

Short-term sedimentation in Conowingo Reservoir and the upper Chesapeake Bay, May-December 2015

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Role of the Palinkas lab in the Conowingo study

Reservoir:

- Sediment characterization (grain size, organic and coal content, etc.) of short (shared with Cornwell group) and long (shared with AECOM)
- Sedimentation rates and ages with naturally occurring radioisotopes – bimonthly (^7Be) and 100-y (^{210}Pb) perspectives



Upper Bay;

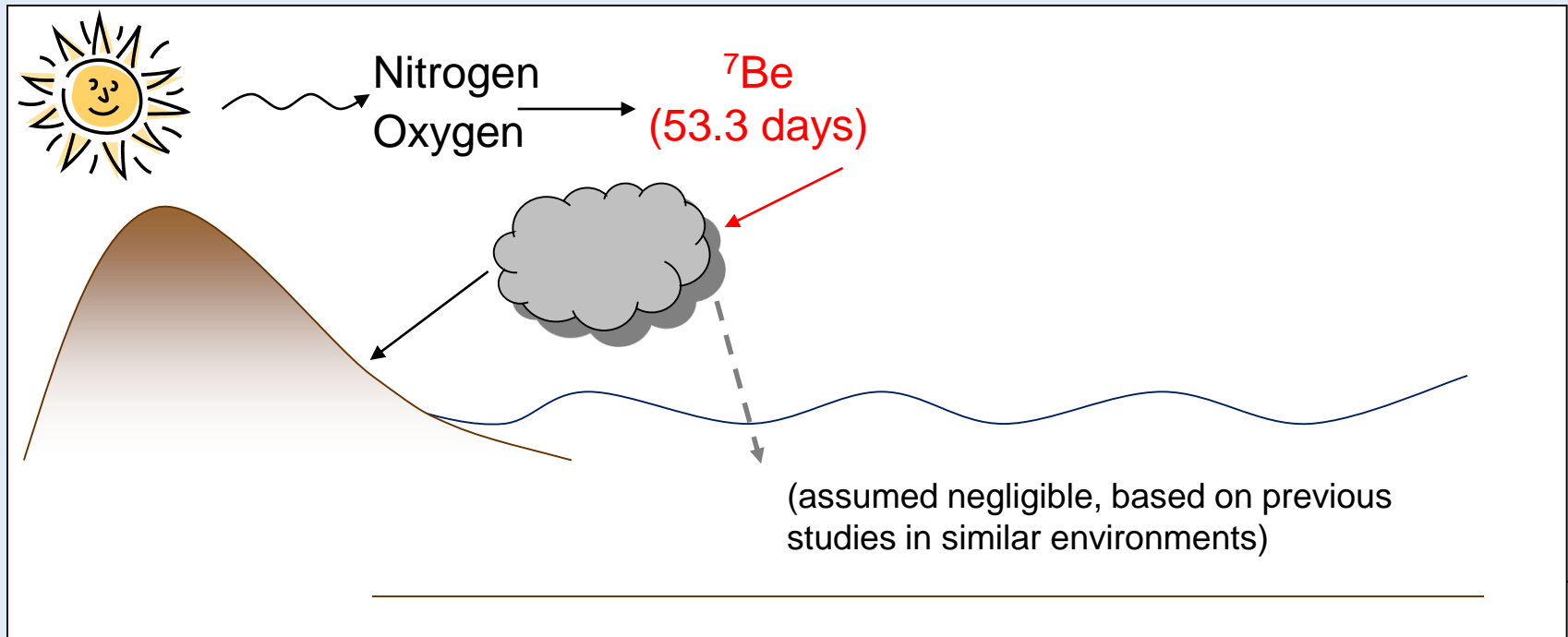
- Sediment characterization and short-term sedimentation rates (summer 2015 cruise on Carson with Cornwell group)
- Post-storm sampling (synchronized with Sanford group; *still waiting for storm...*)

Today:

- Grain size and short-term sedimentation in reservoir – May, July, September, December 2015
- Grain size and short-term sedimentation in upper Bay (August 2015)

Quick primer on ^7Be

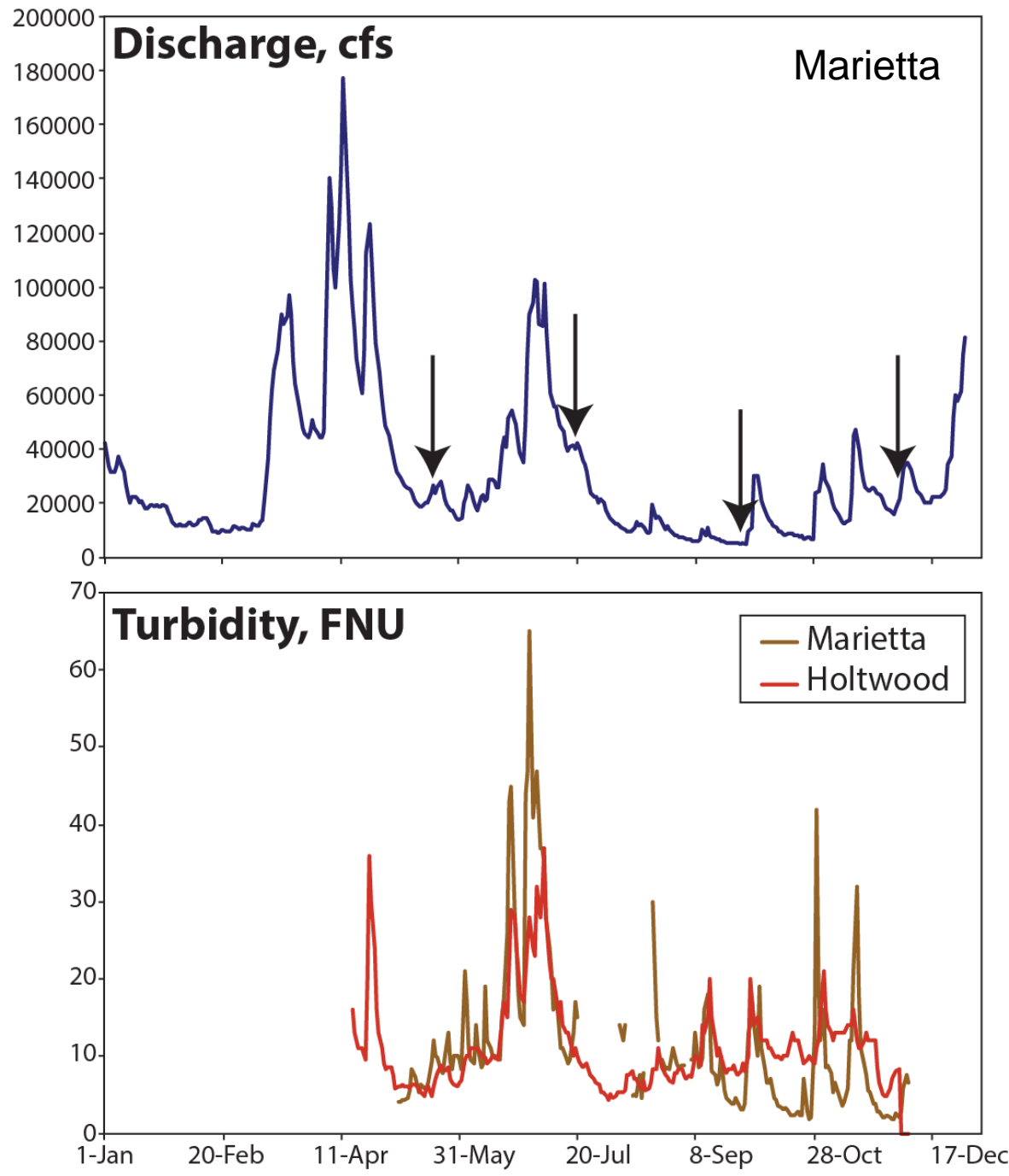
- Produced in atmosphere; delivered to the surface mostly by rainfall, where it attaches to particles on land
- Half-life 53.3 days; assumed limit of detectability 4-5 half-lives (~250 days) and mean lifetime 77 days
- Inventory = how much “new” watershed sediment is present at a specific place at time; decay-correct between consecutive samplings



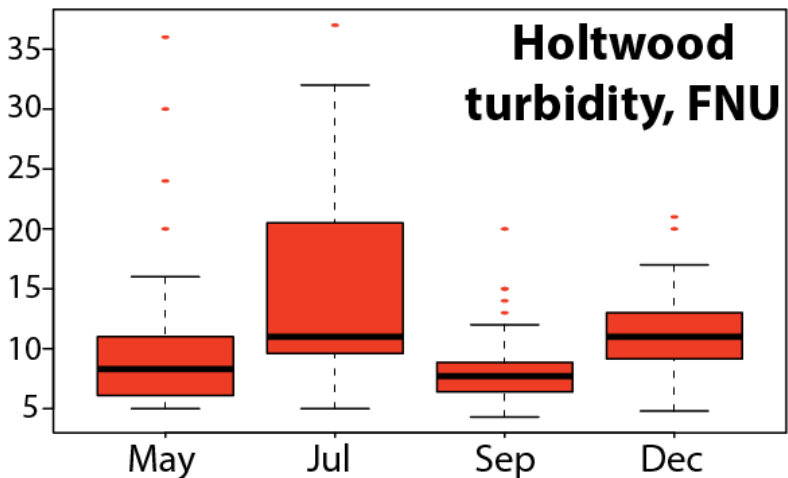
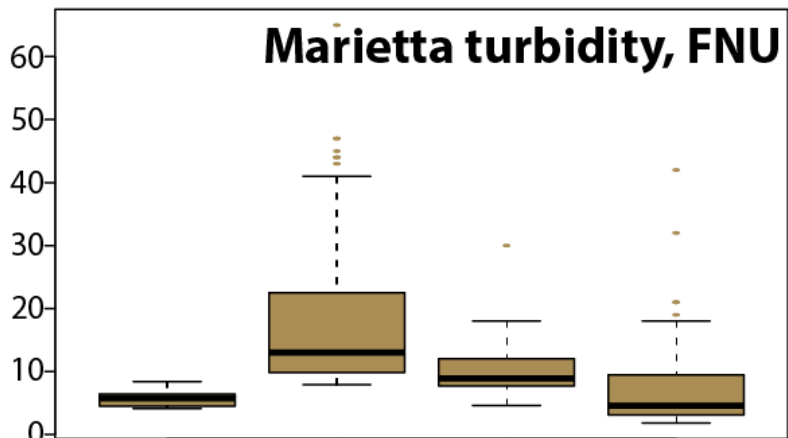
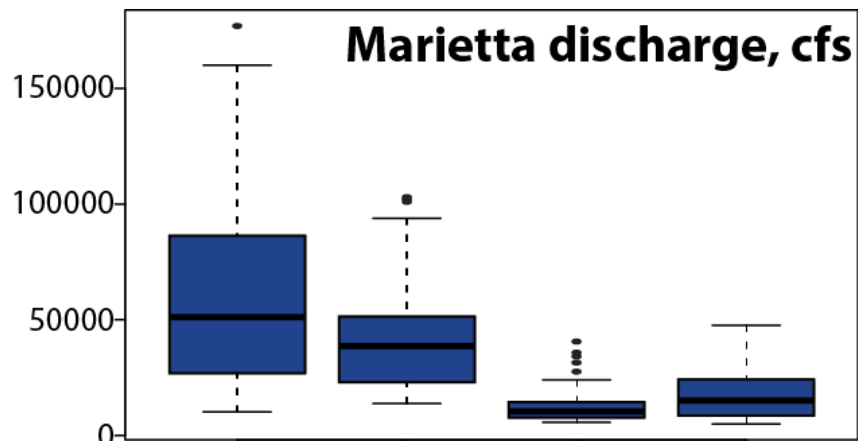
River discharge and turbidity

Data from USGS online portal for 2015

- Arrows indicate sampling dates
- Turbidity data unavailable for most of time before May sampling
- Holtwood turbidity data end on the day of December sampling; Marietta record ends 4 days later



Bimonthly variability in river discharge and turbidity



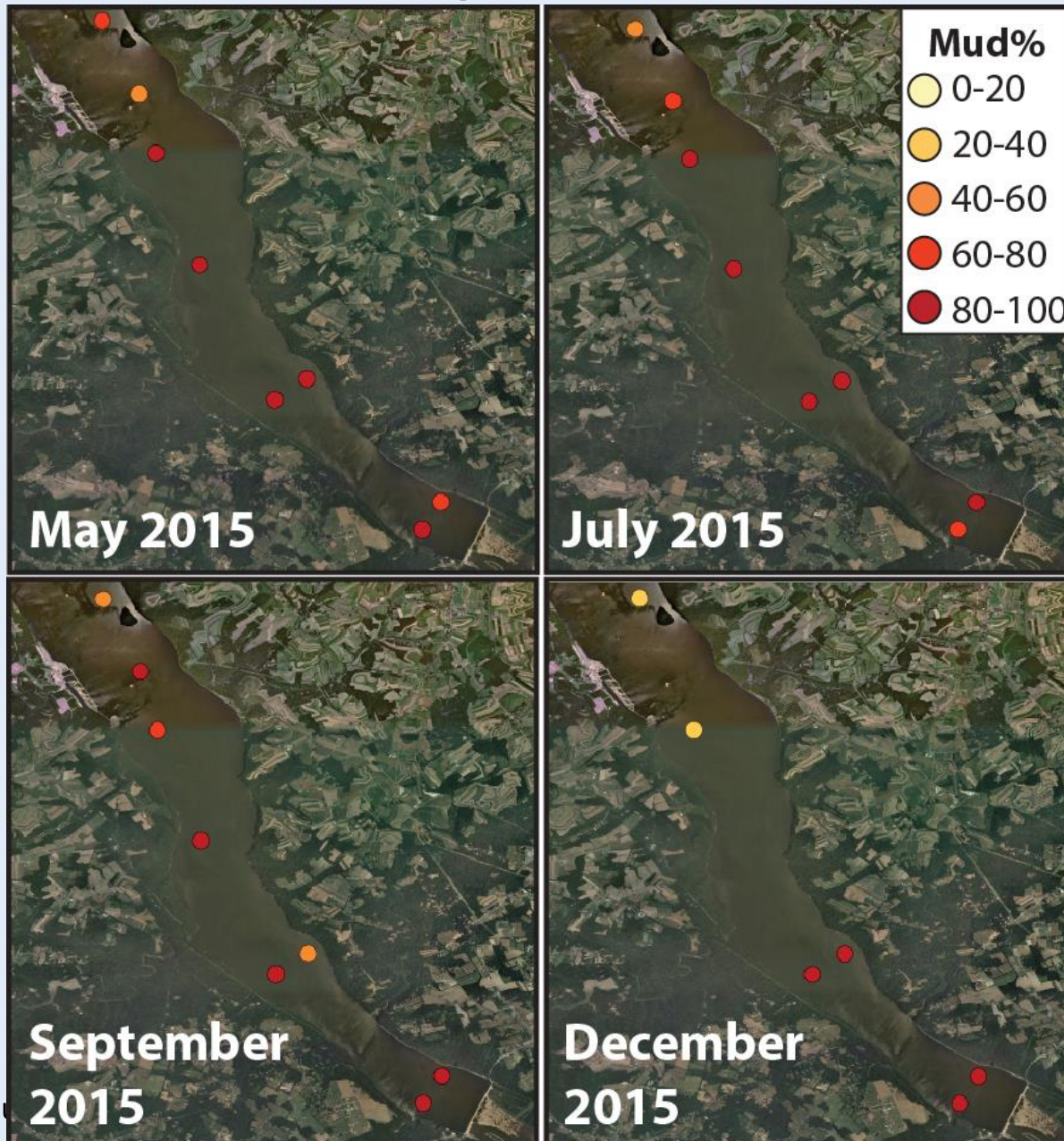
Box plots of values between sampling; May box includes values for 77 days (mean lifetime of ^7Be) before sampling

Note that May turbidity values offer incomplete picture of spring freshet

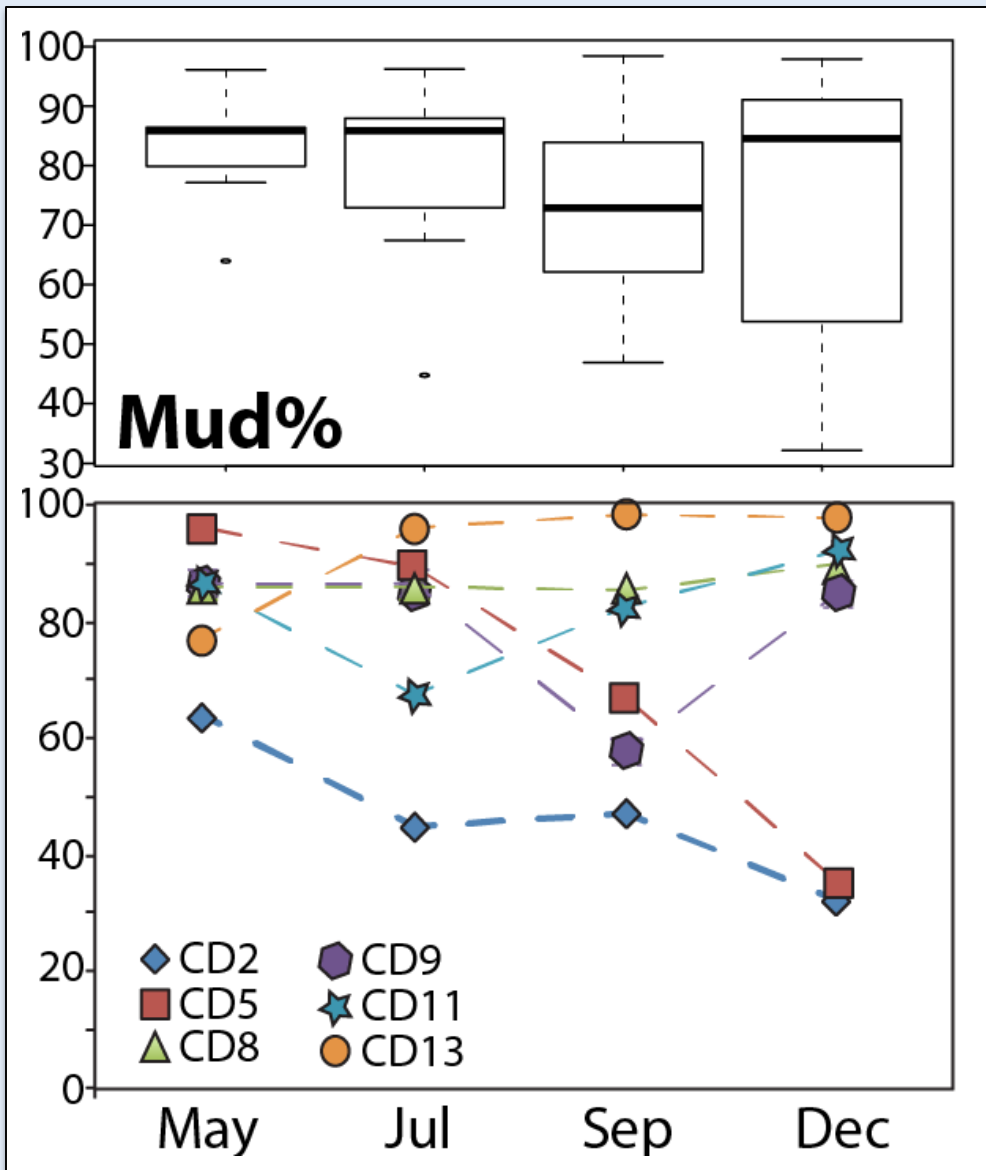
Discharge at Marietta highest in May, lowest in September; turbidity generally follows the pattern of discharge (disregarding May)

Sediment input thus assumed to be highest in May, lowest in September

Surficial sediment grain size in the reservoir

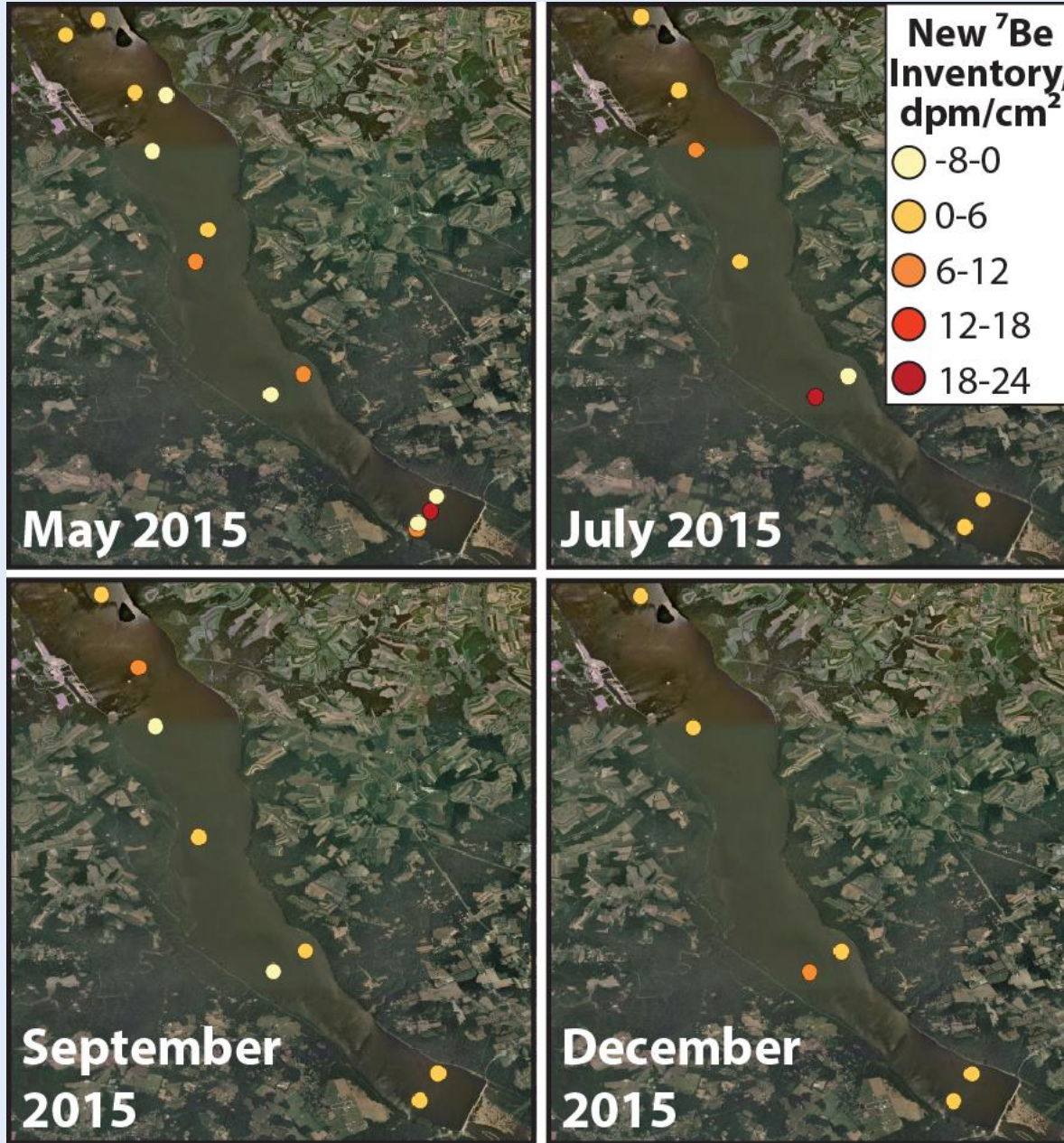


Temporal variability in surficial mud content



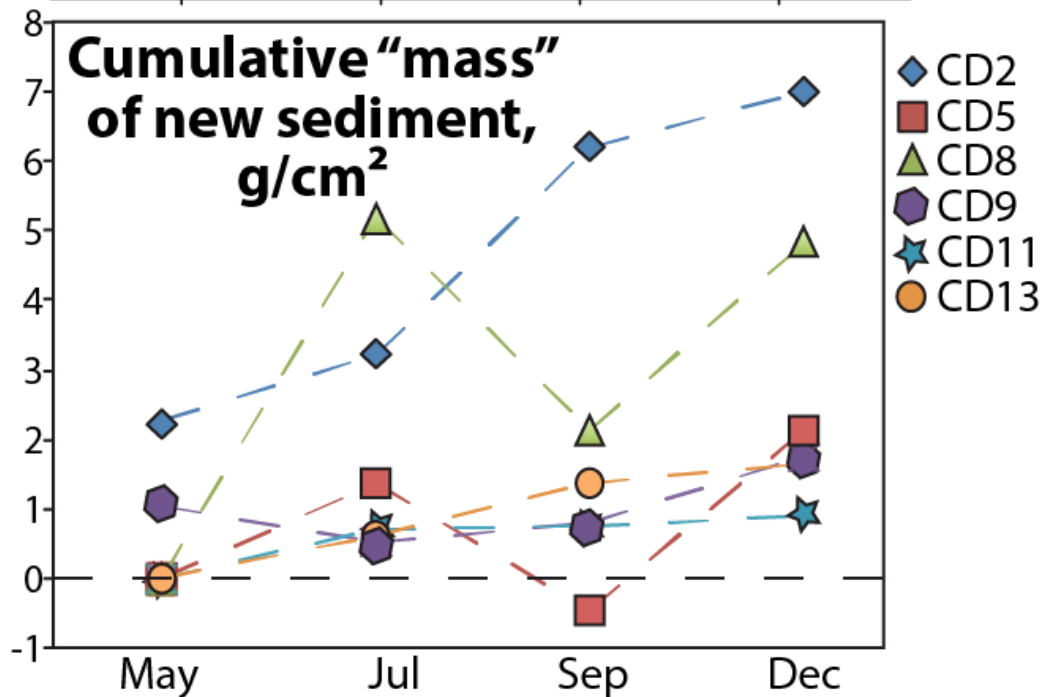
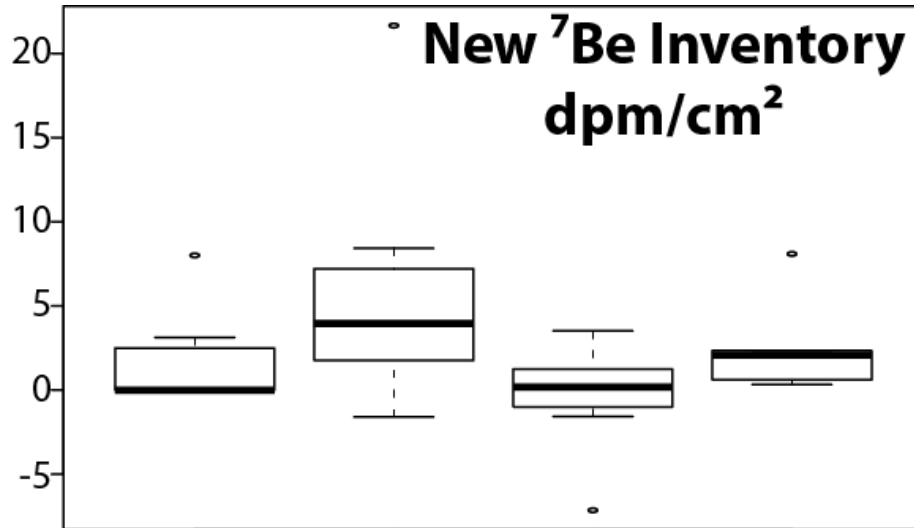
- Median similar in May, July, and December, but September much coarser
- Variability increases over time, toward coarser end of scale
- Surficial sediment coarsens over time at upstream sites (CD2, CD5); fines/is relatively steady at CD13, CD8
- Variable grain size at CD9 and CD11

^7Be inventories in the reservoir



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Temporal variability in “new” sedimentation



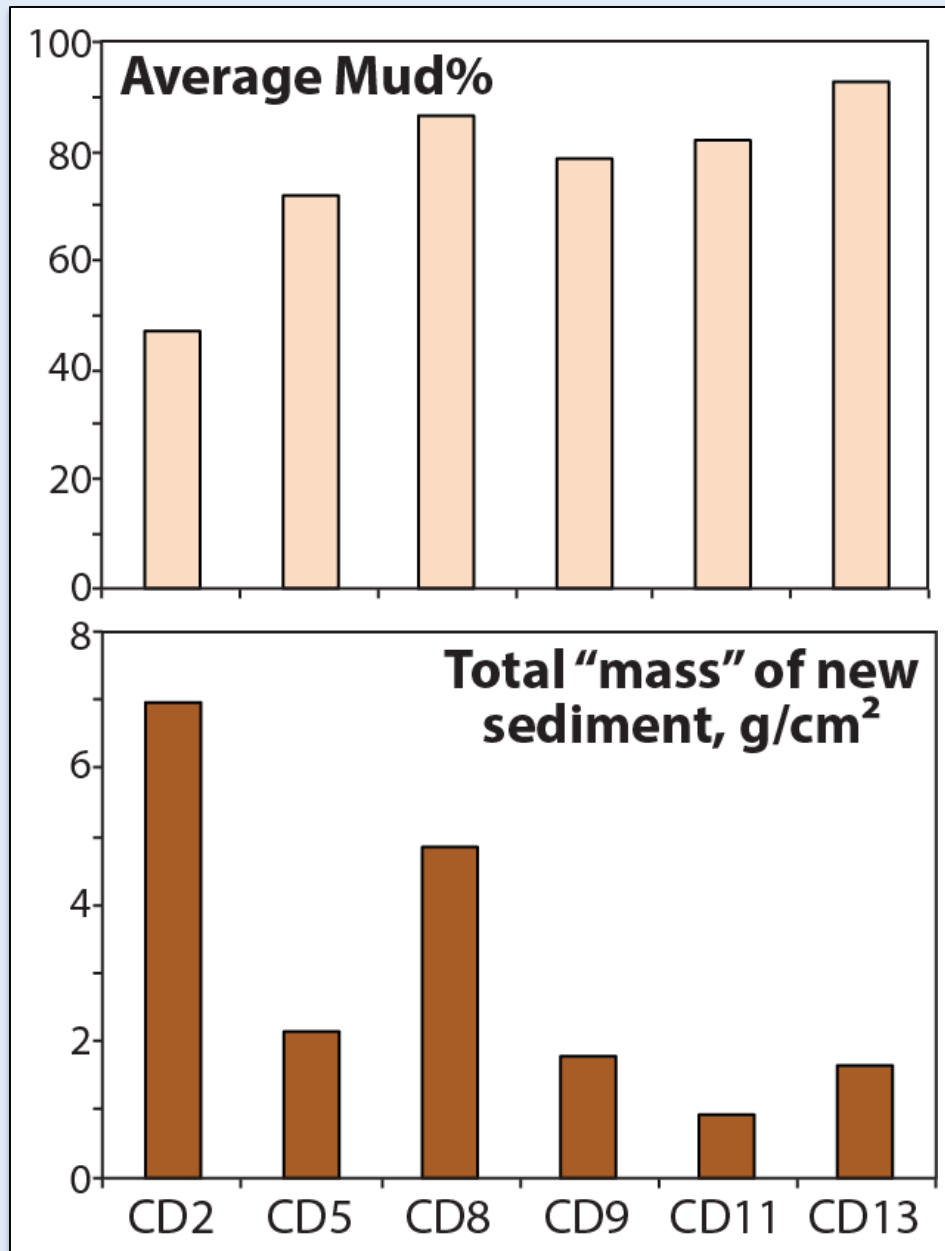
Median inventory is highest in July

Where is sediment from the April/May event? Upstream?

Trends at individual sites are highly variable!

- CD2: consistent deposition of new sediment; shallower water
- CD5 and CD8: new sediment arrives in July, leaves in September (CD8 in channel)
- CD11, CD13: modest deposition; deeper water

Down-stream trends in the reservoir



Grain-size: downstream fining, as expected

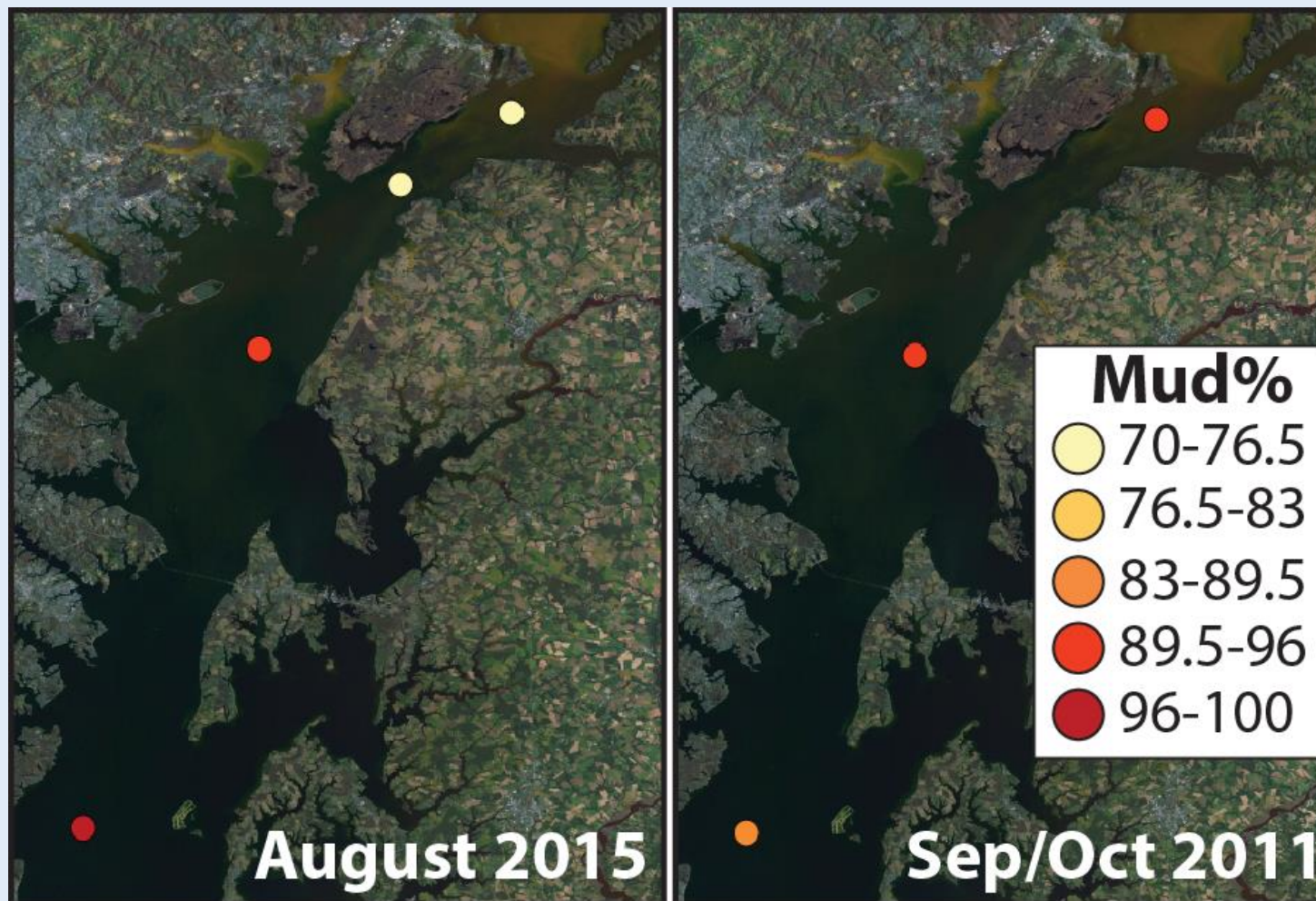
⁷Be: downstream reduction in new inventories

Reduction of inventories downstream could reflect reduced sedimentation and/or older sediment

Understanding trends at individual sites complicated – need to pull all data together

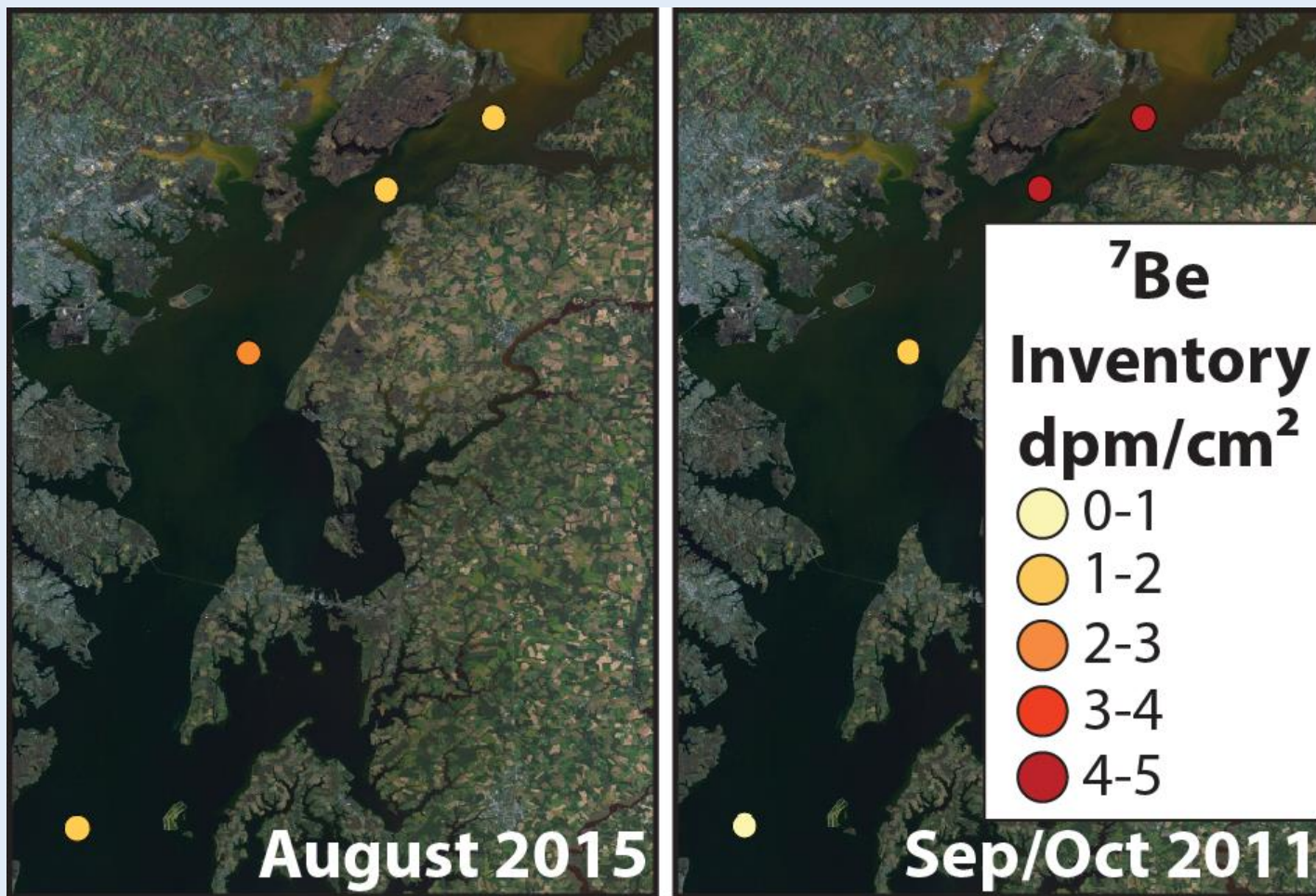
- Hotspot at CD8 may be related to temporary channel deposition/erosion

Surficial sediment grain size in the upper Bay



Sediment is coarser upstream in August 2015 than after TS Lee, but downstream sediment is finer

^7Be inventories in the upper Bay



Inventories are much lower upstream than after TS Lee and are more evenly distributed, with higher values at downstream sites

Summary

Broad pattern in the reservoir: upstream sites coarsen over time, and mud content of surficial sediment increases downstream; inventory of recent sediment decreases downstream. *Possible explanation:*

- Sediment initially deposits upstream and is subsequently transported downstream, so that sediment is older at the downstream sites
- Much variability in space and time!

“Missing” recent sediment in May – temporarily deposited upstream of coring sites?

Broad pattern in the upper Bay: ^{7}Be inventories are higher upstream of the Bay Bridge after TS Lee; inventories in a “normal” (i.e., absent major storms) year are more evenly distributed and perhaps higher downstream. *Possible explanations:*

- *Supply:* TS Lee sediment dominated by Susquehanna River input; “normal” Susquehanna supply more similar to that from other tributaries
- *Transport:* TS Lee sediment settled rapidly at mouth; “normal” sediment transported past this zone