Skeena Salmon, Food Security & Climate Change

Adapting to an uncertain future

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SkeenaWild Conservation Trust

Photo: Tavish Campbell, 2014

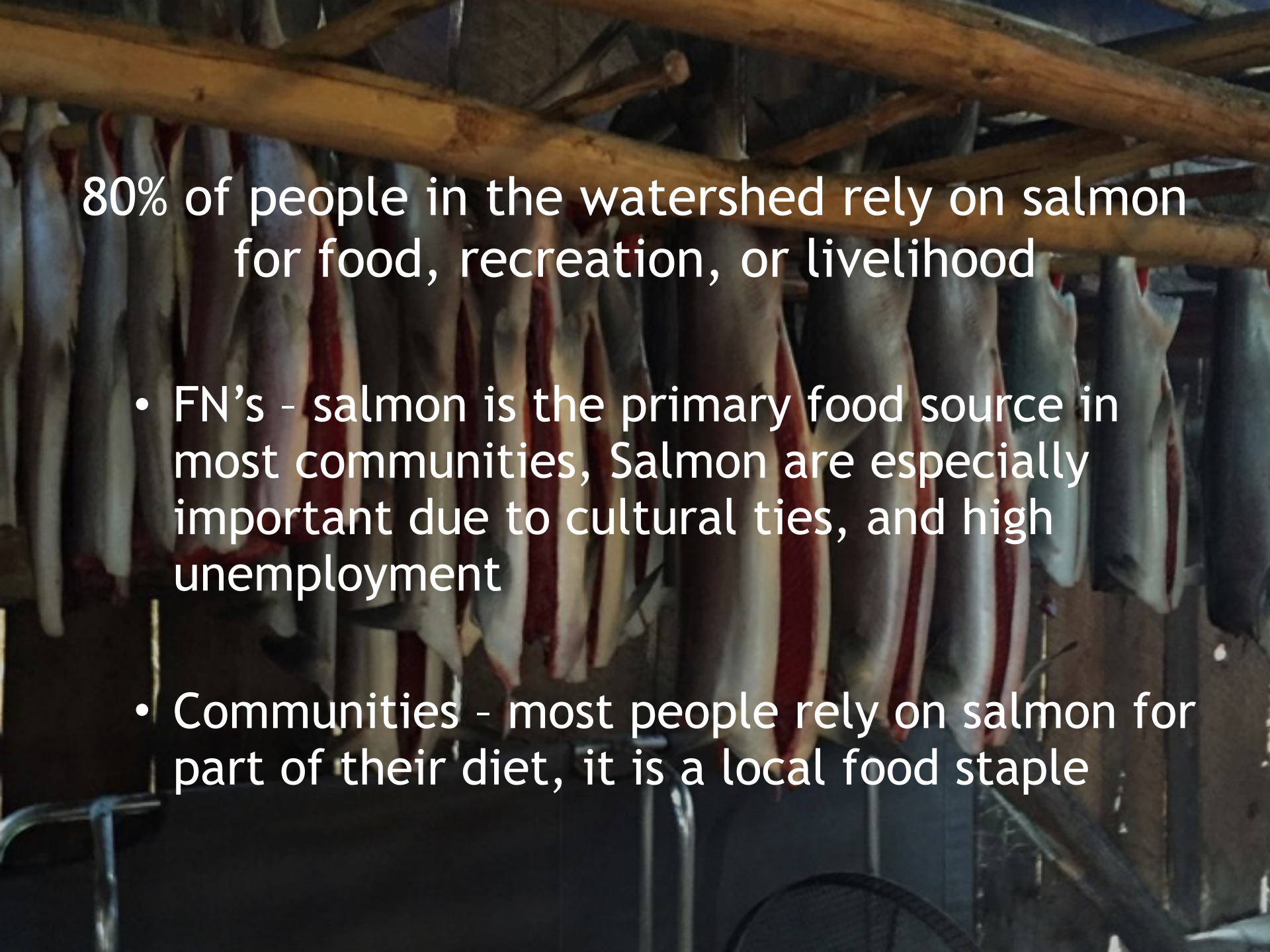
Photos: Canadian Museum of Civilisation





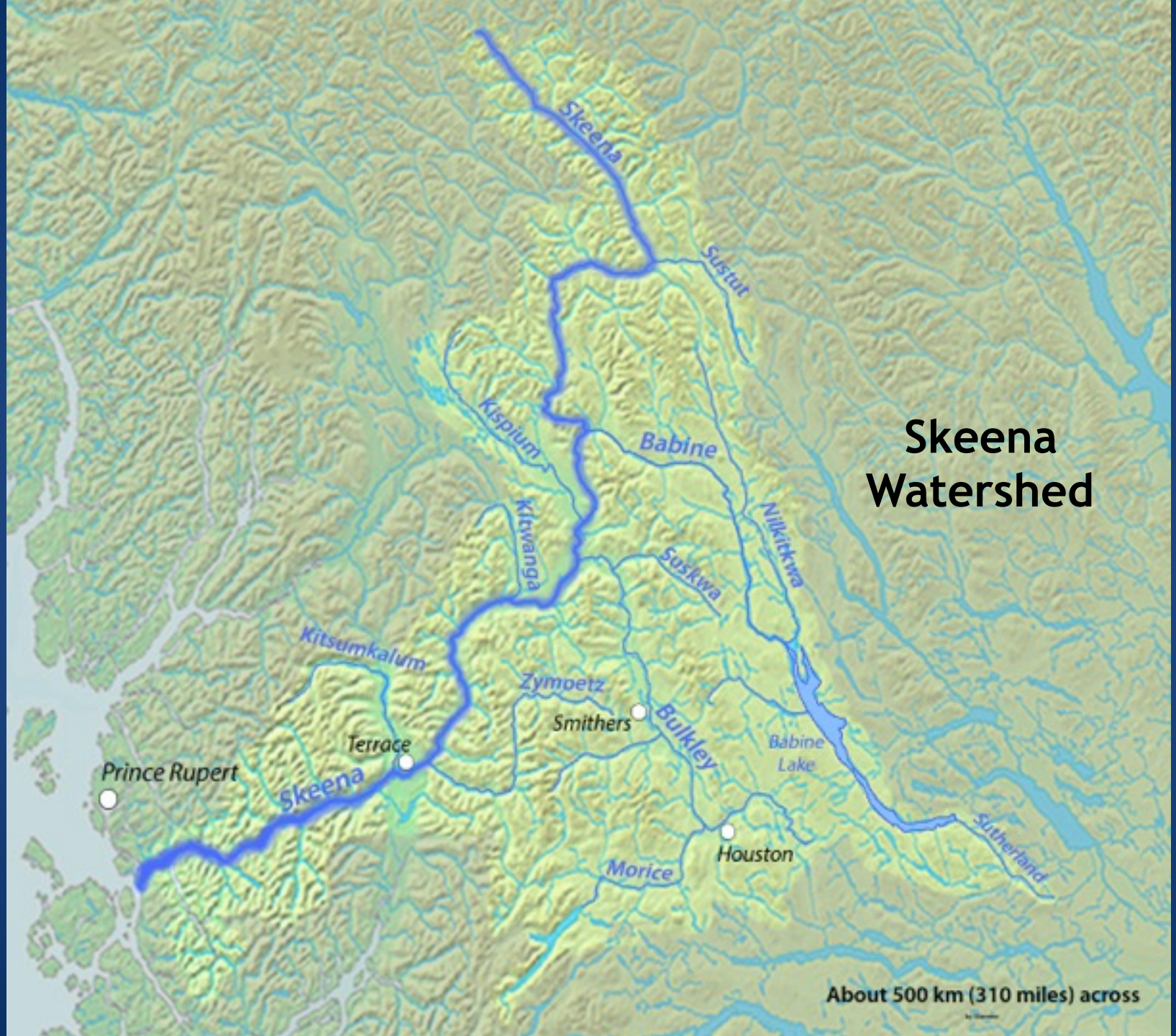






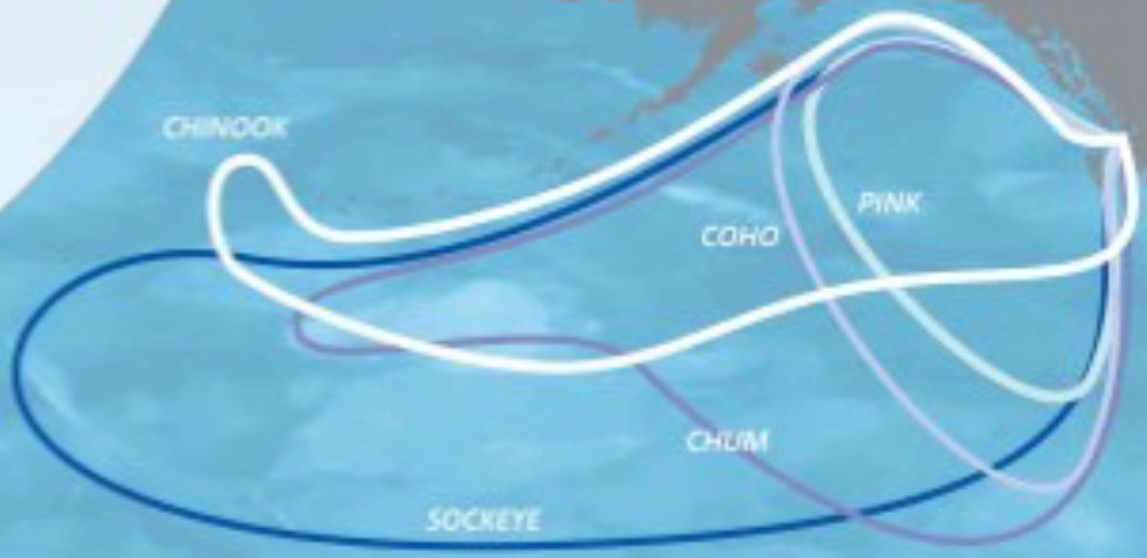
80% of people in the watershed rely on salmon for food, recreation, or livelihood

- FN's – salmon is the primary food source in most communities, Salmon are especially important due to cultural ties, and high unemployment
- Communities – most people rely on salmon for part of their diet, it is a local food staple


Skeena Watershed
Skeena
Sustut
Kispiux
Babine
Kitwanga
Nilkitkwa
Suskwa
Kitsumkalum
Zymoetz
Smithers
Bulkley
Babine Lake
Terrace
Prince Rupert
Skeena
Sutherland
Houston
Morice
About 500 km (310 miles) across

Source: Ecotrust Canada, 2010

ycle
a
non



s and rivers throughout the Skeena
er's headwaters 570 kilometres
ding to species and geography.
ow Chinook or Spring salmon are
Sockeye, Pink, Chum and Coho.

ALEVINS

Alevins hatch from eggs in late winter or early spring, depending on the ambient water temperature and spawning time. They grow beneath the

Source: SkeenaWild, 2009

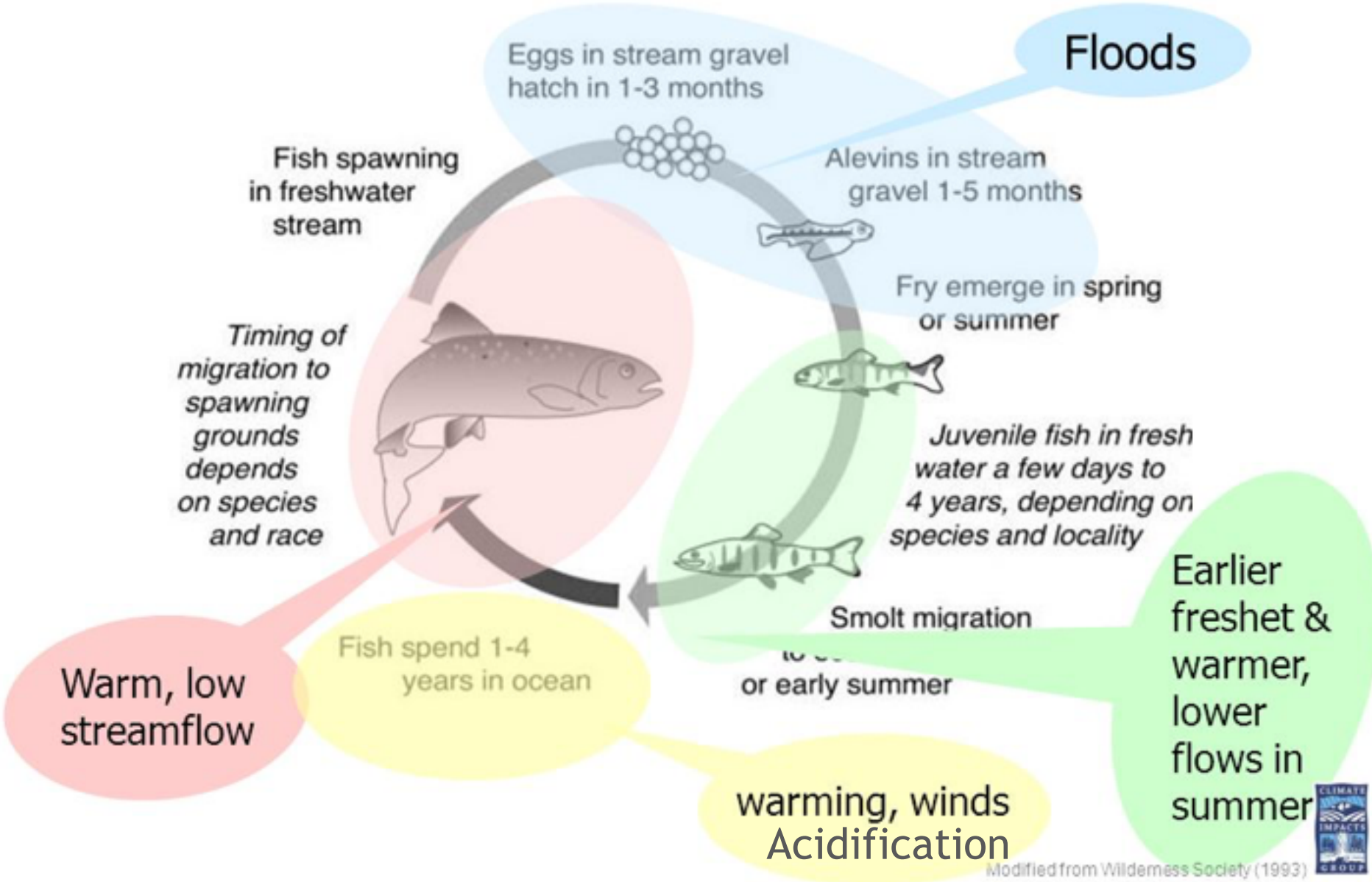
The Story is Complex

The Skeena has 6 species, and over 300 individual populations

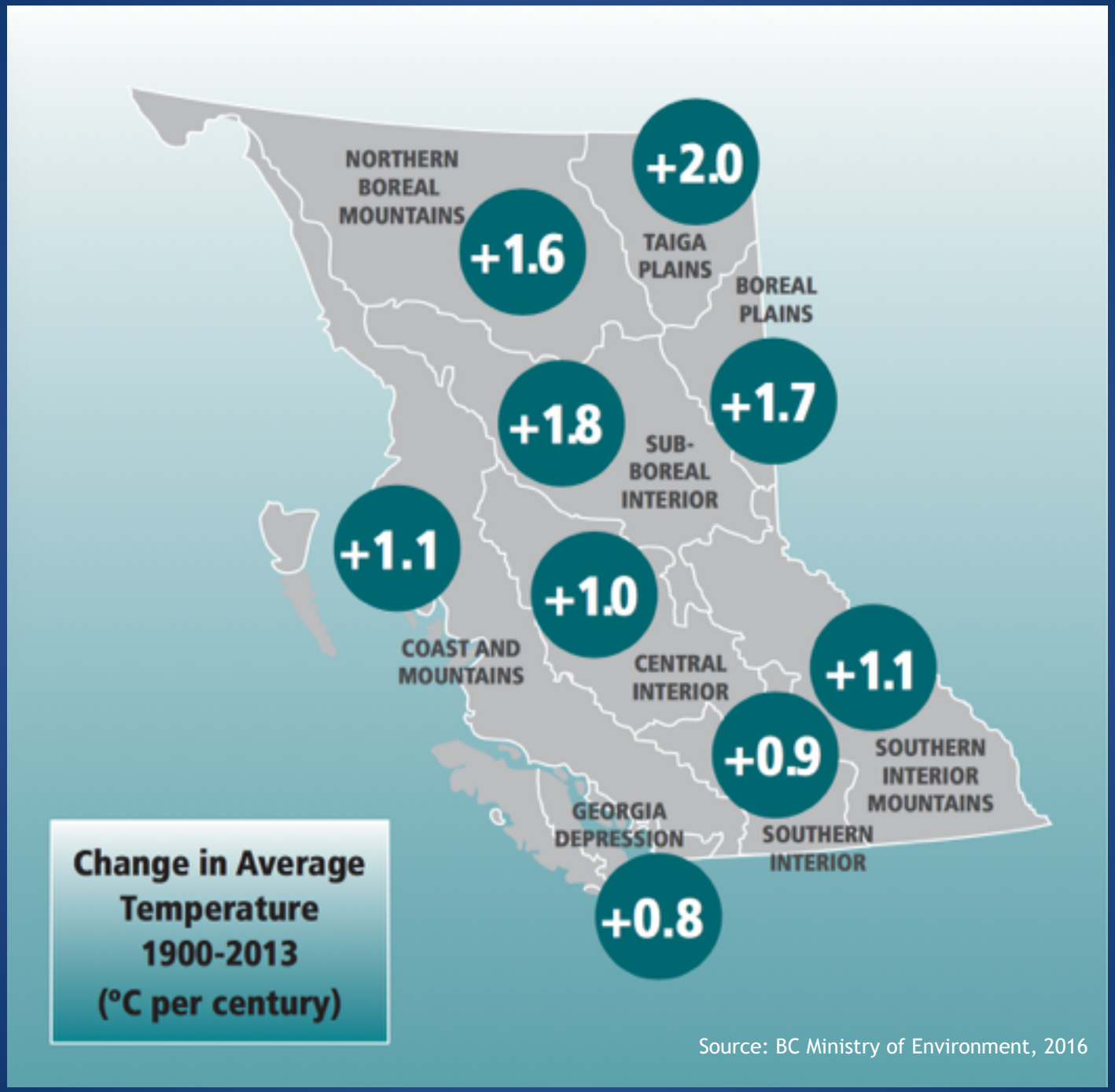
- Each species varies in how long they spend in freshwater, the estuary and ocean, and use slightly different habitats

Climate change impacts all of these environments, species and populations in different, complex, and often unpredictable ways.

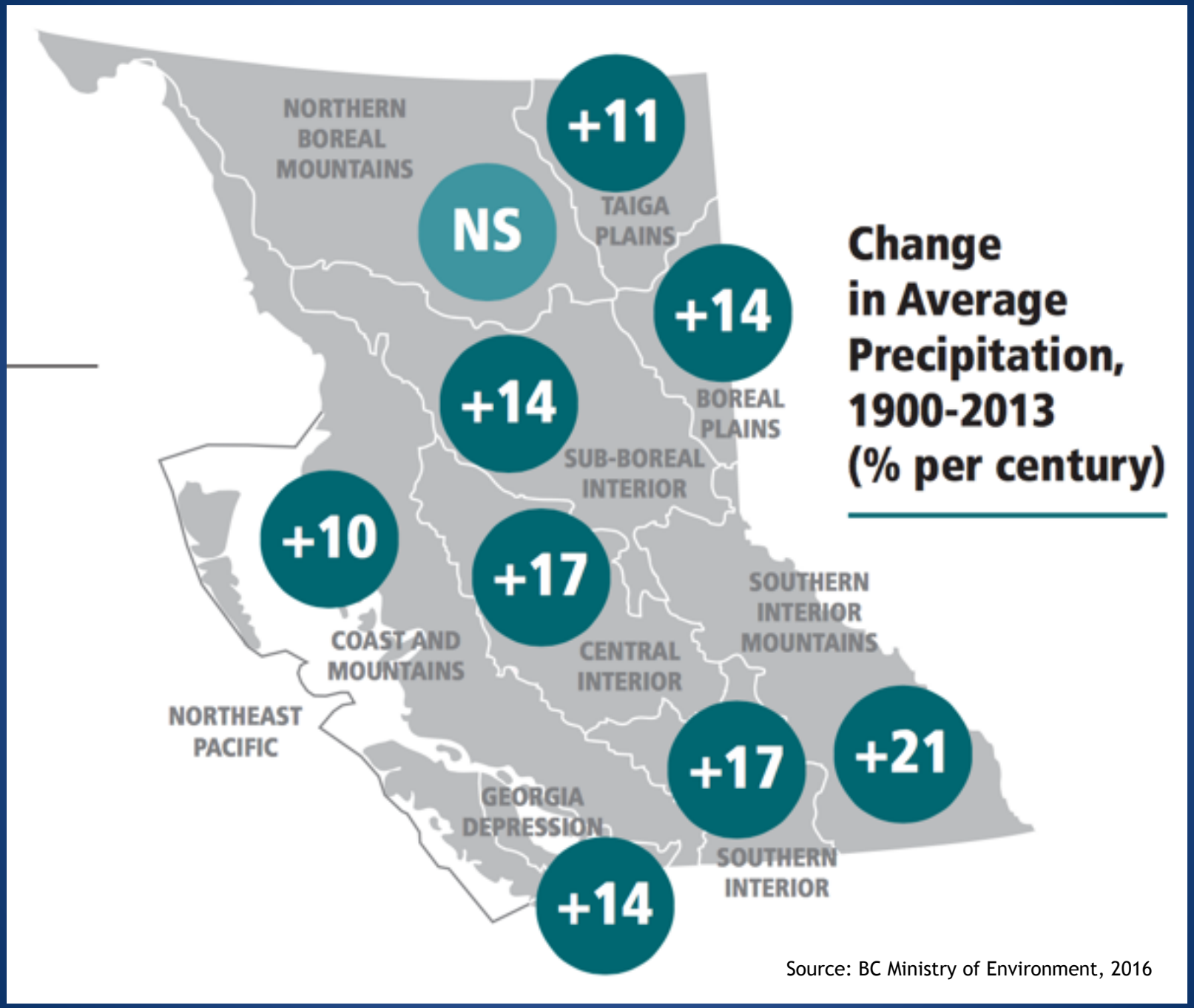
Salmon Affected Across Their Life-Cycle



Are we already seeing climate change impacts in the Skeena?



Source: BC Ministry of Environment, 2016



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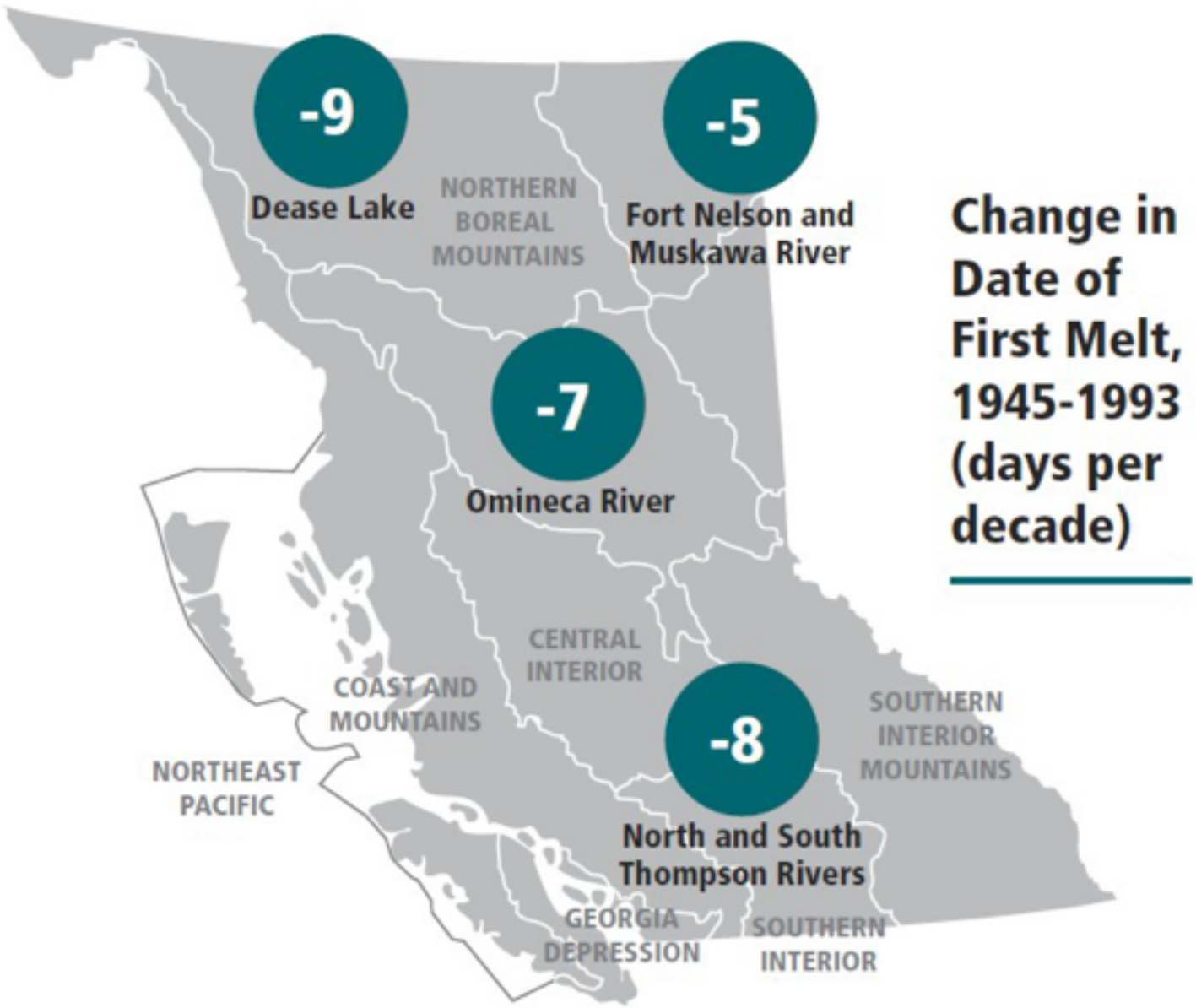


Source: BC Ministry of Environment, 2016

Extreme weather events seem to be more common

Glaciers are receding rapidly

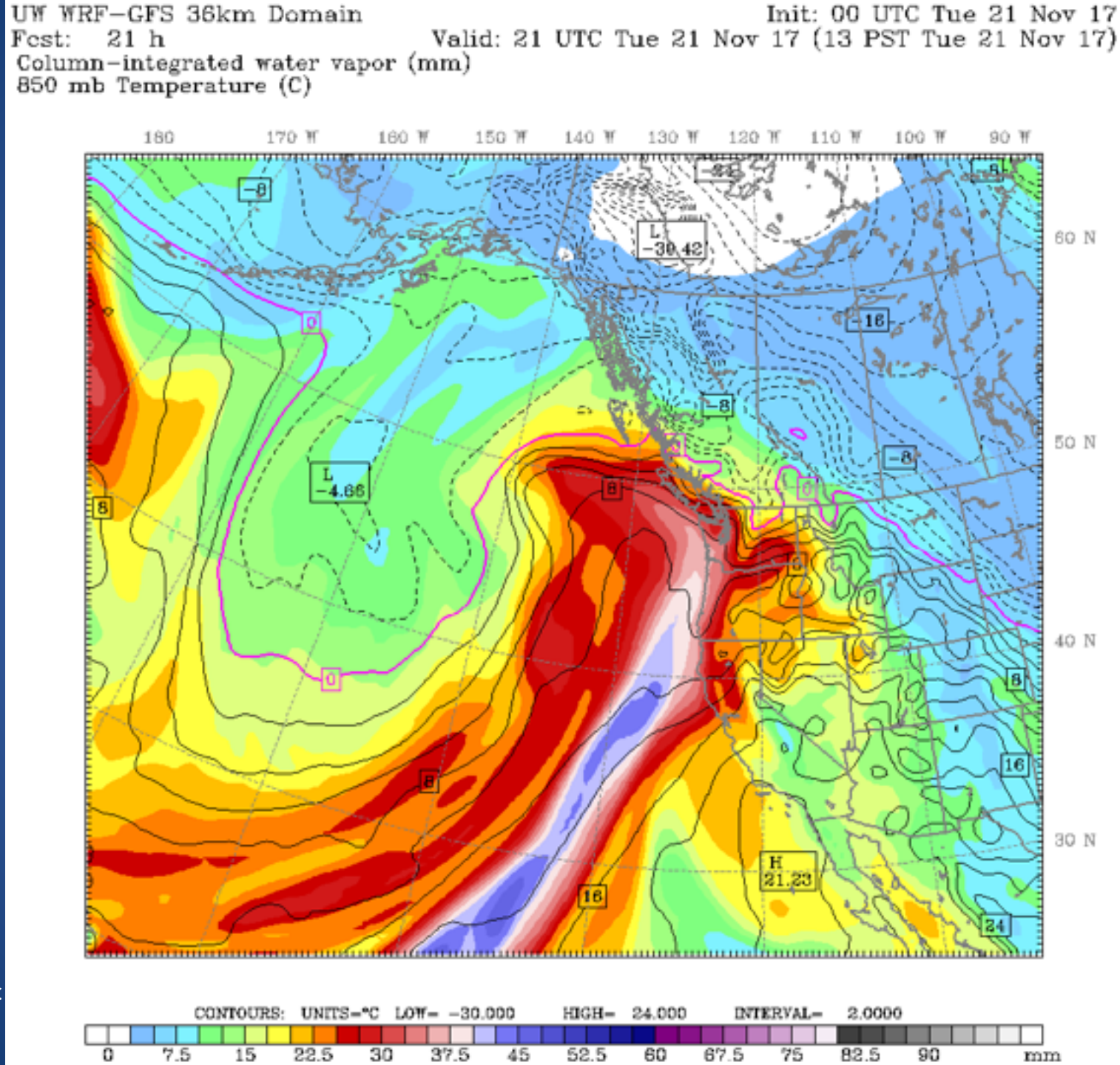
Mountain pine beetle epidemic & forest fires

We also see climate change happening in many other places, indicating it is likely also happening here – a global phenomena

Since the 1980's:

- Arctic summer sea ice has decreased by 50%
- Hurricanes in the Carribean have doubled in frequency and increased in intensity
- Ocean acidification has increased by 30%

"Warm Temperature Records Will Fall As A Strong Atmospheric River Hits the Pacific Northwest"
- Nov 21, 2017



Source: US National Oceanic & Atmospheric Administration

Major Precipitation (Rain) Events

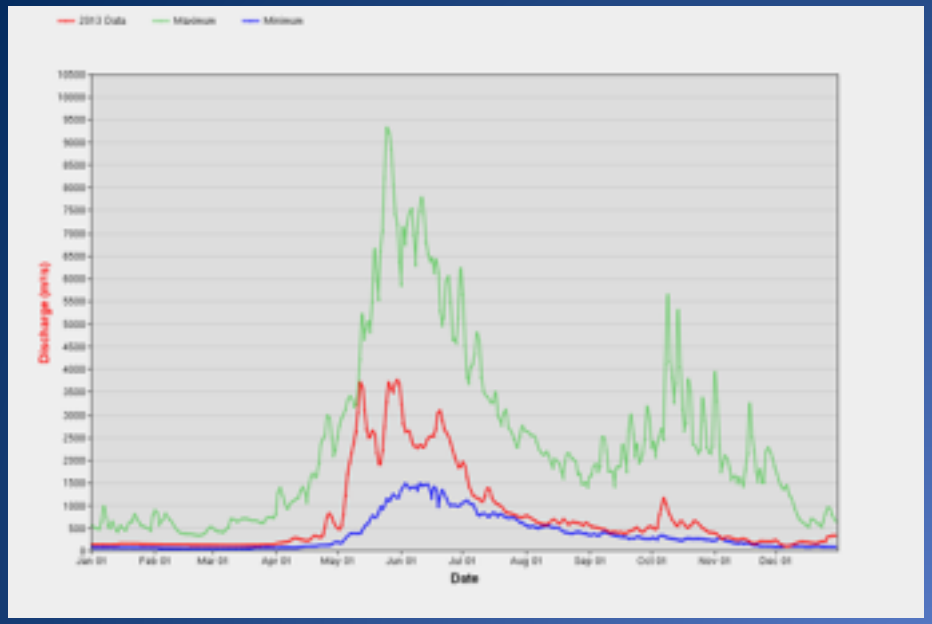
Large flood events can displace eggs, change river habitats, flush nutrients

Land Slides

Impacts from sedimentation

- Changing river geology
- Choking spawning gravels
- Water quality

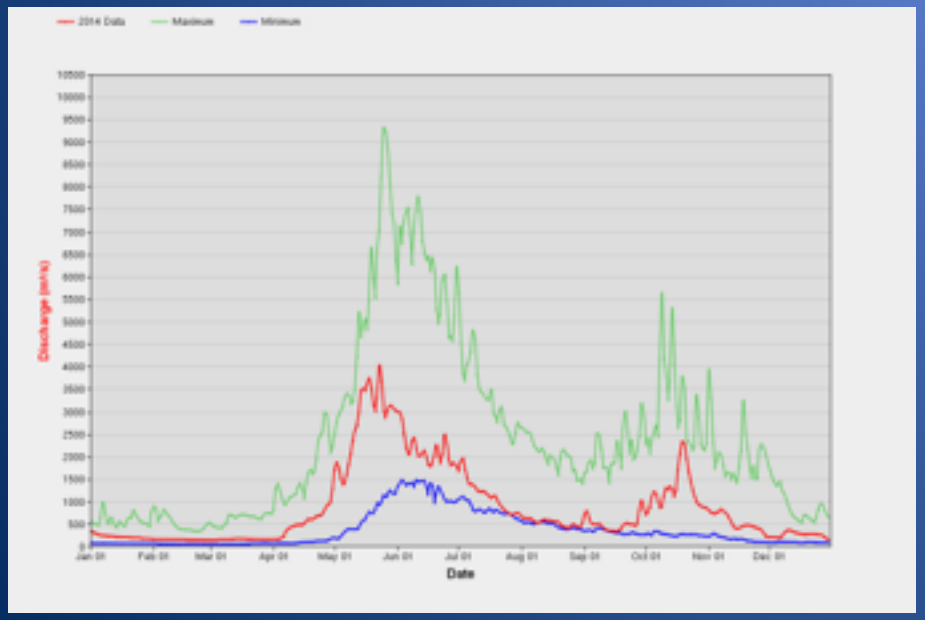
Photo: BC Ministry of Environment



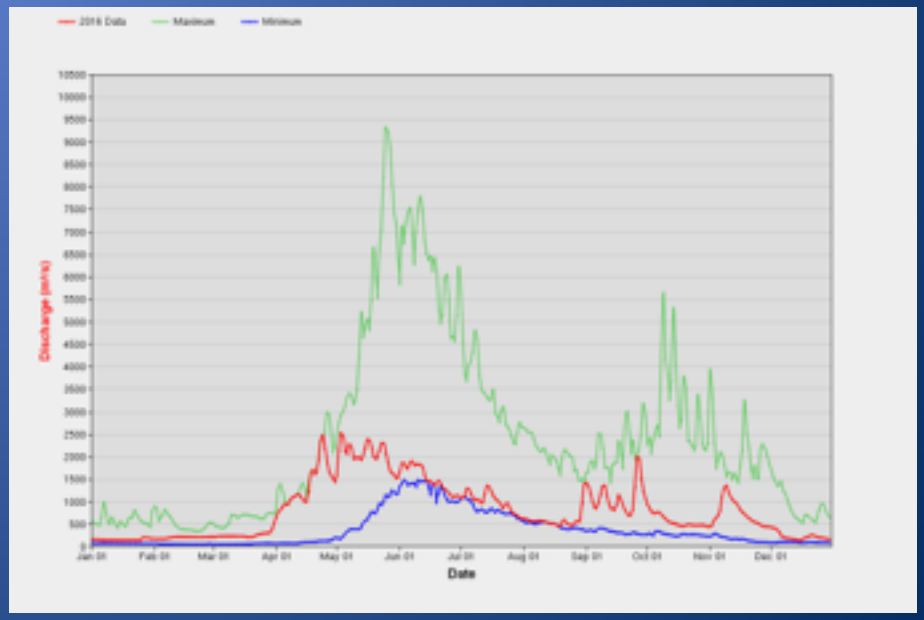
Skeena River at Usk - 2013

Low summer flows

- Delays / changes in migration
- Increase vulnerability to fisheri
- Warmer temperatures



Skeena River at Usk - 2014



Skeena River at Usk - 2016

(Environment Canada)

Babine Experience

Low water can prevent spawning access, increase predation, increase stress

Photo: Lake Babine Nation Fisheries, 201

Photo: Lake Babine Nation Fisheries, 2016

Kitwanga River

Photo: Gitanyow Fisheries Authority, 2016

Pre-Spawn Mortality, Disease and Parasites

Issue for Skeena sockeye some years (Babine)

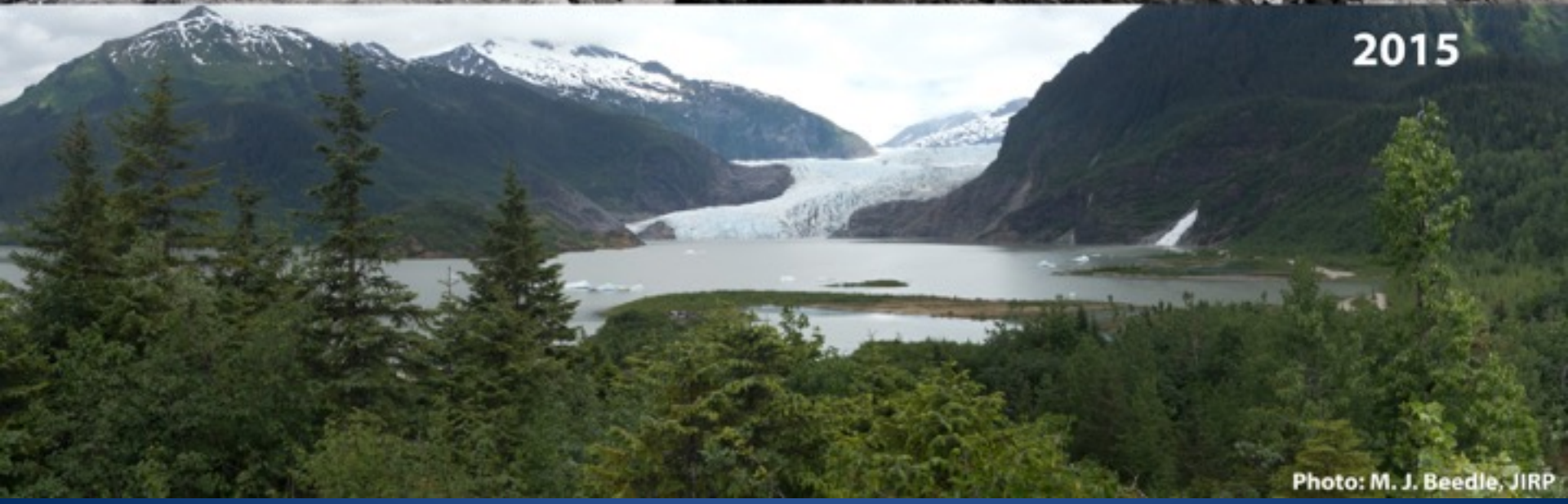
Increasing issue for Fraser sockeye


Photo: Scott Renyard


Photo: USGS

Low Snow Pack

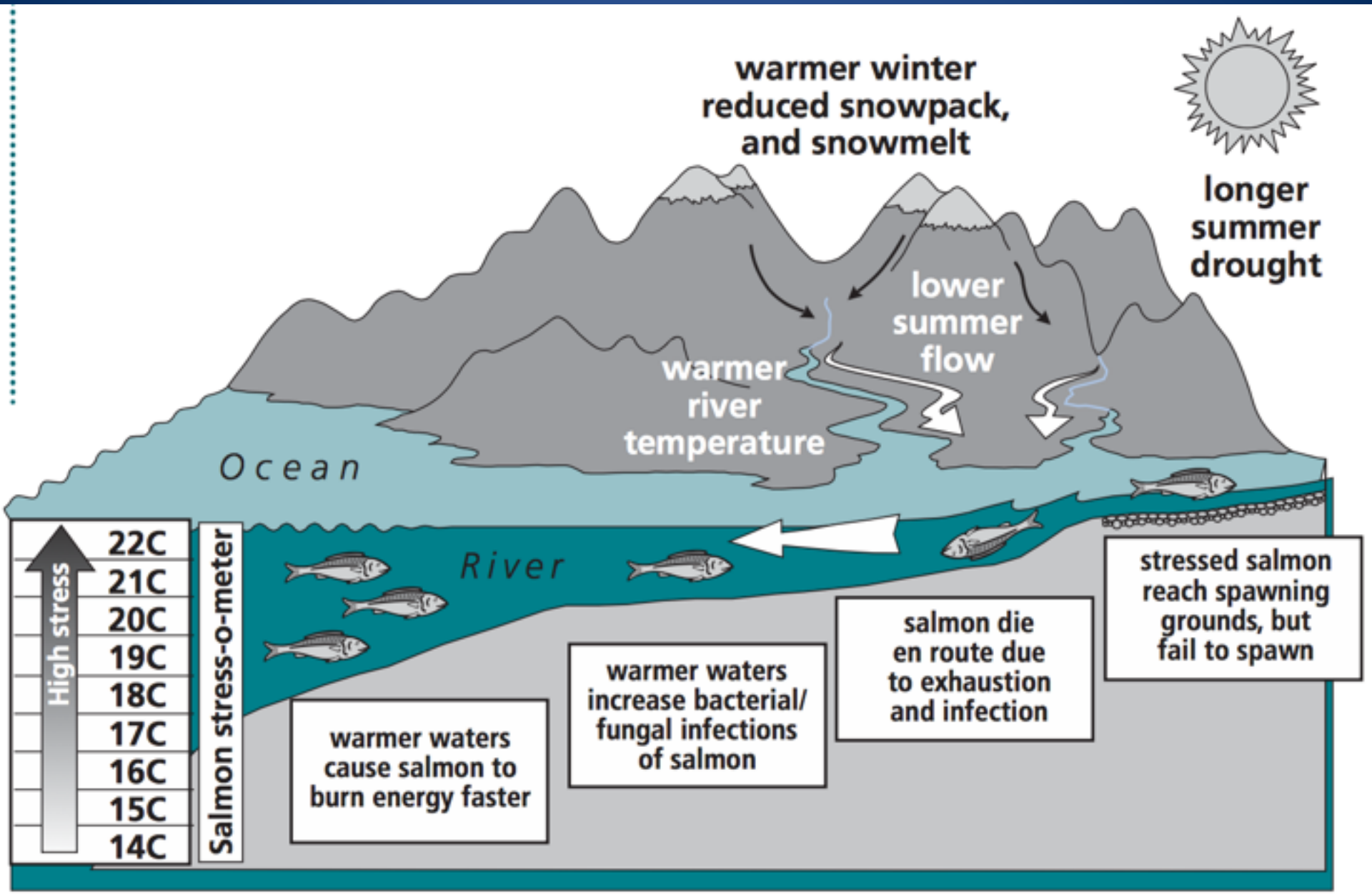
Receding Glaciers



Glaciers help provide cold water input in short term, which helps buffer against warm, dry summers

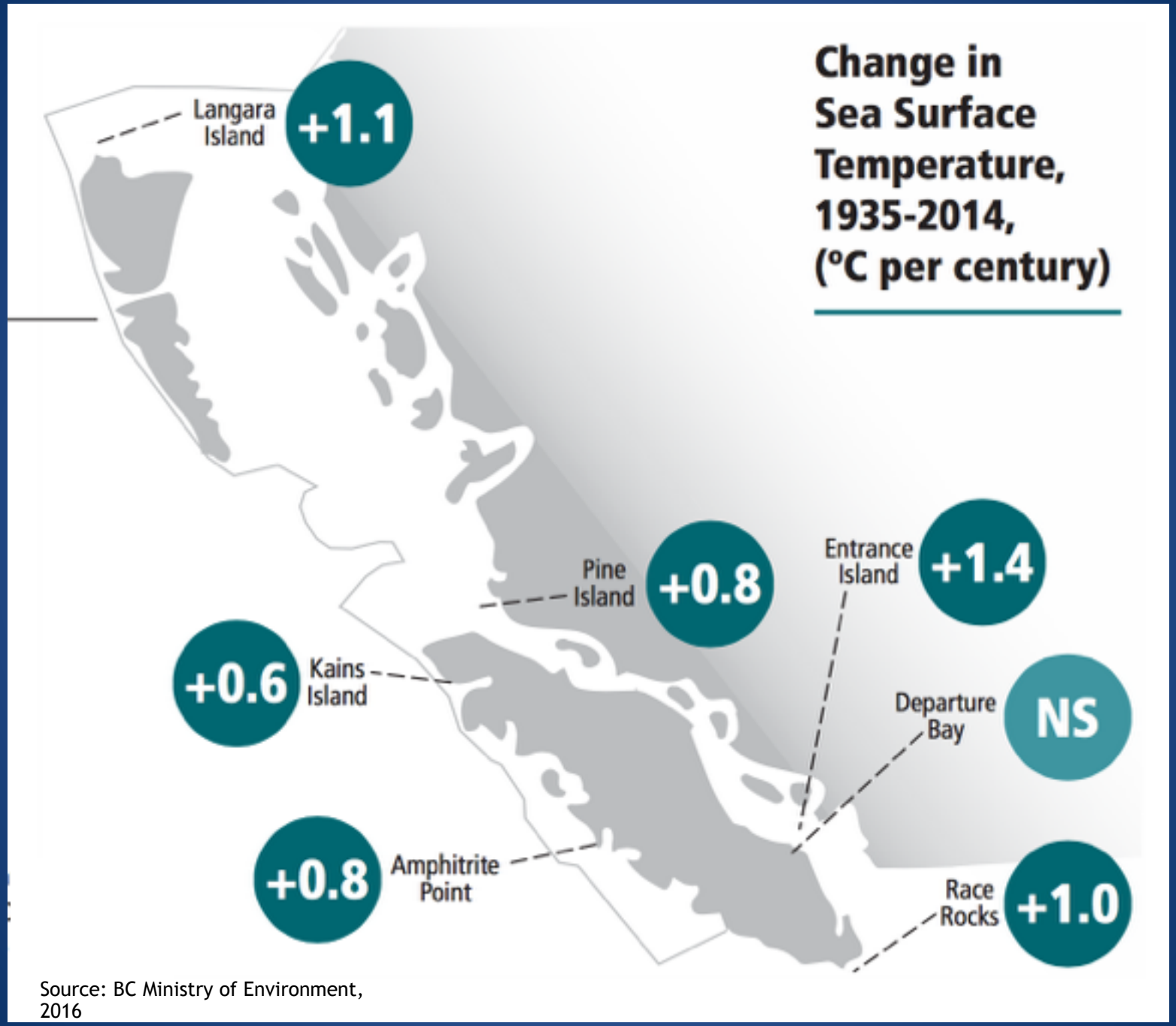
Once they melt, can dramatically change a river system:

- Less water in July and August
- Salmon have adapted over time to glacially fed rivers


warmer winter
reduced snowpack,
and snowmelt
longer
summer
drought
lower
summer
flow
warmer
river
temperature
Ocean
River
High stress
22C
21C
20C
19C
18C
17C
16C
15C
14C
Salmon stress-o-meter
warmer waters
cause salmon to
burn energy faster
warmer waters
increase bacterial/
fungal infections
of salmon
salmon die
en route due
to exhaustion
and infection
stressed salmon
reach spawning
grounds, but
fail to spawn

Freshwater / saltwater intersection

Photo: Brian Huntington, 2014



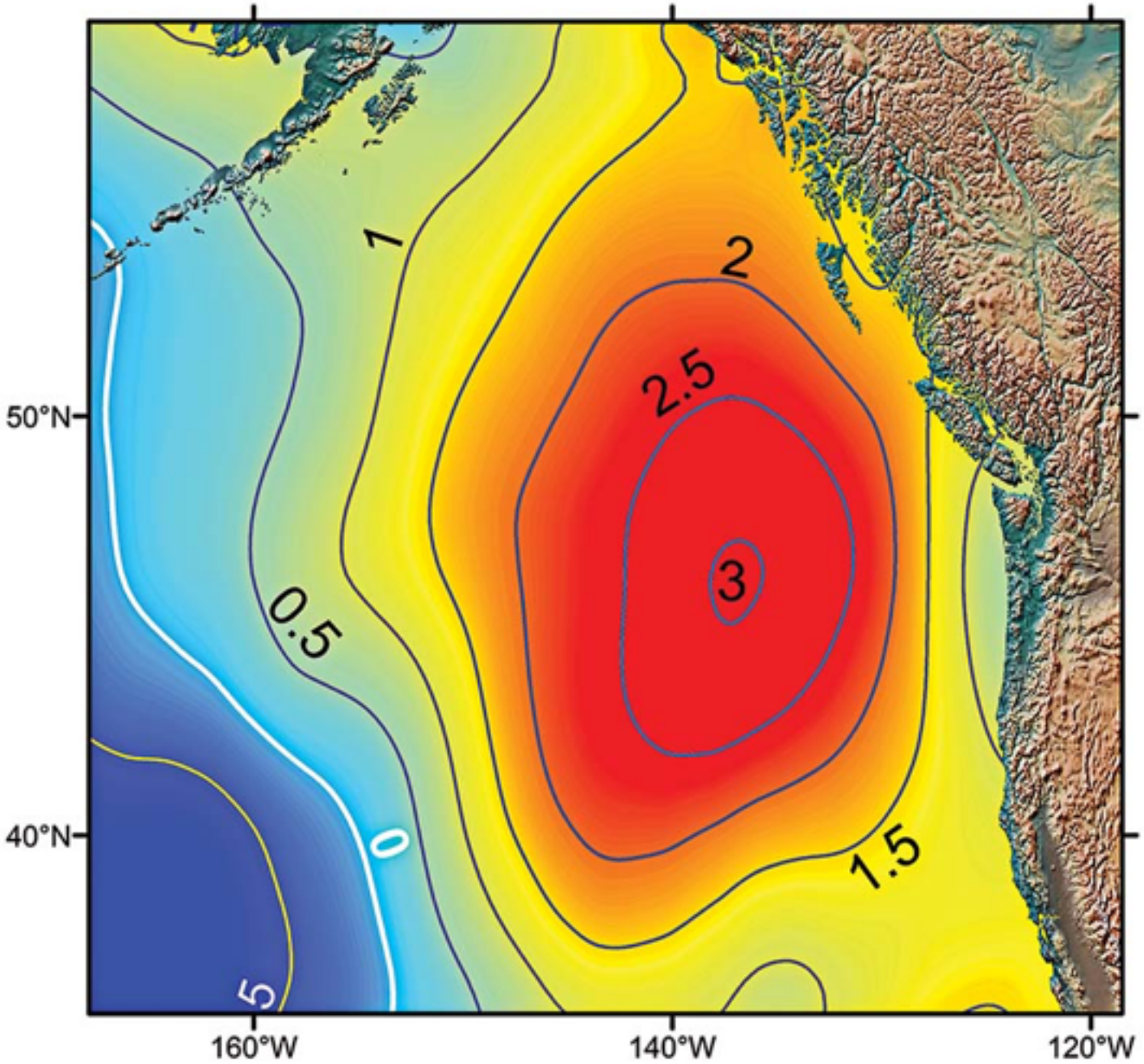
Source: BC Ministry of Environment, 2016

The "Blob"

2013 - 2016

Warm water =

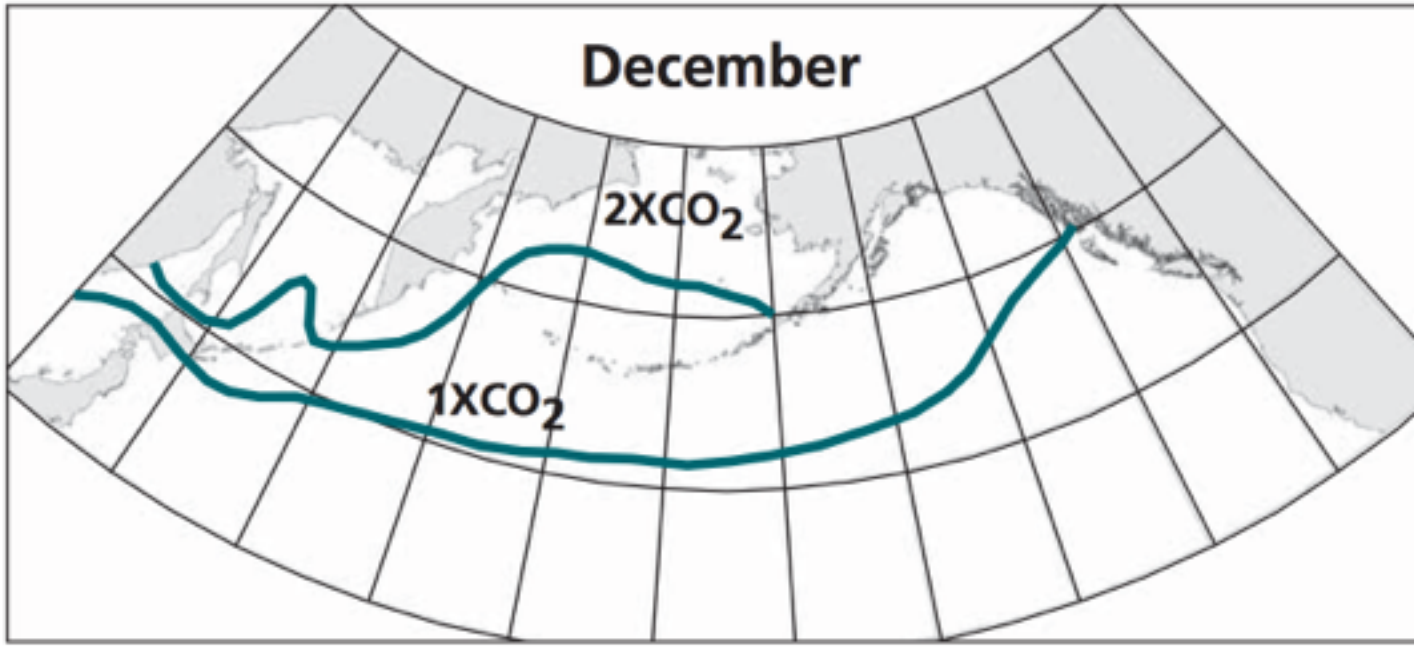
- less food
- Less nutrient rich food
- Shifts in predators

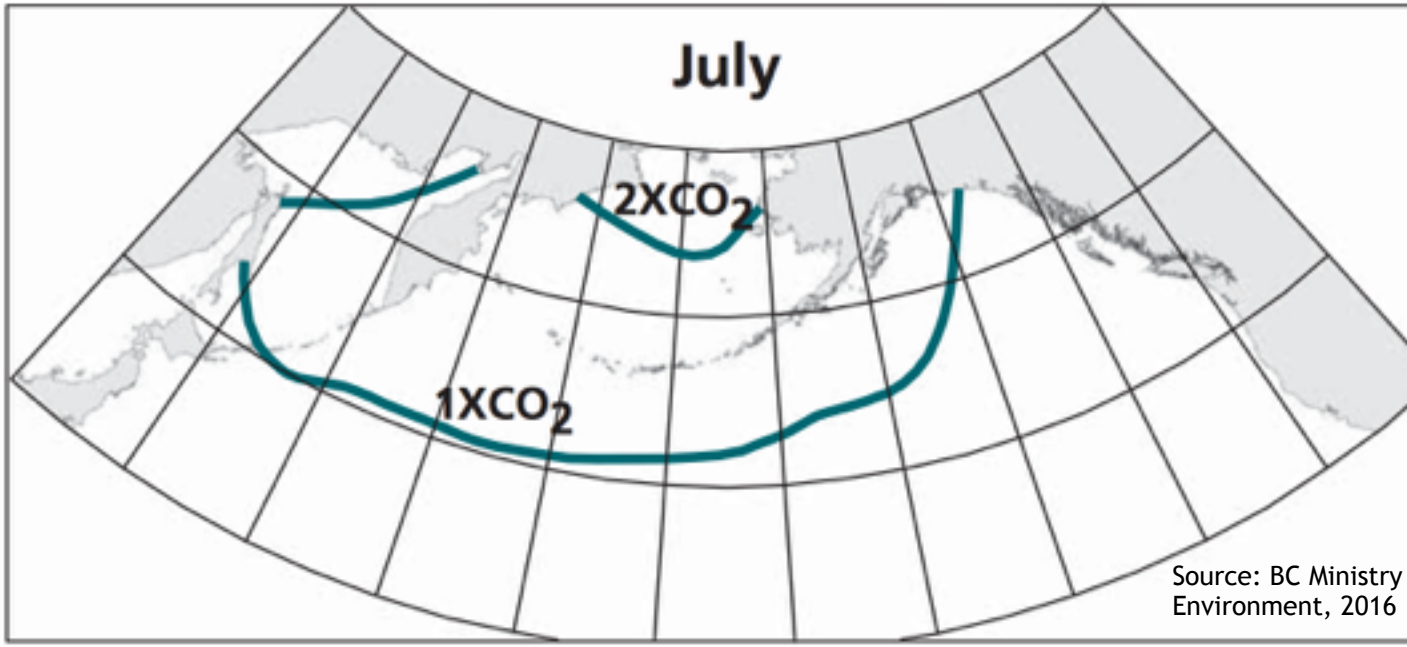


Source: Ocean Networks Canada, 2015

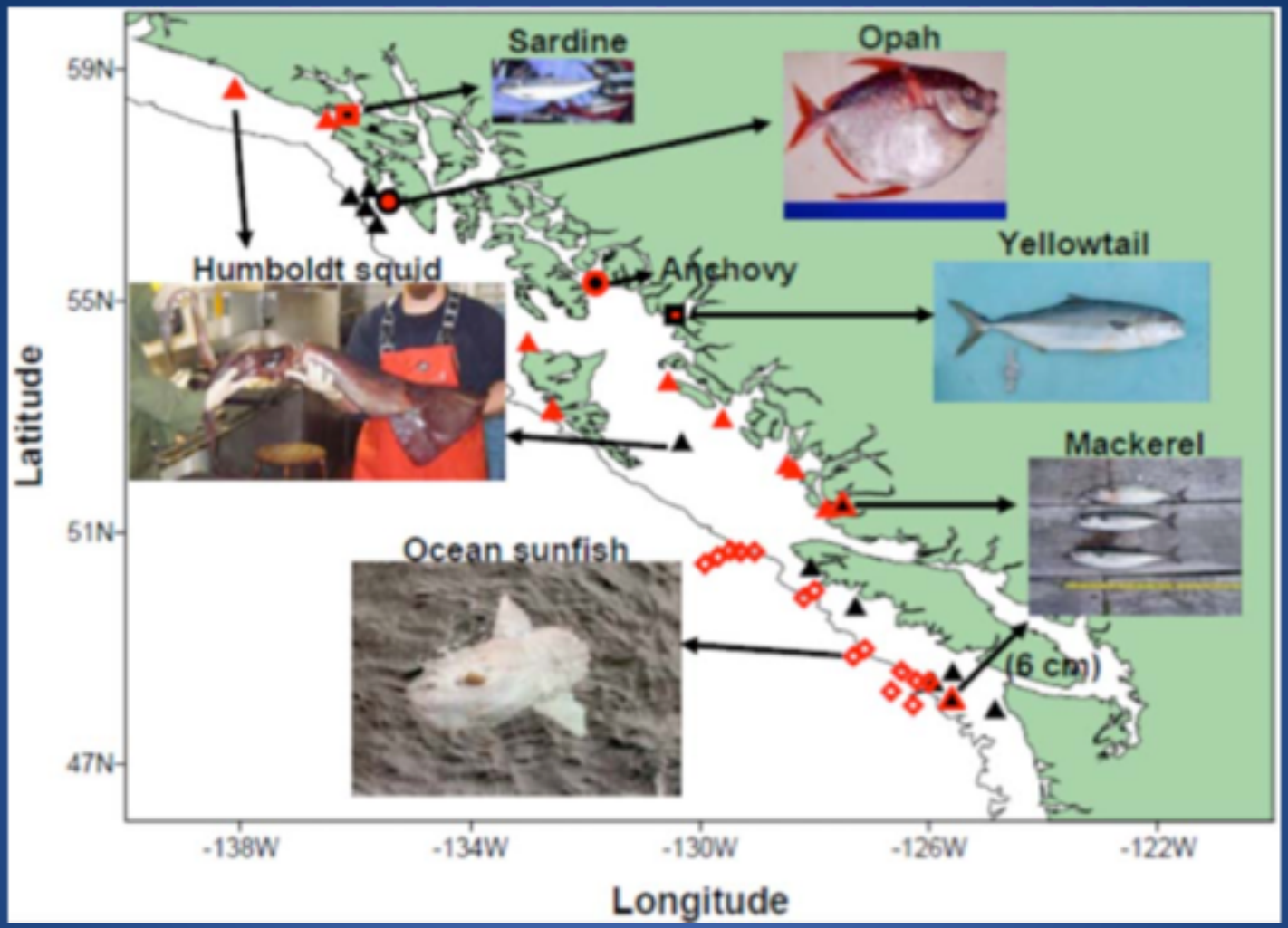
Changes in water temperature are reflected in changes in zooplankton species composition

Winter and Summer Distribution of Sockeye Salmon in the Pacific Ocean, Under Current (1XCO2) and Future (2XCO2) Concentrations of Atmospheric CO2





Source: BC Ministry Environment, 2016



Documented occurrences of warm-water species of fishes and squid in British Columbia and southeast Alaska in 2004 and 2005.

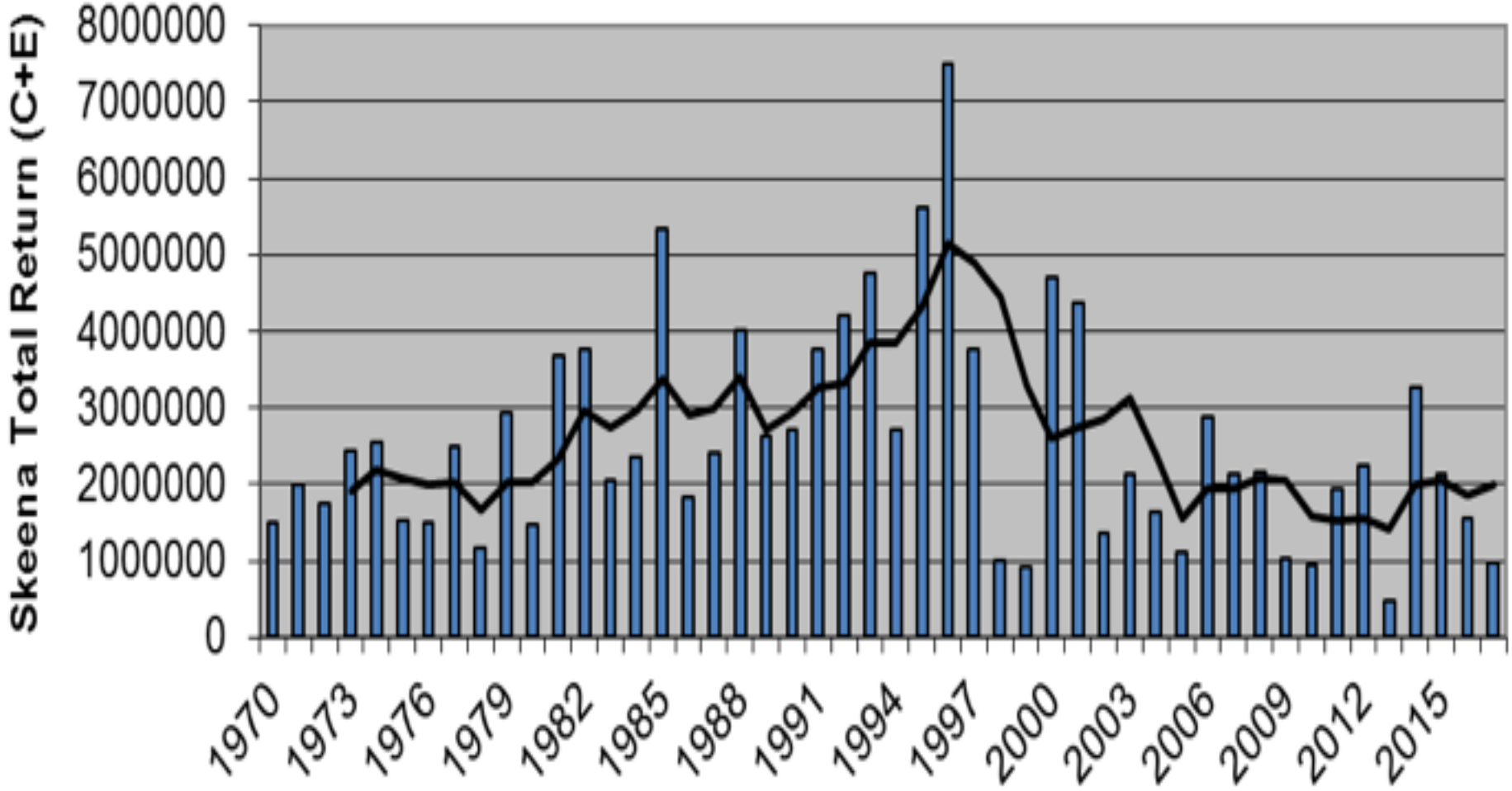
Source: WWF, 2012 (reproduced from Trudel et al. 2006)

How has all of this been impacting returns?

Difficult to measure

- Variation in conditions and returns is normal, but productivity of populations used to be more stable
- Increasing variability in returns of some species & populations
- Smaller size of returning adults = fewer eggs
- Sockeye and Chinook issues
- Ongoing Chum concerns

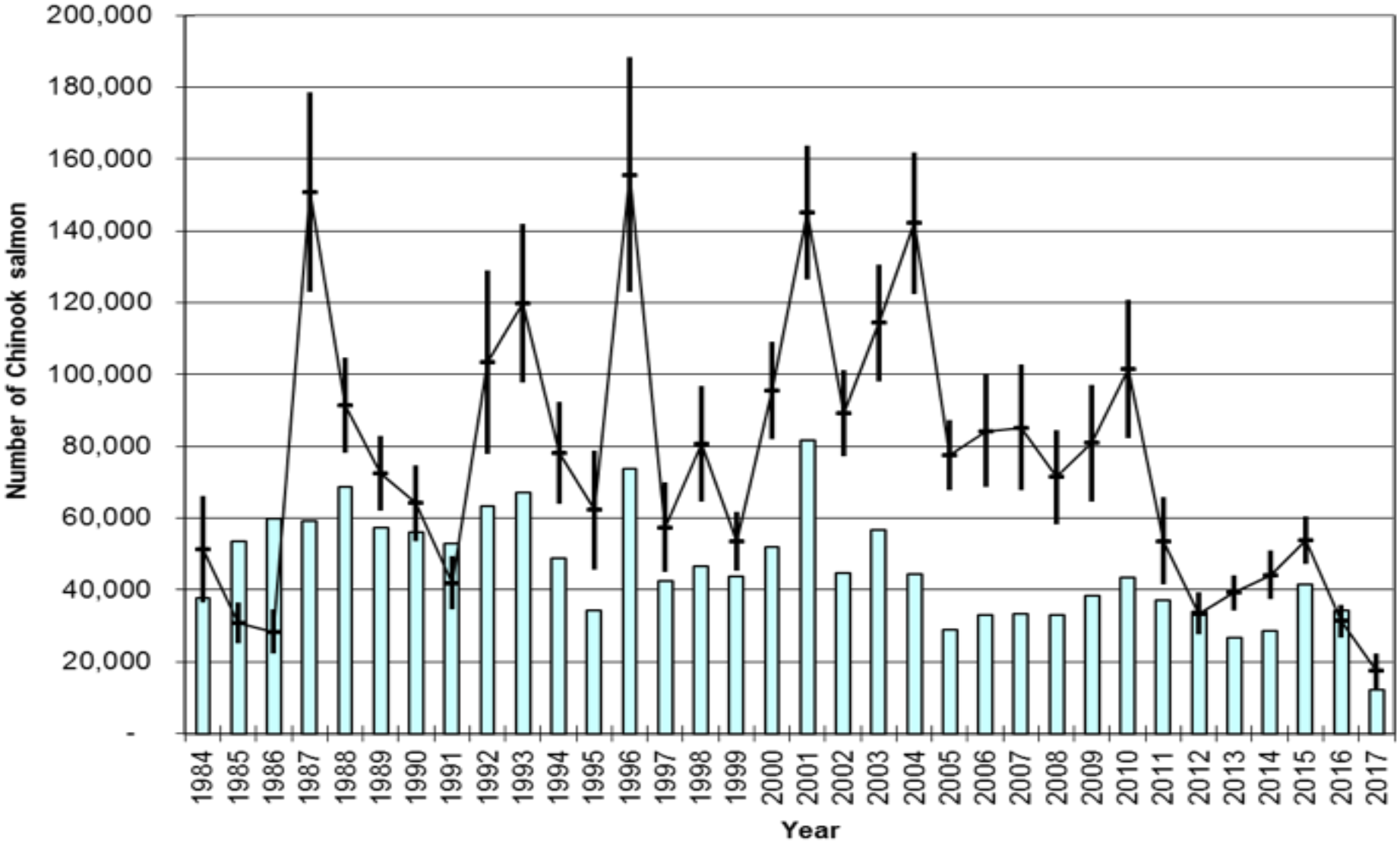
Sockeye



Skeena Sockeye total return, 1984–2017

Source: DFO, 2017

Chinook



Skeena River escapements of Chinook salmon, 1984–2017

Source: DFO, 2018

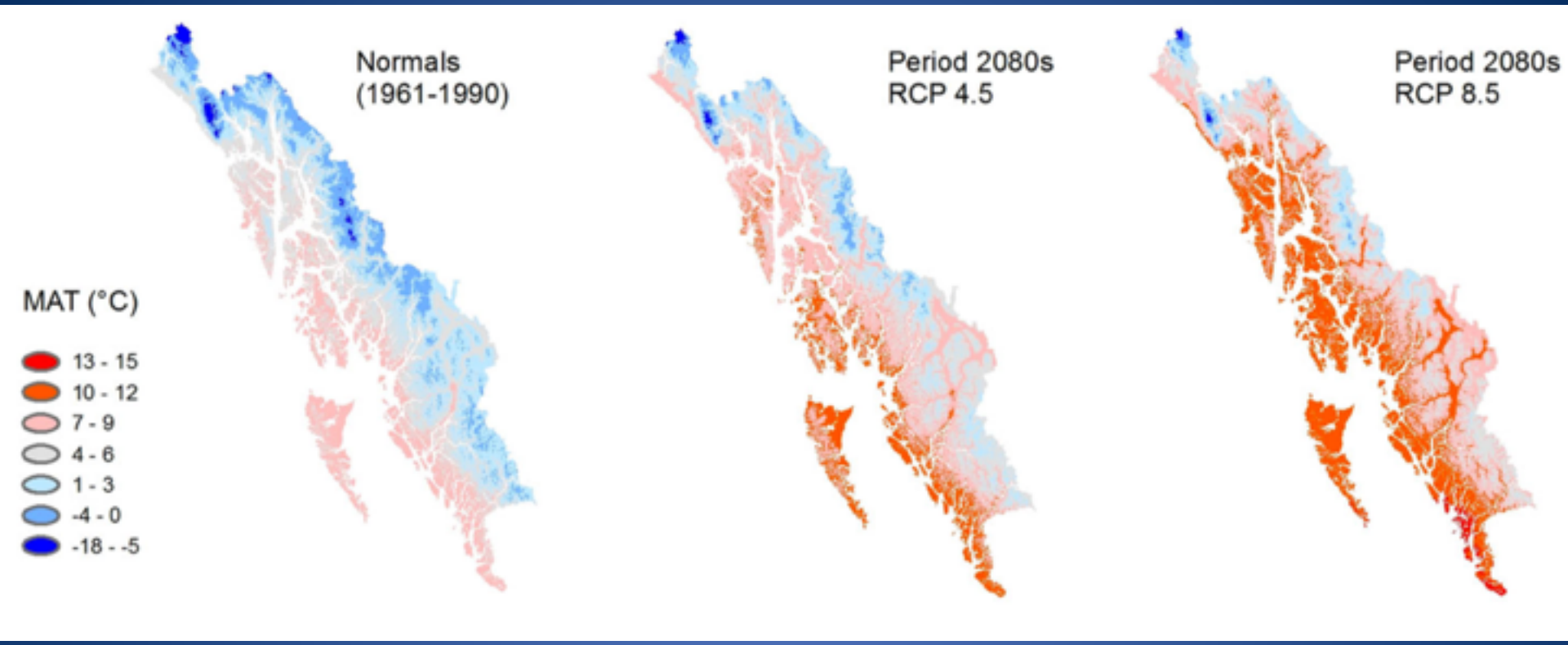
What Changes can we expect to see over the coming decades?

Climate Change Projection for Kitimat-Stikine in the 2050's

Climate Variable	Season	Projected Change from 1961-1990 Baseline	
		Ensemble Median	Range (10th to 90th percentile)
Mean Temperature (°C)	Annual	+1.7 °C	+1.1 °C to +2.5 °C
Precipitation (%)	Annual	+7%	+3% to +12%
	Summer	+1%	-7% to +10%
	Winter	+8%	-1% to +16%
Snowfall* (%)	Winter	-10%	-18% to +5%
	Spring	-59%	-71% to -10%
Growing Degree Days* (degree days)	Annual	+237 degree days	+150 to +369 degree days
Heating Degree Days* (degree days)	Annual	-637 degree days	-904 to -409 degree days
Frost-Free Days* (days)	Annual	+24 days	+13 to +36 days

Source: Pacific Climate Impacts Consortium, 2012

Projected Increases in Mean Annual Temperature - 2080

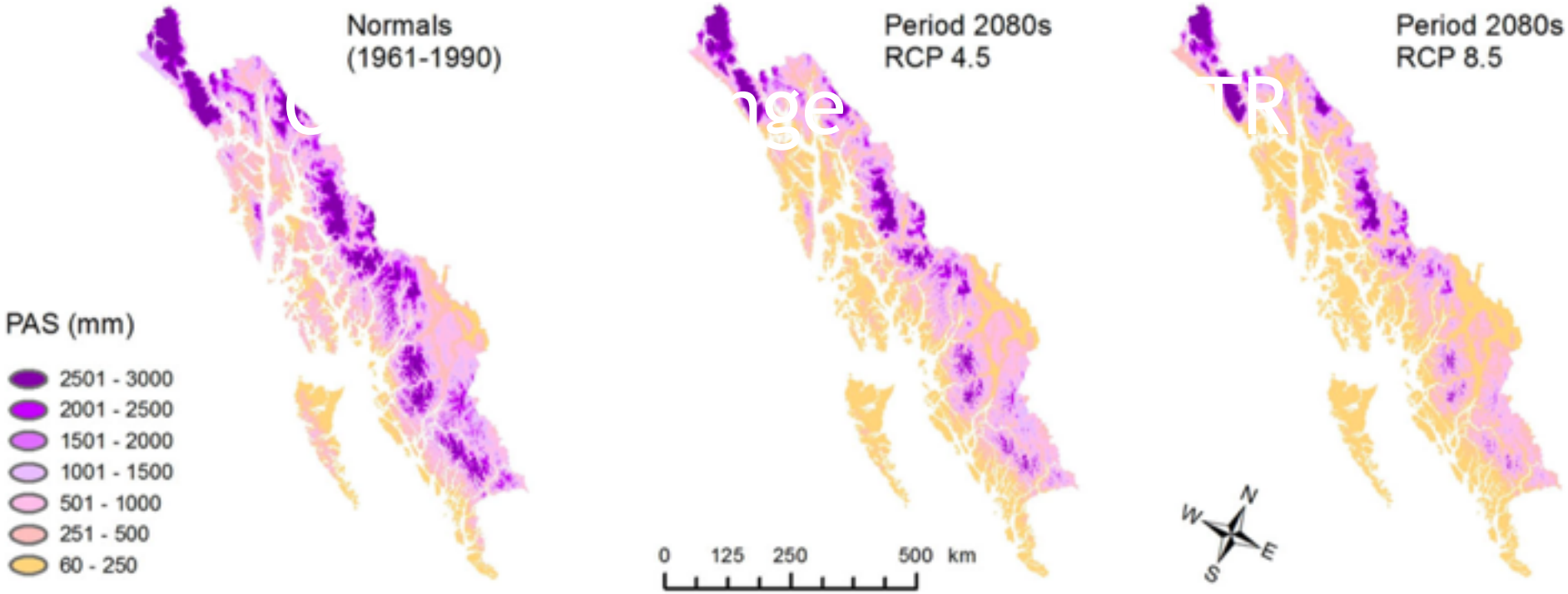


1961 – 1990 mean annual temp = 3.2 °C

+1.7°C to 5.5°C by 2080s

Source: Shanley et al., *Journal of Climatic Change*, 2015

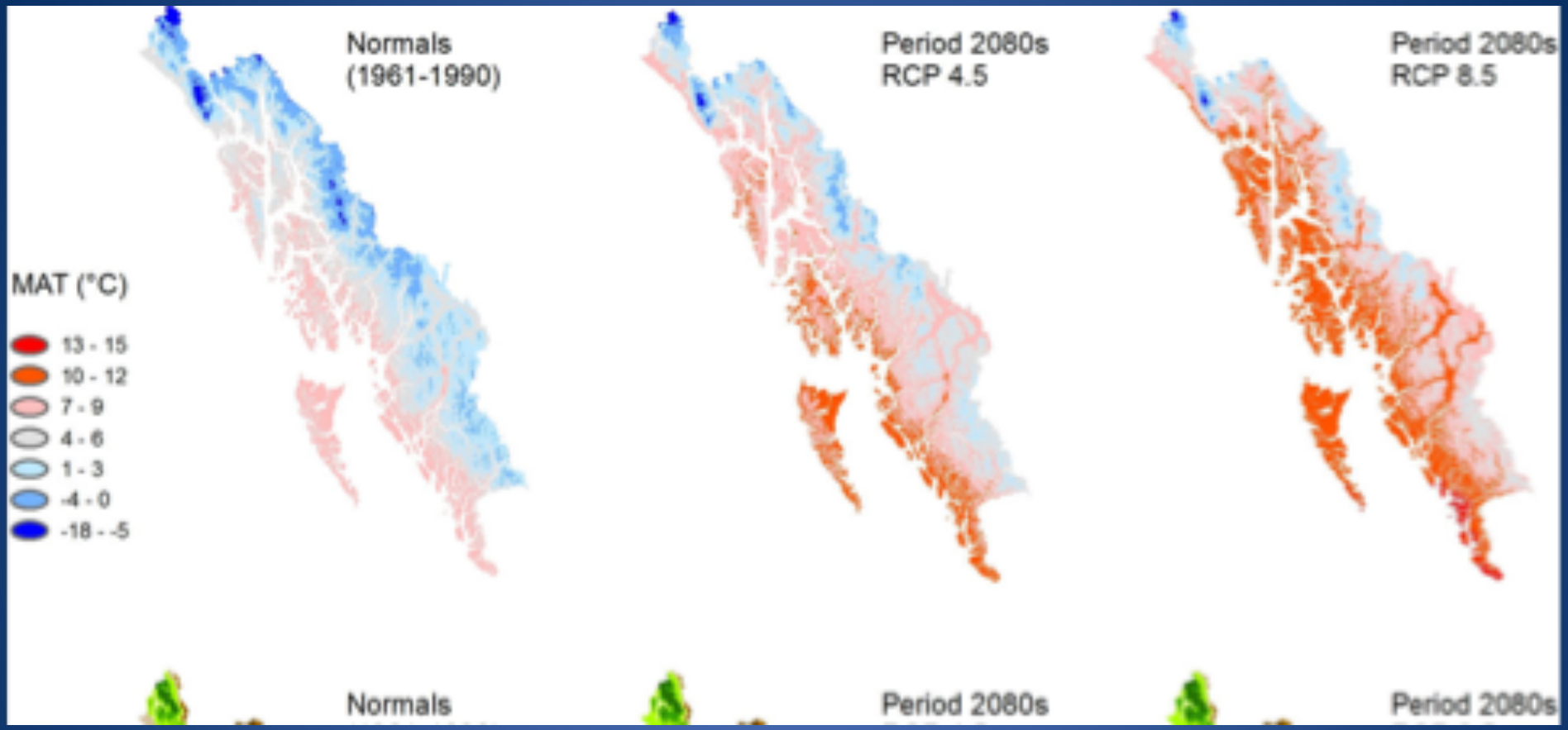
Projected Decrease in Mean Annual Snowpack - 2080



Snow decreasing 22 – 58%

Source: Shanley et al., *Journal of Climatic Change*, 2015

Projected Increase in Mean Annual Precipitation - 2080



Precipitation increasing 3 – 18%

Atmospheric rivers – predicted to increase in frequency and severity
(28% increase in extreme precipitation days by 2080 – 2100 (USGS)

Source: Shanley et al., *Journal of Climatic Change*, 2015

How do we deal with this?

We can help our salmon adapt and help our communities continue to benefit

Better Monitoring – stream counts are at historic lows

Don't kill too many

- Better in-season assessments
- Set clear management actions to deal with uncertainty and greater fluctuations – develop Abundance Based Management Plan's for all species.
- Implement Rebuilding Plans for populations in the red zone

Protect their habitat

- Land use planning with a salmon lens
- Estuary management planning
- Participate in environmental assessments
- Citizen science
- Education

Benefit by being adaptable

- Change our harvest year to year to focus on species & populations that are healthy
- Protect those that are not

Prioritize Local Food Harvesting & Distribution

- Adjust harvest plans to meet First Nations food needs
- Re-think how we allow access to local people
- Work with commercial fishers, processors and First Nations to enable better access for local communities

Will Skeena salmon be able to adapt?

There's Hope!

Salmon are resilient

Skeena salmon are well positioned

- Large diversity – species, genetics, habitats
- Northern location

Some populations may actually become more productive

- Need to make sure they have the opportunity


Questions?