

zones of passage

of areas and the general economy of the water. Any chemical or thermal barrier destroys this valuable source of food and creates unfavorable conditions below or above it.

It is essential that adequate passageways be provided at all times for the movement or drift of the biota. Water quality criteria favorable to the aquatic community must be maintained at all times in these passageways. It is recognized, however, that certain areas of mixing are unavoidable. These create harmfully polluted areas and for this reason it is essential that they be limited in width and length and be provided only for mixing. The passage zone must provide favorable conditions and must be in a continuous stretch bordered by the same bank for a considerable distance to allow safe and adequate passage up and down the stream, reservoir, lake, or estuary for free-floating and drift organisms.

The width of the zone and the volume of flow in it will depend on the character and size of the stream or estuary. Area, depth, and volume of flow must be sufficient to provide a usable and desirable passageway for fish and other aquatic organisms. Further, the cross-sectional area and volume of flow in the passageway will largely determine the percentage of survival of drift organisms. Therefore, the passageway should contain preferably 75 percent of the cross-sectional area and/or volume of flow of the stream or estuary. It is evident that where there are several mixing areas close together they should all be on the same side so the passageway is continuous. Concentrations of waste materials in passageways should meet the requirements for the water.

The shape and size of mixing areas will vary with the location, size, character, and use of the receiving water and should be established by proper administrative authority. From the standpoint of the welfare of the aquatic life resource, however, such areas should be as small as possible and be provided for mixing only. Mixing should be accomplished as quickly as possible through the use of devices which insure that the waste is mixed with the allocated dilution water in the smallest possible area. At the border of this area, the water quality must meet the water quality requirements for that area. If, upon complete mixing with the available dilution water these requirements are not met, the waste must be pretreated so they will be met. For the protection of aquatic life resources, mixing areas must not be used for, or considered as, a substitute for waste treatment, or as an extension of, or substitute for, a waste treatment facility.

ANY BARRIER to migration and the free movement of the aquatic biota can be harmful in a number of ways. Such barriers block the spawning migration of anadromous and catadromus species. Many resident species make local migrations for spawning and other purposes and any barrier can be detrimental to their continued existence. The natural tidal movement in estuaries and downstream movement of planktonic organisms and of aquatic invertebrates in flowing fresh waters are important factors in the re-population