

HYDROPOWER IN THE COLUMBIA RIVER: HISTORY OF FISH PASSAGE DEVELOPMENT AND IMPLICATIONS FOR THE MEKONG RIVER

David Hand, US Fish and Wildlife Service

John Beeman, US Geological Survey



Hydropower and Fish Passage in the Columbia

- ▣ Overview of Columbia River
- ▣ Timeline of dam construction+fish passage
- ▣ Highlight major themes
- ▣ Implications for the Mekong



Columbia River

Length : 2,000 km.

Source:

Columbia Lake,
British Columbia

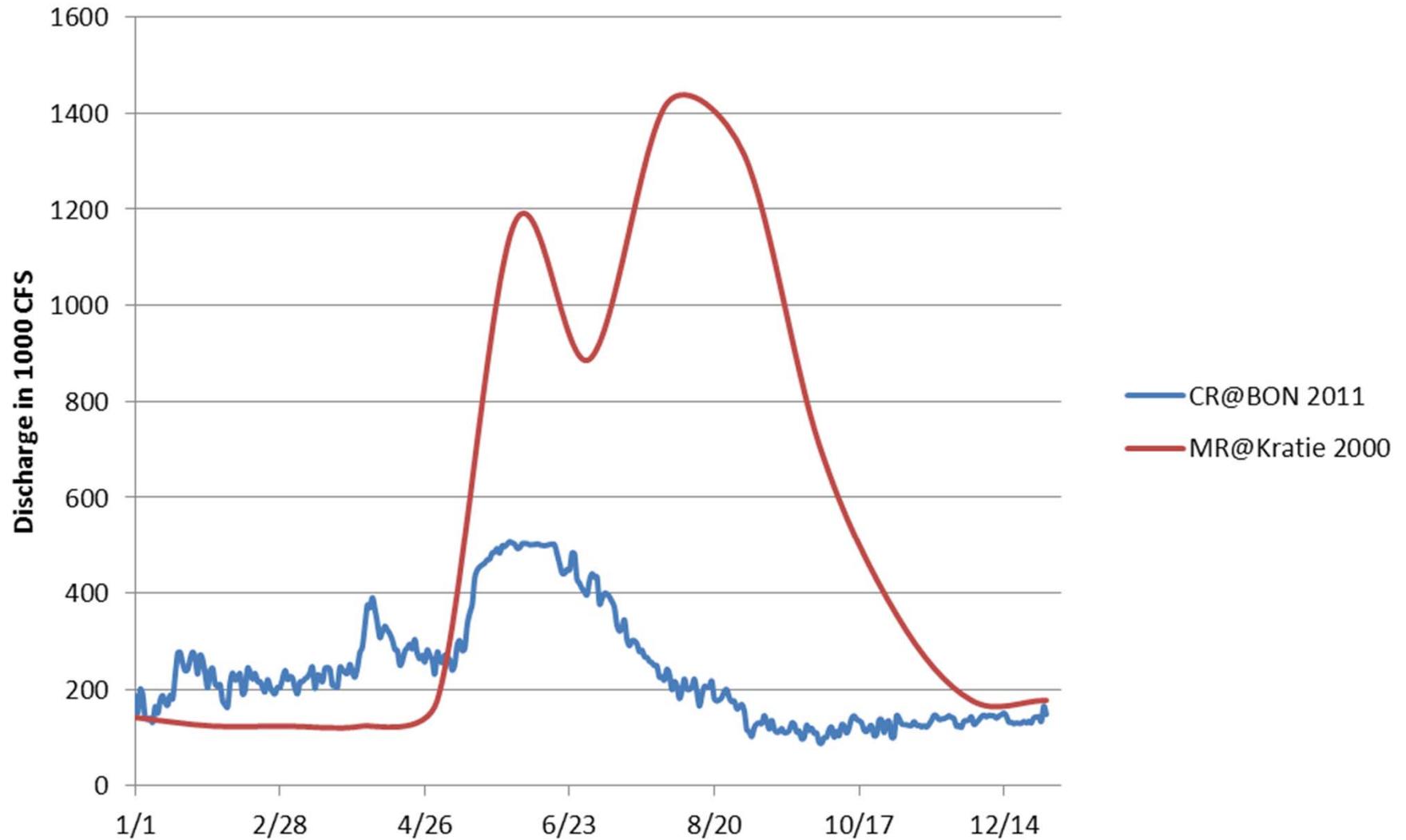
Drainage area:

- 67 million hectares
- Larger than France, Belgium, & Netherlands combined
- 7,500 cms daily mean flow
- 219 major dams:
 - ... 176 in U.S.
 - ... 43 in Canada



| | Columbia | Mekong |
|--|----------|-----------|
| Catchment (km ²) | 670,000 | 795,500 |
| Length (km) | 2,000 | 4,900 |
| Mean discharge (m ³ s ⁻¹) | 7,500 | 14,500 |
| Number of fish species | ~100 | 800-1,100 |
| Mainstem Dams (existing or planned) | 15 | 19 |
| Tributary Dams (existing or planned) | >250 | ~200 |

Discharge of Columbia R. vs. Mekong R.





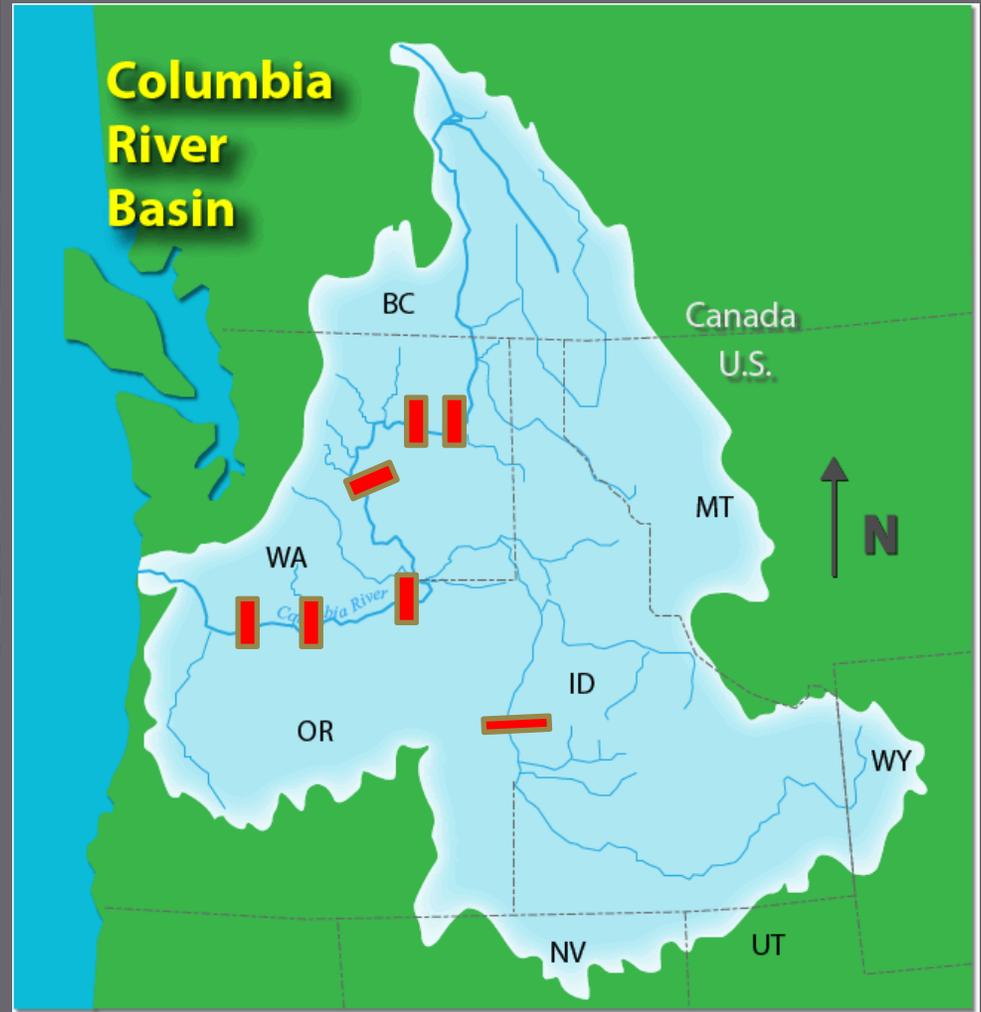
Mainstem Dam Construction Begins

- Rock Island
- Bonneville
- Grand Coulee



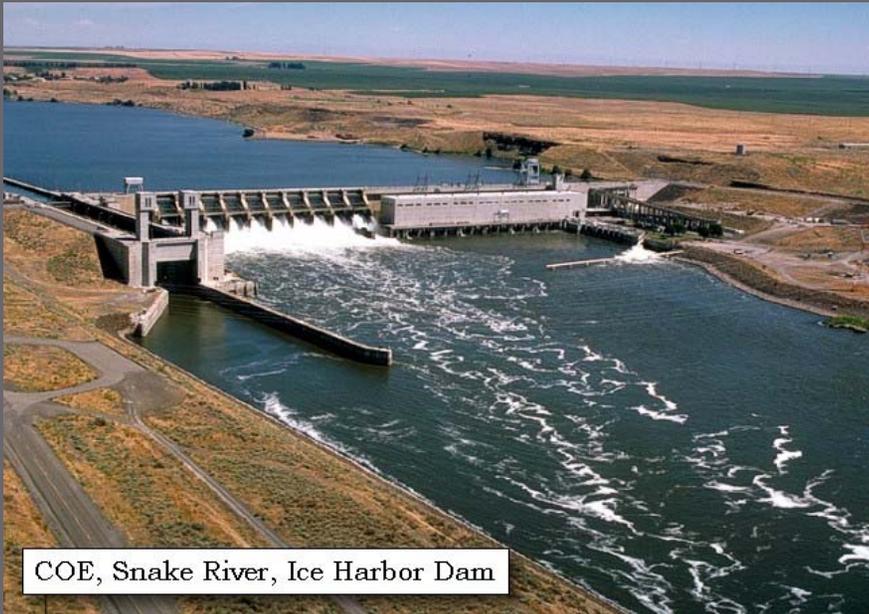


Columbia River Basin

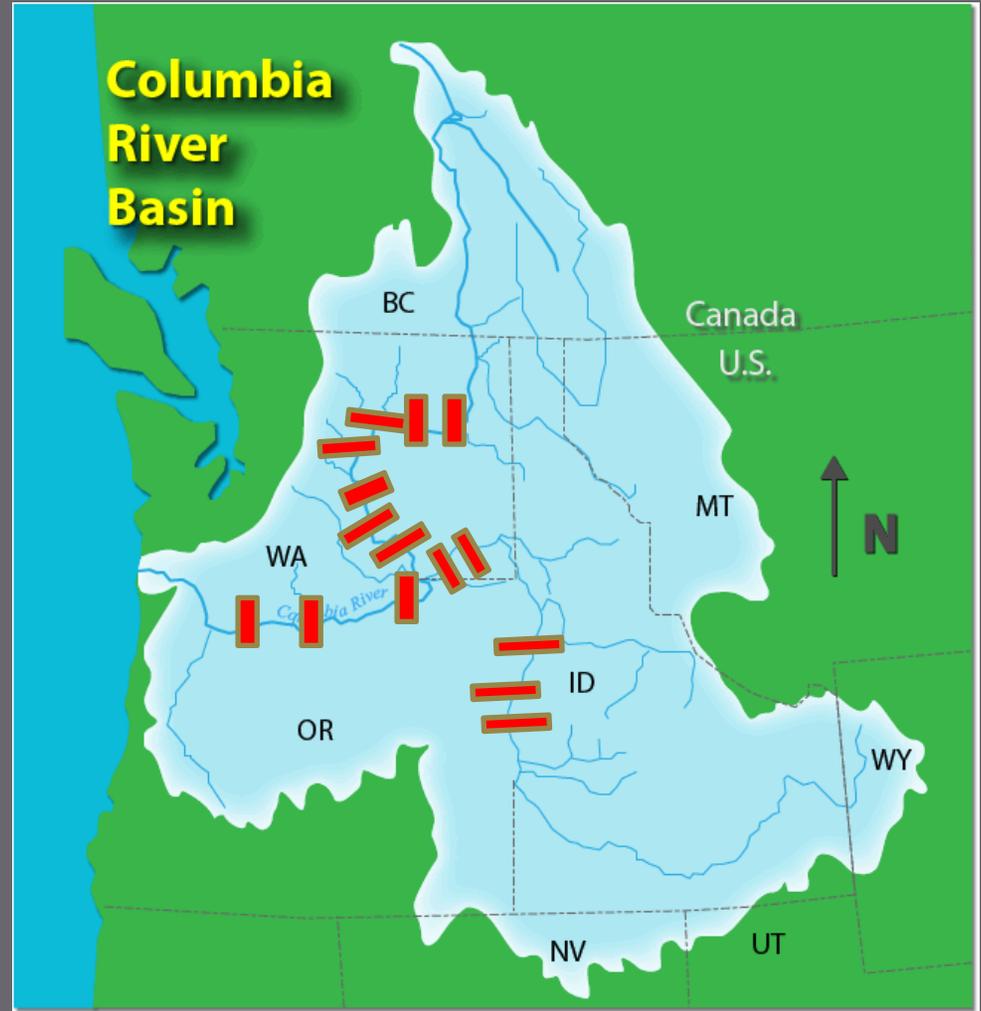


- McNary
- Chief Joseph
- The Dalles
- Brownlee





COE, Snake River, Ice Harbor Dam

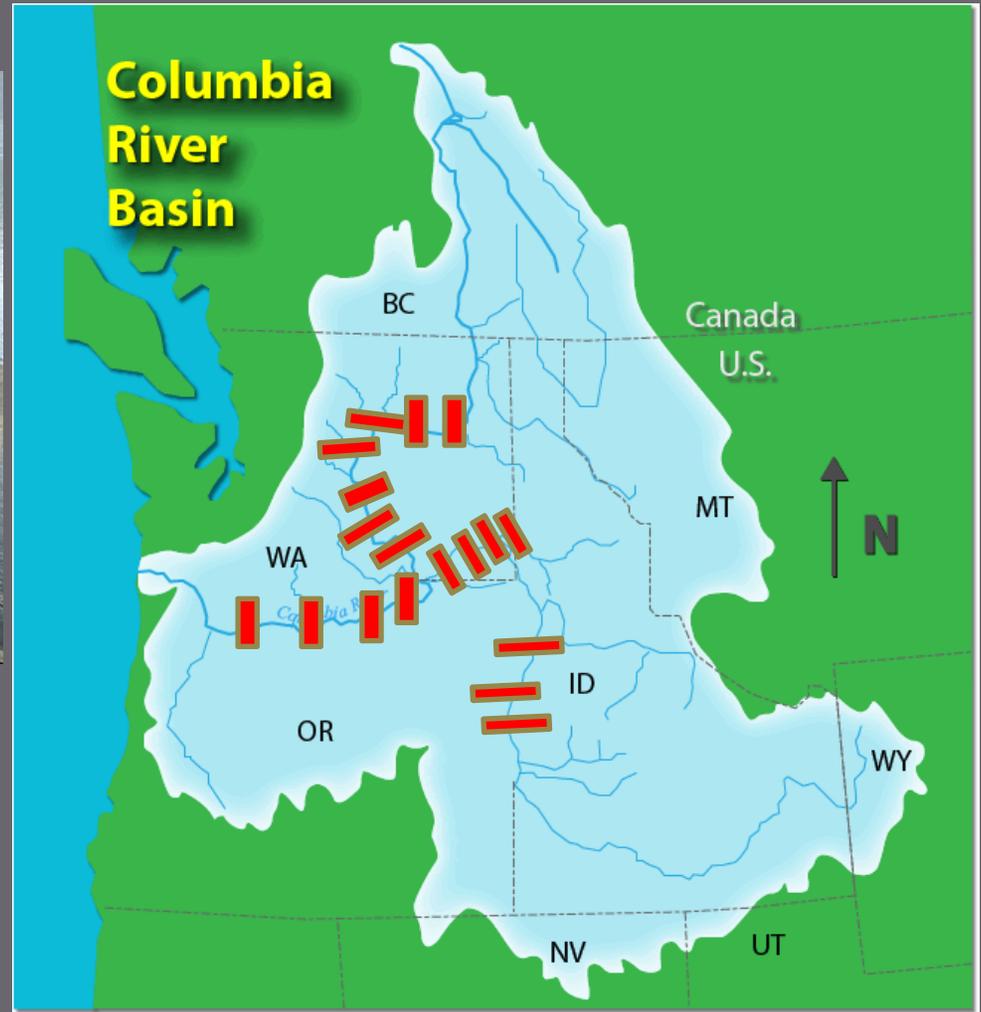


- Rocky Reach
- Priest Rapids
- Wanapum
- Wells
- Oxbow
- Ice Harbor
- Hells Canyon
- Lower Monumental

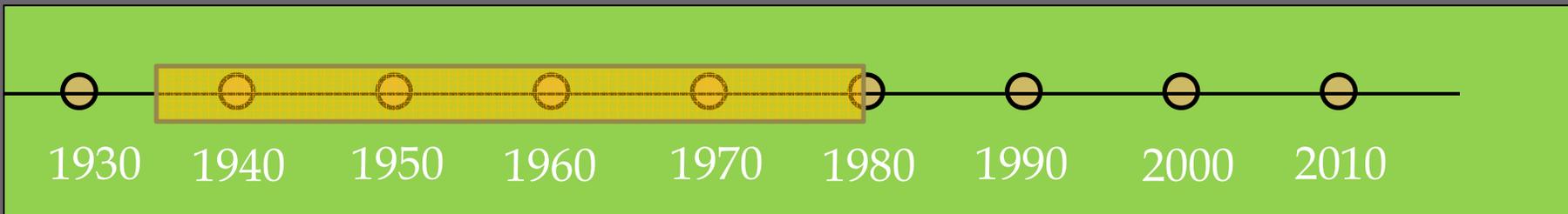




Columbia River Basin

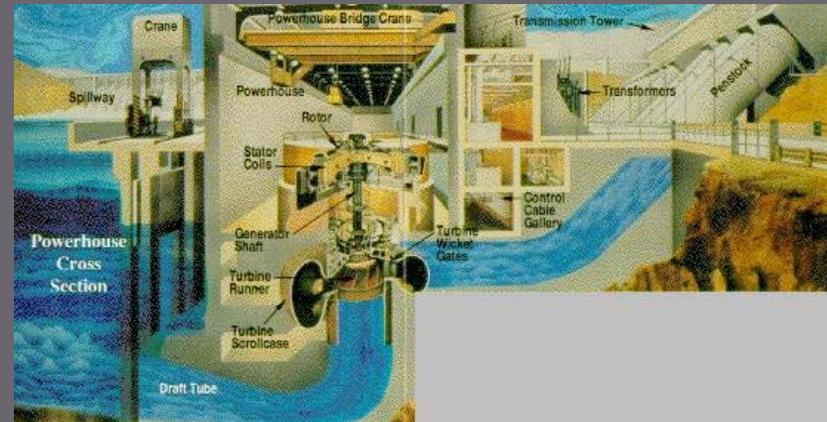


- John Day
- Little Goose
- Lower Granite



Fish Passage Then

- ▣ Downstream passage through turbines



USACE

- ▣ Upstream passage through fish ladders



Bonneville ladder, ODOT

Fish Passage Today

- ▣ Downstream
 - Spill
 - Surface weirs
 - Flow Augmentation
 - Juvenile Bypass
 - Transportation
 - Turbine redesign
- ▣ Upstream
 - Lamprey Passage Systems
 - Spill Patterns

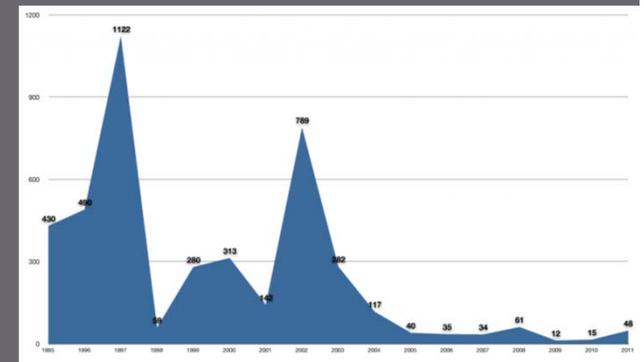


Political Will

- ▣ Fish Conservation=Power Generation
- ▣ Government/Legal Driven
 - ▣ Treaties, NW Power Act, Endangered Species
- ▣ Broad goals → measurable objectives
- ▣ Basing decision on SCIENCE



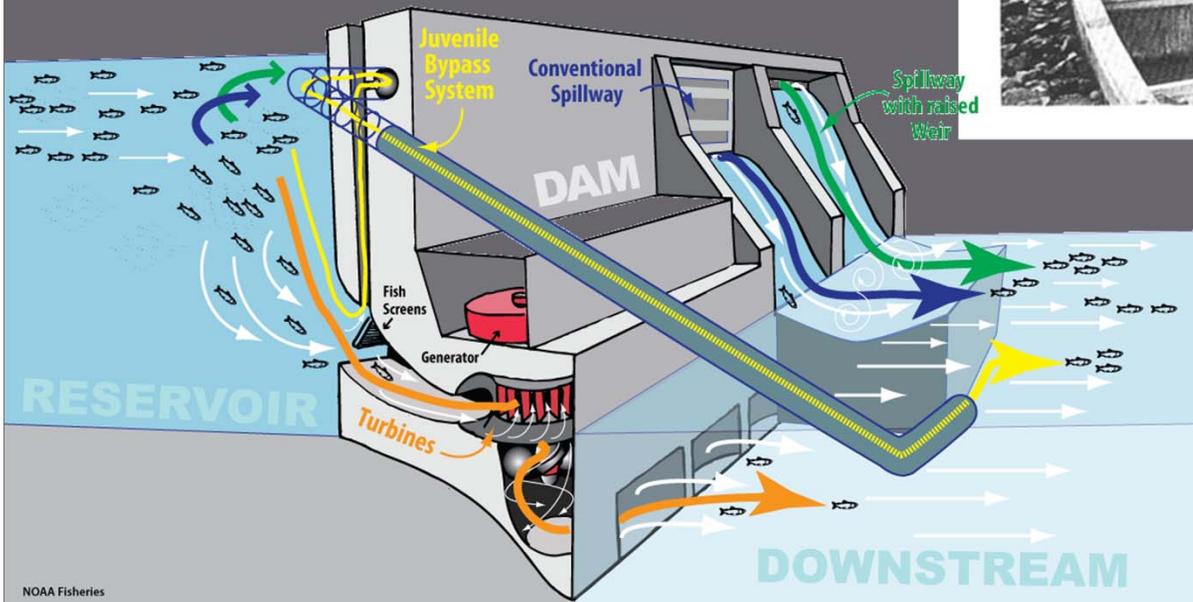
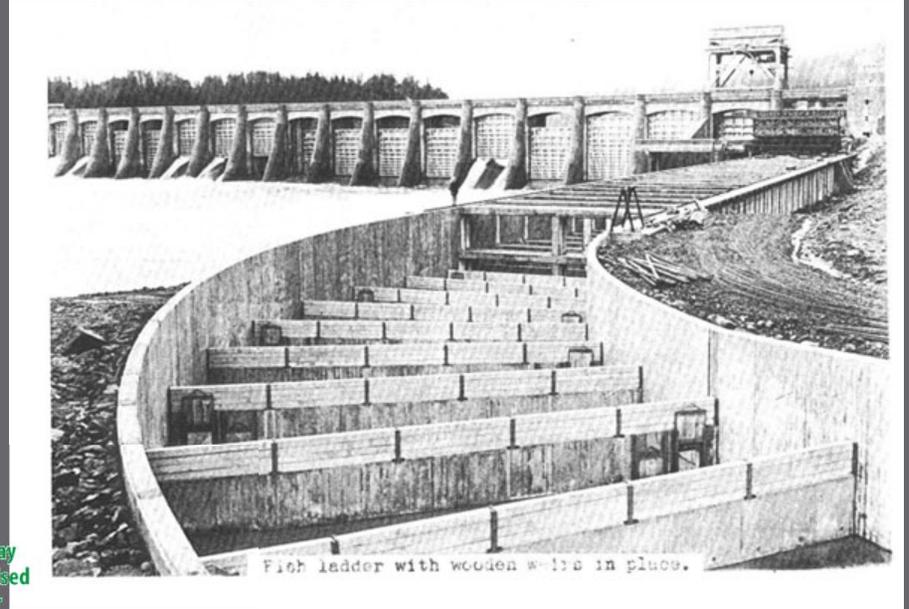
CRITFC



Lamprey counts Granite Dam

Ecosystem Approach

- Initial salmonid focus



Ecosystem Approach

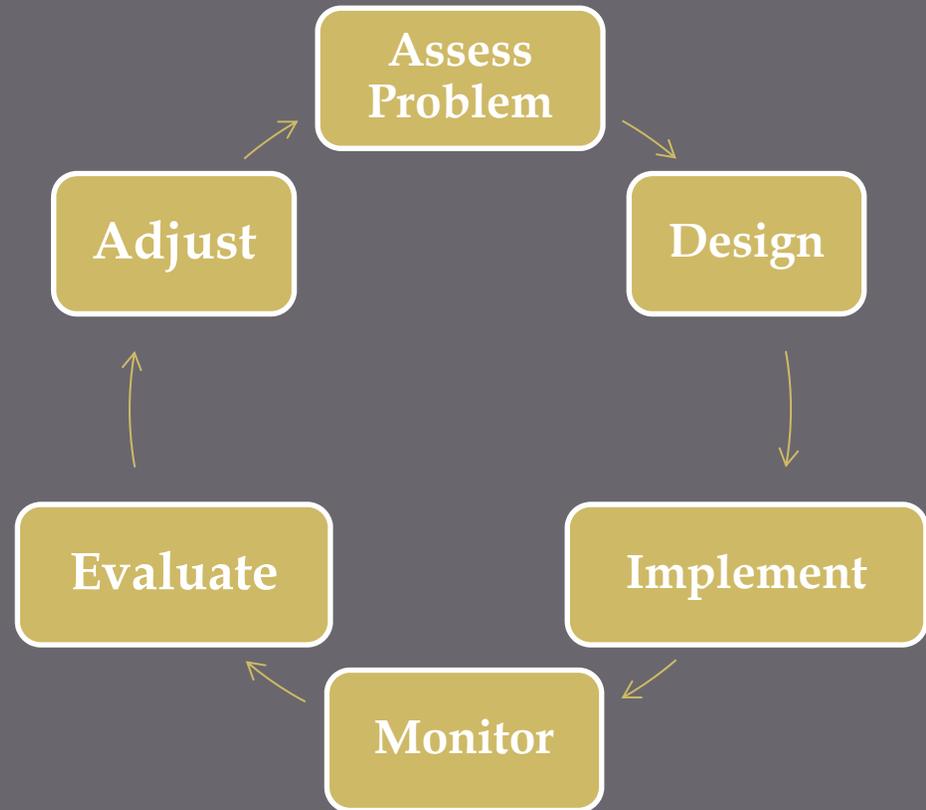
- ▣ Initial salmonid focus
- ▣ Salmon passage \neq non-salmon passage



NOAA

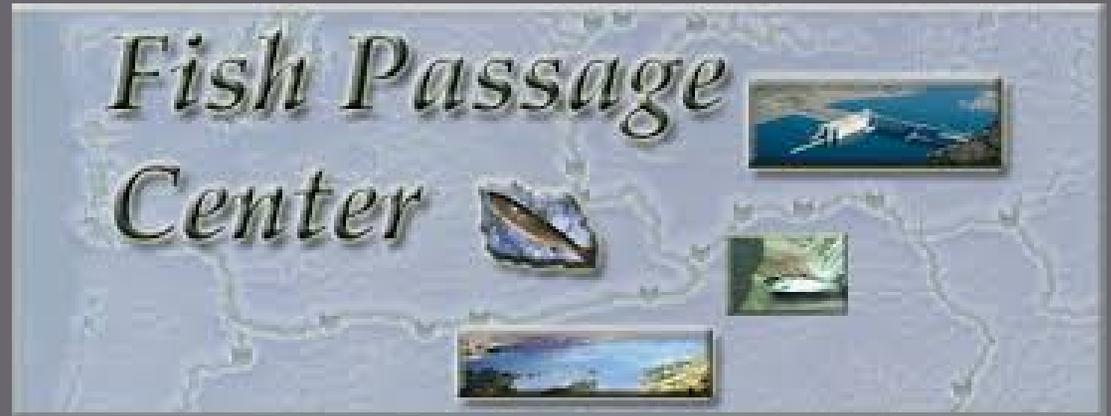
Adaptive Management

- ▣ Test passage designs
- ▣ Rigorous monitoring
- ▣ Flexibility



Long Term Commitment

- ▣ 80+ years of work
 - Complex
 - Long-term monitoring
- ▣ Financial
 - \$US 500 Million annually
 - \$US 3.3 Billion 1982-2001
 - Forgone power generation



Spill at Bonneville Dam, USACE



USGS

| | Columbia | Mekong |
|----------------------|------------------------------------|----------------------------------|
| Political Will | Strong Measurable Objectives | Developing Broad Goals |
| Ecosystem Approach | 100 species | >1,000 species Little known |
| Adaptive Management | Monitoring Flexible | Limited monitoring Inflexible |
| Long Term Commitment | 80+ years Costly | Unknown Limited \$ |

