Willamette Innovations at the Nexus of Food-Energy-Water Systems (INFEWS)
Advisory Team Workshop #1

Meeting Summary

November 13, 2018
Chemeketa Eola Viticulture Center, Salem, Oregon

Participants

Meeting participants included 43 representatives from state and federal agencies (8), local governments and utilities (5), and non-governmental organizations (7), and universities/colleges (23). Seventeen participants were part of the research team. Participant's primary area of interest spanned food-energy-water sectors including uplands forest management/snow (5), energy systems (8), agriculture (9), water laws/regulations/planning (10), hydrology and stream habitat (8), and other topics (3).

Introductory Presentations

Chad Higgins thanked participants for volunteering their time to attend the meeting and serve on the project's advisory team. The 4-year, $2.3 M research project is funded by the National Science Foundation (NSF) to develop and apply a computer model of the food, energy and water (FEW) systems of the Willamette River Basin. NFS's FEW initiative is supporting research projects across the country to advance understanding of how society can best meet growing FEW demands while also maintaining ecosystem services. Chad described the goals of this workshop as: introduce the project, make connections among research team and advisory team members, and receive feedback on the project's conceptual model design, hypotheses, and expected use of alternative future scenarios.

Dave Hulse's presentation provided background context and an introduction to the INFEWS modeling approach (see separate PDF for Dave's slide set). The model utilizes the Envision framework developed by John Bolte at OSU, and will expand modeling capabilities developed by the Willamette Water 2100 project. He described the concept of alternative futures scenarios as a way to explore plausible options for the future of a place, and the role of the advisory group in helping guide choices about the topics represented in the scenarios. He emphasized that the model is necessarily limited in what it can do, and that the end analysis will represent a "sweet spot" between research team and advisory team interests, available data, and modeling capacity.

Questions and comments that followed Chad and Dave's introduction focused on model capabilities and history, a comment from one participant that data gaps are often a limitation in this type of study, and a comment from another that the advisory team can be effective ambassadors for projects like this, and a bridge to needed data sets. One participant expressed a desire for a decision support tool that could be used for adaptive management. Dave replied that the model has been developed so far as a research tool, and that the adaptive management loop is beyond this project's scope. Dave described the tension that exists in projects like this one: to address national research goals set by NSF, but also to address questions of local interest and that are relevant to stakeholder information needs.

Posters and Table Discussions

The research team shared posters on modeling components, and introduced hypotheses that will be explored with the INFEWS model. Posters provided an opportunity for participants and researchers to

talk one-on-one. Posters also included topic-specific questions for meeting participants who were invited to write comments on sticky notes and attach them to posters. Poster titles and presenters included:

1. Willamette Whole Watershed Model Framework: Dave Conklin, Oregon Freshwater Simulations and Maria Wright, OSU
2. Selecting Climate Change Scenarios: David Rupp, OSU
3. Maximizing Snowpack Retention for Water and Healthy Forests: Anne Nolin, Univ. of Nevada – Reno
4. Agrivoltaics in the Valley? A Tech Adoption Proto-Scenario: Chad Higgins, OSU, Majdi Abou-Najm, Univ. of California – Davis, Cynthia Schwartz, OSU
5. Maximizing Instream Flows Via Oregon Water Law: Adell Amos and Doug Quirke, UO
6. Urban Expansion Influences on Native Aquatic Habitat: Cynthia Schwartz, OSU; Chris Enright and Dave Hulse, UO; Chad Higgins, OSU
7. West Coast Electricity Market Dynamics: Jordan Kern, North Carolina State University (NCSU); Joy Hill, Simona Denaro, Greg Characklis, Univ. of North Carolina – Chapel Hill (UNC)
8. Challenges and Opportunities for Solar in the Willamette River Basin: Simona Denaro, Joy Hill, UNC; Jordan Kern, NCSU; Rosa Cuppari, Greg Characklis, UNC

After the poster session, the group broke into four tables for small group discussions around the following topics:

- Participant backgrounds and areas of interest in the FEW nexus
- Opportunities and obstacles for future resource availability in the Willamette Basin
- Impressions of the model and the project's conceptual framework, and whether there were additional data sources, assumptions and influences the team should consider
- Topics/elements/assumptions that should be considered for representation in scenarios

A summary of comments from poster sticky notes and table discussion is listed below, grouped into ways the comments can inform the research team and their modeling efforts. Comments taken directly from sticky notes are written with quotation marks.

"What if?" questions raised by participants and suggestions of topics they would like scenarios to explore, organized by topic --

- Agriculture and agrivoltaics:
    - Suggestions that the project should consider factors that influence agrivoltaic placement including esthetics, distance from residential areas, crop choice, potential impact to birds/wildlife/key habitat, overall farm plans, access and maintenance, farm size, transmission lines, benefits of clustering systems, and land use laws.
    - Suggestions of crops that might be compatible with agrivoltaics – Christmas trees, greenhouses, nursery ornamentals, container crops. Other crops of interest: turnips, radishes, sugar beets, quinoa, hemp, pulses, grapes.
    - Other related questions of interest –
        - "Will farmers shift to new crops or shift timing of planting/growing existing crops?"

        - Benefits of increasing irrigation efficiency (reduce costs) before adding new technology such as agrivoltaics
        - Land use laws and how they affect agrivoltaics
        - Factors that influence capital investments, timelines, risk
        - Factors that influence crop choice such as new technology, value added processing
- Climate:
    - Effect of changes in precipitation intensity. For example, effects on erosion and fate and transport of chemicals.
    - Extremes of too much or too little water – for example, what happens if the valley experiences five years of drought in a row?
    - Increase in weather variability
    - Climate impacts on timing and abundance of water
    - Climate impacts on water quality – harmful algal blooms, reduction in dilution of pollution
- Forest, snow, wildfire:
    - Interest in exploring links between fire, water quality, and drinking water source areas
    - Requests that modeling represent diversity and intensity of wildfire and the role of slope orientation
    - Available management strategies mentioned: selective cutting, thinning, and mowing
    - Request that scenarios vary assumptions based on private timber lands vs. public multi-objective management lands; also that scenarios explore pressures to increase harvest from federal lands
- Population growth/urbanization:
    - Some comments that current land use system won't change significantly and to include current land use planning laws in scenarios; other comments that increasing population could lead to major changes in land use planning laws
    - Other related ideas for scenarios:
        - Interest in exploring small city growth, especially along the I-5 corridor
        - Effect on streamflow of cities using more of the water; many cities not currently using all of their rights
        - Effect of urbanization on agriculture
- Power supply related:
    - Effect of wildfire (CA/local) on electric grid and power market
    - effect of smoke on solar production
    - Smart grids
    - Explore "energy imbalance opportunities, integrated device potential, and demand side management"
    - Consider alternative energy storage mechanisms (water heaters, storage pumping, urban ice/heat buildings)
    - Energy prices – e.g. influence of low gas prices
- Reservoirs/stored water:
    - Many expressed an interest in having the model represent recommendations from the Willamette Basin Review and explore questions raised by the recent USACE/OWRD

process to reallocate stored water in federal reservoirs, such as modeling alternative rule curves for reservoir operations. A related idea for a scenario was, "Reallocation based on 1.6 MAF of storage – what if shortfalls occur repeatedly? Is this storage assumption unrealistic?"
    - Several other comments related to water storage, including priorities for water infrastructure. Example comments included:
        - "What amount of additional storage (be it natural [like forests/beavers] or infrastructural) would be needed given changing climate to:
            - Serve instream flows at current levels
            - Increase flows to meet or come closer to meeting ISWRs [Instream Water Rights]?"
        - "How much storage would it take to replace lost snowpack?"
- Water law:
    - Comments that the project should consider tribal rights and unadjudicated water rights, "Uncertainty exists around volume for tribal water rights. Can that be added as an interaction?"
    - Interest in representing instream flow rights in scenarios, including this comment, "What would the impacts be of modeling a circumstance where all existing instream flows would receive a priority (be "met" or close to this)? What uses would be curtailed and to what degree to serve this "build-out" of instream rights?"
    - Scenarios with increased minimum flows via mechanisms such as:
        - water market trade options or similar to incentivize wise/sustainable use
        - "one water" approaches that incentivize conservation/healthy floodplains
    - Request to model conservation scenarios – for example where "1) municipalities continue to get more efficient; 2) irrigation at 1 ac-ft per acre vs. 2.5 ac-ft per acre".

Additional data sources, assumptions and influences on the Willamette FEW system that the team should consider:

- Agriculture and agrivoltaics:
    - "Not all crops benefit from wet years or suffer from dry years (for example, wet years with rain in June is not positive for many crops)." Consider this in relation to hypothesis that revenues from agrivoltaics and crop yields may offset each other (peak in opposite weather years).
    - "Cows are bothered by voltage, so it might be harder to put agrivoltaics on land shared with livestock."
    - Global markets influence agricultural decisions and change quickly (war/tariffs/weather etc.) – several discussions about how to represent these types of externalities in the model.
    - Role of water storage ponds associated with agrivoltaics – what effect would this have on groundwater recharge?
    - The idea that farms with wind turbines might be useful as analogues for farms with agrivoltaics.
    - "The INFEWS modeling should have the capacity to accommodate the irrational component of decision making. For example, decisions by farmers concerning the sale

of land or the selection of crops, while necessarily influenced by financial considerations, also may be driven by other considerations. "
    - Potential data source: property values and farm deferrals
- Forest/Snow:
    - "Figuring out which species/data from MCFire to bring into snowmodel will be critical"
    - Potential data/information sources:
        - Landtrendr – Ray Davis, Dave Bell, Robert Kennedy
        - "More precise fire effect data available now – shows diversity in intensity. GTAC and UW fire study put in plots to validate remote sensing"
        - CCVA [Climate Change Vulnerability Assessments] for WNF [Willamette National Forest], MTH [Mount Hood National Forest], and Gorge
- Hydrology and stream temperature:
    - Importance of groundwater supply and flux. Consider impacts of groundwater changes on streamflow and temperature.
    - "Groundwater will become increasing important as a water source if there are a string of drought years."
    - Potential data sources:
        - "Kris Yaeger – Northwest statistical model, PROSPER (flow performance)"
        - USGS SPARROW models to model N and P
        - watershed councils stream temperature data
- Power systems:
    - Connect with BPA, Portland General Electric, EWEB, Benton PUD
    - Link up with Northwest Power Planning Council, 2040s forecast
    - Look at power purchase agreements
- Water law:
    - "The broader legal question is: which water rights have yet to be adjudicated/finalized? Not just instream flows, but pre-1909 rights and tribal rights also need to be settled. These could outweigh everything else."
    - "Other laws/policies/things in motion that may need to be considered:
        - FEMA NFIP [National Flood Insurance Program] lawsuit – floodplain management
        - The Three Basin Rule – provides added protections for municipal watersheds (Clackamas, N. Santiam, McKenzie)
        - carbon tax à carbon offset investments"

Comments about modeling scale, uncertainty, modeling timeframes:

- Temporal resolutions that are most useful: seasonal, monthly, years or longer
- Several comments that it is important to represent the uncertainty and confidence of the modeling, and to represent the range of possible climate trajectories
- Several conversations about the usefulness of "end member" scenarios that represent extreme possibilities for example, the effect of changing the cropping system to a much more thirsty crop (like Almonds), or of modeling urban expansion without Urban Growth Boundaries.

Other food-energy-water nexus research topics that are of interest to participants:

- Economic benefits to wildland support service providers from forest maintenance/ wildfire prevention
- Urban expansion occurring without adequate information regarding water availability
- Societal values, for example, "Do people value habitat enough to pay for disruption to other users?"
- "Create inventory of utilities within Willamette Valley"
- Changing ways of thinking about drought management – from emergency to risk management question
- Ways to overcome fear of risk to implement change/new technologies – e.g. demonstration projects
- Value of water in different contexts - passing through a turbine versus a "one time" use in irrigation
- "The trajectory of multiple stressors simultaneously becoming more intense will challenge strongly rooted assumptions. Unless we reexamine them, our actions may be exactly out of phase with our interests. For example, we may remove dams for ecological reasons only to find that we need them to sustain the species we are trying to save."
- Potential changes caused by growing population, for example:
    - The connection between transportation and agriculture; with 6.1 million people, congestion on I-5 and stresses on other transportation systems could lead to reduced imports of food and export of products from the WRB.
    - Changes in the political environment, for example weakening of Oregon's land use planning system and/or the Endangered Species Act
- "Agriculture in the WRB primarily does not produce food crops. Could the Valley feed this many people?"
- Desire for a "decision support" tool, especially if it could represent risk

Comments on the role of stakeholders:

- Interest in the INFEWS model being applied to local communities in addition to the Basin. This includes both data and the potential for Envision to be used by local agencies and interest groups.
- Requests that there be a continuing process of communication between the project and citizens during the project, and not just a production of final report. The PNW-ERC Willamette Alternative Futures project was mentioned as an example of a research project that influenced subsequent events including restoration efforts by OWEB, the WRI, etc. Discussions also mentioned the need for research projects to communicate with the language used by public officials, agency personnel, and citizens, so that the project can help raise awareness about coming challenges for the Willamette River Basin.
- Suggestion that it would be useful to "Go back to WW2100 stakeholders and ask them to what extent the project fed into their decision making process."