USING "CITIZEN SCIENTISTS" TO COLLECT BEACH DATA

Brian C. McFall, PhD, PE

Douglas R. Krafft

Katherine E. Brutsché, PhD Coastal and Hydraulics Laboratory US Army Engineer R&D Center

Shelley Whitmeyer, PhD James Madison University

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BACKGROUND



SIZE DISTRIBUTION







CITIZEN SCIENTISTS



CITIZEN SCIENCE COMES OF AGE

Efforts to engage the public in research are bigger and more diverse than ever. But how much more room is there to grow?

BY AISLING IRWIN

mme participants Donovan Wooten and Maya Sanders record observations with iNaturalis



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STREET SCIENCE

In May, a collaboration that included the Flanders Environment Agency in Belgium ran a month-long citizen-science campaign to help test a computer model of air quality in the region.

Participants installed nitrogen dioxide samplers on first-floor, street-facing windows inside V-shaped signs to create a standard measurement set-up.



All told, some 20,000 people participated in the project across the Flanders region. Each paid €10 (US\$11.5) to join the experiment





The results are still being formally assessed. But early analysis has revealed — among other things — that the ability of some building arrangements to concentrate traffic exhaust in "street canyons" had been underestimated.

NO₂ concentration High O

COASTAL CITIZEN SCIENTISTS

CoastSnap

Dr. Mitchell Harley University of New South Wales Water Research Lab



We are constantly working to expand our network of CoastSnap photo points along the NSW coast. Use the map below to find a photo point near you.



Manly Beach (South Steyne)

Find the CoastSnap photo point at the northern end of Reddall Street, above Manly Life Saving Club. You can access Reddall Street from the stairs from Marine Parade.



North Narrabeen Beach

Find the CoastSnap photo point in Narrabeen Head Reserve on the northern side of the entrance to Narrabeen Lagoon. You can access the reserve by the stairs from the car park next to the North Narrabeen lagoon entrance, or from the trail from Peal Place.



Cape Byron (Tallow Beach)

Find the CoastSnap photo point beside Lighthouse Road on the southern side of Cape Byron overlooking Tallow Beach.



Blacksmiths Beach

Find the CoastSnap photo point on the northern breakwall of Swansea Channel. You can access the breakwall from Blacksmiths Beach or by the shared pathway starting at Grannies Pool car park.



COASTSNAP Help us monitor beaches

The Office of Environment and Heritage and the Water Research Laboratory (UNSW Sydney) have teamed up to develop CoastSnap - an innovative community beach monitoring program that enables you to help us monitor change on NSW beaches.

We have developed smart-phone cradles, so all you need to do is take a snap at one of our locations, and share it with us. By controlling the position and angle of your phone camera, we can measure the changing beach width and shape, and movement of the shoreline, to discover how each beach responds to changing ocean conditions.





CoastSnap

astSnar December 5 at 1:28 AM · 🕄

Our CoastSnap shoreline analysis at Manly Beach indicates that there was minor erosion of up to 10m due to last week's storm. The red line shows the location of the shoreline as it was before the storm hit and the blue line shows the shoreline just two days ago (after the storm).Both shorelines are at the same tide level.

Thanks to frannyfish and Jenny Harley for the two CoastSnaps! #CoastSnapManly



How to get CoastSnapping

Visit a CoastSnap photo point with your mobile device and t

- Place your mobile device in the CoastSnap cradle, with cradle and the screen facing you. This is important, if y can't use your snap.
- 2. Push your mobile device up against the left side of the
- 3. Take a standard photo with your mobile device camera,
- 4. Carefully remove your mobile device from the phone cr
- 5. Share or submit your CoastSnap photo so that we can
- share on Facebook, Instagram or Twitter using the h
- submit your photo via email to Coast.Snap@envirc

Important: If you share your photo on social media other users will be able to see it. You can always choose to submit by email if you don't want to share your photo publicly.

Too much to remember? Don't worry – we have instructions at each photo point, that tell you how to 7 capture and share your snap. Just look out for the CoastSnap sign.



Share



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GRAIN SIZE FROM IMAGES

Historically relied on identification of individual grains or large sample sizes for calibration



BUSCOMBE (2013)

- Treats image as a random field
- Uses spectral techniques to determine spatial wave lengths
- Uses Morlet wavelet rather than Fourier-derived power spectrum
- Matlab GUI





BUSCOMBE (2013)





Rule of thumb: at least 250 grains are needed for RMS error of 20% or less



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INITIAL STRATEGY TO TEST FEASIBILITY

Request students from coastal universities and engineers from coastal USACE districts to:

- Use coin in image for scaling
- Photograph beach sediment
- Take and send in sediment sample of photographed area

Results good or bad will be documented in a Tech Note





INITIAL INSTRUCTIONS

Thanks for helping James Madison University and the US Army Corps of Engineers with this project! We need sediments data from all over the United States and could not do this without your help.

Our shorelines are beautiful and dynamic area. In many areas they are also heavily developed and require active management. Good management begins with good science. The grain size will impact the beach shape and how easily sediment is eroded. Resource managers need this information to make sound management decisions. Before you visit the beach, download the FieldMove Clino app. This app will allow you to measure the slope of the beachface with your phone. App Store: <u>https://itunes.apple.com/us/app/fieldmove</u> <u>-clino/id647463813?mt=8</u> Google Play: <u>https://play.google.com/store/apps/details</u> <u>?id=com.mve.fieldmove.clino&hl=en_US</u> Here is the fun part- go to the beach! While there you will collect...

- the slope of the beachface,
- the sand size, and

your location

The beachface is the part of the beach that slopes down to the water. There are probably waves breaking on this part of the beach.

The sand size will be estimated visually. Take a picture of the sand with a coin in the image for scale, any standard US coin will work.



CIRP Research & Development Next, you need to record your data. Open the online form



Beach Data

Description content for the survey

Please tap the button below to record your location.*



🖬 Verizon 🗢

10:29 AM

survey123.arcgis.com

Ċ,

What is the angle of the beach slope in degrees? Enter the number only.*

You will need to use the Clino Move app to collect the beach slope. This is a free app.

123

Take a picture of the sand with a coin. The picture should include the sand and coin only.*

Click here to upload image file. (<10MB)

Submit

Powered by Survey123 for ArcGIS

https://arcg.is/4urP1

CIRP Research & Development



Ocean Springs, MS Dry Beach





earch & Develop:



Ocean Springs, MS Beach in Water



Galveston, TX

LASER DIFFRACTION RESULTS

Sample	d ₁₀ (mm)	d ₅₀ (mm)	d ₉₀ (mm)
Ocean Springs - Dry	0.248	0.393	0.624
Ocean Springs - Wet	0.234	0.368	0.577
Galveston	0.113	0.163	0.235





OCEAN SPRINGS - DRY

Sample	d ₁₀ (mm)	d ₅₀ (mm)	d ₉₀ (mm)
Large ROI	0.232	0.948	3.39
Small ROI	0.336	0.513	0692
Small ROI (w/Filters)	0.239	0.354	0.568
Laser Diffraction	0.248	0.393	0.624





$$\begin{split} \text{Mean} &= 1.88\\ \text{Sorting} &= 1.84\\ \text{Skewness} &= 0.039\\ \text{D}_{10} &= 0.236\\ \text{D}_{50} &= 0.973\\ \text{D}_{90} &= 3.58 \end{split}$$

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OCEAN SPRINGS - WET

Sample	d ₁₀ (mm)	d ₅₀ (mm)	d ₉₀ (mm)
Large ROI	0.677	3.06	9.89
Small ROI	0.359	0.669	1.22
Small ROI (w/Filters)	0.333	0.451	0.769
Laser Diffraction	0.234	0.368	0.577





Save results

Save Data



Save Graphs



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CIRP Research & Development

OCEAN SPRINGS - WATER

Sample	d ₁₀ (mm)	d ₅₀ (mm)	d ₉₀ (mm)
Large ROI	0.244	1.07	4.69
Small ROI	0.448	0.733	1.27
Small ROI (w/Filters)	0.328	0.451	0.845
Laser Diffraction (wet)	0.234	0.368	0.577

Order 2



Sample Of Image



 $\begin{array}{l} \mbox{Mean} = 0.545 \\ \mbox{Sorting} = 0.246 \\ \mbox{Skewness} = 0.0209 \\ \mbox{D}_{10} = 0.328 \\ \mbox{D}_{50} = 0.451 \\ \mbox{D}_{90} = 0.845 \end{array}$



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GALVESTON

Sample	d ₁₀ (mm)	d ₅₀ (mm)	d ₉₀ (mm)
Large ROI	0.266	1.15	4.45
Small ROI	0.294	0.448	0.957
Small ROI (w/Filter)	0.21	0.366	0.698
Laser Diffraction	0.113	0.163	0.235









BUILDING S

0.0783

Set Resolution (mm/pixel)

Tools

Flatten Filter
Unflatten Unfilter

ROI whole

draw ROI

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INITIAL RESULTS

Small ROI w/Filters

	d ₁₀			d ₅₀			d ₉₀		
Sample	Image (mm)	Laser (mm)	% Error	Image (mm)	Laser (mm)	% Error	Image (mm)	Laser (mm)	% Error
Ocean Springs - Dry	0.239	0.248	4%	0.354	0.393	10%	0.568	0.624	9%
Ocean Springs - Wet	0.333	0.234	42%	0.451	0.368	23%	0.769	0.577	33%
Ocean Springs - Water	0.328	0.234	40%	0.451	0.368	23%	0.845	0.577	46%
Galveston	0.210	0.113	86%	0.366	0.163	125%	0.698	0.235	197%
USARMY US Army Corps of Engineers.									

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Research & Developmen

GALVESTON VS. OCEAN SPRINGS





Ocean Springs



DISCUSSION POINTS

- If successful, what could this data set be used for?
- What kind of response would a typical citizen like?
- Concerns:
 - Armoring
 - Cross-shore size distribution







Sample Of Image



THANK YOU

Mean = 0.534Sorting = 0.208Skewness = 0.0192D₁₀ = 0.333D₅₀ = 0.451D₆₀ = 0.769

BRIAN MCFALL



