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A Comparison of Available National-Level Land Cover Data for National Park Applications

MRLC Briefing

March 11,2010

Objectives

- Context of Comparison
- Current status of NPScape (Landscape Dynamics) Project
- Examples of Landcover results
- Upcoming efforts
- Questions

Staff Involved

- Allison Lundeby/FTCOLLINS/NPS (SCEP)
- Brent Frakes/FTCOLLINS/NPS (GIS)
- John Gross/FTCOLLINS/NPS (Ecologist)
- Leona Svancara/Contractor/NPS (U of Idaho, Ecologist)
- Lisa L Nelson/FTCOLLINS/NPS (GIS)
- Mike Story/DENVER/NPS (Image Processing)
- Peter Budde/FTCOLLINS/NPS (GIS)
- Shepard McAninch/Atlanta/NPS (Network Manager)
- Thom Curdts/Partner/NPS (Image Processing)
- Tom Philippi/FTCOLLINS/NPS (Ecologist)
- Ursula Glick/Contractor/NPS (GIS Developer)

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Relevance of Project: Key Themes

- *Putting science* (landscape-level data/analyses) *into hands of park managers and planners* – signficant role in GMP and other planning activites (e.g., BITH)
- *IMD's role and involvement in multi-agency climate change response* – applicable to vulnerability assessments and subsequent adaptability / mitigation efforts
- Acknowledge influence of *external* changes to *internal resource* dynamics
- Take a *common, systemic approach* to high-priority vital sign for most, if not all, Networks

Goals of NPScape Project

- Help Networks and parks address issues related to landscape-level monitoring questions
- Anticipate climate change influences on park resources and management
- Provide resources and products that should be of use for other applications, e.g., GMPs, NRCAs, etc.

NPScape Products & Deliverables

- Development of *Measures* and respective *Metrics*
- For initial effort activities were focused on six measures:
  - Conservation Status
  - Housing
  - **Landcover**
  - **Pattern**
  - Population
  - Roads

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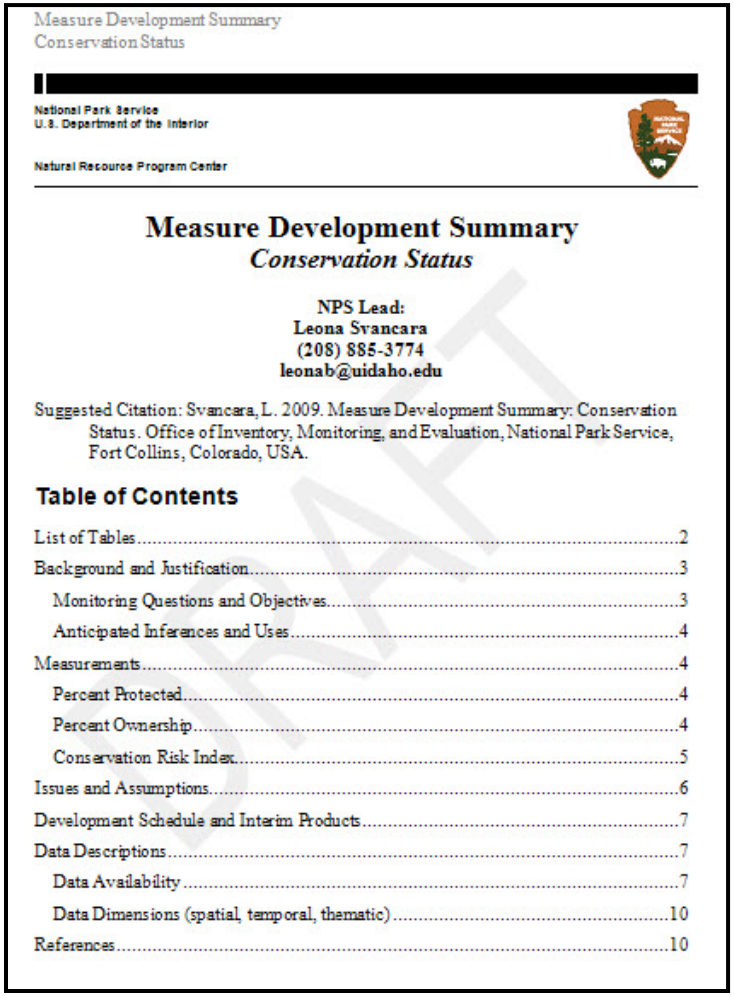
NPScape Products & Deliverables

- For each Measure, created a Measure Development Summary (MDS)
- MDS is fashioned after Protocol Development Summary (PDS)
- *Disclaimer:* Not a single new source data set was created or harmed in completion of this project!!!



Measure Development Summary
Conservation Status

National Park Service
U.S. Department of the Interior

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Measure Development Summary
Conservation Status

NPS Lead:
Leona Svancara
(208) 885-3774
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Suggested Citation: Svancara, L. 2009. Measure Development Summary: Conservation Status. Office of Inventory, Monitoring, and Evaluation, National Park Service, Fort Collins, Colorado, USA.

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Current Metrics

Measure - Metric
Conservation Status – Area Protected
Conservation Status – Ownership Area / Category
Conservation Status – Ownership
Housing – Current Density
Housing – Recent Change (1990-2000) in Density
Housing – Historic Density (100m cells)
Housing – Projected Density (100m cells)
Landcover – Percent Natural vs. Converted
Landcover – Change in Natural vs. Converted
Landcover – Area / Category
Landcover – Percent Impervious
Pattern– grassland morphology; # = edge width scale
Pattern – forest morphology; # = edge width scale
Pattern – patch size (grassland); # = edge width scale
Pattern – patch size (forest); # = edge width scale
Pattern – grassland density; # = moving window size
Pattern – forest density; # = moving window size
Population –Total; # = 1990, 2000
Population – Density; # = 1990, 2000
Population – Recent Change 1990-2000 (% total and density)
Population – Historic Change, by County
Population – Projected Change, by County (% total and density)
Roads – Road Density
Roads – Distance from Roads
Roads – Area without Roads

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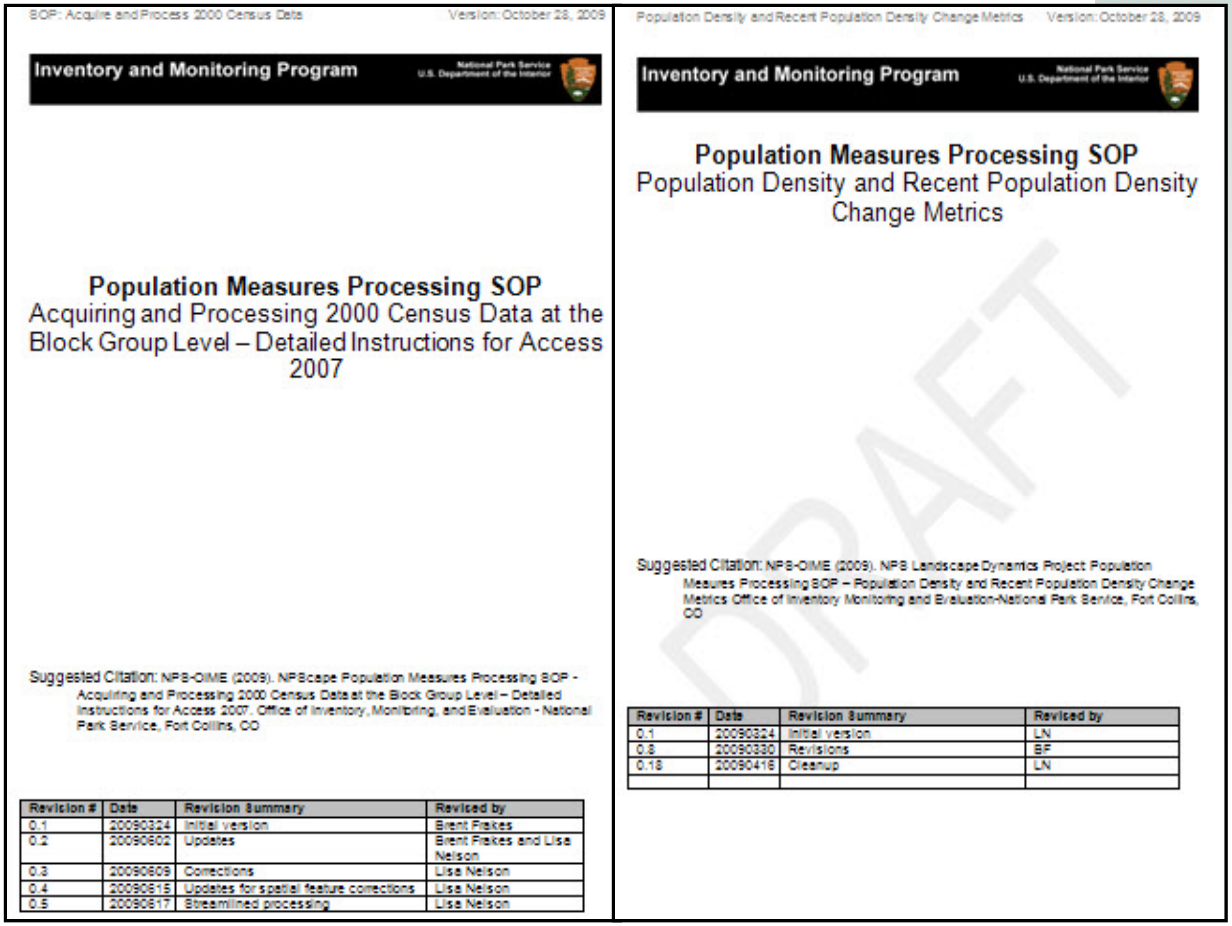
NPScape Products & Deliverables

- Documented procedures for data processing and metric calculation (SOPs)



SOP: Acquire and Process 2000 Census Data — Version: October 28, 2009

Inventory and Monitoring Program — National Park Service, U.S. Department of the Interior

Population Measures Processing SOP
Acquiring and Processing 2000 Census Data at the Block Group Level – Detailed Instructions for Access 2007

Suggested Citation: NPS-OIME (2009). NPScape Population Measures Processing SOP - Acquiring and Processing 2000 Census Data at the Block Group Level – Detailed Instructions for Access 2007. Office of Inventory, Monitoring, and Evaluation - National Park Service, Fort Collins, CO

Revision #	Date	Revision Summary	Revised by
0.1	20090324	Initial version	Brent Frakes
0.2	20090602	Updates	Brent Frakes and Lisa Nelson
0.3	20090609	Corrections	Lisa Nelson
0.4	20090615	Updates for spatial feature corrections	Lisa Nelson
0.5	20090617	Streamlined processing	Lisa Nelson

Population Density and Recent Population Density Change Metrics — Version: October 28, 2009

Inventory and Monitoring Program — National Park Service, U.S. Department of the Interior

Population Measures Processing SOP
Population Density and Recent Population Density Change Metrics

Suggested Citation: NPS-OIME (2009). NPS Landscape Dynamics Project Population Measures Processing SOP – Population Density and Recent Population Density Change Metrics. Office of Inventory Monitoring and Evaluation-National Park Service, Fort Collins, CO

Revision #	Date	Revision Summary	Revised by
0.1	20090324	Initial version	LN
0.8	20090330	Revisions	BF
0.18	20090416	Cleanup	LN

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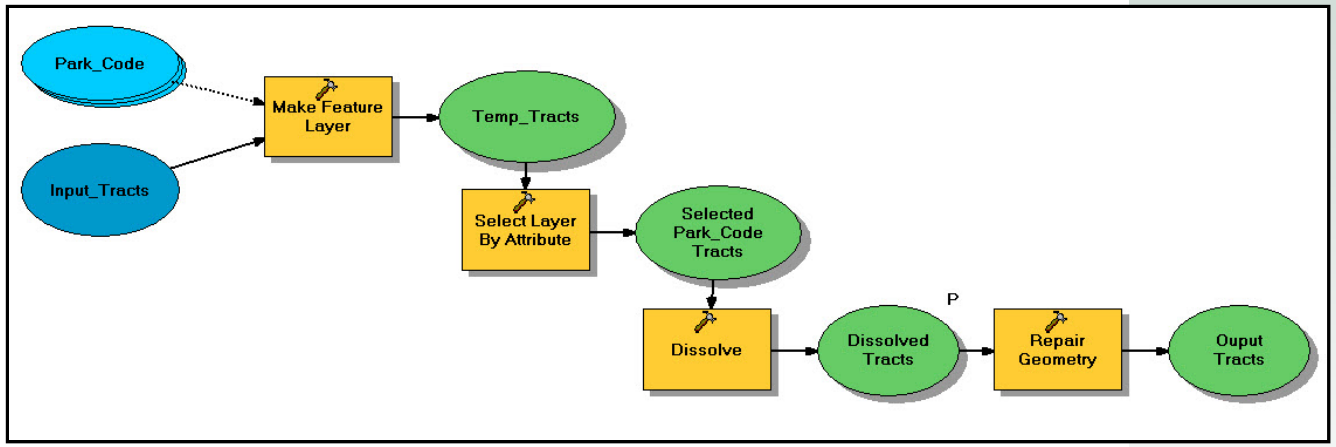
NPScape Products & Deliverables

- Geoprocessing tools and scripts




```
# Load required toolboxes...
gp.AddToolbox("C:/arcgis/ArcToolbox/Toolboxes/Analysis Tools.tbx")
gp.AddToolbox("C:/arcgis/ArcToolbox/Toolboxes/Conversion Tools.tbx")
gp.AddToolbox("C:/arcgis/ArcToolbox/Toolboxes/Data Management Tools.tbx")

Output_Feature_Class = Output_Workspace_or_Feature_Dataset + "\\" + NPS_Unit_Code + "_AOA_" + Layer_Suffix
nps_bound_all_albers_Layer = "nps_bound_all_albers_Layer"

# Process: Make Feature Layer...
Argument = "[UNIT_CODE] = '" + NPS_Unit_Code + "'"
gp.MakeFeatureLayer_management(Input_NPS_Feature_Class, nps_bound_all_albers_Layer, Argument, "", "UNIT_CODE UNIT_CODE VISIBLE NONE

# Process: Create 30km Buffer...
gp.Buffer_analysis(nps_bound_all_albers_Layer, Output_Feature_Class, BufferArea, "FULL", "ROUND", "NONE", "")

# Process: Add AOA_SQKM (4)...
gp.AddField_management(Output_Feature_Class, "AOA_SQKM", "DOUBLE", "8", "3", "", "", "NULLABLE", "NON_REQUIRED", "")
```

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NPScape Products & Deliverables

- Geoprocessing tools and scripts ready to run iteratively!

```
#YOU WILL NEED TO EDIT THE FOLLOWING PATHS
Unit_Code = "ACAD"
Input_AOA_Feature_Class = "C:\\NPSCAPE\\Reference\\AOA_Features_Preliminary.gdb\\AOA_30km\\ACAD_AOA_30km"

NLCD_1992_Dataset = "C:\\NPSCAPE\\Landcover\\SourceData\\lac_nlcd1992_conus.img"
NLCD1992_Reclass1 = "C:\\NPSCAPE\\Landcover\\SourceData\\lac1992_recode_level1classes.dbf"
NLC1992_Reclass2 = "C:\\NPSCAPE\\Landcover\\SourceData\\lac1992_recode_level2classes.dbf"

NLCD_2001_Dataset = "C:\\NPSCAPE\\Landcover\\SourceData\\NLCD_USA.img"
NLCD2001_Reclass1 = "C:\\NPSCAPE\\Landcover\\SourceData\\lac2001_recode_level1classes.dbf"
NLCD2001_Reclass2 = "C:\\NPSCAPE\\Landcover\\SourceData\\lac2001_recode_level2classes.dbf"

LCC_Dataset = "C:\\NPSCAPE\\Landcover\\SourceData\\lcc_conus.img"
LCC_ReclassTable = "C:\\NPSCAPE\\Landcover\\SourceData\\lcc_recode_nc_change.dbf"

LNC_Reclass_Table = "C:\\NPSCAPE\\Landcover\\SourceData\\lnc_recode_2classes.dbf"

LPI_Dataset = "C:\\NPSCAPE\\Landcover\\SourceData\\LPI_conus.img"
LPI_Reclass_Table = "C:\\NPSCAPE\\Landcover\\SourceData\\lpi_recode.dbf"

NPScape_LandcoverProduct_Template_xml = "C:\\NPSCAPE\\Landcover\\SourceData\\NPScape_LandcoverProduct_Template
LogFile = "C:\\NPSCAPE\\Landcover\\LandcoverLogfile.txt"
Output_Workspace_or_Feature_Dataset = "C:\\NPSCAPE\\Landcover\\ProcessedData"

#END OF REQUIRED MODIFICATIONS
##########################################################################################


from lac_AOACalculate_AreaPerCategory import lac_AOACalculate_AreaPerCategory
from lcc_AOACalculate_ChangeNaturalConverted import lcc_AOACalculate_ChangeNaturalConverted
from lnc_NaturalConverted import lnc_NaturalConverted
from lpi_AreaPerCategory import lpi_AreaPerCategory
from NPScape_Utilities import *
```

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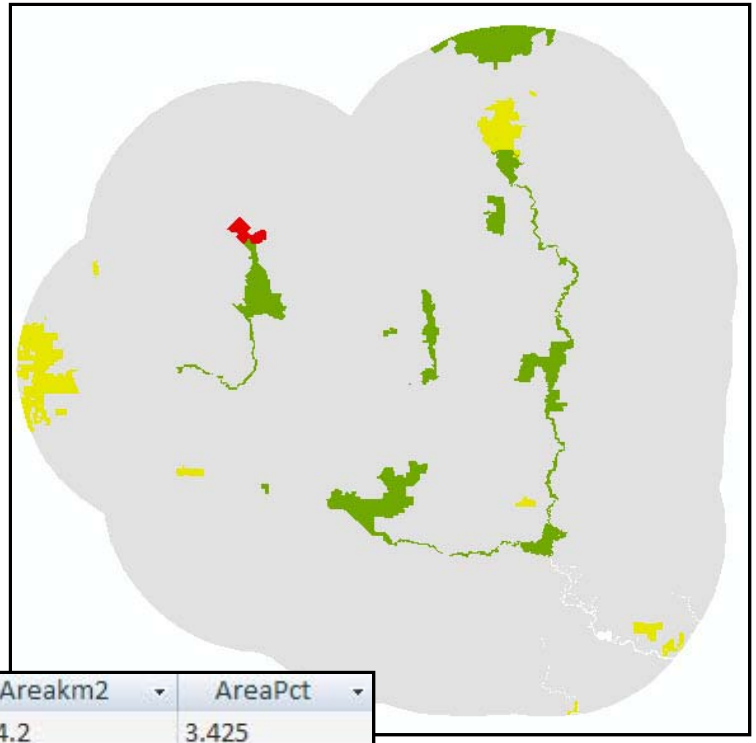
NPScape Products & Deliverables

- Processed data and analyses (output GIS format and statistical summaries)



UnitCode	OWNER_TYPE	FREQUENCY	Areakm2	AreaPct
BITH	Federal	1	474.2	3.425
BITH	Native American	1	18.7	0.135
BITH	Non-Federal Public	1	217.0	1.567
BITH	Private	1	13,170.1	95.114

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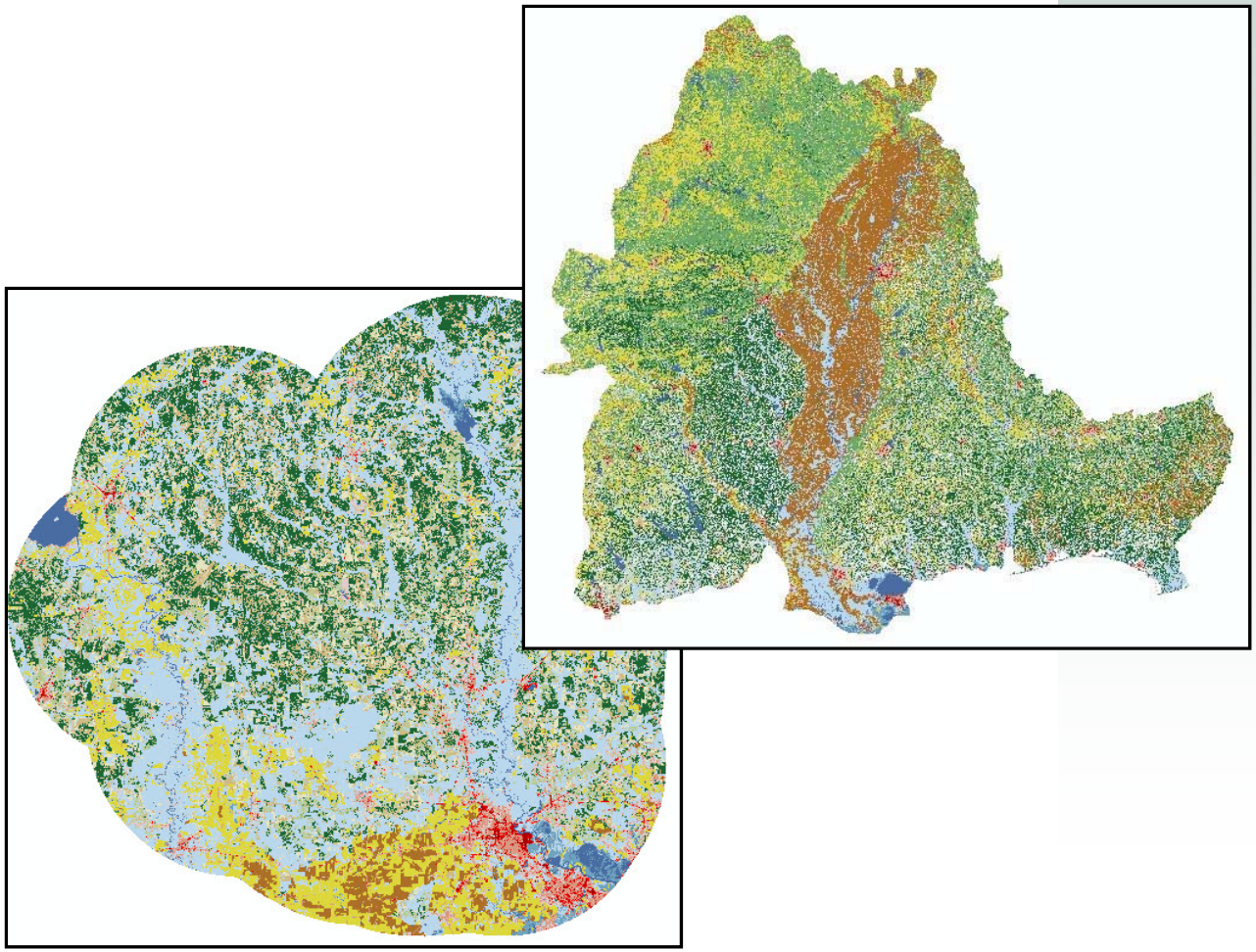
- Procedures replicated for two distinct geographies, i.e., 30 KM, and USFWS National Geographic Areas



NPScape Products & Deliverables

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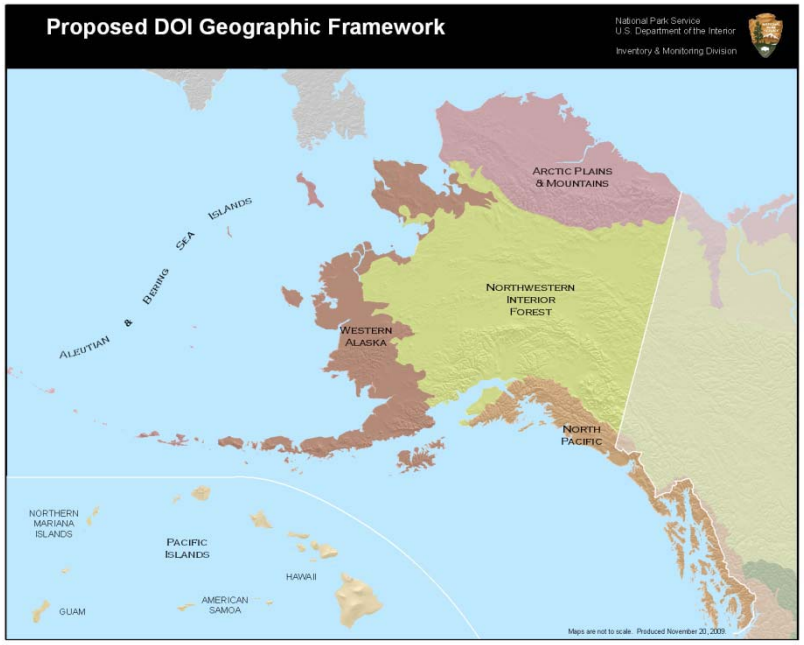

- Proposed DOI Geographic Frameworks

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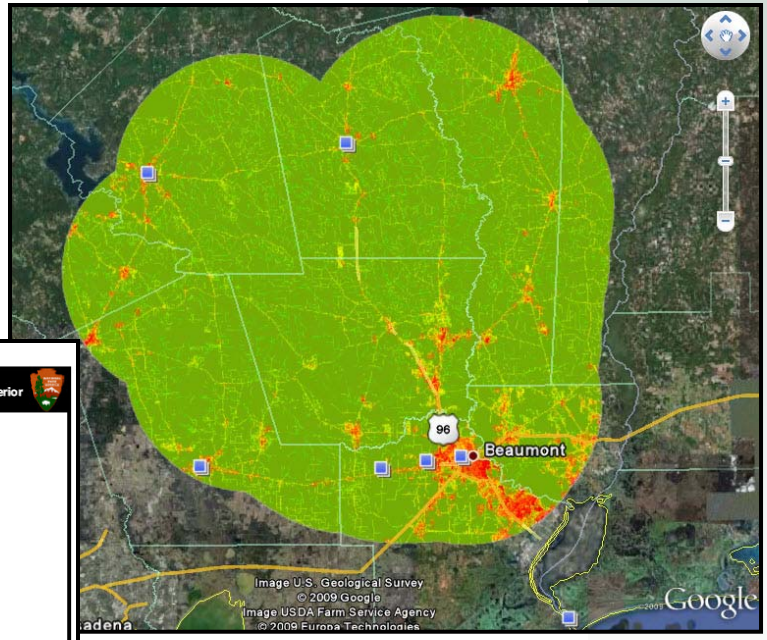
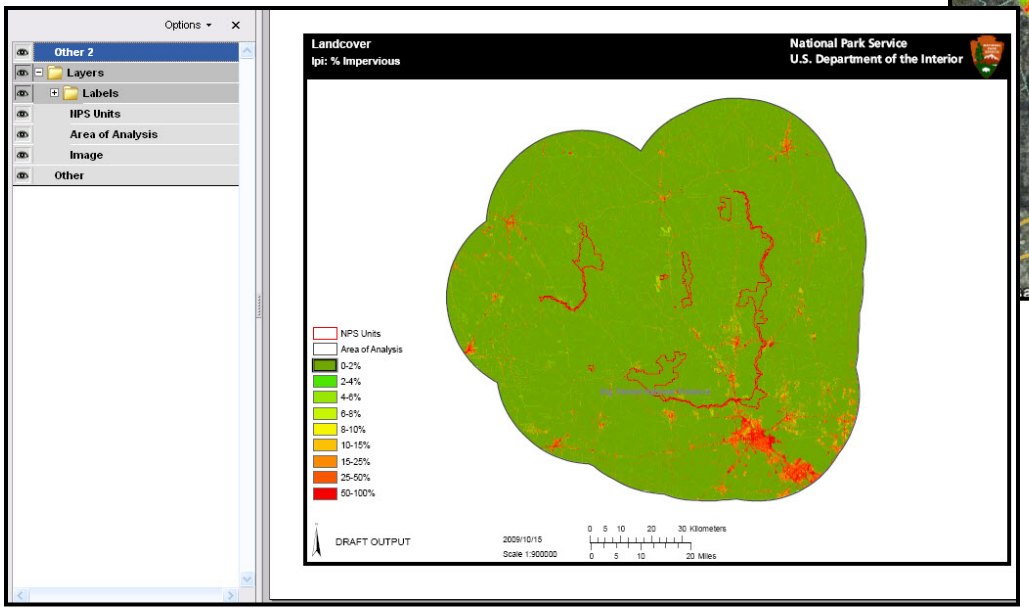
- Output products, including MXDs, MXTs, geo-enabled PDFs, PNGs, KMLs, etc.





Greater range of usage for non-GIS community

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- Tools to automate output product generation
- Approximate number of output files (280 parks * 195 files = 54,000)

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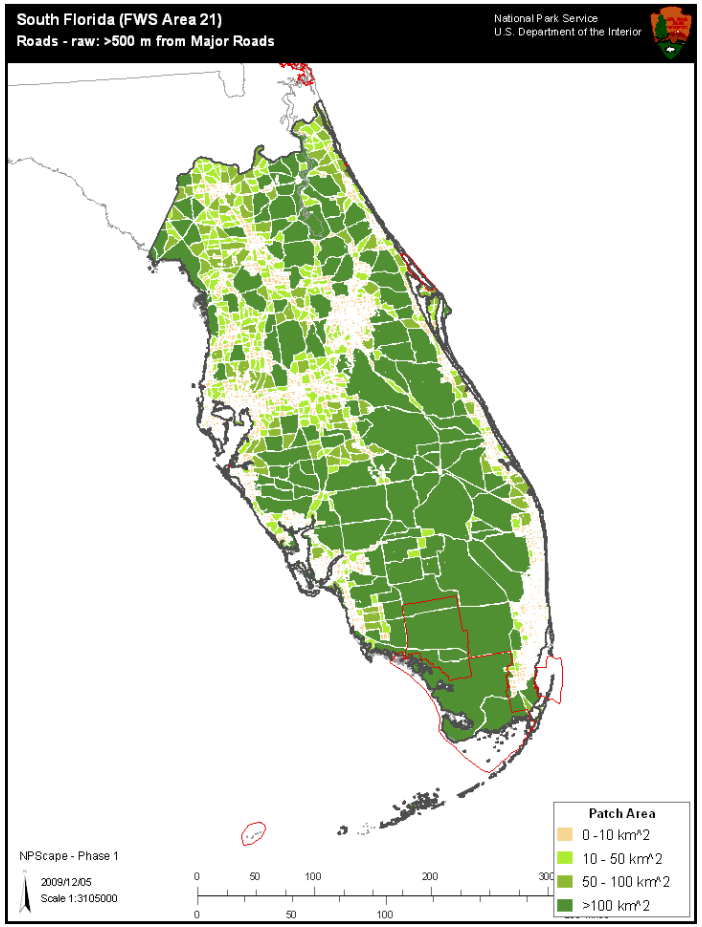
- Sampler of DOI Framework data for South Florida



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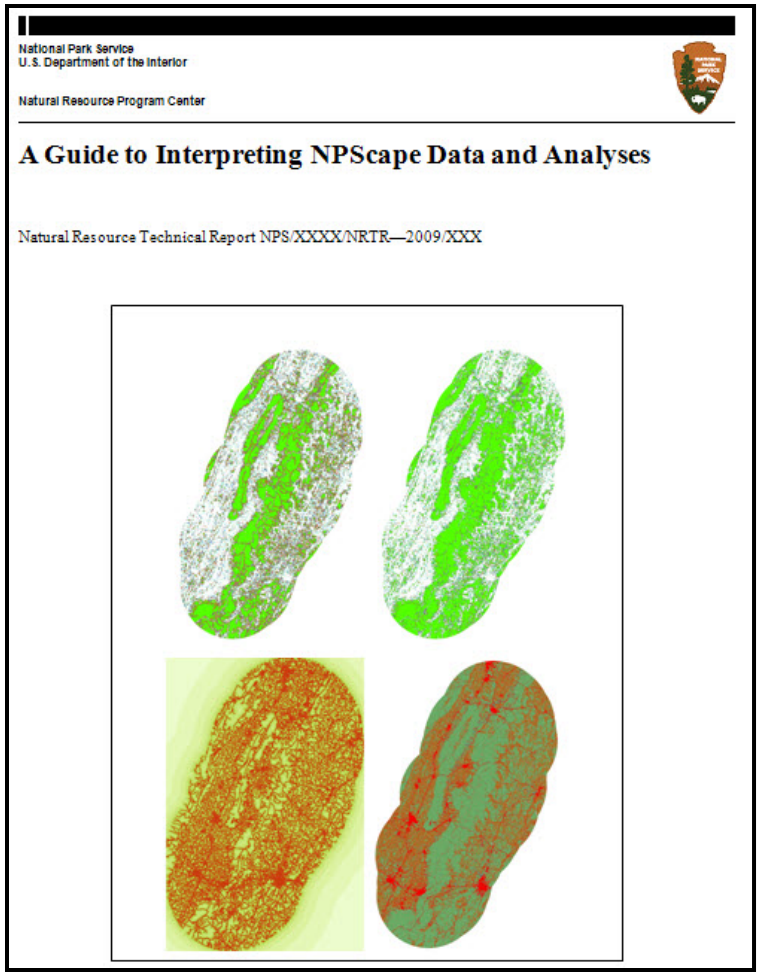
- Interpretive Guide: describes the scientific underpinning of NPScape measures and provides literature summaries, citations, and examples to put results in broader context



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A Guide to Interpreting NPScape Data and Analyses

Natural Resource Technical Report NPS/XXXX/NRTR—2009/XXX

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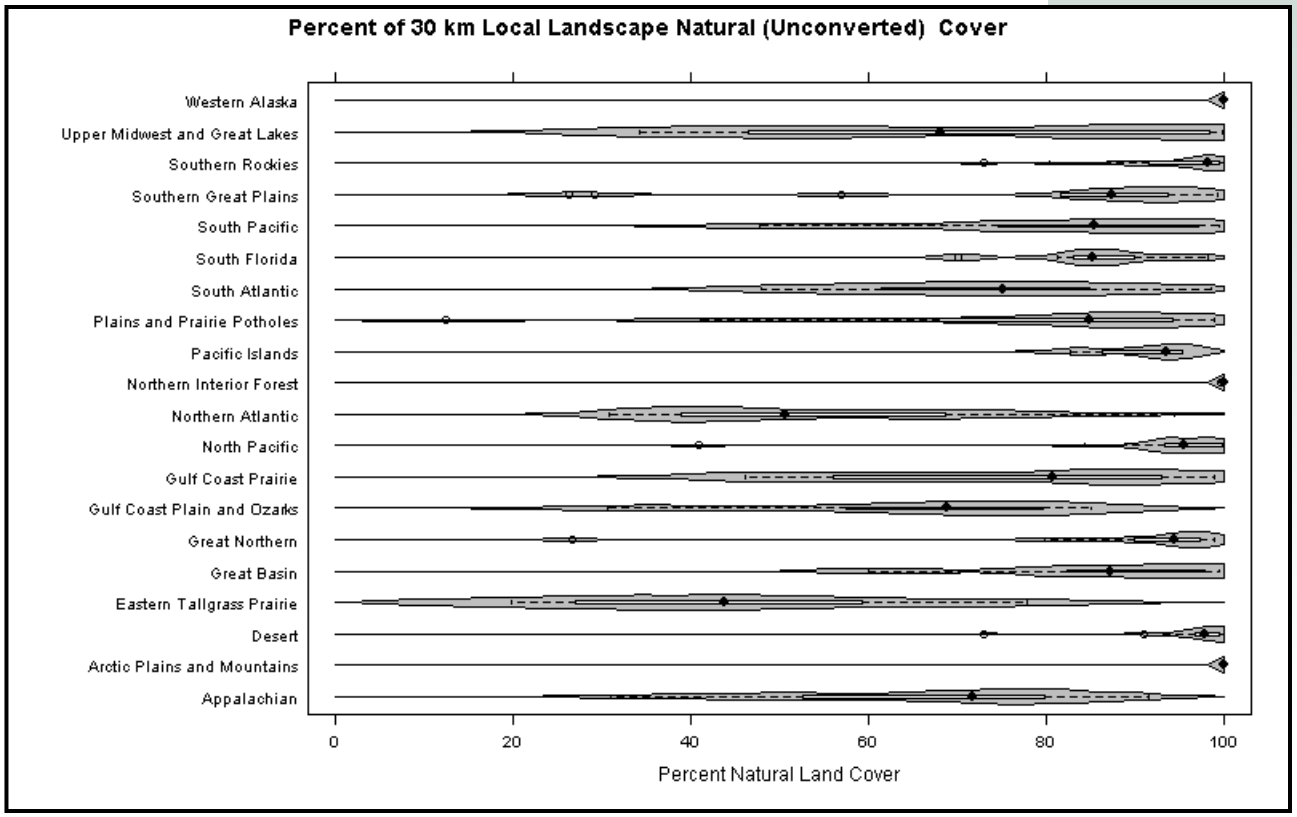
- Interpretive Guide and accompanying Appendix allows for comparison of metrics by National Geographic Framework



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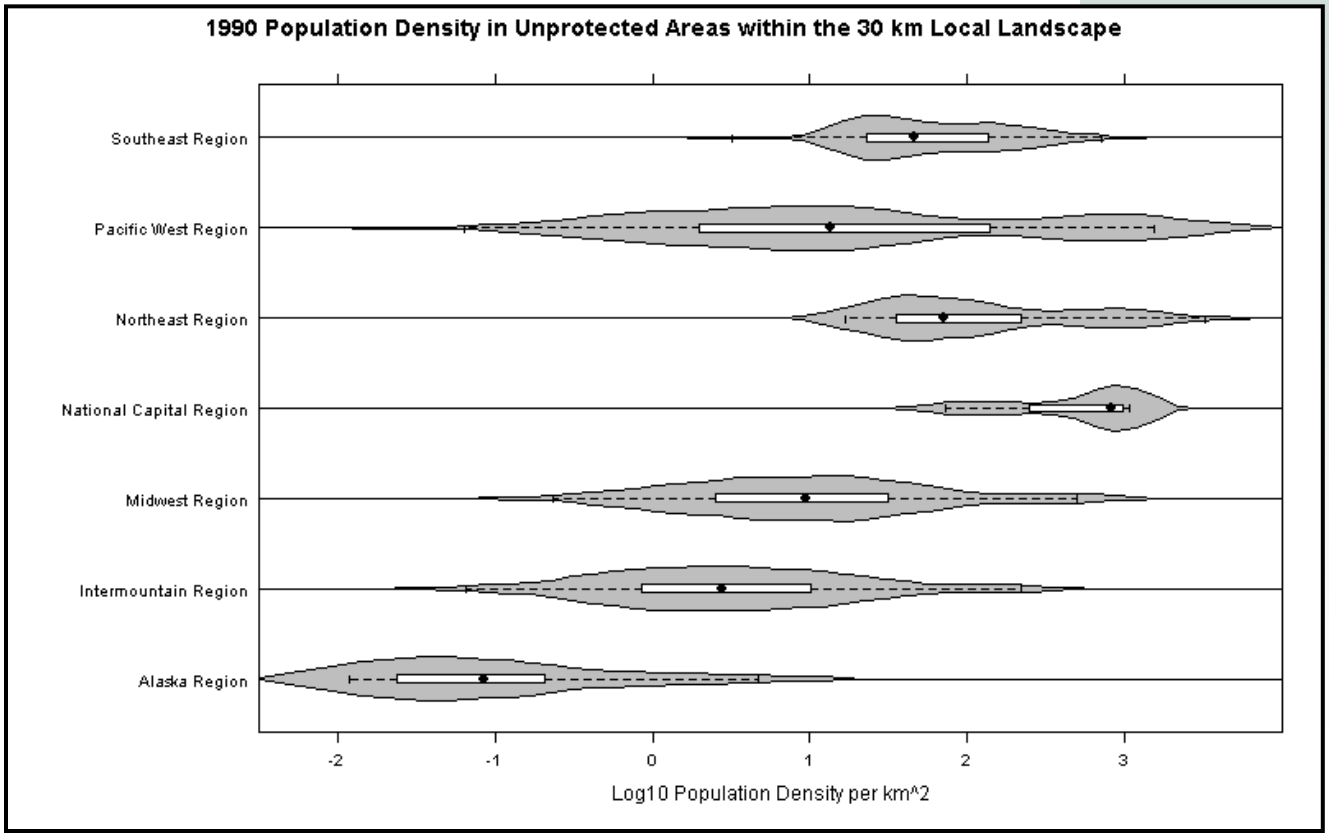
- Interpretive Guide and accompanying Appendix also allows for comparison of metrics by Region



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Future Steps – CY 2010

- Addendum to data
- Peer review of Interpretive Guide
- Tighter integration of tools into ArcGIS
- Increased flexibility of tools
- Additional metrics

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Information and Updates

- Intranet site

http://www1.nrintra.nps.gov/im/monitor/npscape/index.cfm

- Natural Resource Information Portal

http://nrinfo

- Legacy NPS Data Store

http://science.nature.nps.gov/nrdata

Which National Landcover Should We Use?

- What are the similarities
- What are the differences
- What will you do with the data
  - What are your applications
  - How does it relate to other landcover data (NPS I&M Vegetation maps)

Available National Sources

- NLCD
- GAP ReGAP
- Landfire
- NatureServe (LandScope)

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Compare datasets in a variety of Parks

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Compare by

- Reclassify to Anderson Level I
- Sum area by class
- Look for consistentency
- Compare to other available sources (NPS I&M veg map)

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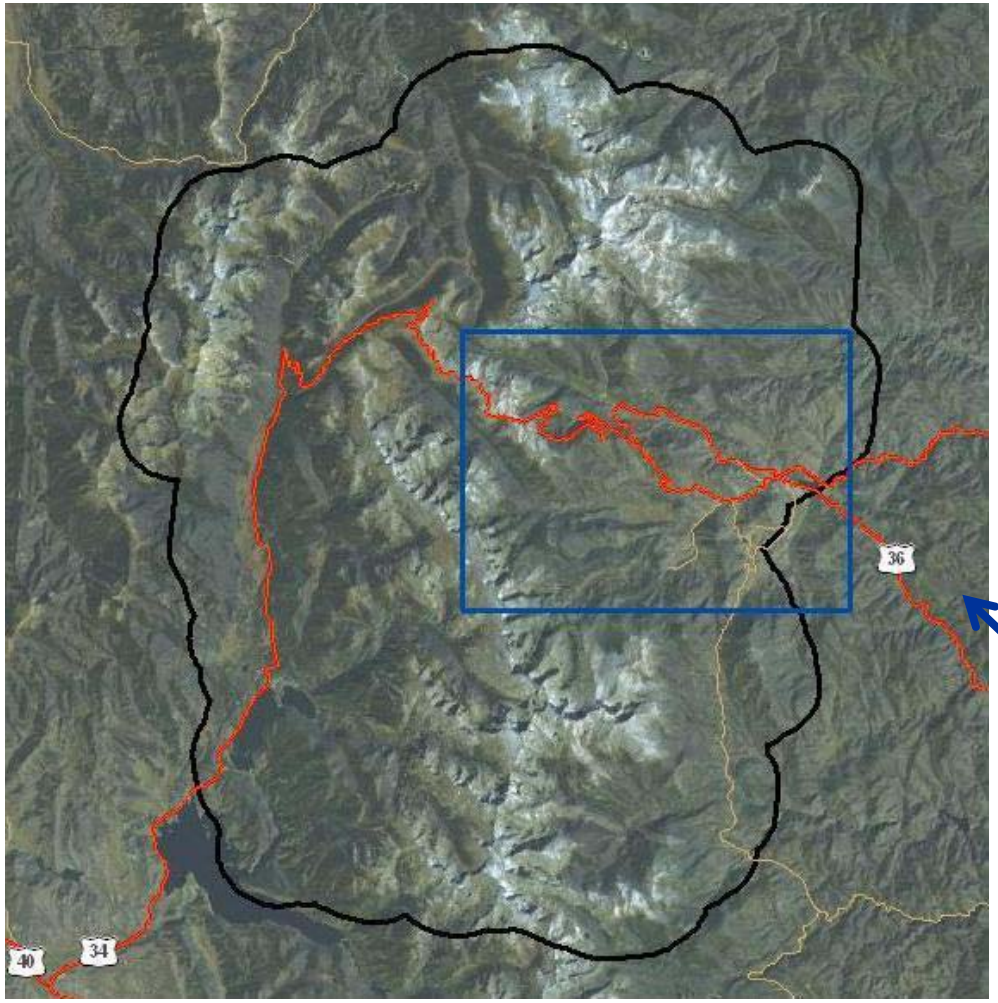
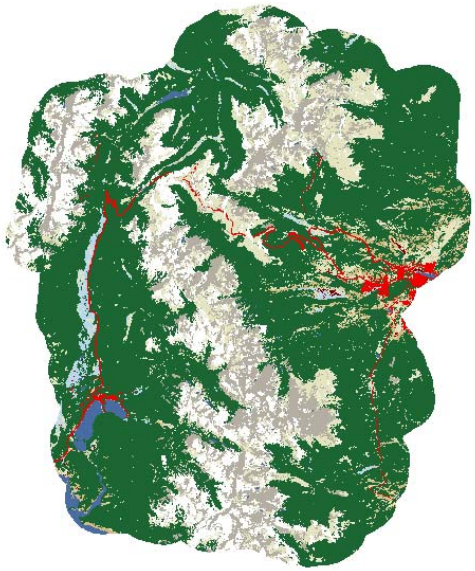
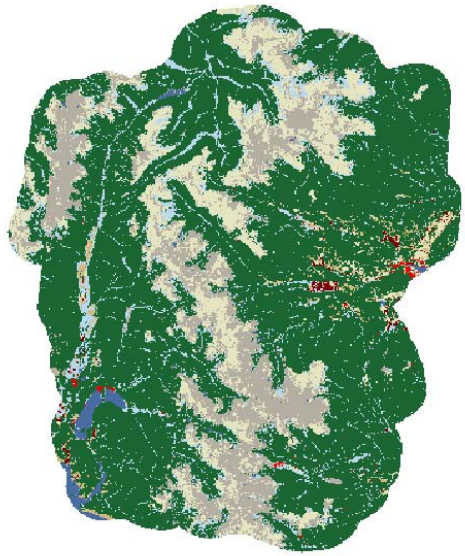


Sample Area

ROMO 3Km Buffer and Sample Area



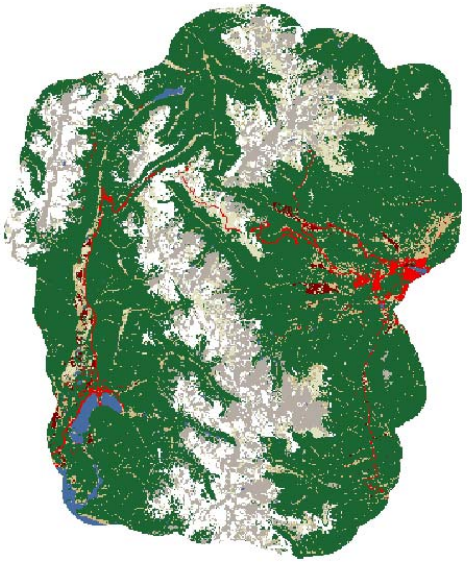
NLCD



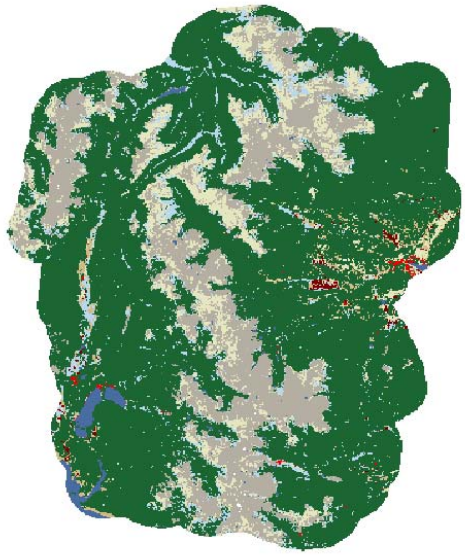
Nature Serve

Legend

- 0 - Background
- 11 - Open Water
- 12 - Perennial Ice/Snow
- 21 - Developed, Open
- 22 - Developed, Low
- 23 - Developed, Medium
- 24 - Developed, High
- 31 - Barren
- 41 - Deciduous Forest
- 42 - Evergreen Forest
- 43 - Mixed Forest
- 52 - Shrub/Scrub
- 71 - Grass/Herbaceous
- 81 - Pasture/Hay
- 82 - Cultivated Crops
- 90 - Woody Wetlands
- 95 - Herbaceous Wetlands



Landfire



ReGAP

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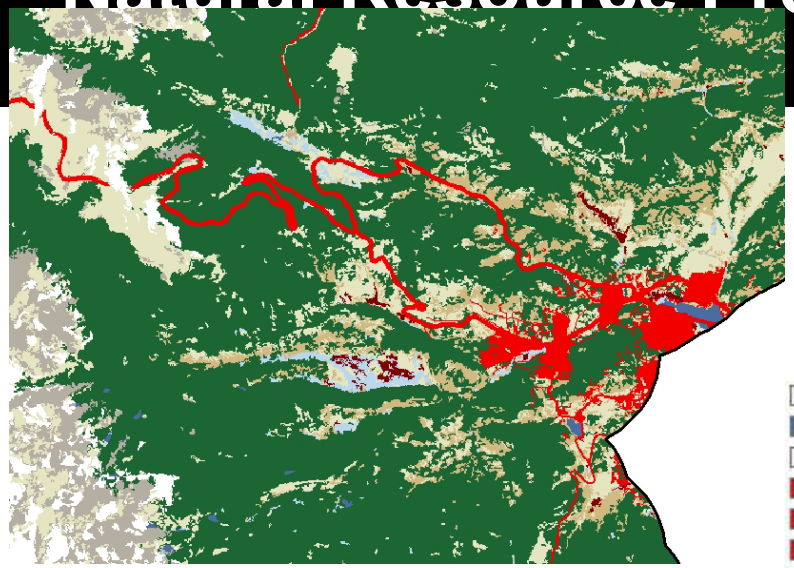
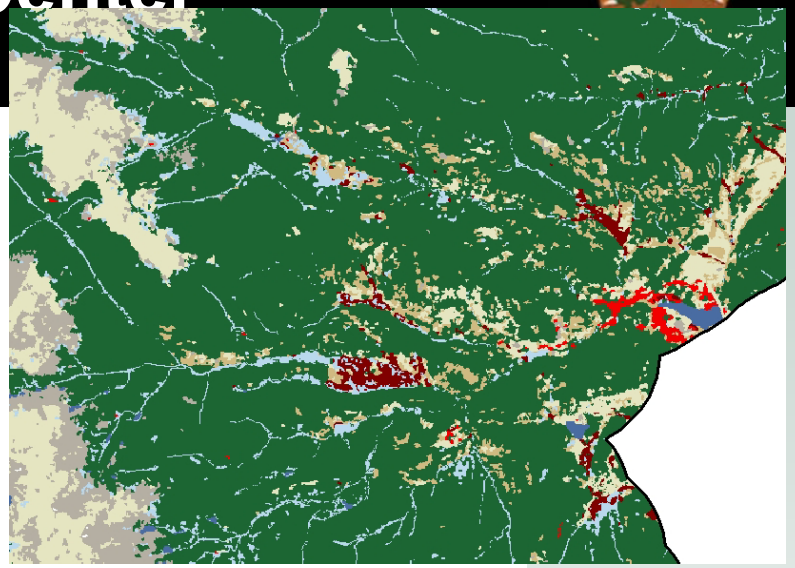


NLCD



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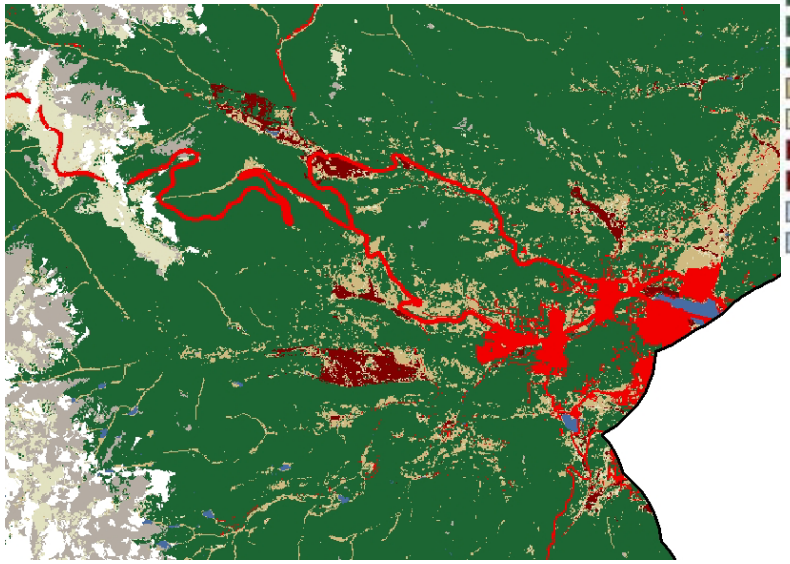
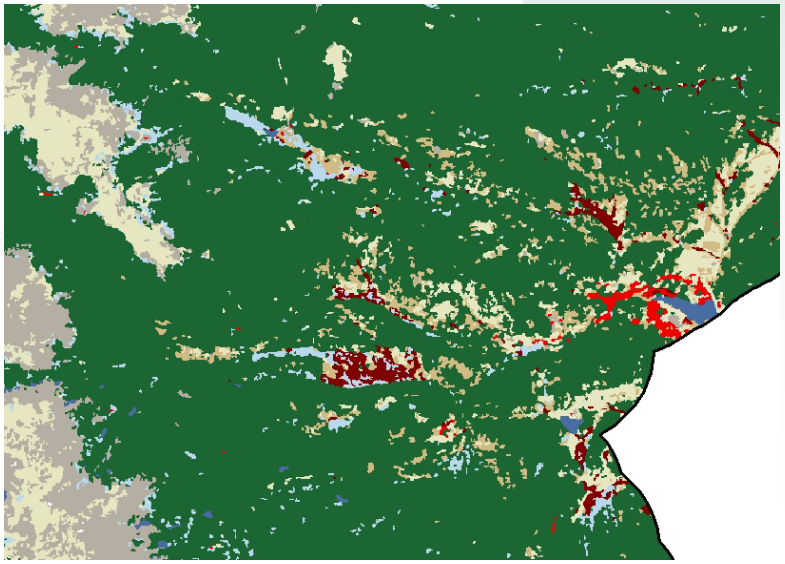


Landfire



ReGAP

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ROMO + 30Km Landcover Comparison

LEVEL I		Area (Hectares)			
Class #	Class Name	NLCD 2001	Landfire	ReGAP	NatureServe
11	Open Water	7,119	9,311	7,780	7,662
12	Perennial Ice/Snow	34,806	35,834	173	173
2	Developed	12,136	13,865	3,684	3,580
3	Barren/Quarries/Transitional	27,537	29,546	48,960	48,783
4	Forest	509,209	555,403	548,608	529,816
5	Shrub/Scrub	87,885	75,078	81,829	80,277
7	Grassland/Herbaceous	85,330	25,194	47,143	47,109
8	Agriculture	16,905	35,037	27,538	27,092
9	Wetlands	24,624	26,297	39,884	61,071
0	Background	200,243	199,916	200,195	200,204
	TOTALS	**1,005,795**	**1,005,480**	**1,005,795**	**1,005,767**
	TOTALS w/out Background	**805,552**	**805,564**	**805,600**	**805,563**

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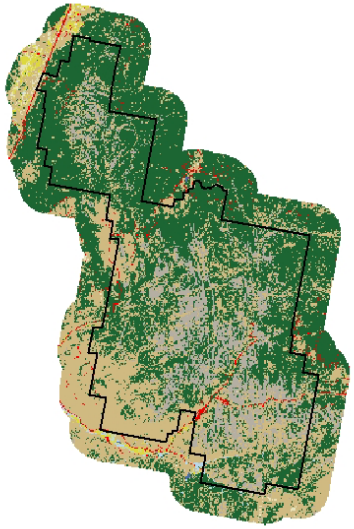

NLCD

Legend

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- 81 - Ag, Hay/Pasture
- 82 - Ag, Cultivated Crops
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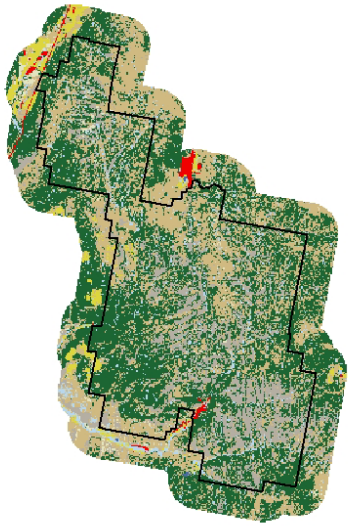
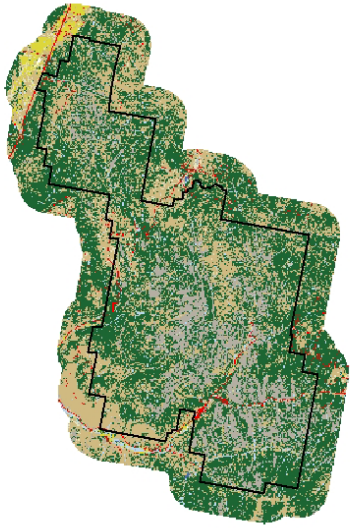
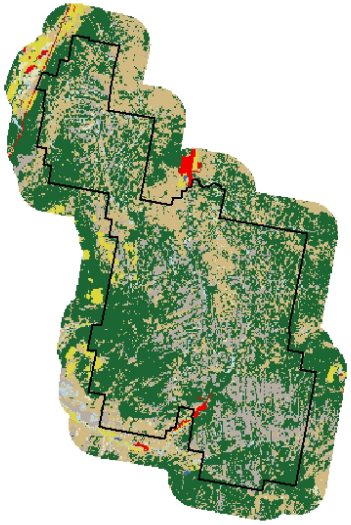
- 95 - Emergent Herb. Wetlands



Nature Serve



Landfire



ReGAP

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ZION + 30Km Buffer Landcover Comparison

LEVEL I		Area (Hectares)			
Class #	Class Name	NLCD 2001	Landfire	ReGAP	NatureServe
11	Open Water	573	582	1,015	3,111
2	Developed	12,449	12,961	10,237	10,375
3	Barren/Quarries/Transitional	29,613	40,843	59,114	47,953
4	Forest	340,829	341,643	324,324	303,479
5	Shrub/Scrub	284,407	262,091	272,645	284,870
7	Grassland/Herbaceous	29,943	16,653	15,162	13,835
8	Agriculture	11,062	12,816	18,997	17,043
9	Wetlands	1,853	23,140	9,272	30,084
0	Background	205,814	205,814	205,515	205,531
	TOTALS	**916,544**	**916,544**	**916,281**	**916,281**
	TOTALS w/out Background	**710,730**	**710,730**	**710,766**	**710,750**

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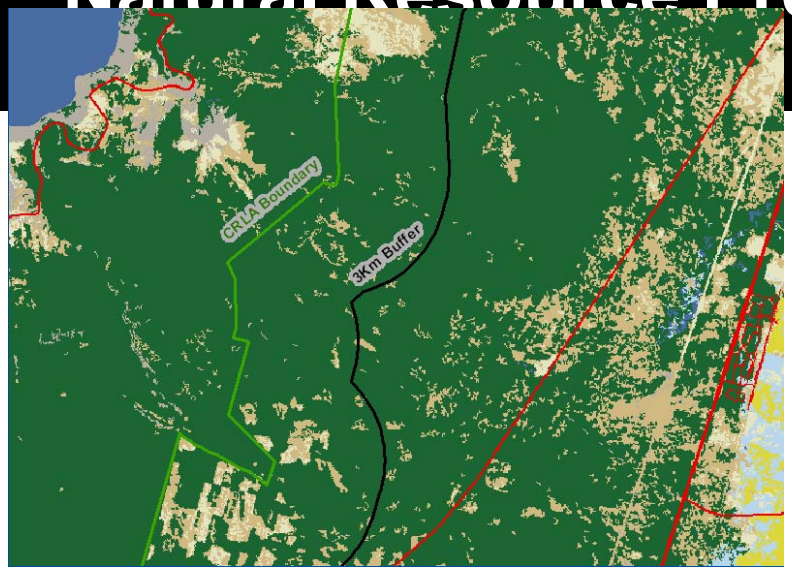
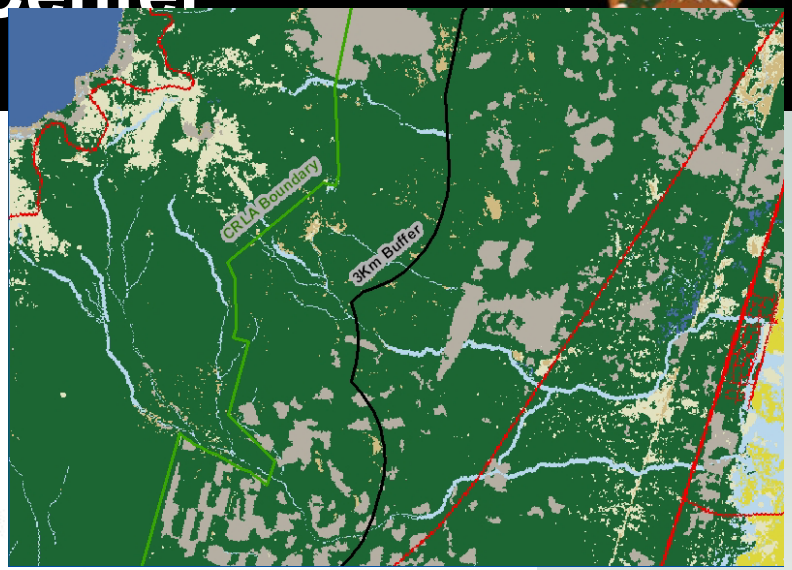


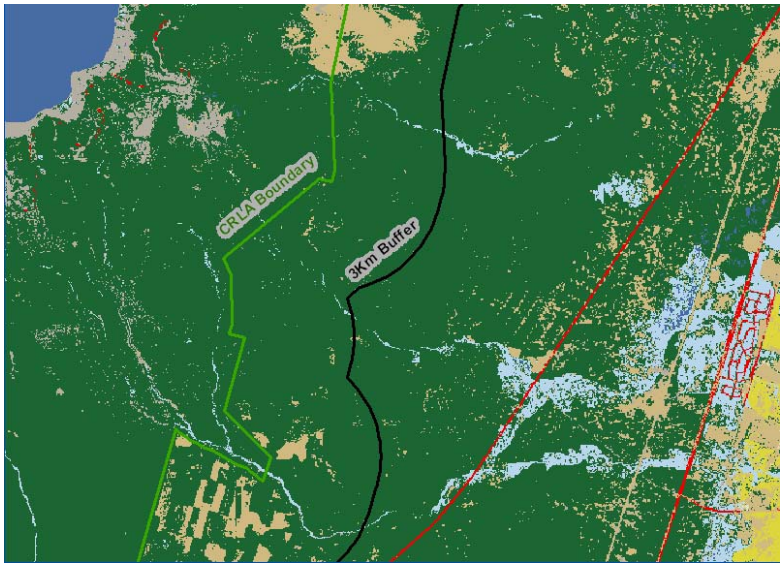
NLCD

Legend

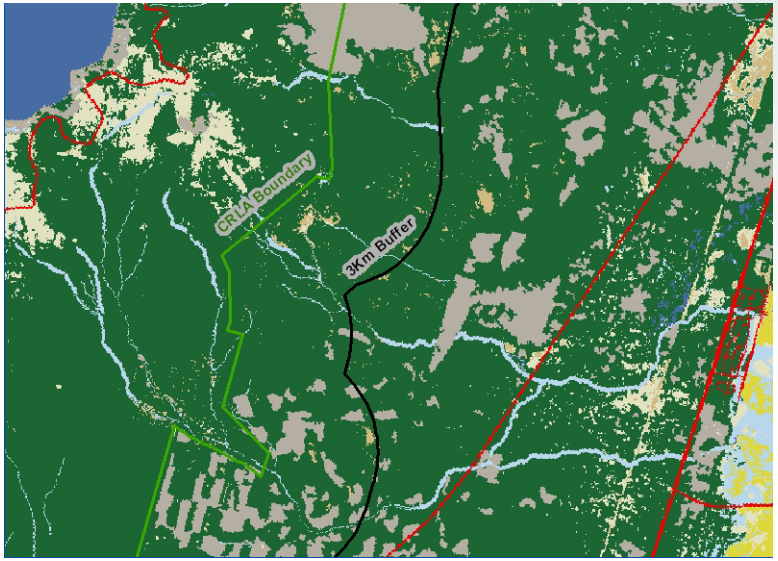
- 11 - Open Water
- 21 - Developed, Open
- 22 - Developed, Low
- 23 - Developed, Medium
- 24 - Developed, High
- 31 - Barren
- 33 - Recently Burned
- 33 - Recently Logged
- 41 - Deciduous Forest
- 42 - Evergreen Forest
- 43 - Mixed Forest
- 52 - Shrub/Scrub
- 71 - Grassland/Herbaceous
- 81 - Ag, Pasture/Hay
- 82 - Ag, Cultivated Crops
- 90 - Woody Wetlands
- 95 - Emergent Herbaceous Wetlands



Nature Serve

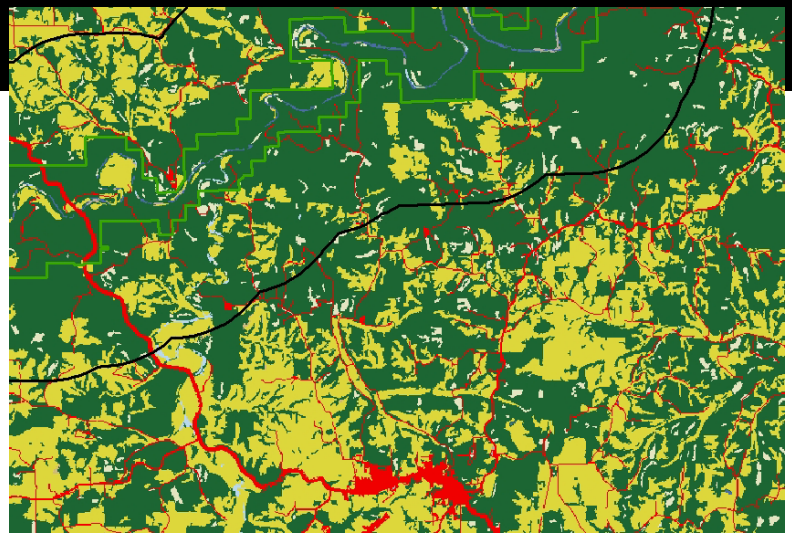


Landfire



NW ReGAP

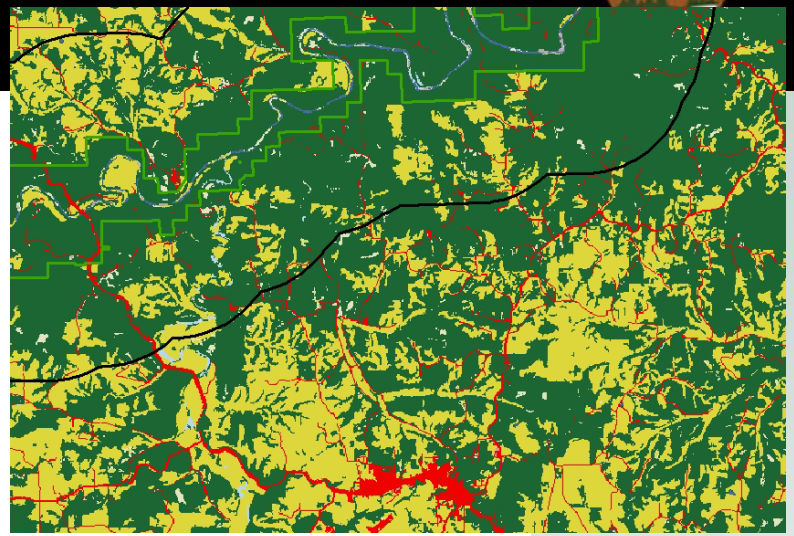
Natural Resource Program Center



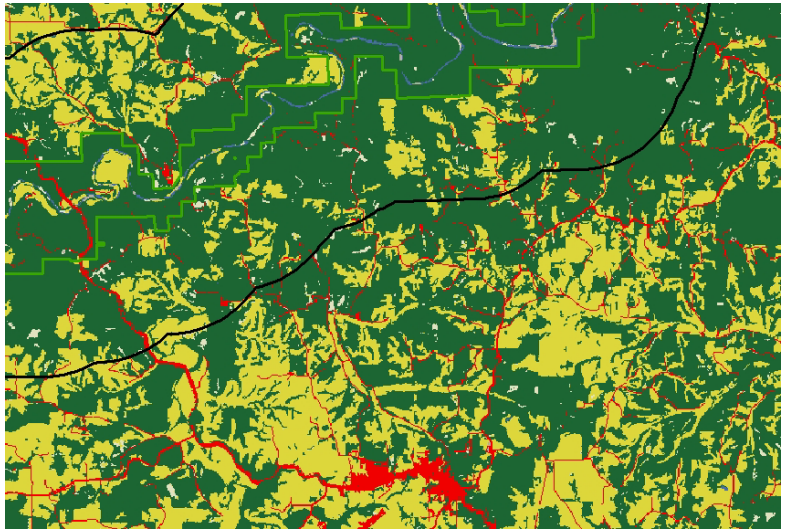
NLCD

Legend

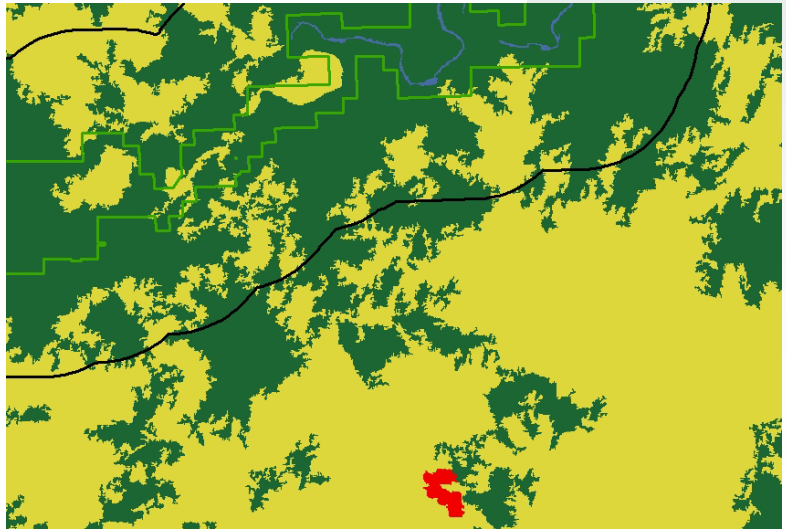
- 11 - Open Water
- 21 - Developed, Open
- 22 - Developed, Low
- 23 - Developed, Medium
- 24 - Developed, High
- 31 - Barren
- 41 - Deciduous Forest
- 42 - Evergreen Forest
- 43 - Mixed Forest
- 52 - Shrub/Scrub
- 71 - Grassland/Herbaceous
- 81 - Hay/Pasture
- 82 - Ag, Cultivated Crops
- 90 - Woody Wetlands
- 95 - Emergent Herbaceous Wetland



Nature Serve



Landfire



AR-GAP

Natural Resource Program Center

EXPERIENCE
YOUR
AMERICA

BUFF + 30Km Buffer Landcover Comparison

LEVEL I		NLCD 2001		Landfire		ARGAP		NatureServe	
Class #	Class Name	Area (Ha.)	Percent	Area (Ha.)	Percent	Area (Ha.)	Percent	Area (Ha.)	Percent
11	Open Water	11,494	1.09	11,583	1.10	12,214	1.16	11,598	1.10
2	Developed	45,049	4.29	36,969	3.52	2,199	0.21	37,000	3.52
3	Barren/Quarries/Transitional	712	0.07	712	0.07	0	0.00	714	0.07
4	Forest	763,432	72.64	779,705	74.19	772,929	73.65	777,440	73.98
5	Shrub/Scrub	630	0.06	0	0.00	0	0.00	0	0.00
7	Grassland/Herbaceous	17,764	1.69	10,194	0.97	0	0.00	10,452	0.99
8	Agriculture	210,014	19.98	211,748	20.15	262,169	24.98	211,998	20.17
9	Wetlands	1,817	0.17	0	0.00	0	0.00	1,727	0.16
	TOTALS	**1,050,911**	**100.00**	**1,050,911**	**100.00**	**1,049,511**	**100.00**	**1,050,929**	**100.00**

Wetlands

- NLCD
  - Tends to classify less wetlands
- NS
  - Tends to classify more wetlands
- GAP
  - Wetlands closely resembles NPS

Forest

- Landfire
  - Tends to classify more forest except at THEO where grasslands were more prevelant
- GAP
  - Closer to NPS classifications

Transitional

- GAP
  - Estimated more area than others
- NPS
  - Classified less than any of the other data (resolution issue?)

Water

- All four were fairly consitent
- NPS maps indicate more that others (resolution again?)

Grassland/Shrub

- No detectable consistency between 4 national data sets
- NPS typically indicates less grassland than others

Agriculture

- Fairly consistent between 4 national data sets
- ROMO example where all show ag in non ag area

Recommendations

- Change
  - NLCD
- Detailed Ecological systems
  - ReGap
- Fire
  - Landfire

What's Next

- C-CAP data for "coastal parks"
- North American Landcover
  - Canada and Mexico

Questions / Comments?