15

Salmon and Lamprey in Western Alaska

Module Composition

Home | Presentations | Readings | Video Resources | Questions

Fisheries Technology

This module will cover five main areas:

1. Biology and Ecology
2. Fisheries
3. Management
4. Research
5. Lamprey

When viewing recorded lectures, the slides will automatically advance. The Prev and Next buttons are available but it is recommended you listen and view the recorded lectures in auto mode. You can return to the main menu of the recorded lectures by tapping the recorded lecture icon (speaker).

At the end of each of the areas there are self-check quizzes to make sure that you understand the basic student learning outcomes for each area.

By the end of this module, you should be able to:

1. Describe the basic life history traits for King and Chum salmon
2. Describe the cultural importance of salmon in the Yukon region
3. Describe the different gear types used on different parts of the Yukon river
4. Describe how in-river management for salmon is broken up
5. Describe the role of the Alaska Department of Fish and Game (ADF&G), the Board of Fisheries and the ADF&G Advisory Committees.
6. Differentiate the Pacific Salmon Treaty and the Yukon River Salmon Agreement
7. Describe the difference between Biological Escapement Goals and Sustainable Escapement Goals
8. Describe the issues regarding the Bering Sea Pollock fishery and Yukon salmon
9. Describe the basic life history traits for lamprey
10. Describe the current fisheries for lamprey in the Yukon

The Yukon Salmon Management Area encompasses the largest river in Alaska. The Yukon River and its tributaries drain an area of approximately 220,000 square miles within Alaska, while the Canadian portion of the river accounts for another 110,000 square miles. The river flows 2,300 miles from its origin 30 miles from the Gulf of Alaska to its terminus in the Bering Sea. Chinook salmon and chum salmon, both summer and fall, are of the most importance to the Yukon River area. Sockeye, pink, and coho salmon, while present, are of minor importance. Chinook salmon have been in a prolonged period of low productivity and this has resulted in much hardship to the residents of the Yukon River drainage. Chum salmon returns, while better than Chinook returns, have been erratic since 1993, with some very poor returns that restricted both commercial and subsistence fishing. Adding to these problems, poor prices and lack of buyers depressed the value of chum salmon harvested from the Yukon River at a time that fuel costs skyrocketed, making the economics of salmon fishing in the Yukon River even more challenging. Both the state and federal government increased funding for management and research after the poor fishery performance of the 1990s. The result has been a major increase in information about the numbers, spawning locations, and relative importance of particular tributaries in the total production of Yukon River salmon.

Read pp 1-5 in

Lamprey.pdf in iBooks

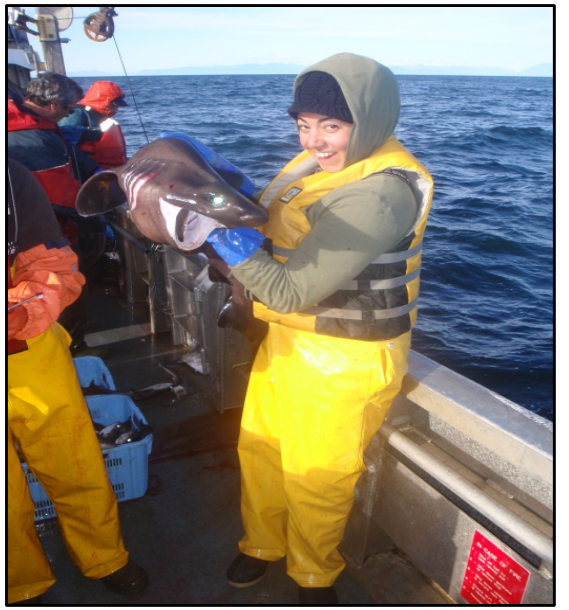
Presentations

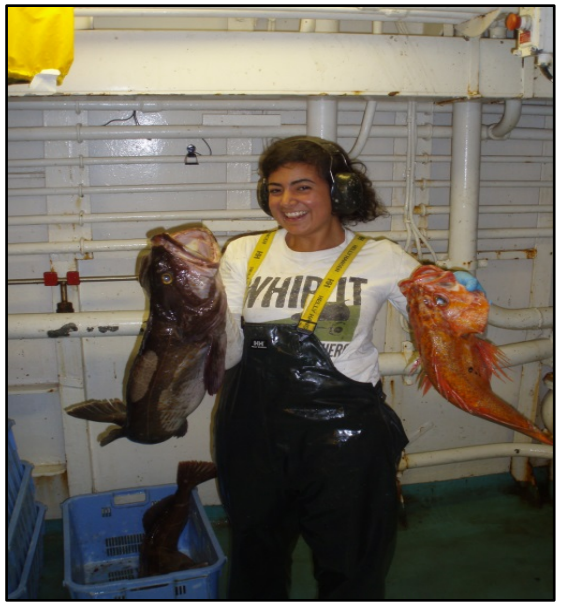
Fisheries Technology

About the Presenter	Sabrina Garcia, Alaska Department of Fish and Game
Fisheries	Chinook salmon, Chum salmon, Subsistence fishing, Commercial fishing, gear types (15 minutes)
Management	Pacific Salmon Treaty, Yukon River Salmon Agreement, Escapement, population trends, sampling (30 minutes)
Research	Summer Chum telemetry, Chinook juvenile project, Chinook smolt project (20 minutes)
Lamprey	Salmon by-catch and salmon enhancement (15 minutes)

Sabrina Garcia

- Studied marine biology at the University of Miami
- Interned with the South Florida Student Shark Program and the Bimini Biological Station
- Graduate degree with specialization in fisheries science
- Dabbled in contract work and consulting
- Assistant manager on the Yukon River





Yukon River

Third largest river in North America

1,979 miles long

Begins in northern British Columbia, flows through the Yukon Territory, and ends in the Bering Sea

Numerous villages reside on tributaries and the mainstem of the Yukon River

All five species of salmon are found in the Yukon

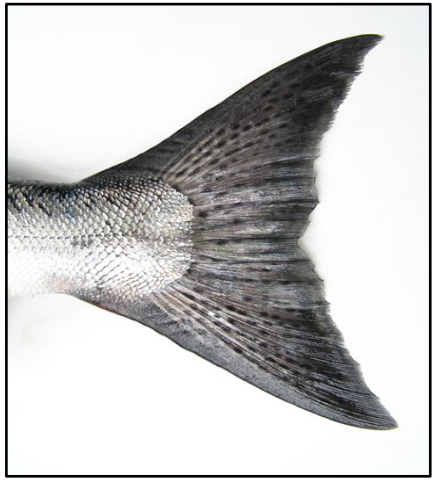
Other non-salmon fish species (burbot, pike, suckers, whitefish spp, lamprey)

http://www.explorenorth.com/library/rivers-lakes/images/yukonmap.gif

http://www.nps.gov/yuch/learn/nature/images/Calico-Bluffs.jpg

Chinook (king) salmon

- Largest of the Pacific salmon
- Anadromous, semelparous
- Two types
  - Stream: Rear in streams for a full year then migrate to sea
  - Ocean: Migrate to the ocean in their first year
- Spend 1-5 years in the ocean
  - Mature between 2-7 years old
  - “Jacks” mature after only one year in the ocean
- Begin entering the river from May-July



http://wdfw.wa.gov/fishing/salmon/chinook.html

Summer chum salmon

- Yukon River produces some of the largest runs of chums in North America
- Anadromous, semelparous
- Migrate to the ocean in the fall/winter of their first year
- Return to spawn between 3-6 years of age
- Enter the Yukon River between early June and July
- Do not spawn in Canada

http://wdfw.wa.gov/fishing/salmon/chum/chum_colors.html,
http://www.epicanglingadventure.com/chum-salmon-nickname-tiger-salmon/,
http://wfrc.usgs.gov/fieldstations/columbia/chum.html

Subsistence fishing on the Yukon River

- Subsistence salmon fishing occurs from May to October
  - Chinook, summer and fall chum, and coho
- Non-salmon species are also harvested
- Use set or drift gillnets, dip nets, and fish wheels

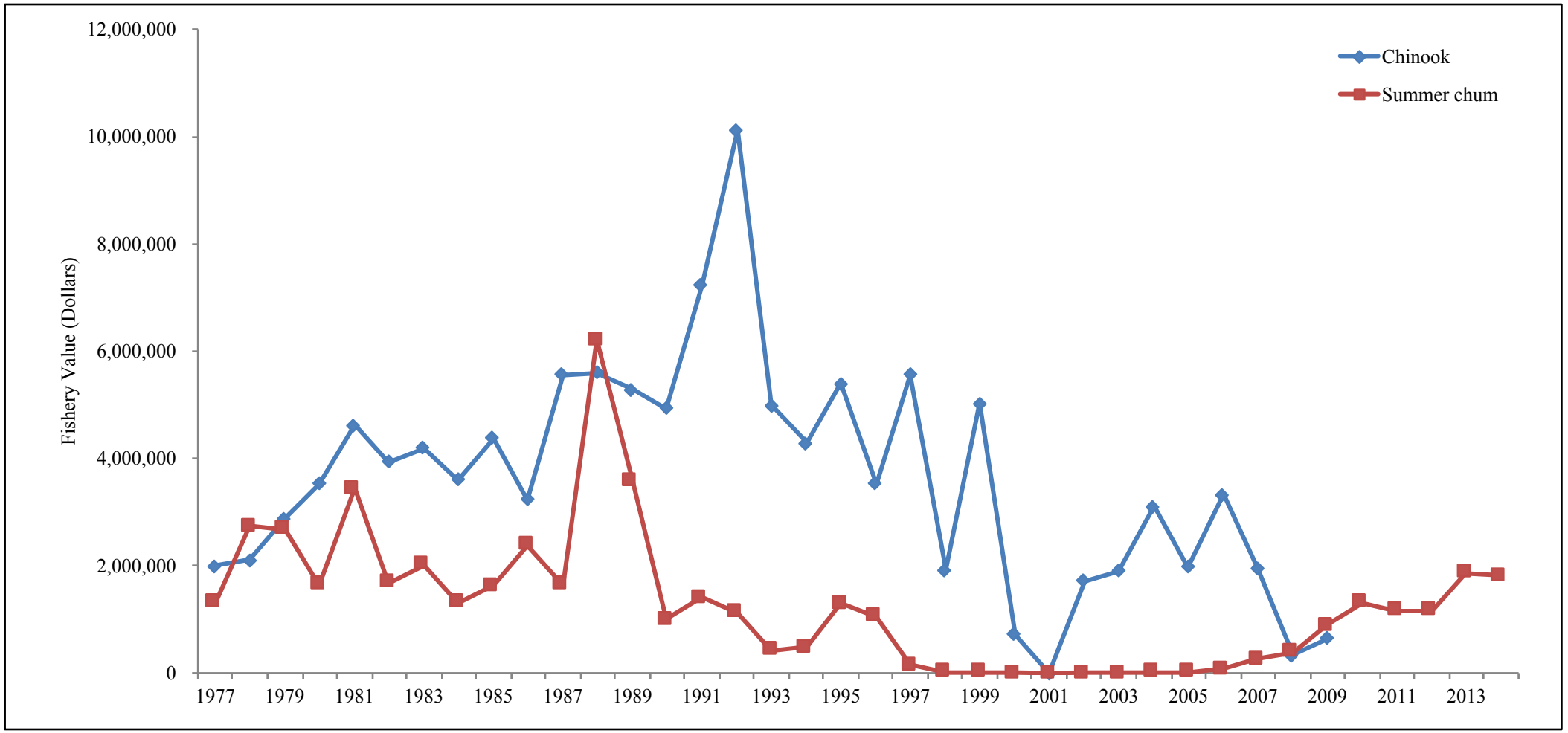


http://overlandcanoe.com/bryces-excellent-adventures/yukon-river-source-to-bering-sea-1995/ , Alaska State Library, and Danielle Ringer

Commercial fishing on the Yukon River

- Can be considered an extension of subsistence fishing
- Started in the early 1900s but really expanded in the 1960s
- Market for both roe (chum salmon) and meat
  - Roe fishery terminated in 1997
- Two seasons
  - Summer: Chinook and chum
  - Fall: chum and coho
- Salmon is sold to the UK and to markets around the US (mainly Seattle)

Commercial fishing on the Yukon River



Gear types

Lower river

- Dip nets
- Beach seines
- Drift and set gillnets

Upper river

- Set gillnets
- Drift gillnets
- Only in a single district and only during certain dates
- Fish wheels

http://www.alaska-in-pictures.com/native-dipnetting-2283-pictures.htm, Sean Larson, http://wasillaalaskaby300.squarespace.com/journal?currentPage=85

Fisheries

http://www.rapidsresearch.com/html/fishwheel_photos_0.html, Stephanie Schmidt, Gene Sandone

All fish are not created equal

Summer chum in District 1
(photo courtesy of Stephanie Schmidt)

Summer chum in District 4
(photo courtesy of Andy Padilla)

Fisheries

Quiz - 5 questions

Last Modified: Jun 15, 2015 at 03:06 PM

PROPERTIES

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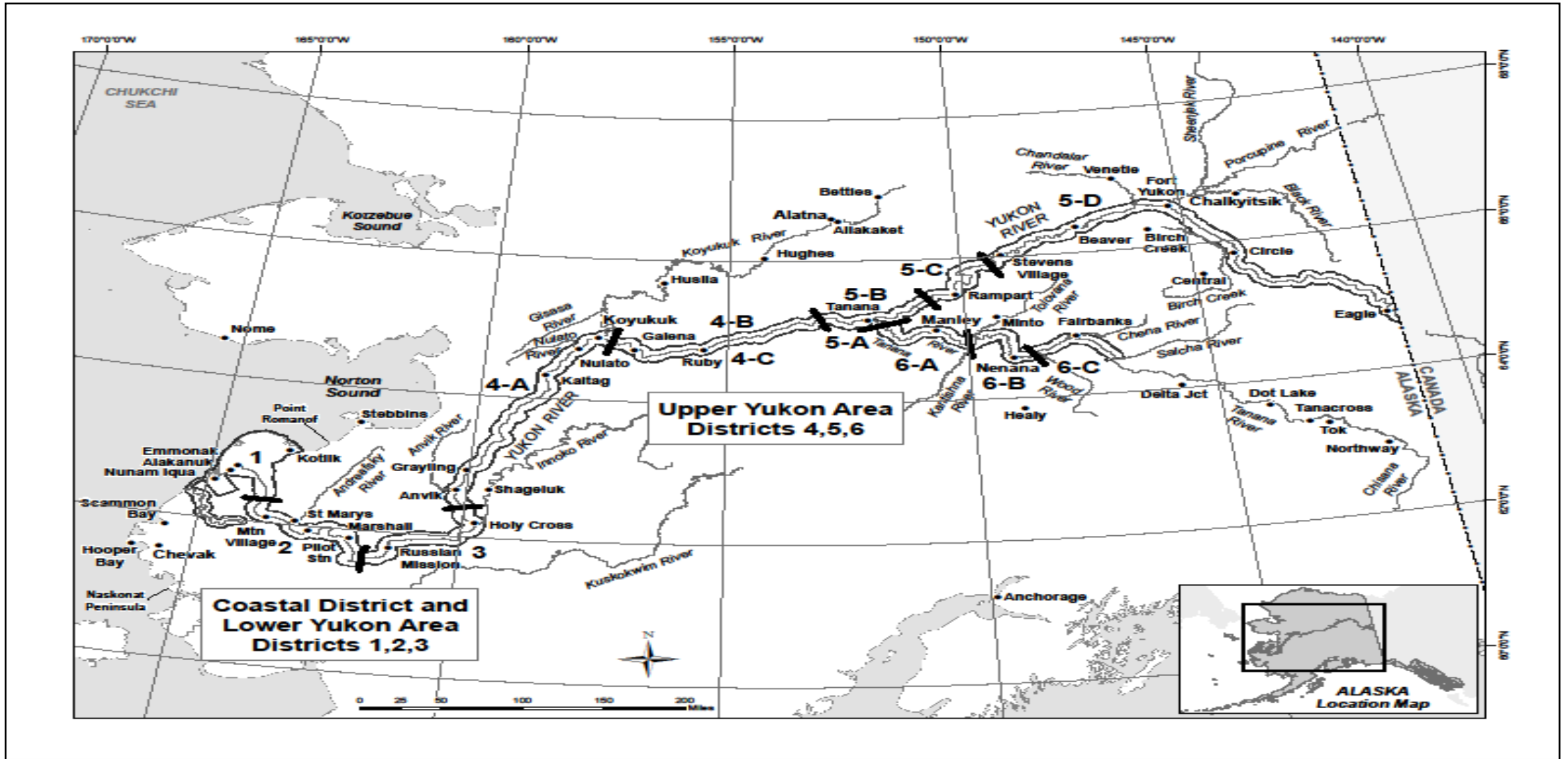
Managing by districts



Management on the Yukon River

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

ALASKA DEPARTMENT OF FISH AND GAME

YUKON Delta Fisheries Development Association

Yukon River Drainage Fisheries Association

Canada
Department of Fisheries & Oceans

Tanana Chiefs Conference

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

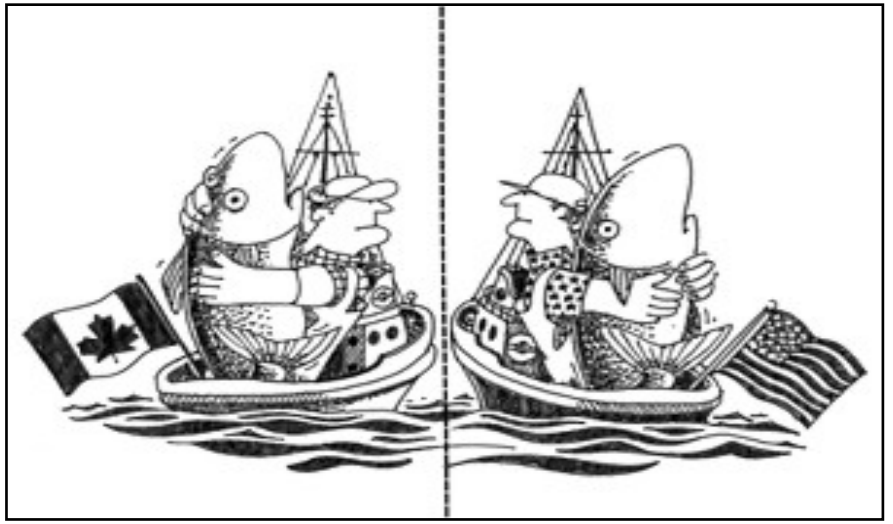
YUKON RIVER PANEL
ALASKA • YUKON

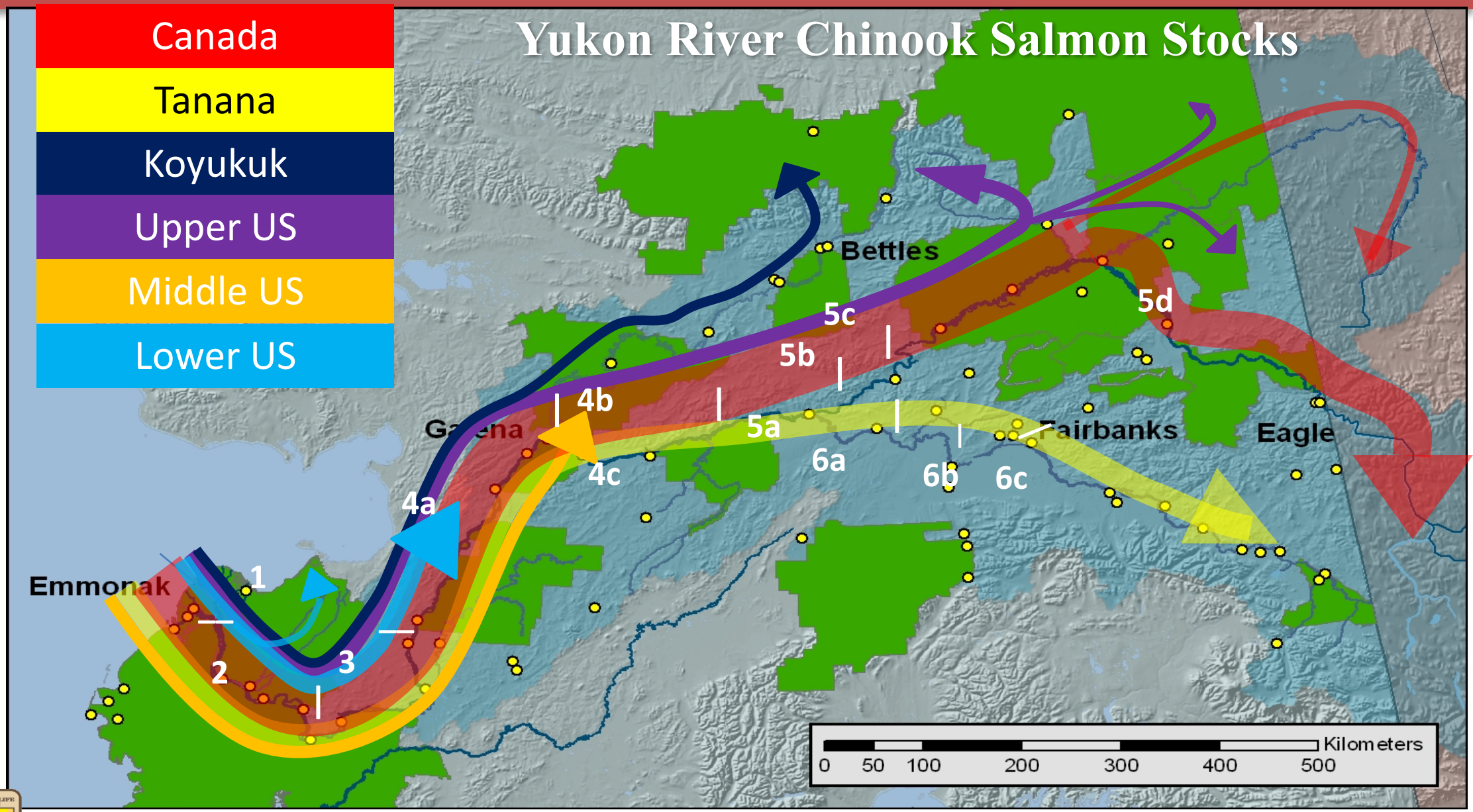
!

Trans-boundary agreements

Pacific Salmon Treaty (1985)

- U.S. and Canada agree to cooperate in the management and research of Pacific salmon stocks of mutual concern
- Agree to prevent overfishing
- Ensures both countries receive benefits equal to the production in their waters





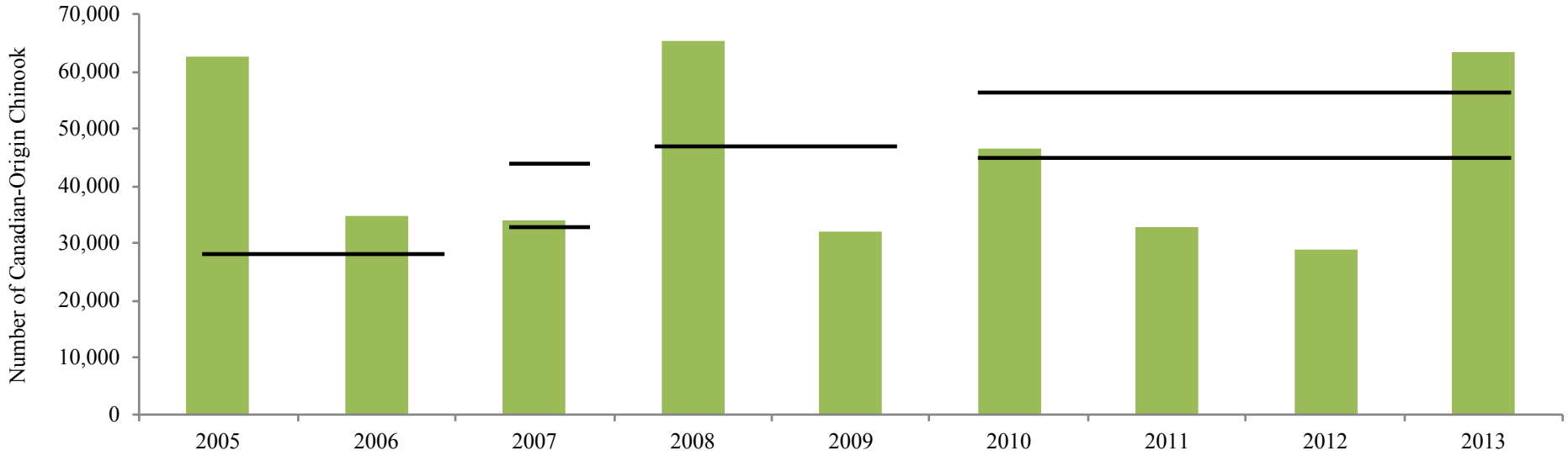
Map courtesy of USFWS

Yukon River Salmon Agreement

Escapement objective is 42,500-55,000 Chinook salmon across the border to spawning grounds in Canada

- Established by the Yukon River Panel
- Alaskan fishers will inevitably harvest Canadian-origin Chinook

The goal has not been met in 4 out of last 10 years



Escapement

Escapement = total number of salmon entering the river minus the harvest

Two different types of escapement goals on the Yukon:

- Biological escapement
- Sustainable escapement

Escapement is measured using aerial surveys, tower counts, weirs, and sonar

ADFG, AKSSF, and US Fish and Wildlife Service

Management implementation

Alaska Dept. of Fish and Game

- Summer and fall season managers
- and assistant managers
- Board of Fisheries

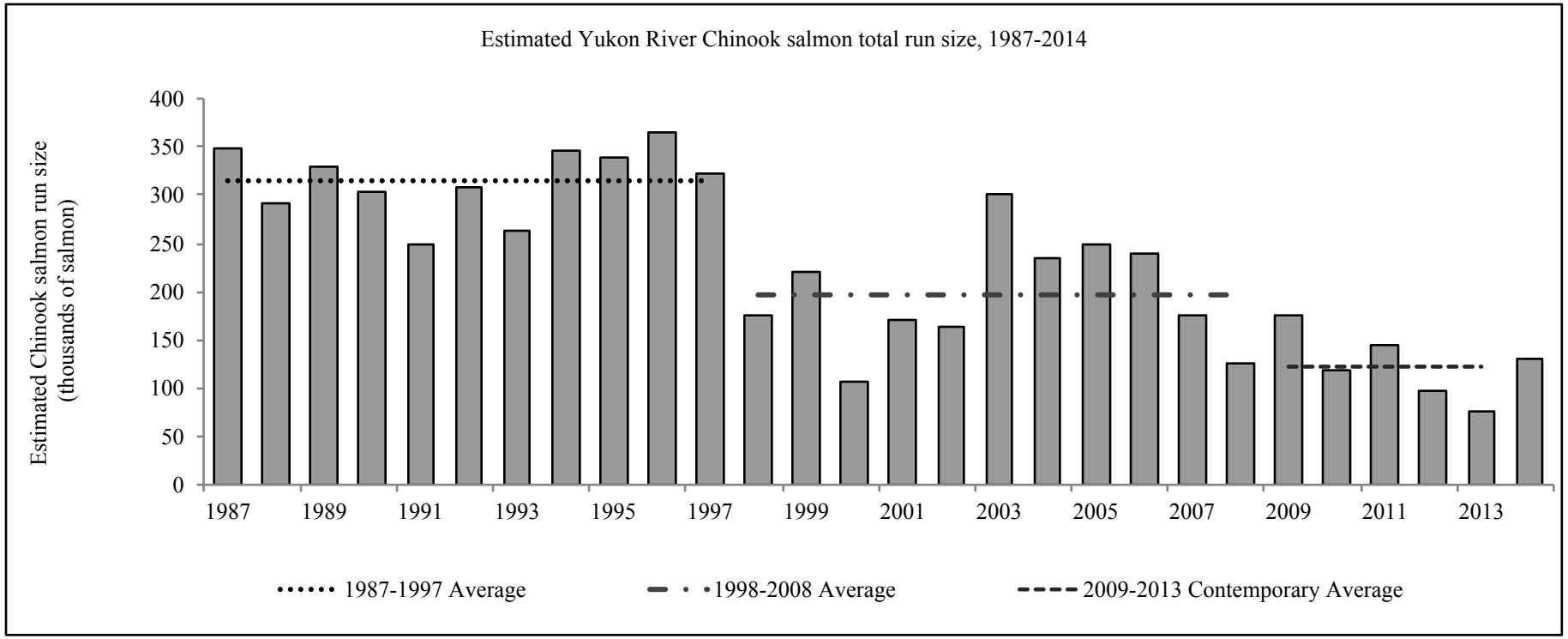
U.S. Fish and Wildlife Service

- Federal managers
- Federal Subsistence Board

Fisheries and Oceans Canada (DFO)

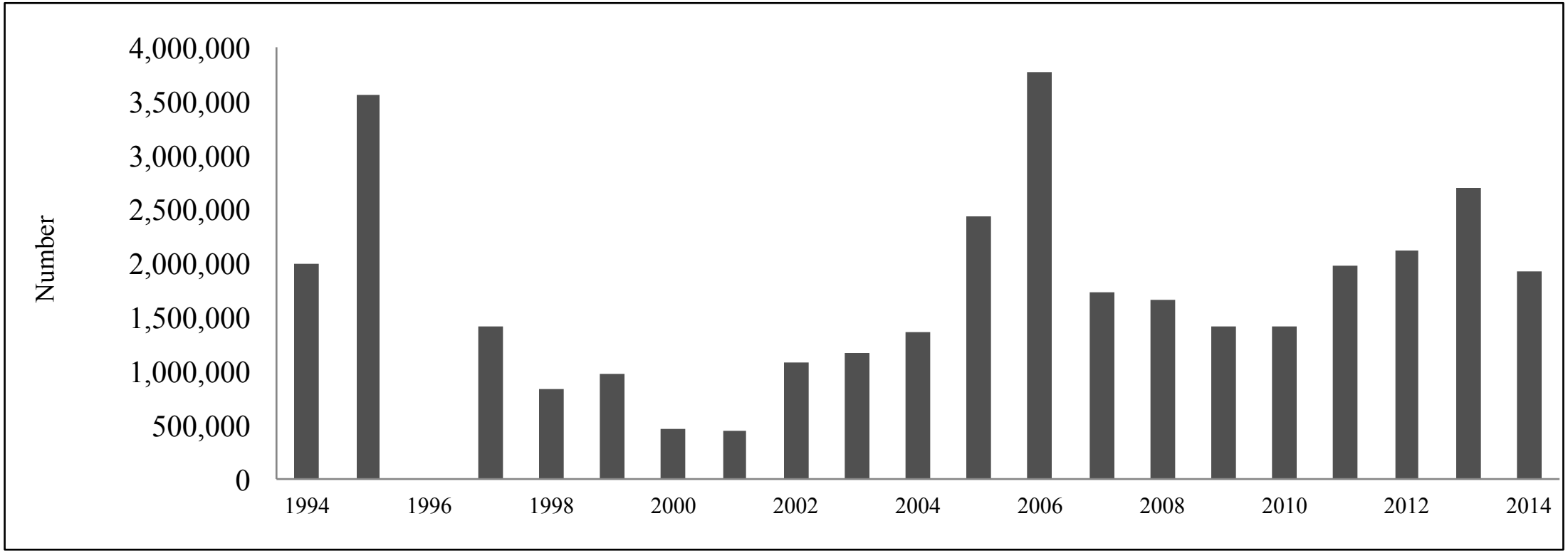
- Canadian counterparts to U.S. managers
- and biologists

Chinook salmon population trends



- Chinook salmon have been in a period of low productivity since 1998
- No one reason can be attributed to this decline (overfishing, climate change, oceanic conditions, weather patterns, freshwater survival as smolts, etc.)
- Commercial fishing for Chinook salmon ended in 2007
- Fisheries disaster was declared for the Yukon River for 2010–2012

Summer chum salmon population trends



- Summer chum salmon were considered a stock of concern from 2001–2003
- Designation was removed in 2007
- Large reliance on summer chum due to Chinook declines

Run assessment and timing (preseason)

How do we know how many salmon will enter the river?

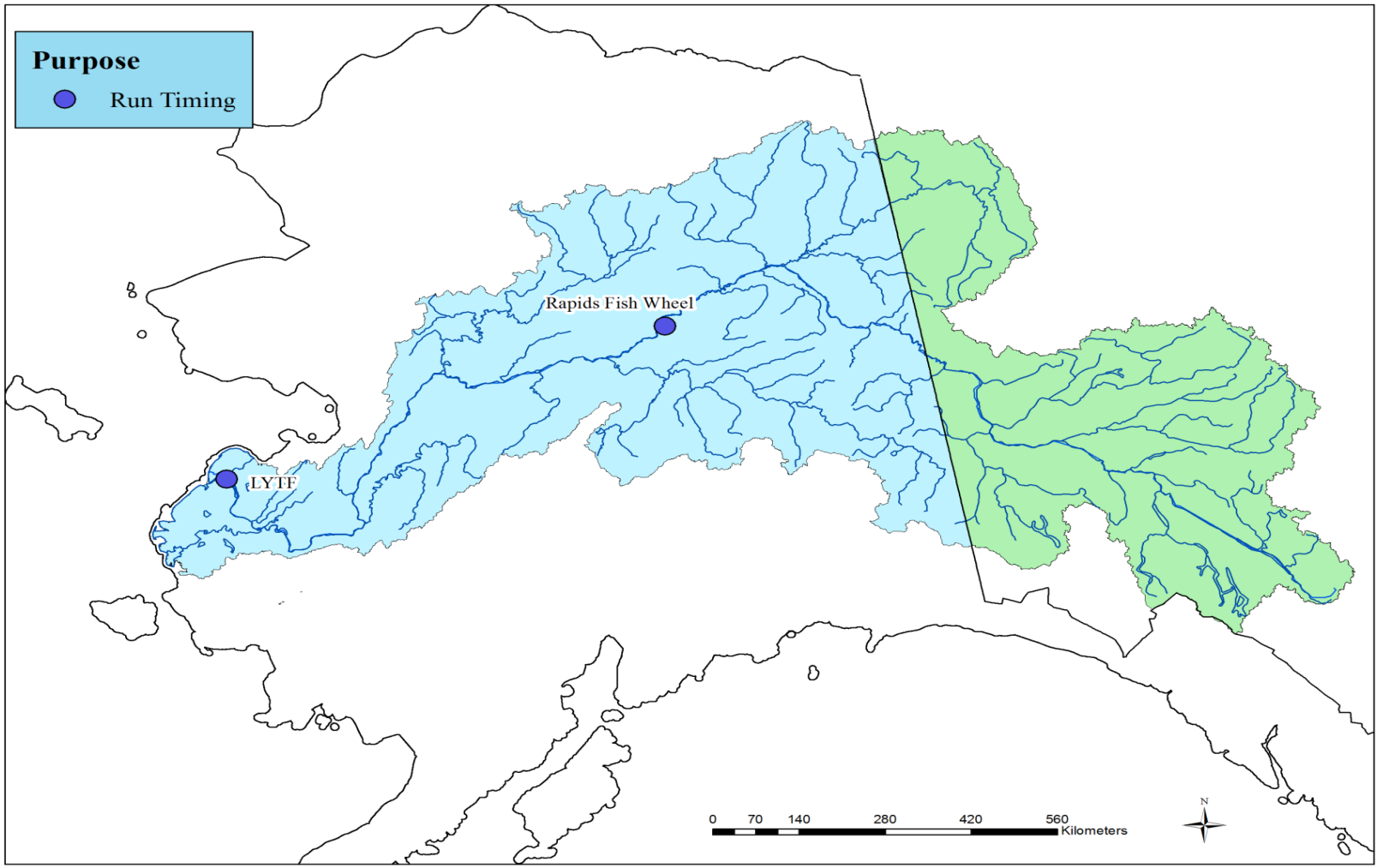
- Preseason outlook (Yukon River Joint Technical Committee)

How do we know when salmon start entering the river?

- Run timing model (NOAA and AOOS)
- Subsistence reports

http://www.kwikpakfisheries.com/emmonak.html

In-season projects



Courtesy of Sean Larson

Run assessment and timing (in-season)

- Lower Yukon Test Fishery (ADFG)
- Use set and drift gillnets to determine catch-per-unit-effort of Chinook and summer chum salmon
- Gives managers both run timing and strength
- Biological sampling
- Donations to the community

Biological sampling

Sampling gives us information on the stock structure (Canadian vs. US origin fish), age composition, trends in size over time

Age

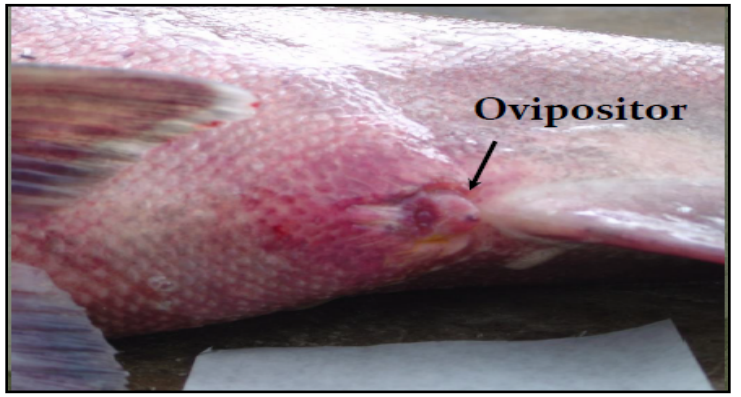
- Using scales

Length

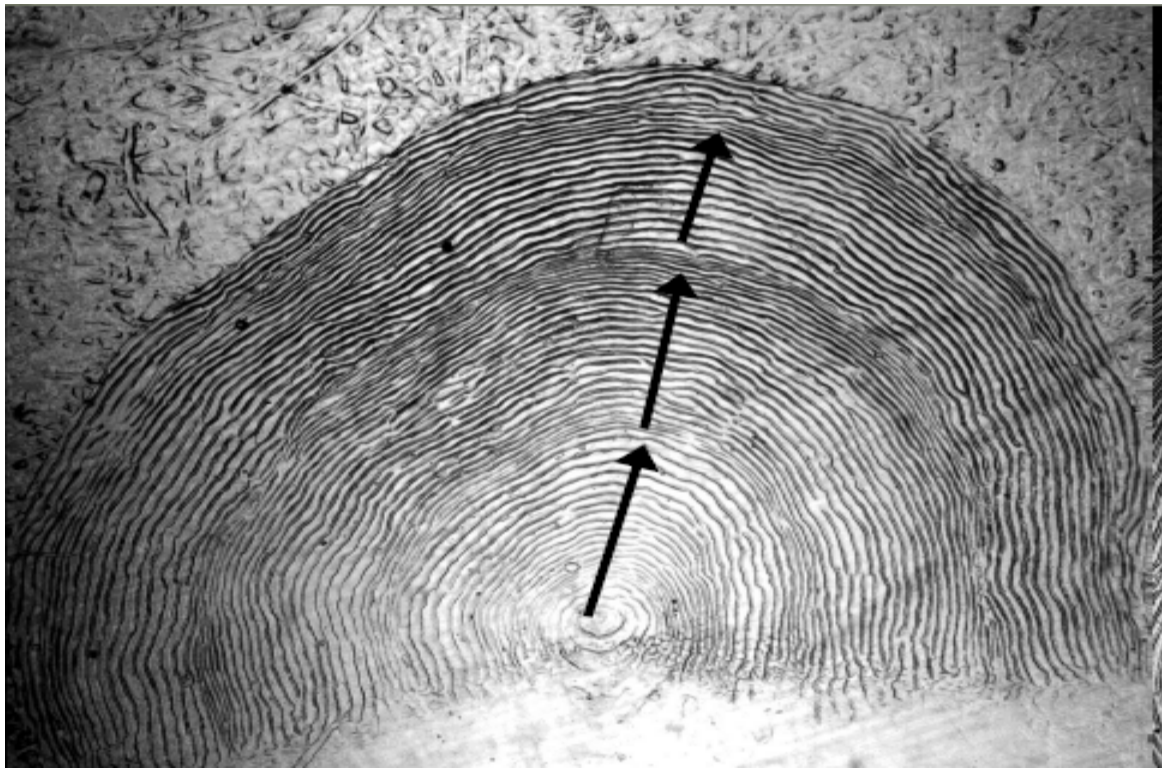
- Mid-eye to fork in tail

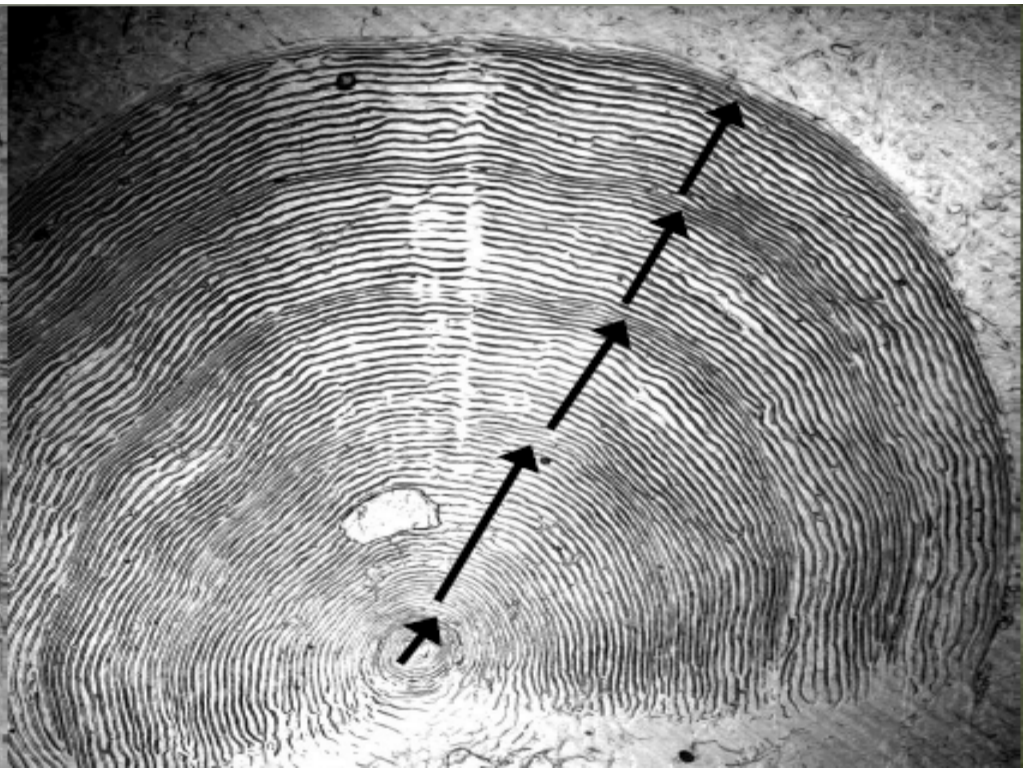
Sex

- Visual inspection of gonads
- Visual inspection of characteristics during commercial sampling (kype, ovipositor, belly size and shape)



Total age= Freshwater years + Saltwater years + 1 year for incubation



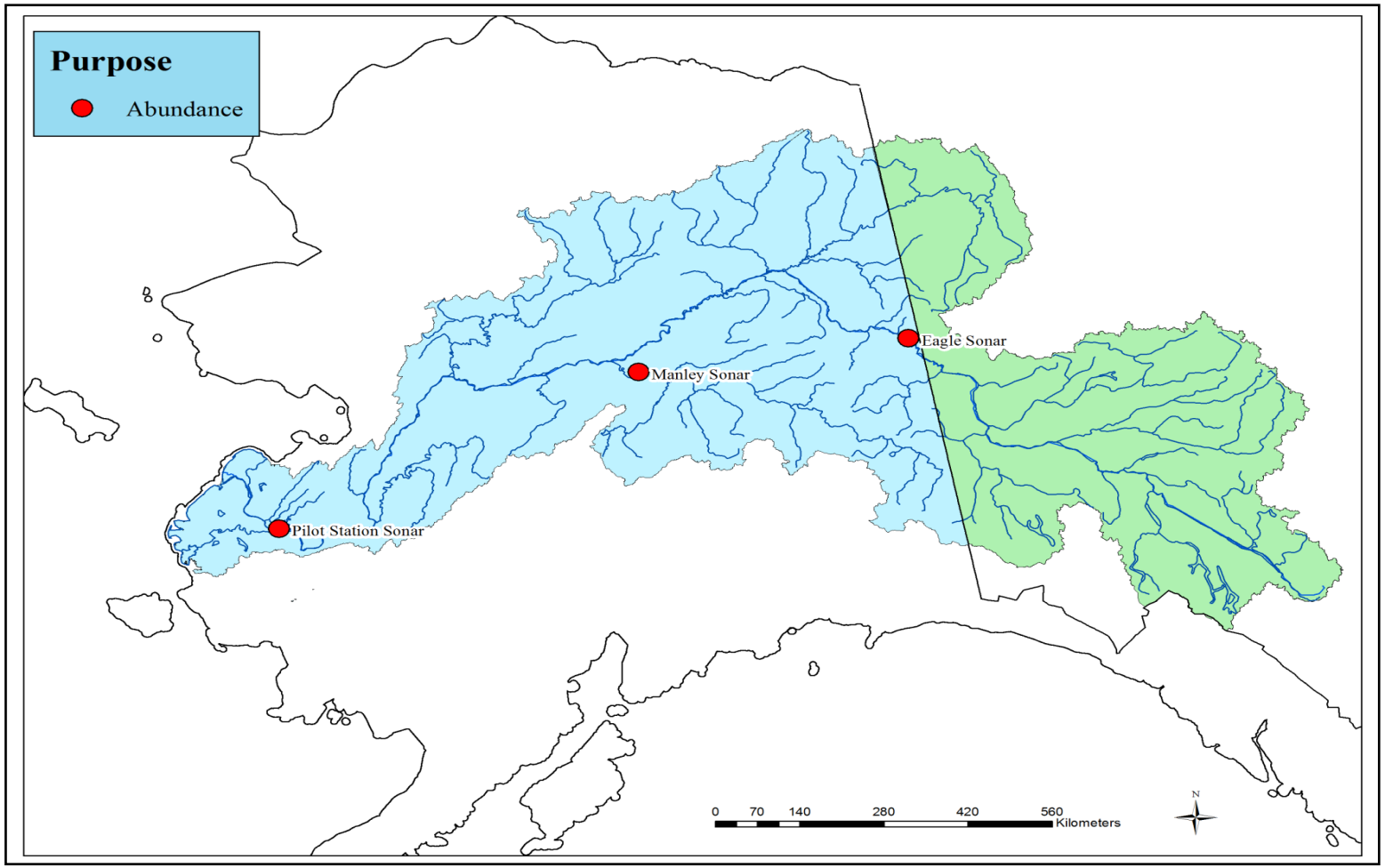


Chum age 0.3 = 4 year old fish

Chinook age 1.4 = 6 year old fish

Courtesy of Shane Eaton (ADFG)

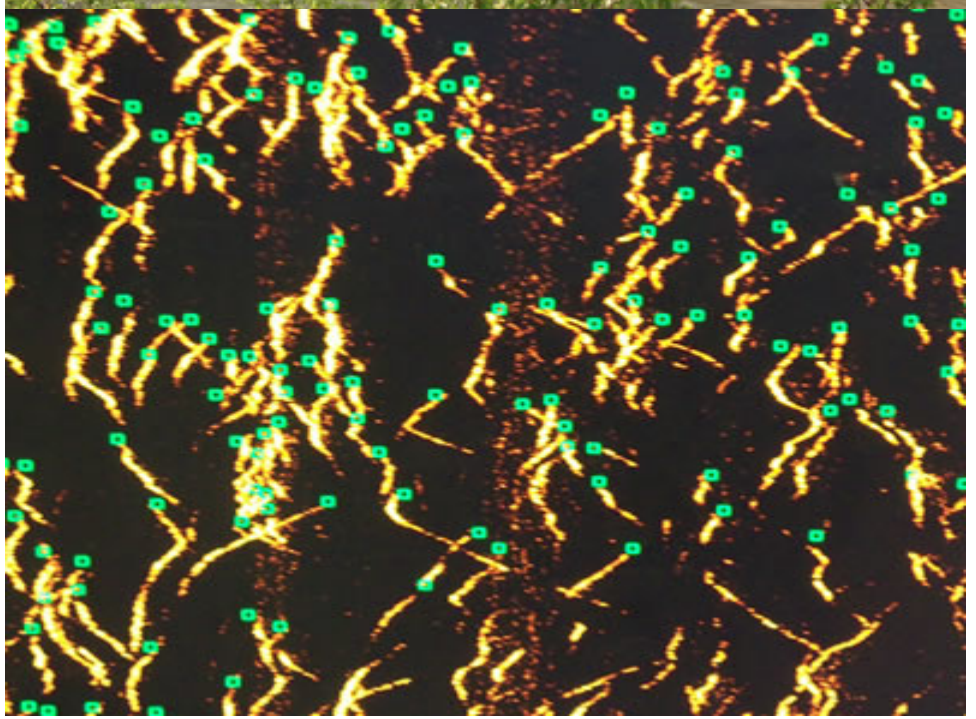
In-season projects

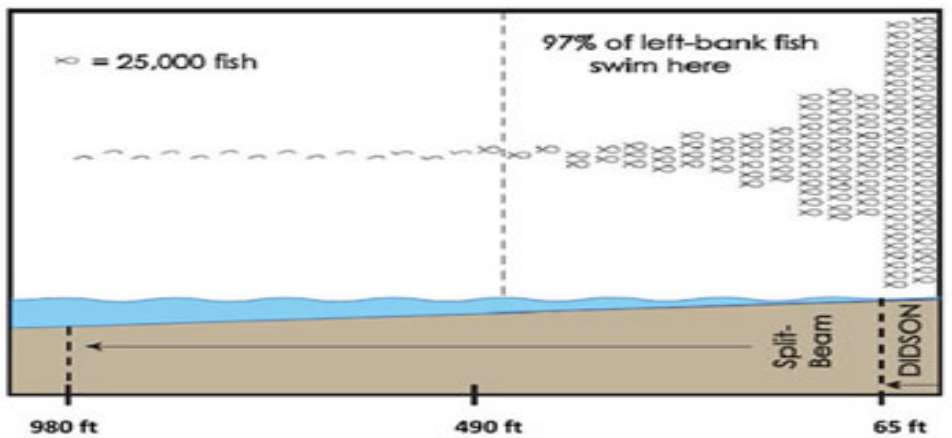


Courtesy of Sean Larson

Abundance estimates (in-season)

- Pilot Station Sonar (RM 121)
- Uses DIDSON and split beam technology to count
- Left bank has two transducers due to the heavy fish
- Test fishing to apportion fish species
- Biological sampling (genetics)





http://www.adfg.alaska.gov/index.cfm?adfg=sonar.site&site=12

In-season Management

Daily information regarding run timing and abundance from projects

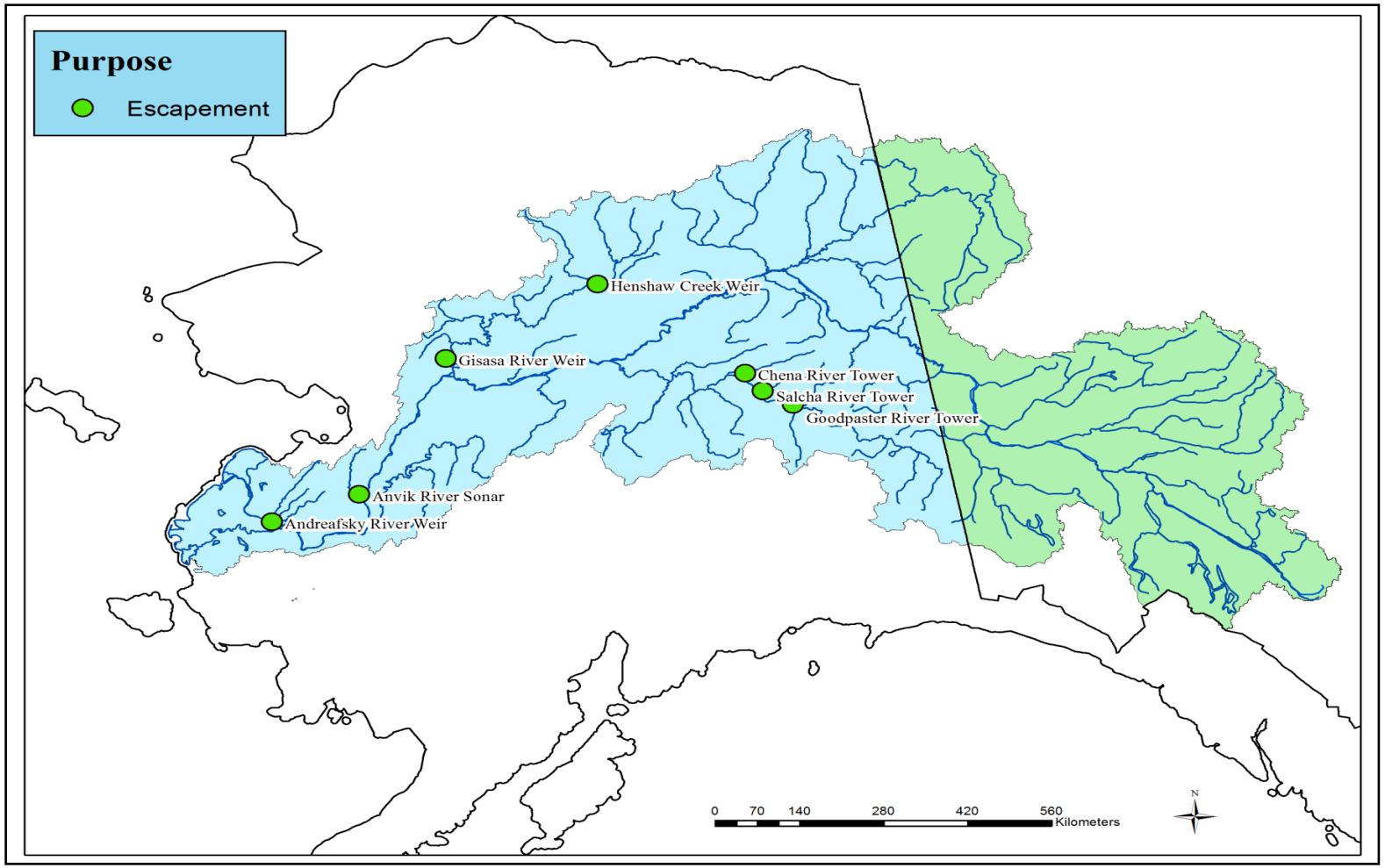
- Better information later in the season

Management actions based on state regulations

- No fishing on 1st pulse of Chinook
- Need 600,000 summer chum to open commercial fishing

Manage fisheries by altering fishing time, gear type, and location

Escapement Projects



Courtesy of Sean Larson

2014 Summer Season (Preseason)

Outlook

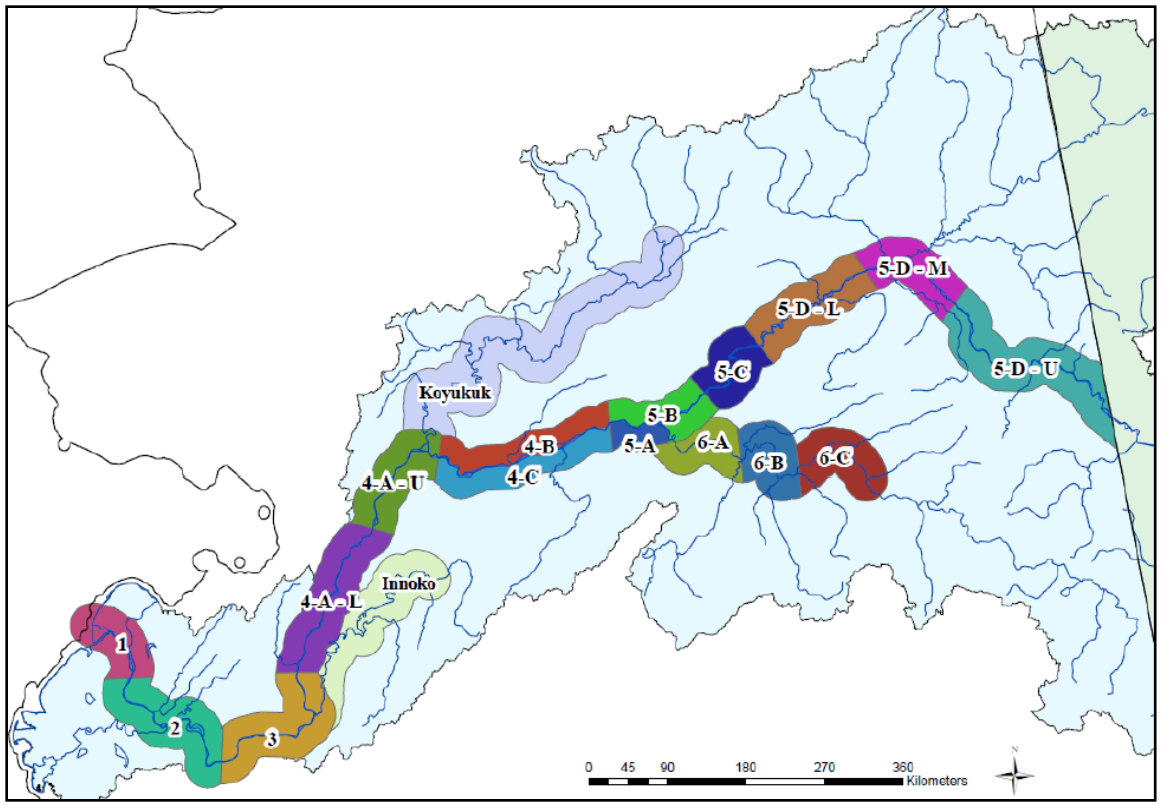
- Chinook salmon run was expected to be the worst on record
- Summer chum salmon run was expected to be average

Management strategy

- Closures initiated in each district as Chinook enter and migrate upstream
- Allow fishing for summer chum salmon using selective gear types
- All Chinook salmon caught in selective gears were required to be released alive

2014 Summer Season (In-season)

- Closed subsistence in the lower river districts on May 26
- Subsistence salmon fishing closures implemented chronologically upriver
- Once summer chum become abundant, open subsistence and commercial fishing with dip nets and beach seines in Districts 1, 2, and 3



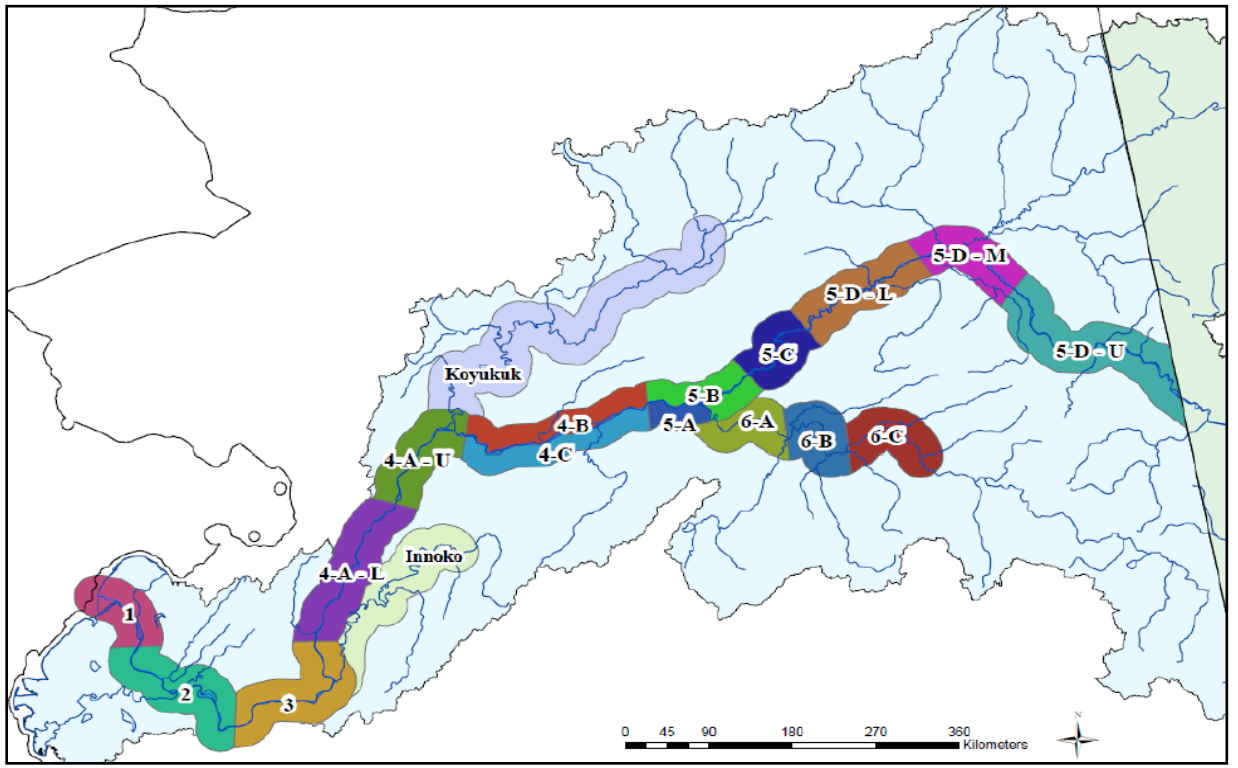
2014 Summer Season (In-season)

- By mid –June, summer chum are entering District 4 so subsistence fishing allowed using dip nets and beach seines

- As summer chum abundance increases in District 4, commercial openings with fish wheels

- By late June, the Chinook run is 90% complete in the lower river

- We continue conservative management in District 4 and District 5



2014 Summer Season (Post season)

- Thanks to the efforts and sacrifices made by fishermen all along the river, we met all of our escapement goals for Chinook salmon

- We surpassed our Canadian border objective by approximately 10,000 Chinook salmon

- Summer chum salmon harvest in the Districts 1 and 2 was the largest since 1989
  - 430,000 summer chum
  - More than half the harvest with dip nets (259,771 summer chum)
  - $1.7 million to lower river fishermen (approx. $4,000 per fisher)

Photos courtesy of Stephanie Schmidt

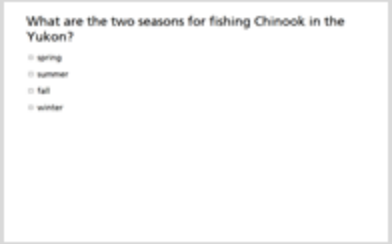
Looking ahead to 2015

Preseason forecast for Chinook and summer chum salmon predict comparable run sizes to 2014

Management actions will likely be the same

- Allow small harvest of Chinook?
- Continue to close all Chinook fishing?

Preseason meetings in April to obtain input from stakeholders



Management

Quiz - 5 questions

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Current research

ADFG projects

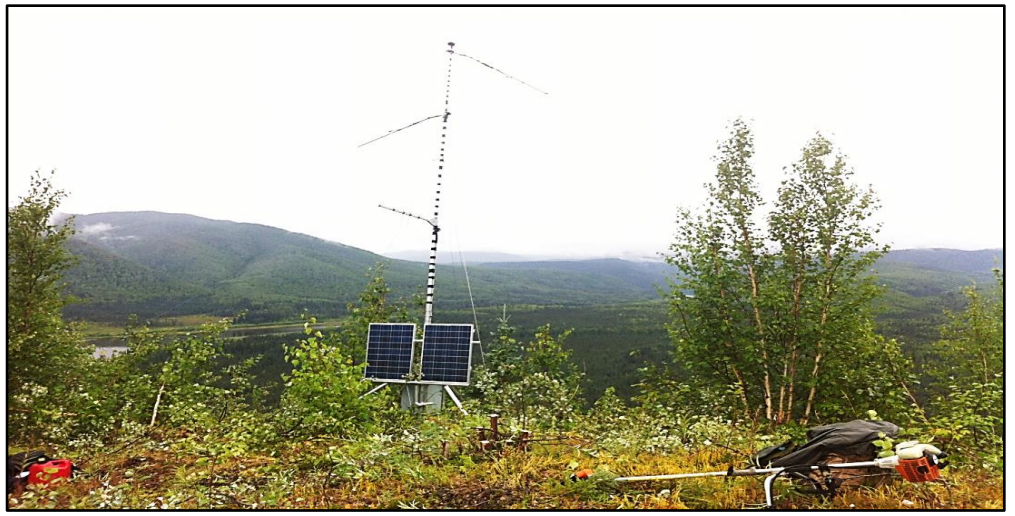
- Summer chum salmon telemetry project
- Chinook salmon marine juvenile project
- Chinook salmon smolt study

Summer chum telemetry project

Summer chum is becoming increasingly important as a subsistence food

This 2-year study will provide information on:

- Escapement in tributaries
- Distribution
- Stock-specific characteristics



Courtesy of Sean Larson

Summer chum telemetry project

Use radio tags to track chum salmon

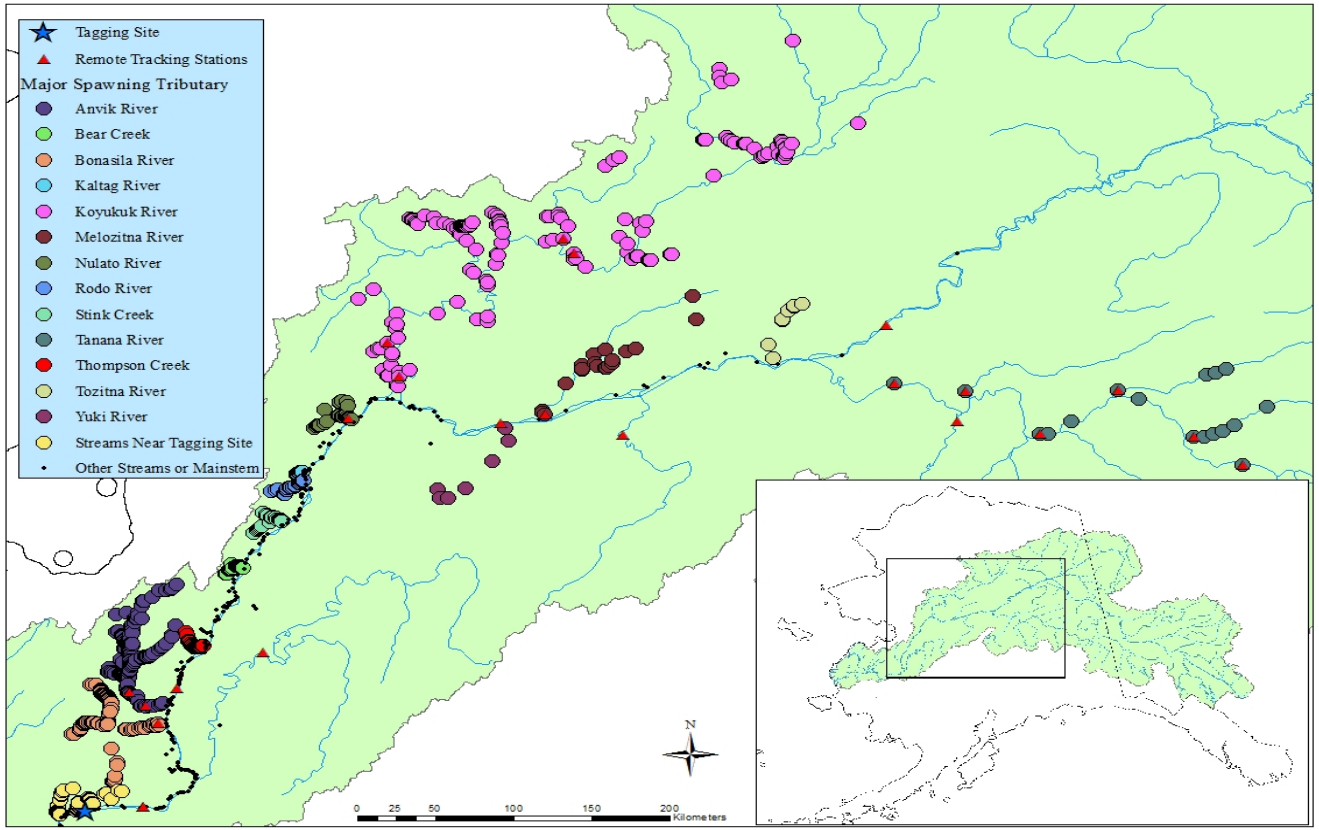
- Radio tag goes into fish's stomach
- Receivers along the river pick up signal and transmit data to a satellite

Courtesy of Sean Larson

Summer chum telemetry project

2014 summary

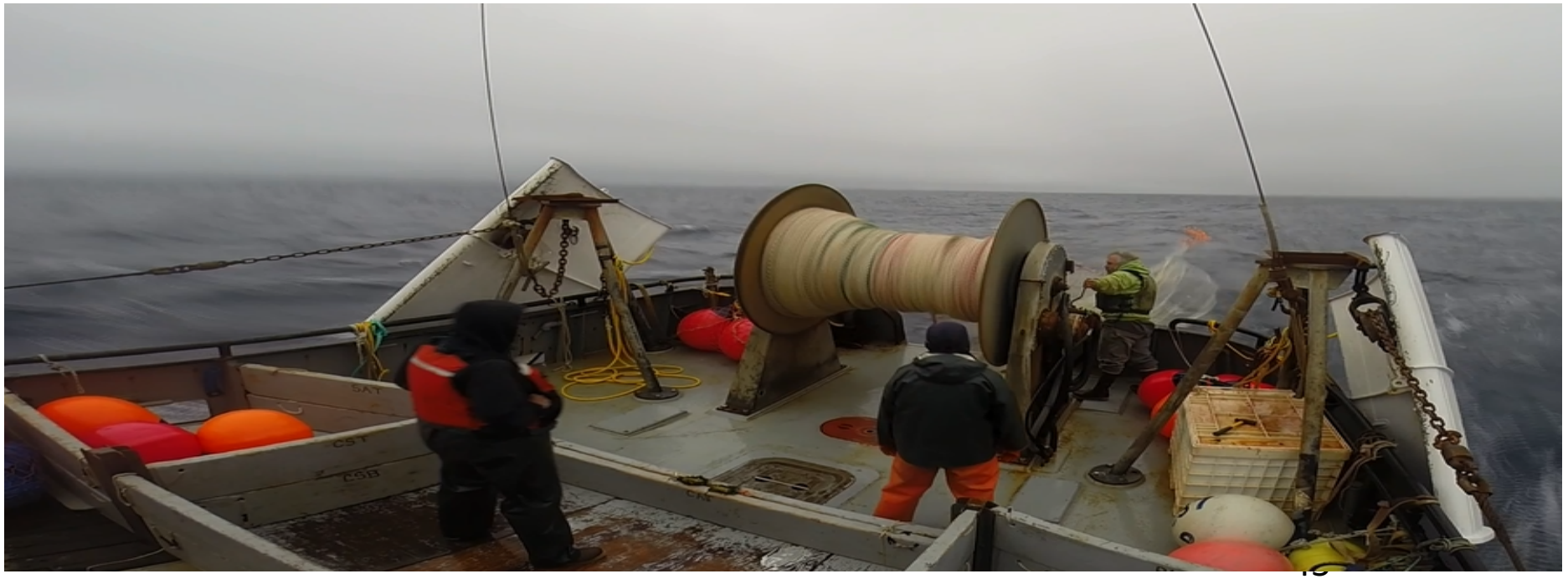
- Tagged 1,200 summer chum
- Identified major spawning streams
- Recommended numerous streams to t



Courtesy of Sean Larson

Juvenile Chinook salmon marine survey

- Occurs in the Northern Bering Sea in August and September
- Estimates abundance, diet, health, and size of juvenile salmon
  - Also obtain biological information from herring and lamprey
- Genetics taken from salmon to determine place of origin (e.g. Canada)



Courtesy of Katie Howard

Juvenile Chinook salmon marine survey

Courtesy of Katie Howard

Yukon River Chinook salmon smolt study

- Focuses on out-migrating Chinook salmon smolt
- Looks at timing, health, diet, and size of smolt as they leave the river
- Attempts to understand what conditions lead to better juvenile survival

Courtesy of Katie Howard

Current Issues

- Salmon bycatch in the Bering Sea pollock fishery
- Hatchery Enhancement
- Quality of escapement (Chinook salmon)
- Variability of run size (summer chum salmon)

Bering Sea pollock fishery

Pollock fishery is one of the largest fisheries in the U.S.

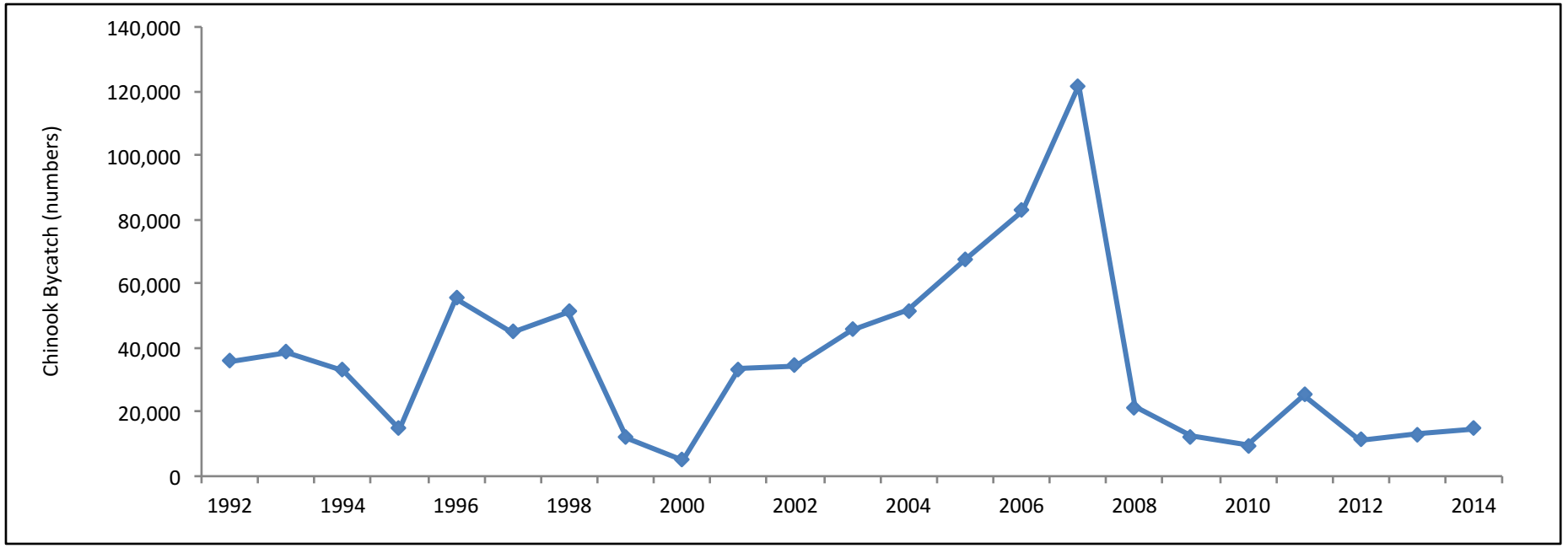
- Mid-water trawl
- Occurs during two season

Managed by the North Pacific Fishery Management Council

Salmon bycatch is an ongoing issue

Salmon bycatch

Chinook and chum salmon are incidentally caught in the Bering Sea pollock trawl fisheries



North Pacific Fishery Management Council currently trying to further reduce bycatch

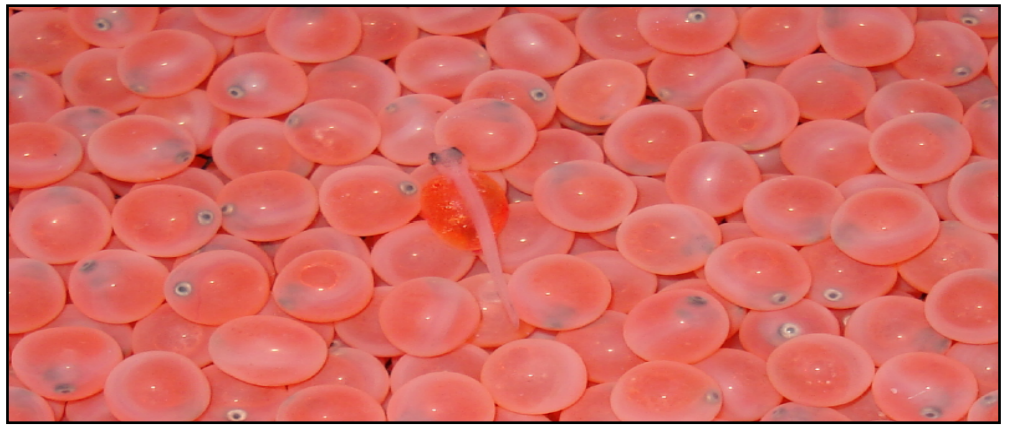
Hatchery enhancement

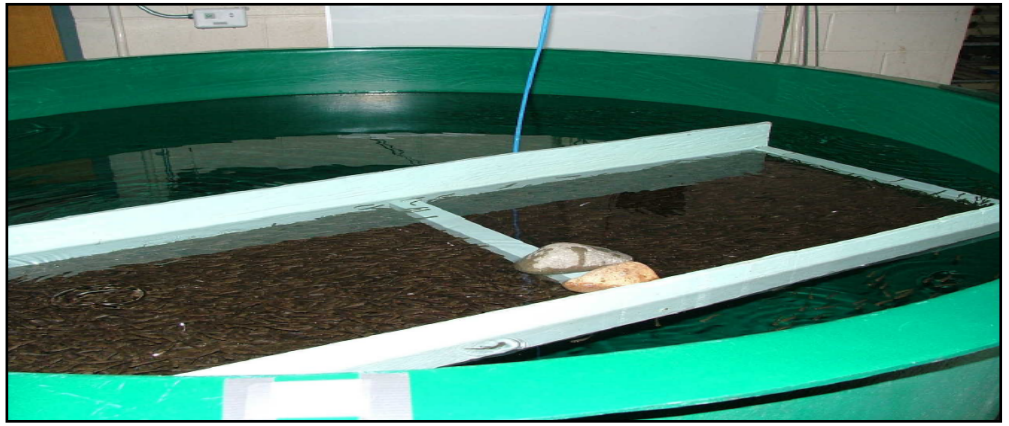
Hatcheries take eggs and milt from salmon and produce smolts for release

Risks

- Competition
- Loss of genetic diversity
- Hatchery cannot replace conservative management

Whitehorse hatchery is the only hatchery producing Chinook salmon smolt for release into the Yukon River





Quality of escapement

- On the Yukon we manage for numbers of Chinook salmon
- Does a 3 year old fish equal a 7 year old fish?
- Are larger females more desirable than smaller females?

Future of chum salmon

- Heavy dependence on chum salmon given declines in Chinook salmon
- Chum salmon populations have declined in the past
- Users are concerned about how their subsistence needs will be met in the event of chum declines

Resources for Yukon River salmon

Subsistence life in Emmonak (video)

- http://www.adn.com/video/video-subsistence-fishing-yukon-river

History of Alaskan commercial fisheries management

- Clark et al, 2006. The commercial salmon fishery in Alaska. Alaska Fishery Research Bulletin. 12(1): 1-146

Resources for Yukon River salmon

ADFG

Chinook Salmon Research Initiative

- http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative.main

Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative

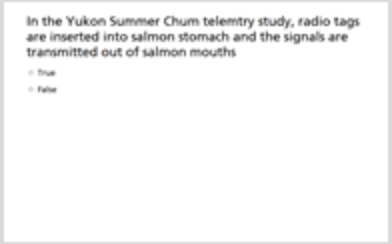
- http://www.aykssi.org/

Alaska Sustainable Salmon Fund

- http://www.akssf.org/

Yukon River Panel Restoration and Enhancement Fund

- http://yukonriverpanel.com/salmon/about/restoration-enhancement-fund/



Research

Quiz - 3 questions

Last Modified: Jun 15, 2015 at 02:56 PM

PROPERTIES

On passing, 'Finish' button:	Goes to Slide
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Allow user to leave quiz:	After user has completed quiz
User may view slides after quiz:	At any time
Show in menu as:	Single item

Edit in Quizmaker

Edit Properties

Arctic lamprey

- Circumpolar distribution
- Jawless
- Ammocoete
  - Filter feed
- Adult form is parasitic
- Anadromous and semelparous
- Used for subsistence

Jeremy Mears, ADFG, and http://www.flyfisherman.com/files/2011/09/lampreywoundweb.jpg

Commercial fishery

- Started in 2003
- No state regulations for an Arctic lamprey fishery
  - Operates on a Commissioner's permit
- Fishery is a way for ADFG to gain information

http://deckboss.blogspot.com/2011/10/almost-lamprey-time-again-on-yukon.htm,l

http://blog.seattletimes.nwsource.com/allyoucaneat/2008/11/20/lamprey_gorgeous_or_horrific_y.html

Commercial fishery

- Users use eel sticks, dip nets, or fyke nets to catch lamprey
- Typically occurs from October to December
- Run is sometimes difficult to intercept
  - Users run test fishing operations
  - and predict upstream migration
- Management is based on a quota
  - Once quota is reached, fishery closes

Fishery quota and harvest

Year	Quota (Pounds)	Harvest (Pounds)
2003	44,080	49,657
2004	44,080	–
2005	5,000	–
2006	40,000	8,196
2007	47,080	42
2008	44,000	11,137
2009	44,080	15,210
2010	40,000	30,713
2011	44,080	783
2012	44,080	336
2013	44,080	11,613
2014	49,080	43,986

2014 lamprey fishery

One 20-ton commercial permit was issued

- Quota was almost all taken

30 permit holders participated in the fishery

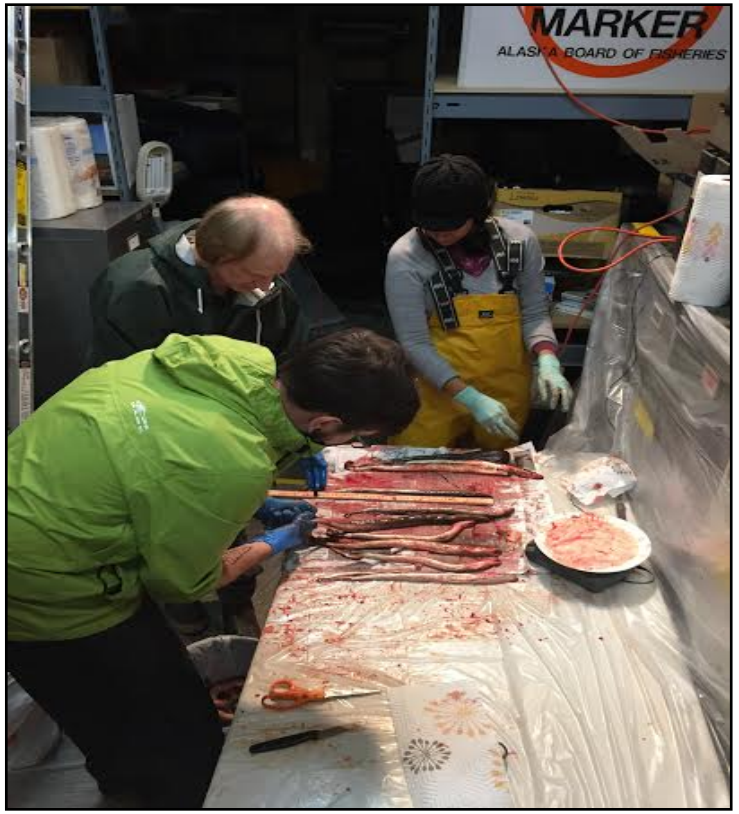
The most profitable fishery since inception

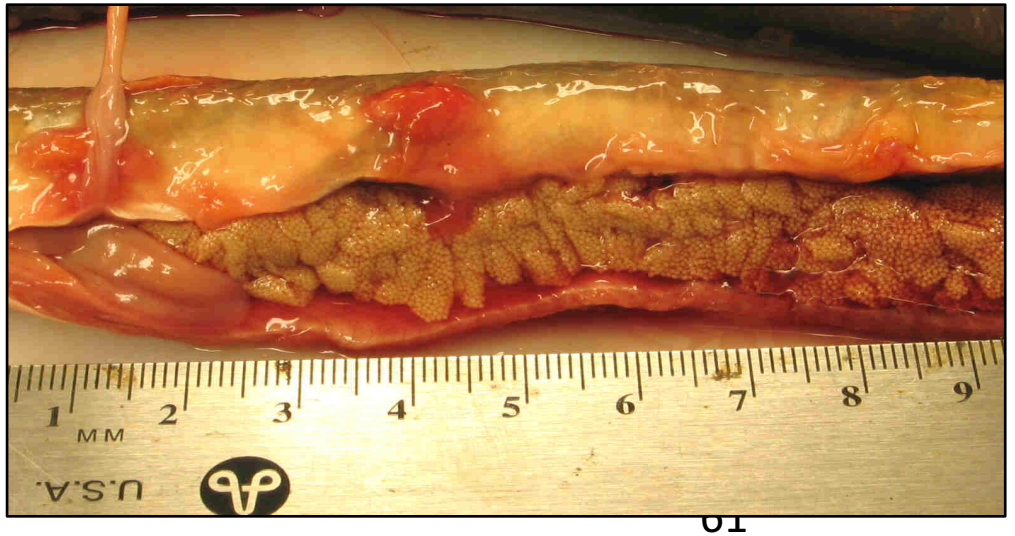
- Sold for $1.50 per pound

Successful year for subsistence fishing

Biological sampling

- As part of their permit, processor must sent samples to ADFG for biological sampling





East Fork Andreafsky River Pilot Study

Very little research on Arctic lamprey

Objectives

- Baseline biological data
- Determine suitability of using East Fork Andreafsky population as an index of the total Arctic lamprey population

Courtesy of Jeremy Mears

East Fork Andreafsky River Pilot Study

Methods

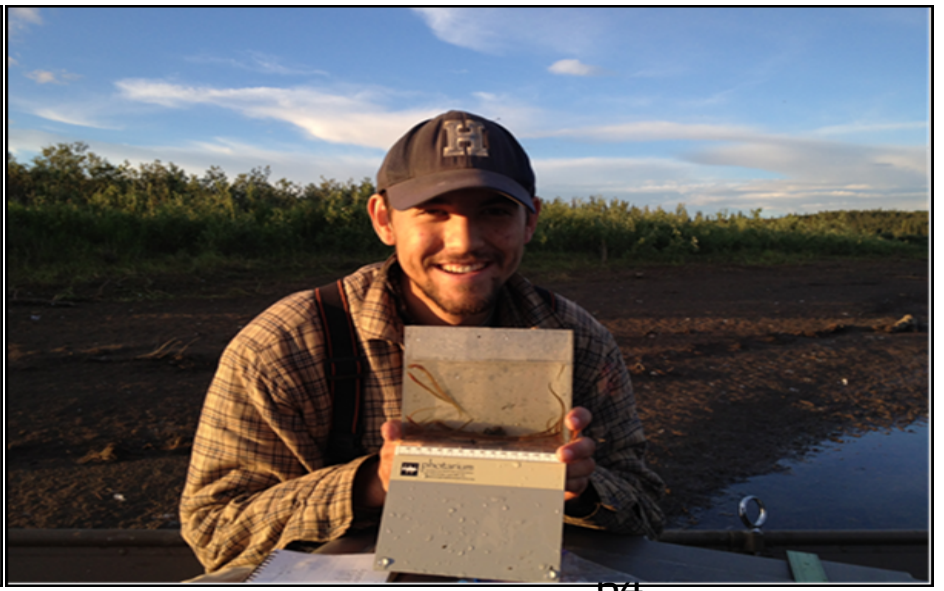
- Sampling occurred from 2012-2014
- Sample ammocoetes with a Surber sampler of known volume
- Assess habitat characteristics
- Use length frequencies to determine age groups

Courtesy of Jeremy Mears

East Fork Andreafsky River Pilot Study

Results

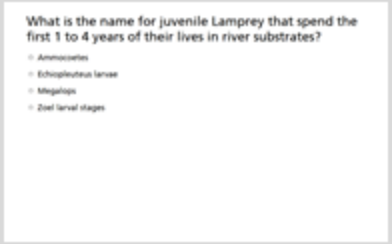
- Ammocoetes are most likely to be found in fine sediment nearshore
- Distinguishing between Alaskan brook lamprey and Arctic lamprey continues to be an issue



Courtesy of Jeremy Mears

Acknowledgements

- Sean Larson, ADFG
- Katie Howard, ADFG
- Shane Eaton, ADFG
- Jeremy Mears, USFWS
- Brian Uher-Koch, USGS
- Stephanie Schmidt, ADFG



Lamprey

Quiz - 4 questions

Last Modified: Jun 17, 2015 at 03:57 PM

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Edit in Quizmaker

Edit Properties

No Videos for this module

Frequently asked questions

Fisheries Technology

- When lamprey come back to freshwater they just let go of their hosts?
- When the ammocoetes come out of the sediments, they just outmigrate to the ocean?
- What do lamprey taste like?
- Does the biomass of lamprey come in pulses?
- With respect to salmon, is the management goal to let 50% into Canada?
- How do you get word out in-season management on the Yukon?

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