Develop A Standard Habitat Classification Scheme and a Habitat Change Analysis for Habitat Mapping Products Conducted in 2001/2002 and 2015/2016

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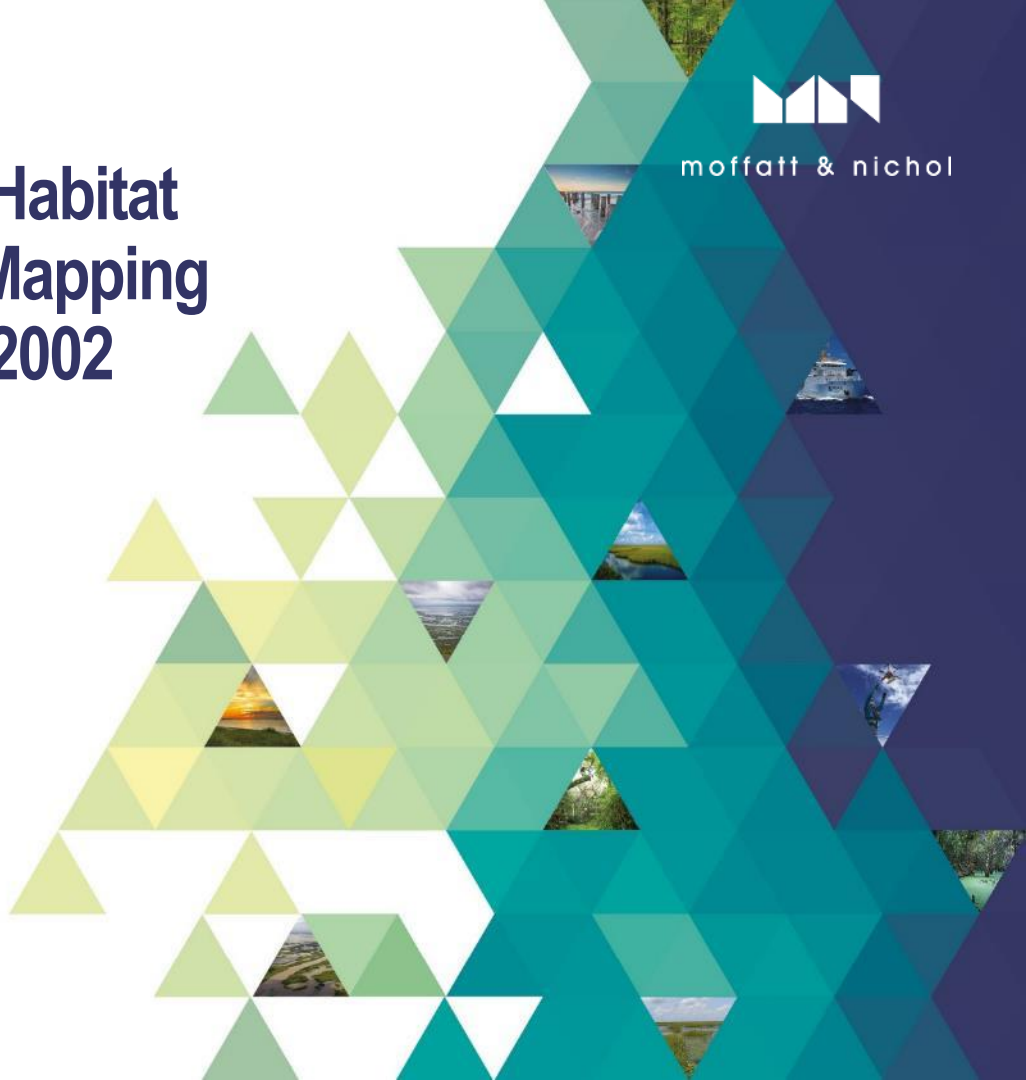
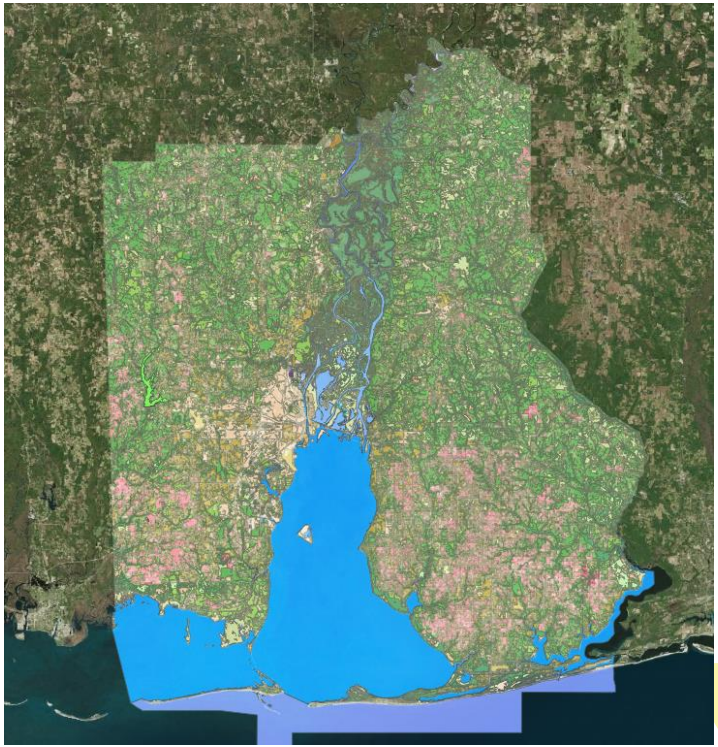
Science Advisory Committee Meeting

9/7/2019



Discussion Items

- Introduction
- Comparison of Previous Habitat Classification Products and translation
- Habitat Classification Approach
- Discuss Status of Habitat Classification Approach and Products to Date



Previous Efforts

- 2005 Habitat Mapper Classification
  - Spectral Landsat and other habitat images. 50m resolution
  - ERDAS Spectral Classification with Subjective Filtering
- 2016 Radiance Habitat Classification
  - January 2016 Aerial Imagery – 1m resolution
  - ERDAS CART Classification – 3-4 spectral bands
  - 700 + Ground Truth Datapoints
  - Merged Cowardin/Anderson Classification
  - Up to 87% accuracy

Issues

- Comparison of classification between 2005 and 2016 not 1:1 and confusing
  - Issues in Resolution 1m vs 50m
  - Issues in matching both polygons classes, resulting in acreage difference caused by methodologies alone
  - Some Groundtruth categories were lumped together
- Solution
  - Review methodologies and develop a translator between the 2 schemes, and try to use objective datasets to discriminate into compatible classification subsets

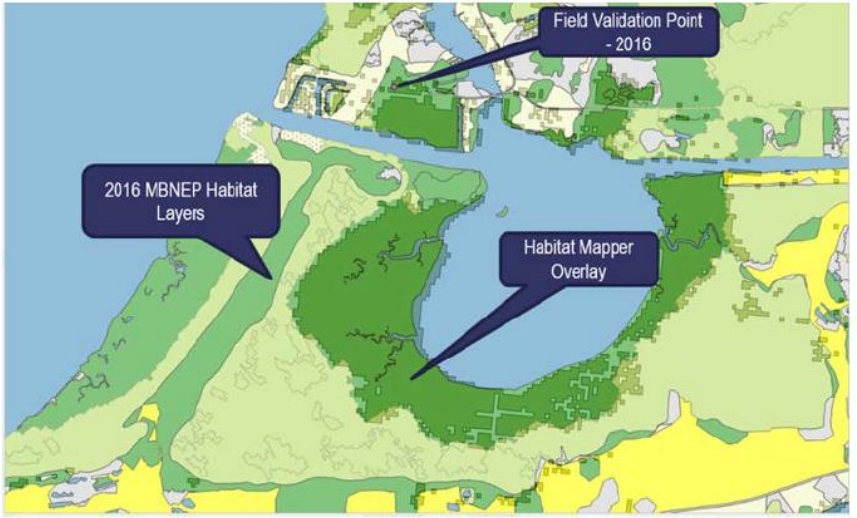
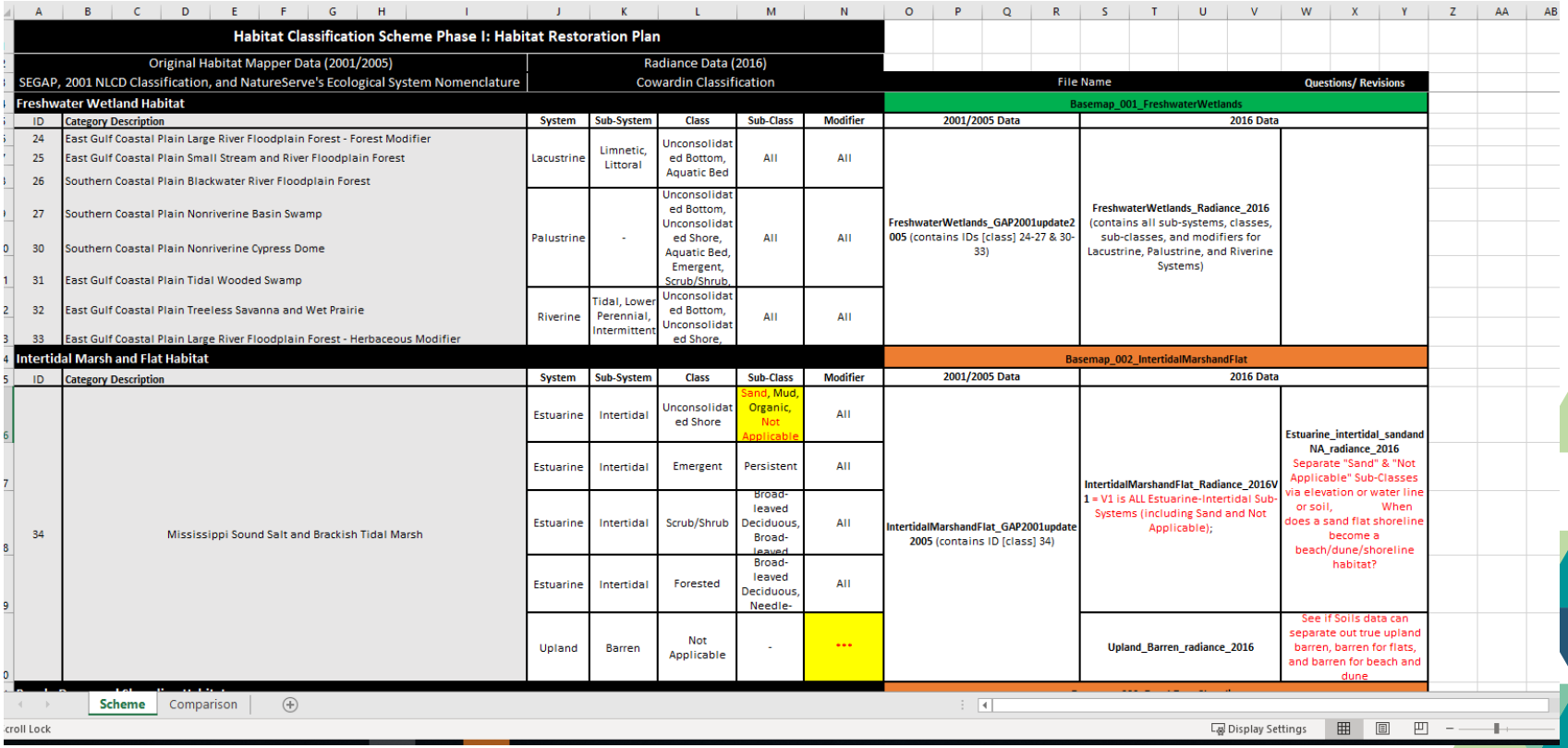


Figure 2. Comparison of MBNEP-2016 Habitat map and 2005 Original Habitat Mapper

Translation Table



Habitat Classification Scheme Phase I: Habitat Restoration Plan

Original Habitat Mapper Data (2001/2005) SEGAP, 2001 NLCD Classification, and NatureServe's Ecological System Nomenclature							Radiance Data (2016) Cowardin Classification					File Name		Questions/ Revisions
Freshwater Wetland Habitat												Basemap_001_FreshwaterWetlands		
ID	Category Description						System	Sub-System	Class	Sub-Class	Modifier	2001/2005 Data	2016 Data	
24	East Gulf Coastal Plain Large River Floodplain Forest - Forest Modifier						Lacustrine	Limnetic, Littoral	Unconsolidated Bottom, Aquatic Bed	All	All	FreshwaterWetlands_GAP2001update2005 (contains IDs [class] 24-27 & 30-33)	FreshwaterWetlands_Radiance_2016 (contains all sub-systems, classes, sub-classes, and modifiers for Lacustrine, Palustrine, and Riverine Systems)	
25	East Gulf Coastal Plain Small Stream and River Floodplain Forest													
26	Southern Coastal Plain Blackwater River Floodplain Forest													
27	Southern Coastal Plain Nonriverine Basin Swamp						Palustrine	-	Unconsolidated Bottom, Unconsolidated Shore, Aquatic Bed, Emergent, Scrub/Shrub,	All	All			
30	Southern Coastal Plain Nonriverine Cypress Dome													
31	East Gulf Coastal Plain Tidal Wooded Swamp													
32	East Gulf Coastal Plain Treeless Savanna and Wet Prairie						Riverine	Tidal, Lower Perennial, Intermittent	Unconsolidated Bottom, Unconsolidated Shore,	All	All			
33	East Gulf Coastal Plain Large River Floodplain Forest - Herbaceous Modifier													
Intertidal Marsh and Flat Habitat												Basemap_002_IntertidalMarshandFlat		
ID	Category Description						System	Sub-System	Class	Sub-Class	Modifier	2001/2005 Data	2016 Data	
34	Mississippi Sound Salt and Brackish Tidal Marsh						Estuarine	Intertidal	Unconsolidated Shore	Sand, Mud, Organic, Not Applicable	All	IntertidalMarshandFlat_GAP2001update2005 (contains ID [class] 34)	IntertidalMarshandFlat_Radiance_2016V1 = V1 is ALL Estuarine-Intertidal Sub-Systems (including Sand and Not Applicable);	Estuarine_intertidal_sandandNA_radiance_2016 Separate "Sand" & "Not Applicable" Sub-Classes via elevation or water line or soil, When does a sand flat shoreline become a beach/dune/shoreline habitat?
							Estuarine	Intertidal	Emergent	Persistent	All			
							Estuarine	Intertidal	Scrub/Shrub	Broad-leaved Deciduous, Broad-leaved	All			
							Estuarine	Intertidal	Forested	Broad-leaved Deciduous, Needle-	All			
							Upland	Barren	Not Applicable	-	---		Upland_Barren_radiance_2016	See if Soils data can separate out true upland barren, barren for flats, and barren for beach and dune

Scheme | Comparison

Translation Table

Habitat Classification Scheme Phase I: Habitat Restoration Plan																					
Original Habitat Mapper Data (2001/2005)										Radiance Data (2016)					File Name						Questions/ Revisions
SEGAP, 2001 NLCD Classification, and NatureServe's Ecological System Nomenclature										Cowardin Classification											
Beach, Dune, and Shoreline Habitat															**Basemap_003_BeachDuneShoreline**						
ID	Category Description									System	Sub-System	Class	Sub-Class	Modifier	2001/2005 Data			2016 Data			
7	Florida Panhandle Beach Vegetation									Upland	Barren	Not Applicable	-	***	BeachDuneandShoreline_GAP2001update2005 (contains ID's [class] 7,21,11)			UplandBarren_radiance_2016			See if Soils data can separate out true upland barren, barren for flats, and barren for beach and dune
21	East Gulf Coastal Plain Dune and Coastal Grassland									Upland	Scrub/shrub	Evergreen	-	Dune				Upland_DuneModifier_radiance2016			
										Upland	Forest	Evergreen	-	Dune							
										Marine	Intertidal	Unconsolidated Shore	Sand	All				Marine_Intertidal_radiance_2016			
11	Unconsolidated shore									Estuarine	Intertidal	Unconsolidated shore	Sand, Not Applicable	***				Estuarine_Intertidal_sandorNA_radiance 2016			See if Soils data can separate out Sand and Not Applicable from that which would be in Intertidal Marsh and flat versus beach dune and shoreline
Jones & Tidwell Shorelines Dataset = shore_protection_total															shore_protection_total			shore_protection_total			Does Jones & Tidwell need to added for "shoreline habitat"?
Stream, River, and Riparian Buffer Habitat															**Basemap_004_StreamRiverRiparianBuffer**						
ID	Category Description									System	Sub-System	Class	Sub-Class	Modifier	2001/2005 Data			2016 Data			
NHD Flowlines															NHDFlowlines (0314,0315,0316,0317)			NHDFlowlines (0314,0315,0316,0317)			Clip to counties
Jones and Tidwell Shorelines Dataset															shore_protection_total			shore_protection_total			Does Jones & Tidwell need to added for "stream, river, riparian buffer habitat"?
Upland Forest Habitat															**Basemap_005_UplandForest**						
										System	Sub-System	Class	Sub-Class	Modifier	2001/2005 Data			2016 Data			
Not Applicable										Upland	Forest	Deciduous	-	All	Not Applicable			Upland_Forest_minusDune_radiance_2016			
										Upland	Forest	Evergreen	-	Minus "Dune"							
										Upland	Forest	Mixed	-	All							
										Upland	Scrub/shrub	Deciduous	-	All				Upland_ScrubShrub_minusDune_radiance_2016			
										Upland	Scrub/shrub	Evergreen	-	Minus "Dune"							
										Upland	Scrub/Shrub	Mixed	-	All							
Longleaf Pine															**Basemap_006_LongleafPine**						
ID	Category Description									System	Sub-System	Class	Sub-Class	Modifier	2001/2005 Data			2016 Data			

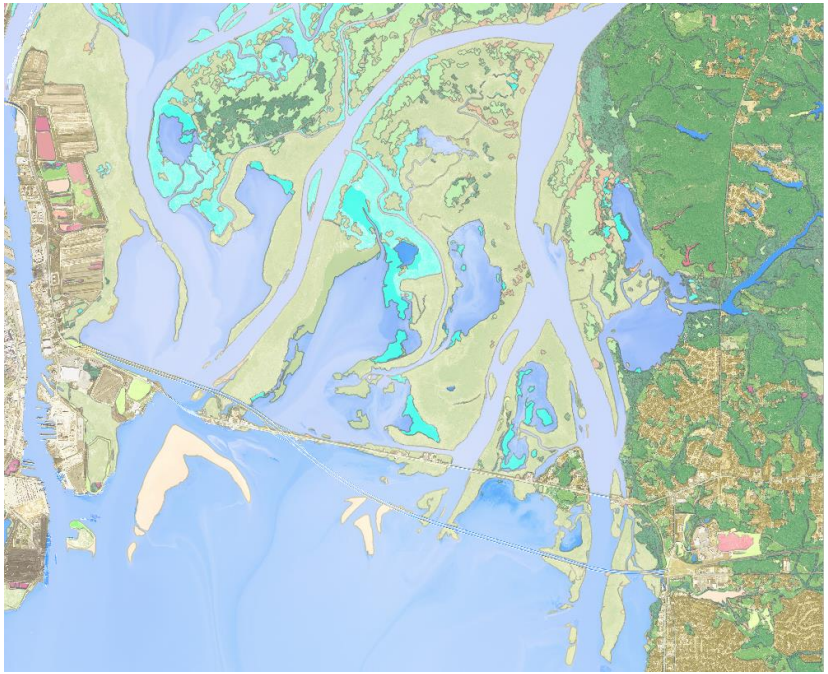
Translation Table

Habitat Classification Scheme Phase I: Habitat Restoration Plan									
Original Habitat Mapper Data (2001/2005) GAP, 2001 NLCD Classification, and NatureServe's Ecological System Nomenclatur			Radiance Data (2016) Cowardin Classification				File Name		Questions/ Revisions
Longleaf Pine							**Basemap_006_LongleafPine**		
ID	Category Description	System	Sub-System	Class	Sub-Class	Modifier	2001/2005 Data	2016 Data	
13	East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Offsite Hardwood Mo	Upland	Forested	Evergreen	-	minus "Dune" ***	LongleafPine_GAP2001update2005 (contains ID's [class] 13,16,17)	Upland_Forest_Evergreen_minusDune_radiance2016	*** clip to soil feature (i.e. retain only areas in non-hydric or longleaf soil layer)
16	East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Loblolly Modifier	Upland	Scrub/shrub	Evergreen	-	minus "Dune" ***		Upland_ScrubShrub_Evergreen_minusDune_radiance2016	*** clip to soil feature (i.e. retain only areas in non-hydric or longleaf soil layer)
17	East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Open Understory Mo								
Pine Savannah							**Basemap_007_PineSavannah**		
ID	Category Description	System	Sub-System	Class	Sub-Class	Modifier	2001/2005 Data	2016 Data	
18	Successional Shrub/Scrub (Clear Cut)	Upland	Scrub/shrub	Evergreen	-	minus "Dune" ***	PineSavannah_GAP2001update2005 (contains ID's [class] 18, 20, 28, 29) Did not include ID [Class] 32 because 32 is included in freshwater wetland habitat	Upland_ScrubShrub_Evergreen_minusDune_radiance2016	*** clip to soil feature (i.e. retain only areas in hydric or pine soil layer)
20	Successional Shrub/Scrub (Other)	Upland	Forest	Evergreen	-	minus "Dune" ***		Upland_Forest_Evergreen_minusDune_radiance2016	*** clip to soil feature (i.e. retain only areas in hydric or pine soil layer)
28	East Gulf Coastal Plain Near-Coast Pine Flatwoods - Offsite Hardwood Modifier	Palustrine	-	Forested	Broad-Leaved Evergreen, Broad-leaved Evergreen/ Needle-Leaved Evergreen, Evergreen, Needle-Leaved Evergreen	***		Palustrine_Forested_Evergreenonly_radiance_2016	***only seasonally and temporarily??? ***Do we include Broad leaved evergreens from Palustrine???
29	East Gulf Coastal Plain Near-Coast Pine Flatwoods - Open Understory Modifier	Palustrine	-	Scrub/Shrub	Broad-Leaved Evergreen, Broad-leaved Evergreen/ Needle-Leaved Evergreen, Evergreen, Needle-Leaved Evergreen	***		Palustrine_ScrubShrub_Evergreenonly_radiance_2016	***only seasonally and temporarily??? ***Do we include Broad leaved evergreens from Palustrine???
~~32~~	~~East Gulf Coastal Plain Treeless Savanna and Wet Prairie~~	Estuarine	Intertidal	Scrub/Shrub	Broad-Leaved Evergreen,	***		Estuarine_Intertidal_ScrubShrub_Evergreenonly_radiance 2016	***Do we include Broad leaved evergreens from Estuarine?*** do we modify via water regime

Translation Table

Habitat Classification Scheme Phase I: Habitat Restoration Plan																							
Original Habitat Mapper Data (2001/2005)									Radiance Data (2016)														
SEGAP, 2001 NLCD Classification, and NatureServe's Ecological System Nomenclature									Cowardin Classification					File Name							Questions/ Revisions		
									System	Sub-System	Class	Sub-Class	Modifier	2001/2005 Data			2016 Data						
15	East Gulf Coastal Plain Maritime Forest								Upland	Forest	Deciduous	-	All	MaritimeForest_GAP2001update2005 (contains ID [class] 15)			Upland_Forest_Deciduous_radiance_2016					Figure out how to establish proximity to coast (i.e. maybe take 10ft contour-AL CZMA), or 100 ft buffer from beach and dune, and shoreline?	
									Upland	Forest	Evergreen	-	minus Dune modifier				Upland_Forest_Evergreen_minusDune_radiance2016						
									Upland	Forest	Mixed	-	All				Upland_Forest_Mixed_radiance_2016						
									Upland	Scrub/shrub	Evergreen	-	minus Dune modifier				Upland_ScrubShrub_Evergreen_minusDune_radiance2016						
									Upland	Scrub/Shrub	Mixed	-	All				Upland_ScrubShrub_Mixed_radiance_2016						
									Palustrine	-	Forested	All	All				Palustrine_Forested_radiance_2016						
									Palustrine	-	Scrub/Shrub	All	All				Palustrine_ScrubShrub_radiance_2016						
									Estuarine	Intertidal	Forested	All	All				Estuarine_Intertidal_Forested_radiance2016						
									Estuarine	Intertidal	Scrub/Shrub	All	All				Estuarine_Intertidal_ScrubShrub_radiance2016						

Current Revised Dataset



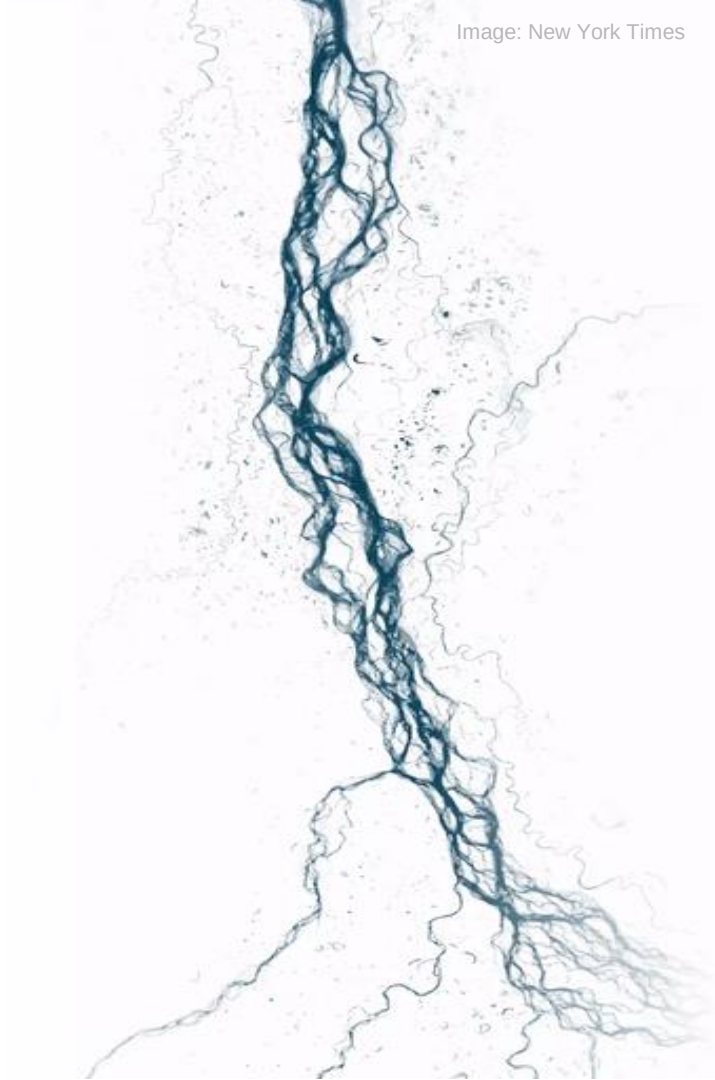


Image: New York Times

Google

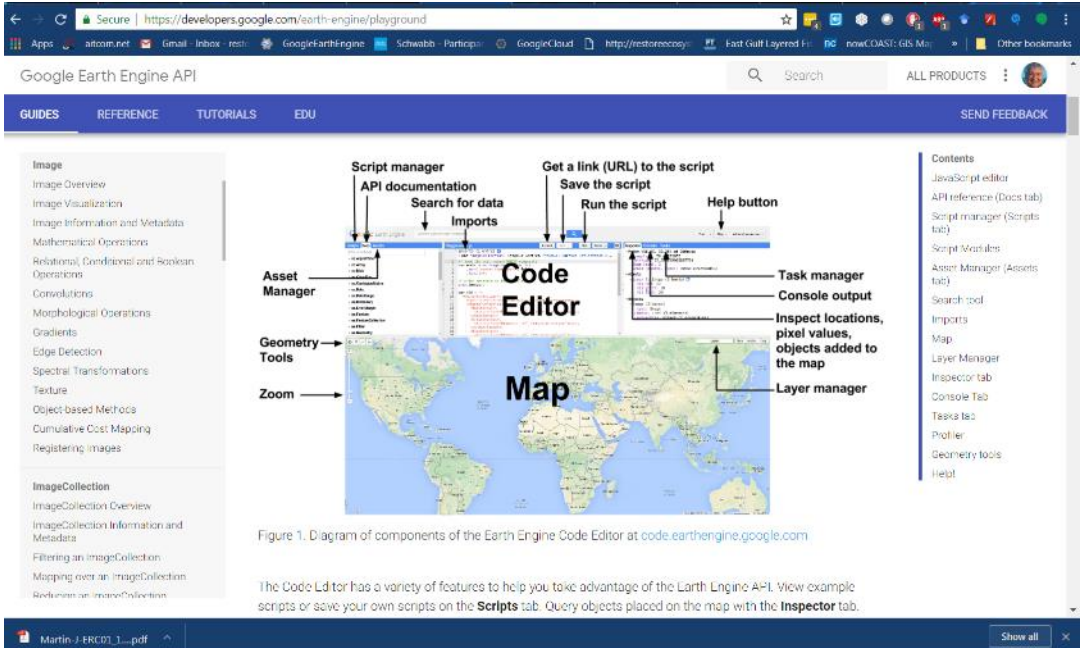
Google Earth Engine

Noel Gorelick
Google Switzerland

Slide Courtesy of Google Earth Image Team

What is GEE

- Archived collection of petabytes of satellite imagery available in the Google cloud
- Interface engine with a code editor (Javascript or Python) to retrieve and manipulate the imagery data for display, export to GIS or data extraction



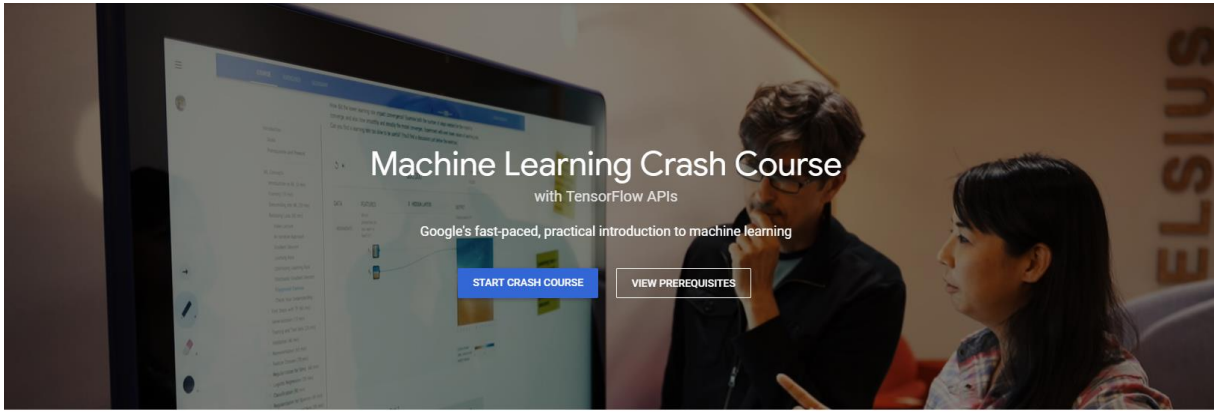
Applications

- Land Use Changes
- Resource Assessments - Wetlands assessment and functionality
- Conservation Activities
- Data Collation for Driving Mechanistic Models

IMAGE: 2017 NDVI from Sentinel 2 via GEE for Upper Barataria, LA

Current Effort

- Current Classification Scheme within Google Earth Engine
  - Spectral, Radar and Other physical layers (Soils, DEM, other data)
  - Machine Learning Classification Scheme (Random Forest Algorithm)



Radiance 2016 Corrected

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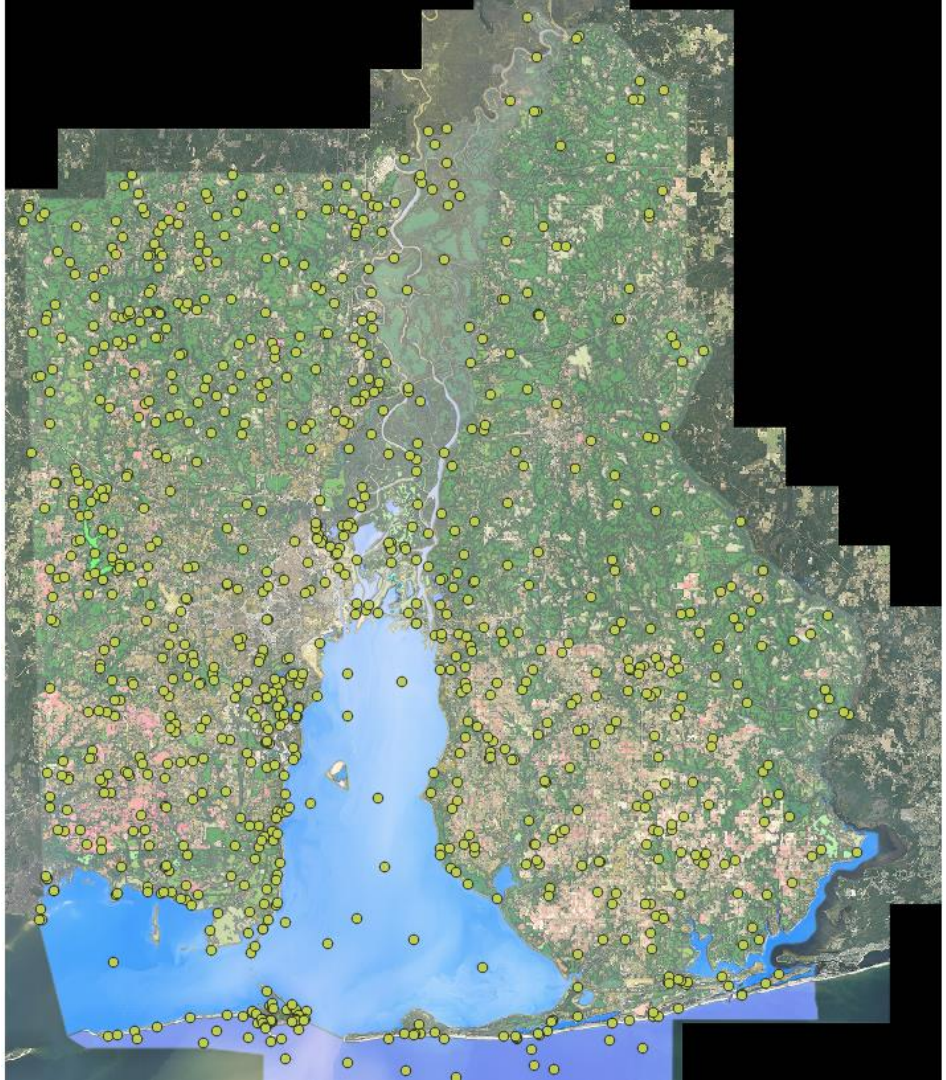
Radiance 2016 Corrected Ground Truth Points



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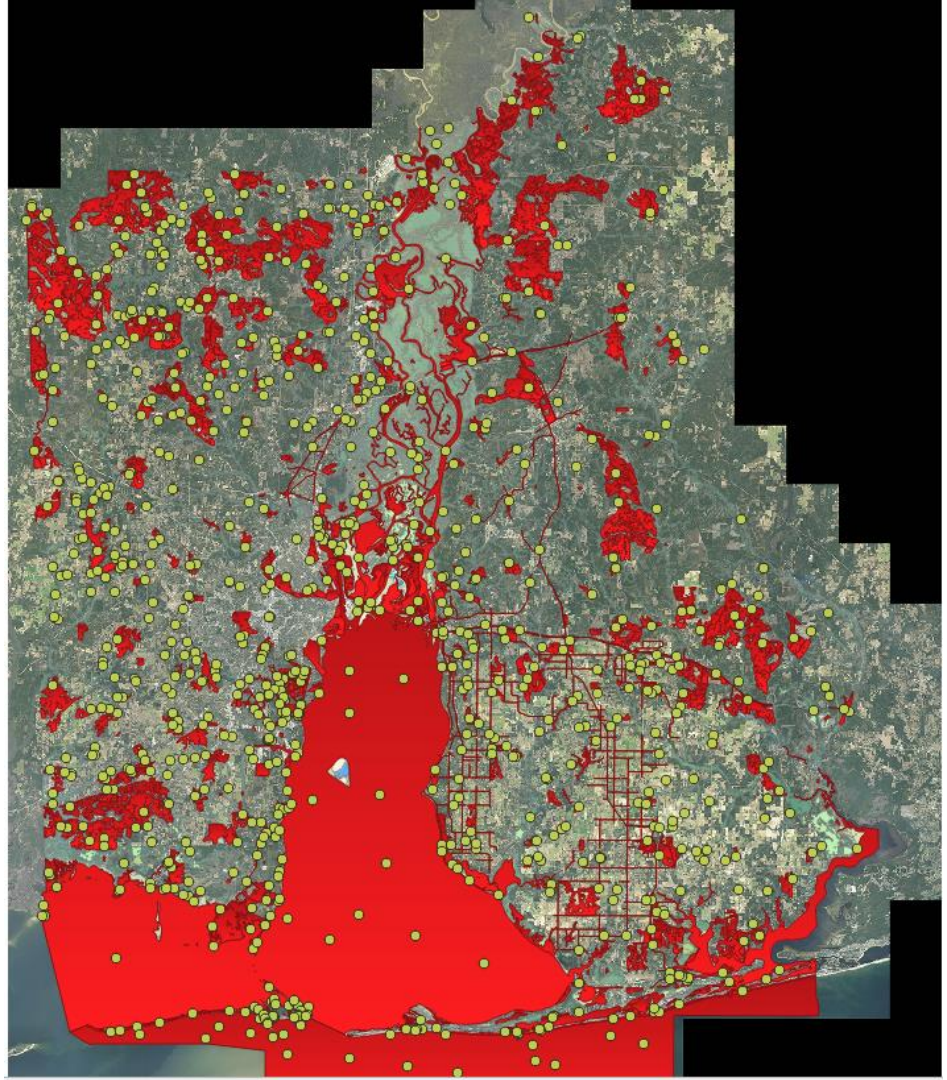
Radiance 2016 Corrected Ground Truth Polygons



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Data used in Current Habitat Classification Scheme

- Spectral
  - Sentinel 2 Bands (10m)
  - Red
  - Blue
  - Green
  - NIR
  - Derived Layers
  - NDVI
  - NDWI
- Radar
  - Sentinel 1 Bands (10m)
  - VV
  - VH
- Physical
  - DEM
  - USDA Forest Types
  - Hydric Soil Types

Data used in Current Habitat Classification Scheme

Sentinel 2 Bands (10m)
Red
Blue
Green
NIR
Derived Layers
NDVI
NDWI

Spectral

Sentinel 1 Bands (10m)
VV
VH

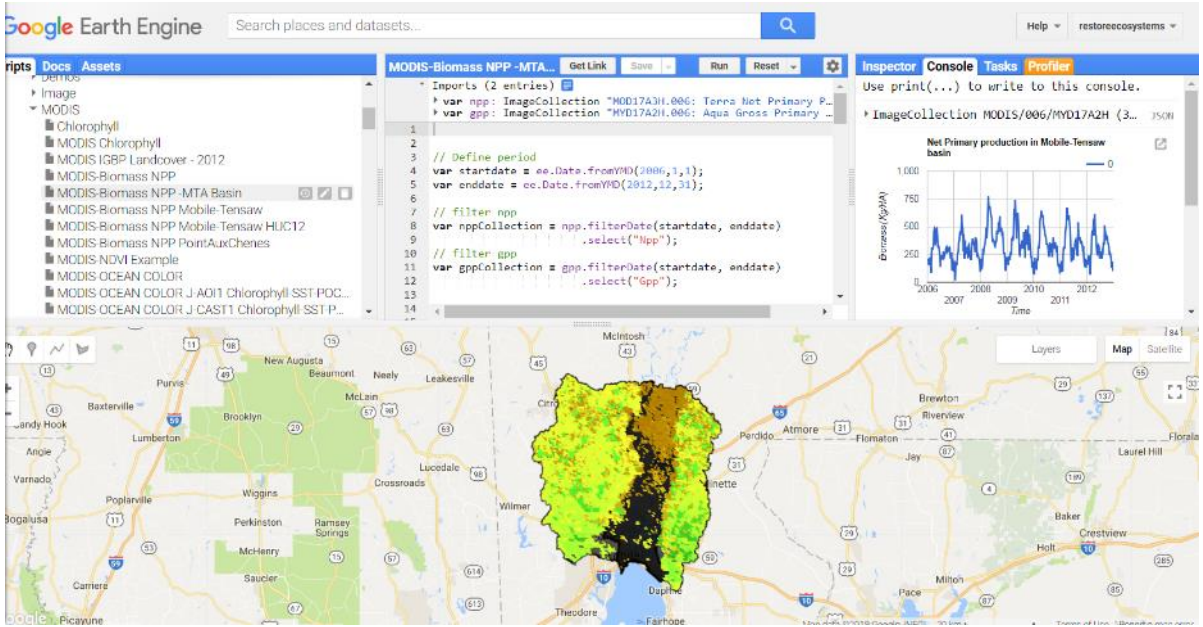
Radar

DEM
USDA Forest Types
Hydric Soil Types

Physical

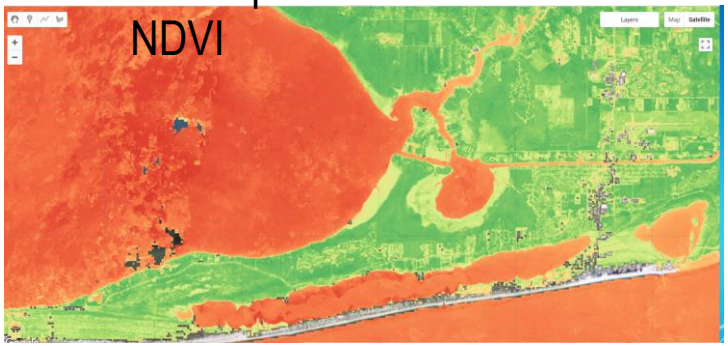
Steps for Data Extraction in GEE

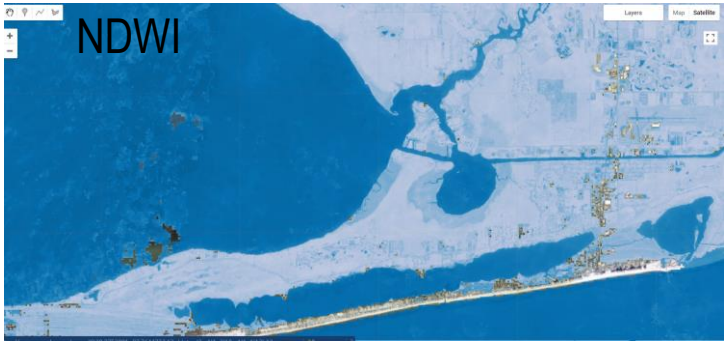
- Search for a dataset & identify imageset
- Define an AOI for the extraction
- Produce Javascript/Python code to extract desired variables



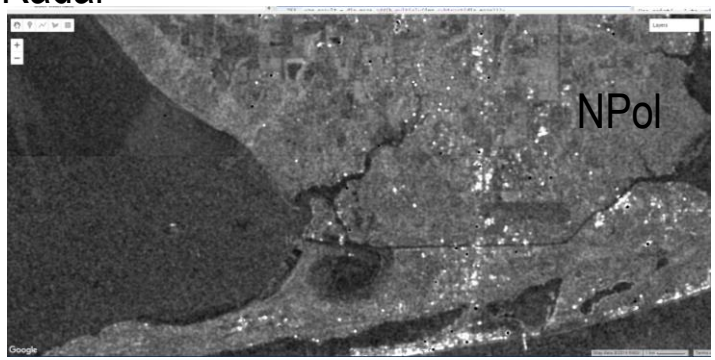
Derived Variables

Spectral

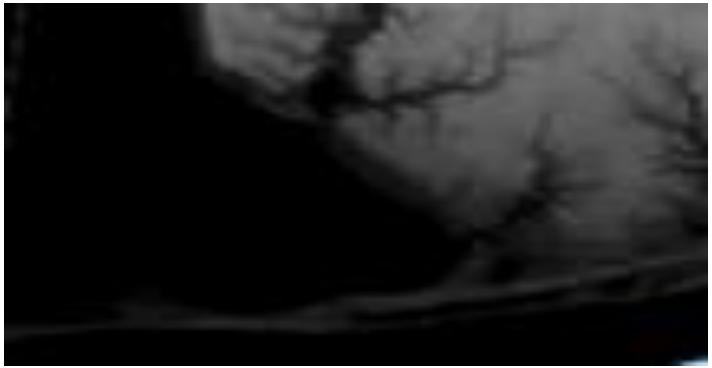




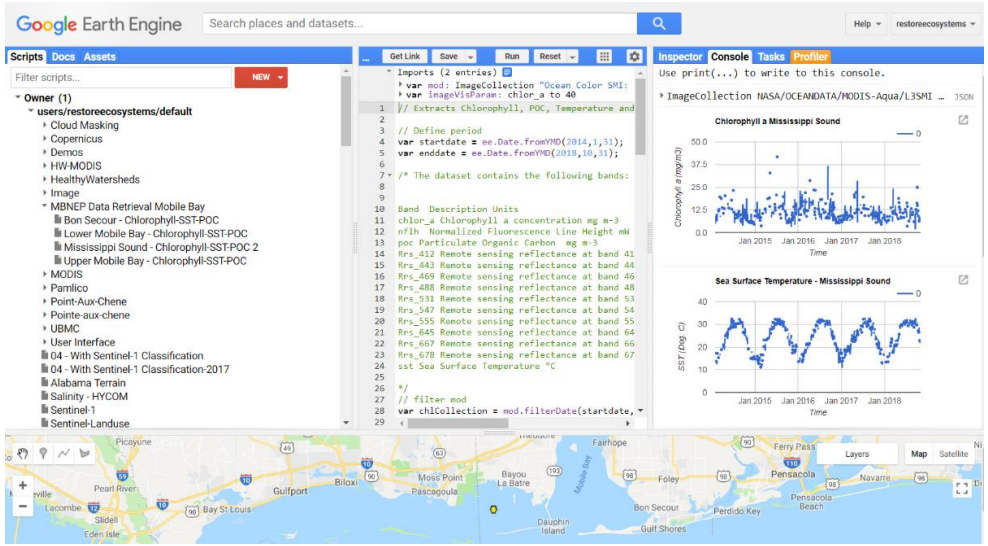
Radar

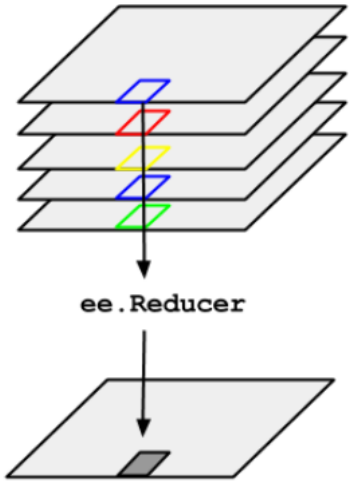


DEM

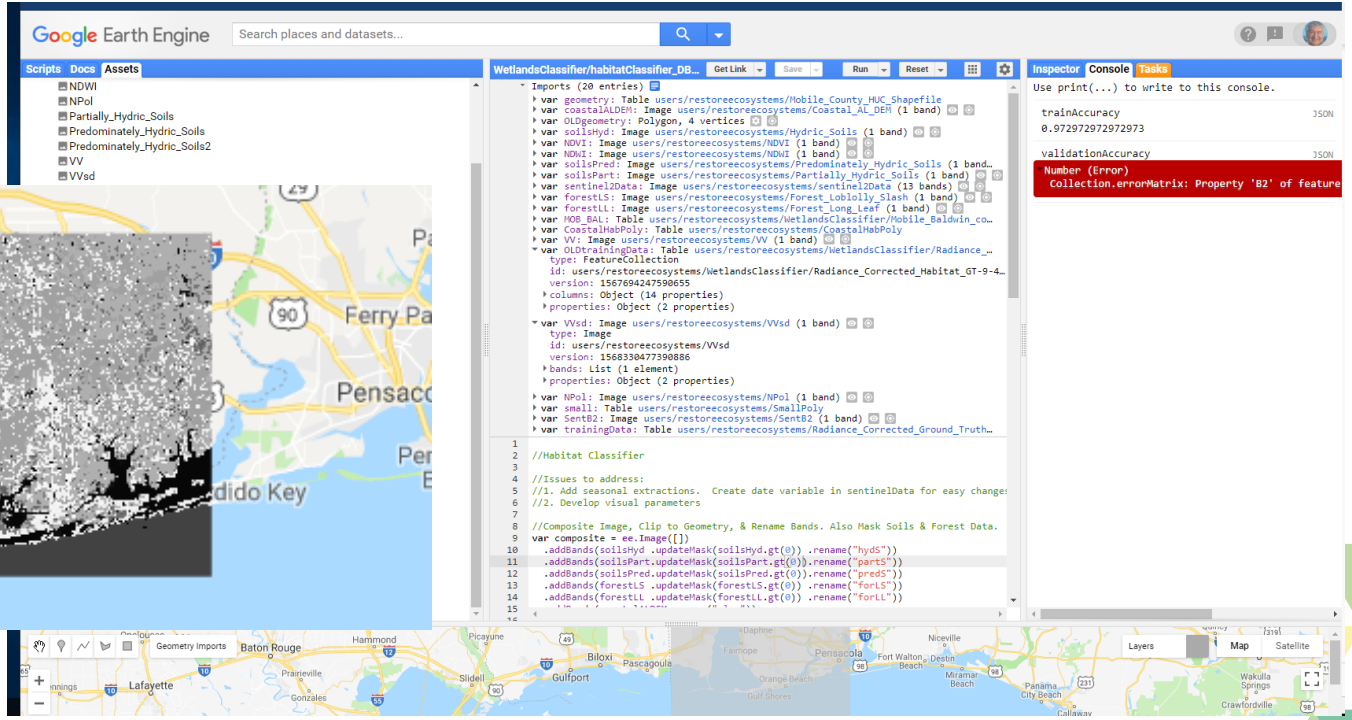


Google Earth Engine





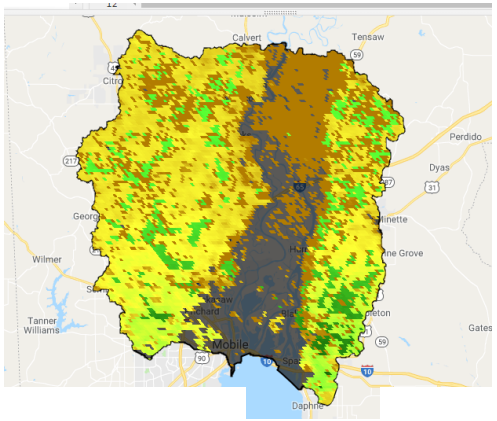
Classifier Status

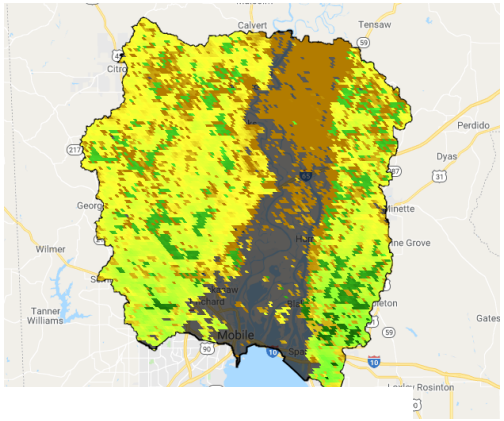


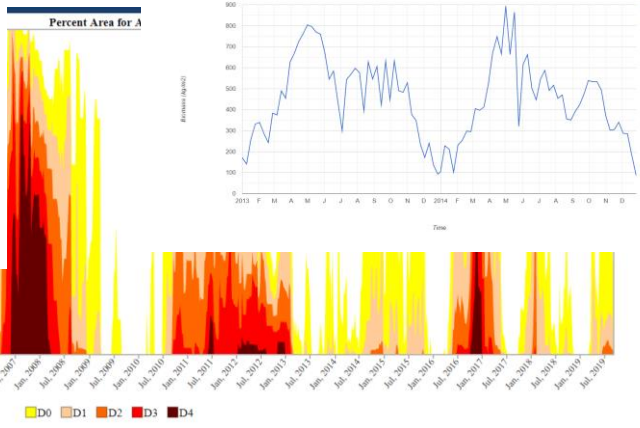
Next Steps

- Trend Analysis
  - Final Verifications of Habitat Types
  - Check consistency between 2005 and 2016 habitats
  - Produce the crosstabs to produce the Trend analysis
- GEE Classifier
  - Refine classifier including all variables
  - Produce a 2016 habitat classification
  - Compare to 2016 Radiance
  -

Productivity







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