

June 16, 2003

To the friends of Valley Creek:

Over the past three years I have had the opportunity to work on an interdisciplinary research project at Drexel University to document the effects of urbanization on Valley Creek watershed. My primary focus in this study was to quantify changes in fish assemblages as related to changing land use and impervious surface cover. As some of you may know, a previous fish community study was done in 1993 by a Drexel graduate student. I compared my data to these baseline data to show the negative effects urbanization is having on the fish communities in Valley Creek. Enclosed is a bound copy of my master's thesis for your organization as well as a copy on CD for you to distribute to whomever you wish. Below is a brief summary of the work that was done, results, and some suggestions for improving the situation in Valley Creek.

I used electroshock fishing to characterize the fish communities at 15 sampling stations throughout the Valley Creek watershed. This was done in July of 2001 and July 2002. Water quality data and notes on habitat and land use were taken seasonally at these same stations. All fish were identified, weighed and measured on site and these data were used to calculate species diversity, abundance, evenness, species richness, similarity index and condition factor. Physical parameters calculated for each station included stream order, distance from mouth, impervious surface cover in each sub-basin, riparian width, sediment composition, stream flow and land use. Below are the major findings of my thesis:

- Fish species richness in Valley Creek watershed declined from 19 species in 1993, to 15 in 2001 and 11 in 2002.
- Fish species composition exhibited a very patchy type of distribution throughout the watershed which was correlated with land use, habitat availability and water quality.
- Fish species diversity was greater in the entire watershed than it was at any individual station, emphasizing this patchiness.
- Adjacent upstream stations showed very low similarity, pointing again to the non-continuous nature of the system.
- Similarity was low between species present at the same stations when comparing 1993 to 2001 and 2002.

- Brown trout declined in numbers, distribution, range, and proportion of the total fish assemblage. In 1993, brown trout made up 25% of the total fish in Valley Creek, at present they make up only 12%.
- Brown trout are more prominent in residential land use areas than areas that are primarily commercial or industrial. Within residential land uses, large lot, low density housing has less of a detrimental effect on fish assemblages than high density housing areas.
- Pollution tolerant species like white sucker and creek chub are more abundant than they were in 1993, both with a much larger distribution area as well.
- Stream temperature is a major driving factor behind these changes in fish assemblages, with the most affected species being the brown trout.
- The average summer temperature at the 15 stations was above that of the preferred range for brown trout.
- The stream temperature is **not** constant all year despite the large amount of groundwater inputs. Some stations have as much as a 20°C differential between summer and winter.
- Groundwater is extremely important in Valley Creek watershed. It helps to buffer the system and allows it to support more diverse fish assemblages than expected in areas with >17% impervious surface cover (ISC). Even stations with up to 35% ISC have fairly good fish assemblages in areas with a lot of groundwater input.

Here are a few suggestions for improving the fish communities in Valley Creek based on my research.

- A main culprit responsible for observed fish community changes is rising stream temperature primarily due to poor stormwater management. The amount of warm stormwater from the large amount of impervious surface cover (i.e. rooftops and parking lots) coming into the Valley Creek system has surpassed the ability of the groundwater to keep the stream cool. However, if the stormwater problem can be resolved or improved upon, resulting in less stormwater going directly into the stream, the groundwater will still be present and stream temperatures could return to more constant levels. With stream temperatures cooler and more consistent, more sensitive fish species will be able to survive and reproduce more successfully.

- Riparian corridors are important in maintaining stream channels, reducing erosion, providing cover for fish. Leaves from riparian vegetation are a large part of the food web in Valley Creek (as we documented in another study). One of the simplest ways to do this, especially on residential properties, is not to cut the grass the whole way down to the stream bank. By leaving only a couple of meters of uncut vegetation, you can improve the quality of the stream immensely.
- Limited habitat availability for fish is another problem that has easy practical solutions. Brown trout in particular need specific habitat types as well as good water quality to survive. By **not** removing large piles of woody debris from the stream, including fallen trees and small natural dams of sticks and leaves, you can preserve valuable brown trout habitat and increase the chances of their survival.
- One specific example of where habitat restoration is essential is the LeBoutiller Rd. (#4) site of Valley Creek. In summer 2001 this was a high quality reach of stream with excellent water quality from the large upstream spring and good habitat availability. In the fall of 2001, some construction was done on the bridge and excess materials were dumped into the stream, filling up the deep holes and gravel runs with fine sediment. By summer 2002, there were very few fish present and the diversity was significantly lower than the previous year, despite the good water quality. The construction debris needs to be removed from this site in order to restore a suitable habitat for brown trout.

Valley Creek is a beautiful and important stream system and I know many of you are working hard to preserve and improve the quality of this watershed. I hope my research will be valuable to you and be an important resource in the protection of Valley Creek. Thank you for all the effort and support you have given me for my research and for the entire Valley Creek project here at Drexel University.

If you have any questions, comments or if you want more information please feel free to contact either myself ([lys23@drexel.edu](mailto:lys23@drexel.edu)) or my supervising professor Dr. Susan Kilham ([kilhams@drexel.edu](mailto:kilhams@drexel.edu) or at (215) 895-2628). We would be happy to talk to you about our research.

Sincerely,

Luanne Steffy