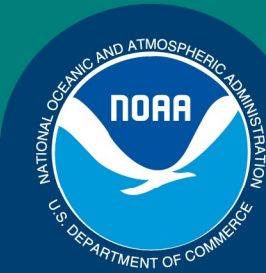


Science, Service, Stewardship



**Eulachon:
State of the Science and Science to Policy Forum**

August 20, 2015

Robert Anderson
Eulachon Recovery Coordinator
National Marine Fisheries Service

**NOAA
FISHERIES
SERVICE**

NOAA

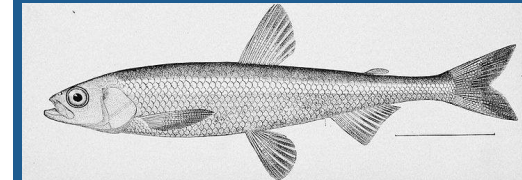
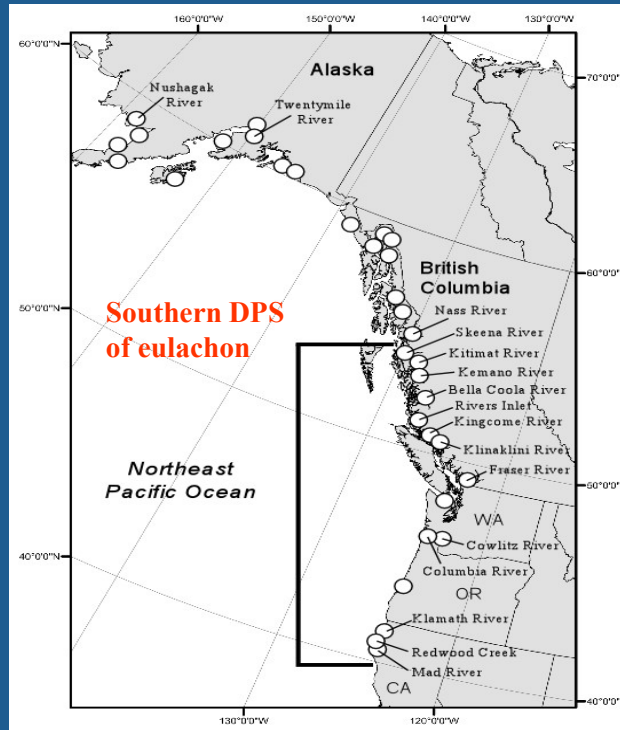
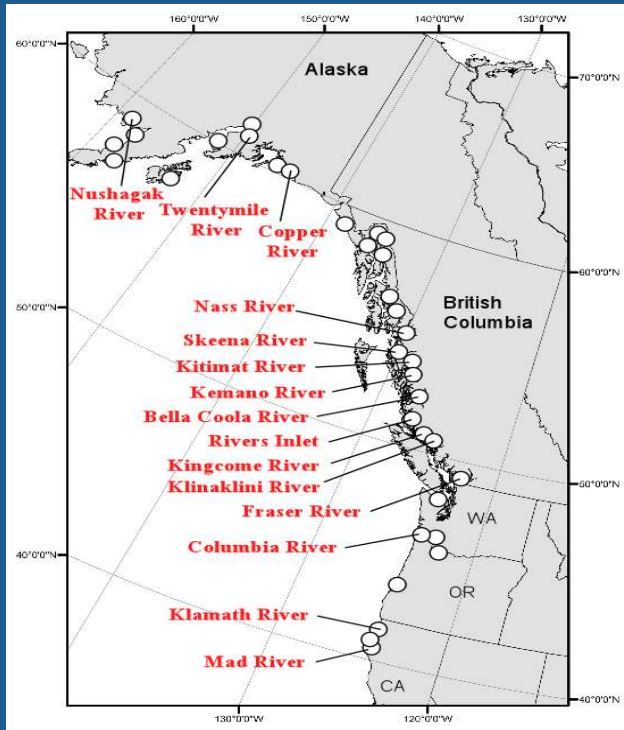
Why We Are Here: Eulachon and Recovery

1. Eulachon Biology and Ecology
2. Cultural and Historical Settings
3. ESA Listing and Critical Habitat
4. Threats/Limiting Factors/Factors for Decline
5. Recovery



Eulachon (*Thaleichthys pacificus*)

(pronounced you-la-kon in the United States), also known as candlefish, small fish, savior fish, salvation fish, fathom fish, Columbia River smelt, hoolakan, hooligan, hoolikan, olachan, ollachan, oolachan, oolichan, oulachan, oulachon, oulacon, ulchen, ulichan, uthlecan, yshuh, ooligan, olachen, olachon, quatra, and páagwáls.



Eulachon are one of 7 species of smelt found in the NE Pacific Ocean. They are distributed from AK to CA.

Eulachon Life History (Southern DPS)

Adult eulachon spawning typically occurs in the lower reaches of larger rivers fed by snowmelt, and takes place over sand, coarse gravel, or mineral grains.

In the Columbia River basin, spawning occurs at temperatures between 4° to 10°C.

Eulachon are semelparous - adults die after spawning.

Highly fecund species (Columbia River - 14,839 to 44,947 with an average of 29,930 eggs - WDFW 2015).

Eulachon eggs attach to small sediment particles (sand and mineral grains), and hatch in 30 to 40 days depending on water temperatures. Eggs incubate and develop while being actively carried downstream by river currents via “mobile incubation” or “tumble incubation.”

Newly hatched larvae are transparent and are transported downstream by spring freshets, and are dispersed by estuarine, tidal, and ocean currents into the estuary-nearshore environment. However, larval eulachon may remain in low salinity, surface waters of estuaries for several weeks or longer before entering the ocean (Hay and McCarter 2000).

Once juvenile eulachon enter the ocean they eventually move from shallow nearshore areas to deeper areas over the continental shelf, typically in waters 66 to 292 feet deep (Hay and McCarter 2000), and sometimes as deep as 597 feet (Barraclough 1964).

Eulachon typically spend 3–5 years in saltwater before returning to fresh water to spawn from late winter through spring, spending 95 to 98 percent of their lives at sea (Hay and McCarter 2000).

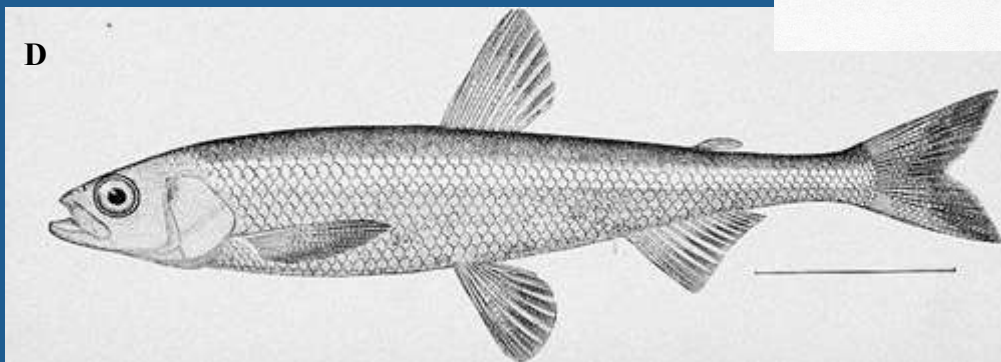
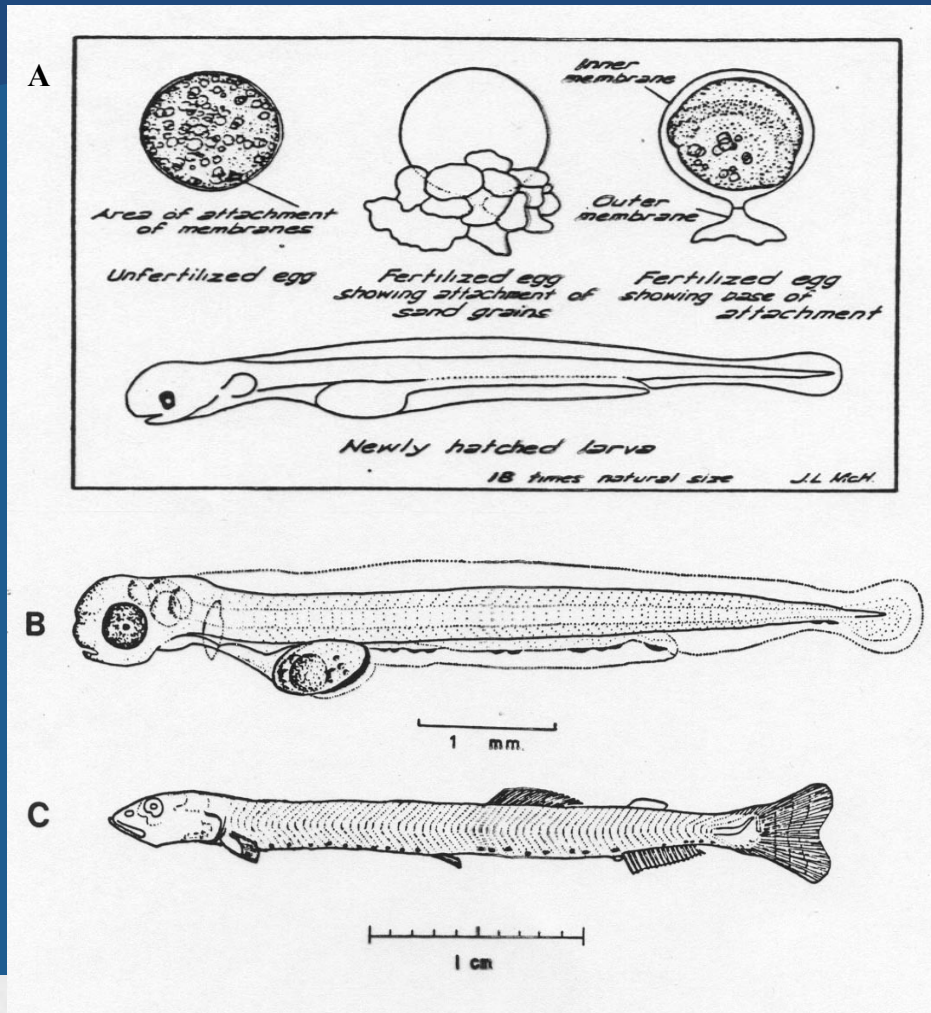
Eulachon – Life Stages

(A) Eggs (1mm).

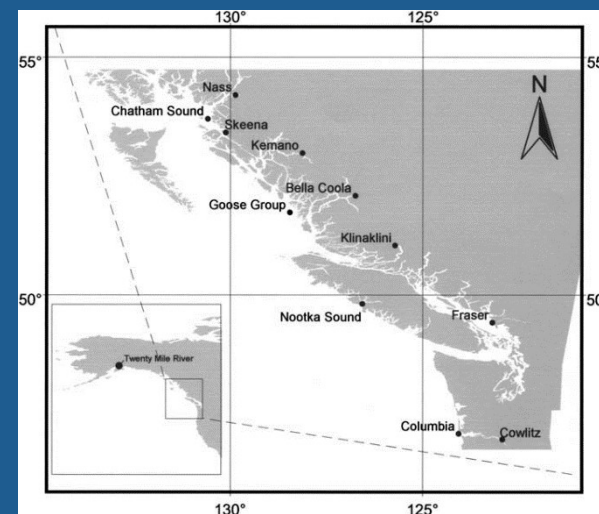
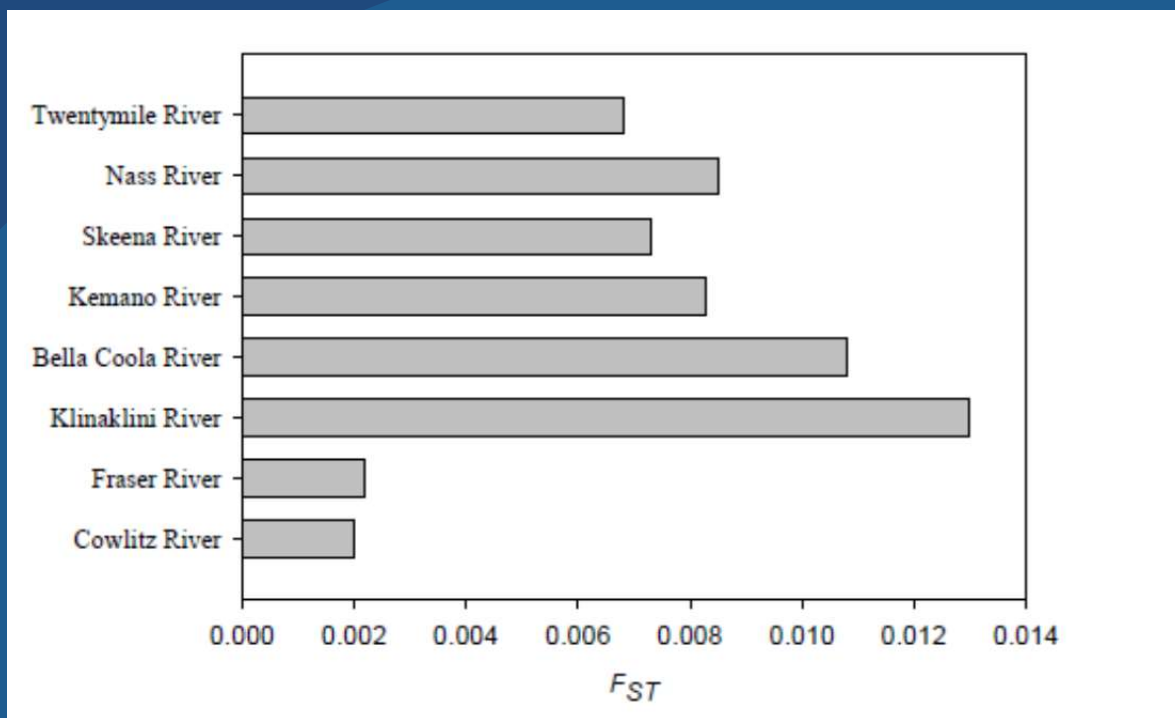
(B) River larvae (4 - 6 mm).

(C) Ocean larvae (5 - 30 mm) ~ size range captured in ichthyoplankton net surveys.

(D) Adult eulachon ~ size range 200 – 254 mm

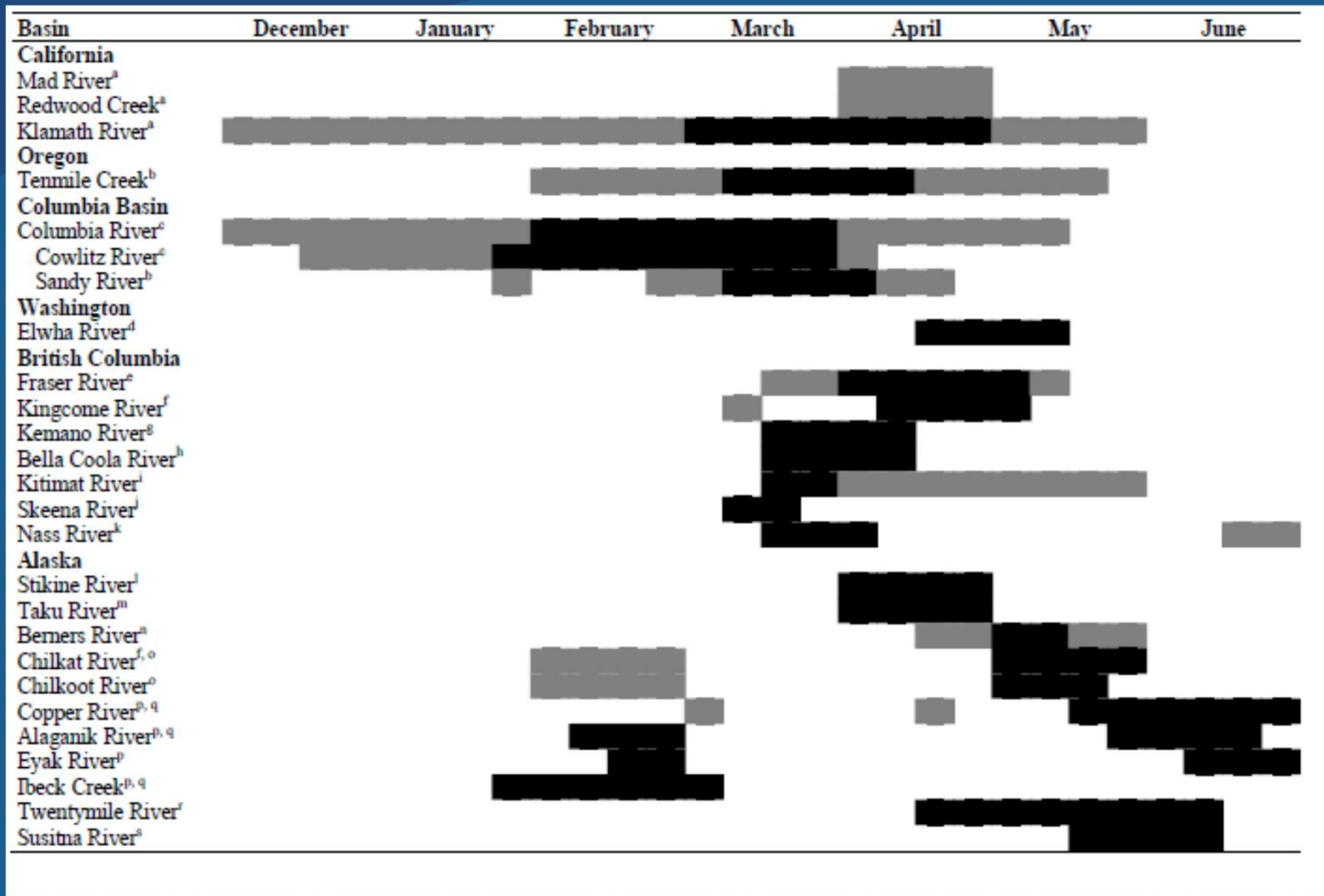


Eulachon – Population Structure



Comparison of F_{ST} (a measure of genetic distance) values of the Columbia River eulachon sample to other eulachon samples
Gustafson et al. 2010, based on data from Beacham et al. 2005.

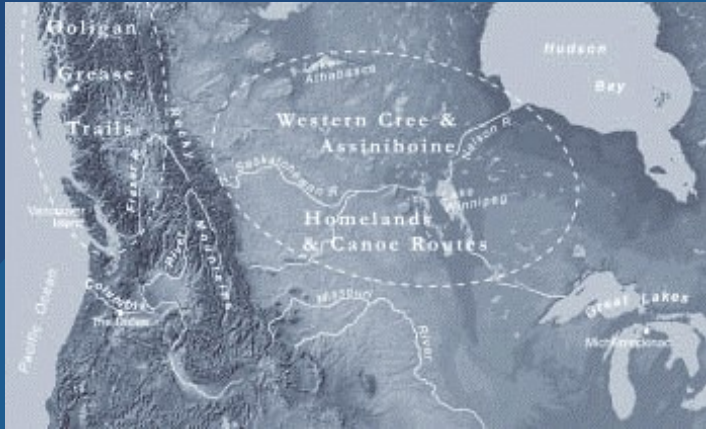
Range (gray) and Peak (black) Timing of Documented River Entry or Spawn Timing for Eulachon



Gustafson et al. 2010

Cultural and Nutritional Importance

Grease Trails – Trade Routes



...the grease trade from the coast to the interior was so important that the trails connecting the communities were known as “grease trails.”

Fishery Bay – Nass River



- Oil signified wealth
- Gift at feasts and potlaches
- Widely traded

Savior or Salvation Fish

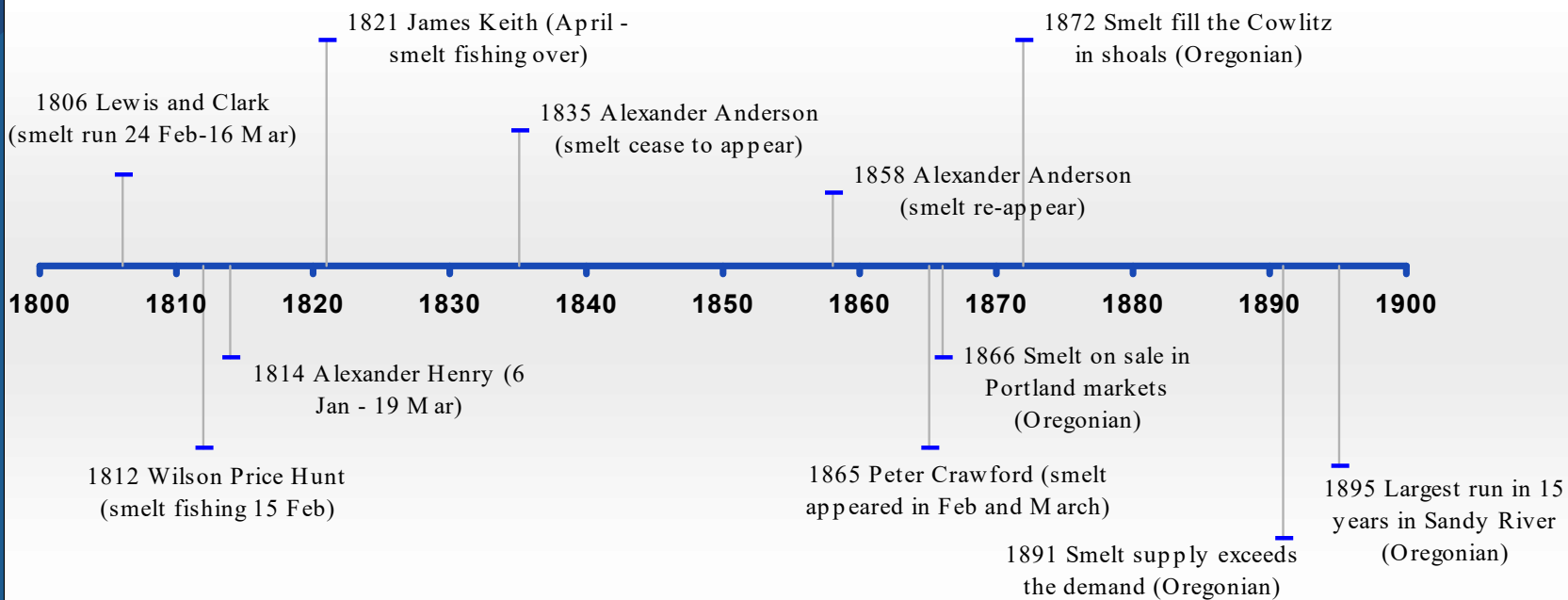
Eulachon oil or “grease”

15% - 20% fat



Historical Events

Historical Columbia River Eulachon Events



Historical Events

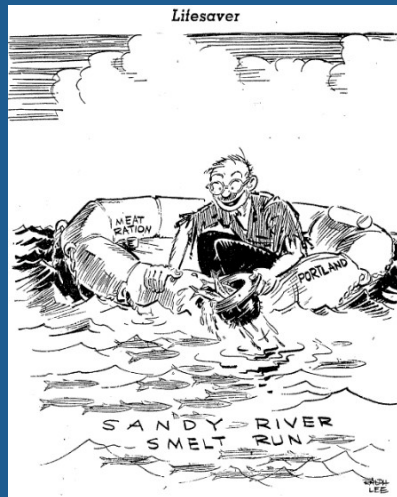
The Oregonian

PORTLAND, OREGON TUESDAY, APRIL 17, 1945

Smelt Run Ends; New Record Set

The smelt vanished from the Sandy river Sunday, after one of the longest and heaviest spawning migrations on record.

More than 17,400 persons bought special licenses to fish for the eulachon. This was almost three times as many as had ever taken such licenses before. Game commission employes and state police estimate that during the two weeks of the run 200,000 men, women and children visited the Sandy merely to watch others net the fish.



**UNUSUAL RUN OF SMELT NEAR PORTLAND—FARMERS
CARRY FISH BY WAGONLOADS FOR FERTILIZER**

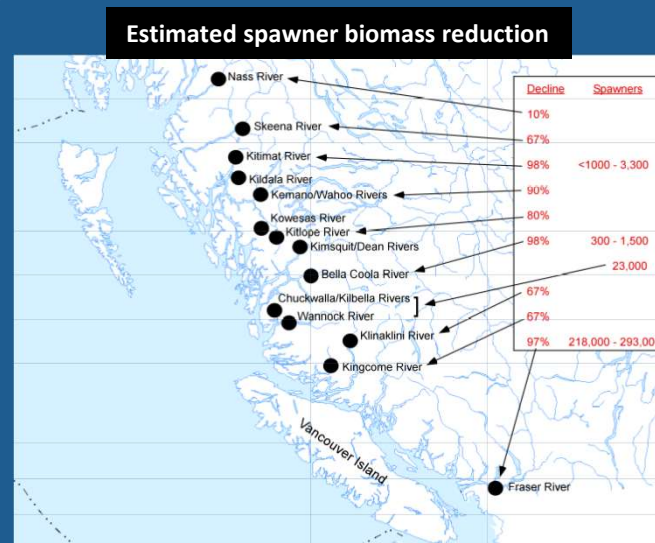
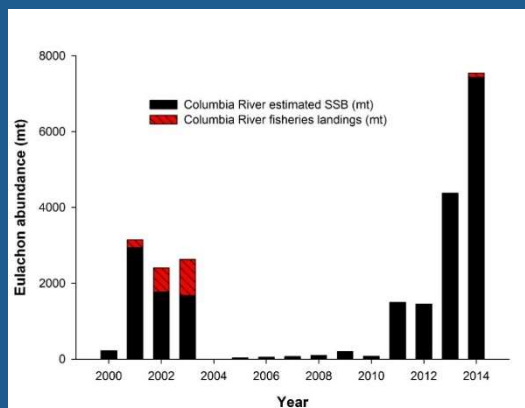
Endangered Species Act – Listing and Critical Habitat

In 1999 the NMFS was petitioned to list eulachon in the Columbia River only, however the petition was rejected due to a lack of supporting information.

In 2007 the Cowlitz Tribe petitioned NMFS to list eulachon in WA, OR, and CA. NMFS accepted the petition, formed a Biological Review Team, and conducted a status review.

The southern DPS of eulachon were listed as threatened under the ESA on March 18, 2010.

On October 20, 2011, NMFS, issued a final rule to designate critical habitat for the southern Distinct Population Segment of eulachon, pursuant to section 4 of the ESA (76 FR 65324).



Eulachon are the first forage fish to be listed under the ESA.

Threats/ Limiting Factors/Factors for Decline

Threats: Human activities or natural events (e.g., road building, floodplain development, fish harvest, hatchery influences, volcanoes) that cause or contribute to limiting factors.

Limiting Factors: Physical, biological, or chemical features (e.g., inadequate spawning habitat, high water temperature, insufficient prey resources) experienced by the fish that result in reductions in viability parameters (abundance, productivity, spatial structure, and diversity).

Factors for Decline: Five general categories of causes for decline of a species, listed in the Endangered Species Act section 4(a)(1)(b): (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or human-made factors affecting its continued existence.



Threats/ Limiting Factors/Factors for Decline

Eulachon qualitative threats rankings by subpopulation (BRT 2010), and ESA Section 4(a)(1)(b) Factors.

Threats	Klamath	Columbia	Fraser	BC	§4 Factor
	Ranking				
Climate change impacts on ocean conditions	1	1	1	1	A
Dams/water diversions	2	4	8	11	A
Eulachon by-catch	3	2	2	2	E
Climate change impacts on freshwater habitats	4	3	4	4	A
Predation	5	7	3	3	C
Water quality	6	5	5	8	A
Catastrophic events	7	8	10	5	A
Disease	8	11	11	7	C
Competition	9	12	12	9	E
Shoreline construction	10	10	9	6	A
Tribal fisheries	11	14	13	10	B
Nonindigenous species	12	15	15	13	E
Recreational harvest	13	13	14	14	B
Scientific monitoring	-	16	16	15	B
Commercial harvest	-	9	6	-	A
Dredging	-	6	7	12	A

Recovery

ENDANGERED SPECIES ACT OF 1973

AN ACT To provide for the conservation of endangered and threatened species of fish, wildlife, and plants...

Section 4(f)(1) RECOVERY PLANS—The Secretary shall develop and implement plans for the conservation and survival of endangered species and threatened species listed pursuant to this section, unless he finds that such a plan will not promote the conservation of the species. The Secretary, in development and implementing recovery plans, shall, to the maximum extent practicable...

(B) incorporate in each plan—

(i) a description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species;

(ii) objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of this section, that the species be removed from the list; and

(iii) estimates of the time required and the cost to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal.

Recovery Planning – Recovery Goals, Objectives, and Criteria

Goals: *The end toward which effort is directed.*

Objectives: *Parameters which characterize the conditions under which a species may be delisted.*

Criteria: *Standards for measurement by which to determine if a species has achieved its recovery criteria.*

Goal:

Recovery-Delisting!

Recovery

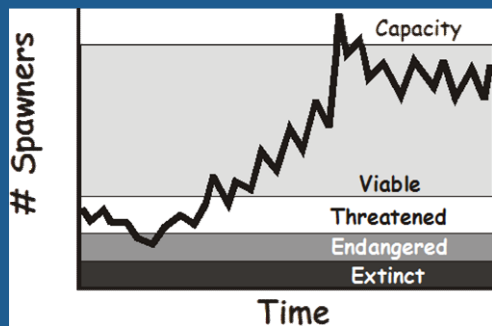
Objectives:

- Prevent eulachon extinction by protecting existing subpopulations and their habitats.
- Eulachon distribution is similar to historical patterns.
- Each subpopulation of eulachon has a sufficiently high mean growth rate to remain stable, even during periods when ocean conditions are not conducive to high survival for eulachon, across multiple generations.
- Conserve existing genetic and life history diversity and provide opportunities for interchange of genetic material between and within subpopulations.
- Develop and implement actions to reduce the severity of major threats.
- Conduct research and monitoring necessary to refine and demonstrate attainment of recovery criteria.

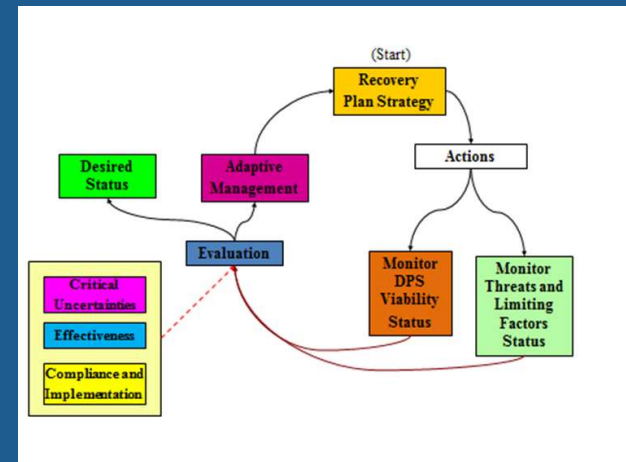
Recovery Actions: actions that reduce the severity of a threat such that special management consideration is no longer necessary.

Proposed Recovery Plan
FRN/Public Comment Period (February 2016)
Final Recovery Plan (December 2016)

Criteria: Biologically-Based *and* Threats-Based



Threats	Klamath	Columbia	Fraser	BC	\$4 Factor
	Ranking				
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Questions?

