concern. While the implications of this information for management decisions remain unclear, these findings help explain ongoing questions regarding movement patterns, and spawning dynamics.

In 2005-06, the this work was furthered by increasing the sample size for Arrow Reservoir and Waneta/Ft. Shepard sample sites, and also to include samples from Roosevelt Reservoir since movement patterns suggest these fish constitute a fourth group. Analysis of capture information from the database will also be included and compared with the results of genetic analysis. This work should complete the analysis and allow definitive identification of the groupings present in this geographic area. In addition, samples from recently captured/reared larval tissue as well as samples from fish recruited since dam construction will be included in the analysis. Inclusion of these tissues should allow us to identify whether the historically present reproductive isolation is being maintained. Findings from this portion of the analysis could have implications for our understanding of recruitment failure, as well as the design of hatchery protocols.

The work will be largely complete by 2006-07, with only report writing required to finish the project.

Recruitment Failure Hypothesis Evaluation

Recovery Measure: 4, 5, 6, 7

Location: Upper Columbia Basin

Cost: \$15,000

Duration: Year 1 of ?

Contact: Steve McAdam

Description: Work is underway to provide detailed direction for technical work investigating Upper Columbia white sturgeon recruitment failure. At present, research and analyses are being undertaken to identify both the causes of the problem and identify potential solutions. The goal is to identify the potential mechanism(s) causing recruitment failure, and feasible restoration options. Outcomes of this phase should be (at least) preliminary designs of restoration actions. Experimental restoration will follow, with the expectation that one or two potential restoration actions will be tested (in addition to ongoing fish culture). Funding for 2006-07 is provided to assist with initial research and analysis, with input from researchers at UBC. The results will be used to complete a 10 year plan currently under development.

Juvenile Habitat Requirements Study

Recovery Measure: 8.6

Location: lab-based work

Cost: \$30,000

Duration: Year 2 of 2

Contact: Steve McAdam

Description: The Technical Working Group requires detailed information on the early life history ecology of white sturgeon to understand and address potential impacts to their survival in the upper Columbia River. This research project is intended to expand on previous lab and field-based studies on juvenile white sturgeon in the lower Columbia River, by obtaining quantitative data on habitat preferences and behaviour of early life stages for the upper Columbia population. The research will

be conducted by Technical Working Group co-chair Steve McAdam, as part of his Ph.D. studies at UBC. The study will involve detailed investigations of behaviour and habitat preferences of free embryo and larval white sturgeon in a laboratory environment. Dispersal, settling, and hiding behaviours relative to a variety of habitat variables will be examined using experimental channels.

Geomorphological Analysis, Phase II

Recovery Measure: 7.1, 7.6

Location: office

Cost: \$50,000

Duration: Year 2 of 2

Contact: Steve McAdam

Description: Although we have recruitment failure hypotheses suggesting that geomorphological changes in river substrates may be contributing to recruitment failure, this hypothesis has been only lightly pursued to date. Current indications that geomorphological changes are strongly implicated in the Kootenay/i and Nechako Rivers provides strong indication the such effects might also be present in the Upper Columbia River. Phase I of the analysis (complete) entailed identification and collection of the existing data and air photos required for hypothesis evaluation. Phase II will involve more detailed examination of the available data to identify the nature, magnitude and timing of geomorphic changes that have occurred from the spawning area downstream. The cost of phase II reflects the fact that very limited data is available to evaluate this hypothesis, and hence there is a need to collect additional information.

Transboundary Reach Angler Awareness Program

Recovery Measures: 1.2, 9.1, 9.5

Location: HLK Dam to US Border, possibly extending into Lake Roosevelt

Cost: \$45,490

Duration: Year 2 of 3

Contact: Bill Green

Description: A very active sport fishery occurs throughout the Transboundary Reach of the Upper Columbia River, and into Lake Roosevelt. The last creel survey in this area occurred in 1991. Since that time, the sport fishery has likely grown and angling for white sturgeon has been stopped. Incidental and illegal catches of white sturgeon are known to occur but the extent of this problem is poorly understood. A creel survey and angler education program was initiated in November, 2003 to fill this data gap. Unfortunately funding was not made available to complete a full calendar year of study and interaction with the anglers, resulting in only a partial picture of the fishery (report currently in prep.) However, the angler education component can be achieved for a fraction of the cost of a creel survey and should still be pursued to meet that objective of the program. The work will focus on the following techniques to improve angler awareness: (i) signs; (ii) one-on-one discussions between with fishermen; and (iii) a brochure distributed to each fishermen.

The majority of the project will be an angler contact program undertaken by a summer student and a seasonal contractor to cover the shoulder angling seasons. The summer student will contact angling guides operating within the project area and provide information on best practices to avoid capturing sturgeon and handling procedures when incidental captures occur. An evaluation survey will be undertaken that identifies rates of encounters with sturgeon, habitat and gear selection used when sturgeon were captured and rate of mortality. Means of reporting mortalities will be identified,

so biologists can track information from these fish (e.g., PIT tag number). The responses from 2006 will be compared to 2007, with particular interest in determining if anglers that received information continue to impact sturgeon. The 2 year duration of the project will allow comparison between two summers, as well as providing funding to conduct the contact program during the spring (March – April 2007) season, a high use period for anglers targeting rainbow trout.

Contaminant Assessment

Recovery Measure: 6.1, 6.5

Location: Upper Columbia Basin

Cost: \$60,000

Duration: Year 3 of 4

Contact: R. Roome?

Description: In 2004-05, funding was used to complete data analysis and reporting for the 2002 and 2003 tissue contaminant data. This interpretive report integrated tissue contaminant analysis data (2002/2003 broodstock, eggs and sperm, juvenile sturgeon from several families, plasma, urine, whole blood and mucous samples), bioassay project and genomics study components. The interpretive report also provided comparisons of data collected to existing literature and make recommendations for refining the contaminants monitoring program as well as future study needs. Direction in 2006-07 will be developed from these recommendations.

Deformity Study Plan

Recovery Measure: 6.3, 8.7, 8.11

Location: Upper Columbia Basin

Cost: \$5,000

Duration: Year 2 of 5

Contact: S. McAdam

Description: Substantial numbers of deformities have been noted amongst juvenile white sturgeon cultured to date. The most common external abnormality appears to be stunting of the pectoral fins. These conditions are evident very early in development, within a month of hatching. Head deformities are also observed. Neither of these conditions appear to be duplicated in the present population of wild adults, suggesting either such fish are not produced in the wild or they do not survive. These observations also reflect only externally visible features, leaving questions about the extent of internal abnormalities. There are a number of possible causes of these deformities, the most likely being related to genetics, contaminants and infectious diseases. Other factors, including hatchery water quality, crowding and handling stress, and nutrition, may also be involved. A review of existing deformity data from the upper Columbia program as well as literature from other research was undertaken in 2004-05. This report will be provided to researchers at UBC, with the intent to develop research plan. The plan will guide existing work (e.g. aquaculture) in documenting the kinds and extent of deformities, and develop new research activities to better understand the origin and implications of the problem in upper Columbia sturgeon.

Stock Assessment and Telemetry Program Review and Maintenance

Recovery Measure: 8.1, 8.2

Location: Columbia River from Revelstoke Dam to Grand Coulee Dam

Cost: Canada \$50,000

Duration: Year 3 of 10+

Contact: Colin Spence and Jason McLellan

Description: This project involves a systematic white sturgeon capture and tagging program in the section of the Columbia River between Revelstoke Dam and the Keenleyside Dam. In Canada, a multi-year contract was established with Golder Associates in 2003 to conduct fieldwork within BC and co-ordinate the project on both sides of the border. Matt Howell with the Washington Department of Fish and Wildlife is leading studies in the U.S. Work is being conducted concurrently with the adult and juvenile assessments in Canada and the US. A Vemco VR2 receiver array is already in place, extending from Big Eddy near Revelstoke, BC, to Barnaby Island south of Kettle Falls, WA. Existing tags placed on adults will continue to be tracked using this system. This will assess movements of these fish to assist in determining population size, population structuring and habitat use in both Canada and the US. The telemetry system should also assist in confirming the 2004 discovery of another spawning area, near Northport, WA.

Work in 2006-07 will first involve a review of progress to date, including programs in both Canada and the U.S. Needs for additional analyses and marking will then be assessed and developed into a project plan. Implementation will occur once this is finalized and agreed upon by the TWG.

Lake Roosevelt Adult Assessment

Recovery Measure: 8.1, 8.2

Location: Border to Grand Coulee Dam

Cost: US \$?

Duration: Year 4 of ?

Contact: Jason McLellan and Deanne Pavlik

Description: The intent of this program is to provide a follow-up to 1998 studies aimed at obtaining information on white sturgeon distribution (including identification of important habitats) and population dynamics in Lake Roosevelt. Additional information obtained from the program will include an assessment of the feasibility to obtain broodstock from the US section of the Transboundary Reach. In 2004, setline sampling was conducted from the US-Canadian border downstream to the Gifford area. Sonic and radio tags were applied to selected individuals and the resulting data were instrumental in identifying a new spawning area near the Little Dalles. This program is also characterizing the interaction of this group of fish with other groups in the Upper Columbia – information that is of particular interest, possibly having genetics and conservation aquaculture implications.

Lake Roosevelt Spawn Monitoring

Recovery Measure:

Location: Border to Grand Coulee Dam

Cost: US \$?

Duration: Year 3 of ?

Contact: Jason McLellan and Deanne Pavlik

Description: To determine if suitable spawning habitat and conditions exist between Lake Roosevelt and the international boundary, the following tasks are proposed:

- 1) Identify potential spawning habitat between Lake Roosevelt and the international boundary based on existing habitat data and spawning site preferences described for other Columbia basin white sturgeon populations.
- 2) Use a combination of sonic and radio telemetry to track movements of mature fish and identify potential spawning sites.

- 3) Use artificial spawning substrate mats and D-ring nets to confirm the presence or absence of eggs and free embryos/larvae at potential spawning sites, identified using habitat characteristics and telemetry.
- 4) Document the frequency of spawning events, and determine the timing and duration of the spawning season.
- 5) Identify physical characteristics associated with spawning including temperature, discharge, velocity, turbulence, depth, and substrate.

In 2004-05, this work revealed spawning activity at Dead Man's Eddy and the Little Dalles, near Northport. Larvae were also obtained using D-ring nets, indicating sufficient levels of spawning and hatching to result in detectable production. Work in 2006-07 will build on these initial findings.

Sturgeon Limiting Factors in Washington

Recovery Measure:

Location: Border to Grand Coulee Dam

Cost: US \$?

Duration: Year 3 of ?

Contact: Jason McLellan and Deanne Pavlik

Description: To determine population productivity and limiting factors for the white sturgeon population in the U.S. portion of the transboundary reach, the following tasks are proposed:

- 1) Estimate age of maturation and spawning periodicity to project average annual spawner numbers and evaluate the potential for spawning stock limitation now and in the future.
- 2) Estimate growth and mortality/survival rates to project population trajectory and composition.
- 3) Collect and analyze stomach contents of representative predatory fish species at and downstream of spawning sites (including Waneta) and release sites for Canadian hatchery juveniles to assess possible predation of eggs, larvae, and juveniles.
- 4) Assess potential limitations posed by contaminants based on analyses of sturgeon tissue, physical/chemical water quality, and sediments chemical composition in potential toxic deposits near spawning areas.

Work in 2006-07 will focus on predation impacts.

Temperature Effects on Incubation Success/Survival

Recovery Measure: 5.1

Location: Revelstoke and Kootenay Sturgeon Hatchery (Wardner)

Cost: \$50,000

Duration: Year 3 of 3

Contact: Bill Green

Description: This work will follow up on earlier studies of Arrow Lakes Reservoir white sturgeon spawning success in the Revelstoke area. Arrow sturgeon spawning period is the latest of all known populations and both spawning and egg incubation are likely delayed by the unnaturally cold temperatures, possibly resulting in high overwintering mortality of developmentally-impaired juveniles. Investigations are currently underway to determine the effects of water temperatures observed downstream of Revelstoke Dam on sturgeon larvae and juvenile survival, physiological

condition and development. In 2005-06, studies will be undertaken to confirm the results of studies presently underway and not scheduled for completion until winter, 2005.

PRIORITY 2 PROJECTS

Cryopreservation Feasibility

Recovery Measure: 3.10

Location: Kootenay Sturgeon Hatchery and University of Idaho

Cost: \$6,300

Duration: Ongoing

Contact: Bryan Ludwig

Description: The original objective for cryopreservation work was to freeze milt early in the spawning season, from running males caught in the wild, and then use those frozen samples to fertilize a small sub-sample of eggs from the captive females. This would allow us to test the efficacy of the cryopreservation within the same spawning season. Good fertilization rates have been obtained with the 0.25 ml straws in the past. However, the volume of the straws makes them difficult to work with, especially when fertilizing large batches of sturgeon eggs. Joe Cloud at the University of Idaho has been experimenting with freezing milt in the large volume straws with some success. This year, provision of fresh sperm (within a few hours of extraction) further improved success in freezing trials. For 2006-07, further testing of the viability of the sperm in large volume straws relative to the 0.25 ml straws will be undertaken. Storage of samples remains an unresolved problem requiring attention as well; few facilities occur where freezers suited to such work are available.

Critical Habitat Identification and Delineation

Recovery Measure:

Location: office

Cost: \$10,000

Duration: Year 1 of ?

Contact: to be determined

Description: The Canadian Species at Risk Act requires the identification of critical habitats for listed species. This process requires, at a minimum, a written description of these habitats and their locations, and would also logically include a mapping exercise. Although considerable research has been undertaken to describe key habitats for various life stages of white sturgeon in the upper Columbia Basin, comprehensive descriptions of these sites for the entire recovery area have yet to be described in a manner that reflects SARA requirements. This project would undertake the first phase of this process by locating and describing all existing information. The end result would likely be a combination of written and map-based interpretations, including a plan for future work to better define these habitats as required.

Waneta Spawn Monitoring

Recovery Measure: 8.4

Location: Waneta Eddy (Pend d'Oreille and Columbia confluence)

Cost: \$60,000

Duration: Ongoing; only to be implemented in low water year

Contact: Larry Hildebrand

Description: Studies were initiated in 1993 to monitor white sturgeon spawning activity in the Waneta spawning area, the only known spawning area for white sturgeon in the Columbia River between Keenleyside and Grand Coulee dams. Due to the extent of previous study, and the fact that numerous spawners (8 females) are now being removed for aquaculture, there is general agreement among the TWG membership that continuation of annual spawning studies is not required. Work will only be conducted in 2006 in the event that a low water year is predicted, as defined in the Project Approval Certificate for the Waneta Upgrade project. In the event low flows are predicted, During the 2006 spawning period, methods (artificial substrate mats) and sample sites used during previous studies will be employed to monitor spawn timing and frequency, as well as flow and temperature characteristics in the spawning/egg deposition area. A brief technical report will be prepared that summarises the results of the study and compares the 2006 data with previous study results in terms of spawning timing, number of spawning events and physical habitat characteristics.

Transboundary Reach Angler Impact (Creel) Survey

Recovery Measures: 1.2, 9.1, 9.5

Location: HLK Dam to US Border, possibly extending into Lake Roosevelt

Cost: \$100,000

Duration: Year 2 of 2

Contact: Bill Green, Colin Spence

Description: A very active sport fishery occurs throughout the Transboundary Reach of the Upper Columbia River, and into Lake Roosevelt. The last creel survey in this area occurred in 1991. Since that time, the sport fishery has likely grown and angling for white sturgeon has been stopped. Incidental and illegal catches of white sturgeon are known to occur but the extent of this problem is poorly understood. A creel survey and angler education program was initiated in November, 2003 to fill this data gap, and specifically:

1. To obtain an estimate (of known precision) of white sturgeon encounter/catch rates and total number of annual WS encounters in the lower Columbia (HLK to border) – lower Kootenay (Brilliant to confluence area (“the area”));
2. To obtain information on the seasonal, geographic and gear type distribution of WS encounters to assist in the design of regulations and enforcement effort to minimize WS encounters;
3. To educate anglers about the need to avoid WS encounters and fishing methods to minimize WS encounters;
4. To obtain estimates (of known precision) of total annual sportfishing effort in the area and of total annual catches of rainbow trout, walleye, mountain whitefish and kokanee;
5. To obtain information on the season, geographic and gear type distribution of sportfishing effort in the area.

Year 2 of this project was to have begun in April 2004, aimed at collecting sufficient data to have a full calendar year available for analysis. Due to funding issues, this work was not undertaken. The remaining work required to describe the entire year is proposed in this project, and would involve: (i) completion of approximately 23 person-months of access point interviews of anglers between April 1 and October 31; (ii) 65 aerial overflights to count shore and boat anglers; (iii) data entry and analysis; and (iv) preparation of draft and final reports with recommendations for possible changes to angling regulations to protect sturgeon.

Purchase of Tags and Gear

Recovery Measure: various

Location: basin wide

Cost: \$20,000

Duration: Ongoing

Contact: Karen Bray; Larry Hildebrand

Description: For the purchase of various tags and equipment as needed.

WUP PROJECTS

Revelstoke Spawn Monitoring

Recovery Measure: 8.4

Location: Revelstoke

Cost: \$50,000

Duration: Ongoing

Contact:

Description: A program will be implemented to monitor white sturgeon spawning activity in the section of the Columbia River between Revelstoke Dam and Arrow Lakes Reservoir. Spawning activity will be monitored through regular (e.g. deployment of VR2 and manual tracking) determinations of pre-spawner locations (assuming that one or more pre-spawners have been tagged with sonic and/or radio transmitters) and deployment of artificial substrate mats. Substrate mats will be checked at sufficient intervals (e.g. every 5 days) to ensure spawning events are not missed. Retrieval of substrate mats and follow-up egg stage analyses would be conducted, along with continuous temperature monitoring. The resulting data would be used to back-calculate the time of spawning, determine river discharges and estimate habitat conditions during egg deposition.

Kinbasket Reservoir Adult Assessment

Recovery Measure: 8.3

Location: Columbia River upstream of Kinbasket Reservoir and Kinbasket Reservoir

Cost: \$56,815

Duration: Year 1 of 2

Contact:

Description: Sampling to determine the presence of white sturgeon in Kinbasket Reservoir has been limited to work undertaken in 1995, consisting of 12 overnight set lines. No sturgeon were captured during this work. However, anecdotal sightings of sturgeon in this area are detailed in recent work in which interviews of local residents were undertaken and documented. Included are observations around Mica Dam at the time of construction. First Nations observations from the Columbia-Spillimacheen confluence also suggest the species ranged well into the upper reaches of this part of the Columbia basin.

The purposes of this project are: (i) to determine if there is a remnant population of white sturgeon in the Kinbasket reservoir/upper Columbia region which can contribute to the foundation of genetic diversity of the meta-population recovery effort; and (ii) if a remnant population persists, to

determine habitat preferences and seasonal movement patterns as the basis for future inventory and broodstock collection work.

In a far more intensive program than the work completed in 1995, set lines will be deployed throughout the reservoir in the fall . Sampling periods will be: (i) in late May-early June, to coincide with low reservoir levels; and (ii) in September, to coincide with kokanee migrations into spawning tributaries. Sampling will be targeted at the mouths of tributaries supporting spawning salmonid populations, and in other areas of prey population aggregation. Standard methods will be used to sample, mark and describe catches. Tissue samples will be collected for genetic analysis and comparison to Arrow and transboundary reach sub-populations. Sonic telemetry will be used to track seasonal movements and identify critical habitats. Any fish captured during the program will be fitted with high-output sonic tags, to increase tracking effectiveness during periods of thermal stratification when conventional sonic tags are less effective. Radio transmitters may also be used to assist in tracking these fish should they move into river habitats upstream of the reservoir.

Feasibility of Turbidity Augmentation

Recovery Measure: 5.2

Location: Upper Columbia Basin

Cost: \$15,000

Duration: Year 1 of 2

Contract:

Description: Loss of natural turbidity in the mainstem Columbia River as a result of dam construction is seen as potentially affecting survival of newly emerged larval sturgeon. Turbid conditions provide cover for larval sturgeon to escape predation. Augmenting existing natural turbidity provided by glacial tributaries and erosion with particulates such as bentonite is a possible rehabilitation initiative. This task would involve assessing historic sources and present sources/levels of turbidity/TSS and documenting areas influenced; some literature review of recent USGS work and preliminary gathering of information on artificial turbidity materials will also be undertaken as time allows. Future work would include experimental evaluation of dispersion mechanics and ecosystem impacts of artificial materials before implementation would be explored. Information on natural sources would feed into pilot habitat restoration efforts.

FUTURE PROJECTS

Transboundary Reach Larval Release and Monitoring

Recovery Measure: 3.2; 7.1

Location: Transboundary Reach

Cost: \$6,500 for hatchery production, \$? for monitoring program

Duration: Year 1 of ?

Contact:

Description: Recruitment failure hypotheses suggesting that geomorphological changes in river substrates may be contributing to recruitment failure have not been pursued to date. The most likely impact on substrate has occurred after HLK was completed, reducing freshet flows and allowing Cominco slag or other materials to deposit in larval settling and juvenile rearing areas.

This project would complement office-based analyses of geomorphological changes and initiate the first stages of 10 year plan to testing hypotheses related to substrate change. The initial phase of this project would involve the release of up to 200,000 hatchery reared larvae near HLK in Castlegar over substrate not affected by historic Cominco slag inputs. At a minimum level, we could simply release larvae and look for recruitment from this event during ongoing gill netting programs the following year. If interest and funding is available, a program to index larvae from the release point to Waneta using D-Ring larval nets could be established to identify where in the water column larvae disperse, dispersal rates and where in the river larvae settle out. Recaptured larvae or juveniles resulting from these releases could be differentiated from wild production with familial genetic identification techniques.

Canadian Columbia (Waneta) Hatchery Feasibility and Design

Recovery Measures: 3.1

Location: Castlegar/Trail/Waneta area

Cost: \$50,000

Duration: Year 1 of ?

Contact: Colin Spence and Bryan Ludwig

Description: Concerns have arisen regarding the off-site location of Canadian conservation aquaculture facilities. Unknowns related to possible impacts on imprinting, as well as affects on spawning success and deformities, have been hypothesized as being related to off-site rearing.

This project needs to be discussed by the Technical Working Group to determine the level of concern and interest in this before being pursued further. The issue of imprinting is unresolved and likely will remain so for the next several years. However, the deformity issue does not appear to be a valid concern at this time, as recent evidence is suggesting similar levels of this problem have occurred at 3 different sites (Hill Creek, Kootenay Sturgeon Hatchery and Columbia Basin Hatchery). Spawning success was also shown to be very high in 2004; when the timing of captures was later in the season, spawning at Kootenay Sturgeon Hatchery was very successful, and virtually identical in timing to what we see at Waneta in the wild. Thus, most obvious benefit might be simply to address imprinting, which is poorly understood and may not provide an adequate rationale to undertake construction of a completely new facility.

Conservation Aquaculture and Stocking Plan Development

Recovery Measure: 3.1

Location: all

Cost: \$15,000

Duration: Year 1 of 1

Contact: C. Spence, B. Ludwig and J. McLellan

Description: With the completion of 4 years of successful aquaculture in Canada and the development of additional hatchery facilities in the U.S., a need now exists for clearer definition of breeding protocols and stocking strategies. This project will see development of plan to address these issues, using the Transboundary Reach and Revelstoke Reach 10 year operational plans as a foundation for defining aquaculture targets. A similar aquaculture plan has recently been completed for Kootenai white sturgeon and should assist in this process on the Upper Columbia. The objective will be to:

- develop general production targets by facility, year, and life stage;
- outline broodstock requirements and breeding protocols for each facility; and

- define a liberation strategy, including timing, location and numbers for release.

Review and Assessment of Research Programs

Recovery Measure: 10.3

Location: office

Cost: deferred

Duration: future, Ongoing

Contact: PMSC

Description: This project will provide for ongoing, independent scientific review of research and monitoring aspects of the recovery plan. It is anticipated that components of the recovery plan (e.g., conservation aquaculture/genetics, water management, contaminants, etc.) would be subjected to independent scientific review on a rotational basis. That is, each component might be reviewed every 5 years, with one program component being reviewed each year. This will require contracting with knowledgeable, independent (and usually academic) researchers.

COMPLETED OR CANCELLED PROJECTS

Multiple Spermiation Induction in Captive Males

Recovery Measure: 3.1

Location: Kootenay Sturgeon Hatchery

Cost: \$6,300

Duration: Ongoing

Contact: Bryan Ludwig

Description: With limited numbers of spawners available for capture each year, biased sex ratios of spawners, and an extended spawning season, the probability of having every captured adult Upper Columbia River white sturgeon contribute genetically to a conservation fish culture program is low. At Hill Creek Hatchery, we began documenting and perfecting a novel technique to conservation fish culture that allows individual adult males to be induced to spermiate multiple times throughout the spawning season.

Other conservation sturgeon culture programs take milt from males only once: either from ripe males in the wild or from induced captive males. To be able to extract viable sperm from individuals males multiple times is a potentially valuable tool for a conservation sturgeon culture program. This technique will allow for males (that previously might not have) to contribute genetically to the program. Previously, if a male and female were mated and the resulting progeny did not survive, both male and female contributions were usually lost to the program. However, with this new technique, if another mature female is available we can induce that same male to spermiate and therefore contribute genetically again.

Work to date has shown that we can successfully induce males to spermiate multiple times. We have documented the motility and density of each male's sperm after each induction event. Preliminary analyses indicate sperm motility is sustained but sperm density decreases with each induction event. We have also confirmed that the males were not spermiating (could not be manually stripped of sperm) between the induction events. We were not able to cross any reinduced male's sperm with eggs because of the limited number successful inductions of females.

We are hoping to continue this work this year. We will continue to track sperm motility and density after reinduction of spermiation. Finally, we will attempt to fertilize a small sub-group of eggs with the sperm from a reinduced male to demonstrate that this technique does not affect sperm viability. This work should not interfere with the overall objectives of the conservation sturgeon program due to the limited (~100 eggs/test) number of eggs used.

DNA Mark Feasibility

Recovery Measure: 8.8

Location: office/lab exercise

Cost: \$8,000

Duration: Year 2 of 5

Contact: Colin Spence, Larry Hildebrand and Steve McAdam

Description: Mark-recapture population estimates are applied routinely to assess the status of the adult sturgeon population in the upper Columbia. The accuracy of these estimates relies on consistent retention of tags over time. However, there is clear evidence that tag loss is an issue. As an alternative to tagging, DNA microsatellite analyses are currently being widely applied to other species such as bears and rockfish to establish individual identification. This technique has reached the stage where the costs and routine nature of work allow large scale application at relatively low cost. The suitability of this work for upper Columbia white sturgeon was tested in 2004 and appeared very promising. Additional marker testing has been recommended and should be pursued at this time, before the program is implemented operationally. As well, methods of addressing the data and tissue sample management side of this approach need to be developed, recognizing that literally hundreds of vials will need to be labelled, stored logically and safely, and handled in a database. In subsequent years, we hope to investigate options to obtain tissues from white sturgeon using special hooks designed to simply remove a plug of tissue without having to land the fish (similar systems are currently in use for marine rockfish and Spanish mackerel).

Age Validation and Biochronology Study

Recovery Measure: 8.9

Location: lab/office

Cost: \$15,000

Duration: Year 2 of 2

Contact: Steve McAdam

Description: **Not yet updated.** Age Validation: Accurate ageing of white sturgeon is a fundamental requirement for understanding the population dynamics of the species and for understanding the causes of recruitment failure. In the absence of confidence around the methods used to age fish there will be continued uncertainty surrounding the temporal linkages between the recruitment failure and other activities in the watershed, such as dam construction. Further, inaccuracies in current age estimates may invalidate assumptions made within the recovery planning process. For example significant underaging (Beamesderfer and Paragamian 2003), would invalidate assumptions used within breeding plans and the recovery plan.

This project will examine the accuracy of white sturgeon age determination using bomb radiocarbon analysis. This technique uses changes in isotope composition associated with the emergence of nuclear testing during the 1950's to accurately identify specific annuli. A recent review by Campana (2002) , as well as discussions with the author, indicated this to be the best form of age validation presently available for cases such as white sturgeon. The first step of the analysis will use one old and one newer sample to test for signal presence and strength. If a signal is present then more detailed analysis would be undertaken on a larger number of samples. Identification of an annuli as a particular year (e.g. 1956) would then allow calibration of ages using fin ray x-sections.

Biochronology: The long record present in fin ray cross sections can provide valuable historic information, in addition to the age of the fish. Information about historic growth rates can be extracted by measuring the age specific growth increments for each year of growth. Subsequent comparison of historic and contemporary samples may provide an indication of the changes in ecosystem productivity. For white sturgeon residing in the Columbia River below Keenleyside Dam the loss of salmon represented the loss of a significant source of nutrients, which likely led to decreased growth rates. Similarly that a decreased nutrient supply could affect the interspawning interval as well as fecundity, and both are parameters that may play a role in recruitment failure and/or restoration.

This project will compare growth biochronologies for fish from the Columbia River below Keenleyside Dam for very old fish born prior to the construction of Grand Coulee Dam with fish that have recruited since the construction of Keenleyside Dam. Due to the length of time between the construction of Grand Coulee Dam and the capture of white sturgeon fin ray samples this analysis will only be able to compare juvenile growth rates, and then make inference about changes in adult growth rates. This study will also benefit from the concurrent analysis (separate funding) of select groups of fish from the Fraser River as well as historic and contemporary samples from the Nechako River. This should allow a very good evaluation of the utility of this method, as well as provide information about growth rate changes that might have contributed to changes in recruitment rate.

Sex Steroid Sex-Maturity Assay Development

Recovery Measure: 3.1

Location: sampling Upper Columbia Basin; analyses Oregon State University

Cost: US \$?

Duration: Year 3 of 5 years

Contact: Molly Webb

Description: Sex steroid sampling is being used to develop a discriminant function analysis model for prediction of sex and maturity for this population using steroid concentrations in plasma, urine, and mucus. This information is essential for the development of field test kits that may allow for the elimination of gonadal biopsies in determining sex and maturity of sturgeon. This proposal requests funds to analyze the biological samples for sex steroids and conduct histology on gonadal tissues.

Gonad Histology

Recovery Measure: 3.1

Location: sampling Upper Columbia Basin; analyses Oregon State University

Cost: US \$5,000

Duration: Year 3 of 5 years

Contact: Molly Webb

Description: Histological analysis of gonadal tissue in recaptured white sturgeon will allow for a description of the maturation cycle and ovarian regression (resorption of developing eggs) in the upper Columbia River. Insights into the age of maturation, frequency of spawning and incidence of failed spawning will be developed. This proposal requests funds to analyze biological samples and conduct histology on gonadal tissue in the samples collected in 2005.

Plasma Cortisol Analysis as an Indicator of Stress

Recovery Measure: 3.1

Location: Upper Columbia Basin

Cost: US\$20/sample

Duration: year 1 of 5 years

Contact: Molly Webb

Description: Sturgeon undergo a stress response typical of modern teleosts. Stress can impede reproduction in fishes by reducing gamete and/or progeny quality, increasing the incidence of gonadal atresia, and compromising immune function. Stress may also lead to direct mortality. Plasma cortisol concentrations are used as an indicator of stress in fishes. Basal (unstressed) plasma cortisol concentrations in white sturgeon are < 10 ng/ml. Plasma cortisol concentrations differed in adult white sturgeon captured in the lower Columbia River using various gear types (gill net: 78.21 ± 4.08 ng/ml, range 3.80 - 213.10 ng/ml; hook and line: 39.24 ± 2.09 ng/ml, range 2.42 - 238.37 ng/ml; and setline: 30.97 ± 3.43 ng/ml, range 0.53 - 103.30 ng/ml). The cortisol concentrations in sturgeon caught in the oversize catch-and-release sport fishery (hook and line) were significantly correlated with play time (i.e. the longer the fish was on the line, the more stressed the fish). This request for funds is to measure plasma cortisol concentrations in white sturgeon broodstock captured over the next five years. Different gear types have been proposed for broodstock capture over the next several years, and cortisol concentrations will be compared between gear types to determine the least stressful method of capture. We will also determine if plasma cortisol concentrations at capture are correlated with spawning success (ovulation and spermiation) and hatch success.