PLANNING AND IMPLEMENTING FISH PASSAGE AT WILLAMETTE PROJECT DAMS

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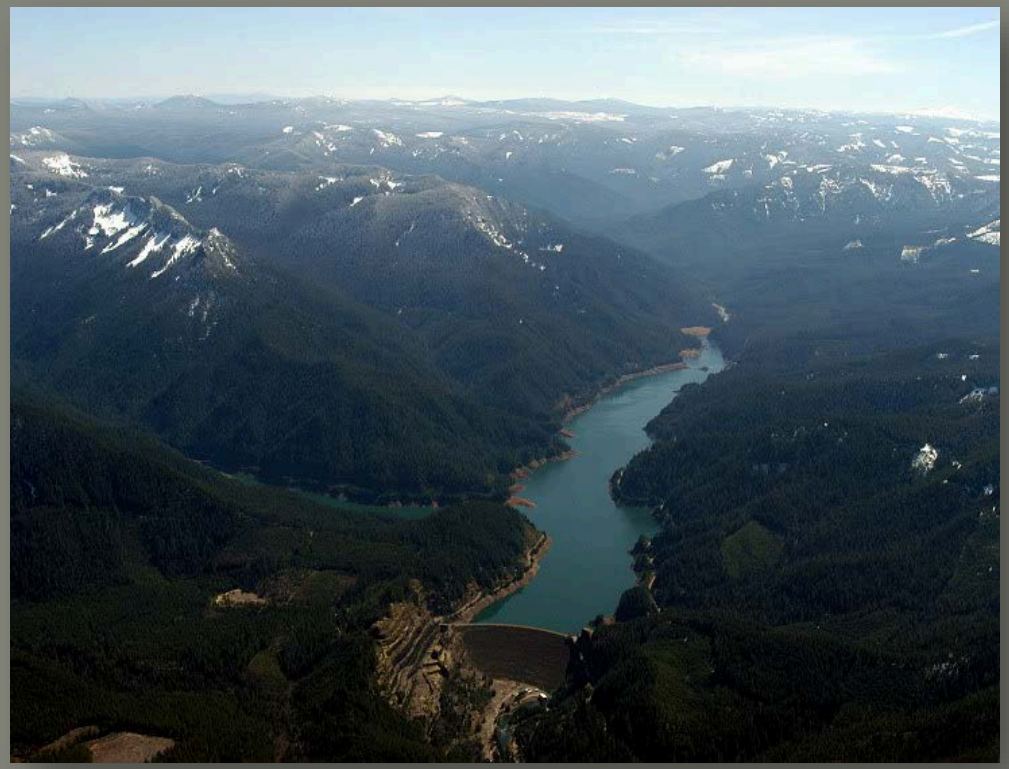
6 February 2018



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PRESENTATION OUTLINE

- Introduction to the Willamette Projects
- Fish Passage
  - Approach
  - Implemented actions and highlights

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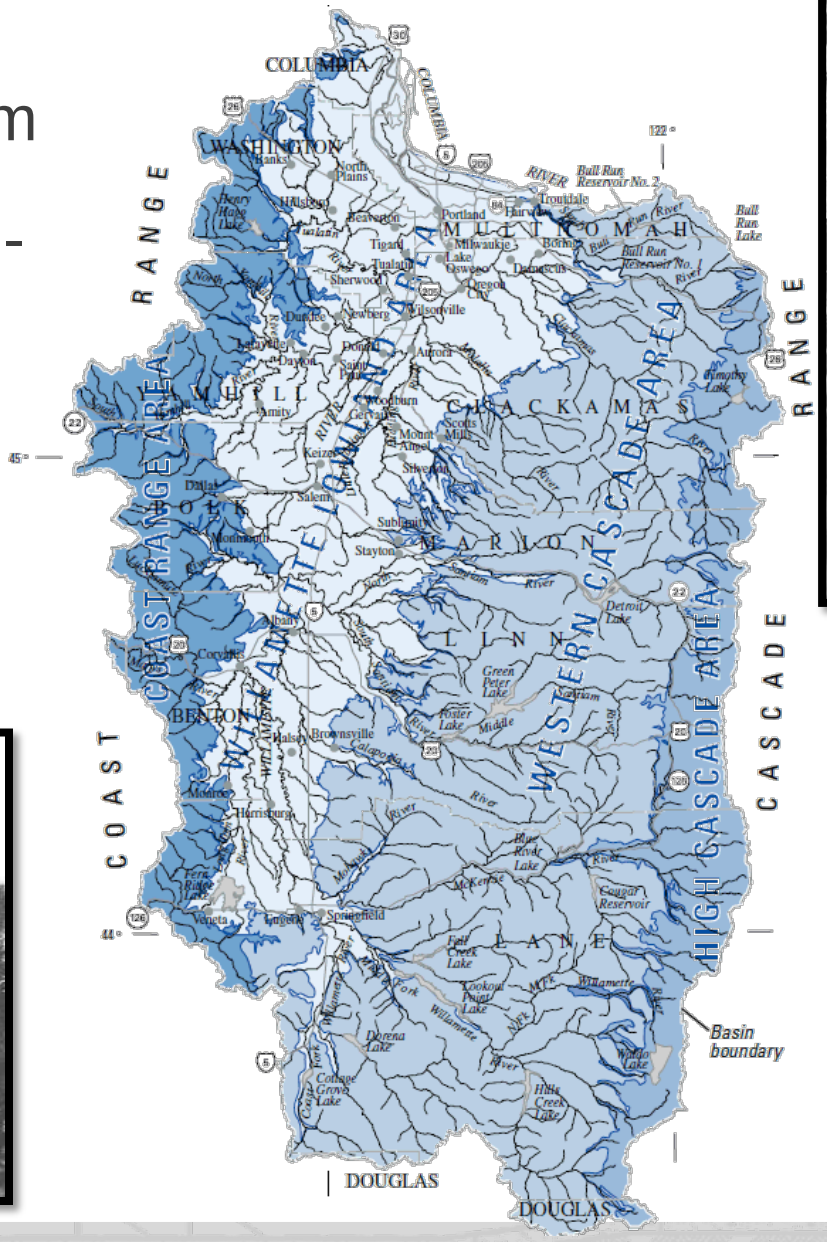
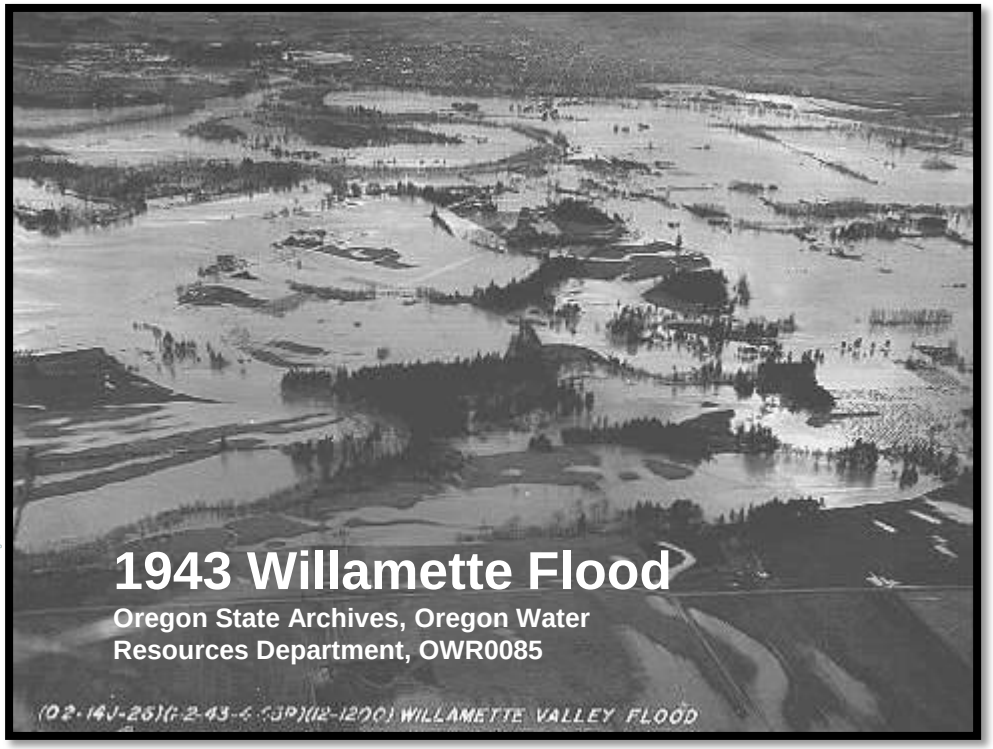
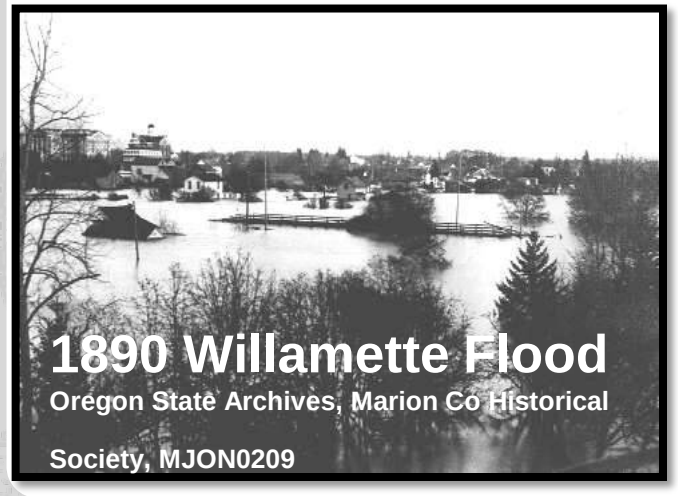
WILLAMETTE BASIN HYDROLOGY

- Rain-driven system
- Major storms Nov.-Mar.







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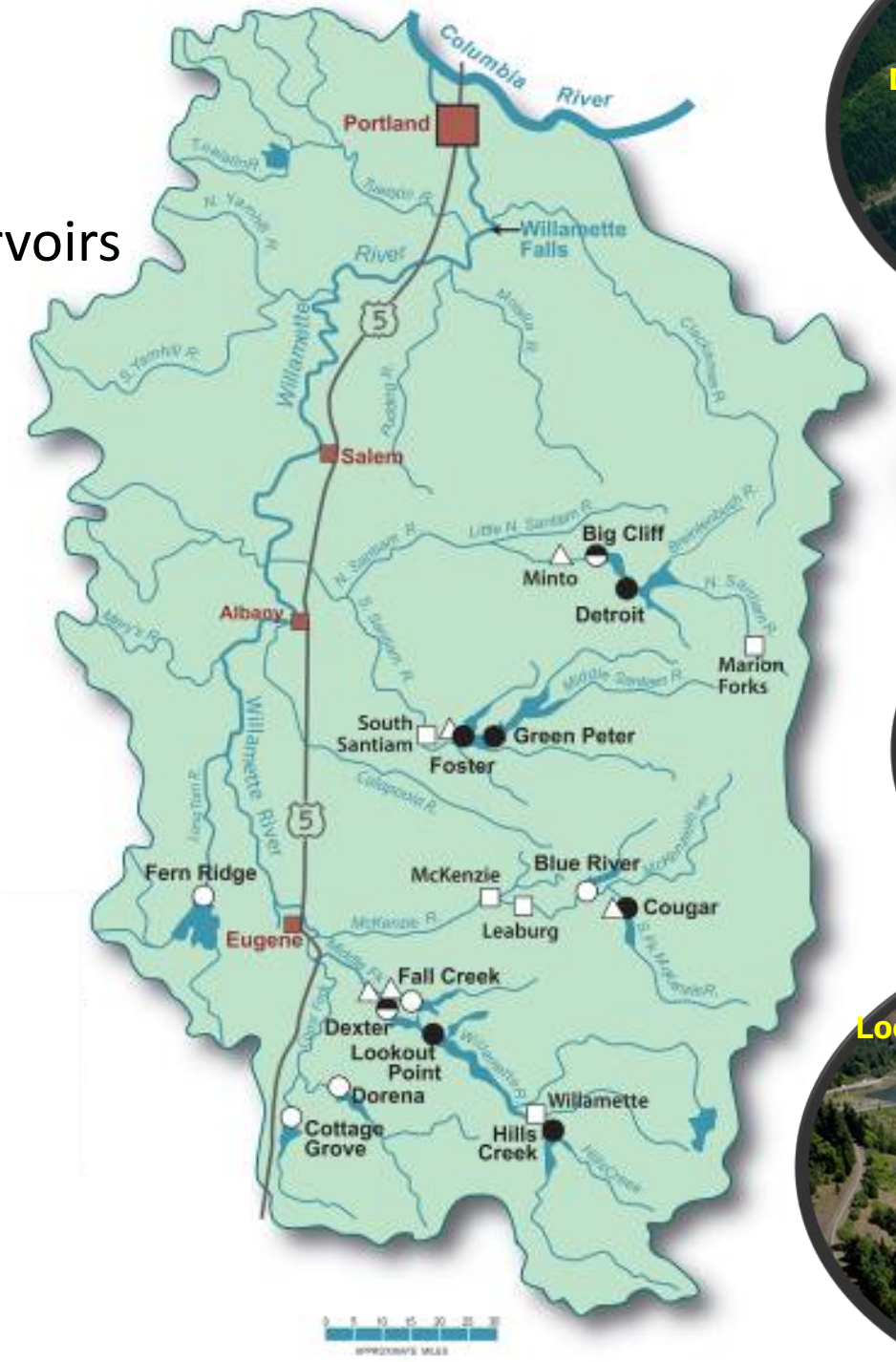
WILLAMETTE SYSTEM

- 13 multi-purpose dams and reservoirs
- 91 miles of revetments

Authorized Purposes

- Flood damage reduction
- Hydropower
- Navigation
- Irrigation
- Fish & wildlife
- Recreation
- Water quality
- Municipal & industrial water supply



Upper Willamette River Spring Chinook salmon

The Willamette Basin

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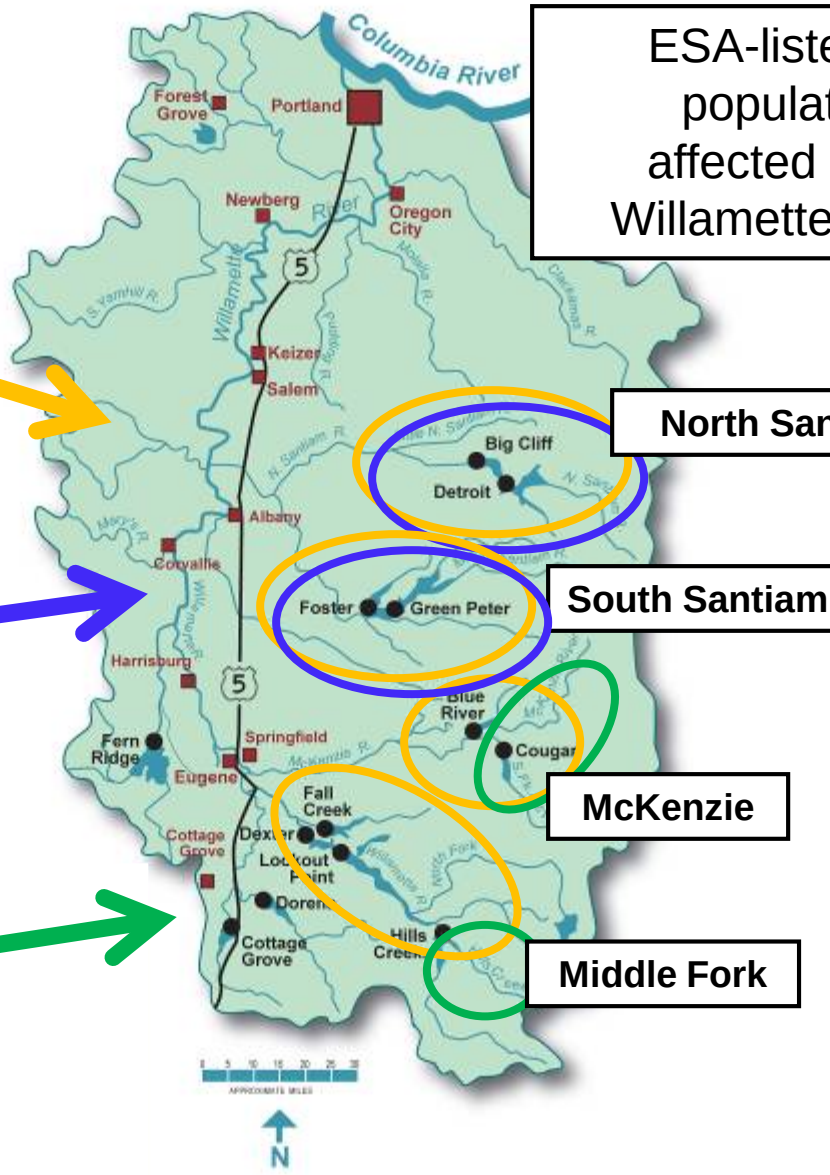


ESA-listed fish populations affected by the Willamette Project

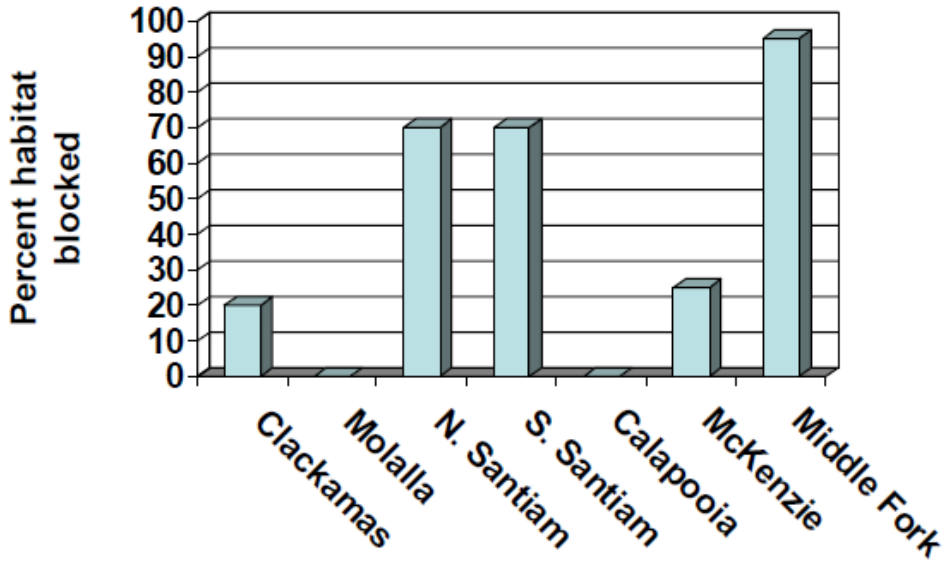
North Santiam

South Santiam

McKenzie

Middle Fork

Chinook habitat loss due to no passage at dams



WILLAMETTE SALMON AND STEELHEAD RECOVERY APPROACH

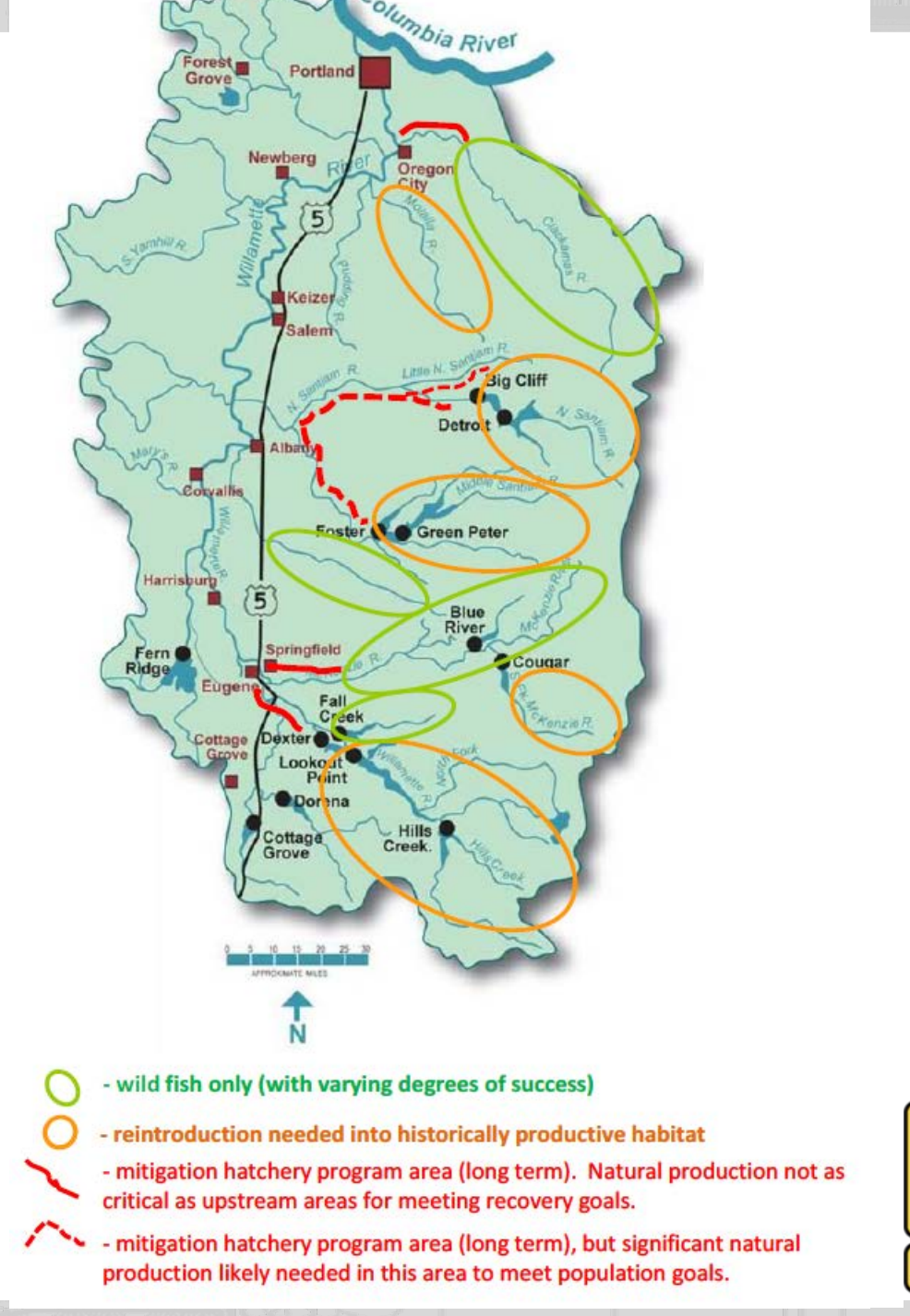
“Split-Basin” strategy

Wild fish above dams, maintain hatchery area below

Highest priority - address direct impacts of dams

- Restore adult access and spawning
- Reduce adult pre-spawning mortality
- Reduce juvenile migration mortality
- Improve downstream habitat attributes
  - flows,
  - water temperatures
  - sediment loads,
  - large wood recruitment

NMFS Biological Opinion, 2008
ODFW/NMFS Recovery Plan, 2011



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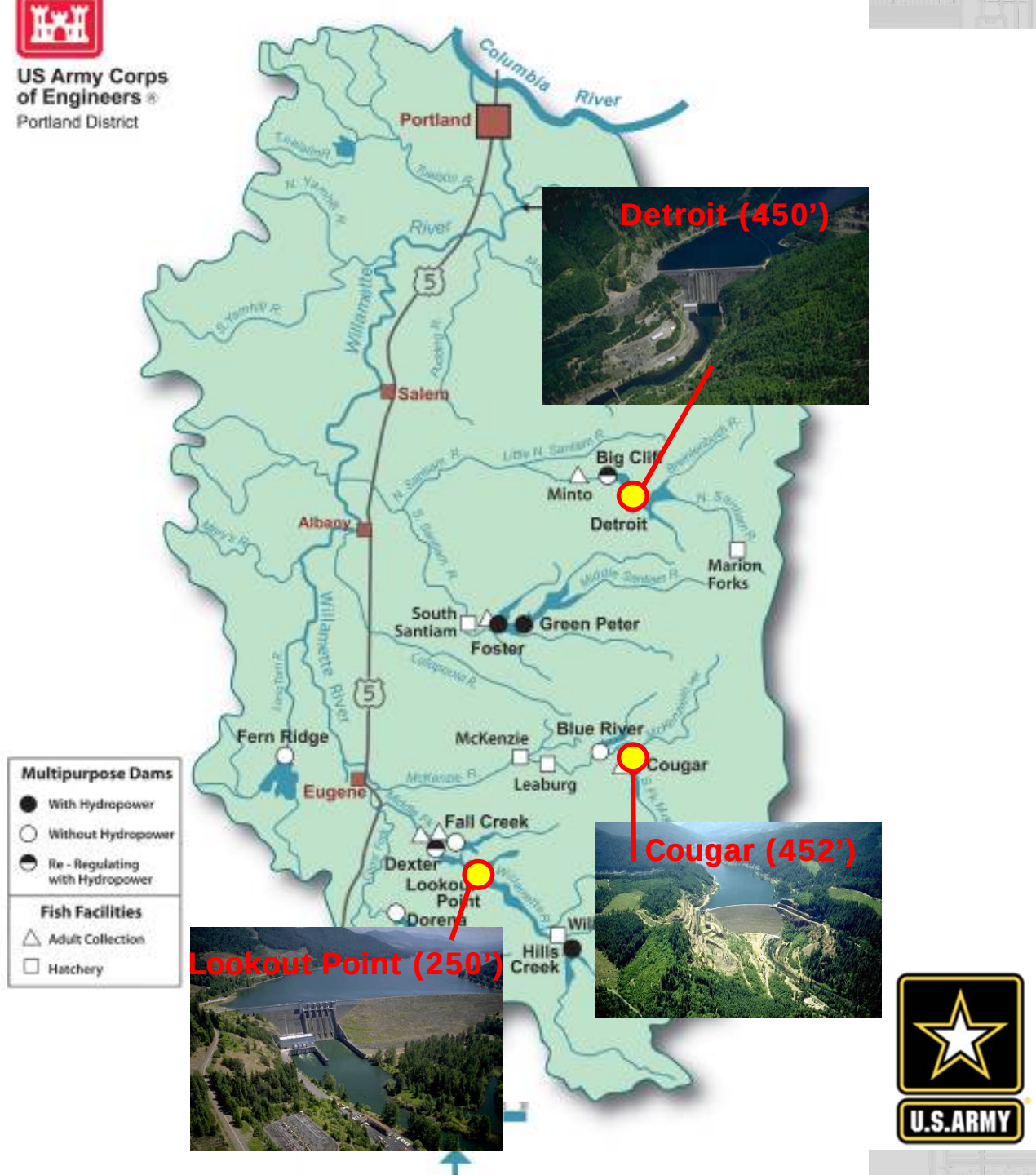
NMFS 2008 BIOLOGICAL OPINION RPA

KEY WORK TO BE DONE – "BIG FOUR"

- Detroit:
  - Temp Control (Ph 1 of DS Psg)
  - Downstream Passage (Ph 2)
- Cougar:
  - Temp Control Tower (in-place)
  - Downstream Passage
- Lookout Point:
  - Downstream Passage



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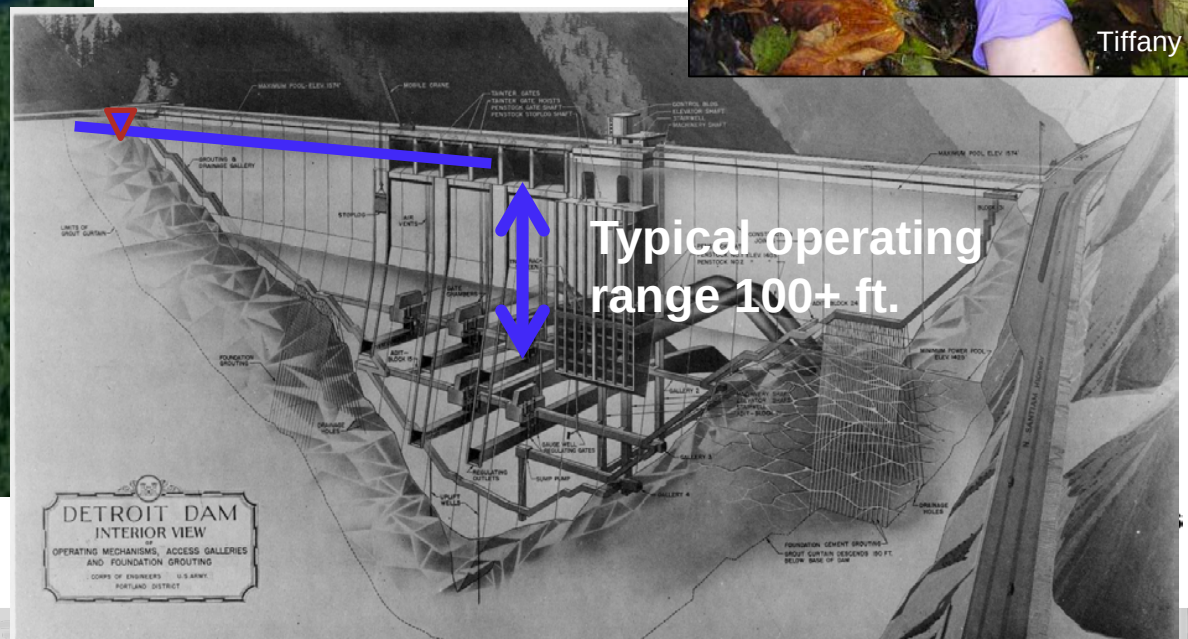
Challenges

- Pre-spawn mortality in transported spring Chinook salmon
- Ability to safely and efficiency pass juvenile salmon and steelhead at high head dams
  - Cougar and Detroit > 400 ft tall dams
  - Reservoir fluctuation >100 ft annually



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NORTH SANTIAM SUB-BASIN

Fish Passage *Program Highlights*

- Dam operations changed to enhance water temperatures and juvenile passage since 2009

- Adult hatchery Chinook outplanted annually since 2000
- New Minto adult facility completed in 2012
- Adult release sites constructed in 2012 and 2013

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Fish Passage *Program Highlights*

Adult trap and haul above Detroit Dam

- Hatchery Chinook Salmon released above dams annually
  - Pre-spawn mortality – LOW
  - Successful juvenile production
- Winter steelhead
  - Above-dam transport after passage improved
  - Expect trap and haul to be effective (e.g. Foster dam)

Juvenile passage at Detroit Dam

- Chinook Salmon: spill improved survival, but not enough
- Juvenile steelhead also prefer surface passage routes; residualization may occur in reservoir
- New temperature tower and fish surface collector in design

(Rerecich presentation, day 2)

Above Detroit Female Chinook Cohort Replacement Rate:
2009: 1.07
2010: 0.19

Black 2017 WFSR presentation

Chinook Salmon PSM above Detroit Reservoir

2014 10%,

2015 12%,

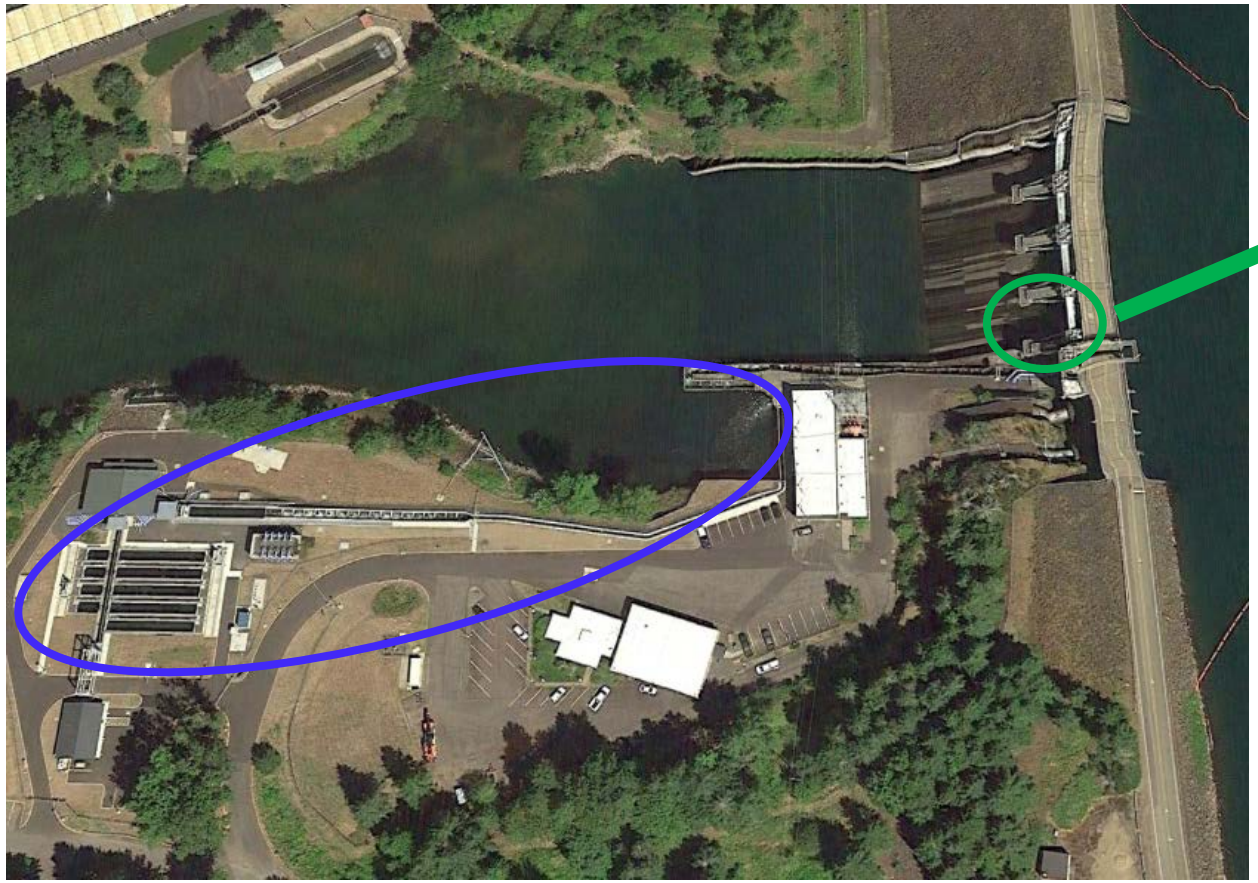
2016 5%

Sharpe et al., 2017

SOUTH SANTIAM SUB-BASIN

Fish Passage *Program Highlights*

- New Foster adult facility completed in 2014



- Fish spill weir operated spring to fall to enhance juvenile downstream passage
- New fish weir being installed and tested in 2018

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SOUTH SANTIAM SUB-BASIN

Fish Passage *Program Highlights*

Adult trap and haul at Foster Dam

- **Only wild (unmarked) adult Chinook and steelhead are transported upstream**
  - Areas for improvement
    - Performance issues with fish ladder and trap
    - Pre-spawn mortality level moderate

(Caudill presentation, day 2)

- Winter steelhead return very low in 2017 (only 18 collected at Foster)
  - Actively studying trap and haul effectiveness

(Weigel-Sheedy presentation, day 2)

Juvenile passage at Foster Dam

- New fish spill weir being installed tested in 2018

(Khan presentation, day 2)

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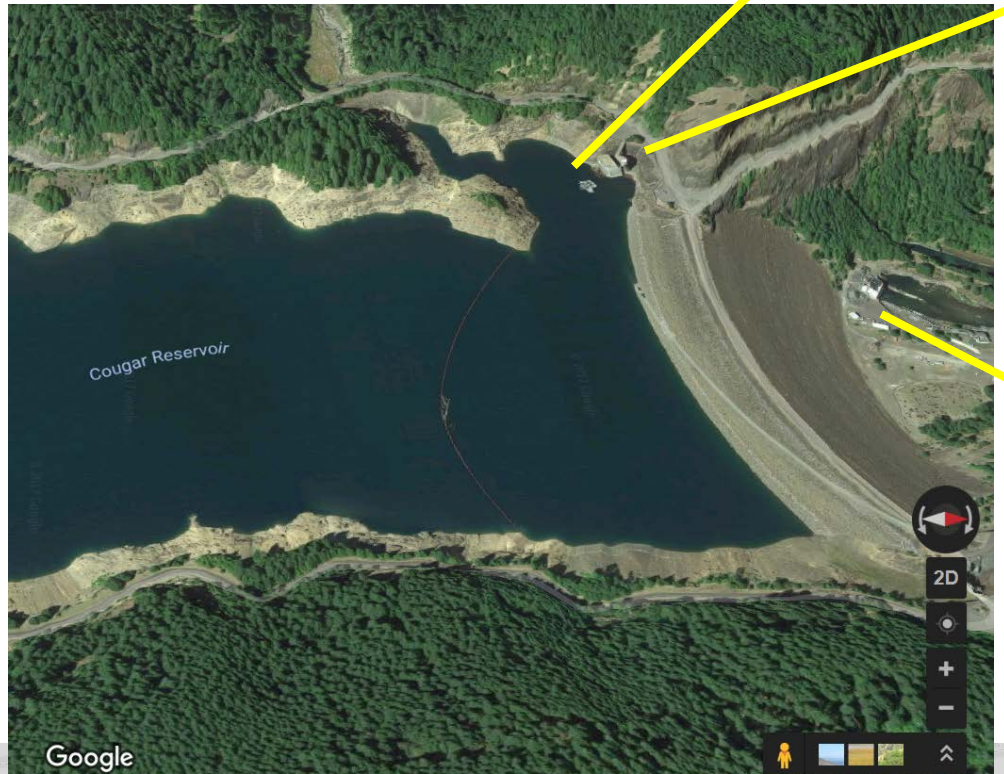
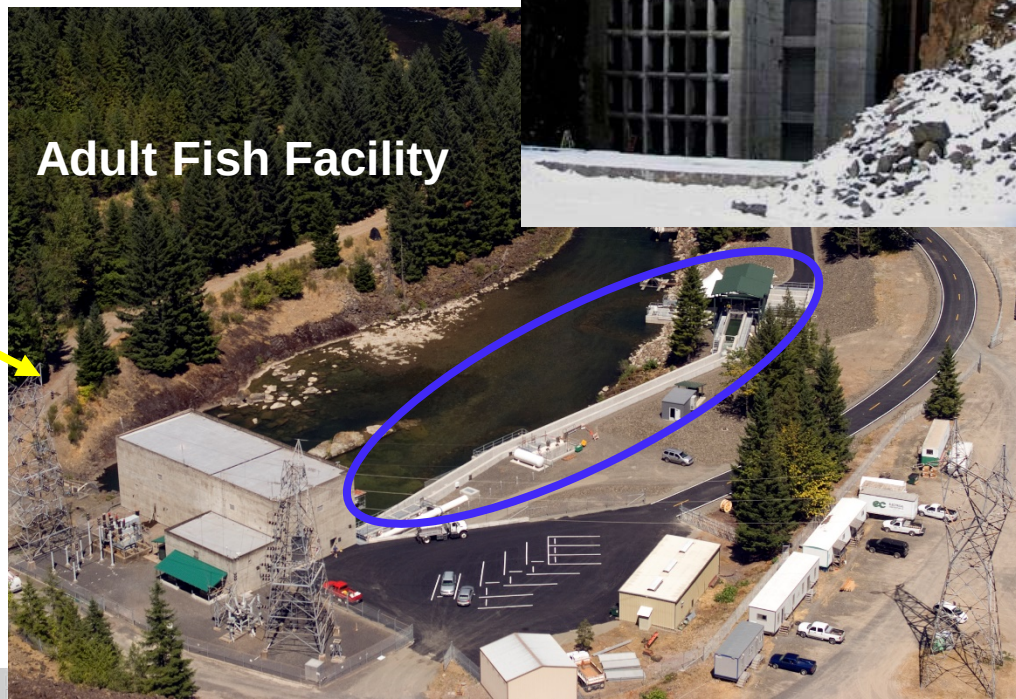
MCKENZIE SUB-BASIN

Fish Passage *Program Highlights*

- New Temperature Tower, 2005
- New adult fish facility, 2010
- Operational spill for juveniles, 2011
- Research juvenile collector (PFFC), 2012





MCKENZIE SUB-BASIN

Fish Passage *Program Highlights*

Chinook salmon adult trap and haul at Cougar Dam

- Low pre-spawn mortality
- Successful juvenile production

Chinook salmon juvenile passage at Cougar Dam

- Substantial improvement needed (cohort replacement rate <0.4)
- At-dam surface collector in design *(Fielding presentation, day 1)*
- Copepods may constrain juvenile passage survival *(Herron presentation, day 1)*

Bull Trout

- Adults and sub-adults that pass downstream from Cougar Reservoir are being collected and safely transported upstream *(Zymonas presentation, day 2)*
- Habitat and population connectivity will be further improved with downstream passage improvements in design

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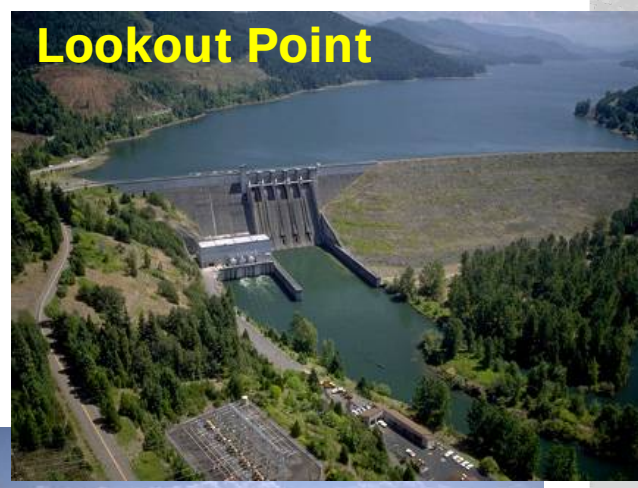
MIDDLE FORK SUB-BASIN *(day 3 presentations)*

- Conditions in the MF pose the most fish passage challenges
  a) High Chinook salmon pre-spawn mortality (92% in Hills Creek, 2014)
  b) Challenging juvenile fish passage conditions (multiple large reservoirs and dams)

- Middle Fork Research Plan, 2017

  Key questions

  a) Can survival across life stages be sufficiently improved to support a sustainable spring Chinook Salmon population above Lookout Point Dam?
  b) Which downstream fish passage strategy is likely best for population viability?
     - at-dam structural passage
     - head-of-reservoir or in-tributary collection and bypass
     - alternative project operations
     - combination



FALL CREEK - MIDDLE FORK SUB-BASIN

Fish Passage *Program Highlights*

Adult trap and haul

- Pre-spawn mortality levels vary
- New adult facility in construction, will start operating in 2018

Juvenile dam passage

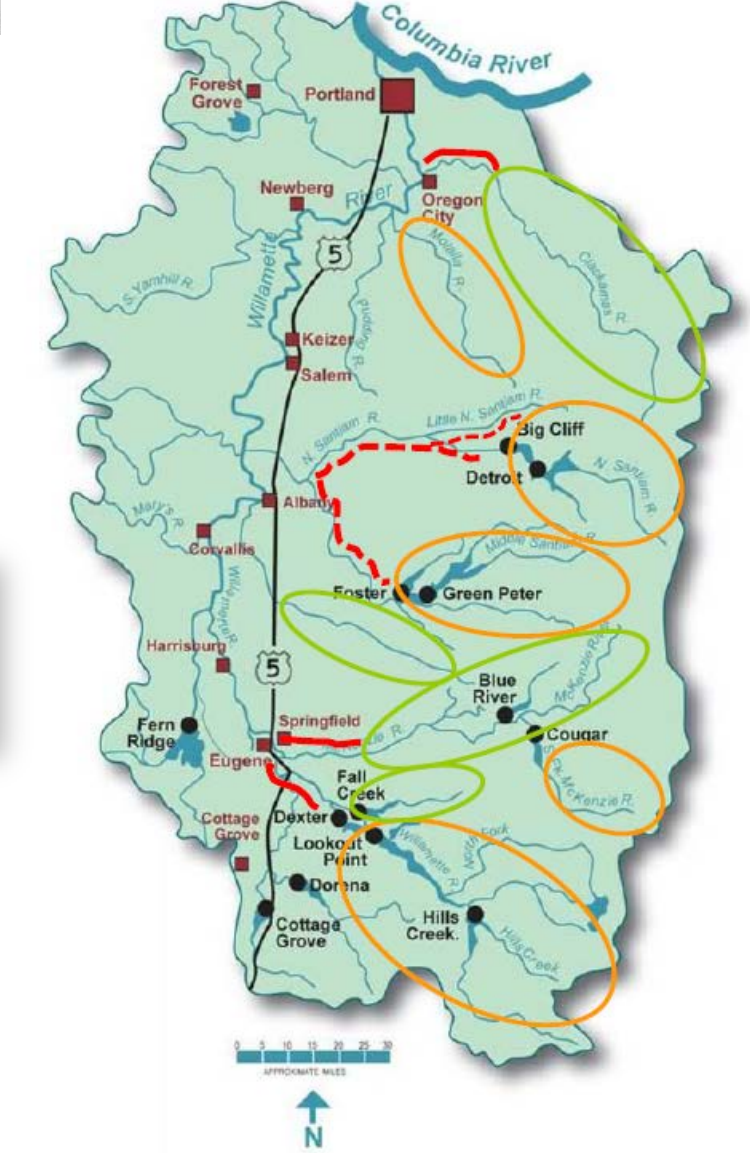
- Downstream passage via reservoir drawdown since 2011

Only wild (unmarked) Chinook released upstream since 2009

STATUS & PLANS FOR REMAINING ACTIONS

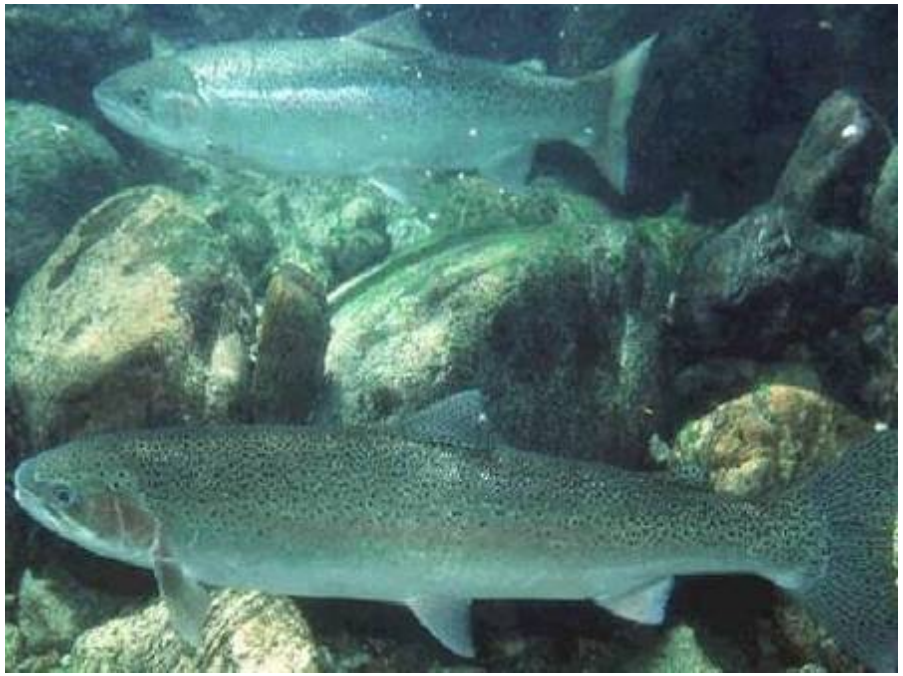
Green = Implemented Blue = Interim Ops / Using Existing Facility

	North Santiam	South Santiam	McKenzie	Middle Fork	
				Mainstem	Fall Creek
Upstream fish passage	Minto	Foster	Cougar	Continuing feasibility evaluations / alternative development	New adult facility 2018
Downstream fish passage	New collector 2028	New spill weir 2018	New collector 2022		Fall Creek Drawdown
Temperature	New tower 2023	NA	Cougar Tower		Operational
Streamflow & Ramping Rates					



- wild fish only (with varying degrees of success)
- reintroduction needed into historically productive habitat
- mitigation hatchery program area (long term). Natural production not critical as upstream areas for meeting recovery goals.
- mitigation hatchery program area (long term), but significant natural production likely needed in this area to meet population goals.

THANK YOU TO ALL OF OUR PARTNERS!!



…..And many more!

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