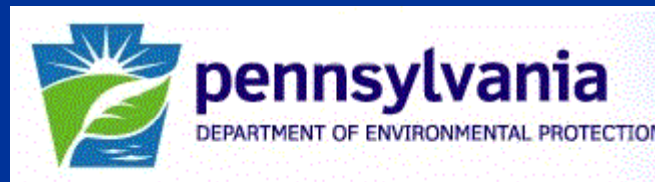


How is the Watershed?

An update on the most recent Aquatic Life Use assessment survey in the Christina Basin

Edward Filip – Stream Assessment Biologist
Pennsylvania Department of Environmental
Protection



5/20/2010

What is an Aquatic Life Use survey?

- A stream can be assessed for 4 different uses:
 - Aquatic Life → the use we are focusing on.
 - Fish Consumption
 - Potable Water Supply
 - Recreation
- Aquatic life Use is the ability of stream to support aquatic organisms such as fish and macroinvertebrates.
- Is a particular stream meeting its Designated Use for Aquatic Life?

Designated Uses

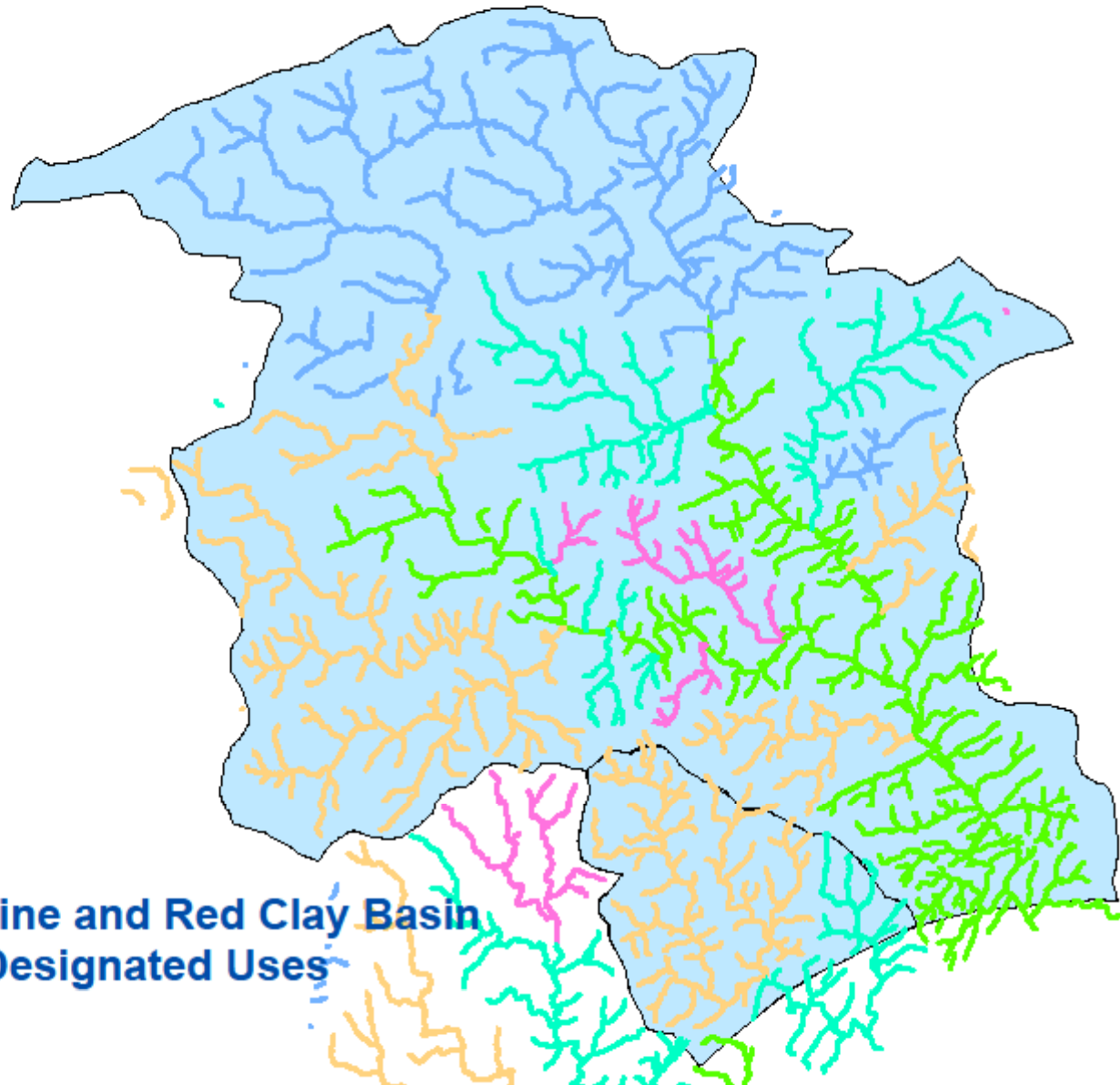
- Each stream has a Designated Use for aquatic life assigned to it.
 - Assigned in the 80s. Not usually changed.
 - A stream is either attaining or impaired for its Designated Use.
- A stream can be:
 - Exceptional Value
 - High Quality
 - Trout Stocked Fishery
 - Cold Water Fishery
 - Warm Water Fishery

Special Protection Status

Regular status
- Special Protection streams are held to a higher standard.

Legend

- CWF
- EV
- HQ
- TSF
- WWF



**Brandywine and Red Clay Basin
Designated Uses**

How do we determine the stream status?

- The establishment of standards
- ICE sampling
- Habitat assessment
- Macroinvertebrate identification
- Station IBI score and assessment
- Stream segment assessment
- (If impaired) Source/Cause determination

** You only see the last two steps in eMAP **

The establishment of standards

- Metrics and IBI (Index of Biotic Integrity) scores.
 - Benthic macroinvertebrates are given values, which in turn help us evaluate a particular stream.
 - Methods and analysis, while based on the EPA RBP III manual (Rapid Bioassessment Protocol), are state specific. Streams are compared to the best in Pennsylvania.
 - Statistical analysis methods developed by Bureau of Water Quality Standards folks in Harrisburg, approved by EPA.
- Goal is to make our findings scientifically defensible.
 - Needed to stand up in a court of law.
- Current standards are tougher to achieve than the less technical analysis methods of the past.
 - More streams are impaired as a result.

ICE sampling

- Instream Comprehensive Evaluation. Methods also established by Harrisburg and approved by EPA.
- Probabilistic and Targeted sampling.
- Water properties and field chemistry.
 - pH, temperature, alkalinity, conductivity, and dissolved oxygen.
- Macroinvertebrate collection.
 - 100 meter reach with riffles selected.
 - 6 “kicks” in different locations with a D-frame net.
 - 1 square meter each for about 1 minute.
 - Net and sieve with 500 micron mesh.
 - Samples preserved and returned to lab for processing.

Sampling is a
“kick”



Sometimes we have help



Habitat assessment

- Visual field assessment of various parameters:
 - Instream Fish Cover
 - Epifaunal Substrate
 - Embeddedness
 - Velocity/Depth Regimes
 - Channel Alteration
 - Sediment Deposition
 - Frequency of Riffles
 - Channel Flow Status
 - Condition of Banks
 - Bank Vegetative Protection
 - Grazing or Other Disruptive Pressure
 - Riparian Vegetative Zone Width.

3800-FM-WFSR0402 Rev. 10/2008 COMMONWEALTH OF PENNSYLVANIA
 pennsylvania DEPARTMENT OF ENVIRONMENTAL PROTECTION
 DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF WATER STANDARDS AND FACILITY REGULATION

**WATER QUALITY NETWORK
HABITAT ASSESSMENT**

WATERBODY NAME _____ STR CODE/RMI _____
 STATION NUMBER _____ LOCATION _____
 DATE _____ TIME _____
 AQUATIC ECOREGION _____ COUNTY _____
 INVESTIGATORS _____
 FORM COMPLETED BY _____

RIFFLE/RUN PREVALENCE

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
1. Instream Cover (Fish)	Greater than 50% mix of boulder, cobble, submerged logs, undercut banks, or other stable habitat.	30-50% mix of boulder, cobble, or other stable habitat; adequate habitat.	10-30% mix of boulder, cobble, or other stable habitat; habitat availability less than desirable.	Less than 10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
SCORE	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	5 4 3 2 1
2. Epifaunal Substrate	Well developed riffle and run, riffle is as wide as stream and length extends two times the width of stream; abundance of cobble.	Riffle is as wide as stream but length is less than two times width; abundance of cobble, boulders and gravel common.	Run area may be lacking; riffle not as wide as stream and its length is less than two times the stream width; gravel or large boulders and bedrock prevalent; some cobble present.	Riffles or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
SCORE	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	5 4 3 2 1
3. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	5 4 3 2 1
4. Velocity/Depth Regimes	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score lower than if missing other regimes).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	5 4 3 2 1
5. Channel Alteration	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging (greater than past 20 yr) may be present, but recent channelization is not present.	New embankments present on both banks; and 40-50% of stream reach channelized and disrupted.	Banks shored gabion or cement; over 80% of the stream reach channelized and disrupted.
SCORE	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	5 4 3 2 1
Total Side 1 _____				

391-3200-001 / DRAFT March 19, 2009 / Page 23

Total Score _____

391-3200-001 / DRAFT March 19, 2009 / Page 24

Macroinvertebrate identification

- 200 count subsample for each station, +/- 20%
 - Selection process eliminates bias and excessive work.
- Identification to the genus level for most macroinvertebrates.
 - Notable exceptions being Chironomidae (family) and Oligochaeta (class).
 - Previous assessments only required identification down to the family level.



Station IBI score and assessment

- The collected macroinvertebrates and their attributed values are used to determine various metric scores.
 - Hilsenhoff, Becks, Shannon Diversity, % Intolerance, various taxa richness.
- The metric scores are used to determine the IBI score.
 - Different metrics are used based on season (summer vs winter) and stream type (freestone, limestone, low grade).
- The IBI score is compared to a criteria for biological assessment.
 - There is some room for best professional judgment in “grey” area scores.
 - Special protection streams are held to a higher threshold level.
- The Habitat score is evaluated for habitat assessment.

IBI assessment criteria

2008 winter method

> 80	Attaining HQ and EV
> 63	Attaining
$50 < x < 63$	Gray zone
< 50	Impaired

2008 summer method

> 80	Attaining HQ and EV
> 50	Attaining
$40 < x < 50$	Gray zone
< 40	Impaired

Grey zone considerations:

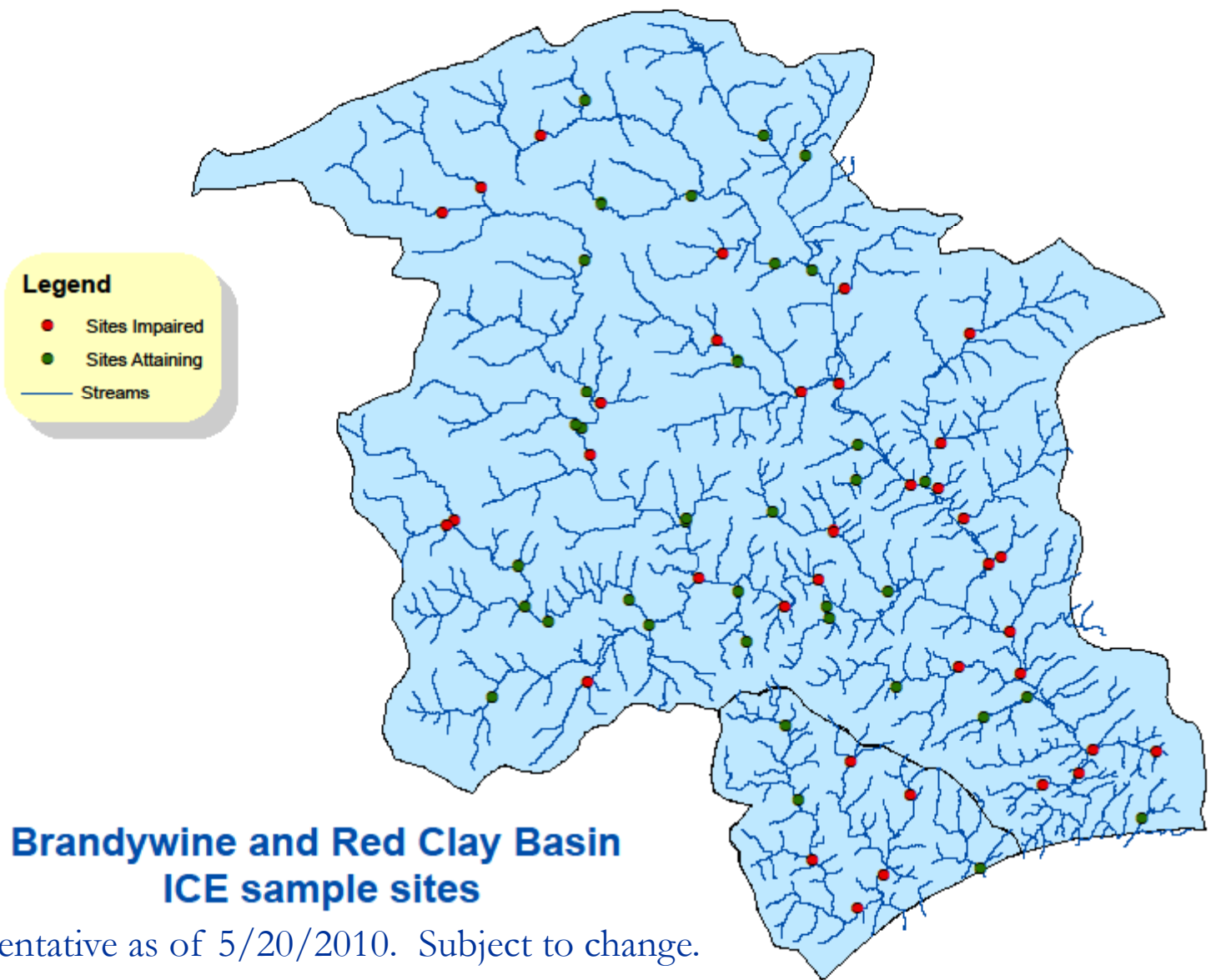
- Dominance of tolerant taxa?
- Absence of EPT taxa?
If so, then impaired.

Stream segment assessment

- Streams are assessed as being attaining or impaired for a designated use.
- Things to consider:
 - Assessment of sampled stations and their spatial relationship to the watershed.
 - Major changes in habitat across the landscape such as WWTP outfalls, point sources, urban areas, reservoirs, etc.
 - Previous assessment status (Delisting an impaired stream requires ample proof).
 - Manner in which special protection status was attained (survey vs conservation).
 - Similarity of streams without stations.

(If impaired) Source/Cause determination

- Sources can include: Urban Runoff, Agriculture, Habitat Modification, etc.
- Causes can include: Siltation, Water/Flow Variability, Organic Enrichment, etc.
- Determined by Biologist's best professional judgment. Things to consider include:
 - Field observations of land use in the watershed.
 - Habitat scores.
 - Macroinvertebrate composition.
 - Changes in watershed since last survey (New development, new farm, new point source).
 - Previous Source/Cause listing.

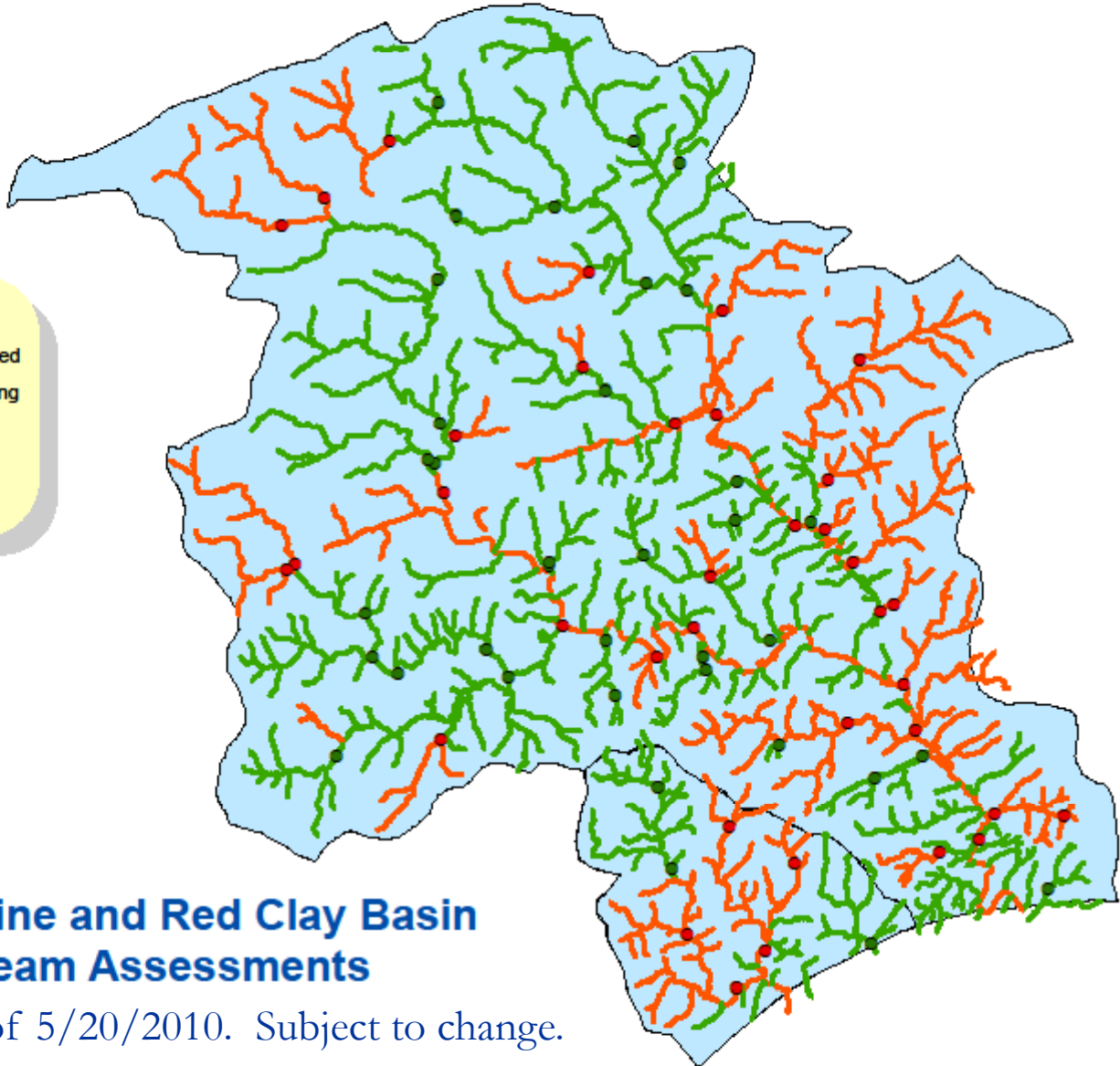


Legend

- Sites Impaired
- Sites Attaining

Assessments

- Impaired
- Supporting

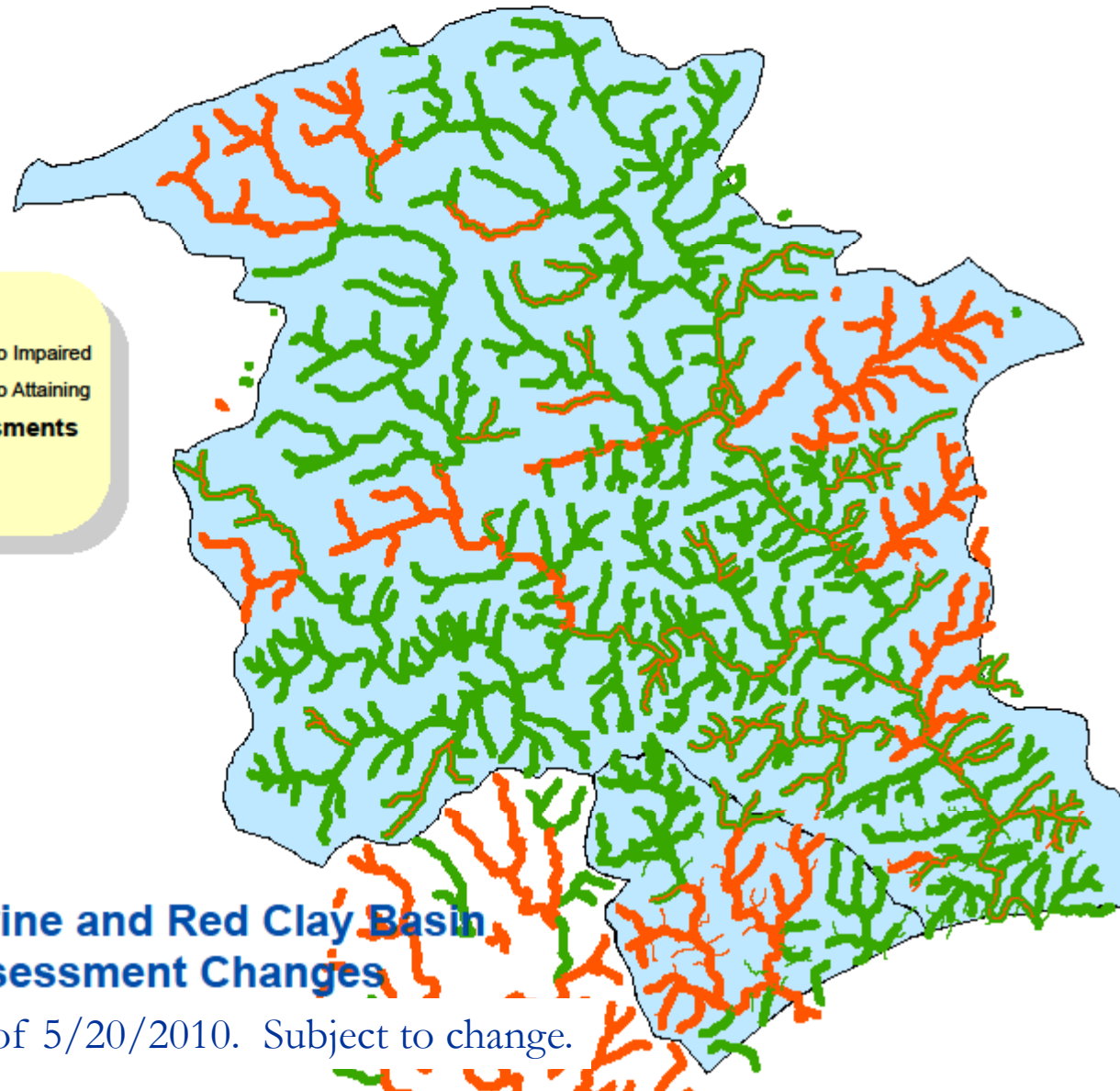


Brandywine and Red Clay Basin Stream Assessments

Tentative as of 5/20/2010. Subject to change.

Legend

- Changed to Impaired
 - Changed to Attaining
- Same Assessments**
- Impaired
 - Attaining

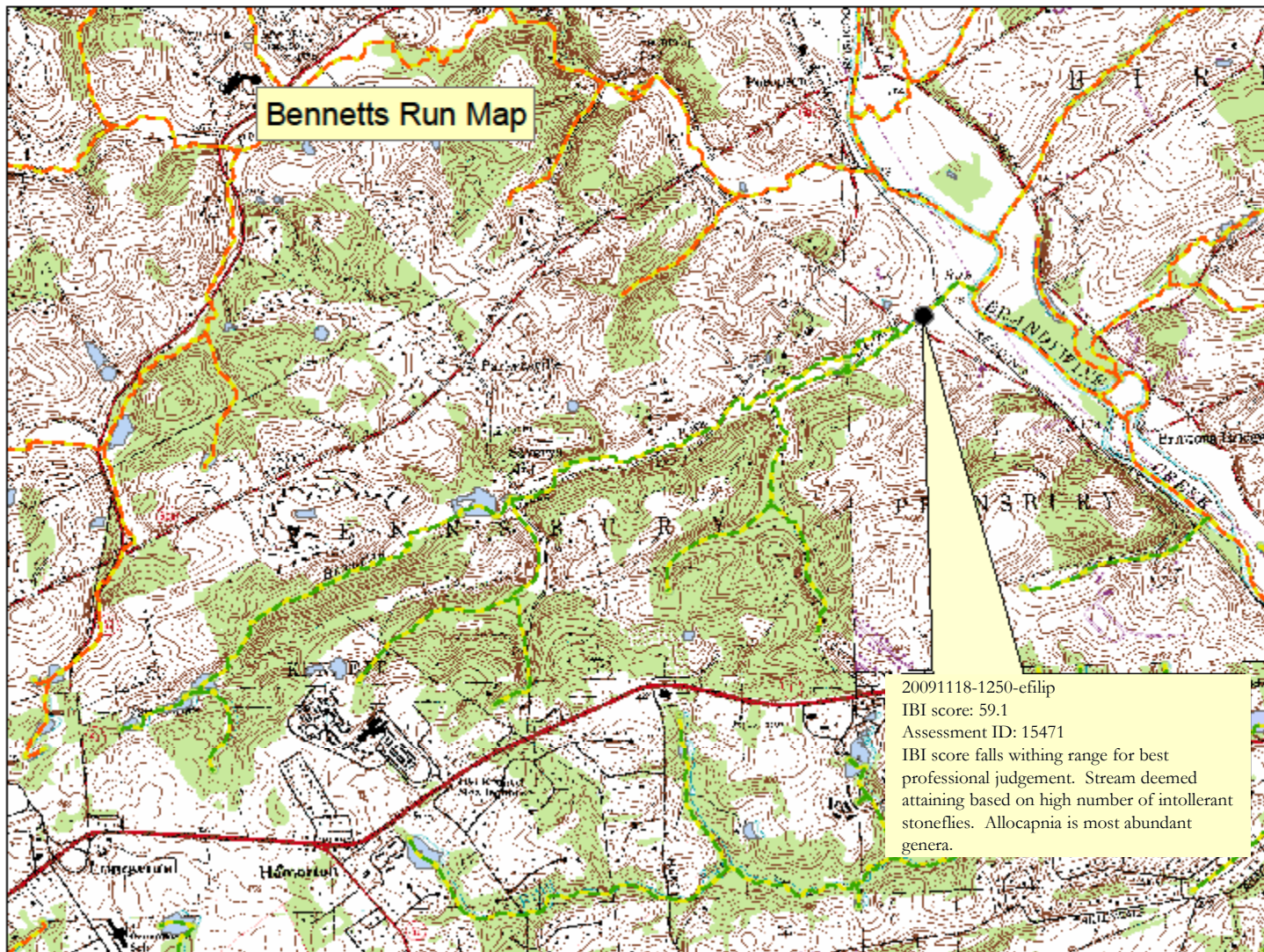


**Brandywine and Red Clay Basin
Assessment Changes**

Tentative as of 5/20/2010. Subject to change.

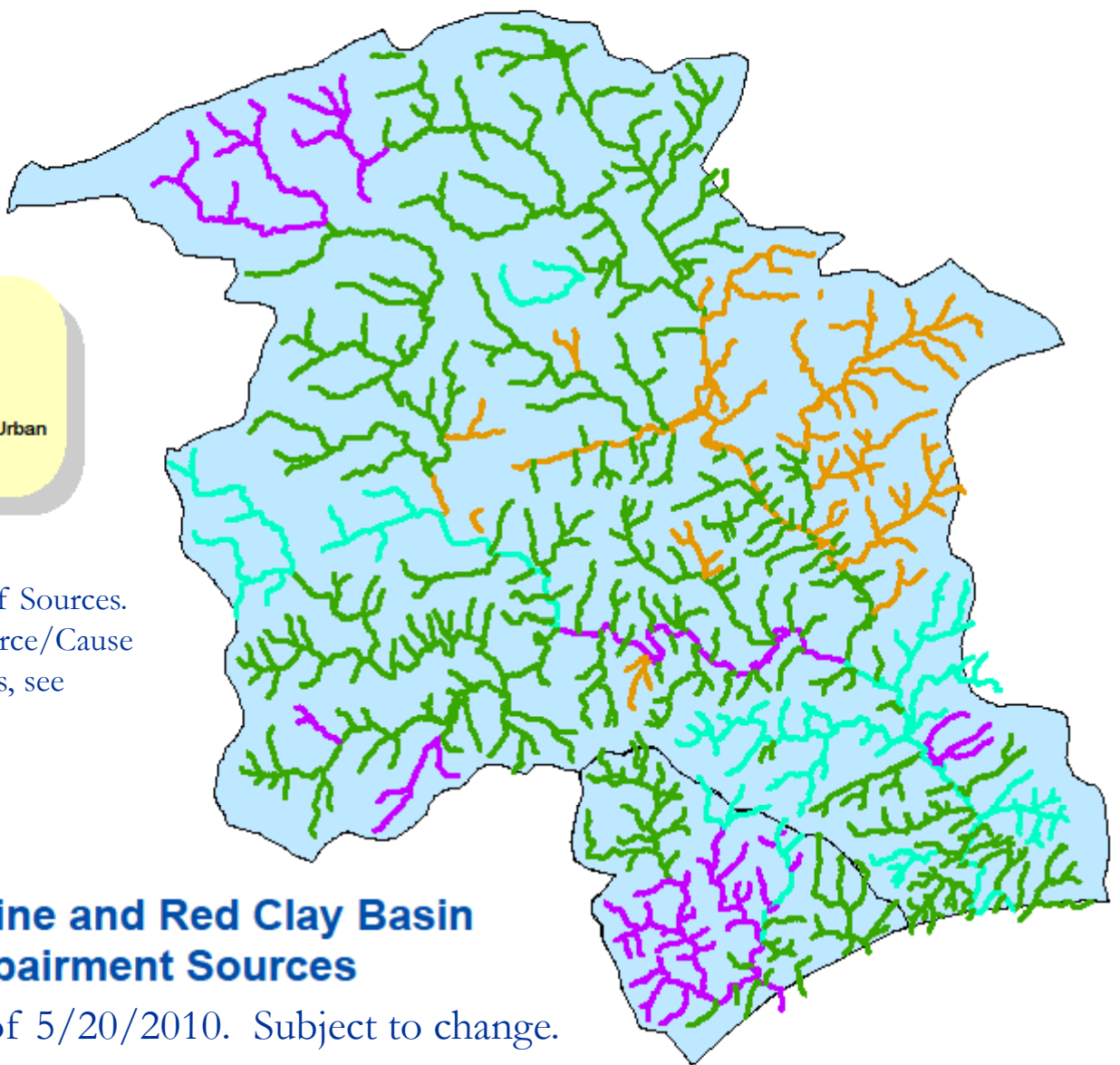
Assessment changes

- Biggest changes include:
 - Impairment of long stretches of the Main Stem, East Branch, and West Branches of the Brandywine Creek.
 - Impairment of Brandywine tributaries such as Shamona Creek, Pocopson Creek, Culbertson Run, Broad Run, Harvey Run, and sections of the headwaters of Buck Run and Doe Run.
 - Impairment of the head waters of the East Branch of the Red Clay Creek
 - Attainment of Bennetts Run (Not depicted on previous map. See following detailed map) and segments of Indian Run and Beaver Run.



Legend

- Attaining
- Agricultural
- Agricultural/Urban
- Urban



Rough grouping of Sources.
For individual Source/Cause
impairment listings, see
eMAP PA

Brandywine and Red Clay Basin Impairment Sources

Tentative as of 5/20/2010. Subject to change.

In closing

- As the science behind stream assessment becomes more precise, our collection and data analysis methods change.
- This data is a summary of our most recent “Tentative” Assessments. Still subject to change.
- Currently the comment period is closed and EPA is considering our assessments for approval.
- The assessment changes have been mostly an increase in impairments. This is reflective of both tougher attainment standards and an increase in water quality stressors.

Any questions?

- Contact information:

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