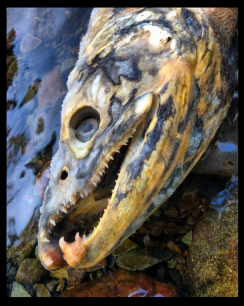
USDA United States Department of Agriculture

Ecology and Habitat of Fish and other Aquatic Organisms in southeast Alaska



Forest Service, R10, Tongass National Forest

Sheila Jacobson, Forest Fisheries Program Manager

September 2023

1

Tongass NF Lands and Waters

16.7 million acres NFS

46,000 mapped stream miles

21,000 (213,000 acres) of mapped lakes & ponds

~5,000 miles NFS roads

2


Tongass National Forest Lands and Waters
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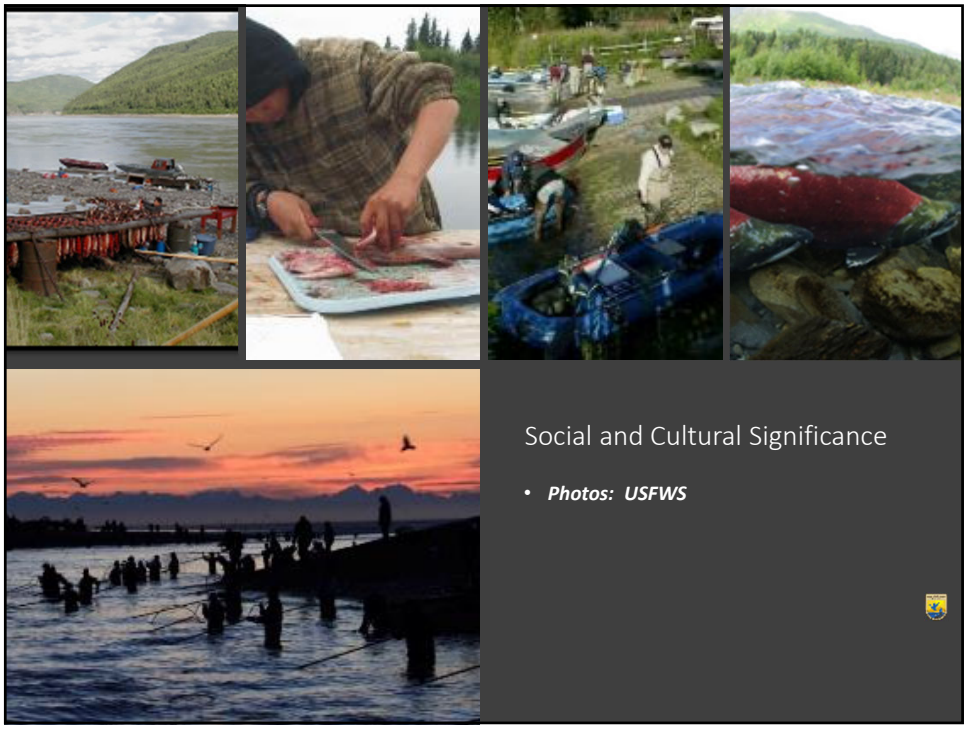
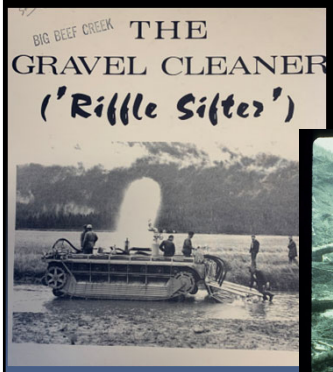
3

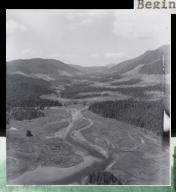

Social and Cultural Significance
• Photos: USFWS

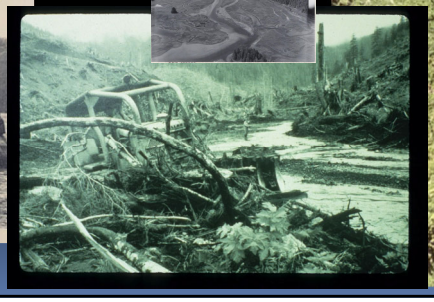
4

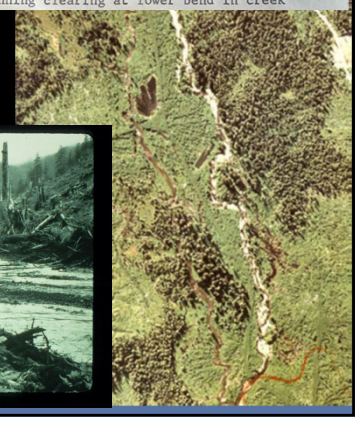
But…

Beginning clearing at lower bend in creek









5

Freshwater and anadromous fishes of southeast Alaska

32 species

- 18 species – anadromous
- 8 species – strictly resident (yet migratory)
- 6 species – principally estuarine / marine

6

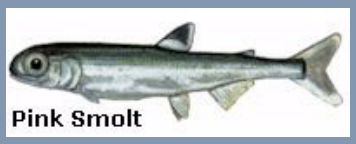
Movement and Migration

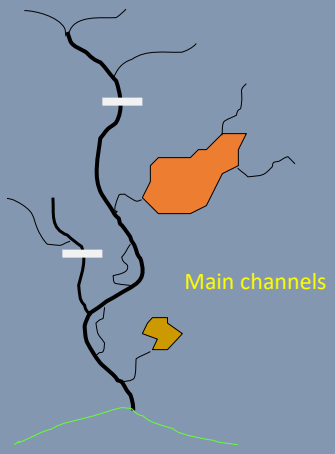
- Daily & seasonal movements for food & cover
- Changes in habitat conditions
- Exploit vacant habitat
- Reproduction
- Dispersal

7

8

Pink Salmon ("Humpy")

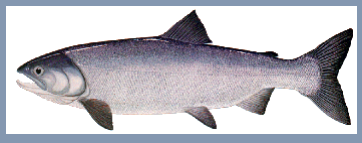


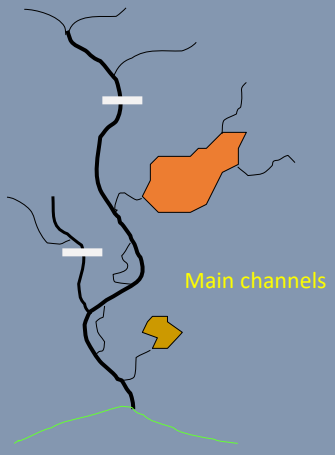


Season:
March-April smolt
Adult spawning= July-September

9

Chum Salmon ("Dog")

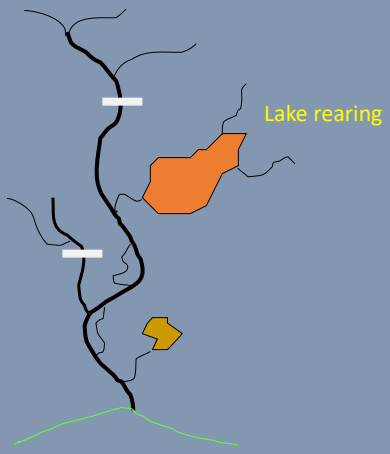




Season:
Juvenile = March-April smolt
Adult spawning = July-November

10

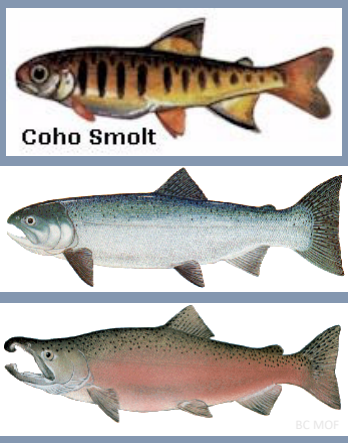
Sockeye Salmon ("Red")



Season:
Juvenile (lake) rearing = All Year
Juvenile (stream) emergence/movement = May-June
Adult spawning = July-September

11

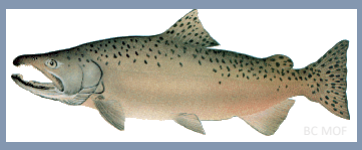
Coho Salmon ("Silver")



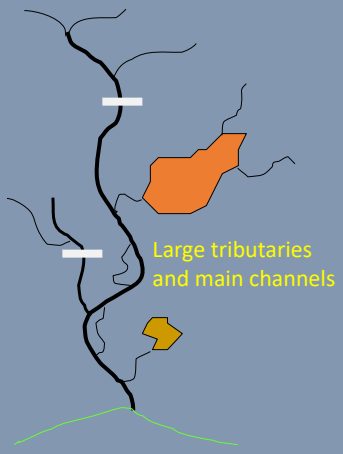
Season:
Juvenile = All Year
Adult = August-November

12

Chinook Salmon ("King")



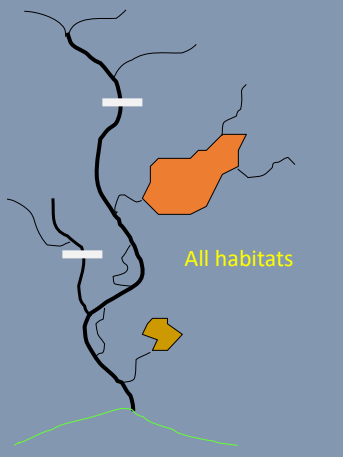
Season:
Juvenile = All Year
Adult = June-August



13

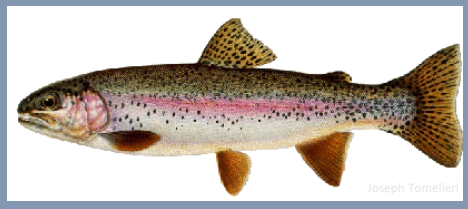
Cutthroat Trout

Season:
Juvenile = All Year
Adult = All Year

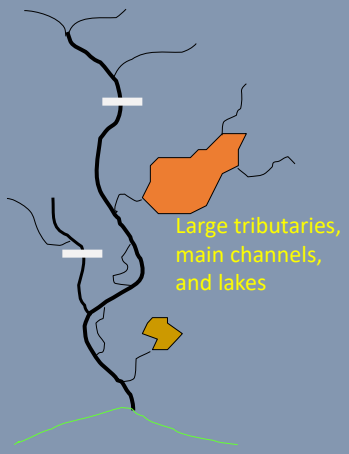


14

Rainbow/Steelhead Trout

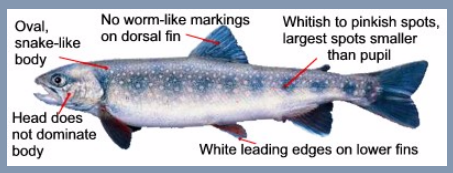


Season:
Juvenile = All Year
Adult = April-June



15

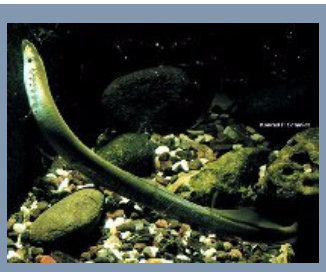
Dolly Varden Char



Season:
Juvenile = All Year
Adult = All Year

16

Lamprey



Season:
Juvenile = All Year (?)
Adult = Spring/All Year (?)

17

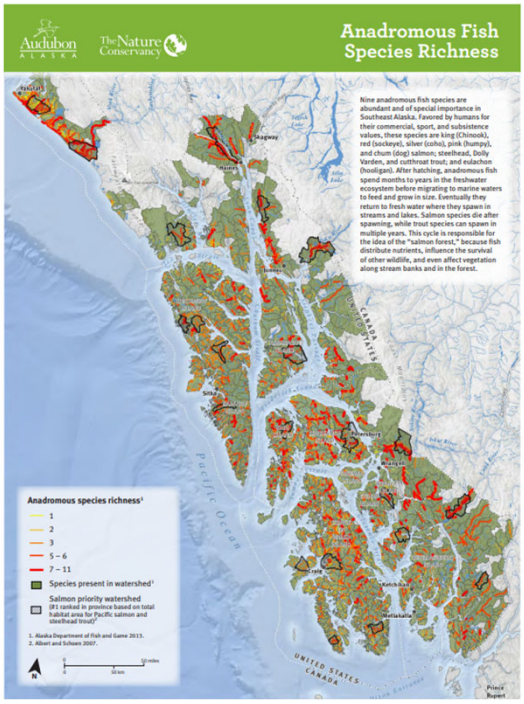
Significance to the Region

- Ecosystem keystone: salmon support 137 other species in Pacific NW
- More than 95% of Pacific salmon body mass is accumulated from the marine environment (Groot and Margolis 1991).
- Terrestrial scavengers may move 58% to 90% of all salmon biomass to land, sometimes hundreds of meters from the stream (Reimchen, 2000)
- Salmon derived nutrients can persist in stream biota up to 9 months after inputs in Alaska (Rinella, 2013)
- Salmon biomass has a stronger relationship with bird density and diversity across watersheds than does forest habitat or watershed size (Wagner and Reynolds 2019)

18

Ecological Atlas of southeast Alaska (2016)

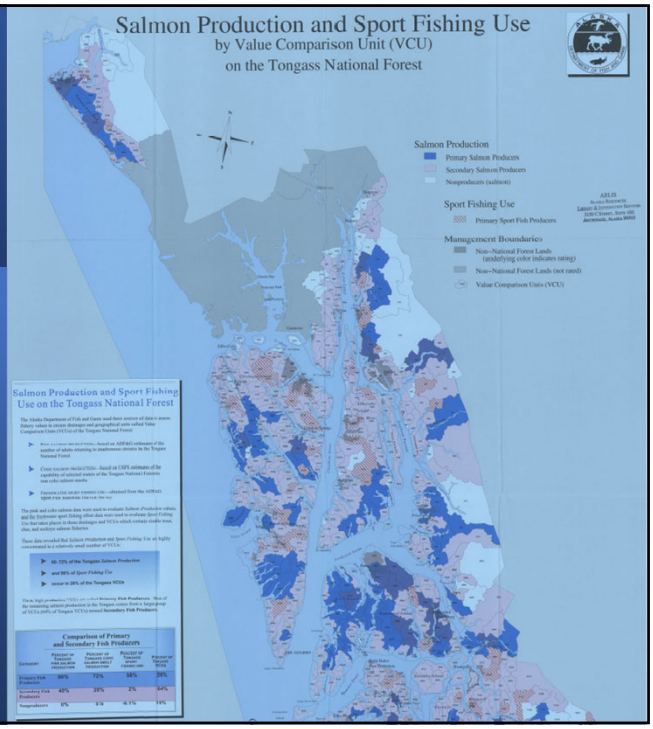
Salmon Priority Watersheds



19

Tongass Fish and Wildlife Resource Assessment (1998)

Primary Salmon Producers



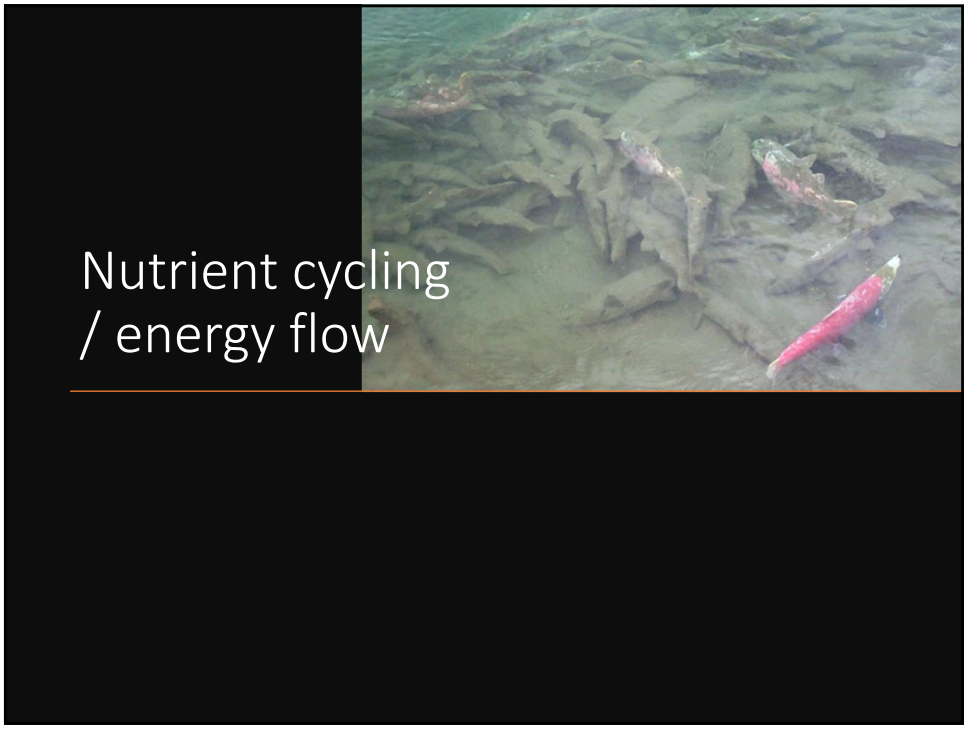
20


tonefly larvae
amselfly larvae
layfly larvae
tick caddis
Photos taken by Brian Smith, NWA
Spiral caddis
Helicops
Smooth-case cad
Stony-case cadd
Stick caddis
Aquatic Communities

21


Streams are not just
conduits for water

22


Nutrient cycling
/ energy flow

23


Organic debris transport &
distribution

24

Sediment Transport

- Creates complex channels, bars, riffles, and pools
- Protects eggs and juveniles from high flows.
- Provides habitat for invertebrate prey
- Sequesters and recycles nutrients
- Provides a vastly increased surface area for biofilm & algae

Staney Creek watershed, Prince of Wales Island

25

Tongass National Forest Stream Classification Field Guide

Generalized Stream Class and Fish Productivity by Process Group

Process Group	Gradient	Landscape Position	Stream Class	Fish Habitat Production Capability
High Gradient Contained (HC)	>6%	Steep mountain slope	1,2,3,4	Small resident populations
Alluvial Fan (AF)	Variable	Depositional footslopes	1,2,3,4	Low productivity due to dynamic channels and interrupted surface flow
Moderate Gradient Contained (MC)	2-6%	Footslopes. Lowlands, valley bottom	1,2	Resident and anadromous habitats with variable productivity
Moderate gradient Mixed Control (MM)	2-6%	Valley bottom, footslope	1,2	Moderate to highly productive anadromous and resident fish habitat
Low Gradient Contained (LC)	0-2%	Lowlands and valley bottoms	1,2	Moderately productive resident and anadromous fish habitats
Flood Plain (FP)	0-2%	Valley bottom, floodplain	1,2	Diverse and productive anadromous spawning and rearing habitat
Palustrine (PA)	<1%	Peatland-bog, wetlands, valley bottom	1,2	High juvenile rearing potential
Estuarine (ES)	0-3%	Estuary, tidal deltas	1	Highly productive anadromous spawning habitat
Glacial Outwash (GO)	Variable	Glacial valleys	1,2,3	Fish habitat concentrated in channel margins and side channels

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Floodplain Process Group (FP)

- **High stream flows are not contained within banks; flood plain development is evident**
- **Stream banks composed of easily eroded alluvial material**
- **Large wood recruited from riparian forest creates complex habitat**
- **Prime fish habitat**
- **Sediment storage**

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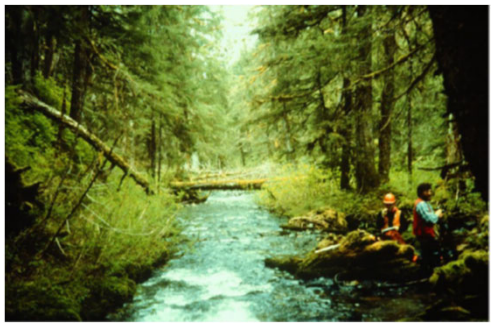
Moderate Gradient Mixed Control (MM)

- **Mixture of bedrock and alluvium in stream bed and banks, limited floodplain development**
- **Moderate to high fish habitat value; coho nursery areas**
- **Sediment transport**



28

Alluvial Fan (AF)

- **Transition between steep mountain slopes and valley floor**
- **Bank erosion, multiple channels, intermittent surface flow**
- **Large wood triggers avulsions, but also creates stability**
- **Moderate fish habitat value – groundwater upwelling**
- **Sediment transport & deposition**

29

External Coordination

- **FS AK Region-ADF&G MOU -Fish Protection**
- Fish/Aquatic Resource (sampling) Permit – ADF&G
- Best Management Practices
- Clean Water Act - Army Corps of Engineers
- Magnuson-Stevens Fishery Conservation & Management Act (Essential Fish Habitat) – NOAA Fisheries
- Endangered Species Act – NOAA Fisheries/USFWS
- Executive Orders – Floodplain and Wetlands

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30

Best Practices for Large Wood Restoration Projects

Follow fish timing windows for in-channel construction activities as determined in consultation with the Alaska Department of Fish and Game, Division of Habitat as per the Title 16 Memorandum of Understanding

Develop erosion and sediment control plans for projects to minimize or mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction and maintenance activities

When off-road travel is necessary, use puncheon material to provide adequate bearing strength to prevent soil disturbance and rutting. De-compact and scatter puncheon trail material upon completion of the project

Apply erosion control measures (silt fences, fiber rolls) during construction activities and native revegetation (mulching, native grass seeding, planting) in areas where detrimental soil disturbance or de-vegetation may result in the delivery of measurable levels of fine sediment to streams or other waterbodies

Establish hazardous material pollution prevention strategies and contingencies. Fuel gas powered equipment (chainsaws, generators, etc.) away from waterbodies

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Best Practices for Large Wood Restoration Projects

Conduct a pre-project meeting with the implementation crew and contractor(s) to review key design features

Maintain the minimum necessary clearing limits for accessing stream locations with heavy equipment or winch-drawn sled. Use cleared trees, brush, and logs as puncheon material to minimize soil disturbance and overall footprint

Replace petroleum-based hydraulic fluid in heavy equipment and bar oil in chainsaws with vegetable–based oil to protect water quality while working within the stream channel.

Heavy machinery access points should be reviewed by a Tongass soil scientist upon implementation. Avoid non-forested wetland areas to prevent rutting. Heavy equipment requires the use of puncheon or a slash mattress to provide adequate bearing strength and prevent rutting. In some instances, the puncheon trail should be scattered upon completion. Minimize soil disturbance.

Include invasive species preventive measures in contract specifications (Tongass National Forest Mechanized Equipment and Vehicle Cleaning Guidance

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ADF&G – Forest Service in-stream construction guide

Southeast Alaska in-stream construction guide

These timing tables for in-stream construction in southern southeast (Figure 1), central southeast (Figure 2), and northern southeast Alaska (Figure 3) are designed to avoid spawning adults, eggs and alevins in the gravel, and autumn high water. When permitting an in-stream activity, consider these tables in combination with species present, site specifics, activity type, and proposed best management practices to minimize impacts to fish and fish habitat.[1] In rearing and migration areas, in-stream construction outside these windows can often occur without negatively impacting fish.[2] Chinook salmon timing is water body specific and highest priority.

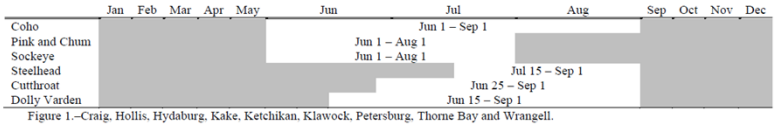


Figure 1.–Craig, Hollis, Hydaburg, Kake, Ketchikan, Klawock, Petersburg, Thorne Bay and Wrangell.

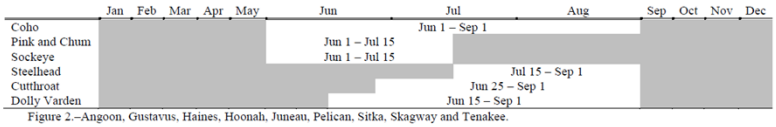


Figure 2.–Angoon, Gustavus, Haines, Hoonah, Juneau, Pelican, Sitka, Skagway and Tenakee.

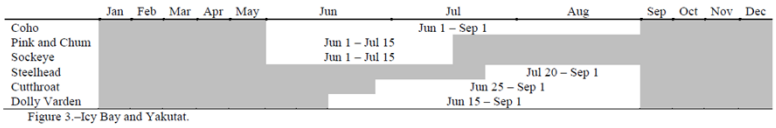


Figure 3.–Icy Bay and Yakutat.

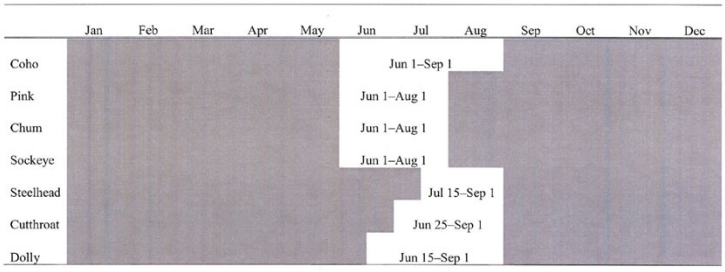
[1] Modify the in-stream construction windows as necessary when the long-term benefits of a project outweigh the short-term impacts to fish and fish habitat.
[2] For instance, during winter low water or when the ground is frozen.

Alaska Department of Fish and Game, March 31, 2015

33

ADF&G – Tongass General Concurrence timing table for instream construction (handtool stream restoration on NFS lands)

Appendix A.–Timing table for instream construction.



Planning work with the timing table for instream construction minimizes the risk of damage to salmonids and habitat quality when adults are spawning and when eggs and alevins are in the gravel. When multiple species are present, timing windows are combined to define a period in which to conduct instream work. Where site specific information is available, restrictions can be adjusted. No work will occur after September 1 when flows increase. Proposals to work outside of these timing windows or in water bodies that support Chinook salmon will be in consultation with ADF&G through the concurrence process described in USDA Forest Service Agreement No. 14-MU-11100100-015.

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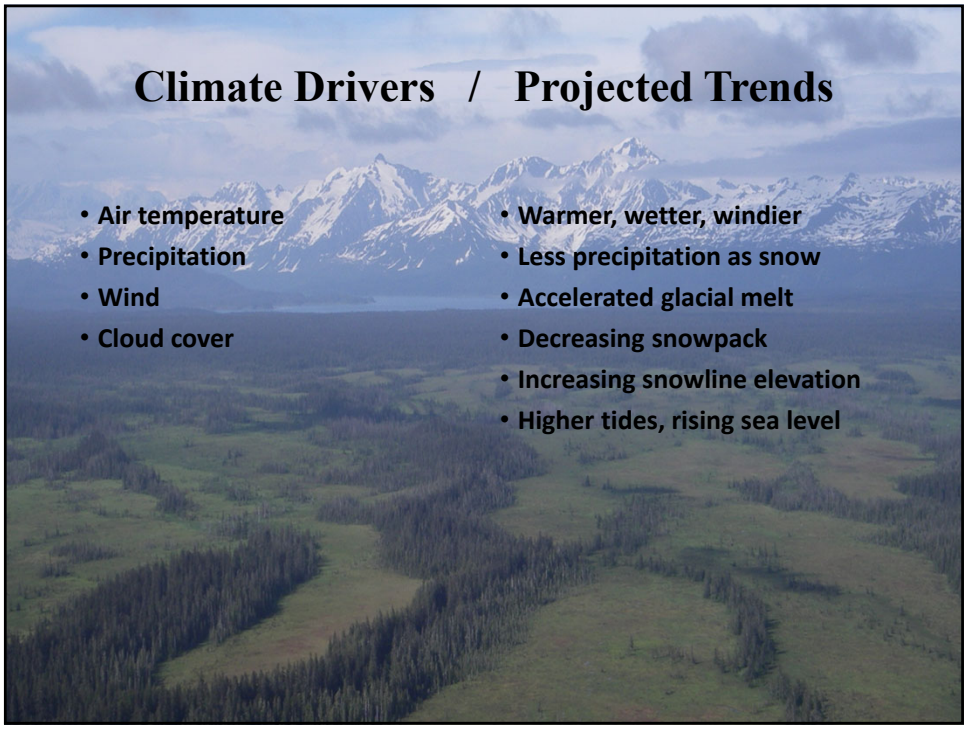
Climate Drivers / Projected Trends
• Air temperature
• Precipitation
• Wind
• Cloud cover
• Warmer, wetter, windier
• Less precipitation as snow
• Accelerated glacial melt
• Decreasing snowpack
• Increasing snowline elevation
• Higher tides, rising sea level

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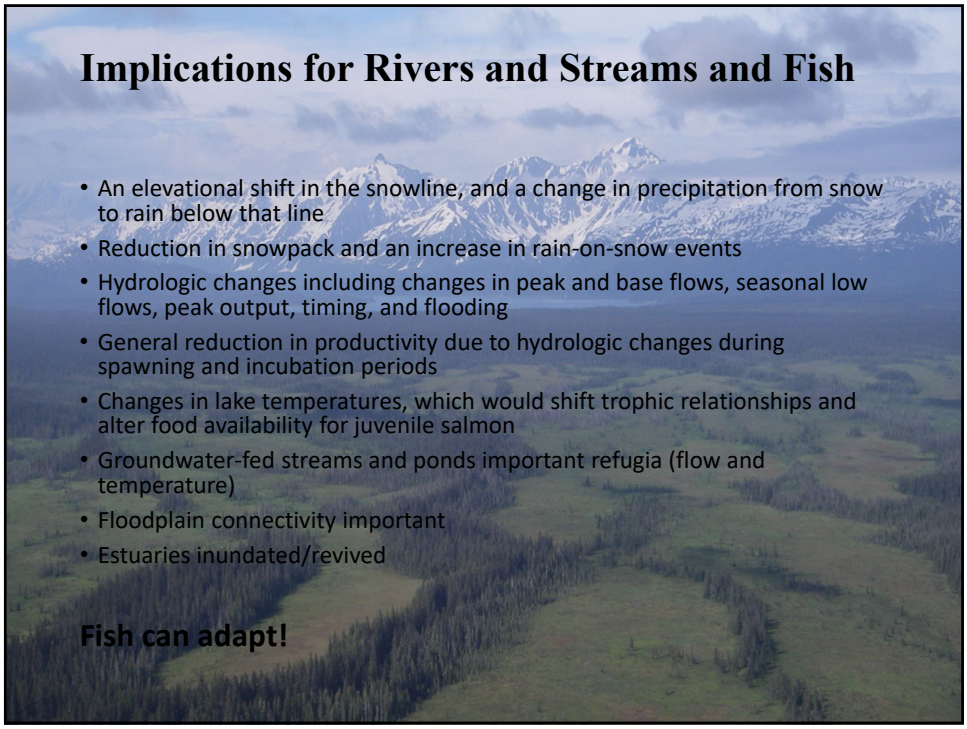
Implications for Rivers and Streams and Fish
• An elevational shift in the snowline, and a change in precipitation from snow to rain below that line
• Reduction in snowpack and an increase in rain-on-snow events
• Hydrologic changes including changes in peak and base flows, seasonal low flows, peak output, timing, and flooding
• General reduction in productivity due to hydrologic changes during spawning and incubation periods
• Changes in lake temperatures, which would shift trophic relationships and alter food availability for juvenile salmon
• Groundwater-fed streams and ponds important refugia (flow and temperature)
• Floodplain connectivity important
• Estuaries inundated/revived
Fish can adapt!

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Tongass National Forest Adaptation Strategies

Restore Ecological Function – aquatic examples

37

38


WHAT WE HEARD
CLIMATE RESILIENCE IS CRUCIAL
The Tongass represents our best path toward climate resilience. It is necessary to evaluate and prioritize projects that have climate resiliency benefits or impacts."

39


WHAT WE HEARD
PARTNERSHIPS & COLLABORATION ARE KEY
Use the collective knowledge and resources of everyone. Continue to work with Tribes, collaborate with municipalities, and invest in the community-driven solutions we are already seeing like community forest partnerships."

40


WHAT WE HEARD
DEVELOP & PRIORITIZE TRIBAL CO-STEWARDSHIP
Work alongside tribal governments and corporations to cooperatively steward the land in a way that increases benefits to communities, environment, and economy."

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Questions?
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Tongass National Forest Stream Value Class

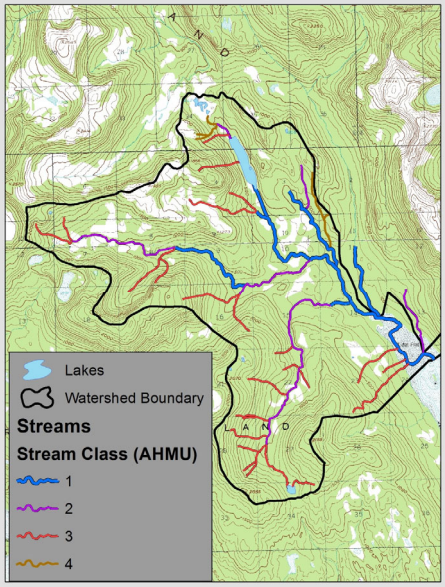
Stream Classes – **Definitions:**

Class I. Streams and lakes with anadromous or adfluvial fish or fish habitat; or high quality resident fish waters, or habitat above fish migration barriers known to provide reasonable enhancement opportunities for anadromous fish.

Class II. Streams and lakes with resident fish or fish habitat – generally steep channels 6 to 25 percent or higher gradient – where no anadromous fish occur, and otherwise do not meet Class I criteria.

Class III. Perennial and intermittent streams with no fish populations but which have sufficient flow, or transport sufficient sediment and debris, to have an immediate influence on downstream water quality or fish habitat capability. For streams less than 30 percent gradient, special care is needed to determine if resident fish are present.

Class IV. Other intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to directly influence downstream water quality or fish habitat capability. Class IV streams do not meet the criteria used to define Class I, II or III streams.



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