# Welcome & Thank You for Coming

## Greater Harney Valley Groundwater Study

OREGON
WATER RESOURCES DEPARTMENT

## Meeting Begins at 5:30

**November 3, 2022**

**Harney Community Center**

# Meeting Agenda 5:30 to 8:30

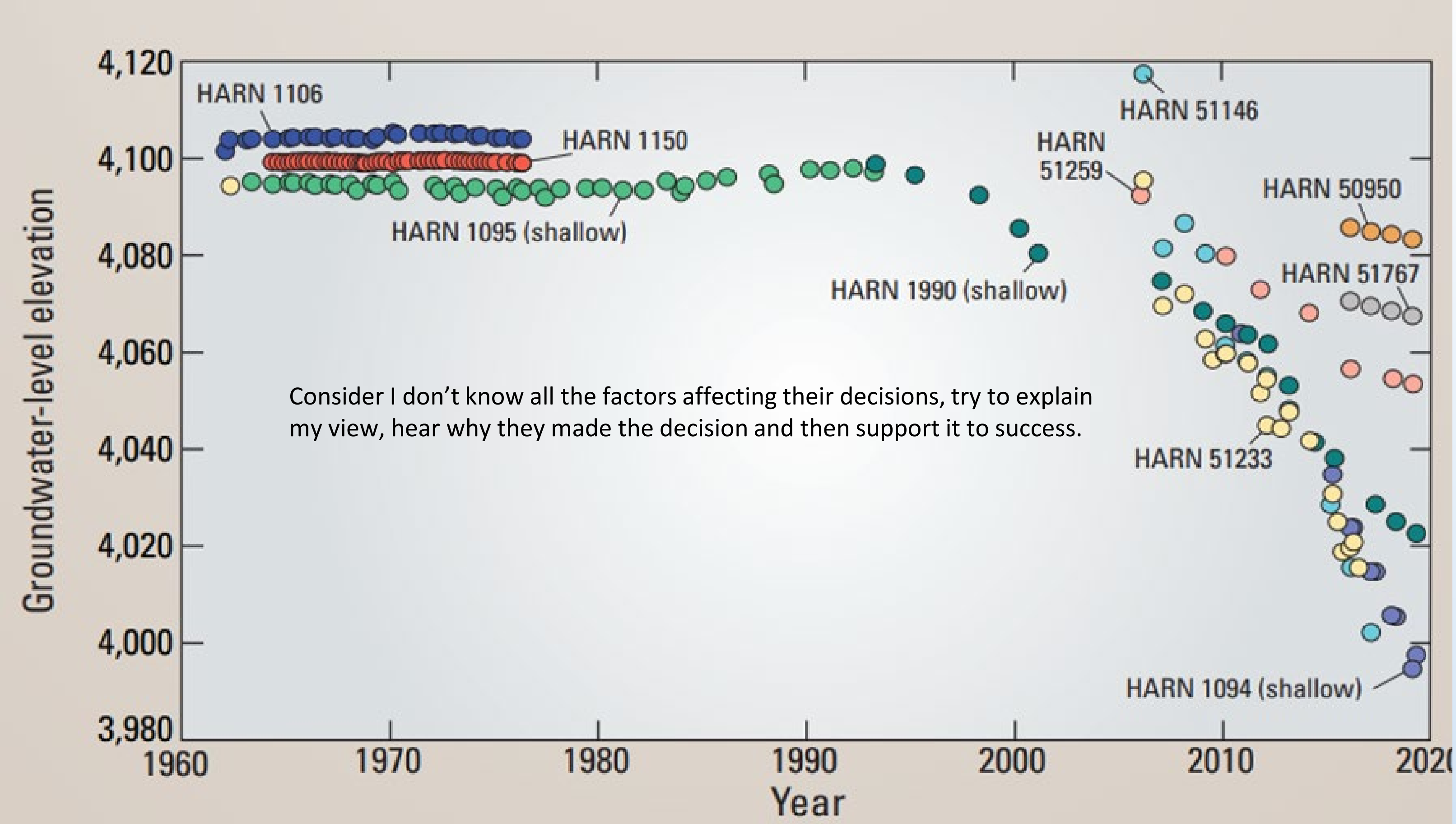
- Opening Remarks
- Why a Groundwater Study in Harney Basin
- Groundwater Study Results
- Public Questions on Study
- Dual Approach to Groundwater Stabilization
- Public Questions and Input
- Closing Remarks
- Open House

# Opening Remarks

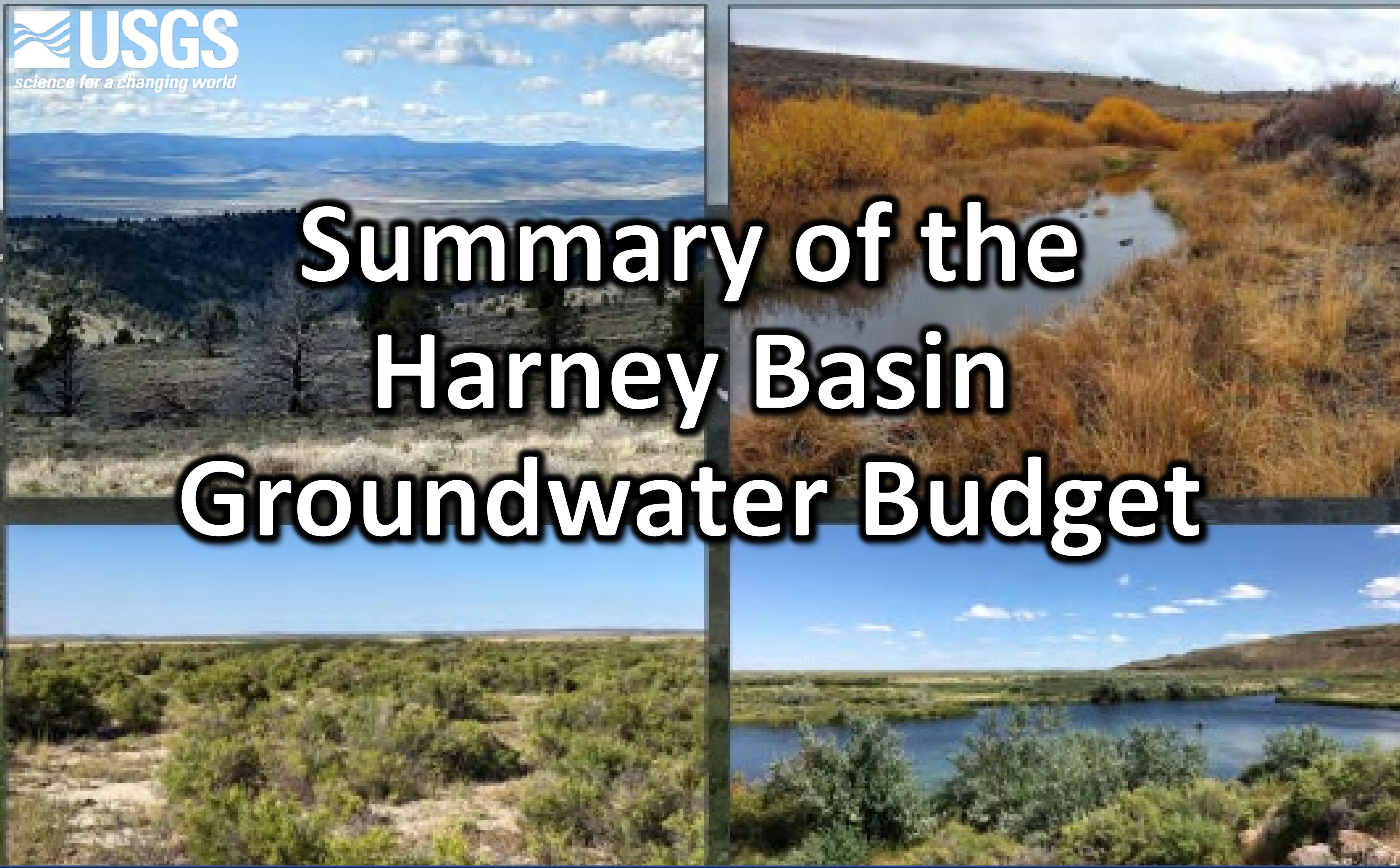
**Thank You to Everyone Who Contributed to the Groundwater Study over the Years**

- **US Geological Survey**
- **OWRD Technical Staff**
- **Oregon Department of Geology and Mineral Industries (DOGAMI)**
- **Study Advisory Committee**
- **Harney Watershed Council**
- **Harney County Commission**
- **Private and Public Well Owners**

# Why a Groundwater Study?




*Groundwater levels (in feet above North American Vertical Datum of 1988) during 1960–2020. From Gingerich and others, 2022.*




# Summary of the Harney Basin Groundwater Budget

U.S. Geological Survey and Oregon Water Resources Department
Harney Basin Groundwater Study Community Meeting, 11/3/2022

U.S. Department of the Interior
U.S. Geological Survey

# Water Budget

**Inflow**

**Outflow**


**Net change in account**

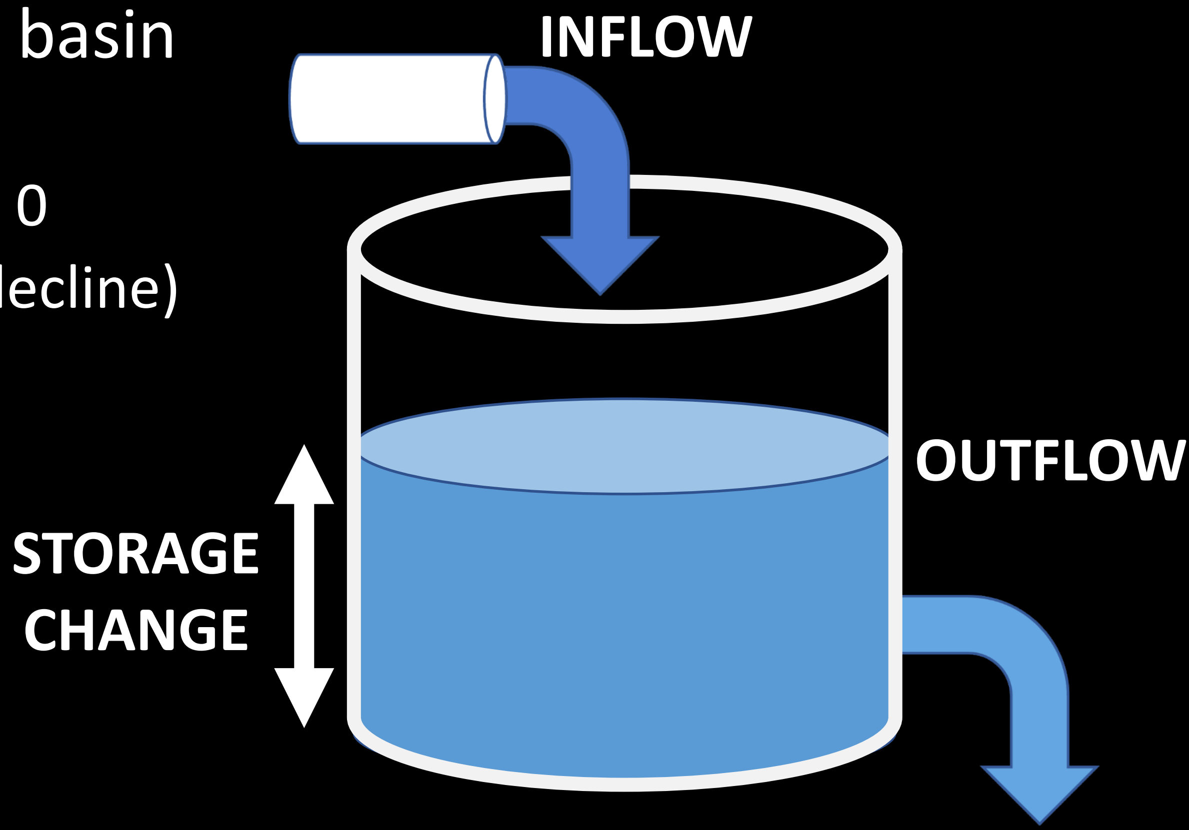
USGS

# Basin Water Budget

**↓INFLOW = ↑OUTFLOW ± CHANGE IN STORAGE**

Steady-state closed basin

- Inflow = Outflow
- Storage change = 0
  (no water-level decline)




USGS

# Budgets for Upland and Lowland Areas

- Lowland areas
  - Central basin valleys and floodplains
  - Precipitation is generally 9 –11 inches per year
  - Where more than 90% of pumpage occurs
- Upland areas
  - Precipitation is generally more than 11 inches per year
  - All areas beyond lowland boundary

Garcia and others (2022)

USGS

# Key Takeaways

## Upland groundwater budget

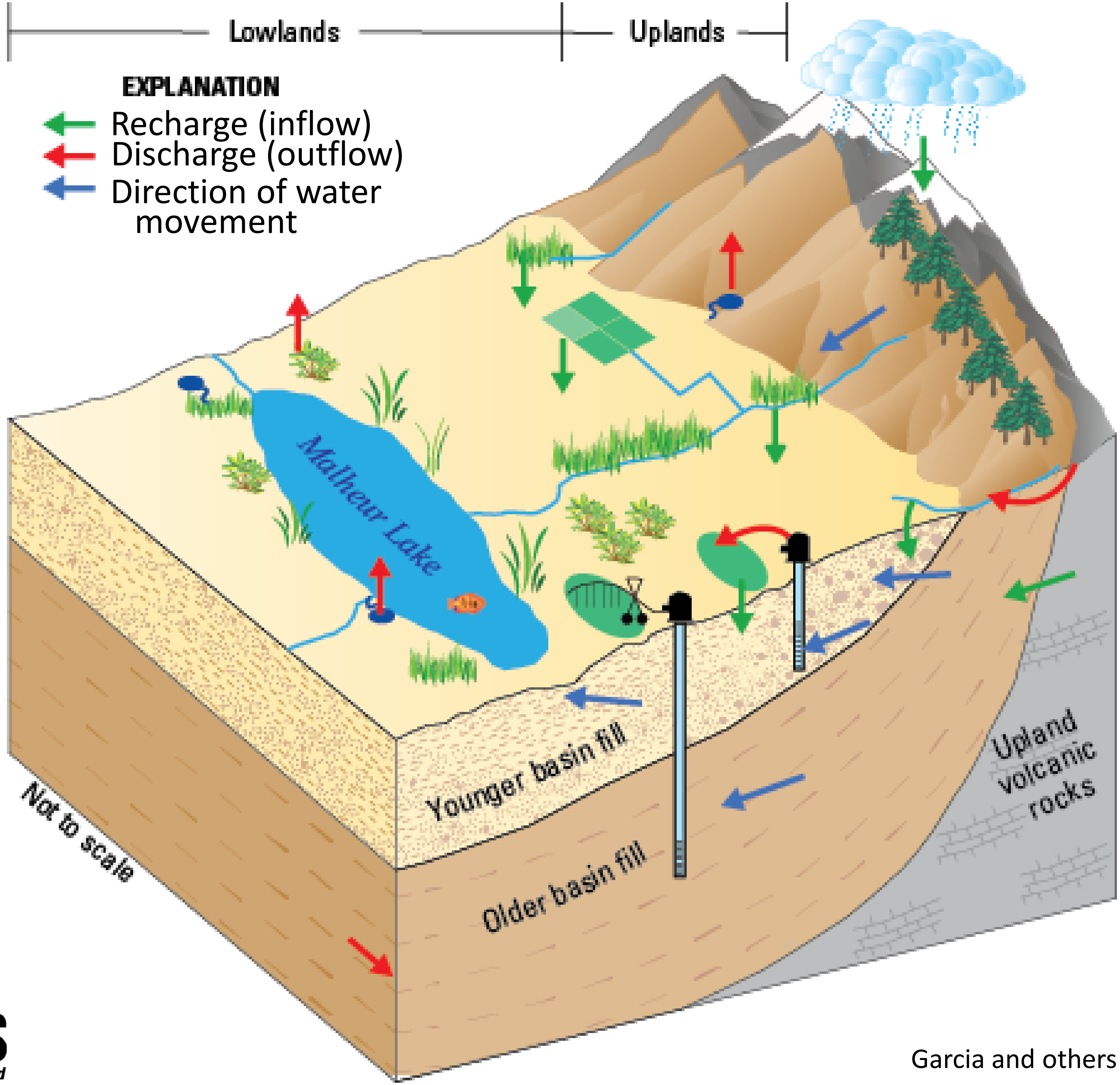
- Minimally affected by groundwater development
- Generally represents the natural system

## Lowland groundwater budget

- Accounts for most groundwater development
- Is out of balance by about –110,000 acre-feet per year
- Current imbalance represents groundwater removed from aquifer storage

USGS

Garcia and others (2022)

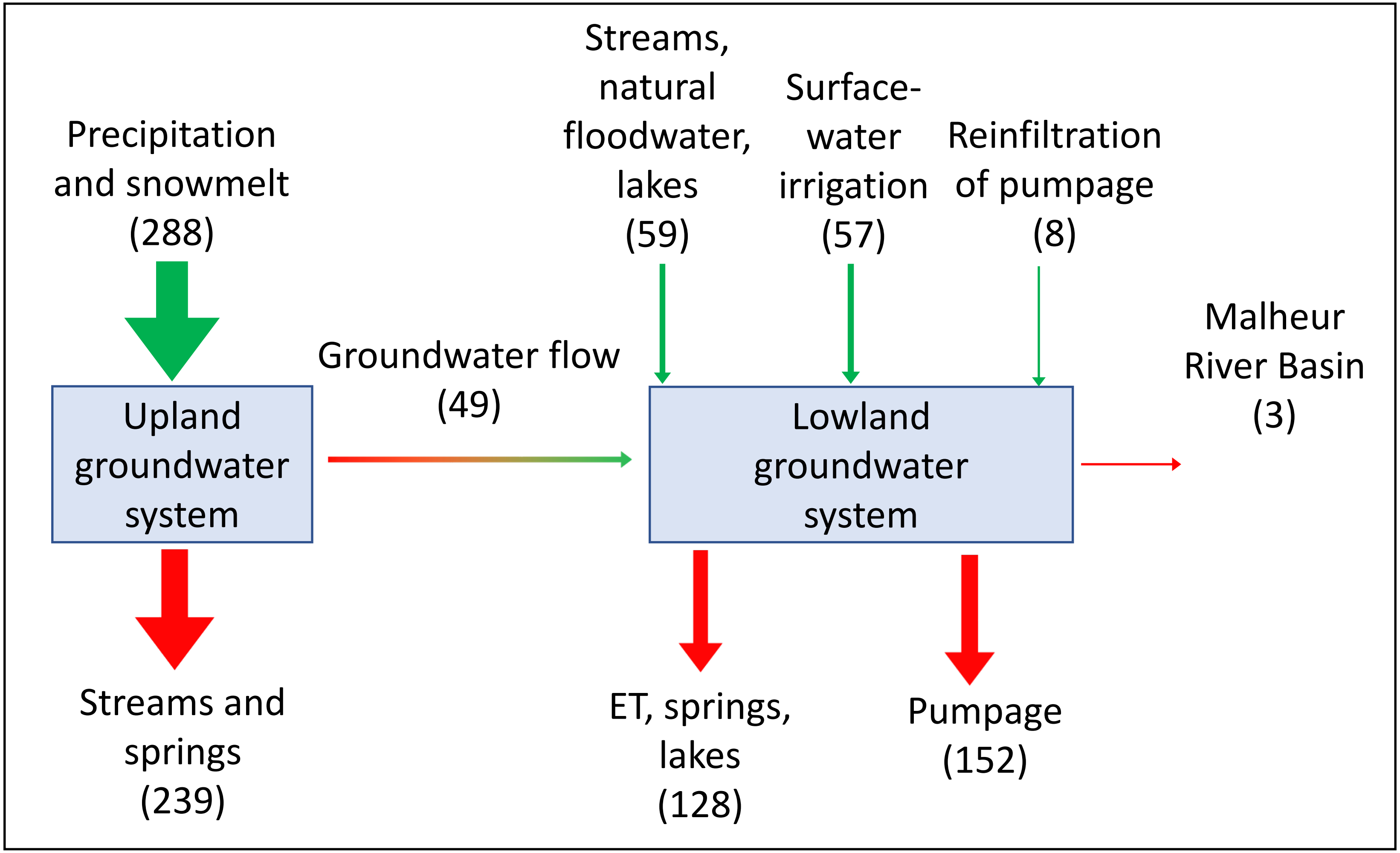



USGS science for a changing world

Garcia and others (2022)

# Mean Annual Groundwater Budget

(in thousands of acre-feet per year)

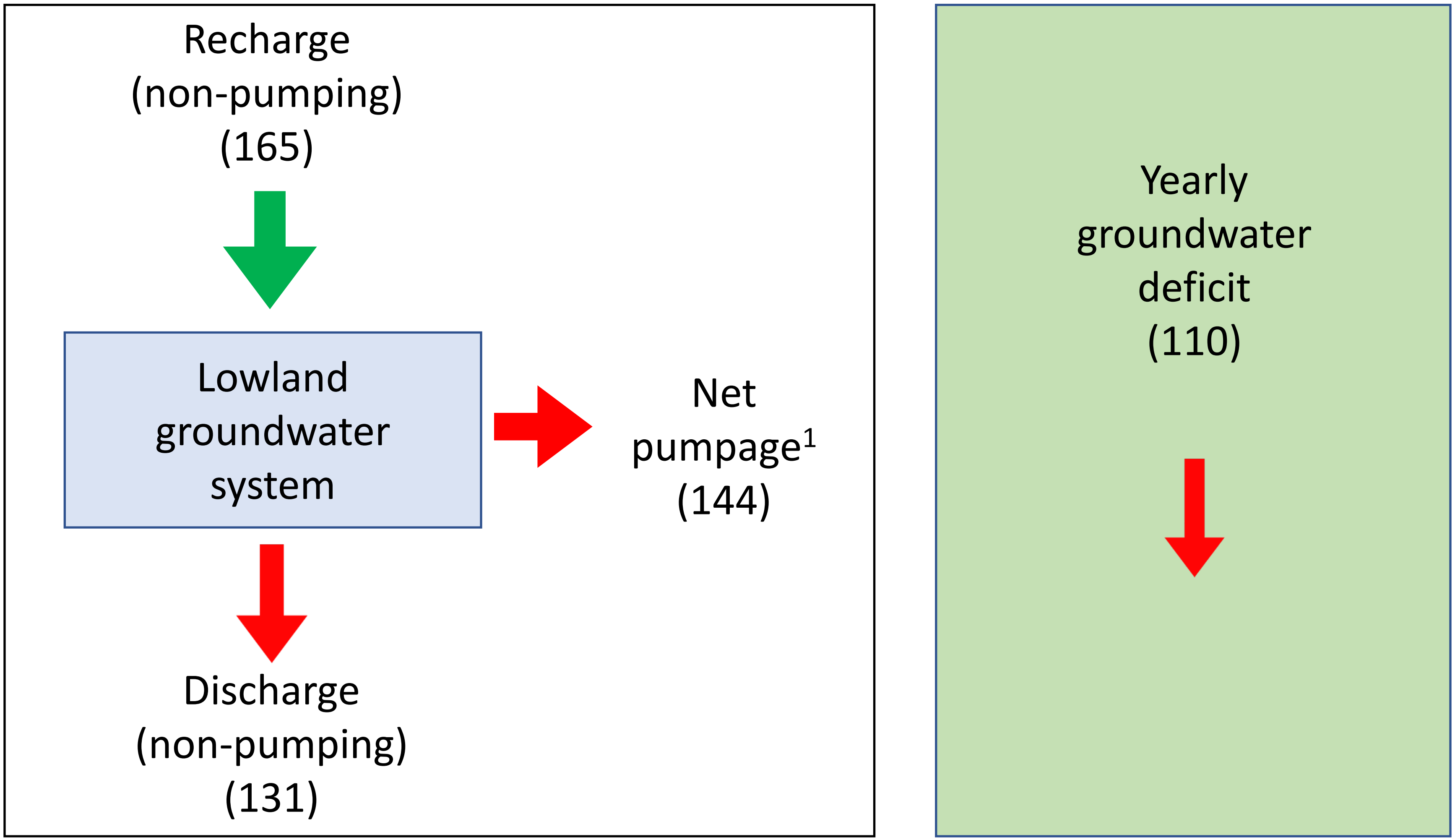





Garcia and others (2022)

# Mean Annual Groundwater Budget

(in thousands of acre-feet per year)

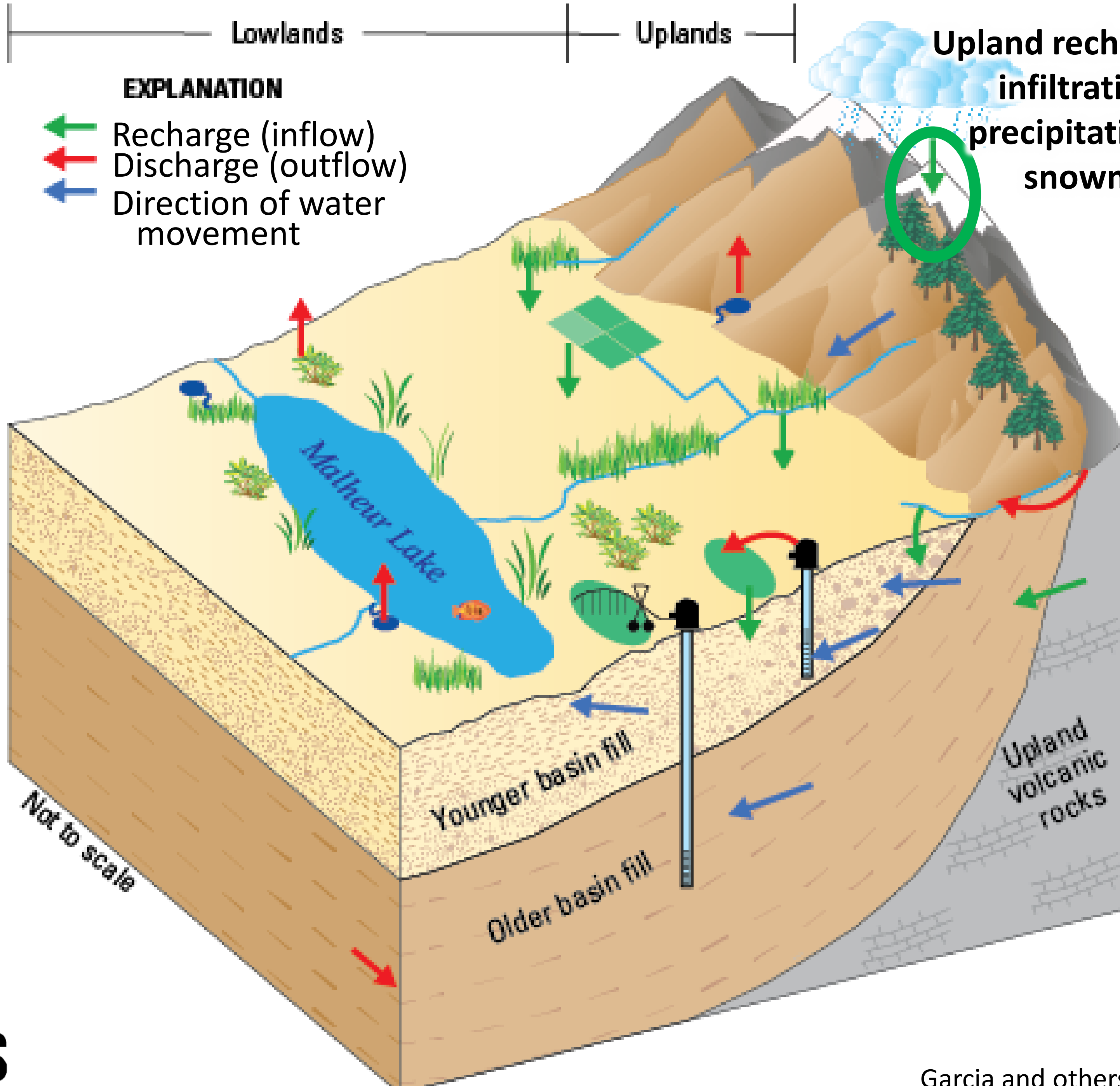



USGS science for a changing world

[1]Net pumpage = total pumpage – reinfiltration of pumped groundwater

Garcia and others (2022)

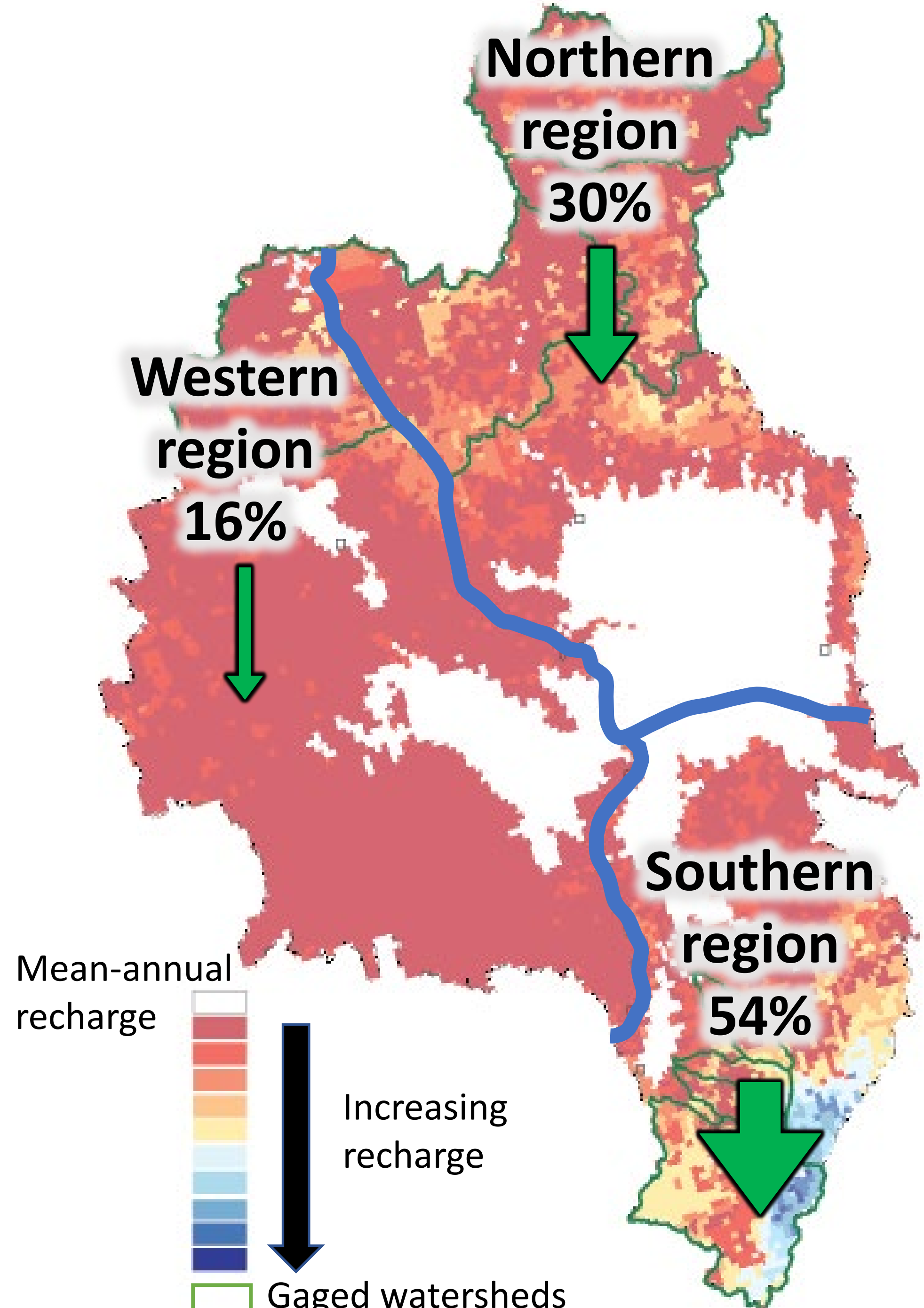
## Upland recharge from infiltration of precipitation and snowmelt




Garcia and others (2022)

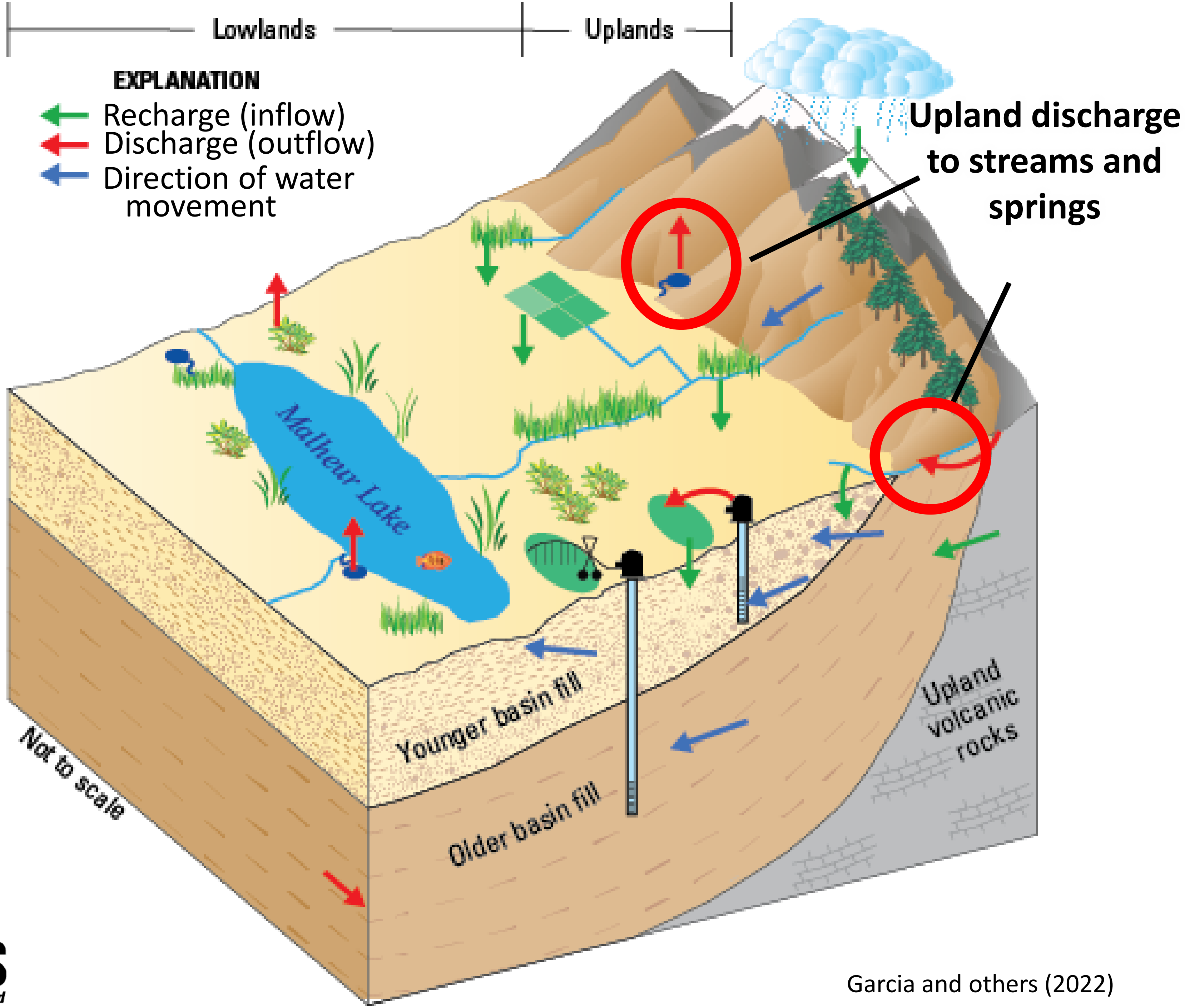
# Total Upland Recharge by Region

- Total upland recharge = 288,000 acre-feet per year




USGS

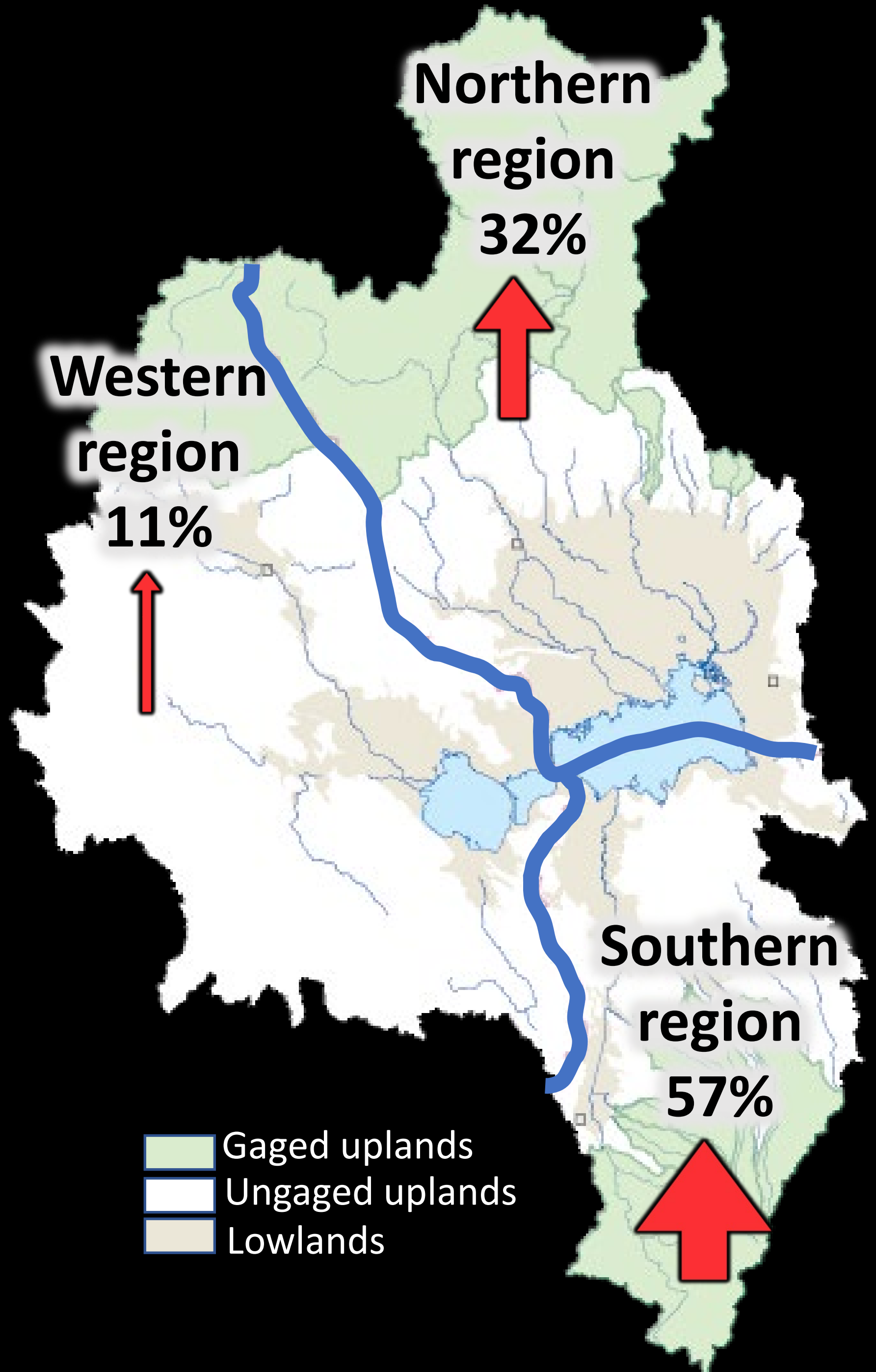
Garcia and others (2022)




Garcia and others (2022)

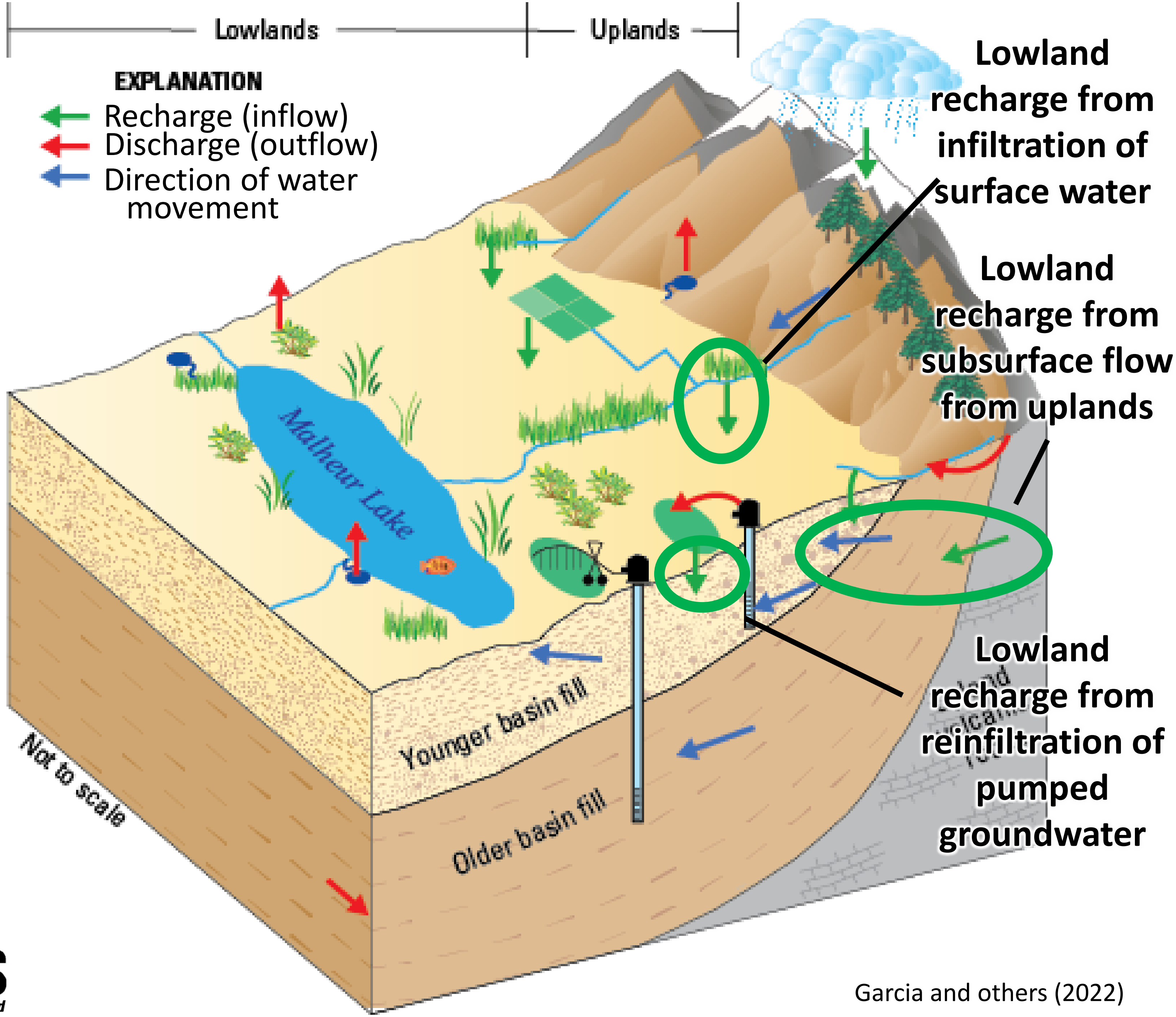
# Total Upland Discharge by Region

- Total upland discharge = 239,000 acre-feet per year
- Most upland recharge discharges in uplands




USGS

Garcia and others (2022)

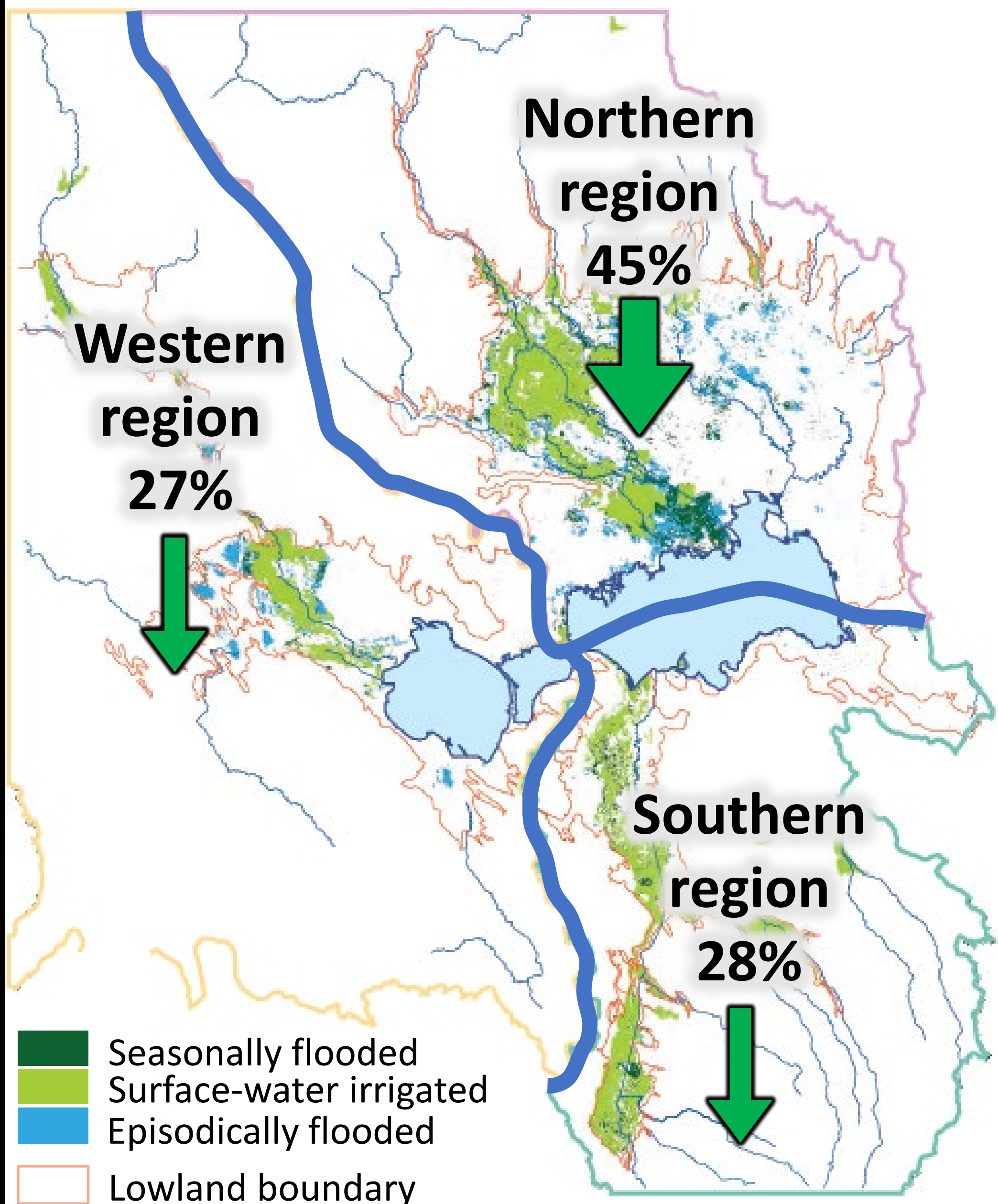



USGS
science for a changing world

Garcia and others (2022)

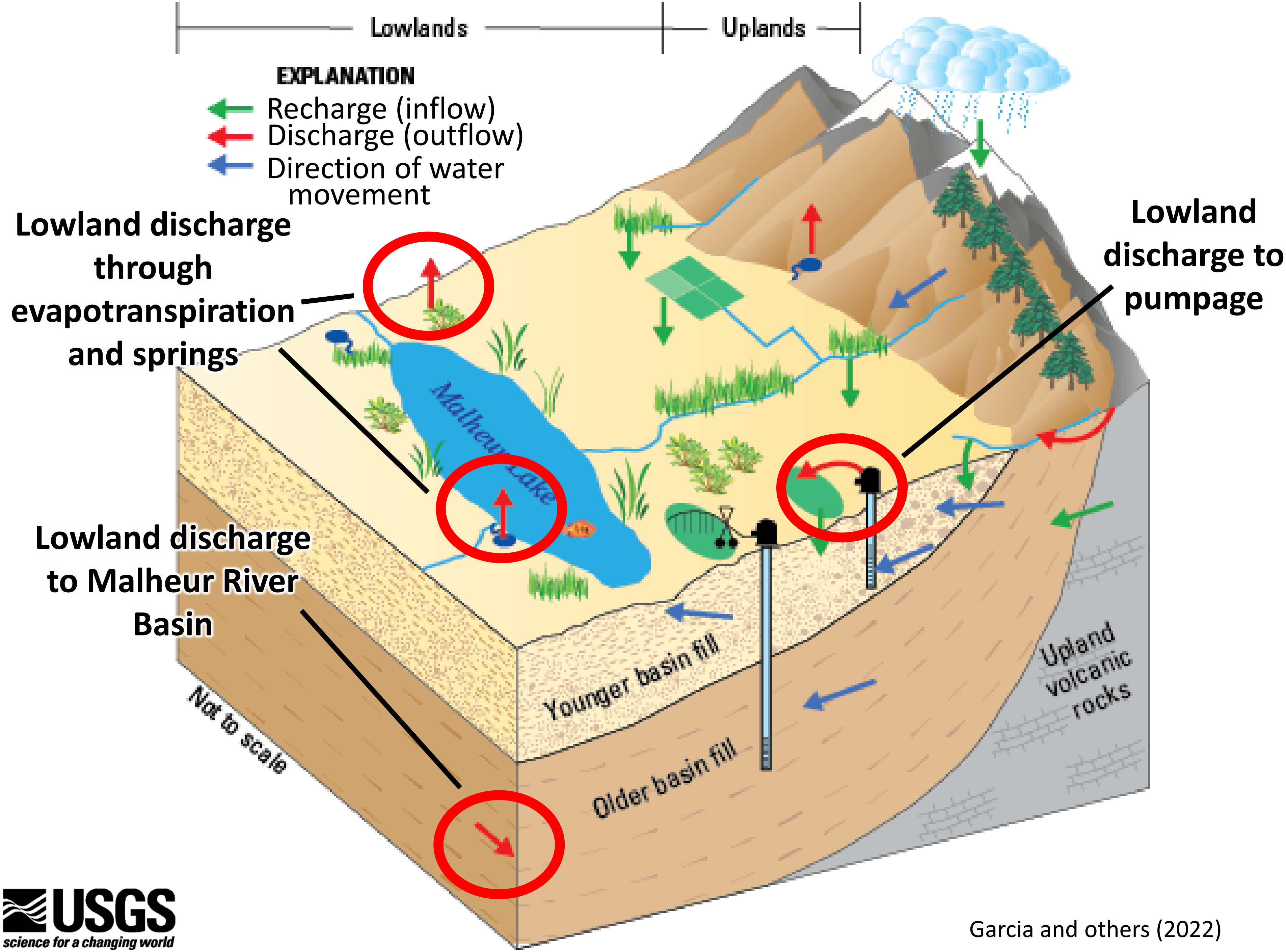
# Total Lowland Recharge by Region

- Total lowland recharge = 173,000 acre-feet per year
  - Mostly infiltration of surface water
  - Some groundwater inflow from uplands
  - Little infiltration of pumped groundwater




USGS

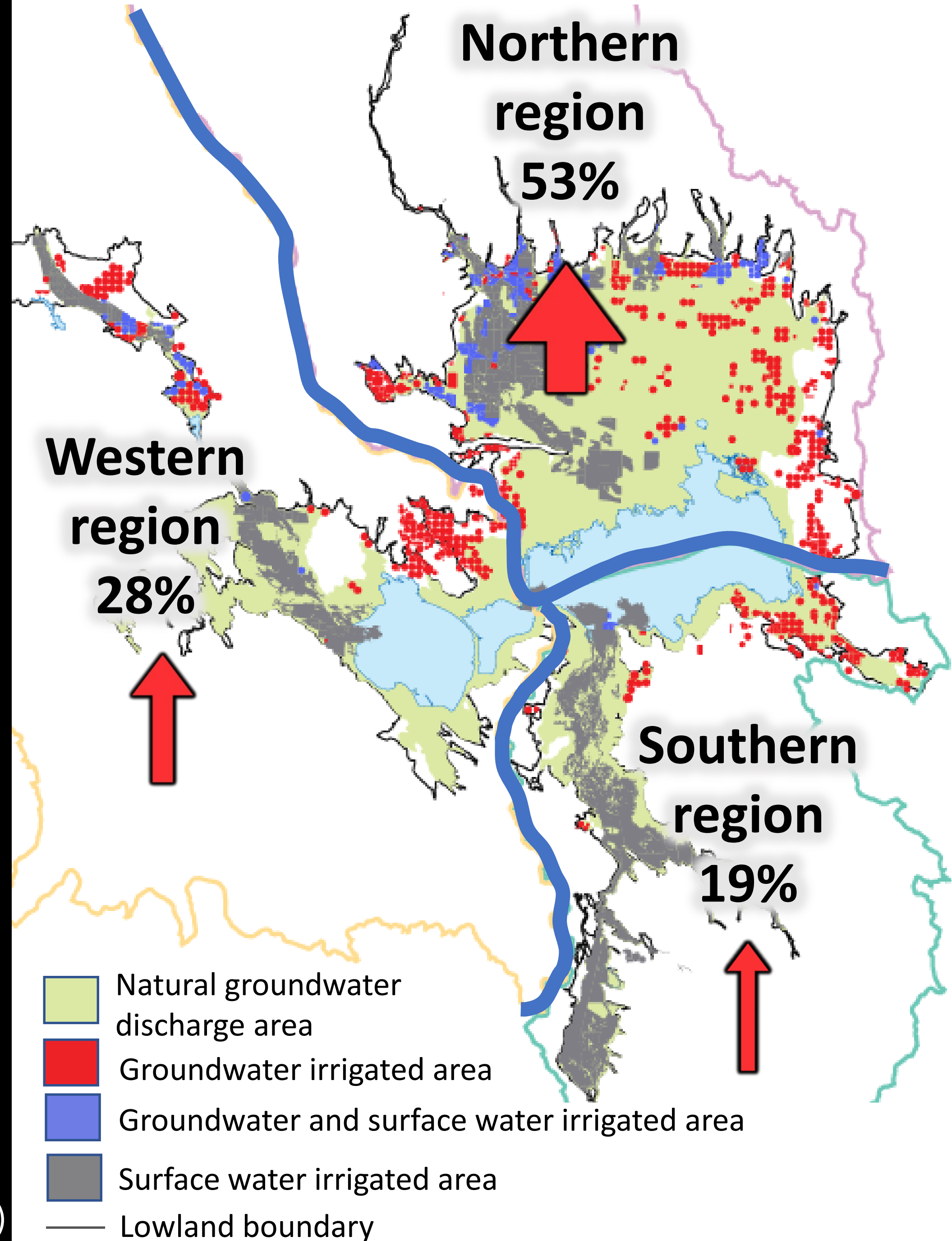
Garcia and others (2022)




Garcia and others (2022)

# Total Lowland Discharge by Region

- Total lowland discharge = 283,000 acre-feet per year
  - Natural discharge in basin
  - Natural discharge out of basin
  - Groundwater pumpage



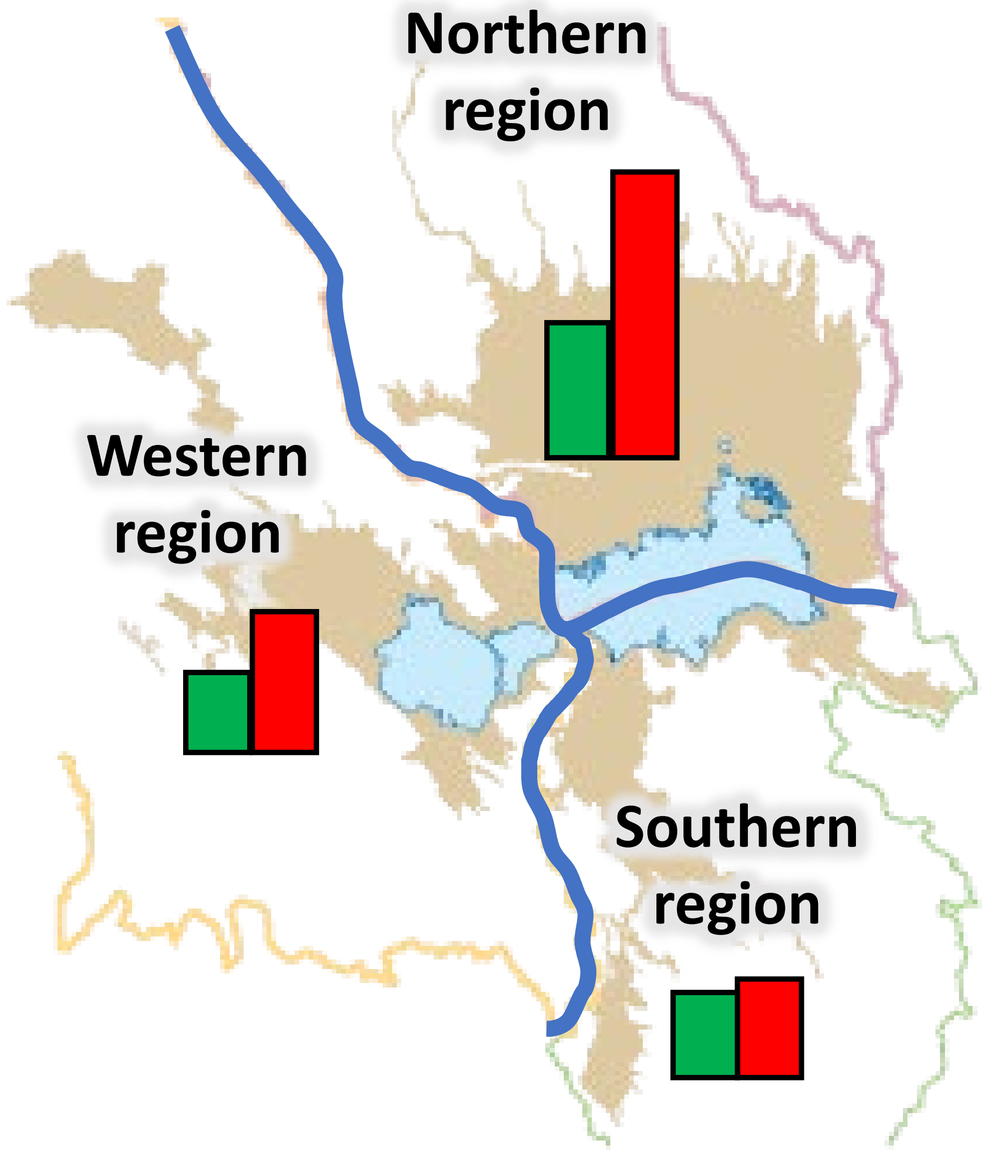

USGS

Modified from Garcia and others (2022)

# Comparison of Lowland Recharge and Discharge by Region

Recharge (inflow)

Discharge (outflow)

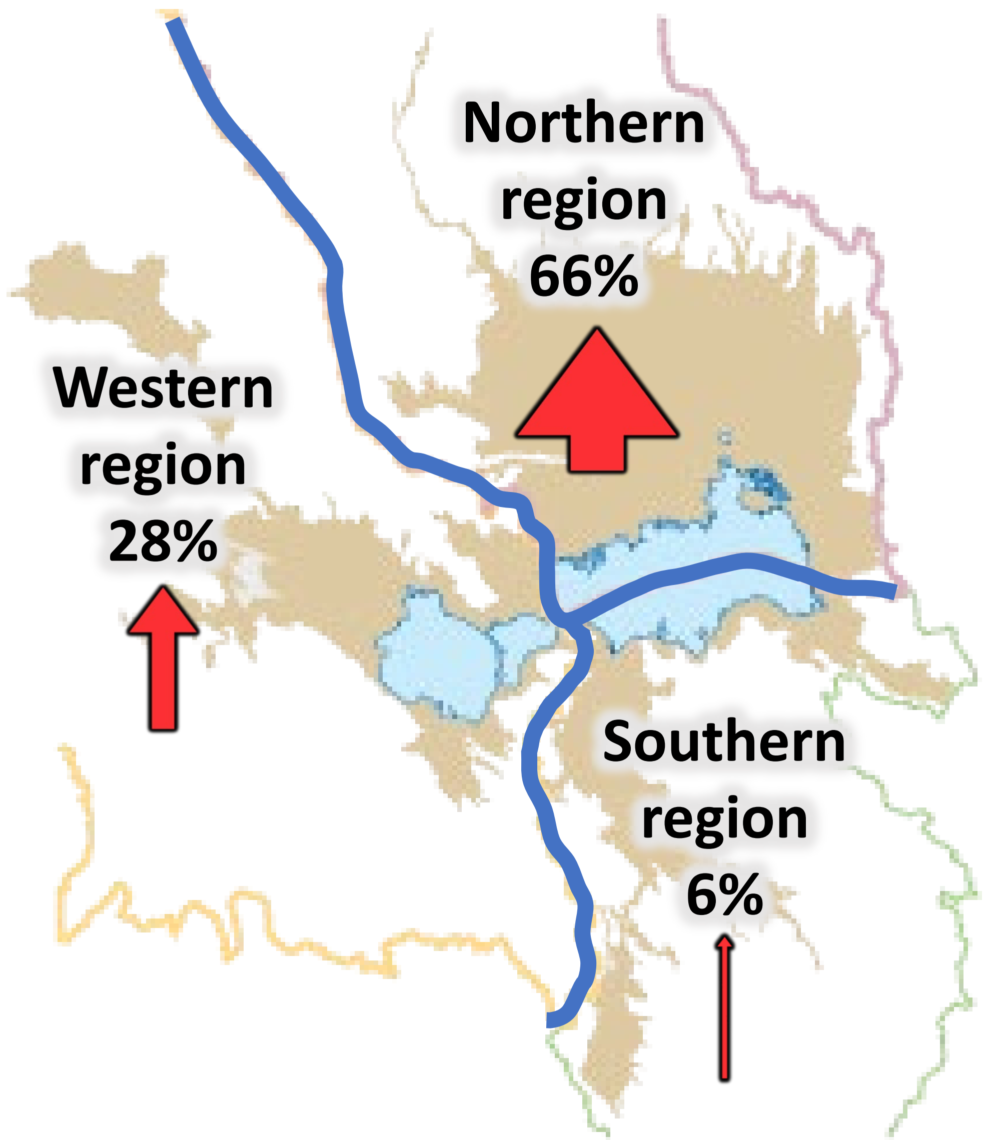



USGS

Garcia and others (2022)

# Lowland Groundwater Budget Imbalance by Region

- Recharge – discharge
- Total imbalance
  – 110,000 acre-feet per year
- Pumpage is currently removing groundwater from aquifer storage and likely capturing a small amount of natural discharge




USGS

Garcia and others (2022)

# Conclusions

- More than 80% of upland recharge discharges in the uplands
- Pumpage is currently removing groundwater from aquifer storage and is likely capturing a small amount of natural discharge
- The largest budget deficit is in the northern region where pumpage exceeds recharge

USGS

# References


Garcia, C.A., Corson-Dosch, N.T., Beamer, J.P., Gingerich, S.B., Grondin, G.H., Overstreet, B.T., Haynes, J.V., and Hoskinson, M.D., 2022, Hydrologic budget of the Harney Basin groundwater system, southeastern Oregon: U.S. Geological Survey Scientific Investigations Report 2021–5128, 144 p., https://doi.org/10.3133/sir20215128.

Gingerich, S.B., Garcia, C.A., and Johnson, H.M., 2022, Groundwater resources of the Harney Basin, southeastern Oregon: U.S. Geological Survey Fact Sheet 2022–3052, 6 p., https://doi.org/10.3133/fs20223052.


USGS

# Groundwater Resources of the Harney Basin

## Harney Basin Groundwater Study
## Community Meeting
## November 3, 2022

### U.S. Geological Survey/Oregon Water Resources Department

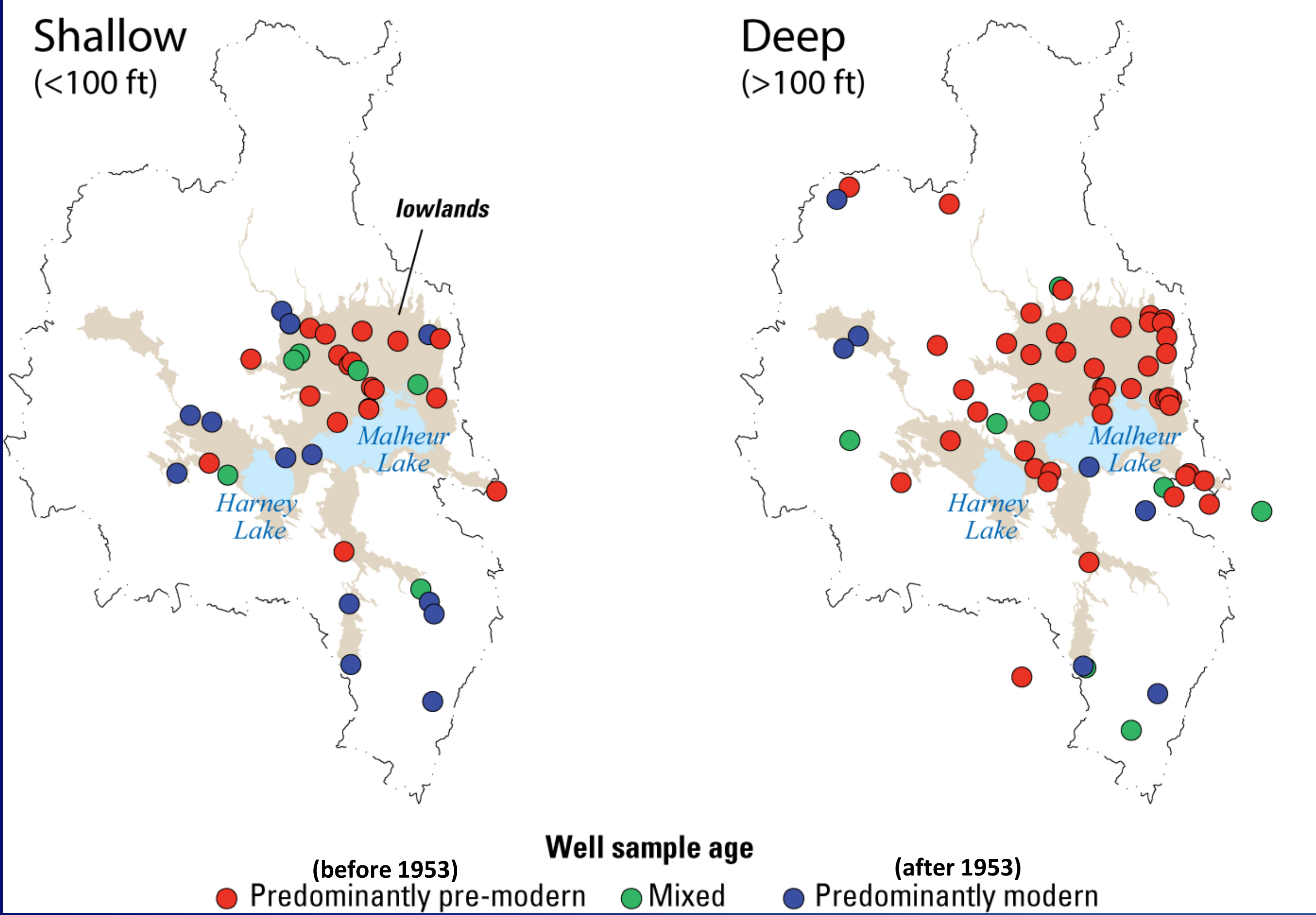
# Key Takeaways

- Most groundwater pumped from lowland wells is ancient and not being replenished at meaningful human timescales.
- The effects of pumping vary across the basin depending on the local geology, the amount of recharge, and the amount of withdrawal
- Pumping large volumes of groundwater from…
  - …low-permeability rocks causes deep drawdown over relatively small areas
  - …high-permeability rocks causes shallow drawdown over large areas

USGS

# Lowland groundwater is mostly ancient:

## recharged 5,000–30,000 years ago

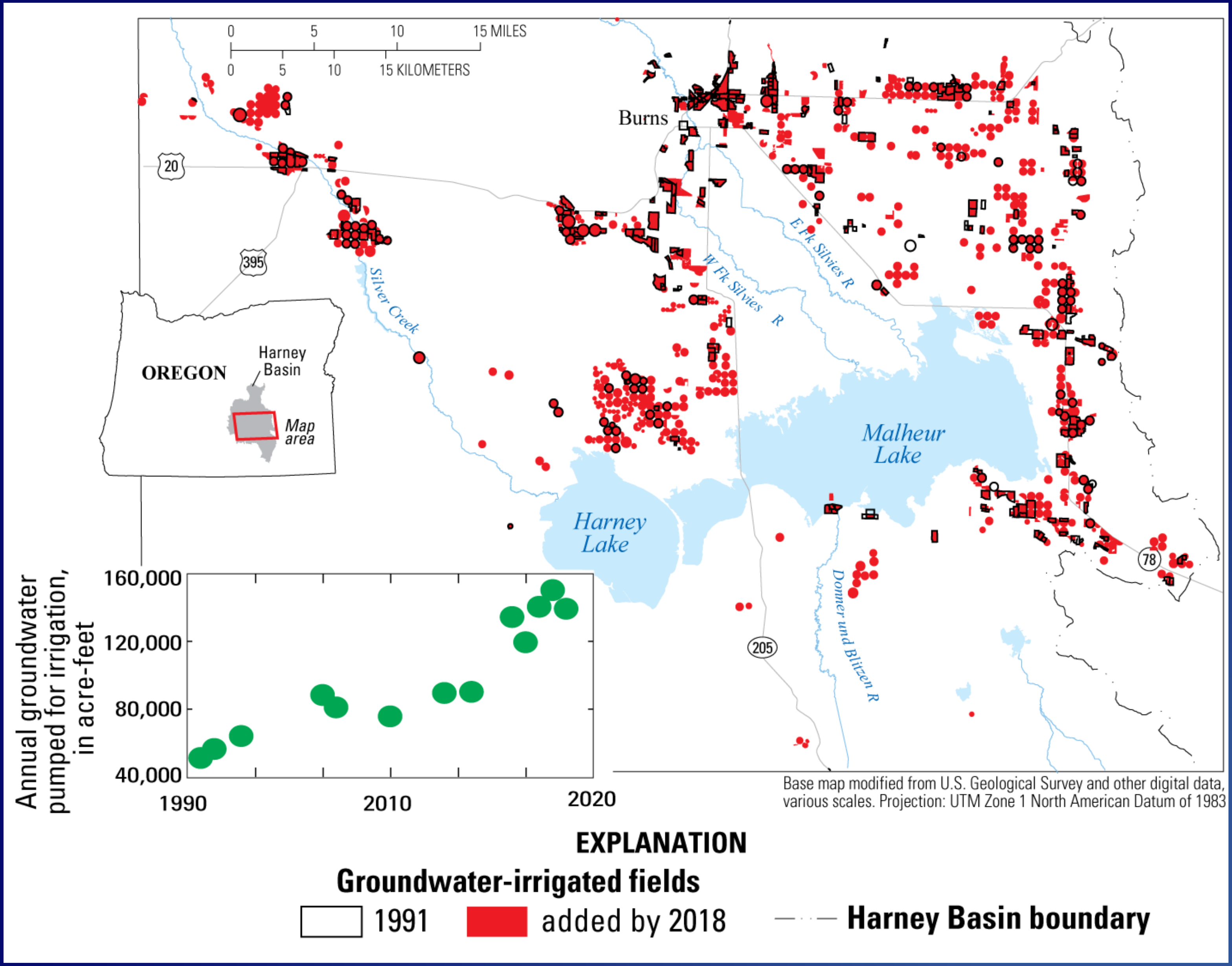



**Based on analysis of tritium and carbon-14 ages and stable isotopes of hydrogen**

USGS

From Gingerich and others, 2022

# Irrigation pumpage tripled since 1991




USGS

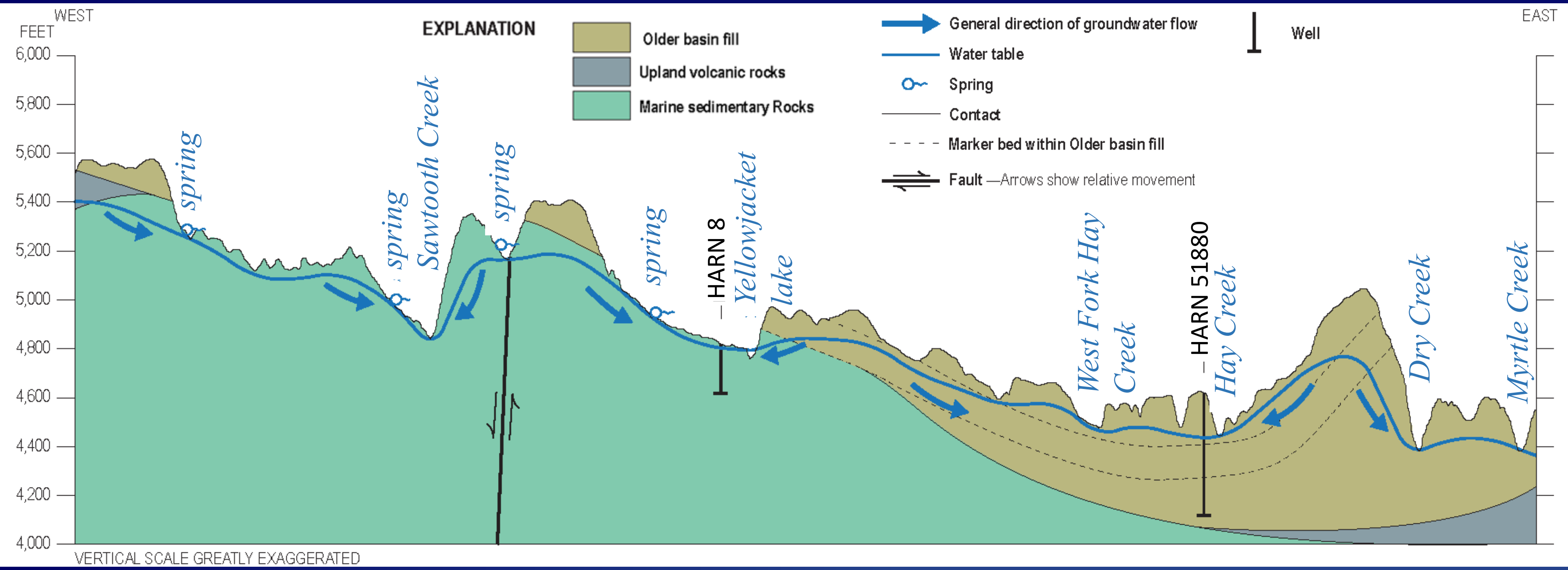
From Gingerich and others, 2022


From Gingerich and others, 2022

Base map modified from U.S. Geological Survey and other digital data, various scales. Projection: UTM Zone 11 North. North American Datum of 1983

USGS

# Low-permeability uplands

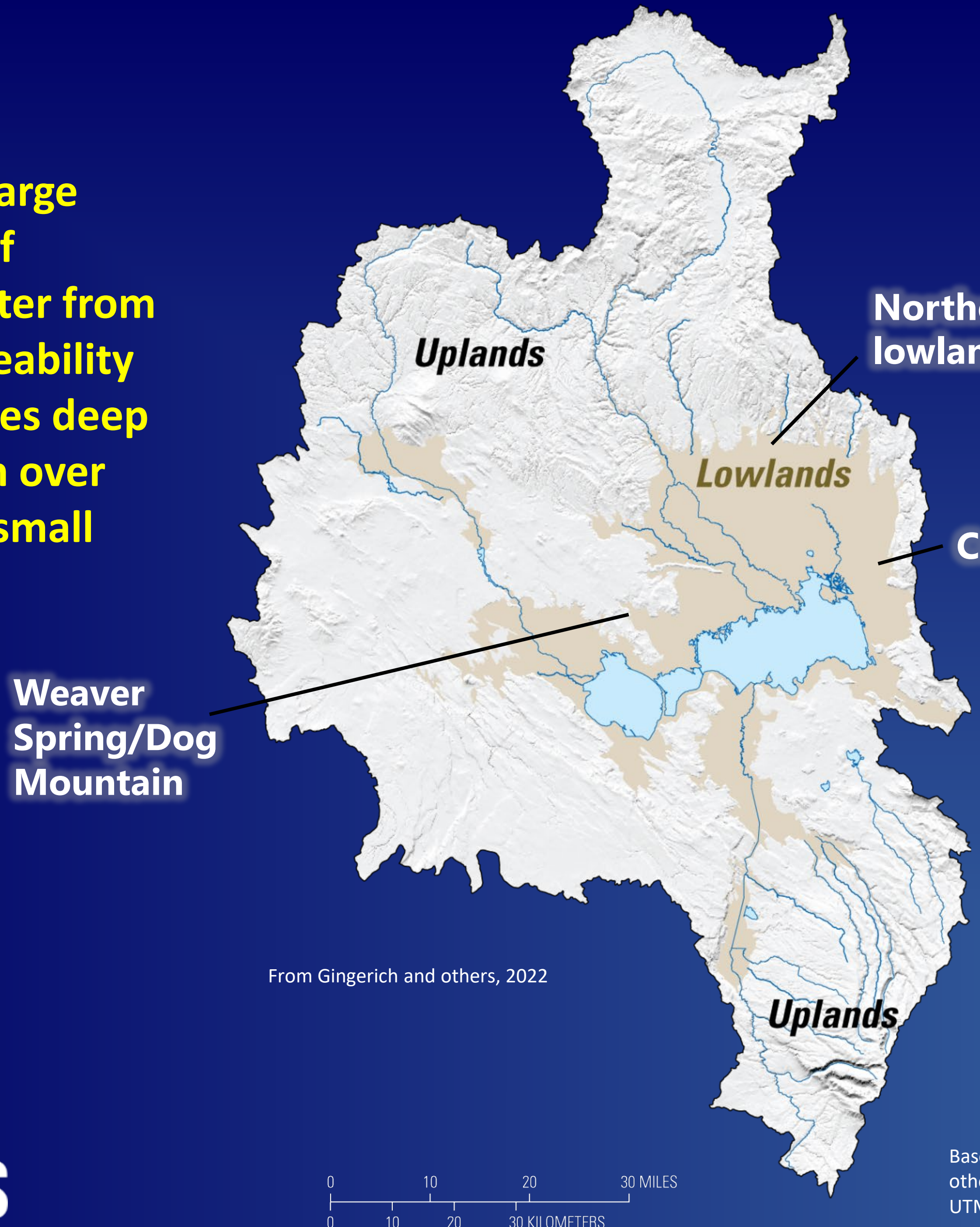



From Gingerich and others, 2022

- Groundwater flow paths are shallow and limited by low permeability
- About 70 % of upland recharge discharges at the land surface nearby
- Groundwater discharge is the primary source of flow in upland streams, springs, wetlands, and meadows during the dry summer months

USGS

Pumping large volumes of groundwater from low-permeability rocks causes deep drawdown over relatively small areas



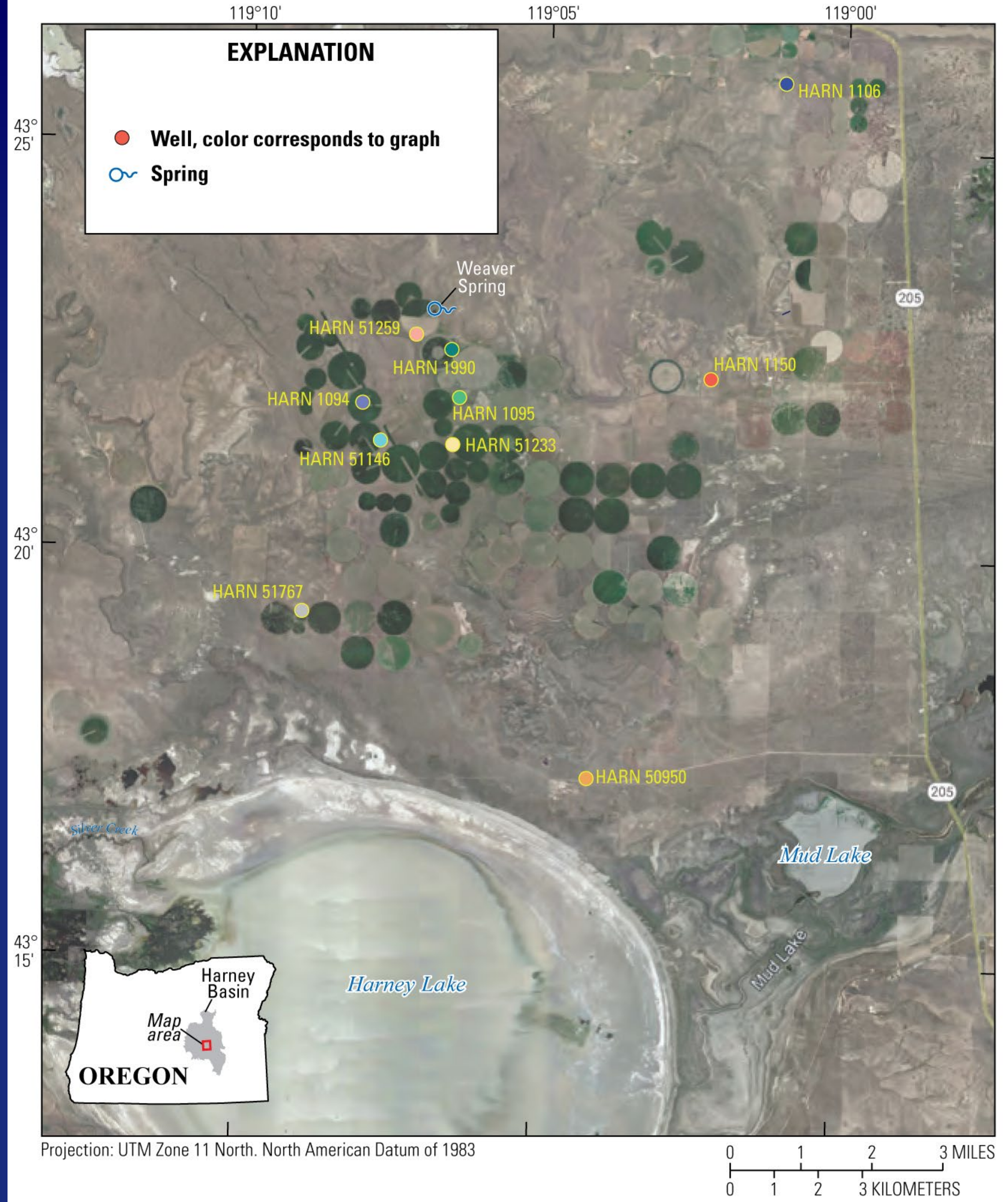

From Gingerich and others, 2022

Base map modified from U.S. Geological Survey and other digital data, various scales. Projection: UTM Zone 11 North. North American Datum of 1983

USGS

# Weaver Spring/Dog Mountain area

- Most water produced from a local area composed of highly permeable rocks surrounded by much less permeable rocks

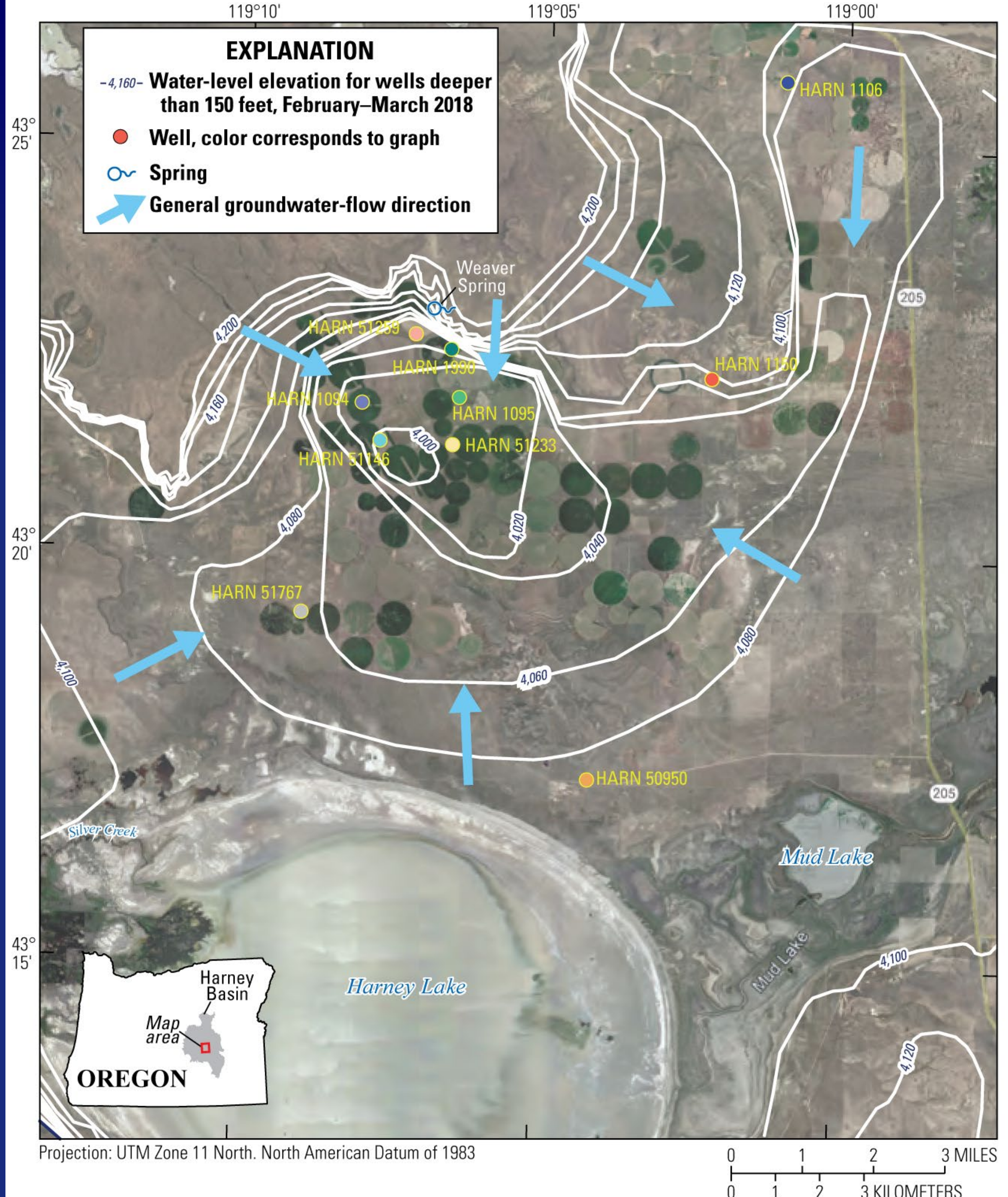



USGS

From Gingerich and others, 2022

# Weaver Spring/Dog Mountain area

- Water levels declined more than 140 feet from predevelopment levels
- Now lowest part of hydrologic flow system (previously was Harney Lake)
- Ancient water is being pumped at rate that isn't being replenished by sparse modern recharge

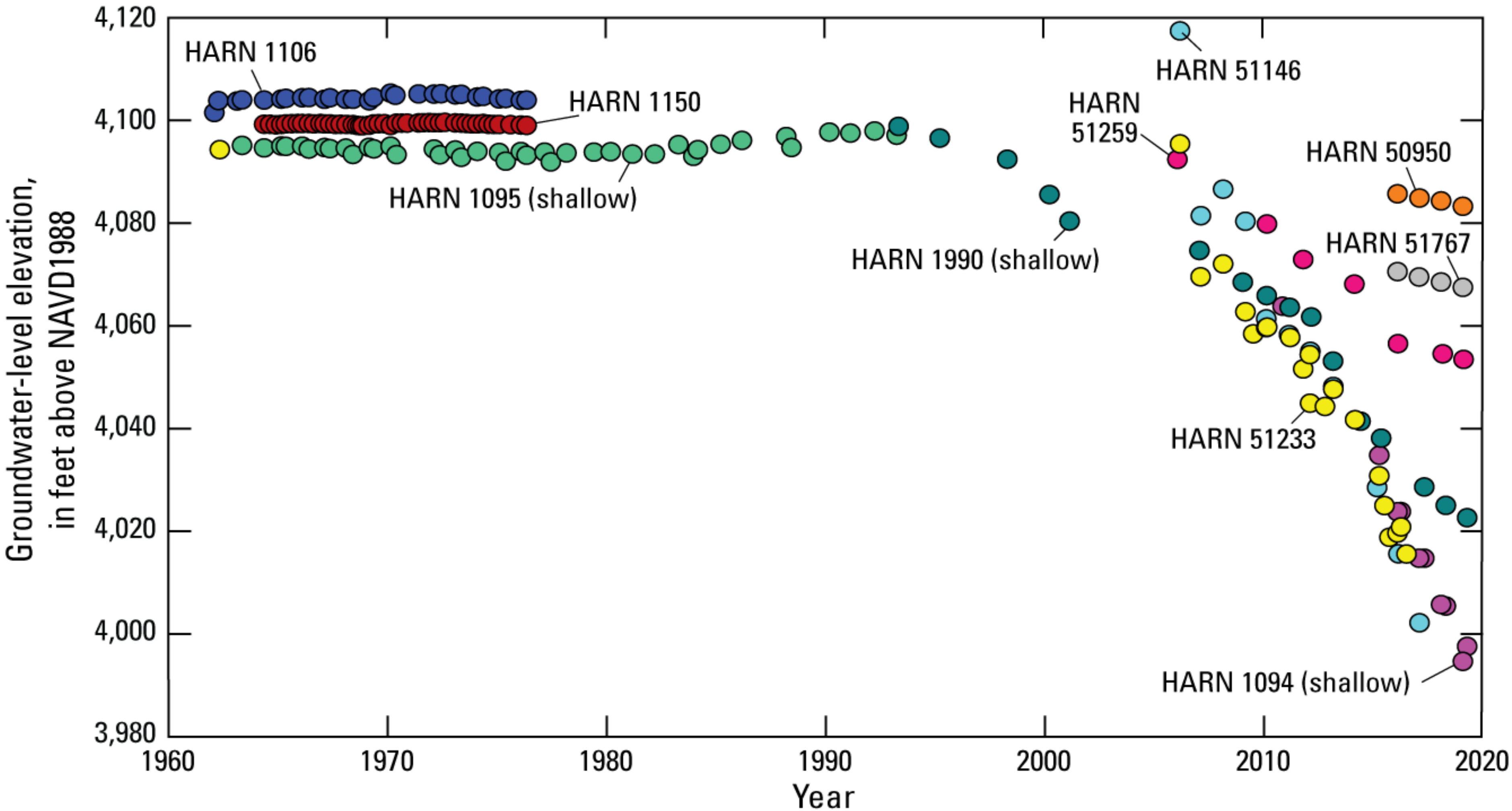



USGS

From Gingerich and others, 2022

# Weaver Spring/Dog Mountain area

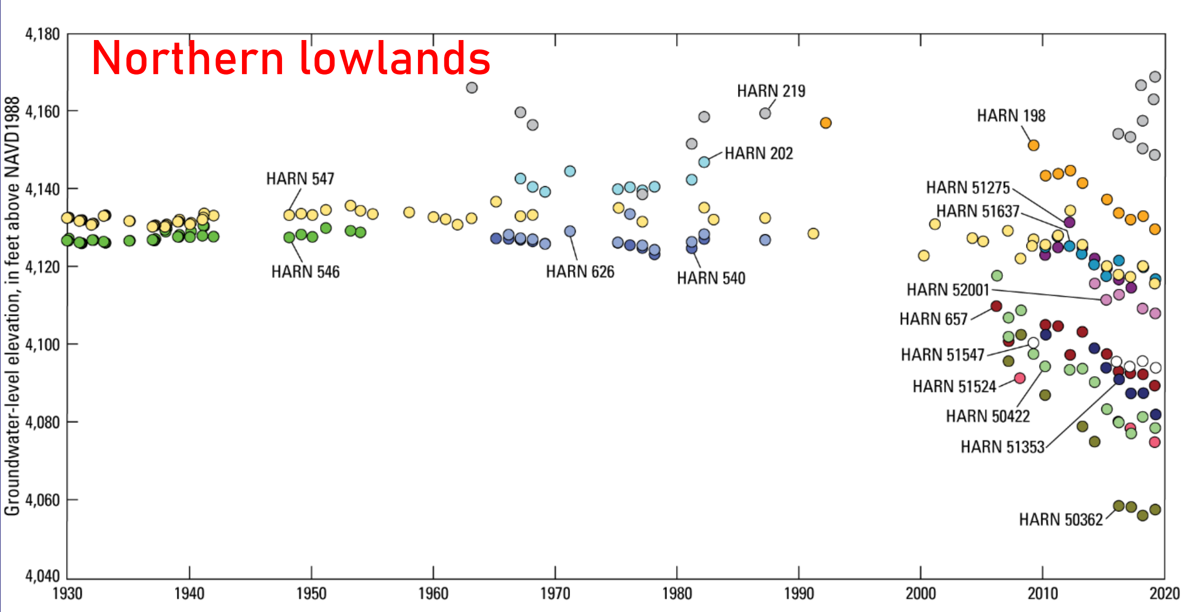
- Some water levels declined 8 feet per year since 2016




From Gingerich and others, 2022

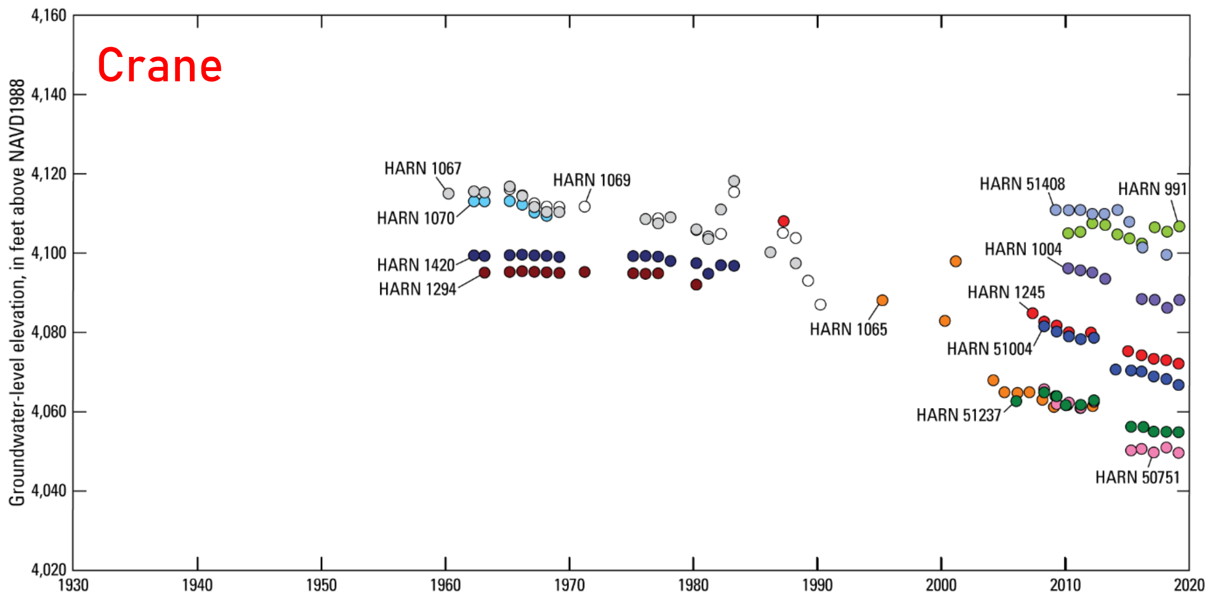
USGS

# Northern lowlands and Crane are similar cases to WS/DM




**Some water levels declined**

**5 feet per year since 2008**




**Some water levels**

**declined 1–2 feet per year**

**since 2008**

USGS

From Gingerich and others, 2022

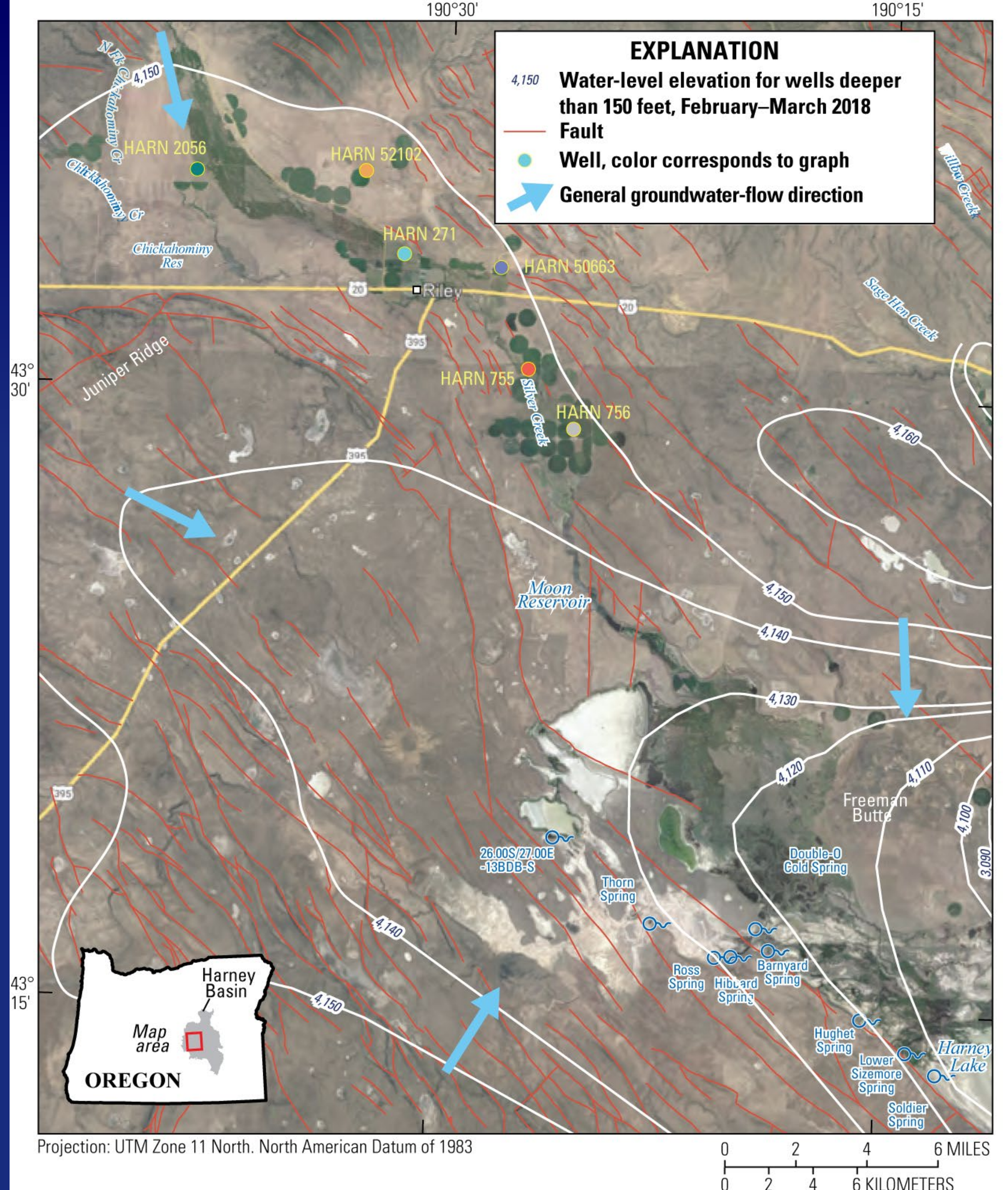
**Pumping large volumes of groundwater from high-permeability rocks causes shallow drawdown over large areas**


From Gingerich and others, 2022

Base map modified from U.S. Geological Survey and other digital data, various scales. Projection: UTM Zone 11 North. North American Datum of 1983

# Silver Creek floodplain area

- Most water produced from a widespread highly permeable zone of rocks
- Water levels declined about 10 feet from predevelopment levels
- Small groundwater-level declines over a large area
- Groundwater withdrawal likely will affect Warm Springs Valley and may affect lower Silver Creek water levels

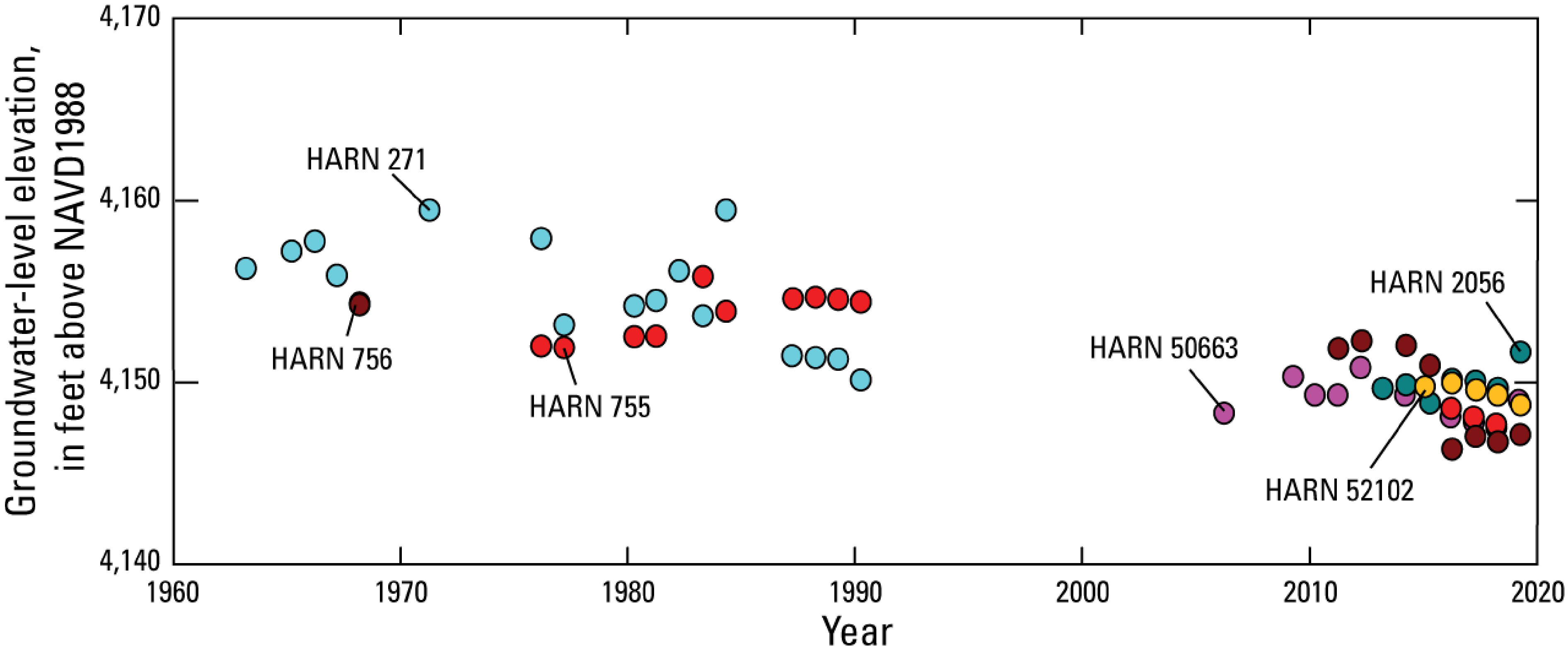



USGS

From Gingerich and others, 2022

# Silver Creek floodplain area

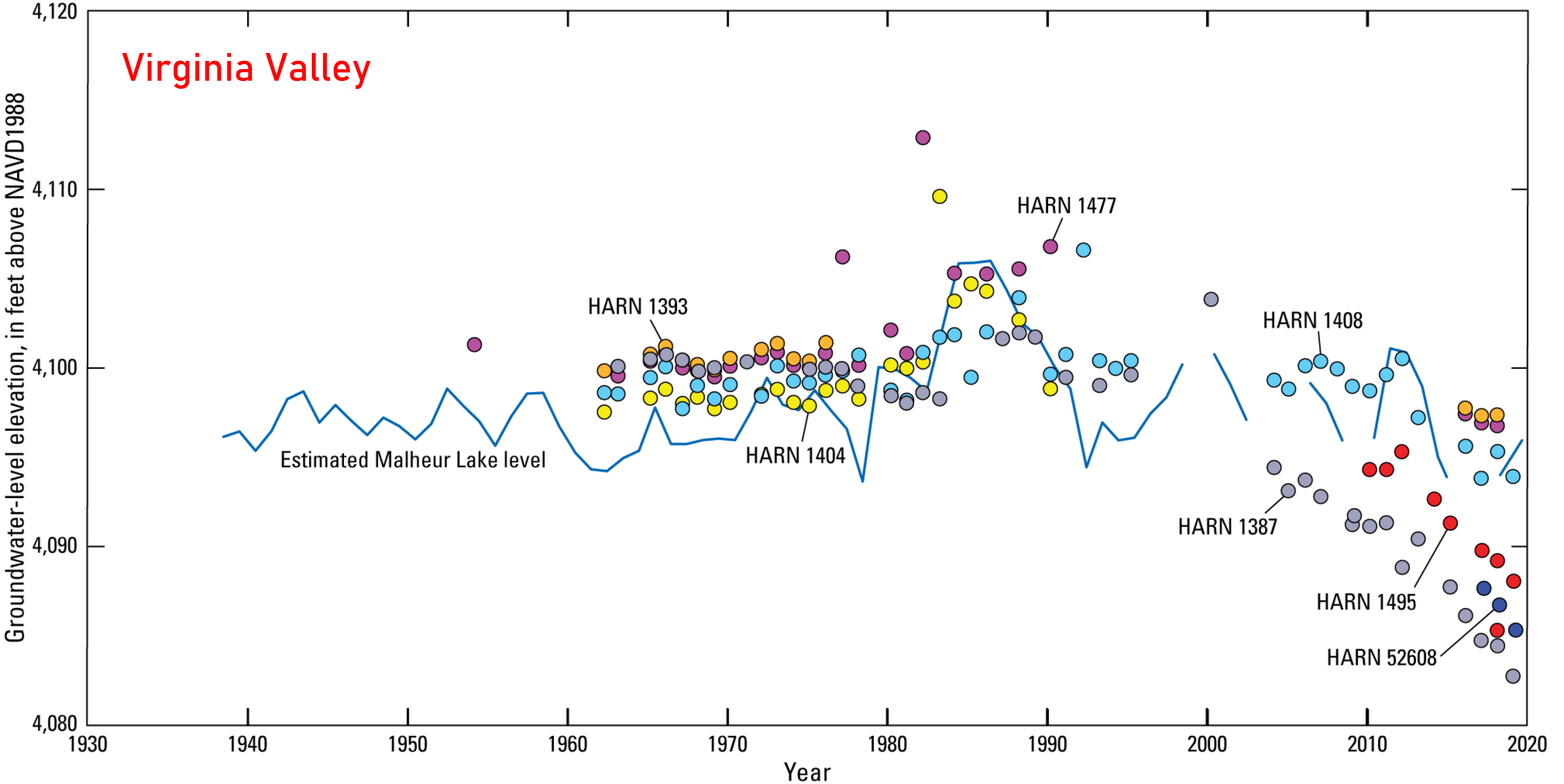
## Some water levels declined 0.5 foot per year since 2015




From Gingerich and others, 2022

# Virginia Valley is a similar case to Silver Creek Valley

## Some water levels declined 1 foot per year since 2010




From Gingerich and others, 2022

USGS

Areas with less drawdown mainly due to higher recharge and less groundwater withdrawal


From Gingerich and others, 2022

Base map modified from U.S. Geological Survey and other digital data, various scales. Projection: UTM Zone 11 North. North American Datum of 1983

USGS

# Key Takeaways–again

- **Most groundwater pumped from lowland wells is ancient and not being replenished at meaningful human timescales.**

- **The effects of pumping vary across the basin depending on the local geology, the amount of recharge, and the amount of withdrawal**

- **Pumping large volumes of groundwater from…**

  - **…low-permeability rocks causes deep drawdown over relatively small areas**

  - **…high-permeability rocks causes shallow drawdown over large areas**

USGS

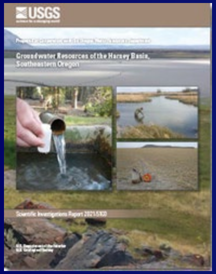
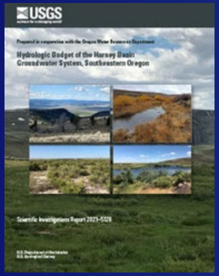
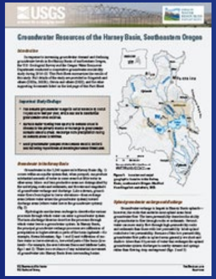
# References and related reports

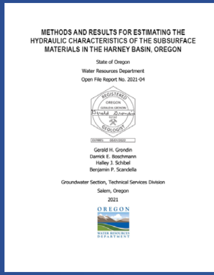
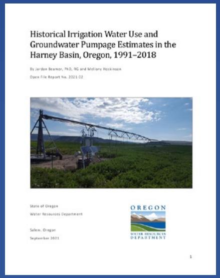

- Beamer, J.P., and Hoskinson, M.D., 2021, Historical irrigation water use and groundwater pumpage estimates in the Harney Basin, Oregon, 1991–2018: Oregon Water Resources Department Open File Report 2021–02, 53 p. [Also available at https://www.oregon.gov/owrd/wrdreports/OWRD_OFR_2021-02_Harney_Basin_METRIC_Irrigation_Use_Report.pdf.]
- Boschmann, D.E., 2021, Generalized geologic compilation map of the Harney Basin: Oregon Water Resources Department Open File Report 2021–01, 57 p. [Also available at https://www.oregon.gov/owrd/wrdreports/OFR_2021-01_report.pdf.]
- Corson-Dosch, N.T., and Garcia, C.G., 2022, Soil-water-balance (SWB) model archive used to simulate mean annual upland recharge from infiltration of precipitation and snowmelt in Harney Basin, Oregon, 1982–2016: U.S. Geological Survey data release. [Also available at https://doi.org/10.5066/P94NH4D8.]
- Garcia, C.A., Corson-Dosch, N.T., Beamer, J.P., Gingerich, S.B., Grondin, G.H., Overstreet, B.T., Haynes, J.V., and Hoskinson, M.D., 2022, Hydrologic budget of the Harney Basin groundwater system, Oregon: U.S. Geological Survey Scientific Investigations Report 2021–5128, 140 p. [Also available at https://doi.org/10.3133/sir20215128.]
- Garcia, C.A., Haynes, J.V., Overstreet, B., and Corson-Dosch, N., 2021, Supplemental data—Hydrologic budget of the Harney Basin groundwater system, Oregon: U.S. Geological Survey data release. [Also available at https://doi.org/10.5066/P9QABFML.]
- Gingerich, S.B., Johnson, H.M., Boschmann, D.E., Grondin, G.H., and Garcia, C.A., 2021, Contour data-set of the potentiometric surfaces of shallow and deep groundwater-level altitudes in Harney Basin, Oregon, February–March 2018: U.S. Geological Survey data release. [Also available at https://doi.org/10.5066/P9ZJTZUV.]
- Gingerich, S.B., Garcia, C.A., and Johnson, H.M., 2022, Groundwater resources of the Harney Basin, southeastern Oregon: U. S. Geological Survey Fact Sheet 2022-3052, 6 p. https://doi.org/10.3133/fs20223052.


USGS

# References and related reports-Cont.


- Gingerich, S.B., Johnson, H.M., Boschmann, D.E., Grondin, G.H., and Garcia, C.A., 2022, Groundwater resources of the Harney Basin, Oregon: U.S. Geological Survey Scientific Investigations Report 2021–5103, 116 p. [Also available at https://doi.org/10.3133/sir20215103.]
- Gingerich, S.B., Johnson, H.M., Boschmann, D.E., Grondin, G.H., Garcia, C.A., and Schibel, H.J., 2022, Location information, discharge, and water-quality data for selected wells, springs, and streams in the Harney Basin, Oregon: U.S. Geological Survey data release. [Also available at https://doi.org/10.5066/P9J0FE5M.]
- Grondin, G.H., 2021, Methods and results for estimating groundwater pumped, returned, and consumed for nonirrigation uses in the Harney Basin, Oregon: Oregon Water Resources Department Open File Report 2021–03, 28 p. [Also available at https://www.oregon.gov/owrd/wrdreports/OWRD_OFR_2021-003_Harney_Basin_non_irrigation_GW_use_report_stamped.pdf.]
- Grondin, G.H., Boschmann, D.E., Barnett, H.J., and Scandella, B.P., 2021, Methods and results for estimating the hydraulic characteristics of the subsurface materials in the Harney Basin, Oregon: Oregon Water Resources Department Open File Report 2021–04, 63 p. [Also available at https://www.oregon.gov/owrd/wrdreports/OFR_2021-04_Harney_Basin_subsurface_hydraulic_properties.pdf.]

https://www.usgs.gov/centers/oregon-water-science-center/science/harney-basin-groundwater-study#overview

OREGON WATER RESOURCES DEPARTMENT

# Questions about the Study

- **Please Ask Questions About the Study**

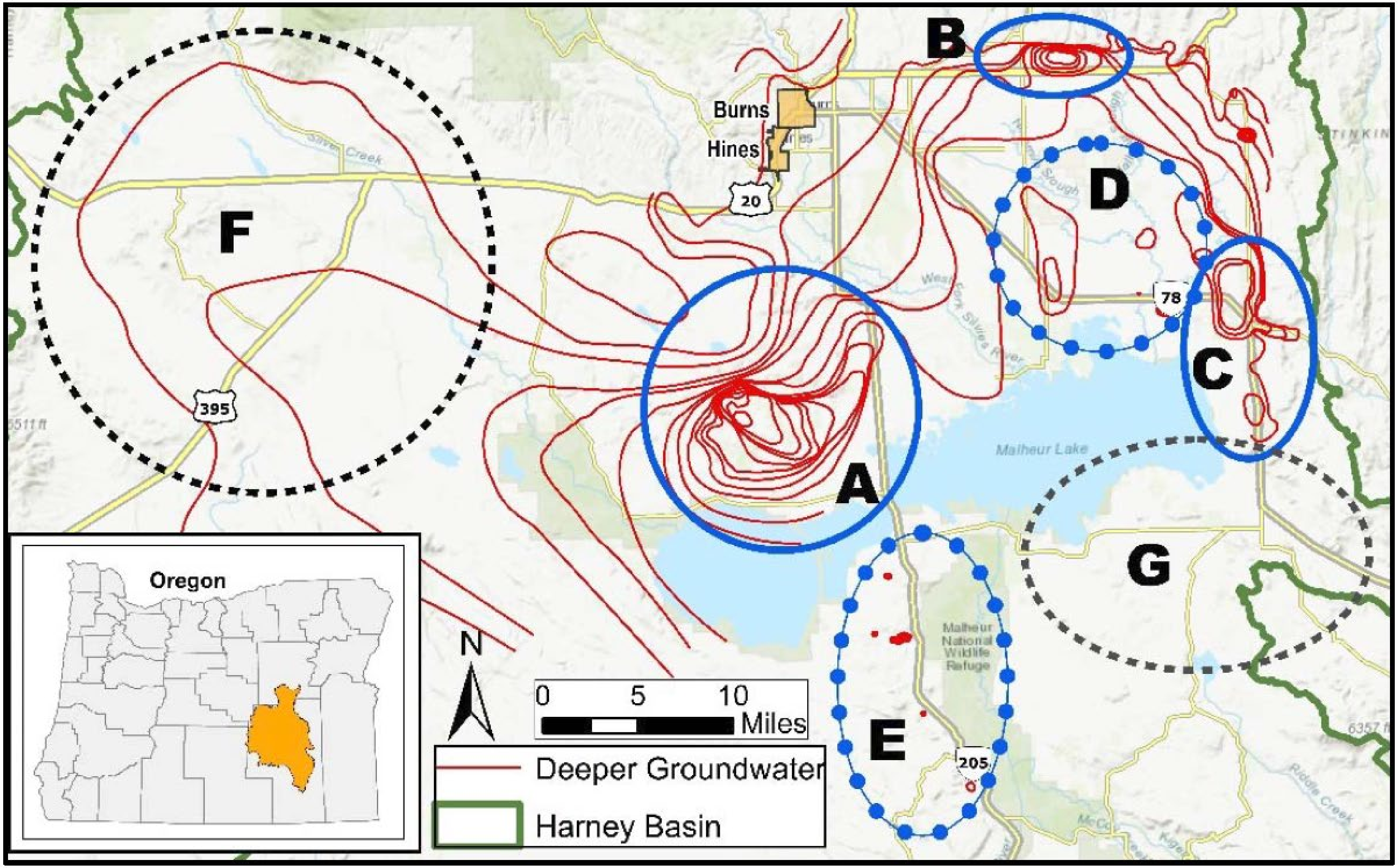
- **The Approach to Groundwater Decline Stabilization and Implications for Water Management is Next on the Agenda**

OREGON WATER RESOURCES DEPARTMENT

# Groundwater Decline Stabilization

- Encourage, Support, and Invest in Voluntary Strategies and Actions
- Implement Regulatory Actions that are Within Agency Authority
- The Goal is Reasonably Stable Groundwater Levels

# Groundwater Stability



# Voluntary Approach

- Conservation Reserve Enhancement Program
- Domestic Well Funds (Statewide and Harney)
- Cost Share Water Measurement Program
- Support of Harney Collaborative Place-Based Plan
- Continued Groundwater Monitoring
- Voluntary Agreement in Lieu of Regulation

ORECON WATER RESOURCES DEPARTMENT

# Regulatory Approach

- Stopped Issuing New Groundwater Permits in 2016
- Stopped Extending Undeveloped Permits in 2019
- Identify, Address, and Report on all Illegal Uses
- Evaluating Enforcement of Permit Decline Conditions
- Division 512 Rulemaking in 2023/24 – Critical Groundwater Area Designation
- Exempt Wells Unaffected

# Division 512 Rulemaking

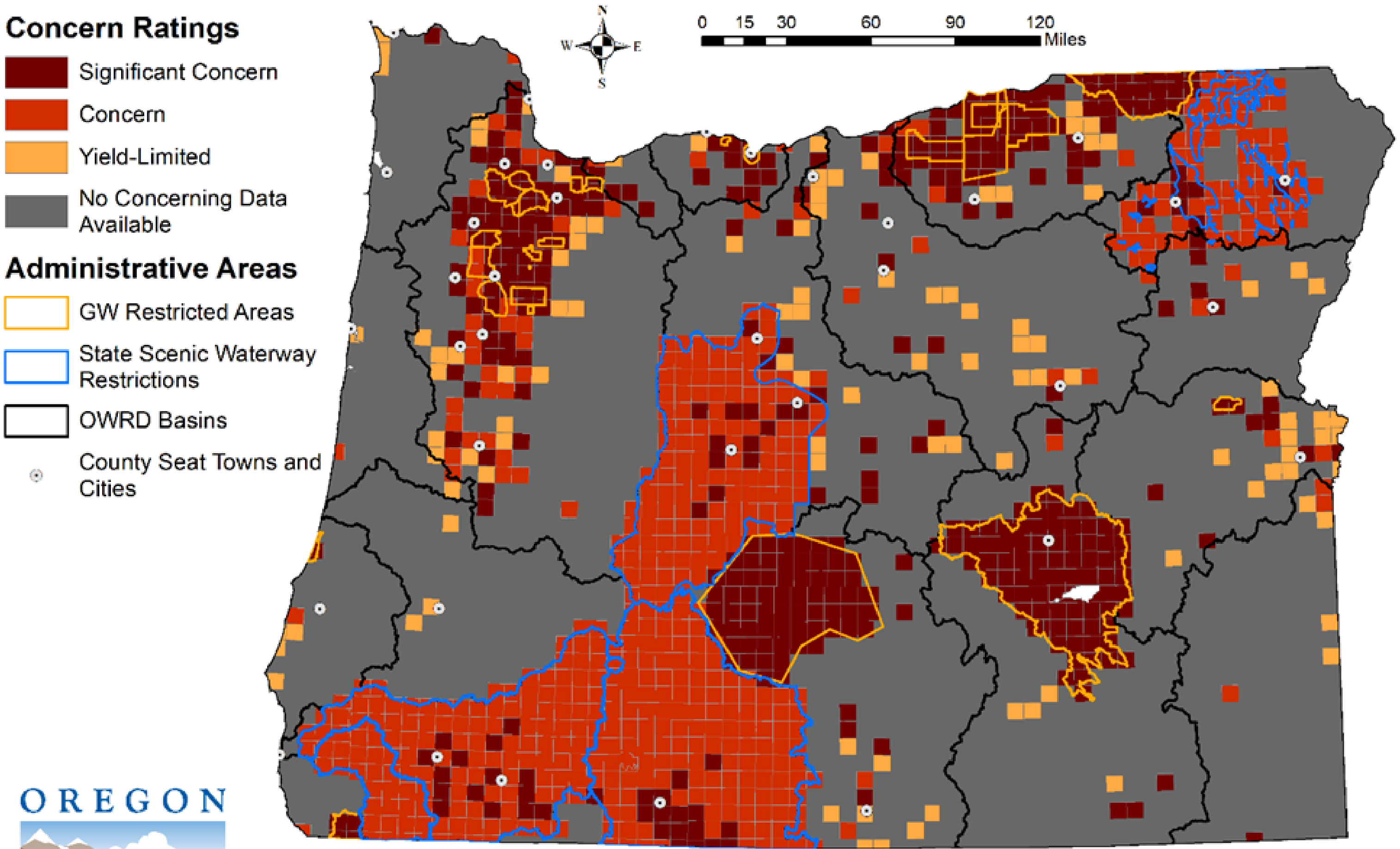
- Division 10 – Why first, what is it?
- Division 512 - What is it and why important?
- 2016 Division 512: Convene a RAC within 1 year
- Who will be Division 512 RAC?
- How does rulemaking work?

# Division 512 Possible Outcomes

- **Designation of Critical Groundwater Area**
- **Serious Water Management Problem Area**
- **Reduction in Use is Needed to Slow Decline**

OREGON WATER RESOURCES DEPARTMENT

# Critical Groundwater Areas




The concern ratings shown on this map reflect the sustainability and restrictions associated with expanded consumptive use of groundwater in a given area. They are not a substitute for a review of a groundwater application to determine availability of water for a specific use. Users of this information should consult the primary report and data to ascertain the usability of the information. This map may not be suitable for legal, engineering, or surveying purposes.
OWRD Groundwater Section, 4/20/2021. Projection: Oregon Lambert NAD 83 (EPSG #2992).

OREGON WATER RESOURCES DEPARTMENT

OREGON WATER RESOURCES DEPARTMENT

# Questions and Input

**What questions do you have about the voluntary and regulatory approaches to stabilizing groundwater level declines?**

**What comments or suggestions do you have for the Department to consider?**

# Thank You For Attending

**Please Stay for the Open House 8:00 to 8:30**

Photo by Chad Sobotka