SANDSNAP: DIGITAL GRAIN-SIZE IMAGERY ANALYSIS AND ENGAGING CITIZEN SCIENTISTS

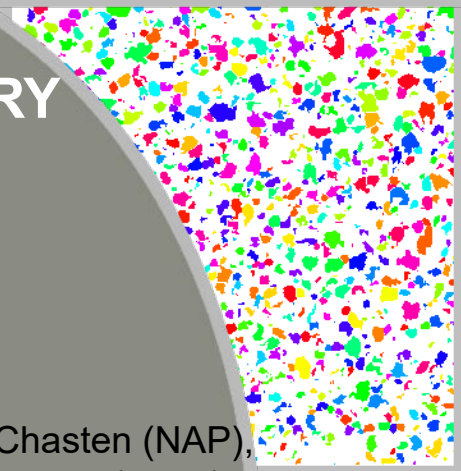
INLET GEOMORPHOLOGY WORK UNIT

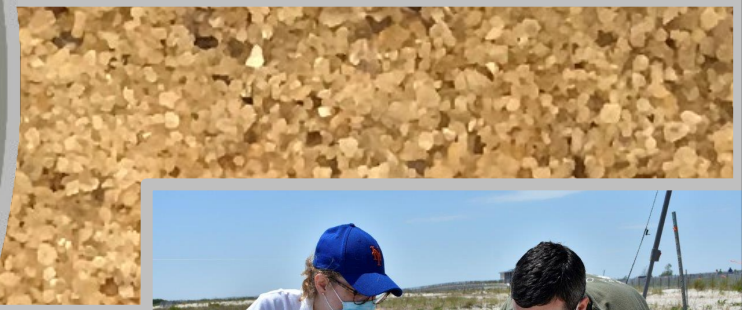
Brian McFall & David Young

Shannon Stever (CHL), Shelley Whitmeyer (JMU), Dan Buscombe (Marda Science), Jon Warrick (USGS)

District PDT Members

Lisa Winter (NAE), Monica Chasten (NAP), Kevin Hodgens (SAJ), Rod Moritz (NWP), Austin Hudson (NWP), Elizabeth Godsey (SAM)





COASTAL INLETS RESEARCH PROGRAM

FY21 IN PROGRESS REVIEW

Tiffany Burroughs

HQ Navigation Business Line Manager

Eddie Wiggins

Technical Director, Navigation

Morgan Johnston

Acting Associate Technical Director, Navigation

CIRP: Mission Support, Technology Transfer, Research & Development

US Army Corps of Engineers®

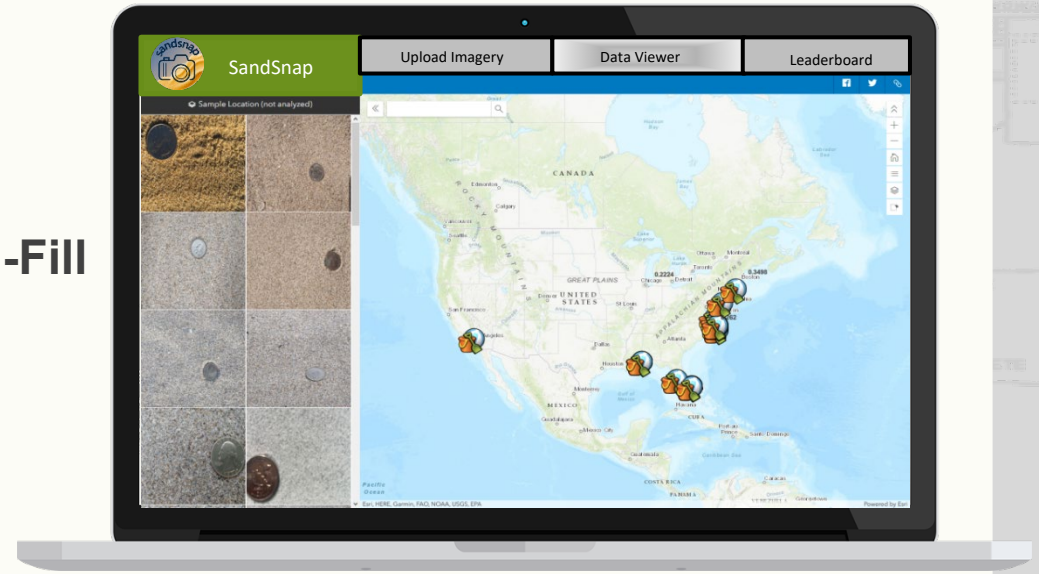
CHL COASTAL & HYDRAULICS LABORATORY

ERDC ENGINEER RESEARCH & DEVELOPMENT CENTER

Problem Statement

- The lack of a nationwide beach grain size database is a fundamental knowledge gap in the composition of our beaches and coastlines.
  - Grain size often has the largest uncertainty in sediment transport modeling (Soulsby, 1997)
- It is unfeasible to collect beach grain size data on a nationwide scale with traditional methods (e.g., sample collection and sieve analysis).
- This deficiency critically limits USACE morphology modeling capability.

- SON's:
  - 2020-NAV-1528: Creating a Beach Sediment Database through "Citizen Scientist" Engagement
  - 2020-FRM-1529: Creating a Beach Sediment Database through "Citizen Scientist" Engagement - Improve Beach-Fill CRSM Performance
  - 2020-ENV-1528 Creating a Beach Sediment Database through "Citizen Scientist" Engagement



Capability and Strategic Impact Statement

This project will create a nationwide beach grain size database from cell phone images collected by citizen scientists, saving the government up to $1M/year.

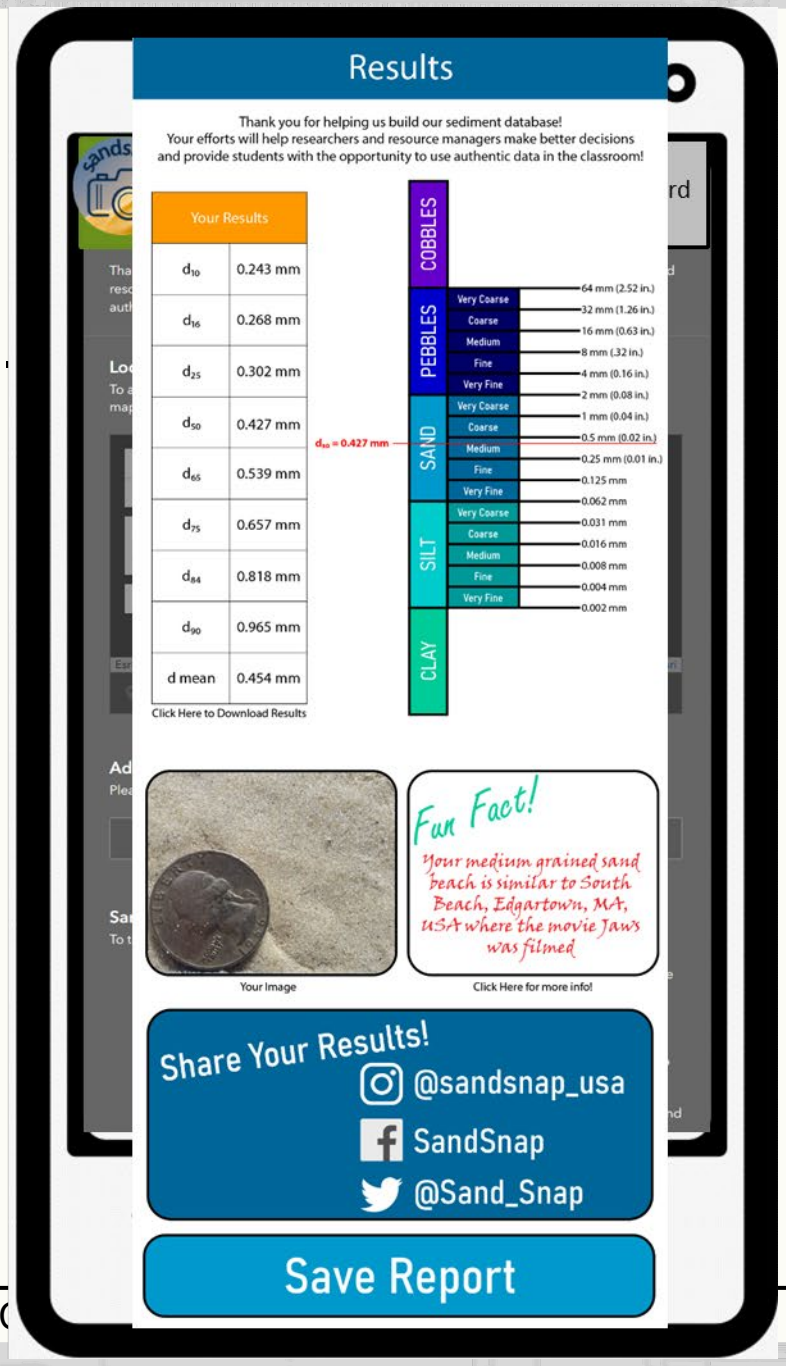
This database will improve regional-scale studies, capture spatial and temporal gradation variations to improve nourishment life cycle analysis and uncertainty, and increase range of beach compatible sediment. Additionally, engaging citizens in the data collection will garner more public support for USACE coastal projects.

Sample Methodology

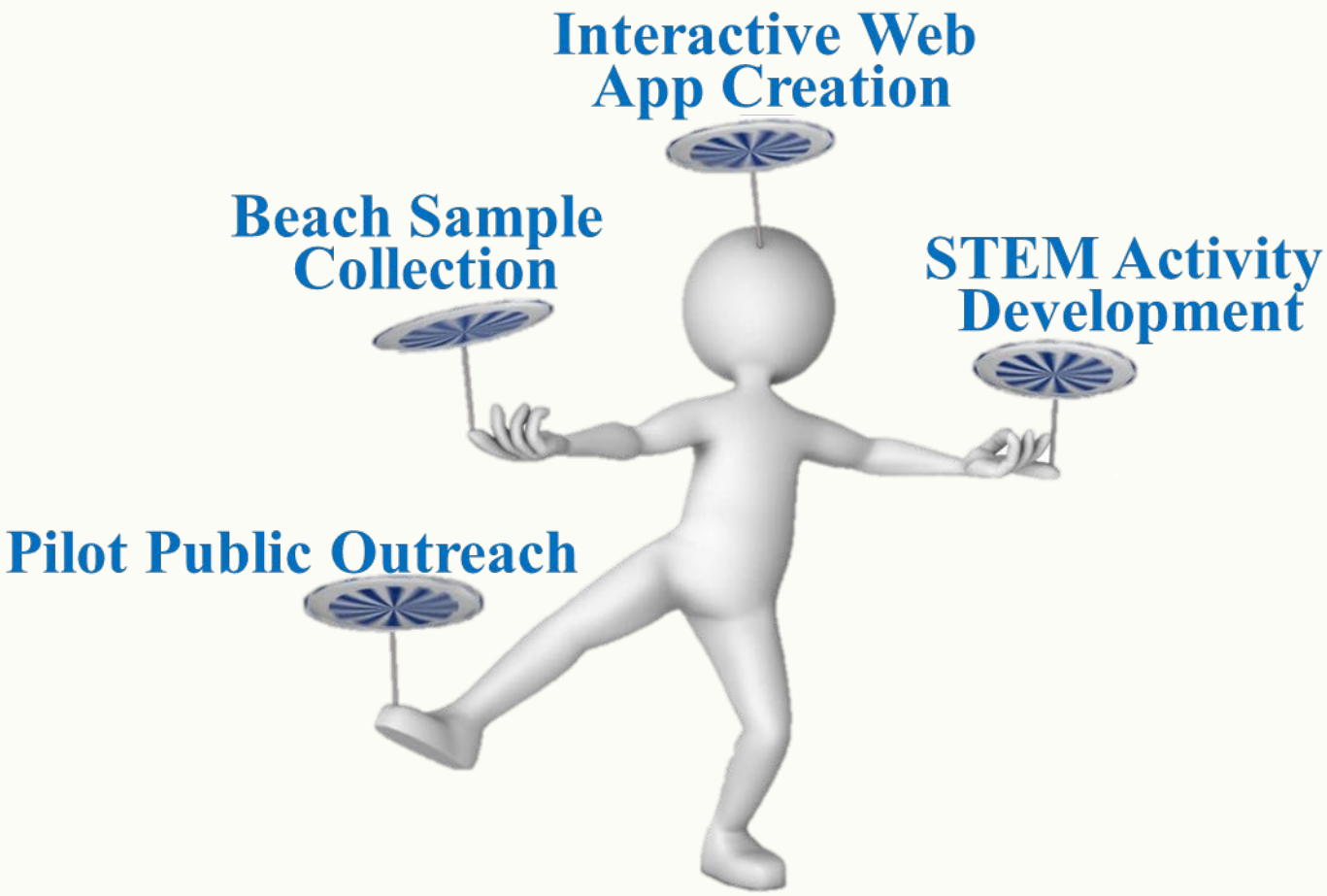
1

2.

3.



FY21 Activities



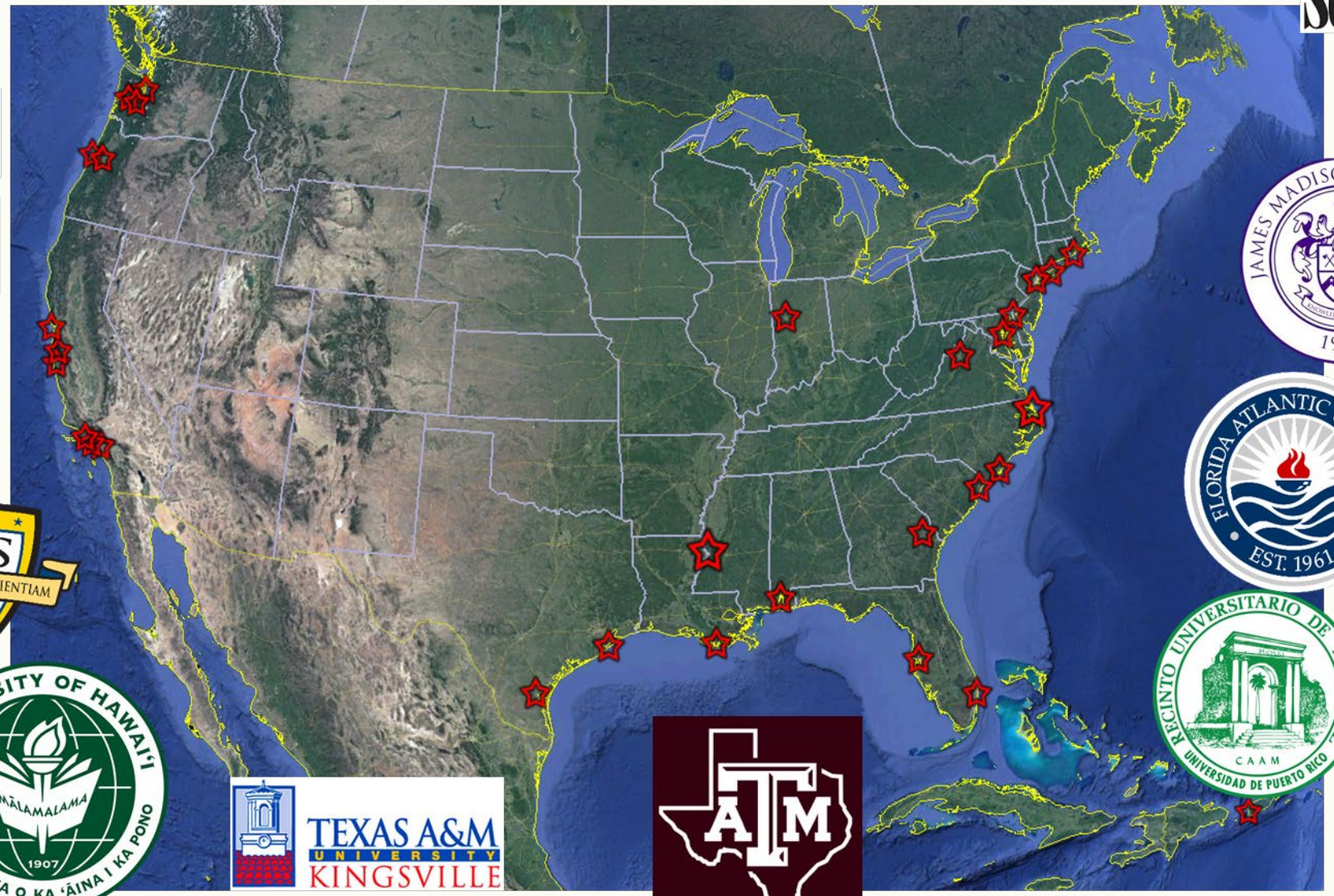
Outreach

- Pilot Public Outreach
- Develop STEM Activities
- More Samples from Around Country
- Coordinate with CoastSnap

Technical

- More Samples from Around Country
- Training model on USACE HPC resources (Onyx)
- Web Application Development

Collaborations



UNIVERSITY of WASHINGTON

Oregon State University

PEPPERDINE UNIVERSITY

USC University of Southern California

CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS 2002

NPS PRAESTANTIA PER SCIENTIAM 1909

OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES 1937

UNIVERSITY OF HAWAI'I MĀLAMALAMA UA MAU KE EA O KA 'ĀINA I KA PONO 1907

TEXAS A&M UNIVERSITY KINGSVILLE

TAMU

RECINTO UNIVERSITARIO DE MAYAGÜEZ UNIVERSIDAD DE PUERTO RICO CAAM

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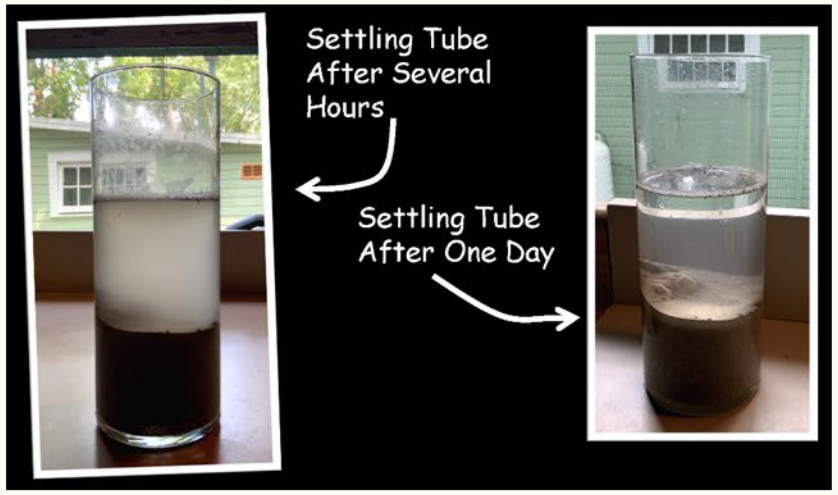
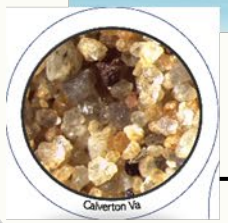
Outreach – With Social Distancing

Library STEM Activity Bags
"Beach Kits"





STEM Activities:

- "Sorting It Out" (Sieve & Sand Castle)
- "That Settles It" (Settling Tube)
- "Digging In Deeper" (Petri Dish & Hand Lens)
- SandSnap

TEST LOCATIONS:

- John Jermain Memorial Library in Sag Harbor, NY
- Nature Center at Jones Beach State Park in Jones Beach, NY

Outreach – In Person

Public Engagement & Girl Scout Event
Jones Beach, NY

Staff:

- 2 James Madison University (JMU) Professors
- 3 JMU Undergraduates
- 2 NAN Engineers
  - Danielle Tommaso
  - Lynn Bocamazo
- 1 Park Employee
- 1 ERDC researcher

Participation:

- 22 Children (18 Girl Scouts) + Parents
- Distributed 80 SandSnap Stickers

Summary

FY21 Major Advances in Capability

- Trained Deep-Learning Model on HPC
- Printed another 1,000 Water Bottle Stickers with QR Code
- Collected More than 200 Images
- Collected More than 100 Physical Samples
- Web Application (Demo by 20 Aug)
  - Migrated model to the Cloud
- Tested 4 STEM Activity Bags
- Piloted Public Outreach/Girl Scout Event

FY21 Major Products & Collaborations

- TN: Technical Feasibility of Creating a Beach Grain Size Database with Citizen Scientists
- 2 Conference Presentations (ASBPA, FSBPA)
- 5 Webinars (CWG, ASCE, CHL Symposium, FAU, etc)
- 1 CIRP TD
- Collaborations:
  - Key Collaborators: James Madison University, Marda Science, LLC., USGS
  - Imagery & Samples: 28 Universities and Gov't Agencies
  - STEM Bags: Library Sag Harbor, NY; Nature Center in Jones Beach, NY
- Leveraged CIRP & RSM Funds

Planned Outyear Products/Advances

- Conference Presentations (ASBPA/AGU-OS)
- Promote Web Application
- Install SandSnap Signage with CoastSnap (Winter 2021)
- Journal Manuscript Education & Outreach (CSR)
- Student Outreach Event (Charleston – Spring 2022)
- Science Fair & Class Lesson Plan Development