

Climate Change and Water in the Columbia River Basin



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Incorporating Climate Change into Decision Making: *Columbia River Basin (CRB) Study*

- Water planning must be conducted at a wide range of spatial scales
- Fine-scale
 - provides detailed hydrologic information at the watershed scale
 - expensive to implement over large areas needed for basin-wide planning efforts.
- Large-scale
 - Already done at 1/8 degree (NWPCC) for Mainstem
 - 1/8 degree in CRB ~ 8.8 miles x 6.25 miles = 55 sq. miles
 - Limited ability to accurately resolve sub-basins

Climate Impacts Group – Ecology Columbia River Basin Study (and ID, BC, OR, BPA and NWPCC)

- Large scale Variable Infiltration Capacity (VIC) model across entire CRB at 1/16 degree
 - 1/16 degree ~ 4.4 miles x 3.1 miles ~ 13.6 sq. miles
 - 4X better resolution than 1/8 degree
- 4 pilot small scale Distributed Hydrology Soil Vegetation Model (DHSVM) at 150m resolution
 - Methow, Okanogan, Walla Walla, and Yakima
 - Changing water temperature, other deliverables not available through VIC
- Compare and contrast VIC and DHSVM
 - Is DHSVM worth the extra cost?

CIG – Ecology CRB Study: *Defining the Parameters*

- What future times?
 - Up to 2100
- How many global circulation models?
 - 10 of available 24 IPCC and an average of the 10
- How many greenhouse gas scenarios (demographics, politics, economics, technology)?
 - A2 (business as usual)
 - 832 CO₂ ppm in 2100
 - 15.1 billion people worldwide in 2100
 - B1 (optimistic)
 - 547 CO₂ ppm in 2100
 - 7.2 billion people worldwide in 2100

Emissions Scenarios

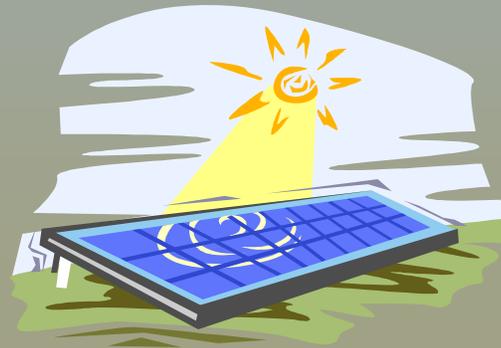
A2

- Less international cooperation
- Slower technological change
- Slower decline of fertility rates
- Lower global average per capita income
- Widespread continued reliance on fossil fuels



B1

- High level of environmental/social consciousness
- Resource friendly lifestyles based on clean technology
- High decline of fertility rates
- Community values triumph over individualist
- Sustainable development



CIG – Ecology CRB Study: *Defining the Deliverables*

- What will our streams look like in a climate changed future?
 - VIC, DHSVM comment on natural or flow
- What's natural flow?
 - Headwaters
 - Streams with no regulation
- Not many streams in the West are natural
- Solution: naturalize



Concurrent Study with Flightner Engineering: Flow Naturalization in CRB

- Estimate diversions on a decadal average
- Estimate return flows
- Make a lot of assumptions
- Adjust historic record of USGS gages to reflect a naturalized record
- Naturalized flows can be used
 - to help calibrate VIC and DHSVM models
 - to estimate what regulated streams will look like (diversion “bias” is reinserted) as another deliverable

CIG – Ecology CRB Study: *Big Picture*

- Inclusion of other CRB stakeholders will help create regional data consistency
 - Idaho
 - Oregon
 - British Columbia
 - BPA
 - NWPCC



CIG – Ecology CRB Study: *Examples of Web Deliverables*

- If you click on these links, you'll see web deliverable examples of what CIG's already done in this field
- [Climate Impact Group's Columbia River Basin site](#)
- [Climate Impact Group – King, Pierce, Snohomish Counties collaboration](#)

CIG – Ecology CRB Study: *Big Picture*

- Flow naturalization work does necessary first step for smaller purveyors to build models the BPA and larger utilities use
- Studies will provide more information to aid WA and regional climate change decision making
 - CIG contract signed 6/07, deliverables due 6/09
 - Flightner Engineering contract signed 5/07, deliverables due 3/08
- Both studies currently limited to CRB (funding came from HB 2860, the Columbia River bill)
 - West side has some flow naturalizing data as well as DHSVM and VIC modeling
 - Formal inclusion of non-CRB Washington into the study would create statewide consistency