



FY21 RSM IPR



ERDC, SandSnap: Web Application Development Brian McFall, David Young

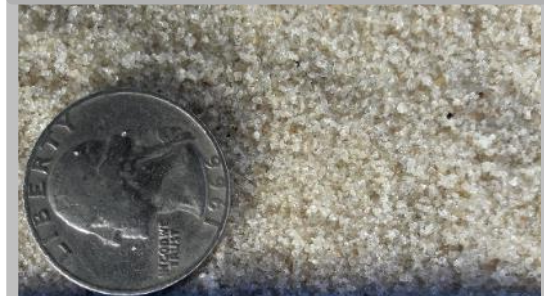
BLUF: SandSnap is a research initiative to engage citizen scientists to amass a spatial and temporally varying nationwide beach grain size database.

Challenge/Objectives

- Develop interactive Web Application
- Pilot outreach activities during COVID

Approach

- Coordinate with ~30 Universities & state agencies around the country to collect images & physical samples
- Develop Web App with OP-J
- Innovative solutions to increase public engagement.



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Sample Methodology:

1.



2.



3.

Results

Thank you for helping us build our sediment database!
Your efforts will help researchers and resource managers make better decisions and provide students with the opportunity to use authentic data in the classroom!

Your Results

d_{15}	0.243 mm
d_{30}	0.268 mm
d_{45}	0.302 mm
d_{60}	0.427 mm
d_{75}	0.539 mm
d_{85}	0.657 mm
d_{90}	0.818 mm
d_{95}	0.965 mm
d mean	0.454 mm

$d_{50} = 0.427 \text{ mm}$

COBBLES

- Very Coarse: 66 mm (2.62 in.)
- Coarse: 32 mm (1.26 in.)
- Medium: 16 mm (0.63 in.)
- Fine: 8 mm (0.31 in.)
- Very Fine: 4 mm (0.16 in.)

PEBBLES

- Very Coarse: 2 mm (0.08 in.)
- Coarse: 1 mm (0.04 in.)

SAND

- Very Coarse: 0.85 mm (0.033 in.)
- Medium: 0.425 mm
- Very Fine: 0.075 mm

SILT

- Very Coarse: 0.062 mm
- Coarse: 0.031 mm
- Medium: 0.016 mm
- Fine: 0.008 mm
- Very Fine: 0.004 mm

CLAY

- 0.002 mm

Fun Fact!
Your medium grained sand beach is similar to South Beach, Edgartown, MA, USA where the movie Jaws was filmed

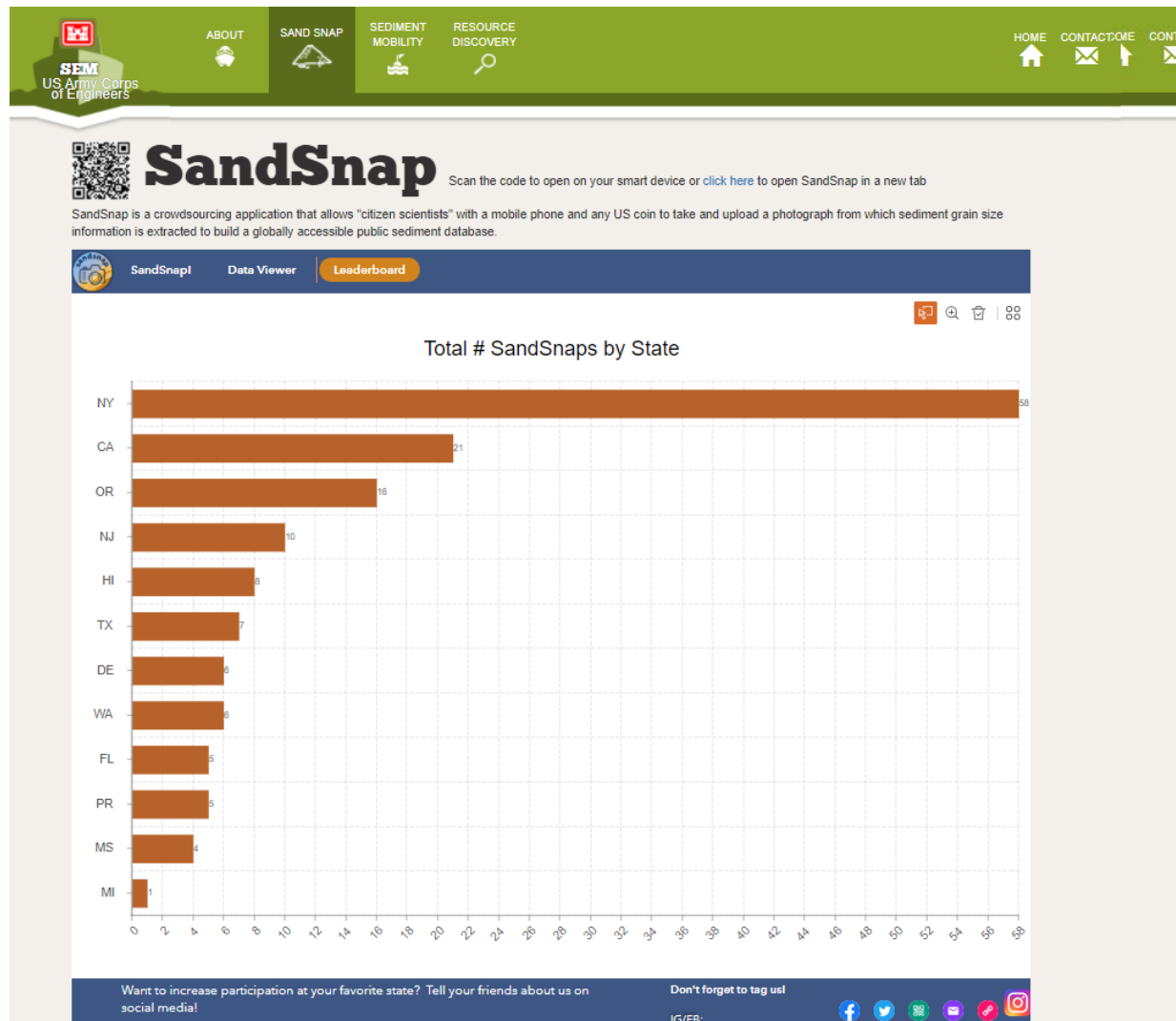
Share Your Results!

- @sandsnap_usa
- SandSnap
- @Sand_Snap

Save Report

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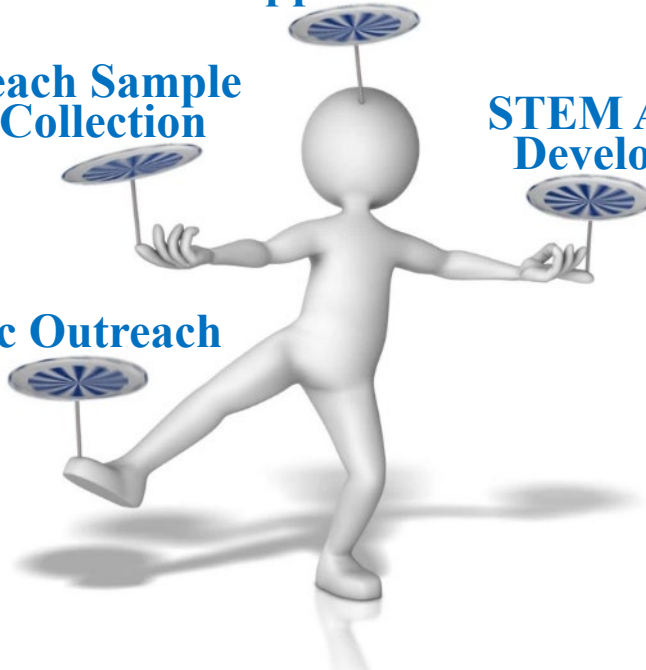
FY21 Activities:

**Interactive Web
App Creation**

**Beach Sample
Collection**

**STEM Activity
Development**

Pilot Public Outreach

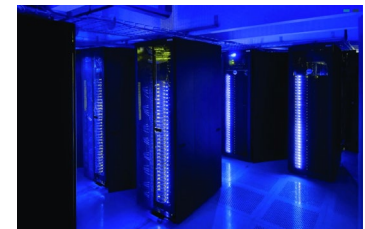


Outreach

- Building Civic Awareness
- 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



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Additional PDT Members:

- Shannon Stever (ERDC)
- Dan Buscombe (MARDA Science)
- Shelley Whitmeyer (James Madison)
- Jon Warrick (USGS-Santa Cruz)

A map of the United States is the central focus, with a large yellow 'P' logo in the center. Red stars are placed along the coastlines and in the Great Lakes region. Surrounding the map are logos for various partner institutions: University of Washington, Oregon State University, Pepperdine University, USC (University of Southern California), California State University Channel Islands, NPS (National Park Service), University of Hawaii, Texas A&M University Kingsville, Texas A&M University, Florida Atlantic University, James Madison University, Stevens Institute of Technology, Sea Grant, Coastal Carolina University, USA (University of South Alabama), and the University of Puerto Rico. At the bottom, the text reads 'US Army Corps of Engineers • Engineer Research and Development Center'.

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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

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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



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Accomplishments

- **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**
 - ▶ **Migrated model to the Cloud**
- **Tested 4 STEM Activity Bags**
- **Piloted Public Outreach/Girl Scout Event**

Deliverables & 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**



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Planned FY22 Products/Advances:

- **Conference Presentations (ASBPA/AGU-OS)**
- **Create Tutorial Videos**
- **Promote Web Application**
- **Install SandSnap Signage with CoastSnap (Spring 2022)**
- **Journal Manuscript - Education & Outreach (CSR)**
- **Journal Manuscript – SandSnap Machine Learning Models**
- **Student Outreach Event (Charleston – Spring 2022)**
- **Science Fair & Class Lesson Plan Development**



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How is this project benefiting the USACE and Nation?

- **Crowdsourcing the data collection engages the public and garners public support for USACE projects**
- **Capturing the critical spatial and temporal variations in the beach sediment grain size will**
 - **improve project uncertainty analysis**
 - **potentially make more dredged sediment compatible for beneficial use on beaches.**
- **This database will massively improve USACE morphology modeling capabilities both in preliminary studies where traditional grain size data is not yet available and in large-scale morphology modeling with large spatial variability in grain size.**

Direct cost savings:

\$100 per sample x 10,000 samples/year = \$1M/year.

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Brian McFall – Brian.C.McFall@usace.army.mil

David Young – David.L.Young@usace.army.mil