2004 ANNUAL MEETING

Progressive Fish Culture:

"New Paradigms for Hatchery Management?"

Agenda and Abstracts

February 12-14, 200

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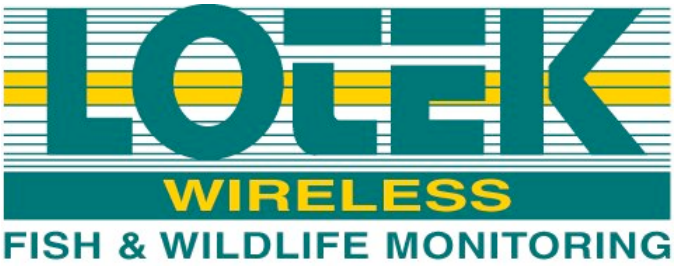

Idaho Chapter American Fisheries Society

Annual Meeting

Thursday, February 12 - Saturday, February 14, 2004

Progressive Fish Culture: "New Paradigms for Hatchery Management?"

Wednesday, February 11, 2004

6:00 PM – 8:00 PM	Registration
7:00 PM – 9:00 PM	ExCom Meeting

Thursday, February 12, 2004

7:00 AM – 10:00 AM	Registration
8:00 AM – 8:10 AM	Introduction and housekeeping
8:10 AM – 8:25 AM	President's Address - Introduction to the Plenary Session

Plenary Session ***Matt Powell, moderator***

8:25 AM – 8:55 AM	**Conservation Hatchery Strategies** Thomas A. Flagg, NOAA Fisheries, Northwest Fisheries Science Center, Washington
8:55 AM – 9:25 AM	**Engineered Habitat: A Restoration Strategy for the Built Environment** Dave Smith, Dept. of Civil Engineering & Aquaculture Research Institute, U of I, Moscow, ID
9:25 AM – 9:55 AM	**Integrating Artificial Production with Salmonid Life History, Genetic, and Ecosystem Diversity: A Landscape Perspective** Richard N. Williams, Center for Salmonid & Freshwater Species at Risk, U of I, Moscow, ID

9:55 AM – 10:15 AM Break

Session 1 ***Matt Powell, moderator***

10:15 AM – 10:20 AM	Introduction
10:20 AM – 10:40 AM	**Use of Hydraulic Sampling Methods to Source Spring Chinook Salmon Eggs for a Captive Propagation Program**

Jeff Heindel, IDFG, Eagle Fish Hatchery, Eagle, ID

Thursday, February 12, 2004 cont'd

10:40 AM - 11:00 AM **Kelt Reconditioning: A Research Project to Enhance Iteroparity inColumbia Basin Steelhead (Oncorhynchus mykiss)**
Ryan Branstetter, CRITFC, Portland, OR

11:00 AM – 11:20 AM **The Hatchery Scientific Review Process in Washington State**
Flagg

11:20 AM – 11:40 AM **Application of a Comprehensive Life Stage Evaluation Approach to Assess Artificial Propagation in Salmon Recovery in Johnson Creek, Idaho**
J.L. Vogel, Nez Perce Tribe, McCall, ID

11:40 AM – 1:00 PM Lunch Committee Breakouts

Session 2 ***Christine Moffitt, moderator***

1:00 PM – 1:05 PM Introduction to session

1:05 PM – 1:25 PM **Effects of Erythromycin on the Intestinal Microflora of Chinook salmon**
Jon J. Amberg, Fish & Wildlife Resources, University of Idaho, Moscow, ID

1:25 PM – 1:45 PM **Understanding the Ecology of Whirling Disease through Modeling of Tubificid Habitat**
Kara J. Anlauf, Idaho Cooperative Fish and Wildlife Research Unit, U of I, Moscow, ID

1:45 PM – 2:05 PM **Implications of Tributary Re-connection to Establishing *Myxobolus cerebralis* in the Lemhi River Drainage, Idaho**
Keith Johnson, IDFG, Eagle Fish Hatchery, Eagle, ID

2:05 PM – 2:25 PM **The Potential for Broodstock Immunizations as a Method to Reduce Bacterial Coldwater Disease in Rainbow Trout (*Oncorhynchus mykiss*) fry**
B.R. LaFrentz, Dept. of Fish & Wildlife, U of I, Moscow, ID

2:25 PM – 2:45 PM **Modeling Effects of *Myxobolus cerebralis* on the Population Dynamics of the Salmonid and Oligochaete, *Tubifex tubifex*, Hosts**
Maura K. Santora, Idaho Cooperative Fish & Wildlife Research Unit, U of I, Moscow, ID

2:45 PM – 3:05 PM **Piecing Together the Pahsimeroi Puzzle**
Michael Colvin, ID Coop. Fish & Wildlife Research Unit, U of I, Moscow, ID

3:05 PM – 3:25 PM Break

Session 3 ***Bart Gamett, moderator***

3:25 PM – 3:30 PM Introduction to session

3:30 PM – 3:50 PM **Enhancing Idaho's Fish Stocks: Protocol and Case Studies On Stream and Lake Fertilization**

Ryan Hardy, IDFG, Coeur d'Alene, ID

Thursday, February 12, 2004 cont'd

3:50 PM – 4:10 PM **Responses of Periphyton and Benthic Macroinvertebrates to Experimental Additions of Nitrogen and Phosphorous in a Mesocosm Study**
G.M. Hoyle, Kootenai Tribe of Idaho, Bonners Ferry, ID

4:10 PM – 4:30 PM **Equivalent Clearcut Area and Fish Habitat Relationships on the Payette National Forest**
Rodger L. Nelson, Payette National Forest

4:30 PM – 4:50 PM **Evaluation of Surface Fines as an Index of Salmonid Habitat Conditions on the Payette National Forest**
Michael N. McGee, Payette National Forest

4:50 PM – 5:10 PM **Ecology of Fishes in the Lower Milk River, Montana in Relation to Spring Discharge**
Julie Bednarski, , Dept of Fish & Wildlife, U of I, Moscow, ID

6:30 PM – ? Palouse Unit Student mixer at the 1912 building on 3rd street.

Friday, February 13, 2004

Session 4 ***Kevin Meyer, moderator***

8:00 AM – 8:10 AM Housekeeping and Announcements

8:10 AM – 8:30 AM **The Status and Management of Yellowstone Cutthroat Trout in the South Fork of the Snake River, Idaho**
Jim Fredericks, IDFG, Idaho Falls, ID

8:30 AM – 8:50 AM **Hydrologic Alteration and its Effect on Trout Recruitment in the South Fork Snake River**
Rob Van Kirk, ISU, Pocatello, ID

8:50 AM – 9:10 AM **Reducing Introgression with the Use of a Barrier in Tributaries of the South Fork Snake River, Idaho**
George W. LaBar , Dept. of Fish & Wildlife Resources, U of I, Moscow, ID

9:10 AM – 9:30 AM **The Status of Mountain Whitefish in the Big Lost River, Idaho Drainage**
Bart L. Gamett, Salmon-Challis National Forest, USFS

9:30 AM – 9:50 AM **Population Trends and an Assessment of Extinction Risk for Westslope Cutthroat Trout in Select Idaho Waters**
Dan Schill, IDFG, Boise, ID

9:50 AM – 10:10 AM Break

Session 5 ***Dan Schill, moderator***

10:10 AM – 10:15 AM Introduction to session

Friday, February 13, 2004 cont'd

10:15 AM – 10:35 AM **Current Status of Bull Trout, *Salvelinus confluentus,* on Forest Service Lands in the Pahsimeroi River Drainage, Idaho**
Jason Pyron , USDA Forest Service

10:35 AM – 10:55 AM **Movement and Mortality of Bull Trout from the Middle Fork East River**
Joe DuPont, IDFG, Coeur d'Alene, ID

10:55 AM – 11:15 AM **Bull trout in North and South Callahan creeks, Idaho**
Jody Walters, IDFG, Coeur d'Alene, ID

11:15 AM – 11:35 AM **Scrambled Eggs? Evaluation of Cattle Stepping on Bull Trout Redds**
Jim Gregory, Gregory Aquatics, Mackay, ID

11:35 AM – 1:40 PM Lunch – ICAFS Annual Business Meeting, Western Division AFS Update

Session 6 ***Chris Peery, moderator***

1:45 PM – 1:50 PM Introduction to session

1:50 PM – 2:10 PM **Temperature-dependent Survival of Juvenile Snake River Fall Chinook Salmon**
Jeff Yanke, USGS, Idaho Cooperative Fish & Wildlife Research Unit, U of I, Moscow, ID

2:10 PM – 2:30 PM **Migration Patterns, Energy Expenditures, and Reproductive Success of Adult Chinook Salmon of the South Fork Salmon River, Idaho**
Amy Pinson, Idaho Cooperative Fish & Wildlife Research Unit, USGS , U of I, Moscow, ID

2:30 PM – 2:50 PM **Tributary-specific Adult Steelhead Abundance in Two Small Tributary Streams of the Imnaha River Subbasin, Oregon**
Jay A. Hesse, Nez Perce Tribe Dept of Fisheries Resources Mgmt , Lapwai, ID

2:50 PM – 3:10 PM **Life History of Endemic Summer Steelhead in Three Grande Ronde Basin Tributaries**
Steve Boe, Confederated Tribe of the Umatilla Indian Reservation (CTUIR)

3:10 PM – 3:30 PM Break

Session 7 ***Shawn Narum , moderator***

3:30 PM – 3:35 PM Introduction to session

3:35 PM – 3:55 PM **Coastwide Standardization of Chinook Salmon Genetic Data**
Shawn R. Narum*, Presenter, Columbia River Inter-Tribal Fish Commission, Hagerman ID

3:55 PM – 4:15 PM **Mitochondrial DNA Variation and Distribution in Yellowstone Cutthroat Trout *Oncorhynchus clarki bouvieri* Across its Native Range: Implications for Management and Conservation**
M. R. Campbell, IDFG, Eagle Fish Genetics Lab, Eagle, ID

Friday, February 13, 2004 cont'd

4:15 PM – 4:35 PM **Population Structure and Intraspecific Hybridization of *O. mykiss* in the Malad River, Idaho**

C. Cegelski, U of I - IDFG, Eagle Fish Genetics Lab, Eagle, ID

4:35 PM – 5:15 PM POSTER SESSION

6:30 PM – 11:00 PM Raffle and auction

Saturday, February 14, 2004

Session 8 ***Paul Anders, moderator***

9:00 AM – 9:05 AM Housekeeping and Announcements

9:05 AM – 9:25 AM **Life-history characteristics of an adfluvial population of bull trout in a northern Idaho stream**

Chris Downs, IDFG, Clark Fork, ID

9:25 AM – 9:45 AM **Overview of Exotic Northern Pike Infestation on the Kenai Peninsula**

Mark Gamblin, IDFG, Boise, ID

9:45 AM – 10:05 AM **Snake River White Sturgeon Stock Assessment, Lower Granite Dam to Salmon River, Idaho**

Scott Everett, Mike Tuell, Jay Hesse; Nez Perce Tribe

10:05 AM – 10:25 AM **The Detection of Paddlefish Spawning Activity Along the Lower Yellowstone River Through the Collection of Eggs Along a Suspected Incubation Reach**

Jon A. Firehammer, Department of Fish and Wildlife Resources, U of I, Moscow, ID

10:25 AM – 10:45 AM Break

10:45 AM – 11:05 AM **Long-term Changes in the Growth Rates of Paddlefish, *Polyodon spathula*, in Fort Peck Reservoir, Montana**

Brett .J. Bowersox, U of I, Moscow, ID

11:05 AM – 11:25 AM **Kootenai River White Sturgeon Recovery Investigations: Set and Jet Program**

Pete Rust - Fishery Research Biologist, Idaho Department Fish and Game, 2750 Kathleen Avenue, Coeur d' Alene, ID

11:25 AM – 11:45 AM **Diet Analyses of Mountain Whitefish and Peamouth Chub in the Kootenai River, Idaho**

Charlie Holderman, Kootenai Tribe of Idaho

11:45 AM Adjourn

12:00 PM Executive Committee Meeting

Contributed Papers - alphabetized by presenter

Amberg

Effects of Erythromycin on the Intestinal Microflora of Chinook salmon

Jon J. Amberg, Fish and Wildlife Resources, University of Idaho, Moscow, ID 83844, 208-885-7139(W), 208-885-9080 (F), ambe5987@uidaho.edu, S.M.A. Mobin, Fish and Wildlife Resources, University of Idaho, Moscow, ID 83844, 208-885-5421 (W), 208-885-9080 (F), mobin@uidaho.edu, Christine Moffitt, Fish and Wildlife Resources, University of Idaho, Moscow, ID 83844, 208-885-7047 (W), 208-885-9080 (F), cmoffitt@uidaho.edu.

ABSTRACT: The use of erythromycin to control bacterial kidney disease has been under increased scrutiny due to potential risk of transferring antibiotic resistance from bacteria in animals to human bacterial pathogens. This study was designed to determine if the use of erythromycin in hatcheries increases the risk to humans from drug resistant bacteria. The objectives of our study were to determine resident microflora, if the percentage of erythromycin resistant bacteria increases, and for how long. We used biochemical techniques to identify bacteria isolated from the lower intestinal tract of Chinook salmon prior to treatment, during treatment, and after treatment (6 fish/raceway/time). The posterior intestines were pulverized, diluted and plated on agar with and without erythromycin. Total bacterial populations declined from 100,000 CFUs/g pre-treatment to 100 CFUs/g during treatment. Only two genera, *Micrococcus* and *Bacillus*, were common between raceways before trials began. *Comamonas* and *Staphylococcus* were common between raceways by the end of treatment, but *Micrococcus* was only identified in a single raceway. Several Gram-positive strains were resistant to erythromycin, including, but not limited to *Bacillis* and *Staphylococcus*. Some resistant strains, *Staphylococcus* and *Enterococcus*, were introduced via feed. Work is in progress to define the extent and mechanisms of resistance. We conclude that the oral treatment of erythromycin decreased the microbial population and altered the bacterial diversity associated with the intestine of Chinook salmon.

Anlauf

Understanding the Ecology of Whirling Disease through Modeling of Tubificid Habitat

Kara J. Anlauf, Christine M. Moffitt, Michael E. Colvin, Idaho Cooperative Fish and Wildlife Research Unit, Department of Fish and Wildlife, University of Idaho, Moscow, Idaho 83844. Phone (208) 885-7139. Fax (208) 885-9080. E-mail kanlauf@uidaho.edu, cmoffitt@uidaho.edu, colv3803@uidaho.edu. Bruce E. Rieman, U.S.D.A Forest Service, Rocky Mountain Research Station, 316 E. Myrtle St., Boise, Idaho 83702. Phone (208) 373-4386. Fax (208) 373-4391. Email brieman@fs.fed.us.

ABSTRACT: We are using geospatial tools to combine knowledge of Myxobolus cerebralis, the causative agent of whirling disease, and its oligochaete host *Tubifex tubifex* with the processes that influence the form and function of aquatic habitats. Our goal is to develop a multi-scale habitat model that identifies the habitat requirements of *T. tubifex* and delimits the risk and extent of *M. cerebralis* infection. Our objectives are 1) Use geospatial features as predictors of stream habitat and substrate compositions, 2) Compare slopes generated by a GIS with field measurements, and 3) Identify relationships among *T. tubifex* populations, sediment compositions and particle size distributions, stream hydrology characteristics, and large-scale geospatial attributes. Our study area is the Pahsimeroi River, a tributary of the Salmon River in East Central Idaho. The subbasin contains public and private lands, hosts a state fish hatchery rearing Chinook salmon (*Oncorhynchus tshawytscha*), and the tributary waters are home to bull trout (*Salvelinus confluentus*) populations. Site selection within the drainage was based on slope stratifications derived from stream elevation grids using a GIS. At each site, a stream reach was defined and physical stream measurements were collected within habitat units. Sediment cores were obtained within reaches for substrate analysis and invertebrate/tubifex identification. In the laboratory, we determined organic content and particle size distributions of the gravel, sand, silt, and clay fractions. Invertebrate samples were sorted and tubificid oligochaetes were mounted on slides to identify to species. We provide a model for estimating *T. tubifex* habitat and associated densities using geospatial features. Further, we describe the stream habitat, organic content, substrate mass and composition, and sediment particle size distribution that may influence *T.* tubifex abundances.

Bednarski

Ecology of Fishes in the Lower Milk River, Montana in Relation to Spring Discharge

Julie Bednarski, University of Idaho, Department of Fish and Wildlife Resources, CNR 105, P.O. Box 441136, Moscow, ID 83844, (208) 885-4008, bedn4057@uidaho.edu.

ABSTRACT:: The Milk River is an important main channel tributary to the upper Missouri River, Montana. The lower 193 km of the river below Vandalia Dam supports a diversity of macrohabitats for several native fish species common to the Missouri River. Twenty-eight fish species native to Montana have been reported in the Milk River, including four Montana Species of Special Concern. A water development project has been proposed that would divert water from Milk River during high spring flows into an off-stream storage reservoir with up to 74 million m3 capacity.

To characterize the spawning of the fish species in Milk River in relation to river discharge larval fish were sampled with a 0.5-m plankton net from May to August 2002, and 2003. The peak discharge for the sampling period was 77.87 m3/sec on June 28, 2002 and 19.9 m3/sec on May 20, 2003. A total of 8,329 larval fish were collected, 8,709 and 250 in 2002 and 2003, respectively. In the samples, larval fish identified include one paddlefish, three blue sucker, river carpsucker (Carpiodes carpio), goldeye (Hiodon alosoides), freshwater drum, carp (Cyprinus carpio), emerald shiner (Notropis atherinoides), shorthead redhorse (Moxostoma macrolepidotum), Catostomus sp., Ictiobus sp., and Pomoxis, sp.

Boe

Life History of Endemic Summer Steelhead in Three Grande Ronde Basin Tributaries

Steve Boe, Confederated Tribe of the Umatilla Indian Reservation (CTUIR); Rey Weldert, CTUIR; Carrie Crump, CTUIR; Mike McLean, CTUIR, sboe@eou.edu, rweldert@eou.edu, crumpc@eou.edu, mmclean@uci.net.

ABSTRACT: Life history information on endemic summer steelhead from Lookingglass Creek, Catherine Creek, and the upper Grande Ronde River in northeastern Oregon has been collected. Upstream-migrating unmarked adults and fallbacks were collected from 2001-2003 at weirs operated on the three streams. Migration timing, sex ratios, and brood year strength will be described within and between populations. Population estimates of upstream migrants were calculated for Catherine Creek and the upper Grande Ronde River. Spawning ground surveys in Lookingglass Creek during 2003 showed most redds occurred in the mainstem and the major tributary, Little Lookingglass Creek. Redd locations in relation to habitat characteristics will be described. Life history information will assist co-managers as they consider alternatives to the use of non-endemic stocks for harvest augmentation in the Grande Ronde River Basin.

Bowersox

Long-term Changes in the Growth Rates of Paddlefish, *Polyodon spathula*, in Fort Peck Reservoir, Montana

Brett .J. Bowersox-Presenter, University of Idaho, P.O. Box 441136, Moscow, ID, 83844-1136; Dennis Scarnecchia, University of Idaho, P.O. Box 441136, Moscow, ID, 83844-1136; Corresponding Author: bowe5111@uidaho.edu.

ABSTRACT: The Missouri River above Fort Peck Reservoir has supported a recreational fishery for the past 30-40 years. Although the catch of adult paddlefish has remained relatively constant, fishery managers have become concerned that large individuals have become increasingly rare. The objectives of this study were to examine changes in paddlefish weight and body length distributions and early growth during three reservoir time periods (1977-1978, 1992-1993, and 2000, 2002).

Weight and body length frequency histograms were constructed based on samples collected from the fishery during the three time periods. Histograms were examined to compare the frequency of large fish (>21 kg males, >45 kg females) within each of the three time periods. In addition, a 2-way ANOVA was run on two age groups (< 15 and 16-20 for males, 16-20 and 21-25 for females) to determine if mean weight achieved for these age groups changed among the three time periods. These analysis indicated that both the number of large fish in the population and early growth of both male and female paddlefish have

decreased over time. While the exact cause of the decrease is not known, it is hypothesized that reduced productivity associated with reservoir aging is a contributing factor.

Branstetter

Kelt reconditioning: A Research Project to Enhance Iteroparity in Columbia Basin Steelhead (Oncorhynchus mykiss)

Doug Hatch (Columbia River Inter-Tribal Fish Commission, Portland, OR, (503)-238-0667), Ryan Branstetter (CRITFC, Suite 200, Portland, OR, 97219, (503)-238-0667), Shawn Narum (CRITFC, Portland, OR), Joe Blodgett (Yakima Nation, Toppenish, WA), Bill Bosch (Yakima Nation, Toppenish, WA), Dr. David Fast (Yakima Nation, Toppenish, WA), Todd Newsome (Yakima Nation, Toppenish, WA), brar@critfc.org.

ABSTRACT: Steelhead (*Onchorynchus mykiss*) possess a life history strategy (termed kelt) that allows reproduction for more than once in their lifetime. In the Columbia Basin this life history strategy is severely depressed due to Columbia River hydrosystem (altered system), currently < 5% of steelhead kelts return to natal streams to spawn. Historically steelhead kelts in the Columbia Basin were estimated to represent ~20% of the spawning run, while presently in the Kamchatka Peninsula (pristine conditions) steelhead kelts comprise >50% of the run. The Columbia River Inter-Tribal Fish Commission (CRITFC) in collaboration with the Yakima Nation in 2002 captured out-migrating steelhead kelts and held them for reconditioning. This experimental process is used to reestablish a feeding response in kelts to increase the chance of survival for another spawning run. Steelhead kelts are held in 20' diameter circular tanks for either short-term (4-8 weeks) or long-term (~6 months) reconditioning and fed an initial diet of krill followed by Moore-Clark pellets. Fish survival to release is high in both experimental groups. Most short-term reconditioned fish had a modest weight loss, while most long-term reconditioned fish showed appreciable weight gains. Long-term reconditioned fish displayed gonadal recrudescence rates >70%. The 2002 short-term reconditioned fish had 8.8% (29/331) returning to respawn for their 2nd time. We anticipate that some short-term, along with long-term fish, may be residing in the ocean and will return in 2003. If the experimental phase of this project proves to be successful, this project could lay the foundation as a region wide recovery tool for listed steelhead stocks in the Pacific Northwest.

Campbell

Mitochondrial DNA Variation and Distribution in Yellowstone Cutthroat Trout *Oncorhynchus clarki bouvieri* Across its Native Range: Implications for Management and Conservation

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ABSTRACT: While Yellowstone cutthroat trout are probably the best-known and one of the most researched of all of the subspecies of cutthroat trout, their overall genetic diversity and genetic population structure remains largely unknown. In this study, we assessed genetic variability and population structure among 40 populations of Yellowstone cutthroat trout over a large portion of their range in Idaho, Montana, Utah, Wyoming, and Nevada, using RFLP analysis of mitochondrial ND1 and ND2 gene regions. Among 800 samples examined thus far, a total of 17 haplotypes have been observed. These data indicate significant geographic structuring of populations between drainages and varying levels of reproductive isolation between populations within drainages, which is likely the result of combinations of historical (glaciation, volcanic) and contemporary (drought, habitat degradation, man-made barriers) processes. Results from this study are of practical significance when prioritizing populations for conservation and management purposes, and identifying suitable populations for translocations, reintroductions, and broodstock development programs.

Cegelski

Population Structure and Intraspecific Hybridization of *O. mykiss* in the Malad River, Idaho

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ABSTRACT: Both isolation and hybridization can be threats to the long-term fitness and genetic integrity of populations. Redband trout, *Oncorhynchus mykiss gairdneri,* in the Malad River represent an interesting case study, in which preventing either isolation or hybridization resulted in conflicting management directions. Microsatellite analysis of *O. mykiss* sampled from three, disconnected reaches of the Malad River (upper, middle, lower), a tributary (Cove Creek) and the adjacent middle Snake River were performed to determine levels of genetic differentiation among sample sets and look for evidence of intraspecific hybridization with introduced rainbow trout. Allelic variation between reaches at five highly variable loci was tested using a homogeneity test computed as an exact test and with F_{ST} estimates. Adjacent reaches (upper and middle Malad, lower and middle Malad, lower Malad and Snake) were not found to be statistically different from one another. However, non-adjacent reaches endured moderate differentiation; with decreasing levels of allelic diversity upstream. Genetic assignment tests provided evidence of intraspecific hybridization and introgression with hatchery rainbow trout in the lower reach and Snake River sample sets but not among Cove Creek samples or those collected from the middle and upper reaches. Given that hydropower diversions are barriers for upstream passage, these results suggest that homogenization of adjacent populations is due to downstream passage of migrants. Malad River populations were previously shown to be genetically distinct from other redband populations using other genetic methods; however, current evidence of hybridization and/or isolation may impact the separate reaches within this system. Based upon these results, management towards restoring connectivity and fluvial migration patterns within the three reaches of the Malad River may enhance the Malad-Snake River population structure and provide greater viability in the long-term than the isolation of small populations.

Colvin

Piecing Together the Pahsimeroi Puzzle

Michael Colvin[1], Kara Anlauf[1], Keith Johnson[2] and Christine M. Moffitt[1; 1]Idaho Cooperative Fish and Wildlife Research Unit, Department of Fish and Wildlife, University of Idaho, Moscow, ID 83844, Phone: (208) 885-7193 Fax: (208) 885-9080, colv3803@uidaho.edu; kanlauf@uidaho.edu; cmoffitt@uidaho.edu; ; [2]Eagle Fish Health Laboratory, Idaho Department of Fish and Game, Eagle, ID 83616, Phone: (208)-939-2413 FAX: (208)-939-2415, kjohnson@IDFG.state.id.us.

ABSTRACT: Idaho Department of Fish and Game conducted seasonal exposures in 2001, at Pahsimeroi State Fish Hatchery, and confirmed year round presence of *Myxobolus cerebralis,* the cause of salmonid whirling disease, in the Pahsimeroi River. Sentinel exposures of juvenile rainbow trout were conducted at locations throughout the drainage during 2001-2003 to determine the relative intensity of *M. cerebralis* in the Pahsimeroi Valley by the University of Idaho and IDFG. We observed variations in intensity of infection and prevalence of *M. cerebralis* in all exposures, and many times infection was highest in lower reaches. In the summer of 2003, we surveyed fish species distributions throughout the river to determine their role in perpetuating infections of *M. cerebralis*. Fragmentation of the aquatic habitat in the Pahsimeroi River caused by sub surficial flow and irrigation withdraws has created distinctly separate reaches where, aquatic habitat and fish populations are separated by dewatered stream channels. We created a new stream coverage t in a GIS to identify stream reaches and fragments affected by irrigation withdrawal and subsurface flow at a 1:24,000 scale. Two stream reaches in the Pahsimeroi valley are positive for *M.* cerebralis. The lower reach extends 24 km upstream from the mouth of the Pahsimeroi River. This reach has four discrete aquatic habitat patches and altered stream flow. Rainbow trout and mountain whitefish were the most abundant fish species at the time of sampling. A second reach including the Pahsimeroi River and Goldburg Creek was identified upstream that was continuous for that reach and dominated by brook trout. Fish populations in the second

reach were significantly smaller than those observed in the lower reach. Different resident fish densities may affect the relationship of M. cerebralis intensity. Managers considering habitat restoration and reconnection of this watershed must consider the effects of this parasite on resulting fish populations.

Downs

Life-history characteristics of an adfluvial population of bull trout in a northern Idaho stream

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ABSTRACT: We utilized a rotary screw trap and weirs to capture migrating bull trout Salvelinus confluentus in Trestle Creek, Idaho, from 2000 through 2002, in order to estimate their abundance, understand basic life-history characteristics, and to evaluate survival rates in the tributary and lake environment. Age-0 outmigrants accounted for greater than 85% of the total annual catch of juvenile bull trout in Trestle Creek in all years. We believe this is largely due to density-dependent competition for rearing habitat, rather than a successful life-history strategy. Age-2 and age-3 outmigrants accounted for the majority of the outmigration of age-1 and older juveniles. We estimated 1,276, 1,094, and 1,147 age-1 and older juvenile bull trout outmigrated from Trestle Creek in 2000, 2001, and 2002, respectively. Annual outmigration of juvenile bull trout occurred primarily at night in two pulses, one occurring in the spring and the other in the fall. The median distance moved downstream per night by juveniles captured in the fall was 315 m (n=40) and 295 m (n=17), in 2001 and 2002, respectively. Adult bull trout also migrated primarily at night, with 92% of the detections (n=631) at the PIT tag weir in 2001 and 2002 occurring between sunset and sunrise. Of those PIT tagged adults marked in 2000 that returned to spawn in either 2001 or 2002, 92.6% (n=224) returned annually versus 7.4% (n=18) returning in alternate years. Based on juvenile outmigration and adult escapement data, we speculate juvenile rearing habitat currently represents a population bottleneck in Trestle Creek. We marked 889 outmigrating juvenile bull trout with PIT tags and will be using their return to estimate juvenile survival in Lake Pend Oreille over the next several years.

DuPont

Movement and Mortality of Bull Trout from the Middle Fork East River

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ABSTRACT: Movement and habitat use of 20 bull trout (400-752 mm in length) from the Middle Fork East River, tributary to Priest River, Idaho, were evaluated from August 12, 2002 to September 2, 2003 with surgically implanted radio transmitters.. Attempts were made to locate these fish every week. Based on our tracking results, bull trout from the Middle Fork East River have an adfluvial life cycle where the adults migrate to either Lake Pend Oreille or Pend Oreille River. Movement patterns in the Middle Fork East River basin can be characterized by little movement the month prior to spawning (no fish moved more than 1 km), followed by increased movement during the spawning period (several fish moved over 6 km). Following spawning in September, a gradual downstream movement was documented with most fish congregating in beaver ponds. Only three bull trout were found to migrate out of East River prior to November, which may have been due to the absence of fall rains. Two of these early migrants were eventually located at the outlet of Pend Oreille Lake.

In an effort to save the radio tagged bull trout in the East River, on December 9th, 2002~~3~~, the four remaining fish were trapped and transported to the Priest River. Once in the Priest River all four fish moved rapidly downstream to the Pend Oreille River making a 17 km migration in 12-24 hours. Two of the fish continued on to Lake Pend Oreille migrating 26 km upstream in one to two days. During late May, two of the fish from Lake Pend Oreille migrated back downstream to the Priest River swimming 26 km in 15 to 40 hrs. These two fish and one other fish that over-wintered in the Pend Oreille River returned to the Middle Fork East River in 2003.

Between October 3 and November 13, 2002 we documented 11 different dead bull trout in the Middle Fork East River. One to three other bull trout died in the Priest River bringing the post-spawn mortality to 60-70%. This mortality rate is not unusual for post-spawn bull trout, especially for the low water conditions these fish encountered during the fall of 2002. The death of these bull trout is believed to be from natural causes (post-spawn stress, lack of feed and predation), although we can not rule out poaching. Throughout the one year

period of this study 13 to 15 of the bull trout that were radio tagged died, bringing their annual morality rate to 65-75%.

Everett

Snake River White Sturgeon Stock Assessment, Lower Granite Dam to Salmon River, Idaho

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ABSTRACT: Assessment of the Snake River white sturgeon (*Acipenser transmontanus*) population between Lower Granite Dam and Hells Canyon Dam occurred from 1997 to 2002. This research supported efforts to identify management actions capable of restoring sustainable annual subsistent harvest opportunities. From 1997 to 2001 white sturgeon were captured, marked, and population data were collected in the Snake and Salmon rivers. A total of 1,785 white sturgeon were captured and tagged in the Snake River and 77 in the Salmon River. The abundance of white sturgeon >60 cm, between Lower Granite Dam and the mouth of the Salmon River, was estimated at 2,483 fish, with a 95% confidence interval of 1,208-7,477. Total annual mortality rate was estimated to be 0.14 (95% confidence interval of 0.12 to 0.17). Relative density of white sturgeon was highest in the free-flowing segment of the Snake River, with reduced densities in Lower Granite Reservoir, and low densities the Salmon River. Differences were detected in the length frequency distributions in Lower Granite Reservoir, the free-flowing Snake River and the Salmon River (Chi-Square test, $P<0.05$). Analysis of the length-weight relationship indicated that white sturgeon in Lower Granite Reservoir had a higher relative weight factor than white sturgeon in the free-flowing Snake River. The proportion of white sturgeon greater than 92 cm (total length) in the free-flowing Snake River has shown an increase of 30 percent since the 1970's. Thirty-five white sturgeon were fitted with radio-tags during 1999-2002. The movement of these fish ranged from 53 km (33 miles) downstream to 77 km (48 miles) upstream; however, 38.8 percent of the detected movement was less than 0.8 km (0.5 mile). No seasonal movement pattern was detected, and no movement pattern was detected for different size fish. Artificial substrate egg mats documented white sturgeon spawning in four consecutive years.

Firehammer

The Detection of Paddlefish Spawning Activity Along the Lower Yellowstone River Through the Collection of Eggs Along a Suspected Incubation Reach

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ABSTRACT: A passive egg sampling technique was developed in order to confirm egg incubation sites and describe the temporal variability in spawning for paddlefish, *Polyodon spathula*, along the lower Yellowstone River. Egg collectors modeled after the mats used in sturgeon research were difficult to retrieve and did not collect eggs during the 2000 sampling season. Tubular egg collectors proved to be more practical and were successfully retrieved 97% of the time during 2001 and 2002. One hundred and thirty Acipenseriform eggs were collected along the suspected incubation reach and 68% of the collected eggs were genetically confirmed as paddlefish. During both years, egg catch-per-unit-effort (CPUE) peaked in mid-June after peak periods of Yellowstone River discharge. River temperatures were typically increasing and between 15-22°C during periods in which eggs were collected. Average egg CPUE was lower during the low flow year of 2001 (0.11 egg/collector/d) than during 2002 (0.39 egg/collector/d). During peak collection periods, 20-45% of the collectors had at least one egg, and 75% of the eggs were found on collectors retrieved from the channel thalweg. However, mean egg counts were low (< 4 eggs/collector) suggesting that either collectors were not placed near the vicinity of concentrations of spawning paddlefish or that spawning effort was distributed over a large portion of the lower Yellowstone River.

Flagg (Keynote)

Conservation Hatchery Strategies

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ABSTRACT: Artificial propagation has been suggested as a potential mechanism to aid recovery of U.S. Endangered Species Act (ESA)-listed stocks of Pacific salmon on the West Coast of the United States. Theoretically, one of the fastest ways to amplify population numbers for depleted stocks of Pacific salmon is through culture and release of hatchery-propagated fish. However, past attempts to use supplementation (i.e., the use of artificial propagation in an attempt to maintain or increase natural production) to rebuild naturally-spawning populations of Pacific salmon have often yielded poor results. The challenge is to develop protocols that increase fitness of hatchery-reared salmonids, thereby improving survival. A framework of Conservation Hatchery strategies to reduce potential impacts of artificial propagation on the biology and behavior of fish is presented. Operational guidelines for Conservation Hatcheries to help mitigate the unnatural conditioning provided by hatchery rearing are discussed and contrasted to those for production hatchery operation. These include: 1) Mating and rearing designs that produce minimal genetic divergence of hatchery fish from their wild counterparts to maintain long-term adaptive traits; 2) Simulation of natural rearing conditions through incubation and rearing techniques that approximate natural profiles and through increasing habitat complexity (e.g. cover, structure, and substrate in rearing vessels) to produce fish more wild-like in appearance, and with natural behaviors and higher survival; 3) Conditioning techniques such as anti-predator conditioning to increase behavioral fitness; 4) Release at a size, stage, and condition which approximates the wild population to reduce potential negative ecological interactions and to promote homing; and 5) Aggressive monitoring and evaluation to determine success of Conservation Hatchery approaches.

Flagg

The Hatchery Scientific Review Process in Washington State

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ABSTRACT: The Hatchery Reform Project was funded by the U.S. Congress in 1999 to evaluate Puget Sound and Coastal Washington State salmon hatcheries. It is a systematic, science-driven redesign of how hatcheries will be used to achieve the goals of: 1) helping to recover and conserve naturally spawning populations, and 2) supporting sustainable fisheries. The project has three structural components: the working Hatchery Scientific Review Group (HSRG) composed of agency representatives and selected independent scientists, a oversight Coordinating Committee composed of tribal and agency policy representatives, and a Facilitation Group to provide project coordination and communications. Initial work by the HSRG included developing a Scientific Framework for Artificial Propagation of Salmon and Steelhead, a Benefit/Risk Assessment Tool, Hatchery Operational Guidelines, and Monitoring and Evaluation Criteria. These tools are being used by the HSRG in a comprehensive region-by-region review that evaluates hatchery programs for consistency with established scientific principles and the objectives of hatchery reform. The HSRG provides both specific program recommendations and “Area-Wide” recommendations that affect policy and management of all programs. HSRG recommendations are being incorporated into management plans and staff responsibilities and in standard negotiation processes between the state and tribal co-managers. Implementation of these recommendations by the co-managing agencies has included such actions as termination of several species-specific programs, a total hatchery closure, plans for removal of hatchery structures that impede wild fish passage, comprehensive monitoring and evaluation plans, hatchery-free steelhead management zones, significant revisions to spawning and rearing practices.

Fredericks

The Status and Management of Yellowstone Cutthroat Trout in the South Fork of the Snake River, Idaho

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ABSTRACT: The South Fork of the Snake River supports a world-renowned fishery and one of the most important Yellowstone cutthroat trout populations in their historical range. Non-native rainbow trout were intermittently stocked for decades until 1981, when stocking was discontinued because of the risk to the native population through introgression and competition. Rainbow trout were a negligible component of the trout population until the late-1980's. In the past 10 years angler and electrofishing surveys have shown a steady increase in rainbow trout to where they are now as abundant and cutthroat trout in the upper reaches of the river. In cooperation with other agencies and non-governmental organizations, the Idaho Department of Fish and Game is working on three fronts to protect and maintain the health of the cutthroat population. First, weirs and fish collection traps have been constructed on the four main tributaries to allow collection of cutthroat and rainbow trout spawners. Based on phenotypic examination, cutthroat trout are passed upstream, whereas rainbow and hybrid trout are transported to catch-out ponds. Second, IDFG has been working with Idaho State University and the Bureau of Reclamation to identify and implement flow regimes that are beneficial to cutthroat trout and detrimental to rainbow trout. A comprehensive analysis suggests the magnitude and shape of the spring runoff flows may have a significant effect on the ratio of rainbow to cutthroat trout recruits. Finally, we used an aggressive program combining regulation changes and public outreach in 2003 to encourage harvest of rainbow trout. Prior to 2003, anglers released the majority of rainbow trout caught on the South Fork. In 1996 an estimated 900 rainbow and hybrid trout were harvested out of 12,700 landed, for a retention rate of about seven percent. In 2003, an estimated 4,900 rainbow and hybrid trout were harvested out of an estimated 20,100 landed, for a retention rate of about 25%. Though the 2003 harvest probably equates to around only 20-30% exploitation, it represents a significant step in an effort to get anglers to take an active role in managing the South Fork cutthroat trout population. Through continued education combined with regulations liberalizing harvest we hope to increase rainbow trout exploitation to 50-70%.

Gamblin

Overview of Exotic Northern Pike Infestation on the Kenai Peninsula

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ABSTRACT: Northern pike are not indigenous south of the Alaska Range and North of the Chugach Mountains. They were illegally introduced into a lake in the Soldotna Creek drainage (a tributary of the Kenai River) in the early 1970's. Since then, northern pike, with the help of bucket biologists, have been found in nearly all of the lakes of the Soldotna Creek drainage; in a lake tributary to the Swanson River (Stormy Lake); and have been reported in lakes tributary to the Moose River (Watson and Egumen Lake). While a sport fish valued by some, non-indigenous pike have severely reduced or eliminated salmonid populations in these lakes, and threaten juvenile populations of anadromous species. Steps taken thus far by the ADF&G Division of Sport Fish with help from the USFWS Coastal Grant Program and the FishAmerica Foundation include but are not limited to: surveying lakes to document presence/absence of northern pike, as well as other species; liberalization of bag limits, seasons, and hook limits; maintaining a blocking net to stop the movement of pike out of an open lake; intensive gill netting to reduce numbers in selected lakes using local homeowners as volunteers; and, the intensive use of hoopnets to selectively remove pike but release native fish unharmed. Future plans include the continuation and expansion of the netting programs, construction of a fish control structure on the outlet of Stormy Lake, and the possible use of chemical removal methods.

Gamett

The Status of Mountain Whitefish in the Big Lost River, Idaho Drainage

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ABSTRACT: The Big Lost River is a hydrologically isolated stream basin located along the northern rim of the Snake River Plain in southeastern Idaho. Mountain whitefish in the Big Lost River drainage are believed to have originated from the upper Snake River sometime during the last several million years. Previous work has shown that this population is genetically distinct from other mountain whitefish populations and may constitute an endemic sub-species. Our objective was to collect basic data needed to evaluate the status of this population. This work indicates that there has been a substantial decline in the distribution of mountain whitefish in the drainage. We estimate that prior to the arrival of European settlers in the late 1860's, mountain whitefish occupied approximately 300 km of stream in the Big Lost River basin. However, it appears that the fish now occupies only about 80 km of stream, indicating distribution has decreased to approximately 27% of historic levels. Furthermore, in areas that are still occupied by the species there appear to have been large declines in abundance. Major factors contributing to the declines appear to be dewatered streams, habitat fragmentation, flow alteration, habitat alteration, and drought.

Gregory

Scrambled Eggs? Evaluation of Cattle Stepping on Bull Trout Redds

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ABSTRACT: Concerns over livestock stepping on bull trout redds have led many Forest Service biologists to remove livestock from areas where bull trout spawn once spawning begins. While this policy has extensive economic and political ramifications, limited data preclude evaluating its benefit to bull trout populations. We obtained data for this evaluation by assessing the probability of cattle stepping on bull trout redds in grazing allotments within the Little Lost River drainage. Bull trout redds were simulated using similarly sized clusters of clay shooting targets. Simulated redds were placed in streams in three grazing pastures where bull trout historically or currently spawn and where grazing typically occurs during the bull trout spawning season. Simulated redds were evaluated following the grazing period (treatment) and following a non-grazing period (control). During the 14 – 21 day grazing period, cattle disturbed and estimated 12 – 78% of the simulated redds. During a standardized 2 week period, cattle were responsible for impacting 10 – 78% of simulated redds and breaking 5 – 49% of the clays. Low impacts occurred in pastures containing dense conifer forests with little understory vegetation along the streams, while high impacts occurred in pastures where riparian canopies were open, grass along the stream was extensive, and the stream was easily accessible. Impacts to actual redds would be ameliorated by grazing before spawning is complete (all redds not at risk) and rotation grazing (risk not recurring annually). Impacts of the magnitude observed in this study could negatively affect bull trout populations if recruitment is the limiting factor, which likely occurs only when populations are depressed below the carrying capacity of the habitat.

Hardy

Enhancing Idaho's Fish Stocks: Protocol and Case Studies On Stream and Lake Fertilization

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ABSTRACT: Past fisheries management programs have focused on recovering a single fish species through direct methods of management. A growing number of fish managers are now, however, beginning to take a more indirect, holistic, ecosystem-based approach to rehabilitating fisheries. The addition of nutrients to boost productivity in trophic interactions is now starting to be recognized in the United States as a viable option for this purpose. This paper covers some of the more technical protocols, utilized primarily in British Columbia, on determining if a stream or lake is nutrient limited, steps to increasing its productivity, and case studies of successful enhancement projects. Identifying a water body's ambient water chemistry, nutrient concentration, and biomass at each trophic level is the first step in this process. A minimum of 1–2 years of pre-treatment study is required not only to determine the water bodies ambient trophic status, but also to identify any changes that take place if and when the treatment is administered. Phosphorous is said to be limited in a lake or stream if sample levels are below 1ug/L soluble reactive phosphorus (SRP) and 2-3 ug/L total dissolved phosphorous (TDP). Streams are considered nitrogen limited when dissolved inorganic nitrogen (DIN) concentrations are less than 20 ug/L or 30ug/L for spring epilimnetic samples obtained from lakes. Current EPA and DEQ water quality standards must be adhered to, and permitting guidelines should be followed prior

to any attempt at adding nutrients. Things to consider when setting up a nutrient enhancement program are: ambient nutrient levels, desired nutrient concentrations, timing of application, location of application site, type of fertilizer, budget, metals concentration of the fertilizer, ratio of DIN:TDP (total dissolved phosphorous). A misconception exists that fertilization will mend any fishery. However, in systems where food production is not the primary limiting factor, fertilization may not provide desired results.

Heindel

Use of Hydraulic Sampling Methods to Source Spring Chinook Salmon Eggs for a Captive Propagation Program

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ABSTRACT: In 1995, the Idaho Department of Fish and Game, in cooperation with NOAA Fisheries, the University of Idaho, and the Shoshone-Bannock Tribes, initiated an experiment to determine if captive rearing could be used to prevent localized extinctions of spring chinook salmon and to insure a continuum of spawners in three Idaho streams. Program objectives include developing fish culture techniques to rear adults through maturation in the hatchery, reintroducing maturing adults with appropriate morphological, physiological, and behavioral attributes, and monitoring and evaluating post-release behavior and spawning success. Fish are reared through smoltification at the Idaho Department of Fish and Game Eagle Fish Hatchery. Rearing from smolt through adult occurs in seawater at the NOAA Fisheries Manchester Experiment Station. In brood years 1994 through 1998, pre-smolts and smolts were collected to source rearing groups. Rearing groups collected as juveniles experienced losses associated with the presence of parasitic gill copepods and bacterial kidney disease. In addition, fish from two of the three stocks were infected with the causative agent of whirling disease. All stocks collected as juveniles exhibited skewed sex ratios and were slow to convert to a hatchery diet. Since brood year 1999, eyed-eggs have been collected to source rearing groups using hydraulic sampling equipment. Survival from collection to ponding has ranged from 75.4% to 100% and averaged 95.7%. Survival from ponding to seawater transfer has ranged from 88.3% to 97.9% and averaged 93.8%. Parasitic gill copepod and whirling disease infections have been absent in the program since brood year 1999. Additionally, mortality associated with bacterial kidney disease has been greatly reduced. Sex ratios in rearing groups are more evenly balanced and concerns associated with conversion to a hatchery diet have been eliminated. Drawbacks associated with sourcing rearing groups as eyed-eggs include higher age-2 male maturation and the potential disturbance of wild/natural redds.

Hesse

Tributary-specific Adult Steelhead Abundance in Two Small Tributary Streams of the Imnaha River Subbasin, Oregon

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ABSTRACT: Snake River steelhead (*Oncorhynchus mykiss*) have exhibited significantly declining numbers and low level of abundance of adults counted at Lower Granite Dam and are listed as threatened under the Endangered Species Act. Tributary specific quantitative information of steelhead status and population structure in the Snake River Basin is limited for B-run steelhead aggregates and virtually non-existent for A-run steelhead aggregates, making development of fisheries conservation or management actions problematic. Annual non-biased and precise quantification of adult abundance in component populations is essential to effective management. In this study, we estimated adult spawner abundance of anadromous A-run steelhead into two non-supplemented tributaries of the Imnaha River. Adult escapement monitoring via upstream and downstream portable picket weirs was initiated in Lightning Creek in 2000 and Cow Creek in 2001. Tributary specific estimated abundance in Lightning Creek has been 36 (35 – 41 95% CI), 141 (103 –186 95% CI), 231 (136 – 264 95% CI), from 2000 to 2002. Estimated abundance in Cow Creek has been 86 (70 –105 95% CI), 63 (54 – 71 95% CI), and 102 (88-116 95%CI) adults annually through 2003. Adult run-timing into spawning

areas spans from early-March through early-June. Sex ratios have been highly skewed, ranging from 62 to 87 percent female. Stray hatchery origin adults have comprised two to 32 percent of the total escapement.

Holderman

Diet Analyses of Mountain Whitefish and Peamouth Chub in the Kootenai River, Idaho

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ABSTRACT: Mountain whitefish (*Prosopium williamsoni*) and peamouth chub (*Mylocheilus caurinus*) diet was examined in the Kootenai River as part of an ongoing biomonitoring effort between the Kootenai Tribe of Idaho and the Department of Idaho Fish and Game. Whitefish and peamouth are the dominate fishes (numerically) in the canyon and meander reaches of the Kootenai River respectively, and were selected for analyses to provide a dietary baseline to compare post-treatment results with (a large-scale, controlled nutrient addition is being considered), and to gain understanding of in-river food web dynamics. Approximately 30 fish were collected at 5 biomonitoring stations each September during annual electrofishing. Fish were selected to represent small (<150mm), medium (150-250mm) and large (>250mm) size classes. Invertebrates were identified to the lowest possible taxonomic level, with most identified to genera. Initial findings are pending analysis but will be available at the ICAFS meeting in February 2004.

Hoyle

Responses of Periphyton and Benthic Macroinvertebrates to Experimental Additions of Nitrogen and Phosphorous in a Mesocosm Study

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ABSTRACT: The Kootenai River in Idaho is nutrient-depleted due to extensive river diking, channelization, impoundments and isolation/drainage of floodplain wetlands. Whole-river fertilization has recently been proposed to restore river productivity and native fish populations. Based on theoretical concepts of nutrient co-limitation, responses of naturally-colonizing periphyton and benthic macroinvertebrates to experimental additions of both N and P were assessed in a river mesocosm study. Treatment effects were 1.5 mg l^{-1} P $\pm$ 30 mg l^{-1} N, 3.0 mg l^{-1} P, 5.0 mg l^{-1} P $\pm$ 30 mg l^{-1} N.

Algal biomass and benthic macroinvertebrate density increased at higher P concentrations, particularly in relation to elevated N concentrations. There were prominent shifts in algal and macroinvertebrate taxa with nutrient addition. Blue-green and green algae were the dominant taxa at higher P and N concentrations, resulting in extensive periphyton blooms. Mayfly density progressively declined and chironomids density increased in response to these shifts in algal taxa. Yet, these growth responses should be anticipated in only select reaches of the Kootenai River. Given complex interactions between nutrients and fluvial geomorphology inherent to large alluvial rivers, additional studies will be required before undertaking large-scale fertilization of the Kootenai River.

Johnson

Implications of Tributary Re-connection to Establishing *Myxobolus cerebralis* in the Lemhi River Drainage, Idaho

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ABSTRACT: Language if the NOAA Fisheries Biological Opinion on habitat stresses re-establishing connection of tributaries. Both the federal and state bull trout recovery plans have similar reconnection provisions. Within the Lemhi River drainage there are several tributaries that are currently either permanently or seasonally disconnected from the main stem. Efforts to evaluate the feasibility and practicality of tributary connections have been ongoing. This has lead to a prioritization of tributaries within this effort. An aspect in this decision process that has been lacking is the potential to expand the geographic range of *Myxobolus cerebralis*, the cause of salmonid whirling disease as the result of re-connection. Therefore, the goal of our

study was to evaluate the presence/absence of the parasite within streams being considered a priority for re-connection.

Exposure of sentinel rainbow trout have proven an effective technique to demonstrate the relative prevalence and intensity of infection with *M. cerebralis.* Two series of exposures were performed during the summer, 2003. Methods employed were similar to those reported by Colvin et al (this meeting) in that each sentinel group was composed of 50 Hayspur strain rainbow trout reared to a size of 0.5 to 0.7 g, exposed in cylindrical liveboxes for 10 days. Following exposure sentinel groups were returned to the wet laboratory at the Eagle Fish Health Laboratory and held in 13 C well water until 1300 Celsius temperature units had accumulated. Individual fish were euthanized, decapitated and the heads split along the mid-line. Spore counts were performed with a hemocytometer on half-heads, expanded two-fold to yield an assay sensitivity of 3,300 spores/head. Infection prevalence was determined as the percent of the group demonstrated with spores typical of *M. cerebralis* and intensity based on the spore count (000).

The first exposure series (May,03) utilized four sites in the main Lemhi River: at the L6 irrigation diversion upstream of Salmon, mid-Lemhi (1 km downstream of the confluence of Hayden Creek), upper Lemhi and Big Springs Creek (2 km downstream of Leadore, ID). Liveboxes were similarly placed in the following tributaries: Bohannon Creek, Wimpey Creek, Kenney Creek, Hayden Creek (near former hatchery ponds), Canyon Creek, Big Eightmile Creek, Big Timber Creek, Canyon Creek, and Hawley Creek. Generally, sites were selected to be the most downstream reliable supply of water considering the 10-day exposure period.

The second exposure series (October, 03) concentrated on sites within the Hayden Creek drainage and repeated the main stem Lemhi river locations done on the first series. Six sites within Hayden Creek received replicated livebox exposure while those in the mainstem sites and Agency Creek had single exposure groups. Other methods of this series were similar to those of the first series.

Results*:* The prevalence of *M. cerebralis* infection of sentinel rainbow trout exposed in all main stem Lemhi River livebox sites was 100% and intensity of infection (average spore counts) for each site exceeded 200,000 spores/head. Sentinels exposed in six of eight tributaries had 100% prevalence but spore counts averaged lower than main stem Lemhi sites. Prevalence was 5% of those exposed in Bohannon Creek and 85% for Wimpey Creek and the intensity was relatively low. Hayden Creek sentinels had a prevalence of 100% but spore counts averaged 22,000 spores/head. This validated Hayden Creek as a good tributary for the second series of sentinel exposures.

The results of the second series are still pending but will be finalized by the time of the meeting. Whirling behavior, black tail, and cranial deformities were noted in sentinels exposed in main stem groups, Agency Creek, and Basin Creek of the Hayden Creek drainage. These observations indicate that a significant exposure was also obtained in the second trial as well.

Discussion and Conclusions*:* The Lemhi River from Leadore downstream to its confluence with the Salmon river was highly infectious for *M. cerebralis*. These observations substantiate previous observations obtained from wild salmonid examinations from the Lemhi River. The only tributary from which a low prevalence and intensity of infection was obtained was Bohannon Creek, all others were demonstrated to be highly infectious. These results of positive tributaries are contrasted to results obtained with similar methods used in tributaries of the Pahsimeroi River.

It is apparent from these sentinel trout exposures that the parasite has become established throughout the Lemhi River and its tributaries. This would lead to the conclusion that actions to reconnect tributaries to the main stem Lemhi River would not increase the existing range of the parasite.

Results from the second series will extend observations into additional tributaries and allow examination of whether tributary connection with the main Lemhi River influences prevalence and intensity of *M. cerebralis* exposure.

LaBar

Reducing Introgression with the Use of a Barrier in Tributaries of the South Fork Snake River, Idaho

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ABSTRACT: Our objectives were to determine if barriers could be used to reduce introgression between non-native rainbow trout *(Oncorhynchus mykiss)* and native Yellowstone cutthroat trout *(0. clarki bouvieri)* in two

spawning tributaries of the South Fork Snake River (SFSR), Idaho. We used a weir to capture rainbow trout, Yellowstone cutthroat trout, and hybrids (Yellowstone cutthroat x rainbow trout) entering into tributaries from the SFSR. In 2002, all phenotypic rainbow trout and hybrids were physically removed. Yellowstone cutthroat were physically passed above the weir to complete their spawning migration. Rainbow and hybrid trout were moved to other landlocked fisheries in eastern Idaho. Tissue (fin clip) samples were collected (10/week) for 8-13 weeks from adults captured at the weir and 10 samples/week were collected from age 0 fry until migration ceased or N = 100. DNA was extracted from tissue samples and three nuclear DNA gene regions were amplified using PCR to observe banding patterns and then converted to allele frequencies. All study areas showed significant allele frequency differences between adults captured at the weir and age 0 fry. Allele frequencies were also compared for released adults to removed adults and released adults to age 0 fry. In 2003, however, with substantially higher water levels, the weirs did not operate effectively, and many fish were killed on the weir panels and many others passed the weir without being captured. The Idaho Department of Fish and Game will be testing a different design in 2004. Nonetheless, this study suggests a physical barrier, when effective, may be used as a management tool to reduce introgression between nonnative rainbow trout and native Yellowstone cutthroat trout in tributaries of the SFSR.

LaFrentz

The Potential for Broodstock Immunizations as a Method to Reduce Bacterial Coldwater Disease in Rainbow Trout (*Oncorhynchus mykiss*) fry

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ABSTRACT*: Flavobacterium psychrophilum*, the etiological agent of bacterial coldwater disease (CWD), causes an acute systemic infection in salmonids and a few other species. Vaccination may be a possible means of reducing the occurrence of this disease, however, mortality often occurs at a life stage when vaccination not possible. The present study was designed to determine: (1) if immunization of female rainbow trout (*Oncorhynchus mykiss*) broodstock against *F. psychrophilum* stimulates transfer of specific maternal antibodies to fry through the egg, and (2) what the functional significance of this response is through challenge of fry with the bacterium. Female rainbow trout (n = 16 per treatment) were vaccinated intraperitoneally with formalin-killed *F. psychrophilum* with or without Freund's complete adjuvant (FCA), crude lipopolysaccharide (LPS) extracted from the bacterium with or without FCA or injected with phosphate-buffered saline. Six weeks following the initial vaccination, fish were booster-vaccinated with the same preparation without adjuvant incorporation. Females were spawned between 9 and 19 weeks post-vaccination, and at the time of spawning, eggs from individual females were fertilized. Sera from adults and eggs/fry at different developmental stages were sampled for the presence of anti-*F. psychrophilum* antibodies by an enzyme-linked immunosorbent assay. Progeny from select groups were challenged with a virulent strain of *F. psychrophilum* at approximately 4 days post hatch. Results demonstrate elevated levels of antibody in the sera, eggs and sac-fry of treatment groups when compared to the PBS controls. Maternally transferred antibody appeared to decrease from the time of fertilization to baseline levels in 8-day post hatch sac-fry. Although specific antibody was shown to be maternally transferred to fry, this antibody did not result in protection from pathogen challenge by injection. However, since this bacterium can be vertically transmitted, it can be speculated that enhanced immunity in broodstock and antibody transfer to eggs and sac-fry could reduce disease severity in newly hatched fry under natural conditions.

McGee

Evaluation of Surface Fines as an Index of Salmonid Habitat Conditions on the Payette National Forest

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ABSTRACT: Forest management occurs in the context of consideration for environmental conditions and potential alterations to fish and wildlife habitats, and often involves activities that can affect hillslope erosion

and sedimentation in streams, potentially degrading habitat quality for salmonid fishes. This topic has been extensively studied, and several sediment indices apparently related to habitat quality are available. The newly revised Land and Resource Management Plan (Forest Plan) for the Payette National Forest uses surface fines as an indicator of watershed condition. However, there appears to be little research supporting the use of surface fines in this role, and casual observation of sediment conditions on the West Side of the Forest while taking surface fines measurements suggested that the index may be misleading. We decided to test whether a statistical relationship between surface fines (using an intersection grid technique) and subsurface fines (using McNeil core sampling) could be detected. Field sampling comprised two phases. On the west side of the Forest (predominantly volcanic), we selected one pool and one low gradient riffle in 21 streams where we took three grid measurements and one core sample (depth ~15 cm). The second phase comprised 198 grid measurements and core samples (depth ~30 cm) in 6 spawning reaches of three streams in granitic landscapes. We modeled significant relationships in both phases of the study, but the variation in surface samples was very high compared to that in the core samples, and the relationships, as evidenced by low coefficients of determination (R^2), were poor. We conclude that surface fines are not particularly good indicators of intragravel conditions, that is, of interstitial living space or incubation area conditions, and is likely not particularly useful, by itself for determining baseline conditions or for monitoring the effects of management actions.

Narum

Coastwide Standardization of Chinook Salmon Genetic Data

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ABSTRACT: Population genetics has proved to be an effective tool for fisheries management providing estimates of hybridization, gene flow, population structure and diversity, and determining stock composition of mixed stock fisheries. As initial molecular techniques such as allozyme analysis yield to DNA techniques (specifically microsatellites), more informative genetic data is available. However, in order for microsatellite data to be fully utilized for management decisions on a broad scale, microsatellite databases must be created that contain standardized data generated from several laboratories. As occurred with the coastwide allozyme database, a period dedicated to standardizing microsatellite loci across labs is necessary. Standardization of loci would result in compatible generation of microsatellite data at all participating labs. This is contrary to the current mode of microsatellite data generation where data from various labs are not completely compatible and therefore not utilized coastwide.

Our lab in Hagerman, Idaho is one of seven participating labs undertaking an effort to standardize microsatellite data in Chinook salmon. The participating labs are located coastwide (Alaska - ADFG, British Columbia - CDFO, Washington – WDFW and NOAA Fisheries Seattle, Oregon - OSU, California - NOAA Fisheries Santa Cruz, and Idaho - UI/CRITFC). The first year of the plan has been dedicated solely to data standardization, with subsequent efforts to focus on generating standardized baselines with wide geographic coverage. The standardization effort has been a three phase process. Briefly the three phases are 1) Evaluate currently used microsatellite markers in all labs on a common set of 500 samples and pick 20 loci for common use at all labs, 2) Optimize data generation on the agreed subset of 20 common loci on 100 common samples, and 3) Provide a final determination of 20 standardized microsatellite loci to be used in all data generation for the coastwide microsatellite database. A final set of standardized loci is expected to be complete by July, 2004.

Nelson

Equivalent Clearcut Area and Fish Habitat Relationships on the Payette National Forest

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ABSTRACT: Equivalent Clearcut Area, or ECA, is an index that is commonly used for forested watersheds to identify the potential for anthropogenic or natural disturbances that remove forest vegetation to alter water

yields. Although the effects of forest vegetation removal on the hydrologic processes in forested watersheds have received extensive study, relationships have been shown to vary widely among watersheds. Furthermore, the effects of changes in hydrologic function, if any, from vegetation removal on attributes of fish habitat in affected streams have received very little study.

We investigated relationships among topographic features, geology, disturbance measures (road development and ECA, and fish habitat attributes to determine whether relationships between ECA and salmonid habitat variables could be detected. In some cases, ECA was correlated with fish habitat attributes, but these seemed to be coincidental rather than causative. Road development, however, was clearly related to streambed conditions (fines, median particle size [D_{50}], and geometric mean particle diameter [D_g]). There seemed to be some differences among channel types and between geologies, the most interesting being that ECA was correlated with larger particles in granitic watersheds; however, sorting results in smaller data sets, which results in weaker analyses. This and other confounding influences from lack of complete road data and methods of estimating ECA are also present. Our principal conclusion is that ECA, as measured on the Payette National Forest, cannot be shown to be related to salmonid habitat conditions, and that probable benefits of obliterating roads may well offset the hypothetical deleterious effects of small increases in ECA as we estimate it. Suggestions for validating relationships between ECA, hydrologic response, and possible effects on fish habitat are also discussed.

Pinson

Migration Patterns, Energy Expenditures, and Reproductive Success of Adult Chinook Salmon of the South Fork Salmon River, Idaho

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ABSTRACT: The purpose of this study is to relate migration history and estimates of energy expenditure to the reproductive success of Chinook salmon. Our objectives are to: 1) compare energy status, by proximate analysis, of South Fork Salmon River (SFSR) summer Chinook salmon at Bonneville Dam, at arrival to the weir on the SFSR, and after death on the spawning grounds (both pre- and post-spawned fish), 2) evaluate non-destructive techniques for assessing energy content, 3) evaluate spawning success of SFSR chinook salmon, and 4) relate the migration history of radio-tagged and PIT-tagged Chinook salmon migrating upstream to spawning grounds on the SFSR to energy status and spawning success.

In 2002, we collected 197 fish for proximate analysis, morphological measurements and bioelectrical impedance analysis. Radio-tagged and PIT-tagged fish were selected when possible. We found that lipid stores in the muscle decreased from an average of 20% at Bonneville Dam during May and June to 1% on the spawning grounds in August. Percentage moisture was negatively correlated with percentage lipid ($r = -0.96$ $p = <0.0001$). Morphological characters found to have the highest predictive value for changes in lipid and moisture content included weight, fork length, hump height, and body width. For fish sampled at the weir, migration time and percentage lipid of the muscle were negatively correlated ($r = -0.612$ $p = 0.0019$). In 2003, we measured 163 chinook salmon outfitted with radio transmitters at Bonneville Dam during May and June and 292 (188 pre-spawned and 104 post-spawned) carcasses found on the spawning grounds between July and September. We were able to follow individual fish from Bonneville Dam to the spawning grounds on the SFSR and found that weight, body depth, and hump height decreased by 27%, 24%, and 18%, respectively.

Pyron

Current Status of Bull Trout, *Salvelinus confluentus,* on Forest Service Lands in the Pahsimeroi River Drainage, Idaho

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ABSTRACT: Since 2001, the Forest Service has been completing an intense assessment of the distribution and assemblage of fish on all Forest Service lands on the Challis Ranger District of the Salmon-Challis National Forest. This paper focuses on all forest service lands located in the Pahsimeroi River drainage, a sub-basin of the Salmon River, Idaho. Some of the objectives of this paper were to determine the current distribution and abundance of bull trout, *Salvelinus confluentus*, and to prepare a preliminary assessment of

factors affecting bull trout populations on Forest Service lands. Through the use of aerial photos and visual assessments, we concluded that 85 out of 264 sample sites had perennial water. Out of the 85 sample sites that contained perennial water, 64 were sampled with electro-fishing or snorkeling equipment. Bull trout were found in 42 out of 64 or approximately 66% of the sampling sites. These results suggest a wide distribution and generally high abundances of bull trout throughout our study area. With a rugged landscape and limited human access, stream habitat is in good condition on most of the forest lands. However, many of these streams are diverted, dewatered, and disconnected from adjacent tributaries and main stem reaches at lower elevations.

Rust

Kootenai River White Sturgeon Recovery Investigations: Set and Jet Program

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ABSTRACT: Recruitment failure and the risk of demographic extinction has caused Kootenai River white sturgeon to be listed on the Federal register as an Endangered Species. Ten years of radio and sonic telemetry coupled with sediment coring by the USGS has indicated that Kootenai River white sturgeon are spawning over a substrate dominated by shifting sand. This poor spawning substrate and larval rearing habitat are thought to be leading contributors to recruitment failure. Although thousands of viable eggs have been collected over the past 10 years, only 1 larval white sturgeon has been collected, despite intense sampling effort. If spawning and rearing habitat is the leading contributor to recruitment failure, then managers and researchers are faced with a choice: to move reproductively mature adults to suitable spawning substrate and rearing cobble, or do nothing with the adults stock and wait until habitat restoration is achieved and then monitor adults. The purposes of the Set and Jet experiment were threefold: 1) to determine the feasibility of moving spawning white sturgeon long distances (> 35 kilometers) to a cobble habitat type; 2) to determine if white sturgeon will spawn after being moved; 3) if spawning does occur, will the cobble substrates lead to increased egg or larval survival. In 2003, nine male and three female white sturgeon with reproductively mature gonads were moved upstream to the Hemlock bar reach (rkm 262.0) and released. Their movements were monitored with radio and sonic telemetry. Four white sturgeon (2 males and 2 females) remained in the study reach for more than 1 week and four white sturgeon (2 males and 2 females) moved upstream after being released. On June 5th, 5 white sturgeon eggs were collected near the release site. No larval white sturgeon were collected. Moving white sturgeon to suitable spawning substrate appears to be a viable short-term program.

Santora

Modeling Effects of *Myxobolus cerebralis* on the Population Dynamics of the Salmonid and Oligochaete, *Tubifex tubifex*, Hosts

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ABSTRACT: Researchers recently have begun to explore risk analysis techniques to avoid the expansion of a salmonid whirling disease epidemic to uninfected trout populations. We developed a discrete compartmental model describing a simplified course of the parasitic infection of *Myxobolus cerebralis* through the populations of its two hosts, salmonid and *Tubifex tubifex*. The host dynamics influence host response over time, and hosts move between states of being susceptible, infected, and removed. We modeled one emerging fry population with twelve assumptions confining the model and seven equations regulating the process. Parameter estimates were interpreted and integrated from published literature when possible. The greatest influencing factors on fry survival were found to be *T. tubifex* density, susceptible fry density, and the density of the triactinomyxon form of the parasite. This was a first step model and we offer suggestions for future research to improve parameter estimates and construct probability distributions. Building a stochastic model with parameter probability distributions would incorporate random variability. To improve the model itself, dynamics could be extended to multiple years in order to examine effects on the population in the long term. Finally, model validation is necessary before being of serious use to managers.

Smith (Keynote)

Engineered Habitat: A Restoration Strategy for the Built Environment

Schill

Population Trends and an Assessment of Extinction Risk for Westslope Cutthroat Trout in Select Idaho Waters

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ABSTRACT: Despite westslope cutthroat trout (*Oncorhynchus clarki lewisi*) being petitioned for listing under the Endangered Species Act, formal evaluations of extinction risk for the sub-species have been quite limited. In this study, we summarize existing population trend data for westslope cutthroat trout, use the trend data to estimate population growth rates, and combine these with various likely initial population sizes to assess generalized extinction risk for westslope cutthroat trout within select Idaho drainages. Given the extensive monitoring period and the relatively broad dispersion of the sample sites involved, it is likely that the snorkel trend counts for westslope cutthroat trout in Idaho, collected by U of I graduate students and numerous IDFG/USFWS biologists, comprise the most extensive monitoring effort for a resident trout species ever conducted in America. Trend analysis of these data, including both inspection of graphs, and calculation of infinitesimal growth rates, indicate that westslope cutthroat trout have maintained or increased their population abundance over a large area within the state of Idaho during the past 15-34 years. Total estimates of westslope cutthroat trout numbers within various Geographic Management Units (GMU's) conservatively range from 6,500 to 341,000 fish, with a combined estimate of approximately 1.2 million fish for the GMUs considered in this study. Mean sub-basin population size ranged from about 400 to 13,000 fish. Population persistence for 100 years ranged from high to low for various individual local populations. However, study results suggest that numerous sub-populations within most GMU's, available to interact within a classic or less traditional metapopulation framework, would result in a high ($\geq$95%) probability of westslope cutthroat trout persistence over 100 years.

Van Kirk

Hydrologic Alteration and its Effect on Trout Recruitment in the South Fork Snake River

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ABSTRACT: Hydrologic alteration may contribute to declining Yellowstone cutthroat *Oncorhynchus clarki bouvieri* and increasing nonnative rainbow *O. mykiss* trout abundances in the South Fork Snake River, Idaho. We calculated natural flows on upper and lower reaches of the South Fork below Palisades Dam and compared them with regulated flows. We measured hydrologic alteration as percent difference between regulated and natural discharge and the sum of its absolute value over time. We investigated trout-hydrology relationships with regression analysis. Regulation has caused decreased winter, increased early spring, decreased peak (June), and increased irrigation season (summer) flows. Trout recruitment depended more on hydrologic characteristics during spawning and first-summer growth periods than on those during other life history periods and more on alteration than on actual discharge. In the upper reach, rainbow trout recruitment made abrupt jumps following years in which maximum/minimum discharge ratio was low. Cutthroat recruitment was highest following years in which maximum/minimum ratio was high, tributary discharge was high, and spring through fall alteration was low. Rainbow trout remain absent from the lower reach, where maximum/minimum discharge ratios are much higher due to winter-time diversion. We recommend changing management to provide higher and sharper peak flows and higher maximum/minimum discharge ratios.

Vogel

Application of a Comprehensive Life Stage Evaluation Approach to Assess Artificial Propagation in Salmon Recovery in Johnson Creek, Idaho

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ABSTRACT*:* In the Johnson Creek drainage of central Idaho, the Nez Perce Tribe has established a supplementation program with the goal to reduce the demographic risk of extirpation and to conserve genetic and life history traits of a threatened summer chinook salmon subpopulation. Comprehensive monitoring and evaluation of the supplementation program requires knowledge of phenotypic traits and life cycle survival rates of a species that exhibits a diverse life history. This program incorporates a life cycle and life history characteristic approach that monitors the fish from egg to adult to quantify, juvenile survival, smolt-to-adult return rates, and progeny-to-parent ratios. Utilizing PIT tag technology, survival estimation modeling (juvenile survival to Lower Granite Dam), adult counts, spawning ground and carcass surveys and genetic analysis, we can provide the crucial information to examine differential life stage survival for both supplemented and natural fish.

Supplementation releases were initiated in Johnson Creek in the year 2000 from adults collected in 1998. Smolt survival from Johnson Creek to Lower Granite Dam has ranged from 19-24% for supplemented fish and 49-62% for natural fish. The first complete cohort of returning supplemented and natural fish completed their adult returns in 2003. Smolt-to-adult return rates (Lower Granite Dam to Johnson Creek) were 2.8% for supplementation fish and 3.6% for natural fish and progeny-to-parent estimates were 13.7 for supplemented fish and 8.3 for natural fish.

Utilization of these concepts is starting to provide quantification of the effects of artificial propagation for conservation and recovery.

Walters

Bull Trout in North and South Callahan Creeks, Idaho

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ABSTRACT: Bull trout are known to occur in North and South Callahan creeks (Kootenai River drainage), Idaho, but little else is known about this population. Redd surveys were conducted in 2002 and 2003 to determine spawn timing and sizes of spawning fish. A total of 17 redds were found in 2002 and 42 were found in 2003. Most spawning occurred during the last two weeks of September and the first week of October, while water temperatures were below 9 ^{o}C. The median total length of bull trout observed during redd surveys was 460 mm (range = 150-680 mm), indicating a fluvial or adfluvial spawning population. Electrofishing surveys were also conducted in August 2003 to determine the size structure of bull trout rearing in the streams. Based on length frequencies, most juvenile bull trout were age-0, 1, or 2, indicating successful recruitment from the 2000, 2001, and 2002 year-classes. Maximum daily water temperatures in July and August were frequently between 16 and 16.5 ^{o}C, but average daily temperatures remained below 14.5 ^{o}C. The Callahan Creek drainage supports the largest population of bull trout in the Idaho portion of the Kootenai River drainage, and should be monitored relative to ESA recovery goals for the drainage. I recommend annual index redd counts be conducted on North Callahan Creek from the mouth of Jill Creek upstream for approximately 3 km to a waterfall migration barrier, and on South Callahan Creek from the bridge crossing on Forest Road 4554 (just downstream of the Idaho-Montana border) upstream to the bridge crossing on Forest Road 4541 (just upstream of Glad Creek). The index counts should be done during the second week of October.

Williams (Keynote)

Integrating Artificial Production with Salmonid Life History, Genetic, and Ecosystem Diversity: A Landscape Perspective

Yanke

Temperature-dependent Survival of Juvenile Snake River Fall Chinook Salmon

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ABSTRACT: Previous research with passive integrated transponder (PIT)– tagged juvenile fall Chinook salmon released into Lower Granite reservoir in the Snake River demonstrated an inverse correlation between water temperature and fish survival. The causal mechanism for this relationship is unknown, as is the level of post-tagging mortality associated with high temperatures. To compensate, cool waters are released into the reservoir each summer when surface temperatures reach 20°C. We conducted a laboratory study to assess the relationship between water temperature and survival in fresh and seawater, and to quantify the differential mortality that may be caused by PIT tagging. Control (i.e., not tagged) and PIT-tagged fish were gradually acclimated to constant temperatures of 16, 20, 24 and 28°C. We observed high survival and growth rates in fish held at 16 and 20°C. We observed detrimental effects on growth, behavior, physical appearance, and survival in freshwater and seawater in groups of fish that were acclimated to a constant temperature of 24°C. We observed 100% mortality in groups of control and PIT-tagged fish when temperature exceeded 26°C during the acclimation period of a 28°C treatment. When compared with fish reared at lower temperatures, blood plasma profiles from fish reared at 24°C showed likely tissue damage, reduced energy conversion and lowered osmoregulatory responses after a seawater challenge. Our preliminary findings support the 20°C management objective for Lower Granite Reservoir and the use of PIT tags to study temperature-survival relations.

POSTERS

Brodstrom

The Fish Restoration and Mitigation Act and National Fish Passage Program - Funding Opportunities for Irrigation Diversion Screens and Fish Passage in Idaho

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ABSTRACT: The U.S. Fish and Wildlife Service (Service) has two cost-share programs that specifically fund projects to increase fish survival and restore native fish and other aquatic species to self-sustaining levels by reconnecting habitat that has been fragmented by barriers. The first, the Fish Restoration and Mitigation Act (FRIMA) funds fish screening and passage projects associated with water diversions in Idaho, Washington, Oregon and western Montana. Using a 65% cost-share, the Service works with landowners, local groups, and state, tribal and local governments to build fish screens, fish ladders and related modifications to water diversions that are directly associated with screening or passage improvements. Completed or ongoing projects in Idaho include the Bear Creek Ditch in the Weiser Subbasin, Garden Creek in the South Forks Snake River, several projects in the Upper Salmon basin and diversion inventory projects conducted by the Idaho Department of Fish and Game. The second program is the National Fish Passage Program, which provides technical assistance and funding to local communities and partner agencies to restore natural flows and fish migration through barrier removal and bypass. Projects in the Pacific Northwest include culvert renovations, fishways, dam removals and fish screening structures. In Idaho, there have not been any projects submitted or funded through the National Fish Passage Program through 2003, but several projects were submitted for funding in 2004. Those not funded by the National Fish Passage Program are considered for funding using habitat monies implemented out of the Idaho Fisheries Resource office. One project using this funding mechanism, the East Fork American River culvert replacement, will be completed in 2004. The FRIMA program information and applications can be obtained at

http://pacific.fws.gov/Fisheries/Fish%20Passage-Screening%20Applications.htm. Information on the National Fish Passage Program can be viewed at http://fisheries.fws.gov/FWSMA/FishPassage/index.htm.

Cegelski

An Assessment of Introgressive Hybridization Between Yellowstone Cutthroat Trout and Introduced Rainbow Trout in the Snake River Basin: Conservation and Management Implications

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ABSTRACT: One factor contributing to the decline of Yellowstone cutthroat trout (YCT) throughout its historic range is introgressive hybridization with non-native rainbow trout. In this study, we examined levels of hybridization and introgression within populations of cutthroat trout throughout the Snake River basin, upstream of Shoshone Falls. Fifty populations were screened with one diagnostic mitochondrial DNA marker and four diagnostic nuclear markers. Results indicate that 70% of the populations were without detectable rainbow trout alleles. However, localized areas of introgressive hybridization were observed in the Blackfoot River and the South Fork of the Snake River. Fisheries managers are now focusing efforts within these localized areas to identify and preclude phenotypic hybrids and rainbow trout from moving above weirs to YCT spawning tributaries. Results from a case study on the Blackfoot River not only indicated that phenotypic identifications were highly accurate in differentiating YCT from rainbow trout and first generation hybrids, but also demonstrated low numbers of hybrids and no rainbow trout introgression within the adfluvial population sampled at the weir. This indicates weir management may be effective at monitoring introgression rates and reducing the rate of introgression over time. However, the presence of resident rainbow trout above weirs as well as multiple migrant and resident YCT populations within each drainage may complicate management actions. Future assessments should include routine genetic investigations to monitor introgression rates and address more detailed questions involving population genetic structure.

Redding

A Simple Isolation Incubator for Specialized Rearing of Salmonid Eggs and First-Feeding Fry

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ABSTRACT: We designed an inexpensive isolation incubator for small-scale fish culture and laboratory use. The simple, inexpensive (US$5) isolation incubator is routinely used to incubate up to 800 sockeye *Oncorhynchus nerka* and chinook salmon *O. tshawytscha* green eggs through the first-feeding fry stage of development at the Idaho Department of Fish and Game's Eagle Fish Hatchery. The incubator is designed to be small, portable, requires a small amount of water per individual unit, and provides a means to incubate multiple rearing groups in a quarantine environment through early development. While our use has been exclusively for incubation of salmonids, we expect that this design can be used to successfully incubate eggs from a number of different fish species.

Steifel

Spatial Distribution of Radio-tagged Migratory Bull Trout Mortalities in the Boise River Watershed

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ABSTRACT: We monitored the movements of radio-tagged migratory bull trout *Salvelinus confluentus* from 1 September through 31 December 2003 in Arrowrock Reservoir and the upper Boise River, located in

southwestern Idaho. We observed a dramatic increase in mortality rates of tagged fish when compared to previous years in the same system. In telemetry studies it is difficult to definitively identify causes of mortality using recovered radio tags and carcasses because observers are not usually present at the time of death. In the Boise River system we have identified several sources of mortality including predation and asphyxiation following the collapse of undercut banks. The location and cause, based on observation in the field, of each mortality was imported into ArcGIS and a density analysis was performed. Spatial analysis revealed that particular sources of mortality were prevalent in specific areas in and around Arrowrock Reservoir. Predation did occur throughout the watershed but the highest densities were located near the confluence of the South Fork of the Boise River, which is known to be a wintering area for raptors. Asphyxiated fish were found only in the river channel located between the normal minimum pool and reduced pool, where the channel defined itself following dewatering.