

# Threats to Aquatic Biodiversity

## Threats to Freshwater Species

- 20% of freshwater fishes extinct or in serious decline
- Extinct/at-risk salmon/steelhead runs outnumber healthy by 3:1
- In CA, 57% of fish species are extinct or declining (Moyle and Williams)
- Aquatic species worse-off than terrestrial
- Top 6 stressors (most aquatic species face multiple threats):
  - 1) Habitat removal/damage
  - 2) Invasive species (limit recovery more than historical)
  - 3) Altered sediment loads
  - 4) Altered hydrologic regime (flow, depth, temperature)
  - 5) Altered nutrient inputs
  - 6) Toxic contaminants (limit recovery more than historical)
- Top 4 sources: Agriculture (56%); Municipal land-use (34%); Power generation (21%); Exotic species (18%--higher for current source)
- Agricultural non-point pollution perceived as bigger threat in East; invasive species and loss of surface water bigger in West

# Endangered Species Act of 1973: Part A

## Section 4: Listing, critical habitat designation, recovery plans

### *Listing*

- Initiated by private actors through petition or FWS (NOAA Fisheries for marine species) through candidate conservation program
- Species will then be listed as either “threatened” or “endangered”
- FWS promulgated regulations that automatically extend “endangered” protections to “threatened” species

### *Critical Habitat*

- Specific geographic area essential for species recovery that may require special management/conservation
- Federal agencies required to consult FWS on projects that affect critical habitat; private landowners not affected

### *Recovery plans: The Measure of Success*

- FWS tries to develop recovery plan 2.5 years after listing, but usually takes longer
- Many questions about adequacy of recovery plans

# **Endangered Species Act of 1973: Part B**

## **Section 7: Jeopardy**

- Federal agencies prohibited from taking any action that would jeopardize a listed species or modify critical habitat
- Federal agencies must consult with FWS
- Formal consultation lead to biological opinion: “Jeopardy” or “no jeopardy”
- During 90-day consultation period, FWS develops “reasonable and prudent” alternatives for avoiding jeopardy

## **Section 9: Prohibiting Take**

- No person may “take” a listed species, or engage in trade
- “Take”: Harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.
- Extended by regulation to include habitat modification

## **Habitat Conservation Planning**

- Authorized by Section 10 of the ESA; 1982 Amendments
- Habitat Conservation Plan is a legally binding document, which details actions that a landowner must take to improve species habitat
- In return, landowner receives “incidental take permit”; allows harm to species in areas not protected in HCP



## **American River Steelhead and Chinook (King) Salmon**



# Anadromous Fish Biology

## Species

- Chinook/king; coho/silver; sockeye/red; chum/dog; humpback/pink
- Also Steelhead and coastal cutthroat
- Anadromous fish return to their home streams to spawn; leads to genetic variation and specialized life-history strategies
- *semelparous*—they die after spawning once (salmon).
- *Iteroparous*--Fish that can spawn more than once; return to the river several times (steelhead)
- Significant differences between age and seasonal timing of spawning, how far they go up river, how far the travel in open ocean
- Habitat requirements: Clean, cold water, overhead to protect juveniles, aerated gravel to hold eggs and provide dissolved oxygen

## Evolutionarily Significant Units

- Collection of one or more salmon populations that share similar genetic, ecological, and life history traits and have a different evolutionary trajectory from salmon in other ESUs.
- Salmon ESUs are considered to be "distinct population segments" under the federal Endangered Species Act (ESA).
- The biological definition of ESU set up by NMFS; biological definition for "runs" (although some ESUs encompass multiple runs)

# Threats to Anadromous Fish

## Historical Harvesting Patterns

- Cultural symbol in the Pacific Northwest
- One estimate says historic harvest by Native Americans in Columbia River was 42 million pounds; today, 5-8 million for all harvesting
- Native Americans had cultural institutions for harvesting
- European arrival creates open access fishery: fish traps, gillnetting, fish wheels, canneries, open water commercial
- State wildlife laws are first to respond; banning certain techniques and setting catch limits
- Treaties in place are supposed to preserve Native American fishing rights
- Hatcheries now produce majority of harvested fish; hatcheries important to fish production but reduce genetic diversity/fitness

## Current Threats

- Lots of regional variation (e.g., Sacramento river irrigation problems vs. Columbia)
- Mining, agriculture, logging blocking and silting streams
- Surface water impoundments (flow and temperature, Klamath)
- Dams (especially on Columbia; above Bonneville Dam, only 50 miles of free-flowing river; Grand Coulee Dam extinguished the big Chinooks)
- NW hydropower is cheap; but 75-85% loss of anadromous runs has major economic costs (\$372 million annually?)



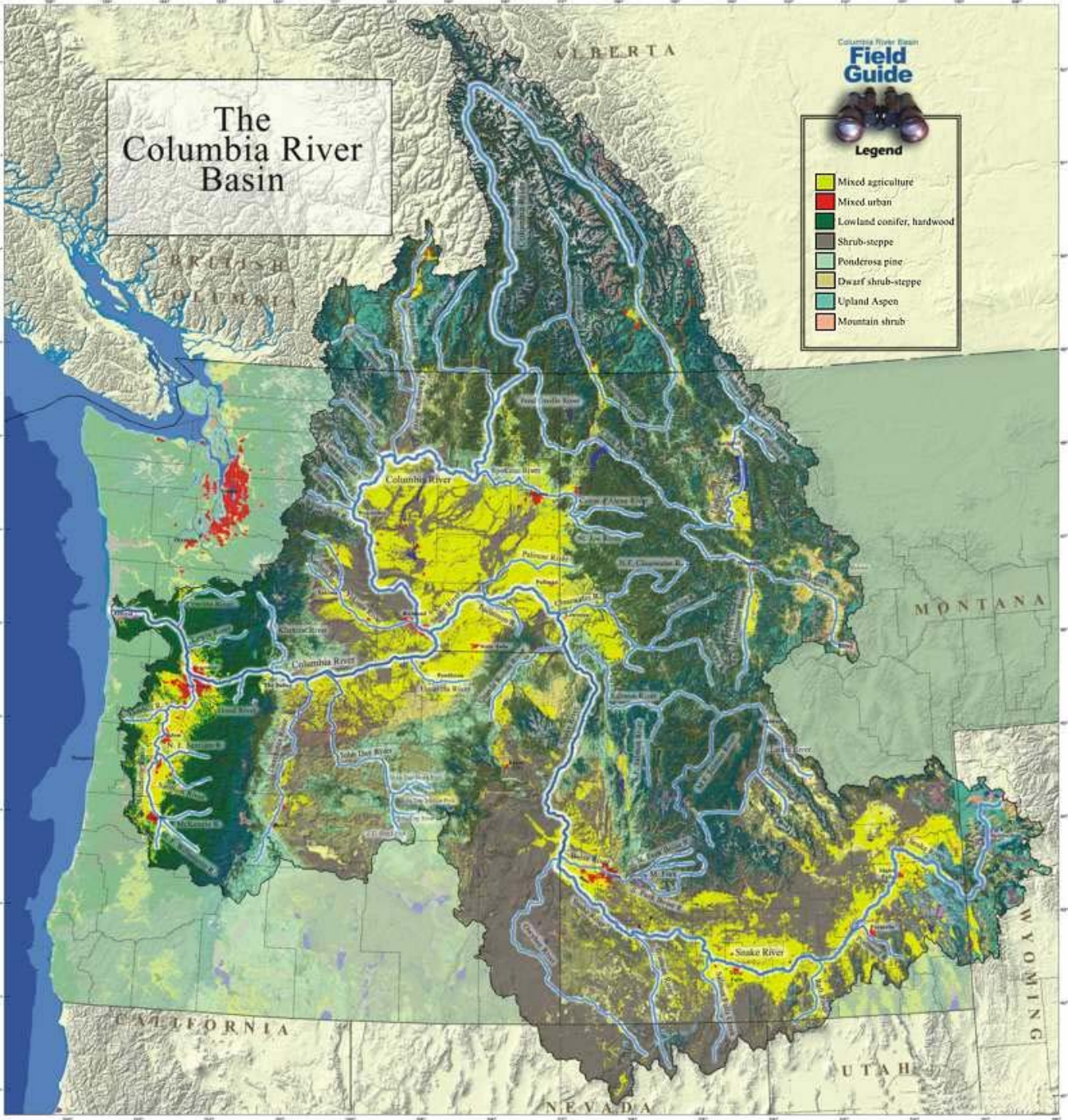
# The Columbia River Basin

Columbia River Basin  
**Field Guide**



### Legend

- Mixed agriculture
- Mixed urban
- Lowland conifer, hardwood
- Shrub-steppe
- Ponderosa pine
- Dwarf shrub-steppe
- Upland Aspen
- Mountain shrub





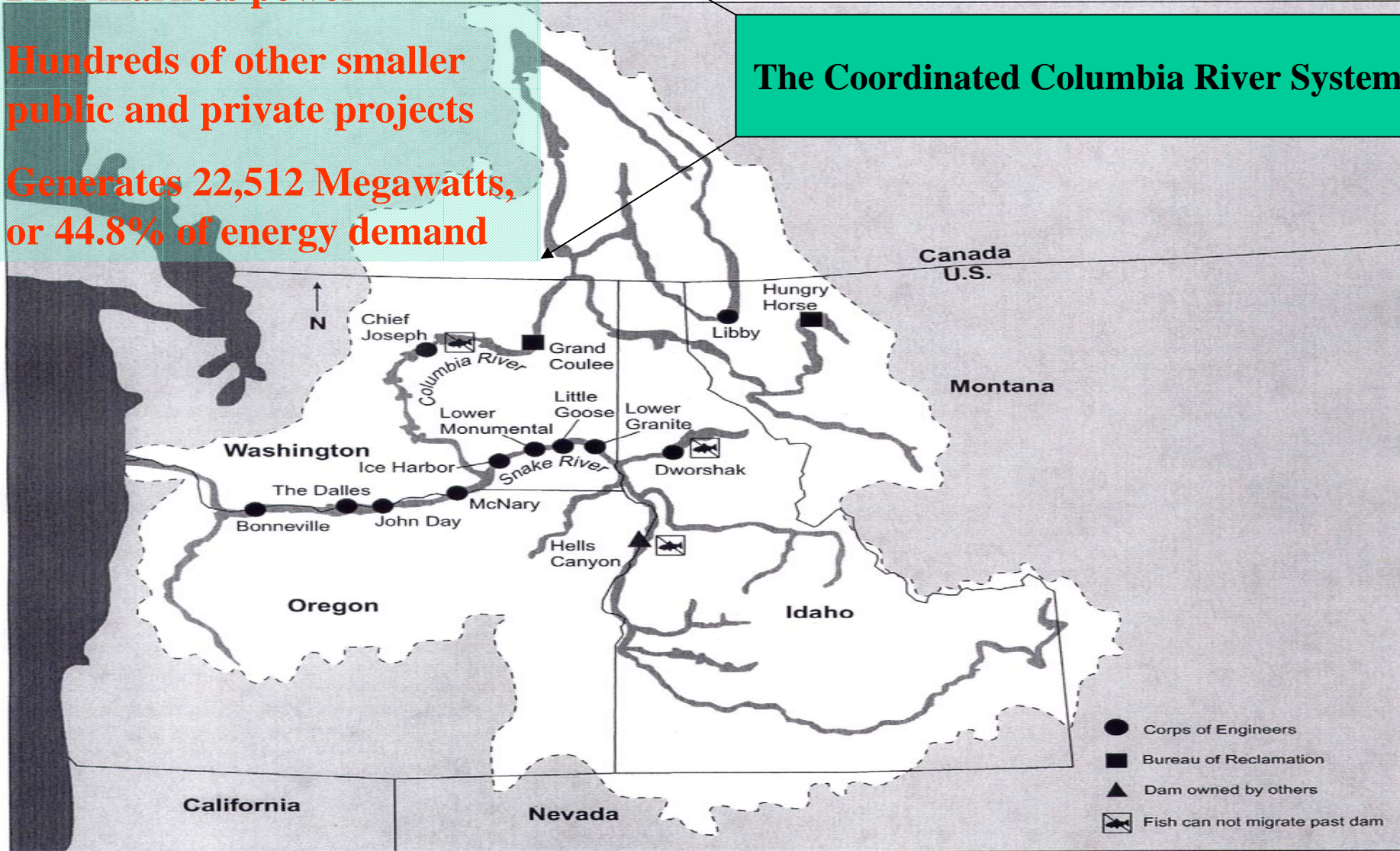
**21 Corps, 8 Reclam. Dams;  
BPA markets power**

Figure 1.1: Major Dams Affecting Salmon Migration in the Columbia River Basin

**Hundreds of other smaller  
public and private projects**

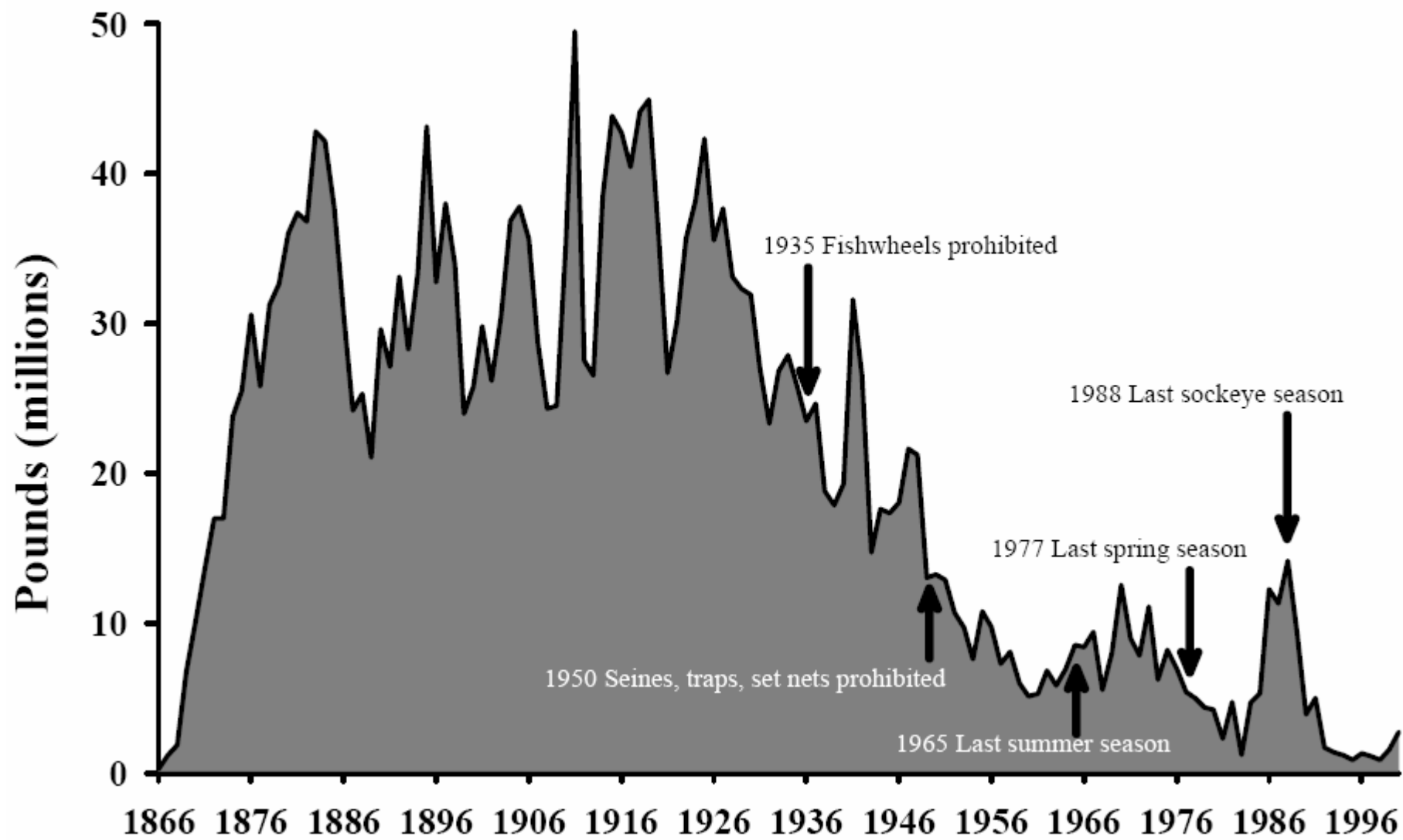
**Generates 22,512 Megawatts,  
or 44.8% of energy demand**

**The Coordinated Columbia River System**



Source: U.S. Army Corps of Engineers.





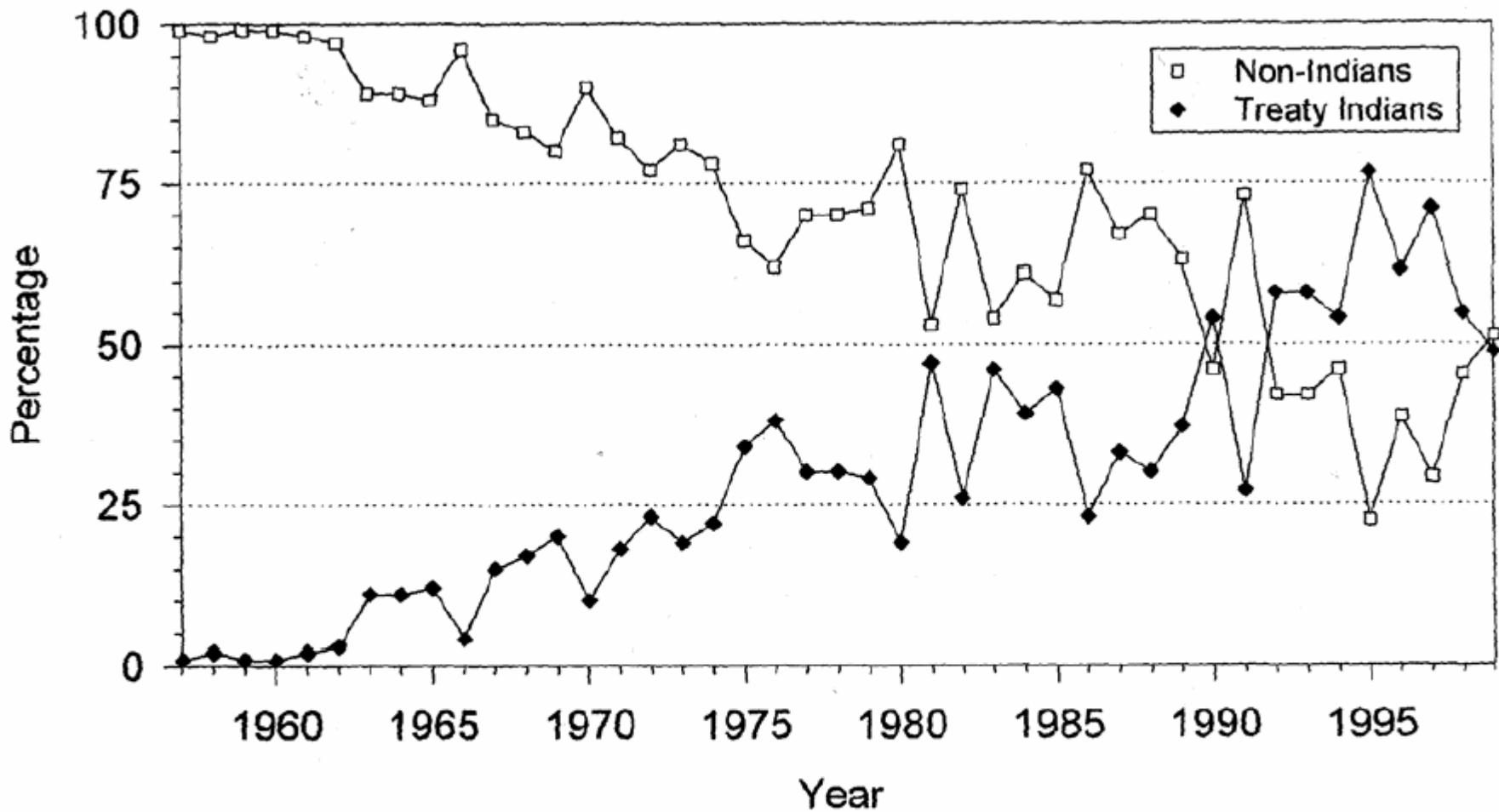


Figure 17. Percentage of Columbia River commercial landings of salmon and steelhead in pounds made by non-Indians and treaty Indians, 1957–02 (ODFW and WDFW 2004).

# Northwest Anadromous Fish Governance (Some of it!)

## **Columbia River Compact (1918)**

- Interstate Compact between Oregon and WA creates Columbia River Commission
- Sets fishing seasons from mouth of Columbia river up to McNary dam (280 river miles)

## **Pacific Fishery Management Council (1976)**

- Set up by the Magnuson-Stevens Fisheries act
- Governs ocean fishing in the “exclusive economic zone”—3-200 miles

## **Boldt Decision (1974)**

- Affirms treaty rights of Native Americans to traditional fisheries
- Native Americans allowed 50% or more of runs within traditional grounds; co-managers of fisheries

## **Pacific Northwest Power and Conservation Act (1980)**

- Sets goal of protecting anadromous fish co-equal with power
- Creates Northwest Power Planning Council: Interagency partnership for implementing fish conservation; oversees Bonneville Power Administration operations

## **US-Canada Salmon Interception Treaty (1985)**

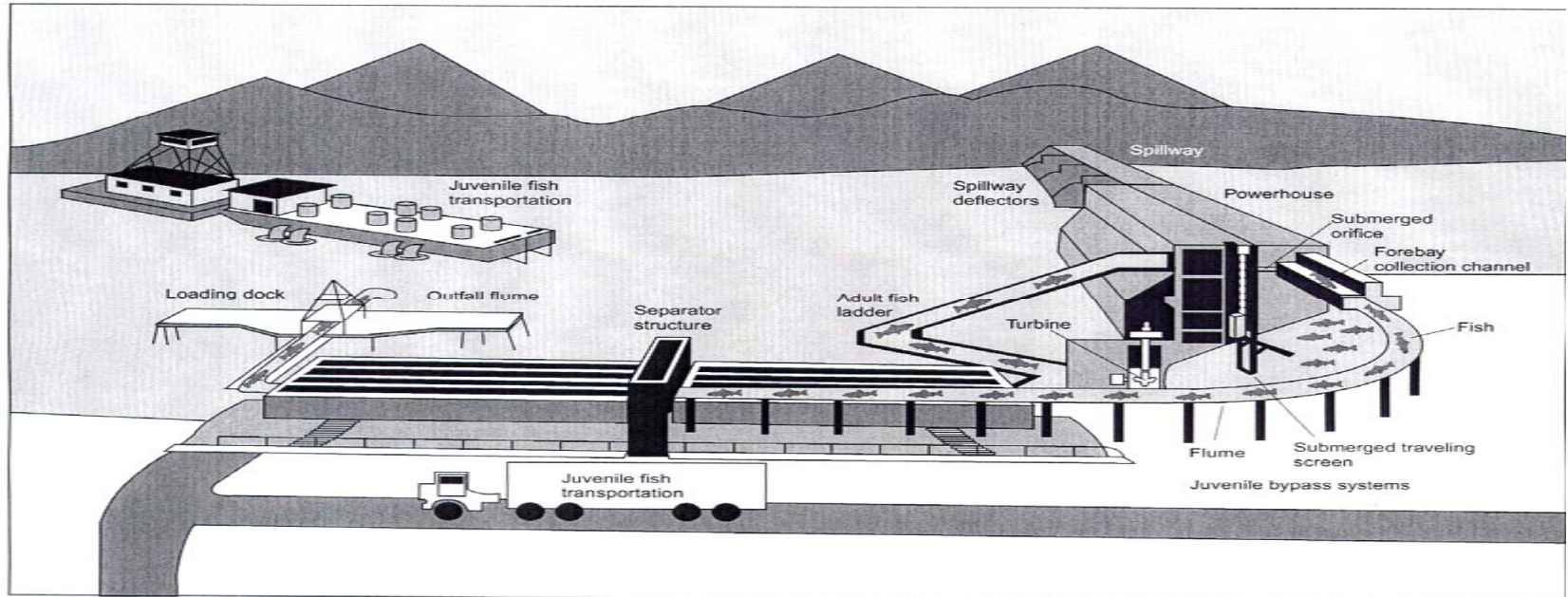
- Abundance-based harvest limits on international stocks
- Cooperative restoration efforts
- Complements existing treaties about hydrosystem operations

## **Pacific Northwest Coordination Agreement (1964; renewed 1997)**

- Coordinates federal/non-federal annual operating plans for the entire Columbia River Power System
- System operation must be consistent with NFMS biological opinions; e.g., flow requirements; juvenile fish passage

# Fish Passage Facilities and USACOE Fish Mitigation

Figure 1.2: Existing Fish Passage Systems at the Corps' Dams on the Lower Columbia and Snake Rivers



Source: U.S. Army Corps of Engineers

- Under 1995 NFMS Biological Opinion, Army Corp of Engineers implements Fish Mitigation Program (Funded by annual appropriations—makes Corp personnel happy!)
- 1995 GAO identifies significant problems with implementation; delays, cost overruns (about 40% of mitigation projects)
- Subsequent biological opinions (2000; 2004) challenged by enviros; NFMS not examining “without dams” scenarios in 2004
- 2005: Judge orders NMFS to rewrite BiOp—enforceable mitigation, consider no dams option, recovery as goal



## From 2006 remand of 2004 BiOP:

its analytical framework. The new framework ignored ESA regulations and NOAA's own handbook and, not surprisingly, found that the proposed DAM operations would not jeopardize listed species. This finding eliminated the need for an RPA, additional federal funding, or serious collaboration with any of the sovereigns. In sum, NOAA returned to the practice, criticized by Judge Marsh in 1995, of tailoring its framework for analyzing jeopardy in order to reach a no-jeopardy finding.

If the Executive and Legislative Branches do not allow NOAA to follow the law of the land, NOAA and the Action Agencies will fail again to take the steps that are plainly necessary to do what the ESA requires and what the listed species require in order to survive and recover. We are all aware of the demands of other users of the resources of the Columbia River and Snake River but we need to be far more aware of the needs of the endangered and threatened species.

Figure 1. BPA Fish and Wildlife Cumulative Expenditures 1978-2002

(Dollars in Billions)

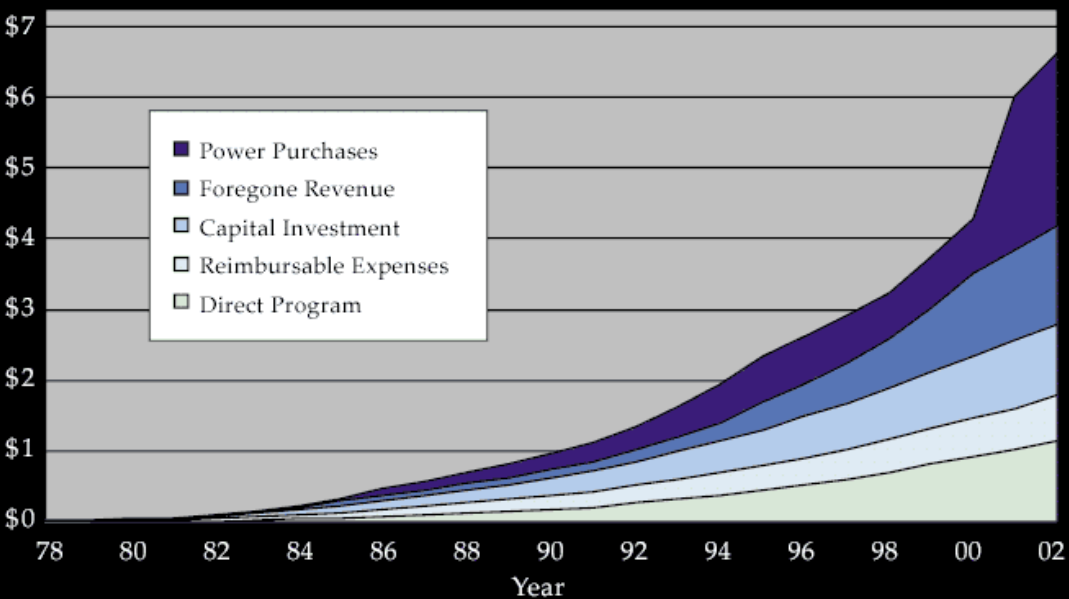
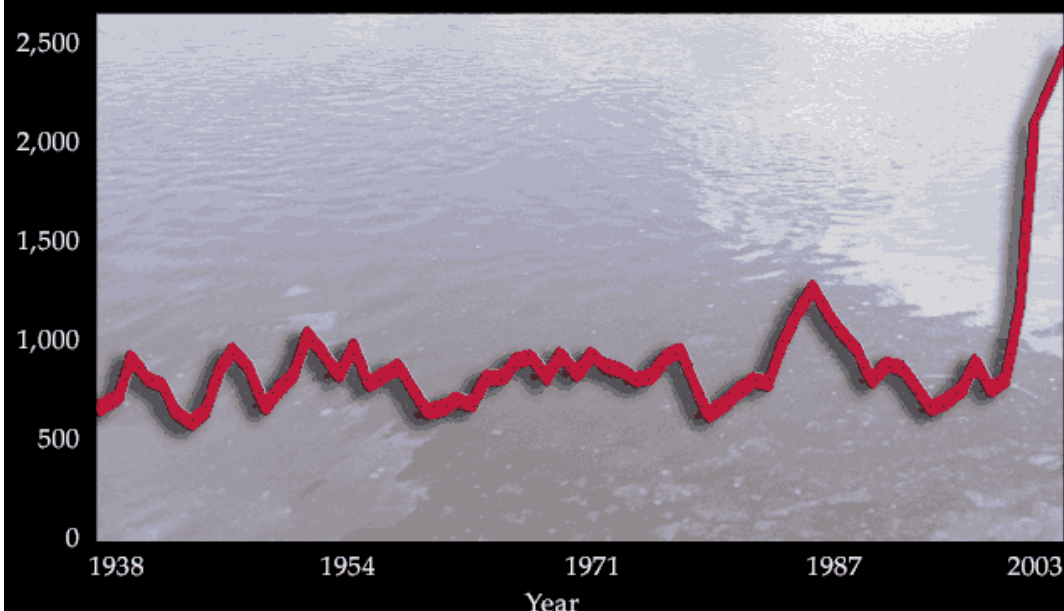


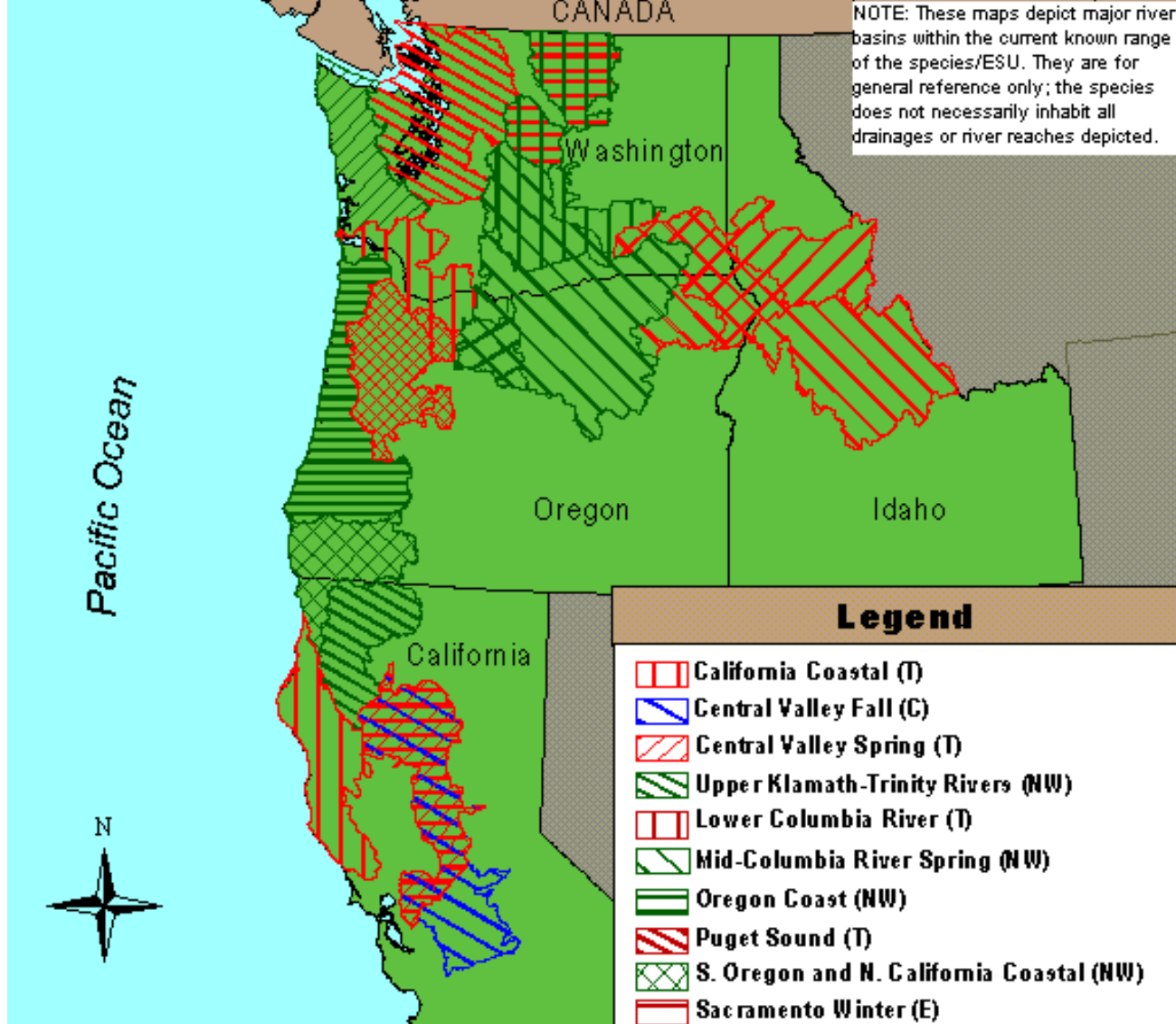
Figure 2. Adult Salmon and Steelhead Counts at Bonneville Dam on the Columbia River, 1938-2003

(Fish in Thousands)



# Salmon Recovery Teams

- 26 of 52 Evolutionarily Significant Units of anadromous fish are listed threatened/endangered
- Development of recovery plans divided into geographically based “Recovery Domains”; each domain contains one or more ESU
- Each sub-region has Technical Recovery Team to identify:
  - 1) Population and ESU de-listing criteria
  - 2) Habitat/fish abundance relationships
  - 3) Factors for decline and limiting factors for each ESU
  - 4) Early actions that are important for recovery;
  - 5) Research, evaluation, and monitoring needs; and
  - 6) Server as science advisors to groups charged with developing measures to achieve recovery.
- TRTs are “Phase I” of NMFS recovery strategy; Phase II will be some type of collaborative process for developing official recovery plans
- TRT efforts not very far along; some TRT not even appointed; plans not completed; recovery plans still a long way off



Status	
E	- Endangered
T	- Threatened
C	- Candidate
NW	- Not Warranted

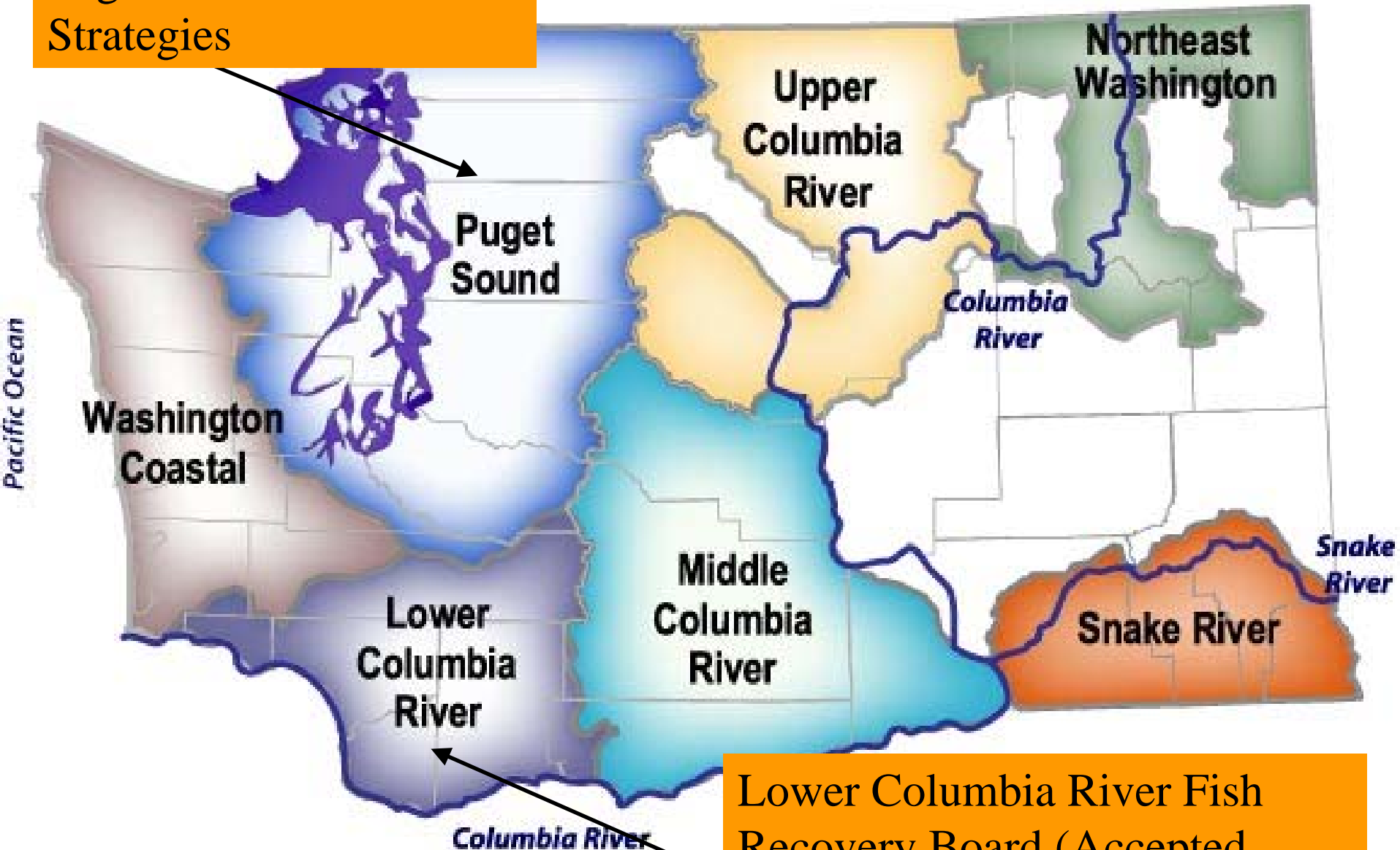
Legend	
	California Coastal (T)
	Central Valley Fall (C)
	Central Valley Spring (T)
	Upper Klamath-Trinity Rivers (NW)
	Lower Columbia River (T)
	Mid-Columbia River Spring (NW)
	Oregon Coast (NW)
	Puget Sound (T)
	S. Oregon and N. California Coastal (NW)
	Sacramento Winter (E)
	Snake River Fall (T)
	Deschutes River Summer/Fall (NW)
	Snake River Spring/Summer (T)
	Upper Columbia River Spring (E)
	Upper Columbia River Summer/Fall (NW)
	Upper Willamette River (T)
	Washington Coast (NW)



# Washington State

- Local watershed collaborative groups submit draft Recovery Plans to NOAA
- Regional plans encompass multiple ESU
- NOAA can choose to adopt those plans as the official Recovery Plan
- Focus on cooperation, build on pre-existing salmon recovery efforts, and integrate local knowledge
- Integrates several other watershed programs supported by state legislation; funding for watershed plans and projects
- April 2005: NOAA accepts and releases the Draft “Lower Columbia River Salmon Recovery Plan” for public comment

**Puget Sound Shared Strategies**



**Lower Columbia River Fish Recovery Board (Accepted recovery plan)**

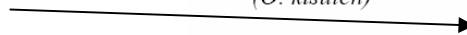
# ESU and Fish Hatcheries

- Should hatchery fish be included in population assessments of evolutionarily significant units?
- Hatchery fish can increase harvest of wild fish stocks, reduce genetic diversity, lower reproductive success
- Hatchery fish make up largest portion of ESU in many cases (numbers?)
- 2001 *Alsea Valley Alliance vs. Evans*: District Court says ESU is legit, but NOAA must consider influence of hatchery fish
- 2001 *Alsea* decision officially delists coho salmon and requires NMFS to develop new hatchery policy
- 2001: Environmentalists appeal *Alsea*, get temporary injunction on delisting
- 2004 court appeal upholds *Alsea*; court has not yet issued “mandate” for delisting
- Current status: NMFS recently released new hatchery policy and listing determinations—reinstates Coho listing

## Summary of Proposed Listing Determinations for 27 Evolutionarily Significant Units

Salmonid Species	ESU Reviewed	Current ESA Status	Recommended Proposed Listing Determination	Number of Hatchery Stocks Included in ESU
Sockeye Salmon ( <i>O. nerka</i> )	Snake River	<i>Endangered</i>	<i>Endangered</i>	1
	Ozette Lake	<i>Threatened</i>	<i>Threatened</i>	2
Chinook Salmon ( <i>O. tshawytscha</i> )	Sacramento River Winter-run	<i>Endangered</i>	<i>Threatened</i>	2
	Central Valley Spring-run	<i>Threatened</i>	<i>Threatened</i>	0
	California Coastal	<i>Threatened</i>	<i>Threatened</i>	7
	Lower Columbia River	<i>Threatened</i>	<i>Threatened</i>	17
	Upper Willamette River	<i>Threatened</i>	<i>Threatened</i>	7
	Upper Columbia River Spring-run	<i>Endangered</i>	<i>Endangered</i>	6
	Puget Sound	<i>Threatened</i>	<i>Threatened</i>	22
	Snake River Fall-run	<i>Threatened</i>	<i>Threatened</i>	4
Snake River Spring/Summer-run	<i>Threatened</i>	<i>Threatened</i>	15	
Coho Salmon ( <i>O. kisutch</i> )	Central California Coast	<i>Threatened</i>	<i>Endangered</i>	4
	S. Oregon/N. California Coasts	<i>Threatened</i>	<i>Threatened</i>	3
	Oregon Coast	<i>Candidate</i>	<i>Threatened</i>	5
	Lower Columbia River	<i>Candidate</i>	<i>Threatened</i>	21
Chum Salmon ( <i>O. keta</i> )	Hood Canal Summer-run	<i>Threatened</i>	<i>Threatened</i>	8
	Columbia River	<i>Threatened</i>	<i>Threatened</i>	3
<i>O. mykiss</i>	Southern California	<i>Endangered</i>	<i>Endangered</i>	0
	South-Central California Coast	<i>Threatened</i>	<i>Threatened</i>	0
	Central California Coast	<i>Threatened</i>	<i>Threatened</i>	2
	California Central Valley	<i>Threatened</i>	<i>Threatened</i>	2
	Northern California	<i>Threatened</i>	<i>Threatened</i>	2
	Upper Willamette River	<i>Threatened</i>	<i>Threatened</i>	0
	Lower Columbia River	<i>Threatened</i>	<i>Threatened</i>	10
	Middle Columbia River	<i>Threatened</i>	<i>Threatened</i>	7
	Upper Columbia River	<i>Endangered</i>	<i>Threatened</i>	6
Snake River Basin	<i>Threatened</i>	<i>Threatened</i>	6	

Target of *Alsea*  
decision





## 2005 Low Salmon Returns

- Columbia River Compact: Congressionally designated commission decides commercial fishing seasons for Oregon/Washington
- 5/10/2005: 52,000 out of an expected 371,000 Chinook returned (14%)
- 5/4/2005: Only 533 salmon scale all eight major federal dams into Snake River; compared to 23,000 in '04 and 92,000 in '01
- These Spring Chinook are the progeny of 1991 spawning adults—1991 had the highest level of “escapement” since Bonneville dam was built in 1938
- Northwest states are closing their commercial fishing seasons!!!
- Cause? Drought? Open ocean conditions? Management? Predation? We may never know (or if we do—nobody may ever agree!)