



TETRA TECH

Implementing a Healthy Watersheds Assessment for Maryland Tier II Waters



Nancy Roth, Brian Pickard, Mark Southerland, and Paige Hobaugh, Tetra Tech
Renee Thompson, USGS/Chesapeake Bay Program

Maintain Healthy Watersheds Goal Implementation Team



MDHWA Final Results and Next Steps - Renee Thompson, USGS – HWGIT
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Testing Predictive Power of Metrics

Built Random Forest models to assess
which watershed condition metrics were
the best predictors of stream condition



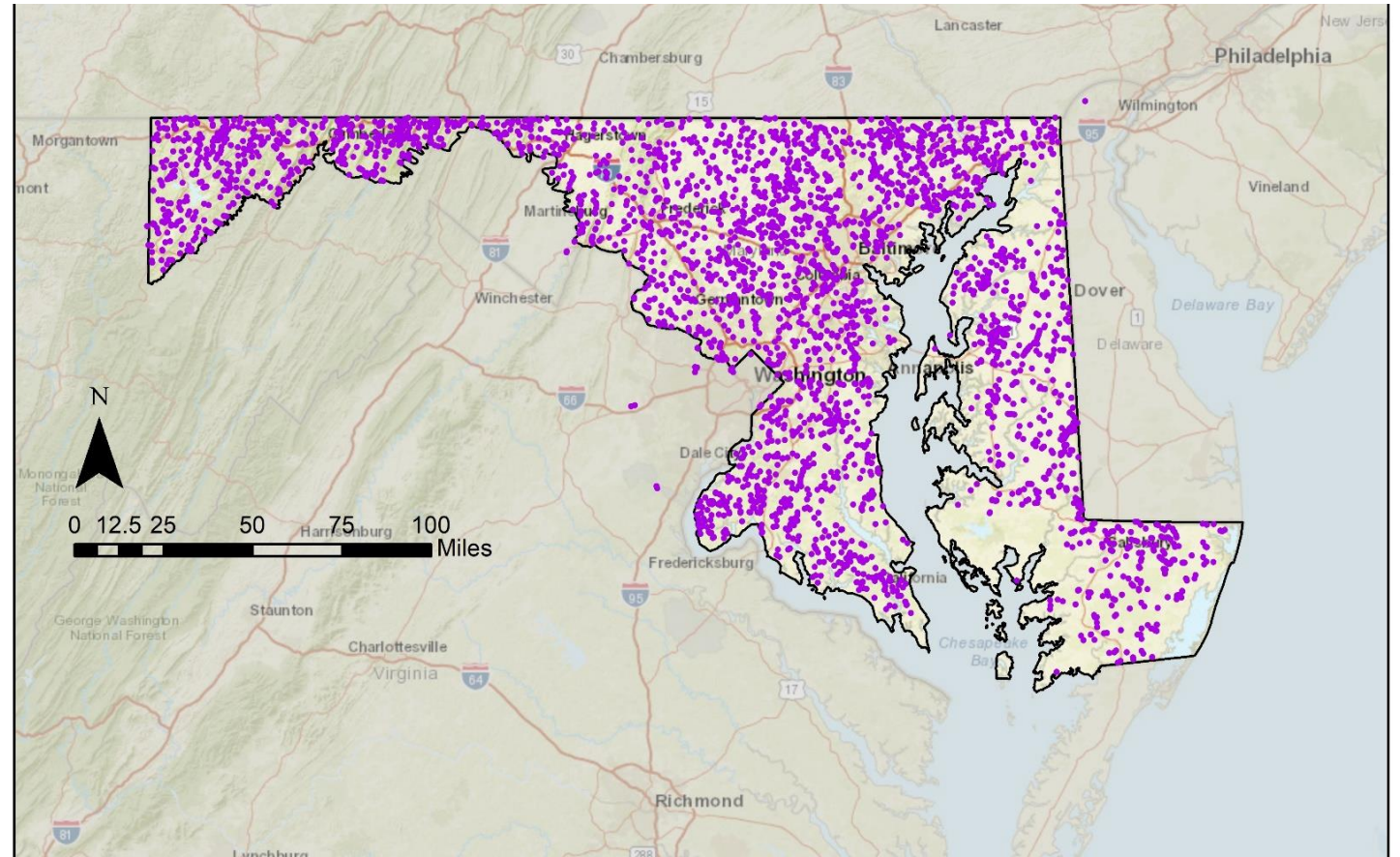
Maryland Biological Stream Survey

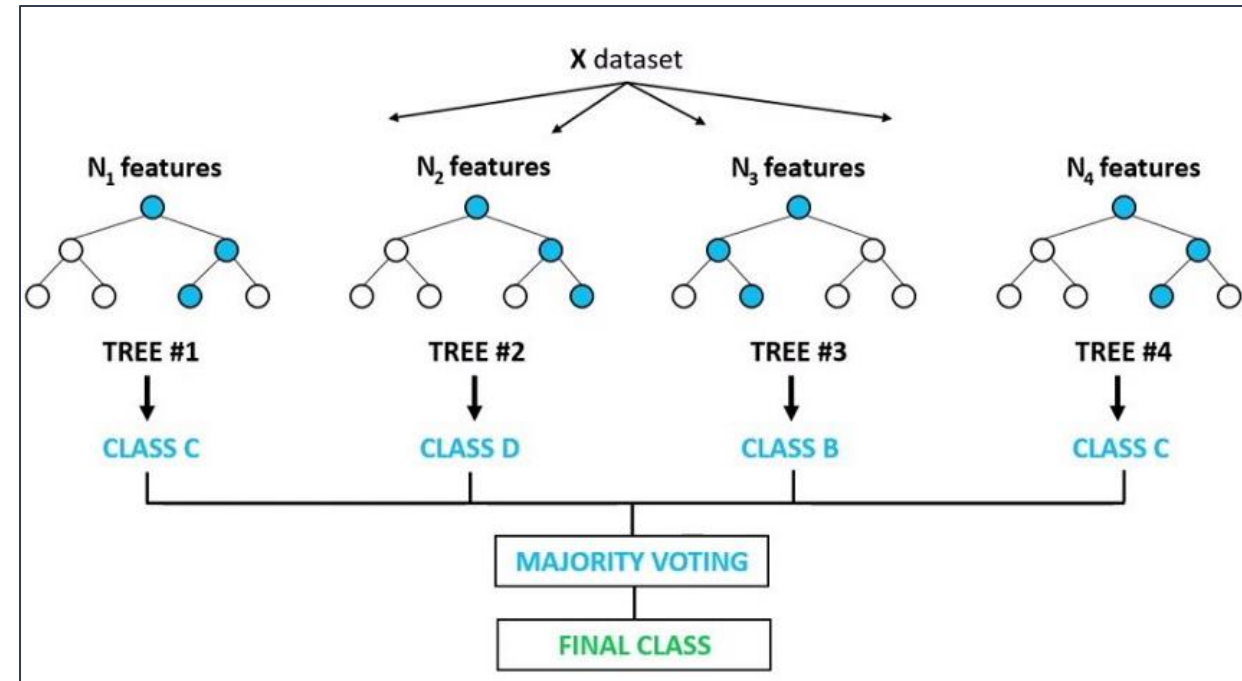
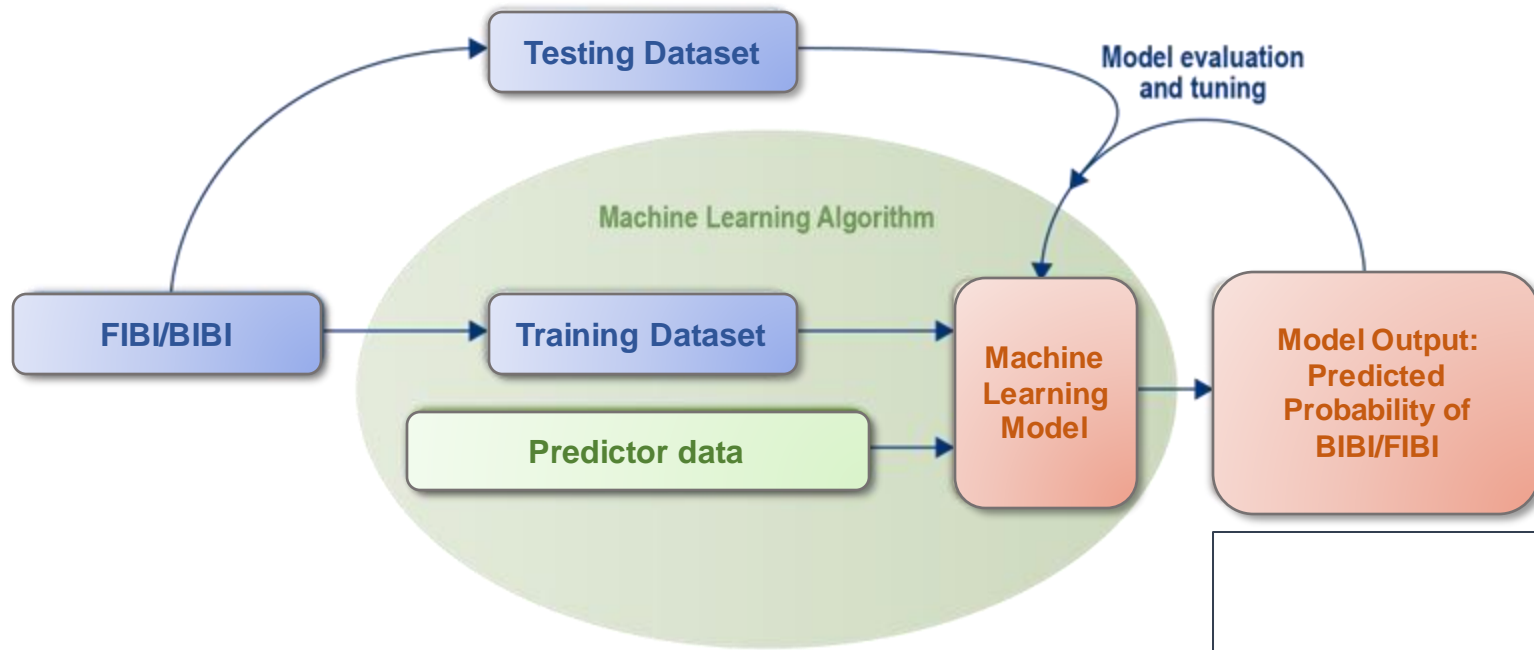
>5,000 samples since 1990s

Monitoring of non-tidal stream
communities – both benthic
macroinvertebrate and fish
Indices of Biotic Integrity (IBI)

IBIs as response variables

MBSS Sampling Locations



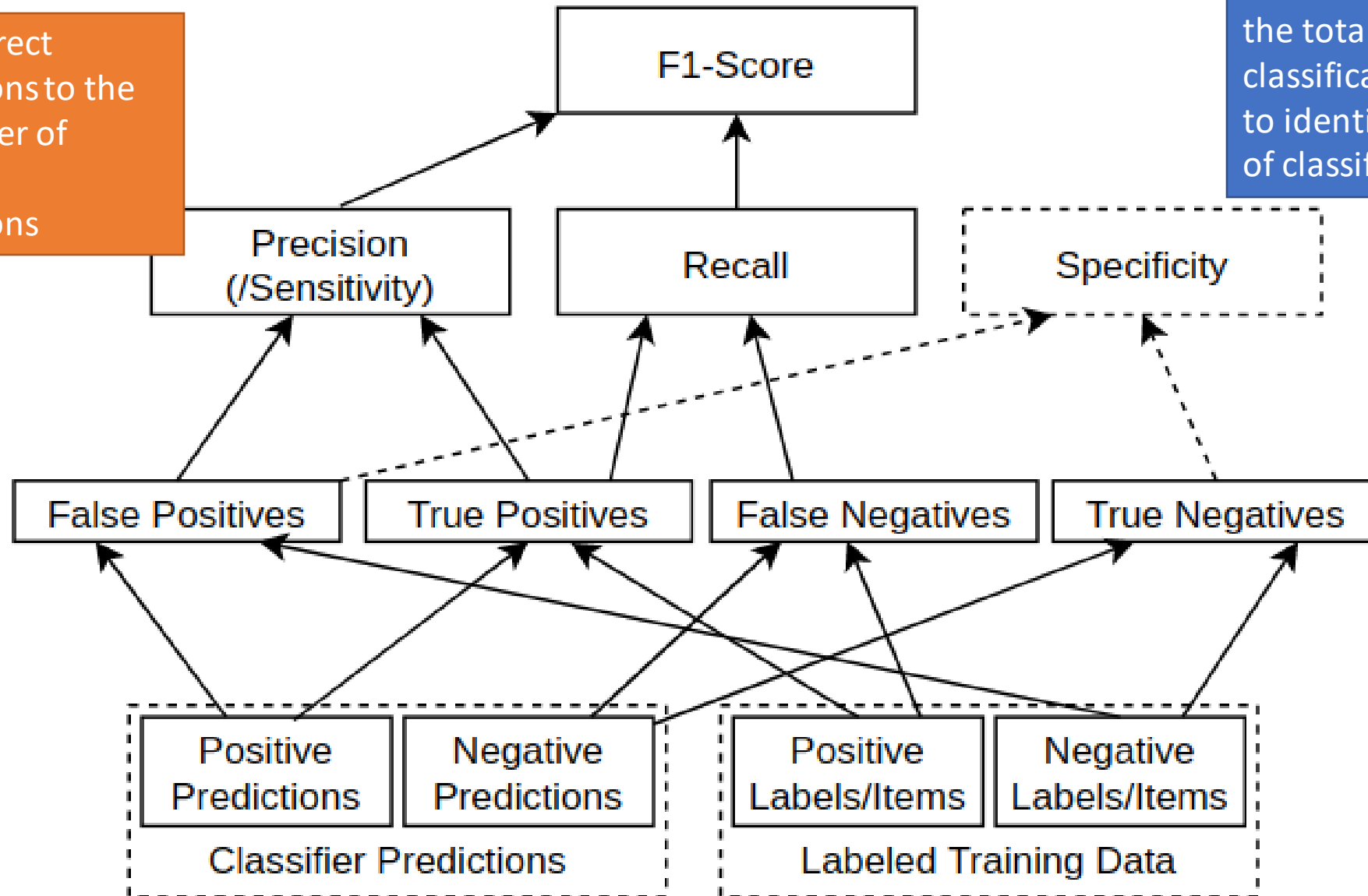


Random Forest
Model

F1 score is the harmonic mean of precision and recall and is intended as a balanced indicator of model performance.

Recall is the ratio of correct classifications to the total number of classifications and is used to identify the sensitivity of classification

ratio of correct classifications to the total number of predicted classifications

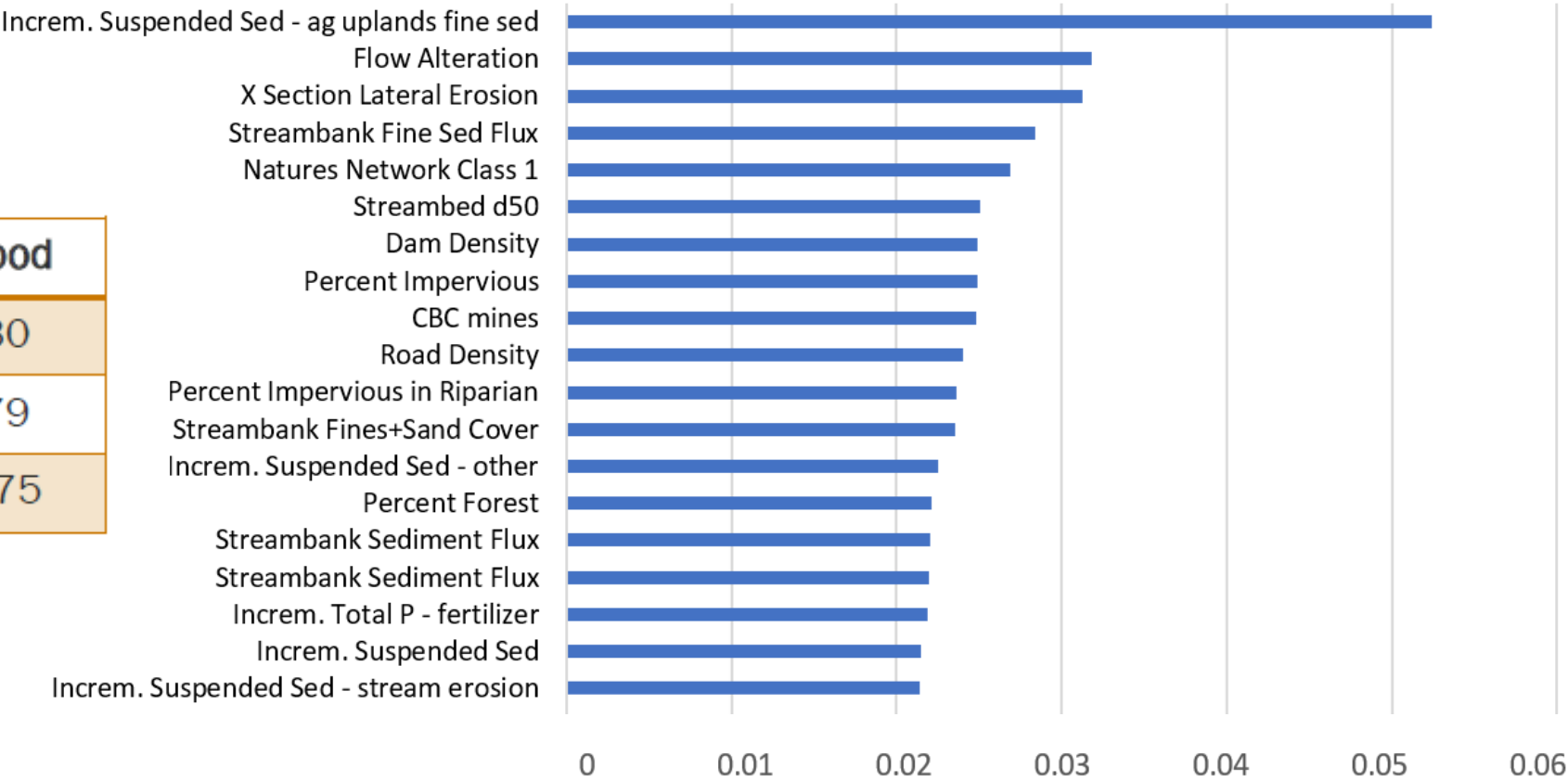


Preliminary Results

FIBI - Random Forest:
Accuracy: 0.65

FIBI Classification	Precision	Recall	F1-score
Poor	0.68	0.71	0.70
Fair	0.50	0.34	0.40
Good	0.66	0.79	0.72

FIBI feature importance plot



Predicted

Observed

	Poor	Fair	Good
Poor	203	22	30
Fair	75	89	79
Good	24	44	275

Preliminary Results

BIBI - Random Forest:
Accuracy: 0.62

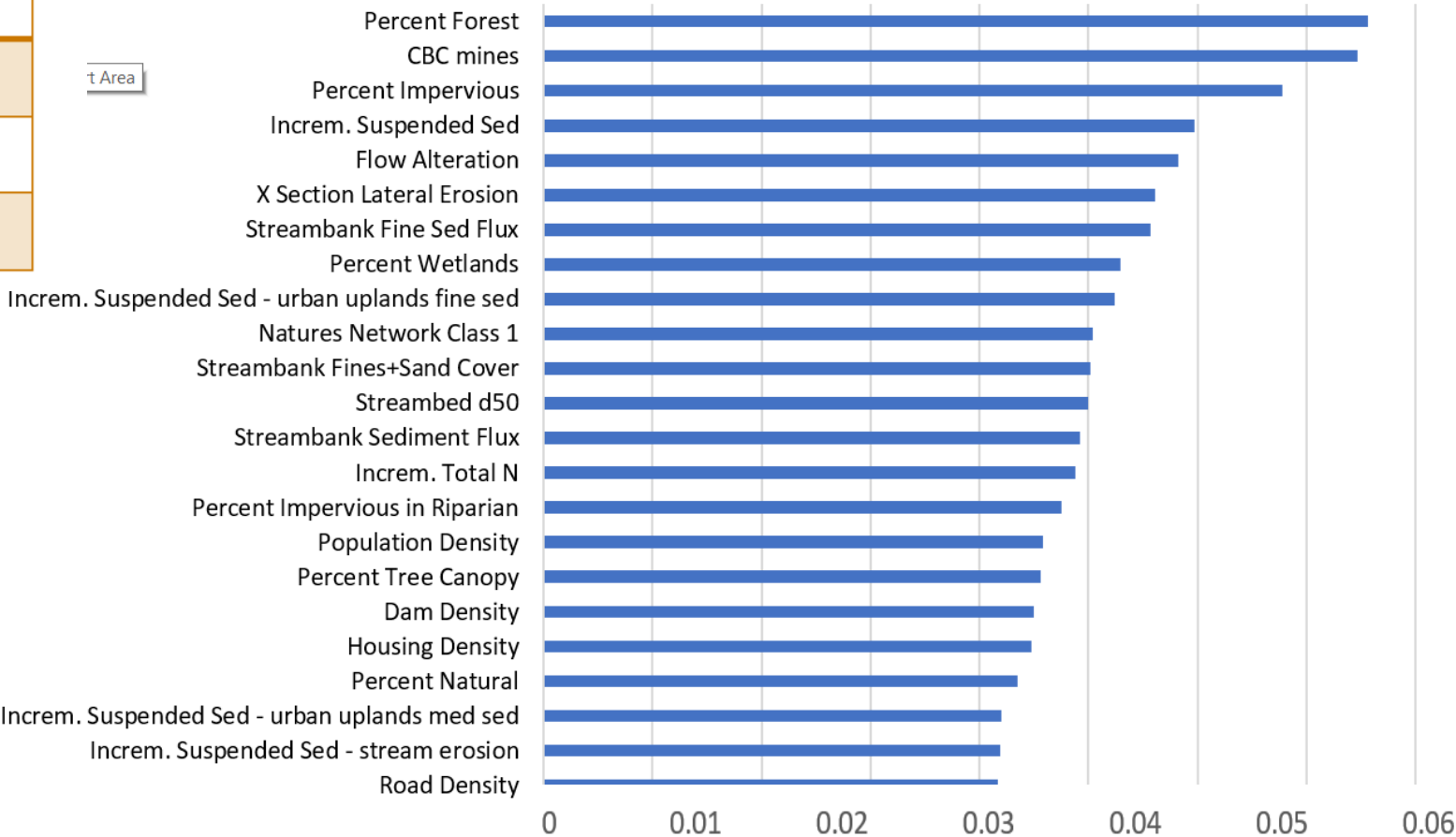
Observed

Predicted

	Poor	Fair	Good
Poor	279	45	32
Fair	83	73	71
Good	34	47	159

BIBI Classification	Precision	Recall	F1-score
Poor	0.69	0.78	0.73
Fair	0.38	0.32	0.35
Good	0.67	0.64	0.65

BIBI feature importance plot



Consistently Important Metrics

Streambank and Streambed erosion metrics

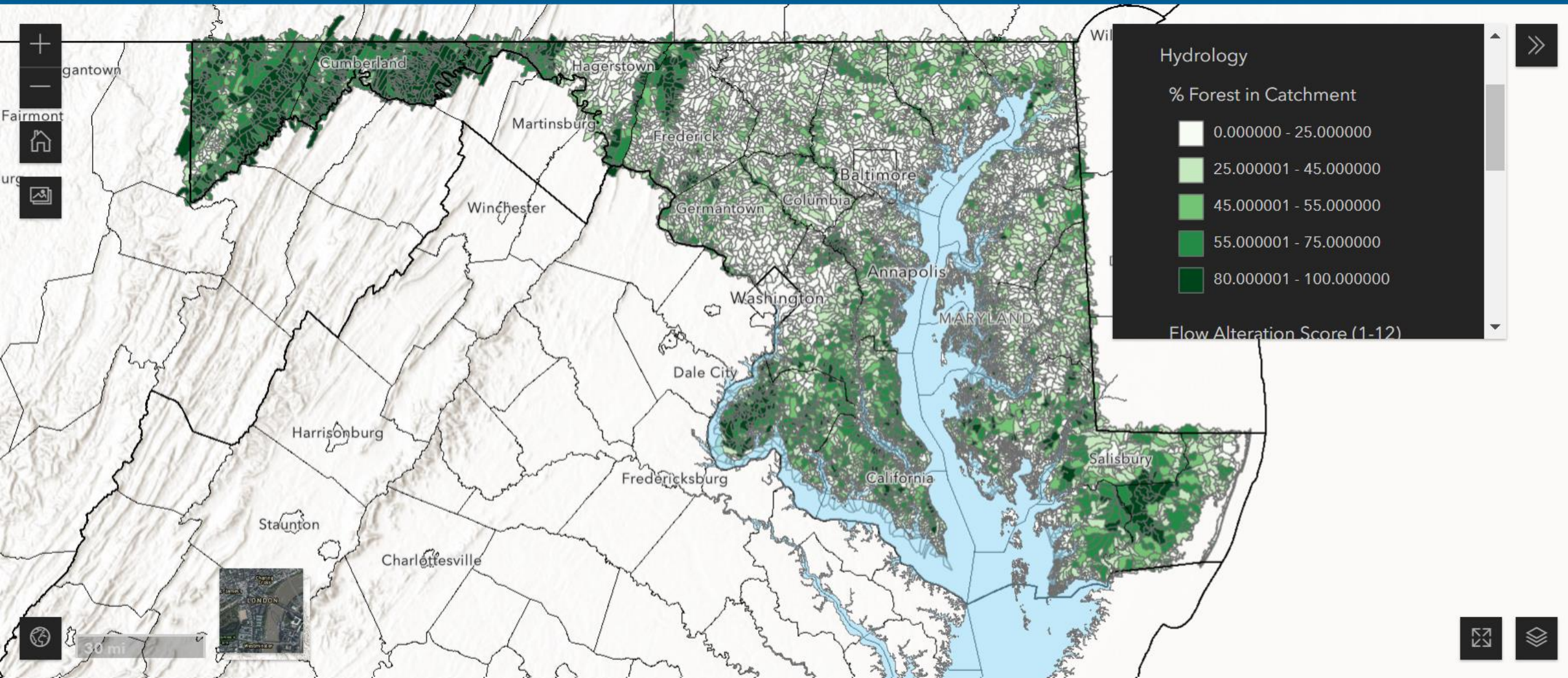
SPARROW sediment and nutrient related metrics

% impervious

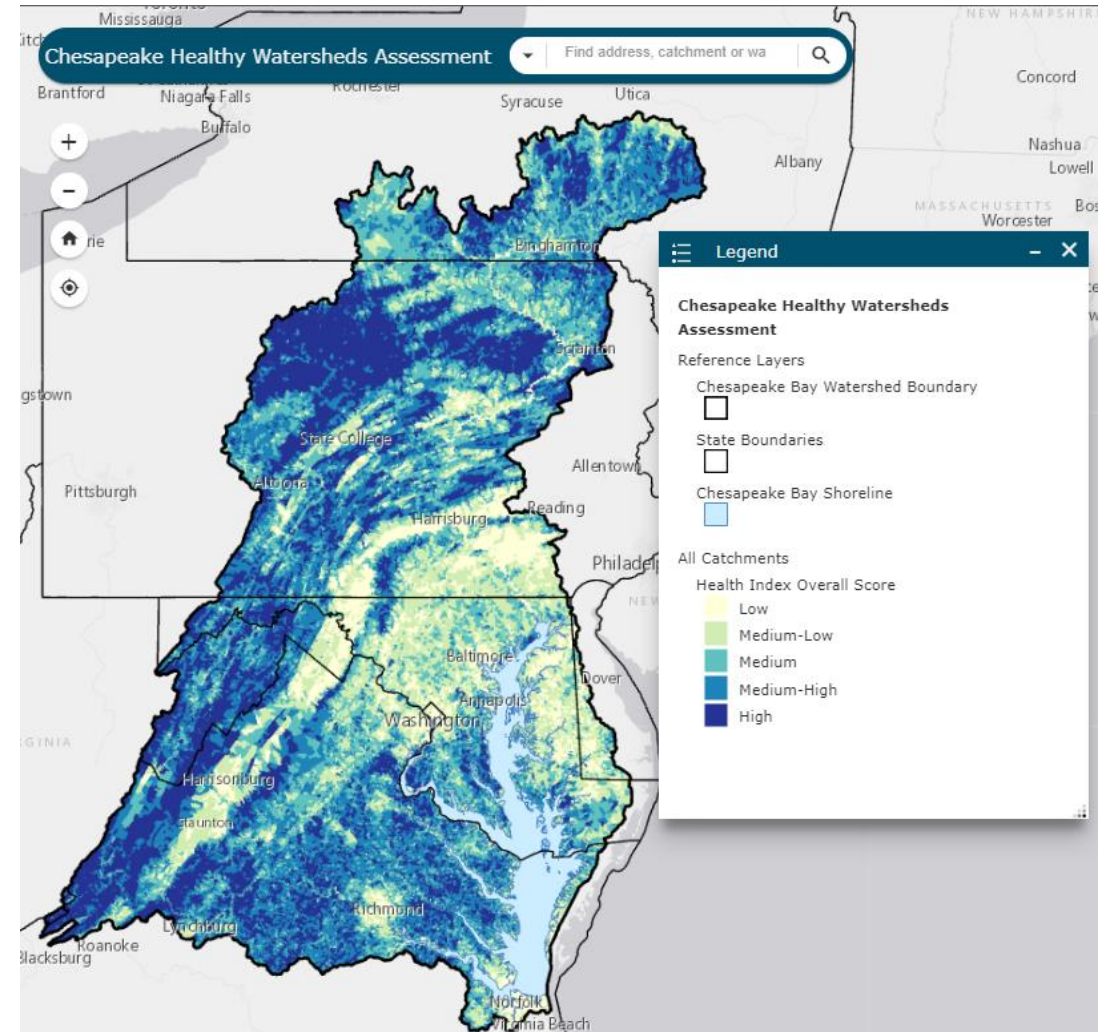
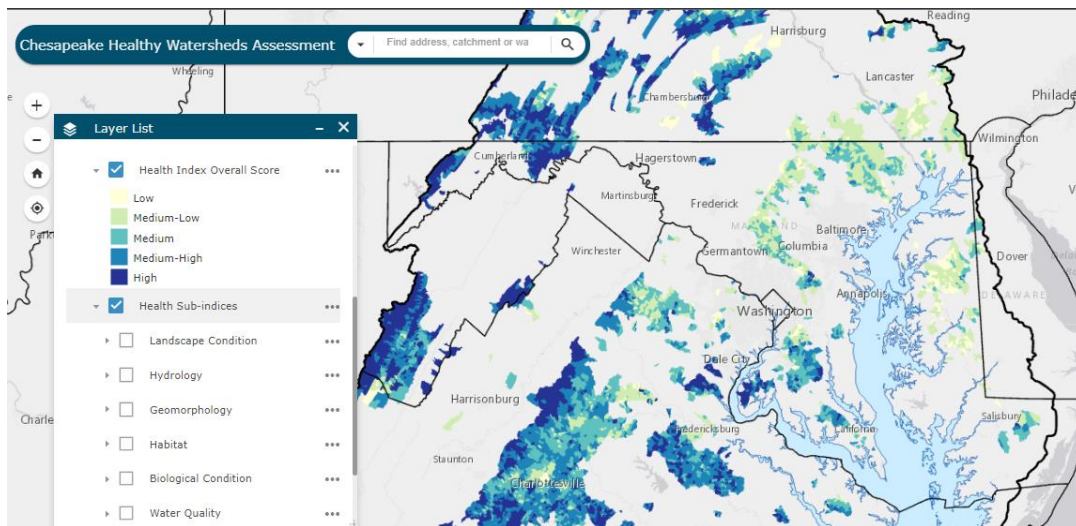
% forest cover

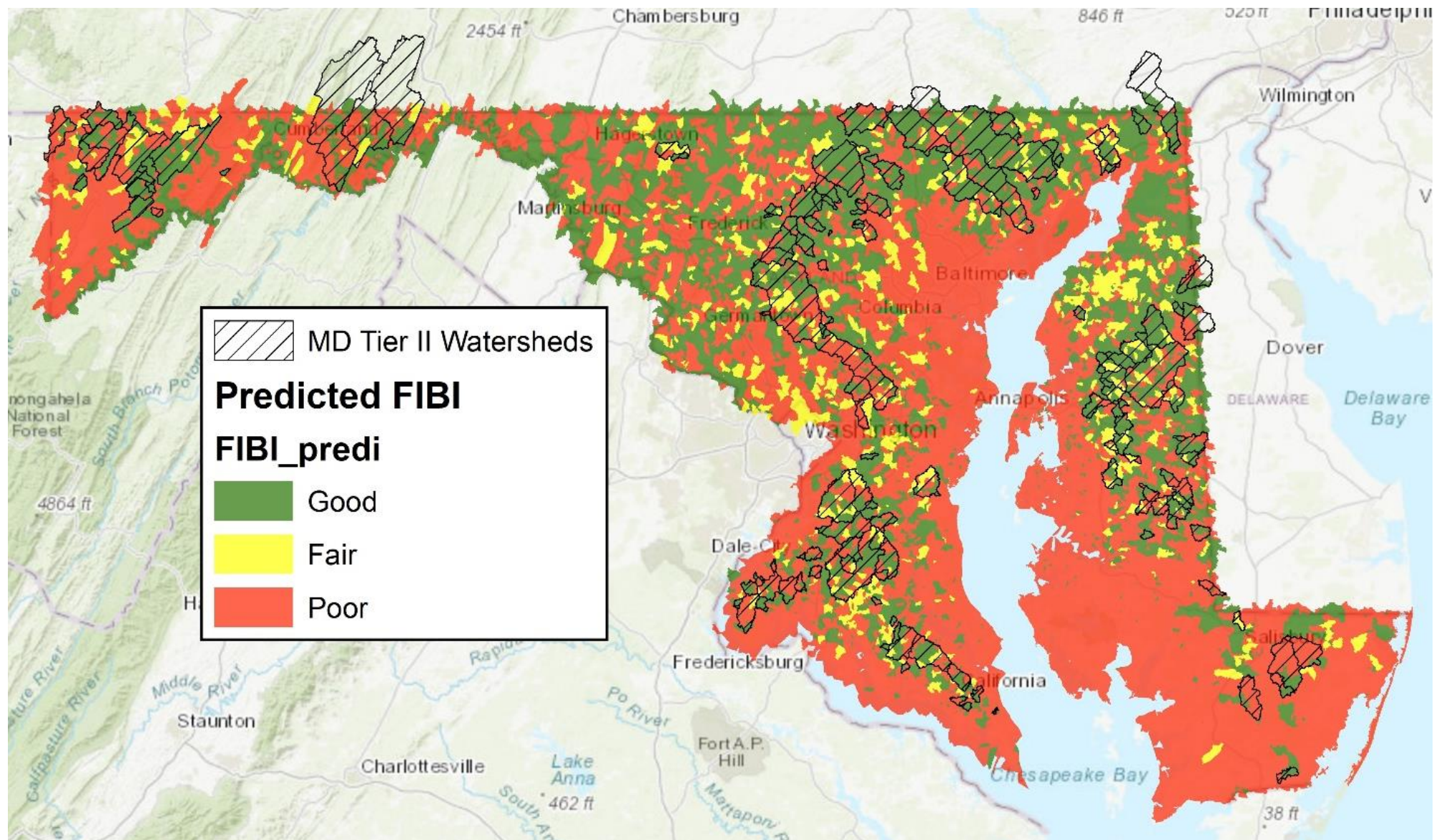
% impervious within the riparian area.

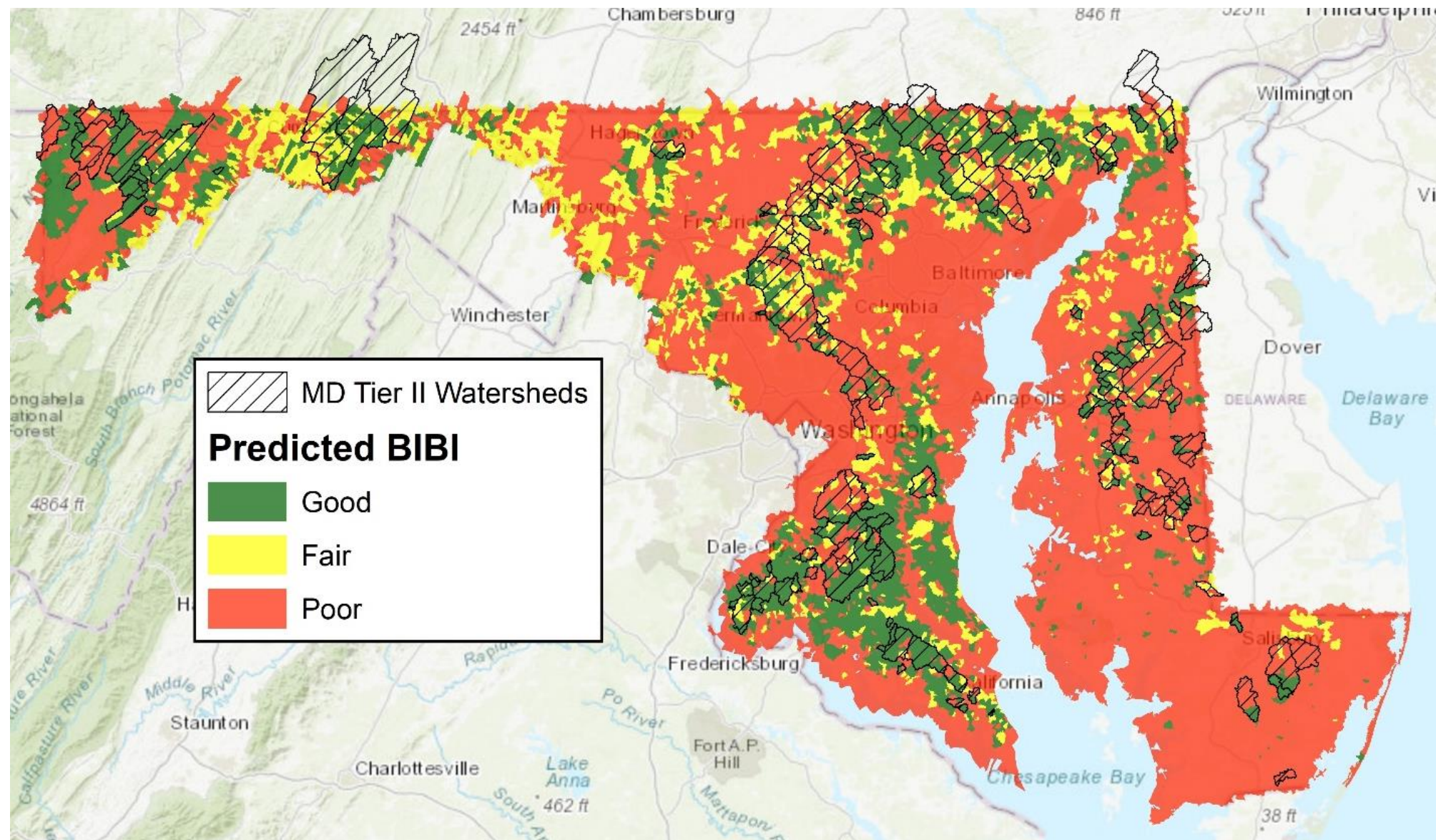
Maryland Healthy Watersheds Assessment Catchment Metrics



Previous efforts (e.g., PHWA and CHWA) relied on the development of sub-indices and an overall index of watershed health









(Photo by Will Parson/Chesapeake Bay Program)

Applying the Healthy Watershed Assessments

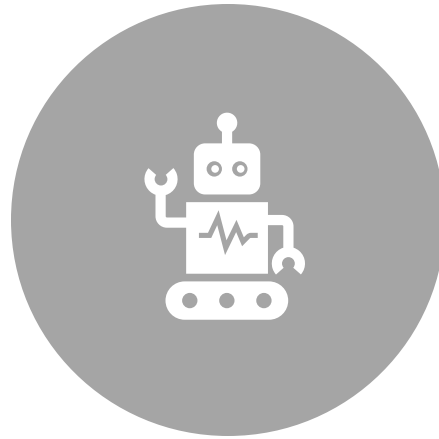
Providing data to support management decision-making, particularly for maintaining the health of watersheds

- Assess current watershed condition
- Track condition over time
- Provide early warning signs – vulnerability to degradation
- Identify resiliency – ability to sustain good watershed health in spite of stressors

Next Steps



NEW DATA TO EXPLORE AND
INCORPORATE



IMPROVEMENTS TO CHWA 2.0
(HARNESSING CODE AND MODEL
DEVELOPED FOR MDHWA)



CHART A COURSE FOR DEVELOPMENT
OF AN INDICATOR TO INFORM
PROGRESS TOWARD OUTCOME.

New Data to Explore

- USGS Conductivity Research
- Additional Forest Health Data
- Accumulated watershed wide land use/land cover data
- Effective Impervious Cover
- Climate Vulnerability Index and Climate Change Likelihood datasets
- Stream Temperature
- Updated geomorphic metrics from FACET
- Additional Brook Trout data
- Toxic metrics
- Fish health metrics

Additional Opportunities

- Clarify relationship between CHWA and Stream Health Workgroup metrics
- Clarify evidence expectations for states to claim success in maintaining their healthy watersheds by 2025
- If the CHWA is refreshed regularly, can it be used directly to represent a “signal of change” in condition?

Renee Thompson, Geographer
Lower-Mississippi Gulf WSC,
USGS,

Chesapeake Bay Program
Coordinator Maintain Healthy
Watersheds

Goal Implementation Team

Rthompso@chesapeakebay.net

