Chehalis Basin Strategy Climate Change

Chehalis Basin Board Presentation

November 4, 2020

Overview of Presentation

- Relationship to Board outcomes
- How climate change analysis has been used to date
- Potential limitations of current analysis
- Near-term options
- Long-term options
- Perspectives from Technical Advisory Committee
- Staff recommendation

Climate Change – Board Desired Outcomes

- Plan for the 100-year flood conditions that are predicted for 2080 when considering outcomes and actions
- This planning assumption provides the foundation for all of the outcome measures agreed to by the Chehalis Basin Board
- This will also focus their initial evaluation on what kinds of actions can most feasibly reduce risks associated with this expanded floodplain of the future

Climate Change Projections

Overview of Methods used

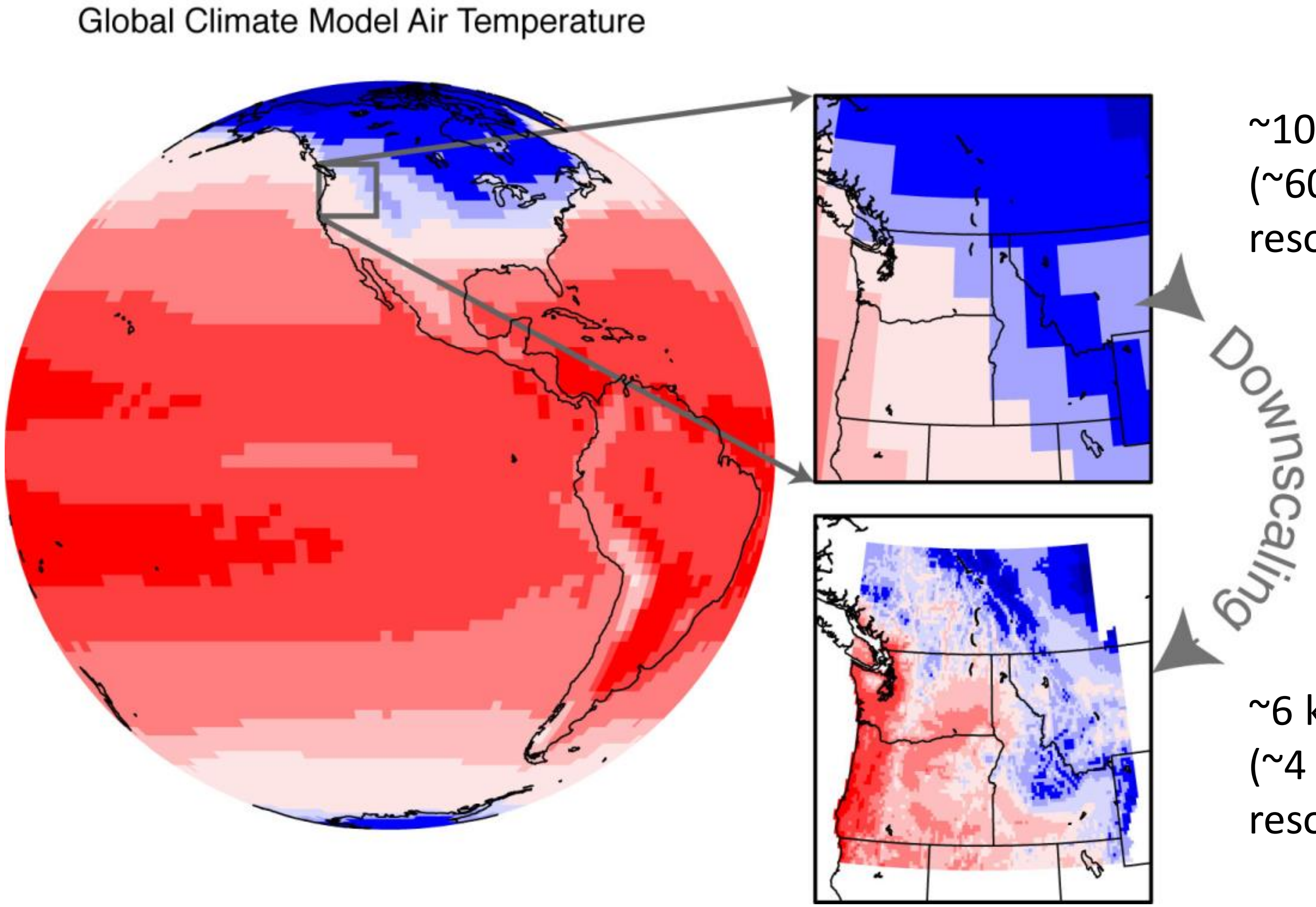
in the SEPA Draft EIS

GCMs and Downscaling

"GCM":

Global Climate Model

"Downscaling":



~100–200 km
(~60–120 mi)
resolution

~6 km
(~4 mi)
resolution

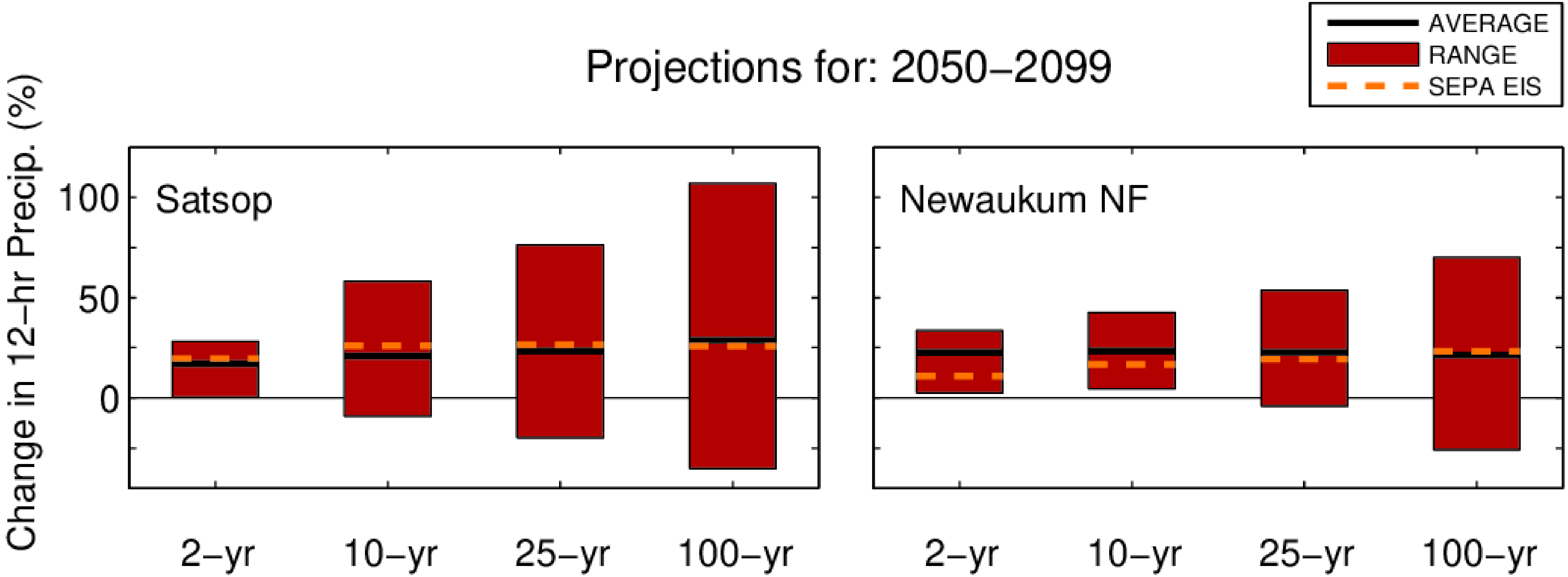
Projections in SEPA Draft EIS

- We used projections from two GCMs
  - ACCESS 1.0, RCP 4.5 (low-end GCM, low greenhouse gas scenario)
  - GFDL CM3, RCP 8.5 (high-end GCM, high greenhouse gas scenario)

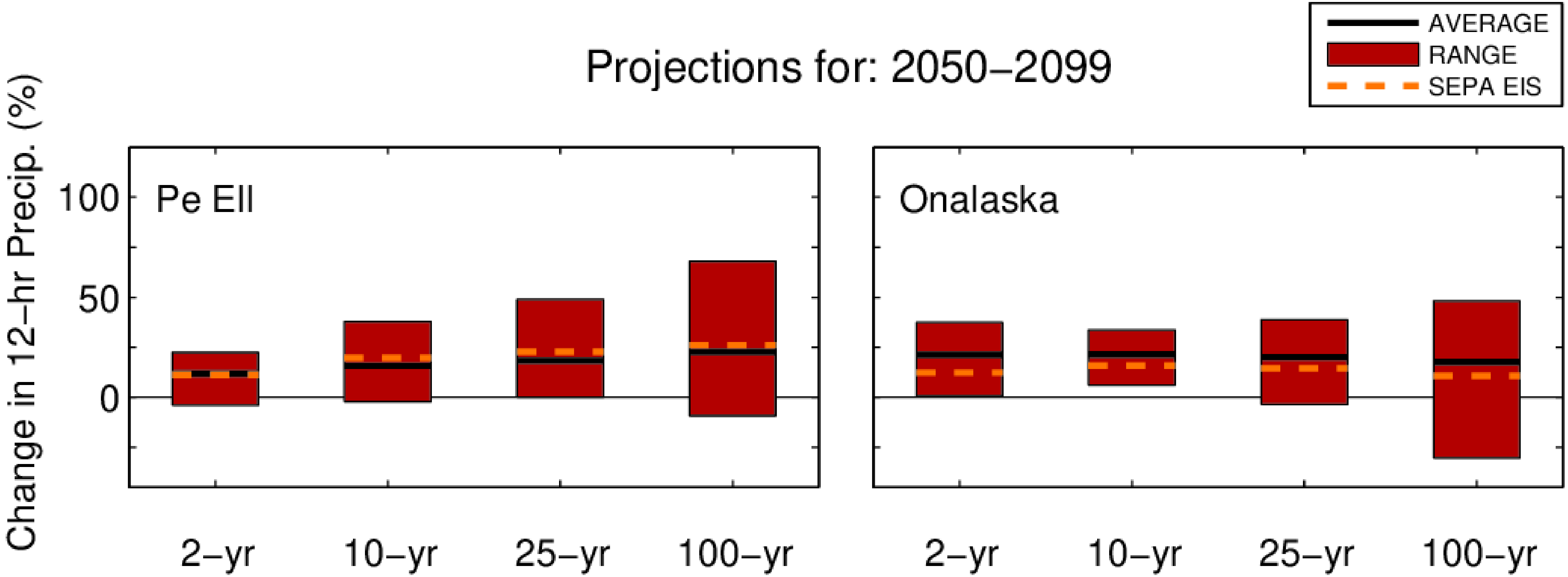
- These GCM projections were "dynamically downscaled" using a Regional Climate Model ("WRF"), because research indicates *this approach is better than statistical downscaling at capturing changes in precipitation extremes*

- **ONLY TWO PROJECTIONS WERE AVAILABLE AT THE TIME – More available now**

Full Range of Projections v. GFDL



Full Range of Projections v. GFDL



Error Found in Dynamic Downscaling

- Subsequent to most of the EIS analyses, CIG found an error in the GFDL downscaling
- Corrected GFDL projection was modeled in DHSVM and results were reprocessed
- *Result*: Corrected GFDL data showed a 50% increase in peak flows for late century
- Identification of error by CIG came too late for SEPA EIS analysis

Future Flood vs. Flood of Record

- Flood of Record (Dec 2007) is larger at Doty but late-century catastrophic flood is larger at all other locations on Chehalis
- Late-century catastrophic flood is larger on upstream tributaries
- Extreme floods on Satsop and Wynoochee don't generally coincide with mainstem floods

Comparison of Historical and Modeled Flows in Chehalis River Basin

LOCATION	LATE CENTURY 100-YEAR FLOOD	FLOOD OF RECORD (CFS)	FLOOD OF RECORD DATE
Chehalis River near Doty	45,100	52,600[1]	12/3/2007
Chehalis River near Grand Mound	102,200	79,100	12/4/2007
Chehalis River at Porter	120,700	86,500	12/5/2007
SF Chehalis River near Wildwood[2]	N.A.	12,200	12/3/2007
SF Chehalis River at Boistfort[2]	26,700	5,700	2/7/1945
Newaukum River near Chehalis	18,500	13,300	2/8/1996
Skookumchuck River near Bucoda	19,500	11,300	2/8/1996
Satsop River near Satsop	26,600	63,600	3/19/1997
Wynoochee River above Black Creek	18,100	25,600	3/19/1997

[1] WSE estimated value (2014), the USGS estimated that this event had a peak flow of 63,100 cfs

[2] The hydraulic model only extends to Boistfort so late century catastrophic flood data is not available at Wildwood. The USGS gauge at Boistfort stopped operating in 1965 and the gaginggauging near Wildwood began in 1995. The basin area to Boistfort is approximately double the basin area at Wildwood so the December 2007 flow at Boistfort might be approximated as about double the flow at Wildwood.

Climate Change Projections

Options for Updating Climate Projections for use in Local Actions Project

- Near-term: work completed and used by Board for their deliberations prior to March
- Long-term: work over the next biennium

Climate Change Modeling Options for Near-term Analyses

- Need to do: use same increase as used in SEPA Draft EIS
  - 26% scalar used to estimate change from historical to late-century
  - Allows *“apples to apples”* comparisons to SEPA Draft EIS modeling
  - 26% increase likely represents about the median increase in range
- Optional: use additional, larger scalar to capture high-end scenario
  - Corrected GFDL modeling showed ~50% increase
  - GFDL generally a “high-end” scenario in terms of heavy precipitation
  - Alternatively, CIG could review data from similar studies and give estimate of the high end of the range
  - High end of range allows “worst case” floodplain to be delineated

Technical Group Feedback Near-term

- Acknowledge benefit of using 26% for “apples to apples” comparison
- Makes technical sense to using 50% increase for qualifying potential increase in floodplain and providing worst-case scenario
- Some members not ready to recommend approach due to short time frame for review

Climate Change Modeling Options for Long-term Analyses

- Option 1: Explore range in climate projections by evaluating additional GCM projections in existing DHSVM model
- Option 2: Improve DHSVM model accuracy and calibration
- Option 3: Re-evaluate the approach to developing flow scalars

Technical Group Feedback Long-term

- Acknowledgment that more accurate climate change predictions needed in future
- Group members wanted more information about how the Board would use climate predictions in future decisions
  - For example: landowner outreach/education, project design, updated maps for application of existing or new regulations
- Needed more information and time to develop recommendations for long term

Staff Recommendation

- Near-term
  - Use 26%
  - Incorporate 50% increase in analysis for future floodplain
  - Complementary analysis based on precipitation for tributaries
- Long-term
  - Board provide additional guidance on how information will be used
  - Technical Group revise information and provide recommendations

Board Questions

- Do you approve recommendations for near term?
- What additional guidance do you have for use of climate analysis in long term?
  - Use in mapping future floodplain for landowner outreach/education, hazard planning, application of existing regulations, and future land use management?
  - Design of flood damage reduction projects?
  - Other?