Production of the Missouri Land Cover Data Layer
Brief Notes 1/00

DRAFT

This land cover data layer was derived from Thematic Mapper (TM) satellite data from 1991, 1992, and 1993 (listed below). For most scenes, two dates of acquisition for each path and row were merged and the classification produced as follows:

Image Processing

1. We evaluated the band correlation for each TM scene.
2. The three most unrelated bands were identified and extracted, and two dates were merged to form a six-band data set.
3. We ran an unsupervised classification using ERDAS Imagine software on the product derived from steps 1 and 2 to identify 60 spectral clusters per image.
4. We initially assigned land cover classes to each spectral class for each scene using expert knowledge (views of the classified and raw images on screen) plus views of NAPP photographs from 1992. We then intersected ecological subsections with the classification in order to carry forward with collection of ground-based data, and to refine the classification by re-assigning land cover class by subsection for each image as needed.
5. We segmented the images by ecological subsection and created maps of the initial classification results, field data collection forms, and a protocol to collect on-the-ground data. Our goal was to check several examples of the land cover class assignment for each spectral class within each ecological subsection of Missouri for all images. More than 100 biologists collected data on more than 10,500 polygons (marked in USGS 7.5' quadrangles); each polygon represented a cluster of pixels from one spectral class.
6. We developed a Microsoft Access database to manage and to analyze the field data. These data and further review of photographs and expert opinion were used to derive the final classification results. This map finalization process involved many hours of on-screen review and revision. To make the final land cover assignments for areas where scenes overlapped, we gave confidence ratings to each spectral cluster for each image, and we defined the order of image overlap. Hence, each pixel got a unique cover class assignment based on our confidence rating for individual images plus the order of overlap of images (if confidence ratings were equal but cover class assignments different for a given pixel, the 'tie' was decided based on the order of overlap of images).

List of Thematic Mapper Scenes

Scene	Path	Row	Date (yr/m/d)
1	23	34	910106
2	23	34	931015
3	23	35	921012
4	23	35	930422
5	24	33	910814
6	24	33	911017
7	24	35	921003
8	24	35	910421
9	24	35	930616
10	25	32	920503
11	25	32	920924
12	25	33	920503
13	25	33	920924
14	25	34	920503
15	25	34	920924
16	25	35	920503
17	25	35	920924
18	25	35	930927
19	26	32	921001
20	26	32	920323
21	26	33	910929
22	26	33	910406
23	26	34	920814
24	26	34	920323
25	26	35	920713
26	27	32	920501
27	27	32	920821
28	27	33	920314
29	27	33	920821
30	24	34	921003

Post-processing

Forty-four land cover classes were assigned based on the process described above. We merged these to form 16 cover classes in this version of the classification results (see land cover table below). In addition, the original 30-meter pixel resolution database was modified to reduce noise using an AML in Arc/Info (available on request; see contact information below). All regions with fewer than four contiguous 30-meter cells were converted to No Data. The No Data cells were filled with the majority surrounding class. If no majority class

could be identified, then the No Data designation was conserved. These remaining No Data cells were assigned a cover class based on the nearest neighbor as calculated using Euclidean distance (e.g. closer to 'true distance' versus cell-based distance).

Land Cover Classification

The land cover classification was produced via interagency committee. Our goal was to follow the hierarchical scheme outlined in the National Vegetation Classification first produced by The Nature Conservancy and later modified by a working group of the Ecological Society of America. This scheme was molded in an iterative way by the committee as dictated by the results of the unsupervised classification. Following is the current classification with short descriptive notes:

A Land Cover Classification Table appears at the end of this document. Class names in bold represent the land cover classes within this data layer. Names in regular font represent more detailed cover classes that comprise these more-aggregated types. Brief descriptions accompany each named land cover type.

Caveat:

Other versions of land cover were produced using these data and were distributed on a limited basis. In particular, a 44-class statewide land cover was distributed to MoRAP partners, generally without post-processing. In the future, customized versions may be produced on a limited basis; for example, we anticipate that a few single TM scene classifications will be distributed. If you are viewing on of these customized versions, and need more information, see the GIS/Remote Sensing coordinator within your organization/agency or contact MoRAP. *Optimal use for TM-based classifications such as this are at map scales of 1:100,000 or larger, and we generally discourage it's use above a scale of 1:50,000.*

Contact Information:

Missouri Resource Assessment Partnership
4200 New Haven Road
Columbia, MO 65201

573/876-1834

Class #	Name	Brief Description
1	**Urban Impervious**	
2	**Urban Vegetated**	Vegetated urban environments including small parks, tree lined streets, and yards.
	High Intensity Urban	Vegetated urban environments with a high density of buildings.
	Low Density Urban	Vegetated urban environments with a low density of buildings.
3	**Barren or Sparsely Vegetated**	Minimally vegetated areas including bluffs, quarries, and natural expanses of rock, mud, or sand.
	Sparsely Vegetated Bluff/cliff/quarry	Minimally vegetated areas associated with bluffs, quarries, and natural expanses of rock.
	Sparsely Vegetated Gravel/cobbles/talus	Minimally vegetated areas associated with gravels and other fragmented rock surfaces.
	Sparsely Vegetated Sand/Mud/Soil	Minimally vegetated areas associated with sand/mud/soil such as sand or mud bars.
4	**Row and Close-grown Crops**	Cropland including row, close-grown, and forage crops.
5	**Cool-season Grassland**	Mainly non-native, cool-season grass (tall fescue, smooth brome) pasture with less than 10% tree or shrub cover.
	Broomsedge/Fescue Grasslands	Non-native, cool-season grass pasture with a substantial component of broomesedge.
	Non-Native (mainly tall fescue) Grasslands	Mainly non-native, cool-season grass (tall fescue, smooth brome) pasture with less than 10% tree or shrub cover.
6	**Warm Season Grassland**	Grasslands dominated by native warm season grasses including prairie and plantations.
	Warm Season Grassland (General)	Grasslands dominated by native warm season grasses including prairie and plantations.
	Warm Season Plantation Grassland	Plantations of native warm season grass.
7	**Glade Complex**	Native grassland and/or woodland mosaic with bedrock near the surface.
	Eastern Redcedar Glade Woodland	Native glade/woodland complex with 20-80% cover of eastern redcedar.
	Eastern Redcedar-Hardwood Glade Woodland	Native glade/woodland complex with 20-80% cover of mixed eastern redcedar and deciduous trees and shrubs.
	Oak Glade Woodland	Native glade/woodland complex with 20-80% cover of deciduous trees and shrubs.

	Bluestem Glade Grasslands	Native glade dominated by grass and less than 20% cover of woody species.
8	**Eastern Redcedar and Redcedar-Deciduous Forest and Woodland**	Old fields and native woodlands with 20-100% cover of eastern redcedar or mixed redcedar and deciduous trees and shrubs.
	Eastern Redcedar Old Field Forest	Old fields, fence lines and invaded draws with >80% cover of eastern redcedar .
	Eastern Redcedar Old Field Woodland	Old fields, fence lines and invaded draws with 30-80% cover of eastern redcedar.
	Eastern Redcedar Sparse Old Field Woodland	Pastures, old fields, fence lines, and invaded draws with 10-30% cover of eastern redcedar.
	Eastern Redcedar-Hardwood Old Field Sparse Woodland	Pastures, old fields, fence lines, and invaded draws with 10-30% cover of mixed eastern redcedar and deciduous trees and shrubs.
	Eastern Redcedar-Hardwood Old Field Forest	Old fields, fence lines, and invaded draws with 80% cover of mixed eastern redcedar and deciduous trees and shrubs.
	Eastern Redcedar-Hardwood Old Field Woodland	Old fields, fence lines, and invaded draws with 30-80% cover of mixed eastern redcedar and deciduous trees and shrubs.
	Eastern Redcedar (mainly non-invasive) Woodland	Mainly native woodlands with 30-80% cover of eastern redcedar; often on steep carbonate slopes and blufftops.
	Eastern Redcedar-Hardwood (mainly non-invasive) Forest	Mainly native woodlands with >80% cover of eastern redcedar; often on steep carbonate slopes and blufftops.
	Eastern Redcedar-Hardwood (mainly non-invasive) Woodland	Mainly native woodlands with >80% cover of mixed eastern redcedar and deciduous trees and shrubs; often on steep carbonate slopes and blufftops.
9	**Deciduous Woodland**	Native and old field woodlands with 30-80% cover of deciduous trees and shrubs.
	Mixed Hardwood Invasive Woodland	Pastures, old fields, fence lines, and invaded draws with 30-80% cover of deciduous trees and shrubs.
	Mixed Hardwood Invasive Sparse Woodland	Pastures, old fields, fence lines, and invaded draws with 10-30% cover of deciduous trees and shrubs.
	Mixed Oak (Burr, White, Black) Woodland	Native oak woodlands with 30-80% cover of oak trees.
	Deciduous (mainly oak) Sparse Woodland	Native oak woodlands with 10-30% cover of oak trees.
	Deciduous Shrubland	Pastures, old fields, fence lines, and invaded draws with 30-80% cover of mixed eastern redcedar and deciduous trees and shrubs.
10	**Deciduous Forest**	Native forests with > 80% cover of deciduous trees.

	Mixed Hardwood Forest	Native mixed forests with >80% cover of oak and mixed hardwood tree species; often on protected slopes.
	Mixed Oak Forest	Native forests with > 80% cover of oak trees.
	Post Oak Forest	Native forests with > 80% cover of post (and black) oak trees; identified mainly on high flat plains in Ozarks.
11	**Shortleaf Pine-Oak Forest and Woodland**	Native forests (>80% tree cover) and to a lesser extent woodland (30-80% tree cover) with 25-75% of the tree cover shortleaf pine.
	Shortleaf Pine-Oak Forest	Native forests (>80% tree cover) with 25-75% of the tree cover shortleaf pine.
	Shortleaf Pine-Oak Woodland	Native woodlands (30-80% tree cover) with 25-75% of the tree cover shortleaf pine.
12	**Shortleaf Pine Forest and Woodland**	Native forests (>80% tree cover) and to a lesser extent woodland (30-80% tree cover) with >75% of the tree cover shortleaf pine.
	Shortleaf Pine Forest	Native forests (>80% tree cover) and to a lesser extent woodland (30-80% tree cover) with>75% of the tree cover shortleaf pine.
	Pine Plantations	Plantations of shortleaf pine.
13	**Bottomland Hardwood Forest and Woodland**	Native floodplain forests (>80% tree cover) and to a lesser extent woodland (30-80% tree cover) .
	River Front Forest	Native floodplain forests (>80% tree cover) dominated by willow, cottonwood, sycamore, and other streamside species.
	Bottomland Hardwood Forest	Native floodplain forests (>80% tree cover) dominated by oaks, sugar maples, walnut, and other bottomland trees of higher floodplains and terraces.
	Bottomland Hardwood Woodland	Native floodplain woodlands with 30-80% cover of bottomland trees; mainly associated with minor areas of flood killed timber.
14	**Swamp**	Native floodplain forests (>80% tree cover) and to a lesser extent woodland (30-80%tree cover) or shrubland (30-100% shrub cover) with semi-permanent flood waters.
	Forested Swamp	Native floodplain forests (>80% tree cover) and to a lesser extent woodland (30-80%tree cover) with semi-permanent flood waters.
	Shrub Swamp	Native floodplain shrubland (30-100% shrub cover) with semi-permanent flood waters.
15	**Marsh and Wet Herbaceous Vegetation**	Semi-permanently and seasonally flooded areas dominated by herbaceous vegetation.

	Marsh	Herbaceous dominated seasonally and semi-permanently flooded native marshes.
	Wet Herbaceous Vegetation	Wet areas with herbaceous vegetation, including some marshes, lake and river margins, and ephemeral wet spots in fields.
16	**Open Water**	Rivers, lakes, ponds, and other open water areas; identification of this type is influenced by rainfall/flooding events.

Example Merge #1

1	**Urban**
2	**Row and Close-grown Crops**
3	**Grassland**
4	**Forest and Woodland**
5	**Swamp and Marsh**
6	**Open Water**

Example Merge #2

1	**Urban**
2	**Row and Close-grown Crops**
3	**Grassland**
4	**Forest and Woodland**
5	**Open Water**