Snohomish Basin **2060** Scenarios: *Supporting long term decisions to maintain ecosystem services*

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Problem Definition

The Snohomish Basin, bound by WRIA 7 and located north of Seattle, is a vast forested landscape draining from the Cascade Range to the Puget Sound. The greater Seattle Metropolitan Area relies heavily on the **ecosystem services p**rovided by these natural lands, from drinking water and biodiversity, to carbon storage and recreation. In fact, it is estimated that the Snohomish Basin:

- provides more **drinking water** than any other Basin in the State[1],
- is one of the **primary producers of salmon** in the Puget Sound region[2]
- supports more **carbon stock** per acre than any other Basin in the Puget Sound[3]
- and with more than six hundred thousand acres of protected lands – is one of the greatest **recreation destinations** within thirty minutes of a metropolitan area in the State.

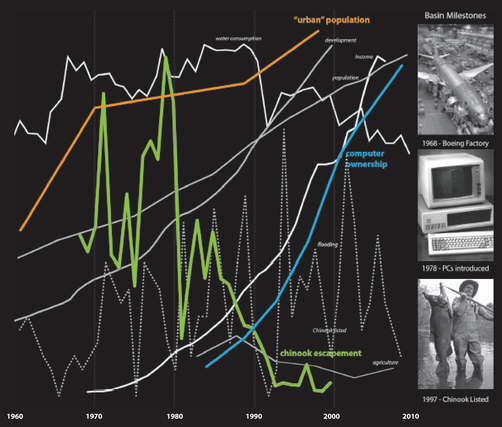
Challenges:

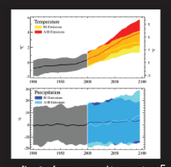
- the Snohomish Basin is one of the **fastest growing** areas in the State
- the Basin has shifted from supporting a largely rural population to an **urban population**[4]
- the Basin has seen dramatic **transitions** in landscape character, resource consumption and governance

*> Urban growth and ecosystem service provision don't have to be at odds with one another, but they certainly pose important **challenges and tradeoffs**.*

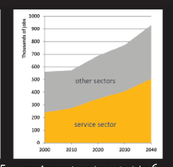
Research Need:

- Strategies that decision-makers employ today will influence the ability of the Basin to ***continue to provide the very ecosystem services that are needed to successfully support the growing population***.
- Future conditions in the Basin, controlled largely by **external drivers**, will change how **effective** regional strategies are at maintaining ecosystem service provision.
- There is great **uncertainty** in predicting future conditions due to the complex interactions between multiple drivers at various scales[10].

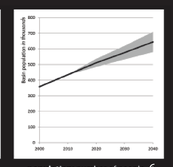




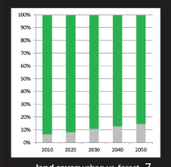
climate change: annual temperature 5



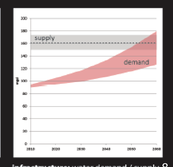
employment: service sector jobs 6



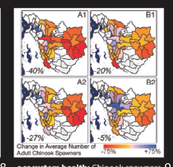
population: number of people 6



land cover: urban vs. forest 7



infrastructure: water demand / supply 8



ecosystem health: Chinook spawners 9

References

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2 Snohomish Basin Salmonid Recovery Technical Committee. May 2004. Snohomish River Basin Ecological Analysis for Salmonid Conservation.

3 Hutyra, L.R., Yoon, B., Alberti, M. Terrestrial carbon stocks across a gradient of urbanization: A study of the Seattle, WA region. Global Change Biology, 17: 783-797, 2011. Calculated per WRIA

4 OFM, Population growth per census block, 1980,1990,2000.

5 Washington Climate Change Impact Assessment (WACCIA), Climate Impacts Group, 2009. http://cses.washington.edu/cig/res/ia/waccia.shtml

6 PSRC. 2012 Puget Sound Economic and Demographic Forecasting: 2050 Puget Sound Economic and Demographic Forecast. Last Accessed 04.20.12.

7. Land Cover Change Model (LCCM) for Central Puget Sound. April 2010. Report prepared for Weyerhaeuser as part of the Puget Sound Development and Climate Change Project. Matt Marsik and Marina Alberti. Urban Ecology Research Laboratory. Department of Urban Design and Planning. University of Washington. http://www.urbanecu.washington.edu/R_LandcoverChange.html37 USFS Wilderness Area GIS layer, 2010.

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10. Millennium Ecosystem Assessment. 2005. Ecosystem and Human Wellbeing. v2, ch 4. Island Press. http://www.maweb.org

Scenario Planning

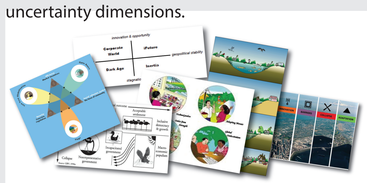
The Snohomish Basin Scenarios project characterizes the future uncertainty of the Basin through **four alternative future scenarios** for the Snohomish Basin.

The objective of the project is to ***support critical decisions that aim to maintain ecosystem service provision out to 2060 despite irreducible future uncertainty.***

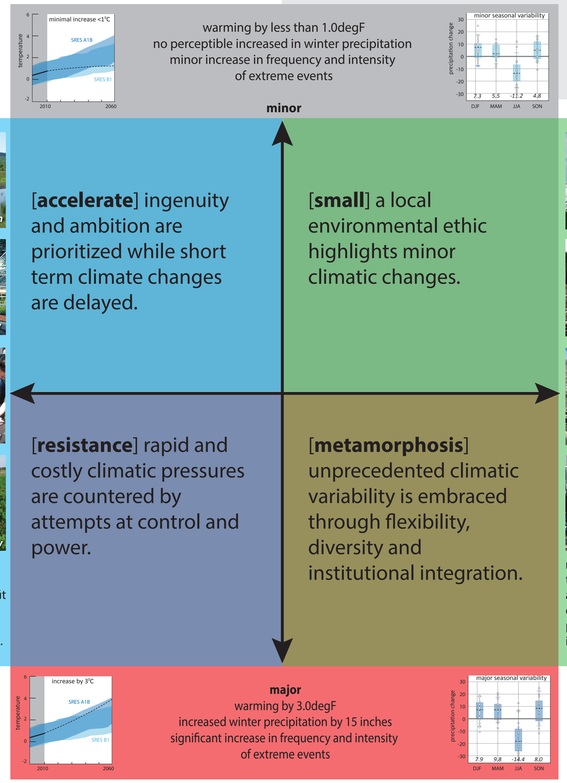
Over the past 2 years, the UERL has worked with more than a hundred regional experts to:
1] assess the current state of the Basin,
2] test out hypotheses for how the Basin might look in the future, and
3] discuss how possible future conditions can inform decision making today.

What are Scenarios

- Scenarios are hypotheses of alternative futures designed to highlight the risks and opportunities involved in strategic decisions.
- Instead of focusing on a single prediction extrapolated from past trends, scenarios focus on uncertain drivers and expand the assumptions of predictive models and illuminate otherwise unforeseen interactions between individual trajectories.
- Scenarios are illustrative accounts of multiple futures that direct our attention towards a handful of alternative outlooks that contain the most relevant uncertainty dimensions.



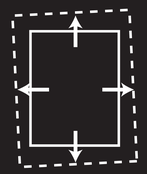
Examples of global scenarios. Pictured, left to right: Shell, Monte Fluer, WA Dept of Commerce, Millenium Ecosystem Assessment, Northern Highland Lakes District, WI, and Puget Sound Scenarios.



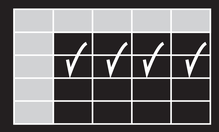
The Science Team identified **climate change** and **social values** as the two most important and uncertain drivers influencing future conditions in the Snohomish Basin by 2060. These two drivers shaped the final four scenarios, or stories, which describe alternative trajectories, challenges, and opportunities for maintaining ecosystem service provision. **'Accelerate'** *is a story of how our ingenuity and ambition support unprecedented prosperity at a great price to our environment.*
'Small' *is a story of how a local environmental ethic adapts to a long-term economic recession.*
'Resistance' *is a story of how extreme climate challenges are countered by powerful human actions.*
Finally, **'Metamorphosis'** *is a story of how we embrace change through experimentation and upfront investments.*

Decision Support

Whether choosing between creating a new reservoir and protecting riparian habitat, decision-makers are faced with allocating limited resources while resolving conflicting interests and coordinating with increasing overlapping jurisdictions over resource management. Critical decisions are delayed in the effort to support extensive and controversial cost-benefit analyses, and due to disagreements regarding the assessment criteria. Meanwhile, critical decisions are suspended, incur paralyzing additional costs, and exhaust the time and interest of assigned committees. The Snohomish Basin Scenarios provide an alternative approach for decision-makers to move forward despite irreducible uncertainty; ***to make more informed decisions by integrating the uncertainty into the decision-making process***. The project culminates in five arenas of decision making support:



An **Expanded Framework of Analysis**: The Scenarios prompt new questions decision-makers can consider leading to an expanded inclusion of potential relationships.



Robust Strategies: The Scenarios focus on critical uncertain drivers influencing the trajectories of future conditions to identify priorities and mechanisms that are appropriate across divergent futures.

Creative Solutions: The Scenarios process challenges the assumptions that shape current thinking to expose potential blind spots and support explorations of opportunities and risks.

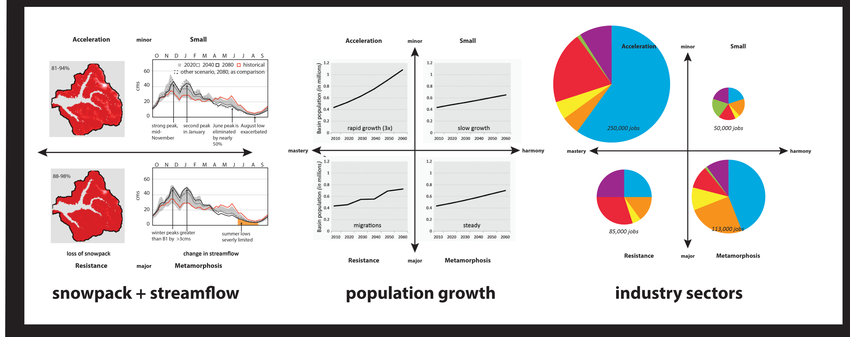
Adaptive Capacity: The Scenarios help decision-makers embrace future uncertainties by coupling experimentation and adaptation with early warning indicators for monitoring the directions of trends and assessing their relationship to critical thresholds.

Integrative Decision Context: The Scenarios redefine the decision context of emerging problems by expanding the consideration of potential shifts in major actors, their unique lens for assessing system conditions, and preferred actions.

Example of Robust Strategies:

One of the challenges of traditional decision-making based on predictive models is that if the future ends up differently than the forecasted 'probable outcome,' the chosen strategies may be ineffective. Robust strategies are different from optimal strategies in that they may be less effective under one set of conditions, but they generally support more improved conditions across the entire suite of scenarios. When developing a strategy, decision-makers can test the potential costs and benefits of the proposed strategy against divergent conditions exposed by the scenarios (see figure below). For example, the question of 'during what time period does drinking water demand exceed demand?' requires expanding the forecast trajectories of both demand (e.g. population growth, efficiency) and supply (e.g. climate change).

The Snohomish Basin scenarios couple the implications of multiple future conditions into logical pairings to more realistically test divergent outcomes, as opposed to assessing each trajectory individually.



snowpack + streamflow | **population growth** | **industry sectors**