2018 Catch the King Thank You and Data Review

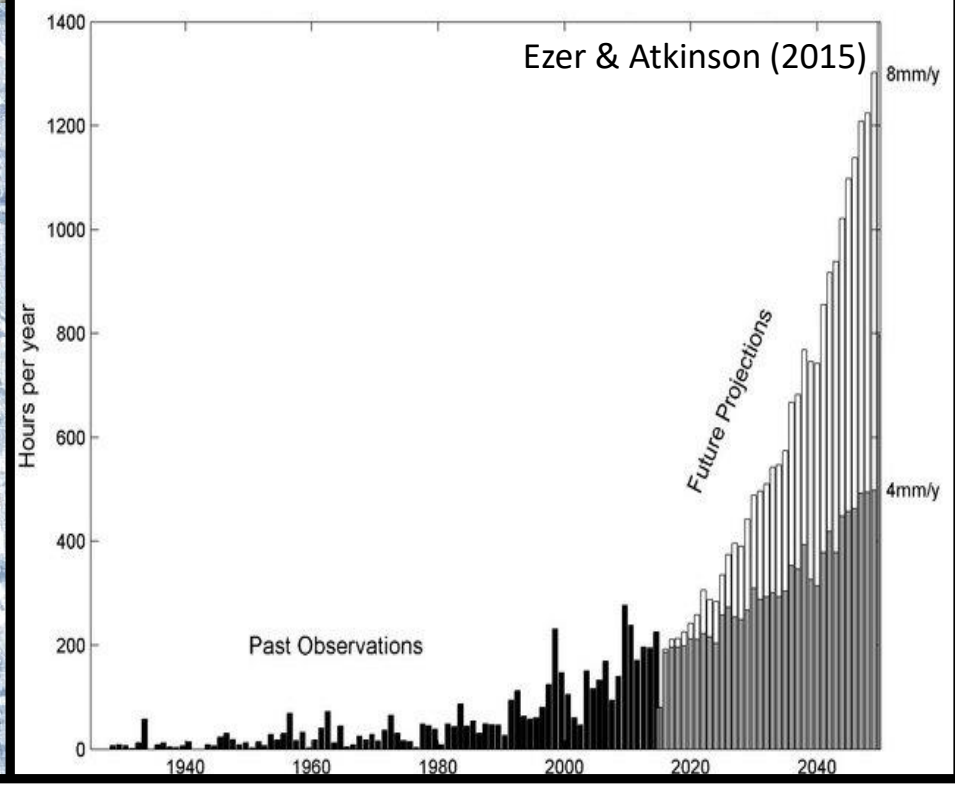
Dr. J. Derek Loftis, VIMS, W&M | *Mapping the Heartbeat of Hampton Roads*

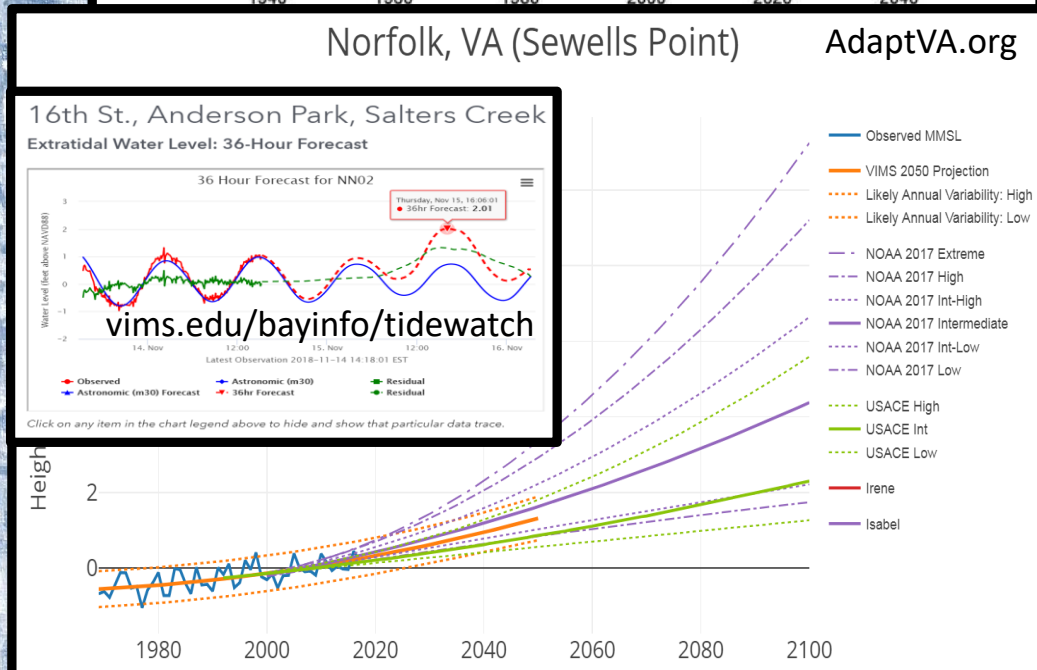
Foreground: 5 years of water levels at NOAA's Sewells Point sensor; denotes SLR App mapping events

Background: Drone video captured by Drs. Thomas Alberts and Tom Allen, Old Dominion University

Outline

1. Thank You!
   - A. Volunteers, Teachers, and Tide Captains
   - B. To Our Enthusiastic Media Partners
   - C. School Groups and Student Projects
   - D. Modeling Researchers
   - E. To the App Developers
2. Data Review
   - A. App Data and Model Comparison
   - B. What We Learned
   - C. Conclusions





Catch the King Tide 2018

Thank You & Review

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Thanks to Our Many Volunteers:

- We were able to validate and improve flood prediction models
- 42 unique volunteer training events around Hampton Roads resulted in:
  - 347 people on Sat., Oct. 27 caught 33,847 GPS max. flood extents & 1,126 chrono-geotagged pictures
  - 141 people on Fri. Oct. 26 caught 3,881 GPS max. flood extents & 136 chrono-geotagged pictures

Catch the King — 10/27/2018 Rank By # of Volunteers

Final Statistics based upon Participation by Locality via the Sea Level Rise App (as of 11/01/2018)

#	Final Stats for 10/27	GPS Points	Volunteers
1	Norfolk	13078	121
2	VA Beach	8893	79
3	Hampton	2959	30
4	Gloucester / Mathews	2101	24
5	York / Poquoson	2428	21
6	Chesapeake	1241	20
7	James City / Williamsburg	1914	16
8	Newport News	531	12
9	Portsmouth	306	11
10	Outside HR	265	9
11	Suffolk	131	4
	TOTAL	**33847**	**347**

Background Drone Imagery of Norfolk's Hague on Oct. 27, 2018 courtesy of Dr. Thomas Alberts, ODU

Thanks to Our Volunteers

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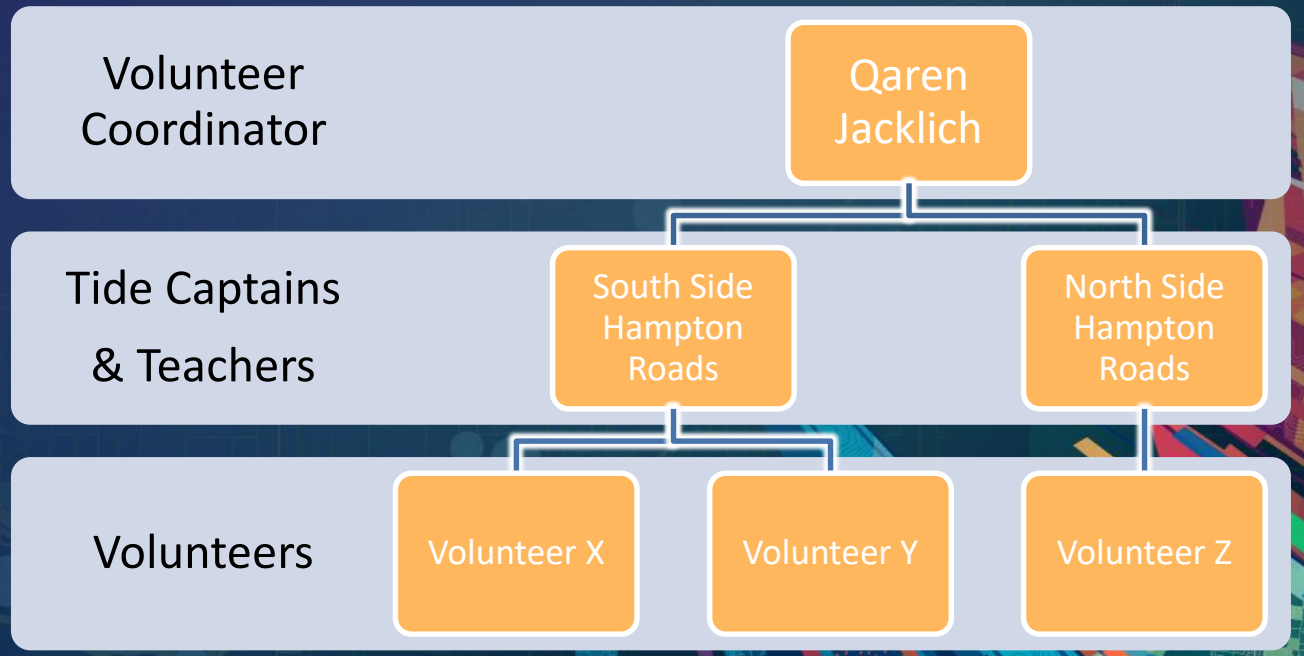
Thanks to You and Your Perseverance!

The sheer number of volunteers involved in this effort made organization tough:



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A Big Thanks to This Year's Adept Tide Captains!

Date Registered	Name	Region	Area of Interest	Preferred Location	Role
8/23/2017 11:22:49	Dell young/West Shore Drivers	Virginia Beach	VB/Baylake	Baylake beach, between learner's bridge	Tide Captain
7/10/2018 13:07	Edgardo "Pete" Abreu	Virginia Beach	VB/Windsor Woods & Lynnhaven	No preference	Tide Captain
7/10/2018 14:52	Lynn Gilbert	Chesapeake	Chesapeake/Indian River	Indian River/ Ashburn Point	Tide Captain
7/11/2018 10:28	Patrick McGrath	Gloucester	Gloucester	Naxera	Tide Captain
7/11/2018 12:33	Diane Peters	Chesapeake	Chesapeake/Bells Mill and Camp Young	Riverwalk/ Fernwood Farms, but will go v	Tide Captain
7/17/2018 9:52	Karen Duhring	Gloucester	Gloucester	no preference	Tide Captain
7/17/2018 10:15	mike overstreet	Virginia Beach	VB/Thalia	Thalia	Tide Captain
7/19/2018 11:32	Monica Ward	Virginia Beach	VB/Rudee Inlet	No Preference	Tide Captain
7/22/2018 15:18	Peter Johnston	Norfolk	Norfolk/Downtown-HarborPark		Tide Captain
7/27/2018 11:03	Dana Perry	Newport News	NN/Riverview Farm Park/Hilton Village	Riverview Farm Park	King Tide Captain
7/27/2018 11:10	Garry Harris	Portsmouth	Portsmouth		King Tide Captain
7/27/2018 12:31	Karen Cifranick	Norfolk	Norfolk/Ocean View	Bayview	King Tide Captain
8/1/2018 10:54	Cheryl Loughran	Chesapeake	Chesapeake/Great Bridge		King Tide Captain
8/1/2018 13:01	Jamie	Hampton	Hampton/Grandview	Grandview	King Tide Captain
8/1/2018 17:34	Lisa T Nickel	Williamsburg/James City	Williamsburg/James River		King Tide Captain
8/2/2018 9:45	Bill Judge	Norfolk	Norfolk/East Ocean View	No preference	King Tide Captain
8/2/2018 14:19	Lisa White	Matthews	Gloucester	Mathews, Woodas Creek, East River	King Tide Captain
8/2/2018 18:19	Peter J Dreher	York/Poquoson	York/Poquoson	Williamsburg/ James City County	Teacher/Youth Leader
8/2/2018 18:30	jean kerry	Virginia Beach	VB/Thalia		King Tide Captain
8/3/2018 14:18	Alfonso Macias-Tapia	Norfolk	Norfolk/Downtown-HarborPark	downtonwn Norfolk	King Tide Captain
8/6/2018 19:20	Betty Baucom	Norfolk	Norfolk/Barraud Park	Lindenwood/Barraud Park	King Tide Captain
8/8/2018 12:31	Michael D Claya	Norfolk	Norfolk/Ghent	No preference	King Tide Captain
8/8/2018 13:44	Awilda S. Velez Chambers	Suffolk	Suffolk	Somewhere in Isle of Wight	Teacher/Youth Leader
8/27/2018 20:03	Sarah McBride	Portsmouth	Portsmouth	Paradise Creek Nature Park	King Tide Captain
9/11/2018 12:48	Margaret R. Mulholland	Norfolk	MtM	Lafayette River - Measure the Muck	King Tide Captain
9/13/2018 9:47	Michelle Jackson	Virginia Beach	VB/Broad Bay	Areas around Great Neck Middle School	Teacher/Youth Leader
9/13/2018 16:57	Jordan Wooley	Norfolk	Norfolk/Ghent	Ghent	Teacher/Youth Leader

Thanks to Media Partners

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Catch the King 2018 Graciously Supported By:

- WHRO Public Media
- The Virginian-Pilot
- Daily Press
- The Commonwealth Center for Recurrent Flooding Resiliency

Sponsored by:

- Hampton Roads Sanitation District
- Batten Environmental Education Initiative

Thanks to Media Partners

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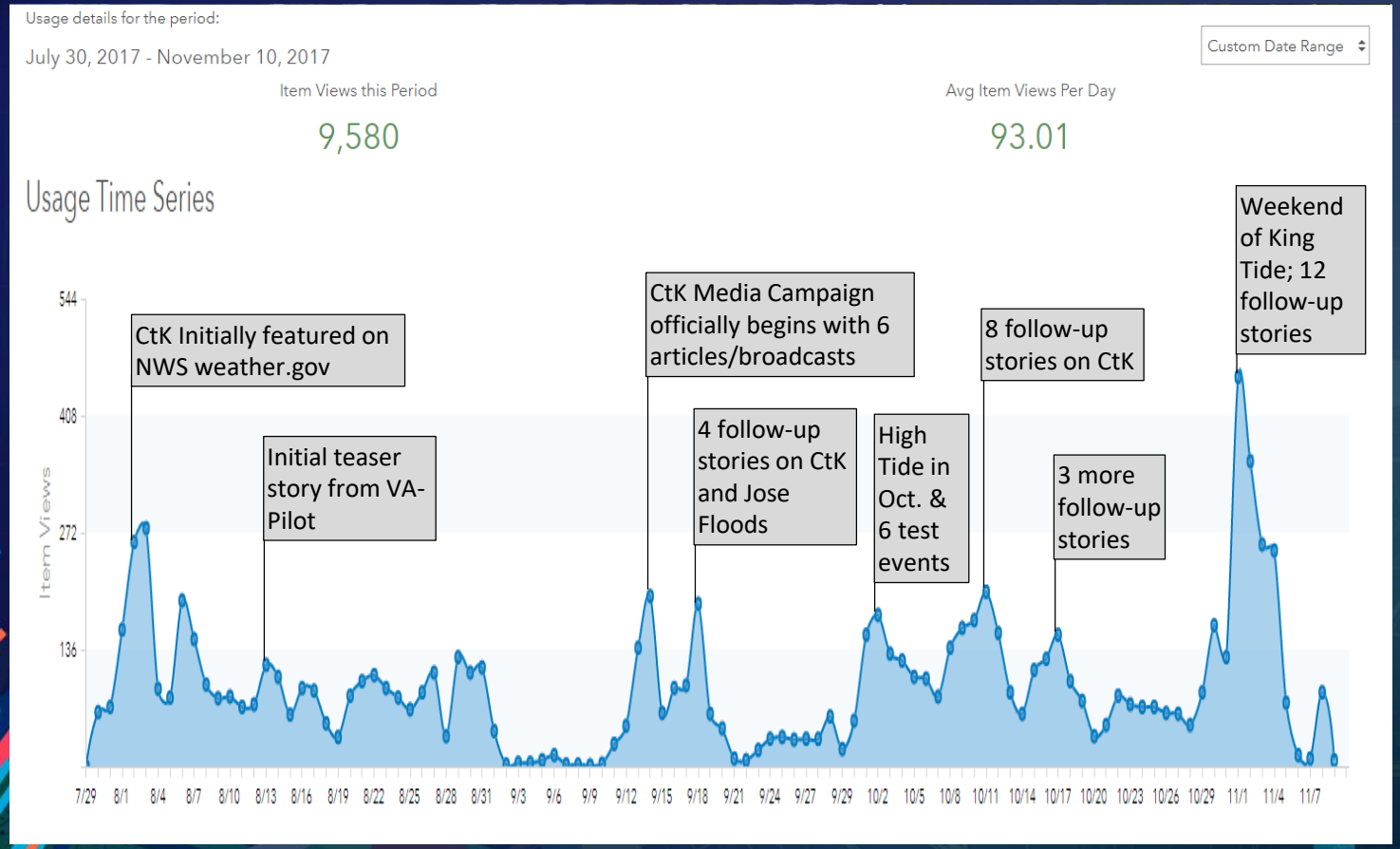
- Embedded and linked to volunteer recruitment forms, App download, and interactive story map:



Volunteer Recruitment Story Map URL (2018):
http://www.vims.edu/people/loftis_jd/Catch%20the%20King/index.php

Thanks to Participating Schools

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- WHRO helped get >120 elementary, middle, and high schools choose Catch the King as their science class project.
- The event touches on 6 major SOLs, including physics, geometry, chemistry, and water quality.

Thanks to Olivia and HRA

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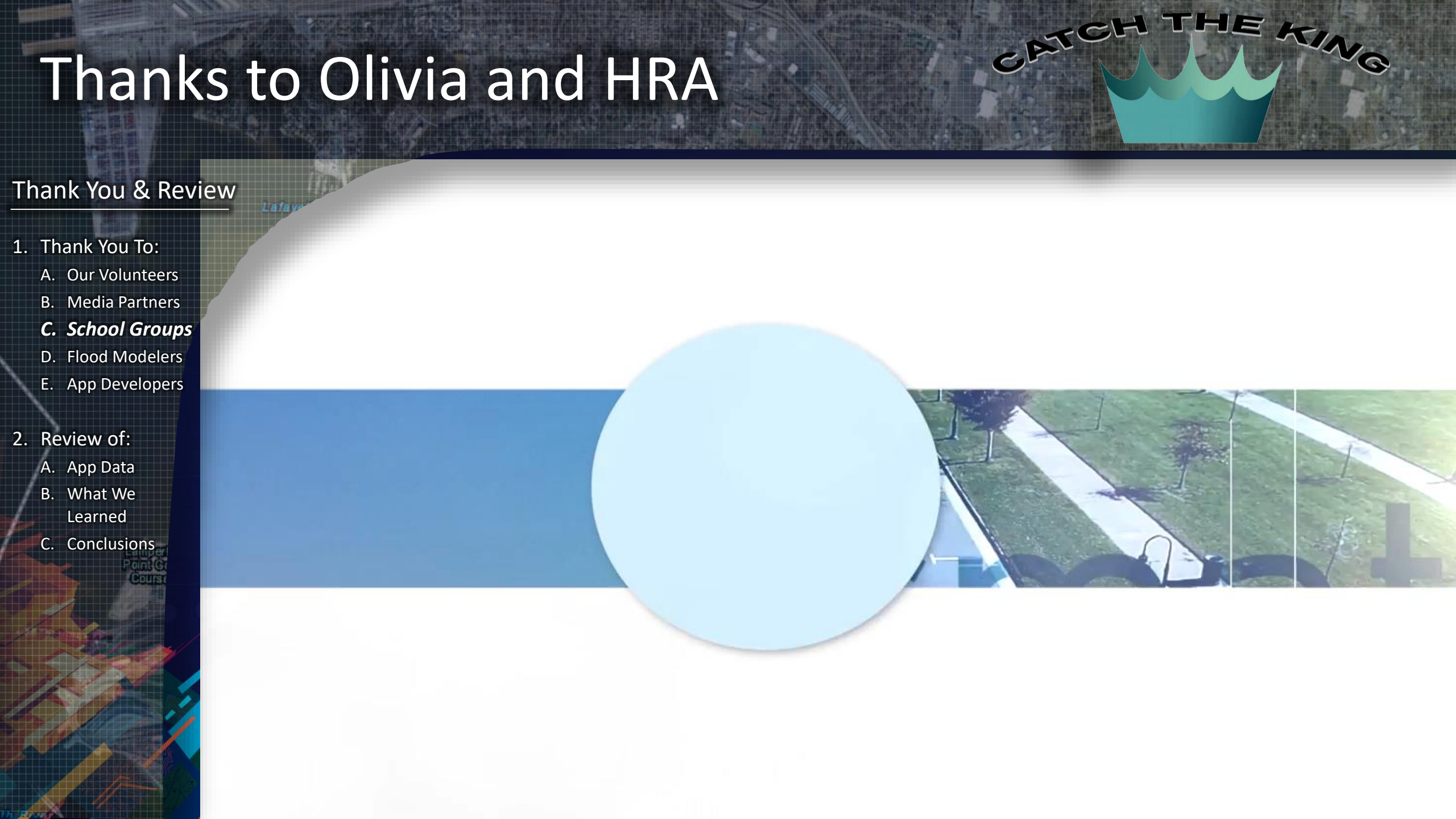


Crabbing Hampton's Tidal Flooding

Six flood-monitoring gauges around Hampton, Virginia installed Fall 2018 by Olivia Basco

Goals

Accomplish the following within the 650$ fund

- **Analyze effects of sea level rise in Hampton, Virginia** Look at the global problem primarily caused by polar ice melting, the Gulf Stream, and land subsidence through tidal flooding
- **Raise awareness about increased risks of tidal flooding** Involve citizen-scientists to collect data
- **Develop a three-dimensional flood map of Hampton, Virginia** Collect altitudinal measurements of tidal flooding to add to data outlining horizontal range of tidal flooding

The Gauges

components to each site

Signs

Each gauge is a different crab which is Hampton's mascot.

Crabbing Hampton's Tidal Floods

Help us track flooding!

1. **Snap a flood photo of this gauge.**
2. **Scan the QR code above and upload pic**
3. **Enter the coordinates for this location:**

Lat: 37.017374 Long: -76.352396

(or use your phone's location services)

QR-code scannable with any smartphone camera

Aluminum UV-resilient crab sign with website for more information.

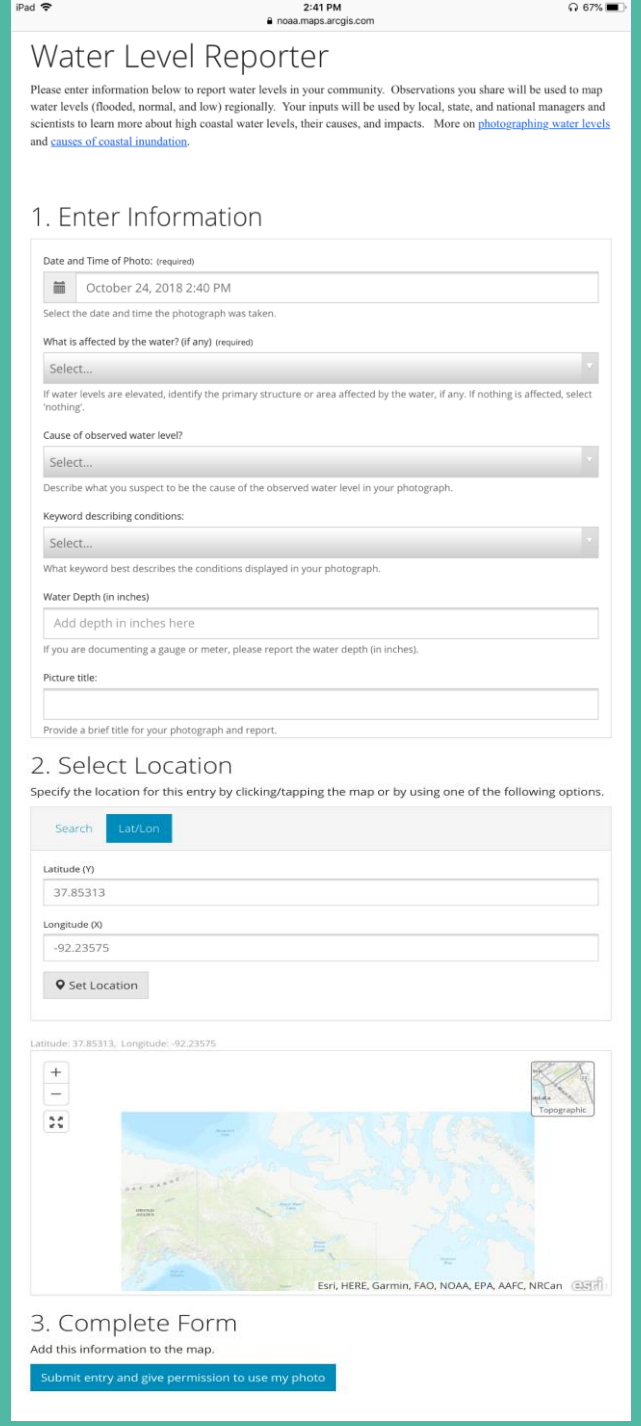
Aluminum UV-resilient sign with directions, QR-code, and coordinates of location

Easy access to gauge

Mean lower low water level (0)

How it works

1) Hold smartphone camera up to QR code and follow the link to online form
2) Fill out the online form including a photo of the gauge
3) Data is compiled overtime in a large database shared with UNC and NOAA



More information

The project's website (tinyurl.com/floodgauge) features many pages with more information about the project including an in-depth explanation of the project, a page for each gauge, my biography, and the scientific importance of my project.

Thanks to Flood Forecasters

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Forecasts

Evidence-based planning for changing climate

Climate change is responsible for changes in water levels, temperature, and precipitation. Our ability to forecast these changes helps mitigate impacts and plan for resilient communities. Forecasting traditionally uses historic data to determine the direction of future trends. Uncertainty is introduced when processes affecting change are not static over long time periods. Strategic integration of information across planning horizons can allow communities to more effectively plan for the next tide, a catastrophic storm, or a future landscape that might look very different from today.

WATER LEVELS

Information on water levels now and into the future; real-time data, near and long-term predictions

About VA Sea Level

Historic data and projections

Tidewatch

Tidewatch network of 10 observing stations predicts a 36 hour water level forecast

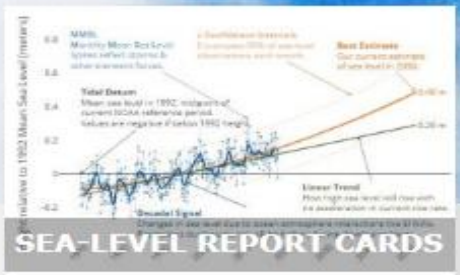
WATER LEVEL VIEWERS

How deep and where will the water be from various sea level rise scenarios

Sea Level Projection Viewer

See the 36 hour water level forecast. Currently functional for Hampton Roads.

Tidewatch Viewer



SEA-LEVEL REPORT CARDS

The Virginia Institute of Marine Science display of sea-level trends and projected sea-level height for 32 U.S. coastal locations

Report Cards

ADAPTVA AdaptVA.org

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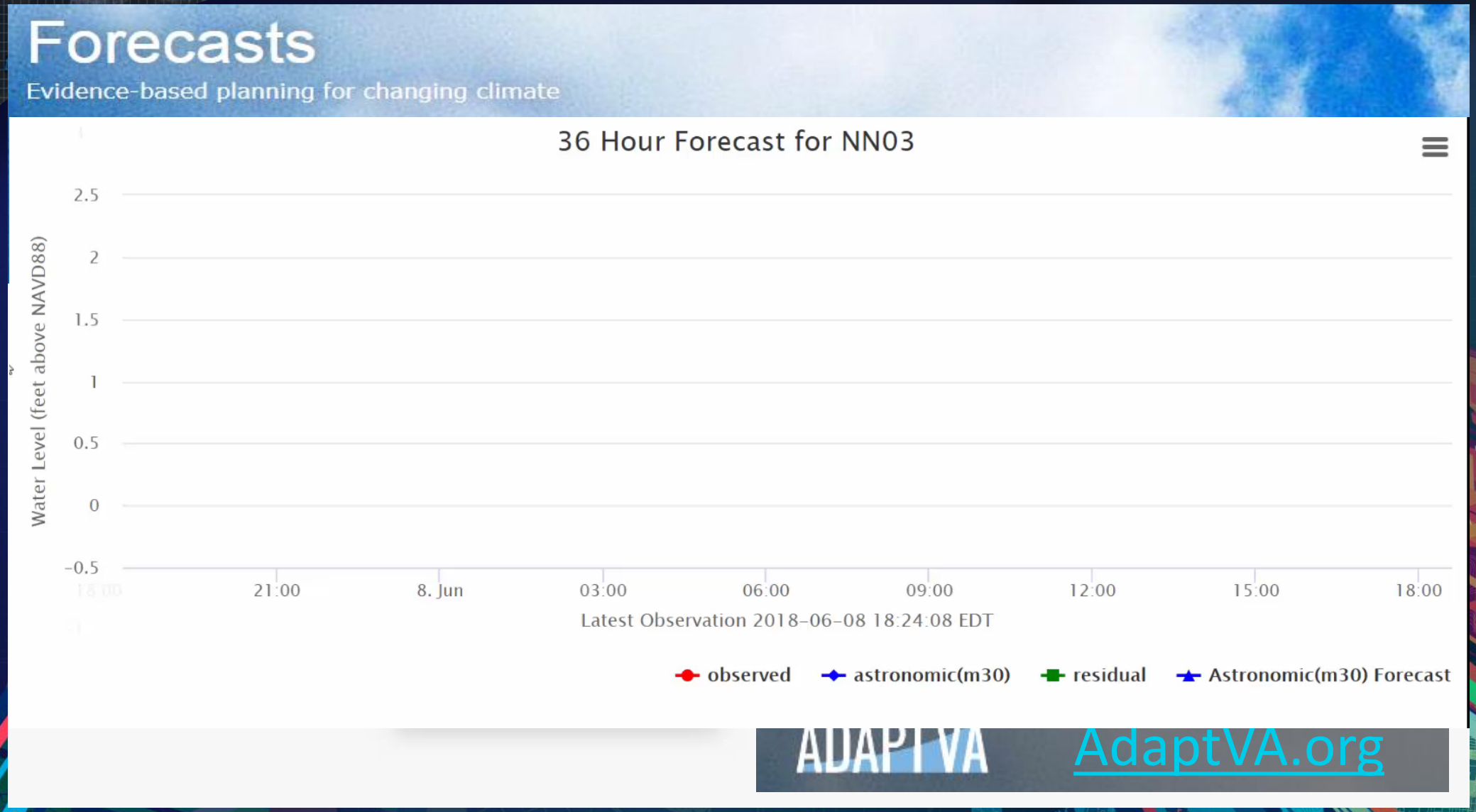

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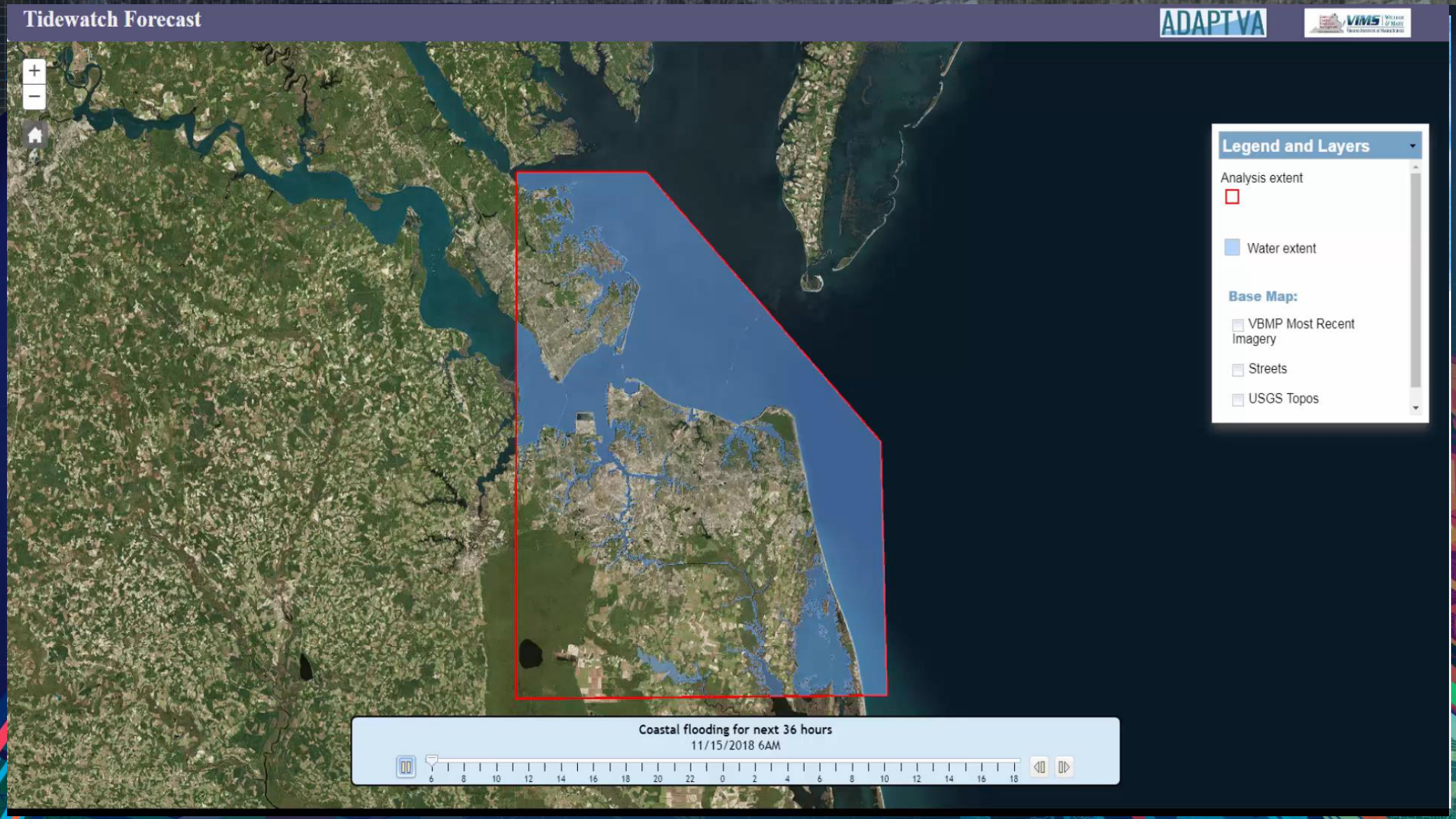

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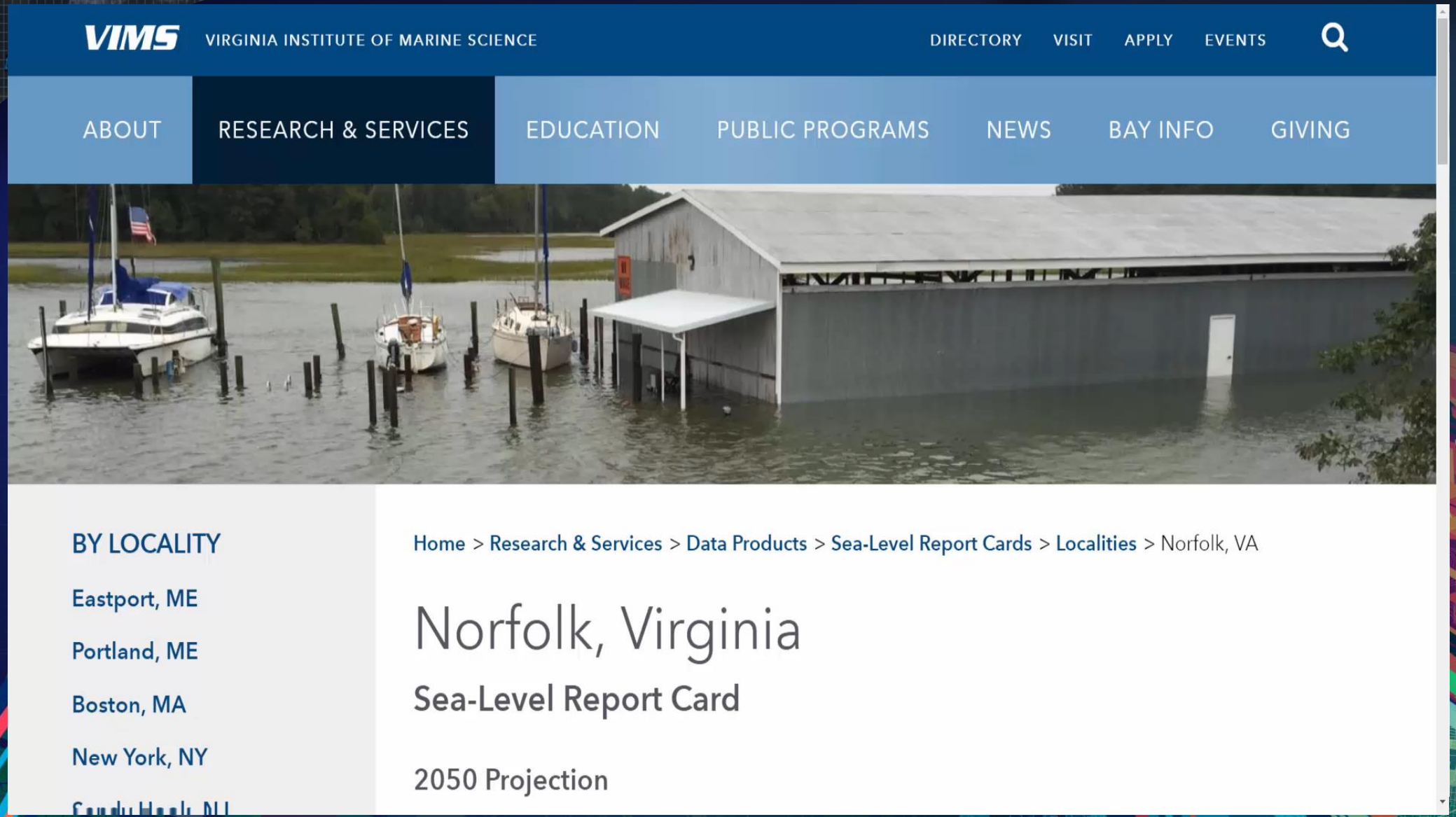

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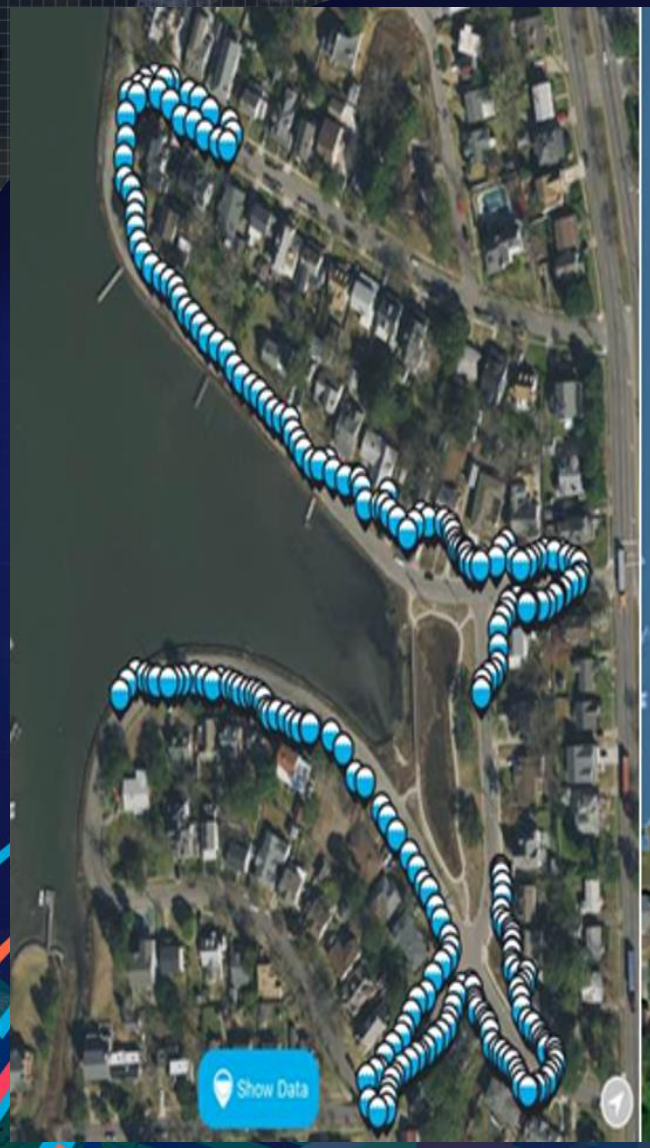

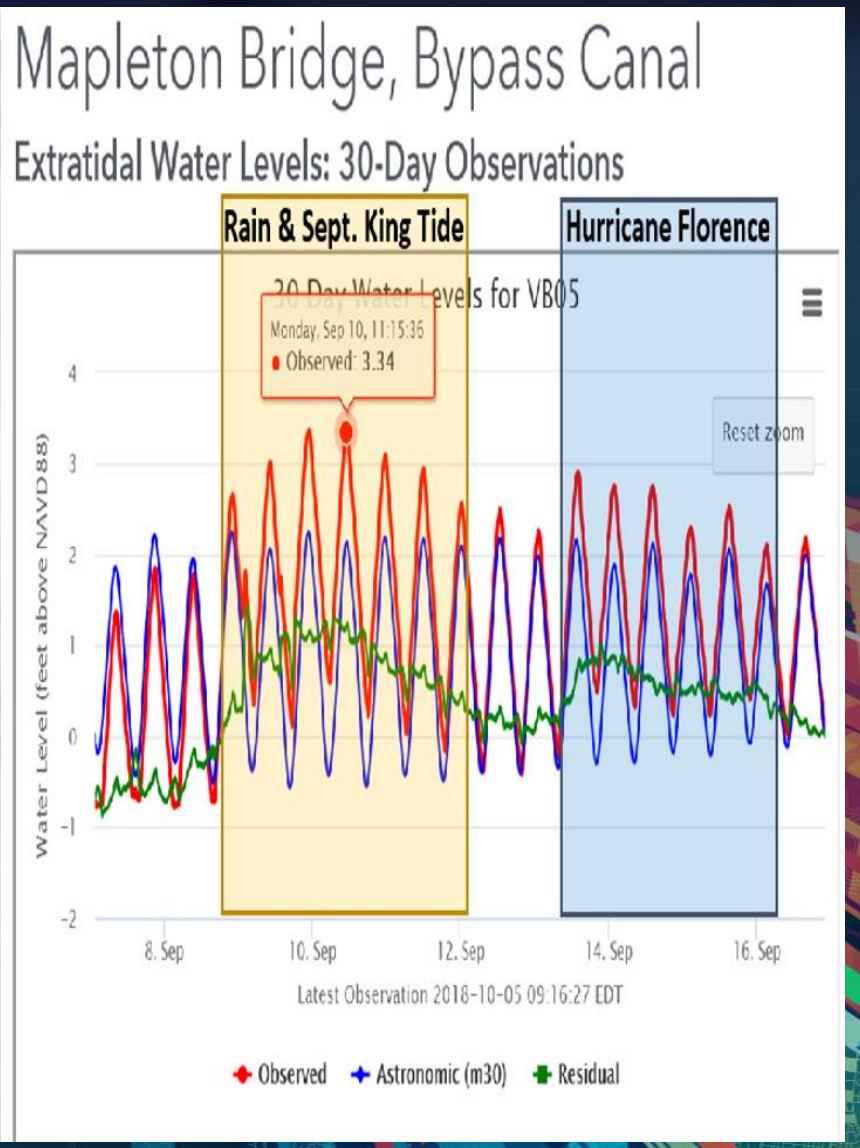

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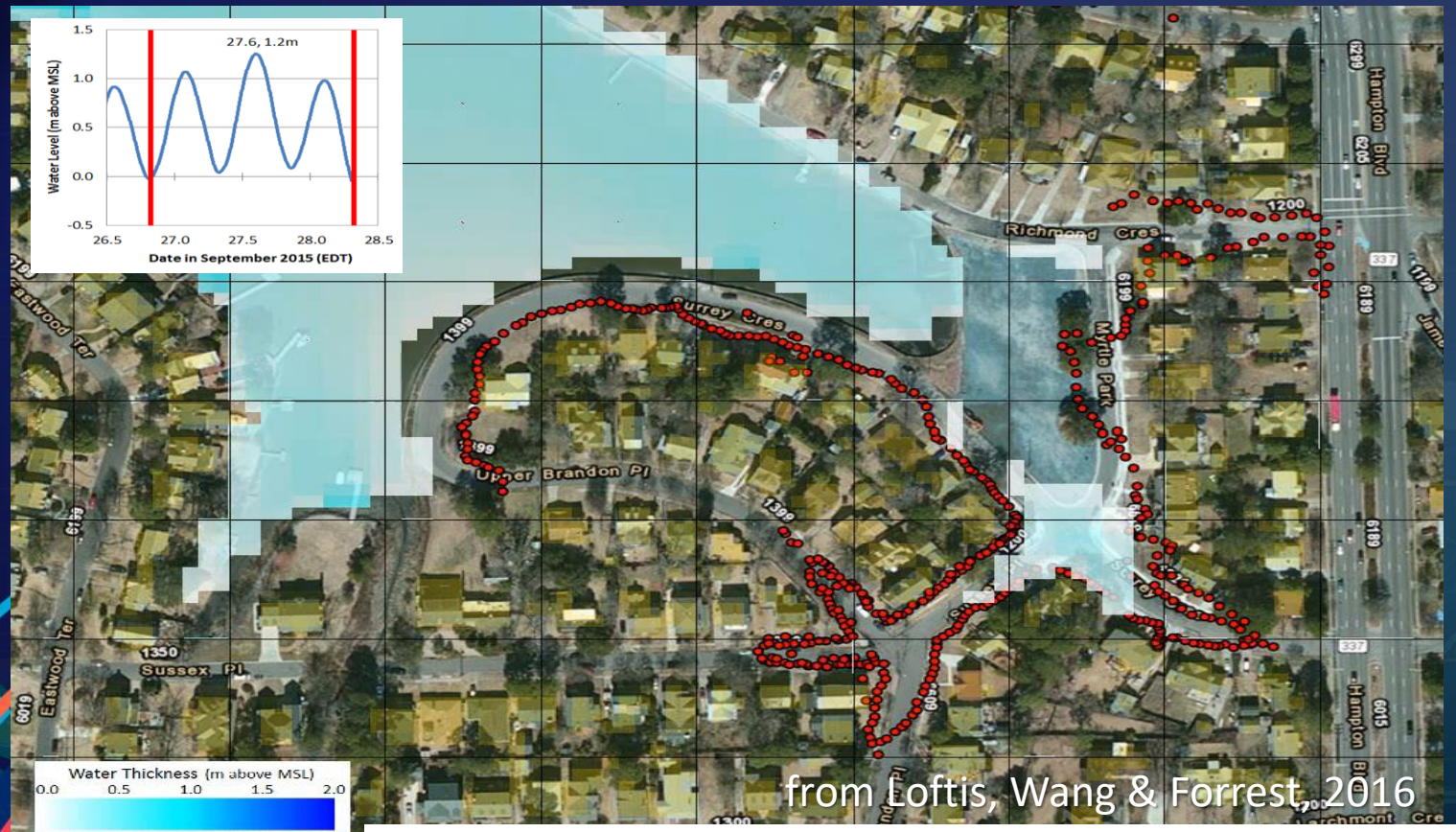
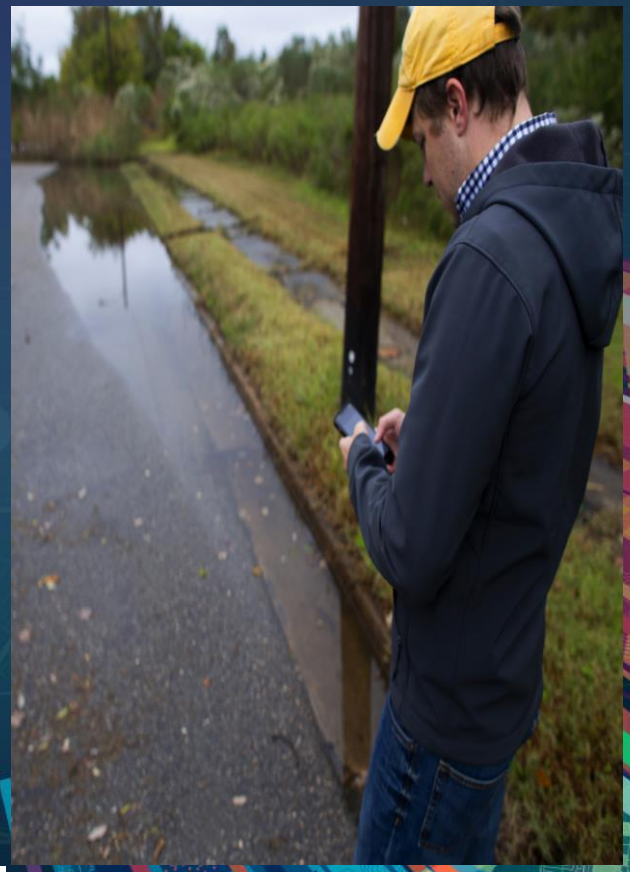
- Witnessed past King Tides and inundation events since 2014

Animation of Forecast Modeled Extents on September 27, 2015 in Surrey Crescent
Plotted with Maximum Inundation Extents from Sea Level Rise App





Average Horizontal Distance Difference = 8.25m (n = 345 points)

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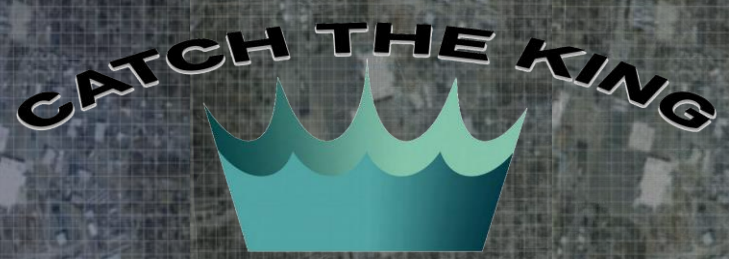

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Changes Since Last Year's Catch the King

1. Now only request to join new regions- Not events too

- Removes a step in training sessions
- Can immediately collect data in a region's events once admitted by a manager

2. Image URLs now associated with points

- See pictures in a map popup by clicking on their associated data point
- View/download the images directly from the auto-generated app event URLs

3. Directional heading visualization added

- Images are more useful when superposed on a map with directional heading
- 3D street-level model results can be more readily compared with these data

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Changes Since Last Year's Catch the King

1. **Mappers now only have to join a region to access all of its mapping events, and don't have to also request access to map in its events.**
   - Removes a step in training sessions
   - Can immediately collect data in a region's events once admitted by a manager

   Consequence: Ease of Use. Volunteers from last year's Catch the King didn't even have to join the king tide mapping event. Just 5 seconds to open the app, tap the tools tab, and join that day's event to start mapping.

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Changes Since Last Year's Catch the King

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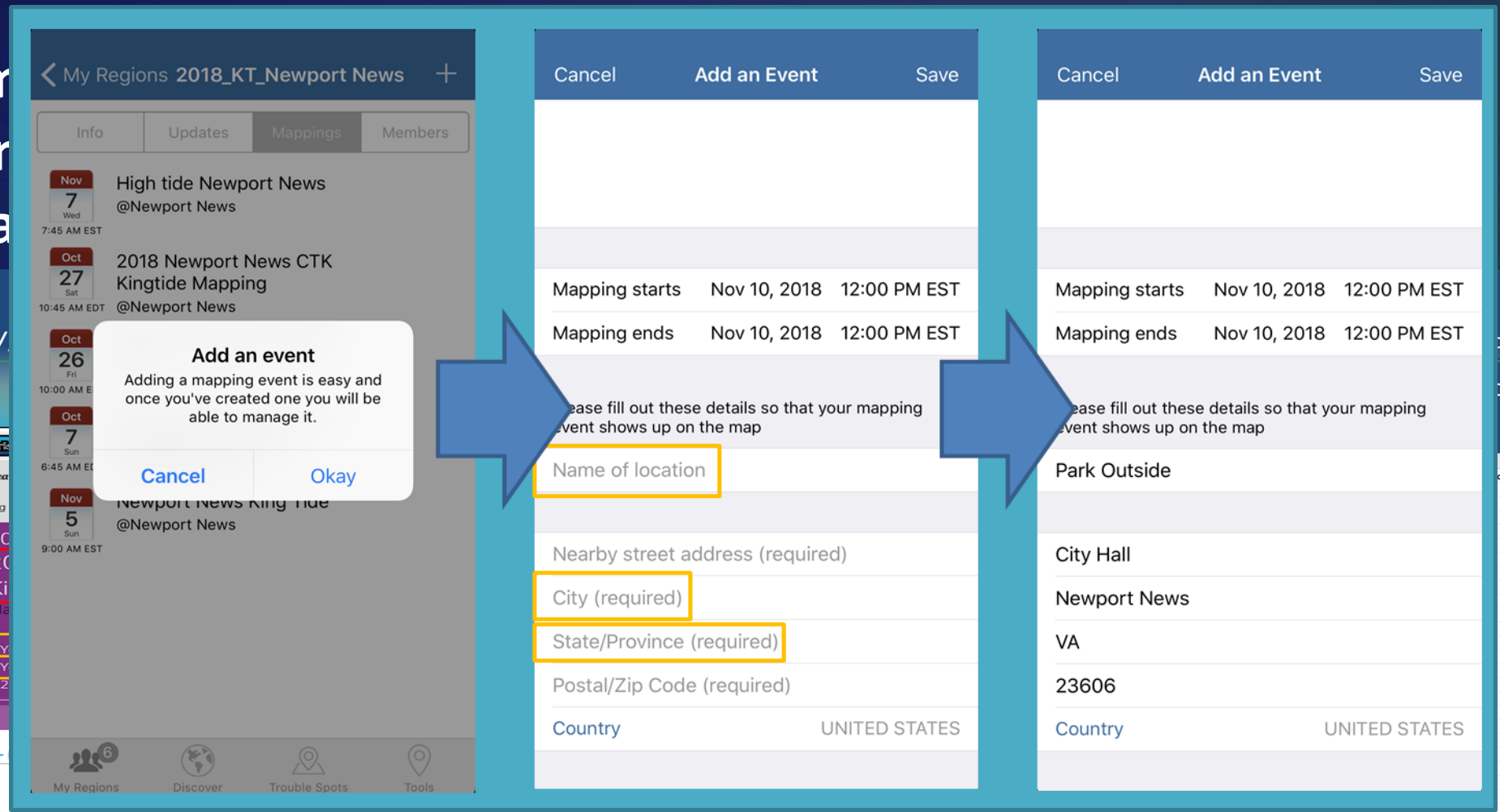
data



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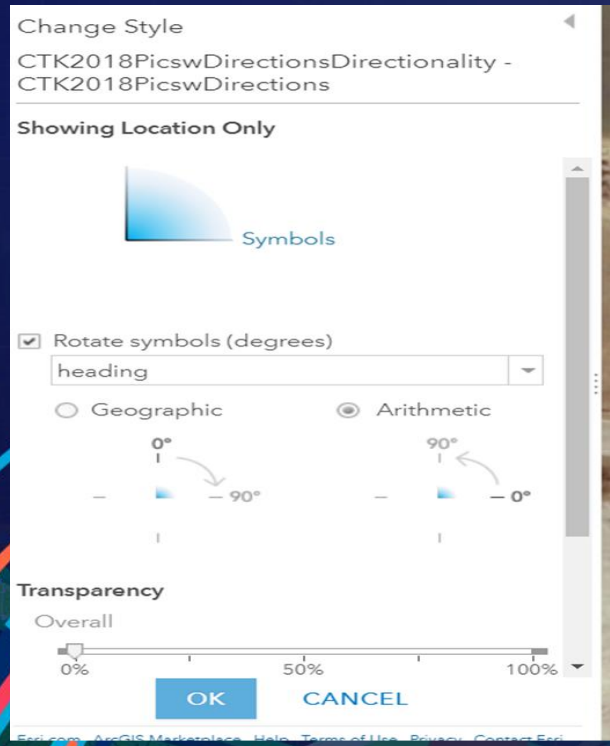
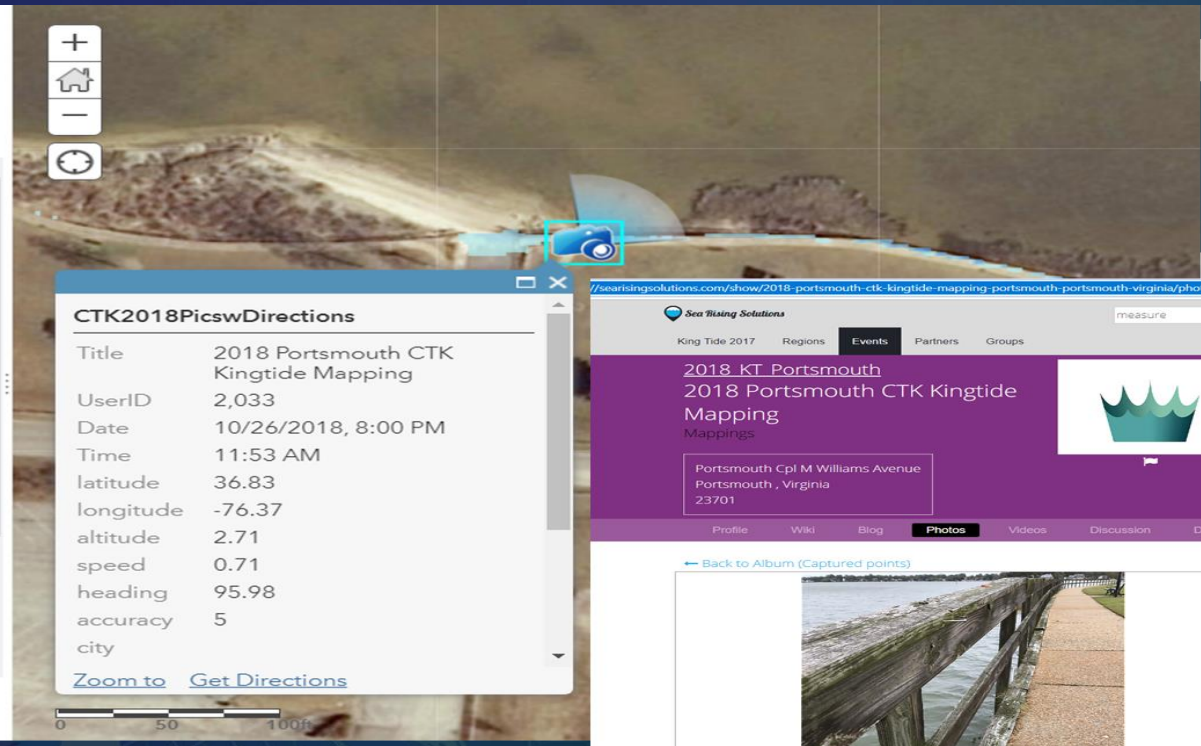
Changes Since Last Year's Catch the King

3. Directional heading functionality is now incorporated into the App's internal metadata (from Concursive).





Review of App GPS Data

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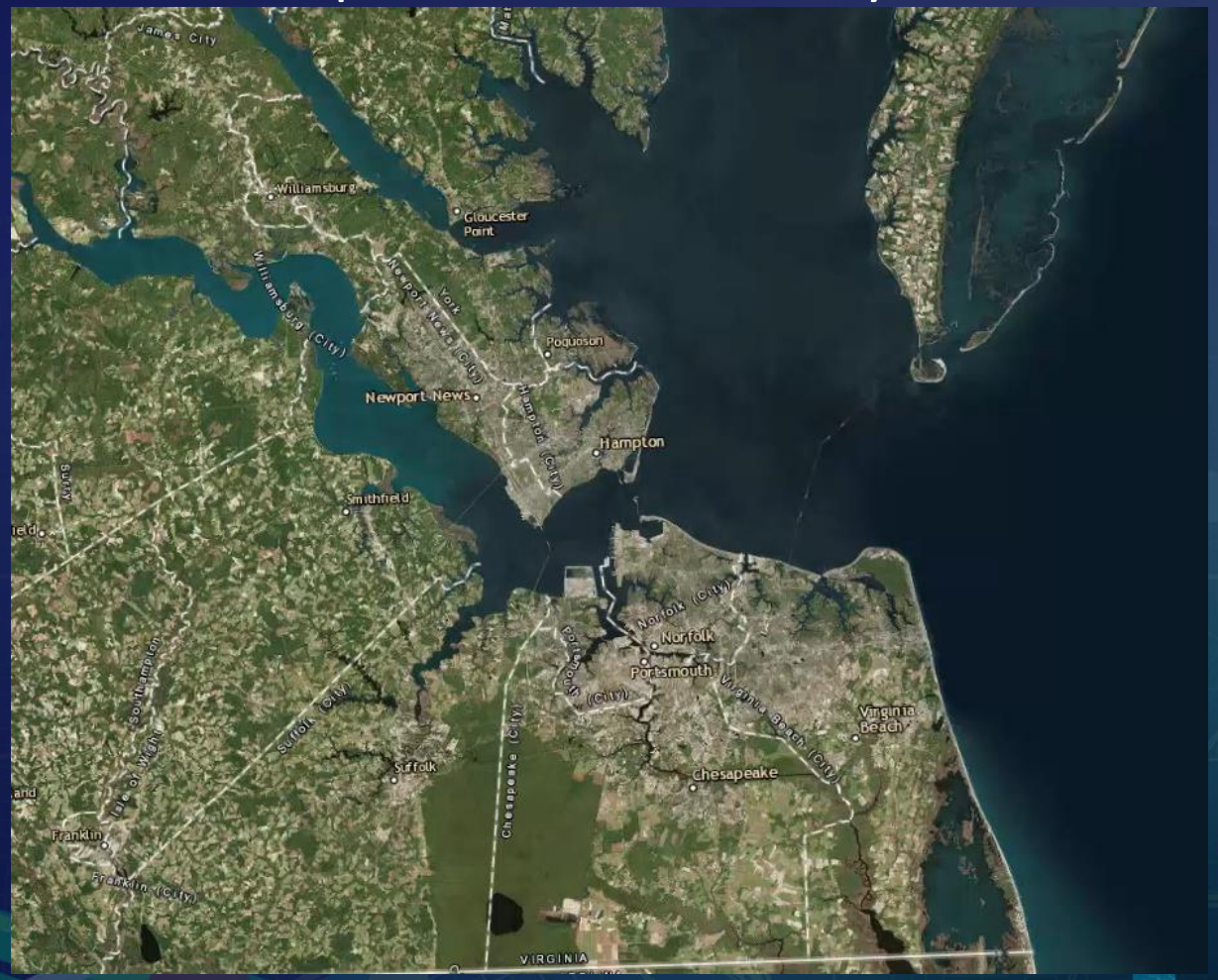
Dynamic Time Lapse of GPS Data Entry on Oct. 27



Interactive Flood Map Comparison

http://bit.ly/2zcS7Ba

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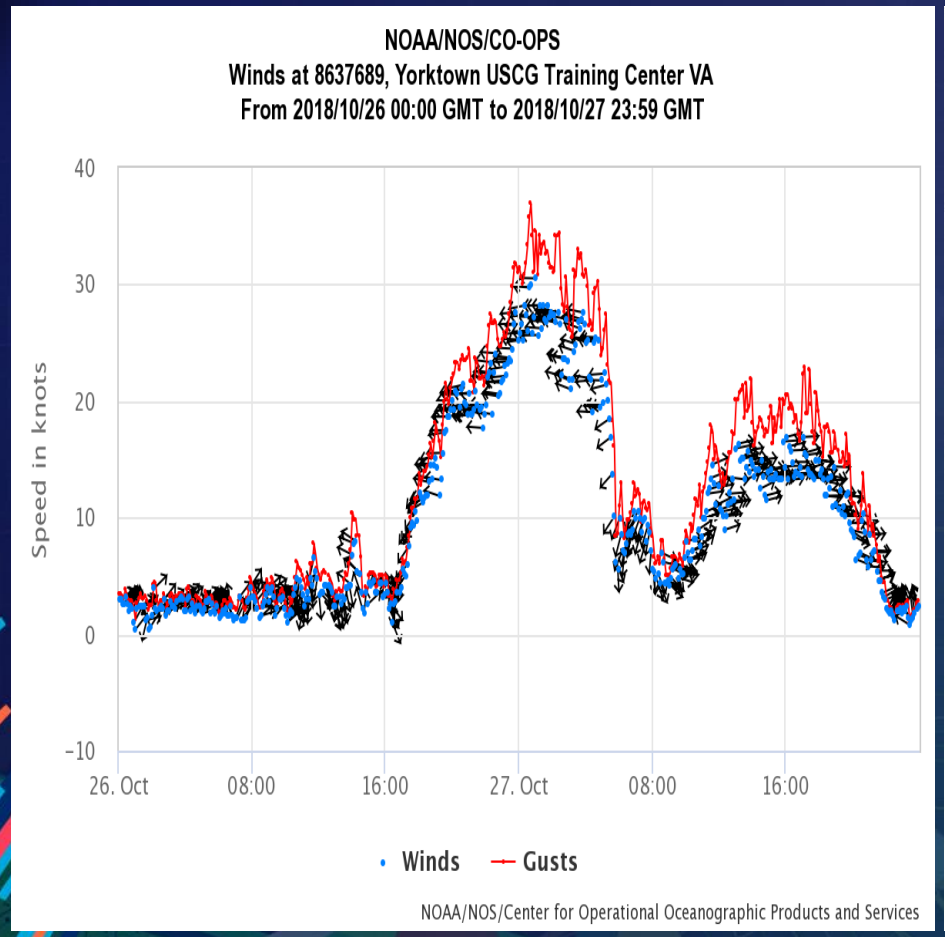
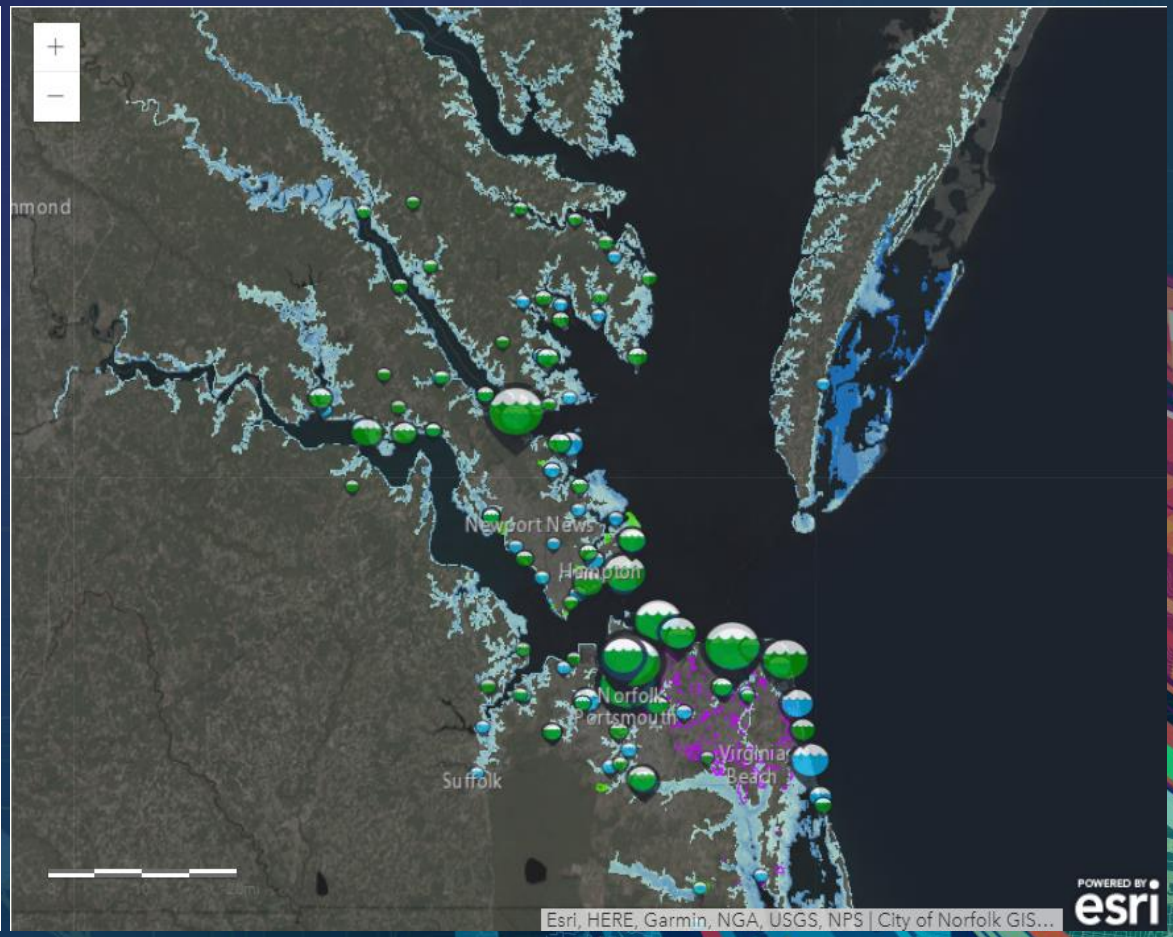
Oct 27, 2018 King Tide Data Web Map:

(http://www.vims.edu/people/loftis_jd/Catch%20the%20King/index.php)





What We Learned from ➔

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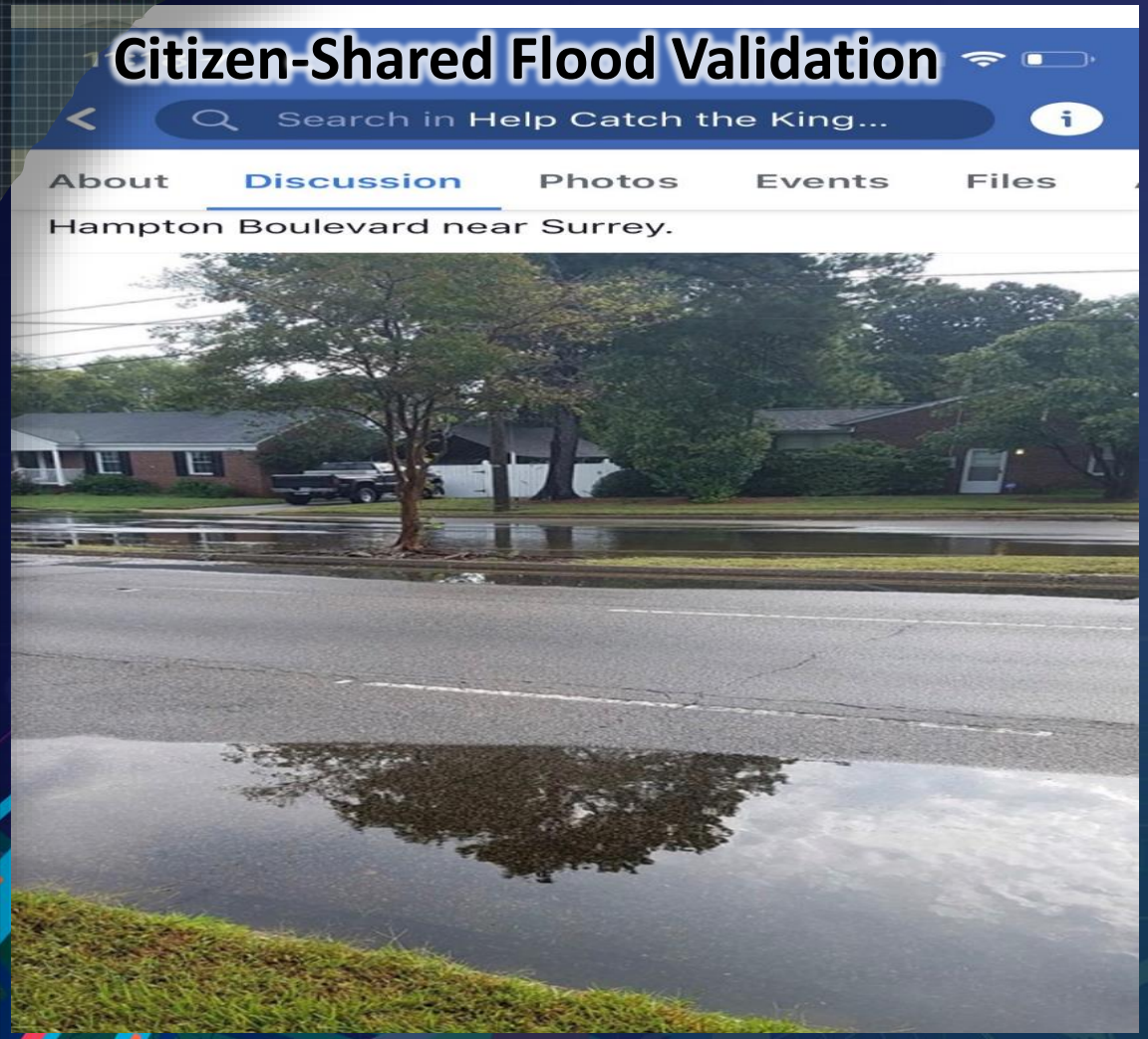

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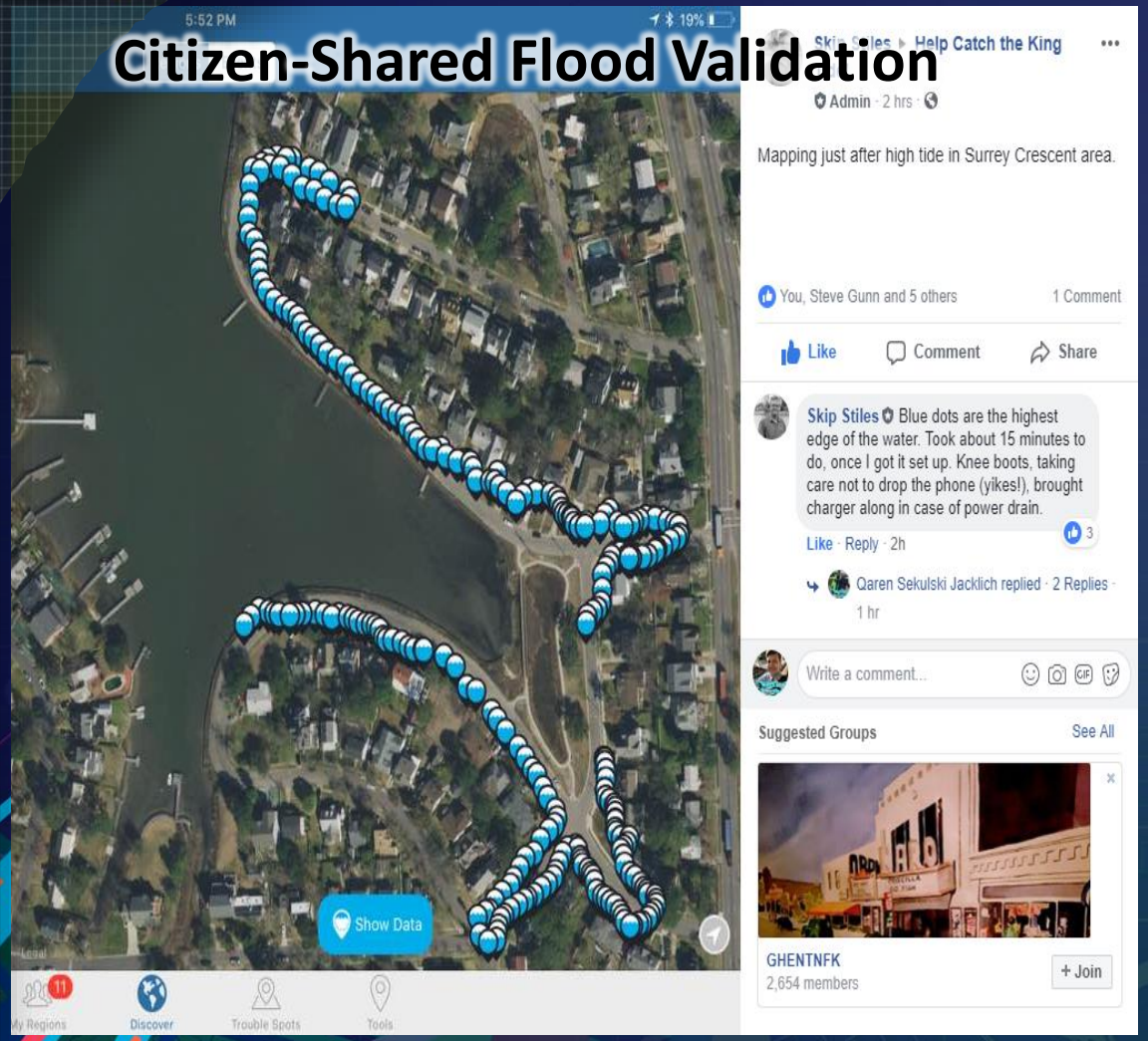

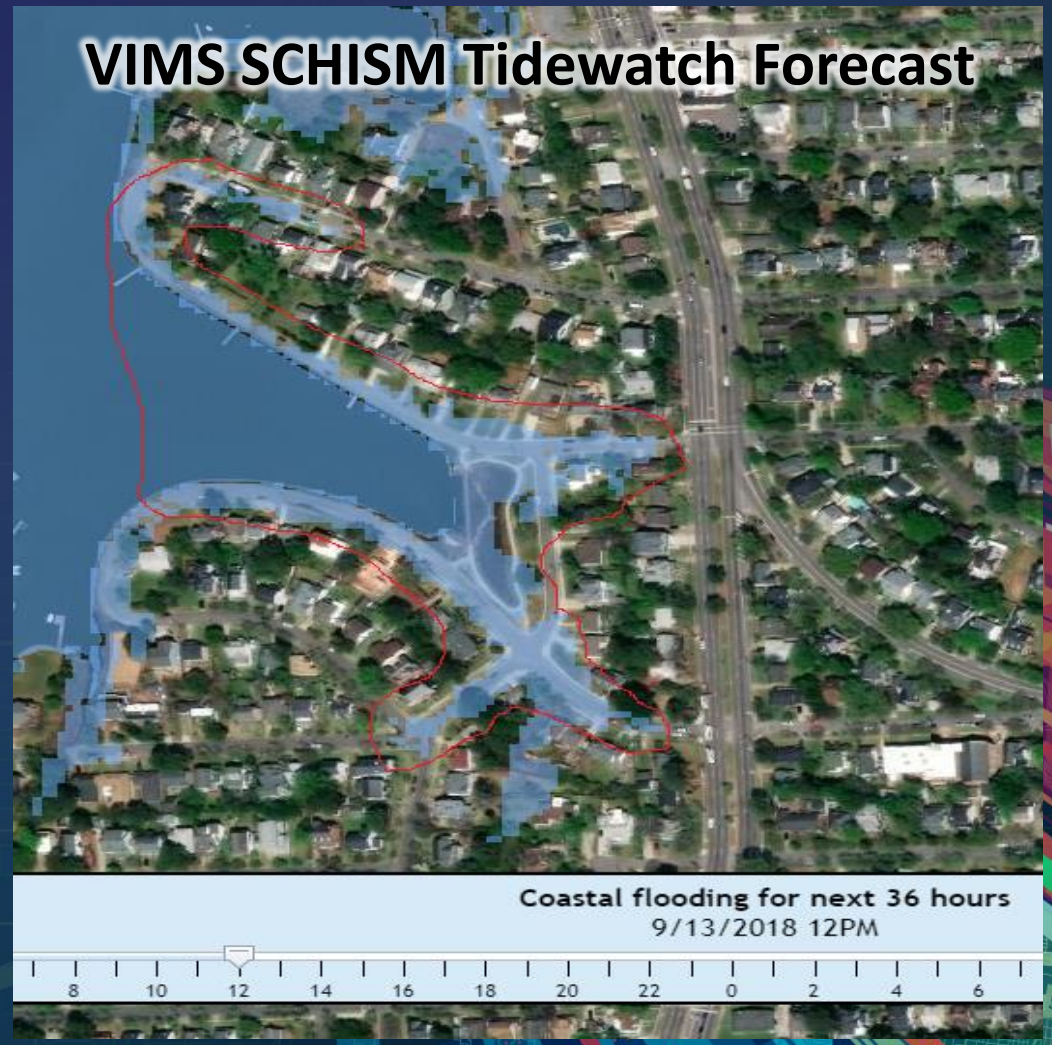

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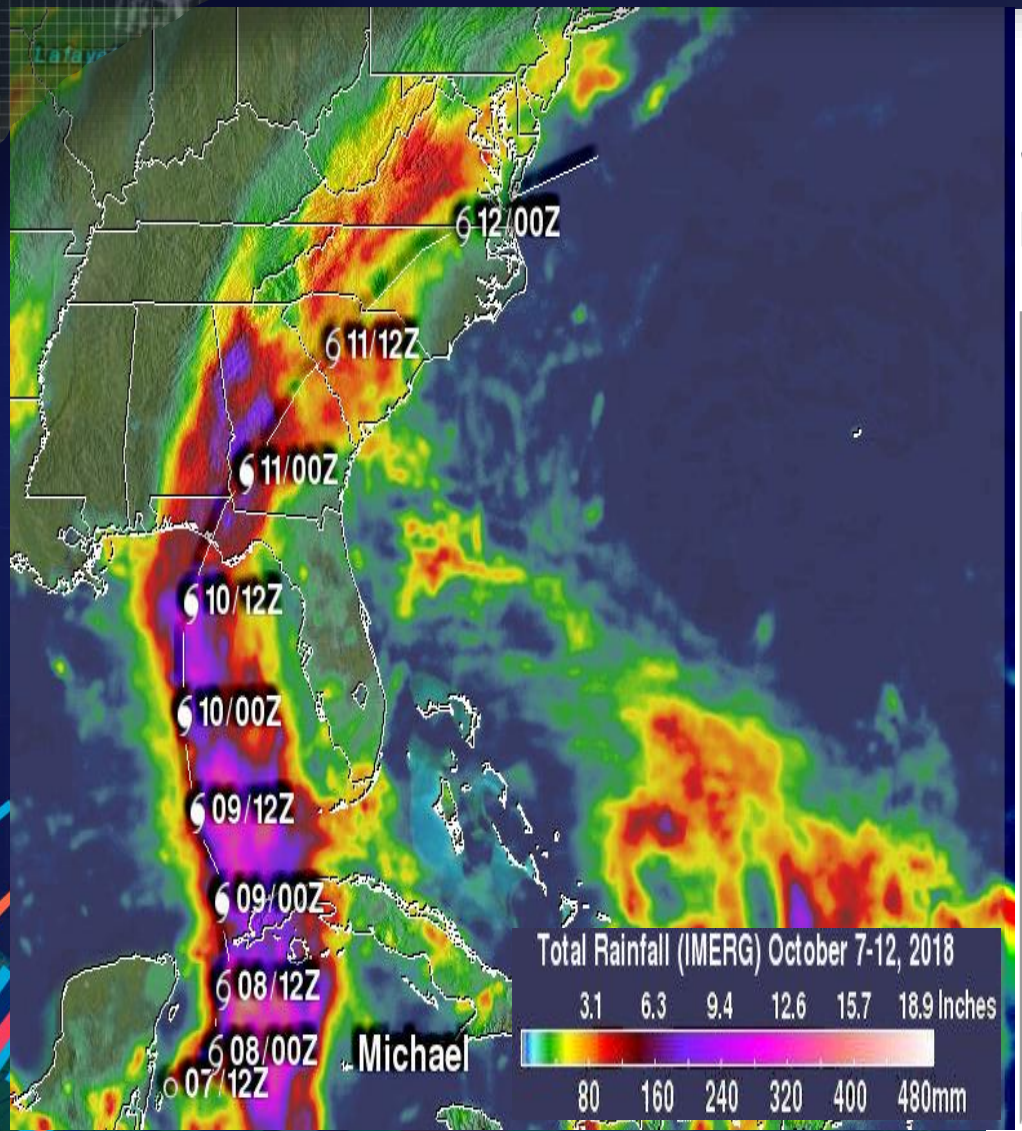
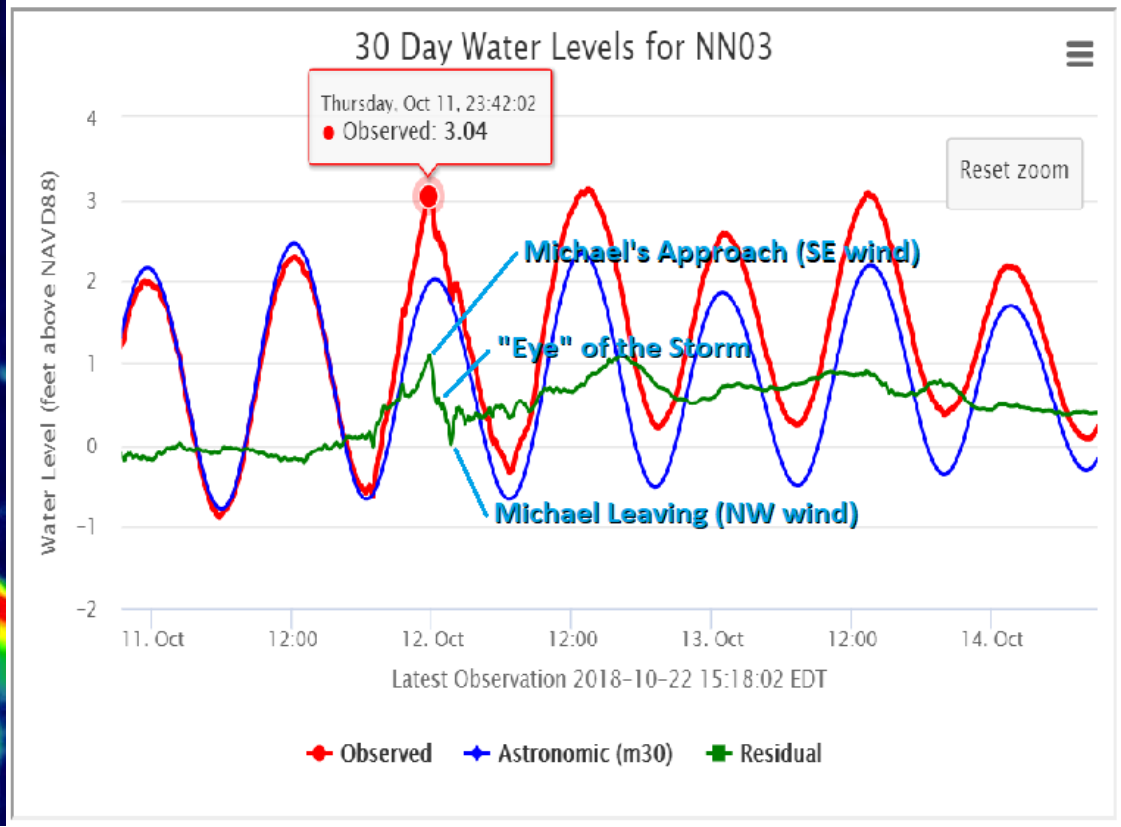


Leeward Marina, Huntington Park, James River

Extratidal Water Levels: 30-Day Observations



Review of App GPS Data

Thank You & Review

1. Thank You To:
   A. Our Volunteers
   B. Media Partners
   C. App Developers

2. Review of:
   A. App Data
   B. What We Learned
   C. Conclusions

Examples of Crowdsourced Hydrocorrection

One of the biggest unanticipated benefits of Catch the King was the free hydrologic correction of fine-scale drainage features missing from aerial lidar surveys.

This can be laborious to fix and involves field surveys to confirm; often costing several $100k for private firms to correct! VA got this for free through CtK.

In Conclusion

CATCH THE KING

Thank You & Review

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2. Review of:
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   B. What We Learned
   C. Conclusion

1. Year-round flood monitoring will help us better understand inundation from different types of events.
2. The results from Measure the Muck suggest that nutrients transported into the water system due to flooding events should be considered for a better estimation of TMDL.
3. VIMS' 2018 flood forecast was accurate:

≈1.8 in. (3.7 cm) ≈24.6 ft. (6.2 m)

In Conclusion

Thank You & Review

1. Thank You To:
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2. Review of:
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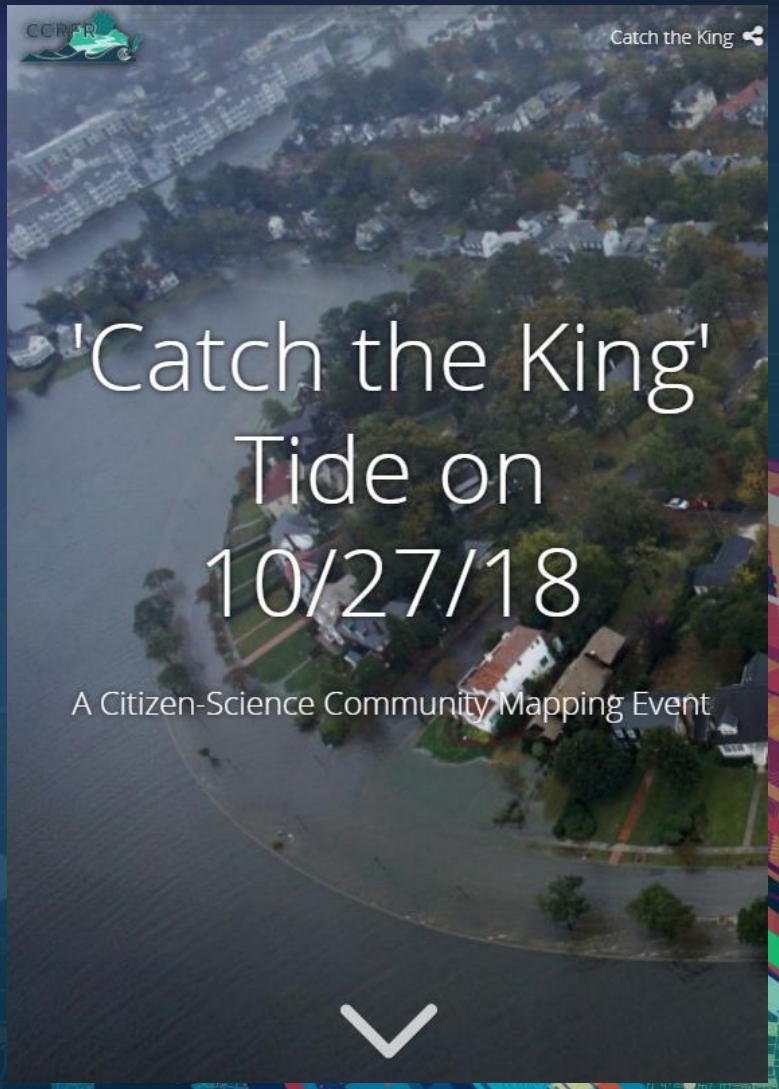
3. Catch the King effectively crowdsourced hydro-correction. Ground-truthing information is valuable. Some waterways weren't accurately represented by LiDAR:
   - Including ditches and narrow creeks
   - Areas canopied by trees during flyovers
4. Engaging the public affords scientists greater extensibility for these type of projects (i.e. private property access).
5. Year-round mapping efforts have been spearheaded by WHRO to keep mapping going through to Catch the King 2019



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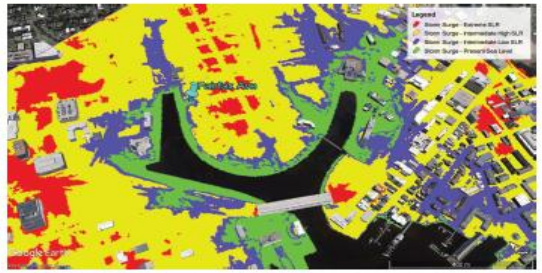

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