Developing a Wetland Monitoring and Assessment Program for Montana

Randy Apfelbeck
Water Quality Specialist
Montana Department of Environmental Quality

Overview

- Program Goals
- Study Areas
- (Level 3) Developing biological assessment tools
- (Level 2) Rapid Wetland Assessments
- (Level 1) Landscape Assessments
- Watershed assessments
- Long-term Implementation Strategy

Goals

- Coordinate with state, tribal, and federal agencies, and nonprofit groups to develop wetland assessment procedures that have wide spread application in Montana.
- To develop a wetland assessment program that provides valuable information about wetland loss and condition for watershed planning purposes
- To determine statewide status and trends.
- To conduct comprehensive watershed assessments that integrate the assessment of wetlands, streams and lakes.

Strategies for Developing Assessment Procedures

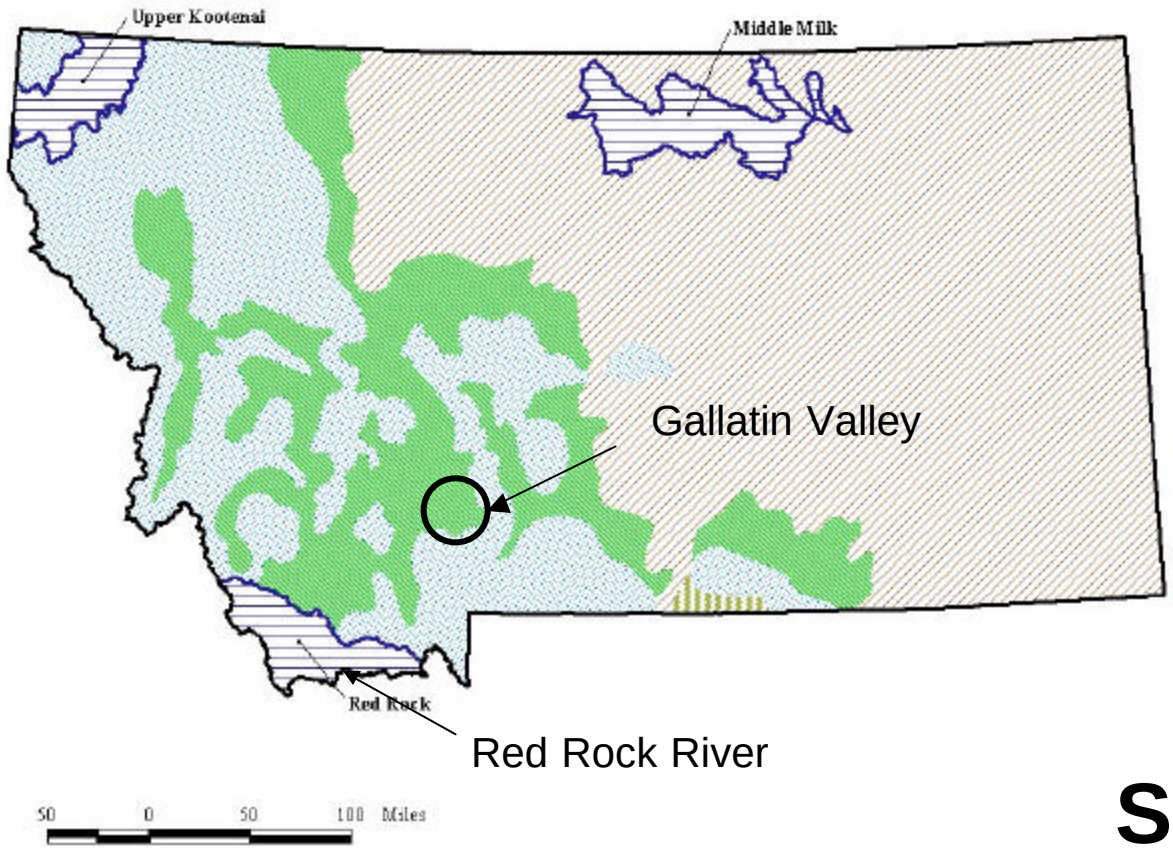
- Develop Partnerships
  - Universities
  - Natural Heritage Program
  - Tribal, State and Federal Agencies
  - Local Water Quality Districts and Watershed Groups

Figure 1. Montana Ecoregions and Pilot Watersheds

(4th Level HUCs)

Upper Kootenai

Middle Milk River

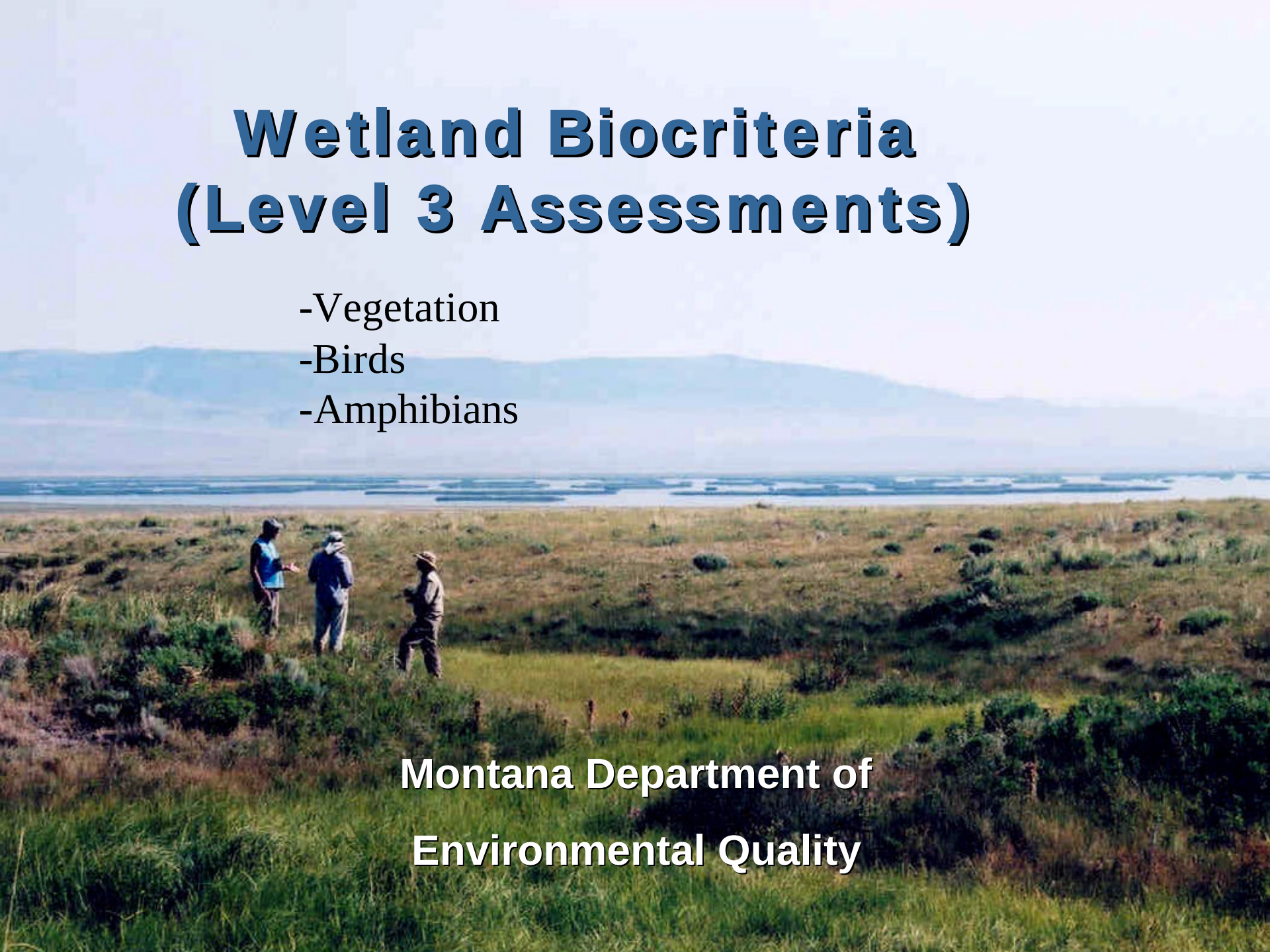


Map created by M. Jones, November 19, 2001

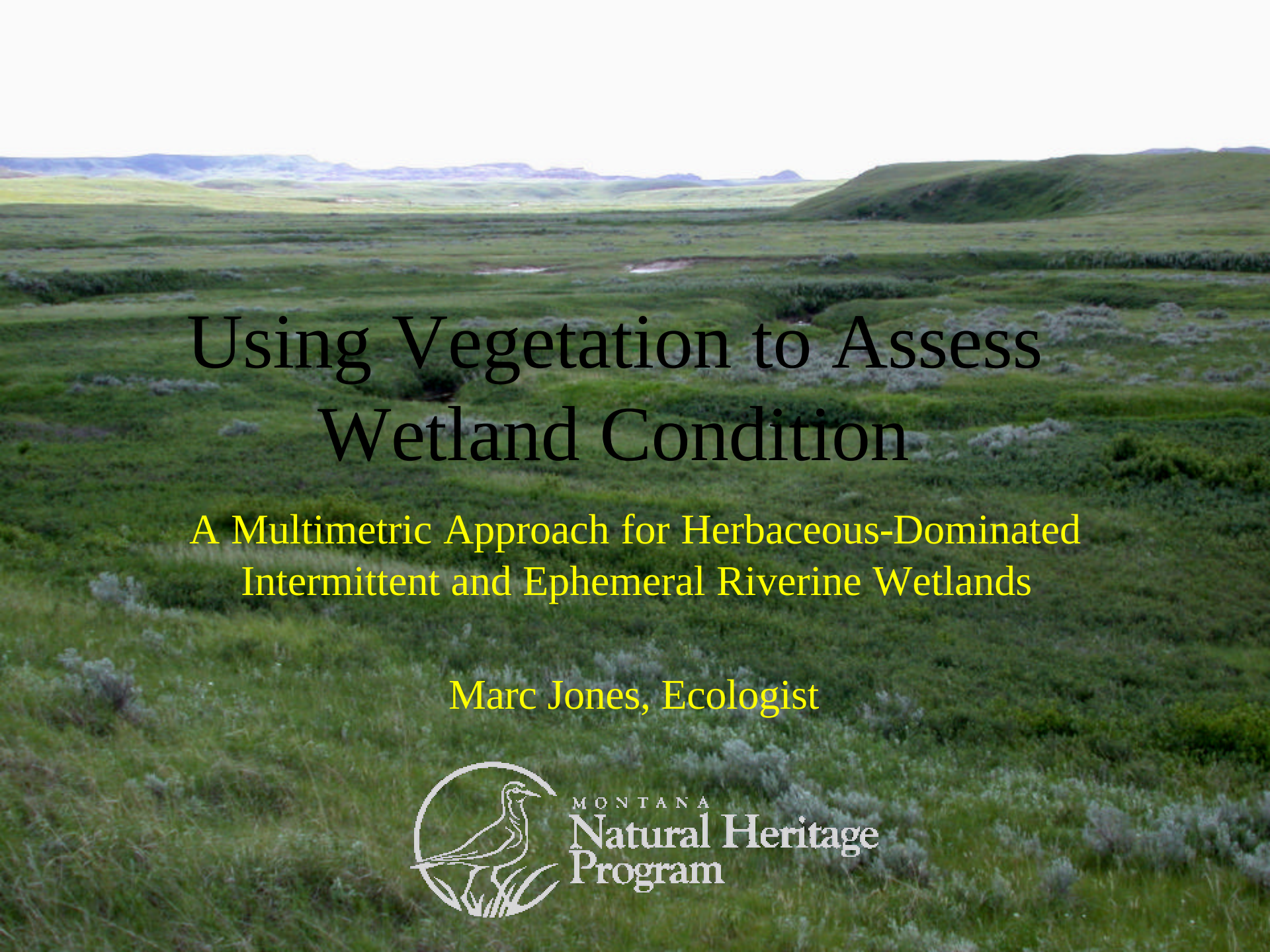
Study Areas

Wetland Biocriteria (Level 3 Assessments)

-Vegetation
-Birds
-Amphibians



Montana Department of Environmental Quality

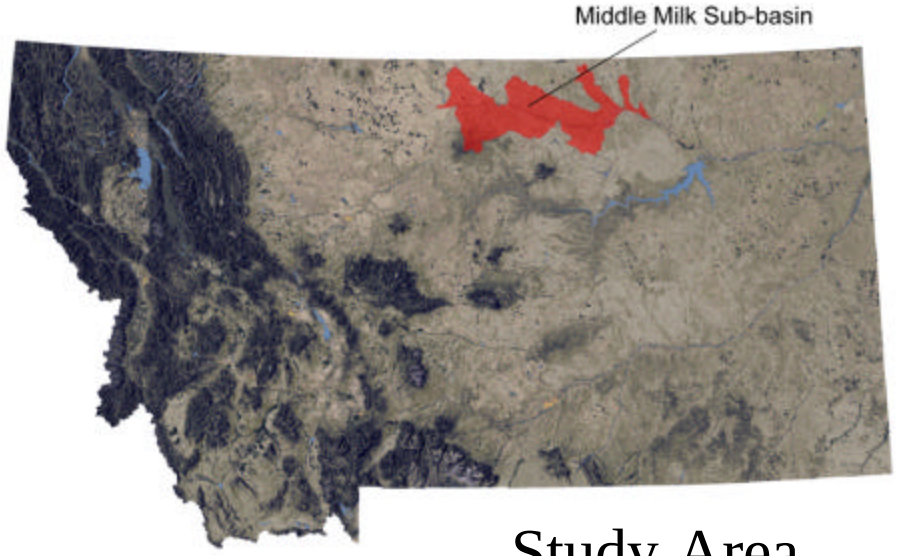


Using Vegetation to Assess Wetland Condition

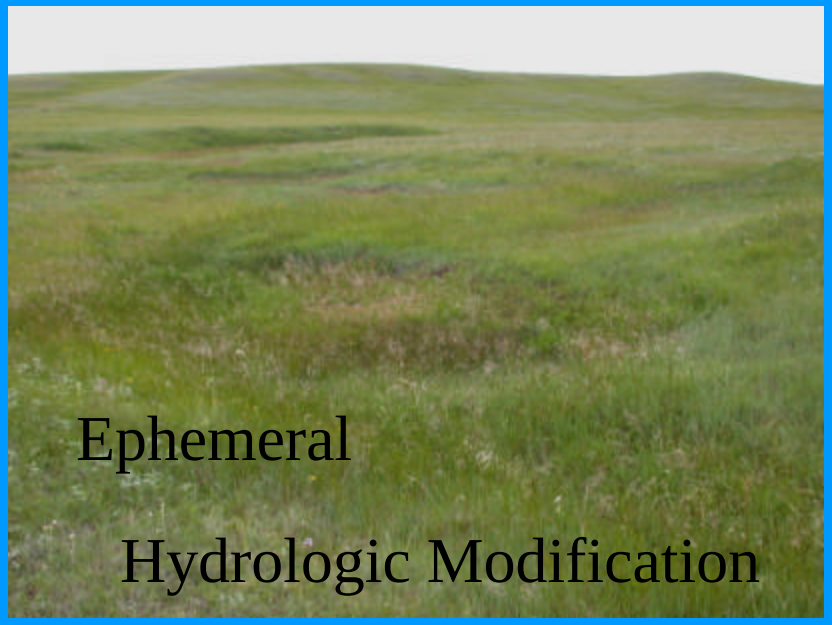
A Multimetric Approach for Herbaceous-Dominated Intermittent and Ephemeral Riverine Wetlands

Marc Jones, Ecologist

MONTANA
Natural Heritage
Program


Middle Milk Sub-basin

Study Area


Ephemeral
Hydrologic Modification

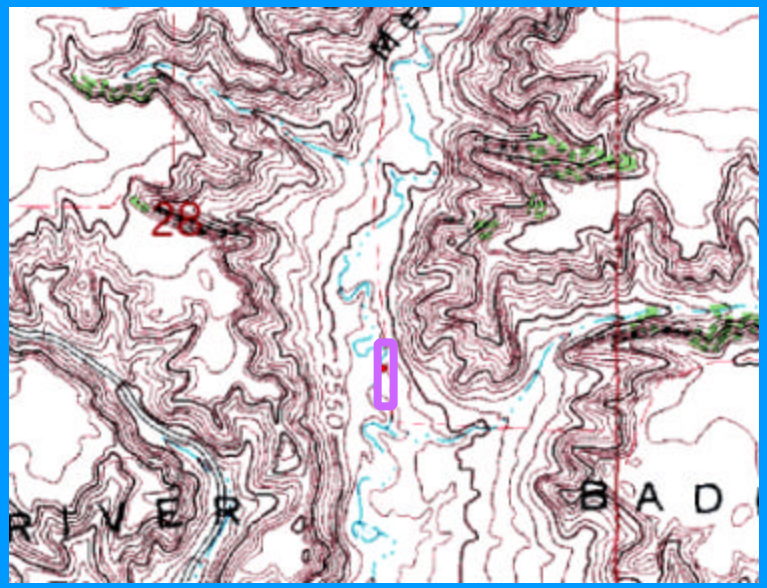

Grazing Impacts


Intermittent

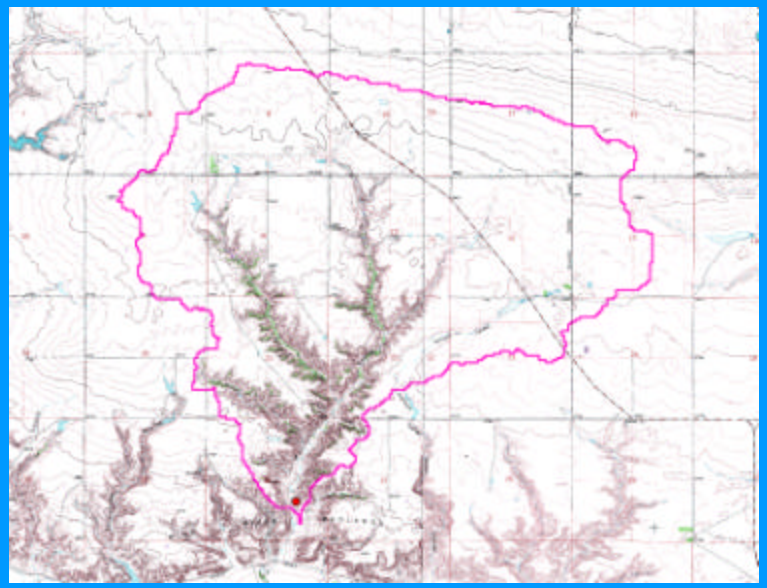
Measuring Human Disturbance

Human disturbance was measured at two spatial scales:

Local (within sample reach)



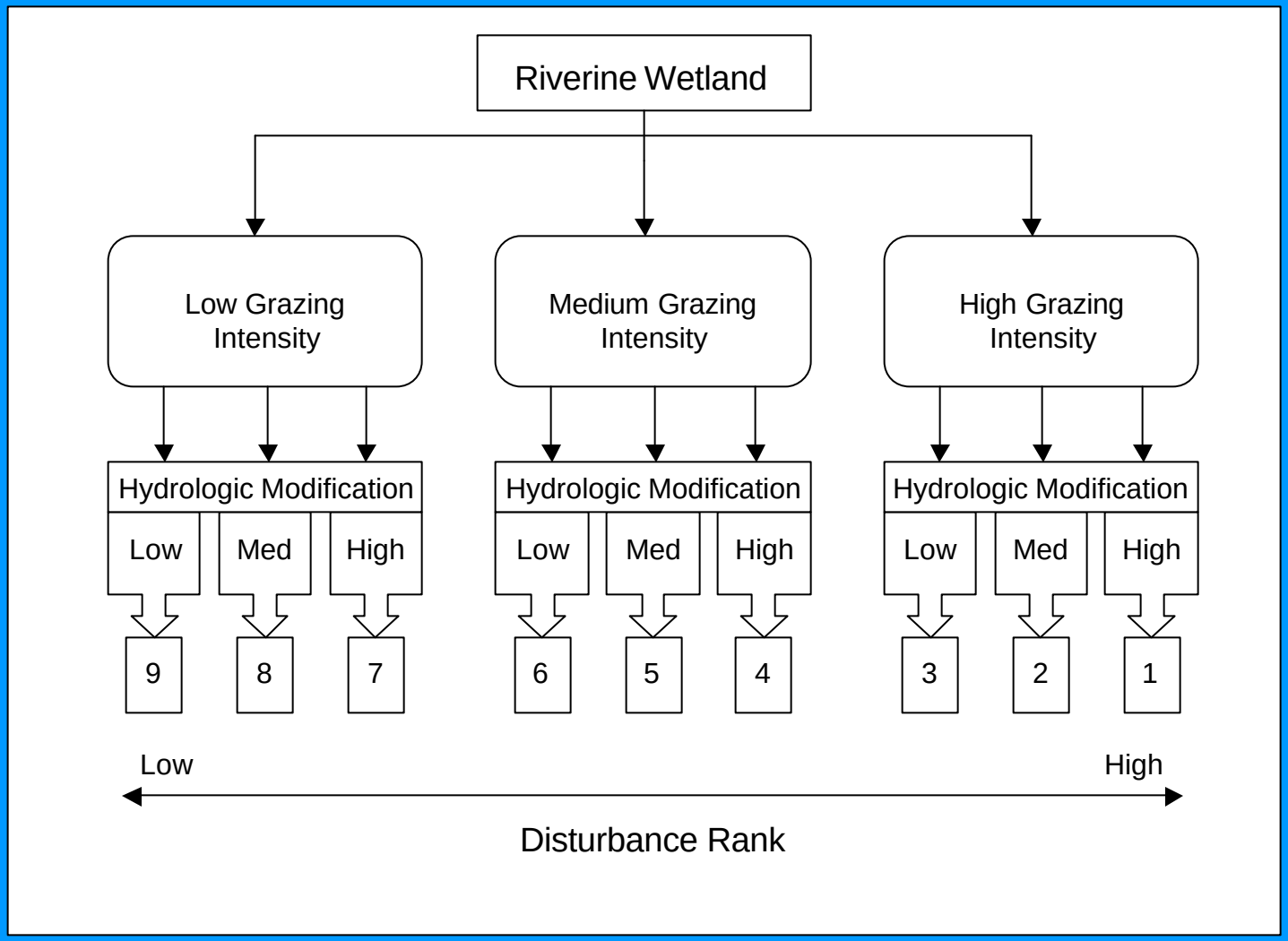
Catchment



Characterizing Human Disturbance

Disturbance Factor	Category	Criteria
Grazing Intensity	Low	Banks stable with little or no slumping, little to no pugging or hummocking
	Medium	Moderate or localized bank erosion or slumping, some pugging or hummocking present
	High	Extensive bank erosion or slumping over channel length, extensive pugging or hummocking
Hydrologic Modification	Low	0 dams/1,000 ha
	Medium	0.01–0.3 dams/1,000 ha
	High	> 0.3 dams/1,000 ha

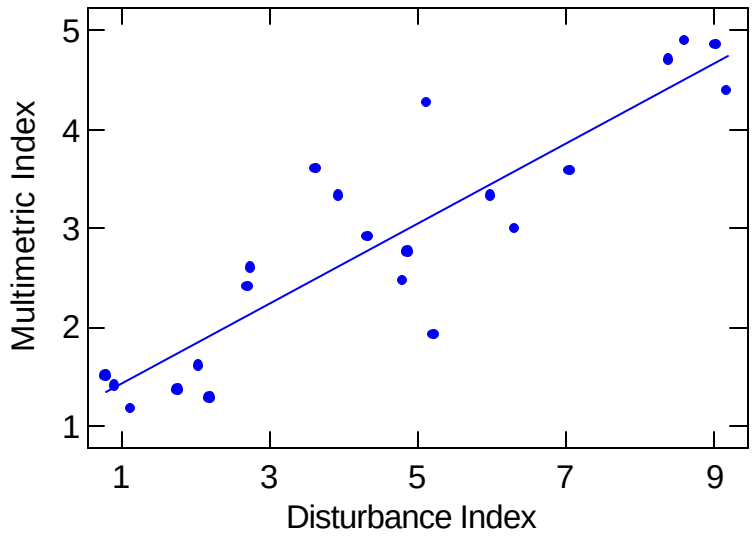
Human Disturbance Gradient



Vegetation Response

Metric	Response	Spearman's r
Richness of Native Perennials	Decrease	0.681
Simpson Diversity Index	Decrease	0.677
Relative Cover of Intolerant Species (C ≥ 6)	Decrease	0.675
Proportionate Richness of Tolerant Species (C ≤ 2)	Increase	–0.496
Floristic Quality Index	Decrease	0.761

$F_{1, 20} = 77.511$, $R^2 = 0.795$, $P < 0.001$



Key Findings

- Vegetation is a useful indicator of site condition
- In highly variable systems, metrics based on functional groups are the most useful indicators
  - e.g., richness/cover of perennials, annuals, tolerant/intolerant taxa

Assessing Bird Communities in Montana Wetlands

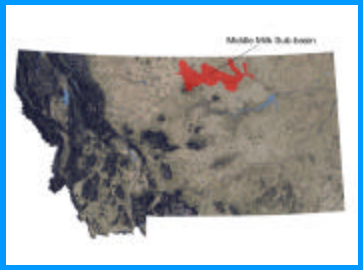
Anna Noson

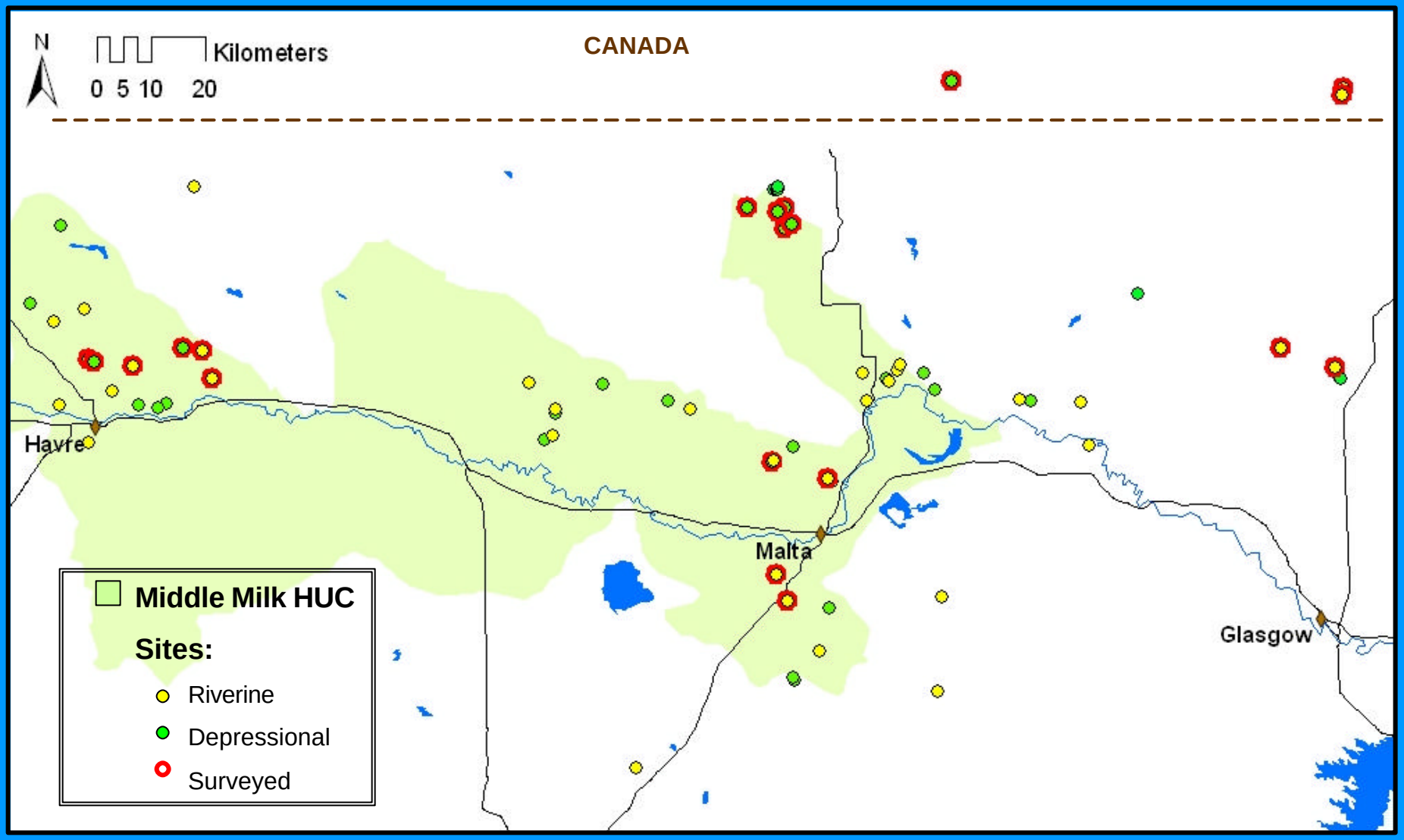
Amy Cilimburg

Division of Biological Sciences

University of Montana

Middle Milk HUC Surveys





Survey Protocol

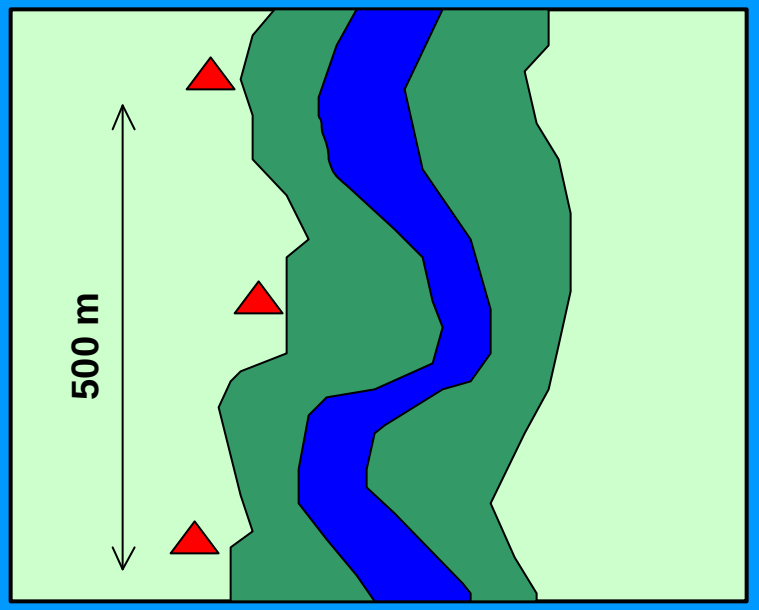
Point Count▲

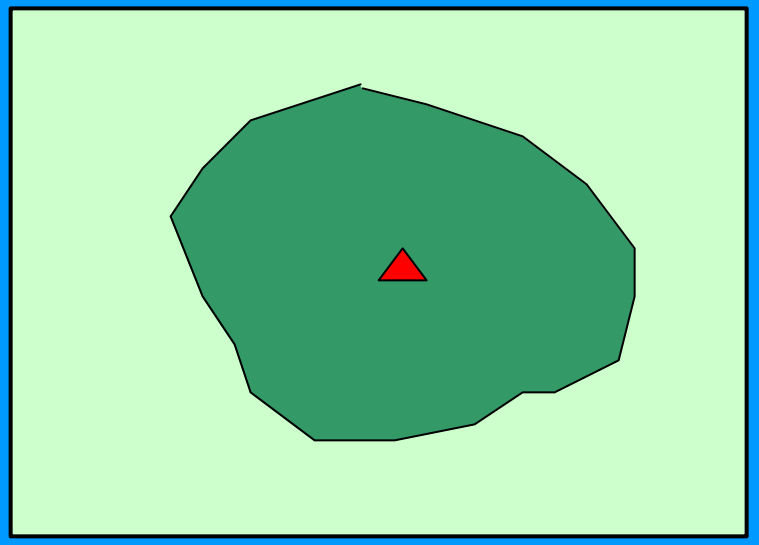
Riverine:

- 3 points located 250 m apart on edge of wetland

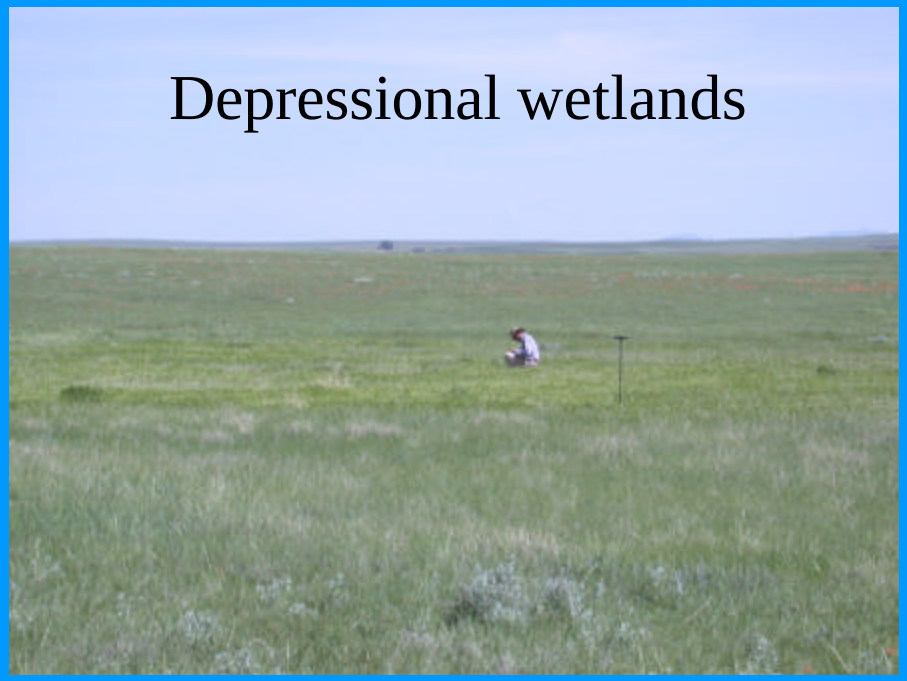
Depressional:

- 1 Point located in center of wetland, or on edge of inundated area





Middle Milk Region



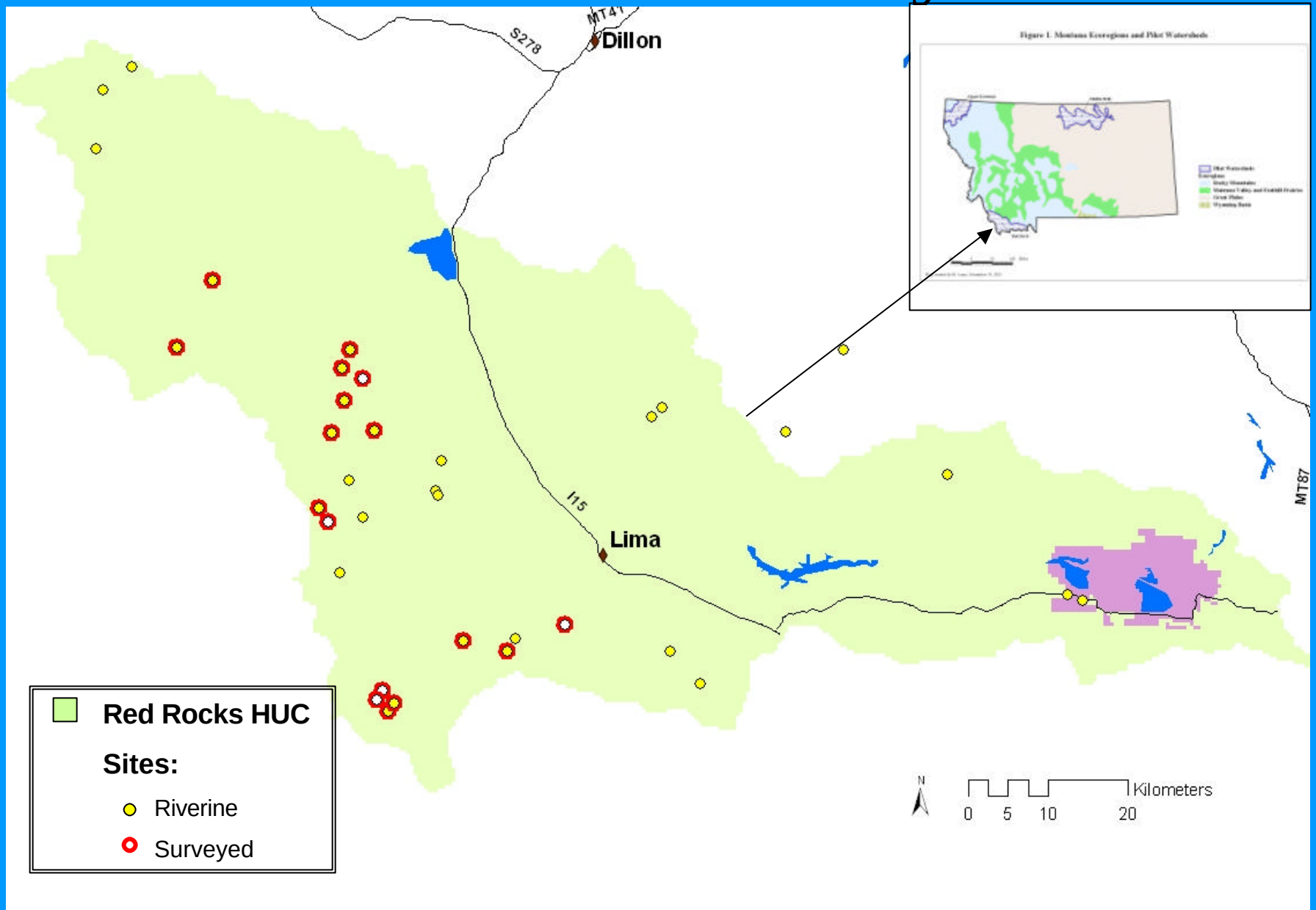
Wetlands were “seasonal” and “temporary”

Most sites < 1 ha

Few distinct site condition differences

Few streams had shrub or trees which was often due to over grazing or hydrologic modification

Red Rocks Surveys



Red Rocks: Riverine

Grazing Human Disturbance Gradient

Beaver Ponds

A Statewide Wetland Monitoring and Assessment Program for Amphibians and Aquatic Reptiles

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Amphibian Inventory Watershed Summary 2000-2003

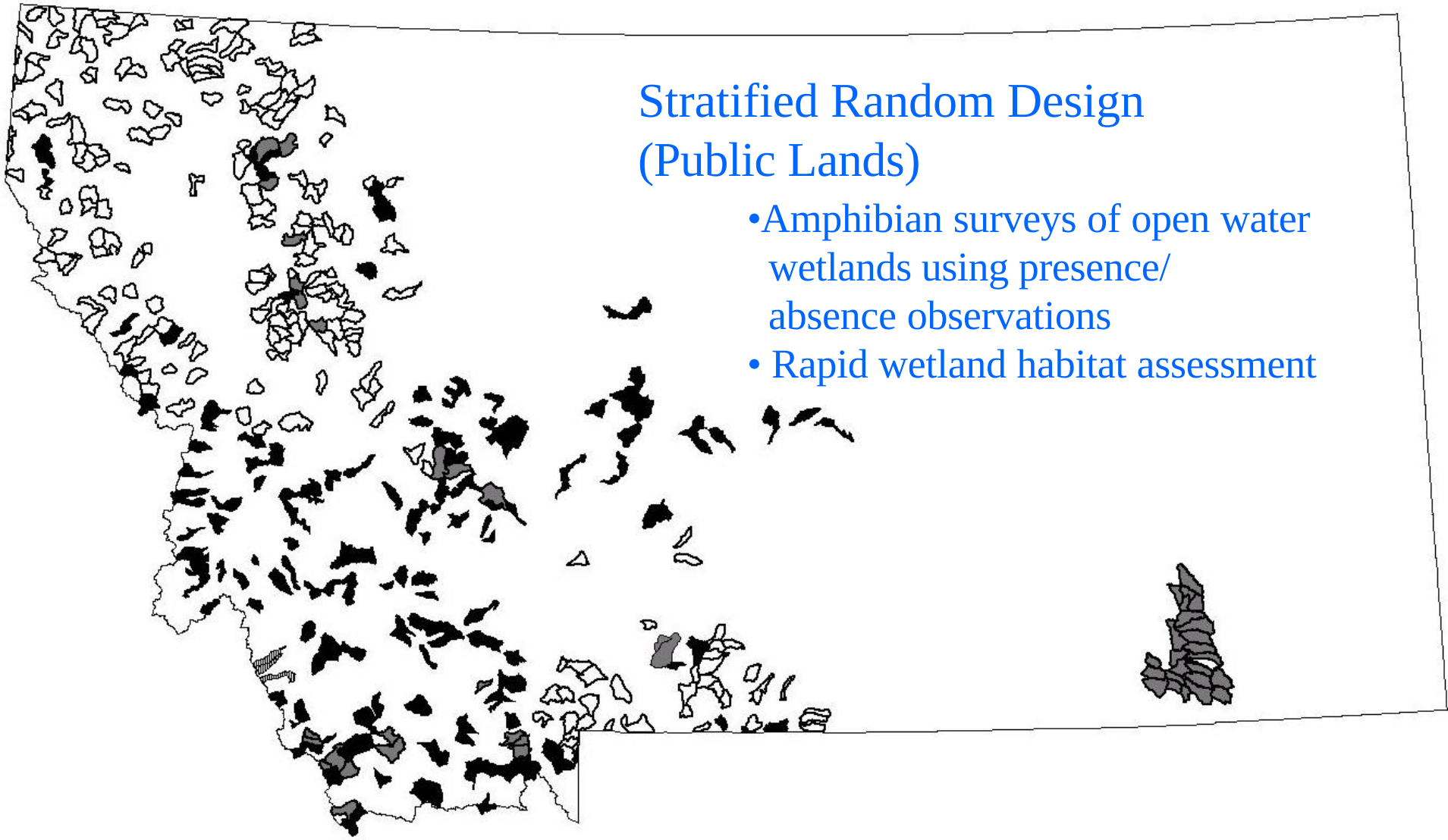
Outlined = Remain to be surveyed

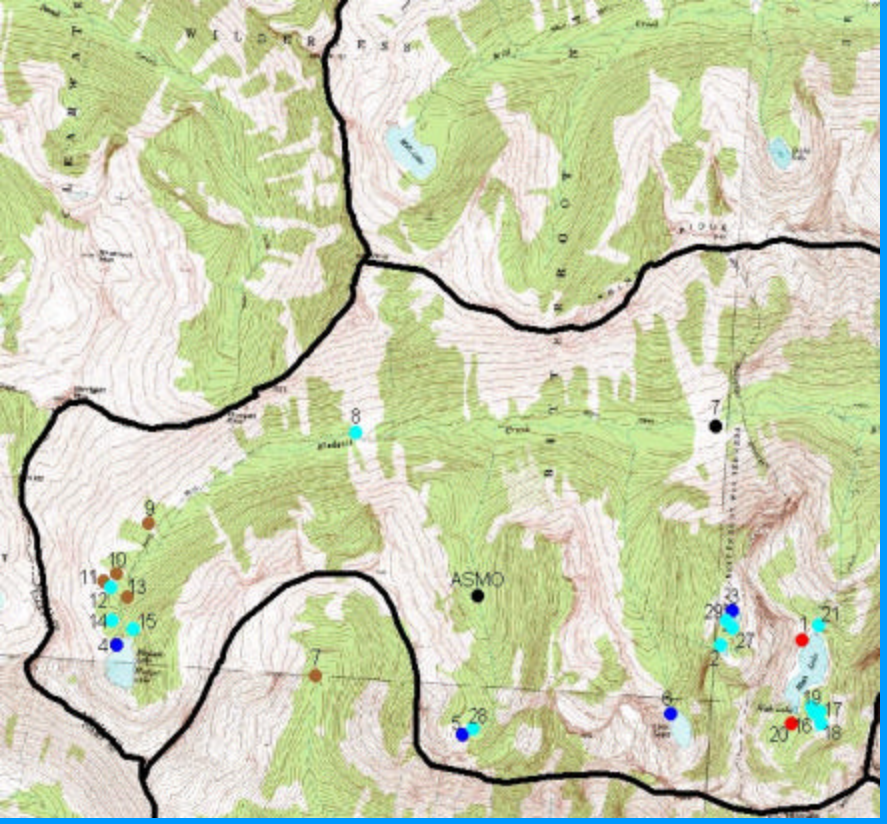
Black = 158 randomly selected watersheds that have been completed

Gray = 49 non-randomly selected completed for issues of concern (fish stocking or coal bed methane)

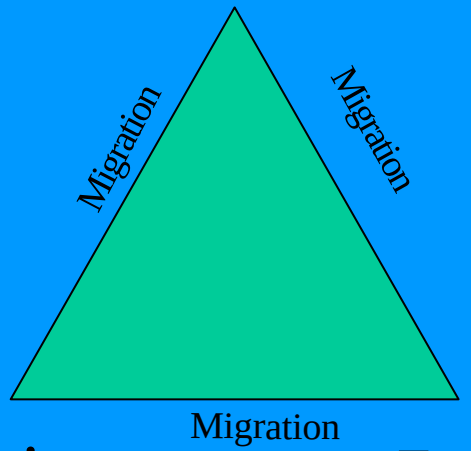
***Surveys of 207 watersheds and >3,600 sites**

****3300 new species records with 16 extensions of known geographic and elevation ranges**

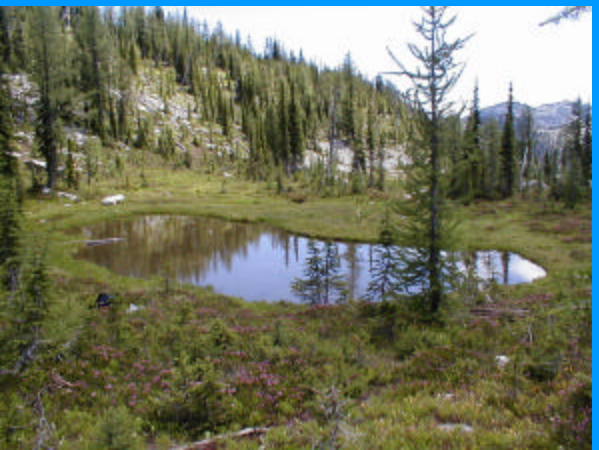




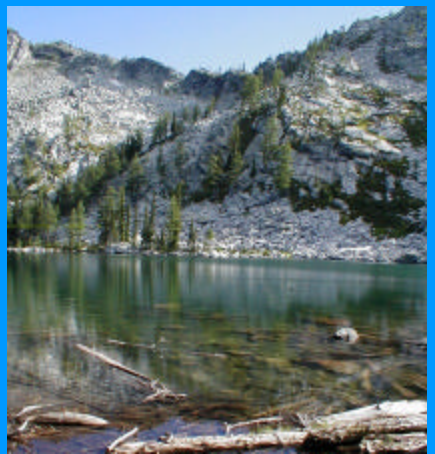
Distribution of Habitats on the Landscape (Species Specific)



Foraging Overwintering



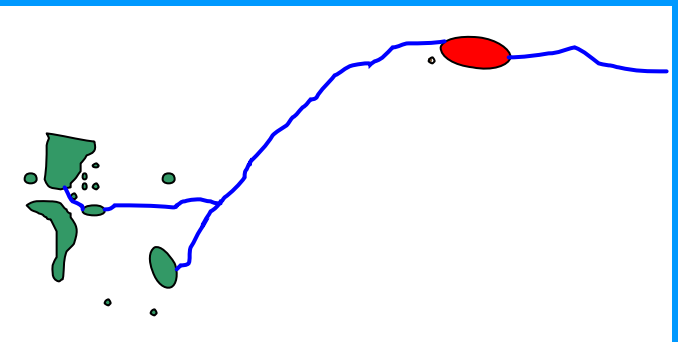
Overwintering

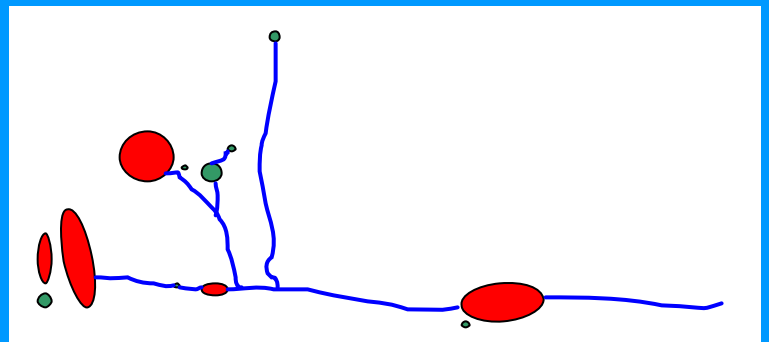


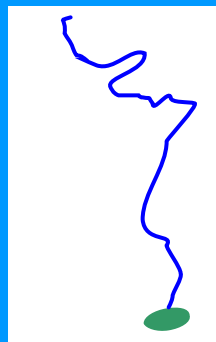
Breeding & Foraging

Possible metrics for Local and Landscape Features and Processes that Promote the Persistence of Amphibians?

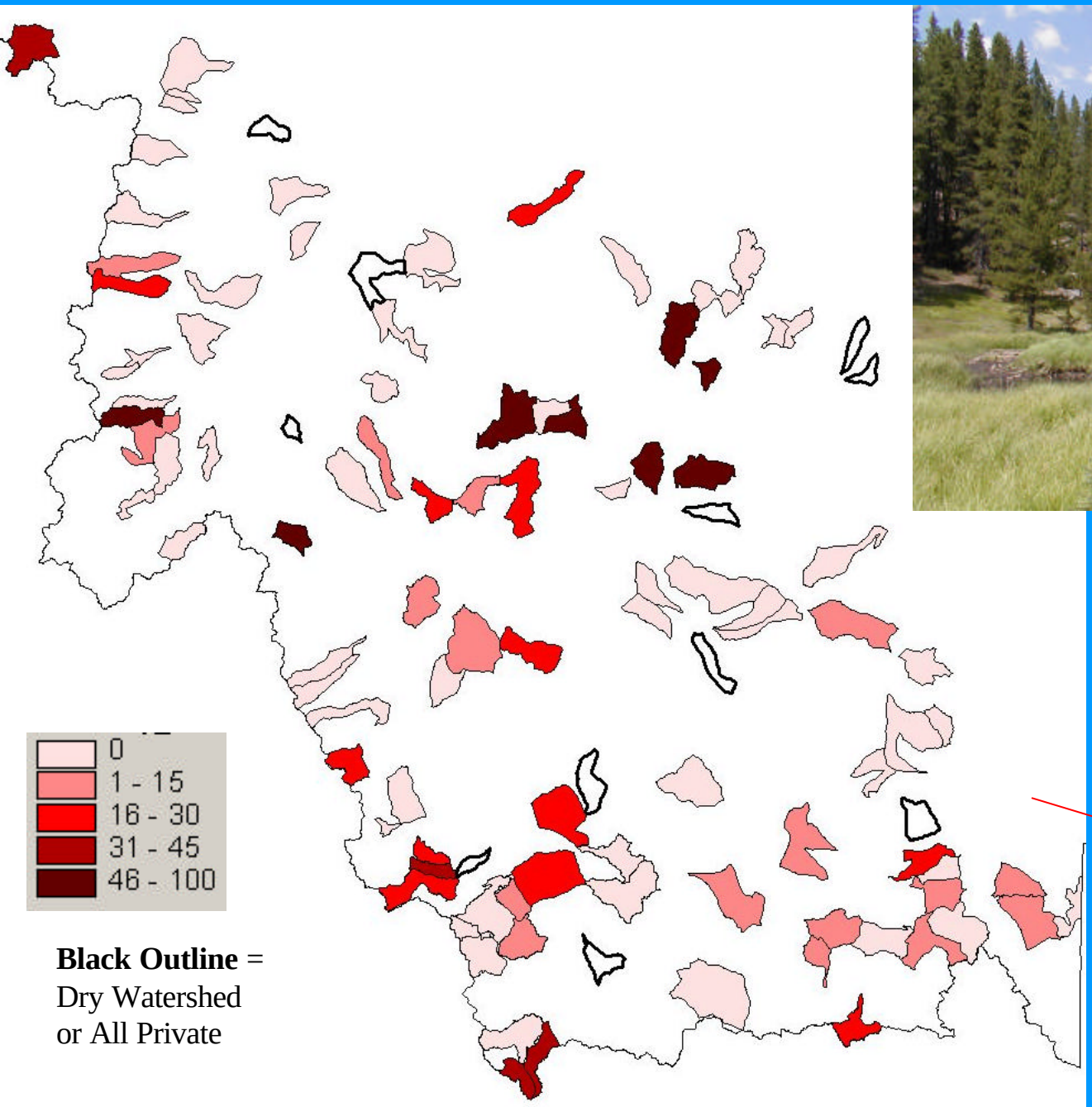
- Habitat type and condition
- Number and/or percentage of water bodies with fish
- Status of natural processes such as flooding and beaver
- Number of lentic water bodies in a basin
- Number of water bodies capable of supporting reproduction
- Distance between and spatial configuration of breeding, foraging, and overwintering habitat







Percent of Lentic Sites Created By Beaver

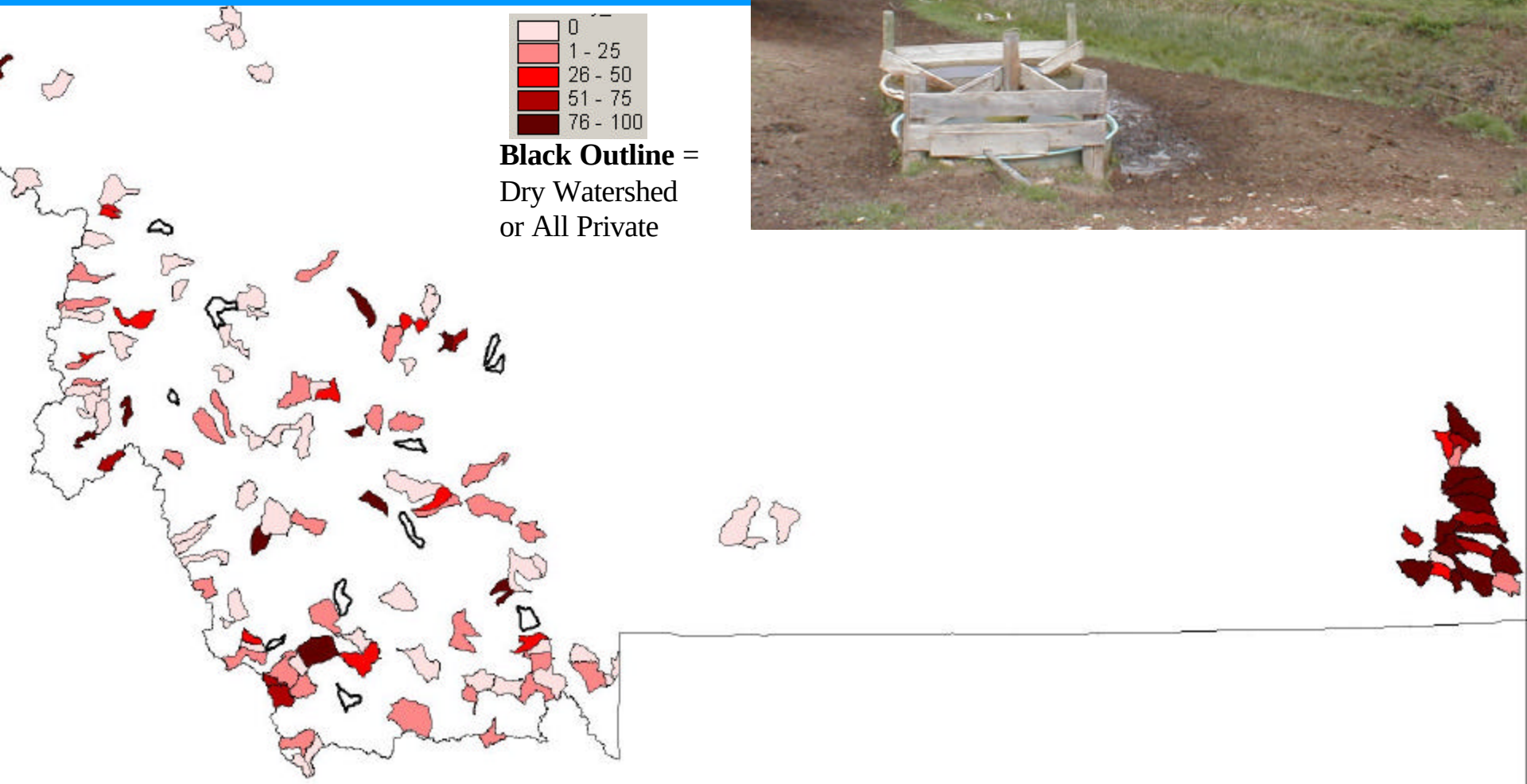


Black Outline =
Dry Watershed
or All Private

Percent of Lentic Sites Capable of Supporting Amphibian Reproduction Heavily Impacted by Cattle

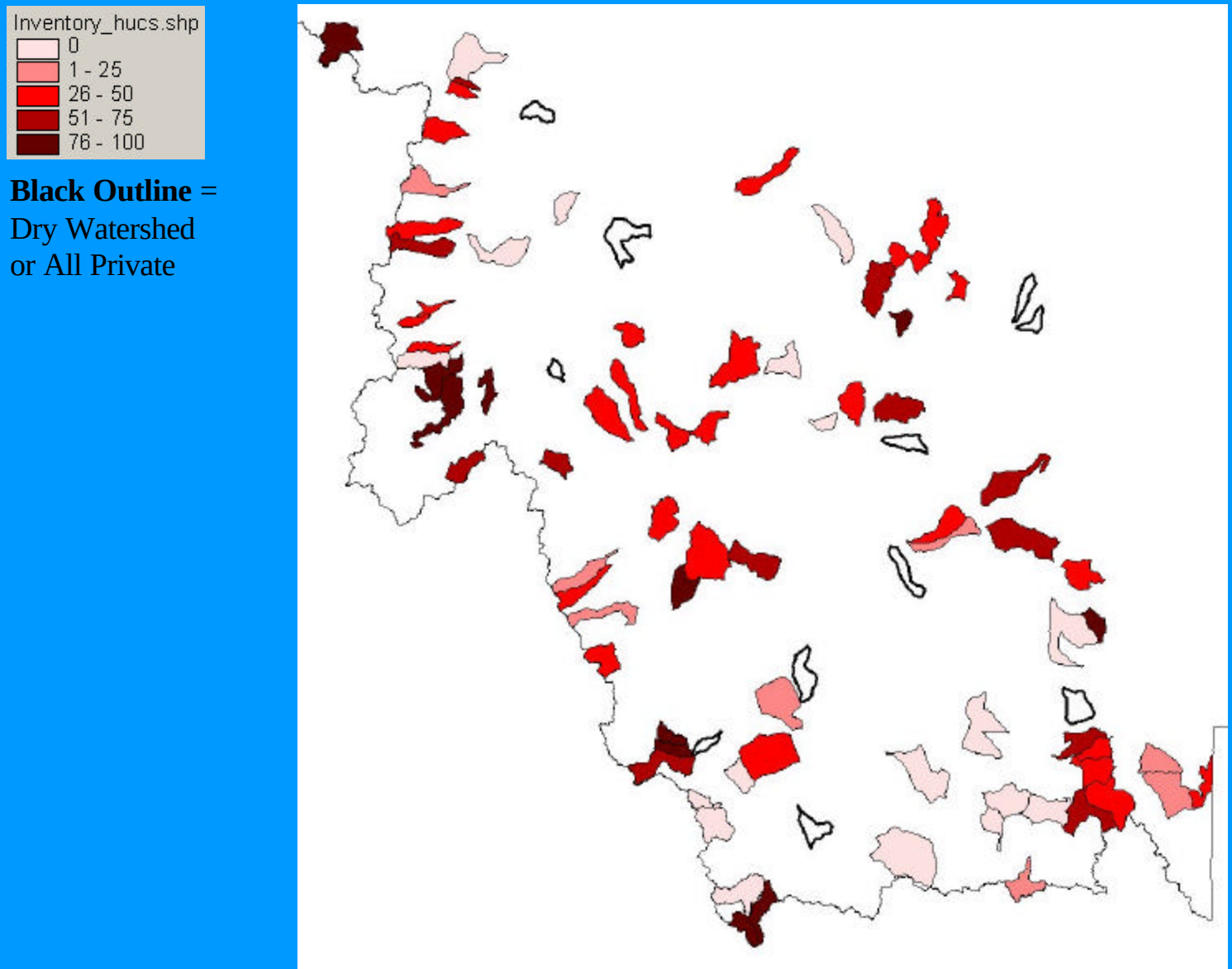
Black Outline = Dry Watershed or All Private

Percent of Lentic Sites Capable of Supporting Amphibian Reproduction with Water Dammed or Diverted



Black Outline = Dry Watershed or All Private

Percent of Permanent Lentic Sites with Fish



Black Outline = Dry Watershed or All Private

Rapid Wetland Assessments (Level 2 Assessments)

Elizabeth Crowe
Montana Natural Heritage Program

Erin Fehringer
Montana Dept. of Environmental Quality

Draft Rapid Wetland Condition Assessment Form

- **Rapid Assessment (2 hrs/site) for all wetland types with rankings of excellent, good, fair and poor condition.**
  - Water Quality condition Index
  - Hydrogeomorphology Condition Index
  - Buffer Condition Index
  - Vegetation Condition Index
- **Testing in 2004 field season**
  - Calibrate with site-intensive data (Level 3) "accuracy"
  - Conduct replicate assessments to determine precision

Water Quality Condition Index

Hydrogeomorphology Index


Fluctuating Water levels


Dredge and Fill


Stock Watering


Loss of floodplain


Pugging

Buffer Condition Index

Vegetation Condition Index

- Noxious weeds and aggressive non-natives
- Browse condition
- Removal of tree layer or dead and dying trees or shrubs

Landscape Assessments (Level 1 Assessments)

Montana Department of

Environmental Quality

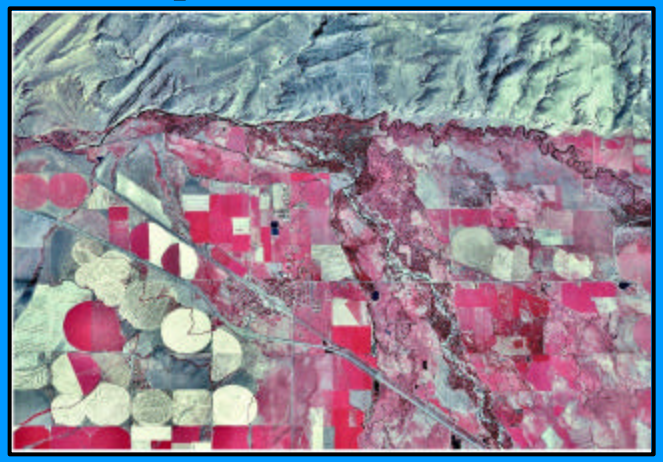
Traditional Wetland Identification Techniques

On-site analysis

- Time consuming
- Expensive
- Inefficient for large areas
- Accessibility problems on privately owned lands

Aerial Photo Interpretation

- Synoptic view of study area
- CIR imagery is widely applicable data resource
- Allows equally intensive study for both private and public lands
- Enables rapid analysis of large landscapes



Watershed Level

- GIS based assessments
  - Uses existing data layers
  - Coarse level assessment

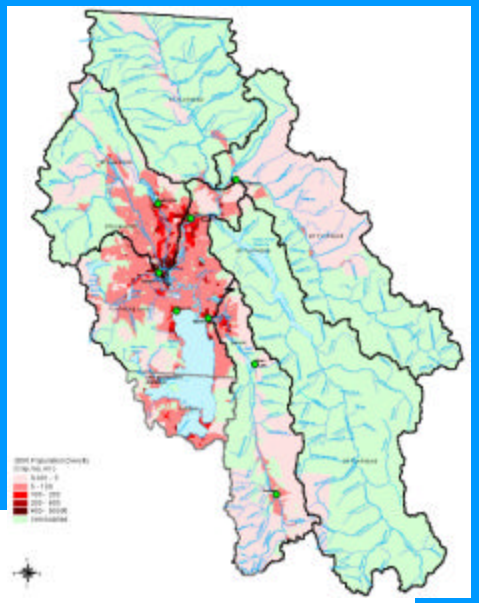
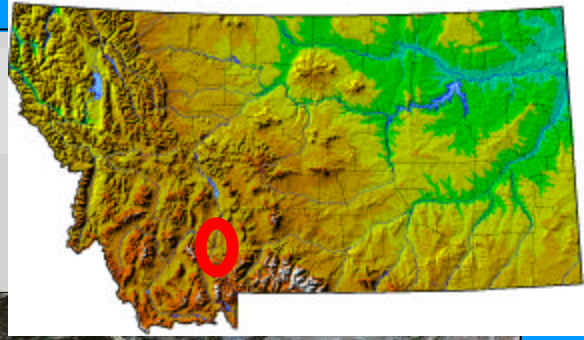


Table 1.

Human Disturbance Factors	**Units**
Water Rights Irrigation	Percent
Population Density	Persons per Square Mile
Corps 404 Stream/Wetland Permits	Permits per 100 Square Miles
S303d Listed Streams	Meters per Square Mile
Road Density	Miles per Square Mile
Well Density	Wells per Square Mile
Mine Density	Mines per Square Mile
Discharge Permit Density	Permits per Square Mile
Road/Stream Crossings	Crossings per 10 Square Miles
Federal Land	Percent
Wilderness	Percent
Land Cover	Percent

Wetland Project Area in Gallatin Valley

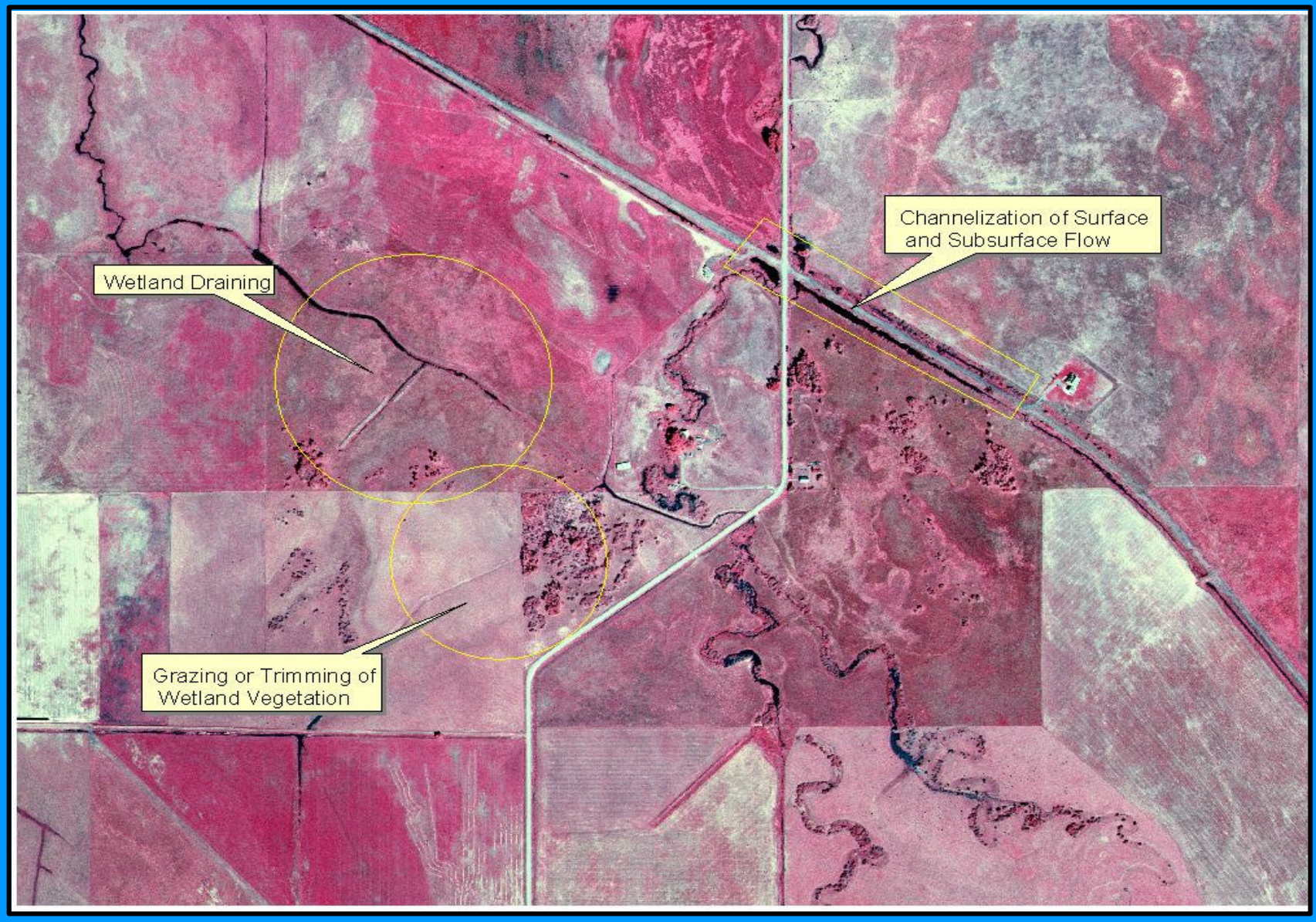
Project Boundary 3 0 3 6 Kilometers



Cory Baker
Gallatin Local Water Quality District

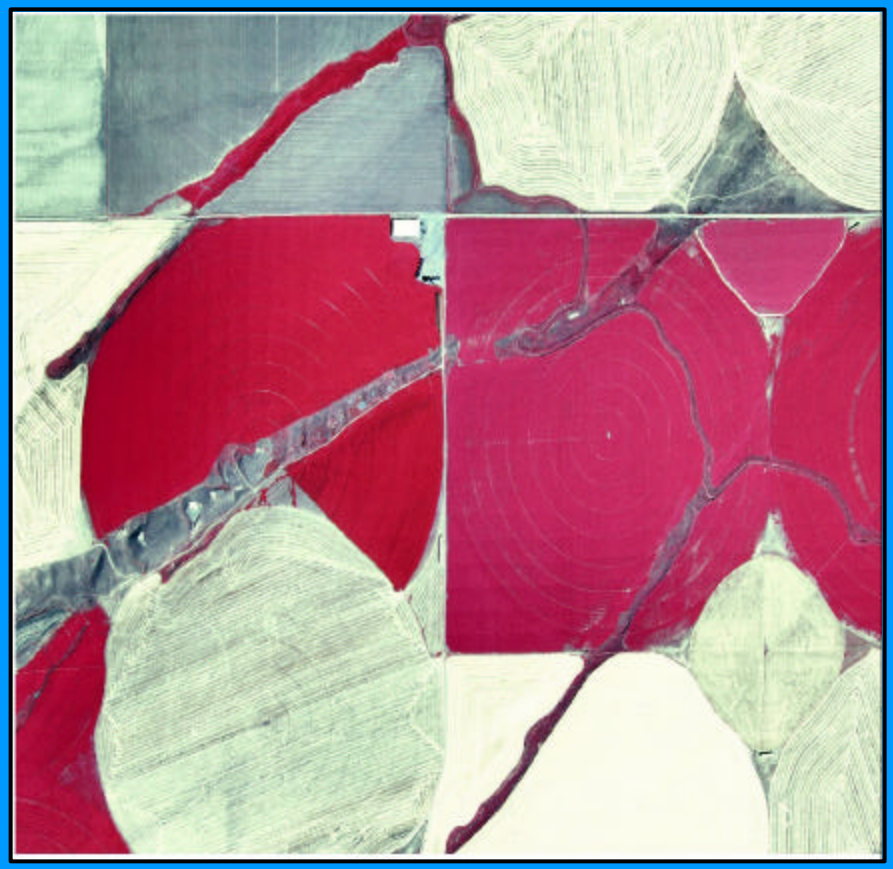
520 sq. miles (335,000 acres)

Evidence of Human Impacts

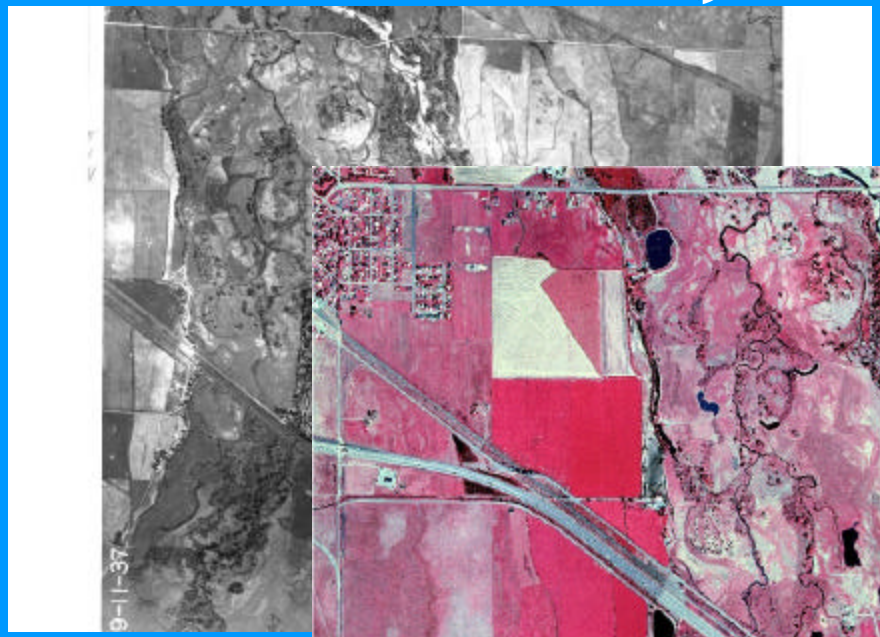


Roadbeds and Hydrologic Influence

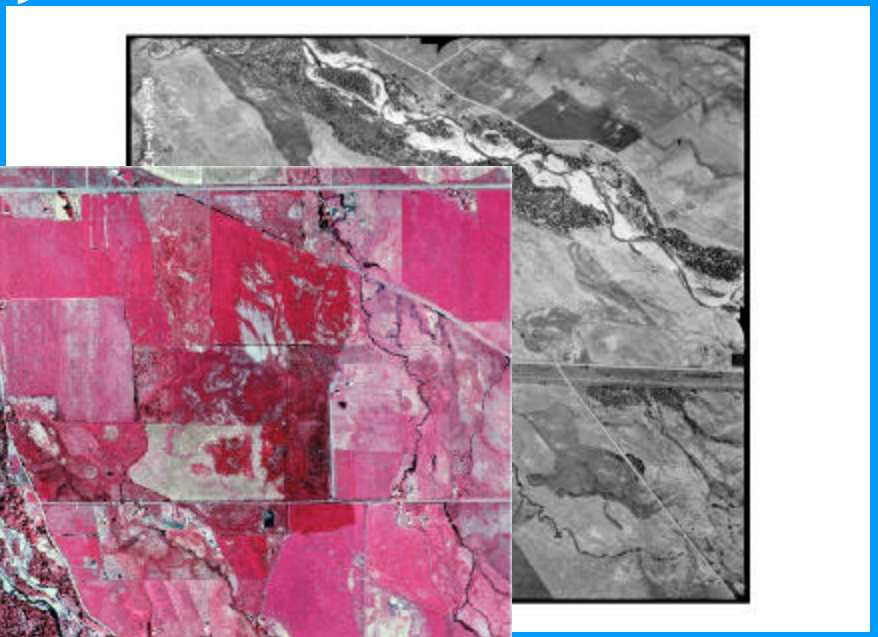
Irrigation Dependent Wetlands



I-90 & West Gallatin Corridor
1937, 1959, & 2001



1937 Photo



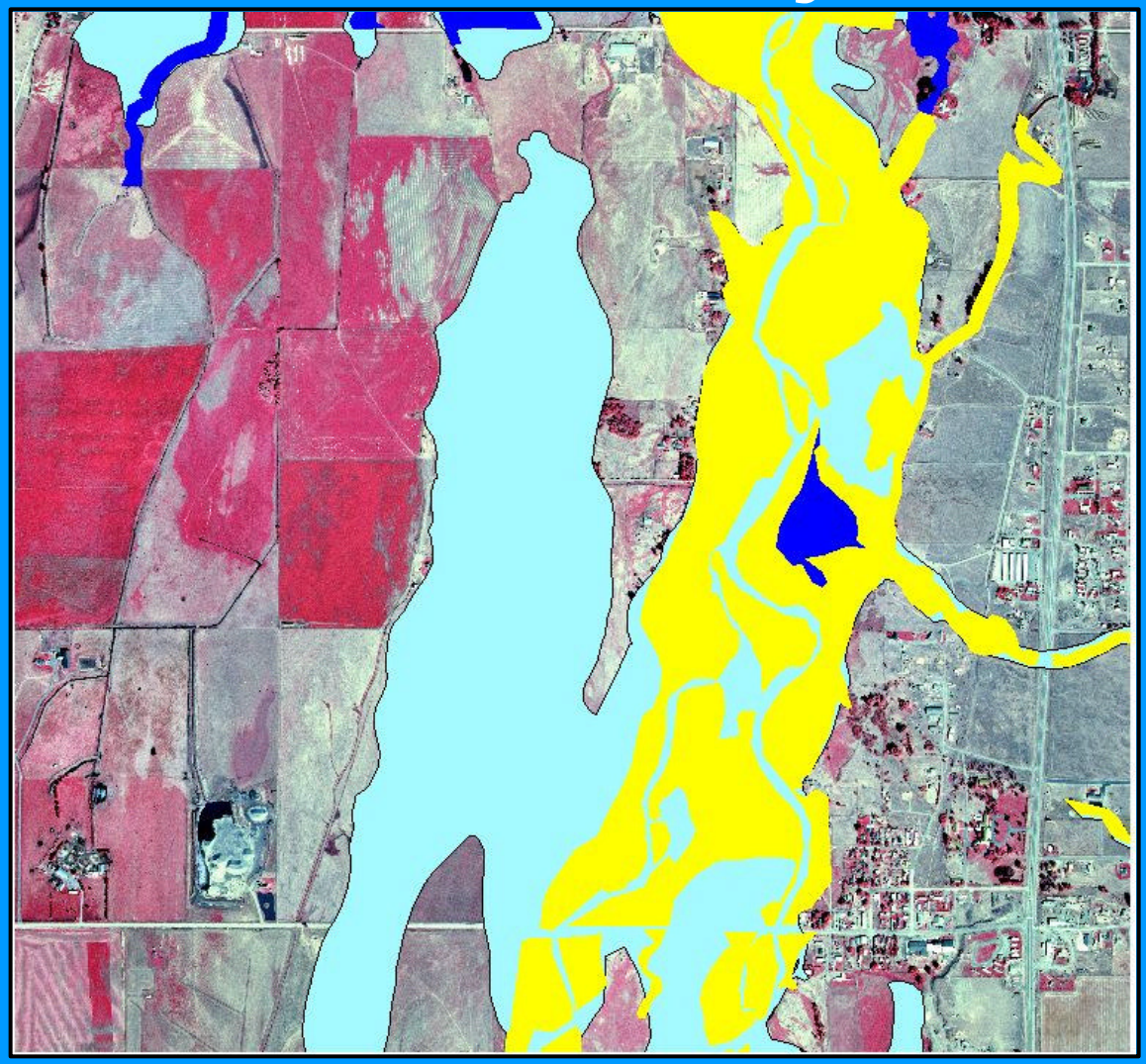
1959 Photo

2001 Photo

Historical vs Current Wetlands in Gallatin Gateway

Map Legend

- 2001 Riparian Area
- 2001 Wetland Area
- Historical Wetland Area



Wetland Assessment Program Implementation Strategy

Montana Department of

Environmental Quality

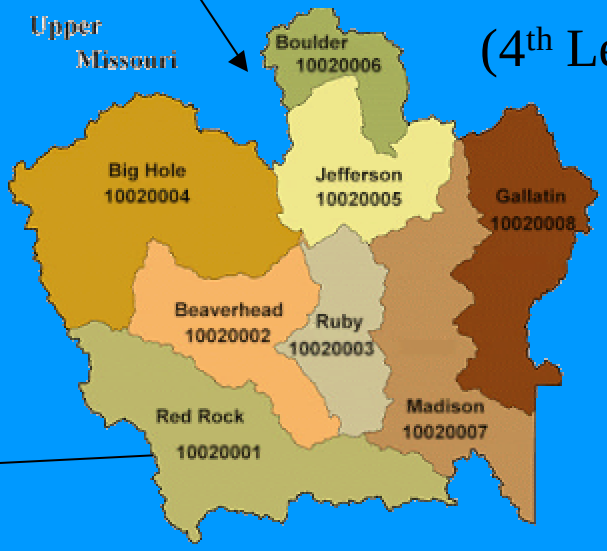
Watershed Assessments

- Cost-effective wetland assessment protocols
- Rank and prioritize watersheds for restoration or conservation
- Integrate the assessment of streams, lakes and wetlands
- Identify the primary risk factors (stressors) that limits aquatic life uses
- Determine status and trends.
- Systematic approach that is both quantitative and judgmental

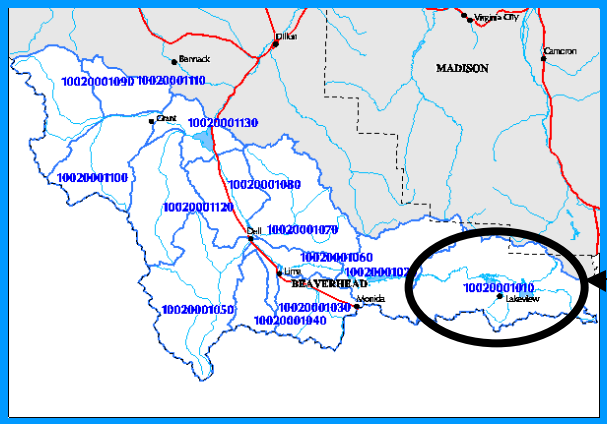
Watershed Scale

River Basins

Subbasins
(4th Level HUC)



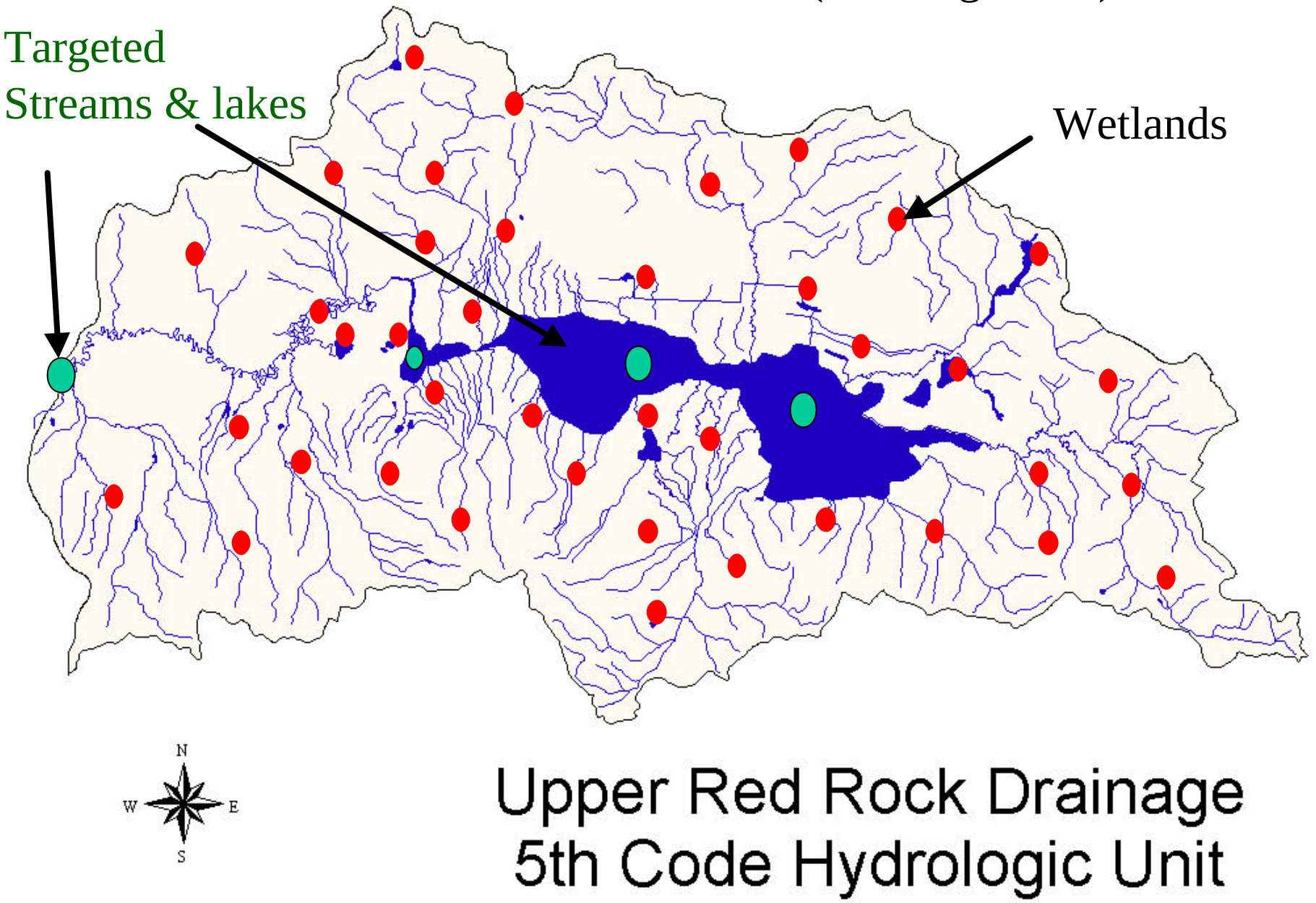
Watershed (5th Level HUC)

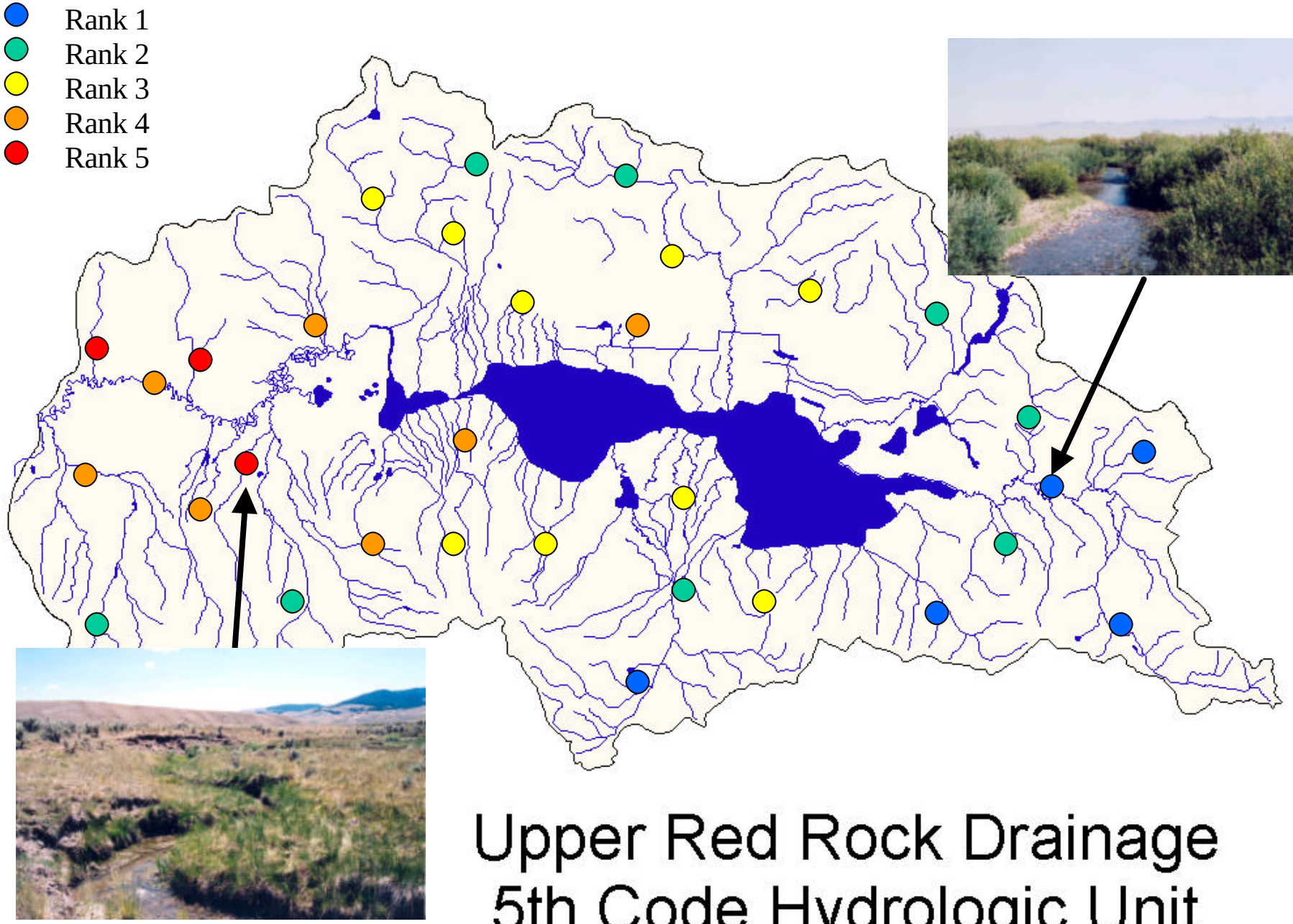


Test Watershed(s)

- We intend to use the assessment protocols that are developed in test watersheds (e.g., Gallatin Valley).
  - Level 1, Landscape
  - Level 2, Rapid Field Assessment
  - Level 3, Site Intensive assessments
- Watershed Assessment and Report
  - Provides an assessment framework that can be used to initiate the development of watershed plans

Probabilistic Watershed Assessments (Rotating Basin)

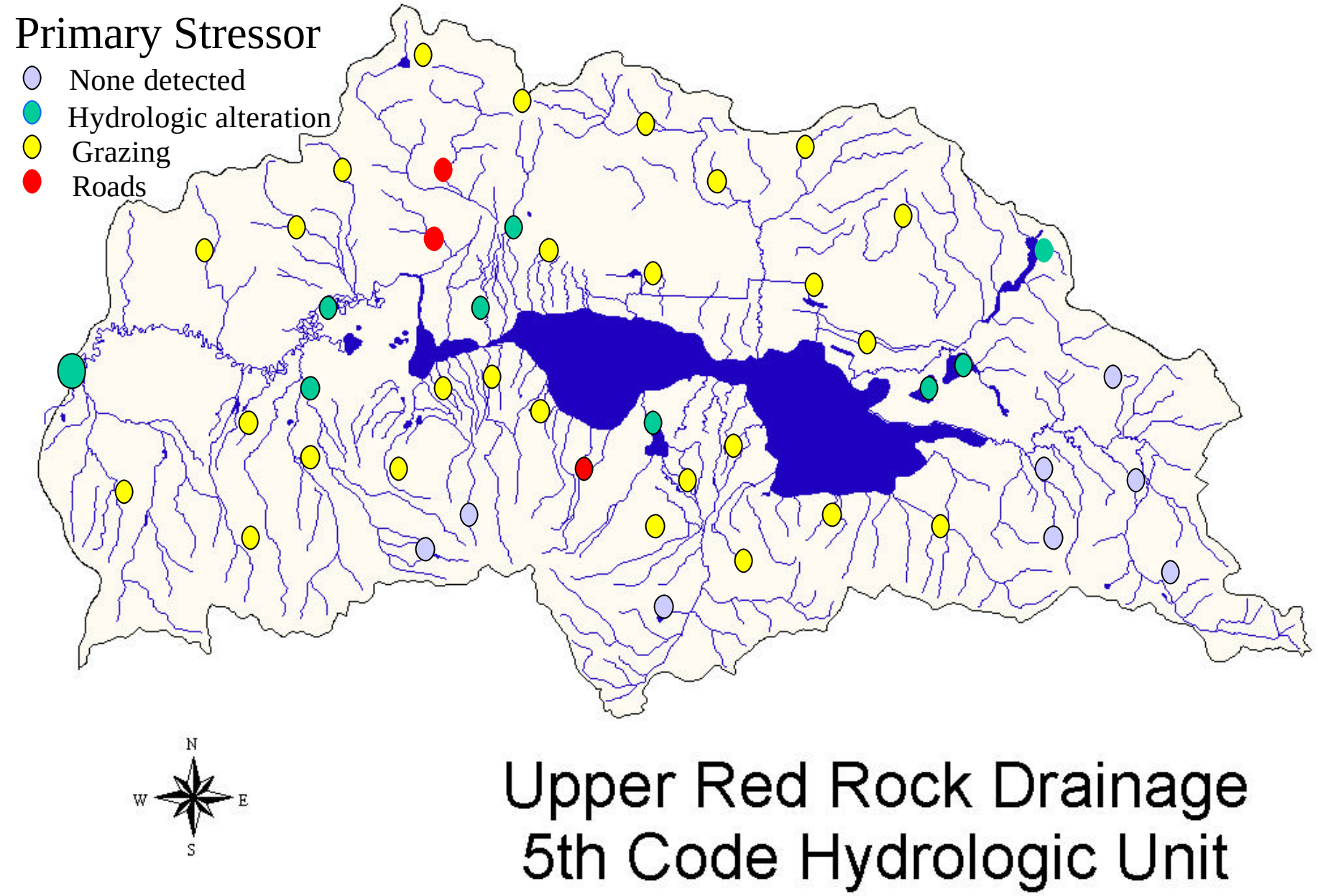




Upper Red Rock Drainage
5th Code Hydrologic Unit

Watershed Rank = 3; Primary Stressor = Grazing

Probabilistic Watershed Assessments (Rotating Basin)



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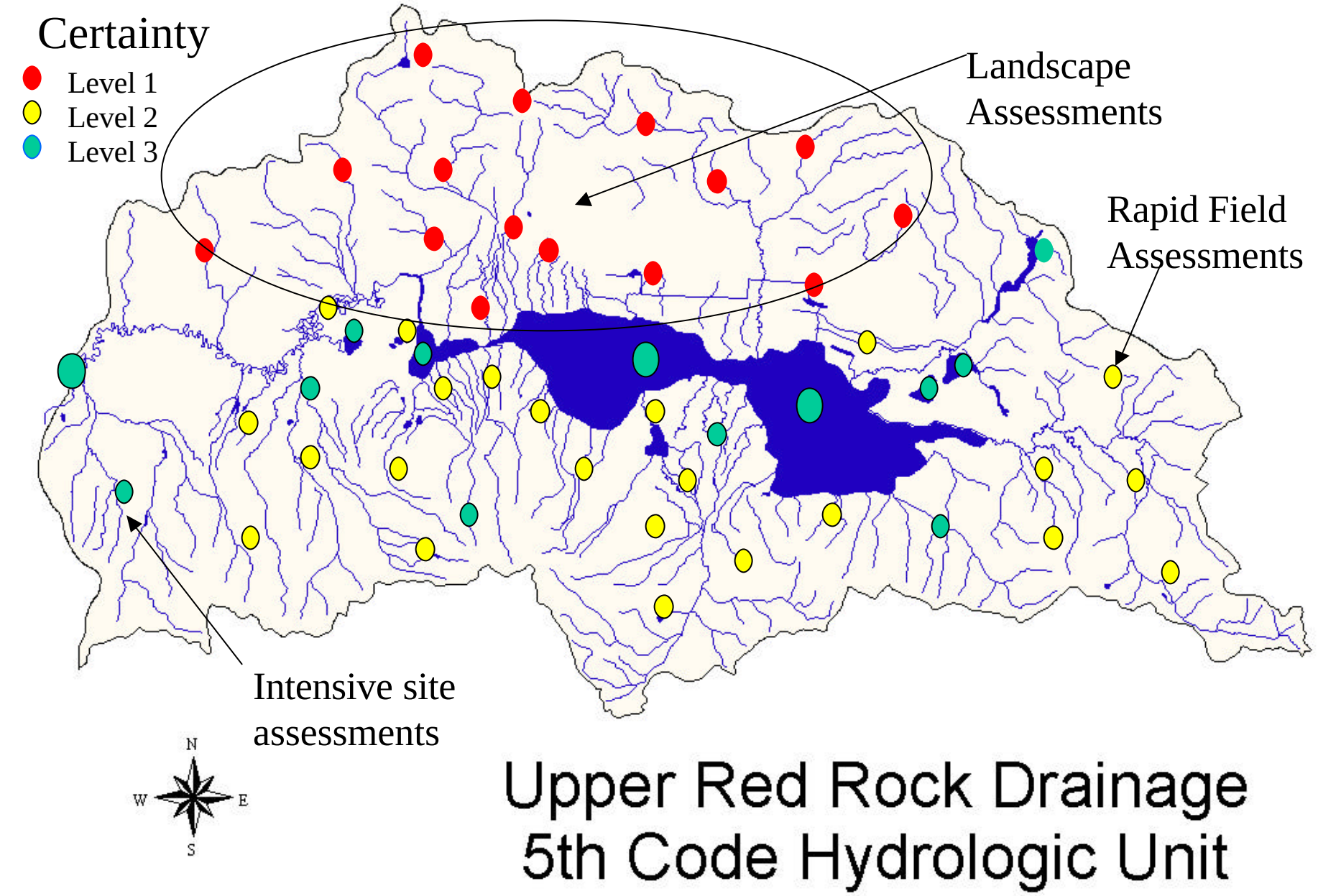
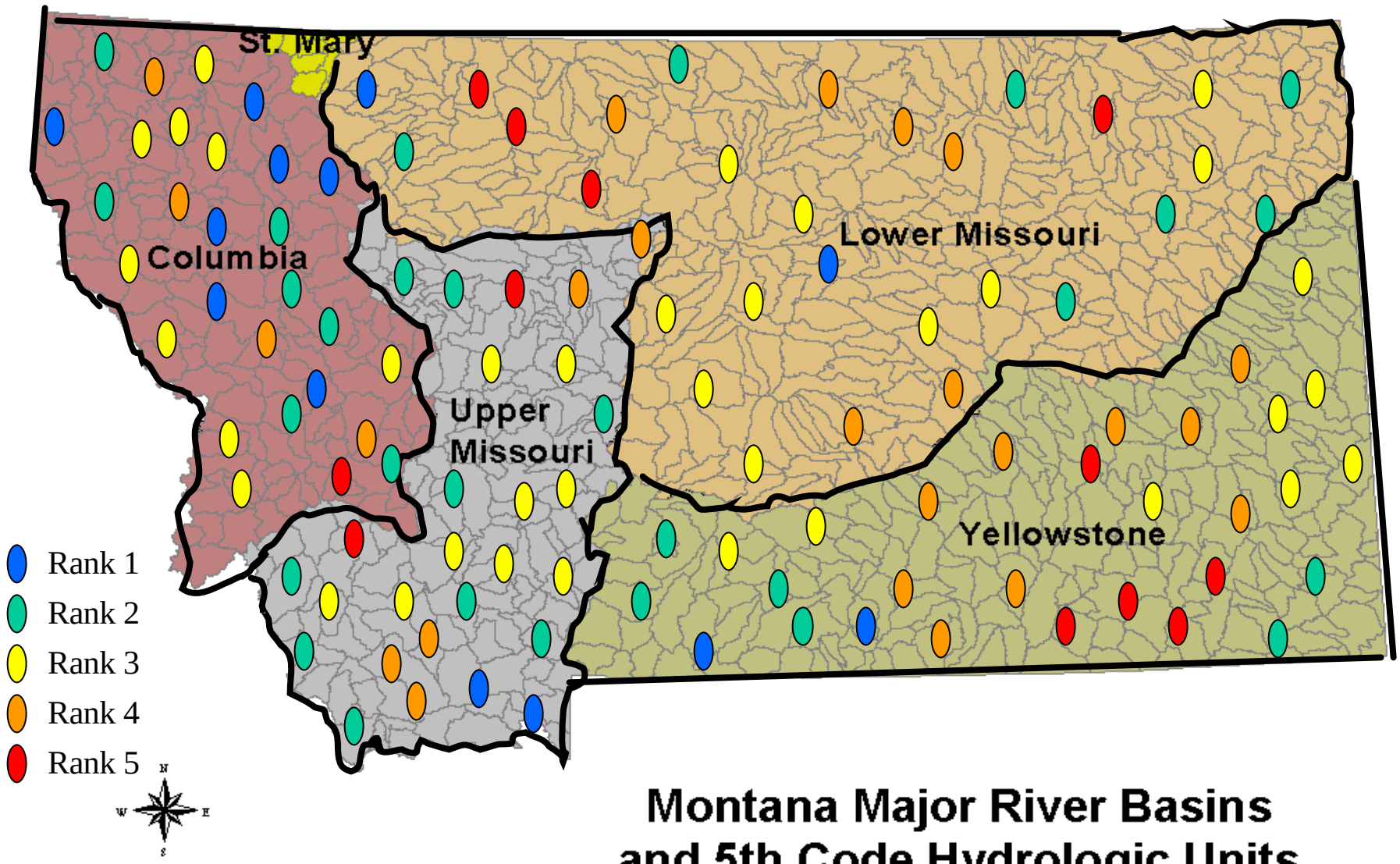


Probabilistic Watershed Assessments (Rotating Basin)



Montana Major River Basins and 5th Code Hydrologic Units

(40,000 – 250,000 acres)

The End

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