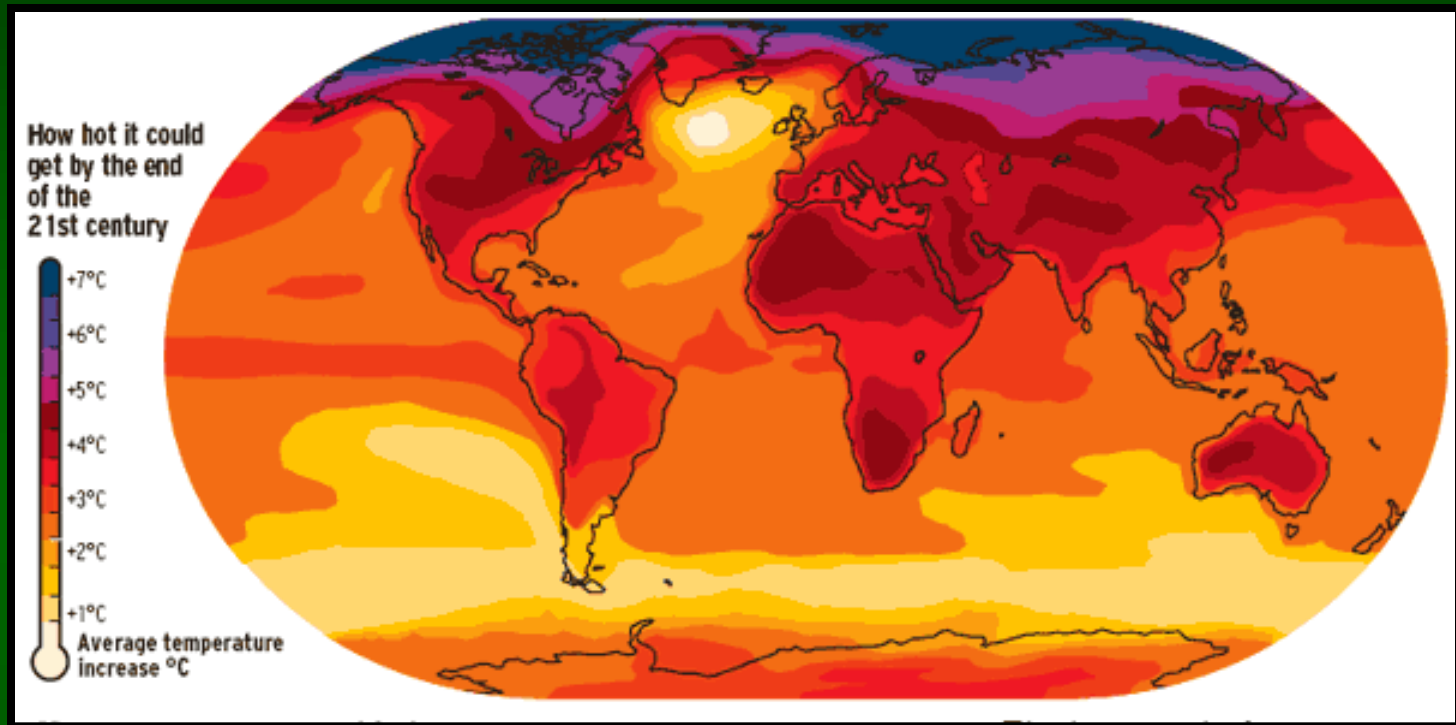


# Climate and Fish communities in the Interior: landscape perspectives and future research directions

Amanda Rosenberger  
Bessie Green Markley  
Stan Triebenbach  
Anupma Prakash  
Terry Chapin  
Joseph Margraf



# Big Questions

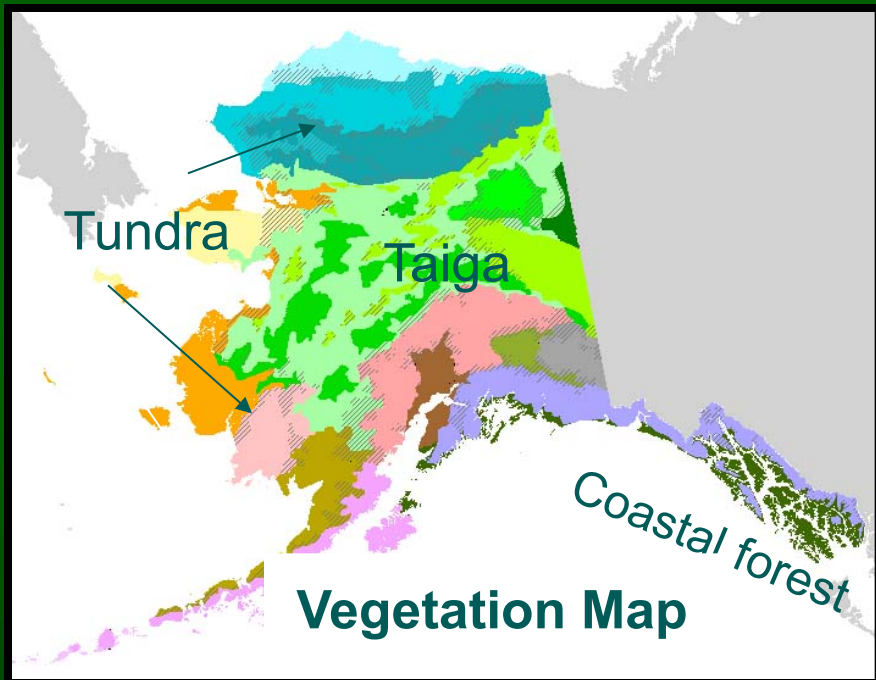


- How do we sustain ecosystems in a directionally changing world?
  - Alaska an ideal place to address question



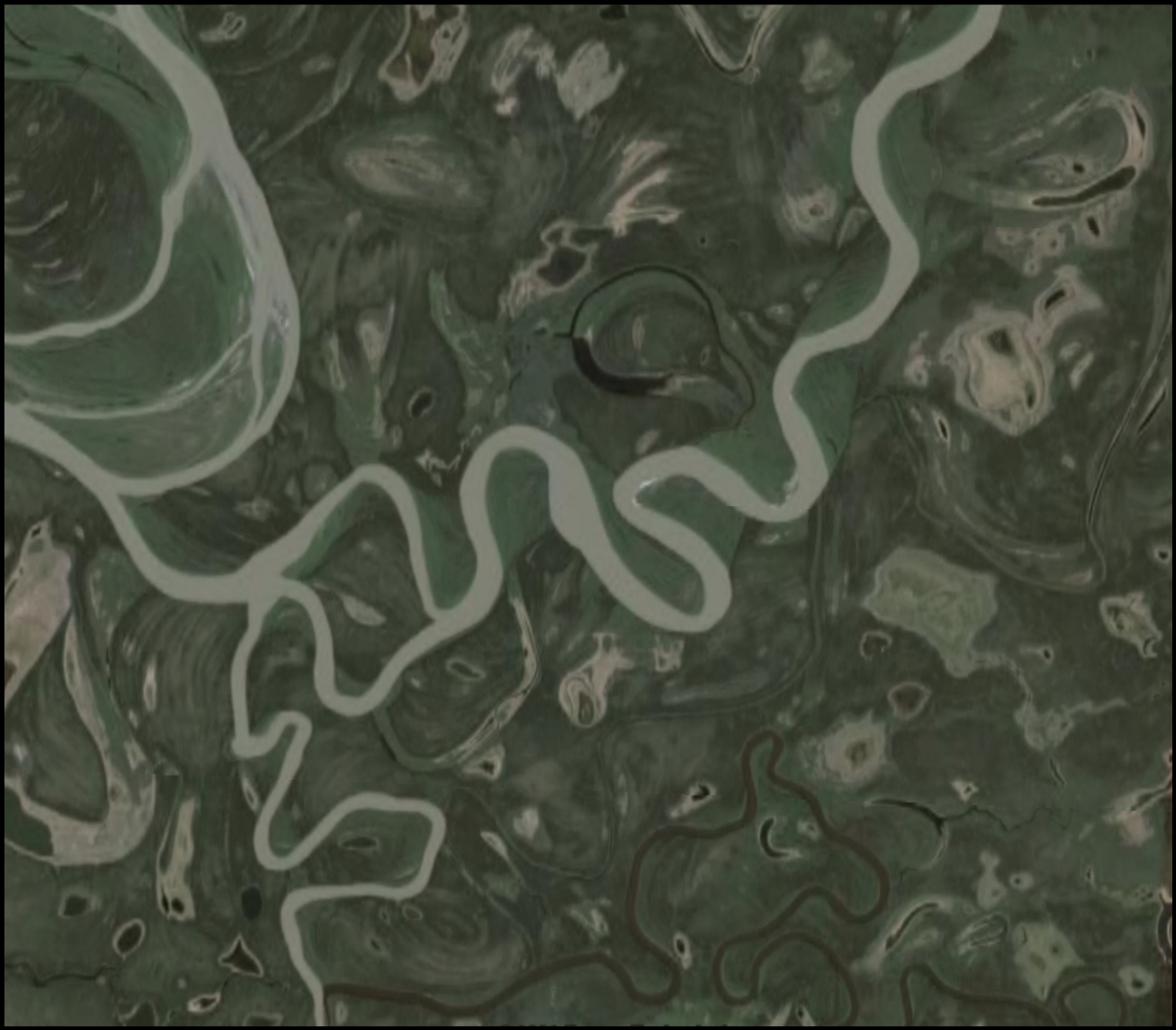
# Close connection between ecology and culture

If we change an ecosystem,  
what happens to its people?





























# Hypotheses on factors that affect fish Distributions

Important features for fish occupancy:

## 1) Lake size

- Availability of suitable habitat
- Freezing in winter

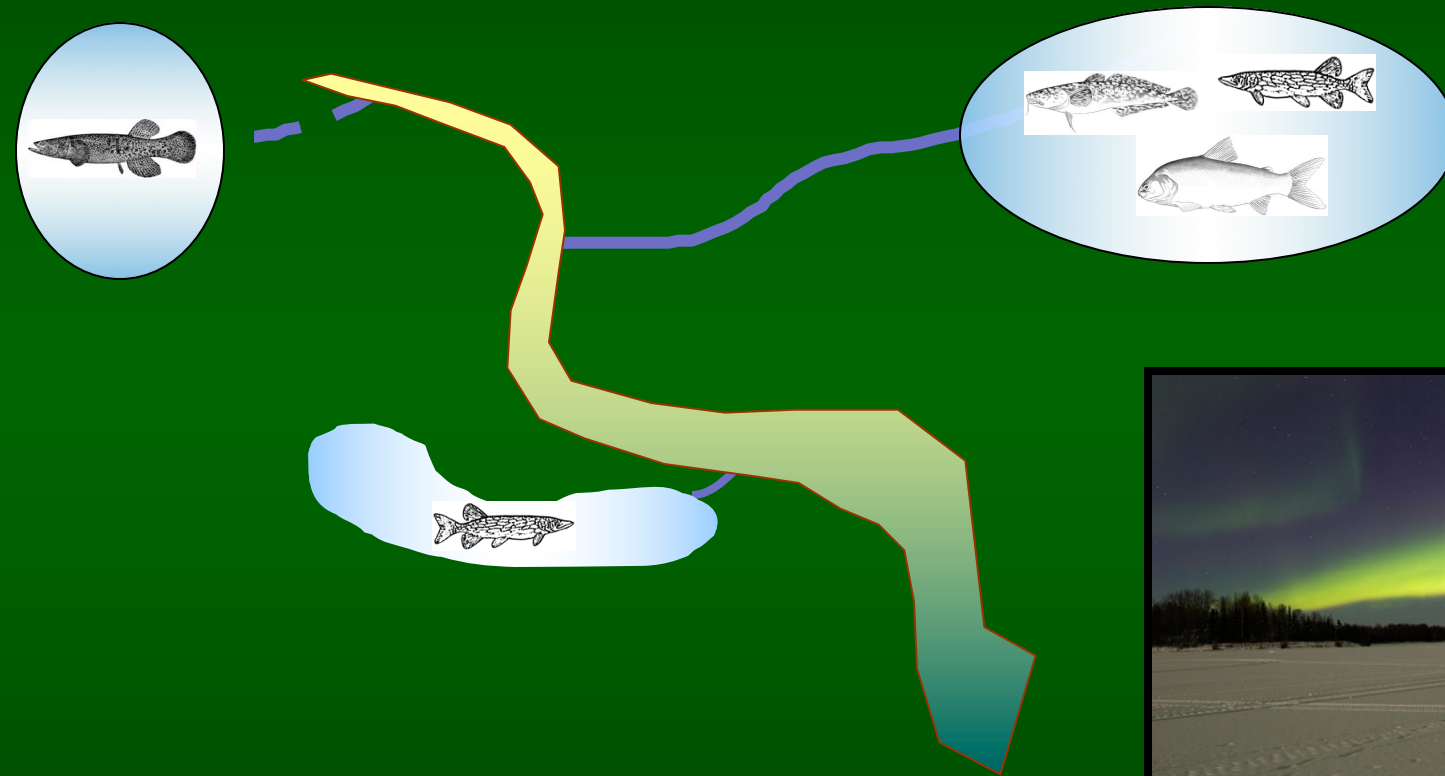
## 2) Lake connectivity

- Seasonal or permanent connection
- Proximity to rivers and tributaries (flooding)

## 3) Habitat suitability

- Lake limnology
- Vegetation (pike breeding habitat)

# Connectivity and Lake volume











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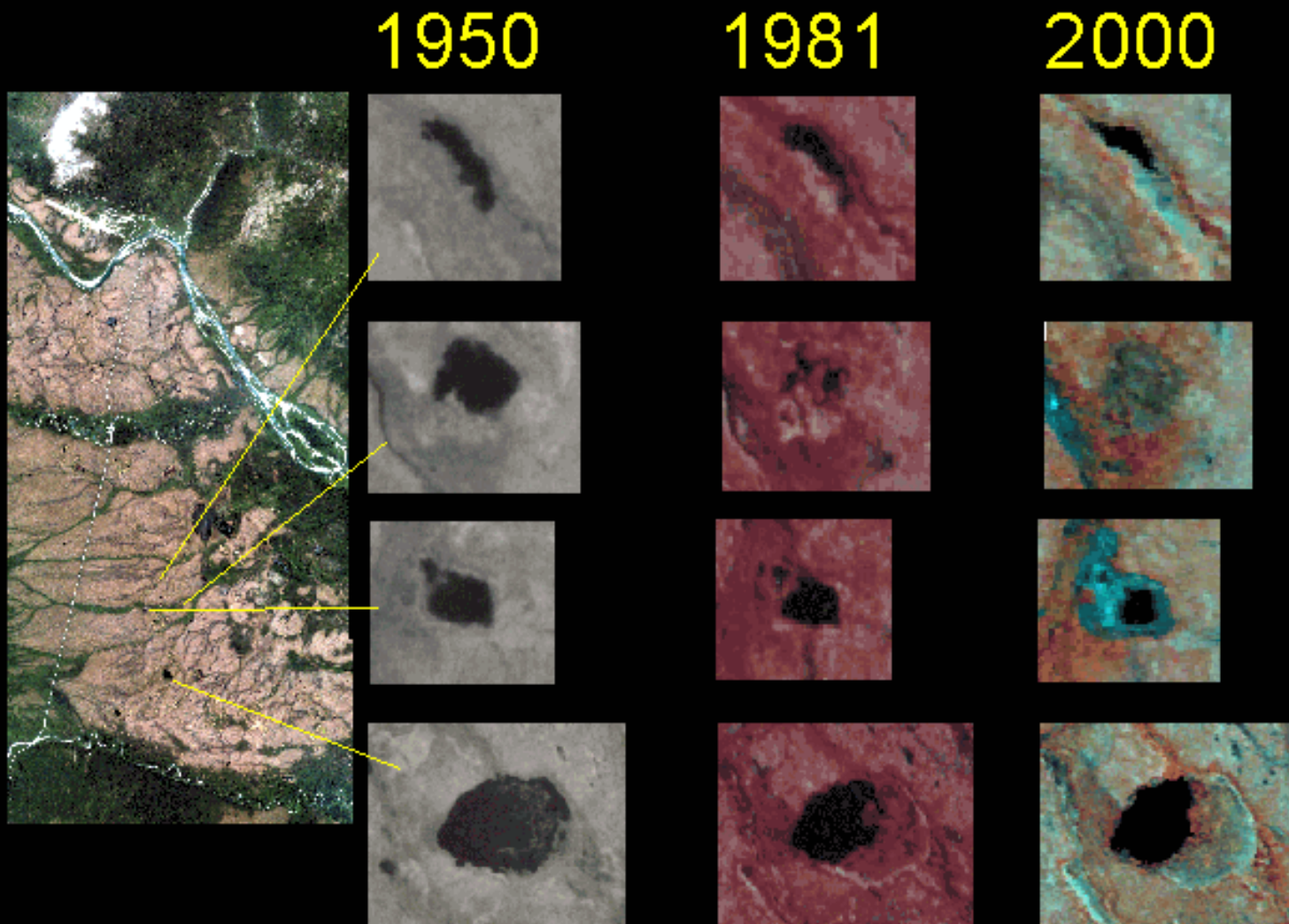
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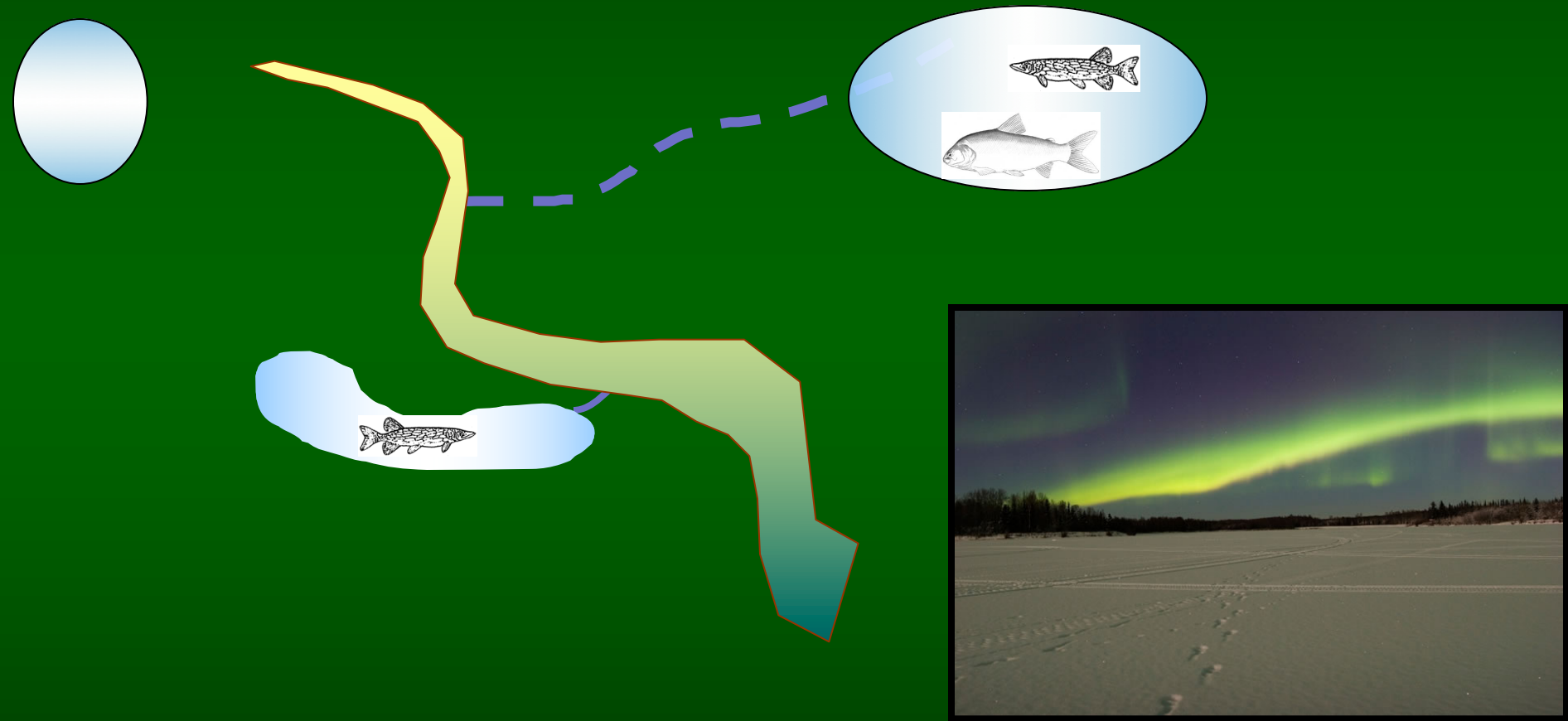
- Lake limnology
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# Interior Lake drying





# Connectivity and Lake volume





# Healthy Salmon Stocks – Human Health





## Fishing restrictions, high fuel and food prices take toll on Interior Alaska villages

By Tim Mowry

Published Monday, August 14, 2006

FAIRBANKS — With little bare space on local television about what winter holds for the village of Fort Yukon.

"I'm concerned about the impact on the tribal council in Fairbanks. "If they're forced to eat food they can't afford because of higher cost, and it's not our traditional foods."

A weak king salmon run placed on subsistence needs. Canadian spawning runs make it impossible to catch fish. The toll on villagers, however, is high because of food prices.

"We had mushers at the fair saying they were going to not get food," Alex said.

Almost 300 miles down the Yukon, Moore is feeling the same pain. Tanana for more than a year has lost 10 percent of the king salmon.

"I don't think anybody

## Biologists brace for dismal Yukon River king salmon run

By Tim Mowry

Published Saturday, July 29, 2006

King salmon are beginning to enter the Yukon River, and state biologists are bracing for what could be another weak run.

An unexpected weak run was a surprise last year, but this year with one of the worst runs in decades, fisheries are bracing for the worst.

Unlike past years, whether to open a commercial fishery about a quarter of the way up the river, the average is around July 15. It's a halfway point in the run, and a decision this season will be made by the state manager for the Department of Fish and Game.

"That's to ensure we can meet our subsistence needs and our treaty obligations to the state and the federal government."

Biologists last year in a strong one and opened commercial fishing. By the time biologists start fishing, fishermen have already come up 31,000 to Canada as part of an international treaty regarding management.

## Yukon River life takes a hit because of dismal king salmon run

By Tim Mowry

Published Thursday, July 3, 2008

FAIRBANKS — The king salmon run in the Yukon River may not be as bad as state fisheries biologists thought, but it still won't likely be big enough to fill fish racks and smokehouses in many villages on the middle and upper part of the river, or meet Alaska's international treaty obligations to Canada.

Thanks to a late spike of fish, biologists with the Department of Fish and Game upped their projection for this year's chinook run past a sonar counter on the lower Yukon from 80,000 last week to as high as 120,000 this week, which is still short of the required 140,000 needed for adequate spawning numbers and a sufficient subsistence harvest.

"We're doing better than we were a week ago," said area management biologist Steve Hayes, who is monitoring the run in Emmonak at the mouth of the Yukon.

The Yukon king run is typically made up of four "pulses" of fish entering the river. Last week's four-day spike represented the third pulse of the season, Hayes said. A fourth "bump" is expected to hit the river this weekend, he said.









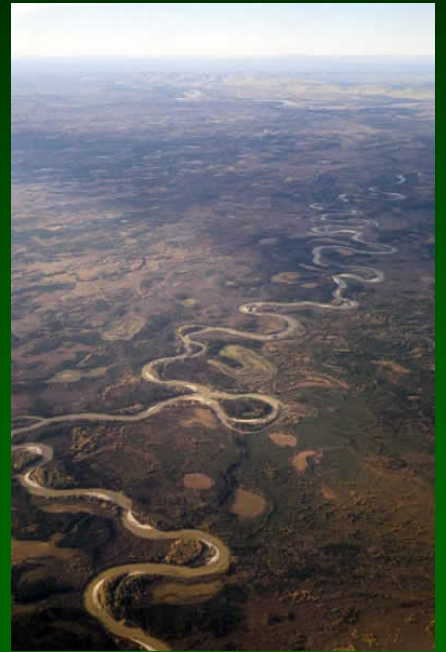
**Rural communities now fixed by infrastructure – cannot easily track changing resources**



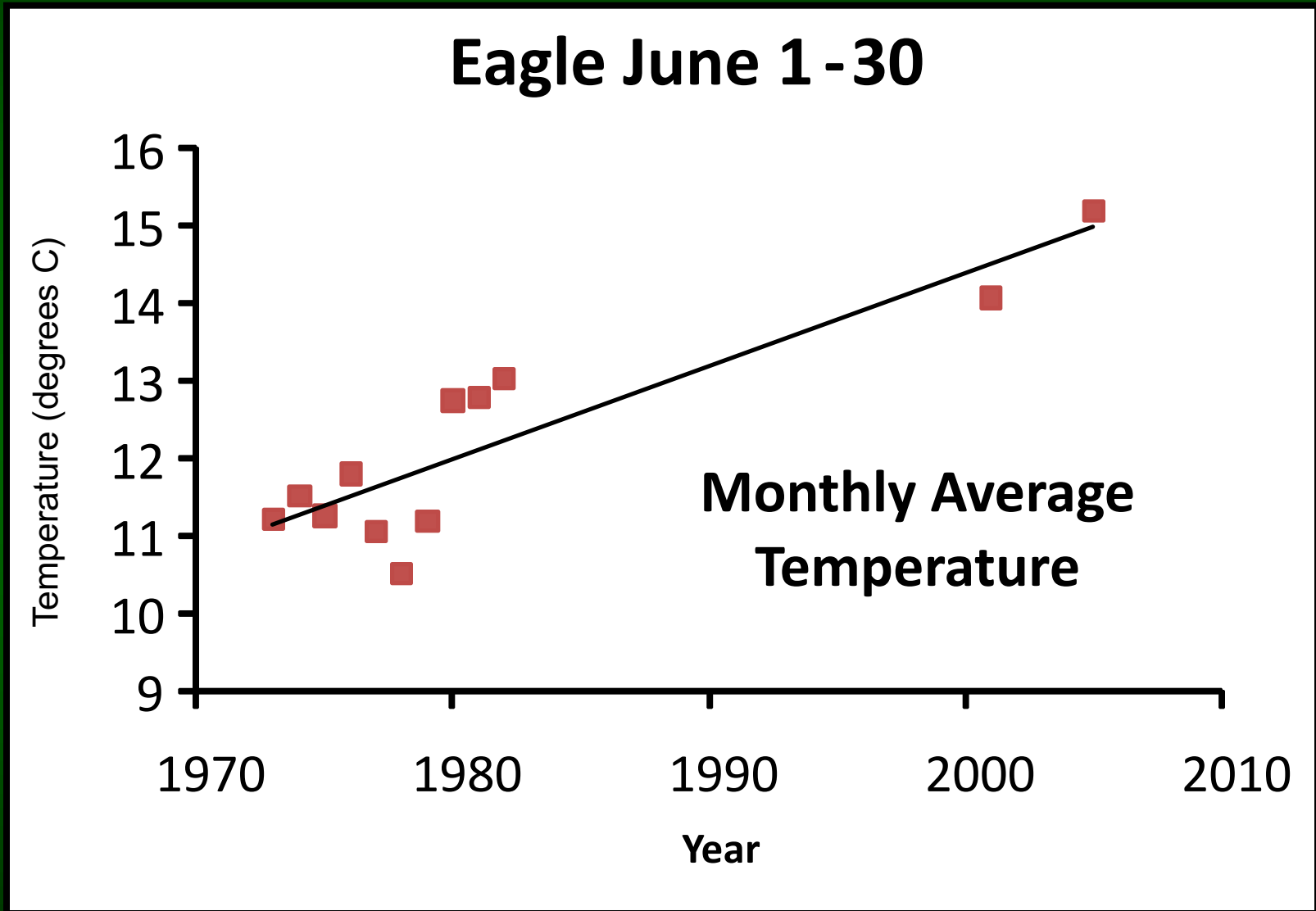






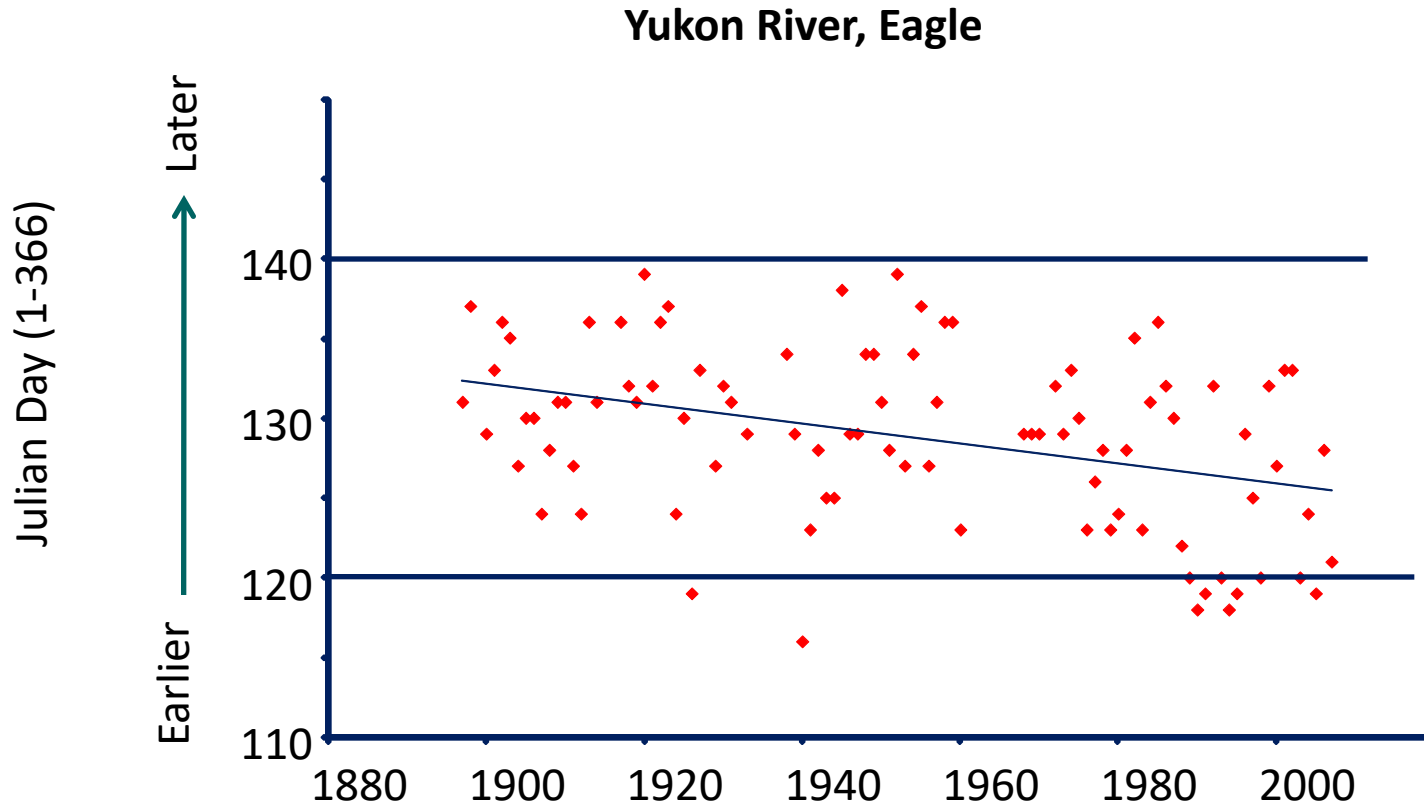


# Warmer river temperatures



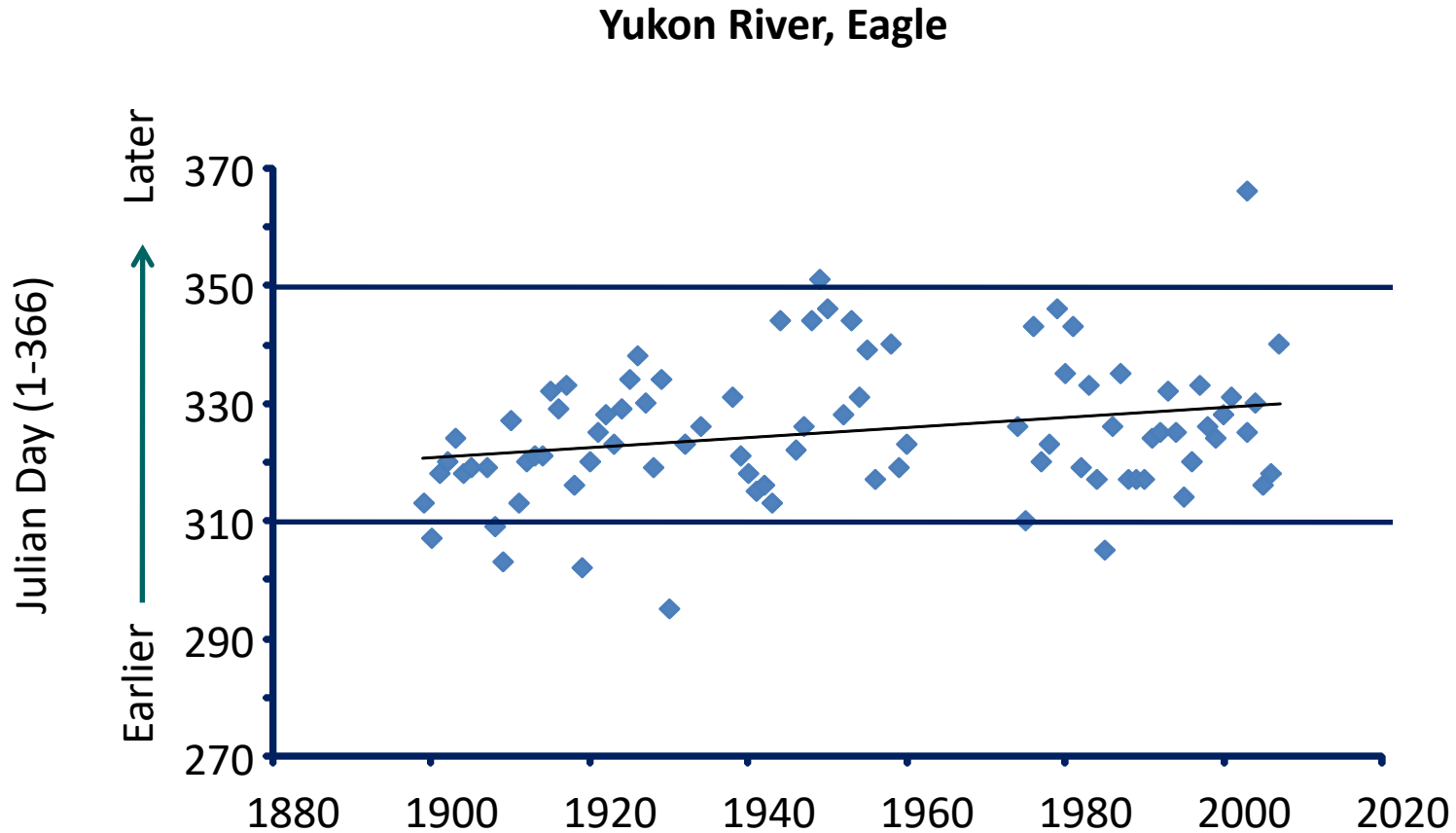
Hunt and Rosenberger, unpubl. data

# Earlier Breakup





# Later Freeze-up



# Our goals

- Determine assemblage characteristics of peripheral habitats
- Identify major landscape filters
- Using remote sensing techniques, monitor changes in filters seasonally and over decades
- Predict major changes in fish community
- Combine with human knowledge



# Challenges

- Size and remoteness of study area
- Integrating human and biotic issues
  - Mechanisms of both biotic & human resilience to effects of drying & climate change
- Remote sensing technology
- Limited understanding of ecology of non-salmon species
- Incorporating other regime changes

# Opportunities

- Incorporating human and biotic resilience concepts
- Mechanisms of fish resilience
  - Movement
  - Life history diversity
  - No nonnative fish; limited human development
- Area of rapid change; effects more pronounced – good model



# Additional issues to discuss

- Fish kills – temperature and oxygen
- Availability of wood for fish and people
- Beaver dams
- Monitoring, Monitoring, Monitoring
  - Instruments vs. human observation
  - Remote sensing techniques
- Salmon
  - returns, disease, migratory patterns

