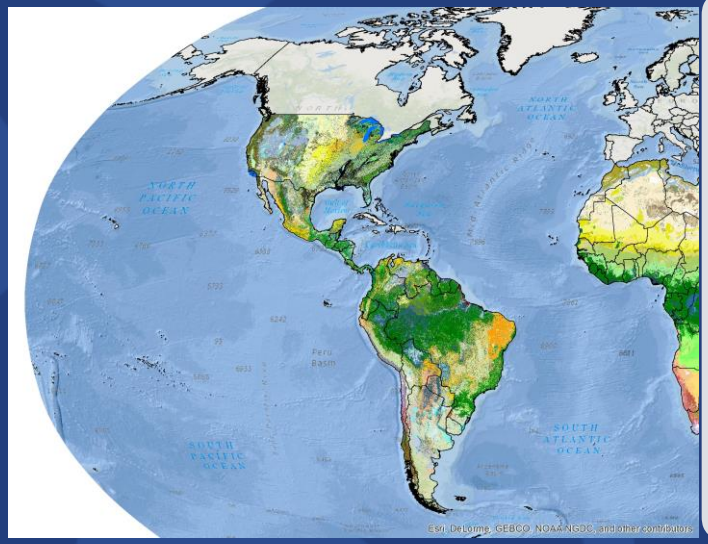
Map Legend Comparison



Don Faber-Langendoen and Regan Smyth

NatureServe
A Network Connecting Science With Conservation

OVERVIEW

The challenge of creating a common map legend among the 4 projects.

1. Lumping/splitting
   - Aggregates
   - Finer scale units
   - Ruderal vegetation

2. Choice of which systems to map.

3. Describing the map classes

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Creating a Common Map Legend

- Systems were target for all efforts, but differences in how they were applied
- Common legend required reconciling:
  - Different versions of classification
  - Different coding schemes
  - Use of non-standard systems
  - Use aggregates
  - Use of finer scale units (modifiers)
  - Different classifications for ruderal & cultural types

Creating a Common Legend

code aggregate **System** finer-scale unit who (original code)

unique c		Names		Lookup Codes			
code	Aggregate Unit	System	Finer Scale Unit	SEGAP	LF EVT	NS ESLF	TNC
4108		Laurentian-Acadian Northern Hardwoods Forest	Laurentian-Acadian Northern Hardwood Forest, high conifer				5642
4108		Laurentian-Acadian Northern Hardwoods Forest	Laurentian-Acadian Red Oak-Northern Hardwood Forest				5644
4108		Laurentian-Acadian Northern Hardwoods Forest	Laurentian-Acadian Northern Hardwoods Forest: moist-cool				5649
4316		Acadian Low-Elevation Spruce-Fir-Hardwood Forest			2373	4316	5650
4317		Acadian-Appalachian Montane Spruce-Fir Forest			2374	4317	566
5210		Acadian-Appalachian Alpine Tundra			2386	5210	567
5320		Acadian-Appalachian Subalpine Woodland and Heath-Krummholz			2389	5320	
3188		Laurentian-Acadian Acidic Cliff and Talus					569
3144		Laurentian-Acadian Calcareous Cliff and Talus					570
5462		N. Appalachian-Acadian Rocky Heath Outcrop					571
5461		Laurentian-Acadian Calcareous Rocky Outcrop					572
3189		Acadian-North Atlantic Rocky Coast					573
9150	Laurentian-Acadian Swamp Systems	**Laurentian-Acadian Swamp Systems**			2526		
9346	Laurentian-Acadian Swamp Systems	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp					X
9346	Laurentian-Acadian Swamp Systems	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp 1				5740
9346	Laurentian-Acadian Swamp Systems	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp 2				5742
9346	Laurentian-Acadian Swamp Systems	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp 3				5747
9346	Laurentian-Acadian Swamp Systems	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp 4				5749
9345	Laurentian-Acadian Swamp Systems	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp			2481	9345	X
9345	Laurentian-Acadian Swamp Systems	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp 1				5750
9345	Laurentian-Acadian Swamp Systems	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp 2				5752
9345	Laurentian-Acadian Swamp Systems	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp 3				5757
9345	Laurentian-Acadian Swamp Systems	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp 4				5758
9345	Laurentian-Acadian Swamp Systems	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp 5				5759
9210	Acadian Salt Marsh and Estuary Systems	**Acadian Salt Marsh and Estuary Systems**			2491		
9278	Acadian Salt Marsh and Estuary Systems	Acadian Coastal Salt Marsh				9278	578
9292	Acadian Salt Marsh and Estuary Systems	Acadian Estuary Marsh				9292	579
9146	Boreal Acidic Peatland Systems	**Boreal Acidic Peatland Systems**			2477		
9301	Boreal Acidic Peatland Systems	Acadian Maritime Bog					580
9177	Boreal Acidic Peatland Systems	Boreal-Laurentian Conifer Acidic Swamp				9177	
9354	Boreal Acidic Peatland Systems	Boreal-Laurentian Bog				9354	581
9198		Laurentian-Acadian Alkaline Fen					585
9144	Laurentian-Acadian Floodplain Systems	**Laurentian-Acadian Floodplain Systems**			2475		
9328	Laurentian-Acadian Floodplain Systems	Laurentian-Acadian Floodplain Forest				9328	587
9113	Laurentian-Acadian Floodplain Systems	Eastern Boreal Floodplain			2444	9113	588
9215	Laurentian-Acadian Shrub-Herbaceous Wetland	**Laurentian-Acadian Shrub-Herbaceous Wetland Systems**			2494		

Aggregates

- Primarily Landfire wetland systems
- Example:

Laurentian-Acadian Shrub-Herbaceous Wetland Systems
Laurentian-Acadian Freshwater Marsh
Boreal-Laurentian-Acadian Acidic Basin Fen
Laurentian-Acadian Wet Meadow-Shrub Swamp

- Also some ruderal and non-natural systems
  - *The "agriculture aggregate"*
- TNC system combinations

203.264/203.301	Northern Atlantic Coastal Plain **Dune and Swale** / Northern Atlantic Coastal Plain **Sandy Beach**

Aggregates

System	SEGAP	LF EVT	NS ESLF	TNC
Gulf and Atlantic Coastal Plain Sparsely Vegetated Systems		2498		
Northern Atlantic Coastal Plain Dune and Swale	203.264	2436	7149	
Northern Atlantic Coastal Plain Sandy Beach			3124	
Central Atlantic Coastal Plain Sandy Beach			3162	
Northern Atlantic Coastal Plain Dune and Swale/NACP Sandy Beach				264
Northern Atlantic Coastal Plain Dune and Swale/Central Atlantic Coastal Plain Sandy Beach				264064

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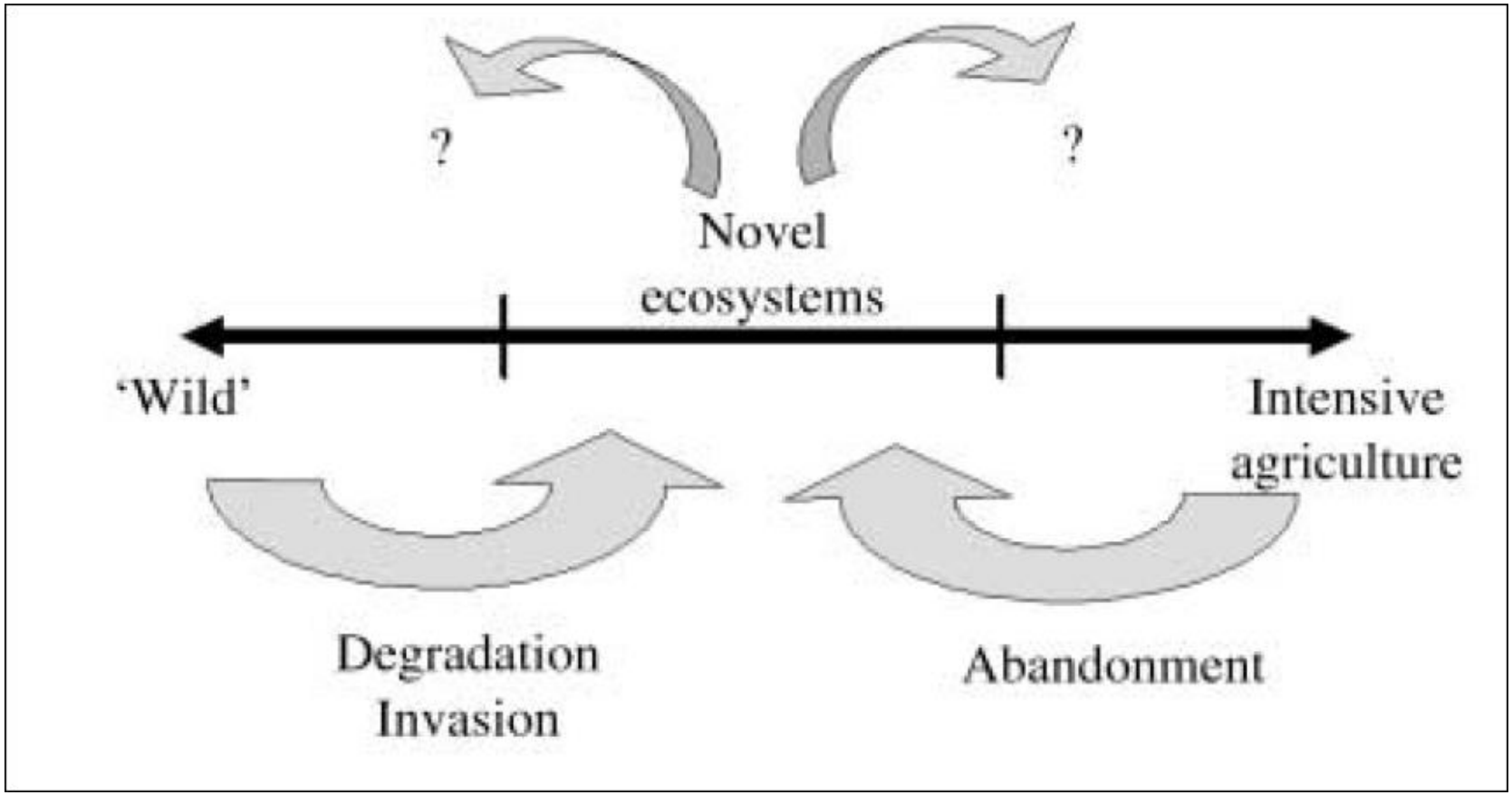
Finer-Scale Units

- TNC: varied
  - including wetland characteristics
  - moisture gradients
  - pH
  - conifer vs. hardwood dominated
- SEGAP:
  - structural
  - conifer vs. mixed vs. hardwood dominated
- Landfire: structural
- NatureServe: did *not* use. When present in source data, rolled up to systems level.

Central Interior and Appalachian Floodplain Aggregate with Finer-scale Modifiers

System Name	Finer-Scale Unit	LF	SEGAP	NS	TNC
Central Interior and Appalachian Floodplain Systems		2471			
Central App River Floodplain Central App River Floodplain	Central App Floodplain - Forest Modifier		X 202.608a	9333	608
SCI Large Floodplain SCI Large Floodplain SCI Large Floodplain	SCI Large Floodplain - Forest Modifier SCI Large Floodplain - Herbaceous Modifier		X 202.705a 202.705b	9334	
Southern Piedmont Large Floodplain Forest				9324	324

Ruderal Vegetation



Treatment of Ruderal Vegetation

- Not standardized; classifications concepts still under development at time of mapping
- Little documentation provided by mappers
- TNC: did not attempt to capture
- Others: did, but not evenly

Ruderal Forest

- NatureServe: single class
- Landfire: six distinct classes
- SEGap: Not specifically mapped, but modifiers on natural types
- TNC: NA

Ruderal Forest types (Landfire)

System Name		LF	SEGAP	NS	TNC
Ruderal Forest				8311	
Ruderal Forest	Mixed Loblolly-Slash Pine	2553			
Ruderal Forest	Pinus elliottii Saturated Temperate Woodland Alliance	2551			
Ruderal Forest	Pinus taeda Forest Alliance	2550			
Ruderal Forest	Ruderal Forest-Northern and Central Hardwood and Conifer	2532			
Ruderal Forest	Ruderal Forest-Southeast Hardwood and Conifer	2533			
Ruderal Forest	Ruderal Upland-Treed	2194			

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Ruderal Grassland & Shrubland

- Attempted to group into broad classes
  - Recently Logged Grassland/Shrubland
  - Successional Grassland & Shrubland
- LF, SEGAP, NS all have multiple finer-scale units beneath broad classes
- Additional LF (and NS) classes for:
  - Recently burned
  - Introduced upland
  - Introduced wetland
  - Modified/managed grasslands
- TNC: NLCD 52/71: shrublands/grasslands class

Agriculture

- TNC, SEGAP: NLCD
- Landfire: NLCD + NASS
- NatureServe: same as source maps, but rolled up and some modifications
- We combined legend groups into two broad agriculture classes:
  - row crop
  - pasture/hay

Differences in Mapped Targets

- Once common legend built, able to ask "who mapped what?"

System	Finer-Scale Unit	SEGAP	LF	NA	TNC
Laurentian Pine-Oak Barrens			2407	5423	
Laurentian-Acadian Northern Pine-(Oak) Forest			2362	4265	719
Great Lakes Alvar			2409	5458	721
Great Lakes Wooded Dune and Swale			2466	9135	726
C. Interior Highlands and Appalachian Sinkhole and Depression Pond					X
C. Interior Highlands and Appalachian Sinkhole and Depression Pond	Large River FP				18
C. Interior Highlands and Appalachian Sinkhole and Depression Pond	Small River FP				10018
Southern Ridge and Valley Calcareous Glade and Woodland					24
Great Lakes Wet-Mesic Lakeplain Prairie			2411	7124	
Central and Southern Appalachian Spruce-Fir Forest		202.028	2350	4253	28
Southern Appalachian Northern Hardwood Forest		202.029	2309	4115	29
Great Lakes Coastal Marsh Systems			2492		
Great Lakes Freshwater Estuary and Delta				9268	
Northern Great Lakes Coastal Marsh				9296	

Differences in Mapped Targets

- Once common legend built, able to ask "who mapped what?"

System	Finer-Scale Unit	SEGAP	LF	NA	TNC
Laurentian Pine-Oak Barrens		NA	2407	5423	
Laurentian-Acadian Northern Pine-(Oak) Forest		NA	2362	4265	719
Great Lakes Alvar		NA	2409	5458	721
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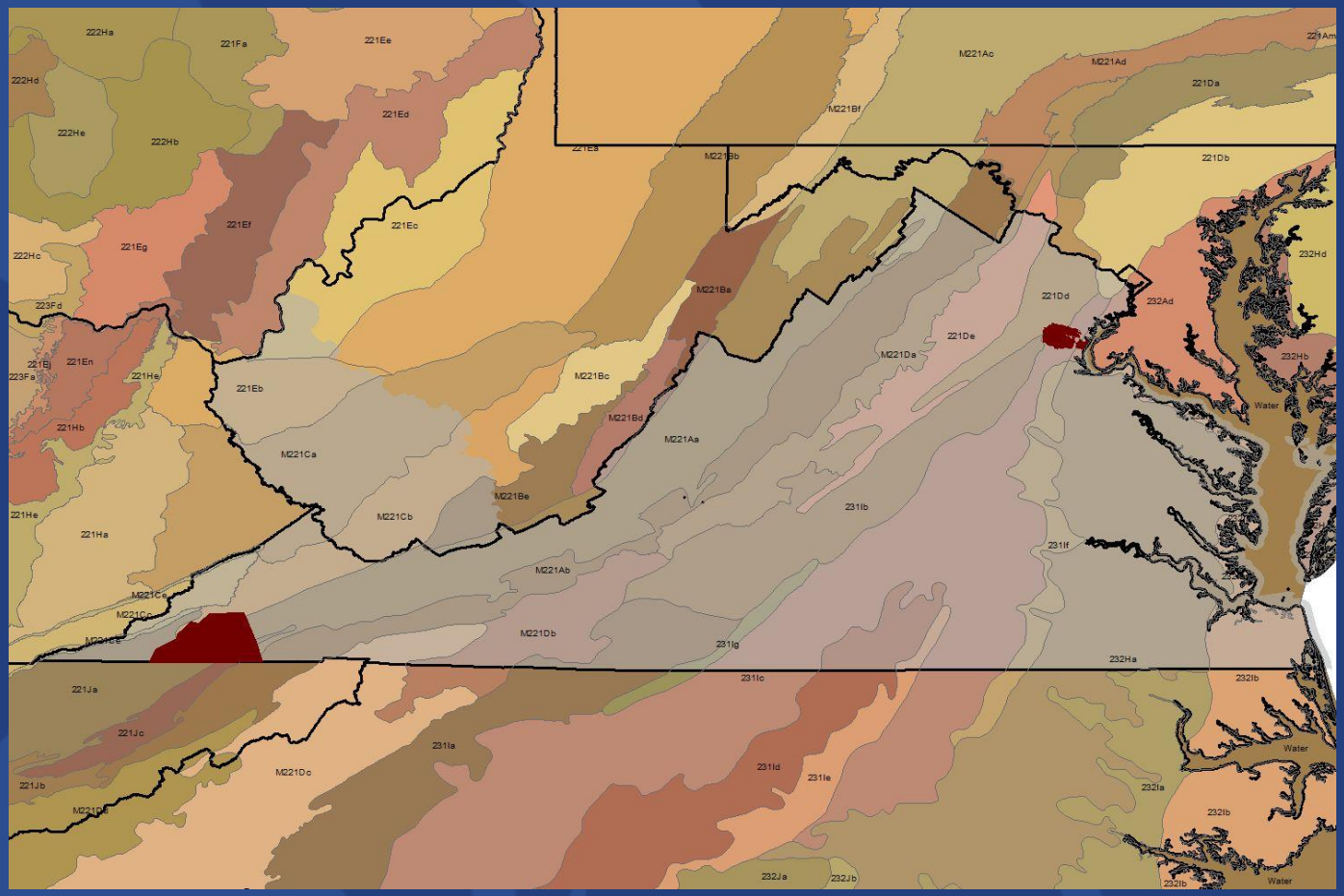
C. Interior Highlands and Appalachian Sinkhole and Depression Pond					X
C. Interior Highlands and Appalachian Sinkhole and Depression Pond	Large River FP				18
C. Interior Highlands and Appalachian Sinkhole and Depression Pond	Small River FP				10018
Southern Ridge and Valley Calcareous Glade and Woodland					24
Great Lakes Wet-Mesic Lakeplain Prairie		NA	2411	7124	NA
Central and Southern Appalachian Spruce-Fir Forest		202.028	2350	4253	28
Southern Appalachian Northern Hardwood Forest		202.029	2309	4115	29
Great Lakes Coastal Marsh Systems		**NA**	2492		
Great Lakes Freshwater Estuary and Delta				9268	
Northern Great Lakes Coastal Marsh				9296	

West Virginia / Virginia:
The one area where all 4 project maps overlap



Targets of WV - VA mapping

- ~85 ecological systems mapped
- 25 of those mapped by everyone
- 8 additional TNC systems / system-combos
- 14 mapped systems not expected in region
- 30 systems known to occur not mapped by anyone

Only Mapped by TNC (9 systems)

- Central Interior Highlands and Appalachian Sinkhole and Depression Pond
- Southern Ridge and Valley Calcareous Glade and Woodland
- Southern Piedmont Glade and Barrens
- Southern Piedmont Granite Flatrock and Outcrop
- Southern and Central Appalachian Mafic Glade and Barrens
- Southern Interior Calcareous Cliff
- North-Central Appalachian Acidic Swamp
- Northern Atlantic Coastal Plain Riverine Peat Swamp
- Southern Atlantic Coastal Plain Tidal Wooded Swamp

Only Mapped by NatureServe/SEGAP (6 systems)

- Southern and Central Appalachian Bog and Fen
- Southern Piedmont Cliff
- South-Central Interior Large Floodplain
- South-Central Interior Small Stream and Riparian
- Atlantic Coastal Plain Blackwater Stream Floodplain Forest
- Northern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh

Only Mapped by Landfire (2 systems)

- Atantic Coastal Plain Streamhead Seepage Swamp, Pocosin and Baygall
- Atlantic Coastal Plain Upland Longleaf Pine Woodland

Systems (>10 km^2) Mapped Outside Their (reported) Range

System	Area (sq km)			
	TNC	LF	NS	SEGAP
Atlantic Coastal Plain Small Blackwater River Floodplain Forest			965	965
Central Atlantic Coastal Plain Sandy Beach			6	
Central Interior Calcareous Cliff and Talus	0.3		7	147
Laurentian-Acadian Freshwater Marsh	388			
Laurentian-Acadian Wet Meadow-Shrub Swamp	175			
NCI and Appalachian Rich Swamp	15			
NCI Wet Meadow-Shrub Swamp			93	
S. Atlantic Coastal Plain Dune and Maritime Grassland			25	25

Systems Not Mapped

- Mostly small patch: seeps, glades, cliffs, ponds
- Also linear types: riverscour, ravines, beaches and bluffs
- Large patch types include seagrass and aquatic beds, tidal marshes, peatlands, lakeshores
- One matrix system [but edge of range]: Central Atlantic Coastal Plain Wet Longleaf Pine Savannah and Flatwoods

MAP CLASS DESCRIPTION

Our review of the 4 map projects suggests the following:

- Map class types of ecological systems are not the same as the ecological systems classification types, even though the map is attempting to express the spatial (ecological, geographic) pattern of the ecosystem type.
- Map class description should summarize
  - map to classification relations
  - mapping process, and
  - ecological content of the map class

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MAP CLASS DESCRIPTION: EXAMPLE OF A TEMPLATE

NAME

A. Map Class Name:

B. Relation of map class to ecological system type(s)

- E.g. a) aggregate, b) directly equivalent, c) complex, d) new system.
- Reason for relationship.
- Classification type name reference.

MODELING PROCESS

C. General citation for mapping methods.

D. Mapping approach (including post processing)

E. Model parameters (number of plots, ancillary data, etc).

F. Validation and AA.

MAP CLASS DESCRIPTION

H. Map class ecological description(?) (geography, acres, ecology).

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MAP CLASS DESCRIPTION: Name

NAME

A. Map Class Name: **Gulf and Atlantic Coastal Plain Sparsely Vegetated Systems**

B. Relation to Ecological Systems: Aggregate

- Northern Atlantic Coastal Plain Dune and Swale
- Central Atlantic Coastal Plain Sandy Beach
- Northern Atlantic Coastal Plain Sandy Beach

Comment:

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MAP CLASS DESCRIPTION: Mapping Approach

EGCP Jackson Prairie and Woodland: (Kleiner 2007 – SEGAP):

This class was manually burned in. Known occurrences from the original point dataset (see Table 4) were overlaid on DOQs and the prairie patches were digitized.

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MAP CLASS DESCRIPTION: Mapping Approach

Mapping Approach: Ferree and Anderson 2013 (TNC)

System-code	System-name	Basic_model	Landcover
201.57	Acadian-Appalachian Montane Spruce-Fir-Hardwood Forest	lower elevation limit = (-100 * latitude) + 5129; upper elevation limit = (-83 * latitude) + 5150; latitude in decimal degrees, results in meters	Upland natural landcover, any class
201.56	Acadian Sub-boreal Spruce Flat	Acadian Low-Elevation Spruce-Fir-Hardwood Forest model from matrix forest analysis	Natural landcover, any class
201.57	Acadian-Appalachian Alpine Tundra	to identify areas above upper elevation limit for spr-fir: upper elevation limit = (-83 * latitude) + 5150; latitude in decimal degrees, results in m; exclude any cliff-talus model occurrences	Any landcover class above montane spruce-fir-hardwood model; classes 32,52,71 within 10-cell distance of basic model

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MAP CLASS DESCRIPTION: Validation and AA

- Validation and AA: Ferree and Anderson 2013 (TNC)

Table 6: Comparison of error rates across ecoregions and system type.

HAL: 800 trees, 10 variables, sampsize1 = c(200,200,200,135,200)								
Looks like all 52 variables								
OOB estimate of error rate: 27.06%								
	AHNHF	CADOPF	LANHF	LAPHHF	NEIDMOF	class.error	Known_Occ's	Adjusted_KOs
AHNHF	444	39	26	9	46	0.2128	564	200
CADOPF	26	170	6	4	58	0.3561	264	200
LANHF	27	4	179	16	3	0.2183	229	200
LAPHHF	13	4	19	92	7	0.3185	135	135
NEIDMOF	42	29	0	0	134	0.3463	205	200
							Total: 1397	Total: 935

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Map Class Description: end of story

- Given that large-area maps need to model the ecosystem types, documentation of the method is essential.
- Providing a map class description for each type allows users to readily understand how the map was created.
- Users will often be interested in description and accuracy of individual types, rather than the whole map!

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SUMMARY

A common map legend among the 4 projects had to overcome a number of challenges

1. Lumping/splitting of systems.
   - Aggregates
   - Finer scale units
   - Ruderal vegetation

2. Choice of which systems to map.

3. Understanding how each system was treated in the mapping process. Map class descriptions, which some projects provide, make the interpretation of the map much easier.

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List of Systems not mapped

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