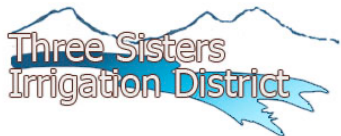


# **Saving Water for Fish and Farms:**

## ***Modernizing Central Oregon's Irrigation Infrastructure***



Marc Thalacker



Tygh Redfield

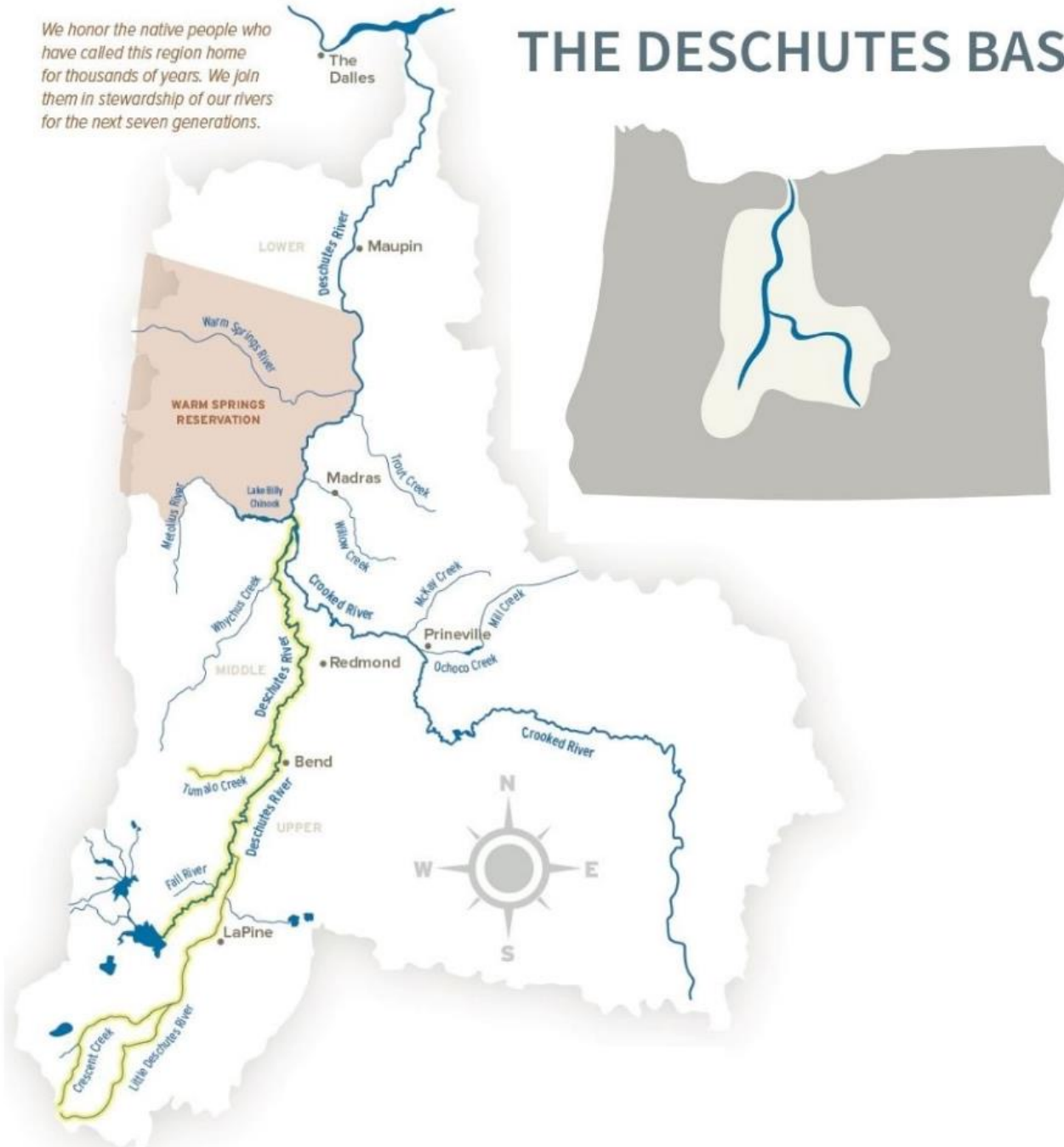
Lisa Seales



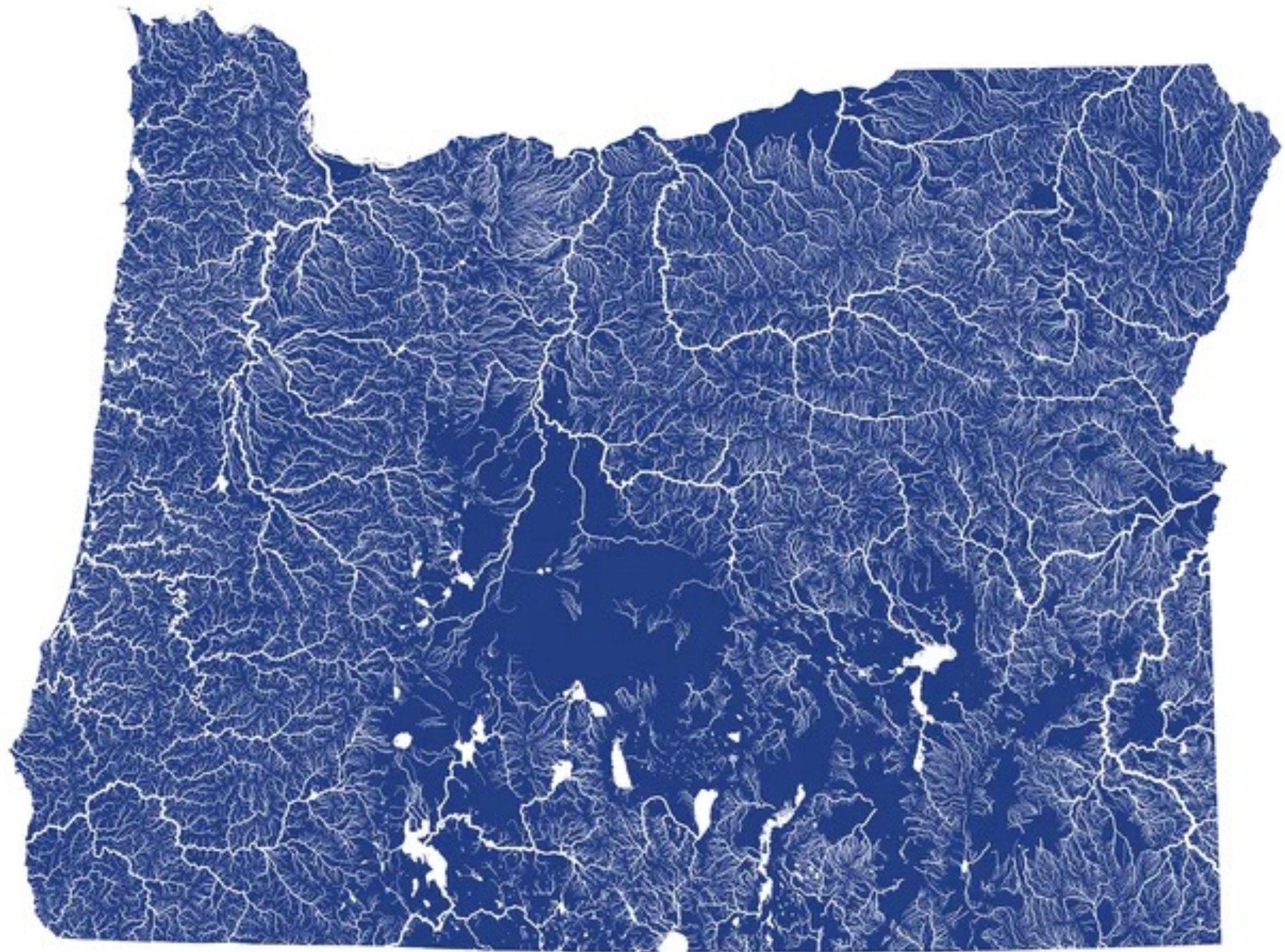


*We honor the native people who have called this region home for thousands of years. We join them in stewardship of our rivers for the next seven generations.*

# THE DESCHUTES BASIN

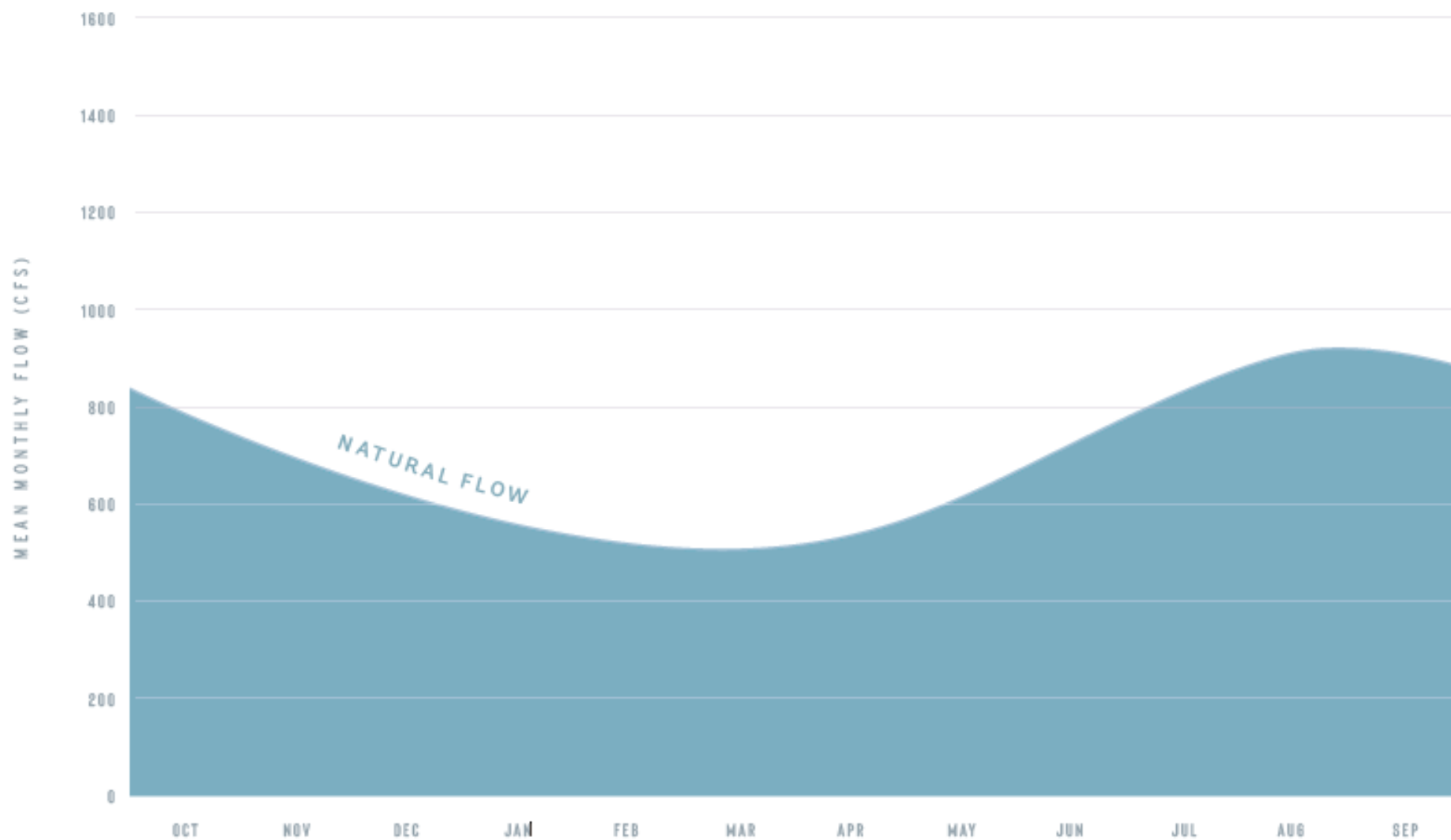




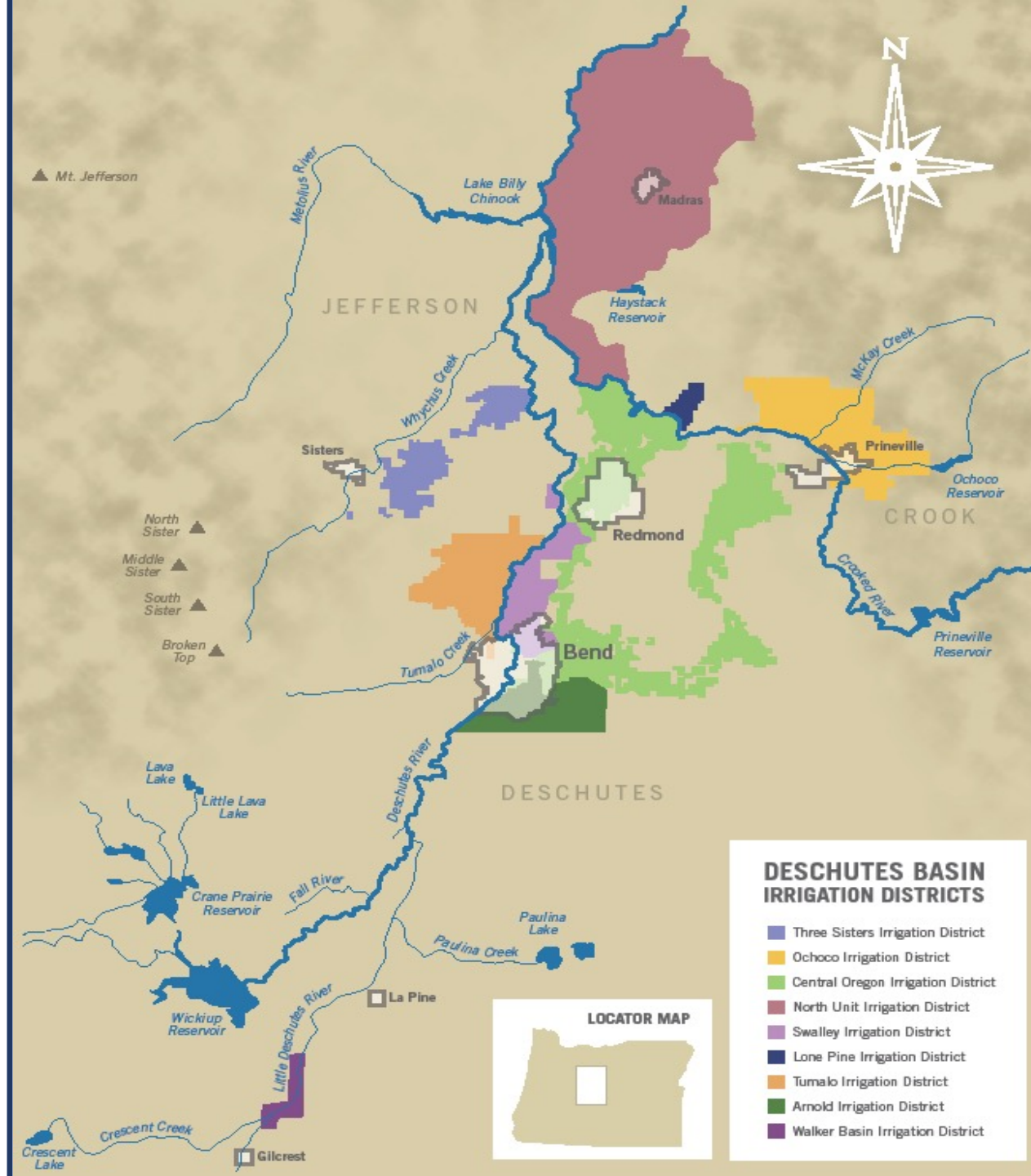


Source: Muir Way Maps

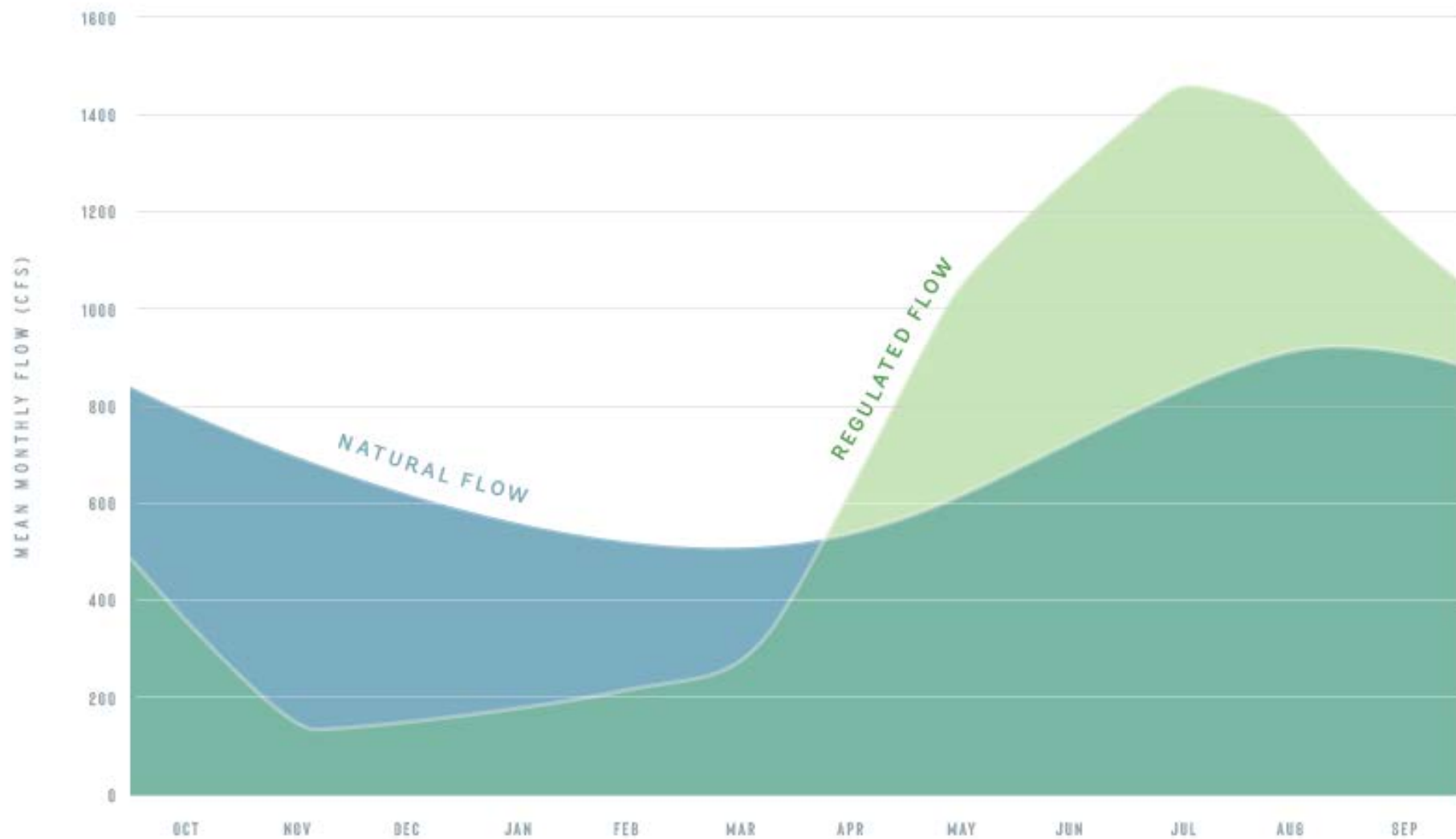
## Hydrograph of Natural Streamflow: Deschutes River below Wickiup Reservoir





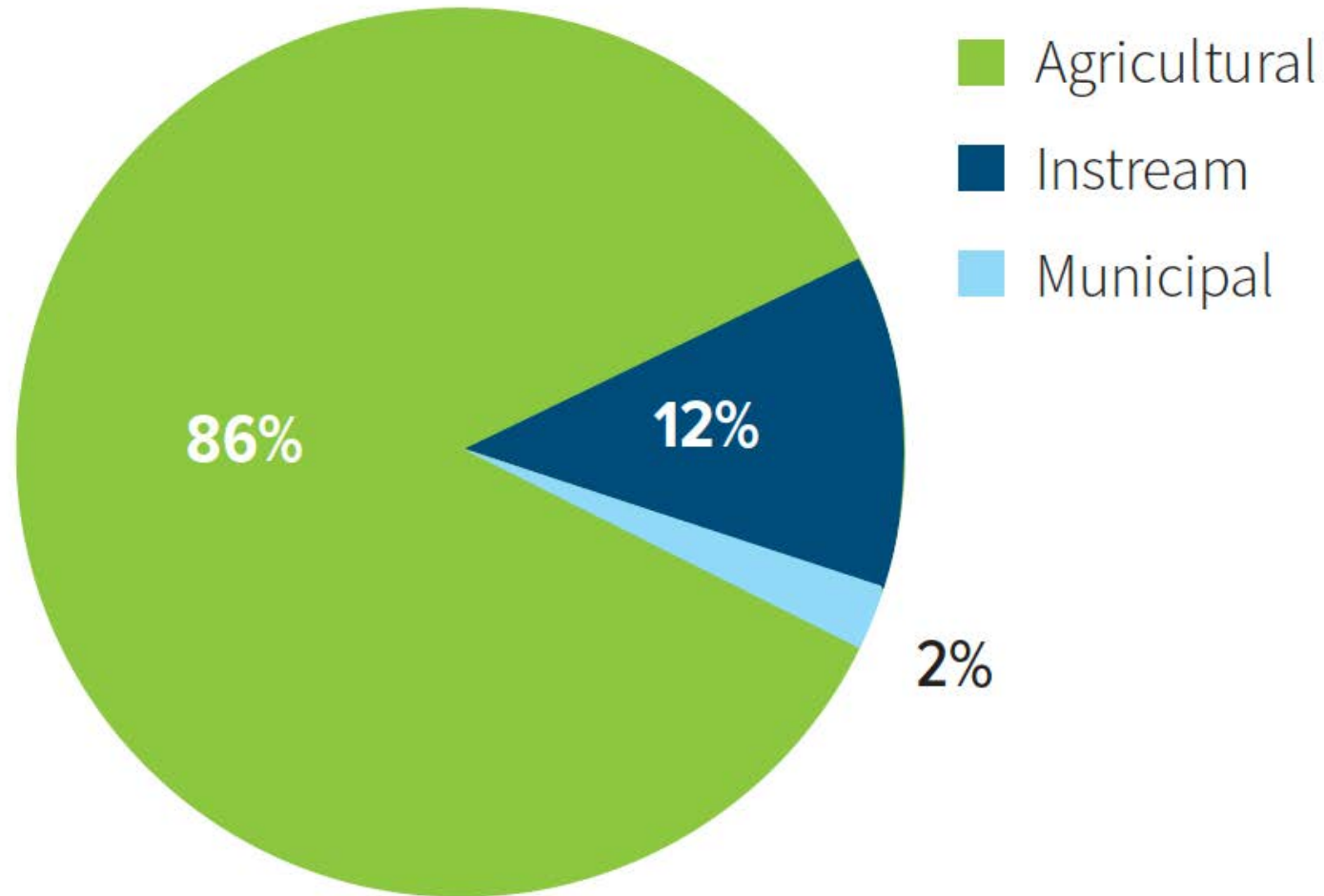


## Hydrograph of Natural and Regulated Streamflows: Deschutes River below Wickiup Reservoir (1983-present)





# How is Water Distributed in the Deschutes Basin?



## Deschutes River

---

98% of flows were  
diverted for irrigation



## Whychus Creek

---

Every 2 out of 3 years,  
the creek would run dry



## Crooked River

---

Extensively diverted flows  
would leave only a trickle of  
water at Smith Rock





# What is Irrigation Modernization?

- Piping canals and laterals
- Improved measurement, monitoring, and management using telemetry
- Converting flood irrigation to sprinklers
  - Pivots, wheel-lines, drip irrigation
  - Low elevation sprinkler applications
- Improving irrigation practices
- Soil moisture monitoring
- Crop selection



# Why Pipe?

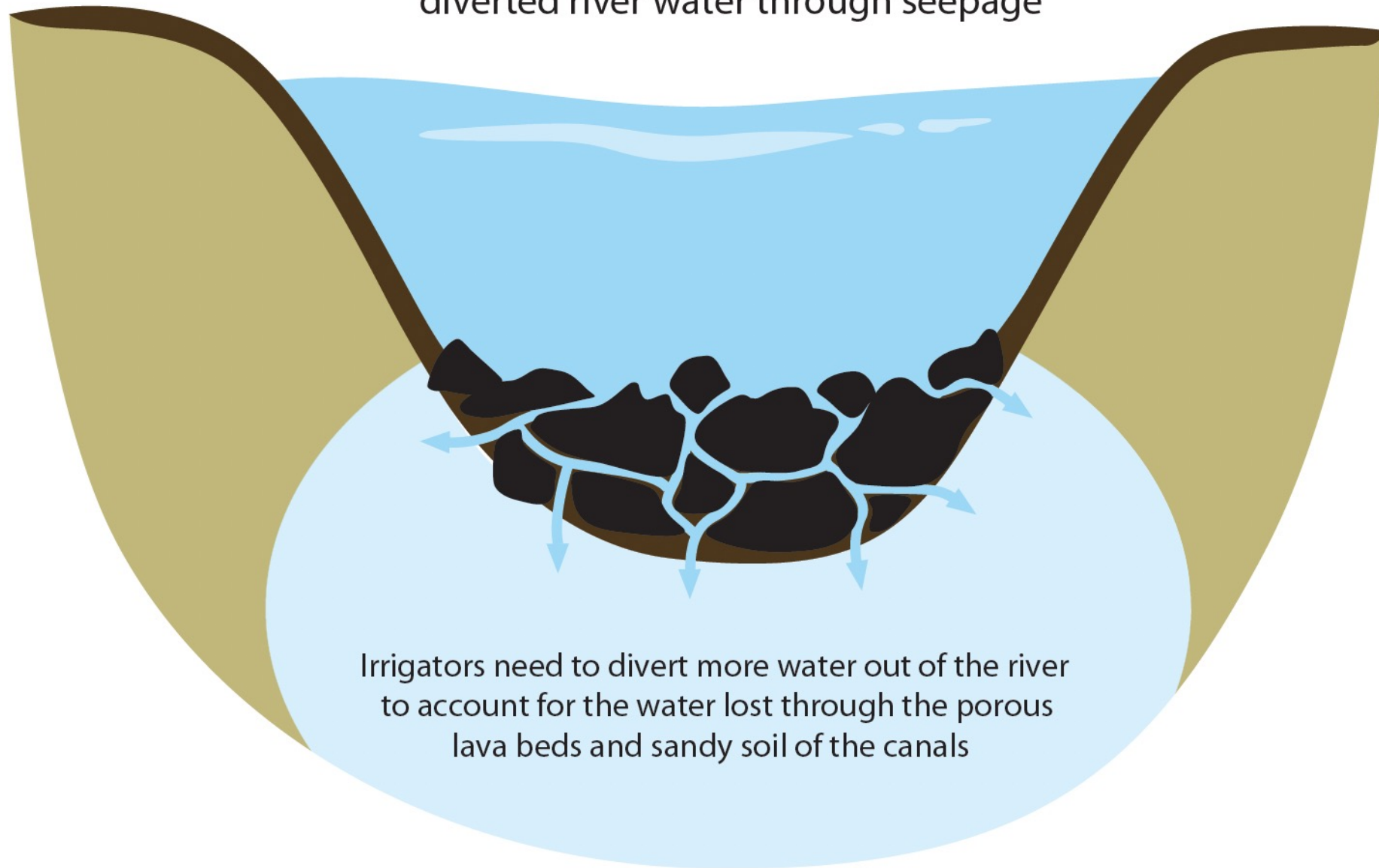
- 700 miles of canals in Central Oregon
- Leaking ~50% of their water
- Divert twice as much as is needed on farm



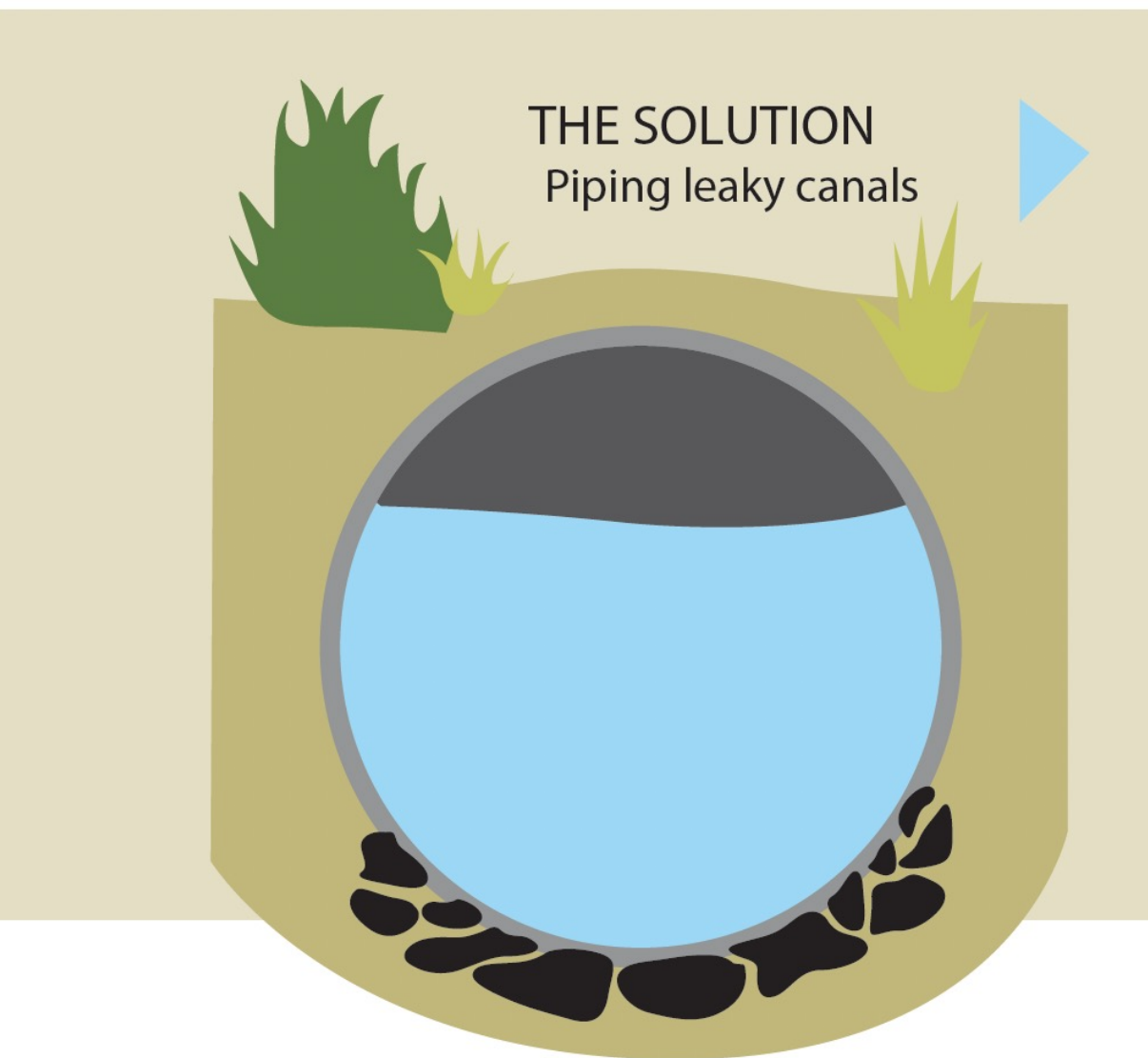


## THE PROBLEM

Outdated canals can lose up to 50% of diverted river water through seepage

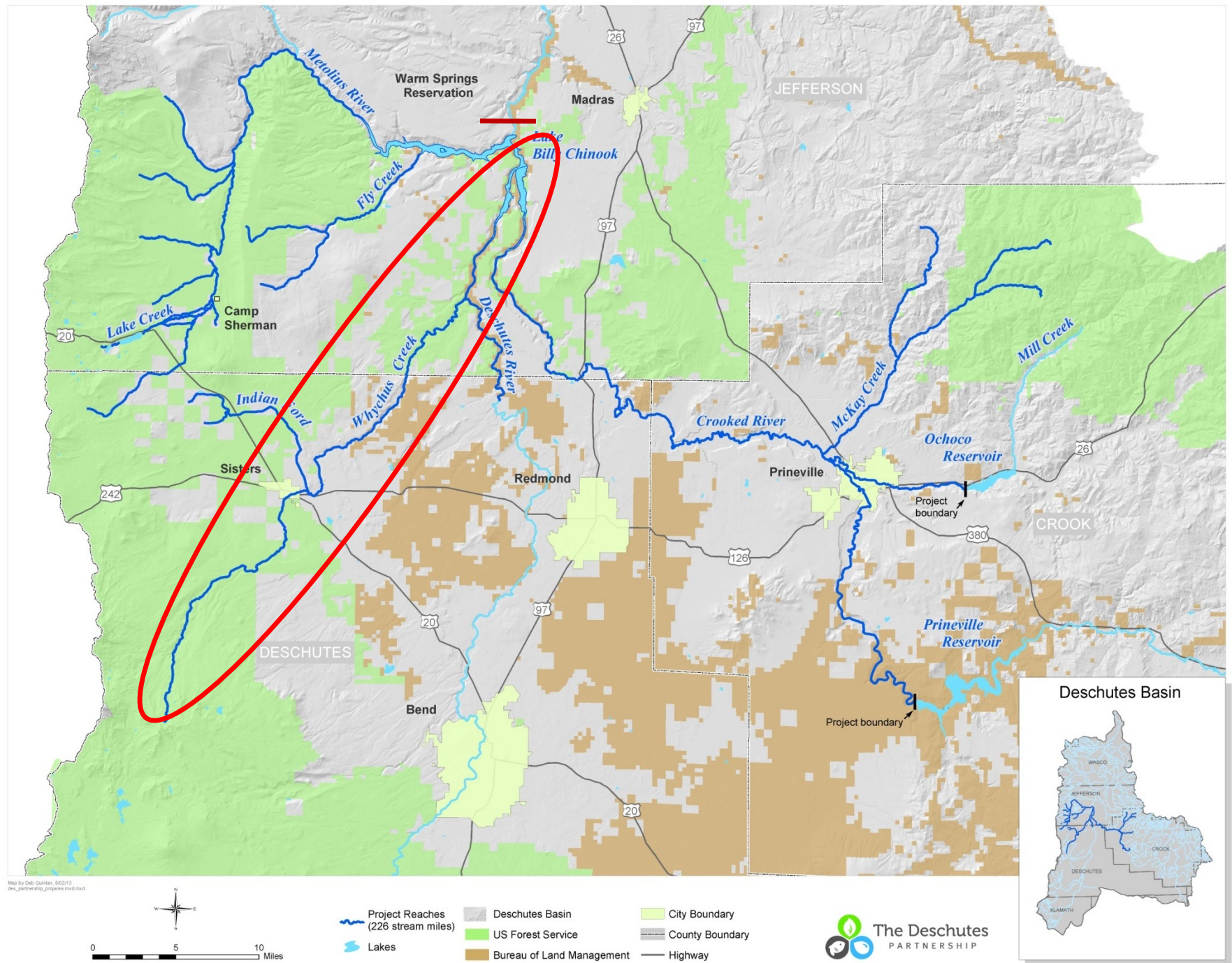


Irrigators need to divert more water out of the river to account for the water lost through the porous lava beds and sandy soil of the canals



- Eliminates water lost through seepage
- Saved water is permanently protected in the river by the State of Oregon
- Creates an opportunity for pressurized hydropower that doesn't have a negative impact on the river







# Need: Streamflow Restoration





# Need: Fish Passage





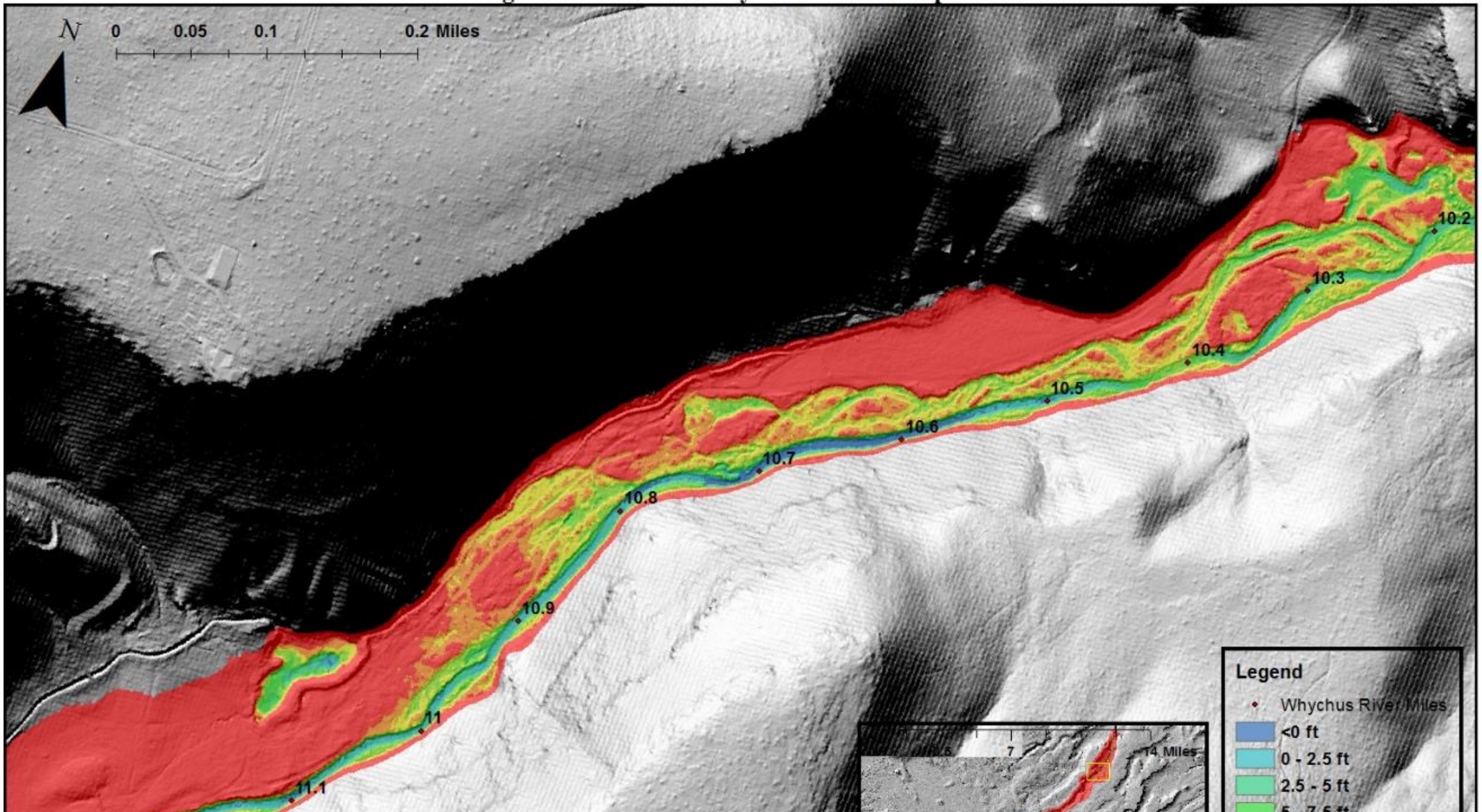
# Need: Fish Screening





# Need: Floodplain Restoration

Height Above River - Whychus Creek - Map 11





# Open Ditch Liabilities

- Water Loss
- Pollution
- Flood Damage
- Safety—drownings of people and animals in canals
- Maintenance Nightmares
- Operating Inefficiency









































# Flood Irrigation vs Sprinkler Irrigation









# Modernization Goals Achieved Through Partnerships

- Water Conservation
- Energy Conservation
- Carbon Footprint Reduction
- Sustainable Agriculture
- Anadromous Re-introduction
- Stream Restoration



Portland General Electric







HydroTEK Engineering  
150 kW  
High Efficiency Francis

Three Rivers Irrigation District  
EnergyTrust  
Oregon Department of Energy  
USDA  
Designed by:  
Turbines:  
HydroTEK 150 kW high efficiency Francis  
COAR Industries 22.39 kW Vertical Francis  
Cornell Pumps 14 kW reverse pump  
2 nozzle Tangential Impulse Pelton



# Outcomes and Results

- Whychus never goes dry now!  
Minimum streamflow of 23-45 cfs
- 9.5 stream miles of and 3,100 acres have been protected via acquisition or conservation easements
- 6 fish passage barriers have been retrofitted or removed
- 4.5 miles of stream and 385 acres of high-quality habitat restored







## Fish Passage and Screening









United States Department of Agriculture

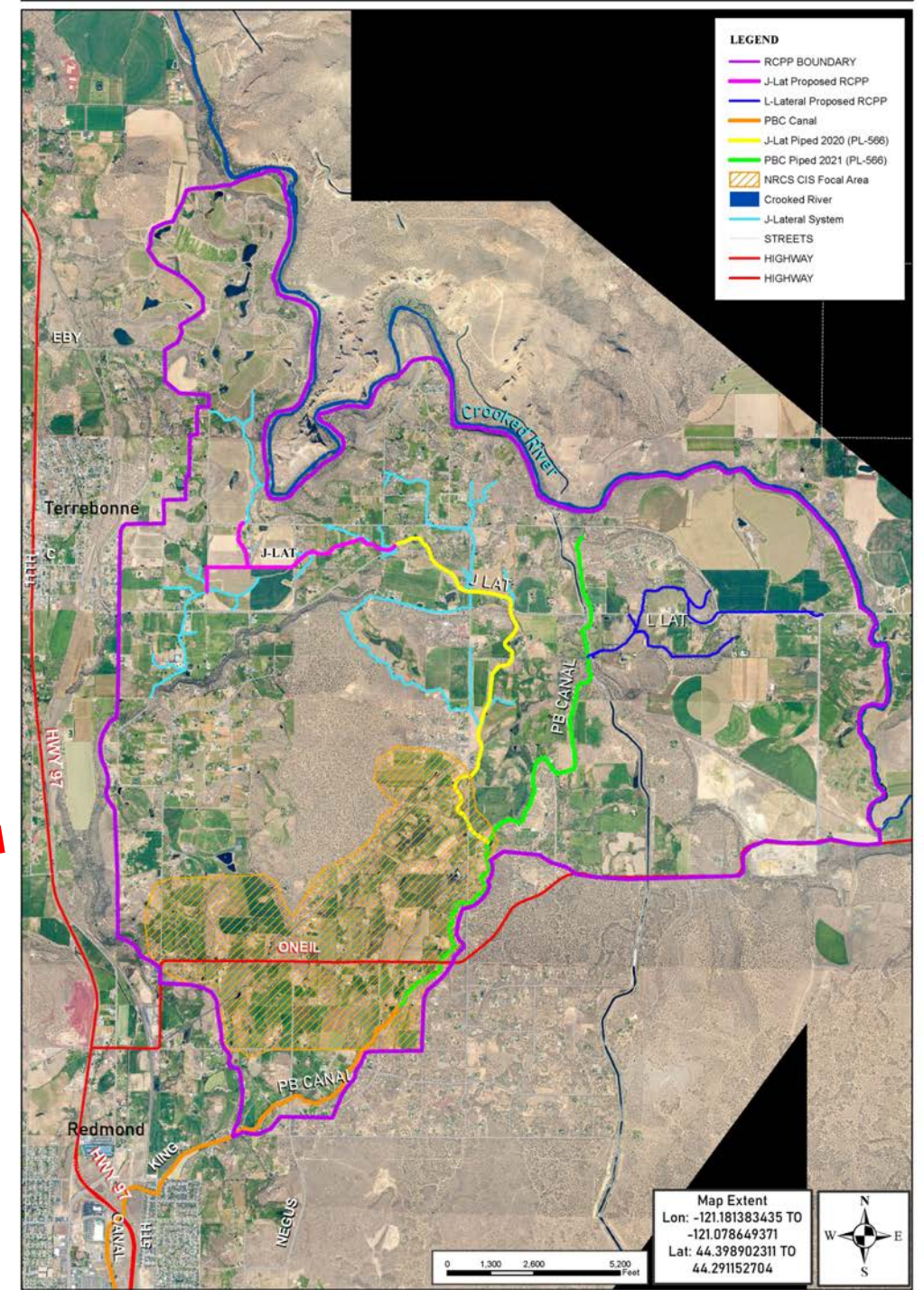
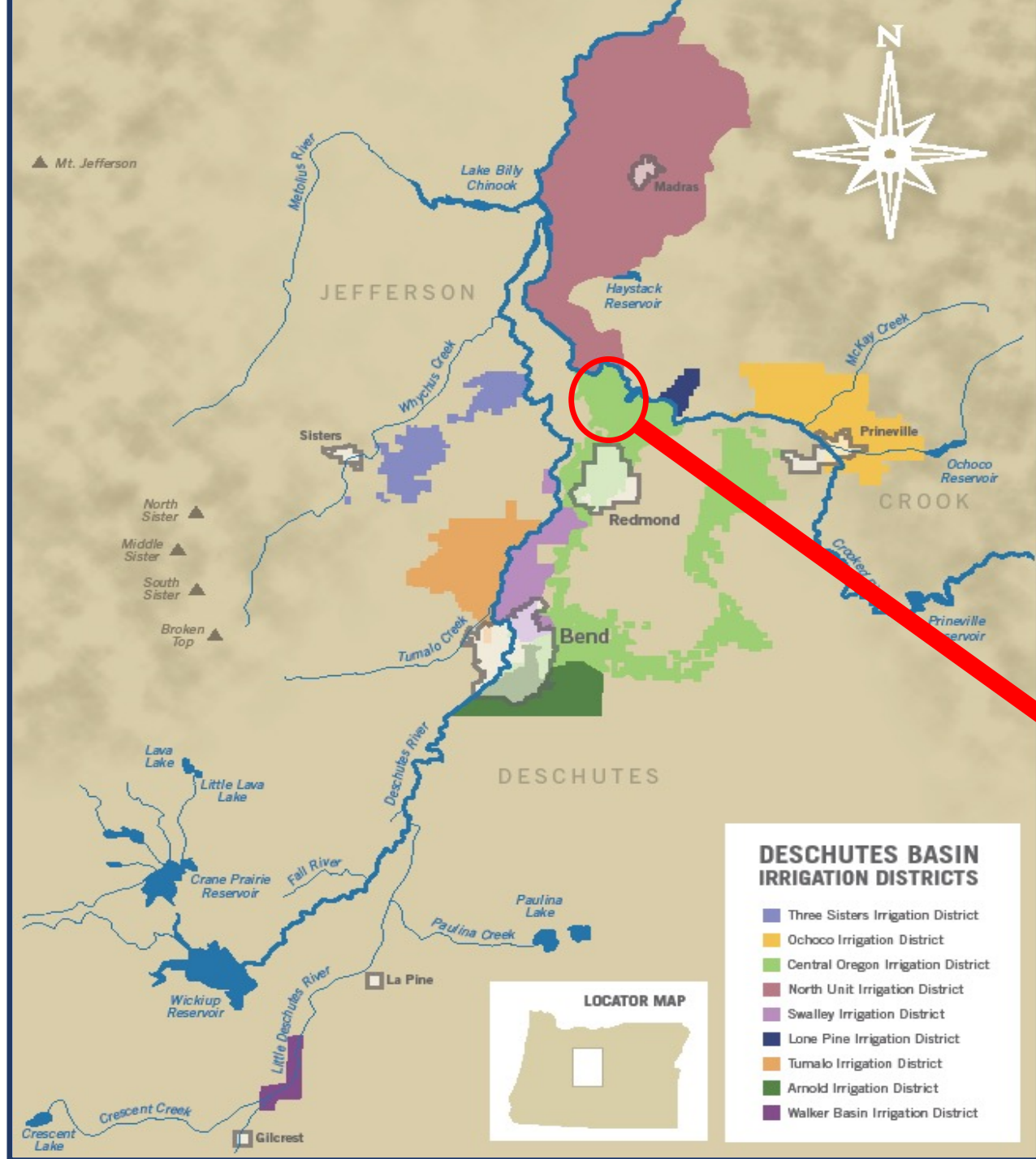
# RCPP

## Regional Conservation Partnership Program



### Partnering for Conservation Solutions







## WINTER

Flows are held back in winter to fill the reservoir to ensure enough water is available for summer irrigation. Water is also being released to benefit fish and wildlife.

Wickiup Reservoir

Upper Deschutes  
Minimum of 100 cfs



Fish can become stranded when flows get too low. The river becomes disconnected from wetlands and limits Oregon spotted frog habitat.

Tributaries and natural springs add flow to the river above Benham Falls.



Benham Falls

Bend  
550 cfs

Middle Deschutes 550 cfs

Lake Billy Chinook

## SUMMER

Dramatic seasonal high and low flows lead to degradation of fish habitat, river bank erosion, and, consequently, silt deposits downstream.

Wickiup Reservoir

Upper Deschutes  
up to 1800 cfs

Benham Falls

Bend  
1800 cfs

Irrigation diversions around Bend reduce streamflows in the Middle Deschutes.

Middle Deschutes 60-130 cfs

Low flow and increased water temperature impact fish habitat.



Lake Billy Chinook



# Impacts to the Deschutes River





# Piping and Impacts to Wildlife

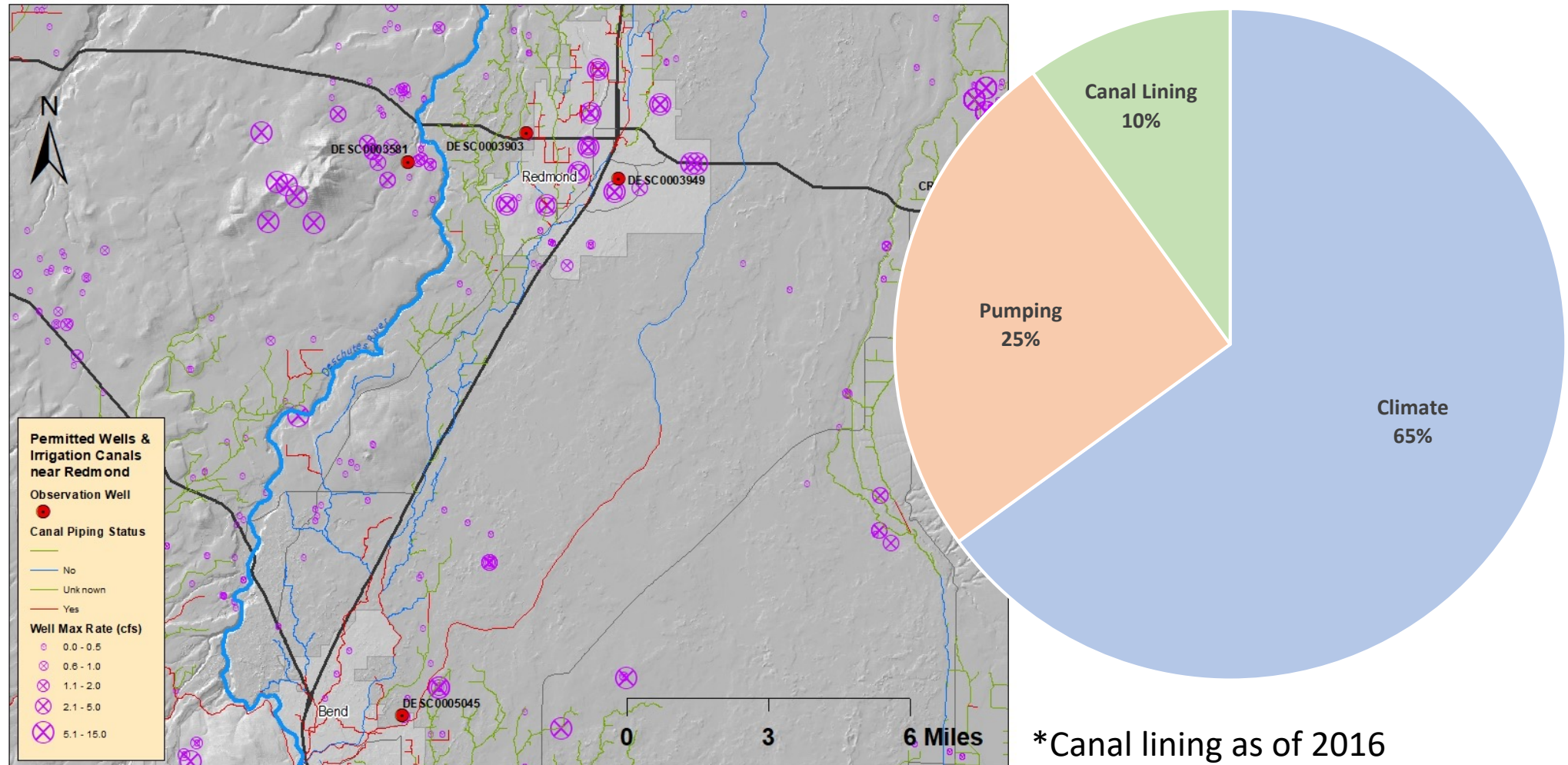
- Oregon Department of Fish and Wildlife: piping is safer for wildlife!
  - Canals are hazards that can trap deer in both winter and summer, especially if the canal is lined with concrete.
- In the absence of canals, mule deer and other animals will find water elsewhere.
  - “There are usually irrigated fields, ponds, and yards nearby that provide sources of water,” Walch said. “It just may shift the distribution and patterns of wildlife that folks are used to seeing on their property.”





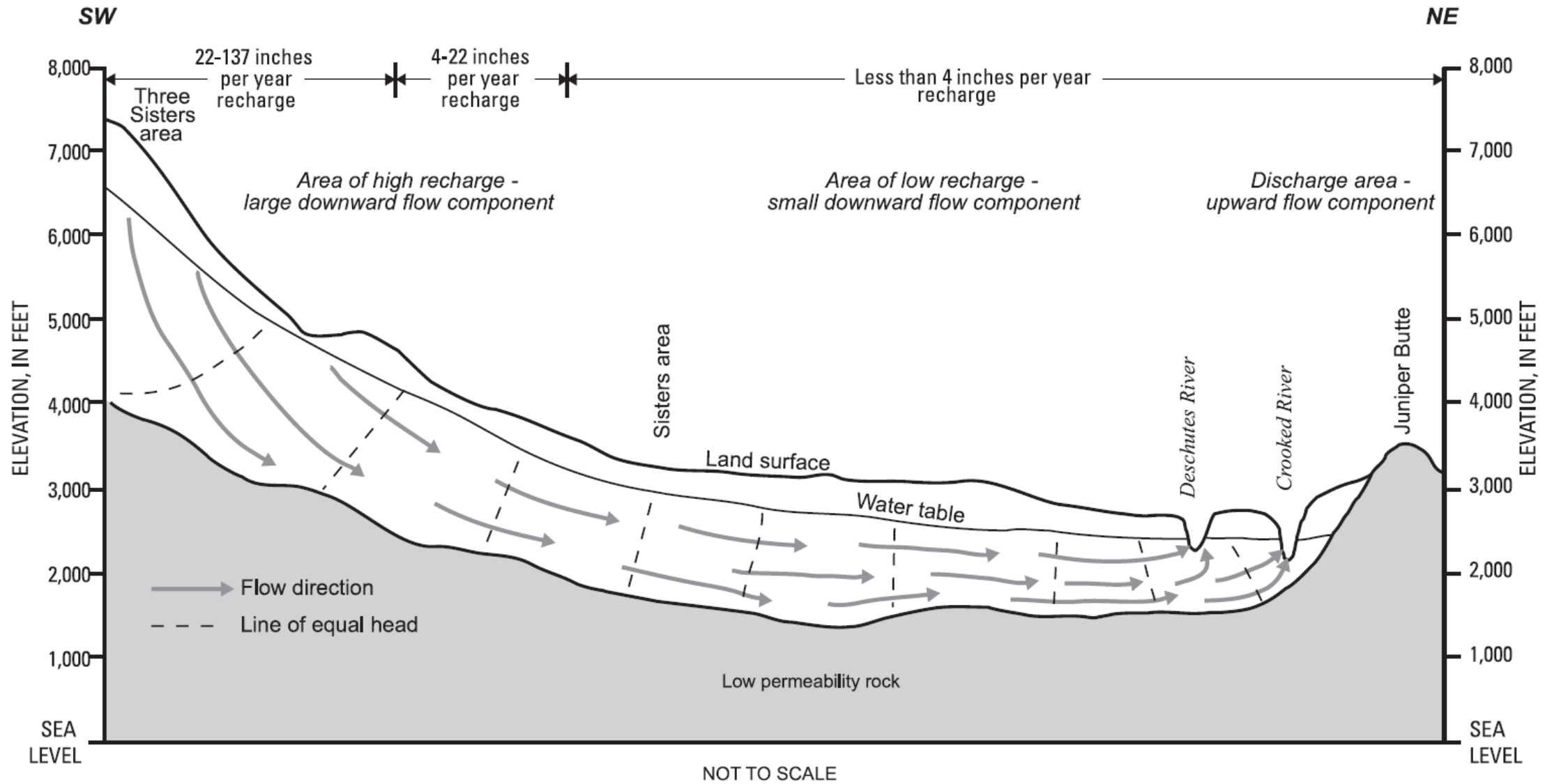
# Why are Groundwater Levels Declining?

Estimated Relative Contribution to Groundwater Declines in Redmond Area  
(Gannett and Lite, 2013)



Gannett, M.W., and Lite, K.E., Jr., 2013, Analysis of 1997–2008 groundwater level changes in the upper Deschutes Basin, Central Oregon: U.S. Geological Survey Scientific Investigations Report 2013-5092, 34 p., <http://pubs.usgs.gov/sir/2013/5092>.





Source: Gannett, M.W., Lite, Jr., K.E., Morgan, D.S., and Collins, C.A., 2001, Ground-water hydrology of the upper Deschutes Basin, Oregon: U.S. Geological Survey Water-Resources Investigations Report 00-4162, 74 p.





# Take Home Messages

- Irrigation Modernization is a critical tool to help restore rivers, while providing farmers the water they need to grow crops.
- It also reduces irrigation district operations and maintenance.



# Questions?



DESCHUTES RIVER  
CONSERVANCY



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