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 logo]
**Geospatial Technician Education -- Unmanned Aircraft Systems (GeoTEd-UAS)**

- **Partners**: Thomas Nelson Community College; Mountain Empire Community College; Virginia Tech; Virginia Community College System (VCCS); VSGC
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
Focus on small UAS (<55lbs)
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)
### DACUM Research Chart for GIS Technician

#### Specific employment tasks

<table>
<thead>
<tr>
<th>A</th>
<th>Manage GIS Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1 Obtain data sets *</td>
<td>A-2 Update versioned data</td>
</tr>
<tr>
<td>A-4 Perform QA/QC on GIS data</td>
<td>A-5 Update metadata</td>
</tr>
<tr>
<td>A-6 Perform backup of GIS data</td>
<td>A-7 Update data inventory</td>
</tr>
<tr>
<td>A-8 Report GIS data changes</td>
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<table>
<thead>
<tr>
<th>B</th>
<th>Create GIS Data</th>
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<tbody>
<tr>
<td>B-1 Create data schema</td>
<td>B-2 Collect field data</td>
</tr>
<tr>
<td>B-4 Georeference spatial data</td>
<td>B-5 Geocode raster data</td>
</tr>
<tr>
<td>H-6 Process survey data (e.g., CADD, ESRI, GIS, DTM)</td>
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<tr>
<td>H-7 Convert data across formats (e.g., CADD, ESRI, CSV, DBF)</td>
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<table>
<thead>
<tr>
<th>C</th>
<th>Create Static Maps</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1 Collaborate with stakeholders *</td>
<td>C-2 Determine purpose of map</td>
</tr>
<tr>
<td>C-4 Prepare cartographic data sets</td>
<td>C-5 Determine type of layout for map</td>
</tr>
<tr>
<td>C-6 Design map template</td>
<td>C-7 Design existing map document</td>
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<table>
<thead>
<tr>
<th>D</th>
<th>Create Dynamic Maps/applications</th>
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<tbody>
<tr>
<td>D-1 Determine purpose of application</td>
<td>D-2 Identify data sets for application</td>
</tr>
<tr>
<td>D-3 Prepare cartographic data sets for application</td>
<td>D-4 Determine type of map for application</td>
</tr>
<tr>
<td>D-5 Design custom application layout</td>
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<tr>
<td>D-6 Determine analysis parameters, e.g., extent, scale, filters, layers, responses</td>
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<tr>
<td>E-6 Prepare project deliverables</td>
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<tr>
<th>E</th>
<th>Analyze GIS Data</th>
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<tbody>
<tr>
<td>E-1 Define reason for analysis</td>
<td>E-2 Determine feasibility of analysis</td>
</tr>
<tr>
<td>E-3 Outline analysis process</td>
<td>E-4 Develop analysis data sets</td>
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<tr>
<td>E-5 Identify analysis tools</td>
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<thead>
<tr>
<th>F</th>
<th>Support Internal/external Customers</th>
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<tbody>
<tr>
<td>F-1 Process customer requests</td>
<td>F-2 Deliver product to customer</td>
</tr>
<tr>
<td>F-3 Create map products, e.g., geo PDF, web maps, data sets, databases, references</td>
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<tr>
<td>F-4 Compile training materials</td>
<td>F-5 Provide GIS training</td>
</tr>
<tr>
<td>I-5 Provide equipment training (e.g., GPS, plotters, scanners)</td>
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<tr>
<td>I-7 Troubleshoot hardware issues</td>
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<tr>
<td>I-8 Troubleshoot software issues</td>
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<thead>
<tr>
<th>G</th>
<th>Maintain Hardware/software Systems</th>
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<tbody>
<tr>
<td>G-1 Initiate IT tickets</td>
<td>G-2 Install software</td>
</tr>
<tr>
<td>G-3 Install hardware (e.g., computers, servers)</td>
<td>G-4 Update firmware</td>
</tr>
<tr>
<td>G-5 Apply software patches</td>
<td>G-6 Maintain software and equipment inventory</td>
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<tr>
<td>G-7 Change out equipment</td>
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<table>
<thead>
<tr>
<th>H</th>
<th>Perform Administrative Tasks</th>
</tr>
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<tbody>
<tr>
<td>H-1 Maintain supply chain</td>
<td>H-2 Submit time sheet</td>
</tr>
<tr>
<td>H-3 Submit travel expenses reports (e.g., travel, procurement)</td>
<td>H-4 Submit expense reports (e.g., travel, procurement)</td>
</tr>
<tr>
<td>H-5 Archive projects</td>
<td>H-6 Facilitate meetings (e.g., WebEx, phone, in-person)</td>
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<tr>
<td>H-7 Create purchase requests</td>
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<tr>
<td>H-8 Manage paper files</td>
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<thead>
<tr>
<th>I</th>
<th>Maintain Professional Knowledge</th>
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<tbody>
<tr>
<td>I-1 Develop personal training plan</td>
<td>I-2 Participate in training activities (e.g., online course, in-person sessions)</td>
</tr>
<tr>
<td>I-3 Attend professional conferences</td>
<td>I-4 Present at GIS events</td>
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<tr>
<td>I-5 Represent organization at community events</td>
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<tr>
<td>I-6 Review trade publications</td>
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<tr>
<td>I-7 Maintain professional memberships</td>
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* * Task is performed across more than one duty
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
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)
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

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. Fieldwork 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 prerequisite 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.
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
(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.”

<table>
<thead>
<tr>
<th>Week: Dates</th>
<th>Course Activities</th>
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| 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.
Sea level rise and shoreline determination/delineation |
NASA Wallops Island
http://arcg.is/1O72l8X
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.
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
Student Role:

- Classifying the P3 composite image from DroneDeploy
- Stitching and classifying the P2 images
- Writing the final report for NASA
Classification of NIR Imagery of Southern Site

Wallops Island South Manual Flight NoIR Imagery

April 2016

Legend

- Shoreline
- Possible Phragmites
- Other Vegetation

Scale: 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)