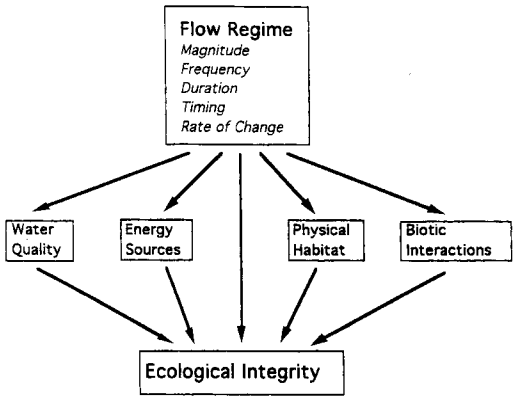


Figure 1. Flow regime is of central importance in sustaining the ecological integrity of flowing water systems. The five components of the flow regime—magnitude, frequency, duration, timing, and rate of change—influence integrity both directly and indirectly, through their effects on other primary regulators of integrity. Modification of flow thus has cascading effects on the ecological integrity of rivers. After Karr 1991.

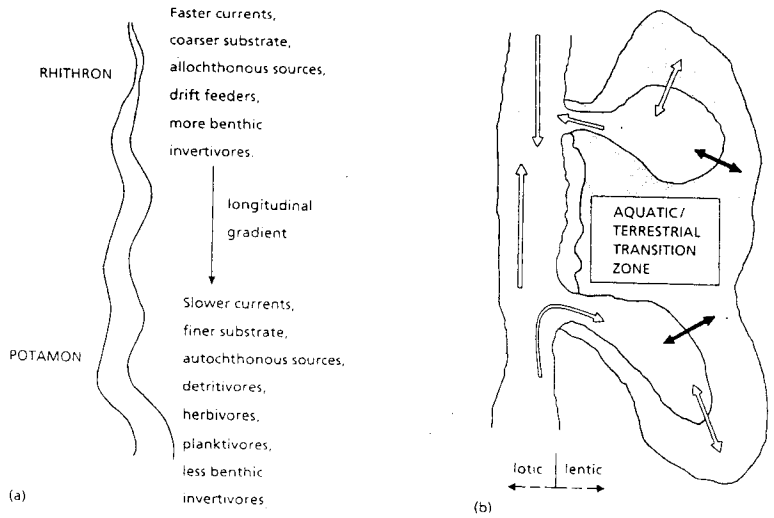
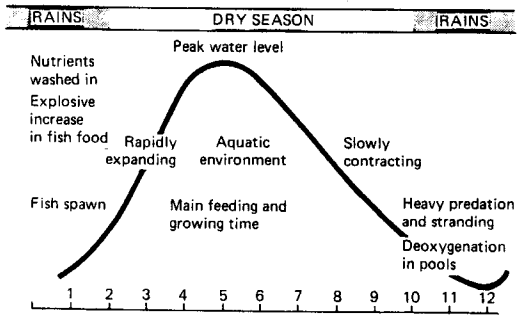


Fig. 12.3 Some contrasts between (a) the river continuum and (b) flood pulse concepts as applied to fishes. (⇨'white' fishes, ➔ 'black' fishes; arrows indicate migrations.)

Fig. 1.2. The seasonal cycles of events in a floodplain river.



Fish movements	up river	disperse on floodplain	back to river	confined to pools
Fish biomass	production of young	very rapid growth	heavy losses	much reduced
Fishing	of upstream migrants (destructive)	difficult: fish dispersed, much cover	intensive as fish move back to river	in pools (dry season refugees)

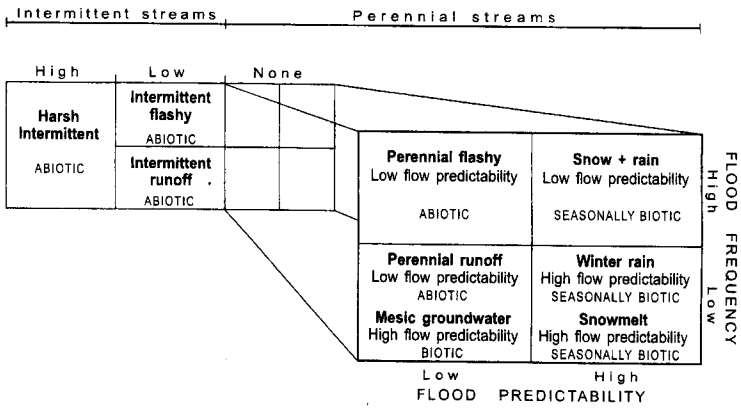


Figure 9.12. *A conceptual model of stream classification based on discharge regime. The relative effects of abiotic (flow regime) and biotic (e.g. predation, competition) processes on community structure differ between the various classes, as indicated. Redrawn from Poff and Ward (1989). Reproduced by permission of NRC Research Press*

Table 9.13. *Ecological correlates of streamflow sources in Michigan rivers. Source: Wiley and Seelbach (1997)*

Dominant source of streamflow	Degree of flood and drought disturbance	Summer stream characteristics	Dominant fishes (community type) families
Runoff	High	Warm temperatures (max >26 °C) after with large diel flux, sluggish flows, shallow depths, silt deposition on riffles	(warm-water fishes) suckers, sunfishes, catfishes, minnows and mudminnows
Throughflow or mixed sources	Moderate	Cool temperatures (max 22–26 °C), modest currents, shallow to moderate depth, little silt deposition in riffles	(cool-water fishes) suckers, sunfishes, pikes, perches, minnows
Groundwater	Low	Cold (max <22 °C) and stable temperatures, swift flows with good depth, clean coarse substrates	(cold-water fishes) trouts and salmons, sculpins

TABLE 3.—Composition of the assemblage of juvenile anadromous salmonids in three streams of the central Oregon Coast Range that had differing histories of major natural disturbance (G. H. Reeves, unpublished data collected in July 1988 and 1989).

Stream	Mean percent of estimated total numbers		
	Age-0 coho salmon	Age-1 steelhead	Age-1 cutthroat trout
Harvey Creek	98.0	1.0	1.0
Franklin Creek	85.0	12.5	2.3
Skate Creek	100.0	0.0	0.0

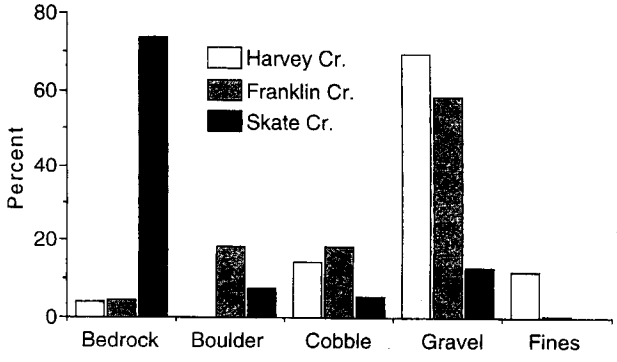


FIGURE 2.—Substrate composition in three streams of the central Oregon Coast Range that had differing histories of major natural disturbance. The time since the last major natural disturbance was 90–100 years for Harvey Creek, 160–180 years for Franklin Creek, and more than 330 years for Skate Creek. Cr = Creek (G. H. Reeves, unpublished data collected in July 1988 and 1989).

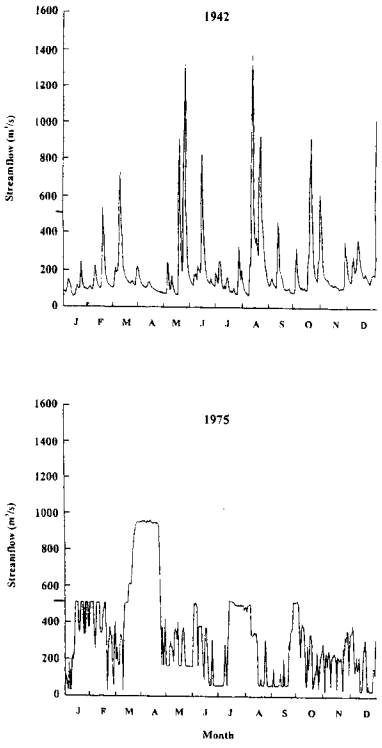


Figure 1. Two hydrographs for the Roanoke River at Roanoke Rapids in North Carolina can be characterized by the five general features of a hydrologic regime: magnitude, frequency, duration, timing, and rate of change. These regime features can be altered by human influences such as dams, as illustrated by a comparison of the upper pre-dam hydrograph for 1942 with the lower post-dam hydrograph for 1975 (cms = cubic meters per second = 35.315 cubic feet per second).

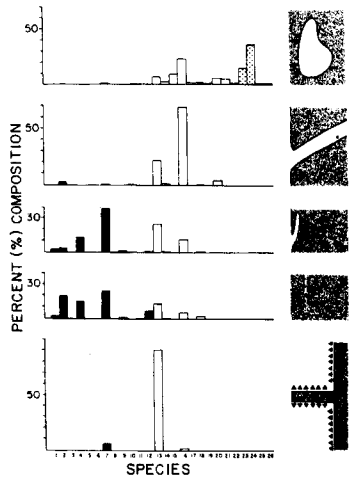


Figure 4. Percentage composition of fish in their first summer of life (age 0+) in five habitat types in the Danube River, Austria (adapted from Schiemer and Spindler 1989). Habitat types from top to bottom include disconnected backwater, connected backwater, small bay in the inshore zone of the river, gravel bank, and artificial shoreline made of angular stone. Three groups of species are identified: fast-water species (black columns), generalist species (open columns), and slow-water species (dotted columns). See Schiemer and Spindler (1989) for species identifications.

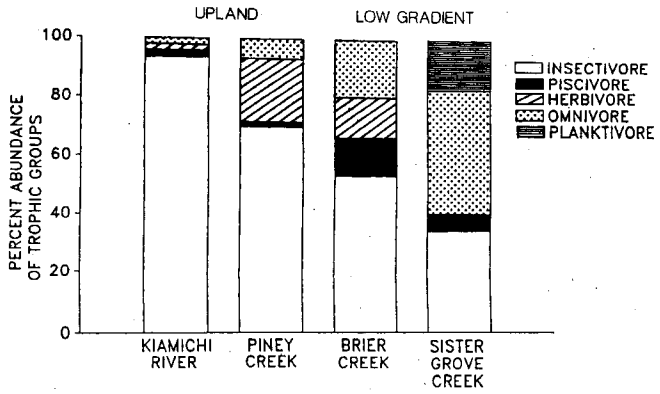


Figure 2.11. Percent abundance of five defined trophic groups of fishes, for four streams ranging from high-gradient, upland streams (Kiamichi River, Oklahoma; Piney Creek, Arkansas) to low-gradient prairie-margin streams (Brier Creek, Oklahoma; Sister Grove Creek, Texas). [Reprinted from Brown and Matthews (1995) with kind permission from Elsevier Science-NL, Sara Burgerhartstraat 25, 1055 KV Amsterdam, The Netherlands].

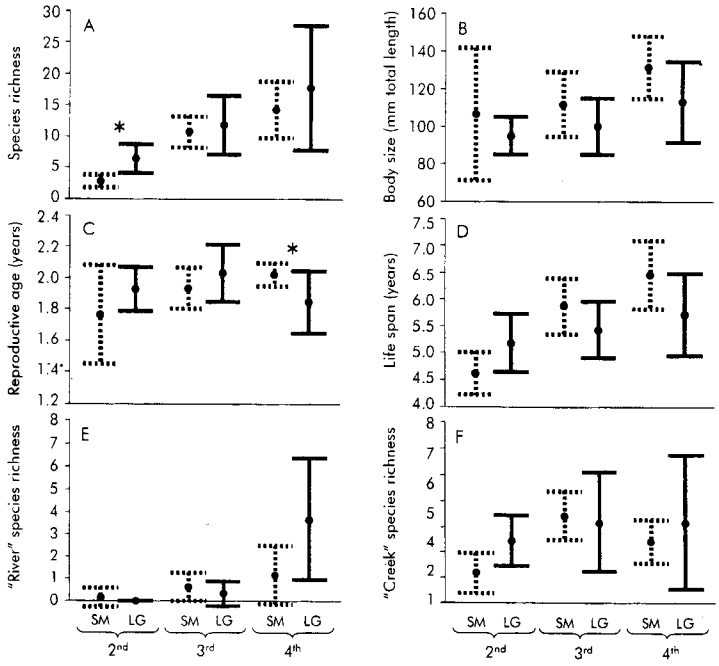


Figure 4. Effects of adjacent stream size on local species richness (A), mean adult body size (B), mean reproductive age (C), mean life span (D), "river" species richness (E), and "creek" species richness (F) across stream orders. Mean values (circles) and 95% confidence intervals (whiskers) are shown. Small adjacent streams (SM) are indicated with dashed lines; solid lines indicate the presence of large adjacent streams (LG). See text for definitions of river and creek species and adjacent stream size categories. Asterisks indicate significant differences ($P < 0.05$) between large and small adjacent streams (Table 2).

TABLE 8. Summary of relative characteristics of habitat structure and fish community organization along two physical gradients in a headwater stream.

Characteristic	Relative position on gradient: Downstream or pool environment	Relative position on gradient: Upstream or riffle environment
1. Habitat structure	Deep, temporally stable	Shallow, temporally variable
2. Fish community structure		
a. Species richness	High	Low
b. Age structure	Old fish	Young fish
c. Size composition	Large fish	Small fish
d. Dominant trophic group(s)	Insectivore-piscivores, benthic insectivores	Generalized insectivores
3. Fish community function		
a. Net production	Low	High
b. Absolute and relative growth rates of age 0–1 of the dominant trophic group(s)	High	Low
4. Seasonal and annual and stability of community attributes, i.e., species richness, trophic structure, age structure, and production	High	Low
5. Hypothesized dominant processes regulating community organization	Competitive exclusion and predation	Recolonization dynamics, effects of gradual changes in the physical environment on competitive interactions, and temporal variation in reproductive success