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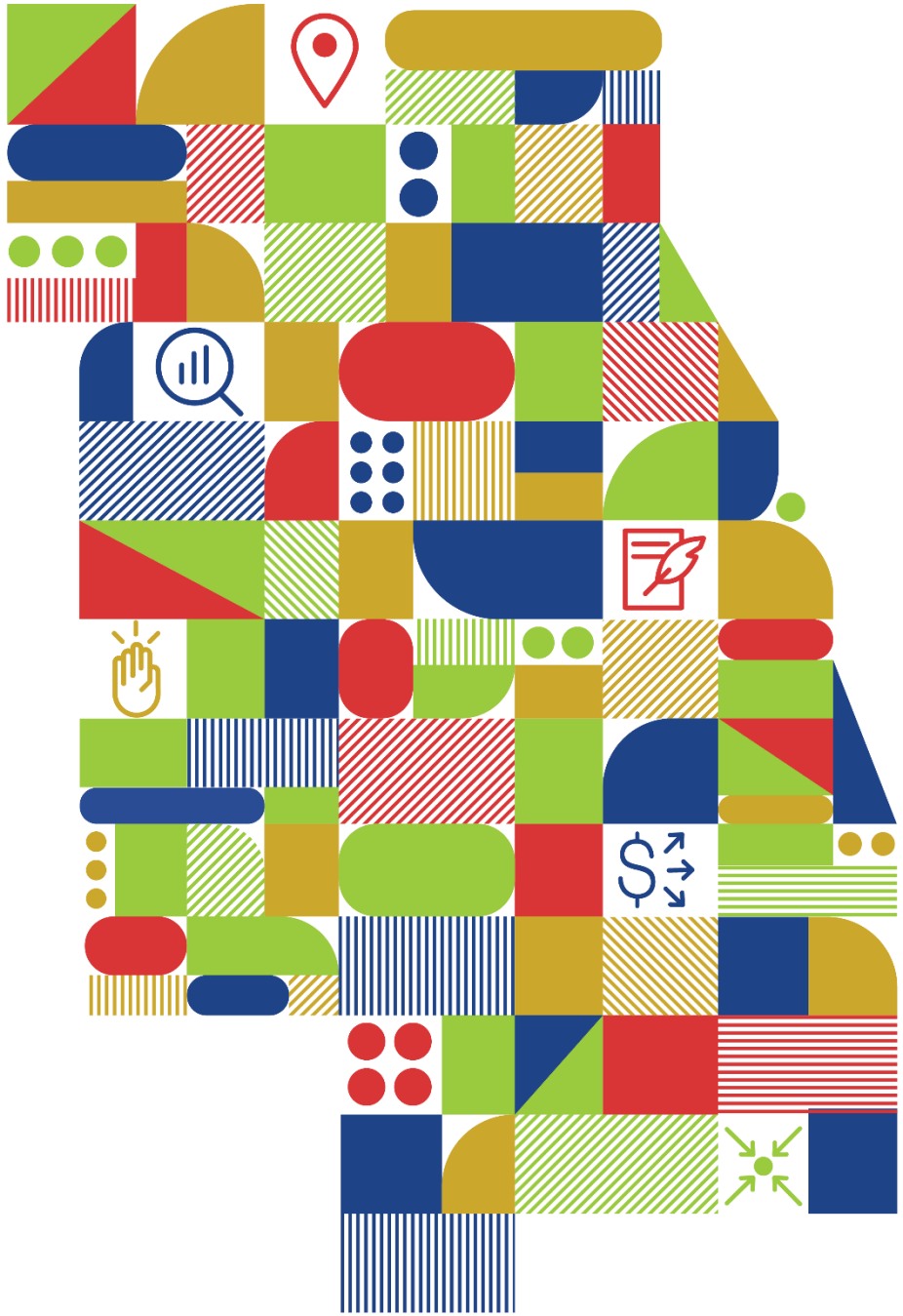
# Sustainability goals used in planning efforts in other states

April 26, 2022



# IDNR Grant Proposal

Develop a Water Supply Sustainability Plan

- Utilize ISWS sustainable yield estimates to establish water use sustainability goal
- Outline strategies to get there
- Estimate performance of strategies for reaching goal
- Work to build consensus around needed strategies and voluntary reduction targets

***NWPA Mission Statement:***

The NWPA, formed by intergovernmental agreement, seeks to collaboratively plan for and steward our shared river and groundwater resources to ensure a sustainable water supply for the people, economy, environment, and future generations.

***NWPA Vision Statement:***

The NWPA area will have dependable supplies of water for generations to come.

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# NWPA Water Supply Sustainability Plan

Planning process would provide NWPA members with the answers to the following questions:

- How much less water do we need to use?
- How far will specific conservation strategies get us?
- What strategies are the most effective?

# NWPA Water Supply Sustainability Plan

## What it is

Voluntary

Broad water use reduction targets for the NWPA region, not focused on any one municipality

Raises awareness of the need for action and provides steps

## What it is not

Does not establish any new or broader regulatory authority

Does not address unique conditions and issues facing individual municipalities

Some locations may need to conserve more water

Local governments, particularly in risk areas, will still need to develop their own local plans

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# Case studies

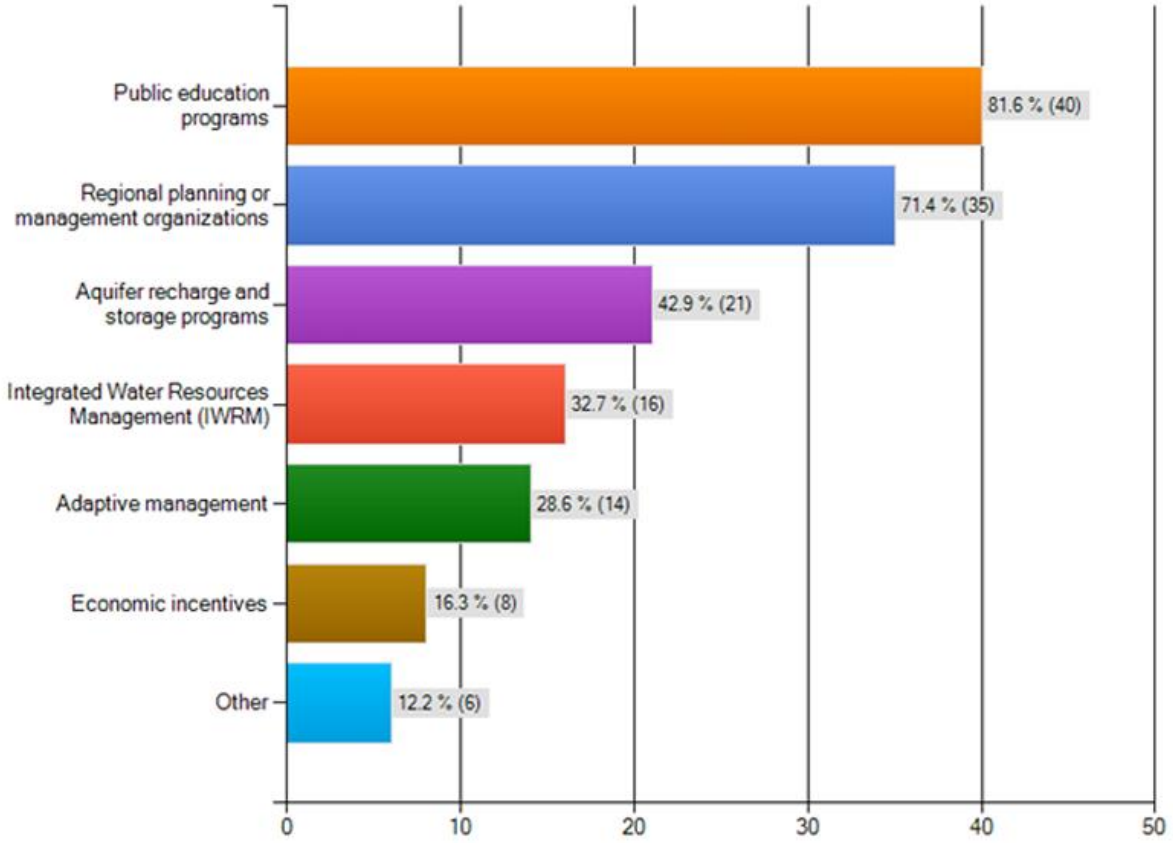
# Why look to other states?

Contamination and over-withdrawal of groundwater sources are issues other states are dealing with too.

Survey of States shows that most have updated policies and/or anticipate further changes in the coming years.

Learn from others to see if similar approaches could work in northeastern Illinois.

**State employing particular groundwater management strategies**

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Gerlak, A., Megdal, S. B., Varady, R., & Richards, H., “Groundwater governance in the U.S.: Summary of initial survey results”, May 2013 (https://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/pdfs/GroundwaterGovernanceReport-FINALMay2013.pdf).

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# Planning efforts

Looked for states that have a groundwater management planning process.

- Minnesota
- Texas
- California

Each state provides guidance on what these plans need to cover and how to establish goals.

For each, we present:

- Overview of planning process
- How is sustainable yield determined?
- How is sustainability defined?
- How are the above 'operationalized' in an example plan?

# Texas

# Texas

**Planning entity:**
Groundwater Conservation Districts (GCDs)

**Sustainable management criteria:**
Achieve "Desired Future Conditions," which are quantifiable future groundwater conditions (particular groundwater level, a level of water quality, a volume of spring flows, etc)

**Timeline:**
50 years

**Required plan components:**
GCDs must consider the plans of other GCDs within the same Groundwater Management area and jointly develop the slate of "desired future conditions.“

- existing total usable volume of groundwater;
- annual groundwater use;
- annual amount of recharge in the district/ recharge potential
- Measurable performance standards and management objectives, actions necessary to achieve objectives Modeled Available Groundwater (MAG) in the GCD based on the desired future condition (DFC) in 50 years.

**Plan review:**
Texas Water Development Board (TWDB)

# Texas

Groundwater Conservation Districts (GCDs) work together within the 16 Groundwater Management Areas (GMAs) to develop Desired Future Conditions (DFCs)

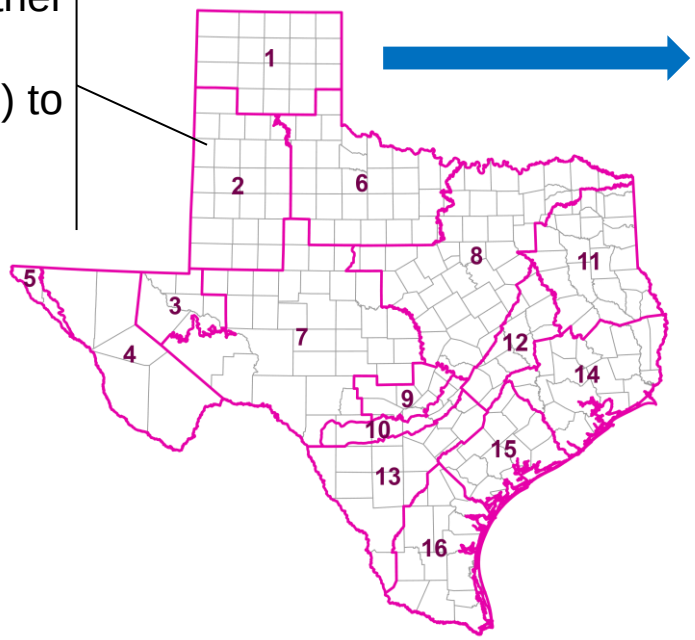
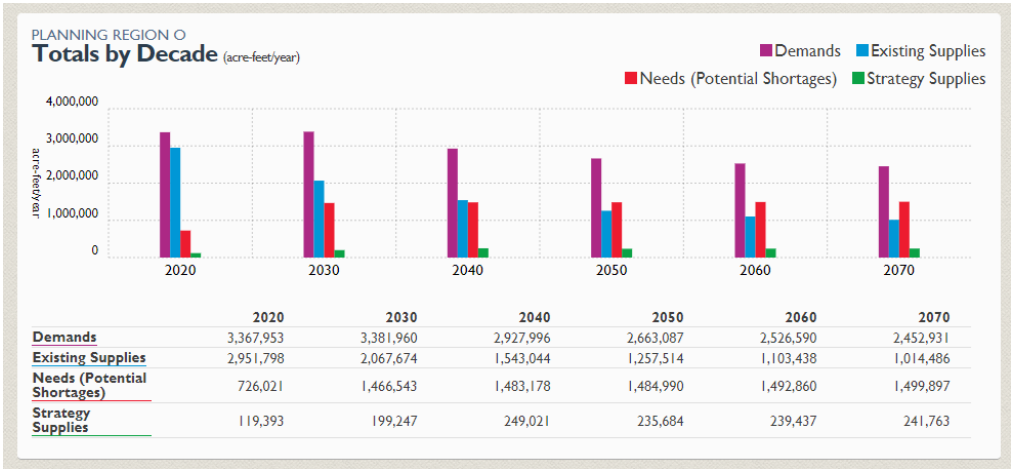



**Table 3-2. Desired Future Conditions for Portions of GMAs 2 and 6 Corresponding to the Llano Estacado Region**

| GMA | Aquifer | DFC Description | Adoption Date |
|---|---|---|---|
| 2 | Ogallala and Edwards Trinity (High Plains) | Average drawdown of between 23 and 27 feet for all of GMA 2 from 2012 to 2070. | 10/19/2016 |
| 2 | Dockum | Average drawdown of 27 feet for all of GMA 2 from 2012 to 2070. | 10/19/2016 |
| 6 | Dockum | 27 feet decline from 2020 - 2070 | 11/17/2016 |
| 6 | Ogallala | 23 - 27 feet decline from 2020 - 2070 | 11/17/2016 |
| 6 | Seymour | 15 feet decline from 2020 - 2070 | 11/17/2016 |

GMA = Groundwater Management Area; DFC – desired future condition

Desired future conditions can include declines in aquifer levels.




| | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|
| Demands | 3,367,953 | 3,381,960 | 2,927,996 | 2,663,087 | 2,526,590 | 2,452,931 |
| Existing Supplies | 2,951,798 | 2,067,674 | 1,543,044 | 1,257,514 | 1,103,438 | 1,014,486 |
| Needs (Potential Shortages) | 726,021 | 1,466,543 | 1,483,178 | 1,484,990 | 1,492,860 | 1,499,897 |
| Strategy Supplies | 119,393 | 199,247 | 249,021 | 235,684 | 239,437 | 241,763 |

The Texas Water Development Board uses the DFCs to determine how much groundwater is available -- modeled available groundwater -- for withdrawal and these form the State Water Plan

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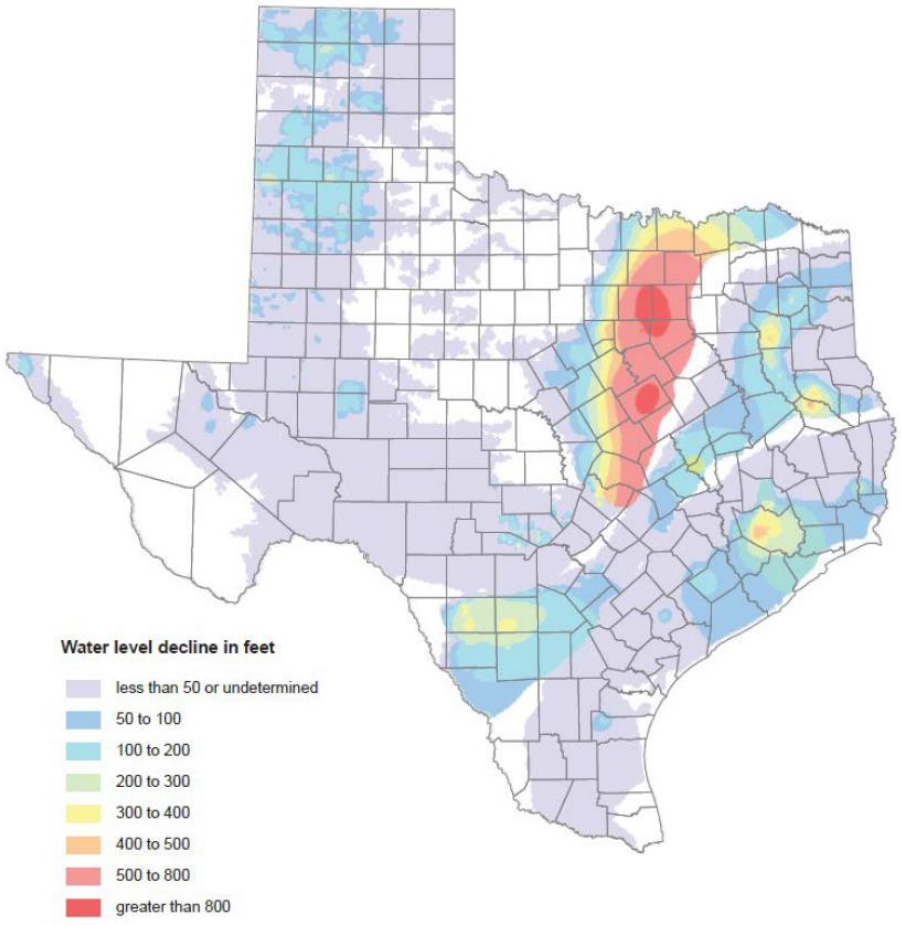
# Mace, 5 gallons in a 10 gallon hat

- Mace reviews ***maximum sustainable production*** (not sustainable yield) against the planned Desired Future Conditions for each of the groundwater management areas.

- Defines maximum sustainable production as the maximum amount of groundwater that can be produced indefinitely regardless of environmental, economic, or social consequences.

- A planning process that identifies unacceptable environmental, economic, or social consequences for groundwater sustainability would likely result in a sustainable yield less than the maximum sustainable production.




Mace, Robert E. 2021. “Five Gallons in a Ten Gallon Hat: Groundwater Sustainability in Texas,” The Meadows Center for Water and the Environment, Texas State University, Report 2021-08.

# Texas

- ~ 95% of locally-expressed desired future conditions are based on water-level declines
- Groundwater is currently being produced at 1.8 times the maximum sustainable production amount, and groundwater is expected to be produced 2.4 times the maximum sustainable production amount in the future.
- Of the 21 aquifer systems analyzed, 13 are currently being produced at or below the maximum sustainable production amount. But in the future, this drops down to 5.

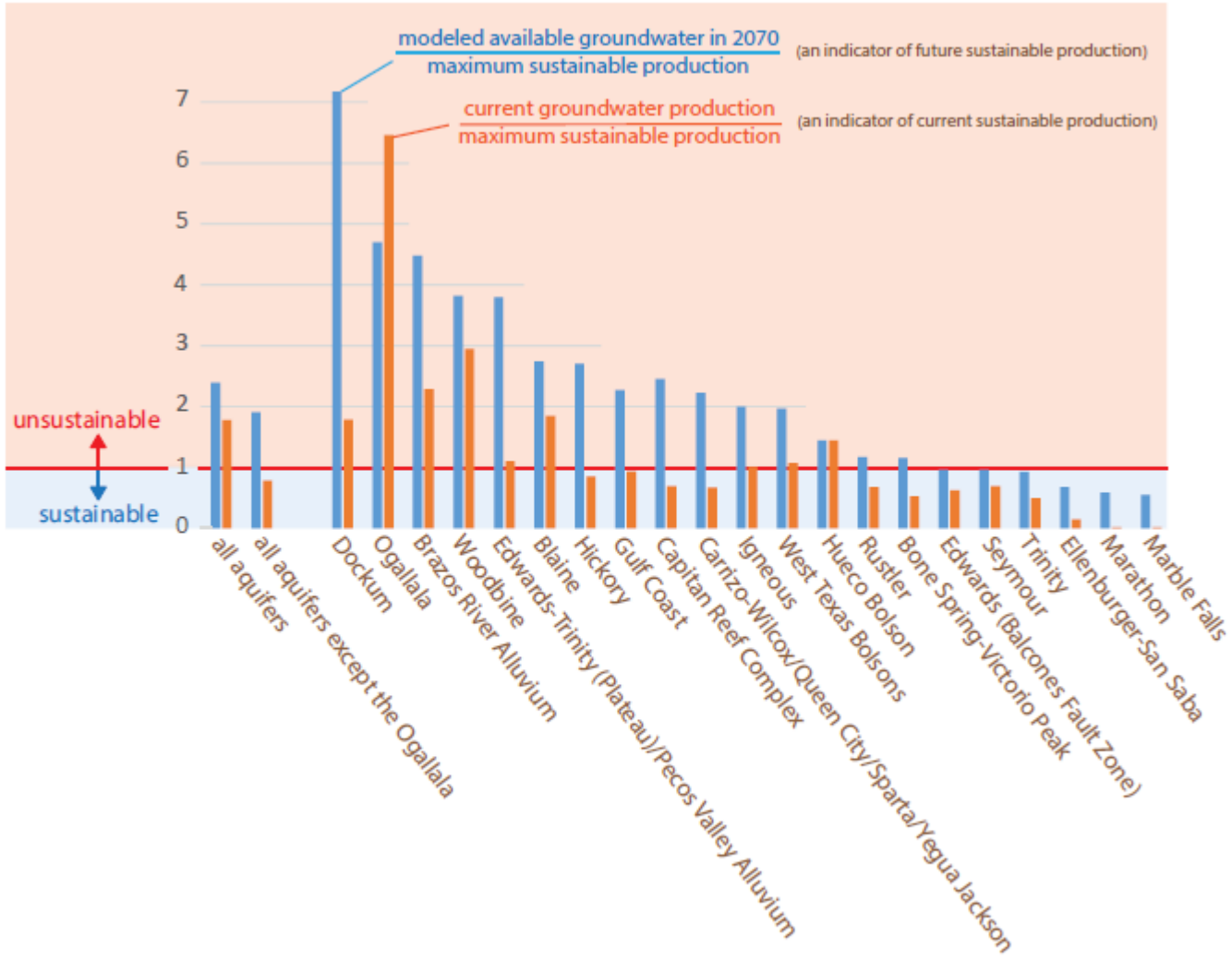



FIGURE 9. CURRENT AND FUTURE SUSTAINABILITY OF THE STATE'S AQUIFERS.

Mace, Robert E. 2021. "Five Gallons in a Ten Gallon Hat: Groundwater Sustainability in Texas," The Meadows Center for Water and the Environment, Texas State University, Report 2021-08.

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# California

# California

**Planning entity:**
Groundwater Sustainability Agencies (GSAs) in high-and medium-priority basins.

**Planning Geography:**
A basin prioritization process determines the requirement for forming GSAs and preparing groundwater sustainability plans (GSPs).

**Goal:**
the management and use of groundwater in a manner than can be maintained during the planning and implementation horizon without causing undesirable results.

**Each plan is designed to avoid six undesirable results:**
- Lowering of Groundwater Levels
- Reduction of Storage
- Seawater intrusion
- Degraded quality
- Land subsidence
- Surface water depletion

**Required plan components:**
- Basin description;
- Water budget;
- Establish sustainable management criteria, including developing minimum thresholds for each of the 6 undesirable results;
- Climate change incorporation;
- Strategies;
- Monitoring network plans to monitor sustainability criteria

**Implementation Geography:**
A GSA can define management areas that are required to meet different undesirable result minimum threshold criteria and therefore have different implementation actions

**Plan review:**
State

# What is groundwater sustainability?

## sustainable yield & groundwater levels

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# California

**Six undesirable results**

| Sustainability Indicators | Lowering GW Levels | Reduction of Storage | Seawater Intrusion | Degraded Quality | Land Subsidence | Surface Water Depletion |
|---|---|---|---|---|---|---|
| **Metric(s) Defined in GSP Regulations** | • Groundwater Elevation | • Extraction Volume | • Chloride concentration isocontour | • Migration of Plumes<br>• Number of supply wells<br>• Volume<br>• Location of isocontour | • Rate and Extent of Land Subsidence | • Volume or rate of surface water depletion |

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# California

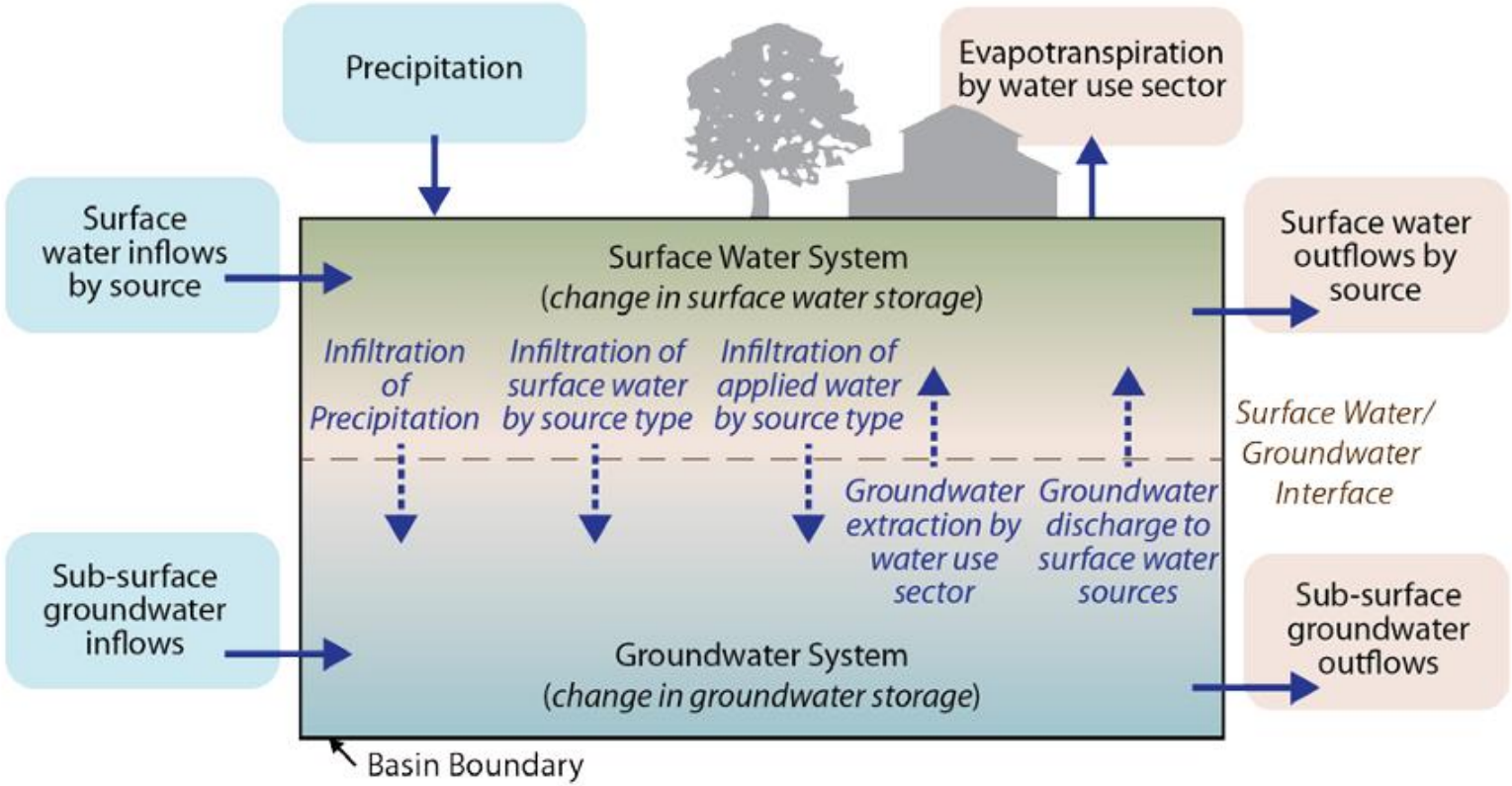


**Figure 5 – Required Water Budget Components**

The water budget shall quantify the following, either through direct measurements or estimates based on data:

1. Total surface water entering and leaving a basin by water source type.
2. Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.
3. Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.
4. The change in the annual volume of groundwater in storage between seasonal high conditions.
5. If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.
6. The water year type associated with the annual supply, demand, and change in groundwater stored. An estimate of sustainable yield for the basin.

# California

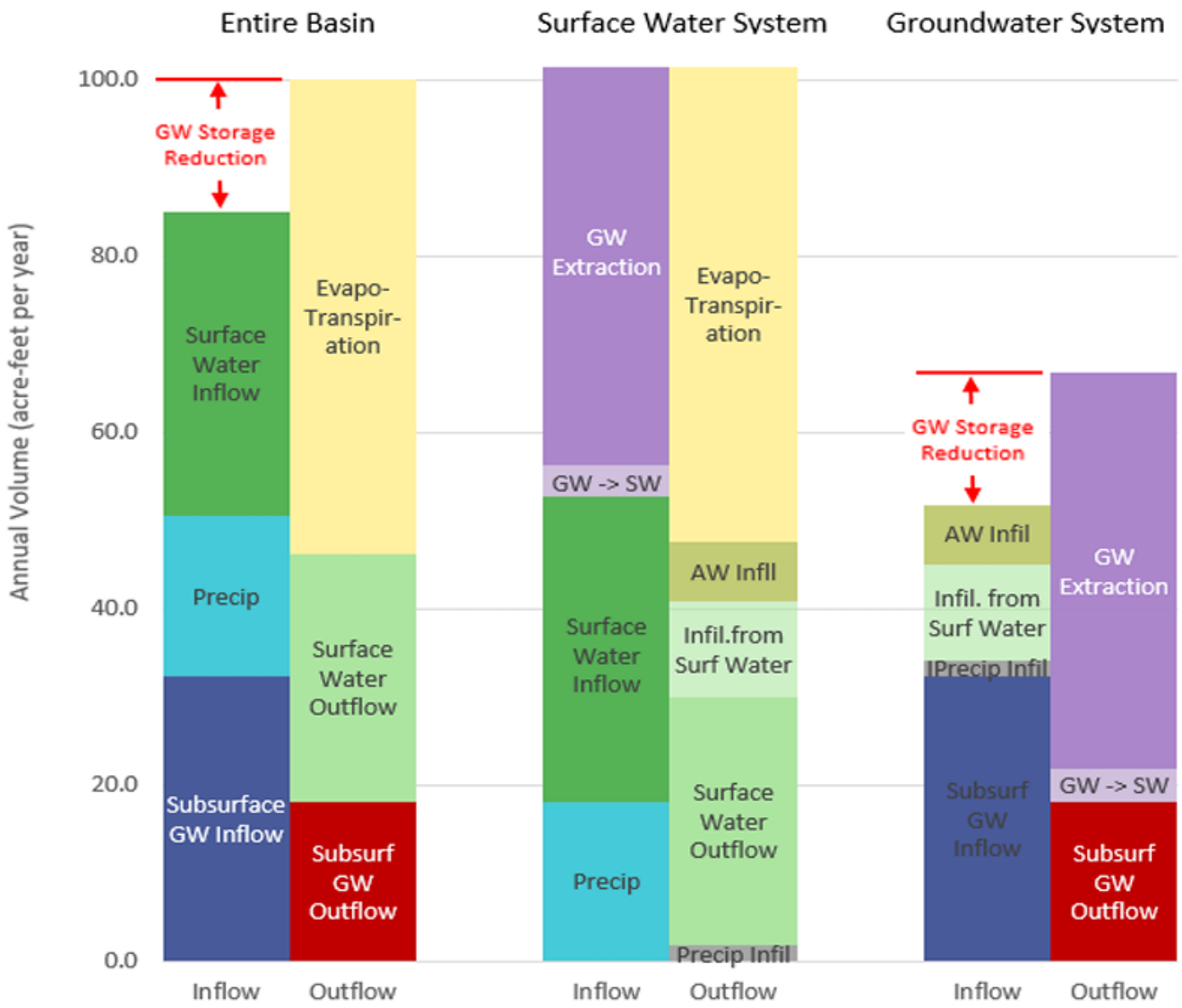


**Figure 6 – Paired Bar Water Budgets**

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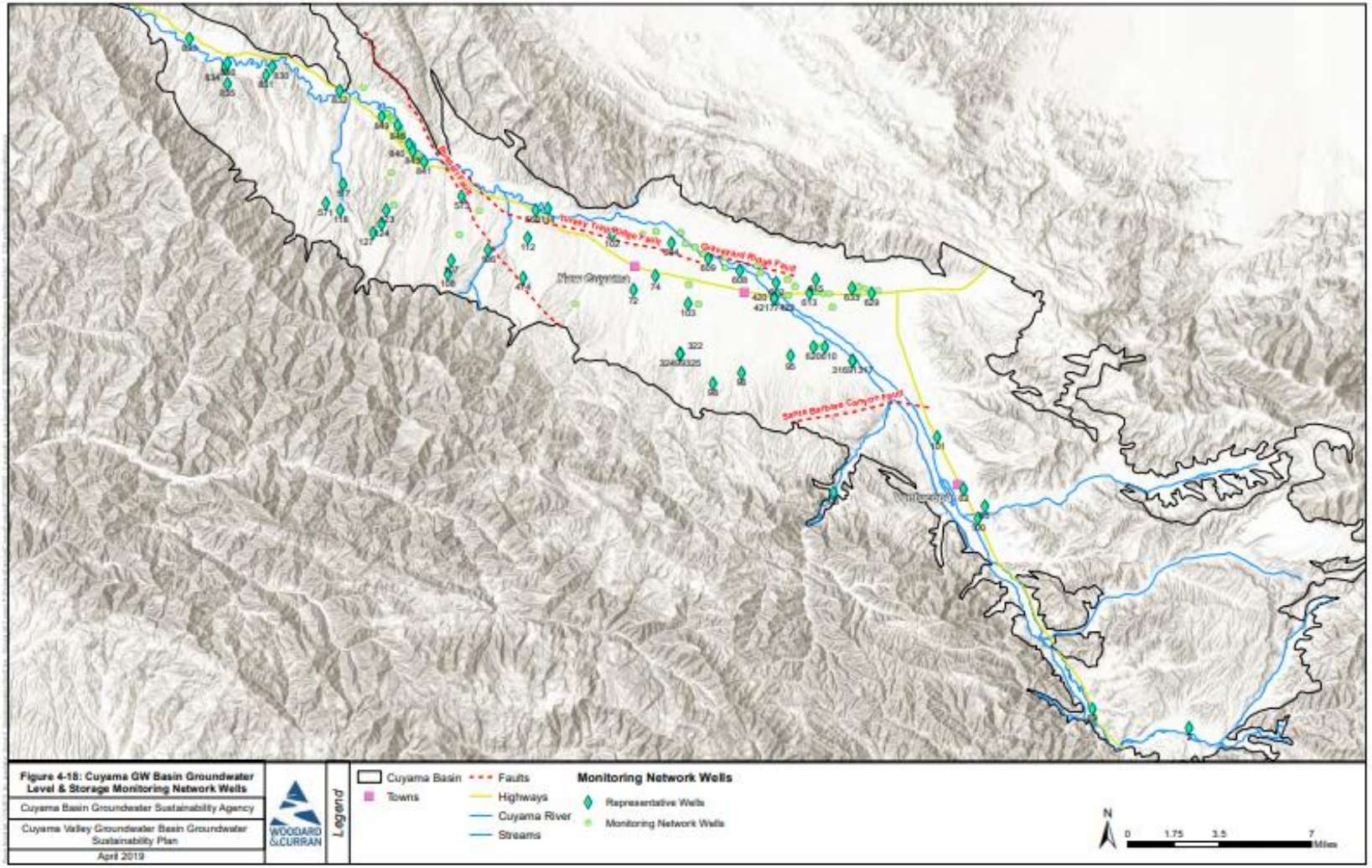
# California




Representative Monitoring Sites Example

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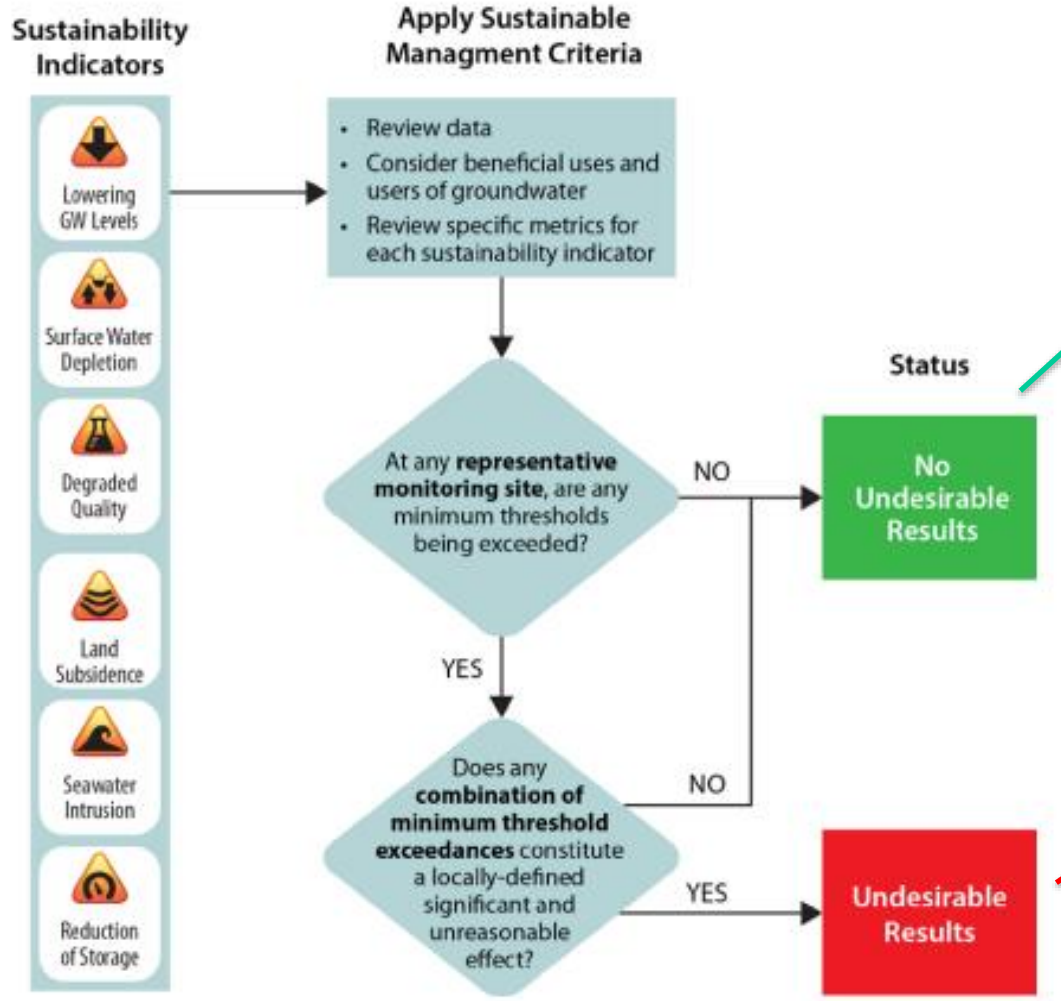
The relationship between sustainability indicators, minimum thresholds, and undesirable results is shown in the illustration below.



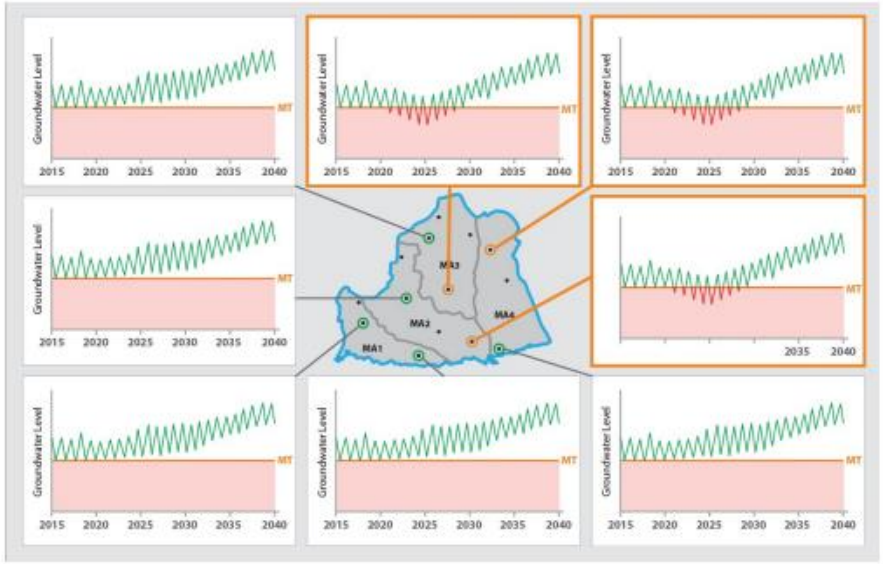



Figure 12. Example Groundwater Level Representative Monitoring Sites – Scenario 2

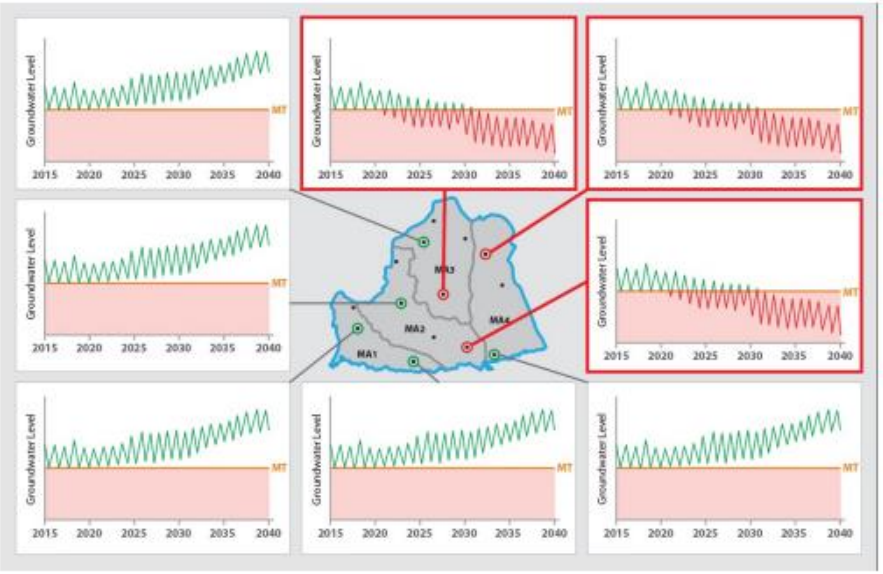


Figure 13. Example Groundwater Level Representative Monitoring Sites – Scenario 3

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# Timeframe

# California – Planning Timeframe

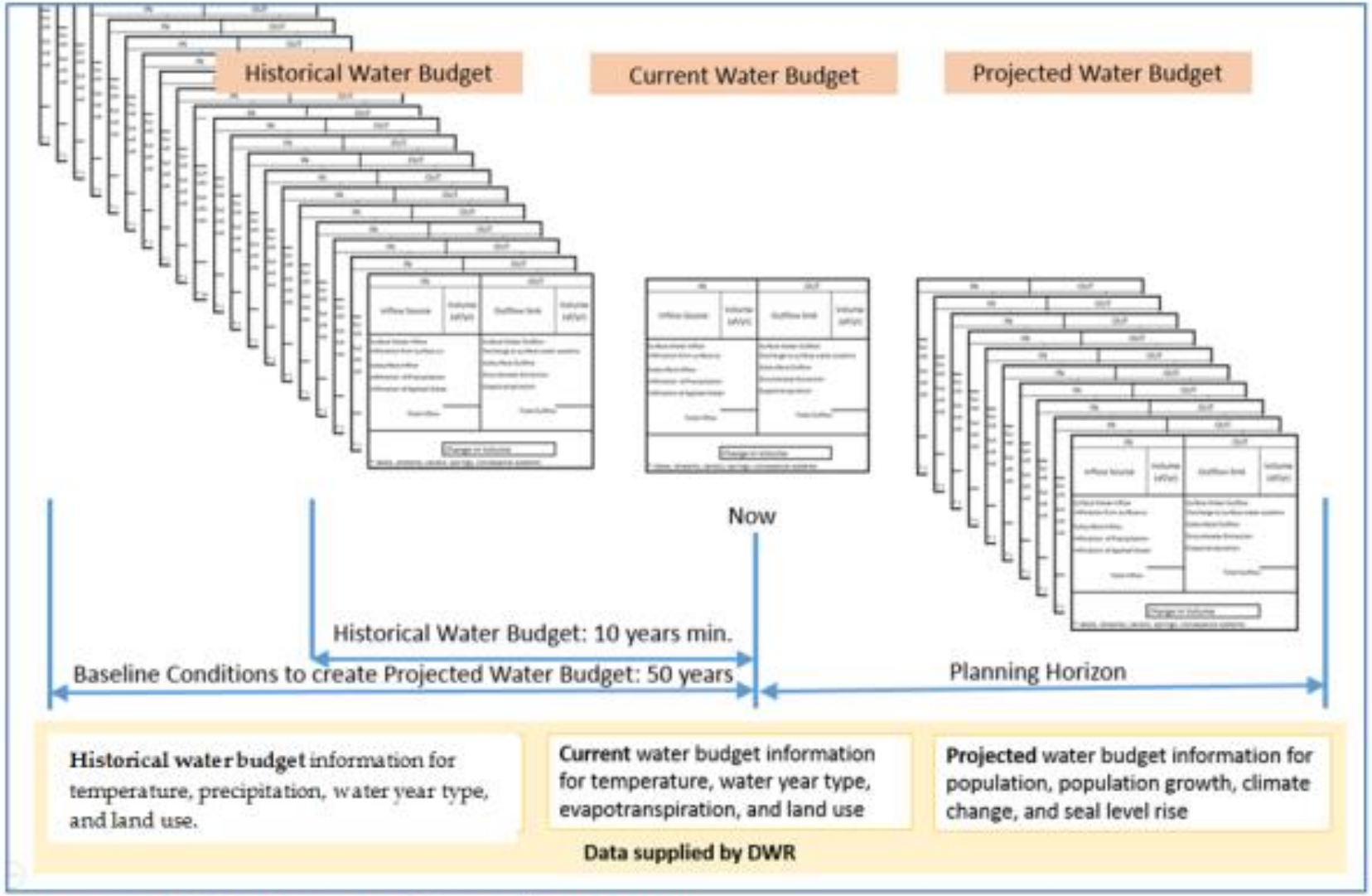


**Figure 9 – GSP Water Budget Time Frames**

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# California

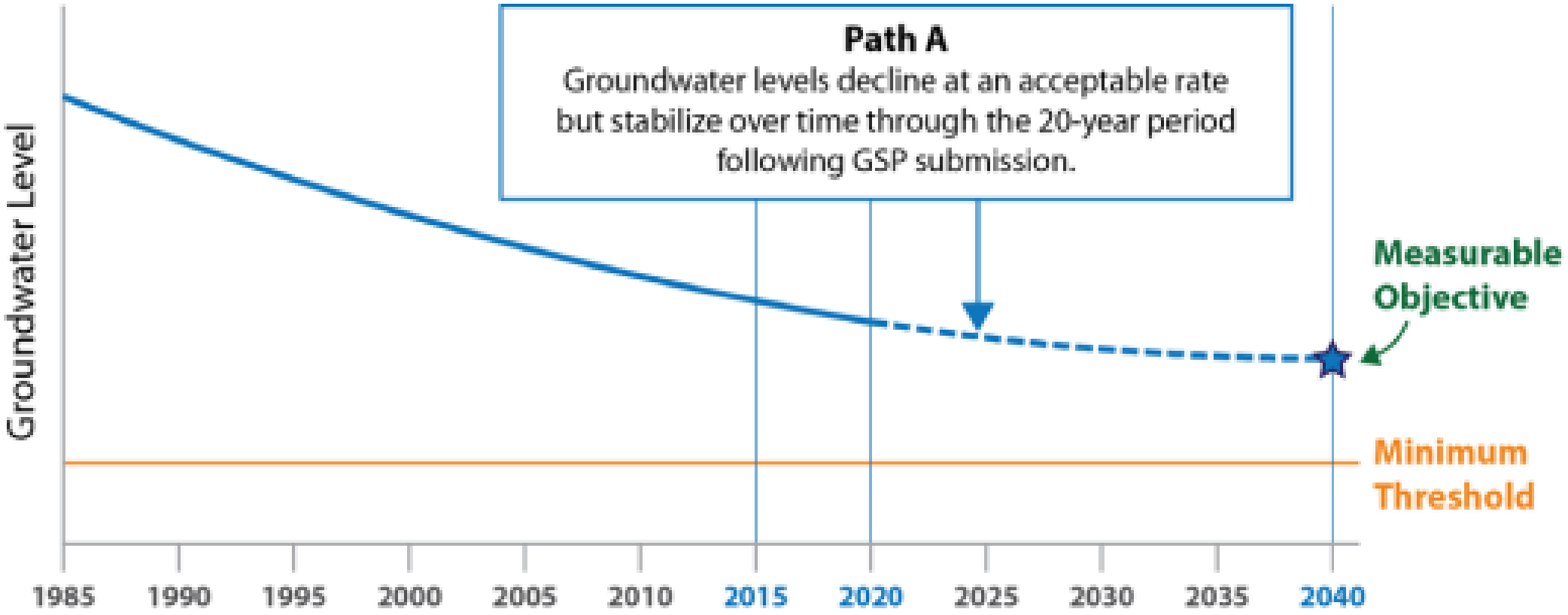


Figure 15. Potential Paths to Sustainability

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# California

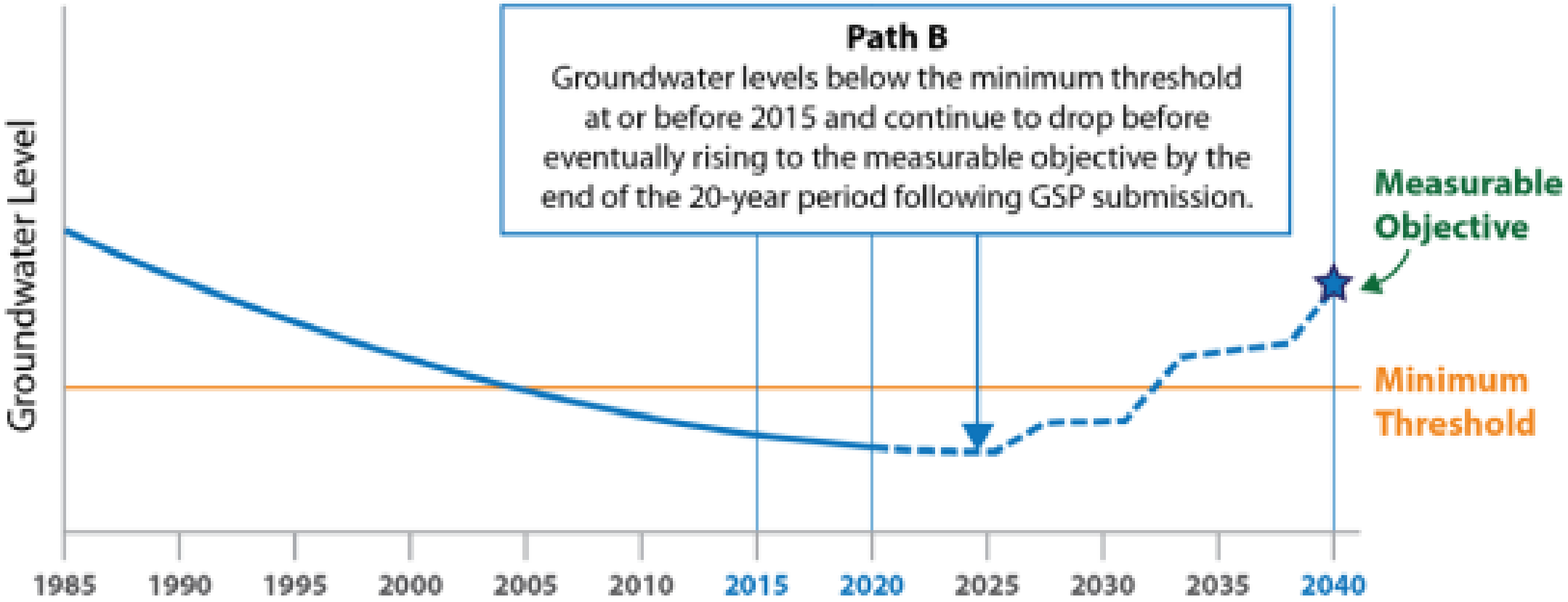


Figure 15. Potential Paths to Sustainability

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# California

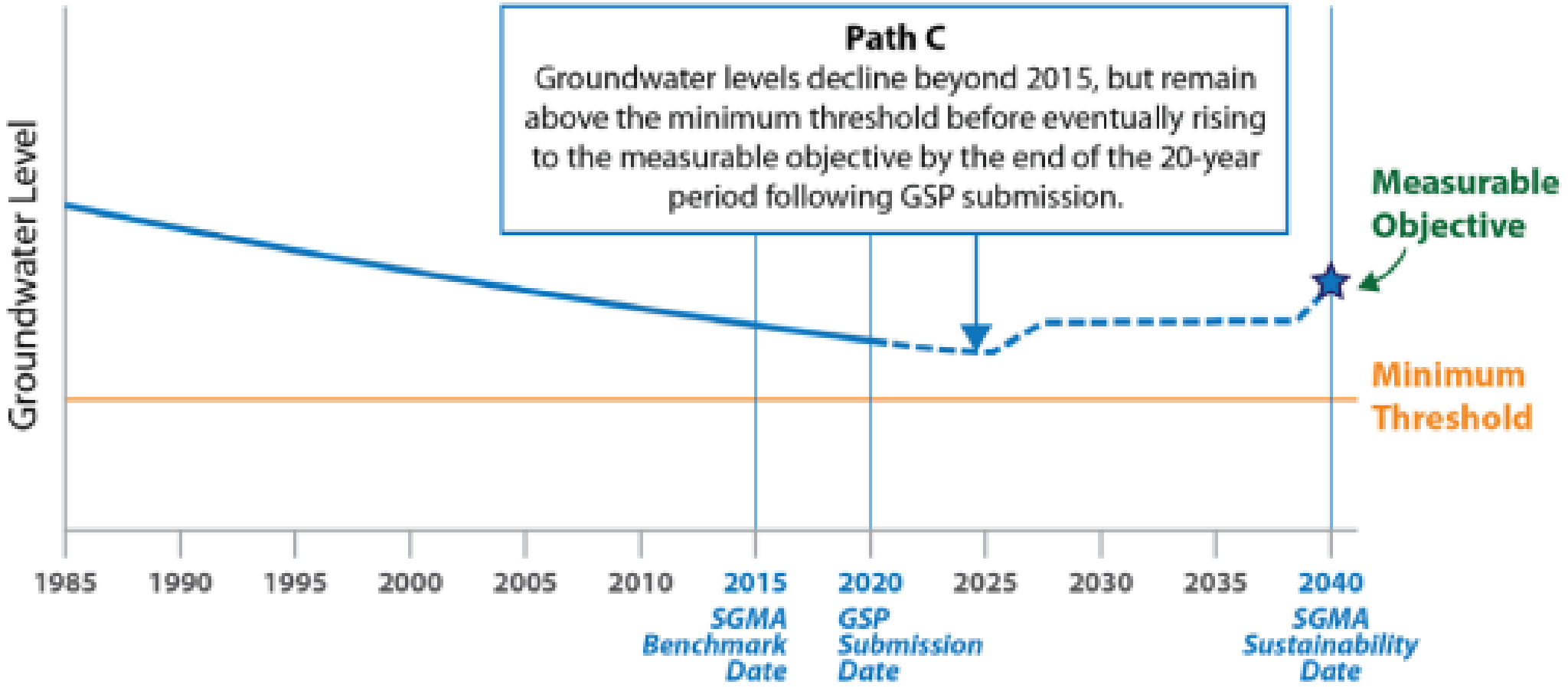


Figure 15. Potential Paths to Sustainability

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# California – Implementation Timeframe

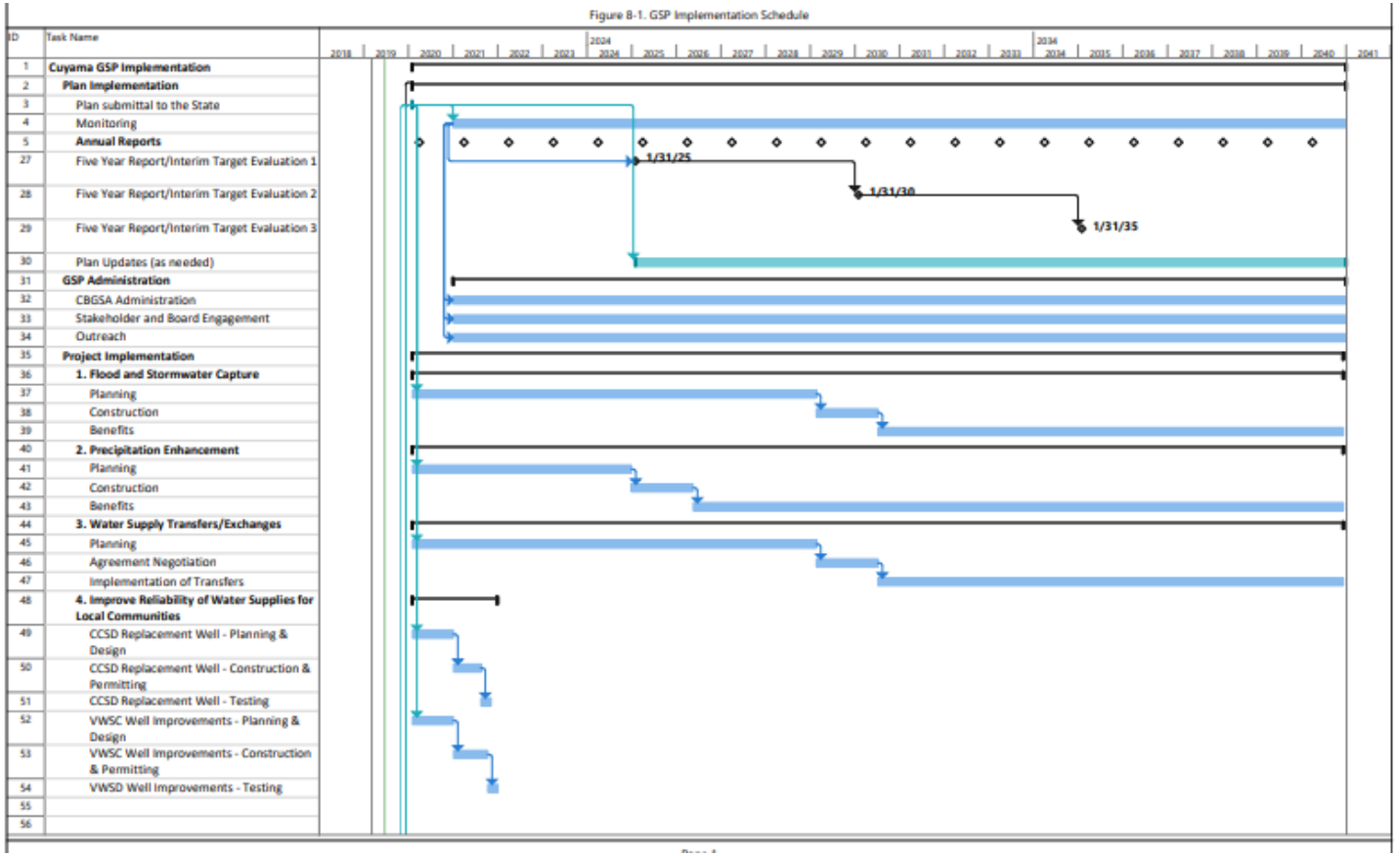
Figure 8-1. GSP Implementation Schedule

| ID | Task Name |
|---|---|
| 1 | **Cuyama GSP Implementation** |
| 2 | **Plan Implementation** |
| 3 | Plan submittal to the State |
| 4 | Monitoring |
| 5 | **Annual Reports** |
| 27 | Five Year Report/Interim Target Evaluation 1 |
| 28 | Five Year Report/Interim Target Evaluation 2 |
| 29 | Five Year Report/Interim Target Evaluation 3 |
| 30 | Plan Updates (as needed) |
| 31 | **GSP Administration** |
| 32 | CBGSA Administration |
| 33 | Stakeholder and Board Engagement |
| 34 | Outreach |
| 35 | **Project Implementation** |
| 36 | **1. Flood and Stormwater Capture** |
| 37 | Planning |
| 38 | Construction |
| 39 | Benefits |
| 40 | **2. Precipitation Enhancement** |
| 41 | Planning |
| 42 | Construction |
| 43 | Benefits |
| 44 | **3. Water Supply Transfers/Exchanges** |
| 45 | Planning |
| 46 | Agreement Negotiation |
| 47 | Implementation of Transfers |
| 48 | **4. Improve Reliability of Water Supplies for Local Communities** |
| 49 | CCSD Replacement Well - Planning & Design |
| 50 | CCSD Replacement Well - Construction & Permitting |
| 51 | CCSD Replacement Well - Testing |
| 52 | VWSC Well Improvements - Planning & Design |
| 53 | VWSC Well Improvements - Construction & Permitting |
| 54 | VWSD Well Improvements - Testing |
| 55 | |
| 56 | |



- GSPs have 20-years to achieve sustainability, and must include 5-year interim milestones, the sustainability criteria vary over the timeframe to allow for beneficial uses while still moving towards sustainable yield.

- As long as the plan demonstrates project implementation moving towards SY, failure to meet SY in any given year is acceptable.

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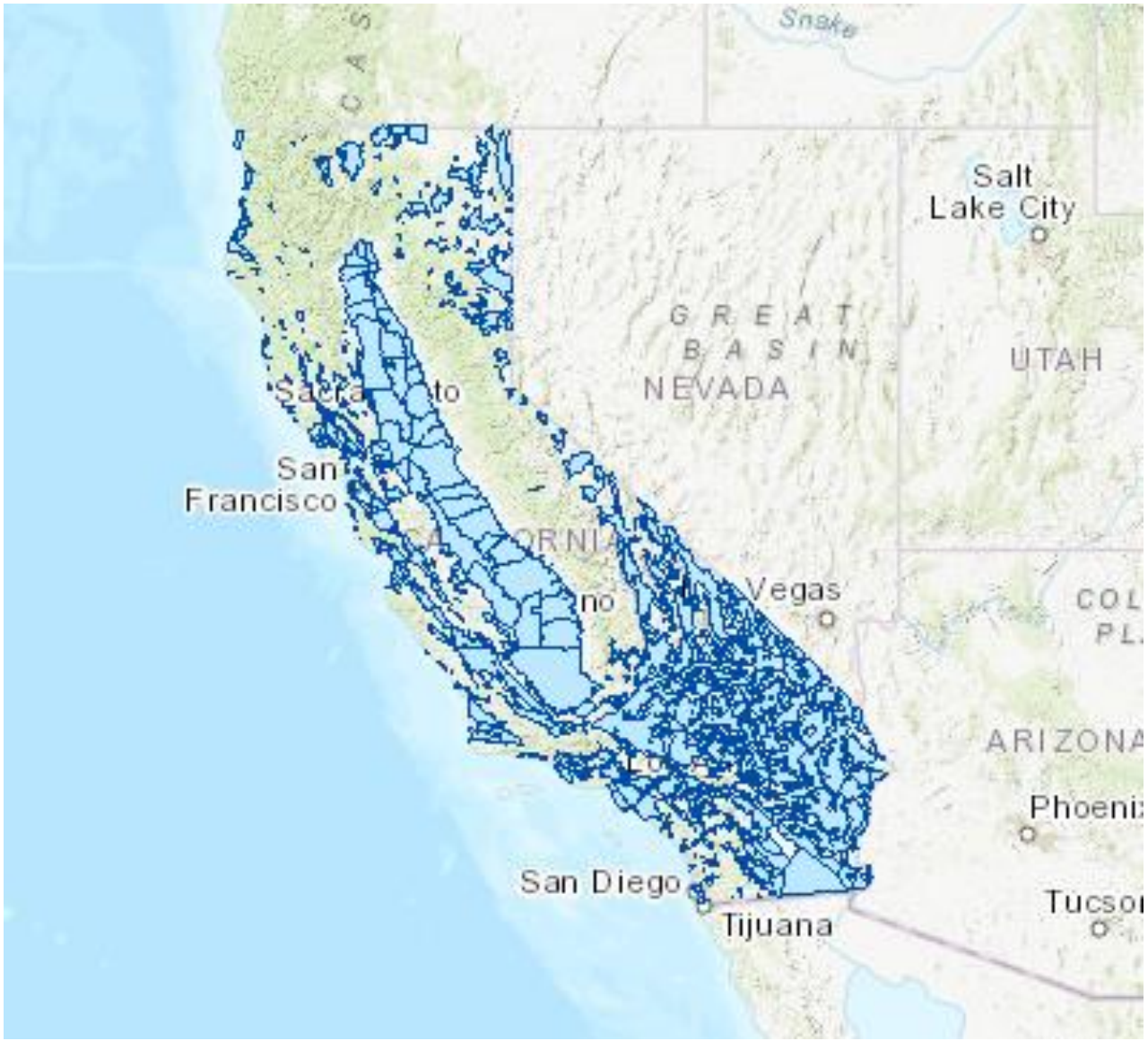
# Spatial Scale / Geography




Lateral basin boundaries planning geography is defined by the state as the Basin itself.

- Local agency(ies) form GSAs at the basin scale

-If no agency(ies) form a GSA, and the basin is medium-high-priority, the GSA authority defaults to the county in which the basin is contained.

- If a GSA is not formed for a basin, the basin is put on probationary status and subject to probationary actions (fees, increased reporting requirements).

Vertical basin boundaries determined by the GSP

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# California – Geography

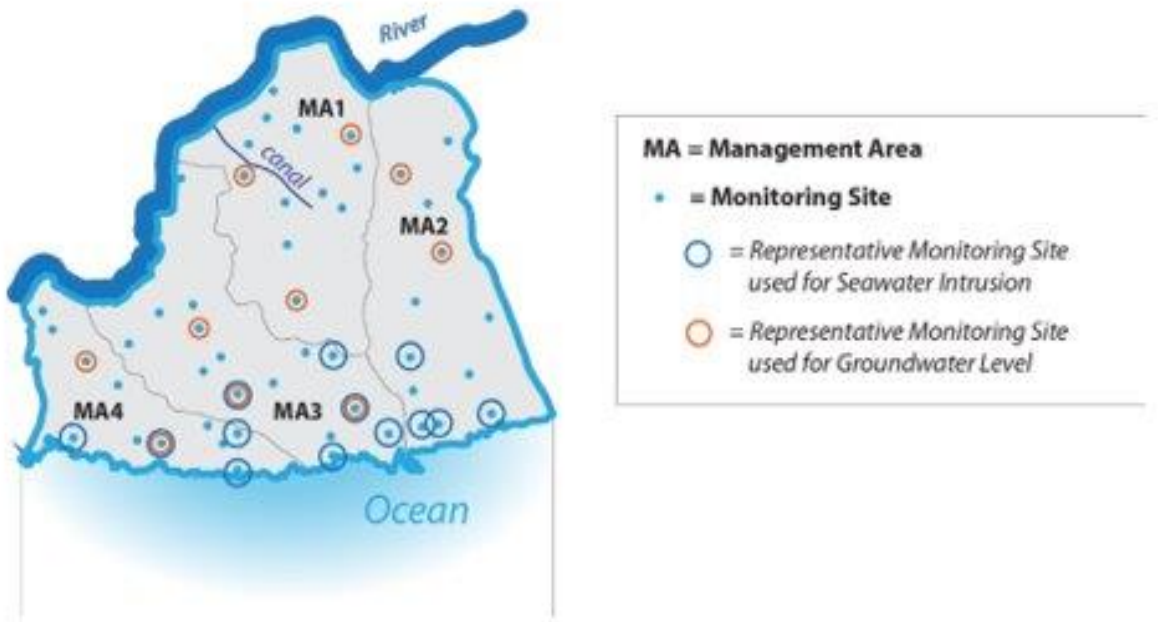


Figure 1. Example Monitoring Network and Representative Monitoring Sites

- Sustainability is evaluated at multiple spatial scales within the basin
- Representative monitoring wells are used to evaluate sustainability criteria (minimum threshold exceedance) and criteria can vary across wells / combinations of wells
- Not all monitoring wells have to meet the minimum threshold criteria to avoid an undesirable result; the GSA makes a determination as to when the lowering of groundwater levels becomes ' significant and unreasonable'

# California – Geography

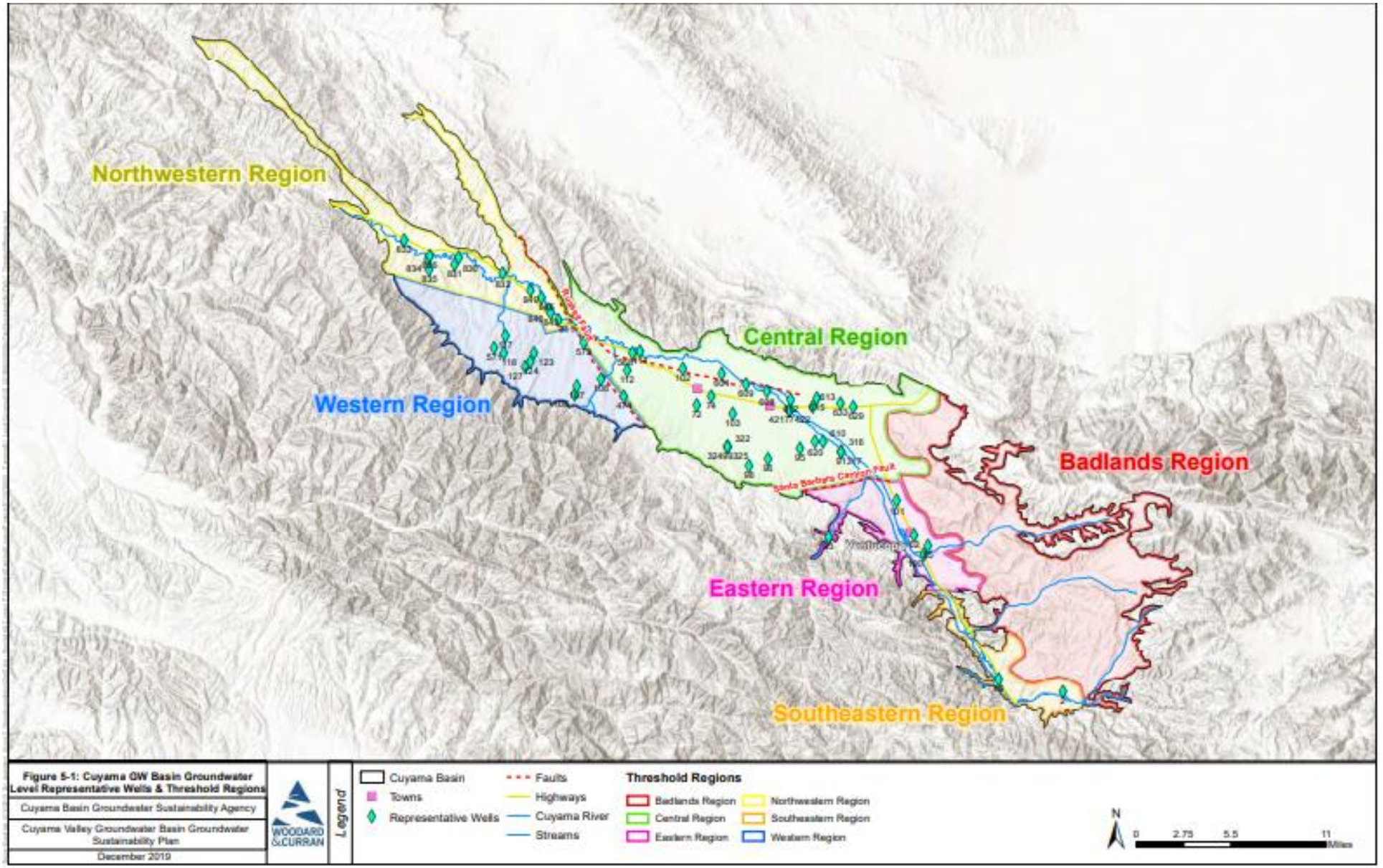


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**Table 5-1: Representative Monitoring Network and Sustainability Criteria**

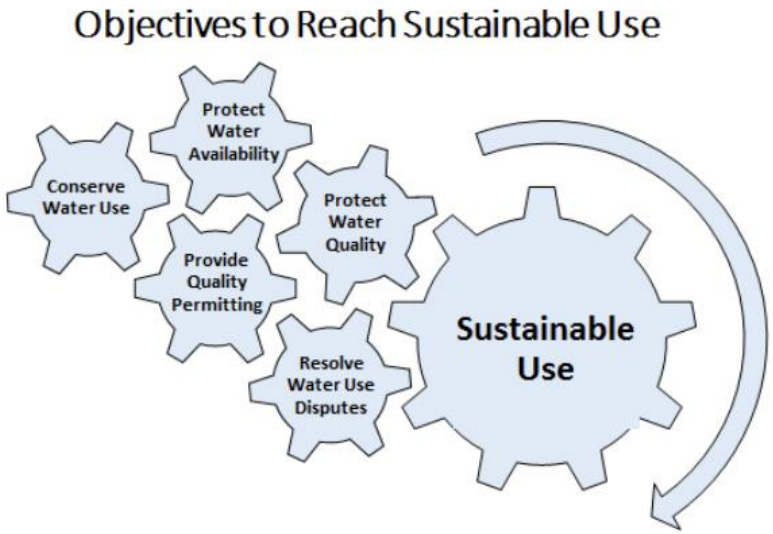
| OPTI Well | Region | Final MT | Final MO | 2025 IM | 2030 IM | 2035 IM | Well Depth (feet) | Screen Top (feet) | Screen Bottom (feet) | GSE (feet) |
|---|---|---|---|---|---|---|---|---|---|---|
| 421 | Central | 446 | 398 | 446 | 430 | 422 | 620 | -- | -- | 2,286 |
| 422 | Central | 444 | 397 | 444 | 428 | 421 | 460 | -- | -- | 2,286 |
| 474 | Central | 188 | 169 | 188 | 182 | 179 | 213 | -- | -- | 2,369 |
| 568 | Central | 37 | 36 | 37 | 37 | 37 | 188 | -- | -- | 1,905 |
| 604 | Central | 526 | 487 | 526 | 513 | 507 | 924 | 454 | 924 | 2,125 |
| 608 | Central | 436 | 407 | 436 | 426 | 422 | 745 | 440 | 745 | 2,224 |
| 609 | Central | 458 | 421 | 458 | 446 | 440 | 970 | 476 | 970 | 2,167 |
| 610 | Central | 621 | 591 | 621 | 611 | 606 | 780 | 428 | 780 | 2,442 |
| 612 | Central | 463 | 440 | 463 | 455 | 452 | 1,070 | 657 | 1070 | 2,266 |
| 613 | Central | 503 | 475 | 503 | 494 | 489 | 830 | 330 | 830 | 2,330 |
| 615 | Central | 500 | 468 | 500 | 489 | 484 | 865 | 480 | 865 | 2,327 |
| 620 | Central | 606 | 566 | 606 | 593 | 586 | 1,035 | 550 | 1035 | 2,432 |
| 629 | Central | 559 | 527 | 559 | 548 | 543 | 1,000 | 500 | 1000 | 2,379 |
| 633 | Central | 547 | 493 | 547 | 529 | 520 | 1,000 | 500 | 1000 | 2,364 |
| 62 | Eastern | 182 | 157 | 182 | 169 | 170 | 212 | -- | -- | 2,921 |
| 85 | Eastern | 233 | 209 | 233 | 204 | 221 | 233 | -- | -- | 3,047 |
| 100 | Eastern | 181 | 152 | 181 | 162 | 167 | 284 | -- | -- | 3,004 |
| 101 | Eastern | 111 | 88 | 111 | 101 | 100 | 200 | -- | -- | 2,741 |
| 840 | Northwestern | 203 | 153 | 203 | 186 | 178 | 900 | 200 | 880 | 1,713 |

# Minnesota

# Minnesota

**Planning entity:**
Minnesota Department of Natural Resources for priority basins

**Goal:**
Sustainable water use that does not harm aquifers/ecosystems, negatively impact surface waters, degrade water quality, create unresolved well interferences or water use conflicts; and is reasonable, efficient, meets water conservation requirements.




**Required plan components:**
- Hydrologic data;
- Present and future water and land use;
- Problems and concerns;
- Water conservation strategies;
- Other relevant regulations & plans

**Plan review:**
State

# What is groundwater sustainability?

Use that does not harm ecosystems, water quality, or the ability of present and future generations to meet their needs

# Minnesota

**North & East Metro GWMA**

I. Groundwater use in the GWMA does not harm aquifers and ecosystems, and does not negatively impact surface waters.

II. Groundwater use in the GWMA is reasonable, efficient, and complies with water conservation requirements.

III. Groundwater use in the GWMA does not degrade water quality.

IV. Groundwater use in the GWMA does not create unresolved well interferences or water use conflicts.

V. All groundwater users in the GWMA have the necessary permits to use groundwater.

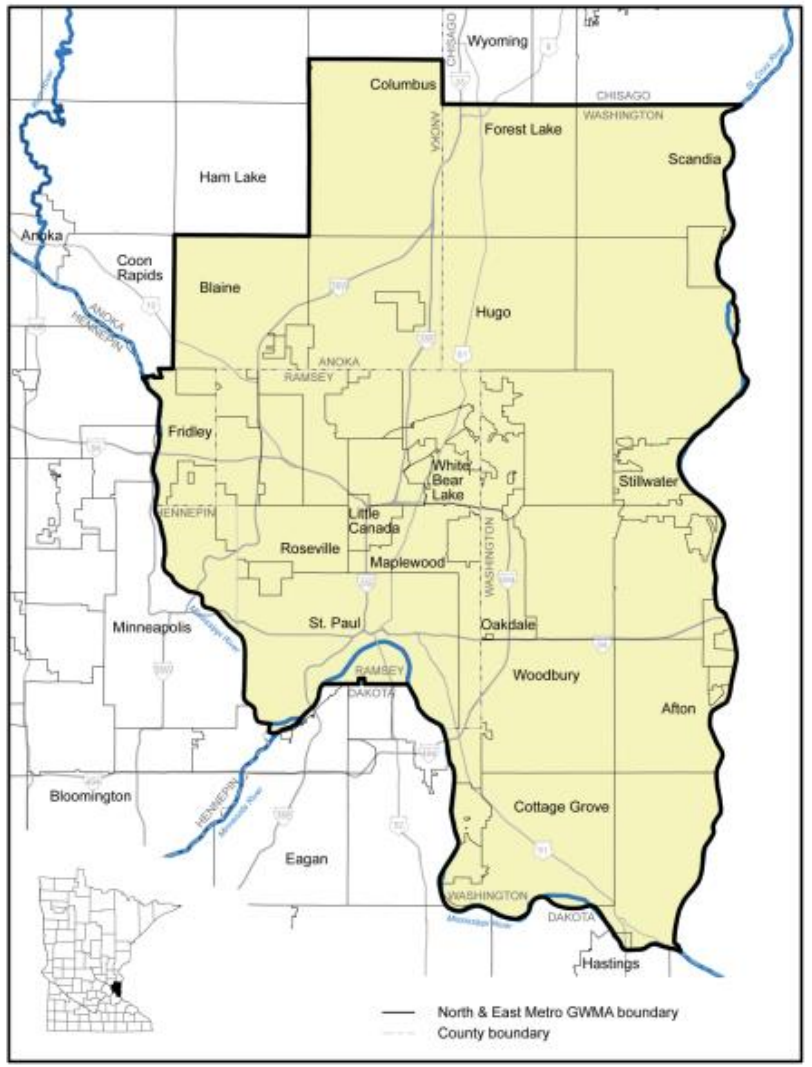



**Figure 2-1** Boundary of the North & East Metro GWMA

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# Minnesota

***I. Groundwater use in the GWMA does not harm aquifers and ecosystems, and does not negatively impact surface waters.***

- Safe Yield is used as the measure of limits on allowable water use.
- Safe yield is defined by state statute, and thresholds determined separately for Confined and Unconfined aquifer.
- Water levels that have stabilized above the threshold indicate compliance with safe yield.
- Groundwater appropriations may also be subject to additional limits based on their surface water and other related resource impacts as established in MN statute

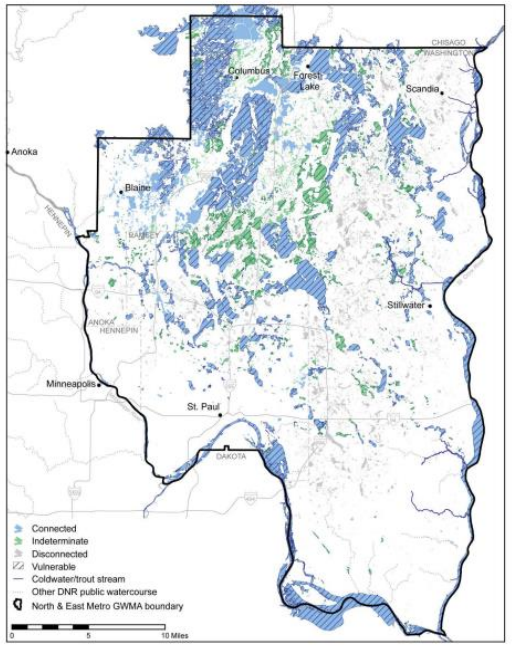


**Figure 2-9** Lake and wetland connection to the regional groundwater system
Classification by Barr for Metropolitan Council (2010)

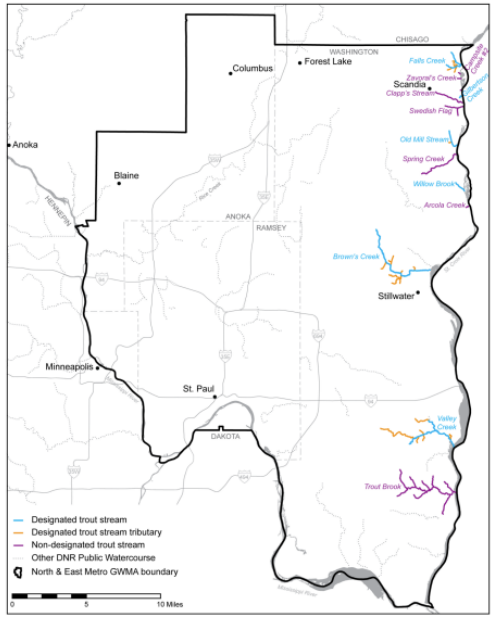


**Figure 2-6** Designated trout streams and other coldwater streams

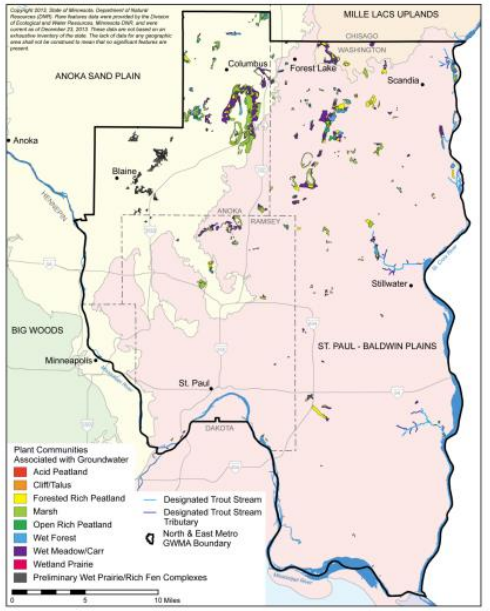


**Figure 2-7** Native plant communities associated with groundwater grouped by Ecological Systems

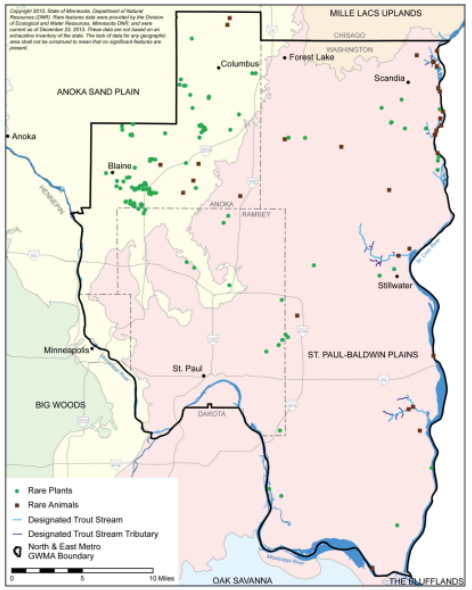


**Figure 2-8** Rare species associated with groundwater

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# Minnesota

**Safe yield**

- Confined Aquifer: Threshold set at a percent of the available head.
- Measured by water elevation at an observation well some distance from the high capacity well.
- 25 percent of the available head must remain in an observation well
- Watering threshold is 50 percent of the available head to allow time to put plans into effect to avoid continued declines.

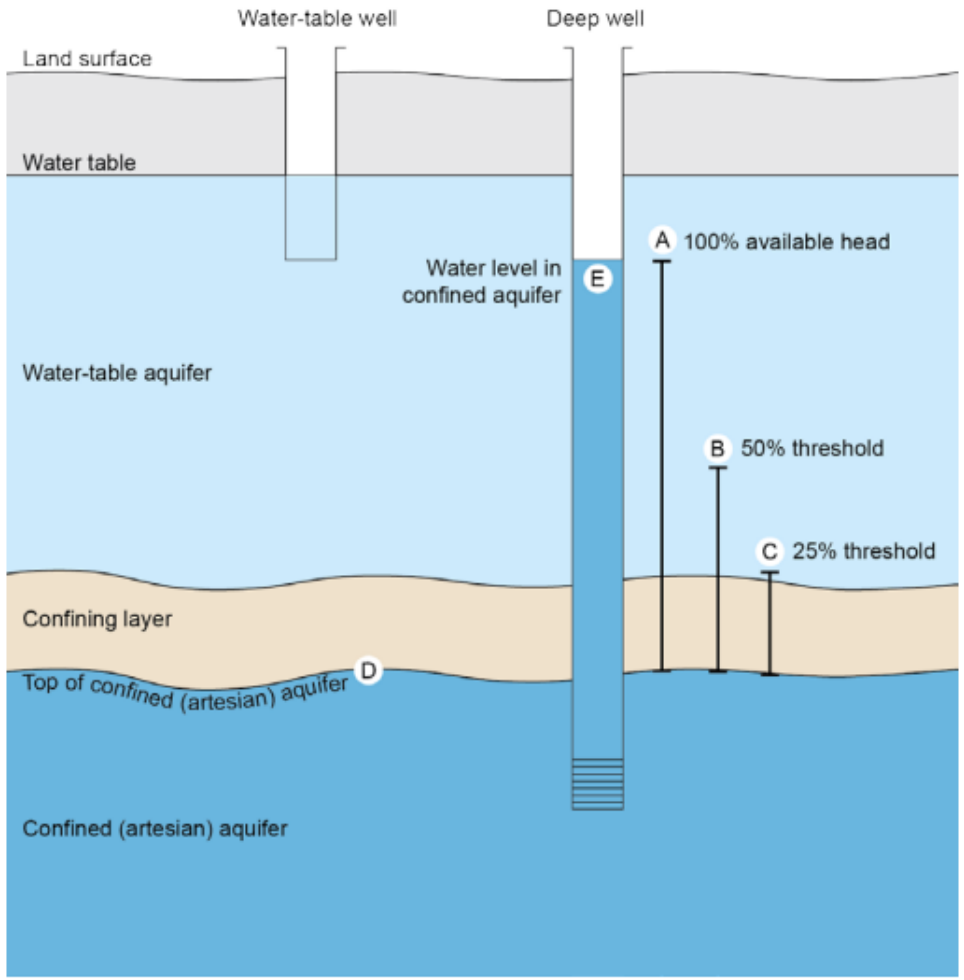


**Figure 3-1** Safe yield thresholds for artesian (confined) aquifers
The available head (A) is the distance between the top of the confined aquifer (D) and the water level (E) in the deep well. The 50-percent threshold (B) is halfway between these same points; the 25-percent threshold (C) is one-fourth of the way. Water levels in a confined aquifer must not stabilize below the 25-percent safe yield threshold.

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# Minnesota

**Groundwater-Level Data and Trends**

**-** DNR statewide network of dedicated water-level observation wells

- The GWMA contains 60 actively measured obwells (Figure 4-2).

- DNR staff reviewed data from obwells for statistically significant trends in annual minimum water levels for the 20-year period from 1993 through 2012. In the North & East Metro GWMA, sufficient data for analysis was available for 19 wells at 14 locations

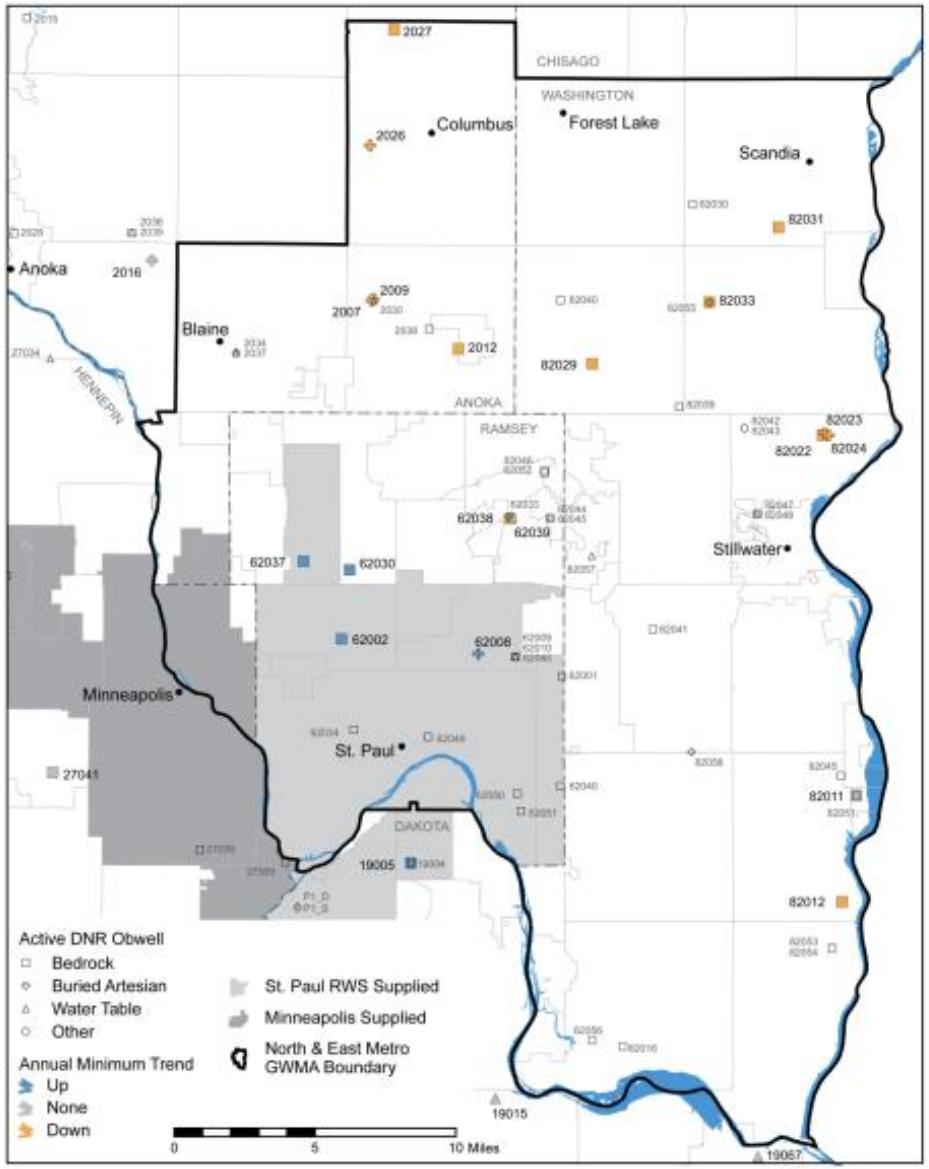


**Figure 4-2** Active DNR obwells and trends in annual water level minima (1993 – 2012)

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# Minnesota

***II. Groundwater use in the GWMA is reasonable, efficient, and complies with water conservation requirements.***

- By MN statute, public water suppliers serving more than 1.000 people must implement demand reduction measures (next slide).
- Water conservation conditions on appropriation permits for non-municipal suppliers where reasonable use can be determined.
- Water conservation for non-permitted water users can be established via local jurisdictions (watershed districts, municipal government).

**Table 4-3 Municipal Water-Use Information**

Summary of data reported on the Municipal Water-Use Information Sheet averaged for the 5-year periods 2005-2009 and 2010-2014.

| Public Water Supplier | Water Pumped (million gallons) | | Total Per Capita Demand (gallons/day) | | Residential per Capita Demand (gallons/day) | | Maximum Day/ Average Day | | Unaccounted (percent of total) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Period of Record | 2005-09 | 2010-14 | 2005-09 | 2010-14 | 2005-09 | 2010-14 | 2005-09 | 2010-14 | 2005-09 | 2010-14 |
| Goal* | - | | - | | <= 75 | | <= 2.6 | | <= 10 | |
| Bayport | 91.1 | 43.3 | 76.8 | 34.2 | 40.7 | 24.5 | 2.1 | 2.8 | 1.5 | 5.7 |
| Blaine[1] | 2420.4 | 2560.7 | 128.7 | 119.4 | 84.6 | 74.5 | 2.6 | 3.2 | -0.7 | 7.0 |
| Centerville | 94.8 | 102.7 | 67.4 | 73.8 | 58.6 | 60.4 | 3.2 | 2.8 | 1.9 | 9.4 |
| Circle Pines | 177.1 | 158.5 | 94.6 | 86.4 | 78.1 | 69.5 | 2.5 | 2.9 | 11.2 | 8.1 |
| Columbus | - | 16.0 | - | - | - | 39.0 | - | 15.6 | - | 19.0 |
| Cottage Grove | 1424.8 | 1318.8 | 122.5 | 110.6 | 88.9 | 82.0 | 3.0 | 2.7 | 15.6 | 12.5 |

# Minnesota

**State water conservation standards**
**Condition of permit for public water suppliers serving more than 1,000 people**

- Reduce unaccounted water loss to less than 10%
- Reduce residential use to less than 75 gpcd
- Achieve at least 1.5% annual reduction in industrial, institutional, commercial and agriculture use
- Reduce peak demand to less than 2.6 times the average demand and
- Implement a water conservation rate structure (or a uniform rate structure with a conservation program).

# Minnesota

***III. Groundwater use in the GWMA does not degrade water quality.***

- Compliance with safe yield for confined aquifers precents water quality degradation
- Use of pollution containment wells where pumping would cause pollutants to spread
- Water quality considerations for surface water incorporated into groundwater appropriation thresholds for surface water

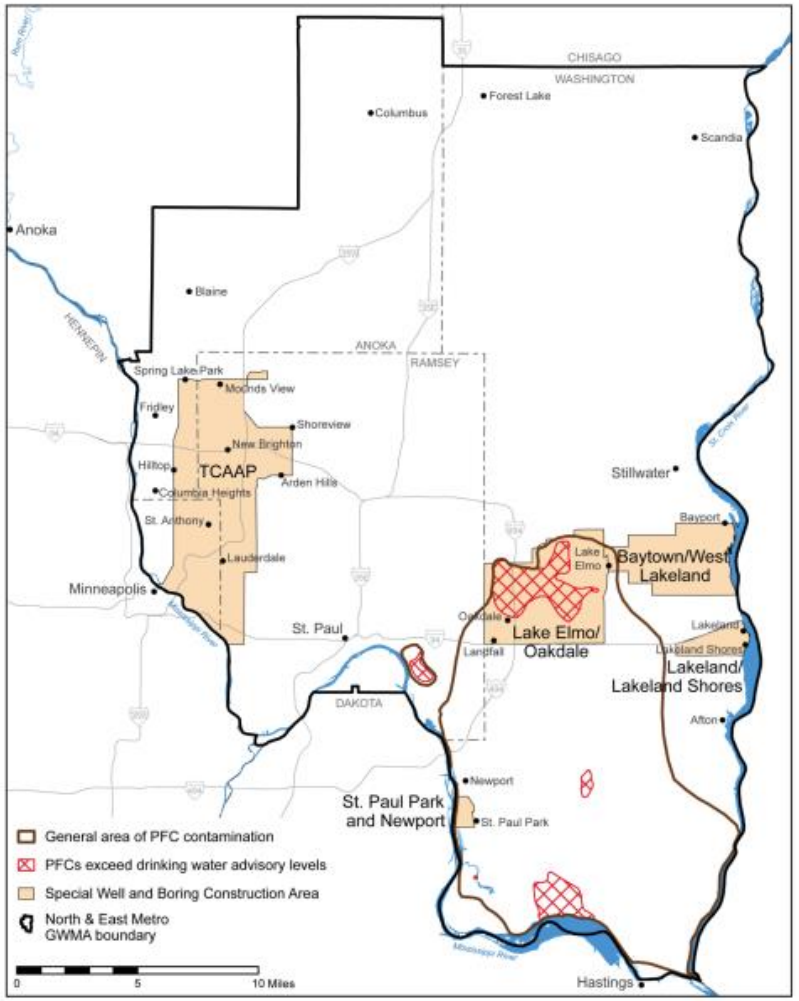


**Figure 2-10** Selected areas with groundwater contamination
Special Well and Boring Construction Areas, areas of PFC contamination, and DNR permitted pollution containment wells

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# Minnesota

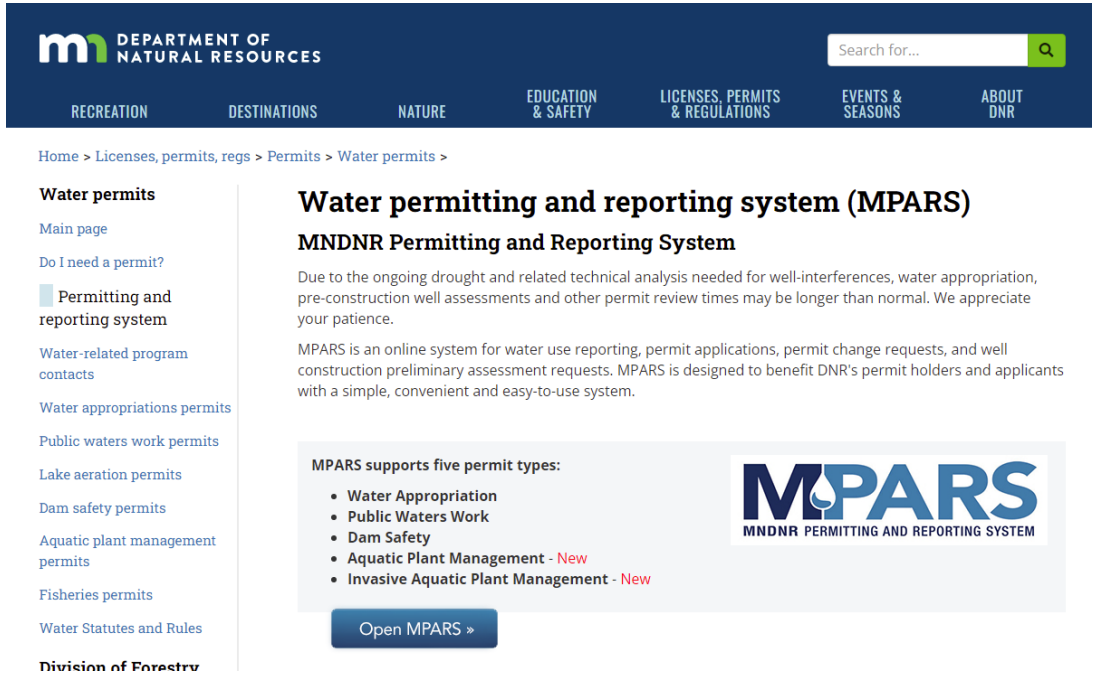
***IV. Groundwater use in the GWMA does not create unresolved well interferences or water use conflicts.***

- Water allocation priorities are sent by state statute. Priorities, from highest to lowest are as follows:
  - (1) domestic water supplies and power producers which have approved contingency plans;
  - (2) uses of less than 10,000 gallons per day;
  - (3) agricultural irrigation and processing of agricultural products consuming in excess of 10,000 gallons per day;
  - (4) power production without approved contingency plans;
  - (5) other uses in excess of 10,000 gallons per day; and
  - (6) nonessential uses of water.
- Well interference, defined by state statute (when groundwater appropriation causes the water level to fall below the reach of those wells. Interference complaints only valid for wells constructed prior to permit issuance for well allegedly causing interference was issued; remedy for existing and potential conflicts are outlined in state law
- Water use conflict, defined by state law, occurs when water demands for existing and proposed users exceed available waters and can be resolved only by limiting or restricting pumping (outlined in state law)

# Minnesota

***V. All groundwater users in the GWMA have the necessary permits to use groundwater.***

- The preceding objectives can only be achieved with a permitting system, as they provide data on use and the means to limit use to meet sustainability thresholds.
- High capacity users (10,000 gallons per day or 1 million per year) must obtain a water appropriation permit, pay annual fees, and report annual water use.
    - Must also comply with any special conditions placed on permits to ensure sustainability.

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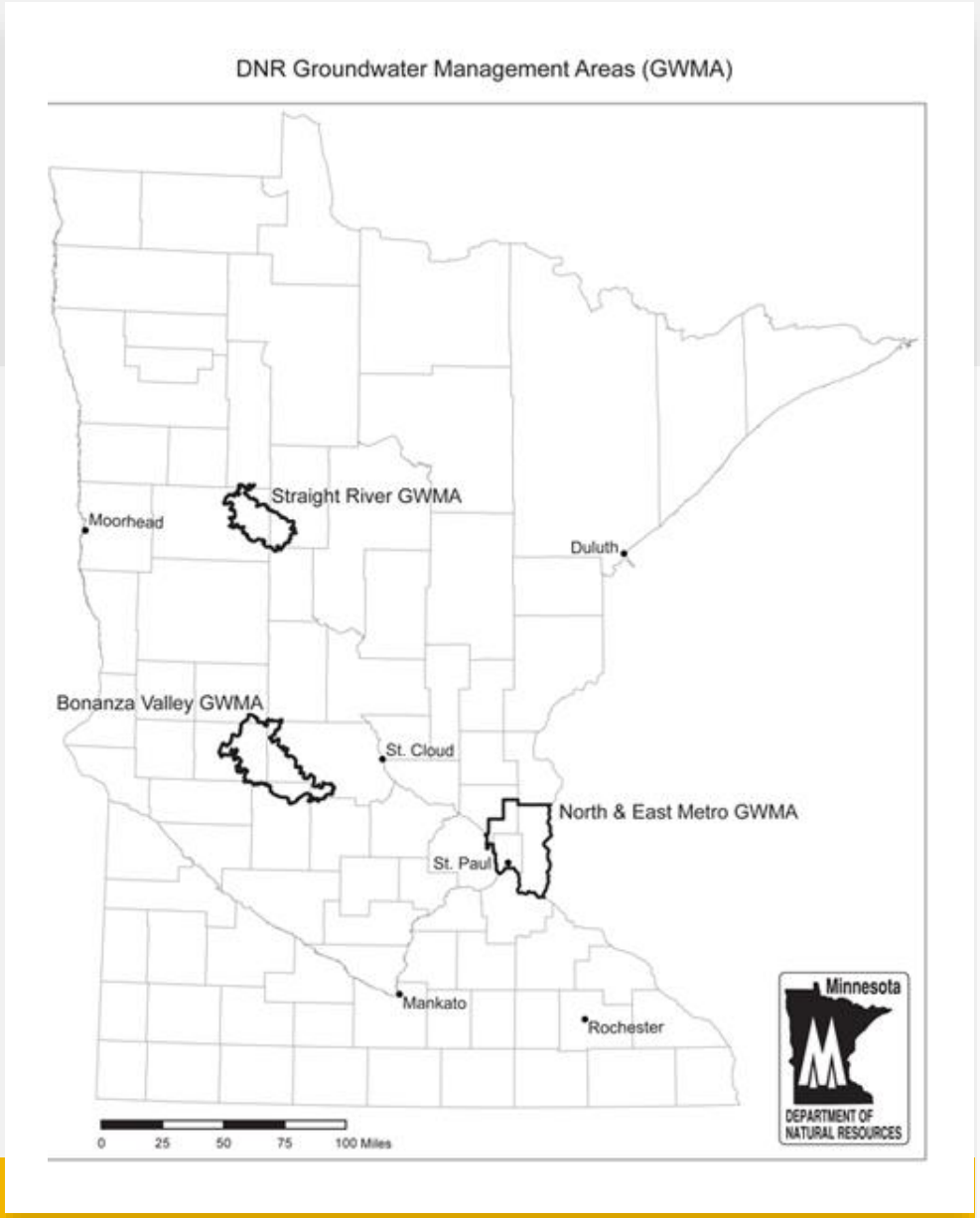
# Timeframe & Geography

# MN Groundwater management plans

- Three groundwater management areas have been identified, where trends suggest GW use might be or become unsustainable
- Each area now has a plan, authored by DNR
- Given varying levels of information about the groundwater systems, two of the plans do not establish or include a total allocation limit; instead they outline a path for DNR to determine sustainable thresholds and manage appropriations to stay within the thresholds in a planned and transparent framework.



# MN Groundwater management plans

Plans identify **future work by MDNR in the next five years** to lead to more sustainable outcomes

**Table 6-2 Implementation Timing by Objective**

Duration (Years) | Ongoing Work | Completed Annually | Completed Semi-Annually

| Action ID | Action | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| **Objective I. Groundwater use in the GWMA does not harm aquifers and ecosystems and does not negatively impact surface waters** | | | | | | |
| I.1 | The DNR will improve monitoring of groundwater levels, basin water levels, stream flows, climate, groundwater-associated biological communities, and water use within the GWMA to inform the DNR permit decisions | | | | | |
| I.1.a | Hydrological and climate monitoring system. The DNR will coordinate with federal, state, and local agencies in these efforts | | | | | |
| I.1.a.i | Evaluate opportunities for stream flow monitoring collaboration or data collection | ■ | ■ | | | |
| I.1.a.ii | Add lake gauges as needed | ■ | ■ | ■ | ■ | ■ |
| I.1.a.iii | Install DNR observation wells and work with permit holders on reporting groundwater data and adding observation wells | ■ | ■ | ■ | ■ | ■ |
| I.1.a.iv | Weather stations: Identify climate monitoring requirements and add weather stations as needed to provide precipitation, temperature, solar radiation, dew point, and wind speed for improved evapotranspiration estimates | | | | | |
| I.1.a.iv.i | Establish up to two weather stations to provide real time data from the GWMA | | - - - | - - - | | |
| I.1.a.iv.ii | Participate with cooperators in the monitoring of White Bear Lake evaporation | - - - | - - - | | | |
| I.1.a.iv.iii | Evaluate the benefits of evaporation monitoring networks on lakes in the GWMA | | - - - | - - - | - - - | |
| I.1.a.iv.iv | Summarize available climatological data related to groundwater management for the new GWMA reporting system | ▬ | ▬ | ▬ | ▬ | ▬ |
| I.1.b | The DNR will continue to improve information on water use within the GWMA | | | | | |
| I.1.b.i | Refine estimates of groundwater use that does not require a permit (<10,000 GPD or 1MM GPY) | - - - | | | | |
| I.1.b.ii | Develop guidance for consistent water use reporting categories | - - - | - - - | | | |
| I.1.c | The DNR will develop and use groundwater models for use in the permit decision process | | | | | |
| I.1.c.i | Develop and use standard groundwater models and methods to predict impacts from groundwater appropriations | ■ | ■ | | | |
| I.1.c.ii | Support Met Council/USGS refinements of the Metro Model 3 and use to understand groundwater-lake interaction where feasible. | - - - | - - - | | | |
| I.1.d | Develop additional information on groundwater associated biological communities | | | | | |
| I.1.d.i | Develop GIS model of wet prairie complexes | - - - | - - - | | | |
| I.1.d.ii | Wetland/native plant community field surveys | - - - | - - - | | | |
| I.1.e | Create GWMA reporting system for public access to data collected and analysis | ■ | ■ | ■ | ■ | ■ |
| I.2 | The DNR will develop and apply sustainability thresholds for aquifers, ecosystems and surface waters in the GWMA | | | | | |
| I.2.a | Use safe yield thresholds for aquifers | ■ | ■ | ■ | ■ | ■ |
| I.2.b | Prepare report to legislature with recommendations for thresholds for negative impacts to surface waters | - - - | | | | |
| I.2.c | The DNR will use specified thresholds (Obj I.2.b) for determining negative impacts to streams from groundwater appropriations | | | | | |
| I.2.c.i | Coordinate studies and work with permitted groundwater users having potential negative impacts on trout streams within the GWMA | ■ | ■ | ■ | ■ | ■ |
| I.2.d | The DNR will develop thresholds of negative impacts to water basins and wetlands as required by Minn. Stat. sec. 103G.287, subd. 2 | | | | | |
| I.2.d.i | Work with others to evaluate susceptibility of selected water basins to groundwater-level changes in the GWMA | | - - - | - - - | | |
| I.2.d.i.a | Work with USGS to model total annual volume withdrawn from White Bear Lake due to permitted groundwater appropriations | | - - - | - - - | | |

CMAP

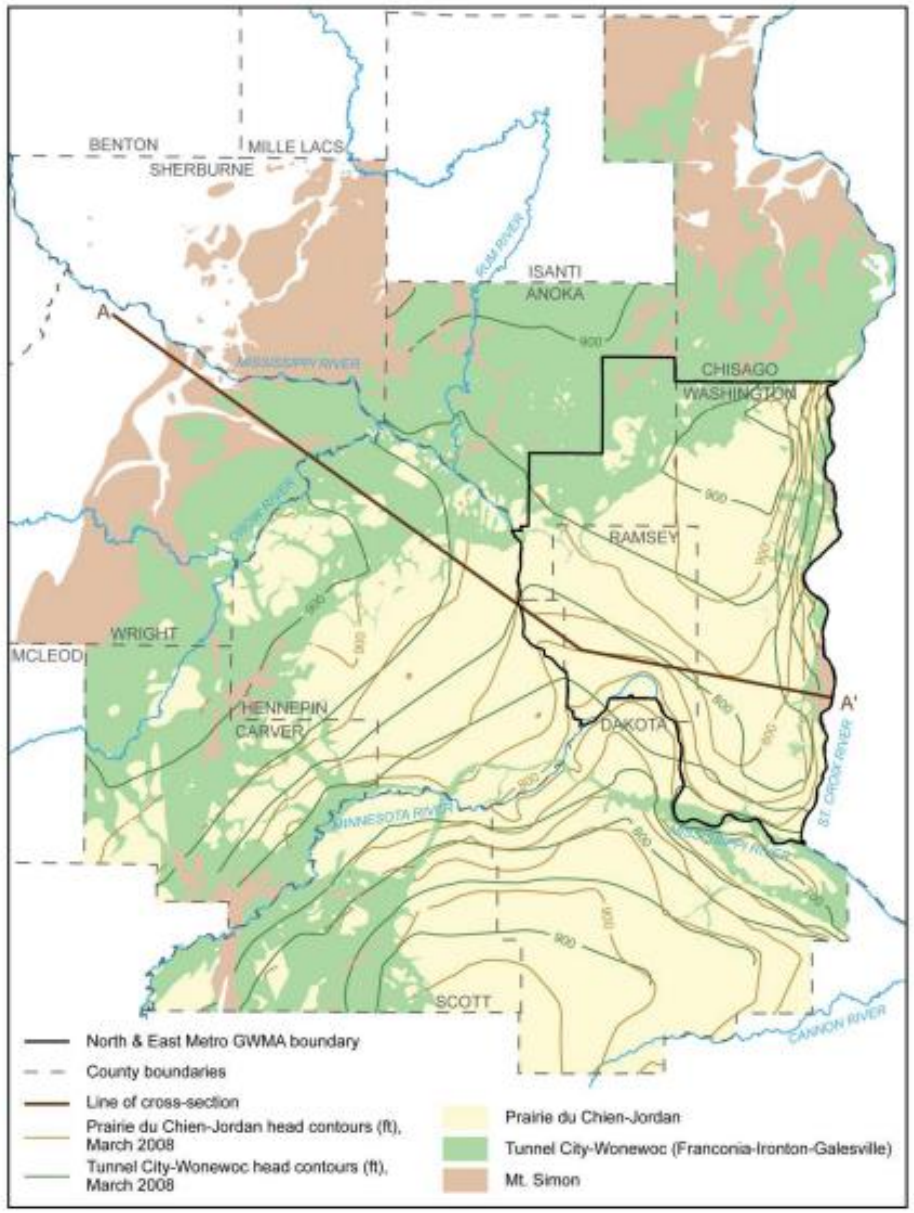



**Figure 2-2** Bedrock aquifers
Modified from Mossler[1], potentiometric head contours from Sanocki et al.[2], and cross section location.

Elements considered in selecting the boundary of the GWMA included

- Hydrogeology
- Water use
- Water dependent natural resources
- Water quality
- Jurisdictions, governance and planning

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# Discussion

Summary:

# Groundwater Management Planning

| | California | Minnesota | Texas |
|---|---|---|---|
| **Author** | Groundwater Sustainability Agencies (GSAs) with DWR assistance/ review | MNDNR | Groundwater Conservation Districts (GCDs) |
| **Geography/ Scale** | Local Units of government (GSAs) in coordination with other GSAs in the same high- and medium priority basins | Defined by water use, hydrogeology, watershed boundaries; including multiple aquifer systems. Typically portions of 2-5 counties | County, but coordinating within 16 management areas |
| **Timeframe** | 20 year planning | 5 years planning timeframe | 20 year planning timeframe |
| **Goal** | Avoid six undesirable results (lowering of GW levels, reduction of storage, seawater intrusion, degraded quality, land subsidence, surface water depletion) | State's sustainability goals: Sustainable water use that: does not harm aquifers/ecosystems, negatively impact surface waters; degrade water quality; create unresolved well interferences or water use conflicts; and is reasonable, efficient, meets water conservation requirements | Achieve "Desired Future Conditions," which are quantifiable future groundwater conditions (particular groundwater level, a level of water quality, a volume of spring flows, etc) |

# Discussion questions

**1. What struck you about these planning approaches?**

**2. Is there a particular aspect of a state's approach you could see working in Illinois?**

**3. Is there another state you think we should look at?**

CMAP

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