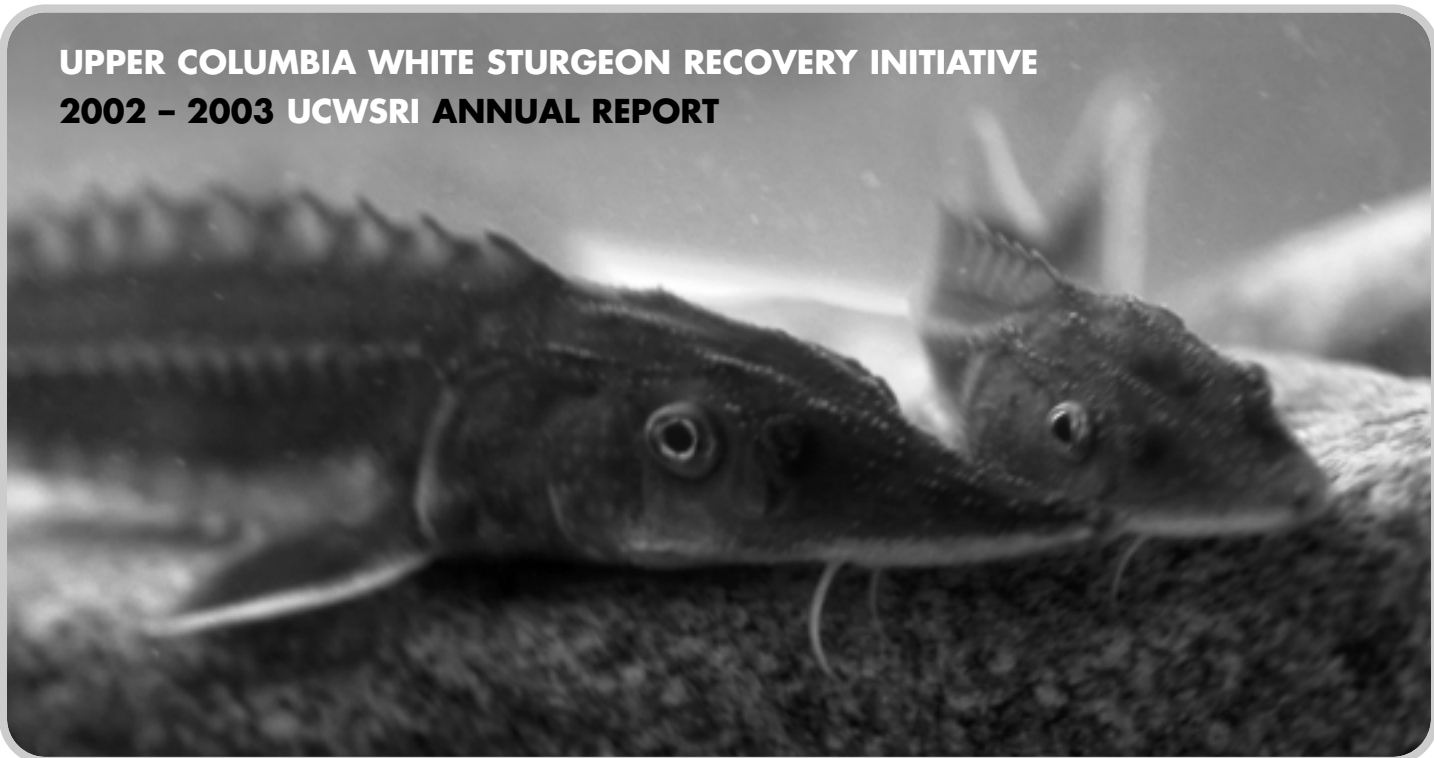


**UPPER COLUMBIA WHITE STURGEON RECOVERY INITIATIVE  
2002 - 2003 UCWSRI ANNUAL REPORT**



**...“HELPING HANDS FOR ANCIENTS OF THE DEEP”**

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**For more Information about the UCWSRI**

Check out our Initiative Web site at [www.uppercolumbiasturgeon.org](http://www.uppercolumbiasturgeon.org) or contact us at [info@uppercolumbiasturgeon.org](mailto:info@uppercolumbiasturgeon.org)

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**back cover**

PREPARATION Margaret Birch EDITING by Kirsten Hildebrand and Steve Thornton  
PHOTOS David R. Glus/UCWSRI DESIGN Kathy Verigin

**COVER PHOTOS**

TOP Five-month old upper Columbia River juvenile white sturgeon.  
LOWER LEFT Hatchery staff return spawned-out adult white sturgeon to the Columbia River.  
CENTRE Research staff prepare adult white sturgeon for its transfer to conservation fish culture hatchery.  
RIGHT Initiative representatives assist hatchery staff release 2001 brood juvenile white sturgeon to Columbia River, August 20, 2002.

## MESSAGES FROM THE CHAIRS

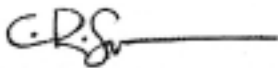
### Recovery Team

ANOTHER YEAR OF HIGHLY PRODUCTIVE AND COOPERATIVE work between the partners in the Upper Columbia White Sturgeon Recovery Initiative is now behind us. With a Recovery Plan now complete, the program is gathering momentum.

This year marks our second successful cycle of conservation aquaculture operations and the release of the first hatchery brood into the upper Columbia. These fish represent the first significant production of juvenile white sturgeon in the recovery area in two decades, and are a real milestone in the recovery process. The young hatchery fish carry our hopes for the future of this population while we work toward understanding and improving the success of spawning in the wild.

I feel privileged to work with so many highly supportive agency staff, First Nations and Tribal representatives, industry participants, contractors and volunteers in this program. The strength of the Recovery Initiative lies in the enthusiasm brought to the process by each of these people. With recovery expected to take several decades, maintaining this level of support amongst technical experts, funding partners and local communities will be critical to our success.

I know I speak for the entire Recovery Team in expressing our excitement and optimism for the future of these fish as we see the recovery process unfold.



Colin Spence, *Co-Chair, Recovery Team*  
Ministry of Water, Land and Air Protection

### Action Planning Group

WORKING TOGETHER TO SECURE A FUTURE for the endangered upper Columbia white sturgeon population has been a challenging yet rewarding experience. Bringing our first-ever Annual Report to fruition allows us to reflect upon those ups and downs as we see all our achievements to date collated between these covers.

As the Co-chairs for the public-based Action Planning Group (APG), our objective is to assist the committee in ensuring the Upper Columbia White Sturgeon Recovery Initiative's goals are always in plain sight. A common vision, reflected in the Recovery Plan and supported by Initiative partners, the public, and organizations on both sides of the Canada-U.S. border, is critical.

By assisting the Recovery Team in evaluating the economic and social viability of project plans, the committee helps to ensure the credibility of the Initiative. By becoming fully informed, APG members can confidently represent the Initiative as we strive to gain understanding and support within the community at large and seek the funding necessary to deliver this important program.

The APG is the embodiment of the Initiative's slogan: "...helping hands for ancients of the deep." Our role as communicators is to give a voice to this imperiled fish.



Ted Down *Chair, Action Planning Group*  
Ministry of Water, Land and Air Protection



Steve Macfarlane *Co-Chair, Action Planning Group*  
Fisheries and Oceans Canada



Colin Spence  
*Co-Chair, Recovery Team*



Ted Down  
*Chair, Action Planning Group*



Steve Macfarlane  
*Co-Chair Action Planning Group*

## HOW WE GOT STARTED

### Introduction and background

FOR MORE THAN A CENTURY, the upper Columbia River white sturgeon, *Acipenser transmontanus*, has been swimming against the currents of change. Once abundant, the white sturgeon has suffered a serious decline in population due to numerous environmental changes. The Upper Columbia White Sturgeon Recovery Initiative (UCWSRI), a collaboration among transboundary partners, was established to help this ancient fish return from the brink.

The UCWSRI was launched in 2000 by a signed Letter of Understanding between BC Environment and BC Fisheries, (now the Ministry of Water, Land and Air Protection), Fisheries and Oceans Canada, and BC Hydro, formalizing a common commitment to address the endangered upper Columbia River white sturgeon. The agreement defined strategies for white sturgeon recovery, allocation of funds, and the involvement of First Nations and the public. It was the first step toward the stabilization and stock recovery of white sturgeon in the upper Columbia River. After a two-year effort, a Recovery Plan, which identifies goals and recovery measures for rebuilding the white sturgeon population, was completed in November 2002.

Over the past three years, culminating in 2002-2003, the UCWSRI has become a transboundary program consisting of over 25 partners, including government, First Nations and American tribes, industry, environmental groups and others committed to the challenge of building a healthy future for the white sturgeon in the upper Columbia River in British Columbia and the United States.

The upper Columbia River white sturgeon is found in Canadian and U.S. portions of the Columbia River, from the Hugh L. Keenleyside (HLK) Dam south to the Grand Coulee Dam, in the Arrow Lakes Reservoir and the Revelstoke Reservoir, and possibly in part of the Kinbasket Reservoir near the Mica Dam (Big Bend). The upper Columbia River populations are genetically distinct from sturgeon found in the Kootenay River system, and thus provide an important contribution to biodiversity in the Columbia River basin. Their role in First Nations' and American tribes' traditional and modern culture is important.

Recent estimates put the Canadian portion of the upper Columbia River basin population at 1,400 adult white sturgeon, with another 1,500 to 2,000 adults estimated in the U.S. portion of the Columbia River from the Canada-U.S. border to the Grand Coulee Dam. The majority of these white sturgeon are more than 30 years old, suggesting a population of aging fish with relatively few young to replace them. The Committee on the Status of Endangered Wildlife in Canada describes white sturgeon as Endangered. Provincially, they are Red Listed: a "critically imperiled" species.

In the last 125 years, human development, construction of hydroelectric dams, changes in flow patterns, loss of habitat, introduction of exotic species, and harvesting in the Columbia River have led to the sturgeon's decline. While spawning has been recorded, young fish are seldom found, indicating they are not surviving to adulthood.

Biologists, fish culturists and basin organizations have been conducting extensive research and monitoring, conservation fish aquaculture work, and public outreach and education since the Initiative's inception. Results of the research, technical programs, and communications undertaken during the 2002-2003 project funding year are provided in this first UCWSRI Annual Report. Details on the Recovery Team and Action Planning Group (APG) activities, past and present memberships, financial reporting since the 2000-2001 project funding year and completed reports and projects since 2000 are also included.

It is hoped that with the significant effort and commitment being made by so many Columbia basin partners from British Columbia and the United States, through a combination of water management, habitat restoration and conservation aquaculture, the upper Columbia River white sturgeon will make a full recovery.



Juvenile upper Columbia River white sturgeon.

## HOW ARE WE DOING

**DURING THE SPRING OF 2002** and following two years of work, the Recovery Team completed the draft Upper Columbia White Sturgeon Recovery Plan. In preparing the Recovery Plan, the Recovery Team assigned responsibility to several sub-committees for addressing a range of issues, supplying relevant information, making recommendations, and defining a rationale for the Plan.

The efforts of the working groups are well documented in the Recovery Plan and Technical Appendices (“the plan”) for the Upper Columbia White Sturgeon Recovery Initiative, which was finalized in November 2002. The plan was subsequently accepted by the APG in February 2003. The plan will guide the Initiative in the coming years.

For the purpose of this Annual Report, highlights of their terms of reference and actions taken by each of the working groups are provided in the following section, with project details for 2002-2003 to follow.

### Working groups

#### HABITAT RESTORATION

The Habitat Restoration Sub-Committee’s role during 2002-2003 was to develop input for the Recovery Plan. Their work involved gathering information on white sturgeon life history, and defining known habitats used by white sturgeon within the geographic range of the Recovery Plan.

The team was tasked with identifying potential habitat changes that may have contributed to recruitment failure, and listing options for enhancement, recovery, or restoration of sturgeon habitat.

#### CONSERVATION FISH CULTURE

The Recovery Team quickly determined that fish culture was a key element in the conservation and restoration of upper Columbia white sturgeon. In conjunction with the Ministry of Water, Land and Air Protection and BC Hydro, a pilot conservation aquaculture program for sturgeon was established at Hill Creek Hatchery on the Arrow Reservoir.

During 2000-2001, while the hatchery was being refitted for white sturgeon fish culture, the Conservation Fish Culture working group developed four alternatives for broodstock collection, and completed an extensive survey of practices of sturgeon hatchery programs elsewhere in North America. The program implemented a combination of options, including the capture of ripe adult sturgeon for transport to the hatchery and subsequent spawning, as well as the collection of wild fertilized eggs which were taken to the hatchery. Current fish culture activities for 2002-2003 are reported in the detailed project section.

#### GENETICS

The Genetics Sub-Committee was formed to provide discussion, scientific review and recommendations on the presence and implications of population substructure, genetic hazards and risks associated with endangerment, and to develop a breeding plan to guide conservation fish culture activities.

The sub-committee focused primarily on the development of the breeding plan. Details of this group’s work are contained in the Recovery Plan.

#### WATER MANAGEMENT

The Water Management Sub-Committee provided recommendations regarding water management measures required to support spawning and survival of young fish in the Arrow and Transboundary Reach white sturgeon populations.

The group proposed hypotheses regarding impacts of Columbia River flows, reservoir levels and water temperatures on spawning and early life stage survival, and proposed recovery measures for investigating these hypotheses. Several hypotheses were documented by this sub-committee and can be found in the Recovery Plan’s Technical Appendices.

#### CONTAMINANTS

The Sturgeon Contaminants Working Group was formed to assist the Recovery Team in evaluating the potential effects of contaminants on the transboundary reach population. There is little information on bioaccumulation and the physiological effects of environmental contaminants on white sturgeon reproductive and immune functions.

The committee provided input to the Recovery Plan. While completion of the committee’s work will take several years, work undertaken during 2002-2003 is reported in this section.

#### POPULATION ASSESSMENT

Ongoing work to assess the current population of adult white sturgeon is vital to understanding the status of the population. This recovery measure calls for periodic adult stock assessments with limited invasive procedures to monitor population productivity. Annual assessments can be undertaken in association with broodstock collection efforts. Assessments in the Canadian portion of the transboundary reach shall continue; however, the status of white sturgeon populations between Grand Coulee Dam and the Canada-U.S. border is unclear, and comprehensive studies are needed.

*“Working groups” continued on page 6*

As resources enable, the Recovery Team strives to conduct spawning investigations at key spawning sites, to conduct regular juvenile population indexing, to identify and quantify essential habitats for each life stage, and to identify early life history stages where juvenile recruitment is failing.

Several research projects directed at these and other objectives were initiated prior to the Initiative in 2000. Projects that continued or were started during 2002-2003 are reported in the projects section which follows.

## COMMUNICATIONS

The Communications Sub-Committee was tasked by the APG with assisting the Initiative in raising public awareness and gaining support for the need to protect the upper Columbia River white sturgeon, while advising the public that the project will take time to show tangible results.

The sub-committee has four main roles: developing and distributing information and educational materials; supporting the APG in obtaining community, in-kind and financial support; participating with Initiative partners in events, shared meetings, Web site linking, displays, communications materials, etc.; and, utilizing the Communications Plan as the template for promoting and educating communities about the status of the endangered upper Columbia white sturgeon population.



Verifying the presence of PIT tag in juvenile sturgeon.

## Project reports 2002 – 2003

The Initiative coordinated more than 20 projects during the 2002-2003 year, several of which continued previous years' work, while others were launched as new studies. The two main program and funding areas are comprised of Administration and Communications activities, and Technical projects. The Technical component includes hatchery operations and conservation fish aquaculture work at the pilot Hill Creek hatchery, near Nakusp, B.C.<sup>1</sup> from spring 2001 until February 2003.

### Administration and Communications

#### RECOVERY TEAM AND ACTION PLANNING GROUP COMMITTEE SUPPORT AND FACILITATION

**Recovery Measure:** *Planning, Coordination and Implementation* (Year 2 and ongoing) Support service contracts were issued and based from Castlegar, B.C., to provide facilitation of four to six meetings per year for the Recovery Team and three to four meetings for the APG. The budget included fees, expenses, and travel support for volunteer APG members. Meetings involved the review and analysis of project information and progress updates, financial project reporting, special conservation aquaculture presentations, development and public evaluation of the Recovery Plan, and communication, public education and outreach activities.

#### RECOVERY IMPLEMENTATION COORDINATOR

**Recovery Measure:** *Planning, Coordination and Implementation* (Year 1 and ongoing) In 2002, the UCWSRI secured funding to acquire the services of an Implementation Coordinator to assist with program delivery. The successful approach involved a half-time position, associated travel and miscellaneous disbursements. Karen Bray, Columbia Basin Fish and Wildlife Compensation Program (CBFWCP) biologist, based in Revelstoke, B.C. served as the new Implementation Coordinator. This arrangement will continue as funding is available.

#### COMMUNICATIONS AND PUBLIC OUTREACH

**Recovery Measure:** *Information and Education* (Year 2 and ongoing) The APG and its Communications Sub-Committee continued with implementation of an Inter-Agency Communications Plan, formally adopted in September 2001. During Year 2, the document was continually updated. Public information brochures, enhanced media

<sup>1</sup> Hill Creek Hatchery served as the UCWSRI pilot facility for adult holding and spawning and the culture and raising of juvenile white sturgeon from spring 2001 until February 2003, when the sturgeon operations were relocated to the Kootenay Sturgeon Conservation Hatchery, at the Kootenay Trout Hatchery, Wardner, B.C., near the city of Cranbrook.

attention and reporting on the Initiative increased public awareness. A variety of methods and tools were used to enhance public awareness, including information display panels at outreach events, the construction of a white sturgeon replica model, informational brochures and presentations, group workshops about the Initiative and Recovery Plan, the establishment of a Web site, [www.uppercolumbiasturgeon.org](http://www.uppercolumbiasturgeon.org), and news releases. The Communications Sub-Committee supported the APG in seeking funding to maintain stewardship and outreach projects.

#### RECOVERY PLANNING

**Recovery Measure:** *Planning, Coordination and Implementation*  
(Year 2 of 2) This year involved funding the work necessary to complete the Recovery Plan and Technical Appendices for the Initiative. Although extensive progress was made during 2001, further work during the summer and fall of 2002, including a review and feedback from the APG in September 2002, was needed. The working plan and appendices were completed in November 2002 and formally accepted by the APG in February 2003. Year 2 costs included a contract with S.P. Cramer and Associates of Oregon, to assist with the September 2002 APG workshop, as well as editing and travel expenses for Recovery Team members attending out of area meetings.

#### **Technical Programs** – in order of Recovery Team priority for 2002-2003 programs

##### WANETA SPAWN MONITORING

**Recovery Measure:** *Population Assessment, Monitoring and Research*

(Year 2 and ongoing) A spawn monitoring program continued in the Waneta Eddy, the most important known spawning site for white sturgeon in the upper Columbia River between HLK and Grand Coulee dams. Waneta Eddy is located at the outlet of the Pend d'Oreille River.

Artificial substrate mats were used to monitor spawn timing and frequency, and in order to identify the best method of safely obtaining large numbers of eggs for incubation and rearing in the hatchery. Ongoing study will improve our understanding of the factors controlling spawning activity and egg and larval survival. The spawn monitoring program extended from June 2 to July 31, 2002, with five spawning events recorded. Approximately 1,400 eggs were collected, with eggs staged to determine the timing of each spawning event. In situ incubation of about 650 eggs was conducted and a large sample of resulting larvae was preserved for future DNA analysis.

##### HILL CREEK HATCHERY – STURGEON CULTURE – OPERATIONS AND MAINTENANCE

**Recovery Measure:** *Culture and Stocking*

(Year 2 of 2 years at Pilot Facility) Hill Creek Hatchery is located near the Upper Arrow Reservoir, north of Nakusp. With funding from the CBFWCP, the Ministry of Water, Land and Air Protection operated and maintained the hatchery for upper Columbia white sturgeon fish culture activities at a cost of \$298,000, about 1/3 of the total annual Initiative budget. During 2001, Hill Creek Hatchery served as a pilot facility. Releases from the 2001 broodstock (totaling approximately 9,000 fish) were stocked in various locations between HLK Dam and the Canada-U.S. border in May and August 2002.

During spring 2002, 13 adults (six females, seven males) were collected from the Columbia River downstream of HLK Dam, at Castlegar, and transported to Hill Creek. By late August, eggs from two of the females were fertilized by five mature males in hopes of increasing genetic diversity from the limited number of spawning adults. The conservation fish aquaculture work is one of the highest priorities of the Recovery Team. In February 2003, operations were moved to the Kootenay Sturgeon Conservation Hatchery, where they are expected to remain. Progeny from the 2002 broodstock, reared at the new location, were released in the spring and summer of 2003.

##### BROOD STOCK CAPTURE – TRANSBOUNDARY REACH COLLECTION

**Recovery Measure:** *Culture and Stocking*

(Year 2 of 10+) In conjunction with the conservation fish culture program, adult white sturgeon broodstock were collected in the area between HLK Dam and the Canada-U.S. border. Set line sampling was conducted during spring and summer 2002 sessions with 10 index sites in the Columbia and Kootenay rivers from HLK and Brilliant dams downstream to near the Columbia-Pend d'Oreille confluence. A total of 29 site-days and 13,292 hook-hours resulted in a total catch of 139 white sturgeon. Maturity stage was assessed for 42 fish, with ripe males identified without surgery, and the remainder assessed by surgical examination. Six late reproductive/ripe males and six late-vitellogenic/ripe females were successfully transported to Hill Creek Hatchery for gamete collection.

To date, it is suggested that some limited natural recruitment is taking place; however, growth of smaller sturgeon in lower sections of the transboundary reach is extremely slow, posing a possible threat to recovery. This type of information will be provided annually and will supply important data for measuring the recovery baseline and progress.

*"Project reports" continued on page 8*

#### PASSIVE INTEGRATED TRANSPONDERS (PIT,) SONIC AND RADIO TAG PURCHASES

##### **Recovery Measure:** *Culture and Stocking*

(Year 2 and ongoing) Assessment requires that all stocked, hatchery-reared white sturgeon are marked. To date, released fish have been marked with scute removal and PIT tags, a practice that is expected to continue, with approximately 12,000 tags required for purchase each year. Associated application and scute marking costs are covered under other budget items (i.e., Hatchery Operations).

In addition, several specialized sonic and radio tags were purchased. Sonic tagging of both adult and juvenile white sturgeon will provide better information on their life history and habitat requirements. Specialized equipment and tags were purchased during 2002-2003 to apply during the 2003 field season.

#### CRYOPRESERVATION FEASIBILITY

##### **Recovery Measure:** *Culture and Stocking*

(Year 1) The original objective for hatchery and research staff located at the Kootenay Sturgeon Conservation Hatchery and at the University of Idaho during 2002-2003 was to freeze milt from running males caught in the wild early in the spawning season, and to fertilize a small sub-sample of eggs from captive females. Arrangements were made to transport sperm from male white sturgeon spawned at Hill Creek during the 2002 spawn period to the university. The goal was to test the efficacy of cryopreservation within the same spawning season. However, timing and logistics, primarily related to transportation difficulties, did not allow this work to be completed in that 2002 spawning season. This endeavour would be attempted again during the 2003 spawning year (2003-2004) from the Kootenay Sturgeon Conservation Hatchery. Assessing new techniques to cryopreserve sperm and potentially bank genetic material would support future in-hatchery spawning work should viable mature males become difficult to obtain.

#### U.S. - CANADA HATCHERY SITE SELECTION

##### **Recovery Measure:** *Culture and Stocking*

(Year 1 of ?) Additional facilities may be needed to meet the long-term requirements of the recovery program's white sturgeon culture component. Particular concerns include the need for a failsafe facility, the desire to have additional fish culture work conducted in the U.S., and the potential to hatch and rear the progeny of wild eggs collected at Waneta.

Considering the area from the Canada-U.S. border to Grand Coulee Dam in Washington, preliminary discussions were started in 2002-2003 to assess options, pros and cons, and costs of meeting long-term conservation fish culture goals of the program and its U.S. and Canadian participants. A review of existing facilities and their potential, a search for properties where new facilities could be constructed and further development of recommendations will continue through 2003-2004.

#### DATABASE DEVELOPMENT

##### **Recovery Measure:** *Planning, Coordination and Implementation*

(Year 1 and ongoing) A data system was started to track tagging information for several thousand released white sturgeon in the upper Columbia River. By 2002-2003, more than 10,000 PIT-tagged release entries had been loaded to a database. Given these numbers, the time over which recovery efforts will take place, and the number of different partners involved in the program, a coordinated approach to data management and reporting is required. A carefully designed data management system is required so that data can be electronically entered in the field using laptop computers with CD-RW backup systems. Initial planning should lead to the design and development of a comprehensive database management system in 2003-2004.

#### TRANSBOUNDARY REACH JUVENILE SAMPLING (CANADA) 2002

##### **Recovery Measure:** *Population Assessment, Monitoring and Research*

(Year 1 of 10+) In response to the release of hatchery-raised 2001 brood juvenile white sturgeon into the upper Columbia River during the spring and summer of 2002, a pilot field sampling program was conducted to determine appropriate non-destructive methods for assessing the distribution, abundance, survival, growth, and condition of juvenile white sturgeon released in the study area. In each of two release events, approximately half of the fish were planted between HLK and Brilliant dams on the Kootenay River and half were released between Beaver Creek and Waneta Eddy.

In total, 37 juvenile white sturgeon were captured (36 hatchery juveniles and one wild juvenile), 32 were observed using underwater video systems and nine were observed by divers. Of the 37 juvenile white sturgeon captured, 36 were captured during 510.8 net-hours of gill net sampling and one was captured by a diver. Juvenile white sturgeon were not captured during set line sampling or boat electroshocking and were not observed during snorkel surveys. The juveniles were observed in HLK Dam Eddy and Waneta Eddy. Of the 36 hatchery juvenile white sturgeon captured during the 2002 study, 19 exhibited pectoral fin deformities, with the majority of these deformities consisting of stunted or malformed pectoral fins.

A key component of this program was the integration and coordination of juvenile indexing programs on both sides of the border. Coordination was initiated through frequent communication between respective researchers, the development of standardized catch and habitat forms, and cross-border visits to compare juvenile rearing habitat conditions and to ensure equivalent sample techniques are used.



## TRANSBOUNDARY REACH JUVENILE SAMPLING – LAKE ROOSEVELT (UNITED STATES) 2002

**Recovery Measure:** *Population Assessment, Monitoring and Research*

(Year 1 of 10+) Recovery efforts for the upper Columbia River white sturgeon recently have been recognized as a management priority in the United States and Canada. In conjunction with a transboundary approach, researchers from Washington completed sampling programs to locate juvenile upper Columbia white sturgeon in the Lake Roosevelt system. Over a three-day fall 2002 study period, the Spokane Tribe of Indians deployed 45 benthic-set horizontal gillnets in the northern portion of Lake Franklin D. Roosevelt between Northport and Kettle Falls, Washington.

The 1.8 by 30.5 metre mesh nets using 50.8 mm stretch twine were set to sample the greatest possible diversity of habitats. The nets were fished for a total of 924.62 hours. A total of 134 fish were collected, comprising 11 species from six families. Of the samples collected, six were juvenile white sturgeon, and two possessed PIT tags. The two tagged sturgeon juveniles, identified as originating from the British Columbia-based fish culture program at Hill Creek Hatchery, were collected near the river-lake interface between 192 and 209 km upstream of Grand Coulee Dam. The other four sturgeon collected were not marked and were captured in close proximity to each other. These fish ranged from 626 mm to 710 mm in total length, possibly representing a single-year class.

Additional research will be necessary to determine if spawning is occurring in Lake Roosevelt or its tributaries. Movement of white sturgeon from Canada into the United States has now been verified; however, further monitoring will be required to determine if these fish return to Canada at some point in their long life-cycle.

## CONTAMINANT ASSESSMENT

**Recovery Measure:** *Contaminants*

(Year 1 of 3) During 2002, the Sturgeon Contaminants Working Group, a collaboration of scientists and managers throughout the Columbia River basin, was formed to assess the status of existing contaminant research and to evaluate the potential effects of contaminants on the transboundary reach population. Contaminant effects on white sturgeon can vary from acute to chronic. A number of factors make sturgeon particularly susceptible to exposure and bioaccumulation of contaminants. These include their long life span, late age at maturation, benthic habitats and position at the top of the food chain.

The degree of contaminant effects on white sturgeon has not been assessed adequately. This project involves a multi-year research initiative aimed at determining if exposure to contaminant levels is contributing to the lack of recruitment seen in sturgeon populations. In 2002-2003, the working group

collected tissue samples (eggs, sperm, liver, gonad muscle and blood) from adult white sturgeon during broodstock collection and induced spawning. Similar samples will be collected in Year 2 (2003-2004) of the study program. Methods for non-lethal collection of liver samples was also initiated this year and will be further developed through 2003-2004.

Larval sturgeon exposure studies were carried out using effluent obtained from two Columbia River industrial sites and biological samples archived for future analyses contingent upon funding. Contaminant concentrations will be correlated with embryo survival, hatch success, and mortality associated with initiation to feeding and body deformities.

## ESTIMATION OF SPAWNER ABUNDANCE

### – FAMILY STRUCTURE AND GENETIC CONSIDERATIONS

**Recovery Measure:** *Population Assessment, Monitoring and Research*

(Year 2 of 3) Genetic research will play a major role in the development of options for recovery of upper Columbia white sturgeon. A research study was started in 2001 using state-of-the-art genetic analysis to estimate the family structure within known white sturgeon spawning locations on the Columbia River, downstream of the confluence with the Pend d'Oreille River in British Columbia. Samples were collected by the Ministry of Water, Land and Air Protection from several spawning locations in 2001. Due to some egg or sac fry being coated in fungus, little DNA could be extracted; however, attempts to genotype 169 wild samples were successful. This work continued through the 2002-2003 report year, with further sampling of young wild fish used to provide the additional number of tissue samples required to complete the work. From the viable samples analyzed, results indicate as many as 22 families could be represented by spawning events tracked at Waneta in 2001. Analysis will proceed through 2003 with further reports to follow.

## AGE/GROWTH VALIDATION

**Recovery Measure:** *Population Assessment, Monitoring and Research*

(Year 1 of 2) Accurate aging of white sturgeon is an important measure for understanding the age structure of a species population and the reason mature adults aren't contributing enough progeny to sustain healthy numbers. Uncertainty around the methods used for aging may invalidate assumptions made by the Recovery Team in the planning process. If significant underaging has occurred, then current assumptions on age structure, proposed breeding plans and the Recovery Plan may be jeopardized.

*"Project reports" continued on page 10*

This project is examining the accuracy of white sturgeon age determination utilizing bomb radiocarbon analysis, a technique that uses changes in isotope composition to accurately identify specific annuli. Initially through the 2002-2003 year, a project involving age estimation from digitized images was undertaken; however, further verification that annuli being found were not misinterpreted requires a second validation stage involving bomb radiocarbon analysis. Addressing this next stage of work is very slow with samples supplied for study during 2003. Results of the verification in the 2003-2004 reporting year and possible biochronology experiments using fin ray cross sections will assist researchers in clarifying suspected concerns of under-aging using existing aging methods.

#### LOWER ARROW RESERVOIR ADULT ASSESSMENT

**Recovery Measure:** *Population Assessment, Monitoring and Research*

(Year 2 of 3) Until 2001, most work on Arrow Reservoir had targeted the upper basin, from Burton ("the Narrows") to Revelstoke. The majority of set line sampling occurred at Beaton Flats, reflecting high use by existing sonic tagged fish. At the same time, many sonic tagged sturgeon in this area could not be found during the summer, suggesting they may be using a part of the basin where summer tracking has been limited.

Starting in 2001, through this 2002-2003 reporting year, set line sampling on Lower Arrow Reservoir was undertaken to provide better understanding of the importance of this area to white sturgeon. In August 2001, one adult sturgeon was captured; from late August to September 2002, five adult sturgeon were captured and four were tagged with Vemco V16 pingers (sonic transmitters). Tracking these fish in mid-October 2002 showed relocation 80-94 km upstream into the Burton area indicating that summer movements into the Narrows may be for feeding and that Arrow sturgeon may be one population. This assessment will continue for a third year in the summer/fall of 2003 (2003-2004).

#### ARROW SONIC TELEMETRY – CAPTURE AND TRACKING

**Recovery Measure:** *Population Assessment, Monitoring and Research*

(Year 1 of 3) Adult capture sessions were undertaken during October and November 2002 in both Upper and Lower Arrow basins with the aim of capturing and tagging adult white sturgeon with Vemco V16 pingers or CHAT tags. The VR remote receivers were subsequently deployed to track seasonal movements throughout the reservoir. Both sessions resulted in the recapture of a fish previously caught and tagged in the Beaton area. Tracking of the existing sonic tagged sturgeon will continue and additional capture sessions in 2003-2004 will be conducted to implant the remaining Vemco V16 pingers. Vemco tags and remote receivers are used to find spring spawning migration movements and identify general movements in the reservoir.

#### PRE AND POST IMPOUNDMENT HABITAT EVALUATION

**Recovery Measure:** *Habitat Diversity, Connectivity and Productivity* (Year 1 of 3) The long term objective of this technical project is to provide digitized mapping of pre-impoundment habitat conditions, which when compared to current conditions should provide documentation of loss of preferred sturgeon habitat types. This information will be used to identify and prioritize habitat restoration needs. During 2002-2003, pre-impoundment mapping and aerial photographs of the Columbia River drainage from the U.S. border to Revelstoke were obtained by BC Hydro biologists. Exploration of opportunities to meet this objective using GIS techniques in cooperation with local colleges, the CBFWCP, and possibly the U.S. Bureau of Reclamation will be the next step.

#### TEMPERATURE INVESTIGATIONS

**Recovery Measure:** *Water Quality*

(Year 1 of ?) Upper Columbia white sturgeon spawn at the outlet of the Pend d'Oreille River and below Revelstoke Dam. Water temperatures at these sites fall close to known extremes for spawning and incubation, ranging from less than 11°C at Revelstoke to more than 20°C at the mouth of the Pend d'Oreille. Effects of temperature on the development of sturgeon eggs and larvae have been researched but not with sufficient detail to address the situation facing this population.

During 2002, the Initiative met the need for ongoing monitoring of river temperatures by installing a series of temperature loggers to serve as back ups for existing thermograph arrays. In addition, Canadian Columbia River Inter-tribal Fisheries Commission staff installed electronic temperature data loggers at seven different river habitat locations between Revelstoke and Invermere. Data gathered will help the Recovery Team determine if these areas are potentially suited as locations for white sturgeon population recovery.

During 2003, additional thermographs were purchased and installed, allowing further assessment of the population's response to local temperature conditions. As well, temperature studies investigating egg/larval development under laboratory and natural conditions were initiated.



Five-month old juvenile white sturgeon rearing at Hill Creek Hatchery, fall 2002.

## PLASMA SEX STEROID RESEARCH AND DEVELOPMENT

### **Recovery Measure:** *Culture and Stocking*

(Year 3 of 3) Little is known about the maturation cycle of wild white sturgeon, with spawning intervals in wild sturgeon thought to range from 1 to 10 years. Researchers at Oregon State University have investigated the maturation cycle and the use of steroids as indicators for determining the sex and stages of maturity in upper Columbia River white sturgeon.

Preliminary analyses indicate that urine and mucus sex steroid concentrations may be used to differentiate sturgeon males and females at various stages of development. The measurement of sex steroids may allow for the elimination of gonadal biopsies in determining sex and maturity of sturgeon. Avoiding field surgeries would greatly reduce stress to the fish and eliminate related risks of infection.

Paired blood and gonad samples were collected in 2000, 2001 and 2002 from upper Columbia River white sturgeon. The sex steroid concentrations in plasma were found to be typical of other white sturgeon populations and may be used to successfully differentiate between sexes and stages of maturity. Further investigations may use a discriminant function analysis to develop a model for prediction of sex and maturity for this population using sex steroid concentrations in plasma, urine and/or mucus.

## BROODSTOCK HANDLING PROTOCOL

### **Recovery Measure:** *Culture and Stocking*

(Year 1 of 1) During 2002-2003, Recovery Team members recognized the need for a consistent, well-documented approach to adult white sturgeon broodstock collection as a guideline for all agencies, organizations and consultants involved in capturing and handling adult sturgeon. An upper Columbia River adult white sturgeon capture, transport and handling manual was produced to provide a standardized methodology. Methods described were based on the concerns and results from the 2001 and 2002 broodstock collection programs, as well as standard white sturgeon sampling techniques used elsewhere in the Columbia and Kootenay rivers in Canada and the United States. The manual was completed in May 2003.



Landing adult white sturgeon for biological examination.

## STURGEON MORTALITY INVESTIGATIONS

### **Recovery Measure:** *Entrainment*

(Ongoing) 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 jeopardize recovery. Sturgeon mortalities are periodically observed in the upper Columbia River and the public is encouraged by the Initiative to report carcasses to the Provincial Ministry of Water, Land and Air Protection, Nelson; BC Hydro, Castlegar; or the Washington Department of Fish and Wildlife, Spokane, Wash. A Canada-U.S. toll-free Sturgeon Hot Line was implemented to enable the public to report and supply information about sturgeon sightings. The funding supports investigations of reports of dead sturgeon, including determining the cause of mortality and taking appropriate samples. One investigation of a dead adult sturgeon was undertaken in July 2002, involving a fish found a short distance downstream from Hugh L. Keenleyside Dam. Samples were taken from the fish but the cause of death was not determined.

## FISHERY REGULATIONS

### **Recovery Measure:** *Harvest/Bycatch*

(Ongoing) Province of British Columbia and Washington State fishing regulations prohibit fishing for white sturgeon in Canadian and U.S. waters of the upper Columbia River. These regulations will remain in effect until the recovery process is well advanced. Limited mortality will likely result from set line activities associated with sampling and broodstock collection; however, the current population status and productivity is not consistent with any additional fishing mortality.

Recreational fishers and the public are being educated through a variety of outreach mechanisms, i.e., signage, brochures and direct communication to release all sturgeon incidentally caught while fishing. As well, anglers are being encouraged to minimize incidental catches by avoiding habitat areas known to be highly used by sturgeon, and to report any illegal white sturgeon captures to the Ministry of Water, Land and Air Protection's Observe, Record, Report Hot Line, a Washington State Patrol Fish and Wildlife Enforcement Officer on the U.S. side, or the Initiative's dedicated Sturgeon Hot Line.

## INITIATIVE BALANCE SHEET

### Three Years from April 2000 – March 2003

#### 2000 - 2001

THE UPPER COLUMBIA WHITE STURGEON RECOVERY Initiative began its first project year with a start-up fund of \$790,000 from BC Hydro and the Habitat Conservation Trust Fund. The bulk of the funding was directed at modification and construction of a pilot facility for white sturgeon conservation aquaculture at the Provincial Ministry of Water, Land and Air

Protection's Hill Creek Hatchery. Additionally, resources were directed toward research and technical programs, support for a September 2000 public workshop, and the formation of technical and public-based committees. Of the total, 82% of the fund was contributed by BC Hydro and 18% by the Habitat Conservation Trust Fund.



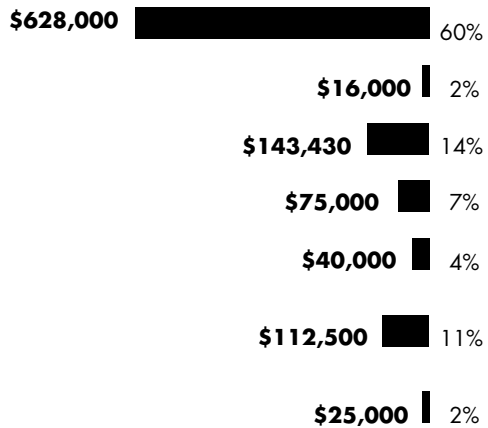
**BC Hydro** Sustainable Environmental Initiative

**Habitat Conservation Trust Fund**

#### 2001-2002

DURING YEAR 2, a significant milestone was reached by securing just over \$1 million in funding from seven major funding sources. BC Hydro provided 62% of the funding, 14% came from the Habitat Conservation Trust Fund, and 11% from U.S. tribes and agencies and the Bonneville Power Administration. The funding was used to continue research

programs, support conservation fish culture, and provide administrative support for the Recovery Team and APG. The Initiative also grew to involve over 25 supporting agencies and organizations working cooperatively in a transboundary effort. More than 14 projects were launched or completed during 2001.



**BC Hydro** Sustainable Environmental Initiative

**BC Hydro** Kootenay Generation Area

**Habitat Conservation Trust Fund**

**Columbia Basin Trust** and **Columbia Power Corporation**

**Environment Canada/Government of Canada's Habitat Stewardship Program for Species at Risk**

**US Tribes, Bonneville Power Administration and Washington Department of Fish & Wildlife**

**Columbia Basin Trust** Environmental Sector



U.S. field crew undertaking sturgeon sampling activities in Lake Roosevelt.

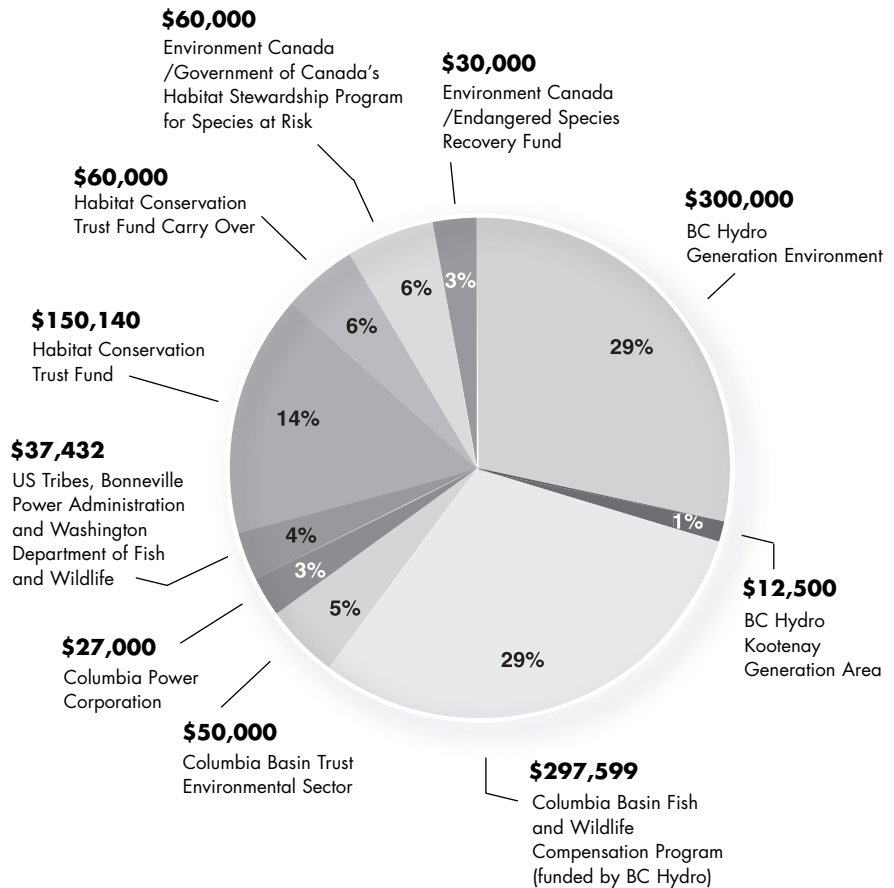


Biological Technician recaptures two-year-old Columbia River sturgeon during juvenile monitoring program.

**2002-2003**

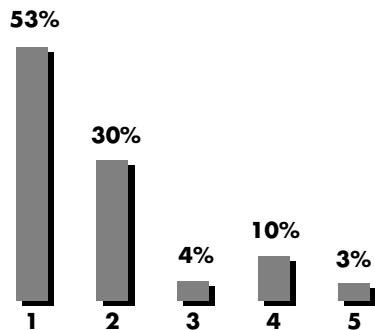
FOR REPORTING YEAR 3, Initiative project funding levels reached just over \$1 million with an expanded 11 of 26 partners directly funding new and continuing recovery projects. Milestones included review and implementation of the Recovery Plan, and the movement of aquaculture operations to new facilities at the Kootenay Sturgeon Conservation Hatchery. In addition, ongoing support was provided for Recovery Team and APG committees as well as several technical and communications sub-committees. Nearly 70% of Initiative funding was provided by BC Hydro, the CBFWCP (who joined as a new Initiative partner) and the Habitat Conservation Trust Fund. Detailed explanations of sub-committee initiatives and 24 technical and administration projects addressed during 2002-2003 are provided in the project reports section of this document.

**2002-2003 FUNDING BY INITIATIVE PARTNERS**



**2002-2003 Funding by Recovery Measure**

TEN "RECOVERY MEASURES," each consistent with goals and strategies developed by the Recovery Team's technical sub-committees, were adopted by the Recovery Team and incorporated in the Recovery Plan. The measures were used to guide funding allocations and prioritization of ongoing and new projects. The graphic to the right illustrates the allocation of the 2002-2003 project funding for four of the 10 recovery measures; remaining measures comprised less than 3% of the total funding allocation so were classified as "Other." As the Initiative continues and projects are completed, funds will be directed toward lesser funded recovery measures.



- 1 Culture and Stocking**
- 2 Population, Assessment, Monitoring and Research**
- 3 Information and Education**
- 4 Planning, Coordination and Implementation**
- 5 Other** (includes: Harvest/Bycatch; Entrainment; Water Management; Water Quality; Contaminants; and Habitat Diversity, Connectivity and Productivity)

## WHERE TO FROM HERE

### Funding and projects ahead for 2003 – 2004

FOR THE NEXT PROJECT YEAR, THE INITIATIVE ESTIMATES an annual operational program budget of \$1.3 million is required to deliver up to 30 priority technical, administrative and communications activities, as outlined in the 2002 Recovery Plan. Outreach and educational programs are required to assist in informing the public that this effort will take time.



Reading PIT tag code in adult white sturgeon.



Examining adult white sturgeon in Lake Roosevelt.

#### Highlights of the program plans for the 2003-2004 year include:

- Recovery Implementation Coordinator to assist with project implementation
- Action Planning Group/Recovery Team facilitation and committee support
- Communications and public outreach – education and information
- Technical advisory support to the Recovery Team
- UCWSRI Web site re-development project
- Fish culture hatchery operations and maintenance at the Kootenay Sturgeon Conservation Hatchery
- Adult broodstock collection
- PIT and sonic tag purchases for juvenile and adult white sturgeon
- Transboundary reach juvenile white sturgeon monitoring in Canada and U.S.
- Cryopreservation development research
- U.S. hatchery site feasibility study and interim aquaculture program
- Waneta and Revelstoke adult sturgeon capture and tagging
- Lake Roosevelt adult sturgeon assessment
- Contaminant assessment and fin deformities studies
- Plasma sex steroid and population structure analyses
- Transboundary reach creel survey and angler awareness program
- Age validation and biochronology studies
- Temperature effects on incubation success/survival studies
- Risk assessment of failsafe population concept
- Genetic considerations
- Pre and post impoundment habitat evaluation research
- Arrow Reservoir adult white sturgeon capture, sonic tagging, telemetry tracking
- Database management of tagging information and coordinated data collection
- Annual report coordination and production
- Sturgeon mortality investigations and ongoing fishery management regulation



Returning spawned-out adult white sturgeon to upper Columbia River at Robson B.C.



Fisheries Restoration Technician provides education and outreach about the UCWSRI at basin-area Ecological Fair.

## PARTNERS AND PEOPLE

### Recovery Team and Action Planning Group, members involved, past and present

THE INITIATIVE IS COMPOSED OF TWO CORE TEAMS: a technically-based Recovery Team and a public-based Action Planning Group. Several technical sub-committees and a communications sub-committee are also associated with these groups. These teams bring skills, expertise and community perspective to the white sturgeon recovery process.

**The Recovery Team** is responsible for the development and implementation of the Recovery Plan, and is composed of biologists, researchers, and other sturgeon experts from provincial, federal and state governments, BC Hydro, Teck

Cominco Metals, Bonneville Power Administration, B.C. First Nations and American tribes and others. Recovery is a shared Canada-U.S. goal, so the team includes members from Washington and Oregon states as well as British Columbia.

#### RECOVERY TEAM AND TECHNICAL SUB-COMMITTEE MEMBERSHIP SINCE 2000:

|                  |                  |                 |
|------------------|------------------|-----------------|
| Ray Beamesderfer | Bob Hallock      | Mike Parsley    |
| Julia Beatty     | Jay Hammond      | Deanne Pavlik   |
| Scott Bettin     | Larry Hildebrand | Laird Siemens   |
| Gary Birch       | Brad James       | Dan Sneep       |
| Karen Bray       | Bill Duncan      | Colin Spence    |
| John DeVore      | Bryan Ludwig     | Keith Underwood |
| Ron Ek           | Jerry Marco      | Curt Vail       |
| Bill Green       | Steve McAdam     | Molly Webb      |



UCWSRI Recovery Team members.

**The Action Planning Group** is responsible for developing a common vision, garnering public support for sturgeon recovery, providing information and feedback on recovery operations, informing the public, and seeking funding for

recovery projects. Members of this group represent a range of interests including federal, provincial and local governments, First Nations and American tribes, industry and environmental groups, U.S. regulatory agencies and the public.

#### ACTION PLANNING GROUP AND COMMUNICATIONS SUB-COMMITTEE MEMBERSHIP SINCE 2000:

|                    |                 |                  |
|--------------------|-----------------|------------------|
| Ted Down           | Suzanne Rorick  | Chris Beers      |
| Steve Macfarlane   | Fred Salekin    | Clancy Boettger  |
| Hugh Smith         | Joan Snyder     | Jim Clarricoates |
| Kevin Conlin       | Margaret Trenn  | Les Brazier      |
| Bill Duncan        | Rena Vandebos   | Margaret Birch   |
| Kim Klassen        | John Whalen     | Andy Dunau       |
| Vicente Loyola     | Sabrina Curtis  | Sue Heaton       |
| Kindy Gosal        | Dwayne D'Andrea | Barry Bartlett   |
| Fiona Mackay       | David deGit     | Carrie Mishima   |
| Llewellyn Matthews | Maureen DeHaan  | Audrey Repin     |
| Gerry Nellestijn   |                 |                  |



UCWSRI Action Planning Group members.

### Initiative Sub-Committees

The completion of the November 2002 Recovery Plan and Technical Appendices and the extensive steps taken by the APG to provide education, information and outreach on the Initiative were only possible through the collaborative efforts of several technical and administrative sub-committees, including:

Habitat Restoration, Conservation Fish Culture, Genetics, Water Management, Contaminants, Population Assessment and Communications. Details on the nature of work each committee provided during 2002-2003 is reflected in the project reports summary.

## APPENDIX

### Reports and publications since 2000 - Reports listed in order of year<sup>2</sup>

- R.L. & L. Environmental Services Ltd., 2000. White sturgeon investigations in Arrow Reservoir and Columbia River, B.C., 1999 study results.  
Report prepared for BC Ministry of Environment, Lands and Parks, Nelson, B.C. R.L. & L. Report No. 754F: 38 p. + 4 app.
- R.L. & L. Environmental Services Ltd., 2000. A summary of white sturgeon investigations in isolated water bodies within the Columbia River basin in B.C., 1995 to 1999.  
Report prepared for BC Ministry of Environment, Lands and Parks, Nelson, B.C. R.L. & L. Report No. 755F: 31 p. + 6 app.
- Upper Columbia White Sturgeon Recovery Initiative, 2000. Information brochure prepared for BC Hydro.  
Prepared by Birchland Heights Enterprises, Castlegar, B.C. 4 p.
- Upper Columbia River White Sturgeon Restoration Annual Report 2000-2001, 2001. Report prepared for the Habitat Conservation Trust Fund, Victoria, B.C.  
Prepared by Colin Spence, Ministry of Water, Land and Air Protection, Nelson, B.C. 12 p.
- Upper Columbia White Sturgeon...on the brink, 2002. 2001-2002 Volume 1 Number 1 UCWSRI Initiative brochure.  
Brochure prepared for three Initiative partners, BC Hydro, Habitat Conservation Trust Fund, and the Habitat Stewardship Program.  
Prepared by Anne DeGrace and Steve Thornton, Nelson, B.C. and Kathy Verigin, Castlegar, B.C. 6 p.
- R.L. & L. Environmental Services Ltd., 2001. White sturgeon investigations in Arrow Reservoir and the Columbia River, B.C., 2000 study results.  
Data report prepared for BC Ministry of Environment, Lands and Parks, Nelson, B.C. R.L. & L. Report No. 840F: 23p. + 4 app.
- Prince, A. 2001. Local Knowledge of Columbia River fisheries in British Columbia, Canada.  
Report prepared for Columbia-Kootenay Fisheries Renewal Partnership, Cranbrook, B.C. Prepared by Westslope Fisheries, Cranbrook, B.C. 50 p. + 1 app.
- 2 *The Initiative started during 1999-2000, however most project reports supporting funding by Initiative partners date from 2000. Some draft and completed reports produced after spring 2003 are included; a full reporting of these reports would be provided in a future 2003-2004 Annual Report. Earlier study reports on upper Columbia white sturgeon (pre-2000) are available by searching through AquaCat (Ministry of Sustainable Resource Management's Aquatic Report Catalogue) <http://srmapps.gov.bc.ca/apps/acat/>*
- R.L. & L. Environmental Services Ltd., 2001. Columbia River white sturgeon spawning studies, 2000 investigations.  
Data report prepared for BC Ministry of Environment, Lands and Parks, Nelson, B.C. R.L. & L. Report No. 853F: 24p. + plates + 2 app.
- Prince, A., 2001. Lower Arrow adult white sturgeon assessment 2001 Data Report.  
Report prepared for Canadian Columbia River Inter-tribal Fisheries Commission, Cranbrook, B.C. Report prepared by Westslope Fisheries, Cranbrook, B.C. 25 p.
- Future of the White Sturgeon, 2001.  
Brochure prepared by Initiative partner BC Hydro.
- Lee, C., and K. Underwood, 2002. Lake Roosevelt white sturgeon juvenile sampling 2001.  
Report prepared for Ministry of Water, Land and Air Protection, Nelson, B.C., Canada. Prepared by Spokane Tribe of Indians, Wellpinit, Wash. 8 p.
- Upper Columbia River White Sturgeon Restoration Annual Report 2001-2002, 2002. Report prepared for the Habitat Conservation Trust Fund, Victoria, B.C.  
Prepared by Colin Spence, Ministry of Water, Land and Air Protection, Nelson, B.C. 8 p.
- Golder Associates Ltd., 2002. Upper Columbia River white sturgeon broodstock investigations 2001 study results.  
Report prepared for BC Ministry of Environment, Lands and Parks, Nelson, B.C. Golder Associates Ltd. Report No. 012-8920D: 52 p. + 7 app.
- Species At Risk Recovery Initiatives Demonstrating Results. (Summer 2002 – Number 9). *Program Update*, p. 1 & 3.
- White Sturgeon Recovery Initiative, 2002. August 2002 upper Columbia white sturgeon release – unedited video footage.  
Video prepared for Columbia Basin Fish and Wildlife Compensation Program and Celgar Pulp Company.  
Produced by Mike McMann, Nelson, B.C. (VHS1.20 hrs)
- Upper Columbia River White Sturgeon Recovery Initiative, 2002. Upper Columbia White Sturgeon Recovery Initiative Communications Plan – Project for Inter-Agencies and the Action Planning Group (APG) Working Document – for use as a guideline November 2002.  
Prepared for the APG by the APG Communications Sub-Committee. 20 p. (1st version was Sept 2001, with version updates prepared in January and June 2003.)



Upper Columbia River White Sturgeon Recovery Initiative, 2002. Upper Columbia white sturgeon Recovery Plan and Technical Appendices.

Plan and technical appendices prepared for the UCWSRI. Prepared by S.P. Cramer & Associates, Sandy, Ore. 90 p. +107 p.

Upper Columbia White Sturgeon...on the brink, 2002. Fall and Winter 2002 Volume 1 Number 2 UCWSRI Initiative brochure. Brochure prepared for three Initiative partners, Government of Canada's Habitat Stewardship Program, BC Hydro and Columbia Basin Trust.

Prepared by Anne DeGrace and Steve Thornton, Nelson, B.C., Margaret Birch, Castlegar, B.C. and Kathy Verigin, Castlegar, B.C. 6 p.

Lake Roosevelt Forum (Winter 2002). Upper Columbia White Sturgeon on the Brink? *Lake Roosevelt Forum Newsletter Winter 2002*. p. 3 & 6.

Prince, A., 2003. Lower Arrow Reservoir white sturgeon assessment 2002 Data Report. Prepared for Canadian Columbia River Inter-tribal Fisheries Commission, Cranbrook, B.C. Prepared by Westslope Fisheries, Cranbrook, B.C. 24 p. + 3 app. 33 p.

Ardnt, S., 2003. Upper Columbia River white sturgeon brood-stock collection 2002 Data Summary Report. Prepared for the Upper Columbia White Sturgeon Recovery Initiative (UCWSRI). Prepared by Columbia Basin Fish and Wildlife Compensation Program, Nelson, B.C. 16 p.

Lee, C., and D. Pavlik, 2003. Lake Roosevelt white sturgeon juvenile sampling 2002. Report prepared for Ministry of Water, Land and Air Protection, Nelson, B.C., Canada. Prepared by Spokane Tribe of Indians, Wellpinit, Wash. 9 p.

Golder Associates Ltd., 2003. Upper Columbia River juvenile white sturgeon monitoring, Phase I investigations, fall 2002. Report prepared for BC Hydro, Castlegar, B.C. Golder Report No. 0228046F: 33 p. + 2 app.

Golder Associates Ltd., 2003. Upper Columbia River adult white sturgeon capture, transport and handling manual. Prepared for Ministry of Water, Land and Air Protection, Nelson, B.C. Golder Report No: 03-1480-003D: 16 p. + 7 plates + 5 app.

Upper Columbia White Sturgeon Recovery Initiative, 2003. UCWSRI Summer 2003 Newsletter.

Newsletter prepared for Initiative partners, Government of Canada's Habitat Stewardship Program for Species at Risk, Columbia Basin Trust and Columbia-Kootenay Fisheries Renewal Partnership. Coordinated by Chris Beers, Revelstoke, B.C., for the Initiative. 4 p.

Prince, A., 2003. Arrow Reservoir white sturgeon assessment 2001-03. Report prepared for Canadian Columbia River Inter-tribal Fisheries Commission, Cranbrook, B.C. Prepared by Westslope Fisheries, Cranbrook, B.C. 26 p. + 3 app.

Upper Columbia River white sturgeon life cycle, 2003. Poster prepared for Initiative partners, BC Hydro, Government of Canada's Habitat Stewardship Program for Species at Risk, and Columbia Basin Trust. Prepared by the UCWSRI Communications Sub-Committee, Castlegar, B.C.

Recovery, 2004. Upper Columbia white sturgeon Winter 2003/2004 Newsletter. Newsletter prepared for Initiative partners, Columbia Basin Trust, Columbia-Kootenay Fisheries Renewal Partnership, Government of Canada's Habitat Stewardship Program for Species at Risk. Coordinated by Margaret Birch, Castlegar, B.C., for the Initiative. 6 p.

Golder Associates Ltd., 2004. Upper Columbia River juvenile white sturgeon monitoring, Phase 2 investigations, fall 2003 – spring 2004. Report prepared for BC Hydro, Castlegar, B.C. Golder Report No. 03-1480-034D: (*in preparation*).

2004 Creel Survey and Angler Awareness Program, 2003. Brochure and white sturgeon incidental catch information survey prepared for Initiative partners, BC Capacity Initiative, BC Hydro, Columbia Basin Trust, Columbia-Kootenay Fisheries Renewal Partnership and Government of Canada's Habitat Stewardship Program for Species at Risk.

Golder Associates Ltd. 2003. White sturgeon spawning at Waneta, 2002 investigations. Report prepared for Columbia Power Corporation, Castlegar, B.C. Golder Report No. 0228016F: 23 p. + 1 app. (*in preparation*).

Upper Columbia White Sturgeon...on the brink, 2004. Spring 2004 Volume 1 Number 3 UCWSRI Initiative brochure. Prepared for four Initiative partners: Columbia Basin Trust, Columbia Power Corporation, the Government of Canada's Habitat Stewardship Program for Species at Risk and Teck Cominco Metals Ltd.

Prepared by Margaret Birch, Castlegar, B.C., edited by Kirsten Hildebrand, Nelson, B.C. and Kathy Verigin, Castlegar, B.C. 6 p.

Webb, Molly A. H. and Carisska L. Anthony, March 2004. Preliminary report for the investigation of the maturation cycle and the use of steroids to determine sex and stage of maturity in upper Columbia River white sturgeon.

Report prepared for the Upper Columbia White Sturgeon Recovery Initiative. Prepared at Oregon State University, Corvallis, Ore. 3 p.

Rodzen, Jeff, and Bernie May, 2004. Estimation of family structure within white sturgeon spawning locations.

Report prepared for Ministry of Water, Land and Air Protection, Nelson, B.C. Prepared by Genomic Variation Laboratory, University of California, Davis, Calif. 6 p. and 4 Figs.

Golder Associates Ltd. 2004. White sturgeon investigations in Arrow Reservoir B.C., 2002 - 2003 study results.

Draft data report prepared for BC Hydro, Castlegar, B.C. Golder Report No. 031480045/0228056/0228047D: 24 p. + 4 app. (in preparation).

Golder Associates Ltd. 2004. White sturgeon spawning at Waneta, 2003 investigations.

Draft data report prepared for Teck Cominco Metals Ltd. and BC Hydro. Golder Report No. 031480032D: 19 p. + 1 app. (in preparation).

Golder Associates Ltd. 2004. Upper Columbia River: White Sturgeon Population Dynamics and Analysis.

Draft report prepared for Upper Columbia River White Sturgeon Recovery Initiative. Golder Report No. 031480023D 41 p. + 3 app. (in preparation).

Golder Associates Ltd. 2004. An investigation of the effects of temperature on the development of white sturgeon eggs, 2003 Data Report.

Draft report prepared for BC Hydro, Castlegar, B.C. Golder Report No: 031480046D: 11 p. + 1 app. (in preparation).

Canadian Columbia River Inter-tribal Fisheries Commission, 2004. Final Report: White sturgeon egg and larval development in response to summer temperature conditions observed downstream of Revelstoke Dam.

Report prepared for the Endangered Species Recovery Fund. Report prepared by Mark Tiley, CCRIFC, Cranbrook, B.C. 29 p. (in preparation).

Canadian Columbia River Inter-tribal Fisheries Commission, 2004. 2002 temperature characteristics of the Columbia River mainstem and major Columbia river tributaries upstream of Kinbasket Reservoir in relevance to the development of a failsafe white sturgeon population upstream of Mica Dam.

Report prepared for the Canadian Columbia River Inter-tribal Fisheries Commission, Cranbrook, B.C. Prepared by Mark Tiley and Jim Clarricoates, Cranbrook, B.C. (in preparation).

Howell, M.D. Lake Roosevelt White Sturgeon Recovery Project, 2004. 2003 Annual Progress Report.

Prepared for the Spokane Tribe of Indians, Wellpinit, Wash., and U.S. Department of Energy, Bonneville Power Administration, Portland, Ore. (in preparation).

Howell, M.D. and J.G. McLellan, 2004. Lake Roosevelt White Sturgeon Hatchery Implementation Project. 2003 Annual Progress Report.

Prepared for the Spokane Tribe of Indians, Wellpinit, Wash., and U.S. Department of Energy, Bonneville Power Administration, Portland, Ore. (in preparation).



Initiative representatives and families assist in the release of 2001 brood juvenile white sturgeon to the Columbia River, August 20, 2002.

## GLOSSARY

### ***Acipenser transmontanus***

Scientific name of the white sturgeon.

### **Annuli**

zones of crowded, thin, or incomplete circuli, (circular bony ridges, concentric around a focus) indicating a sudden decrease in growth rate; possibly over winter.

### **Anthropogenic**

of human cause or origin.

### **Bycatch**

incidental or unintended catch of nontarget species.

### **Bioaccumulation**

the accumulation of a substance, such as a toxic chemical, in various tissues of a living organism, for example, the bioaccumulation of a metal in fish.

### **Biopsy**

the removal and examination of tissue taken from a living person or animal in diagnosis.

### **Conservation aquaculture or fish culture**

differing from more traditional fish culture methods of fish hatchery production, this approach refers to culturing a species to preserve integrity and aid in rebuilding native populations, with the goal of the population sustaining itself naturally in future years.

### **Cryopreservation**

the process which involves preserving live tissue at very low temperatures, for future use.

### **Discriminant function analysis**

is a statistical technique used to determine which variables discriminate between two or more naturally occurring groups.

### **Failsafe population**

in this context, a sturgeon population which is established at a separate location from the population units being recovered, in order to provide a hedge against unforeseen circumstances. Failsafe populations are not expected to reproduce naturally and may be established in areas that historically produced sturgeon or in other areas where sturgeon are not present.

### **Genetic diversity**

the fact or quality of being genetically different and various.

### **Genetic risk**

threat to population composition and productivity as a result of loss of inherited diversity and potential inbreeding which may increase expression of deleterious recessive traits.

### **Gonad**

the reproductive organs such as ovaries and testes.

### **HLK**

Hugh L. Keenleyside Dam located near Castlegar, B.C. and the current upstream boundary of the transboundary reach.

### **Longevity**

life span typically thought to approach or exceed 100 years of age for white sturgeon.

### **Pectoral fins**

refers to the anterior ventral and lateral parts of the fish.

### **PIT tag**

an internal Passive Integrated Transponder fish tag about the size of a grain of rice that can be used to individually mark fish. Tags can be read by an electronic detector passed along the body.

### **Pre-impoundment**

the period of time before a dam was constructed, when the river flow was not impacted. A dam impacts the natural river flow, creating a reservoir behind it and changes in water flow and quality below.

### **Radiocarbon analysis**

used to determine the age of ancient organic materials. The amount of radiocarbon, especially Carbon 14, in a piece of bone is an indication of its age.

### **Recovery**

for purposes of the Recovery Plan, refers to a population level that ensures the persistence and viability of naturally-producing white sturgeon and provides opportunities for beneficial use if feasible.

### **Recruitment**

successful natural reproduction and survival of juvenile fish to a size or age where many are likely to contribute to future generations.

### **Scute(s)**

a horny or bony plate on the body of the fish.

### **Spawning**

in flowing water, one or more males releasing milt containing sperm as eggs are released by a female of the same species.

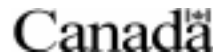
### **Transboundary**

portion of the Columbia River extending from Grand Coulee Dam in the U.S. to HLK in Canada that includes the most significant remaining white sturgeon population in the upper Columbia River basin.

### **Vitellogenic**

refers to the sexual maturation stage where a female is ripe with eggs (having formed a yolk inside) that are ready to be fertilized.

**PARTNERS INVOLVED 2000 – PRESENT**



**For more Information about the UCWSRI**

Check out our Initiative Web site at [www.uppercolumbiasturgeon.org](http://www.uppercolumbiasturgeon.org) or contact us at [info@uppercolumbiasturgeon.org](mailto:info@uppercolumbiasturgeon.org)

