SALMON DIE-OFF AND THE CHANGING LANDSCAPE IN THE NORTON SOUND REGION

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HAL SHEPHERD
WATER POLICY CONSULTING, LLC

2019 on track to become Dreist Summer Ever in Southcentral Alaska

Weeks without rain affecting Southcentral Alaskan communities that rely on snow pack and rain water for water requiring water rationing;

- Nanwalek reservoir diminished rapidly
  - requiring the village to have water flown in for 60 households

Entire forests in Southeast "are falling prey to spruce bark beetles and hemlock sawflys, which are taking advantage of a lack of rainfall and higher than average temperatures."

Heat Wave in Southcentral

In early July, temperatures over 81 F were recorded in southcentral Alaska. This resulted, in salmon spawning stream temperatures exceeding 80 degrees for the first time ever.

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

Drought conditions combined with low snow pack, caused Jackoloff Creek to dry up Completely resulting in die-off of Pink salmon returning to spawn and Silver smolts trapped in diminishing pools of water.

Atmospheric River in the North

While dry weather has also forced cuts in hydropower production in South central Alaska, an "atmospheric river" consisting of a deluge of rain from the Pacific Ocean , has been drenching northern sections of Alaska and disrupting hydropower and other infrastructure;

Rain instead of snow is becoming more prominent in the fall and winter resulting in increased flood events in such threatening community infrastructure and scouring stream beds used by fish.

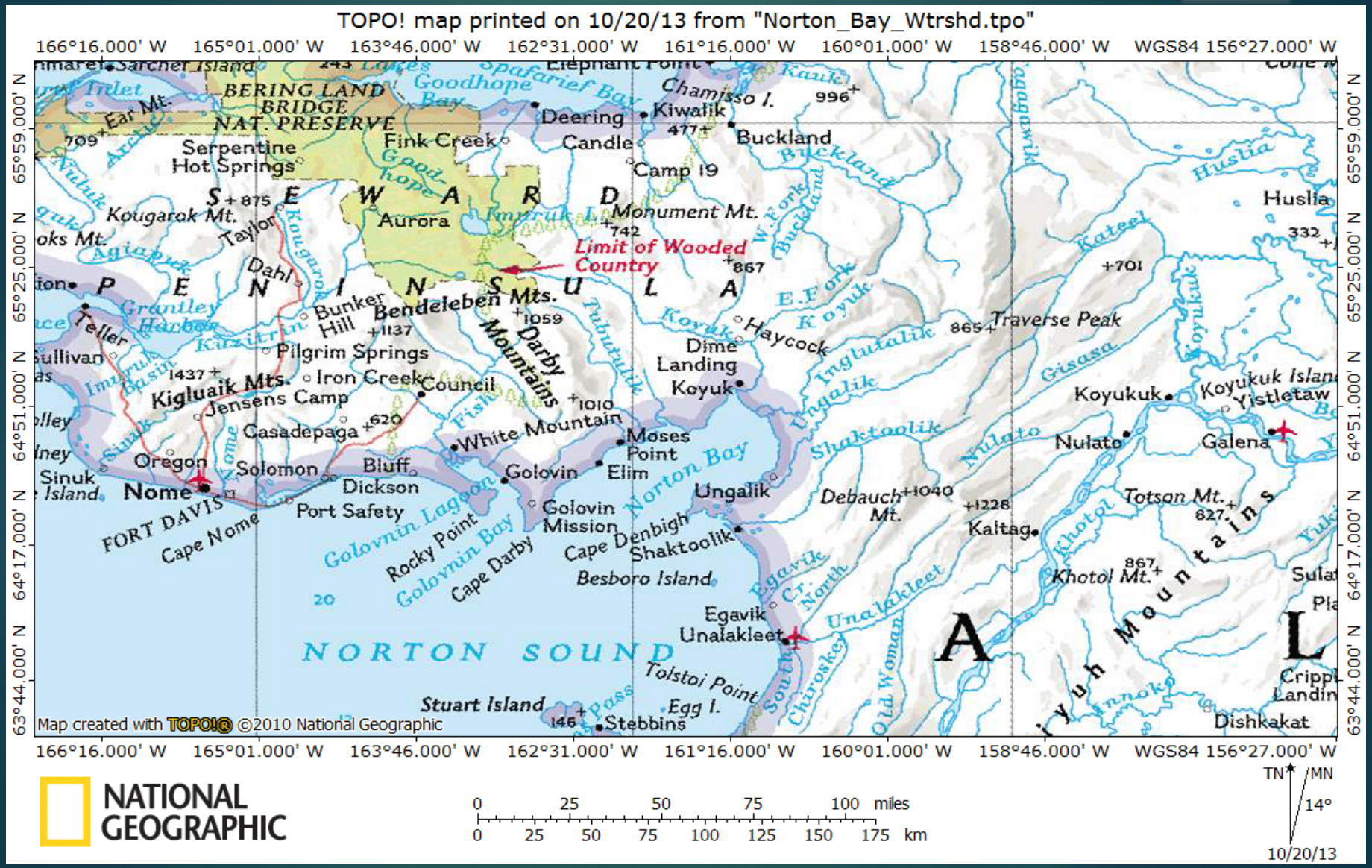
Norton Sound Area Fish Die-Off

Scope of the "larger than normal salmon die-off covered several communities from east to west in the Norton Sound region"

Although salmon die-offs often occur naturally, "for this many 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."

Wes Jones, Development Director for Research - Norton Sound Economic Development Corporation

The Norton Bay Watershed



Vulcan Creek Gage Site

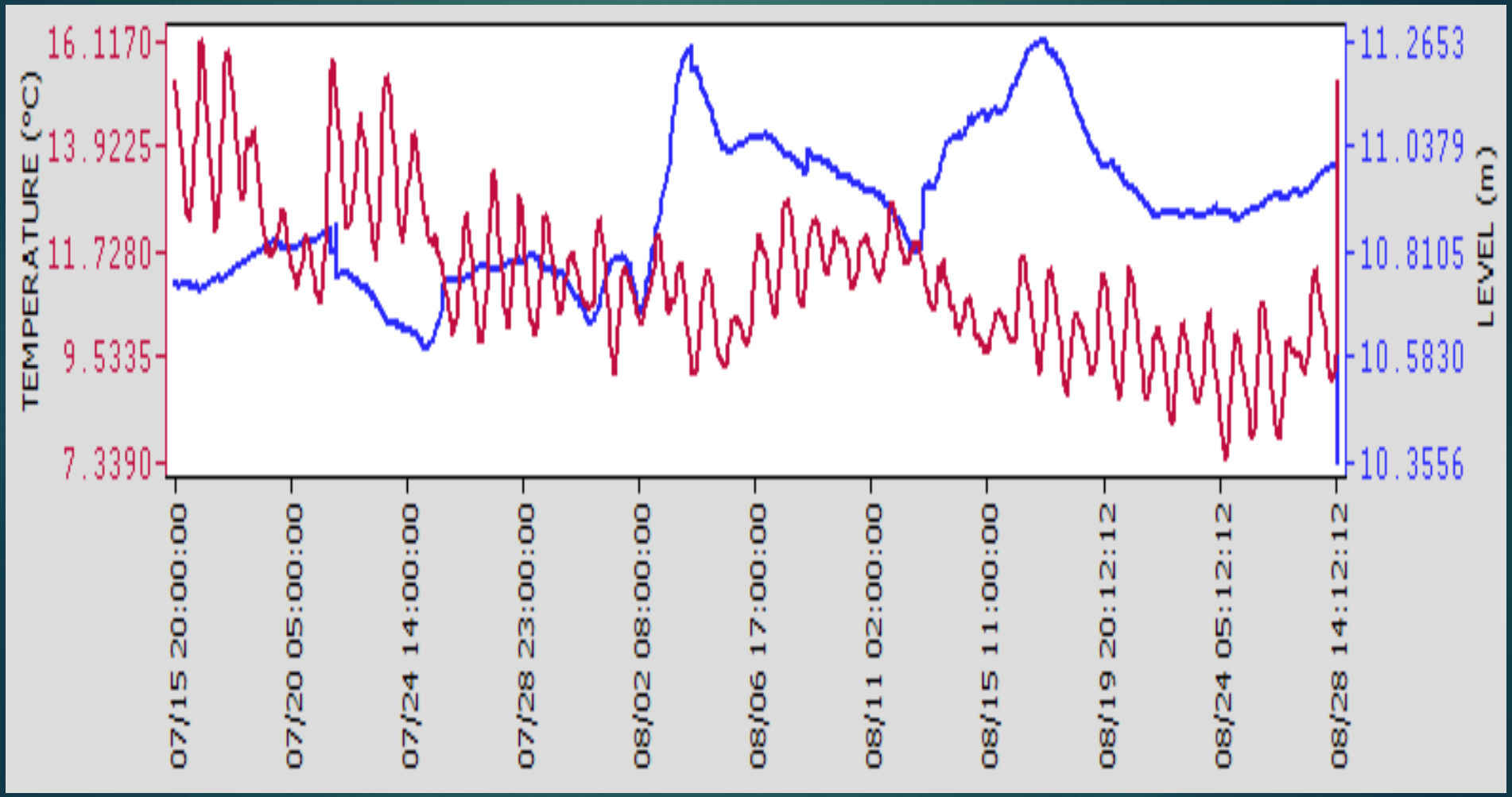
Tubutulik River Fish Die-off

Vulcan Creek Gage Site - observed hundreds of otherwise healthy dead fish including Pink and Chum salmon and white fish;

Took temperature and dissolved oxygen (DO) readings indicating the water was between 61– 64 degrees and DO as low as 8 ppm;

Continued data collection temperature - 58-60 degrees for the next several days before dropping down to 54 degrees.

Vulcan Creek Gage Site Level Logger



That "Uncertain Climate Future" has Arrived for Alaska

State's fish die-off is "directly in line with the predictions of what scientists…have been warning is likely to occur, and we need to prepare ourselves and not be surprised when it happens again in the future, because it will."

- Peter Westley, Assistant Professor of fisheries conservation and fisheries ecology, UAF

"We're 50 years ahead of where we thought we would be"

- Sue Mauger Science Director - Cook Inlet Keeper

Bank Erosion

Can accelerate with scouring by ice during spring breakup, and also at times of heavy water discharge, but are known to occur during low flow conditions as well.

This year, significant erosion occurred in Nikolai, Napakiak, Akiak on the Kuskokwim River; Huslia on the Koyukuk; and several areas along the Matanuska River.

Warming temperatures and less ice are transforming the Bering Sea ecosystem

"The region is in transition, heading to a future that is expected to be warmer and less icy than the past, with far-reaching implications for fish, marine mammals, birds and people, scientists said at last year's Alaska Marine Science Symposium."

Alaskans find more dead seals along warming Arctic seas

- https://www.arctictoday.com/alaskans-find-more-dead-seals-along-warming-arctic-seas/

Alaska seabird die-offs, are a 'red flag' in warming climate

Every year, it seems like there's been a large die-off event of some kind, so that's unusual… Seabirds are indicators of the ecosystem's functions, if not ecosystem health. These are red flags that we have to pay attention to."

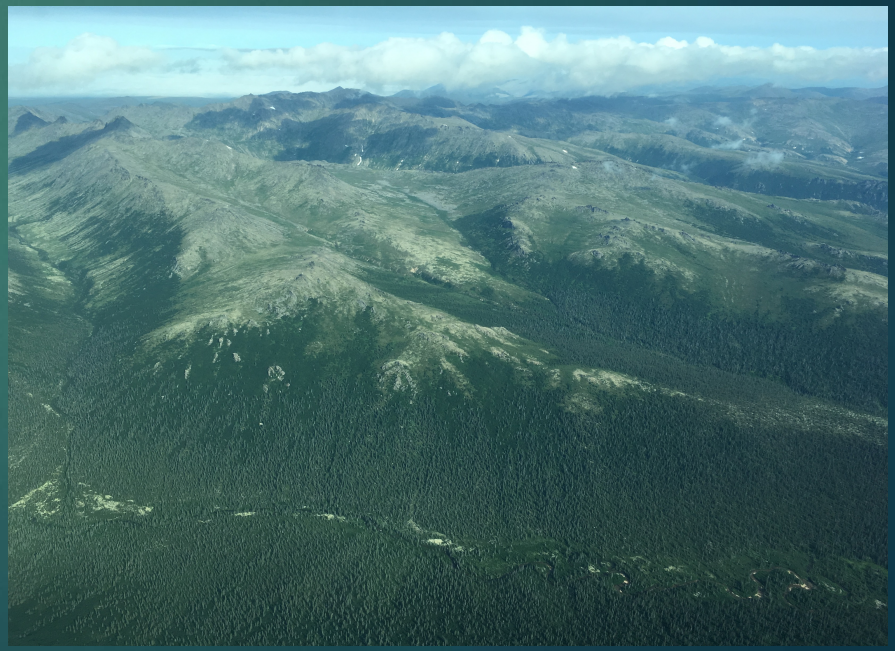
Kathy Kuletz, - Fish and Wildlife Service's Alaska Migratory Bird Management Program

Can We Slow it Down?

Stephanie Quinn-Davison, Director - Yukon River Inter-Tribal fish commission – create a network of locals from native village communities to monitor temperature, low flows, dissolved oxygen in nearby rivers to try and anticipate salmon die-offs before they occur;

Michael Brubaker - Leo Network, is tracking impacts from the regional drought and request that Network members post observation to the website.

Michael Ophiem - Seldovia Village Tribe - identifying habitat on Jackaloff Creek watershed were water levels and temperature are currently adequate for salmon spawning and plan to Use a wet incubator for out-planting eggs to those areas.



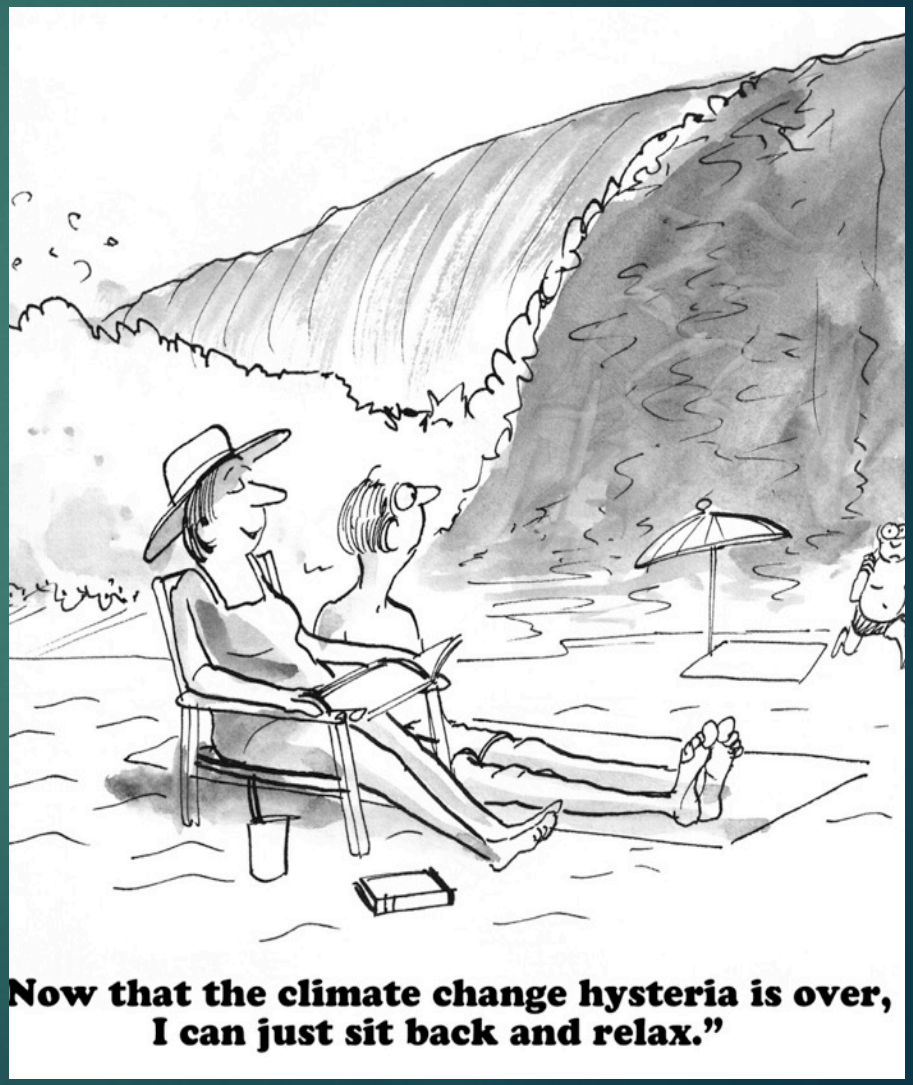
Norton Bay Watershed Ocean and Coastal Management Plan.

Apply the North American Marine Protected Area Rapid Vulnerability Assessment Tool (MPARVAT), created by the Council on Environmental Cooperation's 2015-2016 Marine Protected Areas:

Monitoring to Predict Die-offs

Continue monitoring water temperature, dissolved oxygen and flow levels for villages in the Norton Sound Region;

Work with stakeholders to develop rapid assessment capability and under-standing watershed responses to extreme events including heavy precipitation and drought conditions.



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