







Possible climate change impacts on the Willamette Valley dam system

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Presentation Outline



- Climate change for USACE and Portland District
- Most recent climate change studies
- Overview of climate change trends
- Potential implications
- Q/A and discussion



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BLUF: Bottom line up front.

- This presentation shall discuss the potential impacts from climate change based on a recent Corps studies.
- We present climate change trends from a couple of especially relevant studies and others and their take-a-ways.





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BLUF (cont.)

- While we are expanding our knowledge base of potential climate change impacts, we are not contemplating any immediate changes to the Corps 'rules curves' based on climate change

- We also want to emphasize that the current and future flood risk management mission (FRM) can not be compromised when responding to climate change.

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Climate change for the Corps/Portland District

- Climate change is a concern planning a sustainable water resource management future.

- Consideration and planning for climate change is seen as critical for Corps operational resiliency.

- There is increased public and congressional interest of Corps water management changes at dams.

- Interest focuses on potential increase in flooding, water supply, recreation and habitat/species issues.

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Response

- The Corps' Institute for Water Resources (IWR) is funding studies throughout the country at the regional/local levels.

- The Corps is building a 'portfolio' of studies of potential impacts on infrastructure and future water-management operations.

- At this time there are no planned changes in water management operations based solely on climate change.

- **Flood risk reduction must not be compromised!**

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Portland District concerns

- Portland District (NWP) manages projects in the lower Columbia, Willamette Valley and Rogue basins.
- Portland water-management is focused significantly in the Willamette Valley.
- This discussion will focus on the recent climate change studies conducted for the Willamette Valley.



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Willamette Valley ops overview

- The Corps operates 13 projects in the Willamette Valley.
- Projects control 25% of the runoff area in the Willamette Basin.
- We store up to 1.6 million acre-ft in conservation storage.
- The Corps bases operations on a project “rule curve”

- Defines wintertime drawdown and spring refill
- Based on historical/observed weather and flows



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We are allowed to operate below and to the project rule curve, but not above.

It takes an “act of Congress” to change the rule curves.



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Potential impact from climate change

- **The concern is a change to seasonal precipitation and runoff timing, reduced snow pack and higher temperatures which can stress our ability to provide current levels of flood protection, refill our reservoirs and provide flow for biological and ecosystem function.**

- This leads to the often asked question, does the Corps plan to change rule curves in the future?



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Potential impact from climate change (cont.)

- We continue building our portfolio of knowledge for longer term planning purposes.
- **NO. We do not have plans for immediate changes to dam rule curves or current operations based on climate change study information.**

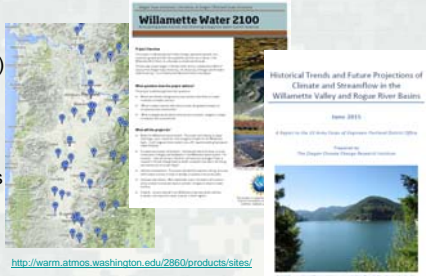


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Recent studies

- Pacific Northwest Hydroclimate Scenarios Project (2860)
- Water 2100
- OCCRI/Corps 2015 Historical and future trends analysis



<http://warm.atmos.washington.edu/2860/products/sites/>



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Willamette/Rogue CC Trends Analysis Projected Future Temperature

Table 9 Mean and range across all models, scenarios, and sub-basins of projected changes in minimum and maximum temperature for the 2040s compared with simulated historical baseline (1970-1999).

Variable	Annual	Winter	Spring	Summer	Fall
Minimum Temperature (°F)	3.2 (0.8, 5.3)	3.1 (0.8, 5.4)	3.6 (1.8, 5.3)	3.7 (0.7, 6.9)	3.2 (0.1, 5.7)
Maximum Temperature (°F)	8.9 (1.3, 15.5)	8.1 (0.8, 8.3)	8.1 (0.8, 8.2)	8.8 (1.5, 16)	9.8 (0.7, 16.2)

- Av. Annual min and max
- ~ 1° to 5.5 °F
- Summer Delta is greatest
- ~ 1.5° to 7.8 °F

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Willamette/Rogue CC Trends Analysis Projected Future Precipitation (Mid Century: 2030-2059)

Table 11 Mean and range across all models, scenarios, and sub-basins of projected changes in precipitation for the 2040s compared with simulated historical baseline (1970-1999).

Variable	Annual	Winter	Spring	Summer	Fall
Precipitation (Inches)	0.0 (-6.7, 6.2)	1.3 (-3.9, 6.9)	0.0 (-2.6, 3.3)	-0.5 (-2.6, 1.3)	-0.1 (-4.6, 3.9)

- Small annual change.
- Large Yr to Yr variability.
- Less rain in summer/fall.
- More in winter.

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Conclusions and Implications



- No surprises from the CC weather/climate trends analysis.
- Warmer 2040's, annual, ~ 1° to 5.5 °F, Summer ~ +1.5° to +7.8 °F
- Annual precipitation will be about the same with some variance, greater wintertime rainfall, much less SWE, leading to more extreme winters, less springtime runoff higher wintertime flows and less summer base-flow.

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**Conclusions and Implications
(cont.)**

- Thru mid century, it is difficult to tease out natural variability and cc signal.
- Native fish make up 97% native species of fish in the Willamette River.
- Based on climate change projections, the occurrence of cold-water species is likely to decrease as river temperatures warm in the future.






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**Conclusions and Implications
(cont.)**

- That being said, there is a lot of uncertainty in the future 2040's and beyond, projections.
- We are still planning for abrupt and severe changes from anthropogenic forcing (greater emissions).

We do not foresee revising the rule curve, but we will continue studying climate change.

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