Groundwater Dependent Ecosystem Selection in Butte Valley, California

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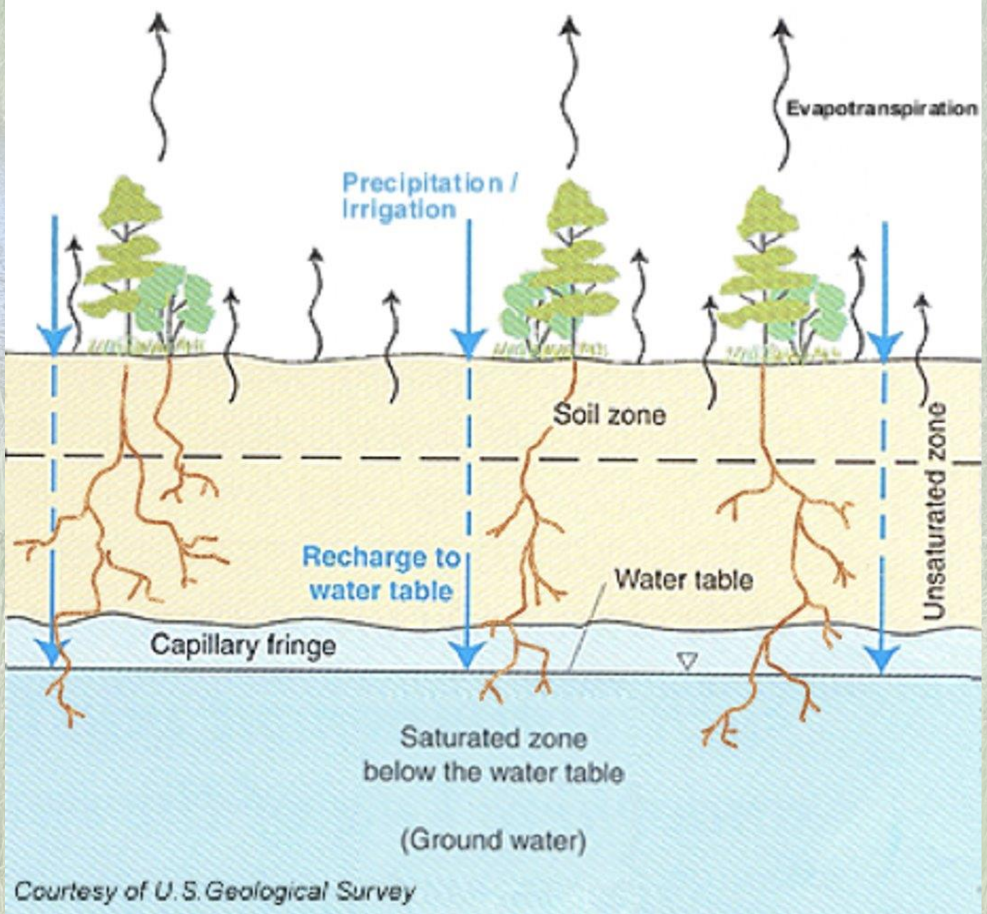
WC § 10727.4(l) Impacts to GDEs

- 23 CCR § 351(m): "Groundwater dependent ecosystem"
- Refers to ecological co mmunities or species that depend on:
  - Groundwater emerging from aquifers; or
  - Groundwater occurring near the ground surface.



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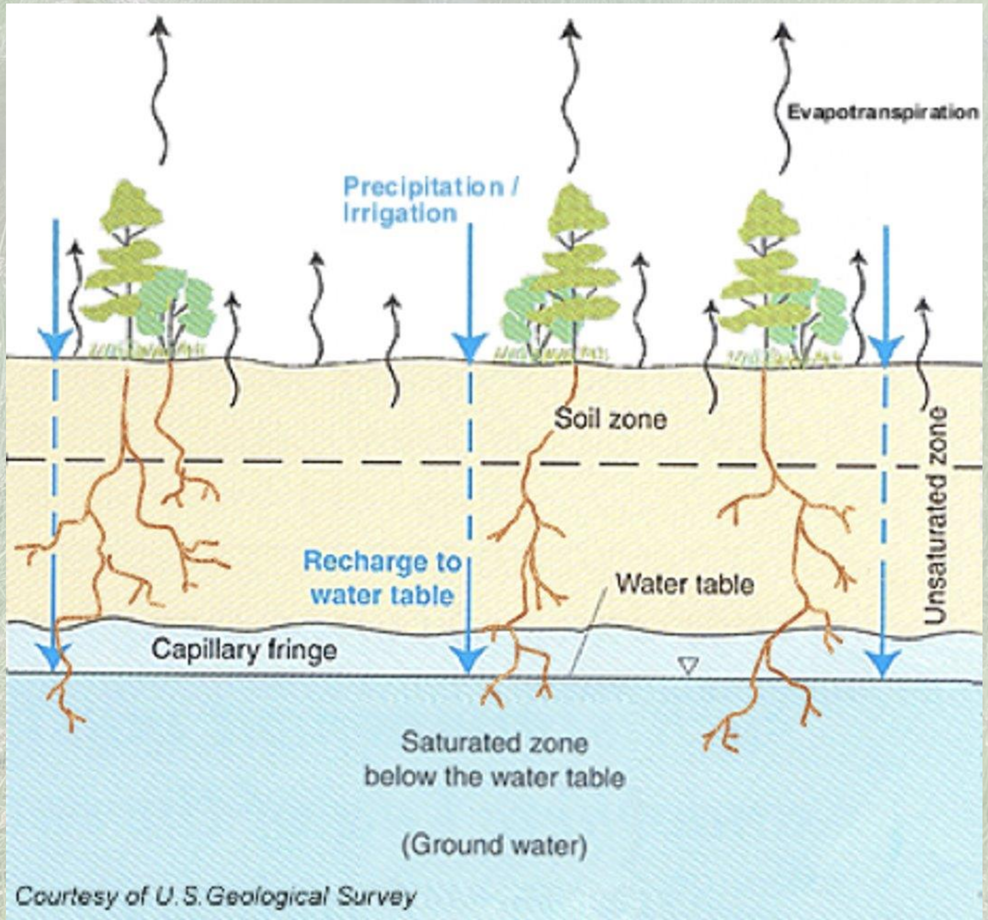
Not GDEs (The Nature Conservancy)

- Managed wetlands
  - Butte Valley Wildlife Area
- Obvious human-made features
  - Drainage ditches



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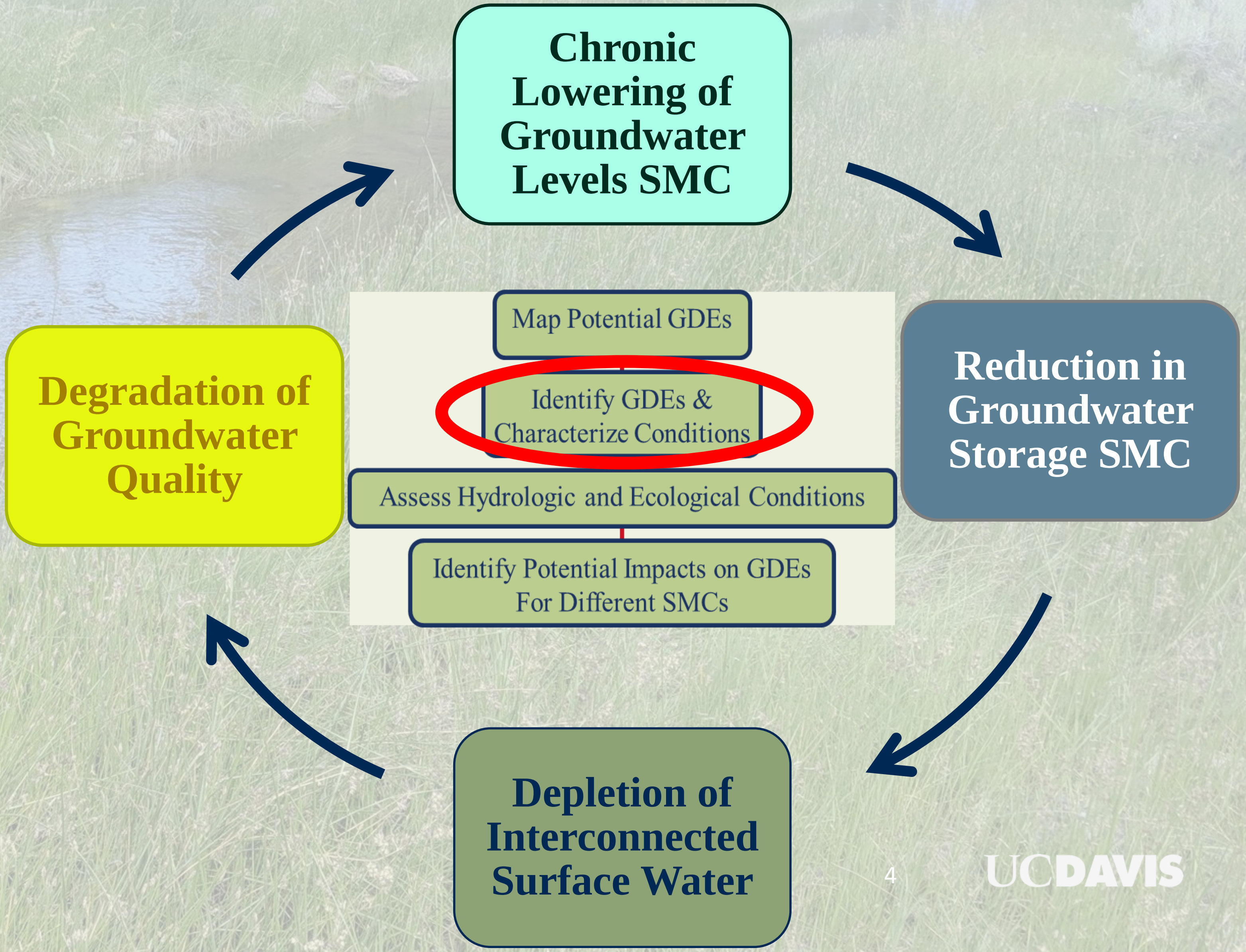
Goals of the GDE Analysis Discussion

- Discuss and agree on mapped GDEs
- Explore and discuss methodologies to identify GDEs and characterize hydrologic conditions
- Set up appropriate next steps and criteria to finalize identification and characterization of GDEs



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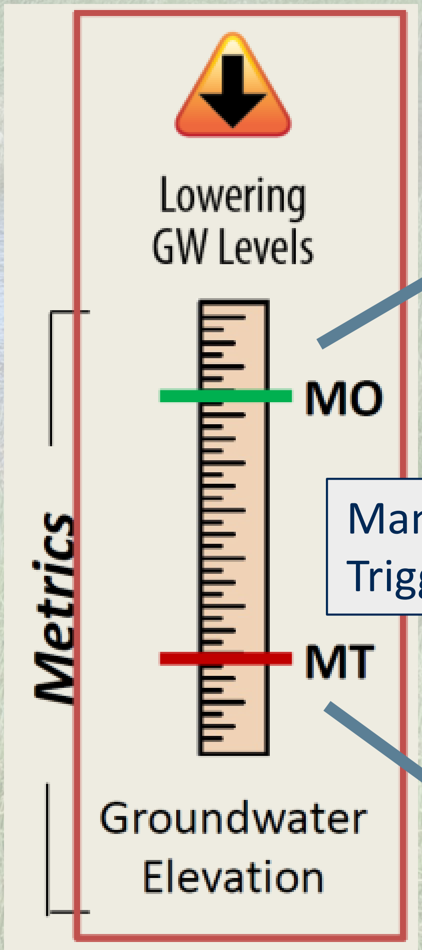
Butte GDE Characterization

- Classifying GDEs in two categories
  1. Vegetative GDEs
     - Where plant communities exist that rely on shallow, regional groundwater to survive.
     - Groundwater level thresholds will be based on historical water levels.
  2. Interconnected Surface Water (ISW) GDEs
     - Where "groundwater emerging from aquifers" creates habitat includes springs and creeks.
     - Thresholds will be based on the ISW criteria, i.e. groundwater levels as proxy or a 'rate or volume of depletion'.

Undesirable Results and Minimum Thresholds of GDEs

- Undesirable Results (UR) for GDEs is the lowering of groundwater levels to cause diminishment of GDE habitat.
- Minimum Thresholds (MT) for GDE should be historic level of groundwater near the vicinity of mapped GDEs.



Ideal operating range

Management Action Trigger to avoid the MT

Leads to Undesirable Result

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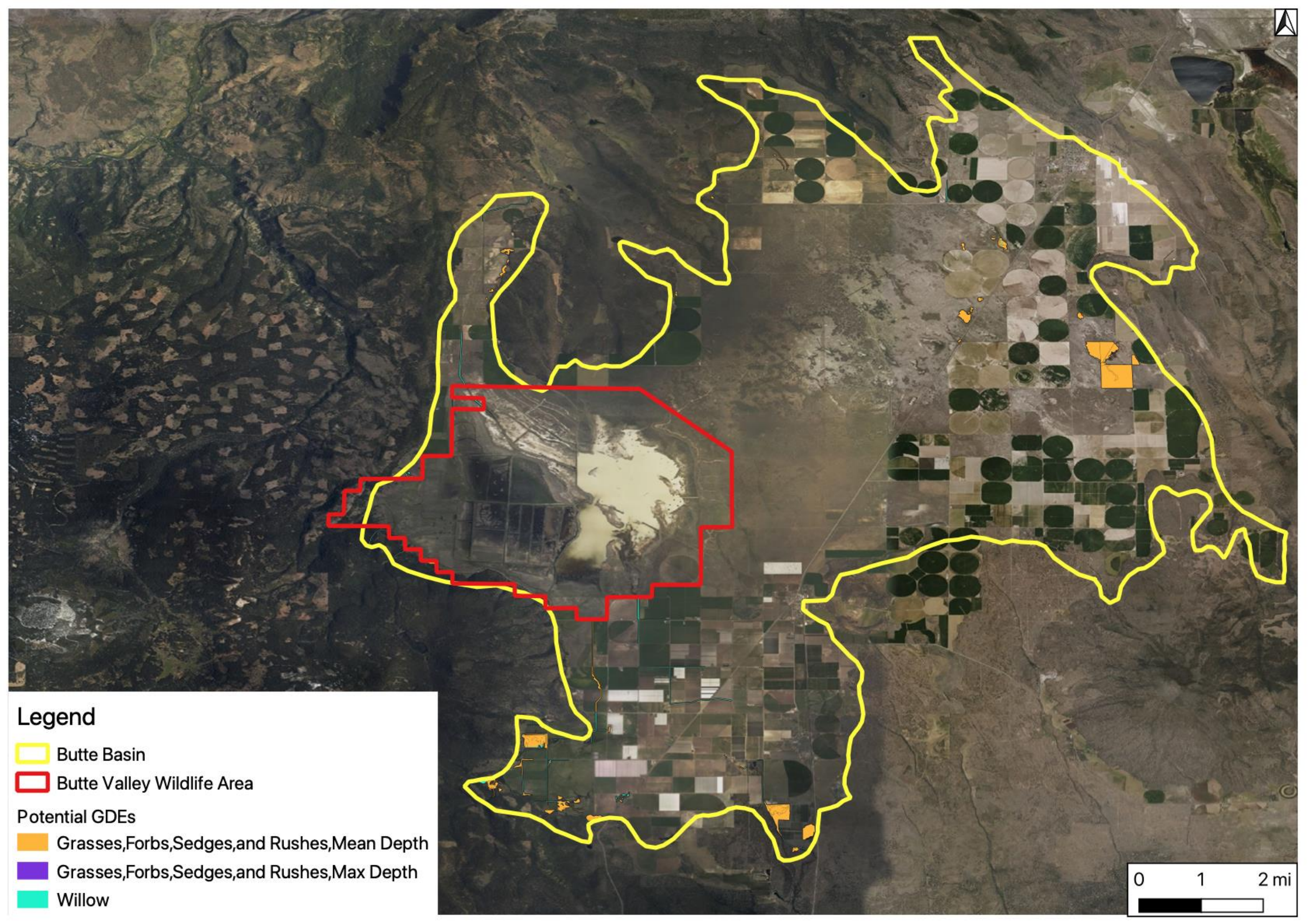
Groundwater Dependent Ecosystem (GDE) Analysis

1. Mapped Potential GDEs
2. Vegetation Rooting Zone Depths
3. Depth to Groundwater
4. Relationship Between Rooting Zone and Groundwater Depths
5. Potential GDE Characterization

1. Mapped Potential GDEs

- Natural Communities Commonly Associated with Groundwater Dataset (NC dataset)
  - Collaboration between DWR, CDFW, and The Nature Conservancy (TNC)
- Comprised of 2 datasets
  - Vegetation
  - Wetlands



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1. Mapped Potential GDEs

NC Datasets + Local Vegetation Datasets + Review = Mapped Potential GDEs

2. Vegetation Rooting Zone Depths

Vegetation Class	Source	Assumed Vegetation	Assumed Rooting Depth (ft.)
Palustrine, Emergent, Persistent, Seasonally Flooded	NC Dataset – Wetland	Grasses, Forbs, Sedges, and Rushes Mean Rooting Depth	4.8
Riverine, Unknown Perennial, Unconsolidated Bottom, Semipermanently Flooded	NC Dataset – Wetland	Grasses, Forbs, Sedges, and Rushes Mean Rooting Depth	4.8
Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded	NC Dataset – Wetland	Grasses, Forbs, Sedges, and Rushes Mean Rooting Depth	4.8
Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded	NC Dataset – Wetland	Grasses, Forbs, Sedges, and Rushes Mean Rooting Depth	4.8
Palustrine, Emergent, Persistent, Semipermanently Flooded	NC Dataset – Wetland	Grasses, Forbs, Sedges, and Rushes Mean Rooting Depth	4.8
Seeps and Springs	NC Dataset – Wetland	Grasses, Forbs, Sedges, and Rushes Max Rooting Depth	9.6
Willow (Shrub)	NC Dataset - Vegetation	Willows	13.1
Palustrine, Scrub-Shrub, Seasonally Flooded	NC Dataset – Wetland	Willows	13.1
Palustrine, Forested, Seasonally Flooded	NC Dataset – Wetland	Willows	13.1
Palustrine, Unconsolidated Shore, Seasonally Flooded	NC Dataset – Wetland	Willows	13.1

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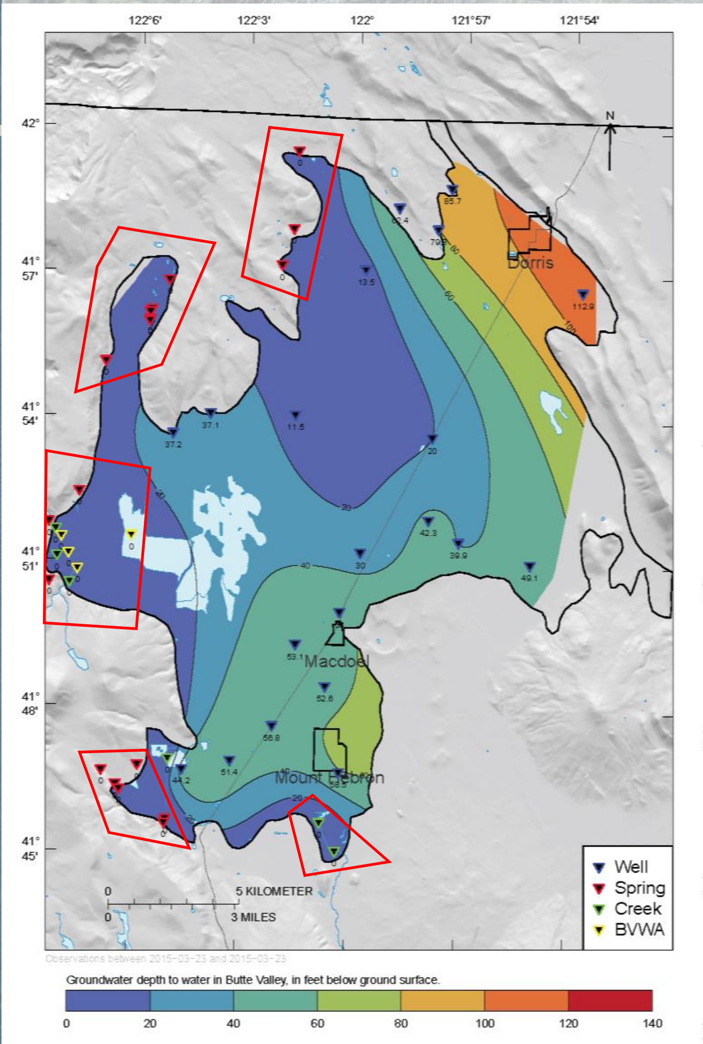
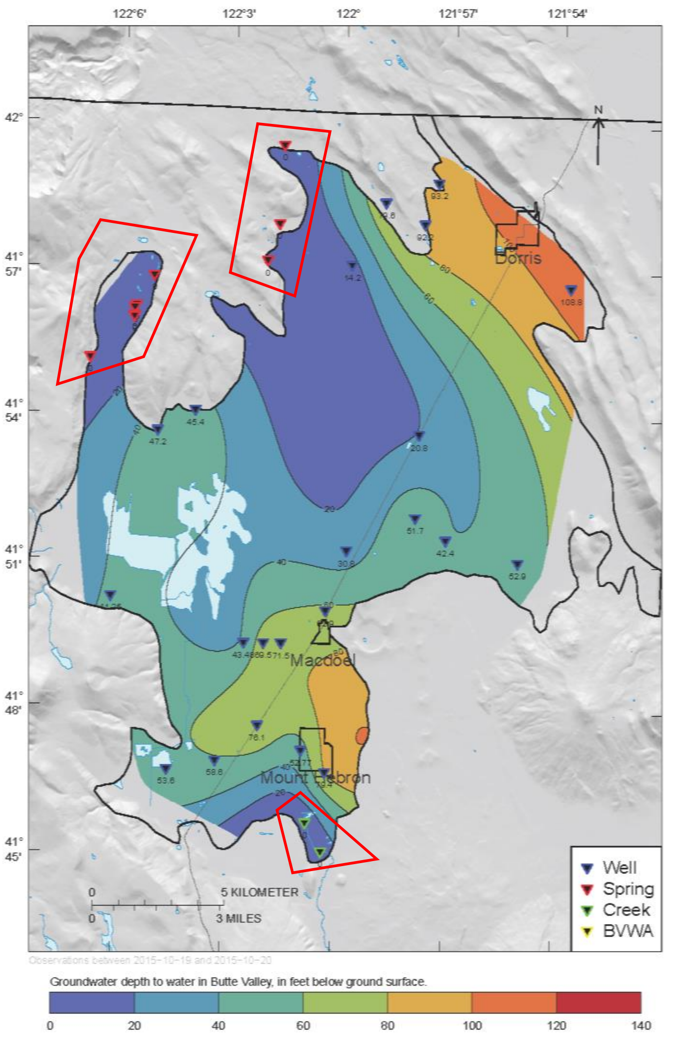
• 3. Depth to Groundwater

- Grid-Based Analysis
  - Interpolated groundwater elevations using Kriging
  - Series of statistical representations
    - Fall/Spring
    - Rolling multi-year averages
    - Current conditions
  - Major data gaps at the valley edges near the GDEs
    - Filled by USGS maps of springs and stream observations
- Point-Based Analysis
  - Area of influence (AOI) for each well
  - Time-series representation of groundwater elevations for GDEs within AOI

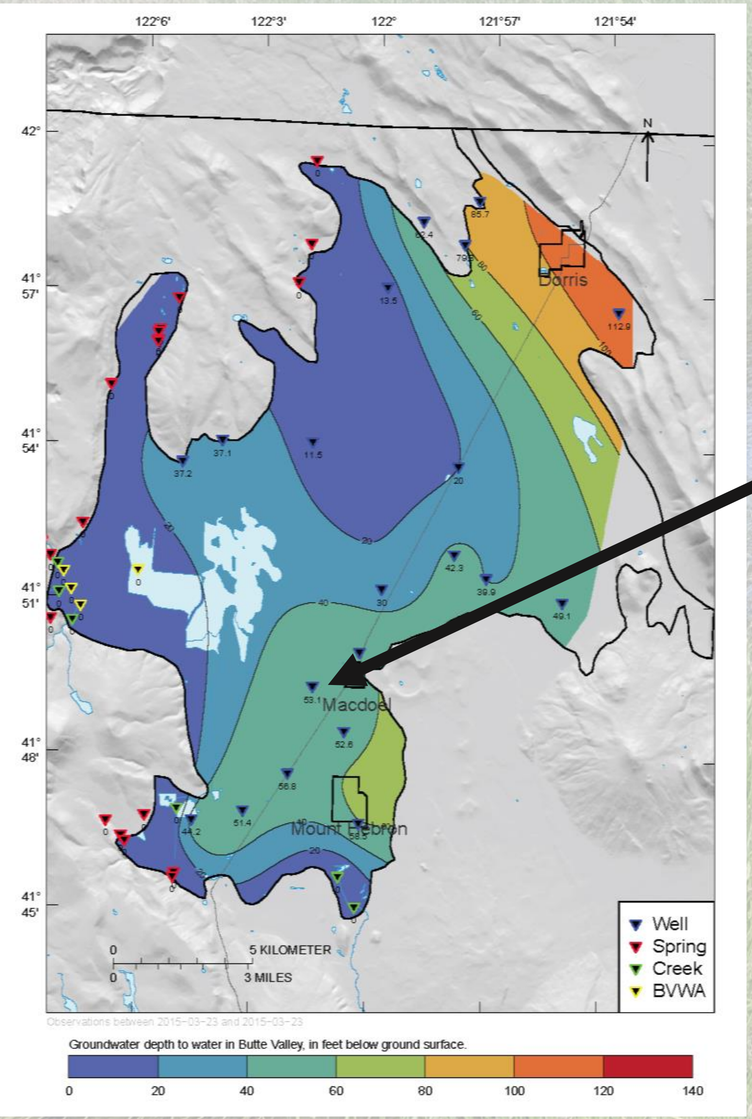


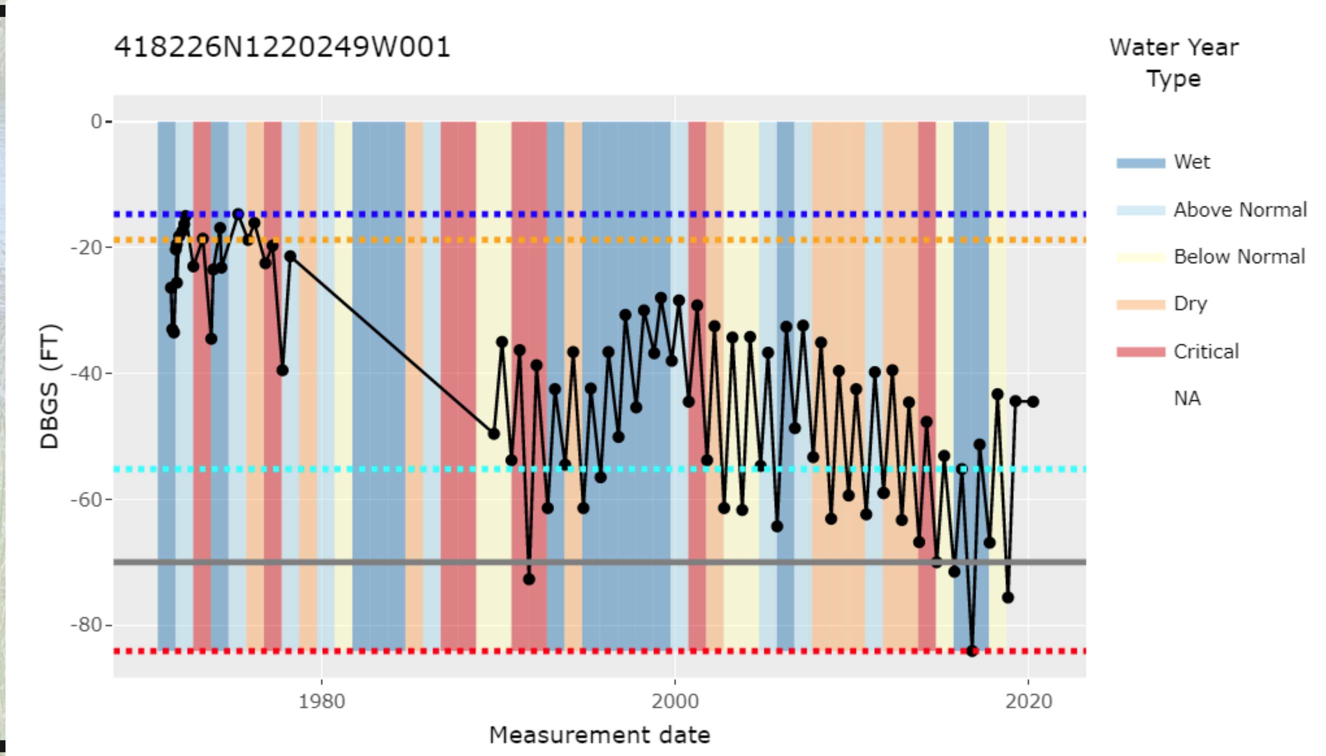
Spring 2015

Fall 2015



3. Depth to Groundwater





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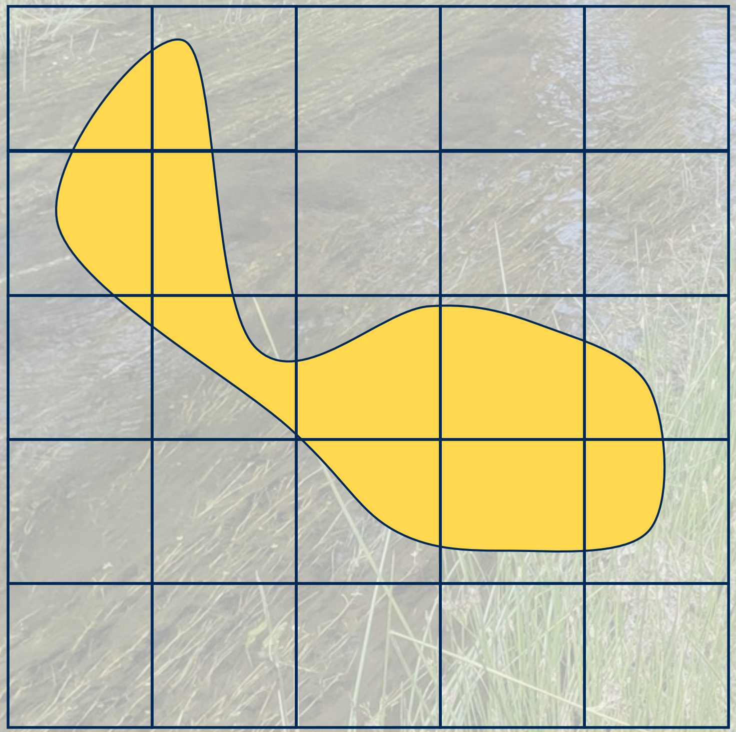
4. Relationship Between Rooting Zone and Groundwater Depths

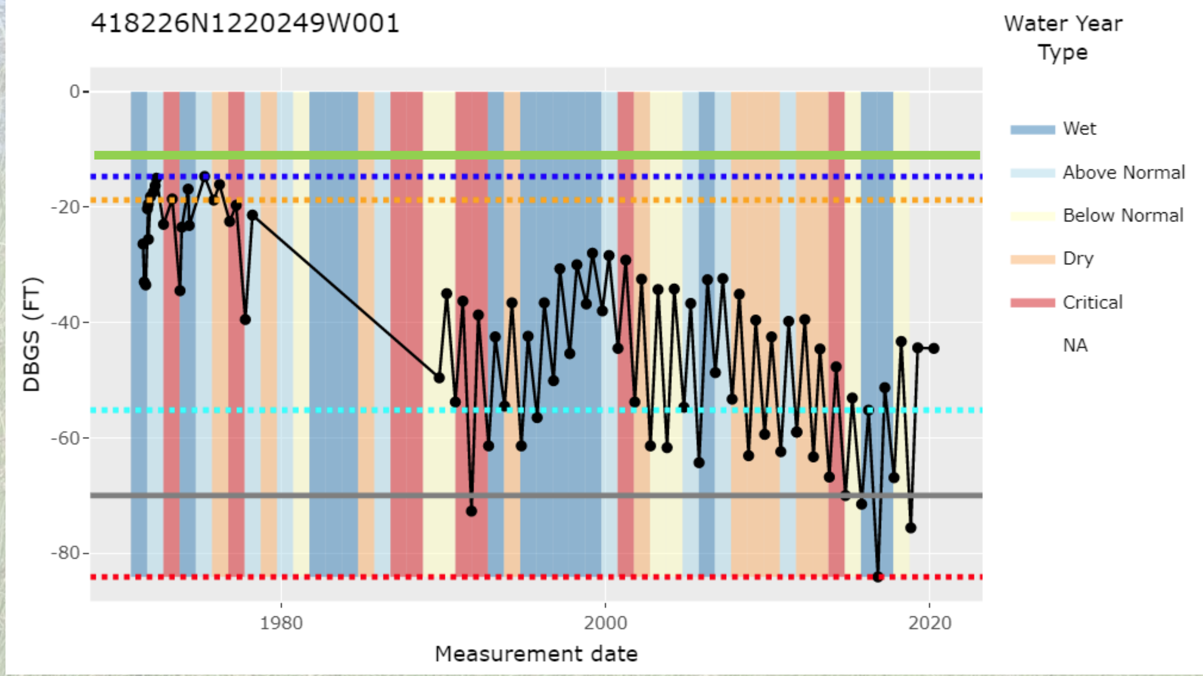
Grid-Based Analysis

1. GDE with rooting zone (RZ) depth = 13.1 ft.
2. Area-weighted depth to groundwater (GW) within GDE (zonal statistics)
3. Comparison of RZ and GW depths



Point-Based Time Series

1. GDE with rooting zone (RZ) depth = 13.1 ft.
2. Comparison of RZ and GW depths
3. Frequency of RZ reaching GW



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5. Potential GDE Characterization

- Not a GDE
- **Disconnected**
- Likely Disconnected
- Likely Connected
- Connected

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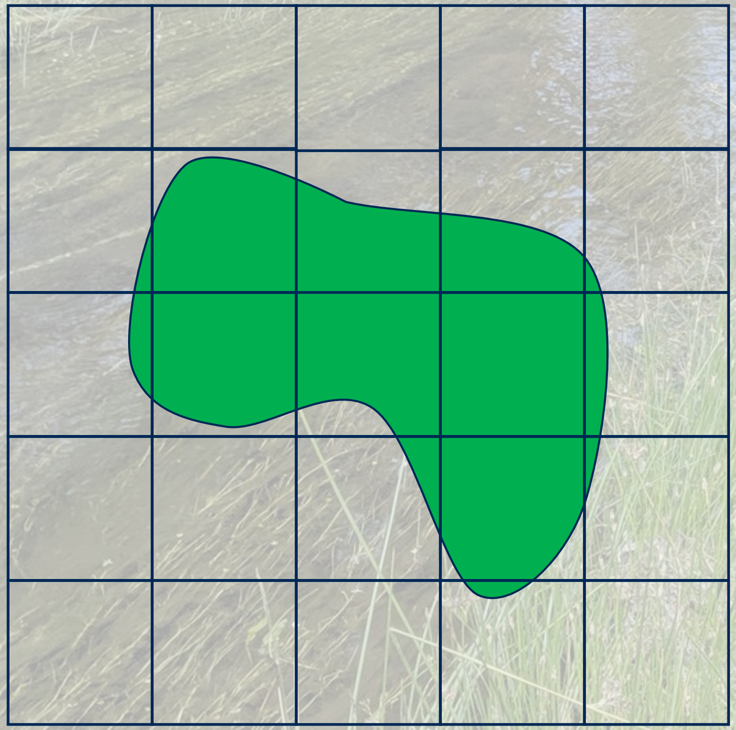
4. Relationship Between Rooting Zone and Groundwater Depths

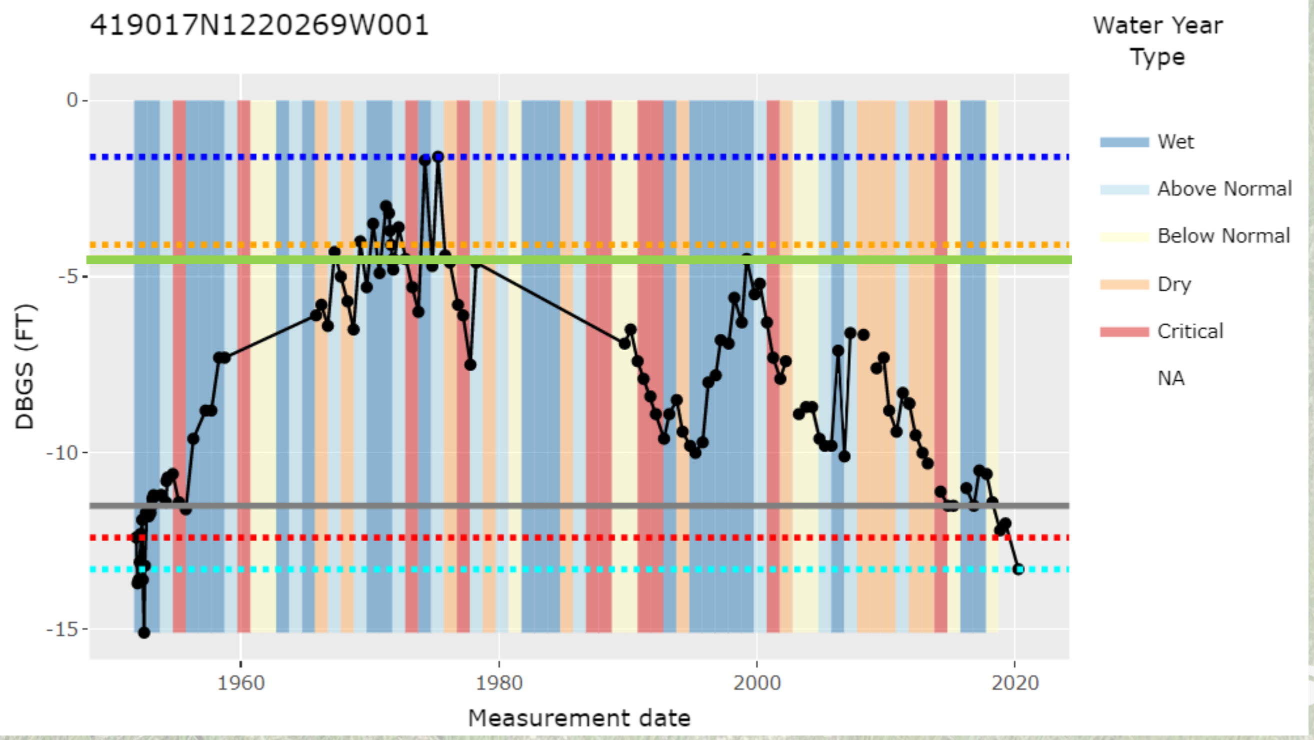
Grid-Based Analysis

1. GDE with rooting zone (RZ) depth = 4.8 ft.
2. Area-weighted depth to groundwater (GW) within GDE (zonal statistics)
3. Comparison of RZ and GW depths



Point-Based Time Series

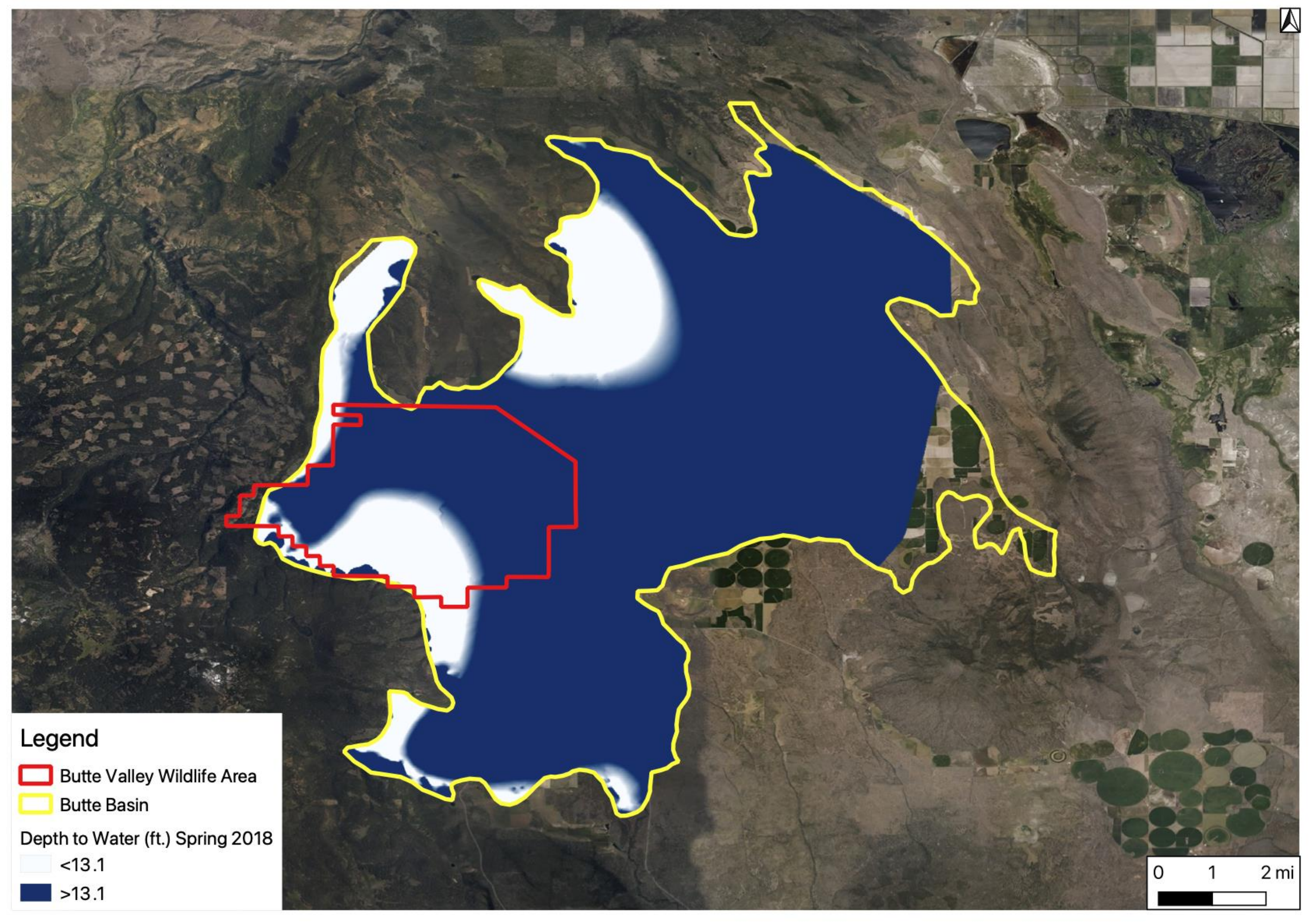
1. GDE with rooting zone (RZ) depth = 4.8 ft.
2. Comparison of RZ and GW depths
3. Frequency of RZ reaching GW



5. Potential GDE Characterization

- Not a GDE
- Disconnected
- Likely Disconnected
- Likely Connected
- Connected

5. Potential GDE Characterization: Spring 2018



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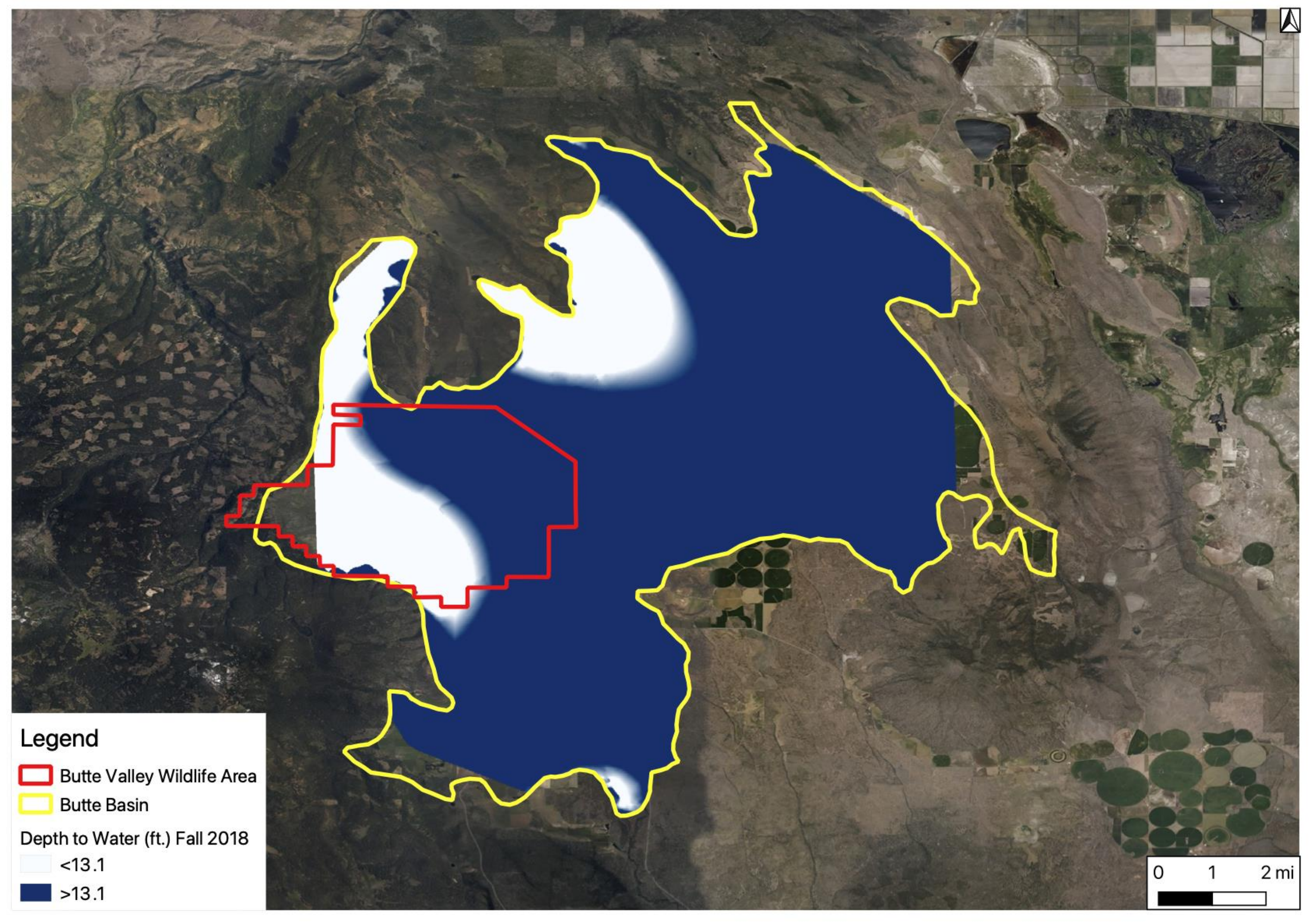
5. Potential GDE Characterization: Fall 2018



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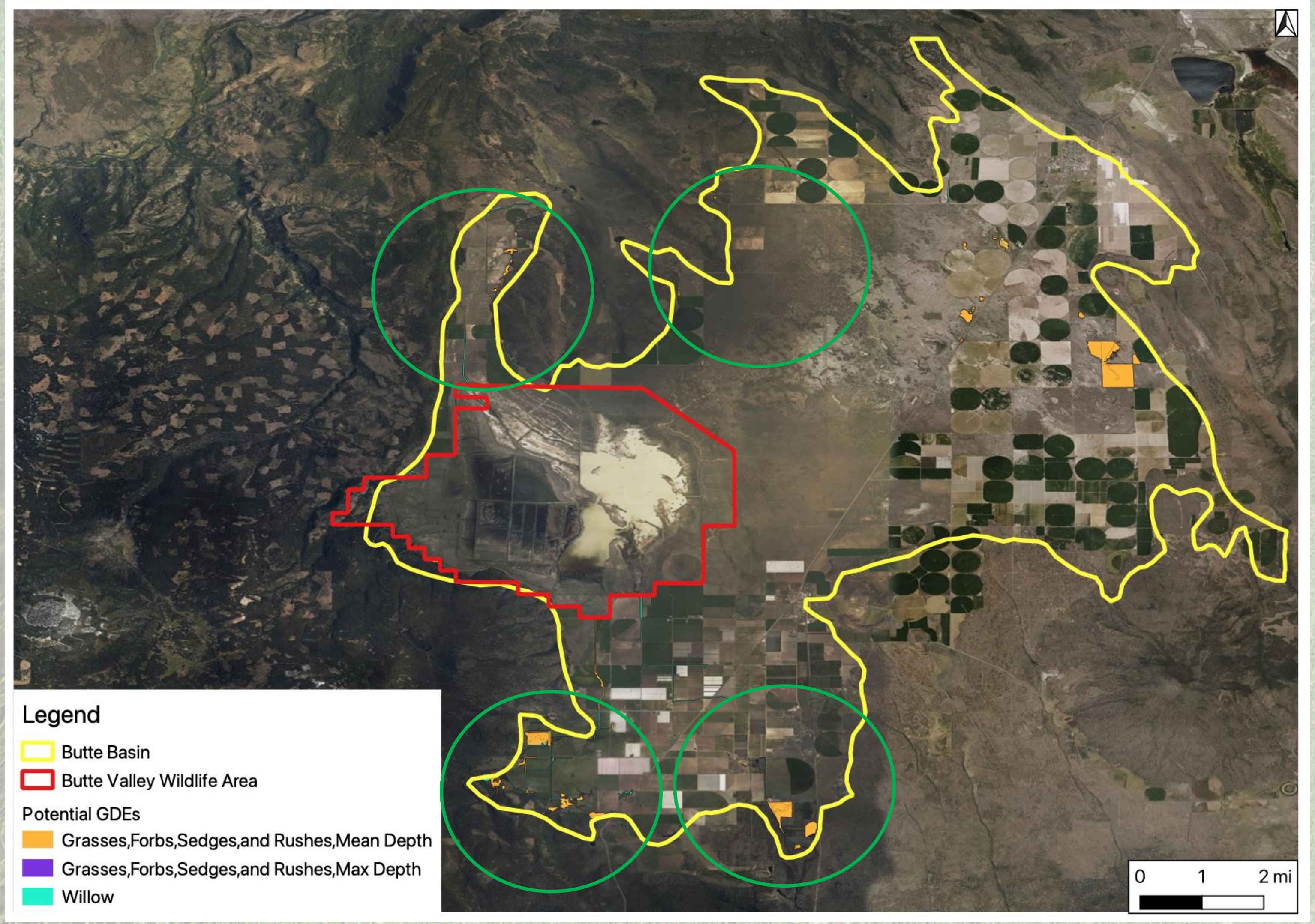

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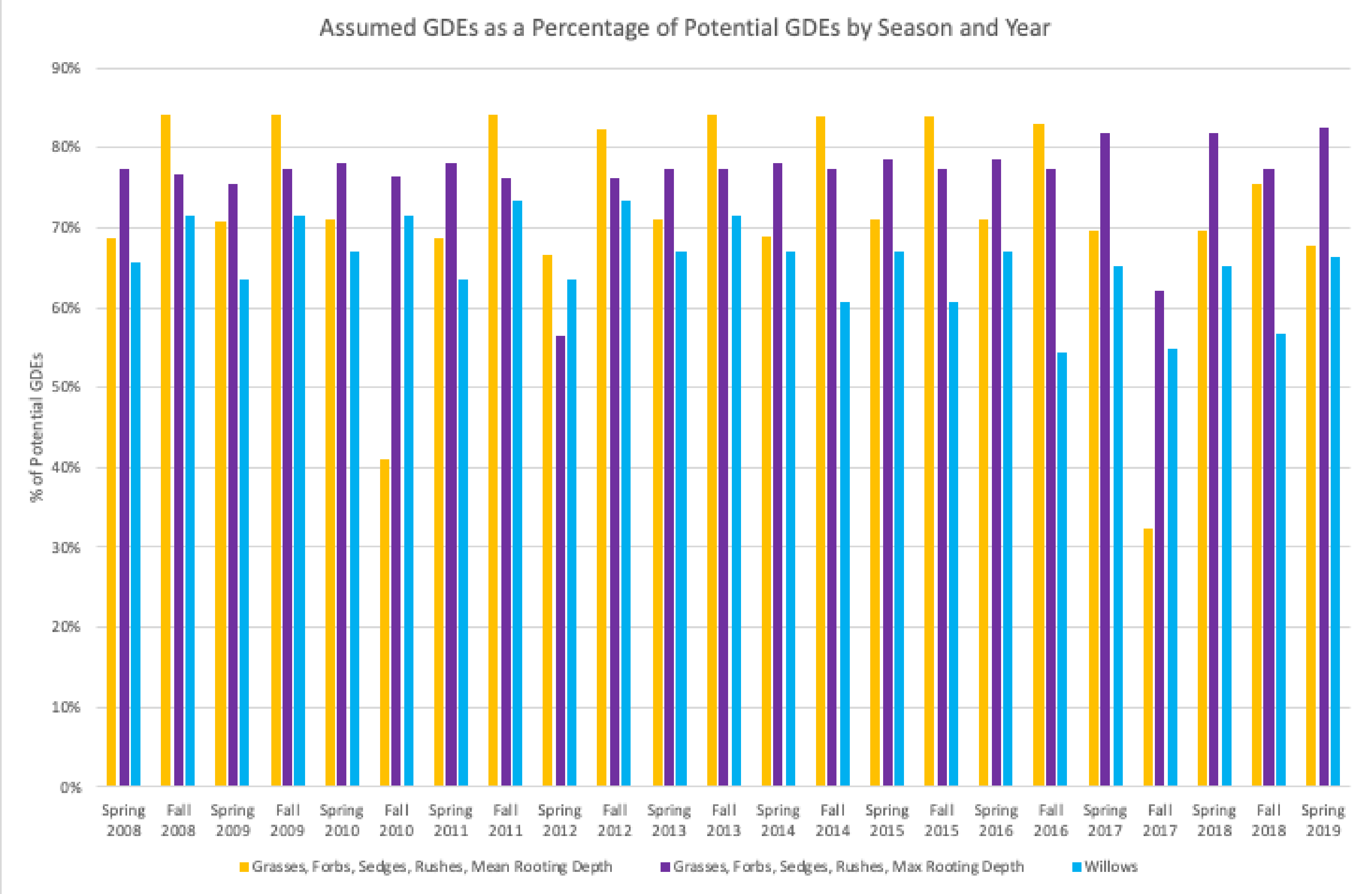
5. Potential GDE Characterization



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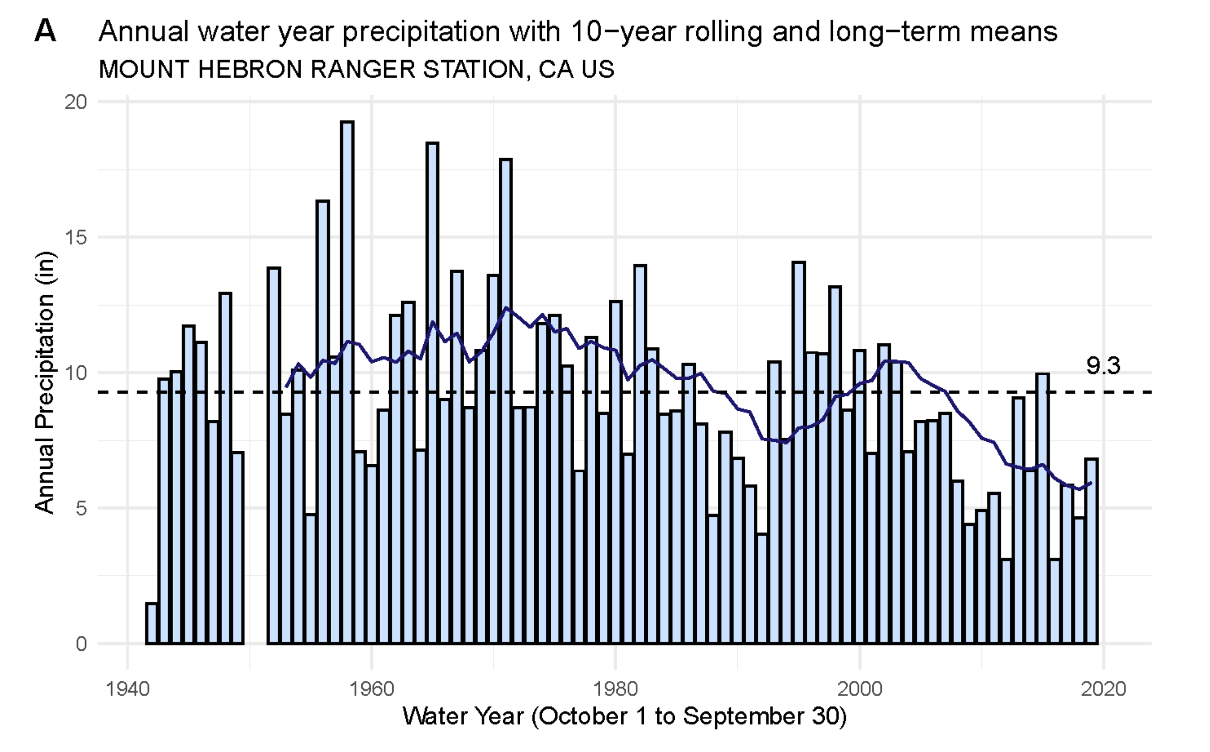
6. Assumed GDEs

Two sets of GDEs are shown in the following slides, in which climate conditions were different:

- 2015
- 2018



Yearly Rainfall:

- 2015: 9.96 inches (normal)
- 2018: 4.64 inches (dry)

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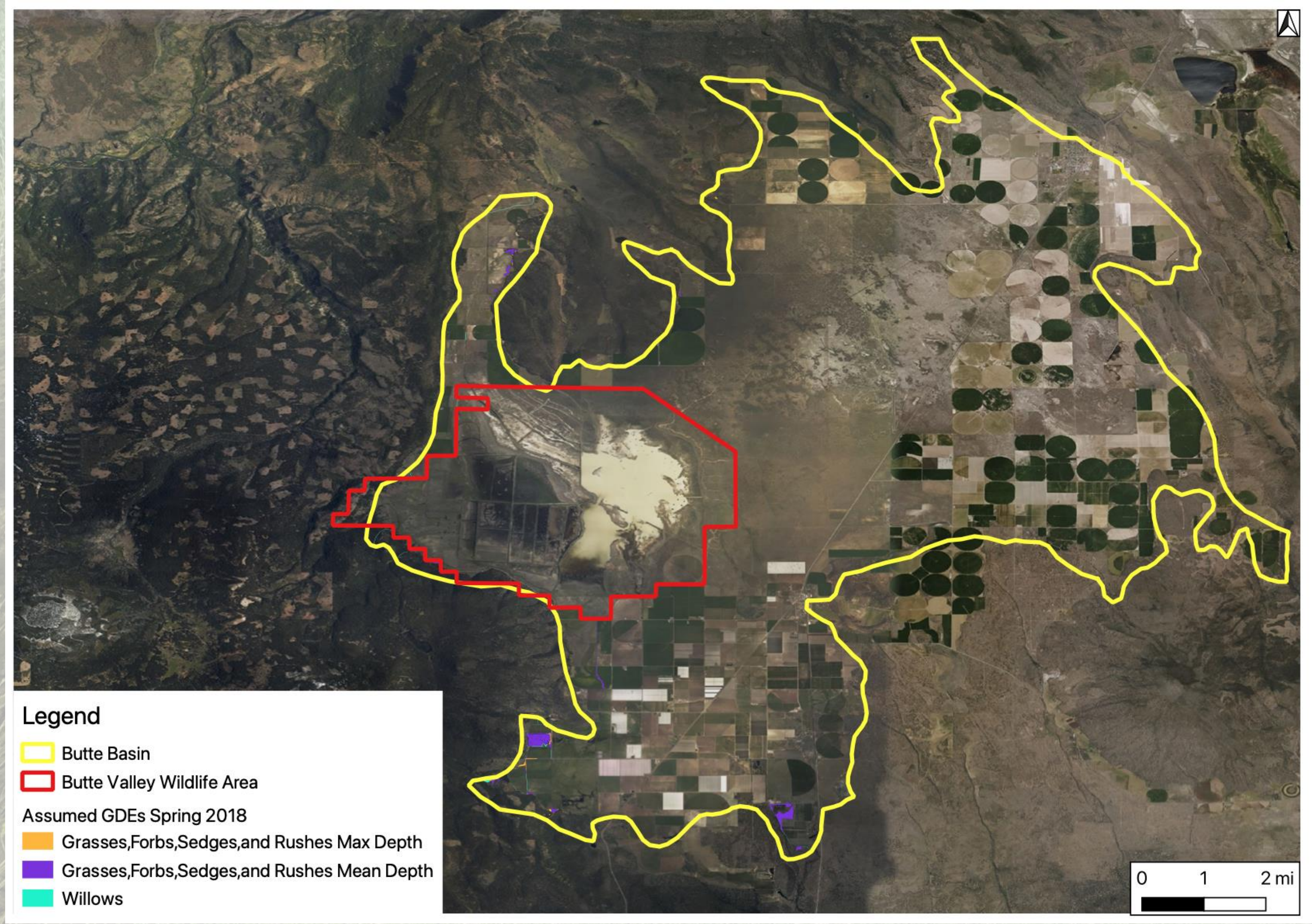
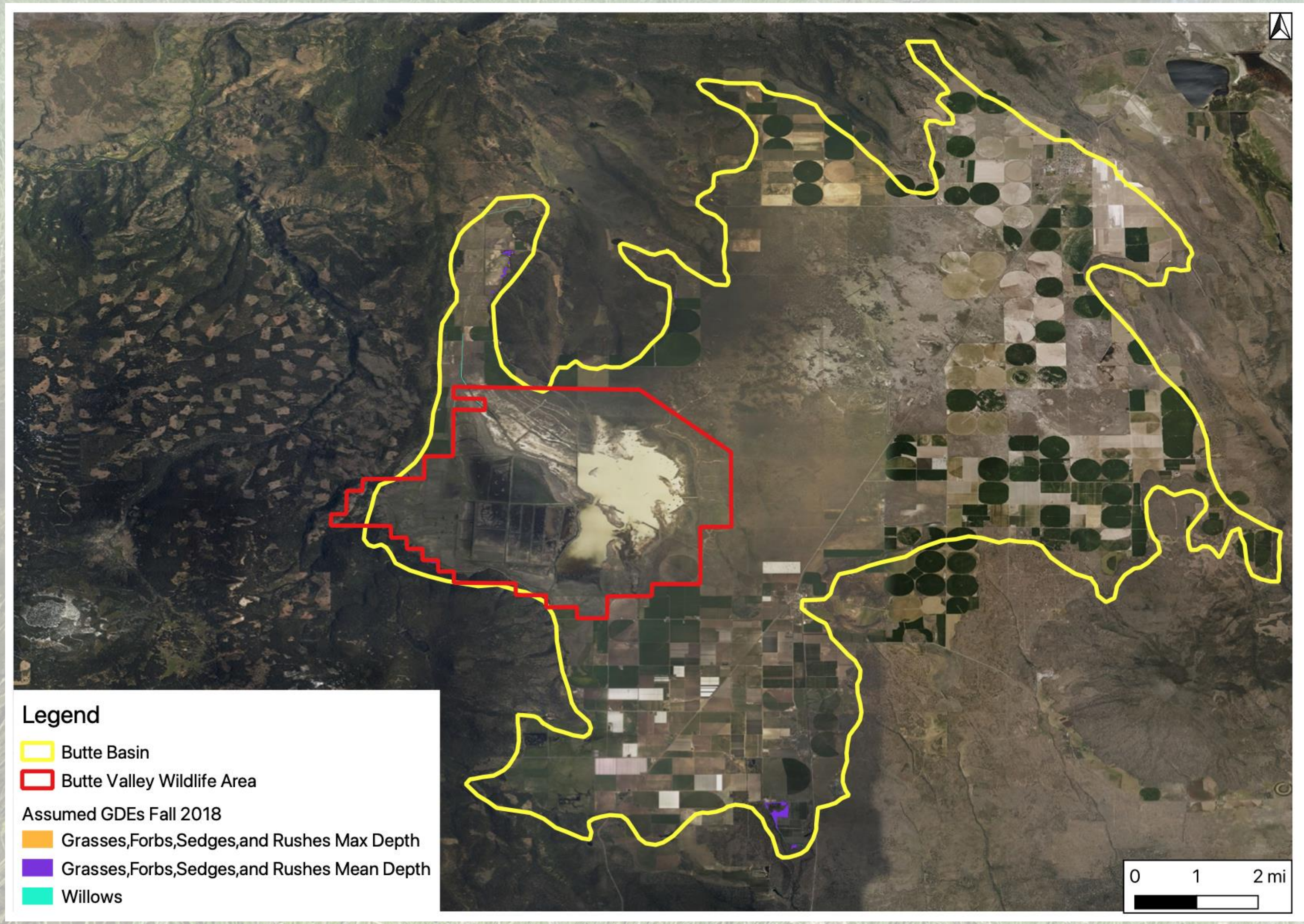
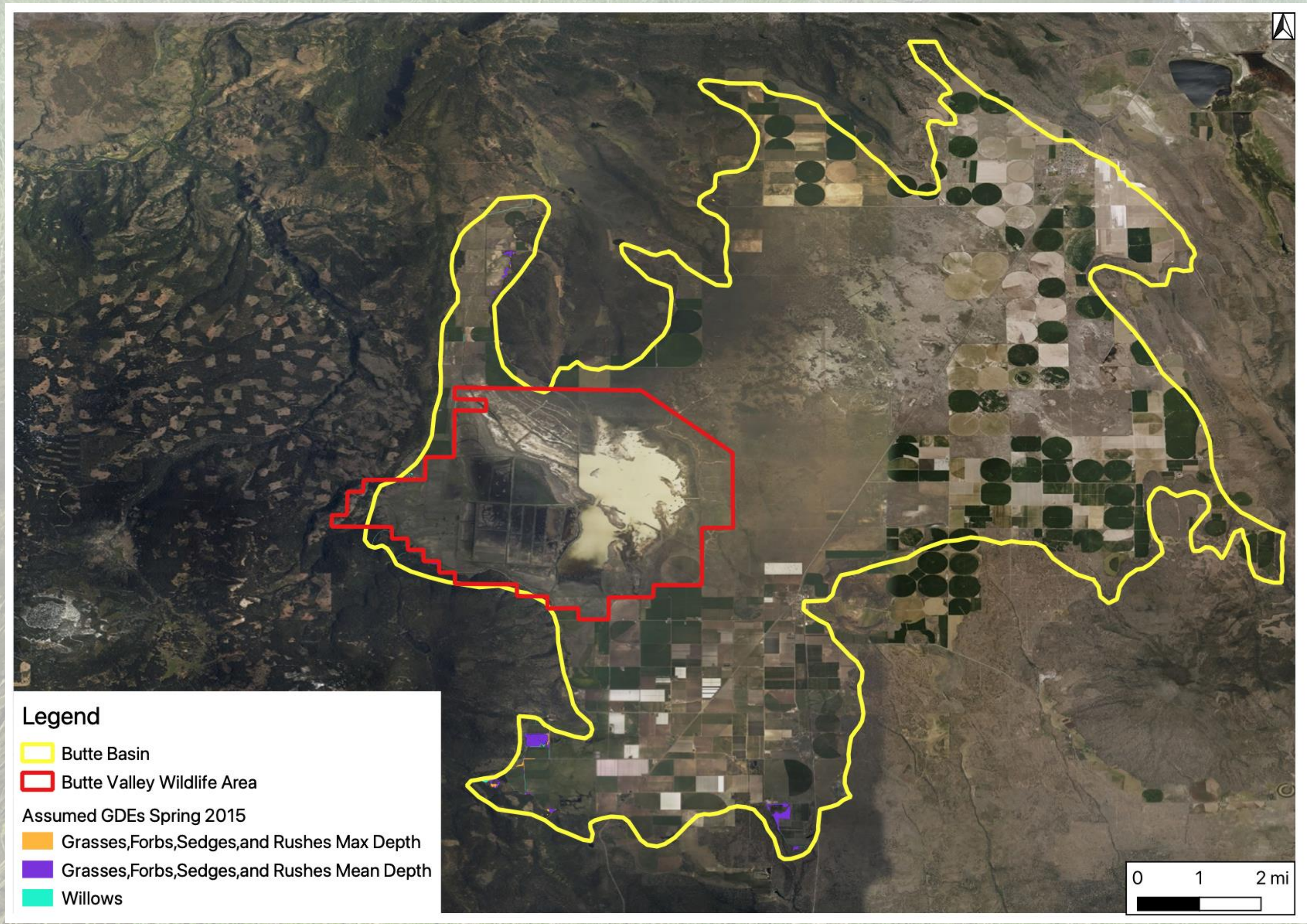
6. Assumed GDEs: Spring 2018



6. Assumed GDEs: Fall 2018



6. Assumed GDEs: Spring 2015



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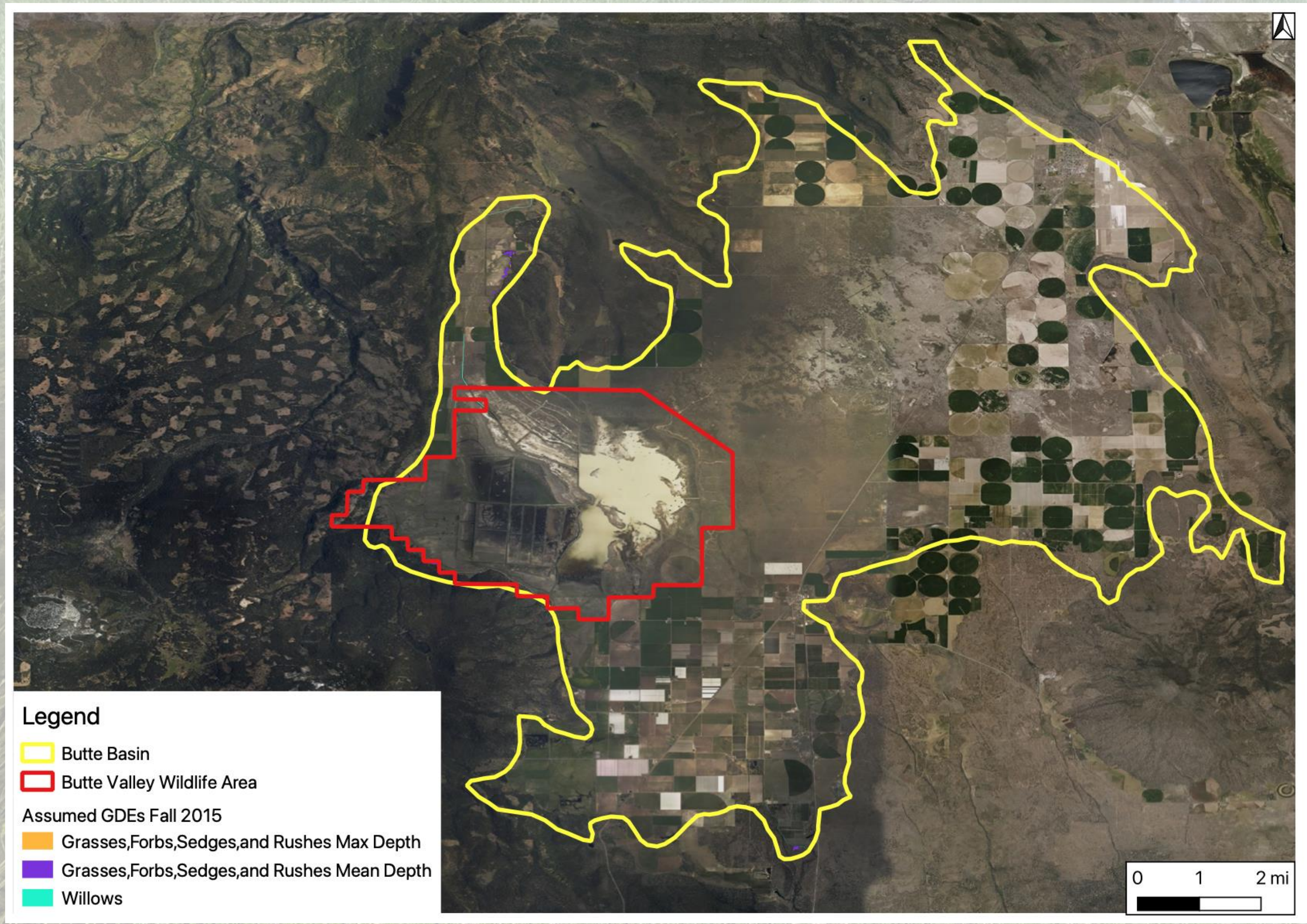
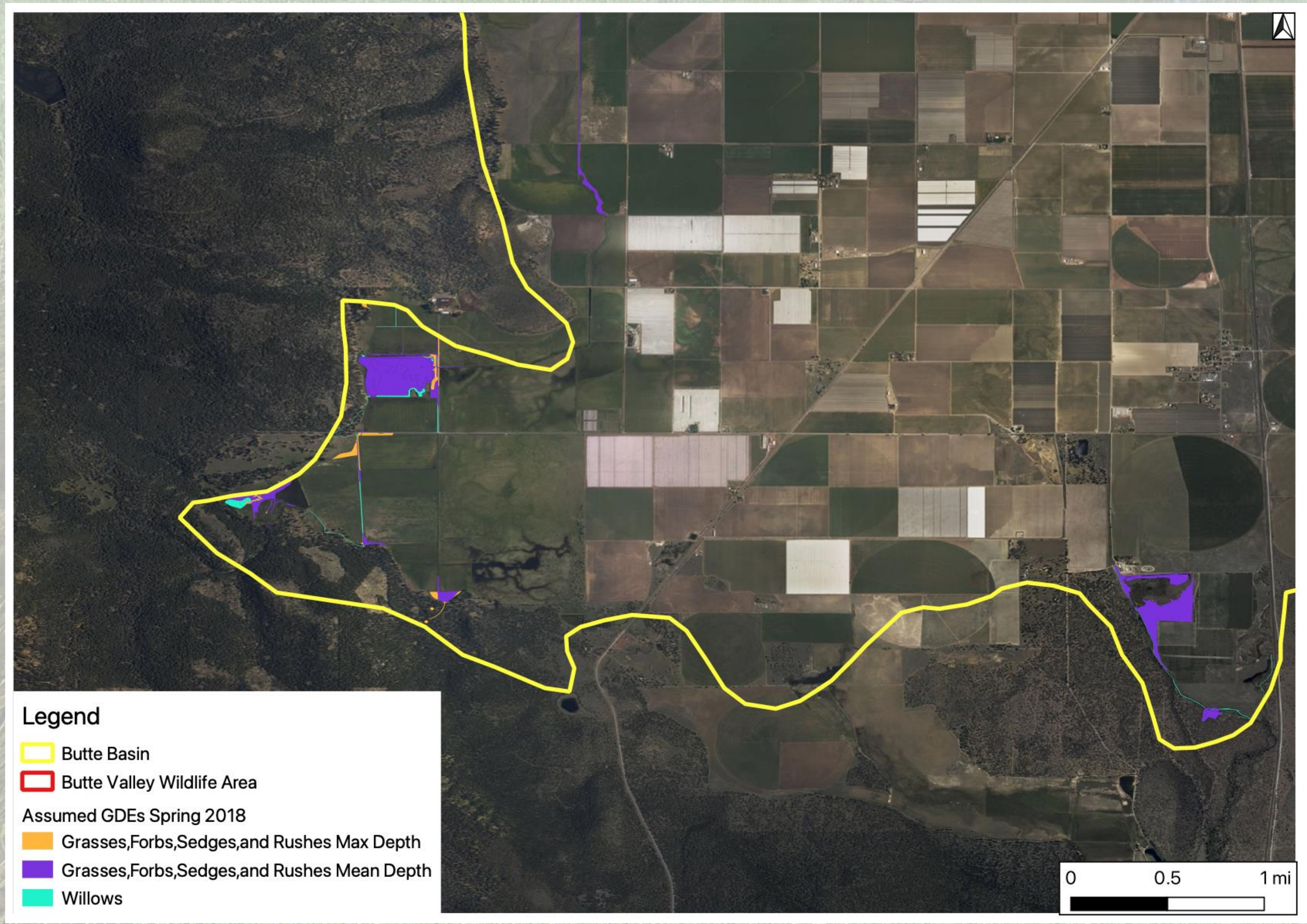


6. Assumed GDEs South: Spring 2018



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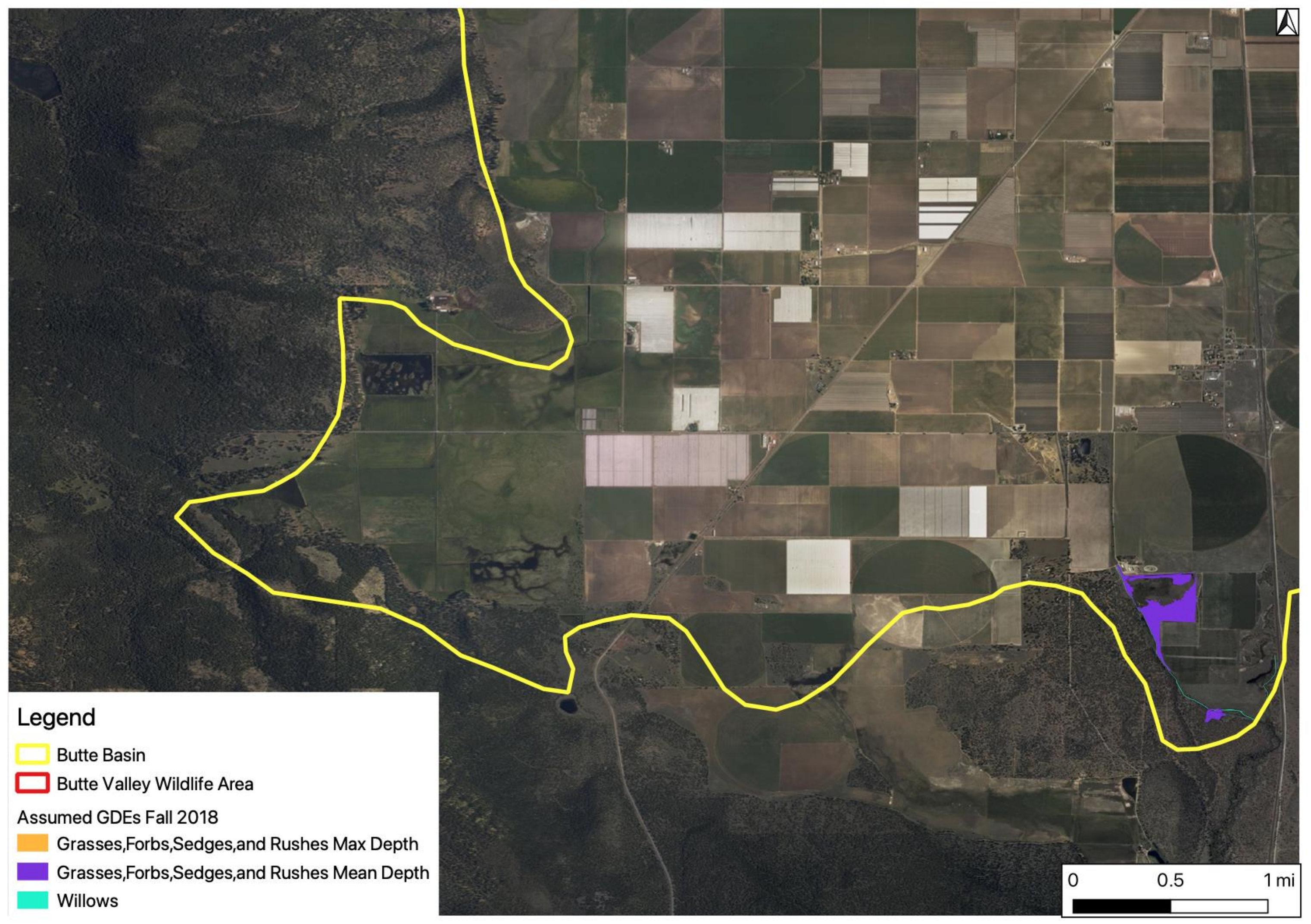

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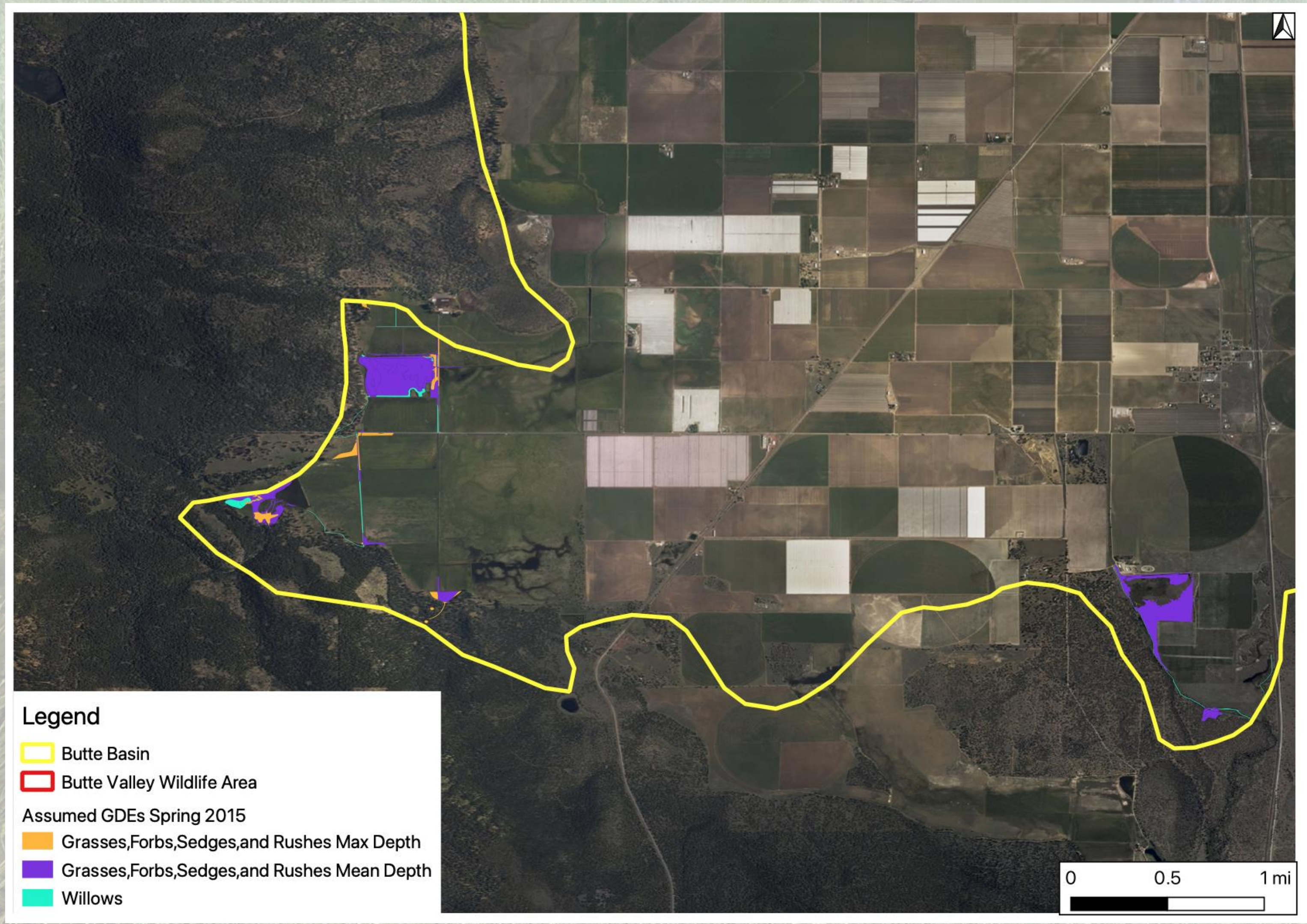

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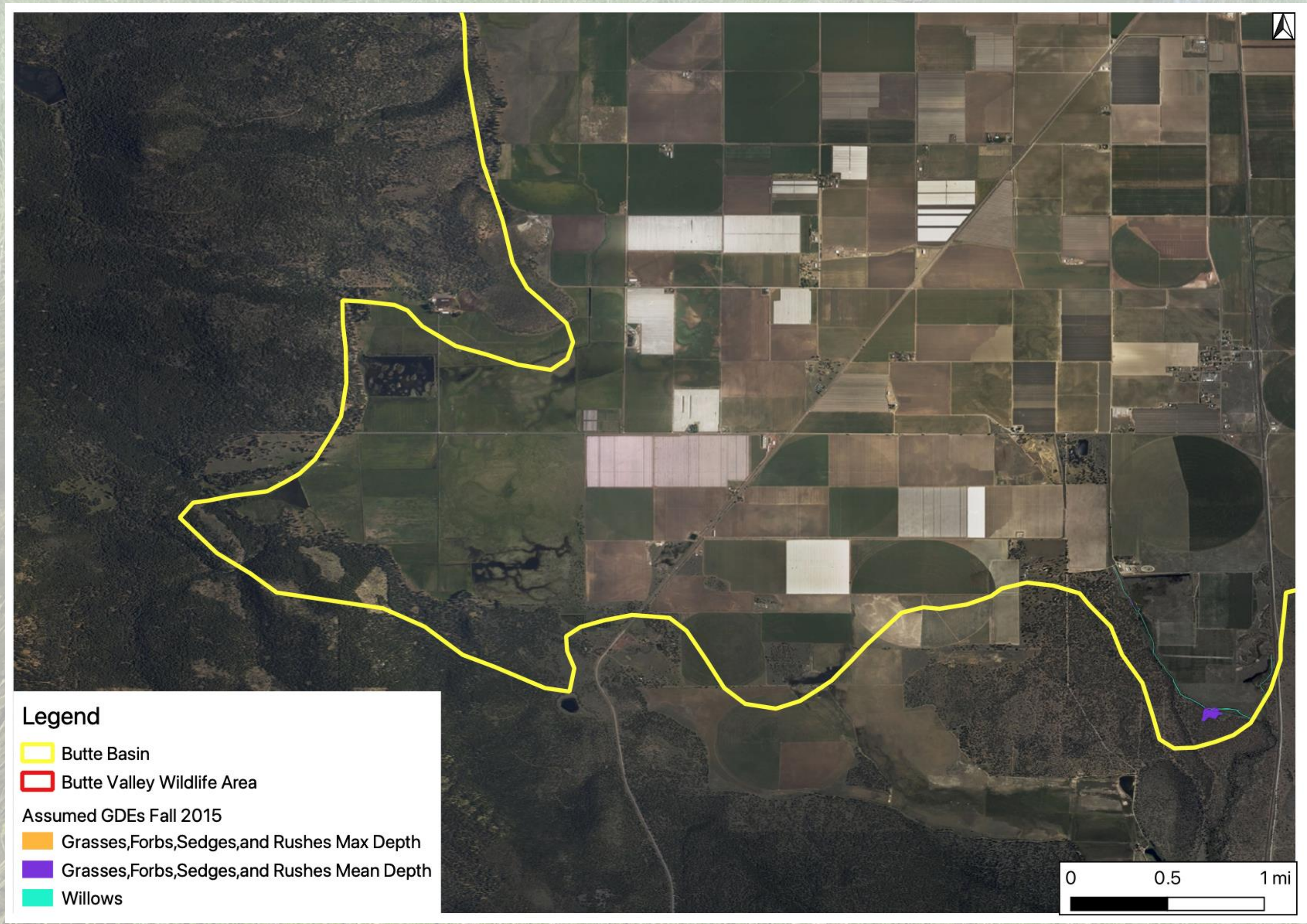

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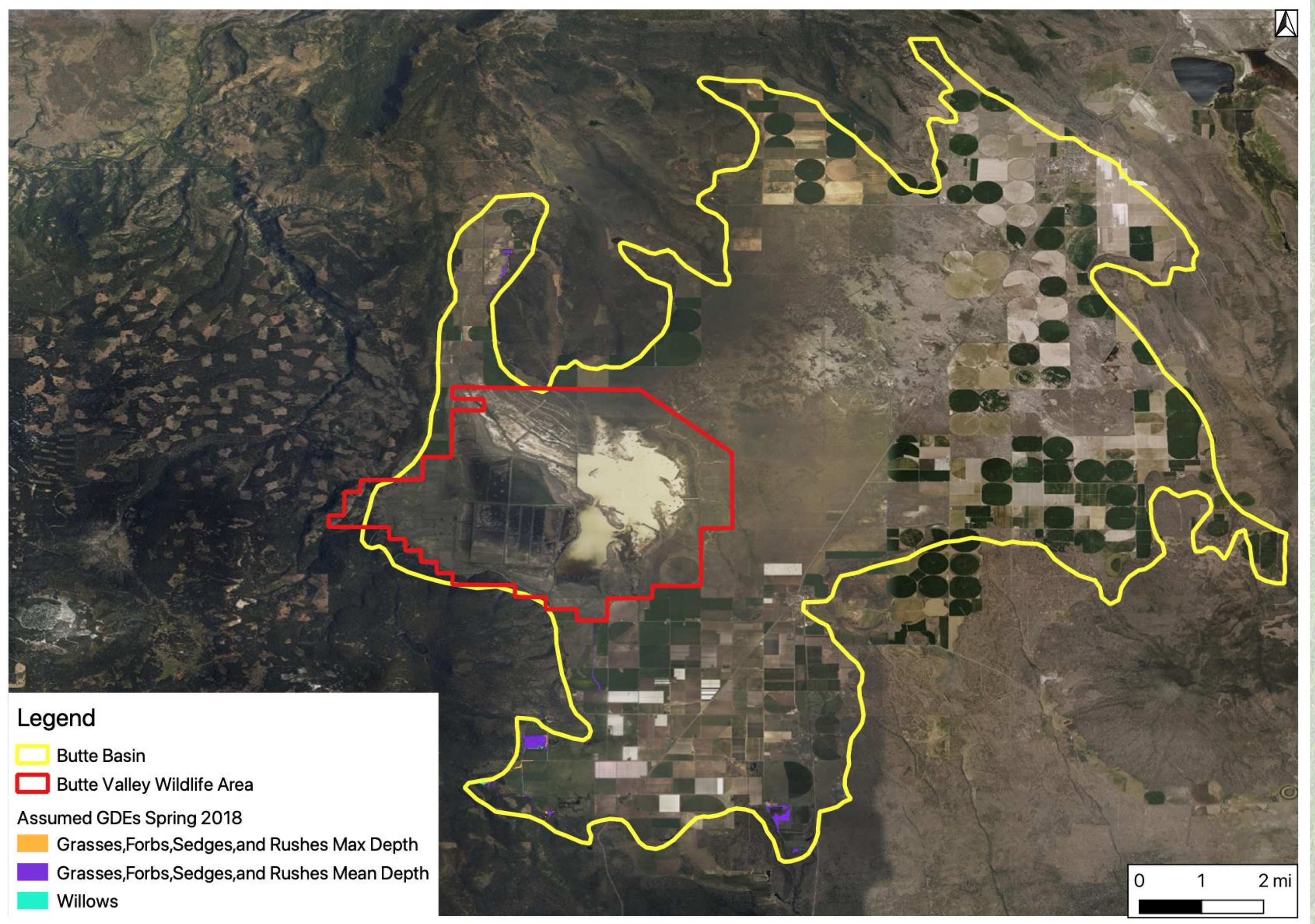

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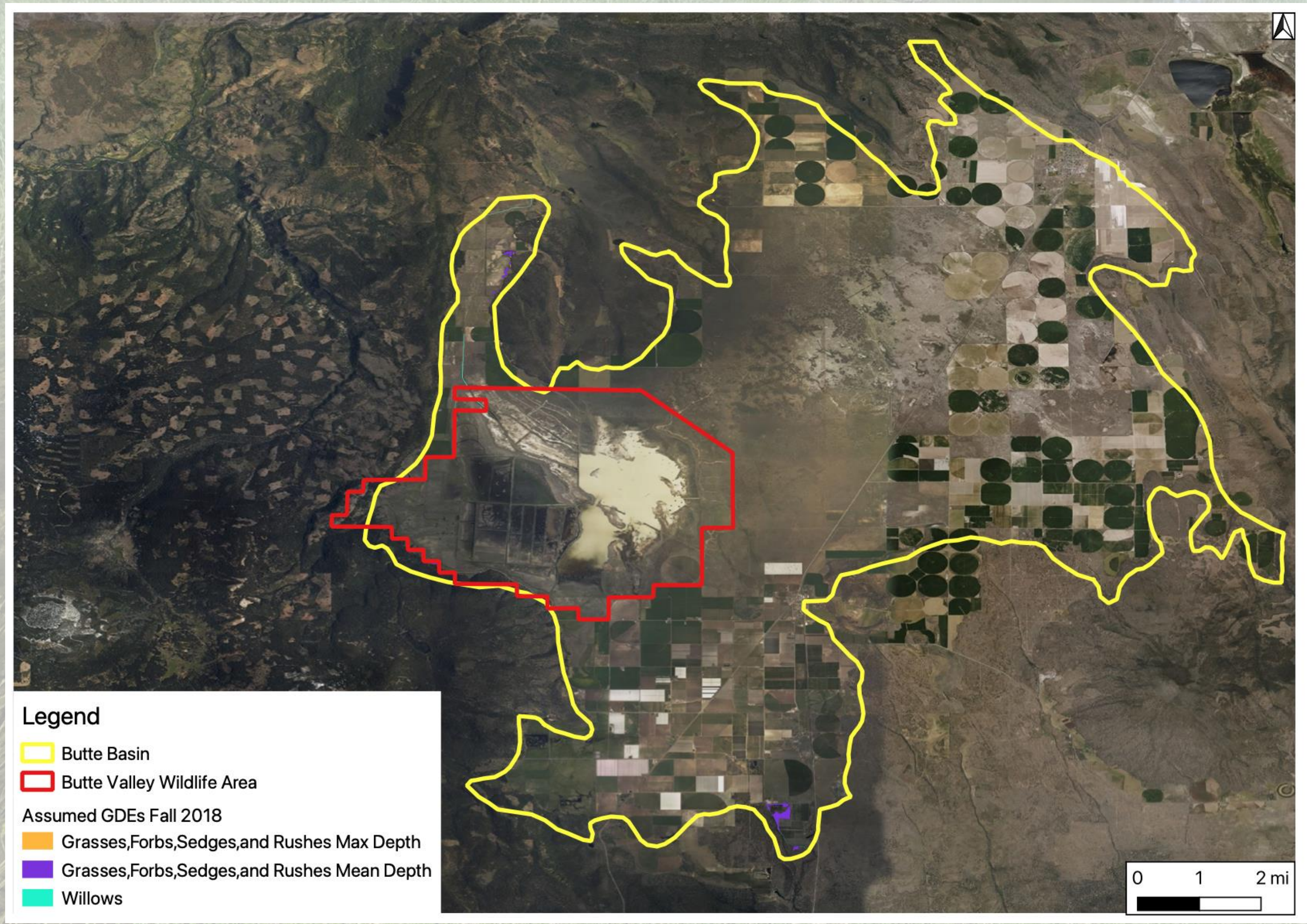

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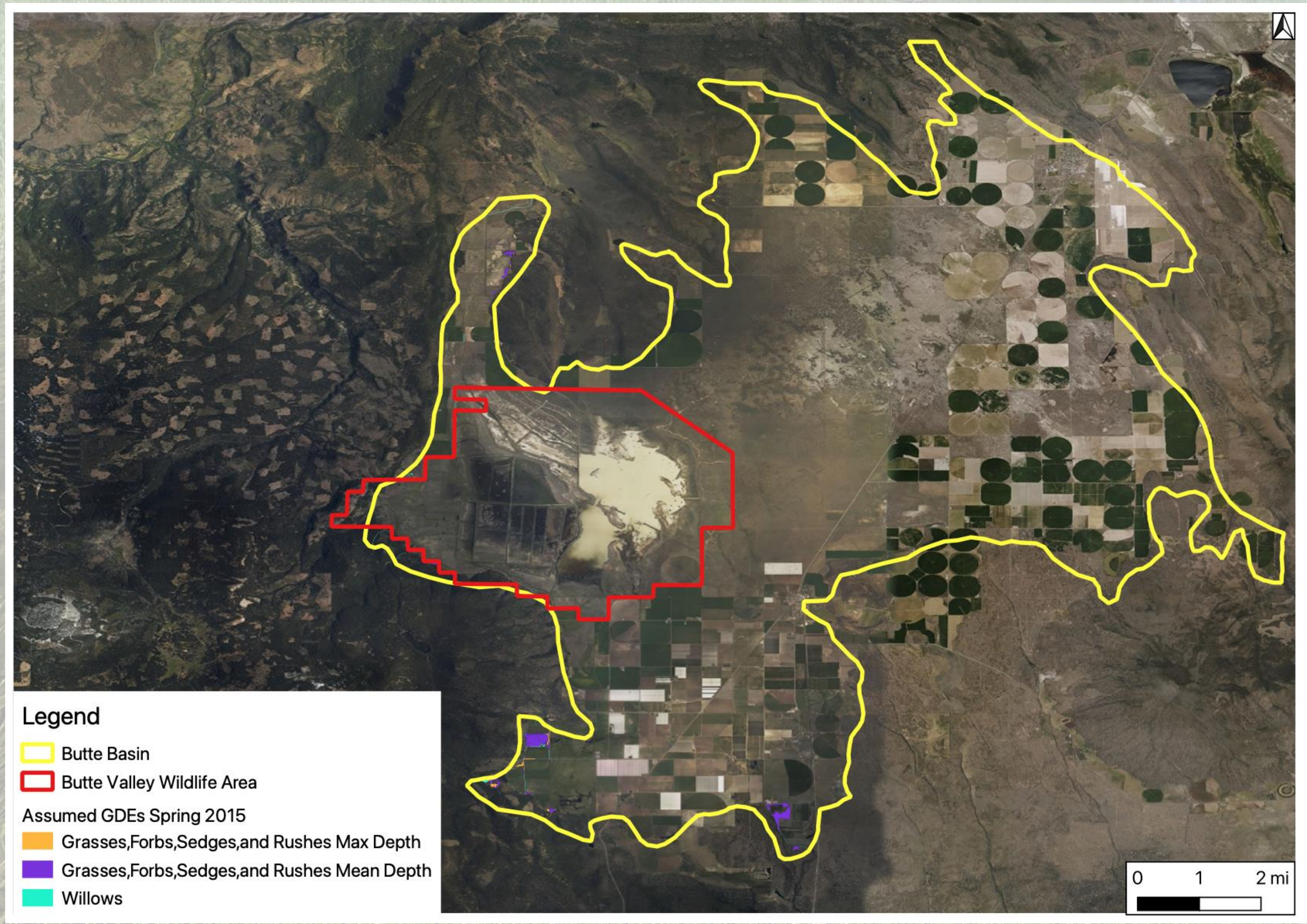

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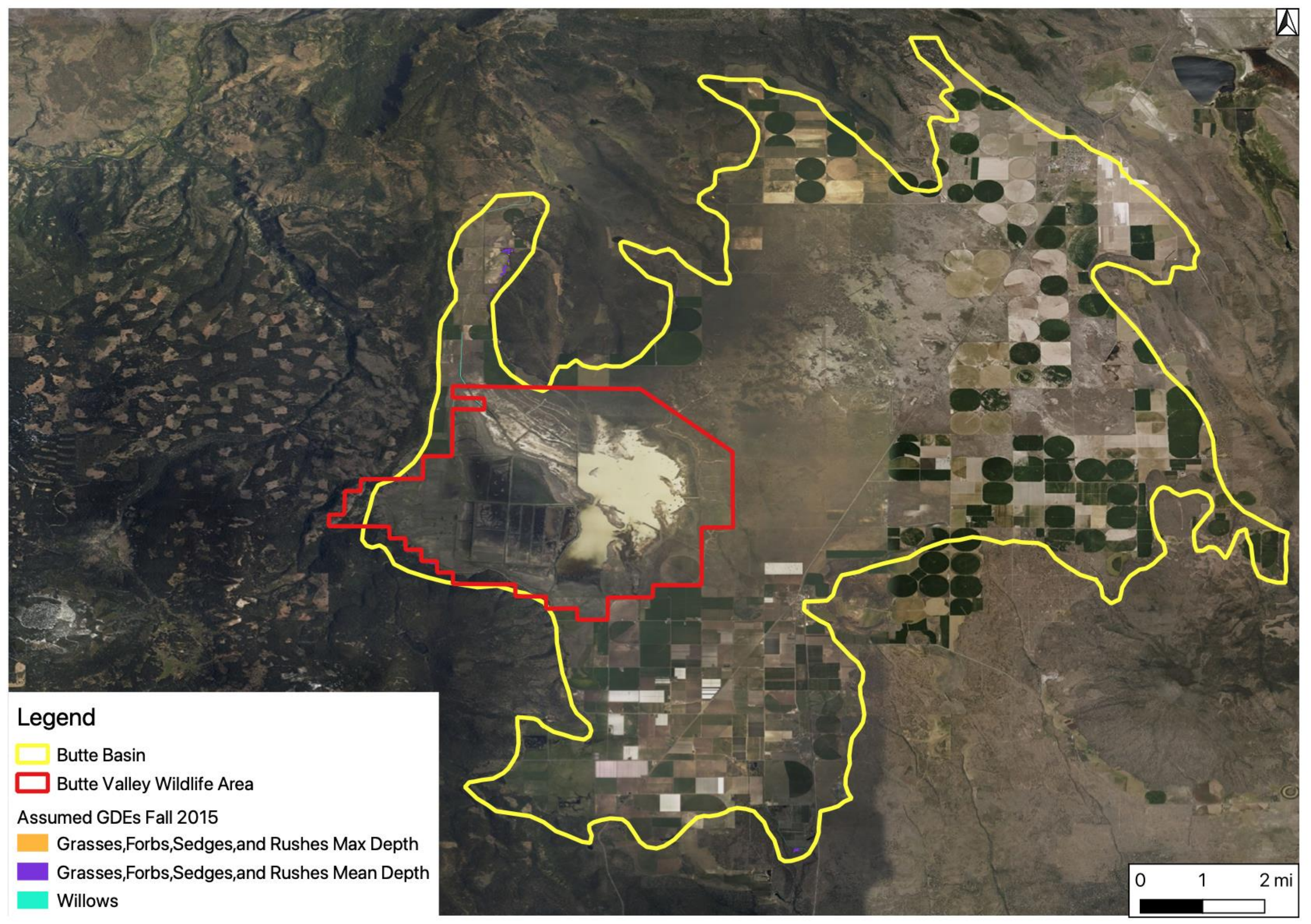

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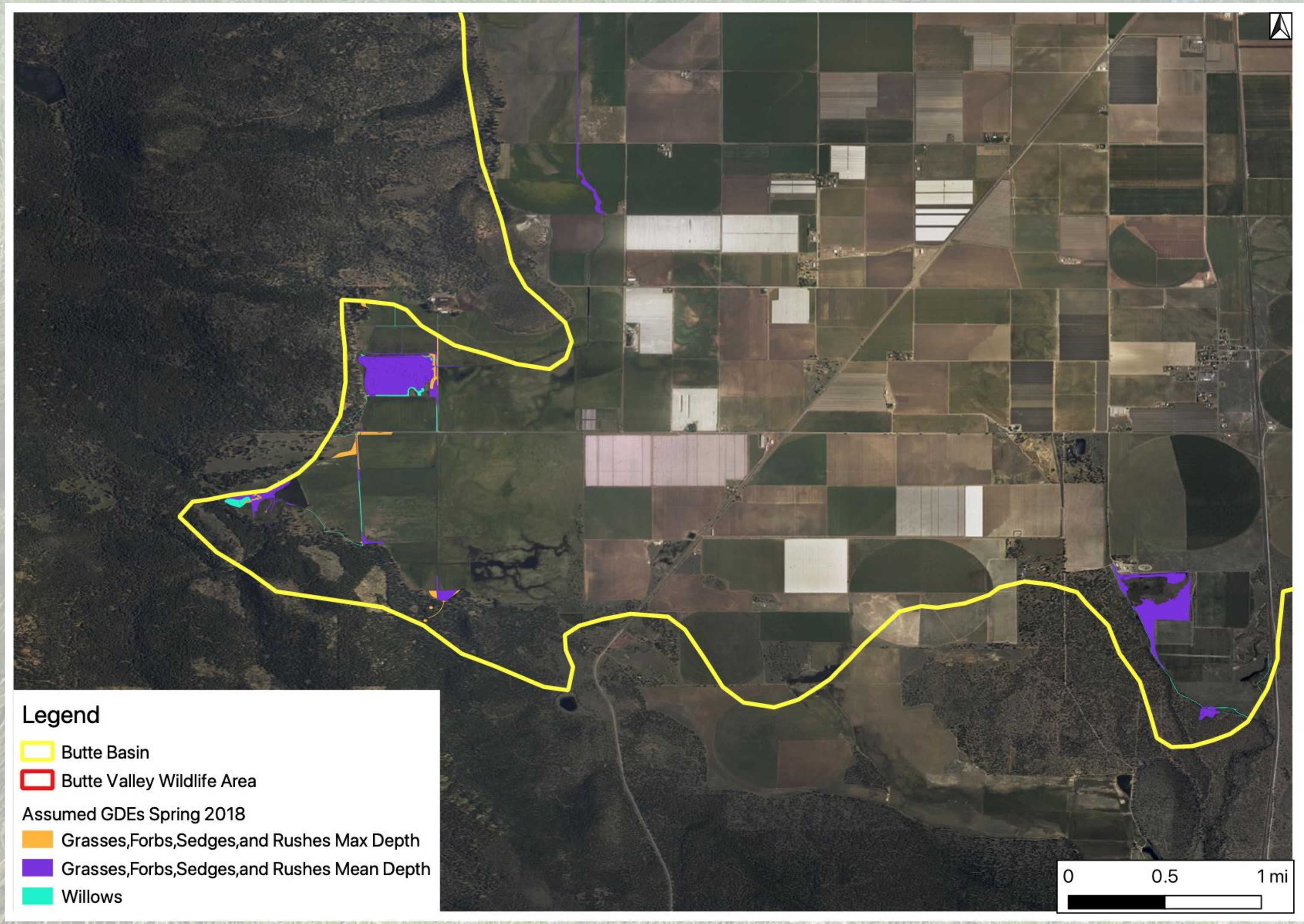
6. Assumed GDEs Southwest: Spring 2018



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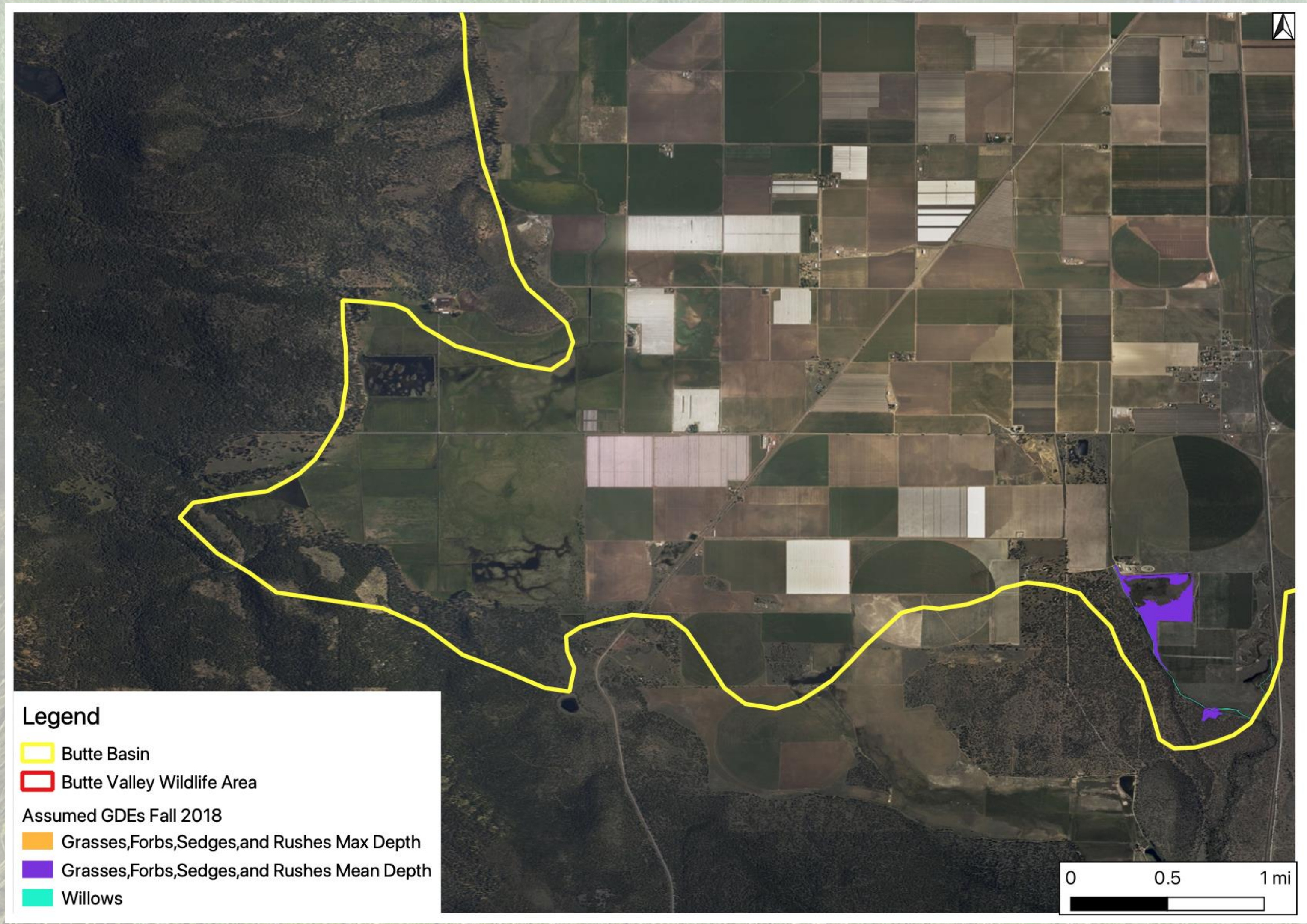

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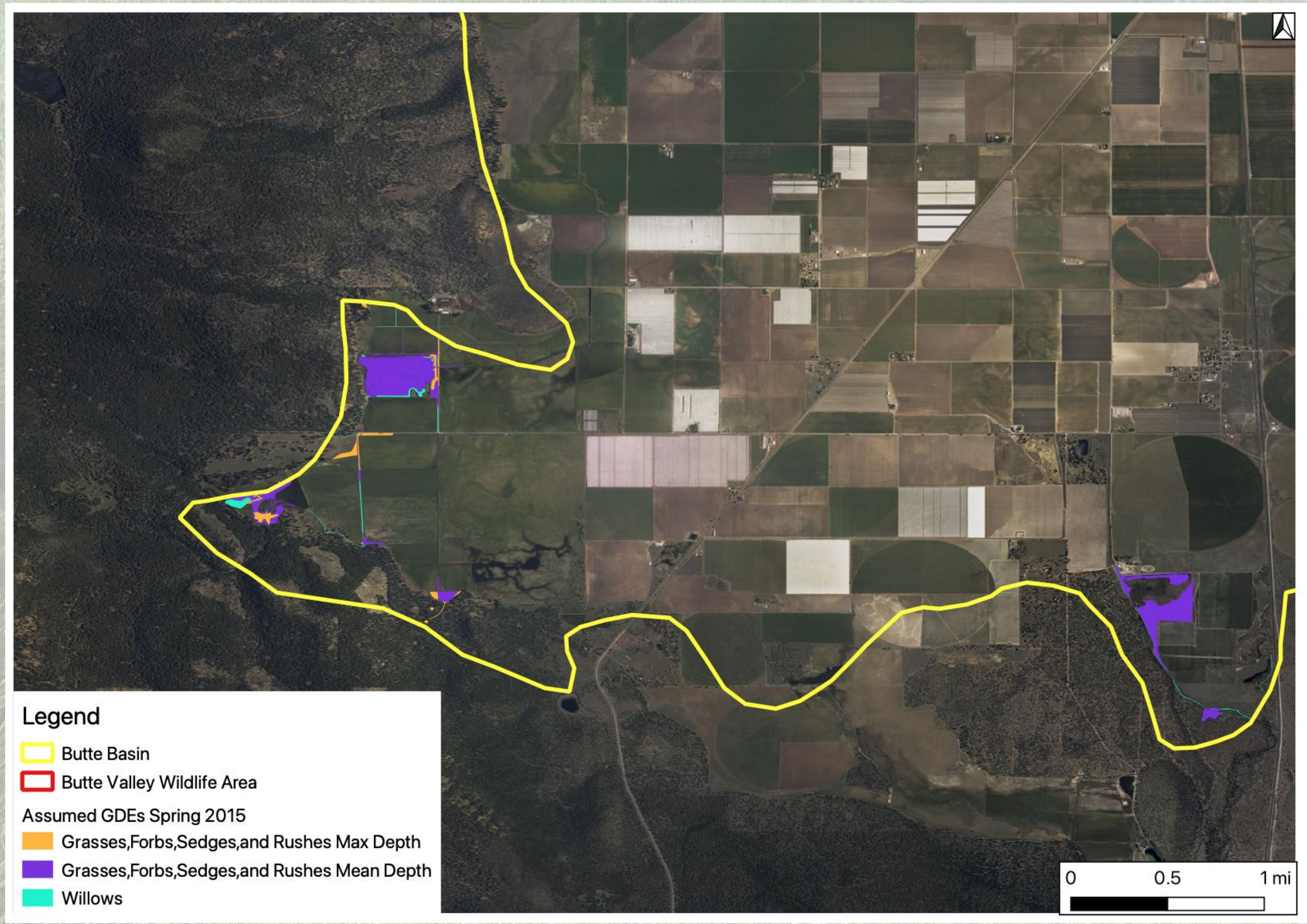

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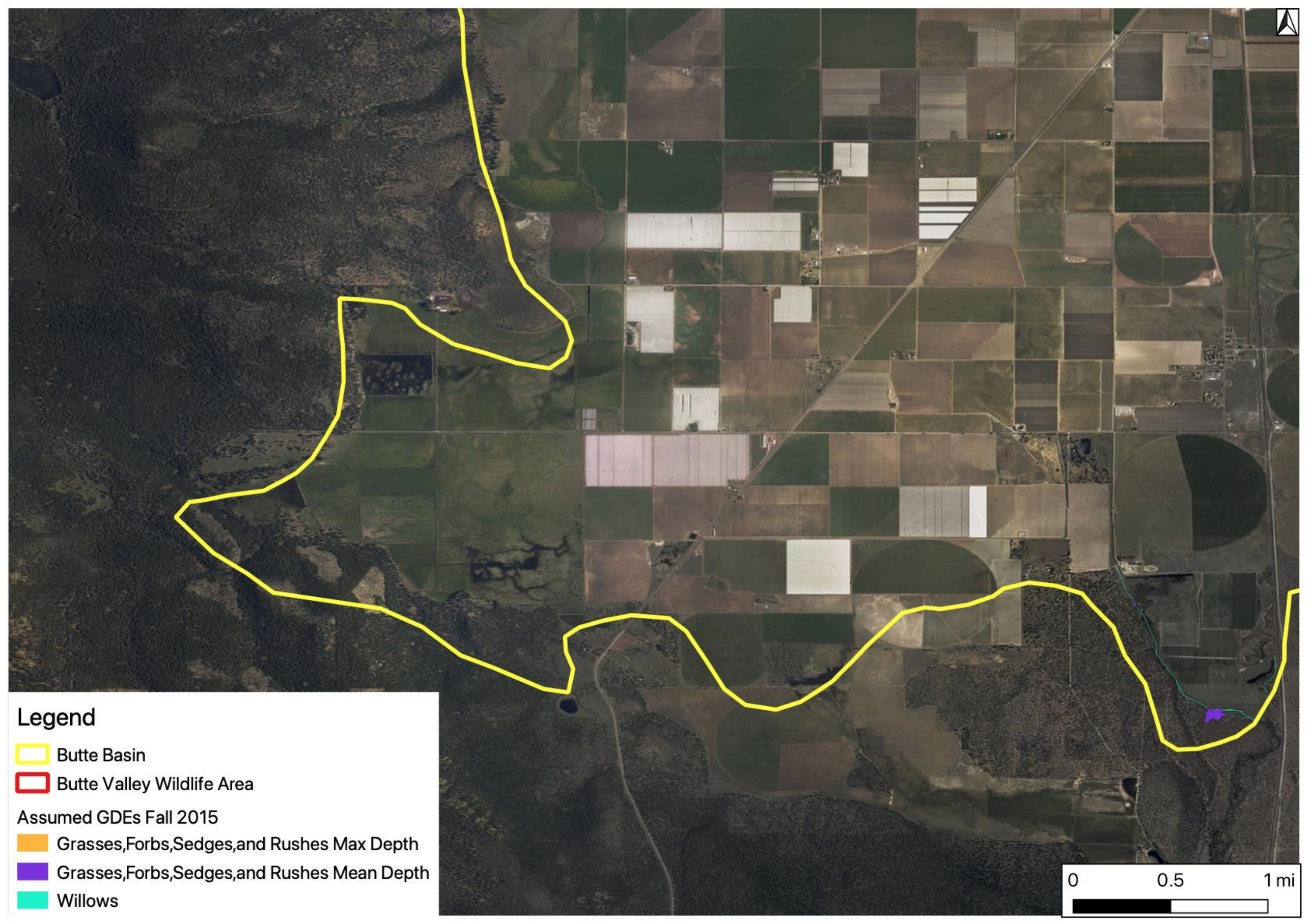

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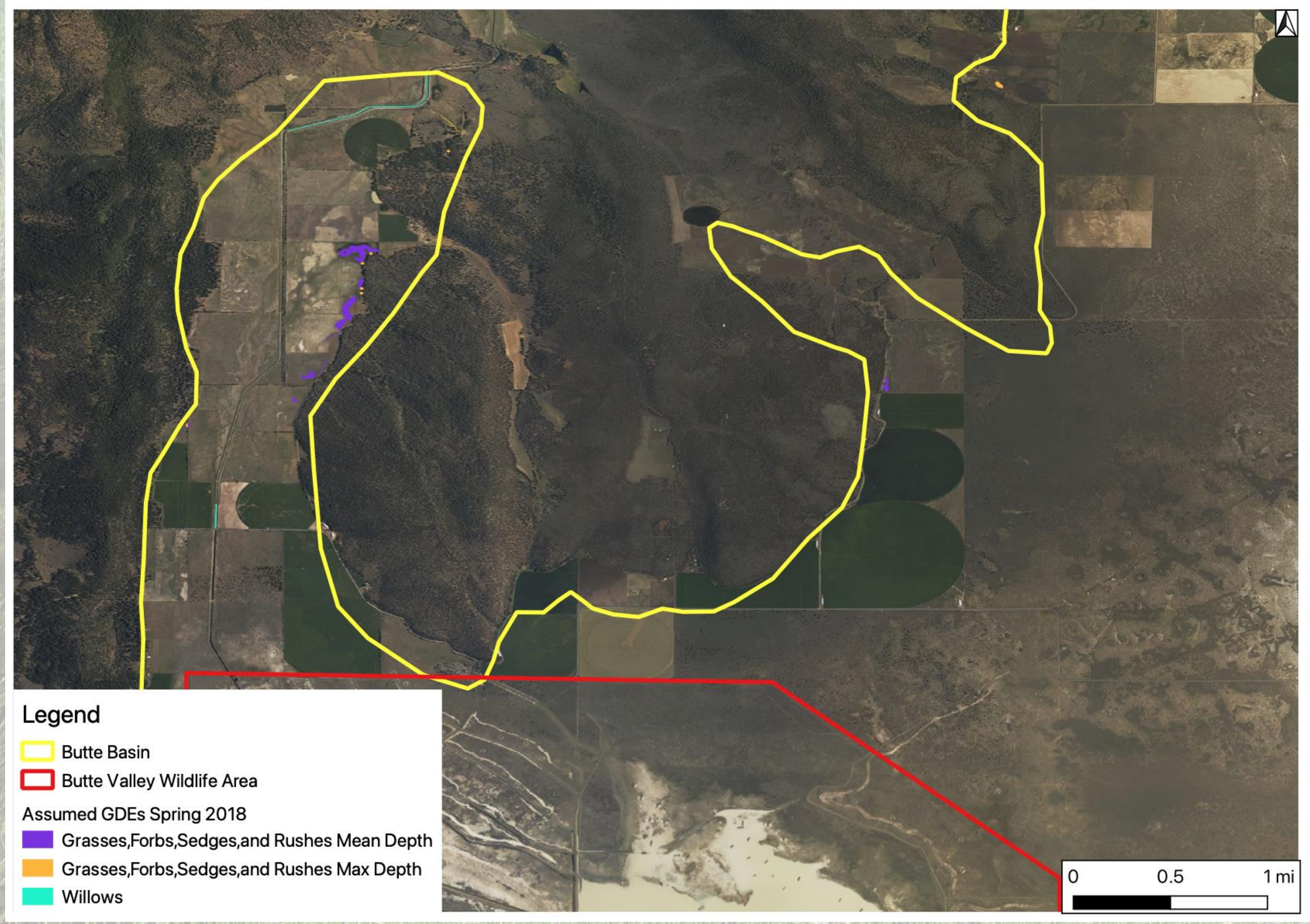
6. Assumed GDEs Northwest: Spring 2018



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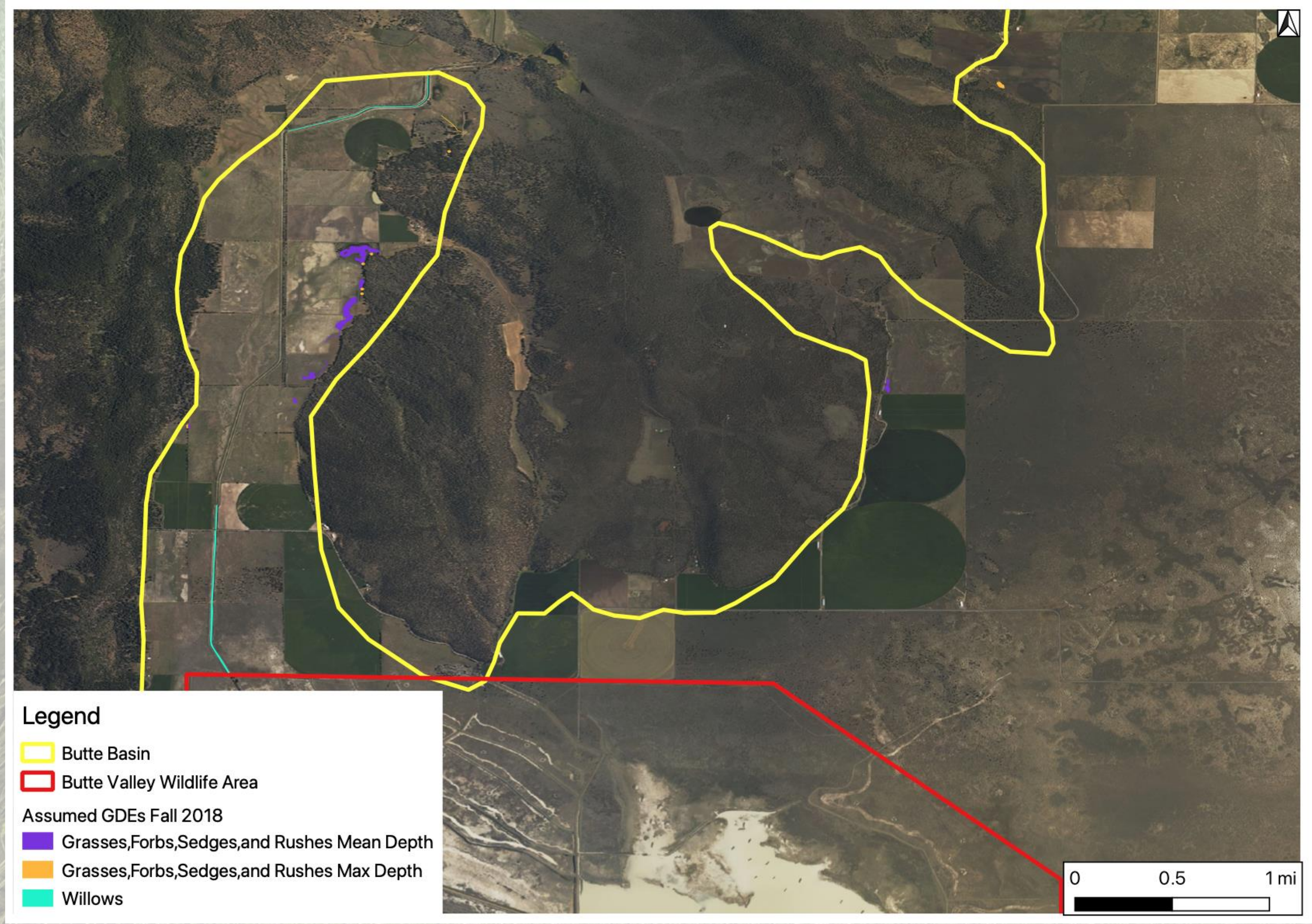

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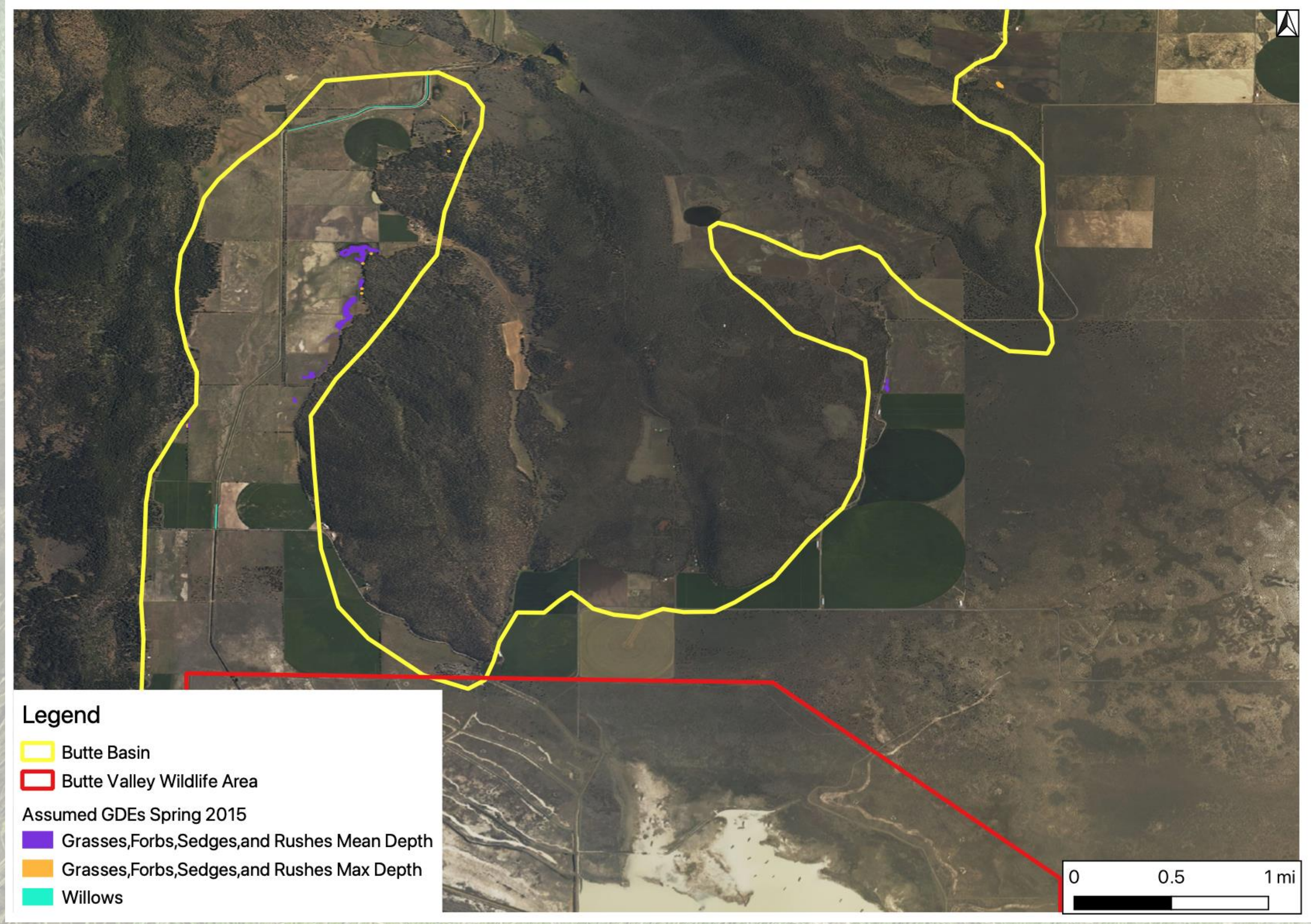

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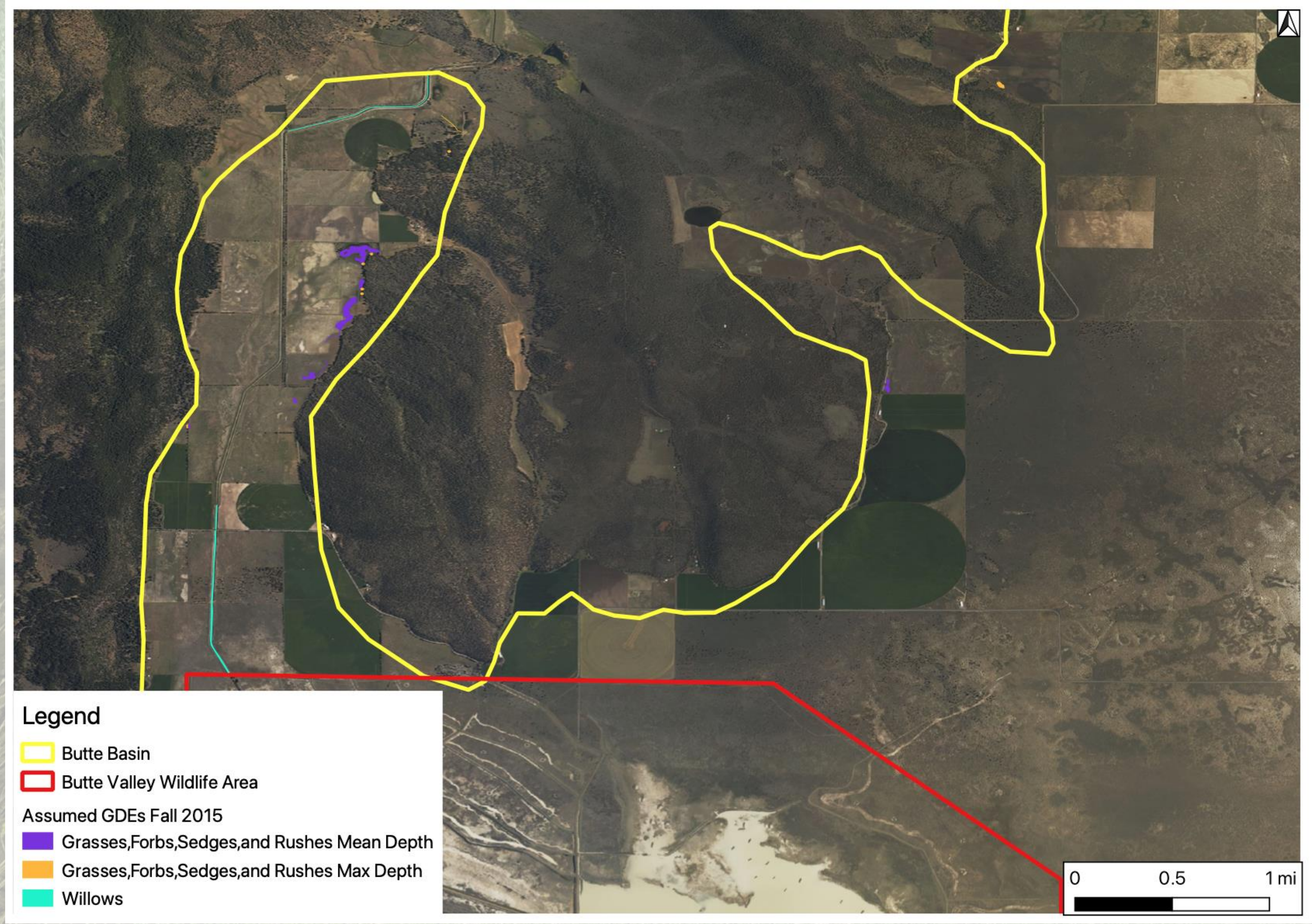

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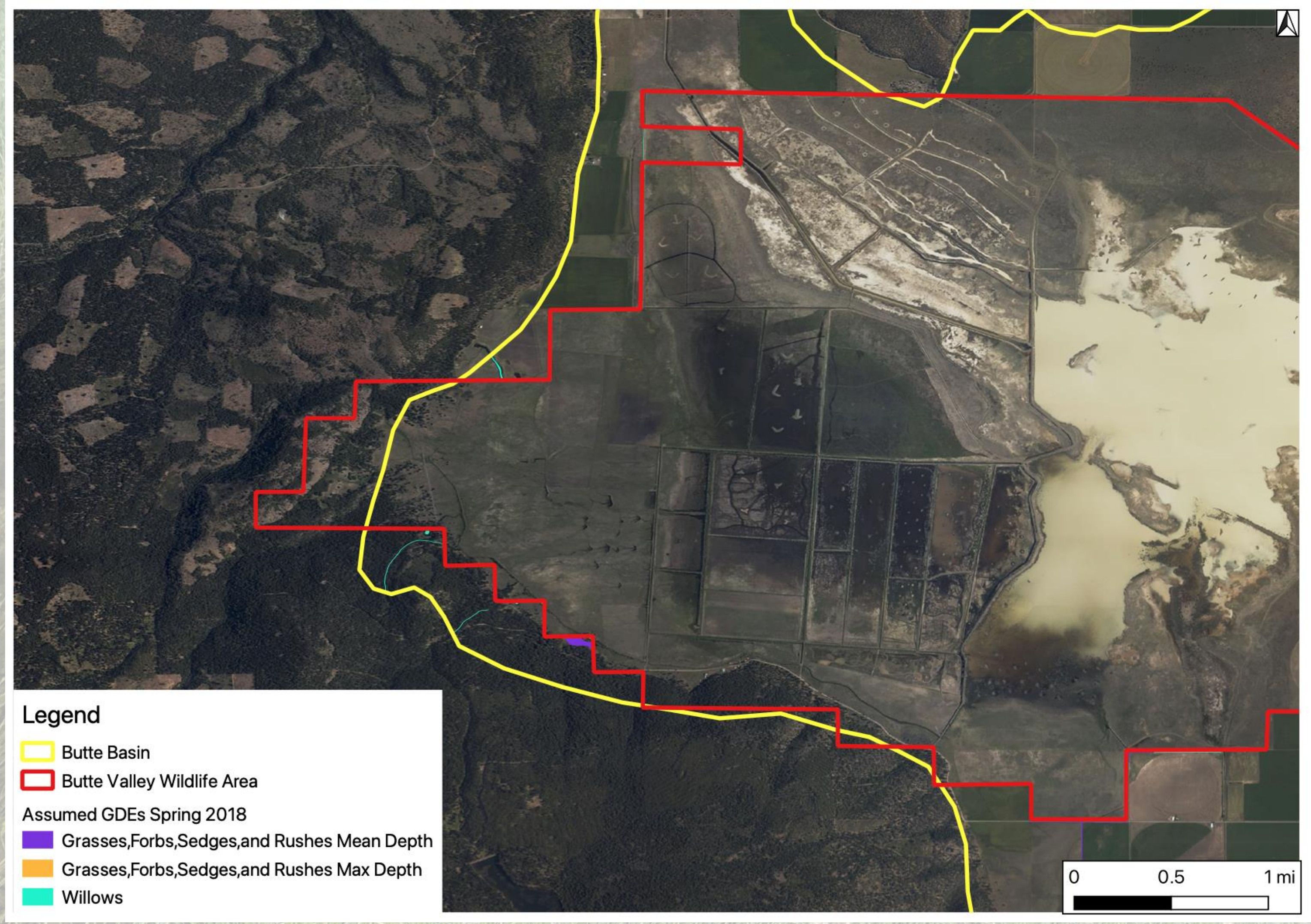
6. Assumed GDEs West: Spring 2018



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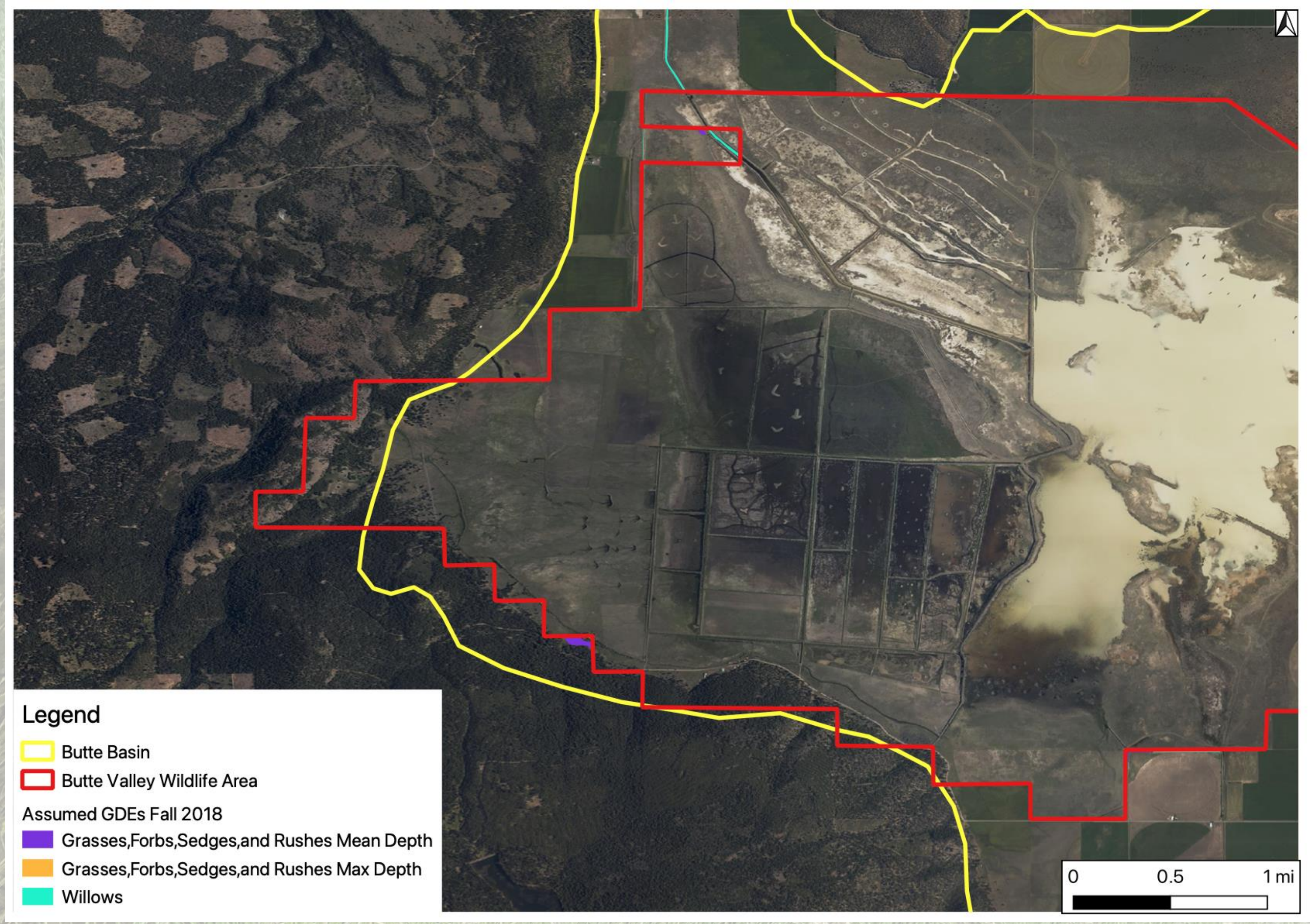

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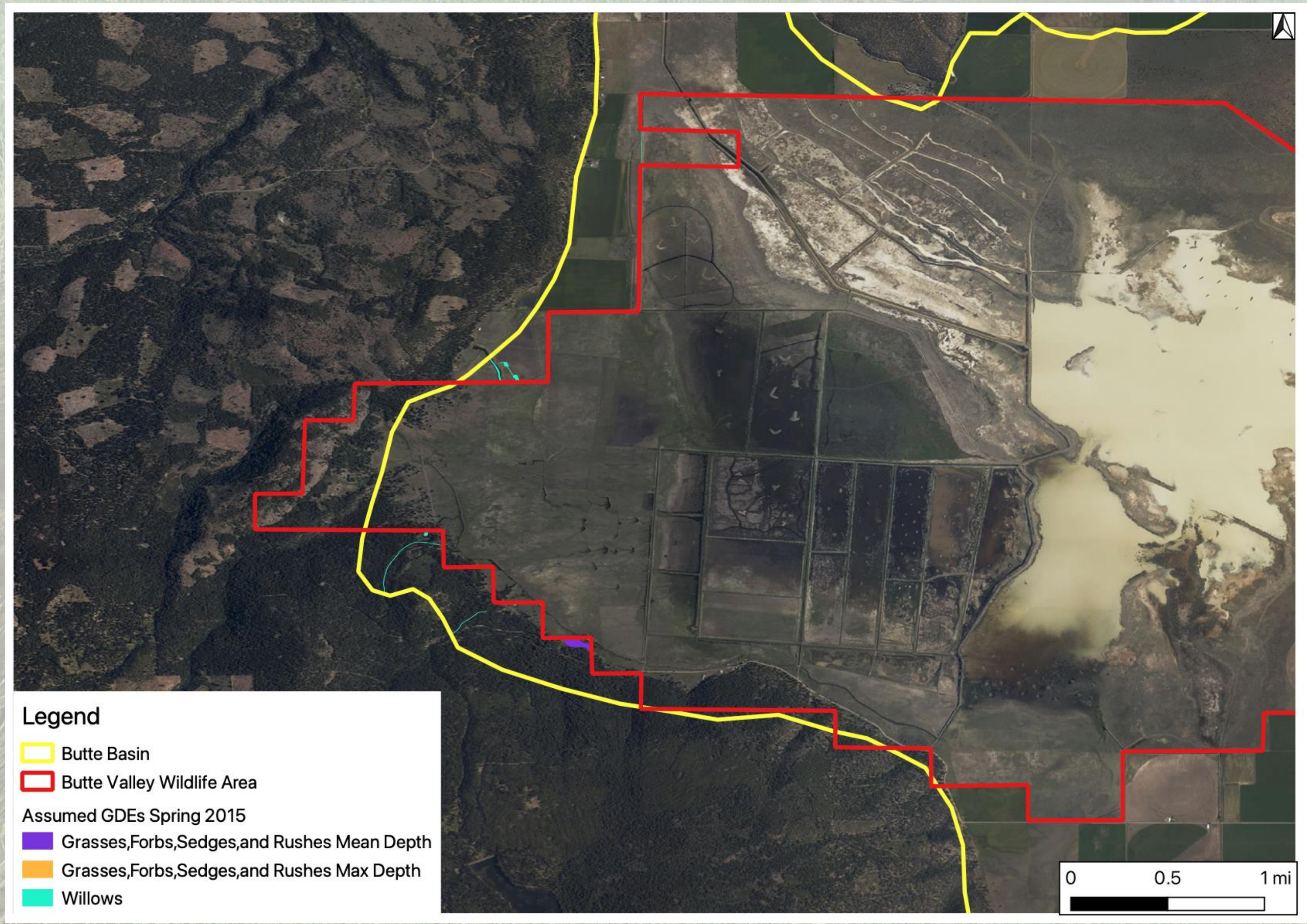

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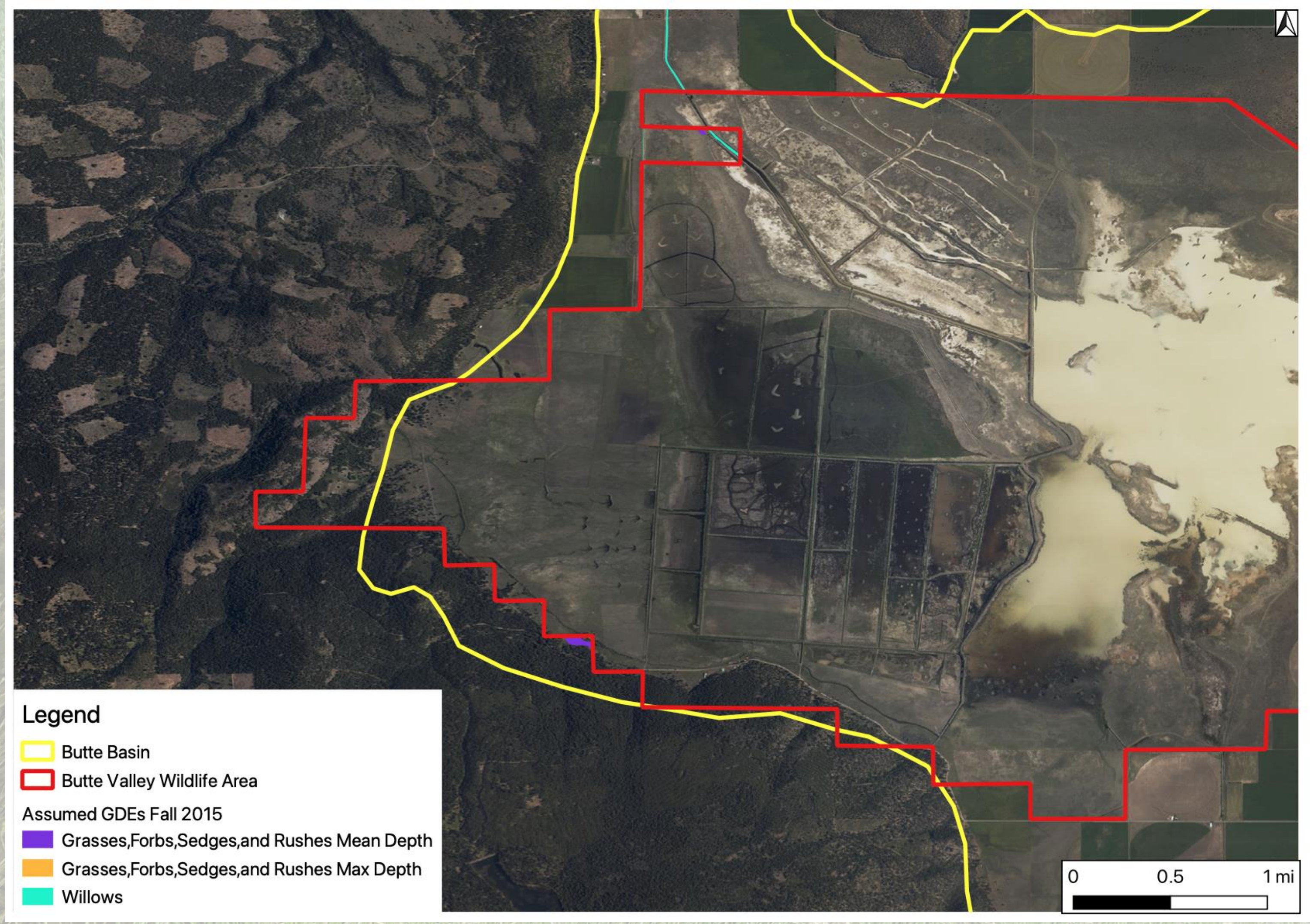

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Butte Valley Proposed Projects and Management Actions

Butte Valley GSA Advisory Committee

February 25, 2021

Identifying Possible Projects and Management Actions

Projects and Management Actions

- Why do we need projects and management actions (PMAs)?
  - To **achieve the sustainability goal** by 2042 and avoid undesirable results through 2092
  - To respond to **changing conditions** in the Basin
  - Each of the PMAs may support achieving sustainability for **one or more sustainability indicators**
- Can be categorized into
  - Existing PMAs
  - Proposed or planned PMAs to reach sustainability
  - PMAs to be evaluated in the future

Projects and Management Actions

- Can be categorized into
  - Existing PMAs
  - Proposed or planned PMAs to reach sustainability
  - PMAs to be evaluated in the future

- Key Information
  - Project Goal(s)
  - Costs – Capital and O&M
  - Completion status/date
  - Impacts on the system
  - Single or multiphase
  - Targeted sustainability indicator(s)

PROJECTS & MANAGEMENT ACTIONS				
Date				
Project Title				
PROJECT PROPONENT				
Agency Name				
Key Contact				
Email				
Phone				
PROJECT LOCATION				
Map				
PROJECT DESCRIPTION				
Description of Project Elements				
Actions				
Project Goals				
Project Benefits				
Project Impacts				
Project Costs/Financing				
PROJECT STATUS				
Concept ☐	Planned ☐	In-Design ☐	Under Construction ☐	Completed ☐
Project Schedule				

Integrated Model and PMAs

- What the Integrated Model Provides:
  - Simulates existing and potential PMAs to assess their impact in terms of the relative change between baseline and projected conditions.
  - Helps evaluate how such impacts would translate to SMC settings and achieving the sustainability goal
  - Final projected model will include all relevant PMAs agreed upon for the GSP that allow maintenance of SMCs over the 50-year planning and implementation horizon.
- What It Needs:
  - Detailed information that quantifies projects in a manner that is implementable in the model

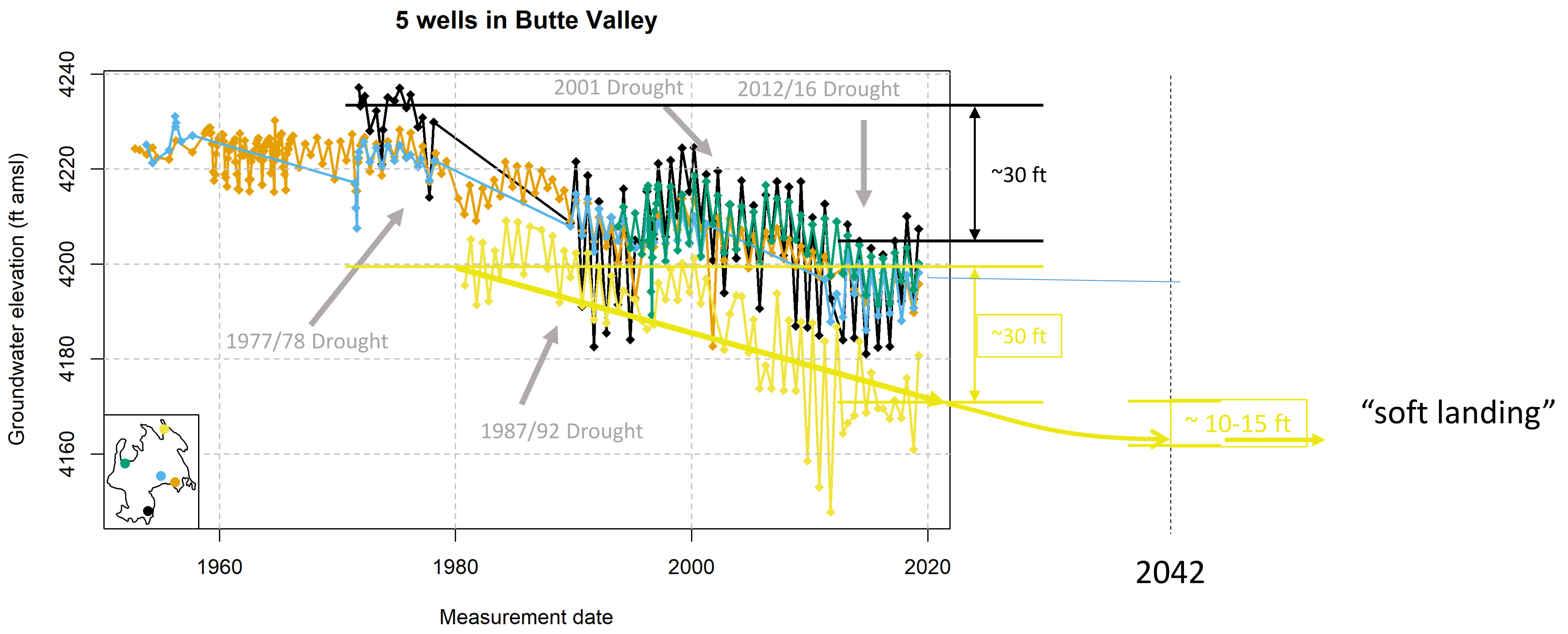
Butte Valley Brainstorm List of Projects/Management Actions

- Cap on consumptive water use
- Change in recharge point from Butte Creek
- Explore recharge benefits in National Grasslands from Meiss Lake overflow
- Irrigation efficiency measures or on-ground projects
- Soft landing
  - Funding strategy for deeper wells
  - Strategic reductions in groundwater pumping (timing)
- Upland management

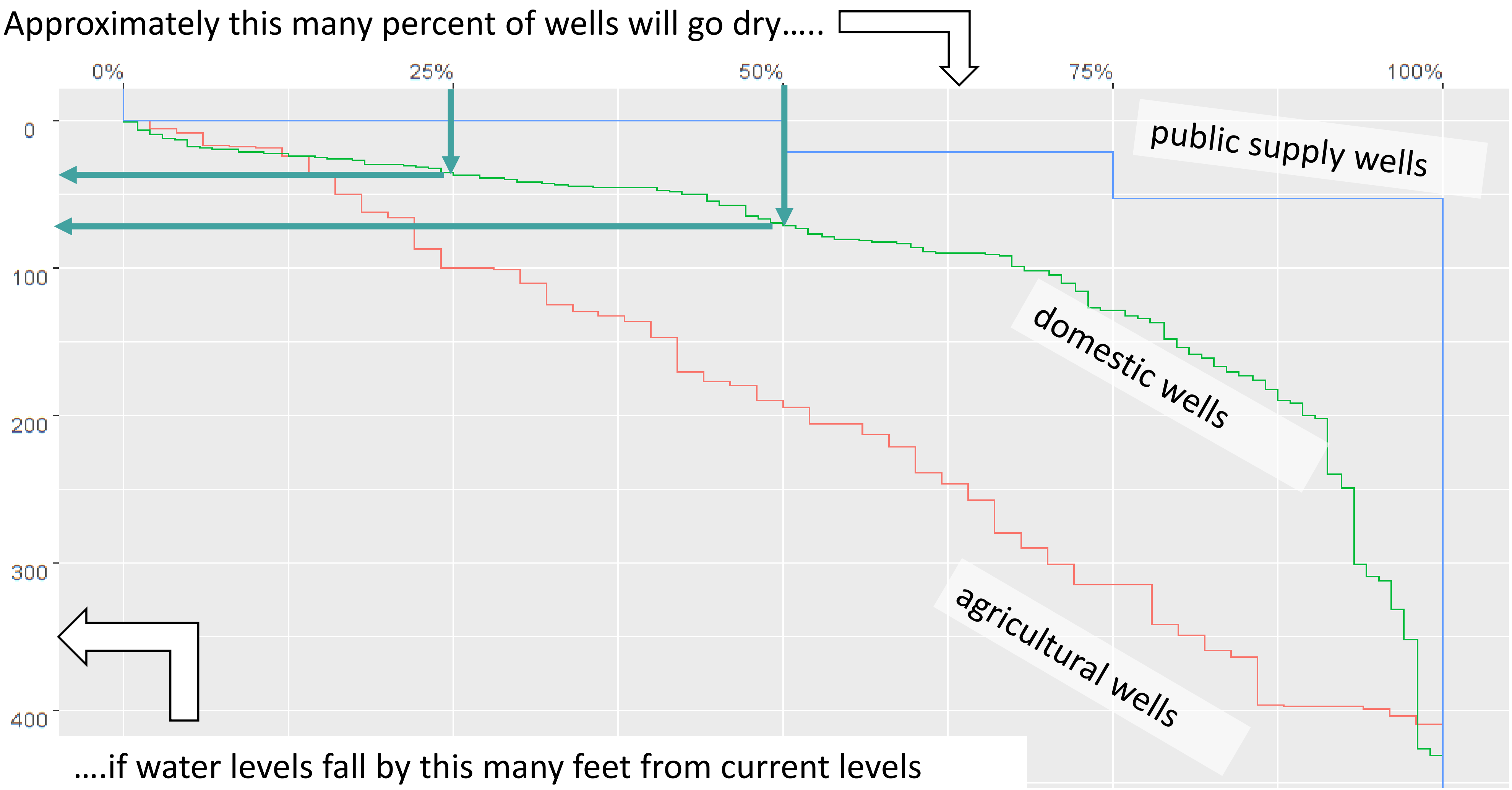
Proposed Projects and Management Actions

- Starting in 2022: No expansion of basin-wide net groundwater pumping (no additional consumptive water use (ET) at present rate)
- Payments for well outages
- Reduce net use of groundwater in Butte Valley by reducing ET
    - At trigger levels: voluntary programs / incentives
        - For this GSP: spell out possible options (above) with actions to finalize specifics in next 5-year period
    - At minimum threshold: mandatory program
        - For this GSP: actions to begin a planning process in next 5-year period
    - Improve agricultural irrigation efficiency to reduce evaporative losses (reduction in consumptive use)
    - Reduce crop ET
        - Less cropped acreage
        - Less crop ET through reduction in irrigation (deficit irrigation)
        - Alternative crops with lower ET
        - Water market

How do we get more operational flexibility than 10-15 ft, IF NEEDED?



The deeper we set the MT, the more well outages occur and the higher the pumping cost (more undesirable results that are not avoided by a deeper MT)



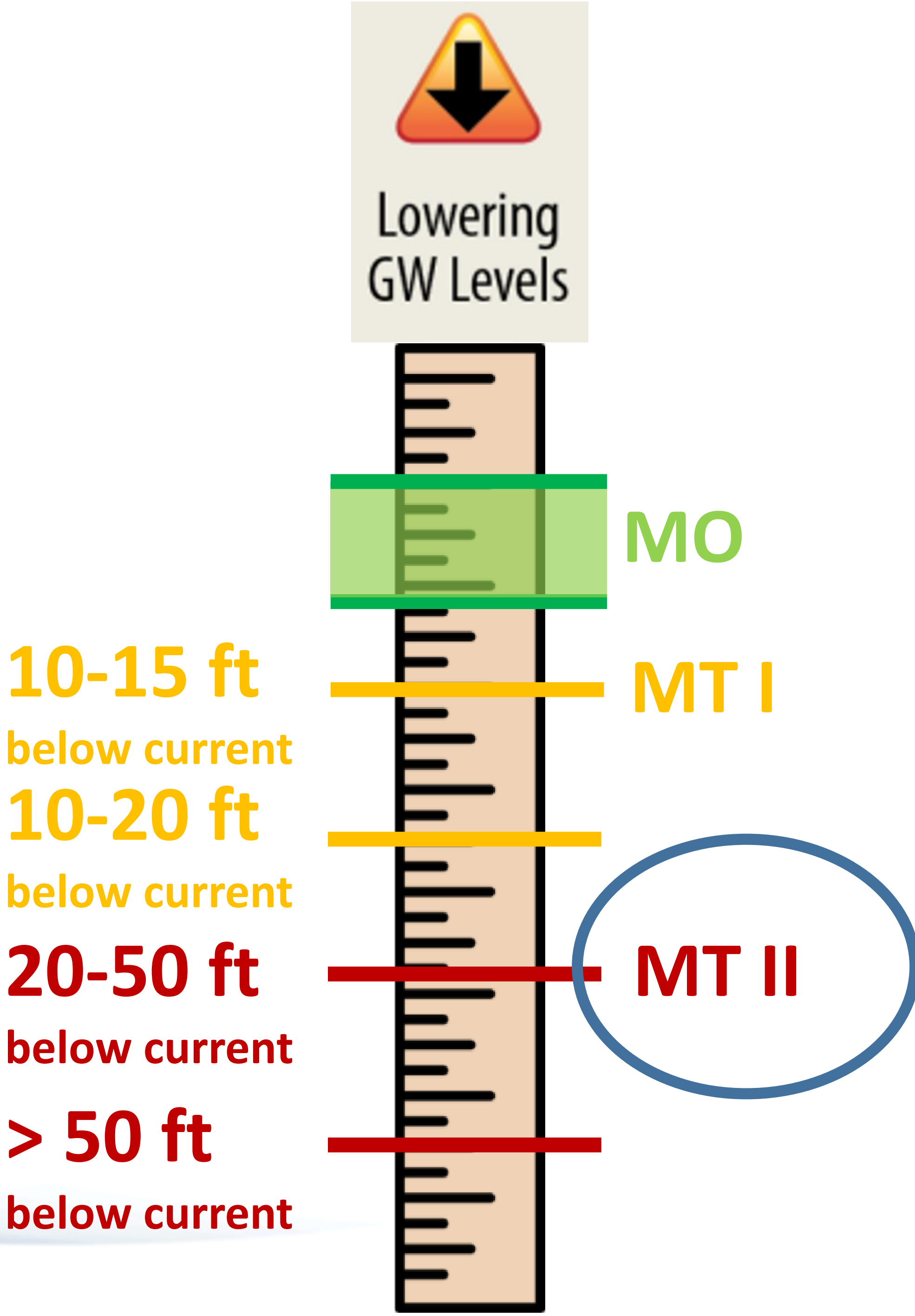
Note: The vertical axis represents the depth from the current water level to within 20 ft (domestic wells) or 50 ft (ag, public supply wells) of the bottom of the well. Here, we use this depth as a rough indicator for well outage because many wells in Butte Valley may have pumps below the top of the screen or in open basalt. Many actual well outages may occur even at higher water levels.

Constraints on Setting Water Level SMC:

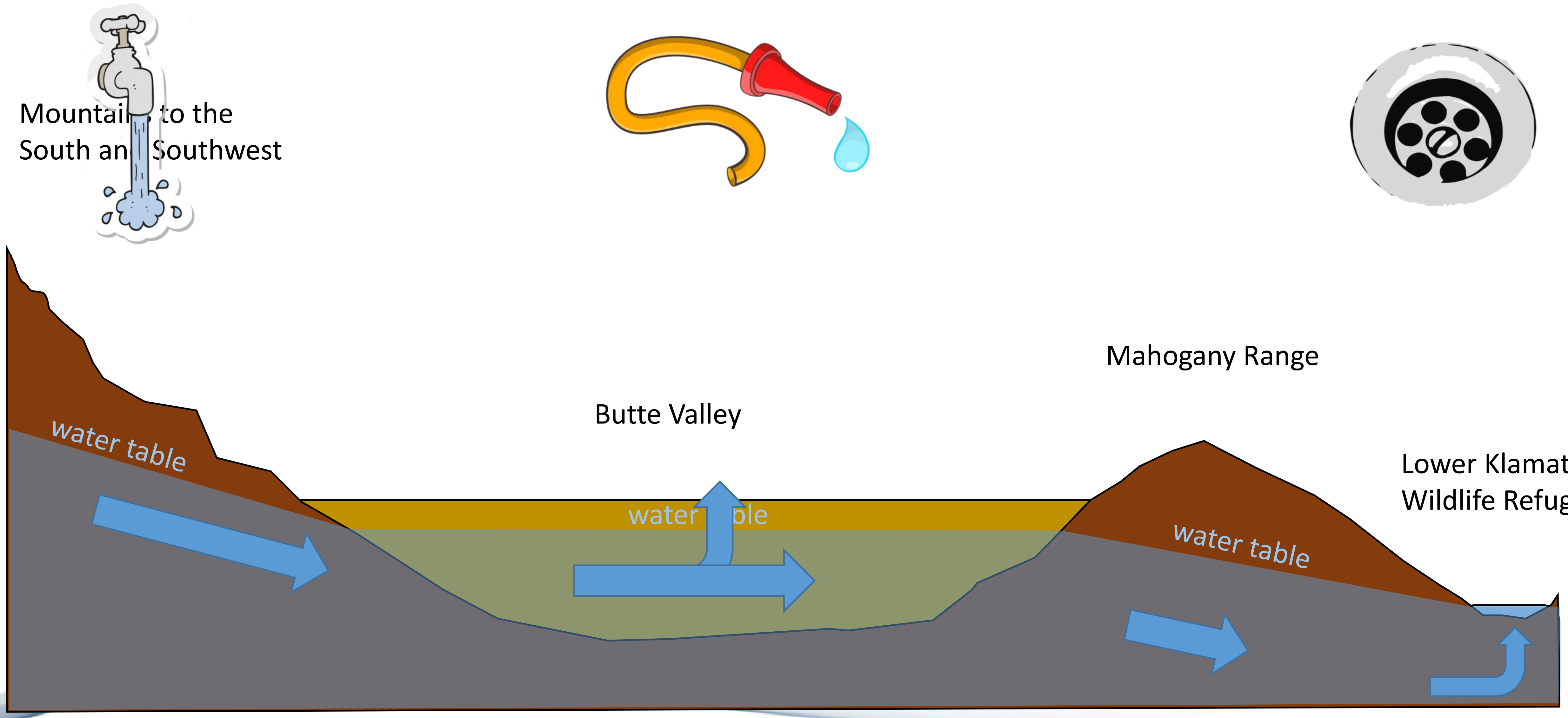
- "soft landing"
- well outa... mping cost

$$ support for well replacement

- "expanded soft landing"
- Lower Klamath elevation

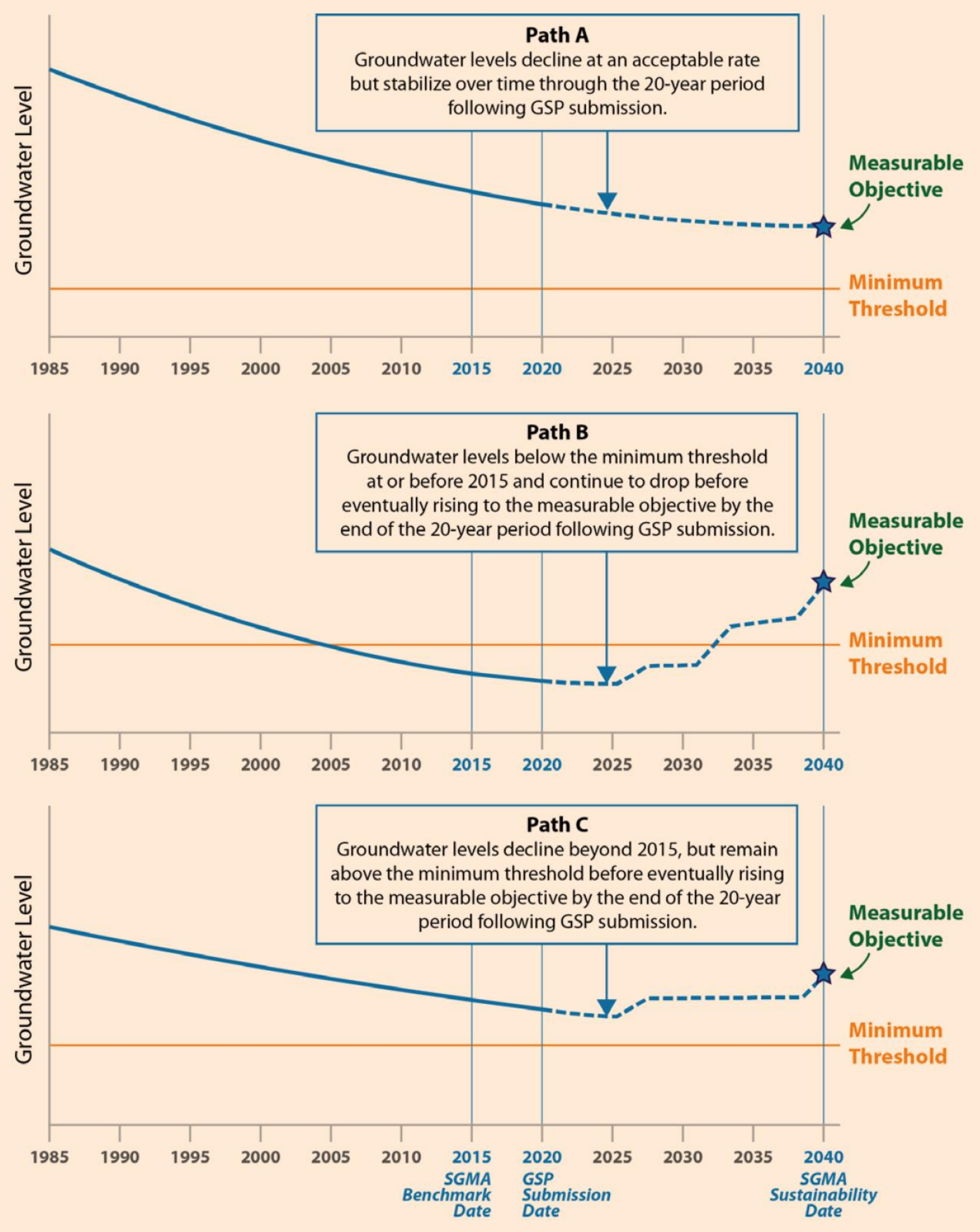


South to North Cross-Section Butte Valley



Constraints on Setting Water Level SMC:

Consider how to “bend” long-term water level decline



from: DWR, Sustainable Management Criteria Draft Guidelines