Seeing the Forest *and* the Trees

Using spatial technology to help manage and analyze riverine research at the VCU Rice Rivers Center

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Virginia Commonwealth University
Rice Rivers Center http://www.vcu.edu/rice/
Center for Environmental Studies http://ces.vcu.edu/

VCU Rice Rivers Center

- Part of the Virginia Commonwealth University
- The VCU Rice Rivers Center is comprised of approximately 500 acres along the James River in Charles City County, Virginia
- Habitat includes tidal and non-tidal wetlands, upland and bottomland forest, a pine forest, open meadow and vernal pools.
- Facilities include Education Building, Pier and boat house.
- Future plans include a lodge and dedicated research building.

VCU Rice Rivers Center

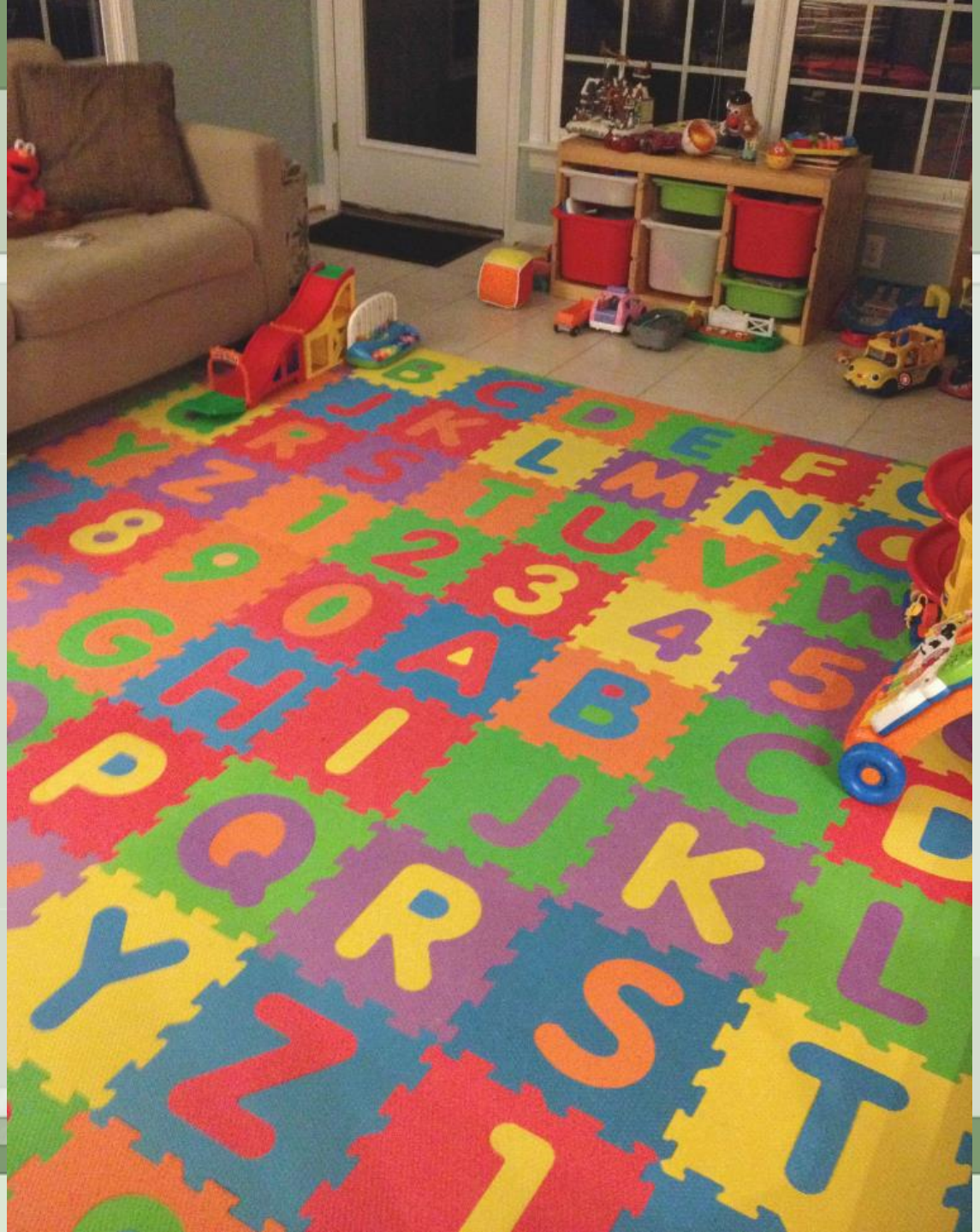
Promoting better understanding and knowledge of the environment, the river we live on and the natural resources that nourish life

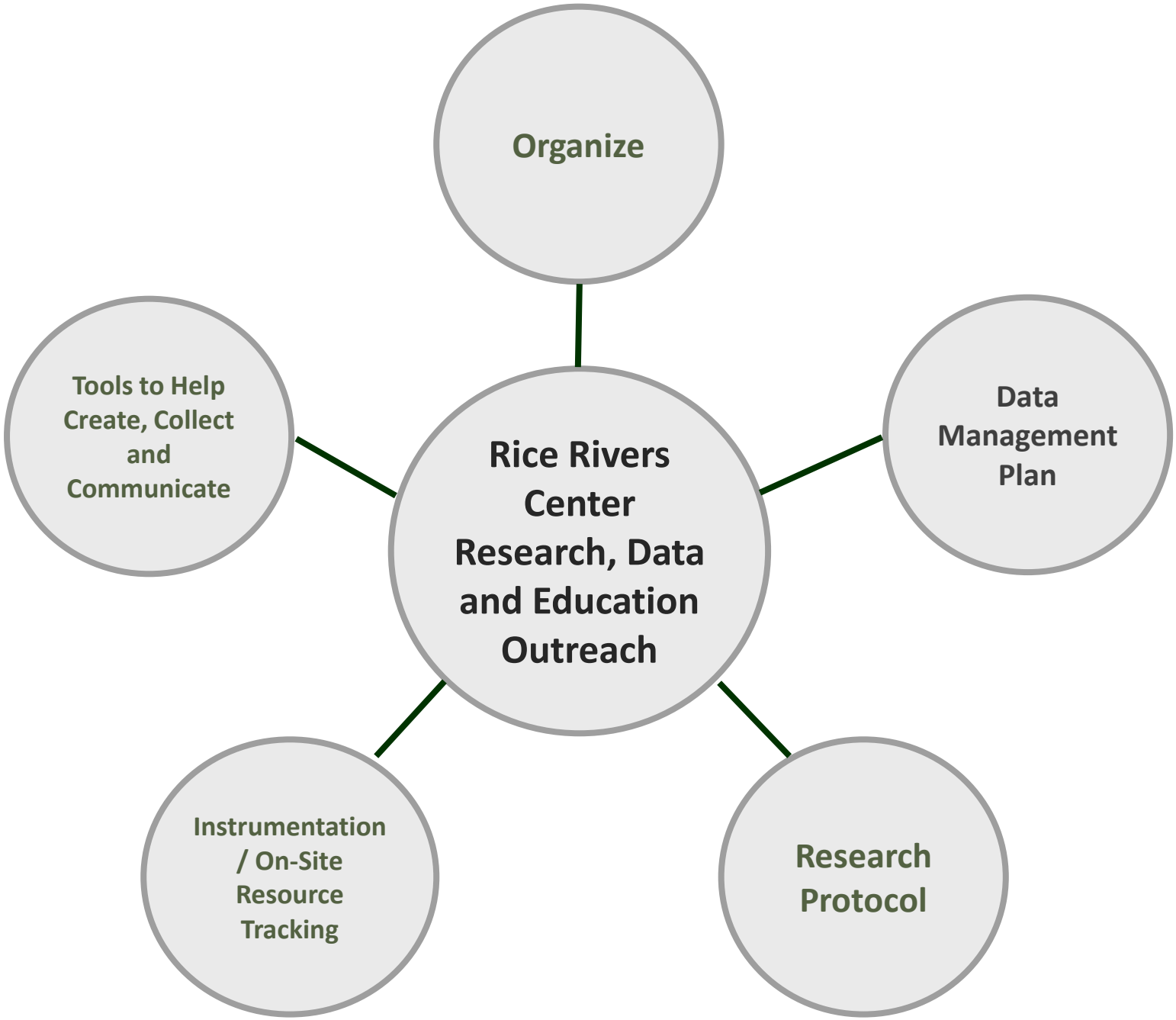
What We Do

- The Research
  - Science and policy of large rivers and their fringing riparian and wetland landscapes
  - Inform public policy
  - Undergraduate and graduate education
  - Outreach
- Core Team:
  - Director
  - Research Director
  - Data and Research Coordinator
  - IT Director
  - Director of Wetland Studies
  - Facility Director / Manager
  - Education and Outreach
  - Onsite facility manager
- Faculty / Affiliate Faculty
- Researchers

Driving Mission

"...to be internationally recognized for our academic programs focused on scientific research, education and public outreach, and for informing public policy related to river ecosystems, their watersheds and the conservation of species that inhabit those watersheds."




Organize
Tools to Help Create, Collect and Communicate
Rice Rivers Center Research, Data and Education Outreach
Data Management Plan
Instrumentation / On-Site Resource Tracking
Research Protocol

Instrumentation

Active:

- Mesocosms
- Seismometer
- Wi-Fi access points
- Meteorological tower
- Water quality instrumentation
- VEMCO receivers

Coming Online:

- Carbon flux tower
- Pandora
- Buoy (connected to the Chesapeake Bay Interpretive Buoy System)

Real Time Data

gis.vcu.edu/riceriversrealtime/Pier.aspx

VCU Rice Rivers Center
James River Pier Data
Current Weather Data
main page

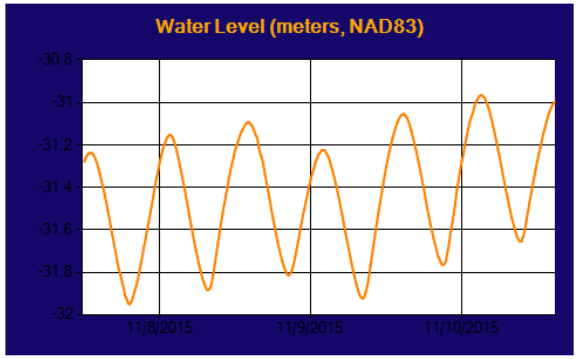
Time Stamp	PAR W/M2	Wind Speed MPH	Wind Direction	Temperature (F)	Humidity (%)	Air Pressure	Precipitation (in)
11/10/2015 2:45:00 PM	93.9	3.973	279.6	59	87.2	29.83	0
11/10/2015 2:30:00 PM	95.2	5.043	273.8	59.13	87	29.83	0
11/10/2015 2:15:00 PM	126.8	3.849	276.7	59.12	87.6	29.84	0
11/10/2015 2:00:00 PM	121.9	3.378	280.3	59.09	88	29.84	0
11/10/2015 1:45:00 PM	105.6	3.229	282.3	59.01	88.3	29.85	0
11/10/2015 1:30:00 PM	127.7	5.249	269	58.85	88.4	29.85	0
11/10/2015 1:15:00 PM	139.6	5.906	273.2	58.8	88.4	29.86	0
11/10/2015 1:00:00 PM	157	6.672	264.1	58.96	88.3	29.87	0
11/10/2015 12:45:00 PM	162.8	4.019	266.3	58.97	88.4	29.87	0
11/10/2015 12:30:00 PM	142.6	3.322	267.5	58.91	88.8	29.88	0

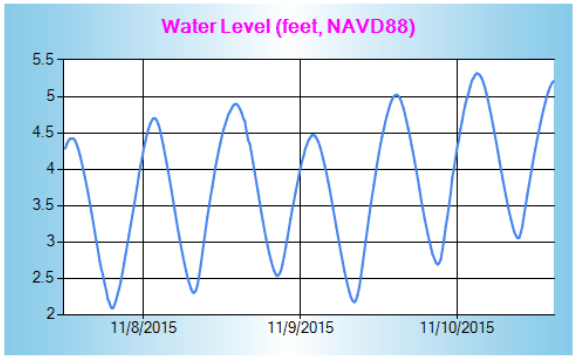
1 2 3 4 5

Current Water Quality Data

DateTime	Sonde1_tempC	Sonde1_tempF	Sonde1_SpCond_mScm	Sonde1_Sal_psu	Sonde1_pH	Sonde1_turb_ntu	Sonde1_chla_ugl	Sonde1_BGAPC_rfu	Sonde1_ODOsat	Sonde1_ODOmgl	Sonde2_levelNad83m	Sonde2_levelNAVD88_ft
11/10/2015 2:45:00 PM	16.12	61.01	0.22	0.11	7.75	21.08	19.53	0.94	92.79	9.13	-30.9978	5.211
11/10/2015 2:30:00 PM	16.1	60.98	0.22	0.11	7.75	20.48	17.89	0.88	92.9	9.14	-31.00786	5.177999
11/10/2015 2:15:00 PM	16.09	60.96	0.22	0.11	7.75	19.91	17.86	0.88	92.91	9.15	-31.02127	5.134001
11/10/2015 2:00:00 PM	16.08	60.94	0.22	0.11	7.74	20.31	17.94	0.88	92.69	9.13	-31.03987	5.073
11/10/2015 1:45:00 PM	16.07	60.92	0.22	0.11	7.73	21.05	17.6	0.87	92.56	9.12	-31.0612	5.003
11/10/2015 1:30:00 PM	16.05	60.89	0.22	0.11	7.72	21.49	17.1	0.85	92.39	9.1	-31.08772	4.916
11/10/2015 1:15:00 PM	16.04	60.87	0.22	0.11	7.71	22.13	17.14	0.85	92.05	9.07	-31.11485	4.827
11/10/2015 1:00:00 PM	15.96	60.73	0.22	0.1	7.67	23.71	15.96	0.8	90.72	8.96	-31.14441	4.73
11/10/2015 12:45:00 PM	15.92	60.66	0.22	0.1	7.65	23.15	15.69	0.81	90.14	8.91	-31.17611	4.625999
11/10/2015 12:30:00 PM	15.9	60.62	0.22	0.11	7.65	23.43	15.58	0.8	89.99	8.9	-31.21055	4.513

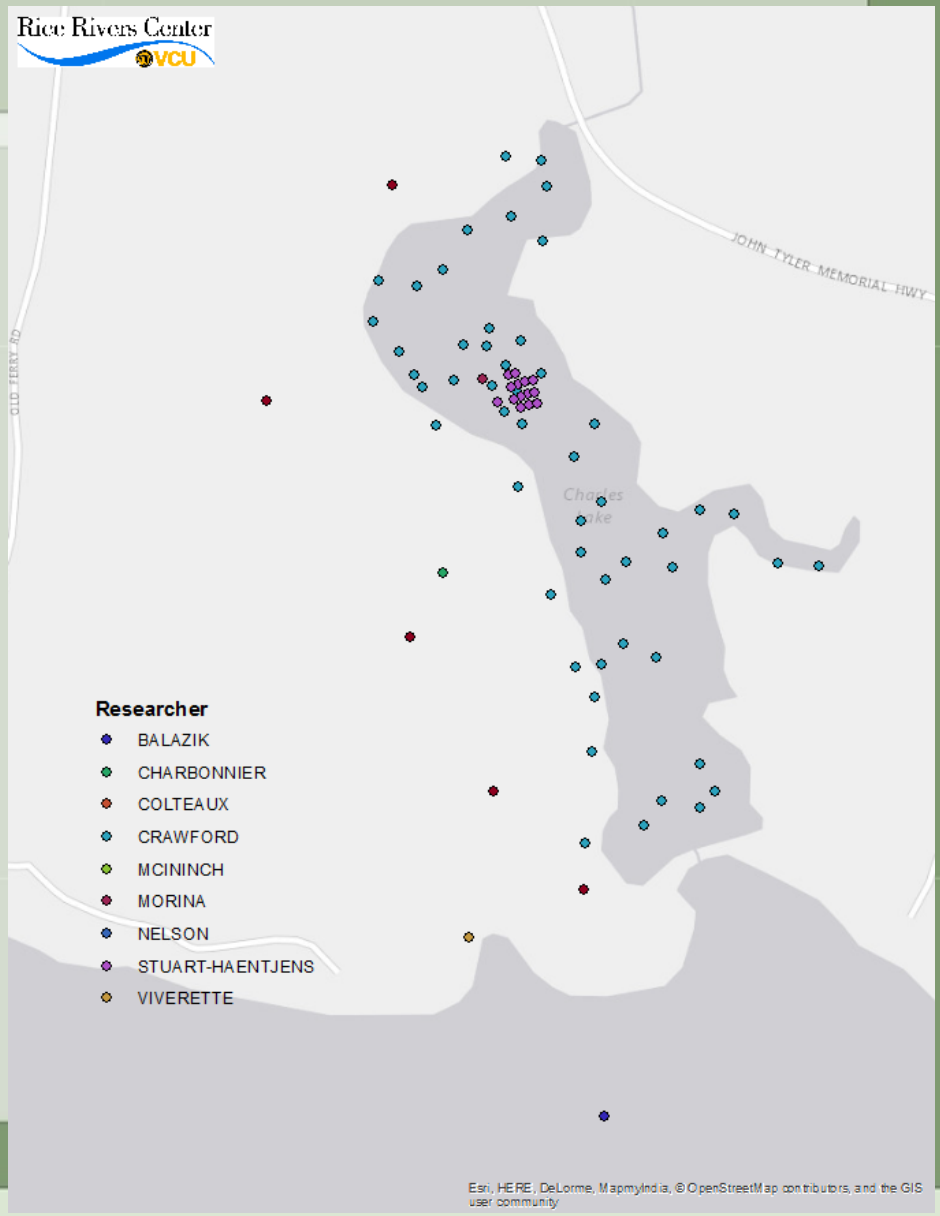
1 2 3 4 5 6 7 8 9 10 ...





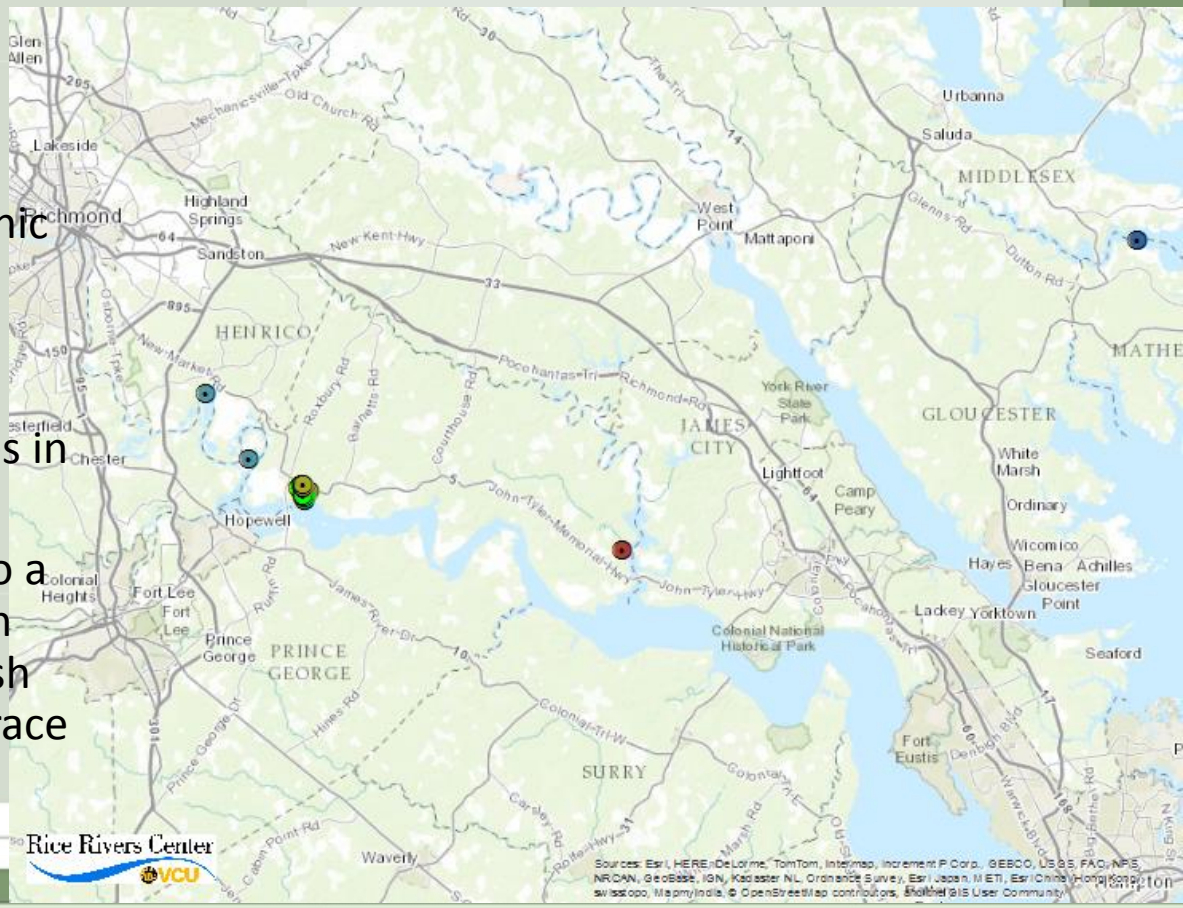
Research on the Site

- Focus is riverine research but research includes:
  - Effects of urbanization on the black widow
  - Owl surveys
  - Prothonotary Warbler long term study
  - Baseline assessment of Kimages Creek hydrology and geomorphology
  - Carry-over effects of the larval environment on post metamorphic performance of spotted salamanders
  - Sturgeon restoration project
  - Wetland restoration project
  - Temporal dynamics of nitrite reductase expression
  - Effects of urbanization on parasitism levels of the fall cankerworm
  - Pupal predation of the gypsy moth
  - Effects of tidal forcing on water quality
  - Assessing saltwater disturbance on tidal freshwater wetlands
  - Carbon sequestration and greenhouse gas fluxes of restored and old-growth forested wetlands



Bigger than just a site

- Rice Rivers research includes research conducted on the site and research funded by Rice Rivers support
- Includes:
  - Assessment of fishery response to oyster reef restoration and the trophic pathways that link the resource to the reef.
  - Population viability of common snapping turtles in Virginia waterways
  - The Effect of Proximity to a Coal-Fired Power Plant in Central Virginia on Fly Ash and Concentrations of Trace Metals

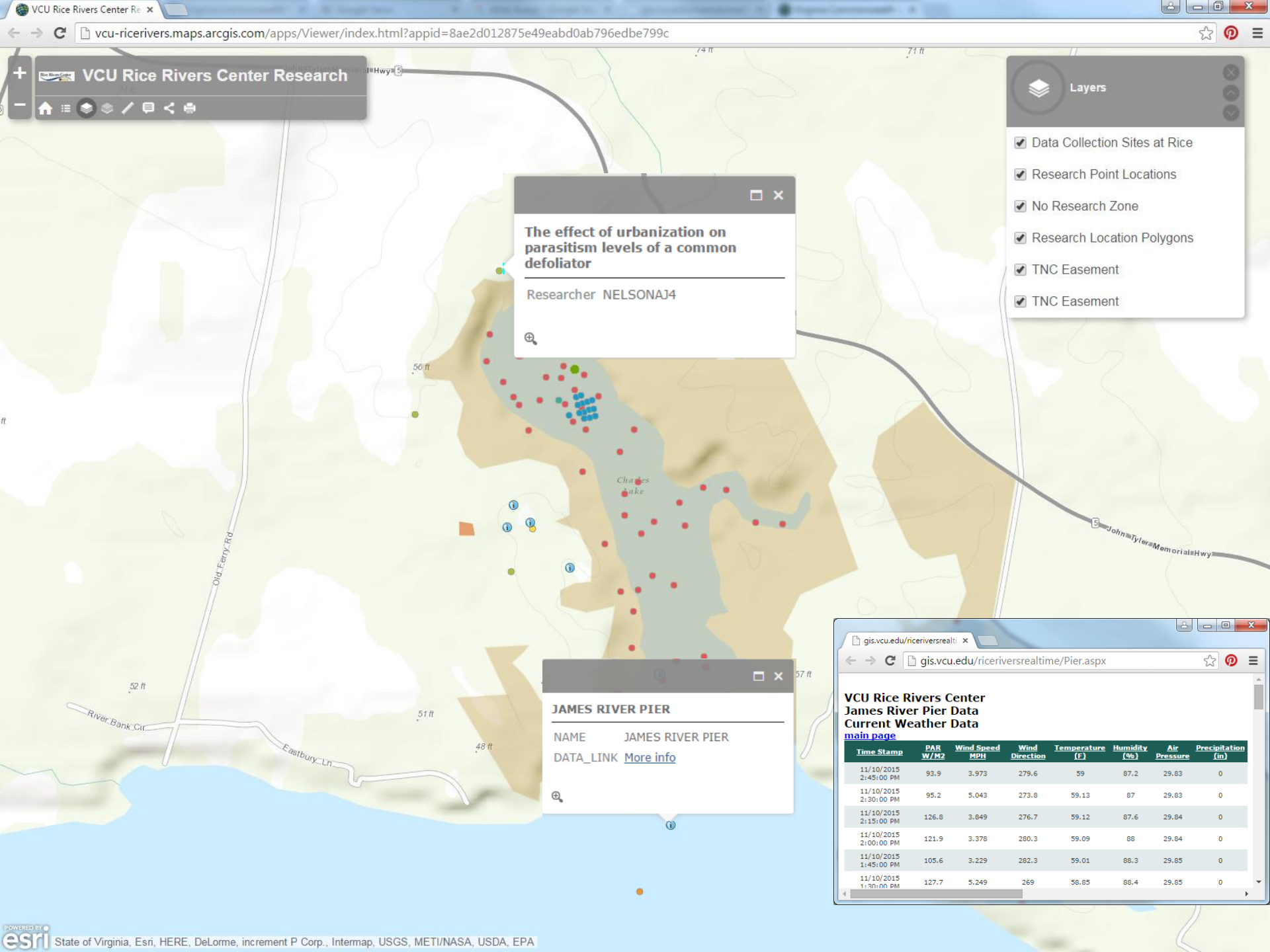


Apps and Tools to Help Administrators

- Leverage ArcGIS Online Apps to create interactive, dynamic maps of research and instrumentation
  - Create GIS services of research sites and instrumentation sites
    - Server in house versus leveraging the ArcGIS cloud (credits)
  - Create ArcGIS Online map with sites
  - Edit pop-ups to include links to real time data and researcher specific information
  - Expose map as a web app

Service Credits by Capability

Service	
Storage	
Feature Services Storage	2.4 credits per 10 MB stored per month
Tile and Data Storage	1.2 credits per 1 GB stored per month


VCU Rice Rivers Center Research
Layers
Data Collection Sites at Rice
Research Point Locations
No Research Zone
Research Location Polygons
TNC Easement
TNC Easement
The effect of urbanization on parasitism levels of a common defoliator
Researcher NELSONAJ4
JAMES RIVER PIER
NAME JAMES RIVER PIER
DATA_LINK More info
VCU Rice Rivers Center
James River Pier Data
Current Weather Data
main page
Time Stamp | PAR W/M2 | Wind Speed MPH | Wind Direction | Temperature (F) | Humidity (%) | Air Pressure | Precipitation (in)
11/10/2015 2:45:00 PM | 93.9 | 3.973 | 279.6 | 59 | 87.2 | 29.83 | 0
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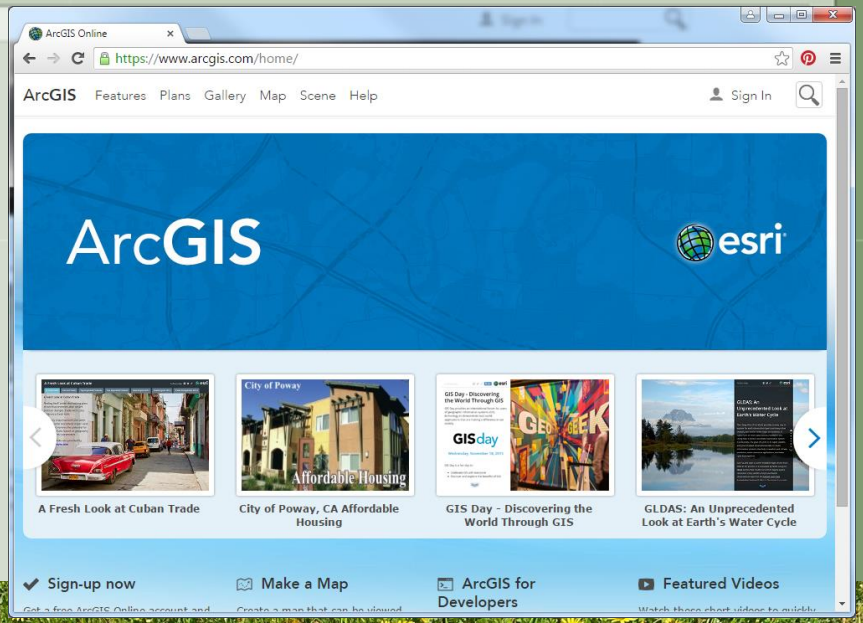
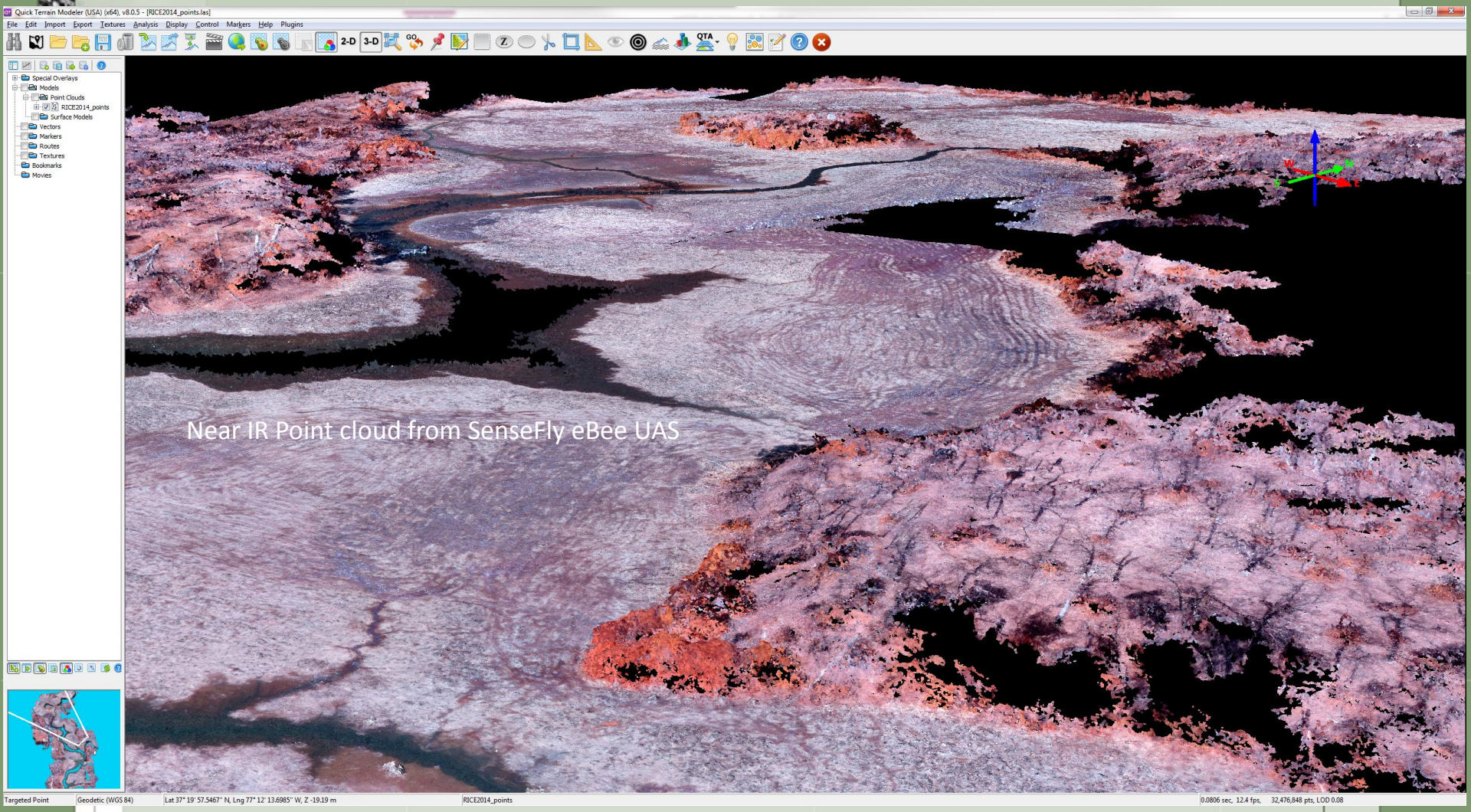
11/10/2015 1:45:00 PM | 105.6 | 3.229 | 282.3 | 59.01 | 88.3 | 29.85 | 0
11/10/2015 1:30:00 PM | 127.7 | 5.249 | 269 | 58.85 | 88.4 | 29.85 | 0
Old Ferry Rd
River Bank Cir
Eastbury Ln
John Tyler Memorial Hwy
State of Virginia, Esri, HERE, DeLorme, increment P Corp., Intermap, USGS, METI/NASA, USDA, EPA

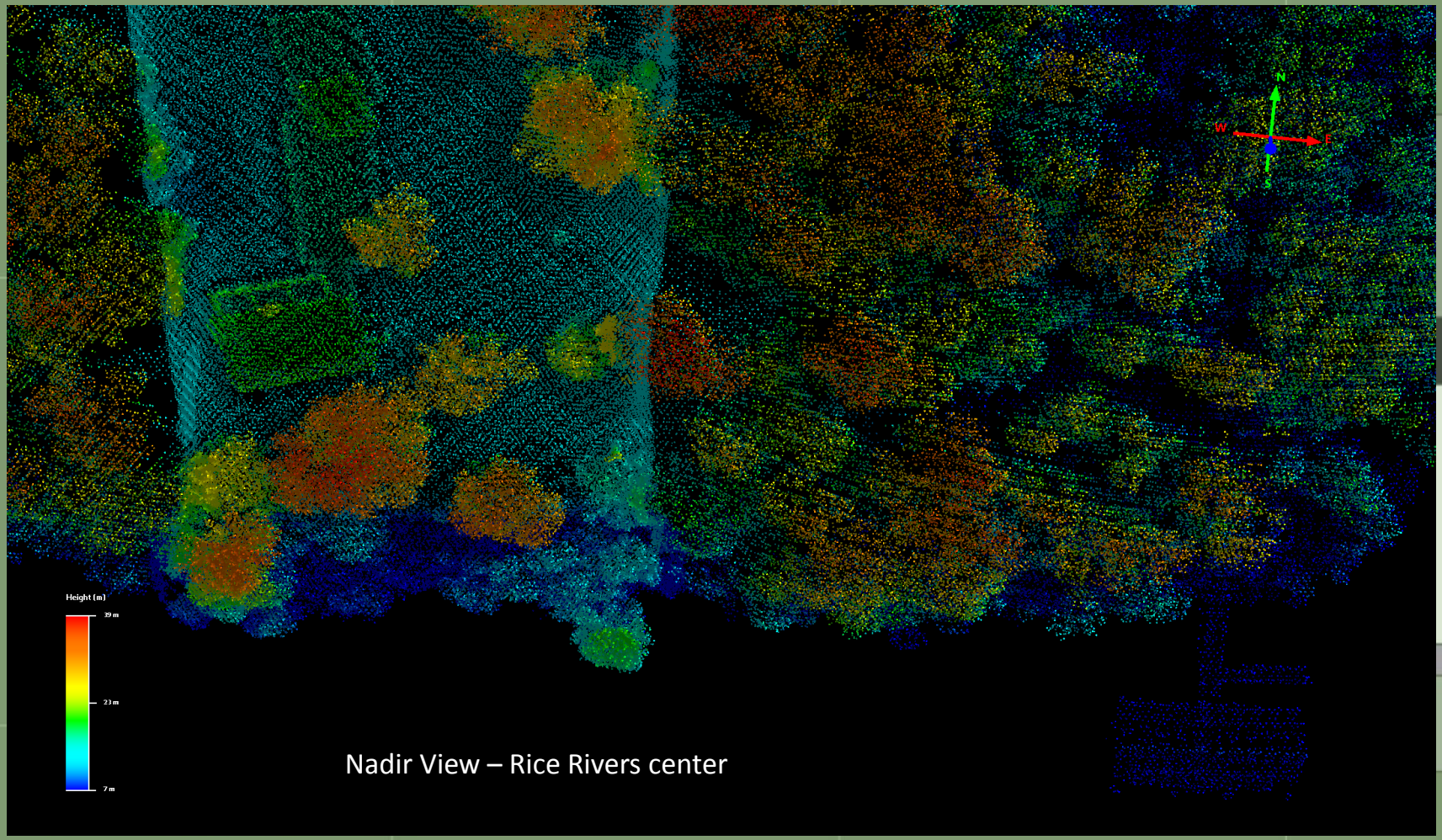
Apps and Tools to Help Researchers

- Trimble GPS
- ArcGIS Online
- Collector
- Drone



Near IR orthomosaic from
SenseFly eBee UAS
3cm/pixel


Quick Terrain Modeler (USA) (x64), v8.0.5 - [RICE2014_points.las]
File Edit Import Export Textures Analysis Display Control Markers Help Plugins
2-D 3-D
Special Overlays
Models
Point Clouds
RICE2014_points
Surface Models
Vectors
Markers
Routes
Textures
Bookmarks
Movies
Near IR Point cloud from SenseFly eBee UAS
Targeted Point
Geodetic (WGS 84)
Lat 37° 19' 57.5467" N, Lng 77° 12' 13.6985" W, Z -19.19 m
RICE2014_points
0.0806 sec, 12.4 fps, 32,476,848 pts, LOD 0.08

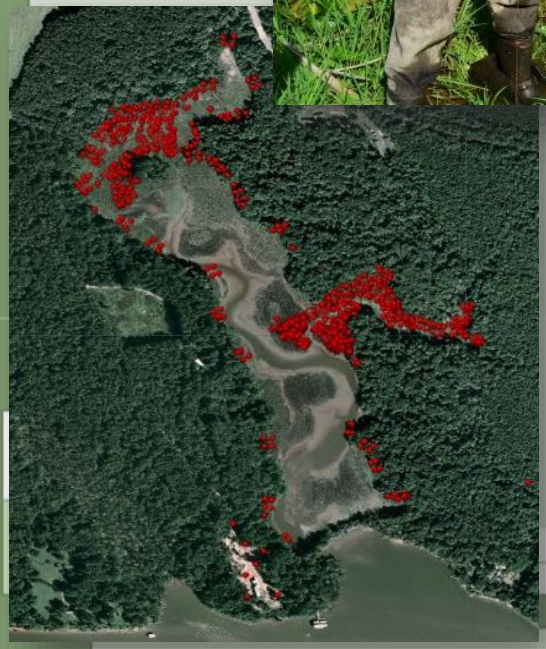


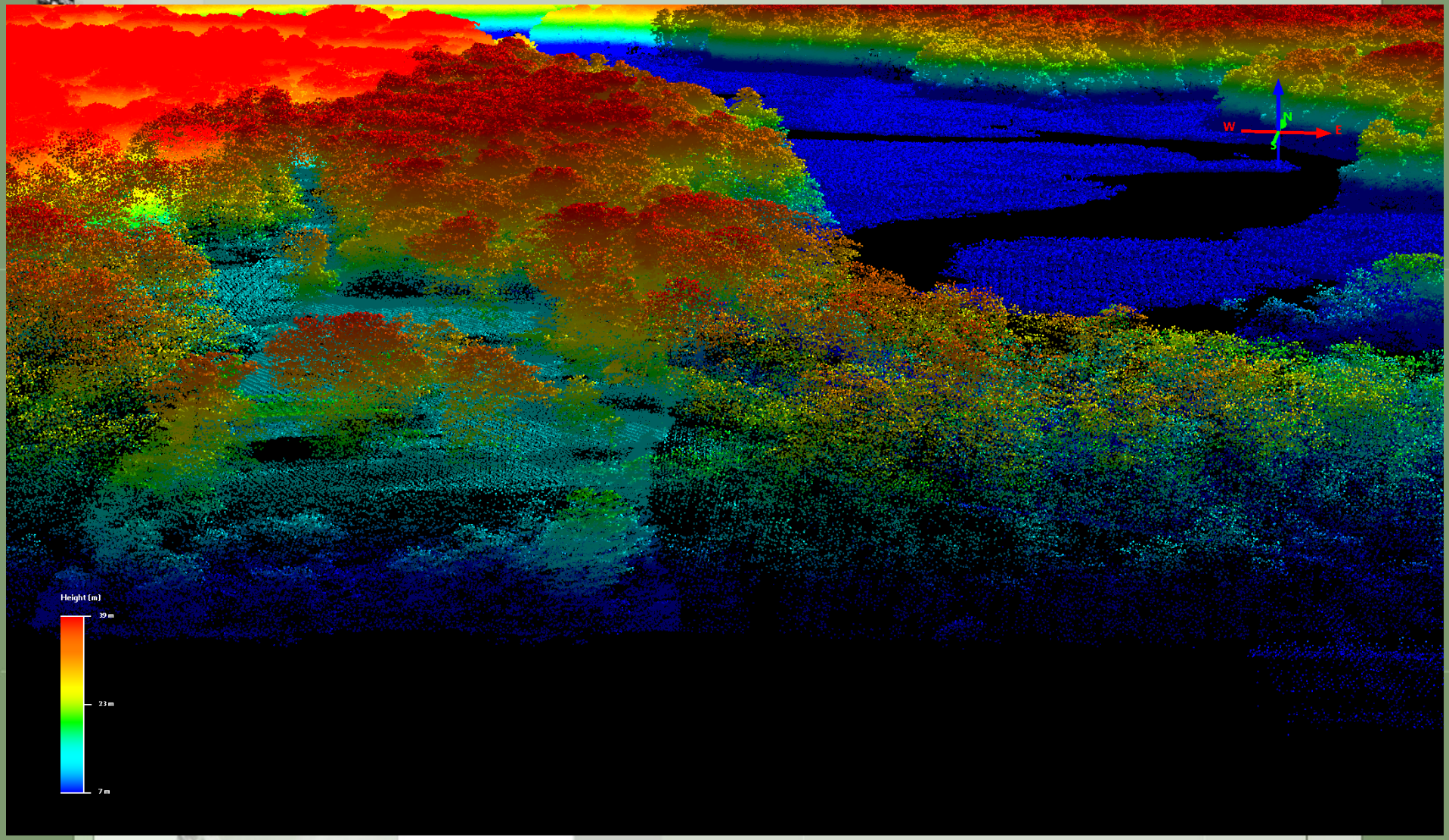
Nadir View – Rice Rivers center

Application

Got the tools…. who and how do we use them?

Tidal Wetland Restoration Project



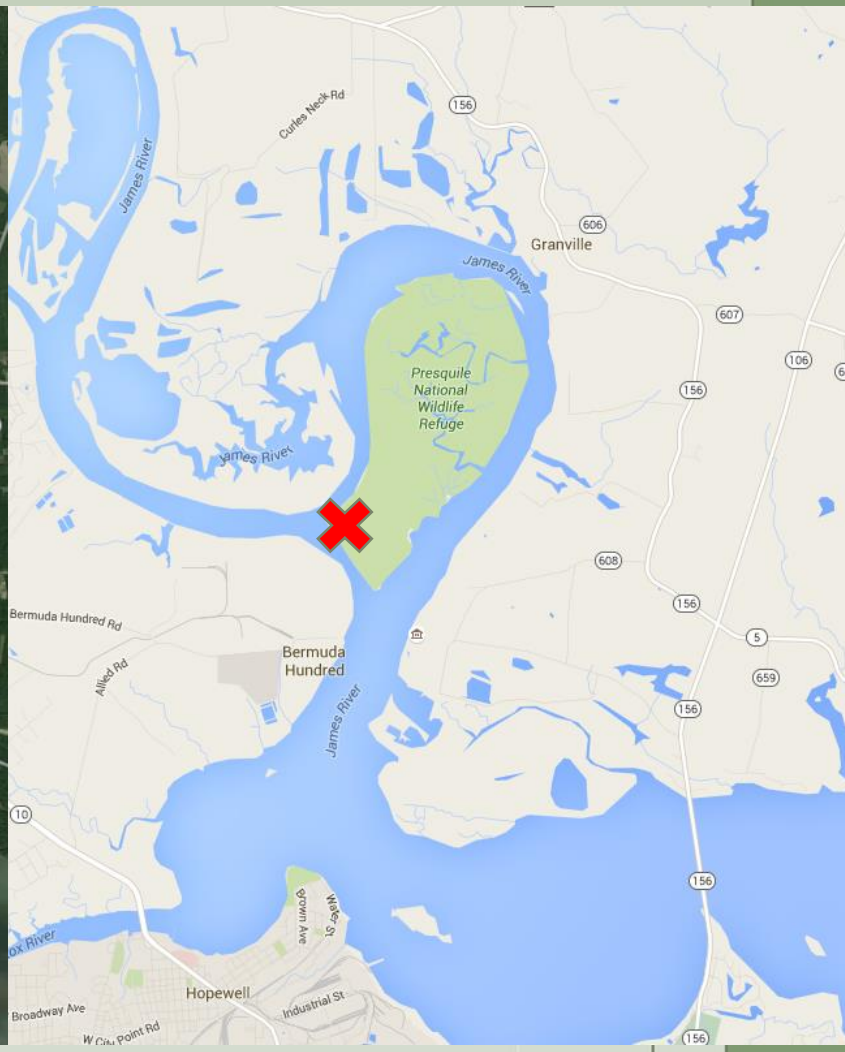

W
N
E
S
Height (m)
39 m
23 m
7 m

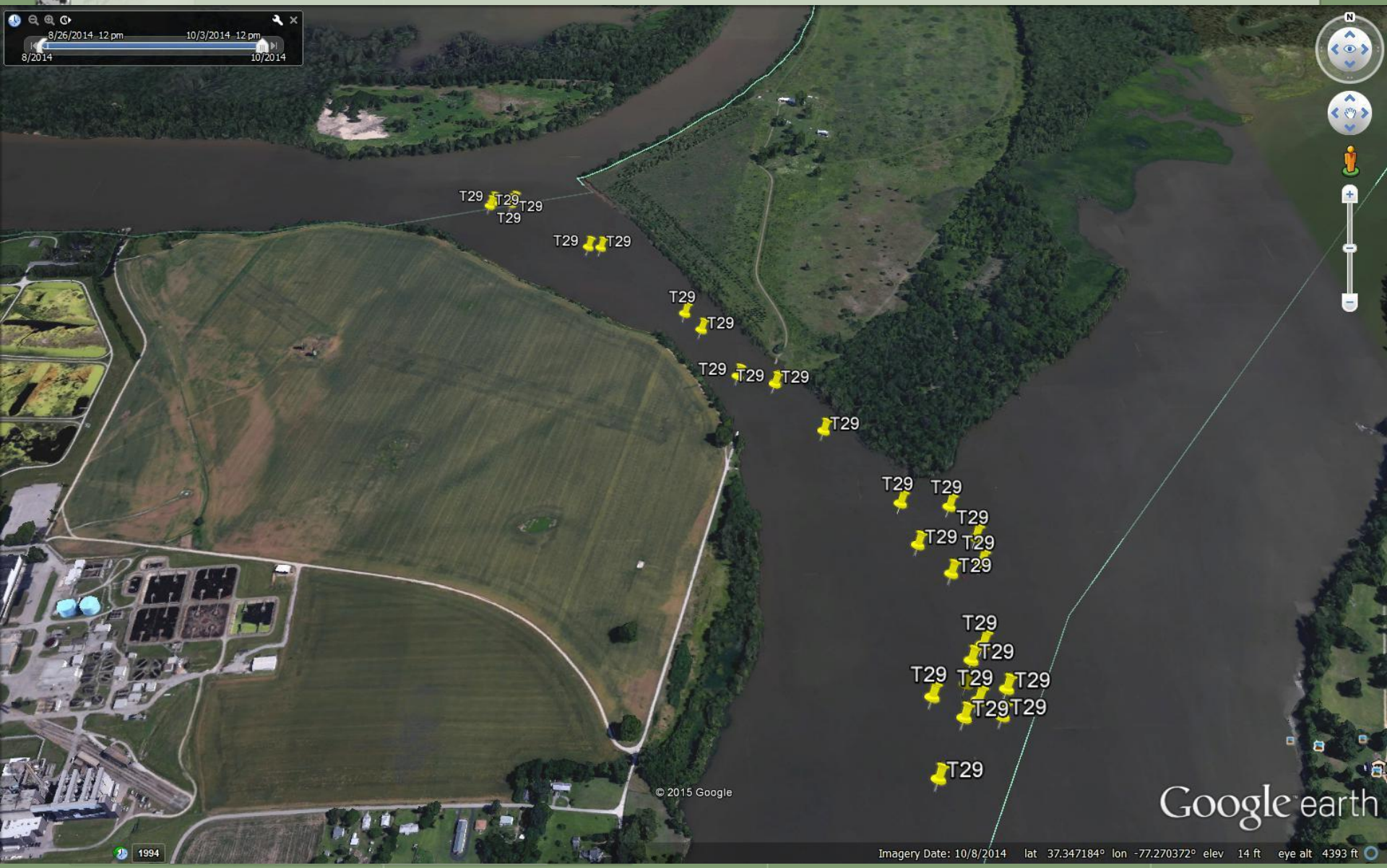
Restoration of Atlantic sturgeon in Virginia's coastal rivers

- The Atlantic sturgeon (Acipenser oxyrhynchus) is the largest and longest-lived aquatic organism in the Atlantic rivers of North America. The Atlantic sturgeon played a critical role in the establishment of the first English settlement as Jamestown's 'founding fish' and was (and remains) culturally significant to Native Americans throughout the region.
- Following centuries of over-fishing, habitat alteration, and pollution, this migratory species has been extirpated from many Chesapeake Bay tributaries and — in Virginia — persists as a small but viable population only in the James River. As a consequence of the species' long decline and current rarity, biologists understand very little about sturgeon behavior, movements and reproduction in Virginia waters. This lack of knowledge prevents effective management and restoration of the species in Virginia. In recognition of its imperiled status, the U.S. Fish and Wildlife Service (USFWS) recently proposed the Atlantic sturgeon for listing as a federally threatened species.

VEMCO Fish Receivers


James River
Granville
James River
Presquile
National
Wildlife
Refuge
James River
Shirley Plantation
Colonial mansion
& working farm
Bermuda
Hundred
Rivermont Crossing


James River
Curles Neck Rd
Granville
James River
Presquile
National
Wildlife
Refuge
James River
Bermuda Hundred Rd
Allied Rd
Bermuda
Hundred
James River
Hopewell
Broadway Ave
Industrial St


8/26/2014 12 pm
10/3/2014 12 pm
8/2014
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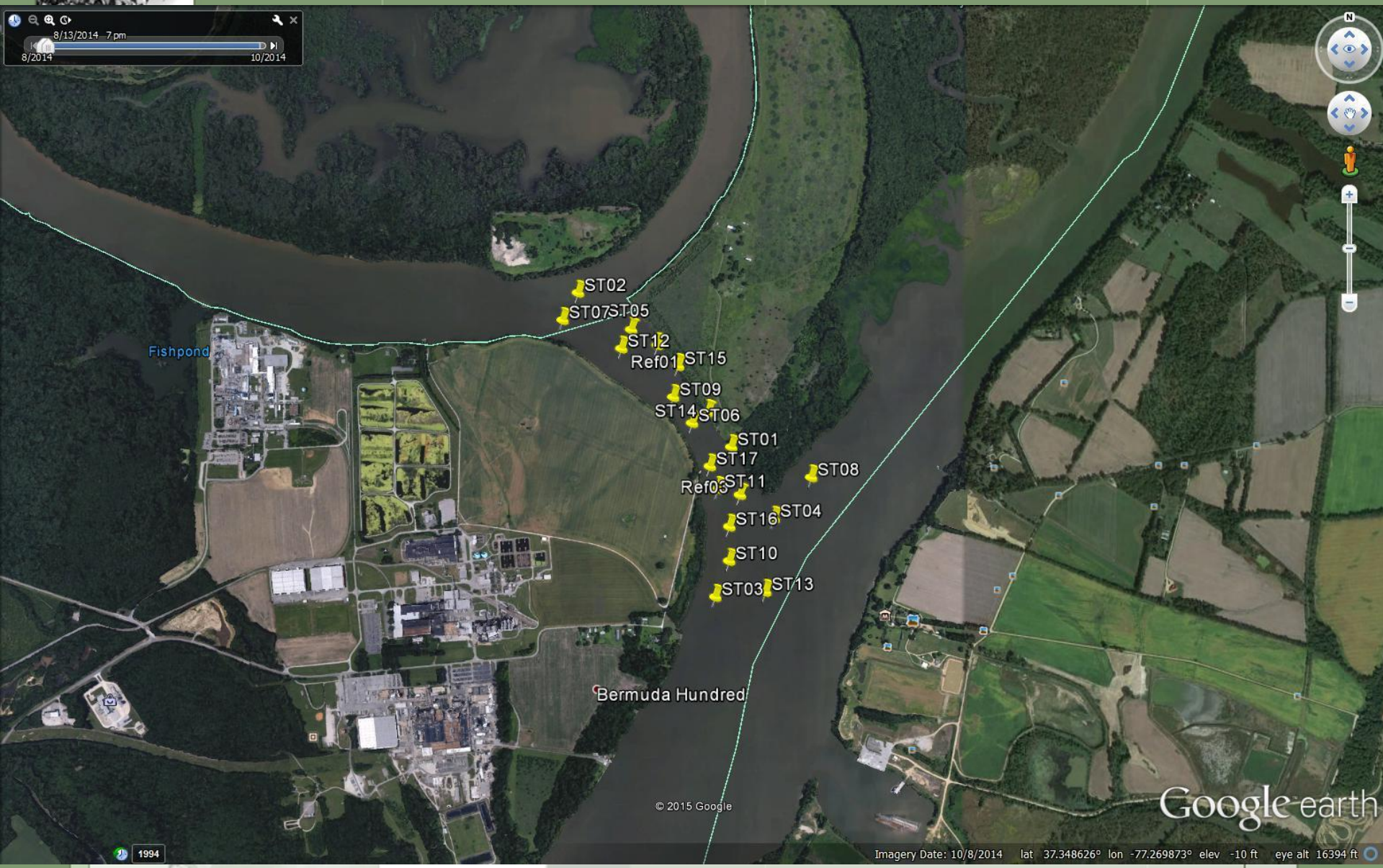
T29
© 2015 Google
Google earth
1994
Imagery Date: 10/8/2014 lat 37.347184° lon -77.270372° elev 14 ft eye alt 4393 ft


8/13/2014 7 pm
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ST04
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ST03
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Fishpond
Bermuda Hundred
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Google earth
1994
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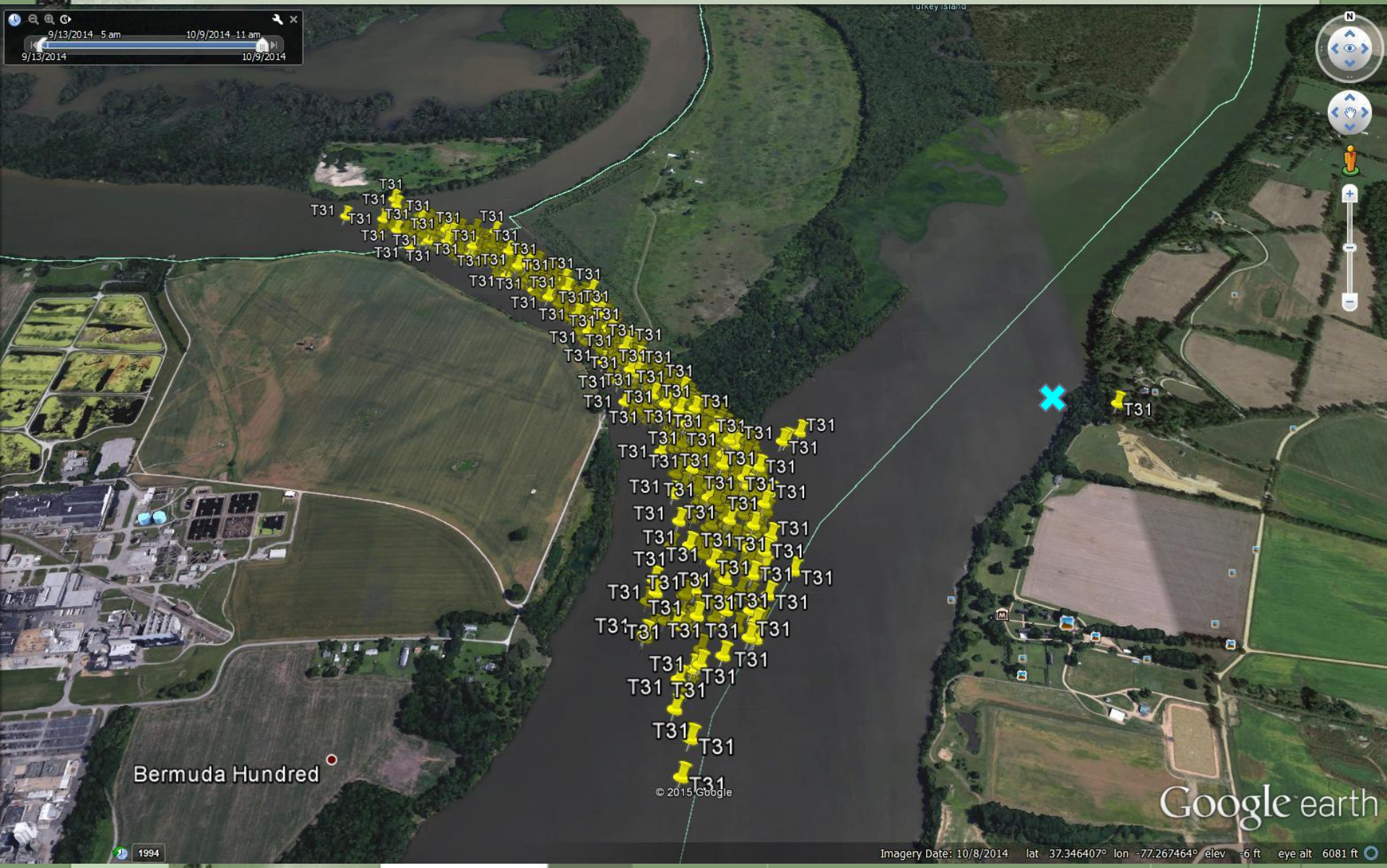

9/13/2014 5 am
10/9/2014 11 am
9/13/2014
10/9/2014
T31
Bermuda Hundred
© 2015 Google
Google earth
1994
Imagery Date: 10/8/2014 lat 37.346407° lon -77.267464° elev -6 ft eye alt 6081 ft

The Use of GIS as a Messaging Tool

- Administrators happy?
- Researchers happy?

- Done!

- What's the next step?
- Bridge the gap from science to public to help inform public policy

Virginia Commonwealth U

vcu-ricerivers.maps.arcgis.com/home/index.html

Home Gallery Map Scene Groups Sign In

Rice Rivers Center

Featured Content

VCU Following the Footprints Storytour

VCU Rice Rivers Center Research

VCU Rice Rivers Center Research Story Tour

The VCU Rice Rivers Center is Virginia Commonwealth University's research field station, located in Charles City County along the James River. For more information visit the VCU Rice Rivers Center website. Visit the VCU Scholars Compass to view our recently published research posters from the VCU Rice Rivers Center Research Symposium.

Research at Virginia Commonwealth University's Rice Rivers Center

VCU Rice Rivers Center

A River Runs Through Us: Promoting better understanding and knowledge of the environment, the river we live on and the natural resources that nourish life.

Welcome to the Inger and Walter Rice Rivers Center for Environmental Life Sciences

Informally known as the VCU Rice Rivers Center, this site is Virginia Commonwealth University's field station devoted to a broad range of environmental research, teaching and public service. More Info


1 Welcome to the Inger and Walter Rice Rivers Center for


2 Wetland Ecology and Restoration


3 Characterization of Variations in Sediment

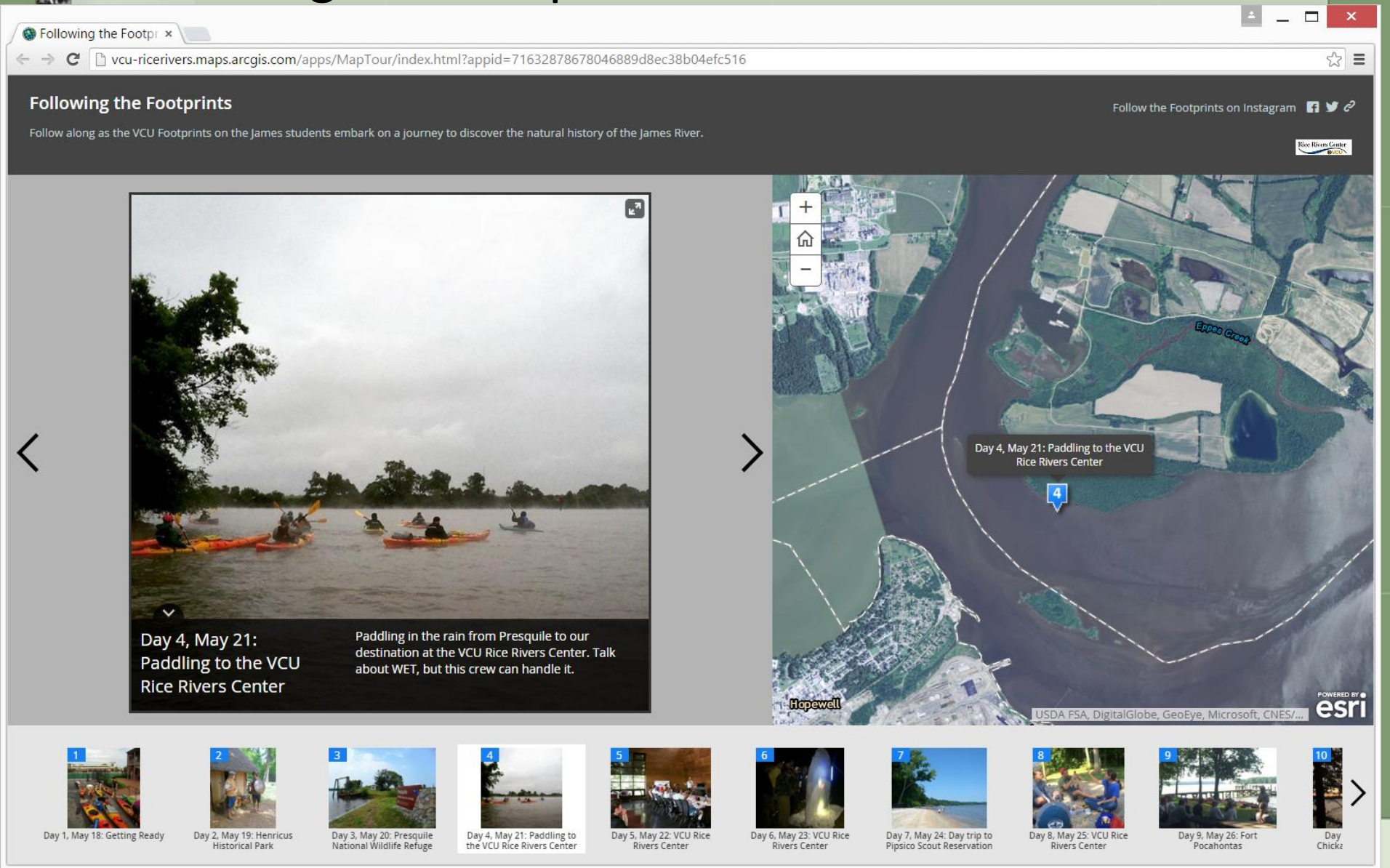

4 Temporal Dynamics of Nitrite Reductase Expression


5 The effect of urbanization on parasitism levels of a


6 Aquatic Mesocosm Facility


7 Integrating density and size specific growth and

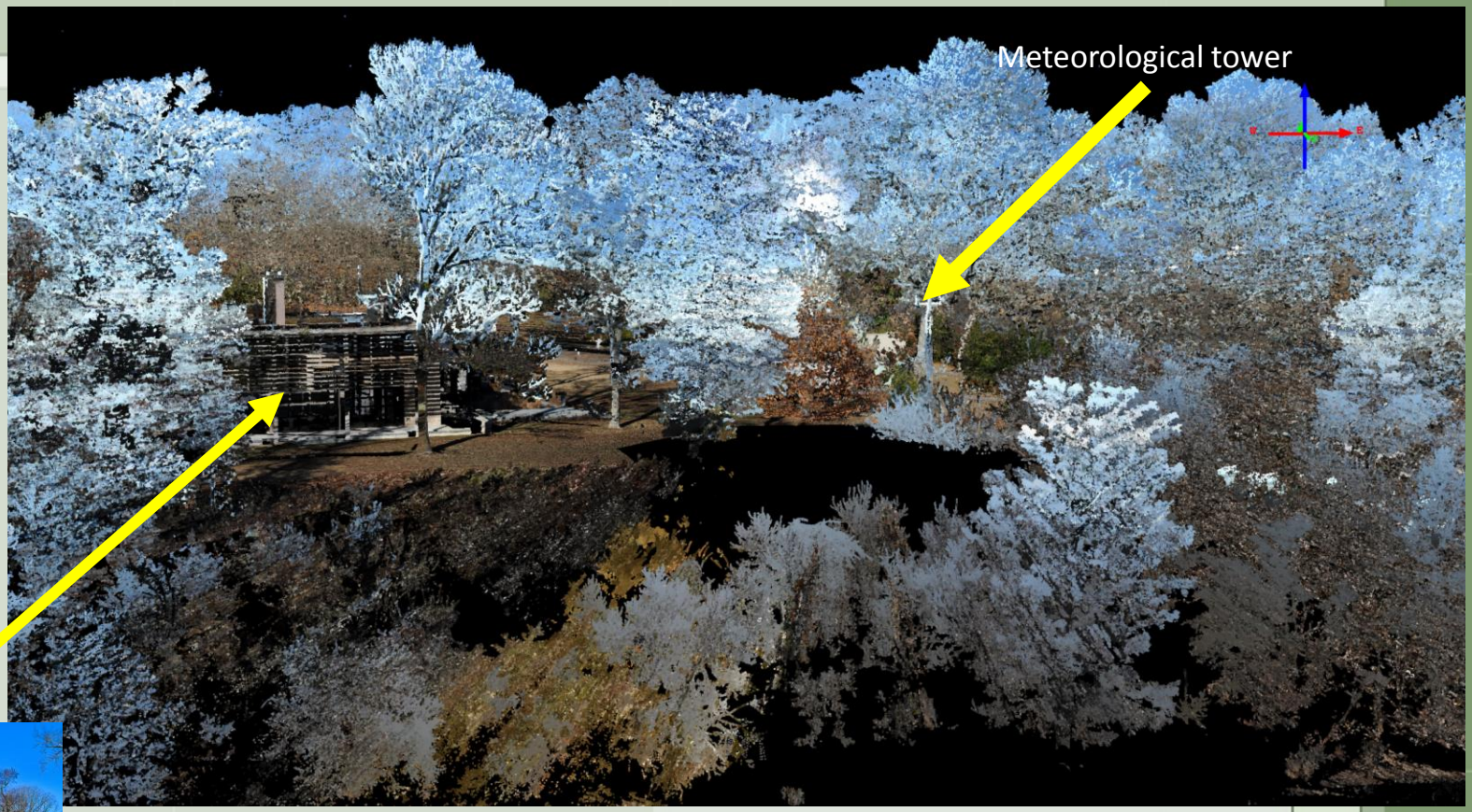
Following the Footprints



Next Steps

- Implement policy
- Refine and deploy tools in an easily accessible way
- Expand ArcGIS analytical capacity to help with research (i.e. consulting services)
- Expand the use of ArcGIS online to help communicate our message


Rice Rivers Center


Meteorological tower