Migration timing, growth, and estimated parr-to-smolt survival rates of wild Snake River spring-summer Chinook salmon from Idaho to the lower Snake River

Fish Conservation & Management Session

Keywords

Survival, growth, and juvenile migration timing are key life history traits for at-risk salmon populations. To estimate these traits in threatened wild Snake River spring-summer Chinook salmon, we PIT (passive integrated transponder) tagged these fish as parr in as few as 3 to as many as 17 natal streams, each summer, within the Salmon River basin from 1992 to 2003. Each spring and summer following tagging, fish were detected as smolts in the juvenile fish bypass systems of lower Snake River dams. Estimated parr-to-smolt survival to Lower Granite Dam ranged from 3 to 48% for individual populations and from 8 to 25% (yearly average 16%; yearly standard errors generally less than 1%) for all streams combined. Annual migration timing distributions for fish populations from the different streams varied highly within and between years at this dam. Overall annual average parr-to-smolt growth rates from tagging to detection at Little Goose Dam ranged from 39.7 to 43.3 mm from 2001 to 2004, with significant differences in growth among sites and years. Development of in-stream monitoring of PIT-tagged fish will be briefly discussed. Baseline data generated by this project provide a foundation for understanding the bio complexity of these populations, an understanding critical to effective recovery efforts for these threatened wild fish stocks.

Contact

Achord, Stephen
Fisheries Research Biologist
National Marine Fisheries Service, NOAA
2725 Montlake Blvd. E.
Seattle, WA 98112-2097USA

Email: Steve.Achord@noaa.gov
Phone: 509-547-7518
Fax: 509-547-4181

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Richard Zabel
National Marine Fisheries Service
Rich.Zabel@noaa.gov

Benjamin Sandford
National Marine Fisheries Service
Ben.Sandford@noaa.gov

John Williams
National Marine Fisheries Service

John.G.Williams@noaa.gov

Surveying professional opinion to describe limiting factors, establish keys to recovery and prioritize future research efforts for bull trout.

Bull Trout Symposium

Keywords
bull trout subcommittee, survey, limiting factors

Understanding the ecology of a species and how threats actively or historically influence(d) the distribution and status of that species across wide geographic ranges is difficult. This is especially true for bull trout, since populations are often small and isolated, and threats may operate independently across drainages. In 2005, the Montana Chapter of AFS proposed a professionally-designed survey of members with bull trout expertise that would allow for objective, scientific responses to address concerns regarding the research, monitoring, and the current threats to this species. Within this context, we developed a survey to assess limiting factors, current status and ability to detect status, and to determine and possibly prioritize possible future research efforts for bull trout. The survey was sent to AFS member fisheries biologists in government agencies, Tribes, academia, and private sectors involved in bull trout research and monitoring. We maintained confidentiality on employment affiliation and level of experience, and summarized those results by category to estimate potential bias introduced in respondent's observations based on background. Results of this survey are intended to provide policy and decision makers with additional perspective, incorporating professional scientific judgment of prospects for bull trout recovery and the impediments or keys to achieving it.

Contact

Al-Chokhachy, Robert
Bull Trout SubCommittee
Utah State University; Utah Cooperative Fish and Wildlife Research Unit

5210 Old Main
Logan, UT 84322-5210USA

Email: robertal@cc.usu.edu
Phone: 435-797-3524

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Don Ratliff
Portland General Electric
Donald.Ratliff@pgn.com

Frank Shrier
Pacificorp
Frank.Shrier@Pacificorp.com

Steve Yundt
Idaho Fish and Game
syundt@idfg.idaho.gov

Wade Fredenberg
US Fish and Wildlife Service
Wade_Fredenberg@fws.gov

Chris Frissell
Pacific Rivers Council
hanfris@digisys.net

Shelley Spalding
US Fish and WIldlife Service
Shelley_Spalding@fws.gov;

Kate Walker
US Forest Service
kpwalker@fs.fed.us

Bob Hughes
Oregon State University, EPA
Hughes.Bob@epamail.epa.gov

Using mark-recapture techniques to assess bull trout demographics and guide recovery efforts

Bull Trout Symposium

Keywords
Bull trout, life-cycle models, survival estimates

Designing recovery and management strategies for fish populations often requires explicit information regarding the life stage that limits population growth. Bull trout, a threatened species of char native to the Pacific Northwest, have experienced significant declines throughout their range. For bull trout populations that are composed of both resident and migratory forms, the identification of factors limiting population growth can be especially challenging. We used individual mark-recapture data in combination with passive, instream detectors to estimate key demographic rates including survival, emigration, and growth rates across six size classes (2002-2005). We used this information to model bull trout population dynamics using perturbation analyses and to estimate relative contributions of different size-classes and life-history forms to overall population growth. Across life-history forms, our results suggest that fish that exhibited migratory behavior had significantly higher survival rates than resident bull trout. Our population models suggest that survival rates of juvenile size classes (<220 mm) have the greatest influence on population growth; changes to adult survival rates (>220 mm), however, have only a moderate influence on population growth rates. Our estimates of demographic and vital rates provide critical information necessary for directing the recovery, habitat restoration, and management of this imperiled species.

Contact

Al-Chokhachy, Robert
Utah State University, Utah Cooperative Fish and Wildlife Research Unit
Aquatic, Watershed, and Earth Resources Department
5210 Old Main
Logan, UT 84322-5210USA

Email: robertal@cc.usu.edu
Phone: 435-797-3524

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Phaedra Budy
Utah Cooperative Fish and Wildlife Research Unit
phaedra.budy@cc.usu.edu

ASSESSMENT OF TUBIFEX TUBIFEX HABITAT AND MYXOBOLUS CEREBRALIS DISTRIBUTION IN PELICAN CREEK, YELLOWSTONE NATIONAL PARK

Natives & Newcomers Symposium

Keywords
Myxobolus cerebralis, Whirling disease, Yellowstone cutthroat trout, introduced parasite

The introduced parasite that causes whirling disease (WD) in salmonids, Myxobolus cerebralis, poses a significant threat to the Yellowstone cutthroat trout (YCT) population of Yellowstone Lake. Although, numbers of YCT have declined significantly in Pelican Creek, a large spawning tributary to Yellowstone Lake, similar declines have not been observed in other nearby spawning tributaries. Infection risk in Pelican Creek was quantified using infection prevalence in the alternate host, Tubifex tubifex (Oligochaeta: Tubificidae) and compared with infection prevalence and severity in sentinel fish. The development of tubificid habitat assessment and detection tools based on variation among tubificids and habitat in the Pelican Valley are in progress. Uniform (100%) infection prevalence and high infection severity in sentinel fish suggested that WD risk was high among sites in the Pelican Creek watershed. In contrast, patchy patterns of infection in tubificids suggested that M. cerebralis does not have uniform distribution throughout the watershed. Thus, the highly variable patterns of tubificid and infected tubificid abundance relative to habitat type warrants further investigation. Knowledge of the distribution of M. cerebralis is important for understanding the factors affecting WD risk and YCT population declines, and to facilitate YCT conservation efforts within Yellowstone National Park.

Contact

Alexander, Julie
310 Lewis Hall
Montana State University
Bozeman , MT 59717USA

Email: jalexander@montana.edu
Phone: 406.994.4068

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Billie Kerans
bkerans@montana.edu

Todd Koel
todd.koel@nps.gov

Assessing the Feasibility of Reintroducing Bull Trout (Salvelinus confluentus) into the Clackamas River, Oregon

Bull Trout Symposium

Keywords
bull trout, reintroduction, feasibility assessement, Clackamas River

A collaborative working group of fisheries biologists and scientists have assessed the feasibility of reintroducing bull trout (Salvelinus confluentus) in the Clackamas River, tributary to the Willamette River, Oregon. Bull trout, recorded and documented by David Starr Jordan in the 1870s and once prolific throughout Clackamas River, are locally extinct; being last documented in the upper river during the early 1970s. Using the 1988 American Fisheries Society guidelines for introductions of threatened and endangered species (Williams et al. 1988), the collaborative working group examined five major components in assessing the feasibility of reintroduction. First, all major factors accounting for the local extirpation of bull trout in the Clackamas River were examined to determine if threats have been remedied. Second, a thorough habitat suitability analysis was completed to determine available habitat patches capable of supporting spawning and rearing life-stages. Third, a genetic and demographic analysis was made to assess potential donor stocks for use. Fourth, evaluations were conducted to address concerns relating to potential ecological interactions with other species (both native and non-native) and food web dynamics. And fifth, specific monitoring and evaluation recommendations were developed. The feasibility assessment is scheduled to be finalized in the spring of 2006.

Contact

Allen, Christopher
Fisheries Biologist
U.S. Fish and Wildlife Service
2600 SE 98th Avenue, Suite 100
Portland, OR 97266USA

Email: chris_allen@fws.gov
Phone: 503.231.6179
Fax: 503.231.6195

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Dan Shively
U.S. Forest Service, Mt. Hood NF
dshively@fs.fed.us

Brad Goehring
U.S. Fish and Wildlife Service
bradley_goehring@fws.gov

Todd Alsbury
Oregon Department of Fish and Wildlife
Todd.Alsbury@state.or.us

Jason Dunham
USGS, FRESC
jdunham@usgs.gov

Tim Shibihara
Portland General Electric
tim.shibahara@pgn.com

Comparison of a Mark-Recapture Population Estimate and a Hydroacoustics Survey Estimate on Northern Pikeminnow in Lake Cascade, Idaho

Fish Conservation & Management Session

Keywords
population estimates, northern pikeminnow

The yellow perch Perca flavescens fishery in Lake Cascade, an 11,330 ha reservoir in west central Idaho, was Idaho's number one sportfishery in the 1980's. The perch population dramatically declined by the late 1990's, impacting both the fishery and the economics of the area. Efforts to understand and rebuild the sportfishery began in 1998 by Idaho Department of Fish and Game managers. A major constraint to yellow perch production was hypothesized to be predation by adult northern pikeminnow Ptychocheilus oregonensis. To better understand the possible predation aspects of our situation we conducted two independent population estimates on northern pikeminnow in the reservoir in 2003. We used Lake Merwin Traps to capture and mark northern pikeminnow. We then conducted a reservoir wide stratified gill net recapture effort. Concurrent with the more standard mark-recapture study we also conducted a hydroacoustics survey using a split-beam digital echosounder and multi-plexing between horizontally and vertically-aimed transducers The mark-recapture estimate for northern pikeminnow > 250 mm was 24,413 (95% CI) +/- 25%. The hydroacoustics estimate produced for northern pikeminnow > 250 mm was 42,108 (90%CI) +/- 30%. The similar estimates were strong evidence for managers to propose experimental reductions of northern pikeminnow as a recovery measure for yellow perch.

Contact

Allen, Dale
Regional Fishery Manager
Idaho dept. of Fish and Game
555 Deinhard Lane
McCall, ID 83638USA

Email: dallen@idfg.idaho.gov
Phone: 208-634-8137
Fax: 208-634-4320

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Arthur Butts
Idah Department of Fish and Game
abutts@idfg.idaho.gov

Paul Janssen
Idaho Department of Fish and Game
pjanssen@idfg.idaho.gov

Utilization of Floodplain Habitats by Native Fish Species and Non-Native Brook Trout (Salvelinus Fontinalis)

Natives & Newcomers Symposium

Keywords
brook trout,floodplain

Brook trout (Salvelinus confluentus) are broadly introduced in western North American rivers and lakes with variable impacts on native aquatic ecosystems. Influences on native fish communities in floodplains are particularly inadequately understood. The objective of our study is to examine habitat utilization by native fish species and non-native brook trout across a flood plain of the Middle Fork Flathead River (MT). We quantified fish communities and habitat structure of main channel riffle, run, and pool reaches and lateral shallow shoreline, backwater, parafluvial springbrook and orthofluvial springbrook reaches. Parafluvial habitats are those scoured by annual flood flows while in orthofluvial zones annual floods predominately deposit sediment. Habitat use was measured using visual streamside observation, snorkeling, benthic surveys, and electrofishing in 2004-2005. Backwaters and parafluvial springbrooks contained the most diverse native fish communities for species and life history stages. While brook trout were found in all floodplain habitats, they achieved an order of magnitude higher density (1.26 fish/m2) and biomass (3.81 g/m2) in orthofluvial springbrooks. Orthofluvial springbrooks provide low scouring flood frequency, high physical habitat complexity, stable thermal regimes in the preferred temperature range for salmonids (5-15o C), abundant high quality spawning sites, and terrestrial food subsidies from riparian vegetation.

Contact

Anderson, Michelle
Flathead Lake Biological Station, University of Montana

Polson, MT 59860-9659USA

Email: laperi@excite.com
Phone: 406-982-3301

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Jack Stanford
Flathead Lake Biological Station
jack.stanford@umontana.edu

Use of In-stream PIT-tag Detectors to Monitor Bull Trout Populations in Washington and Montana

Bull Trout Symposium

Keywords
PIT tag, stream monitoring, bull trout, movement

We installed in-stream PIT-tag detectors in the Tucannon River, Washington, and in Trail Creek, Montana to monitor population demographics and life history characteristics of bull trout. The Tucannon River project is funded by the U.S. Army Corps of Engineers and managed by the U.S. Fish and Wildlife Service and the Trail Creek project is funded by the Bonneville Power Administration and Montana Fish, Wildlife and Parks. Biomark Inc. developed a weir antenna designs because it may be less susceptible than pass-through antennas of being displaced by debris or high flow events. Weir antennas were installed at both sites, while flat plate and pass-through antennas were also installed in the Tucannon River. The flat plate “log” antennas are approximately 3 m long, the pass-through antennas openings measure 1-by-6 m, and the weir antennas are each 2 m wide. In Trail Creek, we implanted 300 juveniles upstream of the antenna during fall 2005, and 295 fish were tagged in the Tucannon River. As of January 2006, ten PIT-tagged bull trout were detected passing downstream over the Trail Creek detector system, and 12 bull trout released in the Tucannon River were detected. Future work will assess detection efficiencies of adult spawners and potential design modifications. These data will be used to help fisheries biologists to more precisely monitor population trends, identify recovery and extinction thresholds for conservation and recovery programs, and examine effects of recovery and restoration activities.

Contact

Anglea, Steve
Fisheries Biologist
Biomark, Inc.
7615 W. Riverside Dr.
Boise, ID 83714USA

Email: steve.anglea@biomark.com
Phone: 208-275-0011
Fax: 208-275-0031

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Carrie Bretz
U.S. Fish and Wildlife Service
Carrie_Bretz@fws.gov

Clint Muhlfeld
Montana FWP
cmuhlfeld@mt.gov

An Assessment of Native Fish Losses to Irrigation Diversions on Lost Horse and Tin Cup Creeks, Montana

Poster Session

Keywords
westslope cutthroat trout, native fish, entrainment rates, irrigation diversions

Information about entrainment rates of fish into irrigation diversion canals in riverine systems and the factors that influence these rates is limited. Entrainment is especially prevalent among migratory native salmonid species, which can enter diversions as post-spawn adults migrating downstream or as juveniles emigrating from nursery tributaries. Such problems appear to be particularly common among westslope cutthroat trout and bull trout populations in tributaries of the Bitterroot River, where irrigation losses may be responsible in part for low abundances and restricted distributions of these species. Our goals were to quantify entrainment rates of fish into all diversions on two tributaries of the Bitteroot River and to identify physical, spatial, and temporal characteristics of these diversions that correlate with rates of entrainment. We sampled fish species in 2005 by snorkeling, electrofishing, fry trapping, and reconnaissance at 60 sites located in irrigation diversions on Lost Horse and Tin Cup Creeks. A total of 9,256 adult and juvenile fish in Lost Horse Creek diversions and 2,819 adult and juvenile fish in Tin Cup Creek diversions were observed or captured. Preliminary analysis of our data indicates that the highest entrainment rates occurred in canals diverting the greatest amounts of water.

Contact

Bahn, Leslie
Graduate Research Assistant
Montana Cooperative Fishery Research Unit
Montana State University
P.O. Box 173460
Bozeman, MT 59717USA

Email: lbahn@montana.edu
Phone: 406-994-6643
Fax: 406-994-7479

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Alexander Zale
Montana Cooperative Fishery Research Unit
zale@montana.edu

Christopher Clancy
Montana Fish, Wildlife, and Parks
cclancy@fs.fed.us

Mark Lere
Montana Fish, Wildlife, and Parks
mlere@state.mt.us

Seining Effort Needed to Estimate Species Richness of Small Littoral Zone Fishes: A Simulation Study in Three Wyoming Reservoirs

Fish Conservation & Management Session

Keywords
sampling effort, seine, species richness, Wyoming

Seining is commonly used to determine species distributions and to estimate species richness of small fishes in littoral zones of lentic habitats. However, little guidance exists on the seining effort required to properly estimate species richness for lentic habitats. Our objective was to determine the seining effort needed to estimate species richness for three Wyoming reservoirs. We conducted a simulation study based upon seining data collected from three reservoirs in order to define the sampling effort needed to estimate species richness. Eighteen to thirty-eight seine hauls were needed to have a 90% probability of detecting approximately 90% of the species present and 42 to 66 seine hauls were needed to have a 90% probability of detecting all of the species present. Seining appears to be an effective tool for estimating species richness for Wyoming reservoirs even though considerable effort is required for precise estimates.

Contact

Bailey, Paul
Fisheries Biologist
North Dakota Game and Fish Department
406 Dakota Avenue
Riverdale, ND 58565USA

Email: pbailey@state.nd.us
Phone: 701-654-7475
Fax: 701-654-7503

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Ken Gerow
University of Wyoming, Department of Statistics
gerow@uwyo.edu

The Lake Sakakawea Chinook Salmon Fishery: Current Stocking Strategies and Challenges

Chinook Culture Symposium

Keywords
Chinook salmon, culture, stocking, size

Chinook salmon were first introduced into North Dakota's Lake Sakakawea in 1976 and currently constitute 8% of the fish harvested annually from this fishery. Stocking strategies have varied greatly with 37,000 to 1,140,000 fish stocked annually ranging in size from 1,880/lb. to 7.4/lb. Coded wire tagging studies have lead to several significant refinements to our stocking strategies including size at stocking, culture methods and stocking location. The present drought and corresponding declines in forage fish populations have severely impacted this fishery and present numerous challenges to fish spawning operations.

Contact

Bailey, Paul
Fisheries Biologist
North Dakota Game and Fish Department
406 Dakota Avenue
Riverdale, ND 58565USA

Email: pbailey@state.nd.us
Phone: 701-654-7475
Fax: 701-654-7503

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Partial Covers on top of Circular Tanks Improve Salmonid Rearing Performance

Fish Conservation & Management Session

Keywords
salmonid, hatchery rearing, trout, cover, tank

Juvenile brown trout Salmo trutta and rainbow trout Oncorhynchus mykiss were grown in circular tanks either completely open on top or partially (29%) covered. In each of four trials, fish reared in tanks with partial covers were significantly larger than those reared in completely uncovered tanks. The use of partial tank covers also improved total tank weight gain and feed conversion, although these means were significantly different in only 2 or the four trials. No significant differences in percent mortality between open and partially-covered tanks were observed. The use of partial tank covers is recommended to improve the growth of juvenile trout in circular tanks during hatchery rearing.

Contact

Barnes, Michael
South Dakota Department of Game, Fish and Parks
McNenny State Fish Hatchery
19619 Trout Loop
Spearfish, SD 57783USA

Email: mike.barnes@state.sd.us
Phone: 605-642-6920
Fax: 605-642-6921

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Will Sayler
South Dakota Department of Game, Fish and Parks
will.sayler@state.sd.us

Dan Durben
Black Hills State University
dandurben@bhsu.edu

Jess Miller
South Dakota School of Mines and Technology

Spawning returns from landlocked fall chinook salmon reared in raceways receiving different water flows.

Chinook Culture Symposium

Keywords
chinook salmon, landlocked, post-stocking, flows, hatchery rearing

Feral landlocked fall chinook salmon from Lake Oahe, South Dakota were reared under different water flow regimes using two raceway series at McNenny State Fish Hatchery, Spearfish, South Dakota in both 1999 and 2000. One raceway received flows of 750 L/min and flows in the other were 1,500 L/min. Approximately 10,000 salmon at a mean weight of 5 g were moved into the two raceway series in 1999 and reared for 5 months prior to stocking at a mean weight of 56 g. In 2000, 15,000, 17 g salmon were reared for two months prior to stocking at 56 g. No significant differences in gain, conversion, growth, or fin condition were observed in fish reared under the different flow regimes in either rear of the study. From the salmon stocked in 1999, 64 fish (6.5%) and 71 fish (7.3%) returned to spawn from the establish flow and high flow groups respectively. The high flow regime in 2000 had 183 (12.2%) salmon return to spawn, which was significantly more than the 117 (7.8%) from the low flow group. Fluctuations in Lake Oahe environmental conditions likely contributed to the differing results from year to year.

Contact

Barnes, Michael
South Dakota Department of Game, Fish and Parks
McNenny State Fish Hatchery
19619 Trout Loop
Spearfish, SD 57783USA

Email: mike.barnes@state.sd.us
Phone: 605-642-6920
Fax: 605-642-6921

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Will Sayler
South Dakota Department of Game, Fish and Parks
will.sayler@state.sd.us

Robert Hanten
South Dakota Department of Game, Fish and Parks
Robert.Hanten@state.sd.su

Rick Cordes
South Dakota Department of Game, Fish and Parks
Rick.Cordes@state.sd.su

Hatchery rearing density impacts on fall chinook salmon spawning returns

Chinook Culture Symposium

Keywords
chinook salmon, landlocked, post-stocking, density, hatchery rearing,

Feral landlocked fall chinook salmon from Lake Oahe, South Dakota were reared at two different densities during the 52 days prior to stocking. One group of approximately 15,000 salmon was split into 12, 1.8-m diameter circular tanks (1,250 fish/tank; 3.05 kg/m3) after coded-wire tagging and adipose fin-clipping. A second group of 15,000 tagged and clipped salmon was put into 5 circular tanks at normal loadings (3,000 fish/tank; 7.89 kg/m3). Final densities prior to stocking on June 2, 1999 were 7.29 kg/m3 and 15.02 kg/m3. Two precocious males from each group returned to spawn at Whitlocks Spawning Station on Lake Oahe in October 2000. In 2001, one male and one female (2 total) returned to spawn from the normal density group, whereas 13 males and 4 females (17 total) returned from the group reared at a lower density. Only 1 age-4 female returned in 2002 from the normal density group, compared to 9 reared at the lower density. Overall, 28 salmon reared at low densities returned to spawn versus only 5 salmon reared at normal densities. The spawning return rates of fingerling salmon reared at different densities may have substantial hatchery rearing and management implications.

Contact

Barnes, Michael
South Dakota Department of Game, Fish and Parks
McNenny State Fish Hatchery
19619 Trout Loop
Spearfish, SD 57783USA

Email: mike.barnes@state.sd.us
Phone: 605-642-6920
Fax: 605-642-6921

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Will Sayler
South Dakota Department of Game, Fish and Parks
will.sayler@state.sd.us

Robert Hanten
South Dakota Department of Game, Fish and Parks
Robert.Hanten@state.sd.su

Rick Cordes
South Dakota Department of Game, Fish and Parks
Rick.Cordes@state.sd.su

Native Fish and Habitat Surveys in Two Southeastern Wyoming Prairie Watersheds

Warmwater/Prairie Streams Symposium

Keywords

In southeastern Wyoming, the Lower Laramie River and Horse Creek watersheds are considered aquatic priorities due to their high densities of native fish species and state species of concern. Yet, little is known about the distribution and habitat requirements of native fishes within these two prairie watersheds. The recently developed Warmwater Stream Assessment (WSA) was applied throughout these two regionally important watersheds to assess native species presence and habitat conditions. Assessments were applied to 30 sites in the Lower Laramie River and Horse Creek watersheds in 2005. A total of 16,991 fish were captured in the surveys representing twenty native species, ten introduced species, and nine families. Four species of concern were collected including common shiner, hornyhead chub, plains topminnow, and suckermouth minnow. Overall, instream habitat varied among the sites and was mainly influenced by water development practices throughout these watersheds. The fish distribution and habitat information collected from these two watersheds will aid in future conservation efforts focused on species of greatest concern in southeastern Wyoming prairie watersheds.

Contact

Barrineau, Christina
Aquatic Habitat Biologist
Wyoming Game and Fish Department
528 S. Adams St.
Laramie, WY 82070USA

Email: christina.barrineau@wgf.state.wy.us
Phone: 307-745-5180 x240
Fax: 307-745-8720

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Beth Bear
Wyoming Game and Fish Department
christina.barrineau@wgf.state.wy.us

Factors influencing the distribution of cottids in small forested watersheds upstream from naturally occurring migration barriers in western Oregon

Fish Ecology Session

Keywords
cottids, distribution, extent

In small forested watersheds of western Oregon, upstream from natural barriers to migration, fish communities are dominated by coastal cutthroat trout (Oncorhynchus clarki clarki) and cottid spp. Although cutthroat trout are more ubiquitous in these environments, cottids represent a potentially important, though poorly understood component. To evaluate distribution and spatial extent of cottids, we conducted spatially continuous surveys of stream habitat noting the presence or absence of cottids throughout the entire fish bearing portion of the channel in thirty five randomly selected watersheds (500–1000 ha) in the Cascades, Coast Range, and Klamath Mountains ecoregions of western Oregon. A regression tree approach was used to identify variables useful in separating watersheds where cottids were present from those where they were absent. Cottids were present in 10 of the 35 watersheds and the two factors most effective in delineated presence or absence were the number of fish-bearing tributaries and watershed area upstream from the migration barrier. These results suggest that cottid presence in headwater streams is linked to the spatial distribution of refugia, channel connectivity, and how those factors influence the process of ebb and flow.

Contact

Bateman, Doug
Oregon State University
Forest Science Laboratory
3200 SW Jefferson Way
Corvallis, OR 97330USA

Email: batemand@fsl.orst.edu
Phone: 541-758-8817
Fax: 541-758-8806

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Robert Gresswell
Northern Rocky Mountain Science Center U.S. Geological Survey
robert_gresswell@usgs.gov

Christian Torgersen
Forest and Rangeland Ecosystem Science Center, U.S. Geological Survey
ctorgersen@usgs.gov

International perspectives on the ecology and conservation of bull trout, white-spotted charr, and Dolly Varden charr

Bull Trout Symposium

Keywords

Bull trout (Salvelinus confluentus), white-spotted charr (S. leucomaenis), and Dolly Varden (S. malma) share a common geography and evolutionary history, are collectively less well-known than other closely related charrs (e.g., brook trout, arctic charr), and they provide an instructive comparison of the conservation problems and uncertainties associated with management of native charrs in North America and Asia. Here we preview the findings of a pan-Pacific Rim workshop whose goal was to bring together an international group of scientists to write a synthesis paper on the biology and conservation of these species. Our specific objectives were to 1) provide a brief background on the natural, scientific, and social history of these three species; 2) review selected aspects of their biology and ecology, 3) compare and contrast conservation issues among the species, and 4) provide guidance for future research and conservation efforts focused on charr around the Pacific Rim. In particular, we expect U.S. biologists and fishery managers focused on endangered bull trout will gain insight and useful information from these comparisons. Our overall aim is to draw more attention to these charr, which have much in common with their better-known relatives, yet pose many unique challenges.

Contact

Baxter, Colden
Department of Biological Sciences, Idaho State University

Pocatello, ID 83209USA

Email: baxtcold@isu.edu
Phone: 208-282-6098
Fax: 208-282-4570

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Jason Dunham
USGS, Forest and Rangeland Ecosystem Science Center
jdunham@usgs.gov

Kurt Fausch
Department of Fishery and Wildlife Biology, Colorado State University
kurtf@cnr.colostate.edu

Wade Fredenberg
US Fish and Wildlife Service
Wade_Fredenberg@fws.gov

Satoshi Kitano

Nagano Environmental Conservation Research Institute, Japan
kitano-satoshi@pref.nagano.jp

Itsuro Koizumi
University of Helsinki, Finland
itsuro.koizumi@helsinki.fi

Kentaro Morita
Hokkaido National Fisheries Research Institute, Japan
moritak@affrc.go.jp

Tomoyuki Nakamura
National Research Institute of Fisheries Science, Japan
ntomo@fra.affrc.go.jp

Bruce Rieman
USFS, Rocky Mountain Research Station
brieman@fs.fed.us

Ksenia Savvaitova
Moscow State University, Russia
savvaitova@mail.ru

Jack Stanford
Flathead Lake Biological Station, University of Montana
jack.stanford@umontana.edu

Shoichiro Yamamoto
National Research Institute of Fisheries Science, Japan
ysho@fra.affrc.go.jp

Estimating Observer Efficiency of Mark-Recapture Snorkel Surveys of Trout Species

Poster Session

Keywords
trout, snorkel survey, observer efficiency

In the Kootenay Region of British Columbia, and in other areas in North America, mark-recapture snorkel surveys are a common methodology used to estimate the abundance of adult trout populations. These surveys typically involve marking adult trout with a visible tag, and a team of snorkel wimmers surveying the areas in which the trout were marked to enumerate marked and unmarked fish. One of the problems associated with these types of surveys is the factor of observer efficiency (i.e., it is unknown how many of the marked fish in a section are actually seen by the survey team). This poster will present data on observer efficiency estimates for two species of trout (rainbow trout and westslope cutthroat trout), and identify methodologies which can be used to estimate observer efficiency.

Contact

Baxter, James
Fisheries Biologist
BC Hydro
601 18th Street
Castlegar, BC V1N2N1Canada

Email: James.Baxter@bchydro.bc.ca
Phone: 250-365-4551
Fax: 250-365-4559

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

John Hagen
BC Hydro
hagen_john2@yahoo.ca

Prioritization of Eastern Wyoming Prairie Streams for Conservation

Warmwater/Prairie Streams Symposium

Keywords
prairie streams, native fish, Wyoming, index of biotic integrity

The abundance and distribution of native fish species in warmwater streams has declined throughout North America, but little is known about the current distribution, abundance, and habitat requirements of native fishes in eastern Wyoming streams. Prairie streams are an imperiled resource and future monitoring and conservation of these streams is crucial for the protection of native fishes in these streams. Therefore, in 2004 and 2005, 104 Warmwater Stream Assessment surveys were conducted to assess the status of habitat and native species in prairie streams of eastern Wyoming. A total of 56,931 fish were captured, representing 39 species (14 nonnative) and nine families. A fish assemblage index of biotic integrity (IBI), originally developed in Montana for Northwestern Great Plains streams, was modified for use in Wyoming. This index used metrics based on species richness, species composition, and trophic and reproductive groupings to determine the biologic integrity of streams. The IBI scores and presence of species of concern were then used to prioritize streams for future conservation efforts.

Contact

Bear, Beth
Fisheries Biologist
Wyoming Game and Fish Department
528 S. Adams
Laramie, WY 82070USA

Email: Beth.Bear@wgf.state.wy.us
Phone: 307-745-5180 x. 256
Fax: 307-745-8720

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Bozeman Fish Technology Center - Aquatic Nuisance Species and Aquatic Animal Health Program

Poster Session

Keywords

The USFWS - Bozeman Fish Technology Center (BFTC) added a new program to the facility in April, 2005. The Aquatic Nuisance Species (ANS) and Aquatic Animal Health Program mission is to increase knowledge of aquatic nuisance species threats to aquatic systems and promote aquatic health through research, outreach and technical assistance. There are five main goals of this program: 1. Improve ANS detection and identification of colonization pathways, 2. Acquire biological and ecological information on ANS and important indicators of aquatic system health, 3. Determine effects to natural ecosystems, threatened and endangered species and industry 4. Disseminate information through education, outreach and technical assistance, and 5. Survey National Fish Hatchery water supplies and effluent systems to identify ANS and potential hazards. The BFTC has been working together with State and Federal agencies on a regional and national level to support the mission and goals of this program.

Contact

Beck, Linda
US Fish & Wildlife
4050 Bridger Canyon Road
Bozeman, MT 59715USA

Email: linda_beck@fws.gov
Phone: 406-994-9947
Fax: 406-586-5942

The presenter is someone other than the contact person and is listed below.

Yvette Converse
yvette_converse@fws.gov

This contact person is the primary author.

Additional Authors

Yvette Converse
USFWS-Bozeman Fish Technology Center
yvette_converse@fws.gov

A habitat criteria mapping approach to instream flow management

Fish Conservation & Management Session

Keywords
instream flow, habitat criteria mapping, low elevation aerial photograph, bull trout, Chinook salmon

A habitat criteria mapping approach was used to assess instream flows in regulated reaches of the McKenzie and Smith rivers, Oregon. The approach relies on ground-based field mapping of suitable habitat on digitally rectified low-elevation aerial photographs for a sub-sample of habitat units (e.g., pool, riffle, run). Suitable habitat was delineated in the field using quantitative habitat criteria for the species and life stages of interest in selected habitat units at various flows. The resulting polygons were transferred into a GIS framework to calculate available habitat area for each species and life stage for each measured flow. Available habitat area was then extrapolated to similarly classified habitat units to estimate total habitat availability within the reach with an associated estimate of variance. The approach allows an estimation of total area available at each flow, rather than an index of habitat area (e.g., as in PHABSIM), is repeatable, and can be applied in hydraulically complex streams where other techniques may be inappropriate. Available habitat areas for specific life stages of bull trout and spring Chinook salmon were ultimately used in stock-production population dynamics models to estimate the response of bull trout and spring Chinook salmon populations to various flow management scenarios.

Contact

Bell, Ethan
Aquatic ecologist
Stillwater Sciences
850 G Street Suite K
Arcata, CA 95521USA

Email: ethan@stillwatersci.com
Phone: (707) 822-9607 x203
Fax: (707) 822-9608

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Frank Ligon
Stillwater Sciences
frank@stillwatersci.com

Dirk Pedersen
Stillwater Sciences
dirk@stillwatersci.com

Sharon Kramer
Stillwater Sciences
sharon@stillwatersci.com

Resource similarity between sauger and walleye in the Missouri River, Montana: Implications for declining sauger populations

Warmwater/Prairie Streams Symposium

Keywords
sauger, walleye, competition, resource overlap, Missouri River

Sauger Sander canadensis populations throughout Montana and North America have exhibited declines over the past few decades. Various factors may be contributing to the reduced population abundance of sauger in Montana, including interspecific competition with walleye Sander vitreus. To assess competition potential, movement, habitat use, and food habits of both species were compared in the Missouri River, Montana. Sauger and walleye were tracked using radio telemetry to establish and compare seasonal movement patterns. Habitat was quantified at fish locations and food habits were collected on fish sampled using electrofishing. Prior to the spawning period, all sauger and 57% of the walleye migrated downstream as far as 273 km. After spawning, both species returned to previously-occupied river reaches and demonstrated site fidelity during the summer. Habitat use and selection by sauger and walleye was similar. Diet overlap (Pianka Index) was high during the spring [0.72 (SE=0.003)] and summer [0.95 (SE=0.0008)] and moderate during autumn [0.49 (SE=0.003)]. These results suggest that sauger and walleye in the Missouri River, Montana exhibit similarities in movement, habitat use, and food habits. Thus, the potential for competition between these two species is high, which may preclude the recovery of native sauger populations if resources are limiting.

Contact

Bellgraph, Brian
Graduate Research Assistant
Montana Cooperative Fishery Research Unit
301 Lewis Hall
Montana State University
Bozeman, MT 59717USA

Email: bbellgraph@montana.edu
Phone: 406-994-6643
Fax: 406-994-7479

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Christopher Guy
Montana Cooperative Fishery Research Unit
cguy@montana.edu

Stephen Leathe
Montana Fish, Wildlife and Parks
sleathe@mt.gov

William Gardner
Montana Fish, Wildlife and Parks

fwplew@tein.net

The dynamics of hybridization between westslope cutthroat trout and rainbow trout in the Upper Kootenay River, British Columbia.

Natives & Newcomers Symposium

Keywords
cutthroat, rainbow trout, hybridization, conservation, abiotic factors

Since 1999, we have been studying the hybridization between native westslope cutthroat trout (WCT) and introduced rainbow trout (RBT) in southeastern British Columbia. We are trying to answer three questions: 1) can abiotic factors predict the presence/absence of WCT, RBT and their hybrids, 2) have recent changes in fisheries management influenced the rate of hybridization, and 3) what is the status of WCT populations compared to other regions in their range? During this talk we will present preliminary results from worked conducted during a PhD project initiated in 2002 combined with results previously published from a master's project conducted from 1999-2002.

Contact

Bennett, Stephen
Dept. Aquatic, Watershed, and Earth Resources, Utah State Univeristy
Utah State University
5210 Old Main Hill
Logan, UT 84322-5210 USA

Email: sbennett@cc.usu.edu
Phone: 435 797 2500

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Dr Jeff Kershner
USGS Northern Rocky Mountain Science Center
jkershner@usgs.gov

Peter Corbett
Mirkwood Ecological Consultants Ltd
pcorbett@idmail.com

Assessing small stream biotic integrity using fish assemblages across an urban landscape in the Puget Sound Lowlands of Western Washington

Fish Ecology Session

Keywords
Biological indicators, urbanization, watershed management

We developed an urban fish index (UFI) as part of an ecological risk assessment for the Greater Lake Washington Watershed. The UFI was developed using data from 70 sites in 30 basins and tested using a data from 79 sites in 18 basins within the same watershed. Fifty four metrics were evaluated relative to a measure of human disturbance (percent total impervious area; TIA). We found eight metrics to be useful for the UFI based on their response to TIA. Each metric was scored according to standardized criteria and metric scores were summed into a final index score. There was a negative correlation between UFI scores and TIA; R2 values ranged from 0.58 to 0.64 ($p<0.001$) depending on the number and choice of metrics used. Sensitivity of the UFI was tested by comparing data from replicate sites. UFI scores from data collected ten years apart were significantly different ($p<0.05$), but data collected one year apart were not significantly different, indicating sensitivity to long-term trends. The UFI developed in this study could serve as a useful management tool in conjunction with other indicators to assess the condition of fish communities across Puget Sound lowland streams.

Contact

Berge, Hans
Senior Ecologist
King County Dept. of Natural Resources and Parks
201 S. Jackson St.
Suite 600
Seattle, WA 98104USA

Email: hans.berge@metrokc.gov
Phone: 206-296-1964
Fax: 206-296-0192

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Deanna Matzen
University of Washington
damatz@u.washington.edu

Physical characteristics of bull trout redds in the Skykomish and Yakima Basins in Washington State

Bull Trout Symposium

Keywords
bull trout, redds

Salmonids in the Pacific Northwest have evolved with frequent and sometimes catastrophic natural disturbances. Through natural selection, species that are able to tolerate these conditions have survived. Since most of the mortality associated with salmonids occurs during the period of egg incubation, spawning habitat site selection and construction is particularly important. Bull trout typically spawn in most disturbed areas of a watershed, and generally have a longer incubation period which makes them particularly susceptible to pre-emergence mortality. We wanted to find out whether these strategies vary for bull trout on the eastern slope versus the western slope of the Cascades in Washington State. We recorded the habitat features, substrate, velocity, temperature, and physical dimensions of 122 bull trout redds in the Skykomish River and 324 in the Yakima Basin to gain a better understanding of spawning site selection for bull trout in two very different watersheds. These data may help in designing habitat rehabilitation projects targeted at improving or creating suitable spawning habitat for bull trout.

Contact

Berge, Hans
Senior Ecologist
King County Dept. of Natural Resources and Parks
201 S. Jackson St
Suite 600
Seattle, WA 98104USA

Email: hans.berge@metrokc.gov
Phone: 206-296-1964
Fax: 206-296-0192

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Scott D. Craig
US Fish and Wildlife Service
Scott_Craig@fws.gov

Status of Rio Grande cutthroat trout in Cabresto Creek, New Mexico

Fish Conservation & Management Session

Keywords
Rio Grande cutthroat trout, New Mexico, replacement, hybridization

Cabresto Creek is 17-mile long tributary to the Red River in north-central New Mexico. Historically, the only native salmonid in the drainage was the Rio Grande cutthroat trout (Oncorhynchus clarkii virginalis). The Rio Grande cutthroat trout has been replaced throughout much of the Red River drainage by non-native brook trout, brown trout, and rainbow trout. Hybridization between the Rio Grande cutthroat trout and rainbow trout has also occurred throughout the drainage. In lower seven miles of Cabresto Creek, the fish assemblage is dominated by non-native salmonids with cutthroat trout being rare to absent. However, within ten miles upstream of the confluence with the Red River, Rio Grande cutthroat trout become abundant, with approximately half of the density and biomass being comprised of cutthroat trout, and brook trout comprising the remaining portion of the fishery. Brook trout continue to decline in abundance until only cutthroat trout are found in the upper four miles of Cabresto Creek. Genetic analysis indicates that the Rio Grande cutthroat trout in the upper reaches of Cabresto Creek are genetically pure. Future activities being considered include expanded genetics analysis, developing plans for a barrier on Cabresto Creek, and assessing the feasability of brook trout removal.

Contact

Bergstedt, Lee
Fisheries Biologist
Chadwick Ecological Consultants, Inc.
5575 S. Sycamore St.
Suite 101
Littleton, CA 80120USA

Email: Chadeco@aol.com
Phone: 3037945530
Fax: 3037945041

This contact person is the presenter.
The first author is someone other than contact person and is listed below.

James Chadwick
5575 S Sycamore St
Suite 101
Littleton, CO 80120 United States
Phone: 3037945530
Fax: 3037945041
Email: Chadeco@aol.com

There are no additional authors for this abstract.

Lee Bergstedt
Chadwick Ecological Consultants, Inc

Chadeco@aol.com

Electrofishing as a technique to remove lake trout from a spawning site in Yellowstone Lake

Natives & Newcomers Symposium

Keywords
non-native species control, lake trout, electrofishing

The Yellowstone cutthroat trout of Yellowstone Lake is seriously threatened by a recently established lake trout population. The National Park Service has directed an extensive gillnetting program toward removal of the lake trout. Despite substantial removal efforts, where almost 20 km of gillnet are in place each day fishing from June through September, lake trout in Yellowstone Lake are still present in high numbers and pose a serious threat to native cutthroat trout. During the 2004 and 2005 spawning seasons, efforts were expanded to include use of electrofishing to remove lake trout congregating in shallow water for spawning. When traditional electrofishing settings were used, designed to stun and not harm fish, many lake trout were able to escape capture because the sheer density of fish in the area precluded netting them all. However, after increasing the amperage three-fold, electrofishing was found to be a very efficient means of incapacitating lake trout. Although electrofishing was used only 5 nights in 2004 and 8 nights in 2005, we were able to capture 13% and 23%, respectively, of the annual spawning lake trout catch, using this method.

Contact

Bigelow, Patricia
Fishery Biologist
National Park Service
P.O. Box 168
Yellowstone National Park, WY 82190USA

Email: pat_bigelow@nps.gov
Phone: 307 344 2284
Fax: 307 344 2211

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Philip Doepke
National Park Service
philip_doepke@nps.gov

Brian Ertel
National Park Service
brian_ertel@nps.gov

Todd Koel
National Park Service
todd_koel@nps.gov

Improving invertebrate biological monitoring

Bioassessment Symposium

Keywords
power analysis, macroinvertebrates, biological assessment

Statistical power analysis contributed to the design and implementation of a reservation-wide biological monitoring program for streams on the Confederated Salish and Kootenai tribal lands. Invertebrate bioassessment metrics and indices were studied and sampling intensity was adapted to increase the likelihood of detecting small-to-moderate changes in community attributes thought to be related to disturbances. We compared results between watersheds to test whether a single sampling scheme could be generalized to the variety of streams on the reservation.

Contact

Bollman, Wease
Chief Biologist
Rhithron Associates, Inc.
1501 West Central Ave.
Missoula, MT 59801USA

Email: wbollman@rhithron.com
Phone: 406 721 1977
Fax: 406 721 2028

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Dispersal and introgression of non-native rainbow trout genes in native westslope cutthroat trout populations

Natives & Newcomers Symposium

Keywords

We used diagnostic microsatellite loci and Bayesian admixture analysis to describe the dispersal pattern of hybrids between native westslope cutthroat trout and introduced rainbow trout in the North Fork Flathead River drainage, Montana. Hybridization was detected in 17 of 31 sites and the proportion of admixture and number of rainbow trout alleles within hybridized sites showed a significant negative correlation with fluvial distance from Abbot Creek, a suspected source of rainbow trout introgression in the drainage. Most (85%) of the rainbow trout alleles found among hybridized sites were present in Abbot Creek and several F1 individuals were detected in upstream sites lacking pure rainbow trout. Sites with low levels of admixture contained individuals classified as later-generation backcrosses. These findings suggest that straying from a downstream source population ultimately facilitates the spread of rainbow trout alleles in this drainage. Over time, this pattern of gene flow and introgression may lead to a loss of inter-population genetic diversity and local adaptation in native westslope cutthroat trout populations.

Contact

Boyer, Matthew
University of Montana
1655 Haskill Basin Road
Whitefish, MT 59937USA

Email: matt.boyer@mso.umt.edu
Phone: (406) 862-7702

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Fred Allendorf
University of Montana
fred.allendorf@umontana.edu

Clint Muhlfeld
Montana Dept. of Fish, Wildlife, and Parks
cmuhlfeld@mt.gov

Comparison of scuba strip surveys assessing the abundance and distribution of razorback suckers (Xyrauchen texanus) in the Colorado River below Hoover Dam: 1983 versus 2003.

Fish Conservation & Management Session

Keywords
razorback suckers

Razorback suckers (Xyrauchen texanus) were originally found throughout the Colorado River system but populations were isolated in the 20th century by the construction of high dams. The population in Lake Mohave, AZ-NV appeared to be the most abundant throughout the river as late as the 1980's. While abundance surveys have been conducted in the reservoir proper for decades, little work has focused on the riverine habitats of Black Canyon below Hoover Dam due to difficulties of conducting surveys. Strip counts conducted using scuba by paired divers were conducted in the spring of 1983 and again in 2003 to assess changes in the abundance and general distribution of razorback suckers in the Colorado River from 0.3 km to 24.6 km below Hoover Dam. In both surveys, razorback suckers observed were restricted to the more upstream (i.e., less impounded) river reaches. However, the 2003 strip surveys clearly showed fewer adult razorback suckers than in the 1983 strip surveys, they were also less widely distributed, and were associated with warm geothermal springs. These observations suggest that numbers of razorback suckers are declining in riverine portions of the reservoir which concurs with surveys in the reservoir indicating that the overall population is in decline.

Contact

Bozek, Michael
Cooperative Research Unit Leader
Wisconsin Cooperative Fishery Research Unit
College of Natural Resources
University of Wisconsin-Stevens Point
Stevens Point, WI 54481USA

Email: mbozek@uwsp.edu
Phone: 715-346-4023
Fax: 715-346-3648

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Peter Brown
Montana State University
pbrown@montana.edu

Randal Piette
Wisconsin Cooperative Fishery Research Unit

A mechanistic model to explain differential recruitment success of pallid sturgeon and shovelnose sturgeon in the upper Missouri River basin

Sturgeon Symposium

Keywords
larval drift, river fragmentation, Missouri River, Yellowstone River, pallid sturgeon, shovelnose sturgeon

Shovelnose sturgeon Scaphirhynchus platorynchus and the federally endangered pallid sturgeon S. albus inhabit in the lower Yellowstone River and fragmented hydroscape of the Missouri River between Fort Peck Dam and Lake Sakakawea. Populations of both species contain reproductively mature individuals that produce viable eggs and sperm, and spawning is known to occur in both species. Whereas shovelnose sturgeon exhibit annual recruitment success, there is little to no evidence of recent recruitment in pallid sturgeon. Experimental studies of larval sturgeon drift dynamics provide a mechanism to explain the differential recruitment success in these species. Larval pallid sturgeon drift for 11- 17 days after hatching, and may be transported 435 km downstream after hatching. Larval shovelnose sturgeon have a shorter drift duration (6 days), and drift only 200 km downstream after hatching. Larval drift models suggest that an adequate length of river is not available downstream from suspected spawning areas currently used by pallid sturgeon to meet the larval drift requirements. Thus, if spawning occurs in the pallid sturgeon population, export of larvae to the downstream reservoir likely accounts for lack of survival and recruitment. In contrast, due to the shorter drift distance required by larval shovelnose sturgeon, sufficient river length is available to facilitate larval survival and recruitment.

Contact

Braaten, Patrick
Fishery Biologist
U. S. Geological Survey, Columbia Environmental Research Center
P.O. Box 165
East Kansas Street
Fort Peck, MT 59223USA

Email: patrick_braaten@usgs.gov
Phone: 4065263253
Fax: 4065263671

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

David Fuller
Montana Department of Fish, Wildlife and Parks
stizodave@yahoo.com

DAM REMOVAL ON THE ELWHA RIVER, WASHINGTON: LIFE HISTORY PATTERNS OF BULL TROUT PRIOR TO WATERSHED RESTORATION

Bull Trout Symposium

Keywords
Bull trout, Dam removal, Salvelinus, Radio telemetry, watershed restoration

The Elwha River was historically one of the most productive rivers for anadromous salmonids on the Olympic Peninsula, Washington. Construction of two dams from 1910 to 1913 eliminated anadromous fish from accessing over 130 km of habitat in Olympic National Park (OLYM). Removal of the two dams is scheduled to begin in 2009, and will be the largest ecological restoration project for Pacific salmonids in the U.S. The reestablishment of 10 populations of salmonids in the Elwha River represents an unprecedented opportunity to evaluate recolonization at the watershed scale. Bull trout occur throughout the Elwha Basin, have been reproductively isolated for 96 years, and are confined to potamodromous life history forms upstream from the dams. We implemented a radio telemetry study to characterize movements, life histories, and genetic composition of bull trout prior to dam removal. Information will be used to establish baseline conditions necessary to evaluate future recolonization and determine whether bull trout resume anadromy. The telemetry infrastructure also will be used to monitor recolonization of Pacific salmon after dam removal. OLYM contains some of the last remaining pristine habitat throughout the range of bull trout, and this study may prove useful to ongoing conservation efforts in other watersheds.

Contact

Brenkman, Sam
Fisheries Biologist
National Park Service, Olympic National Park
600 East Park Avenue
Port Angeles, WA 98362USA

Email: sam_brenkman@nps.gov
Phone: 360-565-3081
Fax: 360-565-3070

The presenter is someone other than the contact person and is listed below.

Pat Crain
patrick_crain@nps.gov

This contact person is the primary author.

Additional Authors

Steve Corbett
National Park Service, Olympic National Park
steve_corbett@nps.gov

Pat Crain
National Park Service, Olympic National Park
patrick_crain@nps.gov

USE OF OTOLITH CHEMISTRY AND RADIOTELEMETRY TO DETERMINE AGE-SPECIFIC MIGRATORY PATTERNS OF ANADROMOUS BULL TROUT IN THE HOH RIVER, WASHINGTON

Bull Trout Symposium

Keywords
Bull trout, Salvelinus, Otolith chemistry, radio telemetry, anadromy

The complimentary use of otolith chemistry and radio telemetry revealed that bull trout moved between freshwater and the Pacific Ocean and between watersheds along coastal Washington. Bull trout either resided in the river, inhabited freshwater for prolonged periods and later became anadromous, or were anadromous and made multiple migrations to sea. Analysis of otolith chemistry of bull trout (n=105) that were incidentally killed in gill-net fisheries directed at other Pacific salmonids revealed that 85% migrated to sea at least once with 75% migrating multiple times. Anadromous females produced 95% of all individuals examined, but both anadromous and non-anadromous females produced progeny that were anadromous. Age at first seaward migration ranged from 3 to 6 years, and 88% first emigrated to sea in their 3rd or 4th growth year. Bull trout ages 3 to 5 years old were the most encountered age group killed in commercial gill-net fisheries (88% of total bycatch). This is the first study to verify anadromy as a primary life history form in bull trout. In view of direct mortality in gill-net fisheries, an understanding of age-specific seaward movements, life history variability and diversity of habitats occupied by bull trout will be essential to future conservation efforts.

Contact

Brenkman, Sam
Fisheries Biologist
National Park Service, Olympic National Park
600 East Park Avenue
Port Angeles, WA 98362USA

Email: sam_brenkman@nps.gov
Phone: 360-565-3081
Fax: 360-565-3070

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Steve Corbett
National Park Service, Olympic National Park
steve_corbett@nps.gov

Eric Volk
Alaska Department of Fish and Game
eric_volk@fishgame.state.ak.us

Barriers to prevent nonnative fish movement: a survey.

Poster Session

Keywords
Barrier

Barriers to non-native fish movement are important tools in the conservation of native fish species. Natural and manmade barriers provide protection to some of the last populations of native fish and barriers are frequently used to help restore a species to a larger portion of its native range. Barrier design, longevity, cost, and functionality vary, and those designing barriers often lack all of the information necessary to build the best barrier to meet their management needs. The goal of this project is make information about barrier designs and associated benefits and drawbacks easily accessible to fish managers. We surveyed barriers in six western states currently being used to prevent non-native fish movement. The falls barrier was found to be the most common type of barrier. Other types included mesh, perched culverts and velocity barriers. Results of this survey are stored in a database that can be accessed by the internet. An array of barrier designs has been entered into the database and has helped to expose gaps in the knowledge base necessary to construct effective barriers, such as the jumping performance of wild fish, proper barrier siting, and barrier designs that accommodate high and low discharge.

Contact

Brown, Peter
301 Lewis Hall
Montana State University
Bozeman, MT 59717USA

Email: pbrown@montana
Phone: 406-994-4549

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Alexander Zale
Montana Cooperative Fishery Research Unit
Zale@montana.edu

Bradley Shepard
Montana Cooperative Fishery Research Unit, Montana Fish, Wildlife and Parks
brshepard@mt.gov

The isolated effects of sunlight, organic matter, and turbulence on the piscicides rotenone and antimycin.

Poster Session

Keywords
Piscicide, rotenone, antimycin

Piscicide persistence in streams is perhaps the most pressing unknown factor associated with piscicide application. Sunlight, turbulence, and organic matter detoxify piscicides but their effects have not been studied in sufficient detail to recommend appropriate adjustments to application techniques. In the absence thereof, applicators commonly use higher than necessary concentrations of piscicides or overlap piscicide applications in water bodies where one or several of these environmental conditions might affect piscicide toxicity. These practices result in wasteful use of piscicide and unnecessary invertebrate mortality. The objective of this study is to determine the isolated amount of exposure to sunlight, organic matter, and turbulence necessary for the piscicides rotenone and antimycin to become ineffective. We exposed water treated with rotenone or antimycin to a simulated environmental condition and determined the toxicity, after exposure, using a modified toxicity test. Fish were exposed to piscicide treated water for 8 hours, after which they were removed from piscicide treated water and dead fish were counted. The remaining fish were placed in fresh water and the number dead were counted every 24 hours for a period of 96 hours. Preliminary results indicate that even low levels of sunlight exposure significantly degrade piscicides.

Contact

Brown, Peter
301 Lewis Hall
Montana State University
Bozeman, MT 59717USA

Email: pbrown@montana.edu
Phone: 406-994-4549

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Alexander Zale
Montana Cooperative Fishery Research Unit
zale@montana.edu

Two- and Three-Dimensional Water Velocities in Culverts

Fish Conservation & Management Session

Keywords
culvert, hydraulics, fish passage

A full understanding of the challenges that fish encounter when navigating culverts requires adequate consideration of the diversity of water velocities that exist in the culvert barrel. Contemporary models and design tools are largely based on one-dimensional hydraulic computations. While the mean velocity in the culvert barrel is informative and will often suffice for conservative predictions of passage concerns, it does not adequately express the nuances of the system that may ultimately determine whether a given fish can pass through the culvert or not. This presentation is a progress report on two studies dealing with velocity diversity in culverts. We are modeling culverts located on Mulherin Creek, a tributary to the Yellowstone River near Gardiner, Montana, using three dimensional finite volume models (CFX running on the Ansys platform). Our goal is to determine the extent to which velocity diversity as measured at the culvert inlet perpetuates through the length of the culvert. We have measured several sets of three dimensional velocities in the field using an acoustic Doppler velocimeter that we will use to validate the computational model. With the model functional, geometric or boundary condition alterations can be imposed to determine if culverts can be made more hospitable for fish passage by intentionally causing diverse inlet velocities to propagate. A related study is to use field data and interpolation methods to determine just how many velocity measurements should be made to establish usable inlet boundary conditions for three dimensional modeling.

Contact

Cahoon, Joel
Assoicate Professor
Civil Engineering
Montana State University
220 Cobleigh Hall
Bozeman, MT 59717USA

Email: JOELC@CE.MONTANA.EDU
Phone: 406 994 5961
Fax: 496 994 6105

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Otto Stein
Montana State University

Jesse Patton
Montana State University

Matt Blank
Western Transportation Insitiute, MSU

Success of broodstock Chinook salmon and culture techniques used at Cleghorn Springs State Fish Hatchery

Chinook Culture Symposium

Keywords

Chinook salmon were originally stocked into Lake Oahe in 1982. Since then, stocking numbers have been adjusted based on changes in management practices. In 2001 and 2002 salmon were not stocked based on a depletion of rainbow smelt, the primary prey base for Lake Oahe. Due to concerns about the success of return of salmon to Whitlocks Bay in Oahe, hatchery staff experimentally spawned the 95 year class still remaining at Cleghorn Springs State Fish Hatchery. A total of 111,396 salmon eggs were spawned from 4 year old Chinook Salmon reared at Cleghorn Springs State Fish Hatchery in 1999. During the first egg take on 9/21/99, 12 females were spawned and incubated individually to determine the variability between females. Each female was fertilized with one male, eggs were enumerated and placed into Heath tray incubators. Over 13,000 were collected on Sept 21, 1999. Eggs per female range from 803 to 1714 with and average of 1136 eggs/female. Survival to eye ranged from 0 to 98% with an average of 83%. Survival to swim-up from the eyed egg stage was 90%. On average, survival to eye from fish spawned from Lake Oahe is approximately 45%.

Contact

Carreiro, John
Hatchery Biologist
Cleghorn Springs State Fish Hatchery
4725 Rimrock HWY
Rapid City, SD 57702USA

Email: john.carreiro@state.sd.us
Phone: 605-394-4100
Fax: 605-394-1872

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

An Overview of Uses and Applications of Ultrasound Imagery in Fish Culture

Chinook Culture Symposium

Keywords
Ultrasound, Chinook, Captive Brood

Ultrasound imagery has long been used as a rapid non-invasive diagnostic tool in human medicine. Advances in technology have allowed its application to extend to other fields such as veterinary medicine and aquaculture. In the Grande Ronde Basin Captive Broodstock Program, ultrasound has assisted in separating maturing fish from immature fish in multiple year classes and determining the sex of the fish months earlier than in past years. This has reduced the number of handlings and stress to which the fish are subjected and allowed maturing saltwater fish to be transfer to freshwater in a timelier manner, thus reducing osmoregulatory stress. It also permits fish culturists and researchers to better plan for spawning and implement the use of spawning matrices to preserve the genetic diversity of the stocks. The intent of this presentation is to explain the basic principles and technology of ultrasound and show the practical uses and applications for fish culture.

Contact

Chaney, Marla
Assistant Manager
Oregon Department of Fish and Wildlife
70543 NE Herman Loop
Cascade Locks, OR 97014USA

Email: captivebrood@saw.net
Phone: 541-374-2255
Fax: 541-374-8090

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

The evolution of fish, science education and why we should care

Contributed Paper Session

Keywords
evolution, science education, fish

Title: The evolution of fish, science education, and why we should care. The evolution of fish bridges a span of roughly 200 million years from early multi-cellular invertebrates through land dwelling vertebrates. During the Devonian Period or “age of fishes” many different forms of fish evolved and many interesting examples of evolutionary processes are evident in fish today including sticklebacks, cichlids, guppies, cavefish, notothenioids and others Theodosius Dobzhansky made the famous quote: "Nothing in Biology makes sense except in the light of evolution.” Evolution is a well-substantiated theory that has been described as the unifying concept of biology. Since Charles Darwin put forth his ideas about the theory of evolution and natural selection, acceptance has been mixed. The scientific community overwhelmingly accepts the theory, however, within the general population considerable skepticism exists. Most of this skepticism is rooted in the idea that the theory is in conflict or at least troublesome to some religious beliefs. Efforts to teach Creationism, Intelligent Design or alternatives to evolution can undermine quality science education.

Contact

Clancy, Chris
Fisheries Biologist
Montana Fish, Wildlife and Parks
1801 N. First St.
Hamilton, MT 59840USA

Email: cclancy@fs.fed.us
Phone: (406) 363-7169
Fax: (406) 363-7106

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Zooplankton Production and Planktivore Consumption in Lake Pend Oreille, Idaho

Fish Conservation & Management Session

Keywords
zooplankton production, plantivore, kokanee, Mysis shrimp

We assessed the feeding demand of planktivores in Lake Pend Oreille in relation to crustacean zooplankton food availability. The copepods Diacylops bicuspidatus thomasi and Leptodiaptomus ashlandi accounted for 75% of the standing zooplankton biomass over a two-year study period, whereas Daphnia spp. were the cladocerans of highest biomass. Annual zooplankton production, estimated using temperature-dependent empirical models that relate production to biomass, was 97.11 and 139.19 kg/ha. During the same study years, we estimate that zooplankton consumption by the lake's two primary planktivores, kokanee and the opossum shrimp Mysis relicta, comprised 56 and 42% of total zooplankton production. Consumption of cladoceran zooplankton, the preferred prey for both species, was estimated to be 63% of production over the study period. Although few studies exist which relate zooplankton production to consumption by the planktivore community, our literature comparisons suggest high levels of zooplankton consumption in relation to production in Lake Pend Oreille, and that insufficient zooplankton abundance may exist to support management efforts to increase kokanee abundance.

Contact

Clarke, Lance
Fishery Biologist
U.S. Fish and Wildlife Service
UCA-1207, 1917 Marsh Road
Yakima, CO 98908USA

Email: lclarke@pn.usbr.gov
Phone: 509-575-5848 x325

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Adult post-spawn movements and juvenile outmigration of fluvial Bear River Bonneville cutthroat trout in the Thomas and Smith's Fork rivers, ID—WY

Poster Session

Keywords
fluvial, Bonneville cutthroat trout, Bear River, trapping, outmigration

Like many interior cutthroat trout subspecies, Bonneville cutthroat trout (BCT) have been widely extirpated from large rivers by anthropogenic activities that have fragmented habitats and introduced non-native competitors. Selective pressures against migratory behaviors and mainstem river occupation have relegated BCT to isolated headwater habitats and prevented the expression of fluvial life history traits in most populations. Bear River BCT, however, are unique in that they continue to persist in the mainstem river system in which they evolved, despite wide-spread habitat degradation. These fish exhibit a true fluvial life history strategy, traveling large distances to satisfy specific habitat requirements during different life stages. Whereas recent research has used telemetry to begin to describe movement patterns of fluvial Bear River BCT, little is known about the patterns of juvenile outmigration and adult spawning numbers in key tributaries. As part of a fish passage restoration project in the central Bear River watershed we used two-way fish traps to monitor movements of post-spawn adult and juvenile outmigrant BCT in two major spawning tributaries to the Bear River—the Thomas Fork and Smith's Fork—between 2003 and 2005 . We found that (i) fluvial migrants comprised a large portion of captured adult fish, and (ii) most juvenile and adult BCT migrated out of spawning tributaries during high flows in early summer.

Contact

Colyer, Warren
Coordinator, Bear River Native Trout Program
Trout Unlimited
249 South 100 West
Providence, UT 84332USA

Email: wcolyer@tu.org
Phone: 435-753-3132

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Adam Sepulveda
University of Montana
adam.sepulveda@mso.umt.edu

Amy Harig
Trout Unlimited
aharig@tu.org

Dana DeGraaf

Trout Unlimited
ddegraaf@tu.org

Influence of human-made instream structures on the management and conservation of three native Colorado River Basin fishes in the Muddy Creek watershed, Wyoming.

Warmwater/Prairie Streams Symposium

Keywords
Colorado River Basin native fishes, movements, human-made instream structures, PIT tagging

Bluehead sucker, flannelmouth sucker, and roundtail chub dominate the upper portion of Muddy Creek, a tributary to the Little Snake River in south-central Wyoming. Our goal was to examine the effects of human-made instream structures on movements of the three species in the system. Fish were captured and implanted with passive integrated transponder (PIT) tags in three segments of Muddy Creek formed by human-made structures. Movements over structures between April and August 2005 were evaluated using fixed locality monitoring stations that recorded tagged fish upon passage. Reaches throughout the study area were sampled in July and August 2005 by electrofishing. Monitoring stations detected movements of 393 fish and sampling by electrofishing recovered 200 fish. Bluehead suckers appeared to be the most mobile species. Fish moved downstream, but not upstream at two structures and both upstream and downstream at a third structure. Probable bluehead sucker and flannelmouth sucker spawning runs up an ephemeral tributary of Muddy Creek were identified in one segment. PIT-tag technology was useful in detecting fish movements and human-made structures may have formed barriers to upstream movements. Source/sink dynamics may be occurring among segments of Muddy Creek formed by human-made structures.

Contact

Compton, Robert
Graduate Student
Wyoming Cooperative Fish and Wildlife Research Unit
Box 3166 - Biological Science Bldg. - Rm. 419
Laramie, WY 82071USA

Email: bcompton@uwyo.edu
Phone: 307-766-2322
Fax: 307-766-5400

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Wayne Hubert
Wyoming Cooperative Fish and Wildlife Research Unit
whubert@uwyo.edu

Frank Rahel
University of Wyoming
frahel@uwyo.edu

Mike Quist

Iowa State University
mcquist@iastate.edu

Mike Bower
USDI Bureau of Land Management
Micheal_Bower@blm.gov

IMPROVEMENTS IN BROWN TROUT POPULATIONS IN THE UPPER ARKANSAS RIVER, COLORADO, 1994-2005

Contributed Paper Session

Keywords
brown trout, Arkansas River, California Gulch, metals, reclamation

We collected fish population data from the upper Arkansas River since 1994 to monitor conditions in the river relative to historic mining and recent remediation activities in the California Gulch drainage. California Gulch flows directly into the Arkansas River and historically contained elevated levels of several metals. Reclamation efforts lowered concentrations of metals entering the Arkansas River. Monitoring of brown trout populations from 1994 through 2001 at a site just downstream of California Gulch showed gradual improvement in brown trout density from 130/ha to 786/ha, and biomass from 16kg/ha to 68kg/ha during this period. A dramatic increase in both brown trout density and biomass occurred in the drought year of 2002, with estimates being more than five times historical averages. Subsequent sampling from 2003 through 2005 demonstrated that the improvement observed in 2002 was not an anomaly as density remained at over 1,600/ha and biomass remained over 130 kg/ha over the past three years, and met or exceeded density and biomass estimates of brown trout at a reference site upstream of California Gulch. These results indicate reclamation efforts have improved and are continuing to improve conditions for fish populations in the river downstream of California Gulch.

Contact

Conklin, Don
Aquatic Ecologist
Chadwick Ecological Consultants
5575 S. Sycamore St
Suite 101
Littleton, CO 80120USA

Email: Chadeco@aol.com
Phone: 3037945530
Fax: 3037945041

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Lee Bergstedt
Chadwick Ecological Consultants, Inc
Chadeco@aol.com

James Chadwick
Chadwick Ecological Consultants, Inc
Chadeco@aol.com

Bozeman Fish Technology Center – A Multidimensional Research Facility

Poster Session

Keywords

The Bozeman Fish Technology Center (Center) is one of seven US Fish and Wildlife Service fish research centers. The Bozeman Center partners with several other research programs including the Aquatic Animal Drug Approval Program, USDA Agricultural Research Service Trout-Grains Program, Montana Microbial Products, a private company, Montana State University and US Geological Survey. The Center research has six areas of emphasis: (1) Traditional Fish Culture and Water Treatment Systems, (2) Fish Reproductive Physiology, (3) Pallid Sturgeon Recovery, (4) Fish Nutrition and Feed Development, (5) Sensitive Fish Species Conservation, and (6) a newly initiated Aquatic Nuisance Species and Aquatic Ecosystem Health program. Through these programs the Center offers a unique opportunity to collaborate, offer technical assistance and answer cutting-edge questions to promote fisheries sciences.

Contact

Converse, Yvette
USFWS-Bozeman Fish Technology Center
4050 Bridger Canyon Road
Bozeman, MT 59715USA

Email: yvette_converse@fws.gov
Phone: 406-994-9903
Fax: 406-586-5942

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Substituting space for time is a poor method for evaluating stream restoration effectiveness in the southern interior of British Columbia.

Contributed Paper Session

Keywords
stream restoration, statistical power,

We evaluated the effectiveness of the Fisheries and Oceans Canada eroding stream bank rehabilitation program for salmon streams of the southern interior of British Columbia. Restoration involved bank grading, rock toes and wood current deflectors, riparian planting, and livestock exclusion. Absence of site-specific pre-treatment data necessitated a space-for-time substitution where untreated eroding banks were assumed representative of pre-treatment restored banks. We measured in-channel and riparian conditions plus invertebrate abundance and biomass at 16 sites treated >5 years ago and 11 control sites distributed across three river segments. Statistical analyses found no differences between treatment and control groups although treatment sites trended to higher inside banks and narrower widths. Absence of a measurable response may indicate these locations lack the stream power needed to export accumulated fine sediments and recreate habitat complexity. As such, fisheries enhancement efforts may need to focus on off-channel habitats such as spawning-rearing channels. Alternatively, absence of statistical differences might be due to low statistical power as > 75 sites per group would need to be sampled for power to reach 0.8. Our results illustrate the need for collecting pre-treatment data as a part of restoration efforts so the more powerful 'before-after' experimental design can be applied.

Contact

Cooperman, Michael
Dr.
Center for Applied Conservation Research, University of British Columbia
3022-2424 Main Mall
Forest Sciences Center
Vancouver, BC V6T 1Z4Canada

Email: michael.cooperman@ubc.ca
Phone: 604-822-1969
Fax: 604-822-9102

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Scott Hinch
Dept. of Forest Sciences, Univeristy of British Columbia
shinch@interchange.ubc.ca

Comparison of local versus aggregate population productivity for naturally produced spring/summer Chinook salmon in the Snake River basin

Fish Ecology Session

Keywords
Chinook salmon, population productivity, stock-recruit relationship

Stock-recruit (SR) relationships are important to understanding forces influencing abundance, but it is critical to understand the processes that shape the relationship. Aggregate SR curves are the product of the life stages and spatial components that compose the stock. The aggregate freshwater productivity of naturally spawning spring/summer Chinook salmon in the Snake River exhibits Beverton-Holt (BH) density dependence during brood years (BY) 1990-2002. Our objective was to compare and contrast the relationship described in aggregate to comparable data from the spawning areas of eight selected component populations. Strength of density dependence varied widely among populations with model form including linear, Ricker, and BH. In general, local populations did not exhibit as much density-dependence as the aggregate, indicating that density-dependence occurs downstream from spawning areas. Intrinsic productivity predicted by the aggregate BH model was 411.2 smolts/female. Intrinsic productivity of local populations ranged from 31.5 to 393.6 smolts per redd (mean = 173.0) and from 337.2 to 874.3 parr/presmolts per redd (mean = 526.4). Relative to the aggregate, low local smolt productivities versus high parr/presmolt productivity indicate the importance of juvenile life history diversity to population regulation. Results need to be scaled by survival to Lower Granite Dam for better comparison.

Contact

Copeland, Timothy
Senior Fishery Research Biologist
Idaho Dept of Fsih & Game
1414 E Locust Ln
Nampa, ID 83686USA

Email: tcopeland@idfg.idaho.gov
Phone: 208-465-8404
Fax: 208-465-8434

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

David Venditti
Idaho Dept of Fish & Game
dvenditti@idfg.idaho.gov

Modeling and mapping habitat use large migratory bull trout in stream networks.

Bull Trout Symposium

Keywords
bull trout, migration, CART

The habitat associations of small bull trout in spawning and rearing locations have been well studied in the last 15 years. However, investigations of large, migratory bull trout have typically focused on documenting the extent of their movement. We used existing data to model and map patterns habitat use by large migratory bull trout. Data were from studies of fish movement using radio telemetry conducted in three watersheds in Idaho. To conduct the analysis we divided the watersheds into stream segments based on tributary junctions. Responses derived from telemetry data included the total number of observations per stream segment and the number of individual fish residing in a stream segment. To model habitat use, we included several site-scale variables in the analysis including: stream segment length, contributing area, and presence of roads. Landscape-scale variables used in the analysis included distance to a reservoir, link magnitude, and an index of segment connectivity based on a weighted average distance to spawning patches in a watershed. The results of this analysis represent the second stage of the bull trout radio telemetry synthesis project.

Contact

Dare, Matthew
Research Assistant Professor
Boise State University
Department of Biology
1910 University Drive
Boise, ID 83725USA

Email: mdare@boisestate.edu
Phone: 208-426-2923
Fax: 208-426-4267

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Jason Dunham
USGS FRESC Corvallis Research Group
jdunham@usgs.gov

Coalbed Natural Gas Development in the Powder River Basin: Implications for Warmwater Stream Fish Assemblages

Warmwater/Prairie Streams Symposium

Keywords
coalbed natural gas, warmwater stream fish assemblages, Powder River Basin, toxicity, salinity

The Powder River Basin in Wyoming and Montana is currently undergoing one of the world's largest coalbed natural gas (CBNG) developments. Because CBNG development involves production and disposal of large quantities of coalbed ground water that differs from surface waters, potential exists for substantial effects on aquatic ecosystems. Coalbed natural gas product-water typically has high concentrations of dissolved solids, including elevated levels of sodium and bicarbonate ions. Information on chronic toxicity of CBNG product-water to warmwater fishes is lacking, presenting a substantial gap in predicting the effects of saline discharges in the Great Plains ecosystem. We employed three different approaches to determine the effects of coalbed natural gas development on fish assemblages in streams of the Powder River Basin in 2005. First, we compared fish assemblages in streams with CBNG development and streams without development. Second, we compared the longitudinal distribution patterns of fish assemblages at multiple points above and below CBNG development. Finally, we compared fish assemblages present in 2005 to fish survey data from the mid 1990s in areas with and without CBNG development. Streams in drainages with CBNG development had an average of less than 4 species per stream whereas those without development had an average of 5.4 species per stream.

Contact

Davis, Windy
Graduate Research Assistant- MS
Montana Cooperative Fishery Research Unit
301 Lewis Hall
Bozeman, MT 59717USA

Email: wdavis@montana.edu
Phone: 4069946643

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Robert G. Bramblett
Montana Cooperative Fishery Research Unit
bbram@montana.edu

Alexander V. Zale
Montana Cooperative Fishery Research Unit
zale@montana.edu

Development of genetic tags for endangered pallid sturgeon in the Upper Missouri River

Sturgeon Symposium

Keywords
pallid sturgeon, genetic tags, parentage analysis

Pallid sturgeon are listed as endangered throughout their native range. To compensate for a lack of natural recruitment in the upper Missouri River, each year wild adults are captured and spawned in hatcheries. Previously, juveniles were reared in hatcheries until they were large enough for PIT tags, at which point they were tagged and released. Raising fish to this size significantly limited the number of fish that could be released due to problems with disease and space limitations. Alternatively, we developed a protocol for using genetic markers to identify hatchery-origin pallid sturgeon in order to reduce the amount of time required for rearing and increase the number of fish that can be released. We identified a set of 17 microsatellite loci that showed Mendelian patterns of inheritance in pallid sturgeon and could also be used to differentiate pallid and shovelnose sturgeon. Each year adults spawned in a hatchery in the Upper Missouri River basin are genotyped at these 17 loci so that genetic parentage analysis can be used to identify the progeny of hatchery matings. In fall of 2005, five untagged juvenile Scaphirhynchus were captured in the upper Missouri River. We used these methodologies to determine that all five were hatchery origin pallid sturgeon.

Contact

DeHaan, Patrick
U.S. Fish and Wildlife Service
Abernathy Fish Technology Center
1440 Abernathy Creek Road
Longview, WA 98632USA

Email: patrick_dehaan@fws.gov
Phone: 360-425-6072 x331
Fax: 360-636-1855

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Don Campton
U.S. Fish and Wildlife Service
don_campton@fws.gov

William Ardren
U.S. Fish and Wildlife Service
william_ardren@fws.gov

Changes observed in the spawning population of lake trout of Yellowstone Lake, after a decade of mechanical removal efforts

Natives & Newcomers Symposium

Keywords
lake trout, yellowstone cutthroat trout, yellowstone lake, gill net,

Lake trout a predominantly piscivorous fish were officially documented in Yellowstone Lake in 1994. Yellowstone Lake contains the world's largest lentic population of Yellowstone cutthroat trout. Spawning run counts and index netting catch of Yellowstone cutthroat trout decreased steadily starting in 1990 and 1996 respectively. Bioenergetic research determined individual adult lake trout could eat an average of 42 cutthroat trout annually. To lessen the impact lake trout were having on cutthroat trout, efforts to mechanically remove lake trout began immediately after discovery in 1994 and continue at present. Age analysis using otoliths collected from lake trout captured on spawning grounds from 1997 through 2005 has shown the spawning population is relatively young and fast growing. Mature lake trout ranged in age from 6-21 years in 1998 and 4-17 years in 2005. During the August-October spawning season mean total length of mature lake trout caught on spawning grounds or staging areas has progressively decreased from 1996 to 2005; mature males from 601 to 517 mm, mature females from 675 to 555 mm. Excellent growth rates, relative young age at maturation, and few old fish indicate removal efforts are impacting this population.

Contact

Doepke, Philip
Fisheries Technician
NPS Yellowstone National Park
Yellowstone Center for Aquatic Resources
PO Box 168
Mammoth Hot Springs, WY 82190USA

Email: philip_doepke@nps.gov
Phone: (307) 344 2244
Fax: (307) 344 2211

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Patricia E. Bigelow
NPS Yellowstone National Park
pat_bigelow@nps.gov

Brian D. Ertel
NPS Yellowstone National Park
brian_ertel@nps.gov

Todd M. Koel
NPS Yellowstone National Park
todd_koel@nps.gov

Daniel L. Mahony
NPS Yellowstone National Park
dan_mahony@nps.gov

Migratory Response of Bull Trout in Clark Fork River Drainage following Upstream Transport

Fish Ecology Session

Keywords
bull trout, transport, radio telemetry

Electrofishing and a fish ladder/trap were used to capture 129 adult bull trout Salvelinus confluentus in the Clark Fork River downstream of Cabinet Gorge Dam, from 2001 through 2004. A portion of these fish were presumed to have migrated downstream as juveniles from Montana tributaries through or over the dam and reared in Lake Pend Orielle, Idaho. Captured adult bull trout were radio tagged, transported upstream, and released in Cabinet Gorge Reservoir, Montana. Of the 129 bull trout released in Montana, 78 were detected in tributaries to Cabinet Gorge Reservoir during the spawning season. Forty of the 129 bull trout were detected at Noxon Rapids Dam, the second dam on the Clark Fork River, with 70% (28) of these fish now known to have originated upstream of Noxon Rapids Dam. In 2004, a “Rapid Response Genetic Analysis” was employed to determine natal tributary of origin of captured fish prior to transport above Cabinet Gorge Dam. Genetic assignments to tributaries of origin were accomplished for most fish captured over the 4-year study period, with fish movements of transported fish now correlated to genetic assignment. Of the 112 viable genetic samples collected below Cabinet Gorge Dam, 90% were assigned to upstream tributaries.

Contact

DosSantos, Joseph M.
Aquatic Program Leader
Avista Corporation
P.O. Box 1469
Noxon, MT 59853USA

Email: jdossantos@avistacorp.com
Phone: 406-847-1284
Fax: 406-847-2265

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Lawrence L.

Lawrence L. Lockard
U.S. Fish and Wildlife Service
larry_lockard@fws.gov

LaDana Hintz
Avista Corporation
LaDana.Hintz@avistacorp.com

Innovative Spring & Fall Chinook Rearing Techniques at Little White Salmon National Fish Hatchery

Chinook Culture Symposium

Keywords

Established in 1898, the Little White Salmon National Fish Hatchery has been involved with the rearing of Chinook salmon for more than 100 years. The current hatchery program is accomplished with reimbursable funding from NOAA – Fisheries, the U.S. Army Corps of Engineers, and the Bonneville Power Administration. As a result, fish produced at the hatchery are an important source of native fish for mitigating the impacts of hydroelectric projects on the Columbia River; providing sport, commercial and tribal fisheries; and for restoring extinct or depleted native stocks in the Columbia River Basin. The rearing practices used today are the result of time-tested methods and improvements in fish culture incorporating the latest hatchery technology and scientific advancements. The use of baffles during raceway rearing, reduced-density egg incubation and rearing, segregation and culling of returning adult fish with elevated pathogen levels, the use of antibiotics to control disease, and an aggressive monitoring and evaluation program have contributed to a very successful hatchery program. As a result, the hatchery routinely exceeds adult fish escapement goals and fuels an intensive terminal area sport and tribal fishery concentrating effort on the harvest of hatchery (non-wild) fish in the Little White Salmon River.

Contact

Doulos, Speros
Complex Manager
U.S. Fish & Wildlife Service
Little White Salmon/Willard National Fish Hatchery Complex
56961 SR14
Cook, WA 98605USA

Email: speros_doulos@fws.gov
Phone: 509-538-2755
Fax: 509-538-2880

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Sampling efficiency for burbot in standing waters of the Wind River drainage, Wyoming.

Fish Conservation & Management Session

Keywords
burbot, sampling, hoop net, cod trap, trammel net

Burbot are poorly understood by fishery managers in Wyoming, despite their importance as a native sportfish. Previous attempts to study burbot have been hindered by ineffective sampling techniques. We tested the efficiency of three different gear types (hoop net, cod trap, trammel net) for sampling burbot in lakes and reservoirs of the Wind River drainage. Hoop nets and cod traps have been used successfully to sample burbot in other states, but trammel nets have never been tested. We established three study areas to represent a diversity of standing water habitats, varying from a small, natural lake to a large reservoir. Within each study area, nine sampling sites were selected. Gears were randomly rotated through the sites, allowing each gear to fish at a site for one night during a three-night period. We also evaluated seasonal differences in burbot sampling efficiency. Burbot are most active from late-autumn through early-spring, so we sampled each study area prior to ice-up in 2005 and replicated sampling soon after ice-out in 2006. This study is the initial step towards developing statewide sampling protocols for burbot in Wyoming and will lead to more detailed burbot population assessments.

Contact

Dux, Andrew
Fisheries Biologist
Wyoming Game and Fish Department
3030 Energy Lane, Suite 100
Casper, WY 82604USA

Email: Andrew.Dux@wgf.state.wy.us
Phone: 307-233-6410
Fax: 307-473-3433

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Joe Deromedi
Wyoming Game and Fish Department
Joe.Deromedi@wgf.state.wy.us

Dave Dufek
Wyoming Game and Fish Department
Dave.Dufek@wgf.state.wy.us

Pacific Salmon Gamete Collection at Michigan Department of Natural Resources Weirs

Chinook Culture Symposium

Keywords
Weir, FELISA, Bacterial Kidney Disease, Erythromycin

Pacific salmon gametes for MDNR's salmon program are collected annually from three permanent weirs. Chinook gametes are collected at the Swan River Weir and at the Little Manistee River Weir. Coho gametes are collected at the Upper Platte River Weir. The weirs go into place in mid-August and fish generally begin showing up in noticeable numbers near the beginning of September. One-to-one crosses are done to maximize genetic variability. From 1993 through 2004, FELISA testing was done to screen for females that were positive for bacterial kidney disease (BKD). Due to problems with accuracy and precision, FELISA testing was discontinued in 2005. Beginning in 2005, the use of a one hour erythromycin bath during water hardening was started. Both males and females are screened for internal and external signs of disease. Any with obvious disease are culled and their gametes discarded. At the end of a day's egg harvest, buckets of green, fertilized eggs are sent to the three hatcheries that rear salmon. MDNR weirs also harvest gametes for state agencies in Indiana, Illinois and Wisconsin. Surplus salmon and carcasses of those used for gamete collection become the property of a vendor who is hired via the competitive bidding process to operate the weirs. They provide manpower to operate the weirs and twenty-four hour security during weir season.

Contact

Eisch, Ed
Northern Lower Peninsula Area Hatchery Manager
Michigan Department of Natural Resources
Oden State Fish Hatchery
8258 South Ayr Road
Alanson, MI 49706USA

Email: eische@michigan.gov
Phone: 231-347-4689
Fax: 231-347-8421

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Culture of Pacific salmon in Michigan Department of Natural Resources Fish Hatcheries: An Overview

Chinook Culture Symposium

Keywords
Early mortality syndrome, Michigan raceways, baffles, disc filters, serial reuse, net pens

The Michigan Department of Natural Resources has been culturing Pacific salmon since the mid-1960's. Pacific salmon are cultured at three of MDNR's six fish hatcheries. Wolf Lake SFH rears roughly one million chinook salmon annually. Thompson SFH produces 500,000 chinook smolts annually. Platte River SFH raises 1.5 million yearling coho salmon and 3.8 to 4.1 million chinook smolts each year. Thompson and Wolf Lake rear their salmon on pumped ground water. Platte uses surface water from three different sources. All three facilities use vertical flow through incubators. Salmon fry receive a 750ppm, one hour flow through thiamine treatment, just prior to or just after tanking to mitigate the effects of Early Mortality Syndrome (EMS). Early rearing occurs in baffled tanks following the Michigan raceway design. The fish are eventually transferred to larger baffled raceways. All three facilities utilize serial reuse technology. Solids management at Wolf Lake and Thompson includes quiescent settling zones which are cleaned weekly and a solids storage tank which is pumped annually. Rather than using a quiescent zone, the solids in the outdoor raceways at Platte are kept in suspension and are removed by use of disc filters between series' of raceways. All three facilities feed BioOregon Biodry 1000, Low-P. As part of a long term research study, some fish are transferred to net pens in receiving waters prior to smolting and others are stocked directly into the receiving waters immediately prior to the onset of smolting.

Contact

Eisch, Ed
Norhtern Lower Peninsula Area Hatchery Manager
Michigan Department of Natural Resources
Oden State Fish Hatchery
8258 South Ayr Road
Alanson, MI 49706USA

Email: eische@michigan.gov
Phone: 231-347-4689
Fax: 231-347-8421

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Gathering and Using Information: Two Montana Projects Where Information Research Can Lead to On-the-Ground Wetland and Stream Protection

Contributed Paper Session

Keywords
streams, wetlands, development projects, land use planning

As more and more people choose to build homes next to Montana's streams, rivers, lakes, and ponds, and as property values increase, the pressures to develop our state's wetlands and riparian areas are increasing—often to the detriment of fish and wildlife. Two research projects about Montana's wetlands and streams, how development projects impact those areas, and how to implement protection measures were developed to facilitate on-the-ground protection of these important resources. The first publication, A Planning Guide for Protecting Montana's Wetlands and Riparian Areas, explains how impacts to these areas can be avoided by land use planning decisions made at the local level. An overview of the handbook will be presented, along with examples of how communities in Montana have used the principals outlined in this book to protect stream and wetland resources. The second publication, Impacts of the 404 Permit Program on Wetlands and Waterways in Montana and Recommendations for Program Improvement, examines 13 years of information on Section 404 of the Clean Water Act, administered by the Army Corps of Engineers, to identify where and how development projects are impacting Montana's streams and wetlands.

Contact

Ellis, Janet
Executive Director
Montana Audubon
P.O. Box 595
Helena, MT 59624USA

Email: jellis@mtaudubon.org
Phone: 406-443-3949
Fax: 406-443-7144

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Use of the Total Maximum Daily Load (TMDL) Process in Conservation of Fluvial Arctic Grayling, a Candidate for Protection under the Endangered Species Act (ESA)

Fish Conservation & Management Session

Keywords
Arctic grayling, TMDL, candidate species, water quality, temperature

Development of TMDL plans for impaired waters is a requirement of the Clean Water Act and supports the goal of restoring water quality to meet state standards and promote full support of beneficial uses. Among listed pollutants in the upper Big Hole River is temperature, which poses a considerable threat to a remnant population of fluvial Arctic grayling, a candidate for ESA listing. Factors contributing to warm water temperatures in the Big Hole River include chronic dewatering from irrigation withdrawals, removal of shade-producing willows, and associated changes in channel geometry. Targets included mean and maximum daily temperatures, shrub cover, stream flow, and width-to-depth ratios. Application of a thermal model indicated substantial decreases in mean and maximum daily temperatures were possible with target attainment. Allocations for thermal loading among the identified influential factors followed a performance-based approach that will provide adequate shading and flows, and suitable channel geometry to maintain cooler temperatures. Proposed restoration and monitoring activities build on agreements among federal and state agencies and landowners designed to promote grayling recovery in a working watershed. Specific restoration activities call for maintenance of flow targets, re-establishment of functioning shrub communities, channel restoration where warranted, and implementation of agricultural best management practices.

Contact

Endicott, Carol
Senior Ecologist
Confluence Consulting, Inc.
PO Box 1133
Bozeman, MT 59715USA

Email: cendicott@confluenceinc.com
Phone: 406 585-9500
Fax: 406 582-9142

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Movements of Green Sturgeon in the Rogue River, Oregon: do jet boats affect the behavior and health of individual fish?

Sturgeon Symposium

Keywords
green sturgeon, Rogue River, behavior, jet boats

Green sturgeon, Acipenser medirostris, are known to spawn in three river systems; the Rogue River, Oregon is one of those rivers. Green sturgeon enter the Rogue River during the spring to spawn. After spawning, individuals select small holding sites where they remain for months before returning to the ocean. Some have speculated that green sturgeon do not feed while in fresh water, and previous studies suggested limited movements by individuals during the summer-fall holding period. Commercial and recreational jet boats are present on the Rogue River. If green sturgeon hold positions to minimize energy loss during this fresh-water phase, then it is possible that chronic disturbances by jet boats could impact the health of individual fish. The purpose of this study was to determine whether jet boat activity on the Rogue River affects the behavior of green sturgeon. Movements of green sturgeon were monitored using 3 methods: (1) manually tracking radio-tagged fish, (2) continuously logging the horizontal movements of tagged fish using submersible receivers anchored at discrete sites, and (3) continuously logging fish depth using pressure-sensitive tags. Results were surprising: tagged individuals were extremely active within their home ranges during day and night, regardless of jet boat activity.

Contact

Erickson, Dan
Conservation Fisheries Scientist
Wildlife Conservation Society
541 Willamette Street
Eugene, OR 97431USA

Email: derickson@wcs.org
Phone: 541-302-3234
Fax: 541-302-3234

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Distribution and movement of adult Yellowstone cutthroat trout in the upper Yellowstone River drainage

Fish Ecology Session

Keywords
Yellowstone, cutthroat, telemetry, radio, adfluvial

Yellowstone cutthroat trout were historically the most widely distributed subspecies of cutthroat trout in the world, but now occupy less than 10% of their historic range. The largest remaining population of genetically pure, adfluvial Yellowstone cutthroat trout is found in the Yellowstone Lake basin. The Yellowstone River is the largest of 127 tributary streams in this system, providing over 30% of the water that enters Yellowstone Lake. While long term data exists for several tributaries in the northern portion of the lake, prior to this study, no comprehensive fisheries assessment had been conducted on the upper Yellowstone River and its tributaries. We surgically implanted radio transmitters into 151 adult cutthroat trout in the Yellowstone River drainage. Fish were tracked weekly during the spawning season (May through August) and monthly for the rest of the year over a three year period. These data will be used to help determine the contribution of the upper Yellowstone River to the Yellowstone Lake cutthroat trout population and identify resident versus migratory populations of cutthroat trout within the system.

Contact

Ertel, Brian
Biotech/ Masters Student
National Park Service / Montana State University
P.O. Box 168
Yellowstone National Park, WY 82190USA

Email: brian_ertel@nps.gov
Phone: (307)344-2282
Fax: (307)344-2211

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Todd Koel
National Park Service
todd_koel@nps.gov

Thomas McMahon
Montana State University
tmcmahon@montana.edu

NEZ PERCE TRIBE WHITE STURGEON MANAGEMENT PLAN

Sturgeon Symposium

Keywords
white sturgeon, management, Snake River

White sturgeon (Acipenser transmontanus) in the Hells Canyon reach (HCR) of the Snake River are of cultural importance to the Nez Perce Tribe. Hydrosystem development in the Columbia River Basin has depressed numbers and productivity of white sturgeon in the HCR by isolating fish in impounded reaches of the basin, restricting access to optimal rearing habitats, reducing the anadromous forage base, and modifying early life-history habitats. Consequently, a proactive management plan is needed to mitigate for the loss of white sturgeon production in the HCR. A multi-pronged approach for management was decided upon whereby various actions will be implemented and evaluated under different timeframes. Priority management actions include: produce juvenile white sturgeon in a hatchery and release into the management area; collect juvenile white sturgeon from other populations in the Snake or Columbia rivers and release them into the management area; and restore white sturgeon passage upriver and downriver at Lower Snake and Idaho Power dams. An integral part of this approach is the continual monitoring of performance measures to assess the progressive response of the population to implemented actions, to evaluate the actions' efficacy toward achieving objectives, and to refine and redirect strategies if warranted.

Contact

Everett, Scott
Fisheries Research Biologist
Nez Perce Tribe
P.O. Box 365
Lapwai, ID 83540USA

Email: scotte@nezperce.org
Phone: 208-843-7320
Fax: 208-843-2351

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Michael Tuell
Nez Perce Tribe
miket@nezperce.org

Jon Firehammer
Nez Perce Tribe
jonf@nezperce.org

Jay Hesse
Nez Perce Tribe
jayh@nezperce.org

Survival of Conventional vs Semi-Naturally Reared Supplemented Spring Chinook Salmon

Chinook Culture Symposium

Keywords
chinook, culture, semi-natural rearing, supplementation

The Cle Elum Supplementation and Research Facility (CESRF) is a hatchery and acclimation complex founded in 1997 to test innovative concepts relative to supplementation and hatchery reform. The experimental design for the hatchery has a total release of 810,000 spring Chinook (Oncorhynchus tshawytscha) smolts annually from three acclimation sites associated with the facility. Releases for brood years 1997 to 2001 compare the effectiveness of optimum conventional (OCT) and semi-natural (SNT) rearing treatments for producing smolts and returning adults for supplementation programs. Survival indices from release to McNary Dam (smolt-to-smolt) and adult returns to Roza Dam (smolt-to-adult) were estimated with Passive Integrated Transponder (PIT) tags by treatment for each year. Smolt survival indices were developed for outmigration years 1999 to 2003. There was not sufficient statistical evidence to indicate that the SNT treatment resulted in higher smolt-to-smolt survival indices than did the OCT treatment over the five outmigration years. Adult returns were evaluated from 2000 through 2006. A logistic analysis of variation for adult returns also indicated that there was no significant difference between the SNT and OCT treatments. The potential impact of disease factors, highly variable freshwater outmigration flows and ocean productivity on these results is discussed.

Contact

Fast, David
Senior Research Scientist
Yakama Nation
Nelson Springs Research Facility
771 Pence Rd
Yakima, WA 98902USA

Email: FAST@YAKAMA.com
Phone: 509 -945-1206
Fax: 509 966 4972

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

William Bosch
Yakama Nation

William Bosch
Yakama Nation
bbosch@yakama.com

Charles Strom
Yakama Nation

Monitoring Fish Migration Past Two Instream Structures

Poster Session

Keywords
Fish migration, fish barrier, transition zone streams, mark-recapture

Colorado's Front Range streams contain diversion and grade-control structures that have the potential to be fish barriers. We conducted mark-recapture studies on fish in Spring Creek in Fort Collins, and the St. Vrain River in Longmont to determine if fish were moving past potential barriers (a 0.7-m high vertical drop in Spring Creek and a rock-ramp fishway on the St. Vrain River). Sites were sequentially electrofished upstream and downstream of the barrier twice monthly every other month for one year. Fish were individually marked with visual implant elastomers, and recaptures were recorded on subsequent trips. We recaptured 520 fish out of 3,416 marked on Spring Creek: only 4 moved upstream past the barrier. Estimated transition probabilities between reaches separated by the barrier were negligible (program MARK), supporting our assertion that the structure effectively prevents upstream fish movement. We marked 1115 fish on the St. Vrain but recaptured too few fish (n=17) to evaluate movement rates over the rock-ramp fishway. Further study would be necessary to determine its effectiveness in allowing upstream migration. However, because it incorporates multiple depths, water velocities, and velocity shelters, we can qualitatively say that the structure likely allows passage of a variety of fishes.

Contact

Ficke, Ashley
Graduate Research Assistant
Colorado State University
Campus Delivery #1474
Fort Collins, CO 80523-1474USA

Email: adficke@lamar.colostate.edu
Phone: 970-491-5830

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Christopher Myrick
Colorado State University
Chris.Myrick@Colostate.edu

Mark Johnston
Yakama Nation

David Lind
Yakama Nation

Doug Neeley
IntSTATS Consulting

Brassy Minnow and Arkansas Darter Swimming and Jumping Performance and Their Implications for Fishway Design

Fish Conservation & Management Session

Keywords
Fish ladders, fish migration, plains fishes, Colorado, Front Range

Instream structures (e.g., weirs, grade control devices, and low-head dams) in Colorado's Front Range streams may impede movement of small-bodied native fishes. We studied brassy minnow and Arkansas darter swimming and jumping performance at 10, 17.5, and 25° C so that we could evaluate the barrier potential of existing structures, and recommend efficient fishway designs. Swimming performance was measured using fixed velocity (4 – 64 cm/s) endurance trials, and jumping performance was tested with 5 – 30 cm plunge pool depths and weir heights of 0 – 20 cm. Brassy minnow swimming endurance was temperature– and velocity-dependent: they sprinted at 32 cm/s at 10° C but exhibited sustained swimming at this velocity at higher temperatures. Arkansas darter endurance was dependent only on swimming velocity; they performed similarly to brassy minnows held at 10° C. Brassy minnow jumping success depended upon temperature, weir height, and a weir height/ plunge pool interaction. Brassy minnows jumped four times higher at 25° C than at 10° C. Arkansas darters did not jump, and only temperature affected movement probability when weir heights equaled zero. Therefore, water velocities in Front Range fishways should be ? 32 cm/s. Furthermore, fishways that require jumping would prevent upstream movement of both species.

Contact

Ficke, Ashley
Graduate Research Assistant
Colorado State University
Campus Delivery #1474
Fort Collins, CO 80523-1474USA

Email: adficke@lamar.colostate.edu
Phone: 970-491-5830

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Christopher Myrick
Colorado State University
Chris. Myrick@Colostate.edu

The paddlefish spawning migration in the Yellowstone River: regulated by flow or fidelity?

Sturgeon Symposium

Keywords

Paddlefish, Polyodon spathula, of the Yellowstone-Sakakawea stock, Missouri and Yellowstone rivers, Montana and North Dakota, were radio-tagged to assess the influence of spring discharge on movement patterns during spawning migrations, 1999-2002. Paddlefish exhibited repeated directional changes in movement, traveling extensively upriver and downriver in association with increasing and decreasing levels of river discharge. The choice of river ascended (Missouri or Yellowstone) was also associated with increasing levels of discharge. Contrary to expectations, fish ascended to similar reaches in all years despite differences in flow regimes. Sixty-five of the 74 migrants restricted their migration to reaches below Yellowstone River kilometer (YRkm) 55. Ten of the 22 paddlefish contacted in more than one spring displayed site-fidelity, which primarily occurred within a 25 rkm reach (YRkm 30 – YRkm 55). One male, however, was contacted further upriver than YRkm 100 in three of the four migrations. Results from this study suggest that, in years of moderate spring flows, site-fidelity may be as influential as discharge in determining the reaches to which paddlefish ascend. In addition, findings from the study provide insight into how annual variations in or modifications to the spring flow regime might affect movement patterns in migratory paddlefish and, consequently, spawning success.

Contact

Firehammer, Jon
731 E. 6th Street
Moscow, ID 83843USA

Email: fire0983@uidaho.edu
Phone: 208 883-4730

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Dennis Scarnecchia
Department of Fish and Wildlife Resources, University of Idaho
scar@uidaho.edu

Automated real time fish tracking and plant operations data capture

Fish Conservation & Management Session

Keywords

Fully automatic radio telemetry based systems are being used to simultaneously monitor fish movement and plant operations data to help support the development of effective fish passage strategies at a hydroelectric installation near Thompson Falls, Montana. Approximately 120 fish of varying ages, weights, and species, have been fitted with surgically implanted radio transmitters and released downstream from the plant. Fish location data are then gathered by an array of automated radio receiving stations that monitor individual fish movements. The plant SCADA system provides simultaneous operations data such as turbine flow, flashboard configuration, gate position data, lake levels, and other information. Automated systems download the data, perform additional processing, and then upload the results to a dedicated Internet site for user interactive display and analysis. An animation application was also written to incrementally display simultaneous plant operations and fish location data through time, so that analysts and designers can assess the behavior of fish based on plant operations and other physical conditions.

Contact

Foss, Douglas
Mechanical Engineer
2245 West Koch Street, Ste F
Bozeman , MT 59718USA

Email: dfoss@geiconsultants.com
Phone: 406 522 9669
Fax: 406 522 7387

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Framework Modeling of Ecotype Production for a Sympatric Population of Anadromous and Resident O. mykiss; Yakima River, Washington.

Fish Ecology Session

Keywords
Resident and anadromous rainbow trout

Determining recovery strategies for upper Yakima River basin steelhead (O. mykiss) has been constrained by our limited understanding of the ecotype interactions between the sympatric populations of anadromous and resident O. mykiss. A life cycle model based on the intrinsic productivity and capacity of the freshwater environment was constructed to investigate the response in population demographics and abundance between the anadromous and resident ecotypes. Life history stage-specific recruitment curves were developed for modeling differential productivity and capacity thresholds for freshwater age classes of the combined ecotype population. Modeled abundance estimates for both adult spawners and smolt production integrated ecotype-specific age structures for accurate representation of recruitment per brood year. Explicit assumptions affecting adult abundance include initial adult abundance, smolt-to-adult return rates and relative production of each life history form resulting from potential breeding crosses. Results from this analysis and future work will improve our understanding of the ecotype interactions and potential recovery options available to restore a viable population of steelhead to the upper Yakima River basin.

Contact

Frederiksen, Chris
Population modeling scientist
Yakama Nation Fisheries YKFP
771 Pence Rd
Yakima, WA 98908USA

Email: chrisf@yakama.com
Phone: (509) 966-5156
Fax: (509) 966-4972

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Restoring Pallid Sturgeon Populations In The Upper Missouri River Basin, Montana.

Sturgeon Symposium

Keywords
Pallid sturgeon, stocking, survival, growth, dispersal

Pallid sturgeon was listed as endangered throughout its range in 1990. Very few adult pallid sturgeon remain in Montana with about 160 individuals in Area 2 and <50 individuals in Area 1. No significant recruitment has occurred in over 30 years. Stocking hatchery-reared pallid sturgeon back into these areas is a short-term goal of the Recovery Plan. Survival, growth and dispersal of hatchery-reared pallid sturgeon were monitored over the course of seven years to determine the effectiveness of the present stocking program. Survival rates for the five year-classes of stocked pallids could only be assessed for the 1997 year-class. The survival rate for this year-class after seven years in the wild was 42% and was 4 times greater than the stocking plan model predicted. The recaptured hatchery-reared pallid sturgeon grew at a surprisingly slow rate, averaging 38mm year –1. Initial results of the stocking program will be used to make appropriate modifications so that the anticipated goals will be met.

Contact

Gardner, William
Fisheries Biologist
Montana Fish Wildlife and Parks
P. O. Box 938
Lewistown , MT 59457USA

Email: fwplew@tein.net
Phone: 406.538.4658
Fax: 406.538.3249

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

EXTRACTION OF MYXOSPORES FROM SEDIMENT UTLIZING A SOIL TEXTURE CENTRIFUGE TECHNIQUE AND SODIUM HEXAMETAPHOSPHATE

Poster Session

Keywords

Myxobolus cerebralis (causative agent of whirling disease) is the most intensively studied member of the phylum Myxozoa. Although there is much information about the development of myxosporean spores, little is known about the movement of spores in water and their interactions with sediment. Varying quantities of sediment and stained myxospores were combined with aqueous sodium hexametaphosphate ([NaPO3]6). We were able to extract myxospores from all of the sediment and myxospore samples using a soil texture centrifuge technique to separate particles by density. The mean percent myxospore recovery declined as the quantity of sediment added to each sample increased. These results support previous research indicating that even small quantities of sediment in a sample can negatively affect myxospore extraction. The soil texture centrifuge technique used with aqueous [NaPO3]6 effectively isolated M. cerebralis myxospores from water samples with no sediment. This technique could be used to assess whirling disease infection levels in water samples without sediment.

Contact

Gates, Kiza K.
MS Candidate
Montana Cooperative Fishery Research Unit
301 Lewis Hall
Montana State University
Bozeman, MT 59717USA

Email: kgates@montana.edu
Phone: 406-994-3698
Fax: 406-994-7479

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Christopher S. Guy
Montana Cooperative Fishery Research Unit
cguy@montana.edu

MOVEMENT OF RESIDENT AND NON-RESIDENT ANGLERS IN THE GREATER YELLOWSTONE ECOSYSTEM: IMPLICATIONS FOR TRANSFERRING AQUATIC NUISANCE SPECIES

Poster Session

Keywords

Humans play an influential role in the transport of aquatic nuisance species throughout the world. Understanding the movement patterns of anglers in Montana will provide information regarding the potential transport of aquatic nuisance species among drainages, states, and globally. We surveyed anglers at access sites on the Beaverhead, Madison, Gallatin, Missouri, Yellowstone, and Bighorn Rivers in Montana from June through August of 2005. Anglers were asked questions regarding their most recent prior fishing trip, fishing trips in the past month, planned fishing trips in the coming week, and their state or country of residency. Of the anglers surveyed, 60% were Montana residents while 40% where non-residents. Non-residents represented 39 states and 2 foreign countries. Over half of all non-residents surveyed had fished in at least one other state than Montana in the past month. The average distance traveled by Montana residents from their home zip code was 59.2 miles (± 67.1, [95% CI], n=112). The average distance traveled by non-residents was 1,526.4 miles (± 5,943.9, [95% CI], n=162). Our results indicate that anglers in Montana are highly mobile and that increased angler awareness campaigns and access site monitoring could be of value in preventing the spread of aquatic nuisance species.

Contact

Gates, Kiza
MS Candidate
Montana Cooperative Fishery Research Unit
301 Lewis Hall
Montana State University
Bozeman, MT 59717USA

Email: kgates@montana.edu
Phone: 406-994-3698
Fax: 406-994-7479

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Christopher S. Guy
Montana Cooperative Fishery Research Unit
cguy@montana.edu

Alexander V. Zale
Montana Cooperative Fishery Research Unit
zale@montana.edu

Travis B. Horton

Montana Fish, Wildlife, & Parks
thorton@state.mt.us

Effects of exposure to low dissolved oxygen on survival, development, and growth of Snake River fall Chinook salmon eggs and alevins

Fish Ecology Session

Keywords
fall chinook salmon, incubation, Snake River, dissolved oxygen, temperature, survival to emergence

Fall Chinook salmon eggs were exposed to water temperatures of 15-16.5°C at dissolved oxygen (DO) levels of 4-8 mg O2/L, and 100% air-saturation. Water temperatures were immediately adjusted downward 0.2°C/day while initial DO was adjusted upward 2 mg O2/L on day 17 post-fertilization (PF). On day 39 PF, all embryos were moved to saturated DO to complete development through emergence. Survival to emergence was greater than 83% for all treatments. At the lowest DO level, the eggs took 6-10 days longer to reach hatch and 13-24 days longer to reach emergence than eggs exposed at the same temperature to saturated DO. The yolk weight at emergence was higher from eggs initially exposed to saturated DO than in groups exposed to 4-8 mg/L DO (7.5 mg). Survival at low DO may have been possible by reducing metabolism and slowing growth. The consequence of this strategy is that emergence was significantly later for those fry that were initially exposed to low DO at the egg stage. Delaying emergence may be detrimental to fall Chinook salmon survival because late migrants encounter unsuitable conditions in downstream reservoirs that may reduce their probability of reaching the ocean.

Contact

Geist, David
Staff Scientist
Battelle
Post Office Box 999
Mailstop K6-85
Richland, WA 99352USA

Email: david.geist@pnl.gov
Phone: (509) 372-0590
Fax: (509) 372-3515

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Distribution of flannelmouth and bluehead sucker in the Green River drainage of Wyoming and the threat of hybridization with non-native white sucker

Natives & Newcomers Symposium

Keywords

Flannelmouth and bluehead sucker are native to the Colorado River drainage and conservation efforts have been initiated to protect and restore these species in their native range. These species face numerous threats to their persistence in Wyoming, including habitat fragmentation, habitat destruction and the introduction of non-native fishes. In 2003, a study was undertaken to determine the distribution and status of flannelmouth and bluehead sucker in the Green River drainage of Wyoming and the extent of hybridization between flannelmouth and bluehead sucker and introduced white sucker. To date, 236 reaches have been sampled in the Green River drainage upstream of Flaming Gorge Reservoir. Bluehead sucker, flannelmouth sucker and white sucker were found in 4%, 26% and 50% of the reaches, respectively Phenotypic hybrids between flannelmouth and white sucker were found at 18% of the reaches and hybrids between bluehead and white sucker were found at 3% of the reaches. In the study area, we only identified a single population of each species that is isolated from white sucker. Given the widespread distribution of white sucker throughout the drainage, introgressive hybridization may be the foremost threat to flannelmouth and bluehead sucker persistence in the Green River drainage of Wyoming.

Contact

Gelwicks, Kevin
Fisheries Biologist
Wyoming Game and Fish Department
528 S. Adams St.
Laramie, WY 82070USA

Email: kevin.gelwicks@wgf.state.wy.us
Phone: 307-745-5180 ext 236
Fax: 307-745-8720

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Curtis Gill
Arizona Game and Fish Department

Aaron Kern
Wyoming Game and Fish Department
aaron.kern@wgf.state.wy.us

Hydropower Relicensing Using the New Integrated Licensing Process: the Mystic Lake Example

Contributed Paper Session

Keywords
hydroelectric power, dams, relicensing, Federal Energy Regulatory Commission

The Integrated Relicensing Process or ILP became the obligatory Federal Energy Regulatory Commission standard licensing process in 2005 for future relicensings. Although 13 ILP proceedings are in process, no Licensee has yet received a new FERC license under ILP rules. The ILP process differs from previous relicensing processes because the schedule of activities is rigorous and unforgiving. Disputes are resolved via an appointed dispute resolution panel with on a specified timeline. There are incentives for stakeholders to collaborate and participate early on. The Mystic Lake Project, owned and operated by PPL Montana, is in the first group of projects to undertake this new licensing process. I will use the Mystic Lake relicensing as an example to highlight some of the opportunties and potential pitfalls in the ILP process.

Contact

Gillin, Ginger
Environmental Scientist
GEI Consultants, Inc
127 E Front St
Suite 216
Missoula, MT 59802USA

Email: ggillin@geiconsultants.com
Phone: 4068293648
Fax: 4068290362

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Interactions between smallmouth bass (Micropterus dolomieui) Umpqua chub (Oregonichthys kalawatseti) and foothills yellow-legged frogs (Rana boylii) in Cow Creek, Oregon

Poster Session

Keywords
smallmouth bass, Umpqua chub, foothills yellow-legged frogs, introduced species

Since the introduction of smallmouth bass into the Umpqua River, Umpqua chub and foothills yellow-legged frogs, both native species, have declined throughout much of the mainstem. We chose six sites within an eight mile section of Cow Creek where all three coexist and examined species specific habitat use and predator-prey interactions. Bass associated with deeper pools and riffles, while chub were found closer to banks in shallower areas with aquatic vegetation. Yellow-legged frogs were observed on banks in rocky areas or on channel bottoms in shallow runs and riffles. Non-lethal stomach content analysis showed smallmouth bass fed on a variety of prey items including crayfish, sculpins, redside shiners, lamprey, frogs, and insect larvae. No chub were recovered from stomachs; however, other research has shown that chub are within the potential prey size range for smallmouth bass. It is unclear whether bass presence affects chub behavior; however, past surveys indicated that chub occupied the entire channel which suggests that their association with vegetation was a behavioral response to bass presence. Yellow-legged frogs were found in habitats similar to those in previous studies without bass, suggesting that bass presence did not affect frog habitat choice. The impacts of bass on native species in the Umpqua drainage have yet to be fully quantified; however, the coexistence of chub, frogs and bass in our study area may suggest that partial prey refuges exist and are crucial to native species survival.

Contact

Godfrey, Jacob
Oregon State University
1955 NW Grant Ave.
Corvallis, OR 97330USA

Email: godfreja@onid.orst.edu
Phone: 971-235-1391

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Jonathan Baldwin
Oregon State University
baldwinj@onid.orst.edu

Kevin Stertz
Oregon State University
stertzk@onid.orst.edu

Thomas Litwin

Oregon State University
litwint@onid.orst.edu

Matt Hamilton
Oregon State University
o2shredder@hotmail.com

Tyler Reid
Oregon State University
chevysportsman@hotmail.com

Derric Jacobs
Oregon State University
jacobsd@onid.orst.edu

Caitlin Madden
Oregon State University
caitlinrose79@hotmail.com

Alyssa Stutte
Oregon State University
alyssastutte@msn.com

Reproductive strategies of Poeciliopsis gracilis at tropical shallow lake in Morelos, Mexico

Poster Session

Keywords
reproduction, sex ratio, P. gracilis, Morelos, México

Reproductive analysis of 1 225 specimens of Poeciliopsis gracilis obtained through monthly samples from the Coatetelco lake, was made. There was and evident sexual dimorphism in the morphological features of this species. A difference in body size between the sexes at the onset of reproduction was noted. Sex ratio deviated significantly from unity. Monthly variations in Gonadosomatic Index (GSI) and stages of ovarian development showed that the spawning season for P. gracilis ranged from July to October, coincidental with the rainy season. Females reached greater sizes than males. The largest sizes found were 50 mm for females versus 43 mm males

Contact

Gómez-Marquez, José Luis
Fes Zaragoza, UNAM
Batalla 5 de mayo esq. Fuerte de Loreto
Col. Ejército de Oriente, Iztapalapa
México, DF 09230México

Email: lgomez@servidor.unam.mx
Phone: (52) 56230754
Fax: (52) 57736336

The presenter is someone other than the contact person and is listed below.

Isaías Salgado-Ugarte
isalgado@servidor.unam.mx

This contact person is the primary author.

Additional Authors

Bertha Peña-Mendoza
FES Zaragoza, UNAM
berthapegna@yahoo.com.mx

Abby K Sanchez-Herrera
FES Zaragoza, UNAM

Leonardo Sastré-Baes
FES Zaragoza, UNAM
samuraihell@hotmail.com

Isaías H. Salgado-Ugarte
FES Zaragoza, UNAM
isalgado@servidor.unam.mx

Tilapia fishery at Coatetelco lake, Morelos, Mexico

Poster Session

Keywords
Age, growth, tilapia, Morelos, México

Fishing at Coatetelco lake (Morelos State, Mexico) plays an important role for the local inhabitants. The exploited species is tilapia (Oreochromis niloticus) which represents an alternative food source for an important fraction at the village people. The catches are obtained mainly by gill-nets with 2.5" mesh size, although some cast nets of the same mesh size are also used. Catch is composed of organisms ranging from 8.9 to 16.5 cm standard body length (11 to 21 cm total length). Samples of fish from de commercial catch were taken from January to December 1999. A total of 1039 fish were analyzed (538 females and 501 males) to estimate population parameters such as age, growth, longevity, fishing gear selectivity and sex ratio. The results obtained show that the species do not reach more than 21 cm standard length and, indicated that in the lake there is no regulation on exploitation. Moreover, there is no catch limit and each fisherman can take as much as 40 kg daily. Age limit or longevity for the tilapia is 36 months. Considering the mesh size this leads to the fishing of small organisms which in turn, does not permit adequate population renewal because the organisms are caught before they have experience more than two reproductive periods. In order to avoid this unfavorable situation it is necessary to consider a change to a bigger mesh size (3 or 3.5") to allow fish to be larger when caught.

Contact

Gómez-Marquez, José Luis
Fes Zaragoza, UNAM
Batalla 5 de mayo esq. Fuerte de Loreto
Col. Ejército de Oriente, Iztapalapa
México, DF 09230México

Email: lgomez@servidor.unam.mx
Phone: (52) 56230754
Fax: (52) 57736336

The presenter is someone other than the contact person and is listed below.

Isaías Salgado-Ugarte
isalgado@servidor.unam.mx

This contact person is the primary author.

Additional Authors

Bertha

Bertha Peña-Mendoza
FES Zaragoza, UNAM
berthapegna@yahoo.com.mx

Isaías H. Salgado-Ugarte
FES Zaragoza, UNAM

isalgado@servidor.unam.mx

Eloísa A Guerra-Hernández
FES Zaragoza, UNAM
eagh@servidor.unam.mx

José Luis Guzmán-Santiago
FES Zaragoza, UNAM
lgomez@servidor.unam.mx

Salmon Culture in North Dakota 1969-2006

Chinook Culture Symposium

Keywords
Salmon, culture, symposium

Salmon Culture in North Dakota 1969-2006 The construction of Garrison Dam and the formation of Lake Sakakawea in the late 50's created coldwater habitat on the Missouri River system that no native species was capable of utilizing. It was felt salmon would be able to make use of this habitat and provide a new fishing experience for North Dakota anglers. In 1969 the first of eight stockings of Coho salmon were made, the last taking place in 1981. Coho failed to establish themselves and in 1976 the first of ten stockings of Fall Chinook salmon took place. By 1981 the Fall Chinook had become established enough that the first spawning of the resident population was possible. Addition stockings of fish from other sources were continued until 1987. Since 1988 the Fall Chinook population in Lake Sakakawea has been self sustaining. This population is unique in that it has remained pathogen negative for its entire existence. Extreme water level fluctuations in the reservoir greatly affect the amount of cold water habitat available and pose a threat to the continued existence of the population. In 1999 it was decided to attempt a captive broodstock program to see if it was feasible as a backup source of pathogen free eggs. The program was successful providing almost 600,000 pathogen free eggs in its fifth and final year. It also provided some interesting comparisons with the free ranging population that might answer some of the questions that have puzzled the fisheries managers for many years

Contact

Gravning, Jon
Fishery Biologist
US Fish and Wildlife Service Garrison Dam NFH
PO Box 530
Riverdale, ND 58565USA

Email: jon_gravning@fws.gov
Phone: 701-654-7451
Fax: 701-654-7683

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Influence of Discharge Patterns on Movement of Coastal Cutthroat Trout

Fish Ecology Session

Keywords
movement, stream discharge, hydrology, migration

To understand physical and biological processes in headwater streams, we have been investigating distribution and movement patterns of coastal cutthroat trout in two watersheds in western Oregon since 2002. In each watershed, all pool and cascade habitat-types are surveyed annually using single-pass electrofishing, and cutthroat trout ≥ 100 mm are implanted with a passive integrated transponder. A network of fix-station antennae records relocation information as fish pass by a station, and every 3 months, continuous stream surveys using mobile antennas are conducted to relocate tagged trout. Flow and temperature are being measured throughout the stream network, and instantaneous sediment readings are collected during storm events. Resulting data are providing new insights into the relationships between the magnitude and timing of stream flows and patterns of fish movement in headwater streams. Specifically, we are investigating how the timing, magnitude, and duration of flow events influence fish movement and migration at the network scale. Relationships between movement and fish species, length, and location in the network are also being evaluated. This information is critical for assessing the passage effectiveness of existing crossing structures and will provide new insights into the design of future structures.

Contact

Gresswell, Robert
USGS - NRMSC and Department of Ecology, Montana State University
1648 S. 7th Avenue
Bozeman, MT 59717USA

Email: bgresswell@usgs.gov
Phone: 406-994-7085

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Douglas Bateman
Department of Forest Science, Oregon State University
dbateman@usgs.gov

David Hockman-Wert
USGS - FRESC
dhockman-wert@usgs.gov

The plight of the pallid: the cost of living in an endangered ecosystem

Sturgeon Symposium

Keywords
pallid sturgeon, large river,

Although sturgeons have been in existence since the Mesozoic Era, currently many sturgeon species are in jeopardy of extinction. The pallid sturgeon was listed as endangered in 1990, however naturally recruiting populations remain in real danger of going extinct. We argue that no significant efforts have been made to resolve the fundamental ecosystem alterations that originally caused the decline of pallid sturgeon. For example, to date we have failed in addressing the most pressing “Actions needed” as listed in the 1993 Recovery Plan. Therefore, is there any reason to expect that our current trajectory will avert the pallid sturgeon’s extinction? The rivers inhabited by pallid sturgeon will remain highly modified unless societal values change regarding dams and the services they provide versus services provided by naturally functioning large river ecosystems. Thus, society should be realistic about what can be expected regarding recovery of pallid sturgeon. We surmise the next era for pallid sturgeon will be the “Propagation Era” and we propose some ideas that will be necessary to cross the threshold into the “Recovery Era.”

Contact

Guy, Christopher
Assistant Unit Leader
U.S. Geological Survey, Montana Cooperative Fishery Research Unit
301 Lewis Hall
Montana State University
Bozeman, MT 59717USA

Email: cguy@montana.edu
Phone: 406-994-3491
Fax: 406-994-7479

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Robert Bramblett
U.S. Geological Survey, Montana Cooperative Fishery Research Unit
bbram@montana.edu

Determining the appropriate location for a fish passage facility at a complex tailrace at a Western Montana hydroelectric facility.

Fish Conservation & Management Session

Keywords
Dams, fish passage, bull trout, telemetry

Thompson Falls Dam located on the lower Clark Fork River, MT is owned and operated by Pennsylvania Power and Light, Montana (PPL Montana). The dam consists of a complex arrangement of two separate powerhouses and dams. Due to presence of bull trout (Salvelinus confluentus) and westslope cutthroat trout (Oncorhynchus clarki lewisi) in the project area, PPLM is currently studying the feasibility of a fish passage facility at the project. We used radio telemetry to understand the ideal location for a permanent fish passage facility. In all, over 60 salmonids were tagged with coded radio telemetry transmitters between 2004 and 2005. Preliminary results indicate that even with many attraction flows in project area, migratory fish tend to travel to the most upstream area that they can navigate. Therefore, we believe that the main channel dam (the most upstream area) is the best alternative for a permanent fish passage facility. Studies in 2006 should lend valuable information on the specific location to construct the entrance to the future fishway.

Contact

Haddix, Tyler
GEI Consultants, Inc
127 E Front St. Ste 216
Missoula, MT 59802USA

Email: thaddix@geiconsultants.com
Phone: 406-829-3648
Fax: 406-829-0362

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Brent Mabbott
PPL Montana
lbmabbott@pplweb.com

Ginger Gillin
GEI Consultants, Inc.

Current Conservation Strategies for Kootenai River White Sturgeon

Sturgeon Symposium

Keywords
Sturgeon, Conservation, Strategy, Kootenai River

Current Conservation Strategies for Kootenai River White Sturgeon The endangered Kootenai River white sturgeon occupy the Kootenai River from Kootenai Falls, Montana downstream to Kootenay Lake, British Columbia. There has not been a significant year class since 1974, coinciding with construction and operation of Libby Dam. An interim conservation aquiculture program using wild adults is being carried out by the Kootenai Tribe of Idaho and the Fresh Water Fisheries Society of British Columbia to preclude extinction. Recovery emphasis is on restoring habitat conditions essential to spawning site selection and survival during the first three weeks of life. Modest flow enhancement over the last decade has failed to cause sturgeon to both migrate to and spawn over suitable rocky substrates. We are attempting two approaches to habitat restoration. First, we are adding rocky substrate, and enhancing water velocity at sites now used for spawning. Secondly, we are restoring water depth and velocity in an area with suitable substrates. About half of the radio tagged pre-spawners visit this site before dropping downstream to spawn over unsuitable sandy substrate. A combination of increased river flows from Libby Dam, partially restored river stages through cooperative backwater management of Kootenay Lake, and structural confinement of the river channel to increase both depth and velocity are being considered.

Contact

Hallock, Bob
Endangered Species Specialist
U. S. Fish and Wildlife Service
11103 E. Montgomery Drive
Spokane Valley, WA 99206USA

Email: bob_hallock@fws.gov
Phone: 509-891-6839
Fax: 509-891-6748

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Jason Flory
U. S. Fish and Wildlife Service
jason_flory@fws.gov

Efforts to Reduce Lake Trout in Flathead Lake to Benefit Bull Trout

Bull Trout Symposium

Keywords
lake trout, bull trout

Flathead Lake was once noted for its abundant bull trout population. Mysis relicta, first documented in 1981, started a cascade of trophic shifts, including increased survival of lake trout. Predation by lake trout has restructured the fish assemblage and suppressed native trout. Montana Fish Wildlife and Parks and the Confederated Salish and Kootenai Tribes co-manage Flathead Lake and have chosen to reduce lake trout by means of public angling, even though lake trout represent over 80% of the fishery in most years. To achieve this goal, managers are employing liberalized regulations, i.e., two lines, a bag limit of 20, and fishing contests. The contests, based on a lottery system, target fish less than 710 mm (TL). The contests change angler behavior by motivating them to catch and harvest 100% of their limits. Currently harvest in the contests had risen to equal about 25% of the annual harvest. Despite these successes, there are currently no strong indicators that the present level of harvest is reducing the lake trout population size. Managers are currently evaluating whether it is more prudent to stay the course with public angling as a tool for reducing lake trout numbers, or to employ another method of reduction.

Contact

Hansen, Barry
Fisheries biologist
Confederated Salish and Kootenai Tribes
P.O. Box 278
Pablo, MT 59855USA

Email: barryh@cskt.org
Phone: 406 883-2888 x7282
Fax: 406 883-2897

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

History of the South Dakota Salmon Program

Chinook Culture Symposium

Keywords
South Dakota, Chinook, salmon, history

In the 1970's, the South Dakota Department of Game, Fish and Parks (SDGFP) attempted to develop a sport fishery in Lake Oahe that would utilize the lake's coldwater habitat. Numerous coldwater prey and predator species introductions were attempted but were unsuccessful. Rainbow smelt stocked in Lake Sakakawea established a self-sustaining population in Lake Oahe by 1976. Lake Michigan fall Chinook salmon were stocked as smolts in Sakakawea in 1978 and salmon reached Oahe by 1979. Success of the Sakakawea smelt and salmon introductions, prompted the SDGFP to implement a Chinook program in 1982. South Dakota has been relatively self-sufficient for salmon eggs since 1984. Salmon return via a fish ladder at Whitlocks Bay Spawning Station (WBSS), SD where eggs are collected, fertilized and transported to SD hatcheries for incubation and rearing. Smolts are stocked into Oahe so annual egg-production needs are met and a sport fishery is maintained. Electrofishing is used to supplement egg collection efforts at WBSS during years of low returns and is the sole collection method during low lake elevations that prevent operation of WBSS. Average annual salmon stockings ranged from 888,537 fish and 5,575 kg in the 1980's to 156,814 fish and 1,675 kg in 2004-2006.

Contact

Hanten, Robert
Fishery Biologist
South Dakota Department of Game, Fish and Parks
20641 SD Highway 1806
Pierre, SD 57532USA

Email: robert.hanten@state.sd.us
Phone: 605-223-7702
Fax: 605-223-7717

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Fish screens: efficacy and population effects on Skalkaho Creek, Montana

Poster Session

Keywords
entrainment, irrigation, fish screens, PIT, westslope cutthroat trout, migration

Irrigation canal entrainment has largely eliminated migratory westslope cutthroat trout in Skalkaho Creek, a tributary of the Bitterroot River. Our goal is to determine the efficacy of fish screens recently installed in three of seven irrigation canals on Skalkaho Creek, and their effect on downstream-migrating juvenile westslope cutthroat trout. The efficacy of screens at preventing entrainment of age-1 through 4 juveniles is quantified using half duplex PIT tags and PIT tag-detecting antennae. Fish screens were effective at precluding entrainment of PIT-tagged juveniles in 2005. The effect of screening on age-0 westslope cutthroat trout movements is determined by estimating the number of age-0 fish moving downstream above, between, and below the screened diversions. At unscreened diversions entrainment rates are quantified by estimating the numbers, and determining the fate of migratory fish that encounter these diversions using traps, half duplex PIT tags and PIT tag-detecting antennae. By quantifying fish screen efficacy, and gaining an understanding of the effects of screened and unscreened canals on downstream-migrating juveniles, we may determine whether the existing fish screens are an effective management tool for enhancing the migratory life-history strategy of westslope cutthroat trout in Skalkaho Creek or whether entrainment-preventing measures are required on remaining unscreened canals.

Contact

Harnish, Ryan
M.S. Candidate
Montana Cooperative Fishery Research Unit
MTCFRU Montana State University
PO Box 173460
Bozeman, MT 59717USA

Email: rharnish@montana.edu
Phone: 406-994-3698

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Alexander Zale
Montana Cooperative Fishery Research Unit, Primary Advisor
zale@montana.edu

Christopher Clancy
Montana Department of Fish, Wildlife, and Parks, Collaborator
cclancy@fs.fed.us

USDA Forest Service Northern Region Fish Passage Assessment at Stream/Road Crossings

Fish Conservation & Management Session

Keywords
Aquatic Organism Passage

An assessment of aquatic passage at streams/road intersections in the Northern region is critical to address restoration needs for aquatic organisms. Fragmentation of fish populations is one of the key factors to address in recovery planning of threatened, endangered and sensitive fish species including bull trout, steelhead salmon, chinook salmon, westslope cutthroat trout and yellowstone cutthroat trout. In 2002, the Northern Region identified the need for an assessment of stream crossings in the Region that were barriers to aquatic passage. This information was necessary to better define the issue in the Region and the anticipated program of work. This presentation summarizes survey efforts for aquatic passage in the Northern Region from 2002 to 2004. During this time period more than $750,000 was spent inventorying culverts at potential fish-bearing stream and road crossings. These surveys were performed primarily on Forest System roads and do not represent private, state, and county roads systems. Surveys were conducted using the guidelines of the National Inventory and Assessment Procedure for Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings (Clarkin et. al. 2003). Data is stored in an Access Database that is located at each Forest/Grassland and is also available on the Regional Aquatic Organism Passage intranet website (http://fsweb.r1.fs.fed.us/wildlife/wwfrp/fisheries/Fish_Passage_Web_Page.htm). This data has been aggregated to determine the extent of fish passage issues. Approximately 2,800 culverts have been inventoried and assessed for fish passage within the Northern Region and their results are summarized for adult and Juvenile salmonids. The adult results indicate that approximately 80% (Figure 5) of the inventoried crossings in the region are an upstream barrier to migrating fish during some timeframe throughout the year, 13% are indeterminate (Gray), and seven percent are not considered barriers. The juvenile results are similar to the adults in that 84% are barriers, 9% are indeterminate, and seven percent are passable (Figure 5). The Lolo National Forest completed a hydraulic assessment for their Gray culverts and used the calculated flow values with the FishXing program. FishXing determined that approximately 80% and 20% of the Gray culverts (approx. 45) turned to Red and Green, respectively. Although this is a small sample size, it gives an idea of what Gray pipes from other Forests may be determined if flows were calculated and run through FishXing.

Contact

Hendrickson, Shane
Fisheries Biologist
US Forest Service, Region 1, Lolo National Forest
Building 24
Fort Missoula
Missoula , MT 59804USA

Email: shendrickson@fs.fed.us
Phone: 406-329-3727
Fax: 406-329-1049

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

High mortality of migrating adult Fraser River sockeye salmon: physiological and temperatures causes of a conservation crisis

Fish Conservation & Management Session

Keywords
Salmon, migration, mortality, physiology, energetics, disease

The 'Late-run' sockeye stock complex is one of the major groups of salmon in the Fraser River, the most productive salmon river in Canada. Historically, these fish milled in the estuary for several weeks before initiating fall spawning migrations. Since 1996, segments of Late-run sockeye, as well as other salmon species, now enter freshwater 3-6 weeks earlier than normal. Associated with this abnormal behaviour is extraordinarily high mortality (90-96% in some years). This high mortality phenomenon has caused the collapse of fisheries and emergency listing of stocks. We initiated a large multi-year research project in 2002, which continues to present, involving whole-body physiological assessments and tracking of physiologically biopsied fish that carry transmitters from ocean to spawning areas. Abnormally behaving and prematurely dieing fish have unusual ionic, osmotic and energetic states. Lab and field experiments indicate that mortality is caused by increased number of accumulated degree days which appears to accelerates disease, energy use and senescence.

Contact

Hinch, Scott
Professor
University of British Columbia
Dept Forest Sciences
2424 Main Mall
Vancouver, BC V6T 1Z4Canada

Email: scott.hinch@ubc.ca
Phone: 604 822-9377
Fax: 604 822-1969

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Steve Cooke
Carelton University
scooke@connect.carleton.ca

Tony Farrell
University of British Columbia
farrellt@interchange.ubc.ca

Glenn Crossin
University of British Columbia
crossin@interchange.ubc.ca

Todd Mathes

University of British Columbia
mathes@interchange.ubc.ca

Karl English
LGL Ltd.
kenglish@lgl.com

Effects of sediment pulses on channel morphology and sediment transport in a gravel-bed river

Contributed Paper Session

Keywords
geomorphology, fluvial sediment transport, sediment pulses

Sediment delivery to stream channels in mountainous basins is strongly episodic with large inputs of sediment typically delivered by infrequent landslides and debris flows. Identifying the role of large but rare sediment delivery events in the evolution of channel morphologies and fluvial sediment transport is crucial to an understanding of the development of mountain basins. In July of 2001, intense rainfall triggered numerous debris flows in the severely burnt Sleeping Child watershed, Sapphire Mountains, Montana. Ten large debris flow fans were deposited on the valley floor. Investigations focused on the channel response to the large input of sediment. The channel has aggraded immediately upstream of the fans, and braided in reaches immediately downstream. Channel incisement through the fans has created sets of coarse-grained terraces. The deposition upstream of the pulses consists almost exclusively of fine material resulting in a median bed material size (D50) 1-2 orders of magnitude lower than the ambient channel material. The volume of sand being transported is so great that these aggrading reaches can extend hundreds of meters upstream of the pulses with 1-2 meters of sand deposited across the entire valley floor. In a 10 kilometer study reach with 10 debris flow fans, cross section surveys, longitudinal profiles, and pebble counts chronicle channel response to a major increase in sediment supply and provide insight on the processes of sediment wave dispersal.

Contact

Hoffman, Daniel
724 Defoe Street
Missoula, MT 59802USA

Email: dan@munich.com
Phone: 406.543.1899

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Emmanuel Gabet
University of Montana
manny.gabet@mso.umt.edu

The influence of abiotic and biotic factors on the migration timing of subadult bull trout (Salvelinus confluentus) in Northeast Oregon

Bull Trout Symposium

Keywords
migration cues

Bull trout, a threatened species of char native to the Pacific Northwest, exhibit multiple life-history strategies. The migratory life-history form, in particular, has experienced widespread decline due in part to habitat fragmentation and degradation. As such, recovery of bull trout must include an understanding of migratory cues and patterns, in order to evaluate potential threats to persistence. We examine the effects of environmental and biological cues on the timing of bull trout migration in the South Fork Walla Walla River in Northeast Oregon. We tagged over 1500 bull trout with Passive Integrated Transponder tags (PIT tags) from 2002-2005, and monitored seasonal and diel movement patterns using active recapture methods and two passive PIT tag detectors. We then evaluated relationships between seasonal and diel movement, and both environmental (i.e., discharge, water temperature, photoperiod, and light intensity) and biological cues (i.e., body size at migration, presence of spawning adults). Timing of outmigration was related to seasonal changes in temperature and flow, and appeared to be differentially influenced by body size. We summarize different models for characterizing these relationships and expressing the variation among individuals. Furthermore, we discuss the implications of our findings in the context of bull trout management.

Contact

Homel, Kris
Graduate Student
U.S. Geological Survey / Utah Cooperative Fish and Wildlife Research Unit
Dept Aquatic, Watershed, and Earth Resources
5210 Old Main Hill
Logan, UT 84322USA

Email: krishomel@cc.usu.edu
Phone: (435) 640-7026

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Phaedra Budy
U.S. Geological Survey/ Utah Cooperative Fish and Wildlife Research Unit
phaedra.budy@cc.usu.edu

Lake Trout Suppression in Lake Pend Oreille, Idaho

Bull Trout Symposium

Keywords

Non-native lake trout have had significant negative impacts on native bull trout and other popular sport fisheries in lakes in the northern Rockies. Evidence of a rapidly expanding lake trout population and declining kokanee population in Lake Pend Oreille, Idaho, prompted significant fishing regulation changes in 2000, including no limit on lake trout. A commercial rod-and-reel fishery for lake trout was established in 2003 upon recommendation of a Citizens Advisory Committee. Participation has been limited and harvest of lake trout by the fishery has been less than 1,300 fish due to a limited market and strict FDA regulations. The CAC also approved the experimental use of deep water trap nets similar to those used on Lake Michigan to commercially harvest lake whitefish. Evaluation of commercial trap nets was implemented in the fall of 2003, with 1,183 lake trout caught, tagged and released in 31,025 h of effort for a Schnabel multiple-census population estimate of 6,376 fish > 52 cm. However, no lake trout were harvested due to social concerns over trap netting. The second year of the trap net contract was implemented in 2005 with 1,800 lake trout caught, tagged and released in 19,075 h of effort for a population estimate of 9,870 fish > 52 cm. Trap nets have been effective in catching about 15-20% of the estimated population of fish over 52 cm. Deep set gill nets will be used from February to April 2006 to conduct a Peterson mark recapture population estimate of lake trout and lake trout removal with means other than the sport fishery. Sport fish harvest of lake trout is currently inadequate to control lake trout expansion. Angler incentives have been used to increase participation from 8% to 20% of the anglers fishing for lake trout, but the vast majority of anglers are still fishing for rainbow trout. Continued declines in the kokanee population have prompted Idaho Fish and Game to implement an aggressive lake suppression program in 2006 using all means necessary.

Contact

Horner, Ned
Regional Fishery Manager
Idaho Department of Fish and Game
2885 W. Kathleen Ave
Coeur d'Alene, ID 83815USA

Email: nhorner@idfg.idaho.gov
Phone: 208 769-1414

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Distribution and Relative Abundance of Burbot in the Upper Missouri River, Montana

Fish Conservation & Management Session

Keywords
Missouri River, Burbot

A paucity of information exists on the basic ecology of burbot in the Upper Missouri River. The primary objective of this study was to determine the relative abundance of burbot on a spatial scale in the Missouri River from Holter Dam to Black Eagle Dam in Northcentral Montana—a 142-km reach of river. Secondary objectives were to determine exploitation, movement, size structure, and body condition. The study area was divided into eight 17.8-km reaches. Reaches were randomly selected from the upper and lower half of the river weekly; all reaches were sampled in March 2005 and 2006. Six hoop nets were fished systematically so that both sides of the river were sampled for a 2-night period every 2 km in each reach. When suitable backwater habitat existed, one cod trap was fished for three 2-night periods within each reach. Sampled burbot were tagged with a Floy tag and a PIT tag. A spatial density gradient exists within the river, where burbot density is highest near Holter Dam and progressively decreases downstream. For example, average hoop net CPUE in 2005 was 2.44 in the upper half of the study area compared to 0.48 in the lower half of the study area.

Contact

Horton, Travis
Fisheries Biologist
Montana Fish, Wildlife & Parks
4600 Giant Springs Road
Great Falls, MT 59405USA

Email: thorton@mt.gov
Phone: 406-454-5853
Fax: 406-761-8477

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Evaluation of Redd Counts as a Measure of Adult Bull Trout Abundance

Bull Trout Symposium

Keywords
bull trout, redds, abundance,

A critical demographic measure for the conservation and recovery of bull trout populations is an estimate of adult population size. Redds counts are the most widely used technique to assess population abundance. Previous work has examined sources of error in redd counts and their power to detect trends in abundance; however, there has been no systematic evaluation of the relationship of redd counts to adult abundance. We rigorously estimated the abundance of mature females of fluvial and resident populations prior to spawning and the corresponding number of redds produced. Fluvial adults were intercepted at an upstream trap and examined for sex and maturity with ultrasound. We used mark-recapture to estimate the number of potentially mature females residing above the trap. Numbers of mature resident females were determined using a combination of endoscopy and expanded removal estimates. Since 1998 the trend in numbers mature fluvial females has been stable, while redd counts have been more variable. Redds/fluvial female have averaged 1.3. Redds/female for the resident population were 0.4-0.6; however, estimates of resident redds were strongly negatively biased.

Contact

Howell, Philip
Fisheries Biologist
USDA Forest Service
Forestry & Range Sciences Lab
1401 Gekeler Lane
La Grande, OR 97850USA

Email: phowell@fs.fed.us
Phone: 541-962-6559
Fax: 541-962-6559

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Paul Sankovich
US Fish and Wildlife Service
Paul_Sankovich@fws.gov

Steve Jacobs
Oregon Department of Fish and Wildlife
steve.jacobs@oregonstate.edu

Seasonal movements and habitat use of adult saugers in the Little Wind River drainage, Wyoming

Warmwater/Prairie Streams Symposium

Keywords
sauger, movements, habitat, spawning

Movements and habitat use of adult saugers from fall to early summer were described in the Little Wind River drain age, Wyoming. Fifty-four adult saugers were captured during fall 2004 at the downstream extent of the Little Wind and Popo Agie rivers, Wyoming. Tagged saugers selected large, deep pools with low current velocities throughout the year. During fall and winter, tagged saugers remained sedentary or moved short distances between pools in close proximity to each other. Longer movements occurred during spring and early summer, and were associated with upstream and downstream migrations to and from two spawning locations. After spawning, most saugers returned to locations where they had been tagged in the fall and spent the winter. This research suggests that preservation of the sauger fishery in the Wind River drainage will depend on maintaining connectivity throughout the watershed, as well as preserving natural fluvial processes that form deep pools and maintain temporal and spatial temperature and turbidity patterns.

Contact

Hubert, Wayne
Dr.
Wyoming Cooperative Fish and Wildlife Research Unit
University of Wyoming
Dept. 3166, 1000 E. University Ave.
Laramie, WY 82071USA

Email: whubert@uwyo.edu
Phone: 307-766-5415
Fax: 307-766-5400

The presenter is someone other than the contact person and is listed below.

Kristopher Kuhn
kmkuhn@atlanticbb.net

The first author is someone other than contact person and is listed below.

Kristopher Kuhn
University of Wyoming
Dept. 3166, 1000 E. University Ave.
Laramie, WY 82071 USA
Phone: 307-766-5415
Fax: 307-766-5400
Email: kmkuhn@atlanticbb.net

There are no additional authors for this abstract.

Distribution of Nonnative Aquatic Vertebrates in Western USA Streams and Rivers

Natives & Newcomers Symposium

Keywords

Nonnative aquatic vertebrates have been widely introduced across the western USA. We analyzed data from the Environmental Monitoring and Assessment Program's (EMAP) Western Pilot to determine occurrence and proportion of stream length occupied by nonnative fish and aquatic herptiles in streams and rivers of 12 conterminous western states. A total of 1159 sites were sampled from 2000-2003. Native and nonnative species numbers and proportionate abundances based upon stream length are reported westwide, by ecoregion (Mountains, Xeric , Plains) , and by state (WA, OR, CA, AZ, NV, ID, MT, ND, SD, WY, CO, UT). An estimated 51.7% (± 5.2%) of the stream length in the study where vertebrates were collected contain nonnative vertebrates. Nonnatives represent >50% of the individuals in 21.9 ± 3.6% of the total stream length and are present in 79.9 ± 9.9 % of total river length ≥5th order. From 30 to 33 nonnative species were found in each of the three ecoregions Trout (rainbow, brown, brook) are the most common nonnative aquatic vertebrates found in the western states based upon proportion of stream length occupied. Of the 12 states, we collected the most nonnative taxa (23) in California. Nonnatives are usually gamefish, forage fish or baitfish.

Contact

Hughes, Robert M.
Department of Fisheries & Wildlife
Oregon State University
200 SW 35th Street
Corvallis, OR 97333USA

Email: hughes.bob@epa.gov
Phone: 541 754 4516

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Gregg A. Lomnicky
Dynamac
lomnicky.gregg@epa.gov

Thomas R. Whittier
Oregon State University
whittier.thom@epa.gov

David V. Peck
U. S. Environmental Protection Agency
peck.david@epa.gov

A Summary Of Recent Chinook Salmon Research From The Middle Fork Salmon River: What Have We Learned, Where Are We Going?

Fish Conservation & Management Session

Keywords
Chinook salmon, conservation, redd, connectivity, synchrony, autocorrelation, genetic, georeferencing

Guidance for effective conservation of declining native fish populations may be obtained through study of natural populations and understanding characteristic spatial and temporal dynamics. Beginning in 1995, we initiated an annual survey designed to georeference all wild Chinook salmon redds across 800 km of stream network in the Middle Fork Salmon River. Data from these surveys, and related efforts to obtain genetic samples and use pre-existing databases, have facilitated a series of studies that provide insights useful for managing this species. Results suggest that populations retain significant genetic diversity despite recent demographic bottlenecks. Spatial genetic structure exists at scales smaller than the MFSR, although it appears to be shaped by environmental characteristics. Autocorrelation analysis of redd distributions confirms this environmental effect and suggests dispersal may occur at distances ranging from 3 – 9 km. Maintaining suitable spawning habitats within these distances may be important, as it appears that habitat geometry (i.e., habitat size and connectivity) plays a dominant role in determining habitat use. Large habitats, supporting high densities of spawners, are most important when abundances are low and could serve as refugia during periods of population stress. Significant spatial and temporal interactions, however, indicate that distributions are dynamic and conservation efforts should not focus exclusively on the best contemporary habitats or populations. Temporal synchrony analysis highlights the dramatic changes that can occur among populations, and also suggests that populations have become strongly synchronized in recent decades—potentially increasing the likelihood of simultaneous extirpations and regional loss. Therefore, although it will remain important to maintain large, interconnected networks of habitat, populations in these areas may be susceptible to broad disturbances and spatial replicates in other portions of the species range will be needed to ensure persistence. Georeferencing and spatially continuous sampling lent tremendous analytical flexibility to the data used in these studies and these data will remain foundational in efforts to explore new spatial and temporal themes associated with Chinook salmon in the Middle Fork Salmon River.

Contact

Isaak, Dan
Fisheries Biologist
US Forest Service
322 E. Front St., Suite 401
Boise, ID 83702USA

Email: disaak@fs.fed.us
Phone: 208-373-4385
Fax: 208-373-4391

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Russ Thurow

US Forest Service
rthurow@fs.fed.us

Helen Neville
University of Nevada-Reno
hneville@unr.nevada.edu

Bruce Rieman
US Forest Service
brieman@fs.fed.us

Jason Dunham
US Forest Service
jdunham@usgs.gov

Relative Roles of Habitat Size, Connectivity, and Quality on Occupancy of Spawning Patches by Chinook Salmon

Poster Session

Keywords
metapopulation, habitat fragmentation, patch geometry, connectivity, conservation, Chinook salmon, Oncorhynchus tshawytscha, redd

Declines in many native fish populations have led to reassessments of management goals, often changing the focus from harvest to species persistence. As management has shifted, the perception of what constitutes relevant environmental characteristics has evolved from traditional metrics that described local habitat quality to characterizations of patch geometry, or those factors related to the size and connectivity of these habitats. Despite the implications this shift has for how habitats may be conserved and restored, it has been rare for habitat quality metrics to be evaluated relative to patch geometry metrics. We used an information-theoretic approach to select the best models from sets of logistic regressions that linked habitat quality, size, and connectivity to the occurrence of Chinook salmon nests. Spawning distributions were sampled annually from 1995 – 2004 and complimented with field measurements that described habitat quality in 43 suitable spawning patches across an interconnected stream network that drained 1150 km2 in central Idaho. Results indicate that the most plausible models were dominated by patch geometry metrics and habitat quality variables were of lesser importance. Implications for management are that the size and connectivity of existing habitats should be maintained whenever possible. In situations where habitat restoration is occurring, decisions about which habitats are prioritized for treatment could be made after consideration of habitat size and connectivity to surrounding areas.

Contact

Isaak, Dan
Fisheries Biologist
US Forest Service
322 E. Front St., Suite 401
Boise, ID 83706USA

Email: disaak@fs.fed.us
Phone: 208-373-4385
Fax: 208-373-4391

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Russ Thurow
US Forest Service
rthurow@fs.fed.us

Bruce Rieman
US Forest Service
brieman@fs.fed.us

Jason Dunham
US Forest Service
jdunham@usgs.gov

Stock complexity in green sturgeon: evaluating natal origins of mixed estuarine stocks beyond Distinct Population Segment boundaries

Sturgeon Symposium

Keywords
Distinct Population Segments, mixed stock analysis, microsatellite DNA, estuaries

We use assignment-testing algorithms to determine the contribution of two distinct population segments of green sturgeon to three oversummering coastal aggregations in Washington State. Green sturgeon (Acipenser medirostris) have a Northern population in rivers of the Klamath Mountains Province (KMP), and a Southern population containing a single spawning stock in the Sacramento River. During the summer, these anadromous fish aggregate in estuaries along the Pacific Northwest coast. The natal origins of these concentrating fish have long been questioned. A genetic stock identification baseline has been created with microsatellite DNA markers. A preliminary simulation study demonstrates the utility of the baseline for measuring the contribution of experimentally constructed mixed collections. The mixed stock analyses suggest the Southern DPS contributes primarily to aggregations north of the KMP (ie. Columbia River, Willapa Bay), while Northern DPS green sturgeon seem to aggregate more locally in estuaries of the KMP (ie. Winchester Bay). This pattern is unlike any previously observed migratory pattern in anadromous Pacific species, and requires additional examination to understand if the migratory habits of these fish are related to biogeographic relationships among stocks or habitat utilization by specific stocks. These data will also be useful for determining the potential impact of specific estuarine harvests on green sturgeon.

Contact

Israel, Joshua
Graduate Researcher
UC-Davis
Department of Animal Science
2403 Meyer Hall
Davis, CA 95616USA

Email: jaisrael@ucdavis.edu
Phone: 530-752-6351

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Olaf Langness
Washington Department of Fish and Wildlife
LANGNOL@DFW.WA.GOV

Bernie May
Genomic Variation Laboratory
bpmay@ucdavis.edu

The effect of macro-scale habitat features on post-stocking dispersal of hatchery-reared juvenile pallid sturgeon

Sturgeon Symposium

Keywords
pallid sturgeon, habitat suitability, Yellowstone River

Although there is evidence that pallid sturgeon may successfully spawn in the Yellowstone River below Intake Diversion (river kilometer 115), long downstream drift times following hatching preclude recruitment; larval pallid sturgeon likely drift into Sakakawea Reservoir and die. Therefore, establishing spawning populations far upstream of reservoirs is necessary if natural recruitment is to occur. However, no stocking has occurred above Intake Diversion partly because these habitats were considered unsuitable; pallid sturgeon are thought to prefer habitats with more complex channel patterns, lower gradients, and sand substrates. To assess suitability of the Yellowstone River above Intake Diversion, post-stocking dispersal patterns of telemetered juvenile hatchery-reared pallid sturgeon released below Cartersville Diversion (rkm 379) were compared to those of fish released below Intake Diversion. Cartersville Diversion fish dispersed further downstream (229 km) than Intake Diversion fish (38 km), although half of the Cartersville Diversion fish remained above Intake Diversion. Most fish dispersed to reaches in river breaks ecoregions that had complex (anabranching or meandering/islands) channel patterns. Fish were evenly distributed between higher gradient (0.000551) cobble-gravel reaches and lower gradient (0.000189) fines-sand reaches. Initial results suggest that parts of the Yellowstone River upstream of Intake Diversion are suitable for pallid sturgeon stocking.

Contact

Jaeger, Matthew
Fisheries Biologist
Montana Fish, Wildlife and Parks
2068 Highway 16
Glendive, MT 59330USA

Email: matthew_jaeger@yahoo.com
Phone: (406) 687-3057
Fax: (406) 687-3058

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Mark Nelson
Montana Fish, Wildlife and Parks
marknelson80@hotmail.com

Sue Camp
U. S. Bureau of Reclamation
scamp@gp.usbr.gov

George Jordan

U. S. Fish and Wildlife Service
george_jordan@fws.gov

THE RISE, FALL, AND RISE?? OF YELLOW PERCH IN LAKE CASCADE, IDAHO

Fish Conservation & Management Session

Keywords
yellow perch, northern pikeminnow, reservoir, predation

Lake Cascade, an 11,330 ha reservoir in West Central Idaho was one of Idaho's number one sport fisheries in the 1980's. Anglers averaged 78,700 angler days annually pursuing yellow perch Perca flavescens and rainbow trout Oncorhynchus mykiss. The yellow perch fishery collapsed in the mid 1990's and by 2001 angling pressure dropped to 5,700 angler days, an economic impact of $3.9 million to the area economy. Studies were begun by Idaho Department of Fish and Game fisheries managers in 1998 to determine causes of the decline and fishery restoration options. Food, water quality, and habitat changes were all eliminated as causes for the decline. Studies revealed that juvenile yellow perch disappeared by August of their second year and there has been no yellow perch recruitment since 1990. Predator exclusion pens, population estimates, food habits, and bioenergetics modeling studies indicated that predation by northern pikeminnow Ptychocheilus oregonensis was consuming all annual yellow perch production and therefore preventing their recovery. Bioenergetics modeling studies suggested that reducing the northern pikeminnow population combined with reintroductions of adult yellow perch could feasibly recover the yellow perch fishery. Northern pikeminnow removal and adult yellow perch reintroductions were begun in 2004, with positive results to date.

Contact

Janssen, Paul
Fisheries Biologist
Idaho Dept. Fish and Game
555 Deinhard Lane
McCall, ID 83638USA

Email: pjanssen@idfg.idaho.gov
Phone: 208-634-8137

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Dale Allen
Idah Fish and Game
dallen@idfg.idaho.gov

Cryopreserved Sperm – How much is enough? How much is too much?

Poster Session

Keywords

Cryopreserved sperm has been collected in the Captive Broodstock Program since 1995 when we found ourselves with maturing 2 and 3-year-old males and no females to spawn them with. This reserve of cryopreserved sperm was first used to fertilize eggs in 1998 when the live males were not yet producing milt for the first ripe females of the spawn season. The assumption has been (1) that about 450 eggs can be fertilized with one 0.5 ml straw of cryopreserved sperm and (2) that too many straws on a few eggs could be detrimental because the cryopreservant material might block the micropyle of the egg. But were these assumptions correct? Our goal was to find the number of eggs that would yield the highest fertility when crossed with a 0.5 ml straw of cryopreserved sperm. From one of our earlier trials we found that small batches (250 – 500) of eggs had better fertilities than large batches (750 – 1000) no matter the number of straws used to fertilize them. Consequently we took small batches and put lots of cryopreserved sperm on them (2-8 straws). Though more trials are needed, the initial results were that more cryopreserved sperm does yield better fertilities and extra cryopreserved sperm on the eggs did not have a deleterious effect on the fertilities.

Contact

Jensen, Loren
Hatchery Manager
Oregon Department of Fish and Wildlife
70543 NE Herman Loop
Cascade Locks, OR 97014USA

Email: bvhatchery@saw.net
Phone: 541-374-8393
Fax: 541-374-8090

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Marla Chaney
Oregon Department of Fish and Wildlife
captivebrood@saw.net

Safe and Humane Killing of Adult Salmon Brood Fish Returning to Bonneville Fish Hatchery

Chinook Culture Symposium

Keywords

Killing of brood fish in hatcheries is a necessary component of the spawning process. Using traditional methods, fish are lightly sedated and generally killed by clubbing the fish on the head. The two main concerns of this method are issues of safety / operator injury and public perception. While manual clubbing is normally effective as a rapid killing method, there is a generally held perception that it is inhumane. A new compact device developed by Seafood Innovations in Australia uses a pneumatically powered percussive blow to instantly stun fish when they enter the machine and contact the trigger mechanism. The fish are then released and flow through the machine. The device is known as the SI-5 Fish Stunner and has been adapted for brood fish from a similar machine used in the commercial harvesting of farmed salmon in Canada, Australia and Scotland.

Contact

Jensen, Loren
Hatchery Manager
Oregon Department of Fish and Wildlife
70543 NE Herman Loop
Cascade Locks, OR 97014USA

Email: bvhatchery@saw.net
Phone: 541-374-8393
Fax: 541-374-8090

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Factoring Angler Experience into Aquatic Education

Contributed Paper Session

Keywords
aquatic education, angler education, pedagogy, outreach

Two foci predominate publicly funded North American angler/aquatic education programs: teaching children and novice anglers fishing skills and presenting conversation-related topics to more experienced sport fishers. These ingrained biases aren't easily attributed to regional sport fishery factors, and are often linked to institutional points of view. Therefore, two questions should be posed, "Are we presenting all adults the angling skills and scientific topics they want or think they should learn in the aquatic education programs we offer? Specifically, are we ignoring the educational needs of more experienced anglers?" To help answer this question, a comprehensive questionnaire was distributed to the general public gauging their educational wants and requirements among various sport fishing and aquatic education topics. By integrating the surveys' results, a model adult angler/aquatic education program can be created that serves a broader spectrum of angler experience levels. Upon further study, the author noticed a few variations to the aforementioned predominate sport fishing pedagogy. This presentation also brings to light these notable exceptions and effective alternative programs. Such examples provide insight and possible solutions to stagnant adult participation levels faced by those people interested in improving angling/aquatic education programs across North America.

Contact

Jones, Shann
Instructor of Outdoor Activities & Interdisciplinary Graduate Student
University of Alaska Fairbanks
P.O. Box 750134, UAF
Fairbanks, AK 99775-0134USA

Email: Shann.Jones@gi.alaska.edu
Phone: 907 474-7790
Fax: 907 474-7290

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Influences of Reach- and Watershed-scale Habitat Features on Fish Distribution in Streams in the Great Plains of Montana

Warmwater/Prairie Streams Symposium

Keywords
Great Plains, warmwater, CART

The prairie biome has become one of the most endangered regions in North America. Consequently, the chance of extinction for many prairie fishes is greater than fishes of other regions; however, prairie streams and fishes have been largely ignored until recently due to a lack of angler interest in these species. In order to effectively conserve fishes, managers must first have insight into the ecology of the species and how communities of fishes may be impacted by natural and human-induced disturbances. This study examines small warmwater streams of the Great Plains of Montana in depth and specifically focuses on how physicochemical, biotic, and watershed-scale characteristics influence the distribution of species and trophic and reproductive guilds are influenced by environmental gradients at the reach and watershed scale. Comparisons of individual species models produced somewhat unexpected results in that no single type of variable (physicochemical, biotic, or watershed) was superior in explaining species distributions. However, these comparisons did highlight the importance of biotic interactions in prairie streams and how they may influence the persistence of prairie fishes. This study provides information into the ecology of fishes of small Great Plains streams but also highlights a need for further research of these systems.

Contact

Jones-Wuellner, Melissa
M.S.
Montana State University
301 Lewis Hall
Montana State University
Bozeman, MT 59717USA

Email: mjones@montana.edu
Phone: 605-864-0611

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Robert G. Bramblett
Montana Cooperative Fishery Research Unit
bbram@montana.edu

Christopher S. Guy
Montana Cooperative Fishery Research Unit
cguy@montana.edu

Alexander V. Zale
Montana Cooperative Fishery Research Unit
zale@montana.edu

Jim Johnson
Confluence, Inc.
jjohnson@confluenceinc.com

Factors influencing variation in scale-based ages of cutthroat trout from Yellowstone Lake

Fish Ecology Session

Keywords
age assessment, fish scales, environmental effects, reader effects, cutthroat trout

Reliable assignment of age to fishes is important for estimation of age-class abundances. As part of an ongoing investigation of the historic environment-recruitment relations for Yellowstone cutthroat trout Oncorhynchus clarkii bouvieri (YCT) in Yellowstone Lake, the extensive time series (spanning 35 years) of scale-based YCT ages was examined. The YCT were caught during September in gill nets used to annually monitor the YCT population at 11 lake sites. Multiple regression revealed that variation in mean total length at capture of YCT, considered age 2 or age 3 on the basis of scale annuli, was attributable to lake site and environmental effects as well as scale-reader error. Logistic regression models based on these key effects correctly classified ~90% of the age-2 and age-3 YCT to their scale-based ages and provided an objective means of assigning ages to YCT whose scale-based ages were otherwise questionable or only their length at capture and netting site were known. The resulting data set is more reliable and extensive than its predecessor, particularly for the recruitment age-classes (i. e., ages 2 and 3) of YCT whose abundances will be key response variables in subsequent analyses of historic environment-recruitment relations for the population.

Contact

Kaeding, Lynn
US Fish and Wildlife Service
4052 Bridger Canyon Rd
Bozeman, MT 59715USA

Email: lynn_kaeding@fws.gov
Phone: 406-582-0717
Fax: 406-582-7674

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Daniel Goodman
Montana State University
goodman@rapid.msu.montana.edu

Todd Koel
National Park Service
Todd_Koel@nps.gov

Bob Gresswell
US Geological Survey
bgresswell@usgs.gov

Effects of Temperature on Egg Development and Larvae Survival of Shovelnose Sturgeon

Poster Session

Keywords

Understanding the developmental biology and thermal requirements of shovelnose sturgeon early life stages has hatchery rearing implications and may increase our ability to manage and protect habitat to ensure their persistence. All fish species have a preferred temperature range for egg incubation within which egg survival is high. Temperatures outside the optimum impede normal cellular functions resulting in abnormality and death. Temperature tolerances of early life stages are more limited than those of older fish, and reproduction and stock recruitment are the most vulnerable phases of sturgeon life history. Temperature ranges tolerated by fish eggs and larvae are related to adult distribution in the wild. The laboratory study we performed was designed to determine the optimal incubation temperature range for development and survival of eggs and larvae, determine threshold temperatures that impede survival, and determine egg developmental rates. We incubated shovelnose sturgeon eggs at 8, 12, 16, 20, 24, and 28ºC. Developmental rates are discussed and compared to other sturgeon species. Egg development ceased and mortality was 100 percent for eggs incubated at 8 and 28ºC. Survival was highest at temperature from 12 – 20ºC and optimal temperature range appears to be between 16 and 20ºC

Contact

Kappenman, Kevin
Fishery Biologist
USFWS
4050 Bridger Canyon Road
Bozeman, MT 59715USA

Email: kevin_kappenman@fws.gov
Phone: 406-587-9265

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Molly Webb
USFWS
molly_webb@fws.gov

Determination of Thermal Optima and Tolerance for Young-of-Year Shovelnose Sturgeon Growth and Survival

Sturgeon Symposium

Keywords

Shovelnose sturgeon are considered abundant in Montana in the Missouri River and smaller tributaries, but their numbers have been significantly reduced throughout the lower Missouri and Mississippi. Water temperature plays a key role in determining the persistence of this species, however specific thermal optima and tolerances are not known. We performed a replicated lab experiment that exposed juvenile shovelnose sturgeon to twelve temperatures ranging from 8 to 30ºC at 2 degree intervals to determine the specific thermal optima for growth and survival. This study has important implications to understanding the life history of shovelnose sturgeon in the wild and significant hatchery implications. The thermal requirements established in this work may help protect habitat critical to the species and guide restoration efforts, such as determining temperature regime requirements for regulated and hydroelectric impacted rivers and establishing new guidelines for conservation propagation. By reducing thermal stress in hatcheries, we can increase growth, decrease incidence of disease and infection, and produce healthier fish that are more suited to survival upon release. The information we present will also be relevant to pallid sturgeon recovery initiatives and may help explain why shovelnose sturgeon thrive while pallid sturgeon remain threatened in the same rivers.

Contact

Kappenman, Kevin
Fishery Biologist
USFWS
4050 Bridger Canyon Road
Bozeman, MT 59715USA

Email: kevin_kappenman@fws.gov
Phone: 406-587-9265

The presenter is someone other than the contact person and is listed below.

Cal Fraser
Cal_Faser@usfws.gov

This contact person is the primary author.

Additional Authors

Cal Fraser
USFWS
cal_fraser@usfws.gov

Matt Toner
USFWS
matt_toner@usfws.gov

Linda Beck
USFWS
linda_beck@usfws.gov

Molly Webb
USFWS
molly_webb@usfws.gov

Analyses of potential mitigation efforts and harvest effects on a white sturgeon population using extinction risk and biomass dynamic models

Sturgeon Symposium

Keywords

Fishery managers are determining methods to recover the Hells Canyon Snake River white sturgeon population. This population has been impacted by over fishing and habitat alterations. Harvest restrictions have been in effect for thirty years but recovery has not met managers' expectations. Managers are interested in knowing if the current population can sustain a larger harvest and, if not, what the best mitigation strategies are to achieve this goal. Studies to determine abundance and structure of this population were performed beginning in the 1970's with the latest performed from 1997- 2001. Though methods for these population estimates differ and parameter uncertainty around this population is variable, this is the best information available to analyze this population. We fitted Hells Canyon Snake River sturgeon population estimates to a Logistic Model estimating intrinsic growth rate and the carrying capacity. Using the parameter estimates obtained from the logistic model fitting, and looking at both deterministic and stochastic estimates of population size over the next 50 years, we assessed maximum sustainable harvest levels that would allow the population to persist. We evaluated extinction risk for this population over the next 50 years and examined the effects mitigation actions might have on population persistence.

Contact

Kappenman, Kevin
Fishery Biologist
USFWS Fish Technology Center
4050 Bridger Canyon Road
Bozeman, MT 59715USA

Email: kevin_kappenman@fws.gov
Phone: 406-587-9265

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Rishi Sharma
Columbia River Inter-Tribal Fish Commission
shar@critfc.org

Scott Everett
Nez Perce Tribe
scotte@nezperce.org

Molly Webb
USFWS
molly_webb@fws.gov

EVALUATION OF A CYLINDRICAL WEDGE-WIRE SCREEN SYSTEM AT BEAL LAKE, ARIZONA, 2005cap

Poster Session

Keywords
Colorado River, habitat improvment, desert fishes, nonnative

We evaluated a prototype cylindrical wedge-wire screen system that was installed at the inlet of Beal Lake AZ, which is being developed as a predator-free backwater habitat for native lower Colorado River fishes. The system was designed to allow enough surface flow to compensate for summertime evaporation losses, but exclude all life stages of nonnative fishes. The purpose of this evaluation was to determine whether enough flow was being delivered to compensate for evaporation loses. To assess the system's hydraulic performance, a two stage evaluation plan was developed. The first component was to regularly monitor water levels on either side of the system to determine if differences were occurring throughout the year. The second component was to directly measure in-pipe flow to determine whether the total flow was being delievery to compensate for evaporation loss. Based on the results of our evaluation, the system does provide adequate water flow. Throughout the summer, water level differences remained less than 3 cm on either side of the screen system. Flow measurements indicated that the system was capable of delivering approximately 3.7 ha/m of water, and more than 4 times the estimated evaporation rate estimated to occur from Beal Lake during the summer.

Contact

Karchesky, Chris
Fisheries Biologist
Normandeau Associates Inc.
PO Box 1159
45 SE Cascade Ave.
Stevenson, WA 98648USA

Email: ckarchesky@normandeau.com
Phone: (509)-427-4793

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Robert McDonald
Normandeau Associates Inc.
rmcdonald@normandeau.com

Gregg Garnett
Bureau of Reclamation
ggarnett@lc.usbr.gov

Cool water refugia use by migrating adult salmon and steelhead: beneficial thermoregulation or ecological trap?

Fish Ecology Session

Keywords
chinook salmon, steelhead, temperature, migration

Regional climate change and competing water uses have resulted in increasing water temperatures and extended warm water periods in many aquatic systems throughout western North America. Rising temperatures have marginalized conditions for salmonids at many sites, including the migration corridors for anadromous species. In the Columbia River corridor, for example, mean and maximum summer temperatures now routinely exceed the ranges preferred by many species. Over the last ten years we have used radiotelemetry to study the relationships between Columbia River water temperatures and the migration behaviors and survival of adult Chinook salmon and steelhead. Results from thousands of reconstructed migration histories indicate that many salmon and steelhead behaviorally thermoregulate during the warmest periods, seeking out non-natal cool-water tributaries as temporary refugia. Use of these sites provides clear physiological and energetic benefits. However, the behavior can cause substantial migration delays. Temporary use of lower river refugia also concentrates large numbers of fish from upriver populations where they are exposed to extensive terminal fisheries, greatly increasing mortality risk for some groups. These findings have clear implications for the management of multiple ESA-listed anadromous populations in the Columbia River basin, as well as for temperature-sensitive salmonids in other systems.

Contact

Keefer, Matthew
Idaho Cooperative Fish and Wildlife Reserach Unit
P.O. Box 441141
Univesity of Idaho
Moscow, ID 83844-1141USA

Email: mkeefer@uidaho.edu
Phone: 4065560639
Fax: 4065879422

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Christopher Peery
Fish Ecology Research Laboratory, University of Idaho
cpeery@uidaho.edu

Wild Fish Habitat Initiative

Poster Session

Keywords
wild fish, habitat restoration, stream restoration

Habitat degradation is one of the principal reasons for the listing of wild fish as “threatened” or “endangered” under the Federal Endangered Species Act. Habitat degradation can exacerbate the detrimental effects of fish predators, exotic competitors, and diseases such as whirling disease. In addition, land values are diminished by habitat degradation and the subsequent loss of wild fish populations. A critical national effort towards the restoration of important fish and wildlife habitat is the Partners for Fish and Wildlife Program, administered by the US Fish & Wildlife Service. This voluntary program provides financial and technical assistance to private landowners interested in restoring habitat on their lands. The Wild Fish Habitat Initiative seeks to augment the Partners Program and other programs by conducting targeted research related to habitat restoration techniques, by implementing a technology transfer program to provide technical information to land owners and project managers, and by collating information on habitat restoration projects completed within the intermountain west. The Wild Fish Habitat Initiative began in summer 2002 with a grant from the US Fish & Wildlife Service to the Montana Water Center. It is being carried out by Montana State University biologists in collaboration with several private- and public-agency biologists.

Contact

Keith, Kristin
Researcher, Technical Writer
Montana Water Center
101 Huffman Bldg
Bozeman, MT 59717USA

Email: kkeith@montana.edu
Phone: 406-994-2550
Fax: 406-994-1774

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Molly Boucher
Montana Water Center
mboucher@montana.edu

Liz Galli-Noble
Montana Water Center
lgnoble@montana.edu

Movement Patterns of Adult Bull Trout in the Wenatchee River Basin, Washington

Poster Session

Keywords
bull trout, telemetry

We used radiotelemetry to monitor seasonal movements and habitat used by adult migratory bull trout in the Wenatchee River basin from 2000 to 2004. The Wenatchee River is a tributary to the Columbia River, and bull trout utilize both of these large rivers, a large undammed lake, and numerous tributaries. We implanted radio transmitters and tracked movements of 51 bull trout: 24 bull trout in one year, 16 in two years, and 11 in three years. Movements of three distinct groups of fish with different ranges and winter refuge areas were documented. One group spawned in upper basin streams and wintered in Lake Wenatchee and the upper Wenatchee River. The second group spawned in upper basin streams and wintered in the Columbia River. The third group used middle Wenatchee River tributaries and wintered in the middle Wenatchee River and Columbia River. Considerable variation was found within the groups. Several bull trout used more than one tributary, sometimes within the same years and others in alternate years, generally using spawning habitat in one tributary and feeding or refuge habitat in the other tributaries. Bull trout with different life history patterns used the same spawning habitat, and bull trout that used different spawning habitat overlapped in overwintering areas and in tributaries used. It appeared that as few as 19% of 27 bull trout tracked in more than one year spawned consecutively in two or three years. No alternate year spawning was documented. The low number of fish spawning multiple times could partly be explained by post-spawning and overwintering mortality, and with few fish tracked in three years alternate year spawning would be difficult to detect. Some bull trout in the year after spawning migrated to other tributaries. Bull trout were found to move primarily at night. Bull trout moved past Dryden Dam, Tumwater Dam and the Chiwawa weir usually within a day, but some individuals took several days to pass. The longest one-way migration was 131 km between the Columbia River and the upper Chiwawa River, and the migration was repeated in three years. We externally attached archival temperature and pressure tags and recovered one that revealed a pattern of frequent vertical migrations in Lake Wenatchee, typically during the daytime. Movement patterns within the Wenatchee River basin may reveal the full range of migratory diversity typical of historic bull trout populations.

Contact

Kelly Ringel, Barbara
Fishery Biologist
U.S. Fish and Wildlife Service
7501 Icicle Road
Leavenworth, WA 98826USA

Email: barbara_kellyringel@fws.gov
Phone: 509-548-7573
Fax: 509-548-5743

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Judy De La Vergne
U.S. Fish and Wildlife Service
judy_delavergne@fws.gov

Linking Smolt Physiology and Migration Timing to Avian Predation Risk in the Columbia River Estuary: Cutthroat trout and Wild and Hatchery Steelhead of Similar Genetic Origin from a Lower River Tributary

Fish Ecology Session

Keywords
Steelhead, Columbia River Estuary, Tern Predation, Migration Timing, Physiology, Cutthroat Trout

Steelhead smolts migrating through the Columbia River Estuary are vulnerable to predation by Caspian terns and double-crested cormorants. Previous studies have found that over 10% of PIT-tagged steelhead passing Bonneville Dam were eaten and deposited by birds on estuary islands. Our objective was to determine if smolt traits relating to seawater tolerance (gill Na+K+ ATPase) and migration were related to the probability of predation of fish PIT-tagged at a screwtrap in Abernathy Creek, WA (rkm 87). We found that 12% of wild steelhead, 15% of cutthroat and 20% of hatchery steelhead sampled were presumably consumed by birds (PIT tags were detected on islands). For steelhead, lower ATPase levels (lower seawater tolerance) were related to higher predation risks while no relationship existed for cutthroat trout. Additionally, wild steelhead that migrated downstream early were more prone to predation than later migrants. Conversely, cutthroat trout that emigrated later were more prone to predation. Hatchery steelhead had similar predation risks regardless of their migration timing. Our data support the idea that despite similar genetic origin wild steelhead are more prepared for seawater and may have reduced mortality compared to hatchery fish, while predation risk for cutthroat trout may be strongly related to migration timing.

Contact

Kennedy, Benjamen
Fishery Biologist
US Fish & Wildlife Service, Abernathy Fish Tech Center
US Fish & Wildlife Service, Abernathy Fish Tech Center
1440 Abernathy Creek Road
Longview, WA 98632USA

Email: benjamen_kennedy@fws.gov
Phone: 360-425-6072 ext 327
Fax: 360-636-1855

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

William Gale
US Fish & Wildlife Service, Abernathy Fish Tech Center
william_gale@fws.gov

Kenneth Ostrand
US Fish & Wildlife Service, Abernathy Fish Tech Center
kenneth_ostrand@fws.gov

Sturgeon fisheries and harvest management in Oregon

Sturgeon Symposium

Keywords
Oregon, sturgeon, harvest, management

Sturgeon fisheries in the states of Oregon and Washington represent a wide range of population conditions. Many white sturgeon populations in the two states support substantial harvest fisheries, including commercial and recreational harvests that are likely the highest sustainable annual harvest levels in the world. At the other end of the spectrum are populations that are either dwindling, have already vanished, or were likely never historically abundant. In Oregon and Washington, fisheries managers focus on conservation of remaining sturgeon populations, restoration of depressed populations, and distribution of annual harvests among various user groups, depending on location. Discussion of sturgeon harvest is a unique topic to many scientists familiar with sturgeon population biology, since most sturgeon populations are unable to support consistent harvest. This presentation will provide historical background of sturgeon populations and harvest fisheries in Oregon and Washington, focusing mostly on white sturgeon. The presentation will also discuss regulation changes and management strategies over time, and corresponding responses of sturgeon populations.

Contact

Kern, J. Chris
Project Leader, Sturgeon Research
Oregon Department of Fish and Wildlife
17330 SE Evelyn St
Clackamas, OR 97015USA

Email: j.chris.kern@state.or.us
Phone: 503-657-2000 x412
Fax: 503-657-6823

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Evaluation of Thermal Requirements for June Sucker Propagation

Fish Ecology Session

Keywords
Thermal criteria, native fish species, June sucker, propagation, fish culture

A laboratory study was conducted to monitor June sucker (Chasmistes liorus) performance when reared at an average of approximately 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, and 30o C for 16 weeks. The June sucker is an endangered fish native to Utah Lake, UT. A meeting was held in November, 2004 to discuss and prioritize June sucker propagation issues. Rearing temperature was identified as a key component necessary for the design of a new June sucker hatchery and for achieving the June Sucker Recovery Implementation Program supplementation goal of 350,000 eight-inch fish annually. In this study weight gain, mortality, and feed efficiency were affected by water temperature with 21.9o C being the optimum for June sucker growth using quadratic regression analysis. The acclimated chronic exposure water temperature (50% survival for 60 days) was greater than 27.9o C. Deformities did increase during this study but did not appear to be temperature related. Continued research is needed on other propagation issues such as diets for different life stages, deformities, and spawning and reproductive physiology requirements. This data may be applicable for the propagation and habitat requirements of other Chasmistes spp.

Contact

Kindschi, Greg
Research Fishery Biologist
U.S. Fish and Wildlife Service
Bozeman Fish Technology Center
4050 Bridger Canyon Road
Bozeman, MT 59715USA

Email: greg_kindschi@fws.gov
Phone: 406-994-9908
Fax: 406-586-5942

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Matt Toner
U.S. Fish and Wildlife Service
matt_toner@fws.gov

William Fraser
U.S. Fish and Wildlife Service
william_fraser@fws.gov

Doug Routledge
Utah Division of Wildlife Resources
dougroutledge@utah.gov

Maureen Wilson
Utah Reclamation Mitigation and Conservation Comm.
mwilson@uc.usbr.gov

Yvette Converse
U.S. Fish and Wildlife Service
yvette_converse@fws.gov

A SUMMARY OF ECOLOGIC, AND SOCIOECONOMIC MANAGEMENT TOOLS TO ASSIST IN RESTORATION PRIORITIZATION

Bioassessment Symposium

Keywords
Bioassessment, Functional Assessment, Restoration, Prioritization

Ecosystem based capital improvement projects, stream and wetland restoration, and preservation of ecological significant areas are increasing at unprecedented rates in the North American West. To allocate limited resources effectively, these projects must be prioritized using best available science. However, due to information constraints, overriding socioeconomic concerns, and a general lack of applicable ecological theory, these conservation decisions may be reactive and adequately account for potential ecological benefits. Several recent projects in the American West are currently applying various techniques to prioritize restoration projects between multiple and within individual watersheds. These techniques have consistent approaches that include: • Using Regional and National Experts; • Developing Project Goals; • Incorporating Ecological Theory and Landscape perspectives; and • Accounting for Cumulative Impacts, Ecological Benefits, and Socioeconomic Benefits The intended results are a suite of socio-ecological based decision tools that are appropriate in scale, cost-effective, and management focused. These decisions tools incorporate a combination of detailed evaluation questionnaires, economic evaluations, multimetric bioassessment, habitat assessment, and/or ecological assessment models such as the benthic index of biotic integrity (B-IBI), the index of habitat integrity (IHI), the hydrogeomorphic approach to functional assessments (HGM). This presentation will provide a summary of these prioritizing techniques.

Contact

Kleindl, William
Parametrix, Inc
2225 N 60th
Seattle, WA 98103USA

Email: bkleindl@att.net
Phone: 425-458-6200

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Marti Louther
Parametrix, Inc.
mlouther@parametrix.com

THE HYDROGEOMORPHIC (HGM) APPROACH TO ASSESSMENT OF THE FUNCTIONS RIVER ECOSYSTEMS

Bioassessment Symposium

Keywords
Bioassessment, Functional Assessment, Restoration, Prioritization

The Hydrogeomorphic (HGM) Approach to assessment of the functions river ecosystems can be used in the Clean Water Act 303 and 404 processes. Specifically, HGM can be used in the more technically focused stages of the practicable alternatives analyses, and for impact assessment, impact minimization, and mitigation. HGM can be used as an impact assessment and predictive tool that can help permit specialists suggest, and/or examine, alternatives for projects involving streams and wetlands. Furthermore, HGM can also be used to develop and/or condition restoration or creation project targets and to trigger contingencies when creation or restoration project standards are in jeopardy There are three important components to the HGM approach. 1. Classification of wetlands based on hydrogeomorphic factors, 2. Determination of functions performed by the wetland class, and 3. Establishment of a referenced base regionalized data set that describes the range of functions for the wetland subclass under consideration.

Contact

Kleindl, William
Parametrix, Inc
2225 N 60th
Seattle, WA 98103USA

Email: bkleindl@att.net
Phone: 425-458-6200

This contact person is the presenter.
The first author is someone other than contact person and is listed below.

William Kleindl
2225 N. 60th

Seattle, WA 98103 USA
Phone: 425-458-6200
Fax:
Email: bkleindl@att.net

Additional Authors

Jim White
Jicarilla Apache
jwhite@jicarillaonline.com

Jiri Doskocil
Jicarilla Apache
jirid@jicarillaonline.com

Steve Albert
Parametrix
Salbert@parametrix.com

Development and Evaluation of a Juvenile Pallid Sturgeon Bioenergetics Model

Fish Ecology Session

Keywords
pallid sturgeon, bioenergetics, growth, consumption, modeling, validation

Restoration of the endangered pallid sturgeon Scaphirhynchus albus in the Missouri River is predicated on propagating and stocking juvenile fish as well as habitat modification and restoration. However, temperatures, turbidity, and flow of remaining riverine habitats are affected by operation of the Missouri River main stem dams with unknown consequences on pallid sturgeon growth. Good growth implies suitable habitat conditions and bioenergetics models provide a simplified approach to estimate and compare feeding and growth rates of fishes under variable environmental conditions. To parameterize a bioenergetics model for juvenile pallid sturgeon, functions describing the weight and temperature dependence of maximum consumption rate and routine metabolism, as well as the upper incipient lethal temperature were determined from laboratory experiments. Consumption and growth estimated by the juvenile bioenergetics model was compared to that observed for individual fish in the laboratory reared under variable temperature regimes and rations. A corroborated pallid sturgeon bioenergetics model has important management implications and will be useful to simulate growth and consumption under various flow scenarios for the main stem dams and assess habitat quality of remaining riverine reaches of the Missouri River or restoration projects.

Contact

Klumb, Robert
Fisheries Biologist
U.S. Fish and Wildlife Service
Great Plains Fish and Wildlife Management Assistance Office
420 South Garfield Avenue, Suite 400
Pierre, SD 57501USA

Email: robert_klumb@fws.gov
Phone: 605-224-8693
Fax: 605-224-9974

This contact person is the presenter.
The first author is someone other than contact person and is listed below.

Elizabeth Wright
Department of Wildlife and Fisheries Science
South Dakota State University
Brookings, South Dakota 57007 USA
Phone: 605-688-6121
Fax: 605-668-4515
Email: custer18@aol.com

Additional Authors

Steven Chipps

South Dakota Cooperative Fish and Wildlife Research Unit
steven.chipps@sdstate.edu

Population dynamics of bull trout in the upper McKenzie River, Oregon

Bull Trout Symposium

Keywords
bull trout, population dynamics, stock-production model, impact assessment

A population dynamics modeling approach was used to assess the impacts of a hydroelectric project on bull trout in the upper McKenzie River, Oregon, and to provide a tool to guide future management of the project. Conceptual models were developed that provided a theoretical foundation for quantitative models, by identifying factors that limit life history stages and the overall production of the populations. This information was used to develop a quantitative stock-production population model. Values from the literature and field studies assessing life-stage-specific population estimates, survival, and suitable habitat were used to parameterize the model. Based on the conceptual and quantitative models, the bull trout population in the upper McKenzie River is currently limited by available habitat for subadults and adults; very few juveniles are needed to replace subadults that either emigrate or die. Model results indicate that efforts to increase habitat for subadults and adults in Trail Bridge Reservoir (e.g., increased habitat complexity) could increase carrying capacity, which would result in an increase of the adult population. In addition, if mortality of the adult population related to angling and poaching were reduced (e.g., via increased law enforcement), the adult population would increase.

Contact

Kramer, Sharon
Senior Aquatic Ecologist/Principal
Stillwater Sciences
850 G Street Suite K
Arcata, CA 95521USA

Email: sharon@stillwatersci.com
Phone: 7078229607 est 204
Fax: 7078229608

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Frank Ligon
Stillwater Sciences
frank@stillwatersci.com

Ethan Bell
Stillwater Sciences
ethan@stillwatersci.com

Population estimates of bull trout in a small McKenzie River reservoir, Oregon; comparison of different approaches using PIT tagging

Bull Trout Symposium

Keywords
bull trout, population estimate, baited video station, PIT tag

We used several different capture methods and population estimators to estimate the bull trout population size in Trail Bridge Reservoir on the upper McKenzie River, Oregon. Initially, a Baited Video System (BVS) and mobile PIT tag antenna were used in August 2004 to estimate abundance because methods that involved handling fish were determined to be too risky to the very small bull trout population in the reservoir. The video camera recorded all bull trout that swam into view near the bait, and the PIT tag antenna detected all tagged bull trout in view. This tag and virtual recapture method enabled a population estimate using a modified Petersen estimator, based on detected PIT-tagged bull trout, the known number of bull trout tagged, and an estimate of the recapture sample size, using the observed number of passes of all bull trout through the PIT tag antenna's range. The BVS population estimate provided justification for using various direct capture methods (Oneida nets, fish traps, night-time diver hand netting, hook and line, and screw traps) to generate population estimates in conjunction with PIT tag detections at antennas located at tributary junctions with Pollock's Robust Design (Program MARK). The results of the estimates were similar.

Contact

Kramer, Steve
Fisheries Biologist
Stillwater Sciences
850 G Street Suite K
Arcata, CA 95521USA

Email: steve@stillwatersci.com
Phone: 7078229607 ext 205
Fax: 7078229608

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Sharon Kramer
Stillwater Sciences
sharon@stillwatersci.com

David Zajanc
Stillwater Sciences
zajanc@stillwatersci.com

Peter Baker
Stillwater Sciences
peter@stillwatersci.com

Ethan Bell
Stillwater Sciences
ethan@stillwatersci.com

Use of Dual Frequency Identification Sonar to Quantify Adult Salmon Abundance in an Idaho Stream

Fish Conservation & Management Session

Keywords
chinook salmon,abundance,

Dual frequency identification sonar technology (DIDSON) is a new method in fisheries science that is being experimentally tested to estimate wild stock adult salmon abundance in a tributary stream. High frequency DIDSON sonar files were collected in the Secesh River in 2004 and 2005 continuously throughout the salmon migration period. Salmon counts acquired by the DIDSON technique were validated by an independent method, underwater optical cameras, during both years of operation. Total estimated salmon abundance in 2004 was 950 fish ± 52 (95% confidence interval). Independent validation comparison, within the validation zone in 2004, using a paired t-test demonstrated no significant difference between the DIDSON and optical camera count means (T = 0.00, P = 1.0) on 914 salmon passages. Validation zone comparison in 2005 indicated that DIDSON salmon counts and optical camera counts were identical (no variation), in enumerating 448 salmon passages. DIDSON daily net upstream salmon counts were also compared with a fish counting station daily net upstream salmon counts as another method to assess the accuracy of the DIDSON counts. A linear regression demonstrated that DIDSON and fish counting station daily net upstream counts were nearly identical (slope = 1.01), and were highly correlated (R2 = 0.998).

Contact

Kucera, Paul
Escapement Monitoring Project Leader
Nez Perce Tribe Department of Fisheries Resources Management
28761 Salmon Lane
Lapwai, ID 83540USA

Email: paulk@nezperce.org
Phone: (208)843-7145
Fax: (208)843-9184

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Rick Orme
Nez Perce Tribe Department of Fisheries Resources Management

The use of hoop nets seeded with mature conspecifics to remove brook trout

Natives & Newcomers Symposium

Keywords
brook trout, non-native, control methods

Brook trout have been associated with the decline or disappearance of indigenous trout species in the western United States. Recently, fisheries agencies have started managing brook trout in ways that benefit native trout, including removal. Current methods of control employ electro-fishing or chemical applications, both of which are non-species specific. We present a method, using probable pheromonal attraction, to passively remove brook trout using hoop nets. We studied four streams in north-east Idaho using hoop nets seeded with; 1) a male/female pair; 2) a single male; and 3) no fish. We successfully removed 1,298 brook trout; 634 were mature males, 222 were mature females, and 442 were immature. Hoop nets seeded with the male/female pair captured the largest proportion of mature males (42.7%) and females (39.2%) followed by nets with no fish (30.0 and 34.2%, respectively). Unfortunately, we encountered a high degree of variation in catch; therfore, the analysis was unable to detect a difference in the mean number of brook trout captured between the three treatments. Although statistical support is lacking, it appears that nets seeded with a male/female pair capture more brook trout, on average, and should be considered if hoop netting is employed for brook trout removal.

Contact

Lamansky Jr., James A. (Tony)
Graduate Student / Sr. Fisheries Technician
Idaho State University / Idaho Department of Fish and Game
1414 E. Locust Ln.
Nampa, ID 83686USA

Email: tlamansky@idfg.idaho.gov
Phone: 208-465-8404 ext 226

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Ernest R. Keeley
Idaho State University
keelerne@isu.edu

Michael K. Young
U. S. Forest Service
mkyoung@fs.fed.us

Kevin A. Meyer
Idaho Department of Fish and Game
kmeyer@idfg.idaho.gov

An investigation of fish entrainment to the Cross Cut Canal from the Henry's Fork River, Idaho

Fish Conservation & Management Session

Keywords
Henry's Fork, rainbow trout, canal entrainment

A hydroelectric project proposed on the Chester Dam, located on the Henry's Fork River near St. Anthony, may increase entrainment of fishes into the Cross Cut Canal. Losses of rainbow trout from this blue ribbon fishery were believed to be significant. We conducted studies of fish entrainment using a screw trap and periodic electrofishing surveys of the canal during 2005. Drifiting vegetation interfered with screw trapping and electrofishing surveys were hampered by high flows. The best information was obtained from a salvage operation conducted after an herbicide treatment of the canal where most of the fishes were Age-0 whitefish and rainbow trout of various sizes. These data provide the first quantitative insights to entrainment in this canal. We discuss the value and limitations of each data set and their ramifications to river populations. We recommend that a well-coordinated collection following each annual herbicide treatment may offer the best, most cost effective method of estimating annual losses to the canal and assessing impacts of the proposed hydroelectric project.

Contact

Lawrence, Keith
Aquatic Biologist
Ecosystems Research Institute
9009 S. Lindfield Circle
Sandy, UT 84093USA

Email: lawrence@ecosysres.com
Phone: 801-947-0281

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Erik Steimle
Ecosystems Research Institute
steimle@ecosysres.com

Hybridization Between Westslope Cutthroat Trout and Rainbow Trout in an Area of Natural Sympatry: the Kootenai River Drainage, USA

Fish Ecology Session

Keywords
westslope cutthroat trout, rainbow trout, hybridization, natural sympatry

Trout populations (N=103) in the Kootenai River drainage were determined to be native westslope cutthroat trout (38), native redband trout (36), or hybrid swarms between rainbow (coastal rainbow and/or redband) and westslope cutthroat trout (29) using data from four diagnostic allozyme loci. There are no known diagnostic allozyme loci between redband and coastal rainbow trout. Coastal rainbow trout populations, however, generally have lower LDH-B2*76 and higher sSOD-1*152 frequencies than redband trout populations. A higher proportion of coastal rainbow trout populations (80%) possess sSOD-1*152 than redband populations (50%). Therefore, if coastal rainbow trout had a significant genetic contribution to hybrid swarms, three trends should be apparent in the data: 1) a higher proportion of hybrid swarms should possess sSOD-1*152 than redband populations, 2) on the average hybrid swarms should have lower LDH-B2*76 and higher sSOD-1*152 frequencies than redband populations, and 3) when hybrid swarms are included with redband populations there should be a negative correlation between the LDH-B2*76 and sSOD-1*152 frequencies. All three trends were observed in the data indicating that the introduction of coastal rainbow trout is the likely mechanism for the breakdown of reproductive isolation between westslope cutthroat and redband trout in the Kootenai River drainage.

Contact

Leary, Robb
Montana Fish,Wildlife, and Parks Conservation Geneticist
Montana Department of Fish, Wildlife, and Parks
Division of Biological Sciences
University of Montana
Missoula, MT 59812USA

Email: robb.leary@mso.umt.edu
Phone: 406 243 6725
Fax: 406 243 4184

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

G. Kevin Sage
U. S. Geological Survey
kevin_sage@usgs.gov

Naohisa Kanda
Center for Cetacean Research
kanda@cetacean.jp

Fred Allendorf

University of Montana
fred.allendorf@mso.umt.edu

Influence of Diel Period and Discharge on Microhabitat Preference by Juvenile Chinook Salmon.

Fish Conservation & Management Session

Keywords

We evaluated the influence of diel period and discharge on microhabitat preference by juvenile Chinook salmon (Oncorhynchus tshawytscha) in the Cedar River, WA. Seasonal diel habitat suitability criteria (HSC) were developed for different discharges and tested for transferability to other diel periods and discharges. HSC varied with season, diel period, and discharge based on the range of preferred conditions for depth, velocity, and substrate. Weighted Usable Area (WUA) calculated for our study reaches using HSC developed for different seasons, diel periods, and discharge varied considerably (> 100% in some cases). However, flows providing the most useable area to juvenile Chinook were generally consistent across discharge and diel period. However, combined depth, velocity, and substrate HSC developed at different discharges generally did not transfer as well as the individual HSC. These results support one of the basic assumptions of the Instream Flow Incremental Methodology that HSC are transferable to different discharges. However, discharges providing the most WUA varied with the habitat variable selected.

Contact

Leavy, Tracy
U S Fish and Wildlife Service
102 Desmond Dr Ste 102
Lacey, WA 98503USA

Email: Tracy_Leavy@fws.gov
Phone: 360 753-4064
Fax: 360 753-9407

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Roger Peters
U S Fish and Wildlife Service
Roger_Peters@fws.gov

Dan

Dan Lantz
U S Fish and Wildlife Service

Howard Gearns
U S Fish and Wildlife Service

Benthic invertebrate response to heavy metal contamination in the Panther Creek Drainage (Idaho): A case study using McGuire's Metal Tolerance Index.

Bioassessment Symposium

Keywords
Bioassessment, metals, macroinvertebrates, mining impacts

Heavy metal discharges from legacy mining activities in the Panther Creek drainage (Idaho) continue to impact water quality. Benthic invertebrate sampling at several sites in this drainage yielded diagnostic results attributable to heavy metal contamination. A Metal Tolerance Index (MTI) developed in the Clark Fork River (Montana) was tested in the Idaho drainage. Results showed that the MTI was linearly correlated with copper concentrations within the drainage. Dilution of copper concentrations in a downstream direction was identified by the benthic invertebrate community MTI score. Results of this study suggest that this index may be applicable to other western streams experiencing similar contamination issues.

Contact

Lester, Gary
President
EcoAnalysts, Inc.
105 East 2nd Street, Suite #1
Moscow, ID 83843USA

Email: glester@ecoanalysts.com
Phone: 208-882-2588x21
Fax: 208-883-4288

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Bull Trout Biology and Management in the Metolius River and Lake Billy Chinook

Bull Trout Symposium

Keywords

The historically fluvial bull trout populations in the Metolius River basin became adfluvial when Lake Billy Chinook was created by construction of the Pelton Hydro Project's Round Butte dam in 1964. Biologists began studying these populations in the 1980's, and through redd surveys found that the populations were small. Management action was taken in 1997 to change angling regulations and to close some areas to fishing. These changes reduced angling impacts to bull trout and contributed to a rapid increase in population size. However, beginning in 2001 kokanee numbers began to decline while bull trout numbers continued to increase. This apparent difference in the two populations peaked in 2004, creating a concern among some biologists that an imbalance existed. Construction of the Pelton upstream and downstream passage facilities will be completed by 2009. This will result in changes to reservoir limnology and productivity; reintroduce chinook and steelhead; and allow downstream and upstream migration of chinook, steelhead, kokanee, bull trout, and other species. In addition, recent wildfires have affected some Metolius basin bull trout habitats. It is unclear what the net effect of these changes will be on reservoir habitat, existing fisheries populations, and reintroduced populations.

Contact

Lickwar, Peter
Fish & Wildlife Biologist
USFWS
20310 Empire Avenue Suite 100A
Bend, OR 97701USA

Email: Peter_Lickwar@fws.gov
Phone: 541 383-7146
Fax: 541 383-7638

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

More years or more sites: optimal design for assessing smolt response to watershed scale restoration

Contributed Paper Session

Keywords
restoration, monitoring, design, smolt, coho, watershed

Substantial resources are directed towards the restoration of anadromous salmonid habitat in the Pacific Northwest. While monitoring has become relatively common in the last couple decades, measuring the watershed scale effect of restoration on salmonid populations is relatively rare. We use available data to investigate which study designs are most likely to detect watershed scale effects of restoration on coho smolt abundance. This is done in three steps. First we construct a simple model of coho restoration response parameterized by the available data, second we use this model to estimate the statistical power of different designs, and third we determine the optimal design by incorporating cost estimates. Issues that effect the optimal design include the value of controls and whether they are paired with treatment watersheds, variability in response across watersheds, temporal variability, the relative cost of adding years and watersheds, and the time period over which the response occurs. When asking the question “are these types of watershed scale restoration projects effective”, adding sites tends to have a much larger effect on power than adding years, and only a substantial cost penalty to adding sites results in optimal designs with more than 4 years per site.

Contact

Liermann, Martin
Northwest Fisheries Science Center / NOAA fisheries
2725 Montlake Blvd. E.
Seattle, WA 98112USA

Email: martin.liermann@noaa.gov
Phone: (206) 860-6781
Fax: (206) 860-3334

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Phil Roni
Northwest Fisheries Science Center / NOAA fisheries
phil.roni@noaa.gov

Longitudinal variation in small fish assemblages through the Wind River watershed and into Boysen Reservoir, Wyoming

Poster Session

Keywords
Fish assemblages, ecology, longitudinal changes, introduced species,

Understanding patterns in fish assemblage structure and their relations with longitudinal gradients is an important part of stream ecology. Numerous studies have shown alterations to fish assemblages downstream of impoundments, but little is known about the effects of impoundments on upstream fish assemblages. We assessed the longitudinal variation in small warmwater fish assemblage structure through the Wind River watershed and into Boysen Reservoir, Wyoming and evaluated patterns relative to habitat characteristics and occurrence of non-native fish species. Patterns of zonation and addition were observed with downstream progression, most of which were associated with occurrence of non-native fishes. An increased occurrence of non-native fish species occurred with downstream progression, increasing from 25% of the species observed in the upper-most river segment to 46% in the river segment immediately upstream from the reservoir and 48% in the reservoir. Our data suggest that Boysen Reservoir is acting as a source of non-native fish species and influencing the structure and distribution of fish assemblages upstream of the reservoir.

Contact

Lionberger , Patrick
U.S. Geological Survey, Cooperative Fish and Wildlife Research Unit University of Wyoming, Laramie
Department of Zoo & Phys Box 3166 Bio Sciences 419
Laramie , WY 82071USA

Email: plionber@uwyo.edu
Phone: 766-2091

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Wayne Hubert
U.S. Geological Survey, Cooperative Fish and Wildlife Research Unit University of Wyoming, Laramie, whubert@uwyo.edu

Evidence of Sauger Movements from a Reservoir Nursery to Riverine Habitat as Adults based on Otolith Chemistry

Warmwater/Prairie Streams Symposium

Keywords
Sauger, life history, otolith chemistry, nurseries, movement

Little is known about habitat of juvenile saugers Sander Canadensis relative to habitat of adults. Sampling in the Wind River watershed yielded no juvenile saugers in riverine habitat upstream from Boysen Reservoir, but juvenile saugers were found in Boysen Reservoir. Consequently, we hypothesized that Boysen Reservoir may be nursery habitat for saugers that move upstream to lotic portions of the Wind River watershed as adults. Analysis of otolith microchemistry was used to test the hypothesis. We observed no significant difference in Sr/Ca ratios at the core (age 0) through fourth annuli between adult saugers collected from the river and the reservoir; however, significant differences were observed from the fifth through ninth annuli. These results suggest movements of some saugers from the reservoir to the river after age 4, the approximate age at sexual maturity. Otolith microchemistry and movement patterns of adults in the upstream river provide evidence of the life history of saugers in the river with residence in riverine habitat as adults, drift from spawning areas to the reservoir as larvae, residence in the reservoir as juveniles, and upstream movement to the river system upon sexual maturity.

Contact

Lionberger , Patrick
U.S. Geological Survey, Cooperative Fish and Wildlife Research Unit University of Wyoming
Department of Zoo & Phys Box 3166 Bio Sciences 419
Laramie , WY 82071USA

Email: plionber@uwyo.edu
Phone: 307-760-2091

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Wayne Hubert
U.S. Geological Survey, Cooperative Fish and Wildlife Research Unit University of Wyoming
whubert@uwyo.edu

Robyn Hannigan
Arkansas State University
hannigan@astate.edu

Expanding management objectives with baseline surveys--"you can't always get what you want, but..." Yellowstone cutthroat trout vs. finespotted cutthroat trout in the Snake River headwaters

Fish Conservation & Management Session

Keywords
Yellowstone cutthroat trout, distribution, inventories

A multi-year survey of the Snake River headwaters attempted to delineate the distribution of Yellowstone cutthroat trout and the closely-related Snake River fine-spotted cutthroat trout in the watershed by assigning individual fish to their respective subspecies based on their spotting patterns. Although most of the specimens had typical Yellowstone cutthroat trout features and a few trout appeared to be the classic fine-spotted form, numerous individuals exhibited an intermediate pattern that yielded equivocal classification. Results suggest that either the fine-spotted form is extremely rare upstream from Jackson Lake, or the predefined field classification criteria do not consistently distinguish between the two subspecies. However, several results unrelated to the original study objectives were obtained during the survey. Among these were: persistence of a Yellowstone cutthroat trout isolate population in an intensely burned watershed; widespread distribution of mottled sculpins upstream from apparent barriers; and restricted distribution of non-native species, including brown trout and brook trout, despite the absence of barriers to upstream movement. Only limited anecdotal historical information exists with which to compare the current survey; yet these results indicate that systematic inventories of the occupied length of stream may yield additional management considerations beyond the scope of the original survey objectives.

Contact

Mahony, Dan
Fisheries Biologist
National Park Service
Yellowstone Center for Resources
Fisheries and Aquatics Section
Yellowstone National Park, WY 82190USA

Email: Dan_Mahony@nps.gov
Phone: 307-344-2280
Fax: 307-344-2211

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Mark Novak
Bridger-Teton National Forest and Utah State University
manovak@fs.fed.us

Todd Koel
National Park Service, Yellowstone Park, Wyo
Todd_Koel@nps.gov

Operation of a large fall Chinook program on a biological water reuse system.

Chinook Culture Symposium

Keywords
Fish Culture

Spring Creek National Fish Hatchery operates as a large conservation and mitigation hatchery on the Columbia River that produces tule fall Chinook salmon. The broodstock was established from native stock from the White Salmon River, located 2 miles up river from the hatchery. The program began in the early 1900s and has continued with little to no influence from other outside stocks. The facility releases more than 15 million subyearling smolts each spring with an escapement goal of 7,000 adults back to the facility. The hatchery operates a biological water reuse system that utilizes spring water as the makeup water source. The reuse system consists of aeration and deaeration facilities, 44 burrows ponds, 18 filter beds with oyster shell media, which circulates 30,000 gallons per minute through the system. The 2,500 gpm of spring water used to provide fresh makeup water maintains the operating temperature between 47 and 51 degrees Fahrenheit. The tule fall Chinook hatchery stock provides a major component for recreational and commercial fisheries both in-river and ocean, as well as interjurisdictional fisheries and tribal trust responsibilities. This sock is also used to mitigate for habitat loss due to construction of John Day Dam on the Columbia River.

Contact

Marchant, Larry
Project Leader
Spring Creek NFH - U.S. Fish and Wildlife Service
61552 S. R. 14
Underwood, WA 98651USA

Email: Larry_Marchant@FWS.GOV
Phone: 509-493-1730
Fax: 509-493-2980

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Non-lethal Estimation of Energy Content of Yukon River Salmon

Contributed Paper Session

Keywords
proximate analysis, lipids, energy density, bioenergetics, Chinook salmon, chum salmon

Field measurement of the ecological condition of fish has been greatly constrained by the lack of a means to directly determine in vivo energy density or fat (lipid) content. Knowledge of the amount of energy available to Pacific salmon during their upriver spawning migration is a critical need for understanding and predicting the consequences of fisheries management practices, human development activities, and global climate change. Fortunately, recent developments of Bioelectrical Impedance Analysis (BIA) promise a simple, non-lethal means of estimating proximate composition (e. g. fat, protein, water content) for field applications with fish. In this study we demonstrate the utility of BIA for estimating the proximate composition of Chinook and chum salmon on their spawning migration in the Yukon River, Alaska. From a sample of 134 fish, we were able to estimate fat content using BIA with 90% accuracy relative to the amount of fat measured by standard laboratory proximate analysis. Similar results were obtained for protein, water, and energy density. While some minor refinements in field technique are still needed, we now have a reliable and accurate means of estimating proximate composition and energy density of live fish that can be used in a variety of research or management contexts.

Contact

Margraf, Joe
USGS/AK-CFWRU
210A Irving I Bldg., UAF
PO Box 757020
Fairbanks, AK 99775-7020USA

Email: joe.margraf@uaf.edu
Phone: 907-474-6044
Fax: 907-474-7872

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Kyle Hartman
West Virginia University
hartman@wvu.edu

Keith Cox
Sheldon Jackson College
kcox@sj-alaska.edu

Diagnosis of white sturgeon recruitment failure in Nechako and Upper Columbia Rivers

Sturgeon Symposium

Keywords
white sturgeon, recruitment, geomorphology. larval behaviour

Recruitment restoration is complex and costly, due largely to uncertainty regarding the cause of recruitment failure and the large river environments occupied by white sturgeon. Recruitment failure hypotheses can be evaluated by comparing patterns of historic recruitment and environmental change, which can diminish uncertainty regarding causation. Recruitment failure in the Nechako River occurred rapidly in 1967 and was concurrent with the arrival of a sand "wave" due to an upstream avulsion. Limited development in the Nechako watershed and the 15 year lag between dam completion and recruitment failure provide strong support for the role of substrate shifts in recruitment failure. Incorporation of population substructure into the analysis of Upper Columbia River population identifies substrate change as one of two hypotheses consistent with observed patterns. Laboratory experiments which identify a greater tendency to downstream movement when larvae are expose to sand substrates provide further evidence of the importance of substrate change. Collectively these results identify a potential recruitment failure mechanism, and suggest possible avenues for restoration.

Contact

McAdam, Steven
Hydro Impacts/Sturgeon specialist
BC Ministry of Environment
2202 Main Mall
University of British Columbia
Vancouver, BC V6T 1Z4Canada

Email: steve.mcadam@gov.bc.ca
Phone: (604) 222-6760
Fax: (604) 660-1849

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Captive Broodstock Programs for Snake River Spring Chinook - Life in a Circular Ocean - The Manchester Experience

Chinook Culture Symposium

Keywords

In 1995, the Idaho Department of Fish and Game (IDFG) and the Oregon Department of Fish and Wildlife (ODFW), in cooperation with National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries), established a cooperative captive broodstock program to aid in recovery of six stocks of Snake River Spring Chinook listed as threatened in 1992 under the Endangered Species Act. Captive broodstocks are a form of artificial propagation in which fish are cultured in captivity for their entire life cycle. Increased survival in protective culture rapidly increases population size, accelerating recovery efforts by producing large numbers of offspring that can be returned to the wild. Both programs employ similar rearing strategies throughout most of the lifecycle – collection of wild eggs or parr, rearing in freshwater to smolt, rearing from smolt to adult in seawater, and final maturation in freshwater. The programs diverge at this point with ODFW spawning adults in the hatchery and releasing smolts into their natal streams and IDFG releasing adults for volitional spawning into their natal streams. A brief history of both programs is provided with a main focus on the challenges of captive chinook rearing in a pumped seawater facility at the NOAA Manchester Research Station.

Contact

McAuley, Carlin
Fisheries Biologist
NOAA Fisheries
7305 Beach Dr E
Port Orchard, WA 98366USA

Email: carlin.mcauley@noaa.gov
Phone: 360-871-8314
Fax: 206-842-8364

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Thomas Flagg
NOAA Fisheries
tom.flagg@noaa.gov

Desmond Maynard
NOAA Fisheries
des.maynard@noaa.gov

Paul Kline
Idaho Department of Fish and Game
pkline@idfg.idaho.gov

Timothy Hoffnagle
Oregon Department of Fish and Wildlife
tim.hoffnagle@eou.edu

Role of Hyporheic Upwelling in Chum Salmon Spawning Habitat Selection, Grays River, Washington

Fish Ecology Session

Keywords
chum,salmon,hyporheic,spawning,groundwater

The Grays River, Washington represents one of only two remaining significant chum salmon (Oncorhychus keta) spawning locations in the Lower Columbia River. Within this system, chum salmon spawn in diverse habitats, including the 5th order Grays River, a 4th order tributary, and a 1st order spring brook within the Grays River floodplain. We investigated the distribution of chum salmon spawning among these streams during 2002-2004 and the role of hyporheic upwelling in spawning habitat selection relative to the traditional characteristics of velocity, depth, and substrate. Preliminary logistic regression analyses suggest: 1) most spawning occurred in the 800-m long spring brook, 2) hyporheic temperature appeared in most models, explaining the most variation in spawning use across all stream types, 3) the roles of depth and velocity varied with stream type whereas substrate did not appear in any model for any stream type, and 4) although upwelling occurs throughout the spring brook, spawning was not associated with specific upwelling sites. Although analyses are ongoing, our data suggest that locations of hyporheic upwelling may be the most effective predictor of chum salmon spawning in streams dominated by surface water, but not in streams dominated by hyporheic water.

Contact

McGrath, Kathleen E.
Research Associate
Pacific Northwest National Laboratory
Ecology Group
P.O. Box 999, MS K6-85
Richland, WA 99352USA

Email: kathleen.mcgrath@pnl.gov
Phone: (509) 376-6206
Fax: (509) 372-3515

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

David R. Geist
Pacific Northwest National Laboratory(PNNL)
david.geist@pnl.gov

Evan V. Arntzen
Pacific Northwest National Laboratory(PNNL)
evan.arntzen@pnl.gov

LONG-TERM MACROINVERTEBRATE MONITORING INDICATES FUNDAMENTAL ENVIRONMENTAL CHANGES IN THE UPPER MISSOURI RIVER BASIN

Bioassessment Symposium

Keywords
macroinvertebrates,drought

Data from several macroinvertebrate studies deliniate environmental changes that threaten high quality trout fisheries in hundreds of kilometers of the Upper Missouri River Basin. Macroinvertebrate-based assessments of the Missouri, Madison, Jefferson and Big Hole rivers document fundamental ecological changes during the past 25 years. Repeated periods of drought appear to be the principle driver of recent change and were characterized by increased benthic community density, shifts in community composition, range expansions of warmwater species and contracted distributions of coldwater species. Proximal causes of drought–induced changes in aquatic communities included increases in fine sediment deposition, aquatic vegetation coverage, diel dissolved oxygen sags, and summer water temperatures. These environmental conditions were primarily attributable to diminished streambed scour and low summer stream flows. Drought-induced changes in aquatic macroinvertebrate communities may foretell changes at higher tropic levels.

Contact

McGuire, Daniel
McGuire Consulting
95607 Reata Road
Kennewick, WA 99338USA

Email: pmedvick@earthlink.net
Phone: (509) 628 8772

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Temperature and Competition between Bull Trout and Brook Trout: A Test of the Elevation Refuge Hypothesis

Bull Trout Symposium

Keywords
bull trout, brook trout, temperature, competition

We tested the elevation refuge hypothesis that colder temperatures impart a competitive advantage to bull trout Salvelinus confluentus thus accounting for increased biotic resistance to invasion by brook trout Salvelinus fontinalis in headwater streams. Growth, survival, and behavior were compared in allopatry and sympatry at temperatures of 8 to 20°C in the laboratory. In allopatry, bull trout and brook trout grew at similar rates at temperatures of 8.0 to 14.5°C, but brook trout grew significantly faster at higher temperatures. In sympatry, bull trout grew significantly less than brook trout at all test temperatures, with growth differences increasing linearly with increased temperature. Bull trout feeding and aggression rates were significantly less when sympatric with brook trout at 8 and 16°C whereas bull trout had no effect on feeding and aggression in brook trout. Modeled growth based on tributary temperature data from a high (10°C mean summer temperature) and low elevation site (14.5°C) was similar for both species in allopatry. However, brook trout achieved much greater size than bull trout in sympatry, particularly at the warm site where predicted size of brook trout was 21.7 mm (23%) greater in length and 4.9 g (60%) greater in weight. Brook trout have a marked behavioral and physiological advantage over bull trout at warmer temperatures, but the evidence was equivocal for bull trout gaining a similar advantage over brook trout at colder temperatures.

Contact

McMahon, Thomas E
Montana State University
Ecology Department, Fish and Wildlife Program
Bozeman, MT 59717USA

Email: tmcmahon@montana.edu
Phone: 4069942492
Fax: 4069943190

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Alexander V. Zale
Montana Cooperative Fishery Research Unit
zale@montana.edu

Frederic T. Barrows
Bozeman Fish Technology Center
rbarrows@uidaho.edu

Jason Selong
Montana State University
jselong@yahoo.com

Robert Danehy
Weyerhaeuser Company, Springfield, OR
Bob.Danehy@weyerhaeuser.com

Fish assemblages of Glacier National Park, Montana

Poster Session

Keywords
fish assemblage, Glacier National Park

Little information is available related to the distribution of fishes among lakes within Glacier National Park, Montana. The distribution of sport fishes among park lakes draining into the Flathead River system has received some attention; however, sampling efforts have rarely targeted non-game species. Fish assemblages were sampled in 17 lakes in Glacier National Park using multiple sampling methods, including experimental gill nets, backpack electrofishing, and hook and line. A total of 5,742 fish comprised of 15 species were sampled, including native and nonnative species that have invaded from downstream sources in the Flathead drainage (e.g., lake trout Salvelinus namaycush) or that were intentionally introduced (e.g., brook trout S. fontinalis). Fish assemblages varied from monospecific (e. g., Upper Kintla Lake) to lakes containing at least 12 fish species (e.g., Lake McDonald). Use of multiple sampling methods often resulted in detection of more species within a lake than would have been detected using a single method. Additionally, some fish species were detected in waters where they had not previously been reported. These data provide baseline distribution data for park waters draining into the Flathead River system and may be used to develop sampling protocols for monitoring fish species assemblages within Glacier National Park.

Contact

Meeuwig, Michael
Graduate Research Assistant
Montana Cooperative Fishery Research Unit
Montana State University - Ecology
PO Box 173460
Bozeman, MT 59717-3460USA

Email: mmeeuwig@montana.edu
Phone: (406) 994-3698
Fax: (406) 994-7479

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Christopher Guy
Montana Cooperative Fishery Research Unit
cguy@montana.edu

Wade Fredenberg
US Fish and Wildlife Service
Wade_Fredenberg@fws.gov

Effects of lake trout presence and lake morphometry on the relative abundance of adfluvial bull trout in Glacier National Park, Montana

Poster Session

Keywords
bull trout, lake trout, Glacier National Park

The relative abundance of adfluvial bull trout Salvelinus confluentus was compared between lakes invaded by and not invaded by nonnative lake trout S. namaycush. Bull trout catch per unit effort (C/f) and lake trout presence were determined by experimental gill nets set overnight in 14 lakes in Glacier National Park, Montana. Bull trout C/f was greater and more variable in lakes not invaded by lake trout (2.5 ± 3.1 bull trout per net night; mean ± one standard deviation) than in lakes invaded by lake trout (0.6 ± 0.7). Bull trout C/f was related to lake trout presence and lake surface area. Bull trout C/f remained relatively low and consistent among lakes invaded by lake trout; however, bull trout C/f increased with increasing lake surface area among lakes not invaded by lake trout. These data indicate that invasion by nonnative lake trout may result in maintenance of bull trout populations at numbers below that which may be possible in lakes not invaded by lake trout.

Contact

Meeuwig, Michael
Graduate Research Assistant
Montana Cooperative Fishery Research Unit
Montana State University - Ecology
PO Box 173460
Bozeman, MT 59717-3460USA

Email: mmeeuwig@montana.edu
Phone: (406) 994-3698
Fax: (406) 994-7479

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Christopher Guy
Montana Cooperative Fishery Research Unit
cguy@montana.edu

Wade Fredenberg
US Fish and Wildlife Service
Wade_Fredenberg@fws.gov

Evolutionary History of Oncorhynchus clarki stomias and O.c. pleuriticus

Poster Session

Keywords
Oncorhynchus clarki, Yellowstone lineage, population genetics, phylogeography, evolutionary history

Cutthroat trout (Oncorhynchus clarki) are an economically, politically, and ecologically important group of fish. They are distributed across Western United States, divided into 14 subspecies of which 2 are extinct, 3 are federally listed. The evolution of this species is characterized by the effects of glacial cycles on water systems and their subsequent effect on the ability of these fish to cross major geographical barriers and disperse. Due to the recent nature of the cutthroat trout geographic divisions, relationships between subspecies, especially minor subspecies, are difficult to detect using morphology. O.c. stomias (greenback cutthroat trout) and O.c. pleuriticus (Colorado River cutthroat trout) are minor subspecies of the Yellowstone complex that are geographically separated by the continental divide. We use ten microsatellite loci to better understand the relationship within and among the populations of these two subspecies. Furthermore, we will include several populations from each of the four other subspecies in the Yellowstone complex (O.c. bouvieri, O.c. behnkei, O.c. utah, O.c. virginialis) to better understand how O.c. stomias and O.c. pleuriticus populations are related to other populations within the Yellowstone complex.

Contact

Metcalf, Jessica
University of Colorado
N122 Ramaley Biology
University of Colorado
Boulder, CO 80309USA

Email: jessica.metcalf@colorado.edu
Phone: 303 492-2573
Fax: 303 492-8699

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Andrew Martin
University of Colorado
am@colorado.edu

Hybridization between Native Greenback Cutthroat Trout (Oncorhynchus clarki stomias) and Introduced Rainbow Trout (Oncorhynchus mykiss)

Poster Session

Keywords
Oncorhynchus clarki stomias, Oncorhynchus mykiss, hybridization, evolution, asymmetric hybridization, differential introgression

Newly formed hybrid systems provide an excellent opportunity to examine the permeability of species boundaries. We investigated introgression patterns in two hybrid populations of native greenback cutthroat trout and introduced rainbow trout. Based on allele frequency profiles and linkage disequilibrium statistics, both populations constitute hybrid swarms; however, Cony Creek appears to be an older hybrid system than Graneros Creek. Although hybrid swarms have formed in both populations, we detected differential introgression among nuclear genes and between mitochondrial and nuclear genes. By comparing results from this study to other published studies between populations of the various cutthroat trout subspecies and native or introduced rainbow trout, we are able to pinpoint which trends appear to be due to behavior or environmental factors versus trends that are due to the interaction of genes.

Contact

Metcalf, Jessica
University of Colorado
N122 Ramaley Biology
University of Colorado
Boulder, CO 80309USA

Email: jessica.metcalf@colorado.edu
Phone: 303 492-2573
Fax: 303 492-2573

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Matthew Siegle
University of Colorado
matthew.siegle@colorado.edu

Wolanin Katarzyna
University of Colorado
katarzyna.wolanin@colorado.edu

Andrew Martin
University of Colorado
am@colorado.edu

Distribution, abundance, and population viability of bull trout in Idaho

Bull Trout Symposium

Keywords
bull trout, trend, abundance, population viability

Broad-scale declines in bull trout Salvelinus confluentus distribution and abundance led to listing under the Endangered Species Act in 1998. Despite this listing, quantitative evaluations of trends in abundance and estimates of existing population sizes over most of its historical range have not been made. We evaluated bull trout distribution and long-term trends in abundance, estimated population sizes, and conducted population viability analysis (PVA) for bull trout in Idaho. We used stratified sampling extrapolations of fish surveys conducted at 2,521 study sites (not randomly distributed) scattered across 77,447 km of stream within Idaho. Long-term trends from bull trout redd counts, spawning weirs, and snorkel and electrofishing population surveys indicate that many bull trout populations declined through the mid-1990s, but in general have increased over the last 10 years along with other salmonid species. We estimated there was approximately 1.13 million bull trout in Idaho. Population viability analysis suggests the risks of extirpation of bull trout in five recovery units in Idaho are low. Our results suggest that in Idaho bull trout remain widely distributed and abundant in large stream networks, and their abundance in general has been increasing for most areas over the past decade.

Contact

Meyer, Kevin
Idaho Department of Fish and Game
1414 East Locust Lane
Nampa, ID 83686USA

Email: kmeyer@idfg.idaho.gov
Phone: (208) 465-8404 ext227
Fax: (208) 465-8434

This contact person is the presenter.
The first author is someone other than contact person and is listed below.

Brett High
1414 East Locust Lane

Nampa, ID 83686 US
Phone: (208) 465-8404
Fax:
Email: bhigh@idfg.idaho.gov

Additional Authors

Daniel Schill
Idaho Department of Fish and Game
dschill@idfg.idaho.gov

Elizabeth Mamer

Idaho Department of Fish and Game
lmamer@idfg.idaho.gov

Status of Yellowstone cutthroat trout in Idaho

Fish Conservation & Management Session

Keywords
status assessment

We electrofished 961 study sites to determine the current status of Yellowstone cutthroat trout and non-native salmonids in fluvial habitat in the Upper Snake River Basin in Idaho. Yellowstone cutthroat trout were the most widely distributed species of trout. Of the 457 sites that contained cutthroat trout, <50% contained non-native salmonids. In the 11 river drainages where sample size permitted abundance estimates, there were about 2.2 million trout ≥ 100 mm and about 2.0 million trout < 100 mm; about 1/2 of each estimate was cutthroat trout. Both estimates are almost certainly biased low due to methodological constraints. Yellowstone cutthroat trout were divided into approximately 70 sub-populations but estimates could be made for only 55 sub-populations; of these, 28 contained more than 2,500 cutthroat trout. We compared morphological assessments of hybridization with subsequent molecular DNA analysis from 51 of the study sites and found that levels of hybridization were positively correlated between methods (r = 0.84). Based on this agreement, we classified cutthroat trout (based on morphological characteristics alone) as “pure” at 81% of the study sites within these GMUs. Our results suggest that Yellowstone cutthroat trout remain widely distributed and appear healthy in several river drainages in Idaho.

Contact

Meyer, Kevin
Research Biologist
Idaho Department of Fish and Game
1414 E. Locust Lane
Nampa, ID 83709USA

Email: kmeyer@idfg.idaho.gov
Phone: 208-465-8404

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Dan Schill
Idaho Department of Fish and Game
dschill@idfg.idaho.gov

Tony Lamansky
Idaho Department of Fish and Game
tlamansky@idfg.idaho.gov

Matt Campbell
Idaho Department of Fish and Game
mcampbell@idfg.idaho.gov

Chris Cegelski

Idaho Department of Fish and Game
ccegelski@idfg.idaho.gov

Atlantic Sturgeon: Status Overview and Ongoing Issues in Conservation and Restoration.

Sturgeon Symposium

Keywords
Atlantic sturgeon

The Atlantic sturgeon historically supported a valuable commercial fishery in several rivers on the Atlantic seaboard. Fisheries targeted adult sturgeon for both meat and caviar, and coastal fisheries targeted sub-adults for meat. Overfishing has existed and the Atlantic States Marine Fisheries Commission (ASMFC) enacted a coastwide moratorium on harvest in 1998. Sampling rare species in large river systems is problematic; the low probability of recapture of juvenile Atlantic sturgeon makes abundance estimation difficult. A more practical tool for monitoring population trends is the monitoring of annual indices of relative abundance from a standardized sampling design. The Hudson River supports perhaps the largest remaining population on the east coast, and is home to much of the ongoing research. In-river habitat use by juveniles, as well as seasonal movements and distribution are being investigated to promote monitoring efforts. Efforts to locate spawning grounds are underway. Techniques for captive propogation are being advanced as a last resort for addressing conservation goals. Efforts to integrate genetic considerations into captive spawning protocols are emphasized. Atlantic coast states are engaged in an ongoing process to develop appropriate restoration goals, methods, and implementation schedules.

Contact

Millard, Michael
U.S. Fish & Wildlife Service
Northeast Fishery Center
308 Washington Avenue
Lamar, PA 16848USA

Email: mike_millard@fws.gov
Phone: 570-726-4247
Fax: 570-726-7247

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Observer Error Structure in Bull Trout Redd Counts in Montana Streams: Implications for Inference on True Redd Numbers

Bull Trout Symposium

Keywords
bull trout, redd counts, observer error, salmonid monitoring, recovery and conservation programs

Despite the widespread use of redd counts to monitor trends in salmonid populations, few studies have evaluated the uncertainties in observed counts. We assessed variability in migratory bull trout Salvelinus confluentus redd counts among experienced observers in Lion and Goat creeks, tributaries to the Swan River, Montana. We documented substantially lower observer variability in bull trout redd counts than previous studies. Observer counts ranged from 78% to 107% of our best estimates of true redd numbers in Lion Creek and from 90% to 130% in Goat Creek. Observers made both errors of omission and errors of false identification, and we modeled this combination using a binomial probability of detection and a Poisson count distribution of false identifications. Redd detection probabilities were high (mean = 83%) and exhibited no significant variation among observers (SD = 8%). We applied this error structure to annual redd counts in the Swan River basin (1982 to 2004) to correct for observer error and thus derived more accurate estimates of redd numbers and associated confidence intervals. Our results indicate that bias in redd counts may be reduced, if experienced observers are used to conduct annual redd counts. Future studies should assess both sources of observer error to increase the validity of using redd counts to infer true redd numbers in different basins. This information will help fisheries biologists to more precisely monitor population trends, identify recovery and extinction thresholds for conservation and recovery programs, ascertain and predict how management actions influence distribution and abundance, and examine effects of recovery and restoration activities.

Contact

Muhlfeld, Clint C.
Native Species Fisheries Biologist
Montana Fish, Wildlife & Parks and Montana State University
490 North Meridian Road
Kalispell, MT 59901USA

Email: cmuhlfeld@mt.gov
Phone: 406.751.4542

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Mark L. Taper
Montana State University
taper@rapid.msu.montana.edu

David F. Staples
Montana State University
staples@rapid.msu.montana.edu

Bradley B. Shepard
Montana Fish, Wildlife & Parks and Montana State University
brshepard@mt.gov

Spatiotemporal variation of fish assemblages in Montana prairie streams.

Warmwater/Prairie Streams Symposium

Keywords

Information on the spatiotemporal variation of fish assemblages in Montana prairie streams is needed to better understand the ecosystem and to enable managers to design more efficient sampling regimes. To assess spatial variation in fish assemblages, we sampled fishes from five streams at nine or ten (dependent on access and permission) longitudinal sites per stream arrayed from the confluence to the headwaters during June and July 2005. To assess temporal variation, a downstream, middle, and headwater site was sampled on each of the five streams in June, July, August, and October 2005, and February and April 2006. Species richness generally decreased from downstream to upstream sites, whether assessing all species or only large river guild species. Increases in species richness at downstream sites may be associated with high flow events. Future evaluations will focus on the spatiotemporal variation of species composition and its relationship to longitudinal position, season, watershed size, and habitat variables.

Contact

Mullen, Jason
Montana Cooperative Fishery Reseach Unit
MT Cooperative Fishery Research Unit
MSU - PO Box 173460
Bozeman, MT 59715USA

Email: jmullen@montana.edu
Phone: (406) 994-6643

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Robert Bramblett
Montana Cooperative Fishery Research Unit
bbram@montana.edu

Christopher Guy
Montana Cooperative Fishery Research Unit
cguy@montana.edu

Alexander Zale
Montana Cooperative Fishery Research Unit
zale@montana.edu

Early life survival and growth of juvenile sockeye salmon: Does paternal migratory experience matter?

Fish Ecology Session

Keywords
sockeye, energetics, paternal effects

Adult Fraser River sockeye salmon frequently encounter extremes in water velocity and temperature during their upriver spawning migrations, which can cause physiological stress and energy depletion leading to enroute mortality. The consequences of such environmental conditions to the offpsring of adults which survive these migrations are not understood. As salmon do not feed during migrations, high energetic requirements for swimming metabolism may result in energy reserves being diverted away from gametes. Elevated stress hormone levels can impair maturation rates. To investigate this issue, we intercepted maturing sockeye enroute to the Weaver Creek spawning channel, Fraser River, British Columbia and subjected them to either high (40 cm/s) or low (10 m/s) current velocities for two weeks in experimental raceways. A bioenergetics model suggested the former treatment would have depleted 5-6 times the energy of the latter. The high velocity treatment caused significant mortality to females. We artificially spawned 5 males from each treatment with 5 common untreated females. Preliminary results suggest paternal treatment did not affect egg to hatching survival rates (p=0.18). Alevin growth rate and fry burst swimming performance were also assessed as additional measures of progeny fitness and will be presented.

Contact

Nadeau, Patrick
MSc. Candidate
Centre for Applied Conservation Research, UBC
UBC Faculty of Forestry
#3041 - 2424 Main Mall
Vancouver, BC V6T 1Z4Canada

Email: nadeaup@interchange.ubc.ca
Phone: 604.822.1969
Fax: 604.822.9102

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Scott Hinch
Department of Forest Sciences, UBC
shinch@interchange.ubc.ca

Kimberly Hruska
Centre for Applied Conservation Research, UBC
hruskak@interchange.ubc.ca

Historical distribution of pallid sturgeon in the Yellowstone River: an oral retrospective.

Poster Session

Keywords
pallid sturgeon, retrospective, Yellowstone River

Historical distributions and abundances of pallid sturgeon in the Yellowstone River were unknown; sampling efforts targeting pallid sturgeon did not occur until the species was listed as endangered in 1990, although factors believed to cause population declines (mainstem diversion dams, impoundment and flow alteration of tributaries) occurred as early as 1905. Recovery efforts are focused on restoring pallid sturgeon to reaches where they historically occurred; however, the only existing information on historical distributions and abundances was in the form of the experiences and photographs of anglers. An accurate account of historical distributions and subsequent declines was needed to better understand which factors may have contributed to declines and which reaches have the most restoration potential. Therefore, a timeline of pallid sturgeon encounters was developed by interviewing anglers that captured and photographed pallid sturgeon in the Yellowstone River.

Contact

Nelson, Mark
Fisheries Technician
Montana Fish Wildlife and Parks
2068 Highway 16
Glendive, MT 59330USA

Email: marknelson80@hotmail.com
Phone: 406-687-3057
Fax: 406-687-3058

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Mathew

Matthew Jaeger
Montana Fish Wildlife and Parks
matthew_jaeger@yahoo.com

Use of passive sonic telemetry to monitor white sturgeon movements in the Kootenai River.

Sturgeon Symposium

Keywords
white sturgeon, telemetry

White sturgeon populations often inhabit large and complex water bodies. In the Kootenai Drainage, the linear extent of white sturgeon habitat use extends over 300 km of lake and river. Because of this large range, actively tracking tagged fish even on a monthly basis has proven difficult, expends a great deal of staff time, and often results in missing data; often does not account for all tagged fish. To reduce staff time efforts and improve coverage of this large geographical area, an array of stationary (passive) sonic receivers was deployed to track white sturgeon. The array has allowed the use of micro transmitters with long battery life for implantation in the smallest of juvenile sturgeon, and larger tags capable of tracking adult sturgeon through more than one spawning cycle. The array has already proven to be cost effective and has produced data not available using traditional active tracking techniques.

Contact

Neufeld, Matthew
Fish Biologist
BC Ministry of Environment
#401 - 333 Victoria St.
Nelson, BC V1L 4K3Canada

Email: matt.neufeld@gov.bc.ca
Phone: 250 354 6931
Fax: 250 354 6332

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Pete Rust
Idaho Department of Fish and Game
prust@idfg.idaho.gov

Landscape distribution, and morphological and genetic variability in cutthroat trout of the Snake River headwaters, Wyoming

Fish Conservation & Management Session

Keywords
cutthroat trout, ecology, morphology, genetics, conservation, Snake River headwaters

We used a landscape scale approach to facilitate the synthesis of ecological, morphological, and genetic information regarding the distribution and organization of Yellowstone cutthroat trout, Oncorhynchus clarkii bouvieri, and fine spotted Snake River cutthroat trout, Oncorhynchus clarkii subspecies, in the Snake River headwaters of northwest Wyoming. Selection criteria allowed us to hierarchically analyze for morphological or geographic structuring from the basin to the stream reach scale. Differences in landscape distribution and watershed scale habitat distinctions will be described. Multivariate analyses of spotting patterns can discriminate between the large-spotted and fine-spotted morphotypes, with <10% misclassification rates. However, enough overlap in spotting patterns exists between the respective morphotypes to confound clear cut morphological distinction. We were unable to genetically differentiate between the morphotypes using an 1,150 bp region of the ND2 mitochondrial genome. Genetic differences among drainages were apparent, and two distinct clades were present in the mtDNA dataset. Clade 1 haplotypes were more common in two northern geographic areas, and clade 2 haplotypes occurred almost exclusively in three southern areas. Cutthroat trout conservation in the Snake River headwaters should emphasize maintenance of phenotypic diversity, and not be encumbered by taxonomic distinction of these morphotypes.

Contact

Novak, Mark
Mark Novak
USDA Forest Service
Utah State University
5210 Old Main Hill
Logan, UT 84322-5210USA

Email: markn@cc.usu.edu
Phone: 435.797.8718
Fax: 435.797.1871

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Jeffrey Kershner
USGS Biological Resource Division
jkershner@usgs.gov

River characteristics associated with chum salmon spawning habitat in southwestern Alaska

Fish Conservation & Management Session

Keywords

Due to diminishing returns of salmon and years of poor commercial and subsistence fishing in western Alaska, fishery management strategies are being re-evaluated and new techniques are being sought. Management tools which recognize nuanced life histories and incorporate mortality at each particular life stage are needed. Toward that goal a study of spawning habitat for chum salmon Oncorhynchus keta was conducted from June 2002 to January 2005 on the Tuluksak River in southwestern Alaska. Large-scale river features related to channel morphology were identified by aerial photographs, satellite images (LANDSAT-7), and synthetic aperture radar images (SAR) and mapped using a GIS system. Small-scale river features that required on-site sampling were particle size of riverbed substrate, stream slope, width, depth, velocity, and redd location. Correlation analysis was employed to examine associations between large-scale variables and spawning areas. Spawning sites were associated with moderate current velocity and stream strata that had a sinuosity greater than 1.5 but less than 2.5. Principal components analysis suggests a strong association between channel intersections, gravel bars, islands, unstable stream reaches and spawning sites. A conceptual model was developed combining the habitat assessment with chum salmon habitat preferences stated in published scientific literature. The model suggests an escapement range of 15,329 to 25,328 individual adult chum salmon is appropriate for the Tuluksak River. The results of this study demonstrate progress towards the development of management strategies that are sensitive to habitat-dependent production potential.

Contact

O'Brien, John
Graduate Student
University of Alaska Fairbanks
P.O. Box 72442
Fairbanks, AK 99707USA

Email: obrien@sfos.uaf.edu
Phone: 907-479-4034

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Joe Margraf
University of Alaska Fairbanks, Alaska Cooperative Fish and Wildlife Research Unit
ffjfm1@uaf.edu

ASSESSMENT OF POST-STOCKING DISPERSAL OF AGE-1 PALLID STURGEON: IMPLICATIONS FOR ACCLIMATION

Poster Session

Keywords
pallid sturgeon, acclimation, post-stocking dispersal

A propagation program for pallid sturgeon in the upper Missouri River was implemented by the U. S. Fish and Wildlife Service in 1997. However, evidence suggests that many hatchery-reared pallid sturgeon are experiencing significant downstream post-stocking dispersal, negatively affecting the population. Therefore, the objective of this study was to evaluate the effects of acclimation to flow and site-specific water conditions on post-stocking dispersal. Fish from three acclimation treatments were radio-tagged, released at two locations, and monitored using passive remote telemetry stations. Treatment 1 fish were acclimated to flow and site specific water conditions for 35 d in tanks on the Marias River, treatment 2 fish were acclimated in cages in the Marias River for 3 d, and treatment 3 fish were reared with no acclimation at the Bozeman Fish Technology Center. Treatment 2 fish experienced 100% mortality. Pallid sturgeon from treatment 1 and 3 drifted less in the lower reaches of the study area where more sand substrate is present. Treatment 1 fish drifted less than treatment 3 fish, experienced lower mortality, and nearly twice as many remained in suitable pallid sturgeon habitat. These preliminary data suggest that acclimation can reduce post-stocking dispersal.

Contact

Oldenburg, Eric
Montana Cooperative Fishery Research Unit
MSU- PO Box 173460
Bozeman, MT 59717-3460USA

Email: ewo@montana.edu
Phone: 406-994-6643

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Christopher Guy
Montana Cooperative Fishery Research Unit
cguy@montana.edu

William Gardner
Montana Fish, Wildlife and Parks
fwplew@tein.net

From ecological patterns to site-specific assessments: an introduction to the use of RIVPACS-type models in biological assessment programs

Bioassessment Symposium

Keywords
bioassessment, RIVPACS, predictive models, macroinvertebrates

RIVPACS-type models are a powerful approach to assessing the biological integrity of aquatic ecosystems. These models use multivariate relations between biological composition and a site's physical features to predict the taxa expected in the absence of human-caused disturbance (E), which can then be compared with taxa observed (O) to quantify biological condition (O/E). Worldwide, these models have received increasing attention from aquatic managers for a number of reasons: 1) O/E has direct biological interpretation, 2) RIVPAC-type assessments are site-specific, 3) assessments have universal interpretation, and 4) biological identities are maintained to facilitate further interpretation of impairment causes. I will provide a brief introduction to the use of RIVPACS-type models as an alternative, or compliment, to Multi-Metric Indices in a biological assessment program. Models generated from data collected at Utah streams will be used to illustrate model construction, validation, and interpretation. Outputs from these models will be used to show potential methods for determining impairment thresholds that allow mangers to relate outputs to fisheries management. Finally, the relative merits of these models to other assessment techniques will be explored.

Contact

Ostermiller, Jeff
288 North 1460 West
PO Box 144870
Salt Lake City, UT 84118-4870USA

Email: jostermiller@utah.gov
Phone: 801-538-6370

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Multi-Agency Effort to Prioritize Habitat Restoration and Protection Projects for Native Salmonids in Large Management Areas

Fish Conservation & Management Session

Keywords

Avista Corporation (Avista) has an aquatic protection, mitigation, and enhancement program for the Clark Fork River Hydroelectric Project on the lower Clark Fork River and its tributaries in Montana and Idaho. Avista's aquatic program is implemented cooperatively by an Aquatic Implementation Team (AIT) consisting of Montana Fish, Wildlife and Parks; Idaho Department of Fish and Game; the U.S. Fish and Wildlife Service; and Avista. The AIT initiated a project to 1) summarize the existing data on fish populations and habitat conditions in tributary streams and 2) prioritize watersheds for future habitat protection and restoration. The team developed criteria to prioritize protection/restoration projects for the lower Clark Fork River drainage at multiple spatial scales, based on a philosophy of 'protect the best first'. This project combined professional knowledge and available data to rank current population and habitat conditions in the drainage. This prioritization allows programs to proceed in a logical order. The ability to prioritize future projects is an important tool for all managers attempting to allocate limited funds and receive maximum biological benefits that are consistent with management goals and objectives. This project provides a template for prioritization that could be adapted to other locations with differing resource management objectives.

Contact

Overberg, Kristi
Environmental Scientist
GEI Consultants, Inc.
127 East Front Street Ste 216
Missoula, MT 59802USA

Email: koverberg@geiconsultants.com
Phone: 406-829-3648
Fax: 406-829-0362

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Validation of a Critical Assumption of the Riparian Habitat Hypothesis for White Sturgeon Recruitment

Sturgeon Symposium

Keywords
spawning, free-swimming embryos, year class,

The riparian habitat hypothesis recently proposed as a mechanism for recruitment failure in white sturgeon Acipenser transmontanus populations hinges on one truth – that white sturgeon eggs and larvae are found in shallow habitats. Past sampling has been directed at documenting the timing, duration, and general location of spawning by white sturgeon and has not targeted seasonally inundated riparian habitats. In 2005 we sampled wadable shorelines downstream from Bonneville Dam on the Columbia River, an area known to have consistent spawning activity by white sturgeon. Eggs were collected on samplers placed in fast-flowing water approximately 1-3 m deep, and newly hatched free-swimming embryos were collected in fast-flowing water less than 1 m deep, thus validating a critical assumption of the riparian habitat hypothesis. Additional studies need to be done to ascertain the proportion of white sturgeon embryos that end up in shallow habitats and contribution to year class strength from shallow versus deeper habitats. It is provoking that some proportion of the white sturgeon embryos produced in this spawning area end up in seasonally inundated habitats that are now susceptible to daily dewatering caused by hydropower peaking operations.

Contact

Parsley, Mike
Research Fishery Biologist
U.S. Geological Survey
Columbia River Research Laboratory
5501A Cook-Underwood Road
Cook, WA 98605USA

Email: michael_parsley@usgs.gov
Phone: 509 538-2299
Fax: 509 538-2843

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Bjorn van Der Leeuw
U.S. Geological Survey
bvanderleeuw@usgs.gov

The Ups and Downs of White Sturgeon Passage at The Dalles Dam

Sturgeon Symposium

Keywords
telemetry, movements, fishways, fish ladders

White sturgeon Acipenser transmontanus were monitored via telemetry at The Dalles Dam to describe their distribution, movements, and behavior near the fishways, navigation locks, and the immediate forebay and tailrace areas. A total of 148 white sturgeon received surgically implanted transmitters; 90 were released in the tailrace and 58 were released in the forebay. All fish were between 95 and 264 cm total length. Volitional upstream and downstream passage was noted with 25 transits of the dam by tagged white sturgeon; 17 downstream and 8 upstream. Interestingly, 11 of these transits were made by only 4 individuals. One fish that entered and resided within the north fishway during June and July 2004 did so again in 2005, suggesting fidelity to fishways. Seasonal use patterns of areas around the dam are evident based on the number of individuals detected at each hydrophone over time. As an example, patterns indicate aggregation of white sturgeon in the cul-de-sac during winter and dispersal into the tailrace during summer. At least 2 white sturgeon passed Bonneville Dam and have been detected in the lower Columbia River. These findings suggest that a complex behavior is exhibited by white sturgeon that reside in the vicinity of dams.

Contact

Parsley, Mike
Research Fishery Biologist
U.S. Geological Survey
Columbia River Research Laboratory
5501A Cook-Underwood Road
Cook, WA 98605USA

Email: michael_parsley@usgs.gov
Phone: 509 538-2299
Fax: 509 538-2843

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Corey Wright
U.S. Geological Survey
cwright@usgs.gov

Christopher Peery
Idaho Cooperative Fish and Wildlife Research Unit
cpeery@uidaho.edu

Mary Moser
NOAA Fisheries
mary.moser@noaa.gov

The influence of biological and physical factors on pink salmon (Oncorhynchus gorbuscha) re-colonization in the Fraser River, British Columbia, Canada

Fish Ecology Session

Keywords
salmon colonization, straying, life-history adaptations, landscape ecology

Pink salmon (Oncorhynchus gorbuscha) in the Fraser River, British Columbia, Canada were cut off from most of the watershed between 1913 and the late 1940s due to a rockslide at Rkm 209 that altered flow conditions and made adult fish passage impossible. Local spawning populations above the slide area disappeared. Fish passage facilities developed in the late 1940s allowed adult pinks to migrate past the flow barrier and re-colonize the Upper Fraser. Rapid re-colonization allowed pink salmon to establish large populations above the landslide in one decade. Population growth rates increased 4.1 fold per generation in the first decade, and continued to average a 1.5 fold per generation increase between the 1950s to the early 1990s. What causes salmonids to rapidly colonize and become successful, self-sustaining populations? Specific life-history adaptations such as straying, coupled with the appropriate geomorphic and ecological conditions, allow salmonids to successfully colonize newly opened habitats like the Fraser River. We examine how four variables – distance from source population, habitat suitability, natural barriers, and population dynamics help determine the spatial and temporal patterns of Fraser River pink salmon re-colonization. Each factor is significant at different scales and is correlated to the observed re-colonization patterns.

Contact

Pess, George
Fisheries Biologist
Northwest Fisheries Science Center
2725 Montlake Blvd East
Seattle, WA 98112USA

Email: george.pess@noaa.gov
Phone: 206-860-3450
Fax: 206-860-3335

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Tom Quinn
University of Washington
tquinn@u.washington.edu

Kris Kloehn
Northwest Fisheries Science Center
kris.kloehn@noaa.gov

Seasonal and Diel Changes in Juvenile Salmonid Distribution Near Engineered and Natural Logjams in Western Washington Rivers

Fish Conservation & Management Session

Keywords
salmonid, habitat use, diel, seasonal, cover

We examined diel and seasonal shifts in distribution of juvenile salmonids near an engineered and a natural logjam in two western Washington Rivers. Juvenile salmonids appeared to be more nocturnally active in the spring (5 oC) than summer (14-15 oC), and young-of-the-year salmonids were more diurnally active than older salmonids during both the spring and summer. Diel habitat use varied for most species and age classes observed, with diel habitats separated by as much as 50 m. Young-of-the-year fish tended to be associated with the water's edge during both day and night during the spring, but were not associated with the water's edge during the summer. The one exception was 0+ trout, which emerge from the gravel later in the spring than other salmonids. All juvenile salmonids tended to move away from woody debris and closer to the bank at night, and appeared to seek shallow sloping banks. This movement occurred independent of current velocities. Therefore, this did not appear to be an energy conservation behavior suggested by other researchers. These results suggest that maintaining habitat diversity, both in the form of edge habitats and variable cover, is important for designing short-term restoration and/or mitigation projects.

Contact

Peters, Roger
U.S. Fish and Wildlife Service
510 Desmond Dr. SE, Suite 102
Lacey, WA 98503-1263USA

Email: roger_peters@fws.gov
Phone: 360-753-9549
Fax: 360-753-9407

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Mark Celedonia
U.S. Fish and Wildlife Service
mark_celedonia@fws.gov

Dan Lantz
U.S. Fish and Wildlife Service
dan_lantz@fws.gov

George Pess
NOAA Fisheries
george.pess@noaa.gov

Chinook Salmon Fish Health Challenges

Chinook Culture Symposium

Keywords

Managing Chinook salmon fisheries in the mid-Missouri River reservoirs of Montana, North Dakota and South Dakota presents significant fish health challenges for fisheries managers. Disease considerations associated with Pacific Chinook salmon stocks have prevented fisheries managers from using salmon from the Pacific northwest as a source of salmon for the Missouri River reservoirs. Chinook salmon from the Great Lakes represented less disease risk and were selected for stocking into the Missouri River reservoirs. However, fish pathogens, such as Renibacterium salmoninarum, the bacteria responsible for bacterial kidney disease, are also a concern with the Great Lakes fish, and fisheries managers must evaluate this risk when considering the benefits Chinook salmon bring to the fisheries of these reservoirs. Fish health issues in the Great Lakes in the early 1980s made importation of Chinook salmon into Montana very difficult. Given changes in laws and regulations, importation of salmon into Montana from the Great Lakes would be much more difficult today. Annual spawning, egg distribution and fish stocking operations depend on results of annual health testing conducted during spawning. Fish health inspections have not detected pathogens of concern in Missouri River Chinook salmon populations, indicating these fish are among the most pathogen-free stocks in the United States. However, detection of specific pathogens of concern may hinder future imports of salmon into any of the three states, or into any of the reservoirs.

Contact

Peterson, James
Fish Health Coordinator
Montana Fish, Wildlife and Parks
4801 Giant Springs Road
Great Falls, MT 59405USA

Email: jipeterson@mt.gov
Phone: 406-452-6181
Fax: 406-727-0035

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Monitoring and Evaluating a Hatchery Program

Fish Conservation & Management Session

Keywords
hatchery, monitoring, evaluation

Chelan County Public Utility District (PUD) has entered into habitat conservation plans (HCPs) with various co-managers in Washington State to mitigate for operation of two hydroelectric projects that occur on the Columbia River. Part of this mitigation strategy is to compensate for “unavoidable” losses at the hydroprojects with hatchery programs. One of the most challenging aspects of these programs is to be able to adequately monitor and evaluate whether the goals and objectives of the program are being met. The HCPs specify that a committee, formed to manage the hatchery programs, develop a monitoring and evaluation plan, which will be reviewed and modified (if needed) on a five-year basis. The hatchery committee developed a conceptual plan and is beginning to implement it. This paper will discuss the objectives and goals of the conceptual plan, how it is organized, and most importantly, how decisions will be made from the information collected.

Contact

Peven, Charles
Fisheries Program Manager
Chelan County Public Utility District
327 N Wenatchee Ave.
Wenatchee, WA 98801USA

Email: chuckp@chelanpud.org
Phone: 509.661.4473
Fax: 509.661.8108

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Andrew Murdoch
Washington Department of Fish and Wildlife
murdoarm@dfw.wa.gov

Tracy Hillman
BioAnalysts
tracy.hillman@bioanalysts.net

Desert water development, population growth, and sustainability: a frightening oxymoron

Plenary Session

Keywords

Before the Endangered Species Act was signed in 1973, the Desert Fishes Council was formed to address problems created by massive water projects designed to promote human population growth throughout North American deserts. When the famous Devil's Hole case entered the courts in 1972, the population of Clark County, Nevada (Las Vegas) was noted to be growing rapidly and by 1980 had grown to 463,000 persons. Today, 25 years later, the population exceeds 1.75 million and is expected to nearly double by the year 2035. Population increase and related economic growth are rampant throughout the Southwest, where every home or industry connected to a water supply affects a natural habitat in an area that receives annual precipitation averaging about 100 mm. The overall impact on aquatic habitats has been enormous, with extinctions already having occurred and many species edging into endangerment. "Unless we change direction we will get to where we are going." This concept is discussed as a means of understanding what is rapidly approaching mass extinction of fish species throughout North America's arid land ecosystems.

Contact

Pister, Phil
Executive Secretary
Desert Fishes Council
P.O. Box 337
Bishop, CA 93515USA

Email:
Phone: (760) 872-8751
Fax: (760) 872-8751

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Salida Hydro: Restoration of a Bypassed Trout Stream in Colorado

Fish Conservation & Management Session

Keywords
Trout stream restoration, economic conflict, hydroelectric power, bypass reaches, IFIM model, adaptive managment, confict negotiation

Three miles of the South Arkansas River are bypassed by a 100-year old diversion for two hydroelectric power plants. Four species of non-native trout: brook, brown, rainbow and cutthroat were present in the drainage. As part of a new Federal Energy Regulatory Commission License, Public Service Company of Colorado conducted studies to assess restoration of stream habitat and the fishery. The Instream Flow Incremental Method PHABSIM Model predicted conflicting biological and economic outcomes. Negotiations led to a staged approach that has resulted in restoration of the fishery to a density equal to or higher than non-bypassed reaches with less water (cost) than predicted by the model. "Adaptive management" may resolve scientific questions but not necessarily economic concerns. The use of monitoring and adjustments that balance competing interests are more likely to be successful when economic and well as conservation goals can be addressed. Lessons learned at Salida Hydro may help others arrive more quickly at "sustainable" solutions at other restoration projects where water diversions are an economic issue and use of "predictive fish or habitat models" are employed.

Contact

Pizzimenti, John
Environmental Practice Leader and Vice President
GEI Consultants, Inc.
311 B Avenue
Suite F
Portland, OR 97034USA

Email: jpizzimenti@geiconsultants.com
Phone: 503-697-1478
Fax: 503-697-1049

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Alfred Hughes
Public Service Company of Colorado
Alfred.Hughes@XCELENERGY.COM

ECOLOGICAL FACTORS INFLUENCING FISH DISTRIBUTION IN A LARGE SUBARCTIC LAKE SYSTEM

Poster Session

Keywords
lake trout Salvelinus namaycush, Arctic char S. alpinus, Dolly Varden S. malma, Arctic grayling Thymallus arcticus, round whitefish Prosopium cylindraceum, pygmy whitefish P. coulterii depth distribution atypical thermal structure remote lakes food habits

The coastal climate influence creates an atypical thermal habitat in the remote Ugashik Lakes. The object of this study was to determine how lake trout Salvelinus namaycush, Arctic char S. alpinus, Dolly Varden S. malma, Arctic grayling Thymallus arcticus, round whitefish Prosopium cylindraceum, and pygmy whitefish P. coulterii were distributed according to depth, substrate particle size, food habits, length, and age. Sample sites were randomly chosen within each sampling strata, and a gill net was set at each site. Lake trout and round whitefish were both the oldest and most abundant. The salmonids of the Ugashik Lakes were affected by the atypical thermal composition of the lakes. Lake trout and Arctic char usually move to deeper, colder waters in the summer months, but both species were abundant in shallow water all summer. The Ugashik Lakes salmonids were opportunistic feeders, and consumed food readily available, such as isopods and amphipods. The coastal location and constant water mixing allowed fish to move wherever they liked regardless of temperature regimes. Collection of baseline information of ecological factors is important for future monitoring of fish populations and for tracking the affect climate change may have on these remote lakes.

Contact

Plumb, Miranda
UAF Graduate student
USFWS and University of Alaska Fairbanks
P.O. 757020
AKCFWRU
Fairbanks, AK 99775USA

Email: plumb@sfos.uaf.edu
Phone: 907-474-7264
Fax: 907-474-7872

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Joe Margraf
Unit Leader, Alaska Cooperative Fish and Wildlife Research Unit
joe.margraf@uaf.edu

Using EMG telemetry and physiological biopsy to assess effects of fish ladder passage on sockeye salmon

Fish Conservation & Management Session

Keywords
fishway,sockeye,emg-telemetry,physiology

Fishways and fish ladders are intended to facilitate upstream passage of fish around dams or other impassable riverine sections. To ensure reproductive success and fitness of adult migrating salmon, such bypass facilities should permit passage in a timely manner with minimal stress and energy use. We examined passage of sockeye (n=15) through the Seton dam fishway, Lillooet, British Columbia, using electromyogram (EMG) telemetry and physiological biopsy. EMG technology couples traditional positional telemetry with a quantitative indication of muscle activity. Only 5 fish successfully ascended the fish ladder on their first attempt. Of the remaining 10, 5 passed on further attempts, and 5 failed to pass. Successful migrants exhibited two different swimming strategies with some continuously ascending, while others displaying a burst then rest and repeat strategy. EMG signals converted to swim-speeds allowed comparisons among individuals in terms of metabolic costs of activity. Relationships between movement patterns and physiological measures revealed linkages between migration success and metabolic costs, physiological stress, and degree of sexual maturation. This is the first study to incorporate physiology into the assessment of upstream fishway passage and insights gained from the integration of these analyses will have relevance to fishway design and salmon management.

Contact

Pon, Lucas
Center for Applied Conservation Research, Dept. of Forest Sciences, University of British Columbia
3022-2424 Main Mall
Vancouver, BC V6T 1Z4Canada

Email: lbpon@interchange.ubc.ca
Phone: 604 822 1969
Fax: 604 822 9102

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Scott Hinch
Dept. of Forest Sciences, University of British Columbia
shinch@interchange.ubc.ca

Steven Cooke
Institute of Environmental Science and Department of Biology, Carleton University
Steven_Cooke@carleton.ca

USFWS Tools for Landowners to Meet the Conservation Needs of At-Risk Fishes of the West.

Contributed Paper Session

Keywords
Safe Harbor Agreement, Candidate Conservation Agreement with Assurances, Endangered Species Act

Many private landowners in the western U.S. are reluctant to implement conservation measures to benefit fishes protected, or considered for protection, under the Endangered Species Act. They fear added land-use restrictions or penalties associated with take that may result from increases in populations and distributions. In response, the U.S. Fish and Wildlife Service (Service) has recently implemented voluntary Safe Harbor Agreements (SHAs) for federally-listed species and Candidate Conservation Agreements with Assurances (CCAAs) for candidate, proposed, or at-risk species. Once these agreements are implemented, the Service issues “Enhancement of Survival” permits to cooperators authorizing future incidental take above baseline conditions. On a programmatic level, state agencies or other entities may also hold permits and are responsible for enrolling cooperators through certificates of inclusion. Currently among western states, ten SHAs exist for eight species that vary from 5 to 50 years in duration and range in area from an 800 square meter pond in Oregon to the species’ historic range throughout Arizona. CCAAs are less numerous, but are popular for salmonid conservation and vary from 10 to 80 years in duration. The future of these agreements looks promising as the Service pursues collaborative projects involving non-federal landowners in meeting its conservation mission.

Contact

Potter, David
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
1340 Financial Boulevard, Suite 234
Reno, NV 89502USA

Email: david_potter@fws.gov
Phone: 775-861-6300
Fax: 775-861-6301

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Jody Brown
U.S. Fish and Wildlife Service
Jody_Brown@fws.gov

Biologic Assessment of Rivers and Streams Using Multimetric Indices: Methods and Applications

Bioassessment Symposium

Keywords
Metrics, Indices, Sampling methods, Benthos, Aquatic invertebrates, Aquatic insects

The development of multimetric indices using benthic invertebrate organisms as bioassessment tools in Western North America will be reviewed. An overview of recommended methods for testing metrics for their usefulness in assessing habitat conditions and water quality will be given. The current status of these indices and their applications and various study designs will be included. Comparisons will be made between various field sampling techniques employed in the Western US.

Contact

Rai, Uttam
Aquatic Biologist
Rhithron Associates, Inc.
1501 West Central Ave.
Missoula, MT 59801USA

Email: urai@rhithron.com
Phone: 406 721 1977
Fax: 406 721 2028

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Surface Collection Investigation for Juvenile Fish Passage at Howard Hanson Dam, Green River, WA

Fish Conservation & Management Session

Keywords
Juvenile Salmon Passage

The U.S. Army Corps of Engineers is partnering with the City of Tacoma to add municipal water supply as an authorized purpose for Howard Hanson Dam, a federal flood-storage dam on the Green River. Mitigation will include restoration of Chinook, coho, and steelhead to the abundant upstream habitat in the upper watershed. Juvenile passage facilities design conditions are extremely challenging, because the dam reservoir fluctuates over 100 ft during each year. Over the last 15 years, a stacked, submerged intake screen and bypass design has evolved, and construction will commence within a year. However, recent surface collection and bypass experience at Corps hydroelectric projects on the Snake and Columbia Rivers suggests surface-oriented juvenile passage systems pass fish more readily than submerged intakes. This paper describes results of an eleventh-hour study that compared fish passage through surface versus submerged passage routes, investigated alternative surface collection configurations, and recommended a preferred surface collector alternative.

Contact

Rainey, Steve
Fish Passage Engineer
GEI Consultants, Inc.
311 B Avenue, Suite F
Lake Oswego, OR 98683USA

Email: srainey@geiconsultants.com
Phone: 503-697-1478
Fax: 503-697-1482

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Invasion and Isolation: tradeoffs in conservation management of native and non-native salmonids

Bull Trout Symposium

Keywords
bull trout, invasion, isolation, brook trout

Invasion of non-native salmonids like brook trout represents an important threat to the integrity and persistence of native fish communities. Species like bull trout, for example, may be threatened by competition and hybridization with brook trout that could ultimately lead to contraction of existing distributions and expanding local extinctions. Intentional isolation (e.g. the construction of migration barriers) and passive retention of non-intentional barriers (e.g. road culverts and diversion dams) have been used by managers to mitigate this threat. Isolation, however, also represents a threat and can lead to lost resilience and eventual extinction of local populations as well. Because the tradeoffs between isolation and potential invasion are likely to vary strongly across important environmental gradients and management objectives we have proposed a simple framework as a context for management decisions and the allocation of limited conservation management resources. The framework is based on four elements: 1) clear definition of the conservation values at issue; 2) vulnerability of the native populations to invasion and displacement by the non-native threat; 3) vulnerability of the native population to isolation; and 4) priorities for management actions emerging from the broader context of surrounding populations and habitats and the general principles of conservation biology. Even when detailed biological data are lacking, existing knowledge can lead to distinct differences among management alternatives. Implementation of such a framework could lead to more consistent, defensible, and effective management decisions.

Contact

Rieman, Bruce
Research Biologist
US Forest Service Rocky Mountain Research Station
322 E. Front St.
Suite 401
Boise, ID 83702USA

Email: brieman@fs.fed.us
Phone: 208-373-4386
Fax: 208-373-4391

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Fausch Kurt
Colorado State University
kurtf@warnercnr.colostate.edu

Young Michael
US Forest Service RMRS
mkyoung@fs.fed.us

Jason Dunham
USGS FRESC
jdunham@usgs.gov

Doug Peterson
US Fish and Wildlife Service
Doug_Peterson@FWS.gov

Effects of Road Culverts on Eastern Montana Prairie Fish Assemblages: Initial Results

Fish Conservation & Management Session

Keywords

Road culverts can serve as obstacles to fish migrating between seasonal habitats. The development of new roads, as well as the repair and upgrade of existing roads has led to research addressing the effects culverts have on fish populations. Much of this research has focused on salmonid species in mountain stream systems, but the total effect road culverts have on species continuity in small, prairie streams remains largely unknown. Because many of the diverse number of fish species found in prairie streams are small bodied, and likely poor swimmers, culverts may act as significant barriers to passage via high outlet drops, high water velocities, and insufficient water depth. Fish passage on several tributaries of the Yellowstone River with a variety of culvert crossings will be examined in this study. Passage abilities of prairie fish species will be assessed indirectly using software models, and directly through the use of mark-recapture experiments. In the first year of this study, we observed diverse fish assemblages with little difference in species composition above and below the culvert crossings studied. Upstream movement through natural reaches as well as culverts was documented for six species of fish. The goal of the study is to identify culvert characteristics that restrict fish passage during the range of flow conditions present in prairie streams from spring to fall and identify species that may be particularly sensitive to fish passage restriction.

Contact

Rosenthal, Leo
M.S. Research Assisstant
Montana State University
Montana State University, Department of Ecology
310 Lewis Hall
Bozeman, MT 59717USA

Email: lrosenthal@montana.edu
Phone: (406)994-1823

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Thomas McMahon
Montana State University
tmcmahon@montana.edu

Joel Cahoon
Montana State University
joelc@ce.montana.edu

Matt Blank
Montana State University

mblank@coe.montana.edu

Western Native Fishes Database; An update on the project

Fish Conservation & Management Session

Keywords
Fish distribution, native species, database, mapping

The Western Native Fishes Database is a project developed by the Native Species Committee of the Western Division of the American Fisheries Society (WDAFS). The goal of the project is to compile accurate information on approximately 300 fish species native to western North America including the Canadian Provinces of British Columbia and Yukon; the Sonoran, Chihuahuan, and Baja California Norte States of Mexico; and the United States that include, or are west of, the continental divide; and Hawaii. Garcia and Associates (GANDA) completed the database design in the summer of 2004, and the data entry for the United States in 2005. The database was distributed for its initial review in early 2006. The database can be queried by species, region, or HUC. The WDAFS envisions the database being used to track regional status of native fishes and to assist agencies and biologists in developing management plans that extend beyond political boundaries. The purpose of this presentation is to show the progress made on the database , describe the data gathering and review processes, and solicit input on how to tailor the final product. We will also present representative data on declining fish populations.

Contact

Roulson, Leanne
Fisheries Biologist
Garcia and Associates
7550 Shedhorn Drive
Bozeman, MT 59718USA

Email: lhroulson@garciaandassociates.com
Phone: 406-582-0661
Fax: 406-582-0659

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Jim Tilmant
National Park Service
jim_tilmant@nps.gov

Lynn Starnes
USFWS- retired
L.Starnes@Comcast.Net

Jeanne Knox
Garcia and Associates
jmknox@garciaandassociates.com

The new war on science: the endangered agency scientist

Plenary Session

Keywords

Natural resources scientists within public agencies face increasing political pressure to prostitute their ethics or allow science to be divorced from decision-making. Little in scientists' professional training prepares them to counter sustained occupational pressure to obstruct or obscure scientific inquiry or the application of science to agency actions. The reluctance of scientists to engage in advocacy because of a perception that it conflicts with professional objectivity is another major impediment to their effectiveness in these non-empirical debates. The legal tools available to individual government employees are often of limited value or counterproductive in their application. PEER is a service organization for state and federal employees engaged in the protection of natural resources. PEER assists public agency scientists in resolving professional challenges to scientific integrity or the faithful administration of environmental laws. We believe that agency scientists have the right as well as a duty to be activists in the public interest.

Contact

Ruch, Jeff
Executive Director
Public Employees for Environmental Responsibility
2000 P Street, NW; Suite 240
Washington, DC 20036USA

Email: jruch@peer.org
Phone: (202) 265-7337
Fax: (202) 265-4192

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Fort Peck Chinook Salmon

Chinook Culture Symposium

Keywords

The success of a Fort Peck Reservoir Chinook program is highly desired by the public due to the potential of catching large salmon. Consistency in egg collection and providing harvestable returns to anglers has been a difficult objective to meet, with only 3 good returns since 1983. Adjustments in stocking numbers, size at time of release, release strategies and management strategies have not improved returns to the creel or egg collection in the last 5 years. Chinook salmon were initially stocked into Fort Peck Reservoir in 1983. Until 1994, stocking relied solely on availability of eggs or fish from North and South Dakota. In 1994 and the seven subsequent years between 1994 and 2005, Montana had only three successful egg takes that produced more than 200,000 green eggs. Both unsuccessful egg collecting and shortfalls in rearing space throughout Montana's hatchery system may be resolved with the completion of the new Fort Peck Hatchery. Fort Peck Hatchery will provide rearing space, close proximity to the reservoir, and options to raise larger sizes and numbers of chinook, resulting in management and stocking alternatives that haven't been available to provide a stockable chinook that will survive to adult size.

Contact

Ruggles, Mike
Fisheries Biologist
Montana Fish Wildlife and Parks
Box 167
Fort Peck, MT 59223USA

Email: fpfisheries@nemontel.net
Phone: 406-526-3471
Fax: 406-228-8161

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Gary Bertellotti
Montana Fish Wildlife and Parks
gbertellotti@mt.gov

Cutthroat Trout Restoration on Yellowstone's Northern Range

Fish Conservation & Management Session

Keywords

Growing concern over the status of Yellowstone cutthroat trout within Yellowstone Lake has led park managers to seek the potential for restoration of this subspecies within watersheds of the park outside of the lake basin. These efforts are focused on Yellowstone's Northern Range, including the Yellowstone River and all of its subwatersheds downstream of the Lower Falls at Canyon. A paucity of data concerning many of the small headwater streams, and a need to centralize the data that do exist, have previsouly limited our complete understanding of Yellowstone cutthroat trout status on the Northern Range. An effort begun in 2005 aims to improve our understanding by combining historical records with contemporary field surveys. Each watershed is being classified by multiple factors, including basin size, potential for metapopulation processes, presence of existing instream barriers, trail access and other logistical factors, and the educational/interpretive value that each may provide. Watersheds will be prioritized to identify those that provide the highest probability for restoration success and overall value to the Northern Range initiative. The results will be used to guide Yellowstone cutthroat trout restoration efforts in Yellowstone National Park in future years.

Contact

Ruhl, Michael
Research Associate
Big Sky Institute (MSU) and Yellowstone National Park
PO BOX 786
Yellowstone National Park, WY 82190USA

Email: michael_ruhl@nps.gov
Phone: (307) 344-2286
Fax: (307) 344-2211

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Jeffrey Arnold
Yellowstone National Park
jeff_arnold@nps.gov

Brian Ertel
Yellowstone National Park
brian_ertel@nps.gov

Daniel Yellowstone National Park
National Park Service
dan_mahony@nps.gov

Todd Koel
Yellowstone National Park

todd_koel@nps.gov

Transportation and Incubation of Eggs Collected from the Fall Chinook Salmon Population of Lake Oahe, South Dakota

Chinook Culture Symposium

Keywords
Chinook, Salmon, Culture

Transportation and incubation methods have been shown to influence the survival of Chinook Salmon embryos. This presentation will provide an overview of current techniques used by South Dakota Game, Fish and Parks personnel. Published research projects that have influenced our processes will be highlighted. The influence of different egg transportation methods was one of the first variables evaluated. Research using scanning electron microscopy has examined external egg membrane characteristics and bacterial numbers from eggs subjected to various formalin and hydrogen peroxide treatments. Other research has looked at bacterial populations in vertical flow incubators during culture of fall Chinook Salmon eggs, the influence to survival of removing dead eggs and fry by hand picking and the use of thiamine hydrochloride treatments during incubation to increase fry survival.

Contact

Sayler, William
Hatchery Manager
South Dakota Department of Game, Fish and Parks
Cleghorn Springs State Fish Hatchery
4725 Rimrock Highway
Rapid City, SD 57702USA

Email: will.sayler@state.sd.us
Phone: 605-394-2397
Fax: 605-394-1872

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Brood Stock Collection, Spawning and Egg Handling Procedures Used in Artificial Propagation of Fall Chinook Salmon from Lake Oahe, South Dakota

Chinook Culture Symposium

Keywords
Chinook, Salmon, Culture

Since the first attempt to collect eggs from the Lake Oahe Fall Chinook Salmon population, methods and techniques have evolved. This presentation in an overview of current procedures used by South Dakota Department of Game Fish and Parks personnel and highlights published research projects that have influenced the evolution of the process. Several scientific experiments evaluating these procedures have been conducted, including research on the influences of environmental factors, spawning techniques, initial egg quality, and female condition on embryo survival. Other studies have examined the effects of collection of adults by electro-fishing versus ladder run fish, the use of fertilization enhancement solutions, and the use of thiamine hydrochloride during spawning on the survival of Chinook salmon embryos.

Contact

Sayler, William
Hatchery Manager
South Dakota Department of Game, Fish and Parks
Cleghorn Springs State Fish Hatchery
4725 Rimrock Highway
Rapid City, SD 57702USA

Email: will.sayler@state.sd.us
Phone: 605-394-2397
Fax: 605-394-1872

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Life history and the costs of reproduction in the Yellowstone-Sakakawea paddlefish stock

Sturgeon Symposium

Keywords
paddlefish, Polyodontidae, sturgeon, life history, Montana, North Dakota

Investigations on the Yellowstone-Sakakawea stock of paddlefish Polyodon spathula in eastern Montana and western North Dakota conducted over the period 1991-2004 have provided information on fish size, population age structure, age-at-maturity, longevity, growth rates, reproductive periodicity, fecundity, energy reserves, migration patterns, mortality rates, and senescence to characterize the life history in relation to the costs of reproduction. Life histories of males and females diverge between age-5 and age-10, as males divert energy and production away from somatic growth into sexual maturation. Females of the same brood year grow more rapidly than their male counterparts until age-13 or age-14, when they begin to divert energy and production away from somatic growth and into sexual maturation. At the time of their first upstream spawning migration, both sexes have mature gonads with attached gonadal fat bodies which function in energy storage much like a capacitor. Increases in fecundity among young adults of both sexes are concurrent with decreases in the weight of gonadal fat bodies. Males typically spawn every one or two years and deplete the gonadal fat reserves gradually over several spawning cycles. Females typically spawn every two or three years and deplete the fat over two to three spawning cycles, largely exhausting it by age-25. Energetic and migration results conform with the idea that middle age and older paddlefish are the most effective spawners. The general life history pattern of growth and energy accumulation early in life, followed by maturation, reproduction, energy depletion and senescence appears to exist widely among Chondrostean fishes, and may exist in many other fishes as well.

Contact

Scarnecchia, Dennis
Professor of Fisheries
University of Idaho
Department of Fishg and Wildlife Resources
University of Idaho
Moscow, ID 83844-1136USA

Email: scar@uidaho.edu
Phone: 208:885-5981
Fax: 208:885-6226

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

L. Fred Ryckman
North Dakota Game and Fish Department
fryckman@state.nd.us

Brad Schmitz
Montana Department of Fish, Wildlife and Parks

Brschmitz@mt.gov

Watch it, he’s angry: movements of little, individual trout in response to electrofishing

Fish Conservation & Management Session

Keywords
electrofishing, movement, trout, stream, estimate, radio telemetry

Estimating abundance is fundamental to enlightened management and ecological understanding of stream fishes. Commonly used estimators assume that fish do not leave sample sections; movement would lead to biased measures of abundance. To prevent fish movement, biologists often install block nets at the boundaries of sampling reaches, which is time-consuming, may be logistically impossible, and detracts from effort that could be invested in sampling additional areas. We individually electrofished 124 trout (ca. 125 mm) of three species implanted with radio transmitters in six small, montane streams in western Montana to quantify movement and the influence of habitat. Most fish (60%) remained in a habitat unit when electrofishing commenced, and only 10% moved more than 2 habitat units. Forty-three percent were captured on the first electrofishing pass, and all fish were eventually recaptured. Capture efficiency was lower in the largest stream sampled, but there were no differences among other streams or species. Habitat variables including water depth, substrate size, and percent cover did not explain fish movement nor capture probability. These data help define the level of bias in estimates of fish abundance produced by fish movement and will help define parameters to monitor fish densities.

Contact

Schmetterling, David
Fisheries Biologist
Montana Fish, Wildlife and Parks
3201 Spurgin Road
Missoula, MT 59804USA

Email: dschmetterling@mt.gov
Phone: 406.542.5514
Fax: 406.542.5529

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Michael Young
Rocky Mountain Research Station, Forestry Sciences Lab
mkyoung@fs.fed.us

Conservation of Westslope Cutthroat Trout by Removal of Brook Trout Using Electrofishing

Fish Conservation & Management Session

Keywords
cutthroat trout, conservation, electrofishing, eradication, brook trout, nonnative

From 1995 to 2004 we employed repeated electrofishing to remove nonnative brook trout from approximately 15.2 km in six streams to conserve sympatric, native westslope cutthroat trout. We successfully eradicated brook trout from 10.7 km in four of these streams. In the two other streams we suppressed brook trout, but dense riparian vegetation, beaver dams, and abundant woody debris prevented us from eradicating them. Costs to eradicate nonnative trout using electrofishing were similar to costs estimated for piscicide treatments. Electrofishing eradication may be preferred in locations where native fish are sympatric with nonnative fish because most of the native fish can be saved during removal efforts. We recommend conducting at least six removal treatments of two to three passes per treatment within two to three years, targeting mature adults during the first year, trampling nonnative redds, conducting at least one removal during late fall or early winter period, and eradicating adults first, then focusing on the smaller fish (age-0 and age-1). Fish barriers must be installed at lower boundaries of treatment areas to prevent re-invasion of nonnative fish. Native cutthroat trout populations responded positively to brook trout removal, but this response often took two to three years.

Contact

Shepard, Bradley
Fisheries Biologist and PhD student
Montana Fish Wildlife and Parks AND Montana Cooperative Fishery Research Unit
Ecology Department - Montana Coopertive Fishery Research Unit
P.O. Box 173460, MSU-Bozeman
Bozeman, MT 59717-3460USA

Email: brshepard@mt.gov
Phone: 406-994-3243

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Lee Nelson
Montana Fish, Wildlife and Parks
leenelson@fs.fed.us

A regional perspective on the ecology and management of steelhead in San Francisco Bay Area streams

Poster Session

Keywords
San Francisco Bay Area, steelhead, population modeling

Using case studies in San Francisco Bay Area streams, we describe a conceptual model that links physical habitat and the life history of steelhead. We use a multi-stage stock recruitment approach to estimate carrying capacities and density-independent mortality at different life stages, with the goal of reaching a mechanistic understanding of how mortality at one or more life stage may limit population size within a given watershed. Two key aspects of our conceptual model are: (1) juvenile rearing habitat limitations are typically great relative to the fecundity of adult steelhead; and (2) individuals tend to have much higher survival to adulthood if they smolt at a larger size, which is typically reached by age 2+ in Bay Area streams. Applying this approach to several Bay Area streams, we found that overwintering habitat for juvenile steelhead, particularly for age 1+ steelhead, may limit steelhead production in some watersheds, while reduced summer flows may limit steelhead growth and production in others. Using the general conceptual model as a starting point, an iterative process of hypothesis development, testing, and refinement can efficiently identify mechanisms that limit population size and lead to management strategies tailored to the needs of individual watersheds.

Contact

Sloat, Matthew R.
Mr.
Stillwater Sciences
2855 Telegraph Avenue, Suite 400
Berkeley, CA 94705USA

Email: matt@stillwatersci.com
Phone: 510-848-8098 x 143
Fax: 510-848-8398

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Anthony J. Keith
Stillwater Sciences
ajkeith@stillwatersci.com

Frank K. Ligon
Stillwater Sciences
frank@stillwatersci.com

The use of half duplex PIT tags to assess the probability of culvert passage of Yellowstone cutthroat trout and rainbow trout

Poster Session

Keywords
cutthroat trout, PIT tags, culvert, fish passage

Culverts at road crossings are known to present possible passage barriers during salmonid migration yet existing models used to predict passage have not been sufficiently tested, particularly for non-anadromous species. Most existing evaluations give "yes" or "no" answers to passage questions when an estimate of the probability of passage under a given set of hydraulic conditions may be more useful. We are utilizing Passive Integrated Transponder (PIT) tags to examine the probability of Yellowstone cutthroat trout and rainbow trout to pass 3 distinct culvert types over a variety of hydraulic conditions. The use of PIT tags eliminates the need for multiple captures thereby reducing stress and biases associated with various trapping methods. The use half duplex PIT tags instead of the more widely utilized full duplex tags reduces costs, allows for the construction of antennas customized for each location and their large reading range of 60 cm is nearly double that of full duplex tags. In addition to determining whether an individual successfully passes a particular culvert, we will are able to determine the number of attempts made at passage of each culvert, time spent in each culvert and travel time between culverts as well as residence time. Examining the probability of culvert passage over a variety of velocities may give a clearer determination of whether a particular culvert poses a barrier to fish passage.

Contact

Solcz, Andrew
Masters Student/Research Assistant
Montana State University
PO Box 11285
Bozeman, MT 59719USA

Email: andrewsolcz@montana.edu
Phone: 406-994-1823

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Thomas McMahon
Montana State University
tmcmahon@montana.edu

Joel Cahoon
Montana State University
joelc@ce.montana.edu

Jesse Patton
Montana State University
jpatton@montana.edu

Matt Blank
Montana State University
mblank@coe.montana.edu

ECOLOGICAL CONDITION OF STREAMS IN THE SOUTHERN ROCKY MOUNTAINS, BASED ON PERIPHYTON

Bioassessment Symposium

Keywords
periphyton, southern rocky mountains, indicator species

The objective of the Western Environmental Monitoring and Assessment Program (EMAP) is to assess ecological condition of streams in twelve western US states, based on the condition of biota in response to anthropogenic stressors. In this talk, we present preliminary results on indicator species analysis to determine periphyton condition in the Southern Rocky Mountains ecoregion. In contrast to the traditional use of diatoms as environmental indicators, in which diatom species are used to infer concentrations of an environmental variable (e.g., pH or nutrient concentration), we are developing tools that will act as a finger on the pulse of diatom health. Our objective is the same as that for the Western EMAP for macroinvertebrates and fish, in which physical and chemical measurements are not ignored, but the emphasis is directed towards the biota themselves. Of the 950 species of diatoms in the EMAP, the majority occur in very low abundance. Rare taxa are often omitted from biological assessments, yet they are highly relevant to ecological condition. We present initial classification of species based on the technique of indicator species analysis that is inclusive of rare taxa. The approach results in a classification of taxa that are indicative of particular groups, based on the idea that "perfect" indicator taxa are 1) faithful to a group (always present in that group) and 2) exclusive to that group (never present in other groups). We divide the Southern Rocky Mountains stream dataset into two parts, one to develop the exclusivity of taxa, and the second to evaluate the approach.

Contact

Spaulding, Sarah
Ecologist
US Geological Survey
999 18th Street
Denver, CO 80202USA

Email: spaulding.sarah@epa.gov
Phone: 303.312.6212

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Pan Yang Don
Portland State University
bwyp@pdx.edu

Jan Stevenson
Michigan State University
rjstev@msu.edu

Karl Hermann
US EPA, Region 8

hermann.karl@epa.gov

Phil Larsen
US EPA, ORD
Larsen.Phil@epamail.epa.gov

Progress and Issues in Recovery of Endangered White Sturgeon in the Upper Columbia Basin

Sturgeon Symposium

Keywords

Recovery efforts have been initiated to address white sturgeon recruitment failure in the area upstream from Grand Coulee Dam to the headwaters of the Columbia basin. Without intervention, severe population bottlenecks will occur within the next 10 years and white sturgeon will become functionally extinct in this area by 2044. A recovery plan has been completed, and research is ongoing to address impacts affecting the 2,700 adults remaining in the population. Recovery objectives are being reached using four strategies. First, direct sources of adult mortality including fisheries and entrainment are being controlled. Second, conservation aquaculture is being undertaken to preserve the remaining population diversity and provide fish to serve as a basis for research. Third, recovery actions are being developed to improve in recruitment and survival based on habitat, flow, and/or water quality restoration. Lastly, the program is taking an adaptive approach based on research and monitoring of sturgeon status, limiting factors, and recovery actions. Progress and issues related to present recovery efforts will be discussed, including hatchery production, critical habitat assessment and recruitment bottleneck identification.

Contact

Spence, Colin
Fish Biologist
BC Ministry of Environment
401-333 Victoria Street
Nelson, BC V1L 4K3Canada

Email: colin.spence@gov.bc.ca
Phone: 250-354-6777
Fax: 250-354-6332

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Expanding the range for an endangered species: Translocation of humpback chub (Gila cypha) above Chute Falls, Little Colorado River

Fish Conservation & Management Session

Keywords

A conservation measure to relocate small humpback chubs (HBC) to upstream areas of the Little Colorado River (LCR) was identified in the December 2002 Biological Opinion on the proposed experimental releases from Glen Canyon Dam and removal of nonnative fish. It was hoped that this translocation effort would increase HBC recruitment to adulthood by allowing them an opportunity to exploit the abundant food resources, warmer water temperatures, and reduced competition/predation by fewer large-bodied fishes associated with this area. Since July 2003, the U.S. Fish and Wildlife Service has translocated 1159 small (between 50-100mm) HBC above Chute Falls in the Little Colorado River. Since monitoring was initiated in 2003, mean growth rates of translocated individuals have been variable (0.28-0.5mm/day) but comparatively higher than growth rates of fish found below Chute Falls. Evidence of spawning was discovered in Fall 2005 with the appearance of a distinct size class ($P<0.001$). While most translocated individuals have dispersed downstream of the release site, some fish have moved upstream, despite increasing CO_2 levels. The growth rates and recent spawning activity may contribute to a demographic expansion of the species range and sheds new hope for recovery efforts for HBC.

Contact

Sponholtz, Pamela
U.S. Fish and Wildlife Service
323 N. Leroux, Suite 401
Flagstaff, AZ 86001USA

Email: pam_sponholtz@fws.gov
Phone: 928-226-1289 EXT 113

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Dennis Stone
U.S. Fish and Wildlife Service
dennis_stone@fws.gov

Aquatic Community Classification for Eastern Montana: Uses in Bioassessment and Conservation

Bioassessment Symposium

Keywords
Aquatic Bioassessment, Aquatic Communities, IBIs, O/E, Stream Classification

The Montana Natural Heritage Program developed a hierarchical classification framework defining 38 Aquatic Ecological Systems (AES) within 13 broader lotic ecosystems of the Missouri River Basin of Montana. We used a combination of classification techniques identifying the dominant variables and indicator species structuring river communities from the mountains to the prairies. Twelve macroinvertebrate and 10 significant fish community groups were delineated using taxonomic data from ~1100 sampling sites within the basin. These community groups were related to elevation, geomorphology, stream size and tolerance to anthropogenic impacts. Fish introductions have played a significant role in structuring the transitional river systems, as well as warm-water fish communities. Reference sites for each classification group were determined and the frequency of occurrence of the indicator species calculated. Thus, for each classification type, we developed an “expected” community of fish and macroinvertebrates that can be analyzed against future samples to test the samples similarity to reference condition, and ultimately determine the biointegrity of the system. Our observed versus expected (O/E) analysis of fish/macroinvertebrate samples from the Powder River and Frenchman Creek produced comparable and slightly more robust values than the existing plains IBI. We contend that using O/E values is a truer measure of ecosystem health than traditional multimetric indicies (i.e. IBI, BIBI), especially for Montana’s lower elevation streams that naturally contain species tolerant to environmental and anthropogenic stressors.

Contact

Stagliano, David
Aquatic Ecologist
Montana Natural Heritage Program
1515 E. 6th Ave.
Helena, MT 59601USA

Email: dstagliano@mt.gov
Phone: 406-444-7329
Fax: 406-444-0581

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Powder River Fish Communities in Montana: Expected and Declining Species based on Historical Perspectives

Warmwater/Prairie Streams Symposium

Keywords
fish communities, native fishes, Powder River, Montana fishes, prairie rivers, Sturgeon chub

Powder River fish communities in Montana were examined from sampling data going back 30 years to determine an expected native fish community for the purpose of biomonitoring. Four fish species (3 native and 1 introduced) have not been collected in sampling events since 1976. Two introduced species, the plains killifish and the walleye, have been collected in the river since the late 1970's. The total number of reported fish species (19) collected in the river has been stable, but the number of native species has decreased from 17 to 15, and species community composition has changed incrementally over the sampling period; with noticeable decreases in sturgeon chubs (MT SOC) and increases in sand shiners. Expected fish communities from the upper Powder River (30-220 RM) averaged 7.5 species and were dominated by the typical prairie river species: flathead chubs, longnose dace, plains and western silvery minnows, sand shiners, catfish and river carpsuckers. While, the lower 30 river miles to the confluence, averaged 8 native fish species with significant species replacements by larger river dominants. We derived frequencies of occurrence for all species collected and compared observed vs. expected communities (O/E) with the existing prairie fish IBI for testing river biointegrity.

Contact

Stagliano, David
Aqautic Ecologist
Montana Natural Heritage Program
1515 E. 6th Ave.
Helena, MT 59601USA

Email: dstagliano@mt.gov
Phone: 406-444-7329
Fax: 406-444-0581

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.

Spatial dynamics of Arctic grayling in the Gibbon River, Yellowstone National Park

Poster Session

Keywords

Fluvial Arctic grayling are presently restricted to less than 5% of their native range in the contiguous United States and are listed as Category 3 under the Endangered Species Act. Fluvial grayling are thought to be restricted to a segment of the Big Hole River, Montana, in which abundances are too low to estimate accurately. Although fluvial grayling of the Madison, lower Firehole, and lower Gibbon rivers of Yellowstone National Park were thought to be extirpated by 1935, anglers have reported catching grayling throughout the Gibbon River annually. Our goal was to determine if a viable fluvial grayling population persists in the Gibbon River, or if fish caught in the river are downstream emigrants from lacustrine populations in headwater lakes. Seventeen grayling were sampled from the Gibbon River in 2005 by intensive electrofishing and fly-fishing efforts. In contrast, fry-trapping yielded few to no grayling at reaches throughout the Gibbon River. These preliminary data suggest that few grayling adults and fry inhabit the Gibbon River, implying that a reproducing fluvial population may not exist. Our findings may affect the potential Endangered Species Act listing of fluvial grayling while supplementing their management and conservation within and outside of Yellowstone National Park.

Contact

Steed, Amber
Amber Steed
Montana State University
Montana Cooperative Fishery Research Unit
P.O. Box 173460, Montana State University
Bozeman, MT 59717USA

Email: asteed@montana.edu
Phone: 406-994-3698
Fax: 406-994-7479

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Alexander Zale
Montana Cooperative Fishery Research Unit, Montana State University
zale@montana.edu

Todd Koel
Yellowstone National Park
todd_koel@nps.gov

Steven Kalinowski
Montana State University
skalinowski@montana.edu

Adult Stonecat Distribution in the Upper Missouri River, Montana (USA)

Poster Session

Keywords
Stonecats, Missouri River, distribution

Stonecats, native to Montana, were sampled in the Missouri River near Craig, Montana, in the late 1800's. Subsequently, stonecats have not been sampled during intense electrofishing efforts throughout the same area over the past 24 years. The objective of this study was to determine adult stonecat distribution within a 142-km reach of the Upper Missouri River in Northcentral Montana, between Holter Dam and Black Eagle Dam. The study area was divided into eight 17.8-km sections and baited hoop nets were systematically fished in each section at approximately 2-km intervals on both sides of the river. Since all eight sections were sampled during March 2005, sampling order was randomly selected. Adult stonecats were only sampled in the most downstream 17.8-km of the study area with mean hoop net catch rates varying from 0 to 33 per 2-night period. Our initial results indicate that adult stonecats presently occupy only the lower 17.8-km of the study area. Canyon Ferry Reservoir's thermal influences on the Upper Missouri River system might help explain the current distribution of stonecats. Additional sampling will commence in March 2006 with an increased effort aimed at sampling younger age classes.

Contact

Strainer, Adam
Conservation Technician
Montana Fish, Wildlife & Parks
4600 Giant Springs Road
Great Falls, MT 59405USA

Email: astrainer@mcn.net
Phone: 406-454-5854
Fax: 406-761-8477

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Travis Horton
Montana Fish, Wildlife & Parks
thorton@mt.gov

Vectors for the spread of Myxobolus cerebralis, the causative agent of whirling disease: a research update and review of management implications

Fish Conservation & Management Session

Keywords
whirling disease, Myxobolus cerebralis, ANS, vectors

Whirling disease, caused by the myxozoan parasite Myxobolus cerebralis, has impacted fisheries is several western states and presents a great challenge to fishery managers and biologists. In the mid-1990s, whirling disease was first implicated in dramatic trout population declines in the American west. Since then, intensive research has increased knowledge about the parasite, its complicated life cycle, and management implications of the disease. Risk analysis has emerged as a top priority for researchers and managers and knowledge about vectors for the spread of Myxobolus cerebralis is vital. The transfer of infected fish is thought to be the primary vector for the spread of whirling disease. Other vectors include human activities, such as boating and wading, and transfer by predatory animals. This project will review available information regarding whirling disease vectors with a focus on recent research developments and will address the management implications of this knowledge.

Contact

Stromberg, Kajsa
Outreach Program Coordinator
Whirling Disease Initiative, Montana Water Center
101 Huffman Building
Bozeman, MT 59717USA

Email: kstromberg@montana.edu
Phone: 406-994-2550
Fax: 406-994-1774

This contact person is the presenter.
This contact person is the primary author.

Additional Authors

Leah Steinbach Elwell
leahelwell@gmail.com

Developments in whirling disease research and management

Poster Session

Keywords
whirling disease, Myxobolus cerebralis, Tubifex tubifex, risk analysis

Whirling disease, caused by the myxozoan parasite *Myxobolus cerebralis* , has impacted fisheries is several western states and presents a great challenge to fishery managers and biologists. In the mid-1990s whirling disease was first implicated in dramatic trout population declines in the American west. Since then, intensive research has increased knowledge about the parasite, its complicated life cycle, and management implications of the disease. Recent developments in risk assessment, gear treatment, parasite and host ecology, parasite detection, and environmental factors have great potential to inform and improve management related to whirling disease. This project summarizes recent developments in whirling disease research and management and describes the current research emphasis of the Whirling Disease Initiative.

Contact

Stromberg, Kajsa
Outreach Program Coordinator
Whirling Disease Initiative, Montana Water Center
101 Huffman Building
Montana State University
Bozeman, MT 59717USA

Email: kstromberg@montana.edu
Phone: 406-994-2550
Fax: 406-994-1774

This contact person is the presenter.
This contact person is the primary author.

There are no additional authors for this abstract.