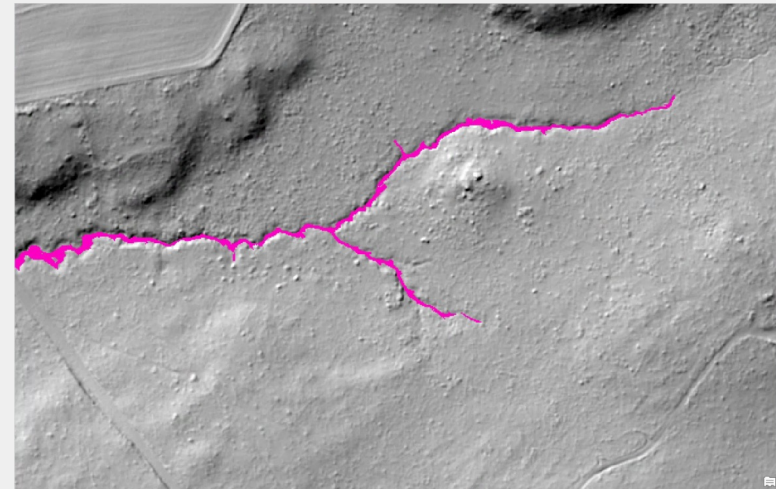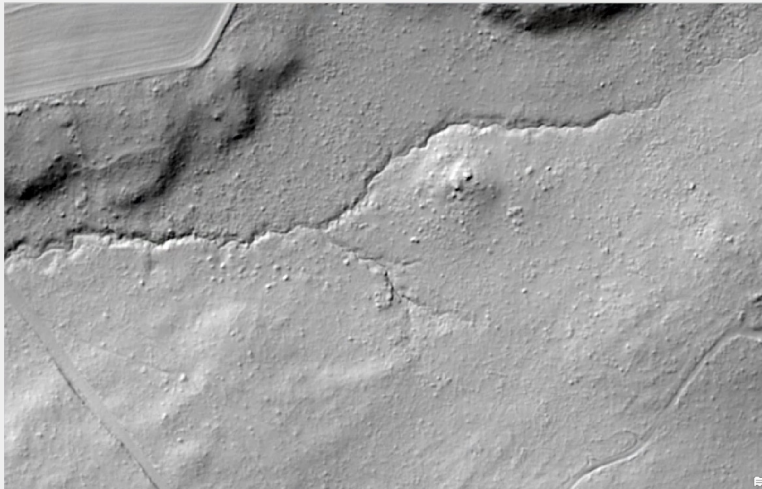# Objective 2: Hyper-Res Hydrography
LUWG Update

Matthew Baker, UMBC
David Saavedra, CIC
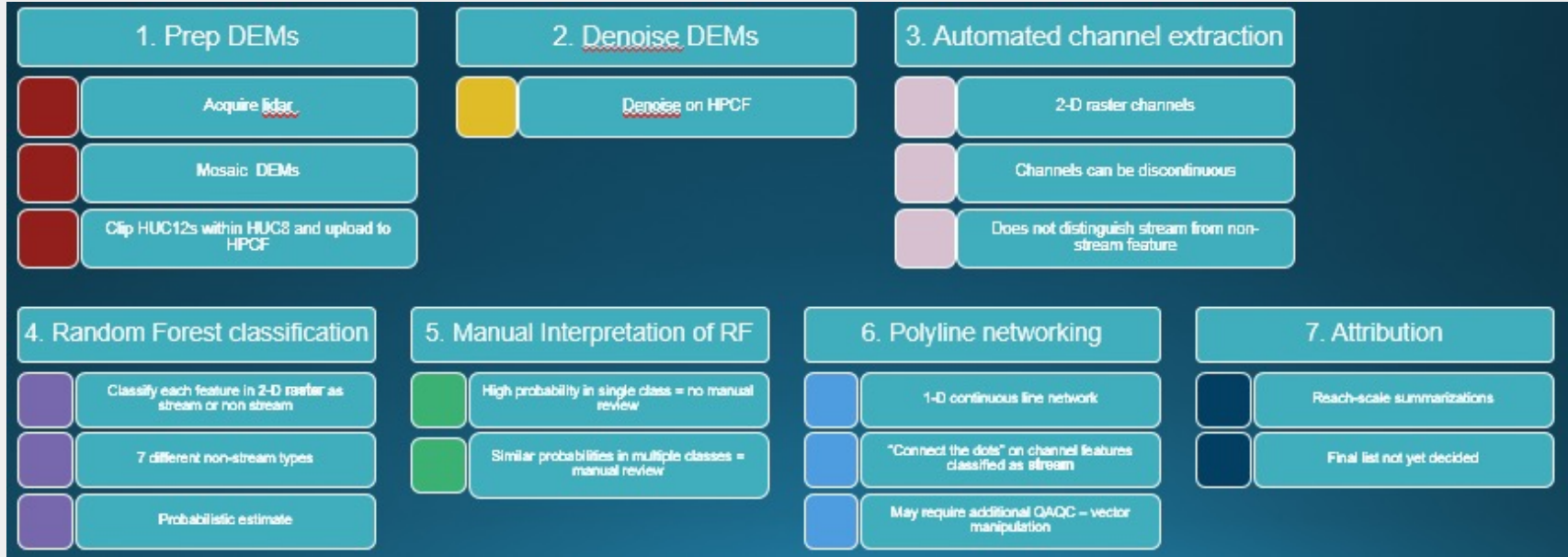Dec 1st, 2021

Overview

- Produce detailed, hyper-resolution hydrographic data for Chesapeake Bay watershed

- Data produced using LiDAR DEMs and a novel approach developed by UMBC and CC in 2017-18

- Automate procedure, improve refine process, update data as needed
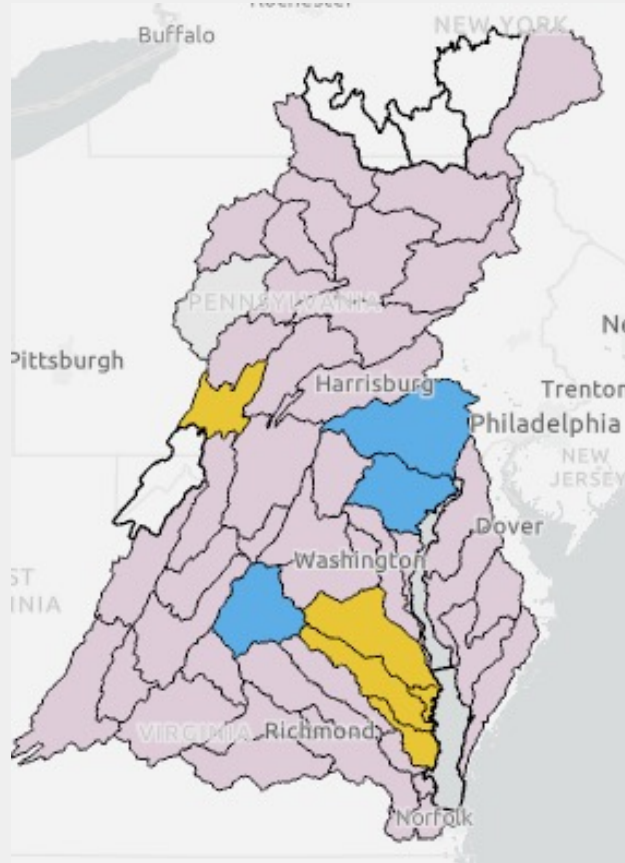
Process

- Reconfigured progress tracking to better reflect actual workflow, color coded to match progress map

1. Prep DEMs	2. Denoise DEMs	3. Automated channel extraction
Acquire lidar	Denoise on HPCF	2-D raster channels
Mosaic DEMs		Channels can be discontinuous
Clip HUC12s within HUC8 and upload to HPCF		Does not distinguish stream from non-stream feature

4. Random Forest classification	5. Manual Interpretation of RF	6. Polyline networking	7. Attribution
Classify each feature in 2-D raster as stream or non stream	High probability in single class = no manual review	1-D continuous line network	Reach-scale summarizations
7 different non-stream types	Similar probabilities in multiple classes = manual review	"Connect the dots" on channel features classified as stream	Final list not yet decided
Probabilistic estimate		May require additional QAQC – vector manipulation	

Progress

- Hired PostDoc Sept 22
- Continue initial channel mapping

  - Progress is being tracked here

  - https://cicgis.org/portal/apps/webappviewer/index.html?id=262ce838a60048e9a0f136d904639f66

  - New PA Lidar will complete remaining HUCs in PA, missing WVA and NY

Legend:
- LIDAR acquired
- DEMs Prepped
- DEMs Denoised
- Automated channel extraction complete
- Random forest channel classification complete
- Manual review of channel classification
- Polyline network produced
- Attributes added to polylines
- LIDAR coverage incomplete

Channel classification

- Random forest model classifies channels based on terrain characteristics, shape, land cover composition, and more

- Outputs probability of feature being a stream or something else

- Stream features are used to produce "blue line" maps. Non-stream features are retained, can be used for other analyses
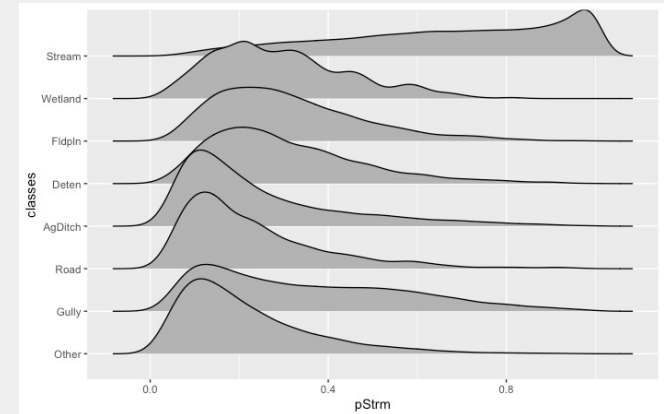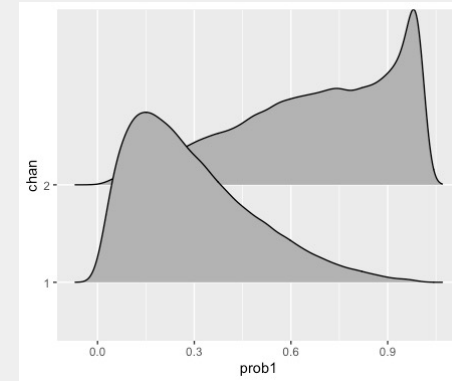
Non-stream classes

- Non-stream features (subject to change):

  - **Rill/Gully:** Often short, relatively straight (non-meandering), erosive feature. Often surrounded by low veg in LC, sometimes surrounded by tree canopy

  - **Ag ditch:** Long and linear, very uniform, surrounded by low veg in LC

  - **Roadside ditch:** Long and linear, uniform, occur near roads in LC

  - **Floodplain feature:** Oxbows, backwaters, secondary/remnant channels, meander scars, etc.

  - **Detention feature:** Ponds, swales, basins meant to store runoff. Often found in agricultural and developed areas

  - **Headwater wetland:** Small, often round or irregularly shaped wetlands near stream heads

  - **Other:** Feature not easily identified as one of the above or any other common fluvial feature

Attribution

- *Spatially-explicit* layers of channel width and bank height are produced automatically
- Spatially-explicit layers can be used for various applications
- Information would be lost in reach-scale summary
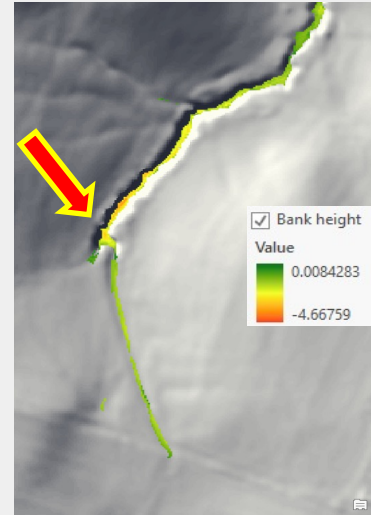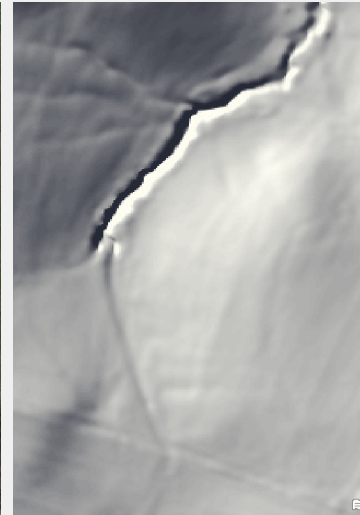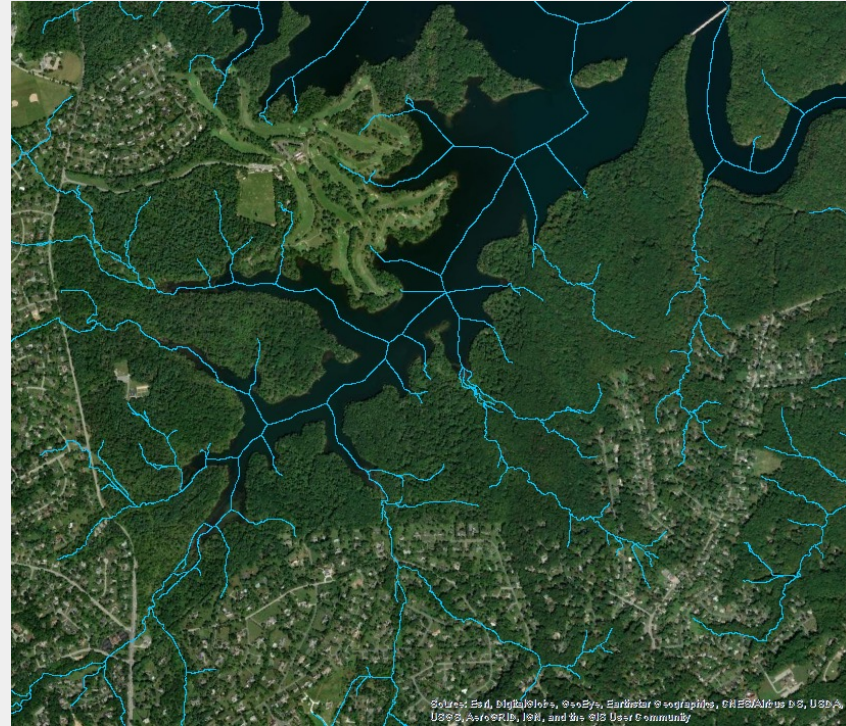

Example #1: Headcut identification

Blue Line Connection

- Consider challenges of
  - Man made vs natural features
  - Road crossings/Dams
  - Open water

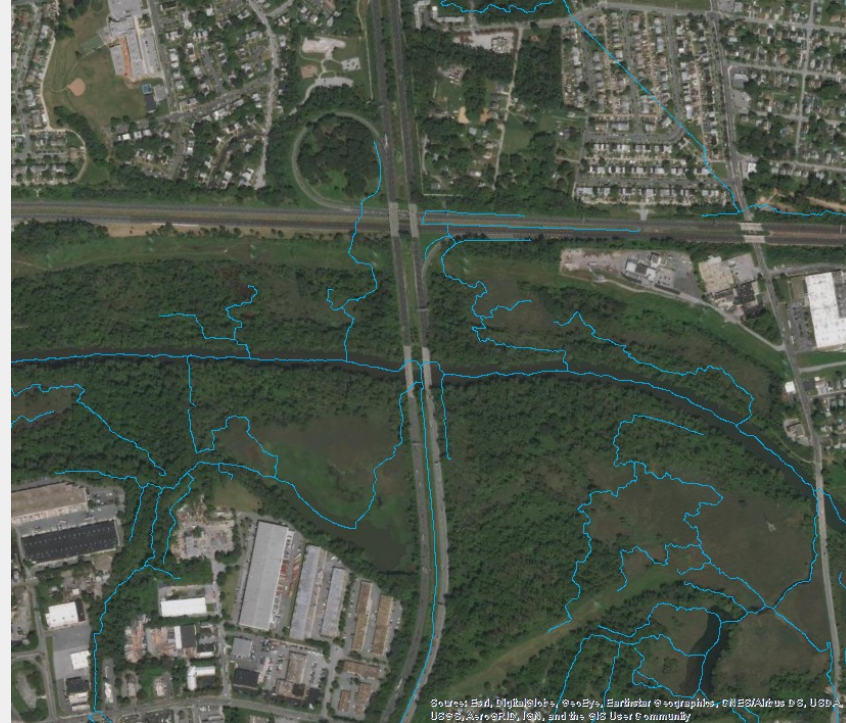- Bank height skeleton provides bread crumbs

Example #2: Loch Raven Reservoir

Blue Line Connection

- Consider challenges of

  - Legacies of human activity

  - Road crossings, bridges ditches, buried streams

  - Open water, wetlands

- Bank height skeleton provides bread crumbs

Example #3: Lower Patapsco River

Field assessment

- UMBC MS student **Nicati Robidoux**, Non-profit group **Friends of the Rappahannock** to conduct field assessment of stratified random sampled stream reaches

- Field data will include channel width, bank height, and presence/absence of flow

- Field data will be compared against desktop-based estimates

- Information gathered in field assessment will inform our approach bay-wide

Year 4 timeline

- Extraction Sept 2021
- Auto RF classification Nov 2021
- Auto attribution Nov 2021
- Networking Dec 2021
- Rolling "blue lines" Jan-Mar 2022
- Revisions to follow as needed (Delmarva and App Plateau)
- Ag/Roadside Ditches Jun 2022
- Flow permanence Jul 2022
- QAQC assessment Fall 2022