

Esri UC Talking Points

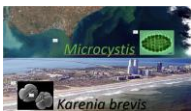


- Harmful Algae Blooms (HABs)
- Rapid growth, “blooming” of toxin producing algae



- They exist on every coast
 - Freshwater and marine species

Commented [1]: Combine for talk



HAB-OFS produces forecasts for two toxin forming species:

Karenia brevis

- “Red tide”
- Marine species, prevalent in the Gulf of Mexico.
- Gulf of Mexico

Microcystis

- Freshwater, scum forming species, prevalent in Lake Erie.

Background

- Landsat of Lake Erie showing scum along Point Pelee and the Ontario coast
- Florida coastline with a bloom of *K. brevis* just offshore - discolored water.



IMPACTS

- Gulf of Mexico
 - Dead fish - noxious smell
 - Commercial and recreational shellfish closures
 - Beach tourism impacts
 - Pulmonary distress to those pre-disposed
- Lake Erie

- Toxic in drinking water - LE intakes
- Mild skin rash to kidney and liver failure
- Pet mortality
- Mixing!!



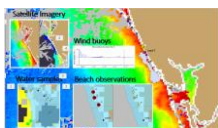
So, what do we do? - IMPACT DRIVEN

- Talk more about what the impacts do vs. what the toxin is.
- Mention ER impacts
- Gear it towards the numbers vs. the mechanism
- Tourism - estimated losses between 15-20 million dollars each decade.
- [Use these!](#)
-



Produce forecasts with ArcGIS

- This is the *most efficient* way to help mitigate impacts - reduce those stats.
 - Primary audience are public health officials, natural resource management (shellfish and wildlife) - most meaningful impacts.



Gulf of Mexico - Analysis

- MODIS Satellite imagery
 - Moderate Resolution Infrared Spectrodiometer
 - Pinpoints bloom location through remote sensing
 - Chlorophyll surface chlor_a concentrations
 - Winds
 - Samples
 - Cool colors = low concentrations
 - Warm colors = high concentrations
 - Ensemble imagery
 - **spectral shape analysis** → **Ensemble anomaly**
 - Helps to refine where K brevis is

Commented [2]: Add HABHRCA language

Commented [3]: Add HABHRCA language

- Water Samples
 - By category
- Beach Observations
 - Dead fish
 - Respiratory irritation
- Wind Buoy data



Forecasts

- Respiratory irritation
 - GIS Infrastructure uses ArcPy code to import
 - Hourly wind forecasts from National Digital Forecast Database (NDFD)
 - Pulling in wind forecasts, using GIS to make it spatial.
 - Be explicit on the types of information GIS is assimilating to make a forecast.
 - Pair with a base map - half country boundaries
 - Sort the highest concentration sample per region
 - Attach a respiratory irritation forecast level by
 - Incipient vs. Ongoing bloom conditions
 - Below 50,000 cells/L - or - above
 - Analysts can interact with each forecast region
 - Export as a csv of daily analyst forecasts

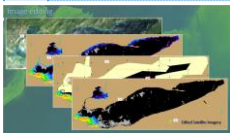
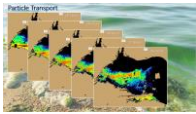


Image Editing

- True color Sentinel imagery
 - Cloudy!
- Chlorophyll indexing
 - Applying a color based on density of chlorophyll at the surface
 - Clouds create erroneous pixels
- Polygons
 - Used to remove erroneous pixels
 - Convert these features to graphics
- Edited Imagery
 - Toolbox converts graphics to features

Commented [4]: Place holder for GOMX toolbox slide

- Erroneous pixels to black
- Creates a clean image, representative of the bloom for transport



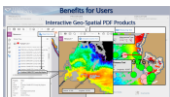
Particle Transport

- GNOME - General NOAA Modeling Environment
- Each pixel left behind is paired with forecast winds and surface currents to move particles over a period of days.
- Specifically important for transport of surface scum.



Recap

- **TIME SAVING!!!! We are an operational shop.**
- Shapefiles with partner data
- Satellite imagery as tifs
- Modeled data - geojsons
- Research
- ArcPy toolboxes
- HAB Team analysis
- Geo-referenced PDF



What are the benefits for users?

- Interactive geospaital PDFs
 - Object data tool
 - Users can visualize daily forecasts by region
 - Measuring tool
 - Users can measure the distance of samples from shore
 - Or the distance of an anomaly from a recent sample, etc.
 - Geospatial location tool
 - Pinpoint an area of interest with lat/long

Commented [5]: Place holder for LE toolbox slide.

- Especially important with LE due to proximity of scum to water intakes.



Integrating future technology

- II Flexible infrastructure
- User requirements fuel future developments
 - Adaptability of toolboxes
- Near real-time data
 - IFCB
 - ESP
 - HABscope
- HABTracker
 - Bloom transport
 - Forecast of wind speed and direction
 - Recent samples
 - Wave/mixing - tie into
- Hopes to use all this as we move towards an **interactive web map**

Jackie's thoughts

Our bulletin generation process has been partially automated thanks to the integration of python and ArcGIS. Our developers created custom **geoprocessing tools** within our toolbox.

Analysts review incoming data from various sources. Based on their subject matter expertise, analysts are able to filter out false positives and artifacts. Analysts then store data into a directory that is recognizable to the python script.

Lake Erie

Image editing:

Analysts use GIS to edit raster data. False positives and cloud-cover artifacts can be eliminated from tif files using a modified edit image geoprocessing tool made by our developers. Tif files can also be merged together using a modified clip and merge raster function

Create Bulletin:

Using ArcGIS templates designed by the HAB team, this tool converts CSV files into shapefiles, which are displayed as layered data in various data frames throughout the bulletin. Named elements in the template are auto-populated with various metadata of the tif geojson and shapefiles.

Save Bulletin:

This tool saves the bulletin in a geospatial pdf, as well as a jpeg printed version of the file for an “at-a-glance” view of the new bulletin.

GOMX

Tool 1:

Python script works for different areas of GOMX based on configuration files. Configuration files include designated bookmarks for imported tif maps of the entire gulf of Mexico, and ensures regional wind buoy data gets ingested into the code.

Tool 2:

Does not involve ArcGIS capabilities at all, but for convenience sake we run a .CSV read and write script through the ArcGIS interface.

Tool 3:

Using ArcGIS templates designed by the HAB team:

The tool converts CSV files into shapefiles, which are displayed as layered data in various data frames throughout the bulletin. Named elements in the template are auto-populated with various metadata of the tif and shapefiles.

Tool 4: This tool saves the bulletin in a geospatial pdf, as well as a jpeg printed version of the file for an “at-a-glance” view of the new bulletin.

[What is geoprocessing?](#)