Welcome

The meeting will begin shortly, in the meantime please:

- Keep your phone muted during the meeting
- If you have a question/comment during the meeting type it in the chat box and it will be read and addressed
- If you experience any technical difficulties, please contact ADWR Help Desk at 602-771-8444 or tickets@azwater.gov

Douglas AMA GUAC
August 28th, 2024

Meeting Agenda

1. Call to Order – Welcome & Introductions – *Chair*

2. Meeting Logistics – *Nicholas Mason, ADWR*

3. Hydrology Update – *Emily LoDolce, ADWR*

Emily will provide an update on groundwater modeling for the Douglas AMA.

4. DAMA First Management Plan Informal Draft

a. 1st Management Plan Draft Overview and Explanation – *Madison Moreno & Casey Allman, ADWR*

b. GUAC Discussion and Comment to Director – *Council*

5. AMA Deputy Director Report – *Ryan Melson, ADWR*

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7. Call to the Public – *Chair*

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- During the Call to Public attendees will have the option to speak to the Council
- This meeting is being recording and will be posted to ADWR's website
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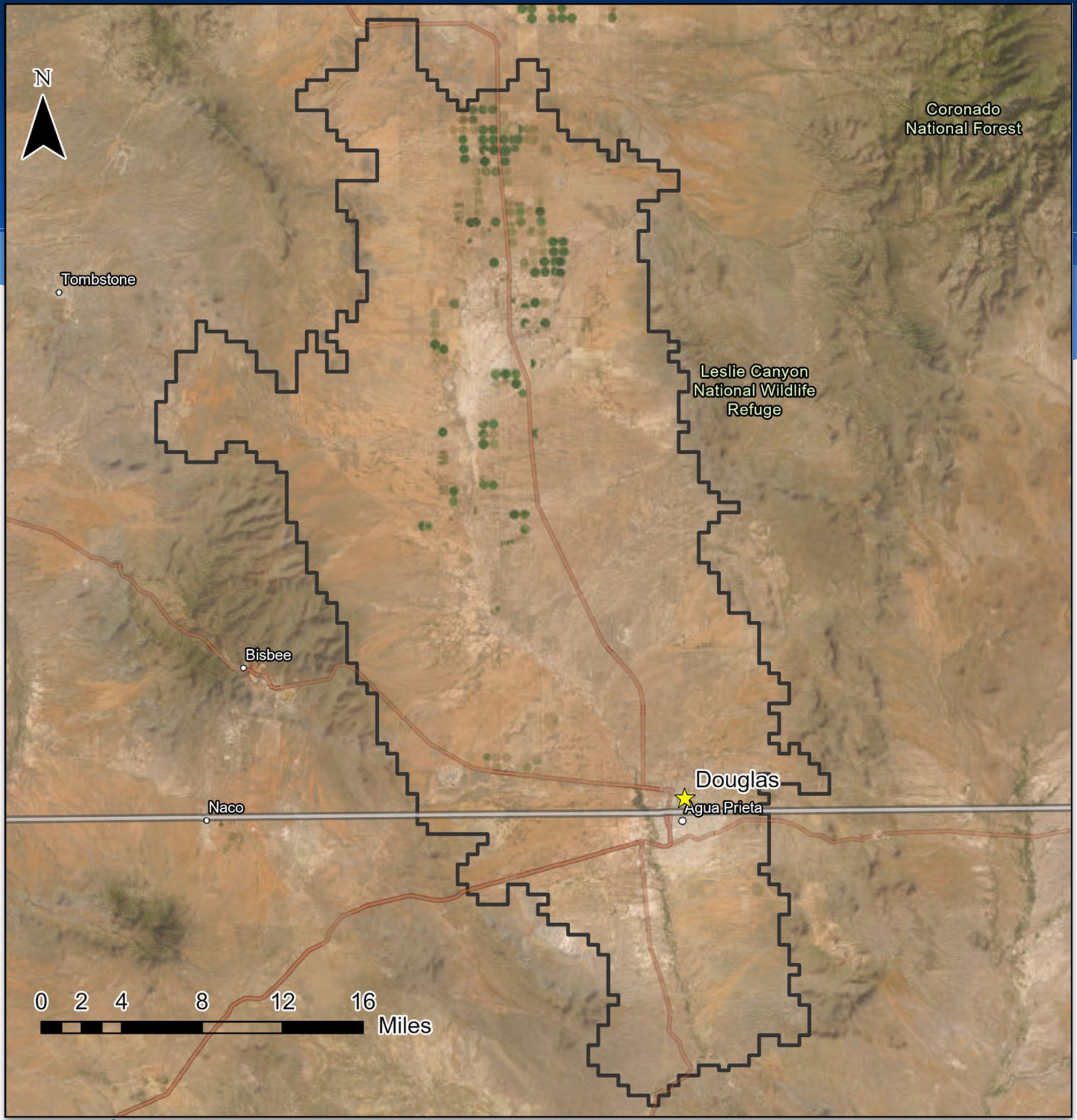
Douglas AMA Model Update

Cera Linehan
ADWR Groundwater Modeling
Arizona Department of Water Resources
August 28, 2024

clinehan@azwater.gov

Agenda

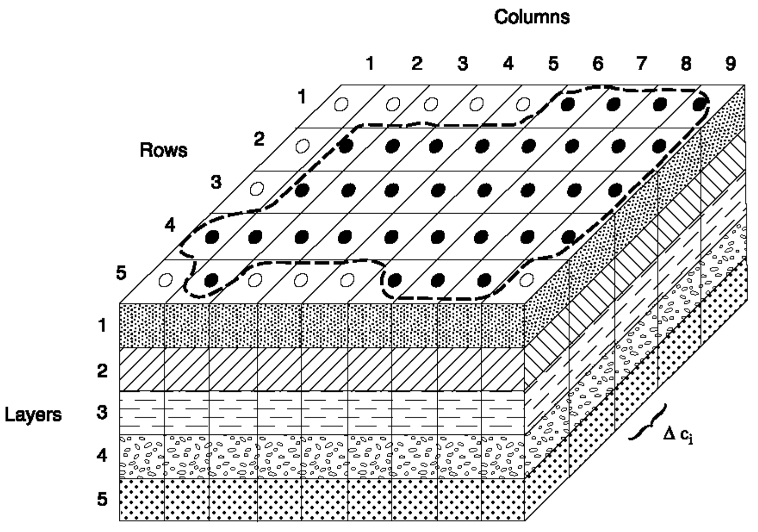
- ★ What is a groundwater model?
- ★ Model grid and layers
- ★ What is a steady-state model?
- ★ Model inflows
- ★ Model outflows
- ★ Next steps

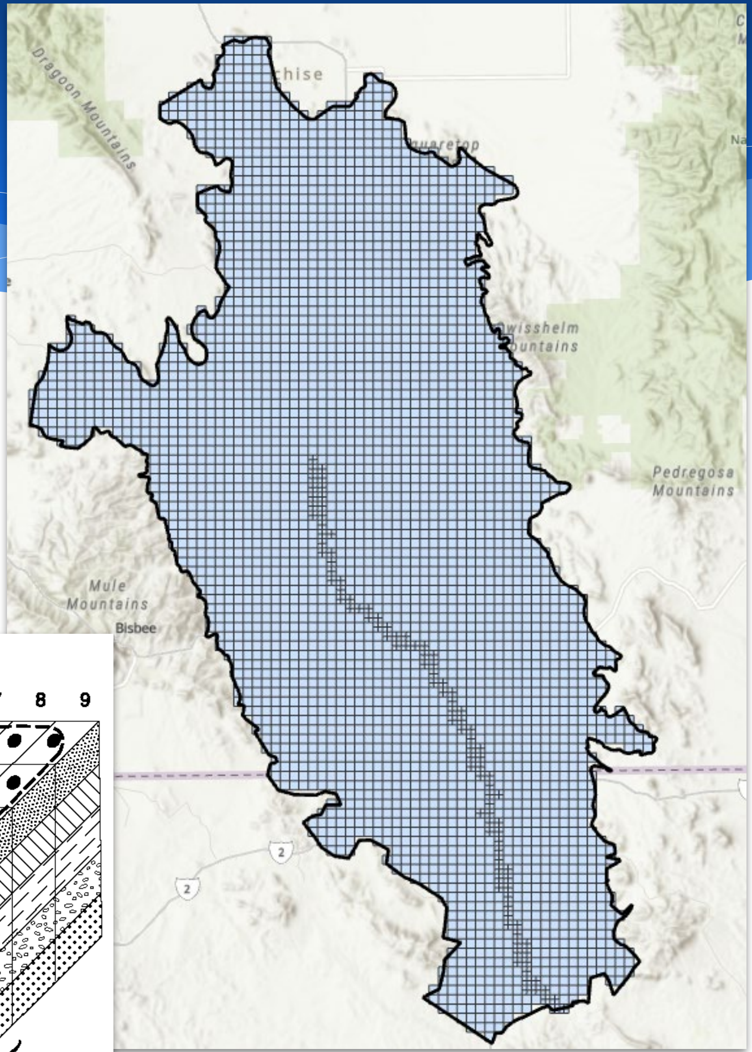


Model Overview - What is a groundwater model?

- Groundwater flow modeling is a tool that can be used to simulate the past, present and future impacts of water use on aquifers.
  - Models act as a conceptual representation of physical reality.
  - Observed data drives the model behavior.
    - Water levels, annual pumping reports, flow rates, etc

- Groundwater models are used to evaluate current conditions and simulate hypothetical future scenarios.
  - Every active cell in a regional model represents conditions unique to its local area.
- ADWR groundwater models are used to advise management decisions.



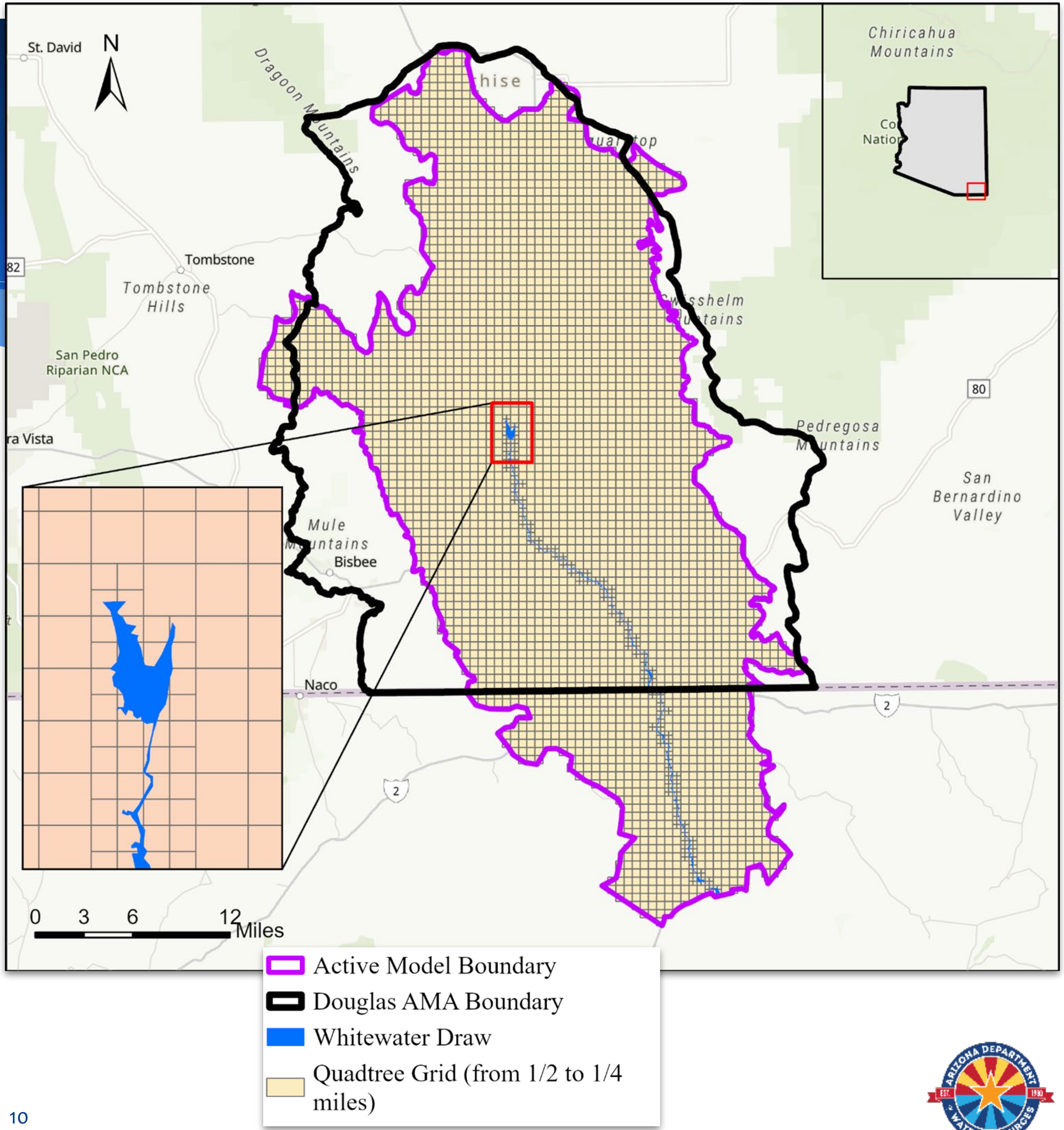


Preliminary Douglas AMA Active Model Grid and Study Area Boundary

Model Grid

Model Quadtree Grid

- ➢ The grid is ½ mile x ½ mile everywhere except for a section surrounding the lower reaches of Whitewater Draw. This area is refined to ¼ mile x ¼ mile.
- ➢ Vertically, 3 Layers to represent:
  - ○ Layer 1: 60 feet thick, only along Whitewater Draw; a separate thin layer to better simulate interaction between Whitewater Draw and groundwater
  - ○ Layer 2: Upper Valley Fill
  - ○ Layer 3: Lower Valley Fill



Model Grid

Previous studies in the Douglas basin have noted large extents of caliche interbedded with valley fill materials. The valley fill is primarily sand and gravels with coarser materials on the edges near the mountains and finer materials in the center of the basin. The basin material is quite variable.

Coates and Cushman (Figure 4; 1955)

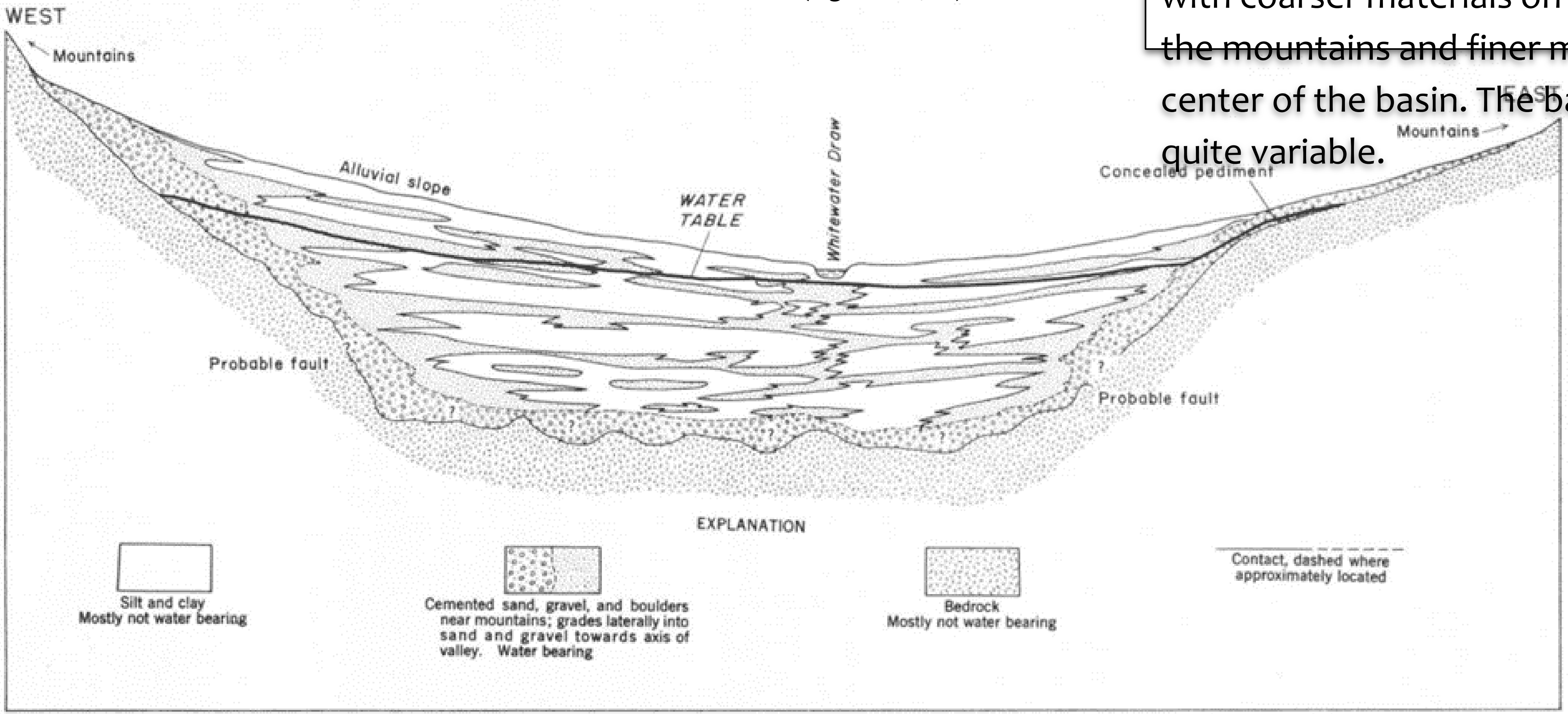


Figure 4.—Diagrammatic cross section of representative valley-fill conditions in Douglas basin.

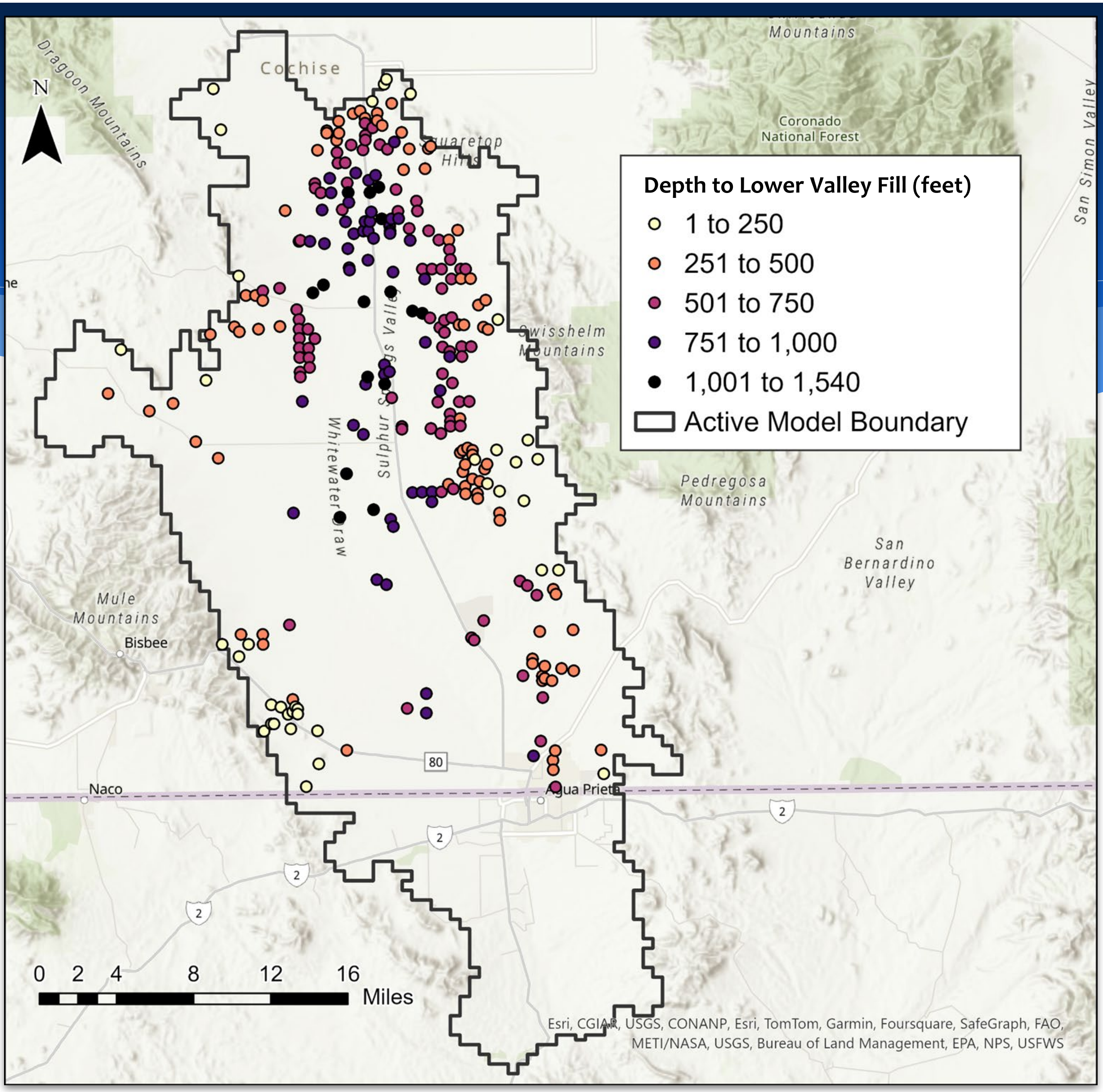
Model Grid

Well Logs

- ➢ Geologist and driller logs were used to define subsurface contacts between layers
- ➢ The log quality was fair. ADWR reviewed more than 2,000 well logs and identified about 300 with quality data.
- ➢ The logs data is used to develop surfaces to split out the upper and lower valley fill.

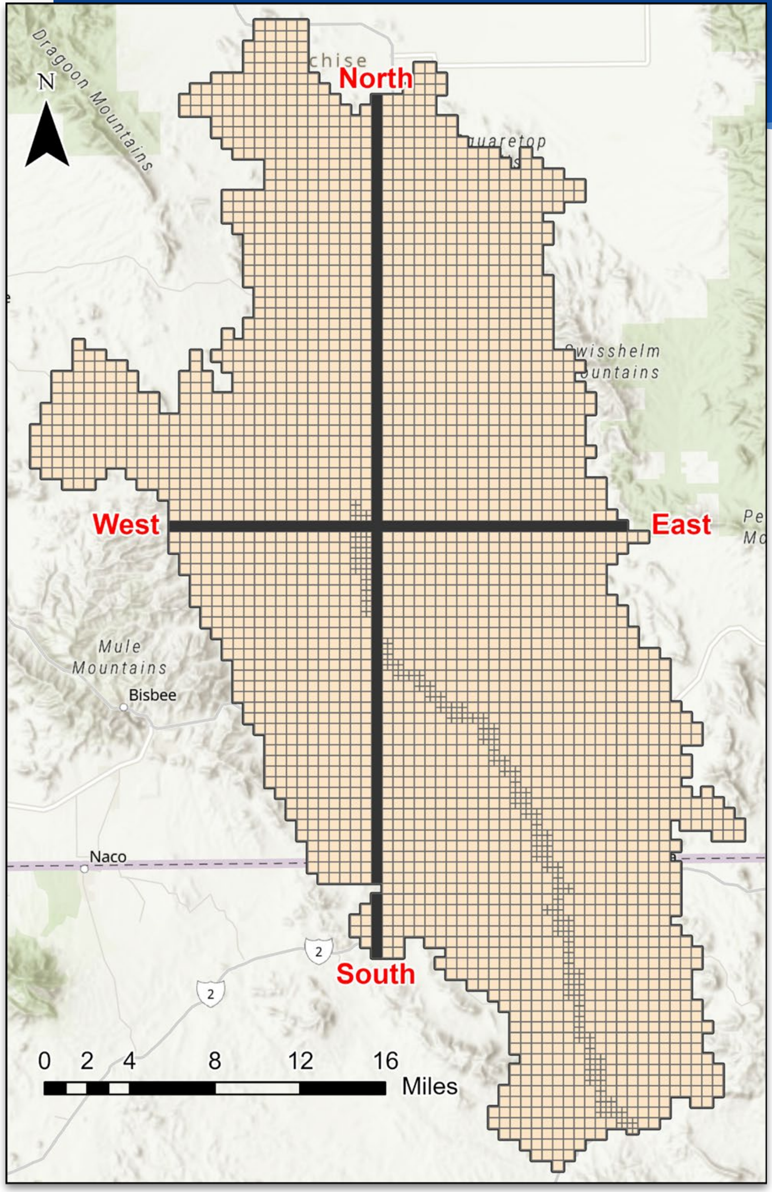
★ The upper and lower valley fill was distinguished by:

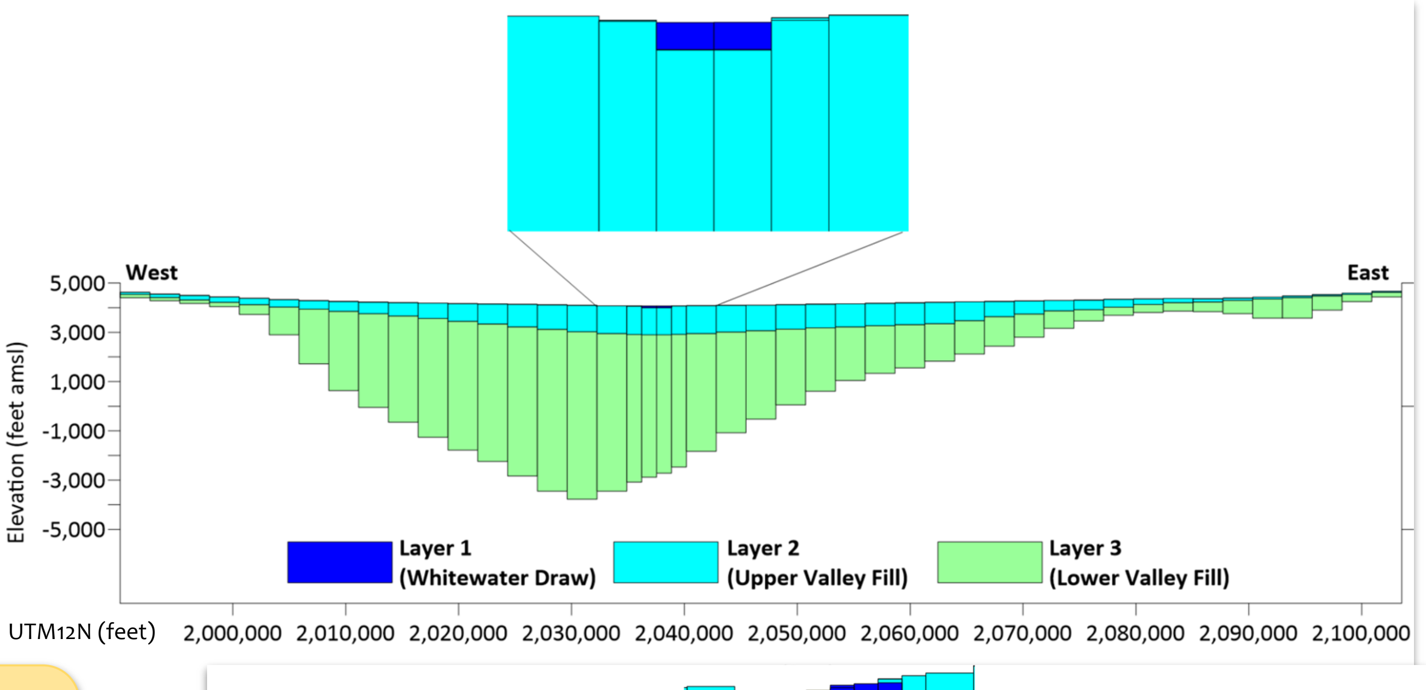
- ➜ Coarser materials with depth relative to the upper valley fill
- ➜ Logs that cited tougher or harder materials with increasing depth



Map of the logs used to define the bottom of the upper valley fill

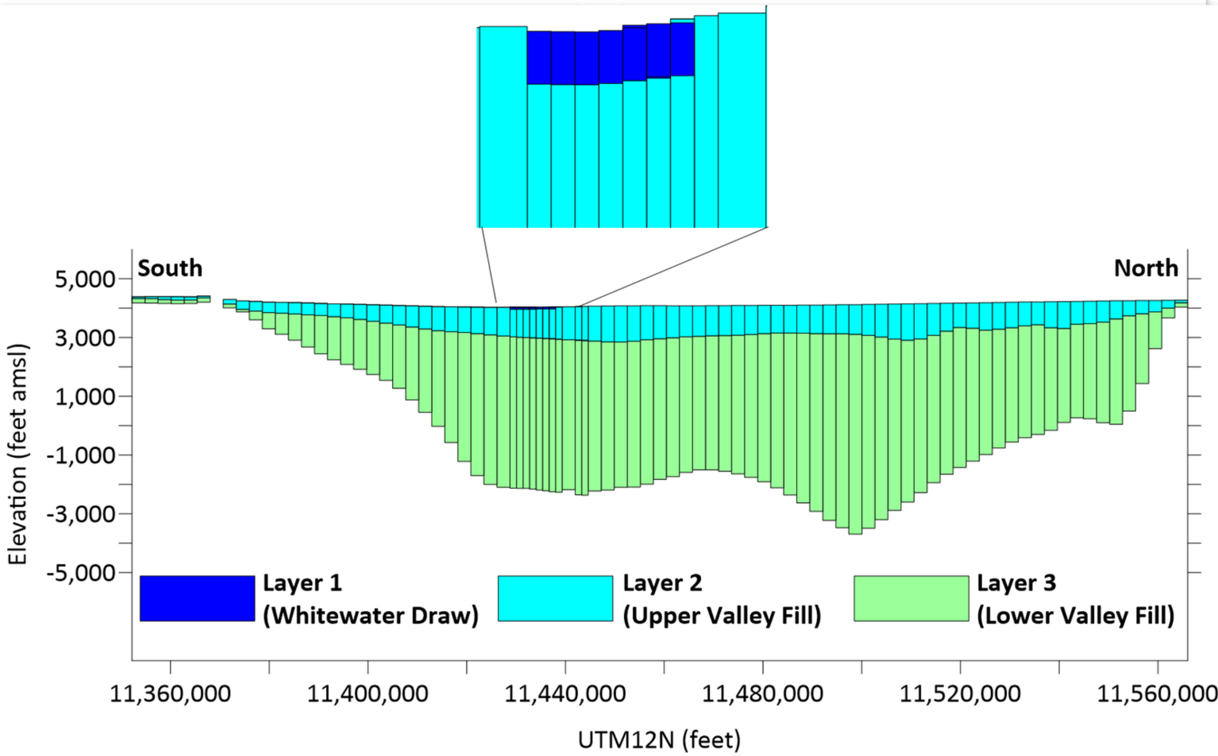
Model Grid





The layers shown are hydrostratigraphic units, not lithologic units.

NOTE: Both cross-sections are vertically exaggerated 5x for readability.
The green and yellow diamonds show the deepest location in each cross-section and on the map.

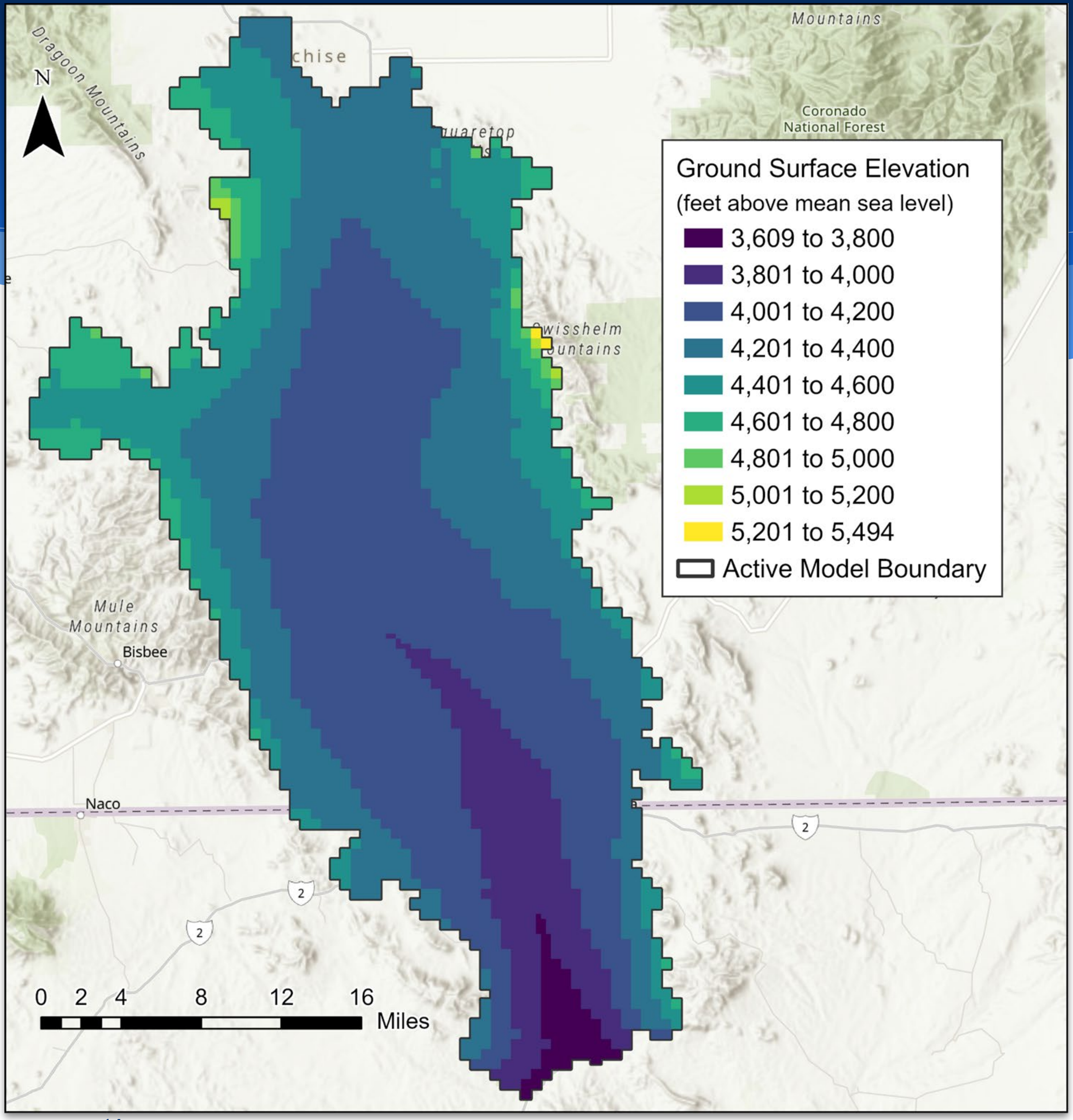


Model Layers
Ground Surface Elevation

Ground Surface Elevation

- ➢ Created from USGS 30 meter DEM
- ➢ Elevation decreases from east and west toward the center, and from north to south into Mexico
- ➢ The elevation ranges from about 3,600 to 5,500 feet above sea level.

The color floods are blocky due to the figures using the model grid.

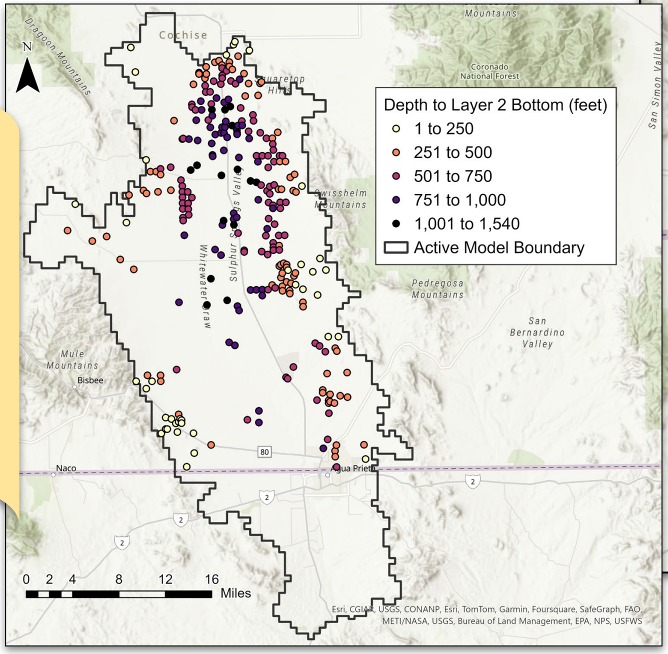


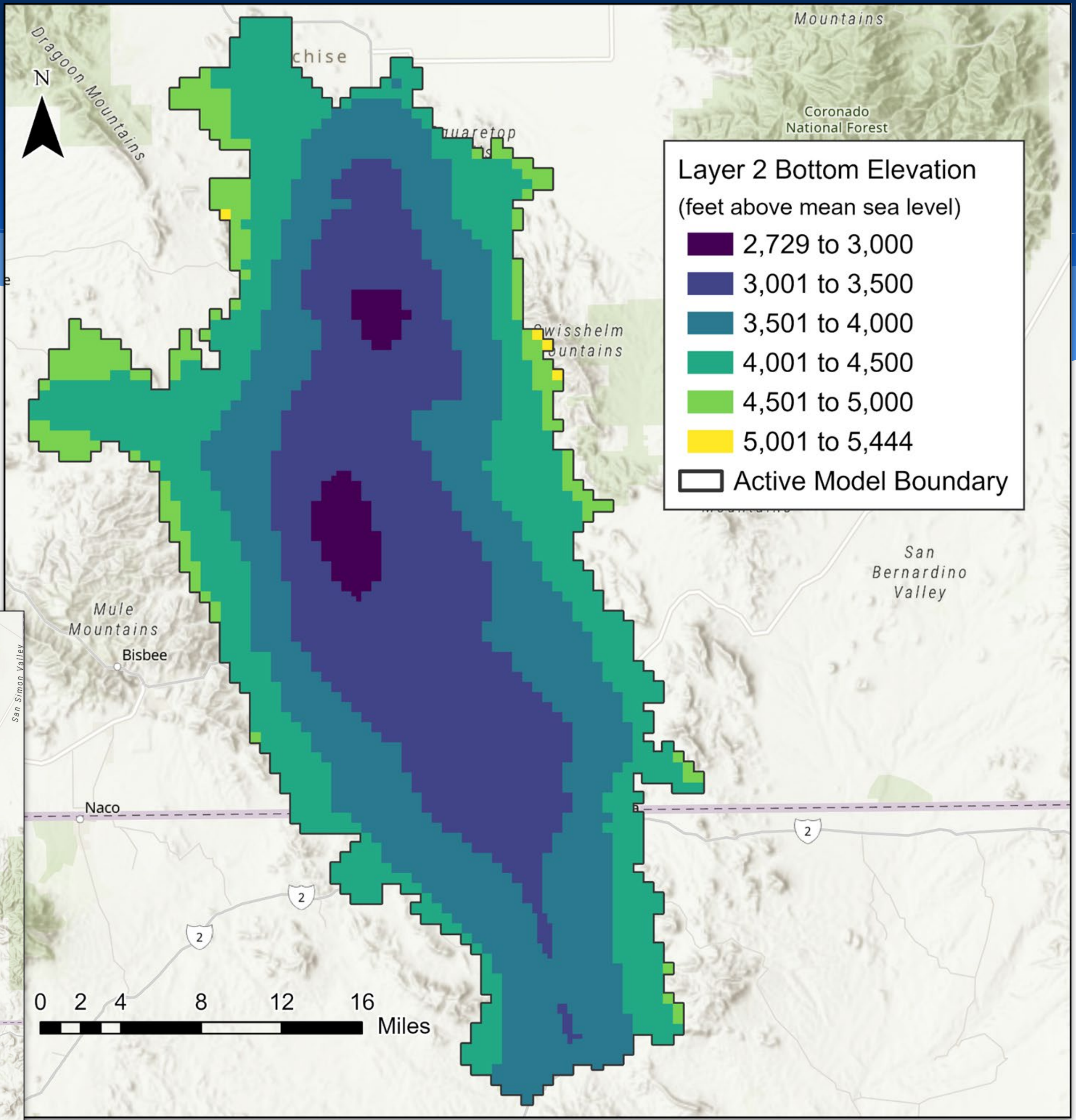
Model Layer Elevations
Upper Valley Fill Bottom

Upper Valley Fill Bottom Elevation

- ➢ Created from 282 driller logs; and the AZ Geological Survey's surficial geology
- ➢ Elevation decreases from east and west toward the center, and from north to south into Mexico
- ➢ Elevation ranges from about 2,700 to 5,500 feet above sea level

The contact between the upper and lower valley fill was estimated based on changing material sizes. The upper fill is finer than the lower fill.

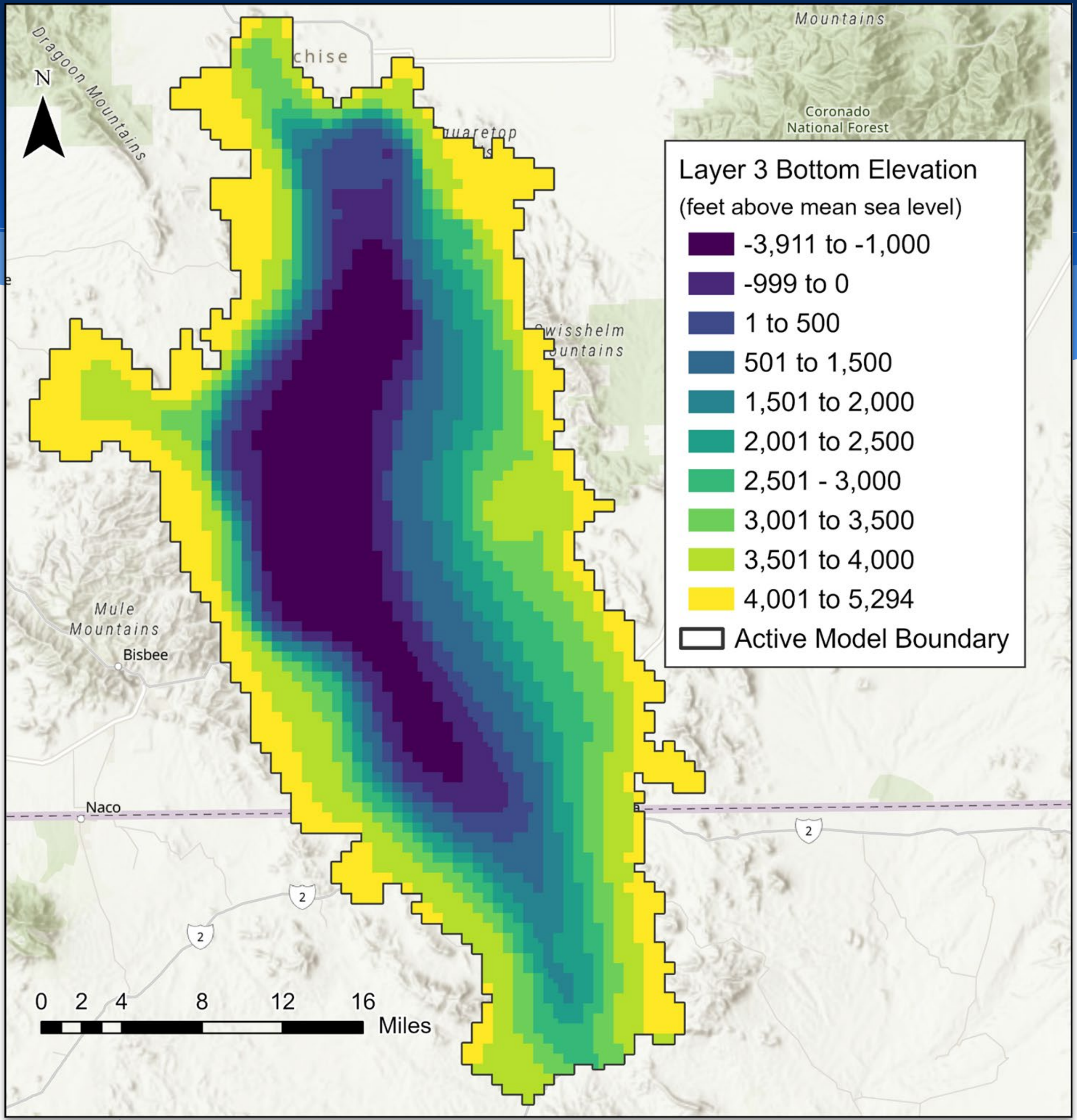




Model Layer Elevations
Lower Valley Fill Bottom

Lower Valley Fill Bottom Elevation

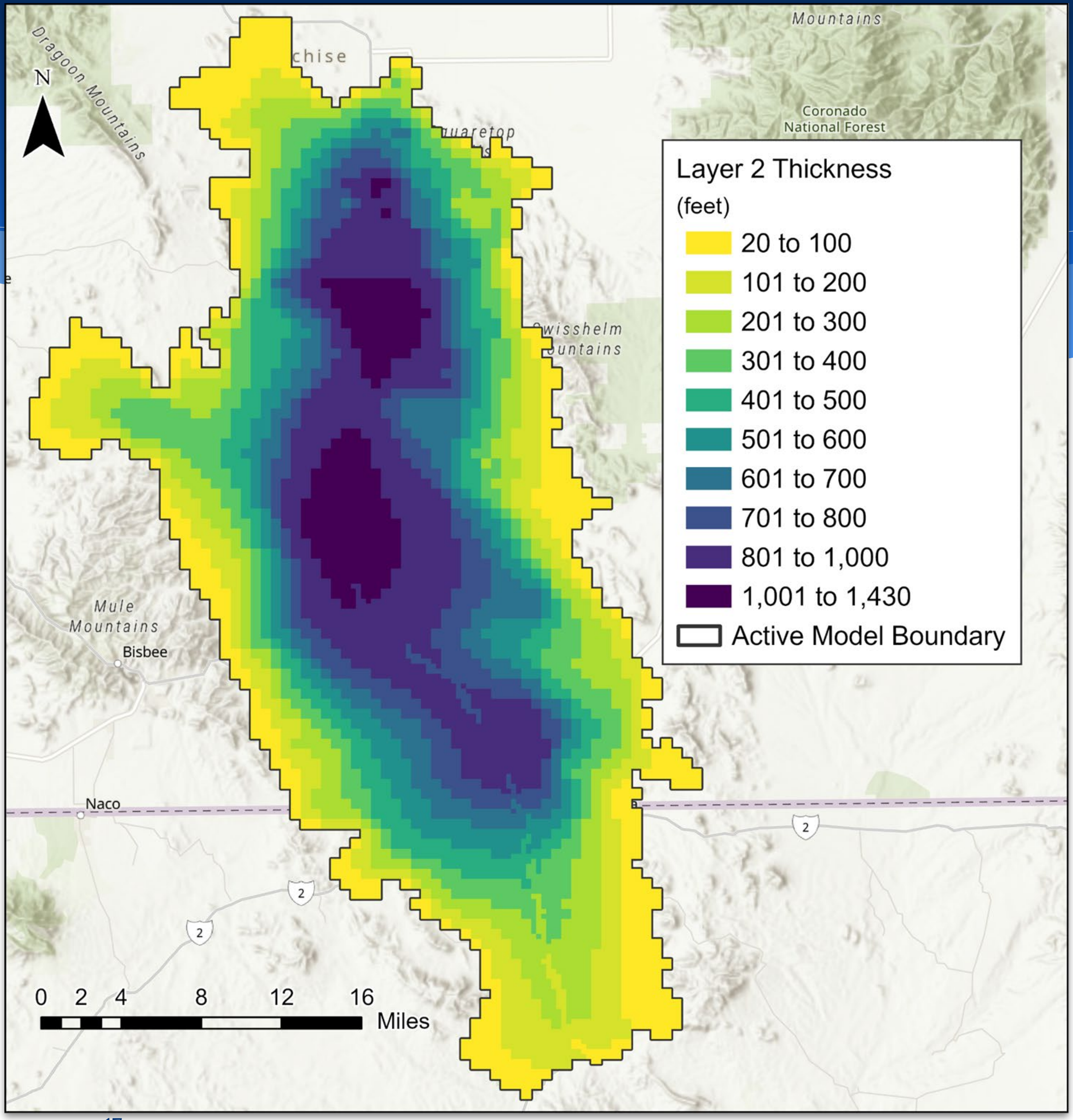
- ➢ Created from AZGS modified bedrock contours from Oppenheimer and Sumner (1980)
- ➢ Elevation decreases from east and west toward the center, and from north to south into Mexico
- ➢ Elevation ranges from about -4,000 to 5,300 feet above sea level



Model Layer Thickness
Upper Valley Fill

Upper Valley Fill Thickness

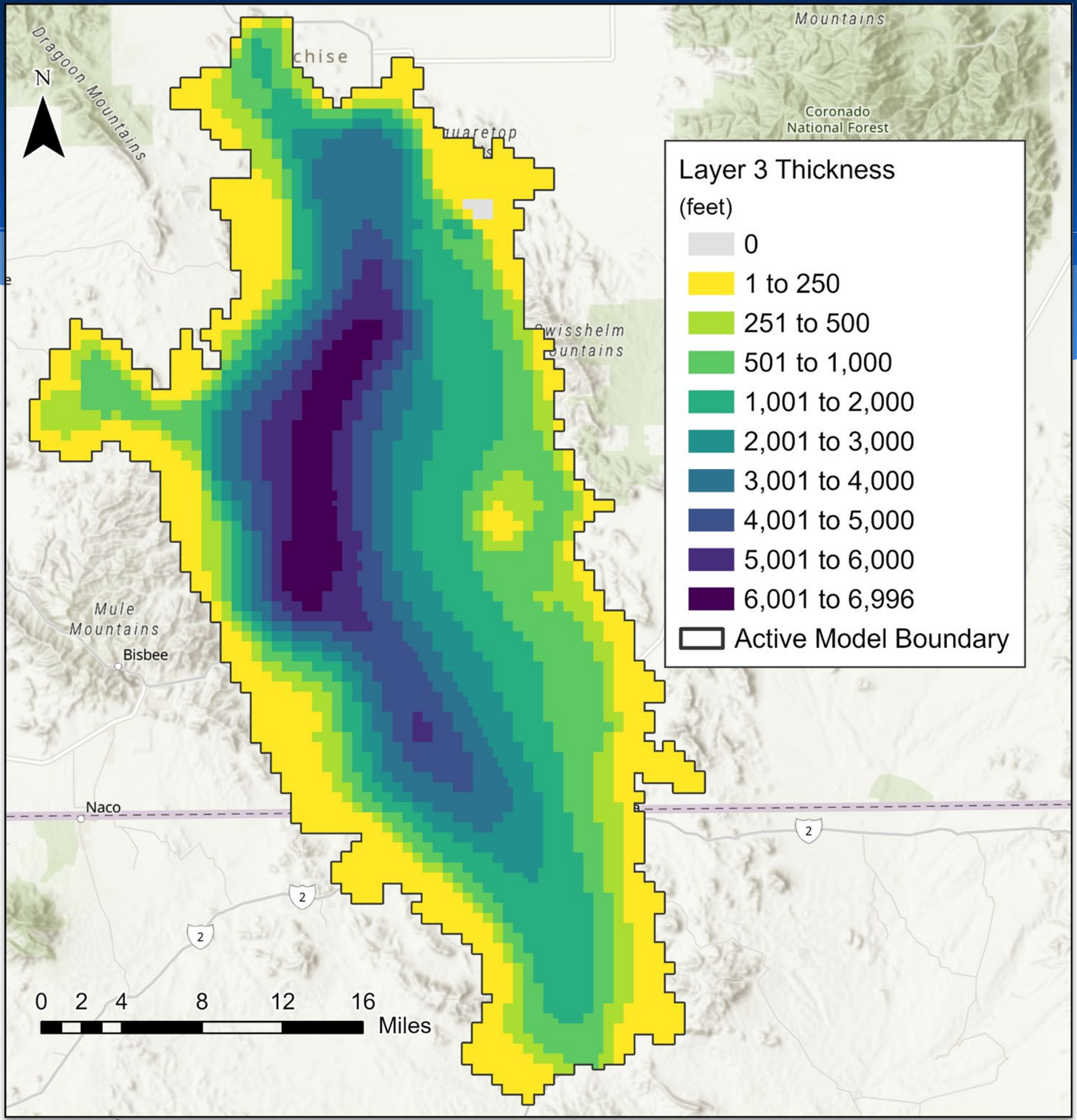
- ➢ The upper valley fill thickness increases from edge to center ranging from about 20 to 1,430 feet



Model Layer Thickness
Lower Valley Fill

Lower Valley Fill Thickness

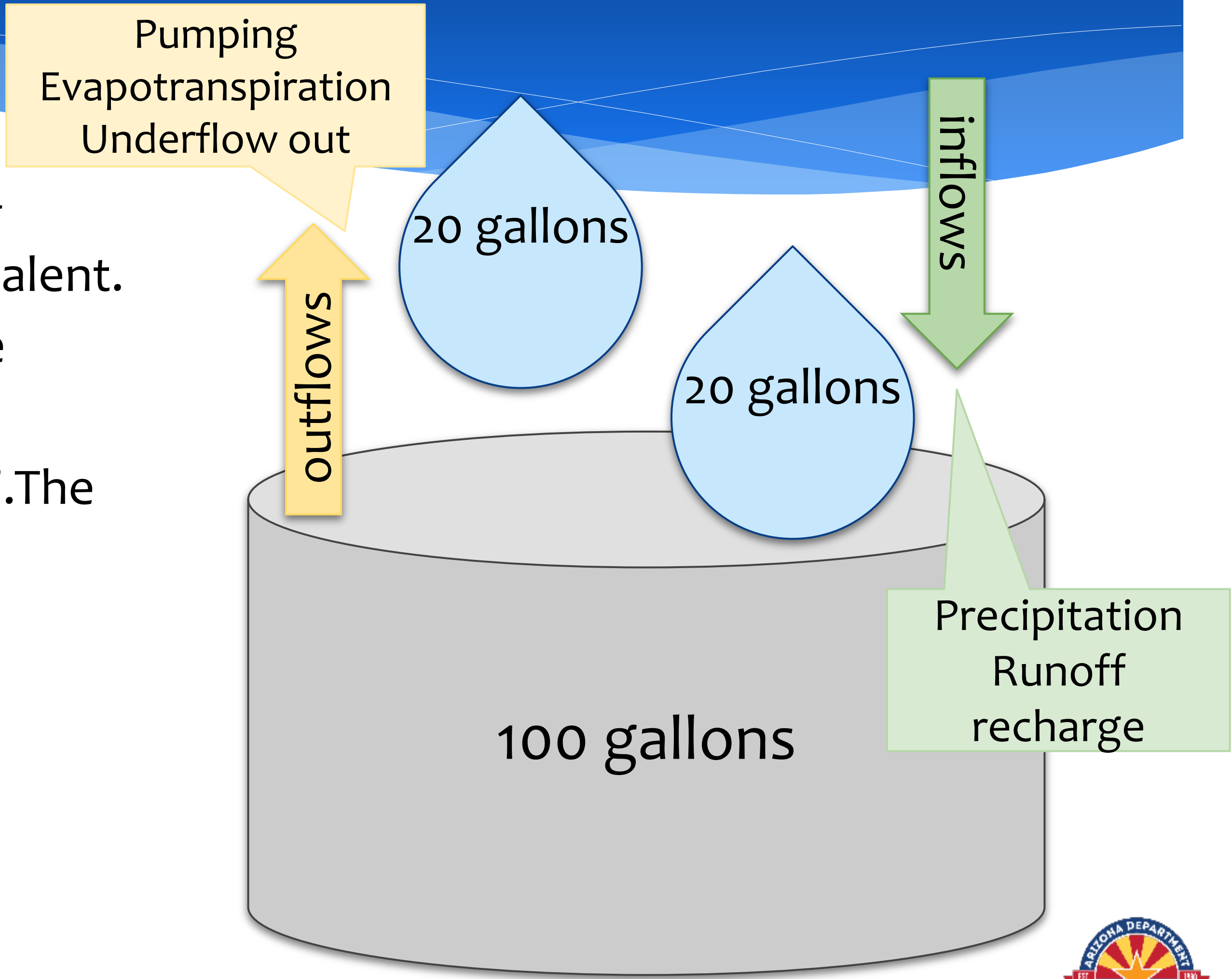
- ➢ The lower valley fill thickness increases from edge to center ranging from about 1 to 7,000 feet
- ➢ A small area near Whitehead Ridge has zero thickness. This is due to the presence of shallow bedrock layers



Steady-State (1940) Water Budget

What is a steady-state water budget?

- The groundwater system is considered "steady-state" when the inflows and outflows are equivalent. The total groundwater storage in a steady-state system would not change.
- Steady-state periods are considered "constant".The transient period changes with time and allow conditions to vary.



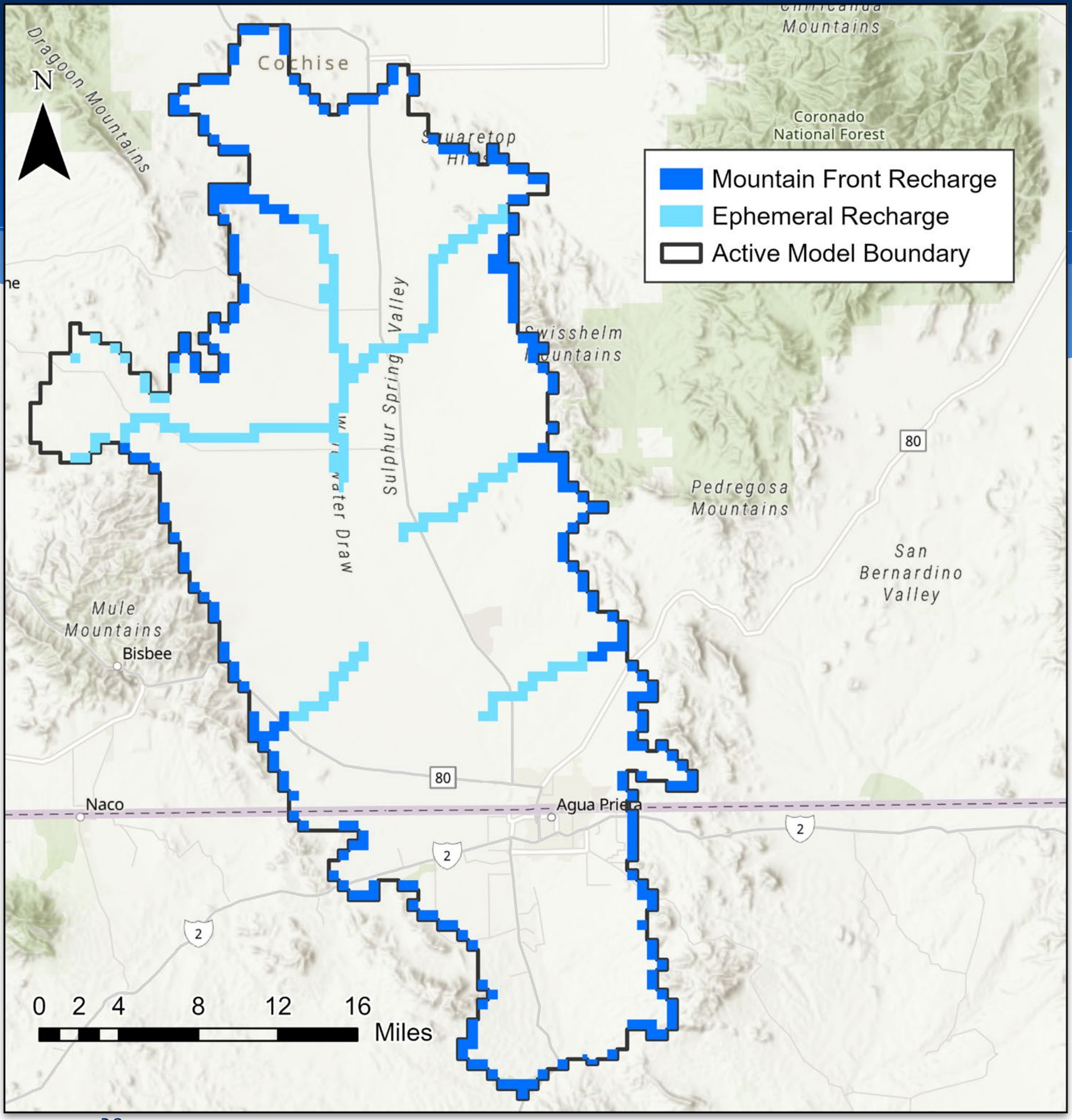
Inflows = Outflows

No Change in storage

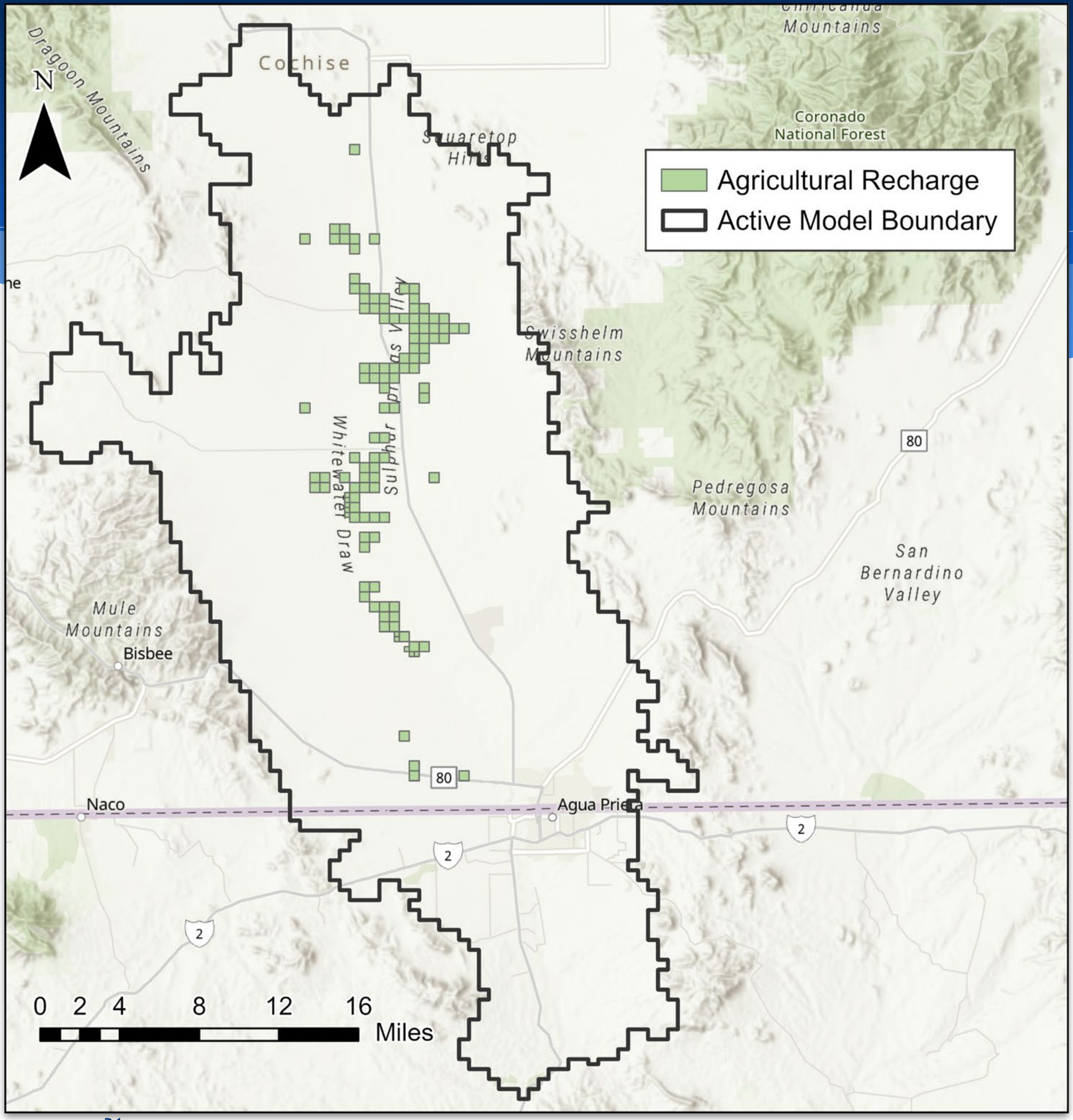
Inflows
Natural Recharge (1940)

Mountain Front and Ephemeral Recharge

- ➢ Mountain front recharge occurs around most of the perimeter of the model domain, and in areas where there is notable surface flow
- ➢ Coates and Cushman (1955) estimates natural recharge to contribute about 20,000 AFY



Inflows
Agricultural Recharge (1940)



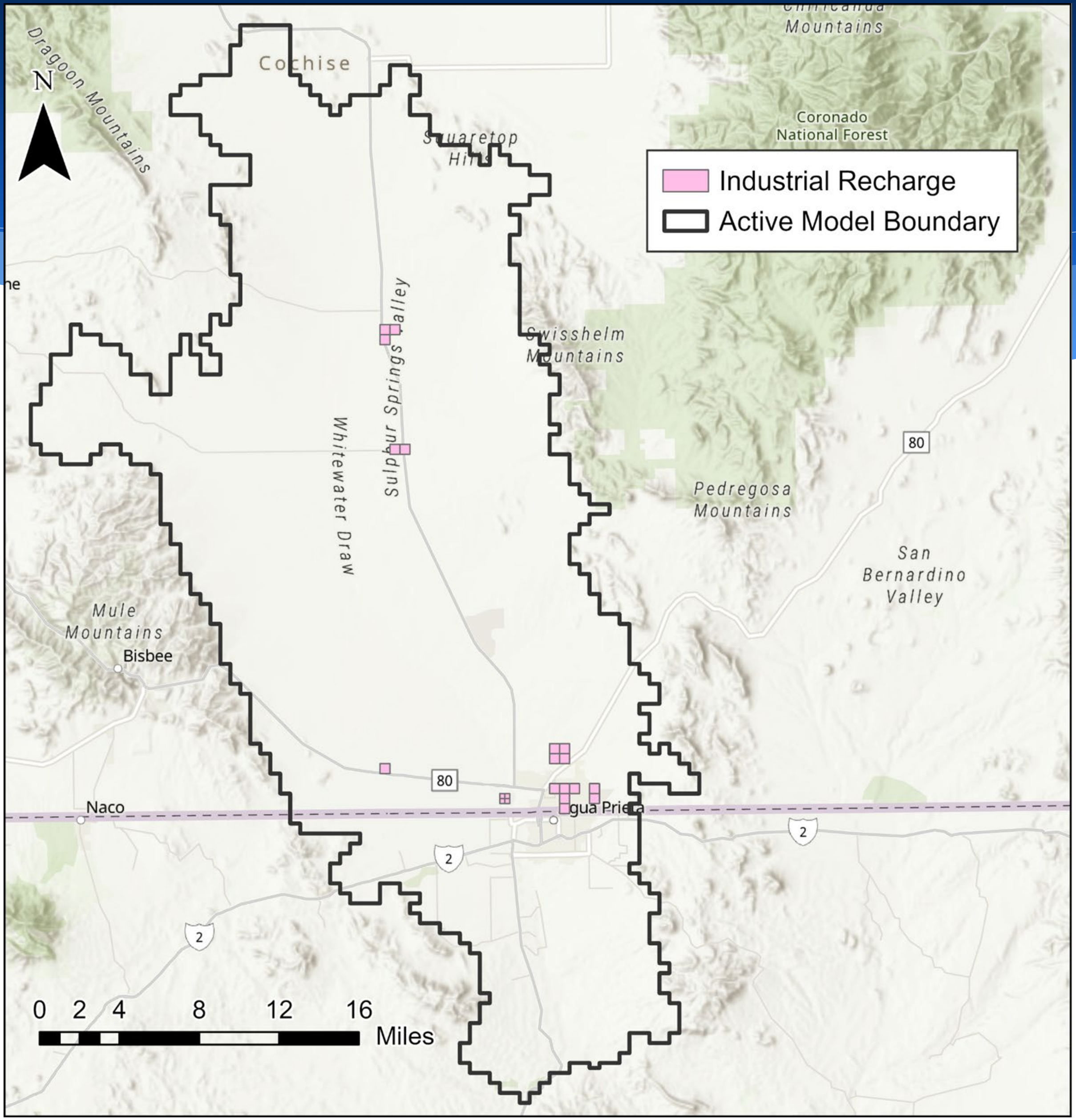
Incidental Recharge

- ➢ Agricultural recharge is based on the estimated agricultural pumping (3,750 AFY) and previous study assumptions about recharge in the basin
- ➢ Recharge was assumed to be 5% of water pumped for agriculture, or about 200 AFY in total
- ➢ Recharge is thought to be minimal in the Douglas Basin due to shallow caliche throughout the area

Inflows
Industrial Recharge (1940)

Industrial Recharge

- ➢ The estimated pumping in 1940 for industrial use was about 1,345 AFY, and the related recharge totals to about 340 AFY
- ➢ Recharge for industrial uses was assumed to be about 25% of the estimated pumping

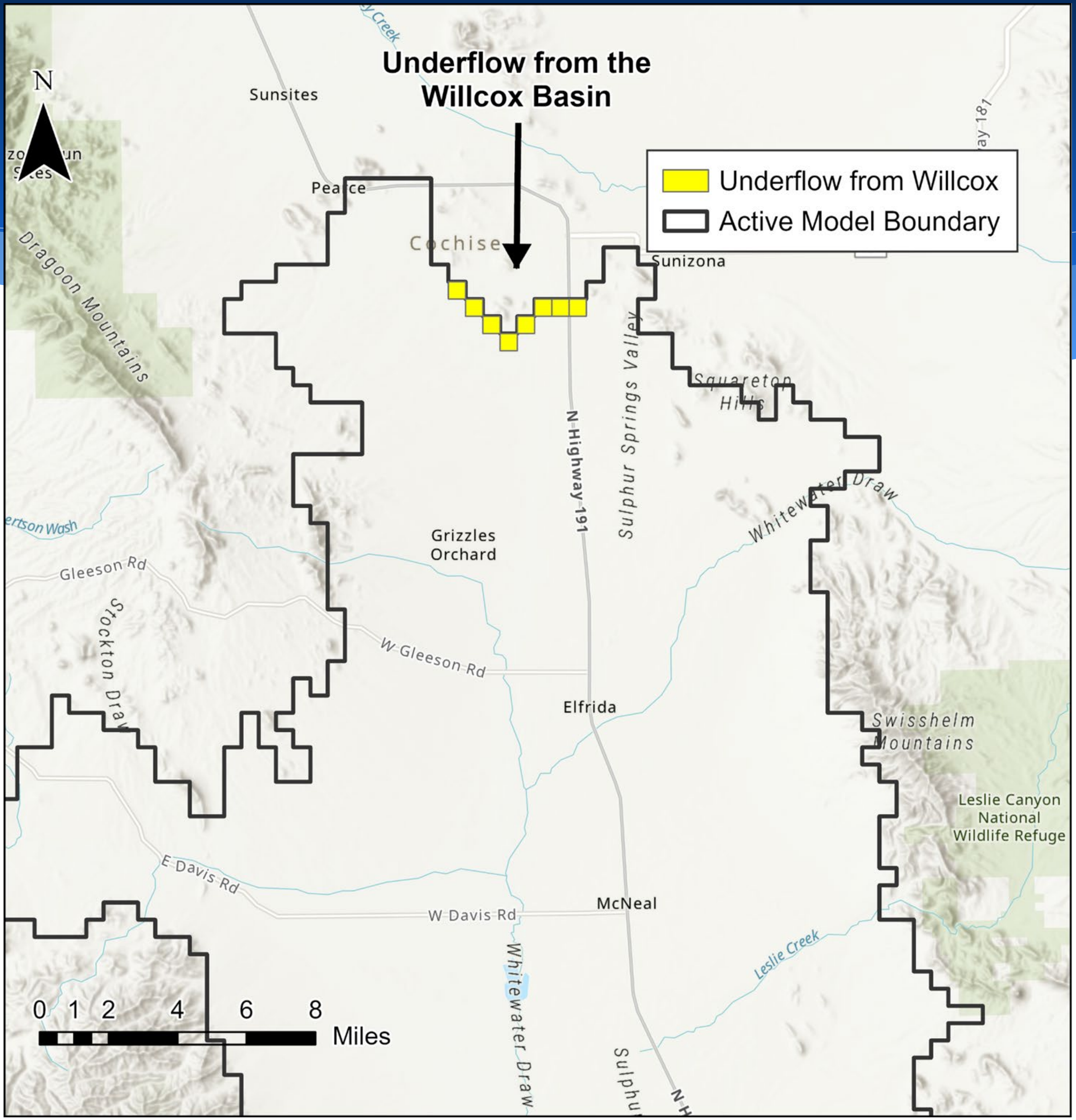


Inflows
Underflow (1940)

Underflow from Willcox

- ➢ Underflow locations are assigned along the model's northern boundary to indicate inflow from the Willcox basin
- ➢ Reference elevations were assigned from GWSI hydrographs and the existing Willcox model

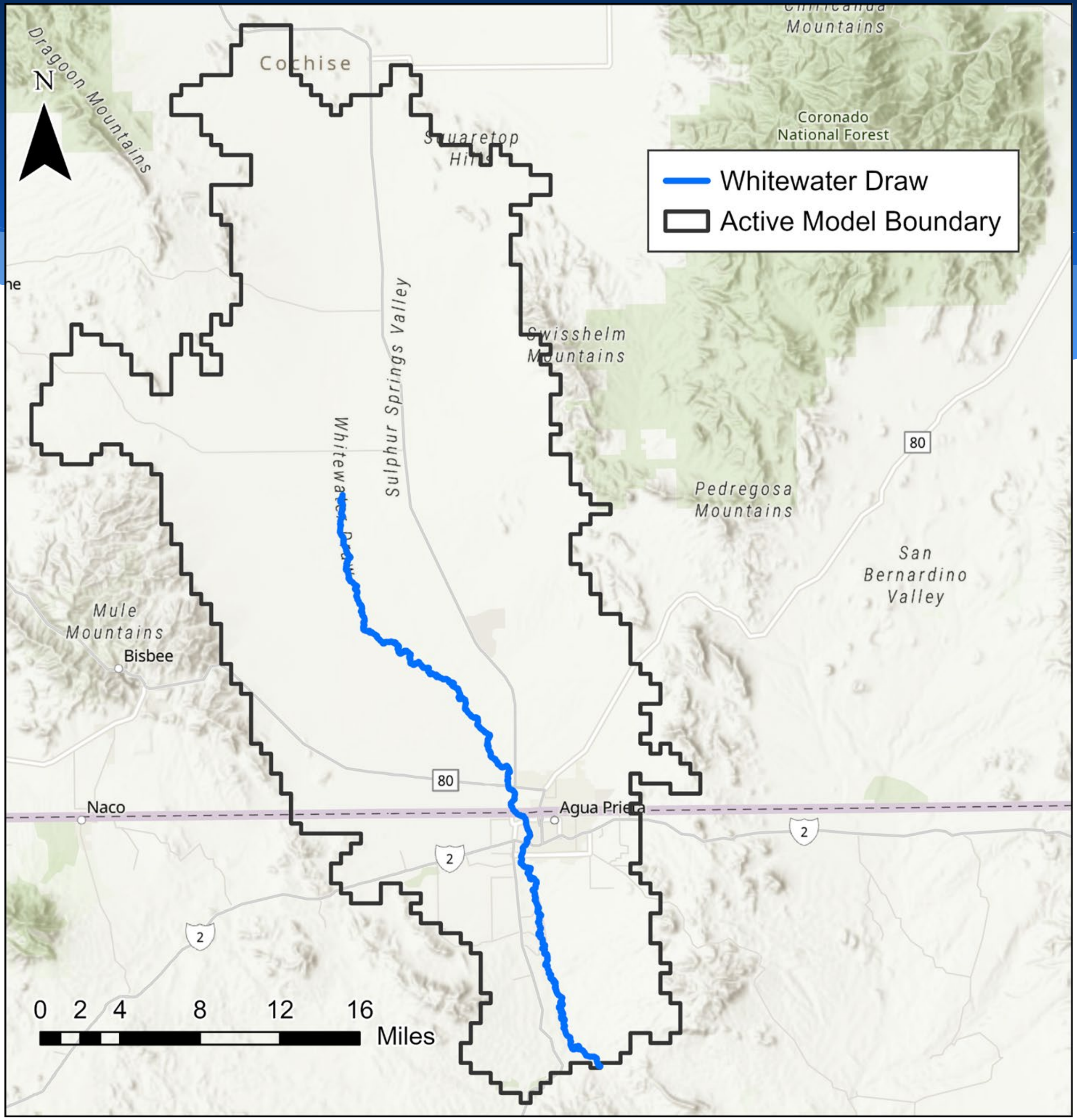
GWSI = Groundwater Site Inventory Dataset



Inflows
Stream Flow (1940)

Whitewater Draw Stream Flow

- Explicitly modeling Whitewater draw allows us to better estimate surface water lost to the aquifer
  - Surface flows occur south of the White Water Draw Wildlife Area (wetlands) and flow south into Mexico
  - South of the wetlands and as Whitewater Draw approaches Mexico, flow becomes perennial rather than ephemeral. The USGS streamflow gage near the border records flows and indicates baseflow in this area.
  - There is surface and groundwater interaction that we want to capture in the model

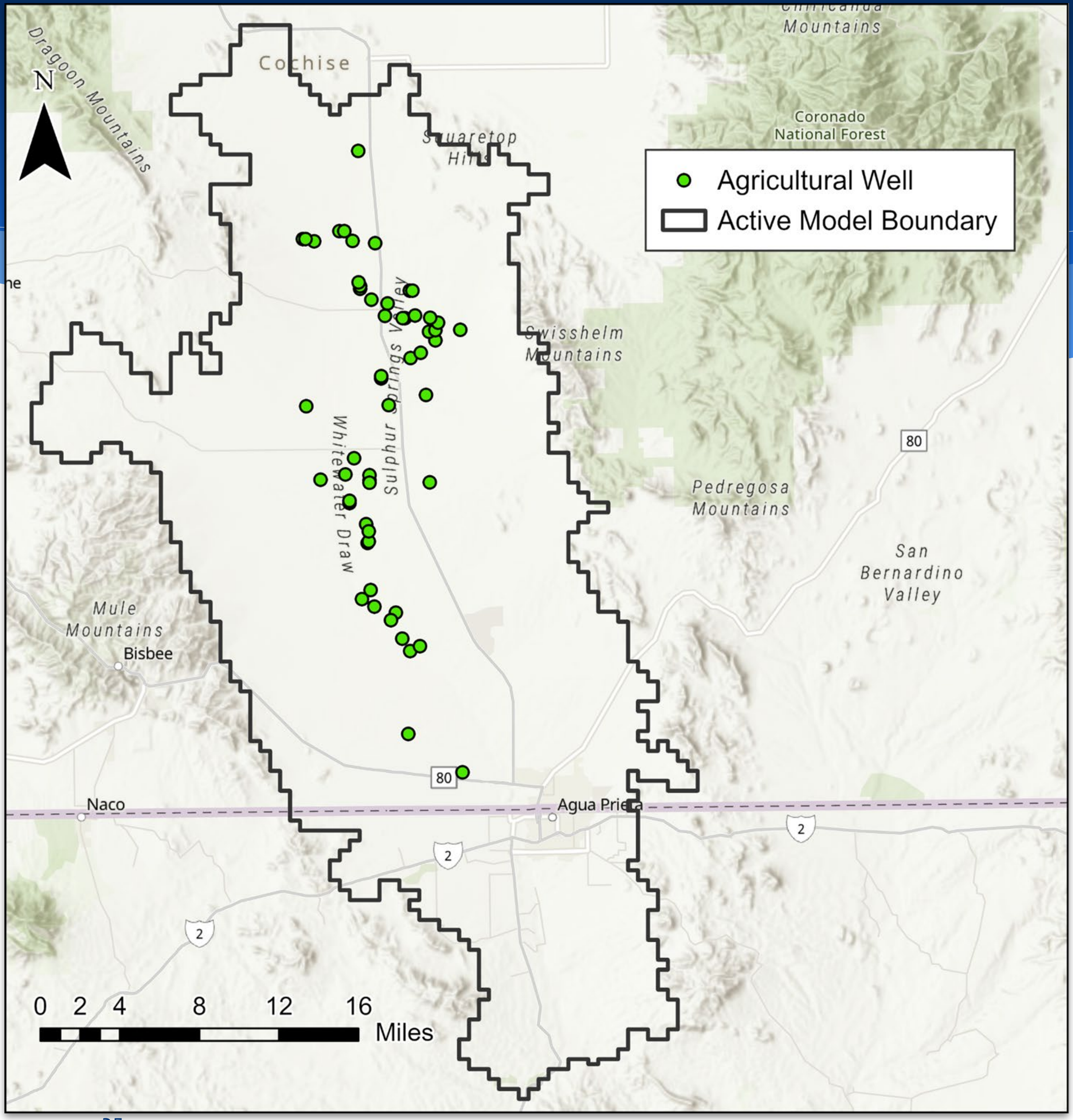


Outflows

Agricultural Pumping (1940)

Agricultural Pumping

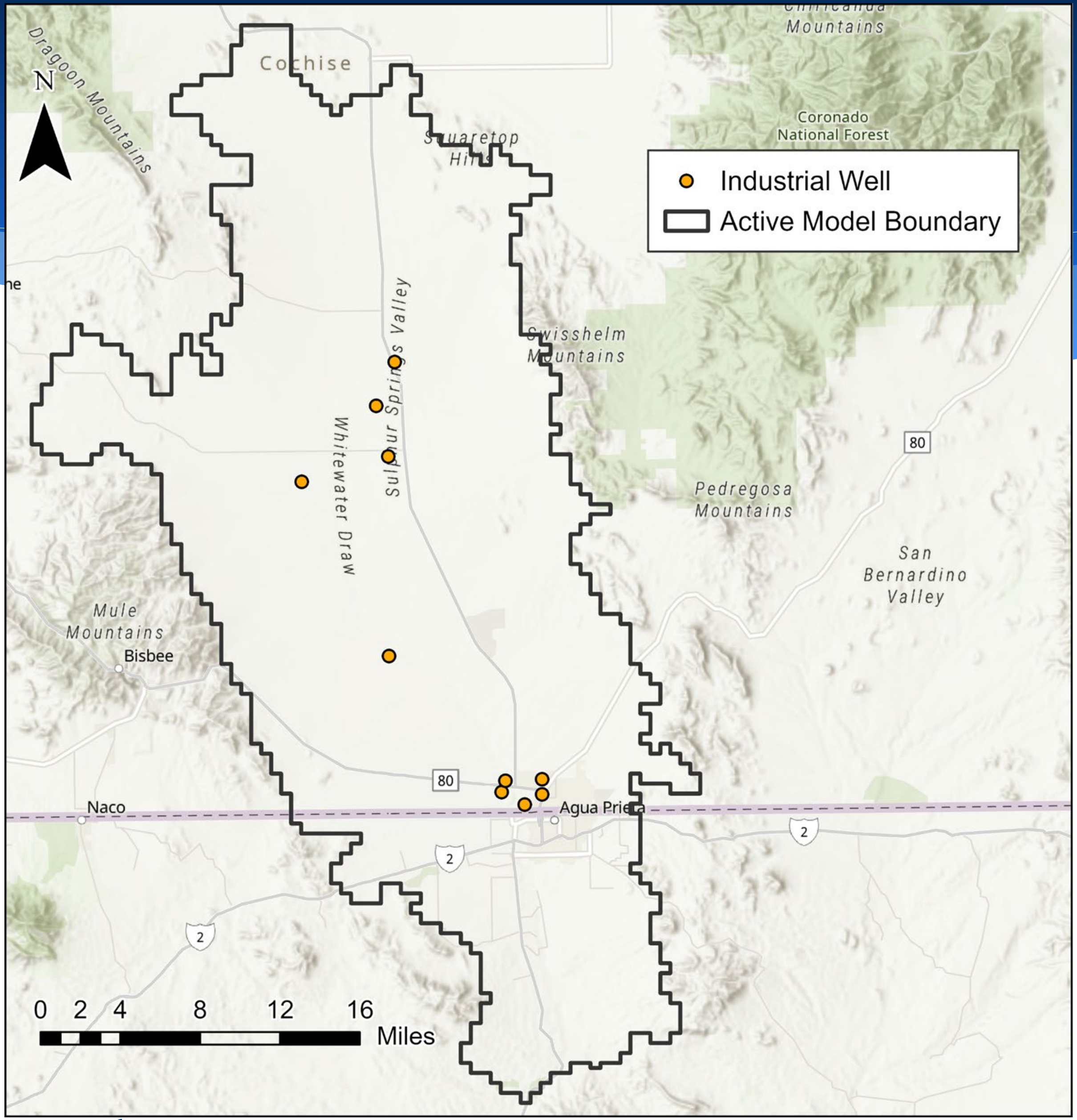
- ➢ 62 pumping wells
- ➢ Total agricultural pumping is about 3,750 AFY (USGS estimate)
- ➢ Pumping was distributed evenly to all wells. Each well is assigned about 60 AFY in the model
- ➢ Pumping is minimal in the steady-state period



Outflows
Industrial Pumping (1940)

Industrial Pumping

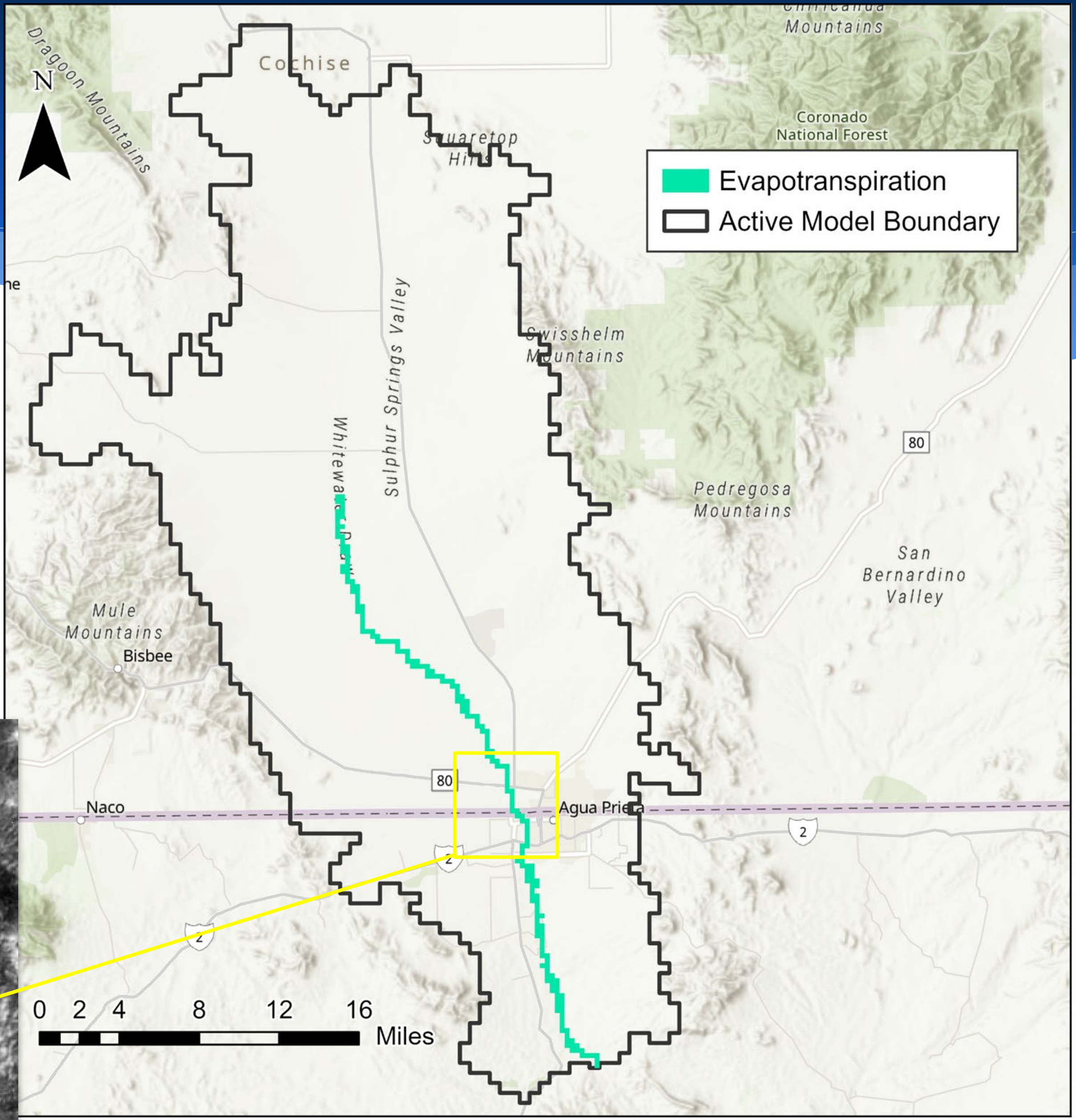
- 10 pumping wells
- Total industrial pumping was about 1,345 AFY (USGS estimate)
- Pumping was distributed to wells based on their historical water use and industrial water use analysis reports
- Pumping is minimal in the steady-state period

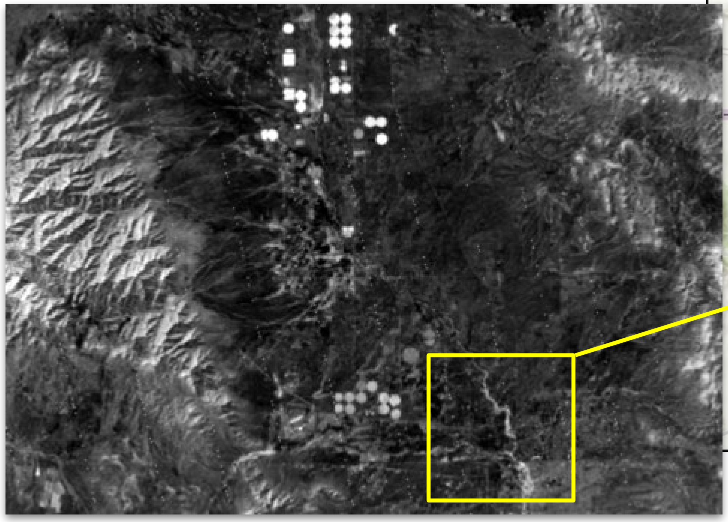


Outflows
Evapotranspiration (1940)

Evapotranspiration

- ➢ Evapotranspiration volumes were estimated from OpenET datasets
- ➢ The maximum uptake rate for the riparian vegetation is about 1,200 mm/year
- ➢ ET occurs along Whitewater Draw where riparian vegetation is present





Next Steps

Next Steps

- ➢ Calibrate the steady-state model
  - ■ The primary calibrated value in our model will be hydraulic conductivity. Any additional aquifer tests would be helpful to fill this data gap.
- ➢ Develop and calibrate the transient model
- ➢ Document the modeling process
- ➢ Publish the completed model

❖ The entire modeling process can take 3-4 years.

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clinehan@azwater.gov

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elodolce@azwater.gov

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Douglas AMA

First Management Plan

Casey Allman & Madison Moreno

AMA Establishment

Arizona Department of Water Resources

August 28, 2024

DAMA Management Plan

* Consistent with A.R.S. § 45-569 (B) "[…]the director, in developing the plan or plans, shall include measures for reducing groundwater withdrawals which follow as closely as practicable the program set forth in sections 45-564 through 45-568 […]"

Douglas AMA Designation: December 1, 2022

Tentative Promulgation of Initial Management Plan: December 1, 2024

Tentative Effective Date for Conservation Requirements: January 1, 2027

Management Plan Overview

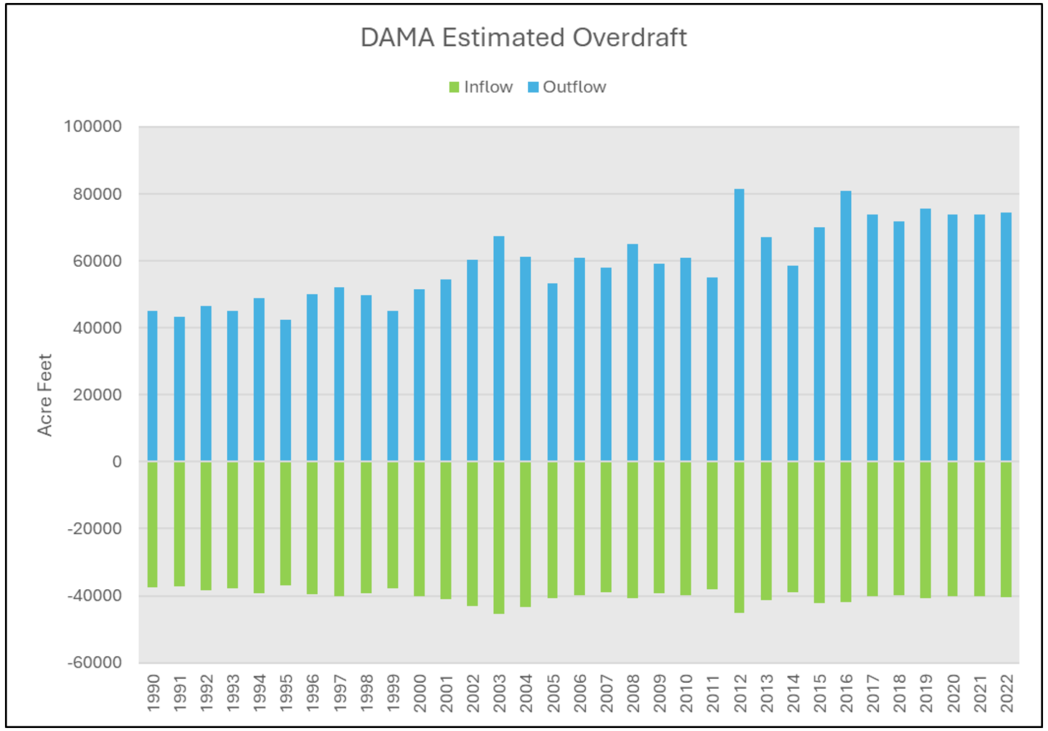
The Douglas AMA 1st Management Plan is laid out as follows. Each chapter will be reviewed during this presentation -

Executive Summary & Introduction

* History and background about the 1980 Groundwater Management Act and the creation of the Douglas AMA
* Stakeholder engagement and development process
* DAMA Management Goal: "The management goal of the DAMA is to support the general economy and welfare of water users in the basin by reducing the rate of aquifer depletion by an amount established in the first management plan and by additional reductions established in each subsequent management plan every 10 years thereafter"

DAMA Management Goal

- Given the DAMA goal of "...reducing the rate of aquifer depletion by an amount established in the first management plan...", the Department aims to decrease the rate of overdraft by 340 AF per year or a total of 3,400 AF over ten years.



Hydrology

* The Douglas Active Management Area (DAMA) covers 949 square miles in Cochise County of southeastern Arizona.
* Groundwater is the main source of water used throughout the Douglas basin.
* As groundwater is withdrawn at greater rates and the water table lowers, land subsidence occurs.

Supply and Demand

* The Department published the DAMA Supply and Demand Assessment Report in December 2023
* Agriculture accounts for 87% of demand
* The Department estimates that there is an insufficient annual supply to meet annual demand, causing an increased rate of aquifer depletion

	1990	2005	2022
Supply	20,805	18,664	22,170
Demand	-37,505	-50,450	-67,494
Balance	-16,700	-31,785	-45,324
Resulting Water Available in Storage	8,883,700	8,502,000	7,754,700

Recharge and Recovery

* The purpose of the Recharge Program is to encourage the development, delivery, use, and storage of renewable water supplies now and in the future.
* Persons who elect to undertake recharge-related activities must obtain the necessary permits from the Department.

Agricultural Conservation Program

* Required of all Irrigation Grandfathered Right holders

* Two Agricultural Conservation Programs
  * Base Program
  * Integrated Farm Program

The Base Program

* Allotment based program
* Utilizes crop consumptive use, irrigation efficiencies, and acreage to determine the annual allotment

Irrigation Water Duty= Total Irrigation Requirements per Acre / Assigned Irrigation Efficiency Irrigation

Allotment= Irrigation Water Duty X Water Duty Acreage

Crop Consumptive Use

* The Department calculated consumptive use numbers to calculate water duties and allotments for Irrigation Grandfathered Right holders.
* The Blaney-Criddle method uses temperature, daylight hours, evapotranspiration, growing seasons, and crop coefficients to determine how much water a specific crop needs to produce in a single year.
* ADWR considered available crop data from the USGS and reported data in the development of the numbers.

Irrigation Efficiencies

Acres	Set Irrigation Efficiency
10-99	80%
100-149	83%
150+	85%

* Irrigation efficiency is a component to the larger calculation for Irrigation Grandfathered Right allotments
* Tiered system based on acreage

Integrated Farm Program

* The Integrated Farm Program is an alternative program that allows the owner/operator of IGFRs to combine the allotments and apply that water anywhere within the combined footprint of the IGFRs.
* The owner/operator of the IGFRs will be able to file a single annual report for the combined IGFRs
* With the combination of the allotments, there will be a 5% cut to the aquifer, therefore the total allotment of the farm unit would be the sum of the individual allotments of the enrolled IGFRs minus five percent of the total

Municipal Conservation Program

* Large Municipal Providers
  * Integrated Water Resource Plan
  * Lost and Unaccounted for Water requirement
* Small Municipal Providers
  * Required to minimize waste of all water supplies, maximize efficiency, encourage reuse, and improve water use efficiency
  * Lost and Unaccounted for Water requirement

Lost and Unaccounted for Water

* All municipal providers must limit the total amount of lost and unaccounted for water in their distribution system
  * Large Municipal Providers
    * No more than **10 percent** of total quantity of water
  * Small Municipal Providers
    * No more than **15 percent** of total quantity of water

Integrated Water Resource Plan

* The IWRP is a scenario planning program designed to increase water use efficiency, promote reuse, and reduce the withdrawals of groundwater while anticipating potential challenges

Individual User Requirement

* An individual user is a person who receives water from a municipal provider for non-irrigation use.
* An individual user is responsible for their own conservation requirements and compliance status

Industrial Conservation Program

* An industrial user is a person who uses groundwater withdrawn pursuant to a Type 1 or Type 2 non-irrigation grandfathered right (GFR) or a withdrawal permit for an industrial use.
* All industrial users are required to submit a conservation plan to the Department

Turf Facilities

* Turf-related facilities include schools, cemeteries, golf courses, or common areas within a housing subdivision, with 10 or more acres of water intense landscaping.
* Base allotments are calculated using the total acreage of turf, low water use landscaped area, water surface area, and an acre-foot by acre application rate. There are two different application rates for golf courses and non-golf courses.

Sand and Gravel Facilities

* Regulated sand and gravel facilities that use more than 100 AF of water in a calendar year.
* Must include two additional best management practices and submit a conservation plan

Power Plants

* Steam electrical plants, Combustion turbine plants, & Combined-cycle plants
* Must submit conservation plan outlining water management practices and technologies the facility is using and will use to maximize water use efficiency

Cooling Facilities

* Cooling tower's purpose is to cool water that has absorbed the heat of a heat-generating process
* They are defined as industrial facilities if they have a minimum cooling capacity of 1,000 tons
* Responsible for submitting a conservation plan of ways to maximize water use efficiency

Dairy Facilities

* Dairy operations that annually house a monthly average of 100 or more lactating cows per day
* Allotment based requirements based on head count of lactating and non-lactating cattle
* Must submit a conservation plan that outlines measures for maximum water use efficiency

Feedlot Facilities

* Cattle feedlot operations that annually house and feed an average of 100 or more beef cattle per day
* Allotment based requirements based on head count of beef cattle
* Must submit a conservation plan that outlines measures for maximum water use efficiency

Mining Program

* Facilities that mine and process ores and use, or have the potential to use, more than 500 AF of water per year.
* Long-range conservation plan
* Minimize water use to the extent practicable

New Large Industrial or Commercial User Program

* New large industrial or commercial users in the 1MP are industrial users that use over 100 AF per year and commence use after January 1, 2027
* Must submit a conservation plan to the Department

Implementation & Compliance

* Administrative review and Variance process
  * Recognizes that certain individual conservation requirements may pose hardships, these processes allow relief in certain situations.

Water Strategy

* The First Management Plan for the Douglas AMA begins the path towards reducing the withdrawals of groundwater.
* This plan and the conservation requirements set forth therein are just one part of a set of tools that allow Arizona to manage its water supplies carefully.

Call to the Council

Additional comments will be accepted through September 9th.

Please submit any informal comments via email
to ManagementPlans@azwater.gov

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Ryan will provide an update on Active Management Areas and Arizona Department of Water Resources activities.

6. Call to the Council – *Council*

7. Call to the Public – *Chair*

8. Adjournment – *Chair*

Meeting Agenda

1. Call to Order – Welcome & Introductions – *Chair*

2. Meeting Logistics – *Nicholas Mason, ADWR*

3. Hydrology Update – *Emily LoDolce, ADWR*

Emily will provide an update on groundwater modeling for the Douglas AMA.

4. DAMA First Management Plan Informal Draft

a. 1st Management Plan Draft Overview and Explanation – *Madison Moreno & Casey Allman, ADWR*

b. GUAC Discussion and Comment to Director – *Council*

5. AMA Deputy Director Report – *Ryan Melson, ADWR*

Ryan will provide an update on Active Management Areas and Arizona Department of Water Resources activities.

6. Call to the Council – *Council*

7. Call to the Public – *Chair*

8. Adjournment – *Chair*

Meeting Agenda

1. Call to Order – Welcome & Introductions – *Chair*

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6. Call to the Council – *Council*

7. Call to the Public – *Chair*

8. Adjournment – *Chair*