1m Land Use and Land Use Change Production Updates

Land Use Workgroup
April 20, 2022

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Overview

- V2 improvements
  - examples
- Production status
- Considerations for 2021/2022 Land Use

V2 Improvements: Architecture

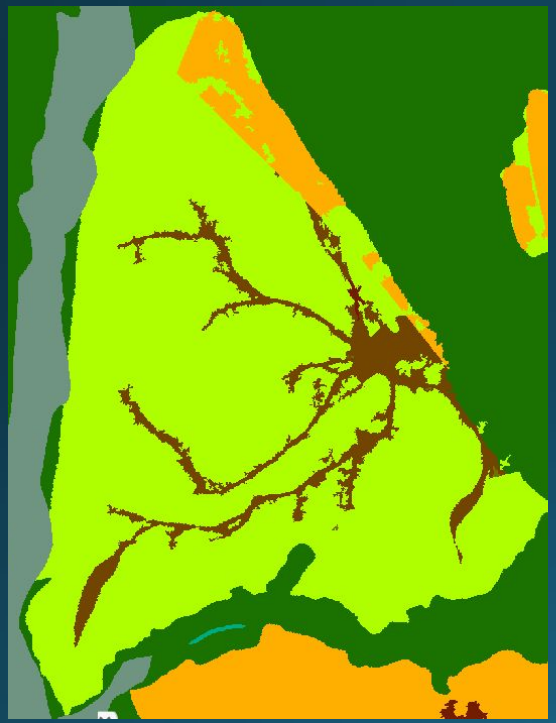
- Refined Azure Batch workflow
- Compute power
  - 30+ nodes
    - 128 GB memory, 16 CPU cores
  - 480 vCPUs
- Automated data pipelines
- Improved error handling
- ~800 test runs in the last 90 days
- Cost reductions

V2 Improvements: Model Improvements

- Updated land cover and segmentation
  - Filled gaps between counties
- Ancillary data additions since Version 1
  - School point data (Turf)
  - VA timber point data (Timber Harvest)
  - Poultry houses (Turf and Cropland)
- Parcel majority rulesets
- Revised water and wetlands model
- Model architecture and efficiency
  - Refined Azure Batch workflow
  - Automated data pipelines
  - Increased compute power to 42

Extractive Corrections

Version 1

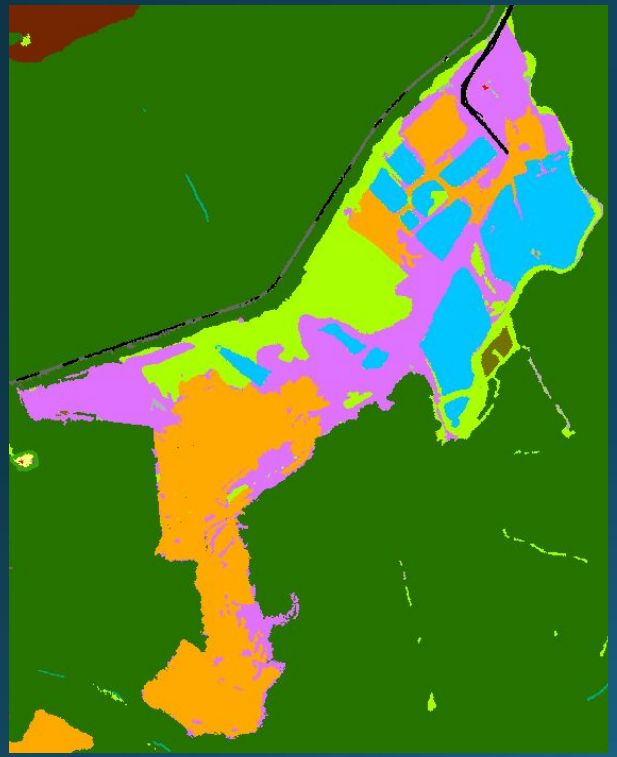


Version 2

NAIP

Extractive Corrections

Version 1

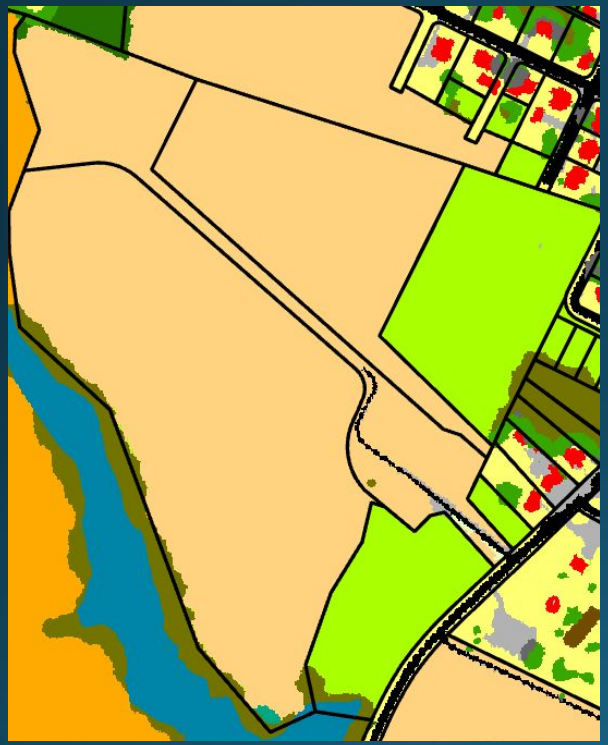


Version 2

NAIP

Succession Corrections

Version 1



Version 2

NAIP

Turf in Undeveloped subdivisions

Version 1

Version 2

NAIP

Production Status

Production Phase		TEST	Production	QA	Details
1	Input Data Preparation	Complete	4/21	Rolling	• 121/206 complete • production tapering with reduced nodes
2	Land Use	4/21	4/29	Rolling	• Production starts when representative sample outputs are approved by Objective 1 team.
3	Land Use Change	4/25	5/6	Rolling	• Testing and QA cannot be completed until LU is finalized
4	Data Hosting	Rolling	Rolling	Rolling	• Applications developed • Waiting on data to be hosted on Azure Blob on a rolling basis

Considerations for 2021/2022 Land Use

- Field boundaries, pseudo field boundaries, or common land units
- Qualitative decision rules rather- regression based
- Parcel vs segment vs pseg rules
- Pasture/hay class
- Ancillary data quality and preprocessing steps
- Time series vs snapshot
- Local data
- Animal operations

Questions?

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High-Resolution Water and Wetlands Classification

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Water Classification

LU Version #1

- Water (roll-up class)
  - Estuarine/Tidal Water
  - Ponds
  - Other water

LU Version #2 / Final

- Water (roll-up class)
  - Estuarine/Tidal Water
  - Lentic:
    - Lakes and Reservoirs
    - Ponds
      - Riverine Ponds
      - Terrene Ponds
  - Lotic:
    - Channels / Streams / Rivers

Water Classification

- Improvement of mapping of intertidal water bodies as tidal water
- Expanded sub-classification of Water Classes:
  - Issues: lentic and lotic classes contain both omission and commission errors – due to lack of fine-scale ancillary data
  - Solution: Inclusion of Hyper-res hydrography to better identify lotic class (draft data available Summer, 2022)
  - Availability of hyper-res hydrography allows potential for mapping other lotic features such as channels versus ditches and sub classes such as lotic over tree canopy or culverts
- Collaborate with UVM to improve of mapping of surface water for non-tidal or in-land water bodies

Lakes and Reservoirs

Location:
Loch Raven Reservoir,
Baltimore County, MD

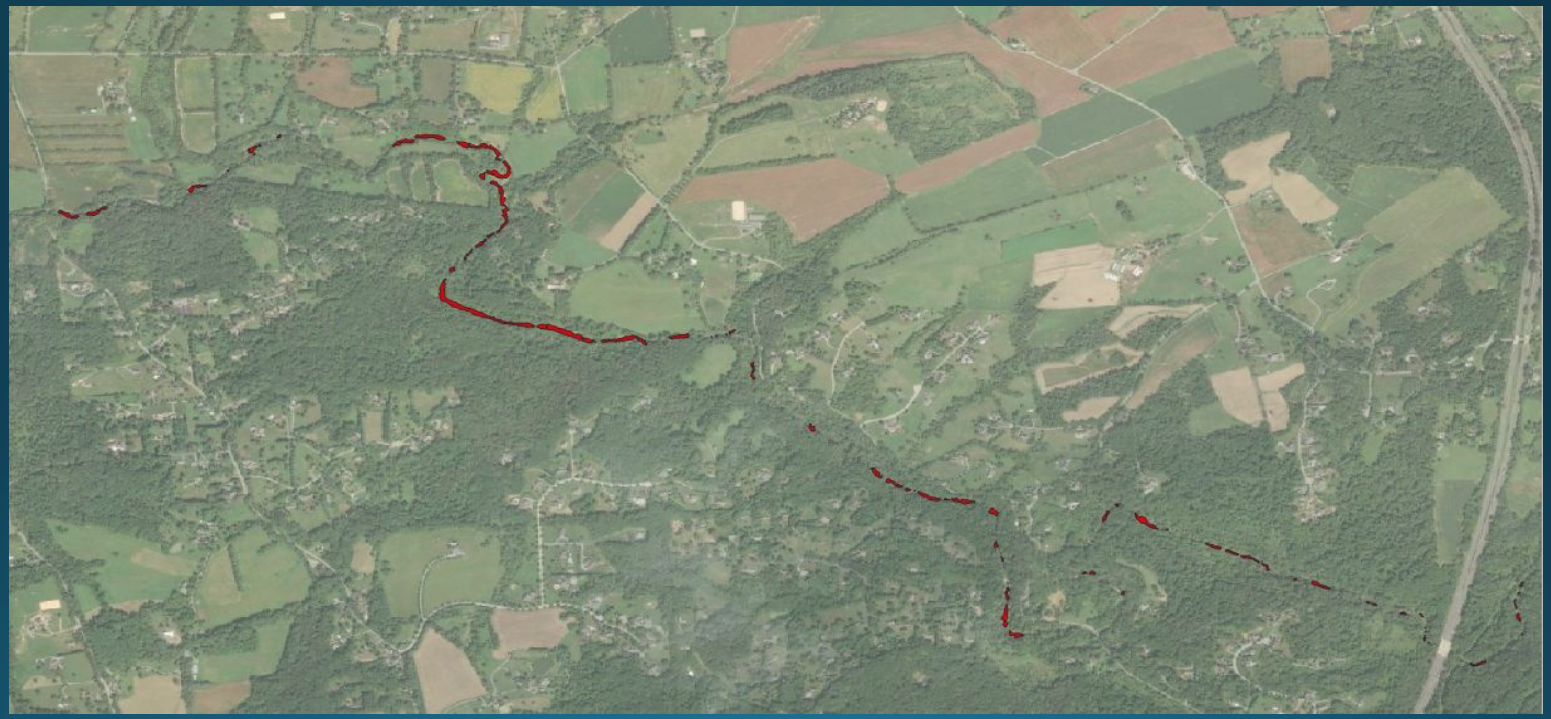
In V1, large in-land water bodies were classed as just ponds. This is fixed in V2 and they are now classed as Lakes and Reservoirs

Lotic / Channels / Streams

Location:
Baltimore County, MD

Channel networks differentiated using National Hydrography Data and FACET Stream Network

Version 1 Classified Lotic Channels as Other Water



Ponds: Riverine and Terrene/Isolated

Location:
Baltimore County, MD

- Stream Network (blue)
- Light Green (riverine ponds)
- Orange (terrene ponds)

Various ancillary data used to differentiate riverine versus terrene. The stream network is to simply illustrate existing presence of channels.

Version 1 grouped all ponds into one class

Land use Water Classification

Location: Blackwater National Wildlife Refuge, MD. Inclusion of intertidal waterbodies as tidal waters in V2. Location In V1, Tidal are in blue and non-tidal areas are red-hatches. In V2, all the red-hatches near tidal areas are now called tidal water

Wetland Classification

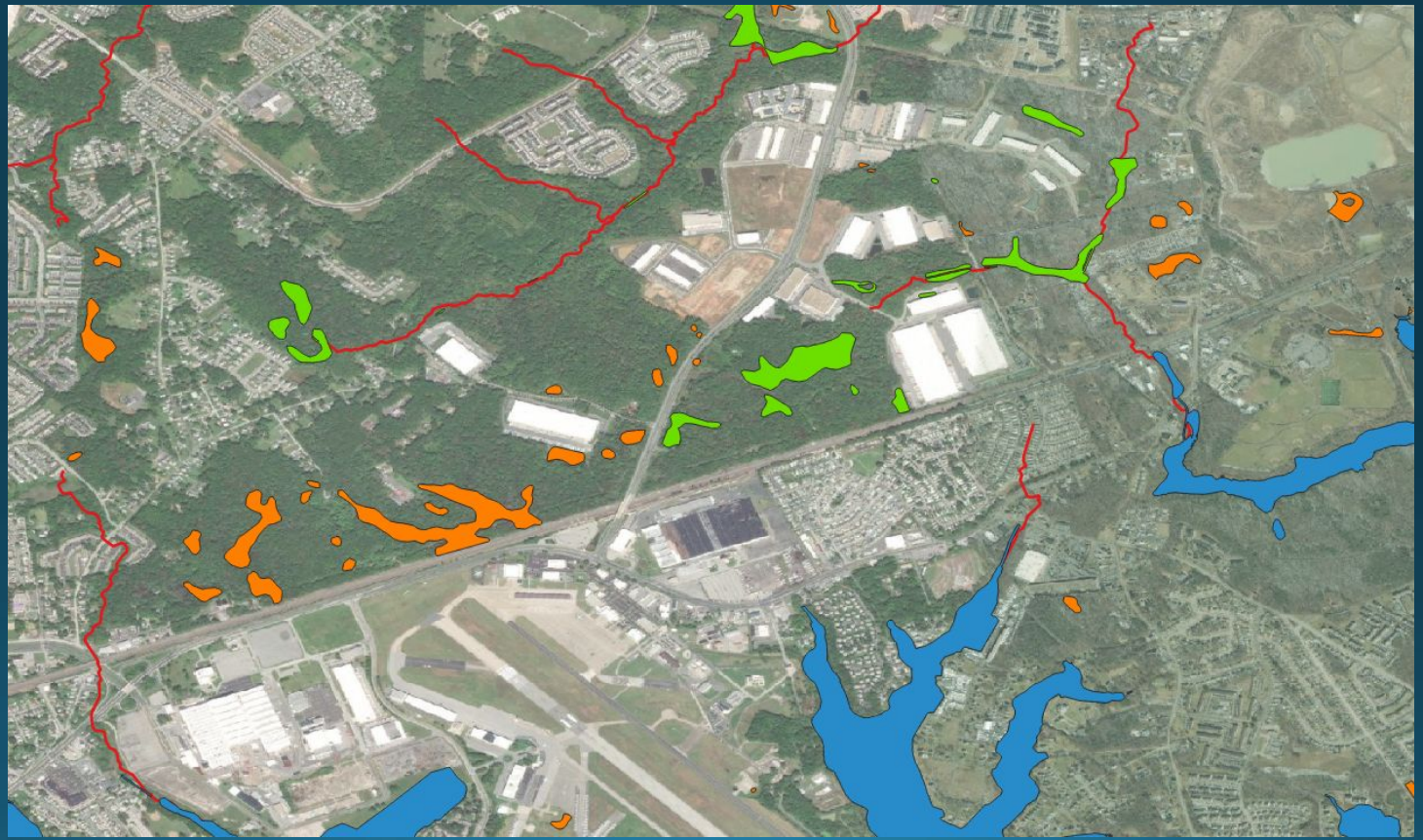
- Wetlands (roll-up class)
  - Tidal Wetlands
  - Non-tidal wetlands:
    - Riverine wetlands
    - Terrene/Isolated wetlands
- Land Use Classification same for Version 1 and 2
- Emergent wetlands added to VA Land Cover in Version 2

Wetlands

Location:
Baltimore County, MD

- Stream network (red)
- Tidal wetlands (blue)
- Riverine wetlands (green)
- Terrene wetlands (orange)

The wetlands are used as an overlay. Only certain land use classes under it are classed as wetlands e.g. low vegetation or forests.



Tree Canopy Land Use Updates

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TC Updates from Version 1

1. Tree Canopy over Turf Grass (TCT) is only present due to buffering of Structures and Turf Grass
   a) Where structures >= 55 sq. meters
2. Tree Canopy within TCT buffers are included for Forest metrics (area >= an acre and width >= 72 meters)
   a) TC within the buffers remain TCT
3. Trees in Agriculture renamed to Other Tree Canopy

- **More Forest and Other Tree Canopy, Less Tree Canopy over Turf**

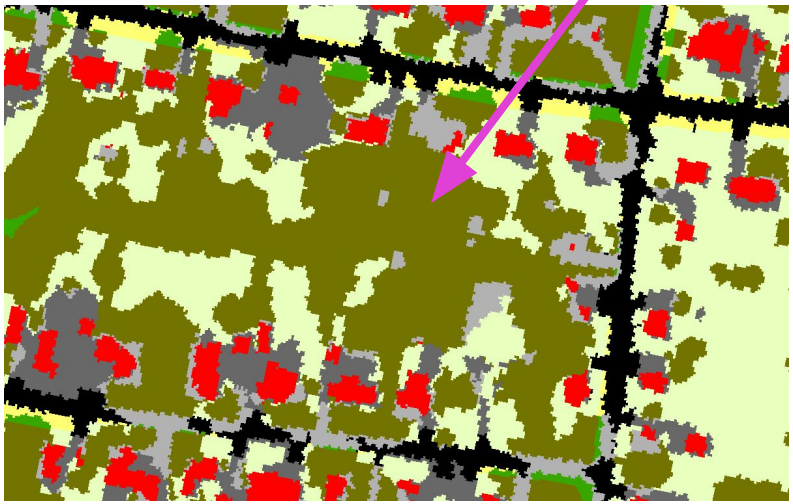
Example: Tree Canopy over Turf Grass (1)

- Version 2 only includes TCT due to buffering of Structures, Turf Grass and Other Impervious

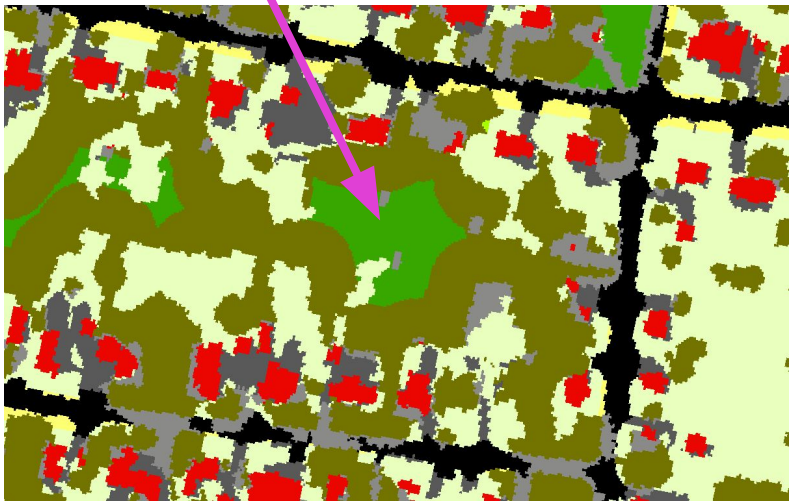
Water
Impervious Roads
Impervious Structures
Impervious, Other
Tree Canopy over Impervious
Turf Grass
Pervious Developed, Other
Tree Canopy over Turf Grass
Forest
Tree Canopy, Other
Natural Succession
Wetlands, Riverine Non,forested

Tree Canopy over Turf Grass

Other Tree Canopy



Version 1



Version 2

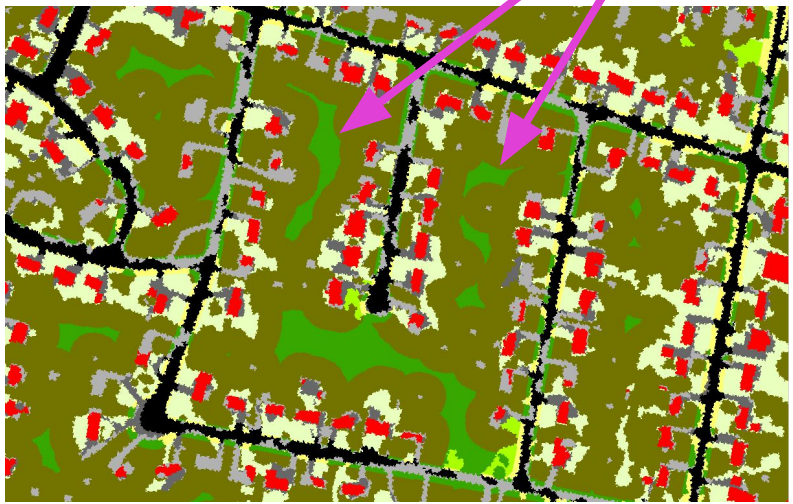
Example: Forest (2)

- Version 1 TCT buffers treated as artificial boundaries, breaking up Forest patches

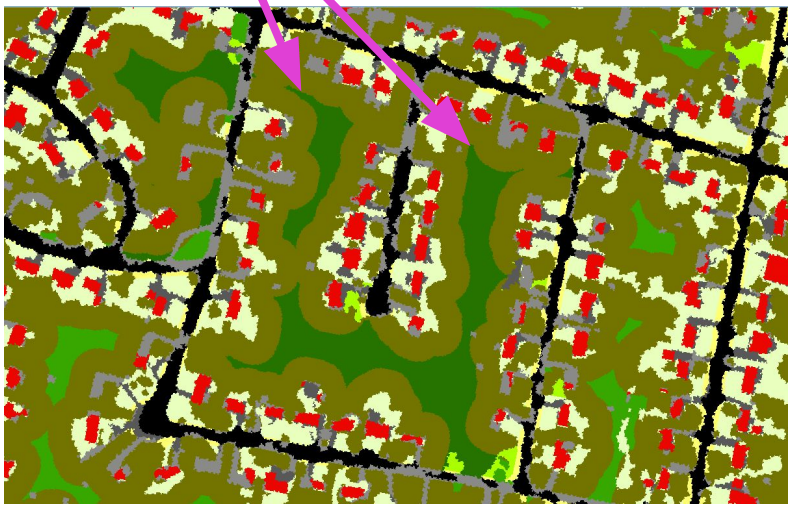
Water
Impervious Roads
Impervious Structures
Impervious, Other
Tree Canopy over Impervious
Turf Grass
Pervious Developed, Other
Tree Canopy over Turf Grass
Forest
Tree Canopy, Other
Natural Succession
Wetlands, Riverine Non,forested

Other Tree Canopy

Forest



Version 1



Version 2

*Estimated patch width without TCT: 35-60 meters

*Estimated patch width with TCT: 75-100 meters

High-Resolution Land Use Change: Version 2 Updates

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What's New with Land Use Change?

- Version 2 maps change between all 54 land uses
  - Version 1 mapped change between 13, Phase 6 classes
- All new workflows!
  - 79 land cover change transitions mapped in the region
  - Each land cover change is translated to land use change with its own individual ruleset
  - Potential for (54x54)-54= **2,862 possible land use transitions**
- Refined code and implemented robust error handling

Updates from Version 1

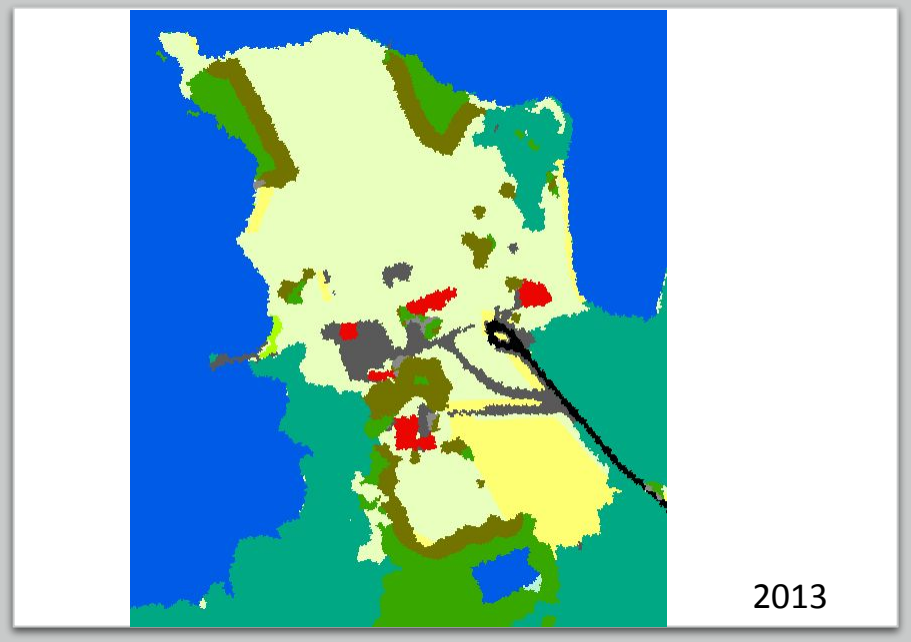
1. Improved wetland change
   a) Better 2013/14 Wetland mapping using wetland overlays

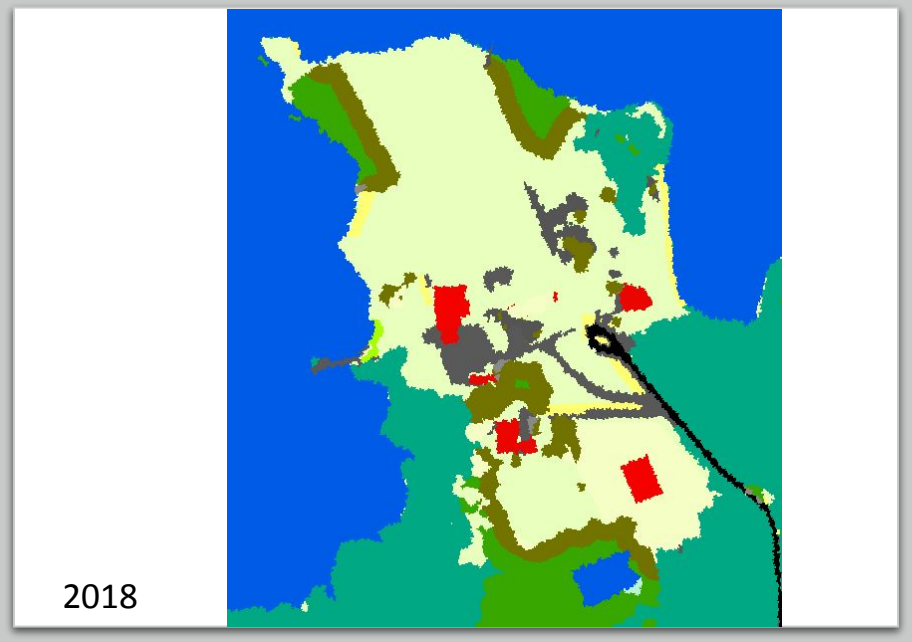
2. Improved Tree Canopy change
   a) More 2013/14 Forest and Other Tree Canopy
   b) Limited Tree Canopy over Turf gain due to development

3. More accurate Agriculture footprint in 2013/14
   a) Updated thresholds to be consistent with 2017/18 Land Use Model

Example: New Development Change

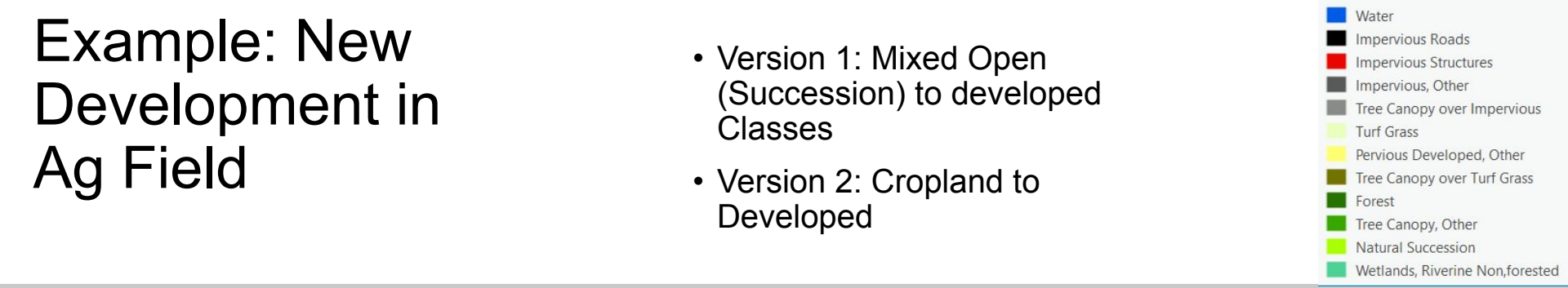
- Added structure to already developed parcel
  - TG -> Structure
- Added Structure to undeveloped parcel
  - Suspended Succession -> Structure
- Tree Canopy over Turf change limited compared to version 1

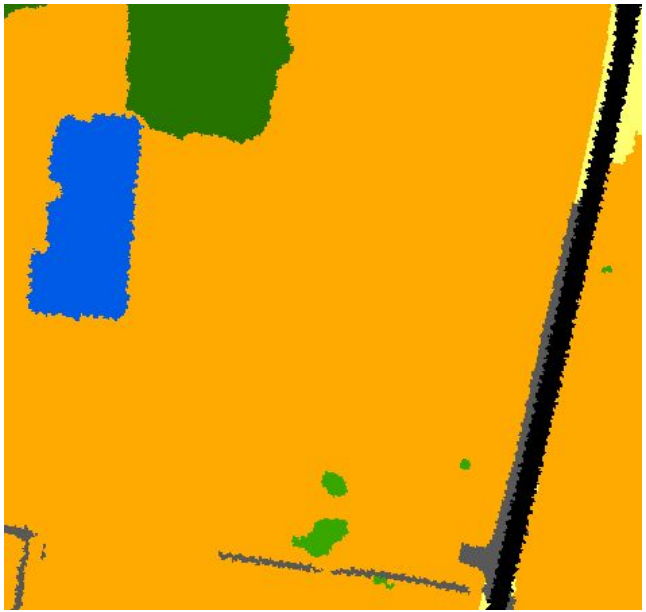




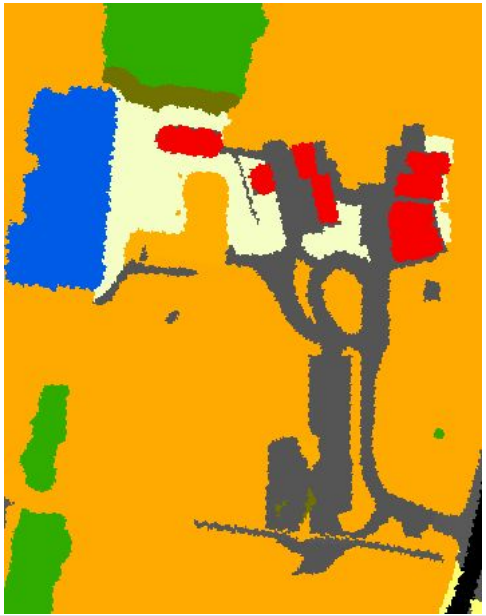
Example: New Development in Ag Field

- Version 1: Mixed Open (Succession) to developed Classes
- Version 2: Cropland to Developed





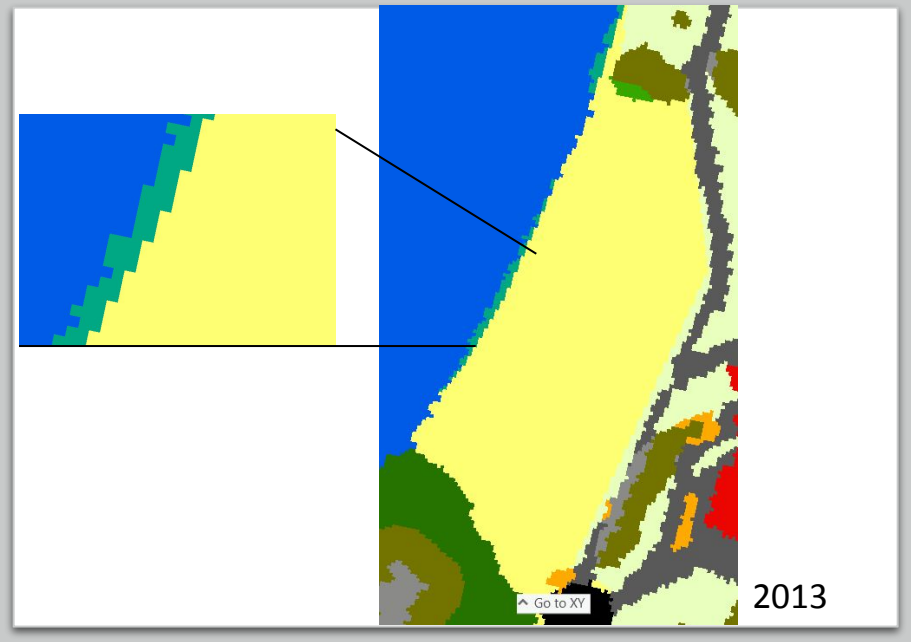
2013

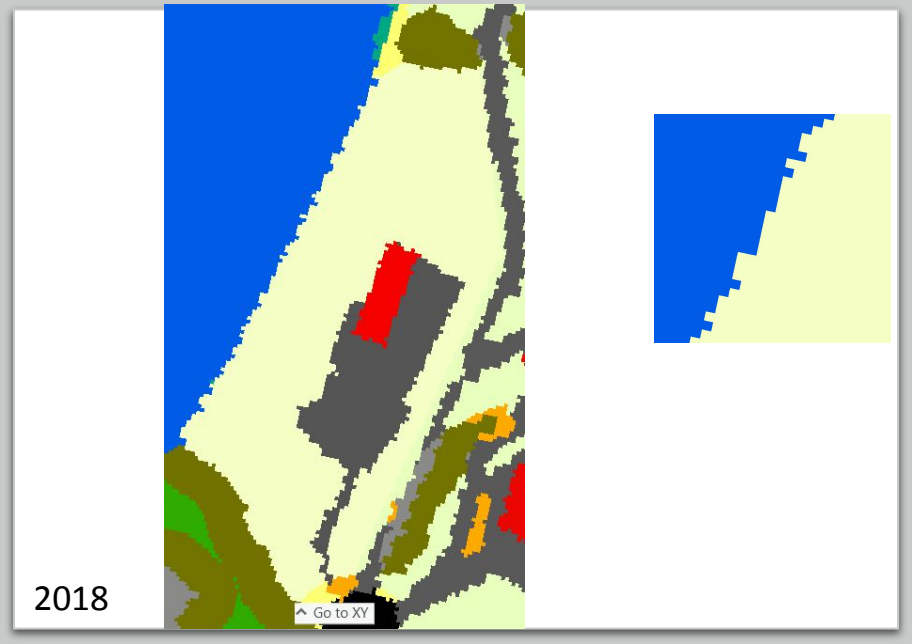


2018

Example: New Development – Tidal Wetlands

- Version 1: Mixed Open (Succession) to developed Classes
- Version 2: Tidal Wetlands to Turf Grass





Pivot Tables

- Full Class 54x54
  - Summarizes change between all classes
- General Roll up 18x18
  - Tree Canopy centric roll up
  - Separates out harvested forest
- Phase 6 Roll up 13x13
  - Classes used in CAST

General Pivot Table (Example for CBW)

** Figures used in table are an example and do not reflect the final

2013/14-2017/18	ROAD	IMPS	IMPO	TCIS	TURF	TCTG	PDEV	FORE	TCOT	NATS	HARF	TDLW	RIVW	TERW	CROP	PAST	EXTR	WATR	Decrease
ROAD	-	10	50	1,143	6	47		217				-	3	-	1	2		-	1,479
IMPS	20	-	25	1,400	1,500	133		58				4	41	12	210	412		5	3,820
IMPO	578	300	-	1,300	3,400	400		186				-	11	1	330	712		7	7,225
TCIS	114	507	790	-	2,000	13		6				2	17	3	57	91		-	3,600
TURF	250	3,450	2,720	-	-	11,210		344							45	69		13	18,101
TCTG	104	2,800	3,640	-	11,367	-		98							516	472		14	19,011
PDEV							-												-
FORE	1,152	5,700	11,600	17	10,660	15,779		-			299,732				20,609	22,054		143	387,446
TCOT									-		5,700								5,700
NATS		150	780	1	28,503	1,037		57,500		-					943	1,788		748	91,450
HARF					2			72,000			-								72,002
TDLW					2							-							2
RIVW					-								-						-
TERW														-					-
CROP	61	1,000	3,400	-	302			3,263							-	151		104	8,281
PAST	51	1,500	3,800	-	451			4,591							178	-		63	10,634
EXTR																	-		-
WATR	1	31	82	-	2			192										-	308
Increase	2,331	15,448	26,887	3,861	58,195	28,619	-	138,455	-	-	305,432	6	72	16	22,889	25,751	-	1,097	629,059
Totals																			
TotGain	2,331	15,448	26,887	3,861	58,195	28,619	-	138,455	-	-	305,432	6	72	16	22,889	25,751	-	1,097	
TotLoss	1,479	3,820	7,225	3,600	18,101	19,011	-	387,446	5,700	91,450	72,002	2	-	-	8,281	10,634	-	308	
Net	852	11,628	19,662	261	40,094	9,608	-	(248,991)	(5,700)	(91,450)	233,430	4	72	16	14,608	15,117	-	789	

Contacts

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