



Stream Watershed Study

First Year Summary

Background

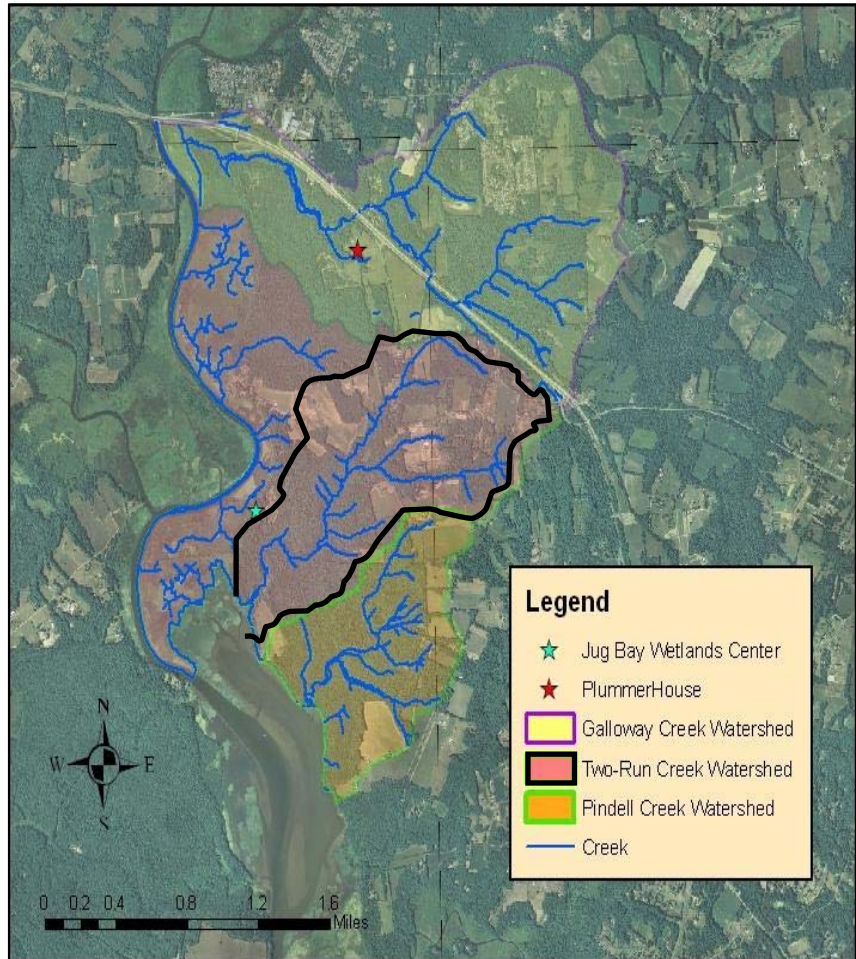
The Jug Bay Wetlands Sanctuary is part of the Anne Arundel County Recreation & Parks Department. Our primary goals are to conduct ecological research, provide environmental education, and conserve and protect the Jug Bay ecosystem. As part of these goals we launched the “Stream Watershed Study” for Galloway Creek, Two Run Branch, and Pindell Branch – small perennial streams that flow through our property and drain to the Patuxent River. The headwaters of these streams are outside our park boundaries. The two purposes of the study are to assess stream health through chemical and biological monitoring, and to form partnerships with neighboring landowners in order to improve stream health over time.

The health of streams affects the rivers they flow into, and ultimately the Chesapeake Bay. Of Anne Arundel County’s nearly 1500 miles of streams, approximately 300 stream miles are in poor or very poor condition. The most widespread stream stressors are nutrients (phosphorus and nitrogen), riparian disturbance, and excess streambed sedimentation. These stressors make it difficult for fish and other aquatic life to survive. Excess nutrients from stormwater runoff, septic systems, wastewater treatment plants, and agricultural sources overload the streams with nitrogen, causing algal growth, robbing the streams of dissolved oxygen, water clarity, and the degrading stream habitat.

Based on the preliminary data we have collected, we assessed stream health for dissolved oxygen, nitrogen, phosphorus, and total suspended solids by calculating milligrams per liter (mg/l). Macroinvertebrates (aquatic insects) and fish are also being studied. The streams received preliminary ratings of **Good**, **Fair**, or **Poor** for the parameter measured. We plan to continue and expand our research in the future.

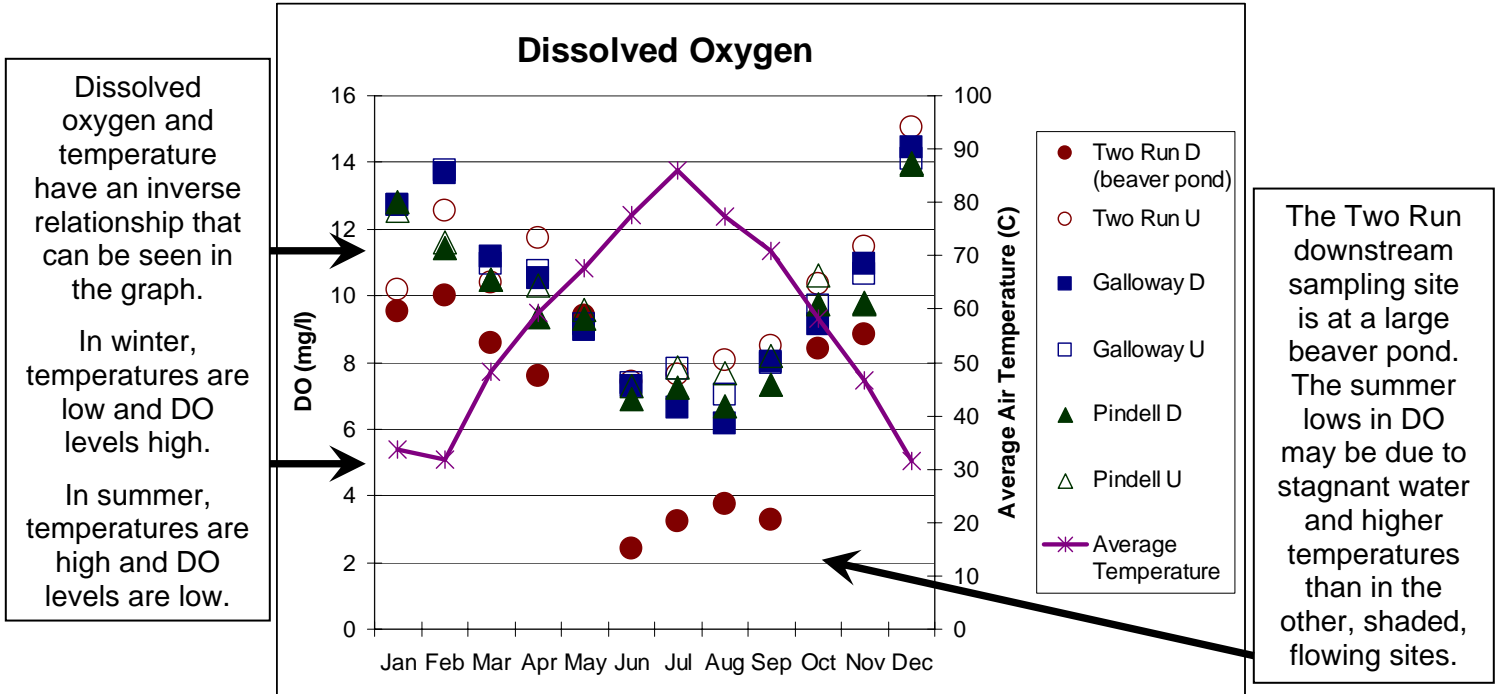
Volunteers

The data presented in this summary was collected largely by volunteers. At Jug Bay, we have a community of citizen scientists studying everything from bacteria to box turtles. The assistance of people interested in ecology is a critical component of our research.



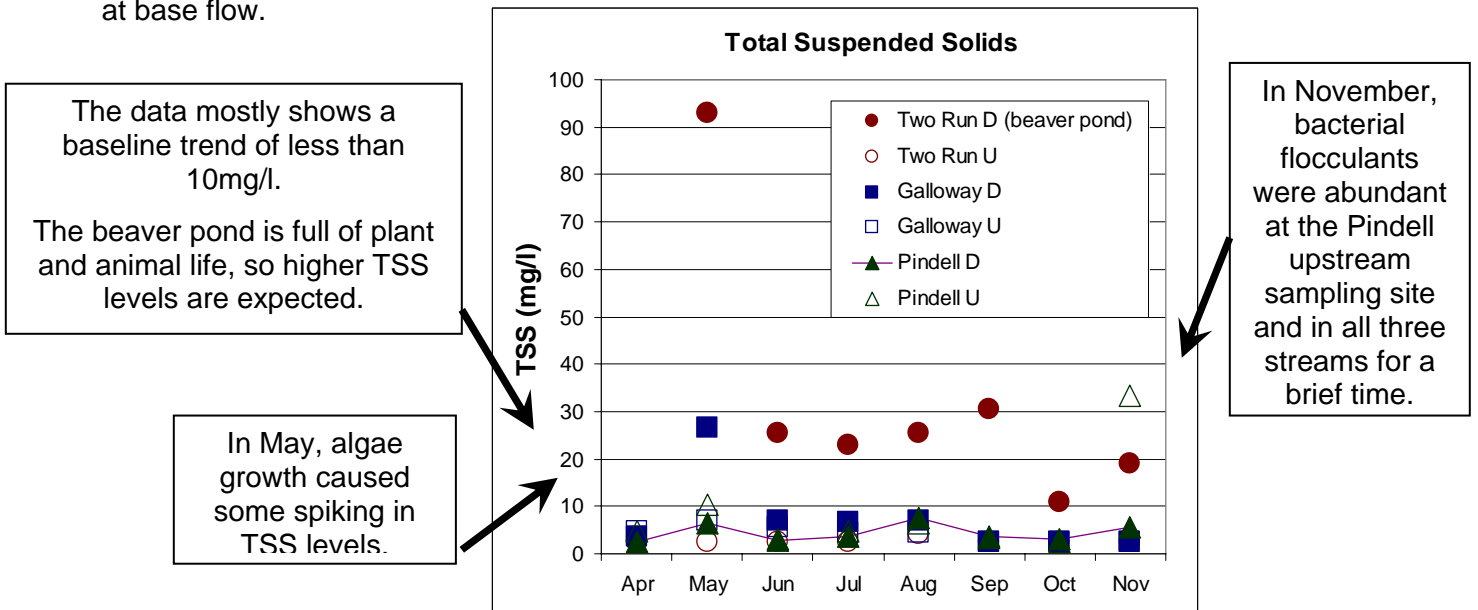
Dissolved Oxygen

Dissolved oxygen (DO) is a measure of the amount of oxygen (O₂) dissolved in the water. Healthy levels of DO are necessary to support fish and other aquatic life. If DO levels drop below 5 milligrams per liter (mg/l), animals are put under stress; the lower the concentration, the greater the stress. Oxygen levels that remain below 1-2 mg/l for more than a few hours can result in large fish kills. Monthly testing of DO levels is graphed below with average air temperature. Apart from lows in the beaver pond in summer, all three streams show **Good** amounts of dissolved oxygen.



Total Suspended Solids

Total suspended solids (TSS) are a measure of the amount of sediment and debris in the water. Too much sediment smothers the habitat of aquatic animals and clouds the water-inhibiting underwater plant growth. TSS should be less than 20 mg/l. Monthly samples are graphed below. Apart from the beaver pond, all three streams show **Good** (low) amounts of total suspended solids at base flow.

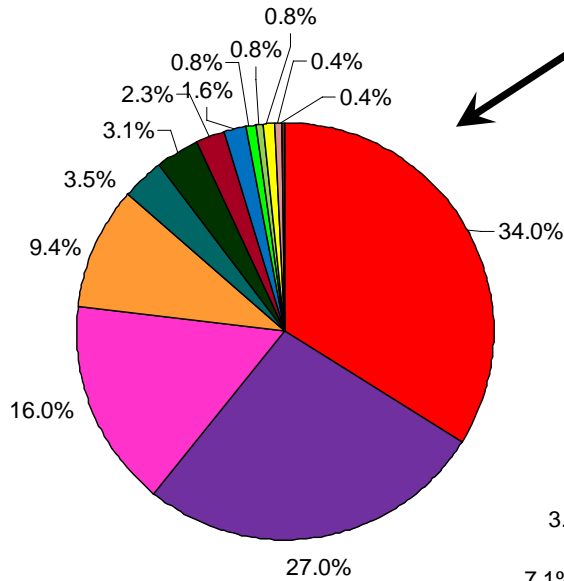


Fish Species

Fish diversity is another way to assess stream health. Preliminary surveys have been conducted but more data is needed before conclusions can be drawn. The species and relative abundance in each stream is graphed below.

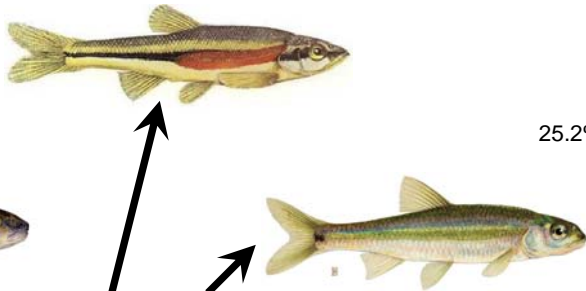
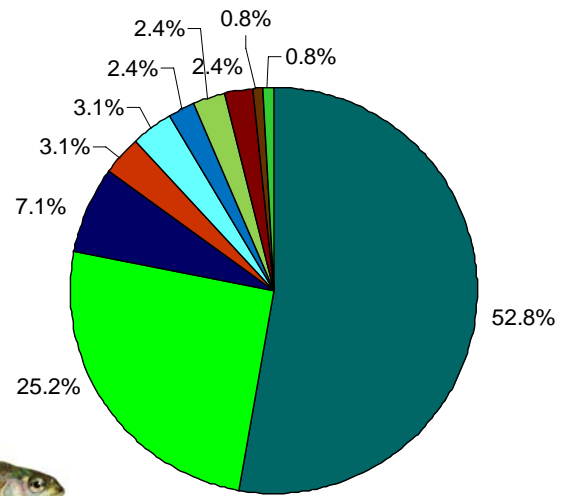
- Eastern Mudminnow
- Black-nosed Dace
- Rosy-sided Dace
- Tesselated Darter
- Mosquitofish
- Bluespotted Sunfish
- Bluegill Sunfish
- Pumpkinseed Sunfish
- Small Mouth Bass
- Brown Bullhead Catfish
- Gizzard Shad
- Mummichog
- Banded Killifish
- Common Shiner
- Spottail Shiner
- White Sucker
- Golden Shiner
- Fallfish
- Unknown Fish

Two Run Branch



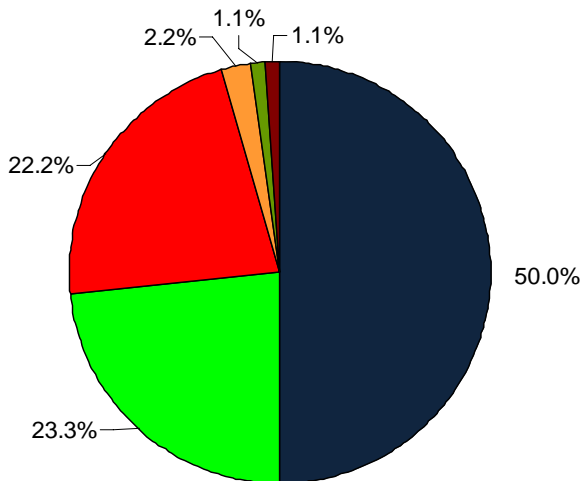
Because of the beaver pond habitat, Two Run has the highest diversity of fish.

Galloway Creek

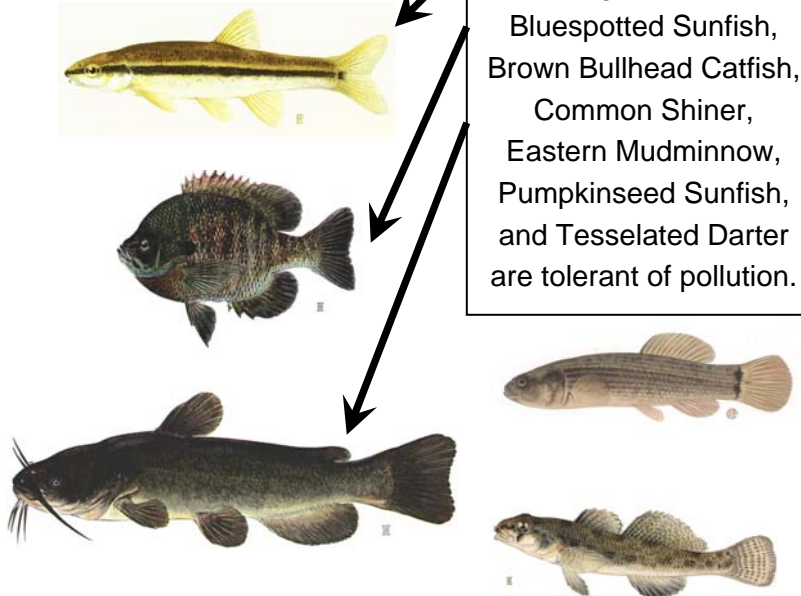


Fallfish, Rosy-sided Dace, and Spottail Shiner are sensitive to pollution and were found in Two Run and Galloway.

Pindell Branch

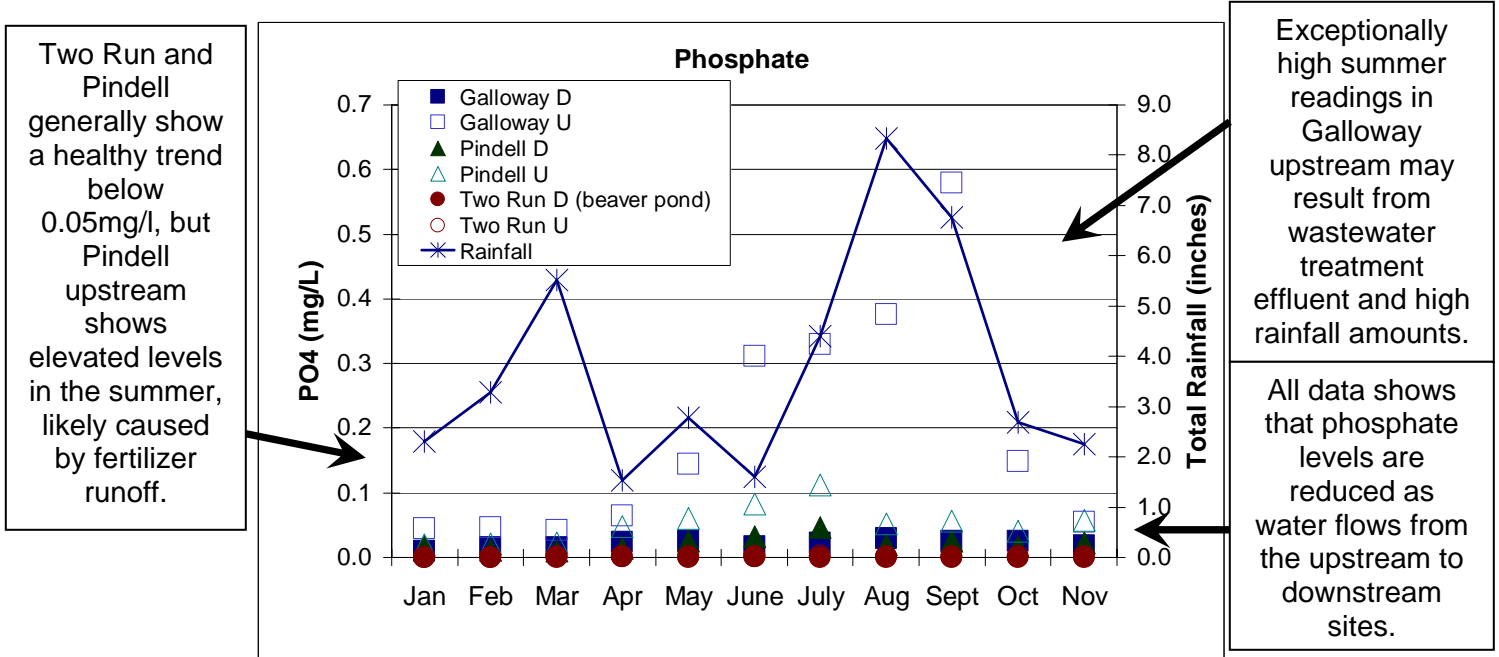


Black-nosed Dace, Bluegill Sunfish, Bluespotted Sunfish, Brown Bullhead Catfish, Common Shiner, Eastern Mudminnow, Pumpkinseed Sunfish, and Tesselated Darter are tolerant of pollution.



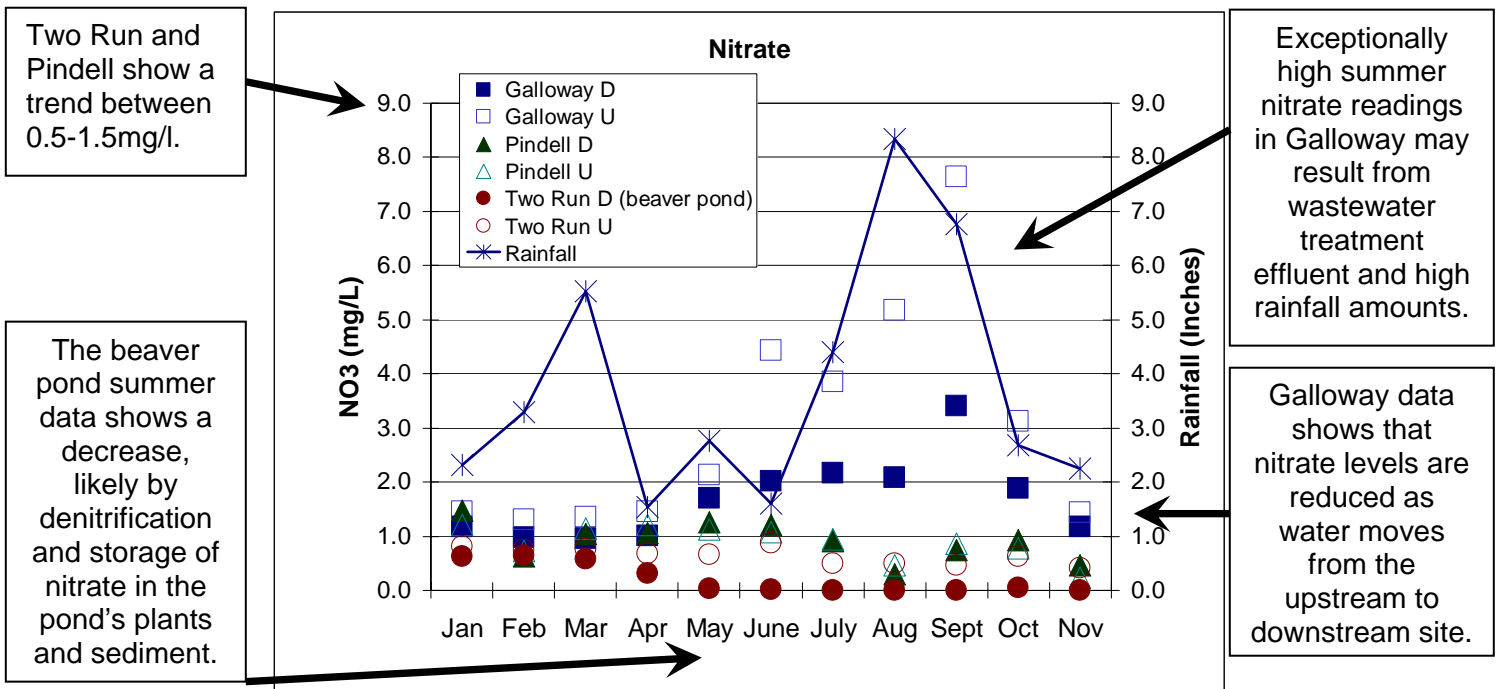
Phosphate

Phosphorus, in the form of phosphates, are naturally occurring. However, in excess they can accelerate the growth of algae and aquatic plants, causing eutrophication. Phosphate levels should be less than 0.05 mg/l. Monthly samples are graphed below with rainfall totals. Preliminary analysis shows that Two Run ranks **Good**, Galloway ranks **Poor**, and Pindell ranks **Fair**.



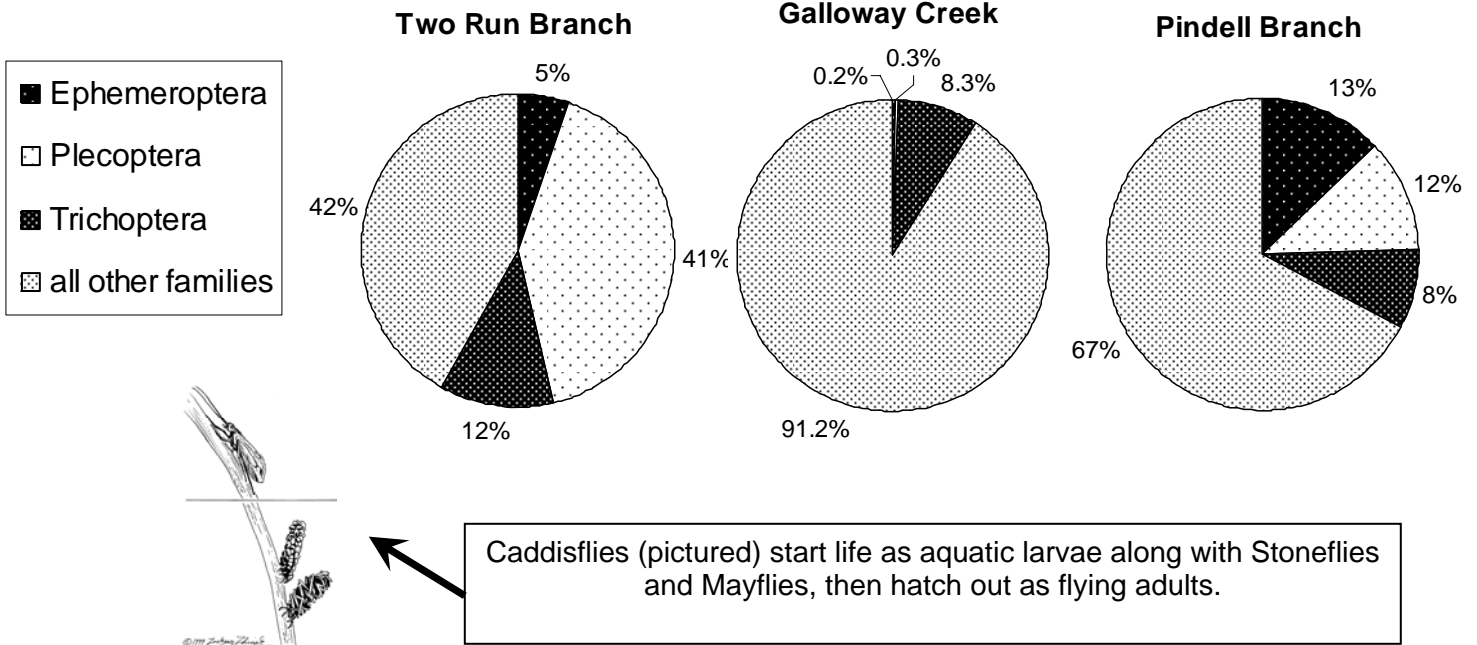
Nitrate

Nitrogen, in the form of nitrate, is essential for plant growth, but excessive amounts entering our waterways is a major source of pollution. Nitrogen compounds enter water from fertilizers, sewage, industrial wastes, and livestock wastes. Nitrate levels should be less than 0.5 mg/l. Monthly samples are graphed below with rainfall totals. Preliminary analysis shows that Two Run ranks **Good**, Galloway ranks **Poor**, and Pindell ranks **Fair**.



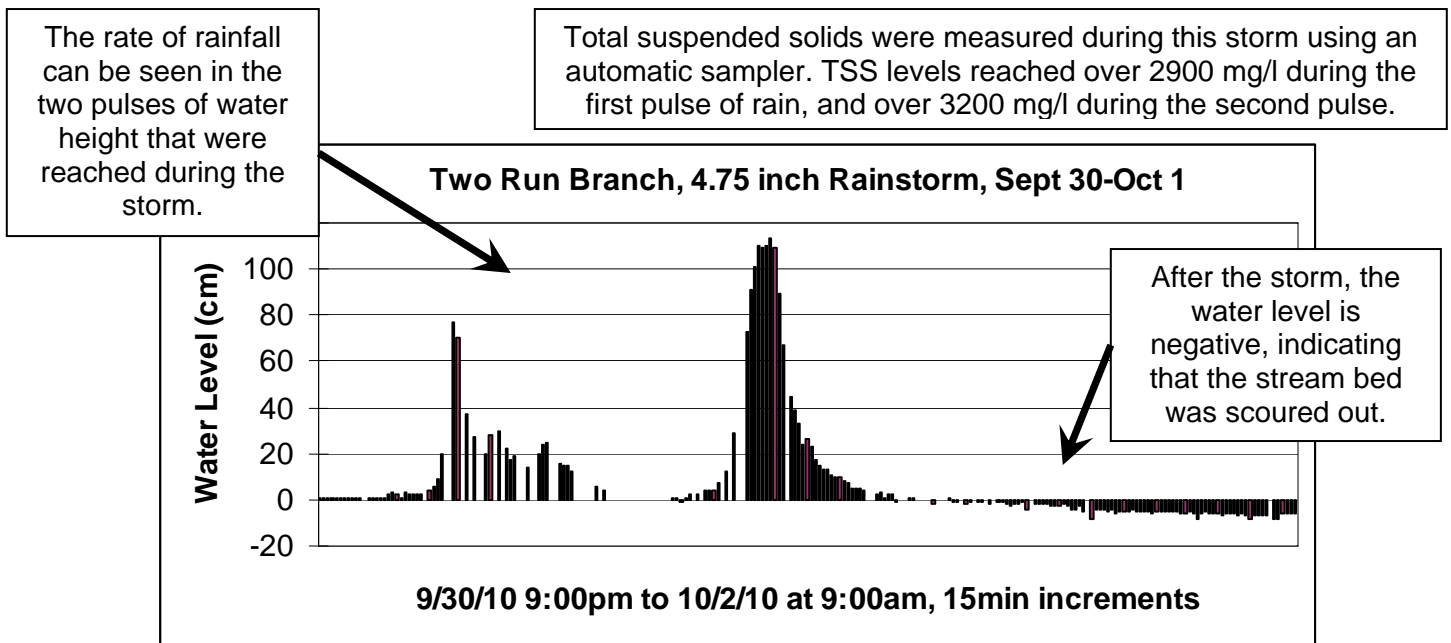
Macroinvertebrates (Aquatic Insects)

Macroinvertebrates are small animals with no backbone. In streams, they form the basis of the aquatic food web and are critical to a healthy ecosystem. Also, since they live for several months or more and do not move far, their abundance and diversity makes them reliable water quality indicators. The three families that are most sensitive to pollution are graphed below against all the other animals caught. The EPT index is based on these three sensitive families, Ephemeroptera (Mayflies), Plecoptera (Stoneflies), and Trichoptera (Caddisflies), and their relative abundance. Preliminary analysis shows that Two Run ranks **Good**, Galloway ranks **Poor**, and Pindell ranks **Fair**.



Stream Flow

One of our intrepid volunteers, Bob Smith, designed and installed a water level detector in Two Run Branch to get baseline data on stream height, and to determine water level during storms. Water level in the stream channel is graphed below during an early fall rainstorm.



Two Run Branch



Galloway Creek



Pindell Branch



Changes Over Time Series

(All photographs by Jack & Jean Filigenzi)

Acknowledgements

This study demonstrates the valuable role volunteers play as citizen scientists in collecting ecological data. We are grateful to the following volunteers: Tommy Bidne, Gordon Burton, Mary Burton, Jeff Campbell, David Davis, Kim Elliot, Jean Filigenzi, Jack Filigenzi, Kristin Fischer, Brian Gates, Ron Griffin, Ben Hollister, Ralph Kurtz, Cliff Loudermilk, Eric Lind, Rob Mitchell, Olaf Rask, Bob Smith, Pete Uimonen, Keri Wixted, Rebecca Wolf, and Lisa Younk.

We are also grateful to the Friends of Jug Bay and Chesapeake Bay National Estuarine Research Reserve for ongoing support of our research, education and stewardship.

The Watershed Stewards Academy has been a source of inspiration for us to not just study the streams, but take action to make them healthier!

