Alaska Regional Drought (and Extreme Events) Impacts 2021 Workshop

Aleutian Islands and Southwest

- Navigation and transportation
    - Airstrip erosion due to heavy thaw of permafrost
    - Erosion in general

- Vegetation
    - Berry production
        - Long-term precipitation effects (two years for fruiting flowers) and short-term production from recent precipitation
        - Low snowfall lowers berry production
    - White spruce - are sensitive to warm or dry early growing-season, increases beetle-kill
    - Increase in invasive plant species

- Aquatic Ecosystems
    - Algal Blooms - Oceanic
        - More near-shore algal blooms due to receiving precipitation as rain instead of snow
        - Shellfish food safety affected by algal blooms
        - Higher-level fish safety may also be affected by algal blooms
    - Increased glacial melt
        - Freshwater influx into the ocean
    - River Levels
        - Low water levels in early summer are driven by snowmelt, precipitation in the previous 6-8 months
        - Shifting mountain snowpack melt affecting river levels
        - Low streamflow affecting fish

- Wildfire
    - Fuel available for fire is determined by recent precipitation

- Energy
    - Current energy sources cost changing
    - Alternative energy sources are an issue
    - Higher cost of living

- Housing
    - Homes on stilts must be restabilized more frequently (permafrost thaw / erosion)

- Water Supply
    - Low aquifer levels
    - Sediment in wells
    - Snow-dependent wells going dry
    - Snowfall blown away or evaporating, lowering snowmelt

- Impacts from low snowfall (also in categories above)
    - Lower berry production
    - More near-shore algal blooms
    - Drying of snow-dependent wells
    - Low river water levels in early summer due to less snowmelt
    - See drought-like effects in spring and throughout summer

Southeast

- Vegetation
    - Berry production
        - Lowered due to drought
    - Forests
        - Increased defoliation of western hemlock, mountain hemlock, and Sitka spruce from hemlock sawfly
        - Impacts from hemlock sawfly in 2019 could be seen in May, obvious impacts by July
        - Did not observe the sawfly outbreak in Hoonah, more on Admiralty island
        - More forest pests surviving and increasing damage (spruce aphid) - Metlakatla
        - Yellow cedar decline - Sitka
    - Evergreen plant damage, in Metlakatla burnt salal
    - Reduced forage quality for deer and mountain goats
    - Muskegs dried out with surface cracking – Hoonah

- Wildlife
    - Increased fish mortality
        - Winter storms scoured eggs from impacted streams, reducing salmon survival - Metlakatla
    - Increased interaction with bears - due to low berry production and low fish availability – Hoonah

- Aquatic Ecosystems
    - Algal Blooms
        - Warmer water temperatures increase algal blooms
    - Rivers
        - River base flows and bank flow width decreased 75% in the most extreme cases - Hoonah
        - Warmer water temperatures in streams, creeks, and ocean affect salmon
    - Where, when, and how much water is available in lakes and creeks in all seasons

- Energy
    - Hydropower significantly affected by drought
        - Reliance on diesel under severe drought conditions
        - Economic impact - diesel generation more expensive

- Water Supply
    - Summer 2019, city worried about drinking water - Hoonah
    - Reduced available municipal water, had to supplement supplies – Metlakatla

- Food supply
    - Subsistence foods, crops, wildlife, and materials affected - Metlakatla

        - Affected by timing of harvest or unable to harvest, reducing quality of life and food diversity of the community
    - Locals dependent on hunting, fishing, and local sourced food. Reduced hunting and fishing availability cause food shortages.
        - Purchasing food is expensive and leads to economic hardship

- Fisheries
    - Negatively affected by drought - Ketchikan
    - Reduced fish returns - Ketchikan
    - Poor run of pink salmon - Ketchikan
    - Reduced survival of salmon at all life stages - Metlakatla
    - Increased predation from being unable to swim upstream, forced into larger streams. Culverts limit mobility and lead to increased mortality - Sitka
    - Particularly impacted by higher water temperatures

- Tourism
    - Positive impact on tourism with more sun, less rain - Ketchikan

- Impacts from low snowfall (also in categories above)
    - Lower average snowfall past 10 years - Metlakatla

- Other concerns noted
    - Extreme rain following drought and those impacts on fish runs, causing scouring of clam beds, and landslides
    - Developing and modifying existing climate adaptation plans
    - Environmental indicators are shifting, including indicators of spring and herring season, outdoor planting
    - Need somewhere to store information (like a database) to house past drought information found from before the USDM began
    - Increased vulnerability of community due to reduced snowpack and changing rain patterns - Metlakatla

Southcentral

- Navigation and Transportation
    - Low water affects navigability on rivers
    - Low snow affects transportation via snowmobiles (usually called snow machines)

- Vegetation
    - Berry production impacted - bushes nearly empty – Seldovia
    - Long timescale - flowers to fruit a two-year process

- Aquatic Ecosystems
    - Rivers: Lower elevation rivers are ephemeral in dry periods - Mat-Su Valley

- Water supply
    - Well water quality declines in drier conditions
        - 2019 very few well issues until mid- August, water quality compounded by development - Anchorage
        - More common to be wet on the other side of the mountain ranges and dry around Anchorage

        - Water delivery common in Mat-Su Valley & can be cheaper than filtering fine sediment out of well water from declining water quality
        - Wells going dry regularly despite using much less water than in the past – Seldovia
    - Mat-Su Valley: Wasilla, Willow, and Palmer municipalities supply water, everyone else on personal wells
    - Irrigation comes from all water
    - Groundwater information unknown - underground water losses not known
        - Less snow, more rain - impact on meltwater in the summer for groundwater recharge – Seldovia
            - Usually have high water tables, concern of drought reducing ground water levels causing perched aquifers and lack of water access

- Wildfire
    - March and April precipitation important for later season water and fire conditions
    - Wildfire affects hunting possibilities, seen in 2019 – Seldovia

- Fisheries
    - Few salmon eggs laid leads to low returns 4-5 years in future
    - Concern about fish passage in low elevation streams when water levels are low
    - 2019 impact on stream salmon less severe than in 2015 - Seldovia

- Tourism
    - Water height and snow depth important for recreation and tourism
    - Iditarod dependent on snow amount

- Impacts from low snowfall specifically
    - Low elevation snow drought strongly affects the Lower Susitna valley
    - Snow depth and tourism
    - Tourism reduced if insufficient snow for the Iditarod
    - Snowfall and groundwater recharge

- Other concerns
    - If drought and dryness is a long-term trend and future planning
    - Stream forecasting an issue in the region
    - Less snowfall, more rainfall

Northwest

- Navigation and Transportation
    - Transportation impact of snow drought – cannot use snowmobiles, ATVs have a more limited distance

- Vegetation
    - Berry production affected by lack of snow and rain

- Aquatic Ecosystems
    - Temperatures - Permafrost thaw can lead to deeper water flow paths and colder water temps
    - Beavers causing higher nutrient flow.
    - Higher water temperatures early in the season
    - Algae blooms noticed east of Kotzebue connected to fish die offs

        - 2014 fish die off (dry conditions not noted in the region in 2014), and another last year
    - Rivers around Nome respond quickly to precipitation deficit, heavy reliance on mountain snowmelt

- Water supply
    - Surface water unsafe due to beaver pollution
    - 5 of 15 villages around Nome do not have running water

- Wildfire
    - Post fire revegetation happens quickly, less dense than prior vegetation
    - Past wildfire - 1977 around Kotzebue

- Food supply
    - Reliance on subsistence hunting and gathering for food - store bought is very expensive
        - Less snowpack and rain affect berry production
        - Order of subsistence: Fish, birds, berries, roots
        - Non-commercial ag: tuber potatoes, roots, willow leaves, medicinal greens, broadleaf plants, kelp
            - No support for non-commercial ag disaster relief or lowered subsistence harvest
    - Changing animals, timing of migration and migration patterns causing problems - Kotzebue
    - Snow drought affects survivability of berries – Kotzebue

- Fisheries
    - Early snowmelt or low snowmelt have effect on salmon, noted around Nome in 2020
    - Fish populations affected by water temps reaching 68°F

- Impacts from low snowfall specifically
    - Snow drought affects berry production
    - Transportation issues
    - Less meltwater in warmer months, affecting water levels and temps

- Drought notes
    - Related to temperature (evapotranspiration) as much as precipitation. Seems like a common note in all regions – all having complications from warmer temperatures from climate change

- Other concerns
    - Permafrost thaw due to higher temperatures is a major concern. Unsure how connected to drought, but likely affected by snow drought. - Kotzebue
    - Sea Ice: Reduced thickness - from 4-5’ down to 19” - Kotzebue
    - Lack of knowledge of groundwater resources and monitoring

Interior

- Navigation and Transportation
    - Water transportation disrupted due to drought
    - Fairbanks’s roads affected by high snowpack 2018

    - More rain caused more potholes

- Vegetation
    - Boreal forest trees dependent on snowmelt infiltration
    - Spruce trees rely on snow melt - low snow melt deadly in two years
        - Fall 2020 noted high amounts of spruce cones - Fairbanks
        - White spruce produces more cones in the year following a hot & dry summer
    - Conifers most vulnerable trees to water stress
    - Seeing an increase in deciduous vegetation as they recover more quickly than fir trees

- Wildlife
    - Ecology issues noticed in summer drought around permafrost

- Water supply
    - Low drinking water and streamflow noted in summer drought impacts
    - Rivers draining the Alaska Range rely on glacial melt
    - Rivers from the Brooks Range driven more by rain
    - State of Alaska and USGS have near real-time data from wells - Fairbanks
    - Noted winter rainfall does not soak into soil after a dry fall – Galena

- Wildfire
    - Drought years result in more fuels for wildfires and cause hotter burning fires
    - Early snowmelt leads to early fire season, does not indicate severity
        - Lack of precipitation in June and July has the greatest effect
    - Summer (August) wildfires impact of drought
    - Fairbanks region - expect more fires due to more lightning from end-of-summer convective rainstorms

- Food supply
    - Crop impacts- reliant on spring rain
    - Drought caused poor hunting conditions in summer period

- Fisheries
    - Fish die-offs noted in summer drought

- Other concerns
    - Climate shifts for the region being warm and moist, noted around Denali area
    - Increase in convective storms for wildfire (lightning) and crop systems (hard to forecast)