Geospatial Technology Education Through Virginia's Community Colleges (GeoTEd)

VSGC Led 3 NSF-Advanced Technological Education (ATE) Awards. Goal: Increase Number of Trained GIS Technicians

1. NSF Planning Project (2007)
   - Statewide Workforce Needs survey; GIS Technician DACUM
2. Statewide Project Grant (2009-12)
   - Virginia Western Community College; Tidewater Community College; John Tyler Community College; Virginia Community College System (VCCS); Virginia Tech
3. GeoTEd (2012-16) – Regional Project
   - Virginia Western Community College; Thomas Nelson Community College; J. Sargeant Reynolds Community College; Southwest Virginia Community College; VCCS; Virginia Tech

- GIS Courses and Pathways; Faculty and Teacher Professional Development; Mentoring; GIS Webportal; Mobile App
- Integration of UAS

GeoTEd
geoted.org

NSF ATE DUE-0903270; 1205110

Geospatial Technician Education -- Unmanned Aircraft Systems (GeoTEd-UAS)

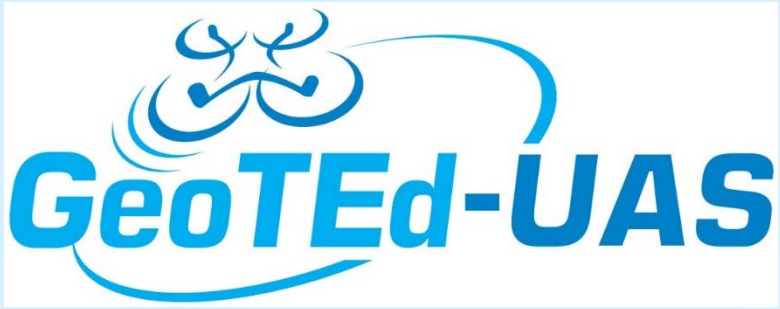
GeoTEd-UAS

- Awarded three-year NSF ATE project proposal ($899,447) (2016-2019)
- Partners: Thomas Nelson Community College; Mountain Empire Community College; Virginia Tech; Virginia Community College System (VCCS); VSGC

NSF ATE
DUE-1601614

Other Partners

- Mid-Atlantic Aviation Partnership (MAAP)
- NASA Langley
- NASA Wallops
- Hampton Roads Chapter of AUVSI
- GeoTech National Center
- SpaceTec
- Flirtey
- Timmons
- Sentinel Robotic Solutions
- Measure Inc.
- AirSight Global
- Nexutech
- Esri
- Jack Kennedy (Unmanned Systems Commission)
- Northland Community and Technical College
- Environmental Monitoring Incorporated
- University of Virginia
- Draper Aden
- U.S. Geological Survey (USGS)



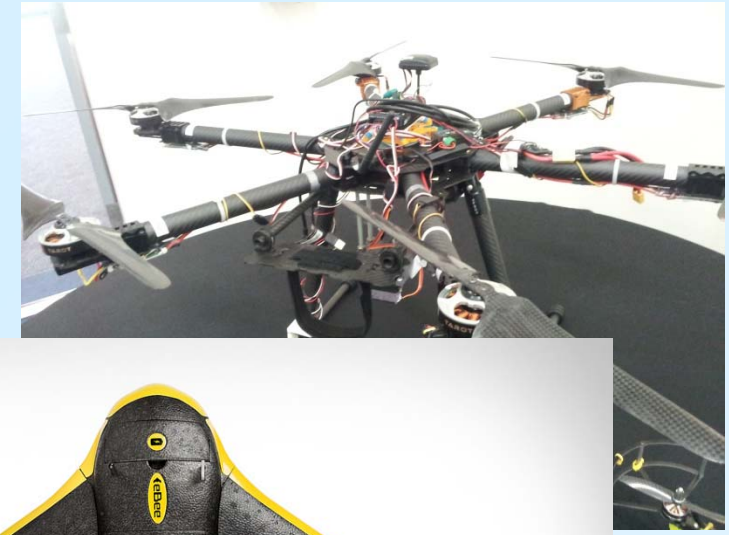
Pathways for ‘UAS Operations Technician’

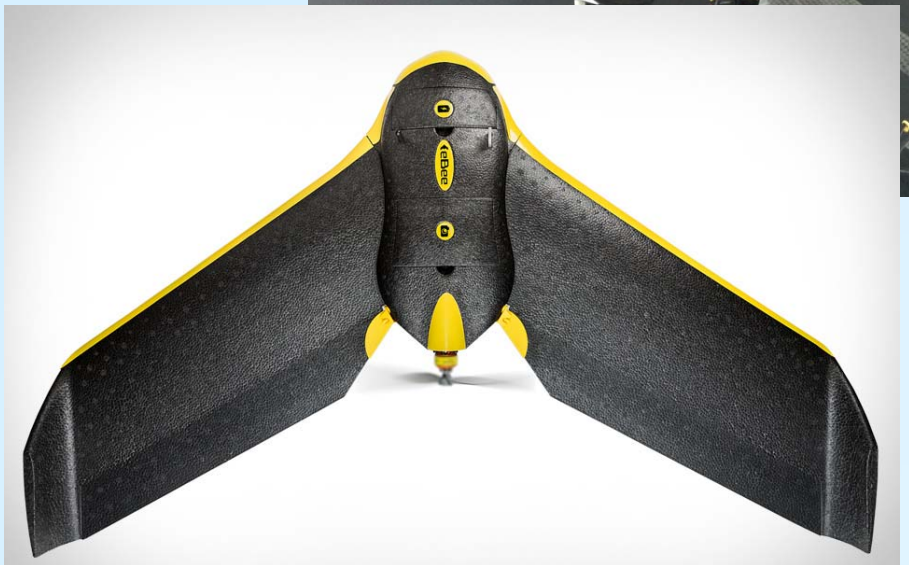
Mission Planning
Flight Operations
Data Collection
Data Post-Processing/Analysis Using GIS
Maintenance and CyberSecurity

Not Just Manufacturing, Pilot, or a Maintenance

GeoTEd-UAS

Focus on small UAS (<55lbs)





GeoTEd-UAS

1. Workforce Demand and Defining Competencies of a UAS Operations Technician

- Developing a Curriculum (DACUM) Panel, August 30-31
- Hosted by R&K Solutions in Roanoke
- Alignment with ASPRS Certification – UAS Technologist (in development)

asprs

DACUM Research Chart for GIS Technician

DACUM Panel

Jason Braunstein, GIS Program Manager
VA Department of Forestry
Charlottesville, VA

Lenée Pennington, GIS Specialist/Cartographer/Crime Analyst
VA Dept. of Game & Inland Fisheries
Richmond, VA

Michael Nichols, Assistant Director
R&K Solutions Inc.
Roanoke, VA

Allison Johnson, GIS Manager
City of Lynchburg
Lynchburg, VA

Katherine Smith, GIS Coordinator
Town of Blacksburg
Blacksburg, VA

Michael Kolonay, GIS Manager & Developer, VEDP

Sponsored by:

GeoTEd
geoted.org

DACUM Research Chart for ~~GIS Technician~~ A UAS Operations Technician

Specific employment tasks →

General employment duties →

A	Manage GIS Data	A-1 Obtain data sets *	A-2 Update versioned data	A-3 Update non versioned data	A-4 Perform QA/QC on GIS data	A-5 Update metadata	A-6 Perform backup of GIS data	A-7 Update data inventory	A-8 Report GIS data changes
B	Create GIS Data	B-1 Create data schema	B-2 Collect field data	B-3 Digitize spatial features	B-4 Georeference spatial data	B-5 Geocode spatial data	B-6 Process raster data	B-7 [illegible]ter survey data [illegible]GO)	B-8 Convert data across formats (e.g. CADD, KML, CSV, Excel, DBF)
C	Create Static Maps	C-1 Collaborate with stakeholders *	C-2 Determine Purpose of map	C-3 Identify specific data sets for map	C-4 Prepare cartographic data sets	C-5 Determine type of layout for map	C-6 [illegible]ign [illegible]t	C-7 Design map template	C-8 Modify existing map document
		C-13 Document customer communication	C-14 Publish static maps	C-15 Print hard copy maps					
D	Create Dynamic Maps/applications	D-1 Determine purpose of application	D-2 Identify data sets for application	D-3 Prepare cartographic data sets for application	D-4 Det[illegible]ine typ[illegible] lay[illegible] for[illegible]plicati	D-5 Design custom application layout	D-6 Modify existing application	D-7 Follow required design specs for application	D-8 Determine application scales
E	Analyze GIS Data	E-1 Define reason for analysis	E-2 Determine feasibility of analysis	E-3 Outline[illegible] an[illegible]ysis proc[illegible]	[illegible]Identify da[illegible]ets	E-5 Identify analysis tools	E-6 Determine analysis parameters (e.g. extent, cell size, filters, relationships)	E-7 Create project workspace	E-8 Prepare dat[illegible] sets
F	Support Internal/external Customers	F-1 Process customer requests	F-2 Deliver product t[illegible] custom[illegible]	F-3 [illegible]evel[illegible] map[illegible]ources [illegible].g. sym[illegible]ol sets, [illegible]plates, logos)	F-4 Compile training materials	F-5 Provide GIS training	F-6 Provide equipment training (e.g. GPS, plotter, scanner)	F-7 Troubleshoot data issues	F-8 Troubleshoot software issues
G	Maintain Hardware/software Systems	G-1 Initiate IT tickets	G-2 [illegible]all [illegible]softwa[illegible]	G-3 Install software updates	G-4 Update firmware	G-5 Apply software patches	G-6 Maintain software and equipment inventory	G-7 Change out equipment	
H	Perform Administrative Tasks	H-[illegible]aintain sup[illegible]nvento[illegible]	H-2 Submit timesheet	H-3 Submit travel requests	H-4 Submit expense reports (e.g. travel, procurement)	H-5 Archive projects	H 6 Facilitate meetings (e.g. webinar, phone conf., in person)	H 7 Create purchase requests	H 8 Manage paper files
I	Maintain Professional Knowledge	I-1 Develop personal training plan	I-2 Participate in training activities (e.g. online course, in person sessions)	I-3 Attend professional conferences	I-4 Present at GIS events	I-5 Represent organization at community events	I-6 Review trade publications	I-7 Maintain professional memberships	

*Task is performed across more than one duty

Coming Soon

GeoTEd-UAS

2. Academic Course and Pathway Development

- Career Studies Certificate – UAS Operations Technician (18+credit hour) (Model for the VCCS) (Flexible)

Potential Courses

Remote Pilot Certification

UAS I and II

GIS 200 and 201

Remote Sensing

Interdisciplinary; Service Learning; Communication

GeoTEd-UAS

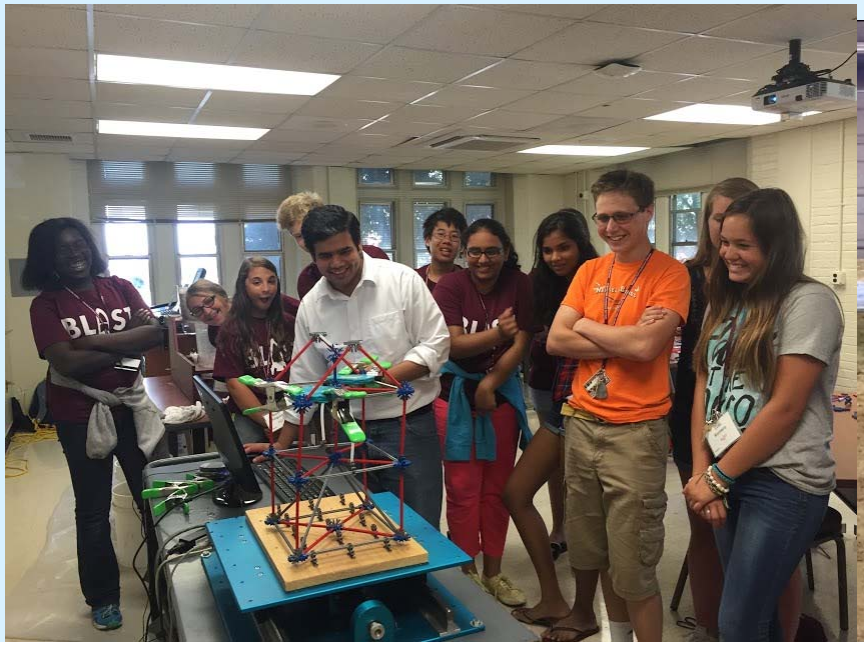
3. Faculty Professional Development

- Leadership Team Training (October 12-14 2016 at VT)
- Train AND Mentor Community College Faculty (Summers 2017 and 2018 at VT)

GeoTEd-UAS

4. Student Pipeline into UAS Careers

- Regional High School UAS Expos and Competitions
- Dual-Enrollment, Transfer, and Articulation Agreements



GIS 295 – Topics in Service Learning GIS Course

Fieldwork at NASA Wallops Island

STEM TAKES FLIGHT
at Virginia's Community Colleges

SERVICE LEARNING COURSE OPPORTUNITY AT NASA WALLOPS ISLAND

HELP NASA INVESTIGATE SEA LEVEL RISE AND INVASIVE SPECIES

Thomas Nelson Community College is offering a three-credit Sea Level Rise Service Learning course. All expenses paid for course tuition and four days of fieldwork including travel, lodging, and food! Open to Virginia community college. Competitive application process, students from all disciplines are encouraged to apply. Sponsored by Virginia Space Grant Consortium (VSGC) and offered through the STEM Takes Flight Program in partnership with NASA Wallops Flight Facility and Thomas Nelson Community College.

GIS 295 - Topics in Service Learning in GIS.
This online course contains four days of outdoor fieldwork at NASA Wallops on Virginia's Eastern Shore. Field work will likely be completed over a weekend (Thursday-Sunday) in April 2016.

Faculty-led student teams will engage with NASA scientists to tackle the issue of sea level rise, invasive species and their impact on coastal communities and ecosystems including NASA Wallops. Using GIS, global positioning system (GPS), unmanned aircraft systems, and other technologies students will model various sea level rise scenarios and gauge their impacts to NASA infrastructure and habitats. Students will compare data with existing datasets and develop a report to be presented to NASA staff.

During the course you will
- Learn about service learning.
- How to use and operate an Unmanned Aircraft Systems (UAS) to collect data
- Develop or acquire geographic information system GIS skills in analyzing data collected with a UAS. (Prior GIS knowledge is not a pre-requisite for this cross-discipline course)
- Learn about remote sensing and how to use regular imagery, near infrared imagery and Lidar to answer questions using a GIS.
- Help NASA solve a problem, work side-by-side with NASA scientists
- Gain real world experience collecting and analyzing data
- Tour the facilities and observe the research being completed at the site.

STEM TAKES FLIGHT
at Virginia's Community Colleges

key.com/r/9HXDL88

/sealevelrise.html

WFF

VIRGINIA SPACE GRANT CONSORTIUM

Thomas Nelson COMMUNITY COLLEGE
Explore. Excel. Succeed.

GIS 295 – Topics in Service Learning GIS Course Goals-

- Determine the efficacy of using low cost sensors and UAS platforms to collect data "on demand"
  - Determining shoreline data to assess sea level rise
  - Detecting phragmites presence, a non-native invasive species of marsh grass

Slichter 2013

13 students representing 6 Virginia Community Colleges

Photo Caption (Credit: Linda Sherman / NASA Wallops): Group picture of the student and faculty participants.

(Left to Right) (Seated Front Row) Chris Carter, VSGC Deputy Director--Nicole Knudson, Tidewater Community College--Carmen Ferraro, Tidewater Community College--Sarah Lubkin, Northern Virginia Community College--Cherie Aukland, Thomas Nelson Community College (Co-Faculty Lead)

(Standing Back Row) Gabriel Fearing, Rappahannock Community College--Heidi Phillips, Virginia Western Community College--Shari Davies, Thomas Nelson Community College--Matthew Cox, Virginia Western Community College--Tim Minich, Thomas Nelson Community College--Jason Sanchez, Northern Virginia Community College--Brian Stemm, Tidewater Community College--David Nicks, Thomas Nelson Community College--Laura Nusz, Thomas Nelson Community College--David Webb, VSGC Consultant (Co-Faculty Lead)

GIS 295 course

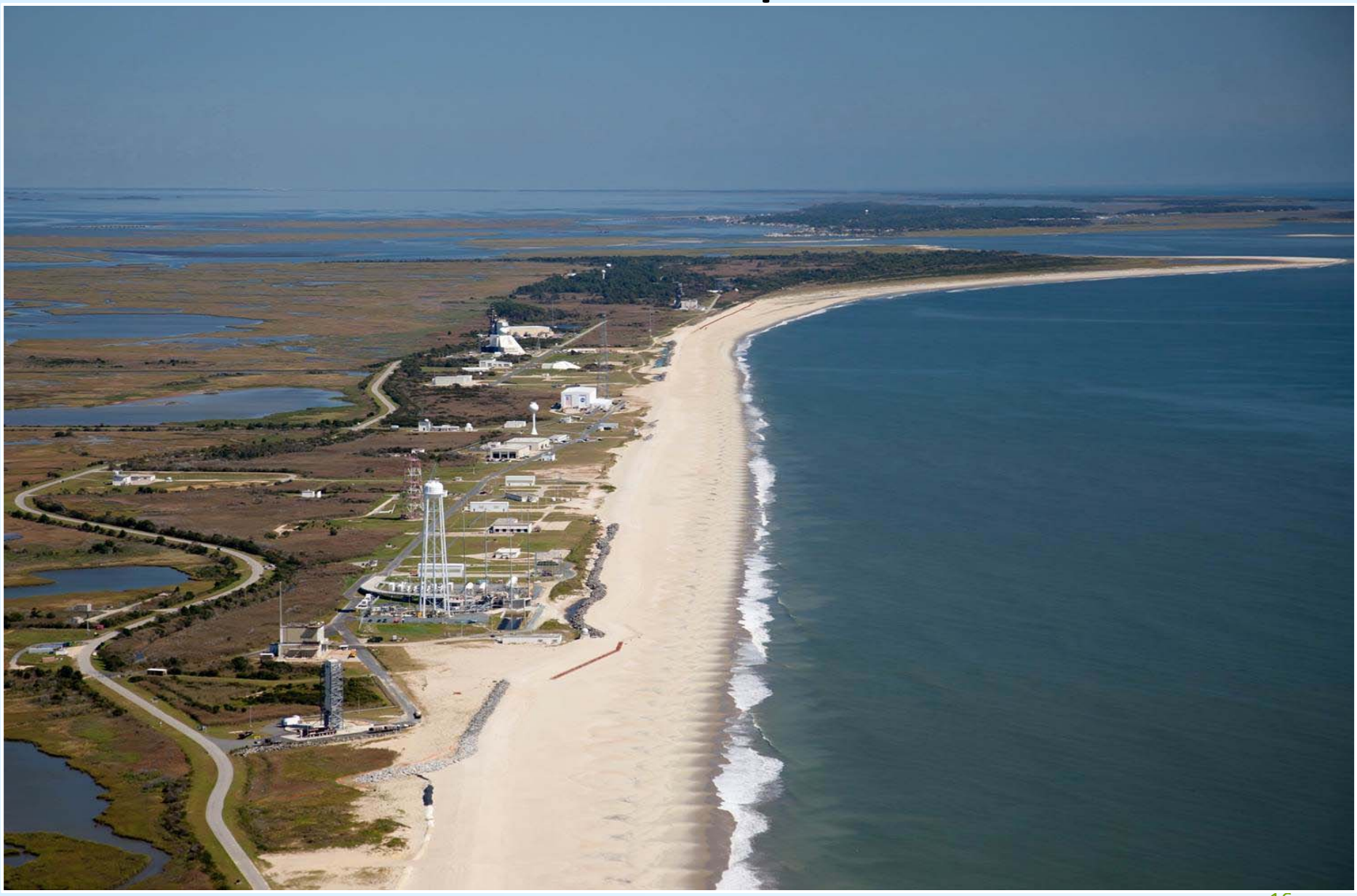
- 12 week course
- First 10 weeks online
  - Prepare for fieldwork at Wallops Island

"…She made sure the students learned from and communicated with each other. I have found this to be generally lacking in hybrid courses, so I appreciate the extra effort she gave to keep the students connected.

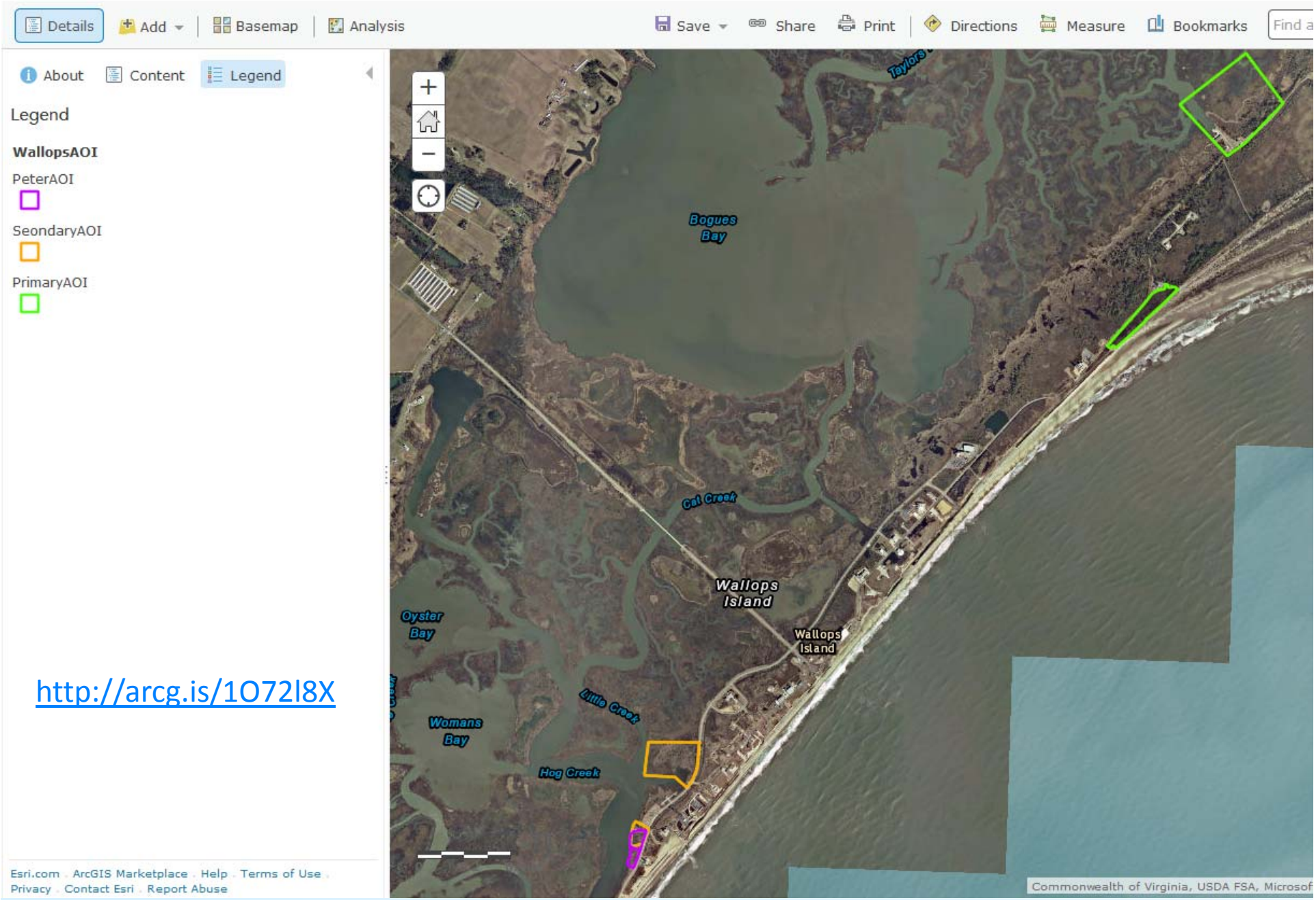
"…..the students communicated with each other far more than they would in a traditional classroom setting. This was very important for the field study component as we would be sharing the same living quarters and working closely together on a tight timeline."

Week: Dates	Course Activities
1: 2/8-2/14	Instructor/Course Introduction Doodle Poll ESRI Account/Install ArcGIS ESRI GIS refresher
2: 2/15-2/21	Intro to Service Learning Intro to Wallops and Study Area What we are doing and why/phragmites/sea level rise
3: 2/22-2/28	Intro to Remote Sensing and exercise (covers supervised classification, spatial analysis, cartography using LandSAT)
4: 2/29-3/6	Review of GNSS data collection Georeferencing/USGS or baseline marks/post processing
3/7-3/13	**SPRING BREAK!**
5: 3/14-3/20	Lidar, NIR, spatial analysis (data formats)
6: 3/21-3/27	UAS –legal, operation, safety, mission planning, softwares involved • Specific info from VT on eBee and VT procedures. • Intro to Phantom III drone • Wallops flight procedures, pre-flight check, safety, e.g.
7: [illegible]28-4/3	Sea level rise and shoreline determination/delineation

NASA Wallops Island



Home ▾ Wallops Island AOI, all areas

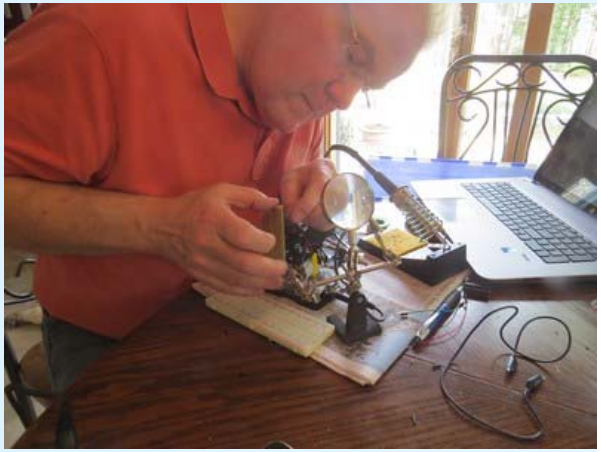


http://arcg.is/1O72l8X

STEM TAKES FLIGHT
at Virginia's Community Colleges

Phantom 2 and 3

Flew Missions on April 6, 2016



Phantom 2 equipment (Manual flight)

- **Computer**: Raspberry Pi Model B 512MB
- **NoIR camera:** Raspberry Pi NoIR Camera Board - Infrared-sensitive Camera

Phantom 3 Equipment (autonomous flight)

- **Stock RGB camera**

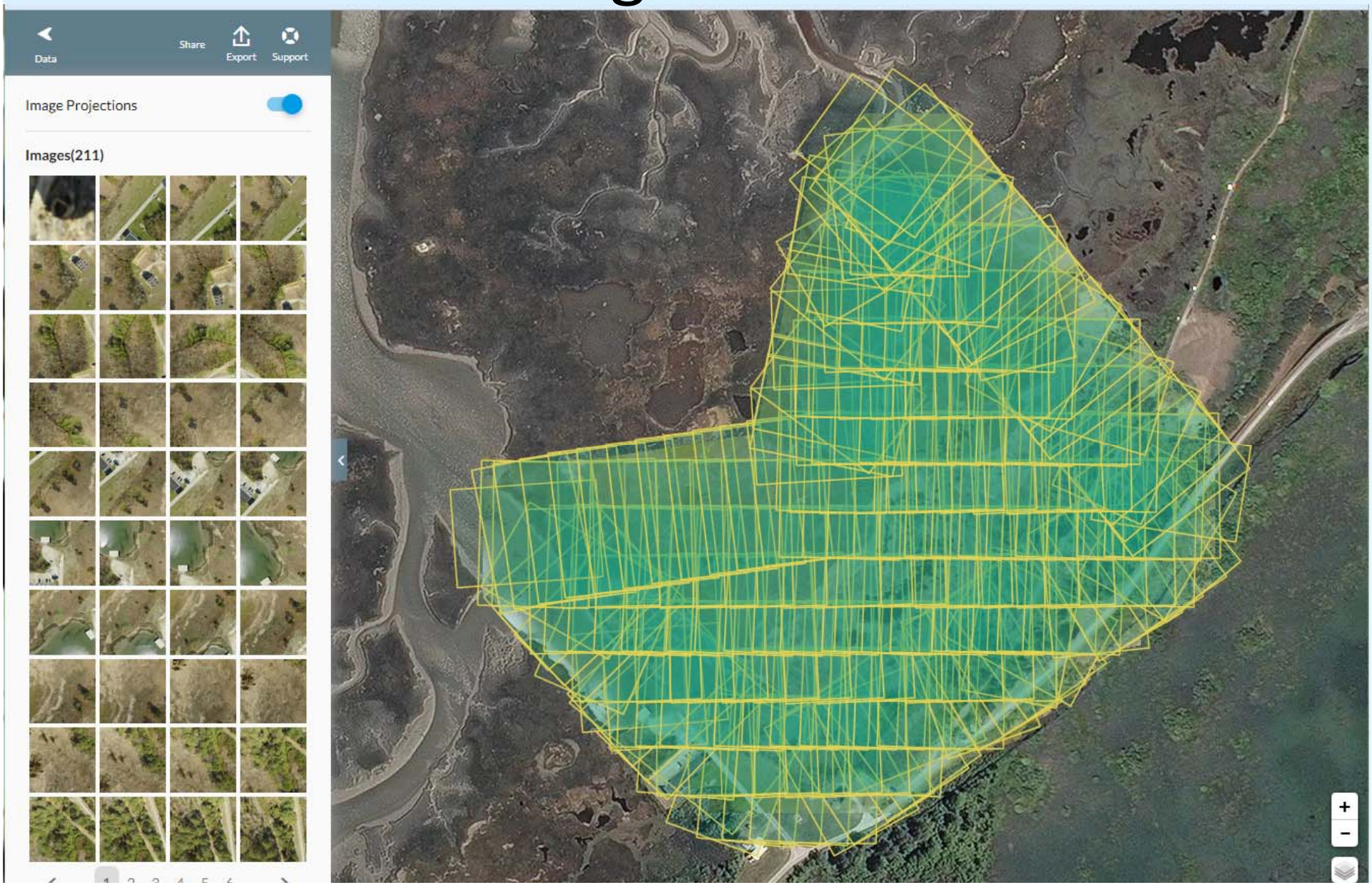
Software: Microsoft ICE, DroneDeploy, and ArcGIS.

North Island Flight Plan-autonomous

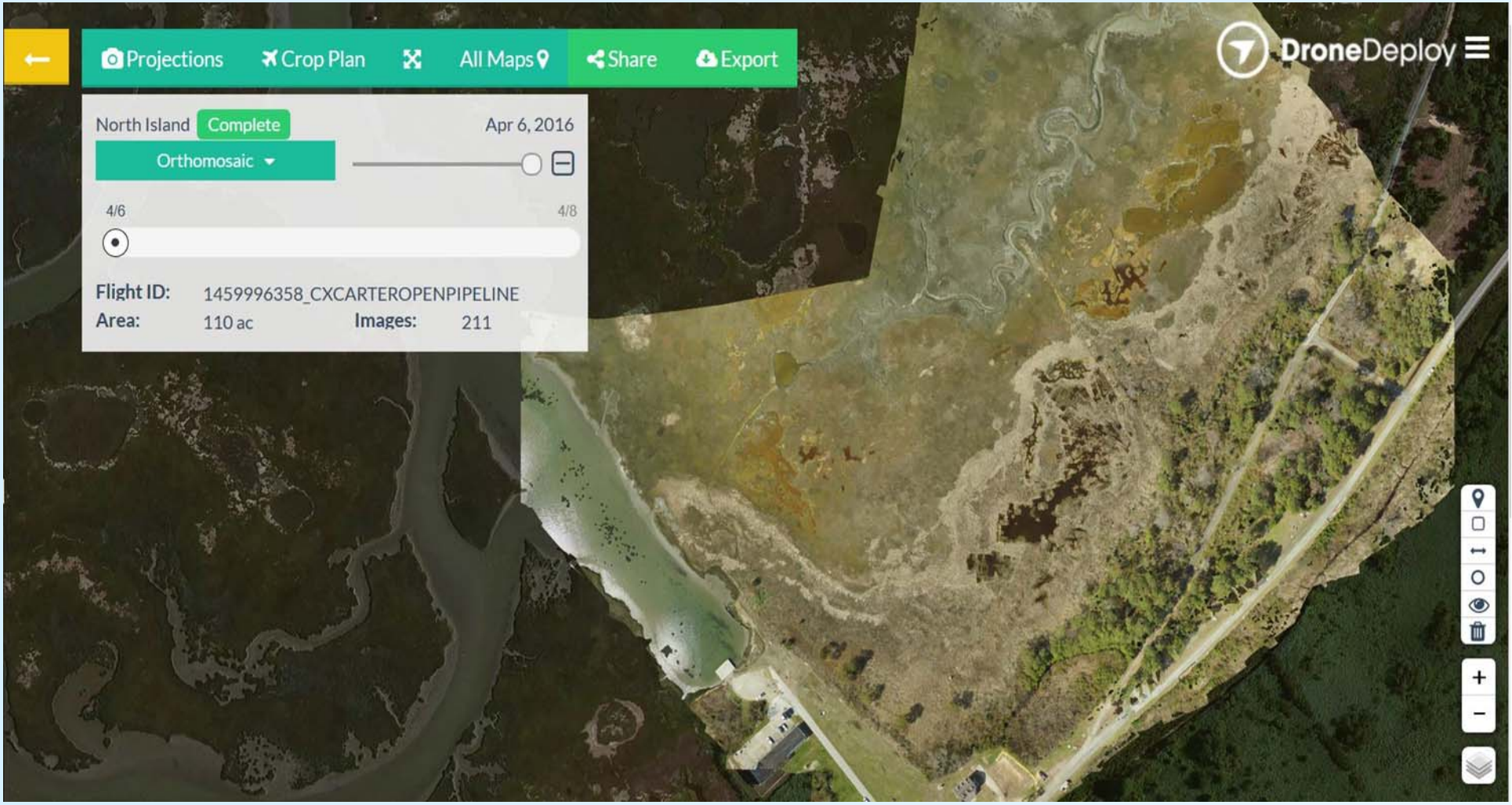
First ever completely autonomous drone flight at NASA Wallops Island!

3 cm resolution!

North Island
211 images collected



DroneDeploy orthomosaic, North Island



South Island

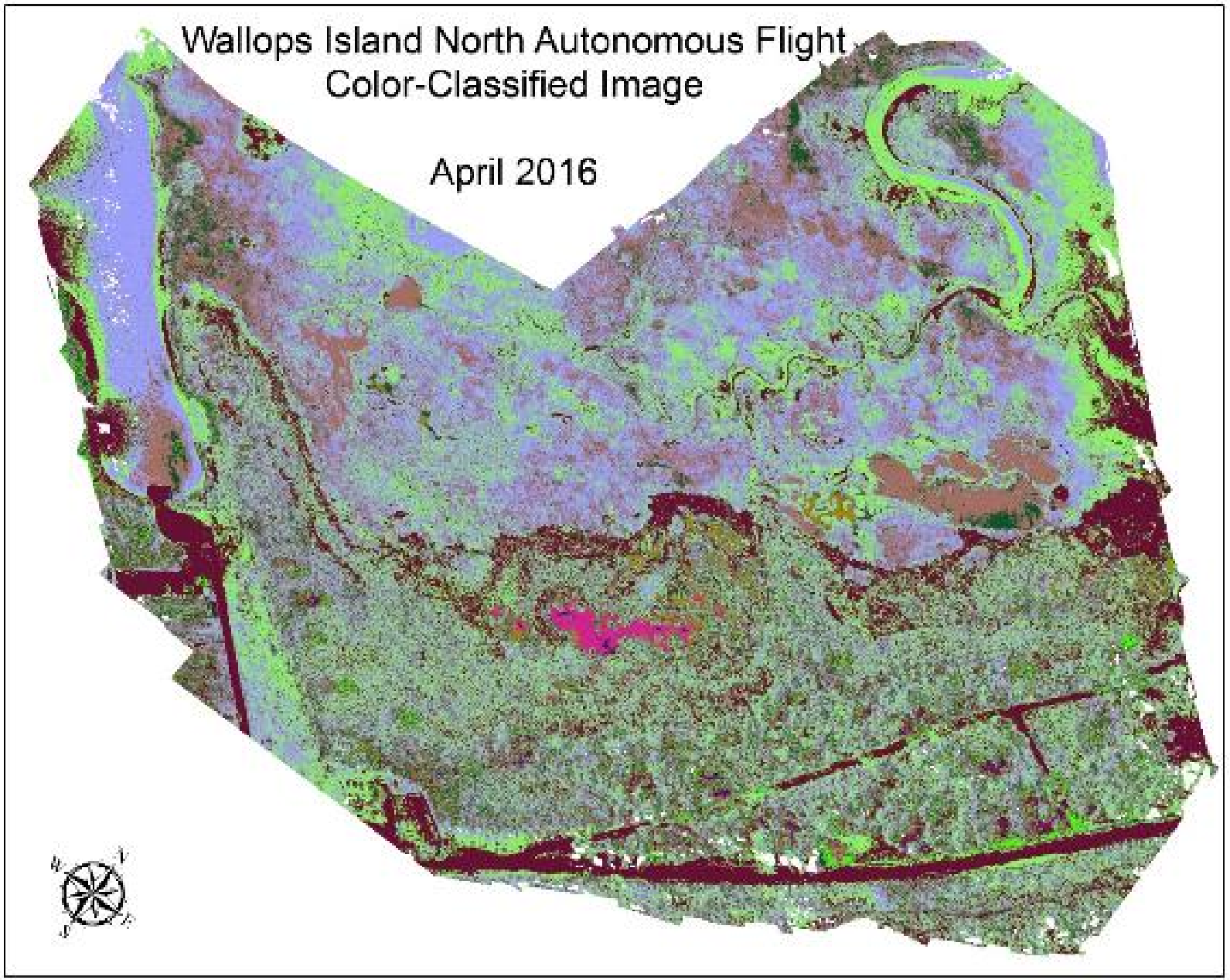
- Manual Flight
  - 163 images taken
  - .5 second intervals
  - 155 images used to develop a composite image with Microsoft ICE photo stitching software
- Brought into ESRI ArcGIS for classification
- Shoreline/phragmites determination

Students working in the Lab

Phantom 3 Over Phragmites

Student Role:

- Classifying the P3 composite image from DroneDeploy
- Stitching and classifying the P2 images
- Writing the final report for NASA


Wallops Island North Autonomous Flight
Color-Classified Image
April 2016

South Site Stitched

Wallops Island South
Manual Flight NoIR Imagery
April 2016
Legend
Shoreline
Possible Phragmites
Other Vegetation
N
W
E
S
0 25 50 100 150 200
Miles

Results

- Autonomous and manual flights with DJI Phantoms can be used to collect data “on demand”
- Possible to use relatively inexpensive drone, near infrared camera, and software to create an orthographic map of a large area
- Could identify the shoreline from high-resolution color imagery and near infrared
- Phragmites could be identifiable; best to repeat when actively growing (August-September)

Utilizing UAS Imagery and GIS Data to Detect

Shoreline Location and Presence of *Phragmites australis* at

NASA’s Wallops Island Flight Facility

STEM Takes Flight at NASA Wallops Island

April 6-9, 2016