MAPPING BOTTOM SEDIMENTS IN THE JAMES AND CHICKAHOMINY RIVER ESTUARIES, VIRGINIA

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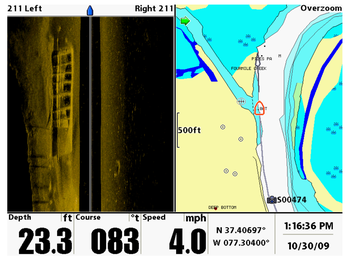
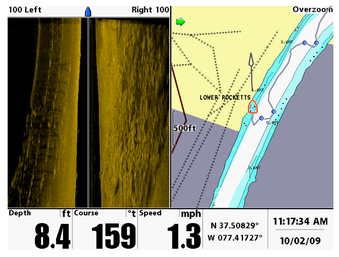
During 2007, the Virginia Division of Geology and Mineral Resources (VDGMR) began mapping bottom sediments in the tidal Chickahominy and James rivers in the Richmond and Williamsburg areas of Virginia as part of the STATEMAP program. Mapping was based solely on many small-volume grab samples. In 2009 VDGMR began using the Humminbird 1197c side-imaging sonar to enhance this mapping. Images on the laptop-sized CPU/monitor allow for differentiation between sand, gravel-cobbles, fluid mud, firm mud, mud and shell, and oyster reef. A split-screen option shows our location on a nautical chart. Interpreted images are simultaneously ground-truthed by grab samples. With a hand-sized transom-mounted transducer on a 17' boat, we are able to navigate in water as shallow as 2 feet and rapidly traverse the map areas.

In the tidal Chickahominy and upper James, sediment in the channel thalwegs are typically sandy or gravelly, however in the lower James, the bottom of the central channel is composed of black, organic-rich muds. Bottom sediments adjacent to marsh or swamp are muddy, but when adjacent to cliffs, they are sandy/gravelly. In places, Pleistocene or Cretaceous sand and gravel or the marine Eastover/Yorktown sediments are exposed on the bottom and indicate scouring conditions. Near Jamestown Island, sand waves show movement upstream and appear to fill the dredged Goose Hill Channel. The delineation of bottom sediments is useful in defining faunal habitat and potential subaqueous economic resources such as sand and gravel. I thank Jack Travelstead of VA Marine Resources Commission and David Stanhope of VA Institute of Marine Science for loan of equipment and technical advice. Thanks also to Lee Bristow, Curt Romanchok, and Meghan Lamoreaux for field assistance.

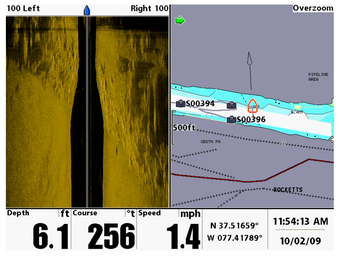
Wreck on muddy bottom, upper James River



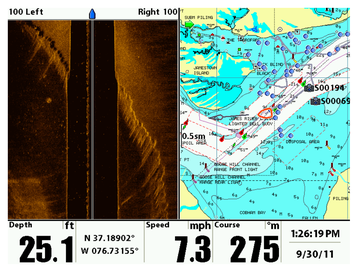
Pilings, gravel, boulders, upper James R.



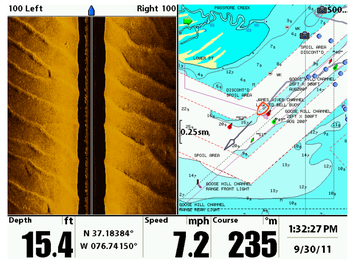
From sand to gravel, boulders, upper James R.



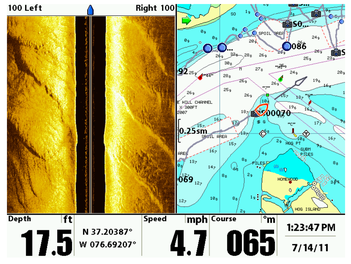
Dredge swath in mud



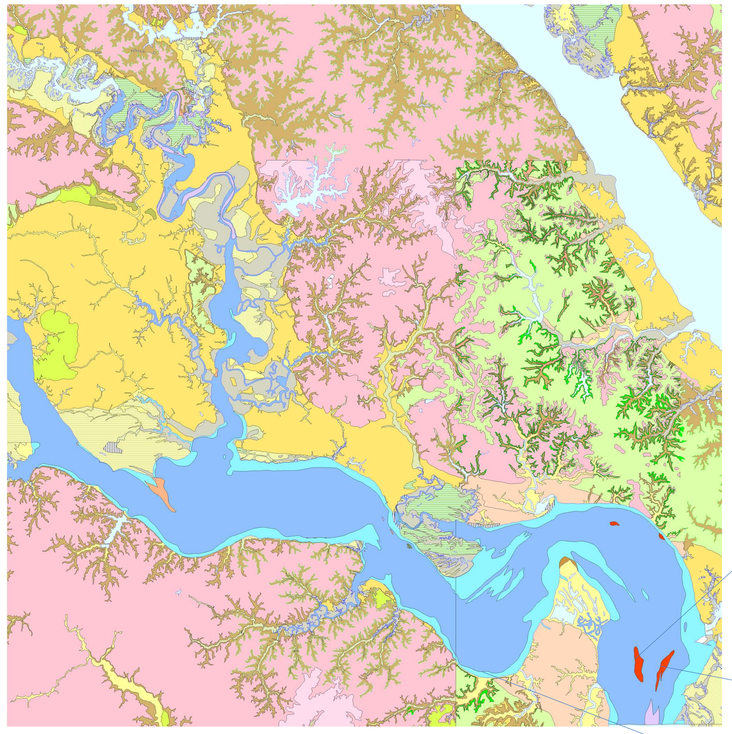
Upstream-facing sand waves



Upstream-facing sand waves



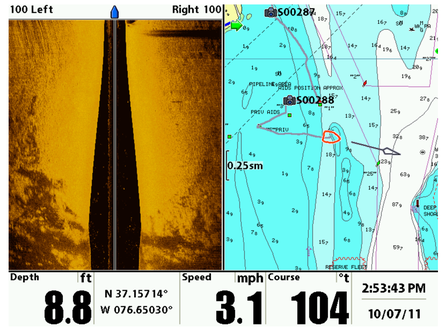
Portion of the geologic map of the Williamsburg 30- by 60-minute quadrangle, Virginia (in progress)



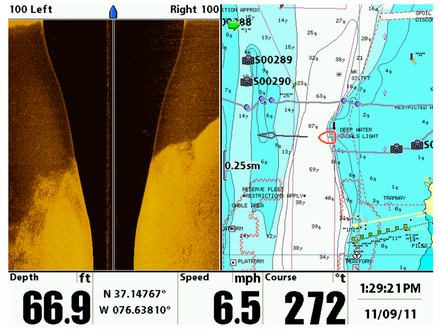
Explanation of bottom sediment mapping units

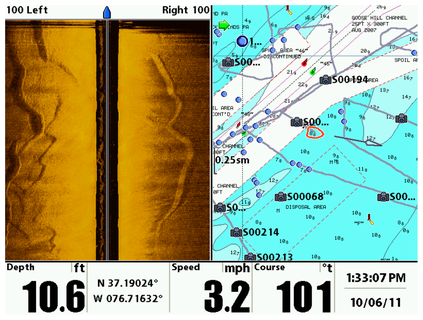
- sh **Shelly Bottom Sediments** Primarily fossil and modern shell (*Rangia*) shell fragments with some sand
- oy **Oysters** Live and disarticulated shells with sand and/or mud
- peat **Peat** Decomposed wood and plant material, includes roots of marsh plants recently submerged
- om **Organic Mud** Organic-rich clay and silt; black, dark gray or dark brown; fluid and soft
- bs **Brown Sand** Fine- to coarse-grained sand, brown to yellow; contacts that shift with time are shown with a zig-zag pattern
- gs **Gray Sand** Fine-to Coarse-grained sand with granules and minor amount of organic material; light to dark gray
- sg **Sand and Gravel** Coarse-grained sand, granules, pebbles, brown to yellow

Passing from mud to oyster shell (reef)

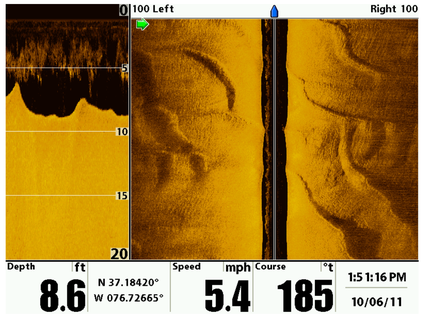


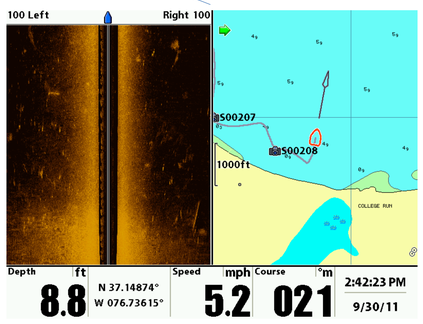
Passing from sand and oyster shell to mud



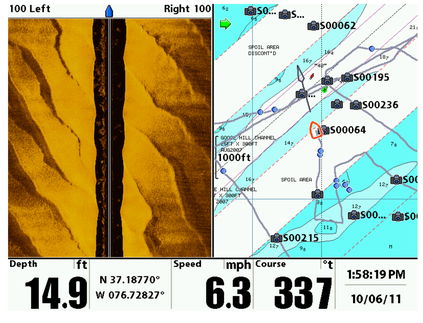


Field of sand waves (above) with 1.5-3 ft. amplitude (below)





Passing from sand to mud (above)
Sand wave field (below)



Humminbird 1198c sidescan sonar monitor, GPS antenna, and transducer mounted on a 17-foot Boston Whaler. Note that the transducer can be lowered 6 inches to "see" below the engine.