

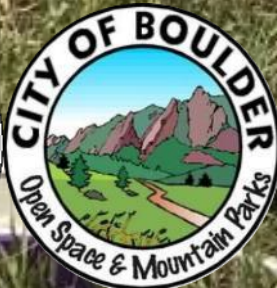
Developing a Wetland Monitoring & Assessment Strategy for City of Boulder Open Space Mountain Parks

2026 ESTP Virtual National Workshop

Cat McIntyre

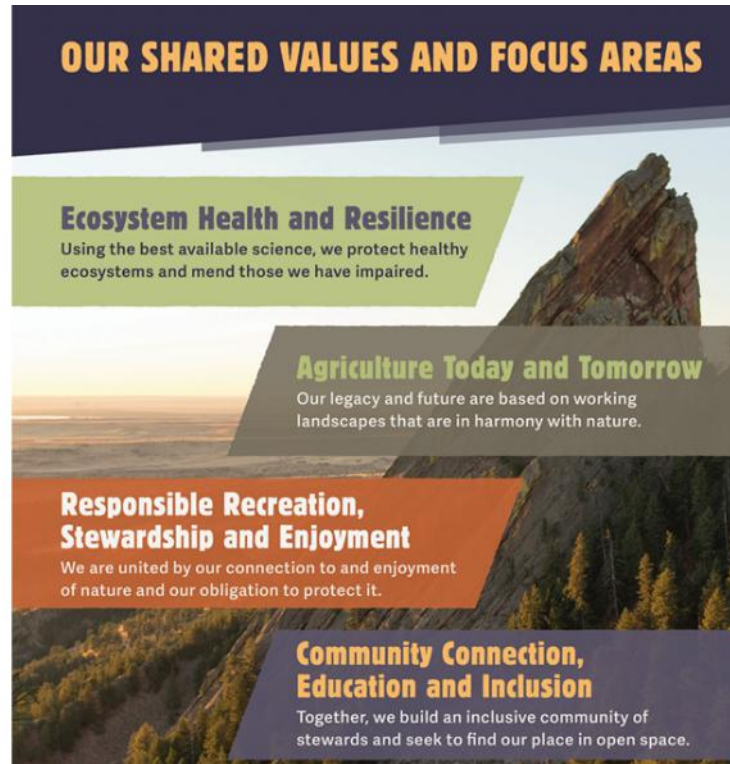
Wetland & Riparian Ecologist

City of Boulder Open Space Mountain Parks



City of Boulder Open Space Mountain Parks (OSMP) Wetland Program

- The City of Boulder charter states that open space land shall be acquired, maintained, preserved, and restored.
- OSMP Master Plan includes the '*Ecosystem Health and Resilience*' focus area



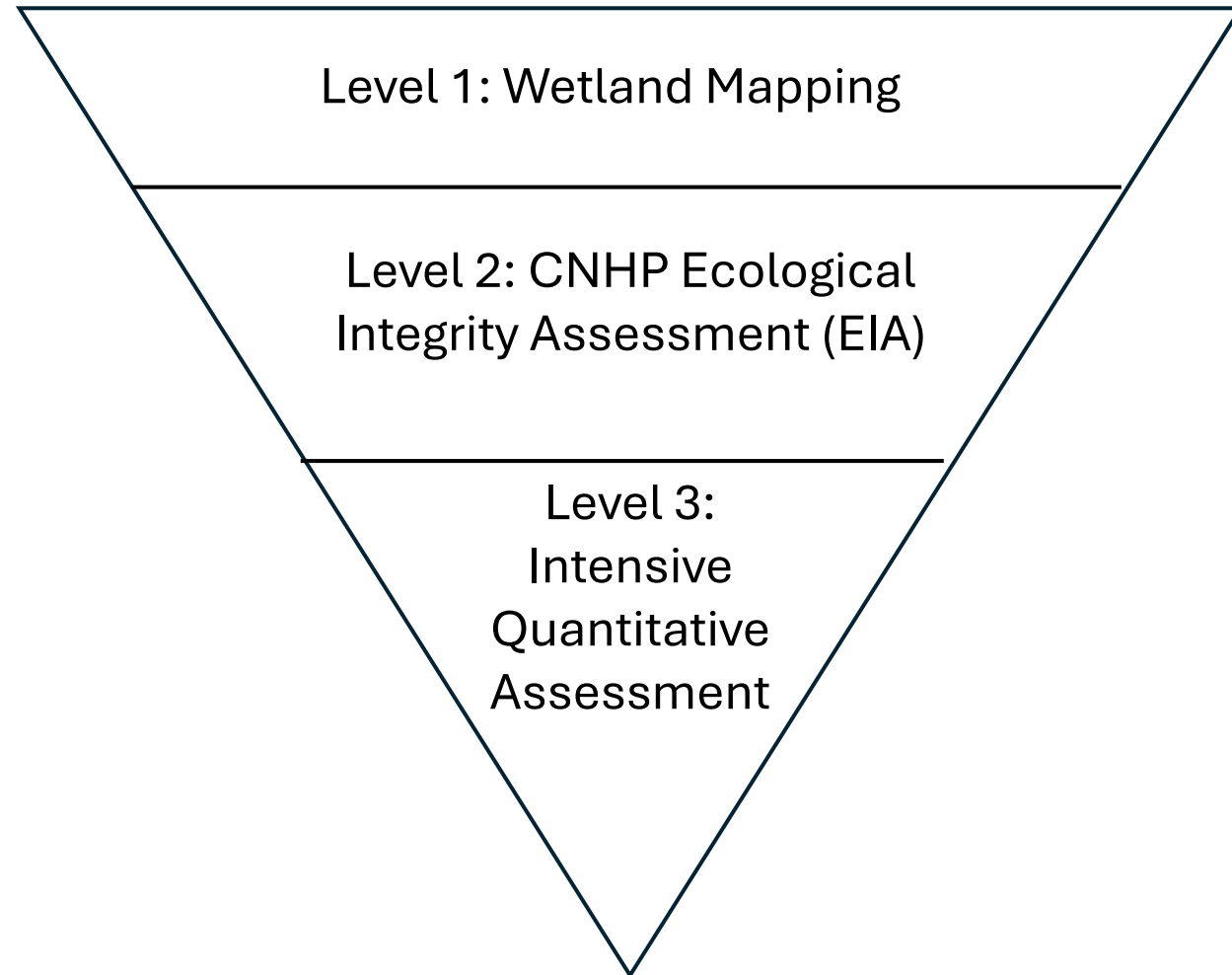
OSMP Monitoring Goals

Identify	Identify priority areas for restoration and/or protection
Track	Track changes in acreage and condition over time
Detect	Detect relationships between human disturbances and wetland condition to help inform land management decisions
Develop	Develop tools to support land management decisions





Monitoring Framework



Wetland and Riparian Mapping Inventory – Cowardin Classification

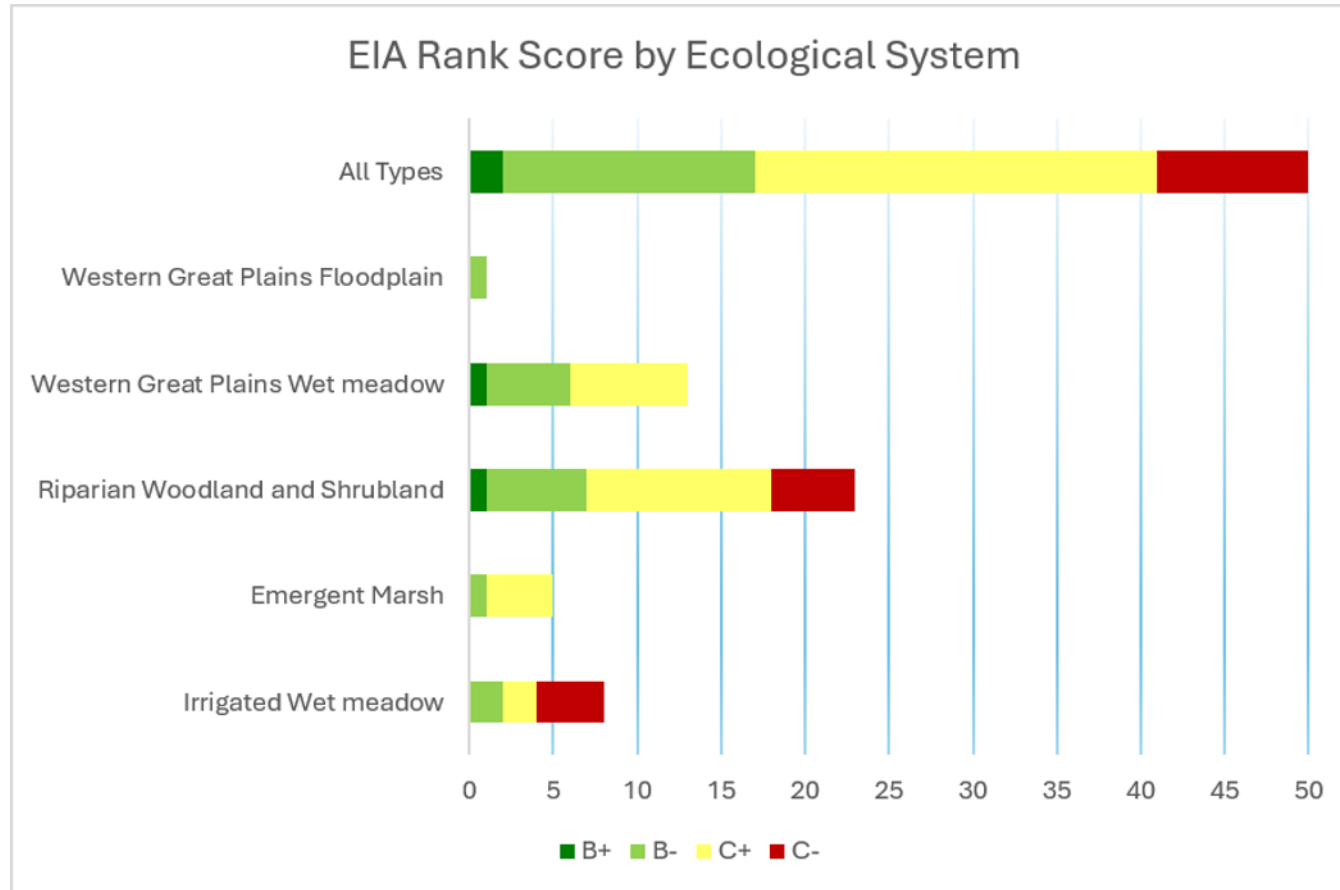
Wetland Types

Wetland and Waterbody Type		Acres	% of NWI Acres	% of Wetland or Waterbody Acres	% of Project Area
Total Boulder OSMP Project Area		37,867	---	---	100.0%
Upland Area (not mapped by NWI)		34,476	---	---	91.0%
Wetlands				% of Wetland Acres	
NWI Code	Wetland Type				
PEM (no x/h)	Herbaceous Wetlands	1,834	54.1%	70%	4.8%
PSS	Shrub Wetlands	311	9.2%	12%	0.8%
PFO	Forested Wetlands	109	3.2%	4%	0.3%
PAB, PUB, PUS, PEMx/h	Ponds an Impoundments	370	10.9%	14%	1.0%
Total Area of Wetlands		2,623	77.4%	100.0%	6.9%
Waterbodies				% of Waterbody Acres	
NWI Code	Waterbody Type				
L	Lakes and Shores	74	2.2%	21%	0.2%
R2	Low-Gradient Perennial Rivers and Sandbars	55	1.6%	15%	0.1%
R3	High-Gradient Perennial Rivers, Streams, and Sandbars	9	0.3%	3%	< 0.1%
R4	Intermittent Streams	104	3.1%	29%	0.3%
R*/x mod, linear PEMx	Canals and Ditches	116	3.4%	32%	0.3%
Total Area of Waterbodies		358	10.6%	100.0%	1.0%

Wetland and Riparian Mapping Inventory – Ecological Systems

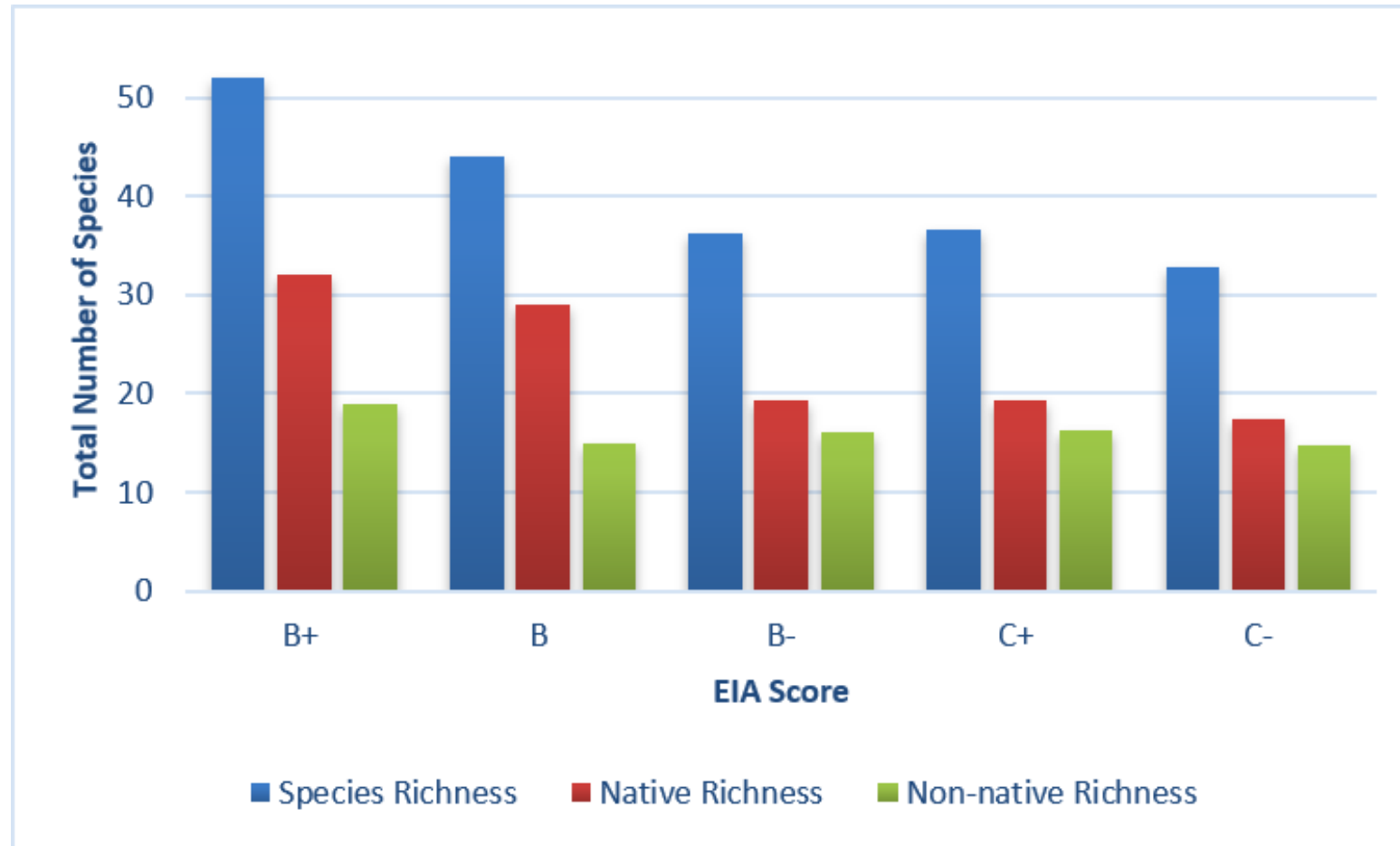
Wetland and Riparian Ecological Systems	Total Acres
Wet Meadows (PEM1A, B, C, or non-fen D*)	1,721
Without direct irrigated lands overlap	710
Overlapping irrigated lands (LLWW ir modifier)	1,011
Riparian Shrublands and Woodlands (Rp*, PSS* or PFO* + location along a waterbody)	828
Riparian Shrubland wetlands (PSS*)	311
Riparian Woodland wetlands (PFO*)	109
Upland Riparian Shrublands and Woodlands (RpSS* and RpFO*)	408
Emergent Marshes (PEM1F and PAB*)	344
Without excavation or impoundment	698
Excavated or impounded (LLWW ex or im)	1,023
Saline Depressions	19
Total Wetland Area Mapped with an Ecological System	2,912

Level 2 Ecological Integrity Assessment



Rank	Numeric Score	Condition Category
A+	≥ 3.8 - 4.0	Excellent/Reference Condition
A-	≥ 3.5 - 3.79	
B+	≥ 3.0 - 3.49	Good/Slight Deviation From Reference
B-	≥ 2.5 - 2.99	
C+	≥ 2.0 - 2.49	Fair/Moderate Deviation from Reference
C-	≥ 1.5 - 1.99	
D	0 - 1.49	Poor/Significant Deviation From Reference

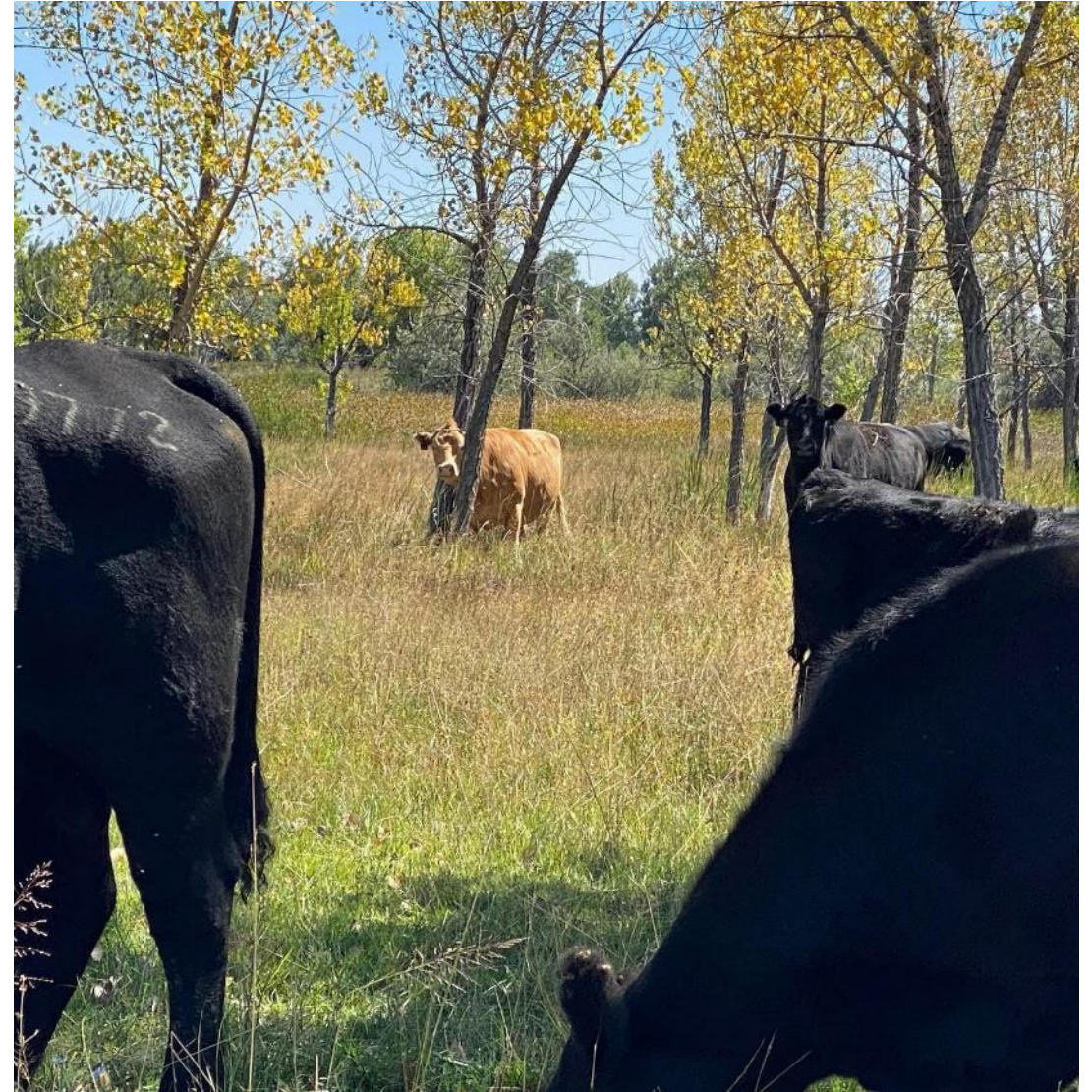
Level 3 Vegetation Results



Natural and Human Disturbances

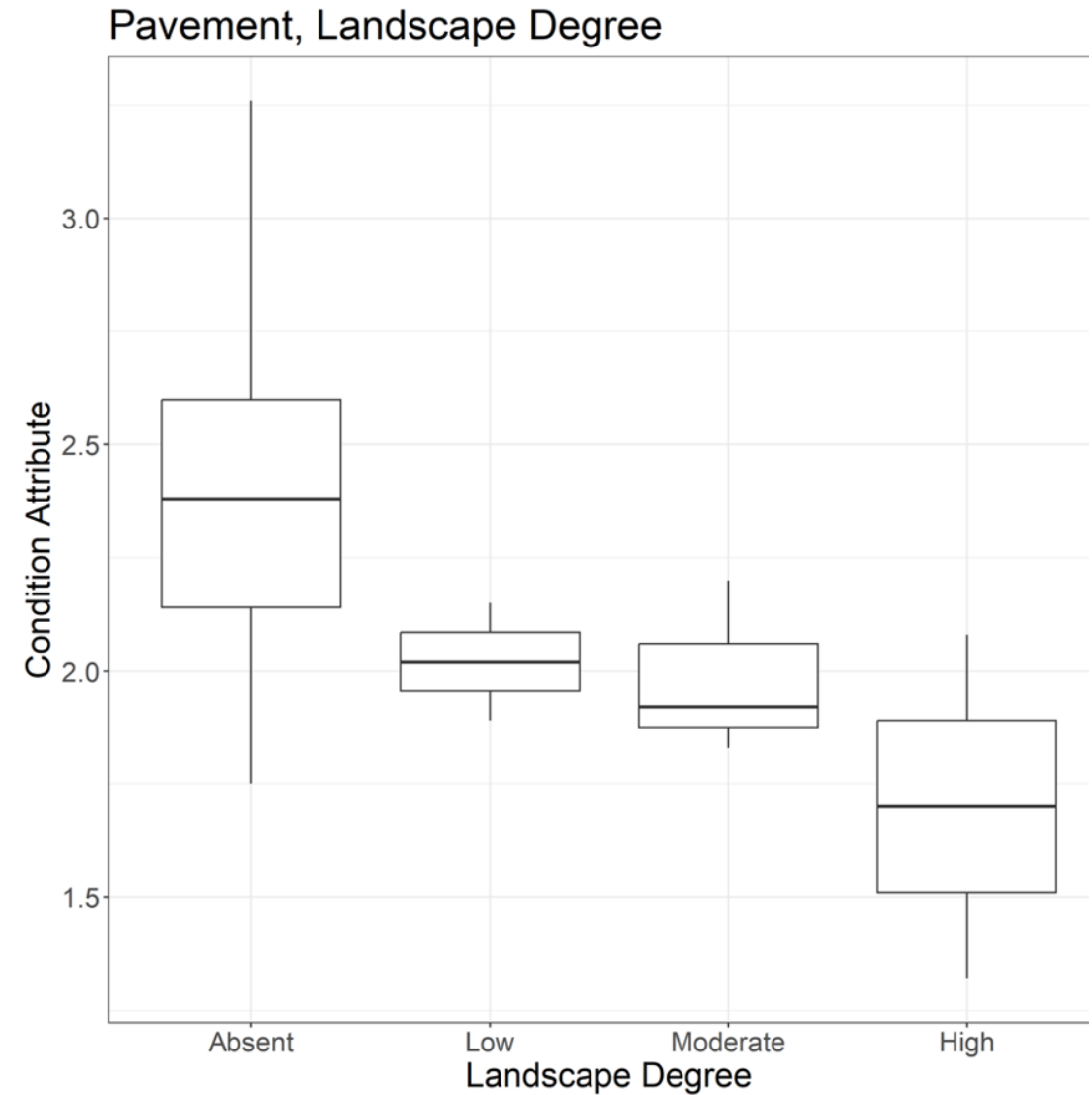
Most Common Disturbances on OSMP:

1. **Non-native invasive plant species –**
 - Present at all 50 sites
 - Most widespread disturbance across landscape and AA scales
 - Degree of impacts very high even at restricted cover.
2. **Livestock grazing –**
 - Present at 42 sites
 - Mostly rare or restricted cover with low to moderate impacts
3. **Soil disturbance from livestock –**
 - Present at 37 sites, but restricted to small areas with low degree of impact



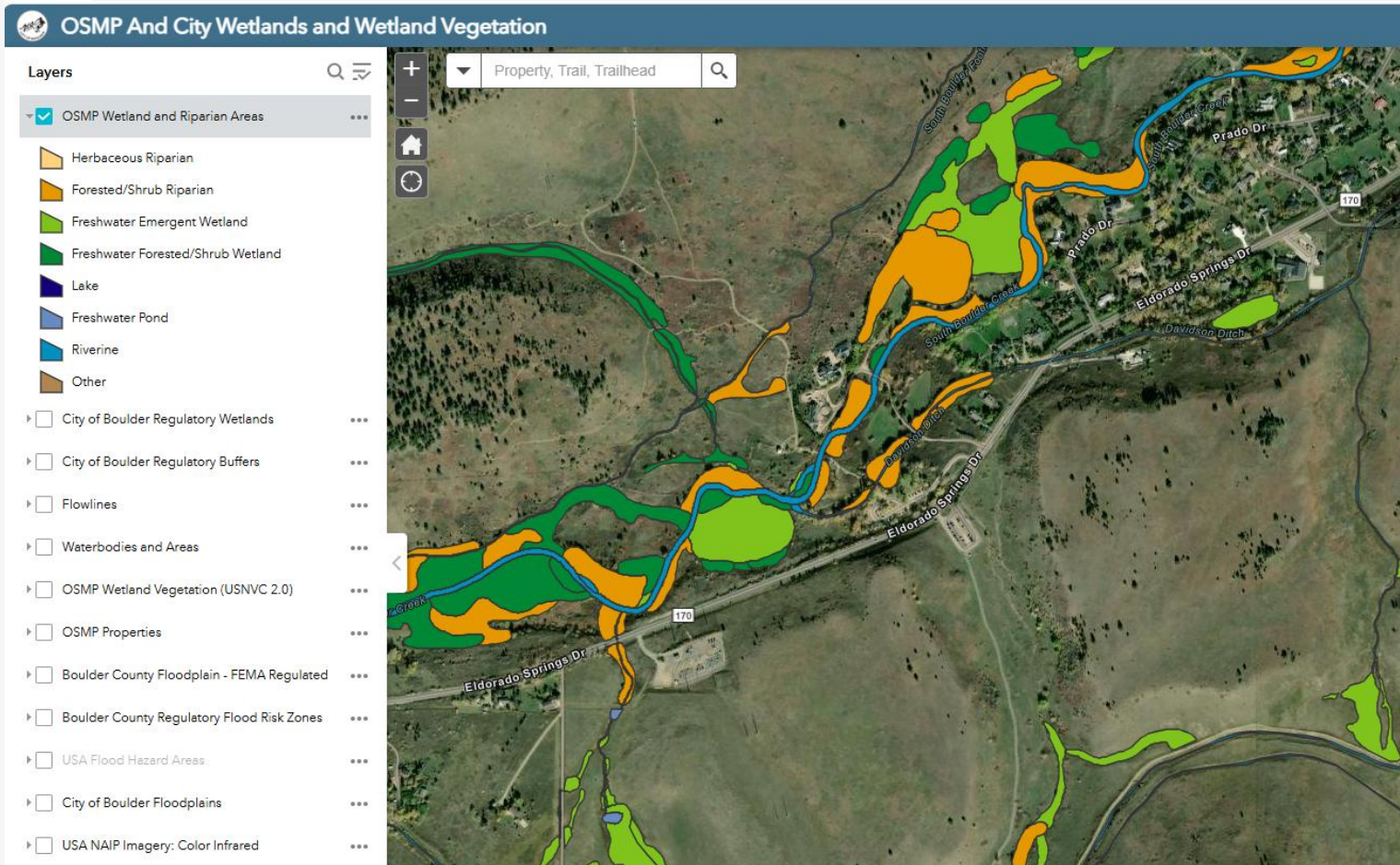
Natural and Human Disturbances

- Paved and gravel parking lots within the 100-m buffer was the only landscape disturbance significantly correlated with declines in wetland condition.
- Native vegetation cover showed a significant positive correlation with increasing trail density within 500 m ($p=0.02$, $\rho=0.34$)
- Nonnative vegetation cover showed significant negative correlations with decreasing road density within 100 m ($p=0.04$, $\rho=-0.29$) and trail density within 500 m ($p=0.03$, $\rho=-0.31$).
- Noxious plant cover also declined significantly with increasing trail density at 500 m ($p=0.01$, $\rho=-0.37$).



Site Prioritization

Properties	Site ID	Key Characteristics	Management Recommendations
Tier 1: Protect and Maintain			
Lippincott Ranch	WAP_2025_15	Wet meadow Highest overall EIA score in the system (3.04; B+) Mean C 2.30; FQA 14.55	Priority for long term protection from disturbance and invasive plant species
Varra East	WAP_2025_181	Scrub shrub wetland High EIA condition (3.03; B+) Mean C 2.85; FQI 20.52 Strong native woody structure and relatively low disturbance.	Maintain Woody regeneration
Gebhard	WAP_2025_196	Wet Meadow High EIA score (2.53; B-) Highest FQA score (FQI = 24.49). Mean C 3.33	High floristic value warrants focused protection from disturbance and invasive plant species
Tier 2: Enhance			
Isenhart - Jones	WAP_2025_82	Forested wetland High EIA Score (2.74; B-) Mean C 2.45; FQI 13.65	Maintain buffer conditions and prevent hydrologic alteration. Maintain cottonwood recruitment.
Rolling Rock Ranch	WAP_2025_218	Scrub shrub wetland EIA Score (2.49; C+) Mean C 2.79; High FQI of 20.85	Maintain hydrology and needs multi-year invasive plant treatment and planting with native seed mix.
Rudd West	WAP_2025_14	Wet meadow High EIA score (2.59; B-) Mean C3.19; FQI 18.03	Needs weed management and reseeding with native seed mix.
Tier 3: Restore			
Tracy Collons	WAP_2025_19	Forested wetland EIA score (2.50; B-) Mean C2.72; FQI 16.97	BDA's and PAL's could help with hydrology; needs weed management to get non-native plants under control.
Fort Chambers/Poor Farm	WAP_2025_101	Forested wetland EIA Score 1.95 (C-) Mean C 1.19; FQI 8.04	This site is a historic gravel mine with large gravel pits located within the Boulder Creek floodplain. Gravel pits could be filled to create a mosaic of wetland and riparian habitat.



Wetland Tools

- In depth protocol and QAPP that can be used to assess wetland condition every 5-years or as needed to track changes in wetland condition
- AGOL web map with wetland mapping and wetland assessment data
- PowerPoint training on how to interpret wetland mapping codes
- Develop disturbance thresholds from Level 3 data to better support land management decisions
- Incorporate disturbance thresholds into lease agreements and management plans

Thank you!

- This project was funded by an EPA Region 8 Wetland Program Development Grant
- Wetland mapping completed by Joanna Lemly and Gabrielle Smith, Colorado Natural Heritage Program

