

# Step up, Get ready, **RESPOND!**

## TAKING FLOOD RESILIENCE TO SCHOOL

**Merrie Koester, Ph.D.** / USC Center for Science Education

**Jennifer Albert, Ph.D.** / The Citadel STEM Center for Excellence

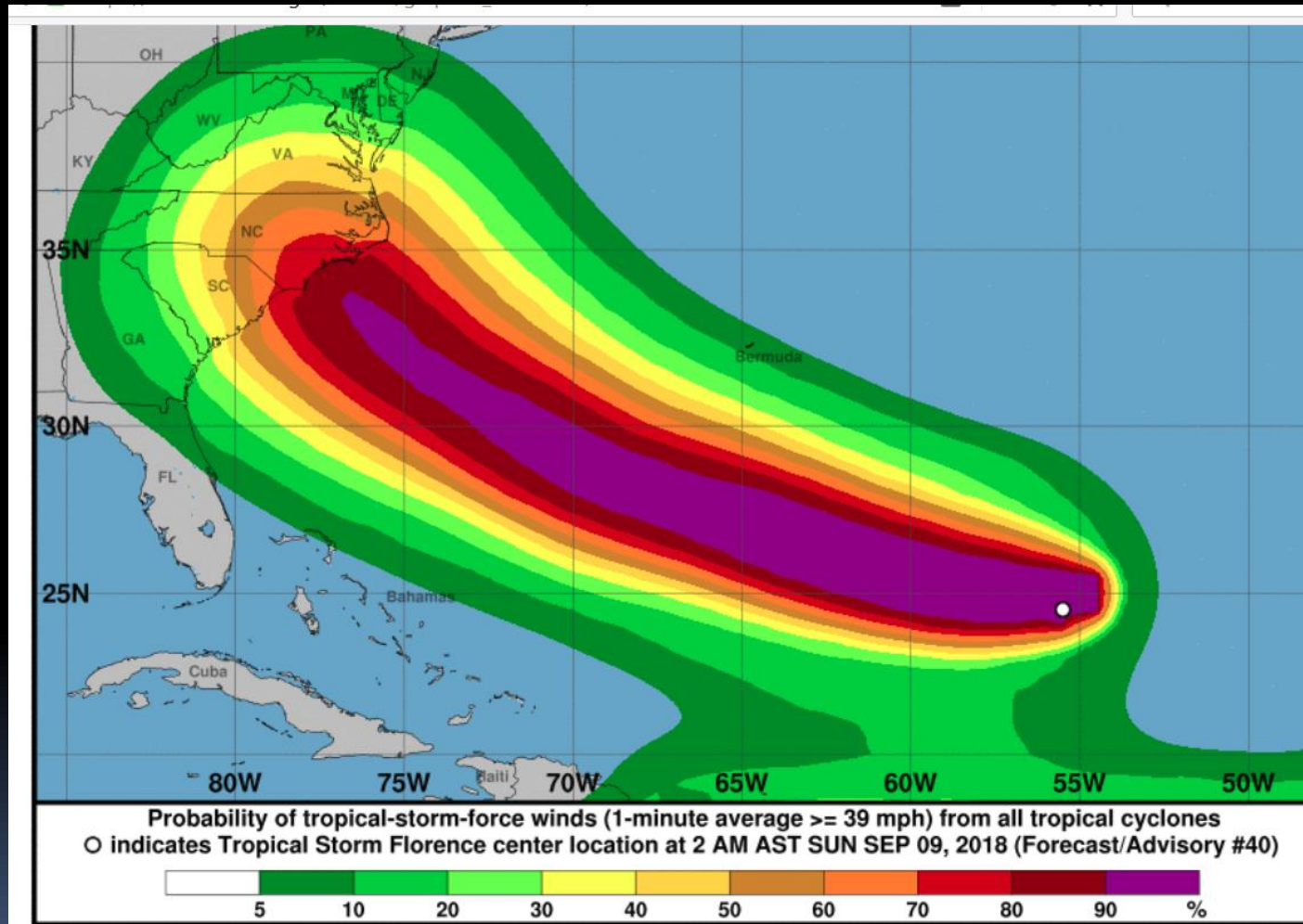
**Jared Bramblett** / Davis and Floyd, Inc.



# THE PROBLEM OF...

**EDUCATIONAL AND  
MOTIVATIONAL VULNERABILITY –**  
lack of access to or awareness of the  
knowledge and resources that might  
reduce one's risk of harm from a  
potential hazard.

# A GIANT HAZARD












## FROM THE LITERATURE:

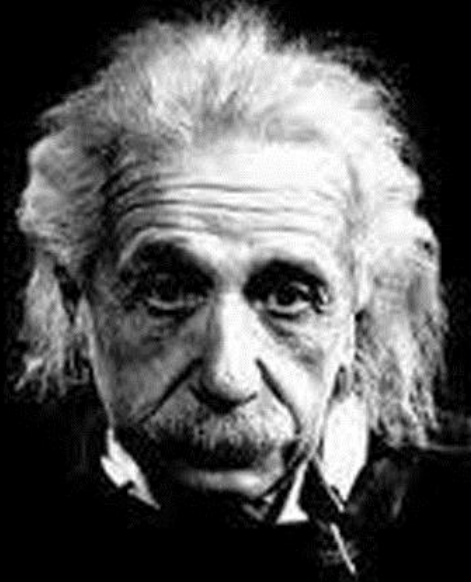
- *Factors such as lack of relevance of science course work to students' lives as well as the perceived lack of social value or impacts on improving conditions for their communities have caused under-represented minorities to leave the sciences.* (Bonous-Hammarth, 2000).



# **EXACERBATING PRE-EXISTING CONDITIONS OF NATURAL, CULTURAL, & EDUCATIONAL VULNERABILITY**

- **Flood-prone, low-income neighborhood**
- **Incomplete STEM & place-based knowledge of why it floods**
- **Trust issues – Need for sustained relationships between sender and receiver of flood hazard messaging (kin and social networks)**
- **Digital divide – lack of internet resources and/or cable TV**

**"WE CANNOT  
SOLVE OUR  
PROBLEMS  
WITH THE SAME  
THINKING WE  
USED WHEN WE  
CREATED THEM"**



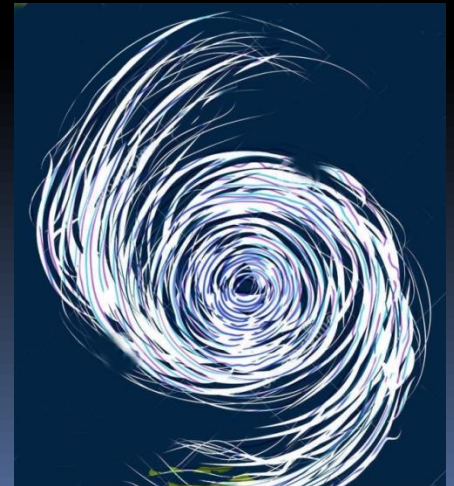


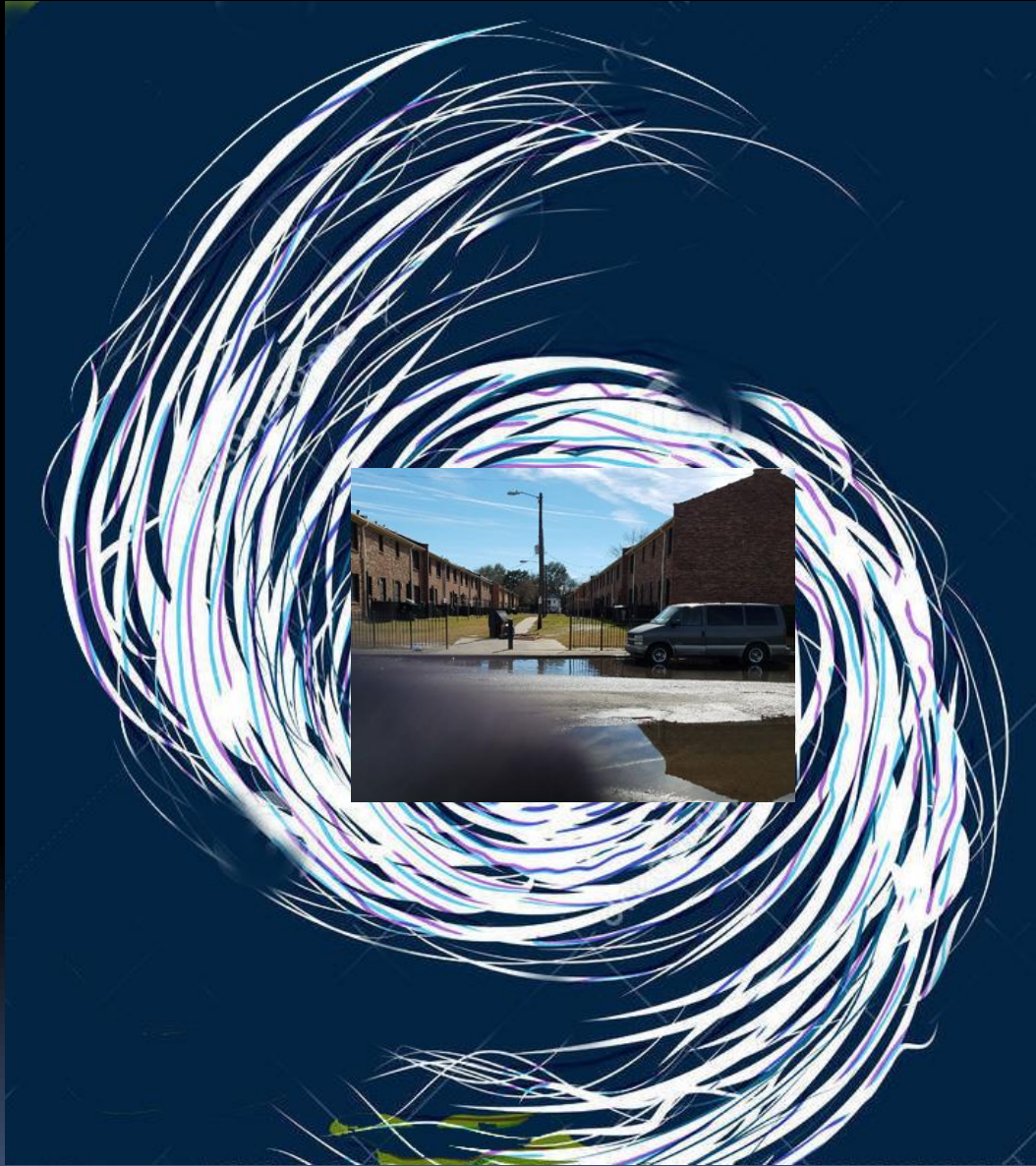


# RESEARCH CLAIM

- When positioned and legitimized as resources of knowledge and as part of a networked improvement community, historically marginalized, at risk middle and high school youth have “the ability to transmit information as well as energy to and from their environment and have multiple means for coordination and direction” (Aguirre, 2007).

Our QUEST:  
To build Educational  
**RESILIENCE** to MITIGATE  
Hazard risks from  
Hurricanes.





Imagine a **Flooding School** in  
a low income  
housing project in the center  
of an  
**EDUCATIVE  
RESILIENCE  
GENERATING  
SYSTEM**





The Kids Teaching Flood Resilience project meets an important Charleston *Sea Level Rise Strategy* goal:

- *Develop clear and immediate communication to enhance public safety.*

# DRAWING IN TOWARD THE FLOODING SCHOOL





# **DRAWING IN ENERGY**

**Merrie Koester, Ph.D.  
USC Center for Science  
Director, Kids Teaching Flood Resilience**



# "Together, we are stronger."

## Charleston Sea Level Rise Strategy



**P**RACTICE  
**E**MBEDDED  
**E**ducational  
**R**esearch  
**P**ARTNERSHIPS

**RESEARCH AND PRACTICE HAVING EQUAL VALUE AND IMPORTANCE.**

**IMPROVING EDUCATIONAL OUTCOMES THROUGH PARTNERSHIP AND MENTORING.**



# Introducing: kids teaching flood resilience

REAL PEOPLE, PLACES, PROBLEMS



Charleston Development Academy Students



Simmons -Pinckney Middle Students

# Building a Community Curriculum Together

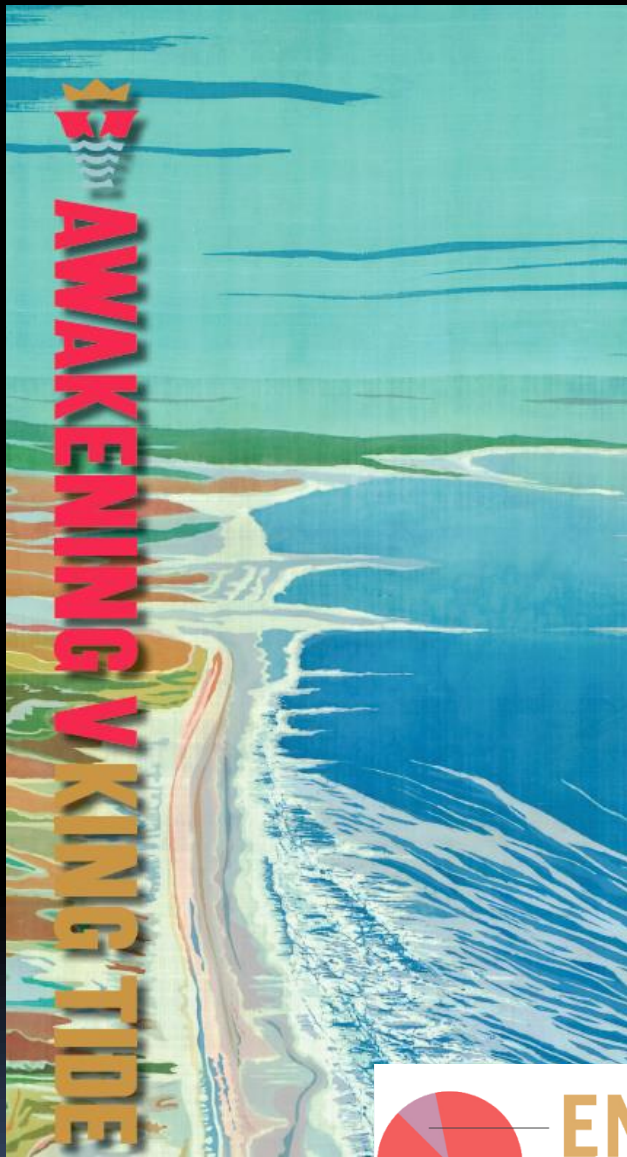




# AWAKENING NOTICING

**Jared Bramblett**

Civil Engineer / Davis and Floyd, Inc.  
WORK – design & management of  
land and infrastructure  
FOCUS -stormwater management,  
resilience, and sustainability



**PEOPLE:** Artists, Scientists, Engineers, Civic Leaders, City Officials

**IDEAS:** Stakeholders share perspectives from their lived experience to develop a project that addresses flooding impacts on vulnerable populations.

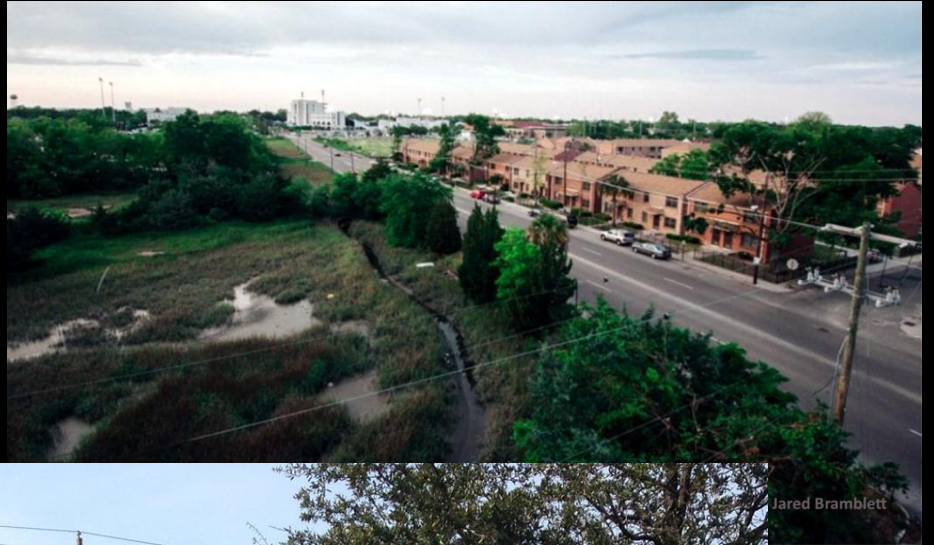
**EXPERTISE:** Community artists translate documented/scientifically-vetted evidence about sea level rise impacts into public art that speaks to a diverse audience.

**TIME:** Aligns with ongoing outreach goals of each participating organization so that each perceives the project as adding value to their ongoing work.



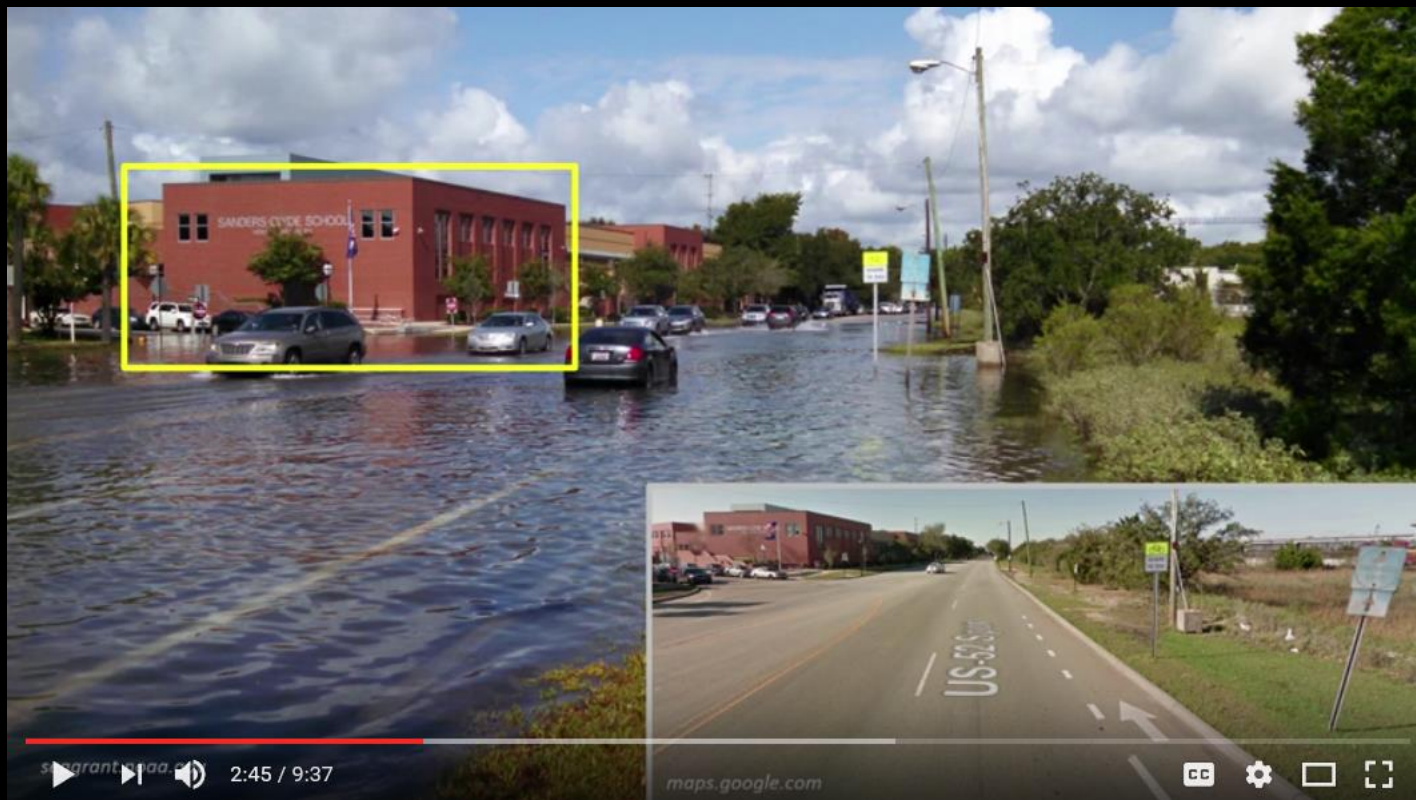


# NOTICING PATTERNS AND RELATIONSHIPS



Jared Bramblett

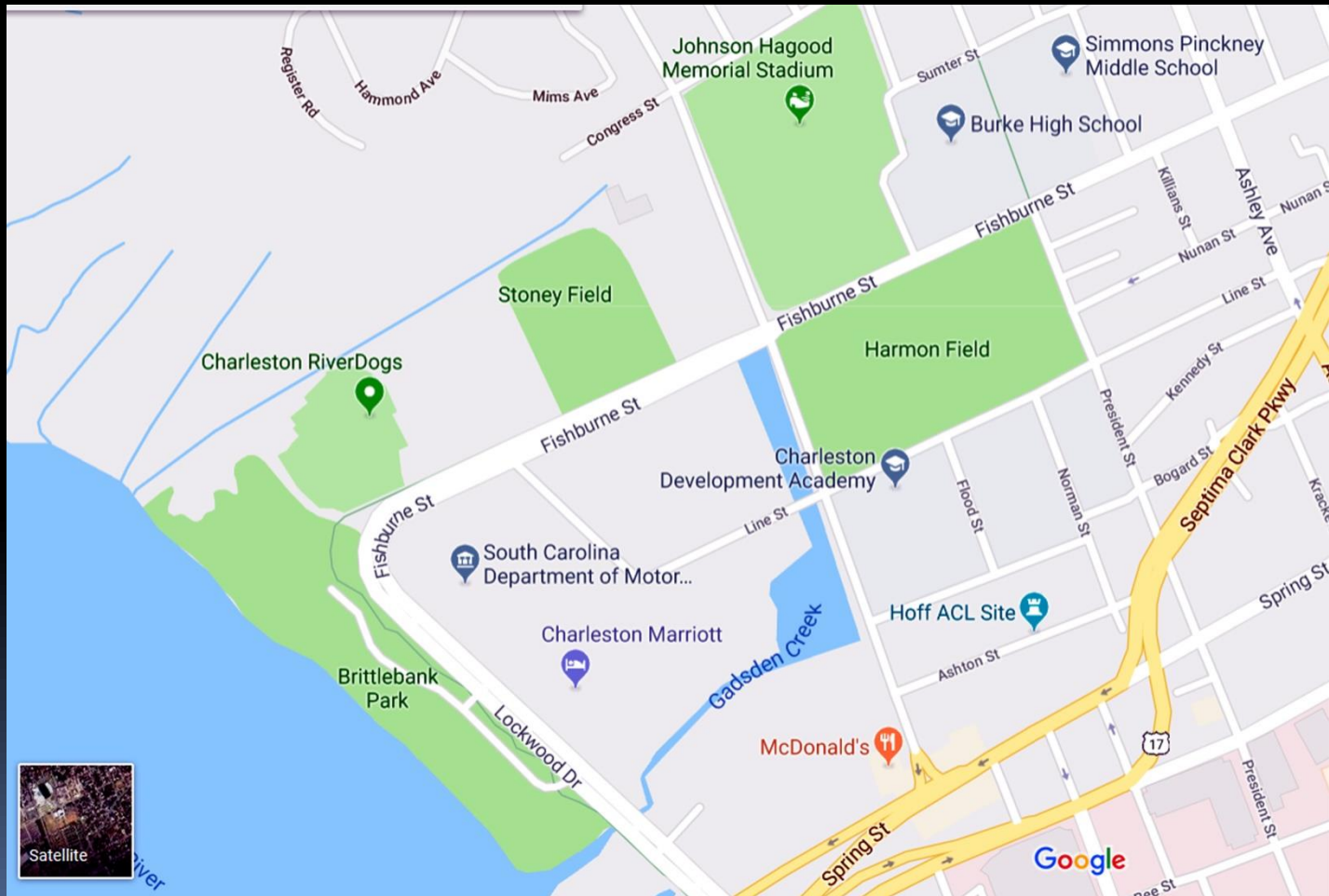
Merrie Koester, Ph.D. / USC Center for Science Education



**Where is all this water  
coming from?  
WAS IT ALWAYS LIKE THIS?**



# Why does it flood so much in my neighborhood?



Source: Merrie Kossler, Ph.D. / Google Maps for Science Education

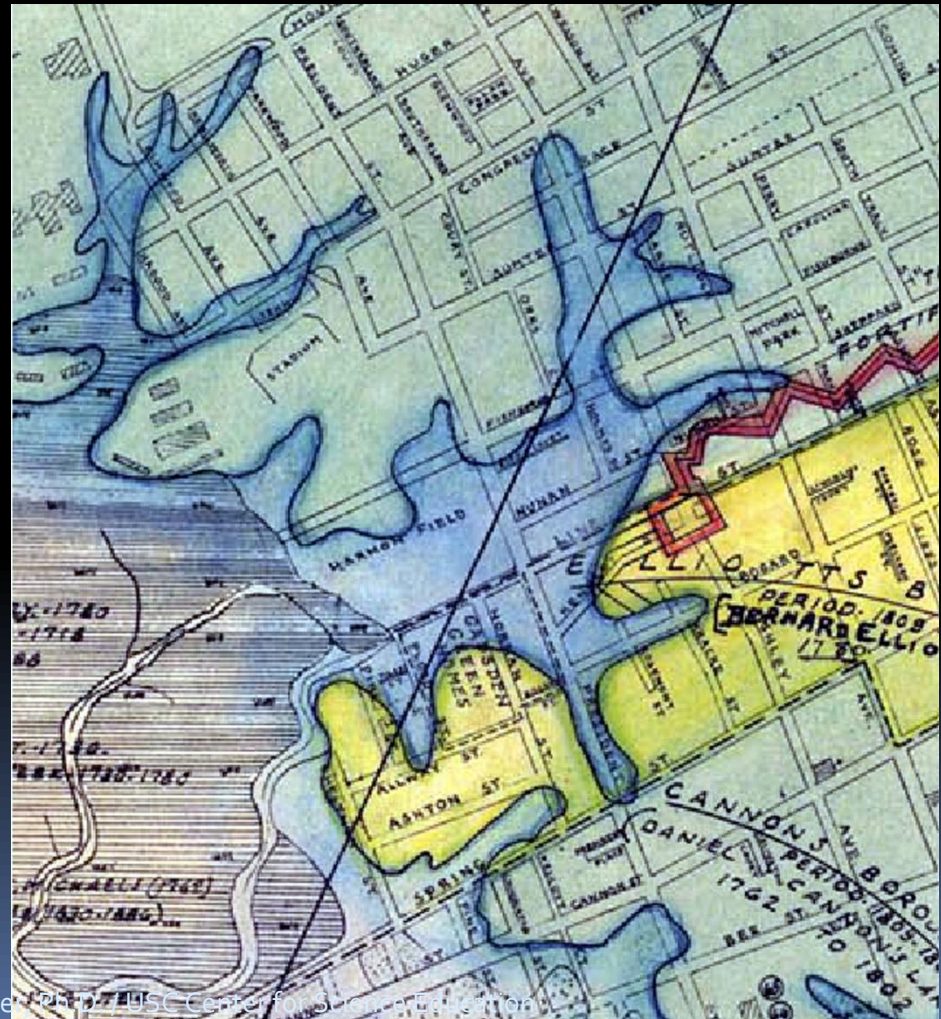


# Formative assessment

- What do you KNOW about Gadsden Creek's history? Is this salt or fresh water in the road?

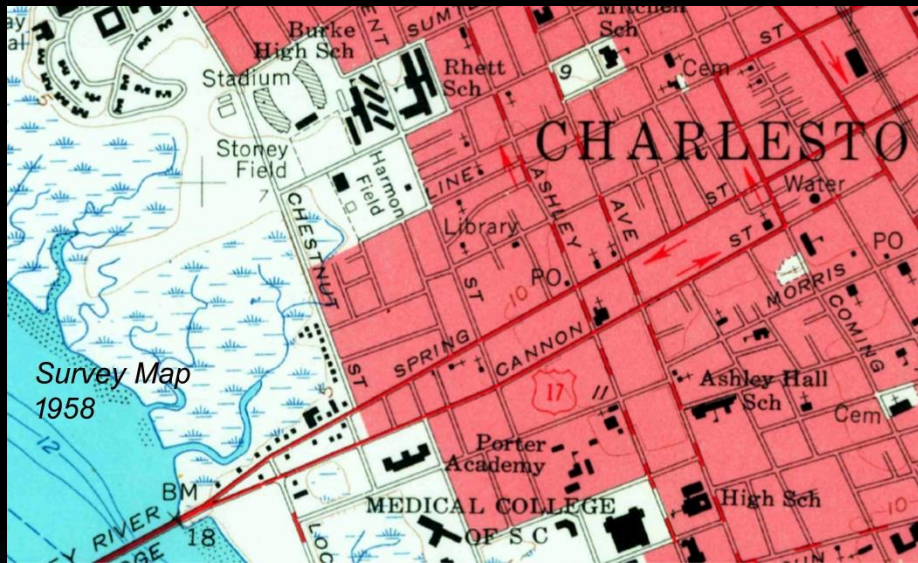


# Noticing a historical map of the Gadsen Creek Tidal Creek System

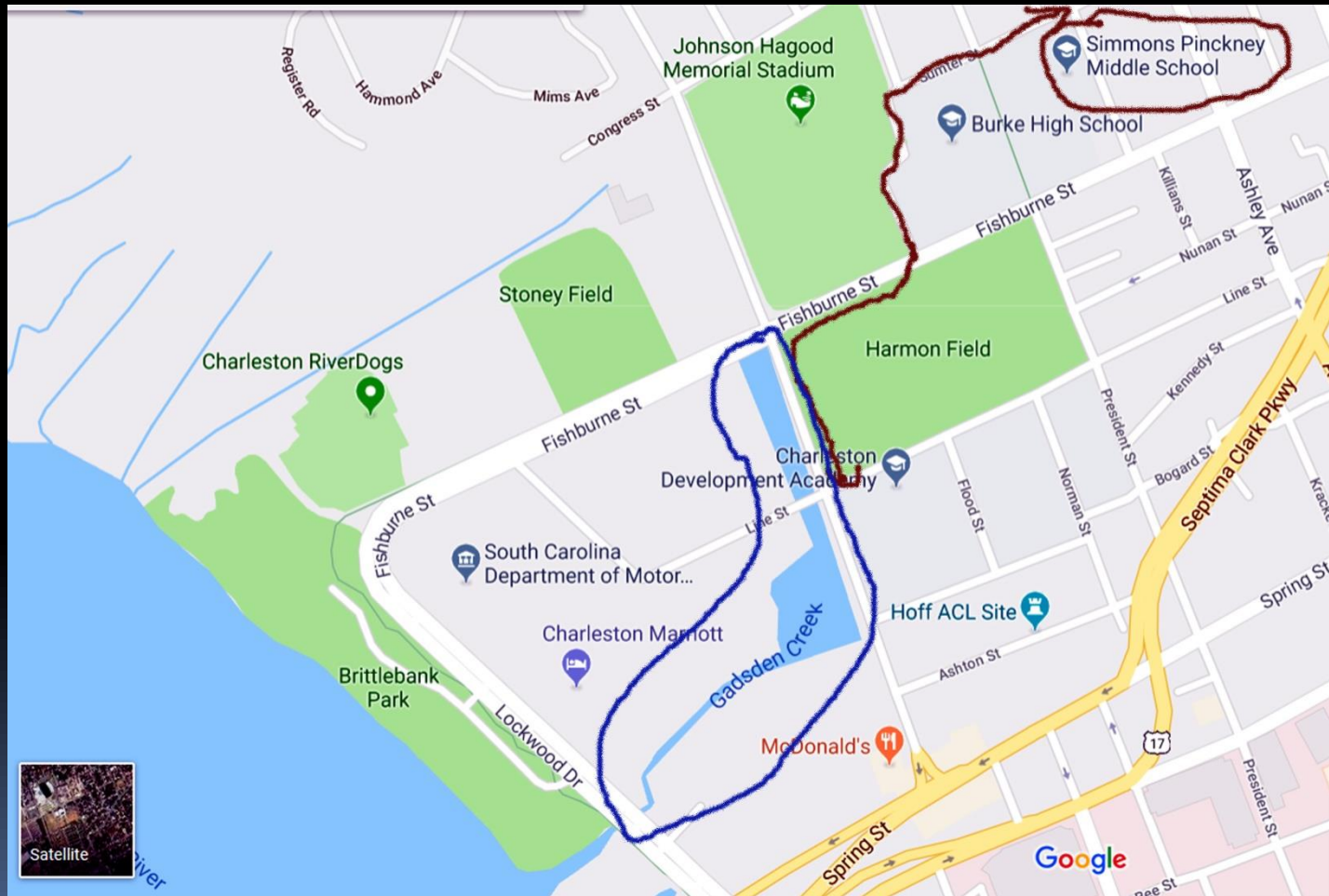




# Noticing CHANGE OVER TIME



# Notice the present-day SHAPE of Gadsden Creek.



# Something to KNOW



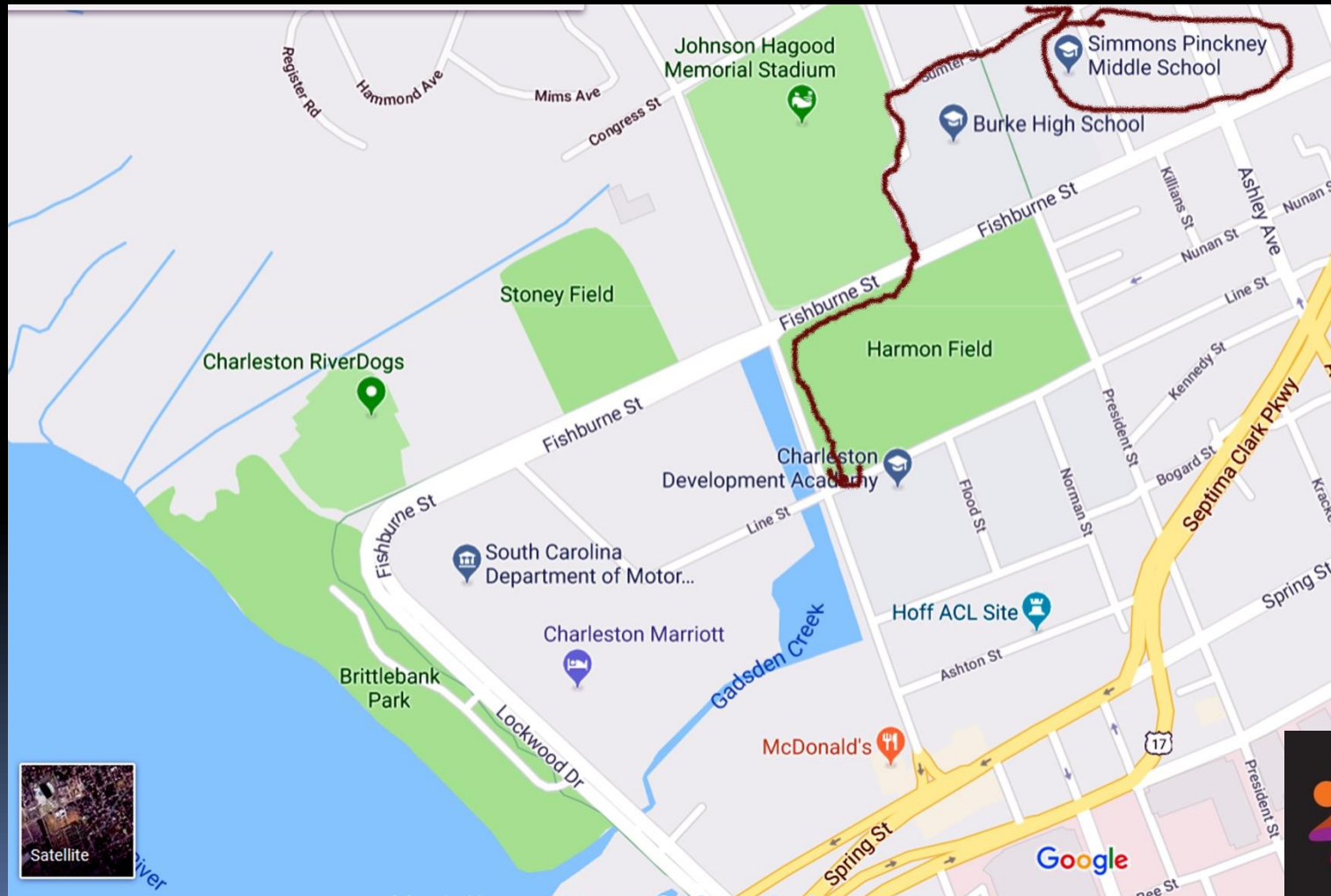
**The West Edge of Charleston was filled in with TRASH! Then covered over with about 2 feet of dirt. Then PAVED!**



How is filling in and paving a salt marsh related to worsened flooding in an area?



# Trace the path we will take on our field trip.





STEM mentors lead  
place-based  
learning and knowledge  
generation.





# **Building a CULTURE OF RESILIENCE**

Merrie Koester, Ph.D. / USC Center for Science Education





Merrie Koester, Ph.D. / USC Center for Science Education



**“WE ARE FLOOD-RESILIENT  
CITIZEN SCIENTISTS!”**

What is happening here?

What STEAM knowledge do I need?

What can I do to be part of the solution?



*Resilient*  
Citizen Scientist

How is this affecting me?

What is happening here?

What STEAM knowledge do I need?

What can I do to be part of the solution?



*Resilient*  
Citizen Scientist

How is this affecting me?

# CHARLESTON DEVELOPMENT ACADEMY FLOOD-RESILIENT CITIZEN SCIENTISTS!



Watch Tonisha and Keirria and be inspired!

# CDA makes a MUSIC VIDEO



# WHAT WE NOW KNOW!



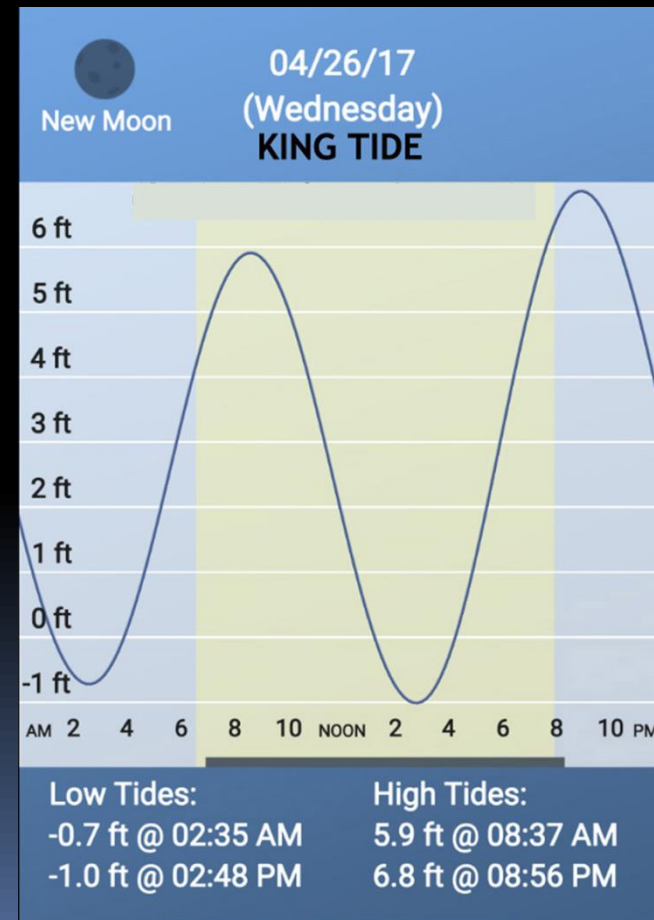
Hi, Lo, Do, Re, Neap

# ALL THESE TIDES ARE FLOODIN' OUR STREETS





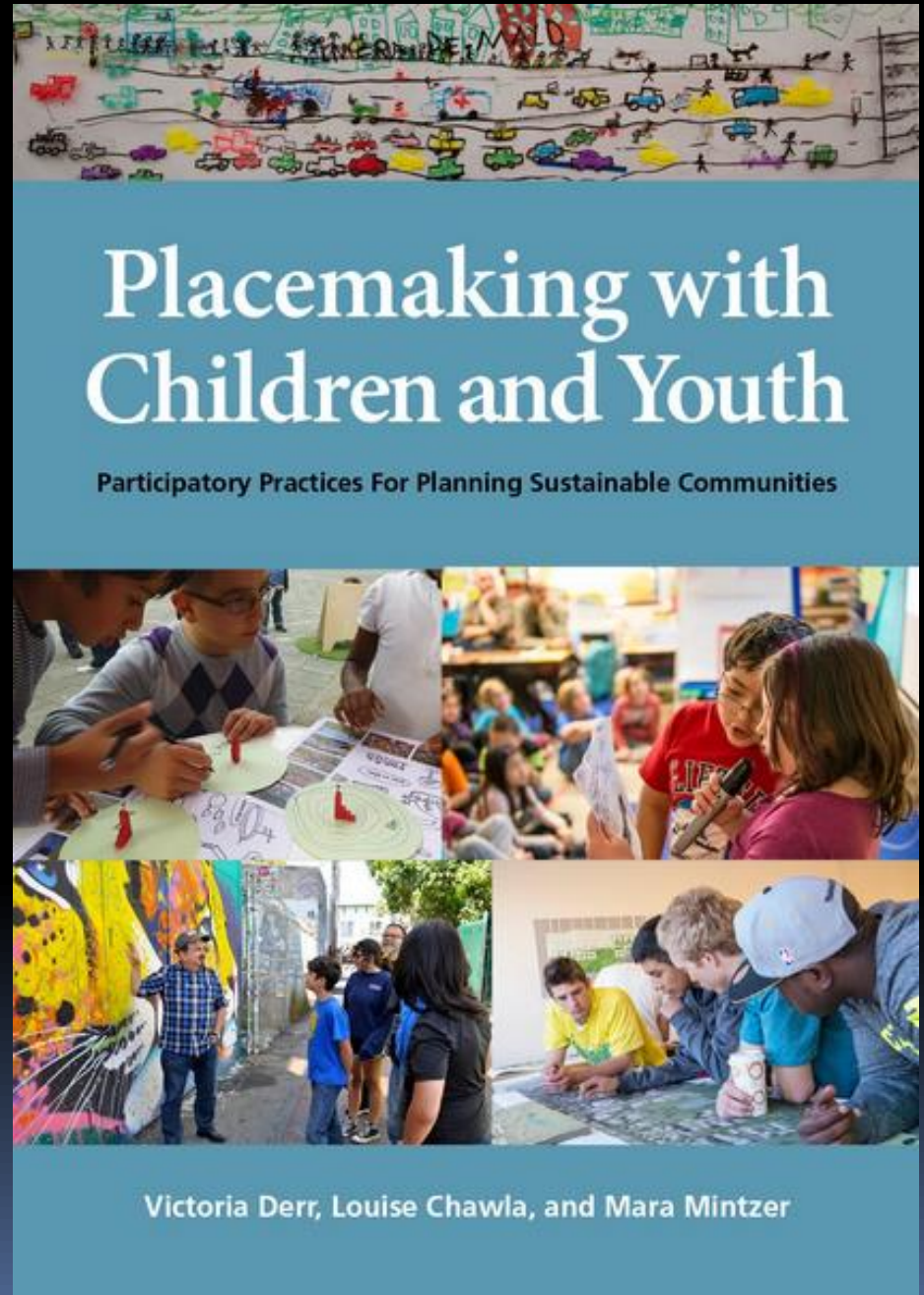
**SPRING, KING-  
NOT THE SAME THING.  
IT ALL DEPENDS  
ON THE MOON'S SWING.**



Because of all the downtown construction,  
Gadsden Creek is facing a reduction.



The *Kids Teaching Flood Resilience* Project is featured in this new book!







# Drawing in MORE ENERGY!

**Jennifer Albert, Ph.D.**

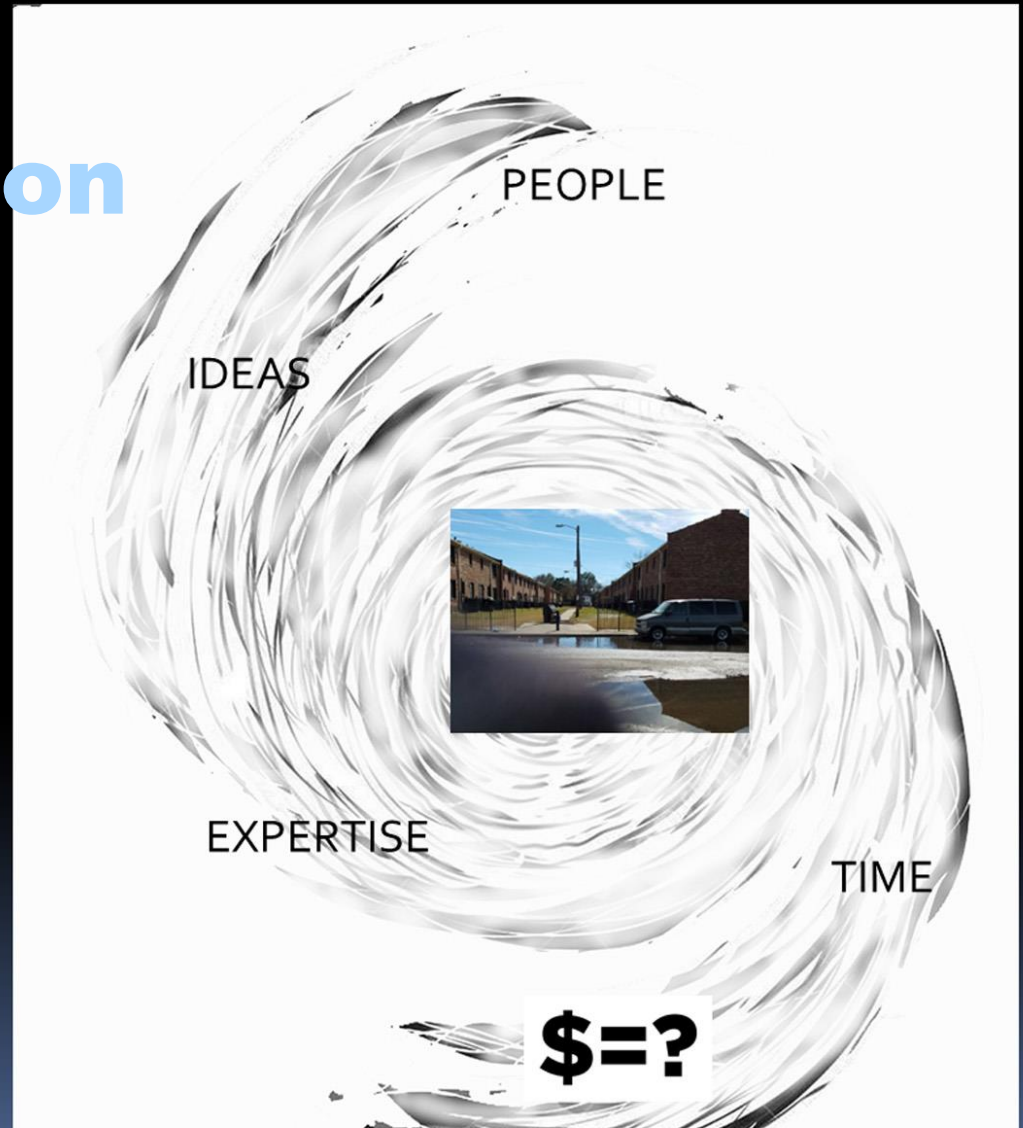
Director, STEM Center for Excellence / The Citadel

WORK – STEM + Computer Science

FOCUS – Maker Spaces/ Science Teacher  
Education

# POTENTIAL ENERGY FORMS

## Higher Education Partnerships



# People, Ideas, Expertise, \$

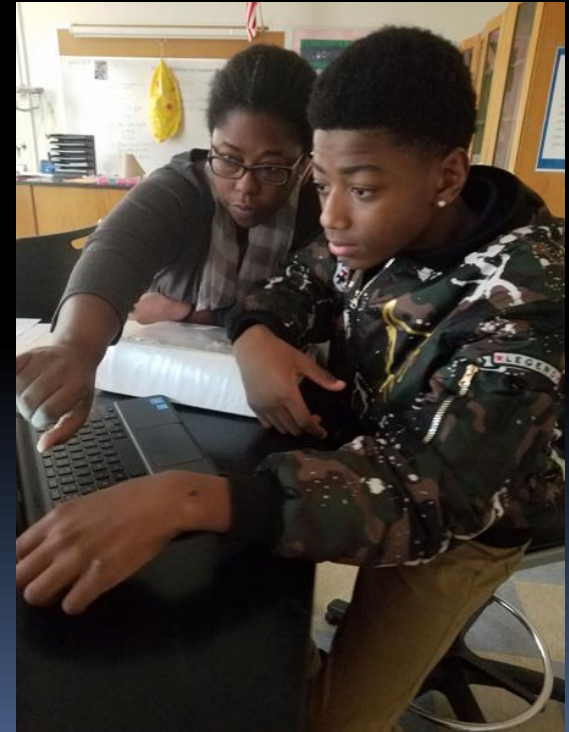
Teacher and student mentoring.





# People, Ideas, Expertise, \$

Developing evidence-based reasoning skills  
with students.



# People, Ideas, Expertise, \$

## Community Outreach







[www.charlestoncounty.org](http://www.charlestoncounty.org)

"YAY \$\$\$!!"

A small grant to pay for artists to work with students.





# Mentor-Mediated Making of KNOWING


What are the **FACTS**,  
so we know how to  
**ACT...**

What to **DO**,  
What to **WATCH**,  
Where to **GO?**

# From the Charleston Municipal Emergency Operations Center (MEOC)



- Check the weather three times a day – Learn to read the hourly NWS forecast.
- Know what to pack in an emergency kit, and then make one!
- Know where the hurricane evacuation bus stops are.
- Don't drive or walk through a flooded area.
- Know your designated hurricane evacuation routes.



# From the Charleston Youth Volunteer Corps (Mayor's Office of Children, Youth, Family)

- What to include in your own backpack sized emergency kit.
- What's reasonable – what's not.
- Having a family evacuation plan.
- How to stay in touch as a family. Writing down phone numbers of relatives and friends in case your phone dies.



# From the Mayor's Office

- Work as a community to keep the City drains clear of debris – Adopt a Drain!



Merrie Koester, Ph.D. / USC Center for Science Education

# Three Guiding Questions



What you gotta **NOTICE?**

What you gotta **KNOW?**

What you gotta **DO**  
with the **INFO?**

Did we get it right?

Does this messaging work?

For whom would it connect?



# THE VIDEO

**What do you NOTICE?**  
**What do you KNOW?**

# COMMUNICATING the MODEL



# KIDS TEACHING FLOOD RESILIENCE PROJECT GOAL

To CO- CREATE  
**EDUCATIVE RESILIENCE-GENERATING SYSTEMS**  
**IN VULNERABLE COMMUNITIES** THROUGH  
PRACTICE EMBEDDED EDUCATIONAL RESEARCH  
**(P.E.E.R.)**  
**PARTNERSHIP**





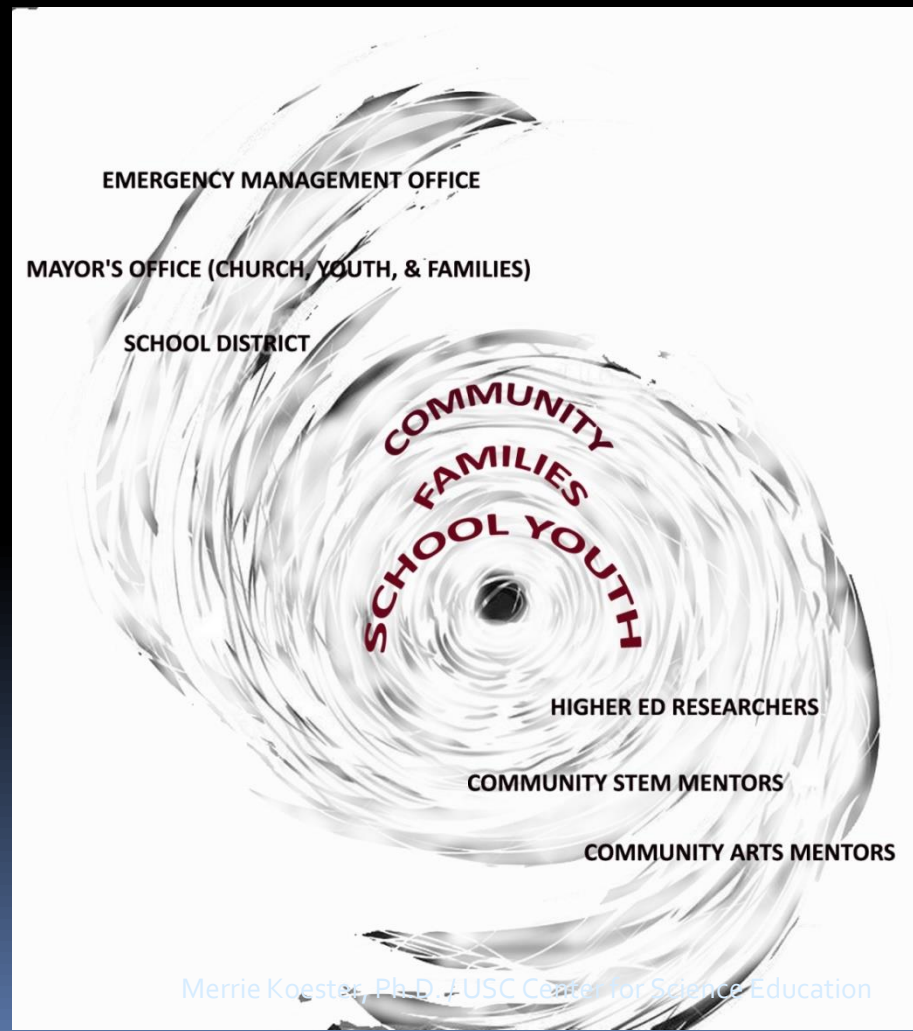
# EMPOWERING YOUTH CIVIC ENGAGEMENT



**This is a multi-vector energy system,  
operating across 3 dimensions.**

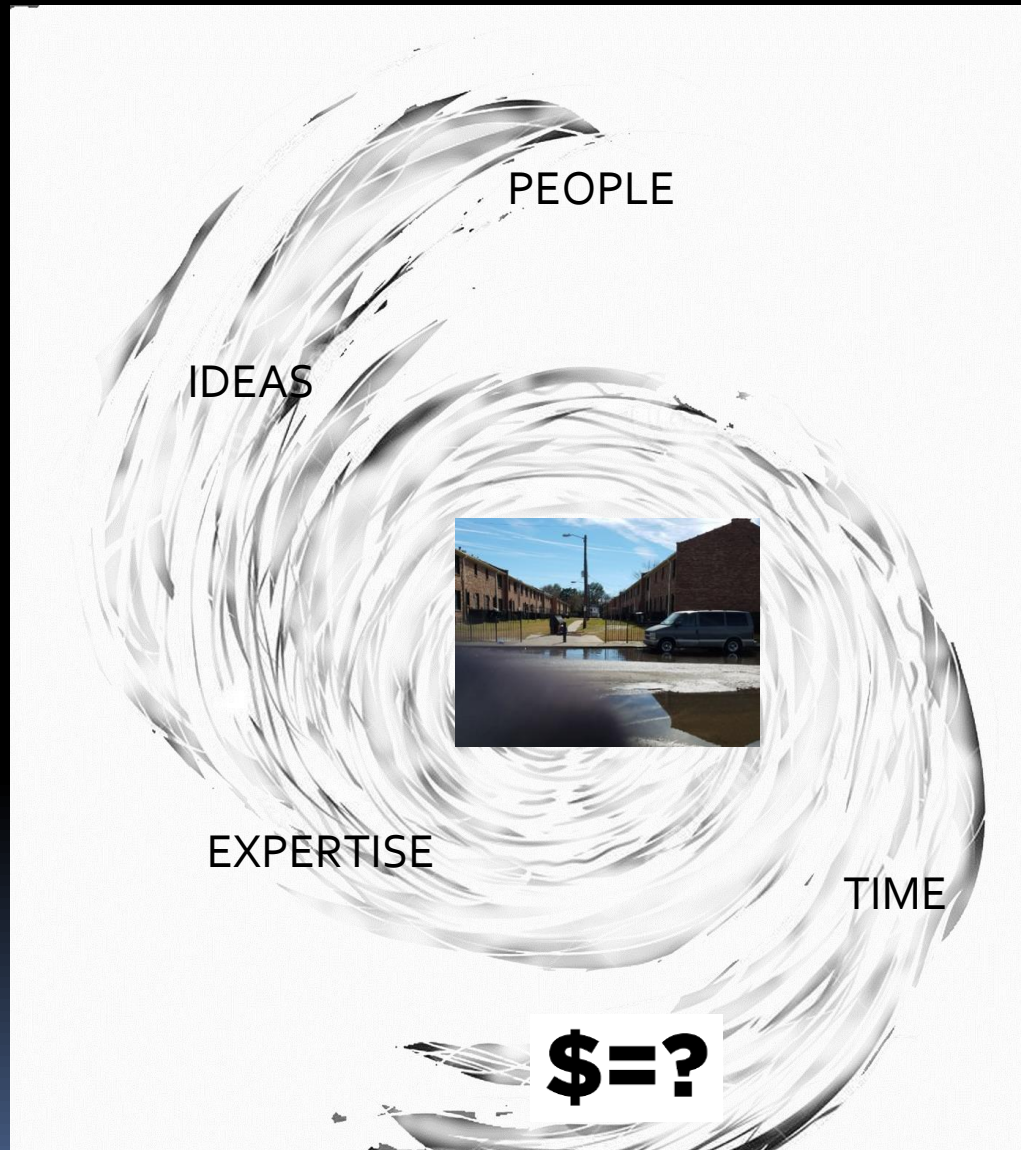



# Our Educative Resilience-Generating System has **6 SOURCES OF POTENTIAL ENERGY**






# POTENTIAL ENERGY FORMS





**WORK FLOW:** the set of processes  
we have employed to organize and  
**transfer energy** throughout the ERGS

- **D**RAWING IN ENERGY
  - **A**WAKENING / NOTICING
  - **R**ESILIENCE-CULTURE-MAKING
  - **E**MPOWERING YOUTH
- 

# METHOD: Give students AGENCY to...

- Collect their own scientific evidence.
- Use their own reasoning.
- Make their own arguments.
- Make and publically share their own HAZARD RISK MESSAGING.







# WE ARE STEPPING UP!

Merrie Koester, Ph.D. / USC Center for Science Education

Flood Resilient Citizen Scientists from Simmons Pinckney Middle School



**WE HAVE SOMETHING TO SAY!**

Please watch and share this video!

Merrie Koester, Ph.D. / USC Center for Science Education

We see our work as aligning with NOAA's **Weather Ready Nation (WRN)** Ambassador initiative.



"WRN Ambassadors are expected to maintain active dialog with NOAA (e.g., maintain current point-of-contact and contact information), use where appropriate NOAA-generated information such as preparedness messages, and identify opportunities for collaboration including research initiatives and outreach events."



# Simmons Pinckney Citizen Science Survey

## How Flood Resilient Are YOU?



# How Flood Resilient are YOU?

## WE HAVE TEN QUESTIONS:

1. Do you know which phases of the moon are most directly tied to flooding events?
2. Do you know where the most flood prone areas of Charleston are?
3. Do you know why these areas are so flood-prone?
4. Are you doing your part to keep Charleston's storm drains clear of debris?
5. Do you know your evacuation route in case you have to leave for a hurricane?



# Next five questions...

1. Do you check the weather three times a day?
2. Do you ever drive your car (or walk) through a flooded area, instead of going around it?
3. Do you know what to pack in an emergency kit in case you and your family are trapped for several days by an extreme weather event?
4. Do you have an emergency kit already packed and ready?
5. Do you know where the nearest hurricane evacuation bus stop is?






What would you add to this curriculum?

- What else do you think these students need to know?
- PLEASE LET US KNOW!



# WHAT DO **YOU** THINK?

- How can we build upon existing community strengths and leadership to build flood resilience in vulnerable communities?
  - Who, where, and what are local community flood resilience assets?
  - How can we employ these local community flood resilience assets to test the efficacy of this video and future flood-resilience artifacts, designed and made by students?
- 



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