

Insects and Fish Indicate Creek's Ecological Health

By Karyn Molines

The variety of fish and insect species living in a stream are excellent indicators of habitat conditions. Each species has a specific tolerance to water turbidity, temperature fluctuations, stream flow, pH (acidity), and nitrate levels. If the physical habitat becomes degraded, specialized feeders and species that are sensitive to pollution may decline, while populations of non-native species and omnivores (animals that eat plants, animals, and detritus) may increase. Changes in habitat structure and prey sources can also cause the species composition of an aquatic community to change.

For over a decade, volunteers have waded into the waters of Two Run Creek to monitor fish and macroinvertebrates—small, bottom-dwelling insects, worms, and crustaceans that are visible to the eye. We analyzed our data for species diversity, composition, and abundance to evaluate the index of “biotic integrity” (IBI) or ecological health of the creek. An IBI compares the stream to a “reference condition” stream—an idealized stream assumed to be of optimal quality and health.

Biotic Integrity: The capability of an ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region.

Both fish and macroinvertebrate IBIs indicate that Two Run Creek supports a healthy complement of species, reflecting good ecological conditions.

Bottom Dwellers

Because of their small size and limited mobility, benthic macroinvertebrates are unable to leave a stream when pollution or other crises occurs. In addition, their life cycles range from several months to several years, making them vulnerable to both short term (flooding or toxic spill) or long-term, cumulative events (climate or

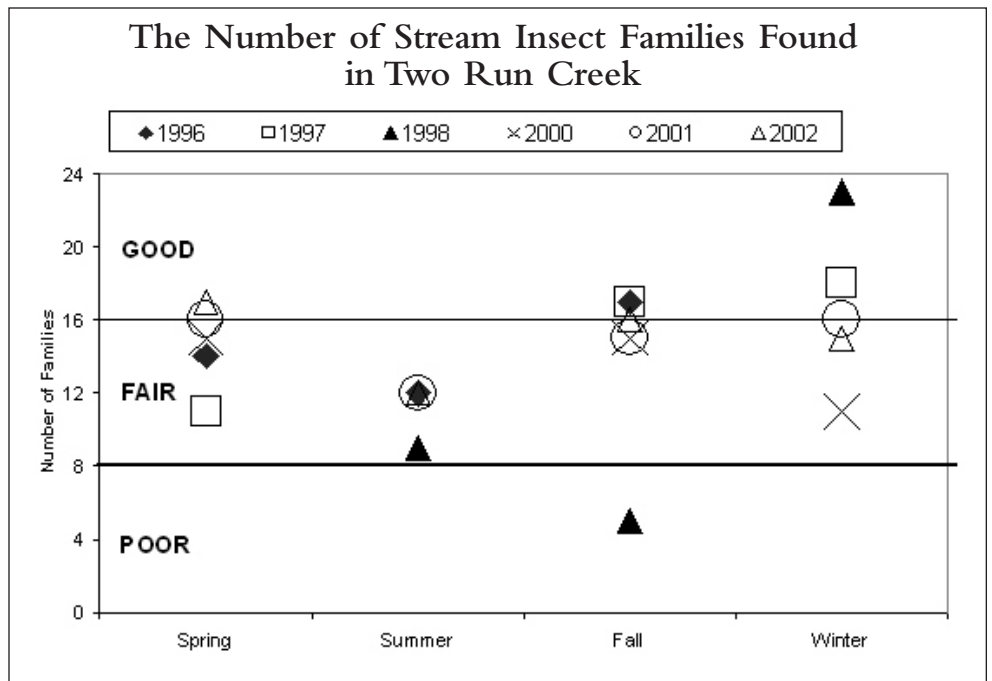
ecosystem change). Some insects, especially stoneflies and mayflies, are very sensitive to pollution and will only survive in the healthiest of streams. Other insects, such as black flies and mosquitoes, can tolerate poor water quality. The presence or absence of certain insects provides clues about the impacts affecting the stream.

Most of these impacts occur as houses, shopping centers, parking lots, and roads replace forests and floodplains. Converting natural habitats to other land uses causes a myriad of problems including increased runoff, excess nutrient and chemical pollution.



Many mayfly species are sensitive to pollution.

late spring or early summer. In the winter, most larvae have grown large enough to be easily caught. At the same time, water conditions are optimal for most stream



Increased rates of sedimentation can smother fish and invertebrate eggs or harm aquatic animals.

The number of macroinvertebrate families found in Two Run Creek varies both seasonally and yearly. Accurate evaluation of stream quality depends on combining multiple years and seasons. Evaluating stream quality from one sample, for example the Fall 1998, would not accurately reflect stream conditions. Seasonal variations occur as insects in their aquatic larval stages undergo metamorphosis and leave the stream to lead terrestrial lives in

The diversity of macroinvertebrates found in Two Run Creek indicates that the creek rates as Fair.

insects: temperatures are cool and dissolved oxygen levels are high (See “Chemistry Key to Water Quality,” p. 8). Yearly differences can also be explained by natural variations in weather conditions. During a summer drought in 2000, we were not able to collect any insects because the stream dried up. The rebounding of macroinvertebrate populations in subsequent years demonstrates the biological resiliency of the stream.

Index of Biological Integrity Based on Fish Species Found in Two Run and Pindell Creeks, 1996-2003

	<u>Two Run</u>	<u>Pindell Creek</u>
Number of Native Fish Species	Good	Good
Number of Pollution Intolerant Fish Species	Good	Good
Percent Pollution Tolerant Fish Species	Good	Fair
Percent Generalist, Insectivorous, Omnivorous	Fair	Poor
Percent Abundance of Dominant Fish Species	Fair	Fair
IBI Ranking	Good	Fair

In addition to ecological monitoring, this study also provides an opportunity for the public to learn about natural science and develop knowledge of stream ecology. South River High School students participated in the study, and then went on to win first place in the Anne Arundel County Envirothon, a national environmental competition for high school students.

Fish

Biotic indices for fish in Two Run Creek rate the stream as "Good." In comparison, Pindell Creek, which flows through the River Farm and drains a smaller land area, is rated as "Fair."

The presence of 17 **native fish species**

in Two Run indicates a diversity of habitats. The most abundant species include Rosy-sided Dace, Black-nosed Dace, Creek Chub, Tessellated Darter, and Spottail Shiner. Fourteen native species were found in Pindell. The Bluegill was the only non-native fish found in both creeks, but it represented less than 0.01% of fish caught.

Species that are **intolerant to pollution**, including the Rosy-sided Dace, Spottail Shiner, and Swallowtail Shiner, constitute 63% of the fish captured in Two Run Creek. A high number of intolerant species indicates minimal human disturbance of the stream. Intolerant species are most affected by degradation, as

they do not survive in streams with excess sediment, high water temperatures, or chemical pollution. Similarly, a low proportion of individuals that are **tolerant to pollution** indicates better ecological conditions.

Species with **Generalist, Insectivorous, or Omnivorous** feeding strategies tend to be more tolerant of environmental stresses than specialized feeders or predators. Dominance of these species increases as specific food sources become less reliable when stream conditions decline. Two Run Creek had two specialized feeders, the Least Brook Lampreys (filter feeders) and Chain Pickerels (top predators). However, the predominance of the other feeding types reflects some degradation of the creek.

As stream conditions decline, the dominant species increases in abundance, and overall species diversity tends to be lower. Two Run Creek had a high species diversity, but the fact that Rosy-sided Dace represented over 51% of fish caught indicates less than healthy environmental conditions.

The animals living in Two Run testify to its habitat diversity and good water quality. Still, conditions in the stream could be improved. To determine the causes of less than optimal conditions would take further study.

Streamside Salamanders Inhabit Floodplain

By *Karyn Molines*

This past fall, Amanda Martin, a research intern from Eleanor Roosevelt High School, conducted an investigation to find out which of the Sanctuary's salamander species live alongside Two Run Creek. She established four plots of sixteen wooden coverboards by the banks of different sections of the creek. Using coverboards, which act as refugia for salamanders, is an easy method for finding salamanders.

Last fall she and Nicole Preti, an intern from Southern High School, checked the coverboards weekly, identifying the salamanders found under the boards. The first Red-backed Salamanders (and a Green Treefrog!) were found in mid-October. Throughout the next month, all four species of streamside salamanders were found. It was not surprising to find so many Red-backed Salamanders—the most abundant salamander species in the Sanctuary. But finding four Four-toed Salamanders on one day was unexpected—and extraordinary! Nicole will be continuing the study this spring, and we are curious about how different salamander populations might vary in different seasons.

Four-toed Salamander.

