

Other types of keystone species are important as habitat modifiers. The beaver is an example of a species that can affect the dominant vegetation to such an extent that the entire ecosystem is changed. Beavers remove trees in stream and pond habitats, which can change the surface water and light conditions present in aquatic environments. Flooding can occur in relatively dry areas adjacent to water bodies that changes the mix and abundance of plant species in an area.

## 1.7 Ecological Stressors

An ecological stressor is any action or material that imposes changes on an ecological system. In order to understand the causes of observed effects at a contaminated site, the types of factors present as stressors need to be defined. Stressors become ecologically significant when they alter population, community, or ecosystem characteristics and function. For example, stressors might affect population size by reducing mating success, reducing egg production, reducing survival of offspring, or reducing survival of reproductive adults. Stressors can also affect population size by changing resistance to disease or parasites or by altering movement of organisms into or out of an area.

At contaminated sites the concern is primarily with chemical factors, although stress from physical and biological forces may also come into play, especially when evaluating remedial alternatives. Stressors can be broadly classified as physical, biological, or chemical.

### 1.7.1 Physical Stressors

Physical stressors are actions that directly remove or alter habitat. Examples include tilling soil, filling wetlands, or dredging a channel or harbor. Ecosystems are dynamic and possess a certain degree of resilience to recover from disturbances. In fact, natural disturbance is a normal part of ecosystem functioning. Generally, larger and more frequent physical stressors result in more excessive and longer-lasting effects. However, the addition of excessive physical stressors from human activities can sometimes exceed the ability of the ecosystem to rebound. The time required for an area to recover from a physical stressor once it is discontinued will often depend upon the type of ecosystem involved.

Aquatic ecosystems are often affected by physical stressors. Erosion from road construction or agricultural activities can create siltation (i.e., sediment buildup) in streams or lakes receiving runoff. Siltation can cause changes to habitat features such as water depth, rooted emergent and submergent rooted plant distribution in a freshwater or saltwater marsh, and loss of refuge or foraging areas for fish fry. Siltation can also result in filling of the interstitial spaces in gravel or cobble materials on the bottoms of water bodies. This can make these areas unsuitable for egg-laying by fishes, can suffocate eggs already present, and reduce or eliminate benthic invertebrates. Water bodies exposed to runoff from soils that are high in clay content can experience increased turbidity for days or weeks after a major rainfall event that, in turn, changes light intensity through the water column. Reduced light penetration can affect a fish's ability to find food and can lower the rate of photosynthesis by aquatic plants.