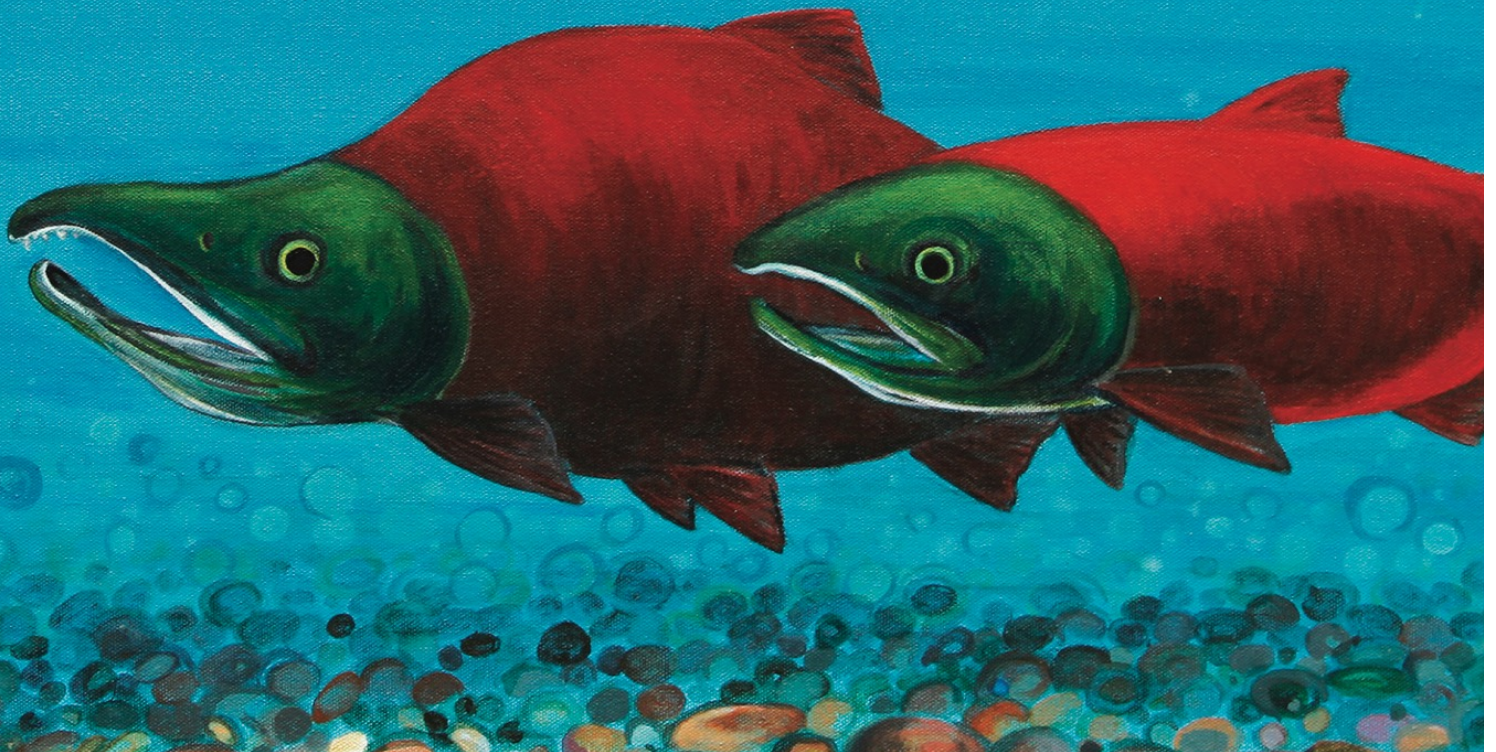


Mat-Su
salmon
PARTNERSHIP

10th Annual
MAT-SU SALMON
SCIENCE & CONSERVATION
SYMPOSIUM

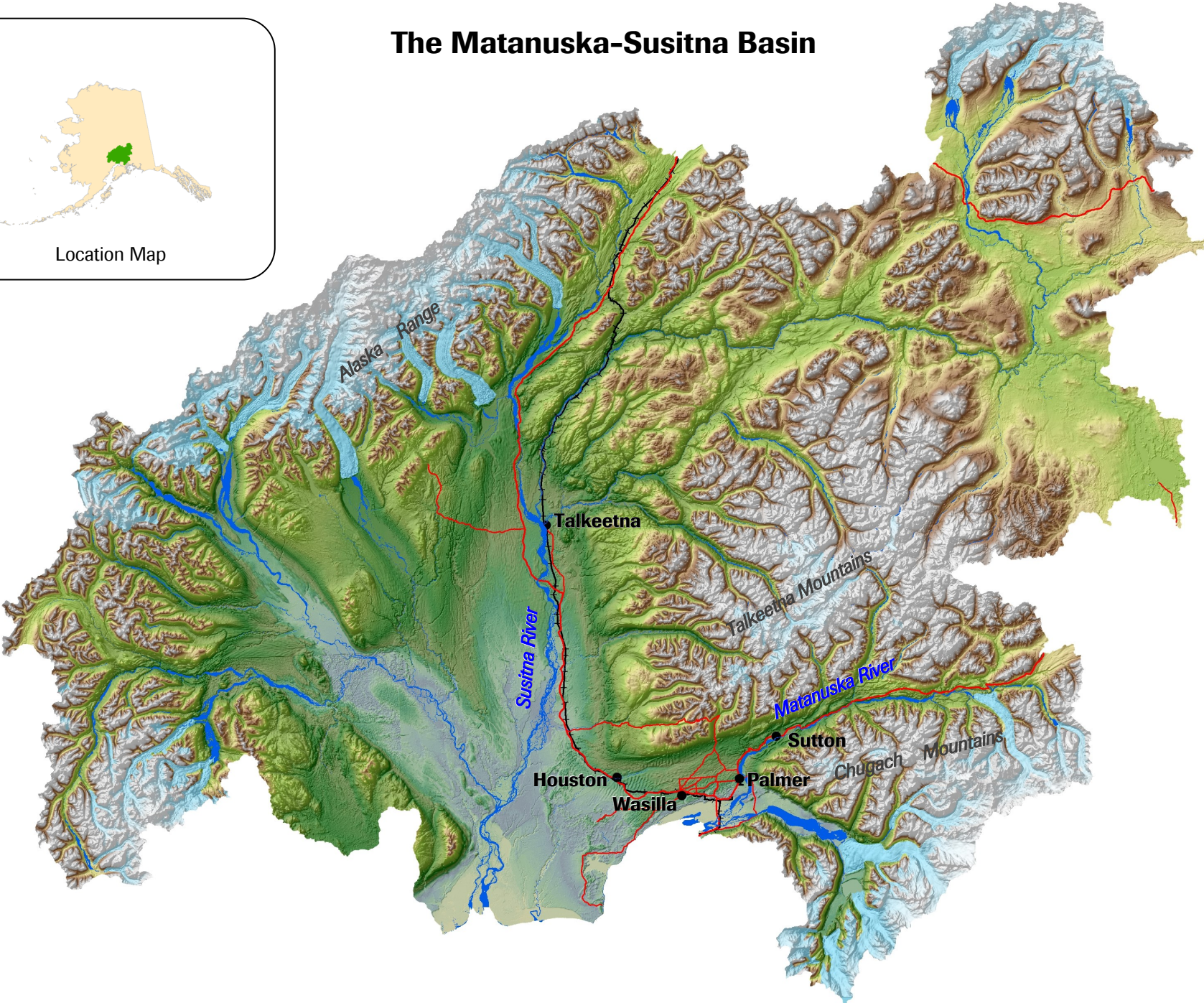
November 8 & 9, 2017 · Palmer Alaska



The Matanuska-Susitna Basin



Location Map





**Welcome to the 10th annual
Mat-Su Salmon Science and Conservation Symposium
Hosted by the Mat-Su Basin Salmon Habitat Partnership**

Thank you for attending the 10th annual Mat-Su Salmon Symposium. We're glad you're here to celebrate this milestone Symposium year, and are looking forward to sharing information and exchanging ideas about salmon science and conservation in the Mat-Su Basin. We have an excellent line-up of presentations including a special evening of salmon storytelling.

We are excited to have Dr. Tara Martin as this year's keynote speaker. She is a conservation scientist in the Department of Forest and Conservation Sciences at the University of British Columbia and is a pioneer in the translation of ecological data into conservation management decisions. Tara will speak about work being done to help organizations decide what actions to take, when and where to get the best conservation outcomes, while taking into account the many other competing needs of society. Dr. Martin's work bridges the gap between science and on-the-ground action.

In this 10th year of hosting the Mat-Su Salmon Symposium, we have much to celebrate – a growing history of collaboration and achievement of our salmon conservation goals and wild salmon populations that are overall still intact. We are also beginning the process of revising the Partnership's Strategic Action Plan, providing an opportunity to re-evaluate and refine the best approach for success.

The Partnership believes that thriving fish, healthy habitats and vibrant communities can co-exist in the Mat-Su Basin. Thank you for your part in keeping wild salmon abundant in the Mat-Su today and into the future.

Special thanks to the 2017 Symposium Planning Committee, presenters, moderators, collaborators, volunteers, and to our Symposium supporters.

We hope you enjoy this year's event!

Mat-Su Basin Salmon Habitat Partnership Steering Committee:

Erika Ammann, NOAA National Marine Fisheries Service
Brianna Blackburn, Matanuska-Susitna Borough
Christy Cincotta, Tyonek Tribal Conservation District
Jim DePasquale, The Nature Conservancy
Trent Liebich, U.S. Fish and Wildlife Service
Amy O'Connor, The Alaska Center
Gillian O'Doherty, Alaska Department of Fish and Game
Jessica Speed, The Nature Conservancy, Partnership Coordinator
Lee Stephan, Native Village of Eklutna
Arni Thomson, Alaska Salmon Alliance



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Symposium Planning Committee:

Joshua Ashline, U.S. Fish and Wildlife Service
George Hoden, Matanuska-Susitna Borough
Catherine Inman, Mat-Su Conservation Services
Katrina Liebich, U.S. Fish and Wildlife Service
Terry Nininger, Mat-Su Borough Fish and Wildlife Commission
Amy O'Connor, The Alaska Center
Adam St. Saviour, Alaska Department of Fish and Game
Jessica Speed, The Nature Conservancy, Partnership Coordinator
Ryan Viola, Wasilla Lake Christian School

Cover art by: Laura Dewey

Cover designed by: David Freeman



Mat-Su Basin Salmon Habitat Partners

** Steering Committee Members*

Alaska Department of Commerce, Community and Economic Development

Alaska Department of Environmental Conservation

**Alaska Department of Fish and Game*

Alaska Department of Natural Resources

Alaska Department of Transportation & Public Facilities

Alaska Outdoor Council

Alaska Pacific University

Alaska Railroad Corporation

**Alaska Salmon Alliance*

Alaska Trails

AlaskaChem Engineering

Alaskans for Palmer Hay Flats

Aquatic Restoration & Research Institute

Bureau of Land Management

Butte Area Residents Civic Organization

Chickaloon Village Traditional Council

City of Palmer

ConocoPhillips Alaska, Inc.

Cook Inlet Aquaculture Association

Cook Inletkeeper

Eklutna Tribal Conservation District

Environmental Protection Agency

Envision Mat-Su

Fishtale River Guides

Glacier Ridge Properties

Great Land Trust

HDR Alaska, Inc.

Innovative Funding

Knik River Watershed Group

Knik Tribal Conservation District

Matanuska River Watershed Coalition

**Matanuska-Susitna Borough*

Mat-Su Anglers

Mat-Su Conservation Services

Mat-Su Trails and Parks Foundation

Montana Creek Campground

** National Marine Fisheries Service*



National Park Service
**Native Village of Eklutna*
Natural Resources Conservation Service
Palmer Soil and Water Conservation District
Pioneer Reserve
Pound Studio
SAGA
Sierra Club
Sustainable Design Group
**The Alaska Center*
The Conservation Fund
**The Nature Conservancy*
The Wildlifers
Three Parameters Plus, Inc.
Trout Unlimited
**Tyonek Tribal Conservation District*
United Cook Inlet Drift Association (UCIDA)
United Fishermen of Alaska
Upper Susitna Soil & Water Conservation District
U.S. Army Corps of Engineers
**U.S. Fish and Wildlife Service*
U.S. Geological Survey
U.S. Forest Service, Chugach National Forest
Wasilla Soil and Water Conservation District

The partnership includes 61 organizations and three private individuals.



The Matanuska-Susitna Basin Salmon Habitat Partnership believes that thriving fish, healthy habitats, and vital communities can co-exist in the Mat-Su Basin. Because wild salmon are central to life in Alaska, the partnership works to ensure quality salmon habitat is safeguarded and restored. This approach relies on collaboration and cooperation of diverse stakeholders to get results.

Learn more about the Partnership and Symposium at the Mat-Su Salmon Partnership website at www.matsusalmon.org and follow us on Facebook!



Wednesday November 8, 2017

Palmer Community Center (Depot), 610 S. Valley Way, Palmer

8:30 Registration & Coffee/Snacks

9:00 Symposium Welcome

Sue Mauger (Mat-Su Basin Salmon Habitat Partnership Science and Data Committee Member, Cook Inletkeeper)

Lisa Wade (Director, Chickaloon Village Health, Social Services and Education) and Albert Harisson (Elder/Member, Chickaloon Village Traditional Council)

Sam Cotten (Commissioner, Alaska Department of Fish and Game)

9:30 Keynote Address: Tara Martin

Strategizing How to Avoid Irreversible Loss of Wild Salmon Populations

Introduction: Jessica Speed (The Nature Conservancy)

10:30 Networking Break

11:00 Identifying and Conserving Community Assets

Moderator: Kim Sollien (Great Land Trust)

Building a Salmon-Safe Mat-Su Basin: Guidelines for Fish-friendly Development

Dan Kent (Salmon-Safe)

A Model for Identifying Community Assets in the Mat-Su Core Area

Matt McMillan (Great Land Trust)

Towards More Integrated Salmon Knowledge Systems

Rachel Donkersloot (Alaska Marine Conservation Council)

Dan Rinella (U.S. Fish and Wildlife Service)

The Public Process and Salmon

Amy O'Connor (The Alaska Center)

12:00 LUNCH

1:00 Improving our Knowledge of Salmon & Their Habitat

Moderator: Matthew LaCroix (U.S. Environmental Protection Agency)

Characterization of Thermal Regimes in the Mat-Su Basin

Rebecca Shaftel (University of Alaska Anchorage)

Winter Inter-gravel Temperature Monitoring of Salmon Redds within the Mat-Su Streams

Michael Mazzacavallo (R2 Resource Consultants Inc.)

Assessing Watershed Integrity in the Matanuska-Susitna River Watershed

Kelsey Aho (U.S. Environmental Protection Agency)

Sampling Previously Unmapped Streams in the Mat-Su Borough

Mark Eisenman (Alaska Department of Fish and Game)

Juvenile Coho Salmon Overwintering Site Selection / Dispersal Strategies in Big Lake Watershed

Joshua Ashline (U.S. Fish and Wildlife Service)



2:15 Break

2:30 Tidbits

Moderator: Catherine Inman (Mat-Su Conservation Services)

Please sign up at the registration desk to present a 3-minute project summary or announcement. If you have a slide or two to project (maximum 2 slides), please load them by the end of lunch.

2:45 Invasive Species and Fish Passage

Moderator: Christy Cincotta (Tyonek Tribal Conservation District)

Landscape Genetic Diversity of Native and Invasive Northern Pike in Alaska

Chase Jalbert (University of Alaska Fairbanks)

Chelatna Lake Invasive Northern Pike Suppression

Mark Willette (Alaska Department of Fish and Game)

Elodea Eradication in Remote, Dynamic Systems

Daniel Coleman (Alaska Department of Nature Resources)

Assessing Fish Passage Success in Culvert Structures with a Two-dimensional Algorithm

Considering Physical Capabilities of Juvenile Salmonids

Alexandra West Jefferies (PND Engineers, Inc.)

DOT&PF Culvert Fish Passage Design Strategy

Paul Janke (Alaska Department of Transportation and Public Facilities)

4:00 Announcements and Adjourn for Daytime Portion of Symposium

Moderator: Arni Thomson (Alaska Salmon Alliance)

6:00 – Evening Public Event: *Salmon Live Here: Stories of the Fish We Love in the Mat-Su Valley*

Palmer Community Center (Depot), 610 S. Valley Way, Palmer

Everyone is welcome to come hear seven, seven-minute fish stories and live music!



Thursday November 9, 2017

Palmer Community Center (Depot), 610 S. Valley Way, Palmer

8:30 Registration & Coffee/Snacks

9:00 Symposium Welcome

Christy Cincotta (Mat-Su Basin Salmon Habitat Partnership Steering Committee Member, Tyonek Tribal Conservation District)

9:15 Protections for Salmon, Conservation & Restoration Updates

Moderator: Dave Albert (The Nature Conservancy)

An Introduction to the Division of Habitat, Who We Are and What We Do

Ron Benkert (Alaska Department of Fish and Game)

Understanding Stand for Salmon: Protecting Alaska's Fisheries for Future Generations

Sam Snyder (Stand for Salmon)

Instream Flow Reservations in the Mat-Su Basin and Upper Cook Inlet

Ann Marie Larquier, Leah Ellis, Kevin Keith (Alaska Department of Fish and Game)

Impacts and Mitigation in Waters of the United States within the Mat-Su

Jeremy Grauf (U.S. Army Corps of Engineers)

Tyonek Tribal Conservation District Habitat Monitoring and Restoration Updates

Nicole Swenson (Tyonek Tribal Conservation District)

10:30 Networking Break

10:45 What Has the Mat-Su Basin Salmon Habitat Partnership Achieved and What Will the Priorities Be Going Forward?

Bill Rice (U.S. Fish and Wildlife Service) and Tara Martin (University of British Columbia)

This session will be a look-back on Partnership progress since its formation, as well as an update and look-forward with an upcoming Strategic Action Plan Revision.

12:15 LUNCH

1:15 Information Sharing and Open Discussion Groups

Moderator: Katrina Liebich (U.S. Fish and Wildlife Service)

These topics were proposed prior to the Symposium. Additional discussion topics can be added during the Symposium: please suggest other topics on the signup sheet at the registration table. At mid-point in the session groups will change to discuss another topic.

1. *Fish Passage Where Roads Cross Streams*

Discussion lead: Mike Daigneault (U.S. Fish and Wildlife Service)

2. *Clean Water for Salmon: Initiating a Salmon Safe Certification Program in the Mat-Su Basin*

Discussion lead: Dan Kent (Salmon-Safe)

3. *Ecosystem Services Success Stories from Alaska: Identifying and Amplifying Those Stories*

Discussion lead: Jimmy Fox (U.S. Fish and Wildlife Service)

4. *Mat-Su Borough Lake Monitoring Program: Indicators to Monitor and Broader Use*

Discussion lead: Melanie Trost (Mat-Su Borough)



5. *Matanuska River Data Needs*

Discussion lead: Jessica Winnestaffer (Chickaloon Native Village)

6. *Invasive Pike Management: How to Prioritize Efforts and Lessons Learned*

Discussion lead: Nicole Swenson (Tyonek Tribal Conservation District)

7. *Stream Temperature: Looking to the Future – Implementing Pro-active Strategies for Fisheries Management*

Discussion lead: Leslie Jones (University of Alaska Anchorage)

8. *Encouraging Conservation Ethics*

Discussion lead: Ryan Viola (Wasilla Lake Christian School)

9. *ATV Use in the Mat-Su Valley*

Discussion lead: Ron Benkert (Alaska Department of Fish and Game)

10. *Inter-communication on Salmon within the Mat-Su and the State*

Discussion lead: Jeremy Grauf (U.S. Army Corps of Engineers)

2:30 Networking Break

2:45 Understanding Origins of Harvested Salmon in Cook Inlet & Spawning Distribution

Moderator: Erika Ammann (NOAA, National Marine Fisheries Service)

Where did Commercially-caught Coho Salmon in Cook Inlet Originate: Genetic Stock Identification Sheds Some Light

Andrew Barclay (Alaska Department of Fish and Game)

Northern Cook Inlet Chinook Salmon Marine Harvest Stock Composition

Adam St. Saviour (Alaska Department of Fish and Game)

Spawning Distribution of Susitna River Chinook Salmon

John Campbell (Alaska Department of Fish and Game)

3:30 Tidbits

Moderator: Leslie Jones (University of Alaska Anchorage)

Please sign up at the registration desk to present a 3-minute project summary or announcement. If you have a slide or two to project (maximum 2 slides), please load them by the end of lunch.

3:45 Conclusions

Larry Engel (Mat-Su Borough Fish and Wildlife Commission)

4:00 Adjourn



Symposium Flashbacks 2008 - 2016





Presentation Abstracts

Arranged in alphabetical order by presenter last name

Kelsey Aho, U.S. Environmental Protection Agency

Assessing Watershed Integrity in the Matanuska-Susitna River Watershed

The U.S. Environmental Protection Agency's (EPA) Index of Watershed Integrity (IWI) is used to calculate and visualize the status of natural watershed infrastructure that supports ecological processes (e.g., nutrient cycling) and services provided to society (e.g., subsistence resources). Specifically, the IWI is based on six functions that watersheds with high integrity are hypothesized to provide: hydrologic regulation, regulation of water chemistry, sediment regulation, hydrologic connectivity, temperature regulation, and habitat provision. To assess the integrity of these six component functions, the IWI considers the occurrence of stressors, or risk factors (e.g., agricultural land cover, road-stream intersections, impervious surfaces). The IWI has been applied to the continuous US and to the western Balkans. To better support regional decision-making bodies, the EPA is beginning planning for a management-based IWI analysis in Alaska. The geographic scope of such an analysis has not yet been finalized, but could range from a single basin, such as the Matanuska-Susitna River Watershed, to the entire state. In both previous applications, the six watershed functions were defined specific to running water. However, seasonal ice affects 58% of North America's streams and rivers. An Alaska IWI that includes winter functions of aquatic systems could provide insights on seasonal functions, both for Alaska and regions of the CONUS that experience a degree of river ice during the winter. Our goal for this project is to include in the IWI functions of cold-climate hydrology, to facilitate use of an Alaska IWI by regional management, especially for adaptation planning. In order to do so, we will present: 1) an overview of the CONUS IWI, 2) novel cold-climate watershed functions (e.g., climate regulation) and stressors (e.g., biodiversity loss, glacial melt/increased streamflow, greening of the arctic, fire risk), and 3) a summary of how the IWI could be used by a multi-agency collaboration such as the Mat-Su Salmon Habitat Partnership. Leibowitz, S.G., LaCroix, M., and Flotemersch, J.E.

Joshua Ashline, Catherine Bradley, Jonathon Gerken, U.S. Fish and Wildlife Service

Suresh A. Sethi, USGS Cooperative Fish and Wildlife Research Unit Cornell University

Juvenile Coho Salmon Overwintering Site Selection/Dispersal Strategies in Big Lake Watershed

Approximately 80 culverts exist within the Big Lake Watershed, the majority of which are characterized as impediments to juvenile Pacific salmon movement at certain flows. In order to inform the potential impact of fish passage barriers on juvenile salmon during the smolting life stage, we present information from a multi-year study utilizing passive integrated transponder technology to assess juvenile Coho Salmon, *Oncorhynchus kisutch*, smolt out-migration behavior and survival in the Big Lake watershed in southcentral Alaska. A total of 6,224 juvenile Coho Salmon were tagged during the summers of 2011 and 2012; of these, 1,503 (24%) were successfully detected as out-migrating smolts. Smolt migrations originated from five primary overwintering areas, and survival through the outward smolt migration varied significantly across migration origination area. We assessed factors influencing differential survival through the smolt migration, including: distance from the estuary, smolt size, and number of culverts passed.



Andrew Barclay, Alaska Department of Fish and Game, Gene Conservation Lab
Where did Commercially-caught Coho Salmon in Cook Inlet Originate: Genetic Stock Identification Sheds Some Light

The Upper Cook Inlet commercial fishery harvests roughly 160,000 coho salmon annually. Without stock-specific harvest information, the exploitation and productivity of coho salmon stocks cannot be estimated, limiting management that is based on sustained yield. Genetic stock identification can be used to estimate stock-specific harvests in a mixed-stock fishery. This method requires the genetic characterization of representative populations that may contribute to the harvest (“baseline”) and sufficient variation among populations to identify stocks in a mixed-stock sample. Through grass-roots efforts by citizens and the Mat-Su Borough, the legislature funded research to establish and test a baseline for coho salmon in Cook Inlet and to collect and analyze coho salmon captured in Cook Inlet commercial fisheries from 2013 to 2016. We identified 7 stocks that could be separated out using genetic data. Stock proportions and stock-specific harvest estimates from the 2013 to 2015 Cook Inlet set and drift gillnet fisheries are published and were presented to the Board of Fisheries in February 2017. Here we present data from 2016. Overall, 37% of the fish originated from the northern west side of Cook Inlet and Yentna River, 24% from the Susitna River, 17% from Knik Arm, 14% from Turnagain Arm and the upper Kenai Peninsula, and the remaining 8% from the Kenai and Kasilof rivers and southern Cook Inlet. As with previous years, most of the harvest occurred in the drift gillnet fishery (89%) and we observed large variations in stock compositions across the geographically dispersed fisheries. These variations in stock compositions across fisheries were driven by relative stock abundances and proximity of fisheries to natal tributaries. These stock-specific harvest estimates improve understanding of productivity and harvest patterns of Cook Inlet coho salmon stocks and inform management of Cook Inlet fisheries.

Ron Benkert, Alaska Department of Fish and Game
An Introduction to the Division of Habitat, Who We Are and What We Do

Discussion of statutes and regulations including how the Habitat Division applies our authority through Fish Habitat Permits, coordination with other divisions and departments, and negotiations with project proponents. Identification of data gaps that could be filled by Partnership participants and others that would assist the Division of Habitat in assessing proposed projects.



John Campbell, Alaska Department of Fish and Game

Spawning Distribution of Susitna River Chinook Salmon

In 2015 and 2016, the Alaska Department of Fish and Game conducted Chinook salmon assessment projects on the Susitna River. A major component of these studies was determining Chinook salmon movements and spawning distribution throughout the drainage. Radio tags were inserted into the esophagus of fish captured in both the Yentna and mainstem Susitna rivers. All radio tagged fish were tracked over time using a series of stationary scanner-recorder sites and biweekly aerial surveys. Putative spawning locations were determined for fish that made upstream progress after being tagged. These spawning locations were used in conjunction with the abundance estimate to estimate the number of Chinook salmon in each of the major tributaries of the Susitna and Yentna rivers.

Daniel Coleman, Alaska Department of Natural Resources

Elodea Eradication in Remote, Dynamic Systems

Elodea is the only submerged freshwater invasive plant to become established in Alaska. It was documented for the first time in the Mat-Su Basin at Alexander Lake in August 2014, and more recently a second outbreak of elodea was found at Sucker Lake in 2017. Elodea is a particularly injurious aquatic perennial that compromises water quality, hinders boat traffic due to its dense growth, fouls float plane rudders, and has the potential to severely impact native fishery spawning and rearing habitat. Because elodea is spreading to other waterbodies, it is critical to eradicate elodea from Alexander and Sucker Lakes. Herbicide treatments in Alexander Lake began in August of 2016 and are ongoing. Plans are being formulated to begin treatment of Sucker Lake during the summer of 2017. Eradication efforts are necessary to eliminate these lakes from being vectors of infestation to other waterbodies and to contribute to the restoration of the once thriving salmon resources of the Mat-Su Basin.



Rachel Donkersloot, Alaska Marine Conservation Council
Dan Rinella, U.S. Fish and Wildlife Service

Towards More Integrated Salmon Knowledge Systems

Alaskan salmon management has a firm science foundation, but it can be difficult for stakeholders of Alaska's salmon system to readily access up-to-date, accurate and integrated information. Existing information is often fragmented and lacks a significant body of indigenous knowledge. In addition, knowledge gaps can leave salmon stakeholders inadequately informed about the status of salmon populations and habitats as well as options to address the increasing pressures on salmon systems. Information asymmetries can undermine the stakeholders' ability to equitably and knowledgeably participate in the management processes. The State of Alaska's Salmon and People (SASAP) is a multi-institution initiative that seeks to provide an up-to-date interdisciplinary perspective on Alaska's salmon systems and the people who rely on them. The SASAP project connects knowledge across disciplines and agencies, between cultures and users, and across regions to create new institutional capacity that allows the generation of interdisciplinary salmon knowledge and establishes a foundation for integrated knowledge that can be built on over time. This presentation describes the SASAP process and intended outcomes, and seeks audience input on how best to share SASAP information with salmon stakeholders in the Mat-Su area. Further details of working group membership and interim progress are available at <https://alaskasalmonandpeople.org/>

Mark Eisenman, Alaska Department of Fish and Game

Sampling Previously Unmapped Streams in the Mat-Su Borough

Between 2009 and 2011 the Alaska Department of Fish and Game conducted a borough wide fish passage assessment of stream crossings. The Department located 124 crossings on unmapped streams (not in the National Hydrography Dataset, NHD,) that did not have any fish information. The subsequent culvert replacement prioritization and optimization models both depend on knowing how much potential upstream habitat exists above a barrier and fish usage. This project proposed to help fill fisheries data gaps by sampling 50 to 60 previously unmapped sites and other sites of interest and use the new NHD stream network, from the 2001 MSB Lidar project, to provide accurate stream courses.

Jeremy Grauf, U.S. Army Corps of Engineers Regulatory Division

Impacts and Mitigation in Waters of the United States within the Mat-Su

The Corps of Engineers' Regulatory mission is to protect the nation's aquatic resources, while allowing reasonable development through fair, flexible, and balanced permit decisions. The Corps of Engineers regulates the placement of dredged/fill material into waters of the United States. The Mat-Su has population and development growth that's impacting waters of the U.S. and the flora and fauna dependent upon them. It's important for agencies, communities, and other stakeholders to work with each other to mitigate the direct, indirect, and cumulative impacts from the current trends. Compensatory mitigation is an effort to ensure that there's no net loss of those waters being impacted from development.



Paul Janke, Alaska Department of Transportation and Public Facilities
DOT&PF Culvert Fish Passage Design Strategy

This talk will describe the process Department of Transportation and Public Facilities (ADOT&PF) follows to design fish passage culverts. This includes the following: data collection, discussions with Alaska Department of Fish and Game (ADF&G), consideration of the Fish Passage Memorandum of Agreement (MOA) between ADF&G and ADOT&PF, other design criteria, design strategy, modification of the MOA to meet site specific constraints, permits and construction.

Chase Jalbert, University of Alaska Fairbanks, Alaska Cooperative Fish and Wildlife Research Unit

Landscape Genetic Diversity of Native and Invasive Northern Pike in Alaska

Northern Pike (*Esox lucius*) were illegally introduced to the Matanuska-Susitna River (Mat-Su) basin in Southcentral Alaska in the 1950's and their populations continue to expand. The spread of invasive Northern Pike has been linked to population-level declines of salmonids and extirpation of Three-spined Stickleback (*Gasterosteus aculeatus*) from at least one location. We are studying the distribution of genetic variation among native and invasive populations of Northern Pike within Alaska to better understand the background of this invasion. We characterized genetic diversity among three native and six invasive populations collected from lakes and streams in the Mat-Su basin and the species native range in Alaska using a genotyping-by-sequencing approach and generated an extensive multilocus genotype dataset comprised of genotypes from over 6000 loci. Based on samples of 20 to 25 individuals per population, the dataset provided sufficient resolution for differentiating population structure and genetic diversity between populations. Invasions resulting from a limited number of individuals are expected to show low levels of genetic diversity. In contrast, multiple introductory events often lead to levels of genetic diversity similar or higher than that of native populations. We tested the prediction that invasive populations have lower genetic diversity than native populations by comparing calculations of heterozygosity and nucleotide diversity. Results show that populations within the invasive range host lower genetic diversity than those in the native range, indicating a small population of founders. Interestingly, one invaded lake population hosted levels of diversity similar to those of native populations, suggesting the introduction of a larger number of individuals and/or ongoing introductions. Furthermore, this population appears to have different genealogical affinities than other invasive populations, providing further evidence for a separate source population. Overall, genetic evidence points towards a low number of introductory events in the Mat-Su basin and indicates these invasive pike populations host remarkably low levels of genetic variability relative to native populations. Finally, we will add more populations from native and invasive ranges to the genetics dataset and create Northern Pike habitat suitability models to better evaluate the vulnerability of juvenile salmonids within the Mat-Su basin.



Dan Kent, Salmon-Safe

Building a Salmon-Safe Mat-Su Basin: Guidelines for Fish-Friendly Development

Oregon-based environmental nonprofit Salmon-Safe will present its market-based incentives for inspiring commercial development that protects water quality and salmon habitat. Salmon-Safe co-founder and executive director Dan Kent will discuss the program's founding by a river and native fish protection organization and its expansion to becoming the leading regional eco label on the West Coast, as well as current work with developers across the Pacific Northwest. Kent also will unveil Salmon-Safe's collaborative work with The Nature Conservancy Alaska to develop fish-friendly development guidelines for the Mat-Su Basin focused on small scale commercial and residential projects.

Ann Marie Larquier, Leah Ellis and Kevin Keith, Alaska Department of Fish and Game
Instream Flow Reservations in the Mat-Su Basin and Upper Cook Inlet

Water of sufficient quantity and quality is needed to maintain fish production and ecological functions in rivers and lakes. Alaska Department of Fish and Game's (ADF&G) Aquatic Resources Unit seeks to protect fish and wildlife habitat through the process of acquiring reservations of water (instream flow water rights). Recently, ADF&G initiated stream gaging networks in the Deshka, Yentna, Little Susitna and Matanuska watersheds to support instream flow reservations. An overview of the existing and anticipated reservations, as well as the hydrologic data collection efforts to support these reservations will be presented.



Michael Mazzacavallo, R2 Resource Consultants, Inc.

Winter Inter-gravel Temperature Monitoring of Salmon Redds within the Mat-Su Streams

In support of the Matanuska-Susitna Borough's (Mat-Su) Salmon Research Monitoring and Evaluation Plan for the Upper Cook Inlet, the goal of this ongoing project is to collect data to better evaluate the quality of salmon spawning habitat, specifically egg incubation temperature. Temperature is a crucial physical driver in freshwater aquatic habitats as it is important to many aquatic habitat processes and plays a critical role in every step of a salmon's lifecycle. Despite the importance of temperature during the early portions of a salmon's life history, there is little information on how changes in air and surface water temperatures relate to temperature in salmon incubation habitats. This two year study monitors inter-gravel temperature over the course of 2016-17 and 2017-18 incubation seasons. Six study sites were located in Mat-Su streams, three had been previously identified as sensitive to increased air temperature (Big Lake Basin) and three were thought to be buffered from air temperature effects through groundwater inputs or other characteristics (Lower Susitna River). Self-logging temperature probes collected ambient air temperature, stream surface water temperature, and inter-gravel water temperature. Inter-gravel temperature was collected at 10 cm intervals to a depth of 1 meter and within known salmon redds. During late summer and fall of Year 1, surface water temperatures at streams categorized as sensitive to air temperature had higher average daily maximum temperatures compared to those categorized as less sensitive to air temperature. While inter-gravel temperatures varied between sites, differences in temperatures across profiles were greatest amongst sites with appreciable groundwater influence. During winter months, inter-gravel temperatures were uniform across profiles. Throughout all sites, temperatures in the upper most 30 cm of profiles were on average $< 1^{\circ}$ C.



Matt McMillan, Great Land Trust

A Model for Identifying Community Assets in the Mat-Su Core Area

A new model for mapping community assets was developed to map the intact habitat and wildlife corridors for the Core Area of the Matanuska-Susitna Borough, which included 19 community councils and over 1500 square miles. Using the Green Infrastructure Center's (GIC) Green Infrastructure toolbox for ArcGIS methodology developed by the GIC and adapted by ESRI and further adapted with local data and community input, hubs were identified containing intact patches of habitat, smaller patches of valuable habitat fragments, and a suite of 16 metrics for each of the habitat patches. An additional model is used to identify the least cost route for wildlife to travel between intact habitat cores or hubs. The process that produces the intact habitat patches and metrics contains four basic steps. (1) The model identifies areas such as forests, wetlands, and waterbodies that have potential to be good habitat by creating hubs or cores. (2) Then assessing fragmentation by taking into account urbanized land, railroads, roads, and buildings that represent disturbances to the habitat by removing edge habitat from cores. Any habitat patch less than 10 acres is deleted. Habitat between 10 and 100 acres are classified as habitat fragments and habitat patches greater than 100 acres are classified as cores. (3) Metrics are then calculated based on a variety of statistics and then in the final step (4) Metrics are combined to rank each of the habitat cores based on quintile breaks and normalized by the area. The model is preliminary and not meant to identify all community assets for the Matanuska-Susitna Borough. It is adapted to the local level by supplementing local data and the outputs of the model with data for farmland soils of importance, anadromous waters, local species richness, NHD, Anadromous Waters Catalog, and many other locally relevant data and assets.

Amy O'Connor, The Alaska Center

The Public Process and Salmon

Salmon swim through all aspect of our lives as residents and visitors to the Mat-Su. They supply a thriving part of our local economy through literature, apparel, arts, culture, food and of course fishing. Local, State and Federal Governments each have different roles to play in managing our salmon resources - learn the roles and responsibilities of each entity and how they pertain to the Ma-Su. Empower yourself to get more involved and elevate YOUR voice as a resident of the Borough.



William Rice, U.S. Fish and Wildlife Service

What Has the Mat-Su Basin Salmon Habitat Partnership Achieved and What Will the Priorities Be Going Forward?

While sporadic restoration activities occurred in the Matanuska-Susitna Borough prior to 2004, the last 13 years have seen a significant surge in both awareness of the importance of aquatic habitat as well as restoration and conservation activities to reduce habitat loss. A significant part of this surge of activity is due to the formation and subsequent guidance of the Mat-Su Basin Salmon Habitat Partnership and its many members. Achievements over the life of the Mat-Su Salmon Partnership will be presented in relation to the Partnership's Strategic Action Plan as well as how the Action Plan has changed over time. With an upcoming update of the Plan, we will discuss where the Mat-Su Salmon Partnership is in terms of organizational development, outreach and conservation from a national perspective, as well as some ideas that can help the Partnership continue to be successful both nationally and in achieving its own salmon conservation goals.

Rebecca Shaftel, Alaska Center for Conservation Science, UAA

Characterization of Thermal Regimes in the Mat-Su Basin

Stream temperatures within river networks influence the abundance, distribution, growth rates, phenology, and survival of Pacific salmon. Examination of maximum stream temperatures in Mat-Su Basin streams showed that many exceed established temperature optimums for salmon. The goal of our project was to use temperature metrics representing magnitude, duration, variability, frequency, and timing of temperatures to classify summertime thermal regimes for 71 sites and 248 site-years in the Mat-Su Basin. We chose temperature thresholds of 13°C and 18°C for our duration and frequency metrics to represent potential impacts to salmon spawning and rearing, respectively. Our results showed four distinct thermal regimes. The largest group of site-years (41%) was classified as cold streams with relatively stable temperatures (cold-stable) and included both glacial and groundwater dominated sites. The second group (cold-variable, 22% of site-years) consisted of cold streams with higher variability in daily maximum stream temperatures compared to cold-stable streams. Additionally, cold-variable sites had the latest timing of maximum stream temperatures across all groups. The third group (warm-variable, 28% of site-years) was characterized by warm temperatures that remained above 13°C for almost two months, but rarely exceeded 18°C, and variation in maximum temperatures similar to cold-variable streams. The final group (warm-long, 8% of site-years) had the warmest and most variable maximum temperatures that remained above 13°C for most of the summer and exceeded 18°C for almost one month. Our final analysis will provide an understanding of the landscape and climate conditions associated with the four thermal regimes, which can be used to help guide habitat conservation strategies and priorities for Mat-Su Basin salmon populations.



Sam Snyder, Stand for Salmon Engagement Director

Understanding Stand for Salmon: Protecting Alaska's Fisheries for Future Generations

For generations, Alaskans across the state have worked to ensure healthy fisheries that sustain Alaska's cultures, economy, and communities. Over the past decade, we have worked to address specific threats to some of the most important fisheries in the state. In spring of 2016 a diverse group from around the Cook Inlet region convened to offer a solution that ensures Alaska salmon - and the communities, cultures, and economies dependent on them - are not inadvertently compromised as our state pursues increased development opportunities and options for diversifying our economy. The goal is to update Alaska's fish habitat permitting law, which has not been updated in over 60 years.

As it currently stands, Alaska's fish habitat permitting law (Title 16) directs the commissioner of the Department of Fish and Game (ADF&G) to approve a fish habitat permit for a "proposed construction, work, or use ... *unless* the commissioner finds the plans and specifications insufficient for the proper protection of fish and game." AS 16.05.871(d).

The problem is, however, that the law is outdated and unclear. Nothing in Title 16 defines what constitutes, "proper protection of fish." Given the scale of development activities, Stand for Salmon is working to update Alaska's law adequately and transparently protect Alaska's fish habitat and fisheries so that clarity and certainty can be provided for both developers and Alaska's communities and seafood industry.

Currently this effort is following two tracks: legislative (through HB 199) and ballot initiative. This presentation will review the work of Stand for Salmon. First it will, overview the key updates, which can be made to strengthen its fish habitat permitting. These changes include creating enforceable scientific habitat protection standards, updating the Anadromous Waters Catalog, creating accountability through increased public process, and providing certainty in the permitting and mitigation processes. Finally, with an update on House Bill 199 and a discussion of the ballot initiative process, this presentation will provide what's potentially in store for the effort to update Alaska's fish habitat permitting law.



Adam St. Saviour, Alaska Department of Fish and Game

Northern Cook Inlet Chinook Salmon Marine Harvest Stock Composition

Genetic tissue samples were collected from Chinook salmon harvested in the Northern District set gillnet commercial and the Tyonek subsistence fisheries in 2014, 2015, and 2016 to determine stock composition of marine harvests in Northern (Upper) Cook Inlet (NCI). Sufficient samples were collected to represent 97% (2014), 80% (2015), and 100% (2016) of commercial harvests and 100% (2014–2016) of subsistence harvests. Genetic mixed-stock analysis was performed to produce stock composition and stock-specific harvest estimates by reporting group for each fishery. The 4 reporting groups chosen for these analyses were: 1) NCI Northwest, 2) Susitna-Matanuska, 3) Knik-Turnagain, and 4) Kenai Peninsula. In all 3 years of the study, NCI Northwest, Susitna-Matanuska, and Knik-Turnagain reporting groups comprised over 98% of the total harvests in both the Northern District Commercial and Tyonek subsistence fisheries. The NCI Northwest and Susitna-Matanuska reporting groups comprised a majority of harvests in the General Subdistrict (south) (88–96%) and the Knik-Turnagain reporting group comprised the majority of harvests in the General Subdistrict (north) (71–89%) in all 3 years. The NCI Northwest, Susitna-Matanuska, and Knik-Turnagain reporting groups comprised over 98% of the Eastern Subdistrict commercial harvest in all 3 years, with similar contributions of the 3 reporting groups in 2014 (28–36%) and higher contributions from the Knik-Turnagain reporting group in 2015 (56%) and 2016 (70%). In the Tyonek subsistence fishery, the NCI Northwest (56%) and Susitna-Matanuska (39%) reporting groups comprised the majority of the harvest in 2014 and the NCI Northwest reporting group dominated the harvest in 2015 (79%) and 2016 (72%). These results represent the first mixed-stock analysis using genetic information of Chinook salmon captured in NCI fisheries. Caution should be used when interpreting the estimates from years where harvests are not fully represented.

Nicole Swenson, Tyonek Tribal Conservation District

Tyonek Tribal Conservation District Habitat Monitoring and Restoration Updates

The Tyonek Tribal Conservation District (TTCD) will be discussing the Habitat Monitoring and Restoration Program updates from 2017; including updates on 2 culvert replacements, juvenile salmon monitoring, spawning ground survey results, and invasive species monitoring and control. This season, TTCD coordinated the removal and replacement of 2 culverts on Indian Creek, continued our juvenile salmon monitoring program on Robert's and Three Mile Creeks, and were involved in both invasive plant and fish monitoring and control in Tyonek, Beluga, and Alexander Creek. This year was our biggest year yet in understanding and addressing the pike problem in the TTCD. During the 2017 field season, TTCD in partnership with Cook Inlet Aquaculture Association, the University of Alaska at Fairbanks, and the United States Geological Survey conducted lake netting surveys in 6 lakes along the Tyonek-Beluga road system. The study design intended to confirm locations of Northern Pike infestations, collect genetic samples to determine stock of origin, and sample stomachs to better understand food-web dynamics in infested waters. TTCD looks forward to the coming years of invasive species management and salmon habitat restoration.



Alexandra West Jefferies, PND Engineers, Inc.

Assessing Fish Passage Success in Culvert Structures with a Two-dimensional Algorithm Considering Physical Capabilities of Juvenile Salmonids

Fish passage through culvert structures requires suitable behavioral and physical conditions for fish. Current practice consists of “stream simulation” design where the stream is replicated throughout the crossing structure; however, space and/or budget constraints do not always allow this practice and require the designer to model hydraulics against fish swimming abilities to assess for barriers. Current models (such as FishXing) are one-dimensional and can be overly conservative.

Field data (including hydrology and fish passage PIT tagging data) was collected by ADF&G over several years on Buddy Creek near Talkeetna, Alaska, and used to develop and test a 2D model. This model was compared with actual passage data from the ADF&G PIT tagging study and with a 1D FishXing model. Both 1D and 2D models resulted in approximate 55% congruency with the actual passage results. Based on similar results, FishXing appears to fairly accurately take into account occupied velocity of the juvenile fish when using proper velocity reduction factors. The results of the study suggest that both FishXing and the 2D algorithm are fairly conservative and appear to be limited by the studied fish swimming abilities, especially for juvenile chinook and coho salmon.

Mark Willette, Alaska Department of Fish and Game, Division of Commercial Fisheries
Chelatna Lake Invasive Northern Pike Suppression

This project removed invasive northern pike from Chelatna Lake in May-June, 2017. Chelatna Lake supports the largest population of sockeye salmon in the Susitna River watershed with weir counts ranging from 17,721 to 84,899 representing an average 17% of the total escapement of sockeye salmon into the Susitna River watershed since 2006. Northern pike predation on juvenile salmon is likely reducing production of salmon populations in Chelatna Lake. Euphotic volume studies indicate that Chelatna Lake has the potential to produce a run of 364,000 sockeye salmon, but this production has not been achieved since monitoring began in the early 1990’s. Variable-mesh gillnets and hoop traps were used to capture and remove northern pike immediately after ice melted, because pike are more active and vulnerable to capture during their spring spawning season. Project success will be evaluated by (1) comparing northern pike catch per effort in variable-mesh gillnets and hoop traps with data collected in 2010-2012, (2) estimating the number of juvenile salmon that would have been consumed by northern pike if the project were not conducted, and (3) comparing average sockeye salmon adult returns per spawner during the 5 years preceding the project and the 5 years after project completion.



Topical Discussions

These topics were proposed before the Symposium. Additional discussion topics can be added during the Symposium: please suggest other topics on the signup sheet at the registration table. At mid-point in the session groups will change and discuss another topic.

Fish Passage Where Roads Cross Streams

Discussion Lead: Mike Daigneault, U.S. Fish and Wildlife Service

Designing fish-friendly road stream crossings is beneficial beyond fish. Topics of potential discussion include how biology, politics and economics interact to result in policy and design standards; getting it right the first time; and more.

Clean water for Salmon: Initiating Salmon-Safe certification in the Mat-Su Basin

Discussion Lead: Dan Kent, Salmon-Safe

Third party certification programs can provide a powerful market incentive to inspire “beyond compliance” land management practices. As the leading environmental certification nonprofit working on the West Coast to promote water quality protection and habitat restoration, Salmon-Safe has been invited by Alaska-based conservation organizations to explore how these tools might be applied in Alaska. The goal of the discussion will be to identify key opportunities and challenges for a salmon focused eco label in Alaska as well as one or more market sectors that might be important for Salmon-Safe certification to explore in its consideration of an Alaska rollout in collaboration with local partners.

Ecosystem Services Success Stories from Alaska: Identifying and Amplifying Those Stories

Discussion Lead: Jimmy Fox, U.S. Fish and Wildlife Service

Rules for private landowners that are designed to protect salmon habitat are often quoted as “takings” and harmful to the landowner and the economy. These claims often become urban legends that should be met with compelling stories of just the opposite. What stories are out there? Can we turn up the volume?

Mat-Su Borough Lake Monitoring Program: Indicators to Monitor and Broader Use

Discussion Lead: Melanie Trost, Matanuska Susitna Borough

If you had a magic wand to obtain any and all water quality data you could ever want for lakes, rivers and streams of Alaska (rather than having limited time, money, manpower, and other resources), what would you identify as the most important water quality indicators, and why do you think they ought to be monitored? If you had access to this information, how might you use it?



Matanuska River Data Needs

Lead: Jessica Winnestaffer, Chickaloon Native Village

This brainstorming session will identify current Matanuska River data needs and surface possibilities for collaboration across organizations. Common and unique data needs will be discussed as well as opportunities for acquisition of data.

Invasive Pike Management: How to Prioritize Efforts and Lessons Learned

Discussion Lead: Nicole Swenson, Tyonek Tribal Conservation District

Join us to discuss the current status of pike invasions in South Central Alaska and identify directions forward. We're interested in identifying what control and eradication efforts have worked and why, how to prioritize infestations, and identify partnerships to streamline efforts.

Stream Temperature: Looking to the Future – Implementing Pro-active Strategies for Fisheries Management

Discussion Lead: Leslie Jones, University of Alaska Anchorage Center for Conservation Science

Stream temperatures influence growth rates, abundance, geographic distributions, spawning migrations, emergence, disease outbreaks, non-native invasions, and overall survival of Pacific salmon. These impacts make stream temperature one of the most important parameters determining the overall health of salmon populations, which provide tremendous economic and ecological benefits for Alaskans. Although recent advancements in stream temperature monitoring have been made, Alaska is still playing catch-up with regards to strategic monitoring, integrated modeling, and direct application of stream temperature products for fisheries management. This group will discuss recent efforts to build a comprehensive stream temperature database for the state of Alaska and how we might capitalize on this momentum to develop pro-active management strategies.

Encouraging Conservation Ethics

Discussion Lead: Ryan Viola, Wasilla Lake Christian School

This discussion group will focus on elements of ethical fishing and how people take care of the outdoor spaces where they enjoy recreating. For instance, how do we educate the community about the importance of proper trash and waste removal? We will brainstorm ideas to encourage behavior that leaves salmon habitat intact for future generations.



ATV Use in the Mat-Su Valley

Discussion Lead: Ron Benkert, Alaska Department of Fish and Game

The proliferation of ATV/ORV use in the valley has dramatically increased in the last 10 to 15 years with the concurrent rapid growth in the area. Not only have the number of machines increased dramatically, but the size and power of these machines has also increased. These factors have led to expansion of the valley trail network and increased the number and extent of stream crossings potentially impacting fish habitat, as well as impacting wetland complexes and degradation of the trail systems. A strategy needs to be developed to address the issues associated with the increase of ATV/ORV use in the valley and should include public outreach and education, evaluation of ATV stream crossing, development and implementation of techniques to improve stream crossings, and closures where multiple crossings are occurring in close proximity to one another.

Inter-communication on Salmon within the Mat-Su and the State

Discussion Lead: Jeremy Grauf, U.S. Army Corps of Engineer

Agencies, organizations, and academics can become hyper-focused on their own tasks and missions, which can make it difficult to broaden knowledge and insight outside of our bubbles. The Salmon Symposium is a great venue to share the latest science and work done within the Mat-Su. What information is lacking within your bubble, needs to be shared outside of your bubble, or what other events in the future do you know of that can help with collaboration?



Keynote Speaker: Dr. Tara Martin

University of British Columbia Department of Forest & Conservation Sciences



Dr. Tara Martin is a conservation scientist in the Department of Forest and Conservation Sciences, University of British Columbia and is a pioneer in the translation of ecological data into conservation management decisions. Dr. Martin's research is being adopted around the world to help organizations decide what actions to take, when and where to get the best conservation outcomes, while taking into account the many other competing needs of society. With over 100 scientific publications, Tara's work bridges the gap between science and on-the-ground action.

Tara is the recipient of several awards and fellowships, including most recently the 2015 Thomson Reuters Citation & Innovation Award for her work on the effects of climate change on habitat loss and conservation decisions, and the 2017 Wilburforce Fellowship. Tara sits on several national and international panels including the International Union for the Conservation of Nature (IUCN) Climate Change Specialist Group, where she leads the Climate Adaptation theme. She is an associate editor for *Conservation Biology* and *Animal Conservation* and her current research interests include: prioritizing threat management for nature conservation and resource management; climate adaptation and mitigation under global change; recovery of endangered species; management of invasive and overabundant species; and decision making under uncertainty. For more on her research and lab go to www.taramartin.org

Abstract

Strategizing How to Avoid Irreversible Loss of Wild Salmon Populations

In this talk, I will speak about work being done to help organizations decide what actions to take, when and where to get the best conservation outcomes, and how to take into account the many other competing needs of society. These techniques can be applied to determine what it takes to avoid irreversible loss of wild salmon populations and prioritize actions for their restoration and conservation. I will draw on my team's current work in the Fraser River Estuary, British Columbia, historically one of the largest salmon bearing rivers in the world.



Attendee List

Kelsey Aho

Hydrographer
U.S. Environmental Protection Agency
200 SW 35th Street, Corvallis, OR 97333
541-754-4431
ahokelsey@gmail.com

Dave Albert

Director of Conservation Science
The Nature Conservancy
416 Harris Street, Suite 301, Juneau, AK 99801
907-586-2301
dalbert@tnc.org

Erika Ammann

Fish Biologist
NOAA, National Marine Fisheries Service
222 W 7th Avenue, Anchorage, AK 99501
907-271-5118
erika.ammann@noaa.gov

Joshua Ashline

Fish Biologist
U.S. Fish and Wildlife Service
4700 BLM Road, Anchorage, AK 99507
907-891-3786
joshua_ashline@fws.gov

Adrian Baer

Fish and Wildlife Technician III
Alaska Department of Fish and Game
1800 Glenn Highway, Ste 2, Palmer, AK 99645
adrian.baer@alaska.gov

Andrew Barclay

Fishery Biologist
Alaska Department of Fish and Game
Gene Conservation Lab
333 Raspberry Road, Anchorage, AK 99518
907-267-2290
andy.barclay@alaska.gov

Ron Benkert

Regional Supervisor
Alaska Department of Fish and Game
1800 Glenn Highway, Ste 6, Palmer, AK 99645
ronald.benkert@alaska.gov

Brianne Blackburn

Environmental Planner
Mat-Su Borough
350 E Dahlia Ave, Palmer, AK 99645
907-861-8439
brianne.blackburn@matsugov.us

Eric Booton

Trout Unlimited
3105 Lakeshore Drive, Suite 102B
Anchorage, AK 99517
ebooton@tu.org

Christy Cincotta

Executive Director
Tyonek Tribal Conservation District
1689 C Street, Suite 219, Anchorage AK 99501
907-646-3109
ccincotta@tyonek.com

Daniel Coleman

Natural Resource Specialist
State of Alaska, Dept of Natural Resources
5310 S Bodenburg Spur, Palmer, AK 99645
daniel.coleman@alaska.gov

Sam Cotten

Commissioner
Alaska Department of Fish and Game
PO Box 115526, Juneau, AK 99811-5526
907-465-6141
dfg.commissioner@alaska.gov

Mike Daigneault

Alaska Regional Coordinator
U.S. Fish and Wildlife Service
1011 East Tudor Road, Anchorage, AK 99503
907-786-3523
michael_daigneault@fws.gov



Nick DeCovich

Fishery Biologist
Alaska Department of Fish and Game
1800 Glenn Hwy Suite 2, Palmer, AK 99645
907-746-6324
nick.decovich@alaska.gov

Jim DePasquale

Spatial Analyst
The Nature Conservancy
715 L Street, Anchorage, AK 99501
907-865-5702
jdepasquale@tnc.org

Rachel Donkersloot

Working Waterfronts Program Director
Alaska Marine conservation Council
907-277-5357
rachel@akmarine.org

Stephen Dotomain

Fishery Biologist I
Alaska Department of Fish and Game
1800 Glenn Highway, Ste 2, Palmer, AK 99645
907-746-6386
stephen.dotomain@alaska.gov

Kristine Dunker

Fishery Biologist
Alaska Department of Fish and Game
333 Raspberry Road, Anchorage, AK 99518
907-267-2889
kristine.dunker@alaska.gov

Ian Dutton

Nautilus Impact Investing
765 G Street, Ste 100-924
Anchorage, AK 99517
907-280-8923
ian@nautilusii.com

Ted Eischeid

Water Quality Technician
Matanuska-Susitna Borough
350 E Dahlia Ave, Palmer, AK 99645
907-861-8606
Ted.Eischeid@matsugov.us

Mark Eisenman

Habitat Biologist
Alaska Department of Fish and Game
333 Raspberry Road, Anchorage, AK 99518
907-242-1885
mark.eisenman@alaska.gov

Laura Eldred

Environmental Program Specialist
Alaska Department of Environmental
Conservation
1700 E Bogard Road, Wasilla, AK 99564
907-376-1855
laura.eldred@alaska.gov

Leah Ellis

Habitat Biologist
Alaska Department of Fish and Game
333 Raspberry Road, Anchorage, AK 99518
907-267-2404
leah.ellis@alaska.gov

Larry Engel

Mat-Su Borough Fish and Wildlife Commission
350 E Dahlia Ave, Palmer, AK 99645

Joe Flotemersch

Ecologist
U.S. Environmental Protection Agency
26 W Martin Luther King Drive
Cincinnati, OH 45268
513-569-7086
flotemersch.joseph@epa.gov

Jeff Falke

U.S. Geological Survey, Alaska Cooperative
Fish and Wildlife Research Unit
PO Box 757020, Fairbanks, AK 99775
jeffrey.falke@alaska.edu

Jimmy Fox

Deputy Manager
U.S. Fish and Wildlife Service
101 12th Avenue, Rm 110, Fairbanks, AK 99701
jimmy_fox@fws.gov



Jonathon Gerken

Branch Chief
U.S. Fish and Wildlife Service
4700 BLM Road, Anchorage, AK 99507
jonathon_gerken@fws.gov

Cindy Gilder

Environmental Program Manager
Alaska Department of Environmental
Conservation
555 Cordova Street, Anchorage, AK 99501
907-269-3066
cindy.gilder@alaska.gov

Michael Gracz

Wetland Program Manager
Kenai Watershed Forum
44129 Sterling Highway, Soldotna, AK 99669
mike@kenaiwatershed.org

Kyle Graham

U.S. Fish and Wildlife Service
43655 Kalifornsky Beach Road
Soldotna, AK 99669
kyle_graham@fws.gov

Jeremy Grauf

Project Manager
U.S. Army Corps of Engineers
CEPOA-RD-NN, North Section
PO Box 6898, JBER, AK 99506
907-753-2798
jeremy.grauf@usace.army.mil

Albert Harisson

Treasurer / Elder
Chickaloon Village Traditional Council
PO Box 1105 Chickaloon, AK 99674
907-745-0749

Suzanne Hayes

Volunteer
Valley Community for Recycling Solutions
9465 Chanlyut Circle, Palmer, AK 99645
shayes@mtaonline.net

Melissa Heuer

Executive Director
Susitna River Coalition
PO Box 320, Talkeetna, AK 99676
Melissa@SusitnaRiverCoalition

Rodney Hobby

Biologist
Cook Inlet Aquaculture Association
40610 Kalifornsky Beach Road
Kenai, AK 99611
907-283-5761
rhobby@ciaanet.org

George Hoden

Land Management Specialist
Matanuska-Susitna Borough
350 E Dahlia Avenue, Palmer, AK 99645
907-861-8489
ghoden@matsugov.us

Kelly Ingram

Conservation Practitioner
The Nature Conservancy
715 L Street, Ste 100, Anchorage, AK 99501
907-865-5703
kelly.ingram@tnc.org

Catherine Inman

Owner
Mat-Su Conservation Services
780 Cascade Ct, Palmer, AK 99645
907-841-2226
catherine@matsuconservation.com

Sam Ivey

Area Management Biologist
Alaska Department of Fish and Game
1800 Glenn Highway, Suite 2
Palmer, Alaska 99645
samuel.ivey@alaska.gov

Cody Jacobson

Fishery Biologist
Alaska Department of Fish and Game, SOA
1800 Glenn Highway, Suite 2
Palmer, Alaska 99645
907-746-6374
cody.jacobson@alaska.gov



Chase Jalbert

Graduate Research Assistant
University of Alaska Fairbanks, Alaska
Cooperative Fish and Wildlife Research Unit
902 N Koyukuk Drive, Fairbanks, AK 99755
907-854-6505
cjalbert@alaska.edu

Paul Janke

Regional Hydrologist
Alaska Department of Transportation
PO Box 196900, Anchorage, AK 99507
907-269-0526
paul.janke@alaska.gov

Michelle Jezeski

Conservationist, Central Hub Leader
USDA, Natural Resources Conservation Service
1508 E Bogard Rd, Ste 203, Wasilla, AK 99654
907-373-6429 x101
michelle.jezeski@ak.usda.gov

Jessica Johnson

Habitat Biologist III
Alaska Department of Fish and Game
333 Raspberry Road, Anchorage, AK 99518
jessica.johnson@alaska.gov

Leslie Jones

Program Aquatic Ecologist
Alaska Center for Conservation Science, UAA
3211 Providence Drive, Anchorage, AK 99508
lajones12@alaska.edu

Kevin Keith

Habitat Biologist
Alaska Department of Fish and Game
333 Raspberry Road, Anchorage, AK 99518
907-267-2836
kevin.keith@alaska.gov

Dan Kent

Executive Director
Salmon-Safe
317 SW Alder St, Ste 900, Portland, OR 97214
503-232-3750
dan@salmonsafe.org

Jonathan Kirsch

Habitat Biologist III
Alaska Department of Fish and Game
1800 Glenn Highway, Ste 6, Palmer, AK 99645
jonathan.kirsch@alaska.gov

Matthew LaCroix

Biologist
U.S. Environmental Protection Agency
222 W 7th Ave #19, Anchorage, AK 9513
907-271-1480
lacroix.matthew@epa.gov

Marc Lamoreaux

Land and Environment Director
Native Village of Eklutna
26339 Eklutna Village Rd, Chugiak, AK 99567
907-688-8522
nve.ledirector@eklutna-nsn.gov

Heather Langendorf

Park Specialist
Alaska State Parks
7278 E Bogard Rd, Wasilla, AK 99654
hlangendorf@gmail.com

Ann Marie Larquier

Habitat Biologist III
Alaska Department of Fish and Game
333 Raspberry Road, Anchorage, AK 99518
907-267-2311
ann.larquier@alaska.gov

Scott Leibowitz

Research Ecologist
U.S. Environmental Protection Agency
200 SW 35th St, Corvallis, OR 97333
(541) 754-4508
leibowitz.scott@epa.gov

Katrina Liebich

Fisheries Outreach Coordinator
U.S. Fish and Wildlife Service
1011 E Tudor Road, Anchorage, AK 99503
907-786-3637
katrina_liebich@fws.gov



Trent Liebich

Habitat Restoration
U.S. Fish and Wildlife Service
4700 BLM Road, Anchorage, AK 99507
907-271-1798
trent_liebich@fws.gov

Megan Marie

Habitat Biologist
Alaska Department of Fish and Game
333 Raspberry Road, Anchorage, AK 99518
907-267-2446
megan.marie@alaska.gov

Sue Mauger

Science Director
Cook Inletkeeper
3734 Ben Walters Lane, Homer, AK 99603
907-235-4068 x24
sue@inletkeeper.org

Michael Mazzacavallo

Biologist
R2 Resource Consultants, Inc.
601 W 5th Ave, Floor 2, Anchorage, AK 99508
907-771-4090
mmazzacavallo@r2usa.com

Matt McMillan

Stewardship Coordinator
Great Land Trust
715 L Street, Suite 200, Anchorage, AK 99501
907-278-4998
matt@greatlandtrust.org

Douglas Molyneaux

Fishery Biologist
Non-affiliated
P.O. Box 233624, Anchorage, AK 99518
dmolyneaux@gci.net

Emily Munter

Fish & Wildlife Biologist
U.S. Fish and Wildlife Service
43655 Kalifornsky Beach Rd
Soldotna, AK 99669
907-260-0124
emily_munter@fws.gov

Terry and Joanie Nininger

Mat-Su Borough Fish and Wildlife Commission
PO Box 877944, Wasilla, AK 99687
nininger@alaska.net

Ray Nix

Resource Manager
Matanuska-Susitna Borough
350 E Dahlia Avenue, Palmer, AK 99645
907-861-7863
ray.nix@matsugov.us

Amy O'Connor

Mat-Su Program Manager
The Alaska Center
364 S Denali Street, Ste #4, Palmer, AK 99645
907-793-8640
amy@akcenter.org

Samantha Oslund

Assistant Area Management Biologist
Alaska Department of Fish and Game
1800 Glenn Highway, Ste 2, Palmer, AK 99645
907-746-6332
samantha.oslund@alaska.gov

William Rice

National Fish Passage Program Coordinator
U.S. Fish and Wildlife Service, Mountain-
Prairie Region
PO Box 25486, Denver, CO 80225
303-236-4219
william_rice@fws.gov

Dan Rinella

Fisheries Biologist
U.S. Fish and Wildlife Service
4700 BLM Road, Anchorage, AK 99507
907-891-3783
daniel_rinella@fws.gov

Heidi Robuck

Water Resources Engineer
DOWL
4041 B Street, Anchorage, AK 99503
907-562-2000
hrobuck@dowl.com



Katherine Schake

Contractor
Anchorage, AK 99508
907-205-0235
kaschake@gmail.com

Ashley Seim

Sr. GIS Programmer/Analyst
Resource Data, Inc.
560 E 34th Ave, Ste 100, Anchorage, AK 99503
907-743-7535
aseim@resourcedata.com

Nina Selvage

Fishery Biologist
Alaska Department of Fish and Game
333 Raspberry Road, Anchorage AK 99518
fishme1@hotmail.com

Rebecca Shaftel

Aquatic Ecologist
UAA, Alaska Center for Conservation Science
3211 Providence Drive, Anchorage, AK 99508
rshaftel@alaska.edu

Jack Sinclair

Executive Director
Kenai Watershed Forum
44129 Sterling Highway, Soldotna, AK 99669
907-398-7497
jack@kenaiwatershed.org

Samuel Snyder

Stand for Salmon Engagement Director
6608 Mink Avenue, Anchorage, AK 99504
907-903-5811
ssnyder@tu.org

Steven Solari

Marketing and Sales Director
Meier Lake
9 Pepper Tree Lane
Palos Verdes Peninsula, CA 90274
solaristeven@gmail.com

Kim Sollien

Mat-Su Program Director
Great Land Trust
642 S Alaska Street, Ste 202 Palmer, AK 99645
907-290-3560
ksollien@greatlandtrust.org

Jessica Speed

Mat-Su Salmon Partnership Coordinator
The Nature Conservancy
715 L Street, Suite 100, Anchorage, AK 99501
907-575-7818
jspeed@tnc.org

Adam St. Saviour

Fishery Biologist
Alaska Department of Fish and Game
1800 Glenn Highway, Ste 2, Palmer, AK 99645
adam.stsaviour@alaska.gov

Jarred Stone

Graduate Student
Alaska Pacific University
4210 University Drive, Anchorage, AK 99510
jstone@alaskapacific.edu

Nicole Swenson

Conservation Director
Tyonek Tribal Conservation District
1689 C St, Room 219, Anchorage, AK 99501
907-646-3110
nswenson@tyonek.com

Arni Thomson

Consultant
Alaska Fisheries Consulting
720 M Street #101, Anchorage, AK 99501
907-570-1959
athomsonak@gmail.com

Melanie Trost

Watershed Coordinator
Matanuska-Susitna Borough
350 E Dahlia Avenue, Palmer, AK 99645
907-861-8608
mtrost@matsugov.us



Tim Troll

Coordinator
SW Alaska Salmon Habitat Partnership
P.O. Box 1388, Dillingham, AK 99576
nmwtlandtrust@hotmail.com

Karli Tyance Hassell

Graduate Student
Alaska Pacific University
4101 University Drive, Anchorage, AK 99508
ktyance@alaskapacific.edu

Kirsten Valentine

Water Resources Engineer
DOWL
4041 B Street, Anchorage, AK 99503
907-562-2000
kvalentine@dowl.com

Tania Vincent

Fishery Biologist II
Alaska Department of Fish and Game
333 Raspberry Road, Anchorage, AK 99518
907-267-2192
vintzensius@gmail.com

Ryan Viola

Teacher
Wasilla Lake Christian School
2001 E Palmer-Wasilla Hwy
Wasilla, AK 99654
907-414-7471
sciencezooguy0@gmail.com

Lisa Wade

Director
Chickaloon Village Health, Social Services &
Education
PO Box 1105 Chickaloon, AK 99674
907-745-0749

Angeleen Waskey

Land and Environmental Coordinator
Native Village of Eklutna
26339 Eklutna Village Road
Chugiak, AK 99567
907-688-8522
nve.lecoordinator@eklutna.nsn.gov

Alexandra West Jefferies

Senior Engineer
PND Engineers, Inc.
1506 W. 36th Ave, Anchorage, AK 99503
907-561-1011
ajefferies@pndengineers.com

Sarah Wilber

Habitat Biologist II
Alaska Department of Fish and Game
Division of Habitat
1800 Glenn Highway, Ste 6, Palmer, AK 99645
sarah.wilber@alaska.gov

Mark Willette

Upper Cook Inlet Research Biologist
Alaska Department of Fish and Game
43961 Kalifornsky Beach Rd, Ste B
Soldotna, AK 99669
907-260-2911
mark.willette@alaska.edu

Jessica Winnestaffer

Environmental Stewardship Director
Chickaloon Native Village
P.O. Box 1105, Chickaloon, AK 99674
907-745-0737
jessica@chickaloon.org



Thank You!

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