Newsletter of the Alaska-Pacific River Forecast Center and
Alaska's NWS Service Hydrologists

Kuigmek: one who watches the river

January, 2018

The Newsletter is back!

Please Note:

Observers, don't forget to send in your Freeze-up Forms! Please indicate 'intermittent' if multiple freeze/thaw cycles occurred.

In This Issue:

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Our newsletter is back after a hiatus and we are expanding our target audience. We want to continue to communicate with our river observers, but also with the larger community of stakeholders in the water-related hazards of our forecast region. Your feedback is welcome!

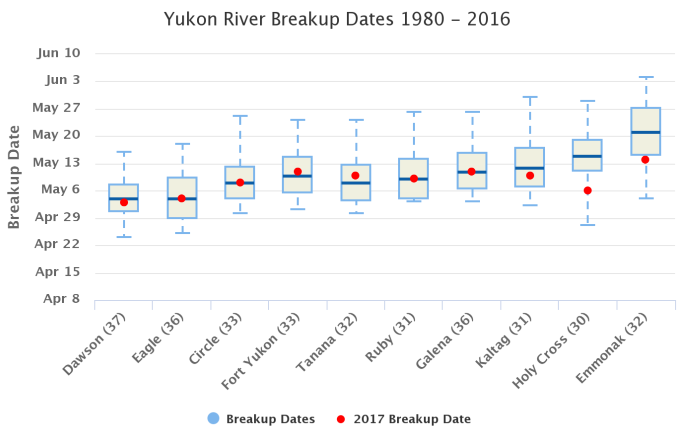
Get to Know Us...

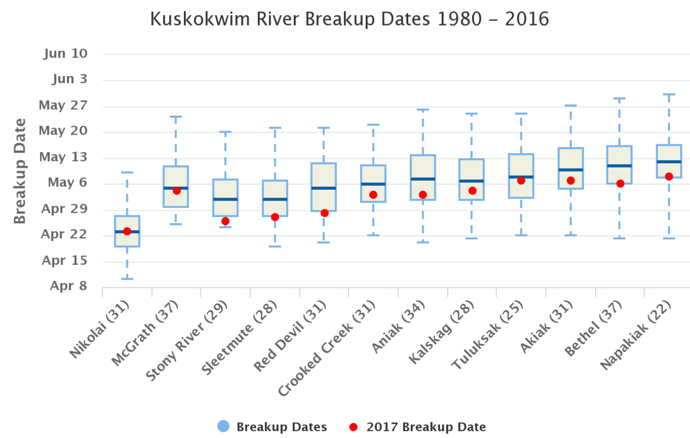
A short reminder of who we are and what we do: The Alaska-Pacific River Forecast Center (APRFC) is a group of 11 hydrologists, meteorologists, computer programmers, and support staff who consolidate observations and weather model output to feed hydrologic models and generate river forecasts for rivers in Alaska and hydrologic guidance for Hawaii. APRFC staff work closely with Service Hydrologists based in the Weather Forecast Offices in Anchorage, Fairbanks and Juneau. We do fieldwork to maintain instrumentation and assess flood impacts, and reach out to our observers and community partners during these trips. The APRFC relies on river and precipitation measurements from our observers, as well as from automated gages and satellites. We are one of thirteen RFCs in the National Weather Service, and are based at the NWS's Sand Lake Facility in Anchorage. We work directly with the general public, as well as local, tribal, state, and Federal governments to provide Impact-based Decision Support Services (IDSS).

Flooding near Cooper Landing, Kenai, in September, 2017. Photo credit: NWS/APRFC staff.

Breakup 2017

River breakup this past spring was very mild. The Yukon and Kuskokwim Rivers broke up early, with the timing on other major rivers closer to normal. We had no reports of significant breakup flooding in 2017. Instead, near drought conditions in Southwest Alaska impacted communities that rely on shipping; we received several reports that low water in early summer delayed river barge traffic on the Kuskokwim.

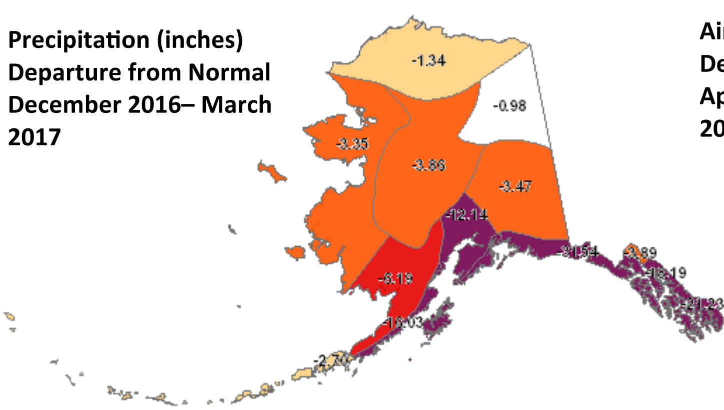




Box and whisker plots show 2017 breakup dates (red dots) at Yukon and Kuskokwim River communities relative to past years. The statistical median is the middle line in the box and the box contains half of the observed years. The whiskers show the minimum and maximum dates. These and other plots can be found at https://www.weather.gov/aprfc/riverView

Last winter was relatively cool and dry in much of the state, leading to a thin snowpack and thick river ice. Air temperatures were much warmer than normal in most of the state in April and May, but that warming was slow and steady. These factors led to predominantly thermal breakup on Alaska's rivers this year, where ice essentially melts in place.

Precipitation (inches) Departure from Normal December 2016– March 2017



Air Temperature (deg F) Departure from Normal April through May, 2017

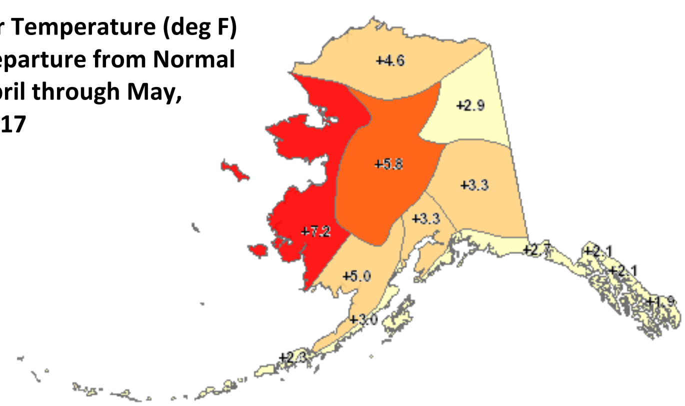
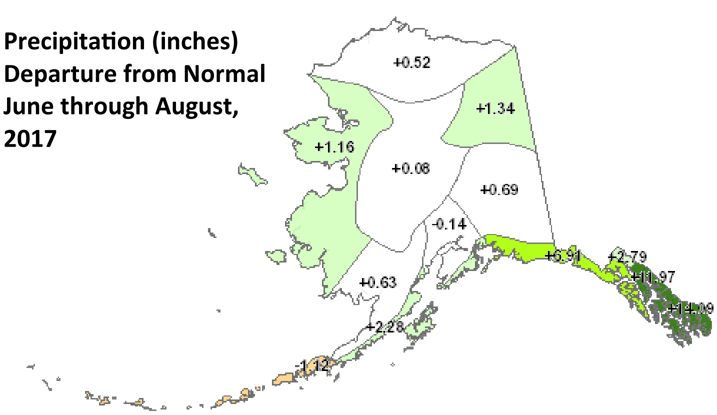


Image credits: NCEI (https://gis.ncdc.noaa.gov/maps/ncei/cag/ak) and departures are based on 1925-2000 normals.

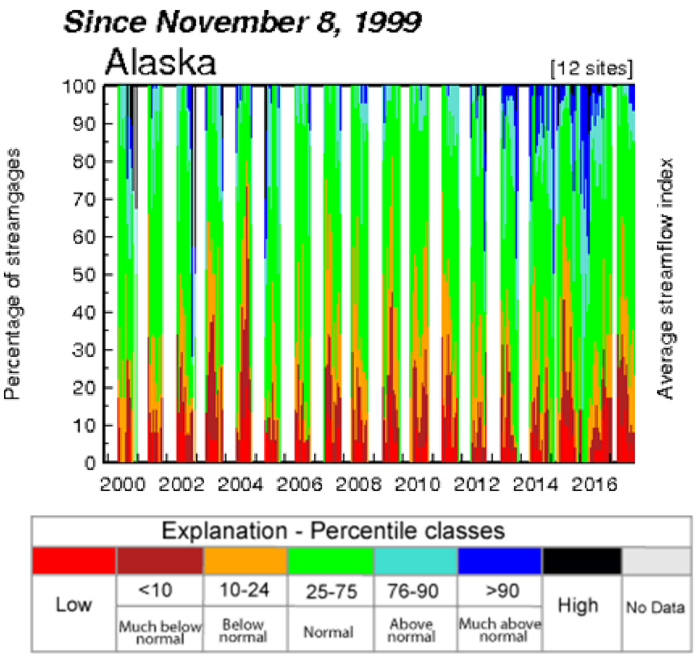
Open Water Season 2017

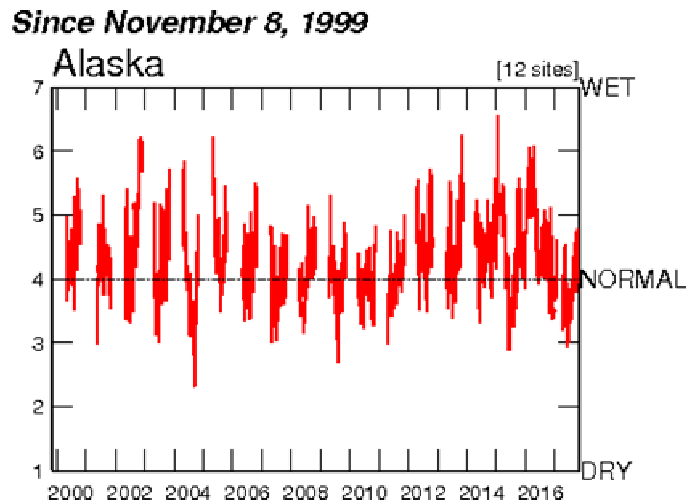
The open water season in 2017 in Alaska started out dry and ended up normal in much of the state, with some regional variation. The southwest corner of the state was exceptionally dry throughout the spring and early summer. Air temperatures were moderately cold last winter, except in the Arctic, but normal to warmer-than-normal during the other seasons, in all regions.

Precipitation (inches) Departure from Normal June through August, 2017



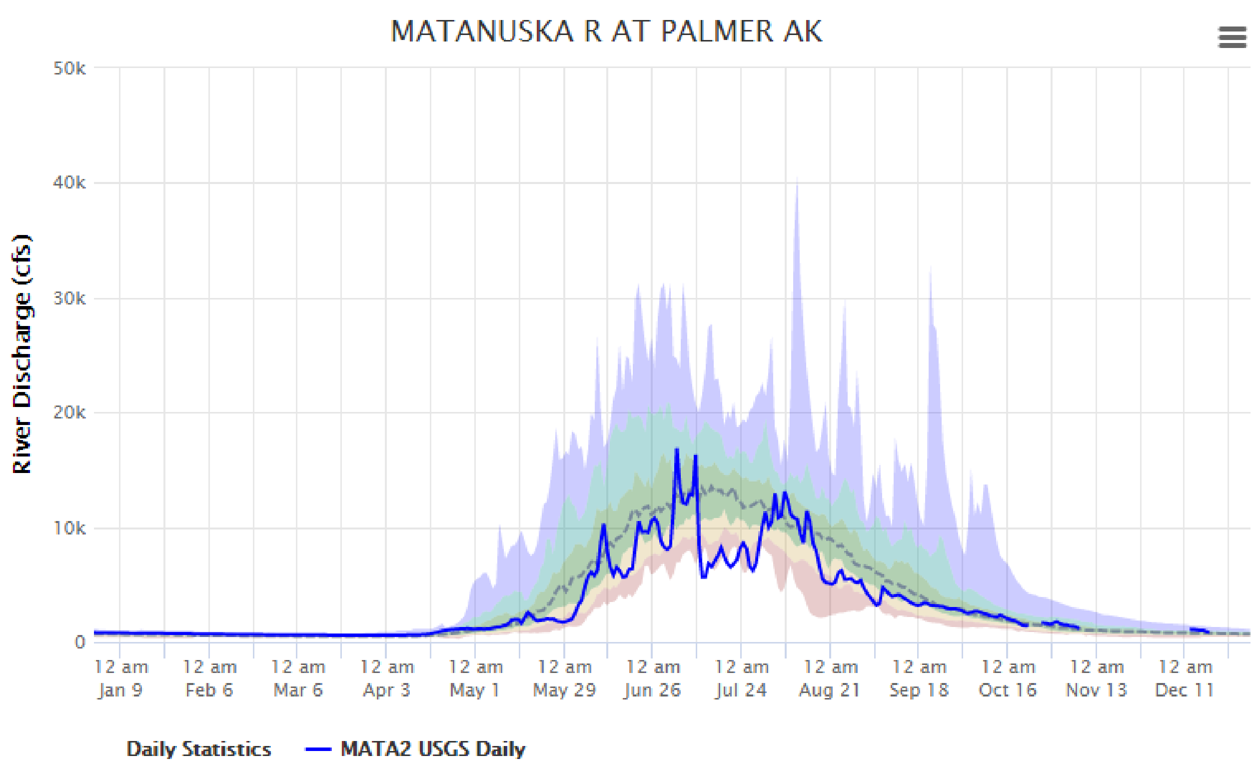
Open Water Season 2017 (continued)





Average Streamflow Percentile and Index at 12 primary USGS Gages in Alaska. Images: USGS (waterwatch.usgs.gov).

Events and impacts included continued erosion on the Matanuska River, although the river's stage and discharge were generally at normal levels or below. Low water conditions were reported issues not just on the Kuskokwim and smaller rivers in Southwest, but also on the Yukon and some of its major tributaries. There was minor flooding near Big Delta. Large-scale flooding in the Tetlin Road area in late July and early August was caused by warm and wet conditions upstream contributing to a breach of the Tanana bank into a historic floodplain.

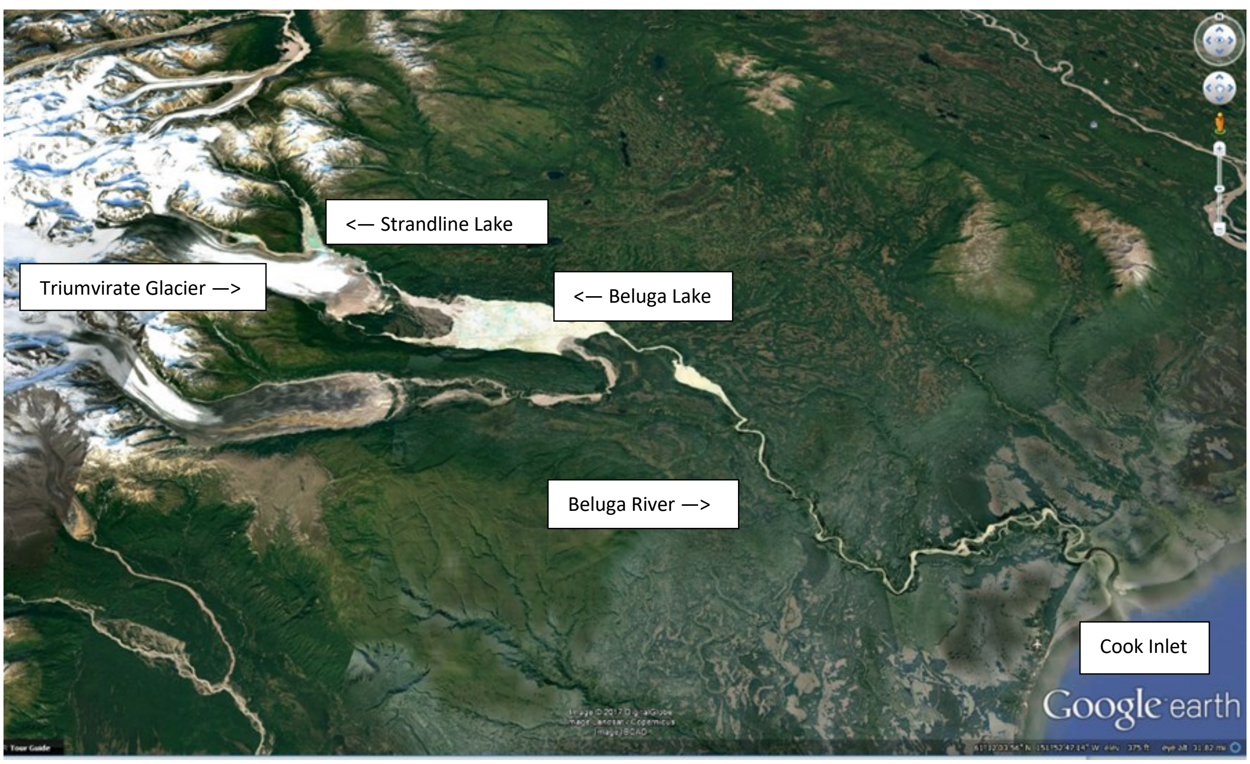


River Discharge on the Matanuska River at the USGS gage near Palmer. The dark blue line is the daily mean discharge during 2017. The dashed line represents the long term average flow and the colored bands correspond to historic daily high and low flows (frequency percentiles: 10%, 10-25%, 25-75%, 75-90%, 90%). Image: APRFC.

Open Water Season 2017 (continued)

Photos: Tetlin Road flooding from Tanana River. Credit: Paul Kelley, used with permission.

We saw small Glacial Dammed Lake (GDL) releases at Suicide Basin into Mendenhall lake in the early part of the summer, and similar small releases in Valdez. The Snow GDL outburst on the Kenai caused minor flooding along Primrose road in September, and Moose Lake released in August with no reported impacts. Closer to Anchorage, Strandline Lake released in mid-August, causing debris flows down the Beluga River.



A series of strong storms, beginning in late August, washed out the Power Creek Road in Cordova and caused subsequent power supply changes. Smaller precipitation events contributed to runway flooding in Seward, several times this summer. In the Anchorage area, another hydrologic side note was the ongoing removal of the Eklutna dam this summer. In mid-September, Kobuk experienced minor flooding from heavy and persistent rain.

Open Water Season 2017 (continued)

Photo: Looking upstream at remnants of the lower Eklutna Dam. Demolition of this concrete arch dam is ongoing. Credit: Crane Johnson, APRFC/NWS.

Observers' Corner: Welcome New Observers!

Over the past seven years we have transitioned many river gages located on the road system to automated equipment. While we don't like to see observers go, the cost savings at these locations has allowed us to expand our observer network off the road system. We can't do our work without the essential data provided by our observers. Thank you all!

New Observers since our last newsletter:

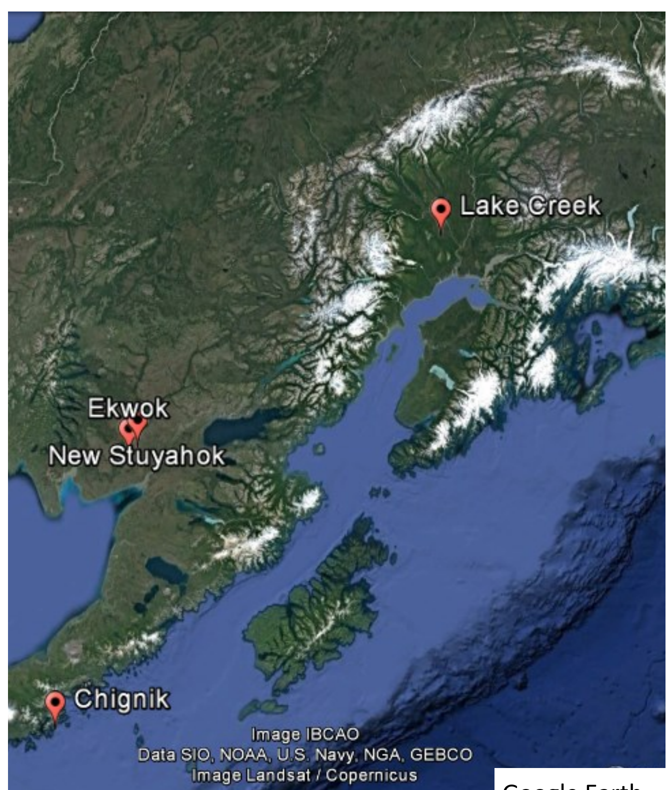
Crystal Clark, Nushagak at Ekwok

Gabriel Andrew, Nushagak at New Stuyahok

Cyndie Abbott, Yentna at Lake Creek

We also wish to thank the ADFG Staff at Chignik (Dawn Wilburn and Lucas Stumpf) for taking temporary measurements until the automated gage could be installed.

Photo: Nushagak River, Credit: APRFC/NWS.

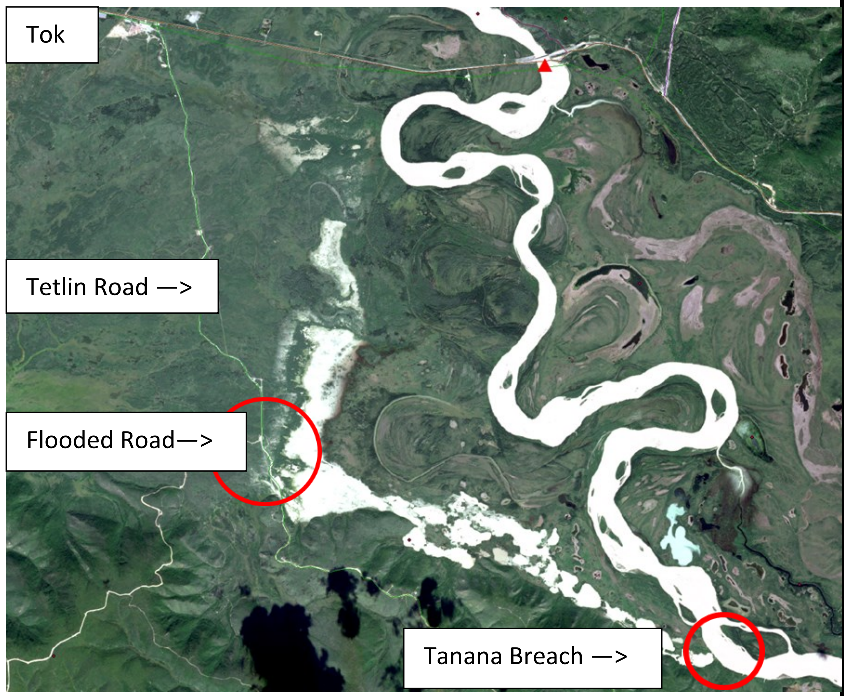


Google Earth

Eye in the Sky: Flood Forecasting from Satellite

Case Study: Tetlin Road Flooding

Late in July, we got word that the road out to Tetlin was flooded and impassable. With help from local observers, the Fairbanks Civil Air Patrol, and satellite imagery, we were able to determine the source of the flood water as a breach in the Tanana River. The summer in the upstream watersheds--the Nabesna and Chisana Rivers—was anomalously warm and wet. Rain and snowmelt contributed to high water on the Tanana, which eroded a narrow natural levy between the river and an historic floodplain. Eventually, that water crossed the Tetlin Road and disrupted travel to village residents and commercial use well into mid-August.



Synthetic Aperture Radar satellite imagery, processed by Lori Shultz of NASA SPoRT.

Case Study II: Jökulhlaups of Summer

The APRFC monitors a number of rivers that are affected by outbursts of lakes behind the glacier ice. These outburst events are sometimes called by their Icelandic name, *Jökulhlaup,* or simply Glacial Dammed Lake (GDL) releases, and may occur on a semi-regular schedule 1-3 years apart. Juneau's Mendenhall Glacier and the Snow and Skilak Glaciers on the Kenai Peninsula are some of the best known GDLs where releases can cause flooding in downstream communities. To determine if a GDL has released, we rely on information from sparse instrumentation (stream gages and webcams) as well as local observers and aviators. We are currently testing methods to use satellite imagery to help monitor sites where we don't have other instrumentation. Sample imagery on page 4 shows Strandline Lake behind the Triumvirate Glacier from commercial satellite imagery on Google Earth. We received word from a local boater this summer that Strandline may have released into the Beluga River, contributing to debris piling up on the bridge there, and we confirmed this release via satellite and aircraft. For more information, see our website: http://www.weather.gov/aprfc/gdlMain .

IDSS in Action: Flood impacts in Cordova

Atmospheric Rivers (long, narrow bands of moist air inbound from over the Pacific Ocean) contributed to heavy rainfall along the Northern Gulf Coast this summer and fall. After Cordova's Power Creek Road was damaged by several heavy rainfall events, the APRFC, the Anchorage NWS Service Hydrologist Andy Dixon, and other members of the forecast team worked with the State Emergency Operations Center personnel and other governmental stakeholders to provide Impact-based Decision Support Services (IDSS) throughout the remainder of the fall season. What does this mean? Stakeholders in Cordova reported that a 1- to 2-day lead time for a heavy precipitation event could help them manage the damaged infrastructure, plan repairs, and activate backup power generation. The NWS routinely provided forecasted precipitation timing, severity, and uncertainty as needed, based on local knowledge. This is just one example of how the NWS is implementing custom IDSS. For more information about Atmospheric Rivers see http://www.noaa.gov/stories/what-are-atmospheric-rivers .

Summer Fieldwork Season

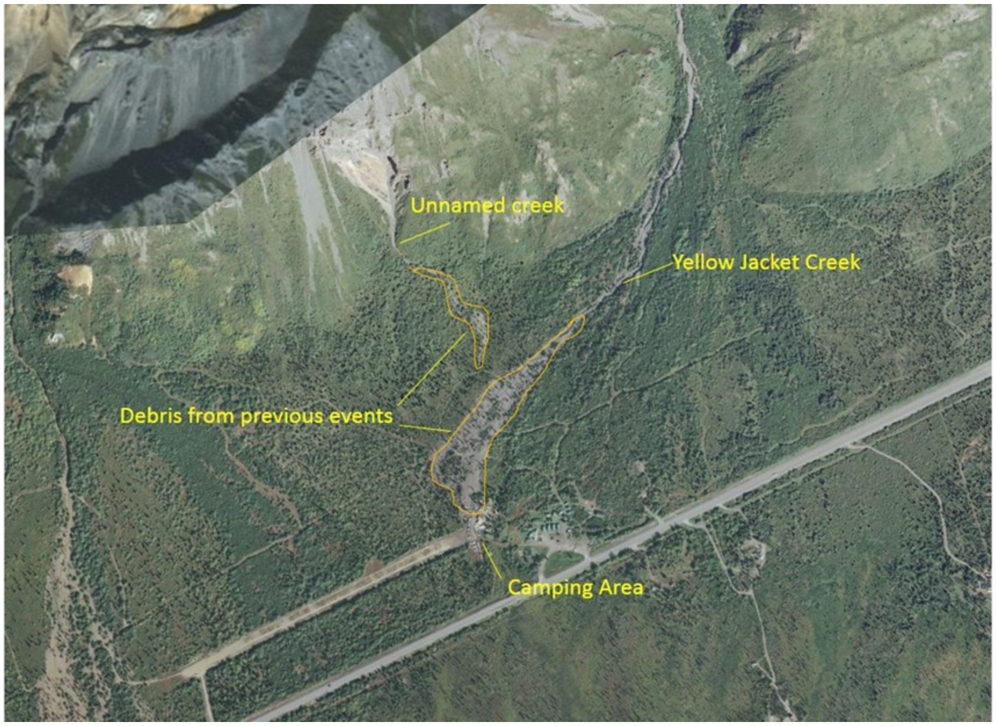
We don't have room to describe all of our fieldwork this summer, but during August, APRFC forecasters Celine van Breukelen and Eric Holloway traveled to the Yukon River communities of Galena, Ruby, and Circle to measure discharge, re-survey gages, and meet with observers. We typically measure discharge using an Acoustic Doppler Current Profiler (ADCP). The relationship between this discharge and the height of the water is called the *rating curve*, and it's important to have a good estimate of this relationship for accurate flood forecasts. Both our manual and automated gages only measure the height of the water (*stage*), so we compute the discharge based on that rating curve. Another important aspect of our fieldwork is working alongside and talking with our river observers. We want to hear how the rivers may be changing and, in case of a flood event, we want to have strong, existing relationships and communication lines in each affected community.

(Left) APRFC Hydrologist Celine van Breukelen met with observer Linda Captain in Ruby. Photo credit: Eric Holloway. (Right) The Yukon River at Ruby is shown here on an overcast day. Photo credit: APRFC/NWS staff.

(Left) APRFC Hydrologist Celine van Breukelen (taking picture) explains the ADCP measurement profile to the boat-driver's grandson. (Right) Anchorage NWS Service Hydrologist Andrew Dixon uses pine needles deposited by flood water to determine the high water level near Cooper Landing, Kenai after the Snow GDL outburst. Photo credit: Jessica Cherry, APRFC/NWS.

Geoscience Corner: Landslides and Heavy Rain

Every year, dozens of landslides occur all over Alaska, and 2017 was no exception. We heard about a large landslide damaging property at Sheep Mountain off the Glenn Highway, and others closing roads near Anchorage and Sitka,



where three people perished in a slide in 2015. What causes landslides? The answer varies across Alaska, but typically heavy rains are the main factor. In forested areas, strong winds are another important factor. Here at the NWS, we look for heavy rain events in steep terrain in the observations and forecasts, which could initiate landslides. While it's not in our mission to forecast landslides, we provide critical information about precipitation to our partners. Many areas in steep terrain lack rainfall data, so we focus on locations like Kodiak, Southeast Alaska, and Denali National Park where we have some measurements.

Recently, forecasters in Juneau have also been utilizing satellite rainfall estimates to help fill the gaps in the land based rainfall data network for landslide prediction and other hazards.

In remote areas with significant permafrost, there are thaw-related landslides occurring in 'slow motion' over the course of several years, and you might hear these referred to as debris lobes. While debris lobes can affect roads and other infrastructure, the APRFC focuses on the faster and potentially life-threatening events, in coordination with our Weather Forecast Offices.

Above: Schematic of Sheep Mountain historical landslides. This area saw the first of several notable landslides this summer, with impacts at the nearby lodge. Image credit: DeAnne Stevens, State of Alaska DGGS and Google Earth.

Photo: boulder and debris field deposited by Sheep Mountain landslide in 2017. Bear spray canister for scale. Photo credit: Crane Johnson, APRFC/NWS.

Website Highlight: Matanuska Erosion

There's been a lot of concern these past few years about erosion on the Matanuska River in South Central Alaska. The river has undercut several properties, and residents have many questions. The NWS partnered with USGS to create an informational website; please take a look: https://www.weather.gov/afc/MatanuskaRiver .

Historic Events: Remembering the 1967 Flood in Fairbanks

This summer was the 50th anniversary of the severe floods that impacted Fairbanks and other interior communities in 1967. APRFC Staff members, along with Ed Plumb from the Fairbanks Weather Forecast Office and NWS Alaska Regional Director Carven Scott, participated in commemorating this event with the City of Fairbanks, the US Corps of Engineers, and other partners. Following the Fairbanks flood, construction began on the Moose Creek Dam in 1973. Completed in 1978, this project has not only protected the City of Fairbanks from major flood impacts, but also created the Chena Lakes Recreation Area. See more on our webpage: https://www.weather.gov/aprfc/FairbanksFlood1967 .


Fairbanks Weather Office

1967 Flood of Fairbanks, Alaska

In the summer of 1967, one of the worst disasters in the history of Alaska struck the Fairbanks area. Unusually heavy rains swelled the Chena and Little Chena rivers up to six feet above their flood stage. During the month of August, 6.20 inches of rain fell in Fairbanks, well above the normal monthly value of 2.20 inches. Water poured into downtown Fairbanks and the outlying regions, driving residents to their rooftops and eventually displacing nearly 7,000 people from their homes. Roads, bridges, and railroads washed away, isolating Fairbanks and hindering rescue efforts. Damage estimates totaled more than $80 million in 1967 dollars. The extensive destruction helped inspire Congress to pass a national flood insurance program. To prevent a disaster of this magnitude from occurring again, the U.S. Army Corps of Engineers Alaska District proposed the "Chena River Lakes Flood Control Project." Its primary purpose was to protect Fairbanks and Fort Wainwright from high waters. Come with us as we explore the history of flooding in the region and projects designed to reduce flooding.

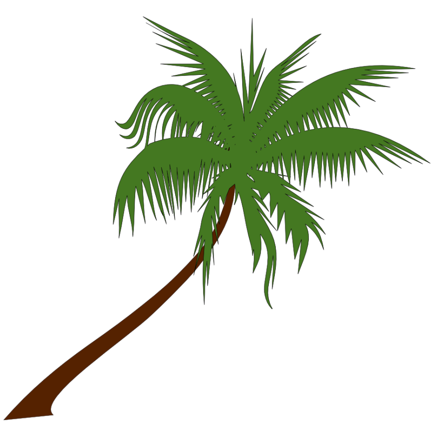
Photo on the right: Aerial view of Fairbanks during the flood event looking northwest. Courtesy of the US Army Corps of Engineers.

This story map provides an overview of the 1967 flood in Fairbanks and subsequent construction of the Chena River Lakes Flood Control Project. Project partners include the following:

Funding for this project was provided, in part, through the NOAA Preserve America Initiative.

Pacific Sector: What's Happening in Hawaii?

As readers have probably gathered, the APRFC focuses more on the 'A' than the 'P' in our name. One of the reasons for this is the lack of large waterways in Hawaii. The Wailua River on Kauai is the only river in Hawaii navigable by a boat larger than a kayak. We generate limited nowcasts for the Wailua near Lihue as well as five smaller rivers on Kauai. These are used internally by the Hawaiian Weather Forecast Offices (WFOs) for situational awareness. Flash flooding, however, is the biggest hydrologic concern in Hawaii, and because of the small scale and need for local knowledge, Flash Flood products are issued directly by the Hawaiian WFOs. The same is true in other parts of the Pacific (and most WFOs for that matter). The APRFC is active in another major endeavor, which is the implementation of the National Water Model (NWM) in Hawaii. You will hear more about the NWM in the future. It's currently running for the contiguous US only. Our Development and Operations Hydrologist Dave Streubel is helping oversee the deployment of this model for Hawaii using inputs such as precipitation measured by radar.



Current APRFC Staff and NWS Service Hydrologists

Scott Lindsey, Hydrologist-In-Charge
David Streubel, Development and Operations Hydrologist
Crane Johnson, Service Coordination Hydrologist
Jessica Cherry, Senior Hydrologist (NEW IN 2017)
Eric Holloway, Hydrometeorologist
Arleen Lunsford, Hydrometeorologist
Edward Moran, Senior Hydrologist
Celine van Breukelen, Hydrologist
Robert Oslund, Computer Programming and Administration
Rebecca Perry, Technical and Administrative Support

WFO Service Hydrologists: Andy Dixon (Anchorage), Karen Endres (Fairbanks, NEW IN 2017), Aaron Jacobs (Juneau), Ed Plumb (now the Warning Coordination Meteorologist in Fairbanks)

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New Staff Bios

In November, 2017, Dr. Karen Endres started at the Fairbanks Weather Forecast Office as the new Senior Service Hydrologist. She came from the USDA Forest Service in the Tongass National Forest and Wrangell Ranger District where she was a Hydrologist for the past 2 years, during which she was detailed as an Acting R9 Dam Program Manager and Acting Assistant Water Program Leader. She spent the prior 10 years modeling water with various non-profits in the private sector. Karen also worked as a minerals hydrologist with the DOI Bureau of Land Management, developing water management plans in collaboration with environmental and regulatory agencies. She has extensive GIS and computer modeling experience. A project highlight in her career was the development of a nationwide GIS database for the NWS to predict flash flooding, using ArcGIS and Hydrologic Engineering Center (HEC) data to create models that established water movement in a river system. She also obtained grants that she used to perform watershed management in California and Michigan. Karen received her Bachelors and Masters in Civil Engineering from Michigan Technological University in 1998 and 2000, respectively, and earned her PhD in Environmental Engineering from Michigan Technological University in 2004. She was awarded the Rudolph Hering Medal by the Environmental and Water Resources Institute of the American Society of Civil Engineers in 2009. Karen is camera shy.

Dr. Jessica Cherry started the position of Sr. Hydrologist at the APRFC in January of 2017. Before arriving at the APRFC, Jessie led a research group at the University of Alaska Fairbanks (UAF) for more than ten years. Her specialties while at UAF included observational network design and deployment, solid precipitation measurement, sensor development, airborne remote sensing, socio-economic impacts of hydrologic change, and historic data rescue. She earned her B.A., M.A., and PhD at Columbia University in New York City where she wrote her dissertation on Arctic Hydroclimatology. This work included modifying NASA's Catchment Land Surface Model to assimilate snow depth data and reconstruct snowfall. More recently, Jessie was the Chief Scientist of the Geographic Information Network of Alaska, serving as Principal Investigator on several NOAA-funded efforts to improve remote sensing products for the NWS. In her spare time, Jessie likes to fly airplanes large and small, as well as read and write. She was a top 100 finalist for the NASA Astronaut classes of 2013 and 2017.