PILOT PROJECT:
EELGRASS AREA CLASSIFICATION – ARCGIS PRO

Fall 2025 Eelgrass Collaborative Meeting

September 24, 2025

Presented by: Kelly Streich and Abbie Winter

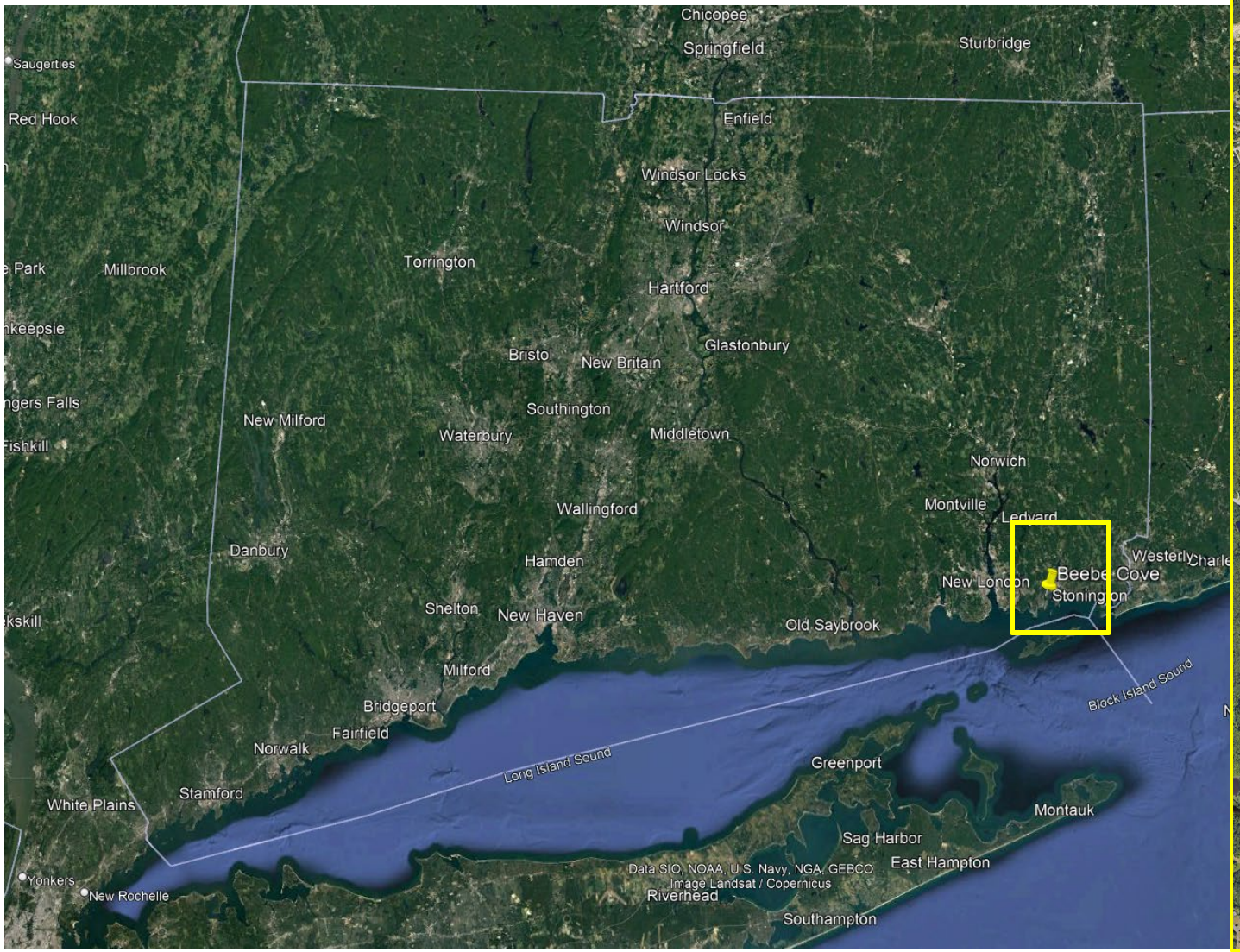
CT Department of Energy and Environmental Protection

BACKGROUND

Purpose: Evaluate feasibility of drone technology to collect imagery & develop an automated method to delineate eelgrass area.

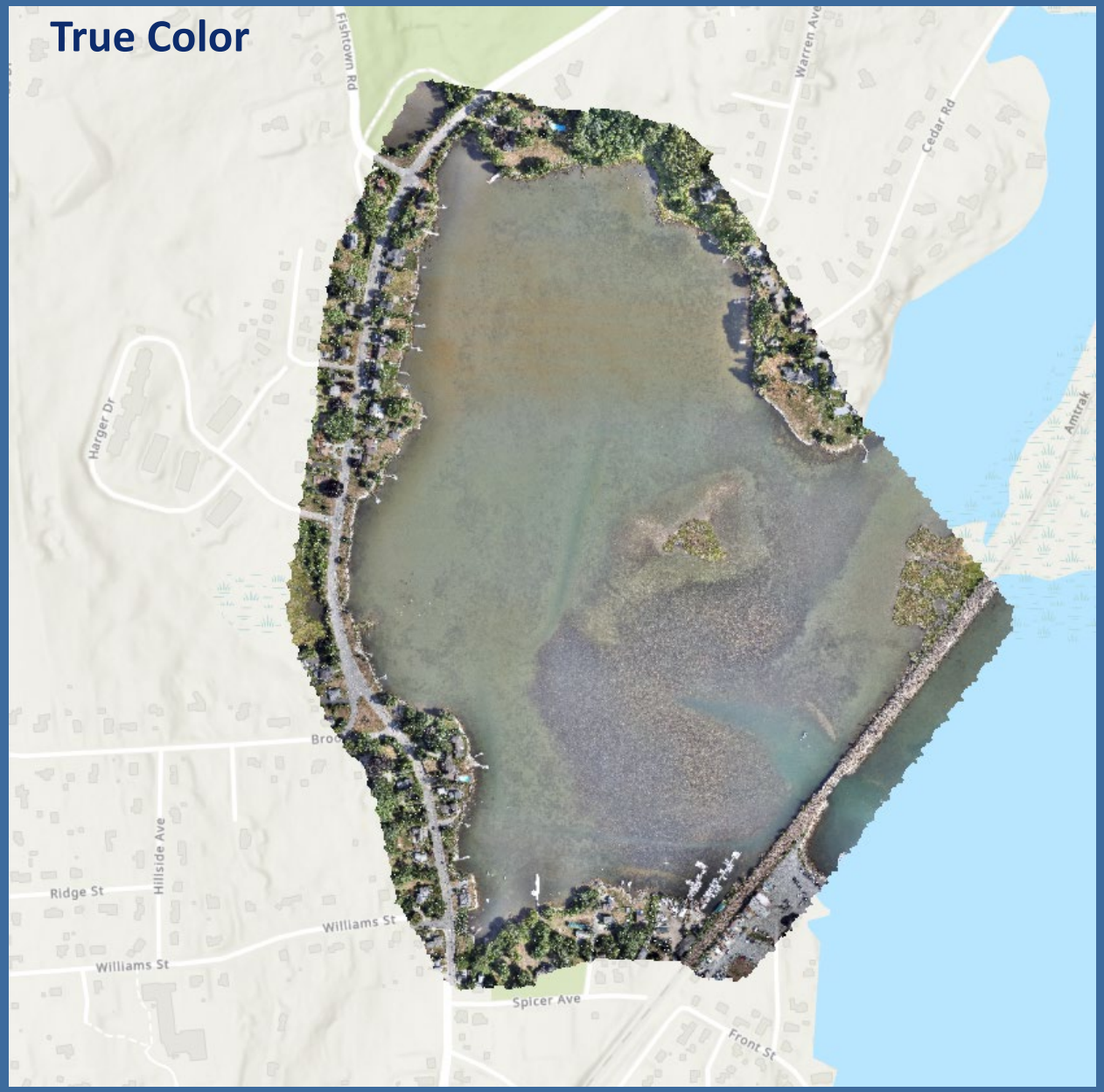
- Prepared a QAPP
- True Color and Multispectral Cameras
- Hand and GIS analysis of the images
- Collected ground truthing data
- Consultant support for GIS
- Final deliverable – Classification manual
- Funded by LIS Partnership

BEEBE COVE, GROTON, CT

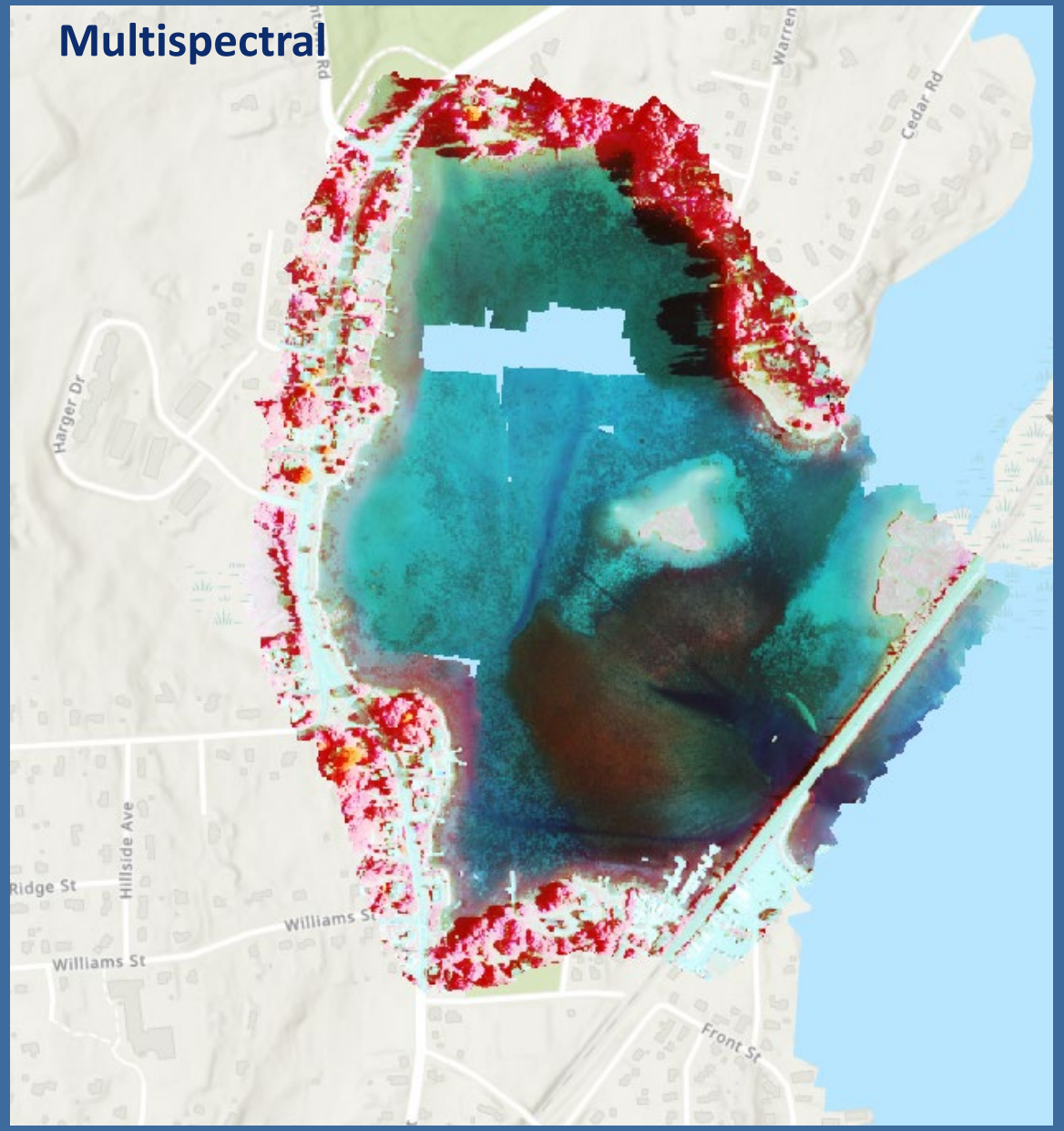


Orthomosaics

True Color



Multispectral



EELGRASS GROUND TRUTHING

Jamie Vaudrey, Ph.D.

Department of Marine Sciences, UConn

Stn ID	Latitude (dec. deg. N)	Longitude (dec. deg. W)	Average Eelgrass (% cover)	Average Ruppia (% cover)	Average Macroalgae (% cover)	Average Bare Sediment (% cover)	Epiphytes (coded: 1=light, 2=mid, 3=heavy)
1	41.32990	-71.98830	97.1	0.0	0.1	2.8	2.0
2	41.33012	-71.98718	100.0	0.0	0.0	0.0	2.8
3	41.33043	-71.98618	0.1	0.0	94.8	5.1	
4	41.33115	-71.98539	0.0	0.0	76.4	23.6	
5	41.33094	-71.98624	100.0	0.0	0.0	0.0	3.0
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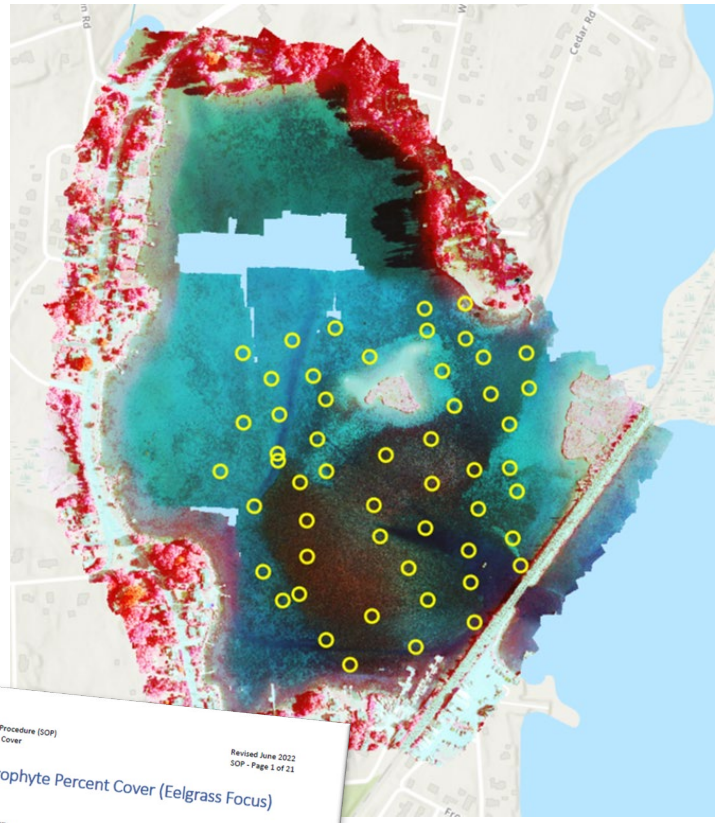

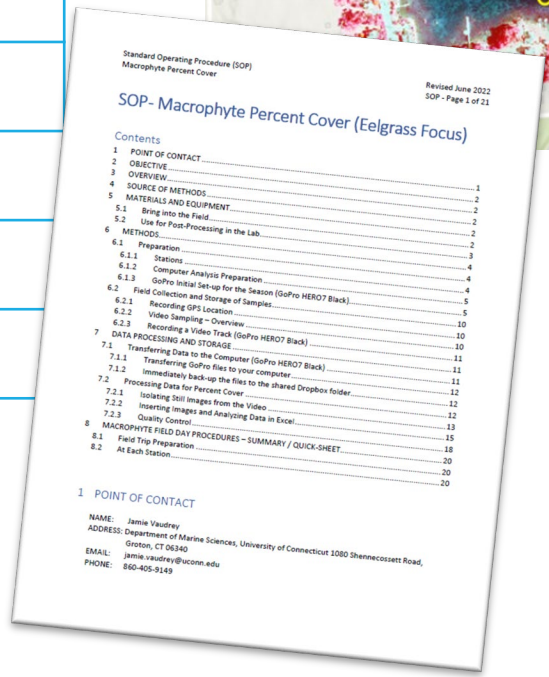
Standard Operating Procedure (SOP)
Macrophyte Percent Cover

Revised June 2022
SOP - Page 1 of 21

SOP- Macrophyte Percent Cover (Eelgrass Focus)

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1 POINT OF CONTACT

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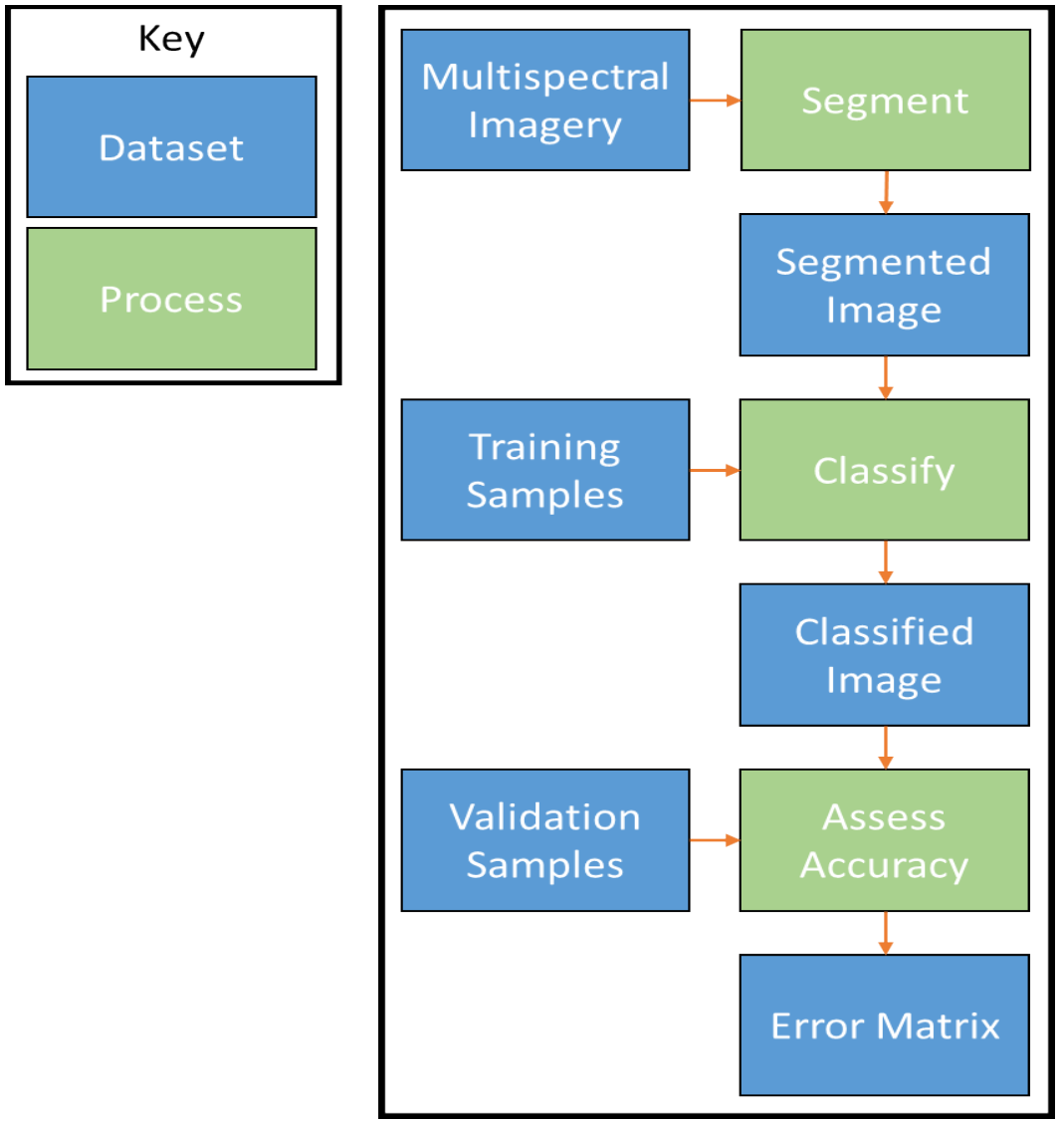
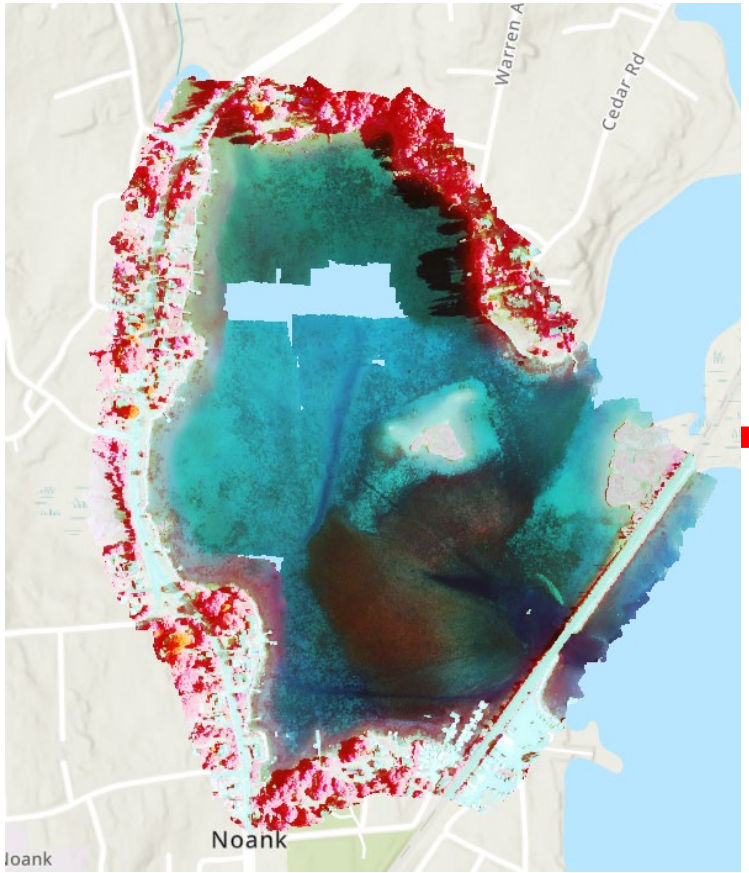
PROCESS

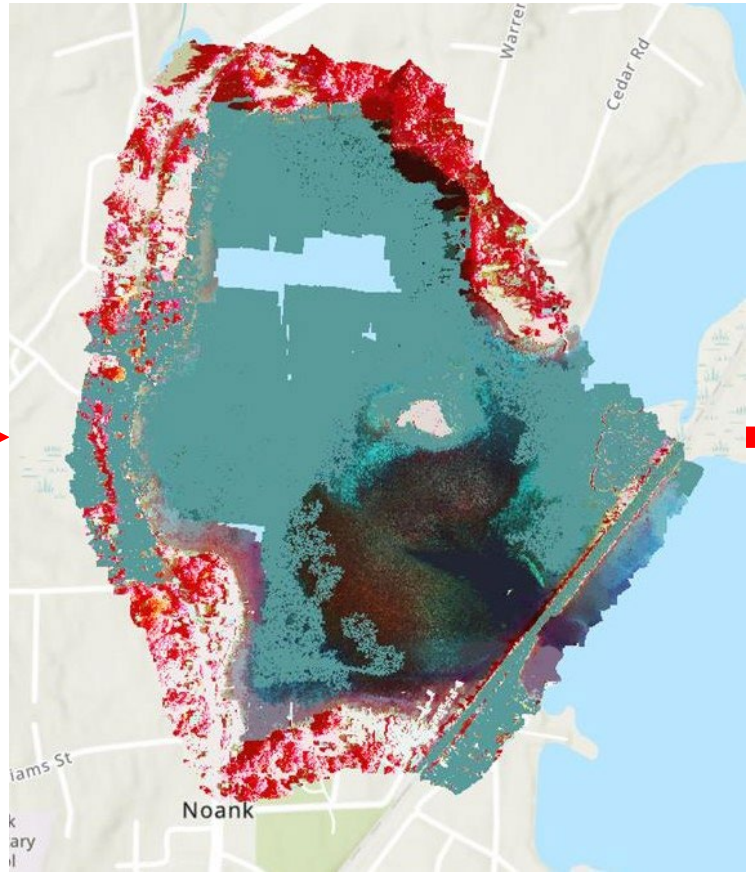
- Evaluated
  - eCognition and ArcGIS Pro
  - True color and Multispectral imagery
  - Pixel and Object Based Methods**
- What worked?
  - ArcGIS Pro
  - Multispectral Imagery
  - Object Based Methods (Maximum Likelihood)
- What we learned?
  - Inconsistencies in ArcGIS Pro
  - Computing power is key



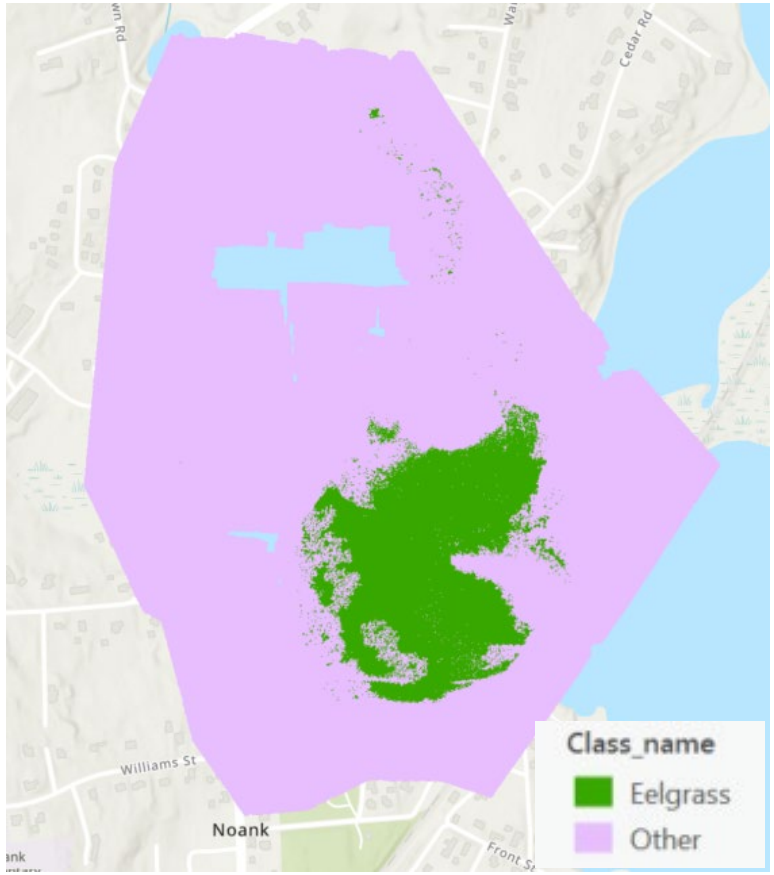
ArcGIS Image Classification Workflow



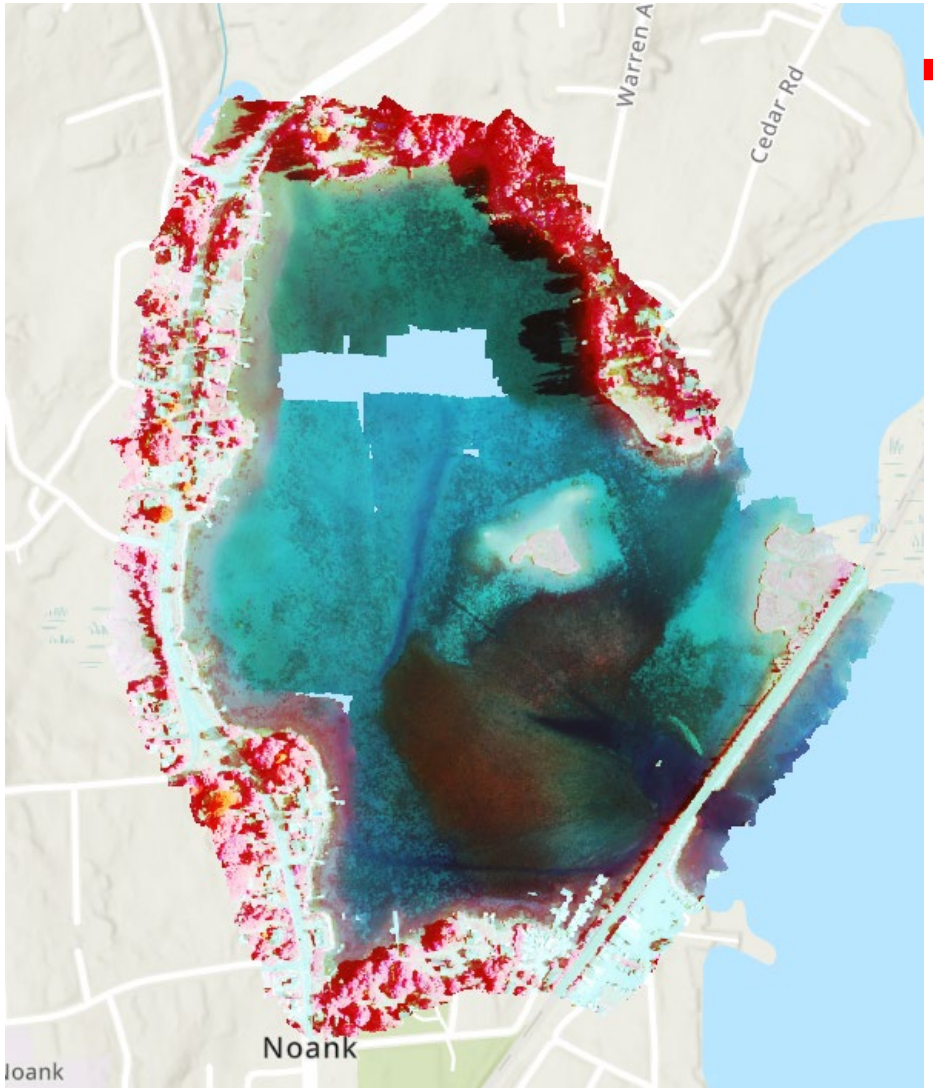
Multispectral Imagery



Segmented Image

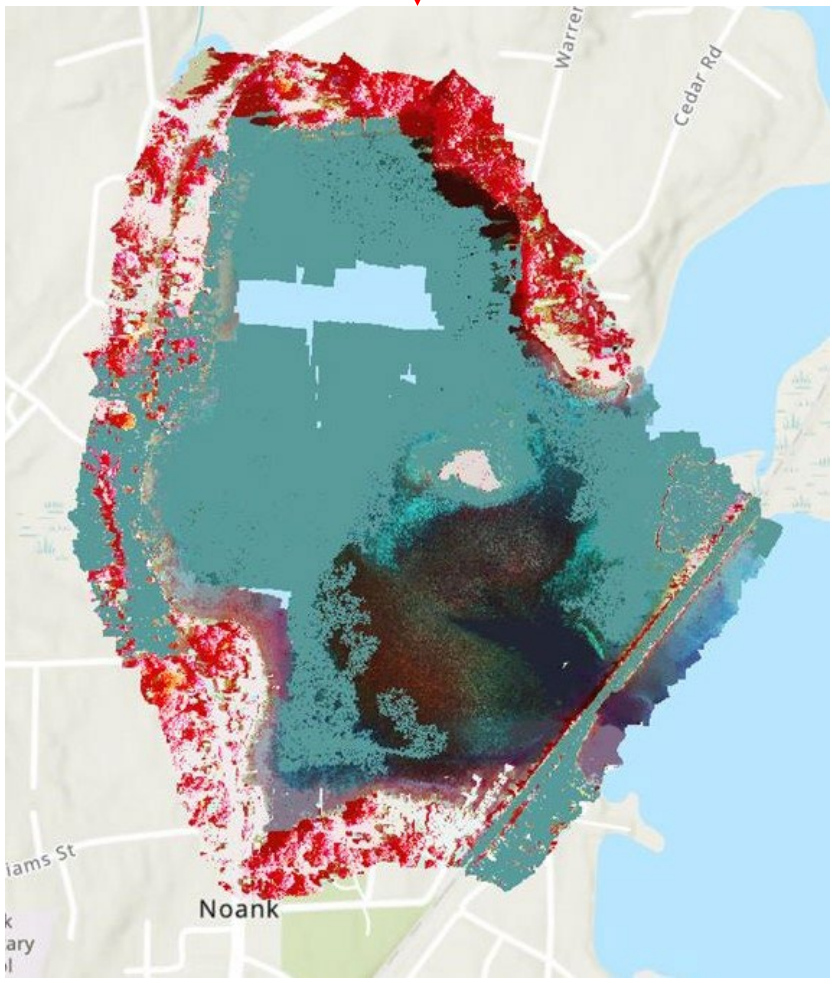


Classified image

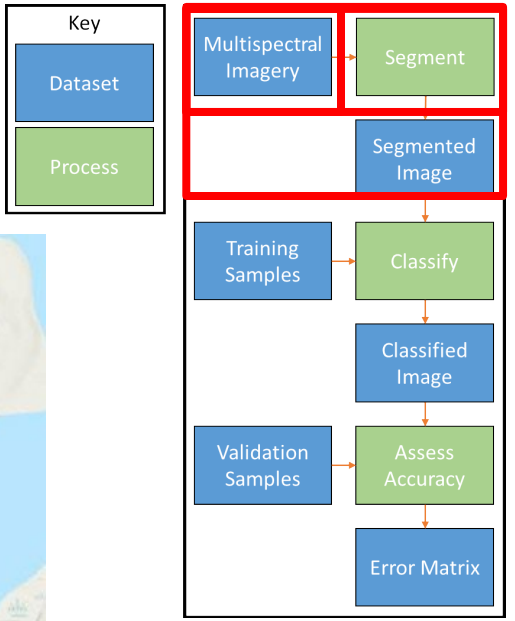


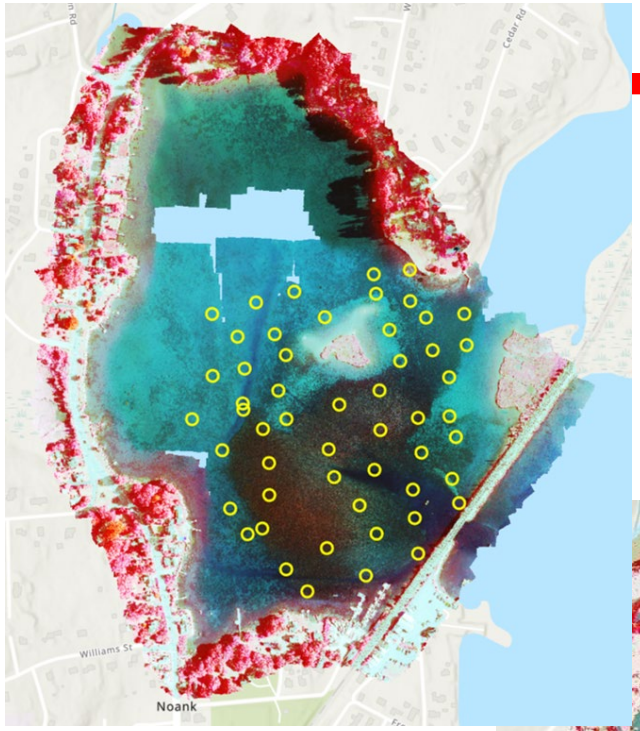
Multispectral Imagery

Segmentation



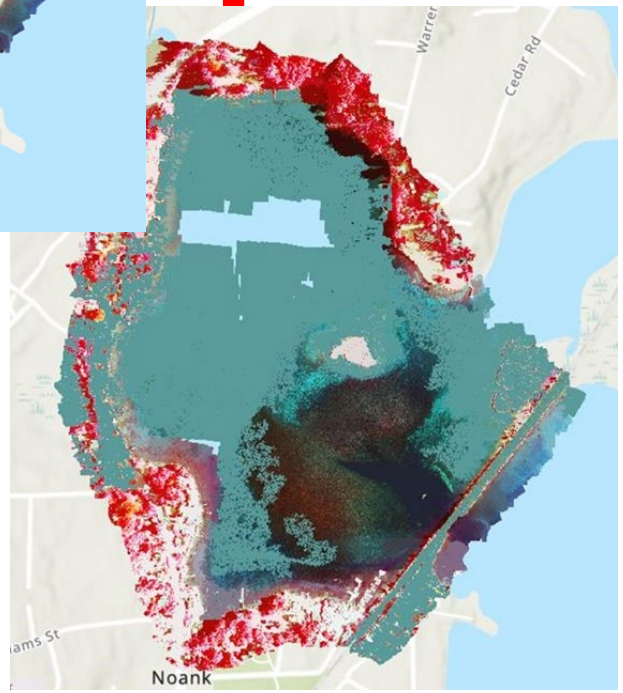
Segmented Imagery





Training Samples

Classify



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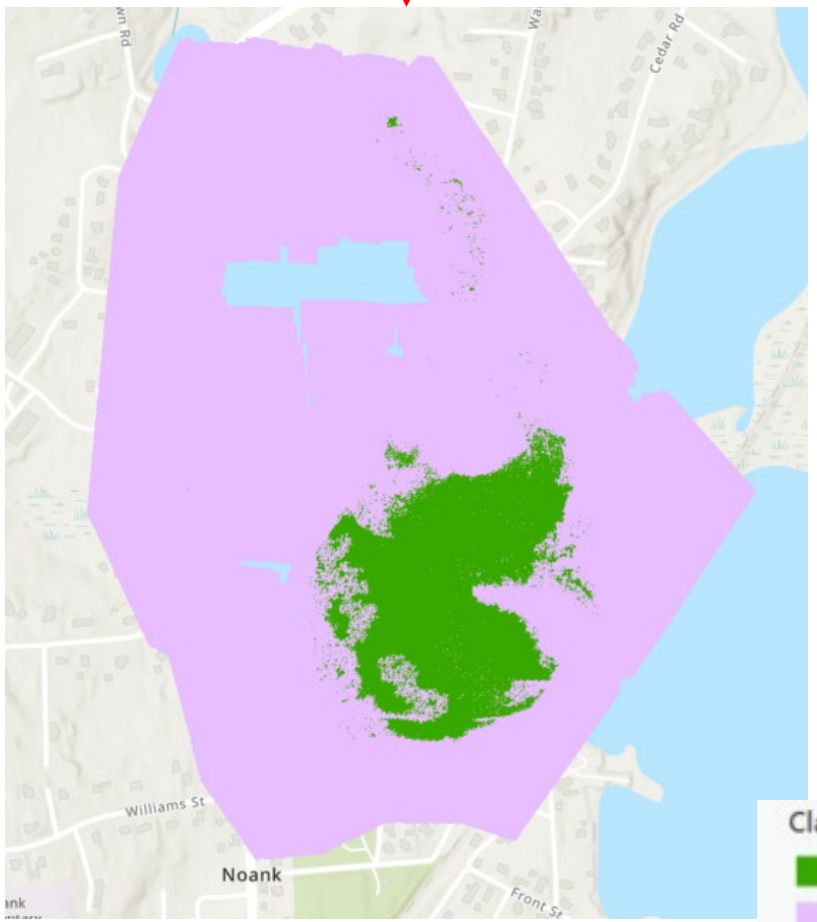
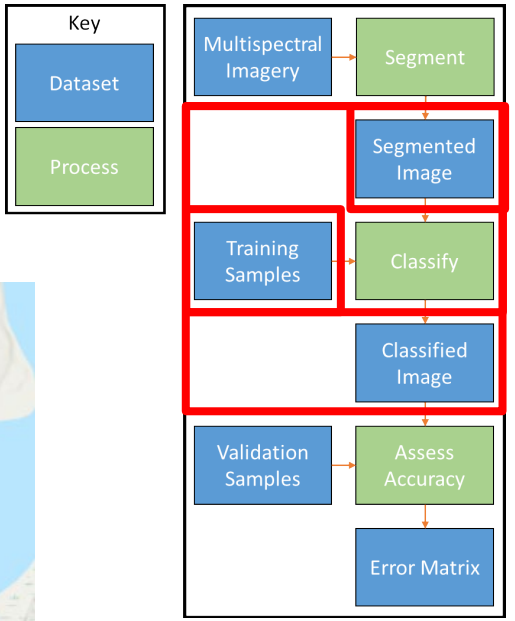
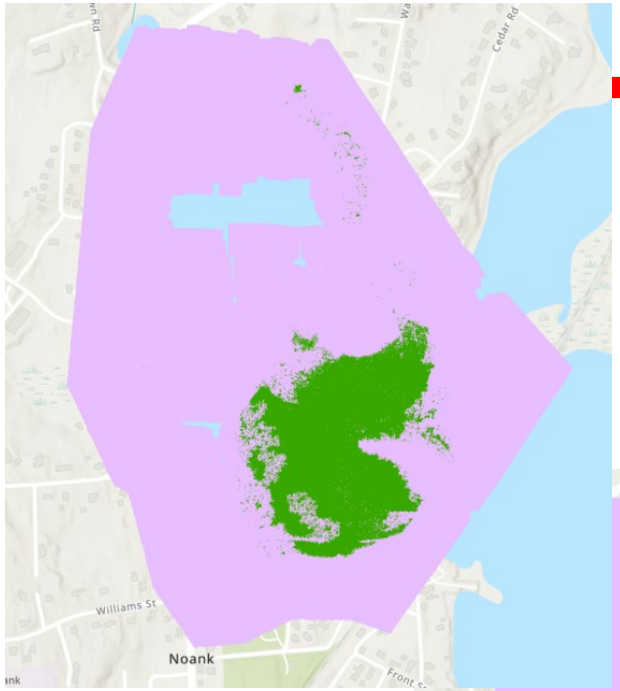


Classified Image

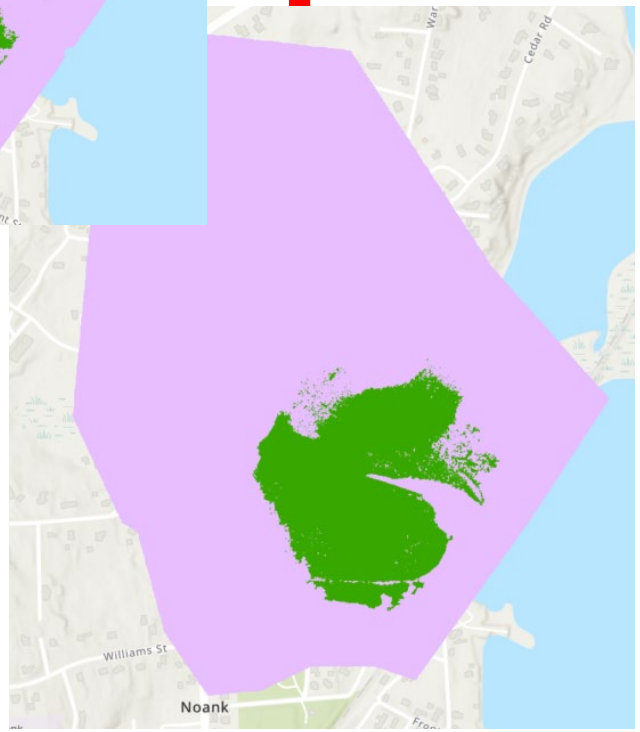


18.79 acres of eelgrass

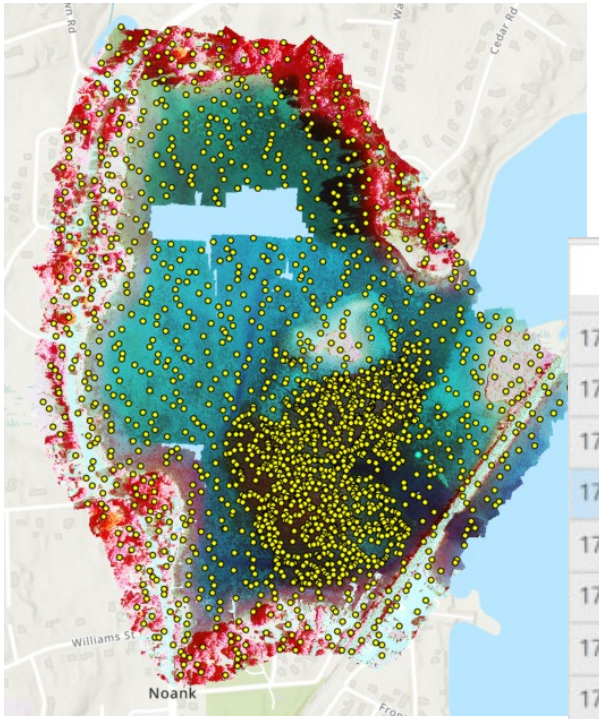


Classified Image

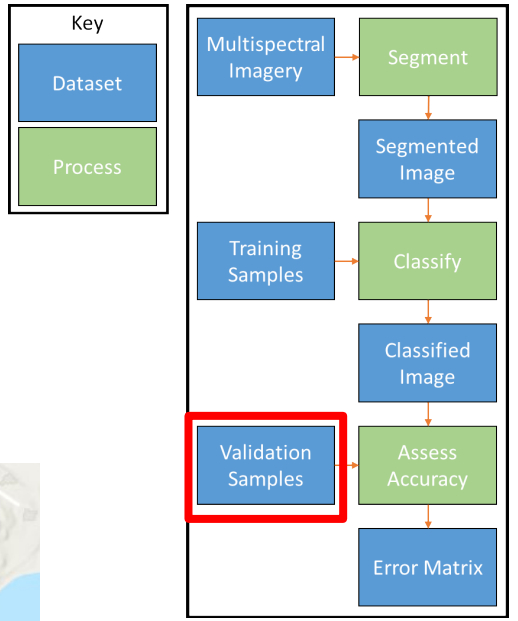
Create Accuracy Assessment Points



Reference data

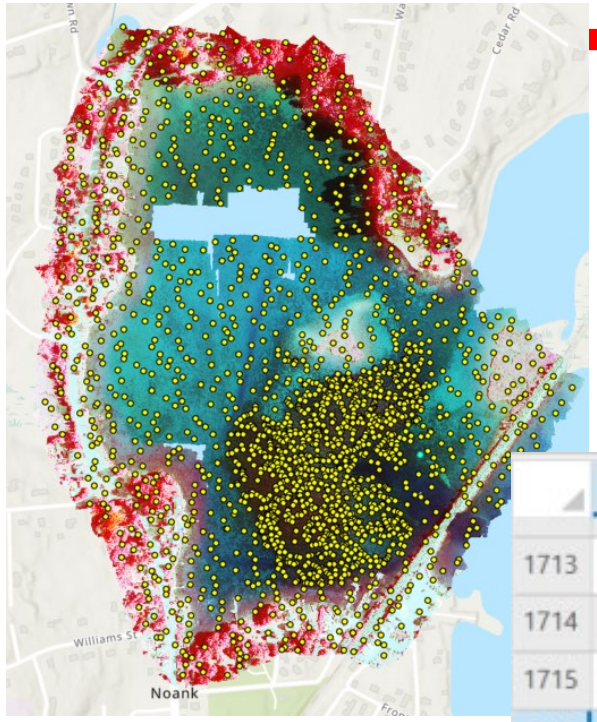


Validation Samples



	FID	Shape	Classified	GrndTruth
1713	1208	Point	2	1
1714	1213	Point	2	2
1715	1214	Point	2	2
1716	1216	Point	2	1
1717	1217	Point	2	2
1718	1218	Point	2	2
1719	1219	Point	2	1
1720	1220	Point	2	2
1721	1221	Point	2	2

1: Eelgrass
2: Other

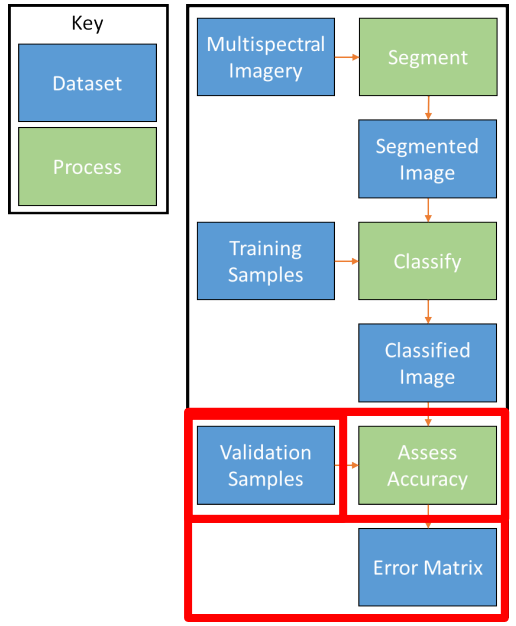


Validation Samples

Compute Confusion Matrix

	FID	Shape	Classified	GrndTruth
1713	1208	Point	2	1
1714	1213	Point	2	2
1715	1214	Point	2	2
1716	1216	Point	2	1
1717	1217	Point	2	2
1718	1218	Point	2	2
1719	1219	Point	2	1
1720	1220	Point	2	2
1721	1221	Point	2	2

1: Eelgrass
2: Other



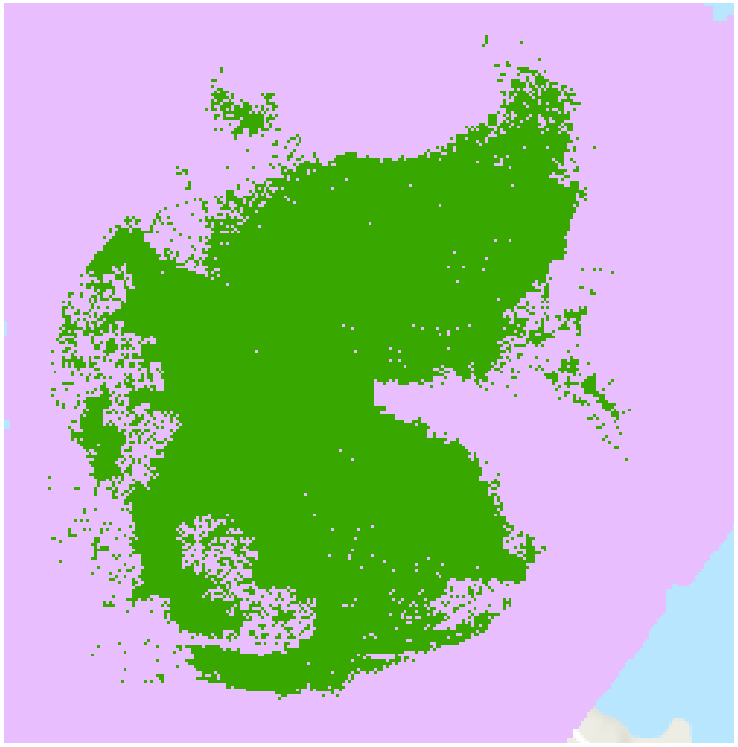
Confusion_Matrix

Field: Selection: Rows:

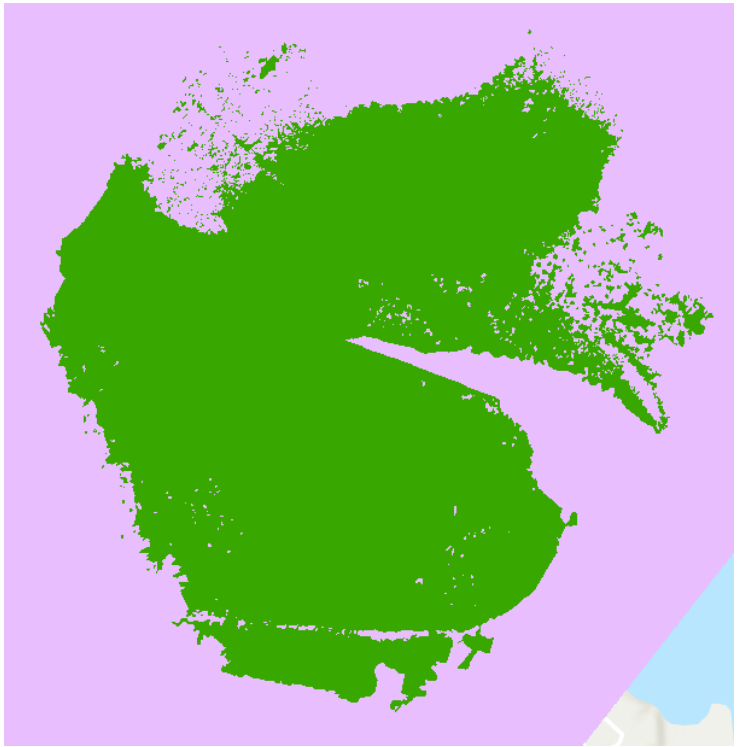
	OID	ClassValue	C_1	C_2	Total	U_Accuracy	Kappa
1	0	C_1	904	96	1000	0.904	0
2	1	C_2	32	968	1000	0.968	0
3	2	Total	936	1064	2000	0	0
4	3	P_Accuracy	0.965812	0.909774	0	0.936	0
5	4	Kappa	0	0	0	0	0.872

Error matrix

OUTCOMES



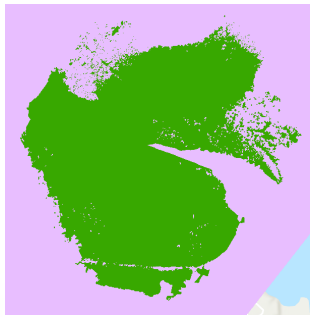
Eelgrass area machine classified (**18.79** acres)



Hand delineated reference data (**20.89** acres)

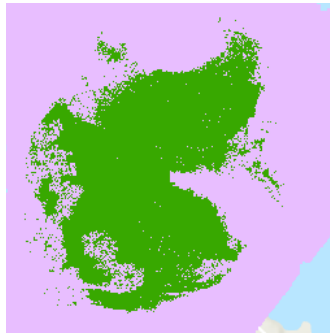
The maximum likelihood classification method slightly **underestimated** the area of eelgrass when compared to the hand delineation outcome in the reference data.

OUTCOMES



# of points the **Reference data** identified as:

# of points the **Max Likelihood classifier** identified as:



Confusion_Matrix

Field: Selection: Rows:

	OID	ClassValue	C_1 (Eelgrass)	C_2 (Other)	Total	U_Accuracy	Kappa
1	0	C_1	904	96	1000	0.904	0
2	1	C_2	32	968	1000	0.968	0
3	2	Total	936	1064	2000	0	0
4	3	P_Accuracy	0.965812	0.909774	0	0.936	0
5	4	Kappa	0	0	0	0	0.872

C_1: Eelgrass
C_2: Other

Where Max Likelihood classifier and the Reference data **agree**

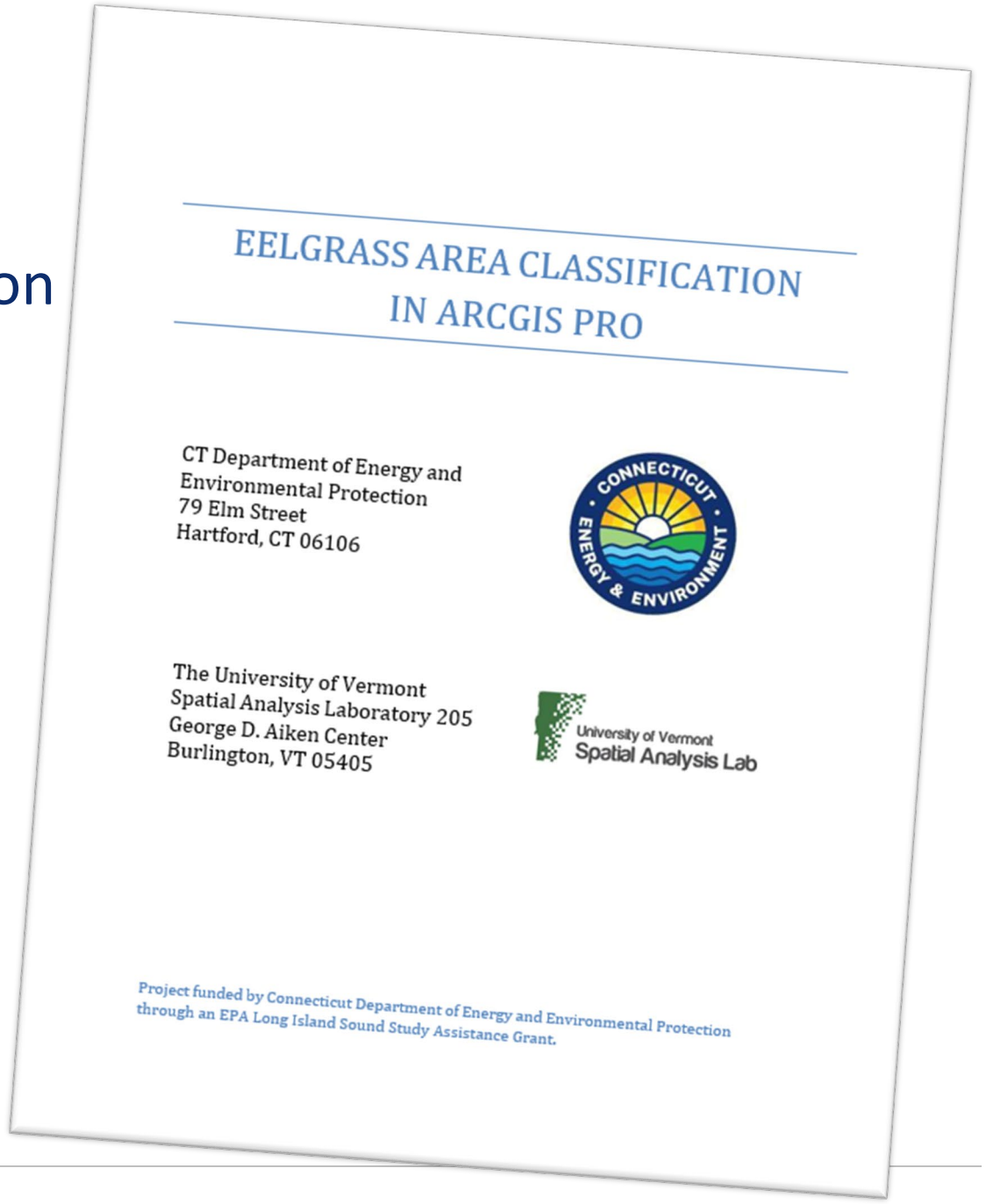
Need to consider both quantitative and qualitative measures to evaluate accuracy!

AVAILABLE PRODUCTS

- Completed Eelgrass Area Classification Manual
- Training data sets available

RECOMMENDATIONS

- Evaluate available technologies


EELGRASS AREA CLASSIFICATION IN ARCGIS PRO

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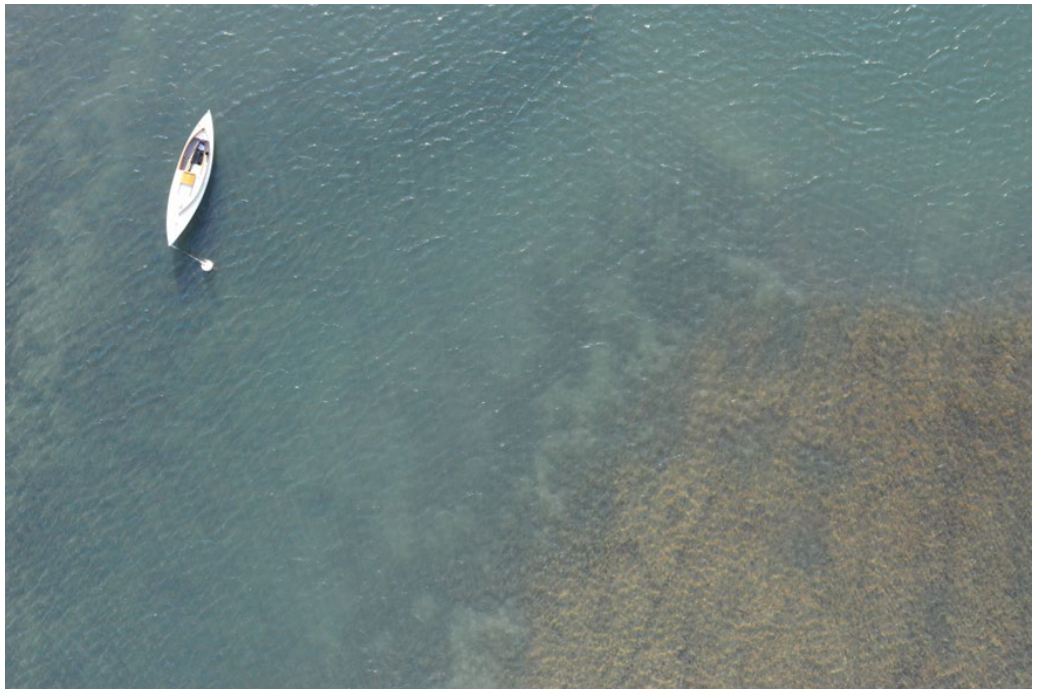

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