Enhanced Wetland Mapping: Opportunities for Tribes

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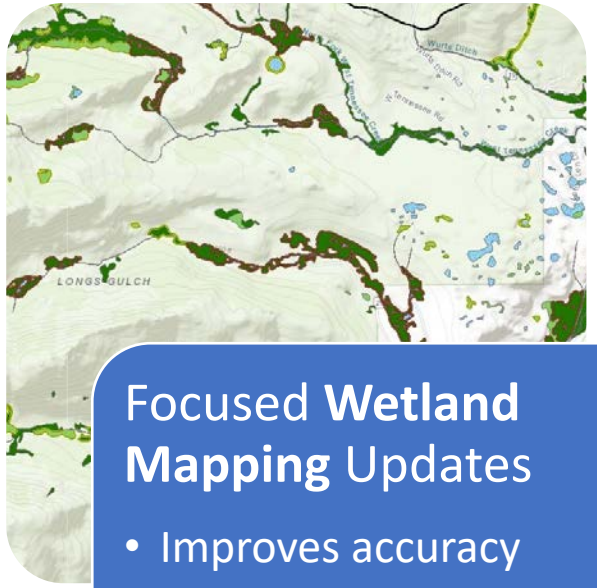
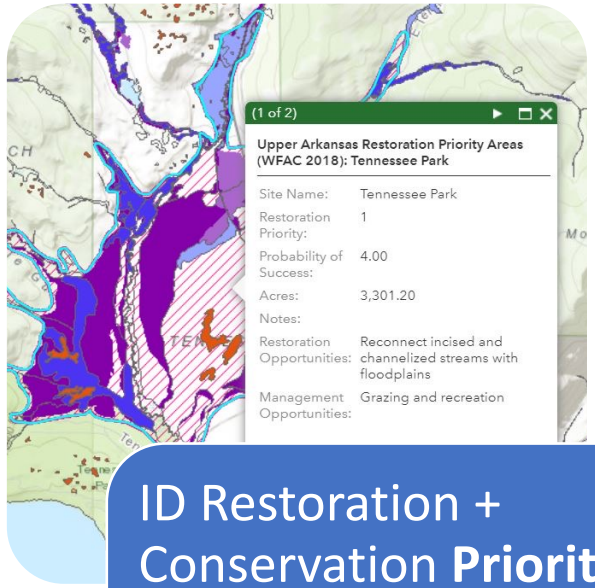
Enhanced Wetland Mapping as a Tool for Watershed Planning



Focused **Wetland Mapping** Updates

- Improves accuracy
- Major land use changes
- Functional attributes
- Add wetland type and land use attributes



ID Restoration + Conservation **Priority Areas**

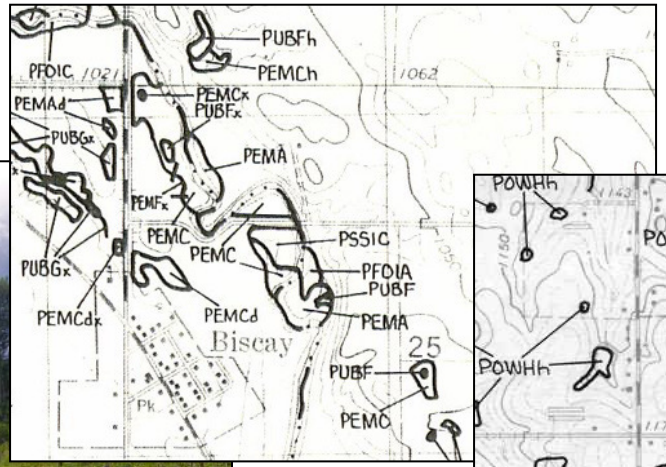
- Large-scale or fine-scale
- Propose potential areas based field-level information
- Stakeholder collaboration and review

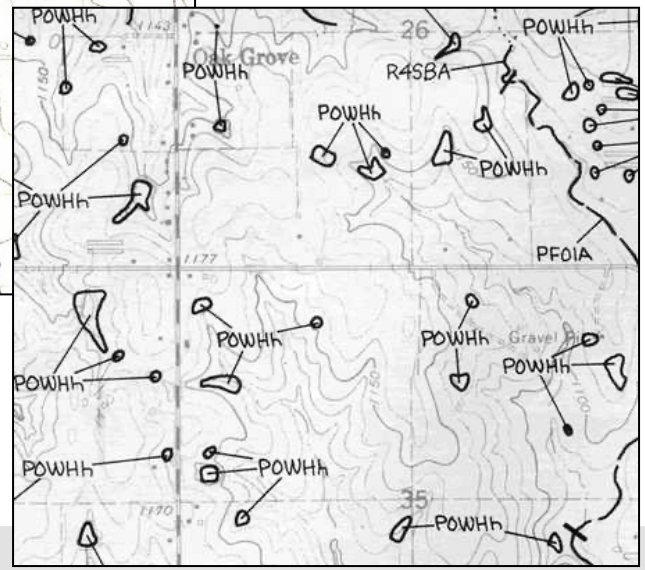
Develop **Watershed Planning Toolbox**

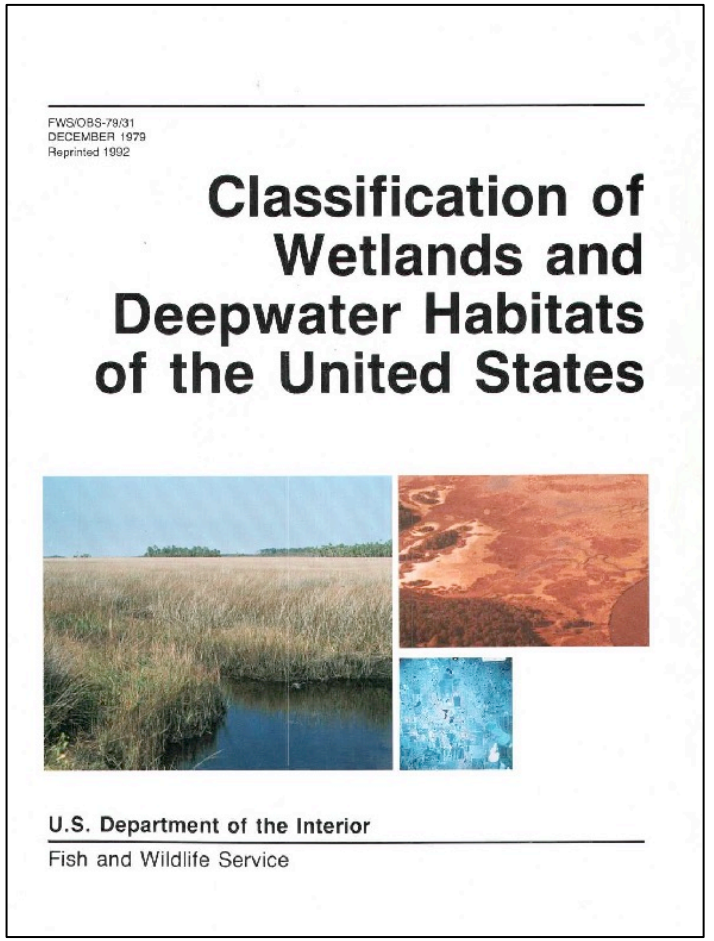
- Several examples in various states
- Multiple data layers to support restoration and conservation activities

USFWS National Wetland Inventory (NWI) Mapping

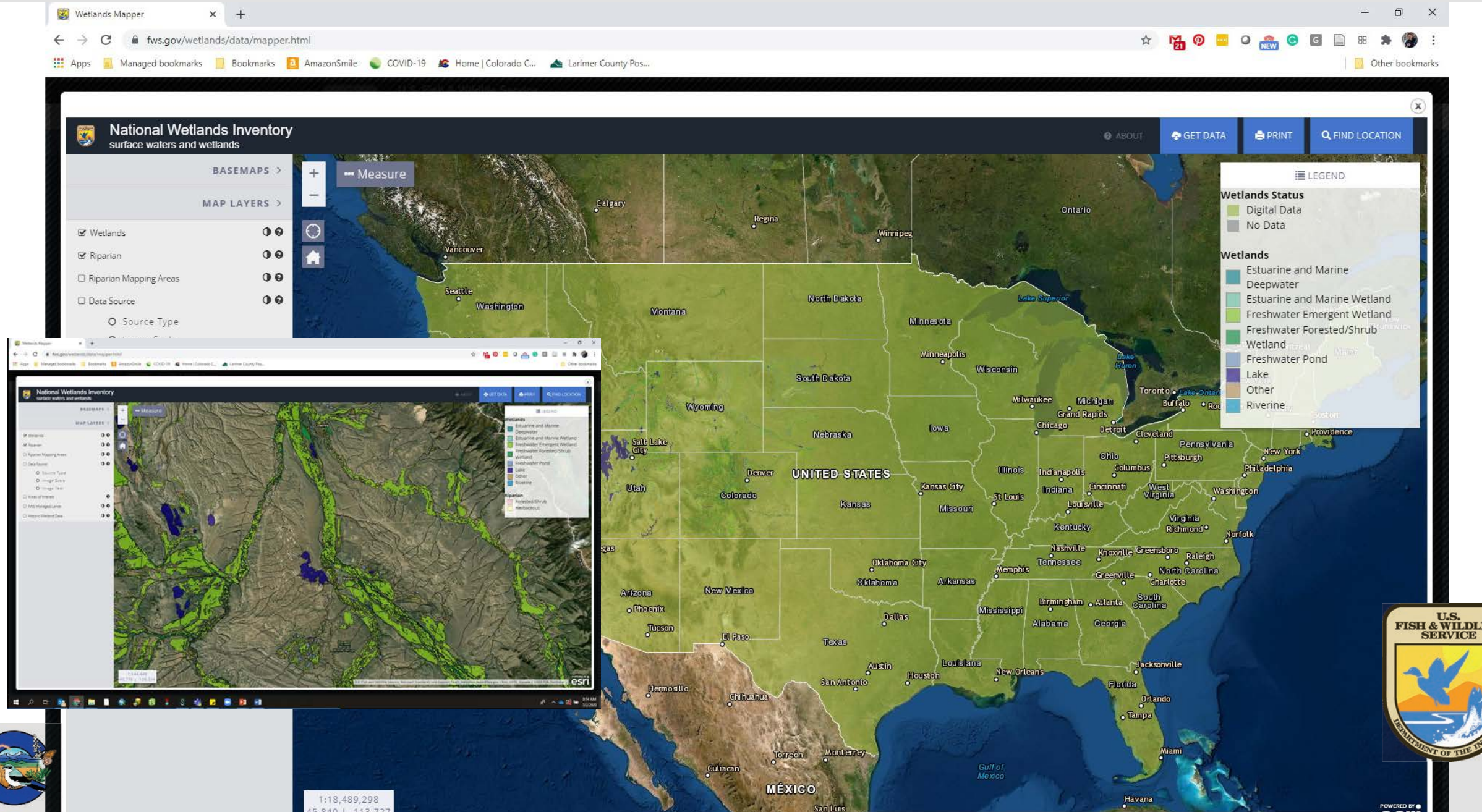
- National Wetland Inventory (NWI) is a program of the USFWS.
- Goal is to map wetlands across U.S. and track changes over time.
- Classification based on Cowardin et al. 1979. and 2013 revision.
- Original mapping was all on paper at lower resolution.







USFWS National Wetland Inventory (NWI) Mapping



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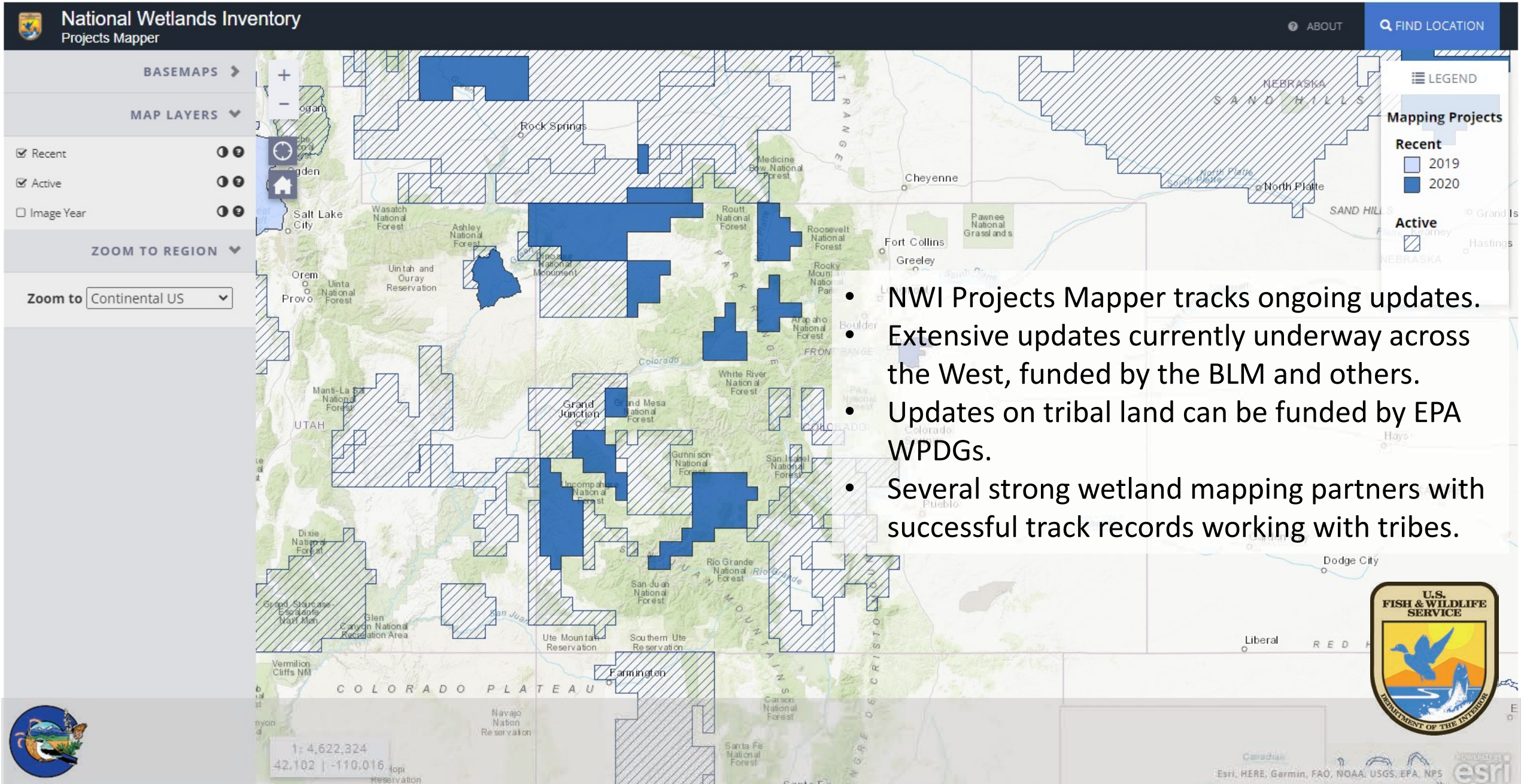
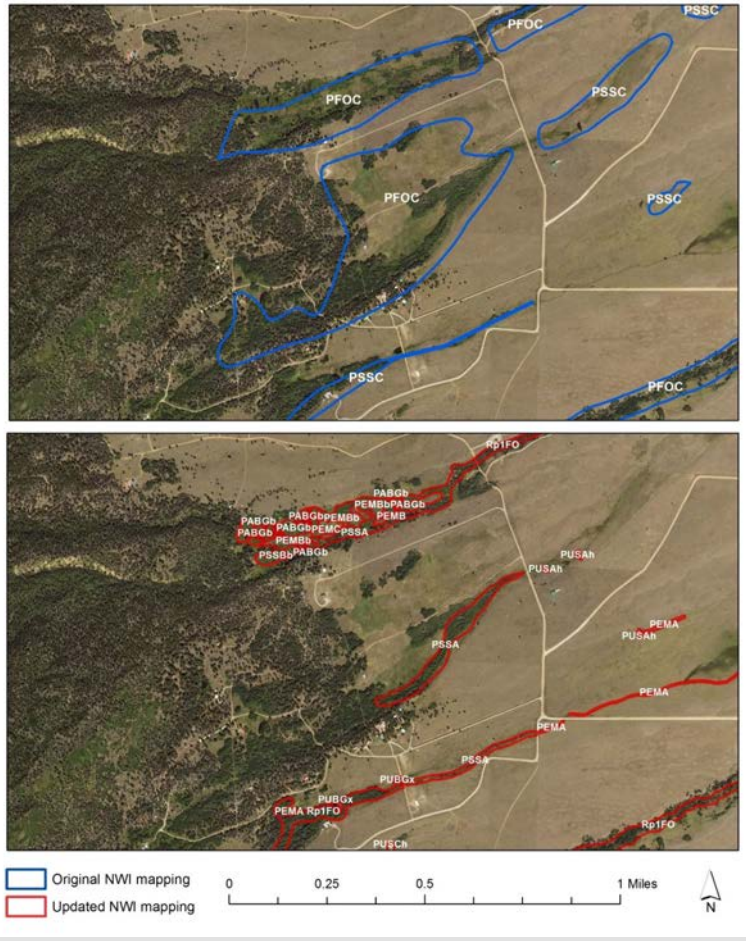
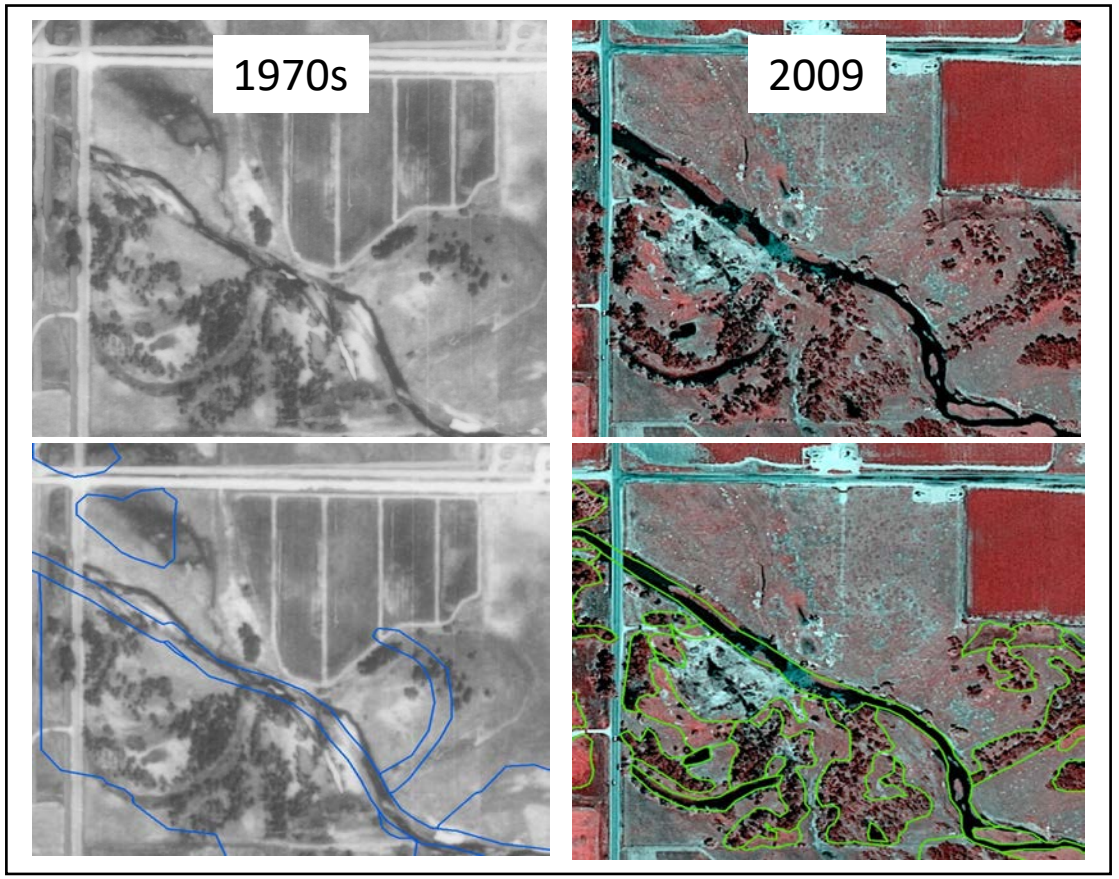


- NWI Projects Mapper tracks ongoing updates.
- Extensive updates currently underway across the West, funded by the BLM and others.
- Updates on tribal land can be funded by EPA WPDGs.
- Several strong wetland mapping partners with successful track records working with tribes.

Updated NWI Mapping Increases Accuracy

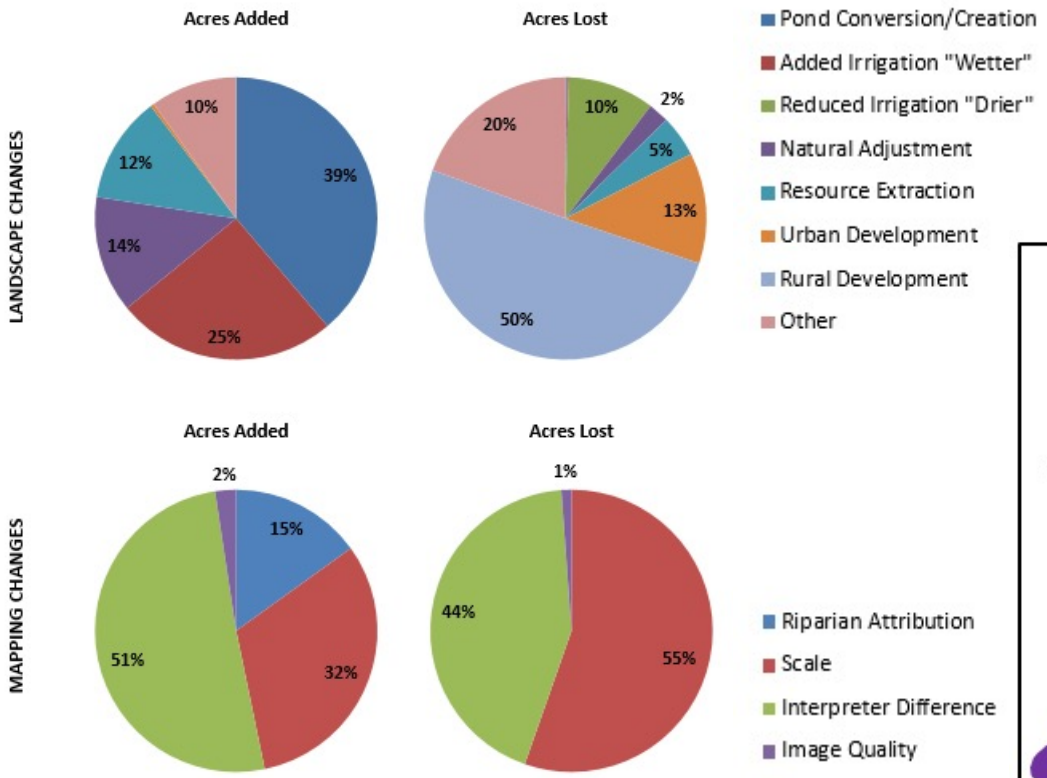
- Updated mapping used higher resolution imagery and maps at a finer scale.
- Original NWI mapping can both over and under map wetlands on the landscape.
- Original polygons are often large blocks that incorporate both upland and wetland.
- Original mapping can also miss small features.

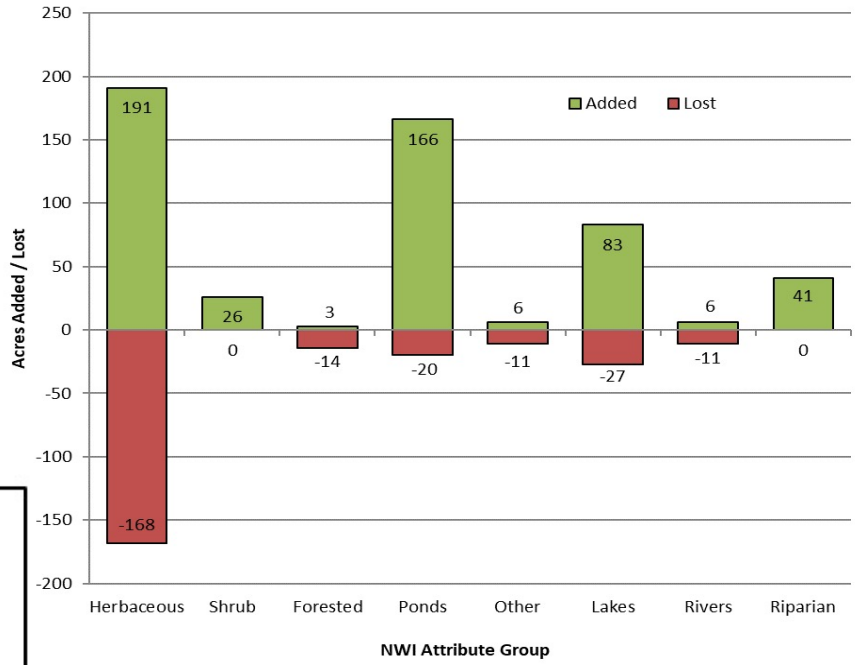


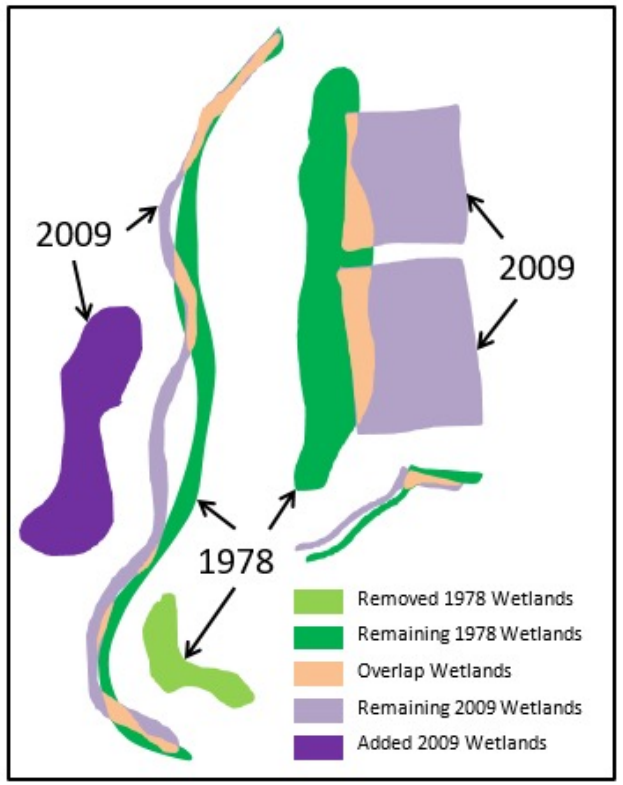


Updated NWI Mapping Increases Accuracy

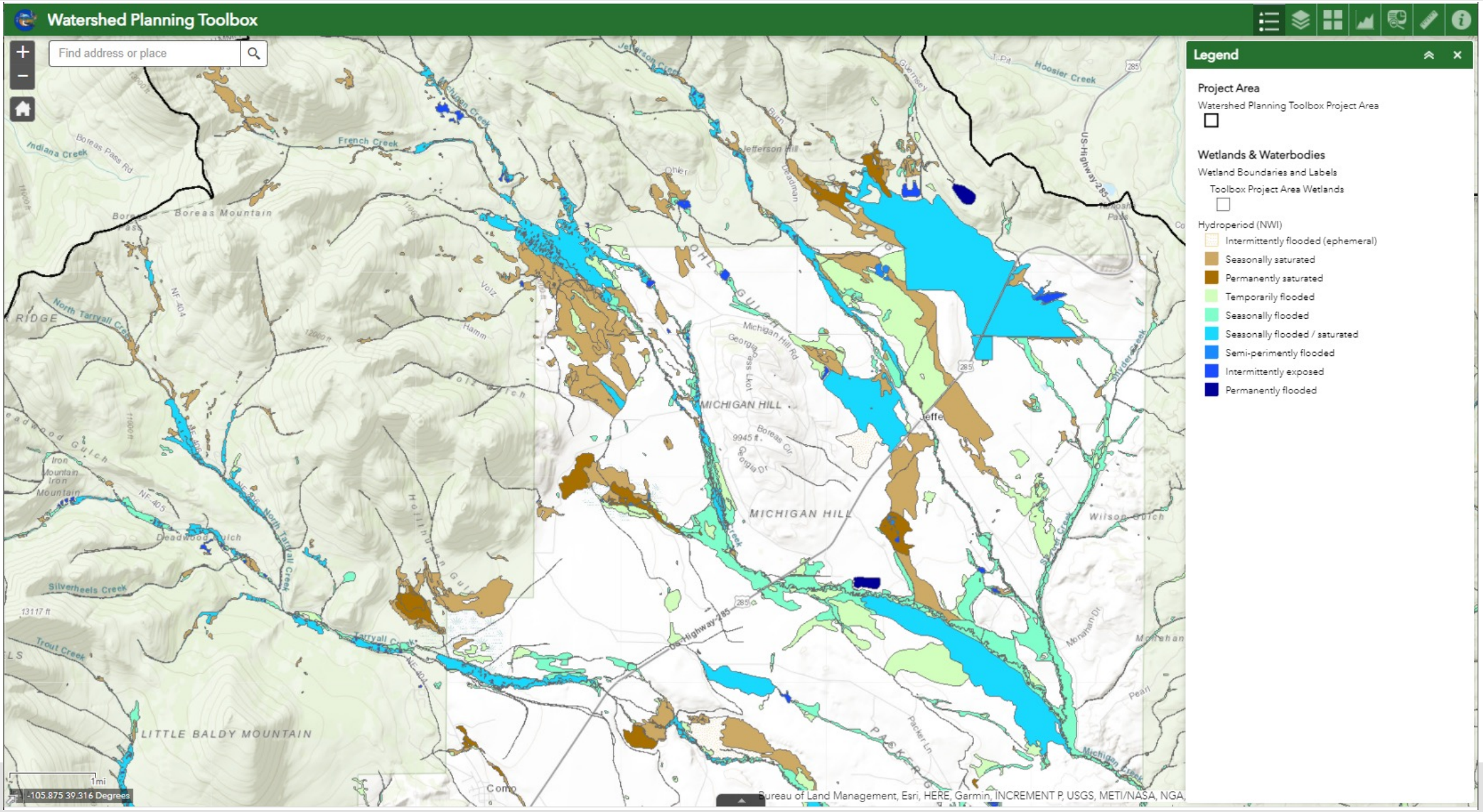
- Intensive studies can detect change over time in wetland area, but this requires identifying changes in mapping methods and changes on the landscape.







Updated NWI Mapping Increases Accuracy - Hydroperiod

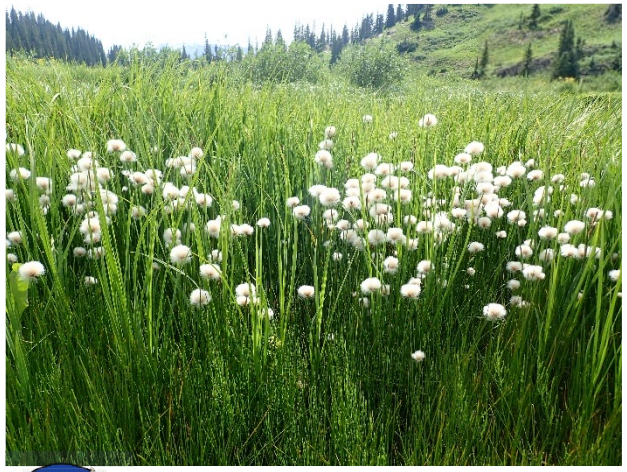


Linking NWI Mapping to Common Wetland Types

Wet Meadow

Riparian Shrubland

Fen



Riparian Forest

Linking NWI Mapping to Common Wetland Types

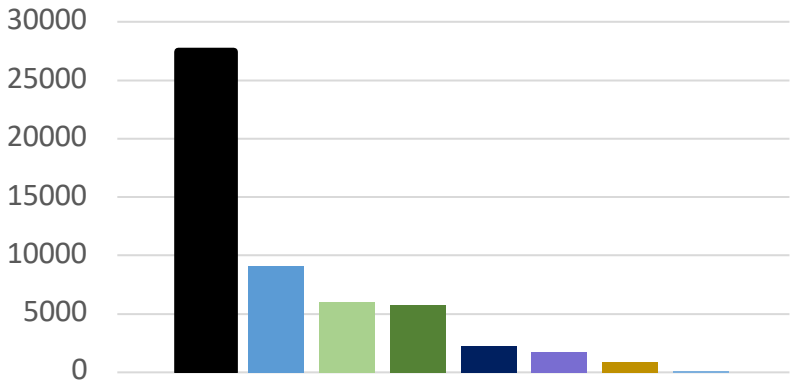
Wet Meadows

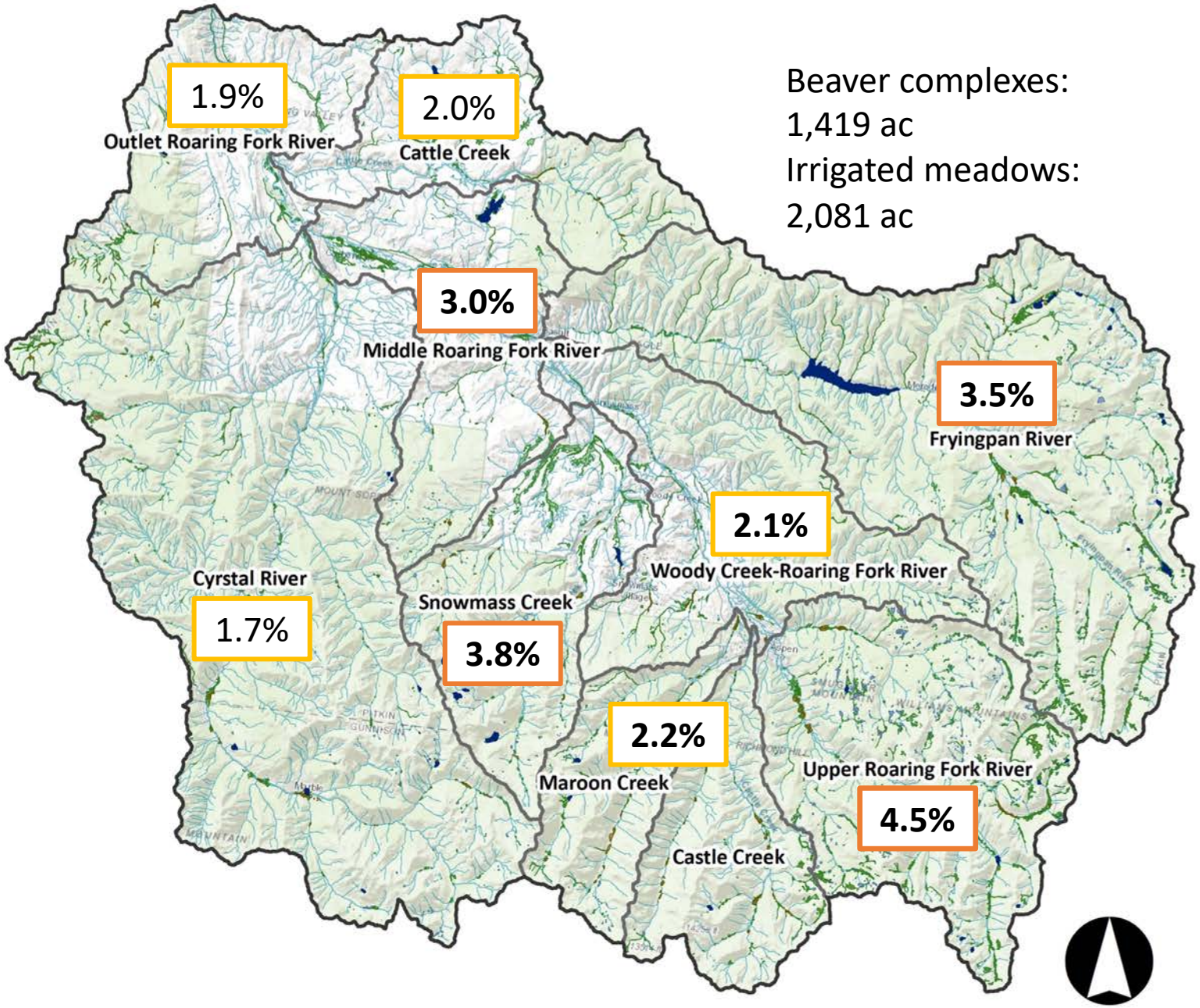
Riparian Shrublands

- May occur on wide, low-gradient **valley bottoms and floodplains**
  - May occur in **headwater basins** that feed into streams
    - Often snowmelt-driven with groundwater inputs
      - Often occur together (adjacent or mosaic)
        - Often associated with **beaver activity**

Wetland Mapping Updates

Total	**27,416 ac**
Stream channels + bars	9,102 ac
Wet meadows	6,049 ac
Riparian Shrublands	5,765 ac
Lakes	2,221 ac
Fens	1,731 ac
Emergent Marshes	901 ac
Riparian Woodlands	96 ac

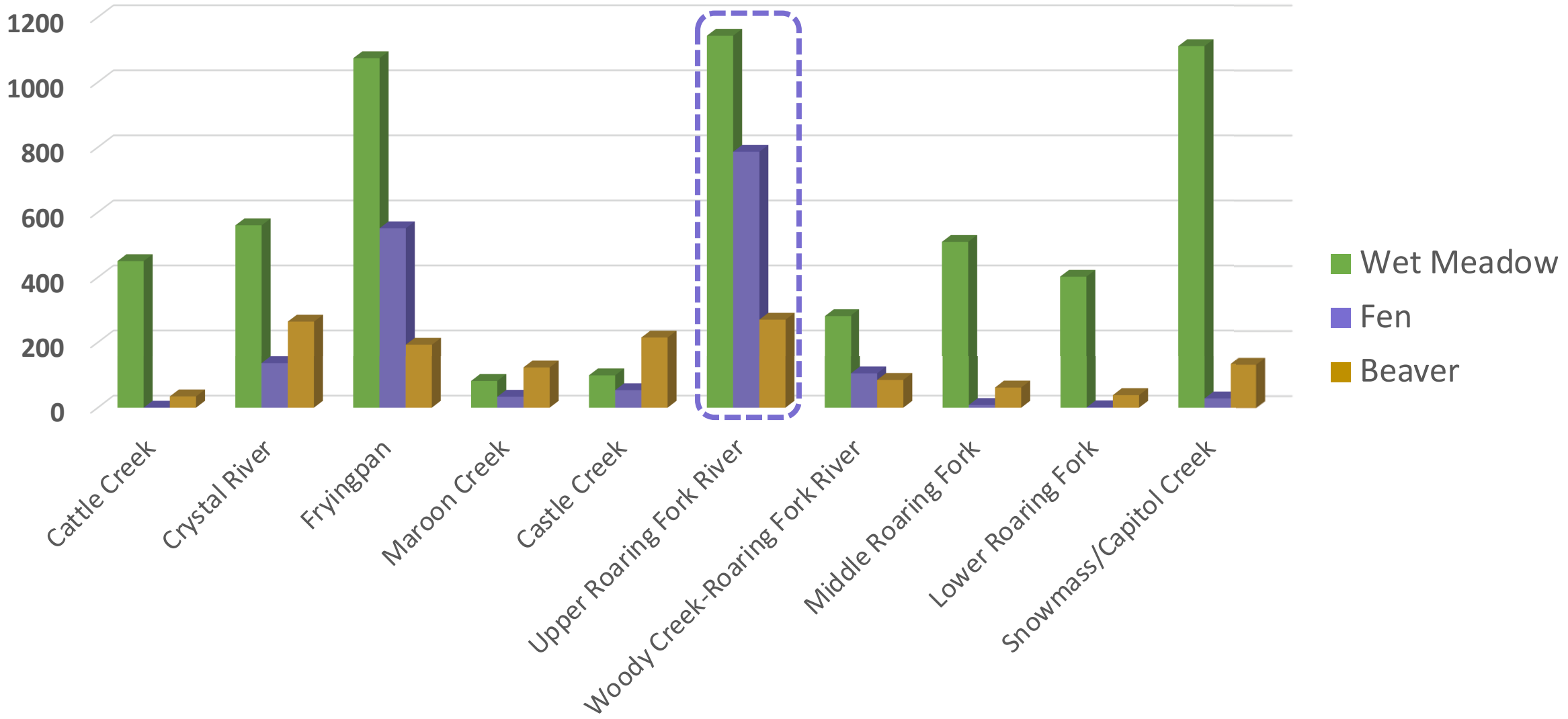




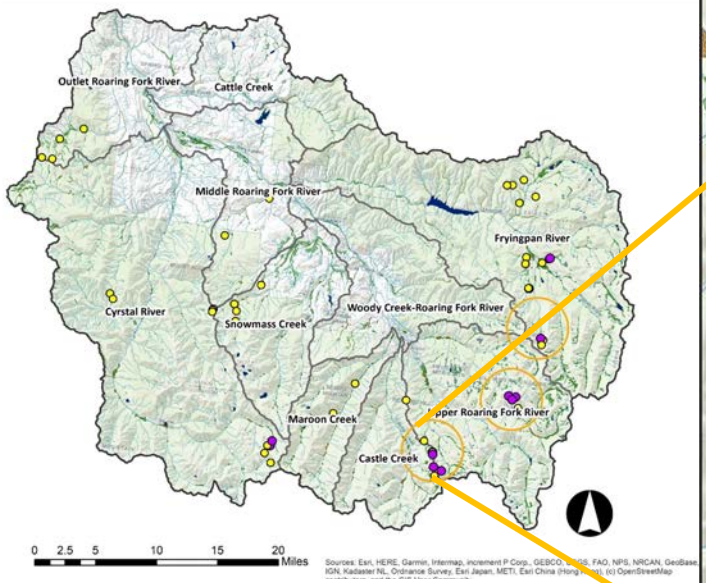
Beaver complexes:
1,419 ac
Irrigated meadows:
2,081 ac

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCA
IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStree
contributors, and the GIS User Community

Wetland Acreage by Type and Subwatershed (HUC10)



Upper Roaring Fork River



Upper Roaring Fork River

Castle Creek

Legend

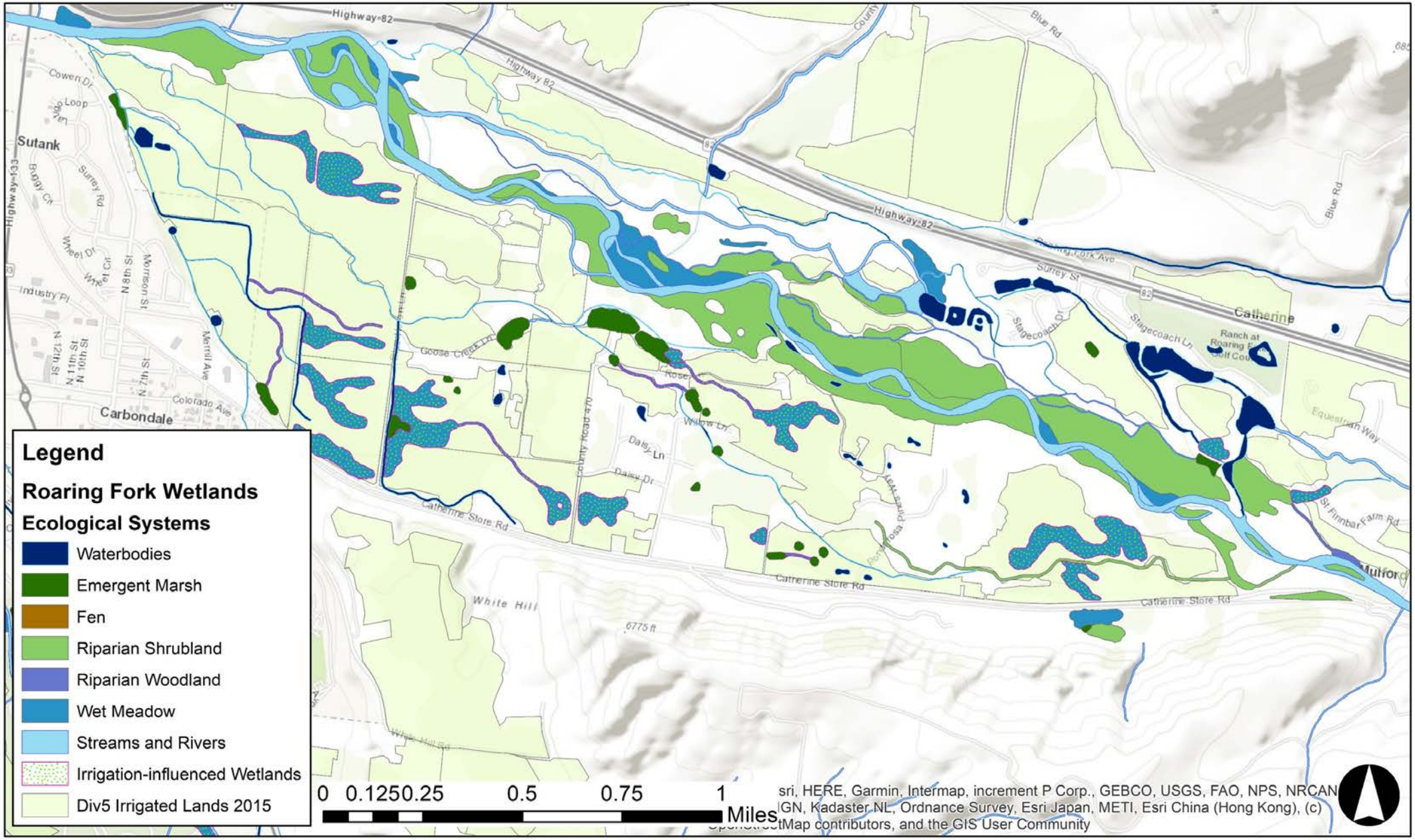
Biodiversity Team Field Points

- Upland Points
- Wetland Points
- Subwatershed (HUC10) Boundaries
- Other Wetlands
- Wet Meadows
- Willow Carrs
- Fens
- Beaver Complexes
- Lakes and Reservoirs

0 0.25 0.5 1 1.5 2 Miles

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Interaction between Wetlands and Irrigation



Enhancing NWI Mapping with Functional Attributes

LLWW Classification

Landscape position:

Lotic (LO) , Lentic (LE), Terrene (TE)

Landform:

Basin (BA), Slope, SL), Floodplain (FP), Fringe (FR), Flat (FL)

Waterbody type:

River (RV), Stream (ST), Lake (LK), Pond (PD)

Water flow path:

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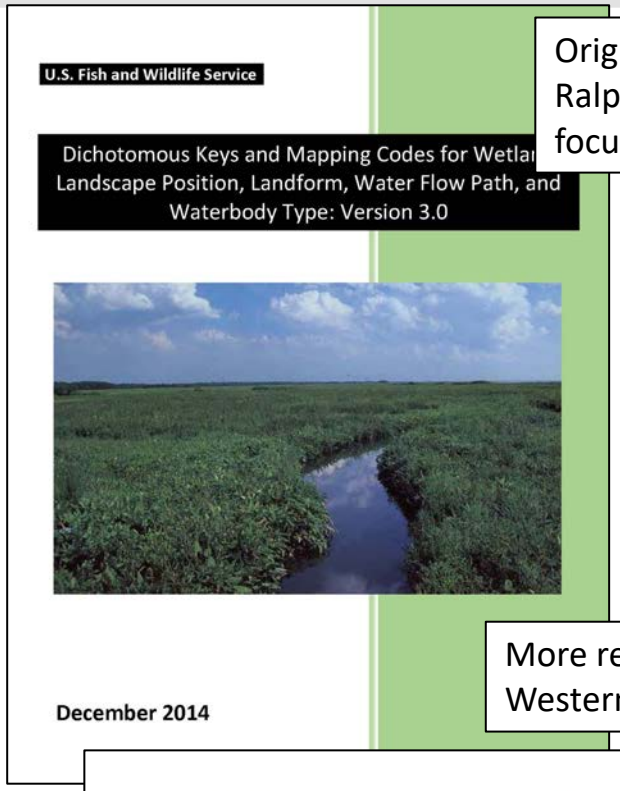
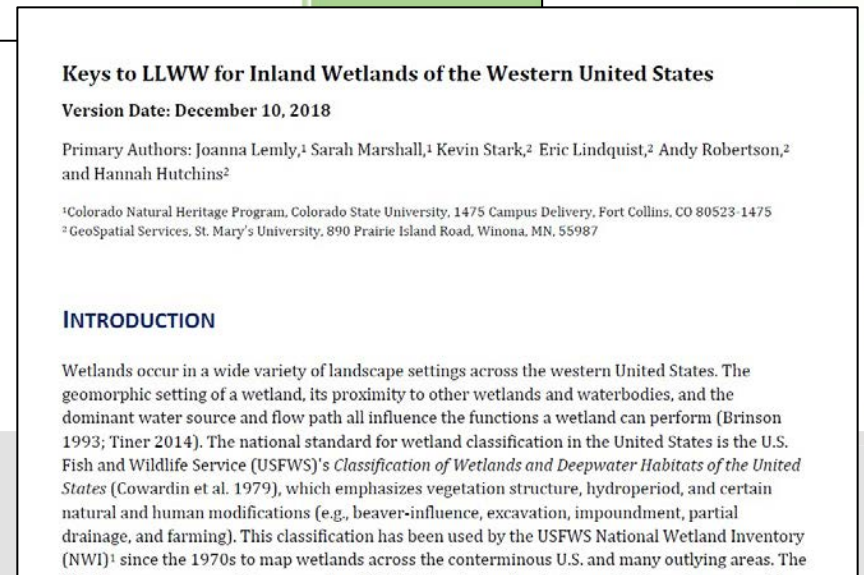

U.S. Fish and Wildlife Service

Dichotomous Keys and Mapping Codes for Wetla
Landscape Position, Landform, Water Flow Path, and
Waterbody Type: Version 3.0

December 2014

Originally developed by Ralph Tiner of USFWS, focused on Eastern US

More recent keys for Western US


Keys to LLWW for Inland Wetlands of the Western United States

Version Date: December 10, 2018

Primary Authors: Joanna Lemly,[1] Sarah Marshall,[1] Kevin Stark,[2] Eric Lindquist,[2] Andy Robertson,[2] and Hannah Hutchins[2]

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INTRODUCTION

Wetlands occur in a wide variety of landscape settings across the western United States. The geomorphic setting of a wetland, its proximity to other wetlands and waterbodies, and the dominant water source and flow path all influence the functions a wetland can perform (Brinson 1993; Tiner 2014). The national standard for wetland classification in the United States is the U.S. Fish and Wildlife Service (USFWS)'s *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979), which emphasizes vegetation structure, hydroperiod, and certain natural and human modifications (e.g., beaver-influence, excavation, impoundment, partial drainage, and farming). This classification has been used by the USFWS National Wetland Inventory (NWI)[1] since the 1970s to map wetlands across the conterminous U.S. and many outlying areas. The

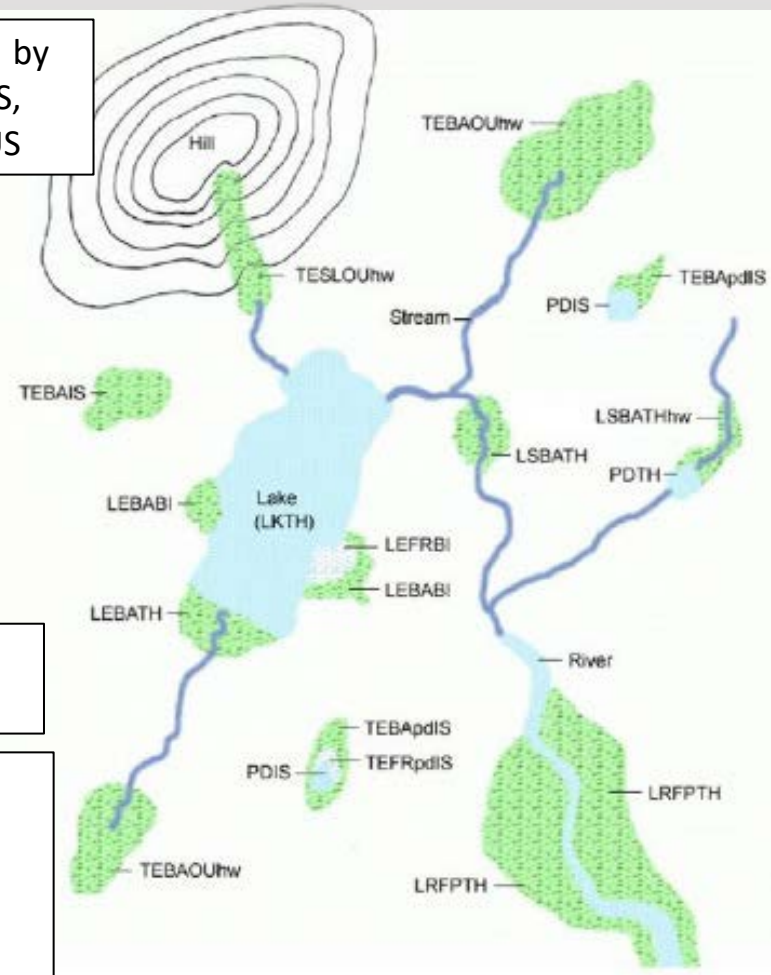

Figure 1. Application of LLWW descriptors to a region with nontidal wetlands. Landscape positions: LR – lotic river, LS – lotic stream, LE – lentic, and TE – terrene; Landforms: BA – basin, FR – fringe, FP – floodplain, SL – Slope; Water flow paths: OU – outflow, IS – isolated, TH – throughflow, BI – bidirectional-nontidal; other descriptors: pd – pond (association), hw – headwater; Waterbodies: PD – pond, LK – lake. Note: Landscape position can be added to lakes and ponds if desirable.

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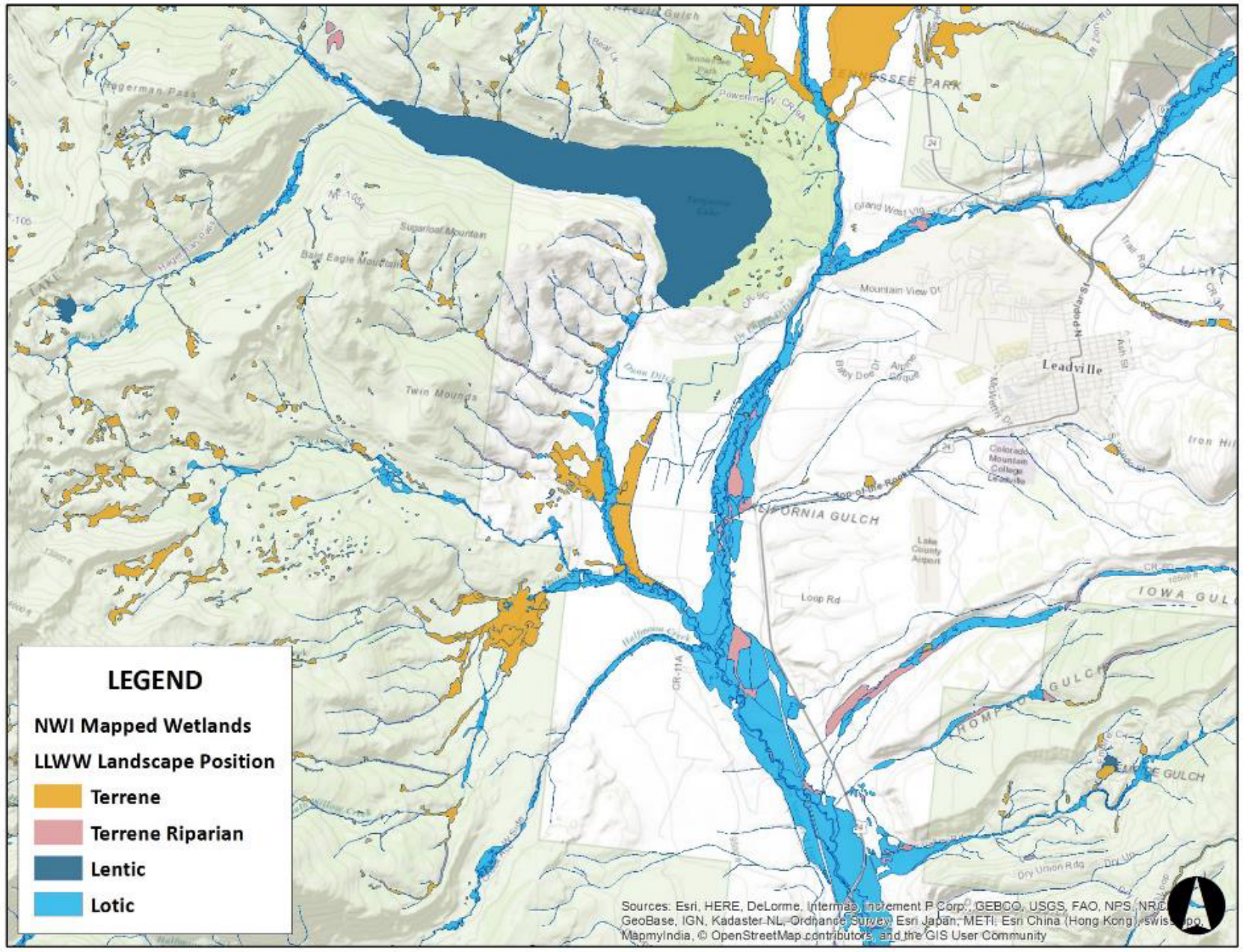

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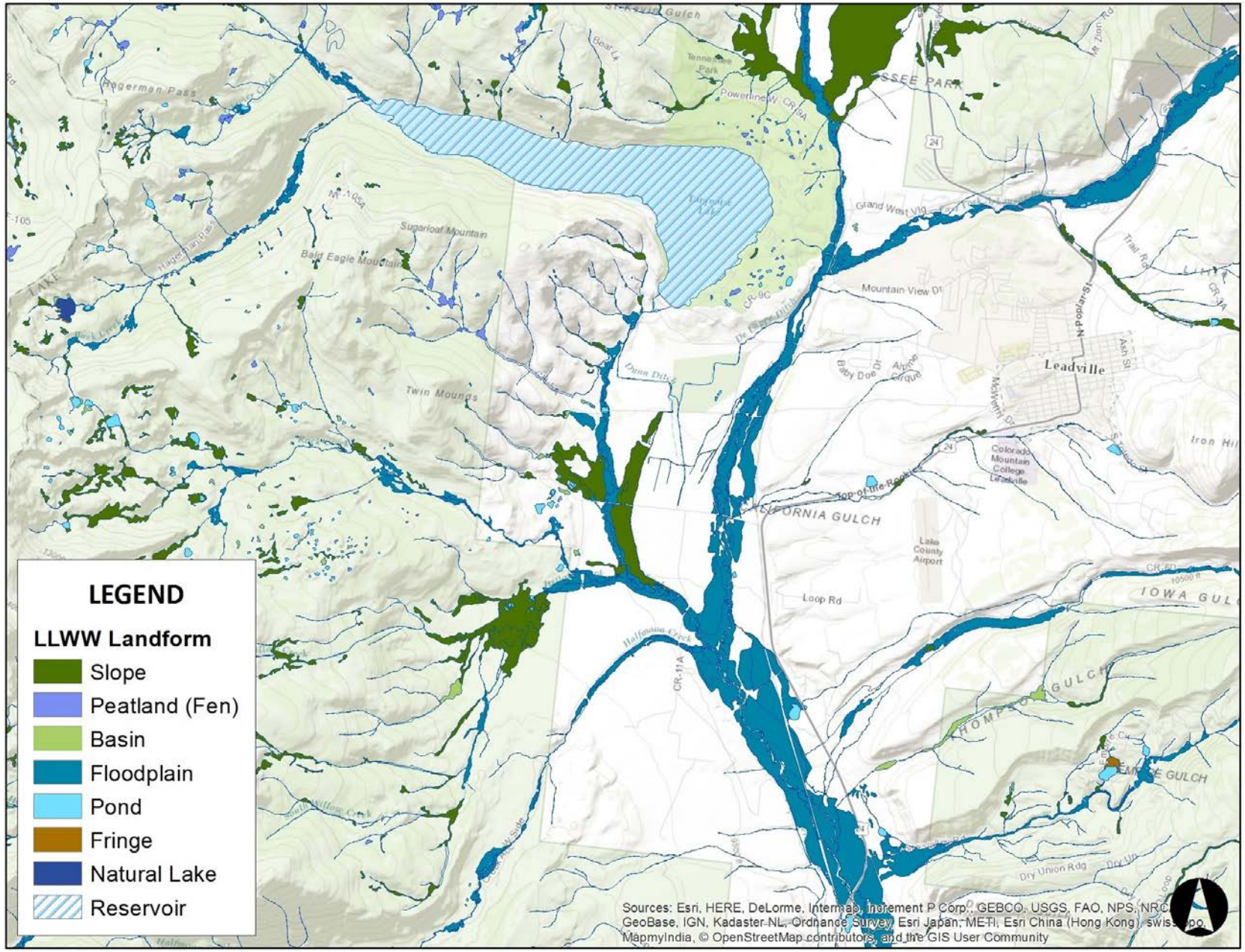

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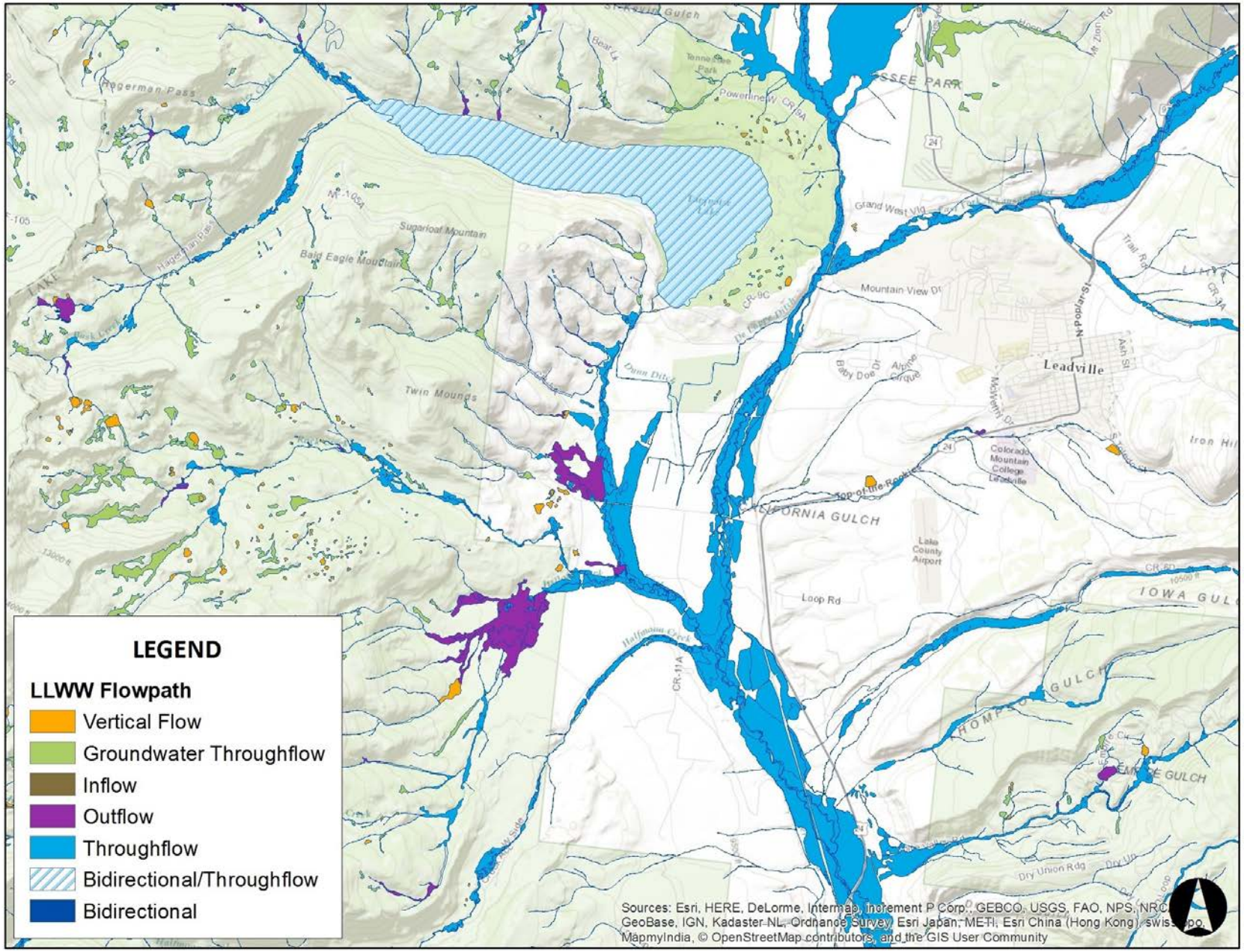

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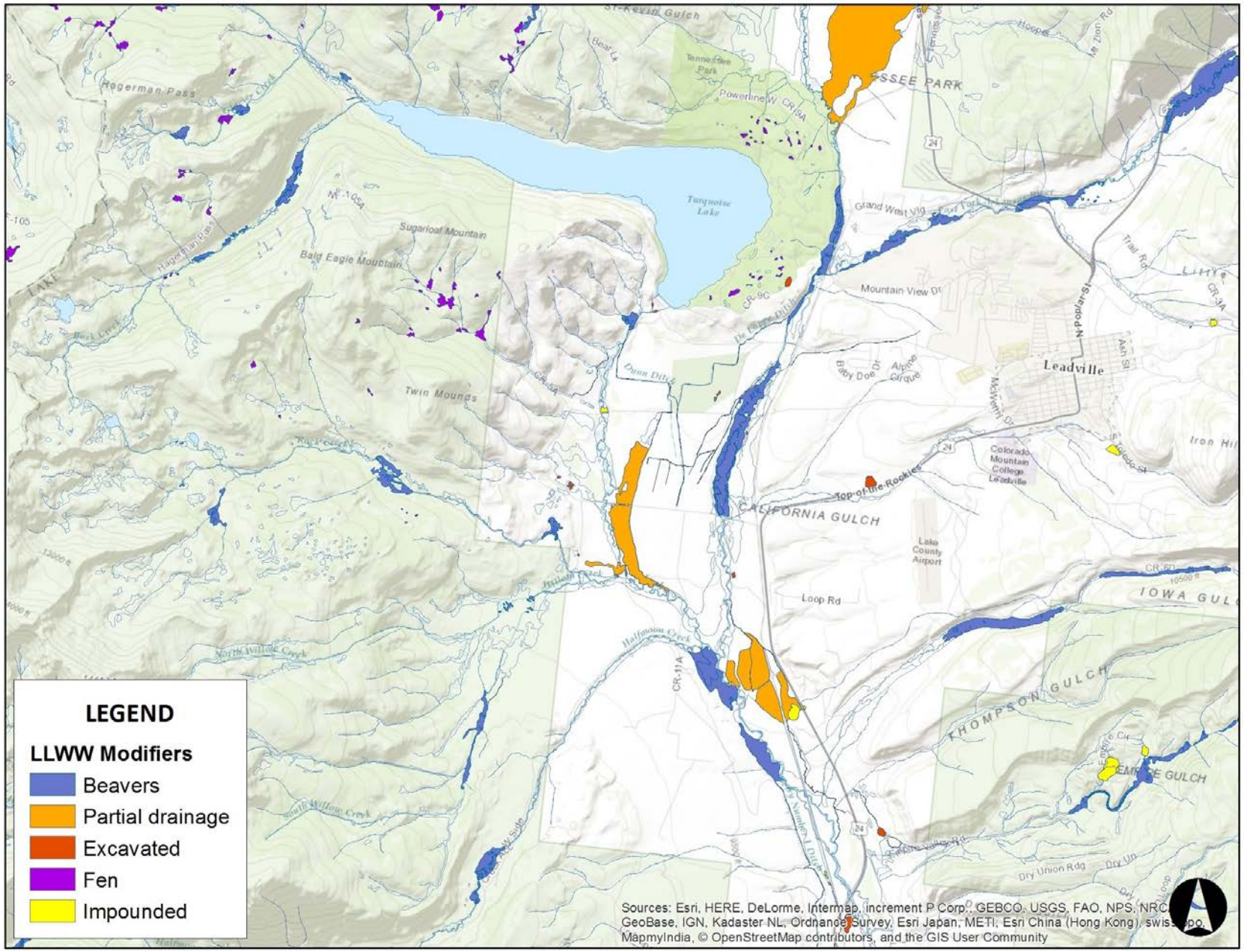
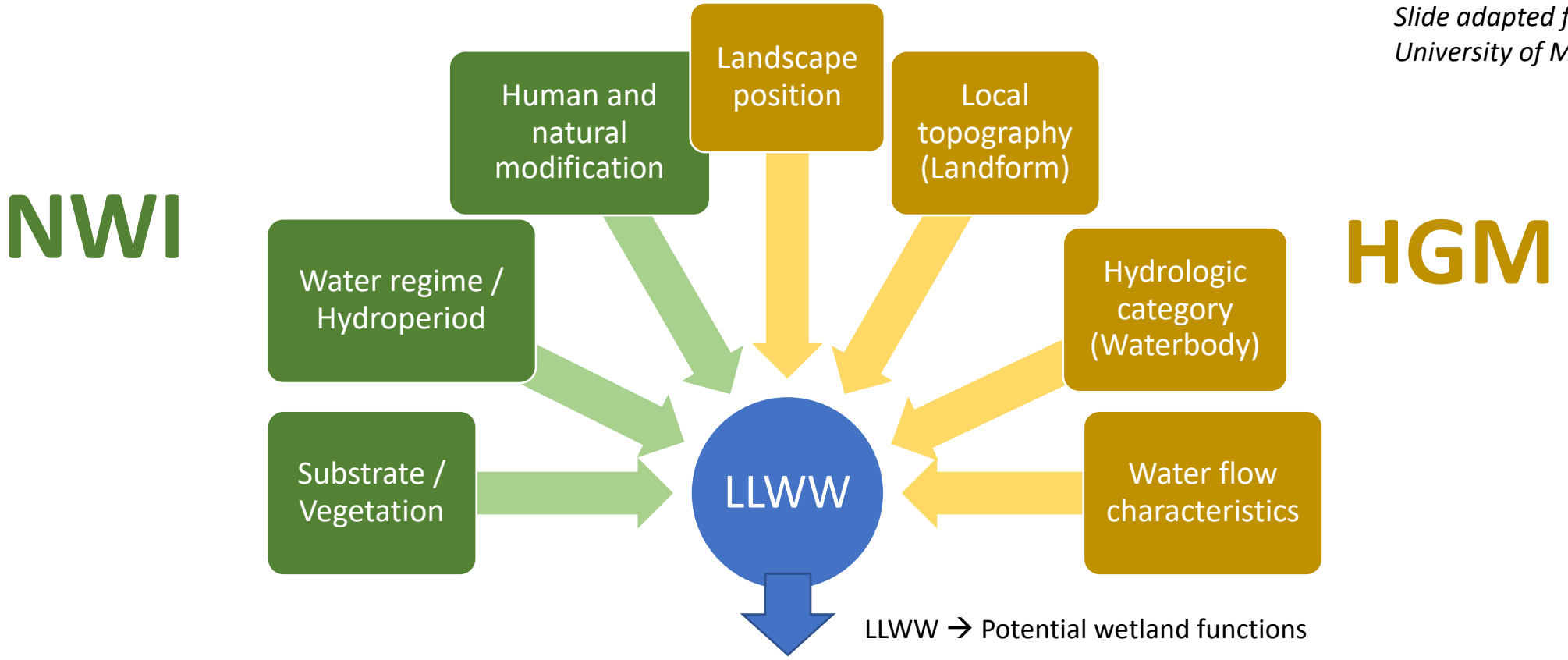


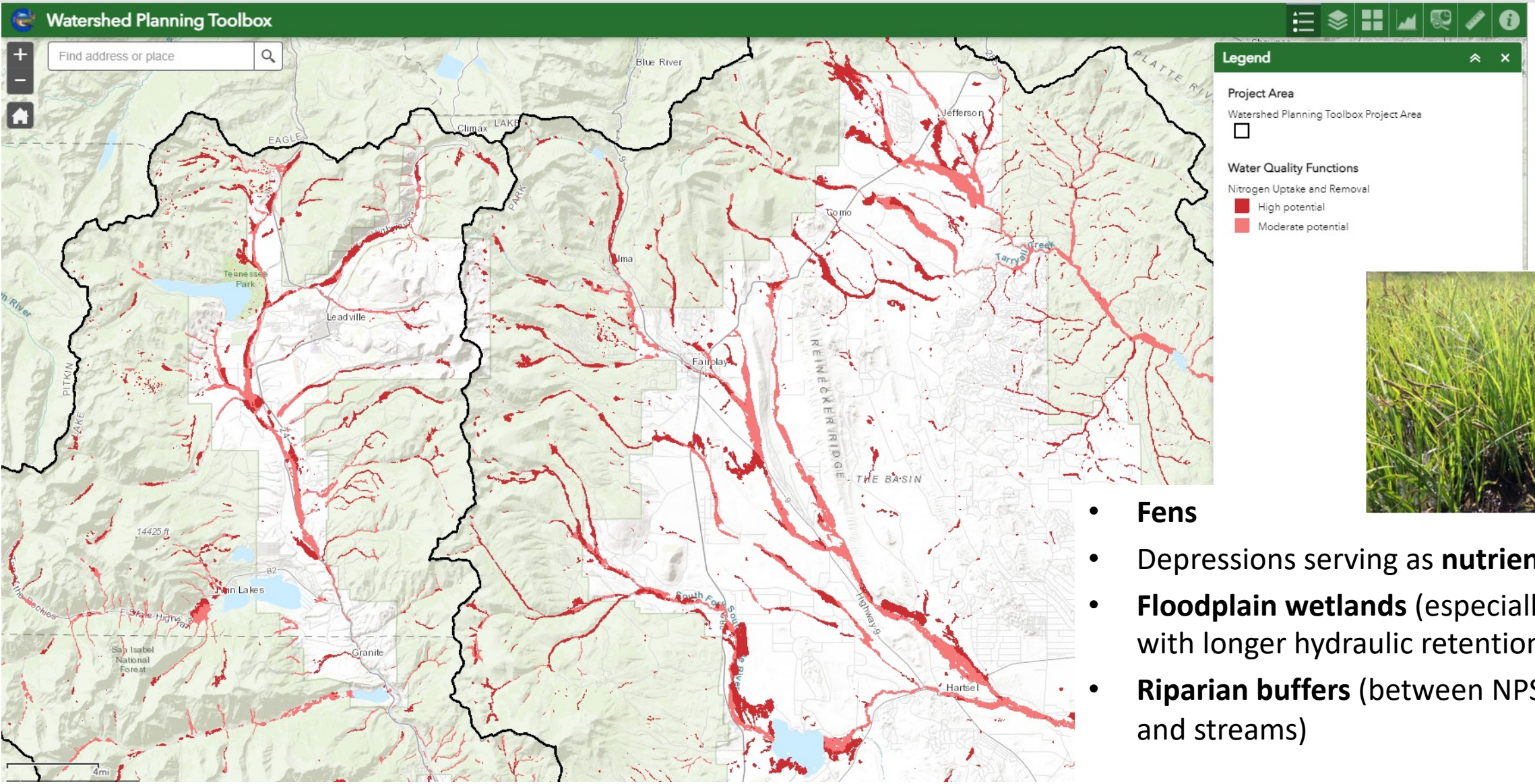
Mapping Wetland Functions

Slide adapted from Sara Owen, University of Montana



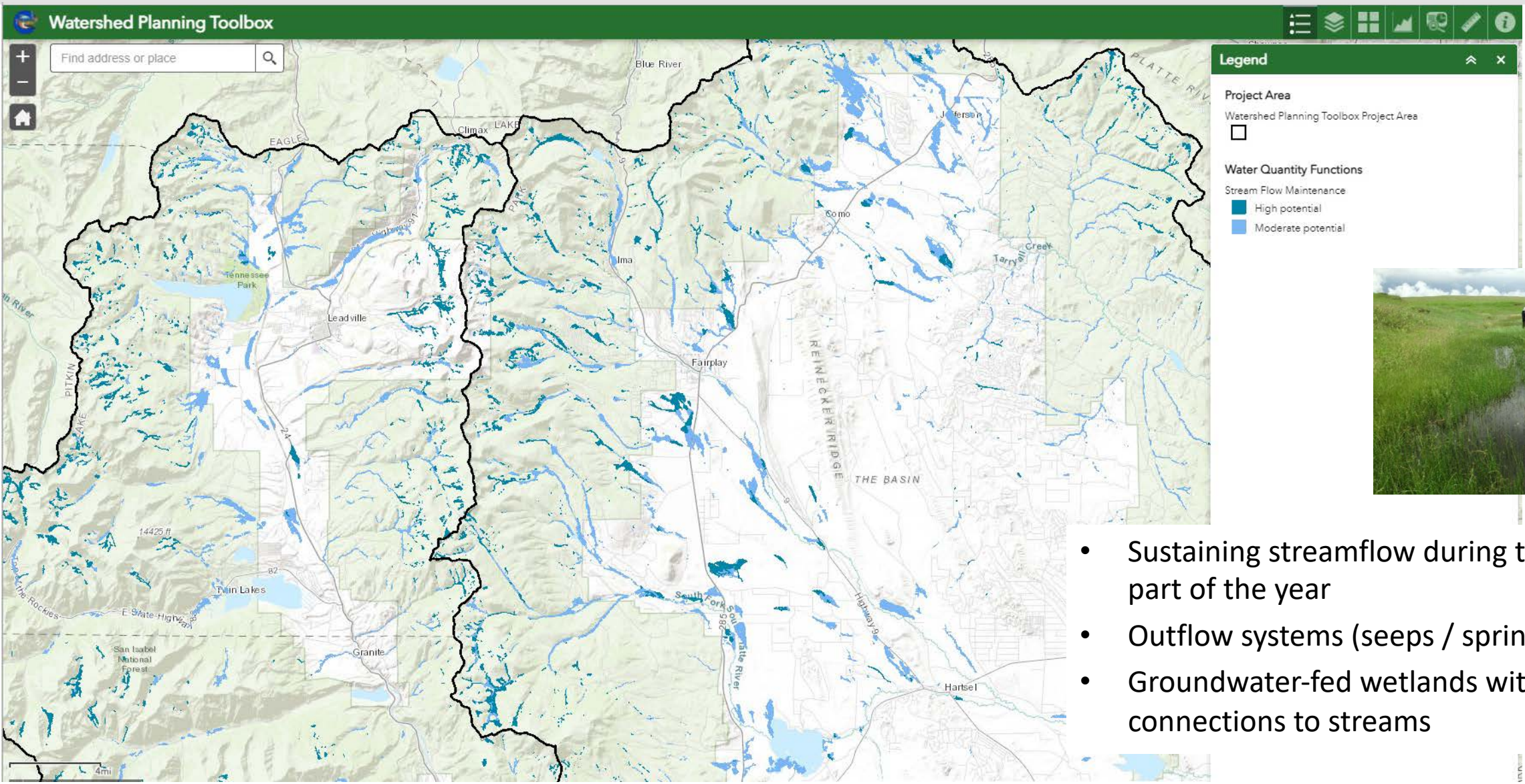
Surface water storage	Nitrogen uptake and removal	Biodiversity conservation
Flood attenuation	Phosphorus removal and storage	Aquatic invertebrate habitat
Sediment capture and retention	Metals removal and storage	Shorebird habitat
Stream flow maintenance	Carbon storage	Waterfowl habitat
Groundwater recharge	Temperature regulation	
Bank and shoreline stabilization		

Mapping Wetland Functions: Nitrogen Uptake and Removal



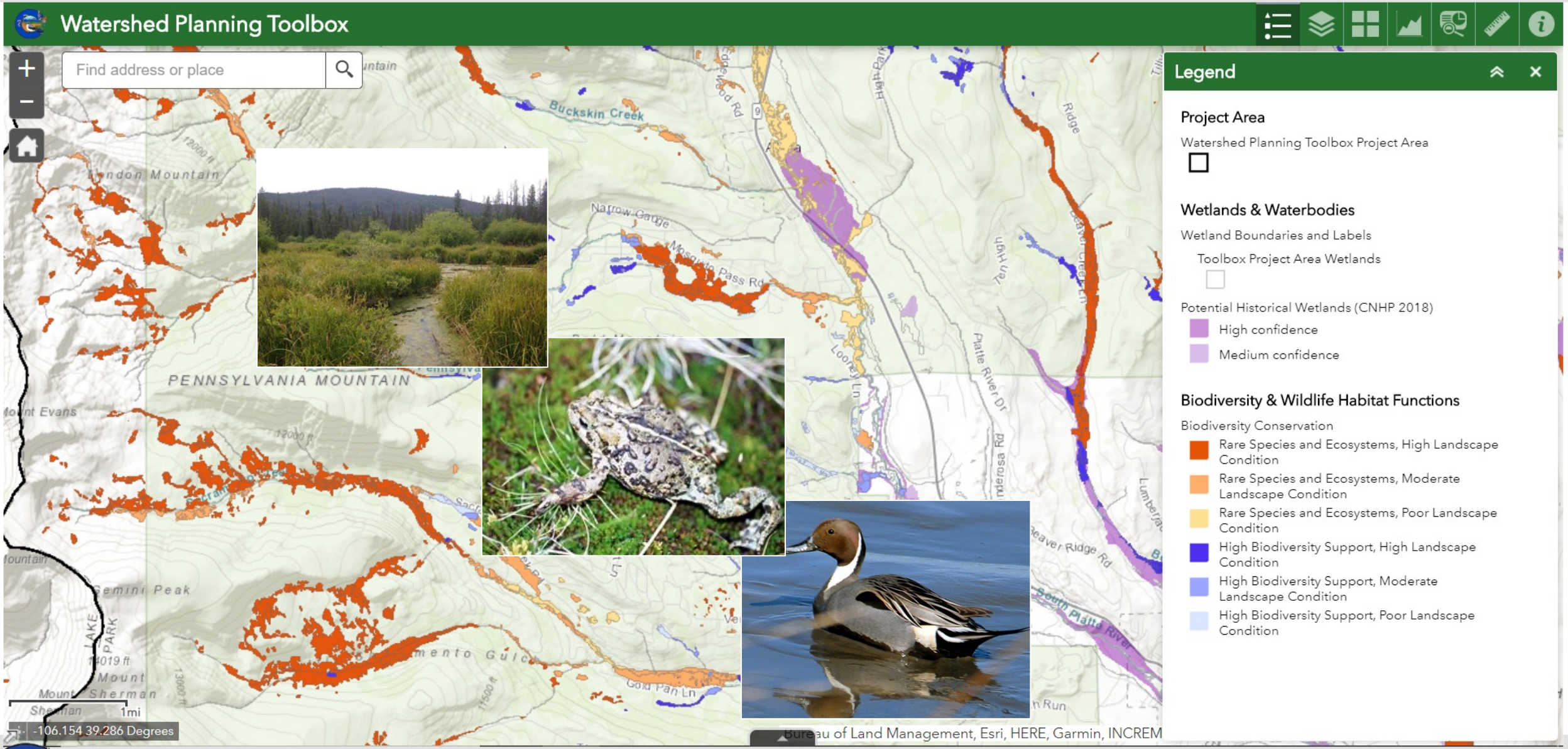
- **Fens**
- Depressions serving as **nutrient sinks**
- **Floodplain wetlands** (especially wetlands with longer hydraulic retention time)
- **Riparian buffers** (between NPS pollution and streams)

Mapping Wetland Functions: Stream Flow Maintenance

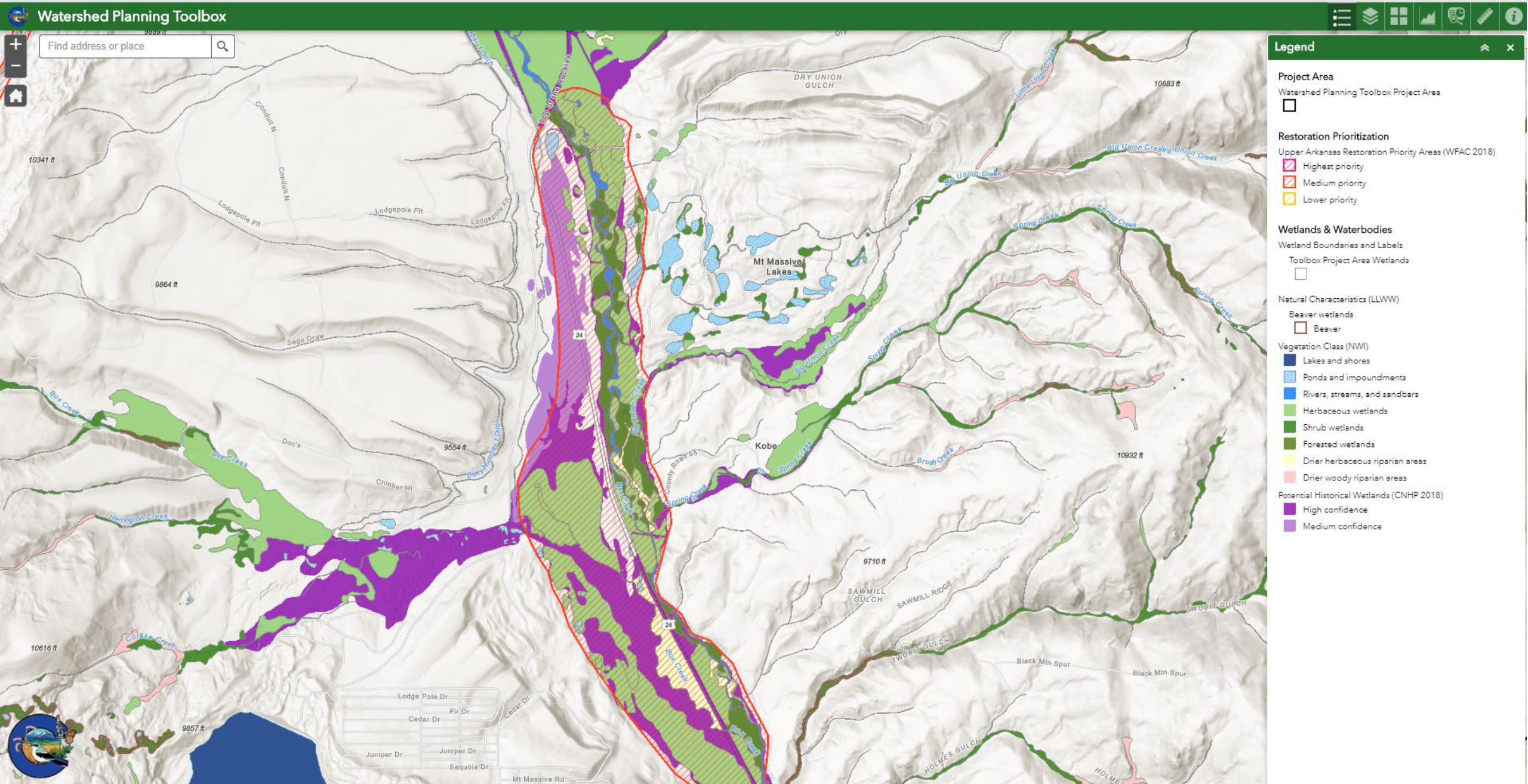


- Sustaining streamflow during the driest part of the year
- Outflow systems (seeps / springs / fens)
- Groundwater-fed wetlands with connections to streams

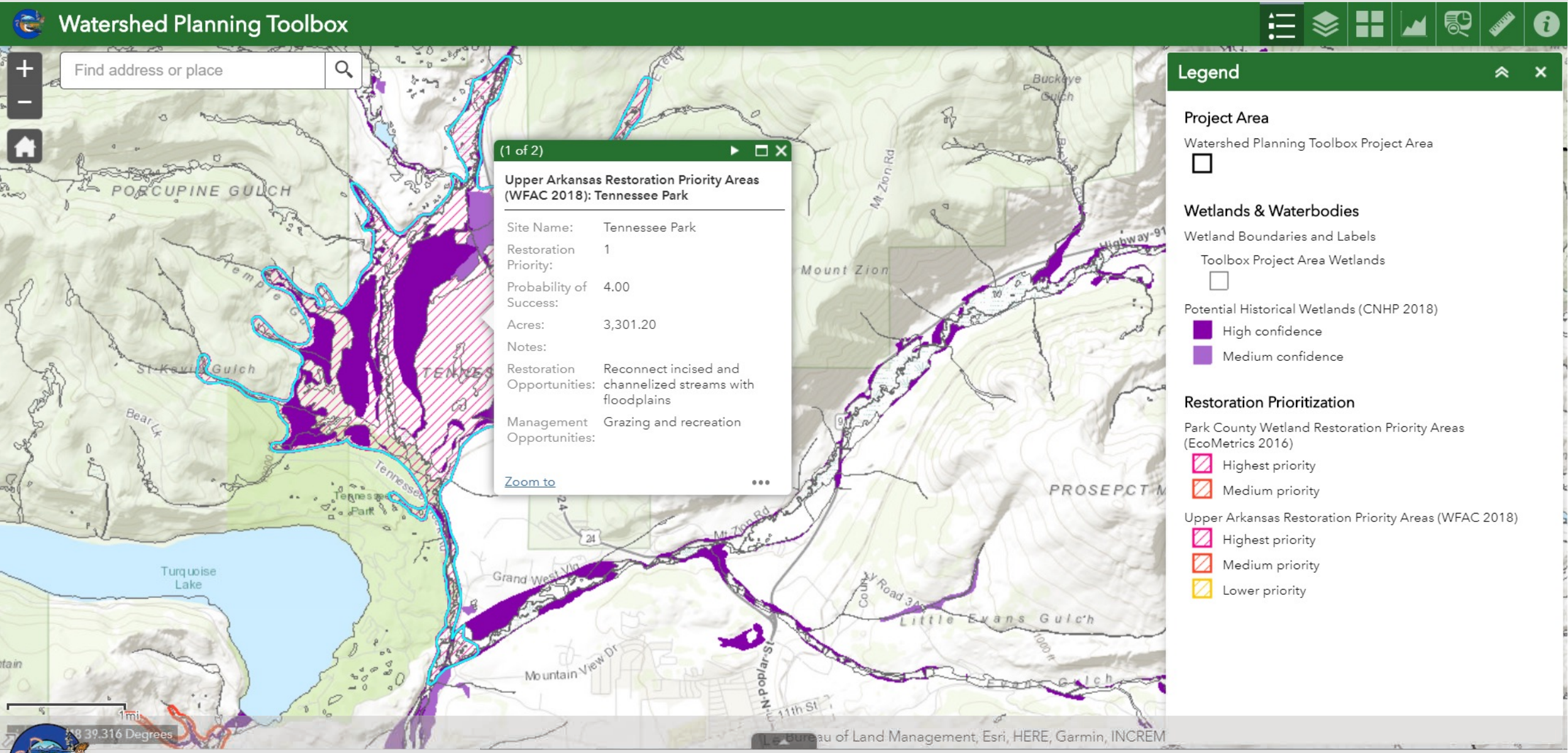
Mapping Wetland Functions: Biodiversity Hotspots



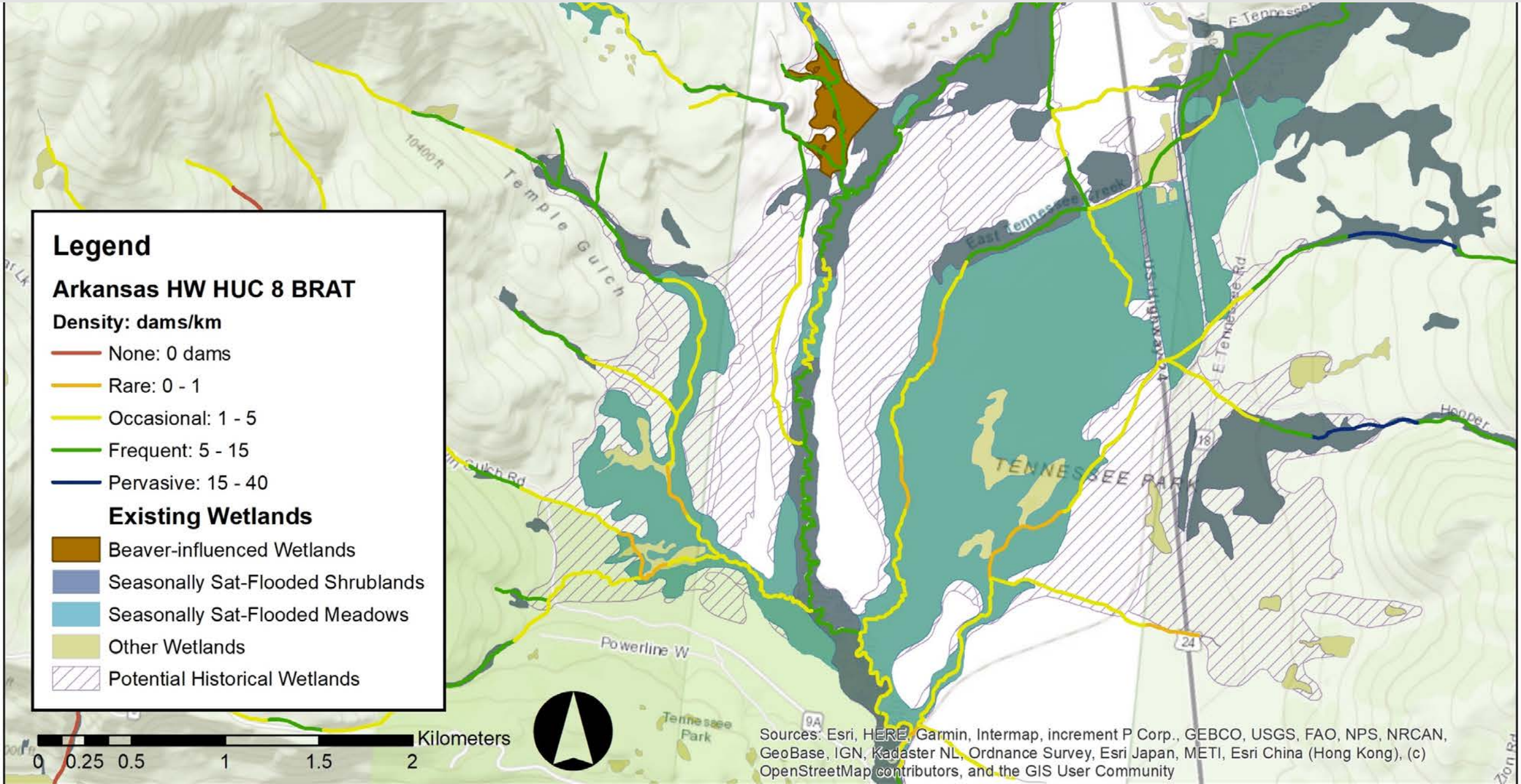
Identifying Restoration Priorities: Mapping Historical Wetlands



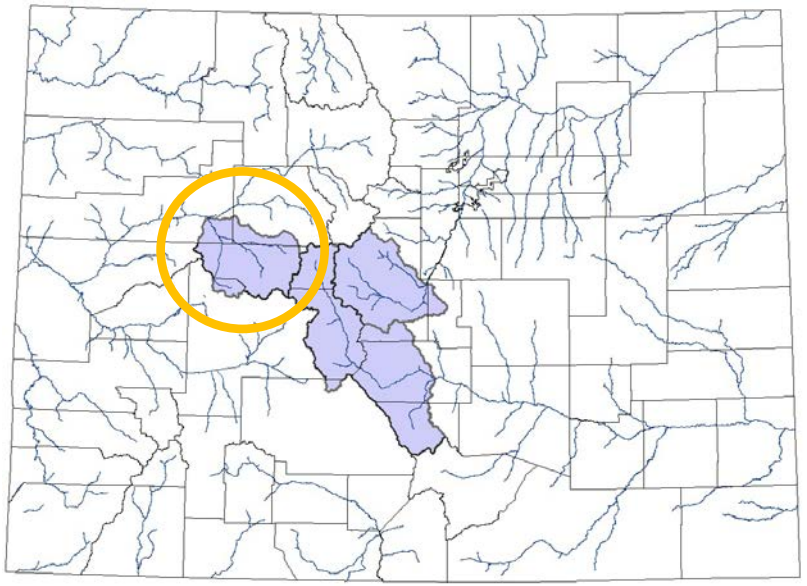
Identifying Restoration Priorities: Stakeholder Involvement



Identifying Restoration Priorities: Opportunities for Beaver

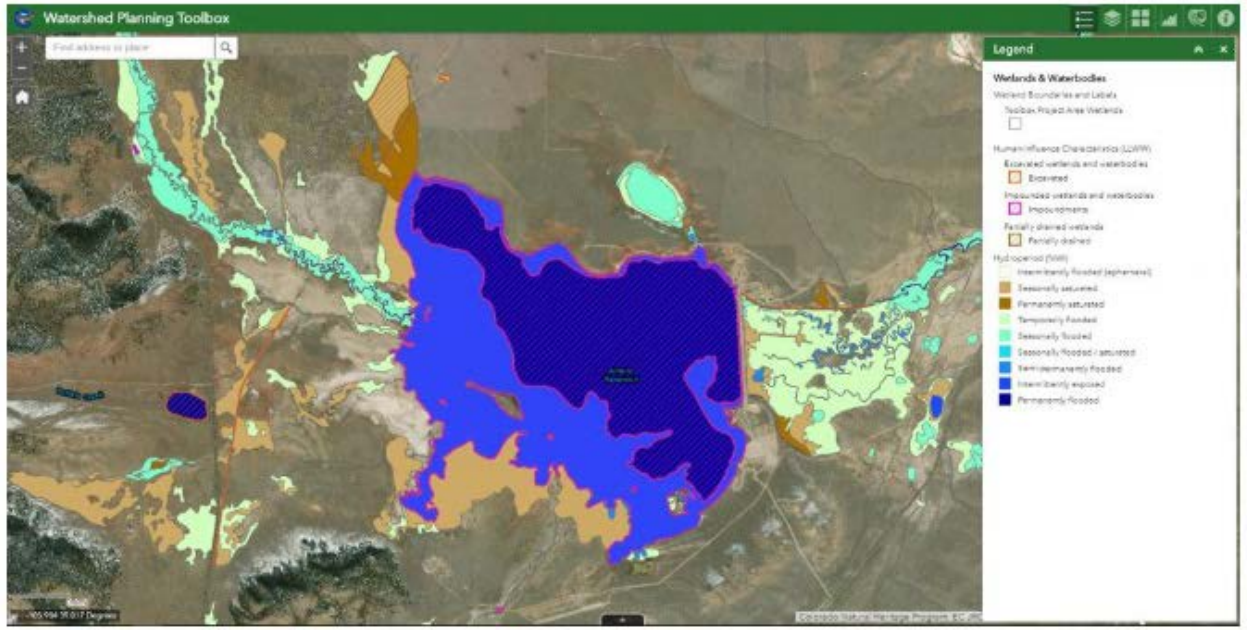


Developing a Watershed Planning Toolbox



The **Watershed Planning Toolbox** is a comprehensive resource for incorporating wetlands and streams into watershed planning, restoring wetlands to improve watershed health, and identifying opportunities for wetland conservation. Many Toolbox data layers have statewide coverage, while some more detailed layers for wetland functions and priority conservation and restoration are building out from the Arkansas and South Platte Headwaters Project Area. The Toolbox includes an interactive mapping platform that allows users to view wetlands, streams, likely aquatic ecosystem functions, ecological stressors, and high-priority sites for conservation and restoration at the landscape scale. Along with geospatial data, the Toolbox includes a gateway to a variety of other restoration and conservation resources via the **Working in Wetlands** web pages.

- Launch the **Watershed Planning Toolbox Mapping Tool**
- Read the **Watershed Planning Toolbox Report**
- Read the **Keys to LLWW for Inland Wetlands of the Western United States**



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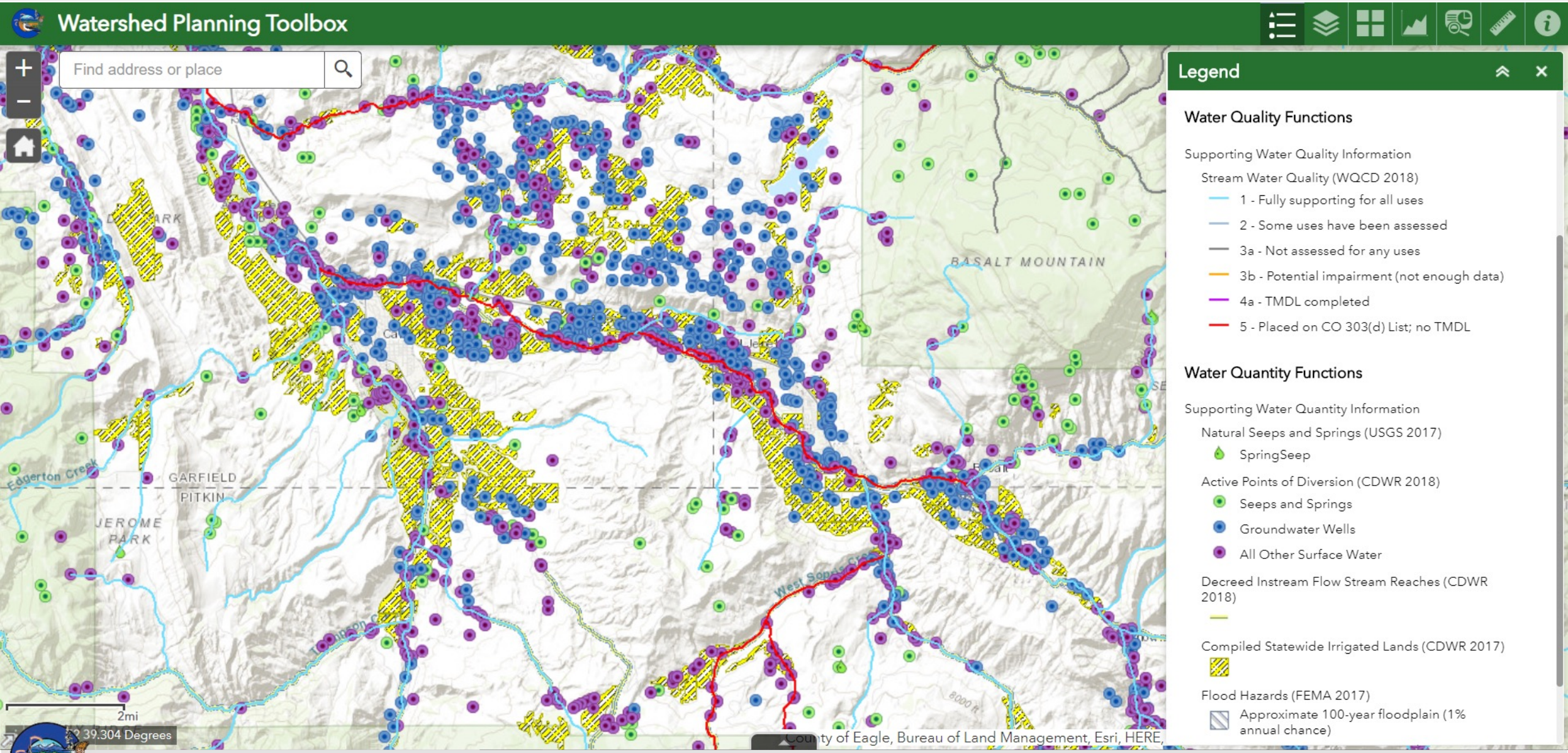





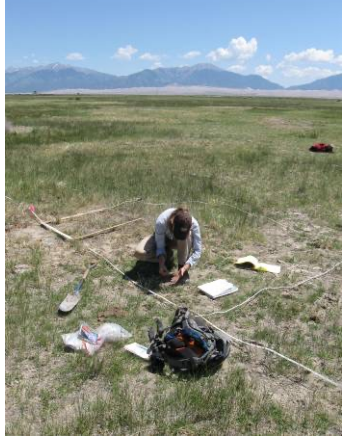










Questions?

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