

Implications of Drought / Low Snow Pack on Community Water Supply

- LEO Webinar May 26, 2015

Introduction: (Jan Deick, PG, MS Hydrology, BS Geology)

The highly variable settings across Alaska make this a complicated topic and generalizations do not necessarily work when trying to evaluate potential impacts to a specific community water supply.

These settings affect the impact to the water resource:

- magnitude/volume
- immediate or delayed
- duration, and frequency to name a few



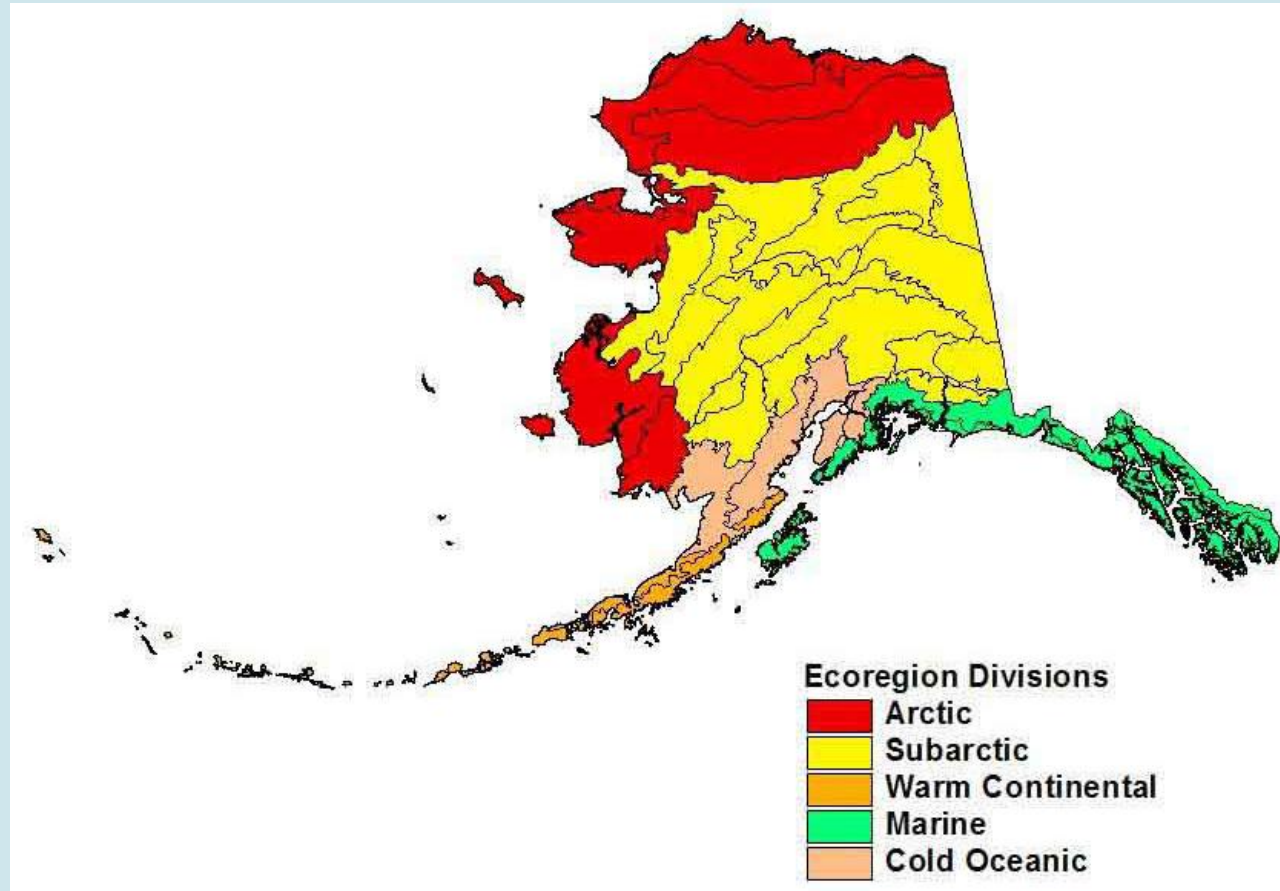
AGENDA TOPICS:

- Overview of hydrologic/water cycle and where your water source fits in important to understand observation needs
- Overview of water source types/settings and vulnerability (surface water and groundwater sources)
- Engineering considerations (groundwater vs surface water, continuous or seasonal availability, water quality, annual and seasonal demand vs potential source)
- Water source evaluation and monitoring
- Local monitoring observations to consider



Physiographic/Hydrologic Setting

Where is your Community located and why is this important?





Physiographic/Hydrologic Setting

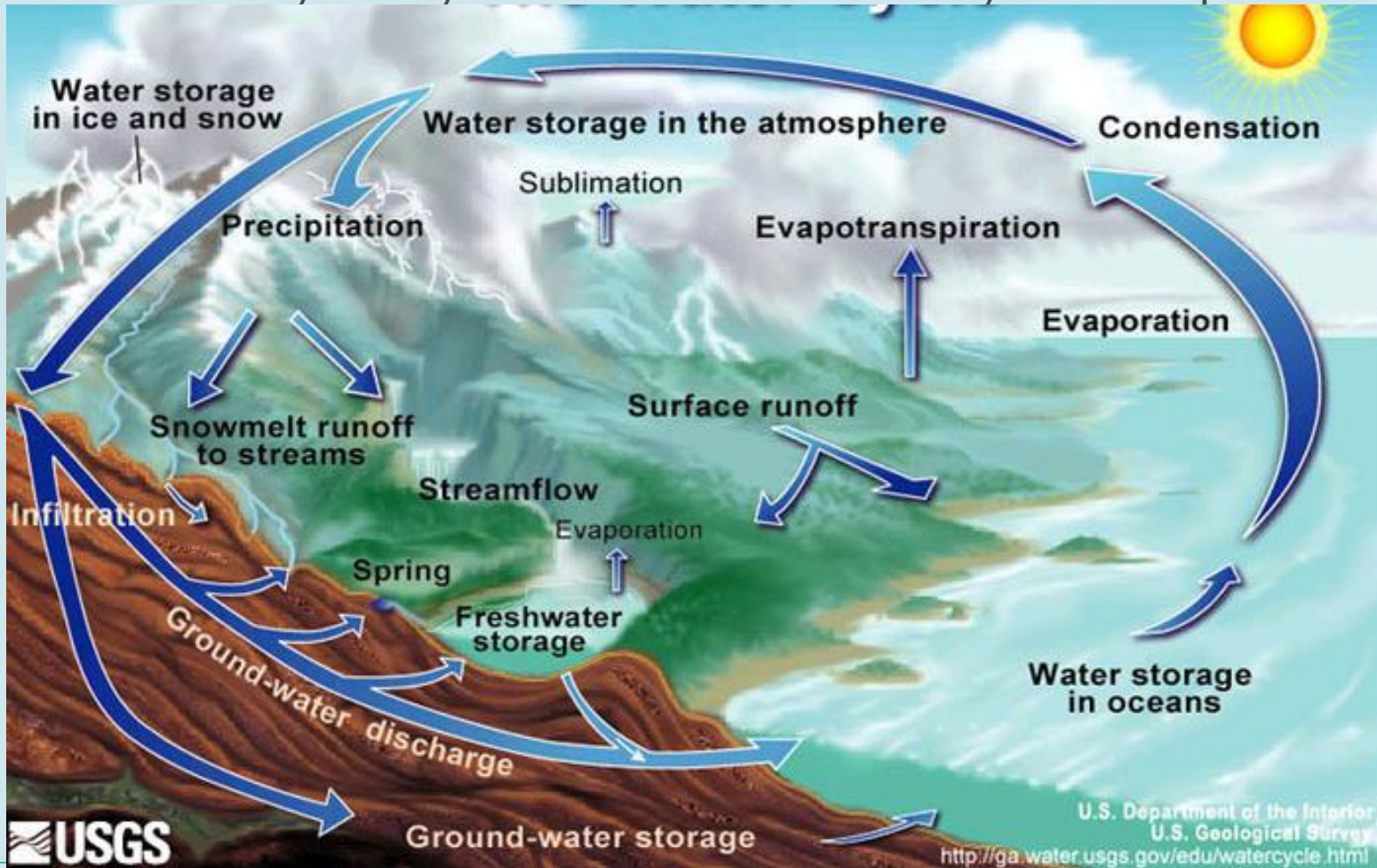
Where is your Community located and why is this important?



Figure 4.1.2. Seven climatic regions used in NOAA Atlas 14 Volume 7.

Hydrologic / Water Cycle

Where in the cycle is your water source and why is this important?





Island Hydrology - Gambell, Alaska





Spring on Nelson Island identified Bedrock Aquifer





Arctic Stream entering Toolik Lake





Slant Well Targeting Talic in Continuous Permafrost Region



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Mountainous SE Alaska - Saxman





SE Alaska - Coffman Creek Sept 11, 2012





SE Alaska - Coffman Creek Sept 12, 2012





Factors that Influence Water Source Vulnerability to Drought/Low Snow Pack

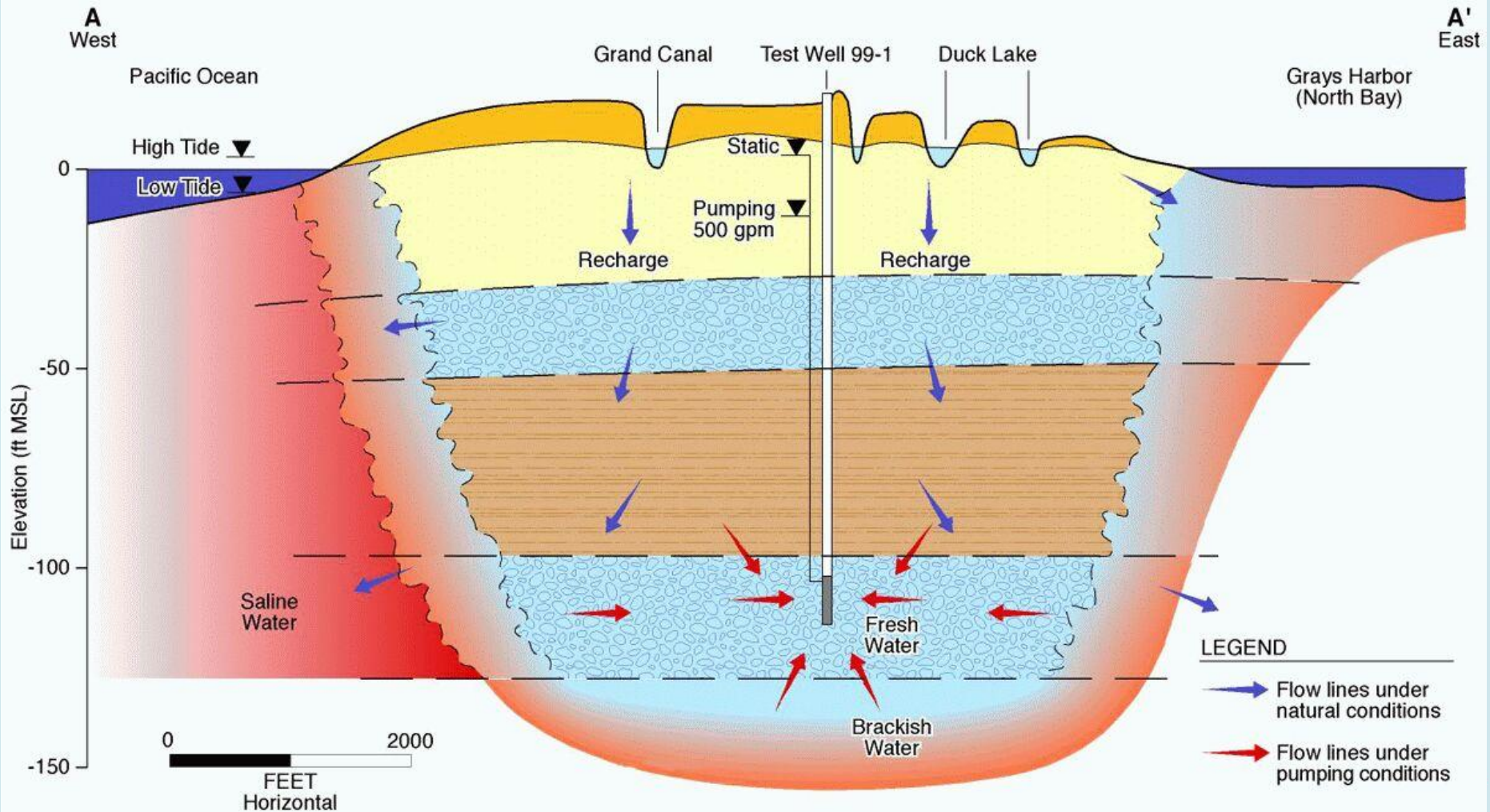
- **Groundwater Source**
 - Aquifer depth (deep/shallow) and type (confined/unconfined)
 - Depth to groundwater
 - Aquifer material (bedrock/sand & gravel)
 - Aquitard (present, extent)
 - Recharge sources
 - Recharge rates
 - Surface water influence
 - Permafrost



Factors that Influence Water Source Vulnerability to Drought/Low Snow Pack

- **Surface Water Source - runoff factors/parameters**
 - Drainage basin size (large/small)
 - Topography (steep or gentle)
 - Vegetation cover (% forested/tundra/brush)
 - Climate type (maritime, arctic, interior continental)
 - Rainfall frequency, duration, and intensity
 - Snow pack amount, longevity, spring melt characteristics
 - Permafrost – continuous, discontinuous
 - Source storage capacity – lake or stream

Coastal & Island Hydrology - Salt Water Intrusion





Groundwater Source Impact Comments

- Can be less susceptible to short term drought events but shallow systems can be for long term drought or low snow pack
- Typically a delayed response
- Can take longer to recover
- Can increase risk of saltwater intrusion to shallow systems





Surface Water Source Impacts

- Impacts from drought including low snow pack can widely depending on:
- Physiographic setting
- Drainage basin size and topography
- Vegetation type,
- Permafrost
- Water Quality Sampling and Evaluation





Monitoring and Observation Comments - Groundwater Source

- Understand/Consider
 - Aquifer Characteristics / Type: (confined, water table, local, regional)
 - Recharge area (local, regional, surface water influenced)
 - Well head protection – (more of an environmental concern but during drought conditions the resource is more valuable and potentially susceptible to contamination)
- Monitoring/Observation
 - Groundwater level indications
 - Spring and seep occurrence and changes
 - Surface water level changes
 - Well performance and water level in wells



Monitoring and Observation Comments – Surface Water Source

- Understand/Consider
 - Watershed characteristics (Source) : (seasonal nature, summer only, flow rate)
 - Recharge (snow melt, summer rains, groundwater, large or small drainage basin, topography)
 - Source area protection (contamination sources, activities that impact storm water runoff, wetlands)
- Monitoring/Observation
 - Spring and seep occurrence and changes
 - Surface water level changes / stream gauge monitoring
 - Well performance and water level in wells
 - Snow pack in water shed (duration, snow water equivalent testing, extent)



Agencies

Table 4.2.1. Agencies that provided data for the project with their dataset names, abbreviations, data reporting interval and common first two digits of station identification numbers.

Data provider	Dataset name	Abbrev.	Reporting interval	Common digits
Alaska Dept. of Transportation	Road Weather Information System	RWIS	1-day,1-hour	60
Environment Canada	N/A	ENV CANADA	1-day,1-hour	21
Midwestern Region Climate Center	19th Century Forts and Voluntary Observers Database	NCDC	1-day	50
National Climatic Data Center	DSI-3200	NCDC	1-day	50
	DSI-3240	NCDC	1-hour	50
	DSI-3260	NCDC	15-min	50
	Integrated Surface Hourly	ISH	1-hour	70
National Interagency Fire Center, Western Region Climate Center	Remote Automatic Weather Stations	RAWS	1-hour	80
National Weather Service and Federal Aviation Administration	Automated Surface Observing System	ASOS	1-hour	55
Natural Resources Conservation Service	SNOWpack TELemetry	SNOTEL	1-day, 1-hour	10
United States Geological Survey	N/A	USGS	1-day	90
University of Alaska Fairbanks	Arctic Long-Term Ecological Research	ARCTIC LTER	1-day, 1-hour	30
	Arctic Transitions in the Land-Atmosphere System	ATLAS	1-hour	41
	Bonanza Creek Long-Term Ecological Research	BONANZA LTER	1-hour	31
	Water & Environmental Research Center, North Slope	WERC	1-hour	40



Thank You For Attending - Questions

- <http://akclimate.org/> (The Alaska Climate Research Center Website)

