# How Satellite-based Evapotranspiration (ET) will update Oregon's consumptive use data

## National Water Use Workshop
## August 16th, 2022

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# Overview

1. OWRD and water use data needs
2. Why satellite-based ET?
3. OWRD Statewide ET project
4. Other non-technical challenges
5. Q&A

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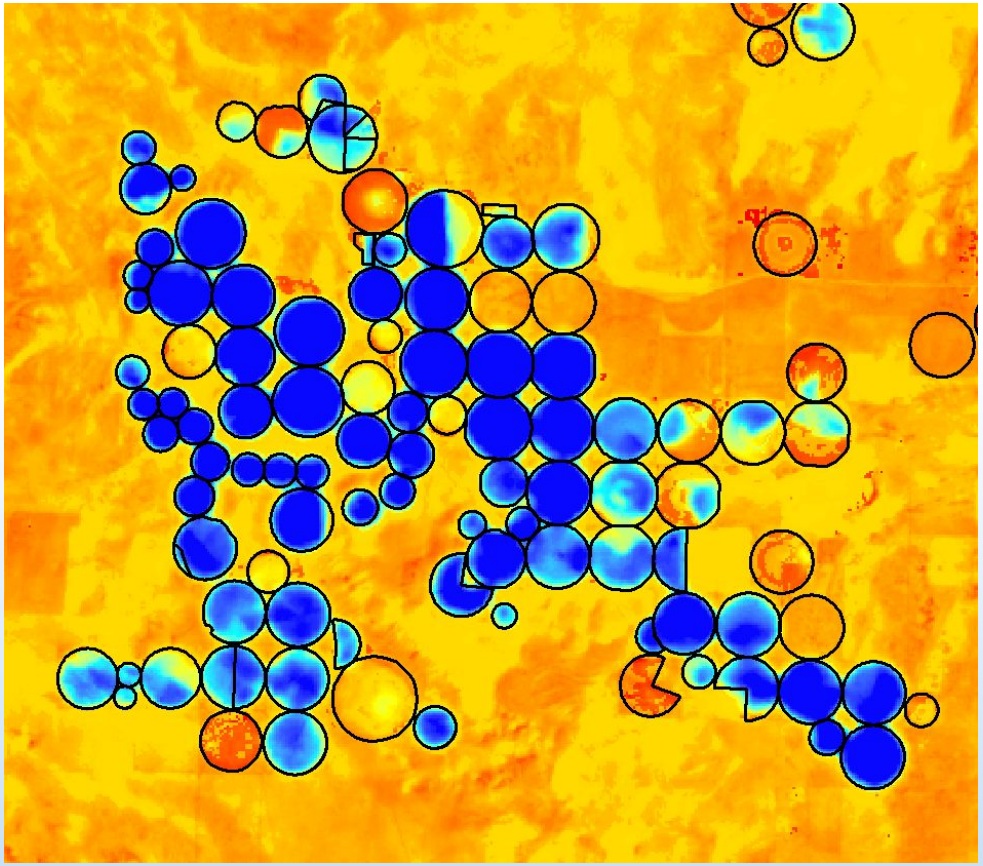
# Hard to manage what you don't measure

- Irrigated agriculture largest user of water in the state
- Limited records of irrigation water use
  - "Hard to manage what you don't measure"
- Need for updated and accurate comprehensive dataset – available to all

**Evapotranspiration (ET) Map from Harney Basin – METRIC Model**



# OWRD current uses of ET data

- Estimates of actual ET and potential ET from irrigated fields is used for:
  - Groundwater Basin Studies
  - Water Availability Analyses
  - Place-Based Planning and Water Development Projects
  - Water Rights
- Current estimates and approaches lack data and data quality
  - Duty vs. actual diversion
  - Potential ET vs. actual ET rates
  - Permitted acreage vs. actual place of use and acreage
- OWRD needs a time series of actual ET for every irrigated field in the state

# Benefits to Oregon using satellite-based ET

- OWRD other applications for satellite-based ET
  - Updating water availability
  - Support water rights transactions
  - Monitoring climate change impacts
- Benefits others outside of the Department
  - State and federal agencies
  - Locally led planning including watershed councils, conservation groups, irrigation districts, etc.
  - Irrigators and consultants
- Learning from and collaborating with other western states

# Oregon Statewide ET Program

- 2020 Funding (USGS WUDR, OR HB 2018 and POP 110) jump started remote sensing of ET in OR

- By late 2023, OWRD to partner with external ET contractor to develop wall-to-wall, statewide datasets of:
  - Mapped agricultural fields statewide
  - Satellite-based ET maps and field summaries 1985 to 2020
  - Updated consumptive use from all irrigated fields and open water evaporation from all major reservoirs

- Provided staff to establish the ET program at OWRD

# OR Statewide ET Program: 2020-2023

## ET Funding and Program Development:

- **2020 USGS WUDR Grant - Statewide field digitizing, IrrMapper and OpenET field summaries, 2016-2021***
- 2021 USGS WUDR Grant – Statewide field irrigation attributes, ET-Demands, 2016-2021
- **JPL-WWAO Columbia River Needs Assessment Funds – Columbia River Basin ET mapping tool, HUC-12 summaries, and stakeholder workshops***
- Oregon POP 110 + House Bill 2018 – Update Statewide CU and open water evaporation (full archive) for GW Recharge/Water Budgets; add 1 FTE ET Hydrologist

**Partners:**

DRI Desert Research Institute

OPENET

AgriMet Cooperative Agricultural Weather Network

USGS science for a changing world

JPL Jet Propulsion Laboratory California Institute of Technology

wwao

Oregon State University

IDWR

Department of Ecology State of Washington

Washington State University

*** Focus of remaining talk**

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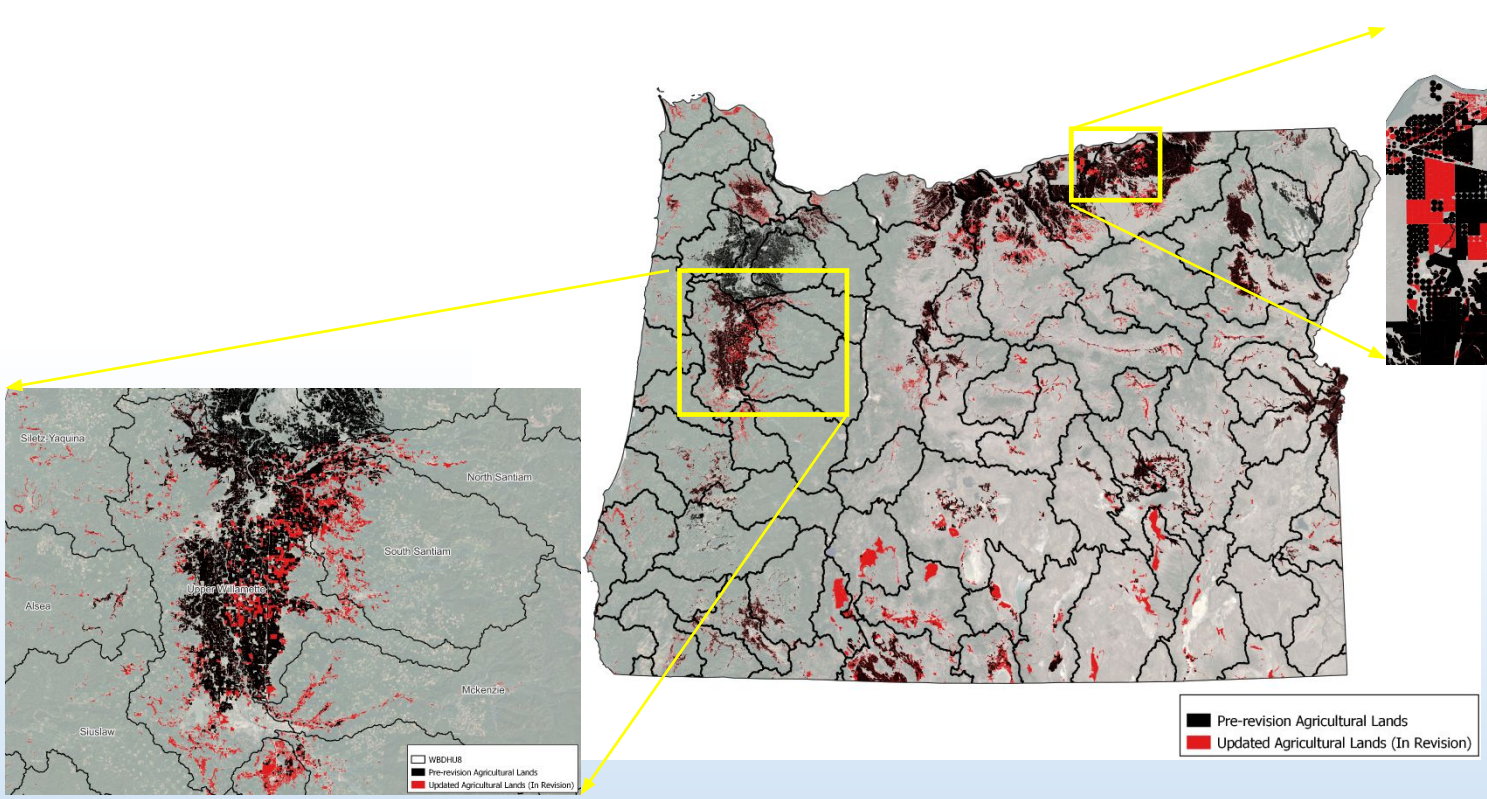
# Step 1: Develop Mapped Agricultural Fields - DRI



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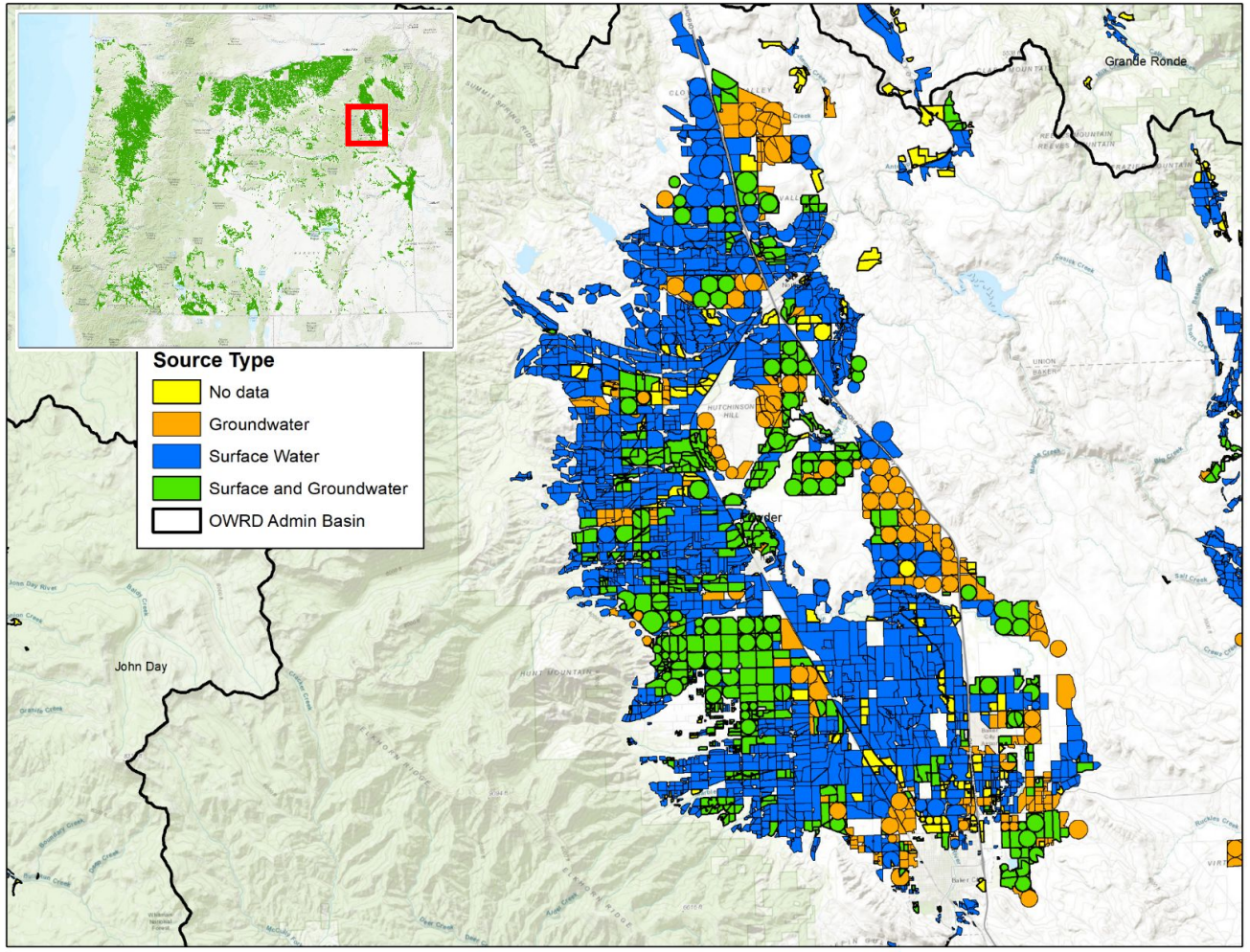
# Step 2: Identify Irrigation Source Type - OWRD

Irrigation Source Type – Powder Basin



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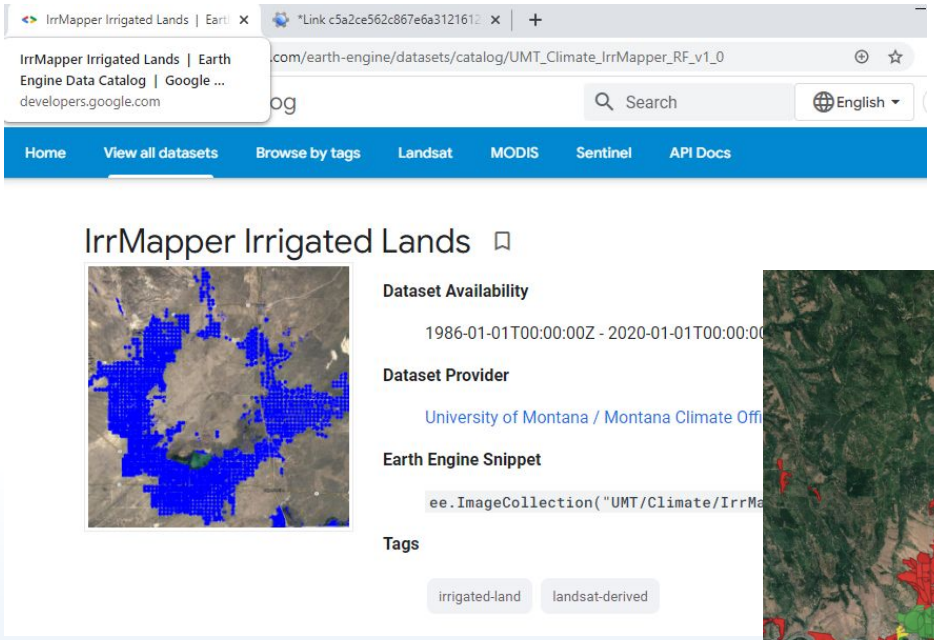
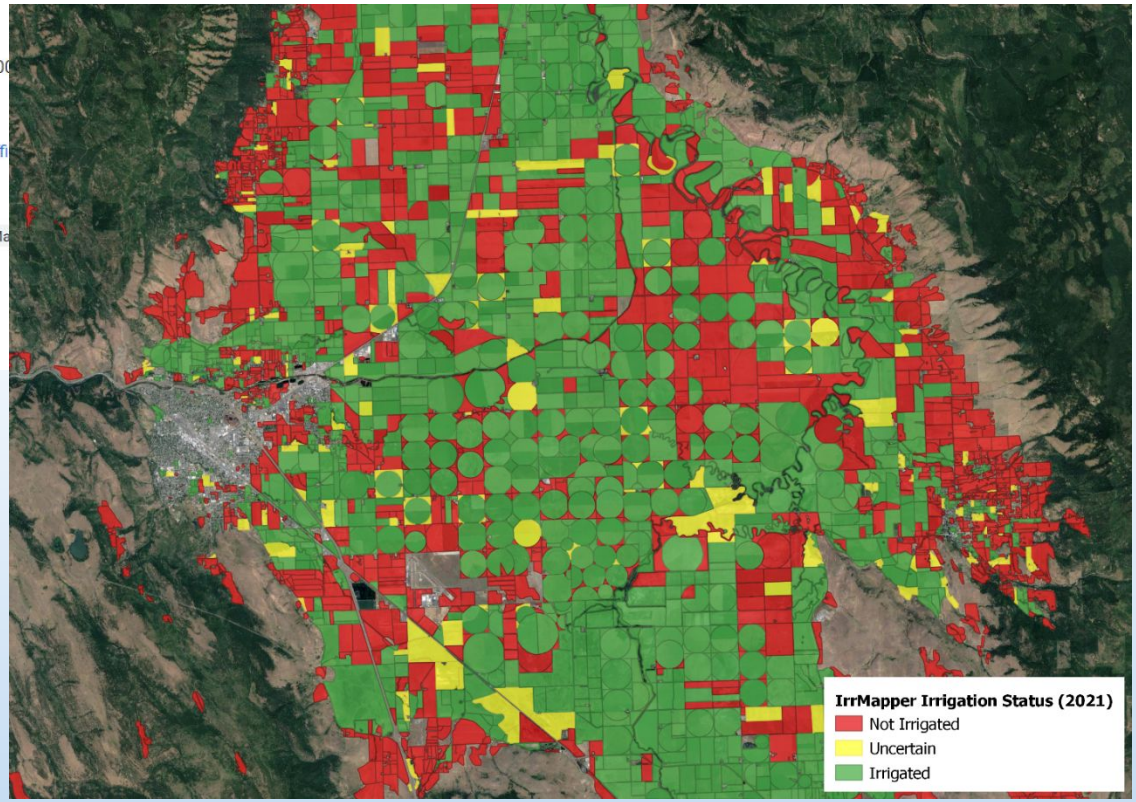
# Step 3: Assign Whether Field Was Irrigated - DRI




IrrMapper 2021 – Grande Ronde Basin




*Ketchum et al., 2020*

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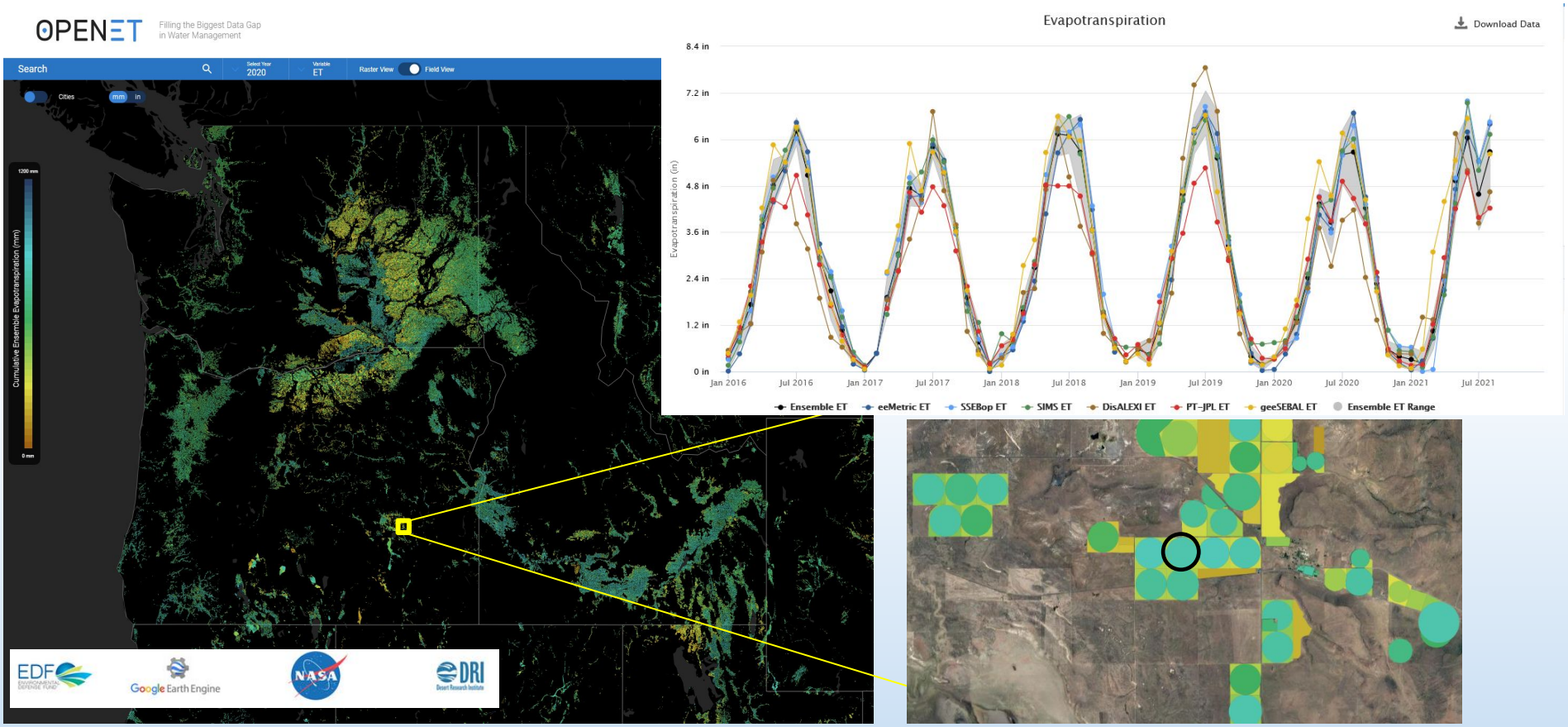
# Step 4: Calculate ET and Net ET by Field – OpenET/DRI




**Public access via https://openetdata.org/**

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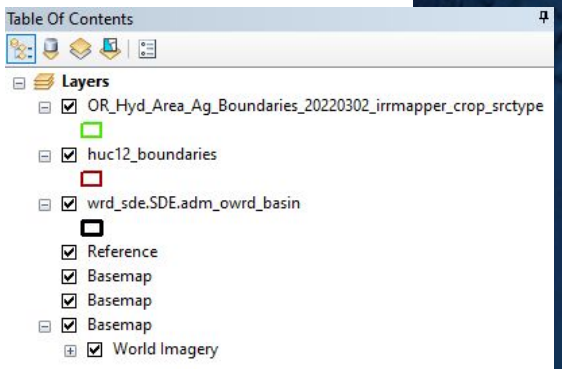
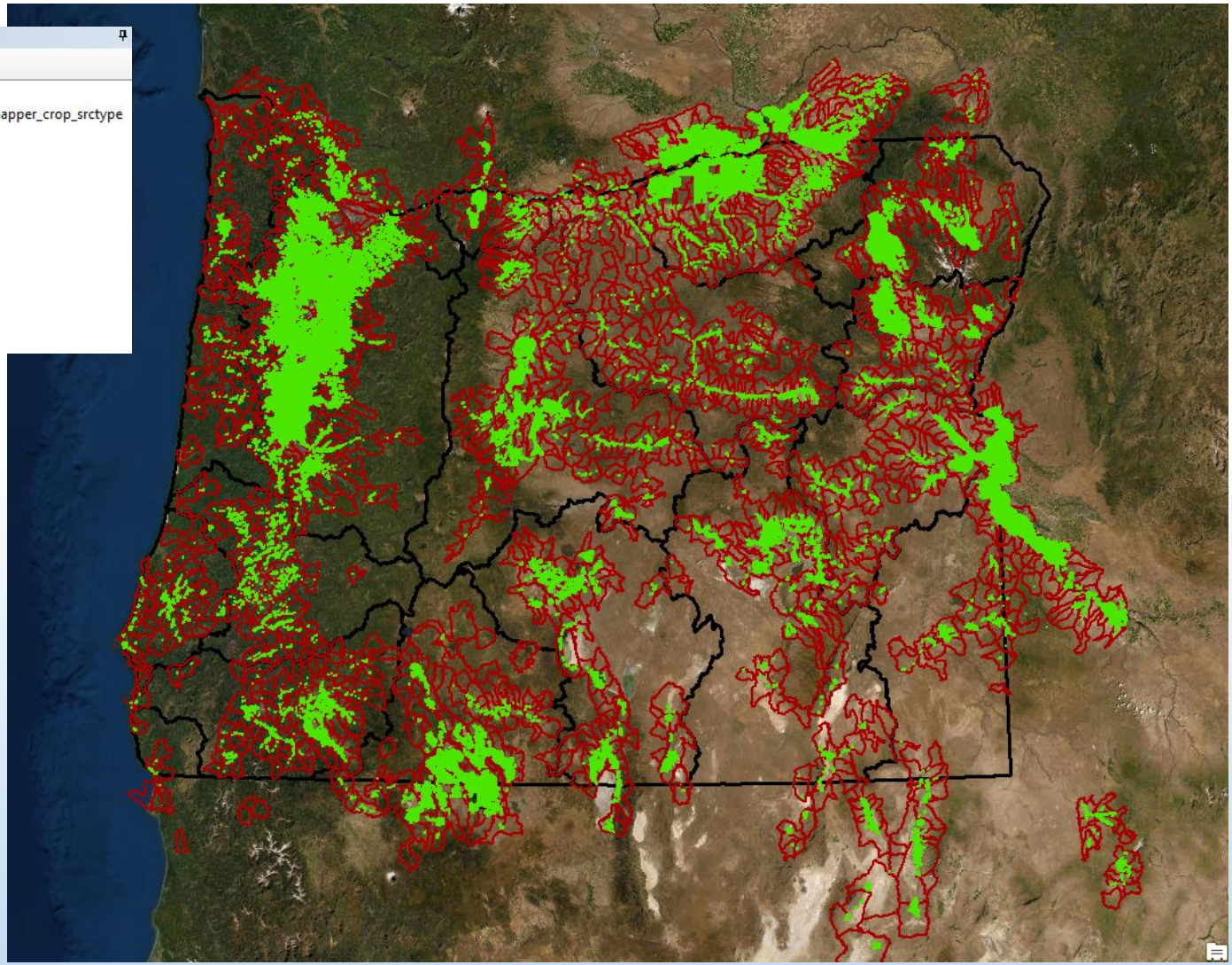
# Step 5: Field and HUC-12 ET Summaries for 2016-2021



- **245,000+ field polygons**
- **1,700+ HUC-12s**

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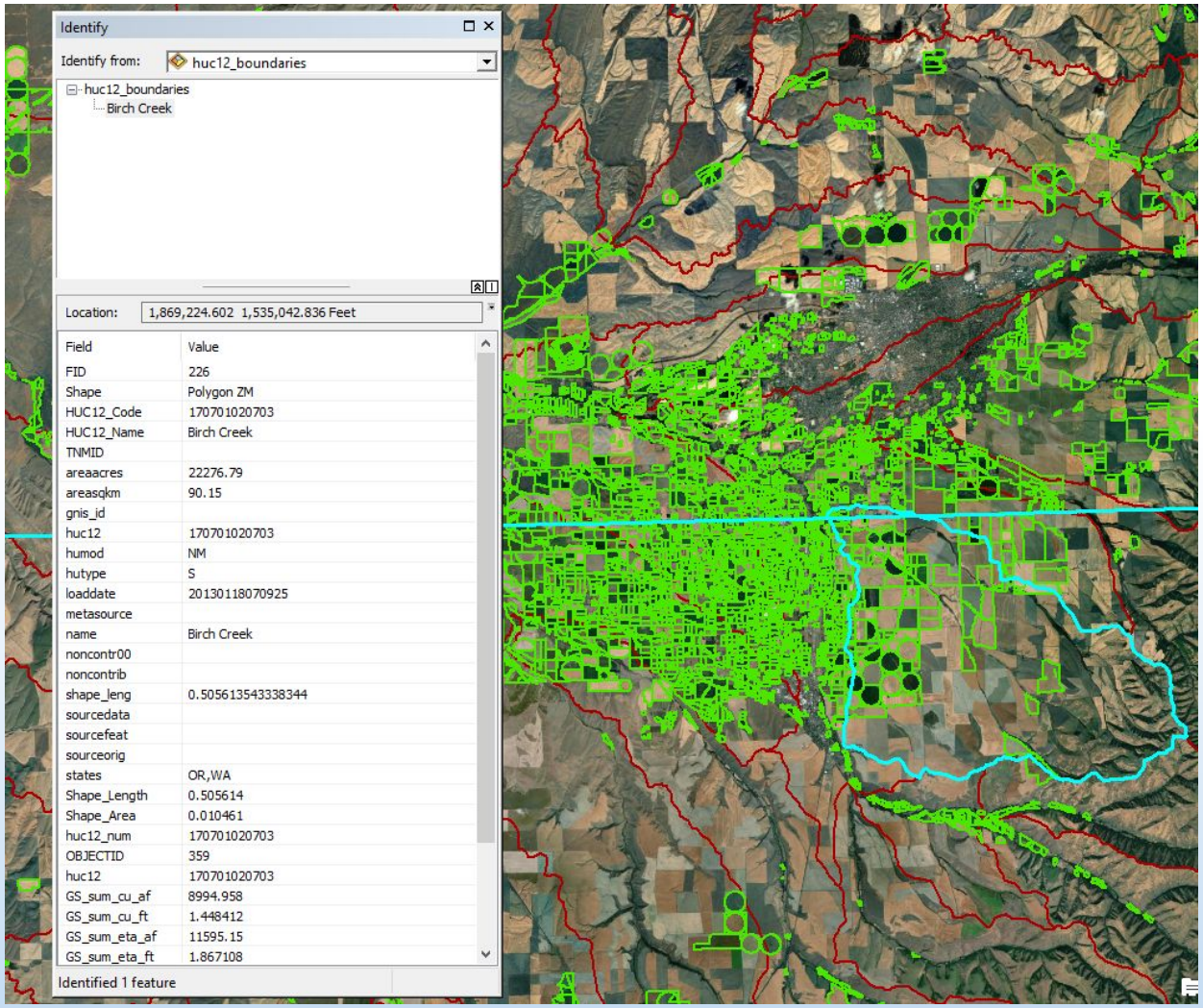
# Oregon ET Summary Data




- OWRD geodatabase that contains field and HUC-12 ET summary data
- Irrigated acreage, crop type, ET rates and volumes for 2016-2021
- HUC-12 summaries for irrigated fields only

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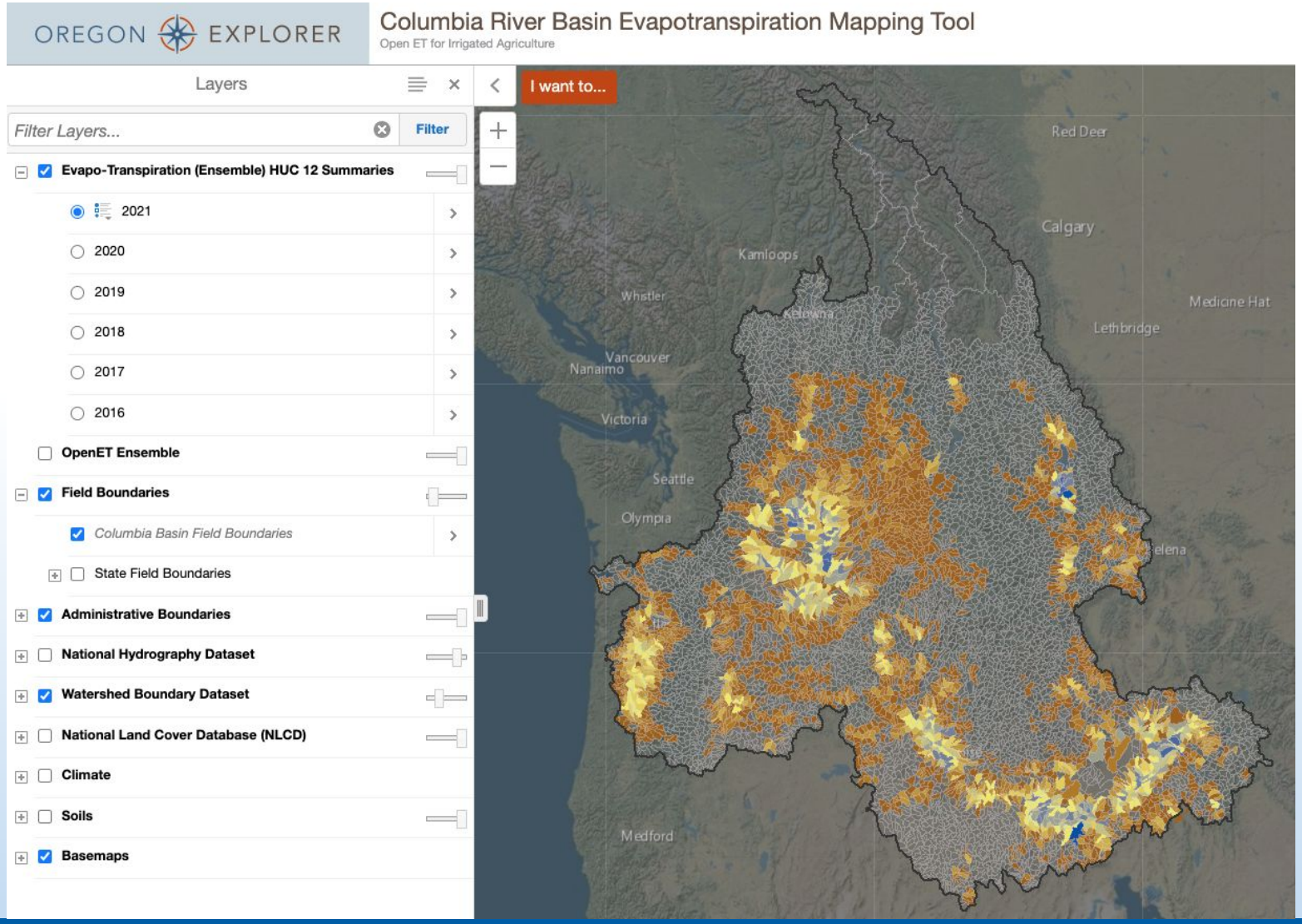
# Columbia River ET Mapping Tool – Oregon Explorer/INR






*Funded by a grant from the NASA Western Water Applications Office*

# Columbia Basin ET Project Timeline

**Tool Refinement, Integration of OpenET Data, Multi-state Meetings & Workshops (OR, ID, WA, DRI)**

- Fall 2021- Spring 2022

**Oregon In-Person ET Workshops (OSU Extension/INR)**

- Hermiston (Eastern OR) and Aurora (Western OR)
- September 2022

**Tool Launch on the Oregon Explorer (INR)**

- November 2022

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# Next Steps

- ET-Demands and open water evaporation modeling (under contract with DRI)
- Historical satellite-based ET modeling
- Comparison with ET measurements and previous studies
- Peer-reviewed consumptive use report
- Technical advisory committee and stakeholder outreach

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# Questions?

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971-707-1964

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# References


- Beamer, J. and M. Hoskinson. 2021. Historical Irrigation Water Use and Groundwater Pumpage Estimates in the Harney Basin, Oregon. *State of Oregon Open File Report No. 2021-02*.
- Ketchum, D., K. Jencso, M.P. Maneta, F. Melton, M.O. Jones, and J. Huntington. 2020. IrrMapper: A Machine Learning Approach for High Resolution Mapping of Irrigated Agriculture Across the Western U.S. *Remote Sensing* 12 (14): 2328.
- Melton, F., J. Huntington, R. Grimm, J. Herring, M. Hall, D. Rollison, T. Erickson, R. Allen, M. Anderson, P. Blankenau, M. Bromley, W. Carrara, B. Daudert, C. Doherty, C. Dunkerly, J. Fisher, M. Friedrichs, A. Guzman, C. Hain, G. Halverson, J. Handen, J. Harding, L. Johnson, Y. Kang, A. Kilic, M. Malloy, B. Minor, C. Morton, S. Ortega-Salazar, T. Ott, P Revelle, A. Ruhoff, M. Schull, G. Senay, J. Volk, T. Wang, Y. Yang, et al. 2021. "OpenET: Filling a Critical Data Gap in Water Management for the Western United States" *J. Am. Water Resour. Assoc.* https://doi.org/10.1111/1752-1688.12956

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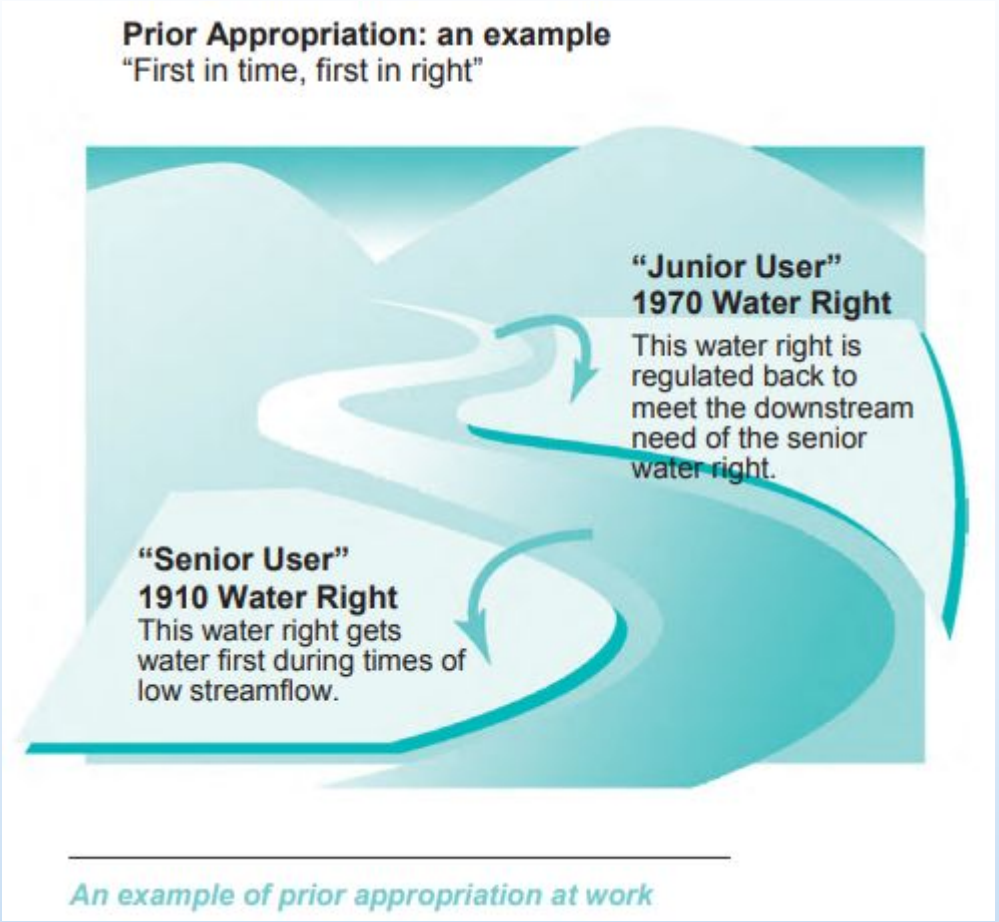
# Extra slides

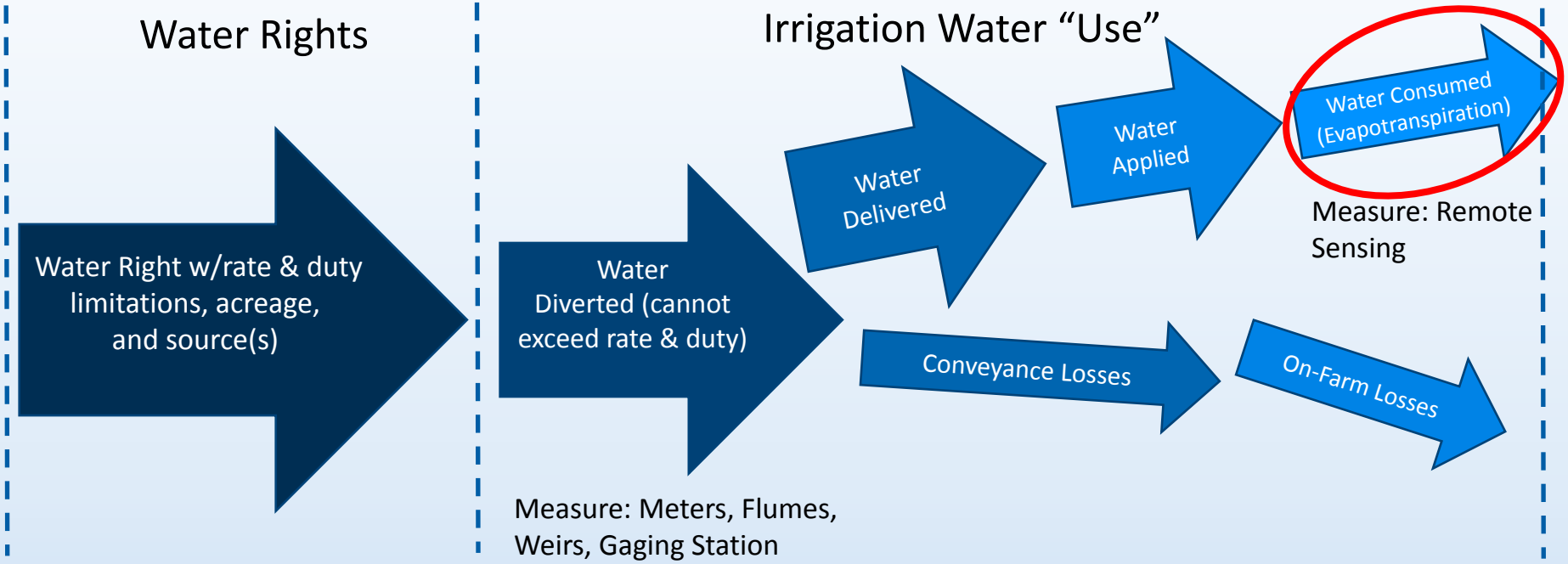
# OWRD's Roles and Responsibilities

- Implement and enforce Oregon's water allocation and distribution laws
- Manage surface water resources to meet instream and out-of-stream uses
- Collect, manage, and analyze water data




*An example of prior appropriation at work*

# From water right to consumption




Focus: Consumptive Water Use from Irrigated Agriculture

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# Harney Flux Station OpenET Comparison