Sharing Knowledge on Agriculture, Water, and Drought in Alaska

Workshops by the USDA Northwest Climate Hub, the National Drought Mitigation Center, and the University of Alaska Fairbanks Cooperative Extension

Delta Junction, AK – November 14, 2022 & Palmer, AK – November 16, 2022

The National Drought Mitigation Center (NDMC), USDA Northwest Climate Hub (NWCH) and the University of Alaska Fairbanks (UAF) held two workshops in November 2022 for the purpose of peer-to-peer learning and discussion on monitoring and managing agricultural impacts of drought. The workshops were held in Delta Junction, Alaska, with 15 participants, and Palmer, Alaska, with 14 participants. Workshop materials can be found here. Participants included local Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA) and UAF Extension staff, as well as agricultural producers raising small grains, rapeseed, hay, grasses, livestock (dairy, beef, yaks), vegetables, peonies, flowers, and fruit.

Discussion of Past Dry Times

In the Delta Junction area, participants remembered many years as being dry enough to affect farming, highlighting the 1970s and 1980s (with a specific mention of 1985), the 1990's (with 1994 remembered as the driest year in Fort Greely in the last 50 years and 1998 remembered as a year when barley yields were so low that changes had to be made to operations) and 2013-2015 as years when an effort was made to get drought declarations for the area. One participant noted that what's normal for their area seemed to be very dry winters and early springs, with more predictable rains beginning in June. Participants said that dry years, then, effectively shorten an already-short growing season, making it more difficult to get crops in the ground and growing in the spring. Their experience was that windy winters made it difficult to hold snow moisture ("snow is like gold") so some farmers tried methods to hold snow such as leaving stubble in the fields. Participants added that, due to variability in local soil types, some areas are more drought prone than others (with Big Delta, for example, benefiting from a higher percentage of humus in soils).

Dry years have potentially devastating impacts on agriculture in the area, in part because of the isolated nature of the state. If the Delta Junction area doesn't make hay, participants said, the whole state will be impacted. There are limited slaughterhouses, and, when they experience drought, livestock producers in the area

all face the same decision (culling the herd), which floods the slaughterhouse and market. Thus, financial impacts may be more likely with drought in Alaska than in other livestock-producing regions. Farmers also felt particularly vulnerable under current conditions given the currently high prices for fuel, fertilizer, and herbicides, making their profit margins very slim. Some farmers can irrigate, but participants raised a concern about relying on irrigation given that local aquifers are fed by glaciers which themselves are threatened by warming temperatures.

Figure 1: Workshop attendees document their past drought experiences. Photo: NDMC

In south central Alaska, meanwhile, participants remembered 2017, 2018, 2019 and 2022 as recent dry years, though one remembered consistent dryness going back to the 1950s. 2017 was also called extremely hot, which affected potato production. 2019 was remembered as a year when all crops and animals needed supplemental water, which was very time consuming for growers if they didn't have adequate irrigation set up.

As in Delta Junction, Palmer-workshop participants said that dryness also led to culling livestock from herds, but being more specialty crop focused, they had additional impacts to report as well. In the spring, for example, drying means that transplanting and direct seeding is difficult when irrigation is limited. In the summer, dryness leads to stressed plants that lack disease resistance, impaired effectiveness of herbicides and reduced crop quality. Producers pointed out that even irrigated crops may be vulnerable because some irrigation systems lack capacity for very hot, dry conditions. Dry conditions can affect crop quality after harvest as well, especially if there is competition for water between irrigation and post-harvest

processing/washing or when unexpected heat causes quality to degrade. One participant noticed that chaga fungus died in 2022, the first time they had seen that happen in over 40 years. When long-lived perennial crops like peonies are damaged, growers are set back five years or more as they reestablish the crops. Participants another mentioned potential impacts to local spruce, like needle rust, resulting both from dryness and excessive wetness. Birch in the area also appear to be affected by drought, with residents seeing increased birch bark borers and roots above ground after drought stress in 2018.

Growers in southcentral Alaska also shared strategies that they or others are already implementing or trying to implement to manage dryness. Participants noted that cover crops are of interest for conserving moisture and that vegetable growers are using newspaper mulch for the same purpose. Irrigation was discussed not only as a strategy for managing dryness but also as a concern for the future. Peony growers in the area implemented drip irrigation after recent hot and dry summers, while other agricultural producers may increasingly look to investing in irrigation as well. But irrigation infrastructure is expensive, and some participants had doubts about the long-term sustainability of irrigation given concerns about water quality at greater well depths and increasing demand. The long-term sustainability of irrigation systems was a concern particularly if temperature and precipitation trends/extremes continue to indicate dryness as a long-term pattern for the region. Participants saw the potential for future conflicts between agriculture and municipal water needs if dry patterns persist. There was interest in practices to catch and hold reserves of water to increase irrigation capacity, such as ponds for fire protection and external cisterns where groundwater (or rainwater) can be pumped to store for periods of high need.

Overall, extreme variability in terms of extended wet and extended dry periods are a concern to participants for future food security for all of Alaska.

Weather and Climate Overview

Rick Thoman (Delta Junction, video; click to download presentation) and Brian Brettschneider (Palmer, video; click to download presentation) gave presentations on precipitation and temperature trends in Alaska. Overall trends include a longer growing season (particularly, a later first freeze), smaller snowpack season, increasing temperatures during the winter leading to more rain (rather than snow) events and increasing precipitation along the coast with the potential for heavy rain. The seasonality of precipitation is such, according to Brettschneider, that drought during the winter is less of a concern, but if precipitation doesn't fall during key spring/summer months, drought can develop quickly with agricultural impacts. Even

if rain does fall later in the season (like in 2022), the early season dryness has lingering impacts.

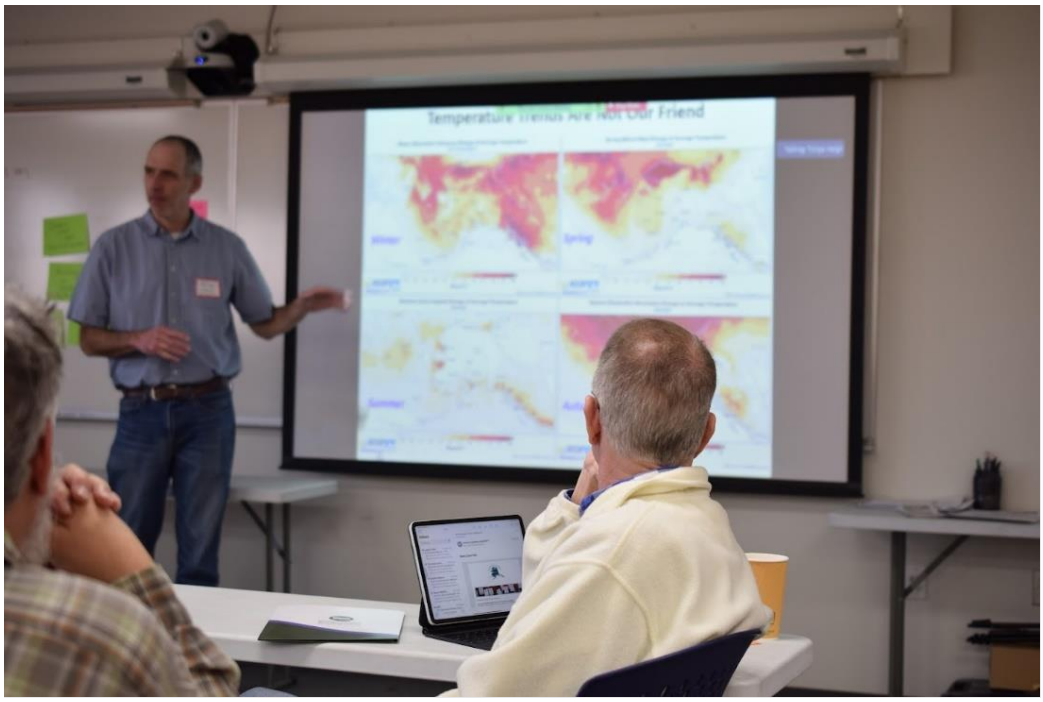

Figure 2: Brian Brettschneider presents on Alaska climate. Photo: NDMC

U.S. Drought Monitor Process Overview

Deb Bathke provided an overview of the U.S. Drought Monitor authoring process. Her presentation can be found here. Her presentation highlighted variables used to assess drought in Alaska including: standardized precipitation index (SPI, at different time scales), evaporative stress index (ESI) 4-week 4km, ESI 12-week 4km, *advanced hydrologic prediction service (AHPS)* at different time scales, US Geological Survey (USGS) streamflow percentiles, collaborative rain hail snow network (CoCoRaHS) observations and condition reports, USGS well data, condition monitoring observer reports (CMOR), Natural Resources Conservation Service (NRCS) SNOTEL snow water equivalent (SWE), radar beam, and soil moisture data modelled from NASA.

Farm Service Agency (FSA) Disaster Designation Process

The USDA Farm Service Agency (FSA) has several disaster assistance programs with some focused-on drought. In 2012, the disaster designation process was revised. The revisions can be seen in the federal register here.

Additional modifications to portions of the programs related to disaster assistance occurred via the 2018 Farm Bills. There are four types of disaster designation:

1. USDA Secretarial disaster designations
2. Presidential major disaster and Presidential emergency declarations
3. FSA Administrator's Physical Loss Notifications
4. Quarantine designations by the Secretary under the Plant Protection Act or animal quarantine laws.

Check out this fact sheet for the different emergency declaration processes. Robert Garcia in Delta Junction and Shelby Johnson in Palmer provided overviews of the FSA Disaster Designation Process.
Click here to view Shelby's presentation (video) and download presentation.

The Delta Junction workshop focused on the Livestock Forage Program and key points included:

- An area automatically goes into drought declaration from FSA's perspective after eight weeks in D2-severe drought, D3-extreme drought, or D4-exceptional drought in the normal grazing period (June to September, 138 days). For producers in Delta Junction, that means they would be experiencing drought for over 40% of the normal gazing period. For all other disasters, a producer with a 30% production loss can request a disaster declaration and a county emergency board will review it.
- Disaster designation will allow producers to get emergency loans or other assistance.
    - Neighboring counties also get assistance or loans because they're contiguous.
- 40% loss in county for hay and grazing and can allow grazing or haying on Conservation Reserve Program (CRP) lands

Figure 3: USDA FSA Representative Robert Garcia presents drought disaster declarations and programs. Photo: NDMC

"Water" You Thinking About Drought? Game:

The University of Nebraska-Lincoln graduate students, Grace Campbell and Caily Schwartz, developed and facilitated a climate-scenario game that focused on agricultural decision making. The game was played at both workshops and different discussions were had at each. In Delta Junction, there was more discussion around the timing of different decisions. For example, one participant talked about how implementing measures to increase soil health needed to be done five years in advance to have any impact on decreasing loss in the event of an extreme drought. In Palmer, in contrast, the discussion focused on cost/benefit analysis and wanting more information for decision-making. One participant mentioned that in real life, you usually know what the benefits are before you choose to implement and purchase something but that won't always be the case. Others noted how the resources needed and available for drought management would vary among farms. Campbell and Schwartz collected feedback on the game itself via a survey administered at the end of the session, which will be summarized in a separate report.

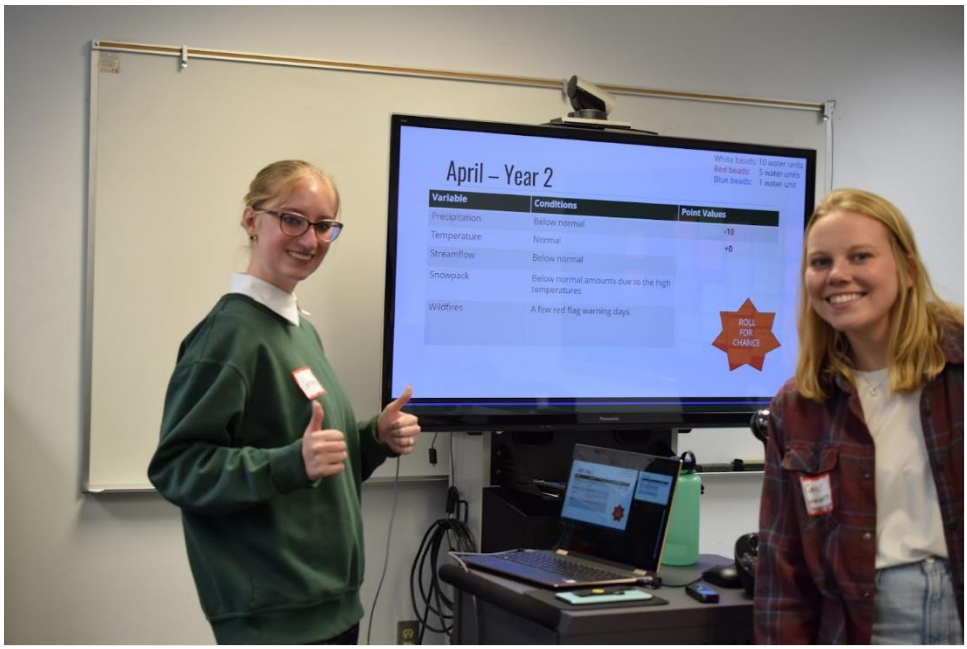

Figure 4: NDMC graduate students Grace Campbell and Caily Schwartz lead workshop participants in decision-making game. Photo: NDMC

Adaptation, Resources, Needs:

Holly Prendeville provided an overview of the USDA Northwest Climate Hub and gave an overview of a new publication, *Adaptation Resources for Agriculture: Responding to Changes in Climate in Alaska*. This workbook reviews the effects of climate change (including drought) on agriculture in Alaska and provides information to help producers adapt their operations. Technology transfer specialists and producers can use this workbook to consider different strategies to increase resilience to weather extremes, improve soil health and address climate-related challenges. The workbook also provides a flexible, structured, and self-guided process for individual agricultural producers to define management goals and objectives, assess site-specific climate change impacts and vulnerabilities, identify adaptation approaches and tactics for implementation, and monitor and evaluate the effectiveness of implemented actions on their land. The presentation led to a discussion of resources available through a number of agencies and efforts.

Figure 5: USDA Northwest Climate Hub representative Holly Prendeville and workshop participant organize input gathered in workshops. Photo: NDMC

Workshop Evaluation

Sixteen workshop participants contributed to an evaluation of the workshops by filling out an online survey. Participants of each workshop were equally represented in the survey results.

When asked what the most worthwhile part of the workshop was, four participants said they appreciated learning more about Alaska climate trends and potential threats to agriculture, and three said they appreciated the discussions around how agricultural producers might plan for and manage future droughts. For example, one participant said, "*Thinking about climate, future trends, and how to deal with the distinct complete dry vs. complete wet sides of the growing season*." Another commented, "*Becoming more aware of possible water shortage and ideas I plan to use for water storage from other local producers*." Four participants appreciated the opportunity to have what one described as "*open conversation between agency personnel and local farmers*." Seven participants added that they appreciated learning about how drought is defined, how it looks in Alaska, how the U.S. Drought Monitor represents Alaska conditions and how the U.S. Drought Monitor is connected to USDA Farm Services Agency relief programs. For example, one participant said, "*Hearing from agency folks, including the Alaska climatologist, about how the national drought monitoring works, and hearing from the local FSA agent as to participating in FSA program options*." Another noted, "*How much difference in moisture there can*

be even in a very small area. Drought in one place can be totally different than a drought in another - i.e., Southeast Alaska vs interior. Also having to wait 6 weeks for disaster relief is needing to be addressed due to our short growing season in Alaska. not the same as lower States."

When asked what could have been improved about the workshop, six participants expressed satisfaction with the workshop and said they'd improve nothing (e.g., "*Time was used wisely. I have no criticisms. There were good presentations, time for questions, and good dialog. The visitors were all knowledgeable and very pleasant.*") Three participants said that they would like more information and details on drought management practices (e.g., "*Details on management practices i.e., how much does mulching retain water, how much water is lost with an overhead sprinkler system vs. drip irrigation etc. In a cost:benefit ratio what are some of the most affordable options with the biggest effect*."). One person suggested holding a summer workshop with an in-the-field focus on soils. Another person suggested that relevance to Alaska agriculture could be improved, saying "*We have more of a water delivery problem than a water shortage problem. Direct delivery of water via drip tape is not the best answer to many of our problems*." And one participant said they'd like even "*more time to chat with people and hear about their experiences...*"

Figure 6: Workshop participants discuss drought management needs for Alaska. Photo: NDMC

In a related question, we asked participants what additional workshops, trainings, or other efforts they think are needed to assist Alaska farmers and ranchers to manage drought. Most participants (9 respondents) mentioned the need for additional workshops for growers on general awareness about drought in Alaska and specific management techniques including managing crop residue, minimum till/no till, permaculture and management practices, irrigation, drought resistant crops and water conservation and harnessing water from snowmelt. One suggested having additional presentations by the FSA regarding their role in drought-related programs. Respondents also pointed to a need to reach more growers, and one suggested working with groups such as Farm Bureau. One participant said, "H*old additional workshops as more growers become aware of what is out there to help them. Not everyone who needs to know about this important topic was present at this year's workshops*." Two participants also saw a need for training/workshops for agency employees related to drought. One said, "*Our growing season is short, I think those in charge of reporting need to understand more in terms of soil moisture. If we could measure the moisture, I think we would see dryer conditions sooner*." And one participated suggested a workshop on how to get funding for tools or resources.

We also asked participants what specific topics they'd like to receive more information about after the current workshops. Participants were interested in learning more about a range of topics, as shown in Figure 7. We will share names with the relevant speaker so that they can follow up with more information.

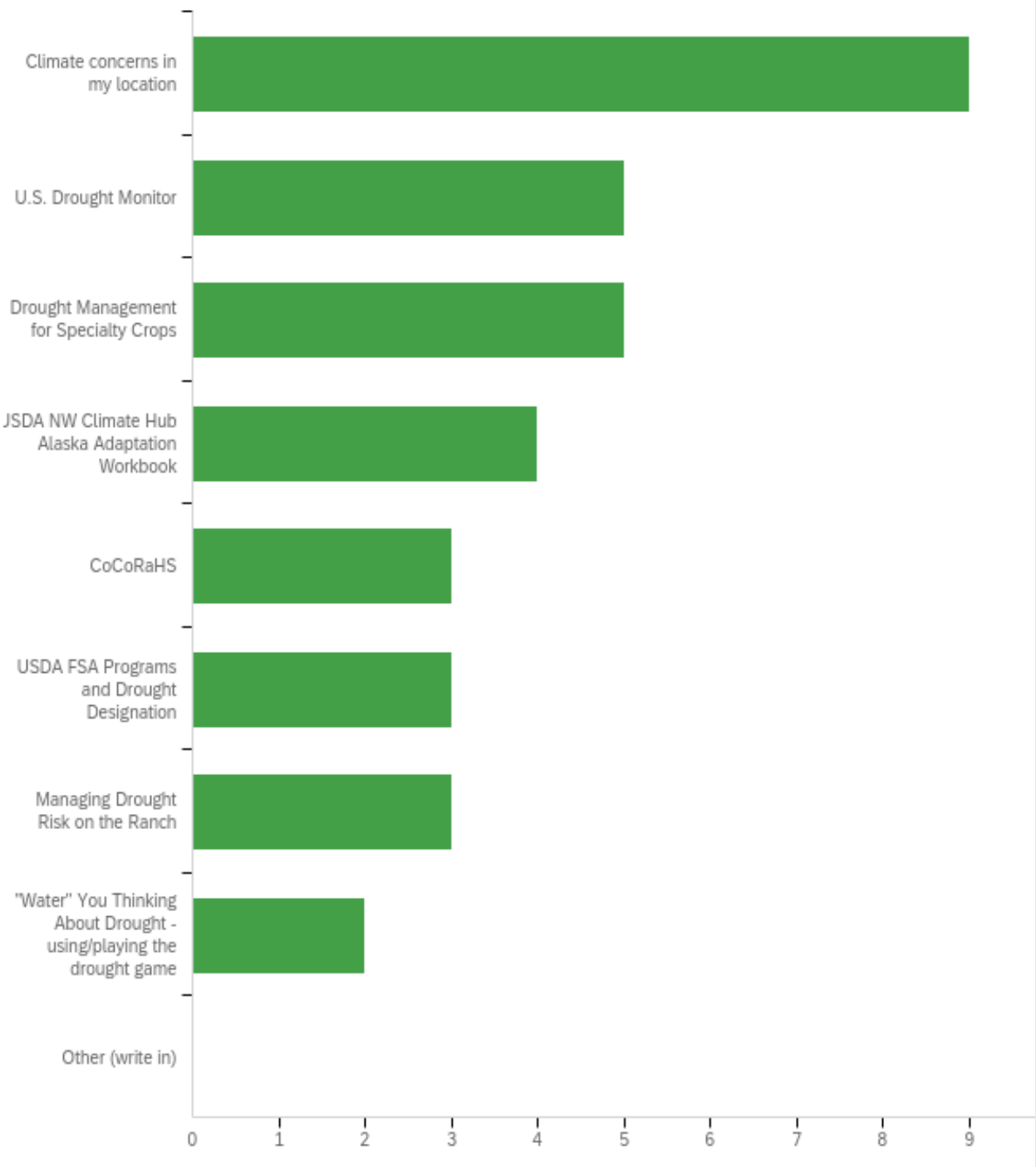

Figure 7: Participant interest in receiving additional information after the workshops.

Finally, we asked participants if there was anything they planned to do or learn more about as a result of the workshop. Two people mentioned paying more attention to climate and drought in Alaska, and four people indicated that there might be an increase in involvement in drought monitoring in the state. For example, one said that they planned to get involved in CoCoRaHS, and another said they'd work to get more

individuals to record and report weather within their farming community. Another expressed interest specifically in learning more about monitoring the water table and measuring variability with seasons and changes in use. Five participants said they planned to change agricultural management approaches or practices as a result of the workshop, including soil health improvements, changes in agronomic practices and investments in irrigation and/or water storage systems. One was also interested in following up on policies related to groundwater use and contamination. Another had connected with others to work on food security, and one said they planned to pass along the information and resources to other growers across the state.

Resources

A list of resources based on information shared at the workshop:

Drought information

- US Drought Monitor map of Alaska
    - List of variables used by the US Drought Monitor to assess drought in the lower 48, whereas those used to assess drought in Alaska are: daily standardized precipitation index (SPI), ESI 4-week DFPPM 4km (Evaporative Stress Index), ESI 12-week DFPPM 4km (Evaporative Stress Index), AHPS Precipitation (Alaska) *Advanced Hydrologic Prediction Service*, USGS streamflow percentiles, CoCoRaHS condition reports (Community Collaborative Rain Hail Snow network), USGS well data, and radar beam.
- Historical drought data and conditions, explore historical drought conditions 2000 to the present via a graph or map of the state. One can also click on a census area to see drought conditions just for that area.
- National Drought Mitigation Center
    - Farm Service Agency Livestock Forage Disaster Program eligibility tool from the National Drought Mitigation Center
- Overview of Weather Water Land Sites, an online tool that shows locations of weather and water monitoring stations in the western US, including Alaska. Note you can also view reference data like radar beam coverage, Risk Management Agency indemnities for weather related claims and other information under references.
- CoCoRHaS, Community Rain Hail and Snow Network, a national non-profit focused on community-based network focuses on precipitation measurements.
    - Training slide shows (all):
        - Getting started

        - Winter precipitation measurements
        - Measuring the water content of snow by weight
        - Alternative methods for making CoCoRaHS snow water content measurements

Climate information

- Alaska Center for Climate Assessment and Policy
- Webinars including a month climate outlook for the state by Rick Thoman
- PRISM climate group, Alaska average monthly and annual precipitation and minimum, maximum, and mean temperature for 1981-2010. Note these are the most up to date climate data from PRISM for Alaska.
- NOAA National Centers for Environmental Information: State Climate Summaries 2022
- National Climate Assessment - Alaska

USDA

- Northwest Climate Hub
    - Adaptation Resources for Agriculture: Responding to Changes in Climate in Alaska, note it has a soils handbook too
    - Demonstrations of adaptation in action throughout Northwest Climate Hub region (ID, OR, WA, AK)
- Farm Service Agency
    - Disaster assistance programs
    - Disaster Assistance Discovery Tool
    - Disaster assistance programs at a glance
    - Emergency disaster designation and declaration process and the regulation governing disaster designations is at 7 CFR Part 759.
- Risk Management Agency
    - Agent locator (Note: none are in Alaska so reset default distance to "no limit".)
    - Whole Farm Revenue Protection Program
    - Micro Farm Program
- Natural Resources Conservation Service