OBJECTIVES:
1) Introduce people who can help you
2) Discuss concept of Water Demand
3) Explore approaches to computing Demand
4) Introduce 2015 OWRD Forecast
5) Gather questions for further support
Presenters

Steve Parrett (OWRD)
Rachel LovellFord (OWRD)
Chris Kowitz (OWRD)
Anna Pakenham Stevenson (ODFW)
Shared Understanding → Solutions

SUPPLY
PS2

Why
How much
Where
When

DEMAND
PS3

SOLUTIONS
PS4
WHAT IS A WATER DEMAND?

Amount of water for different uses, timing, locations
Common Components, Unique Definitions

Your values and goals help define:

• Uses
• Time Periods
• Locations
• Units
List of Preparers

Project Team

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Stephen Irving, MWH
Robert Maher, Commuter Industries
Glen Warren, Commuter Industries
Harry Seely, West Water Research
Dr. Richard Cuenca, Oregon State University

The 2015 Water Demand Forecast was based on information collected and published by the following agencies and institutions:

Municipal water providers throughout Oregon who submitted Water Management and Conservation Plans
Oregon Department of Agriculture
Oregon Office of Economic Analysis
Oregon State University Extension Service
Portland State University, Population Research Center
U.S. Department of Agriculture, National Agricultural Statistics Service
U.S. Department of Commerce, U.S. Census Bureau
U.S. Department of the Interior, Bureau of Reclamation

OWRD retained MWH Americas, Inc. to prepare this 2015 Statewide Long-Term Water Demand Forecast Report [Contract WRD 15 041].
Organization of the Demand Forecast

Table of Contents (page iii)

Introduction

Chapter 1 – Summary of Water Demand Forecast

Chapter 2 – Agricultural Demand Forecast

Chapter 3 – Municipal and Industrial Demand Forecast

Chapter 4 – References

Appendixes A - G
BUILDING AN AGRICULTURAL DEMAND
BUILDING AN AGRICULTURAL DEMAND

Land Area

Crops

Water Use

Time available
Resources available
Priority Concerns/Questions

Simple  Complicated
Examples of datasets:

- OWRD Water Rights Information System
- USDA Crop Data Layer (2008 to 2016; 1 yr)
- USGS Water Use (1950 to 2010; 5 yr)

Important to consider:

- present and/or future
- irrigated/non-irrigated
- other ag uses
Important to consider:
- present and future
- trends over time
- level of detail

Examples of datasets:
- USDA Crop Data Layer (2008 to 2016; 1 yr)
- USDA Ag Census (1840-2012; 5-10 yr)
- Local surveys
Water Use

Important to consider:
• climate change
• scale and variability
• other farm uses

Examples of datasets:
• Water rights (non-irrigation ag uses)
• Potential ET, points: USBR WWCRA
• Actual ET, points: USDA Agrimet
• Actual ET, satellite: METRIC
2015 Statewide Long-Term Water Demand Forecast - Agriculture

**Land Area**
- USGS 2010 - irrigated acreages by county

**Crops**
- USDA 2012 Census of Agriculture – distribution of crop types

**Water Use**
- USBR and Cuenca – NIWR from modeled data using Agrimet
Assumptions

• County crop acreages and types of crops are held constant
• Based on fully watered crop
• Calculations use two different approaches based on available data (WWCRA and Cuenca)
• Diversion and application efficiencies are based on statewide averages
• Stock water demands are not considered in this report (0.5%)

Agricultural demand from Reclamation’s West-Wide Climate Risk Assessment program (WWCRA) is within the WaterSMART Program.


OWRD. 2015 State-wide Water Demand Forecast. Salem, OR. https://www.oregon.gov/owrd/Pages/law/integrated_water_supply_strategy.aspx#Recommended_Actions:_Implementation_Updates_and_Resources
RESOURCES

Websites and Publications

• USBR WWCRA: https://www.usbr.gov/watersmart/wcra/
• USDA Agrimet: https://www.usbr.gov/pn/agrimet/
• USDA Crop Data Layer: https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php
• USDA Ag Census: https://www.agcensus.usda.gov/
• USGS Water Use: https://waterdata.usgs.gov/nwis/water_use/
• PRISM: http://www.prism.oregonstate.edu/
• OOCRI: http://www.occri.net/

Contacts

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BUILDING A MUNICIPAL & INDUSTRIAL DEMAND
CATEGORIES OF M&I DEMAND

• Municipal service water use
  • Domestic and industrial water uses with urban growth boundaries
  • Includes use from 242 incorporated cities

• Unincorporated water use
  • Portion of counties that lie outside of urban growth boundaries

• Self-supplied industrial water use
  • Industrial and commercial water users that are separate from municipal systems and hold their own water rights
METHODOLOGY AND DATA SOURCES FOR M&I DEMAND

Population

Demand (mgd)

Step 1

Current Population

Gallons / Capita/ Day

Current Demand

Step 2

Future Population

Gallons / Capita/ Day

Future Demand

PSU, OEA

WMCPs
CHANGE IN M&I DEMAND

Change in volume by 2050 (thousand acre feet)
Inherent uncertainty exists in any demand forecast (climate, economics, etc.)
- GCPD rates are assumed to remain constant over the planning horizon
- Down-scaling of data should be done with caution
### Identifying Next Steps and Data Gaps

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<td>• Corse-scale assessment of current and future demand</td>
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<tr>
<td>• Identification of source(s), including any limitations on division / appropriation</td>
<td>• Fine-scale assessment of (local) current and future demand</td>
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<tr>
<td>• Assessment of the source(s) of supply to meet future demand</td>
<td>• Assessment of capacity over the planning horizon</td>
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<tr>
<td>• Vulnerability of supply to human and natural events</td>
<td>• Reliability of existing infrastructure</td>
</tr>
<tr>
<td>• Effects of climate change on supply (changing hydrographs, recharge rates, etc.)</td>
<td>• Vulnerability of infrastructure (age, capacity, etc.)</td>
</tr>
<tr>
<td></td>
<td>• Effects of climate change on usage patterns</td>
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</tbody>
</table>
ADDITIONAL SOURCES OF DATA

• OWRD Water Use Reporting under OAR 690, Chapter 85
  • http://apps.wrd.state.or.us/apps/wr/wateruse_query/
• Water System Master Plans (OHA)
  • https://yourwater.oregon.gov/
• Other reference or guidance documents
  • AWWA - https://www.awwa.org/
  • OWRD - WMCP Guidebook for Oregon Municipal Water Suppliers
    http://www.oregon.gov/owrd/docs/wmcp_guidebook.pdf
  • Portland State University – Population Estimates
    https://www.pdx.edu/prc/annual-population-estimates
  • Office of Economic Analysis – Population Forecast
    http://www.oregon.gov/DAS/OEA/Pages/index.aspx
CONTACT INFORMATION

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ADDITIONAL SOURCES OF DATA

• OWRD Water Use Reporting under OAR 690, Chapter 85
  • http://apps.wrd.state.or.us/apps/wr/wateruse_query/
• Water System Master Plans (OHA)
  • https://yourwater.oregon.gov/
• Other reference or guidance documents
  • AWWA - https://www.awwa.org/
  • OWRD - WMCP Guidebook for Oregon Municipal Water Suppliers
    http://www.oregon.gov/owrd/docs/wmcp_guidebook.pdf
  • Portland State University – Population Estimates
    https://www.pdx.edu/prc/annual-population-estimates
  • Office of Economic Analysis – population forecast
    http://www.oregon.gov/DAS/OEA/Pages/index.aspx
BUILDING AN INSTREAM DEMAND
Instream Demand for Aquatic Life

Stream

Species

Water Needs

Future
Streams

- Geomorphology and climate
- Stream size & order
- Hydrograph (flow, timing)
- Temperature
- Level of development

Photo courtesy of Shadow Quality
Species

- Species present
- Distribution
- Life history
- Protection status
- Priority areas
Water Needs

- Site specific
- Micro habitat
  - Depth
  - Velocity
  - Substrate
  - Cover
- Fish needs & life stage (HSC)

= biological flow recommendation
Instream Water Rights

• Place **protection** of instream flows on the same legal standing as consumptive water rights

• ODFW Policy: “**to obtain an in-stream water right on every waterway exhibiting fish and wildlife values**” (OAR 635-400-0005)

• Provide a **guide** as to how much water is needed to conserve, maintain, or enhance fish populations
Assumptions/Limitations of ISWRs

• Less than 10% of the state has been studied or has an ISWR for aquatic life
• ISWR ≠ species’ needs
  – ISWR is the minimum necessary
  – ISWR = EANF ≠ biological flow
  – Does not include Seasonally Varying Flows
• Few ISWRs for pollution abatement and recreation
• Need for education on WRs and Instream needs
Future

- ~5% decrease in stream flow (NRC 2011)
- Shifting hydrograph
- 2.5 – 3.4°C century average warming (Mote et al. 2013)
- Species migrate, chasing thermal envelopes they have evolved to tolerate (Isaak et al. 2017)
Solutions - No Instream Demand
Options for Instream Demand

VELMA
Visualizing Ecosystem Land Management Assessments

Hydrological & Biogeochemical processes

- **Hydrological**: streamflow, ET, vertical & lateral flow...
- **Biogeochemical**: plant-soil carbon & nutrient dynamics, transport of dissolved nitrogen, carbon, mercury...
- **Drivers of change**: climate, fire, harvest, fertilization, grazing, urbanization...

USEPA Office of Research and Development
National Health and Environmental Effects Research Division
Resources for Pilot Sites

Local ODFW District Biologist’s expert knowledge & Water Program

Location and flow values for existing ISWRs and where we have data for your areas (shapefiles & spreadsheets)
- Instream water rights: http://apps.wrd.state.or.us/apps/wr/wrinfo/
- Basin Investigation Reports: http://www.dfw.state.or.us/fish/water/

Species distribution:
- https://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata
- http://www.streamnet.org/

Priority areas- http://www.dfw.state.or.us/fish/water/

*ODFW & WRD looking for funding opportunities for instream demand forecast*

*PBP areas can be test sites for this information*
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NEXT STEPS

Shared demands are Opportunities for Collaboration
Extra Slide Deck
Key Findings for Agricultural Water Demand

Findings

Crop demands increase statewide by 6 to 9 percent.
Crop Demand

Precipitation Amount

Precipitation Timing

then

Irrigation Demand

Crop Consumptive Demand

21-26% MET WITH PRECIPITATION

71-74% MET WITH IRRIGATION

2015

2050
Key Findings for Municipal and Industrial Water Demand

**Findings**

- Increase 20 percent by 2050
- Population major driver
- Combined per capita (domestic, industrial, commercial) use remains steady
- Data from WMCPs anticipate relatively minimal future savings from continued conservation

![Projected Statewide Population](image)

*Population estimates from Portland State University PRC forecast, 2010 US Census, and OEA Long-term Forecast*
Key Findings for Municipal and Industrial Water Demand

Assumptions

• Population forecasts from PSU and OEA
• Per capita values in urban areas lump all users together
• Proxies established between WMCP per capita values and unincorporated areas or unrepresented municipalities

Changes in per capita demand were estimated from 50 recent WMCPs reported since 2008
ADDITIONAL ASSISTANCE

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<table>
<thead>
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<th>Common Components, Unique Definitions</th>
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<tbody>
<tr>
<td><strong>Define Uses</strong></td>
</tr>
<tr>
<td>• Agriculture</td>
</tr>
<tr>
<td>• Municipal and Industrial</td>
</tr>
<tr>
<td>• Instream</td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Define Locations</strong></td>
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<tr>
<td>• Current and Potential</td>
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<tr>
<td>• Resolution/Scale</td>
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