Alaska Chapter
American Fisheries Society

Expanding Perspectives of Fisheries

35th Annual Meeting

Anchorage, Alaska - October 27-30, 2008

Poster/Cover Illustration

Ginger M. Cooley

Artist's comment
"When I think of salmon, I think of their remarkable, life-giving migration toward death. They brave raging rivers, lined with bears and fisherman, to give life to future generations. In my art, I wanted to capture this phenomenon through vivid color and with determination equal to a salmon's."

Ginger Cooley specializes in fantasy-based digital artwork, as well as jewelry and painting. She studied art and photography at Southeastern Louisiana University and 3D animation at DigiPen Institute of Technology, and earned a BA in photojournalism from the University of Alaska, Anchorage. Her artworks is listed at www.iamcooley.com.

Alaska Chapter of the American Fisheries Society
2008 Annual Conference
October 26 - 30, Hilton Hotel Anchorage, Alaska

Executive Committee

Jamal Moss, Past President
Bert Lewis, President
Toshihide "Hamachan" Hamazaki, President Elect
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Audio/Visual

AFS Student Units (UAA, UAF, UAS)

Plenary Keynote Speaker

Terry Johnson

Alaska Sea Grant Marine Advisory Program

Banquet

Mr. Whitekeys & The Fabulous Spamtones

Session Chairs

Jeff Adams, U.S. Fish and Wildlife Service
Jan Conitz, Alaska Department of Fish and Game
Timothy Joyce, U.S. Forest Service
Dennis Lassuy, North Slope Science Initiative
Bert Lewis, Alaska Department of Fish and Game
Douglas Molyneaux, Alaska Department of Fish and Game
Cindy Hartmann Moore, NOAA Fisheries Service
Ted Otis, Alaska Department of Fish and Game

Continuing Education Instructors

Technical Scientific Writing
James Hale
NOAA Fisheries, Alaska Region

Scientific Speaking and Presentations
Andi O'Conor
Communication Consulting, Inc

Wilderness First Aid and CPR
Deb Ajango
SafetyEd

Introduction and advanced topics in DIDSON
Debby Burwen, Suzanne Maxwell, Carl Pfisterer
Alaska Department of Fish and Game

Use of Echoview
Ian Higginbottom
Echoview

2008 Annual Alaska Chapter AFS Conference

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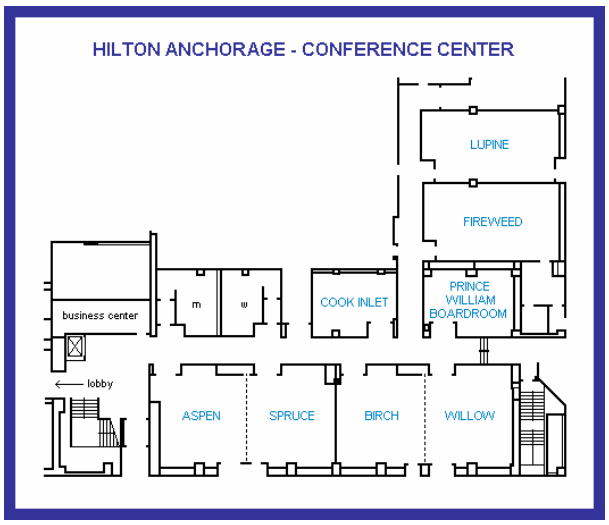
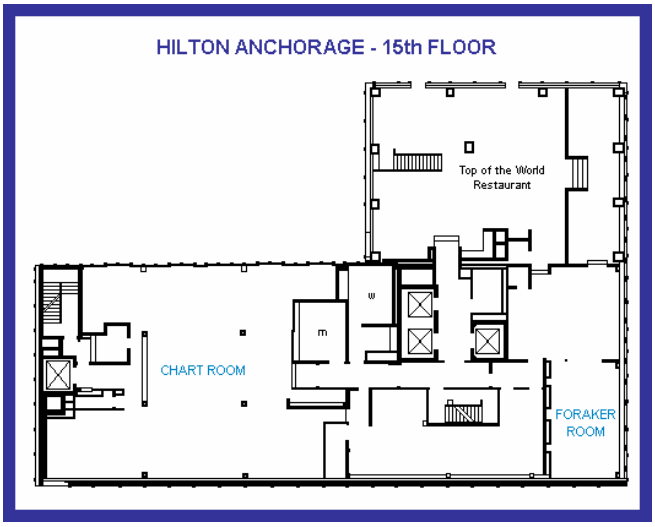
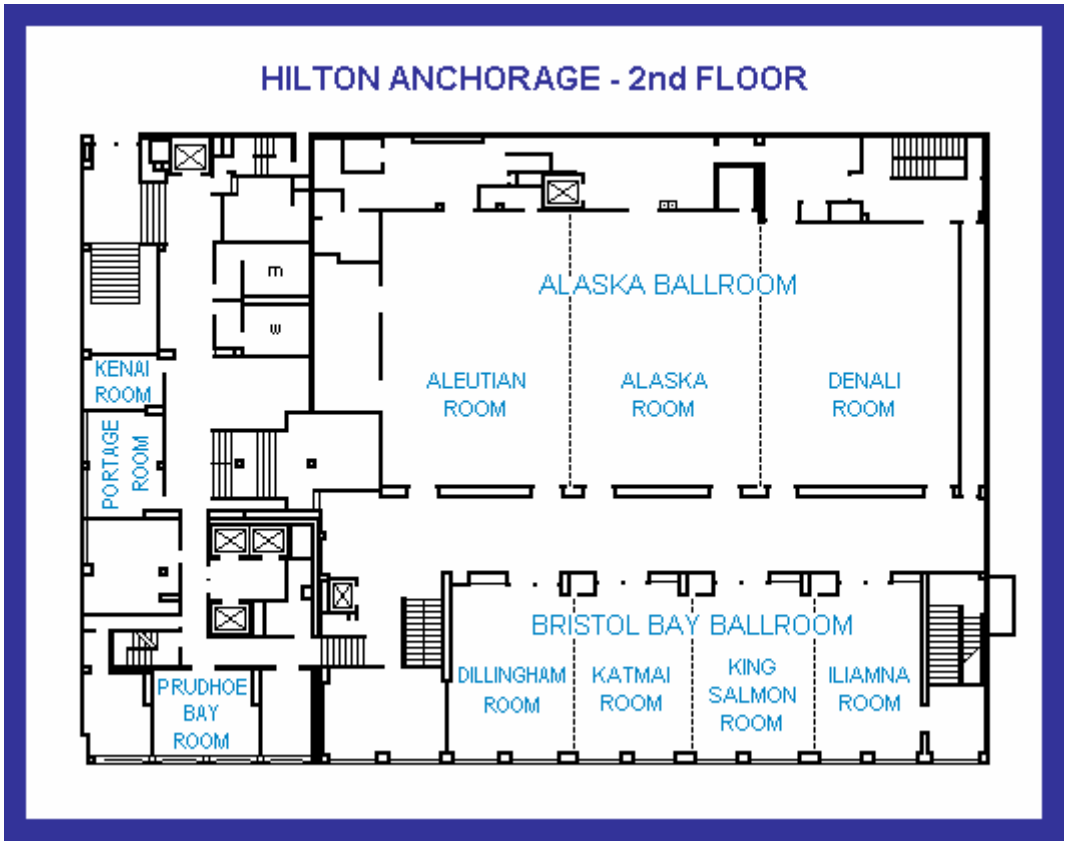
2008 Annual Alaska Chapter AFS Conference Agenda at a Glance

Hilton Hotel Anchorage, Alaska – October 26-30, 2008						
Day/Date	**Time Period**	**King Salmon**	**Lupine**	**Dillingham / Katmai**	**Iliamna**	**Lobby**
Sunday October 26	Morning	Wilderness First Aid (Day 1)	Improving your scientific presentation and skills	Use of ECOHVIEW		
	Afternoon					
Monday October 27	Morning	Wilderness First Aid (Day 2)	Refining your scientific speaking and presentation skills	Introduction to DIDSON-based assessment	Technical Writing	Conference Registration
	Afternoon					
	Evening	**Opening Reception: Chart**		DIDSON presentation		
Day/Date	**Time Period**	**Denali**	**King Salmon / Iliamna**	**Dillingham /Katmai**	**Portage**	**Lobby**
Tuesday October 28	Early Morning	**Plenary session**		Advanced topics in DIDSON tools	Speaker Preparation	Conference Registration
	Late Morning	Applying GIS to fisheries & management	Contributed Papers			
	Lunch	**Luncheon Aleutian / Student-Mentor lunch: Chart**				
	Afternoon	Alaska's Subsistence fisheries	Everything you wanted to know about whitefish			
	Evening	**Opening Social: Snow Goose**				
Wednesday October 29	Morning	What's going on fish and fisheries on the North Slope	Mining and fisheries in Alaska	Poster Session	Speaker Preparation	Conference Registration
	Lunch	**On your own / Past Presidents Luncheon: Foraker**				
				Poster Presentation		
	Afternoon	Kuskokwim River Salmon population Assessment	Mining and fisheries in Alaska			
	Late Afternoon	**AFS Alaska Chapter Annual Business Meeting**	Mining and fisheries in Alaska	Poster Session		
	Evening	**AFS Alaska Chapter Annual Banquet Mr. Whitekeys & The Fabulous Spamatones**				
Thursday October 30	Early Morning	Size trends of Alaskan salmon stocks	Contributed papers		Speaker Preparation	Conference Registration
	Late Morning	Escapement goal management				
		Awards and Adjournment				

Hilton Hotel Floor Map







2008 Alaska Chapter AFS Conference Schedule

Sunday, October 26 – Continuing Education

King Salmon – Wilderness First Aid - Day 1
Deb Ajango
8:30 am – 5:00 pm

Lupine – Improving your scientific speaking and presentation skills
Andi O'Conor
8:30 am – 5:00 pm

Dillingham/Katmai – Use of Echoview
Ian Higginbottom
8:00 am – 5:00 pm

Monday, October 27 – Continuing Education

Lobby – Conference Registration
1:00 pm – 6:00 pm

King Salmon – Wilderness First Aid - Day 2
Deb Ajango
8:30 am – 5:00 pm

Lupine – Refining your scientific speaking and presentation skills
Andi O'Conor
8:30 am – 5:00 pm

Dillingham/Katmai – Introduction to DIDSON based assessment techniques
Debby Burwen, Suzanne Maxwell, Carl Pfisterer
8:00 am – 5:00 pm
6:30 pm – 730 pm Power point Poster presentation

Iliamna – Technical writing
Jim Hale
8:30 am – 5:00 pm

Chart – Opening Reception
5:30 pm – 7:30 pm

2008 Alaska Chapter AFS Conference Schedule

Tuesday, October 28

Lobby – Conference Registration
8:00 am – 6:00 pm

Dillingham/Katmai – Advanced topics in DIDSON tools and techniques
Debby Burwen, Suzanne Maxwell, Carl Pfisterer
8:00 am – 5:00 pm

Aleutian – Luncheon
Chart – Student-Mentor Luncheon
12:20 pm – 1:40 pm

Snow Goose Restaurant/Brew Pub – Opening Social
5:30 pm – 8:30 pm

Denali – Opening remarks and Plenary Session

8:40 am – 9:00 am
Welcome – Bert Lewis
Opening remarks and introduction of the keynote speaker – Toshihide "Hamachan" Hamazaki

9:00 am – 10:00 am
Plenary Keynote Speaker
Expanding perspective of fisheries
Terry Johnson, Alaska Sea Grant Marine Advisory Program

10:00 am – 10:20 am Break

2008 Alaska Chapter AFS Conference Schedule

Denali – Concurrent Session # 1

Applying GIS to Fisheries and Management

Jeff Adams, Chair

10:20 am – 10:40 am
Integrating professions with GIS - Does it help to have a forester involved in a fishery study?
Will Putman
10:40 am – 11:00 am
Using GIS to examine a large river system: The Tanana River erosion study
Will Putman
11:00 am – 11:20 am
Wetland geomorphic linkages to juvenile salmonids and macroinvertebrate communities in headwater streams of the Kenai lowlands, Alaska
Coowe Walker, Ryan King, Dennis Whigham, Steve Baird, Jeff Back
11:20 am – 11:40 am
Urban surface water contaminants and protection issues in Fairbanks, Alaska
La'ona DeWilde
11:40 am – 12:00 pm
AQUABASE Aquatic GIS Geodatabase
David Daum, Jennifer Jenkins, Philip Martin, Peter Hickman
12:00 pm – 12:20 pm
The influence of hydrology and waterway distance on population structure of Chinook salmon (*Oncorhynchus tshawytscha*) in the Yukon River
Jeffrey Olsen, Terry Beacham, Blair Flannery, Lisa Seeb, Christian Smith, Bill Templin, John Wenburg

King Salmon/Iliamna – Concurrent Session # 2

Contributed Papers

Bert Lewis, Chair

10:20 am – 10:40 am
Genetic analysis of Alaskan Pacific Halibut (*Hippoglossus stenolepis*)
Jennifer Nielsen and Sara Graziano
10:40 am – 11:00 am
Winter habitat use and seasonal movements of juvenile coho salmon and Dolly Varden marked with visual implant elastomer (VIE) tags in a tributary of the Chuitna River, western Cook Inlet region, Alaska
John O'Brien, Dave Trudgen, Josh Brekken, Haley Ohms, Arny Blanchard
11:00 am – 11:20 am
Testing the optimal stability hypothesis in the Gulf of Alaska
Sara Miller, Milo Adkison, Lewis Haldorson
11:20 am – 11:40 am
Ecological linkages between fishless headwaters and downstream fish communities
Elizabeth Green, Mark Wipfli, Karl Polivka
11:40 am – 12:00 pm
Developing tools for monitoring marine-derived nutrients in Alaska watersheds
Daniel Rinella, Mark Wipfli, Craig Stricker, Ron Heintz, Coowe Walker
12:00 pm – 12:20 pm
Yukon River Drainage Fisheries Association and Alaska Department of Fish and Game internship, 2008
Kristen Baltz, Nick DeCovich, Robert DuBey

***: Student Speakers**

2008 Alaska Chapter AFS Conference Schedule

Denali – Concurrent Session # 1
Alaska's subsistence fisheries: Balancing tradition, conservation, and economic change
Jan Conitz, Chair

1:40 pm – 2:00 pm
Federal subsistence management overview
Liz Williams
2:00 pm – 2:20 pm
Judicial constraints on State and Federal subsistence regulations
Steven Daugherty
2:20 pm – 2:40 pm
Success in rural Alaska: Meaningfully involving local communities in the management process
Karen Dunmall
2:40 pm – 3:00 pm
Subsistence fishery harvest estimation tools used in the Yukon River management area
Deena Jallen and Dayna Norris
3:00 pm – 3:20 pm
Challenges in management of subsistence Chinook salmon fisheries in the Yukon and Kuskokwim Rivers
Toshihide "Hamachan" Hamazaki

3:20 pm – 3:40 pm **Break**

3:40 pm – 4:00 pm
Improving subsistence sockeye salmon harvest estimates in Southeast Alaska
Jan Conitz
4:00 pm – 4:20 pm
Subsistence rockfish and local-traditional knowledge
Mike Turek
4:20 pm – 4:40 pm
Climate change and Alaska Native subsistence foods
Don Bremmer
4:40 pm – 5:00 pm
Panel Discussion

2008 Alaska Chapter AFS Conference Schedule

King Salmon/Iliamna – Concurrent Session # 2

Everything you wanted to know about whitefish, but were afraid to ask

Timothy Joyce, Chair

1:40 pm – 2:00 pm
Population dynamics and potential harvest impacts on humpback whitefish and least cisco in the Chatanika River
Lorena Edenfield, Trent Sutton

2:00 pm – 2:20 pm
Spawning movements and ecology of humpback whitefish and least cisco in the Chatanika River
Aaron Dupuis, Trent Sutton

2:20 pm – 2:40 pm
Humpback whitefish migration and movements on the Copper River Delta, Alaska.
Brian Neilson

2:40 pm – 3:00 pm
Seasonal movements of Lake Clark humpback whitefish *Coregonus pidschian*
Dan Young and Carol Ann Woody

3:00 pm – 3:20 pm
A traditional knowledge and fisheries biology study: Developing baseline life history data for Bering cisco (*Coregonus laurettae*) in the Yukon River Delta
David Runfola

3:20 pm – 3:40 pm **Break**

3:40 pm – 4:00 pm
Population of origin of Arctic cisco (*Coregonus autumnalis*) collected in the Colville River subsistence fishery
Jennifer Nielsen atd Sara Graziano

4:00 pm – 4:20 pm
Environmentally-induced variation in growth rates of Arctic cisco
Vanessa von Biela, Christian Zimmerman, Lawrence Moulton

4:20 pm – 4:40 pm
Broad whitefish studies in the Chipp/Ikpikpuk river system
Lawrence Moulton, Craig George, Josh Bacon, William Morris, John Rose, Matthew Whitman

4:40 pm – 5:00 pm
Panel Discussion

***: Student Speakers**

2008 Alaska Chapter AFS Conference Schedule

2008 Alaska Chapter AFS Conference Schedule

Wednesday, October 29

Lobby – Conference Registration
8:00 am – 12:00 pm

Foraker - Past Presidents Luncheon
12:20 pm – 1:40 pm

Denali - Alaska Chapter Business Meeting
4:20 pm – 6:00 pm

Alaska/Aleutian - Banquet Mr. Whitekeys & The Fabulous Spamtones
6:30 pm – 9:30 pm

Dillingham/Katmai – Poster Session
8:00 am – 5:00 pm
1:40 pm – 2:00 pm Poster speakers presentation

A GIS / remote sensing based approach to identify potential spawning habitat for fall-run chum salmon in the mainstem Tanana River, Alaska
Lisa South

Identification and characterization of inconnu (sheefish) habitat in the Sulukna River
Jonathon Gerken, Joe Margraf, Randy Brown

Kuskokwim River salmon research
Christopher Sheldon and Douglas Molyneaux

Resources for development of resistance board weirs
Rob Stewart

Ecology and demographics of juvenile Chinook salmon in the Chena River, central Alaska
Mark Wipfli, Nicholas Hughes, Matthew Evenson, Emily Benson, Elizabeth Green, Laura Gutierrez, Jason Neuswanger, Megan Perry

Using fish habitat quality to aid prioritization of fish passage projects
Miranda Plumb

Stock structure and in-season mixed-stock analysis of Yukon River chum
Blair Flannery, Terry Beacham, Russell Holder, Eric Kretschmer, John Wenburg

Ecological effects of an introduced tree, European birdcherry, on stream food webs in Campbell and Chester creeks, Anchorage, Alaska
David Roon, Mark Wipfli, Tricia Wurtz, Michael Rasy, Bill Rice

Development of a fisheries monitoring plan in relation to oil and gas activities in the National Petroleum Reserve - Alaska
Matthew Whitman, Lynn Noel, Lawrence Moulton, Lynett Bontrager

Genetic diversity of sockeye salmon from the Copper River and adjacent drainages
Lisa Seeb, Mike Ackerman, Chris Habicht

DNA barcoding of eight north American coregonine species
Ora Schlei, Alexis Crête-Lafrenière, Andrew Whiteley, Randy Brown, Jeffrey Olsen, Louis Bernatchez, John Wenburg

2008 Alaska Chapter AFS Conference Schedule

Denali – Concurrent Session # 1

What's going on with fish and fisheries on the North Slope?

Dennis Lassuy, Chair

8:20 am – 8:40 am
Fishery management in Alaska's Arctic exclusive economic zone: What may be in store for the future?
William Wilson

8:40 am – 9:00 am
Beaufort Sea survey: Study overview and comparison to historical data
Libby Logerwell and Kimberly Rand

9:00 am – 9:20 am
Beaufort Sea survey: Patterns of fish and invertebrate distribution
Kimberly Rand and Elizabeth Logerwell

9:20 am – 9:40 am
Juvenile pink and chum salmon foraging conditions, growth potential, and distribution in response to the loss of arctic sea-ice
Jamal Moss, James Murphy, Edward Farley Jr., Lisa Eisner, and Alexander Andrews

9:40 am – 10:00 am
Marine migratory life history of least cisco (*Coregonus sardinella*) in freshwater lakes of the North Slope of Alaska.
John Seigle and Jesse Ford

10:00 am – 10:20 am Break

10:20 am – 10:40 am
Overwintering patterns of anadromous dolly varden in northwest and arctic Alaska
Penny Crane, Fred DeCicco, Tim Viavant, and John Wenburg

10:40 am – 11:00 am
Stock status monitoring of overwintering populations of dolly varden char *Salvelinus malma* in the Anaktuvuk, Ivishak, Canning, and Hulahula rivers: current trends and an evaluation of methods.
Tim Viavant

11:00 am – 11:20 am
Bureau of Land Management's recent and future fish work in the National Petroleum Reserve -Alaska
Matthew Whitman

11:20 am – 11:40 am
Overview of fish studies supported by the North Slope Borough Department of Wildlife Management
Lawrence Moulton, Craig George, Josh Bacon, William Morris, John Rose, John Seigle, Matthew Whitman

11:40 am – 12:20 pm
Panel Discussion

12:20 pm – 1:40 pm: Lunch on your own

1:40 pm – 2:00 pm: Poster Session Presentations

2008 Alaska Chapter AFS Conference Schedule

King Salmon/Iliamna – Concurrent Session # 2

Mining and fisheries in Alaska: Issues, impacts, and what we need to know to make resource management decisions. Are mining and fisheries compatible?

Cindy Hartmann Moore, Chair

8:20 am – 8:40 am
The current state of mines and exploration in the State of Alaska
Rick Fredericksen
8:40 am – 9:00 am
Designing for mine closure
Bill Jeffress
9:00 am – 9:20 am
The process for permitting mine projects in Alaska
Tom Crafford
9:20 am – 9:40 am
Alaska mixing zone regulations
Carl Reese and Jeff Estensen
9:40 am – 10:00 am
NPDES permitting for mines in Alaska – EPA's Role
Cindi Godsey
10:00 am – 10:20 am
Aquatic biomonitoring at Red Dog mine.
William Morris, presented by Brendan Scanlon

10:20 am – 10:40 am Break

10:40 am – 11:00 am
Response of salmonids to total dissolved solids in a simulated mine effluent
Michael Stekoll, William Smoker, Barbi Failor-Rounds, and Ivan Wang
11:00 am – 11:40 am
Impacts of copper on the sensory biology and behavior of salmon
Nathaniel Scholz
11:40 am – 12:20 pm
Predicted versus actual water quality at Hardrock mine sites: Failure modes and root causes of water quality impacts
Jim Kuipers and Ann Maest, presented by Sarah Zuzulock

12:20 pm – 1:40 pm: Lunch on your own

1:40 pm – 2:00 pm: Poster Session Presentations

2008 Alaska Chapter AFS Conference Schedule

Denali – Concurrent Session # 1

Advances in Kuskokwim River salmon population assessment
Douglas Molyneaux, Chair

2:00 pm – 2:20 pm
Kuskokwim area salmon fisheries and run assessment – Overview
Douglas Molyneaux
2:20 pm – 2:40 pm
Kuskokwim River chum salmon run reconstruction – missing puzzle piece
Brian Bue, Douglas Molyneaux, Kevin Schaberg
2:40 pm – 3:00 pm
Kuskokwim River Chinook salmon run reconstruction
Kevin Schaberg, Brian Bue, David Orabutt, Eva Patton, Lisa Stuby
3:00 pm – 3:20 pm
Kuskokwim River coho salmon run reconstruction – Progress report
Zachary Liller, Brian Bue, Toshihide Hamazaki, Kevin Schaberg, Mike Thalhauser
3:20 pm – 3:40 pm
Estimation of abundance and run timing of coho salmon stocks in the lower Kuskokwim River using genetic characters
Penny Crane, Doug Molyneaux, John Wenburg
3:40 pm – 4:00 pm
Continued investigations of genetic diversity in Kuskokwim River Chinook salmon.
Nick DeCovich, Sara Gilk, Jeff Guyon, William Templin

King Salmon/Iliamna – Concurrent Session # 2

Mining and fisheries in Alaska: Issues, impacts, and what we need to know to make resource management decisions. Are mining and fisheries compatible?
Cindy Hartmann Moore, Chair

2:00 pm – 2:20 pm
Uncertainties associated with predicting the quality of mine influenced water – Laboratory methods and chemical weathering of soil and rock in mining environments
Stuart Jennings
2:20 pm – 2:40 pm
Acid mine drainage – How it starts, physical and chemical impacts to fisheries, and challenges of remediation.
Kendra Zamzow
2:40 pm – 3:00 pm
Geologic risks and the Pebble mine
David Chambers
3:00 pm – 3:20 pm
Chuitna coal mine-Potential water quality and fish habitat impacts
Bob Shavelson
3:20 pm – 3:40 pm
Indirect impacts of mining on fish and fish habitat
Bill Hauser
3:40 pm – 4:00 pm
Mining policy and the American Fisheries Society
Eric Wagner

4:00 pm – 4:20 pm: Break

4:20 pm – 5:00 pm
Open Discussion

2008 Alaska Chapter AFS Conference Schedule

Thursday, October 30

Lobby – Conference Registration
8:00 am – 12:00 pm

Denali – Awards and Adjournment
12:00 pm – 12:30 pm

Denali – Concurrent Session # 1
Session: Size trends of Alaskan salmon stocks
Dani Evenson, Chair

8:20 am – 8:40 am
Age consistency study of Yukon River Chinook salmon
Larry DuBois and Zachary Liller
8:40 am – 9:00 am
Potential factors contributing to a shift in the dominant age class and reduction of size at age in Copper River Chinook salmon (*Oncorhynchus tshawytscha*).
Bert Lewis
9:00 am – 9:20 am
Variation in age and size at maturity among Lake Clark sockeye salmon spawning populations.
Elizabeth Benolkin and Carol Ann Woody
9:20 am – 9:40 am
An Investigation of the effects of selective exploitation on the demography and productivity of Yukon River Chinook salmon
Jeffrey Bromaghin, Ryan Nielson, and Jeffrey Hard

10:00 am – 10:20 am Break

King Salmon/Iliamna – Concurrent Session # 2
Contributed Papers
Ted Otis, Chair

8:20 am – 8:40 am
Hatchery chum salmon straying into southeast Alaska streams
Andrew Piston
8:40 am – 9:00 am
The detected straying of hatchery-produced Chinook salmon was strongly related to release site in southeast Alaska.
Harold Geiger, Christopher Habicht, James Jasper, Ron Josephson
9:00 am – 9:20 am
Outbreeding depression and the inheritance of traits in coho salmon (*Oncorhynchus kisutch*): an analysis of second-generation hybrids of three geographically distinct Southeast Alaska populations
Tyler Dann, William Smoker, J. Hard, A.Gharrett
9:20 am – 9:40 am
Genetic identification of sockeye salmon in the northern boundary area
Sara Gilk, Chris Habicht, Glen Oliver
9:40 am – 10:00 am
Blasting bridges and culverts in fish stream: Water overpressure and vibration analysis
Kristen Dunlap

10:00 am – 10:20 am Break

***: Student Speakers**

2008 Alaska Chapter AFS Conference Schedule

Denali – Concurrent Session # 1
Escapement goal salmon management
Ray Beamesderfer, Chair

10:20 am – 10:40 am
Ratcheting down escapements: more realistic goals, marine derived nutrient effects, or artifact of the analysis procedure?
Harold Geiger and Mark Wipfli
10:40 am – 11:00 am
Escapement Goal Management and the Elephant in the Pool
Ben Van Alen
11:00 am – 11:20 am
Problems and solutions in escapement goal management of upper Cook Inlet salmon fisheries
Ray Beamesderfer
11:20 am – 11:40 am
Marine-derived nutrients from salmon: management implications
Milo Adkison
11:40 am – 12:00 pm
Application of salmon life-history simulation model for understanding of fish, fishery, and fishery management
Toshihide Hamazaki

2008 Annual Alaska Chapter AFS Conference

Keynote Speaker

Expanding perspectives of fisheries

Terry Johnson

University of Alaska Marine Advisory Program

"Fisheries" means many things to many people. To some it's a field of scientific inquiry or a resource management challenge. To others, it's a business, recreation, a field of social studies, or a theme in artistic expression. People in many diverse occupations and avocations are fisheries people. If the object of fisheries scientific inquiry and management is fish, the purposes are related directly and almost exclusively to promoting human wellbeing. It may be financial wellbeing or something akin to the spiritual. Human relationships to fish are complex, contradictory, and rapidly changing. Nowhere is this more evident than Alaska, with its huge, diverse, and productive commercial fisheries, important recreational and subsistence fisheries, and coastal ecosystems based largely on nutrient originating in the sea. One of the greatest challenges to fisheries professionals is to understand the shifting demands of their human clientele vis-à-vis the needs of their piscine clientele. Just as fisheries biology has evolved into many specializations, the non-biological components of our fisheries have developed the own specialties, each evolving to meet specific human needs. Whether their efforts are directed at maximizing financial returns or promoting other human values, they all are partners with biologists in enhancing the collective wellbeing of people.

2008 Annual Alaska Chapter AFS Conference

Session: GIS and Fisheries

Integrating Professions with GIS
Does it help to have a forester involved in a fishery study?

Will Putman

Tanana Chiefs Conference, Fairbanks, AK, will.putman@tananachiefs.org

The integrating nature of GIS and spatial technologies sometimes requires communication between professionals from a variety of disciplines. This presentation will discuss examples of this, including an ongoing study being conducted through an interagency effort led by the State of Alaska Department and Fish and Game examining Tanana River fall chum salmon spawning near Fairbanks, Alaska. Pros and cons of developing GIS expertise within an organization or profession as opposed to acquiring the expertise elsewhere will be discussed.

Using GIS to examine a large river system: The Tanana River erosion study

Will Putman

Tanana Chiefs Conference, Fairbanks, AK, will.putman@tananachiefs.org

In 1999 and 2000, a study was conducted by Tanana Chiefs Conference and the State of Alaska Division of Forestry examining bank changes in the Tanana River in interior Alaska over a 20 year period. The project was driven by fishery and forestry issues revolving around forest management practices, riparian buffer standards, large woody debris recruitment, and water quality issues in interaction with the inherently dynamic nature of the Tanana River. The project involved a change analysis of the river channel locations by comparing aerial photography from the late 1970's to satellite imagery from the late 1990's for the entire 824 km length of the river. The discussion will include the data used, the data processing required, problems encountered, and a summary of the results.

2008 Annual Alaska Chapter AFS Conference

Session: GIS and Fisheries

Wetland geomorphic linkages to juvenile salmonids and macroinvertebrate communities in headwater streams of the Kenai lowlands, Alaska

Coowe Walker[1], Ryan King[2], Dennis Whigham[3], Steve Baird[1], Jeff Back[2]

1:Kachemak Bay Research Reserve, Homer, AK coowe.walker@alaska.gov, steve.baird@alaska.gov
2: Baylor University, Waco, TX Ryan_S_King@baylor.edu, Jeff_Back@baylor.edu
3: Smithsonian Environmental Research Center, Edgewater, MD whighamd@si.edu

We investigated relationships between wetland geomorphic settings, and headwater stream characteristics, with the goal of being able to attribute the Kenai Lowlands Wetland Management Tool, a GIS based wetland classification and map for the lower Kenai Peninsula. Thirty streams representing relic glacial drainageway, relic glacial lakebed, kettle and mixed-low-wetland-cover geomorphic settings were sampled across the five major drainages of the lower Kenai Peninsula. Stream reaches were sampled for abiotic and habitat characteristics, macroinvertebrate and fish assemblages, and characterization of riparian plant communities. Thirty-seven landscape metrics were calculated using GIS software for each stream segment sampled. Data was analyzed using a combination of Principal Component Analysis (PCA), non-metric multidimensional scaling (nMDS), multiple regression and regression tree analysis (RTA). Results of the PCA showed strong correlations between topography and wetland geomorphic setting, and between topography and in-stream abiotic and habitat characteristics. Ordination of the riparian vegetation data clearly showed that almost all sites were dominated by a single species, *Calamagrostis canadensis*. Regression analysis revealed a topographic index (a measure of the hydrologic condition that is based on upstream drainage area and slope) that had a strong correlations between stream water chemistry variables; hydrology and stream substrates. Streams with a low topographic index (higher gradient, low wetness) had higher velocities, dissolved oxygen, and nitrite-nitrate N, lower temperatures, more woody debris and more gravelly substrates. Higher topographic index streams (lower gradient, high wetness) had lower velocities, higher dissolved organic carbon, higher temperatures and more peat dominated substrates. Macroinvertebrate assemblages varied with the topographic index as did the fish assemblage. Sites with a low topographic index supported higher densities of small salmonids; and higher topographic index streams supported fewer larger fish.

2008 Annual Alaska Chapter AFS Conference

Session: GIS and Fisheries

Urban surface water contaminants and protection issues in Fairbanks, Alaska

La'ona DeWilde

Tanana Valley Watershed Association, Fairbanks, AK, ftld1@uaf.edu

Are the waters in Interior Alaska polluted? What are the challenges associated with protecting the waters of a relatively pristine watershed from urban pollution? Fairbanks, Alaska is the largest community in the 330,000 square mile Yukon River watershed in northwestern Canada and Interior Alaska. This watershed contains a large proportion of the U.S. wetlands and is the major source of salmon for indigenous communities within the watershed. In this study, *Escherichia coli* and fecal coliform bacterial populations as well as trace metals, nutrients, conductivity and temperature were monitored over a one-year period in local Fairbanks rivers, streams, lakes, gravel ponds, sloughs and storm drains. Preliminary results show that *E. coli* and fecal coliform populations were highest in storm drains and areas that are paved or de-vegetated and during flushing events such as spring melt and flooding in late July. Rivers with high sediment loads, streams that are de-vegetated due to mining and active gravel ponds all had higher concentrations of arsenic and other trace metals than other sites. The results suggest that this community is a source of contamination of an otherwise relatively unpolluted watershed. This study also explores ways for the city of Fairbanks to handle local surface water protection issues, education and community outreach. Success in Rural Alaska: Meaningfully Involving Local Communities in the Management Process

AQUABASE Aquatic GIS Geodatabase

David Daum[1], Jennifer Jenkins[1], Philip Martin[1], Peter Hickman[2]

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AQUABASE is a geodatabase that links fish and hydrological information with referenced waterbodies through ESRI ArcIMS map server. Presently, the geospatial region covered is Alaska's eastern North Slope, between the Canning River (west) and USA/Canada border (east). All the region lies within the Arctic National Wildlife Refuge. Waterbodies include freshwater lakes, rivers, and springs. Each waterbody relates to a series of standalone database tables containing detailed fisheries life history and hydrological data, full references to scientific publications, and hyperlinks to scientific publications in Adobe PDF format. Land managers, resource planners, and biologists will benefit from the easy data access, visual data displays, and waterbody-linked references.

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Session: GIS and Fisheries

The influence of hydrology and waterway distance on population structure of Chinook salmon (*Oncorhynchus tshawytscha*) in the Yukon River

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Adult Pacific salmon (*Oncorhynchus* spp.) navigate in river systems using olfactory cues that may be influenced by hydrologic factors such as flow and the number, size, and spatial distribution of tributaries. Thus, river hydrology may influence both homing success and the level of straying (gene flow), which in turn influences population structure. In this study we used GIS data layers and multivariate analysis to examine the extent to which indicators of hydrology and waterway distance, alone and together, explain genetic population structure of Chinook salmon (*O. tshawytscha*) in the Yukon River. We found that indicators of hydrology, particularly the number of drainage basins and drainage basin flow, explained as much or more of the genetic population structure as mainstem and tributary waterway distance. We also found that indicators of hydrology and waterway distance together explained more variation in genetic divergence than either factor alone. However, the most informative combination of indicators varied with spatial scale. Our results suggest that habitat changes, either natural or anthropogenic, that alter hydrology in this system may in turn influence the pattern of gene flow among populations and ultimately the distribution of genetic variation.

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Session: Whitefish

Population dynamics and potential harvest impacts on humpback whitefish and least cisco in the Chatanika River

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The Chatanika River has historically contained large numbers of whitefish and supported a popular fall spear fishery. High levels of harvest resulted in a decline in population abundance of humpback whitefish *Coregonus pidschian* and least cisco *C. sardinella* and resulted in an emergency closure of the fishery. While the spear fishery was reopened in 2007, a thorough examination of the stock structure and population dynamics is necessary to prevent conditions that might again lead to unstable and unsustainable populations of these species. The objectives of this study were to assess the stock characteristics and population dynamics of humpback whitefish and least cisco in the Chatanika River, and evaluate the impacts of varying levels of harvest-induced mortality. Population data were collected in 2008 using a combination of gill netting and electrofishing. Fork length was measured for each fish, and weight and otoliths were collected from a subsample of fish. From these data, size and age structure, growth, condition, and mortality were estimated for each population. Using these inputs, we will assess the relative effects of different levels of recreational harvest on population abundance, biomass, yield, recruitment, and size and age structure of humpback whitefish and least cisco in the Chatanika River using an age-structured population model. The information obtained through modeling simulations will be used to provide a framework for the future management of these populations.

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Session: Whitefish

Spawning movements and ecology of humpback whitefish and least cisco in the Chatanika River

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In 2007, the Alaska Department of Fish and Game reopened a personal use whitefish spear fishery on the Chatanika River for humpback whitefish *Coregonus pidschian* and least cisco *C. sardinella*. However, there is little detailed information available on the spawning migrations or areas, as well as the current state of the reproductive biology for these fishes in this system. The objectives of this study were to describe the upstream spawning migrations, spawning areas, and reproductive biology of these fish. Radio telemetry was used to monitor the spawning migrations and locate spawning areas; a total of 60 and 15 radio transmitters were surgically implanted into humpback whitefish and least cisco, respectively, between June and August 2008. Fish movements were monitored with weekly boat surveys and automated receiving stations. Attempts will be made to confirm spawning areas through egg entrainment and visual observation of spawning behavior. Biological data were collected to estimate age at maturity, fecundity, and gonadosomatic index (GSI). Initial analyses of telemetry data revealed that tagged humpback whitefish and least cisco have moved upstream from tagging areas toward presumed spawning areas between mid-June and late-September at rates of up to approximately 6 km/day. Initial analyses of reproductive biology data suggests that, based on GSI values, there are non-spawning, mature fish that mix with spawning condition fish in the lower portion of the river. These results will provide managers of whitefish populations and the spear fishery additional information to make decisions that will benefit the fish and the people who pursue them.

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Session: Whitefish

Humpback whitefish migration and movements on the Copper River delta, Alaska.

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Research conducted on humpback whitefish (*Coregonus pidschian*) on the Copper River Delta has revealed a complex life history involving annual migrations and the occupation of a variety of habitats including estuarine, tidal sloughs, rivers, and lakes. Thirty humpback whitefish were tagged with radio transmitters in 2006 and 2007 at McKinley Lake. Another 29 whitefish were tagged with acoustic tags in 2008. Movements and migration of tagged fish were tracked using telemetry techniques from boats, airplanes, and fixed receiver stations throughout the spring, summer, and fall. Telemetry results revealed that tagged fish migrate into McKinley Lake in mid to late spring and leave by early fall. Tagged fish migrated to the Copper River in the fall by traveling down the Alaganik River through an estuarine environment and then up river to their spawning grounds. The reverse route was used in the spring. Eleven tagged fish returned to McKinley Lake in 2007 and 2008 revealing fidelity to the summer feeding site. Diel movements of acoustic tagged fish were monitored in 2008 using an acoustic hydrophone array throughout McKinley Lake. Analysis of this movement is in progress. Diet was also examined in humpback whitefish on the Copper River Delta with benthic invertebrates representing the primary prey source and juvenile three-spine stickleback (*Gasterosteus aculeatus*) to a lesser extant.

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Session: Whitefish

Seasonal Movements of Lake Clark humpback whitefish *Coregonus pidschian*

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Next to sockeye salmon *Oncorhynchus nerka*, humpback whitefish *Coregonus pidschian* have historically been the most important subsistence fish in the Kvichak River watershed. Reports of declining subsistence harvests and a lack of information for humpback whitefish in the Lake Clark and Iliamna watershed initiated this study. To monitor the seasonal movement patterns of humpback whitefish in the Lake Clark and Sixmile Lake watersheds, 169 adult whitefish were captured and radiotagged from three sites during May-August 2006 (n=94) and 2007 (n=75). Radio-tagged fish were tracked by boat and aircraft every 1-14 days and monitored 24 hrs/day by remote tracking stations at the outlets of Lake Clark, Sixmile Lake, and several inlet tributaries of Lake Clark. Site fidelity to feeding areas was observed with fish generally remaining near tagging locations. Several fish made directed migrations to subsistence salmon camps where tagged fish were observed feeding on salmon carcasses and eggs. Fish from all tagging sites migrated to spawning habitats in the Chulitna River between late August and early October; fish migrated out of the river between mid October and early November. These results suggest subsistence salmon camps are an important feeding area for humpback whitefish and that the Chulitna River is the primary spawning location for humpback whitefish in the Lake Clark/Sixmile Lake drainage.

Session: Whitefish

A traditional knowledge and fisheries biology study: Developing baseline life history data for Bering cisco (*Coregonus laurettae*) in the Yukon River delta

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Alaska's whitefish are known to be important subsistence species particularly in rural Alaska communities. Many previous studies in Alaska have advanced researchers' knowledge of general life history of whitefish. However, there is still a limited understanding of many aspects of whitefish biology. Recent research reflects an increased interest in these species among fisheries biologists. Through interviews conducted in this study we identified Bering cisco (*Coregonus laurettae*) as a significantly important species for Yup'ik subsistence fishing families on the Bering Sea coast of the Yukon River delta. With guidance from participating fishermen we designed a biological plan of study to develop baseline life history data of Bering ciscoes in the region. We captured Bering ciscoes in estuarine reaches of two Yukon River distributaries, recorded weight and length, examined stomach contents to identify the presence or absence of nine-spine stickleback (*Pungitius pungitius*) remains, and aged individuals by saggital otolith thin-sectioning. Saggital otoliths have also been prepared for inductively coupled plasma - mass spectrometry (ICPMS) in order to quantify the concentrations of trace metals from natal habitat. Currently we have determined that all samples were juvenile fish feeding on invertebrates and nines-pine sticklebacks, except age 0 fish which were feeding exclusively on invertebrates. ICPMS results will provide baseline data for future research which may determine natal habitat for Yukon River delta fish. Results indicate that Yukon River delta estuaries provide important rearing habitat and plentiful forage for juvenile Bering ciscoes. This study also provides a model for fisheries biologists interested in incorporating local subsistence fishermen in developing fisheries biology research in rural Alaska.

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Session: Whitefish

Population of origin of Arctic cisco (*Coregonus autumnalis*) collected in the Colville River subsistence fishery

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Arctic cisco (*Coregonus autumnalis*) harvested from the Colville River subsistence fishery are thought to be anadromous, overwintering migrants from the Mackenzie River, Canada. Local fishermen currently question sustainable recruitment to this fishery based on potential climate change and development impacts in the near-shore waters of the Beaufort Sea. Our study tests population-of-origin hypotheses for Colville River Arctic cisco by comparing genetic data derived from Colville River Arctic cisco with anadromous spawning populations collected in the Arctic Red and Peel rivers, both tributaries of the Mackenzie River. We analyzed genetic variation at eleven polymorphic microsatellite loci and direct sequence information for a 594 nucleotide fragment of the mitochondrial ATPase subunit VI gene. Microsatellite allelic frequencies revealed no significant differences in pairwise F_{ST} among these populations supporting the hypothesis that the Mackenzie River watershed is the primary source of Arctic cisco recruiting to the Colville River fishery. Differences in mitochondrial DNA haplotypes suggest some fish within the Colville River sample collection may be misidentified to species or are hybrids with other Arctic coregonids. Sampling of additional possible source populations upriver in the Mackenzie River will take place August 2008. Data from fish collected from these streams will be critical to understanding the population dynamics of Arctic cisco in the Beaufort Sea and the sustainability of the Colville River fishery.

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Session: Whitefish

Environmentally-induced variation in growth rates of Arctic cisco

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Arctic cisco (*Coregonus autumnalis*) are an important resource in northern Alaska. Subsistence users have expressed concern over declines in harvest and size of cisco from the Colville River. We measured otolith growth of 901 cisco captured in subsistence fisheries in the Colville River between 1986 and 2007, representing 25 year classes (1978 – 2003), to compare growth with environmental variables. Otolith growth was a good predictor of fish growth (linear regression, r^2=0.84, $P < 0.0001$). The first 8 annual growth increments exhibited significant inter-annual variation in growth (one-way ANOVA for each annulus, $P < 0.05$). Young-of-the-year (YOY) otolith growth rates were analyzed separately from other years in relation to environmental variables. In all cases, comparisons were made using linear regression weighted by sample size and significance was set at 0.05. YOY growth was positively related with the winter Arctic Oscillation index (Nov-Mar, r^2 =0.19), mean summer air temperature at Inuvik in the Mackenzie River Delta (June-July, r^2=0.15), mean speed of east wind at Barrow, Alaska (July-Aug, r^2=.016), and mean Mackenzie River discharge at Ft. Simpson lagged 2 years (April-June, r^2=0.50). The residual growth of older juveniles (annuli 3-8) was positively related to the winter Arctic Oscillation index (r^2 =0.16), summer air temperature at Barrow (June-September, r^2 =0.47), and the mean Kuparuk River discharge at Deadhorse in the current year (May-September, r^2 =0.22), but not with a time lag. The lagged river discharge relationship may represent the time needed for prey resources to react to increased nutrient availability associated with increased river discharge, while the unlagged correlation is more likely to index the nearshore salinity. These results suggest that YOY growth is most strongly related to nutrient discharge (lagged river discharge) while older juvenile growth is most strongly related to the current physical environment (temperature and current discharge).

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Session: Whitefish

Broad whitefish studies in the Chipp/Ikpikpuk river system

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The North Slope Borough Department of Wildlife Management has been conducting studies of broad whitefish studies within the Borough since 1988. Recent effort has focused on the Chipp/Ikpikpuk river system, which includes Teshekpuk Lake. This region provides a substantial harvest of broad whitefish, which is the primary target of subsistence fisheries. The Chipp/Ikpikpuk study program was initiated in 2003 with a long-term goal of developing an understanding of fish populations using freshwater habitats linked to Teshekpuk Lake. Defining the system is difficult due to the complex web of interactions among streams, sloughs and lakes in the region. While Teshekpuk Lake itself covers an area in excess of 830 km2, fish using the system of connected channels, lakes and nearshore regions may have access to an area encompassing over 32,600 km2 Field studies based on sampling with fyke nets were conducted at various locations around Teshekpuk Lake from 2003 to 2007 and in the lower Chipp River in 2008.

Objectives of field studies have included:

a) Evaluating potential fish wintering areas,
b) Mapping drainages and attached lakes,
c) Describing habitat use patterns and characteristics of broad whitefish and other abundant species in habitats associated with the Chipp/Ikpikpuk system,
d) Evaluating fish feeding patterns in different habitats,
e) Obtaining information on fish movements within the system, and
f) Comparing results to information obtained in previous studies conducted from 1988-1992 to assess potential changes through time.

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Session: Subsistence Fisheries

The Federal subsistence management program

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The Federal Subsistence Management Program is a multi-agency effort to provide the opportunity for a subsistence way of life by rural Alaskans on federal public lands and waters while maintaining healthy populations of fish and wildlife. Subsistence fishing and hunting provide a large share of the food consumed in rural Alaska. The state's rural residents harvest about 22,000 tons of wild foods each year - an average of 375 pounds per person. Fish makes up about 60 percent of this harvest statewide.

This dependence on wild resources is cultural, social and economic. Global political, social, economic, climatic forces affect subsistence users directly. These issues come to the fore in the Federal Subsistence Management Program through regulatory proposals, special management action requests, public comment and testimony, project proposals/results and extensive discussions at Federal Subsistence Board and subsistence Regional Advisory Council meetings.

The program is mandated by the Alaska National Interest Lands Conservation Act (ANILCA). Public involvement is an important aspect of the program, most notably through the establishment of ten subsistence Regional Advisory Councils. Each Council consists of rural residents who are knowledgeable about subsistence and other uses of fish and wildlife resources in their region. The Regional Advisory Councils provide recommendations and information to the Board; review proposed regulations, projects, policies and management plans; and provide a public forum for subsistence issues.

An important element of the Federal subsistence program is fisheries research and monitoring. The Fisheries Resource Monitoring Program supports and funds projects that provide information needed for subsistence fisheries management. These projects are another avenue for public participation. The Federal Subsistence Board, Regional Advisory Councils and fishery managers use this information when considering regulatory actions. Projects funded by the program are implemented by numerous organizations, including State and Federal government agencies, universities, Alaska Native and rural organizations, and private contractors.

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Session: Subsistence Fisheries

Judicial constraints on State and Federal Subsistence regulations

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The Territorial Game Commission provided broad exemptions to their regulations in order to provide subsistence uses of fish and wildlife by Alaska Natives, miners, dog teams, and others long before Alaska's statehood in 1959. Upon statehood, the State assumed responsibility for sustainable management of all fish and wildlife except as specifically diminished by Congress, and subsistence uses continued to be provided under evolving state laws for all residents on all lands. After passage of the Alaska National Interest Lands Conservation Act (ANILCA) in 1980, the state implemented both the federal and state subsistence laws through the Alaska Boards of Fisheries and Game.

In response to a 1989 state court decision, federal administrators established a separate federal administrative program in 1990 to implement ANILCA on federal lands for rural residents and adopted the State's subsistence regulations. The state continued to provide for subsistence on all lands (federal, state, and private) by all residents except where subsistence is not authorized by federal or state law. The federal and state courts interpreted ANILCA differently through successive court decisions. The federal and state regulations continue to diverge.

Summaries of the major court decisions are provided along with their impacts on the State's management of fish and wildlife and subsistence users. Judicial constraints on federal and state administrators are explained and some of the steps being taken or considered to reduce impacts of duplicative programs on federal lands are discussed.

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Session: Subsistence Fisheries

Success in rural Alaska: meaningfully involving local communities in the management process

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The challenges of fisheries management in rural Alaska are numerous. Limited funding for projects, coupled with enforcement challenges, differences in cultures and priorities, and the basic requirement for affordable food often result in a disassociation between the management directives and the local people. However, fisheries management can be more effective if coupled with local interaction with residents, cooperative projects, and frequent communication. Encouraging villages to develop ideas into potentially fundable projects, assisting in obtaining funding, employing locally, working with local tribal governments, and returning the results to the community are essential to the process of meaningfully including rural residents in the management process. The Pikmiktalik River Salmon Enumeration Project, which operated from 2003-2007 with funding from the USFWS Office of Subsistence Management, is an example of the successful pairing of the Stebbins IRA, a local tribal government, with Kawerak, Inc., the local tribal consortium, to bring an idea spawned at the village level through the entire process of funding and implementation. This project achieved results that increased the information base for managers, and empowered the local people in the management process.

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Session: Subsistence Fisheries

Subsistence fishery harvest estimation tools used in the Yukon River management area

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The Yukon River is a subsistence managed fishery. The large geographical area of the drainage and diverse usage of fishery resources necessitate the use of multiple tools for collecting harvest information. Subsistence calendars, door-to-door household surveys, telephone surveys, postal questionnaires, and permits are combined with applied statistical analysis to produce drainage wide harvest estimates.

Challenges in management of subsistence Chinook salmon fisheries in the Yukon and Kuskokwim Rivers

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Alaska's fishery management objectives and tools are largely based on management of commercial fisheries, such as escapement goals that provide maximum sustainable yields, opening and closing of fisheries, harvest quota, etc. However, those objectives and tools are not really applicable for management of subsistence fisheries, where individual or a group of households harvest needed amount of fish along the river throughout season. In the Yukon and Kuskokwim Rivers, the amount of fish taken by subsistence fishery is so large that their harvest could significantly affect sustainability of the fisheries. Using Chinook salmon subsistence fisheries as a case study, I will illustrate challenges of subsistence fishery management in the Yukon and Kuskokwim Rivers.

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Session: Subsistence Fisheries

Improving subsistence sockeye salmon harvest estimates

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Sockeye salmon is probably Southeast Alaska's most important subsistence resource, both in volume and ubiquity. The region's rugged island geography and history of glaciation have led to the evolution of hundreds of small, isolated sockeye runs, many of which have supported the needs of people in villages and fishing camps for thousands of years. The commercial fishing industry moved into the region in the late 1800s, disrupting and profoundly changing, but never fully eliminating, traditional fisheries. The development of sport fisheries introduced another user group targeting the same resources. After Alaska statehood in 1959, state subsistence fishing regulations, and eventually a permit system, were adopted. Currently, subsistence permit holders are required to report harvests by species, location, and gear type at the end of the fishing season. Recent sockeye harvest surveys, in which fishers were interviewed for catch data on the grounds, or immediately after returning to their community, revealed that subsistence harvest is often, but not always, under-reported. For example, surveys in 2001–2006 showed sockeye harvests from Hetta Cove that varied from four times to only one-half as large as the total harvest reported post-season on returned permits. Cooperative steps to improve the accuracy of subsistence harvest estimates can be beneficial to both fisheries managers and users. For example, conclusions from recent projects have dispelled suspicions of over-harvesting in certain popular fisheries. They have also revealed some sockeye runs where harvest timing, rather than total numbers of fish, may be a problem. Accurate harvest assessments can show usage patterns and needs in subsistence fishing communities, and reveal important management differences between subsistence, sport, and commercial fisheries. They may lead to greater trust and freer exchange of information between agency biologists and community members, ultimately leading to better management and conservation of these unique salmon runs.

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Session: Subsistence Fisheries

Alaska rockfish: Subsistence harvests and local knowledge of Alaska rockfish

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This report describes the results of a study to estimate the subsistence harvest of rockfish, genus *Sebastes*, in 4 Alaskan communities: Sitka in Southeast Alaska, and Nanwalek, Port Graham, and Chenega Bay in Southcentral Alaska. This report also includes local and traditional knowledge (LTK) about rockfish from these communities. Rockfish have been used for subsistence purposes in Alaska for centuries, but changes in federal subsistence fishery regulations for Pacific halibut *Hippoglossus stenolepis* governing the use of longlines raised concerns that the incidental catch of rockfish was increasing. Data were collected through postal household surveys, key respondent interviews, and participant observation. Survey data showed that most of the incidental harvest of rockfish occurred in Southeast Alaska (federal halibut regulatory area 2C), and Southcentral Alaska (federal halibut regulatory area 3A), and a majority of this harvest took place under federal subsistence halibut fishing regulations using rod and reel. Fishers were able to describe various methods for avoiding rockfish while using longlines to catch halibut. In the Southcentral Alaska communities, more than half of the species harvested were black rockfish *S. melanops*, while in Sitka the majority were yelloweye rockfish *S. ruberrimus,* commonly known as "red snapper."

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Session: Subsistence Fisheries

Climate change and subsistence foods in Alaska

Don Bremner

Tlingit

Climate Change Impacts to Alaska Native Subsistence foods has potential for very negative impacts in rural Alaska;

State of Alaska Climate Change Commission Direction:

State Commissioners and federal agencies have been developing a comprehensive overview of the likely impacts of climate change affecting Alaska, and steps to take to mitigate that impact. They say they consider facilities and infrastructure, identify financial implications of climate change, and help our local communities with planning activities.

Our Action as Aboriginal people of Alaska:

We have assessed what is at stake in terms of land, waters, air, and natural resources being affected by climate change. We find the obvious fact that Alaska is still very rich in natural resources and they need to be protected from a conglomerate of negative impacts, which includes climate change. Climate change affects/triggers the replacement value of Native “subsistence foods” in the hundreds of millions of dollars, affects Alaska Native customary and cultural uses of “subsistence” foods, and adds to serious out-migration of rural residents to urban communities, perpetuating a cycle of negative impacts in our rural villages.

Session: North Slope

Fishery management in Alaska's arctic exclusive economic zone: What may be in store for the future?

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Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the North Pacific Fishery Management Council is authorized to conserve and manage the fishery resources of the Alaskan Exclusive Economic Zone (EEZ), including the Chukchi and Beaufort Seas. To date, no large commercial fisheries have developed in these areas, and thus the Council has not had a compelling reason to develop fishery management plans for these Arctic marine areas off Alaska. But the environment for commercial fishery development in the Alaskan Arctic may be changing, with warming trends in ocean temperatures and changes in seasonal sea ice conditions potentially favoring the development of commercial fisheries. Among several policy and management options, the Council intends to adopt a new Arctic Fishery Management Plan which will prohibit commercial fishing in the Arctic Management Area until information improves so that fishing can be conducted sustainably and with due concern to other ecosystem components. This action would clarify fishery management authority in the Alaskan Arctic and provide the Council with a vehicle for addressing future management issues in light of potential climate warming and receding seasonal ice cover and the potential long term effects from these changes on the Arctic marine ecosystem.

Session: North Slope

Beaufort Sea survey: Study overview and comparison to historical data

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During August 2008, scientists from NOAA-NMFS Alaska Fisheries Science Center, University of Alaska and University of Washington conducted the first survey of marine fishes in offshore waters of the Beaufort Sea shelf since 1976. The study was funded by the Department of the Interior's Minerals Management Service and the primary objective was to establish a baseline against which the effects of oil and gas development and climate change could be measured. The *F/V Ocean Explorer* was chartered for the survey. Benthic fish and invertebrate species composition, distribution and abundance were assessed with bottom trawls. Pelagic fish were surveyed with hydroacoustics and mid-water net tows. The distribution of zooplankton was sampled with bongo nets. Physical oceanographic data were collected with conductivity-temperature-depth instruments. Data on the distribution of seabirds and marine mammals were also collected. Fish made up 6% of the bottom trawl catch, and invertebrates made up the remaining 94%. A total of 38 species of fish were identified at sea of which 6 may represent range extensions from the Bering or Chukchi Sea. A total of 174 species of invertebrates were identified. The four most abundant fish species, in terms of biomass, were Arctic cod, eelpouts, Bering flounder and walleye pollock. The most abundant invertebrates were brittle stars, opilio crab, a mollusk (*Musculus niger*) and a seastar (*Ctenodiscus crispatus*). The pelagic community was dominated by arctic cod and jellyfish. The results of this survey will be put into the context of past surveys of the Beaufort, Chukchi and Bering Seas.

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Session: North Slope

Beaufort Sea survey: Patterns of fish and invertebrate distribution

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A survey of marine fish and invertebrates of the Beaufort Sea was completed in August 2008 by scientists from the Alaska Fisheries Science Center, the University of Washington and the University of Alaska. The study was funded by the Department of the Interior's Minerals Management Service. In addition to providing a baseline against which the effects of oil and gas development and climate change can be measured, this study provided an opportunity to examine the habitat associations of Beaufort Sea fishes and invertebrates. The survey used standardized bottom trawling gear from the Alaska Fisheries Science Center's survey division to assess the distribution of benthic species. Physical habitat characteristics measured include bottom depth, bottom type, temperature and salinity. A total of 22 successful tows were completed over 3 depth strata (20 – 50, 50 – 100, and 100 – 500 m). Arctic cod were present in all bottom trawl catches, over all depth strata. Eelpouts were the second most prevalent species of fish and made up 13% of the total catch of fish by weight. Brittlestars and opilio crab were the two most abundant invertebrate species caught. Bottom temperatures recorded during tow duration over the study area ranged from -1.4°C to 1.7°C. Fish and invertebrate distributions will be examined relative to depth strata, bottom temperatures and other habitat characteristics

Session: North Slope

Juvenile pink and chum salmon foraging conditions, growth potential, and distribution in response to the loss of arctic sea-ice

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Climate models predict the arctic to be ice-free by 2030. The loss of Arctic sea-ice will have a profound influence on Arctic ecosystems and marine resources dependent on them. Insight is provided into the potential increased utilization of the Arctic by juvenile salmon associated with the loss of sea ice by examining the foraging conditions, growth potential, and distribution of juvenile pink and chum salmon in the Chukchi Sea during the significant retreat of sea ice that occurred in 2007. Juvenile salmon were sampled in the northern Bering and Chukchi Sea as part of the United States BASIS survey with the objective of investigating implications of climate change on salmon ecology. Juvenile pink (*Oncorhynchus gorbuscha*) and chum (*O. keta*) salmon growth histories were reconstructed from scale circuli patterns, food habits were identified through diet analyses, and growth potential modeling simulations were run to quantify spatial differences in marine habitat. Large catches of juvenile pink and chum in the Chukchi Sea during early autumn 2007 reflected significant utilization of Arctic habitat and was likely in response to warm surface sea temperatures and the extensive loss of sea-ice during the summer. Growth rate was significantly higher for fish inhabiting the Chukchi Sea than those inhabiting the Bering Sea. Larval prickleback (*Lumpenus fabricii*) were heavily preyed upon in the central Chukchi Sea and zooplankton was primarily consumed in the southern Chukchi and northern Bering Sea. The Chukchi Sea is assessed through habitat-specific growth potential models in an effort to increase our understanding of how the loss of sea-ice will impact the growth and survival of salmon.

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Session: North Slope

Marine migratory life history of least cisco (*Coregonus sardinella*) in freshwater lakes of the North Slope of Alaska

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With increased resource development on the western Arctic coastal plain of laska it is important to understand basic life history attributes of fish stocks in the region in order to ensure appropriate management of resources. Whitefish dominate the fish assemblages of freshwater systems in the North Slope of Alaska. Least cisco (Coregonus sardinella) are among the most prevalent of fish in terms of biomass throughout the region. Multiple forms of least cisco have been described based on both appearance and life history traits. Two major forms have been discussed at length in the literature: a larger normal amphidromous form and a dwarf lake resident form. We investigated the migratory life history patterns for normal form least cisco in 6 freshwater lakes and one brackish lagoon on the North Slope of Alaska to verify marine migratory life-history. Using electron microprobe technology we analyzed Sr:Ca ratios in otoliths from over 250 least cisco to investigate the extent to which this form utilizes marine aters and to compare these results with those from least cisco caught in brackish waters. We examined age at first marine migration and frequency of marine excursions. A surprisingly low percentage (< 12%) of individuals captured in freshwater yielded any evidence of marine migratory behavior based on otolith analysis. Least cisco appear to be facultative in their use of marine systems.

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Overwintering patterns of anadromous Dolly Varden in northwest and arctic Alaska

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Dolly Varden are an important component of many sport-and subsistence fisheries in Alaska. Anadromous Dolly Varden rear for up to five years in freshwater before beginning a cycle of entering marine waters to feed during summer and returning to freshwater in the fall to spawn and/or overwinter. Dolly Varden home to natal streams to spawn, but may overwinter in both natal and non-natal systems. We used mixed-stock analysis to quantify contributions of Dolly Varden stocks to mixtures sampled from two critical overwintering areas: the Wulik River, draining into the Chukchi Sea, in 2003-2007; and from the Ivishak River, a tributary of the Sagavanirktok River draining into the Beaufort Sea, in 2003. Samples for our baseline were collected either from juveniles or adults in spawning condition captured from Beaufort Sea, Chukchi Sea and Norton Sound drainages. Bayesian Markov chain Monte Carlo estimates of regional stock proportions show that for the Wulik River mixtures, the majority of fish originate from Kotzebue Sound, and approximately 15-25% of fish originate from Norton Sound. However, the Ivishak River mixture fish predominantly originate from the same drainage, the Sagavanirktok River.

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Stock status monitoring of overwintering populations of Dolly Varden char *Salvelinus malma* in the Anaktuvuk, Ivishak, Canning, and Hulahula rivers: current trends and an evaluation of methods.

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Anadromous Dolly Varden Charr *Salvelinus malma* are found in most major drainages of the Beaufort Sea east of, and including, the Colville River. These fish are an important subsistence resource, and are dependant on limited freshwater overwintering habitat. Most methods of stock monitoring are prohibitively expensive. In order to evaluate aerial survey monitoring, replicate aerial surveys and a mark-recapture abundance experiment were conducted in the Ivishak River during 2001-2003. Five replicate surveys and a mark-recapture abundance experiment were conducted during September in a 28-km index section. Aerial counts were conducted by two observers from a helicopter, each observer counting one side of the channel. Aerial surveys were relatively internally precise, with standard errors for each year ranging from 2.8% to 6.7% of the mean summed count. Mean summed aerial survey counts represented between 22% and 25% of abundance as estimated by mark-recapture methods. Aerial surveys were also conducted of overwintering populations in the Anaktuvuk and Ivishak rivers during 2003, and 2006 – 2008, and in the Canning and Hulahula rivers during 2007 – 2008. The results indicate that aerial counts are a cost-effective indicator of abundance for overwintering aggregations of Dolly Varden in this and other similar systems.

Bureau of land management's recent and future fish work in the National Petroleum Reserve - Alaska

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Until recently, relatively little fish work has been conducted in the National Petroleum Reserve - Alaska (NPR-A) since the early 1980's. The surge of oil and gas activities over the last several years and the emphasis on climate change in the Arctic has accentuated the need for increased knowledge of fish populations and fish habitat within the NPR-A, which is managed by the Bureau of Land Management (BLM). Since 2004 the BLM has been involved in a variety of projects aimed at understanding and documenting fish resources in the region. This presentation will provide an overview of recently completed, ongoing, and future planned projects in the NPR-A relevant to fish that are being conducted or supported by BLM.

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Overview of fish studies supported by the North Slope borough department of wildlife management

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The North Slope Borough Department of Wildlife Management has been conducting and sponsoring fish studies within the Borough since 1988. Studies are focused on fish resources important to subsistence users. The long-term goal is to develop information to allow responsible management of these resources and maintain availability to subsistence users.

Current programs include:
1. Identifying historical subsistence use patterns through village subsistence surveys,
2. Documenting traditional ecological knowledge about fish and fish habitats based on interviews with selected elders,
3. Assessing local fisheries by identifying primary harvest locations and obtaining measures of harvest rate and biological information from harvested species,
4. Mapping drainage systems to quantify the amount of aquatic habitat available for fish production, and
5. Obtaining biological data on fish populations in the most productive regions.

Recent effort has focused on the Chipp/Ikpikpuk river system, which includes Teshekpuk Lake. This region provides a substantial harvest of broad whitefish, which is the primary target of subsistence fisheries.

Objectives of field studies have included:
a) Evaluating potential fish wintering areas,
b) Describing habitat use patterns and characteristics of fish populations in habitats associated with the Chipp/Ikpikpuk system,
c) Evaluating fish feeding patterns in different habitats,
d) Obtaining information on fish movements within the system, and
e) Comparing results to information obtained in previous studies conducted from 1988-1992 to assess potential changes.

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Session: Kuskokwim River

Kuskokwim area salmon fisheries and run assessment - Overview

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This opening presentation will provide background about the Kuskokwim River salmon fisheries and stock status, and describe elements that allowed for development of the current assessment program. The presentations that follow integrate across the many program components and provide the foundation for better understanding of population dynamics and stock composition, guiding management practices, and evaluating the impacts of change.

Kuskokwim River chum salmon run reconstruction – Missing puzzle piece

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A reliable time series of catch, spawning escapement, and age composition is essential for estimating the productivity of salmon populations as well as for the development of management plans for sustainable fisheries. While the salmon catch in the Kuskokwim River has been estimated annually since Statehood, the physical size and characteristics of the lower river, and the size and complexity of the drainage, have made it nearly impossible to obtain accurate estimates of total escapement to the system. In the early 2000's researchers from the University of Alaska developed a statistical model for the reconstruction of the historical chum salmon return for use in estimating productivity. While their method showed great promise the resulting estimates were thought to be biased low, largely because of the reliance on estimates of inriver abundance obtained from a sonar project at Bethel. In addition, the investigators had to rely on a single location in the drainage for an assessment of escapement. A great deal of effort has been directed towards expanding the quality and geographic coverage of escapement estimates in recent years, with a time series of eight years or more now being available for seven tributaries. In addition, a large scale mark-recapture study in 2002 and 2003 produced estimates of escapement for the entire drainage upstream of Kalskag. This infusion of new information suggested that the estimation of historical runs to the system should be revisited. Upon closer examination of the data, however, we found that the total abundance estimates generated in more recent years still greatly underestimate the true number of chum salmon in the Kuskokwim River and that this underestimate prevented an accurate scaling of the run reconstruction. We feel the run reconstruction methodology is well developed but still missing an accurate and precise estimate of total chum salmon abundance.

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Session: Kuskokwim River

Kuskokwim River Chinook salmon run reconstruction

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The Kuskokwim River has annual runs of adult Chinook salmon that range from 150,000 to 440,000 fish (average 250,000), based on preliminary findings of an ambitious initiative to estimate historical annual run abundance. This initiative draws on a collection of fragment historical data sets that provide some index of abundance (tributary escapement from weirs passage and aerial survey counts, commercial and subsistence harvests, and age data), coupled with findings from mark-recapture studies from recent years that provide a means to scale the abundance index. We developed a statistical model that integrates these fragments to yield estimates of annual abundance back to 1976, which will allow for investigating causes of the volatile swings in Chinook salmon abundance, as occurred beginning in 1999 and resulted in unprecedented curtailment of important subsistence and commercial fisheries. Another ambitious aspect of the project is that is integrates a wide range of collaborators including state, tribal, federal, and university representatives. Results will also allow for more informed fishery management decisions on issues such as interest in expanding the Kuskokwim River commercial fishery and the significance of marine interception of fish bound for the Kuskokwim River. In this presentation, we will describe how we compiled the fragments of historical data to develop the time series of annual Chinook salmon abundance estimates, plus we will report findings on drainage-wide distribution and stock-specific run timing through the lower river immediately upstream of where commercial and most subsistence harvest occurs.

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Session: Kuskokwim River

Kuskokwim River coho salmon run reconstruction – Progress report

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Coho salmon are the most commercially valuable salmon species returning to the Kuskokwim River. Recent fluctuations in both run abundance and commercial markets underscore the need of fishery managers to better understand the dynamics of Kuskokwim River coho salmon stocks. We are conducting a mark-recapture project, incorporating radio telemetry techniques, to estimate total abundance, spawning distribution, and stock-specific run timing of coho salmon in the Kuskokwim River drainage in 2008 and 2009. Our total abundance estimates will be used to develop a model to generate age-structured total annual run abundance estimates from 1981 to 2009 using existing harvest, test fishery, and tributary escapement data. In addition, our model will allow for estimation of total run abundance in future years using data from escapement and harvest monitoring indices. The resulting time-series of total abundance estimates may provide a context from which to better understand the effects of climatic shifts, changes in ocean productivity, effects of interception fisheries, and changes in management practices. Furthermore, our findings should help identify locations within the Kuskokwim River drainage that are of particular importance to coho salmon production and determine whether the timing of commercial fishery openings can be adjusted to target or conserve specific stocks. This presentation will cover the general methodologies used and preliminary results from the 2008 mark-recapture efforts.

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Session: Kuskokwim River

Estimation of abundance and run timing of coho salmon stocks in the lower Kuskokwim River using genetic characters

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Coho salmon are the second most abundant salmon in the Kuskokwim River watershed and provide important subsistence- and commercial harvests, making them a mainstay to the ecology and economy of the region. Coho salmon spawn in tributaries throughout the drainage, but the majority of harvest occurs in the lower Kuskokwim River. Tagging studies have demonstrated a tendency for upper Kuskokwim River spawning populations to pass through the lower Kuskokwim River early in the season with progressively later run timing for populations with less distant spawning grounds. A management concern is the potential for differential exploitation of stocks within the Kuskokwim River due to variation in run timing. Genetic variation was assayed in coho salmon sampled from 12 locations in the Kuskokwim River area; further sampling is ongoing. Genetic results to date indicate: 1) populations from Goodnews, Kanektok and Arolik Rivers are distinct from those in the Kuskokwim River; 2) populations in the upper Kuskokwim River are extremely divergent from those in the lower river; and 3) the extreme genetic divergence of upper Kuskokwim River coho salmon allow their presence to be detected in mixed-stock fisheries in the lower Kuskokwim River and Kuskokwim Bay. Test fishery and commercial catches will be sampled in 2008-2010 to estimate the run timing and relative abundance of coho salmon stocks to further evaluate concerns regarding disproportionate exploitation rates.

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Session: Kuskokwim River

Continued investigations of genetic diversity in Kuskokwim River Chinook salmon.

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The subsistence fishery for Chinook salmon in the Kuskokwim Management Area is one of the largest and most significant in Alaska. Sustained productivity of salmon relies on maintenance of genetic diversity through informed management of the resource. A previous study of the genetic diversity of Chinook salmon from the Kuskokwim River investigated two types of genetic markers, allozymes and microsatellites, assayed in 14 populations from within the Kuskokwim River and the Goodnews and Kanektok rivers. We continued this investigation by increasing the number of collections in the baseline and analyzing this baseline with 13 additional microsatellite markers and 44 single nucleotide polymorphisms (SNP's). Comparisons were made between the original and new microsatellite data, and between the new microsatellites and SNP's. The three marker types were found to show a similar population structure. The addition of new populations and additional samples to existing populations created a more refined view of population structure when compared to the previous baseline. Finally, we explored the utility of using this updated baseline for Genetic Stock Identification of mixed fishery samples.

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Session: Mining in and Fisheries in Alaska

The Current state of mines and exploration in the State of Alaska

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Alaska has an active exploration and mining community currently buoyed by higher-than-average commodity prices and a favorable investment market. There are six operating large mines in Alaska (Red Dog, Rock Creek, Fort Knox, Pogo, Usibelli, and Greens Creek with one other in development (Kensington). There are also a number of advanced stage projects that are in or approaching the permitting stage or conducting large scale exploration programs (Chuitna Coal, Kassan Iron, Donlin Creek, Lucky Shot, Pebble). In 2008 the State issued approximately 393 permits for placer mining operations of all types and 86 permits for hard rock exploration. Activities are concentrated on lands owned or selected by the state of Alaska but are spread rather evenly in a geographic sense. As of the fall 2008 approximately 49,000 state mining claims totaling 4.6 million acres were on file; federal claims in Alaska total 11,500 encompassing 230,000 acres. A number of metrics show that activities are at or near all-time highs. State revenue from claims and leases in 2008 is $4.9 million; in 2006 these same revenues were $3.7 million. Exploration expenditures in 2007 totaled $319 million and mining related employment for the year was 3,247 jobs. The average annual mining industry salary is $80,000. Mining primarily benefits rural and smaller communities in Alaska at a time when life in rural communities is increasingly difficult. State and Municipal Revenues from mining operations in 2007 retreated from the record highs of the previous year but exceeded $142 million. The mining industry is the major taxpayer in the Northwest Arctic, Fairbanks North Star, and Denali boroughs as well as the City and Borough of Juneau.

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Designing for mine closure

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An overview of the reclamation and closure requirements for modern hard rock mines in Alaska and the compelling need to design for closure. From the initial project assessment to the more detailed environmental baseline studies, modern mines use this information to establish baseline conditions, complete studies required for engineering and permitting efforts, and evaluate hydrologic conditions from exploration to development, operation, and closure. A comprehensive understanding of water quality, quantity, and mine site material characterizations are essential to mine facilities and process component design for operations and closure.
This presentation will also review examples of Alaska operations that have been reclaimed or have designed for closure maximizing opportunities for terrestrial and aquatic habitat enhancement.

The process for permitting mine projects in Alaska

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Large hardrock mining projects have the potential for significant environmental impacts. Negative water quality impacts due to metal leaching ± acidic rock drainage (ML/ARD) are a particular concern and must be addressed during mine design and permitting. The State of Alaska employs an interagency team of technical professionals to evaluate mining development proposals. There is no single "permit to mine" but, rather, a project specific array of state and federal permits and authorizations that may total 50 or more. The permitting process for large mining projects that require major federal actions is largely controlled by the federal National Environmental Policy Act (NEPA) process for Environmental Impact Statements (EIS). NEPA requires the performance of baseline studies, specifies a sequence of steps to be followed, and includes multiple requirements for public notice and comment. The State works to coordinate its review, permitting, and public notice/comment requirements with the NEPA process to eliminate unnecessary duplication of effort and to facilitate public understanding and ability to comment. Mining projects must "design for closure", have an approved reclamation plan, and post financial assurances for reclamation, monitoring, and care/maintenance. Environmental Audits by 3rd party environmental firms that assess both operator and regulatory agency performance and review financial assurances are conducted every 5 years (or sooner) as a condition for the required renewal of major permits.

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NPDES permitting for mines in Alaska – EPA's role

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EPA currently issues permits for wastewater discharges from mines in Alaska. How water quality and other regulatory requirements affect permitting will be presented. The application that the State of Alaska has submitted to administer the program will be briefly discussed.

Alaska mixing zone regulations

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A mixing zone is a limited area in a waterbody where a permitted wastewater discharge can exceed water quality criteria. They have been used in all states, including Alaska since the 1970s. After public review and comment, in 2006, Alaska adopted revised mixing zone regulations. The Clean Water Act requires EPA to approve state water quality standards prior to their use in NPDES permits. The mixing zone revisions are under review by EPA, a process that typically takes several years. DEC is developing implementation guidance to describe how the new regulations will be carried out. Prior to the 2006 regulations, mixing zones were prohibited in fresh water spawning areas for all anadromous fish (including lampreys and smelt) and 14 specifically listed fish. The new regulations still ban mixing zones in all spawning areas of anadromous Pacific salmon except for permit renewals where salmon were not spawning prior to the initial authorization. The new regulations also retain the prohibition on mixing zones in spawning areas of 14 specifically listed fish. However, for these species, the new regulations allow limited exceptions to the prohibition: 1) for permit renewal where spawning was not occurring at the time of initial authorization; 2) where the substances discharged do not exceed criteria for protection of aquatic life; and 3) when a mitigation plan has been approved. The new regulations require the involvement of ADF&G to delineate the location and time of spawning areas and in the review and approval of mitigation plans. The mitigation policy and procedures are similar to those used by ADF&G to develop fish passage permits for other projects and include a hierarchy of steps: avoid, minimize, rectify, restore, and compensate. Each step must be exhausted before moving on to the next step so compensatory mitigation will be rare.

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Aquatic biomonitoring at the Red Dog mine

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The Red Dog Mine in northwest Alaska is the largest zinc mine in the world, producing more than one million tons of zinc and lead concentrates annually. In 1991, the Habitat Division of the Alaska Department of Fish and Game (ADF&G) initiated annual biomonitoring research on water quality, fish, aquatic invertebrates, and periphyton in streams downstream of and adjacent to the mine as required by the National Pollution Discharge Elimination System (NPDES) permit issued by the Environmental Protection Agency. In recent years, concerns have been raised over fugitive dust from trucks carrying ore from the mine to the port facility on the Chukchi Sea 52 miles away. Results from the 2007 biomonitoring research including measurements of aquatic metals concentrations, algal biomass, and aquatic invertebrate densities as well as juvenile and adult fish sampling will be discussed, as well as comparisons with results of similar measurements from previous years. Finally, the general proficiency of the current Red Dog effluent discharge and fugitive dust containment operations will be summarized.

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Response of salmonids to total dissolved solids in a simulated mine effluent

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In response to a potential revision by the state of Alaska of discharge limits for total dissolved solids (TDS) in the mining industry, we studied various life stages of salmonids exposed to the major ions in a simulated mine effluent at concentrations of salts up to 2500 mg/L. Effects depended on the developmental stage and the exposure period. For short term (24- to 96-h) exposures the fertilization stage was most sensitive. Fertilization was reduced with salts as low as 250 mg/L. A two minute exposure to elevated salts during fertilization was long enough to have deleterious effects on both fertilization and later development. Embryos exposed to the simulated mine effluent continuously from just after fertilization through to swim-up had high post-hatch mortalities. Thus, there may be at least two separate mechanisms of toxicity: an acute response at the moment of fertilization and a response to long-term exposure through swim-up, manifested at the alevin stage. Sensitivity to dissolved salts at fertilization differed among different species of salmonids. Chinook, pink, and coho salmon were most sensitive, and Arctic char were least sensitive to elevated salts. Specific ion tests indicated that calcium was a major contributor to decreased fertilization. We suggest that salmonid fertilization trials may be an appropriate, relatively quick, assay for setting site specific TDS contamination discharge limits.

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Impacts of copper on the sensory biology and behavior of salmon

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In the western United States, exposure to pollutants such as copper is an emerging concern for many populations of threatened and endangered Pacific salmon (*Oncorhynchus* spp.) that spawn and rear in coastal watersheds and estuaries. Because dissolved copper is neurotoxic to fish, the potential for copper to disrupt behaviors that are critical for the survival, migration, or reproduction of individual animals is an important consideration for the conservation and recovery of wild salmon populations. This presentation will cover several years of NOAA research on copper, with a specific emphasis on sensory physiology and behavior. Sensory neurons in the olfactory and lateral line systems are in direct contact with dissolved-phase contaminants, and are therefore particularly vulnerable to the toxic effects of copper. Copper interferes with the normal responsiveness of sensory neurons to environmental stimuli. At higher concentrations, copper causes sensory neuron cell death. These toxic effects occur rapidly (minutes to a few hours) and at relatively low exposure concentrations (very low parts per billion). Sensory neurotoxicity therefore has the effect of isolating salmon from ecologically important signals in the aquatic environment. For example, juvenile salmon exposed to copper fail to respond to chemical predation cues. These behavioral effects, in turn, lead to higher rates of mortality when salmon encounter predators. Copper contamination can therefore have subtle but important influences on biological processes that shape the fitness of individual salmon and, by extension, the intrinsic productivity of wild populations.

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Predicted versus actual water quality at Hardrock mine sites: failure modes and root causes of water quality impacts

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This study reviews the history and accuracy of water quality predictions in Environmental Impact Statements (EISs) for major hardrock mines in the United States. It does so by: identifying major hardrock metals mines in the United States and determining which major mines had EISs; gathering and evaluating water quality prediction information from EISs; selecting a representative subset of mines with EISs for in-depth study; examining actual water quality information for those mines; and, comparing actual water quality to the predictions made in EISs. An analysis was conducted to determine if there were inherent risk factors at mines that may predispose an operation to having water quality problems. Findings showed that mines with close proximity to surface water or groundwater resources and with a moderate to high acid drainage or contaminant leaching potential have an increased risk of impacting water quality. These combined factors at a mine appear to be a good indicator of future adverse water quality impacts. Mines in this category must rely on well executed mitigation measures to ensure the integrity of water resources during and after mining and are also the most likely to require perpetual treatment to guarantee acceptable water quality. An analysis was also performed to identify the most common causes of water quality impacts and prediction failures. Geochemical, hydrologic and mitigations failures are shown to be the most common underlying causes of predictions failures.

The following recommendations are made that would improve the reliability of water quality predictions at hardrock mine sites:

- A more systematic and complete effort should be undertaken when collecting data
- Recognize the importance of thorough hydrological and geochemical characterization
- Utilize information in a conservative manner to identify and utilize mitigation measures
- Consider the likelihood and consequences of mitigation failures

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Uncertainties associated with predicting the quality of mine influenced water—Laboratory methods and chemical weathering of soil and rock in mining environments

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The chemical characteristics of post-mining water quality are difficult to predict. Complex geochemical reactions occurring in mining environments are influenced by many physical, chemical and biological processes. Inaccuracies in laboratory methods used to characterize the risk of acidic drainage formation have been documented. These interpretations may lead to long-term releases of metals and acidity to surface water. Of particular concern is the relative abundance of acid-producing and neutralizing minerals found in tailings, overburden, waste rock and mine soils. Laboratory data were collected using pure mineral specimens to assess the reliability of standard methodologies for identifying and quantifying acid-forming minerals. Standard acid-base account protocols were shown to provide a useful index, but only when linked with the site-specific mineralogy.

Acid Mine Drainage – how it starts, physical and chemical impacts to fisheries, and challenges or remediation

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Acid mine drainage (AMD) is generated when sulfidic rock is exposed to oxygen and water. In this microbially catalyzed weathering process, metal sulfide ores are converted to sulfate, acid, and dissolved metals. Weathering of tailings, waste rock heaps, open pits, and underground mine workings may release significant concentrations of acid and dissolved metals into watersheds, resulting in negative impacts to aquatic and sediment-based flora and fauna. This presentation will discuss AMD impacts in general, and provide some specific examples. A brief introduction to how remediation is achieved, and the challenges that present, will also be included.

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Geologic risks and the Pebble mine

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The proposed Pebble mine is large porphyry copper-molybdenum-gold deposit located north of Illiamna Lake in the Bristol Bay region. There are similar copper deposits in North America, but none with similar hydrogeology and meteorological regimes. Environmental concerns for development of the Pebble deposit center around several major issues – geochemistry of the ore and waste to be mined; the hydrology of the mine area; and, the long term risks posed by the need to store billions of tons of potentially reactive waste in perpetuity.

This talk will address: mining methods likely to be employed – open pit mining and underground block caving; geochemistry of the ore and waste and its similarity to that at other porphyry copper mines; the known hydrology of the Pebble area and its potential environmental implications for both waste storage and fish; and, tailings dams and potential long term risks posed by these structures and the waste they impound.

Chuitna coal mine – Potential water quality and fish habitat impacts

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This presentation will focus on potential water quality and fish habitat impacts stemming from the proposed Chuitna coal strip mine, 45 miles west of Anchorage, near the communities of Beluga and Tyonek, along the shores of Cook Inlet. This large-scale development would include a large surface coal strip mine, a 12–mile long partially enclosed coal conveyance system, airstrip, associated worker housing, a 500,000 ton coal storage facility and a two-mile long trestle/dock extending into Cook Inlet to accommodate coal ships. The first phase of the proposed mine would utilize over 5000 acres of land and produce about 12 million metric tons of coal per year. If fully developed, the mine would strip up to a billion metric tons of coal from roughly 30 square miles over the next 25-50 years. Permit applications show the developer would discharge an average of 7 million gallons per day of mine runoff and draw-down water into the Chuitna River, a relatively low flow system that supports all five species of wild Pacific salmon. This project would mine directly through 11 miles of active salmon habitat, and represents the first time in Alaska where permits could be issued for mining salmon streams.

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Session: Mining in and Fisheries in Alaska

Indirect impacts of mining on fish and fish habitat

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Direct impacts from mining development are often predictable but indirect impacts are less predictable and easily overlooked. Infrastructure developments to support mining can lead to substantial indirect impacts on fish. Road construction and stream crossings can disrupt fish migrations, and affect habitat through increased runoff, and potential creation of acid drainage. Improved access leads to increased human activities, such as increased fishing pressure, commercial and private development, and more roads. Ore products must be transported off site, often with spillage. Large mines require large amounts of energy often produced offsite thereby requiring transmission line installation with support roads and stream crossings. One mine can stimulate more prospecting efforts and possibly more mining.

In the case of the Pebble Mine Project, a 104-mile access road will be constructed and maintained from the mine site to a deep-water port in Cook Inlet. The road may require as many as 120 stream crossings and culverts will likely be used for most crossings. Various studies have found that up to 85 per cent of culverts were inadequate for fish passage. The road corridor proposed for Pebble will also serve as a corridor for an ore slurry pipeline and a waterline to return recycled water to the mine site. Electrical power will be produced off site and an electrical power transmission line will be installed. Extensive areas of the Bristol Bay drainage are staked for mining and the indirect effects of the road and transport corridors on fish and fish habitat should be considered in the assessment of cumulative impacts.

Mining policy and the American Fisheries Society

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The Western Division of the American Fisheries Society has addressed the problems of mining in the West several times in its history. The last policy was written in 1993 and is currently being updated for future ratification at the Western Division and Parent Society level.

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Session: Salmon Size

Age consistency study of Yukon River Chinook salmon

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During the years that the Alaska Department of Fish and Game (ADF&G) has collected scales from Yukon River Chinook salmon *Oncorhynchus tshawytscha,* many different readers have interpreted scale growth patterns and assigned ages. Appropriate age estimation is an inherent assumption of historical age-trend analysis. Recent studies have suggested a decline in the proportion of older-aged Chinook salmon. The objective of this study was to assess temporal consistency from 1964-2006 by ADF&G in estimating Chinook salmon ages. Scale impressions representing over 7,000 fish were aged by three independent readers and compared with the original age estimates by ADF&G. Results suggest that ADF&G has consistently aged Chinook salmon over the past 43 years. No significant differences were found in age composition. In general, the differences in age estimates were negligible and agreement was high. Age-specific differences and agreement were temporally consistent. Differences were identified in age-2 freshwater and age-5 saltwater estimates. These ages are most frequent in older-aged Chinook salmon from the Yukon River.

Potential factors contributing to a shift in the dominant age class and reduction of size at age in Copper River Chinook salmon (*Oncorhynchus tshawytscha*)

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At the 2005 Alaska Board of Fish meeting upper Copper River subsistence users commented that Chinook salmon in the area seemed to be getting smaller. The Alaska Department of Fish and Game examined size and age data for Chinook salmon as a result of these comments. This review determined that the predominant Chinook salmon age class abruptly changed from 1.4 to 1.3 in 1995. Additionally, size at age appears to be decreasing in both age classes for the 22 year data set. Many factors may contribute to this change in predominant age class and reduction in size. The Copper River has had a commercial and subsistence fishery for over 100 years. Factors influencing predominant age class and reduction in size may include selective harvest, ocean conditions, climate change, and competition from increasing aquaculture production.

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Session: Salmon Size

Variation in age and size at maturity among Lake Clark sockeye salmon spawning populations

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Age and size-at-maturity are key life history traits in sockeye salmon (Oncorhynchus nerka) that often reflect adaptations to spawning environment. For example, both traits have been shown to be greater for river spawning versus beach spawning sockeye salmon. We examined sockeye salmon in Lake Clark at nine spawning locations from 2002-2005 to test the hypothesis that age and length-at-maturity are greater for tributary spawning versus beach spawning populations. Our results revealed significant variation in age composition and length-at-maturity among sockeye salmon spawning locations, but not among spawning habitat types, or when data were examined by individual study year. However, interannual variation in age composition and size-at-maturity (which may reflect the cyclic pattern of returning populations or variation in growth or recruitment) confounded comparisons. Although evidence of local adaptation in other heritable phenotypic traits, such as body depth and egg size, has been found among beach and tributary spawners in Lake Clark, similar patterns did not exist for age and size-at-maturity in this lake system. These findings highlight the need for long-term studies quantifying life history traits important to reproductive success of sockeye salmon in this system.

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Session: Salmon Size

An investigation of the effects of selective exploitation on the demography and productivity of Yukon River Chinook salmon

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The Yukon River summer-season gill net fishery targets Chinook salmon (*Oncorhynchus tshawytscha*) with large-mesh gill nets. Recent reductions in apparent productivity and perceptions of reduced size and earlier age-at-maturation have elevated concerns regarding the potential consequences of the selective exploitation of large fish. Exploratory analyses of existing data may be largely uninformative with respect to these concerns due to the lack of pre-fishery data to provide a baseline, the short time series of available data, biased samples obtained via selective gear, and high levels of natural variation. In addition, retrospective analyses of observational data are insufficient to ascribe cause. For these reasons, we investigated the long-term effects of large-mesh gill net fisheries on Chinook salmon by stochastic simulation. We constructed an individual-based model integrating population dynamics and the heritability of traits, using information from Yukon River Chinook salmon to parameterize the model, and simulated the effects of selective exploitation under a variety of productivity and harvest scenarios. In all cases considered, selective exploitation altered population productivity and demography. In most cases, the mean size and age-at-maturation declined rapidly for approximately 50 years and stabilized at reduced levels after approximately 100 years. In these cases, subsequent adoption of gill nets with moderately reduced mesh size was not effective in reversing prior declines in mean size and age unless exploitation rates were also reduced. Our results suggest that selective exploitation of large Chinook salmon is likely to cause reductions in fish size and maturation age, and to impair population productivity. The effectiveness of management efforts to reverse the effects of prior selective exploitation was enhanced by simultaneously reducing both exploitation rates and the selection for large individuals.

Session: Escapement

Ratcheting down escapements: more realistic goals, marine derived nutrient effects, or artifact of the analysis procedure?

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The Alaska Department of Fish and Game, together with the Alaska Board of Fisheries, adopted the Sustainable Salmon Fisheries Policy and the Escapement Goal Policy in 2000, which standardized terms, formalized the escapement goal process, and mandated a review of salmon escapement goals every three years. Because escapement goals were not consistently published prior to the new policies, it is very hard to track trends in the goals from the 1980s and 1990s. However, after reviewing sockeye salmon goals in Southeast Alaska in 2006, we noted that all previous changes to sockeye goals we could document were changes that lowered goals. This led us to consider whether the lowering of stock productivity was a result of the loss of marine-derived nutrients (MDN) from returning adult salmon, a correction to more realistic goals over time, or something else. We concluded there is an obvious bias in the application of the Ricker estimation procedure as it's applied in Alaska, favoring lower goals, and this possible statistical artifact is confounded with the MDN productivity hypothesis. MDN have been shown to increase freshwater productivity, particularly in nutrient-poor systems characteristic of Southeast Alaska, and a continual lowering of escapement goals and escapements may be ratcheting down nutrient loading in fresh water. If so, nutrient deficits could be widening over time as escapements move downward, leading to long-term freshwater productivity declines.

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Session: Escapement

Escapement goal management and the elephant in the pool

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In Alaska, commercial salmon fishery management, since the low returns in the 1960s and 1970s, has incorporated two main features – an effort to rebuild and manage for escapements and an ocean ranching hatchery program. These programs are neither independent nor complimentary. Spawner-recruit data is justifiably needed and used to estimate the status and escapement goal ranges for wild salmon stocks. Thanks to wise investments in programs to estimate escapements and harvests by stock and age useable spawner-recruit data is now available for many stocks. I evaluate the practical use, and potential misuse, of spawner-recruit-based estimates of escapement goals using examples from several stocks. I caution that spawner-recruit relationships can be compromised by hatchery releases. Each hatchery fish released increases competition, decreases growth, increases predation, decreases survival, increases straying, decreases fitness, increases harvest pressure, and decreases management precision on wild fish. I conclude that the production of wild and hatchery salmon is ultimately dependent on the carrying capacity of shared freshwater and marine habitats and that we are best able to seed available rearing habitat by maintaining the natural distribution and abundance of wild stock escapements.

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Session: Escapement

Problems and solutions in escapement goal management of upper Cook Inlet salmon fisheries

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Alaska's escapement-based management system has produced the largest and most valuable wild salmon fishery the in world. However, no management system designed by humans and implemented by the government can be presumed to be without it's imperfections. This presentation critically examines three limitations of escapement-based management including: 1) unpredictability introduced by normal environmental variation, 2) inaccurate escapement goals due to unrepresentative or non-stationary stock-recruitment data, and 3) fishery impacts on mixed stocks or substocks of differing productivity. Potential remedies include: a) increased use of risk-based analysis of fishery strategies that explicitly consider normal variability in salmon dynamics, b) precautionary application of escapement goals when based on limited information, and c) management safety factors to protect species and stock diversity. Issues are illustrated with examples from current Upper Cook Inlet fishery management.

Marine-derived nutrients from salmon: management implications

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From their ocean growth, salmon may import a significant fraction of the nutrients available in their freshwater habitat. These nutrients might have important effects on the productivity of the salmon stock, as well as on other ecosystem components. Using simulation modeling, I examine the following questions: How does dependence of stock productivity on imported nutrients affect MSY, optimal harvest rates, and optimal escapement goals?
Can the effects of nutrients on stock productivity be detected? Which naive management strategies are most robust to potential effects of nutrients?

Session: Escapement

Application of life-history simulation model for understanding of fish, fishery, and fishery management

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The biggest challenges in fisheries management is that fishery must be managed in the lack of complete understanding/data/methods about fish life-history. While various techniques have been proposed in setting escapement goals, we really do not know if the goals are correct and sustainable. Actual fishery management decisions are more complex, dealing with unexpected natural events, uncertainties, insufficient data, needs for fisheries demands. Moreover, understanding of fisheries management decisions are based on past performances, while future is uncertain. Hence, hindsight is always 20/20. How do we deal with those uncertainties?

One approach is to completely change the perspective, and ask question "Suppose we know everything about factors influencing salmon life-history, can we manage its fisheries correctly?" Salmon life-history simulation model incorporates salmon life-history events from egg to returning adults, in which salmon return is influenced by spawning habitat and ocean conditions, marine derived nutrients, and harvests. The model outputs realistic data, such as harvest, escapement, age composition, etc, from which the user can evaluate influence of life-history factors on run size or escapement goal. The user can also evaluate how fishery management decisions affect future returns. The simulation model can interacts with the user more realistic manner. For instance, the can interactively let the user to evaluate and modify escapement goal every 5 years and see consequence of the action and re-evaluate for next 5 years.

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Session: Contributed Papers

Genetic analysis of Alaskan Pacific halibut (*Hippoglossus stenolepis*)

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Pacific halibut (*Hippoglossus stenolepis*) collected offshore of the Aleutian Islands, Bering Sea and Gulf of Alaska were used to test the hypothesis of genetic panmixia for this species in Alaskan marine waters. Nine microsatellite loci and sequence data from the mitochondrial (mtDNA) control region were analyzed. Eighteen unique mtDNA haplotypes were identified with no evidence of geographic population structure. Significant microsatellite heterogeneity was detected between Aleutian Island halibut and fish from the other two regions (F_{ST} range = 0.007 – 0.008). Significant F_{ST} values represent the first genetic evidence of locally adapted groups of halibut in the western Aleutian Archipelago. Previous studies have reported Aleutian oceanographic conditions in deep canyons leading to an ecological discontinuity and unique population structure for several marine species. Unique Aleutian Pacific halibut genetic structure may result from oceanographic mechanisms acting as dispersal barriers reducing gene flow with halibut from other Alaskan waters.

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Session: Contributed Papers

Winter habitat use and seasonal movements of juvenile coho salmon and Dolly Varden marked with visual implant elastomer (VIE) tags in a tributary of the Chuitna River, western Cook inlet region, Alaska.

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Cold weather, ice cover on streams, and deep snow make winter fish research in Alaska challenging during a period critical to fish survival. Consequently, winter fish habitat information for Alaska is limited and much of what we know is derived from research conducted in the Pacific Northwest Region of the United States and Canada. To gather more Alaska-specific data on winter habitat use by juvenile coho salmon and Dolly Varden, a mark and recapture study was undertaken on a 2nd order tributary of the Chuitna River, in Alaska, from October, 2007 to May, 2008. Visual implant elastomer (V.I.E.) was used to tag 2,032 fish (1,097 juvenile coho salmon and 125 Dolly Varden) captured at 8 randomly selected sites. Tagged fish were recaptured during every sampling month with the highest number of recaptures occurring in January, 2008 (n=32) and the lowest in the months of March (n=2), and May, 2008 (n=2). Overall juvenile coho salmon CPUE decreased over time with significantly fewer fish captured in April and May as compared to January. Most fish were recaptured in large channel habitat (n=47), followed by small channel habitat (n=34), and beaver ponds (n=7). Overall CPUE was higher in large channel habitat but with weak significance (p=.05097). The majority of fish (81% of the total recaptures) were recaptured at their original VIE marking site (n=71). Upon recapture 4 out of a total of 6 Dolly Varden (66%) had moved at least 200 m from their original marking location. In comparison, only 13 out of 82 (or 16%) of recaptured juvenile coho salmon had moved at least 200 m from their original tagging locations. Among recaptured fish that moved, upstream movement (n=8) was nearly as common as downstream movement (n=9). Movement direction by species was 100% downstream for Dolly Varden and 38% downstream for juvenile coho salmon. However, a test for significance (α=.05) revealed that the average upstream and downstream movement of both Dolly Varden and juvenile coho salmon was not significantly different than zero. Juvenile coho salmon were observed wintering in large channel habitat and relied less on beaver dammed pools than has been documented in other studies conducted in more southerly portions of their range.

Session: Contributed Papers

Testing the optimal stability hypothesis in the Gulf of Alaska

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Gargett's optimal stability window hypothesis states that atmospheric circulation fluctuations between strong and weak phases of the Aleutian Low pressure system produce in-phase changes in coastal water column stability that affect production of phytoplankton and zooplankton. In northern regions (the Gulf of Alaska), macronutrients are not limited but primary production is limited through low-light levels during part of the year. Therefore, high latitude areas are at the lower end of the optimal stability window and salmon survival is likely to be favored if water column stabilities increase everywhere. Gargett's hypothesis was tested in two parts. First, I tested the relationship between condition index (or the growth exponent) of pink salmon (*Oncorhynchus gorbuscha*) in the central Gulf of Alaska and their subsequent survival using robust linear regressions and correlation tests. Second, I tested for an effect of water column stability on pink salmon condition (or growth) by modeling the condition indices (or the growth exponent) of pink salmon as a function of sampling location, watermass, hatchery of origin, sampling year, pink salmon catch-per-unit-effort (CPUE), and water column stability (both as a linear and as a curvi-linear relationship). Best models were chosen by the Akaike Information Criterion (AIC) and parsimony.

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Session: Contributed Papers

Ecological linkages between fishless headwaters and downstream fish communities

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Downstream transport of nutrients, detritus and aquatic invertebrates by headwater streams can vary widely at the landscape scale with potential consequences for fish and other consumers. We used observations and experiments to determine whether the quantity of drifting invertebrates originating from fishless headwaters can affect fish populations downstream. Specifically, we tested whether variability in prey transport from headwaters, associated with timber harvesting of upland forests and geoclimatic regional classification, affects fish downstream. Sixteen streams were studied in the Wenatchee River sub-basin, Cascade Range, Washington, whose catchments fell into one of four climate and land use combinations. We measured the density and biomass of drifting invertebrates entering fish-bearing reaches from fishless headwaters, along with fish abundance and biomass associated with those estimates of drifting prey during two field seasons, 2006 and 2007. We also measured growth of individual fish over a 6-wk period in these same reaches. We then manipulated invertebrate drift (blocked, supplemented, or control) from headwaters and measured subsequent downstream fish responses (movement, growth, abundance and biomass). There was no correlation between invertebrate drift density and fish biomass or growth in 2006. Drift manipulations showed higher fish growth in habitats receiving more headwater prey in 2006, but not in 2007, possibly due to low recapture success in 2007. Clarifying whether there are important trophic linkages between fishless headwaters and fish downstream will provide insight into how management of headwater forests and streams affects broader riverine ecosystem productivity.

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Session: Contributed Papers

Developing tools for monitoring marine-derived nutrients in Alaska watersheds

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Marine-derived nutrients (MDN), delivered to streams by spawning Pacific salmon, are an ecologically important flux that contributes to the productivity of stream and riparian ecosystems. Optimizing methods for measuring MDN assimilation in stream foodwebs and understanding controls on temporal and spatial variation in MDN assimilation will foster the development of ecologically-based watershed management strategies. Our main objectives were (1) to understand the factors that influence stable isotope and fatty acid measures of MDN assimilation in stream-resident and riparian biota and (2) to examine the ability of these measures to differentiate among sites that vary in the biomass of spawning salmon. We sampled biota spring through fall in each of three regions on the Kenai Peninsula. Within each region we sampled three streams (two with salmon and one without) along a three-site gradient from headwaters to river mouth. We used AIC_c model selection to develop multiple linear regression models expressing C, N, and S stable isotope ratios and fatty acids (ω3:ω6 and multivariate distance from salmon flesh) as a function of spawning salmon abundance and selected covariates. Candidate models expressed spawning salmon abundance in terms of either local spawner density (LSD) or cumulative upstream spawner biomass (USB) to determine which parameter was the better predictor. LSD, region, and Dolly Varden length were the best predictors of MDN assimilation in Dolly Varden. LSD or USB plus season and region were the best predictors of MDN assimilation in macroinvertebrates and *Equisetum*. While confirming the importance of spawner abundance, these results indicate that MDN signals are maintained year-round in Dolly Varden but not in macroinvertebrates and *Equisetum*, that inference must be made on a region-by-region basis, and that larger Dolly Varden assimilate proportionately more MDN. Dolly Varden $\delta^{15}N$ had the most precise relationship with spawner abundance, making this the best indicator of MDN assimilation.

Session: Contributed Papers

Yukon River Drainage Fisheries Association and Alaska Department of Fish and Game internship, 2008

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Salmon are an important source of food and income for many communities in rural Alaska. Due to the large number of people that rely on Alaska Salmon stocks, effective management that addresses both stock structure and stock proportions is essential. Genetic Stock Identification is an effective tool for this kind of management. The Alaska Department of Fish and Game's Gene Conservation Laboratory specializes in DNA based techniques for fishery genetics applications. During my internship I gained experience with the methods of analyzing fishery samples with both microsatellites and single nucleotide polymorphisms (SNP's). While my internship focused on the Yukon River, these techniques are used by the Gene Conservation Laboratory in a variety of fisheries, and they help biologists to make educated management decisions all over Alaska

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Session: Contributed Papers

Hatchery chum salmon straying into southeast Alaska streams

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Hatchery production of chum salmon in Southeast Alaska increased dramatically over the last three decades, from 8.7 million fry released at eight locations in 1980, to 458 million fry released at 22 locations in 2007. Alaska's Sustainable Salmon Fisheries Policy states that "wild salmon stocks and fisheries on those stocks should be protected from adverse impacts from artificial propagation and enhancement efforts (5 AAC 39.222)." High rates of straying would make it difficult for fisheries managers to monitor chum salmon populations through standard survey techniques, and greatly reduce the department's ability to formulate meaningful escapement goals and test whether those goals are being met for wild chum populations as required by the Sustainable Salmon Fisheries Policy. From 1995 to 2002, ADF&G collected otolith samples from 15 summer chum salmon streams near Juneau, in northern Southeast Alaska. Although many of the samples were small and not representative of run-timing within each system, they indicated that a significant number of hatchery strays were present in the summer chum salmon systems that were examined. In 2006, we collected otolith samples from chum salmon carcasses at Traitors Creek, located in the next bay south of Neets Bay hatchery in southern southeast Alaska, and found that 87% of the 192 sampled fish were hatchery strays. Traitors Creek was historically an important producer of wild chum salmon (e.g., chum escapement of 32,000 in 1962). In 2007, we collected 148 otolith samples from chum salmon carcasses at Fish Creek, near Hyder, Alaska, 180 km away from the nearest hatchery release site in Nakat Inlet, and found no otolith marked fish. In 2008, we initiated a project to determine the overall extent of hatchery chum salmon straying in Southeast Alaska. We collected samples from streams in the Ketchikan and Sitka management areas, and from Tenakee Inlet in the Juneau management area
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Session: Contributed Papers

The detected straying of hatchery-produced Chinook salmon was strongly related to release site in Southeast Alaska

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To protect wild Chinook stocks from unwanted hatchery effects, especially the loss of adaptive genetic variation, forward looking fishery managers in Southeast Alaska developed a series of policy statements in the 1980s to discourage, but not prohibit, hatchery stocking in areas with wild Chinook populations. As a formal part of that policy, Southeast Alaska was divided into two zones, the sensitive zone being the one with wild-stock production and the non-sensitive zone being the one without. There have been nearly 2,000 code-wire tag releases of Chinook salmon in Southeast Alaska, which provided an opportunity to observe straying from identifiable hatchery release groups. We attempted to model detected straying of coded-wire tagged fish as a function of the size of the cohort, the remote release distance from the rearing hatchery, the zone, and the hatchery release site as a means to test some of the original assumptions used in the stocking policy. We found that there had been many more remote releases in the sensitive zone than the non-sensitive zone since the policy was adopted in 1983. The release distance from the hatchery was strongly associated with detected straying. Additionally, fish released into the non-sensitive zone had a greater tendency to stray—or more precisely, to be detected as straying. We noted high levels of detected straying into two wild Chinook salmon systems within the sensitive zone. Overall, these results provide additional support for those individuals arguing for caution when permitting long-distance Chinook salmon releases. These results are consistent with earlier conclusions that transplantation disrupts homing in Chinook salmon.

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Session: Contributed Papers

Outbreeding depression and the inheritance of traits in coho salmon (*Oncorhynchus kisutch*): an analysis of second-generation hybrids of three geographically distinct Southeast Alaska populations

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Pacific salmon (*Oncorhynchus spp.*) home to natal streams, which promotes reproductive isolation and allows diversifying selective pressures to act on distinct populations. Each population may adapt to varying environmental conditions with adaptations possibly resulting from both additive and non-additive genetic effects. Hybridization may break down these adaptations, which in turn may cause losses of fitness known as outbreeding depression. Such losses in fitness and the genetic mechanisms that underlie the losses are the focus of this study. We ask: Does the interbreeding of distinct salmon populations result in a loss of fitness? If so, by what genetic mechanism does this occur? To investigate these questions we made F_2 hybrids from returning F_1 adults bred from three distinct Southeast Alaska coho salmon populations. Replicates of the parental and F_1 hybrid cross types were created along with hybrids of the F_1 hybrid cross types. We sampled returning adults for length, sex, and seven bilateral meristic traits. We determined the identity of their parents and their experimental group from variation at six microsatellite loci. Tests of homogeneity were conducted to assess marine survival. We partitioned the variance observed in measured characters and assessed the fluctuating asymmetry of bilateral meristics as another measure of fitness. Line-cross analysis was used to assess whether additive or dominance genetic interactions best described the observed phenotypic data, and we estimated heritabilities for observed characters. We detected no evidence of outbreeding depression. The little variation observed in meristic characters suggests strong canalization for these traits. A majority of bilateral character distributions were best explained by an additive model, whereas length returned variable results. The lack of significant heritability estimates is likely due to low power, arising primarily from the small number of sires involved in our mating designs.

Session: Contributed Papers

Developing tools for monitoring marine-derived nutrients in Alaska watersheds: Genetic identification of sockeye salmon in the northern boundary area

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In this project, 45 single nucleotide polymorphism (SNP) markers were screened in 6,942 sockeye salmon collected from 84 populations in Southeast Alaska (SEAK) and British Columbia to create a baseline suitable for mixed-stock analysis studies in Northern Boundary fisheries. Genetic relationships among comparable collections were similar to Beacham et al. (2006), but the inclusion of some additional highly divergent populations indicated that more spawning aggregates from northern SEAK might need to be included in the baseline before applying GSI methods to northern or central SEAK fisheries. After combining geographically proximate collections, 100% simulations indicated that every population is identifiable in a mixture (using 90% correct allocation criteria). Based on fishery manager needs, collections were combined into 14 reporting groups; 100% simulations indicated that these larger groups are identifiable in mixtures (94% or higher correct allocation). Allele frequencies from this project were used in an examination of the stock composition from the 101 and 104 District samples collected in 2004 and 2005.

2008 Annual Alaska Chapter AFS Conference

Session: Contributed Papers

Blasting bridges and culverts in fish streams: Water overpressure and vibration analysis

Kristen Dunlap

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There are several thousand remote stream crossing structures in the Tongass National Forest in need of removal. In 2007 thirty-three collapsing log bridges, log culverts, and metal culverts no longer in use were removed with explosives. Species of salmon, trout, char, and sculpin are present in the project area. Blasting overpressures may injure or kill fish in streams and ground vibrations can damage salmonid embryos in streambeds. Regulatory agencies offer guidelines with limits for blasting induced overpressures and vibrations. However, there has been no quantification of blast overpressures in shallow streams. Methods used to predict lethal levels for various blasting applications have not been completely validated. This research provides guidance for analyzing ground vibrations and water overpressures during blasting activities in or around fish streams. Overpressures and vibrations were recorded during 19 shots. Three hydrophones and four geophones were placed within streams at various distances from blasted structures. Peak water pressures (lb/in2) were found to have a significant relationship with cube-root scaled distances (CRSD, ft/lb1/3) when plotted on a log-log plot. Peak particle velocity (PPV, in/sec) data were evaluated against square-root scaled distances (SRSD, ft/lb1/2) and grouped by stream substrate type (e.g. gravel, organics, bedrock) taking into consideration source coupling. Regression analysis provided a significant attenuation model with moderate data scatter.

2008 Annual Alaska Chapter AFS Conference

Session: Poster

A GIS / remote sensing based approach to identify potential spawning habitat for fall-run chum salmon in the mainstem Tanana River, Alaska

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The study of large glacial rivers presents difficulties for quantifying salmon spawning habitat due to the fact that these rivers are extremely dynamic, with complex varieties of habitat types. Traditional ground based methods of mapping and quantifying salmon habitat are limited because they only take into account one spatial level of a system when in reality important physical processes that destroy and create habitat for fish are occurring on multiple spatial scales. Integrating traditional methods of habitat data collection with the use of Geographic Information Systems (GIS), Global Positioning Systems (GPS) and Remote Sensing allows researchers and managers to create a more descriptive and potentially realistic picture of the ecology of a species. The use of synthetic aperture radar (SAR) imagery offers a more economical and logistically reasonable way to remotely study a complex and rapidly evolving braided river. Combining data acquired from SAR imagery and in-stream habitat data will allow for a more powerful predictive habitat model for future research and management decisions.

The first objective is to process images collected during October or November of 2007 and 2008. These images would be used to calculate braiding indexes for selected reaches throughout the study area representative of the time of year chum salmon are actively spawning. The second objective is to examine SAR imagery that has been acquired from the months of December through April that span the past 13 years. These images would be processed to show any morphological and hydrological changes within the river. It will also show whether or not these areas of year-round open water are static or whether they are subject to change due to other riverine processes. Due to the homing tendencies of salmon, it is important to determine if fish are responding to current conditions or conditions reflective of past generations that are selecting habitats. A one year, snap shot image of habitat may not be sufficient to describe current distribution of spawning salmon. Additionally, in-stream habitat data will be collected from October to December.

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Session: Poster

Identification and characterization of inconnu (sheefish) habitat in the Sulukna River

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The Yukon River is the third largest drainage in North America, but few known sheefish *Stenodus leucichthys* spawning locations exist. Sheefish spawning habitat needs are relatively unknown and extremely specific. Subsistence fishermen within the Alaska portion of the Yukon River drainage are dependent upon this resource. The low number of known spawning areas and heavy and growing reliance on sheefish as a subsistence resource make quantifying their life history strategies important for fisheries management. Systematic sampling throughout the Sulukna River will occur in September and October when sheefish spawning is occurring. Prevalence of spawning will be identified using a hook/line CPUE effort at transects occurring every 1.8 rKm. Collection of sheefish spawning habitat information will include 1) quantifying small-scale, large-scale, and chemical habitat features and, 2) determining spatial distribution of spawning habitat within the Sulukna River and, 3) applying the model to other identified spawning areas within the Yukon River drainage. Project results will resolve questions regarding preferred habitat for spawning sheefish.

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Session: Poster

Kuskokwim River salmon research

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The Kuskokwim Area supports one of the largest subsistence salmon fisheries in Alaska, as well as modest commercial salmon fisheries and growing recreational fisheries. These fisheries are managed for long-term sustainability through a number of projects, most of which are integrated to provide insight into salmon dynamics over the entire Kuskokwim Area. These projects also serve as platforms for a variety of other research initiatives.

Resources for development of resistance board weirs

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Use of resistance board weirs to count adult salmon migrating in stream has dramatically increased in recent years. Fishery managers and researchers in Alaska and elsewhere are converting to this design as a flood resistant alternative to traditional weirs and counting towers. Staff working in Western Alaska have produced three reports that serve as valuable resource for parties interested in developing new weirs. These reports guide users in the construction, installation and performance of resistance board weirs. Two of these reports, *Resistance Board Weir Construction Manual* and *Techniques for Installation a Resistance Board Weir*, are available at: *http://www.cf.adfg.state.ak.us/region3/pubs/pubshom3.php?a=w*

Session: Poster

Ecology and demographics of juvenile Chinook salmon in the Chena River, central Alaska

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Stock-recruitment models often do not take into account essential environmental conditions and processes that affect Chinook salmon (*Oncorhynchus tshawytscha*) rearing and overwintering, and therefore lack rigor and reliability. Furthermore, it is not clear which chemical, physical, and biological variables are most responsible for driving juvenile Chinook salmon productivity. This study-in-progress is taking place in the Chena River drainage of interior Alaska, one of the most important Chinook producing rivers in the Yukon River basin. The objectives of this work are twofold. First, determine the causes of density dependent mortality that regulates population size. Evidence suggests this occurs during the summer that juveniles rear in freshwater, and is a consequence of competition for food and space. Second, determine how seasonal patterns of stream discharge affect food production including the area and quality of profitable and safe feeding habitat. We are measuring temporal and spatial fluctuations in nutrient concentrations, chlorophyll-a and biofilm mass, stream metabolism, food abundance and availability (i.e., aquatic and terrestrial invertebrates), as well as fish feeding behavior, densities, and growth in response to a broad range of stream flow and temperature. We are advancing stereoscopic video techniques to unobtrusively assess fish growth, quantifying key aspects of foraging behavior, and improving the design of process-based foraging models. Early results suggest high spatial variability in the abundance and size of invertebrates that comprise juvenile Chinook salmon diet. Chinook salmon food intake sharply declined during and one week after a major flood in July and August, 2008, but returned to pre-flood levels several weeks later. Feeding trials led to larger juveniles and localized aggregations of other species – round whitefish, longnose suckers, and Arctic grayling. The eventual output from this study and subsequent analyses will aid biologists and managers in predicting optimal escapements and forecasting future returns.

2008 Annual Alaska Chapter AFS Conference

Session: Poster

Using fish habitat quality to aid prioritization of fish passage projects

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There is insufficient information concerning the habitat quality upstream of fish passage barriers on many streams on the Kenai Peninsula. Habitat fragmented by barriers can be reconnected by replacing problem culverts with crossing structures that allow unrestricted passage of all fish species and age classes. Currently, the majority of Kenai Peninsula barrier removal projects are selected using criteria such as biologist's expertise and knowledge of fish habitat requirements, visual assessment of upstream habitat near the barrier, stream length above the barrier, project cost, and land ownership. The quality of habitat available to fish upstream of fish passage barriers has, thus far, not been quantitatively included in prioritizing fish barrier remediation projects. This study measured key habitat attributes (e.g. bankfull width, depth, substrate) considered important for successful rearing and survival throughout various life history stages of coho salmon. Habitat surveys were conducted on six streams to quantify habitat upstream of existing barriers and to aid prioritization efforts. Habitat quality was evaluated using a modified Habitat Suitability Index (HSI). The measured habitat variables were related to habitat suitability through the use of Suitability Index (SI) curves. SI curves depict hypothesized relationships between variables and a scale of 0 to 1. These values were then aggregated into a HSI and interpreted as indicators of either optimal (1.0) or unsuitable (0.0) habitat for coho salmon. HSI values ranged from 0.0 to 0.5 allowing us to rank the six stream reaches that were surveyed in 2008. The streams with values closest to 1.0 were expected to have good habitat quality and the potential to support more coho salmon. In the future, we will incorporate measures of productivity and riparian canopy, and integrate this into a prioritization model suitable for southcentral Alaska.

2008 Annual Alaska Chapter AFS Conference

Session: Poster

Stock structure and in-season mixed-stock analysis of Yukon River chum

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The management of Yukon River chum salmon fisheries is difficult because of the need to address a variety of complex issues, such as meeting escapements, while still providing harvest opportunities in a mixed-stock and mixed-species fishery. Yukon River chum salmon were assayed for genetic variation at 22 microsatellite loci to establish a baseline for mixed-stock analysis (MSA) applications to assist in addressing these issues. Yukon River chum salmon exhibited a relatively low degree of genetic divergence (G_{ST} = 0.0157) that was structured by seasonal race and geographic region. Using the 12 most informative loci, accuracies in MSA simulations for 14 of 17 reporting groups exceeded 90%, with a range of 80–98%. Stock composition estimates were within 10% of the actual proportions in a known mixture analysis. Stock specific abundance estimates, derived from combining the estimates of genetic stock composition with Pilot Station sonar abundance estimates, were concordant with upriver escapement data, after accounting for harvest. The combination of genetic MSA estimates from the baseline developed in this study and Pilot Station sonar abundance estimates provides a viable tool for assessing stock strength and assisting managers in regulating fisheries to maintain the productivity and evolutionary potential of Yukon River chum salmon.

2008 Annual Alaska Chapter AFS Conference

Session: Poster

Ecological effects of an introduced tree, European birdcherry, on stream food webs in Campbell and Chester Creeks, Anchorage, Alaska

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Introduced species are a concern throughout the globe as they can threaten and displace native species, disrupt natural ecological processes, and cause economic loss. European birdcherry (*Prunus padus L.*), hereafter referred to as EB, is an exotic, ornamental tree that is quickly spreading in parts of Alaska. Originating from urban areas including Anchorage and Fairbanks, EB may be responsible for replacing some native riparian vegetation along two streams that flow through the municipality of Anchorage. Riparian vegetation plays a vital role in stream food webs by supporting both terrestrial and aquatic macroinvertebrate communities, which are the major food source for juvenile salmonids and other fish and animal species. The objectives of this study-in-progress are to: (1) map the current distribution of EB within Campbell and Chester Creek watersheds, (2) determine if EB affects riparian macroinvertebrate abundance and the availability of these prey to stream salmonids, (3) determine whether in-stream leaf litter processing is affected by EB litter inputs, and (4) assess whether juvenile salmonid food intake is affected by EB. Fieldwork is being conducted 2008-2010. To assess the macroinvertebrate community associated with leaf litter in these streams, leaf packs from the 2008 field season are currently being processed in the lab. Fieldwork for 2009 will include: sampling leaf packs for macroinvertebrate species richness and abundance; assessing leaf litter decomposition; determining terrestrial macroinvertebrate abundance and infall into these two streams; and analyzing salmonid diets. Results of this study will help determine the extent of current EB distribution along Campbell and Chester Creeks and predict its future spread throughout the municipality of Anchorage, as well as assessing whether EB poses a threat to streams and stream salmonids. Results will ultimately help guide management decisions about possible future EB control efforts.

2008 Annual Alaska Chapter AFS Conference

Session: Poster

Development of a fisheries monitoring plan in relation to oil and gas activities in the National Petroleum Reserve - Alaska

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The Bureau of Land Management (BLM) strives to protect surface resources in the National Petroleum Reserve - Alaska (NPR-A), such as fish and fish habitat, by establishing Required Operating Procedures (ROPs) and permit-specific stipulations for the oil and gas industry. The effectiveness of these management policies must be evaluated by monitoring oil and gas activities and the resources that may be potentially impacted. In order to address this need a comprehensive freshwater fisheries monitoring plan was recently developed for the NPR-A. A generalized conceptual model was first constructed by a multi-disciplinary panel to describe the connections among key components of oil and gas exploration and development (stressors) and aquatic environmental responses. Expanded models were then developed to describe the detailed processes through which specific oil and gas activities can affect habitat structure and ecological function. BLM ROPs designed to protect fisheries resources within the NPR-A were also organized and reviewed as they relate to the stressors and responses identified in the models. An integrated evaluation process resulted in identification of monitoring parameters and protocols that focus on the resources most at risk. Indicators recommended for monitoring include barriers, hydro-geomorphic changes, fish distribution and movements, water quantity, water quality, fish harvest levels and locations, harvest area use, and weather patterns. Implementation of the NPR-A Fisheries Monitoring Plan will help ensure documentation of changes in fish and fish habitat conditions and determine the cause for any observed changes. Where the cause is determined to be a result of oil and gas exploration or development activities, BLM can initiate adaptive management instituting new ROPs or permit stipulations.

2008 Annual Alaska Chapter AFS Conference

Session: Poster

Genetic diversity of sockeye salmon from the Copper River and adjacent drainages

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The Copper River and adjacent drainages in Prince William Sound support large populations of sockeye salmon that provide major commercial, subsistence, personal use, and sport harvests. Unlike the vast majority of populations of sockeye salmon within Alaska, the genetic diversity of these populations is poorly described. In this project, we are developing SNP assays and assembling a baseline of DNA data for sockeye salmon from the Copper River and adjacent drainages. This information will be used to describe the genetic diversity of spawning populations of sockeye salmon both in terms of geographic and temporal variability. Once assembled, the data can also be used to estimate stock-specific migration patterns of adult and juveniles in both the freshwater and marine environment. The data will also be contributed to a growing baseline of SNP data from throughout the Pacific Rim that can be used in high-seas studies in the Gulf of Alaska and Bering Sea.

DNA barcoding of eight North American coregonine species

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Coregonine fishes have a circumpolar distribution in the arctic and subarctic Northern Hemisphere. This subfamily of Salmonidae consists of three genera: *Prosopium, Stenodus* and *Coregonus, including* over 30 species. Many species overlap spatially and are difficult to distinguish based on morphological characteristics, especially as larvae or juveniles. Here, we present a method for rapid and cost effective species identification for representatives of the three genera based on sequence variation at the mitochondrial cytochrome c oxidase subunit I gene (COI). We examined eight species common to North America with distributional overlap in Alaska. Mean pairwise sequence divergence for all eight species was 7.04% and ranged from 0.46% to 14.23%. This sequence variation was used to develop a genetic assay based on restriction fragment length polymorphism (RFLP). In a blind test, this assay provided correct species assignment for 48 of 49 individuals representing all eight species. The single incorrect assignment may reflect hybridization between two closely related species. This DNA barcode-based assay promises to aid fishery managers and researchers by providing a cost-effective alternative to large-scale sequence analysis for identification of North American coregonine fishes.

American Fisheries Society, Alaska Chapter
The 35th Conference Business Meeting Agenda

October 29, 2008
Anchorage, Alaska

1. Call to Order

2. Determination of a Quorum

3. Approval of Agenda

4. Approval of minuets from Alaska Chapter Business Meeting 2007

5. Reports

    a. Treasurer's report — Lee Ann Gardner
    b. Committee reports
        i. Awards — Cheryl Dion
        ii. Wally Noerenberg Award — Ted Otis
        iii. Cultural Diversity — Jerry Berg & Lisa Stuby
        iv. Molly Ahlgren Scholarship — Hal Geiger
        v. Continuing Education — Bert Lewis
        vi. Environmental Concerns — Cecil Rich
        vii. Electronic Communication — Allen Bingham
        viii. Fisheries Communication — Laurel Devaney
        ix. Past Presidents — Jamal Moss
        x. Student Units — Dona Eidan
        xi. Membership — Lisa Stuby
        xii. Resolutions and Bylaws — Bill Bechtol

6. Outgoing President's Address

7. New Business

8. Old Business

9. Open forum

10. Adjourn

American Fisheries Society, Alaska Chapter
The 34th Conference Business Meeting Notes

November 16, 2007
Ketchikan, Alaska

1. The meeting was called to **order at 12:08** by President Jamal Moss.

2. **Quorum established** - Members of Executive Committee present were President Jamal Moss, President Elect Bert Lewis, In-coming Vice President Lisa Stuby (pending final election results), Treasurer Lee Ann Gardner, In-coming Secretary Carla Banks (pending final election results), Steve Zemke (Past Secretary), and Student Chapter President Scott Ayers. Approximately 30 members were present.

3. **Approval of the Agenda** - The membership approved the agenda as revised and presented at the meeting.

4. **Approval of minutes** from November 15, 2006 business meeting – The minutes of the November 15, 2006 were approved as presented on pages 92 through 95 of the 2007 Program.

5. **Reports.**
   a. **Treasurer's** - Lee Ann Gardner presented the report for 2006-2007. Lee Ann provided a hard copy of her report for the membership prior to the meeting. She reported that the Chapter's finances are good at present, with total assets of $234,354. She highlighted that the UBS Fund A is earning 12% due to moving funds to an investment portfolio with an investment horizon of 7 to 10 years. Overall, funds grew from $219,000 in 2004 to $234,000 for this year. Major income sources were the Chapter's portion of the 2005 parent society meeting profits, and the endowment funding from the establishment of the Molly Ahlgren fund. The UBS checking account numbers as presented in Lee Ann's written report are slightly inflated, as most of the expenses for 2007 annual meeting are still outstanding.

      Lee Ann reported that the 2007 meeting attendance is 172. This compares to 2006 33rd Meeting attendance of 187. This year's numbers reflect significantly fewer students, but more non-members attending. Also, the continuing education attendance was up, with 40 participants attending the 4 classes. This compares to the 15 people attending the one class last year.

      A full report is found on the chapter's website at:
      (http://www.fisheries.org/units/afs-ak/).

   b. **Western Division Report** – Eric Wagoner gave a short presentation on Western Division activities and upcoming events. He reported that the upcoming WDAFS meeting will be held in Portland on May 4-8, 2008. Scott Barner, President Elect, will be the governing officer. The next parent society meeting will be the third week in August, 2008 in Ottawa, Canada. Eric also reported on the Bethesda office move. A committee has been formed to explore the possibility of moving into office shared by other NGO's. Joe Margraf suggested rolling over the profits from sale of the old building to the new space, as AFS owned part of the old building, though not the land.

Eric also reported on the creation of a new on line journal devoted to marine sciences. He called for membership support of this new resource.

Finally, Eric gave a presentation on the new Western Native Fish database. It was started in 2003 and now contains 12 MB of information on non-anadromous fishes of western North America. Eric described the database as a work in progress. The database contains historic and current ranges of the species, as well as summaries for many of the species, though it does not have accounts for all native fish. The database may be found at (http://www.wdafs.org). The Western Division is currently soliciting additional funding to complete the updates for the database.

c. Committee Reports- Full committee reports may be viewed at: (http://www.fisheries.org/units/afs-ak/).

i. Awards – Chairperson Cheryl Dion presented that the Awards Committee received two nominations for the Meritorious Service Award and one for the Alaska Chapter Service Award for 2007. The five committee members recommended Ray Troll for the Meritorious Service Award and Allan Bingham for the Alaska Chapter Service Award. These recommendations were approved by the Ex Com in October, and were presented at this year's banquet. There were no nominations for the Almost Darwin Award.

ii. Wally Noerenberg Award Committee – Ted Otis was not in attendance at the meeting and requested that his report be read into the record. His report indicated that several small changes to the committee protocols were adopted for 2007. Principal among them is the manner in which the committee members are selected. Instead of the immediate Past-President automatically beginning a new 3-year term on the WNA committee, new members are now selected randomly from a list of the Past-Presidents who remain active in the Chapter. The WNA committee members during 2007 were Carol Kerkvliet, Tim Joyce, and Bill Hauser (the random selection), with Ted Otis taking over the chair from Doug Palmer. As the committee did not receive any nominations for the Wally Noerenberg Award prior to the July 31 deadline, no award will be bestowed in 2007.

iii. Cultural Diversity Committee Report– Lisa Stuby gave a report on the activities of the Cultural Diversity Committee. Lisa Kangas was recipient for this year's award. She is a senior at UAF working on a degree in Biological Science and is interested in subsistence fisheries management. She spent her childhood years on the Yukon River, and in high school worked as a fisheries intern for the Partners in Fisheries Monitoring Program. During her college years she has worked on several fisheries monitoring projects, and is currently a College Intern III at the ADF&G, and is working on a study of the distribution and use of non-salmon fish in the Middle Yukon River. Lisa was present, and received acknowledgement from the membership for her award.

iv. Electronic Communications Report – Allan Bingham reported on the status activities of the Electronic Communications Committee (ECC). Primarily they involve maintenance of the Chapter's web-site and email distribution list. The website also hosts the four Student Subunit web sites, though the Sheldon Jackson subunit is currently inactive. The ECC also maintains the membership list, which has proved useful in informing Chapter members of current Chapter activities, such as announcements for the 2007 Annual Conference. The membership list will be updated in the next several months. Allen indicated the ECC also moderates the Chapter's list server, and all

members who subscribe can participate. Alan also asked for members input on the website and asked for comment at: allen.bingham@alaska.gov.

iv(a). Membership Committee Report – Bert Lewis presented membership statistics from 2003 to 2007, from a report submitted by Hamacham Hamazaki. 2007 membership numbers are lower than in 2006. Some of this may be due to "inflated" numbers in 2006, due to "free" membership people received for registering for 2005 parent society meeting in Anchorage. Also, the 2005 numbers may have been inflated by individuals that may have joined or renewed on the basis of the 2005 being held in Anchorage. These suppositions aside, there does appear to be a decline in membership, and this may be a cause for concern that the Chapter needs to address in the coming months.

v. Environmental Concerns Committee Report- Cecil Rich gave a report on the activities of the committee for 2007. The first project was to formulate a letter to Governor Palin urging her to reverse the decision of moving the ADF&G Habitat Division to the Department of Natural Resources. The Chapter received a response form the State that the Governor will first ask the Commissioners of ADF&G and DNR to come up with a position before she makes her decision. This decision may be out within a month or two. Another letter of concern was sent to ADF&G expressing the Chapters concerns over sockeye supplementation activities occurring on McDonald Lake in Southeast Alaska. The Chapter has received a reply, where the State has decided to go forward on the project, as they felt the social/economic concerns was sufficient to override potential biological concerns. Finally, a draft letter is being developed to express concerns over the development of the Pebble Prospect, especially in regards to deficiencies in the State's current permitting process. Cecil requested that members wishing to serve on the Environmental Committee contact him directly at 907-227-3509 or cecil@gci.net.

vi. Fisheries Communication and Education – Laurel Devany gave a report on the committee activities. She reported that the continuing education courses were well attended, and instructors were highly rated, and that a full range of courses should be held next year.

vii. Finance Committee – Ray Hander reported on the 2007 Finance Committee activities. Ray became chair of the committee when the Chapter savings accounts were shifted over to UBS. Ray pointed out that Lee Ann Gardner, as Chapter Treasurer, handles the day to day financial activities for the Chapter. Ray, along with Tim Joyce, meet with UBS representatives on a regular basis. Ray facilitated a discussion on the long term financial plans for the Chapter. Tim Joyce pointed out that a Financial Plan has been already developed for the Chapter four years ago by the Past Presidents Committee, and was previously approved by the general membership. This is now posted on the Chapters website and is contained within the by laws for the Chapter. The final discussion resolved around whether the Chapter should take advantage of the opportunity to invest in the Western Division investment portfolio. The rates of return in the WDAFS funds have been good, and are leveraged due to the larger amounts of money existing within these funds. It was noted that the Ex Com has discussed this possibility but has not made any decision on the matter at this time.

viii. Past Presidents Committee report – Hal Geiger reported on the activities of the Past Presidents meeting. The Past presidents discussed problems in retaining fisheries professionals in the Alaska Department of Fish and Game. The Past Presidents

Committee is composing a draft letter to the Governor of Alaska expressing concerns over the current State of Alaska salary schedules and benefits packages being so low it is creating a critical situation for retention of current fisheries personnel and recruitment of new personnel. The letter would come out under the signature of the Past Presidents Committee, with concurrence of the Executive Committee.

ix. Student Sub-units – Scott Ayers summarized the activities of the different sub units. He reported that the Chapter was able to provide funds for 13 students to travel to the meeting. He highlighted that there are three groups active at present. Scot highlighted that the Anchorage sub unit is currently co-hosting a forum on the Pebble Mine Prospect. He informed the membership that the Juneau sub unit has held its successful annual environmental forum, with focus on student presentations.

x. Resolutions and Bylaws Committee report – Jamal Moss read Bill Bechtol's report into the record. No changes to resolutions or bylaws were received this year. Since the committee is also responsible for maintenance of Chapters Procedures Manual the action as previously described in the report by the Wally Noerenberg Committee (changing the membership of the Wally Noerenberg) will be incorporated into the Chapter's Procedures Manual. A concern was brought up about the need to examine if ad hoc committees are functioning as standing committees. Jamal Moss, under his upcoming role as immediate Past President, agreed to examine the charters of the current committees, and make recommendations to the Executive Committee about which ad hoc committees should become standing committees.

6. **Outgoing Presidents Address -** Jamal Moss gave a short address to the membership. He iterated that his focus for his term was to serve the membership in the best of his abilities. He indicated that continued emphasis on student participation in the Chapter was also a priority, and the Chapters financial contribution to the Student Travel fund is important. Jamal also cited the importance of emphasizing the Chapter's interactions with higher levels of government where there is concern over how policy could be affecting our valuable fisheries, with examples of letters to Governor Palin and the Commissioner of Fish and Game as examples of this interaction. Jamal specifically thanks Hal Geiger for his work as the symposium chair and Past President's Committee chairman. He also thanked Bert Lewis for organizing the 34th Annual meeting. He also thanked the local arrangement committee for all there hard work. Jamal also reiterated that the Chapter is in excellent financial shape. Finally, Jamal congratulated Lisa Stuby and Carla Banks for their upcoming installation to Ex Com committee as Vice President and Secretary, pending final election results tallied by December 5 of this year. At the end of Jamal's comments, Bert Lewis, incoming President awarded Jamal the Alaska Chapter Award for his work as 2007 President.

7. **New Business** – Bert Lewis took the gavel as chair of meeting.
   a. **Cultural Diversity Award criteria** – Hal Geiger moved, with a Tim Joyce second, that the Chapter **should remove** the provision that the Cultural Diversity Travel Award recipient "**must reside greater that 50 miles form the meeting location**". Some discussion followed, with points that there could be financial needs beyond travel costs that might need to be covered, and the award should be based on how much the recipient or recipients need. Tim Joyce then called for the question on the motion. The **vote was unanimous to approve** the motion.

   b. **Molly Ahlgren Scholarship Fund –** Hal Geiger presented the Chapter with the "Revised Guiding Principles for the Molly Ahlgren Scholarship Fund", in written copy at the meeting.

The current suspension of operations at Sheldon Jackson College spurred the need for these changes that are reflected in these revised principles.

The discussion centered on the why the award was limited to only juniors. Hal Geiger indicated that it is to limit the total number of applicants, and to restrict graduate students from participating as they have many other funding options. During discussion it was indicated that Molly felt that the junior year was critical, where few options for additional financial aid, and that graduate students do have other funding options. General consensus indicated that the junior limitation fit Molly's concerns. Other discussion centered on how the process would work for student sub-units to weigh in on the award recipient selection. The process is for the committee to winnow down the list and ask the student subunits for their ranking. Other discussion centered on the whether APU students should be considered for the award, as there is no student subunit at that location. Though some concern was expressed, no opposition to allowing APU students to apply for the award materialized.

Hal Geiger moved, with a second by Jamal Moss, that the principals as presented be amended as follows:

The first sentence of the second paragraph should read: "Accordingly, in response to this change, the following principles are adopted:"

The second bullet, after the first sentence, the following sentence should be added. "Sheldon Jackson students will be provided preference."

With these changes, Tim Joyce called for the question. "The Revised Guiding Principles for the Molly Ahlgren Scholarship Fund" were approved as amended by unanimous vote.

8. Open forum – No discussion occurred.

9. Adjourn - A motion to adjourn was made and seconded. Motion was passed by unanimous consent. The meeting adjourned at 1:47.