

Montgomery County's Special Protection Areas: Evaluating Best Management Practice Effectiveness at Protecting High Quality Waters



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What is a Special Protection Area?

- Water resources or other environmental features that are of high quality or are unusually sensitive and would be impacted by development.
- Special environmental protection measures:
 - Limiting imperviousness
 - Protecting natural features
 - Minimizing and phasing of grading
 - Promoting groundwater recharge
 - Using innovative and redundant control structures

Executive Regulation 29-95: *Water Quality Review for Development in Designated Special Protection Areas*



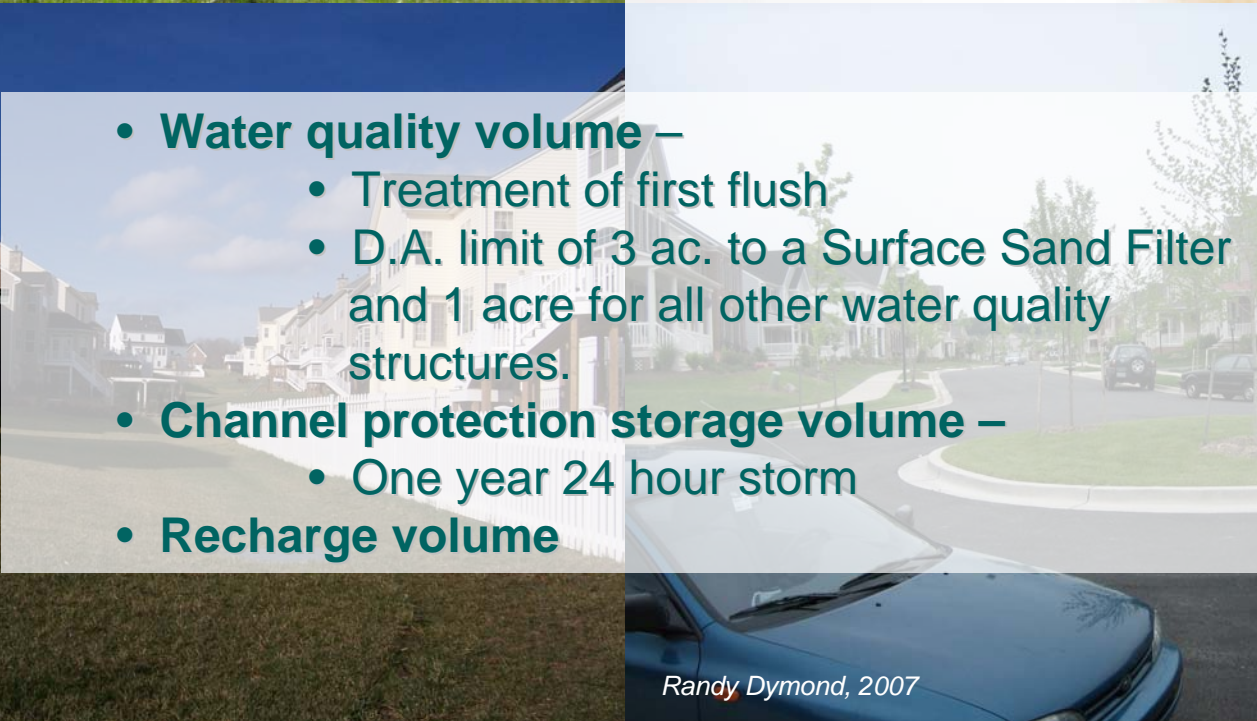
Mike Thompson, 2008



Jennifer St. John, 2007



Diana Hogan, 2007



Randy Dymond, 2007

- **S&EC features –**

- Perforated risers with gravel or filter fiber jackets;
- Filter fence baffles;
- Floating skimmers;
- Dual basins in series;
- Greater storage volumes; and
- Utilizing combinations in the form of a treatment train to improve performance.

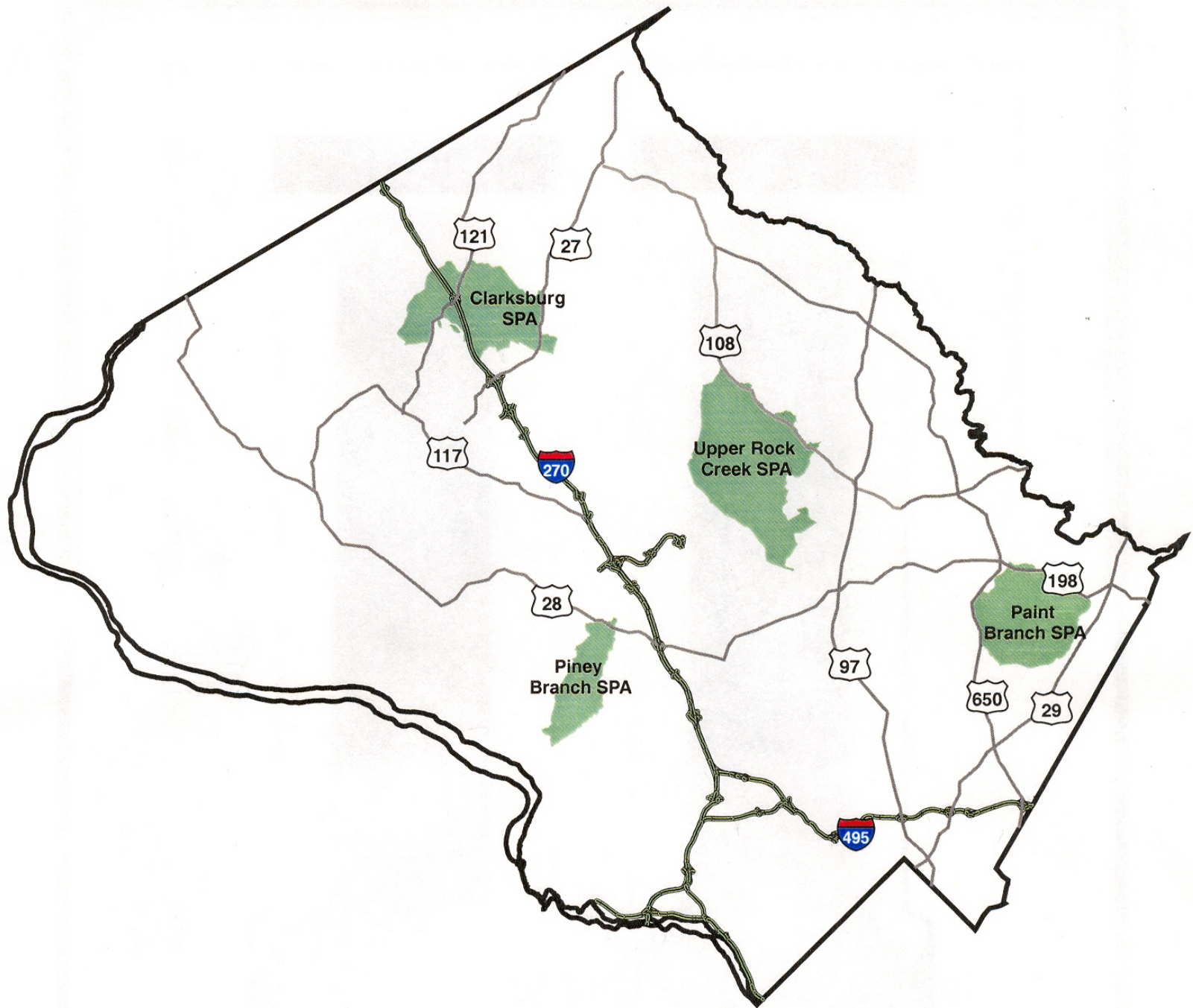
- **Water quality volume –**

- Treatment of first flush
- D.A. limit of 3 ac. to a Surface Sand Filter and 1 acre for all other water quality structures.

- **Channel protection storage volume –**

- One year 24 hour storm

- **Recharge volume**



Performance Goals

1. Stream/aquatic life habitat protection.
2. Maintain stream base flow.
3. Protect seeps, springs, and wetlands.
4. Maintain natural on-site stream channels.
5. Minimize storm flow runoff increases.
6. Identify and protect stream banks prone to erosion and slumping.
7. Minimize increases to ambient water temperature.
8. Minimize sediment loading.
9. Minimize nutrient loadings.
10. Control insecticides, pesticides, and toxic substances.



Data Collected

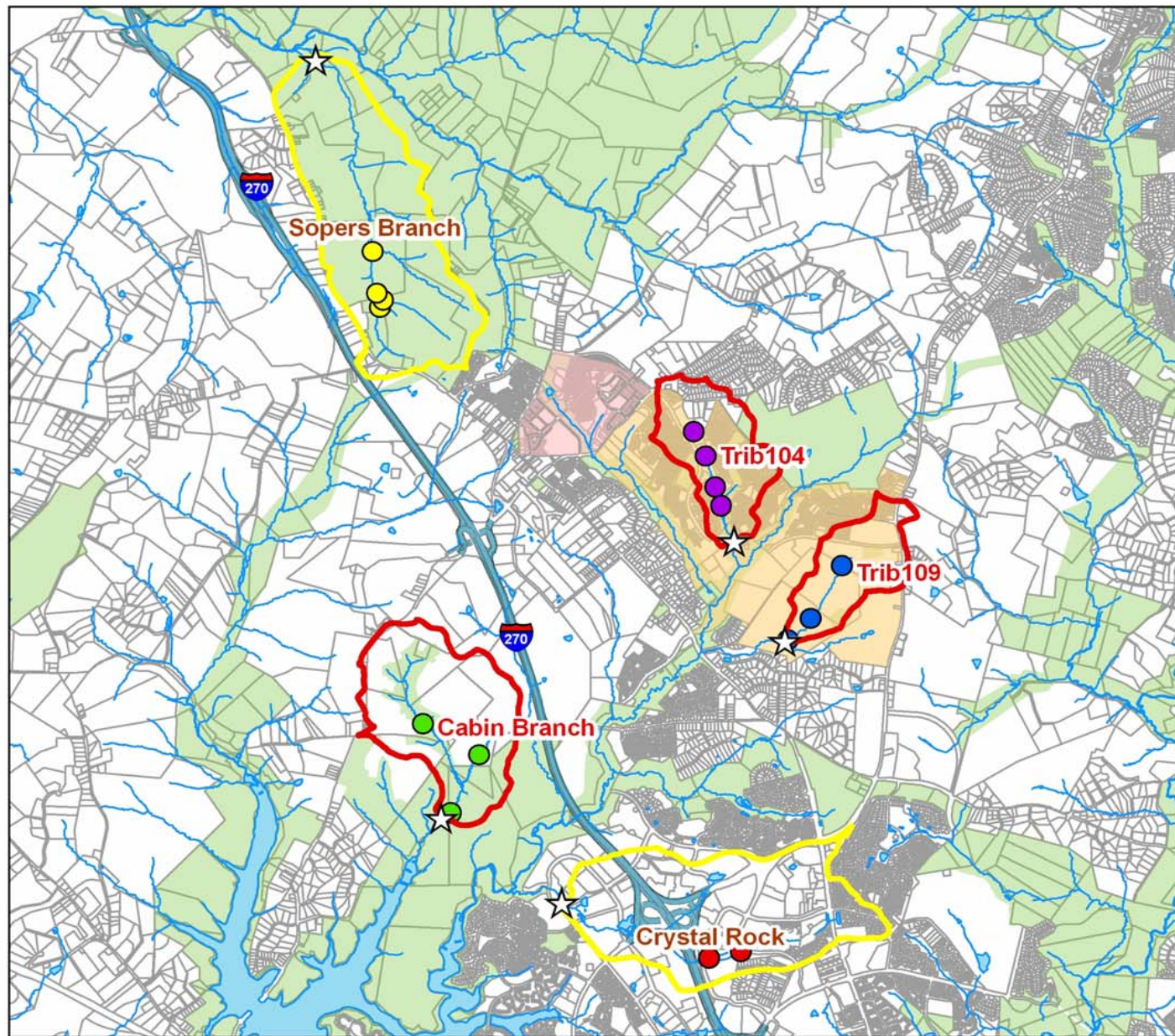
- **Developer/Consultant Monitoring** (within the property)
 - “Stream-specific” water quality parameters
 - Montgomery County Department of Environmental Protection Best Management Practice Monitoring Protocols (1998)
 - Structural monitoring (S&EC and SWM BMPs)
 - In 2007: **14** completed projects; **29** ongoing
- **DEP Monitoring** (upstream and downstream of the development and throughout the watersheds)
 - Biological monitoring: benthic macroinvertebrates, fish, herpetofauna
 - Maryland Biological Stream Survey (MBSS) Protocols
 - Rapid Habitat Assessment
 - US EPA for Riffle/Run Prevalent Streams (Barbour and Stribling)
 - *In situ* water chemistry sampling
 - Multi-parameter probe (MBSS)
 - Continuous Stream Temperature Monitoring
 - 1 June through 30 September
 - **57** stream monitoring stations

Clarksburg Monitoring Partnership

- Montgomery Co. Dept. of Permitting Services
- Montgomery Co. Dept. of Environmental Protection
- Maryland-National Capital Park and Planning Commission
- University of Maryland, College Park
- USGS, Water Resources Division, Baltimore, MD
- USGS, Environmental Resources Center, Reston, VA
- Virginia Polytechnic Institute and State University
- George Mason University
- United States Environmental Protection Agency (USEPA)
 - Landscape Ecology Branch, Reston, VA
 - National Risk Management Research Laboratory, Cincinnati, OH
 - Office of Research and Development, Atlanta, GA
 - Environmental Science Center, Ft. Meade, MD



Clarksburg Study Areas, Biomonitoring, & Geomorphology Stations



Clarksburg Study Areas

-  Test Areas
-  Control Areas
-  Newcut Road Neighborhoods
-  Clarksburg Town Center

☆ Biomonitoring Sites

Geomorphology Survey Areas

-  Little Seneca 104 Tributary
-  Little Seneca 109 Tributary
-  Little Bennett Sopers Branch
-  Cabin Branch
-  Crystal Rock




0 0.250.5 1 1.5 2 Kilometers

0 0.2 0.4 0.8 1.2 1.6 Miles



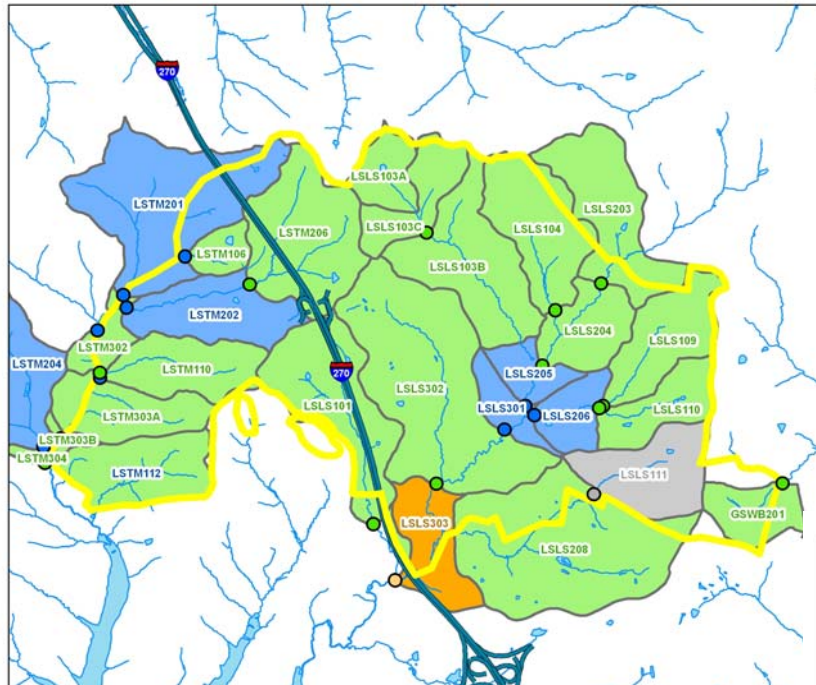
Location





BMP efficiencies of structures alone cannot be used to assess BMP effectiveness at protecting water quality.

Clarksburg SPA - Average Stream Conditions 1994-1998 (Pre-Development)

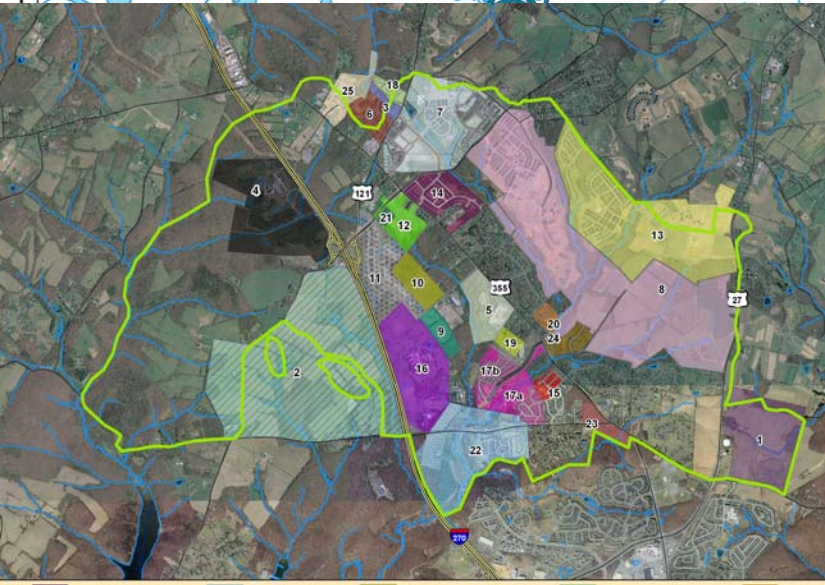


Stream Condition IBI Categories

- Excellent
- Good
- Fair
- Not Monitored until 1999
- Streams
- Clarksburg SPA Boundary

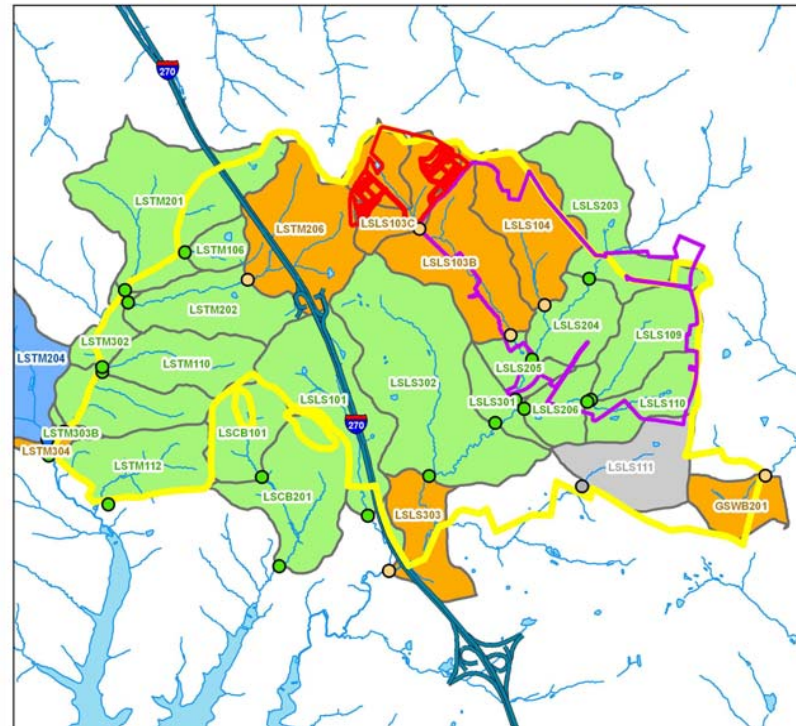


Clarksburg Average Stream Conditions



- | | | | | |
|---|----------------------------------|---|--|----------------|
| 1. All Souls Cemetery | 7. Clarksburg Town Center | 13. Greenway Village | 19. Parkside | 24. Timberland |
| 2. Cabin Branch | 8. Clarksburg Village | 14. Highlands of Clarksburg | 20. Rocky Hill Middle School (no monitoring) | 25. Woodcrest |
| 3. Calverton Manor | 9. Eastside (on hold) | 15. Hurley Ridge (no SPA) | 21. Running Brook | |
| 4. Clarksburg Extension Center (left) | 10. Clarksburg (on hold) | 16. LSCB (on hold) | 22. Westinghouse Rd. Extension | |
| 5. Clarksburg High School (no monitoring) | 11. Gateway 270 Corporate Center | 17a. Marlene Phase I (Older at Hurley Ridge) | 23. Summerfield Crossing | |
| 6. Clarksburg Ridge | 12. Gateway Commons | 17b. Marlene Phase II (Meadows at Hurley Ridge) | 23. Tapestry (on hold) | |

Clarksburg SPA - Average Stream Conditions 2006-2007 (Current)



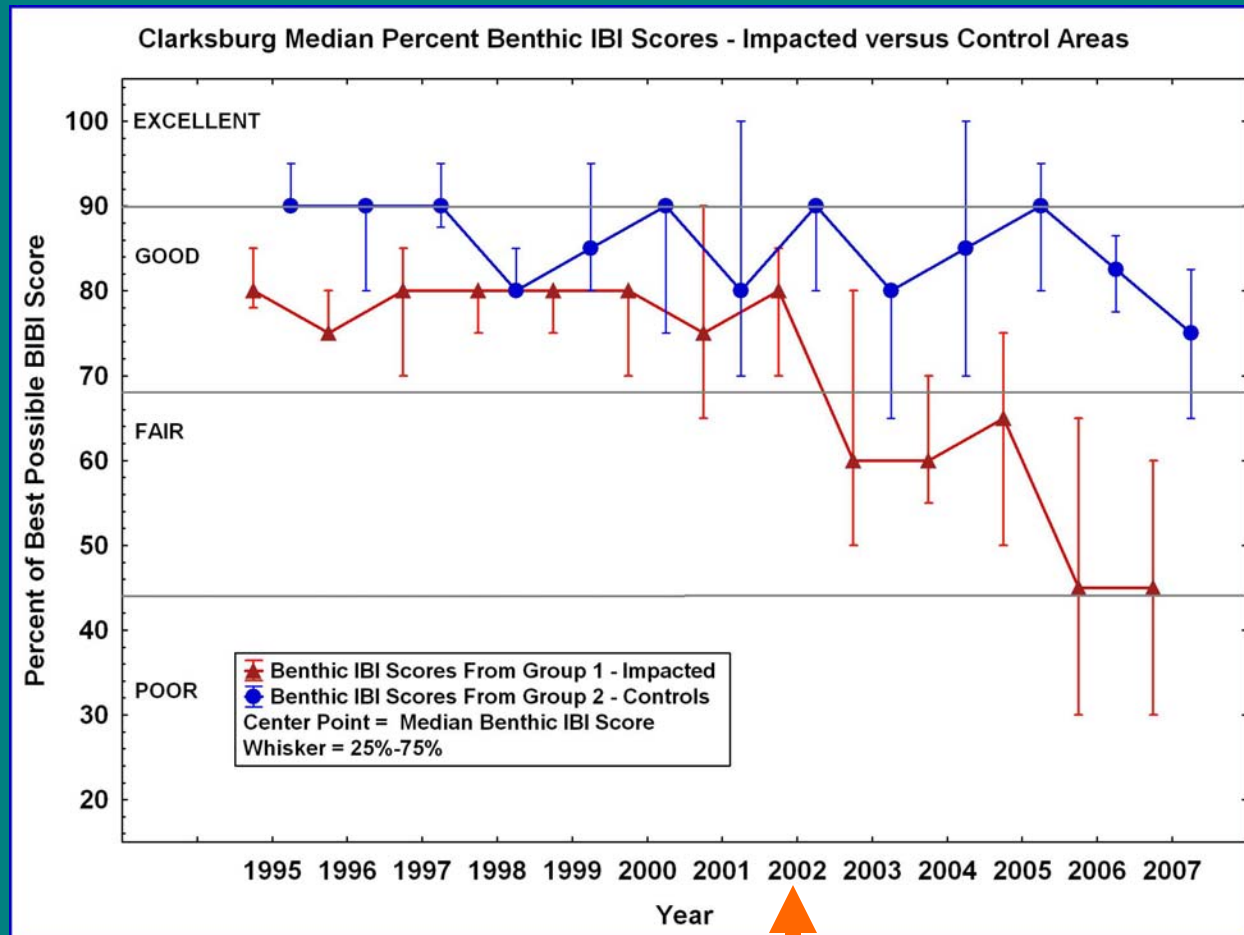
Stream Condition IBI Categories

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- Clarksburg Town Center
- Newcut Road Neighborhoods



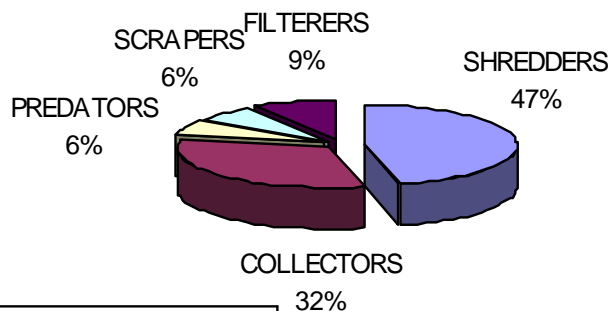
0 0.2 0.4 0.8 1.2 1.6 Kilometers
0 0.15 0.3 0.6 0.9 1.2 Miles





- **Control** – predominantly rural agricultural; unchanged topography
- **Test** – Majority of drainage areas disturbed through the development process

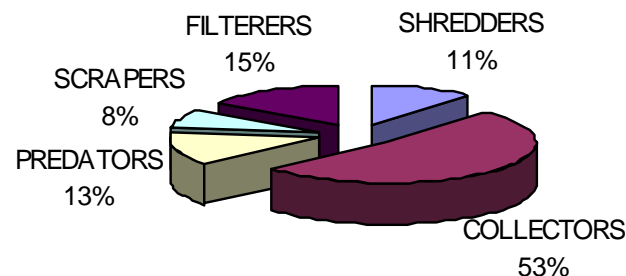
Functional Feeding Groups; Clarksburg Pre-Construction (1996-2000)



Dominant Taxa

Amphinemura sp. (Shredder) = 43 %
Chironomidae (Collector) = 20 %
 N=35
 Total # of Stations=9

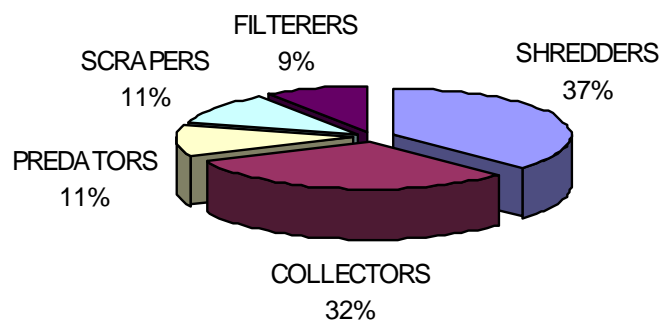
Functional Feeding Groups; Clarksburg Through Construction (2003-2007)



Dominant Taxa

Chironomidae (Collector) = 52 %
Amphinemura sp. (Shredder) = 8 %
 N=37
 Total # of Stations=9

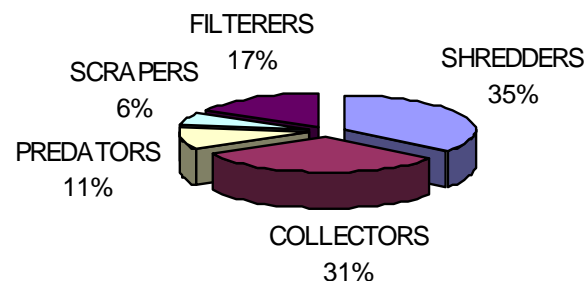
Functional Feeding Groups; Clarksburg Control (1996-2000)



Dominant Taxa

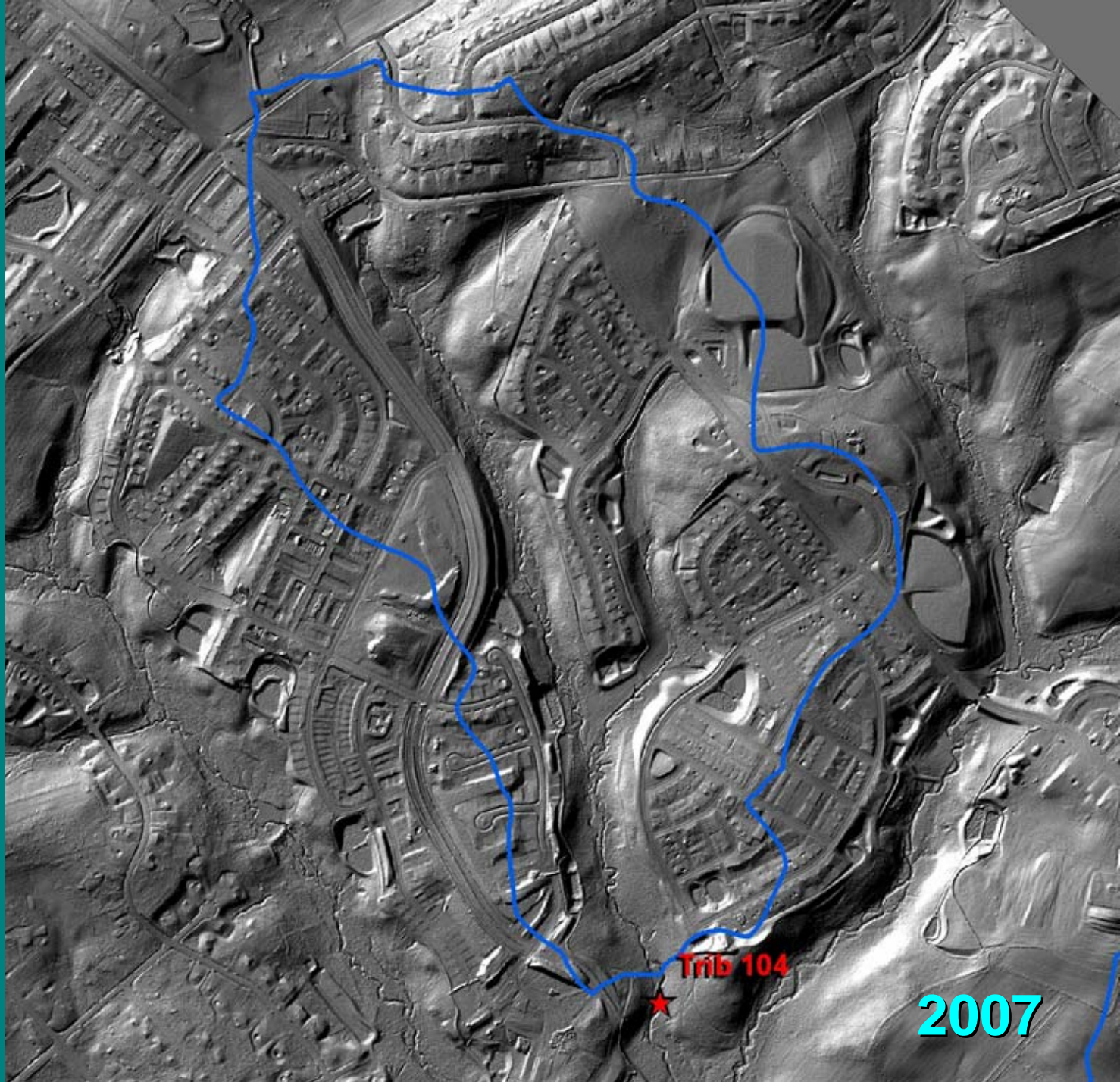
Amphinemura sp. (Shredder) = 33 %
Chironomidae (Collector) = 21 %
 N=25
 Total # of Stations=8

Functional Feeding Groups; Clarksburg Control (2003-2007)



Dominant Taxa

Chironomidae (Collector) = 33 %
Amphinemura sp. (Shredder) = 32 %
 N=27
 Total # of Stations=8



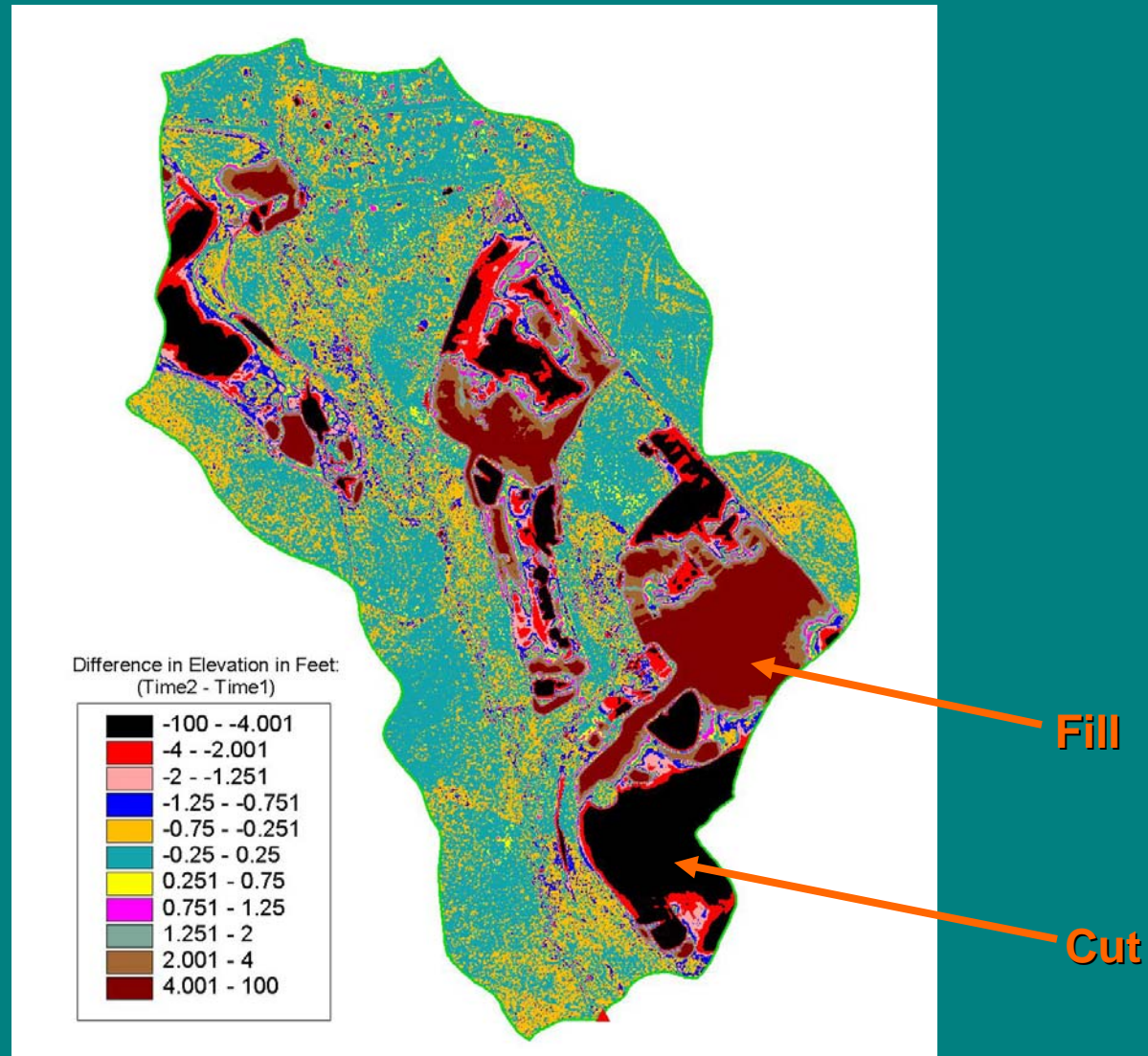
2007

Trib 104



Trib 104

Total Cut and Fill Differences between 2002 and 2007

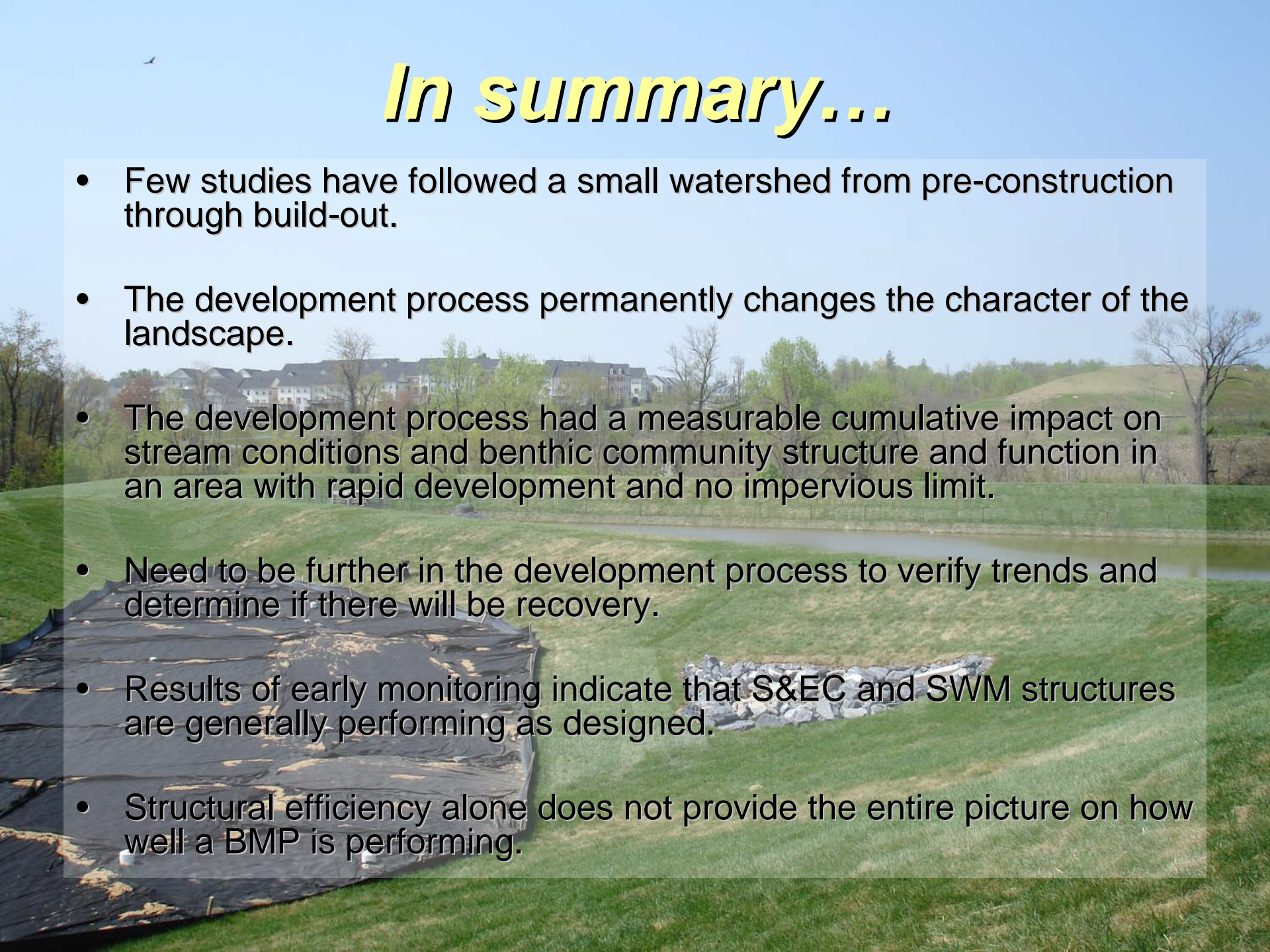


US EPA, Landscape Ecology Branch (Jarnigan 2007)



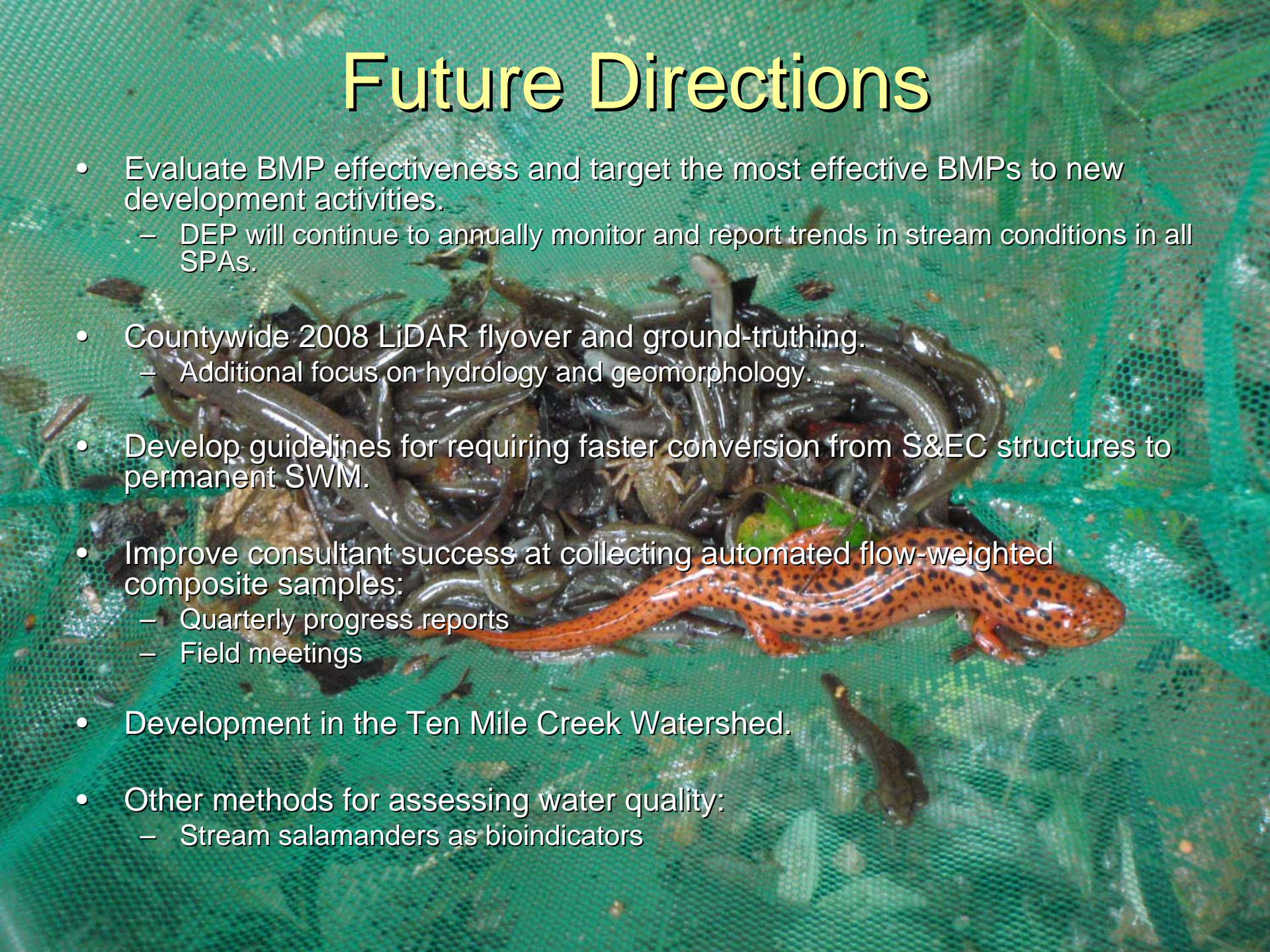
In summary...

- Few studies have followed a small watershed from pre-construction through build-out.
- The development process permanently changes the character of the landscape.
- The development process had a measurable cumulative impact on stream conditions and benthic community structure and function in an area with rapid development and no impervious limit.
- Need to be further in the development process to verify trends and determine if there will be recovery.
- Results of early monitoring indicate that S&EC and SWM structures are generally performing as designed.
- Structural efficiency alone does not provide the entire picture on how well a BMP is performing.



Future Directions

- Evaluate BMP effectiveness and target the most effective BMPs to new development activities.
 - DEP will continue to annually monitor and report trends in stream conditions in all SPAs.
- Countywide 2008 LiDAR flyover and ground-truthing.
 - Additional focus on hydrology and geomorphology.
- Develop guidelines for requiring faster conversion from S&EC structures to permanent SWM.
- Improve consultant success at collecting automated flow-weighted composite samples:
 - Quarterly progress reports
 - Field meetings
- Development in the Ten Mile Creek Watershed.
- Other methods for assessing water quality:
 - Stream salamanders as bioindicators



Acknowledgements

The background of the slide is a photograph of a dirt road. A yellow diamond-shaped pedestrian crossing sign is visible in the middle ground. The road is unpaved and has some tire tracks. The overall tone is warm and slightly grainy.

- **2007 SPA Annual Report**
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