USACE Willamette Valley Project

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Portland District

NW Hydro Operators Forum

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U.S.ARMY

US Army Corps of Engineers
BUILDING STRONG®

Overview

- Introduction
- History
- Authorities & Benefits
- Water Management
- Current Challenges
- Questions

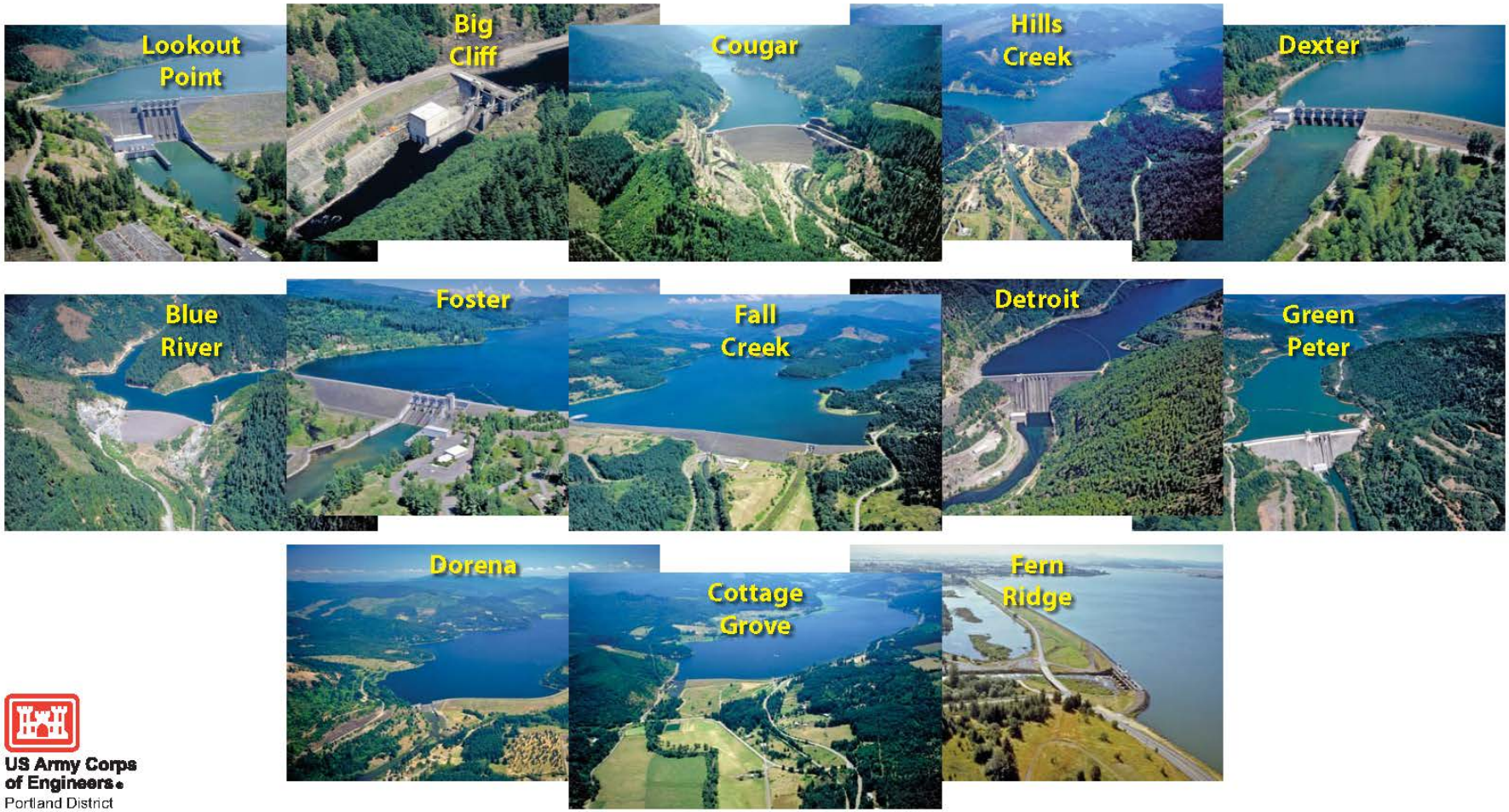
The Willamette Basin

US Army Corps of Engineers ®
Portland District

General

- Matrixed O&M Organization – main office in Eugene
- Corporate Board & Senior Leadership in Portland District, and at Division and HQUSACE
- Remotely operated – 3 control centers (Lookout Point, Foster, Detroit)
- O&M roughly 50% direct funded from BPA, remainder from Federal appropriations
- Mission is distinct from other FCRPS facilities

Willamette Valley Project: 13 multi-purpose dams



US Army Corps of Engineers
Portland District

1894 flood, downtown Portland, Willamette River

PORTLAND DISTRICT
BUILDING STRONG®

History

- **1936**- Congress passed Flood Control Act authorizing Corps to survey flood problems in Willamette Basin

- **1938**- Flood Control Act provided for first seven dams and storage reservoirs

History

- **1940**- Corps began construction of Fern Ridge and Cottage Grove dams
- **1950** and **1962** Flood Control Acts authorized additional structures
- **1969**- 13th dam was completed at Blue River

Fern Ridge Dam construction 1940

Authorized Purposes

- Flood risk management
- Hydropower
- Navigation
- Water quality
- Irrigation
- Municipal & industrial water supply
- Recreation
- Fish & wildlife

Flood Risk Management

- Dams prevented > $22.4 billion in flood damages to the Willamette Valley to date (about $900 million annually)

- Total project controls 27% of the runoff area in the Willamette River Basin at Portland

Spilling water at LOP Dam

Hydropower

- 8 Corps hydropower plants & 1 FERC licensed plant at Dorena
- Corps owned, 16 power generating units with 458 Megawatt capacity
- > 1.5 million Megawatt hours produced annually at a market value of ~ $70 M

Big Cliff Dam & Powerhouse

Navigation/Water Quality

- Water once stored for navigation - now used for water quality benefits
- Clean, cool water from reservoirs also improves conditions for fish
- Minimum flows still required at Albany and Salem

Willamette River

Water Supply

- 60,000 acre-feet of stored water - contracted for irrigation by the BOR
- Municipal & Industrial demand will probably increase in the future
- Willamette Basin Review ongoing

Irrigated farms below Fern Ridge Dam

Fish and Wildlife

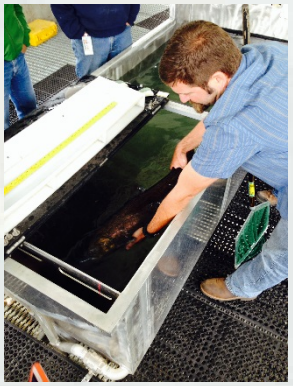
- Complex conservation and stewardship program for habitat and ESA-listed species including:
  - winter steelhead
  - spring Chinook salmon
  - Oregon chub
  - bull trout
  - Fender's blue butterflies
  - Kincaid's lupine
  - western pond turtles
  - red-legged frogs
  - bald eagles
  - migratory songbirds

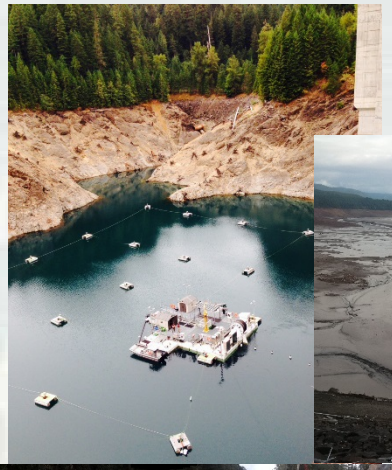
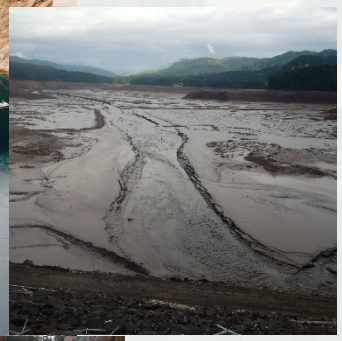




Fisheries Facilities

- Willamette Temperature Control Tower
- Cougar Adult Fish Collection Facility
- Cougar Portable Floating Fish Collector
- Fall Creek Fish Facility
- Minto Fish Collection Facility
- Foster Fish Collection Facility
- Dexter Fish Collection Facility




Recreation

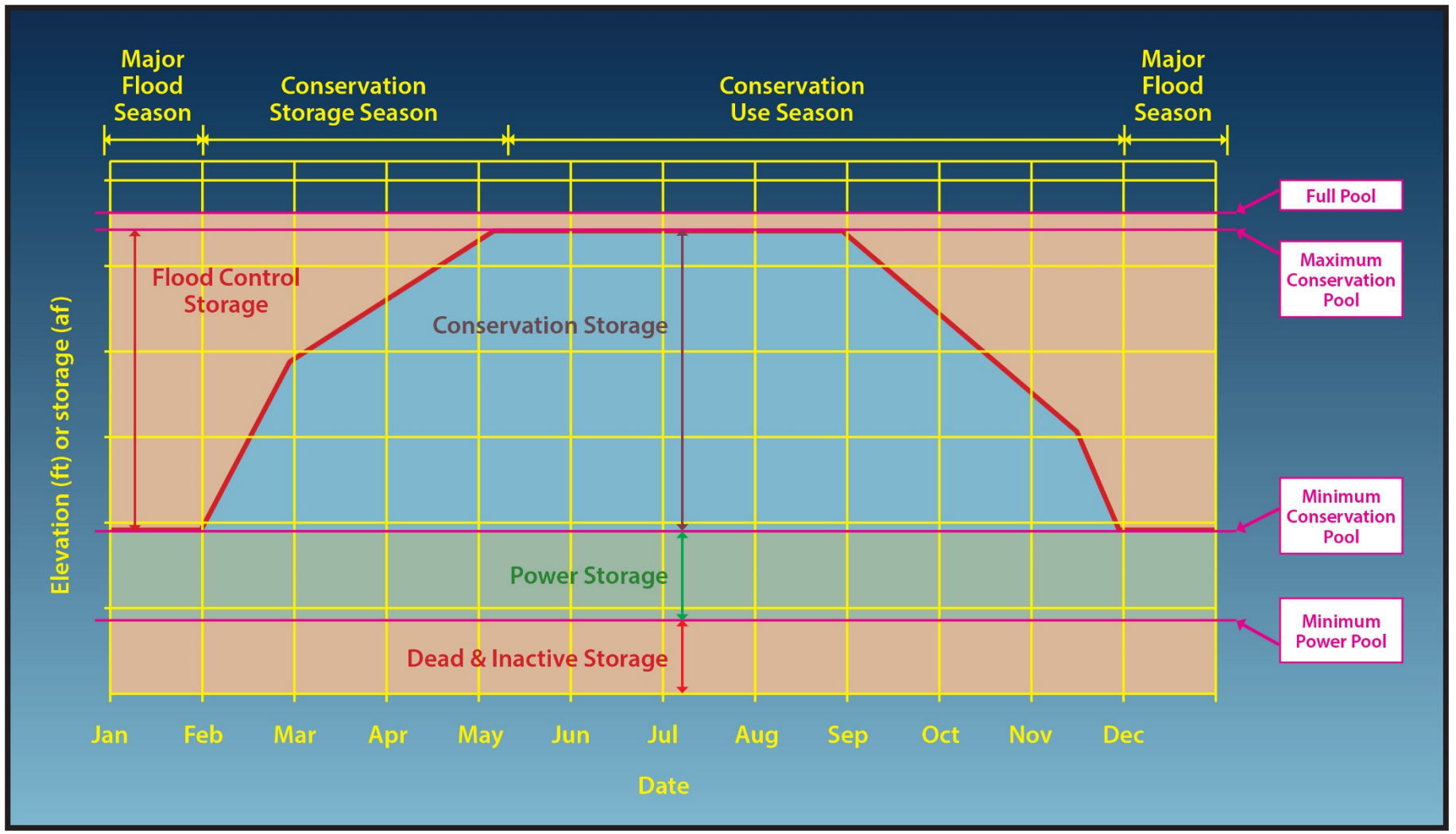
- Over 3.5 million visitors annually
- $100 million in economic benefits annually
- 4 campgrounds, 23 day-use areas, & 7 boat ramps managed by Corps
- 19 campgrounds, 32 day-use areas, 27 boat ramps, and 8 marinas managed through lease agreements

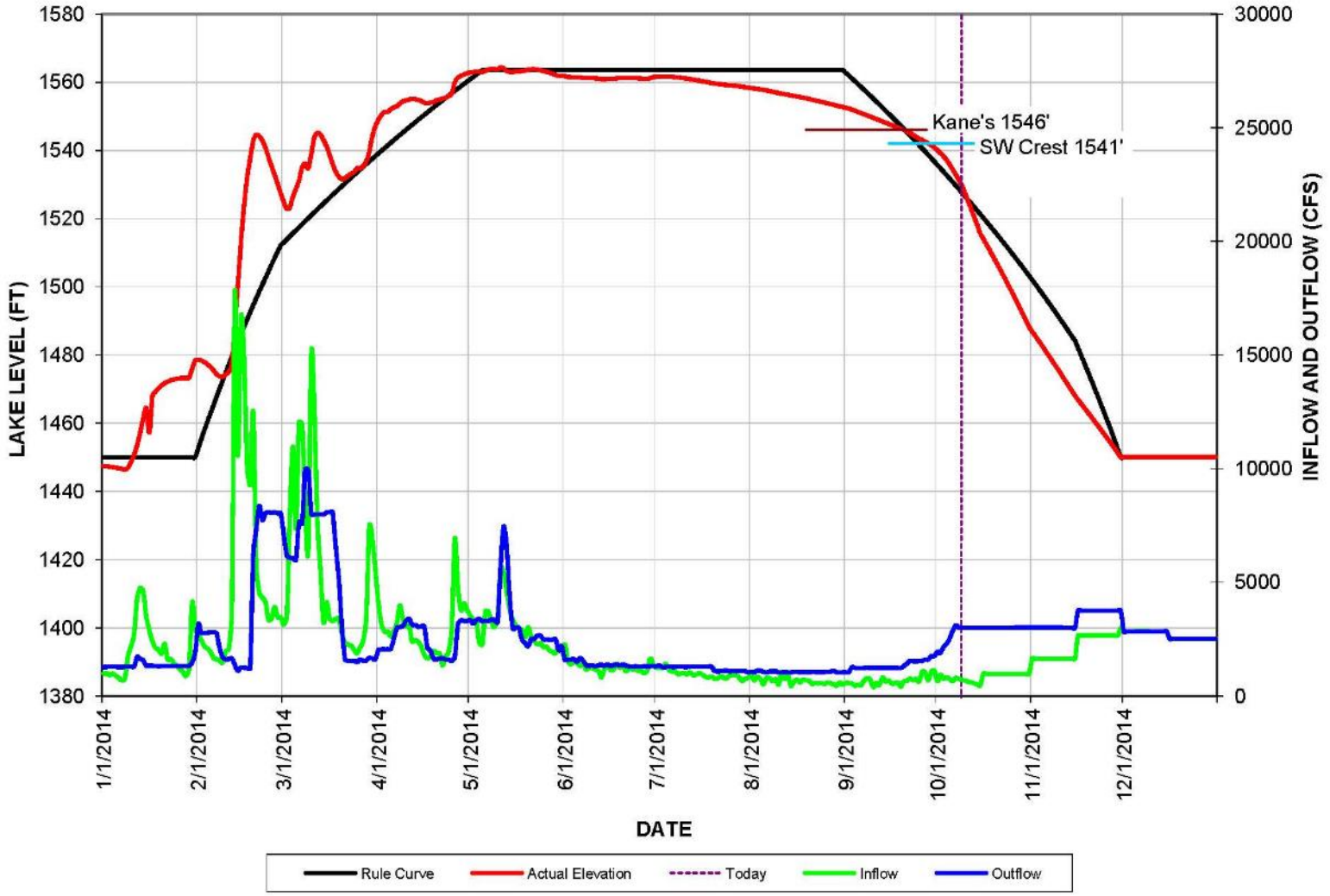
Detroit Lake

Pine Meadows CG

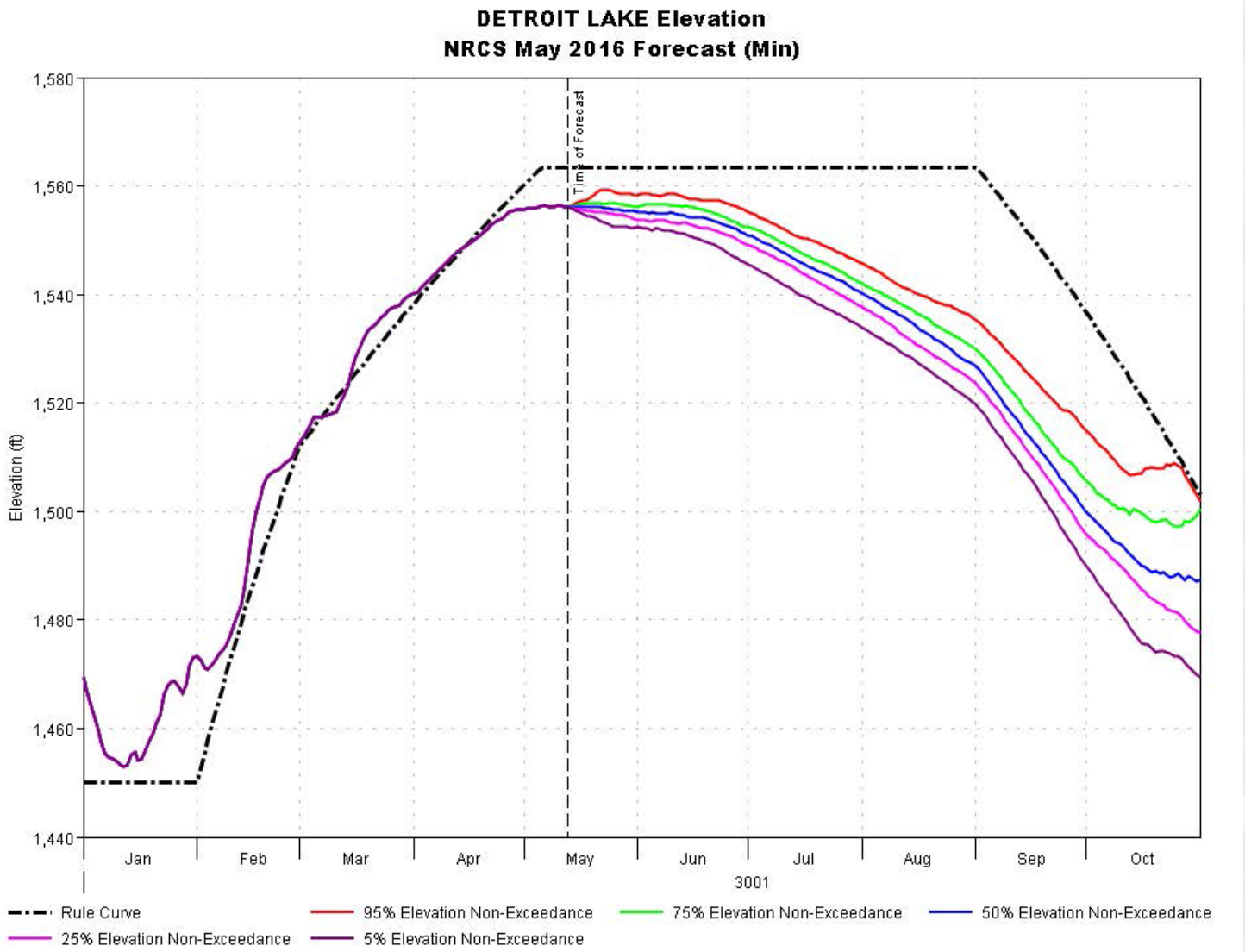
Water Management Summary

- 13 dams of the Willamette Valley are operated as a single system
- Balance between competing authorized purposes, seasonal demands
- Goals are compliance, optimization & collaboration with many


Major Flood Season
Conservation Storage Season
Conservation Use Season
Major Flood Season
Full Pool
Maximum Conservation Pool
Minimum Conservation Pool
Minimum Power Pool
Flood Control Storage
Conservation Storage
Power Storage
Dead & Inactive Storage
Elevation (ft) or storage (af)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date



Detroit Reservoir- 2014


DETROIT LAKE Elevation
NRCS May 2016 Forecast (Min)
Time of Forecast
Elevation (ft)
1,580
1,560
1,540
1,520
1,500
1,480
1,460
1,440
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
3001
Rule Curve
95% Elevation Non-Exceedance
75% Elevation Non-Exceedance
50% Elevation Non-Exceedance
25% Elevation Non-Exceedance
5% Elevation Non-Exceedance

Current Issues

- Aging infrastructure/legacy design challenges
- Legacy contamination/cleanup
- ESA/Biological Opinion compliance
- Dam Safety monitoring/issues
- Physical/cyber security
- Recapitalization
- Seismic concerns
- Climate Variability

Major FRM Component Repairs

- 2008 Foster Dam inspection, subsequent findings that 42 spillway Tainter gates at nine dams needed repairs
- Risk-based priorities executed
- Strengthened steel arms & upgraded mechanical and electrical components
- RO's current assessment, repairs being planned

Spillway Gates

Portland District Spillway Gates*					
Project	*Wire Ropes*	*Gearbox Refurb*	*Electrical Controls*	*Trunnion*	*Gate Rehab Status*
Willamette Valley					
North Santiam Subbasin					
Detroit (6)	Done	P&S (6)	P&S (6)	P&S (2)	P&S complete FY17. Requesting FY18 funds for structural repairs on two gates and mechanical and electrical repairs on all six gates.
Big Cliff (3)	Done	Done	Done	Done	Completed in FY14.
South Santiam Subbasin					
Green Peter (2)	Done	Done	Done	Done	Will complete in FY16.
Foster (4)	Done	$600	$700	Done	Structural work completed in FY10.
McKenzie River Subbasin					
Cougar (2)	FY17 (1) / FY18 (1)	FY17 (1) / FY18 (1)	FY17 (1) / FY18 (1)	FY17 (1) / FY18 (1)	Award one gate at the end of FY16. Will award second gate in FY17 if funds are available.
Blue River (2)	FY17 (1) / FY18 (1)	FY17 (1) / FY18 (1)	FY17 (1) / FY18 (1)	FY17 (1) / FY18 (1)	Awarded both gates. Will begin construction at end of FY16.
Middle Fork Willamette Subbasin					
Hills Creek (3)	Done	FY16 (1) / FY17 (1) / FY18 (1)	FY16 (1) / FY17 (1) / FY18 (1)	FY16 (1) / FY17 (1) / FY18 (1)	Awarded one gate and mechanical/electrical on second gate. Award structural for second gate and mechanical/electrical for third gate in FY17. Requesting FY18 funds to complete third gate structural.
Lookout Pt (5)	Done	FY16 (1) / FY17 (1)	FY16 (1) / FY17 (1)	FY16 (1) / FY17 (1)	All gates awarded. Three gates completed. Remaining gates will be complete in FY17.
Dexter (7)	Done	Done	Done	Done	Completed in FY14.
Fall Creek (2)	Done	Done	Done	Done	Completed in FY16.
Coast Fork Willamette and Long Tom Subbasins					
Fern Ridge(6)	$1,500	$2,500	$2,000	Not needed	
Rogue Valley					
Applegate (2)	Done	Done	Done	Not needed	Mechanical/electrical work completed in FY10.
Lost Creek (3)	$750	$1,000	$1,000	$500	
Columbia River					
Bonneville (20)	$2,500	$6,700	$7,500	Not needed	Major Rehabilitation Report underway.
The Dalles (23)	$2,900	$7,700	$8,500	$4,000	Requesting funds in FY18 for Major Rehab Report.
John Day (20)	Not needed	Not needed	Not needed	$10,000	Need to replace the failing Trunnion bushings.
Totals (110)	*$7,650*	*$18,500*	*$19,700*	*$14,500*	

(#) represents number of gates.
Costs are estimated, in $K.
*As of April 5, 2016.

Planned/Not Started	Completed
In Design	Not needed
Awarded	FY - Construction Year

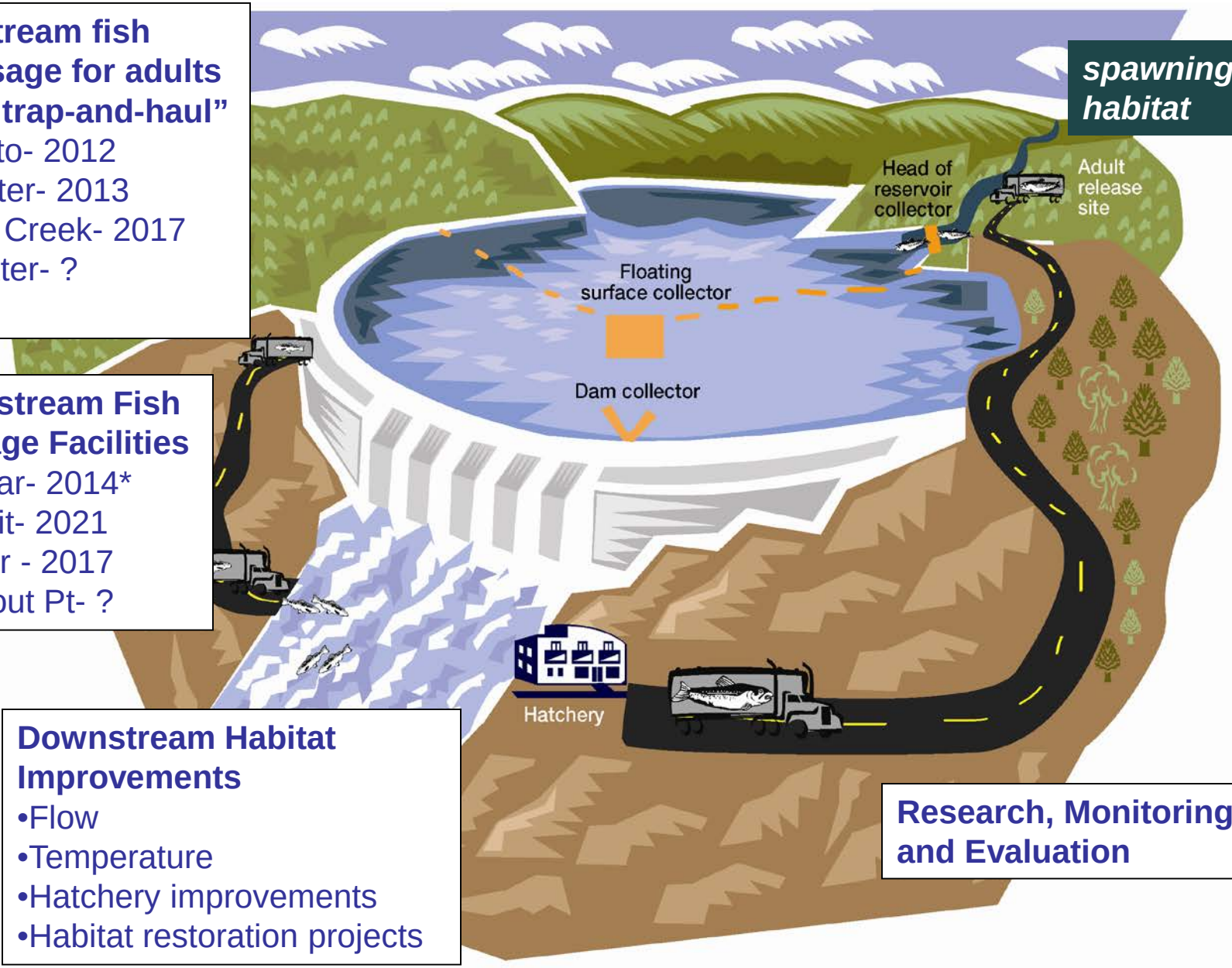
Legacy Contamination

Blue River	High metals, primarily iron
Big Cliff/Detroit	Maintenance Area: Metals Big Cliff Drawdown: TPHs, Metals, PCBs
Dexter	SVOCs, TAL Metals, PCBs
Dorena	Solid Waste
Cougar	Lead
Fall Creek	Lead
Green Peter	Lead, Manganese, Solid Waste

Willamette BiOp Actions: A life-cycle approach

Upstream fish passage for adults via "trap-and-haul"
- Minto- 2012
- Foster- 2013
- Fall Creek- 2017
- Dexter- ?

Downstream Fish Passage Facilities
- Cougar- 2014*
- Detroit- 2021
- Foster - 2017
- Lookout Pt- ?



Downstream Habitat Improvements
- Flow
- Temperature
- Hatchery improvements
- Habitat restoration projects

Research, Monitoring, and Evaluation

Status Report (April 2016)

	North Santiam (CHK & STH)	South Santiam (CHK & STH)	McKenzie (CHK)	Middle Fork (C) Mainstem	Middle Fork (C) Fall Creek
Upstream fish passage	**Minto**	**Foster**	**Cougar**	**Dexter****	**Fall Creek – FY16**
Downstream fish passage	**Detroit**	**Spill Weir at Foster**	**Cougar**	**Lookout Point****	**Fall Creek - Drawdown**
Temperature	**Detroit (operational)**	NA	**Cougar Tower**	NA	NA
Streamflow & Ramping Rates					

Green = Completed Yellow = Partially Completed Red = To Do

** More RME Needed

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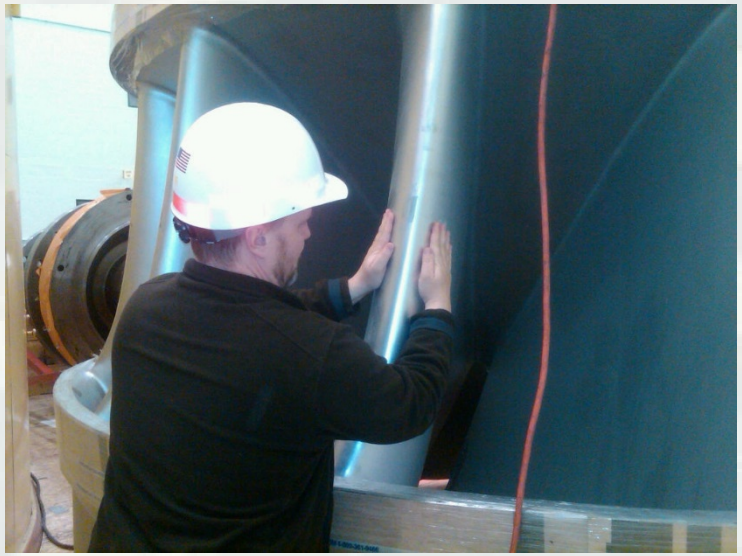
Physical/Cyber Security

- Variable security standards applied
- Bandwidth constraints
- Control system replacement – move to “enterprise system”
- Critical state and local enforcement support

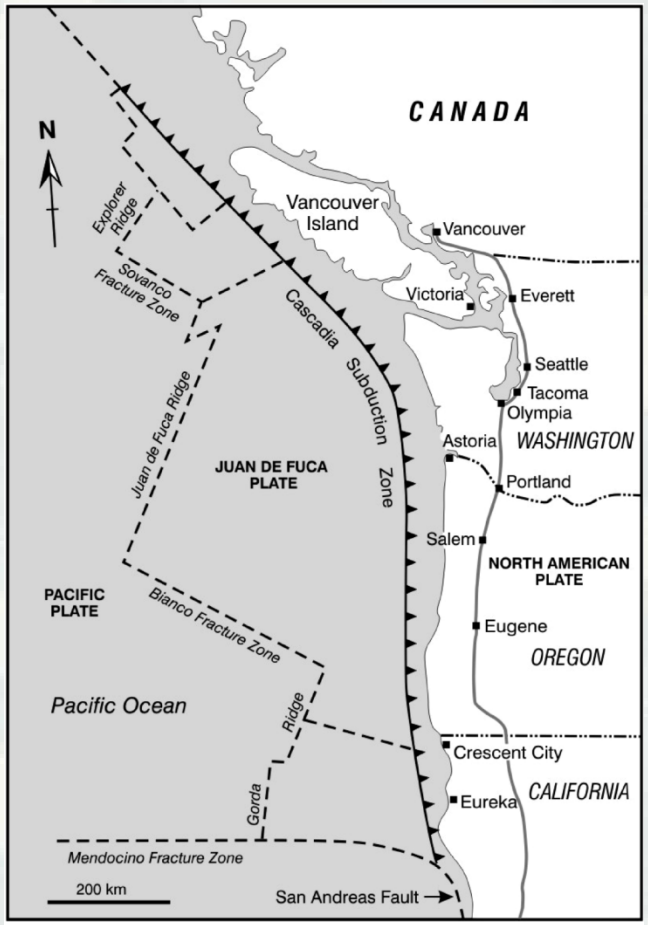
Recapitalization

- 2028 – FCRPS Milestone
- Small plants – rebuilding as we operate
- Mindset change to “Resource Provider”
- Planning, resource accountability – more essential for all
- Human capital often the constraint



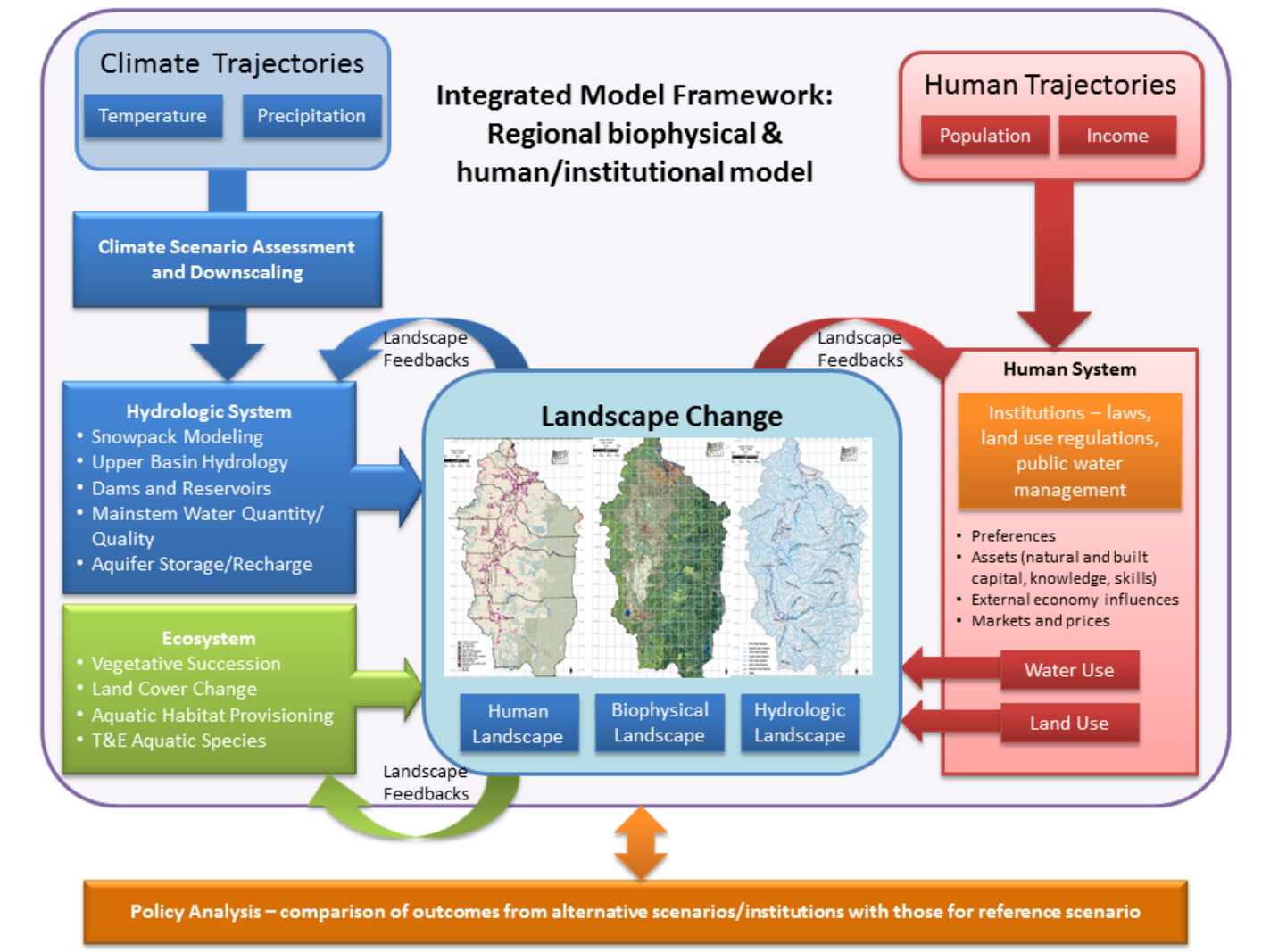
Seismic Concerns

- Dams may get damaged, but total failure is unlikely
- Dams were built to seismic standards of the day
- Dams being re-evaluated for seismic hazard from Cascadia Subduction Zone
- Downriver residents should be prepared for any dam safety emergency



Source: Adapted from the Cascadia Region Earthquake Workgroup (2005)

Climate Variability



For More Information:

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- About the Corps, Portland District: www.nwp.usace.army.mil
- Willamette Valley Project Corps Office: 541.684.4300
- Portland District Public Affairs Office: 503.808.4510

Portland District Videos:

How Dams Manage Water

https://www.dvidshub.net/video/368989/dams-manage-water#.Vx8DG6pf3IX

Willamette Valley Water Management System

https://www.dvidshub.net/video/368986/willamette-valley-system-water-management#.Vx8DoKpf3IX