As more land is converted for human use, the impacts on the health of its ecosystem(s) are growing, especially in stream ecosystems. Understanding the impact of land development on stream ecosystems is essential because, in addition to transporting nutrients and sediments that all other ecosystems depend on, streams act as a habitat for their own ecosystems and are home to a diverse array of organisms.

Stream ecosystem health acts as a barometer of land use pressures on a watershed because stream conditions change in conjunction with surrounding land use changes. Macroinvertebrates act as prime indicators of stream ecosystem health because they are affected by what is both above and below them in the food chain and are more susceptible to environmental factors than most organisms. (Macroinvertebrates are organisms without a spine that are large enough to be seen with the naked eye.)

This study examined how land development effects stream ecosystem health. Macroinvertebrates were used to indicate ecosystem health in selected streams within the Mill Brook Preserve. It was hypothesized that there is a negative correlation between the percent of developed land in the watersheds and their stream ecosystem health.

Four streams were chosen for sampling based on varying types of land use, availability for sampling, and similarity to one another. Streams 1, 2, and 3 all flow into stream 4. Each stream had one designated sampling site just above the confluence of each stream to isolate the extent of impact.

Three biodiversity indices were calculated for each sample: EPT Richness Estimate, Major Group Biotic Index, and Percent Model Affinity. Land use was quantified using GIS mapping to produce percentages of total developed land within the watersheds of each sampled stream.

The relationship between percent developed land and biodiversity indices was calculated using a trendline for each relationship and the correlation was calculated using the coefficient of determination (R^2). This was calculated for Percent Model Affinity and Major Group Biotic Index.

The Habitat Assessment chart indicates that Stream 3 has a slightly higher habitat quality than the other streams. Since the watershed of stream 3 also has the lowest percent of developed land (11%), this data supports the hypothesis.

Streams 1 and 2 had ratings of “slightly impacted” on all three indices. Stream 4 had a rating of “non-impacted” on Biotic Index and Percent Model Affinity and “slightly impacted” on EPT Richness. Stream 3 had a rating of “non-impacted” for all three tests. Stream 3 had the lowest percent of developed land (11%) and was indicated to be the least impacted. Stream 4 had the second lowest percent of developed land (35%) and was indicated to be the second least impacted. Streams 1 and 2 had the highest percentages of developed land (11%) and were indicated to be the most impacted. These scores support the hypothesis.

In the Biotic Index and Percent Developed Land graph, the positive trendline shows that there is a positive relationship between percent of developed land and Major Group Biotic Index. This suggests a negative correlation between percent of developed land in a watershed and stream ecosystem health because a higher Biotic Index indicates a more impacted stream. In the Percent Model Affinity and Percent Developed Land graph, the negative trendline shows that there is a negative relationship between percent of developed land and Percent Model Affinity. This suggests a negative correlation between the percent of developed land in a watershed and stream ecosystem health because a higher Percent Model Affinity score indicates a less impacted stream. The correlation between percent developed land and Biotic Index (R^2) was 0.1458. The correlation between percent land development and Percent Model Affinity (R^2) was 0.4645. These results also support the hypothesis.

Results indicated that land development negatively affects stream ecosystem health, supporting the hypothesis that there is a negative correlation between the percent of developed land in a stream watershed and the stream’s ecosystem health.