PACIFIC SOUTHWEST
Forest and Range
Experiment Station

FOREST SERVICE
U.S.DEPARTMENT OF AGRICULTURE
P.O. BOX 245, BERKELEY, CALIFORNIA 94701

Improved Insect Emergence Trap for Stream Community Population Sampling

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Research Note PSW-328
1978

LaGasa, Eric. H., and Stamford D. Smith
1978. **Improved insect emergence trap for stream community population sampling.** Res. Note PSW-328, 3 p., illus. Pacific Southwest Forest and Range Exp. Stn., Forest Serv., U.S. Dep. Agric., Berkeley, Calif.

A sealed-edge pyramidal trap to sample total insect emergence from a segment of a small stream has been designed and tested in northeastern Oregon. The trap is approximately 10 by 10 feet at the base, and is constructed of wood, clear plastic, and galvanized screening. It is efficient and readily used, and can yield significant data on seasonal population changes and on the environmental impact of insecticides.

Oxford: 145.711:153–015.5 + 145.717:153–015.5.
Retrieval Terms: aquatic insects; population sampling; traps.

Emergence traps have not been used in North America for comparative studies of stream communities of aquatic insects. Because inconsistent results were obtained from previous studies, there is a need for a trap designed to minimize escape and loss of specimens. Such a trap could provide a reasonably efficient and inexpensive method of measuring the species composition and relative productivity of stream communities. The sealed-edge pyramidal emergence trap was constructed while we were taking part in a research program on insecticide effects on nontarget organisms. The trap was designed to sample the total insect emergence from a measured segment of small streams in a number of varied northeast Oregon test areas. It has performed extremely well during three 3-month summer sampling sessions. Apparently, it can be used in various types of long term investigations of stream population changes.

In past studies, the form and construction of the traps have caused many problems in both lotic and lenitic sampling. The reasons why such traps are not functional for quantitative studies have been discussed in the literature.[1] Many problems are directly related to behavior of emerging insects. More recent studies, such as those using the smaller trap of Anderson and Wold[2] and the European "green houses" of Illies[3] have shown encouraging results from new designs. Our trap is designed to solve the problems inherent in previous emergence trap designs and operation.

MATERIALS AND CONSTRUCTION

The trap is a modified A-frame (*fig. 1A*). It differs from earlier traps in that the side walls extend downward to remain in contact with the water surface or the shore, thus forming a structure which completely encloses a segment of creek.

The trap measures 10 by 10 feet at the base. Cross-stream supports vary according to differences in stream width. The trap is anchored on our test plots

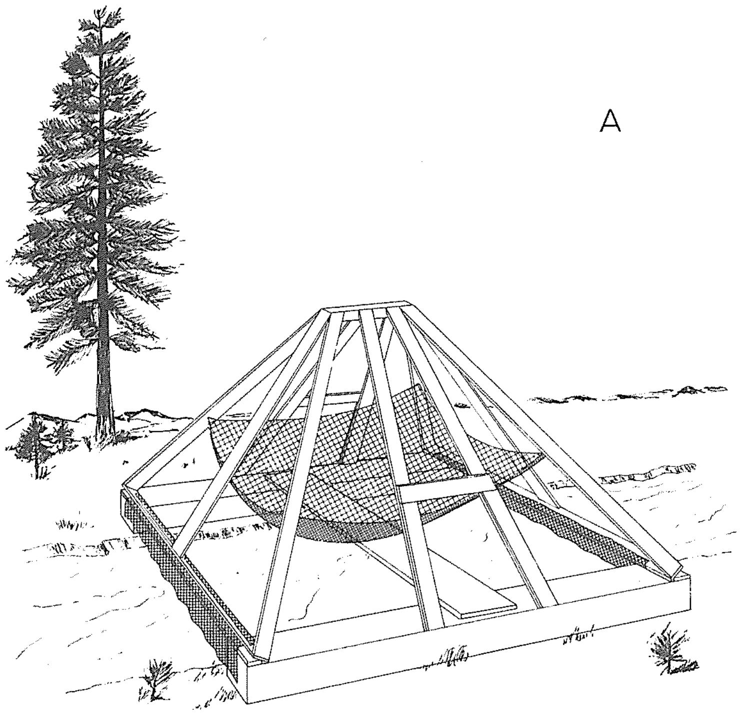
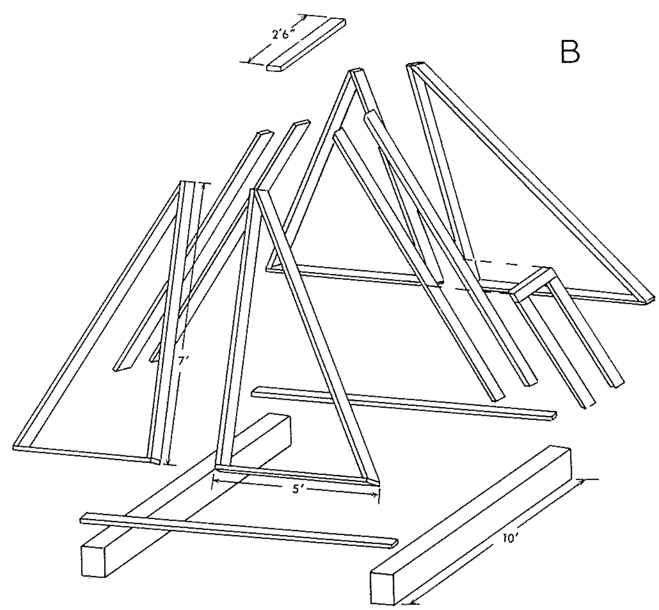


Figure 1—This sealed-edge pyramidal trap was tested in sampling of insect emergence on a small stream in northeastern Oregon. In *A*, the emergence trap is shown in position over the creek; *B* is an exploded view of the trap parts.



to fixed wooden beams (6 by 8 inches by 10 feet) that parallel the stream. The fixed beam bases, although not required, provide greater strength and stability for the trap and allow easy removal of the traps (to avoid winter snow damage), as well as exact relocation. Thus sites can be more easily sampled during successive years, assuming the stream does not change course.

The trap superstructure is a simple A-frame formed from prefabricated triangular end panels connected at the top by a short key piece (*fig. 1B*). Four upright supports complete the basic framework. The end panels and the rest of the trap are covered with alternating sections of clear plastic and galvanized window screening. To collect the insects, the investigator enters through a hinged door at one side of the trap; a plank walkway permits him to move about inside the trap without disturbing the creek bottom.

The upstream and downstream edges of the trap are extended downward by means of screening which remains in contact with the water surface. Where greater fluctuation of stream level occurred, an additional flap of plastic sheeting was attached at the bottom of the screen, and this, by floating on the water surface, effectively sealed the sample area. By using large traps we hoped to allow room for insect movement and reduce losses of insects back into the water. During trap cleanout only a few individuals were seen to fall back into the water. We tried to further reduce those losses by using clear plastic catch sheets suspended horizontally across the middle of the traps. The catch sheet served to concentrate the insects somewhat in the upper area of the trap as well as to catch individuals that weaken and fall from the trap walls.

Our initial observations of trapped insects and counts of insects found dead on the catch sheets showed that specimens apparently survive well in the traps. Although for best results the trapped insects should be removed daily, if necessary they may be allowed to accumulate for a few days without substantial loss or deterioration of specimens.

From time to time, large numbers of specimens appeared in the trap. To aid in removing them, we adapted a small car vacuum for field use.[4] The vacuum, with a small-engine 12-volt battery as power supply, collected the insects into a cloth bag connected to the nozzle. The bag and nozzle assembly was then easily closed, removed from the vacuum and placed in a tightly fitting cyanide container. The vacuum made quick and accurate work of the removal process and did not appreciably damage specimens.

Our study in northeastern Oregon employed nine emergence traps on seven creeks. Preliminary analysis of the great quantities of emergence data collected have proven quite interesting. The Trichoptera and Ephemeroptera were separated for detailed study, and 37 and 41 species, respectively, were identified from the various creeks. In addition to collecting emergence data, cooperating researchers took drift and bottom samples during both years. Ten-minute samples of drifting insects were taken over 24-hour periods at various times during both summers. Bottom samples were taken with a Surber sampler on the same days as the drift samples. Preliminary statistical analysis of the many thousands of emergent insects collected showed relative uniformity of all sites and also provided data on possible pesticide effects. A third year of samples is needed before conclusions can be drawn. We can see, however, that seasonal data are readily available from this type of emergence trap.

After 2 years of field testing, we conclude that the performance of this trap is comparable or superior to that of other methods currently in use.

Acknowledgment: The work leading to this publication was funded under grant 7 from the U.S. Department of Agriculture's Expanded Douglas-fir Tussock Moth Research and Development Program, which is administered by the Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

NOTES

[1] Gledhill, T. 1960. *The Ephemeroptera, Plecoptera, and Trichoptera caught by emergence traps in two streams during the year of 1958.* Hydrobiologia 15:179-88.

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[2] Anderson, N. H., and Janet Wold. 1972. *Emergence trap collections of Trichoptera from an Oregon stream.* Can. Entomol. 104:189-201.

[3] Illies, Joachim. 1971. *Emergenz 1969 im Breitenbach.* Arch. Hydrobiol. 69(1):14-59.

[4] Bon Aire Auto Hand Vacuum Cleaner, Model HV-95. Trade names and commercial enterprises or products are mentioned solely for necessary information. No endorsement by the U.S. Department of Agriculture is implied.

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