

CSAT: NEW METHODS FOR SHOALING ANALYSIS AND QA/QC TOOLS

Michael Hartman

Nicholas Lenssen, Sean McGill, Lauren Dunkin, Ned Mitchell

CIRP Technical Discussion February 9, 2021







Coastal Navigation Portfolio Management



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Advance objective, quantitative, and systems-based approaches to management of the Corps' large coastal navigation portfolio of projects.



Corps Shoaling Analysis Tool (CSAT)

- CSAT estimates shoaling rates using hydrographic surveys within the boundary of the National Channel Framework.
- CSAT uses the historical shoaling rates to predict future dredging volumes at various channel depth intervals.
- Where are shoaling 'hot spots' within the navigation channel?
- How has shoaling changed as a result of meteorological events (extratropical storm, rainfall or drought periods), dredge schedule change or dredge type change?



National Channel Framework, hydrographic survey map sheet from eHydro, and the shoaling rate prediction for Columbia River, OR.

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CSAT Workflow – Survey Type

After-Dredge

- Comparison of elevation differences between surveys
- Identify After-Dredge surveys use as first survey in shoaling
- on + rate set

Elevation

Before-Dredge

•Used as last survey in shoaling rate set





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Time





CSAT Workflow - Traditional



Traditional

 \overline{m} = mean(m₁₂, m₁₃, m₁₄, m₂₃, m₂₄, m₃₄, ... m₅₆, m₅₇, m₅₈, m₆₇, m₆₈, m₇₈)

- $ar{m{m}}$ is reported annualized mean shoaling rate (ft/yr).
- m_{12} is the annualized shoaling rate between Survey 1 and Survey 2.

Advantages:

Uses all the shoaling rates available

Disadvantages:

Sensitive to large changes in depth over a short amount of time





CSAT Workflow – Weighted Mean – NEW





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Weighted Mean



 \bar{m} is reported annualized mean shoaling rate (ft/yr).

*w_i*is a weighting term based on days between surveys

 Δz_i is the depth change between surveys (ft).

Advantages:

Uses all the shoaling rates available Gives additional weighting to long term shoaling rates that may be better representative of overall shoaling rates

Disadvantages:

Reduces contribution of storm events

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CSAT Workflow – End Point Method – NEW



End Point Method

 $\overline{m} = \text{mean}(m_{14}, m_{58})$

m is reported annualized mean shoaling rate (ft/yr).
m₁₄ is the annualized shoaling rate between

Survey 1 and Survey 4.

Advantages:

Simple to apply Emphasizes longer term changes

Disadvantages:

Reduces the benefits of having multiple surveys



All Methods are Reported

- In most recent version of CSAT, the results from all methods are reported in the tabular output products.
- Other output products:
 - Summary Tables
 - Georeferenced Rasters reporting Weighted Mean shoaling rate, Last Observed Depth for each reach









QA/QC Tools

- Larger/smaller shoaling rates than expected?
 - Helpful to understand how CSAT interpreted inputs
- Previously, required in depth review of input tables and underlying survey data to fully understand
 - Time-consuming
- How do we make these tools accessible to all users?
 - Web tools using Jupyter Notebooks
 - Dashboard-type interface means users aren't required to have detailed knowledge of Python











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QA/QC Tools



ShoalingRateTest

Average

Lattude

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-93.35

-93.345

-93.34

Longitude

-93.335

AvgRate_ftPerYr

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Future Work



• Updating CSAT results for download (through end 2020)

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- https://cirp.usace.army.mil/products/csat.php
- Map Viewer: https://arcg.is/094Lur
- Continue development of QA/QC tools
 - Additional figures and interactivity
- Running CSAT outside of NCF boundary

Questions?

