The Effects of Channelization on the Benthic Assemblage in a Southeastern Oklahoma Stream

Steven R. Adams and O. Eugene Maughan, Leader
Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University, Stillwater, OK 74078

There is general agreement that changes in aquatic fauna occur following channelization but little agreement on cause and effect (1-4). Hynes (2) postulated that feeding mechanisms of organisms were disrupted. Forshage and Carter (5) and Rosenberg and Snow (3) reported that changes resulted from heavy siltation. Minshall and Winger (1) considered that changes resulted from less habitat and less food production.

We unexpectedly observed the effects of channelization on stream benthic assemblages in a small headwater stream of the upper Little River, northeast of the community of Octavia in T1N, R23E in 1981-1982. These observations were not part of a designed study but were taken opportunistically. We collected two benthic samples from the stream prior to and three samples after channelization. After collection of the third sample, a drought resulted in cessation of flow at the site and elimination of all benthic populations.

All samples were collected with a 0.2452-m² Circular Depletion Sampler (6). A sample consisting of three subsamples was taken from the same 0.2452-m² area. Each subsample was produced by three consecutive 2-minute units of collecting effort as described by Carle and Maughan (6). Subsamples were fixed in 10% formalin, washed, and preserved in 70% ethyl alcohol. Rose Bengal was added to facilitate sorting. After sorting, the organisms were usually identified to genus (7-14). The generic diversity of each sample was measured with the Shannon-Weaver species diversity index in which $d = n_i \log_2 n_i$ and n_i = density of species i.

Insects were classified into four groups (scrapers, collector-gatherers, predators, and shredders) as proposed by Merritt and Cummins (9). Mean density/m² of each taxon was summed across each group, and the totals were used as a measure of relative seasonal density.

For one season following channelization, the assemblage was dominated by the previously rare isopod *Asellus* (Isopoda) and the stonefly *Taenionema* (Plecoptera). After this season the assemblage returned to pre-channelization conditions (Table 1). Both of the organisms that dominated the system after channelization have been classified as grazers (9). What appeared to happen was that the pathways of organic input shifted from material associated with leaf fall and runoff to material associated with periphyton production. Accompanying

TABLE 1. Characteristics of benthic assemblage on Upper Little River over five consecutive seasons 1981–82. Spring: March, April, May; Summer: June, July, August; Fall: September, October, November; Winter: December, January, February.

	PRE-CHANNELIZATION		POST-CHANNELIZATION		
	Season 1 Spring 1981	Season 2 Summer 1981	Season 1 Fall 1981	Season 2 Winter 1981–1982	Season 3 Spring 1982
Relative density, scrapers	0.002	0.011	0.699	0.019	0.051
Relative density, collectors	0.898	0.940	0.238	0.923	0.878
Relative density, predators	0.098	0.049	0.042	0.049	0.070
Relative density, shredders	0.002	0	0.021	0.009	0.001
Number of taxa	33	26	29	39	40
Seasonal density/m²	989.7	705.5	1757.8	5871.4	1578.3
Diversity Indices, H'	3.15	2.89	1.42	2.27	3.64

this change was a shift of the assemblage from shredder domination to grazer domination and a decrease in diversity.

These data do not represent a rigorous study but were the result of opportunistic observations based upon a unique field situation. Confounding factors, such as clear-cut logging and road building, plus small sample size may have contributed to the changes observed in the benthic community in the upper Little River. However, studies on drainages where channelization did not occur, but logging and road building did, failed to show similar changes in benthos (15). Further study is required to verify these observations.

REFERENCES

1. G.W. Minshall and P.V. Winger, Ecology 49: 580-582 (1978).

2. H.B.N. Hynes, *The Ecology of Running Waters,* University of Toronto Press, Toronto, 1972.

3. D.M. Rosenberg and N.B. Snow, *Ecological studies of aquatic organisms in the McKenzie and Porcupine River drainages in relation to sedimentation.* Technical Report No. 547, Fish and Mar. Serv. Environment Canada, Winnipeg, Manitoba, Canada, 1975.

4. B.C. Pruitt and S.E. Gatewood, *Kissimmee River floodplain vegetation and cattle carrying capacity before and after channelization.* Florida Department of Administration, Division of Planning, 1976.

5. A. Forshage and N.E. Carter, Proc. Annu. Conf. SE Assoc. Game and Fish Comm. 27: 695-708 (1973).

6. F.L. Carle and O.E. Maughan, Hydrobiologia 20: 181-187 (1980).

7. R.W. Pennak, *Freshwater Invertebrates of the United States*, John Wiley and Sons, New York, 1978.

8. R.L. Usinger (Ed.), *Aquatic Insects of California*, Univ. Calif. Press, Berkeley, CA, 1956.

9. R.W. Merritt and K.W. Cummins (Eds.), *An Introduction to the Aquatic Insects of North America*, Kendall/Hunt Publ. Co., Dubuque, Iowa, 1984.

10. G.B. Wiggins, *Larvae of North American Caddisfly Genera (Trichoptera),* Univ. of Toronto Press, Toronto, 1977.

11. W.D. Williams, *Freshwater Isopods (Asellidae) of North America*, in U.S. Environmental Protection Agency Rept. 18050, ELD, Vol. 7.

12. P.A. Lewis, *Taxonomy and Ecology of Stenonema Mayflies (Heptageniidae:Ephemeroptera),* U.S. EPA, Environmental Monitoring Ser. Rept. EPA-670/4-006, 1974.

13. H.P. Brown, *Aquatic Dryopoid Beetles (Coleoptera) of the United States,* in U.S. Environmental Protection Agency Rept. 18050, ELD, Vol. 6, 1972.

14. O.S. Flint, Entomol. Am. 40: 1-117 (1960).

15. O.E. Maughan, S. Burks, A.A. Echelle, A. Rutherford, S. Adams, J. Matlock, K. Collins, R. Collins, and R. Jones, *The Effects of Silviculture on Southeastern Oklahoma Streams,* Completion Report to Oklahoma Department of Wildlife Conservation, 1983.