Virginia Water Resources II VPS Video Transcript

>>JESS JOZWIK: Hundreds of dead fish wash up on shores, they’ve been known to cause illnesses in humans or pets, and the tourism industry is really hurt by the beach closures. Harmful Algal Blooms are a serious problem for this area and we need to learn a lot more before we can really fix it.

Each august, there are huge amounts of algae in our rivers. When you have perfectly manicured lawns, all that fertilizer runs off. That, vehicle emissions, agriculture runoff, all these different pollutants wash nitrogen and phosphorous into the water, creating breeding grounds for different types of harmful algae.

It’s hard, we try to monitor the blooms, but there’s only so much we can do from the ground. We have some fixed water quality testing stations, and we take a boat out to test other areas of the water, but without a bird’s eye view of the bay, we really don’t know what else we’re missing.

We have access to airplanes and occasionally fly over the bay to find the areas that are being severely affected, but those are expensive.

What we really need is a cost effective way to routinely see the whole area at once and to be able to see where these blooms are occurring. Once we know that, we can send out boats to specific areas we know are affected, and conduct our testing there. We won’t be on this wild goose chase of sorts, hunting these Harmful Algal Blooms across a large stretch of water.

>>JESS JOZWIK: Our study area is comprised of Virgina’s Lower Chesapeake Bay, including Mobjack Bay, the James River, the York River, and the Elizabeth River.

>>JESS JZOWIK: NASA and the USGS Landsat 8 Satellite currently orbiting the earth can give our partners both the scope and detail they need to see the entire bay AND see indicators of Harmful Algal Blooms.

Landsat 8 captures images of the earth. From these pictures, we can create true color images. Or, we can change what we see in these images by altering how we color them. Different objects in the image reflect different wavelengths of light. So by altering which wavelengths we see, we can look for things in the image the human eye couldn’t otherwise detect, like burn scars from a fire or chlorophyll concentrations.

We’ll be focusing on chlorophyll. Since it's present in algae, high concentrations of chlorophyll in the water can be used to indicate HABs in our study area.

With this knowledge, we developed a tool that enables our partners to use Landsat 8 images to see chlorophyll hotspots.

>>ARIKA EGAN: To begin, the user inputs raw Landsat 8 images. Since they’re only interested in the water, land pixels need to be masked. Any clouds in the image also need to be removed. In our python tool, a water and cloud mask is provided so the user can complete this step easily.

Next, the tool removes pixels which correspond to a water depth of 2 meters or less, as well as pixels corresponding to high sediment concentrations. Shallow water and high sediment concentrations tend to reflect more light, and can produce false positives when trying to identify chlorophyll hotspots.

Once all of this is removed, the tool calculates photosynthetic activity based on how much infrared and red light is absorbed by organisms. Next, the user applies a preconfigured color stretch to the image. Notice the areas in (red? Whatever color they end up being). Those are areas with high concentrations of chlorophyll a, and could indicate a harmful algal bloom. Users will be able to target these specific areas for water quality testing.

From start to finish, the tool will take in raw data and output a chlorophyll hotspot map.

>>JESS JOZWIK: This problem is larger than just our study area. The waters of the Chesapeake Bay Watershed sustain life for 17 million people. But the health of the Chesapeake Bay is severely threatened by pollution. In order to restore the Bay, we need to understand the biology of what is happening, and how we as humans impact it. With this tool, researchers can better direct their time, energy and resources to specific areas affected by harmful algal blooms. In learning more about the blooms, researchers can inform policy makers and the public, and together communities can find solutions to the problem.