Translating Climate Science into Action
Two Case Study White Papers from the WUCA

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New White Papers

**Embracing Uncertainty**
A Case Study Examination of How Climate Change is Shifting Water Utility Planning

**Actionable Science in Practice**
Co-producing Climate Change Information for Water Utility Vulnerability Assessments
1. Actionable Science in Practice

- Tampa Bay: explored downscaling techniques
- NYCDEP: selection of GCM
- Seattle: transient look beyond supply impacts
- Portland: evaluated hydrology models

Chain of Models for Water Utility Assessments

1. GCM/RCM
2. Downscaling
3. Hydrology Model
4. System Models
5. Utility Planning
What we did
• Developed a new statistical downscaling method

Why we did it
• Existing statistical downscaling methods did not reproduce rainfall characteristics in Florida very well

What we found
• Choice of statistical downscaling method matters in Florida

UF Downscaling Method (BCSA)
Works Best!
GCM evaluation
Performance & Convergence

Probability distribution

Part 2
Downscaling
Delta change factor method

Which scenarios to select?

Fig. 1. Conceptual diagram of a scenario funnel.
Adapted from Liu et al., 2008
Higher temperatures
→ More rain instead of snow
→ Greater streamflow in late fall and early winter
→ Higher turbidity
Seattle’s Research Topics

• Evaluation and Generation
  • GCM
  • Point locations
  • Fire

• Review of key drivers
  • Fall rains
  • Atmospheric Rivers
  • ENSO

• Creation of operational metrics

• Impacts assessment
Portland Water Bureau PUMA

<table>
<thead>
<tr>
<th>Hydrologic model selection criteria:</th>
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<tbody>
<tr>
<td>Non-proprietary software</td>
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<tr>
<td>Able to process multiple runs</td>
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<td>Spatial and temporal scale</td>
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<td>Easy to setup and use</td>
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<td>Cost</td>
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<tr>
<td>Model reputation in other climate change studies</td>
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<tr>
<td>Relevant output parameters</td>
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Models: VIC, PRMS, DHSVM
2. Embracing Uncertainty

13 case studies illustrating how utilities are incorporating complex, highly uncertain climate change information into planning, from immediate-term operational decisions to capital planning and asset management to long-term supply planning

Findings

1. Climate change is being included across all scales of utility decisions
2. Utilities are using scenarios and looking at a range of plausible futures
3. Planning for multiple futures is crucial for long-range term planning
4. Stakeholders are being included from the beginning
Impacts and Implications of Warmer and Shorter Winters for Water Supply

Global Warming

- Warmer Seas
- Melting Glaciers
- Warmer and shorter winters
- Warmer and drier summers
- More intense rainfall events

Sea Level Rise

- Altered natural vegetation and agriculture/forestry practices in aquifer recharge areas
- More rain and less snow
- More rain on snow
- Altered natural vegetation and agriculture/forestry practices in watershed areas
- Later freeze and earlier thaw

- Earlier Spring melt and runoff
  - Increased risk of flood damages to facilities
  - Altered recharge of groundwater aquifers
  - Altered aquifer levels and safe yield from groundwater sources
  - Altered groundwater quality
  - Possible needs for new sources of supply to meet peak demands in late summer and fall

- Altered summer and fall base flows in surface waters
- Lower reservoir levels and less safe yield from surface sources
- Altered surface water quality
- Altered seasonal pattern of water main breaks

- Altered process requirements for water treatment plants

KEY: Climate Changes, Impacts, Implications

Impacts and Implications of Warmer and Drier Summers for Water Supply
Impacts and Implications of More Intense Rainfall Events for Water Supply

Global Warming

- Warmer Seas
- Melting Glaciers
- Warmer and shorter winters
- Warmer and drier summers
- More intense rainfall events

Sea Level Rise

- Altered natural vegetation and agriculture/forestry practices in groundwater recharge areas
- Increased risk of flood damages to facilities
- Changes in surface water contaminants resulting from non-point sources
- Increased sedimentation causing siltation of reservoir and rivers
- Increased turbidity challenges in surface waters
- Increased microbial contamination of surface waters
- Altered natural vegetation and agriculture/forestry practices in watershed areas

Possible needs for new sources of supply

- Altered groundwater quantity and quality
- Altered process requirements for water treatment plants

Altered surface water quantity and quality
Thank you!

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