

Chehalis Basin Strategy: Reducing Flood Damage and Restoring Aquatic Species

Public Presentations

October 1 and 2, 2014



History of Flood Damage



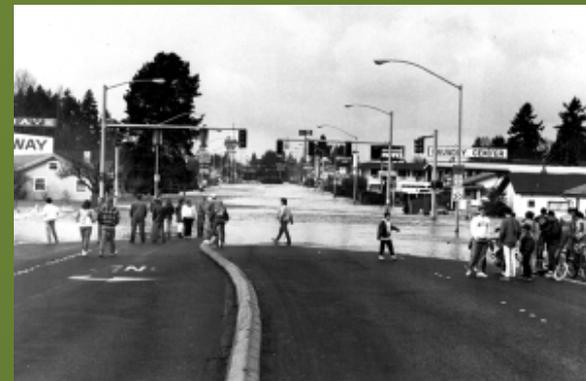
March 1910



December 1933



January 1974



November 1990

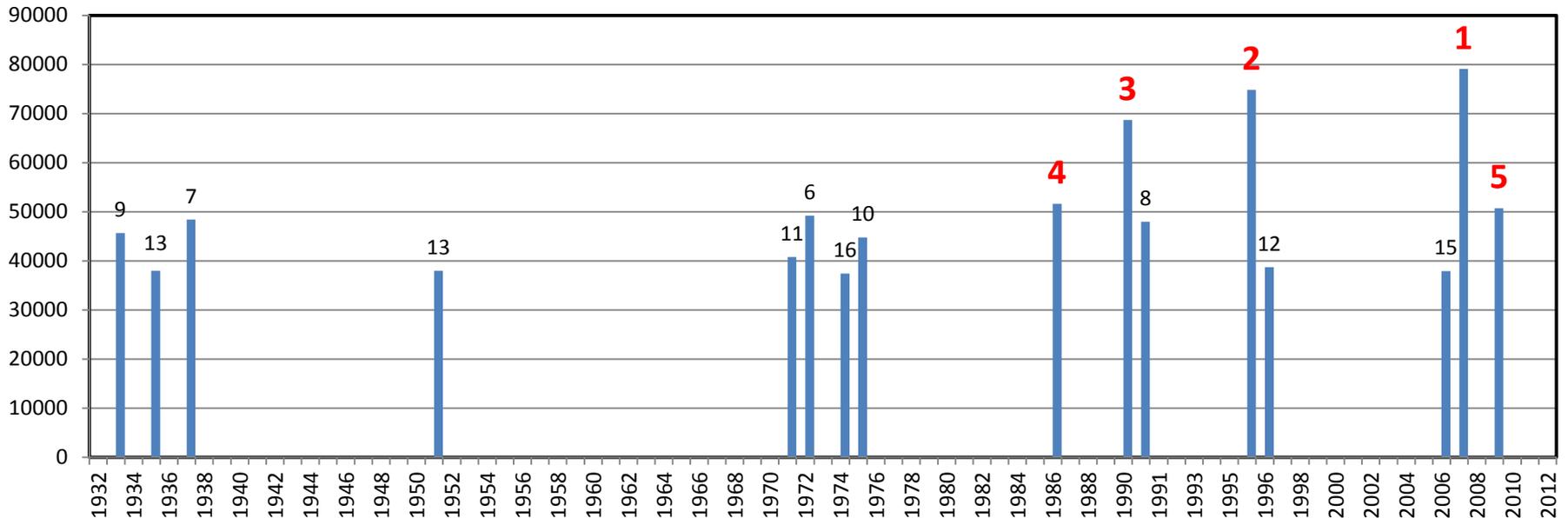
Ranked High-Flow Events:

Chehalis River Flow Rates near Grand Mound (cubic ft./sec.)

Interstate 5 closed 1990, 1996, 2007, 2009

Five largest events have all occurred since 1986 -- Frequent floods are getting worse and damage is increasing . . .

100 year flood estimate increased 33% in last 30 years.



Salmon Declines

- Salmon populations are 15-25% of historic levels.



Upper Chehalis (5/31/2010)
JAMES E. WILCOX / WILD GAME FISH
CONSERVATION INTERNATIONAL

CHEHALIS BASIN SALMON & TROUT

OCEAN PHASE		SPAWNING PHASE
 Chinook	<p>The salmonid lifecycle involves adults maturing in the ocean, migrating back to their home streams and spawning, embryos incubating, fry emerging, juveniles growing, and smolts migrating to the estuary to acclimate to saltwater and moving out into the ocean</p> <p>WHAT SALMON NEED IN FRESHWATER HABITAT</p> <p>Cool, clean water</p> <p>Appropriate water depth, quantity and flow velocities</p> <p>Upland and riparian (stream bank) vegetation to stabilize soil & provide shade</p> <p>Clean gravel for spawning and egg-rearing</p> <p>Large woody debris to provide resting and hiding places</p> <p>Adequate food</p> <p>Varied channel forms</p>	 Chinook Chinook are characterized by their silvery sides and dark spots. Average size: 26-37" in 12 lbs, up to 57" for full-grown fish, weigh 40+ pounds
 Coho		 Coho Chinook-like but smaller. Average size: 20-27" in 12 lbs, up to 30" for full-grown fish
 Chum		 Chum Chinook-like but smaller. Average size: 20-27" in 12 lbs, up to 30" for full-grown fish
 Steelhead		 Steelhead Chinook-like but smaller. Average size: 20-27" in 12 lbs, up to 30" for full-grown fish
 Fall-run		 Fall-run Chinook-like but smaller. Average size: 20-27" in 12 lbs, up to 30" for full-grown fish
 Cutthroat		 Cutthroat Chinook-like but smaller. Average size: 20-27" in 12 lbs, up to 30" for full-grown fish

www.chehalisbasinpartnership.org

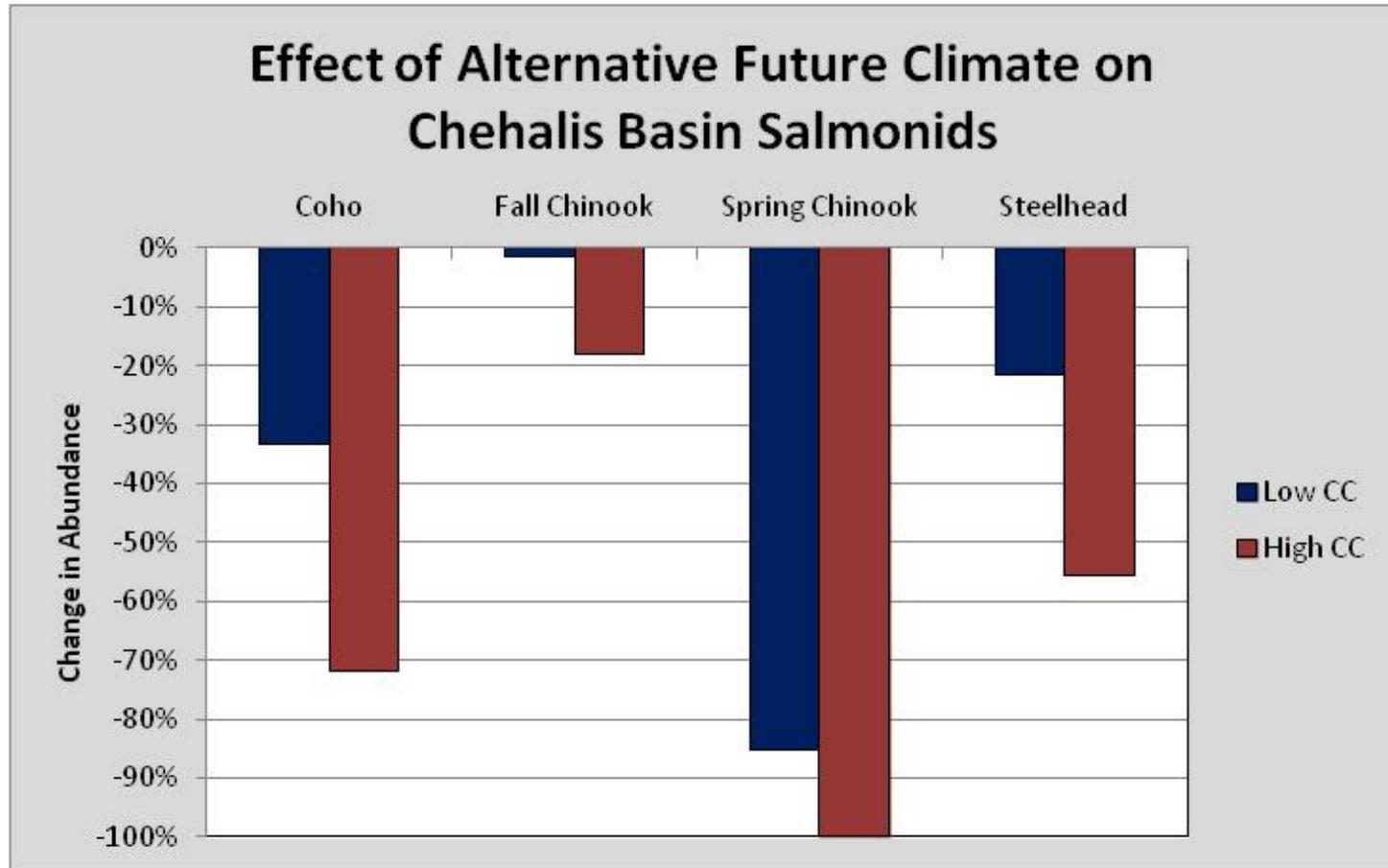
Potential Changes: Flooding and Habitat Degradation

- The amount of climate change is uncertain.
- The predicted change ranges used are an 18 to 90 percent increase in flooding.
- Drier, hotter summers, lower summer flows and higher water temperatures.

Change in 100-year Flows and Water Levels

	Baseline	With 18% Climate Change	With 90% Climate Change
Flow at Grand Mound (cfs)	75,500	91,350	162,900
Water Surface Elevation Upstream of Mellen Street (feet NAVD)	178.1	179.8	184.3

Climate Change



Changing the Long History Political Failure

- No action since 1933.
- More than 830 studies.
- Today action is happening . . .

Aquatic
Species
Surveys,
2013



Adna Levee, 2013

CHEHALIS RIVER BASIN FLOOD AUTHORITY

City of Montesano
Home of the Tree Farm
www.montesano.com

Another Chehalis Basin Flood Protection Project
www.ezview.wa.gov

Wastewater Treatment Plant Flood Prevention Dike

Schedule → February 2014 to April 2014

Budget → \$511,153

Benefit → Protecting essential public infrastructure for all Basin residents

STELLAR J
An independent member company
Parametrix

Montesano WWTTP, 2014



Airport Levee, 2014

Chehalis River Basin Flood Authority

- ▶ Grays Harbor County
- ▶ City of Aberdeen
- ▶ City of Cosmopolis
- ▶ City of Montesano
- ▶ City of Oakville
- ▶ Lewis County
- ▶ City of Centralia
- ▶ City of Chehalis
- ▶ City of Napavine
- ▶ Town of Pe Ell
- ▶ Thurston County
- ▶ Town of Bucoda



Current Projects Underway in the Chehalis Basin

GRAYS HARBOR COUNTY

1. Burger King Trail/Dike
2. Dike Bank of Wishkah North of Highway
3. Market Street Dike
4. Southside Dike/Levee Certification
5. Oxbow Lake Reconnection
6. Sickman-Ford Overflow Bridge
7. Mill Creek Dam Improvement
8. Elma-Porter Flood Mitigation
9. Satsop River Floodplain Restoration (Phase I)
10. Wishkah Road Flood Levee
11. Revetment for Montesano Road, Sewage Treatment
12. Satsop River Floodplain Restoration (Phase II)

BASIN-WIDE PROJECTS

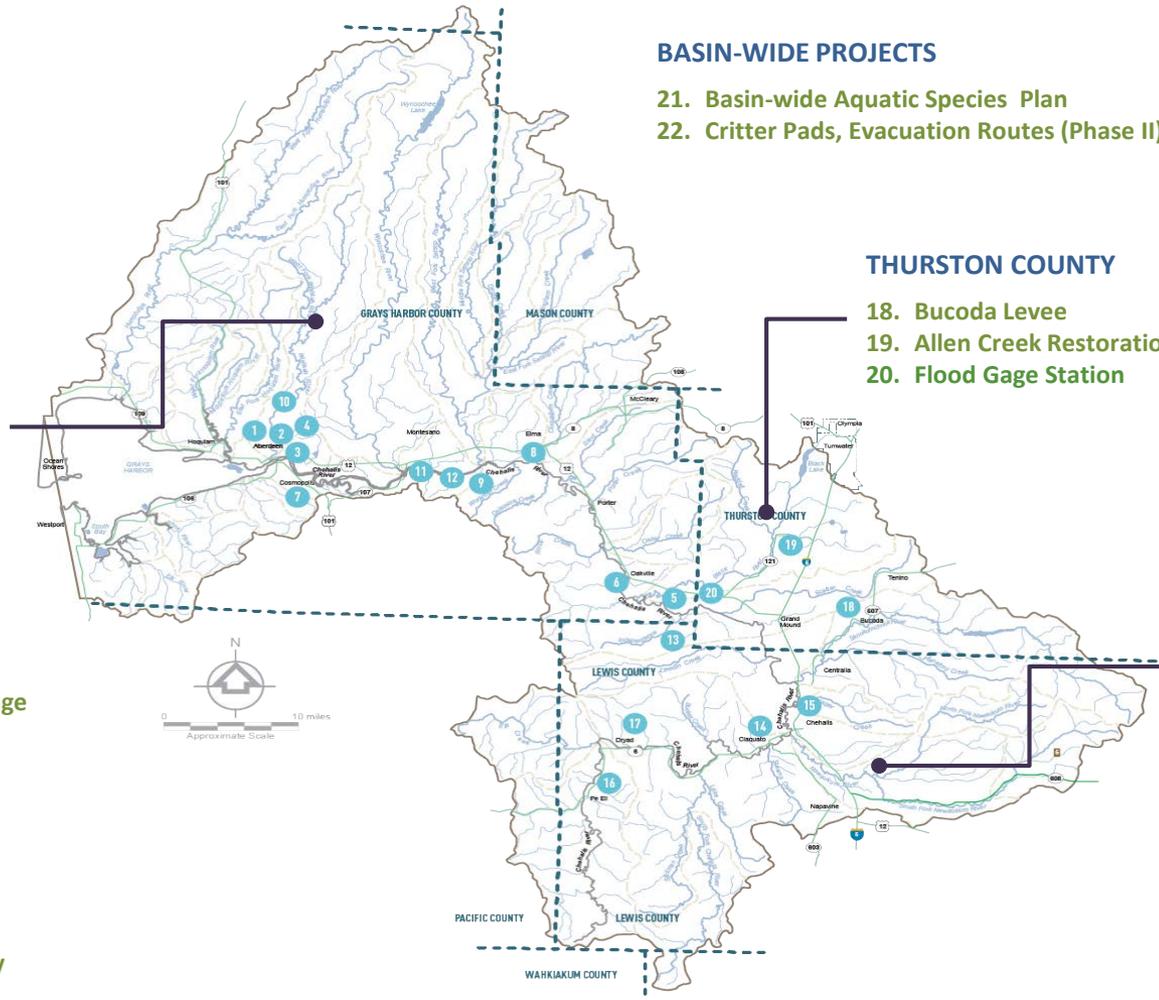
21. Basin-wide Aquatic Species Plan
22. Critter Pads, Evacuation Routes (Phase II) and Geomorphic Analysis

THURSTON COUNTY

18. Bucoda Levee
19. Allen Creek Restoration
20. Flood Gage Station

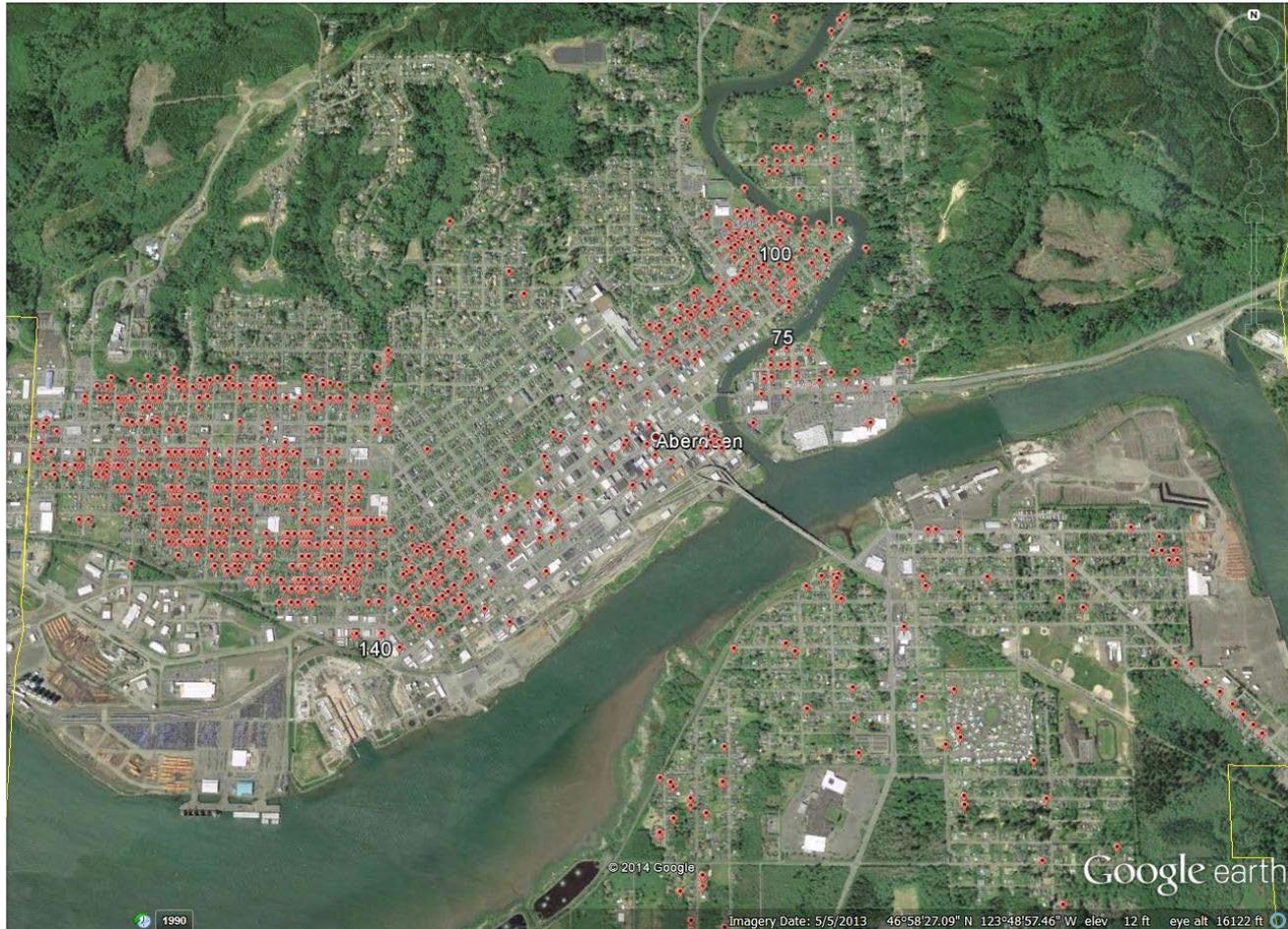
LEWIS COUNTY

13. Oxbow Reconnection at RM 78
14. Adna Levee
15. Airport Levee (Phase I)
16. Wastewater Treatment Plant Flood Prevention
17. Critter Pads, Evacuation Routes (Phase I)

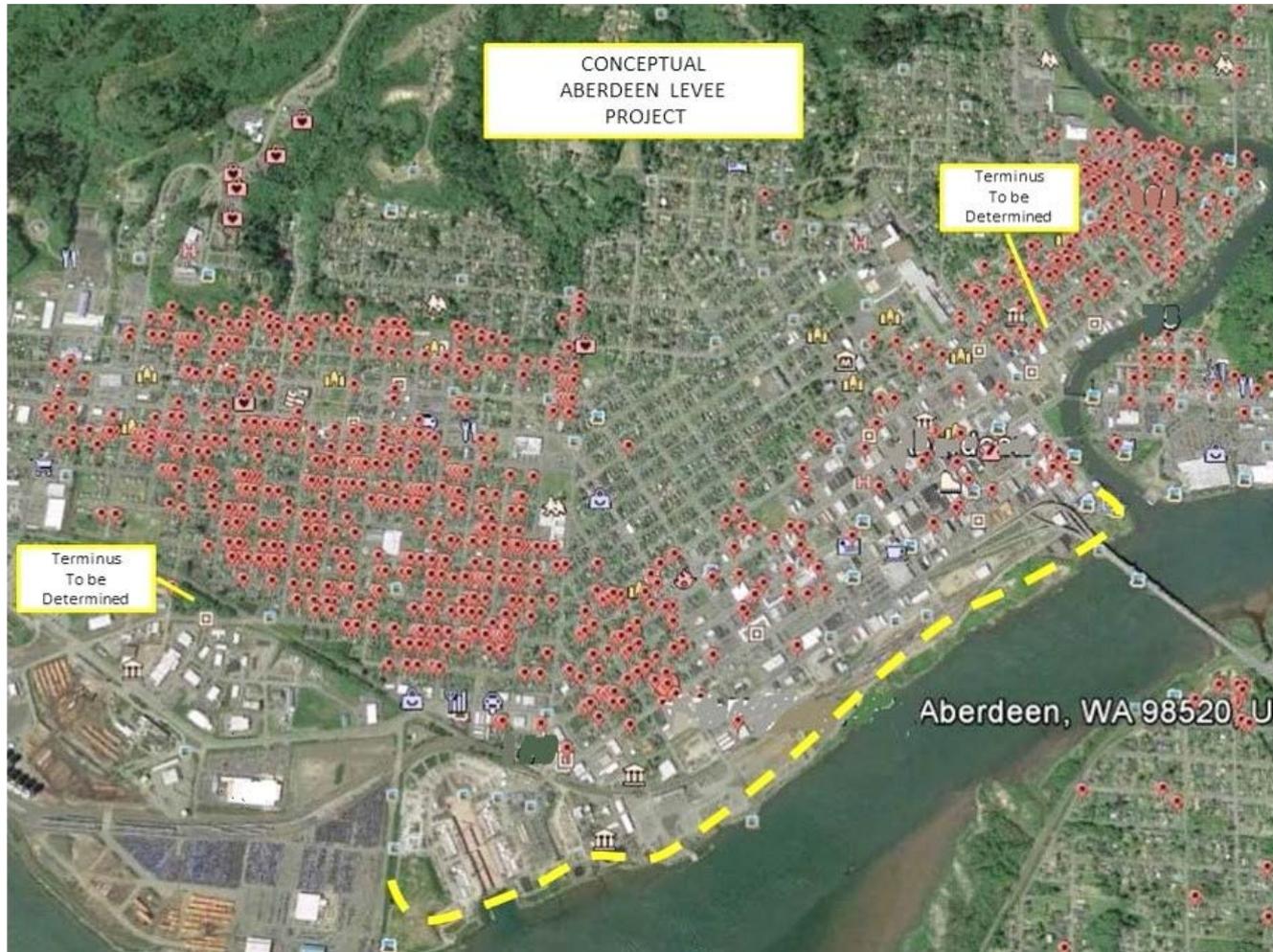


STATUS: Finished / Underway

City Properties Participating in FEMA's Flood Insurance Program



Aberdeen Northside Levee



Governor's Chehalis Basin Work Group

- Tasked by Governor to recommend long-term strategy and budget for next biennium to reduce flood damage and enhance aquatic species.
- Recommendations due mid-November.
- Members are:
 - David Burnett (Chairman Chehalis Tribe).
 - Karen Valenzuela (Thurston County Commissioner, Vice-Chair Flood Authority).
 - Vickie Raines (Mayor Cosmopolis, Chair Flood Authority).
 - J. Vander Stoep (Private Attorney, Pe Ell Alternate Flood Authority).
 - Jay Gordon (President Washington Dairy Federation and Chehalis Farmer).
 - Rob Duff (Governor's Natural Resource Advisor).
 - Keith Phillips (Governor's Energy and Environment Advisor).

Restoring Aquatic Species

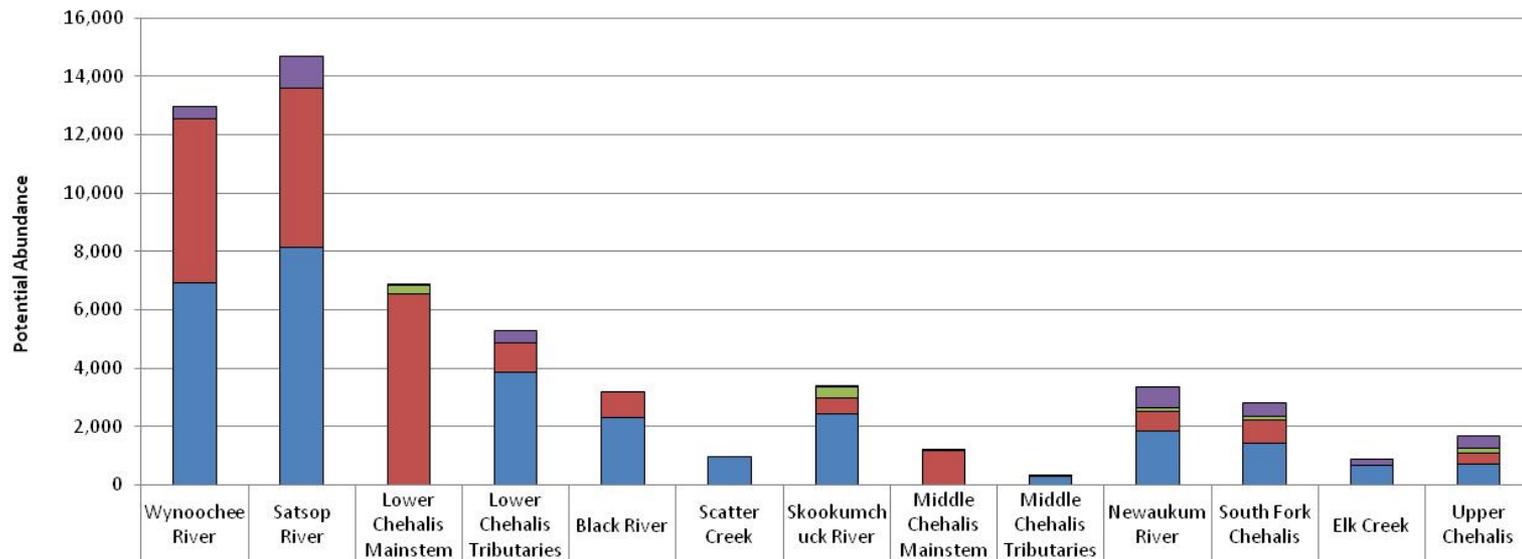


Salmon – Habitat Potential

Species	Current Spawner	Habitat Degradation
Spring Chinook Salmon	2,538	84%
Fall Chinook Salmon	24,317	47%
Coho Salmon	29,322	70%
Winter-run Steelhead	4,114	52%

Existing Salmon Habitat Potential by Sub-Population

Habitat Potential for Chehalis Basin Salmonid Populations

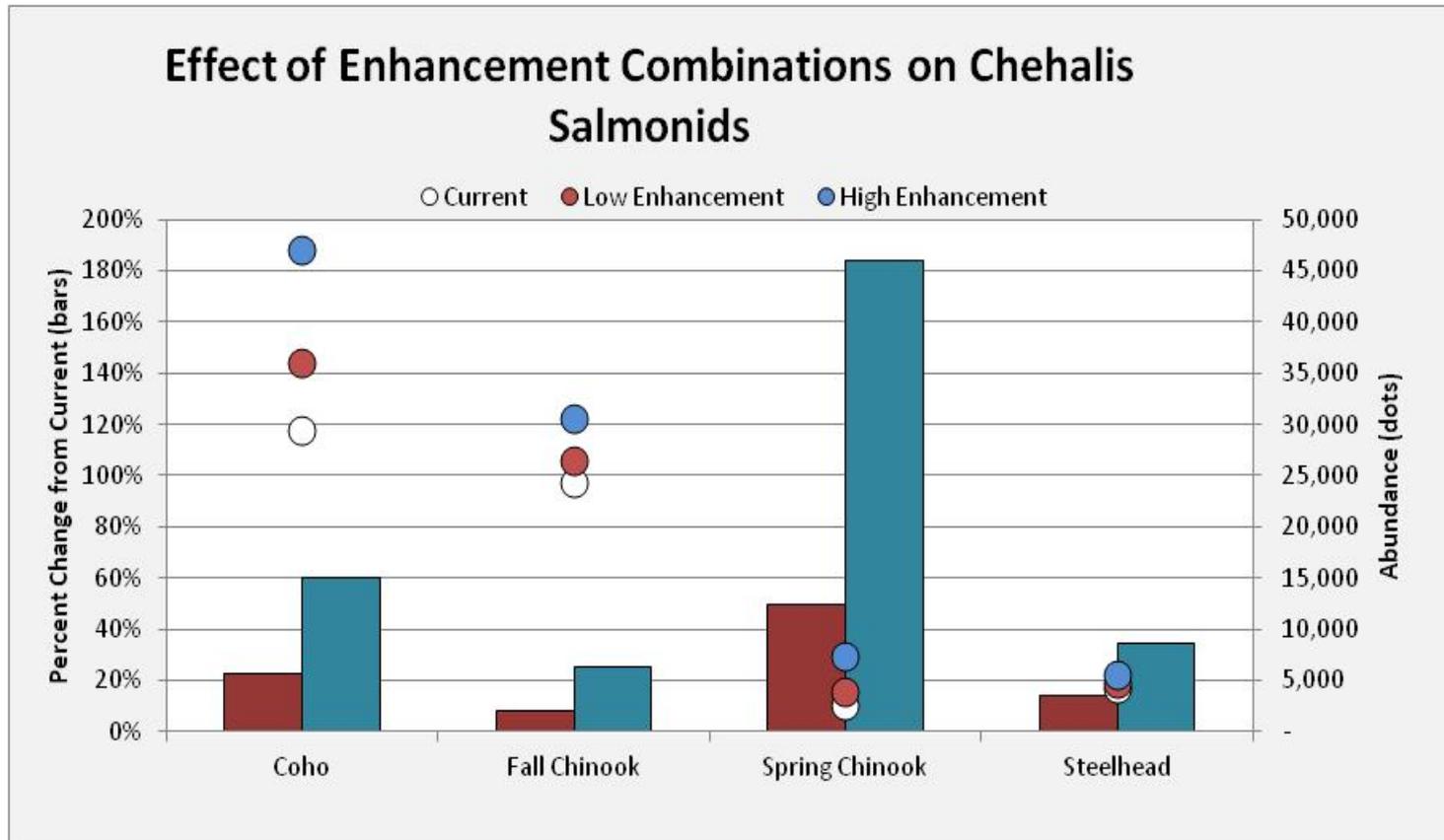


Steelhead - Current	438	1,083	42	434			57	15	12	713	424	199	447
Spring Chinook - Current			267				347	0		156	163	11	153
Fall Chinook - Current	5,618	5,460	6,563	1,010	916		581	1,186	4	661	772	23	371
Coho - Current	6,911	8,125		3,845	2,289	954	2,415	0	290	1,845	1,435	652	717

Habitat Restoration Actions

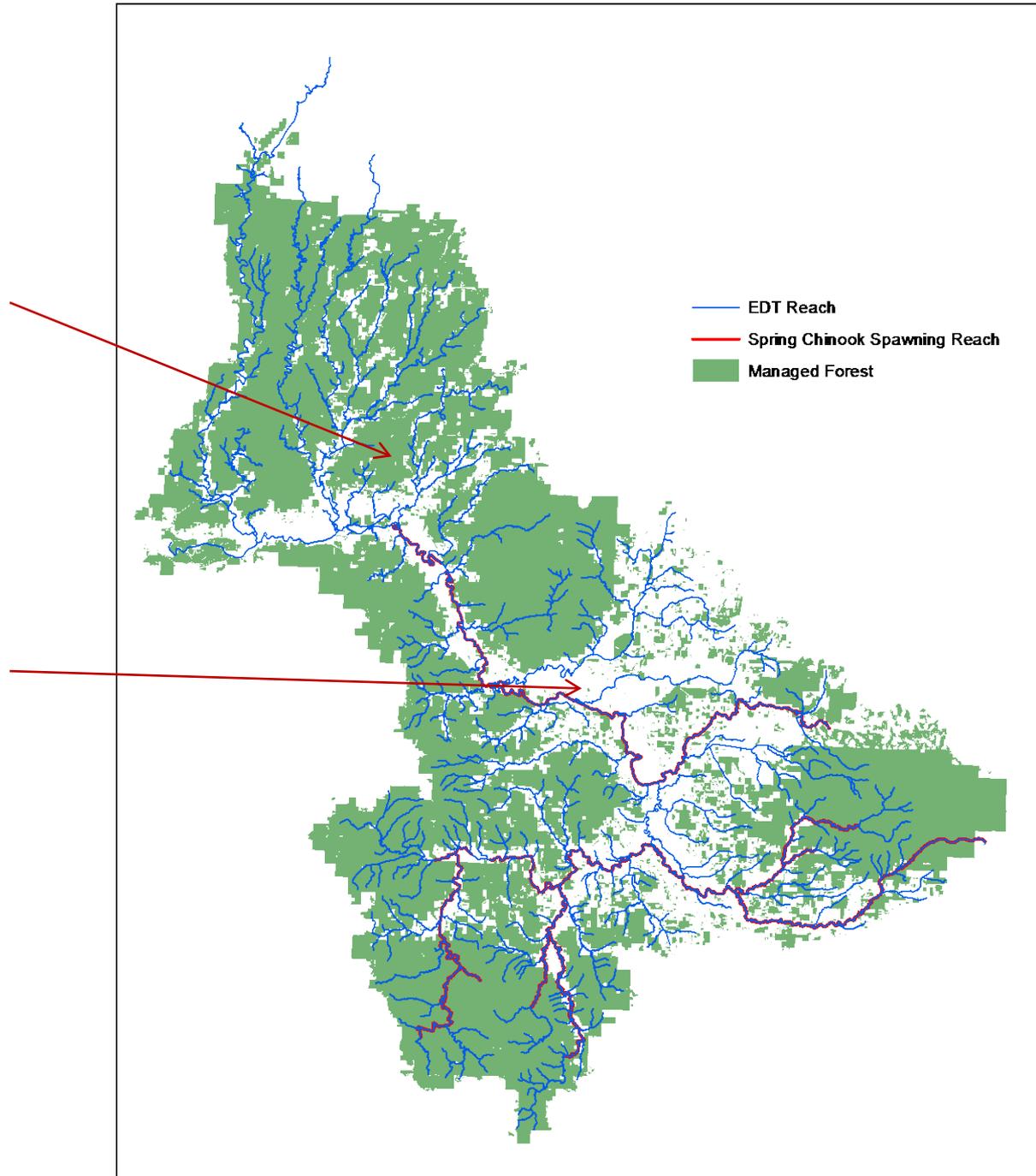
1. Remove barriers to fish passage (culverts) – benefit to coho, steelhead and fall Chinook (not spring Chinook)
2. Benefits from Forest Practice regulations – all stocks
3. Riparian enhancement to restore 50 and 70 percent of Spring Chinook spawning reaches outside of managed forests, 90 to 125 miles.
4. Two levels of effectiveness evaluated.

Results: Habitat Enhancement Combinations

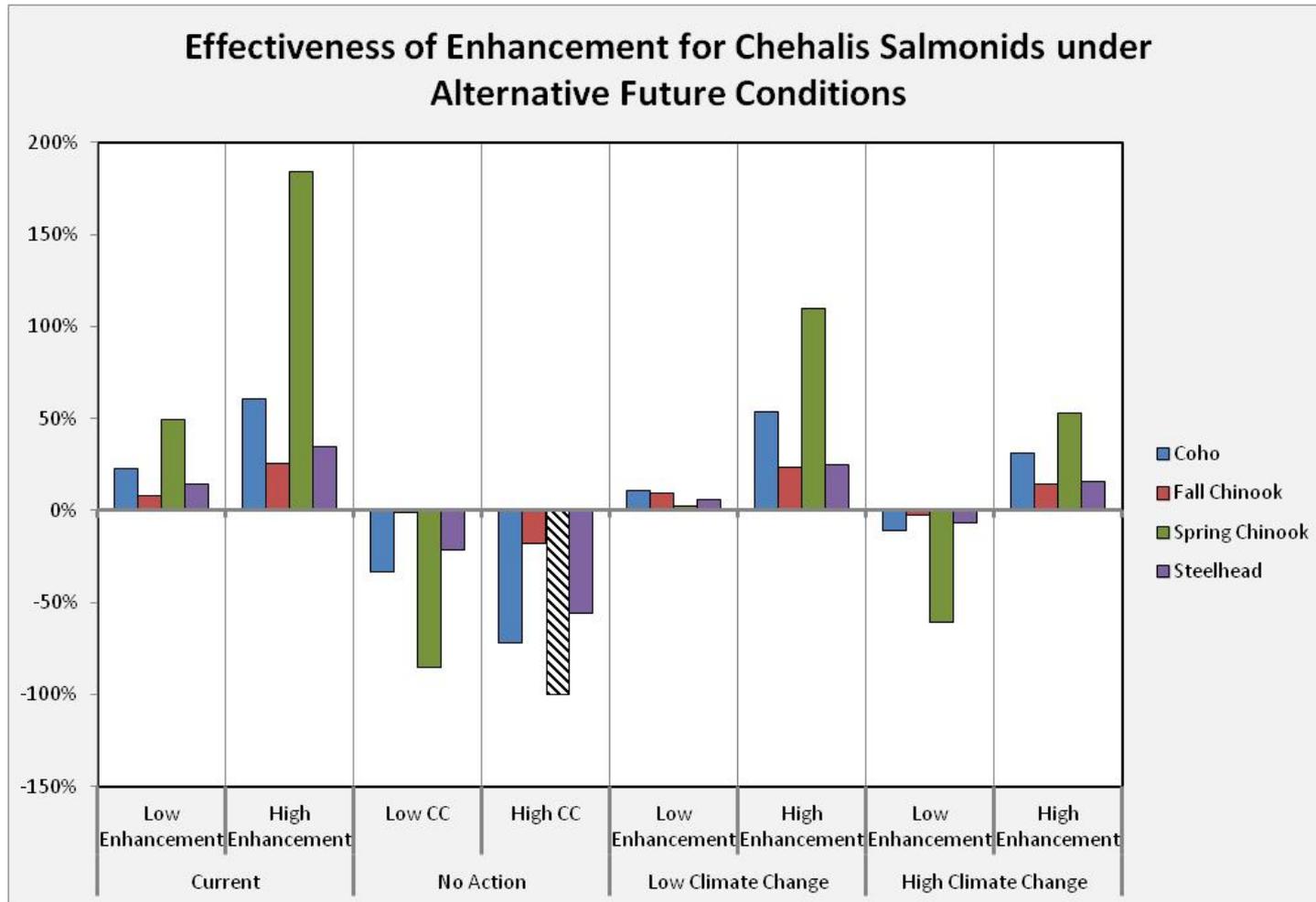


Bars: % change in abundance relative to current condition (left axis)
Dots: Abundance of fish (right axis)

Enhancement
Can
Increase
Salmon
Populations
By
50%



Enhancement + Climate Change (Basin Scale)



Reducing Flood Damage



Past Analyses

- Levees
- Dredging
- Multiple Storage Options
- Relocation
- Floodplain reconnection
- By-pass channels

Reducing Flood Damage - Feasibility Analyses

- Water Retention Feasibility.
- Protection of I-5.
- Floodproofing and Small Projects
- Land Use Management.

Water Retention Structure Options Selected for Evaluation

- Flood Retention RCC* Dam (FR-RCC)
- Multipurpose RCC Dam (MP-RCC)
- Multipurpose Rockfill Dam (MP-Rockfill)

*Roller Compacted Concrete (RCC)

Flood Retention Only Reservoir

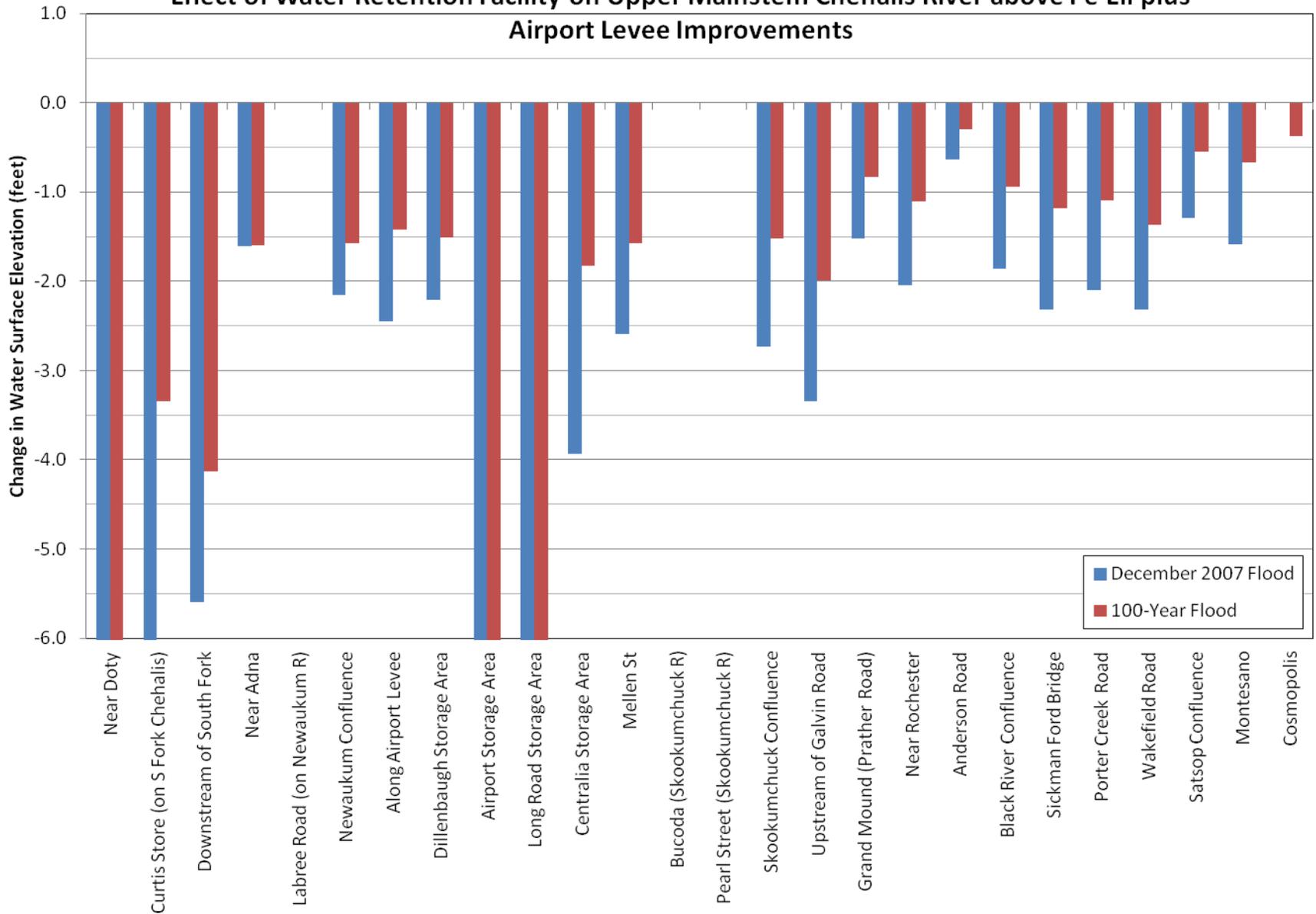


- Dam Height = 227'
- Spillway Crest Elev. = 628
- Dam Crest Elev. = 654
- Area = 860 Acres
- River Inundation Length = 6.8 mi
- Maximum Storage = 65K acre/feet

Objectives for Dam Operation

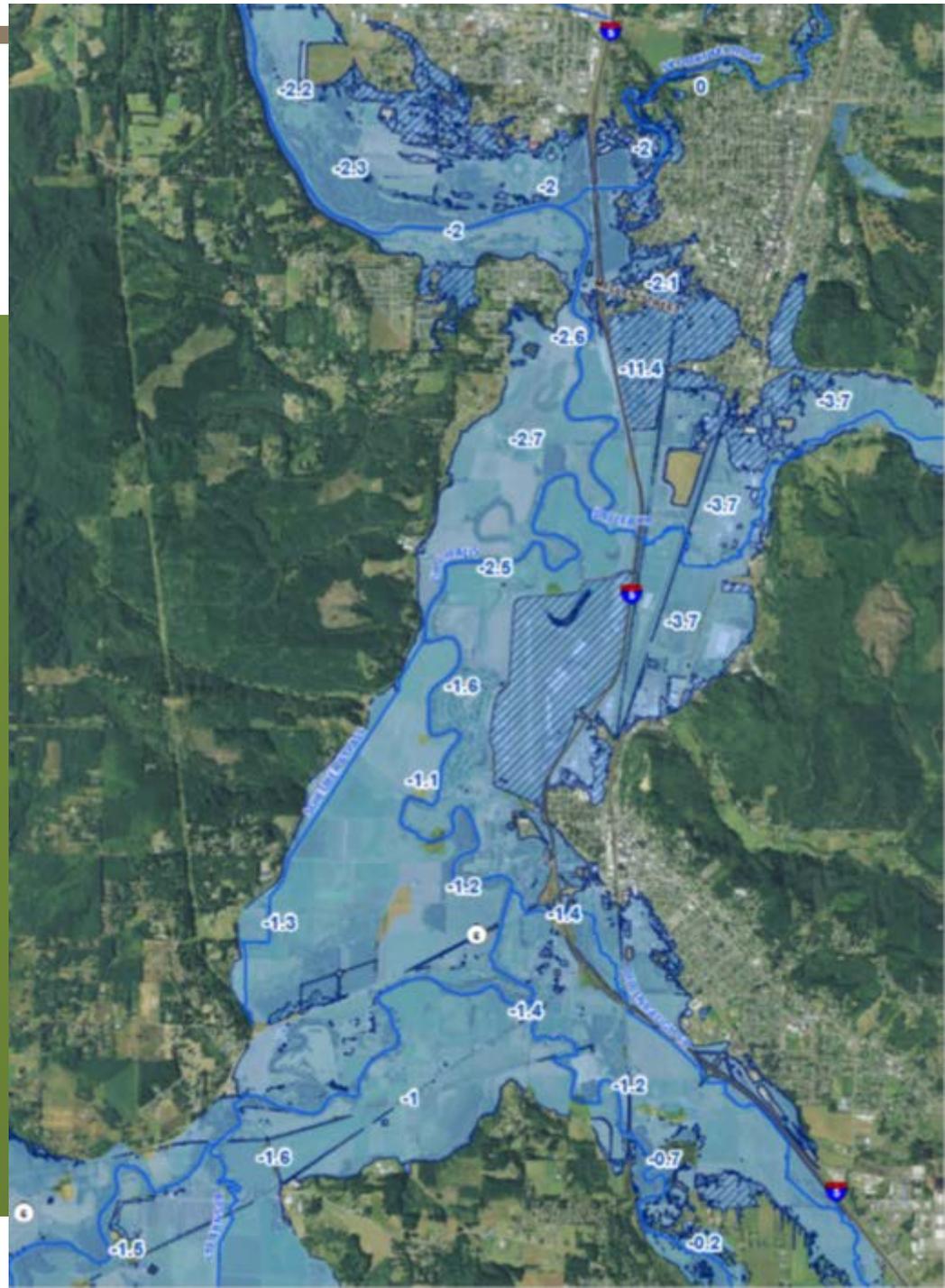
- Provide flood reduction in downstream areas
- Minimize fish and downstream environmental impacts
- Multi-purpose dam would store water during winter and release during summer for fisheries and water quality enhancement

Effect of Water Retention Facility on Upper Mainstem Chehalis River above Pe Ell plus Airport Levee Improvements



Floodplain Map

- Flood reduction shown for 2007 event with dam



Summary of Flood Reduction Benefits

- Used 1 percent of time based on historic record
- Reduces flows by ~15% for 10-100 year
- 100 year to 40 year event, 1.5 feet lower in Centralia, 0.5 lower in Montesano.
- I-5 closed less frequently and for less time
- Multi-purpose increases summer low flows by factor of 3-6.

Changes in Fish Populations – Water Retention Structures

Species	% Change in Fish Population with FRO50
Spring Chinook	-8%
Fall Chinook	-2%
Coho	-2%
Steelhead	-4%
Total	-2.1%

Changes in Salmon Populations – Restoration and Water Retention

Low Restoration	High Restoration	Dam + Low Restoration	Dam + High Restoration
20.1%	54.8%	13.7%	41.9%

Other Species

- Response varied with species
- Much more data is needed to determine in-channel effects on Other Fish and Non-Fish species

Water Retention Damage Reduced/Cost

100 year estimates

- Damage reduced \$600M
- Flood Retention Only Dam Cost \$300M
- Multi-purpose Dam Cost \$400M

Protecting I-5



Protect I-5 with walls and levees

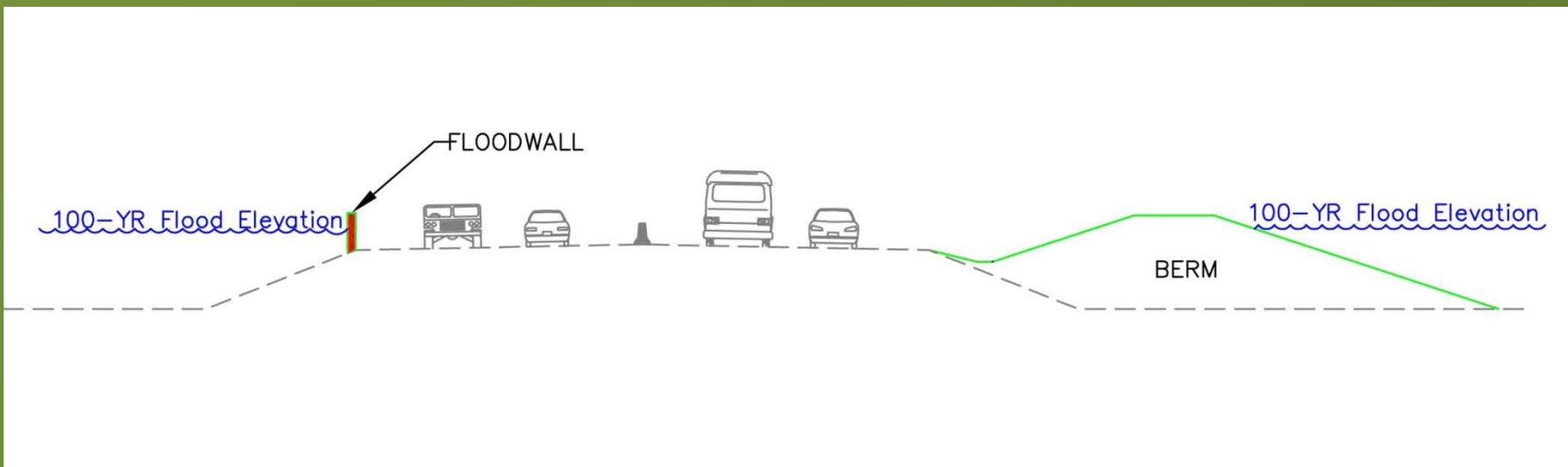
Approach

- Design Concept for Walls

- Install at edge of pavement
- Use to avoid impacts

- Design Concept for Berms

- Use where adjacent ground is not too high
- Use to develop storm water treatment areas



I-5 Damage Reduced/Cost

- Damage reduced \$100M
- Cost \$109M
- I-5 not closed during 100 year flood event

Floodproofing



Structure Database

Delineate all structures in and near 500-year floodplain

© 2013 Google

Google earth

942 ft

Imagery Date: 7/5/2012

46° 48' 31.34" N 123° 07' 48.68" W elev. 116 ft

Eye alt. 4283 ft

Flood Proofing Costs (100 Year Event)

- 9,087 Structures Evaluated
- Benefit \$150M
- Cost \$90M

Land Use Management



Land Use Changes

- Prevent increase in damage
- Increase protection of natural functions
- Improve mapping
- Provide technical assistance to local governments

Combination of Actions



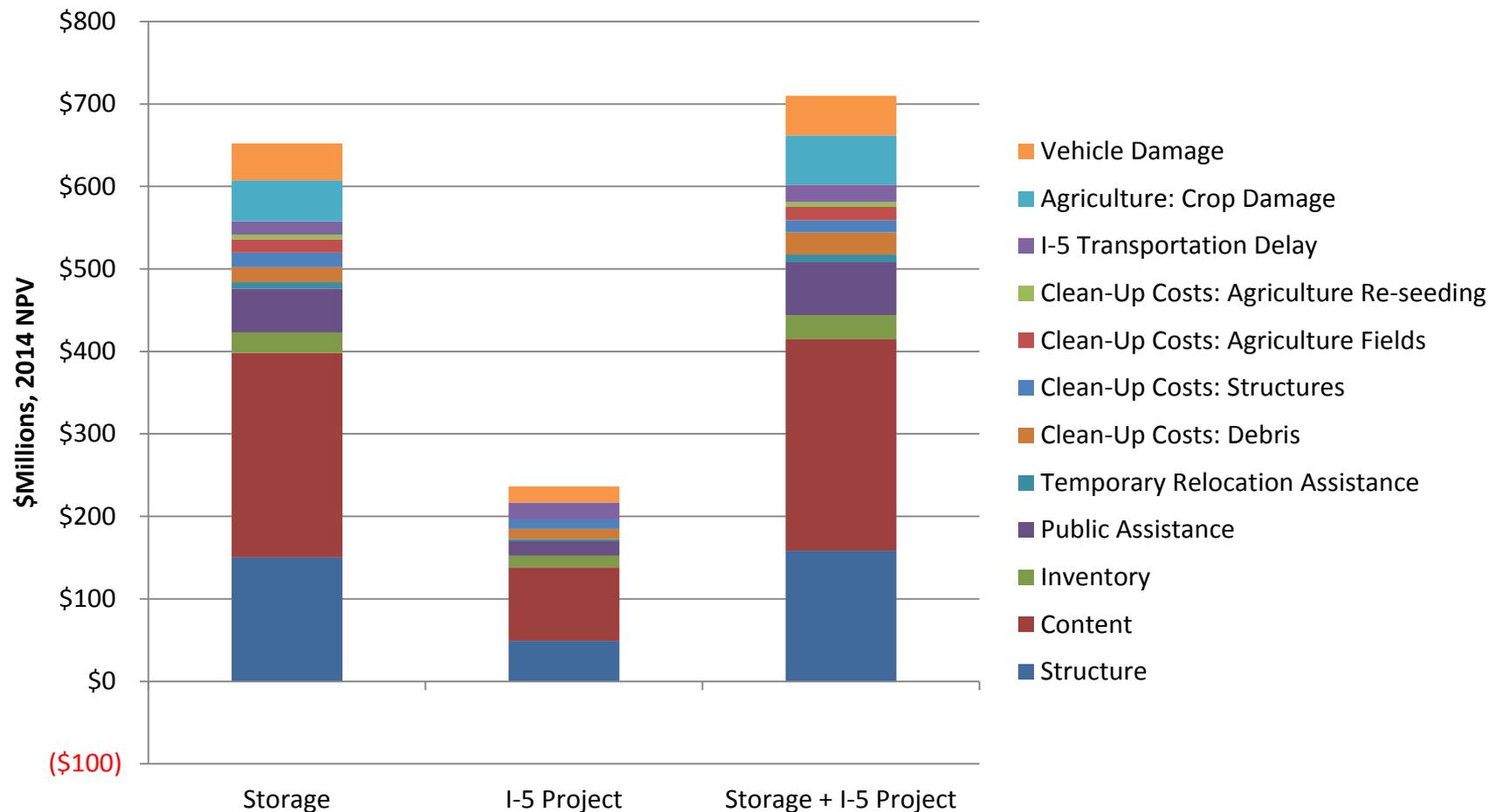
Alternatives Under Consideration

- Water retention, flood proofing, habitat restoration
- I-5, floodproofing, habitat restoration
- Water retention, I-5, floodproofing, habitat restoration

- Small projects would be part of each alternative

Summary of Benefits

Expected Project Alternative 100-Year Net Present Value (\$2014)



Major Conclusions

- The basin is important for diversity of aquatic and semi aquatic species, most notably salmon and steelhead, mud minnow, and Oregon spotted frog.
- Climate change is factor – the magnitude is uncertain
- The basin has gone decades without much attention, an immense amount of restoration is needed to recover, and it will have to be effective and extensive to overcome background degradation.
- Much work ahead to lay the ground work for restoration to be effective.

Major Conclusions

- Floodproofing is cost effective but insufficient by itself
- All dam options negatively impact fish and wildlife.
- Flood Retention only dam is cost effective but impacts need to be offset.
- I-5 walls are not cost effective.
- Combination of dam, floodproofing and restoration is cost effective.
- Flood damage is not eliminated.
- Sequencing of actions is critical to achieve the predicted results.

Next Steps

- Work Group Recommendations to Governor mid-November
- Governor Next Biennium Budget – December
- Legislature Decision – June 2015

More Information

- <http://ruckelshauscenter.wsu.edu/ChehalisFlooding.html>
- <https://www.ezview.wa.gov/chehalisfloodauthority>

Contact: Jim Kramer, Ruckelshaus Center
206.841.2145 or jkramer.consulting@gmail.com

Your Questions and Comments

I-5 Under Water
BRUCE ELY /
OREGONIAN

