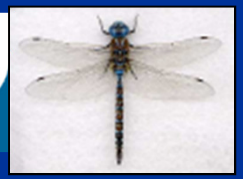
Wetland Associations Of Dragonflies, Damselflies & Butterflies in Montana's Wetlands: Uses in Level II & III Assessments

Montana Natural Heritage Program



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Key Goals for Addressing Montana's Wetland Invertebrates

- Develop "expected" macroinvertebrate species lists for wetland types by investigating the habitat & ecological requirements of the dragonfly, damselfly, and butterfly species.

- Comprehensive understanding of Montana's wetland systems, fill gaps in the MT Field Guide and NHP databases. Determine which wetland types, if effectively protected, will benefit species diversity and conservation of SOC.

- How is the diversity of aquatic assemblages affected by anthropogenic influence? (Community Shifts, Species Loss or replacement)

- Include invertebrate species & community metrics (# Mollusk, % OET) into a wetland IBI which will be representative across wetland types and responsive to wetland condition.

Wetland or Aqautic Type	Ecological Systems	# of Odonata Species	# of SOC Spp.	# of PSOC Spp.
Bogs, Fens	Rocky Mountain Subalpine-Montane Fen	43	4	8
Depressional Wetlands	Great Plains Closed Depressional Wetland	25	0	1
	Great Plains Open Freshwater Depressional	34	0	3
	Great Plains Prairie Pothole	32	0	3
	Great Plains Saline Depression Wetland	29	0	2
Wooded	Northern Rocky Mountain Wooded Vernal Pool	41	3	9
	Northern Rocky Mountain Conifer Swamp	8	1	1
Herbaceous	Western Emergent Marsh[1]	51	5	9
	North American Arid West Emergent Marsh	44	0	6
Open Water	Large Prairie Rivers	6	1	1
	Medium Prairie Rivers	11	0	3
	Medium Intermountain Rivers	6	1	1
	Forested Low-Gradient Streams	23	2	7
	Perennial Prairie Stream	15	0	3
	Intermittent Prairie Stream	28	0	5
	Hot or Warm Springs	3	1	2
	Northwestern Great Plains Perennial Spring	7	1	3
Riparian	Western Great Plains Wooded Draw and Ravine[2]	3	0	1

[1]Same as the North American Arid West Emergent Marsh, but located in the western part of the state
[2]Only in Association with the Northwestern Great Plains Perennial Spring

Total Odonata spp. Association Results

For 82 Species of Odonata:

Highest diversity & potential for species of concern (SOC & PSOC) is the Western Emergent Marsh followed by the Rocky Mountain Subalpine-Montane Fen

- Forested Low-Gradient Streams have a higher probability of harboring PSOC species

Wetland Type	Ecological System	# B-fly Species of the 30	# of SOC Species	# of PSOC Species
Bogs, Fens Wet Meadow	Rocky Mountain Subalpine-Montane Fen	11	2	4
	Rocky Mountain Alpine-Montane Wet Meadow	16	3	4
Depressional Wetlands	Great Plains Closed Depressional Wetland	3	0	0
	Great Plains Open Freshwater Depressional	3	0	1
	Great Plains Prairie Pothole	4	0	1
	Great Plains Saline Depression Wetland	1	0	0
Wooded	Northern Rocky Mountain Wooded Vernal Pool	10	3	1
	Northern Rocky Mountain Conifer Swamp	1	1	0
Herbaceous	Western Emergent Marsh[1]	11	2	2
	North American Arid West Emergent Marsh	7	0	1
Riparian and Floodplain	Northwestern Great Plains Floodplain	4	0	1
	Northwestern Great Plains Riparian	8	1	1
	Western Great Plains Wooded Draw and Ravine	11	1	1
	Northern Rocky Mtn Lower Montane Riparian Woodland & Shrubland	14	2	1
	Rocky Mountain Subalpine-Montane Riparian Shrubland	7	0	1
	Rocky Mountain Subalpine-Montane Riparian Woodland	11	1	1

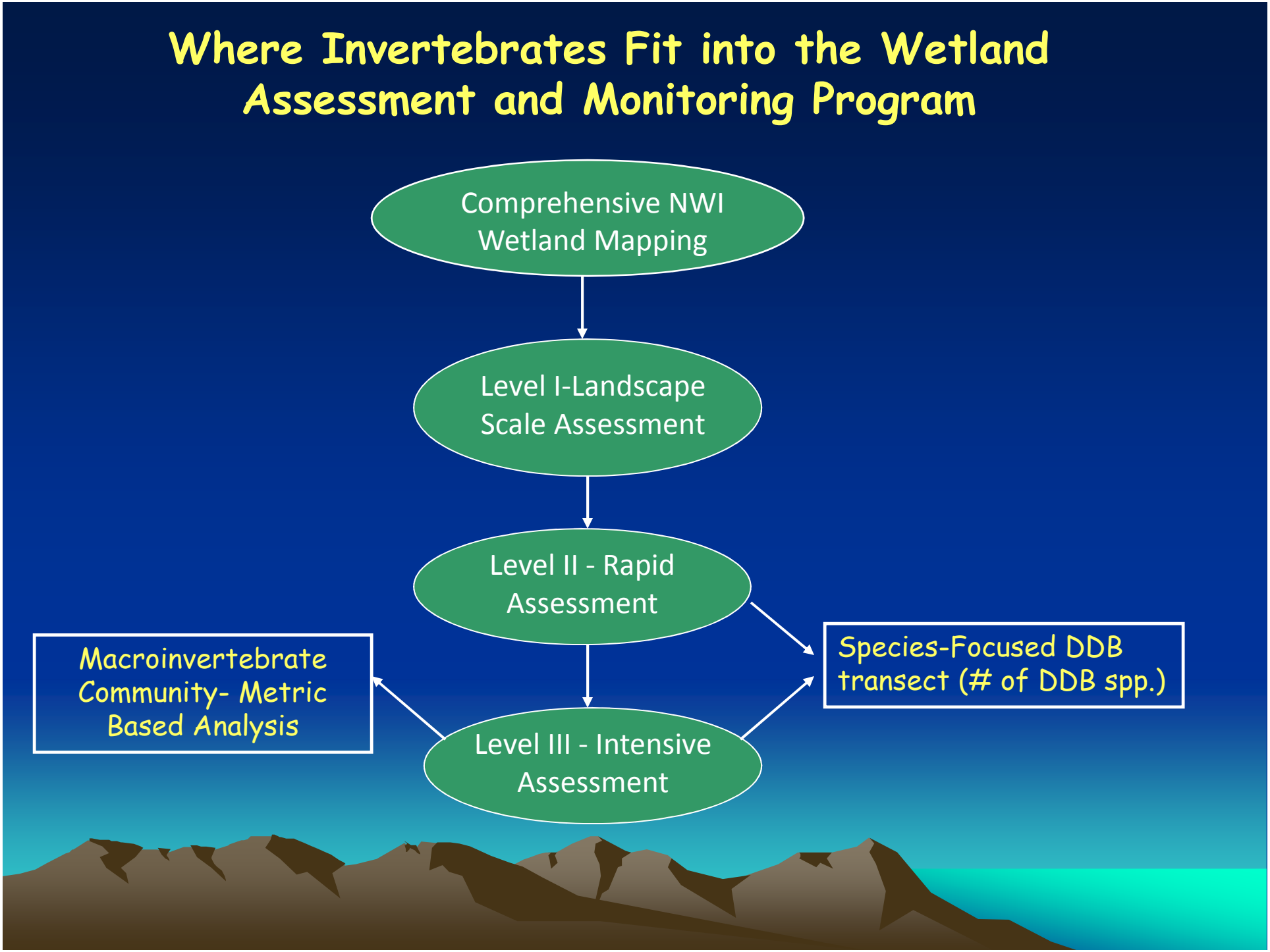
[1]Same as the North American Arid West Emergent Marsh, for the western part of the state

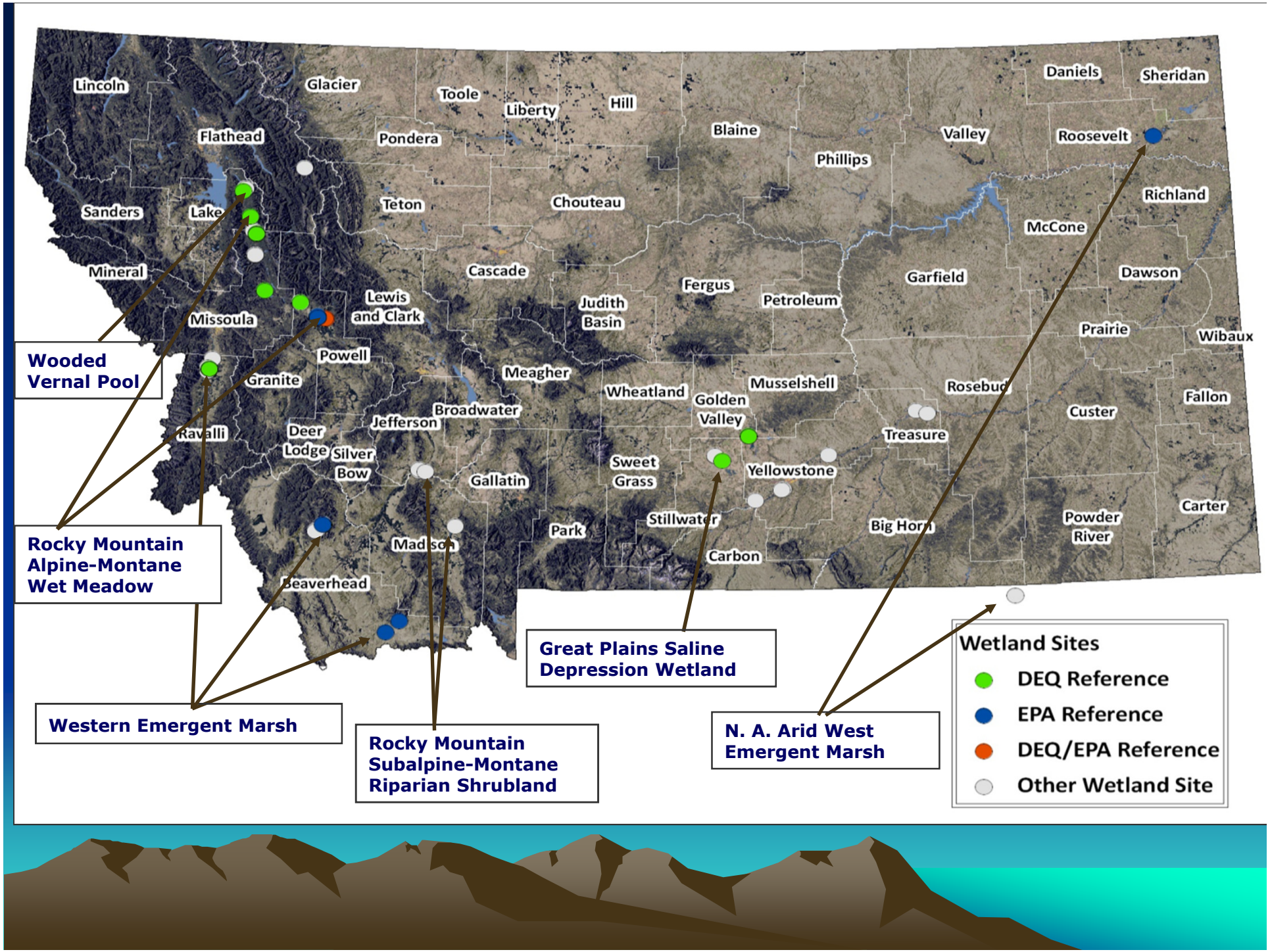
Butterfly Species Association Results

For 30 spp. of Butterflies:

- Highest diversity & potential for SOC & PSOC species is found in the Rocky Mountain Alpine-Montane Wet Meadow, followed by the Rocky Mountain Subalpine-Montane Fen and the Western Emergent Marsh

Where Invertebrates Fit into the Wetland Assessment and Monitoring Program




Lincoln
Glacier
Toole
Liberty
Hill
Daniels
Sheridan
Flathead
Pondera
Blaine
Valley
Roosevelt
Phillips
Sanders
Lake
Teton
Chouteau
Richland
McCone
Mineral
Cascade
Fergus
Garfield
Dawson
Lewis and Clark
Judith Basin
Petroleum
Missoula
Prairie
Wibaux
Powell
Meagher
Granite
Musselshell
Rosebud
Wheatland
Golden Valley
Fallon
Broadwater
Custer
Jefferson
Deer Lodge
Silver Bow
Treasure
Sweet Grass
Yellowstone
Gallatin
Carter
Park
Stillwater
Big Horn
Powder River
Carbon
Beaverhead
Wooded Vernal Pool
Rocky Mountain Alpine-Montane Wet Meadow
Great Plains Saline Depression Wetland
Western Emergent Marsh
Rocky Mountain Subalpine-Montane Riparian Shrubland
N. A. Arid West Emergent Marsh
Wetland Sites
DEQ Reference
EPA Reference
DEQ/EPA Reference
Other Wetland Site

Level II/III-Transect DDB walks (n=72)

Dragonfly/Damselfly/Butterfly (DDB) walks can be used to census Odonates or Butterflies that inhabit or visiting a wetland site. This procedure is modified from the Pollard Walk or 'transect recording' (Pollard 1977).

1) Transect of set length across a variety of wetland micro-habitat types
2) Easy to replicate and repeat in subsequent years, don't need water.
3) Be completed in about ½-1 hour, leave wetland with data in hand.
4) Census and qualitatively assign abundance measures to the DDB species occurring

Level III-Benthic Invertebrate Dipnet Samples (n=25)

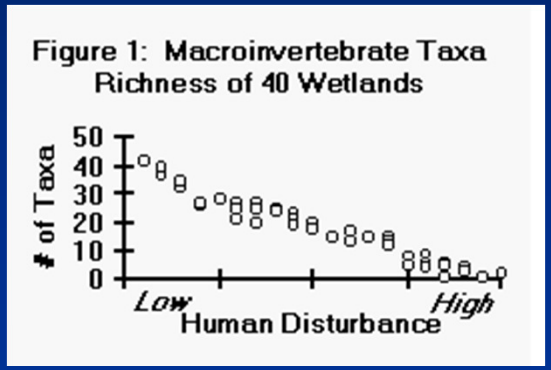
In the Field:
•Sampling performed as a semi-quantitative composite consisting of 10- ½ meter "jabs" collected with a 500-um D-frame net from apportioned habitats in the near shore emergent vegetation zone.
• Random field splits of organic materials

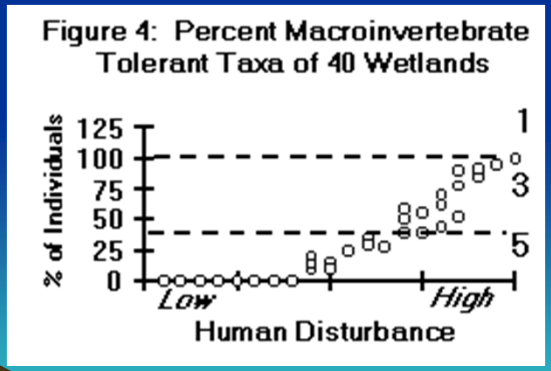
In the Lab
- 300 organism sub-sample
- Organisms identified to genus/species

Benthic Invertebrate Metric Analysis

- Macroinvertebrate species richness, abundance and composition
- Tolerance Indices (EPA taxa_wet)
- Use data to calculate a Wetland Multi-metric Index (MMI)

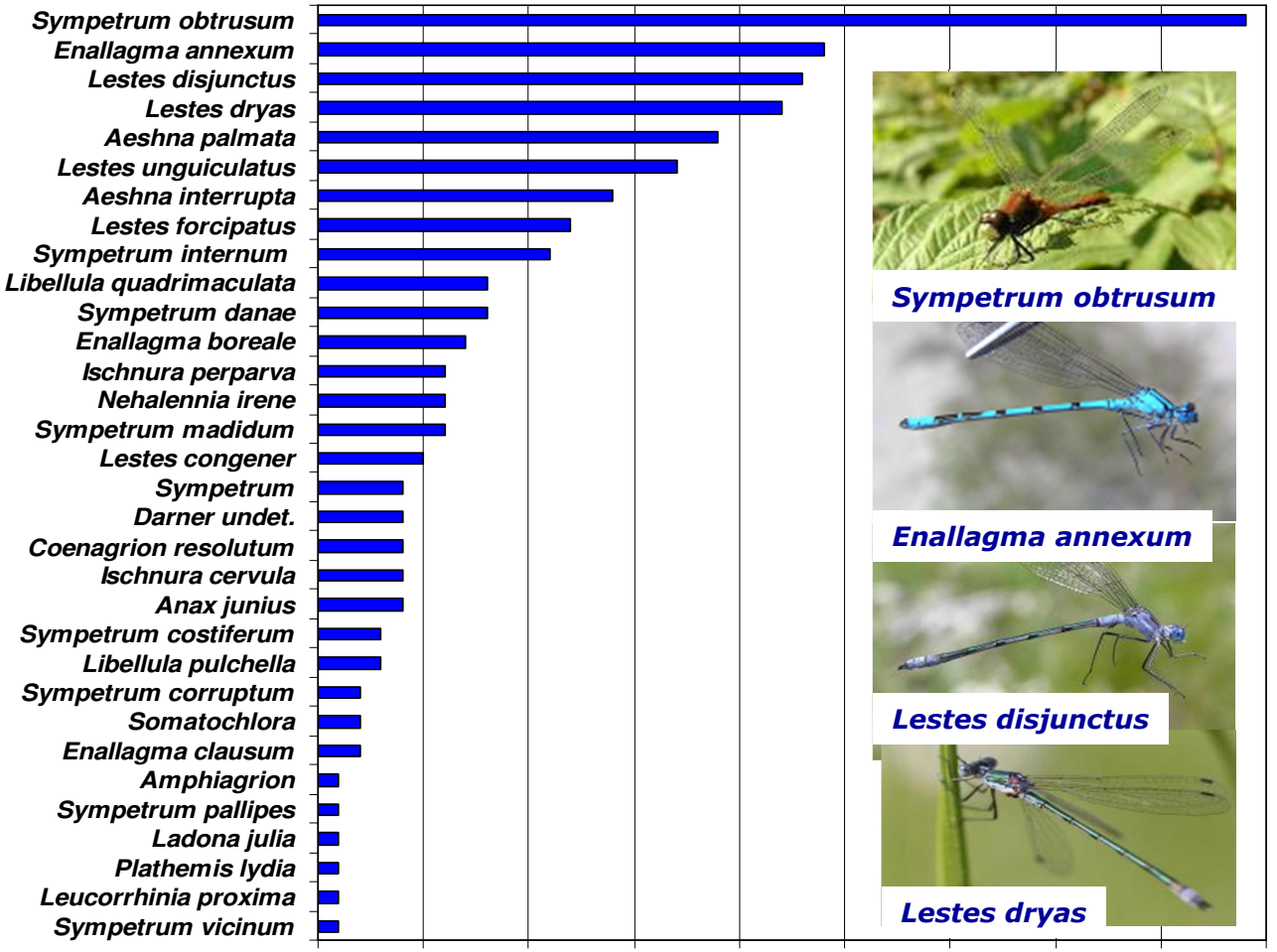
Community Parameter Measured	Metric	Response to Habitat Degradation
Taxa Richness	Total Taxa Richness	Decrease
	OET Richness*	Decrease
	# of Non-Insect Taxa	Decrease
	# Chironomid Taxa (Genera)	Decrease
	ETSD metric	Decrease
	Number of Odonata taxa	Decrease
Tolerance values	Hilsenhoff Biotic Index	Increase
	% Tolerant Taxa	Increase
	Sensitive Taxa Richness	Decrease
Community composition	% OET*	Decrease
	% Non-insect	Decrease
	% Molluscs (Snails+Clams)	Decrease





DDB Walk Species Results

We recorded 46 total species during the DDB walks, 33 Odonata and 13 Butterfly spp., no species of concern, and only 1 PSOC (Mountain Emerald). Four spp. of Odonata dominated sites.

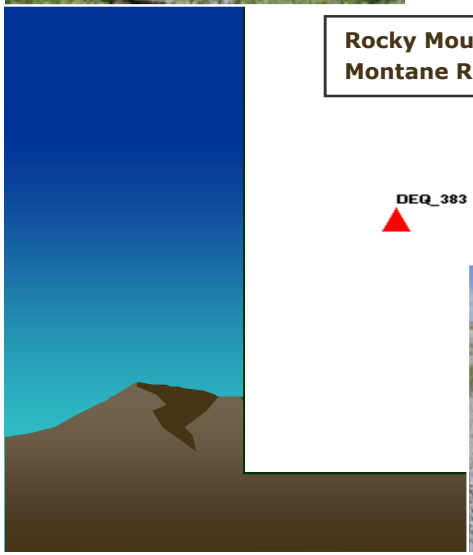


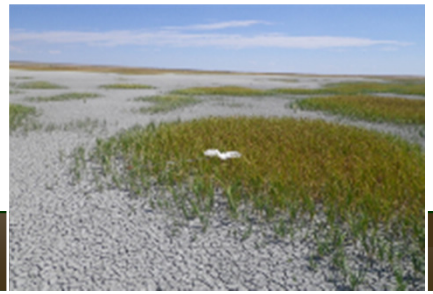
DDB Transect Results

Average total DDB species for 72 walks was 4.7 ± 0.3 SE; combined dragonflies and damselflies averaged 3.8 ± 0.2 SE per transect, while butterflies averaged 0.9 ± 0.1 SE. Seven wetlands (6 EM + 1 RMWM) recorded ≥10 total DDB spp.

Ecological System	Avg DDB species	n
Rocky Mountain Alpine-Montane Wet Meadow	6.0	15
Western Emergent Marsh	5.5	22
Western Emergent Marsh-Lacustrine Fringe	5.3	13
Northern Rocky Mountain Wooded Vernal Pool	4.0	3
Rocky Mountain Lower Montane-Foothill Riparian Wetlands	2.2	13
Rocky Mountain Subalpine-Montane Riparian	2.0	1
Great Plains Saline Depression Wetland	1.5	2
Great Plains Closed Depressional Wetland	0.0	3

DDB Transect Species Results



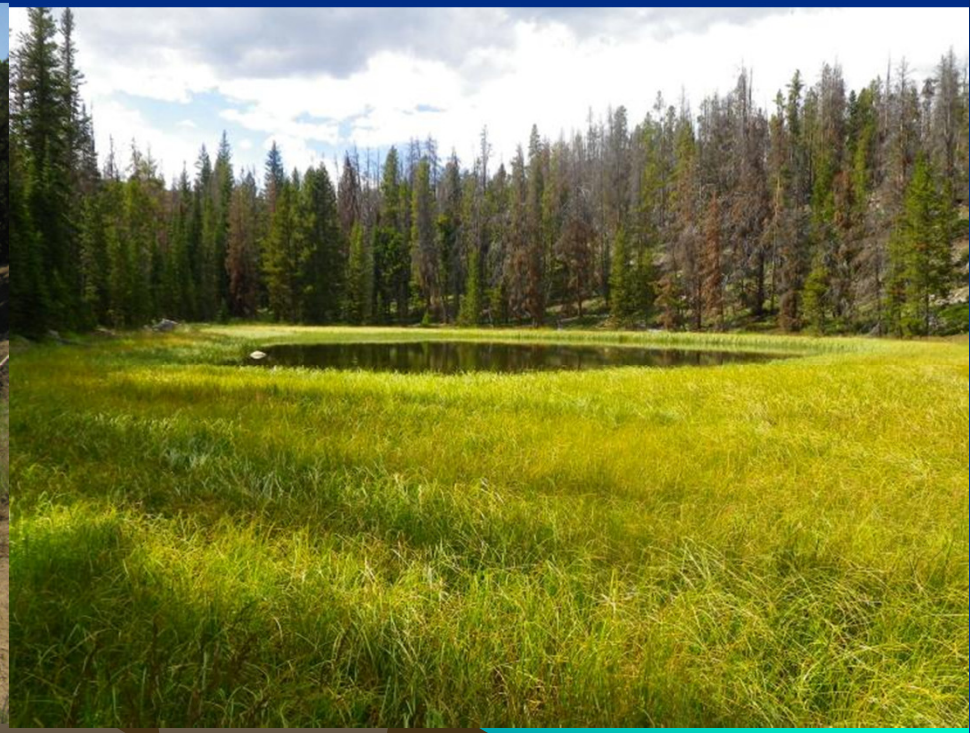


Wetland Ecological Conditon vs. DDB Species

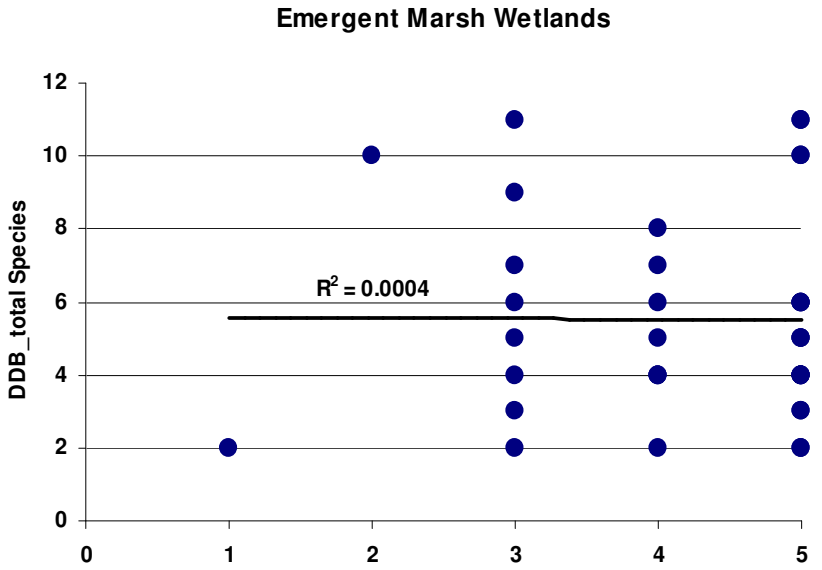
We need the predictive capability of knowing that the # or type of DDB species collected at a reference wetland of a particular ecological system type is significantly different than that recorded at a degraded one.

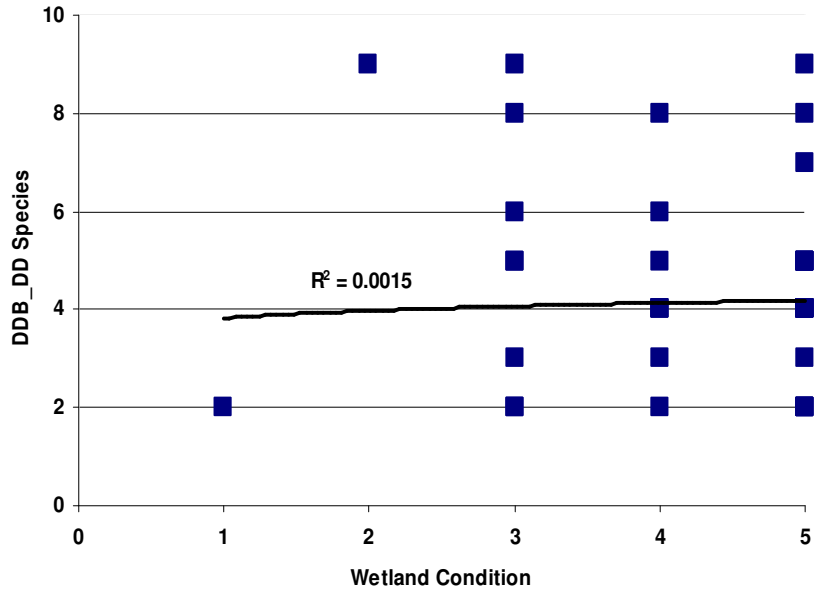
Wetland Condition Score= 60

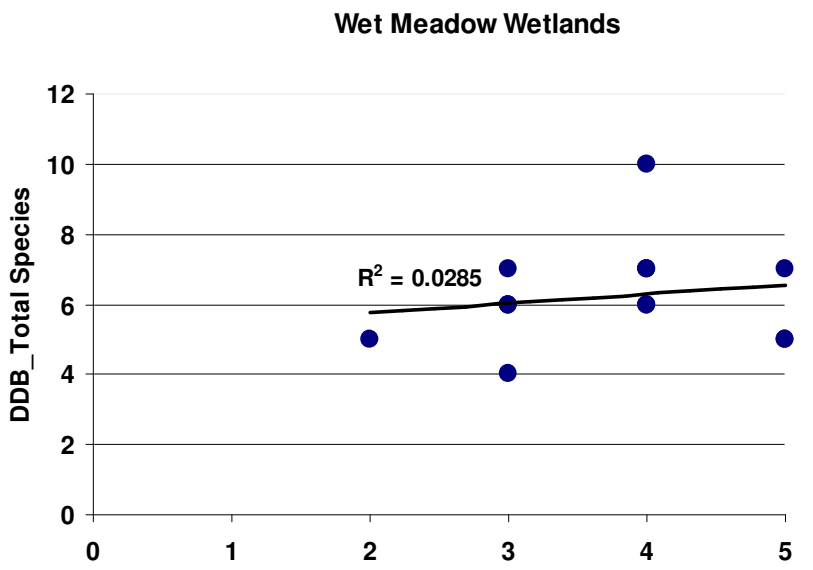
Wetland Condition Score= 95

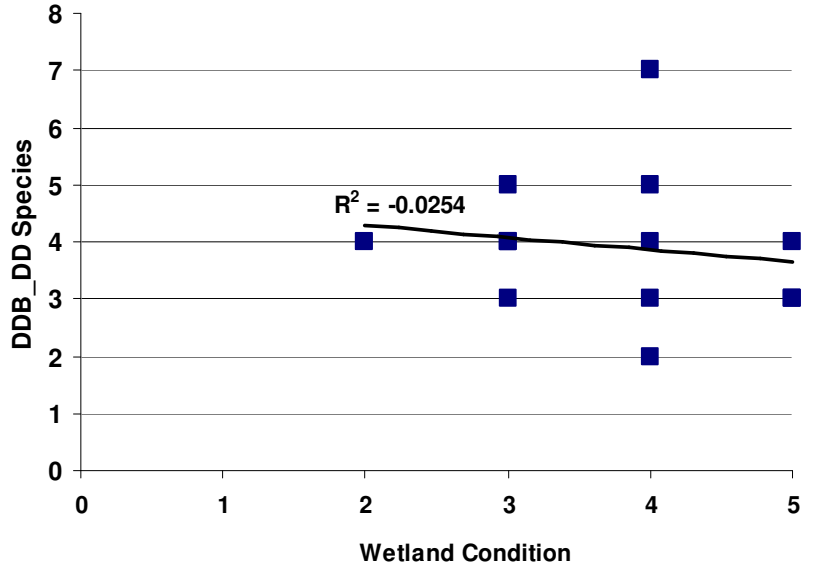


Wetland Ecological Conditon vs. DDB Species









Conclusions & Lessons Learned

- Significant patterns of adult Odonata and Butterfly species richness or indicator assemblages associated to wetland type or condition were not definitive during our first round of data analysis. Dominated by ubiquitous, tolerant species.

- RM Subalpine-Montane Fen was predicted to have the most diversity; in actuality RM Alpine-Montane Wet Meadow is surrogate, shown with the DDB walks, although we originally didn't predict this system as Odonata worthy.

- As with all bioassessment methods, proper classification of reference sites, sampling natural variability and the full disturbance gradient of site condition is essential to defensible assessment.

Acknowledgements

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