

# ROLLOUT OF THE MSDI LANDCOVER/LANDUSE THEME

Claudine Tobalske, Linda Vance,  
Melissa Hart

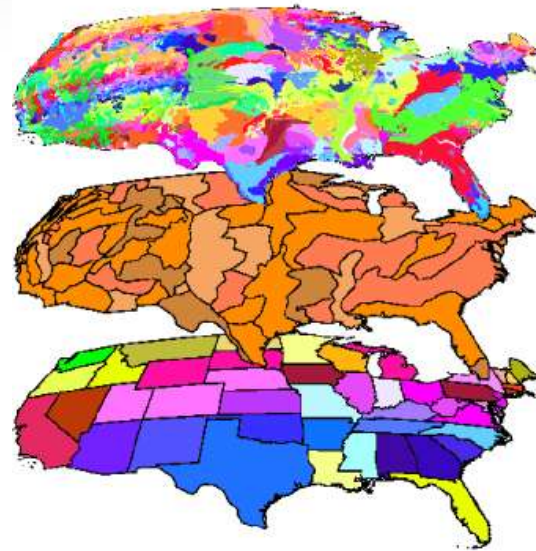


# Objectives

- Refresh your memory... The original Gap Analysis
- ReGap, a regional approach to Gap Analysis
- The Ecological System classification
- The Montana Land Cover/Land Use layer – where we're at
- Comparison with other broad-scale vegetation maps (Original Gap, Landfire, VMap)
- Where do we go from here?

# The original Gap Analysis

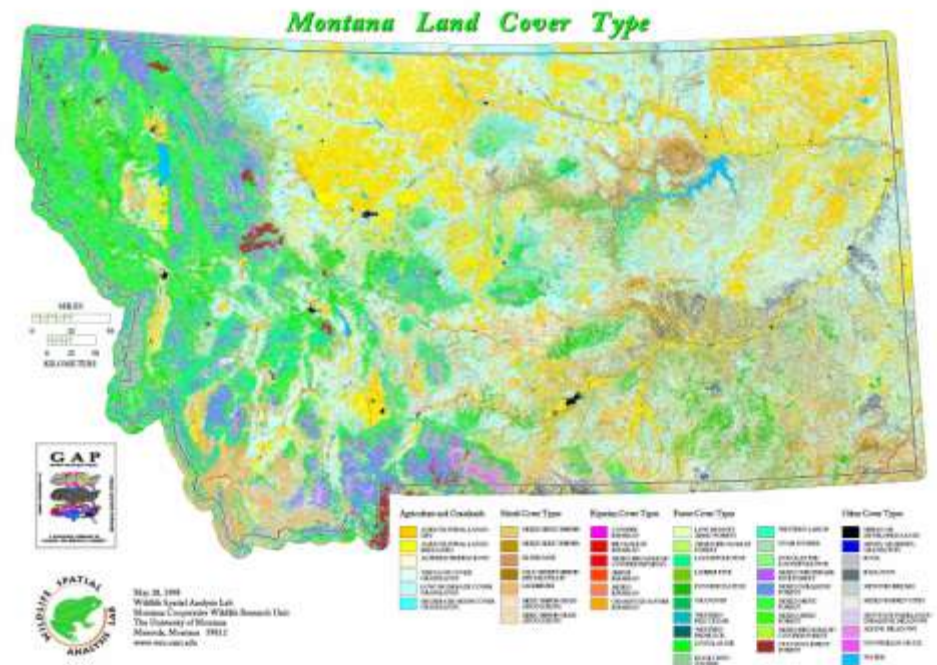
- “Keeping common species common” by identifying gaps in the conservation network
- Done on a state-by-state basis
- Distribution maps of all vertebrate species, based on deductive, species-habitat association models
- Key layers: landcover/landuse and land management



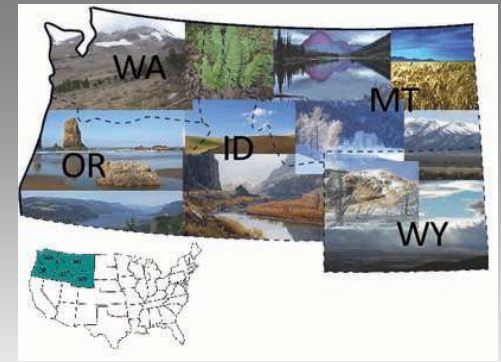
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# Montana Landcover layer, 1998

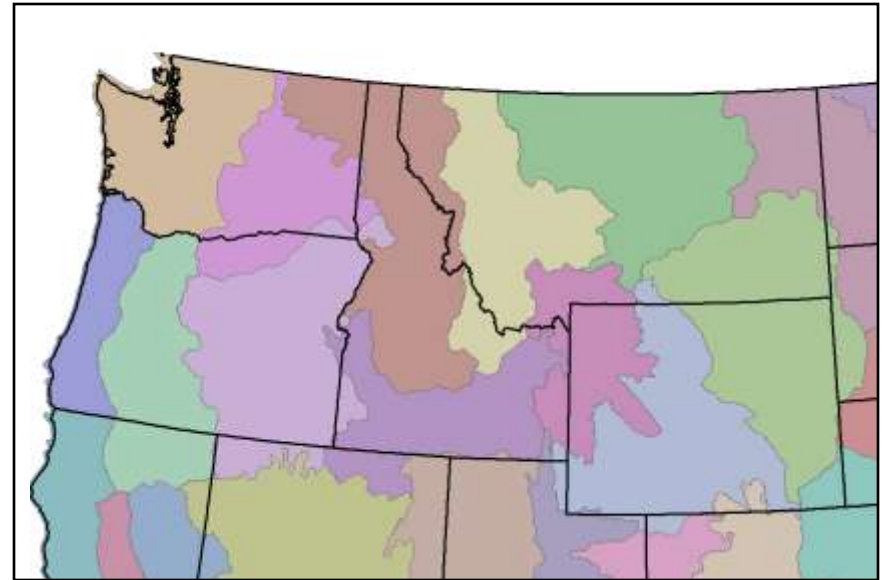
- Unsupervised classification of Landsat TM scenes: automated delineation of uniform patches of pixels
- Existing field data and additional field sampling to assign land cover classes to patches
- Separate riparian layer added to the grid
- 50 vegetation classes



# Northwest ReGap



- Five-states region encompassing Idaho, Montana, Oregon, Washington, and Wyoming
- Primary objective: to use a coordinated mapping approach to create detailed, **seamless** GIS maps of land cover, all native terrestrial vertebrate species, land stewardship and management status
- Mapping done on an ecoregional basis, using MRLC map zone
- Different modeling approaches but a **single classification system.**





# Ecological Systems: national map units



Groups of plant communities that:

- tend to co-occur within areas with similar ecological processes, substrates, or environmental gradients,
- exist at a scale of <1 to 10,000s acres, and
- typically persist for 50-150 years.

# Why ecological systems?

- Ecological systems (aka ecosystems) are a mid-scale biological unit
  - composed of predictably recurring groups of biological communities,
  - in similar physical environments,
  - that are influenced by similar dynamic ecological processes (like fire or flooding)
- Ecosystems are management units for a number of state and federal agencies
- Ecosystems are broadly understood and accessible to a wide audience





# The Montana Legend: Ecological Systems and National Vegetation Standard Aggregates

Class: Polar and High Montane



Division: Alpine Scrub, Forb  
Meadow and Grassland



Macrogroup: Wet Meadow and  
Low Shrub Carr



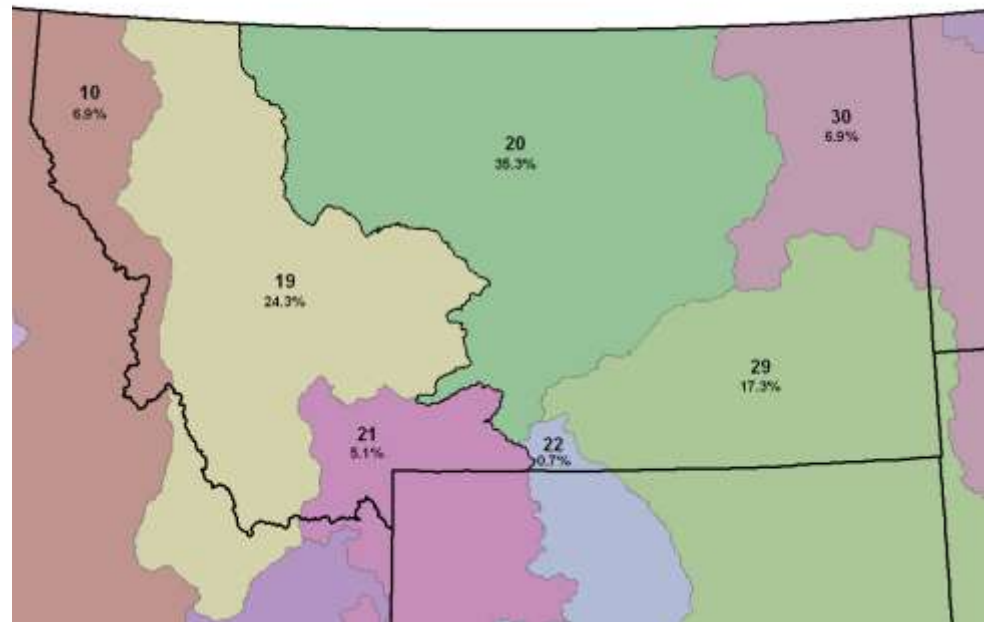
Ecological system: Rocky  
Mountain Alpine-Montane  
Wet Meadow





# Mapping Ecological Systems in Montana

- Seven map zones
- Two modeling agencies: NWGAP (U. of Idaho), zones 10-19-21; Sanborn, zones 20-22-29-30.
- Same pixel-based modeling method: Classification and Regression Tree (CART)
- Based on Landsat ETM+ scenes, ca. 2000
- Edgematching, QC and updates done by MTNHP



# CART modeling

- CART is a nonparametric technique that can select, from among a large number of variables, those and their interactions that are most important in determining the outcome variable to be explained.
- Well suited to land cover mapping:
  - No assumption of normality of training data (many land cover classes do not exhibit a normal distribution in the spectral feature space)
  - Decision trees accept categorical variables and a variety of measurement scales (often the case of ancillary data used to improve land cover classification)
  - Software is readily available and computationally efficient
- ReGap used a suite of tools designed by Earth Satellite Corporation for the United States Geological Survey, in support of the National Land Cover Database efforts.

Field samples

Exploratory variables:  
Landsat ETM+ scenes,  
elevation, slope, aspect,  
etc.

CART sampling  
tool  
(Erdas Imagine)

Output file

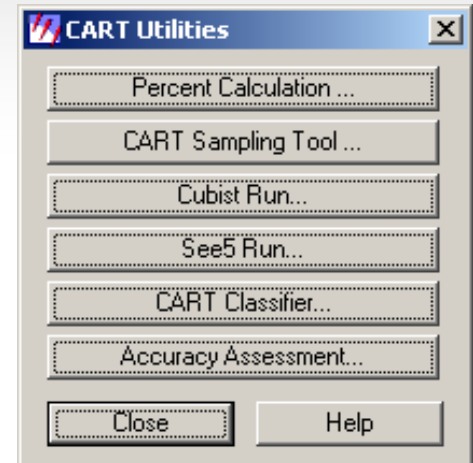
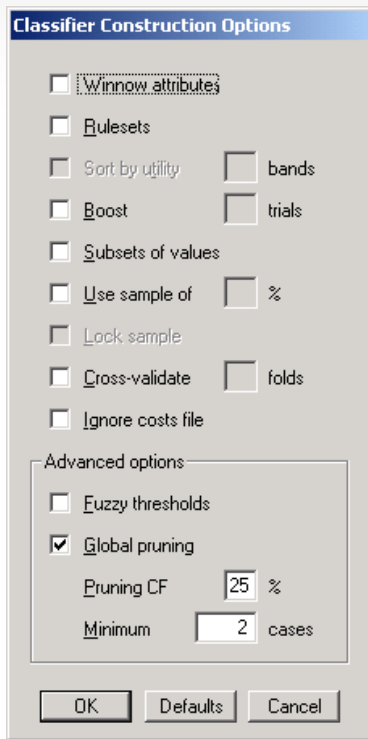
See5 tree classifier

Set of rules

CART Classifier  
tool: Spatial  
extrapolation

Post-modeling

Final product



# Accuracy assessment

- Source of points:
  - Sanborn: points from field data (2006 and 2007 collection), photo-interpretation, external sources (e.g., LandFire);
  - NWGap: 20% points set aside
- Method:
  - Sanborn AA based on fuzzy logic. A matrix of ecological similarity seemed appropriate because the species composition of Ecological Systems is not mutually exclusive.
  - NWGap: AA in process.



Map Class	Error Matrix Zone 22																																			
	RM Aspen Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind	RM Aspen-Mix Conifer Fir - Wind	IMB Aspen-Mix Conifer Fir - Wind
	27	6	1																																	
	1			3	2	1																														
				1		1																														
					1																															
							30	4	6																											
							2																													

Fuzzy	Deterministic
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83%

zone 29-30

85%

61%

zone 20

81%

71%



# Ecological systems: 58 natural systems mapped in Montana

- Ecological Systems include:
  - **Forested, Woodland, and Savannah classes:**  
Example: Northern Rocky Mountain Ponderosa Pine Woodland and Savannah.
  - **Shrubland classes:**  
Example: Intermountain Basins Big Sagebrush Shrubland
  - **Grassland classes:**  
Example: Northern Rocky Mountain Subalpine-Montane Grassland
  - **Barren classes:**  
Example: Western Great Plains Badlands
  - **Wetland Classes:**  
Example: Northern Rocky Mountain Wooded Vernal Pool
- 19 other land cover classes:
  - Developed (4)
  - Introduced vegetation (5)
  - Burned (3)
  - Harvested (3)
  - Agriculture (2)
  - Water, geysers





## Montana Field Guide

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### Kingdom

#### Animals - *Animalia*

(Latin - breath, soul): Multicellular organisms that develop from the fertilization of an egg by a sperm. Heterotrophic (obtain food by ingestion).



#### Plants - *Plantae*

(Latin - plant): Multicellular organisms that are autotrophic (make complex "food" molecules from basic constituents). Most use photosynthesis.



#### Lichens - *Fungi*

(Latin, derived from Greek - sp(h)onges, sponges): Obtain food through absorption, excrete enzymes for digestion. Ex: molds, mushrooms, lichens.



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Welcome to the new website hosting our Montana Field Guides. These guides and this website are a collaborative effort between the Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. The Animal Field Guide provides information on identification, habitat, ecology, reproduction, range, and distribution of Montana's animals; new features include a hierarchal approach to finding an animal of interest, thumbnail photos of the animals and additional links. The Plant Field Guide offers information on plant species of concern, including references and photographs.

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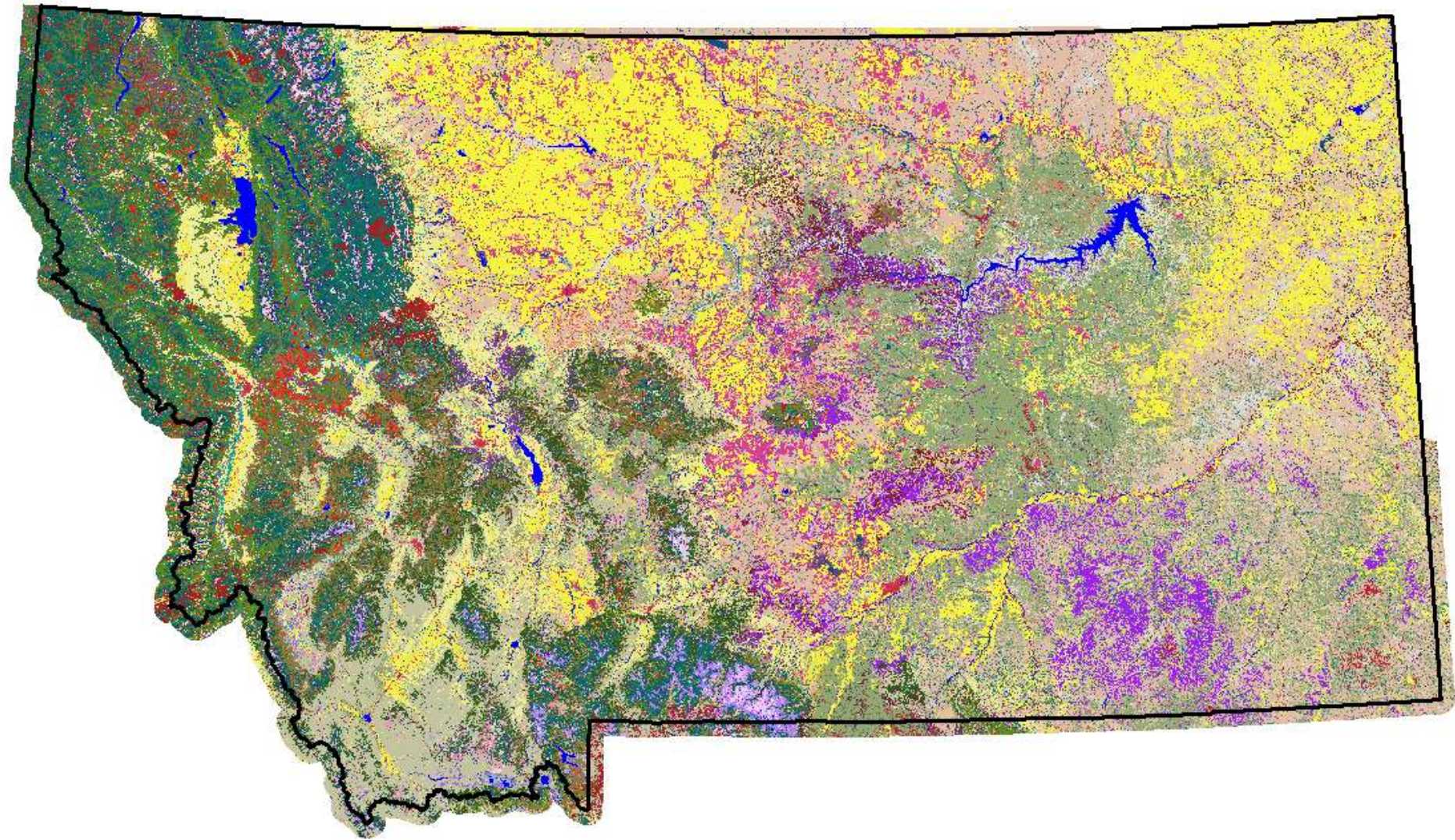


DISCOVER MONTANA'S  
EcoSYSTEMS!



New ecological systems  
field guide will go here





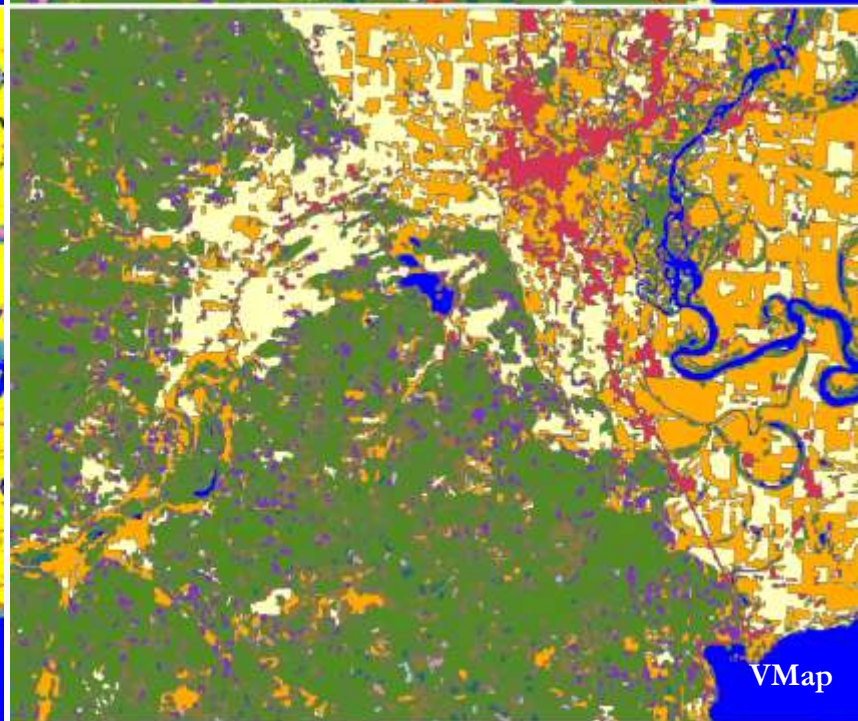
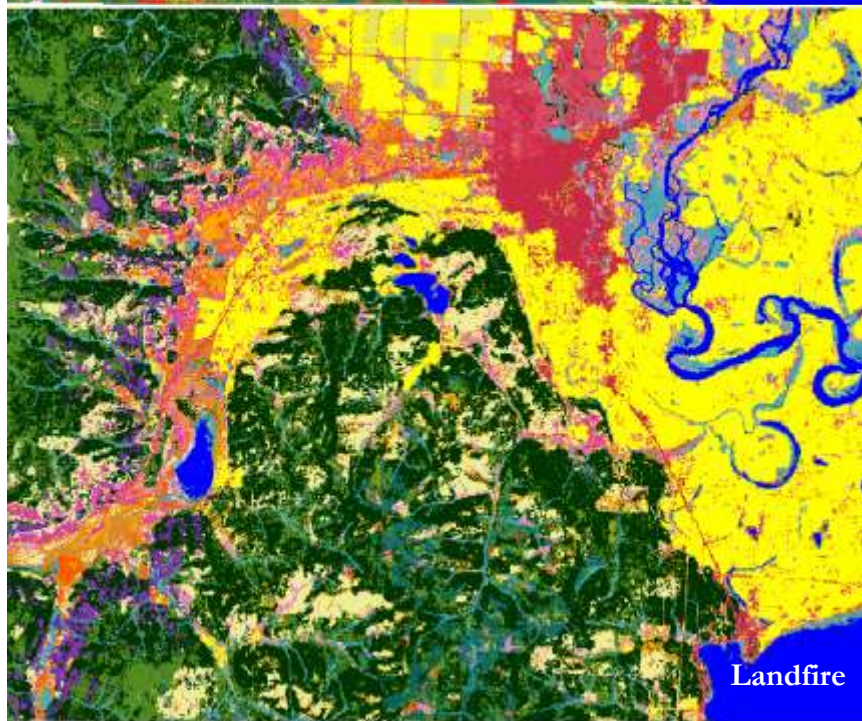
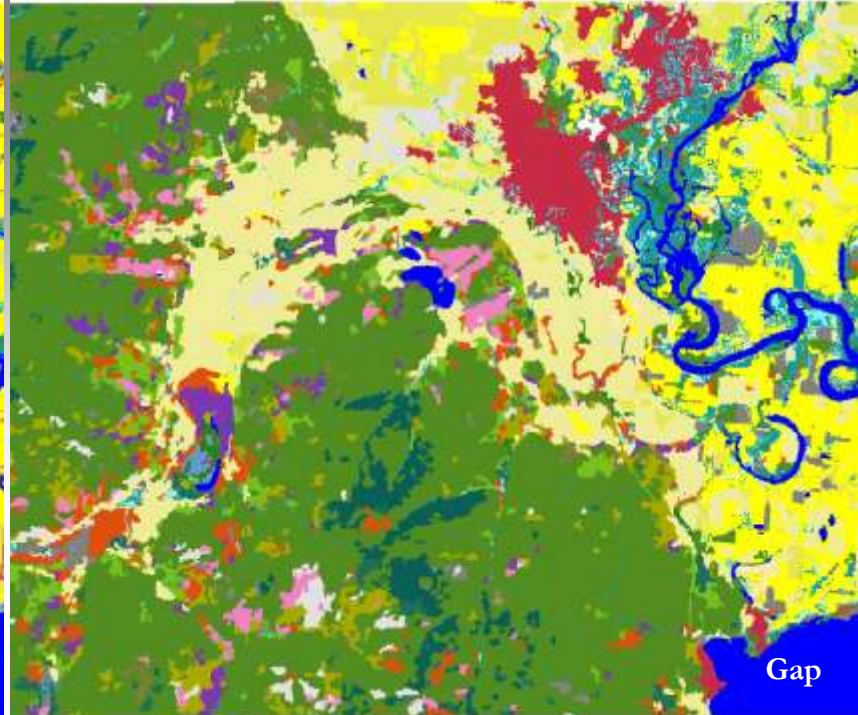
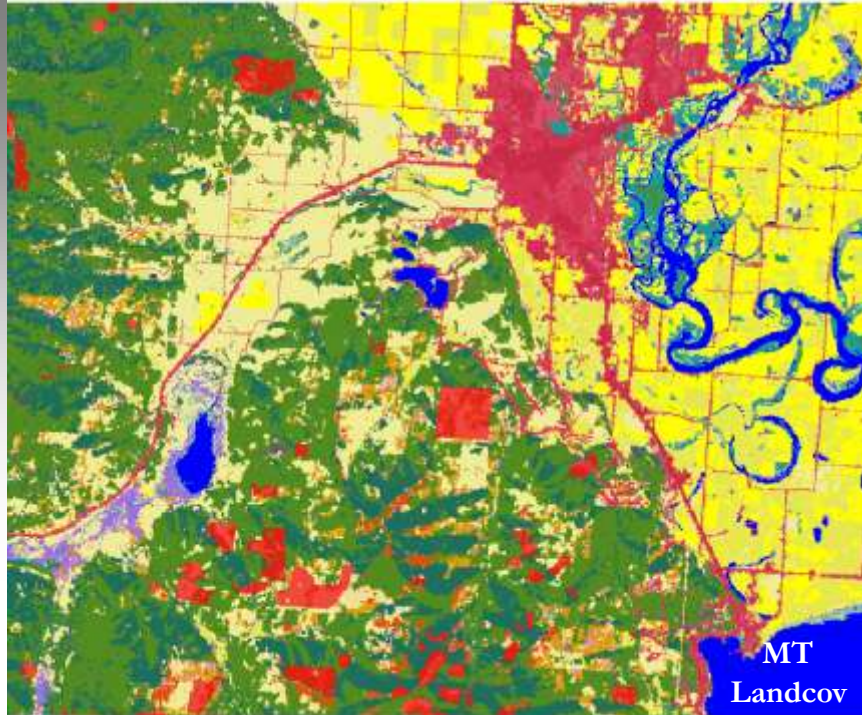


# Comparison with other landcover maps

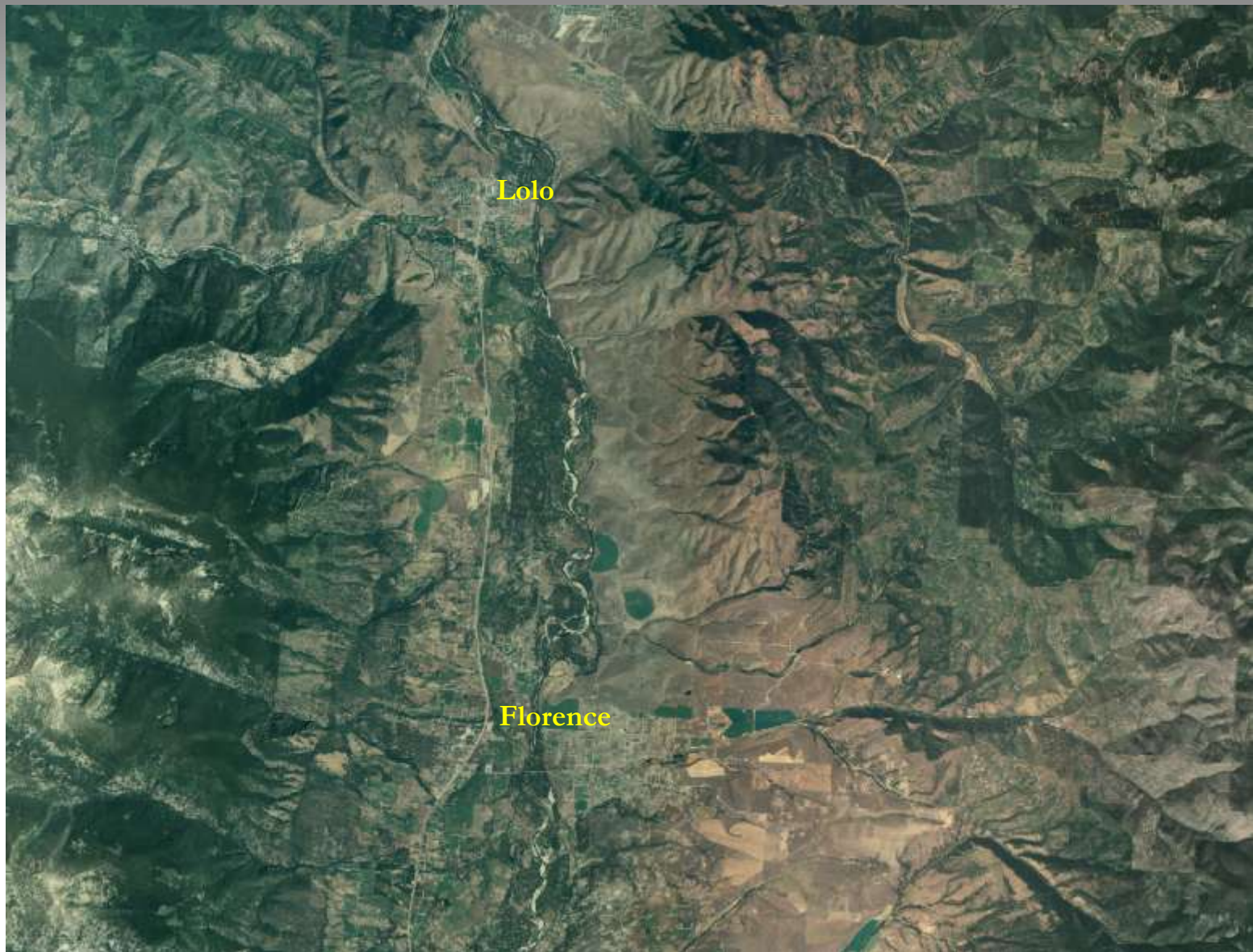
	<b>MT Landcover</b>	<b>MT-Gap</b>	<b>LandFire EVT</b>	<b>Westside VMap 09</b>
<b>Originator</b>	NWGap (U. Idaho)/Sanborn; MTNHP (steward)	WSAL (UM)	Wildland Fire Management Programs	USFS Region 1
<b>Year published</b>	2009	1998	2006	2009
<b>Methods</b>	Supervised classification with CART	Unsupervised & supervised classification	Supervised classification with CART	Multiresolution segmentation
<b>Software</b>	Imagine/See5	Imagine/home-made classifier	Imagine/See5	eCognition
<b>Base data</b>	Landsat ETM+ ca 2000	Landsat TM 1992	Landsat ETM+ ca 2000	Landsat ETM+ 2001-2002
<b>Classification</b>	Ecological Systems	Mix of lifeforms and species	EVT (based on Ecological Systems)	Tree Dominance Type; lifeform
<b>AA area</b> * <b>Fuzzy</b> * <b>Deterministic</b>	20, 22, 29, 30 >80% >60%	Montana 88.8% 61.4%	10, 19, 20, 21, 22 55.6% 31.9%	Region 1 (2004) 67.8% 54.5%



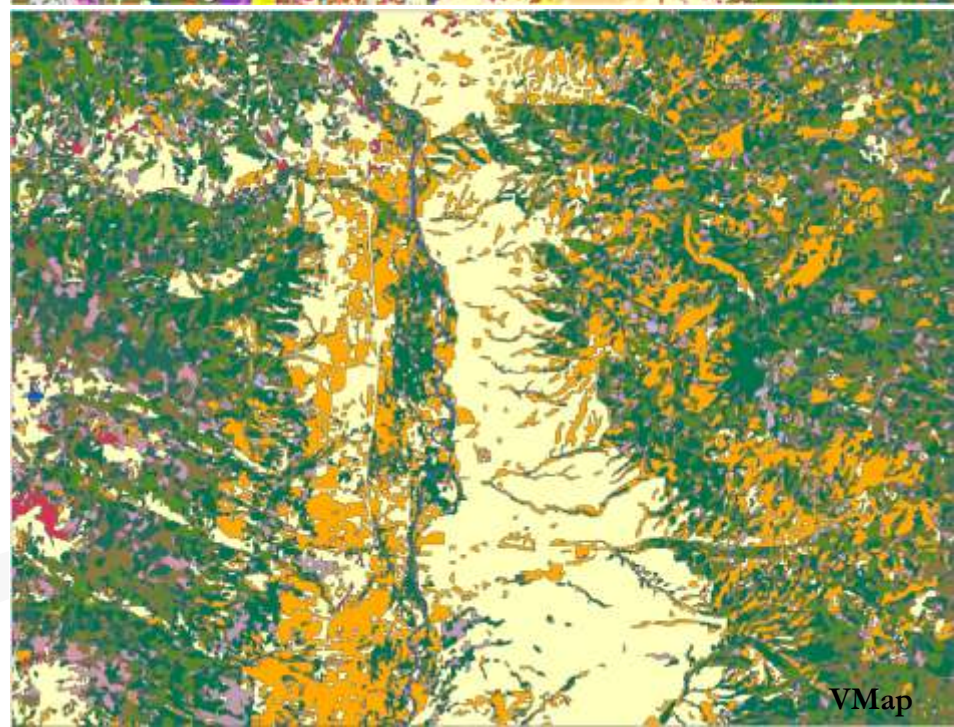
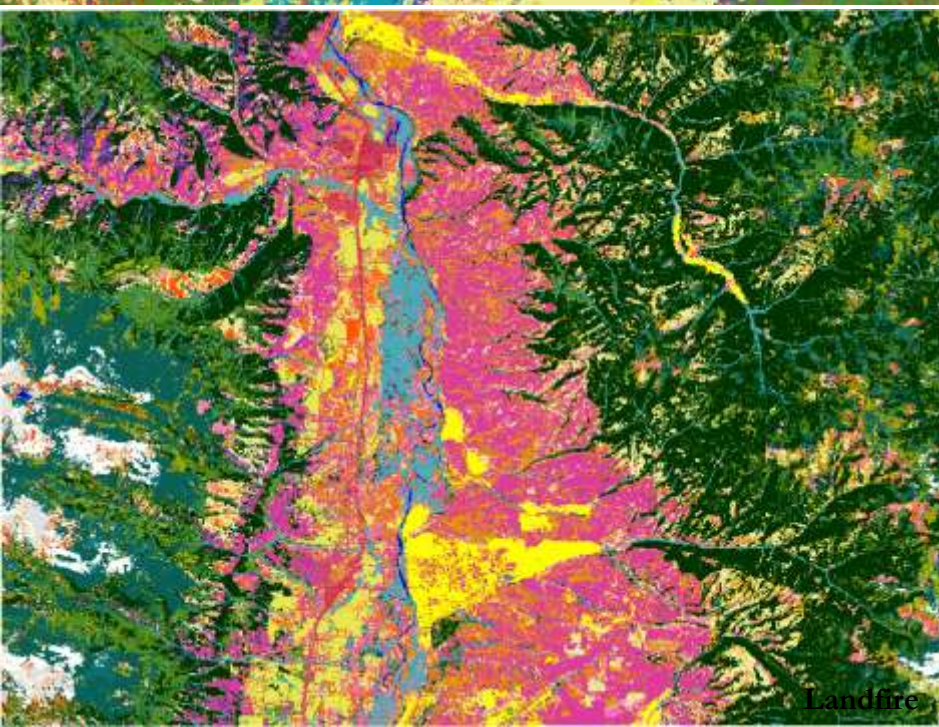
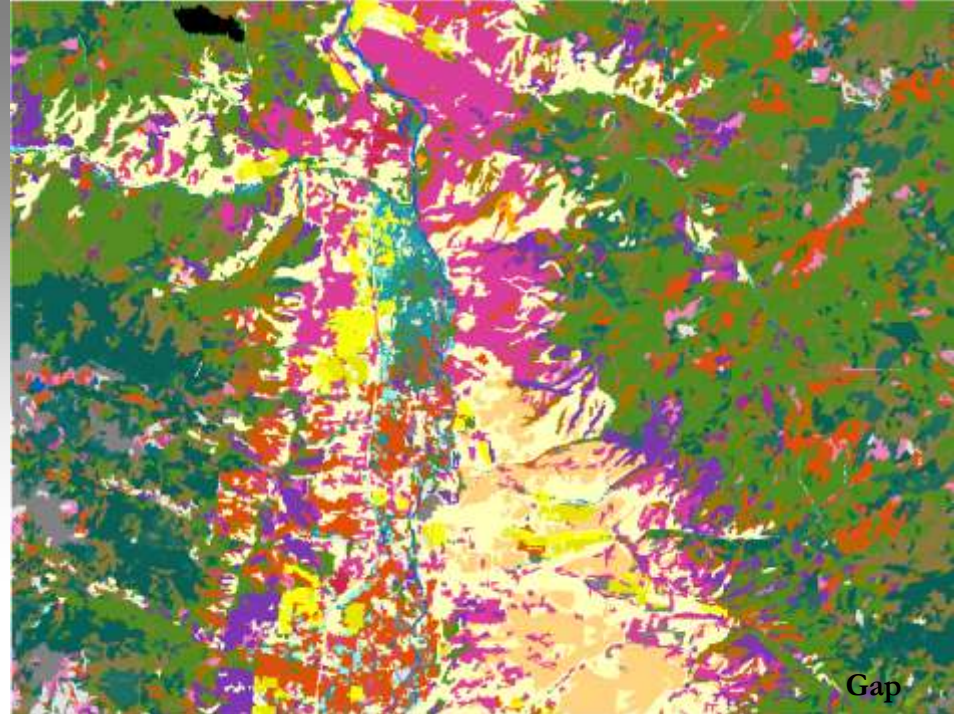
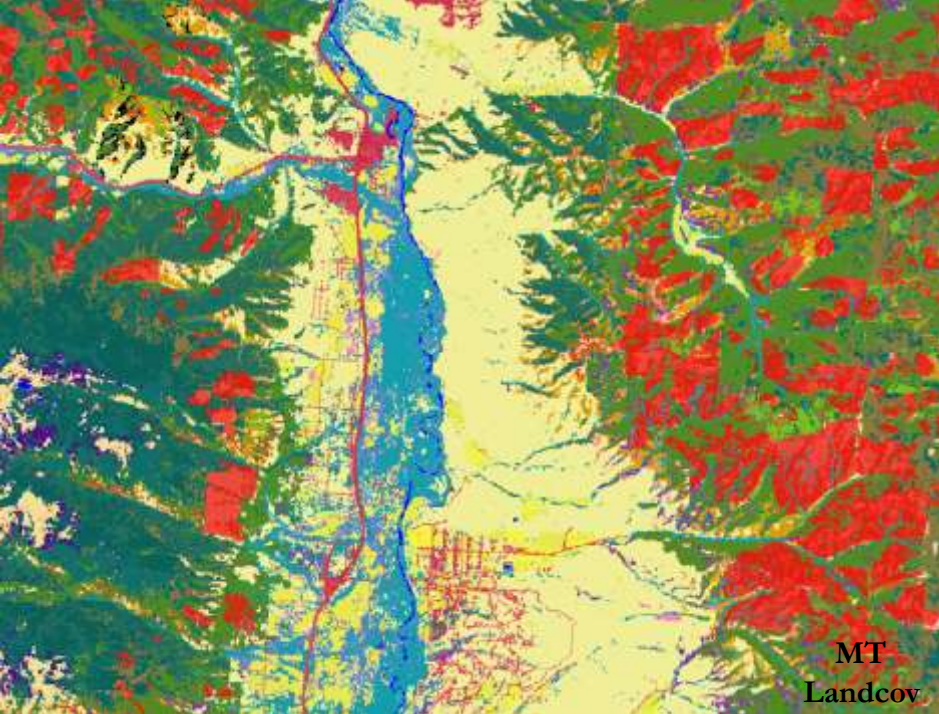




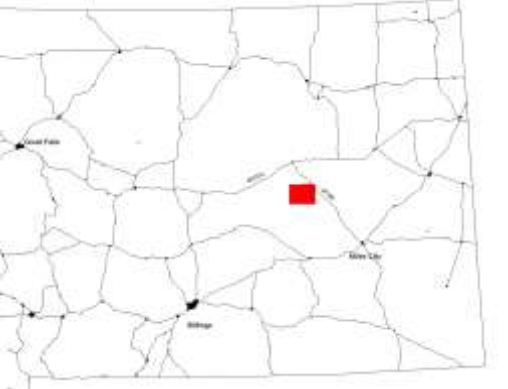






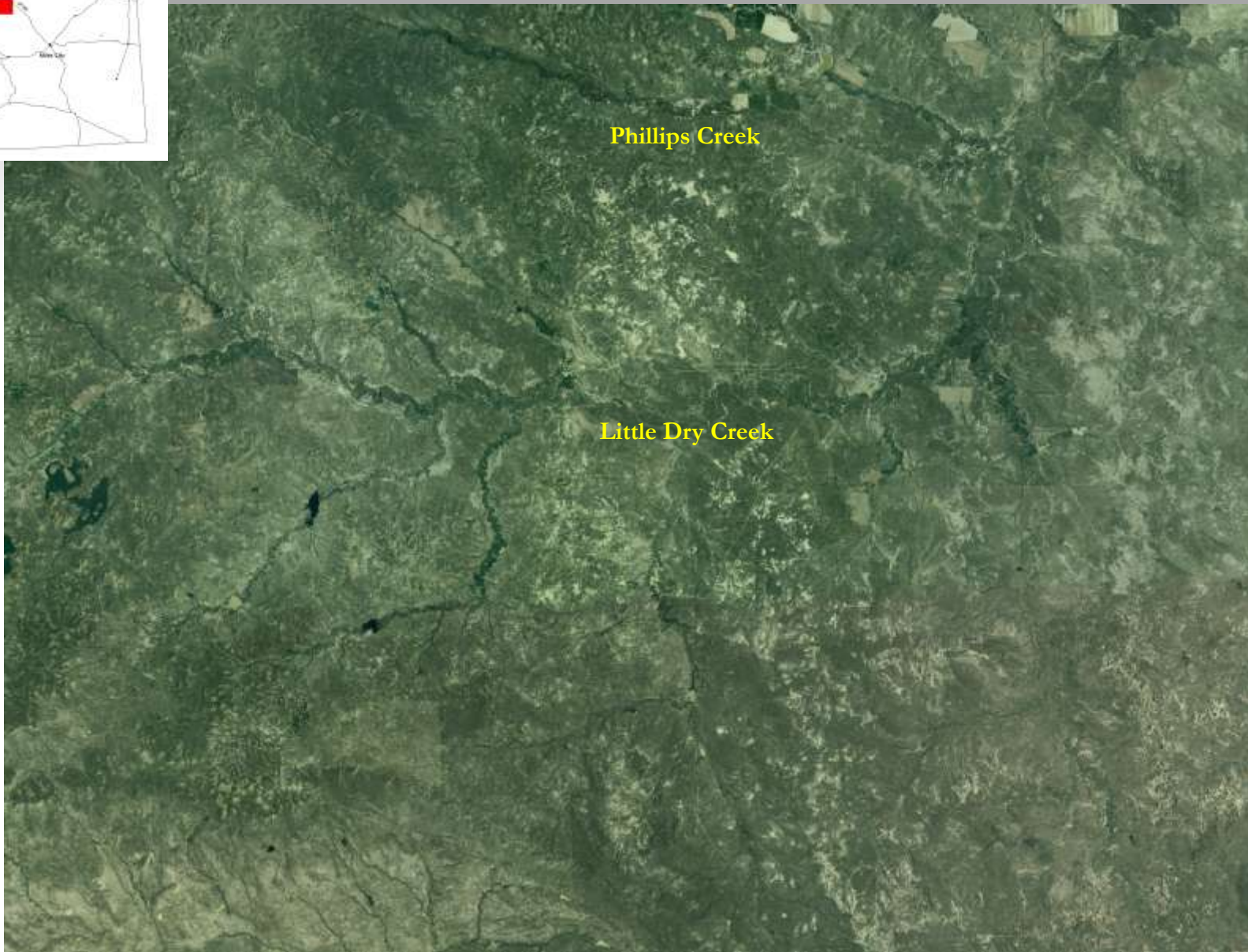




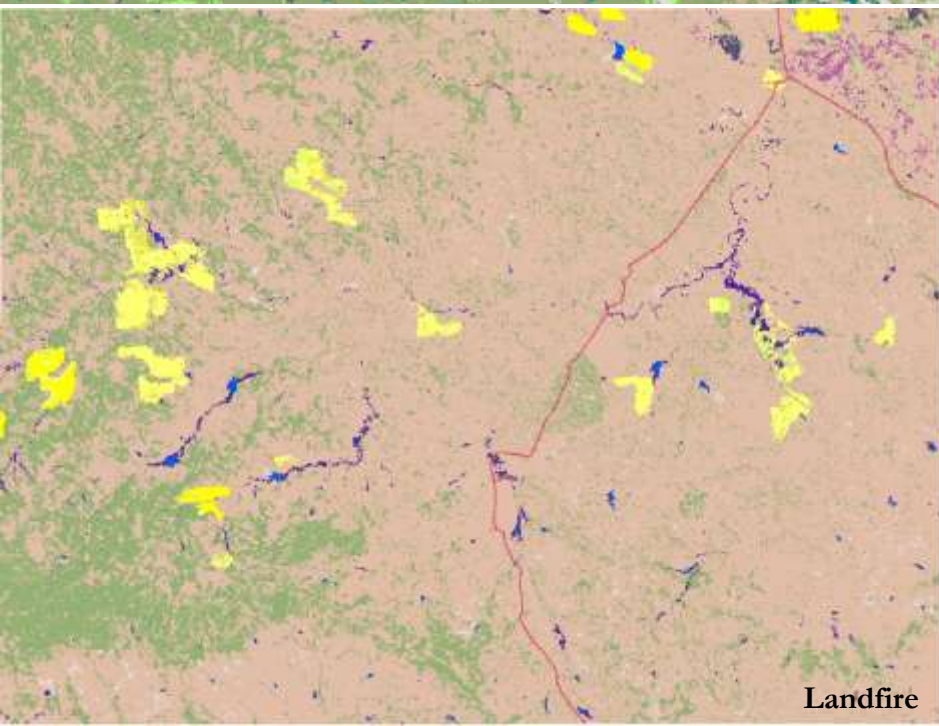
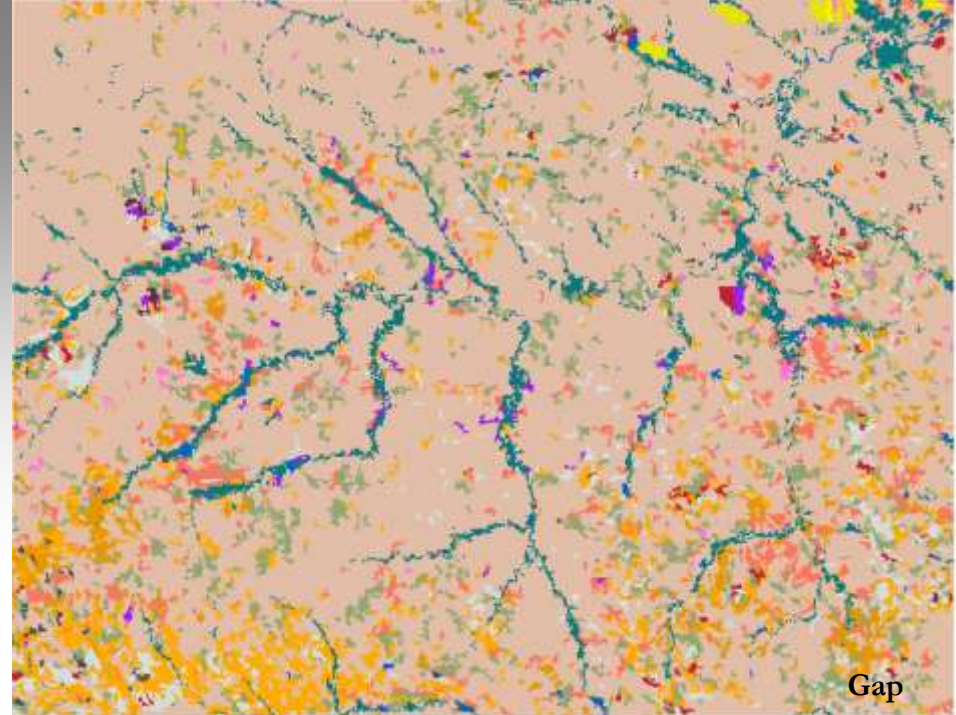
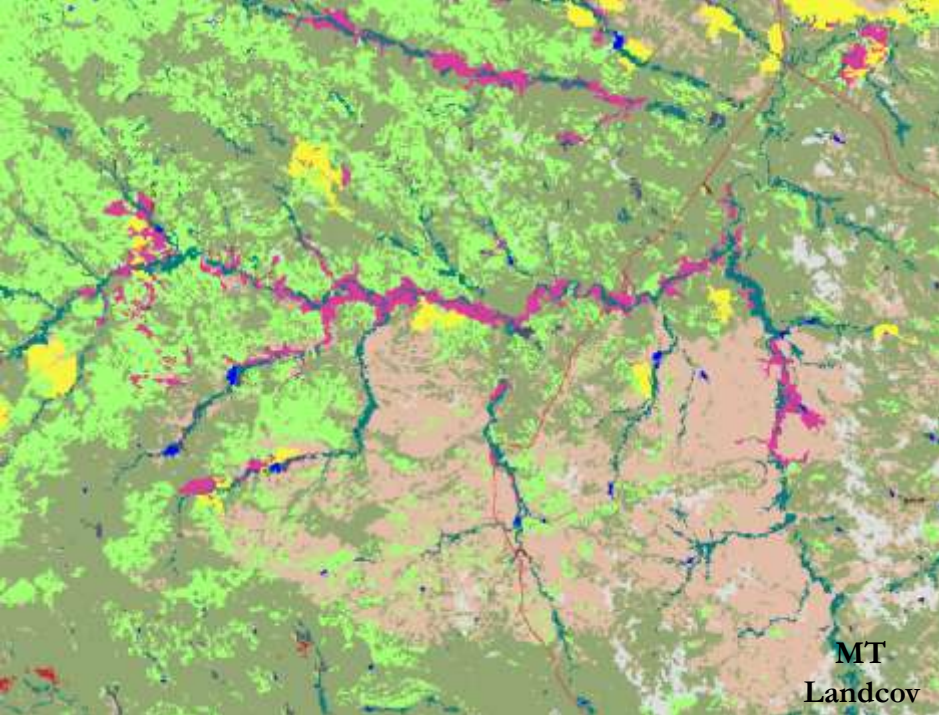


Phillips Creek

Little Dry Creek









# Upcoming updates/questions

- Improve mapping of critical areas that are not well modeled:
  - Riparian/wetland: pilot study: use NAIP and eCognition in Upper Clark Fork and Flint/Rock Creek HUC4.
  - Cliffs and canyon: base model on 10m DEM.
- “Burn in” recent fire perimeters, DOR agriculture?
- Data will be served as raster on NRIS Raster Service; download: what scale (ecoregion, county?)
- Technical committee?

# Accessing the data...

- Go to <ftp://nris.mt.gov/>
- Open ftp site in Windows Explorer
- Download MSDI\_Landcover.zip