Alaska Section of the American Water Resources Association

September 17-19, 2019

Meeting Abstracts

(Alphabetical by last name; oral presentation unless otherwise indicated)

Presenter: Dina Abdel-Fattah

Authors: Abdel-Fattah, Dina, University of Alaska Fairbanks; Trainor, Sarah, University of Alaska Fairbanks; Kienholz, Christian, University of Alaska Southeast; Hood, Eran, University of Alaska Southeast; Jacobs, Aaron, National Weather Service; van Breukelen, Celine, National Weather Service

Title: The role of stakeholder feedback in glacial lake outburst flood monitoring tools – Mendenhall and Snow Glaciers

Abstract: There are a number of glacial lake outburst floods (GLOFs) that affect downstream communities in Alaska. Notably, Suicide Basin – adjacent to Mendenhall Glacier – has impacted areas downstream along Mendenhall Lake and River in Juneau since 2011. Records of glacial dammed lake releases via Snow Glacier date as far back as 1949, affecting downstream areas along the Kenai and Snow river systems. Several informational products – produced by the National Weather Service, the US Geological Survey, as well as the University of Alaska Southeast with regard to Suicide Basin – are available to aid in monitoring both these glacial dammed lakes as well as the ensuing GLOFs. This study (2018 – 2019) analyzed how stakeholders affected by the aforementioned GLOFs utilize these various products. The participants in this project included stakeholders from a variety of different sectors and backgrounds – such as but not limited to federal, state, and local agencies; emergency responders; homeowners; and local businesses – to help capture a diverse set of perspectives and insights. In addition, feedback and suggestions were collected from stakeholders to see if any improvements or modifications could be undertaken by the relevant information providers, to make the informational products more usable. Findings from this study were used to inform changes to the monitoring websites for both Suicide Basin and Snow Glacier.

Presenter: Luca Adelfio

Authors: Adelfio, Luca A. Chugach Nat'l Forest, U.S.D.A. Forest Service; Tanner, Theresa L. Chugach Nat'l Forest, U.S.D.A. Forest Service; Schreck, William J. Chugach Nat'l Forest, U.S.D.A. Forest Service; Kuntzsch, Denya Chugach Nat'l Forest, U.S.D.A. Forest Service

Title: Streamflow data collected for instream water reservations at Bering River, Alaska

Abstract: We have collected stage and discharge data for four years as part of an ongoing study within the Bering River system, important fisheries habitat located 90 km southeast of Cordova. These data and the flow duration method will be used to apply for instream flow reservations. Catchments upstream from each study reach varied in area (75 to 362 sq. km.) and perennial snow and ice cover (0 to 27 percent). We collected 15-minute stage data at stream gauging stations installed on two of the four study reaches, Kushtaka Outlet reach (of Bering River) and Bering Outlet reach (of Lower Dick Creek). We collected discharge measurements and estimated high flows indirectly using the slope-area and slope-conveyance methods. We established rating curves and calculated 15-minute and daily discharge for both gauged reaches. We extended daily discharge records at Shepherd Creek and an upstream reach of Dick Creek using linear regression and mass balance. Daily discharge records were summarized as day-of-year average flow, flow exceedance percentiles, monthly average discharge, and open-water period (15 April to 3 November) discharge. Mean open-water period discharge was highest (2,080 cubic feet per second) at Kushtaka Outlet, the reach with the greatest glacier influence, and lowest (700 cubic feet per second) at Dick Creek, the reach without glacier influence. Day-of-year flows were highest on 16 August at all four reaches. Monthly average flows were lowest in October at Kushtaka Outlet reach and in July at the remaining three reaches. Throughout the study, annual or biannual glacier lake outburst floods released from Berg Lake, affecting the study area. Each event inundated approximately 100 sq. km. downstream, including all four study reaches. In addition to providing data for flow reservations, this project delivered novel insights into the changing water resources of a remote and dynamic glacier river system.

Presenter: Chris Arp

Authors: Arp, Chris D. University of Alaska; Whitman, Matthew S. Bureau of Land Management; Kemnitz, Richard M. Bureau of Land Management

Title: Long-term Evidence for Hydrological System Regime Change from the Fish Creek Watershed Observatory in northern Alaska

Abstract: Rapid changes in climate coupled with expanding development on the Arctic Coastal Plain of northern Alaska (ACP) make sustaining hydrological observations increasingly important. Fish Creek drains a 4600 km2 area of the ACP in the National Petroleum Reserve in Alaska (NPR-A). While oil production in this watershed unit only began in 2016, environmental monitoring began much earlier in 2001. Hydroclimatic datasets for this watershed now span 18 years and record notable changes in precipitation, total runoff, and runoff regimes. Discharge records from three adjacent rivers representing varying geologic conditions and lake extents provide the framework for the Fish Creek Watershed Observatory (FCWO). Three periods with distinct hydrologic regimes were identified from this record. The 2001-2008 period had average mean annual runoff (MAR) of 90 mm with a severe drought in 2007. 2009-2015 was characterized by higher MAR of 120 mm and several years with early and high snowmelt runoff. The most recent three years, 2016-2018, had even higher MAR of 146 mm, but relatively low and late snowmelt. Hydrograph separation suggests a regime shift to rainfall dominated runoff in the most recent period compared to approximately 75% of runoff contributed from snowmelt in the previous 15 years. Our analysis suggest that this shift in runoff contributions and increase in total runoff is partially due to greater open water extent with declining sea ice. Future development on the ACP will require careful planning to avoid flood and channel change hazards, permafrost degradation, and ecosystem damage.

Presenter: Chris Arp

Authors: Arp, Chris D. University of Alaska; Oxtoby, Laura E. University of Alaska; Spellman, Katie V. University of Alaska

Title: Fresh Eyes on Ice: Connecting Arctic Communities through a Revitalized and Modernized Freshwater Ice Observation Network (POSTER)

Abstract: Snow and ice are essential parts of living in cold places, and all northern peoples observe, understand, and appreciate how these change every year. Wide-scale observations of freshwater ice and how its presence has changed over time will meet a fundamental need for a broad range of stakeholders, from rural communities that depend on ice for transportation and subsistence harvest, to industries that rely on winter water for ice road construction, to scientists studying climate change and ecosystem services. The Fresh Eyes on Ice observation network addresses this need by collecting data across a wide area of interior, western, and northern Alaska using satellite observations, monitoring stations on lakes and rivers, and field campaigns by snowmachine—all integrated with a partnership of community-based local scientists, teachers, and school children. The design for this observation network builds on the Alaska Lake Ice and Snow Observatory Network (ALISON), a project hosted by University of Alaska Fairbanks from 1999 to 2011 that used this basic premise for hands-on data collection by K-12 students and teachers in communities across Alaska. Teachers still informally use the ALISON program; by reviving this approach through the Fresh Eyes on Ice observation network, using modernized techniques, this project will foster new appreciation for environmental change in the Arctic and inspire new scientists, in addition to providing valuable information in a time of rapid change.

Presenter: Bernard Romey

Authors: Romey, Bernard, Romey Fisheries & Aquatic Science; Martin, Douglas Martin Environmental

Title: Landscape-level Model for Predicting Juvenile Coho Salmon Rearing Habitat in Southeast Alaska

Abstract: Maintaining viable populations of Coho Salmon requires accurate and comprehensive habitat suitability information. However, comprehensive information on habitat quality and the distribution of important habitat for large regions of coastal southeast Alaska landscapes is limited with poor resolution. In this study, relative densities of juvenile Coho from 47 study reaches representing the range of geomorphic channel types on Chichagof Island in Southeast Alaska were used as an indicator of habitat quality. A high-resolution digital elevation model was used to define and map the spatial patterns of persistent geomorphic attributes that influence the location and quality of habitat utilized by Coho. The most important persistent predictors of Coho reach occupancy were selected using a non-parametric random forest classification model with channel gradient, mean annual flow, and channel constraint adequately predicting where probable habitat occurs across the landscape. This HIP model has practical applications to assist resource manager in mapping complete coverage of habitat quality for large portions of the landscape that are underrepresented and to facilitate the prioritization of conservation or restoration objectives (e.g., fish passage culverts, large wood placement).

Presenter: Bob Bolton

Authors: Bolton, Bob, University of Alaska Fairbanks; Wilson, Cathy J., Los Alamos National Lab

Title: Snow, Vegetation, and Permafrost Interaction on the Seward Peninsula

Abstract: Not Available

Presenter: Jeff Conaway

Authors: Conaway, Jeffrey S. U.S. Geological Survey Alaska Science Center

Title: Overview of the 2019 Water Year at USGS Streamgages

Abstract: A U.S. Geological Survey network of 108 streamflow information stations spans every climactic and physical setting in Alaska. Streamflow magnitude and duration integrates weather, climate, and basin characteristics into one signal. Comparisons of 2019 streamflow and water temperatures to historical values show that 2019 is exceptional at many locations across the entire network. Stations in southeast continued to experience below average streamflows in the spring with record daily low flows recorded in March at Fish Creek near Ketchikan, which has a 100-year record of streamflow. Most of Alaska experienced the hottest and driest summer on record in 2019. Record high daily flows were recorded in June and July at several sites in Southcentral Alaska where glaciers contribute significantly to the streamflow while nearby basins with no glacial contribution to streamflow experienced record daily low flows. Record high daily water temperatures were recorded in the Yukon and Kuskokwim basins and throughout Cook Inlet. Drought conditions in late August were classified as extreme in Anchorage and surrounding areas where record daily low flows on the Little Susitna River prompted a closure to salmon fishing. The Alaska Range and Tanana Basin experienced prolonged rainfall and high flows in August resulting in several flood warnings and flow on the Chena River nearing the level to operate the Moose Creek Dam. Glacial lake outburst floods were observed on the Copper, Taku, Kennicott, Valdez Glacier, Mendenhall, Snow, Tazlina, and Kenai Rivers.

Presenter: Jeff Conaway

Authors: Conaway, Jeffrey S. U.S. Geological Survey Alaska Science Center

Title: U.S. Geological Survey Water Quality Strategy for Transboundary Alaskan Rivers

Abstract: The USGS recently began a baseline assessment to characterize whether multiple, large-scale mining activities operating or planned in British Columbia will have measurable effects on the water quality and ecological conditions of transboundary, Alaskan rivers. Baseline conditions refers to current conditions of the Alsek, Stikine, Taku, and Unuk Rivers in Alaska, which may have already been affected to some extent by upstream mining activities that date back to at least the 1860s. Characterization of baseline conditions will be accomplished through (1) assessment of the geology and mineralization potential of study area watersheds, (2) retrospective analysis and new data collection to characterize the water, sediment, and biological quality of the rivers, and (3) the establishment of partnerships with tribes and government agencies to ensure that assessments meet the needs of Tribes and local

stakeholders. Continuous monitoring of several water quality parameters is underway on each of the rivers. Periodic water quality measurements of metals, nutrients, and major ions will be used to develop relationships with the continuous monitoring data to quantify loads at daily, monthly, and yearly timesteps. These data will serve as the basis for which to identify potential changes in water-quality conditions resulting from future upstream mining activities. Annual surveys will also be conducted to quantify baseline metal concentrations in streambed sediment and aquatic biota, including algae, macroinvertebrates, and fish.

Presenter: Janet Curran

Authors: Curran, Janet H, USGS; Biles, Frances E., U.S. Forest Service

Title: Alaska hydrograph and peak streamflow seasonality and the influence of streamflow drivers

Abstract: Alaska rivers receive runoff from rainfall, snowmelt and glacier melt at varying times and in varying amounts, generating a range of hydrograph patterns. Understanding these patterns and their drivers can inform expectations of hydrologic response to climate, such as how a warm, dry year can produce record high flows in some streams and record lows in others. A classification of hydrograph patterns for 253 streams gaged by the USGS, an increase of 77 streams over a preliminary analysis, identified 9 hydrograph types in 3 major groups. Hydrographs were grouped using a hierarchical cluster analysis of mean monthly streamflow for the period of record, normalized by mean annual flow, also known as Parde coefficients. Identification of seasonal streamflow drivers within each hydrograph type showed that differences in summer melt and rainfall contributions generated notable distinctions between hydrograph types across the state. Summer forms a primary low-flow season in warmer, low-elevation streams, a secondary low-flow season between spring snowmelt and fall rainfall periods in colder but moderate-elevation streams, and a prolonged high-flow season sustained by high-elevation snowmelt and glacier melt in high-elevation basins. Seasonal patterns in annual peak streamflows within hydrograph types facilitated identification of peak populations by streamflow driver. Driver-based peak populations showed differences in magnitude that varied considerably between hydrograph types. Daily temperature and precipitation records for representative streams showed single-driver peak streamflows occurred but were often limited to selected environments such as snowmelt peaks in cold, arid northern regions. More commonly, peak streamflows resulted from hybrid drivers, such as a short-term rainfall-driven pulse during a melt-driven period of elevated daily mean flows.

Presenter: Carl Dierking

Authors: Dierking, Carl GINA; Cable, Jay GINA; Pace, John GINA; Delamere, Jennifer GINA

Title: Polar Satellite Data for Hydrologic Applications in Alaska

Abstract: The size and complexity of Alaska's topography present huge challenges for monitoring hydrologic conditions with surface-based instruments. However, a new generation of satellites with more sophisticated derived products offers potential solutions for observing environmental changes across the state. With support from NOAA's Joint Polar Satellite System (JPSS), GINA/UAF operates two downlink antennas in Fairbanks with a "near real-time" processing system to produce low latency, high

resolution polar satellite products for environmental monitoring over Alaska. Observations are retrieved from many different satellites including the latest JPSS NOAA-20 with 375 meter resolution. Since polar satellite trajectories pass frequently over northern latitudes, GINA is able to provide timely, high resolution information to the National Weather Service (NWS) as well as other state and federal agencies responsible for mitigating potentially hazardous events.

This presentation will review satellite products that GINA is currently producing specifically related to hydrologic monitoring. These include: Rain Rates, Snowfall Rates, and Snow Water Equivalent (SWE) from the Microwave Integrated Retrieval System (MiRS), a River Flood Areal Extent product developed at by Sanmei Li at George Mason University (GMU), and River Ice products developed by Naira Chaouch at City University of New York (CUNY). As these and other examples will demonstrate, the great needs and high latitudes of Alaska make it a natural proving ground for advancing the use of polar orbiting satellite observations into the future.

Presenter: Jason Fellman

Authors: Fellman, Jason. Alaska Coastal Rainforest Center at the University of Alaska Southeast; Bellmore, J. Ryan. USFS Pacific Northwest Research Station; Hood, Eran. University of Alaska Southeast; Dunkle, Matthew R. University of Idaho; Edwards, Richard T. USFS Pacific Northwest Research Station

Title: From glacial, to snow, to rain: Effects of hydrochemical homogenization on stream food webs in southeast Alaska (POSTER)

Abstract: Watersheds in southeast Alaska frequently contain a mosaic of glacier-, snow-, and rain-fed streams that have distinct hydrologic, temperature and biogeochemical regimes. However, as glaciers recede and precipitation increasing falls as rain rather than snow, the physical and biochemical characteristics that make a glacial or snowmelt stream different from a rainwater stream may fade. Among the unforeseen consequences of this regional hydrologic homogenization could be the loss of unique food webs that sustain aquatic consumers, such as juvenile salmonids. To explore this scenario, we parameterized a stream food web model with long-term physico-chemical data from predominantly glacial-, snow- and rain-fed streams in southeast Alaska, and used the model to predict the seasonal and annual dynamics of resource availability and consumer biomass. Model results suggest that these three stream types exhibit seasonal asynchronies in the peaks and troughs of periphyton and aquatic invertebrate biomass over the year. For mobile fish consumers that can track seasonal peaks in resource abundance across river networks, the presence of these resource asynchronies increased the modeled capacity to support annual fish growth. These findings suggest that climate change induced homogenization of watershed hydrologic regimes may result in the loss of unique food web dynamics, which in turn, could undermine the capacity of watersheds to sustain populations of mobile consumers.

Presenter: Jenn Hamblen

Authors: Poinsette, Derek E., Executive Director, Takshanuk Watershed Council; Daniel Klanott, Environmental Specialist, Chilkat Indian Village; Hamblen, Jenn M., Development Director, Takshanuk Watershed Council

Title: Water Quality Monitoring in the Chilkat Watershed, Haines, Alaska

Abstract: The Takshanuk Watershed Council acts as stewards of local watersheds for the Haines and Klukwan communities. We work closely with local tribal partners, the Chilkat Indian Village and Chilkoot Indian Association. In this talk, we will introduce two local water quality projects.

We have begun long term monitoring of stream temperature at representative sites; this work is a part of the Southeast Alaska Stream Temperature Monitoring Network and in Haines is funded by the National Fish and Wildlife Foundation. Over time, this data will show how climate change is impacting stream temperature at a variety of sites with water sources that range from glacial to snowmelt to rainfall dominated.

Also, we perform baseline water quality monitoring throughout the Chilkat watershed to document the current, near pristine conditions prior to expansion of a proposed major industrial development, the Palmer Mine Project by Constantine Metals, Inc. This work is funded by the Chilkat Indian Village. Although this mine is on the US side of this transboundary watershed, the Chilkat is equally as threatened by proposed mining activity as other area transboundary rivers with mining activity (or proposed mines) on the Canadian side of their watersheds. We are working with staff from Central Council of Tlingit and Haida Indian Tribes of Alaska, who are monitoring two of the 4 sites. Parameters measured to date include quarterly water chemistry and soil samples for a suite of metals. Together with CCTHITA, CIA, CIV, and other scientists in both the US and Canada, we are continuing to diversify our baseline monitoring to include methods to catch potential bursts of contaminants at sites, such sampling resident fish tissue for metals and monitoring macroinvertebrate community composition.

Presenter: Eran Hood

Authors: Hood, Eran; Pietzsch, Erich; Wolken, Gabriel; Stahle, Danny; Dryer, Pat; Wilson; McKenzie

Title: Using dendrochronolgy to reconstruct Juneau's avalanche history

Abstract: The City and Borough of Juneau (CBJ), Alaska, has among the highest urban avalanche danger in the United States, with regular impacts to people, property, critical infrastructure, and natural resources. This presentation will describe a new project that is employing dendrochronological methods to construct avalanche chronologies for a series of avalanche paths in the Juneau area. The paths we are sampling range over a distance of more than 100 km from Berner’s Bay to Speel Arm and include sites on Douglas Island and in downtown Juneau. At each avalanche path, 40-100+ tree cross sections and cores along with GPS locations are collected from the flanks and toe of the path. In the lab, cross sections and cores are finely sanded and analyzed with a microscope for age determination. To develop an avalanche chronology, dates of impact scars and reaction wood are recorded for each cross-section and core. These analyses will allow us to construct a tree-ring-based chronology of large magnitude avalanches in the Juneau area. The expected outcomes from our project include: 1) improved knowledge of the spatial extent of specific avalanche paths that will enhance avalanche modeling efforts and updates to local avalanche hazard maps, and 2) improved understanding of links between the incidence and magnitude of avalanches and synoptic-scale weather patterns in southeast Alaska. Ultimately, delineating the spatial extent of large magnitude avalanches in the region will be helpful for

reconstructing avalanche release areas and snow depthsy, which will enhance our ability to forecast large magnitude events in the future via remotely sensed data.

Presenter: Aaron Jacobs

Authors: Jacobs, Aaron, National Weather Service

Title: What is an Atmospheric River (AR)? How do Alaska forecasters monitor these impactful events?

Abstract: Not Available

Presenter: Aaron Jacobs

Authors: Jacobs, Aaron, National Weather Service

Title: Drought in a Rain Forest

Abstract: According to the U.S. Drought Monitor, Southeast Alaska experienced abnormally dry conditions since late January 2018. By May of 2019, drought conditions reached extreme classification over the southern third of the panhandle for the first time in the 20 year history of the drought monitor. Drought impacted hydroelectric power generation, drinking water, streams, fish, and fish hatcheries. Summer of 2019 did not provide much relief but, will the autumn rains come? This talk will cover reported impacts of a drought in a rainforest, discuss if drought conditions are part of the normal climate cycle in a temperate rainforest, and an outlook for fall 2019.

Presenter: Connor Johnson

Authors: Johnson, Connor, University of Alaska Southeast; Hood, Eran W. University of Alaska Southeast; Bellmore, Ryan J. PNW Research station; Dunkle, Matt University of Idaho; Fellman, Jason B. University of Alaska Southeast; Dwyer, Mollie University of Alaska Southeast

Title: Influence of watershed characteristics on invertebrate and organic matter density

Abstract: The amount of organic matter and invertebrate drift in a stream is important for fish and other consumers. The objective of this study was to analyze and contrast organic matter and aquatic invertebrate concentration and export rate within two common coastal stream types in southeast Alaska. The study site was the McGinnis/Montana creek confluence near Juneau, AK. McGinnis creek watershed is primarily snow fed with partial glacier coverage at the highest elevations, while Montana creek watershed is dominated by peatlands and lower elevation forest. Drift nets were placed into each stream to collect invertebrate and organic matter drift. We also measured stream velocity and the submerged portion of the net to estimate the stream water volume associated with each sample. Samples were collected about twice a week at each stream over a period of roughly 5 months (May-October) in 2018. Initial results suggest that the timing, magnitude, and speciation (organic matter versus invertebrates) of drift differed between the two streams. These results provide insights into the availability of resources to support aquatic food webs and how they may change as climate warming

diminishes the amount of runoff from snow and glaciers in coastal watersheds. Finally, these findings hold downstream implications for biogeochemical processes and fish habitat and will contribute to our ability to mitigate the possible detrimental downstream effects of climate change on coastal stream habitats in southeast Alaska.

Presenter: Christian Kienholz

Authors: Kienholz, Christian. University of Alaska Southeast; Pierce, Jamie. US Geological Survey Juneau; Jacobs, Aaron. National Weather Service Juneau; Hood, Eran. University of Alaska Southeast; Wolken, Gabriel. University of Alaska Fairbanks and Alaska Division of Geological & Geophysical Surveys Fairbanks; Amundson, Jason. University of Alaska Southeast; Abdel Fattah, Dina. University of Alaska Fairbanks; Johnson, Crane. National Weather Service River Forecast Center Anchorage; Conaway, Jeff. US Geological Survey Anchorage; Mattice, Tom. City and Borough of Juneau;

Title: Monitoring the 2018 and 2019 outburst floods at Juneau's Mendenhall Glacier

Abstract: Suicide Basin is a glacier-dammed marginal basin of Mendenhall Glacier, Alaska, that has released glacial lake outburst floods (GLOFs) since 2011. The floods cause inundation and erosion along Mendenhall Lake and River, impacting homes and other infrastructure. From 2018 to 2019, we monitored Suicide Basin in detail, conducting water level, ice elevation, ice thickness, and ice speed measurements. We present results from the two field seasons and interpret them in the context of previous years' observations. Specifically, we discuss elevation and volume changes observed in the basin during lake formation and release. We also report on ice dam thinning, ice dam overflow, and lateral lake expansion – all factors that complicate the GLOF forecasting efforts for Mendenhall River. Drones proved particularly useful for our work, hence we emphasize their use in the presentation.

Presenter: Rick Lader

Authors: Rick Lader

Title: Historical and projected precipitation extremes for Southeast Alaska (POSTER)

Abstract: Drought conditions have existed across Southeast Alaska for the past two years and these continue at present. The most extreme drought has occurred across the southernmost areas, but nearly the entire region is under at least moderate drought intensity, according to the United States Drought Monitor. These dry conditions have impacted hydropower electricity generation, water availability and seasonal fish migration. To help place the current drought into a climate context, this research uses new dynamically downscaled reanalysis and climate model simulations to investigate historical trends and future projections of a set of precipitation extremes for Southeast Alaska.

These extremes include magnitude, duration, intensity and threshold-based metrics for both liquid precipitation and snowfall. The historical period from the Climate Forecast System Reanalysis (CFSR) covers 1981-2018 and analysis is presented using daily data at 4-km spatial resolution. Results from two similarly downscaled climate model simulations that utilize a business-as-usual emissions scenario are presented to show how these precipitation extremes are projected to change. Each of these simulations

covers historical (1981-2010) and future (2031-2060) periods. Station data is used as available for comparison with the CFSR analysis. Preliminary results from the CFSR indicate that significant increases have occurred in terms of precipitation intensity, however, the regional maximum number of consecutive wet days shows a significant decrease over the same period.

Presenter: Ann Marie Larquier

Authors: Larquier, Ann Marie Alaska Department of Fish and Game

Title: Protecting Fish and Wildlife Habitat: Alaska's Instream Flow Reservations Program

Abstract: The Alaska Department of Fish and Game's Instream Flow Program is tasked with protecting aquatic resources by quantifying streamflow and acquiring water rights (Reservations of Water) for the purpose of sustaining Alaska's fish and wildlife resources. Since the program's inception in 1986, thousands of miles of fish habitat have been protected on more than 300 rivers and several lakes. The Instream Flow Program is currently operating streamgaging networks across southwest, southcentral, and southeast Alaska. An overview of the existing and anticipated instream flow reservations will be presented, as well as current hydrologic data collection efforts to support these reservations.

Presenter: Uyanga "Angie" Mendbayar

Authors: Comstock, Keith. CEO & President; Mitchell, Duff. Managing Director; Rehfeldt, Jim. Project Lead Engineer; Mendbayar, Uyanga. Associate Engineer; Berlin, Jim. Porject Manager

Title: Heating Buildings with the Warming Seawater

Abstract: The rainforest ecosystem and the ample precipitation in Juneau provide almost 99% of the local electricity production from hydropower (1% from diesel back-up generators) for firm ratepayers, but mining interests use full or partial diesel generation. After seeing the energy insecurity issue from an avalanche incident in 2009, two friends, long-time Juneau residents, and business associates—Keith Comstock and Duff Mitchell—envisioned to strengthen their community resiliency by providing more hydropower from a source away from the Snettisham avalanche hazard zone. This gave birth to the founding of Juneau Hydropower Inc (JHI) in the pursuit of building a hydroelectric facility at Sweetheart Lake, a long-known hydropower resource. After six years of hard work and millions of dollars of investment, the Federal Energy Regulatory Commission (FERC) issued a 50-year license to construct and operate the Sweetheart Lake Project on September 8th, 2016. Since then, JHI has also received a permit from the U.S. Forest Services to start construction in 2019.

Availability of excess renewable energy from the Sweetheart Lake led the founders to envision additional energy security and savings for Juneau. In addition to electrifying transportation and displacing diesel for industrial energy use such as mining, the founders aimed to set Juneau as a renewable energy innovation hub. They sat forth to produce the first seawater heat pump district heating in North America—Juneau District Heating (JDH) to displace heating oil that comprises 86% of Juneau's heating source. Both the hydropower and district heating projects have strong support from the community and local, private investors.

Hereby, Uyanga “Angie” Mendbayar, the associate engineer at JDH, is proposing to present her contribution and the status of the district heating project. She will also explain how this technical engineering work enriches her voluntary activism for climate and energy justice.

Presenter: Sonia Nagorski

Authors: Sonia Nagorski, University of Alaska Southeast; John Hudson. Southeast Alaska Watershed Coalition; Eran Hood. University of Alaska Southeast; Jason B. Fellman. University of Alaska SoutheastTitle: Spawning salmon deliver marine-derived contaminants to southeast Alaskan streams

Abstract: Pacific salmon contribute marine-derived nutrients to freshwater systems where they spawn and die. A potentially negative side effect of their spawning legacy is their contribution of pollutants accumulated during the marine phase of their life cycle. We investigated the contribution of total mercury (Hg) and methylmercury (MeHg) and persistent organic pollutants (POPs) by spawning Pacific salmon to 5 streams in Juneau, Alaska. In streams with natural migration barriers or steep spawner density gradients, we sampled reaches with and without salmon. We measured Hg and MeHg in water, suspended particulates, streambed sediment, biofilm on incubated leaf packs, 2 taxa of benthic macroinvertebrate larvae, and rearing and/or resident fishes. Benthic macroinvertebrates and fishes were also analyzed for a suite of POPs, consisting of historic and current use pesticides and historic and urban use chemicals. For most parameters, contaminant concentrations were higher in the lower reaches where salmon spawners were present, with stronger effects in the streams with higher spawner densities. Filtered MeHg was 10 to 11-fold higher in the lower stream reaches than upstream and made up to 33% of the Hg compared with up to 5% at the upper sites. Biofilm showed particularly consistent spatial patterns, while benthic macroinvertebrates were the least spatially consistent for both Hg and POPs. Fish tissue Hg was not uniformly higher in lower stream reaches due to upstream sources of Hg and different fish species and ages collected above and below barriers. POPs data showed a more consistent signal of marine-derived influence. At all the lower sites, fish tissue HCB, ΣCHLDs, and ΣPCBs, ΣDDTs, were higher than upstream. Several other POPs (dieldrin, oxychlordane, and ΣBDEs), where present, were higher at the lower sites. Our study provides a novel picture of the sources and fate of contaminant contributions to streams in southeastern Alaska.

Presenter: Carl Reese

Authors: Carl Reese, Terry Schwarz, Alaska State Dept of Natural Resources

Title: Regulatory and Hydrologic Considerations for Water Right Applications

Abstract: Water Rights are required for hydroelectric projects and there is a requirement for a "hydrologic study" to complete adjudication. The data needs for a study depend upon if the project is run-of-river, other resource uses on the river, prior appropriators, land use ownership, FERC or state jurisdiction, fish populations, and other environmental considerations. The presentation discusses a framework that for decisions for what hydrology data needs to be collected to adequately adjudicate a water right. There will time for discussion and input.

Presenter: Katherine Prussian

Authors: Prussian, K/ Hydrolgist Tongass National Forest, Stichert, N. Watershed Program Manager Alaska Region Forest Service, Johnson, I. Community Catalyst Hoonah Indian Association

Title: Large Wood Stream Restoration Using Hand Methods

Abstract: The Hoonah Native Forest Partnership (HNFP) successfully restored 300m of Priority Watershed, Spasski Creek, in June 2019. The HNFP work crew used wildlife gaps to thin the riparian area along Spasski Creek. The thinned trees were yarded instream as a restoration effort on Huna Totem Lands in Spasski Watershed. Approximately 25 riparian trees were cut (or tipped over) from 5 wildlife gaps. These trees were yarded into the creek using chainsaw winches and hand tools to strategically place the logs and support existing log jams. The thinned trees resulted in increased light and productivity in the riparian areas and both flood resilience and restored fish habitats in the creek. This work was initiated by the HNFP partnership, supported by a USFWS Tribal Wildlife grant, designed by USFWS and USFS, and implemented by the HNFP local workforce and the Hoonah TRAYLS crew.

Presenter: Katherine Prussian

Authors: Prussian, K. Hydrologist Tongass National Forest and Foss, J. Alaska Region Forest Service

Title: Landslide Data Efforts Around Sitka (POSTER)

Abstract: Numerous partners and members of the public are working to better understand landside terrain and landslide dynamics near Sitka, Alaska. This poster shows data collection currently contributing to this effort.

Presenter: Hal Shepherd

Authors: Hal Shepherd

Title: Salmon Die-off and the Changing Landscape in the Norton Sound Region

Abstract: While scientists only recently started warning about the impacts of climate change on Arctic freshwater systems, water that is too hot for returning salmon illustrates that a major shift such systems has already arrived. The scope of the larger than normal salmon die-offs in July 2019 in the Norton Sound Region covered several communities from east to west in the Norton Sound region (NSR) including Kotlik, Elim, Unalakleet, Shaktoolik, Golovin, Kotlik, Alakanuk, Similarly, although salmon die-offs often occur naturally, for this many salmon to die so early in the spawning season could be a tipping point indicating a larger ecosystem shift in the Norton Sound region as a result of warming waters.

Salmon streams in the NSR, however, were not the only ones affected by Alaska's summer of 2019 heat wave. In early July, for example, temperatures in southcentral Alaska were recorded as being over 81 degrees. For the first time ever, for example, salmon spawning stream temperatures are exceeding 80

degrees. One such river - the Deshka produces more than 20% of the chinook escapements for the Susitna River watershed which drains the Alaskan Mountain Range.

Other rivers on the Kenai Peninsula similarly set temperature records in July. The Anchor River, for example, was recorded at 73 degrees. For spawning adults salmon or growing juvenile, temperatures above 80 degrees can be lethal, primarily due to the loss of oxygen in the water and the fact that warm water makes fish lethargic and, therefore, susceptible to predation.

This presentation will discuss the salmon die-offs and the efforts of Water Policy Consulting, LLC and other entities to continue monitoring salmon die-off monitoring, by collecting more data on water temperature, dissolved oxygen and instream flow throughout the state.

Presenter: Rawser Spicer

Authors: Spicer, Rawser W. IARC; Bolton, W. Robert IARC

Title: Exploring Thermokarst Initiation for the Alaska Thermokarst Model

Abstract: Landscape change in ice-rich permafrost regions, resulting from thermokarst processes, can result in profound impacts on the water, energy, and carbon fluxes; wildlife habitats; and infrastructure. The Alaska Thermokarst Model (ATM) is an intermediate-scale state-and-transition model designed to simulate the transitions caused by thermokarst disturbance. Landscape units (cohorts) are tracked on a gridded subdivision of the model area. Logic-based rules are used to determine when the landscape from its current (parent) cohort to the next (child) cohort. Understanding and predicting thermokarst the cause of thermokarst initiation is an important step in developing the ATM's logic-based rules. We are currently conducting an analysis on the Alaska's Arctic Coastal Plain to determine regions that may be susceptible to thermokarst initiation. Precipitation for early winter (Oct and Nov), the total winter (Oct-Mar), along with winter temperatures (expressed in freezing degree-days) and summer temperatures (expressed as thawing degree-days) were calculated to determine the respective averages from 1901-1950. For each year between 1901-2006, we look at the compare the long-term average for each parameter. These comparisons are then combined to find areas that have been susceptible to thermokarst initiation for any given year. This analysis is also combined with previous thermokarst predisposition studies to eliminate potential areas where thermokarst is not known to occur.

Presenter: Terry Schwarz

Authors: Kevin Petrone, Terry Schwarz, Jacob Coate, Jim Vohden and Roy Ireland

Title: Alaska Groundwater Monitoring Program

Abstract: Not Available

Presenter: Jules Tileston

Authors: Jules Tileston

Title: Wild and Scenic Rivers in Alaska -- Water Resources and land management relationships:

A case history of the Fortymile Wild and Scenic River, Alaska (1970-2019)

Abstract: Not Available