

Greater Harney Valley – Groundwater Study Advisory Committee Meeting

Burns, Oregon

July 27, 2016



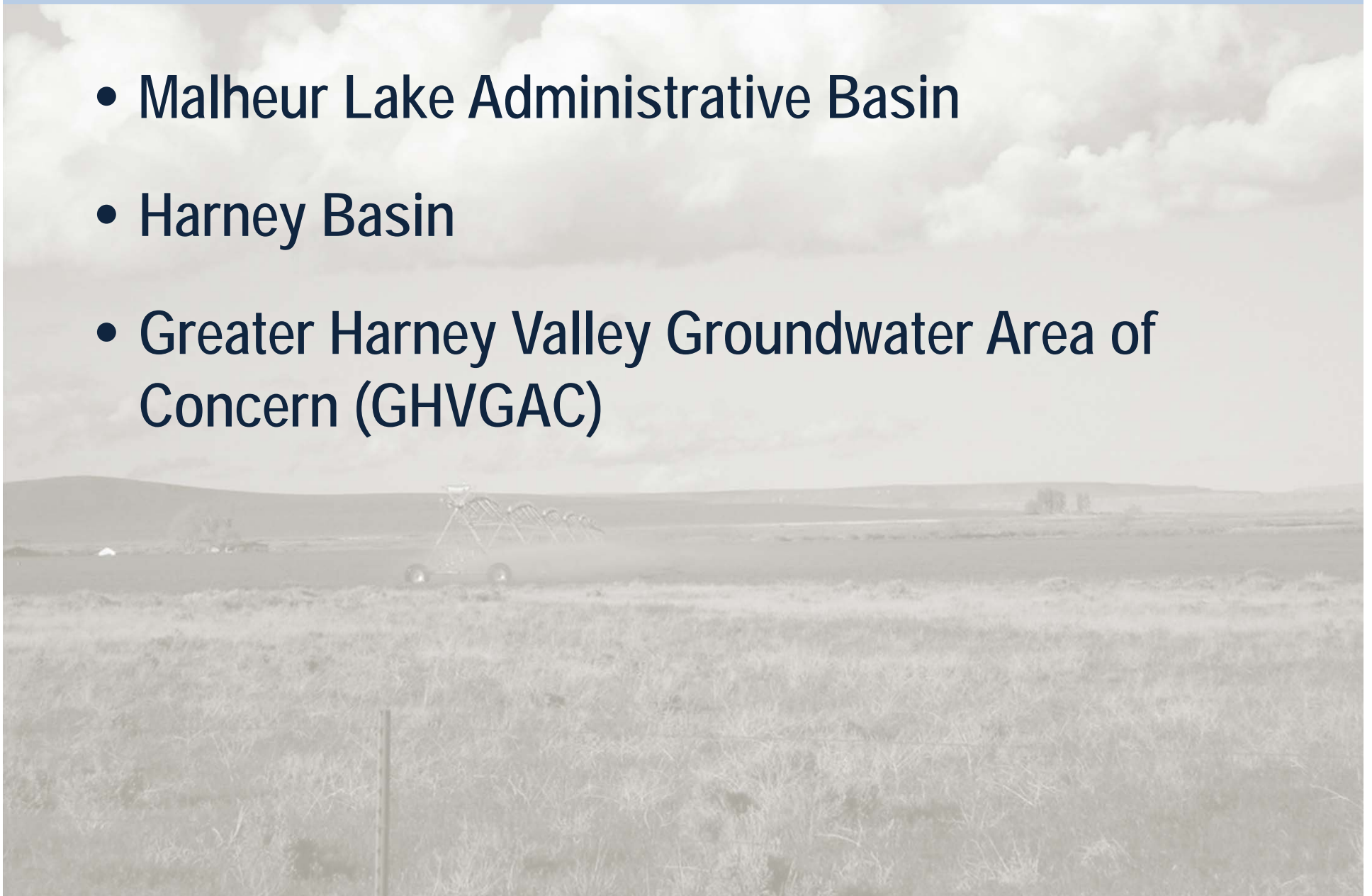
Darrick Boschmann, Hydrogeologist
Oregon Water Resources Department

Purpose of this presentation

- Study area geography and boundary delineation
- History of groundwater development and OWRD activity in the Harney Basin
- Purpose and scope of the groundwater study
- Development of the observation well network
- OWRD online data access

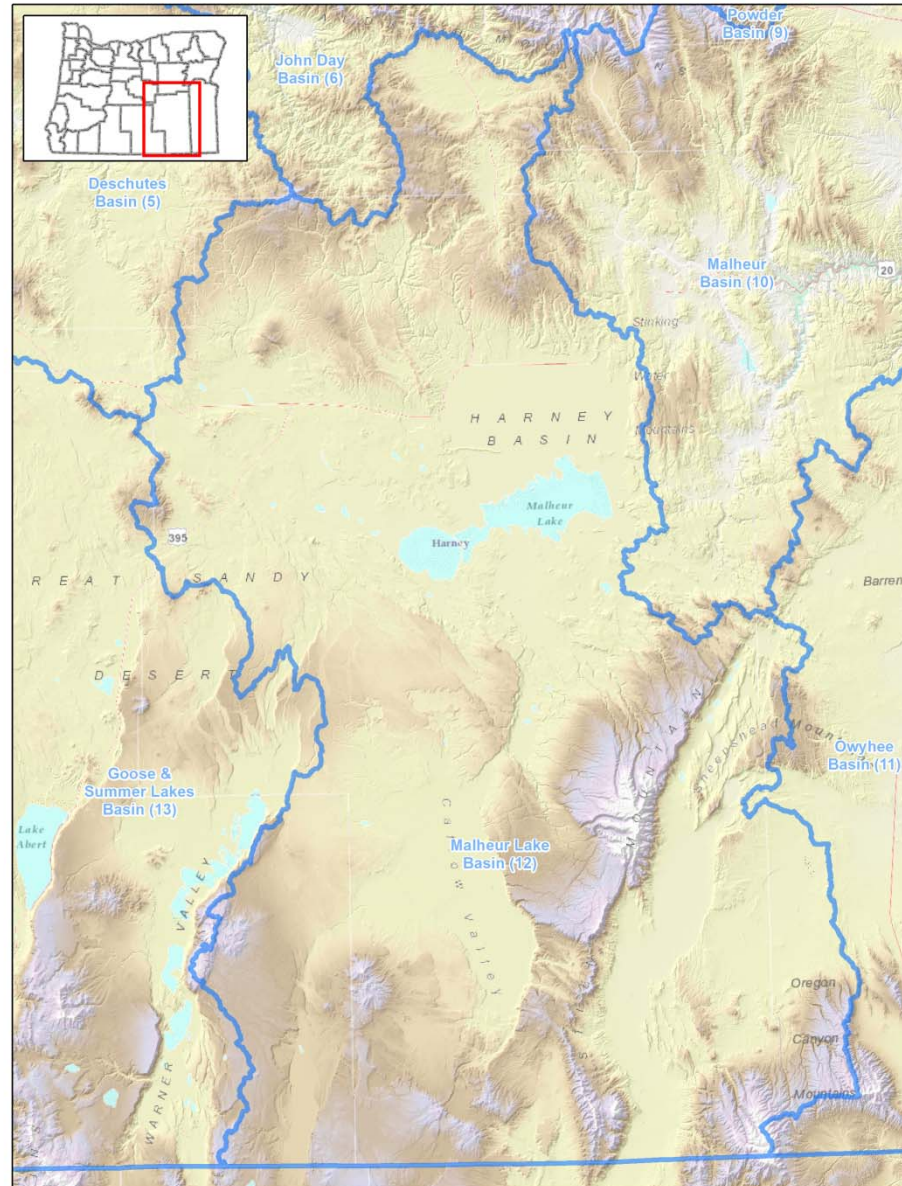
Geography and boundary delineation

- Malheur Lake Administrative Basin
- Harney Basin
- Greater Harney Valley Groundwater Area of Concern (GHVGAC)



Malheur Lake Administrative Basin



 OWRD basins

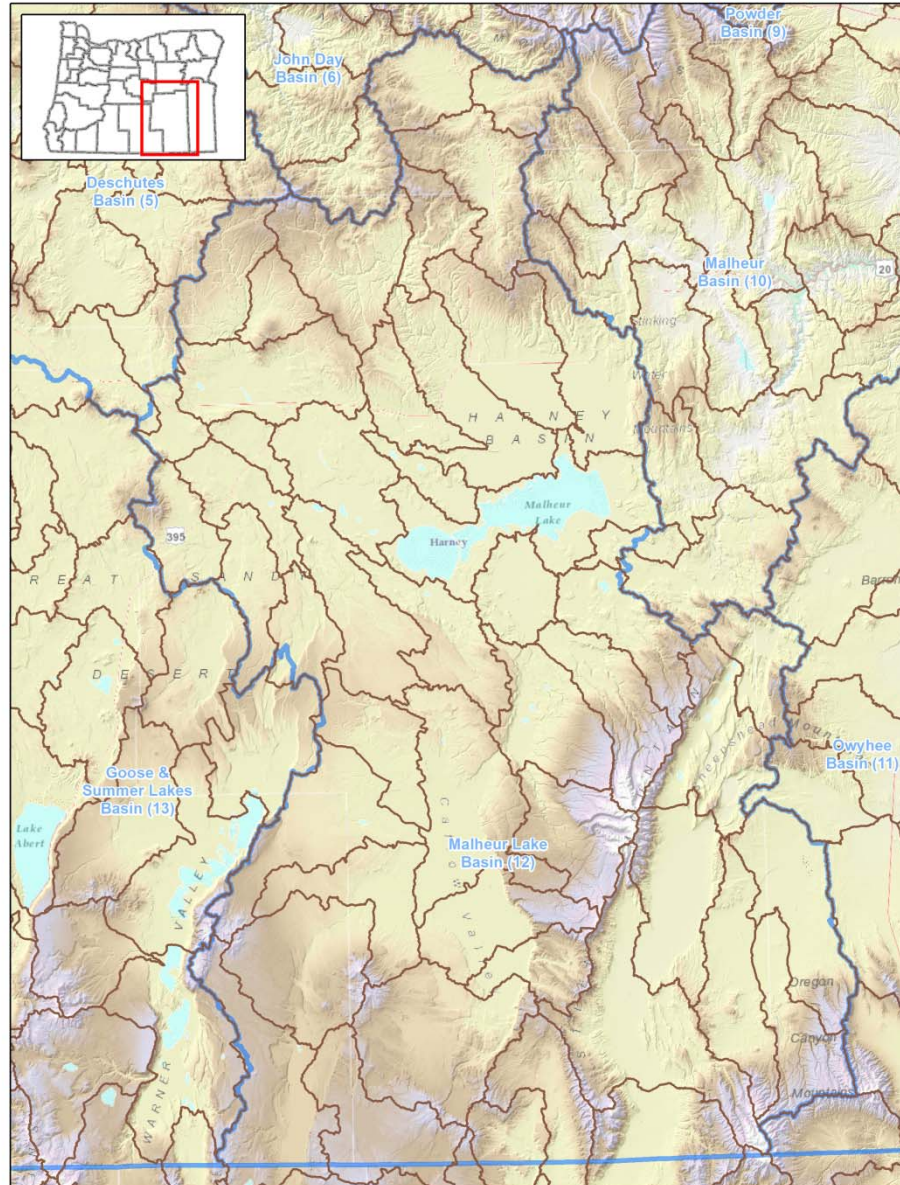


The Malheur Lake Administrative Basin was originally defined by the State Water Resources board in 1967.

While these boundaries were originally derived from hydrologic units, they have become static as administrative boundaries. As hydrologic unit delineation improves, the Administrative Basin boundaries do not change.




10 digit USGS watershed boundaries

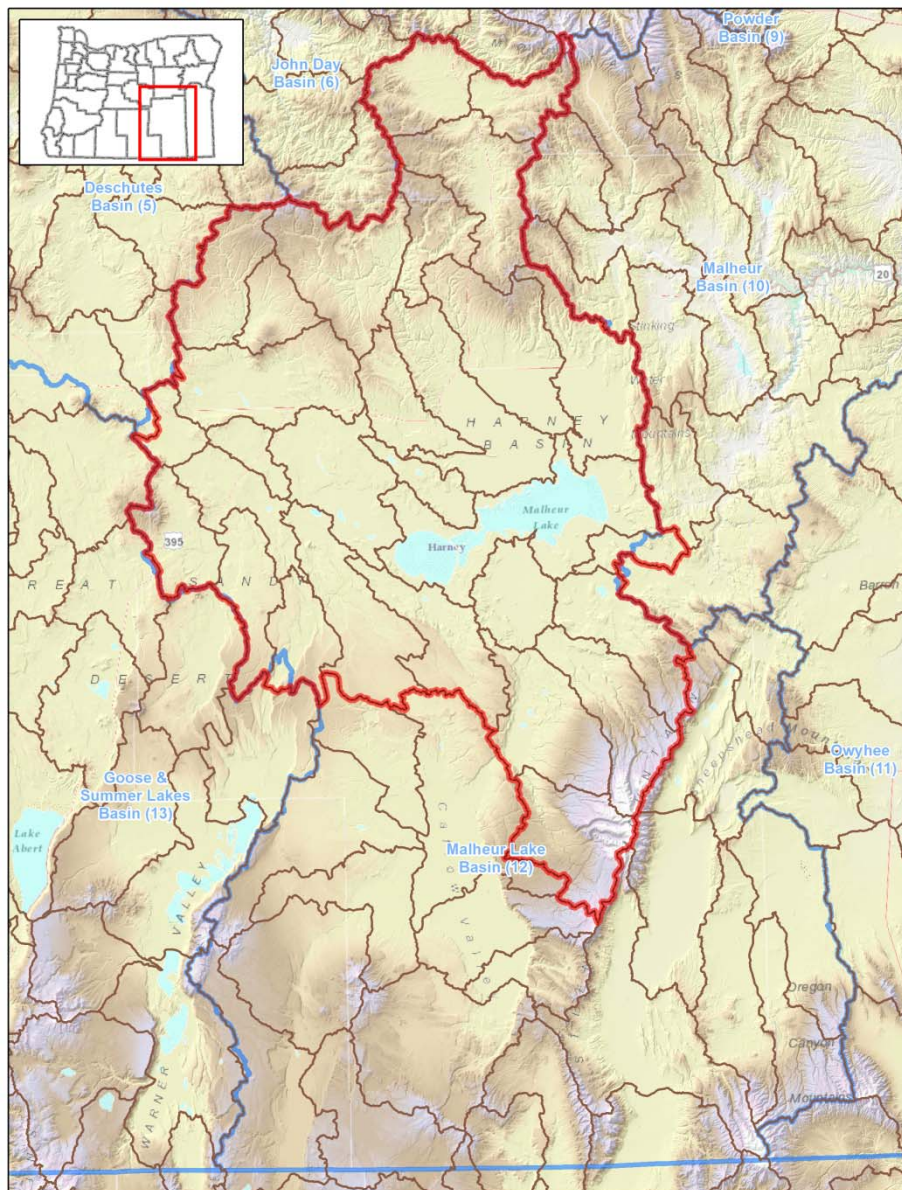
-  OWRD basins
-  10 digit (watershed)



The Watershed Boundary Dataset (WBD) defines the areal extent of surface water drainage to a point, accounting for all land and surface areas. Watershed Boundaries are determined solely upon science-based hydrologic principles, not favoring any administrative boundaries or special projects, nor particular program or agency.

Harney Basin




-  OWRD basins
-  10 digit (watershed)
-  Harney Basin

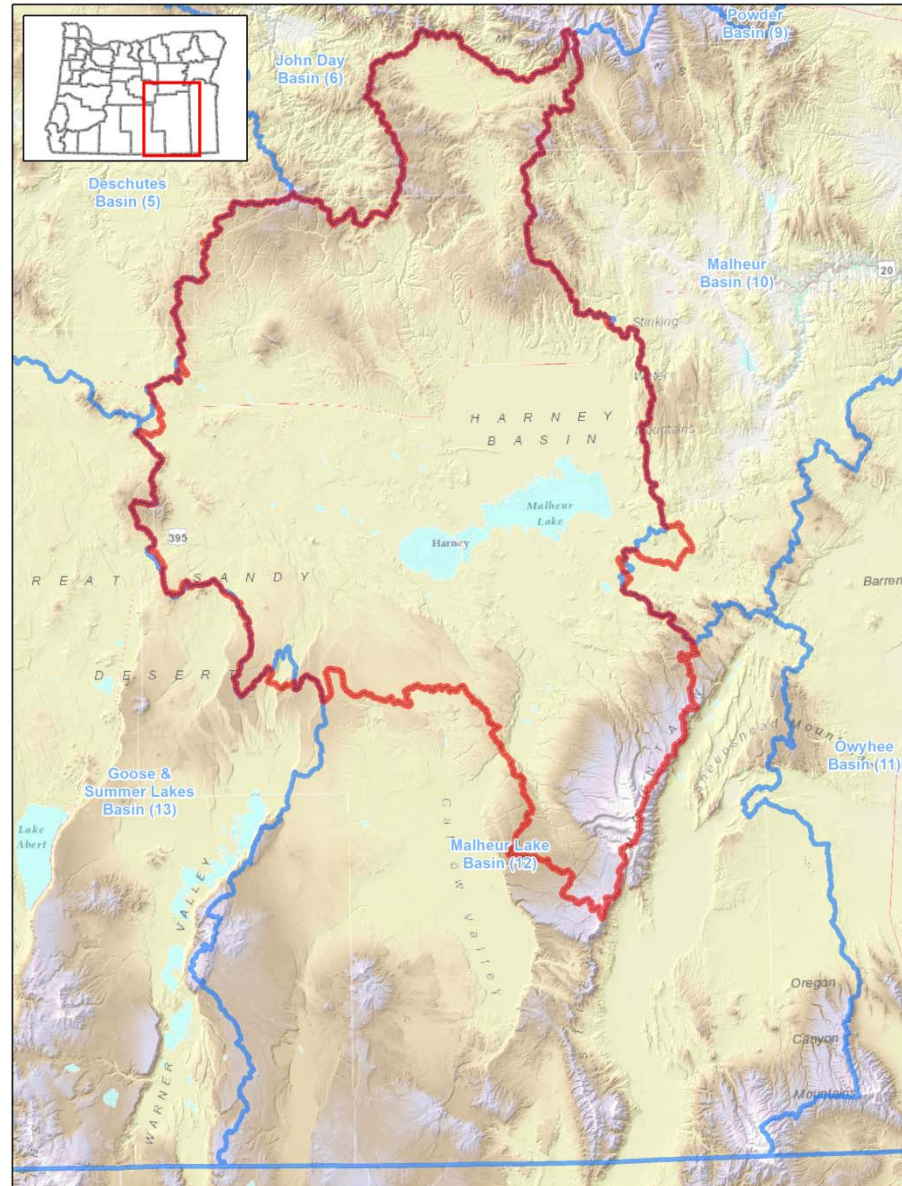


The Harney basin represents the surface-water drainage area of Malheur and Harney Lakes, which are fed by the watersheds of Silver Creek, Silvies River and Donner und Blitzen River.

Basin delineation is based on USGS watershed boundaries.

Harney Basin

-  OWRD basins
-  10 digit (watershed)
-  Harney Basin

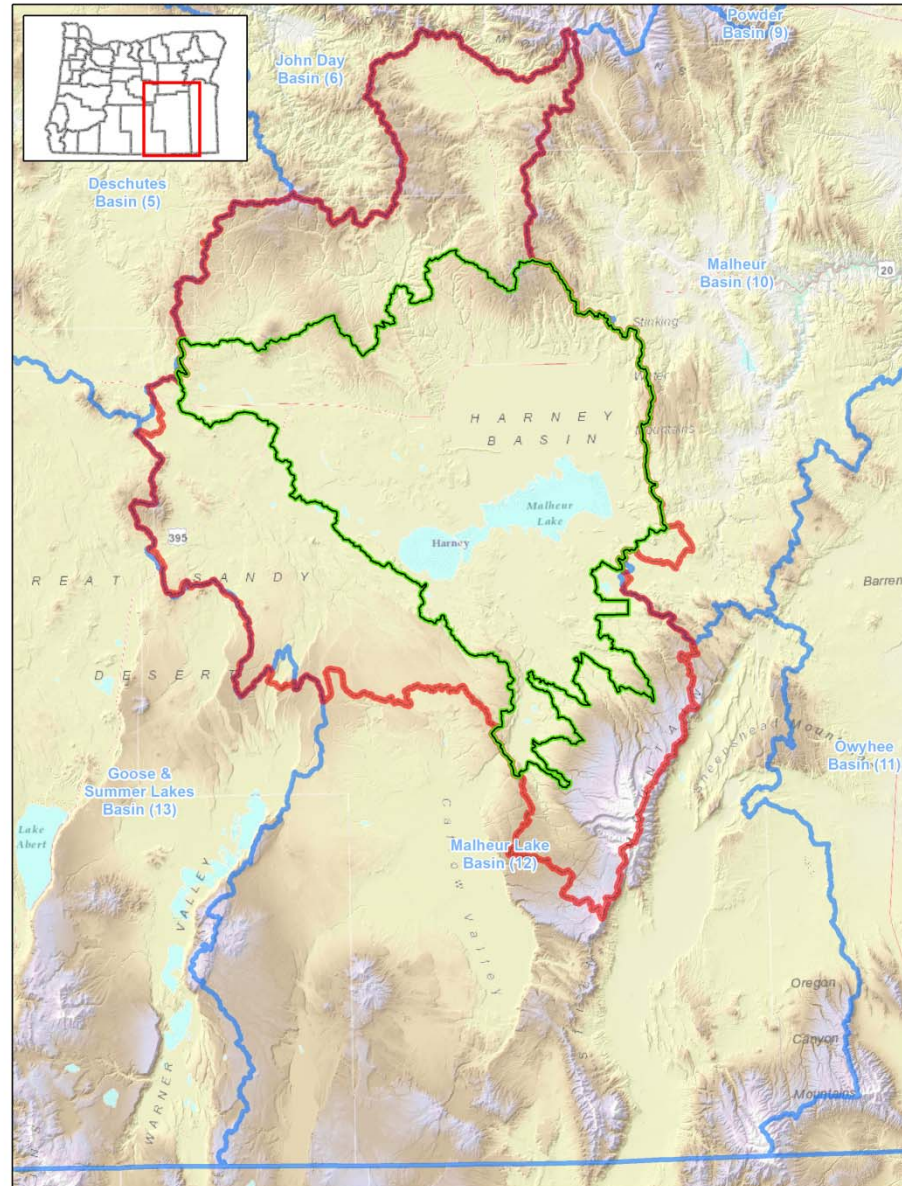


The Harney basin represents the surface-water drainage area of Malheur and Harney Lakes, which are fed by the watersheds of Silver Creek, Silvies River and Donner und Blitzen River.

Basin delineation is based on USGS watershed boundaries.

GHVGAC Boundaries

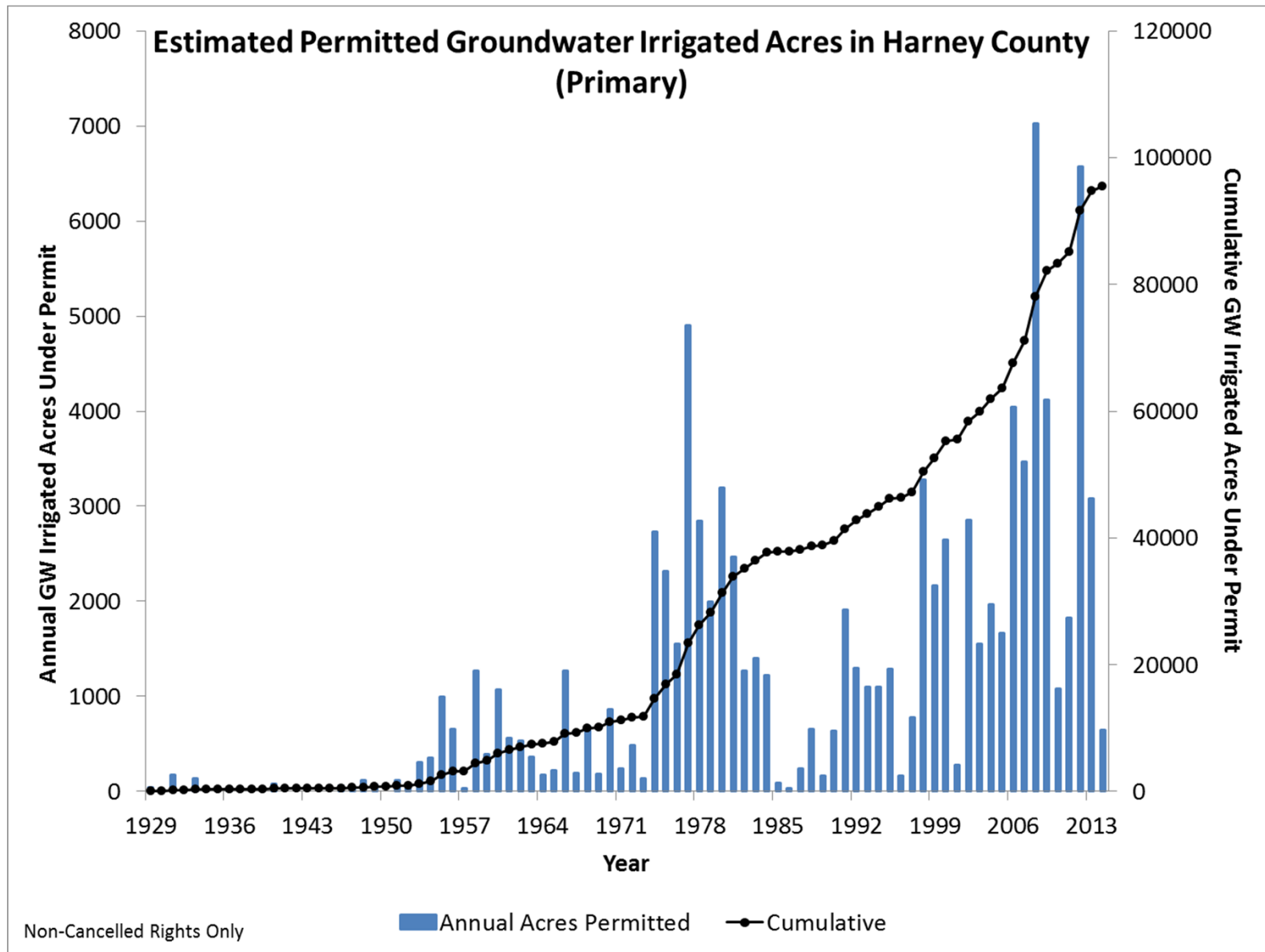
-  OWRD basins
-  10 digit (watershed)
-  Harney Basin
-  GHVGAC



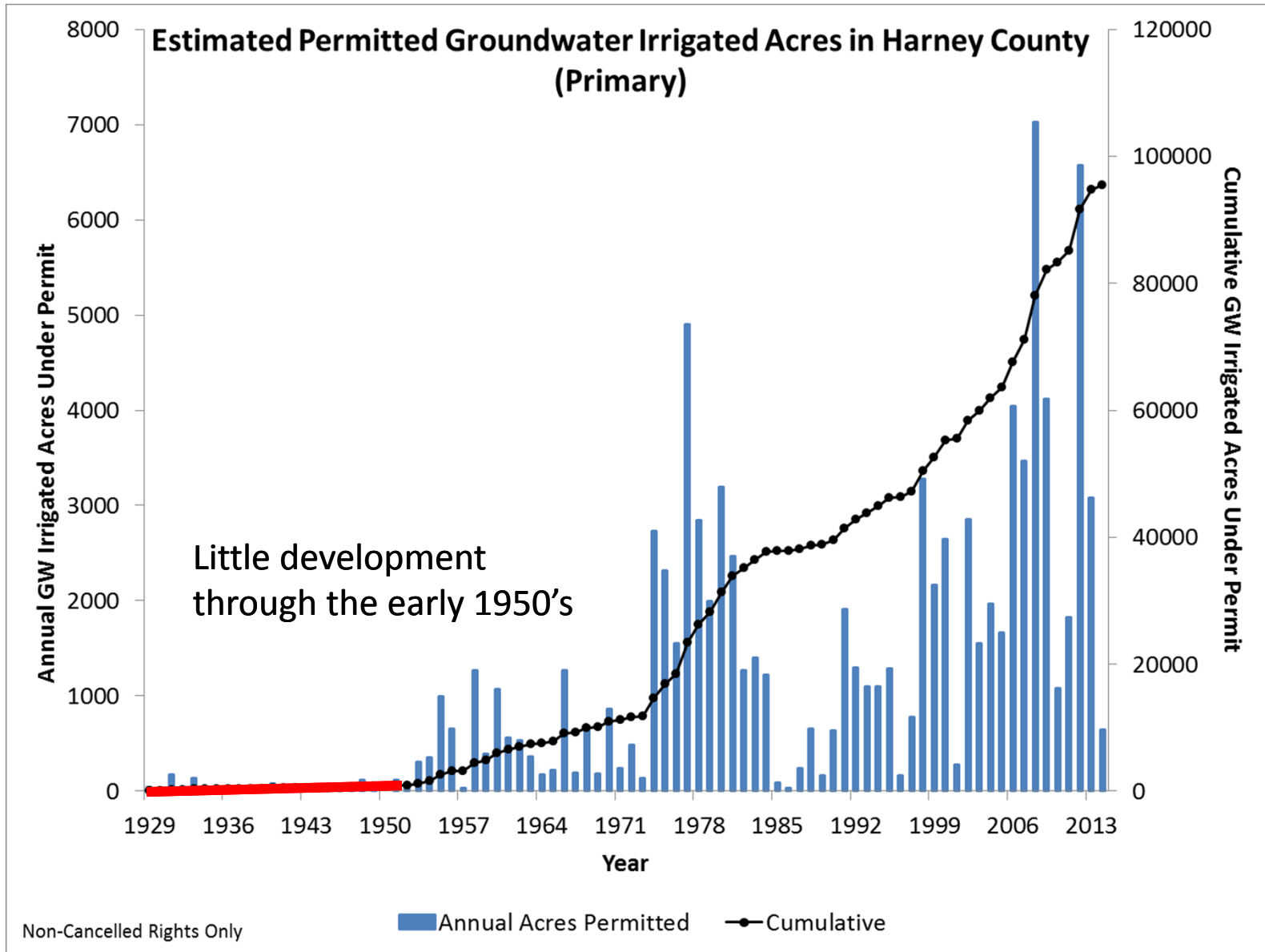
The Greater Harney Valley Groundwater Area of Concern is defined as the area that includes Harney Valley, adjoining valleys, and lower-elevation flanks of uplands facing those valleys.

Administrative area delineated based on 12 digit USGS watershed boundaries, truncated by OWRD administrative boundaries, and modified by Division 512 rule making.

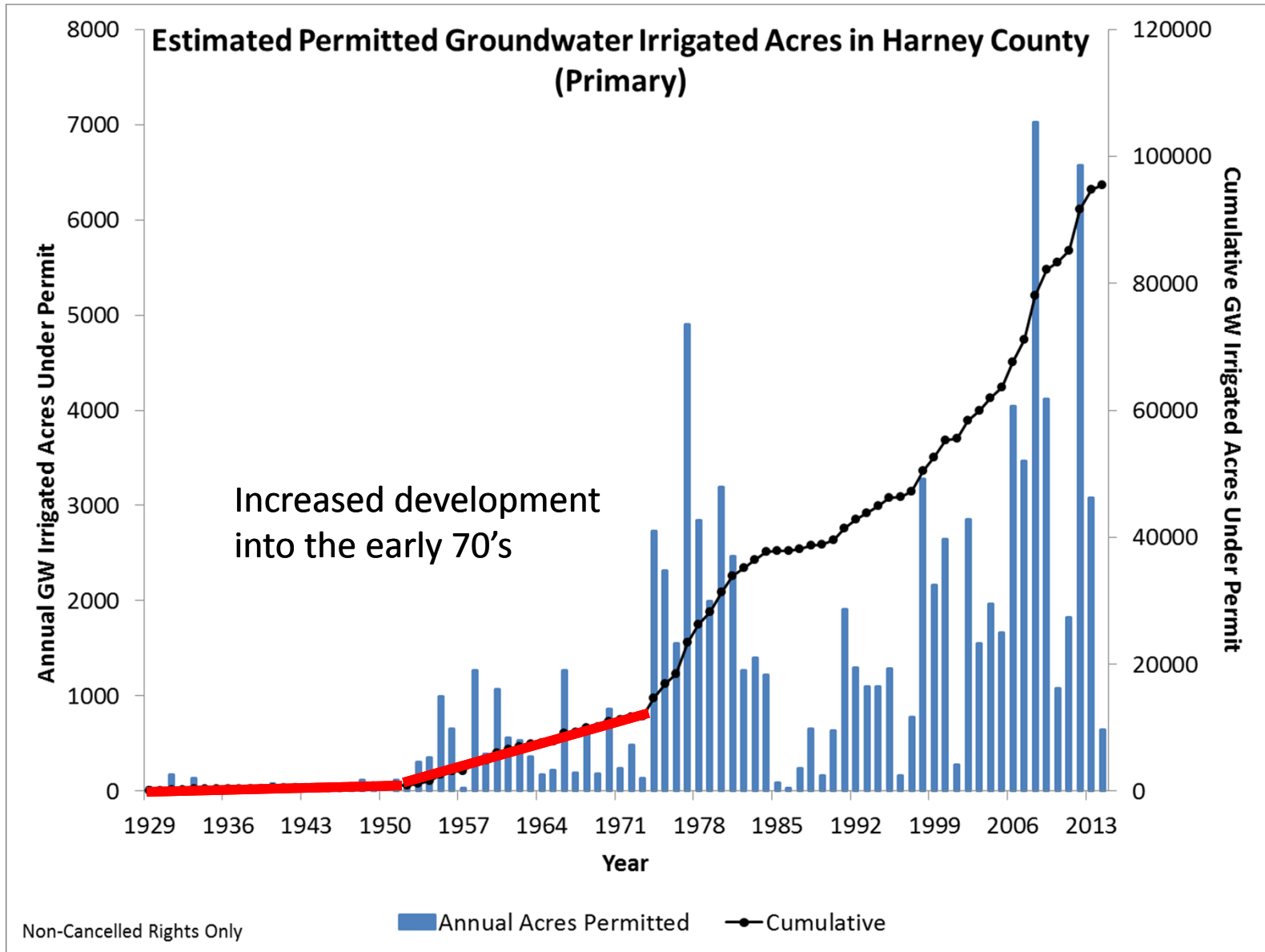
History of groundwater development



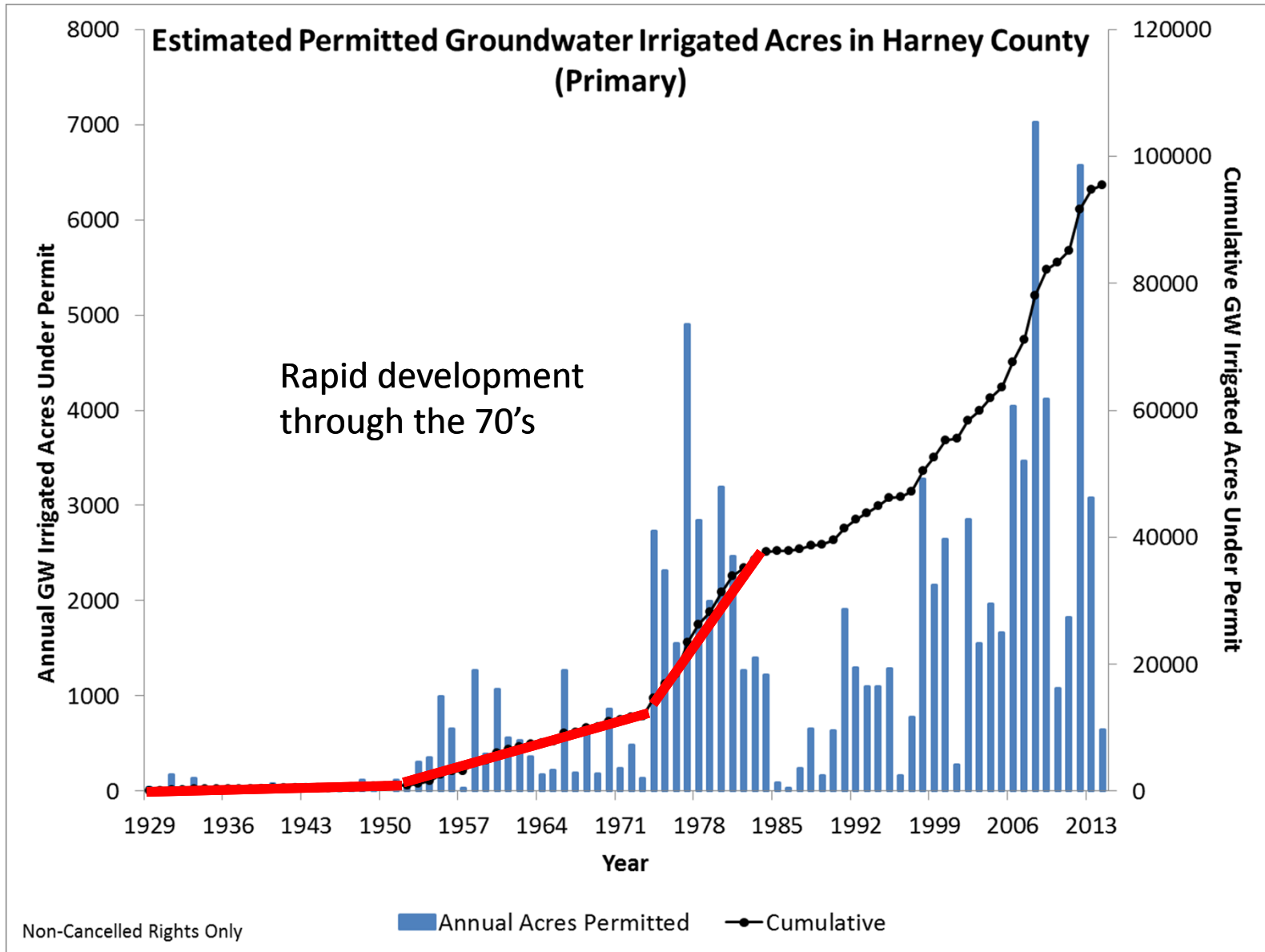
1929 to early 1950's



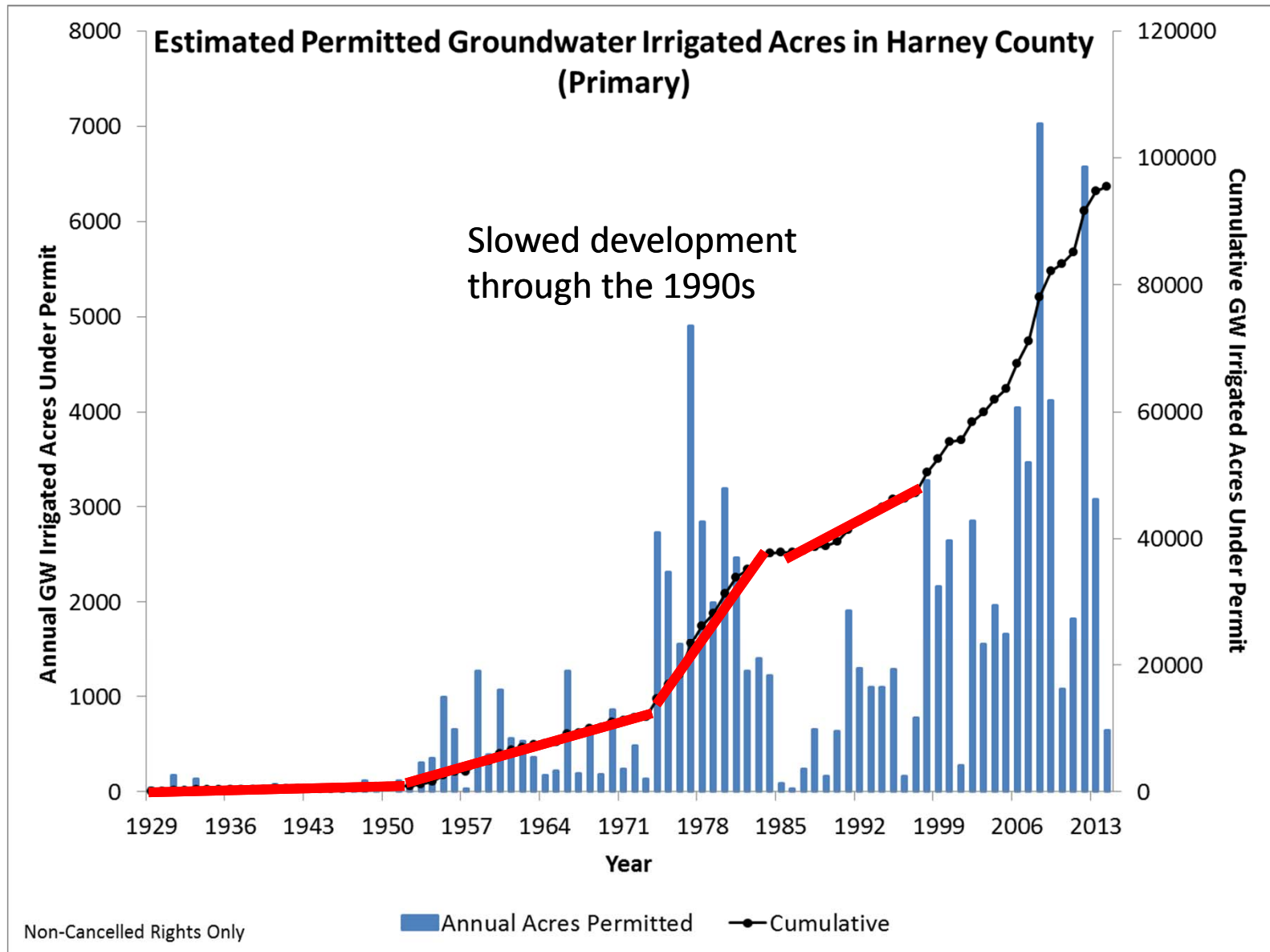
Early 1950's to early 1970's



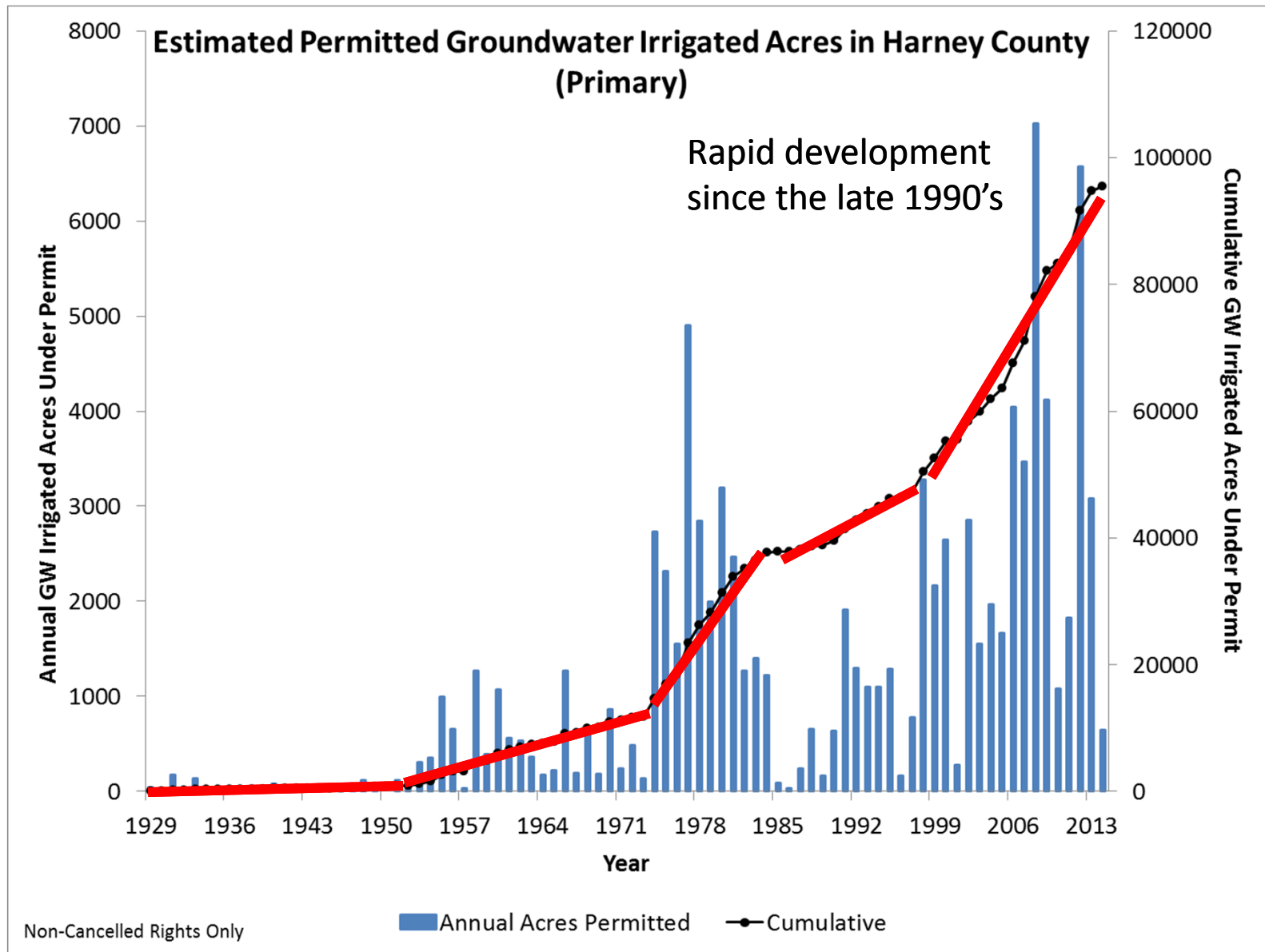
Early 1970's to early 1980's



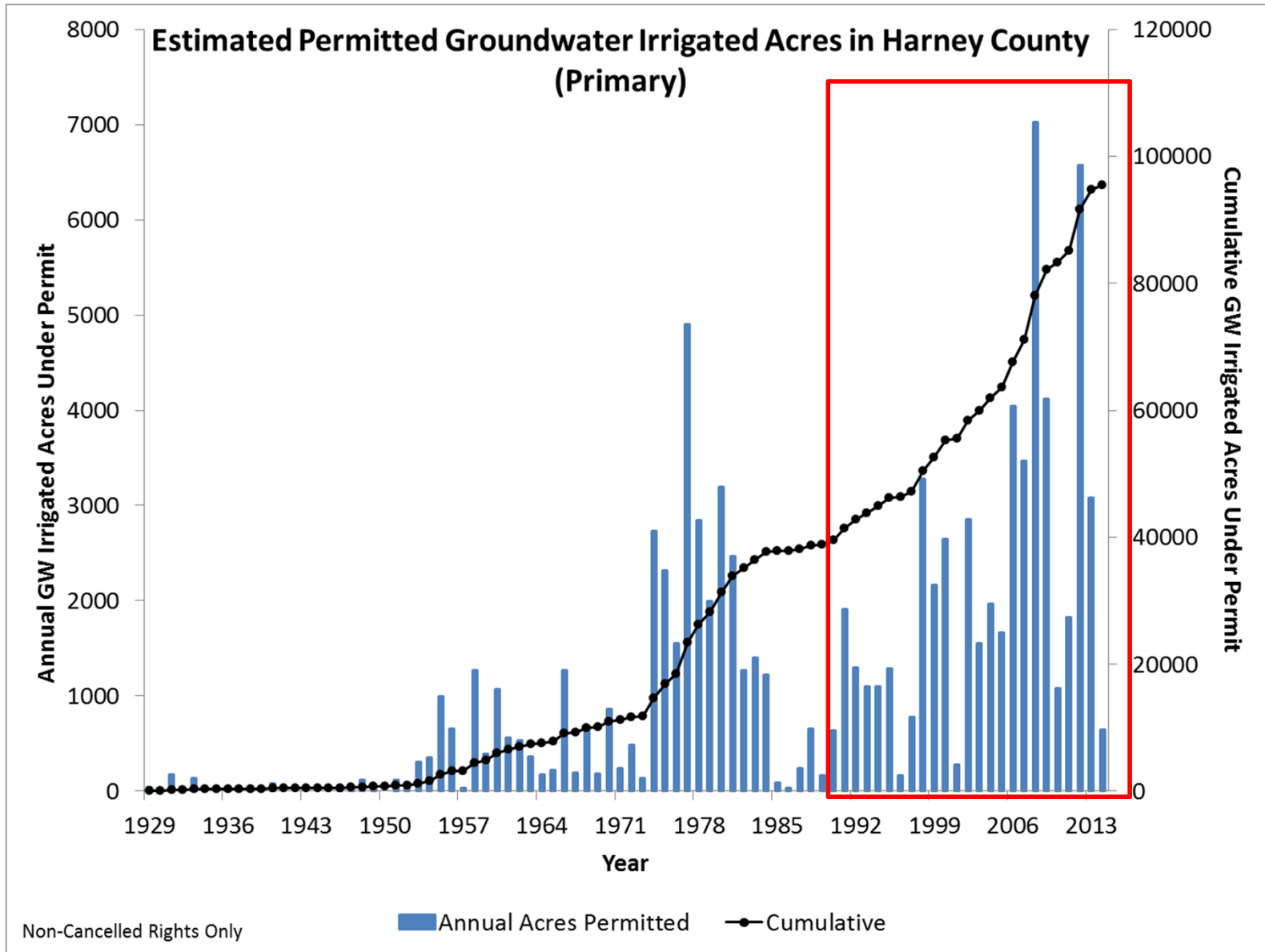
Early 1980's through 1990's

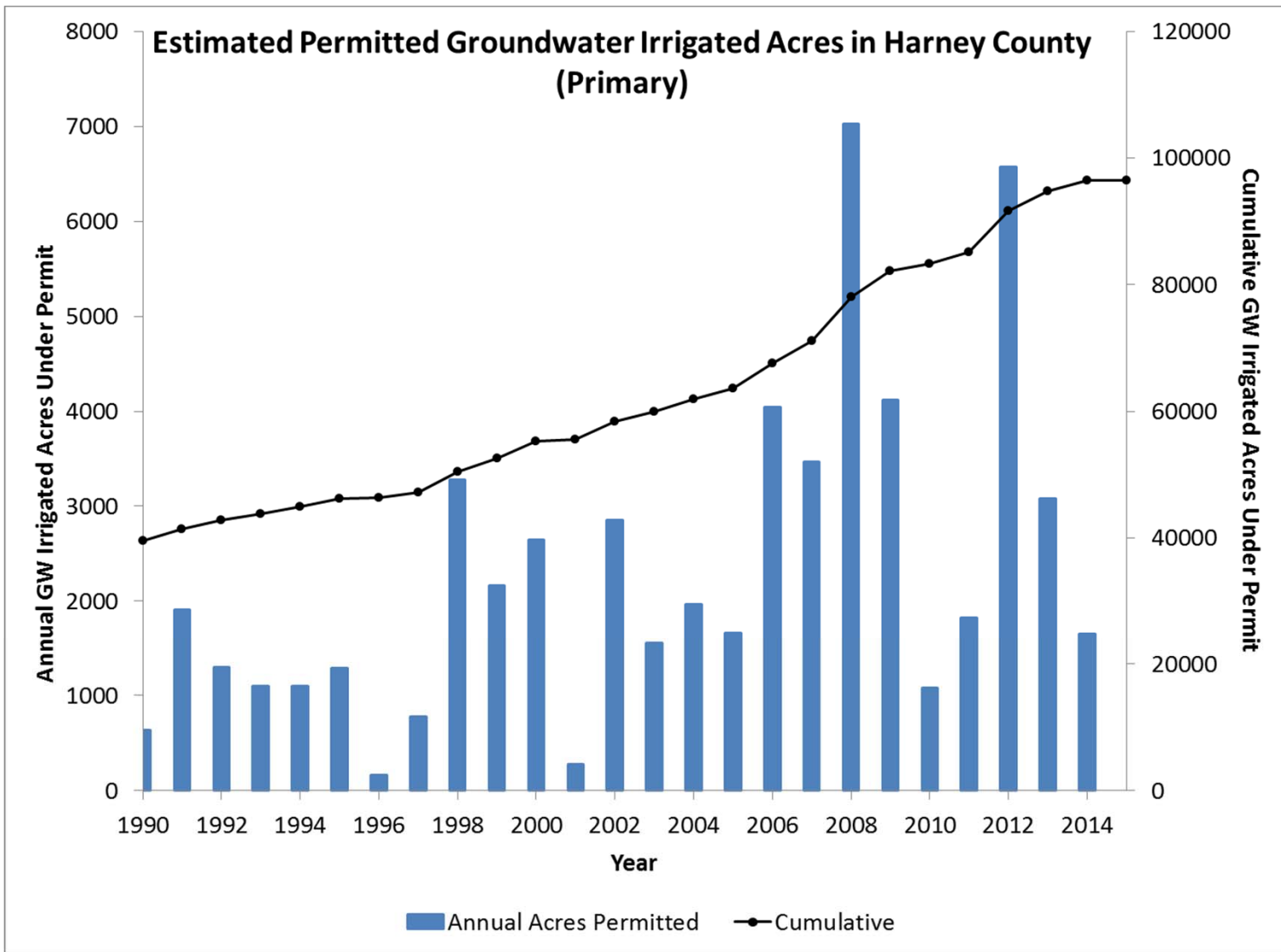


Late 1990's to present

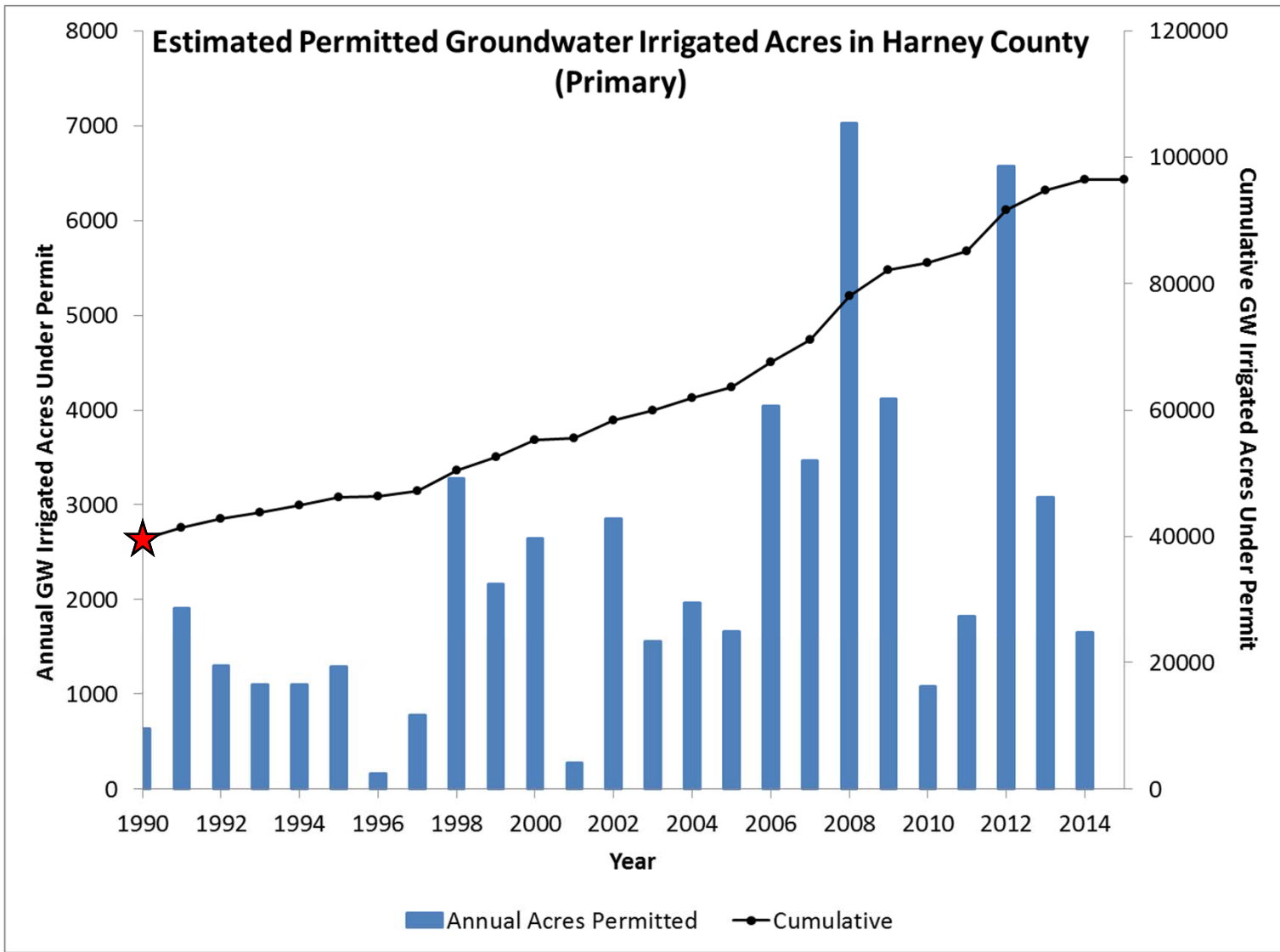


1990 to present

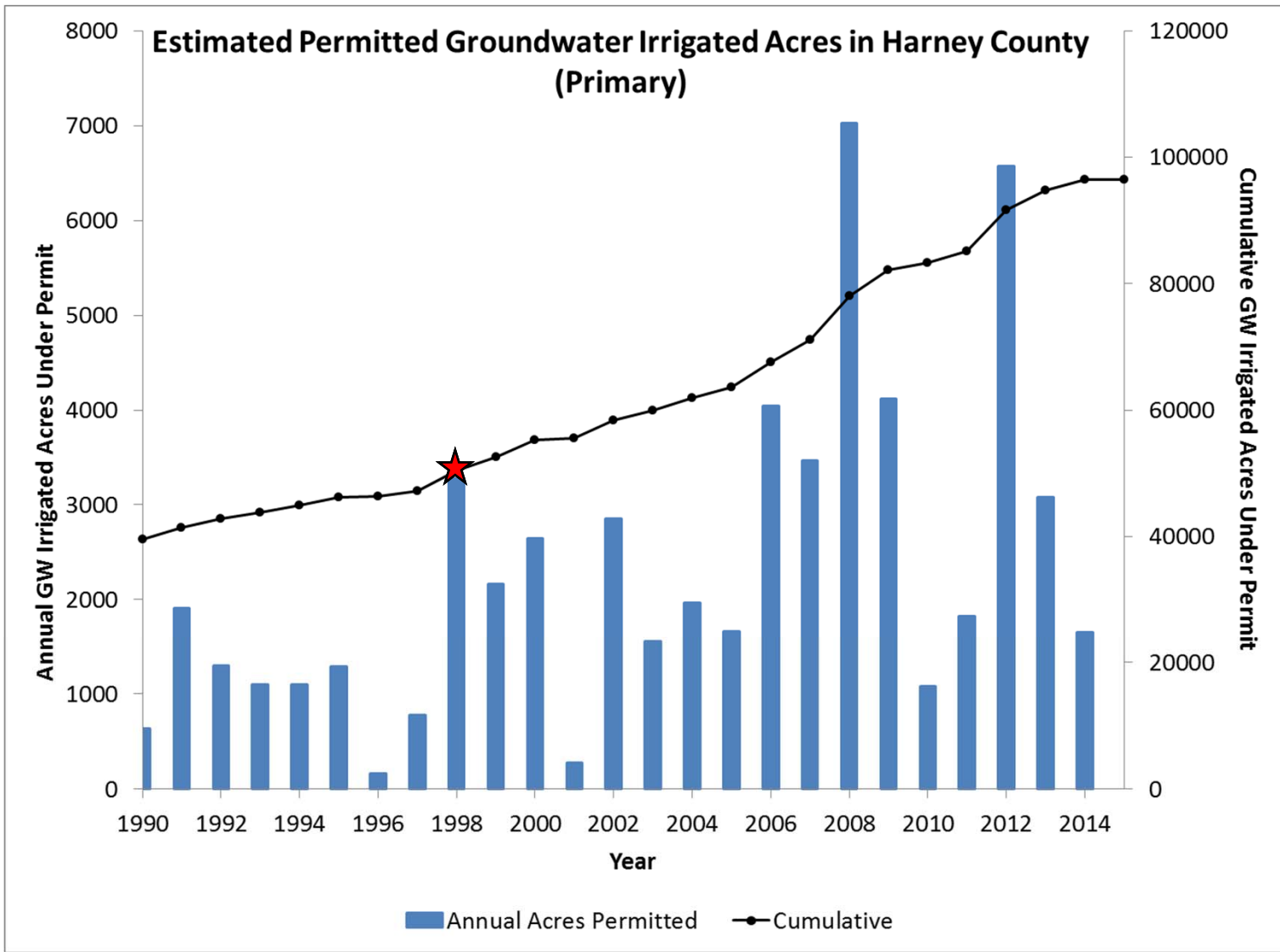




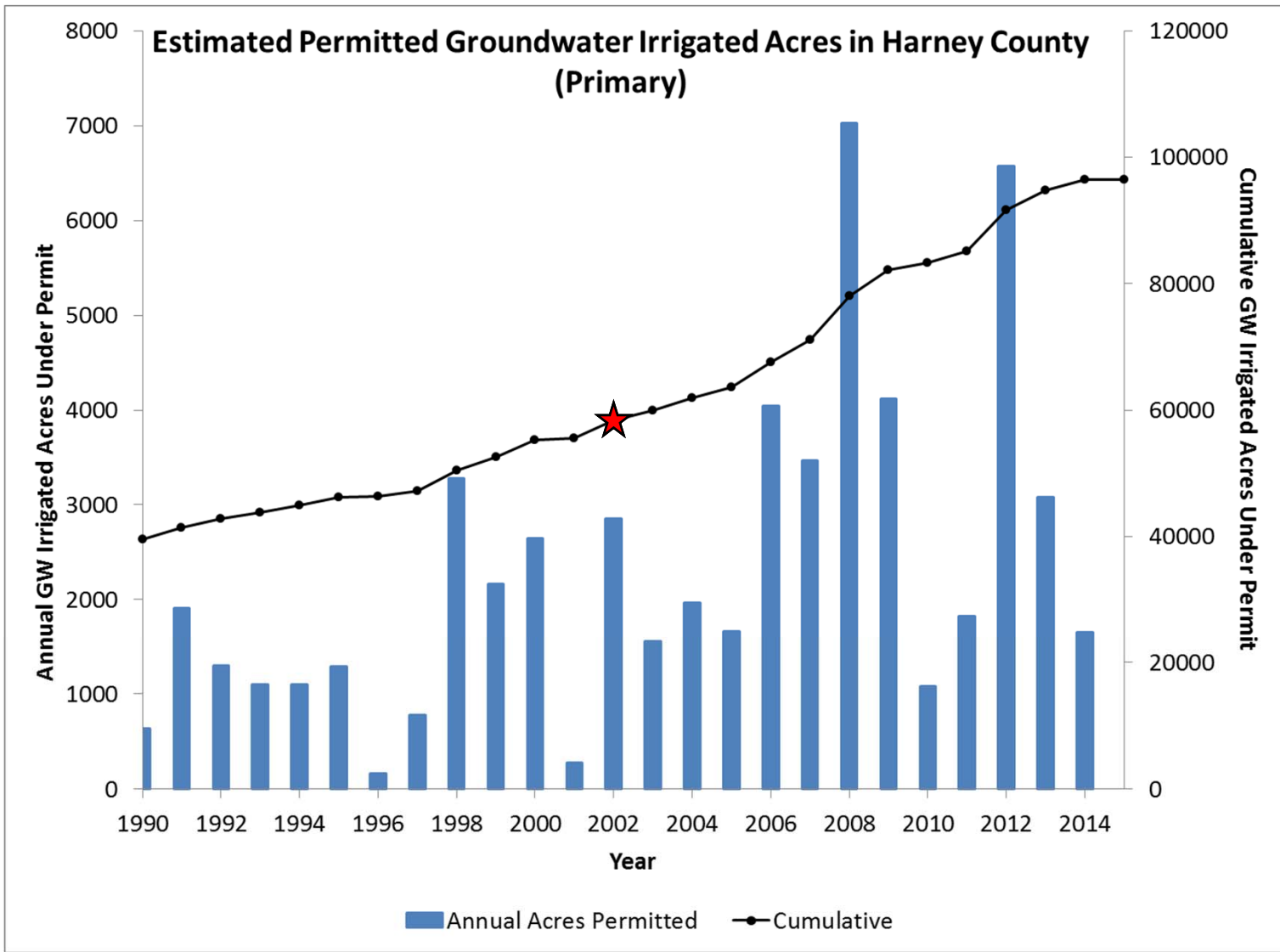
- Pre-1990:
- Most groundwater applications are generally approved with minimal conditions or limitations.
 - Network of State Observation Wells typically measured quarterly.



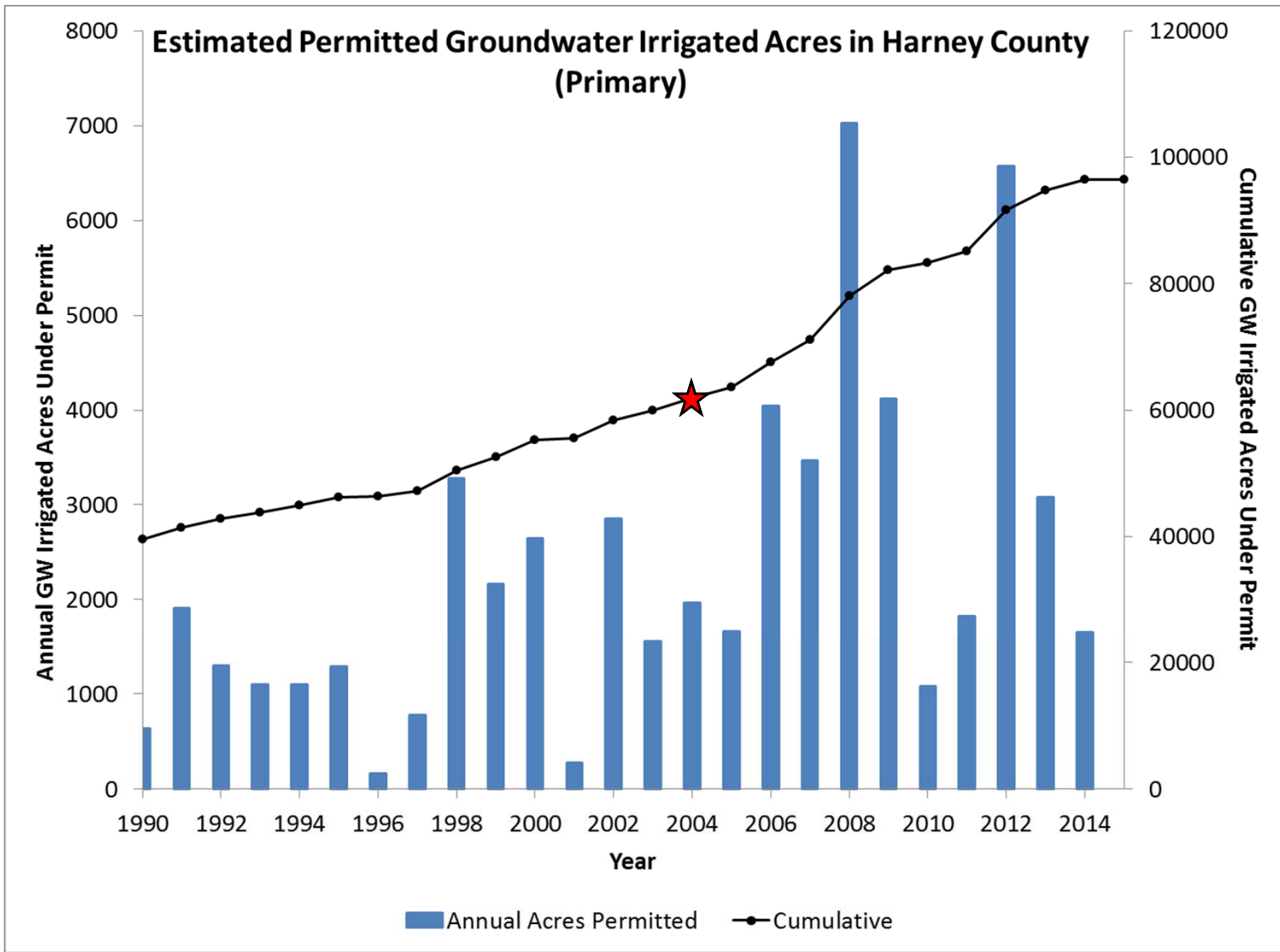
★ 1990: • Measurement, reporting, and decline conditions begin to appear in new permits.



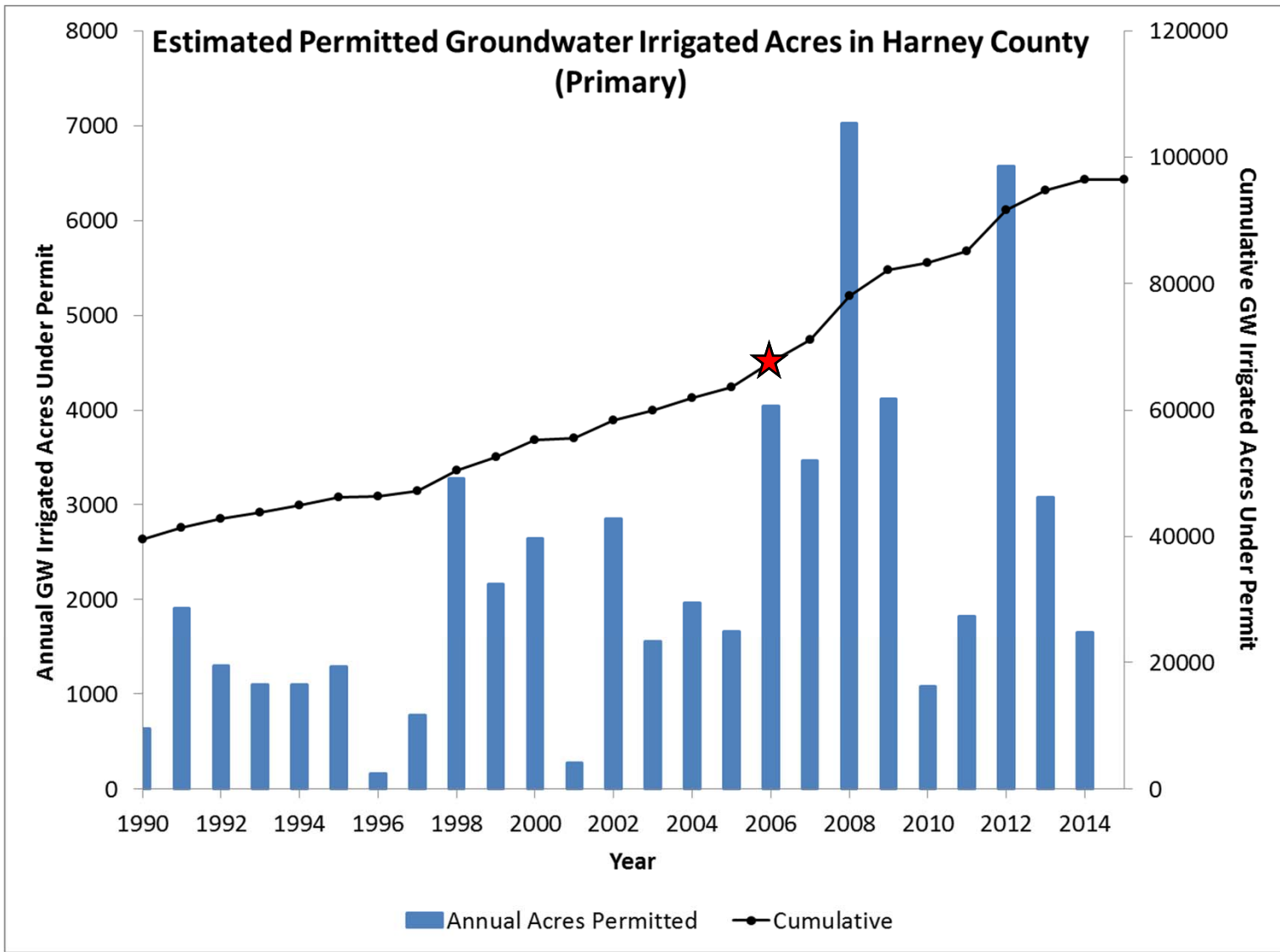
★ 1998: • Increased rate of GW development begins after ~15 year period of slowed development.



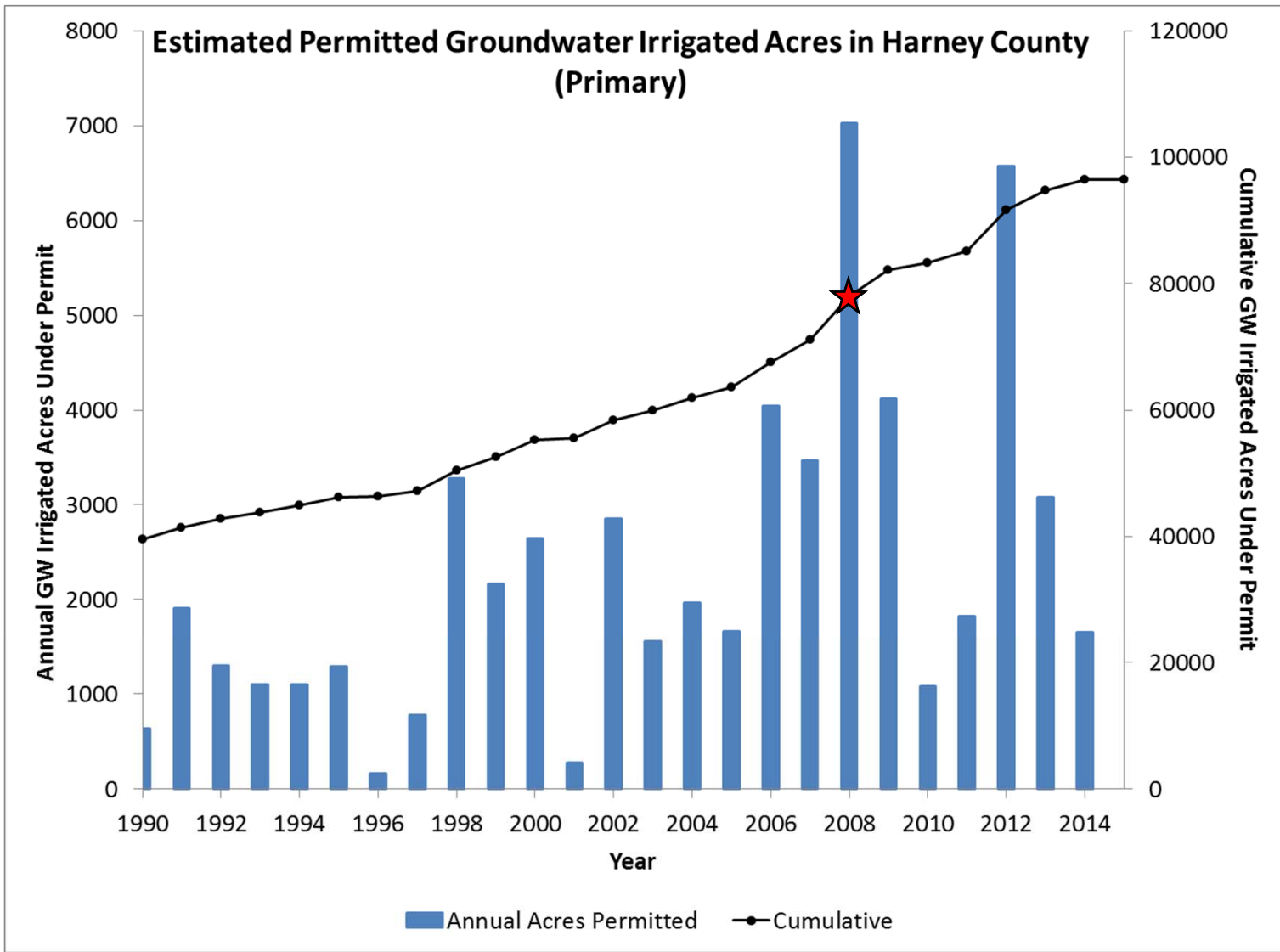
★ 2002: • Measurement, reporting, and decline conditions become common on larger permits.



- ★ 2004:
- Measurement, reporting, and decline conditions placed on almost all new permits.
 - Local concern for overdevelopment near Crane noted.

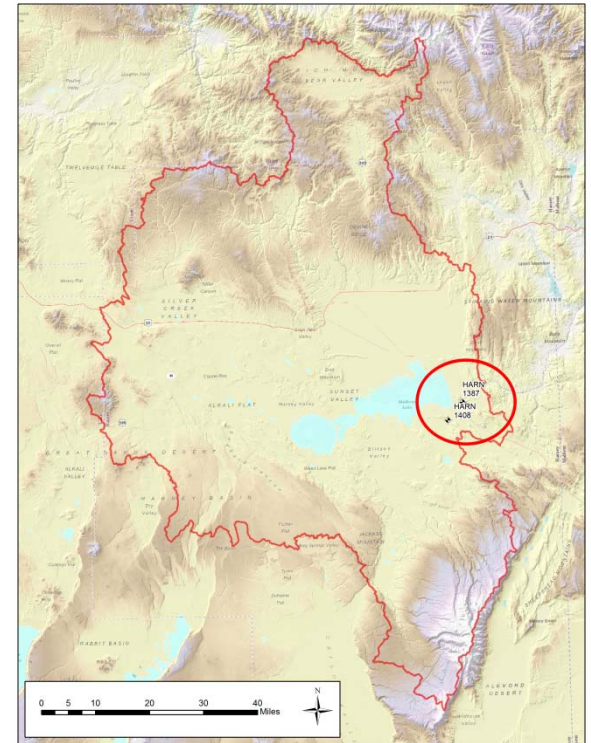
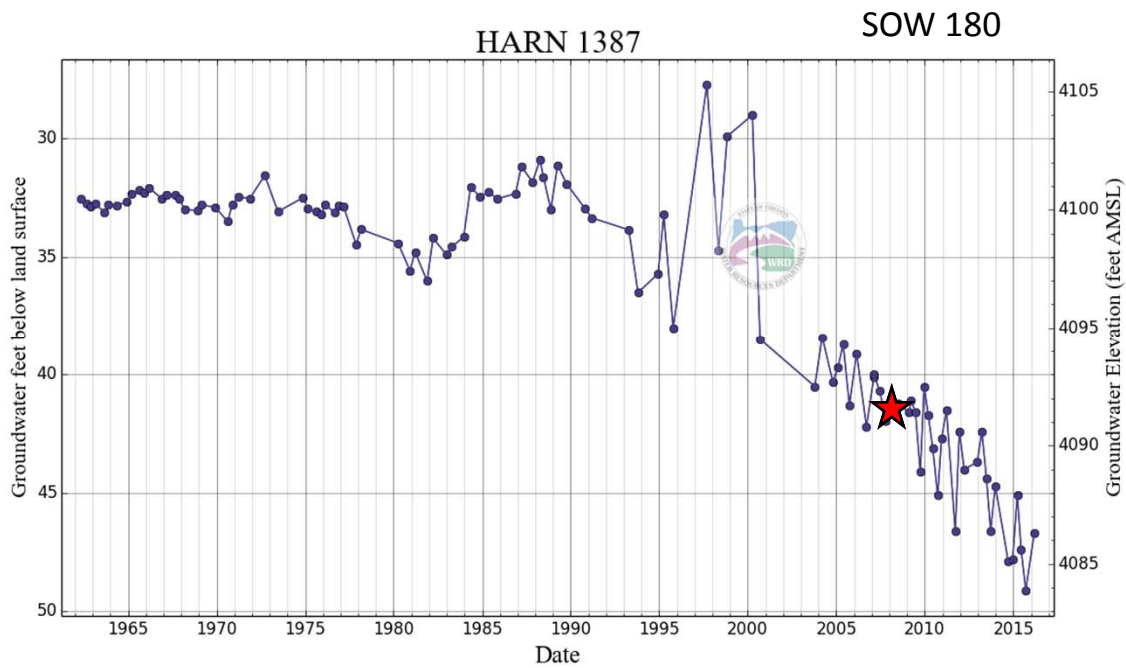
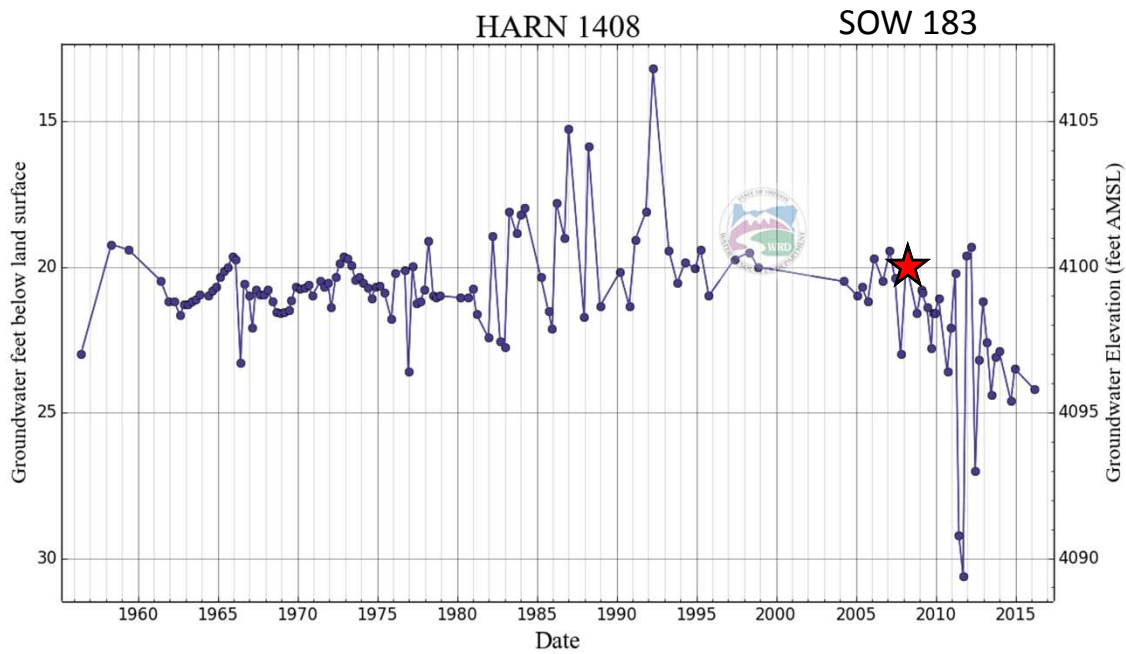


★ 2006: • HARN 1245 recorder installed in response to local concern (Crane area).

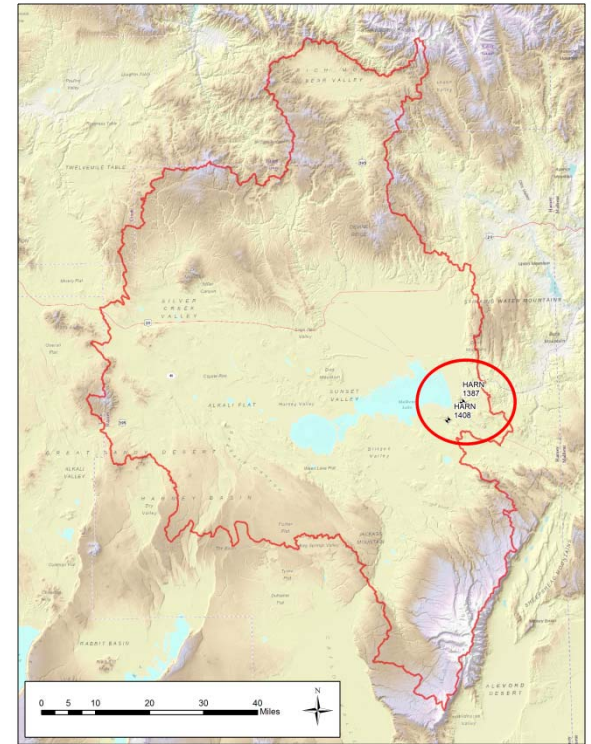
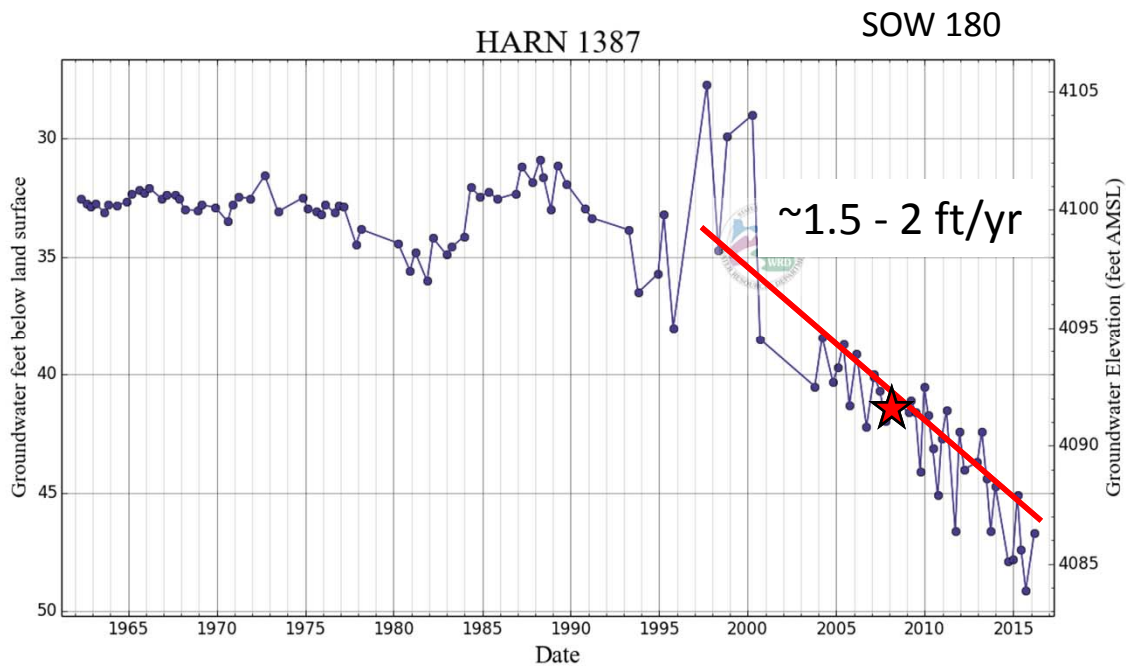
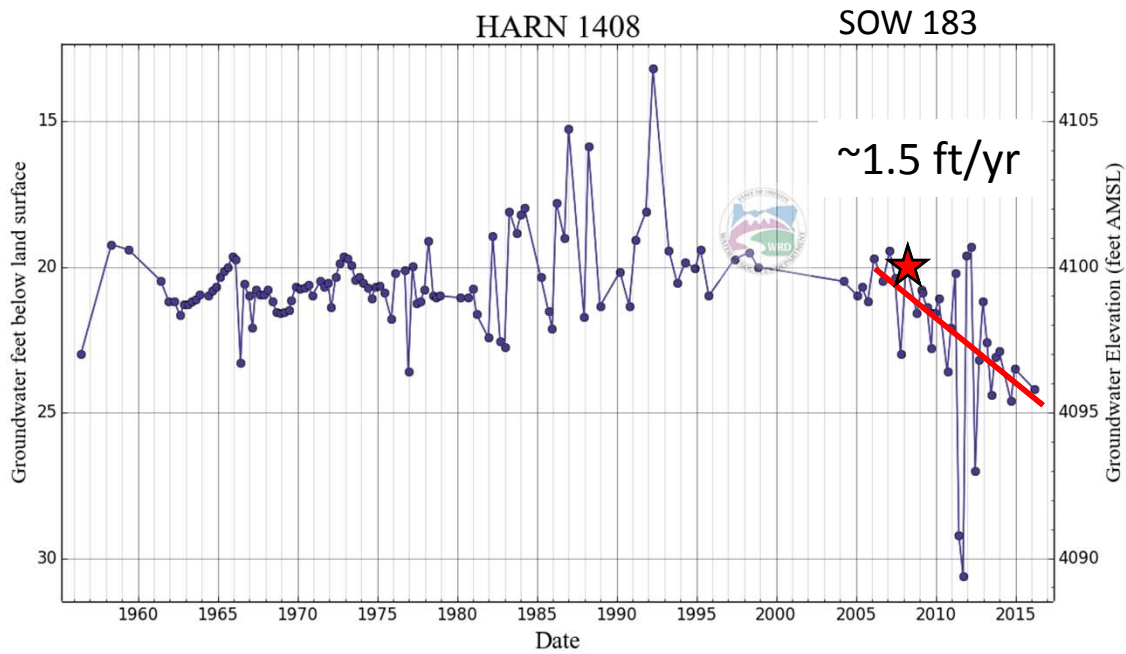


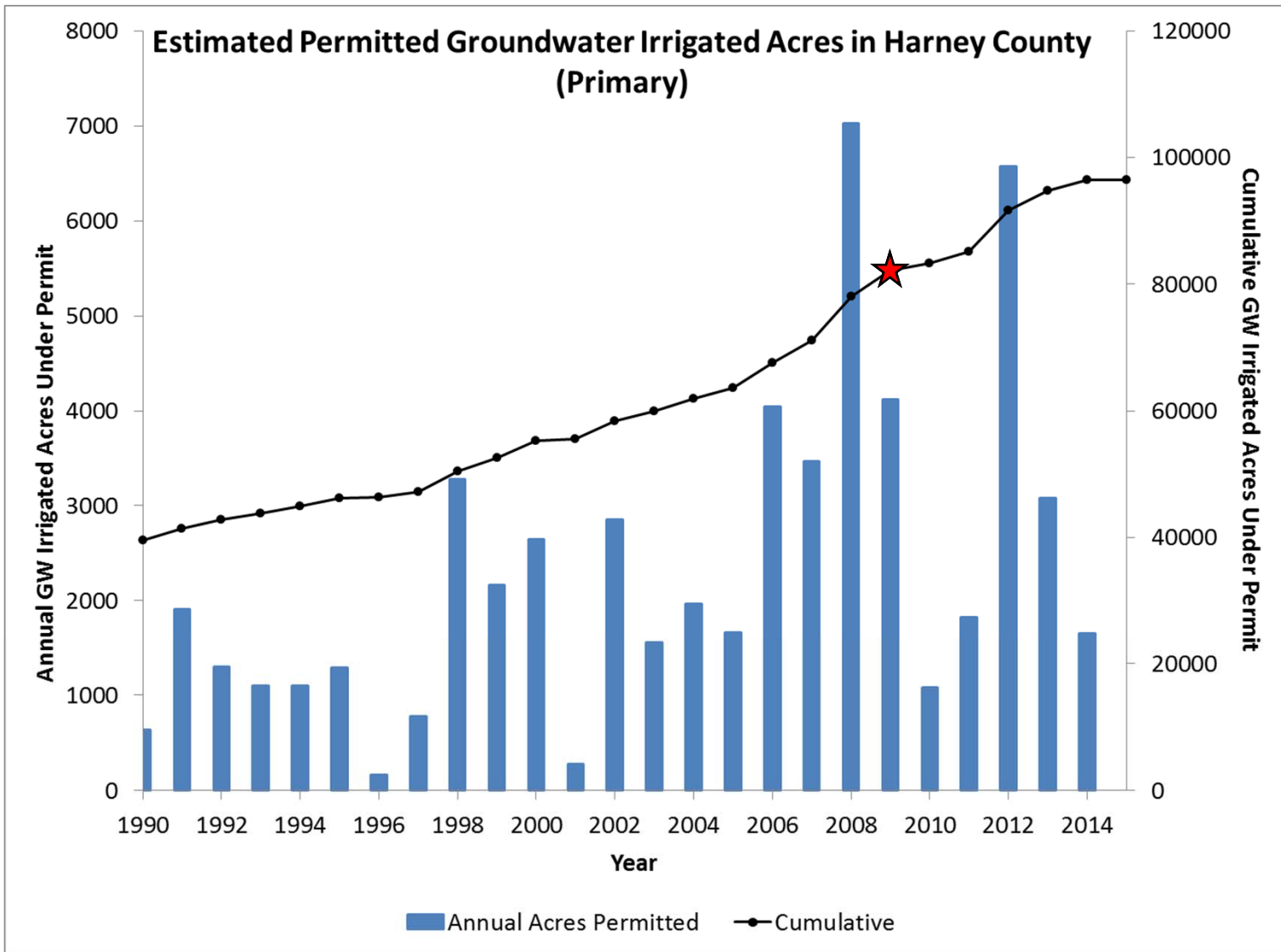
- ★ 2008:
- Small declines noted in SOWs 183 & 180 (Princeton area).
 - Quarterly monitoring of additional wells in the Crane area begins.
 - HARN 440 recorder installed (near Burns airport).

2008



2008



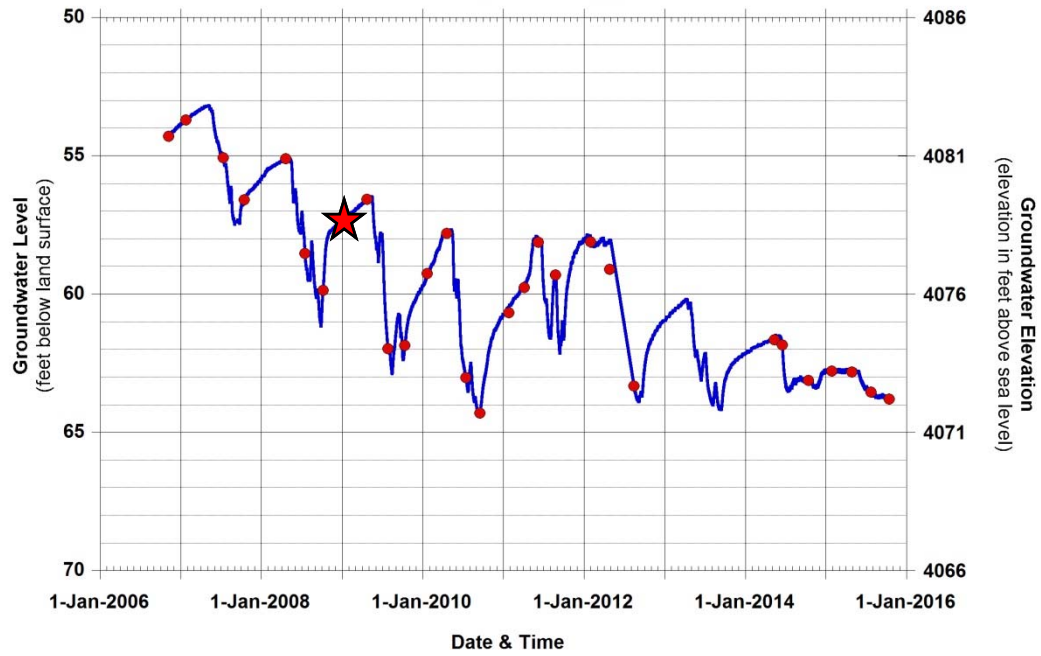


- ★ 2009:
- ~2 ft/yr decline noted in HARN 1245 recorder well (Crane area).
 - Additional wells showing declines in the Crane area.
 - Quarterly monitoring at Weaver Springs begins due to rapid development.

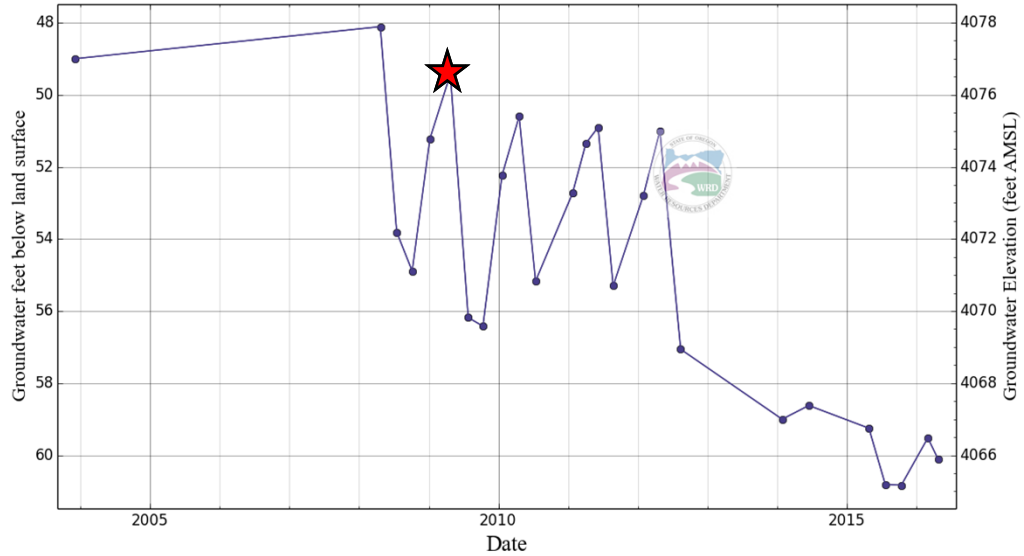
Well Depth = 160 ft
 Casing Depth = 40 ft
 Seal Depth = 20 ft
 Aquifer = Gravel Layers in Clay & Sand

HARN 1245
Mims Recorder Well
T25S/R34E-sec 06 bbb
Harney Valley
(Crane Vicinity)

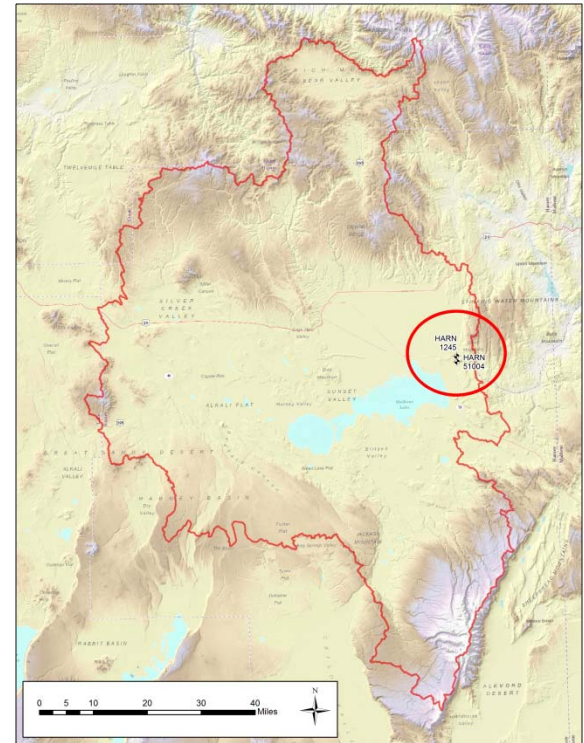
— Recorder Data
 ● Manual Data



HARN 51004



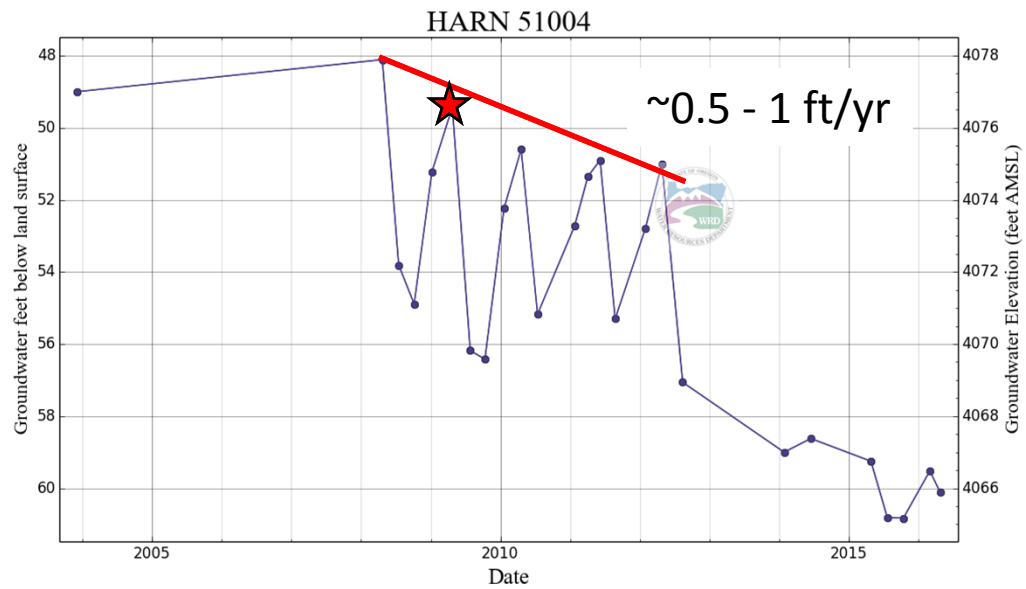
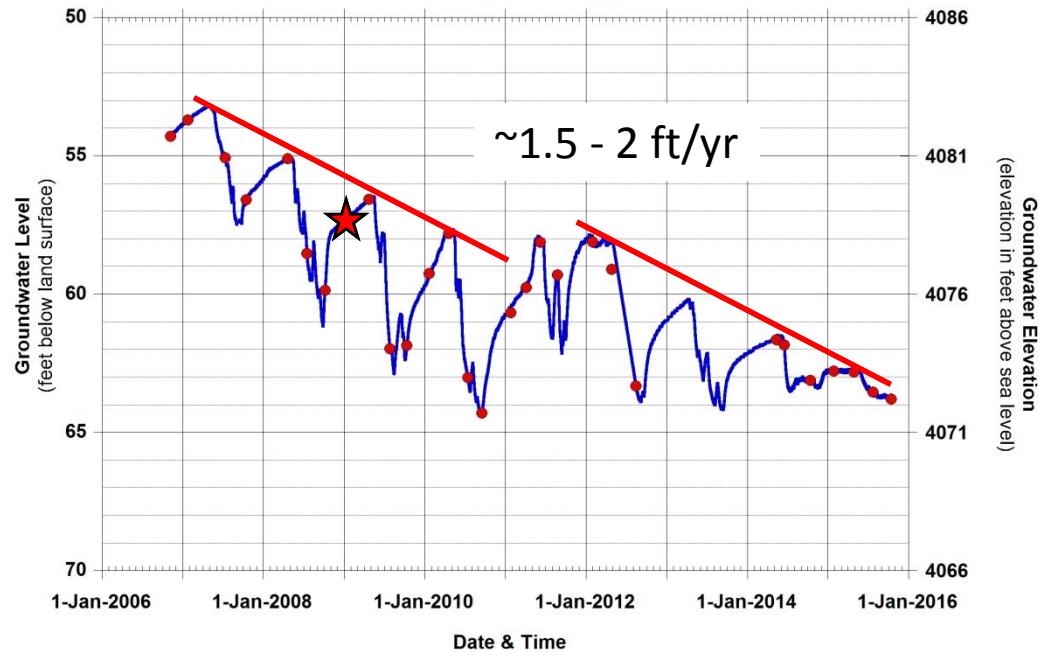
2009



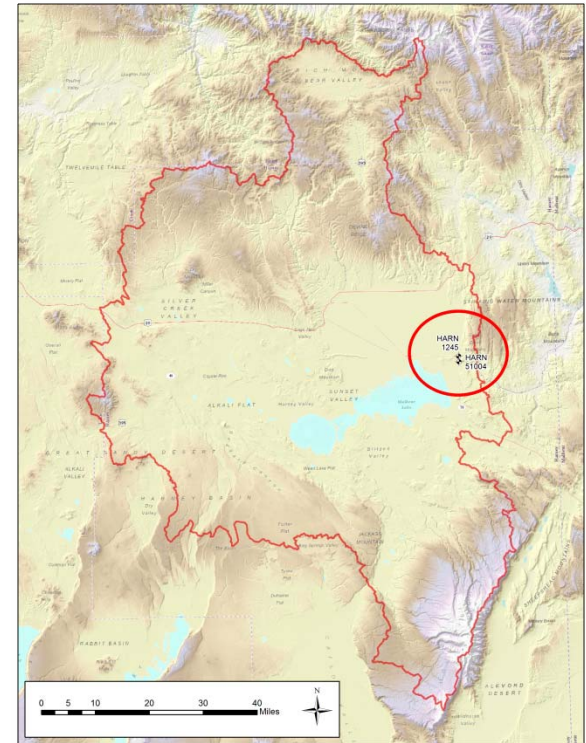
Well Depth = 160 ft
 Casing Depth = 40 ft
 Seal Depth = 20 ft
 Aquifer = Gravel Layers in Clay & Sand

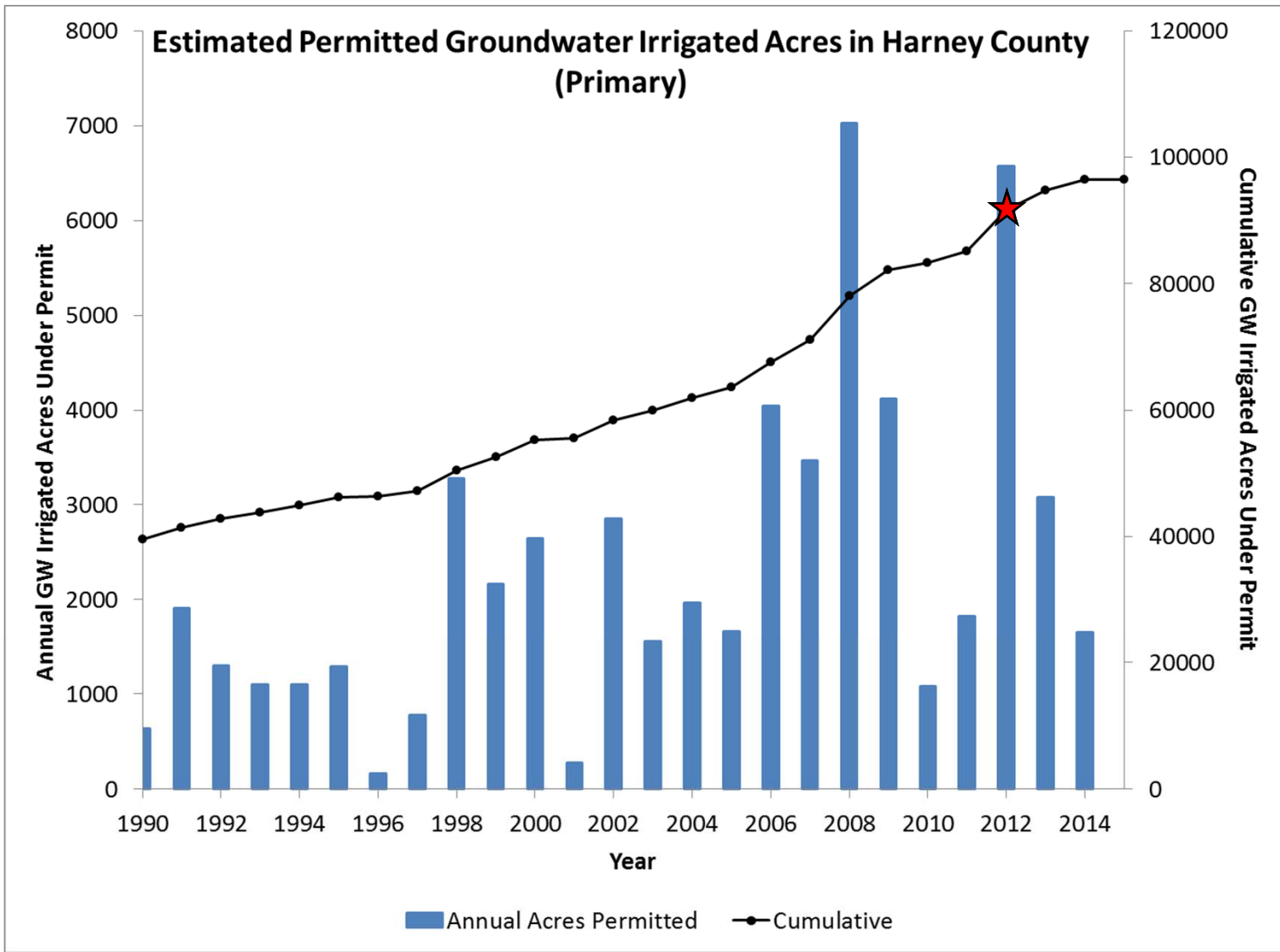
HARN 1245
Mims Recorder Well
T25S/R34E-sec 06 bbb
Harney Valley
(Crane Vicinity)

— Recorder Data
 ● Manual Data



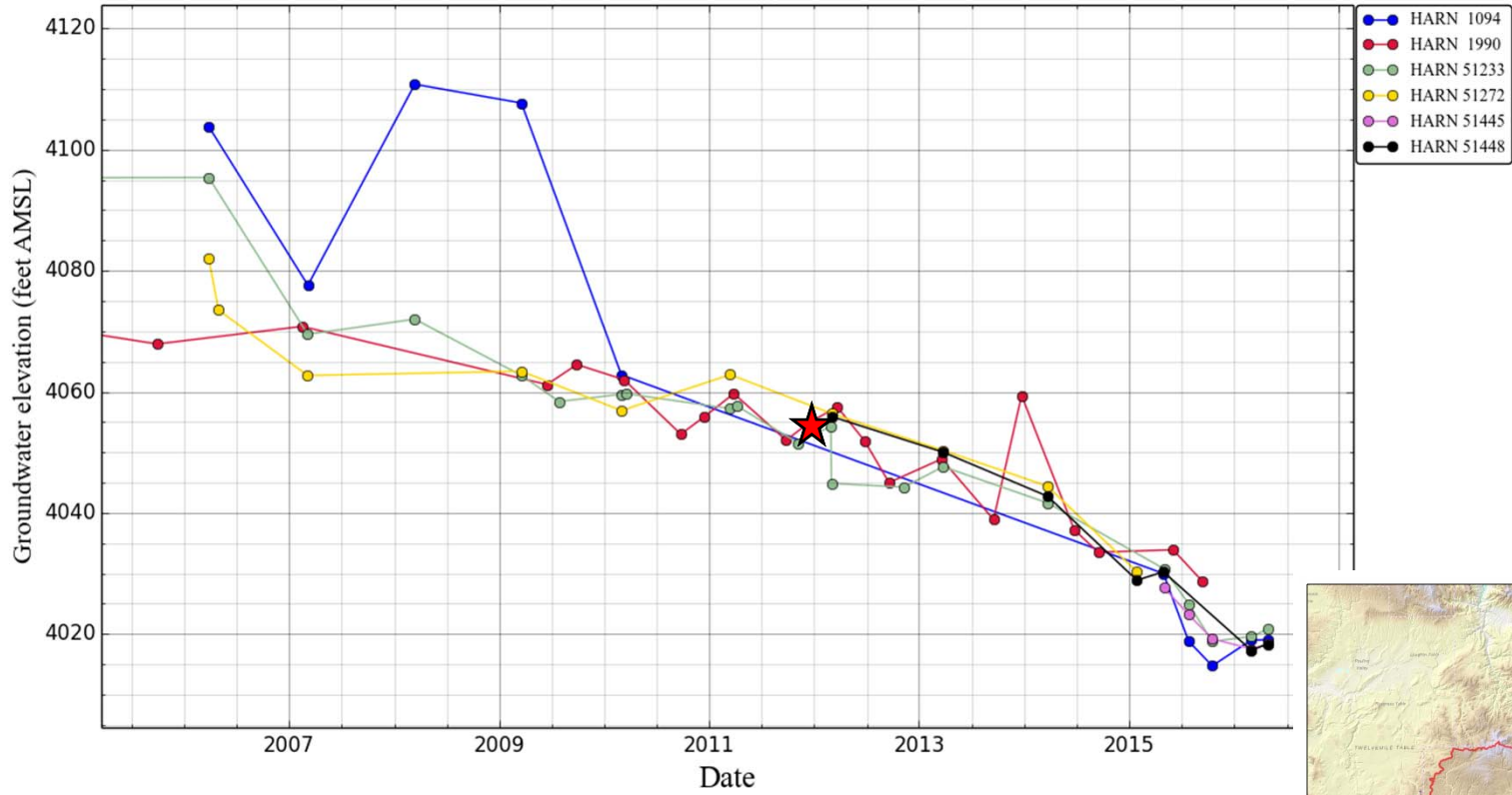
2009



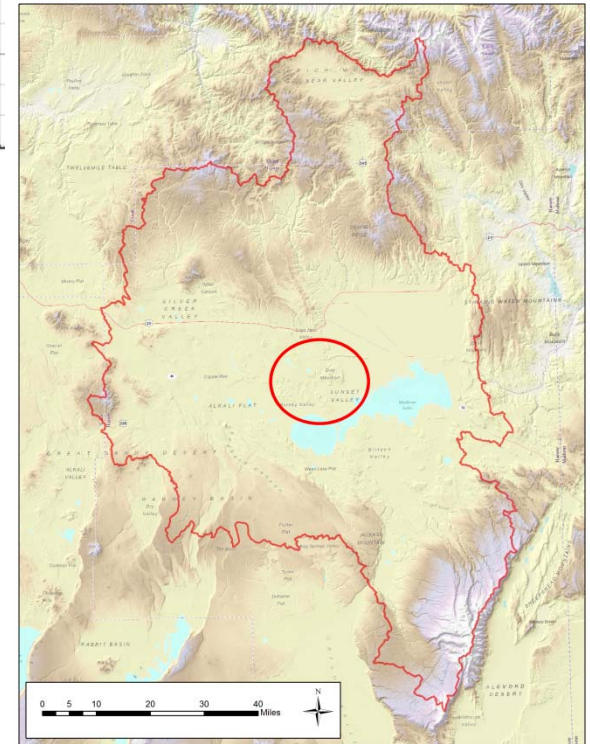


- ★ 2012:
- Weaver Springs declines/over appropriation are well documented.
 - First observation well condition for large application (Buchanan area – 20 cfs).

Observation Well Data

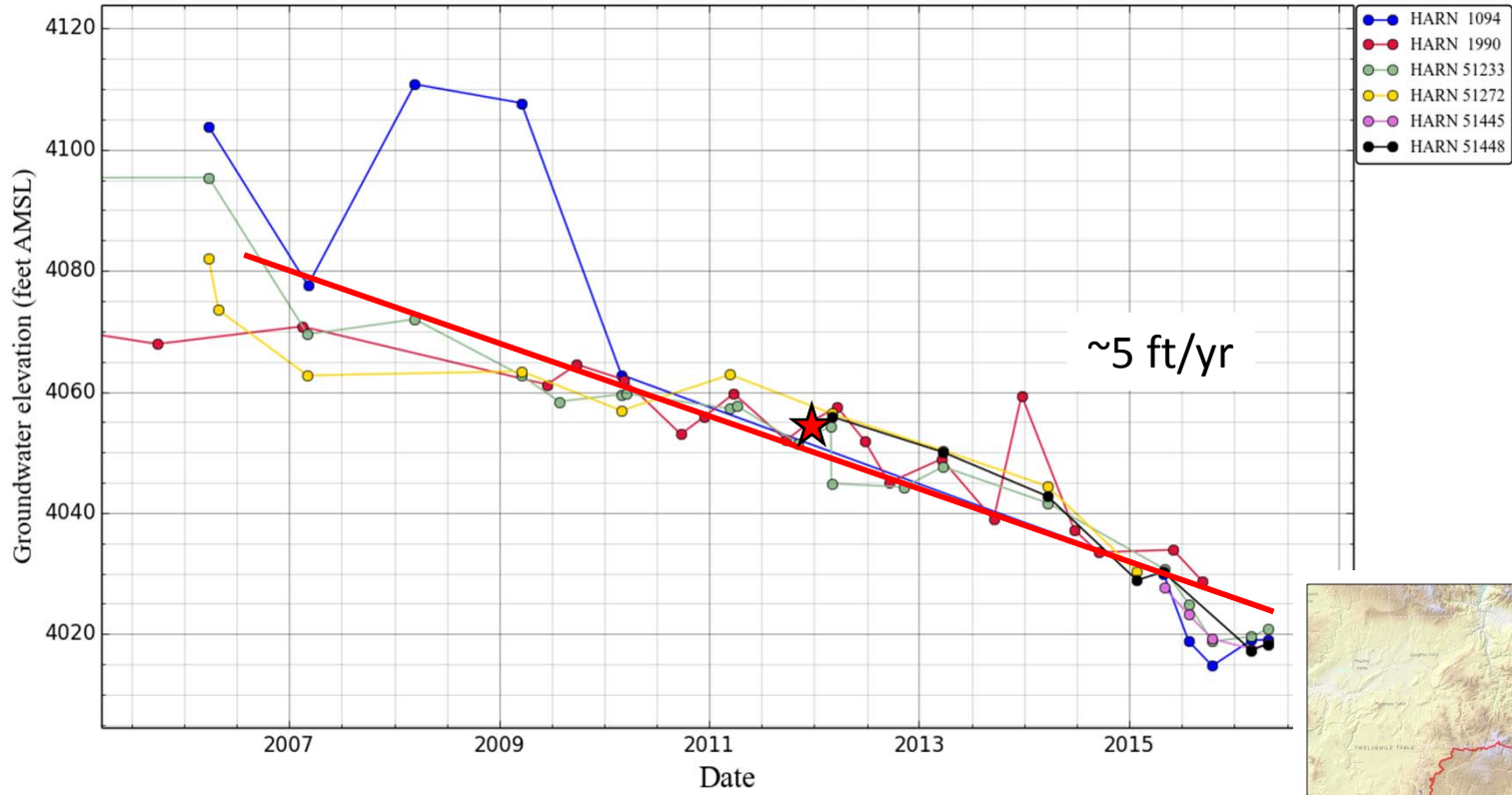


Weaver Springs area wells

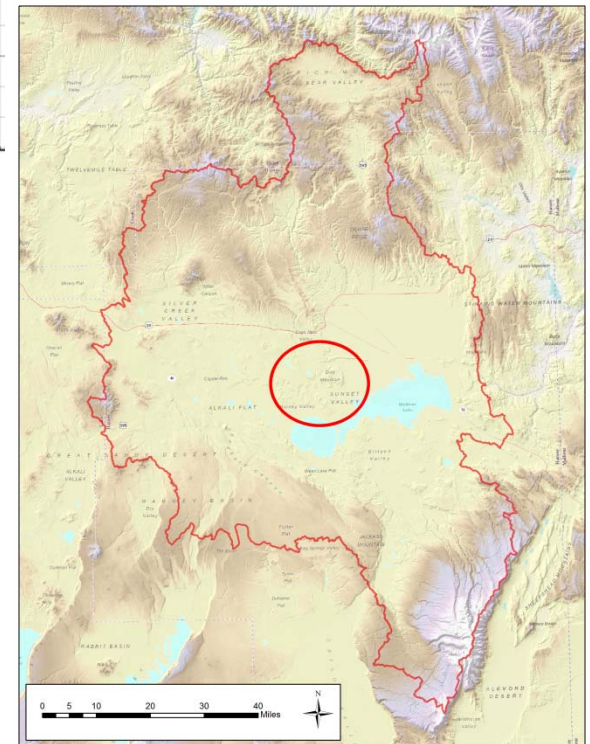


2012

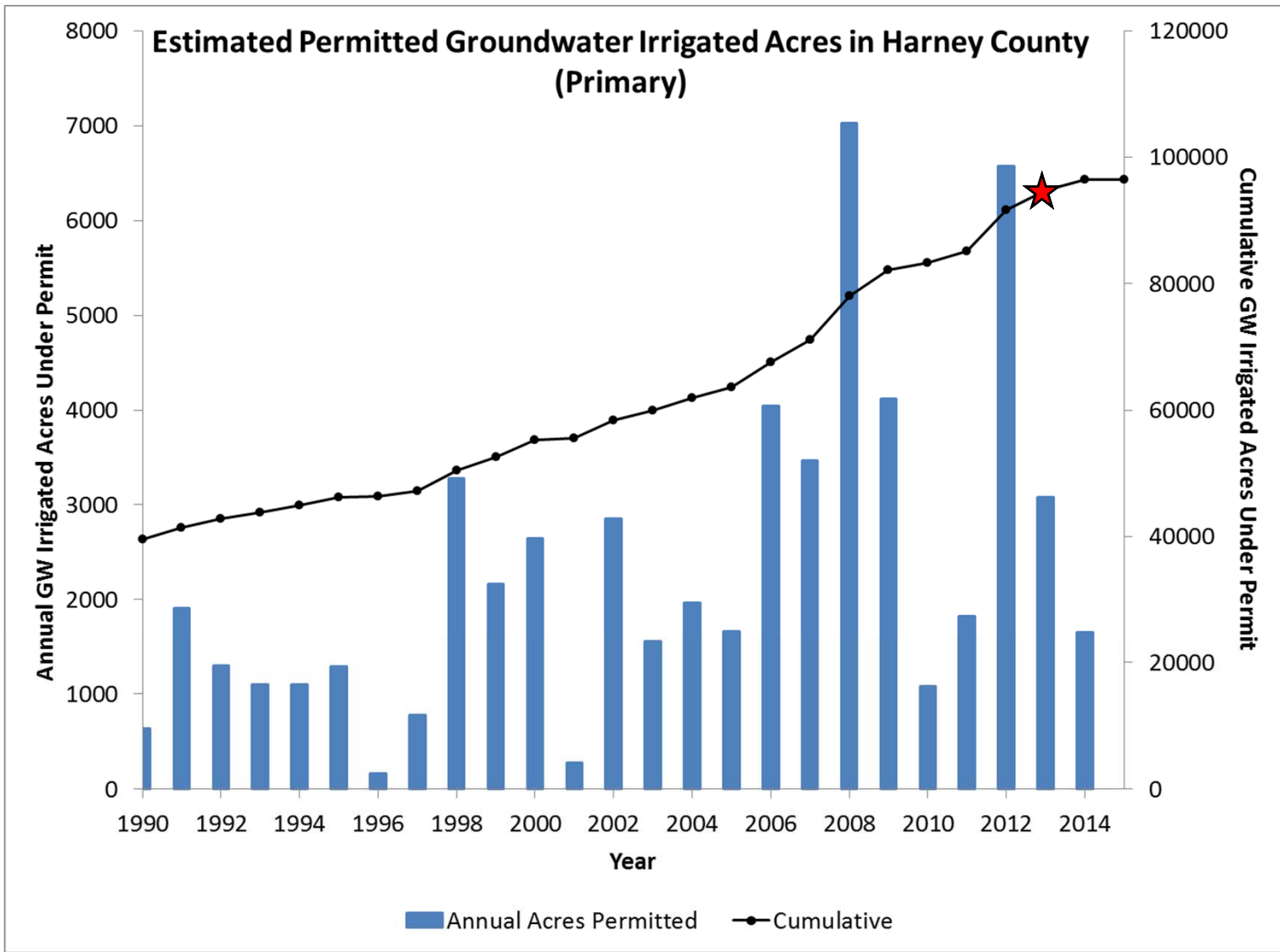
Observation Well Data



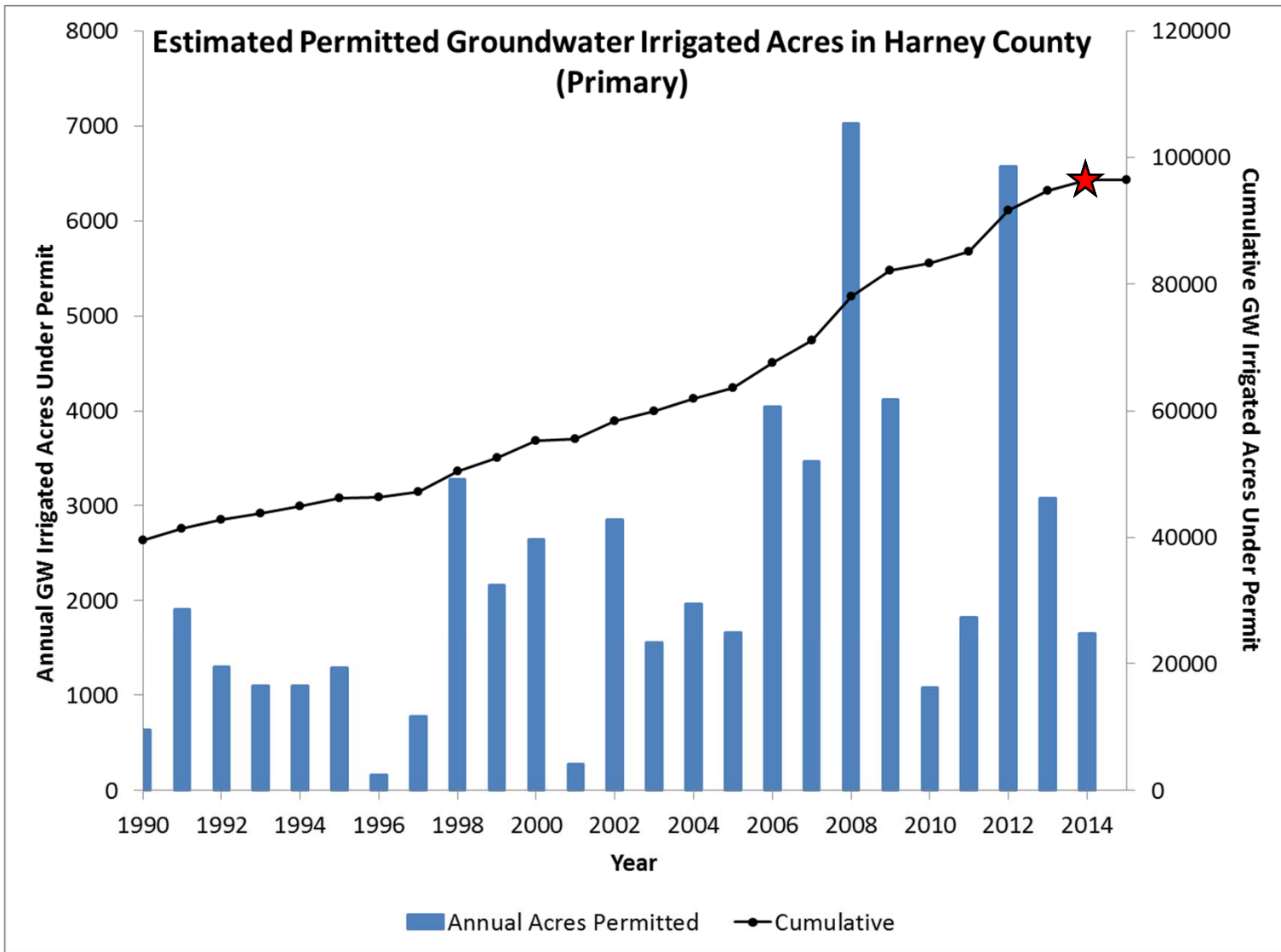
Weaver Springs area wells



2012

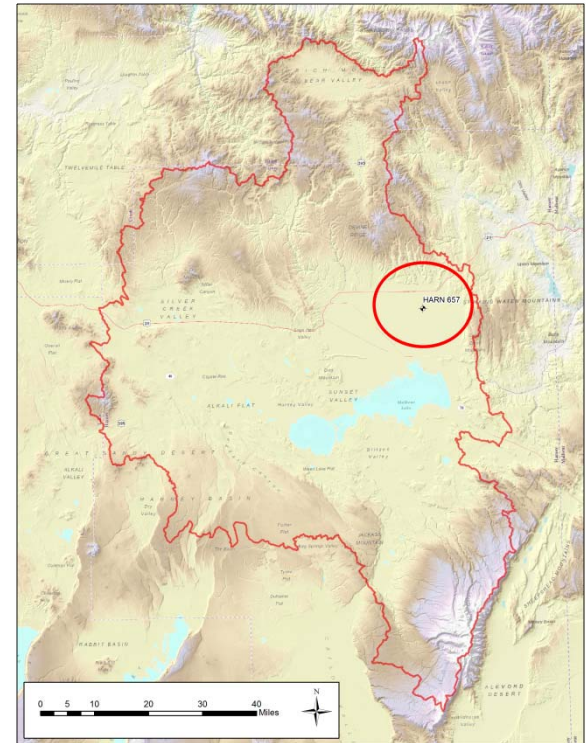
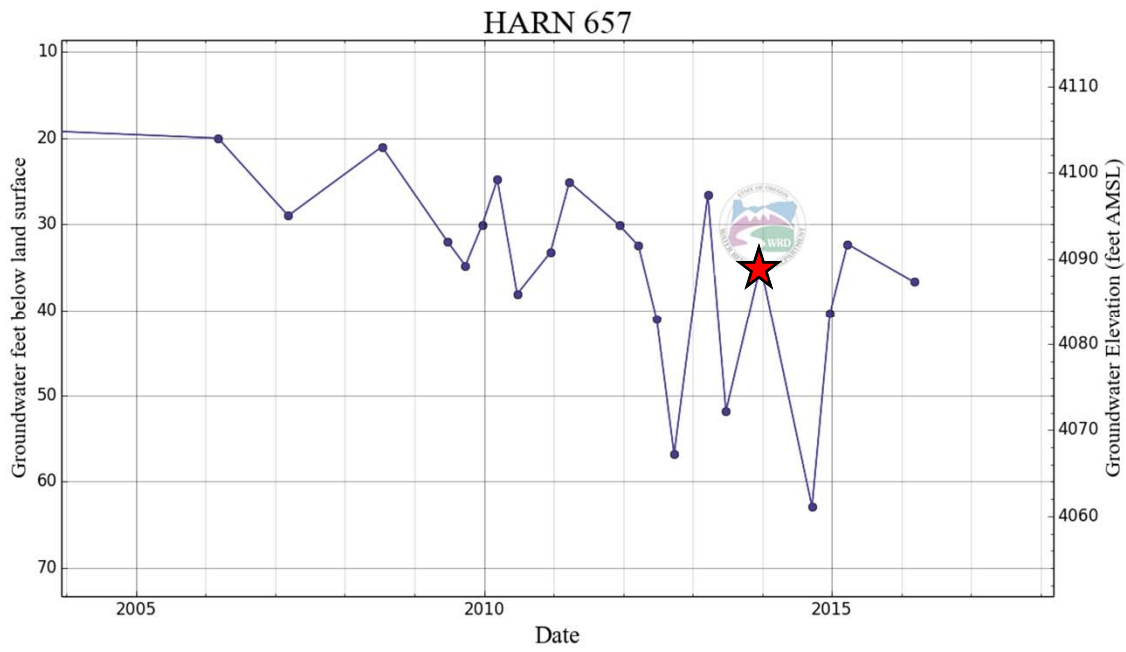


★ 2013: • First “propose to deny” due to capacity/injury (Buchanan area – 10 cfs).

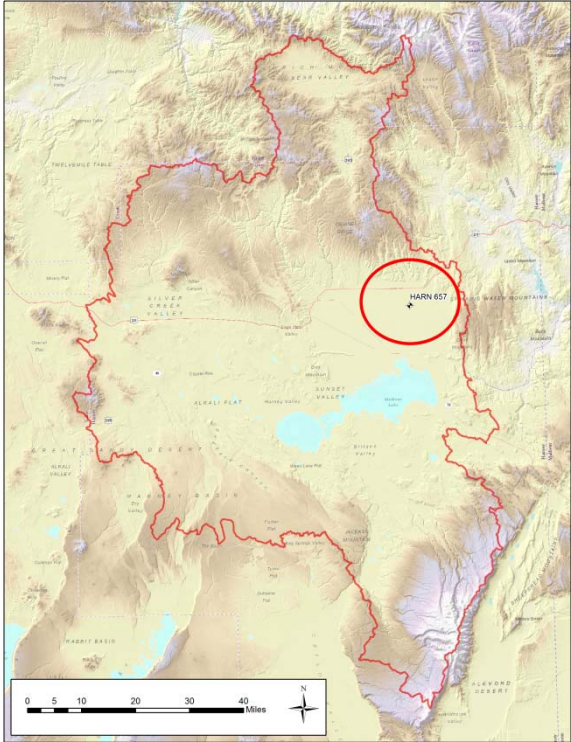
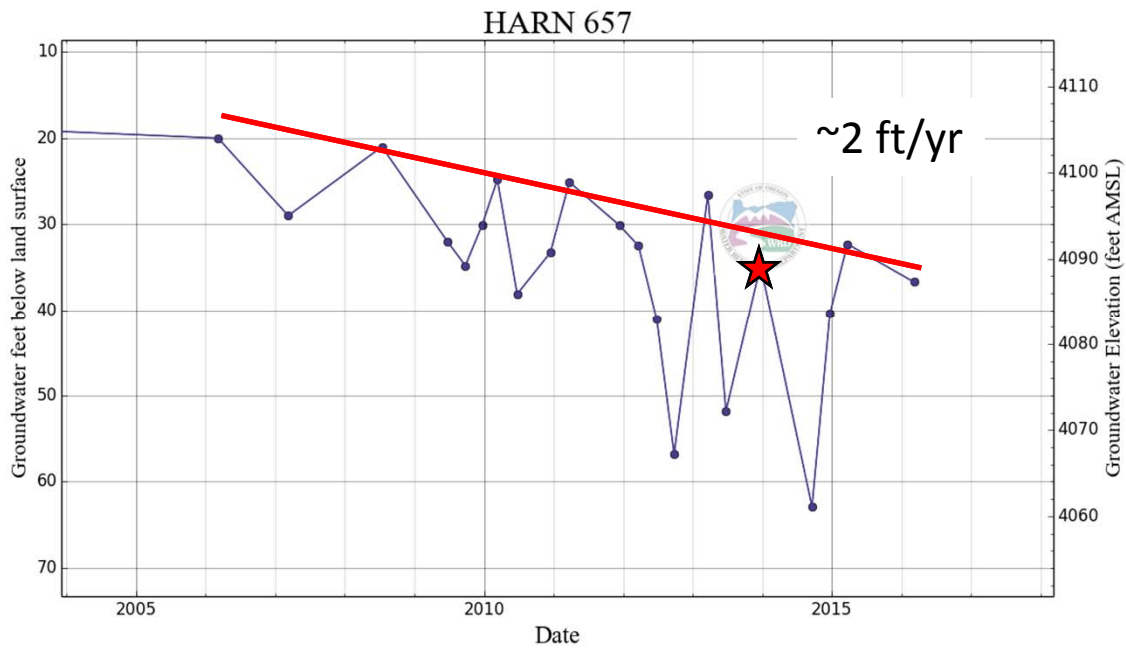


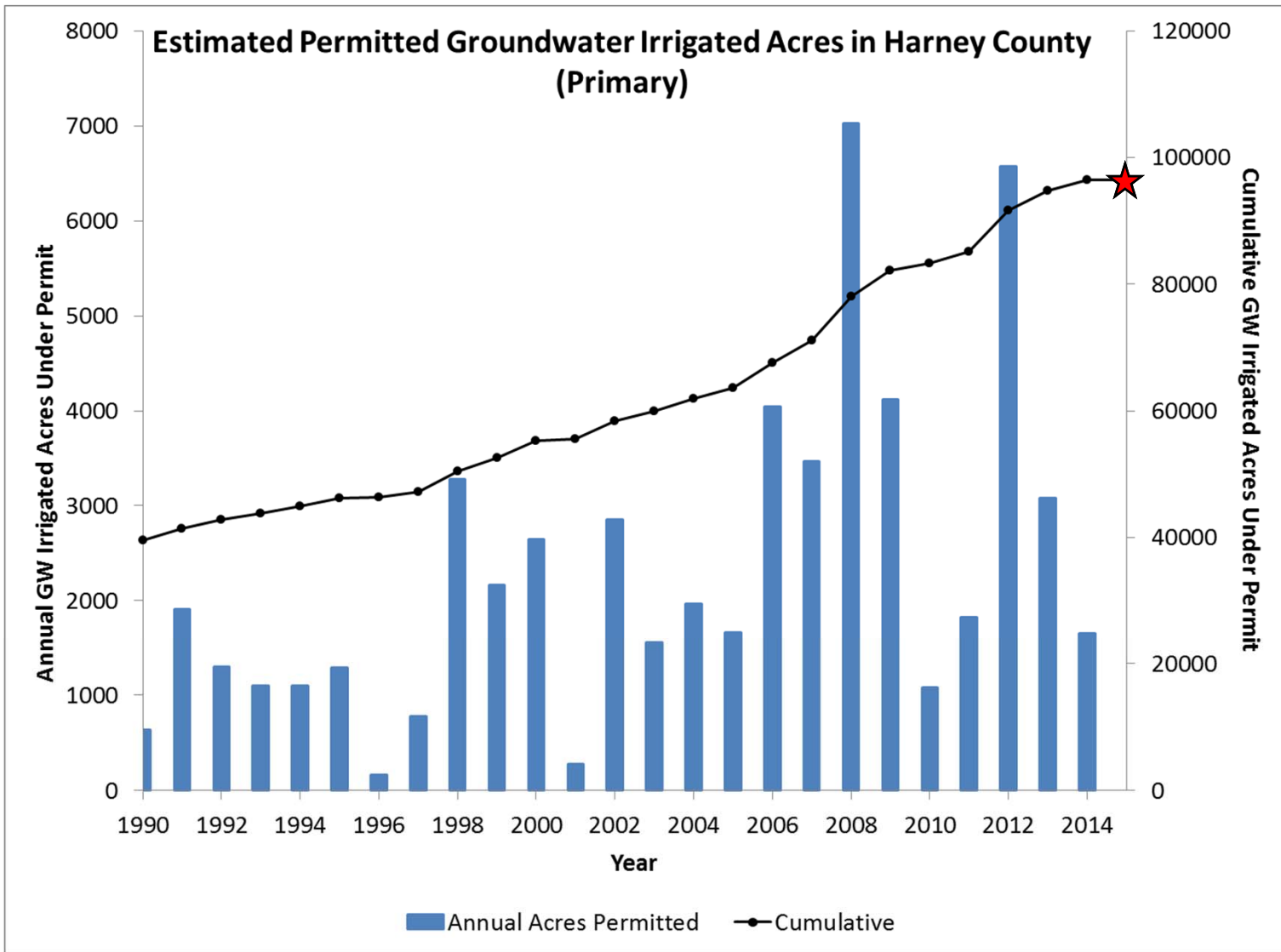
- ★ 2014:
- First “propose to deny” due to capacity/injury (Silver Creek – 64.7 cfs).
 - First “propose to deny” due to capacity/injury (Weaver Springs – 4.62 cfs).
 - Declines noted at SOW 1360 (Newton Rd. & Palomino Ln. area).
 - Expansion of OWRD monitoring across the basin.

2014



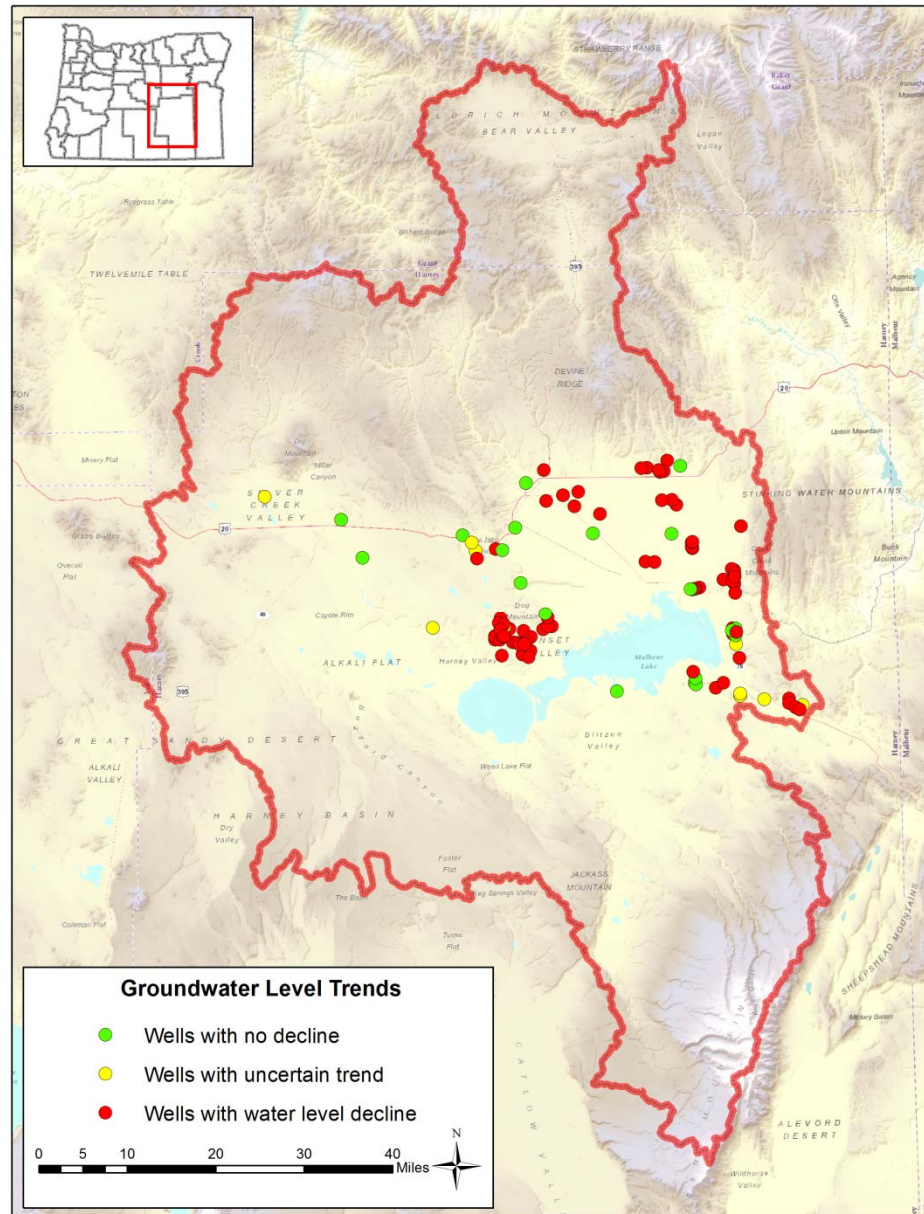
2014



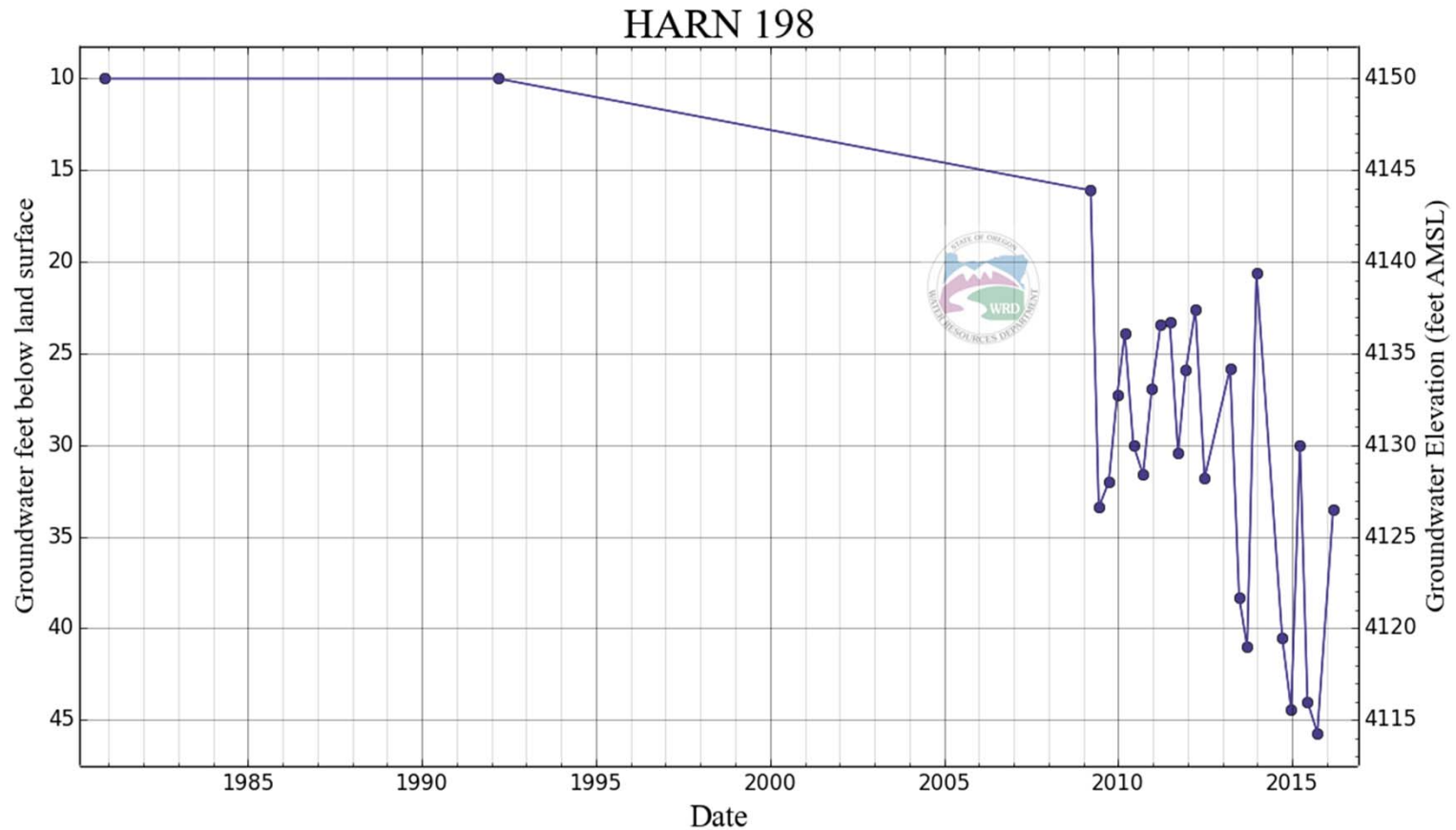


- ★ 2015:
- Additional water level data analysis points to widespread declines.
 - Analysis of recharge vs use points to basin-wide over appropriation.
 - First “GHVGAC” type “propose to deny” based on limited resource capacity.

Basin-wide water level trend analysis: 2015

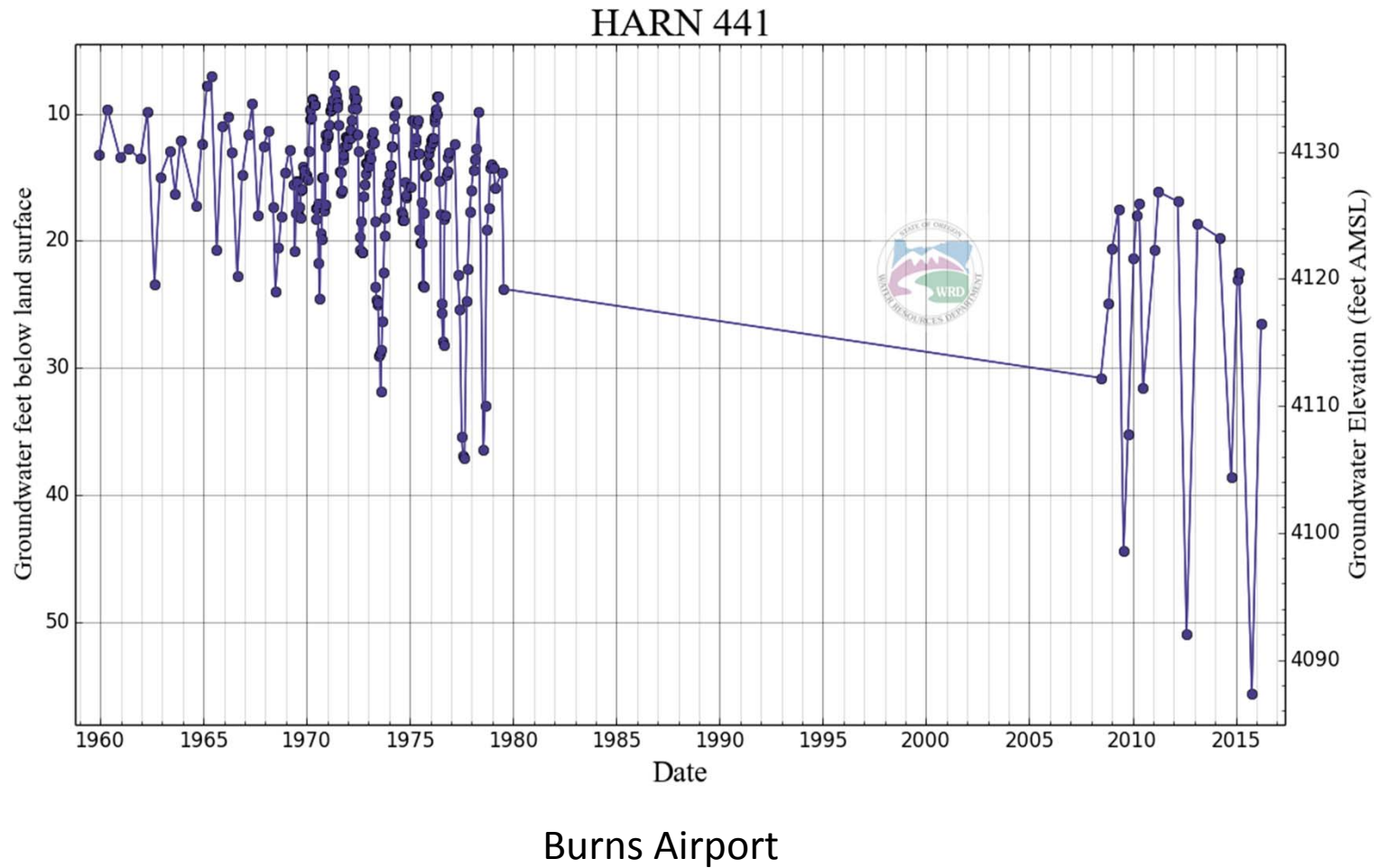


Basin-wide water level trend analysis: 2015

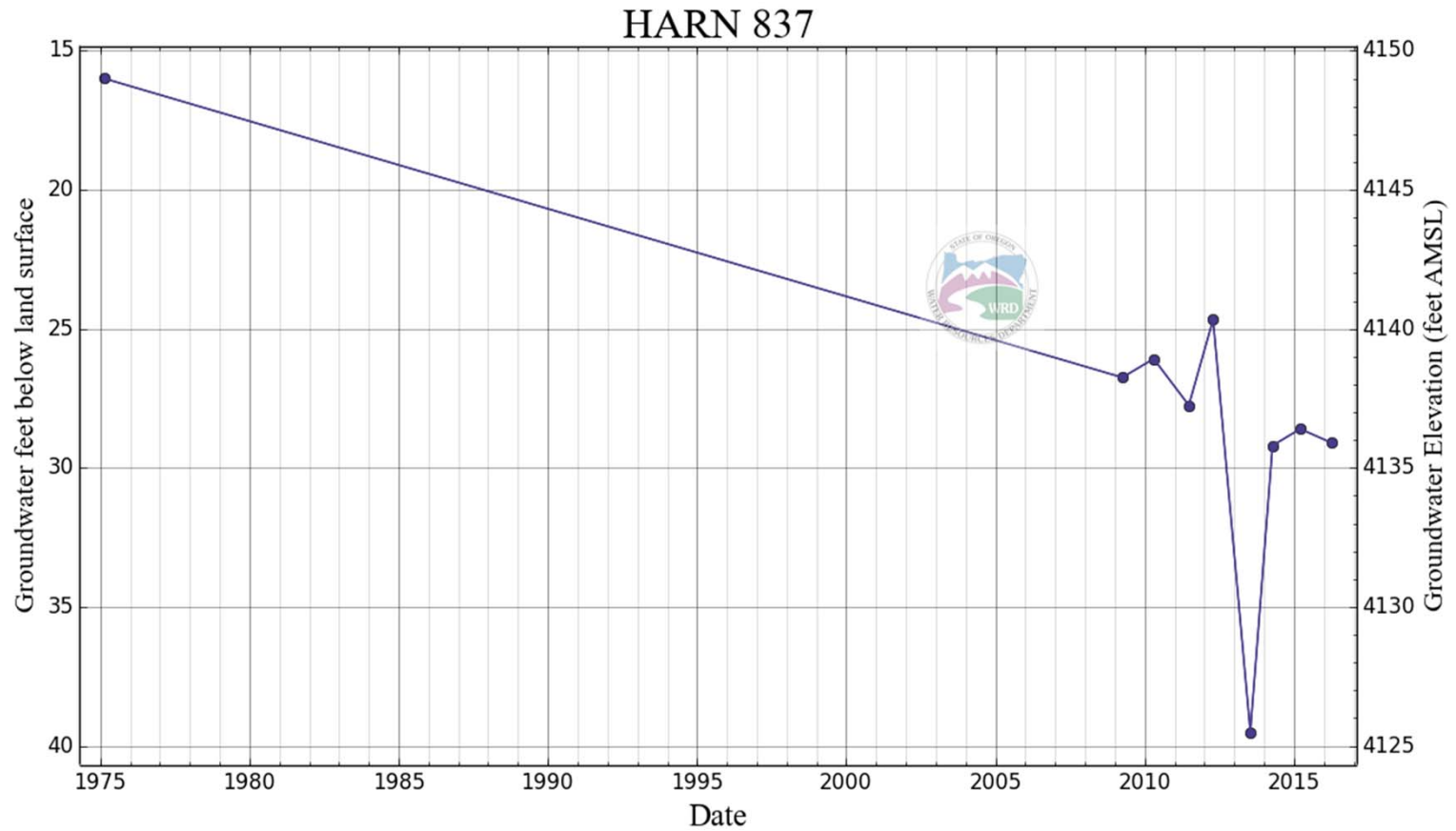


5.5 miles west of Buchanan; north of Hwy 20

Basin-wide water level trend analysis: 2015

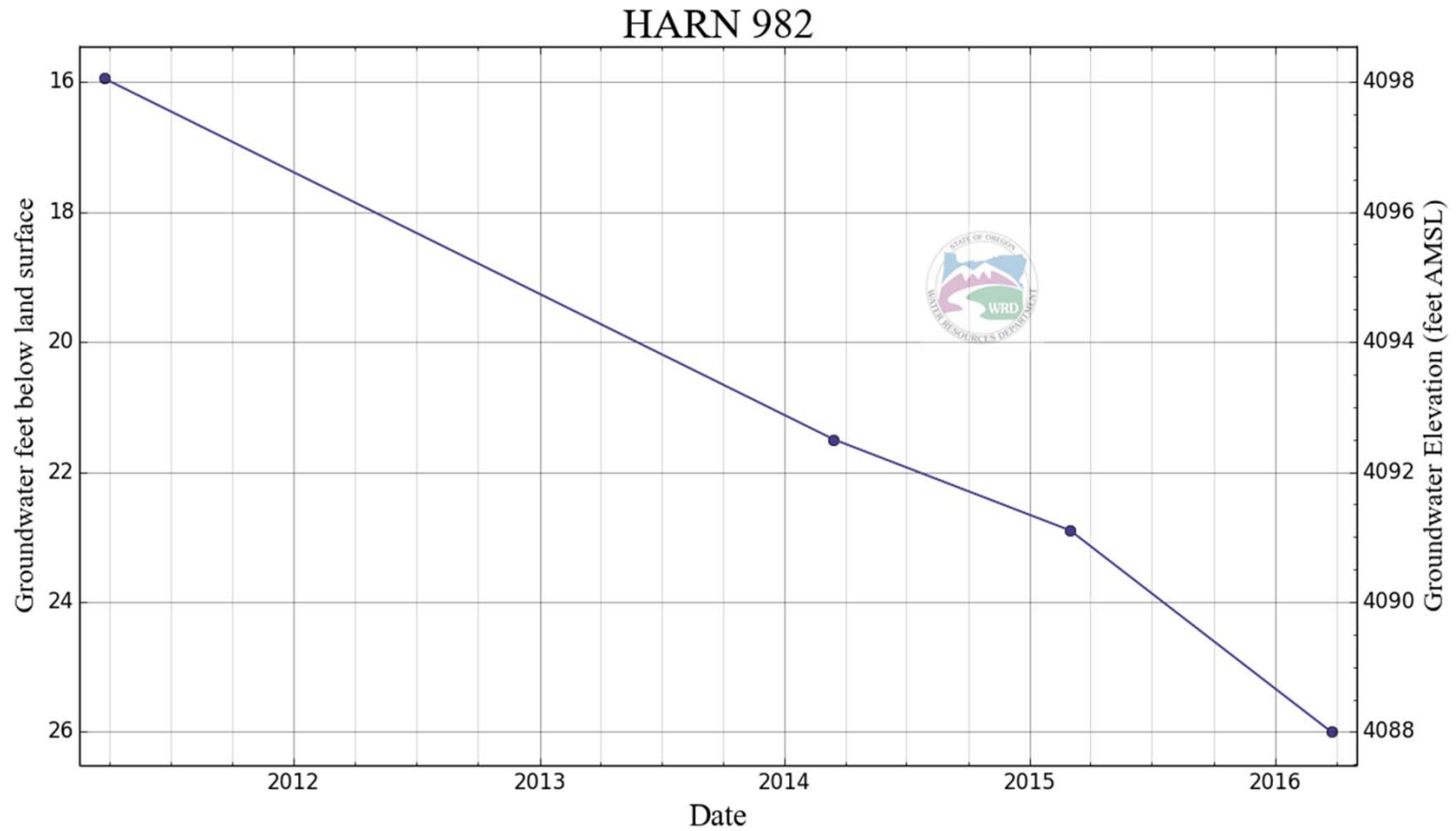


Basin-wide water level trend analysis: 2015



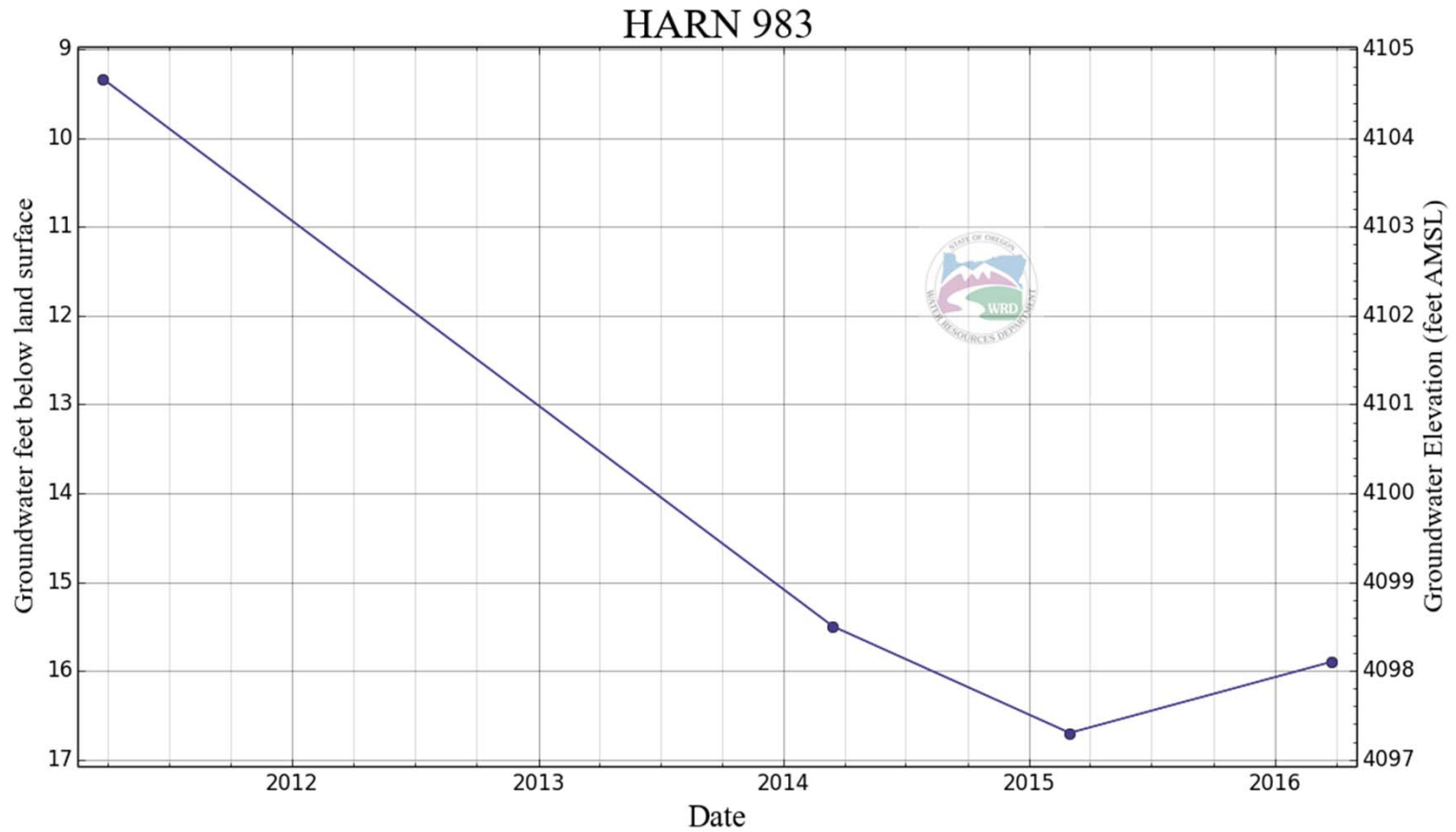
Sage Hen Valley

Basin-wide water level trend analysis: 2015



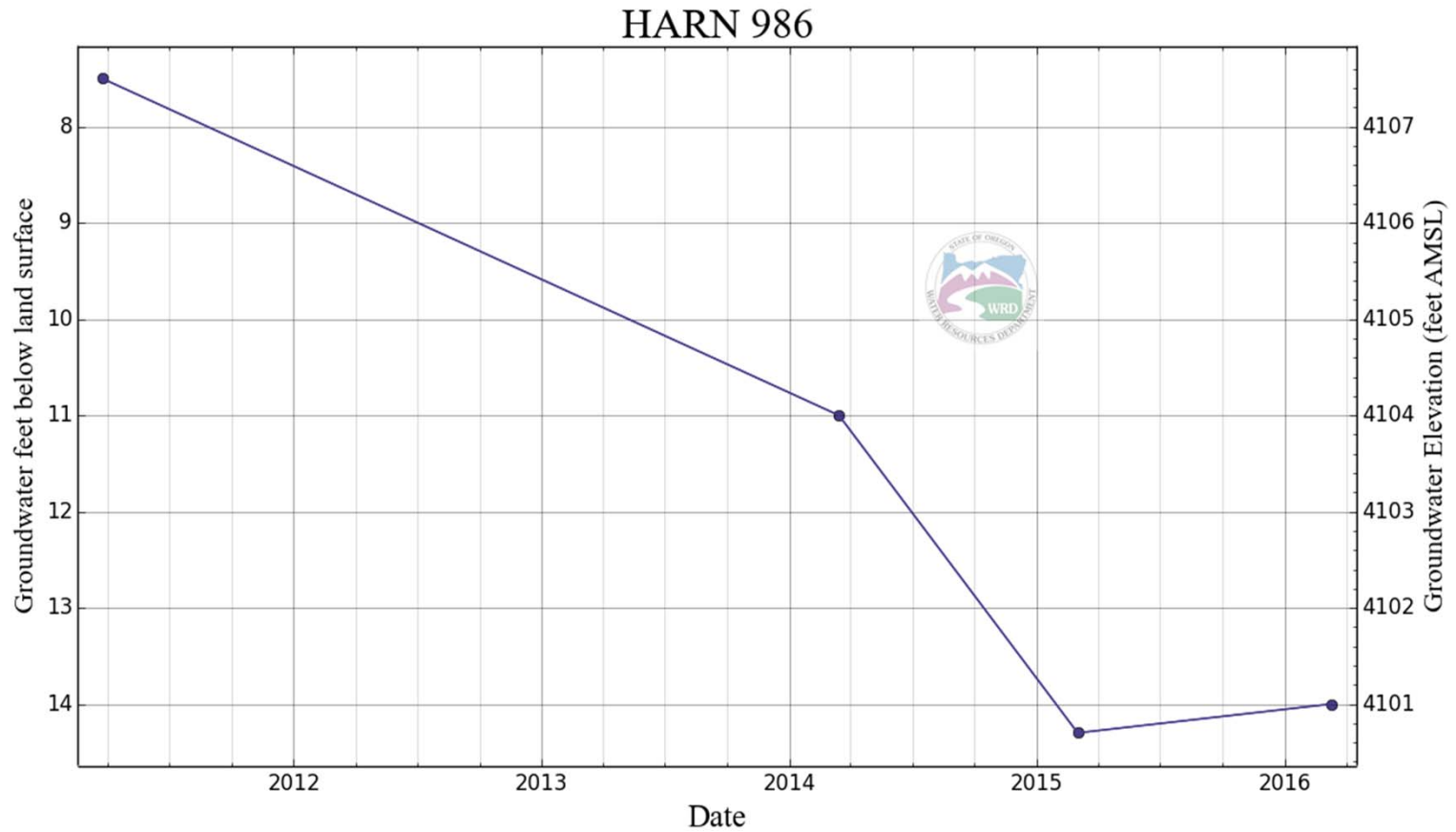
Central Valley area

Basin-wide water level trend analysis: 2015



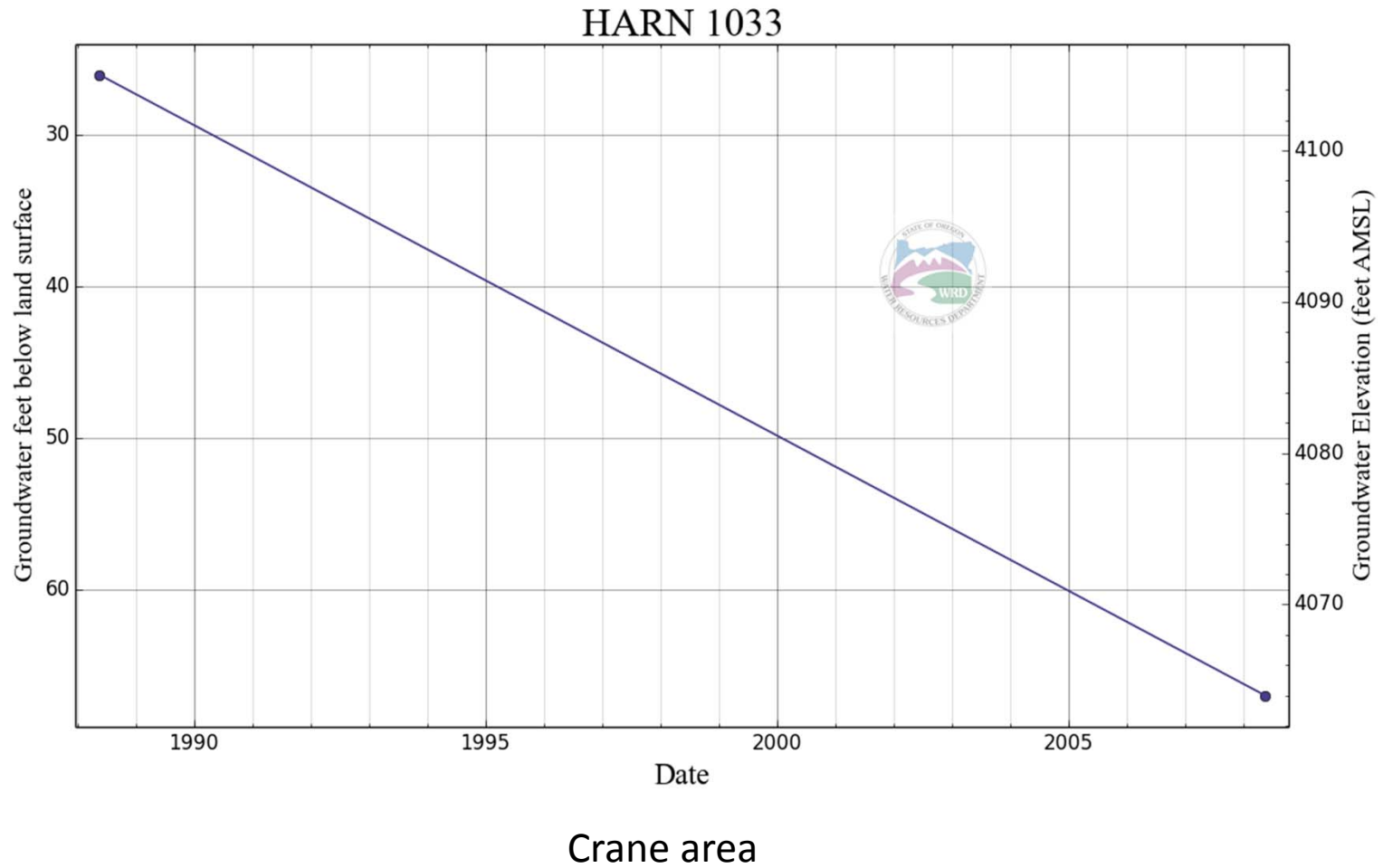
Central Valley area

Basin-wide water level trend analysis: 2015

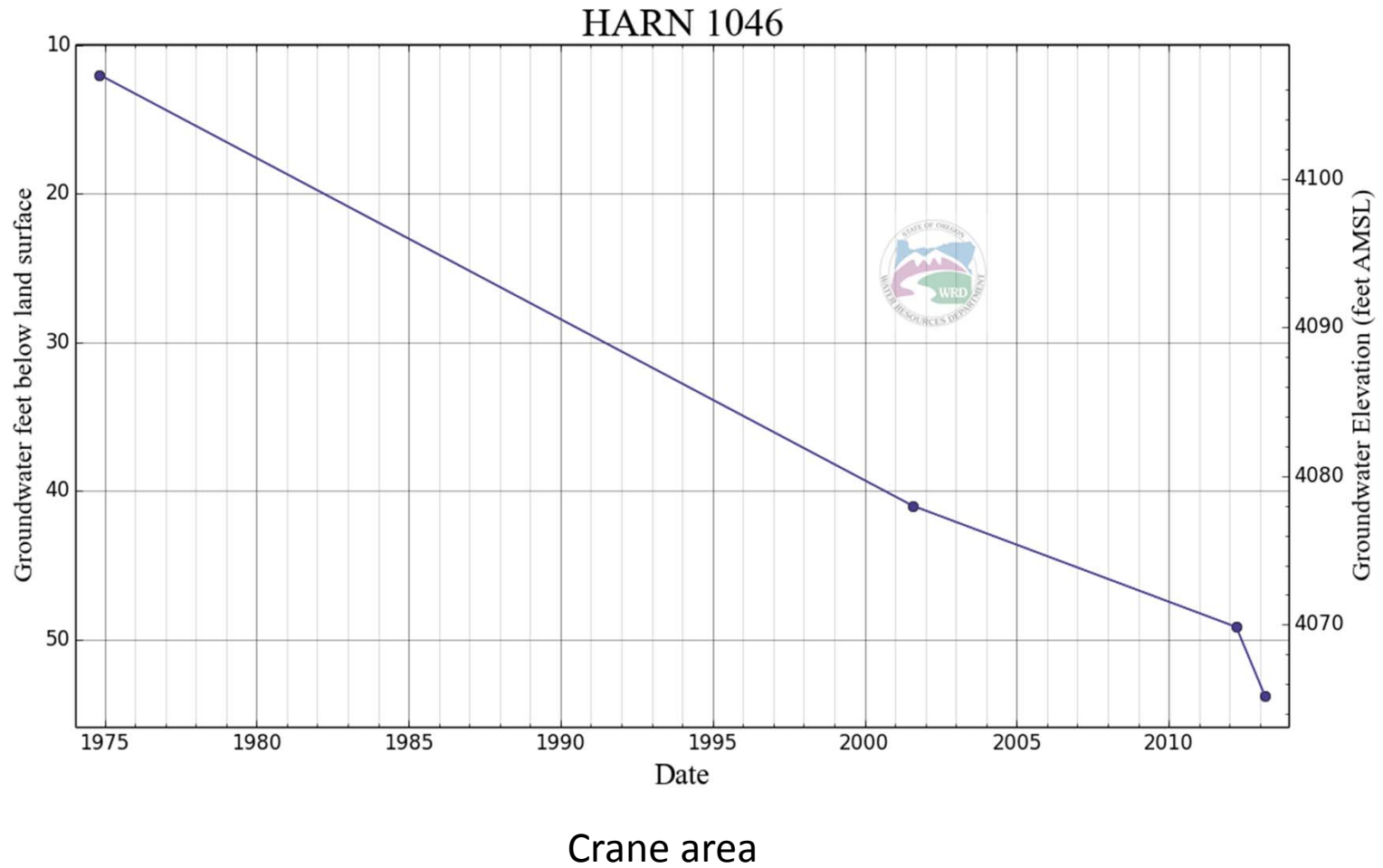


Central Valley area

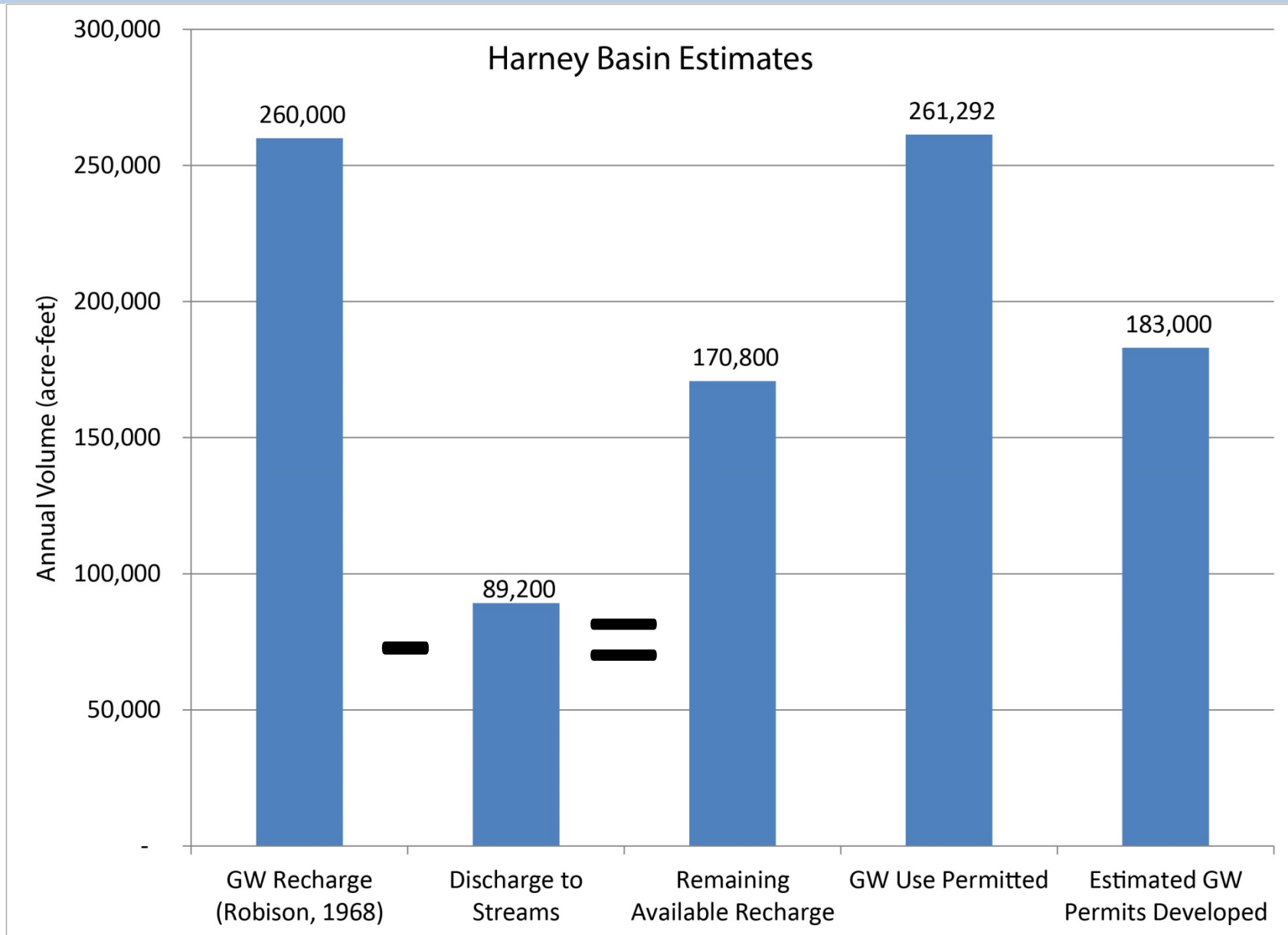
Basin-wide water level trend analysis: 2015



Basin-wide water level trend analysis: 2015



Aquifer Recharge Compared to Groundwater Permits



Purpose and Scope of the Groundwater Study

Need for the groundwater study

- Available data indicates aquifer recharge is insufficient to balance current use.
- Water level declines already observed over much of the basin.
- ~30% of existing allocations are not yet developed. Development of these acres will exacerbate the declines.

- **Protection of long-term resource sustainability**
- **Protection of senior surface water and groundwater rights**

Purpose & Scope of the Groundwater Study

Cooperators

- Oregon Water Resources Department (OWRD)
- United States Geological Survey (USGS)
- Oregon Department of Geology and Mineral Industries (DOGAMI)
- Local involvement through the Groundwater Study Advisory Committee

Study objectives

- Develop a commonly accepted and accurate understanding of the hydrologic system in the Harney Basin.
- Development of a strategy for water-resources management in the Harney Basin.

Purpose & Scope of the Groundwater Study

Primary Questions

1. What is the effect of historical and current groundwater use on groundwater and surface water supplies?
2. What will be the effects of additional groundwater use on groundwater and surface water supplies?
3. How can existing groundwater use be managed to best meet demand while avoiding or minimizing undesired impacts?
4. What are the effects of climate on the groundwater system?
5. What is the water budget of the Harney basin?

Purpose & Scope of the Groundwater Study

Technical objectives

- Gather existing data and water-resource information, assess the data accuracy and reliability, and enter data into appropriate project databases.
- Collect new data required to define the hydrogeologic system.
- Develop a detailed water budget of the study area.
- Develop an improved conceptual model of the Harney Basin groundwater-flow system.

Purpose & Scope of the Groundwater Study

Geologic Framework

- Delineate stratigraphy of geologic units
- Construct regional lithofacies maps
- Determine location and offset of major structures
- Assess effects of faults and other structures on groundwater movement
- Assess change in permeability with depth due to secondary mineralization
- Assess the relation between the thermal and non-thermal groundwater systems
- Analyze drill cuttings from water wells and OWRD test holes
- Geophysical logging of selected wells
- Construct regional cross sections
- Compile regional geologic map and develop consistent stratigraphic nomenclature
- Define and map regionally significant hydrogeologic units

Purpose & Scope of the Groundwater Study

Hydrologic data collection and flow-system evaluation

- Field inventory existing wells
- Compilation of existing water level
- Collection of new water level data
- Conduct new aquifer tests
- Evaluate and interpret water level data
 - Determine GW flow direction
 - Determine GW response to stresses
- Evaluate geochemistry data
 - Age dating
 - Chemical tracers
- Evaluate possible GW subbasins
- Estimate aquifer properties

Purpose & Scope of the Groundwater Study

Hydrologic budget

- Estimate GW discharge to wells
- Estimate GW discharge to streams
- Estimate GW discharge to springs, lakes, wetlands
- Estimate recharge
 - From precipitation
 - From irrigation return flow
 - From surface water
- Evaluate possible interbasin flow

Purpose & Scope of the Groundwater Study

Study Outcomes

- A peer reviewed technical report that will include:
 - A quantitative conceptual understanding of the groundwater flow system
 - A water-budget model for the basin
 - An extensive database of hydrogeologic information

Development of the observation well network

- Five types of observations wells:
 - State Observation wells
 - Quarterly observation wells
 - Synoptic observation wells
 - Recorder wells
 - OWRD dedicated observation well pairs
- General selection criteria (for all types):
 - Geographic distribution
 - Vertical distribution
 - Accessibility



State Observation Wells

- State Observation Wells:
 - Measured quarterly by field staff
 - Domestic, livestock, irrigation, unused wells.
 - Selection criteria:
 1. Located where water level data is needed
 2. Well construction/completion is known
 3. Accessible long term



Quarterly Wells

- Quarterly observation wells:

- January, April, July, October
- Domestic, livestock, unused wells.
- Selection criteria:
 1. Located where water level data is needed
 2. Well construction/completion is known
 3. Historical record
 4. Generally not pumping
 5. Accessible



Synoptic Wells

- Synoptic observation wells:
 - Twice per year – before and after irrigation season
 - Includes all quarterly obs. wells, SOW's, plus additional permitted irrigation wells and other misc. wells.
- Selection criteria:
 1. Located where water level data is needed
 2. Well construction/completion is known
 3. Historical record
 4. Accessible



Recorder Wells

- Recorder wells:
 - Continuous data collection (every 1-2 hours)
 - Selection criteria:
 1. Located where water level data is needed
 2. Well construction/completion is known
 3. Unused well with no pump
 4. Accessible



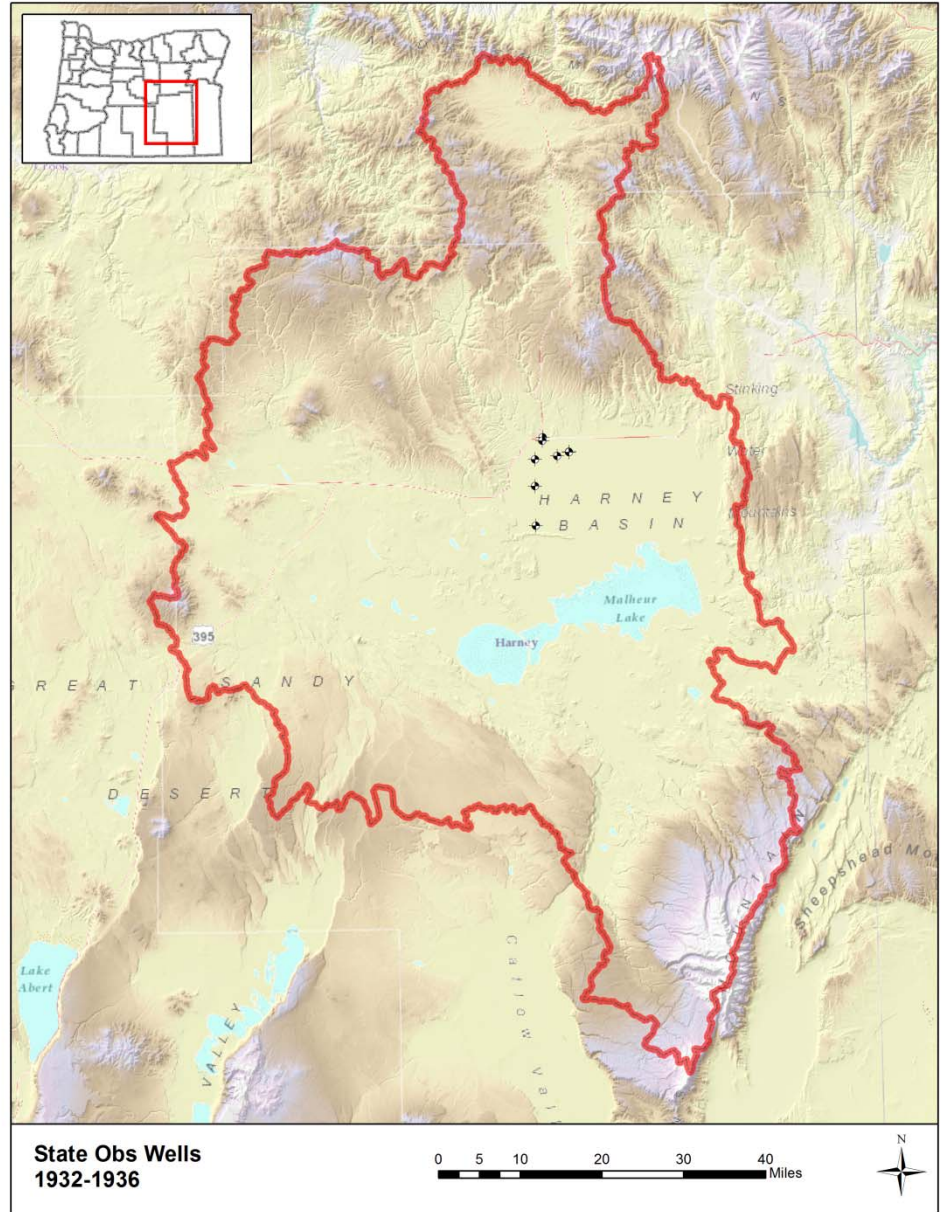
Dedicated Observation Well Pairs

- OWRD dedicated observation well pairs:
 - Continuous data collection (every 1-2 hours)
 - Shallow/Deep pairs drilled by OWRD contractors
 - Selection criteria:
 1. Located where water level data is needed
 2. Located where stratigraphic data is needed
 3. Located in areas of particular interest
 4. Accessible long term



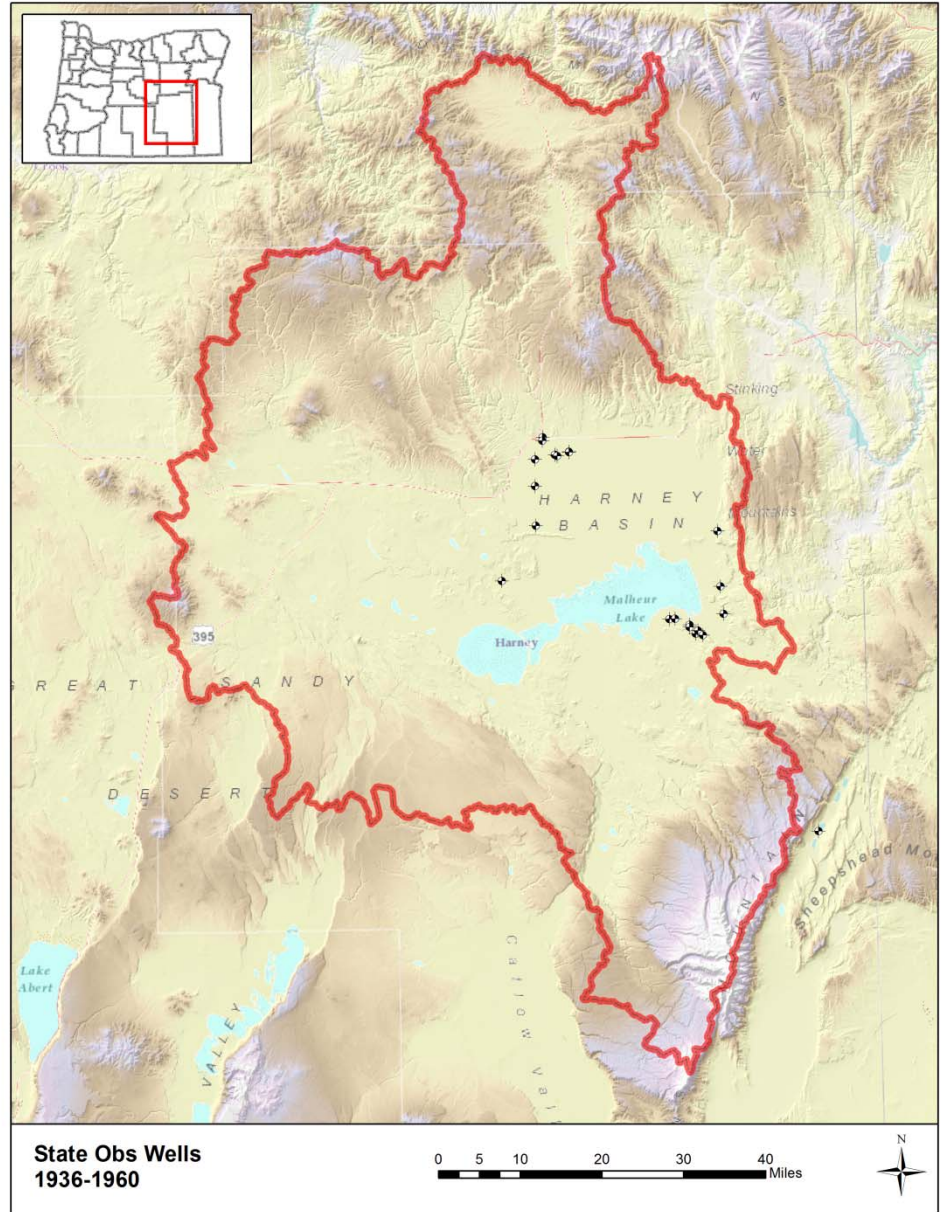
State Observation Wells: 1932-1936

- 1932-1936: 9 State Obs Wells



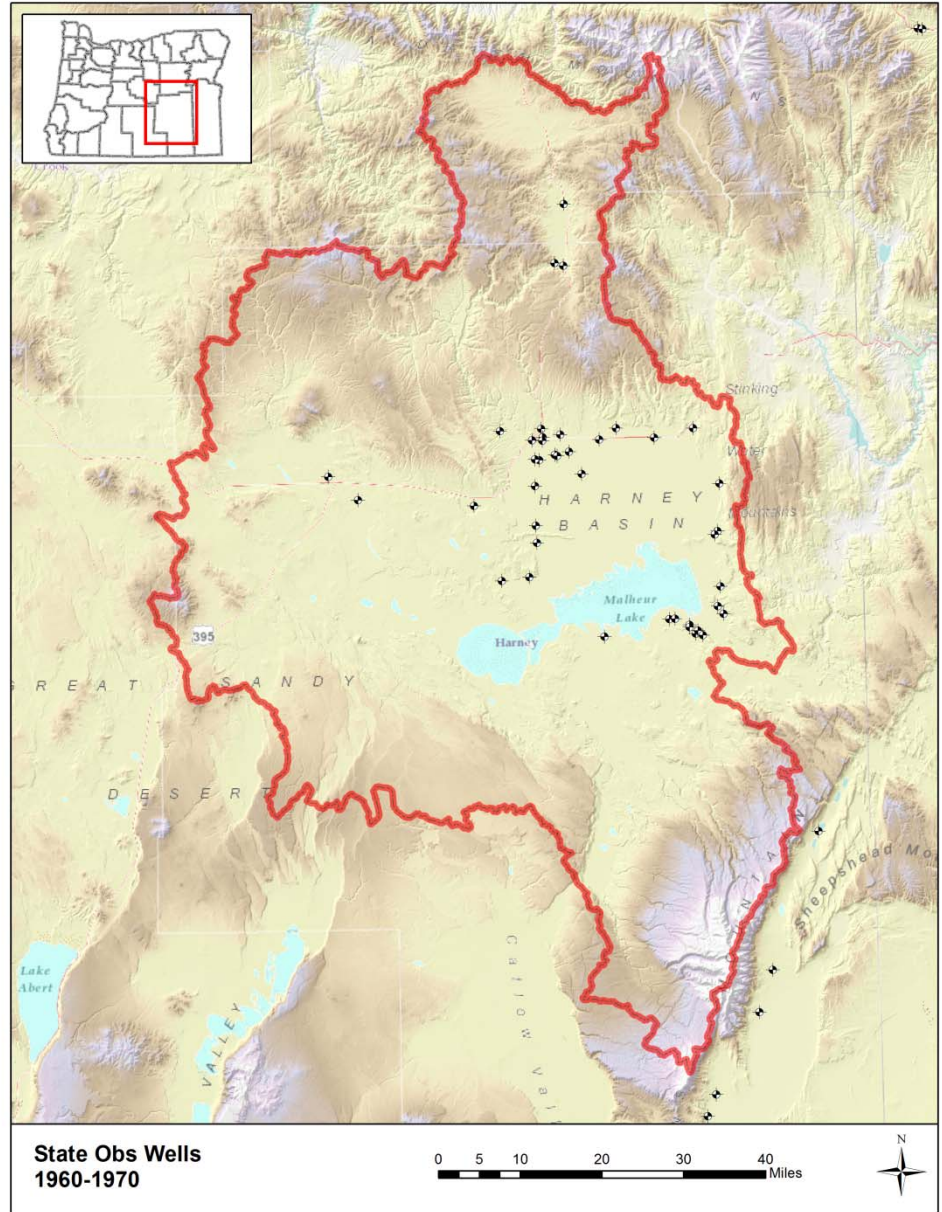
State Observation Wells: 1936-1960

- 1932-1936: 9 State Obs Wells
- 1936-1960: 23 State Obs Wells



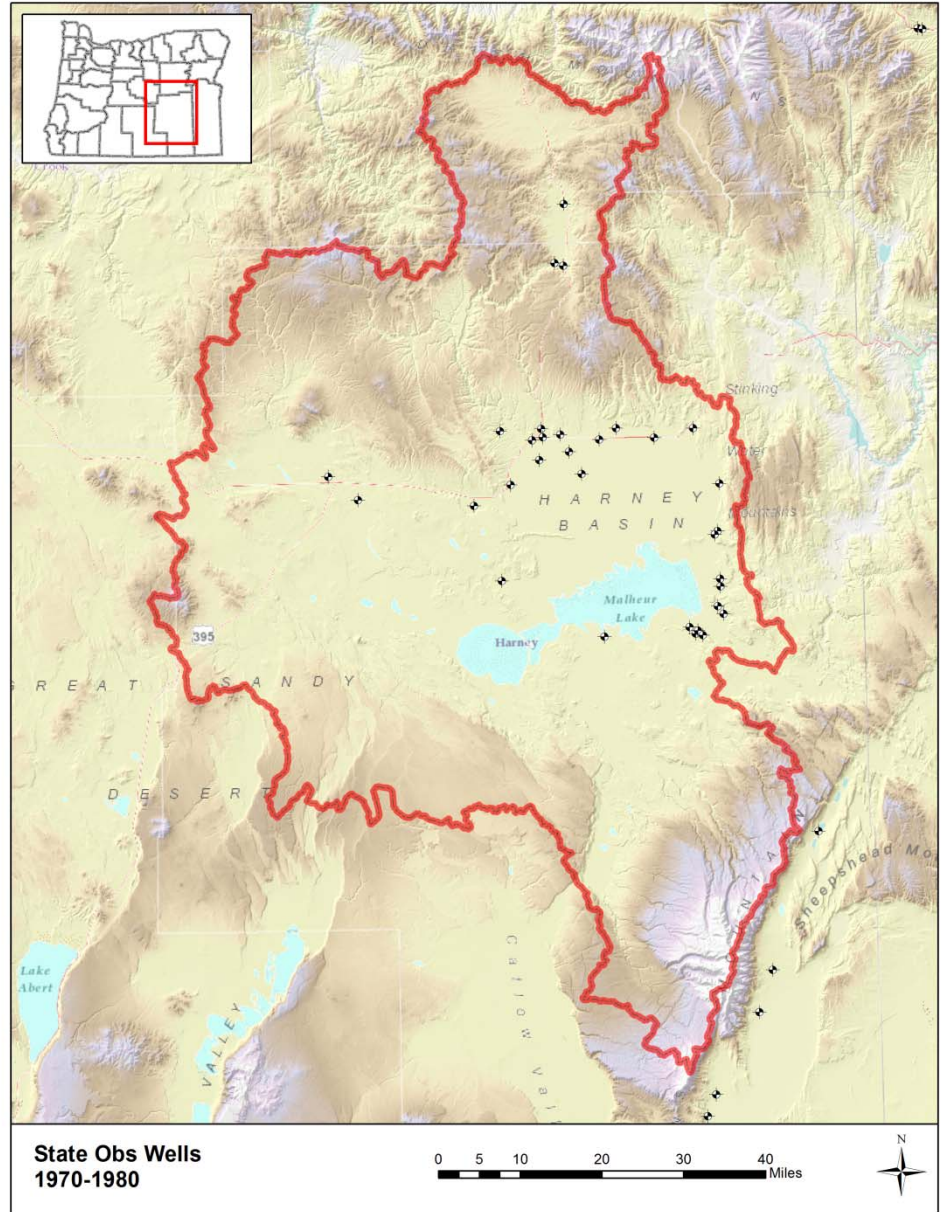
State Observation Wells: 1960-1970

- 1932-1936: 9 State Obs Wells
- 1936-1960: 24 State Obs Wells
- 1960-1970: 53 State Obs Wells



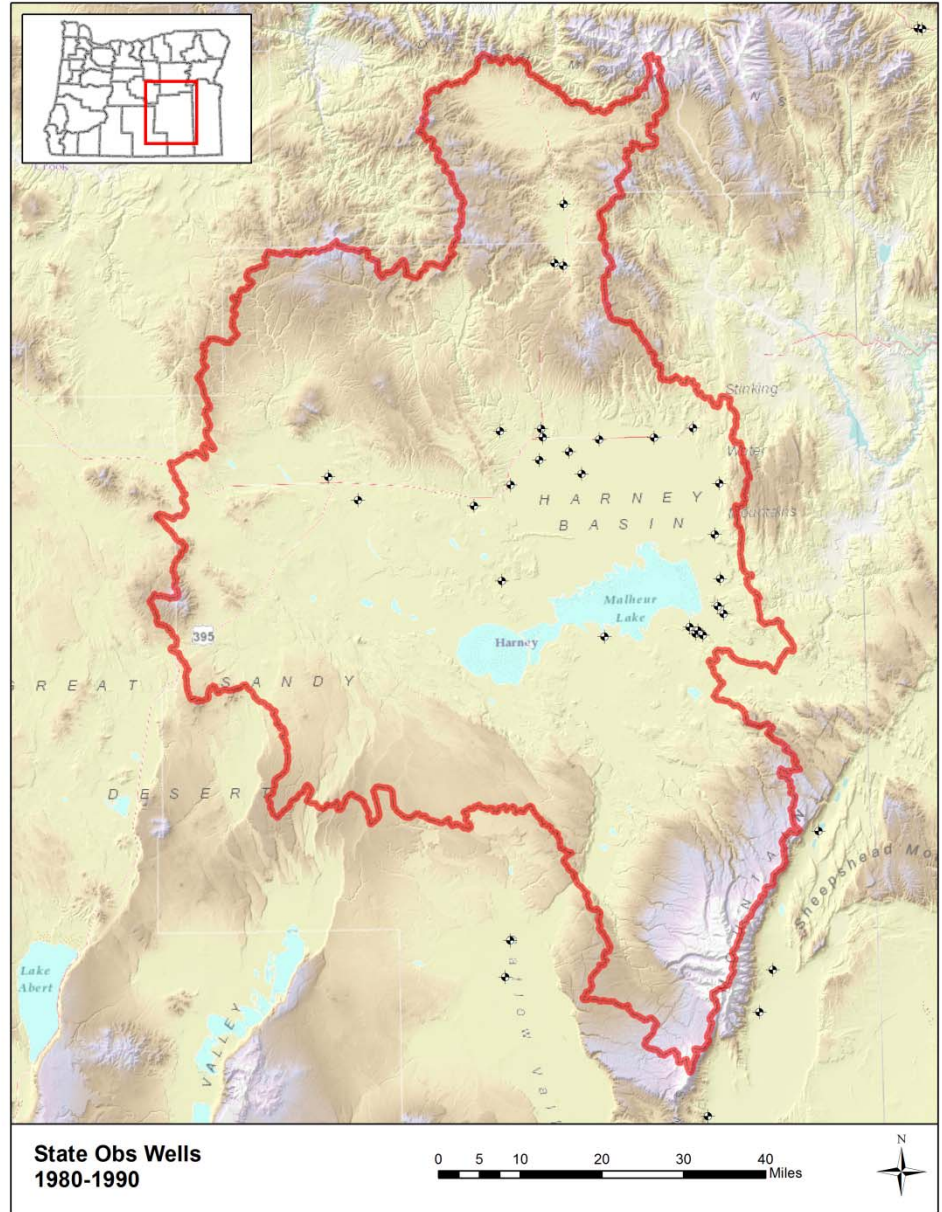
State Observation Wells: 1970-1980

- 1932-1936: 9 State Obs Wells
- 1936-1960: 24 State Obs Wells
- 1960-1970: 53 State Obs Wells
- 1970-1980: 43 State Obs Wells



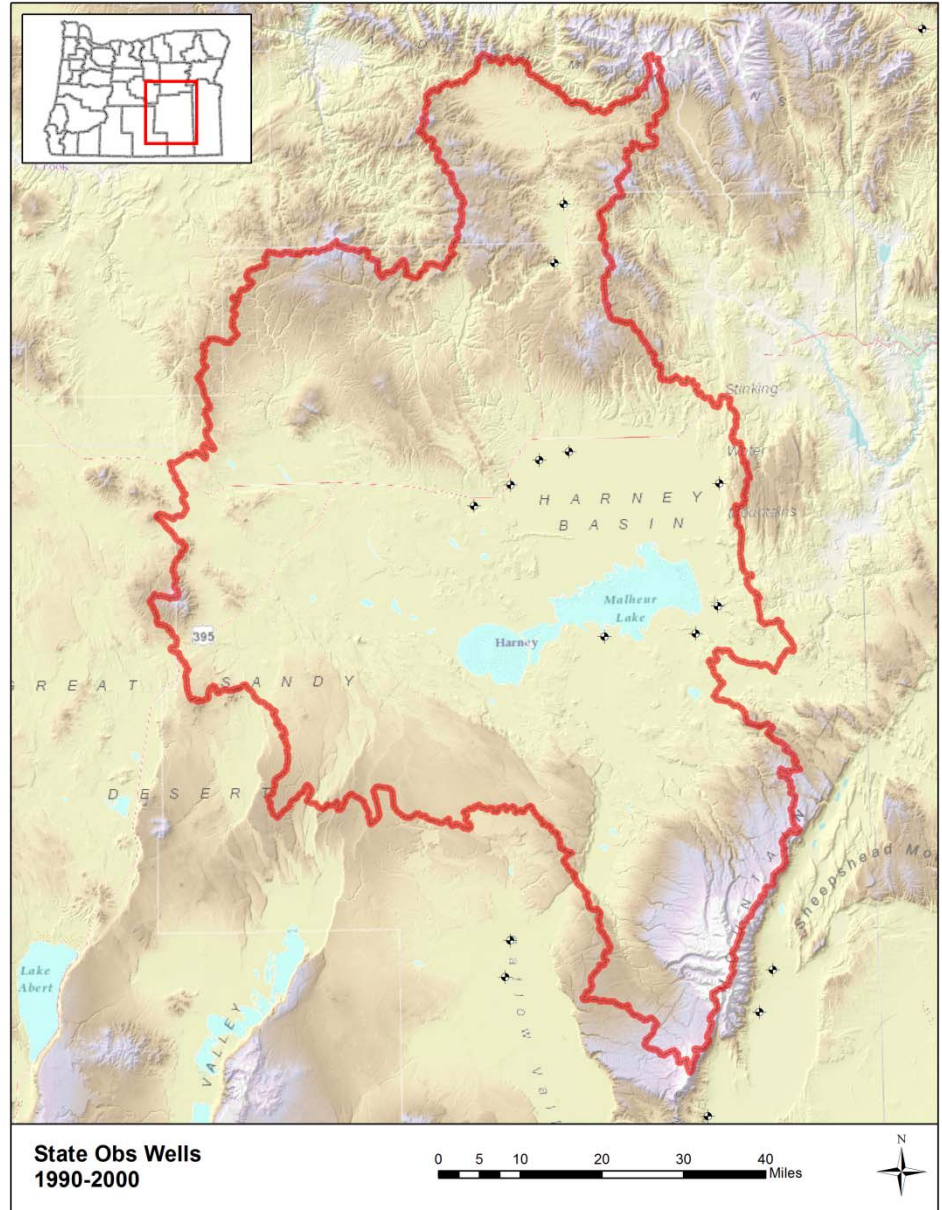
State Observation Wells: 1980-1990

- 1932-1936: 9 State Obs Wells
- 1936-1960: 24 State Obs Wells
- 1960-1970: 53 State Obs Wells
- 1970-1980: 43 State Obs Wells
- 1980-1990: 38 State Obs Wells



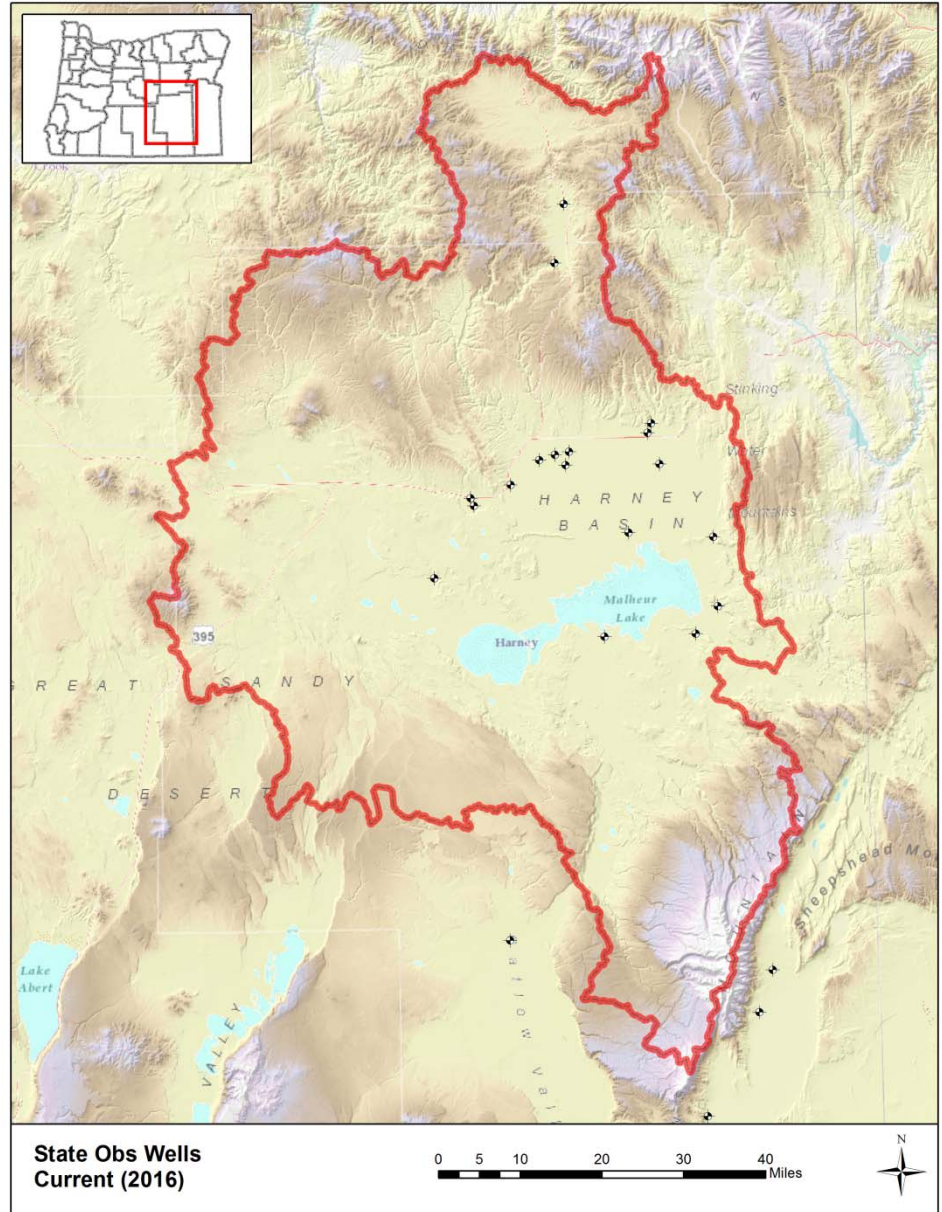
State Observation Wells: 1990-2000

- 1932-1936: 9 State Obs Wells
- 1936-1960: 24 State Obs Wells
- 1960-1970: 53 State Obs Wells
- 1970-1980: 43 State Obs Wells
- 1980-1990: 38 State Obs Wells
- 1990-2000: 16 State Obs Wells
 - 22 SOW's dropped in 1990



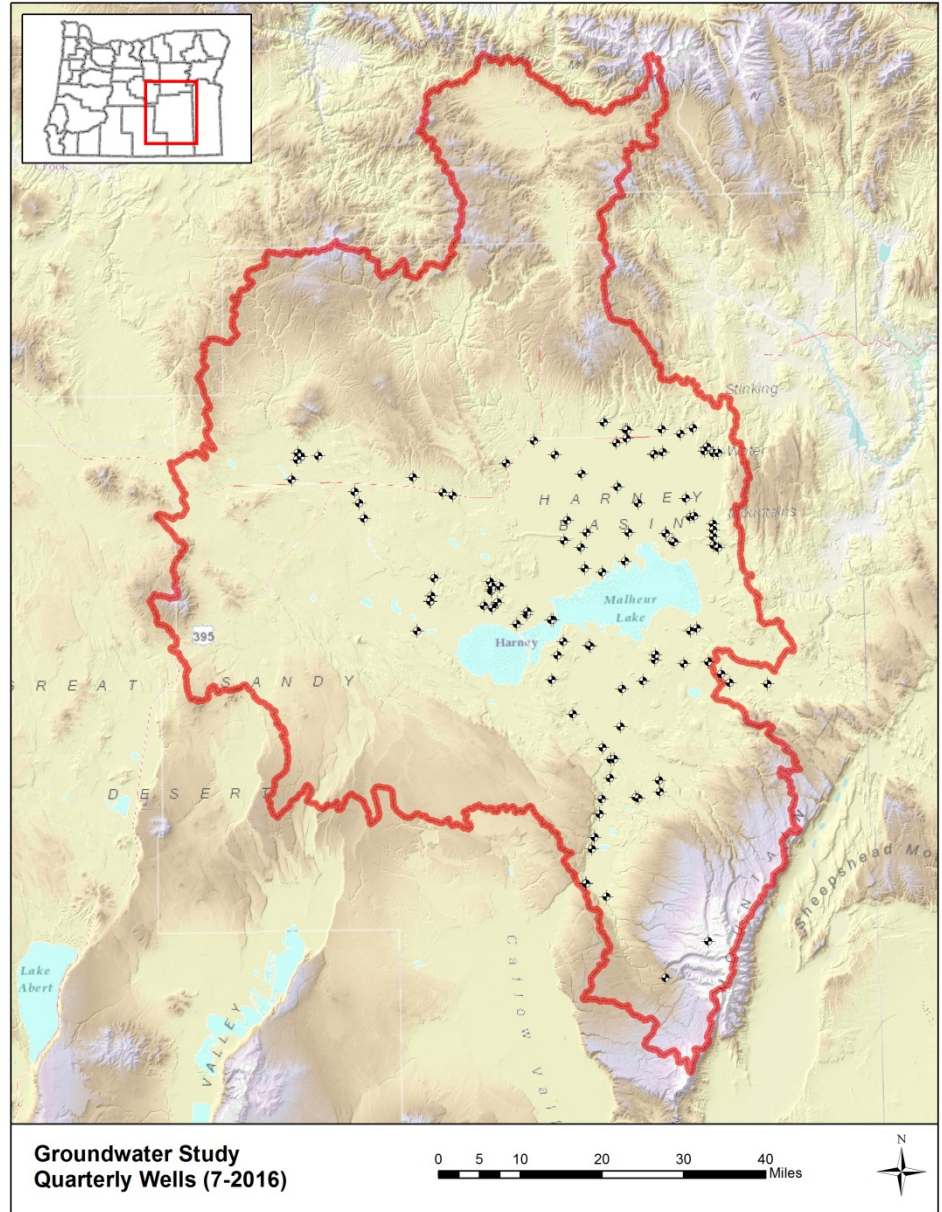
State Observation Wells: 2016

- 1932-1936: 9 State Obs Wells
- 1936-1960: 24 State Obs Wells
- 1960-1970: 53 State Obs Wells
- 1970-1980: 43 State Obs Wells
- 1980-1990: 38 State Obs Wells
- 1990-2000: 16 State Obs Wells
- **Current (2016): 25 State Obs Wells**



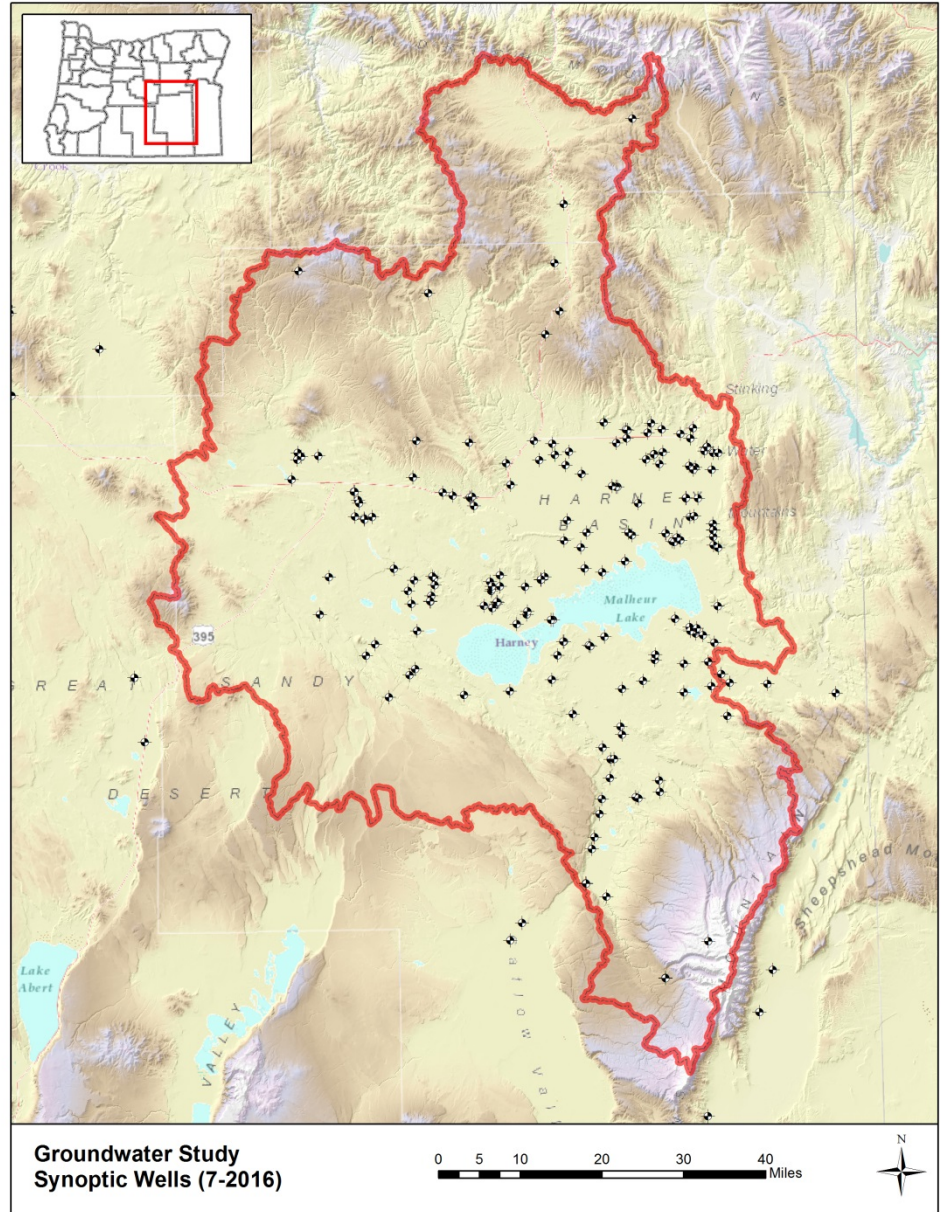
Groundwater Study: Quarterly Wells

- 112 quarterly wells as of July 2016
- Continue to add wells where needed
- Continue to drop wells as redundancies or other issues are identified



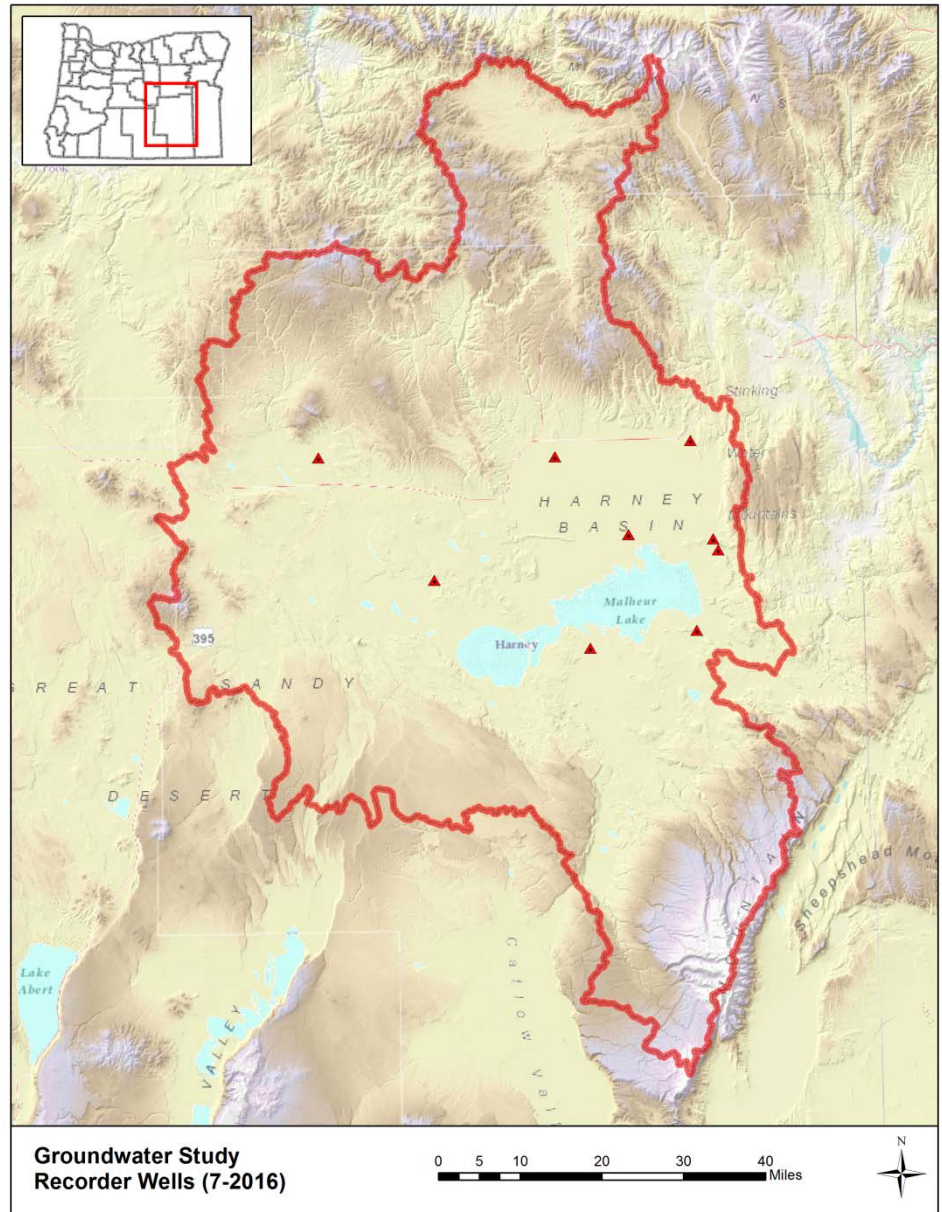
Groundwater Study: Synoptic Wells

- 192 synoptic wells as of July 2016
- Continue to add wells where needed
- Continue to drop wells as redundancies or other issues are identified



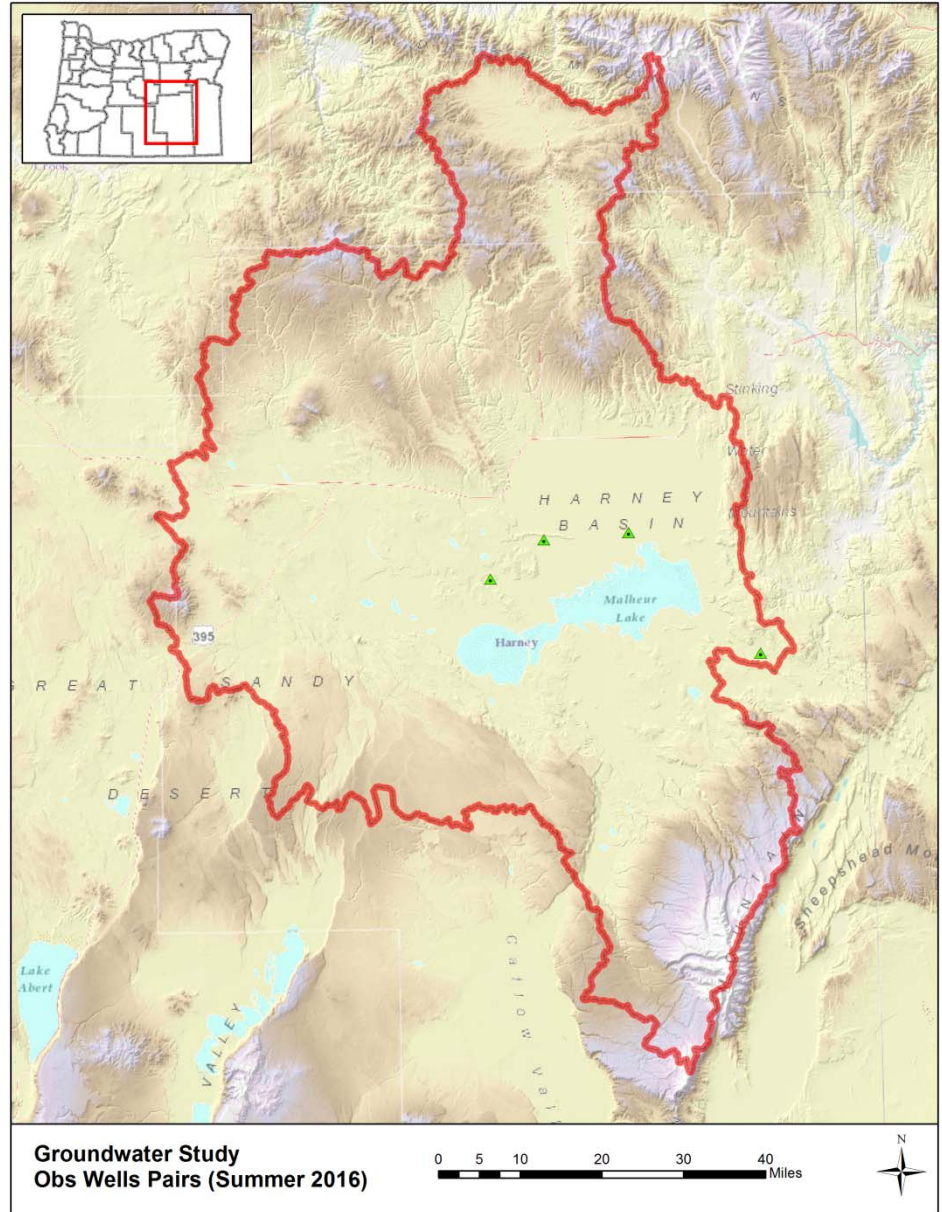
Groundwater Study: Recorder Wells

- **10 recorder wells as of July 2016**
- Continue to add wells where needed
- Continue to drop wells as redundancies or other issues are identified



Groundwater Study: Obs Well Pairs

- 1 obs well pair as of July 2016
- 3 pairs contracted for Summer 2016
- Up to 6 additional pairs pending



OWRD Data Online

<http://www.oregon.gov/owrd/pages/index.aspx>

The screenshot shows the OWRD website homepage in a browser window. The browser's address bar displays www.oregon.gov/owrd/pages/index.aspx. The page features a navigation menu on the left with categories such as 'About Us', 'Contact Us', 'Adjudications', 'Commission', 'Dam Safety', 'File Pickup', 'Forms', 'Funding Opportunities', 'Groundwater', 'Jobs at WRD', 'Links', 'Maps', 'Publications', 'Surface Water', 'Transfers', 'Water Law', 'Water Management', 'Water Rights', and 'Well Construction and Compliance'. The 'Funding Opportunities' link is circled in red. The main content area is titled 'Water Resources Department' and includes a section for the '*New* Water Resources Development Program' with a map of Oregon and descriptive text. Below this is a 'Funding Opportunities' section with a '3 of 3' indicator and a 'Agency Resources' section listing various resources like 'Wells and Well Construction' and 'Water Conservation'. To the right, there is an 'Agency Spotlight' section with sub-sections for 'Water Use and Marijuana', 'Department Rulemaking', '2015 Statewide Long-Term Water Demand Forecast', '2016 Klamath Regulation Update', 'New Water Resources Development Program', 'Monitoring Strategy', and 'Oregon Water Resources Department Receives IWRM Award'. A 'Governor's Drought Page' link is also present. On the far right, a vertical sidebar contains a 'Featured Links' section with items like 'Fee Schedule', 'Learn About Water Rights in Oregon', 'Water Rights Public Notice', 'Water Use Reporting', 'Agency Performance Measures', and 'Locate My Local Watermaster'. Above this sidebar is a 'Public Records Request' link. The top of the page features the 'OREGON.GOV' logo and a search bar.

OWRD Data Online

<http://www.oregon.gov/owrd/pages/index.aspx>

The screenshot shows a web browser window displaying the Oregon Water Resources Department website. The browser's address bar shows the URL www.oregon.gov/owrd/Pages/gw/index.aspx. The website header includes the Oregon.gov logo and navigation links such as "Well Log Query", "Water Rights Information", and "Startcard Query". The main content area is titled "Groundwater" and features a sidebar on the left with various navigation options. The "Groundwater Data" link in the sidebar is circled in red. The main content area includes sections for "Groundwater Overview", "Groundwater Index", "Groundwater Data", "Well Log Forms, Publication & Newsletter", "Well Constructors", "Well Identification Program", "State Water & Monitoring Well Repository", "Groundwater Studies & Publications", "Groundwater Advisory Committee", and "Critical Groundwater Allocations". A photograph of a waterfall is visible on the right side of the page.

Water Resources Department

Groundwater

Groundwater Overview

The Department conducts a variety of functions critical to the management of Oregon's water resources. Staff set standards for water measurements, complete hydrologic studies, enforce water laws, and help water users and local watershed groups identify and solve local water needs. Information gathered by the division's studies is managed and analyzed by agency staff and used for water availability assessments, mapping, planning for future water supplies and supporting local efforts.

Groundwater Index

Groundwater Data
[Click here](#) to access the well log database, water level plots and data, or locate a well constructor.

Well Log Forms, Publication & Newsletter
[Click here](#) to access well log forms, special standard forms, *Well Said Newsletter*, and *Water Well Owner's Handbook*.

Well Constructors
[Click here](#) to find information for continuing education courses, well constructor license exam dates, and access the rules and statutes relating to well construction.

Well Identification Program
[Click here](#) for the well identification application, instructions, and frequently asked questions.

State Water & Monitoring Well Repository
[Click here](#) for access to the State's repository of water well locations. Information is provided about the State GIS standard for Water & Monitoring Wells, objectives of this work, how to query the repository, and links to other state resources for similar data.

Groundwater Studies & Publications
[Click here](#) for information about ground water studies and publications.

Groundwater Advisory Committee
[Click here](#) for more information about the committee, members, agendas, and meeting summaries.

Critical Groundwater Allocations
[Click here](#) for more information about the critical groundwater allocations.

OWRD Data Online

<http://www.oregon.gov/owrd/pages/index.aspx>

Water Resources Departme... x New Tab x +

www.oregon.gov/owrd/pages/toolsdata.aspx#ground_water

Well Log Query Water Rights Informati... Startcard Query Water Right Place of U... WRD Intranet - Home USGS mapView PDF Maps Climate Engine Field Operations Guida... LandsatLook Viewer ePayroll Oregon Snowpack Su... Near Real Time Hydro...

Oregon's water availability is the amount of water that can be appropriated from a given point on a given stream for new out-of-stream consumptive uses. For a detailed description of the WARS program and the methodology used to develop it, you may review the report titled [Determining Water Availability in Oregon](#) (PDF 4.6 MB).

[Interactive Mapping Tool](#): This tool allows access to the vast majority of the information collected by the Department. It allows users to control what data appears on a map, what area of the state and then to query against the map features for more detailed information.

[Back to the top](#)

Groundwater

[Water Level Data](#): A collection of tools for accessing water level data collected by the Department and the US Geological Survey. Included graphs, data downloads and a geographical interface among other options.

[Well Construction Information](#): Frequently referred to as well logs, this database includes data and images of original documents on over 250,000 wells in the state of Oregon.

[Locate a Well Constructor](#): A listing of all well constructors state wide who are licensed by the Department.

[Back to the top](#)

Mapping

[Interactive mapping tool](#): This is a powerful tool that provide a geographical interface to most of the Department's online data.

[Download GIS Water Rights Data](#): Allows you to download water rights data in standard GIS formats by basin statewide.

[Back to the top](#)

OREGON.GOV

- State Directories
- Agencies A to Z
- Oregon Administrative Rules
- Oregon Revised Statutes
- Oregon - an Equal Opportunity Employer
- About Oregon.gov

WEB SITE LINKS

- Text Only Site
- Accessibility
- Oregon.gov
- File Formats
- Privacy Policy
- Site Map
- Web Site Feedback

PDF FILE ACCESSIBILITY

Adobe Reader, or equivalent, is required to view PDF files. Click the "Get Adobe Reader" image to get a free download of the reader from Adobe.

OWRD Data Online

<http://www.oregon.gov/owrd/pages/index.aspx>

Water Resources Department

Water Level Data and Hydrographs

[View Water Level Data](#)
[Download Water Level Data](#)
[Links to USGS Water-Level Data](#)

View Water Level Data

Water-level plots for OWRD observation wells. Includes wells in the state observation well net (generally measured quarterly by regional or district office staff) and other observation wells that were established for various ground water projects

- OWRD Observation Wells (by map - choose a county:)

Baker	Douglas	Lake	Sherman
Benton	Clatsop	Lane	Tillamook
Clatsop	Grant	Lincoln	Umatilla
Clatsop	Harney	Linn	Union
Columbia	Hood River	Malheur	Wallowa
Coos	Jackson	Marion	Wasco
Crook	Jefferson	Morrow	Washington
Curry	Josephine	Multnomah	Wheeler
Deschutes	Klamath	Polk	Yamhill

- [OWRD Observation Wells \(by well log\)](#)

[Back to the top](#)

Download Water Level Data

The following text files contain water-level and well data for OWRD observation wells and field-located project wells.

- Water-level Data: [owrd_wls.txt](#)
- Well Data: [owrd_master.txt](#)
- Well History: [owrd_redrills.txt](#)
- Datafile Documentation: [readme.txt](#)
- Well Shapefile (ESRI GIS Format): [wells.zip](#)

OWRD Data Online

<http://www.oregon.gov/owrd/pages/index.aspx>

OWRD Mapped Results

apps.wrd.state.or.us/apps/gis/kmlviewer/Default.aspx?title=Harney County Observation Wells&backlink=http://www.oregon.gov/owrd/pages/gw/well_data.aspx&kmlfile=http://filepickup.wrd.state.or.us/files/Public

Well Log Query Water Rights Informati... Startcard Query Water Right Place of U... WRD Intranet - Home USGS mapView PDF Maps Climate Engine Field Operations Guida... LandsatLook Viewer ePayroll Oregon Snowpack Su... Near Real Time Hydro...

Oregon Water Resources Department
Harney County Observation Wells

>> Return to Search Page

- State Observation Wells
 - HARN 9
 - HARN 10
 - HARN 75
 - HARN 107
 - HARN 130
 - HARN 147
 - HARN 198
 - HARN 202
 - HARN 219
 - HARN 254
 - HARN 271
 - HARN 323
 - HARN 335
 - HARN 356
 - HARN 440
 - HARN 441
 - HARN 451
 - HARN 462
 - HARN 463
 - HARN 503
 - HARN 523
 - HARN 540
 - HARN 546
 - HARN 547
 - HARN 599
 - HARN 607
 - HARN 626
 - HARN 657
 - HARN 710
 - HARN 741
 - HARN 755

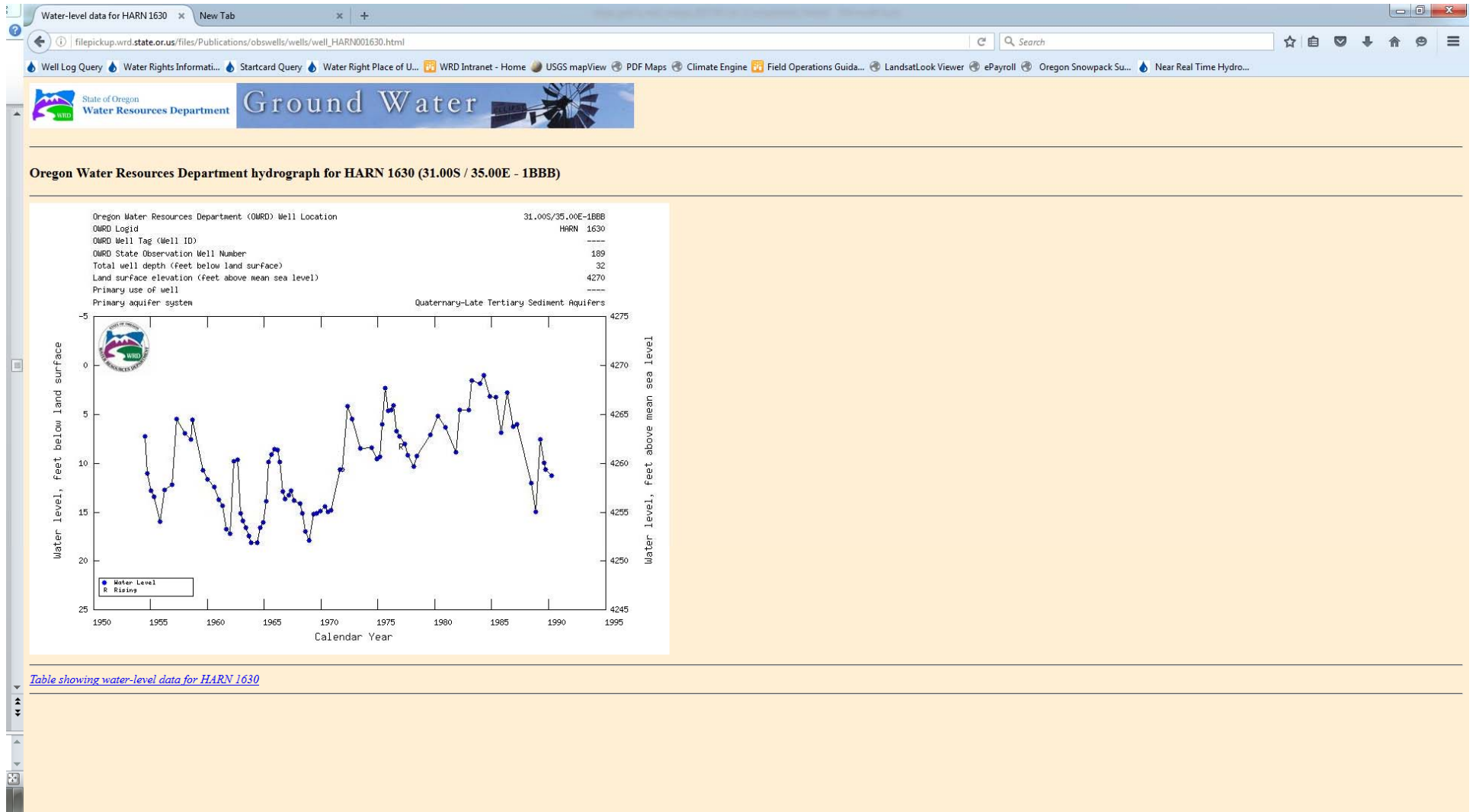
HARN 1630
Observation Well Type: State
Status: Not Current
[Water Levels](#)
[Well Log](#)

Map Satellite

Map data ©2016 Google Terms of Use Report a map error

OWRD Data Online

<http://www.oregon.gov/owrd/pages/index.aspx>



Seeking volunteers

- Observation wells: domestic, stock, irrigation, unused
- Unused wells with no pump
 - Recorder wells
 - Geophysical logging
- Aquifer test wells
 - Higher yield pumping wells
 - Nearby observation wells



Darrick Boschmann, Hydrogeologist
Oregon Water Resources Department

Thank You



Darrick Boschmann, Hydrogeologist
Oregon Water Resources Department