Central Coast GIS User Group 5/12/2014

Minutes

Attendance: Eli, Lee, Sandy, Timothy, Neal, Farhad, John, Scott and Pat

Presentation: Pat Clinton, from the EPA gave an interesting poster presentation. The topic was, "A Decade of Mapping Submerged Aquatic Vegetation using Color Infrared Aerial Photography: Methods Used and Lessons Learned" and it stimulated some interesting conversation about processes, working with aerial imagery at various tide heights and working with little field verification. The poster is attached.

Meeting business: Our Symposium by the Sea is tentatively set for this September or October, but the schedule is tight with other conferences. If we are to pull this off **we need to have an organizing committee of willing volunteers who have the time to pull it all together**. All positions are needed from Event Chair to finding presenters, food, programs, nametags, etc. But most importantly, we need a Symposium Topic.

If you are willing and able to contribute time to this effort please contact Sandy Gruber at sandy@lincolncity.org as soon as possible. We must get this effort going early in June.

GeoTrivia: Lee had us in a geotrivia competition that was difficult, but hard fought. I do believe that Pat was the winner (although there were a lot of points left on the table). The questions will be added to this document when available.

Next Meeting: Wednesday, July 9th at the new offices of the

Devils Lake Water Improvement District

Oregon Coast Community College North Campus

Presenter: Meg Gardner - Oregon Coastal Management

GeoTrivia May 2014

Answers are on page 2 (don't peek!)

1.	How many unique countries are generally	recognized on this Earth?
2	a.	t and last sountries on this list?
2.	r / (-//	st and last countries on this list?
	a.	
2	b. What is the population of the country with	h the lewest penulation?
3.	What is the population of the country wit	n the lowest population?
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4.	What is the population of the country wit	if the highest populations
5.	a. Name the 5 countries with the lowest popular.	vulations
Э.		Julations.
	a. b.	
	о. С.	
	d.	
	e.	
6.	Name the 5 countries with the highest po	nulations
0.	a.	parations.
	b.	
	C.	
	d.	
	e.	
7.	Name one of the top 10 countries for intr	overts (lowest density).
	a.	f.
	b.	g.
	С.	h.
	d.	i.
	e.	J.
8.	List the top 10 countries by land area.	
	a.	f.
	b.	g.
	С.	h.
	d.	i.
	e.	J.

9. What is the most common first letter for country names?

a.

GeoTrivia May 2014

ANSWERS

- 1. 233
- 2. Afghanistan and Zimbabwe
- 3. 799
- 4. 1,359,821,465
- 5. Holy See: 799; Takelau: 1,135; Niue: 1,468; Falkland Islands (Malvinas): 3,017; Saint Helena: 4,244
- 6. China: 1.4 Billion; India: 1.2 Billion; U.S.:312 Million; Indonesia: 240 Million; Brazil: 195 Million
- 7. Greenland, Falkland Islands (Malvinas), Mongolia, Western Sahara, French Guiana, Namibia, Australia, Iceland, Suriname, Botswana
- 8. Russian Federation, Canada, U.S., China, Brazil, Australia, India, Argentina, Kazakhstan, Algeria
- 9. "S"

Thanks, Lee McCoy, for a fun and challenging game.

A DECADE OF MAPPING SUBMERGED AQUATIC VEGETATION USING COLOR INFRARED AERIAL PHOTOGRAPHY: METHODS USED AND LESSONS LEARNED

The views expressed in this poster are those of the authors and do not necessarily reflect the views or policies of the U.S. Environmental Protection Agency. Mention of trade names or commercial products does not constitute endorsement or recommendation for

Patrick Clinton, David Young and David Specht

U.S. Environmental Protection Agency Office of Research and Development - NHEERL - Western Ecology Division

Pacific Coastal Ecology Branch



ABSTRACT

Annual color infrared (CIR) aerial photographs acquired annually between 1997 and 2007 were used to classify distributions of intertidal and shallow subtidal native eelgrass Zostera marina and non-indigenous dwarf eelgrass Z. japonica in lower Yaquina estuary, Oregon. The use of digitally orthorectified aerial photography acquired at extreme low tides enabled very high resolution imagery from 15 to 25 centimeter ground pixels. The use of false-color infrared film enabled a high contrast between submerged aquatic vegetation (SAV) beds and bare substrate not visible in true color (RGB) film. The initial success of this remote sensing method inspired similar efforts in nine Pacific Northwest (PNW) estuaries from Willapa Bay, WA to Humboldt Bay, CA (Fig. 1). Innovative techniques developed during the course of the project included a flight planning tool and a hybrid image classification methodology. The decadal study enabled the mapping of spatio-temporal patterns in the distribution of intertidal vegetation including an exponential expansion of the distribution of non-indigenous dwarf eelgrass Z. japonica in Yaquina Bay. The methods developed in this study are applicable for use with four band digital aerial photography.



Figure 1. PNW estuaries where SAV has been mapped with the aid of CIR aerial photography since 1996. Eelgrass in Upper Newport Bay in Southern California was similarly mapped with the aid of CIR aerial photography.

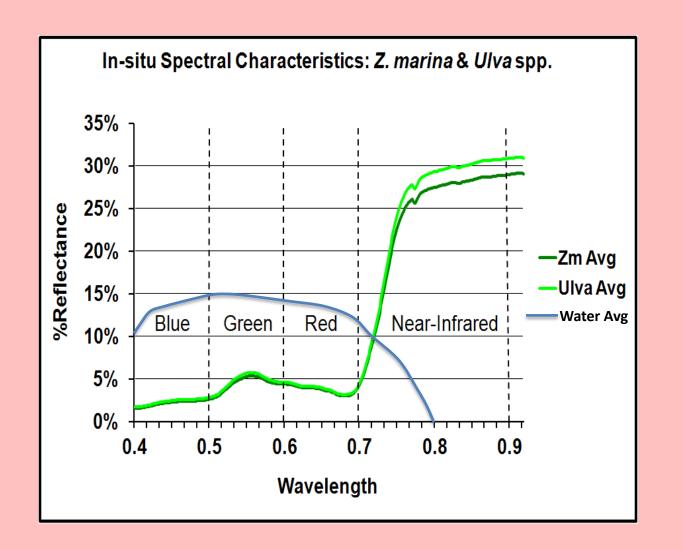
Approach:

The Use of False Color Infrared Film

True color (RGB) vs false-color infrared (CIR)

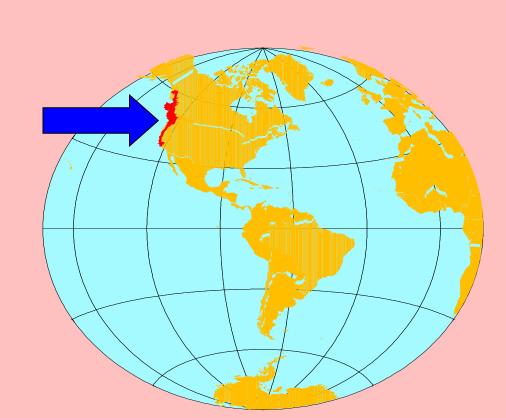


❖ Although the accepted protocol for mapping SAV in 1997 from aerial photography was the use of RGB film, we chose to use CIR film. **SAV** is clearly contrasted with open water and substrate in the falsecolor CIR imagery in comparison to the RGB.



The use of CIR film for detecting SAV is counter-intuitive because: **❖** Vegetation has strong reflectance properties in the Near - IR Band **❖** Water has strong absorption properties in the Near - IR Band

The Pacific Northwest

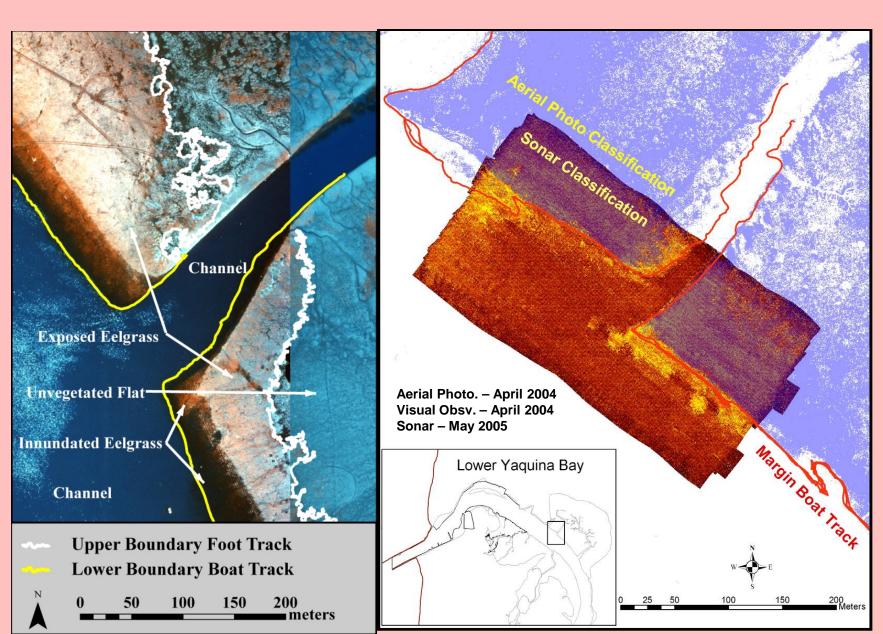


Two factors enable the use of CIR photography for mapping SAV in the PNW if acquired at extreme low tide:

❖The relatively large tidal excursion maxima range (south to north is ~2m to ~4m).

The relatively shallow depth range of the indigenous seagrass, Zostera marina, in the turbid waters of drowned river valley estuaries.

Mapping the Lower Margin of Seagrass Beds in Yaquina Estuary



A comparison of Experimental Sidescan Sonar Classification, CIR Aerial Photography Classification, & In Situ GPS Observations demonstrates that the majority of eelgrass beds including shallow subtidal beds can be classified using CIR film acquired at extreme low tide.

Conclusion:

The Use of False Color Infrared Film to map intertidal and shallow eelgrass is appropriate in locations with large tidal ranges and turbid waters when acquired at extreme low tide.

Approach:

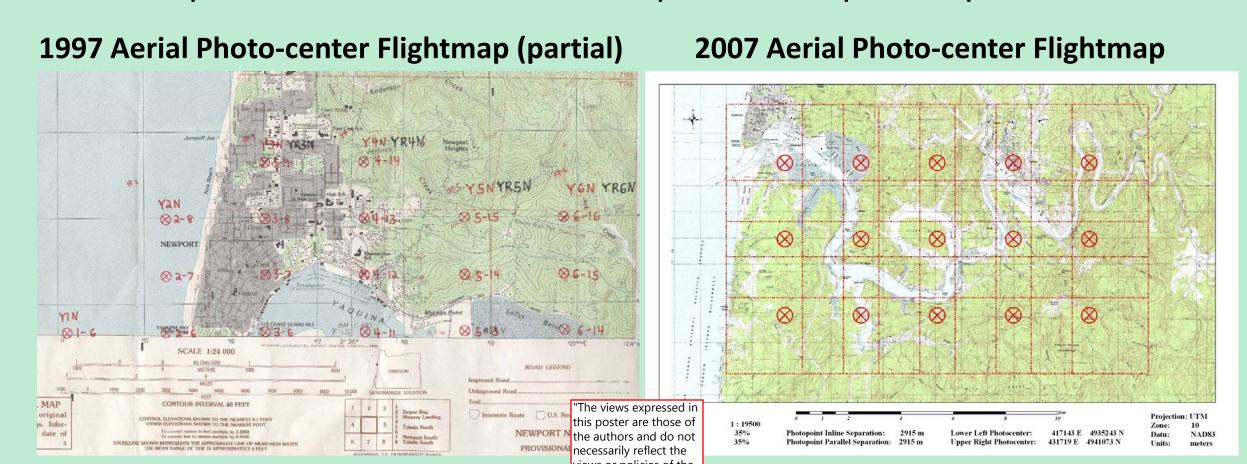
An Interactive Flight Planning Tool

A spreadsheet tool was developed to assist planning aerial photography with interactive "what if" capabilities.

Basic Formulae for Planning Aerial Photography

- **>** Photoscale ► RF = reference fraction > *H* = height above mean terrain elevation
- ► *f* = camera lens focal length A = (RF * f) + e▶ Flight Altitude
- ▶ *e* = mean terrain elevation **▶** Ground Distance (lateral distance
- covered by a photo) **▶** *D* = ground distance
- \mathbf{b} d = film widthNumber of Flight Lines (*NL*)
 - W = width of study area \triangleright *Sg* = sidelap gain (100 – sidelap percentage)
 - **▶** *D* = ground distance
- Number of Photos per Flightline (NP) $NP = ciel\left(\frac{L}{D*Og} + 4\right)$ \triangleright Og = sidelap gain (100 – overlap percentage)

❖The basic formulae for planning aerial photography are based on geometries of the camera and aircraft altitude. **The formula share parameters which facilitated the use of a spreadsheet to explore our options.**



The 1997 flight map used four paper USGS Quad merotection Agency. k 3 months to generate The 2007 flight map was generated digitally and to or commercial products minutes to generate using the PECP Interactive

Aerial Photo Flight Planning Tool INPUT PARAMETERS SHEET

OUTPUT PARAMETERS SHEET

 $NL = ciel\left(\frac{W}{D*Sg} + 2\right)$

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7 Elevation of Study Area) (m)						7							
8 Desired Photo Scale	24000	1/x						8 Width of Study Area	16008	(m)					
9 Film Format (height)		3 (m)						9							
10 Film Format (width)		3 (m)						10 Flight Altitude (m)	3658	(m)	Altitude (ft)	12000	(ft)		
11 Focal Length	0.1524	(m)						11							
12 Desired Overlap(%)	40) #						12 Ground Length of Photo	5520	(m)	.5 Ground Length	2760	(m)		
13 Desired Sidelap(%)	•) #						13							
14 UTM Zone	• • • • • • • • • • • • • • • • • • • •) #						14 Ground Width of Photo	5520	(m)	.5 Ground width	2760	(m)		
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18 LL UTM X-Coordinate	418624	()						18 Sidelap Gain (%)	60%	%	Proportion sidelap	40%	%		
19 LL UTM Y-Coordinate	513527	3 (m)						19		0.4		400/			
20 Extra Flight Lines) #						20 Overlap Gain (%)	60%	%	Proportion overlap	40%	%		
21 Extra End Line Photos	() #						21							
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❖The PECP Interactive Aerial Photo Flight Planning Tool evolved from our initial basic formula spreadsheet. Inputing parameters such as desired photoscale, lens focal length and scanning resolution produce output parameters such as number of flight lines and photos, ground width of photos and ground pixel resolution.

RESULTS GENERATOR SHEET

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3	Note* To save p	revious iterations	of the coverages	s in the same wo	rkspace,			
4	rename coverage	es FliteNet and F.	litePlan and the f	file flite_coords.t	xt before running .	AML.		
5	Coverages will a	utomatically be g	enerated if ArcIn	fo workstation is	installed on the s	same computer		
6	The AML text file	e will be named w	ith the Keyword	entered on the II	nput Parameters μ	page with the extension	n .aml.	
7	This will take a f	ew minutes. Clici	k "Quit" on pop-u	ip messages to d	continue process.			
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❖ With a single click, an ArcInfo macro language (AML) text or ArcMap VBA script would be generated and executed by the geographic information systems (GIS) programs via a com procedure to create photo center points and photo footprint polygon coverages or shapefiles.

ARCMAP VBA SCRIPT

ARCINFO MACRO LANGUAGE (AML) SCRIPT

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2 gp.AddToolbox "C:/Prc Parameters' B14*0.5))," ",('Input Parameters' B19+('Output Parameters' B12*0.5)+'Output Parameters' B12, ""","	
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3 gp.overwriteoutput = 1 Output Parameters iB59-1, """ ອູກະພາ ຂູ້"" ຂູ້"" ຂູ້"" ຂູ້"" ຂູ້"" ຂູ້" "" ຂູ້"" ຂູ້" " ຂູ້"" ຂູ້" " ຂູ້" ຂູ້	26 421384, 5138033 27 421384, 5143553
4 gp. Add Toolbox C./Pfograffi Files/ArcGis/ArcToolbox/Toolboxes/Arialysis Tools.lbx	27 421384, 5143553 28 3312, 3312
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6	30 quit
7 Local variables	31 nodepoint FlitePlan
workspace = "V:\jobs2007\j008.pclinton.fliteplanner\"	32 build FlitePlan point
9 temp_fishnet_shp = "temp_fishnet.shp"	addxy FlitePlan
0	34 tables 35 sel fliteplan.pat
1 test4 points shp = "test4 points.shp"	36 Unload Filte_coords.txt FlitePlan# x-coord y-coord delimited
temp poly shp = "temp poly.shp"	37 g
3 temp points shp = "temp points.shp"	38 /F
4 test4 flite coords txt = "test4 flite coords.txt"	39 generate PhotoBnds
temp Buffer shp = "temp Buffer.shp"	40 polys
6 test4 photobnds shp = "test4 photobnds.shp"	41
	43 &setvar DATA := [read %fillE1% readstat]
	44 &do &while %READSTAT% = 0
B 'Set the current workspace (to avoid having to specify the full path to the feature classes each time)	45 &sv pnt_id [extract 1 %data%]
gp.workspace = workspace	46 &sv x_coord[extract 2 %data%]
ם (47 &sv y_coord [extract 3 %data%]
1 Process: Create Fishnet	48
2 gp.CreateFishnet_management temp_fishnet_shp, "421384 5138033", "421384 5143553", "3312", "3312", "12", "4",	111 NO 49 659 y-11 [calc xy_coords - xhairtxs] 50 8xy x-u1 = [calc xx_coords - xhairtxs]
	51 &sy y-u = [calc %y, coord% + %halfht%]
¹ Process: Feature To Polygon	62 &sv x-ur = [calc %x_coord% + %halfwd%]
gp.FeatureToPolygon management "temp fishnet.shp", temp poly shp, "", "ATTRIBUTES", ""	53 &sv y-ur = [calc %y_coord% + %halfht%]
6	54
7 ' Process: Feature Vertices To Points	55
R on Fastura Vartices To Points management temp noty sho temp noints sho "all" Note	56 %pnt_id%, %x-11% 57 %x-xi1% 2\x\x\x\x\x\x\x\x\x\x\x\x\x\x\x\x\x\x\x
4 h h Input Decembers Output Decembers Anglia VDC suint Concertor Anglia AMI Concertor December Concert	>

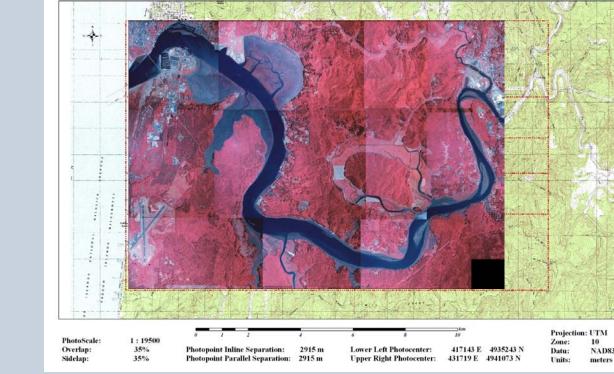
Conclusion:

The OCEB Flight Planner was extremely useful and was used to plan the aerial photography of every major estuary in Oregon in 2005. However, MicroSoft no longer supports VBA scripting and ESRI (the makers of ArcMap) no longer support AML or VBA. Also the basic formula for planning digital aerial photography are likely to be quite different and varied depending upon the sensor. Major revisions are required to update this very useful tool.

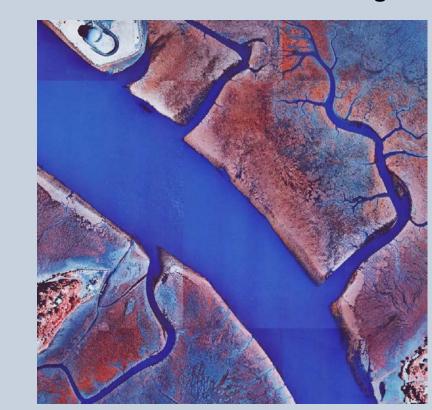
Approach:

A Hybrid Image Classification Method

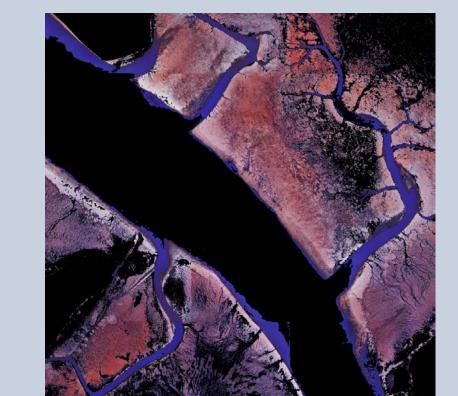
A hybrid method of image classification was developed that combines elements of human photointerpretation technique and computerized image classification algorithms.



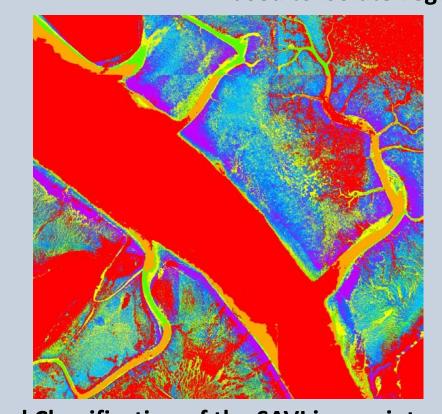
❖Photography was digitally scanned "Desktop Orthorectified" at 0.25m ground pixel resolution and mosaiced using ERMapper.



❖ Aerial photo mosaic detail showing photometric variation

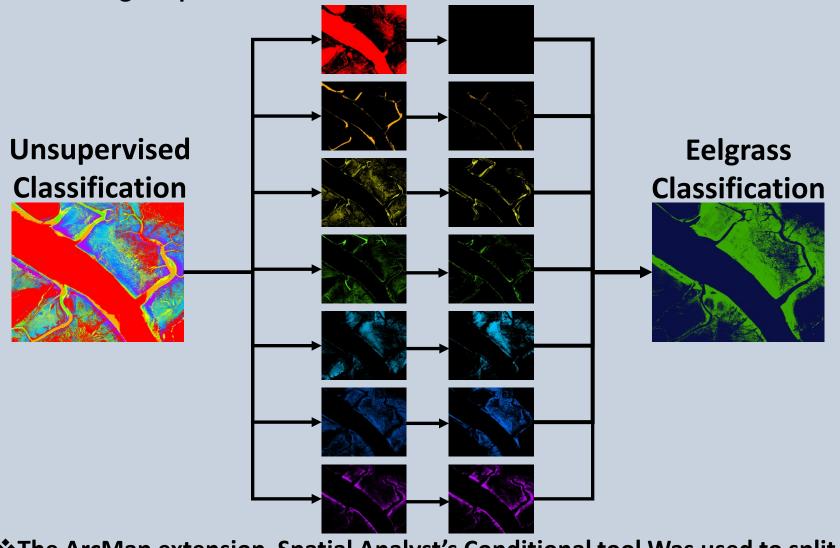


❖A 3-Band Interactive Conditional Soil Adjusted Vegetation Index (SAVI) was used to isolate vegetation in the image.



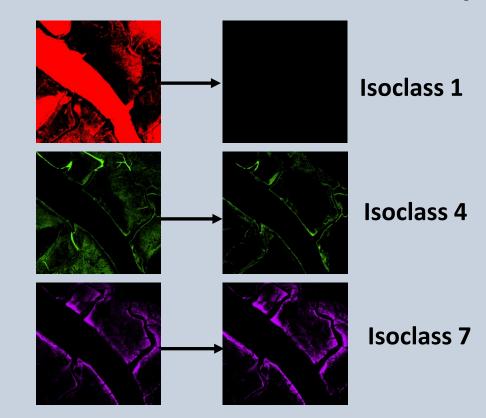
❖An Unsupervised Classification of the SAVI image into seven isoclasses using **ERMapper was performed next.**

❖ The resulting image contained single values for statistically distinct clusters of the original pixel values.

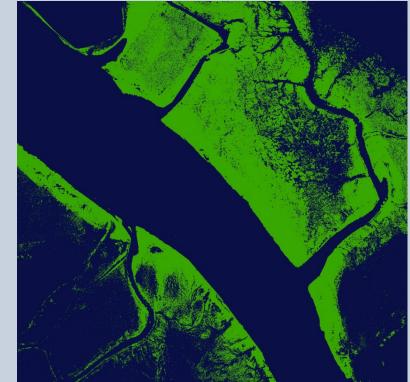


❖The ArcMap extension Spatial Analyst's Conditional tool Was used to split the classification into binary grids

❖The ArcMap extension ArcScan was used for manual "Heads Up" editing of each individual binary grid to remove non-eelgrass pixels.



A detailed look at ArcScan "Heads Up" edits.



Compiled edits form eelgrass classification.

Conclusion:

This method combines the accuracy of human interpretation of spatial information with the precision of the computer processing of reflectance values resulting in highly detailed classifications. The method was successfully applied to digitally acquired half meter 4-band aerial imagery and remains a versatile and useful tool.

*Disclaimer: Mention of product name does not imply endorsement by the U.S.EPA