

Tremont Stream Salamander Monitoring Study **Overview and Protocols**

The objectives of this study are:

- Gather long-term baseline data on salamander populations in Walker Valley.
- Determine species distribution along streams in the Walker Valley.
- Compare populations (SV length, total length, weight, and age distribution) in heavily used streams with populations in less visited streams.
- Compare species richness and abundance in relation to stream habitat and water quality variables in Walker Valley streams.
- Compare the use of three survey methods for streamside amphibians at two or more streams in the Walker Valley, Great Smoky Mountains National Park:
 - Leaf-litter bags,
 - One meter square quadrants (*NOTE: Quadrant searches were not done for several years due to a lack of experienced volunteers.*)
 - Ten meter length area searches (*NOTE: This method was discarded prior to 2001.*)
- Produce data that is compatible with other stream salamander research in the Smokies.
- Provide educational experience for participants at Tremont programs, giving them a chance to learn about and participate in scientific research.

Background:

Streamside salamanders were defined as those species whose larval stages occur within 1st and second order streams and springs. This group is composed of the genera *Desmognathus*, *Eurycea*, *Gyrinophilus*, *Pseudotriton*, and *Typhlomolge* (a western genus).

This group has the following attributes that make them attractive for monitoring:

- Relatively low sampling variation
- Occur in small order streams that collect and concentrate water-borne contaminants from the surrounding landscape and therefore respond to disturbances and pollutants from throughout the watershed.
- Are known to be sensitive to riparian corridor widths and stream acidity
- Are accessible for sampling throughout a lengthy period of time within the year.
- Are the top predators in streams without fish
- Good potential for incorporation into evaluations of headwater and stream habitat quality.
- High public and volunteer interest
- More native charisma than macroinvertebrates
- Fecundity is low and their life cycle lengthy. Thus, combined with a relatively low colonization ability makes the presence of all the life stages in a stream strong evidence for population stability and watershed quality.

This group has the following attributes that detract from their appeal as a monitored group:

- Life history is relatively unknown compared to other species

- Identification of larvae is problematic and in some geographic areas adults also
- Volunteers would require significant training and supervision
- The group has low visibility among scientists, regulators and managers as an important
 - component of stream systems, as a group in need of conservation, and in their potential as
 - indicators.

(From "Eastern Streamside Salamander Monitoring Meetings" June 27, 1999, Sam Droege et al.)

Methods:

Study area: Stream sections were designated for monitoring, including the Dorsey Branch, Bear Sign Branch, Loan Branch, Pig Pen Branch, Ashley Branch, and Spicewoods Branch. Dorsey and Loan Branches are often visited by children looking for salamanders one or two times per week. Bear Sign, Pig Pen, Spicewoods, and Ashley Branches are rarely visited by Tremont groups (other than for salamander monitoring) and appear to be unvisited by almost anyone. One 100 m transect will be designated along each stream channel, with the exception of the Dorsey, which will have a second transect above the area visited by school groups. *NOTE: Bear Sign Branch was dropped in 2002 due to the fact that it is very difficult to access.*

The monitoring methodology will follow the efforts of Shenandoah National Park, though electroshocking will not be employed.

Leaf litter bags: We will use the leaf litter bag method designed by Tom Pauley to survey streamside salamanders (Pauley 1995). Leaf litter bags are placed at 5 m intervals along 100 m transects. At each 5 m interval along the 100 m transect, one bag is placed so as to insure at least 25% submersion in the stream, yielding a total of 21 bags per 100 m transect. Leaf litter bags are placed in streams two weeks prior to the first check. Leaf litter bags are constructed of plastic mesh, which are cut into 50 cm². In the field, the bag is filled with a small, flat rock and several handfuls of leaves above and below the rocks, and the sides are gathered together and cinched together using cable ties to make a sac. A 12" piece of orange flagging tape is tied through the netting at the top of the leaf litter bag so that they are more visible in the stream. The bags are tethered to a bush or tree to keep it in place.

To check leaf litter bags, the bag is lifted into a plastic pan containing some water. The area where the bag used to be is searched for salamanders which were hiding beneath the bag. The leaves are manipulated and thoroughly rinsed, using water from another pan, so as to dislodge any salamander within. The rinse water is then poured into another pan and searched through carefully to insure that even the smallest larva is noticed and collected in a plastic zip-lock bag. A sieve may be used to separate salamanders and debris from muddy rinse water. On the data sheet, record whether the salamander is caught from the initial shake or found under the bag. Over time, leaf litter often disintegrates in the bags. Therefore, it is necessary to replace leaf litter once a month.

One m² Quadrats: At five meter intervals next to the leaf litter bags, we will use 1 m² quadrat sampling modified from (Mitchell 1998). Number of stones within each quadrat is recorded before starting the search. Quadrats are conducted in arbitrarily selected representative habitat near to each leaf bag, yielding 21 quadrats per 100 m transect. This sampling is disruptive, as all

stones within a 1 m² quadrat are overturned. This method will be conducted only 2-3 times annually per stream.

Water Analysis Protocol: We measure water temperature, turbidity, and pH the day of the monitoring. Basic atmospheric data is also available from the Tremont weather station. Water flow and discharge will be estimated each time that sampling is conducted.

Salamanders: Salamanders will be identified to species (as possible). Individuals may be removed from the field temporarily for identification under more optimal conditions back at Tremont. Data recorded will include SV length, total length, mass, and adult vs. larva. Most larvae are not weighed, unless they are especially large.

Protocols will be conducted a minimum of three times per year and no more often than 14 days between efforts. Salamander searches outside of this protocol will not be discouraged at Dorsey Branch. Date, duration of search, and number of individuals broken down by species (to the extent of identification appropriate for the observers) will be recorded for non-protocol visits.