

Status and Management of Amphibians on Montana Rangelands

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MONTANA
**Natural Heritage
Program**
<http://mtnhp.org>

My apologies for not being
there. Thanks Linda!



Max Stephan Maxell

Amphibians & Reptiles that use Lentic Habitats in Montana Rangelands



Tiger Salamander



Plains Spadefoot



Great Plains Toad



Woodhouse's Toad



Boreal Chorus Frog



Northern Leopard Frog
**SOC only in western MT*



Snapping Turtle



Painted Turtle



Terrestrial Gartersnake



Plains Gartersnake



Common Gartersnake

11 species in 8 different Families

4 Species of Concern

Complex Life Histories = Complex Use of Habitat

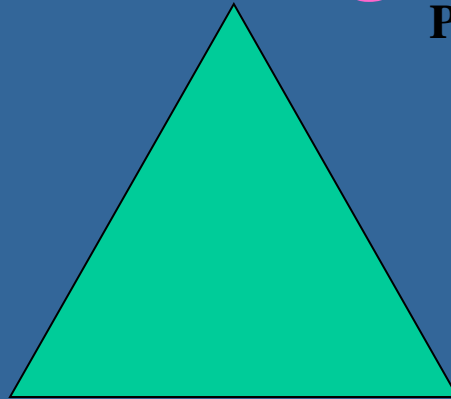
(Eggs, Larvae, Adult)

(Breeding, Foraging, Overwintering)

- Managers need to consider each seasonal habitat and sometimes lengthy migration corridors (several kilometers for some amphibians and tens of kilometers for some reptiles)

Breeding

(Reservoirs, Stock Ponds, Wetlands
Pools on Prairie Streams)



Wintering

Foraging

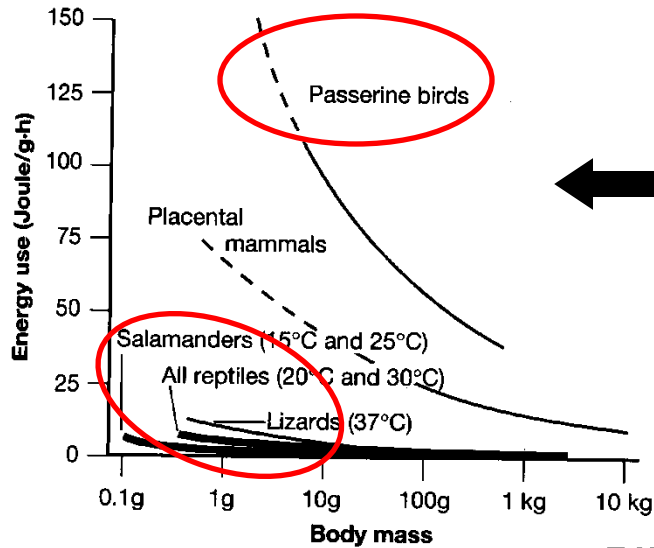
1. Under water
2. Under frost line in burrows
3. Survive temporary freezing by loading tissues with glycogen

(Reservoirs, Stock Ponds, Wetlands
Prairie Streams, Terrestrial Habitats
Kilometers from Water)

Ectothermy Means

1. No wasted energy on maintenance of body temperature (Especially at small body sizes)

2. Much more efficient than endotherms at converting food to biomass



3. High densities make them important in transferring biomass between terrestrial and aquatic food webs



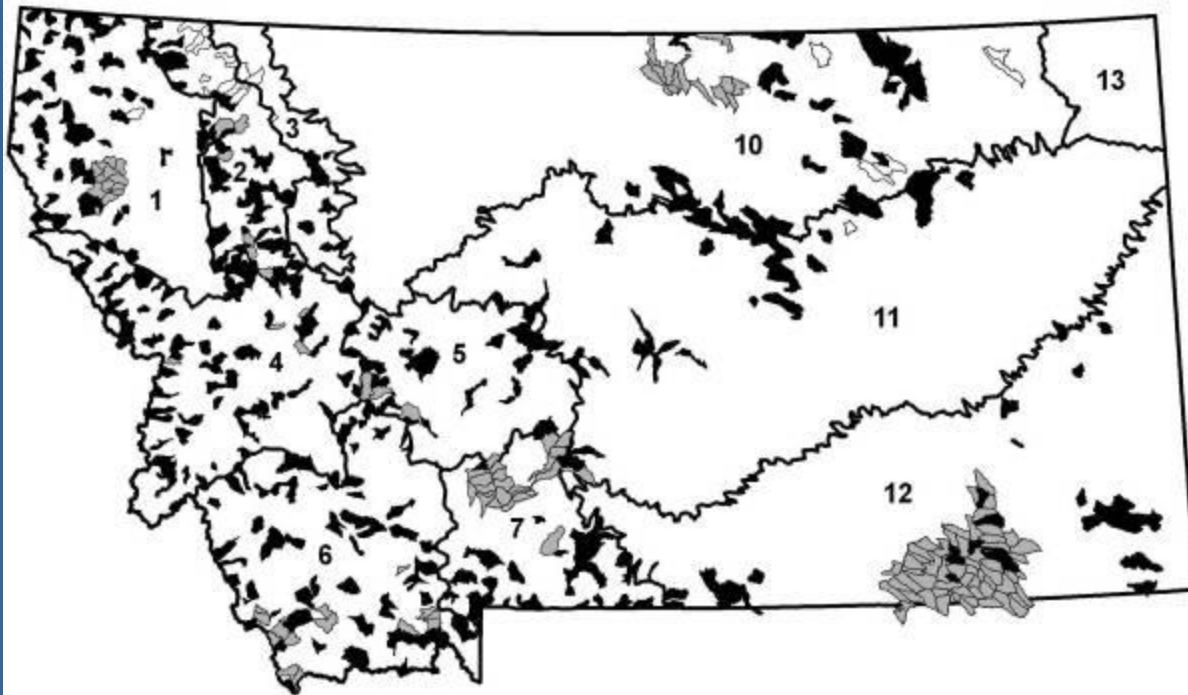
Table 1-1 Efficiency of biomass conversion by ectotherms and endotherms.*

Ectotherms		Endotherms	
Species	Efficiency	Species	Efficiency
Red-backed salamander <i>Plethodon cinereus</i>	48	Kangaroo rat <i>Dipodomys merriami</i>	0.8
Mountain salamander <i>Desmognathus ochrophaeus</i>	76-98	Field mouse <i>Peromyscus polionotus</i>	1.8
Panamanian anole <i>Anolis limifrons</i>	23-28	Meadow vole <i>Microtus pennsylvanicus</i>	3.0
Side-blotched lizard <i>Uta stansburiana</i>	18-25	Red squirrel <i>Tamiasciurus hudsonicus</i>	1.3
Hognose snake <i>Heterodon contortrix</i>	81	Least weasel <i>Mustela rixosa</i>	2.3
Python <i>Python curtus</i>	6-33	Savanna sparrow <i>Passericulus sandwichensis</i>	1.1
Adder <i>Vipera berus</i>	49	Marsh wren <i>Telmatodytes palustris</i>	0.5
Average of 12 species	50	Average of 19 species	1.4

*These are net conversion efficiencies calculated as (energy converted/energy assimilated) × 100.

Source: Pough 1980.

Statewide Status Assessment



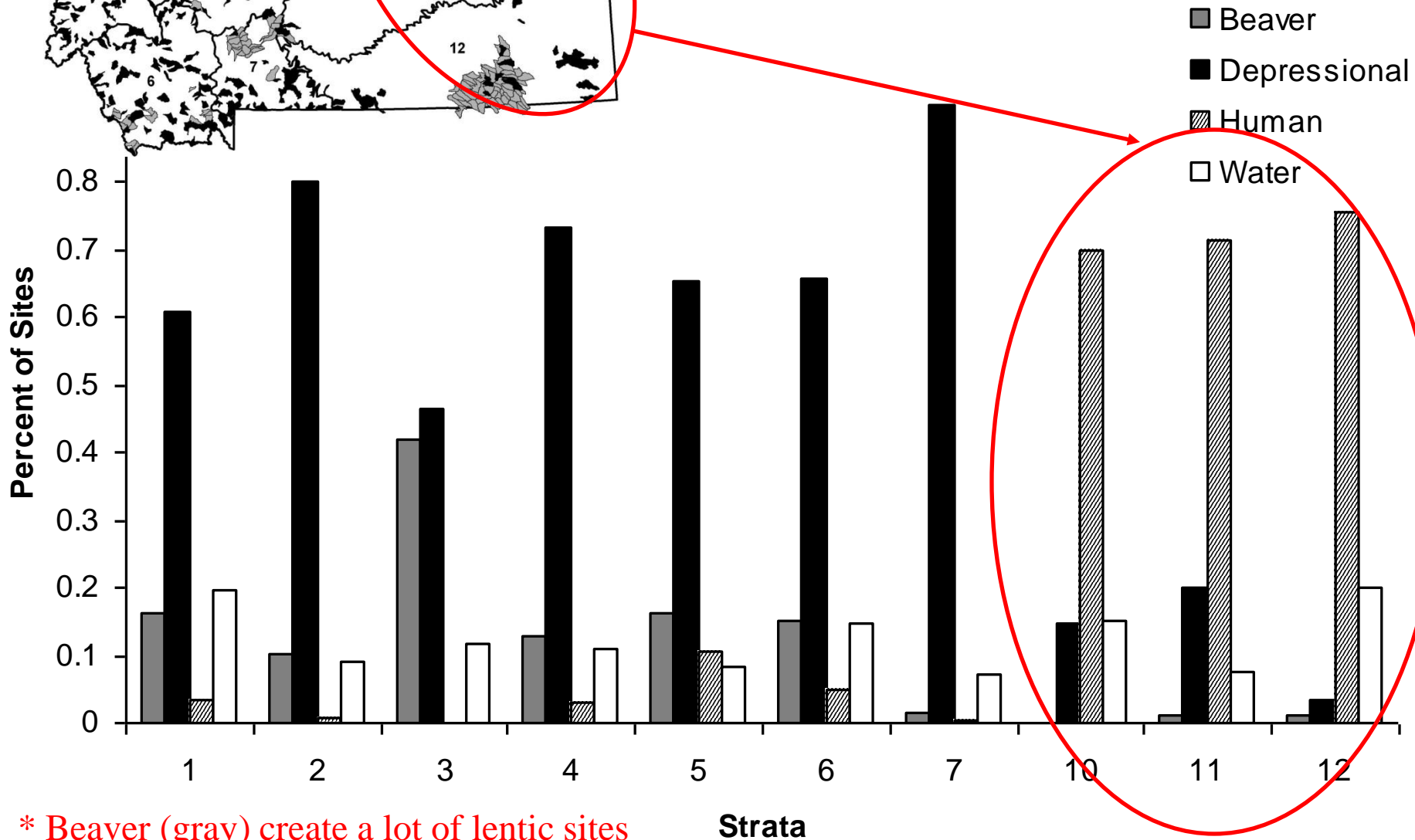
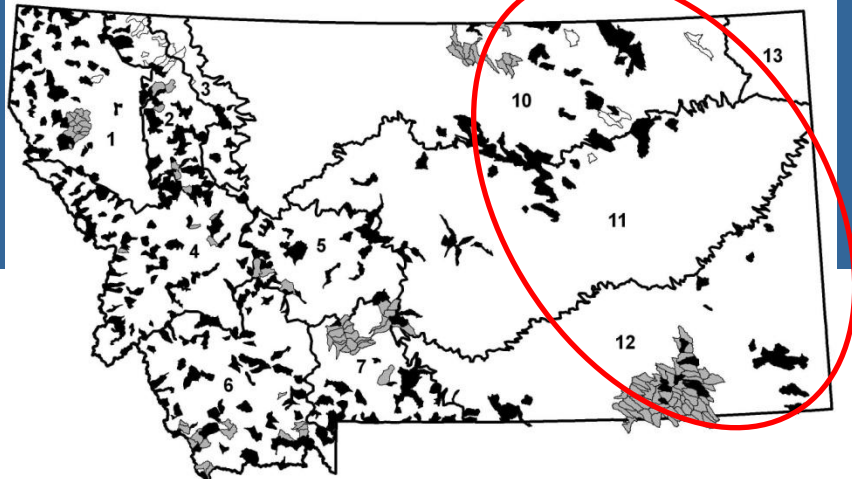
- 11 geographic strata
- 429 random watersheds
- 6,741 lentic sites
- ~129 non-random watersheds
- ~3,000 non-random sites



Goals

- Distribution
- Naïve Watershed Occupancy Rates
- Naïve Site Occupancy Rates
- Identify Site Origins
- Assess threats to habitats and species
- Assess distribution of Chytrid Fungus
- Make information easily available to resource managers

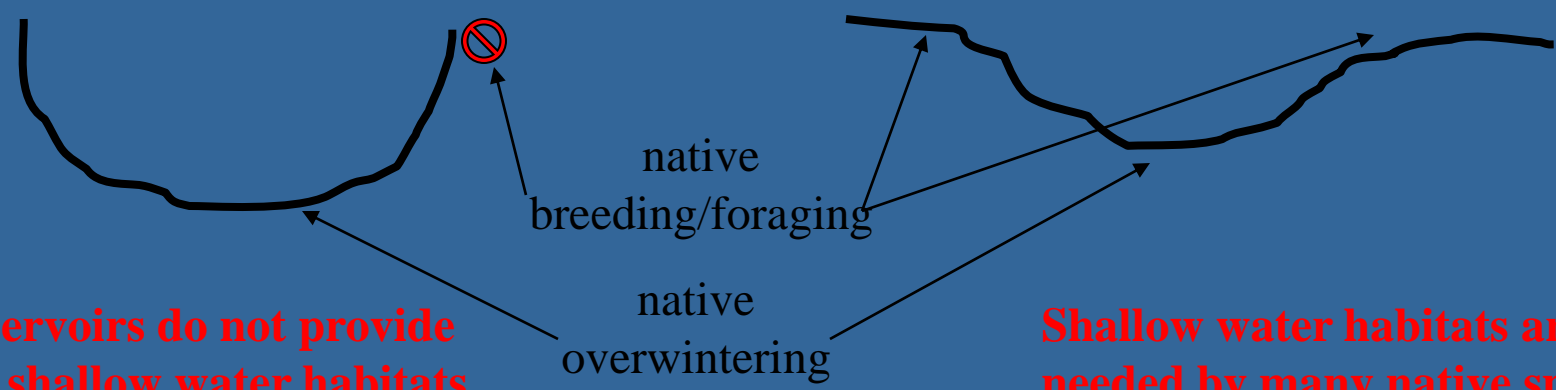
Site Origins



* Beaver (gray) create a lot of lentic sites

Dominated by Reservoirs

Importance of Lentic Site Structure to Amphibian Habitat



Many reservoirs do not provide adequate shallow water habitats

Shallow water habitats are needed by many native species

Importance of Beaver in Creating Lentic Wetland Habitats and Riparian Habitats with Structural Diversity That Support a Variety of Biological Diversity

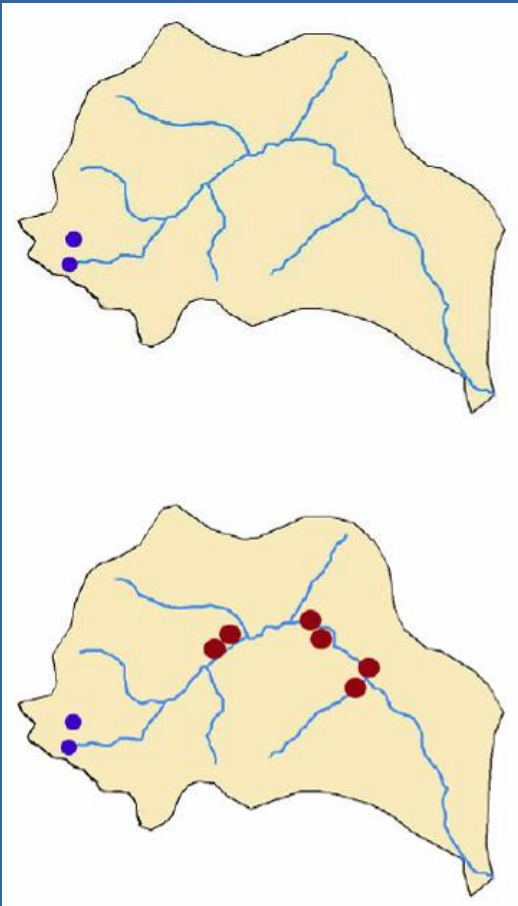


Beaver and Population Structure of Columbia Spotted Frogs

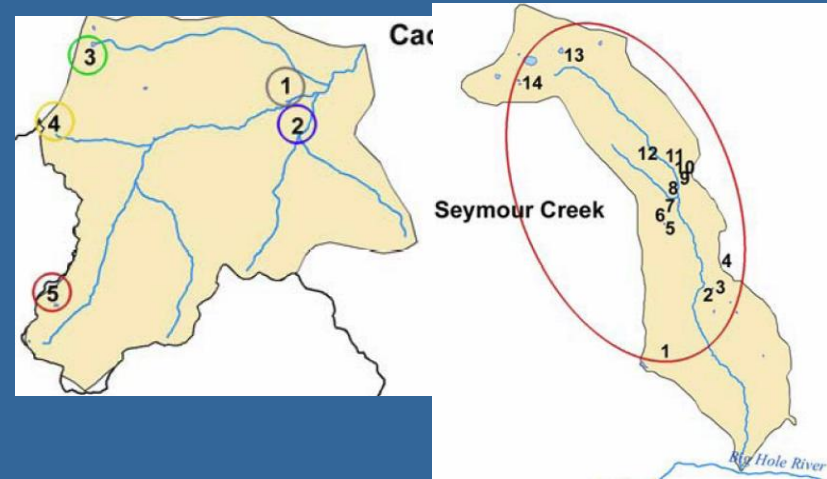
Amish, S.J. 2006. Ecosystem engineering: beaver and the population structure of Columbia Spotted Frogs in western Montana. M.S. Thesis. University of Montana, Missoula, MT. 82 pp. + appendices

- Beaver occupied watersheds had four times as many lentic and breeding sites as non-beaver watersheds
- Frog breeding sites were more evenly distributed across the elevation gradient in beaver occupied watersheds
- Beaver occupied watersheds showed higher levels of genetic connectivity (i.e. less genetic divergence between breeding sites and overall higher levels of genetic diversity)

Lentic Site Differences



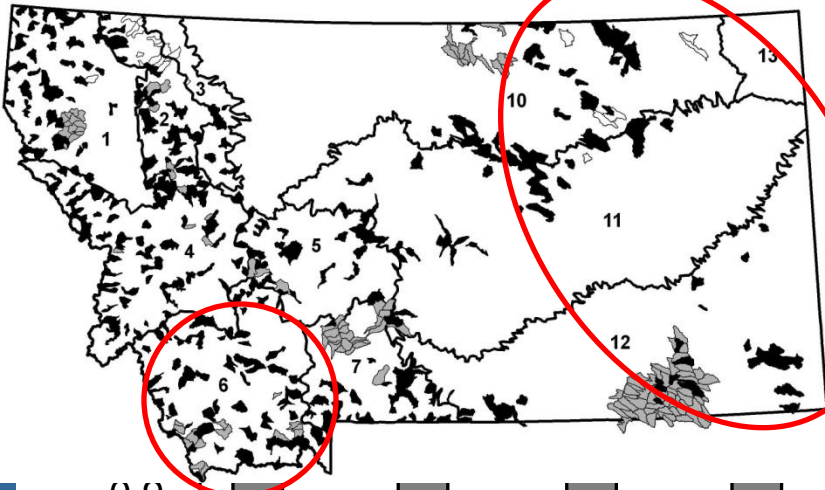
Differences in Population Structure



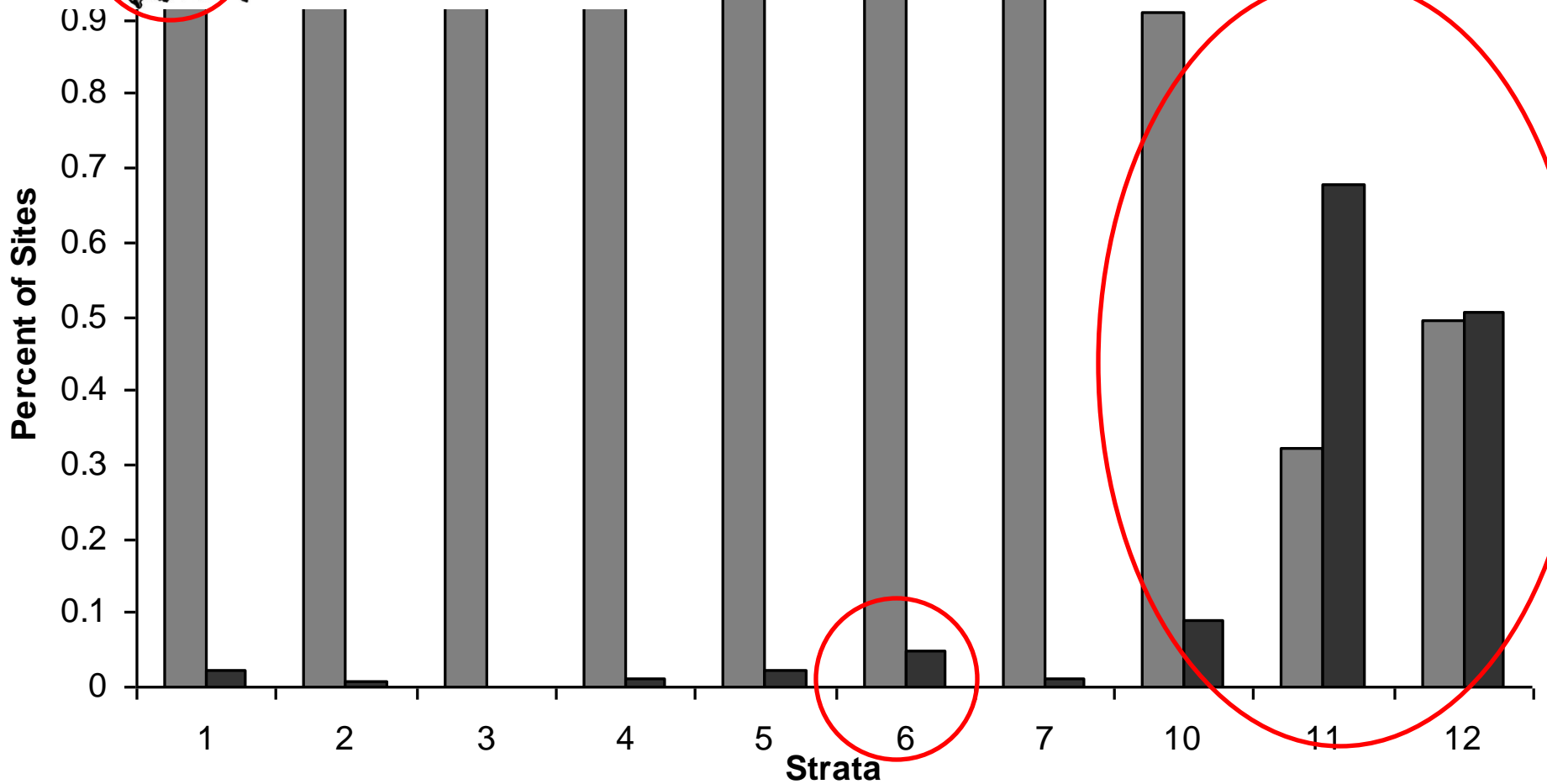
Beaver also valuable in creating watering points for livestock in xeric rangelands



Grazing Impacts



■ No or Light Impacts
■ Heavy Structural or Water Quality Impacts



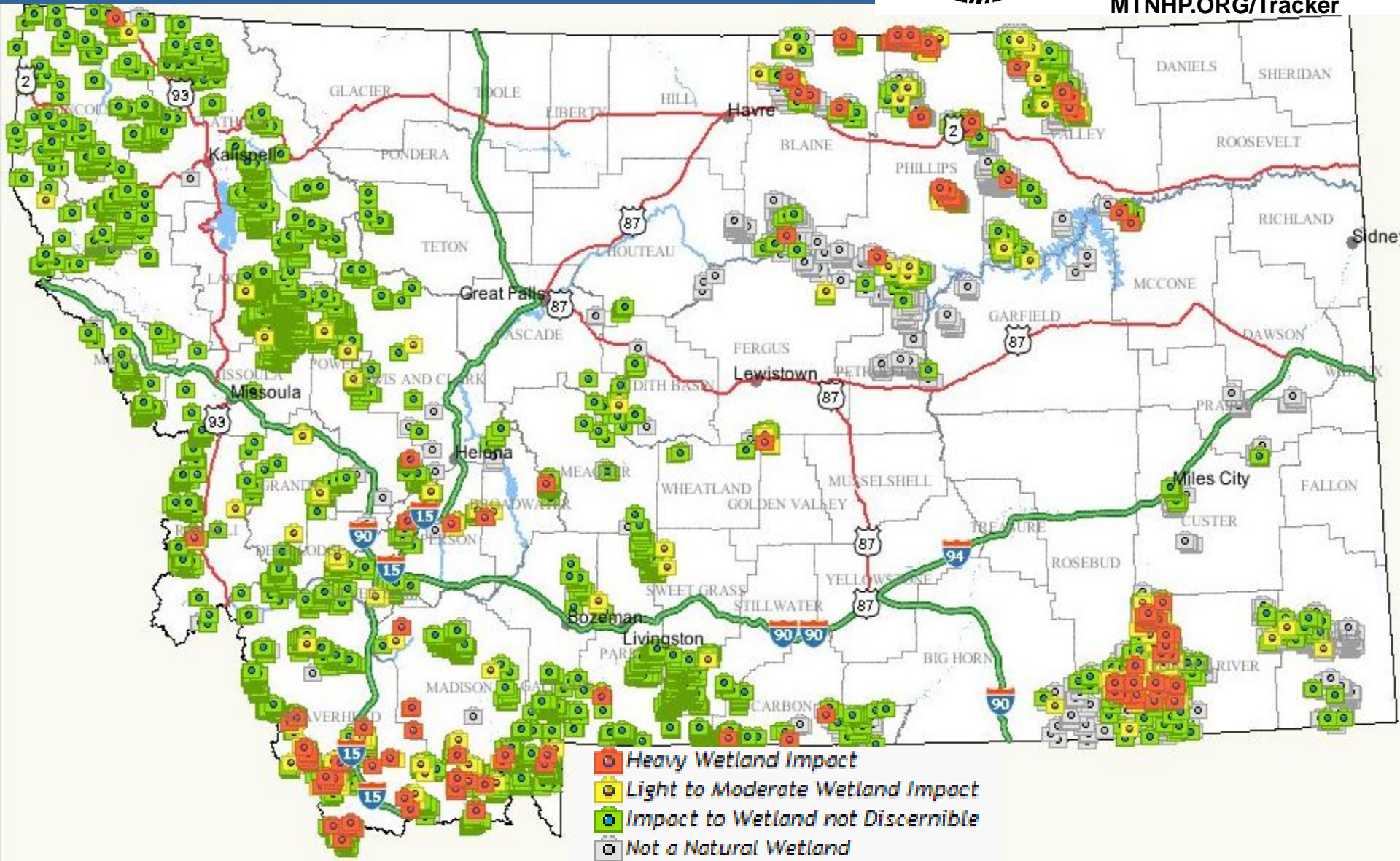
Examples of Heavy Structural Grazing Impacts at time of survey (heavy disturbance to structure of emergent vegetation)

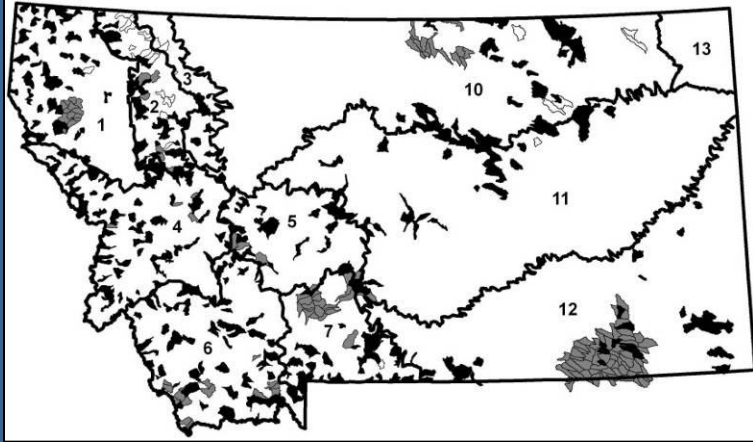


Single Visit Structural Impact to Wetland Viewable on Tracker



Montana Natural Heritage Program
TRACKER
MTNHP.ORG/Tracker





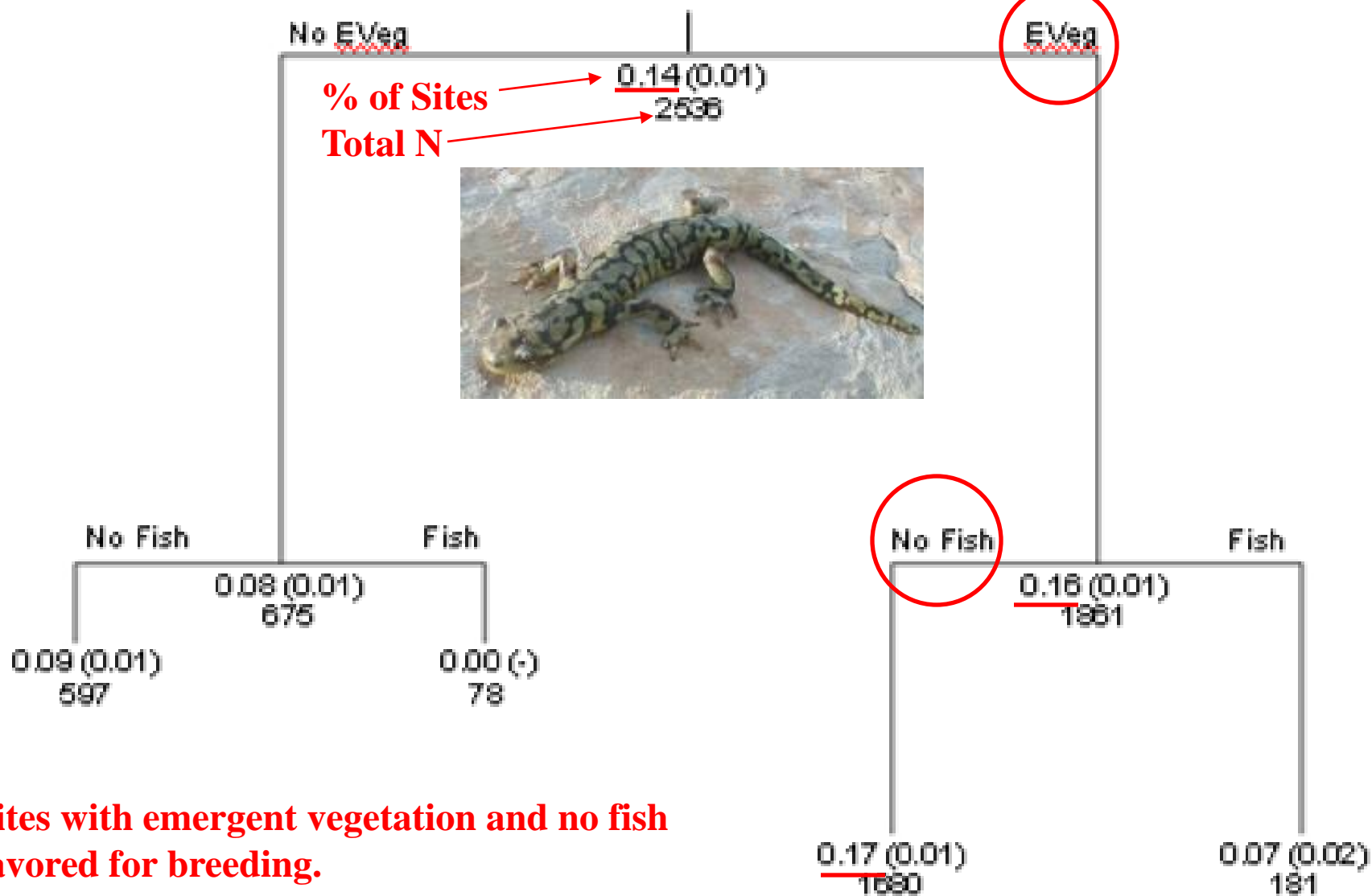
Tiger Salamander (*Ambystoma tigrinum*) Occupancy Rates

*** Some mass mortalities of larvae detected across eastern MT - Presumed to be a result of Rana Virus**

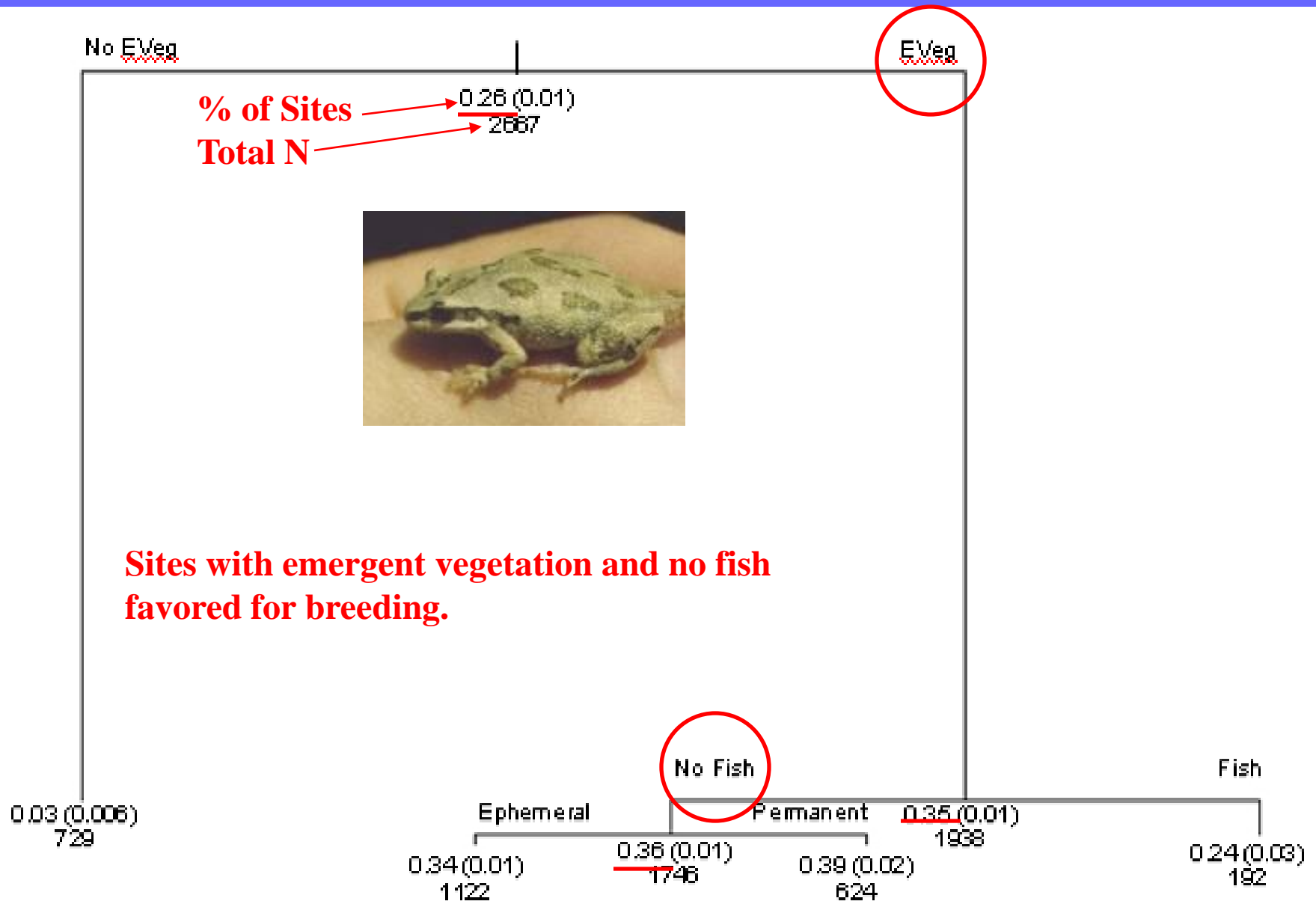


Strata	Total Number Watersheds / Sites	Percent Watershed Occupancy (95% CI ^a)	Percent Site Occupancy (95% CI ^b)
1	2 / 17	0 (-)	0 (-)
6	14 / 222	50 (13–24)	20 (14–25)
7	27 / 749	30 (14–45)	3 (2–4)
10	37 / 922	73 (60–86)	11 (9–13)
11	26 / 139	77 (62–92)	40 (31–48)
12	34 / 487	79 (67–91)	28 (24–32)
Overall	140 / 2536	64 (56–71)	14 (13–15)

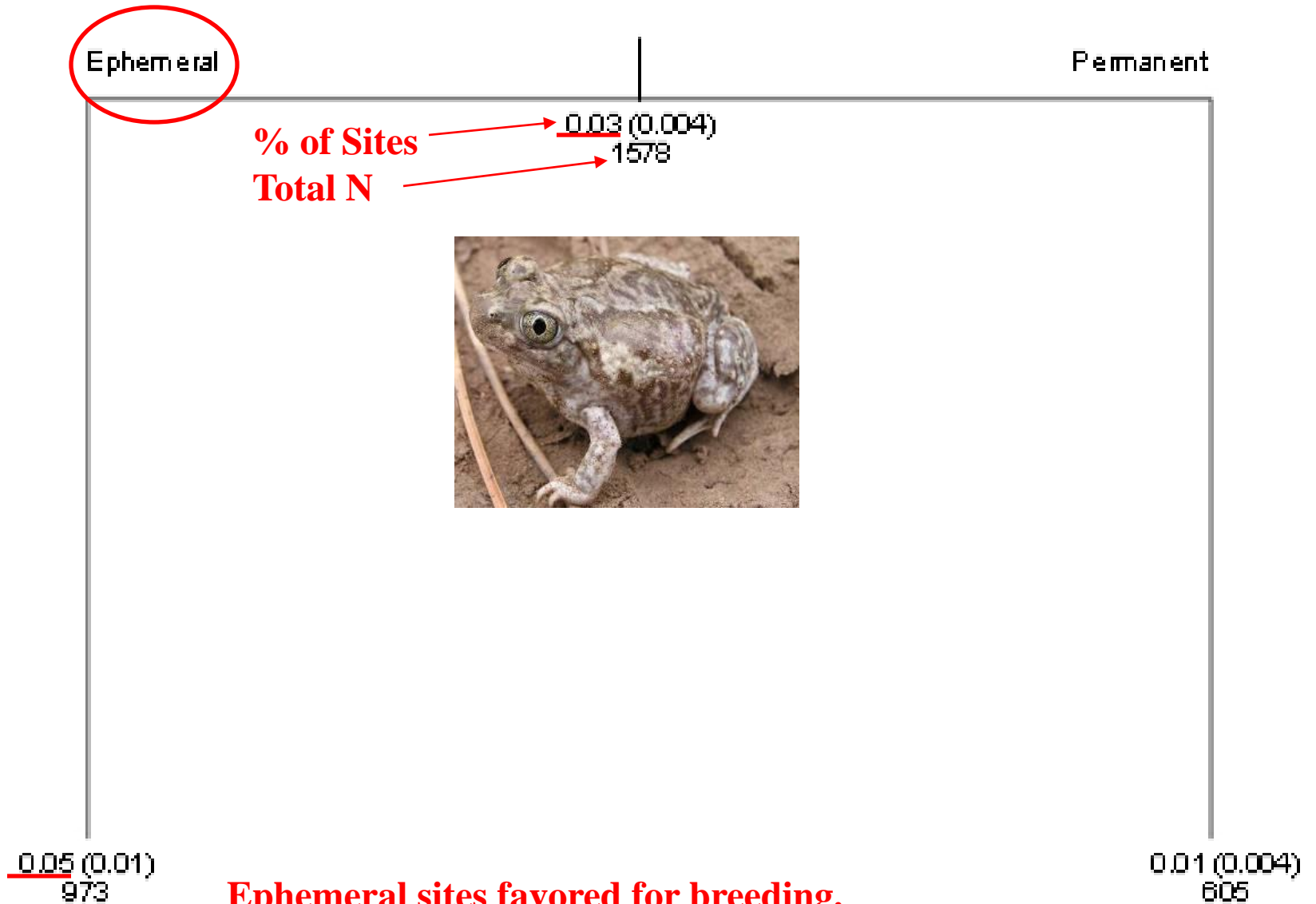
Tiger Salamander (*Ambystoma tigrinum*) Classification and Regression Tree (CART) Model



Boreal Chorus Frog (*Pseudacris maculata*) CART Model



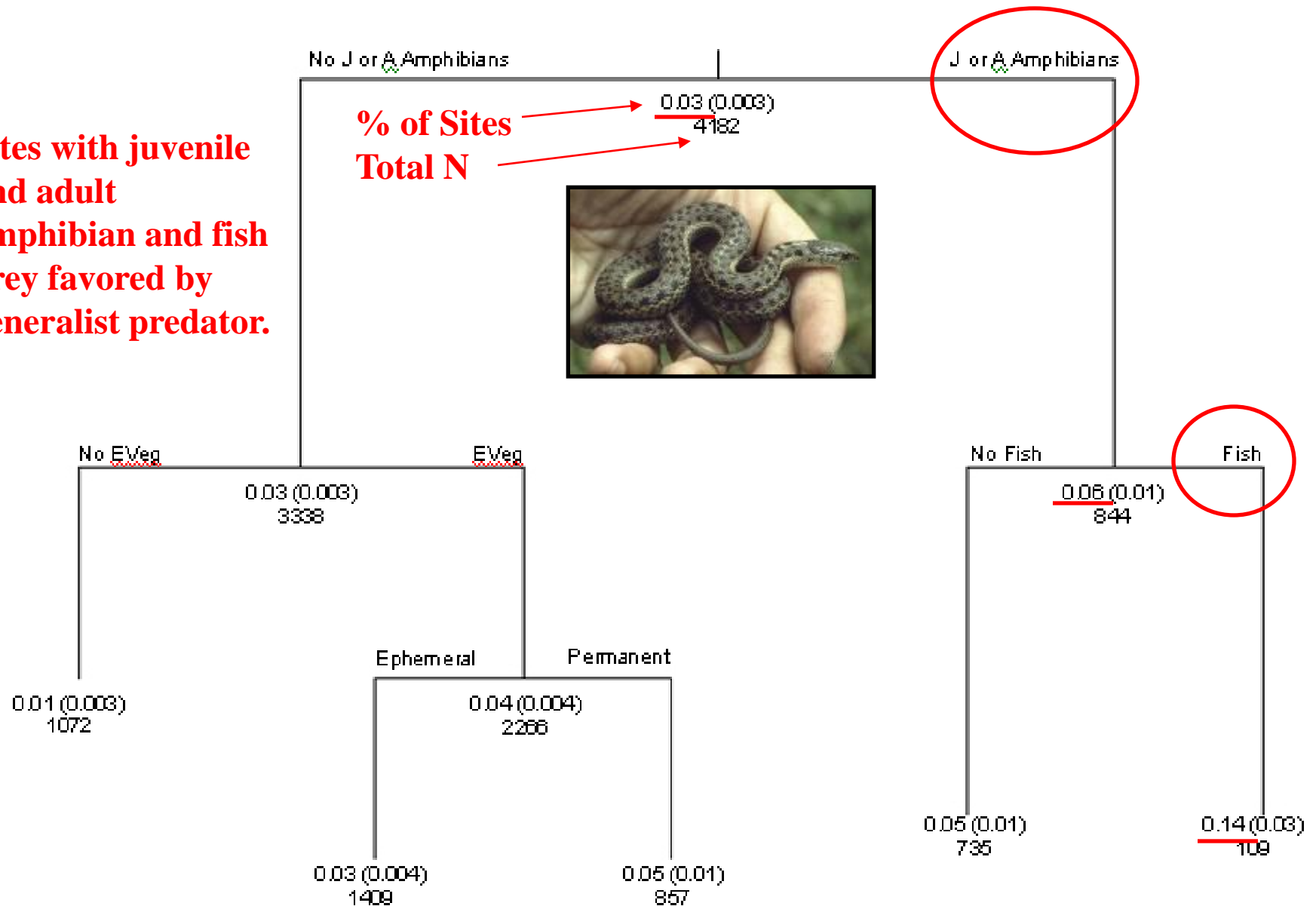
Plains Spadefoot (*Spea bomifrons*) CART Model



**Ephemeral sites favored for breeding.
Important to protect wetlands of all hydroperiods**

Terrestrial Gartersnake (*Thamnophis elegans*) CART Model

Sites with juvenile and adult amphibian and fish prey favored by generalist predator.



No J or A Amphibians

J or A Amphibians

% of Sites → 0.03 (0.003)

Total N → 3993

Common Gartersnake (*Thamnophis sirtalis*)



No EVeg

EVeg

Sites with juvenile and adult amphibians, but not fish favored by specialist predator.

No L Amphibians

L Amphibians

0.02 (0.003)
3204

0.06 (0.01)
789

No L Amphibians

L Amphibians

No Fish

Fish

No EVeg

EVeg

0.01 (0.002)
1057

0.03 (0.004)
2147

0.12 (0.03)
110

0.05 (0.01)
679

0.02 (0.004)
1371

0.04 (0.01)
776

0.02 (0.01)
254

0.05 (0.01)
522

0.14 (0.04)
94

0.00 (-)
16

0.00 (-)
37

0.05 (0.01)
642

0.00 (-)
10

0.15 (0.04)
84

Response Summary

+ = Positive Response

- = Negative Response ● = No clear response

Species	Fish	Eveg	Hydroperiod
Long-toed Salamander	-	+*	Perm/Ephem
Barred Tiger Salamander	-	+*	Perm/Ephem
Plains Spadefoot	●	●	Ephemeral
Western Toad	●	+	Perm/Ephem
Great Plains Toad	-	+	Ephemeral
Woodhouse's Toad	-	+	Perm/Ephem
Boreal Chorus Frog	-	+	Perm/Ephem
Pacific Treefrog	-	+	Perm/Ephem
Northern Leopard Frog	+	+	Permanent
Columbia Spotted Frog	●	+	Permanent
Painted Turtle	●	+	Permanent
Terrestrial Gartersnake	+	+	Perm/Ephem
Plains Gartersnake	+	+	Permanent
Common Gartersnake	-	+	Perm/Ephem

Management Recommendations

- **Consider site characteristics and landscape context to maintain connectivity at local patch and landscape scales.**
- **Consider creating new lentic sites on the landscape either directly or through the reintroduction and protection of beaver**
- **In general don't stock fish in areas they aren't native**
- **Emergent vegetation is preferred by most species and can be used to mitigate impacts of fish**
- **Portions of large numbers of natural and artificial lentic sites could be rotationally fenced to allow emergent veg to thrive – benefits to a large number of species**
- **When creating lentic sites consider full spectrum of hydroperiods species use**

Links to Information Resources on Montana's Amphibians and Reptiles



- Powerpoint overview of Montana's amphibian and reptile species, including identification, habitat use, site occupancy rates, and Maxent and CART model outputs:
[http://mtnhp.org/animal/presentations/060709 MT Herps ID Status files/frame.htm](http://mtnhp.org/animal/presentations/060709_MT_Herps_ID_Status_files/frame.htm)
- MT Amphibian and Reptile Status Assessment, Literature Review, and Conservation Plan: [http://mtnhp.org/reports/Amphibian Reptile Conservation Plan.pdf](http://mtnhp.org/reports/Amphibian_Reptile_Conservation_Plan.pdf)
- Online Montana Field Guide
<http://fieldguide.mt.gov/>
- Field Guide to Amphibians and Reptiles of Montana
http://mountain-press.com/item_detail.php?item_key=498

