NPS Vegetation Inventory Program

NPS Inventory and Monitoring

NCTC Veg Map June 2013

Karl E. Brown, Program Manager
and
Tammy Cook, Program Assistant/Biologist

Natural Resource Stewardship and Science
Biological Resources Management Division
NCTC Case Studies June 17-21, 2013

Outline

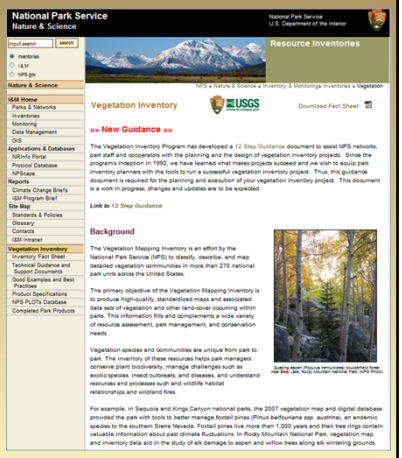
- *Program Overview*
- *Present Program Status*
- *Approach, Process & Products*
- *Available Data / Website*

Program Overview

- High priority requirement of the NPS I&M Program
- National (Service-Wide) Program
- Begins long term vegetation monitoring program
- Has many short term immediate applications

NPS I&M Program

- ***Vegetation***
- Base Cartographic
- Soils
- Geology
- NR Bibliography
- Species Lists
- Air Quality
- Climate
- Water- Quality, Location and Classification



Background

Standards

- NPS management policies, standards & guidelines
- Federal Geographic Data Committee standards
  - metadata, transfer, classification etc.
- Nationally consistent, hierarchical, classification scheme
- National Map Accuracy Standards
- Thematic accuracy >80% per class
- Scale of 1:24,000
- Minimum mapping unit of 0.5 hectare

Products from the Program

- Aerial Photography/ Imagery
- Vegetation Classification Report and Key
- Photo / Image Interpretation Report and Key
- Accuracy Assessment
- Vegetation Map Data (digital coverage, GIS Geodatabase -.mxd with layer files)
- All Appropriate Metadata

NPS Vegetation Inventory Status

Current Status of the Vegetation Inventory Program

129 Parks Complete
136 Parks In Progress
10 Parks Planned
Completion Date 2017-2018
Recurring Inventory – Inventory Strategic Plan

These include the Alaska Region parks which are being addressed as part of the Landcover and Soils Mapping effort through the AKRO I&M Program.
http://science.nature.nps.gov/im/units/akro/AKR_Vegetation.cfm

Major Steps for the Park

- Scoping Meeting
- Data review
- Data acquisition
- Field sampling
- Classification, Key
- Photo/ image interpretation, mapping and automation
- Accuracy assessment
- Final product review
- Final product delivery, incl. website posting

Major Steps for the Park

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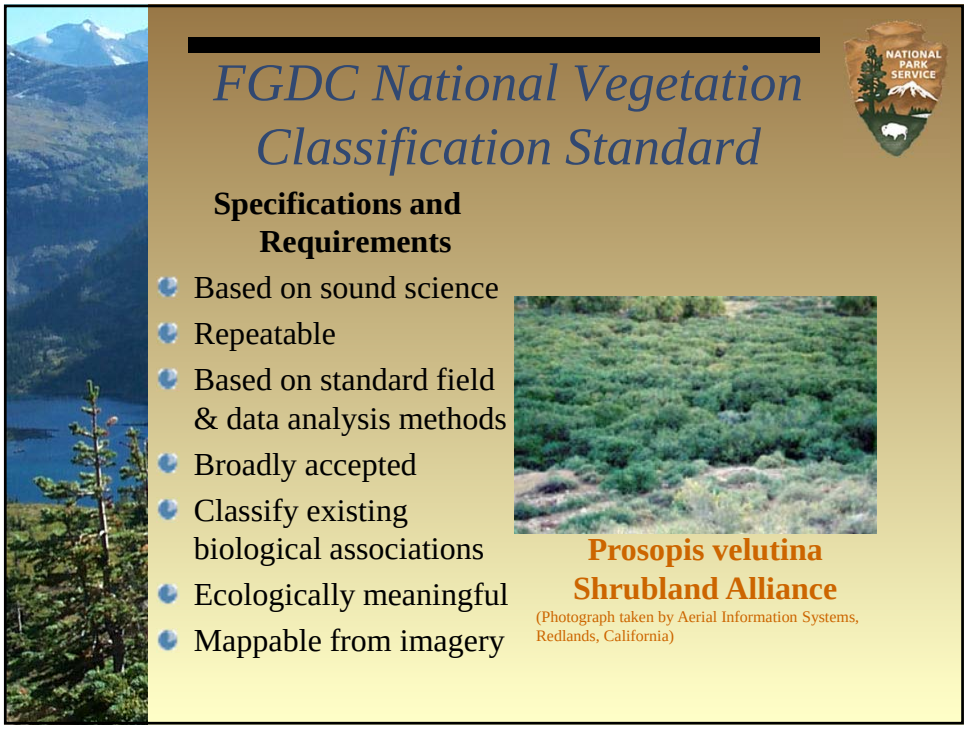
All of these are described in our program guidance document (aka "The 12-step")


Preplanning
Collection and review of existing information
Scoping Meeting
Project Study Plan
Project Sampling Plan


Field Data Collection, Management & Analysis


FGDC National Vegetation Classification Standard
Specifications and Requirements
Based on sound science
Repeatable
Based on standard field & data analysis methods
Broadly accepted
Classify existing biological associations
Ecologically meaningful
Mappable from imagery
Prosopis velutina Shrubland Alliance
(Photograph taken by Aerial Information Systems, Redlands, California)


FGDC National Vegetation Classification Standard
Specifications and Requirements
Hierarchically organized
Appropriately scaled
Flexible and open ended
Well documented - http://usnvc.org/resources/
Can be cross-walked with other frequently used systems
fgdc
esa
Panel on Vegetation Classification
NASA
NRCS
USGS
science for a changing world
NatureServe

1997 FGDC Hierarchy	2008 Revised Hierarchy (for Natural Vegetation) (numbers of known taxonomic units in ()s) (* - count for Phase 1 only)	
Division – Vegetation vs. Non-vegetation	Upper Level	Vegetation vs. Non-vegetation
Order – Tree, Shrub, Herb, Nonvascular		Natural Vegetation vs. Cultural Vegetation
Level 1 – Formation Class		Level 1 – Formation Class (8)
Level 2 – Formation Subclass		Level 2–Formation Subclass (18)
Level 3 – Formation Group		Level 3 – Formation (38)
Level 4 – Formation Subgroup – Natural/Cultural		
Level 5 - Formation		
	Middle Level	Level 4 – Division (77*)
		Level 5 – Macrogroup (214*)
		Level 6 – Group (430*)
Level 6 – Alliance	Lower Level	Level 7–Alliance (1700+)
Level 7 - Association		Level 8 – Association (6105)

Field data used …

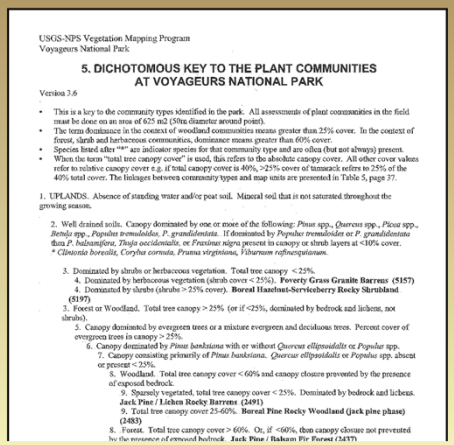
- … to develop detailed descriptions of the vegetation associations, …

Map Code: PW
Association Name: Potamogeton spp. – Ceratophyllum spp. Midwest Herbaceous Vegetation
Association Common Name: Midwest Pondweed Submerged Aquatic Wetland

Description:
Diagnostic features of the type are floating leaf aquatic <10% cover, and dominance by submerged aquatics, mainly Valissneria americana, Potamogeton spp., and Myriophyllum sibiricum. The type is analogous to Ontario's W1 and W3 (Harris et al. 1995). Where floating aquatics, especially Nymphaea odorata and Nuphar variegatum, increase in cover this community grades into the Northern Water Lily Aquatic Wetland. Beaver floodings most commonly have >10% cover of floating aquatics and are therefore usually colonized by the Northern Water Lily Aquatic Wetland. The stands at Voyageurs are most like subgroup C of the global description.

Field data used …

- … and to create a key for identifying vegetation associations in the field.



USGS-NPS Vegetation Mapping Program
Voyageurs National Park

5. DICHOTOMOUS KEY TO THE PLANT COMMUNITIES AT VOYAGEURS NATIONAL PARK

Version 3.6

- This is a key to the community types identified in the park. All assessments of plant communities in the field must be done on an area of 625 m2 (50m diameter around point).
- The term dominance in the context of woodland communities means greater than 25% cover. In the context of forest, shrub and herbaceous communities, dominance means greater than 60% cover.
- Species listed after "**" are indicator species for that community type and are often (but not always) present.
- When the term "total tree canopy cover" is used, this refers to the absolute canopy cover. All other cover values refer to relative canopy cover e.g. if total canopy cover is 40%, >25% cover of tamarack refers to 25% of the 40% total cover. The linkages between community types and map units are presented in Table 5, page 37.

1. UPLANDS. Absence of standing water and/or peat soil. Mineral soil that is not saturated throughout the growing season.

2. Well drained soils. Canopy dominated by one or more of the following: *Pinus* spp., *Quercus* spp., *Picea* spp., *Betula* spp., *Populus tremuloides, P. grandidentata*. If dominated by *Populus tremuloides* or *P. grandidentata* then *P. balsamifera, Thuja occidentalis*, or *Fraxinus nigra* present in canopy or shrub layers at <40% cover.
* *Clintonia borealis, Corylus cornuta, Prunus virginiana, Viburnum rafinesqueanum.*

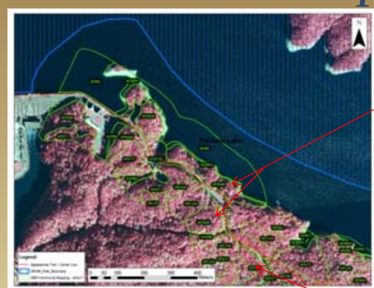
3. Dominated by shrubs or herbaceous vegetation. Total tree canopy < 25%.
4. Dominated by herbaceous vegetation (shrub cover < 25%). **Poverty Grass Granite Barrens (5157)**
4. Dominated by shrubs (shrubs > 25% cover). **Boreal Hazelnut-Serviceberry Rocky Shrubland (5197)**
3. Forest or Woodland. Total tree canopy > 25% (or if <25%, dominated by bedrock and lichens, not shrubs).
5. Canopy dominated by evergreen trees or a mixture evergreen and deciduous trees. Percent cover of evergreen trees in canopy > 25%.
6. Canopy dominated by *Pinus banksiana* with or without *Quercus ellipsoidalis* or *Populus* spp.
7. Canopy consisting primarily of *Pinus banksiana*. *Quercus ellipsoidalis* or *Populus* spp. absent or present < 25%.
8. Woodland. Total tree canopy cover < 60% and canopy closure prevented by the presence of exposed bedrock.
9. Sparsely vegetated, total tree canopy cover < 25%. Dominated by bedrock and lichens. **Jack Pine / Lichen Rocky Barrens (2491)**
9. Total tree canopy cover 25-60%. **Boreal Pine Rocky Woodland (jack pine phase) (2483)**
8. Forest. Total tree canopy cover > 60%. Or, if <60%, then canopy closure not prevented by the presence of exposed bedrock. **Jack Pine / Balsam Fir Forest (3437)**

…

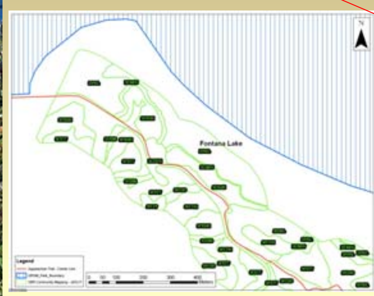
Aerial Photo Interpretation

- Once the vegetation classification system is established, interpretation of the imagery can be finalized.

Photointerpretation Key



Early-Successional Appalachian Hardwood Forest (Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia Forest). This early successional hardwood type has little or no tuliptree.



Successional Tuliptree Forest (Liriodendron tulipifera - Quercus spp. Forest). This early successional hardwood is characterized by >50% tuliptree.

Accuracy Assessment

Table 13. Final contingency table for BRCA. This table represents the 36 polygon map classes retained following accuracy assessment and revision whose accuracy was assessed.

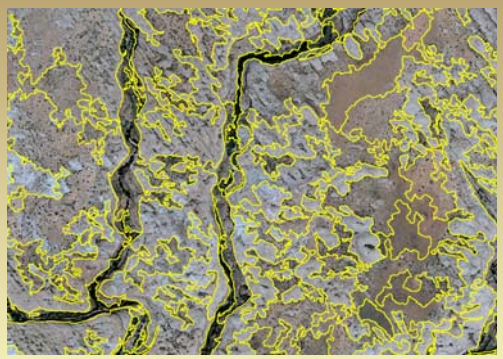
Shaded boxes indicate the number of AA points that agree with the assigned map class. To read the table, columns represent the map class observed in the field, while the rows represent the map class assigned by the photointerpreter. Overall accuracy is 84.2% (Kappa statistic = 83.4%). User's and producer's accuracy values with 90% confidence intervals for each map class appear in Tables 14, 15, and 16.

Mapped Data / Accuracy Assessment Field Plot Data	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	23	24	25	26	27	28	29	30	31	32	33	34	37	40	41	42	45	48	Commission (User's) Error: Correct #	Correct %	90% C.I. -	90% C.I. +
1	41	1	1				1			1		1																									46	89%	80%	98%
2	1	22	2				2																														27	81%	67%	96%
3	1	2	42		1								3																								49	86%	76%	96%
4				5																																	5	100%	90%	110%
5	2				14		1																														17	82%	64%	101%
6			2			20																															22	91%	79%	103%
7	1		2				67	1	1		1	2				1																					76	88%	81%	95%
8			1				2	28	2	1																											34	82%	70%	95%
9					1		1	4	34																												40	85%	74%	96%
10			1	2			2	1		17		1																									24	71%	53%	88%
11		1	1				1	1			22	2										1															29	76%	61%	91%
12			2			1		1		1	1	51	1																								58	88%	80%	96%
13								1				3	32														2										38	84%	73%	95%
14														10		3		1														1			1		16	63%	39%	86%
15												1		1	4																						6	67%	27%	107%
16							1				2		1			93		2									1										100	93%	88%	98%
17																5	14	1				1															21	67%	47%	86%
18												1		1				11																			13	85%	64%	105%
23							1												7				1									1					10	70%	41%	99%
24																				3																	3	100%	83%	117%
25								1	1												10				1												13	77%	54%	100%
26							1				3											23															27	85%	72%	98%
27						1	1	1			1	1											10				1										16	63%	39%	86%
28																								2													2	100%	75%	125%
29									1																7												8	88%	62%	113%
30																										56		1									57	97%	93%	100%
31							2				2	2	1														20										27	74%	58%	90%
32									2						1											1		14				1					19	74%	54%	93%
33												1																	8								9	89%	66%	112%
34																														19					1		20	95%	84%	106%
37																										2					3						5	60%	14%	106%
40												1														2	1		1			16	1	1	1		24	67%	49%	85%
41																												3					12				15	80%	60%	100%
42																																	1	6			7	86%	57%	115%
45												1																				1			24		26	92%	83%	103%
48																																				10	10	100%	95%	105%
Omission (Producer's) Error: correct #	46	26	54	7	16	22	83	39	41	20	32	68	38	12	5	102	14	15	7	3	10	25	11	2	8	41	25	18	9	19	3	20	14	7	27	10	899			
correct %	89%	85%	78%	71%	88%	91%	81%	72%	83%	85%	69%	75%	84%	83%	80%	91%	100%	73%	100%	100%	100%	92%	91%	100%	88%	88%	80%	78%	89%	100%	100%	80%	86%	86%	89%	100%	84.2%			
90% C.I. -	80%	71%	68%	36%	71%	79%	73%	59%	72%	69%	54%	66%	73%	61%	41%	86%	96%	51%	93%	83%	95%	81%	72%	75%	62%	78%	65%	59%	66%	97%	83%	63%	67%	57%	77%	95%				
90% C.I. +	98%	98%	88%	107%	104%	103%	88%	85%	94%	101%	84%	84%	95%	105%	119%	96%	104%	95%	107%	117%	105%	103%	110%	125%	113%	97%	95%	97%	112%	103%	117%	97%	105%	115%	101%	105%	Kappa = 83.4%			

New Models

Mapping: Tests of Detail

- "Alliance / Association" linework
  - "Rock Park" **Arches NP Segmentation Level 5**

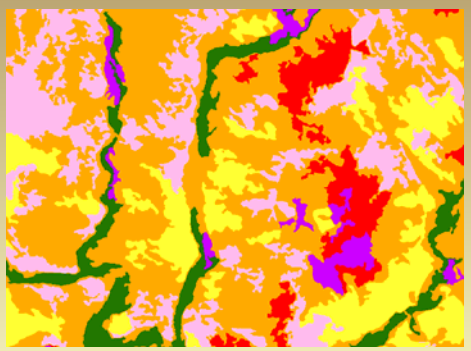


- Import into Erdas Imagine to reduce polygons to minimum mapping units (0.5 hectares) and smooth "rasterized" edges in ArcGIS. Level 5 less detailed than 1.

New Models

Mapping: Tests of Detail

- "Alliance / Association" linework
  - "Rock Park" **Arches NP Segmentation**



"Vegamatic" (veg formations) Level 1 segmentation shown here was input to Erdas for ecological model building

NPS and Partner Collaboration at Great Sand Dunes NPP

Mapping Case Study Great Sand Dunes

Karl E. Brown, Vegetation Inventory Program Manager
Mike Britten, Billy Schweiger / ROMN / NatureServe / TNC, US Fish and Wildlife Service, USGS, GRSA Staff, Colo Natural Heritage Program & Bureau of Reclamation

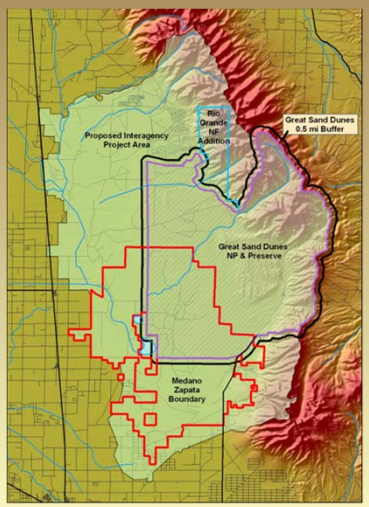




Map Dataset Roll-out Meeting with Partners
Great Sand Dunes HQ Mosca, CO
March 1-3, 2010

New Models

Great Sand Dunes National Park

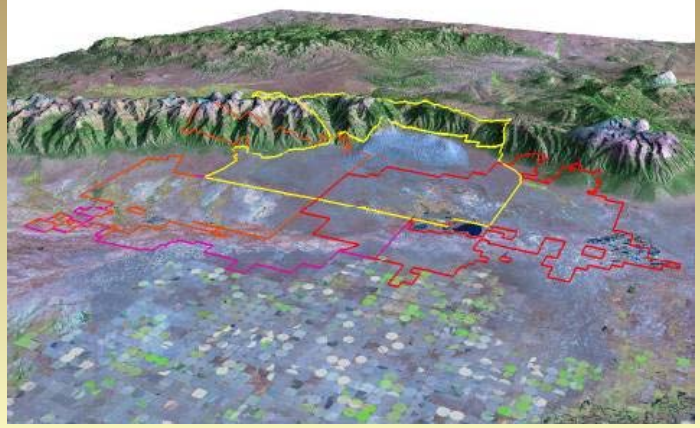


- The Great Sand Dunes National Park sits in a mixed ownership matrix of Federal State and private land in Southwest Colorado.
- US Forest Service and Bureau of Land Management Lands, a US Fish and Wildlife Refuge, and the National Park share a common fire planning unit.

New Models

Great Sand Dunes National Park

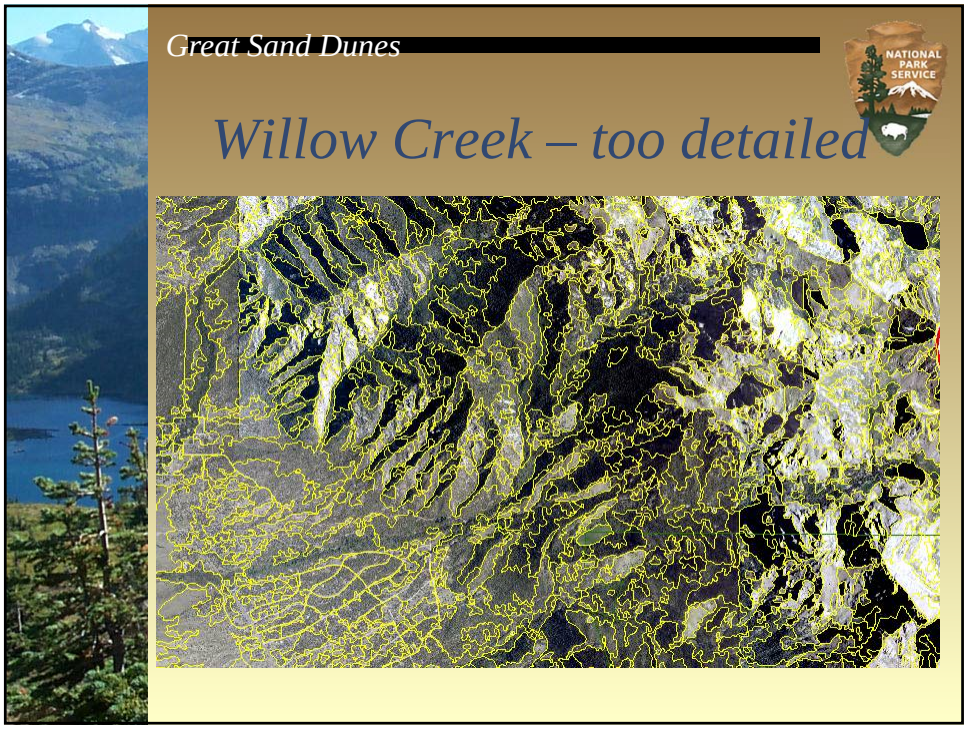
- Oblique view



New Models

Great Sand Dunes National Park

- The US Fish and Wildlife Service collected CIR with their FWS developed 4-band sensor over the lower elevation areas. They did not image the entire project area due to the ceiling limit of 10K for the aircraft.
- Orthorectification was accomplished using ERDAS Imagine. Although initially promising, the color banding was a challenge.
- Segmentation outputs include the dunefield, wash, and woodland transition zone


Great Sand Dunes
Willow Creek – too detailed


Products
Web Delivery
Map Applications

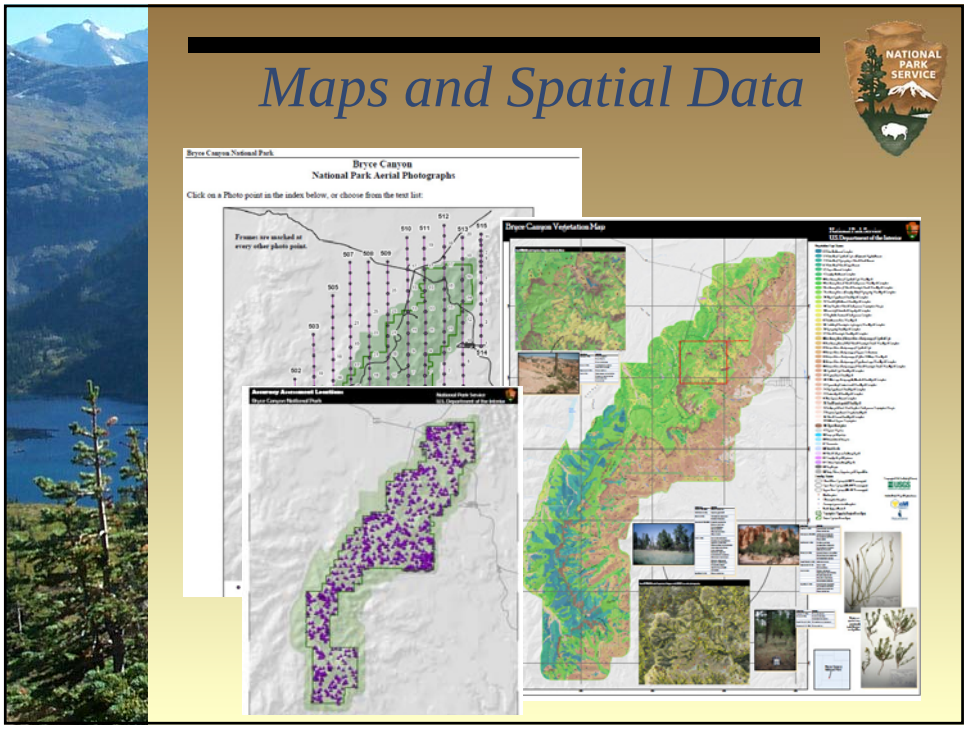
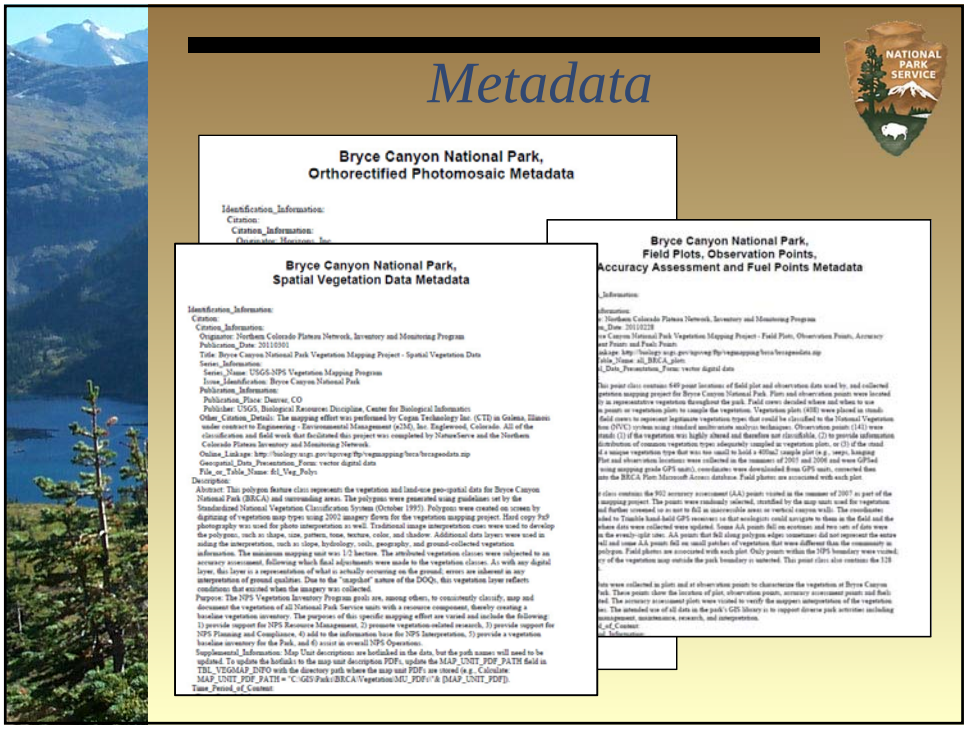
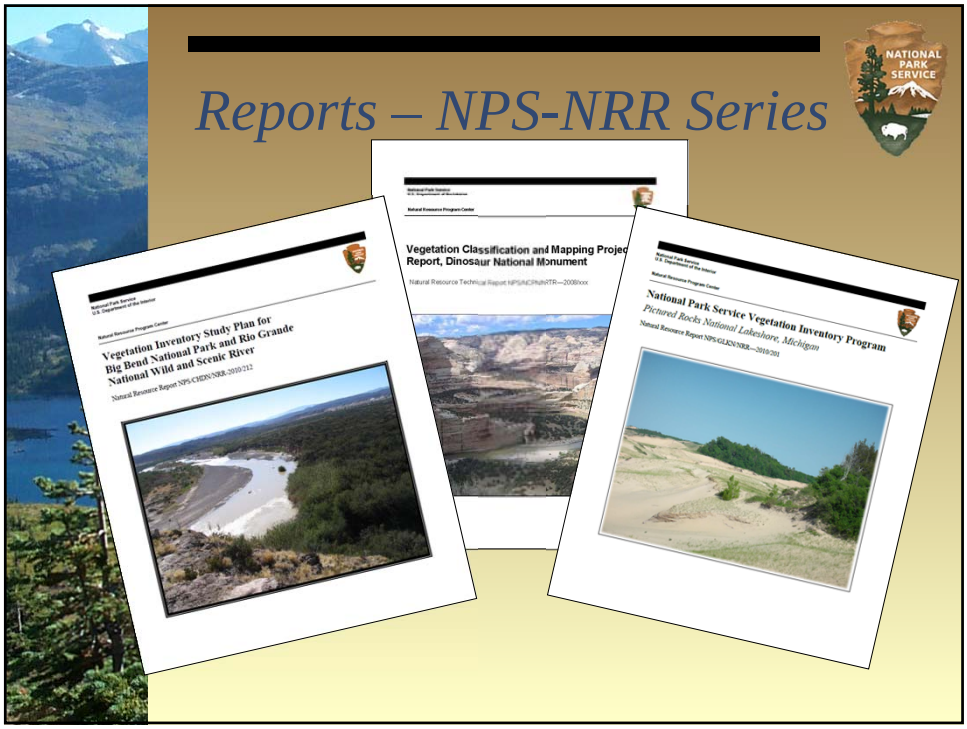
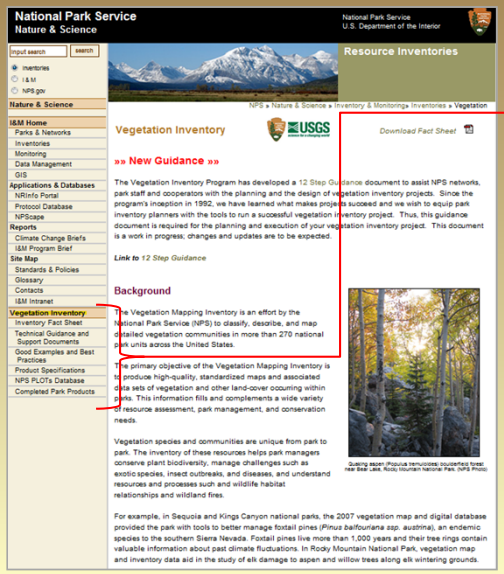

Maps and Spatial Data
Bryce Canyon
National Park Aerial Photographs
Click on a Photo point in the index below, or choose from the text list:
Bryce Canyon Vegetation Map


Photo Management
Taken in conjunction with the fieldwork
Midwest Pondweed Submerged Aquatic Wetland
Black Spruce / Feathermoss Forest


Metadata
Bryce Canyon National Park,
Orthorectified Photomosaic Metadata
Bryce Canyon National Park,
Spatial Vegetation Data Metadata
Bryce Canyon National Park,
Field Plots, Observation Points,
Accuracy Assessment and Fuel Points Metadata


Reports – NPS-NRR Series
Vegetation Inventory Study Plan for
Big Bend National Park and Rio Grande
National Wild and Scenic River
Vegetation Classification and Mapping Project
Report, Dinosaur National Monument
National Park Service Vegetation Inventory Program
Pictured Rocks National Lakeshore, Michigan

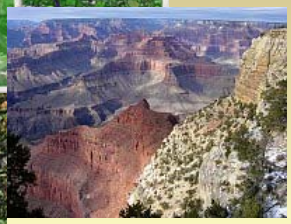
Guidance and Documentation



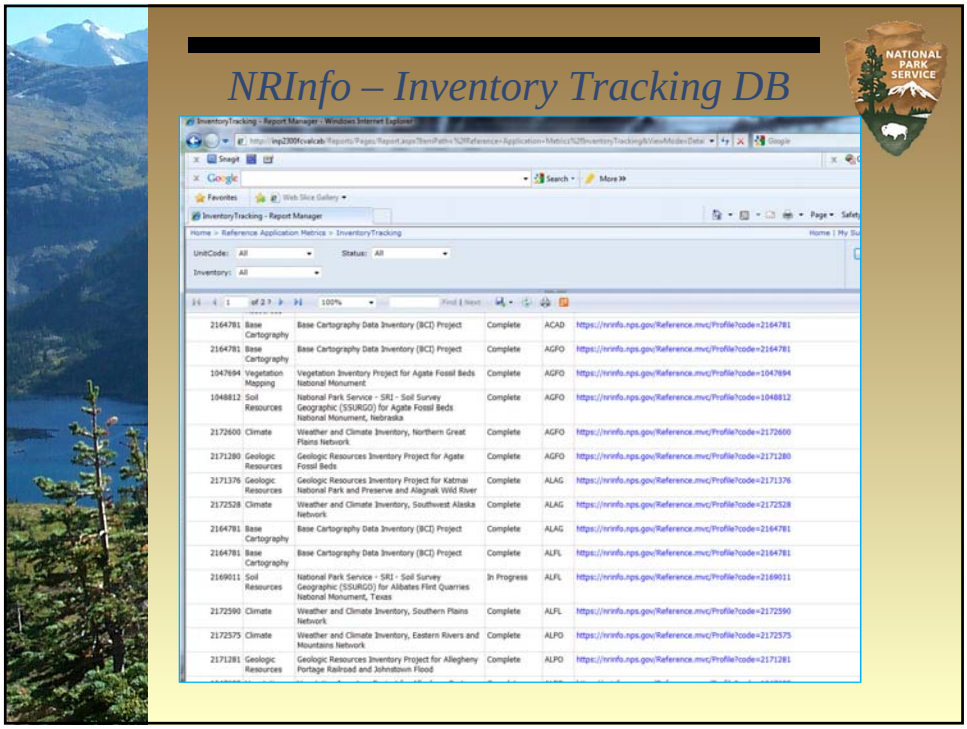
- Fact Sheet
- Guidance
- Examples
- Final Product Specs
- PLOTS db
- Data

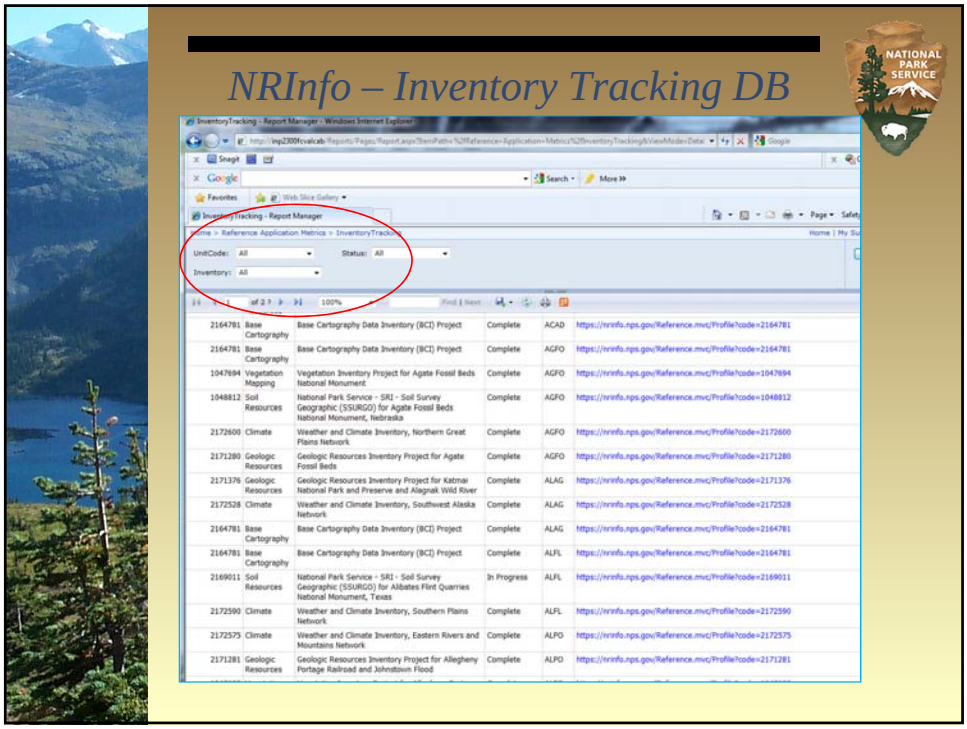
http://science.nature.nps.gov/im/inventory/veg/index.cfm

Data Availability and Application



- NR Information Portal (*NRInfo*)- Reference Application will be renamed the “NPS Data Store” Fall Release.
- Inventory Tracking Database – direct links to NRInfo Portal.
- * NRMapViewer MapService
- I&M Division GIS Team collaboration on products and map viewer support; USGS Partnership – webmaster and products.


NRInfo – Inventory Tracking DB
NATIONAL PARK SERVICE

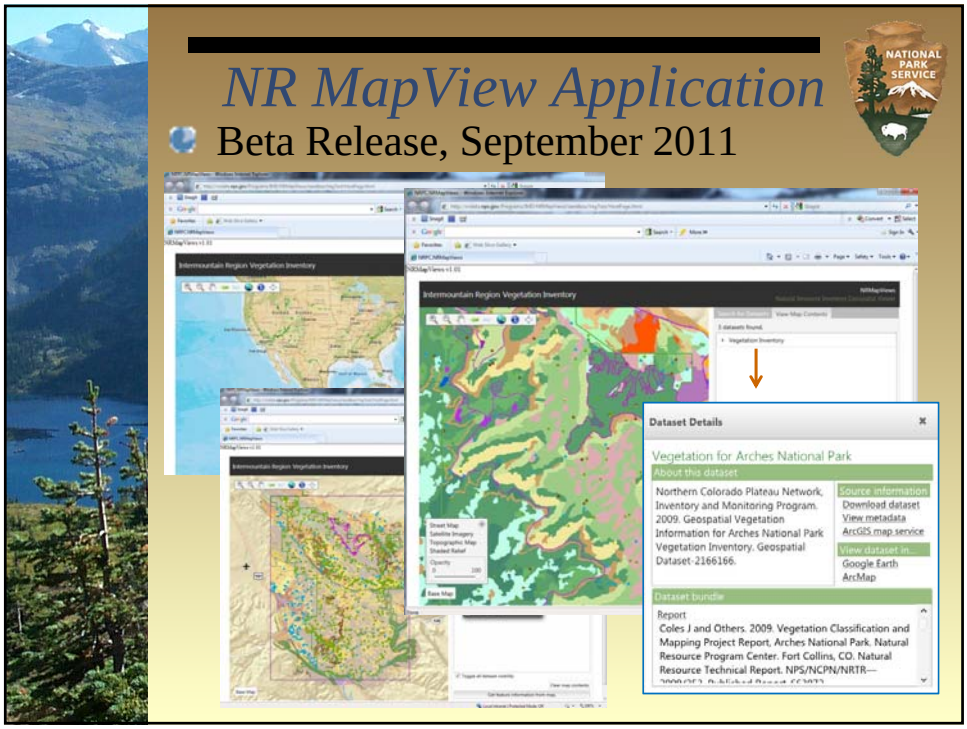

NRInfo – Inventory Tracking DB
NATIONAL PARK SERVICE

Data Availability

- All products are made available through NR INFO Portal: http://nrinfo.nps.gov/Reference.mvc/Profile?Code=2097270
- All products are also made available via a public internet website: http://biology.usgs.gov/npsveg/
- Serving of Complete Data Bundles
- Archiving of Project Records – USGS EROS Data Center (imagery) and Western Archeological Center (hard copies)

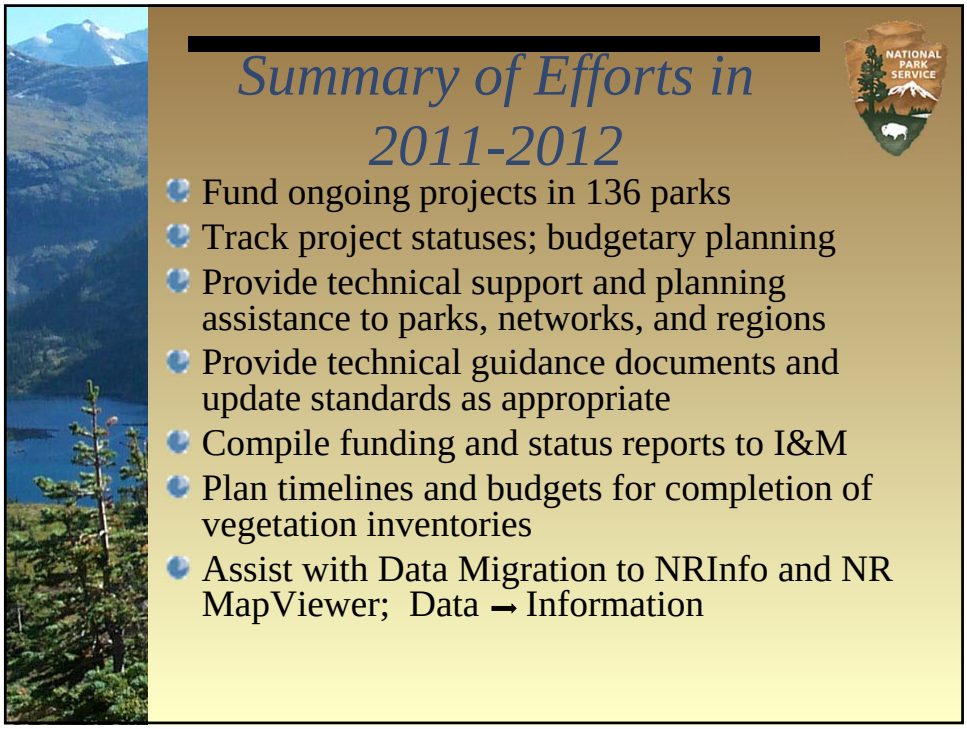
NRMapView Application

- I&M Division GIS Team coordinated effort, 11 park test in development.
- NRMap viewer displays available data, searches Reference (aka DataStore) records in the NRInfo Portal for any NR inventory-related map services, and displays them interactively.
- Coming – Northern Colorado Plateau, Intermountain Region, others.
- Live Example: Alaska Inventory Map Viewer. http://science.nature.nps.gov/im/units/akro/AKR_Inventories.cfm/



NR MapView Application

- Beta Release, September 2011



Summary of Efforts in 2011-2012

- Fund ongoing projects in 136 parks
- Track project statuses; budgetary planning
- Provide technical support and planning assistance to parks, networks, and regions
- Provide technical guidance documents and update standards as appropriate
- Compile funding and status reports to I&M
- Plan timelines and budgets for completion of vegetation inventories
- Assist with Data Migration to NRInfo and NR MapViewer; Data ➞ Information

Recent Applications – Connect the Dots

- Identify unique veg communities; target for management and/or restoration
- Habitat modeling; CRMO Pika
- Wildfire rehabilitation
- Natural Resource Condition Assessment
- Fire effect monitoring; fuels model
- Climate change monitoring
- Change detection; T&E

Primary Contacts …more information

Karl Brown, Ph.D.
NPS I&M (Program Lead)
karl_brown@nps.gov

Mike Mulligan
USGS (Program Coordinator)
mike_mulligan@usgs.gov

Tammy Cook
NPS I&M (Program Assistant)
tammy_cook@nps.gov

Theresa Singh
USGS (Data Manager)
theresa_singh@usgs.gov

Chris Lea- RETIRED!
NPS I&M (Ecologist)
chris_lea@nps.gov


Thanks
NATIONAL PARK SERVICE