# NATIONAL STATUS AND TRENDS PROGRAM

## MARINE ENVIRONMENTAL QUALITY

# *Recent Trends in Coastal Environmental Quality: Results from the Mussel Watch Project*



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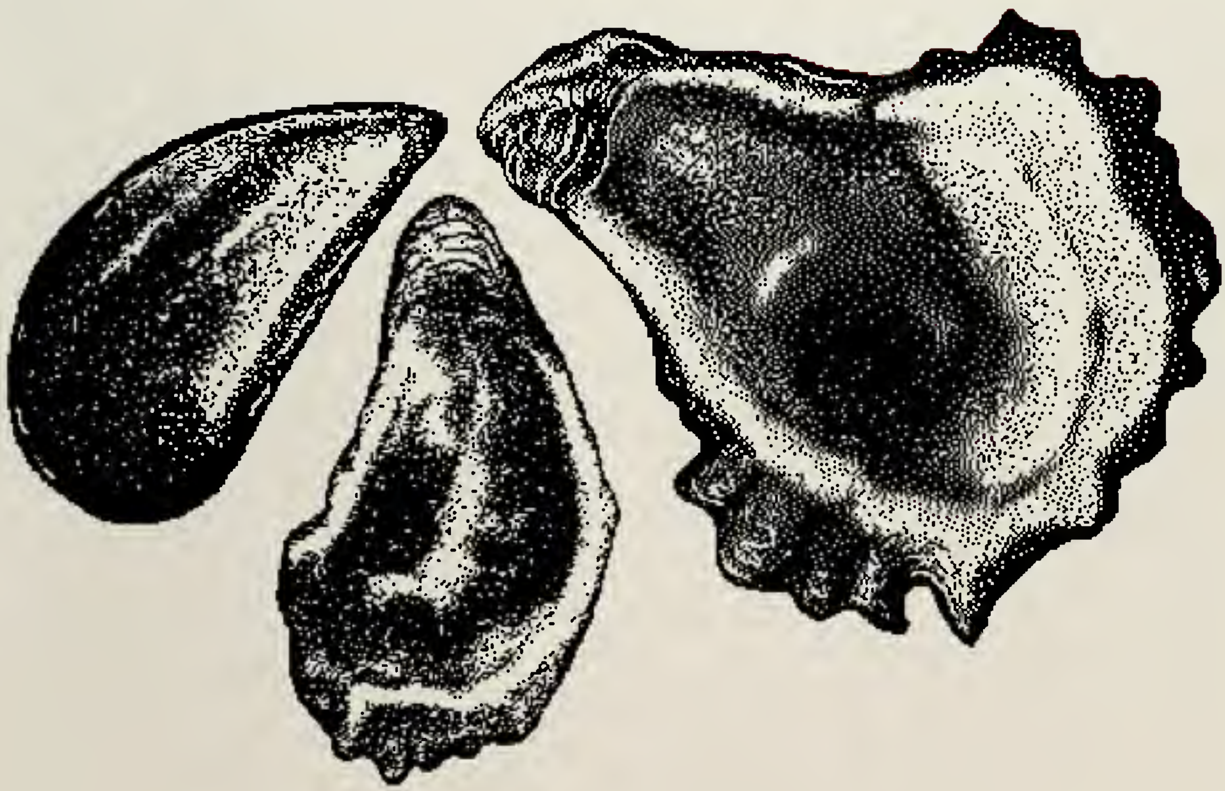

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# Recent Trends in Coastal Environmental Quality: Results from the Mussel Watch Project 1986 to 1993

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## INTRODUCTION

The National Oceanic and Atmospheric Administration (NOAA) created the National Status and Trends (NS&T) Program in 1984 to address national concerns over the quality of the coastal marine environment. One of its goals is to assess spatial distributions and temporal trends in chemical contamination. To meet that goal, the NS&T Mussel Watch Project was formed in 1986 to measure concentrations of a broad suite of trace metals and organic chemicals in surface sediments and whole soft-parts of mussels and oysters collected from about 300 coastal and estuarine sites. Here we summarize results from eight years of annually collecting and analyzing mollusks. The most important of these results indicates that contamination is decreasing for chemicals whose use has been banned, such as chlorinated hydrocarbons, or severely curtailed, such as cadmium. For other chemicals there is no evidence, on a national scale, for either an increasing or decreasing trend. There are some sites where trace element concentrations are both "high" and increasing.

## CHEMICALS MONITORED

The elements and groups of organic compounds listed in Table 1[2] are the subjects of this report. The elements are all potential contaminants in the sense that their concentrations in the environment have been altered by human activities (Nriagu, 1989). Three of the organic groups, total DDT (ΣDDT), total chlordane (ΣCdane), and total dieldrin (ΣDield) are chlorinated pesticides. Uses of DDT and dieldrin were banned in the United States in the 1970s. Chlordane use on U.S. crops ended in 1983, and its use for termite control effectively ended in 1988 (Shigenaka, 1990). Polychlorinated biphenyls (ΣPCB) are a mixture of chlorinated compounds first used in the 1920s for a number of industrial purposes. Their high heat capacities and low dielectric constants were exploited for use in electrical transformers and capacitors. PCB use in the United States began being phased out in 1971, and a ban on new uses took effect in 1976. Large changes in concentrations of ΣDDT and ΣPCB were seen at some locations in the 1970s following bans on their further use (Mearns et al., 1988), but the compounds are still found in tissues and sediments. PCB-containing devices are still in use, chlordane remains in the ground as a termiticide, and DDT remains in the environment because of its resistance to degradation. The pesticide DDT is metabolized to DDE and DDD in the environment, but those compounds degrade very slowly under environmental conditions. The three butyltin compounds, aggregated as ΣBT, are found in mollusks because tributyltin (TBT) has been used as an antifouling agent in the paint commonly used on boats and some underwater marine facilities. Its use on vessels under 75 feet long was banned in 1988 by the U.S. Organotin Anti-Fouling Paint Act. Tributyltin degrades to dibutyltin and then monobutyltin, which itself does not persist, so unlike the chlorinated compounds, ΣBT should degrade relatively quickly (Seligman et al., 1988). Consequently, the NS&T Program should find substantial decreases in ΣBT concentrations during the next several years.



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[2]All tables and figures are located at the end of this report.

Polycyclic aromatic hydrocarbons (PAHs) are like metals in that they occur naturally. They are found in fossil fuels such as coal and oil. Their existence, however, is also attributable to humans because they are produced when organic matter is burned. A multitude of human activities, from coal and wood burning to waste incineration, create PAH compounds in excess of those that would exist naturally. In addition, human production, transport, and use of oil release more PAHs to the environment, on a globally averaged basis, than does natural seepage (NRC, 1985). Because they are relatively more concentrated in oil than in combustion products, 2- and 3-ring PAH compounds, especially those with alkyl groups on a benzene ring such as methyl- and dimethylnaphthalene and methylphenanthrene (Table 1), are sometimes classified separately from the higher molecular-weight 4- and 5-ring PAH compounds. Since high concentrations of both types of compounds tend to be found in the same locations, all PAH compounds have been combined into a single group in this report.

All of these trace metals and groups of organic compounds can be acutely or chronically toxic to marine life and to humans under some conditions. On the other hand, while the elements arsenic, copper, nickel, selenium, and zinc can be toxic at high concentrations, they are also essential in small quantities to the maintenance of life (Nielsen, 1988).

## SAMPLING SITES

The NS&T Mussel Watch Project is national in scale and sampling sites should be representative of large areas rather than the small-scale patches of contamination commonly referred to as "hot spots." To this end, no sites were knowingly selected near waste discharge points. Furthermore, since the Mussel Watch Project is based on analyzing indigenous mussels and oysters, a site must support a sufficient population of these mollusks to provide annual samples.

NS&T sampling sites are not uniformly distributed along the coast. Within estuaries and embayments, they average about 20 kilometers (km) apart, while along open coastlines the average separation is 70 km. Almost half of the sites were selected in waters near urban areas, within 20 km of population centers in excess of 100,000 people. This choice was based on the assumptions that chemical contamination is higher, more likely to cause biological effects, and more spatially variable in these waters than in rural areas.

By 1993, 255 sites had been sampled, but not all sites in all years. The numbers sampled in each year from 1986 through 1993 were 145, 147, 174, 185, 214, 192, 195, and 169, respectively. All are plotted in Figure 1 and listed in Table 2, which indicates years of sampling. Temporal trend detection improves as more years are sampled, so trends discussed here are based on data from the 154 sites sampled in at least six of the eight years.

## SPECIES COLLECTED

Since no single species of mollusk is common to all coasts, it has been necessary to collect seven different ones: the blue mussel *Mytilus edulis* on the East Coast from Maine to Cape May, NJ; the American oyster *Crassostrea virginica* from Delaware Bay southward and throughout the Gulf of Mexico; the mussels *M. edulis* and *M. californianus* on the West Coast; the oyster *Ostrea sandvicensis* in Hawaii; the zebra mussel *Dreissena polymorpha* at sites in the Great Lakes; the mangrove oyster *Crassostrea rhizophorae* in Puerto Rico; and the smooth-edged jewel box *Chama sinuos* at the one site in the Florida Keys.

The multitude of species complicates comparisons among sites, because different species can have different chemical concentrations even if the surrounding environments are identical. At sites in Long Island Sound where it was possible to sample both mussels and oysters, *M. edulis* and *C. virginica*, two trace elements, Cu and Zn, were enriched in oysters by more than a factor of 10 relative to mussels, while Pb was more than three times higher in mussels. For other elements and for organic compounds no strong species-effect was observed. Similarly, at a site off the Columbia River two species of mussels, *M. edulis* and *M. californianus*, were sampled. In that case there were no important concentration differences for any element or organic compound.

There has been some discussion recently among malacologists over whether the West Coast organism called *M. edulis* is actually *M. galloprovincialis* in California and *M. trossulus* towards the north. In fact, the three species may be strains of a single *Mytilus* species (Seed, 1992). Given this uncertainty, the mussels collected at the Columbia River site may have been *M. trossulus* or even *M. galloprovincialis* instead of *M. edulis*. However, the lack of concentration differences between two *Mytilus* species at that site has been taken to validate comparisons among all marine mussels collected in the program.

## DATA AVAILABILITY

Except in the Great Lakes, mollusks are collected in the months of November through March with each site occupied within 30 days of a prescribed date. In the Great Lakes, collections are made in August. From 1986 through 1991, six separate composite samples of 20 oysters or 30 mussels were collected at each site. Three composites were homogenized for trace element analyses and three for trace organic analyses. That protocol still applies whenever a site is sampled for the first time. Otherwise, since 1992 only two composite samples have been collected; one for each analytical category. The concentrations used in this report are the arithmetic means of three concentrations measured prior to 1992 or the single value measured since then. An appendix, available upon request, contains all the mean concentrations of elements or of groups of organic compounds. A computer disk with all the raw data is available, and the raw data can also be obtained on the Internet using the Universal Resource Locator at http://www-orca.nos.noaa.gov/projects/nsandt/nsandt.html.

## LOCATIONS WHERE CONCENTRATIONS ARE HIGH

Using the 1990 data, because it included more sites than any other single year, O'Connor (1992) calculated the following "high" concentrations as the mean plus one standard deviation of the lognormal distribution of concentrations among sites.

| Chemical | "High" concentration | Chemical | "High" concentration | |
|---|---|---|---|---|
| ΣDDT | 120 ppb-dry | mercury (Hg) | 0.24 ppm-dry | |
| ΣPCB | 470 | nickel (Ni) | 3.3 | |
| ΣChlordane | 31 | selenium (Se) | 3.5 | |
| ΣDieldrin | 15 | cadmium (Cd) | 5.7 | |
| ΣPAH | 1020 | arsenic (As) | 17 | |
| ΣBT | 350 ppb(as Sn) | copper (Cu)[1] | 13 (mu) | 490(oy) |
| | | zinc (Zn)[1] | 210 (mu) | 6500(oy) |
| | | lead (Pb)[2] | 4 | |

[1]The "highs" for copper and zinc must be calculated separately for mussels (mu) and oysters (oy).
[2]The "high" for lead in mussels is 4.3 ppm and 0.96 in oysters, the value listed is the lowest public health guideline (see following page).

These "highs" serve as a basis for categorizing sites but, as will be discussed, "high" concentrations are not always indicative of environmental contamination. Because organic compounds showed no concentration differences between mussels and oysters or between two species of mussels, there is some confidence in comparing concentrations of such compounds from all sites, including sites in Hawaii, Puerto Rico, the Great Lakes, and the Florida Keys, even though species from those sites could not be compared with others in terms of their ability to accumulate chemicals. On the other hand, we know that all species are not the same with regard to accumulation of all trace elements.

For some chemicals there is a tendency for concentrations to decrease with time, so comparisons of concentrations among sites are limited to concentrations measured since 1990. The results are listed in Table 3 and plotted in Figures 2 through 13. If a site was sampled in 3 or 4 of the years from 1990 through 1993 and a "high" concentration was found in only one year, that site is not shown on the corresponding figure for that chemical. Such occurrences usually mean that the concentrations were close to but usually below the "high" value. If the site was sampled only once or twice over those years, then even a single exceedance qualified it for inclusion on a figure. In effect, sites are plotted in Figures 2 to 15 if the concentration of the given chemical exceeded the "high" value in at least half the years since 1990 in which the site was sampled.

Despite all those qualifications, two general features about the spatial distributions of "high" concentrations are worth noting. First, that "high" concentrations can often be attributed to human activities because they are found where human populations are high. Second, there are many instances where trace elements are at "high" concentrations for purely natural reasons and are not evidence of contamination.

Chlorinated hydrocarbons are synthesized chemicals with no natural sources. It is evident in Table 3 and Figures 2($\Sigma$PCB), 3($\Sigma$DDT), 4($\Sigma$Chlordane), and 5($\Sigma$Dieldrin) that their concentrations tend to be high in urban areas. The connection of high concentrations with population centers also holds for polycyclic aromatic hydrocarbons (Fig. 6($\Sigma$PAH)), mercury (Fig. 7) and zinc (Fig. 8). Butyltin (Fig. 9) concentrations are high at sites near marinas, which are usually near populated areas.

For some of the other elements, "high" concentrations are found near Boston, New York, San Diego, Los Angeles, Honolulu, and other urban centers, indicating contamination. For nickel, selenium, copper, zinc, cadmium, and arsenic, however, at least some of the "high" concentrations are natural. Finding such concentrations for nickel (Fig. 10), selenium (Fig. 11), and copper (Fig. 12) at every site in the Great Lakes most likely does not indicate environmental enrichment with those elements but, rather, a strong affinity for those elements by the species *D. polymorpha* and the fact that trace elements are more bioavailable in fresh than in marine waters (Cross and Sunda, 1985). The nickel concentrations on the West Coast may be high simply because rocks in that area are enriched relative to those elsewhere in the U.S. (USGS, 1981). High concentrations of cadmium (Fig. 13) on the West Coast have been attributed to upwelling of deep ocean water (Goldberg et al., 1983) because such water naturally contains higher concentrations of cadmium than surface ocean water. Elevated arsenic (Fig. 14) levels in the southeast have been attributed to the natural occurrence of economically valuable phosphate deposits in that part of the country (O'Connor, 1992). The high selenium in San Francisco Bay may reflect soil enrichment with that element in California's Central Valley. Drainage from agricultural soils into the Kestersen National Wildlife Refuge has caused selenium poisoning among fish-eating birds (Presser et al., 1990). However, selenium and cadmium are both also high at sites along the Gulf Coast west of the Mississippi River and we have no data on natural enrichments either in that area or in the Mississippi River.

## EXCEEDANCES OF PUBLIC HEALTH LIMITS

Concentrations were placed in the "high" category on the basis of their magnitude relative to other concentrations. There is no reason to suppose that such concentrations cause harm to marine organisms or to man. With two exceptions at single sites, lead is the only chemical measured in the Mussel Watch Project whose concentration was above a public health guideline.

There are U.S. Federal Drug Administration standards* for chlorinated hydrocarbons and for mercury, such that fish and shellfish with higher concentrations are prohibited from interstate commerce. None of the standards are exceeded for mercury, ΣDDT, Σdieldrin, or Σchlordane at any site in any year. The 10,000 ng/g (dry-weight) standard for ΣPCB was exceeded in 1989 at one site in Buzzards Bay, MA but not in any other year. In 1993, the FDA issued human consumption guidelines for concentrations of five trace elements in molluscan and crustacean shellfish that vary with the age of consumer and rate of consumption. For three of those elements, arsenic, chromium, and nickel, there are no cases where mussels or oysters collected in the Mussel Watch Program exceeded even the most stringent guideline. In 1991, the only year it was successfully sampled, the site in Lake Pontchartrain near New Orleans yielded oysters whose cadmium concentrations exceeded the lowest guideline.

For Pb there were many exceedances. The FDA guidelines converted to a dry weight basis are:

| Group | Consumption rate<br>Mean | Upper 90th percentile |
|---|---|---|
| Children (2-5) | 7.5 ppm-dry | 4.0 ppm-dry |
| Pregnant women | 10.5 | 7.0 |
| Adults | 31.5 | 21.0 |

The last of the figures on spatial distribution of high concentrations is for lead (Fig. 15), and is based on a "high" concentration of 4 ppm. This value is close to the "high" for mussels but is also the lowest public health guideline, applicable to children consuming mollusks at a rate of 8 grams per day. It is evident on Table 4 that progressively fewer sites have mollusks with concentrations at the higher guideline levels. The distribution of sites with high lead concentrations is like those for organic contaminants and mercury in that, for the most part, high concentrations are found in the vicinity of population centers. So, as with those chemicals, high concentrations are attributable to human activities.

## TEMPORAL TRENDS

Chemical concentrations in mussels and oysters are determined by the extent to which the organisms accumulate chemicals from the food they filter out of their surrounding water and from the water itself. When chemical concentrations increase or decrease in their surroundings, the organisms are capable of increasing or decreasing the corresponding concentrations in their tissues (see for example, Roesijadi et al., 1984; Pruell et al., 1987). This, and the fact that they are immobile, make them ideal for monitoring changes in chemical concentrations at fixed sites.

A trend is a correlation between concentration and time. Over a time span as short as eight years, we are not likely to decipher cycles in concentrations, so the trends sought in the Mussel Watch data are linear correlations between ranks of concentration and time. Specifically, the data are examined to see if concentrations are changing in a single direction, up or down.

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*FDA guidelines are given as concentrations on a wet-weight basis. They have been multiplied by five for application to Mussel Watch data which are concentrations in terms of dry-weight. This uses the conventional assumption that the soft-parts of organisms are 80% water by weight. (Actually, mussels and oysters average closer to 85% water which would require multiplying the criteria by 7.5 and, in effect, finding fewer public health exceedances than would the conventional assumption.)

The statistical test is based only on the rankings of concentrations. For example, the rankings of cadmium concentrations at the site outside Hempstead Harbor River in Long Island Sound were:

| Year | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 |
|---|---|---|---|---|---|---|---|---|
| Rank | 2 | 1 | 3 | 4 | 5 | 8 | 6 | 7 |

where the highest value, rank 1, occurred in 1987 and the lowest, rank 8, occurred in 1991. The correlation coefficient between these ranks and years is -0.905. The coefficient is negative because concentrations are decreasing as years increase. The correlation is statistically significant because the coefficient is greater than 0.738 (or less than -0.738) meaning that there is less than a 5% chance that rankings could fall out in that order purely by chance. The conclusion is that cadmium concentrations are decreasing at this site. If the ranking had been:

| Year | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 |
|---|---|---|---|---|---|---|---|---|
| Rank | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

the coefficient would have been -1.000, indicating a perfect correlation, but perfection is not necessary for a determination that a trend exists. Note that the actual concentrations were not used. The actual concentrations were (in ppm-dry):

| Year | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 |
|---|---|---|---|---|---|---|---|---|
| Conc | 3.23 | 3.67 | 2.60 | 1.93 | 1.68 | 1.00 | 1.39 | 1.37 |

but even if they could had been:

| Year | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 |
|---|---|---|---|---|---|---|---|---|
| Conc | 13.2 | 48.7 | 9.60 | 7.93 | 7.90 | 0.40 | 0.50 | 0.45 |

the rank order would have been the same, the Spearman correlation would have been the same, and the same conclusion would have been drawn.

Proceeding with site-by-site and chemical-by-chemical non-parametric correlations, we have calculated correlations for 14 chemicals at the 154 sites with 6 or more years of data. Table 5 from O'Connor (1995) summarizes the results by indicating chemicals for which there is a 90 or 95% probability of a correlation between concentration and year, and whether that trend is an increase (I) or decrease (D). For ΣPAH, the numbers of years are 4 to 6 rather than 6 to 8, and for butyltin the numbers of years are 5 or less. These fewer numbers of years have been taken into account when assigning 90 and 95% levels of confidence.

The 90% probability trends are included for two reasons. First, because there are fewer years for ΣPAH and ΣBT, relaxed statistical criteria are needed to identify trends. Secondly, inclusion of 90%-level trends highlights similarities among groups of sites. For example, the decreasing concentrations of Cd and Cu in Long Island Sound are emphasized by including the Huntington Harbor site where the decrease found at three other sites with 95% certainty is also found but with 90% certainty.

The most common result in Table 5 is a lack of trends. Among the 2156 combinations of 14 chemicals at 154 sites, there are only 41 increases and 217 decreases at the 95% level of confidence. On a per-chemical basis the trends, with 95% confidence, are as follows:

| Chem | Incr. | Dec. | Chem | Incr. | Dec. |
|---|---|---|---|---|---|
| ΣCdane | 0 | 43 | As | 5 | 14 |
| ΣDDT | 0 | 24 | Cd | 3 | 20 |
| ΣDield | 0 | 19 | Cu | 5 | 17 |
| ΣPCB | 0 | 26 | Hg | 7 | 8 |
| ΣPAH | 2 | 3 | Ni | 4 | 5 |
| ΣBT | 0 | 11 | Pb | 7 | 8 |
| | | | Se | 2 | 12 |
| | | | Zn | 6 | 7 |

Given a 5% probability of random data showing trends, there could be 54 increases and 54 decreases that are not real trends. Conceivably, none of the 41 increases are real. The important point, however, is that decreases greatly outnumber increases. Decreases exceed increases by a factor of three or more for all the chlorinated hydrocarbons, tributyltin, arsenic, cadmium, copper, and selenium.

Annual data have been aggregated to national geometric means in Table 6 (O'Connor, 1995) where, because of species differences, concentrations in mussels have been separated from those in oysters for Cu, Pb, and Zn. Decreasing trends at the 95% confidence level and at this national level of aggregation exist for As, Cd, Cu (in mussels), all the chlorinated organics, and ΣBT. Except for selenium, this list highlights the same decreasing trends found by counting trends site-by-site. National geometric means show trends for copper in mussels but not oysters, which is consistent with the site-by-site data where 16 of the 17 decreases were at mussel-sites.

Decreasing trends are not unexpected. All the monitored chlorinated hydrocarbons have been banned for use in the United States and tributyltin has been banned as a biocide on recreational boats. For cadmium and arsenic there have been decreases in their uses.

Annual consumption of Cd in the U.S. averaged 4069 metric tons per year (mt $y^{-1}$) for 1986 through 1989, dropped by 25% in 1990, and averaged 3068 mt $y^{-1}$ for 1990 through 1993 (DOI, 1994). While the use of cadmium in rechargeable batteries is growing, the dramatic decrease in overall use is due to drops in uses for electroplating onto metal surfaces for rustproofing automobile parts, as a stabilizer in plastics, and its use in pigments. Annual consumption of arsenic in the U.S. has remained fairly steady at around 22,000 mt $y^{-1}$ since 1986. Its primary use is as an ingredient in wood preservatives, which has remained fairly stable, but there has been a decline in its agricultural uses. Between 1986 and 1991, the annual agricultural use varied between 4200 and 5000 mt $y^{-1}$, but in 1992 and 1993, respectively, only 3900 and 3000 mt $y^{-1}$ of arsenic were used. There has been no parallel decrease in use of copper within the United States. Possibly, its decreasing trend indicates increased success in control of copper emissions from many sources.

While concentration data themselves do not indicate whether trace element levels in mollusks are affected by human activity, the existence of monotonic trends like those identified here are likely due to activities that are increasing or decreasing an element's concentration in the environment. All sorts of natural factors, either internal, such as mollusk growth or reproduction, or external, such as temperature or rainfall in the period proceeding collection, can affect chemical concentrations (Phillips, 1980). Such natural factors can make trends in chemical concentrations difficult to detect. However, it would be difficult to find a natural factor with year-to-year changes that would cause detection of a monotonic trend in chemical concentrations. The trends, therefore, are most likely due to human actions.

## SITES WITH "HIGH" AND INCREASING CONCENTRATIONS

It is comforting and expected that where trends exist they are, by far, mostly decreases. Increasing trends are uncommon and most of those identified on Table 5 may only be chance sequences of concentrations. However, where such sequences include a concentration in the "high" range, the site deserves attention. The following listing of such sites and chemicals includes trends in parenthesis that were found with only a 90% level of confidence and sites where the "high" concentration was found in only one year since 1990. It should also be noted that the highest concentrations were usually not those measured in the most recent year. Nonetheless, these are trends and, unless shown otherwise, should be interpreted as indicating that ongoing human activity is increasing chemical contamination.

| General Location | Specific Location | State | High Chemical |
|---|---|---|---|
| Penobscot Bay | Sears Island | ME | (Hg) |
| Block Island Sound | Block Island | RI | As |
| Hudson/Raritan Est. | Upper Bay | NY | Cu, (Zn) |
| New York Bight | Shark River | NJ | (Hg) |
| Delaware Bay | Ben Davis Point Shoal | NJ | (Ni) |
| Quinby Inlet | Upshur Bay | VA | ($\Sigma$PAH) |
| St. Johns River | Chicopit Bay | FL | (As) |
| Naples Bay | Naples Bay | FL | Cu |
| Choctawhatchee Bay | Postil Point | FL | Pb |
| Mobile Bay | Hollingers Is. Chan. | AL | Zn |
| Mississippi Sound | Biloxi Bay | MS | Cd |
| Lake Borgne | Malheureux Point | LA | Cd,Hg,(Zn) |
| Mississippi River | Tiger Pass | LA | Cd |
| Matagorda Bay | Lavaca River Mouth | TX | Se |
| Point Loma | Lighthouse | CA | Hg, Ni |
| Pacific Grove | Lovers Point | CA | (Cd) |
| San Francisco Bay | Emeryville | CA | (Cd),Hg |
| Point Arena | Lighthouse | CA | Hg |
| Crescent | Point St. George | CA | (As) |
| Juan de Fuca Strait | Cape Flattery | WA | Se |
| Honolulu Harbor | Keehi Lagoon | HI | Ni |

## CONCLUSIONS

There are many more decreases than increases in chemical concentrations between 1986 and 1993. The chemicals for which most of these trends exist are: chlorinated hydrocarbons, whose use has been banned; tributyltin, whose use as an antifoulant on recreational boats has been banned; cadmium and arsenic, whose uses have been severely curtailed; and copper, whose use has not deceased but whose discharges apparently have diminished. Lead is the only chemical showing concentrations in excess of public health guidelines. There are some sites where chemicals are at high concentrations (though not necessarily threatening to marine organisms or man) and may be increasing.

## ACKNOWLEDGMENTS

The NS&T Mussel Watch samples have been gathered and analyzed by the Battelle laboratories in Duxbury, MA and in Sequim, WA; the Texas A&M University Geochemical and Environmental Research Group in College Station, TX; and the LaJolla, CA laboratory of Scientific Applications International Corporation.

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**Table 1. Chemicals discussed in this report.**

Elements:

As, Cd, Cu, Hg, Ni, Pb, Se, Zn

Goups of Organic Compounds:

∑PCB = sum of concentrations at each level of chlorination or, equivalently and since 1988, twice the sum of concentrations of these18 congeners;
PCB8+PCB18+PCB28+PCB44+PCB52+PCB66+PCB101+PCB105+PCB118+PCB128+
PCB138+PCB153+PCB170+PCB180+PCB187+PCB195+PCB206+PCB209

∑DDT = sum of concentrations of ortho and para forms of parent and metabolites;
opDDE+ppDDE+opDDD+ppDDD+opDDT+ppDDT

∑Cdane = sum of concentrations of four compounds;
alpha-chlordane+trans-nonachlor+heptachlor+heptachlor-epoxide

∑Dieldrin = sum of concentrations of two compounds; aldrin + dieldrin

∑BT = sum of concentrations of parent compound and metabolites;
monobutyltin+dibutyltin+tributyltin (concentrations in terms of tin)

∑PAH = sum of concentrations of 24 compounds*;
naphthalene+ 2-methylnaphthalene+ 1-methylnaphthalene+ biphenyl+ 2,6-dimethylnaphthalene+ acenaphthene+ acenaphthylene + 1,6,7-trimethylnaphthalene+ fluorene+ phenanthrene+anthracene+ 1-methylphenanthrene+ fluoranthene+ pyrene+ benz[*a*]anthracene+ chrysene+ benzo[*b*]luoranthene+ benzo[*k*]fluoranthene+ benzo[*e*]pyrene+ benzo[*a*]pyrene+perylene+ dibenzanthracene+ indeno[1,2,3-*cd*]pyrene+ benzo[*ghi*]perylene

* Six of these compounds did not begin to be measured until 1988. Analysis for trends in tPAH concentrations have not used data from 1986 or 1987.

**Table 2. Site codes, general and specific names, states, latitudes and longitudes (decimal degrees), species, total and specific years sampled.**

| SITE | General Location | Specific Location | State | Sp. | Longitude W | Latitude N | ∑Yrs | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PBPI | Penobscot Bay | Pickering Island | ME | me | 68.7342 | 44.2647 | 8 | x | x | x | x | x | x | x | x |
| PBSI | Penobscot Bay | Sears Island | ME | me | 68.8897 | 44.4522 | 8 | x | x | x | x | x | x | x | x |
| MSSP | Merriconeag Snd. | Stover Point | ME | me | 69.9953 | 43.7580 | 6 | | | x | x | x | x | x | x |
| CAKP | Cape Arundel | Kennebunkport | ME | me | 70.4747 | 43.3478 | 5 | | | | x | x | x | x | x |
| CAGH | Cape Ann | Gap Head | MA | me | 70.5952 | 42.6608 | 7 | | x | x | x | x | x | x | x |
| SHFP | Salem Harbor | Folger Point | MA | me | 70.8670 | 42.5188 | 6 | | | x | x | x | x | x | x |
| MBNB | Massachusetts Bay | Nahant Bay | MA | me | 70.9068 | 42.4217 | 2 | | | | | x | | | x |
| BHDI | Boston Harbor | Deer Island | MA | me | 70.9733 | 42.3583 | 8 | x | x | x | x | x | x | x | x |
| BHDB | Boston Harbor | Dorchester Bay | MA | me | 71.0383 | 42.3042 | 6 | x | x | x | x | x | | | x |
| BHHB | Boston Harbor | Hingham Bay | MA | me | 70.8877 | 42.2742 | 8 | x | x | x | x | x | x | x | x |
| BHBI | Boston Harbor | Brewster Island | MA | me | 70.8780 | 42.3425 | 8 | x | x | x | x | x | x | x | x |
| MBNR | Massachusetts Bay | North River | MA | me | 70.7402 | 42.1608 | 2 | | | | | x | | | x |
| DBCI | Duxbury Bay | Clarks Island | MA | me | 70.6362 | 42.0147 | 5 | | | | x | x | x | x | x |
| CCNH | Cape Cod | Nauset Harbor | MA | me | 69.9483 | 41.7947 | 5 | | | | x | x | x | x | x |
| BBNI | Buzzards Bay | Naushon Island | MA | me | 70.7415 | 41.5128 | 3 | | | | | x | x | x | |
| BBWF | Buzzards Bay | West Falmouth | MA | me | 70.6728 | 41.6128 | 3 | | | | | x | x | x | |
| BBCC | Buzzards Bay | Cape Cod Canal | MA | me | 70.6170 | 41.7395 | 4 | | | | x | x | x | x | |
| BBAR | Buzzards Bay | Angelica Rock | MA | me | 70.8783 | 41.5870 | 8 | x | x | x | x | x | x | x | x |
| BBRH | Buzzards Bay | Round Hill | MA | me | 70.9253 | 41.5408 | 5 | x | x | x | x | x | | | |
| BBGN | Buzzards Bay | Goosebury Neck | MA | me | 71.0223 | 41.4807 | 8 | x | x | x | x | x | x | x | x |
| NBDI | Narragansett Bay | Dyer Island | RI | me | 71.2895 | 41.6033 | 6 | x | x | x | x | x | | | x |
| NBPI | Narragansett Bay | Patience Island | RI | me | 71.3522 | 41.6562 | 5 | | | | x | x | x | x | x |
| NBDU | Narragansett Bay | Dutch Island | RI | me | 71.3928 | 41.5013 | 6 | x | x | | x | | x | x | x |
| BIBI | Block Island Sound | Block Island | RI | me | 71.5857 | 41.1900 | 7 | | x | x | x | x | x | x | x |
| LICR | Long Island Sound | Connecticut River | CT | me | 72.3417 | 41.2638 | 7 | x | x | x | x | x | x | x | |
| LINH | Long Island Sound | New Haven | CT | me | 72.9445 | 41.2567 | 8 | x | x | x | x | x | x | x | x |
| LIHR | Long Island Sound | Housatonic River | CT | me | 73.1097 | 41.1678 | 7 | x | x | x | x | x | x | x | |
| LISI | Long Island Sound | Sheffield Island | CT | me | 73.4128 | 41.0567 | 6 | x | x | x | x | x | | | x |
| LIMR | Long Island Sound | Mamaroneck | NY | me | 73.7005 | 40.9412 | 7 | x | x | x | x | x | x | x | |
| LITN | Long Island Sound | Throgs Neck | NY | me | 73.8012 | 40.8195 | 8 | x | x | x | x | x | x | x | x |
| LIHH | Long Island Sound | Hempstead Harbor | NY | me | 73.6690 | 40.8523 | 8 | x | x | x | x | x | x | x | x |
| LIHU | Long Island Sound | Huntington Harbor | NY | me | 73.4312 | 40.9167 | 7 | x | x | x | x | x | x | x | |
| LIPJ | Long Island Sound | Port Jefferson | NY | me | 73.0920 | 40.9595 | 8 | x | x | x | x | x | x | x | x |
| LIGB | Long Island | Gardiners Bay | NY | me | 72.1113 | 40.9983 | 5 | | | | x | x | x | x | x |
| MBTH | Moriches Bay | Tuthill Point | NY | me | 72.7562 | 40.7775 | 8 | x | x | x | x | x | x | x | x |
| LIFI | Long Island | Fire Island Inlet | NY | me | 73.2860 | 40.6280 | 1 | | | | | x | | | |
| LIJI | Long Island | Jones Inlet | NY | me | 73.5908 | 40.5968 | 2 | | | | | x | | | x |
| HRJB | Hudson/Raritan Estu | Jamaica Bay | NY | me | 73.8980 | 40.5688 | 8 | x | x | x | x | x | x | x | x |
| HRUB | Hudson/Raritan Estu | Upper Bay | NY | me | 74.0425 | 40.6897 | 7 | x | x | x | x | x | x | x | |
| HRLB | Hudson/Raritan Estu | Lower Bay | NY | me | 74.0522 | 40.5662 | 6 | x | x | x | x | x | | | x |
| HRRB | Hudson/Raritan Estu | Raritan Bay | NJ | me | 74.1572 | 40.5065 | 1 | | | | | x | | | |
| NYSH | New York Bight | Sandy Hook | NJ | me | 74.0450 | 40.4878 | 7 | x | x | x | x | x | x | x | |
| NYLB | New York Bight | Long Branch | NJ | me | 73.9760 | 40.2947 | 6 | x | x | x | x | x | | | x |
| NYSR | New York Bight | Shark River | NJ | me | 74.0063 | 40.1863 | 8 | x | x | x | x | x | x | x | x |
| BIBL | Barnegat Inlet | Barnegat Light | NJ | me | 74.0988 | 39.7587 | 5 | | | x | x | x | x | x | |
| AIAC | Absecon Inlet | Atlantic City | NJ | me | 74.4080 | 39.3692 | 5 | | | x | x | x | x | x | |
| DBCM | Delaware Bay | Cape May | NJ | me | 74.9653 | 38.9820 | 5 | | | | x | x | x | x | x |
| DBFE | Delaware Bay | False Egg Island Point | NJ | cv | 75.1908 | 39.2118 | 6 | x | x | x | | x | x | x | |
| DBBD | Delaware Bay | Ben Davis Point Shoal | NJ | cv | 75.2822 | 39.2655 | 6 | x | x | x | x | x | | | x |
| DBAP | Delaware Bay | Arnolds Point Shoal | NJ | cv | 75.4313 | 39.3848 | 6 | x | x | x | | x | x | x | |
| DBHC | Delaware Bay | Hope Creek | NJ | cv | 75.4933 | 39.4267 | 1 | | | | x | | | | |
| DBWB | Delaware Bay | Woodland Beach | DE | cv | 75.4570 | 39.3320 | 1 | | | | x | | | | |
| DBKI | Delaware Bay | Kelly Island | DE | cv | 75.3550 | 39.2028 | 7 | x | x | x | x | x | x | x | |
| DBCH | Delaware Bay | Cape Henlopen | DE | me | 75.1237 | 38.7880 | 5 | | | | x | x | x | x | x |
| CBBO | Chesapeake Bay | Bodkin Point | MD | cv | 76.4012 | 39.1600 | 3 | | | | x | x | | | x |
| CBMP | Chesapeake Bay | Mountain Point Bar | MD | cv | 76.4122 | 39.0737 | 8 | x | x | x | x | x | x | x | x |
| CBHP | Chesapeake Bay | Hackett Point Bar | MD | cv | 76.4167 | 38.9728 | 7 | x | x | x | x | x | x | x | |
| CBCP | Chesapeake Bay | Choptank River | MD | cv | 76.1200 | 38.6053 | 5 | | | | x | x | x | x | x |
| CBHG | Chesapeake Bay | Hog Point | MD | cv | 76.3978 | 38.3123 | 7 | x | x | x | x | x | x | x | |
| PRSP | Potomac River | Swan Point | MD | cv | 76.9337 | 38.2817 | 2 | | | | x | x | | | |
| PRMC | Potomac River | Mattox Creek | VA | cv | 76.9553 | 38.2187 | 1 | | | | | x | | | |
| PRRP | Potomac River | Ragged Point | VA | cv | 76.5978 | 38.1562 | 5 | | | | x | x | x | x | x |
| CBIB | Chesapeake Bay | Ingram Bay | VA | cv | 76.2843 | 37.7938 | 2 | x | x | | | | | | |
| RRRR | Rappahannock River | Ross Rock | VA | cv | 76.7905 | 37.9013 | 5 | | | | x | x | x | x | x |
| CBDP | Chesapeake Bay | Dandy Point | VA | cv | 76.2955 | 37.1007 | 8 | x | x | x | x | x | x | x | x |
| CBJR | Chesapeake Bay | James River | VA | cv | 76.6113 | 37.0678 | 2 | | | | x | x | | | |
| CBCC | Chesapeake Bay | Cape Charles | VA | cv | 76.0198 | 37.2848 | 7 | x | x | x | x | x | x | x | |
| CBCI | Chincoteague Bay | Chincoteague Inlet | VA | cv | 75.3767 | 37.9417 | 8 | x | x | x | x | x | x | x | x |
| QIUB | Quinby Inlet | Upshur Bay | VA | cv | 75.7230 | 37.5308 | 7 | x | x | x | x | x | x | x | |

**Table 2 continued.**

| SITE | General Location | Specific Location | State | Sp. | Longitude W | Latitude N | ∑Yrs | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RSJC | Roanoke Sound | John Creek | NC | cv | 75.6330 | 35.8912 | 7 | x | x | x | x | x | x | x | |
| PSWB | Pamlico Sound | Wysocking Bay | NC | cv | 76.0575 | 35.4112 | 8 | x | x | x | x | x | x | x | x |
| PSPR | Pamlico Sound | Pungo River | NC | cv | 76.4492 | 35.3247 | 5 | | | | x | x | x | x | x |
| PSNR | Pamlico Sound | Neuse River | NC | cv | 76.5245 | 35.1122 | 5 | | | | x | x | x | x | x |
| PSCH | Pamlico Sound | Cape Hatteras | NC | cv | 75.7160 | 35.2062 | 4 | | | | | x | x | x | x |
| BIPI | Beaufort Inlet | Pivers Island | NC | cv | 76.6755 | 34.7183 | 4 | | | | | x | x | x | x |
| CFBI | Cape Fear | Battery Island | NC | cv | 78.0083 | 33.9153 | 8 | x | x | x | x | x | x | x | x |
| WBLB | Winyah Bay | Lower Bay | SC | cv | 79.1963 | 33.2433 | 5 | | | | x | x | x | x | x |
| SRNB | Santee River | North Bay | SC | cv | 79.2487 | 33.1728 | 5 | | | | x | x | x | x | x |
| CHFJ | Charleston Harbor | Fort Johnson | SC | cv | 79.8783 | 32.7553 | 8 | x | x | x | x | x | x | x | x |
| CHSF | Charleston Harbor | Shutes Folly Island | SC | cv | 79.9167 | 32.7805 | 7 | x | x | x | x | x | x | x | |
| SRTI | Savannah River Estua | Tybee Island | GA | cv | 80.8708 | 32.0200 | 8 | x | x | x | x | x | x | x | x |
| SSSI | Sapelo Sound | Sapelo Island | GA | cv | 81.2888 | 31.3867 | 7 | x | x | x | x | x | x | x | |
| ARWI | Altamaha River | Wolfe Island | GA | cv | 81.3080 | 31.3228 | 5 | | | | x | x | x | x | x |
| SJCB | St. Johns River | Chicopit Bay | FL | cv | 81.4438 | 30.3770 | 8 | x | x | x | x | x | x | x | x |
| MRCB | Matanzas River | Crescent Beach | FL | cv | 81.2563 | 29.7667 | 7 | x | x | x | x | x | x | x | |
| IRSR | Indian River | Sebastian River | FL | cv | 80.4775 | 27.8348 | 6 | | | x | x | x | x | x | x |
| NMML | North Miami | Maule Lake | FL | cv | 80.1462 | 25.9355 | 5 | | | x | x | x | x | x | |
| BBGC | Biscayne Bay | Goulds Canal | FL | cv | 80.3142 | 25.5232 | 4 | | | | | x | x | x | x |
| BBPC | Biscayne Bay | Princeton Canal | FL | cv | 80.3292 | 25.5188 | 2 | x | x | | | | | | |
| BHKF | Bahia Honda | Key Florida | FL | cs | 81.2738 | 24.6587 | 2 | | | | | | x | x | |
| PRBB | Puerto Rico | Bahia De Boqueron | PR | cr | 67.1787 | 18.0073 | 2 | | | | | | | x | x |
| PRBM | Puerto Rico | Bahia Montalva | PR | cr | 66.9905 | 17.9705 | 2 | | | | | | | x | x |
| PRBJ | Puerto Rico | Bahia De Jobos | PR | cr | 66.1825 | 17.9388 | 2 | | | | | | | x | x |
| EVFU | Everglades | Faka Union Bay | FL | cv | 81.5130 | 25.9013 | 8 | x | x | x | x | x | x | x | x |
| RBHC | Rookery Bay | Henderson Creek | FL | cv | 81.7367 | 26.0250 | 8 | x | x | x | x | x | x | x | x |
| NBNB | Naples Bay | Naples Bay | FL | cv | 81.7858 | 26.1130 | 8 | x | x | x | x | x | x | x | x |
| CBFM | Charlotte Harbor | Fort Meyers | FL | cv | 81.9228 | 26.5583 | 6 | | | x | x | x | x | x | x |
| CBBI | Charlotte Harbor | Bird Island | FL | cv | 82.0363 | 26.5122 | 8 | x | x | x | x | x | x | x | x |
| TBCB | Tampa Bay | Cockroach Bay | FL | cv | 82.5093 | 27.6758 | 8 | x | x | x | x | x | x | x | x |
| TBHB | Tampa Bay | Hillsborough Bay | FL | cv | 82.3958 | 27.8547 | 4 | x | x | x | | | | | x |
| TBKA | Tampa Bay | Peter O. Knight Airport | FL | cv | 82.4548 | 27.9077 | 5 | | | | x | x | x | x | x |
| TBOT | Tampa Bay | Old Tampa Bay | FL | cv | 82.6325 | 28.0247 | 5 | | | x | x | x | x | x | x |
| TBPB | Tampa Bay | Papys Bayou | FL | cv | 82.6103 | 27.8422 | 8 | x | x | x | x | x | x | x | x |
| TBMK | Tampa Bay | Mullet Key Bayou | FL | cv | 82.7270 | 27.6213 | 8 | x | x | x | x | x | x | x | x |
| TBNP | Tampa Bay | Navarez Park | FL | cv | 82.7547 | 27.7880 | 5 | | | | x | x | x | x | x |
| CKBP | Cedar Key | Black Point | FL | cv | 83.0708 | 29.2053 | 8 | x | x | x | x | x | x | x | x |
| SRWP | Suwannee River | West Pass | FL | cv | 83.1742 | 29.3292 | 1 | | | x | | | | | |
| AESP | Apalachee Bay | Spring Creek | FL | cv | 84.3228 | 30.0625 | 5 | | | | x | x | x | x | x |
| APCP | Apalachicola Bay | Cat Point Bar | FL | cv | 84.8842 | 29.7242 | 8 | x | x | x | x | x | x | x | x |
| APDB | Apalachicola Bay | Dry Bar | FL | cv | 85.0733 | 29.6742 | 8 | x | x | x | x | x | x | x | x |
| SAWB | St. Andrews Bay | Watson Bayou | FL | cv | 85.6320 | 30.1422 | 8 | x | x | x | x | x | x | x | x |
| PCMP | Panama City | Municipal Pier | FL | cv | 85.6633 | 30.1500 | 4 | | | x | x | x | | | x |
| PCLO | Panama City | Little Oyster Bar | FL | cv | 85.6825 | 30.2532 | 5 | | | | x | x | x | x | x |
| CBSR | Choctawhatchee Bay | Off Santa Rosa | FL | cv | 86.2042 | 30.4130 | 8 | x | x | x | x | x | x | x | x |
| CBBL | Choctawhatchee Bay | Bens Lake | Fl | cv | 86.5408 | 30.4525 | 1 | | | | | | | x | |
| CBPP | Choctawhatchee Bay | Postil Point | FL | cv | 86.4788 | 30.4808 | 8 | x | x | x | x | x | x | x | x |
| CBBB | Choctawhatchee Bay | Boggy Bayou | FL | cv | 86.4942 | 30.5030 | 1 | | | | | | | x | |
| CBJB | Choctawhatchee Bay | Joes Bayou | FL | cv | 86.4908 | 30.4103 | 5 | | | | x | x | x | x | x |
| PBSP | Pensacola Bay | Sabine Point | FL | cv | 87.1517 | 30.3467 | 2 | | | | | x | | | x |
| PBIB | Pensacola Bay | Indian Bayou | FL | cv | 87.1063 | 30.5225 | 7 | x | x | x | x | | x | x | x |
| PBPH | Pensacola Bay | Public Harbor | FL | cv | 87.1903 | 30.4105 | 6 | | | x | x | x | x | x | x |
| MBDR | Mobile Bay | Dog River | AL | cv | 88.0453 | 30.5917 | 1 | | | | | x | | | |
| MBHI | Mobile Bay | Hollingers Is. Chan. | AL | cv | 88.0750 | 30.5633 | 6 | | | x | x | x | x | x | x |
| MBCP | Mobile Bay | Cedar Point Reef | AL | cv | 88.1333 | 30.3117 | 8 | x | x | x | x | x | x | x | x |
| MSPB | Mississippi Sound | Pascagoula Bay | MS | cv | 88.6017 | 30.3338 | 8 | x | x | x | x | x | x | x | x |
| MSBB | Mississippi Sound | Biloxi Bay | MS | cv | 88.8575 | 30.3925 | 7 | x | x | x | x | x | x | x | x |
| MSPC | Mississippi Sound | Pass Christian | MS | cv | 89.3267 | 30.2958 | 7 | x | x | x | x | x | x | x | x |
| LPGO | Lake Pontchartrain | Gulf Outlet | LA | cv | 89.0428 | 30.0407 | 1 | | | | | | x | | |
| LBNO | Lake Borgne | New Orleans | LA | cv | 89.8350 | 29.9433 | 1 | | | x | | | | | |
| LBMP | Lake Borgne | Malheureux Point | LA | cv | 89.6783 | 29.8670 | 8 | x | x | x | x | x | x | x | x |
| BSBG | Breton Sound | Bay Gardene | LA | cv | 89.6208 | 29.5983 | 8 | x | x | x | x | x | x | x | x |
| BSSI | Breton Sound | Sable Island | LA | cv | 89.4850 | 29.4018 | 8 | x | x | x | x | x | x | x | x |
| MRPL | Mississippi River | Pass A Loutre | LA | cv | 89.0922 | 29.0812 | 5 | | | x | x | x | x | x | x |
| MRTP | Mississippi River | Tiger Pass | LA | cv | 89.4278 | 29.1448 | 6 | | | x | x | x | | | x |
| BBMB | Barataria Bay | Middle Bank | LA | cv | 89.9422 | 29.2758 | 8 | x | x | x | x | x | x | x | x |
| BBSD | Barataria Bay | Bayou Saint Denis | LA | cv | 89.9958 | 29.4030 | 7 | x | x | x | x | x | | x | x |
| BBTB | Barataria Bay | Turtle Bay | LA | cv | 90.0833 | 29.5112 | 2 | | | x | | | x | | |
| TBLF | Terrebonne Bay | Lake Felicity | LA | cv | 90.4067 | 29.2633 | 8 | x | x | x | x | x | x | x | x |
| TBLB | Terrebonne Bay | Lake Barre | LA | cv | 90.5950 | 29.2600 | 8 | x | x | x | x | x | x | x | x |

**Table 2 continued.**

| SITE | General Location | Specific Location | State | Sp. | Longitude W | Latitude N | ΣYrs | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLCL | Caillou Lake | Caillou Lake | LA | cv | 90.9300 | 29.2542 | 8 | x | x | x | x | x | x | x | x |
| ABOB | Atchafalaya Bay | Oyster Bayou | LA | cv | 91.1350 | 29.2400 | 8 | x | x | x | x | x | x | x | x |
| VBSP | Vermilion Bay | Southwest Pass | LA | cv | 92.0458 | 29.5767 | 8 | x | x | x | x | x | x | x | x |
| JHJH | Joseph Harbor Bayou | Joseph Harbor Bayou | LA | cv | 92.7625 | 29.6292 | 8 | x | x | x | x | x | x | x | x |
| CLSJ | Calcasieu Lake | St. Johns Island | LA | cv | 93.3833 | 29.8305 | 8 | x | x | x | x | x | x | x | x |
| CLLC | Calcasieu Lake | Lake Charles | LA | cv | 93.2917 | 30.0583 | 6 | | | x | x | x | x | x | x |
| SLBB | Sabine Lake | Blue Buck Point | TX | cv | 93.9070 | 29.7917 | 8 | x | x | x | x | x | x | x | x |
| GBHR | Galveston Bay | Hanna Reef | TX | cv | 94.7333 | 29.4808 | 8 | x | x | x | x | x | x | x | x |
| GBSC | Galveston Bay | Ship Channel | TX | cv | 94.9930 | 29.7045 | 6 | | | x | x | x | x | x | x |
| GBYC | Galveston Bay | Yacht Club | TX | cv | 94.9917 | 29.6217 | 8 | x | x | x | x | x | x | x | x |
| GBTD | Galveston Bay | Todds Dump | TX | cv | 94.8970 | 29.5010 | 8 | x | x | x | x | x | x | x | x |
| GBOB | Galveston Bay | Offatts Bayou | TX | cv | 94.8358 | 29.2847 | 6 | | | x | x | x | x | x | x |
| GBCR | Galveston Bay | Confederate Reef | TX | cv | 94.9147 | 29.2625 | 8 | x | x | x | x | x | x | x | x |
| BRFS | Brazos River | Freeport Surfside | TX | cv | 95.3388 | 28.9208 | 6 | | | x | x | x | x | x | x |
| BRCL | Brazos River | Cedar Lakes | TX | cv | 95.4638 | 28.8583 | 5 | | | | x | x | x | x | x |
| MBEM | Matagorda Bay | East Matagorda | TX | cv | 95.8833 | 28.7112 | 8 | x | x | x | x | x | x | x | x |
| MBDI | Matagorda Bay | Dog Island | TX | cv | 96.0025 | 28.6380 | 1 | | | x | | | | | |
| MBTP | Matagorda Bay | Tres Palacios Bay | TX | cv | 96.2242 | 28.6583 | 8 | x | x | x | x | x | x | x | x |
| MBCB | Matagorda Bay | Carancahua Bay | TX | cv | 96.3863 | 28.6567 | 3 | | | x | | x | | | x |
| MBLR | Matagorda Bay | Lavaca River Mouth | TX | cv | 96.5805 | 28.6633 | 8 | x | x | | x | x | x | x | x |
| MBGP | Matagorda Bay | Gallinipper Point | TX | cv | 96.5695 | 28.5875 | 7 | x | x | x | x | | x | x | x |
| ESBD | Espiritu Santo | Bill Days Reef | TX | cv | 96.4378 | 28.4142 | 5 | | | x | x | x | | x | x |
| ESSP | Espiritu Santo | South Pass Reef | TX | cv | 96.6222 | 28.2983 | 6 | x | x | | | x | x | x | |
| SAMP | San Antonio Bay | Mosquito Point | TX | cv | 96.7130 | 28.3442 | 5 | x | x | | x | | x | x | |
| SAPP | San Antonio Bay | Panther Point Reef | TX | cv | 96.7092 | 28.2370 | 7 | x | x | | | x | x | x | x |
| MBAR | Mesquite Bay | Ayres Reef | TX | cv | 96.8325 | 28.1692 | 8 | x | x | x | x | x | x | x | x |
| ABLR | Aransas Bay | Long Reef | TX | CV | 96.9633 | 28.0647 | 8 | x | x | x | x | x | x | x | x |
| CBCR | Copano Bay | Copano Reef | TX | cv | 97.1278 | 28.1412 | 7 | x | x | x | x | x | x | x | |
| ABHI | Aransas Bay | Harbor Island | TX | cv | 97.0753 | 27.8388 | 1 | | | x | | | | | |
| CCIC | Corpus Christi | Ingleside Cove | TX | cv | 97.2380 | 27.8380 | 6 | x | | x | x | x | x | x | |
| CCNB | Corpus Christi | Nueces Bay | TX | cv | 97.3592 | 27.8528 | 7 | x | x | x | x | x | | x | x |
| CCBH | Corpus Christi | Boat Harbor | TX | cv | 97.3787 | 27.8362 | 2 | | | x | | x | | | |
| LMAC | Lower Laguna Madre | Arroyo Colorado | TX | cv | 97.2883 | 26.2800 | 1 | | | | | x | | x | |
| LMPI | Lower Laguna Madre | Port Isabel | TX | cv | 97.2008 | 26.0770 | 2 | | | x | | | | x | |
| LMSB | Lower Laguna Madre | South Bay | TX | cv | 97.1747 | 26.0462 | 8 | x | x | x | x | x | x | x | x |
| IBNJ | Imperial Beach | North Jetty | CA | mc | 117.1325 | 32.5875 | 8 | x | x | x | x | x | x | x | x |
| SDCB | San Diego Bay | Coronado Bridge | CA | me | 117.1572 | 32.6812 | 5 | | | | x | x | x | x | x |
| PLLH | Point Loma | Lighthouse | CA | mc | 117.2487 | 32.6812 | 7 | x | x | x | x | x | x | x | |
| SDHI | San Diego Bay | Harbor Island | CA | me | 117.1930 | 32.7247 | 8 | x | x | x | x | x | x | x | x |
| MBVB | Mission Bay | Ventura Bridge | CA | me | 117.2412 | 32.7678 | 8 | x | x | x | x | x | x | x | x |
| LJLJ | La Jolla | Point La Jolla | CA | mc | 117.3287 | 32.8125 | 7 | x | x | x | x | x | x | x | |
| OSBJ | Oceanside | Beach Jetty | CA | me | 117.3927 | 33.2018 | 8 | x | x | x | x | x | x | x | x |
| SCBR | Santa Catalina Island | Bird Rock | CA | mc | 118.4867 | 33.4517 | 6 | x | x | x | | x | x | x | |
| NBWJ | Newport Beach | Wedge Jetty | CA | mc | 117.8795 | 33.5913 | 7 | x | x | x | x | x | x | x | |
| ABWJ | Anaheim Bay | West Jetty | CA | mc | 118.1302 | 33.7378 | 8 | x | x | x | x | x | x | x | x |
| LBBW | Long Beach | Breakwater | CA | me | 118.1742 | 33.7237 | 4 | | | | | x | x | x | x |
| SPFP | San Pedro Harbor | Fishing Pier | CA | me | 118.2767 | 33.7103 | 7 | x | x | x | x | x | x | x | |
| PVRP | Palos Verdes | Royal Palms State Park | CA | mc | 118.3225 | 33.7183 | 8 | x | x | x | x | x | x | x | x |
| RBMJ | Redondo Beach | Municipal Jetty | CA | mc | 118.4143 | 33.8235 | 4 | | | | | x | x | x | x |
| MDSJ | Marina Del Rey | South Jetty | CA | me | 118.4570 | 33.9613 | 8 | x | x | x | x | x | x | x | x |
| TBSM | Las Tunas Beach | Santa Monica Bay | CA | mc | 118.5622 | 34.0267 | 4 | | | | | x | x | x | x |
| PDPD | Point Dume | Point Dume | CA | mc | 118.8080 | 34.0013 | 8 | x | x | x | x | x | x | x | x |
| SCFP | Santa Cruz Island | Fraser Point | CA | mc | 119.9208 | 34.0598 | 6 | x | x | x | | x | x | x | |
| SANM | San Miguel Island | Tyler Bight | CA | mc | 120.4193 | 34.0280 | 1 | | | x | | | | | |
| SBSB | Point S. Barbara | Point Santa Barbara | CA | mc | 119.7287 | 34.3958 | 8 | x | x | x | x | x | x | x | x |
| PCPC | Point Conception | Point Conception | CA | mc | 120.4333 | 34.4427 | 7 | x | x | x | x | x | x | x | |
| SLSL | San Luis Obispo Bay | Point San Luis | CA | mc | 120.7543 | 35.1607 | 8 | x | x | x | x | x | x | x | x |
| SSSS | San Simeon Point | San Simeon Point | CA | mc | 121.1950 | 35.6367 | 7 | x | x | x | x | x | x | x | |
| PGLP | Pacific Grove | Lovers Point | CA | mc | 121.9152 | 36.6258 | 8 | x | x | x | x | x | x | x | x |
| MBML | Monterey Bay | Moss Landing | CA | mc | 121.7892 | 36.8015 | 4 | | | | | x | x | x | x |
| MBSC | Monterey Bay | Point Santa Cruz | CA | mc | 122.0242 | 36.9533 | 8 | x | x | x | x | x | x | x | x |
| FIEL | Farallon Islands | East Landing | CA | mc | 122.9998 | 37.6962 | 1 | | | x | | | | | |
| SFSM | San Francisco Bay | San Mateo Bridge | CA | me | 122.2527 | 37.5818 | 7 | x | x | x | x | x | x | x | |
| SFDB | San Francisco Bay | Dumbarton Bridge | CA | me | 122.1605 | 37.5267 | 8 | x | x | x | x | x | x | x | x |
| SFEM | San Francisco Bay | Emeryville | CA | me | 122.3288 | 37.8203 | 7 | | x | x | x | x | x | x | x |
| TBSR | Tomales Bay | Spengers Residence | CA | me | 122.9028 | 38.1492 | 7 | x | x | x | x | x | x | x | |
| BBBE | Bodega Bay | Bodega Bay Entrance | CA | mc | 123.0645 | 38.3050 | 8 | x | x | x | x | x | x | x | x |
| PALH | Point Arena | Lighthouse | CA | mc | 123.7383 | 38.9530 | 7 | x | x | x | x | x | x | x | |
| PDSC | Point Delgada | Shelter Cove | CA | mc | 124.0733 | 40.0225 | 8 | x | x | x | x | x | x | x | x |

**Table 2 continued.**

| SITE | General Location | Specific Location | State | Sp. | Longitude W | Latitude N | ΣYrs | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HMBJ | Eureka | Humboldt Bay Jetty | CA | mc | 124.2138 | 40.7510 | 8 | x | x | x | x | x | x | x | x |
| EUSB | Eureka | Samoa Bridge | CA | mc | 124.1682 | 40.8220 | 3 | | | | | x | x | x | |
| KRFR | Klamath River | Flint Rock Head | CA | mc | 124.0797 | 41.5272 | 1 | | | | x | | | | |
| SGSG | Crescent | Point St. George | CA | mc | 124.2072 | 41.7480 | 8 | x | x | x | x | x | x | x | x |
| CBCH | Coos Bay | Coos Head | OR | mc | 124.3308 | 43.3505 | 8 | x | x | x | x | x | x | x | x |
| CBRP | Coos Bay | Russell Point | OR | me | 124.2172 | 43.4292 | 8 | x | x | x | x | x | x | x | x |
| YBOP | Yaquina Bay | Oneatta Point | OR | me | 124.0008 | 44.5830 | 8 | x | x | x | x | x | x | x | x |
| YHSS | Yaquina Bay | Sallys Slough | OR | mc | 124.0158 | 44.6138 | 1 | | | | | | | | x |
| YHYH | Yaquina Bay | Yaquina Head | OR | mc | 124.0780 | 44.6763 | 6 | x | x | x | x | x | x | x | |
| YHFC | Yaquina Bay | Foggerty Creek | OR | mc | 124.0583 | 44.8400 | 2 | | | | | | | | x |
| TBHP | Tillamook Bay | Hobsonville Point | OR | me | 123.9265 | 45.5160 | 8 | x | x | x | x | x | x | x | x |
| CRSJ | Columbia River | South Jetty | OR | me | 124.0463 | 46.2333 | 8 | x | x | x | x | x | x | x | x |
| CRNJ | Columbia River | North Jetty | WA | me | 124.0622 | 46.2778 | 2 | | | | x | x | | | |
| WBNA | Willapa Bay | Nahcotta | WA | me | 124.0060 | 46.5080 | 4 | | | | | x | x | x | x |
| GHWJ | Grays Harbor | Westport Jetty | WA | mc | 124.1175 | 46.9125 | 8 | x | x | x | x | x | x | x | x |
| JFCF | Juan de Fuca Strait | Cape Flattery | WA | mc | 124.7213 | 48.3883 | 7 | x | x | x | | x | x | x | x |
| PSPA | Puget Sound | Port Angeles | WA | me | 123.4168 | 48.1397 | 5 | | | | x | x | x | x | x |
| PSPT | Puget Sound | Port Townsend | WA | me | 122.7650 | 48.1030 | 4 | | | | | x | x | x | x |
| PSHC | Puget Sound | Hood Canal | WA | me | 122.6867 | 47.8317 | 5 | | | | x | x | x | x | x |
| SSBI | South Puget Sound | Budd Inlet | WA | me | 122.9122 | 47.1005 | 8 | x | x | x | x | x | x | x | x |
| CBTP | Commencement Bay | Tahlequah Point | WA | me | 122.5017 | 47.3358 | 8 | x | x | x | x | x | x | x | x |
| PSSS | Puget Sound | South Seattle | WA | me | 122.3987 | 47.5288 | 5 | | | | x | x | x | x | x |
| EBDH | Elliott Bay | Duwamish Head | WA | me | 122.4180 | 47.5758 | 1 | | | | | x | | | |
| EBFR | Elliott Bay | Four-Mile Rock | WA | me | 122.4123 | 47.6392 | 8 | x | x | x | x | x | x | x | x |
| SIWP | Sinclair Inlet | Waterman Point | WA | me | 122.6270 | 47.5508 | 8 | x | x | x | x | x | x | x | x |
| WIPP | Whidbey Island | Possession Point | WA | me | 122.3800 | 47.9025 | 8 | x | x | x | x | x | x | x | x |
| PSEH | Puget Sound | Everett Harbor | WA | me | 122.2370 | 47.9738 | 2 | | | | x | x | | | |
| BBSM | Bellingham Bay | Squalicum Marina Jetty | WA | me | 122.4995 | 48.7542 | 8 | x | x | x | x | x | x | x | x |
| PRPR | Point Roberts | Point Roberts | WA | me | 123.0217 | 48.9817 | 8 | x | x | x | x | x | x | x | x |
| PVMC | Port Valdez | Mineral Creek Flats | AK | me | 146.4625 | 61.1362 | 7 | x | x | x | | x | x | x | x |
| UISB | Unakwit Inlet | Siwash Bay | AK | me | 147.6575 | 60.9558 | 7 | x | x | x | | x | x | x | x |
| HHKL | Honolulu Harbor | Keehi Lagoon | HI | os | 157.8883 | 21.3025 | 6 | x | x | x | | x | x | x | |
| BPBP | Barbers Point | Barbers Point Harbor | HI | os | 158.1242 | 21.3250 | 6 | x | x | x | | x | x | x | |
| KAUI | Kauai | Nawiliwili Harbor | HI | os | 159.3558 | 21.9567 | 1 | | | x | | | | | |
| GBBS | Green Bay | Bayshore Park | WI | dp | 87.7967 | 44.6367 | 1 | | | | | | | | x |
| LMMB | Lake Michigan | Milwaukee Bay | WI | dp | 87.8953 | 43.0333 | 1 | | | | | | | | x |
| LMNC | Lake Michigan | North Chicago | IL | dp | 87.8278 | 42.3055 | 1 | | | | | | | | x |
| LMCB | Lake Michigan | Calumet Breakwater | IN | dp | 87.4950 | 41.7272 | 1 | | | | | | | | x |
| LMHB | Lake Michigan | Holland Breakwater | MI | dp | 86.2147 | 42.7738 | 1 | | | | | | | | x |
| LMMU | Lake Michigan | Muskegon Breakwater | MI | dp | 86.3472 | 43.2270 | 1 | | | | | | | | x |
| SBSR | Saginaw Bay | Saginaw River | MI | dp | 83.8570 | 43.6733 | 2 | | | | | | | x | x |
| SBSP | Saginaw Bay | Sand Point | MI | dp | 83.4983 | 43.9100 | 2 | | | | | | | x | x |
| LHBR | Lake Huron | Black River Canal | MI | dp | 82.4367 | 43.0422 | 1 | | | | | | | x | |
| LSAB | Lake St. Clair | Anchor Bay | MI | dp | 82.7187 | 42.6412 | 2 | | | | | | | x | x |
| LESP | Lake Erie | Stony Point | MI | dp | 83.2263 | 41.9577 | 2 | | | | | | | x | x |
| LERB | Lake Erie | Reno Beach | OH | dp | 83.2298 | 41.6750 | 2 | | | | | | | x | x |
| SBPP | South Bass Island | Peach Orchard Point | OH | dp | 82.8242 | 41.6607 | 2 | | | | | | | x | x |

Table 3. Site codes, names, states, species, number of years sampled since 1990, and number of years since 1990 in which the concentration of the specified chemical was "high."

| SITE | General Location | Specific Location | State | Sp.. | No.yrs | As | Cd | Cu | Hg | Ni | Se | Pb | Zn | ΣDDT | ΣCdane | ΣDield | ΣPCB | ΣPAH | ΣBt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PBPI | Penobscot Bay | Pickering Island | ME | me | 4 | | | | 1 | | | | | | | | | | |
| PBSI | Penobscot Bay | Sears Island | ME | me | 4 | | | | 4 | | | | | | | | | | 1 |
| MSSP | Merriconeag Snd. | Stover Point | ME | me | 4 | | | | | | | | | | | | | | |
| CAKP | Cape Arundel | Kennebunkport | ME | me | 4 | | | | | | | | | | | | | | |
| CAGH | Cape Ann | Gap Head | MA | me | 4 | 4 | | | 1 | | | | | | | | | | |
| SHFP | Salem Harbor | Folger Point | MA | me | 4 | | | | | | | 4 | | | | | | 1 | 1 |
| MBNB | Massachusetts Bay | Nahant Bay | MA | me | 2 | | | | 2 | | | 2 | | | | | | | |
| BHDI | Boston Harbor | Deer Island | MA | me | 4 | | | | 3 | | | 3 | | 1 | 1 | 1 | 2 | 4 | |
| BHDB | Boston Harbor | Dorchester Bay | MA | me | 2 | | | | | | | 2 | | 2 | 2 | | 2 | 2 | |
| BHHB | Boston Harbor | Hingham Bay | MA | me | 4 | | | | 4 | 1 | | 4 | | | 1 | 1 | 4 | | |
| BHBI | Boston Harbor | Brewster Island | MA | me | 4 | | | | 4 | | | 3 | | | | | 1 | 1 | |
| MBNR | Massachusetts Bay | North River | MA | me | 2 | | | | 1 | | | 2 | | | | | | | |
| DBCI | Duxbury Bay | Clarks Island | MA | me | 4 | | | | | | | 1 | | | | | | | |
| CCNH | Cape Cod | Nauset Harbor | MA | me | 4 | | | | | | | | | | | | | | |
| BBNI | Buzzards Bay | Naushon Island | MA | me | 3 | 2 | | | | | 1 | | | | | | 1 | | |
| BBWF | Buzzards Bay | West Falmouth | MA | me | 3 | 3 | | | | | | | | | | | 1 | | |
| BBCC | Buzzards Bay | Cape Cod Canal | MA | me | 3 | 1 | | | | | | | | | | | | | |
| BBAR | Buzzards Bay | Angelica Rock | MA | me | 4 | 2 | | | | | 1 | | | | | | 4 | 1 | |
| BBRH | Buzzards Bay | Round Hill | MA | me | 1 | | | | | | | | | | | | 1 | | |
| BBGN | Buzzards Bay | Goosebury Neck | MA | me | 4 | 2 | | | | | 2 | | | | | | 2 | | |
| NBDI | Narragansett Bay | Dyer Island | RI | me | 2 | 1 | | | | 1 | 1 | 1 | | 1 | | | | | |
| NBPI | Narragansett Bay | Patience Island | RI | me | 4 | | | 2 | | | | 1 | | | 1 | 2 | | | |
| NBDU | Narragansett Bay | Dutch Island | RI | me | 3 | | | | | 1 | 1 | | | | | | | | |
| BIBI | Block Island Sound | Block Island | RI | me | 4 | 2 | | | | | | | | | | | | | |
| LICR | Long Island Sound | Connecticut River | CT | me | 3 | | | | | | | | | | | | | | |
| LINH | Long Island Sound | New Haven | CT | me | 4 | | | | | | | | | | 1 | 1 | 3 | | |
| LIHR | Long Island Sound | Housatonic River | CT | me | 3 | | | 1 | | | | | | | 1 | | 2 | | |
| LISI | Long Island Sound | Sheffield Island | CT | me | 2 | | | | | | | | | | 1 | | | | |
| LIMR | Long Island Sound | Mamaroneck | NY | me | 3 | | | 1 | | | | 3 | | 1 | 2 | 1 | 1 | 1 | |
| LITN | Long Island Sound | Throgs Neck | NY | me | 4 | | | | | | | 4 | | 2 | 3 | 2 | 3 | 4 | |
| LIHH | Long Island Sound | Hempstead Harbor | NY | me | 4 | | | | | | | | | | 3 | 3 | | | |
| LIHU | Long Island Sound | Huntington Harbor | NY | me | 3 | | | | | | | | | | 1 | | | | |
| LIPJ | Long Island Sound | Port Jefferson | NY | me | 4 | | | | | | | | | | | 1 | | 1 | 1 |
| LIGB | Long Island | Gardiners Bay | NY | me | 4' | | | | | | | | | | | 1 | | 1 | |
| MBTH | Moriches Bay | Tuthill Point | NY | me | 4 | | | | 3 | | 1 | | | | | | | | |
| LIFI | Long Island | Fire Island Inlet | NY | me | 1 | | | | 1 | | 1 | | | | | | | | |
| LIJI | Long Island | Jones Inlet | NY | me | 2 | | | | 1 | | | | | | | | | | |
| HRJB | Hudson/Raritan Estu | Jamaica Bay | NY | me | 4 | | | 3 | 3 | | | 4 | | 1 | 2 | 3 | 3 | 4 | |
| HRUB | Hudson/Raritan Estu | Upper Bay | NY | me | 3 | | 2 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 |
| HRLB | Hudson/Raritan Estu | Lower Bay | NY | me | 2 | | | 2 | 1 | 1 | | 2 | | 2 | 1 | 1 | 2 | 2 | 1 |
| HRRB | Hudson/Raritan Estu | Raritan Bay | NJ | me | 1 | | | | | 1 | | | | 1 | 1 | 1 | 1 | 1 | |
| NYSH | New York Bight | Sandy Hook | NJ | me | 3 | | | 2 | 3 | 3 | 1 | 3 | 1 | 3 | 2 | 2 | 3 | 3 | 1 |
| NYLB | New York Bight | Long Branch | NJ | me | 2 | | | 1 | 1 | 1 | 1 | 1 | | | | 1 | 2 | 1 | |
| NYSR | New York Bight | Shark River | NJ | me | 4 | | | | 4 | | | 2 | | | 1 | | 3 | 2 | |
| BIBL | Barnegat Inlet | Barnegat Light | NJ | me | 3 | | | | 2 | | | | | | | | | | |
| AIAC | Absecon Inlet | Atlantic City | NJ | me | 3 | | | | 2 | | | | | | | | | | |
| DBCM | Delaware Bay | Cape May | NJ | me | 4 | | | | | | 4 | | | | | | | | |
| DBFE | Delaware Bay | False Egg Island Poi | NJ | cv | 3 | | | | | 3 | | | | 1 | | 1 | | | |
| DBBD | Delaware Bay | Ben Davis Point Sho | NJ | cv | 2 | | | | | 2 | | | 1 | 2 | | 1 | | | 1 |
| DBAP | Delaware Bay | Arnolds Point Shoal | NJ | cv | 3 | | 3 | 3 | | 3 | | | 3 | 3 | | 1 | | | |
| DBHC | Delaware Bay | Hope Creek | NJ | cv | | | | | | | | | | | | | | | |
| DBWB | Delaware Bay | Woodland Beach | DE | cv | | | | | | | | | | | | | | | |
| DBKI | Delaware Bay | Kelly Island | DE | cv | 3 | | | | | 3 | | | | 2 | | | | | |
| DBCH | Delaware Bay | Cape Henlopen | DE | me | 4 | | | | | | 3 | | | | | | | | |
| CBBO | Chesapeake Bay | Bodkin Point | MD | cv | 2 | | 2 | 1 | | 2 | 2 | | 2 | | 1 | 1 | | | 1 |
| CBMP | Chesapeake Bay | Mountain Point Bar | MD | cv | 4 | | 4 | | | 4 | | | 2 | | | | | | 1 |
| CBHP | Chesapeake Bay | Hackett Point Bar | MD | cv | 3 | | | | | | 1 | | | | | | | | |
| CBCP | Chesapeake Bay | Choptank River | MD | cv | 4 | | | | | 4 | | | | | | | | | |
| CBHG | Chesapeake Bay | Hog Point | MD | cv | 3 | | | | | 3 | | | | | | | | | |
| PRSP | Potomac River | Swan Point | MD | cv | 1 | | | | | 1 | | | | | | | | | |
| PRMC | Potomac River | Mattox Creek | VA | cv | 1 | | | | | 1 | | | | | | | | | |
| PRRP | Potomac River | Ragged Point | VA | cv | 4 | | | | | 4 | | | | | | | | | |
| CBIB | Chesapeake Bay | Ingram Bay | VA | cv | | | | | | | | | | | | | | | |
| RRRR | Rappahannock River | Ross Rock | VA | cv | 4 | | 3 | | | 1 | | | | | | | | | |
| CBDP | Chesapeake Bay | Dandy Point | VA | cv | 4 | | | | | | | | | | | | | | 1 |
| CBJR | Chesapeake Bay | James River | VA | cv | 1 | | 1 | 1 | | 1 | 1 | | 1 | | | | | | 1 |
| CBCC | Chesapeake Bay | Cape Charles | VA | cv | 3 | | | | | | | | | | | | | | |
| CBCI | Chincoteague Bay | Chincoteague Inlet | VA | cv | 4 | | | | | | | | | | | | | | |
| QIUB | Quinby Inlet | Upshur Bay | VA | cv | 3 | | | | | 1 | | | | | | | | 1 | |

**Table 3 continued.**

| SITE | General Location | Specific Location | State | Sp. | No. yr | As | Cd | Cu | Hg | Ni | Se | Pb | Zn | ΣDDT | ΣCdane | ΣDield | ΣPCB | ΣPAH | ΣBt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RSJC | Roanoke Sound | John Creek | NC | cv | 3 | | | | | | | | | | | | | | |
| PSWB | Pamlico Sound | Wysocking Bay | NC | cv | 4 | | | | 1 | 1 | | | | | | | | | |
| PSPR | Pamlico Sound | Pungo River | NC | cv | 4 | | | | | | | | | | | | | | |
| PSNR | Pamlico Sound | Neuse River | NC | cv | 4 | | | | | | | | | | | | | | |
| PSCH | Pamlico Sound | Cape Hatteras | NC | cv | 4 | 2 | | | | | | | | | | | | 1 | |
| BIPI | Beaufort Inlet | Pivers Island | NC | cv | 4 | 4 | | | | | | | | | | | | 4 | 1 |
| CFBI | Cape Fear | Battery Island | NC | cv | 4 | 4 | | | | | | | | | | | | | |
| WBLB | Winyah Bay | Lower Bay | SC | cv | 4 | 4 | | | | | 1 | | | | | | | | |
| SRNB | Santee River | North Bay | SC | cv | 4 | 3 | | | | | 2 | | | | | | | | |
| CHFJ | Charleston Harbor | Fort Johnson | SC | cv | 4 | 4 | | | | | 1 | | | | | | | 2 | |
| CHSF | Charleston Harbor | Shutes Folly Island | SC | cv | 3 | 3 | | | | | 2 | | | | | | | 1 | 2 |
| SRTI | Savannah River Estu | Tybee Island | GA | cv | 4 | 4 | | | | | 1 | | | | | | | | |
| SSSI | Sapelo Sound | Sapelo Island | GA | cv | 3 | 3 | | | | | | | | | | | | | |
| ARWI | Altamaha River | Wolfe Island | GA | cv | 4 | 3 | | | | | 1 | | | | | | | | |
| SJCB | St. Johns River | Chicopit Bay | FL | cv | 4 | 3 | | | | | 2 | | | | | | | | 2 |
| MRCB | Matanzas River | Crescent Beach | FL | cv | 3 | 2 | | | | | | | | | | | | | |
| IRSR | Indian River | Sebastian River | FL | cv | 4 | | | | | 1 | | | | | | | | | 1 |
| NMML | North Miami | Maule Lake | FL | cv | 3 | | | 3 | 1 | | | | | | 1 | | | | 3 |
| BBGC | Biscayne Bay | Goulds Canal | FL | cv | 4 | 1 | | | | | | | | | | | | 1 | 2 |
| BBPC | Biscayne Bay | Princeton Canal | FL | cv | | | | | | | | | | | | | | | |
| BHKF | Bahia Honde | Key Florida | FL | cs | 2 | 2 | | | | 2 | | | | | | | | | |
| PRBB | Puerto Rico | Bahia De Boqueron | PR | cr | 2 | | | | | | | | | | | | | | |
| PRBM | Puerto Rico | Bahia Montalva | PR | cr | 2 | | | | | | 1 | | | | | | | | |
| PRBJ | Puerto Rico | Bahia De Jobos | PR | cr | 2 | 1 | | | | | | | | | | | | | |
| EVFU | Everglades | Faka Union Bay | FL | cv | 4 | | | | | | | | | | | | | | |
| RBHC | Rookery Bay | Henderson Creek | FL | cv | 4 | | | | 1 | | | | | | | | | | |
| NBNB | Naples Bay | Naples Bay | FL | cv | 4 | | | 2 | | | | | | | | | | | 3 |
| CBFM | Charlotte Harbor | Fort Meyers | FL | cv | 4 | | | | | | | | | | 1 | | | | 1 |
| CBBI | Charlotte Harbor | Bird Island | FL | cv | 4 | 2 | | | 1 | | | | | | | | | | |
| TBCB | Tampa Bay | Cockroach Bay | FL | cv | 4 | | | | 1 | | | | | | 2 | | | | |
| TBHB | Tampa Bay | Hillsborough Bay | FL | cv | 1 | | | | | | | | | | | | | | 1 |
| TBKA | Tampa Bay | Peter O. Knight Airp | FL | cv | 4 | | | | | | 1 | | 2 | 2 | 4 | | 2 | | 4 |
| TBOT | Tampa Bay | Old Tampa Bay | FL | cv | 3 | | | | 3 | | | | 3 | | | | | | |
| TBPB | Tampa Bay | Papys Bayou | FL | cv | 4 | | 1 | | 4 | | | | | | | | | | |
| TBMK | Tampa Bay | Mullet Key Bayou | FL | cv | 4 | | | | | | | | | | | | | | |
| TBNP | Tampa Bay | Navarez Park | FL | cv | 4 | 4 | | | | | | | | | 4 | | | 1 | |
| CKBP | Cedar Key | Black Point | FL | cv | 4 | 2 | | | | | | | | | | | | | |
| SRWP | Suwannee River | West Pass | FL | cv | | | | | | | | | | | | | | | |
| AESP | Apalachee Bay | Spring Creek | FL | cv | 4 | 1 | | | | | 1 | | | | | | | | |
| APCP | Apalachicola Bay | Cat Point Bar | FL | cv | 4 | | | | | | | | | | | | | | |
| APDB | Apalachicola Bay | Dry Bar | FL | cv | 4 | | | | | | | | | | | | | | |
| SAWB | St. Andrews Bay | Watson Bayou | FL | cv | 4 | 1 | | | | | | | | 1 | 1 | | 2 | 4 | |
| PCMP | Panama City | Municipal Pier | FL | cv | 2 | 1 | | | | | | | | | | | | 2 | 2 |
| PCLO | Panama City | Little Oyster Bar | FL | cv | 4 | | | | | | | | | 2 | | | | | |
| CBSR | Choctawhatchee Ba | Off Santa Rosa | FL | cv | 4 | | | | 1 | | 1 | | | | | | | | |
| CBBL | Choctawhatchee Ba | Bens Lake | Fl | cv | 1 | | | | 1 | | 1 | | | 1 | | 1 | | | |
| CBPP | Choctawhatchee Ba | Postil Point | FL | cv | 4 | | | | 4 | | 2 | 4 | | 3 | 1 | | | | |
| CBBB | Choctawhatchee Ba | Boggy Bayou | FL | cv | 1 | | | | | | 1 | | | 1 | | | | | |
| CBJB | Choctawhatchee Ba | Joes Bayou | FL | cv | 4 | | 1 | 1 | 4 | | 2 | | | | | 2 | | 4 | 2 |
| PBSP | Pensacola Bay | Sabine Point | FL | cv | 2 | | | | | | | | | | | | | | |
| PBIB | Pensacola Bay | Indian Bayou | FL | cv | 3 | | | | | | | | | | | | 2 | | |
| PBPH | Pensacola Bay | Public Harbor | FL | cv | 4 | | | | | | 1 | | | | | 1 | | 1 | |
| MBDR | Mobile Bay | Dog River | AL | cv | 1 | | 1 | 1 | | | | | 1 | 1 | 1 | | 1 | 1 | |
| MBHI | Mobile Bay | Hollingers Is. Chan. | AL | cv | 4 | | 2 | | | | | | 3 | 4 | 1 | | | | |
| MBCP | Mobile Bay | Cedar Point Reef | AL | cv | 4 | | | | | | | | | 1 | | | | | |
| MSPB | Mississippi Sound | Pascagoula Bay | MS | cv | 4 | 1 | | | | | 1 | | | | | | | | |
| MSBB | Mississippi Sound | Biloxi Bay | MS | cv | 3 | | 1 | | | | 1 | | | | 2 | | | 2 | |
| MSPC | Mississippi Sound | Pass Christian | MS | cv | 3 | | 3 | | | | | | | | | | | | |
| LPGO | Lake Pontchartrain | Gulf Outlet | LA | cv | 1 | | 1 | 1 | | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LBNO | Lake Borgne | New Orleans | LA | cv | | | | | | | | | | | | | | | |
| LBMP | Lake Borgne | Malheureux Point | LA | cv | 4 | | 4 | 1 | 2 | 2 | 2 | | 1 | | | | | | |
| BSBG | Breton Sound | Bay Gardene | LA | cv | 4 | | | | | | 1 | | | | | | | | |
| BSSI | Breton Sound | Sable Island | LA | cv | 4 | | 4 | | | 3 | 1 | | | | | 2 | | | |
| MRPL | Mississippi River | Pass A Loutre | LA | cv | 3 | | 3 | | | 2 | | | | 1 | 1 | | 1 | | |
| MRTP | Mississippi River | Tiger Pass | LA | cv | 4 | | 3 | | | | | | | 1 | | 3 | | | |
| BBMB | Barataria Bay | Middle Bank | LA | cv | 4 | | | | | | | | | | | | | 3 | 4 |
| BBSD | Barataria Bay | Bayou Saint Denis | LA | cv | 3 | | | | | | | | | | | | | | |
| BBTB | Barataria Bay | Turtle Bay | LA | cv | | | | | | | | | | | | | | | |
| TBLF | Terrebonne Bay | Lake Felicity | LA | cv | 4 | | | | | | | | | | | | | 1 | |
| TBLB | Terrebonne Bay | Lake Barre | LA | cv | 4 | | | | | | | | | | | | | | |

**Table 3 continued.**

| SITE | General Location | Specific Location | State | Sp. | No. yr | As | Cd | Cu | Hg | Ni | Se | Pb | Zn | ΣDDT | ΣCdane | ΣDield | ΣPCB | ΣPAH | ΣBt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLCL | Caillou Lake | Caillou Lake | LA | cv | 4 | | | | | 1 | | | | | | | | | |
| ABOB | Atchafalaya Bay | Oyster Bayou | LA | cv | 4 | | 3 | | | | 1 | | | | | | | | |
| VBSP | Vermilion Bay | Southwest Pass | LA | cv | 4 | | 4 | 1 | | | 2 | | | | 1 | | | | |
| JHJH | Joseph Harbor Bayo | Joseph Harbor Bayo | LA | cv | 4 | | | | | | 3 | | | | | | | | |
| CLSJ | Calcasieu Lake | St. Johns Island | LA | cv | 4 | | 1 | | | 1 | 1 | | | | | | | 1 | |
| CLLC | Calcasieu Lake | Lake Charles | LA | cv | 4 | | | | | 1 | | | | | | | | 1 | |
| SLBB | Sabine Lake | Blue Buck Point | TX | cv | 4 | | | | | 1 | 1 | | | | | | | | |
| GBHR | Galveston Bay | Hanna Reef | TX | cv | 4 | | 2 | | | | 3 | | | | | | | | |
| GBSC | Galveston Bay | Ship Channel | TX | cv | 4 | | 3 | | | 2 | 4 | | 1 | 1 | 4 | 4 | 4 | | 3 |
| GBYC | Galveston Bay | Yacht Club | TX | cv | 4 | | | | | | | | | | 2 | 2 | | | 4 |
| GBTD | Galveston Bay | Todds Dump | TX | cv | 4 | | | | | | | | | | | | | | 1 |
| GBOB | Galveston Bay | Offatts Bayou | TX | cv | 4 | | | | | | | | | | 4 | 1 | | | |
| GBCR | Galveston Bay | Confederate Reef | TX | cv | 4 | | | | | | 2 | | | | | | | | |
| BRFS | Brazos River | Freeport Surfside | TX | cv | 4 | | | 1 | | 1 | 2 | | | 3 | | | | 2 | 1 |
| BRCL | Brazos River | Cedar Lakes | TX | cv | 4 | | | | | 1 | 1 | | | 1 | | | | 1 | |
| MBEM | Matagorda Bay | East Matagorda | TX | cv | 4 | | 3 | | | 1 | 2 | | | | | | | | |
| MBDI | Matagorda Bay | Dog Island | TX | cv | | | | | | | | | | | | | | | |
| MBTP | Matagorda Bay | Tres Palacios Bay | TX | cv | 4 | | 1 | | | 1 | 3 | | | | | | | | |
| MBCB | Matagorda Bay | Carancahua Bay | TX | cv | 2 | | 1 | | | | | | | | | | | | |
| MBLR | Matagorda Bay | Lavaca River Mouth | TX | cv | 4 | | 1 | | 4 | 2 | 3 | | | | | | | | |
| MBGP | Matagorda Bay | Gallinipper Point | TX | cv | 3 | | | | 3 | 1 | 1 | | | | | | | | |
| ESBD | Espiritu Santo | Bill Days Reef | TX | cv | 3 | | | | | | | | | | | | | | |
| ESSP | Espiritu Santo | South Pass Reef | TX | cv | 3 | | 1 | | | | 1 | | | | | | | | |
| SAMP | San Antonio Bay | Mosquito Point | TX | cv | 2 | | | | | | 1 | | | | | | | | |
| SAPP | San Antonio Bay | Panther Point Reef | TX | cv | 4 | | 1 | | | | 3 | | | | | | | | |
| MBAR | Mesquite Bay | Ayres Reef | TX | cv | 4 | | 2 | | | | 1 | | | | | | | | |
| ABLR | Aransas Bay | Long Reef | TX | cv | 4 | | 1 | | | | | | | | | | | | |
| CBCR | Copano Bay | Copano Reef | TX | cv | 3 | | 2 | | | | 1 | | | | | | | | |
| ABHI | Aransas Bay | Harbor Island | TX | cv | | | | | | | | | | | | | | | |
| CCIC | Corpus Christi | Ingleside Cove | TX | cv | 3 | | | | | | | | | | | | | | 2 |
| CCNB | Corpus Christi | Nueces Bay | TX | cv | 3 | | | | | | 1 | | | | | | | | |
| CCBH | Corpus Christi | Boat Harbor | TX | cv | 1 | | 1 | | | | 1 | | | | | | | 1 | |
| LMAC | Lower Laguna Madre | Arroyo Colorado | TX | cv | 1 | | | | | | | | | | | | | | |
| LMPI | Lower Laguna Madre | Port Isabel | TX | cv | | | | | | | | | | | | | | | |
| LMSB | Lower Laguna Madre | South Bay | TX | cv | 4 | | | | 1 | | | | | | | | | | |
| IBNJ | Imperial Beach | North Jetty | CA | mc | 4 | | | | | | | | | 4 | | 1 | | | |
| SDCB | San Diego Bay | Coronado Bridge | CA | me | 4 | | 3 | 4 | 2 | 1 | | 1 | 3 | | | 1 | 3 | 4 | 2 |
| PLLH | Point Loma | Lighthouse | CA | mc | 3 | 3 | | 2 | 3 | 1 | | | 2 | | | | | | |
| SDHI | San Diego Bay | Harbor Island | CA | me | 4 | | | 2 | | | | | 3 | 1 | 2 | 1 | 4 | 4 | 3 |
| MBVB | Mission Bay | Ventura Bridge | CA | me | 4 | | | | | | | | | | | | | | |
| LJLJ | La Jolla | Point La Jolla | CA | mc | 3 | 3 | | | 1 | | | | | | | | | | |
| OSBJ | Oceanside | Beach Jetty | CA | me | 4 | | | | | | | | 1 | 1 | 1 | 1 | | | |
| SCBR | Santa Catalina Island | Bird Rock | CA | mc | 3 | 1 | | | | | | | | 1 | | | | | |
| NBWJ | Newport Beach | Wedge Jetty | CA | mc | 3 | | | | | | | 2 | | 2 | | | | | |
| ABWJ | Anaheim Bay | West Jetty | CA | mc | 4 | | | | | | | 2 | | 4 | 4 | 1 | 1 | | |
| LBBW | Long Beach | Breakwater | CA | me | 4 | | | | | | | 3 | 1 | 4 | | 2 | | | 1 |
| SPFP | San Pedro Harbor | Fishing Pier | CA | me | 3 | | | 2 | | | 1 | | 1 | 3 | | | 2 | 3 | 3 |
| PVRP | Palos Verdes | Royal Palms State P | CA | mc | 4 | 4 | | | 2 | | 1 | | 3 | 4 | | | | | |
| RBMJ | Redondo Beach | Municipal Jetty | CA | mc | 4 | 1 | | | | | 3 | | | 4 | | | | | |
| MDSJ | Marina Del Rey | South Jetty | CA | me | 4 | | | | | | 3 | 4 | 2 | 4 | 4 | | | 2 | |
| TBSM | Las Tunas Beach | Santa Monica Bay | CA | mc | 4 | | 1 | 1 | 2 | | 2 | 3 | 2 | 2 | | | | | |
| PDPD | Point Dume | Point Dume | CA | mc | 4 | | | | | | | | | 2 | | | | | |
| SCFP | Santa Cruz Island | Fraser Point | CA | mc | 3 | 3 | 1 | | | | | | | | | | | | |
| SANM | San Miguel Island | Tyler Bight | CA | mc | | | | | | | | | | | | | | | |
| SBSB | Point S. Barbara | Point Santa Barbara | CA | mc | 4 | | | | | 1 | | | | | | | | | |
| PCPC | Point Conception | Point Conception | CA | mc | 3 | | | | | | | | | | | | | | |
| SLSL | San Luis Obispo Bay | Point San Luis | CA | mc | 4 | | | | | | | | | | | | | 1 | |
| SSSS | San Simeon Point | San Simeon Point | CA | mc | 3 | | 2 | | 2 | 3 | | | | | | | | | |
| PGLP | Pacific Grove | Lovers Point | CA | mc | 4 | 1 | 3 | | | | | 4 | 3 | | | | | | |
| MBML | Monterey Bay | Moss Landing | CA | mc | 4 | | | | | 3 | | 2 | | 3 | 1 | 2 | | | |
| MBSC | Monterey Bay | Point Santa Cruz | CA | mc | 4 | | | | | | | 1 | 1 | 1 | | 3 | | | |
| FIEL | Farallon Islands | East Landing | CA | mc | | | | | | | | | | | | | | | |
| SFSM | San Francisco Bay | San Mateo Bridge | CA | me | 3 | | 2 | | 2 | 1 | 3 | | | 1 | 1 | 2 | 3 | 1 | |
| SFDB | San Francisco Bay | Dumbarton Bridge | CA | me | 4 | | 3 | | 3 | 4 | 4 | | | 2 | 1 | 4 | 4 | 2 | |
| SFEM | San Francisco Bay | Emeryville | CA | me | 4 | | 4 | | 4 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 4 | 4 | 2 |
| TBSR | Tomales Bay | Spengers Residence | CA | me | 3 | | | | | 1 | | | | | | | | | |
| BBBE | Bodega Bay | Bodega Bay Entranc | CA | mc | 4 | | 4 | | | | | | | | | | | | |
| PALH | Point Arena | Lighthouse | CA | mc | 3 | | 3 | | 1 | 3 | | | | | | | | | |
| PDSC | Point Delgada | Shelter Cove | CA | mc | 4 | 1 | 3 | | 2 | 1 | | | | | | | | | |

**Table 3 continued.**

| SITE | General Location | Specific Location | State | Sp. | No. yr | As | Cd | Cu | Hg | Ni | Se | Pb | Zn | ΣDDT | ΣCdane | ΣDield | ΣPCB | ΣPAH | ΣBt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HMBJ | Eureka | Humboldt Bay Jetty | CA | mc | 4 | | | | | 1 | | | | | | | | | |
| EUSB | Eureka | Samoa Bridge | CA | mc | 3 | | | 1 | | 1 | | | | | | | | | |
| KRFR | Klamath River | Flint Rock Head | CA | mc | | | | | | | | | | | | | | | |
| SGSG | Crescent | Point St. George | CA | mc | 4 | 3 | 2 | | | 4 | | | | | | | | | |
| CBCH | Coos Bay | Coos Head | OR | mc | 4 | | | | | 1 | | | | | | | | | |
| CBRP | Coos Bay | Russell Point | OR | me | 4 | | | | | 1 | | | 2 | | | | | | 1 |
| YBOP | Yaquina Bay | Oneatta Point | OR | me | 4 | | | | | | | | | | | | | | |
| YHSS | Yaquina Bay | Sallys Slough | OR | mc | 1 | | | | | | | | | | | | | | |
| YHYH | Yaquina Bay | Yaquina Head | OR | mc | 2 | | 1 | | | | | | | | | | | | |
| YHFC | Yaquina Bay | Foggerty Creek | OR | mc | 2 | | | | | | | | | | | | | | |
| TBHP | Tillamook Bay | Hobsonville Point | OR | me | 4 | | | | | 1 | | | | | | | | | |
| CRSJ | Columbia River | South Jetty | OR | me | 4 | | | | | | | | | | | | | | |
| CRNJ | Columbia River | North Jetty | WA | me | 1 | | | | | | | | | | | | | | |
| WBNA | Willapa Bay | Nahcotta | WA | me | 4 | | | | | 2 | 4 | | 1 | | | | | 1 | |
| GHWJ | Grays Harbor | Westport Jetty | WA | mc | 4 | | | | | | 2 | 1 | | | | | | | |
| JFCF | Juan de Fuca Strait | Cape Flattery | WA | mc | 4 | | 2 | | | | 1 | | | | | | | | |
| PSPA | Puget Sound | Port Angeles | WA | me | 4 | | | | | | | | | | | | | | |
| PSPT | Puget Sound | Port Townsend | WA | me | 4 | | | | | | | | | | | | 1 | 4 | |
| PSHC | Puget Sound | Hood Canal | WA | me | 4 | | | | | | | | | | | | | 1 | |
| SSBI | South Puget Sound | Budd Inlet | WA | me | 4 | | | | | | | | | | | | | 1 | |
| CBTP | Commencement Bay | Tahlequah Point | WA | me | 4 | | | | | 1 | | | 1 | | | | | 4 | |
| PSSS | Puget Sound | South Seattle | WA | me | 4 | | | | | | | | | | | | | 4 | |
| EBDH | Elliott Bay | Duwamish Head | WA | me | 1 | | | | | | | | | | | | | 1 | |
| EBFR | Elliott Bay | Four-Mile Rock | WA | me | 4 | | | | | | | | 2 | | | | | 4 | |
| SIWP | Sinclair Inlet | Waterman Point | WA | me | 4 | | | | | | | | 1 | | | | | | |
| WIPP | Whidbey Island | Possession Point | WA | me | 4 | | | | | 3 | | | | | | | | | |
| PSEH | Puget Sound | Everett Harbor | WA | me | 1 | | | | | | | | | | | | | 1 | |
| BBSM | Bellingham Bay | Squalicum Marina Je | WA | me | 4 | | | 1 | | 2 | | | 3 | | | | | 3 | |
| PRPR | Point Roberts | Point Roberts | WA | me | 4 | | | | | 3 | | | 1 | | | | | | |
| PVMC | Port Valdez | Mineral Creek Flats | AK | me | 4 | | | 1 | | | 2 | | | | | | | | |
| UISB | Unakwit Inlet | Siwash Bay | AK | me | 4 | | | | | | 3 | | | | | | | | |
| HHKL | Honolulu Harbor | Keehi Lagoon | HI | os | 3 | 2 | | 3 | 2 | 1 | | 3 | | | 2 | 2 | | 3 | 3 |
| BPBP | Barbers Point | Barbers Point Harbo | HI | os | 3 | 2 | | 3 | | 2 | | | | | | | | | 3 |
| KAUI | Kauai | Nawiliwili Harbor | HI | os | | | | | | | | | | | | | | | |
| GBBS | Green Bay | Bayshore Park | WI | dp | 1 | | | | | 1 | | | | 1 | | | 1 | | |
| LMMB | Lake Michigan | Milwaukee Bay | WI | dp | 1 | | | 1 | | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | |
| LMNC | Lake Michigan | North Chicago | IL | dp | 1 | | 1 | 1 | | 1 | 1 | 1 | | 1 | | | 1 | | |
| LMCB | Lake Michigan | Calumet Breakwater | IN | dp | 1 | | 1 | 1 | | 1 | 1 | | | | | | | | |
| LMHB | Lake Michigan | Holland Breakwater | MI | dp | 1 | | | | | 1 | 1 | | | 1 | 1 | 1 | 1 | | |
| LMMU | Lake Michigan | Muskegon Breakwat | MI | dp | 1 | | | 1 | | 1 | 1 | | | 1 | 1 | 1 | 1 | | |
| SBSR | Saginaw Bay | Saginaw River | MI | dp | 2 | | 1 | 2 | | 2 | 2 | | | 1 | | | 2 | 1 | |
| SBSP | Saginaw Bay | Sand Point | MI | dp | 2 | | | 1 | | 1 | 1 | | | | | | | | |
| LHBR | Lake Huron | Black River Canal | MI | dp | 1 | | 1 | 1 | | 1 | 1 | | | | | | | | |
| LSAB | Lake St. Clair | Anchor Bay | MI | dp | 2 | | | 2 | | 2 | 2 | | | | | | | | |
| LESP | Lake Erie | Stony Point | MI | dp | 2 | | 2 | 2 | | 2 | 2 | 1 | | | | 1 | 2 | 1 | |
| LERB | Lake Erie | Reno Beach | OH | dp | 2 | | 2 | 2 | | 2 | 2 | | | | | 1 | | | |
| SBPP | South Bass Island | Peach Orchard Point | OH | dp | 2 | | 2 | 2 | | 2 | 2 | 1 | | 1 | | | 1 | | |

**Table 4. Site codes, names, states, number of years sampled since 1990, and number of years when lead concentration exceeded the FDA guideline.**

| | | | | No yrs | No yrs | No yrs | No yrs | No yrs | No yrs | No yrs |
|---|---|---|---|---|---|---|---|---|---|---|
| SITE | General Location | Specific Location | St | since 90 | Pb>4 ppm | Pb>7 ppm | Pb>7.5 p | Pb>10.5 | Pb>21ppm | Pb>31.5 |
| SHFP | Salem Harbor | Folger Point | MA | 4 | 4 | 4 | 4 | 4 | none | |
| MBNB | Massachusetts Bay | Nahant Bay | MA | 2 | 2 | none | | | | |
| BHDI | Boston Harbor | Deer Island | MA | 4 | 3 | 1 | 1 | none | | |
| BHDB | Boston Harbor | Dorchester Bay | MA | 2 | 2 | 2 | 2 | 2 | none | |
| BHHB | Boston Harbor | Hingham Bay | MA | 4 | 4 | 4 | 4 | 2 | none | |
| BHBI | Boston Harbor | Brewster Island | MA | 4 | 3 | 2 | 2 | 1 | none | |
| MBNR | Massachusetts Bay | North River | MA | 2 | 2 | 1 | 1 | none | | |
| DBCI | Duxbury Bay | Clarks Island | MA | 4 | 1 | none | | | | |
| NBDI | Narragansett Bay | Dyer Island | RI | 2 | 1 | none | | | | |
| NBPI | Narragansett Bay | Patience Island | RI | 4 | 1 | none | | | | |
| LIMR | Long Island Sound | Mamaroneck | NY | 3 | 3 | none | | | | |
| LITN | Long Island Sound | Throgs Neck | NY | 4 | 4 | 1 | 1 | none | | |
| HRJB | Hudson/Raritan Estua | Jamaica Bay | NY | 4 | 4 | 1 | 1 | none | | |
| HRUB | Hudson/Raritan Estua | Upper Bay | NY | 3 | 3 | 3 | 3 | 3 | 2 | none |
| HRLB | Hudson/Raritan Estua | Lower Bay | NY | 2 | 2 | none | | | | |
| NYSH | New York Bight | Sandy Hook | NJ | 3 | 3 | 2 | 2 | none | | |
| NYLB | New York Bight | Long Branch | NJ | 2 | 1 | none | | | | |
| NYSR | New York Bight | Shark River | NJ | 4 | 2 | none | | | | |
| CBPP | Choctawhatchee Bay | Postil Point | FL | 4 | 4 | 3 | 3 | 1 | none | |
| SDCB | San Diego Bay | Coronado Bridge | CA | 4 | 1 | none | | | | |
| NBWJ | Newport Beach | Wedge Jetty | CA | 3 | 2 | none | | | | |
| ABWJ | Anaheim Bay | West Jetty | CA | 4 | 2 | 1 | 1 | none | | |
| LBBW | Long Beach | Breakwater | CA | 4 | 3 | none | | | | |
| RBMJ | Redondo Beach | Municipal Jetty | CA | 4 | 1 | none | | | | |
| MDSJ | Marina Del Rey | South Jetty | CA | 4 | 4 | 2 | 2 | none | | |
| TBSM | Las Tunas Beach | Santa Monica Bay | CA | 4 | 3 | 1 | none | | | |
| PGLP | Pacific Grove | Lovers Point | CA | 4 | 4 | 2 | 3 | 1 | none | |
| MBML | Monterey Bay | Moss Landing | CA | 4 | 2 | none | | | | |
| MBSC | Monterey Bay | Point Santa Cruz | CA | 4 | 1 | none | | | | |
| SFEM | San Francisco Bay | Emeryville | CA | 4 | 1 | none | | | | |
| GHWJ | Grays Harbor | Westport Jetty | WA | 4 | 1 | 1 | 1 | none | | |
| HHKL | Honolulu Harbor | Keehi Lagoon | HI | 3 | 3 | 2 | 2 | 1 | 1 | 1 |
| LMNC | Lake Michigan | North Chicago | IL | 1 | 1 | none | | | | |
| LESP | Lake Erie | Stony Point | MI | 2 | 1 | none | | | | |
| SBPP | South Bass Island | Peach Orchard | OH | 2 | 1 | none | | | | |

**Table 5. Site-by-site per chemical listing of increasing (I) and decreasing (D) trends in annually measured concentrations. Two asterisks (**) denote statistical confidence at the 95% level, while one asterisk (*) denotes 90% confidence.**

| SITE | Genaral Location | Specific Location | St. | ΣYr | Sp. | As | Cd | Cu | Hg | Ni | Pb | Se | Zn | tCdar | tDDT | tDield | tPCB | tPAH | tBT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PBPI | Penobscot Bay | Pickering Island | ME | 8 | me | | | | | | | | | | | | | | |
| PBSI | Panobscot Bay | Sears Island | ME | 8 | me | | | D** | I* | | | | | D* | | D* | D** | | |
| | | | | | | | | | | | | | | | | | | | |
| MSSP | Marriconeag Snd. | Stover Point | ME | 6 | me | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| CAGH | Cape Ann | Gap Head | MA | 7 | me | | | | | | | | | D* | | | D** | | |
| SHFP | Salem Harbor | Folger Point | MA | 6 | me | | | | | | | | | | | | | | |
| BHDI | Boston Harbor | Deer Island | MA | 8 | me | | | D** | | | | | | | | | | D* | D** |
| BHDB | Boston Harbor | Dorchester Bay | MA | 6 | me | | | | | | | | | | | | | | |
| BHHB | Boston Harbor | Hingham Bay | MA | 8 | me | | | | | | | | | D* | | | | | |
| BHBI | Boston Harbor | Brewster Island | MA | 8 | me | | | D** | | | | | | D** | | D* | | | |
| | | | | | | | | | | | | | | | | | | | |
| BBAR | Buzzards Bay | Angelica Rock | MA | 8 | me | | | | | D* | D* | | | D* | | | | | D* |
| BBGN | Buzzards Bay | Goosebury Neck | MA | 8 | me | | | D* | | | | | | | | D** | | | |
| | | | | | | | | | | | | | | | | | | | |
| NBDI | Narragansett Bay | Dyer Island | RI | 6 | me | | | D** | | | D** | | | | | | | | |
| NBDU | Narragansett Bay | Dutch Island | RI | 6 | ma | | | | | | | | | | | | | I* | D* |
| | | | | | | | | | | | | | | | | | | | |
| BIBI | Block Island Sound | Block Island | RI | 7 | me | I** | | D** | | | | | | D** | | | D** | | D* |
| | | | | | | | | | | | | | | | | | | | |
| LICR | Long Island Sound | Connecticut Rivar | CT | 7 | me | | | | | D* | | | | | | | | | D* |
| LINH | Long Island Sound | New Haven | CT | 8 | me | | | | | | | | | | | | D** | | D* |
| LIHR | Long Island Sound | Housatonic River | CT | 7 | me | | | | | D* | | | | | | | | | |
| LISI | Long Island Sound | Sheffield Island | CT | 6 | me | | D** | | | | | | | | | | | | |
| LIMR | Long Island Sound | Mamaroneck | NY | 7 | me | D** | D** | | | | | D* | | D* | D* | | | D* | D* |
| LITN | Long Island Sound | Throgs Neck | NY | 8 | me | | | D** | | | | | D** | | | | D* | | |
| LIHH | Long Island Sound | Hempstead Harbor | NY | 8 | me | D* | D** | D** | | D** | D** | | D** | D** | D** | | D** | | |
| LIHU | Long Island Sound | Huntington Harbor | NY | 7 | me | | D* | D* | | | | | | D** | | D* | D** | | |
| LIPJ | Long Island Sound | Port Jefferson | NY | 8 | me | | | D** | | | | | | | | | D** | | D* |
| | | | | | | | | | | | | | | | | | | | |
| MBTH | Moriches Bay | Tuthill Point | NY | 8 | me | | D* | | | I** | I* | | | D** | D** | | D* | I** | |
| | | | | | | | | | | | | | | | | | | | |
| HRJB | Hudson/Raritan Est | Jamaica Bay | NY | 8 | me | I* | D** | | | | | | | | D** | | | | |
| HRUB | Hudson/Raritan Est | Upper Bay | NY | 7 | me | I* | D** | I** | | | | | I* | | | | | | |
| HRLB | Hudson/Raritan Est | Lower Bay | NY | 6 | me | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| NYSH | New York Bight | Sandy Hook | NJ | 7 | me | I* | D* | | | | | | | | | | | | |
| NYLB | New York Bight | Long Branch | NJ | 6 | me | | D* | | | | | | | | | | | | |
| NYSR | New York Bight | Shark River | NJ | 8 | me | I* | D** | D** | I* | | | | | D** | D** | | | | |
| | | | | | | | | | | | | | | | | | | | |
| DBFE | Dalaware Bay | Falsa Egg Island Po | NJ | 6 | cv | | | | | | | | | | | | | | |
| DBBD | Delaware Bay | Ben Davis Point Sh | NJ | 6 | cv | | | | | I* | | | | | | | D* | | |
| DBAP | Delawara Bay | Arnolds Point Shoa | NJ | 6 | cv | | | | | | | | | D* | | | D** | | |
| DBKI | Dalaware Bay | Kelly Island | DE | 7 | cv | | D* | | | | | D** | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| CBMP | Chesapeake Bay | Mountain Point Bar | MD | 8 | cv | D** | | | | | | D** | | D** | D** | D** | D** | | D* |
| CBHP | Chesapeake Bay | Hackett Point Bar | MD | 7 | cv | | | | | | | | | D** | D** | | D** | | |
| CBHG | Chesapeake Bay | Hog Point | MD | 7 | cv | | | | | | | | | D** | D** | D** | D** | | |
| CBDP | Chesapeake Bay | Dandy Point | VA | 8 | cv | | | | | | | | | | | | | | |
| CBCC | Chesapeake Bay | Cape Charles | VA | 7 | cv | D* | D** | | | | | | | D** | | D** | | | |
| | | | | | | | | | | | | | | | | | | | |
| CBCI | Chincoteague Bay | Chincoteagua Inlat | VA | 8 | cv | | | | | | | | | D* | | D** | | D** | |
| | | | | | | | | | | | | | | | | | | | |
| QIUB | Quinby Inlet | Upshur Bay | VA | 7 | cv | I** | | | | | I** | | | D** | | | D* | I* | |
| | | | | | | | | | | | | | | | | | | | |
| RSJC | Roanoke Sound | John Creek | NC | 7 | cv | | D* | | | | | | | | | | | D* | |
| PSWB | Pamlico Sound | Wysocking Bay | NC | 8 | cv | | | | | | | | | D* | | | D* | | |
| | | | | | | | | | | | | | | | | | | | |
| CFBI | Cape Fear | Battery Island | NC | 8 | cv | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| CHFJ | Charlaston Harbor | Fort Johnson | SC | 8 | cv | | | | | | | | | D** | | | D* | | |
| CHSF | Charlaston Harbor | Shutes Folly Island | SC | 7 | cv | | | | | | | | | D* | | | D** | | |
| | | | | | | | | | | | | | | | | | | | |
| SRTI | Savannah River Estu | Tybee Island | GA | 8 | cv | | | | I* | | | | | D** | | D* | | | |
| | | | | | | | | | | | | | | | | | | | |
| SSSI | Sapelo Sound | Sapelo Island | GA | 7 | cv | | | | | | | | | | D* | D* | D* | I** | |

**Table 5 continued.**

| SITE | General Location | Specific Location | St. | ΣYr | Sp. | As | Cd | Cu | Hg | Ni | Pb | Se | Zn | tCdar | tDDT | tDielc | tPCB | tPAH | tBT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SJCB | St. Johns River | Chicopit Bay | FL | 8 | cv | I* | | | | | D** | | | D** | D** | | D** | | |
| MRCB | Matanzas River | Crescent Beach | FL | 7 | cv | | | | | | | | | | | D** | D** | | D* |
| IRSR | Indian River | Sebastian River | FL | 6 | cv | | | | | | | | | | | | I* | | |
| EVFU | Everglades | Faka Union Bay | FL | 8 | cv | D** | | | | | | D* | | | | | | | |
| RBHC | Rookery Bay | Henderson Creek | FL | 8 | cv | D** | | | | | | | | | | | | | D** |
| NBNB | Naples Bay | Naples Bay | FL | 8 | cv | D** | | I** | | | | | I** | D** | | | D** | | D* |
| CBFM | Charlotte Harbor | Fort Meyers | FL | 6 | cv | D** | | | | I** | | | | | D** | | | | |
| CBBI | Charlotte Harbor | Bird Island | FL | 8 | cv | | D** | | D** | | | | | D** | D** | | D** | | |
| TBCB | Tampa Bay | Cockroach Bay | FL | 8 | cv | | | | | | I** | | | | | | | | D* |
| TBPB | Tampa Bay | Papys Bayou | FL | 8 | cv | D** | | | | D** | | | | D** | D* | | D* | | |
| TBMK | Tampa Bay | Mullet Key Bayou | FL | 8 | cv | D** | | | | | | | | D** | | | | | |
| CKBP | Cedar Key | Black Point | FL | 8 | cv | | | | | | | | | D** | D* | | | | |
| APCP | Apalachicola Bay | Cat Point Bar | FL | 8 | cv | | | I** | | | | | | D** | D** | D** | D* | | |
| APDB | Apalachicola Bay | Dry Bar | FL | 8 | cv | | | | | | | | | | D** | | D* | D** | |
| SAWB | St. Andrews Bay | Watson Bayou | FL | 8 | cv | | D** | | | | | | | D** | | | | | D** |
| CBSR | Choctawhatchee Ba | Off Santa Rosa | FL | 8 | cv | | D* | | D* | | | | | D** | D** | | | | |
| CBPP | Choctawhatchee Ba | Postil Point | FL | 8 | cv | | | | | | I** | | | D** | | | D* | | |
| PBIB | Pensacola Bay | Indian Bayou | Fl | 7 | cv | | | | | | | | | D** | D** | | | | |
| PBPH | Pensacola Bay | Public Harbor | FL | 6 | cv | | | | | | | | | | | | | | |
| MBHI | Mobile Bay | Hollingers Is. Chan. | AL | 6 | cv | | | I** | I** | | | | I** | D* | D* | | | | |
| MBCP | Mobile Bay | Cedar Point Reef | AL | 8 | cv | D* | | | | | | | | | | | D* | | |
| MSPB | Mississippi Sound | Pascagoula Bay | MS | 8 | cv | | | | D** | | | | | | | | | | |
| MSBB | Mississippi Sound | Biloxi Bay | MS | 7 | cv | D** | I** | | | | | | I** | D** | D** | | D** | | |
| MSPC | Mississippi Sound | Pass Christian | MS | 7 | cv | | | | | | | | | D** | | | | | |
| LBMP | Lake Borgne | Malheureux Point | LA | 8 | cv | | I** | | I** | | | | I* | D* | | | | | |
| BSBG | Breton Sound | Bay Gardene | LA | 8 | cv | | | I* | I* | | | | I** | D** | | D** | D** | | |
| BSSI | Breton Sound | Sable Island | LA | 8 | cv | D* | | | | | | | | | | | | | |
| MRTP | Mississippi River | Tiger Pass | LA | 6 | cv | | I** | | | | | D** | | | | | | | |
| BBMB | Barataria Bay | Middle Bank | LA | 8 | cv | | | | | | | | | D** | | | D* | | |
| BBSD | Barataria Bay | Bayou Saint Denis | LA | 7 | cv | D** | | | | | I** | | | D* | | | | | |
| TBLF | Terrebonne Bay | Lake Felicity | LA | 8 | cv | | | I** | | | | | | D** | | D** | | | |
| TBLB | Terrebonne Bay | Lake Barre | LA | 8 | cv | | | | | | | | | D* | | D** | | | |
| CLCL | Caillou Lake | Caillou Lake | LA | 8 | cv | | | | | | I** | | | D* | | | | | |
| ABOB | Atchafalaya Bay | Oyster Bayou | LA | 8 | cv | | | | | | | | | D** | D** | D** | D** | | |
| VBSP | Vermilion Bay | Southwest Pass | LA | 8 | cv | | | | | | | | | D* | | | | | D* |
| JHJH | Joseph Harbor Bayo | Joseph Harbor Bay | LA | 8 | cv | | | | | | | | | D** | | | | | |
| CLSJ | Calcasieu Lake | St. Johns Island | LA | 8 | cv | | | | | | | | | D** | D** | D** | D** | | |
| CLLC | Calcasieu Lake | Lake Charles | LA | 6 | cv | | | | | | | | | | | | | | I* |
| SLBB | Sabine Lake | Blue Buck Point | TX | 8 | cv | I* | | | D** | | | | D* | D* | | D* | | | |
| GBHR | Galveston Bay | Hanna Reef | TX | 8 | cv | | | | | I* | I* | | | D* | | D** | | | |
| GBSC | Galveston Bay | Ship Channel | TX | 6 | cv | | | | | | | | | | | | | | |
| GBYC | Galveston Bay | Yacht Club | TX | 8 | cv | | | | | | | | D** | D* | D** | D** | D** | | |
| GBTD | Galveston Bay | Todds Dump | TX | 8 | cv | | | | | | | | | D* | | | | | |
| GBOB | Galveston Bay | Offatts Bayou | TX | 6 | cv | | | | | | | | | | | | | | |
| GBCR | Galveston Bay | Confederate Reef | TX | 8 | cv | | | | I** | | | | | D** | | D** | D* | | |

**Table 5 continued.**

| SITE | General Location | Specific Location | St. | ΣYr | Sp. | As | Cd | Cu | Hg | Ni | Pb | Se | Zn | tCdan | tDDT | tDielc | tPCB | tPAH | tBT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BRFS | Brazos River | Freeport Surfside | TX | 6 | cv | | | | | | | | | | | | | | |
| MBEM | Matagorda Bay | East Matagorda | TX | 8 | cv | | | | | | | | | D•• | D•• | D•• | | | |
| MBTP | Matagorda Bay | Tres Palacios Bay | TX | 8 | cv | | | | | | | | | D•• | | D•• | D•• | | |
| MBLR | Matagorda Bay | Lavaca River Mouth | TX | 8 | cv | | | | | | I•• | I•• | | | D•• | | | D•• | D• |
| MBGP | Matagorda Bay | Gallinipper Point | TX | 7 | cv | | | | | | | | | D• | | D• | | | I• |
| ESSP | Espiritu Santo | South Pass Reef | TX | 6 | cv | | | | | | | D•• | | | | | | D• | |
| SAPP | San Antonio Bay | Panther Point Reef | TX | 7 | cv | | D• | | | | | | D• | D•• | | | | | |
| MBAR | Mesquite Bay | Ayres Reef | TX | 8 | cv | I•• | | | | | I•• | | | | D• | D• | | | |
| ABLR | Aransas Bay | Long Reef | TX | 8 | cv | | D•• | D•• | | | | | D• | D• | | | | | |
| CBCR | Copano Bay | Copano Reef | TX | 7 | cv | | | | | | | | | | D•• | | | | D• |
| CCIC | Corpus Christi | Ingleside Cove | TX | 6 | cv | | | | | | | | | D•• | | | | | I• |
| CCNB | Corpus Christi | Nueces Bay | TX | 7 | cv | D• | D•• | D• | | | I• | | | D•• | | | | | |
| LMSB | Lower Laguna Madr | South Bay | TX | 8 | cv | D•• | D•• | | | D•• | | | D• | | | | D• | | D•• |
| IBNJ | Imperial Beach | North Jetty | CA | 8 | mc | | | | D• | | | D•• | | D•• | | | D• | I• | |
| PLLH | Point Loma | Lighthouse | CA | 7 | mc | | | | I•• | I•• | | | | | D• | | D•• | | |
| SDHI | San Diego Bay | Harbor Island | CA | 8 | me | | D•• | | | D• | D• | | D•• | | | | | | D• |
| MBVB | Mission Bay | Ventura Bridge | CA | 8 | me | | D•• | | D•• | | D•• | | | D•• | D•• | | | | D•• |
| LJLJ | La Jolla | Point La Jolla | CA | 7 | mc | | D•• | I• | | | D• | D•• | | | | | | | |
| OSBJ | Oceanside | Beach Jetty | CA | 8 | me | I•• | D•• | I• | | | | | | | | | | | D•• |
| SCBR | Santa Catalina Islan | Bird Rock | CA | 6 | mc | | | | | | | D•• | | | | | | | |
| NBWJ | Newport Beach | Wedge Jetty | CA | 7 | mc | | | I• | | | | D• | | | | | | | D• |
| ABWJ | Anaheim Bay | West Jetty | CA | 8 | mc | | D•• | | D• | | D•• | | D•• | D• | | D• | | | D•• |
| SPFP | San Pedro Harbor | Fishing Pier | CA | 7 | me | | | | | | D• | | | D•• | | | | | |
| PVRP | Palòs Verdes | Royal Palms State | CA | 8 | mc | | | | | | | | I•• | D• | | | | | D•• |
| MDSJ | Marina Del Rey | South Jetty | CA | 8 | me | | | | D•• | | D• | | | | | | | | |
| PDPD | Point Dume | Point Dume | CA | 8 | mc | D•• | | D• | | D•• | | D•• | | | | | D•• | | D• |
| SCFP | Santa Cruz Island | Fraser Point | CA | 6 | mc | | | | | | | | | | | | | I• | |
| SBSB | Point S. Barbara | Point Santa Barbara | CA | 8 | mc | D• | | | | | | | I•• | | | | | | |
| PCPC | Point Conception | Point Conception | CA | 7 | mc | D• | I• | | | | | | | | | D• | D• | | |
| SLSL | San Luis Obispo Bay | Point San Luis | CA | 8 | mc | | | | | D•• | | | | D• | | | | | D• |
| SSSS | San Simeon Point | San Simeon Point | CA | 7 | mc | | | | | | | | | | | | D• | | |
| PGLP | Pacific Grove | Lovers Point | CA | 8 | mc | | I• | | | | | | | D• | | | | I• | D• |
| MBSC | Monterey Bay | Point Santa Cruz | CA | 8 | mc | | | | | | | | | | | | | | |
| SFSM | San Francisco Bay | San Mateo Bridge | CA | 7 | me | | | | | | | | | D• | | | | | D• |
| SFDB | San Francisco Bay | Dumbarton Bridge | CA | 8 | me | | | | | | | | I• | | | | | | D•• |
| SFEM | San Francisco Bay | Emeryville | CA | 7 | me | | I• | | I•• | | | | | | D• | | D• | | D•• |
| TBSR | Tomales Bay | Spengers Residence | CA | 7 | me | | | | | | | | | | | | | | |
| BBBE | Bodega Bay | Bodega Bay Entran | CA | 8 | mc | | | | | | | D•• | | | | | | | |
| PALH | Point Arena | Lighthouse | CA | 7 | mc | | | | I•• | | | D•• | | | | D• | | I• | |
| PDSC | Point Delgada | Shelter Cove | CA | 8 | mc | | | | | | | D•• | | | | | | | |
| HMBJ | Eureka | Humboldt Bay Jett | CA | 8 | me | | | | | | | | | | | | | | D• |
| SGSG | Crescent | Point St. George | CA | 8 | mc | I• | | | I•• | | | | | | | | | | |
| CBCH | Coos Bay | Coos Head | OR | 8 | mc | | D•• | D•• | | | D•• | | | | I• | D•• | | | D• |

**Table 5 continued.**

| SITE | General Location | Specific Location | St. | ΣYr | Sp. | As | Cd | Cu | Hg | Ni | Pb | Se | Zn | tCdar | tDDT | tDield | tPCB | tPAH | tBT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CBRP | Coos Bay | Russell Point | OR | 8 | me | | | | | | | | | | D** | | D* | | D* |
| | | | | | | | | | | | | | | | | | | | |
| YBOP | Yaquina Bay | Oneatta Point | OR | 8 | me | D** | D** | D** | | | | | | | | | D* | | D* |
| YHYH | Yaquina Bay | Yaquina Head | OR | 7 | mc | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| TBHP | Tillamook Bay | Hobsonville Point | OR | 8 | me | | | | | | | | | | | | D* | | |
| CRSJ | Columbia River | South Jetty | OR | 8 | me | | | D** | | | | | | | | | | | |
| GHWJ | Grays Harbor | Westport Jetty | WA | 8 | mc | I** | | | | | | | | | | | | D* | D* |
| JFCF | Juan de Fuca Strait | Cape Flattery | WA | 7 | mc | | | | | | | I** | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| SSBI | South Puget Sound | Budd Inlet | WA | 8 | me | | D** | | | | | | D** | | | | | | |
| CBTP | Commencement Ba | Tahlequah Point | WA | 8 | me | | | D** | | | | | | | | | | | D* |
| EBFR | Elliott Bay | Four-Mile Rock | WA | 8 | me | | | D** | D** | | D** | | | D** | D** | | D** | | D** |
| SIWP | Sinclair Inlet | Waterman Point | WA | 8 | me | | | D** | D** | | D* | | | | | | | | D** |
| WIPP | Whidbey Island | Possession Point | WA | 8 | me | | | | D** | | | | D** | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| BBSM | Bellingham Bay | Squalicum Marina | WA | 8 | me | | | | | | | | | | | | | | D* |
| PRPR | Point Roberts | Point Roberts | WA | 8 | me | | | | | | | D* | | D* | | D* | D** | | |
| | | | | | | | | | | | | | | | | | | | |
| PVMC | Port Veldez | Mineral Creek Flats | AK | 7 | me | | | | | | | | | | | | | | |
| UISB | Unakwit Inlet | Siwash Bay | Ak | 7 | me | D** | | D** | | | D** | | | | | | D* | | |
| | | | | | | | | | | | | | | | | | | | |
| HHKL | Honolulu Harbor | Keehi Lagoon | HI | 6 | os | | | | | I** | | | | | | | | | |
| BPBP | Barbers Point | Barbers Point Harb | HI | 6 | os | | | | | | | D** | | D** | | D** | | | |

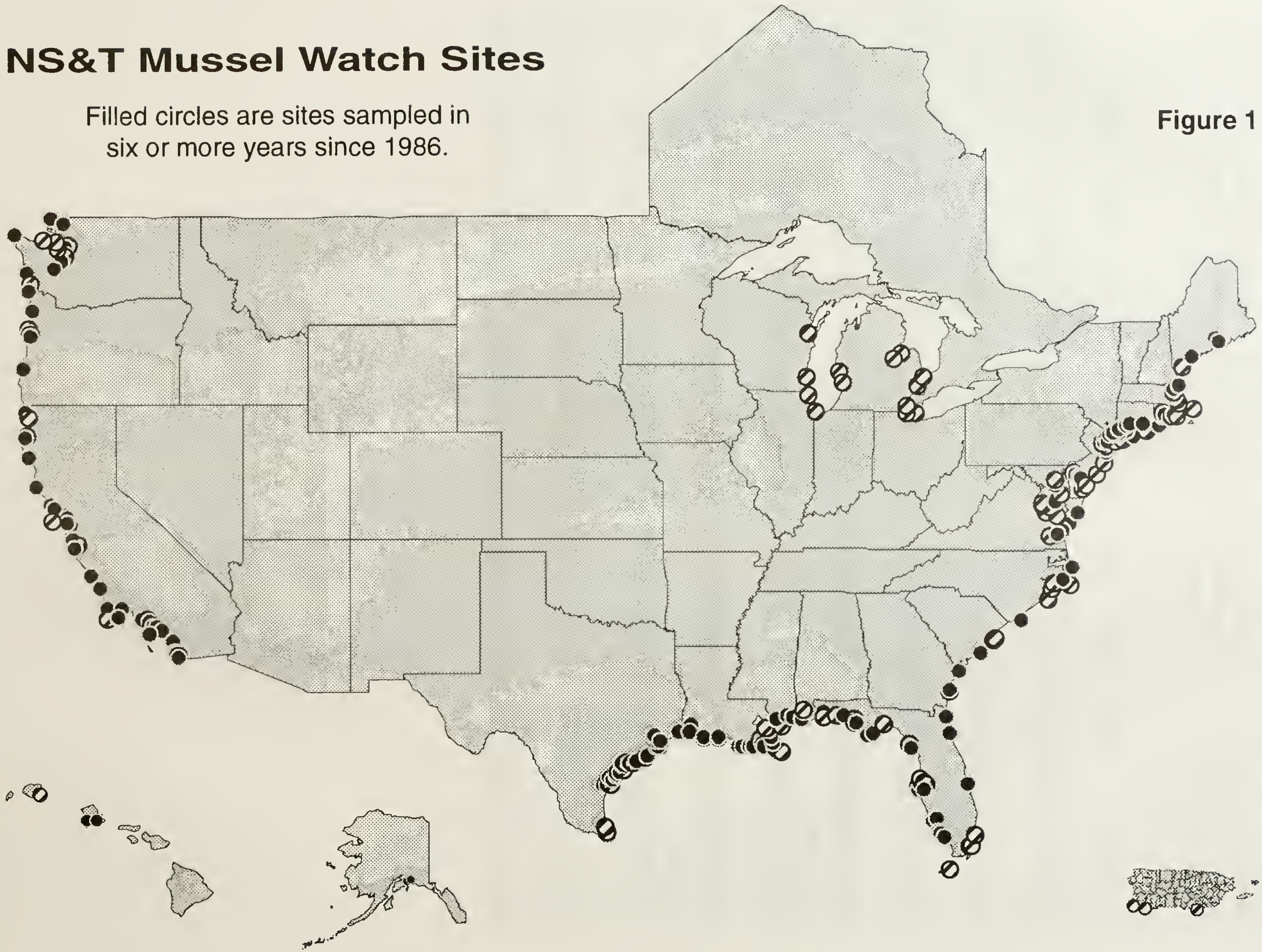
**Table 6. Annual geometric mean concentrations of chemicals in mollusks for sites sampled in at least six years from 1986 to 1993. Concentration units: μg $g^{-1}$-dry for elements and ng $g^{-1}$-dry for organic compounds with ΣBT in terms of ng of Sn $g^{-1}$-dry. Last column is the Spearman rank correlation coefficient of concentration versus year with an asterisk (*) denoting statistical significance at the 95% level of confidence.**

| Chemical | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | $r_s$ |
|---|---|---|---|---|---|---|---|---|---|
| As | 10.2 | 9.8 | 9.4 | 8.5 | 9.5 | 9.1 | 9.3 | 8.5 | -0.786* |
| Cd | 3.1 | 2.9 | 2.7 | 2.6 | 2.8 | 2.7 | 2.1 | 2.5 | -0.857* |
| Cu (mussels) | 9.9 | 9.9 | 9.3 | 10 | 8.9 | 9 | 8.7 | 8.1 | -0.810* |
| Cu (oysters) | 110 | 110 | 130 | 120 | 150 | 120 | 130 | 120 | 0.294 |
| Hg | 0.11 | 0.11 | 0.11 | 0.12 | 0.09 | 0.11 | 0.11 | 0.12 | 0.429 |
| Ni | 2.1 | 2.1 | 1.9 | 1.7 | 1.7 | 2.1 | 2.3 | 1.7 | -0.333 |
| Pb (mussels) | 2.1 | 2.2 | 2.1 | 1.7 | 1.9 | 2.1 | 1.6 | 1.7 | -0.571 |
| Pb (oysters) | 0.42 | 0.53 | 0.49 | 0.45 | 0.55 | 0.6 | 0.5 | 0.59 | 0.667 |
| Se | 2.5 | 2.6 | 2.9 | 2.2 | 2.4 | 2.6 | 2.5 | 2.4 | -0.381 |
| Zn (mussels) | 140 | 130 | 130 | 120 | 140 | 130 | 130 | 130 | -0.291 |
| Zn (oysters) | 1800 | 1700 | 2100 | 2100 | 2300 | 1700 | 2000 | 1900 | 0.133 |
| ΣCDANE | 16 | 19 | 14 | 14 | 14 | 6.2 | 7.3 | 7.2 | -0.886* |
| ΣDIELD | 6.6 | 8.6 | 5.4 | 5.4 | 3.7 | 3 | 4.4 | 3.7 | -0.810* |
| ΣDDT | 39 | 46 | 39 | 42 | 36 | 20 | 26 | 25 | -0.878* |
| ΣPCB | 180 | 140 | 130 | 140 | 110 | 67 | 86 | 82 | -0.833* |
| ΣPAH | | | 350 | 310 | 270 | 250 | 280 | 300 | -0.486 |
| ΣBT | | | | 120 | 78 | 71 | 47 | 32 | -1.000* |

# NS&T Mussel Watch Sites

Filled circles are sites sampled in six or more years since 1986.

Figure 1



High $\sum$PCB Concentrations

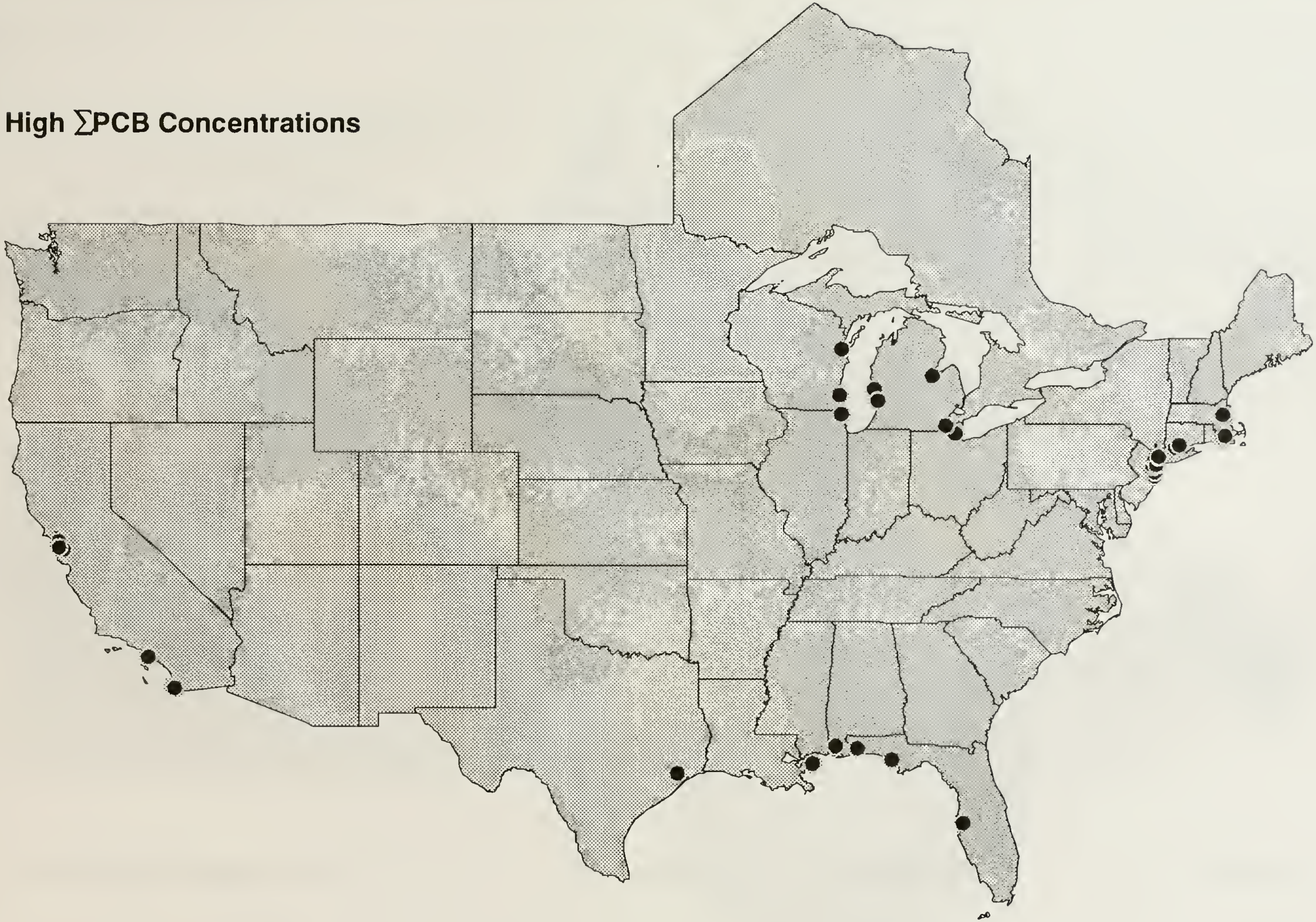
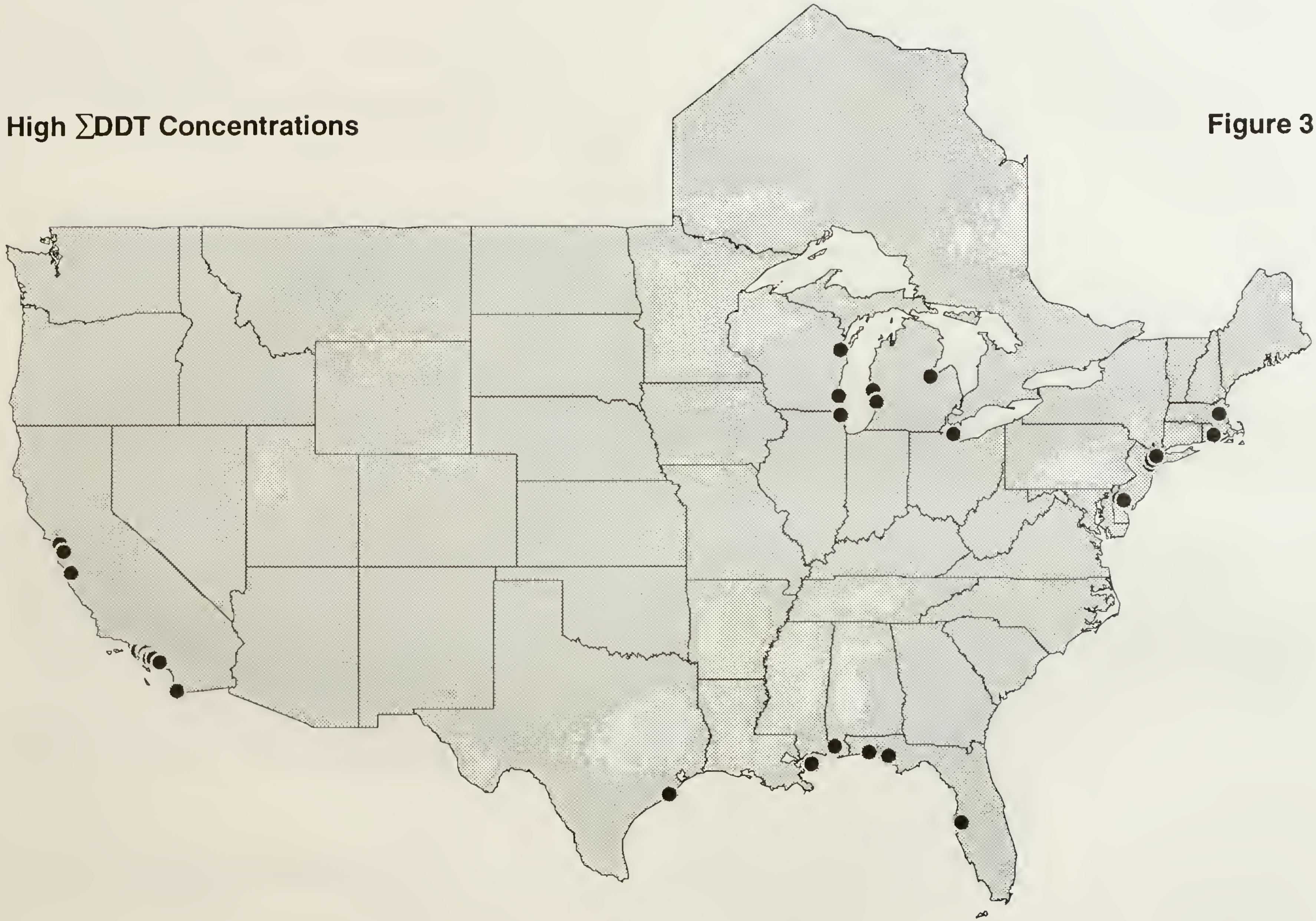


Figure 2

## High $\sum$DDT Concentrations

**Figure 3**



## High $\sum$Chlordane Concentrations

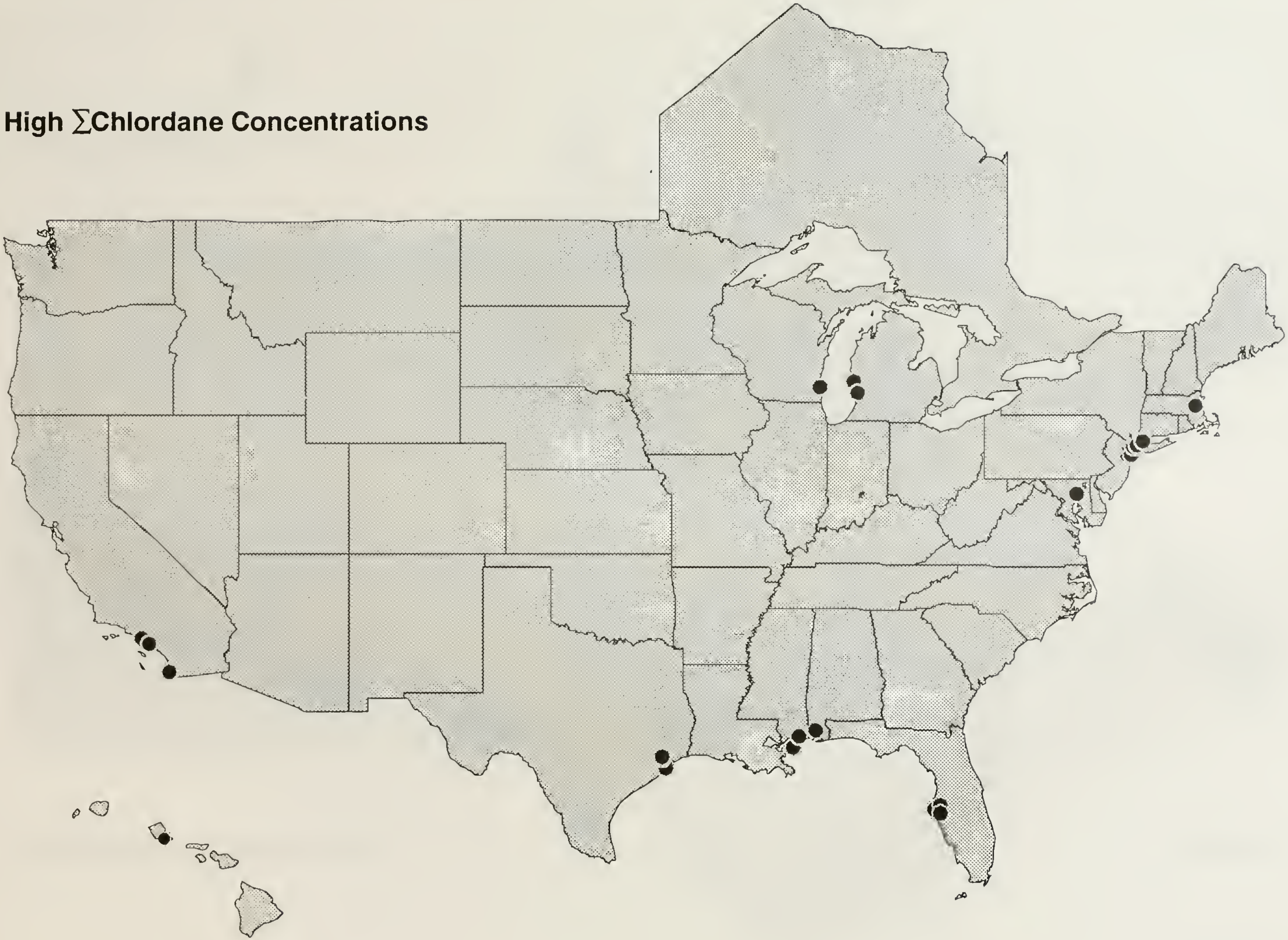
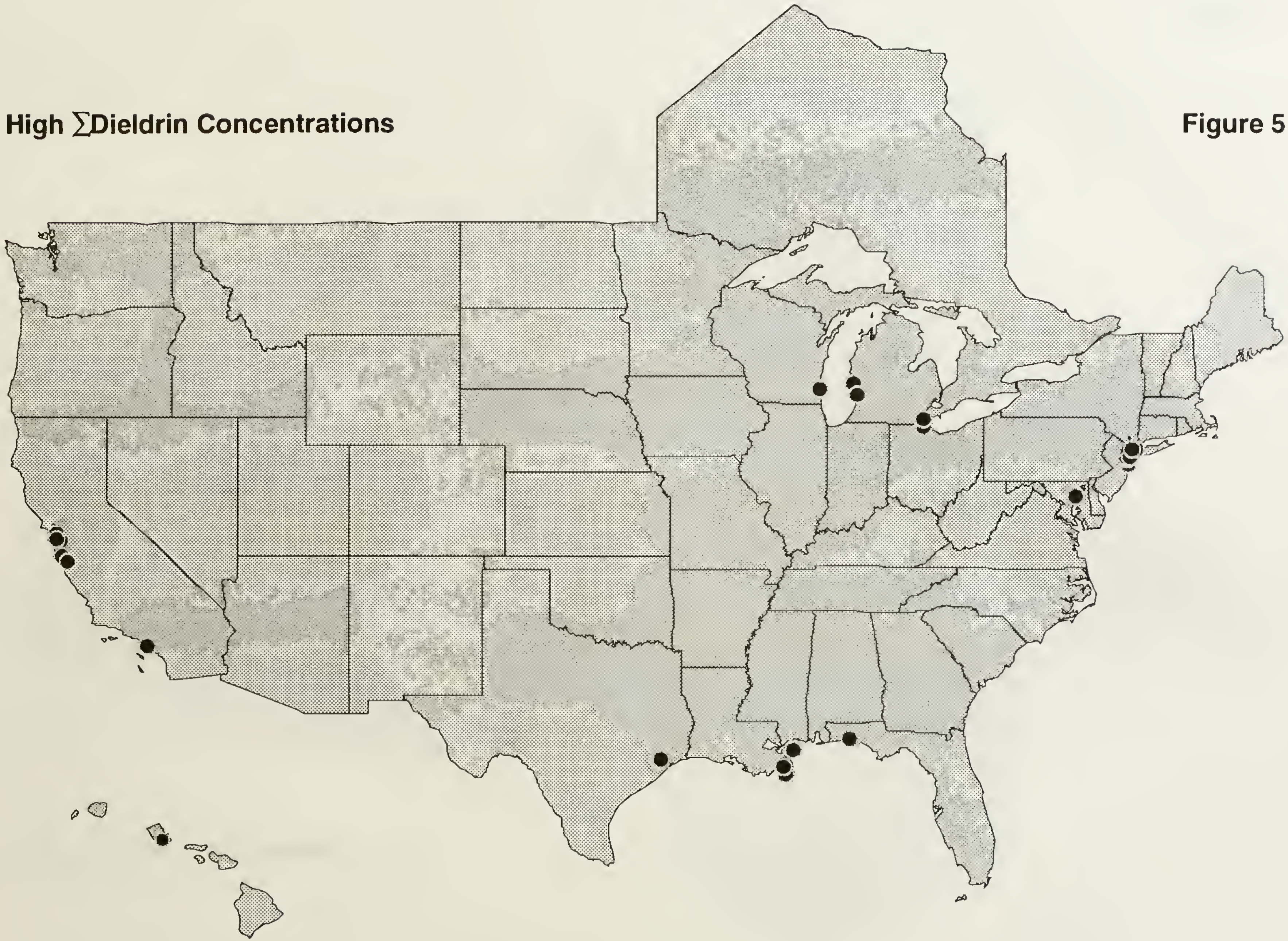


Figure 4

## High $\sum$Dieldrin Concentrations

Figure 5



## High $\sum$PAH Concentrations

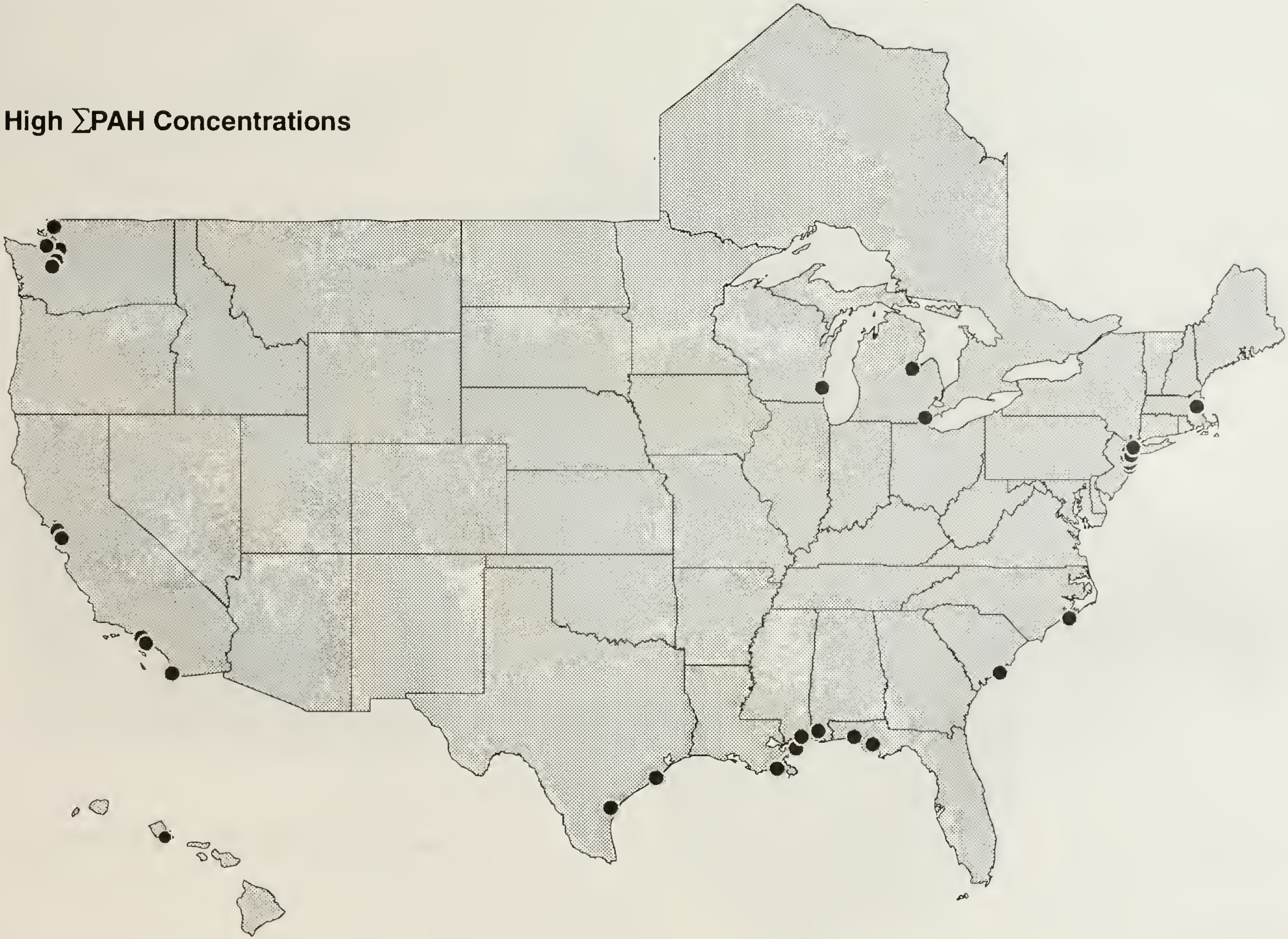
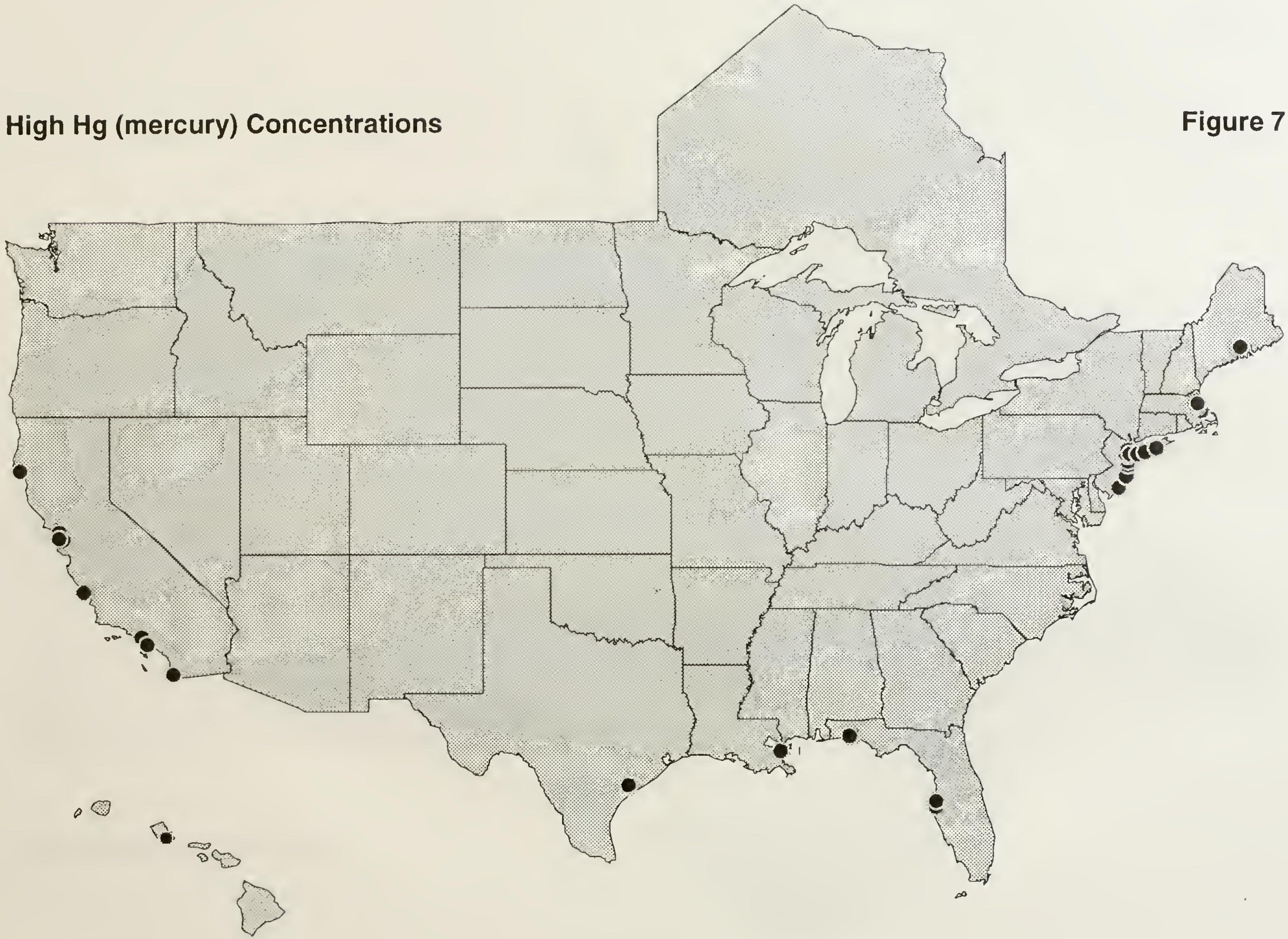


Figure 6

## High Hg (mercury) Concentrations

Figure 7



## High Zn (zinc) Concentrations

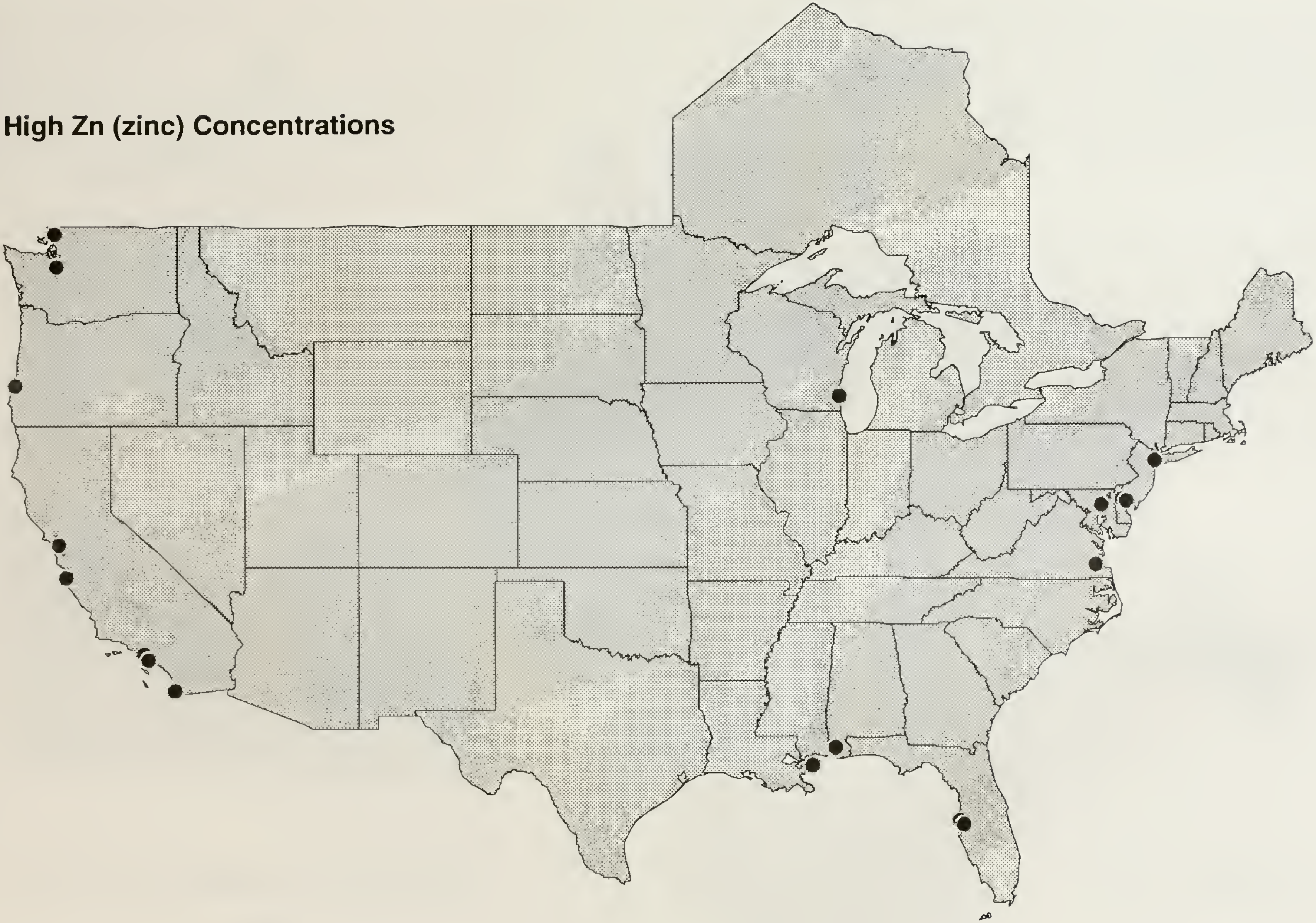
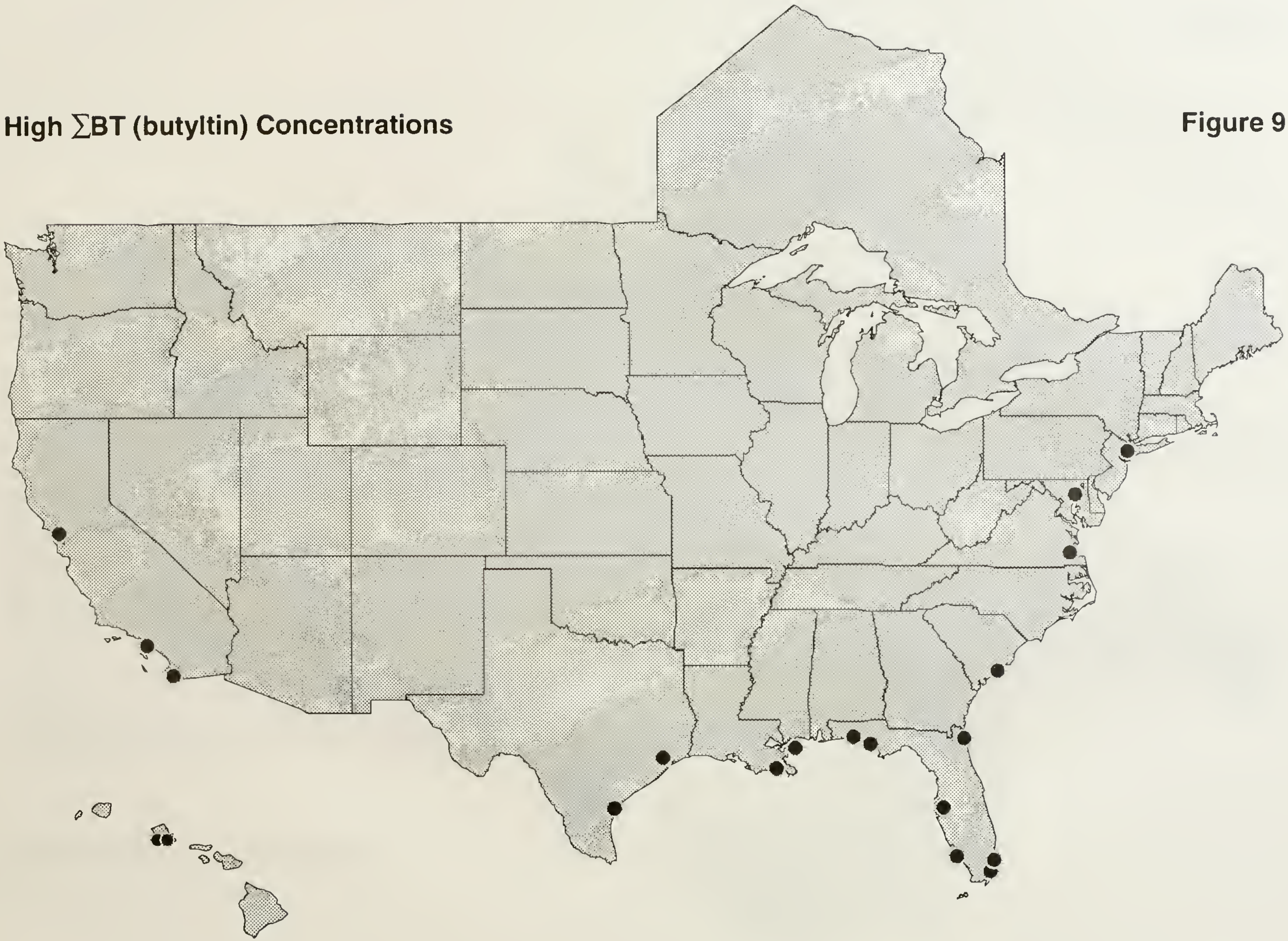


Figure 8

**High $\sum$BT (butyltin) Concentrations**

**Figure 9**



## High Ni (nickel) Concentrations

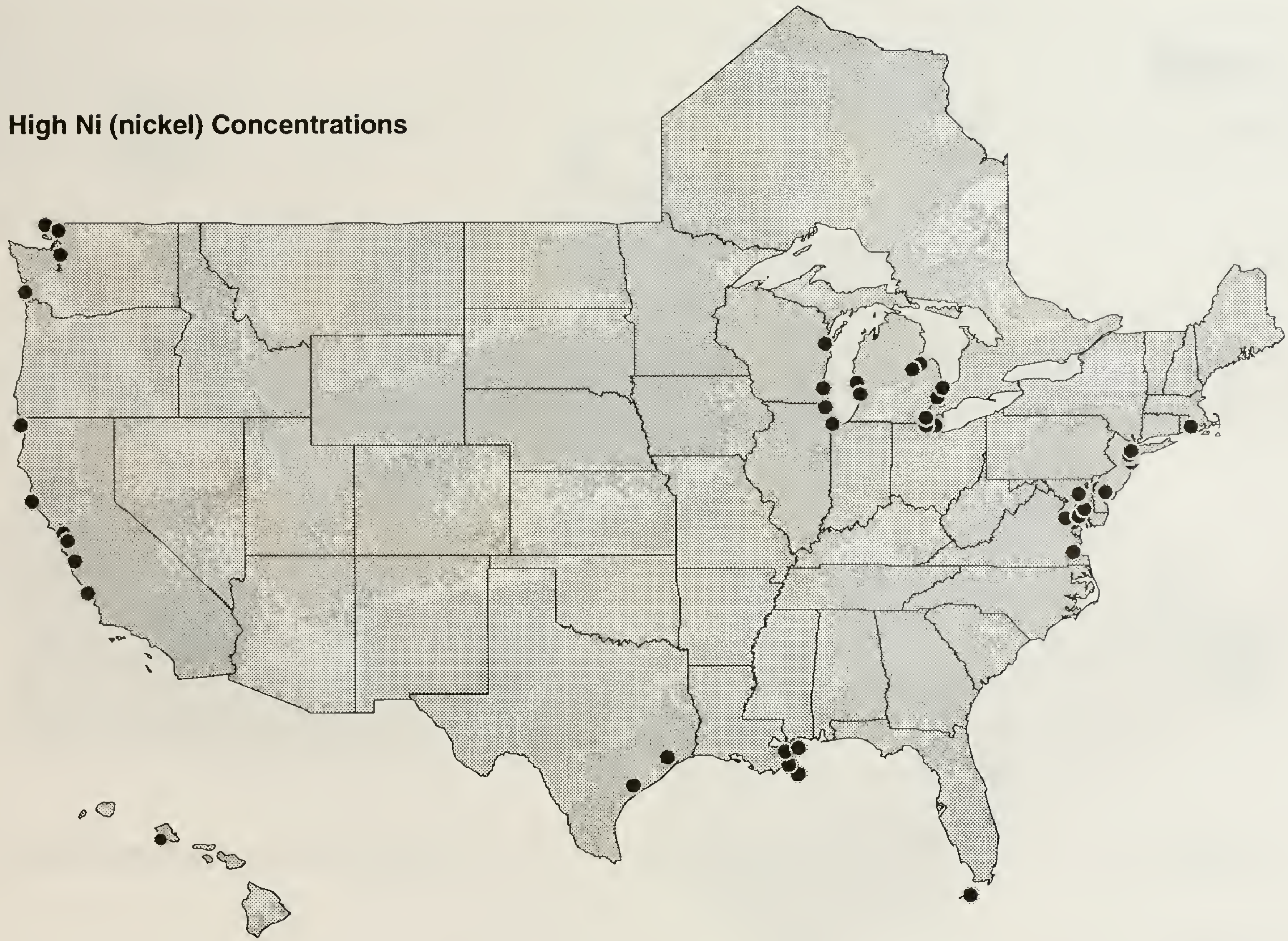


Figure 10

## High Se (selenium) Concentrations

Figure 11

## High Cu (copper) Concentrations

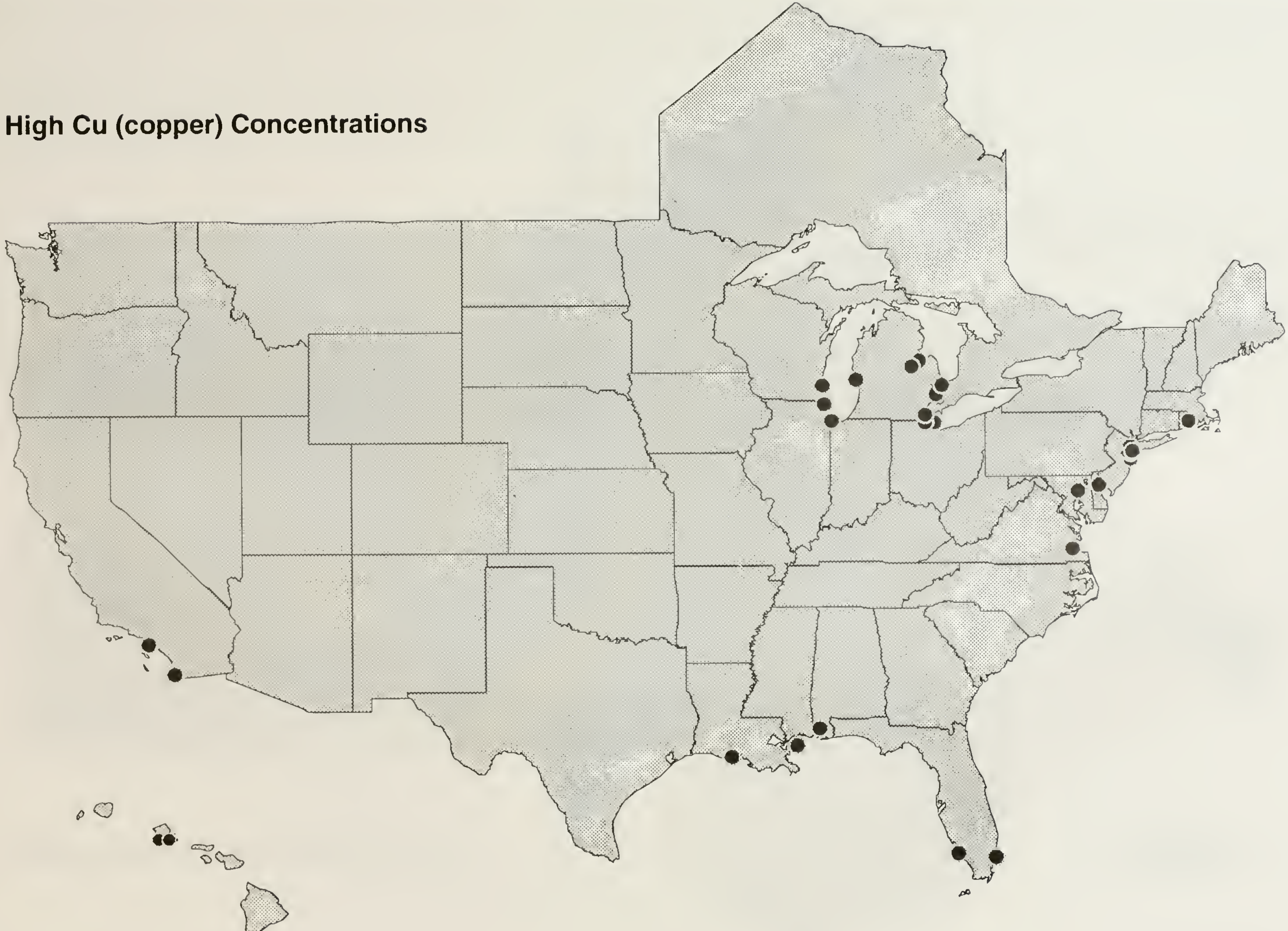
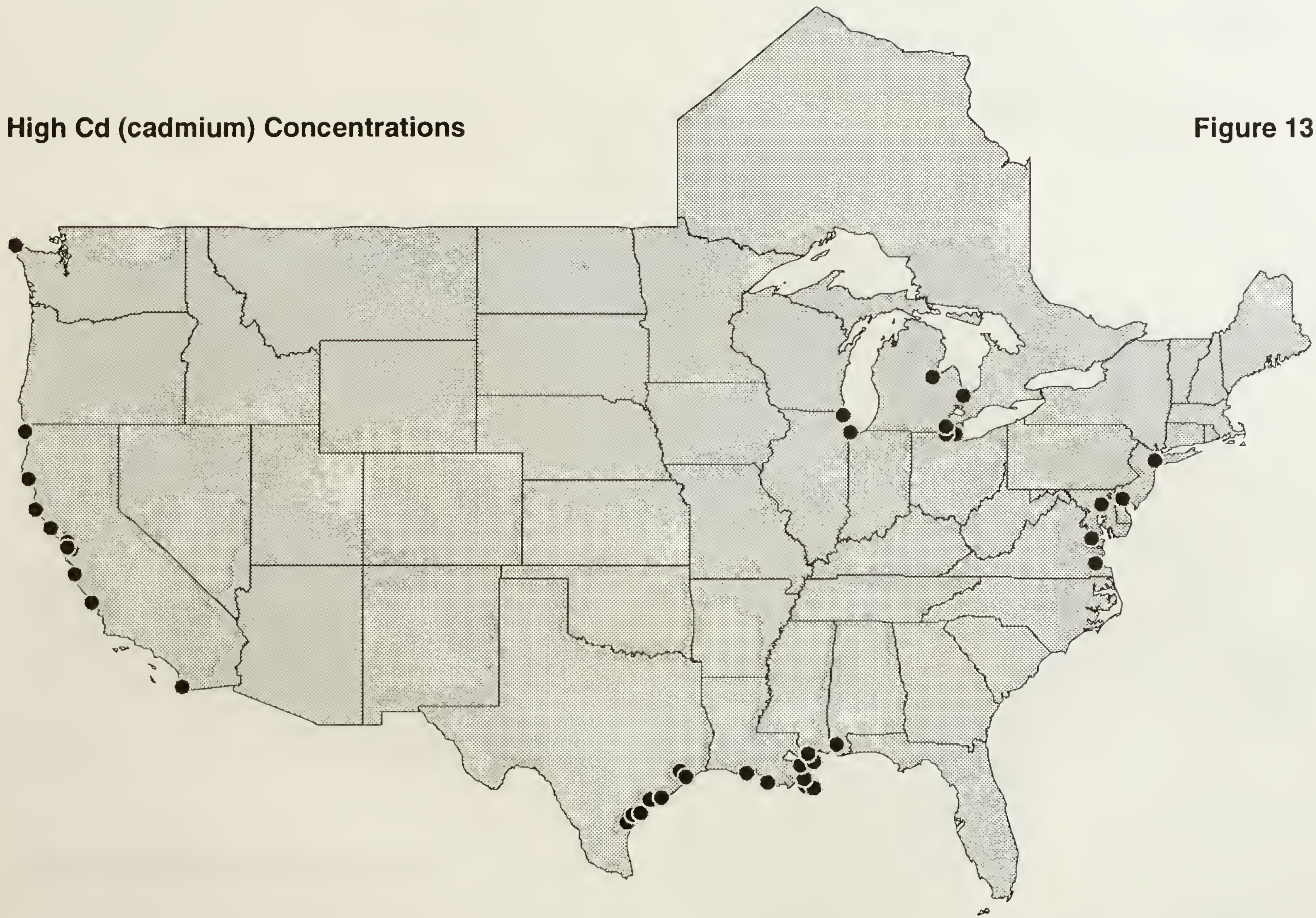


Figure 12

## High Cd (cadmium) Concentrations

Figure 13



## High As (arsenic) Concentrations

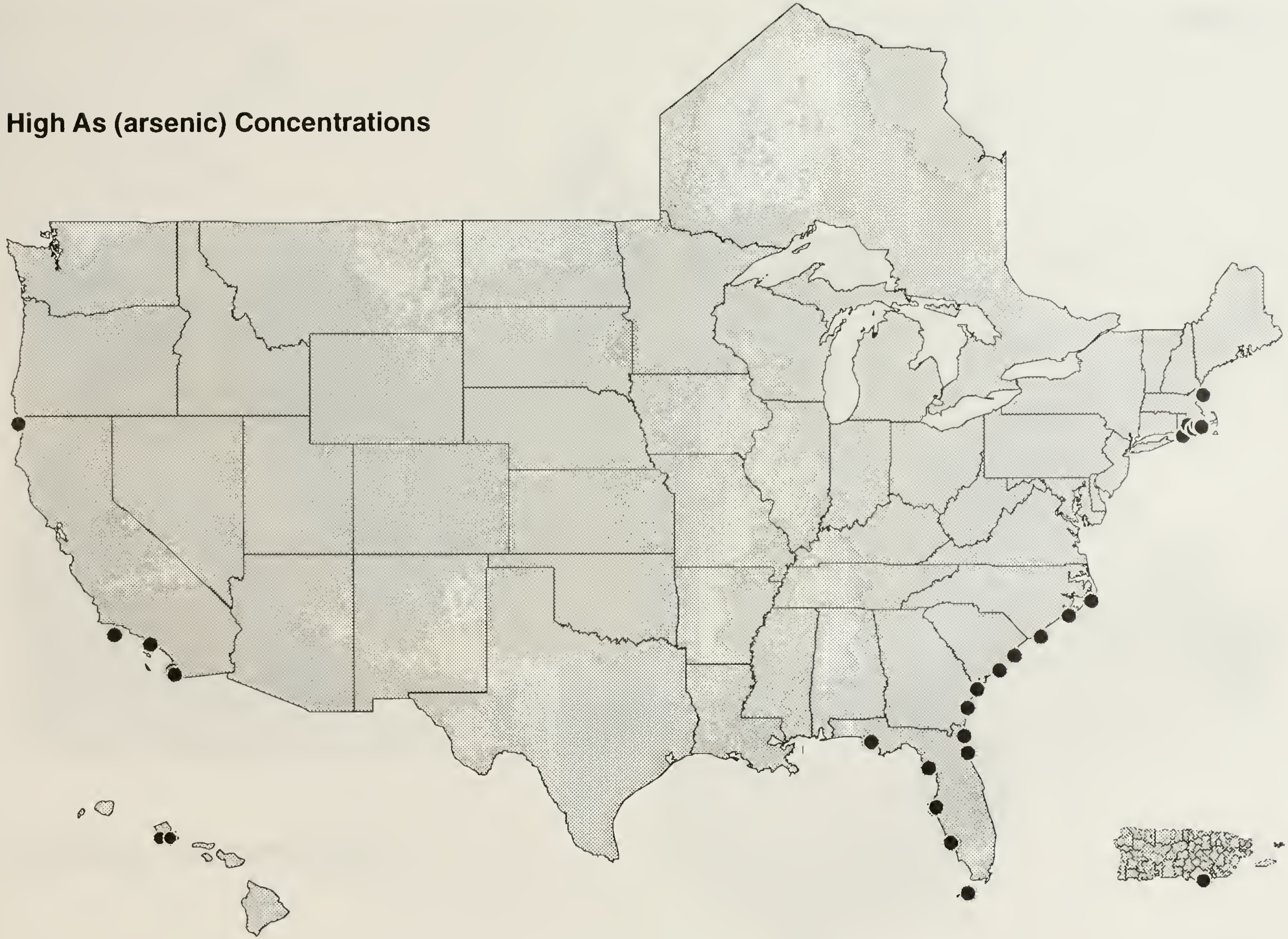


Figure 14

## High Pb (lead) Concentrations

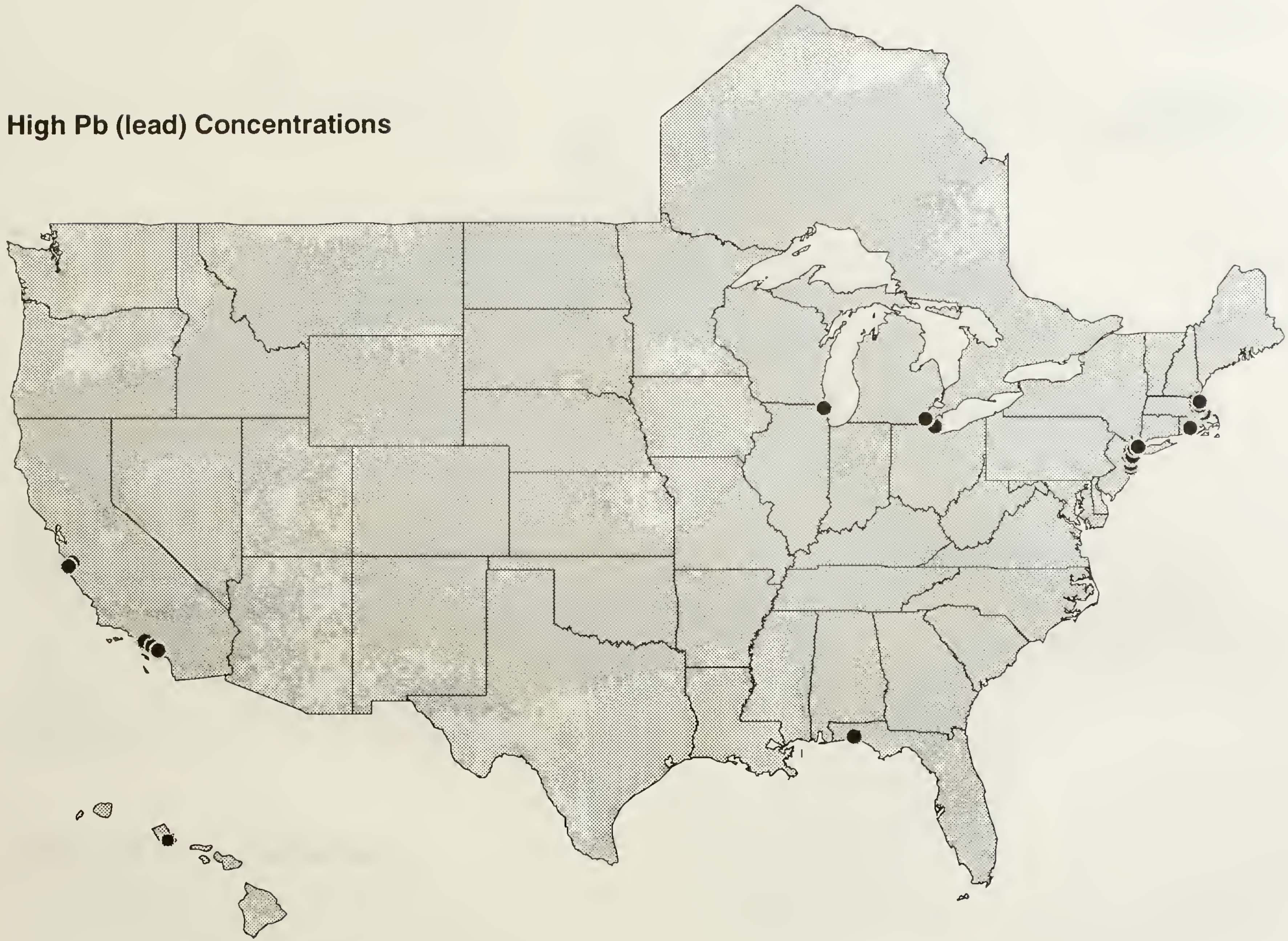


Figure 15

June, 1995