Level	Organism	DDT Concentration (parts per million)
Level 1	Water plant	0.08
	Plankton	0.04
	Marsh plants:	
	shoots	0.33
	roots	2.80
Level 2	Cricket	0.23
	Mosquito	0.30
	Clam	0.42
	Mud snail	0.26
	Bay shrimp	0.16
	Silversides	0.23
	Eel	0.28
	Fluke	1.28
	Blowfish	0.17
	Minnow	0.94 to 1.24
Level 3	Billfish	2.07
	Terns	3.15 to 6.40
	Osprey egg	13.8
	Green heron	3.57
	Merganser	22.8
	Cormorant	26.4
	Gulls	3.52 to 75.5

Figure 6-9 Concentration (parts per million) of DDT in three trophic levels of a Long Island, New York, estuary
Source: Woodwell et al. 1967.

those found in most of the species listed in Figure 6-9. This tendency to concentrate persistent materials above ambient levels is particularly important since environmental levels appear to be increasing.

Rising Ambient Persistent Pollutant Levels

Many of the potentially harmful materials in industrial and agricultural production have essentially no impact on the global environment. They degrade quickly into harmless products or are isolated and disposed of permanently before they can enter global air or water streams or be incorporated in living tissues. A persistent material must be present widely and in significant quantities before it has a potential for global damage. The fourth historical behavior mode, an apparent general increase in the environmental level of persistent materials, is thus of special interest.

Time-series data are not available for many indices of the global persistent pollution load. However, where data do exist, they suggest rapid and widespread increases in the level of pollution. Lead and mercury concentrations in the Greenland icecap appear to have been increasing for at least the past several decades (Murozumi et al. 1969, Weiss et al. 1971). An analysis of successive rings in United States elm

trees revealed a marked secular rise in lead concentrations. The rings added to trees during 1900–1910 were found to contain 0.12 ppm of lead, those from 1940–1947 contained 0.33 ppm, and those added during 1956–1959 contained 0.74 ppm (Schroeder and Balassa 1961).

The concentration of dissolved solids in fresh water is rising. In Lake Ontario, for example, the level of materials in solution has increased from 130 ppm in 1910 to 200 ppm in 1970 (Beeton 1970). In this case the growth in ambient levels will probably continue. An exhaustive study of future material flows in the U.S. environment employed a variety of assumptions about possible changes in the rate of population and economic growth and about the urgency with which abatement techniques will be developed. Under the most favorable assumptions, dissolved solids in U.S. water supplies would increase by 60 percent between 1970 and 2000. Under the least optimistic set of assumptions, the increase would be over 160 percent (Ridker 1972). The report did not present similar data on the possible abatement for other persistent pollutants. However, the analysis of shorter-lived materials is encouraging. With reduced rates of population and GNP growth and with strenuous abatement policies, many important classes of short-lived pollution, particularly air pollution, may be reduced in the United States before the year 2000 to levels lower than those existing in 1970.

The level of persistent materials in the ocean appears to be rising. A recent survey of marine contamination off the south and east coasts of the United States revealed that

> contamination covered 50 percent (80,000 square miles) of the survey area along the East Coast continental shelf; 80 percent (280,000 square miles) of the survey area in the Caribbean to the Gulf of Mexico; and 90 percent (305,000 square miles) of the survey area north of the Antillean chain. [NYT 1973]

The ubiquity of the increase in pollutants is illustrated by the presence of DDT in the Greenland icecap and by measurements of DDT residues in the body tissues of humans around the world. DDT was first applied in significant quantities in 1940. (Before 1940 there was, of course, no DDT anywhere in the ecosystem.) Evidence now suggests that the vast majority of all humans carry DDT residues in their body tissues (Wayland 1966). PCBs, another family of synthetic chemicals, have also been found in increasing amounts in the tissues of humans around the world (Jensen 1972).

Except for the synthetic chemicals, most persistent materials are also released to the global environment through natural sources. Many of the heavy metals are even required in trace amounts to support some life forms. However, there is no reason to believe that the natural emissions of persistent pollutants are increasing while, as we have already mentioned, human use of these materials is increasing rapidly. In fact, the amounts of at least 13 materials released into the globe's freshwater streams by man are already greater than the quantities of these materials released through natural processes (SCEP 1970, p. 116). It is clear that man's activities are the prime contributor to the increasing accumulation of persistent pollutants in the biosphere.

Materials released into the environment do not remain there forever to cause