

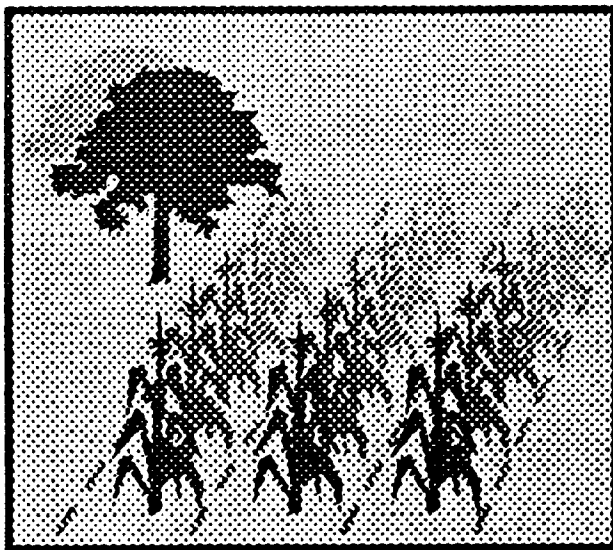
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**THE NATIONAL COASTAL POLLUTANT
DISCHARGE INVENTORY**

***AGRICULTURAL PESTICIDE USE IN
ESTUARINE DRAINAGE AREAS:
A Preliminary Summary for Selected Pesticides***

ANTHONY S. PAIT, DANIEL R. G. FARROW, JAMISON A. LOWE, AND
PERCY A. PACHECO

January 1989



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NOAA's National Coastal Pollutant Discharge Inventory (NCPDI) Program

The National Coastal Pollutant Discharge Inventory (NCPDI) Program is a series of data base development and analytical activities within the National Oceanic and Atmospheric Administration's (NOAA) Strategic Assessment Program of coastal and estuarine areas. The cornerstone of the program is a comprehensive data base and computational framework that has been developed over the last eight years. The data base contains pollutant loading estimates for all major categories of point, nonpoint, and riverine sources located in coastal counties or the 200-mile Exclusive Economic Zone that discharge to the estuarine, coastal, and oceanic waters of the contiguous USA (excluding the Great Lakes).

The NCPDI Program is part of NOAA's Strategic Assessment Program of the Nation's coastal and oceanic regions. The goal of this program is to develop information and assessment tools to identify and evaluate existing and future conflicts over the use of resources in the coastal zone. These types of assessments are characterized as "strategic" because they are carried out from a comprehensive perspective that focuses on the Nation as a whole or on large coastal or oceanic regions. They are important because they provide synoptic pictures of resource use issues that allow environmental managers to view the overall scale of resource problems in the coastal zone. They bridge the gap between the mountains of very detailed data available for some areas (typically hard to reduce and compare from area to area) and the sparse data available for the rest of the Nation's coastal zone.

The pollutant discharge estimates in the NCPDI are made for the base year 1982, but can be considered to approximate pollutant discharge conditions during the period 1980-85. Estimates are made for 18 pollutants in nine major categories: 1) wastewater; 2) oxygen-demanding materials; 3) particulate material; 4) nutrients; 5) heavy metals; 6) petroleum hydrocarbons; 7) chlorinated hydrocarbons; 8) pathogens; and 9) sludges. The pollutant estimates can be aggregated by county or USGS hydrologic cataloging unit.

A series of projects are currently underway within the NCPDI Program to improve and refine the estimates for selected pollutant source categories and coastal areas. These improvements include expanding the study area to include more inland areas within estuarine drainage basins, updating the base year to 1987, using improved methods to estimate discharge, and adding a number of toxic pollutants to the inventory. In addition, projects are being undertaken to assess the impact of management practices on nonpoint source pollutant discharges and to develop computer applications that allow a user to better access and query the data base.

In 1987, the NCPDI Program began a project to evaluate the impact of both agricultural and non-agricultural pesticide use and discharge on the health of the Nation's estuarine systems. Funding assistance was provided by the Environmental Protection Agency's Office of Marine and Estuarine Protection. This report presents the results of the first phase of this work.

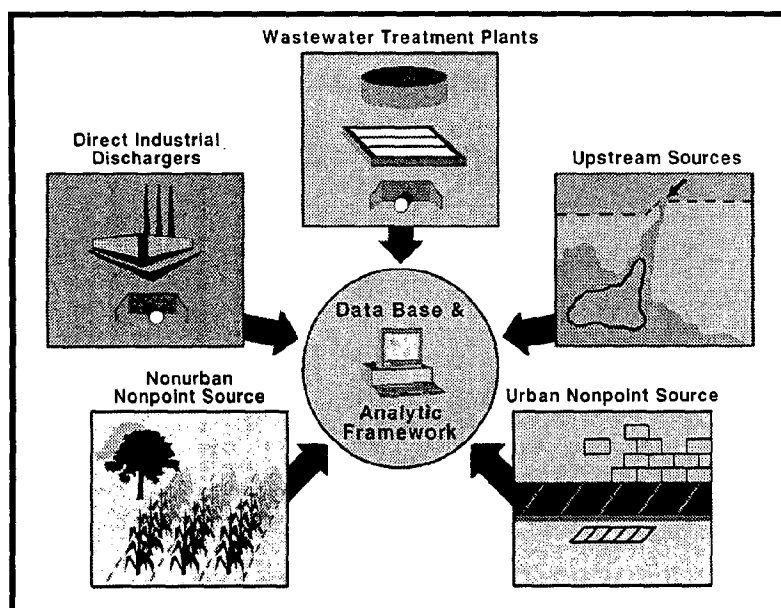
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(Acronyms on Inside of Back Cover)

Introduction

This report summarizes the agricultural application of a group of 28 commonly applied pesticides in the 78 estuarine drainage areas (EDAs) contained in the National Oceanic and Atmospheric Administration's (NOAA) *National Estuarine Inventory* (NEI) (Figure 1)¹. The estimates of pesticide use are taken from a data base developed as part of a joint NOAA/ Environmental Protection Agency (EPA) project to assess pesticide use, runoff, and potential impact in the Nation's estuaries. The pesticide use estimates are circa 1982 and are based on county use estimates taken from the *National Pesticide Use Inventory* compiled by Resources for the Future (RFF). EPA's Office of Marine and Estuarine Protection provided support for the development of the data base. The primary purpose of the project is to identify estuaries most at risk due to agricultural pesticide use.

Two experimental approaches are taken in this report to assess the potential impact of these pesticides. The first accounts for the varying toxicity of the 28 pesticides to estuarine organisms. The second approach develops a quantitative measure that can be used to compare and rank estuarine systems with respect to the amount of pesticides applied per unit area of cropland. An analysis of the relative toxicities of the pesticides to aquatic organisms and additional supporting information (for example, a discussion of each pesticide's half-life in the environment, bioconcentration potential, mode of action, and EPA regulatory status) is also included to provide a more complete picture of the use and potential impact of these pesticides.

Because the use estimates are based on typical application rates and assumptions about the percent of crop receiving treatment, estimates for specific pesticide/crop combinations for a particular area may be an over- or underestimate. However, taken over an entire estuarine drainage area the estimates portray the differences in general patterns of use among estuarine systems and coastal regions.

The Pesticides

The 28 pesticides currently in the inventory (Table 1) are applied to a number of field and orchard crops (Table 2). A list of common/trade names for these pesticides can be found in Appendix A. The estimates made in this report do not include nonagricultural applications such as mosquito control, golf course use, right-of-way, and residential use which may be important for some compounds. The pesticides were selected jointly by NOAA, RFF and EPA's Office of Pesticide Programs based on toxicity, quantities used and data availability. Agricultural experts in government and academia were asked to review the list for comprehensiveness and to suggest additional pesticides. In the coming year, 10 additional pesticides will be added to the data base as a result of these recommendations.

Regulatory Status. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) enacted in 1972, and amended in 1978, 1985, and 1988 requires the EPA to register newly manufactured pesticides, and to re-register previously manufactured compounds. Under FIFRA, the manufacturer must supply EPA with information on the physical, chemical, and toxicological properties of the compound. The EPA then evaluates the risks and benefits of the pesticide and decides if the compound should be allowed to enter or remain on the market, and if any restrictions will be placed on its use. States can also regulate the use of pesticides provided they do not ease the restrictions placed on the compound.

¹ An EDA, as defined in the NEI, is that portion of an entire watershed that most directly affects the estuary and is delineated by the limits of the tidal influence and the U.S. Geological Survey hydrologic cataloging units (NOAA, 1985). EDAs were drawn to coincide with the cataloging unit(s) that contains the head of tide and seaward estuarine boundaries. A map of the estuarine drainage areas in the NEI along with their numerical designations is presented in Figure 1.

In addition to listing the pesticides, Table 1 also shows the current EPA regulatory classification and the initial registration dates of each compound. Restricted pesticides can only be applied by certified applicators under specific conditions and only to certain crops. For example, chlorobenzilate was restricted to use on citrus by the EPA in 1979. The EPA can suspend the registration of a compound if the registrant does not comply with the requirements of re-registration, or if the pesticide is judged by EPA to pose an imminent hazard. In this case, suspension is used to prevent further application of the compound while cancellation is underway. At the present time, the registration of the herbicide dinoseb has been suspended, although the EPA has granted partial exemptions to this suspension in the Northwest. A pesticide registration is cancelled if the EPA finds that its continued use presents too great a risk to humans or the environment. A pesticide can also be voluntarily cancelled by the manufacturer as in the case of the fungicide captan. However, stockpiles of this compound can still be used.

Data Sources. Ideally, estimates of pesticide use should be based on actual use or sales records. However, no such nationwide data base exists, and even at state and local levels, this type of information is difficult to obtain. Consequently, use must be estimated. Estimates of use for each pesticide by crop and county were taken from the *National Pesticide Use Inventory* (NPUI) developed by Resources for the Future (RFF). The estimates were generated using a variety of sources including the *1982 Census of Agriculture* (Department of Commerce), the *1982 Crop and Livestock Pesticide Usage Survey* (U.S. Department of Agriculture, Economic Research Service) and state data bases. Information was also obtained from state and local agricultural extension agents on the average application rates and percent acres of crop treated with a particular pesticide. A simple algorithm was used to estimate the annual pesticide application by county for each pesticide/crop combination:

$$\begin{array}{ccccccc} \text{acres of particular} & & \times & \text{percent of crop} & & \times & \text{pounds/acre/year} & = & \text{estimated yearly} \\ \text{crop in county} & & & \text{receiving pesticide} & & & \text{of active} & & \text{pesticide use for} \\ & & & \text{application} & & & \text{ingredients} & & \text{crop in county} \\ & & & & & & \text{typically applied} & & \end{array}$$

Estimates of pesticide use by EDA were then made by prorating the estimated yearly pesticide use by the percent of the total agricultural land in the county within the EDA boundary. This percentage was derived from NEI land use data. A more detailed discussion of the estimation methodologies can be found in Appendix B.

Assessing Toxicity

Pesticides are applied to control a wide variety of plant and animal pests, and ideally, should only affect a specific target organism. Unfortunately, many pesticides are nonspecific, and are toxic to nontarget organisms as well. Table 3 identifies properties of each pesticide that are important when considering the effects of acute (short-term, high dosage) or chronic (long-term, low dosage) exposure to estuarine fish and invertebrates. The pesticides in the table are grouped according to chemical class, and compounds within each class tend to share similar toxicological properties. The following discussion describes in detail each column in Table 3. A discussion of the physical parameters of the pesticides is presented in Appendix C.

The *Environmental Hazard Rating System* (EHRS) in Table 3 provides a graphical summary of the potential hazard to aquatic animals posed by exposure to each pesticide. This classification scheme, similar to the one proposed by Weber (1977), rates the toxicity (as measured by the LC_{50}) of the pesticide to fish, the persistence of the compound in soil (half life or $T_{1/2}$), and the potential for each pesticide to accumulate (the bioconcentration factor or BCF) in fish. For each category (toxicity,

persistence and bioconcentration), the hazard posed by the pesticide (either low, moderate, or high) is indicated by the degree of shading. According to this rating system, the more hazardous pesticides score high (dark shading) in one or more categories. For example, chlorothalonil is highly toxic and accumulates in fish. The herbicide 2,4-D, in contrast, has a fairly low toxicity, does not accumulate, and therefore poses a lower hazard. It should be noted that an evaluation system based on other classes of aquatic life such as crustaceans or plants would present a somewhat different picture of the potential environmental hazard. The numerical values used to develop the present rating system are given in Appendix D.

The Aqueous LC₅₀ (LC₅₀) is the experimentally determined aqueous concentration of a pesticide that is lethal to 50 percent of test organisms within a specific time (e.g., 24, 48 or 96 hours). The LC₅₀ is determined using a statistical transformation of dose/response data, and is frequently given in parts per million (ppm) or milligrams of pesticide per liter of water. The LC₅₀ is typically the first test performed when trying to determine the acute toxicity of a chemical. It provides the toxicologist with a preliminary idea of the hazard posed by the pesticide, and helps direct additional testing.

The LC₅₀ values shown in Table 3 are for estuarine and freshwater fish. These values provide a relative measure of acute toxicity. The smaller the LC₅₀ value, the more toxic the pesticide. However, an LC₅₀ can vary depending on the environmental conditions, the life stage of the organism, and the species. For example, the 96-hour LC₅₀ for ethoprop using the sheepshead minnow (*Cyprinodon variegatus*) is 0.74 ppm; for the pink shrimp (*Penaeus duorarum*) the 96-hour LC₅₀ is only 0.013 ppm.

A *Coefficient of Relative Toxicity (CRT)* was developed to normalize pesticide application to acute toxicity. A CRT was computed for each pesticide by dividing its LC₅₀ for fish into the LC₅₀ of the most toxic compound in the inventory (the organophosphate insecticide phorate). The CRT was then multiplied by the use estimate for that pesticide so that the original amount applied in the EDA was translated into units of phorate normalized toxicity. In this way, the total toxic load for all pesticides in the EDA could be evaluated. A heavily used but less toxic compound would contribute less to the toxicity normalized load than would a little used but highly toxic pesticide. For example, if 10,000 pounds of alachlor were applied in an EDA, the toxic loading would be:

$$\frac{0.0013 \text{ ppm (phorate LC}_{50}\text{)}}{4.3 \text{ ppm (alachlor LC}_{50}\text{)}} \times 10,000 \text{ pounds of alachlor applied in an EDA} = 3.0 \text{ pounds of toxicity normalized pesticide applied}$$

If however, 1,000 pounds of the more toxic pesticide captafol were applied in an EDA, the toxic loading would be:

$$\frac{0.0013 \text{ ppm (phorate LC}_{50}\text{)}}{0.032 \text{ ppm (captafol LC}_{50}\text{)}} \times 1,000 \text{ pounds of captafol applied in an EDA} = 41 \text{ pounds of toxicity normalized pesticide applied}$$

The application of the CRTs integrates toxicity with use, and provides an initial indication of the hazard posed to estuarine systems as a result of pesticide use patterns.

The *Bioconcentration Factor (BCF)* is the ratio of the amount of active ingredient accumulated by an organism from water to the amount remaining in the aqueous phase at equilibrium, and is expressed as:

$$BCF = \frac{\text{mg pesticide/kilogram of tissue}}{\text{mg pesticide/liter of water}}$$

The BCF can be experimentally determined by allowing a pesticide to reach equilibrium between the organism and the aqueous phase, or it can be determined using a mathematical model. The BCF values in Table 3 are for estuarine and freshwater fish. If a BCF was not found in the literature, an estimated value was calculated from water solubility data.

The degree of bioconcentration is related to a number of factors. A pesticide with a low water solubility (i.e., a hydrophobic compound), will readily accumulate in an organism, especially in the lipid-containing tissues, in much the same way that a hydrophobic compound will partition out of the aqueous phase in an octanol/water mixture. In addition, bioconcentration will be somewhat dependent on the organism, as different species contain varying amounts of lipid. Finally, the extent of accumulation is related to the ability of the organism to metabolize and excrete the pesticide. The breakdown products or metabolites of a compound are usually more water soluble, and therefore easier to excrete. A compound that is rapidly metabolized will have less chance of being accumulated in an organism. In general, fish have a greater ability to metabolize aromatic compounds than crustaceans or molluscs. The BCF values in Table 3 vary widely as do their water solubilities. For example, the trifluralin BCF is 930, while the BCF for the water soluble (Appendix C) metolachlor is only 7.

Class of Aquatic Life at Risk is a general classification system designed to indicate the class of aquatic animals (excluding mammals) most at risk due to exposure. Some species are more sensitive to pesticides because of physiological differences. Many of the pesticides, such as parathion and diazinon, pose a risk to both fish and invertebrates, while others, such as methyl parathion, are more hazardous to invertebrates. Atrazine is moderately toxic to fish, and there also remains some concern regarding its effects on aquatic plants.

Mode of Action identifies how the pesticide affects the target organism. Most currently used insecticides affect some aspect of the insect's physiology, usually the nervous system. The organochlorine insecticides are thought to interfere with the essential flow of potassium and sodium ions across the nerve cell membrane. The organophosphate and carbamate insecticides inhibit the functioning of acetylcholinesterase (AChE), an enzyme important in the process of muscle contraction. The disruption of the nervous system caused by insecticides most likely leads to death in the target organism, although in many cases, the exact cause is still unknown.

Herbicides affect a number of plant processes including photosynthesis, enzyme function, and the hormonal control of plant growth. The triazine herbicides (e.g., atrazine and cyanazine) inhibit energy production during photosynthesis. The carbamate herbicides affect a variety of enzyme systems which prevent normal growth and functioning of the plant. Alachlor and metolachlor appear to inhibit protein synthesis in the plant. The chlorinated phenoxy herbicides 2,4-D and acifluorfen mimic natural plant hormones, causing improper plant growth. Dinoseb inhibits the production of high energy phosphate compounds necessary for plant metabolism.

Chronic Toxicity is the long-term, low dose effects a compound has on an organism. Chronic toxicity tests are designed to predict the effects of a chemical at environmentally realistic concentrations. Chronic effects include changes in behavior (e.g. ability to escape predation), biochemistry (e.g., enzyme function), and reproduction (e.g., fertility), which can be detrimental to a species. At the present time, limited information exists on the chronic effects of pesticides to estuarine organisms, although it is known that thiobencarb decreases growth in fish and chlorothalonil causes a decrease in fertility. In addition, the organochlorines, along with a number of other pesticides shown in Table 3, are suspected carcinogens. Tests carried out with laboratory animals however, may not be applicable to some classes of estuarine organisms. Organophosphate and carbamate insecticides generally have a low chronic toxicity due to their shorter environmental half-lives. The herbicides cyanazine and dinoseb are suspected teratogens (i.e., they cause embryonic malformations) in laboratory animals.

The *Toxicity of the Degradation Products* is the hazard posed to an organism by the metabolites or breakdown products of a pesticide. While a pesticide may be rapidly metabolized, the products of this metabolism may also be toxic. In general, the organophosphates and carbamates degrade to less toxic compounds, although there are exceptions. For example, the organophosphate insecticide disulfoton is metabolized to a series of compounds, some of which inhibit acetylcholinesterase activity to an even greater degree than the original pesticide. The carbamate insecticide carbaryl is metabolized to 1-naphthol which is very toxic to molluscs.

Pesticide Use and Toxicity in the EDAs

Crop Patterns in the EDAs. Tables 4a-d show the major acreage crops grown in the four coastal regions of the U.S. by EDA. For the most part, corn, soybeans, wheat and hay are the dominant (highest acreage) crops in the Nation's EDAs. A number of regional crop patterns can also be seen. Corn, soybeans, alfalfa and hay are important crops in a number of EDAs in the Northeast. Soybeans are an important crop, particularly from Hudson River/Raritan Bay to the Chesapeake Bay. In the Southeast, soybeans and corn are by far the dominant crops. In 13 of the 18 EDAs in this region, soybeans are the dominant acreage crop, while corn is a major crop in all EDAs in the Southeast. Citrus is the dominant crop in four Florida EDAs, while sugarcane is the highest acreage crop in the two most southern EDAs in this state, Biscayne Bay and Ten Thousand Islands. In many of the Gulf Coast EDAs from northern Florida to Texas, soybeans are again dominant. In Texas, sorghum is the highest acreage crop from the Matagorda Bay EDA south. In Laguna Madre, cotton is also an important crop. On the West Coast, alfalfa is a dominant crop along with barley and corn, while in the fertile San Joaquin Valley area, corn, grapes, tomatoes and broccoli are the major crops. Farther north in Oregon and Washington, hay, cranberries and peas are dominant. Pasture/range was not included in Tables 4a-d as it is not a true crop. However, areal and pesticide use estimates for pasture/range are contained in the Appendices.

Factors Affecting Pesticide Use and Toxicity in the EDAs. Three factors affect pesticide use estimates in the EDAs. The first is the area of cropland within the EDA. An area of heavy use occurs from Delaware Bay to Winyah Bay on the East Coast (Figures 2a, 3a, and 3b). In these EDAs, the agricultural acreage is on average about 28 percent of the total land area. A second factor involves the types of crops grown. Field crops such as soybeans and corn are pesticide intensive (e.g., they are treated with as many as 16 of the 28 pesticides (Appendix E)). These two crops received the majority (57 percent) of the 28 pesticides applied agriculturally in the EDAs (Figure 4). As a result, EDAs where these crops are grown receive large amounts of the pesticides. In Appendix F, the area of major crops grown in each EDA is summarized. The third factor involves the size of the EDA. In the Chesapeake Bay EDA (approximately 17,700 square miles), 33 percent of the land area is agricultural. In the smaller Delaware Bay EDA (approximately 4,000 square miles), 42 percent of the land area is agricultural. The Chesapeake Bay EDA has a higher pesticide load (approximately 5.3 million pounds) than Delaware Bay (1.5 million pounds), primarily because of its larger size.

Pesticide Use Patterns in the EDAs. Annual agricultural application of all pesticides (active ingredients) in the contiguous United States is roughly 800 million pounds (Gianessi, 1988). Approximately 412 million pounds of the 28 pesticides were applied nationwide in 1982 (Gianessi, 1988), representing approximately 50 percent of all pesticides applied agriculturally in the Nation. In the EDAs, 34 million pounds of these 28 pesticides were applied, representing approximately eight percent of their total use nationwide.

Figures 2 and 3 show the patterns of pesticide use by EDA. East Coast EDAs (Figure 2a) receive some of the highest applications of these pesticides in the country. The Chesapeake Bay EDA received the greatest amount of pesticides of any in the Nation with approximately 5.3 million pounds (Figure 3a). Large amounts of pesticides were also applied in three EDAs along the Gulf Coast - Laguna Madre, Atchafalaya and Vermilion Bays, and the Matagorda Bay (Figure 3c).

Herbicides accounted for more than 70 percent of the pesticides applied in the Nation's EDAs while insecticides accounted for approximately 19 percent. The USDA, Economic Research Service (Delvo et al., 1987) estimates that herbicides account for 85 percent of pesticide use nationally. Pesticide application by coastal region and pesticide class is shown in Figure 5. The highest estimated herbicide application occurred in the Southeast and along the Gulf Coast with a combined 1982 total of over 16 million pounds. The most insecticides were applied in the Southeast (approximately 2.3 million pounds). The USDA/ERS (Delvo et al., 1987) noted that corn and soybean production is responsible for most of the herbicide use in the country, while corn and cotton dominate insecticide use. As noted earlier, both the Southeast and Gulf Coasts are important corn, soybean and cotton growing areas.

Figure 6 shows the total application of individual pesticides by EDA. The herbicides alachlor and atrazine dominate use. These two compounds account for 11.7 million pounds or 35 percent of the total amount applied in EDAs in 1982 (Appendix G). Alachlor is used on a number of crops including corn, soybeans, sorghum, and peanuts to control annual grasses and broadleaf weeds. High use of this herbicide was estimated for a number of EDAs in the Northeast, Southeast, and in the Gulf of Mexico. The heaviest regional application was in the Southeast where nearly 3 million pounds were applied, the majority on corn, soybeans and peanuts in the Albemarle and Pamlico Sound EDAs. The highest application of alachlor in any EDA occurred in the Chesapeake Bay EDA with approximately 1.45 million pounds. Atrazine, which is used mainly on corn, sorghum, and sugarcane was used most heavily in the Northeast (2 million pounds). Approximately 69 percent of the atrazine used in this region was applied in the Chesapeake Bay EDA (1.42 million pounds), the majority on corn. Metolachlor, a herbicide used on a number of crops (Appendix E) was third in terms of individual pesticide use in the EDAs (approximately 2.9 million pounds). In the Northeast approximately 1.1 million pounds of this herbicide were used on crops such as corn, potatoes and soybeans. In the Gulf of Mexico EDAs, approximately 990,000 pounds were used.

The major *insecticides* applied in the EDAs were carbaryl, carbofuran and methyl parathion. Carbaryl was used heavily in the Southeast (840,000 pounds) in 1982 followed by the Gulf of Mexico (620,000 pounds). In the Southeast, carbaryl is applied mainly to soybeans, peanuts and corn. The heaviest application of carbaryl in any EDA occurred in Winyah Bay, with over 290,000 pounds, the majority applied to soybeans. Methyl parathion is used on a variety of crops including soybeans, cotton and rice. In the Atchafalaya/Vermilion Bays in Louisiana, over 277,000 pounds were applied to these crops in 1982. In Winyah Bay over 355,000 pounds of methyl parathion were applied to cotton and soybeans.

The four fungicides included in the inventory are chlorothalonil, captan, metiram, and PCNB. These are used on crops such as apples, potatoes, soybeans and citrus. Their use accounted for approximately eight percent of the total pesticides applied and was well distributed among the Northeast, Southeast, and Gulf Coasts (Figure 5). Fungicide use in the West Coast EDAs was fairly low. In the Gulf Coast EDAs, approximately 930,000 pounds were applied in 1982. Chlorothalonil was applied most heavily in the Southeast and Gulf Coasts. In the Laguna Madre EDA, over 261,000 pounds were applied in 1982, mainly to cantaloupes, cabbage and broccoli. In the Southeast, 165,000 pounds were applied in the Winyah Bay EDA, primarily to peanuts.

The *nematicide* in the inventory, ethoprop, is used on crops such as corn, peanuts, soybeans and sugarcane and was applied most heavily in the Southeast (474,000 pounds). In Winyah Bay, over 182,000 pounds were applied, mainly to tobacco, soybeans and corn. The only *miticide* included in the inventory is chlorobenzilate which was restricted to use on citrus by the EPA in 1985. As a result, the EDAs in the Gulf of Mexico and in the Southeast received the largest amount of this pesticide. In the Charlotte Harbor EDA in Florida, approximately 200,000 pounds were applied.

Toxicity Normalized Application of Pesticides. Figure 2b (national map of the toxicity normalized use) shows a somewhat different pattern from the map in Figure 2a (national map of

pesticide use). The major EDAs in terms of toxicity normalized use are located on the East Coast, with a concentration in the Southeast. For toxicity normalized use eight of the top 10 EDAs in the Nation are located on the East Coast, with five of these located in the Southeast (Table 5b.). Combining use estimates with toxicity is an approach designed to screen those EDAs applying the more toxic pesticides in the inventory.

Although the herbicides alachlor, atrazine and metolachlor are the three most widely used pesticides in the inventory, their toxicity to fish is fairly low (Table 3). In the bar graph of regional toxicity normalized use (Figure 5b), insecticides and fungicides account for the majority of the load, in contrast to that found in Figure 5a. In general, the herbicides are less toxic to fish than either insecticides or fungicides and therefore contribute less to a toxicity normalized load.

The pesticides phorate, chlorothalonil, trifluralin, and parathion are the more toxic compounds in the inventory, and the application of these and a few others drive the toxic loadings in the EDAs. The crops that these pesticides are applied to (Appendix E) produce the highest toxicity normalized loads in the EDAs. In Albemarle Sound, for example, the majority (26,240 pounds) of the normalized load (44,050 pounds) is a result of the organophosphate insecticide phorate applied to peanuts. Phorate is also applied to soybeans and corn, and although the percent acres treated and the average application rate of phorate on these two crops is low (Appendix H), the large number of acres of these two crops makes them important in terms of EDA applied phorate. In Albemarle Sound, a substantial amount of the fungicide chlorothalonil is applied to peanuts, which contributes to the toxic load as well. A complete listing of the toxicity normalized application by major crop is presented in Appendix I. In Winyah Bay, over 3,200 pounds of trifluralin (normalized for toxicity) was applied to soybeans. In Laguna Madre in Texas, phorate is applied to sorghum, corn and cotton, while chlorothalonil is applied to cantaloupes, carrots and cabbage. Phorate is also applied to potatoes in the Chesapeake Bay, Delaware Bay, Hudson River/Raritan Bay and the St. Johns River EDAs. In this last EDA, phorate applied to potatoes is responsible for a substantial amount of the toxic load.

The Intensity of Pesticide Use and Toxicity Normalized Use. To identify EDAs with the highest per unit area of pesticide application, the square miles of cropland in each EDA was divided into the use and toxicity normalized use values. National maps of this information are presented in Figures 7 and 8. In Figure 9, the intensity of use and toxicity normalized use by individual EDA can be seen. The East Coast from Cape Cod Bay in Massachusetts, south to St. Andrew/St. Simons Sound in Georgia is an area of intensive pesticide use (Figure 9). The top 10 EDAs in terms of the intensity of pesticide application (Table 5c), and the intensity of toxicity normalized application (Table 5d), are located in this region. With the exception of Delaware Bay, however, none of these EDAs are among the top 10 in terms of the percent of agricultural land area (Table 5f).

The Albemarle Sound EDA had the highest annual pesticide application per square mile of cropland (1,682 pounds/square mile) and the highest toxicity normalized application (34.7 pounds/square mile/year) in an EDA (Figure 9). Gardiners Bay in New York, an area of high potato production, had the second highest rate in terms of use/square mile and toxicity normalized application/square mile. Potatoes are a pesticide intensive crop receiving up to 13 of the 28 pesticides. Appendix J contains a more detailed summary of the intensity of use and toxicity.

Several EDAs (e.g., Laguna Madre, Puget Sound, Matagorda Bay, and Hudson River/Raritan Bay) in which pesticide use is high are low in terms of the intensity of application. In most of these EDAs, however, pasture/rangeland accounts for more than half of the land area (land use categories are averaged over the entire EDA). Pasture/rangeland receives relatively little pesticide and "dilutes" the overall intensity of application. These EDAs likely have areas of high application but as a result of averaging across an entire EDA, the intensity of use is low.

Limitations

To properly use the information contained within this report, it is important to understand its limitations.

Source of Data. Pesticide use information is based on estimates and not on actual reported data. Ideally, pesticide application data would be available from the states or from sales data but states vary widely in the amount and types of use information collected, and pesticide sales records are usually proprietary. In addition, a national inventory of reported use data does not exist, nor is one being planned (Gianessi, 1987). NOAA's pesticide use data base was developed using the county estimates from the NPUI data base created by RFF. The NPUI data base was developed to provide reasonable estimates of pesticide use so that informed decisions regarding pesticide use could be made. The NOAA data base was developed to provide information regarding pesticide use for that part of the watershed that directly affects the environmentally sensitive estuaries.

Time-Frame of Estimates. The estimates in the data base are circa 1982. They were generated primarily from information published by the Department of Commerce, the USDA Economic Research Service, and various state data bases. The pattern of pesticide use, however, is a dynamic one. Application varies from year to year due to a number of factors including the farmer's preference for certain pesticides, marketing by the manufacturer, the severity of infestation, crop rotation, change in the acres of crops grown over time, and the governmental regulation of pesticides. The information in this report provides a "window" on the use patterns of 28 commonly applied pesticides. Since 1982, use patterns have changed and this should be kept in mind when using the information. In addition, some of these compounds are currently suspended or being considered for cancellation by EPA. The herbicide dinoseb for example, is a suspected teratogen and its application has been suspended with the exception of certain applications in the Northwest. The present use of this compound is now lower than the estimates in the data base. The fungicide captan has been voluntarily cancelled and remaining stockpiles are now being used. The miticide chlorobenzilate is a suspected carcinogen and has been restricted to use on citrus. A special review is now underway at EPA which could lead to its cancellation.

The Pesticides Considered. The 28 pesticides do not represent the universe of pesticides (approximately 600 active ingredients) used in this country. They do, however, account for approximately 50 percent of the total amount of pesticides applied agriculturally in the Nation circa 1982.

The estimates in the data base are only for the agricultural use of the pesticides. Some of these compounds have significant nonagricultural usage including right-of-way, residential and other urban applications, and mosquito control. The state of Florida, for example, estimated that 75 percent of the malathion and 38 percent of the carbaryl in that state was applied non-agriculturally in 1978-1979 (IFAS, 1981).

Resolution and Uniformity of Pesticide Use Patterns. Currently, pesticide use patterns in NOAA's data base can be resolved down to the county. The information cannot be used to assess pesticide use patterns or impacts at a more refined level. For example, the data base was not designed to provide information on a certain portion of a county or field in an EDA, because the use estimates were made for the entire county and subsequently prorated to the EDA. The information in the data base is useful, however, for examining pesticide use patterns among counties, EDAs and regions.

The information in the data base assumes that crop patterns in the counties and EDAs are uniform. Clearly, this is not the case, as the types and locations of crops vary from farm to farm. In the absence of more detailed data, however, the Census of Agriculture county-level figures represent the best available crop acreage data at the national level.

Toxicity Normalization. The toxicity normalized use estimates were generated using LC₅₀ data for estuarine and freshwater fish. These values provide information on the relative toxicity of the compounds to these organisms. However, in many cases, a particular pesticide will be more toxic to one class of organism than to another. For example, while the methyl parathion LC50 for the sheepshead minnow (*Cyprinodon variegatus*), an estuarine fish, is greater than 0.8 ppm, the LC₅₀ for this same compound in the pink shrimp (*Penaeus duorarum*), a crustacean, is only 0.0019 ppm. Similarly, algae are often more sensitive to herbicides than aquatic animals. For example, the atrazine LC₅₀ for the estuarine fish northern spot (*Leiostomus xanthurus*) is greater than 1 ppm; the concentration needed to affect growth in the algae *Chlorella* sp. is only 0.082 ppm. Thus, the toxicity normalized use estimates as presented are most representative for estuarine fish. In the future, CRTs will be developed for other major classes of estuarine organisms.

Upstream Inputs. The current use estimates do not account for pesticides carried into the EDA by rivers and streams crossing the inland EDA boundary. In cases where there are large areas of agricultural land upstream of the EDA (e.g., in the San Joaquin and Sacramento River Valleys), these pesticide inputs could represent a significant additional load to the estuary. A NOAA project to quantify the contribution from upstream inputs is planned for 1989.

Scope of the Information. The information in the data base provides a summary of the application of the pesticides in the EDAs but does not include information on the amount entering the estuaries themselves. In the future, a group of empirically determined runoff coefficients that range between 0.5 and 3 percent of the amount applied (depending on the compound and its formulation) will be applied to the use estimates to approximate what fraction of the pesticides used may be carried away from the field in runoff (Wauchope, 1988).

This report is not a detailed risk assessment or model. A risk assessment would provide an analysis of the benefits and risks posed by pesticide use in each EDA, ultimately addressing the effects on man as a result of consuming contaminated seafood. A model to predict pesticide runoff and fate in the estuarine environment would have to integrate a number of processes, including transport of the pesticide to the system, sorption of the compound onto sediments, bioaccumulation into biota from water and sediment, degradation, and volatilization. An analysis of this type would not be practical at the national scale.

How the Data Can Be Used

The purpose of this report, and of the project, is to provide a screening tool to point out which estuaries may be at risk due to pesticide application patterns in the EDAs. A detailed on-site investigation and analysis of each estuarine system is neither practical nor possible. All problems cannot be analyzed equally, everywhere. The information contained in this report can be used to prioritize the allocation of available resources to specific sites and problems. In this way, estuaries most likely impacted by pesticides can be evaluated, and some general insights regarding pesticide impacts in estuaries can be obtained by investigating these high risk systems.

Types of Users. Two types of users are envisioned for this report. The first is the decisionmaker who requires information summarized in such a way so that conclusions regarding pesticide use and possible problem areas can be made. The report is organized so that this type of information can be located quickly. The second user will be more concerned about pesticide use patterns in one or two EDAs, and possible implications for the estuary. For this user, the extensive appendices in the report provide this detailed information. For example, pesticide application patterns by EDA and by region are presented in the main body of the report as well as in the appendices. In addition, the amount of pesticides applied to each crop is also presented to illustrate which crops are responsible for the

use and toxicity normalized use of the 28 pesticides. The quantity of information presented here lends itself to a variety of applications and levels of investigation.

Concluding Comments

NOAA's pesticide project was undertaken to summarize the application patterns of a group of environmentally important pesticides in the Nation's estuarine drainage areas, and to provide information on the possible hazards posed by these compounds to the Nation's estuaries. The report summarizes the information collected to date, and provides a mechanism for soliciting feedback on the design, content and utility of the project.

Patterns of Pesticide Use and Toxicity. Use of the 28 pesticides is concentrated in the EDAs on the East Coast and along the Gulf of Mexico, the majority of which is applied to soybeans and corn. The highest use occurred in the Chesapeake Bay EDA followed by Winyah Bay, both on the East Coast. While the compounds in the inventory do not include the universe of pesticides used agriculturally, a similar geographic pattern might also be expected for other pesticides. Most of the herbicides, insecticides, and fungicides used throughout the U.S. are applied to corn, soybeans, peanuts, and cotton (Delvo et al., 1987), which are the dominant crops in many of the EDAs in the Southeast and Gulf of Mexico.

In terms of toxicity normalized use, the major EDAs at risk appear to be located on the East Coast, particularly in the Southeast. The Albemarle Sound EDA had the highest toxicity normalized use in the country, followed by the Chesapeake Bay which borders the Southeast. Crops such as corn, peanuts, potatoes, sorghum, and soybeans received much of the toxic load. The top 10 EDAs in terms of pesticide application per square mile (Table 5c) were all located on the East Coast, with six of these in the Southeast. Albemarle Sound had the highest intensity of toxicity normalized use in the Nation's EDAs in 1982. This was a result of phorate and chlorothalonil application to peanuts, soybeans and corn.

Effects of Pesticides in Estuaries. For the most part, the pesticides currently used agriculturally have relatively short half-lives when compared with the older organochlorines such as DDT, chlordane and lindane. Many of the carbamates, organophosphates, and triazines now applied degrade ($T_{1/2}$) in soil and water in a period of a few months, weeks, or even days within the environment, as compared with years for DDT. As a result, most of the effects of pesticides in the estuaries or coastal rivers are likely to be short-lived (e.g. a fish kill as a result of a runoff event). Effects that result from longer, low level exposure of estuarine organisms to pesticides (impaired enzyme functionality, decreased fertility, or changes in behavior) may occur but are more difficult to pinpoint. Whereas the cause of a fish kill may be directly linked to the introduction of one or two pesticides as a result of runoff, these more subtle effects may be related to the interactions of pesticides with other pollutants, as well as the environmental conditions present in the estuary. In addition, any effects are likely to be seasonal because the pesticides in current use, for the most part, are applied during the growing season and few persist long enough to accumulate in the environment.

Documented impacts of pesticide residues on estuarine ecosystems are very limited. State and federal agency programs vary widely in terms of field investigations and monitoring. Reasons include the high cost of these types of studies, the fact that the effects are short-lived or subtle, and that residues are often undetectable. There are some indications, however, that pesticides may be causing problems in the Nation's estuaries and coastal rivers. Trim (1987) found that in the period 1977-1984, a total of 128 coastal fish kills were recorded in South Carolina, and that half of these were the result of pesticides. Evidence of subtle effects is much less conclusive. In the southwest portion of the Biscayne Bay in Florida, Skinner (1982) found an overabundance of gill parasites and gill abnormalities in fish such as the yellowfin mojarra (*Gerres cinereus*) and the grey snapper (*Lutjanus*

griseus). Traces of diazinon, 2,4-D and parathion were found along with heavy metals and ammonia in water samples. Skinner (1982) hypothesized that the pollutants may have acted as an irritant, stressing the fish and reducing its resistance to infection by the parasites.

In the Pamlico River, North Carolina in 1984, Atlantic menhaden (Brevoortia tyrannus) began to display deep skin lesions. Investigations by Noga and Dykstra (1986) found a fungus to be associated with the ulcers. In November of that year, a massive fish kill of the menhaden was observed. Other fish such as the southern flounder (Paralichthys lethostigma) and weakfish (Cynoscion regalis) also developed some degree of ulceration. Noga and Dykstra (1986) did not discover the agent initiating the lesions, but noted that some non-infectious stressor may have been responsible, allowing the fungi to invade the tissues of the fish. These authors noted that the Pamlico River has become increasingly eutrophic as a result of agricultural and industrial inputs. While at present there is no definitive evidence linking pesticide residues in these waters with the abnormalities observed, because the Albemarle/Pamlico Sound EDAs are an area of heavy pesticide use, pesticide residues may be contributing to increased environmental stress on these species, rendering them more susceptible to infection. Further research is needed to determine if a causal relationship exists.

Future Activities. A series of projects are currently underway to improve and refine the estimates in NOAA's pesticide use data base, and to assess the potential impacts of pesticides in the Nation's estuaries. In the coming year, 10 additional pesticides will be added to NOAA's inventory. The compounds were chosen based on use patterns, toxicity, persistence, and on the recommendations of pesticide experts from around the country. In 1989, all of the use estimates will be updated from a base year of 1982 to 1987. Pesticide use patterns are not static, but change over time as a result of a variety of factors. The newer estimates will provide a more up to date, and a more complete picture of pesticide application in the coastal areas.

The final product of the project will be a volume in NOAA's National Estuarine Inventory Data Atlas Series. The Atlas will contain detailed tabulations of pesticide use and discharge by compound and crop type, for each of the 78 estuarine drainage areas in the NEI. In addition, the Atlas will contain extensive supporting information on the physical and toxicological properties of the pesticides, a summary of the regulatory status and history of use, and an assessment of the policy implications of the use patterns portrayed. The Atlas is scheduled for release in the fall of 1989. In the coming year, a series of interim assessment products will be produced, including an analysis of pesticide risks to other classes of estuarine organisms, an inventory of pesticide related fish kills in the Nation's estuaries and coastal rivers, and a description of a simple screening methodology to identify potential hotspots of agricultural pesticide discharge.

Estuaries are some of the most productive systems in the world (Mann, 1982), providing nursery areas and habitats for many commercially and recreationally important species of fishes and invertebrates (Monaco and Emmett, 1988). It is imperative that these systems be protected so that their ecologically important role can continue. At the same time, however, the use of pesticides in the agricultural areas adjacent to estuaries is currently necessary to control plant and animal pests. Without their use, yields for many crops would decline. The toxicity of these compounds, however, requires that they be used in such a way so as to minimize their environmental impact. In this report, we have pointed out estuarine systems, a number in the Southeast, that show the highest potential for impairment from the agricultural use of a select group of pesticides in the EDAs. Additional research is needed before any conclusions can be made regarding effects of pesticide residues in estuaries and coastal rivers. The information in this report can be used to better direct some of these efforts.

Figures and Tables

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- Figure 3. Agricultural Use and Toxicity Normalized Use for 28 Pesticides in Estuarine Drainage Areas, circa 1982.
- Figure 4. Agricultural Pesticide Use for 28 Pesticides in Estuarine Drainage Areas by Major Crop, circa 1982.
- Figure 5. Agricultural Pesticide Use and Toxicity Normalized Use by Pesticide Class and by Coastal Region, circa 1982.
- Figure 6. Agricultural Pesticide Use in Estuarine Drainage Areas by Region and by Pesticide Class, circa 1982.
- Figure 7. Intensity of Agricultural Pesticide Use for 28 Pesticides in Estuarine Drainage Areas, circa 1982.
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- Table 3. Toxicological Properties of Pesticides in NOAA's Pesticide Use Data Base
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Figure 1. Key to Estuarine Drainage Areas.

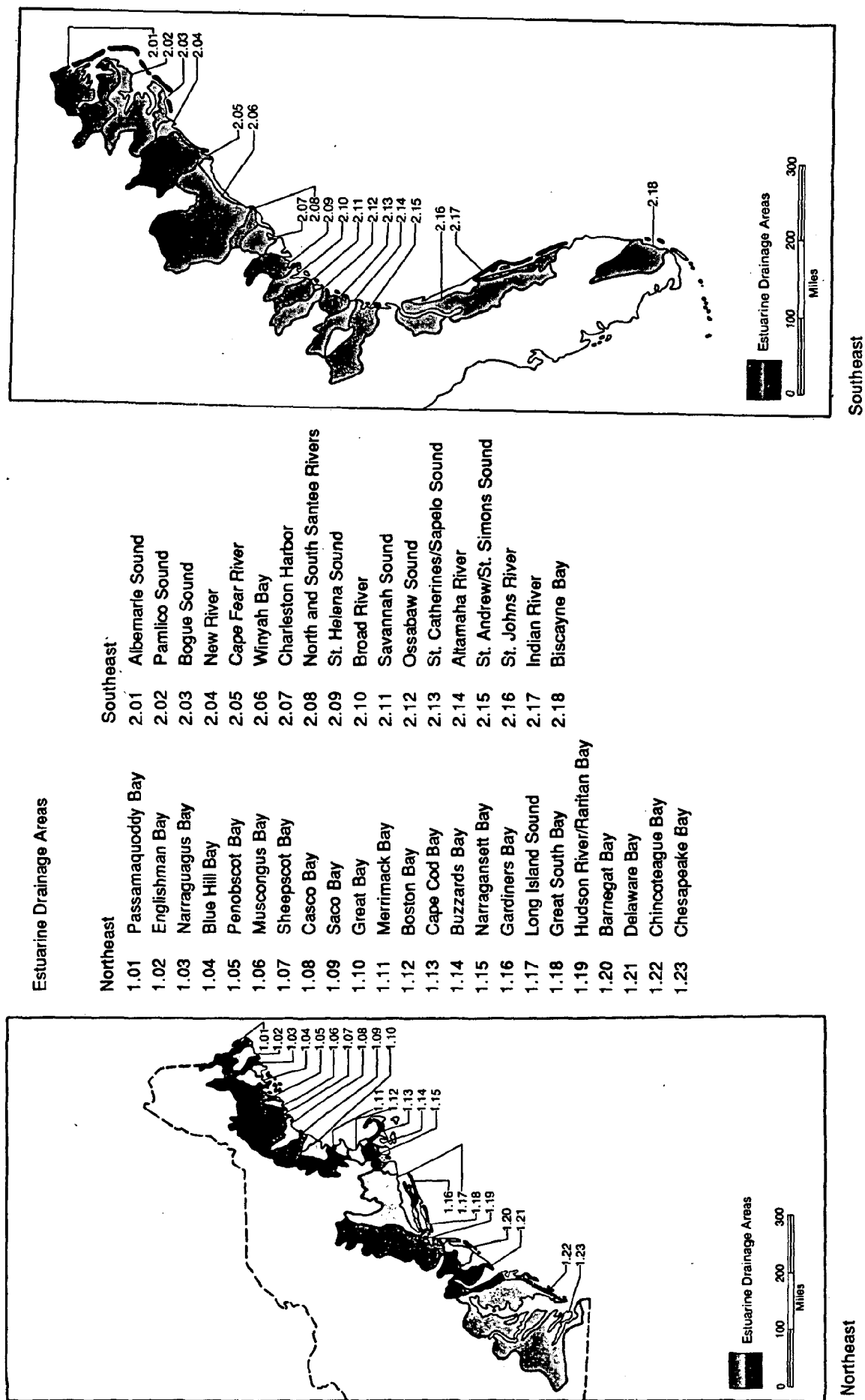
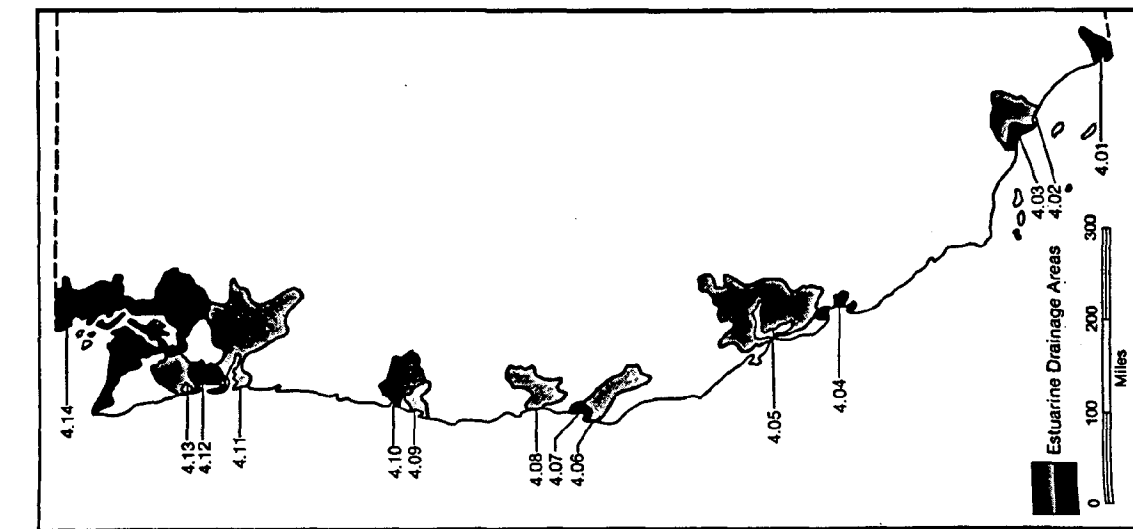


Figure 1. Key to Estuarine Drainage Areas (continued).



West Coast

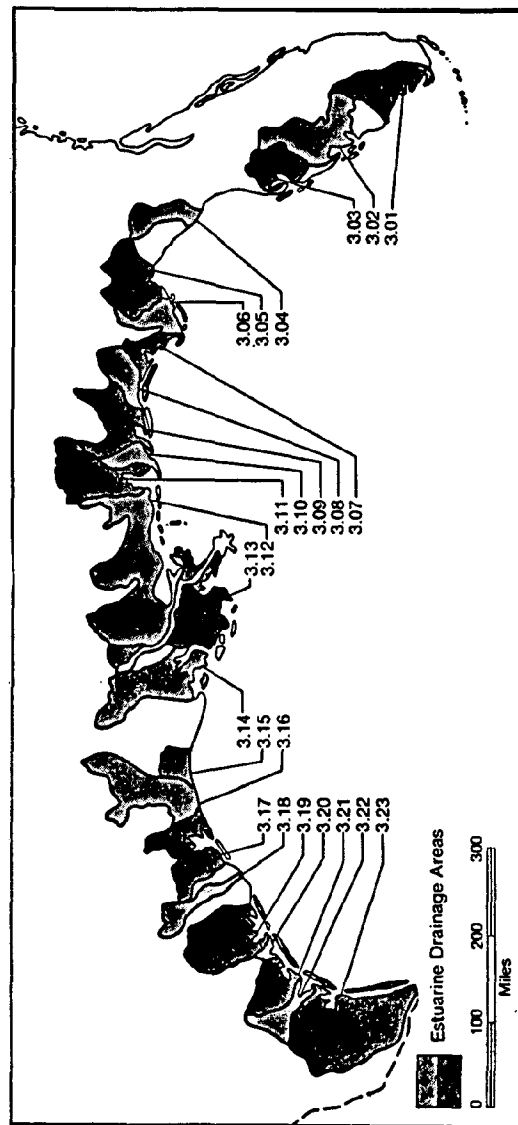
Estuarine Drainage Areas

West Coast

- 4.01 San Diego Bay
- 4.02 San Pedro Bay
- 4.03 Santa Monica Bay
- 4.04 Monterey Bay
- 4.05 San Francisco Bay
- 4.06 Eel River
- 4.07 Humboldt Bay
- 4.08 Klamath River
- 4.09 Coos Bay
- 4.10 Winchester Bay
- 4.11 Columbia River
- 4.12 Willapa Bay
- 4.13 Grays Harbor
- 4.14 Puget Sound

Gulf of Mexico

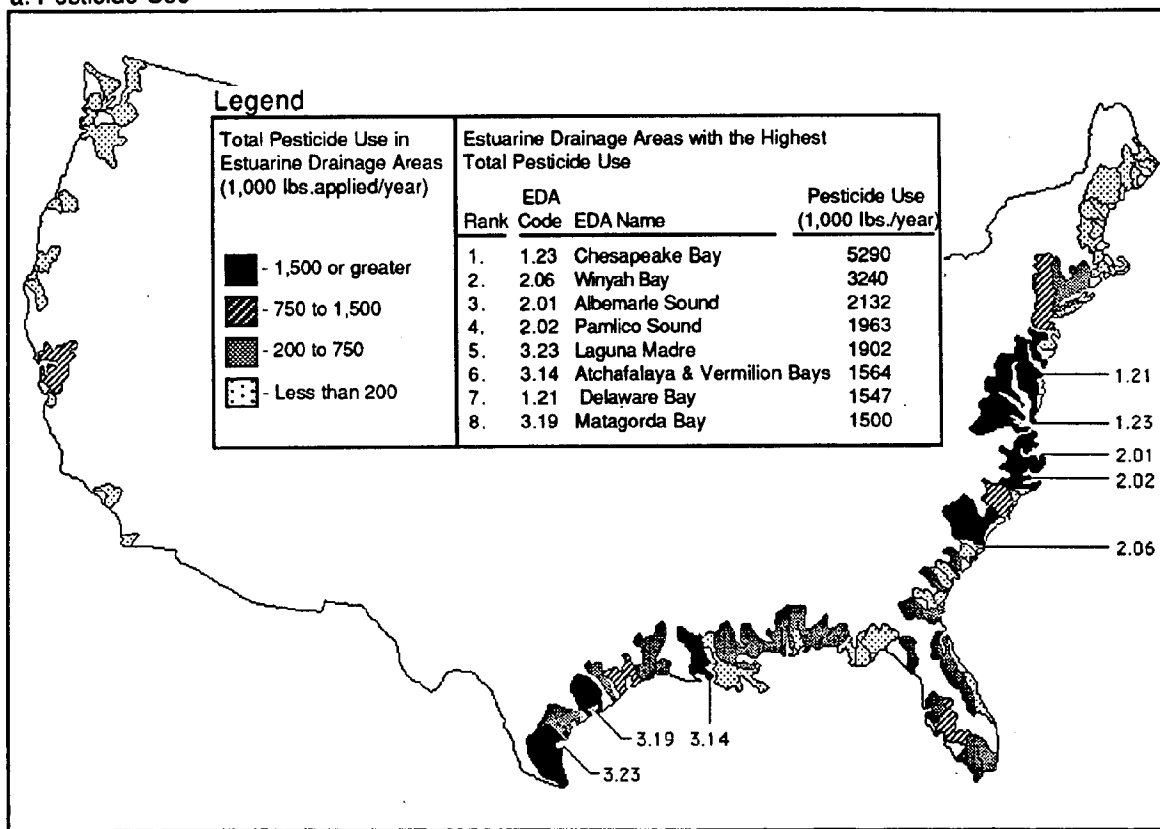
- 3.01 Ten Thousand Islands
- 3.02 Charlotte Harbor
- 3.03 Tampa Bay
- 3.04 Suwannee River
- 3.05 Apalachee Bay
- 3.06 Apalachicola Bay
- 3.07 St. Andrew Bay
- 3.08 Choctawhatchee Bay
- 3.09 Pensacola Bay
- 3.10 Perdido Bay
- 3.11 Mobile Bay
- 3.12 Mississippi Sound
- 3.13 Mississippi Delta Region
- 3.14 Atchafalaya and Vermilion Bays
- 3.15 Calcasieu Lake
- 3.16 Sabine Lake
- 3.17 Galveston Bay
- 3.18 Brazos River
- 3.19 Matagorda Bay
- 3.20 San Antonio Bay
- 3.21 Aransas Bay
- 3.22 Corpus Christi Bay
- 3.23 Laguna Madre



Gulf of Mexico

Figure 2. Use and Toxicity Normalized Use for Selected Agricultural Pesticides in Estuarine Drainage Areas, circa 1982.

a. Pesticide Use



b. Toxicity Normalized Pesticide Use

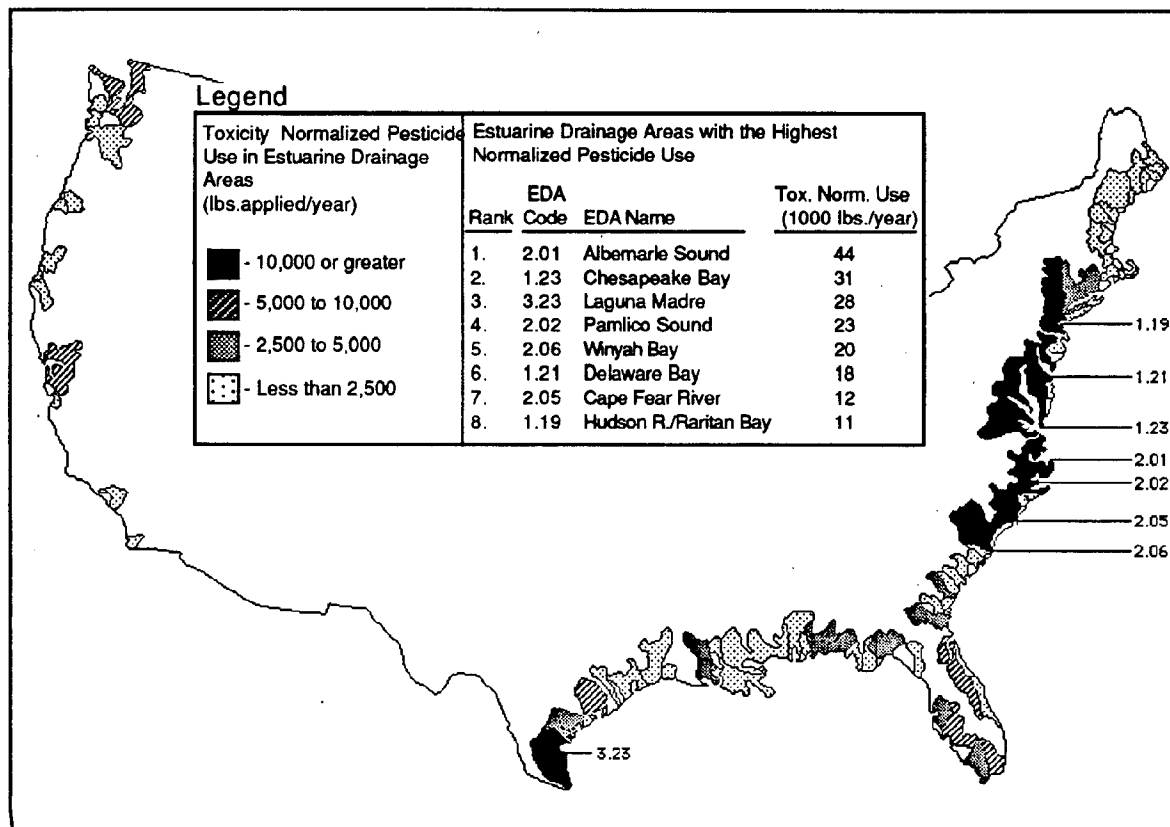
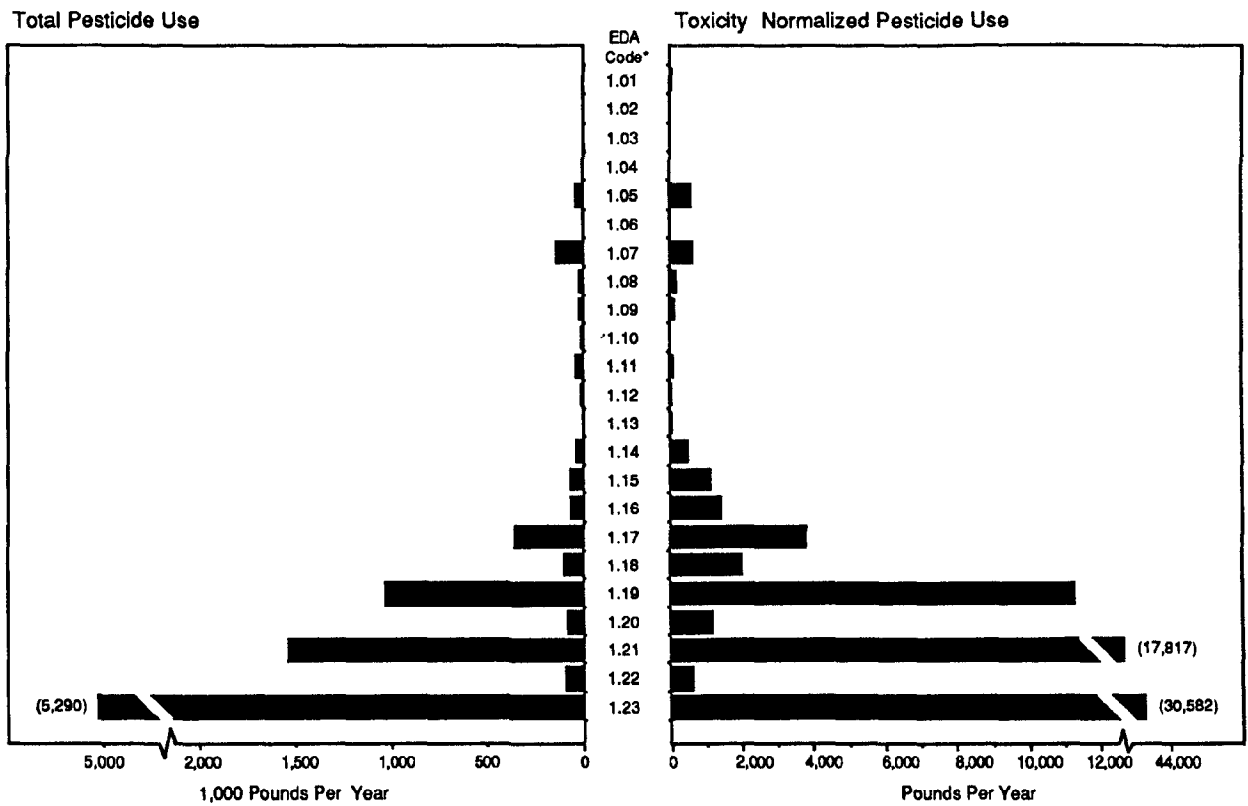
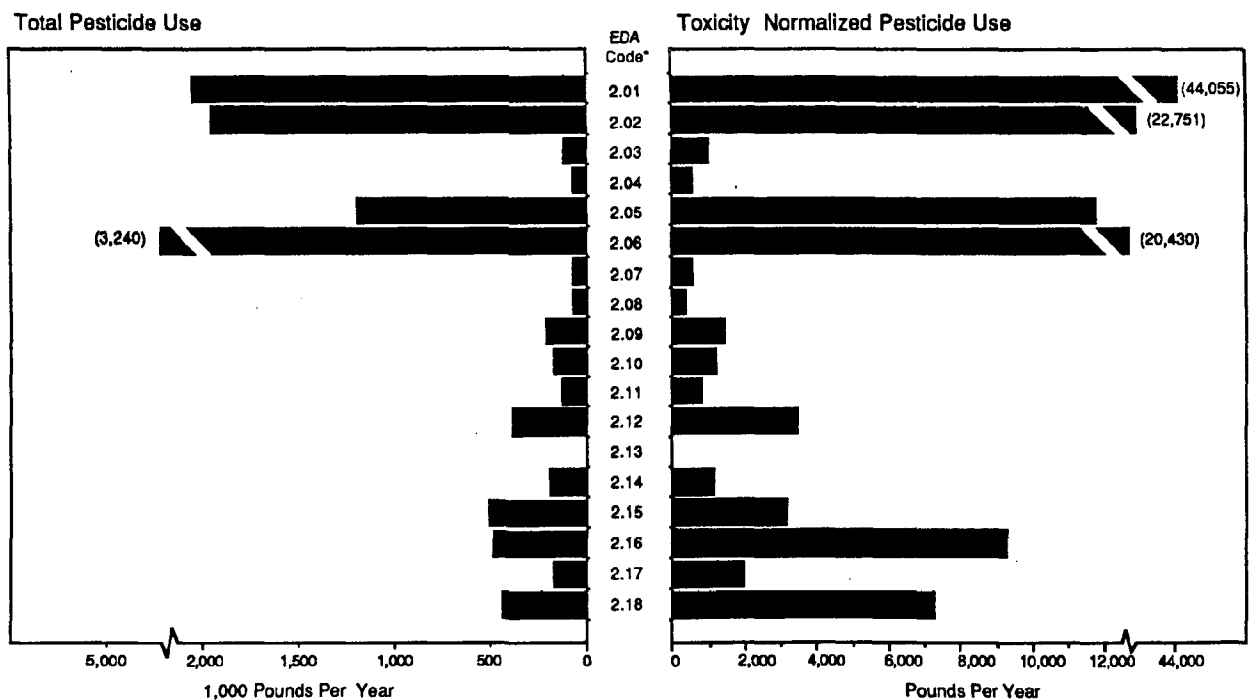


Figure 3. Agricultural Use and Toxicity Normalized Use for 28 Pesticides in Estuarine Drainage Areas, circa 1982.

a. Northeast



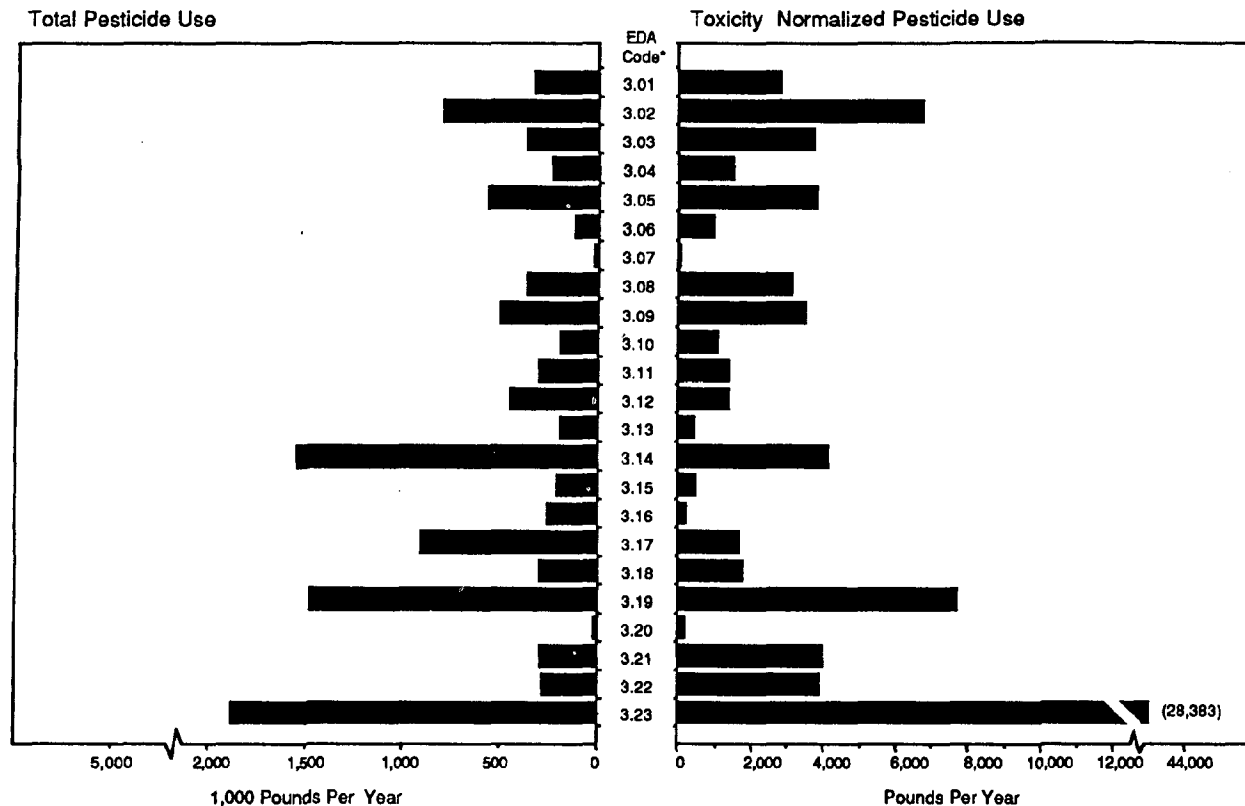
b. Southeast



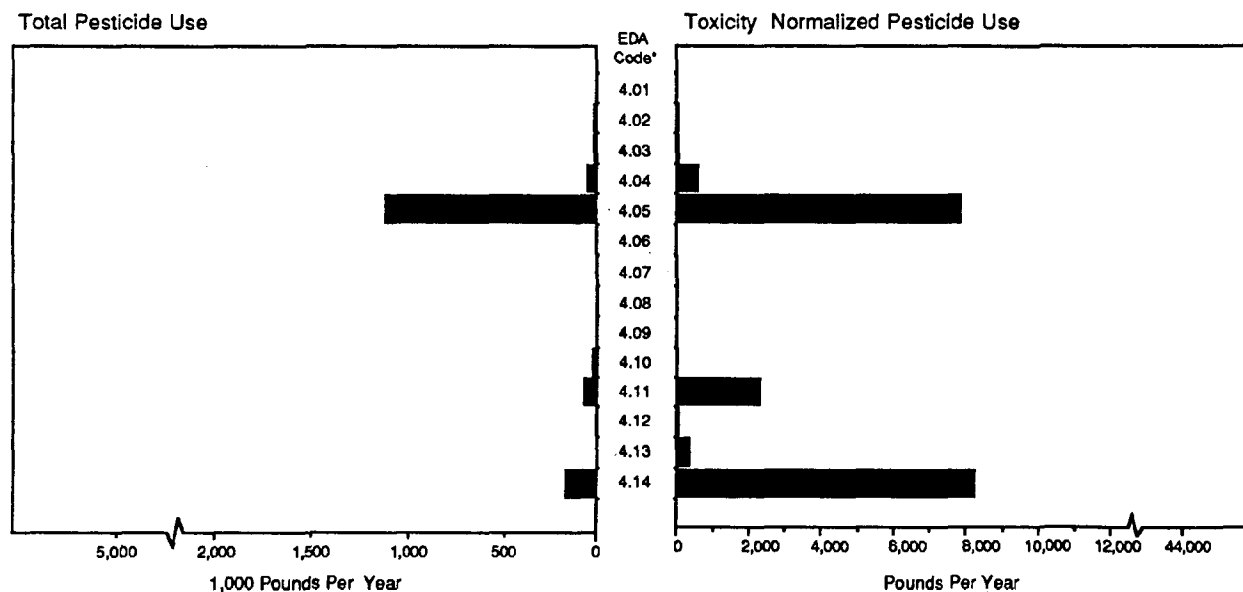
* See Figure 1.

Figure 3. Agricultural Use and Toxicity Normalized Use for 28 Pesticides in Estuarine Drainage Areas, circa 1982 (continued).

c. Gulf of Mexico



d. West Coast



* See Figure 1.

Figure 4. Agricultural Pesticide Use for 28 Pesticides in Estuarine Drainage Areas by Major Crop, circa 1982.

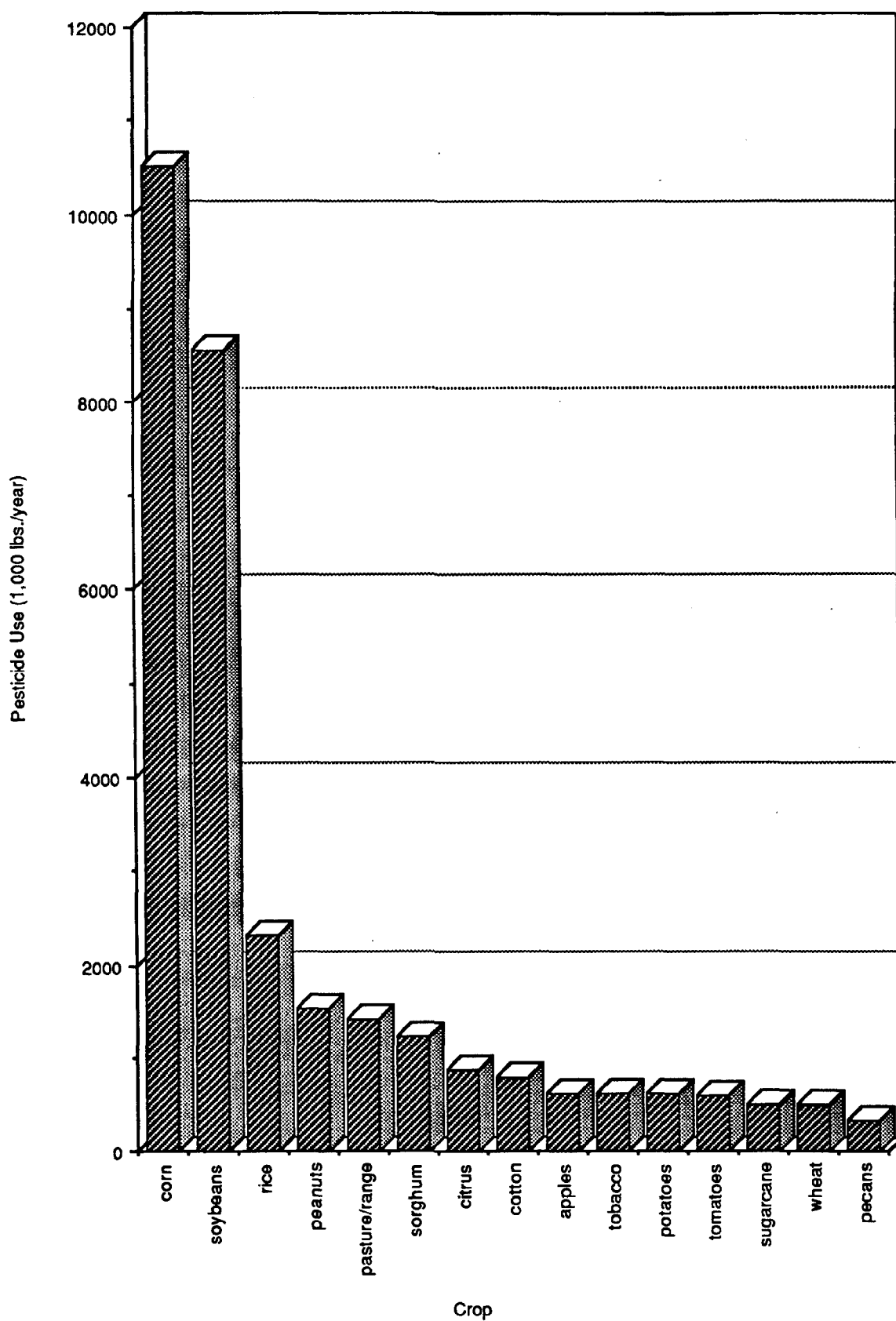
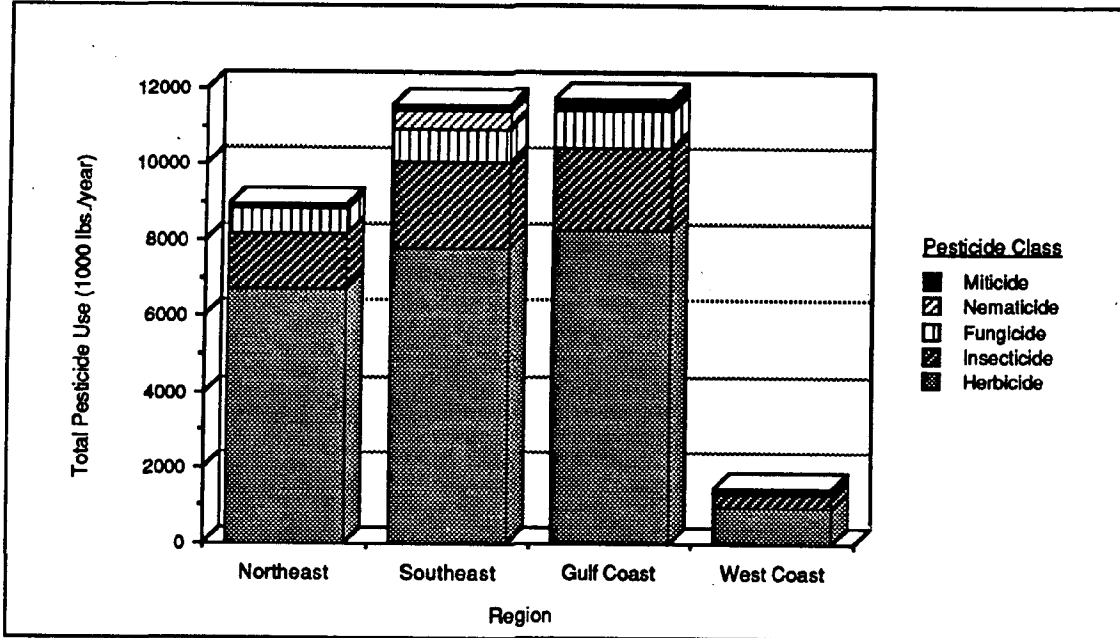


Figure 5. Agricultural Pesticide Use and Toxicity Normalized Use by Pesticide Class and by Coastal Region, circa 1982.

a. Pesticide Use



b. Toxicity Normalized Pesticide Use

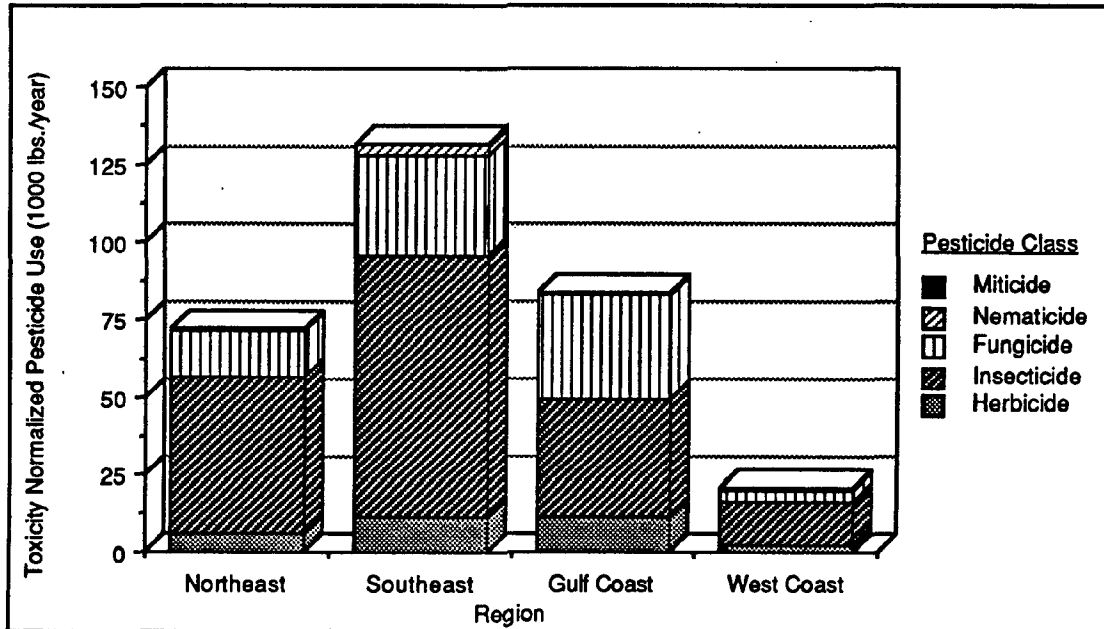


Figure 6. Agricultural Pesticide Use in Estuarine Drainage Areas by Region and by Pesticide Class, circa 1982.

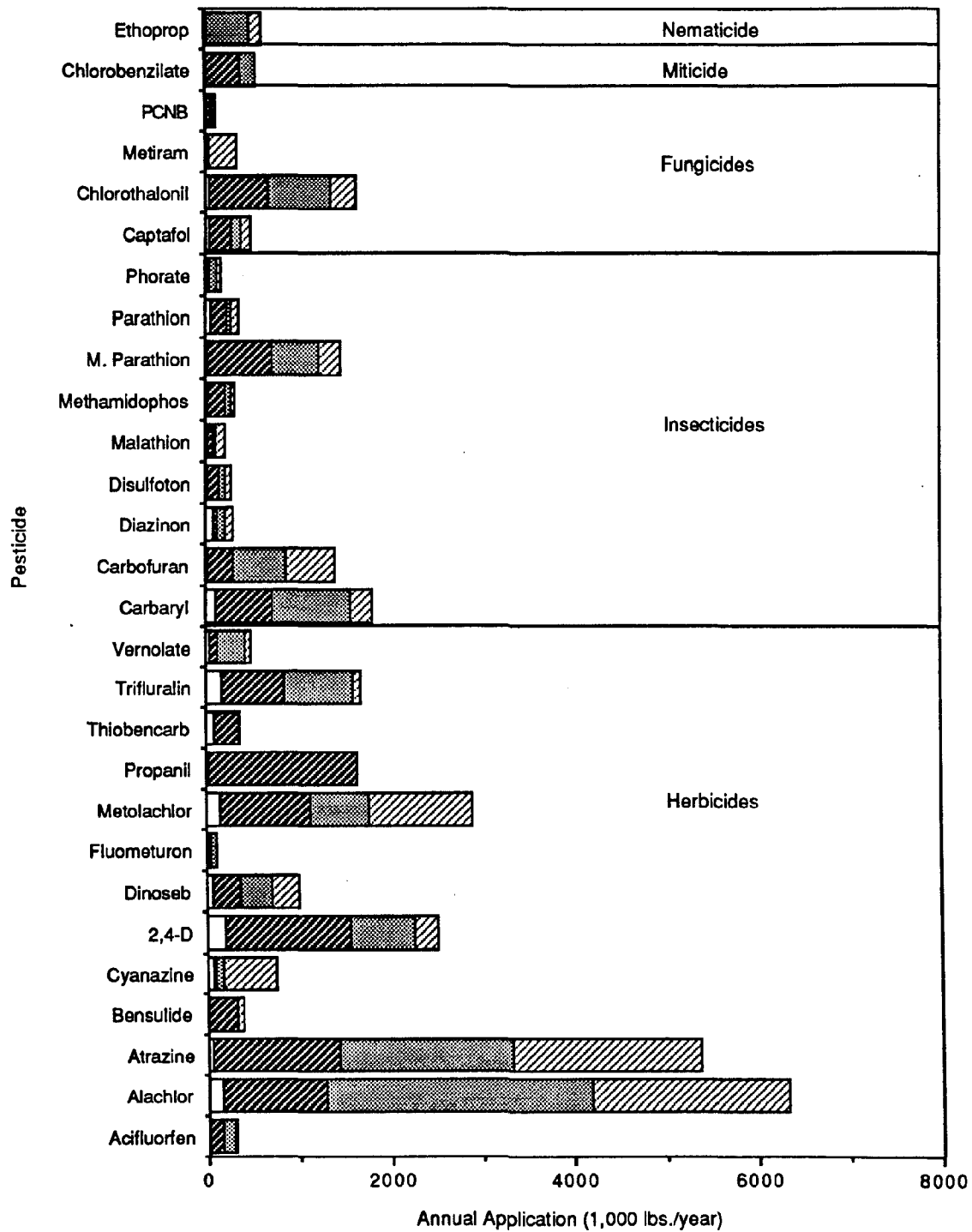


Figure 7. Intensity of Agricultural Pesticide Use for 28 Pesticides in Estuarine Drainage Areas, circa 1982.

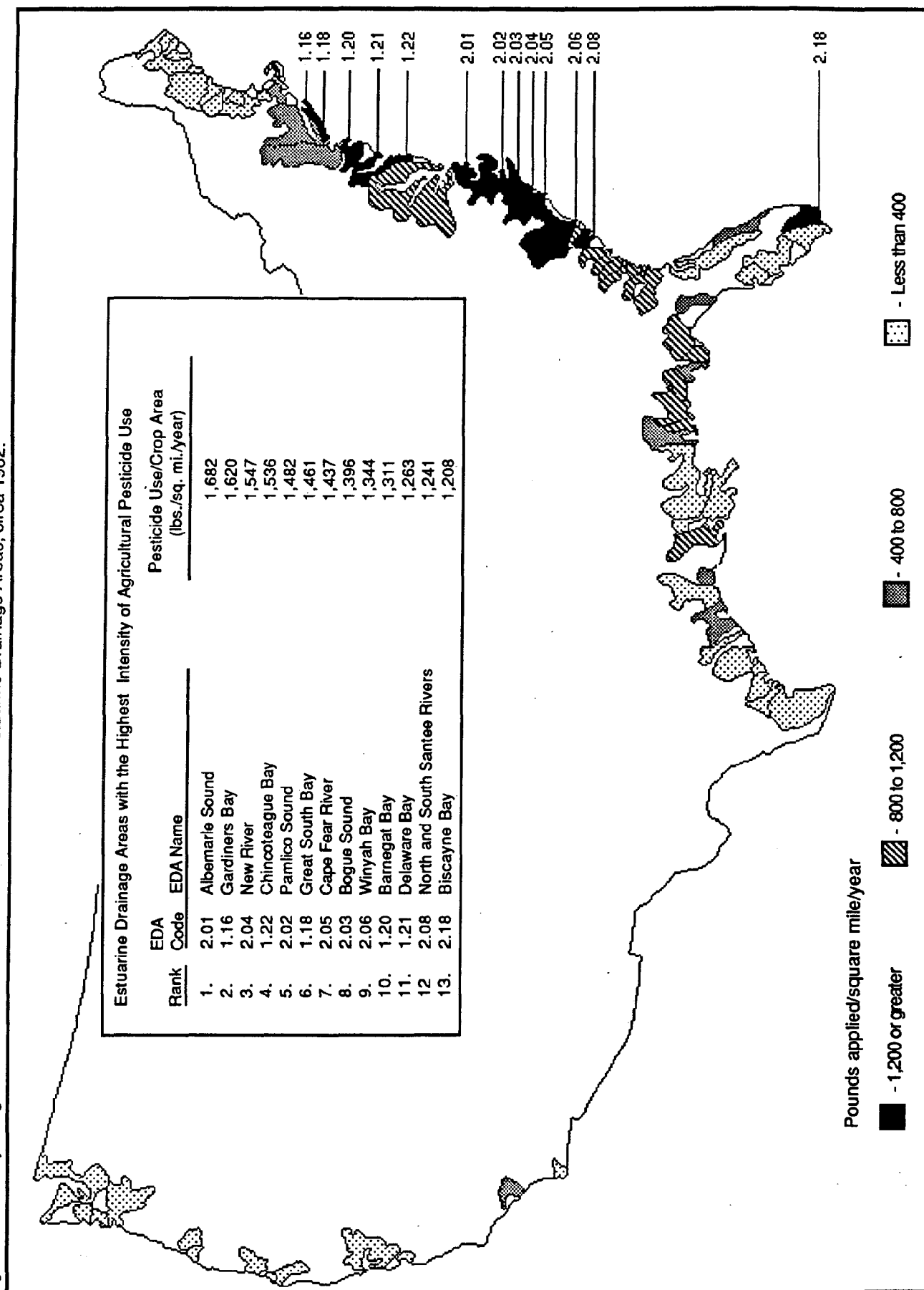


Figure 8. Intensity of Toxicity Normalized Pesticide Use for 28 Pesticides in Estuarine Drainage Areas, circa 1982.

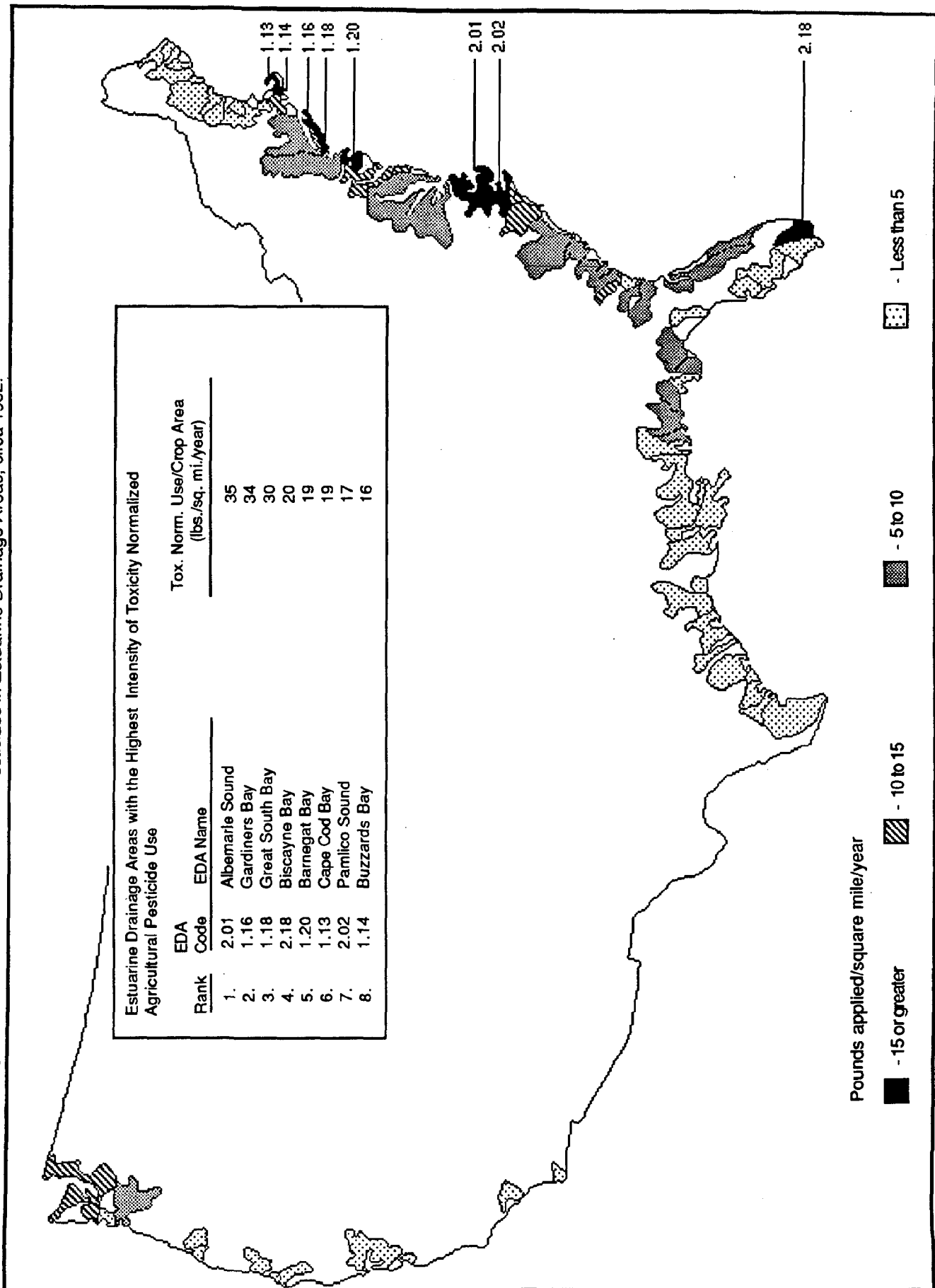
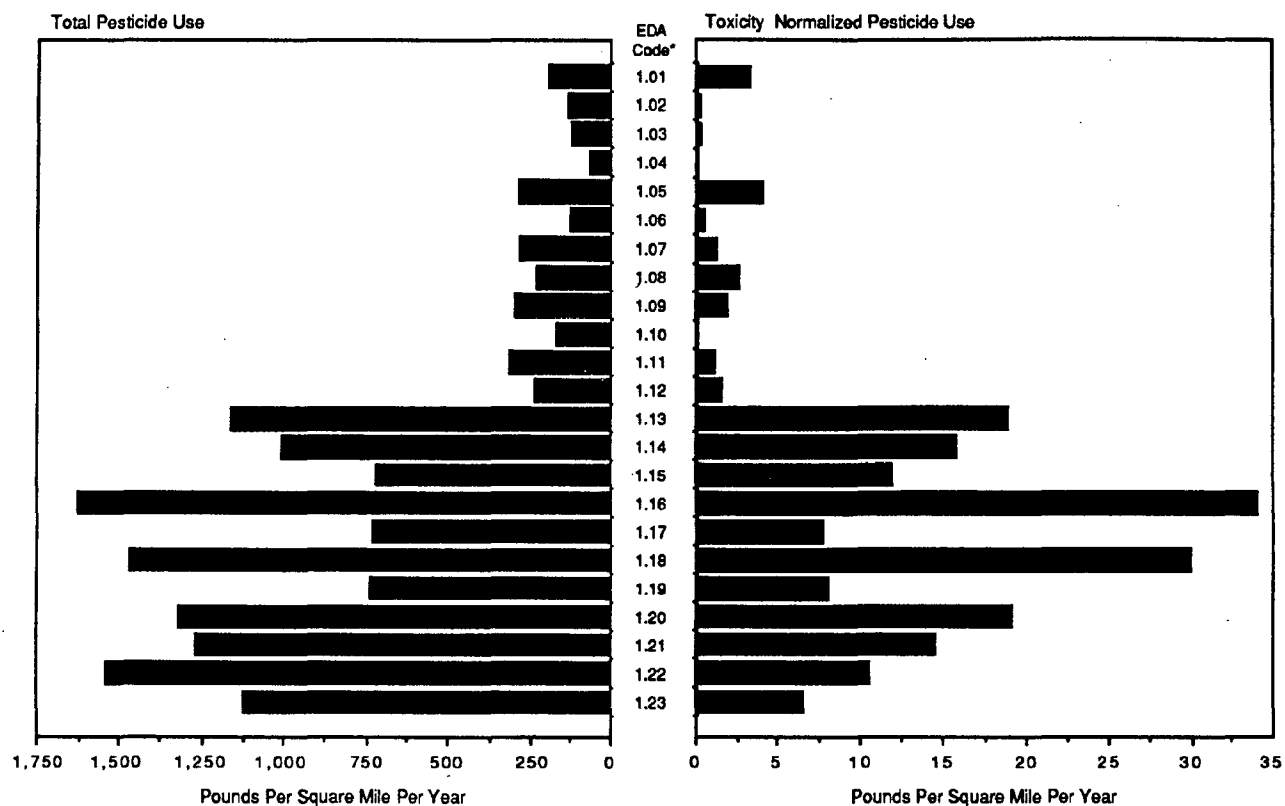
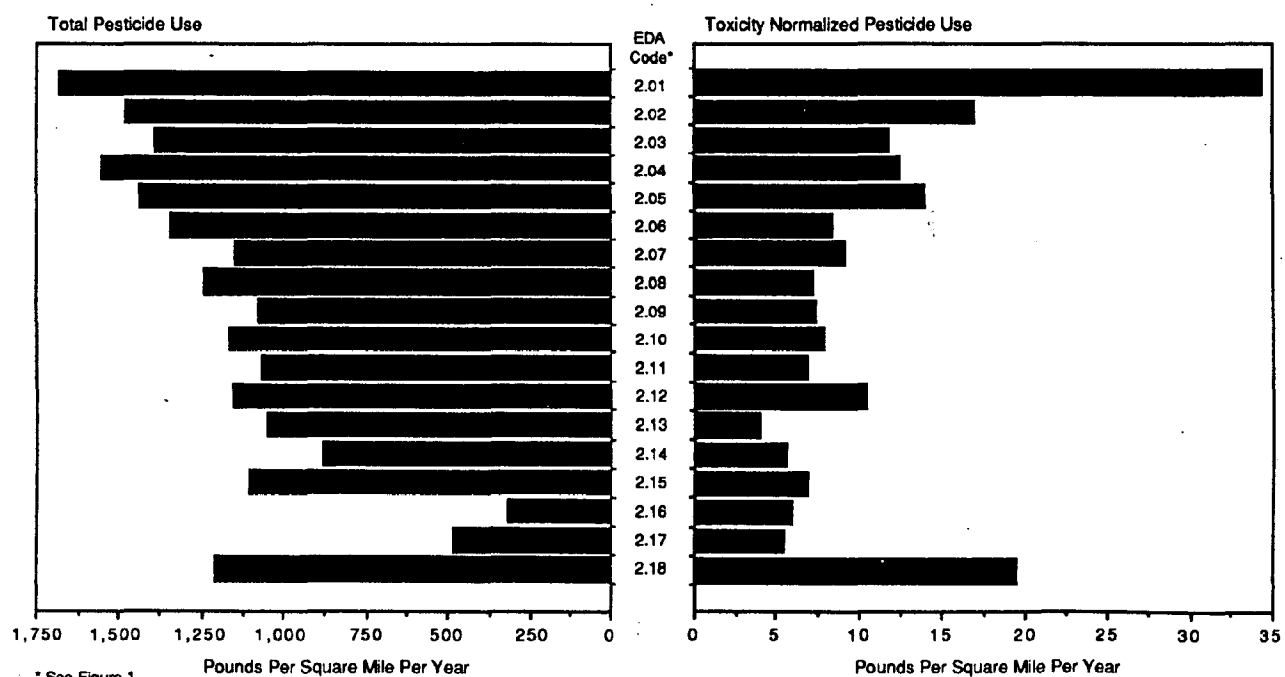


Figure 9. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Estuarine Drainage Area, circa 1982.

a. Northeast



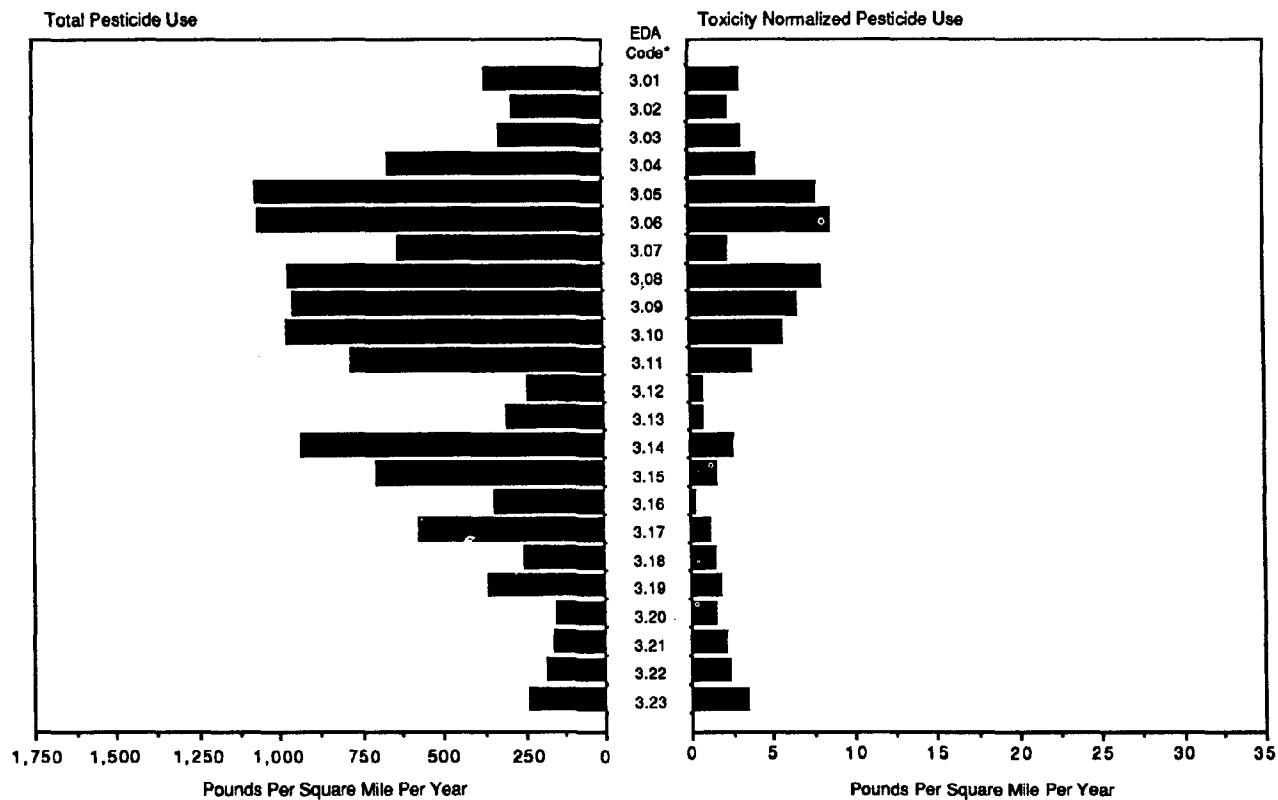
b. Southeast



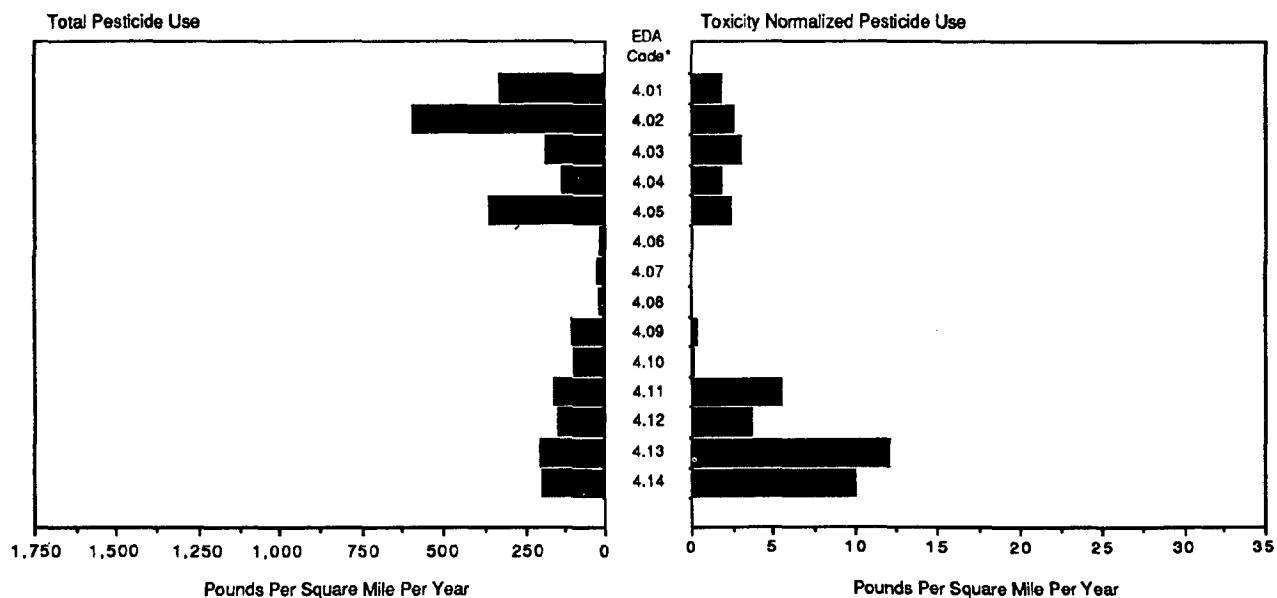
* See Figure 1.

Figure 9. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Estuarine Drainage Area, circa 1982 (continued).

c. Gulf of Mexico



d. West Coast



* See Figure 1.

Table 1. Compounds Included in NOAA's Pesticide Use Data Base.

Pesticide	Pesticide Class	Target Organisms	EPA Classification	Registration Date
Acifluorfen	Herbicide	Pre- and postemergent control of annual grasses and broadleaf weeds	General Use	1978
Alachlor	Herbicide	Preemergent control of annual grasses and broadleaf weeds	General Use	1969
Atrazine	Herbicide	Seasonal control of weeds, mainly in corn and sorghum	General Use	1967
Bensulfide	Herbicide	Preemergent control of annual grasses and broadleaf weeds	General Use	1964
Captafol	Fungicide	Wide range of fruit and vegetable fungi	Voluntarily Cancelled	1962
Carbaryl	Insecticide	Wide range of insect pests on a variety of crops	General Use	1958
Carbofuran	Insecticide	Wide range of insect pests on a variety of crops	Restricted	1969
Chlorobenzilate	Miticide	Citrus mites	Restricted	1953
Chlorothalonil	Fungicide	Wide range of fruit and vegetable fungi	General Use	1966
Cyanazine	Herbicide	Pre- and postemergent control of annual grasses and broadleaf weeds	Restricted	1971
2,4-D	Herbicide	Postemergent control of broadleaf weeds	General Use	1948
Diazinon	Insecticide	Soil insects, pests of fruit and vegetables	General Use	1952
Dinoseb	Herbicide	Weed control in legume fields and orchards	Suspended	1948
Disulfoton	Insecticide	Wide range of insects and mites	Restricted	1958
Ethoprop	Nematicide	Soil mites and insects on a variety of crops	Restricted	1967
Fluometuron	Herbicide	Preemergent control of annual grasses and broadleaf weeds	General Use	1960
Malathion	Insecticide	Wide range of insect pests on a variety of crops	General Use	1956
Methamidophos	Insecticide	Aphids, mites and lepidopterous larvae on vegetables and fruits	Restricted	1980
Methyl parathion	Insecticide	Wide range of insect pests on a variety of crops	Restricted	1954
Metiram	Fungicide	Wide range of fruit and vegetable fungi	General Use	1967
Metolachlor	Herbicide	Pre- and postemergent control of annual grasses and broadleaf weeds	General Use	1976
Parathion	Insecticide	Wide range of insect pests on a variety of crops	Restricted	1948
PCNB	Fungicide	Wide range of fruit, vegetable, and seed fungi	General Use	1972
Phorate	Insecticide	Wide range of insect pests on a variety of crops	Restricted	1959
Propanil	Herbicide	Postemergent control of annual grasses and broadleaf weeds	General Use	1962
Thiobencarb	Herbicide	Pre- and postemergent control of annual grasses and broadleaf weeds	General Use	1984
Trifluralin	Herbicide	Preemergent control of annual grasses and broadleaf weeds	General Use	1963
Vernolate	Herbicide	Weeds in soybeans and peanuts	General Use	1964

Table 2. Crops Included in NOAA's Pesticide Use Data Base.

Field Crops			Orchard Crops
alfalfa	eggplant	rye	almonds
artichokes	garlic	safflower	apples
asparagus	guar	seed crops	apricots
barley	honeydew melons	sod	avocado
beans	hops	sorghum	cherries
beets	hot peppers	soybeans	citrus
blackberries	lettuce	spinach	filberts
blueberries	mint	squash	grapes
broccoli	oats	strawberries	nectarines
Brussels sprouts	okra	sugar beets	peaches
cabbages	onions	sugarcane	pears
cantaloupes	other hay	sweet corn	pecans
carrots	pasture/range	sweet peppers	plums
cauliflower	peanuts	sweet potatoes	
celery	peas	tobacco	
collards	potatoes	tomatoes	
corn	pumpkins	walnuts	
cotton	radishes	watermelons	
cranberries	rice	wheat	
cucumbers			

Table 3. Toxicological Properties of Pesticides in NOAA's Pesticide Use Data Base.

Compound	Environmental Hazard Rating		Aqueous LC50 ^a Concentration (mg/l)	Exposure Time (24 hr 48 hr 96 hr)	Coefficient of Relative Toxicity (CRT)	Bioconcentration Factor (BCF)	Class of Aquatic Life at Risk	Mode of Action	Chronic Toxicity to Aquatic Organisms	Toxicity of Degradation Products	
	Toxic.	Persist. Bloconc.									
Organochlorines											
Chlorobenzilate	■	□	1	(42)	●	1.30E-03 ^d	188 ^b	aquatic invertebrates (63)	neural inhibitor (80)	carcinogen (45) ^c	NF
PCNB	■	■	0.88	(47)	●	1.48E-03	260-590 (51)	NF	depressed growth (81) ^c carcinogen (45) ^c		NF
Organophosphates											
Bensulfide	■	□	0.32	(42)	●	4.08E-03	100 (31)	fish (63)	unknown (86)	low (45)	NF
Diazinon	■	□	1.5	(42)	●	8.67E-04	18-150 (46)	fish and aquatic invertebrates (68)	AChE inhibitor (19)	low (45)	low (45)
Disulfoton	■	□	0.52	(42)	●	2.50E-03	100 (31)	NF	AChE inhibitor (19)	low (45)	high (76)
Ethoprop	■	□	0.18	(42)	●	7.22E-03	15 ^b	fish and aquatic invertebrates (71)	AChE inhibitor (19)	low (45)	low (71)
Malathion	■	□	0.32	(42)	●	4.08E-03	37 (31)	NF	AChE inhibitor (19)	low (45)	low (4)
Methamidophos	□	□	34	(63)	●	3.82E-05	no accum. ^b	aquatic invertebrates (63)	AChE inhibitor (19)	low (45)	low (45)
Methyl parathion	■	□	>0.8	(42)	●	8.13E-04	71 (11)	aquatic invertebrates (69)	AChE inhibitor (19)	possible neural damage (89)	high (45)
Parathion	■	□	0.036	(42)	●	3.61E-02	340 (6)	fish and aquatic invertebrates (70)	AChE inhibitor (19)	possible neural damage (70) suspected carcinogen (70) ^c	low (45)
Phorate	■	□	0.0013	(42)	●	1.00E+00	68 ^b	NF	AChE inhibitor (19)	low (45)	low (45)
Carbamates											
Carbaryl	■	□	1.6	(42)	●	8.13E-04	140 (13)	fish and aquatic invertebrates (77)	AChE inhibitor (45)	low (50)	high (6)
Carbofuran	■	□	>0.1	(42)	●	6.50E-03	21 (31)	fish and aquatic invertebrates (78)	AChE inhibitor (45)	low (50)	low (75)
Thiobencarb	■	□	1.4	(42)	●	9.29E-04	450 - 470 (46)	aquatic invertebrates (63)	plant enzyme inhibitor (63)	depressed growth (63)	NF
Vernolate	■	□	>1	(42)	●	6.50E-04	50 ^b	fish (63)	preemergent enzyme inhibitor (16)	low (50)	low (63)
Abbreviations: AChE, acetylcholinesterase; NF, not found											
^a estuarine and freshwater fish; ^b laboratory animal results; ^c calculated from Kenaga (1980); ^d scientific notation, 1.30 x 10 ⁻³											
() = citation, see References											
continued...											

Abbreviations: AChE, acetylcholinesterase; NF, not found
^a estuarine and freshwater fish; ^b calculated from Kenaga (1980); ^c laboratory animal results; ^d scientific notation, 1.30 x 10⁻³
 () = citation, see References

continued...

Table 3. Toxicological Properties of Pesticides in NOAA's Pesticide Use Data Base (continued).

Compound	Environmental Hazard Rating		Aqueous LC50 ^a		Coefficient of Relative Toxicity (CRT)	Bioconcentration Factor (BCF)	Class of Aquatic Life at Risk	Mode of Action	Chronic Toxicity to Aquatic Organisms	Toxicity of Degradation Products	
	Toxic.	Persist.	Bloconc.	Concentration (mg/l)							Exposure Time (24 hr 48 hr 96 hr)
Chloroacetamides											
Alachlor	■	□	□	4.3 (43)	●	50 (8)	NF	protein synthesis inhibitor (28)	suspected carcinogen (72) ^c	NF	
Metolachlor	■	□	□	8 (43)	●	7 (14)	low toxicity to aquatic organisms (64)	protein synthesis inhibitor (28)	suspected carcinogen (64) ^c	NF	
Triazines											
Atrazine	■	■	□	>1 (42)	●	3-10 (82)	low toxicity to aquatic animals, toxic to aquatic plants (23)	photosynthesis inhibitor (15)	low (35)	NF	
Cyanazine	□	□	□	16 (43)	●	10-34 (31)	low toxicity to aquatic organisms (79)	photosynthesis inhibitor (15)	suspected teratogen (12) ^c	low (79)	
Chlorinated phenoxy compounds											
2,4-D	□	□	□	180 (43)	●	1 (47)	NF	plant growth regulator (38)	depressed growth (23)	NF	
Acifluorfen	□	□	□	31 (63)	●	<1 (6)	NF	plant growth regulator (38)	NF	NF	
Other											
Captafol (phthalimide)	■	□	■	0.032 (42)	●	500 (31)	fish and aquatic invertebrates (17)	NF	suspected carcinogen (12) ^c	NF	
Chlorothalonil (isophthalate)	■	□	■	0.032 (42)	●	260 (74)	fish and aquatic invertebrates (67)	NF	reduced fecundity (74) ^c suspected carcinogen (67)	high (67)	
Dinoseb (nitrophenol)	■	□	□	0.16 (43)	●	62 (8)	fish and aquatic invertebrates (63)	plant enzyme inhibitor (29)	suspected teratogen (12) ^c	NF	
Flumeturon (phenylurea)	□	□	□	43 (43)	●	50 ^b	NF	photosynthesis inhibitor (21)	NF	NF	
Metiram (dithiocarbamate)	□	■	■	32 (58)	●	NF	NF	NF	NF	NF	
Propanil (amide)	□	□	□	18 (43)	●	22 ^b	NF	plant enzyme inhibitor (29)	NF	NF	
Trifluralin (dinitroaniline)	■	■	■	0.16 (42)	●	930 (20)	fish and aquatic invertebrates (6)	plant enzyme inhibitor (53)	low (45)	low (45)	

Abbreviations: AChE, acetylcholinesterase; NF, not found

■ low ■ moderate ■ high

^a estuarine and freshwater fish; ^b calculated from Kenaga (1980); ^c laboratory animal results; ^d scientific notation, 3.02 x 10⁻⁴

() - citation, see References

Table 4. Major Crops Grown in Estuarine Drainage Areas, by Coastal Region.

a. Crops Grown in Northeast Estuarine Drainage Areas.

Estuary	Crops														
	Alfalfa	Apples	Beans	Blueberries	Barley	Cabbage	Corn	Cranberries	Hay	Peaches	Potatoes	Soybeans	Squash	Sweet Corn	Wheat
Passamaquoddy Bay	○			●			○		○		○				
Englishman Bay	○		○	●					○		○				
Narraguagus Bay	○		○	●					○		○				
Blue Hill Bay	○	○		●			○		○						
Penobscot Bay	○			○			○		●		○				
Muscongus Bay	○	○		○			○		●						
Sheepscot Bay	○	○					○		●		○				
Casco Bay	○	○					○		●		○				
Saco Bay	○	○					○		●		○				
Great Bay	○	○	○				○		●						
Merrimack River	○	○					○		●					○	
Boston Bay	●	○					○						○	○	
Cape Cod Bay	○						○	●					○	○	
Buzzards Bay	○						○	○					○	○	
Narragansett Bay	○						○	○	○		○				
Gardiners Bay						○	○				○			○	○
Long Island Sound	○	○					○		○		○				
Great South Bay						○	○				○			○	○
Hudson River/Raritan Bay	○	○					○		○			○			
Barnegat Bay							○			○		○		○	○
Delaware Bay	○						○		○			○			○
Chincoteague Bay					○		○				○	○			○
Chesapeake Bay	○				○		●					○			○

b. Crops Grown in Southeast Estuarine Drainage Areas.

Estuary	Crops											
	Beans	Cabbage	Citrus	Corn	Cotton	Hay	Peanuts	Potatoes	Soybeans	Sugar Cane	Sweet Corn	Tobacco
Albemarle Sound				○	○		○		●			
Pamlico Sound				○			○		●			
Bogue Sound				○				○	○			○
New River				●		○			○			○
Cape Fear River				○		○			○			○
Winyah Bay				○	○				○			○
Charleston Harbor				○		○			○			
North and South Santee Rivers				○		○			○			○
St. Helena Sound				○		○			○			
Broad River				○		○			○			○
Savannah Sound				○		○	○		○			
Ossabaw Sound				○		○	○		○			
St. Catherine's/Sapelo Sound				○		○	○		○			○
Altamaha River				○		○			○			
St. Andrew/St. Simons Sound				○		○			○			○
St. Johns River		○	○	○		○		○				
Indian River			○	○		○						
Biscayne Bay	○		○	○						○	○	

● = Dominant crop by acreage in EDA
○ = Important crop by acreage in EDA

Table 4. Major Crops Grown in Estuarine Drainage Areas, by Coastal Region (continued).

c. Crops Grown in Gulf of Mexico Estuarine Drainage Areas.

Estuary	Crops															
	Alfalfa	Beans	Citrus	Corn	Cotton	Hay	Peanuts	Peas	Pecans	Potatoes	Rice	Sorghum	Soybeans	Squash	Strawberries	Sugar Cane
Ten Thousand Islands			○			○										○
Charlotte Harbor			●			○								○		○
Tampa Bay		○	●			○									○	○
Suwannee River				●		○		○					○			
Apalachee Bay				●		○	○						○			○
Apalachicola Bay				○		○	○						○			○
St. Andrew Bay				○		○	○						○			○
Choctawhatchee Bay				○		○	○						○			○
Pensacola Bay				○	○	○							○			○
Perdido Bay				○		○				○			○			○
Mobile Bay				○		○			○				○			○
Mississippi Sound				○		○							○			○
Mississippi Delta Region						○			○				○			○
Atchafalaya and Vermilion Bays						○					○		○			○
Calcasieu Lake	○					○							○			○
Sabine Lake				○		○					○		○			○
Galveston Bay				○		○					○	○	○			○
Brazos River				○	○	○					○	○	○			○
Matagorda Bay				○		○					○	○	○			○
San Antonio Bay				○	○	○					○	○	○			○
Aransas Bay				○	○	○						○	○			○
Corpus Christi Bay				○	○	○						○	○			○
Laguna Madre				○	○	○						○	○			○

d. Crops Grown in West Coast Estuarine Drainage Areas.

Estuary	Crops															
	Alfalfa	Apples	Barley	Beans	Broccoli	Citrus	Corn	Cranberries	Grapes	Hay	Peas	Potatoes	Rice	Strawberries	Sweet Corn	Tomatoes
San Diego Bay			○			○			○					○		○
San Pedro Bay	●		○			○								○		○
Santa Monica Bay	●		○		○											○
Monterey Bay	○		●		○				○							○
San Francisco Bay							●		○				○			○
Eel River	●	○	○				○					○				○
Humboldt Bay	●		○				○					○			○	
Klamath River	●		○				○				○	○			○	
Coos Bay	○		○				○			●						○
Winchester Bay	○	○					○			●						○
Columbia River	○		○				○			●						○
Willapa Bay	○						○	●			○	○				○
Grays Harbor	○		○				○				○					○
Puget Sound	○		○				○				○					○

● = Dominant crop by acreage in EDA
○ = Important crop by acreage in EDA

Table 5. Ranking of Selected Pesticide Use and Land Use Characteristics in Estuarine Drainage Areas.

a. Pesticide Use in EDAs

Rank	Estuarine Drainage Area	Pesticide Use (lbs./year)
1	Chesapeake Bay	5,290,000
2	Winyah Bay	3,240,000
3	Albemarle Sound	2,133,000
4	Pamlico Sound	1,963,000
5	Laguna Madre	1,902,000
6	Atchafalaya & Vermilion Bays	1,564,000
7	Delaware Bay	1,547,000
8	Matagorda Bay	1,500,000
9	Cape Fear River	1,202,000
10	San Francisco Bay	1,104,000

b. Toxicity Normalized Use in EDAs

Rank	Estuarine Drainage Area	Tox. Norm. Use (lbs./year)
1	Albemarle Sound	44,060
2	Chesapeake Bay	30,580
3	Laguna Madre	28,380
4	Pamlico Sound	22,750
5	Winyah Bay	20,430
6	Delaware Bay	17,820
7	Cape Fear River	11,770
8	Hudson River/Raritan Bay	11,290
9	St. John's River	9,281
10	Puget Sound	8,209

c. Pesticide Use Per Unit of Cropland

Rank	Estuarine Drainage Area	Pesticide Use/Area (lbs./sq. mi./year)
1	Albemarle Sound	1,682
2	Gardiners Bay	1,620
3	New River	1,547
4	Chincoteague Bay	1,536
5	Pamlico Sound	1,482
6	Great South Bay	1,461
7	Cape Fear River	1,437
8	Bogue Sound	1,396
9	Winyah Bay	1,344
10	Barnegat Bay	1,311

d. Toxicity Normalized Use Per Unit of Cropland

Rank	Estuarine Drainage Area	Tox. Norm. Use/Area (lbs./sq. mi./year)
1	Albemarle Sound	35
2	Gardiners Bay	34
3	Great South Bay	30
4	Biscayne Bay	20
5	Barnegat Bay	19
6	Cape Cod Bay	19
7	Pamlico Sound	17
8	Buzzards Bay	16
9	Delaware Bay	15
10	Cape Fear River	14

e. Total Area of Crops in EDAs

Rank	Crop	Total Land (sq. mi.)
1	soybeans	7,012
2	corn	5,053
3	sorghum	2,327
4	wheat	2,044
5	hay	1,394
6	rice	879
7	citrus	808
8	cotton	798
9	sugarcane	548
10	alfalfa	499

f. Percent Agricultural Land in EDAs

Rank	Estuarine Drainage Area	% Agricultural Land
1	Brazos River	75
2	Matagorda Bay	66
3	Galveston Bay	52
4	Corpus Christi Bay	47
5	Atchafalaya/Vermilion Bays	43
6	Delaware Bay	42
7	Tampa Bay	40
8	San Francisco Bay	40
9	Calcasieu Lake	38
10	Charlotte Harbor	36

g. Total Land Area of the EDAs

Rank	Estuarine Drainage Area	Area (sq. mi.)
1	Puget Sound	27,660
2	Chesapeake Bay	17,690
3	Laguna Madre	10,520
4	Mississippi Sound	9,951
5	Winyah Bay	9,560
6	Hudson R./Raritan Bay	7,869
7	San Francisco Bay	6,110
8	St. Johns River	5,910
9	Sheepscot Bay	5,838
10	Mississippi Delta Region	5,703

h. Fluvial Drainage Area of the EDAs

Rank	Estuarine Drainage Area	Fluvial Drainage Area (sq. mi.)
1	Mississippi Delta Region	1,129,800
2	Columbia River	252,030
3	Atchafalaya & Vermilion Bays	92,600
4	Chesapeake Bay	47,330
5	Matagorda Bay	44,400
6	San Francisco Bay	44,150
7	Brazos River	44,050
8	Mobile Bay	39,730
9	Galveston Bay	20,040
10	Apalachicola Bay	17,980

Appendices

- Appendix A. Common/Trade Names of Pesticides in NOAA 's Pesticide Use Data Base
- Appendix B. Pesticide Use Estimation Methodologies
- Appendix C. Physical Properties of Pesticides in NOAA's Pesticide Use Data Base
- Appendix D. Environmental Hazard Rating System (EHRS)
- Appendix E. Pesticides Applied to Selected Crops in NOAA's Pesticide Use Data Base
- Appendix F. Area of Crops in Estuarine Drainage Areas
- Appendix G. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Estuarine Drainage Area
- Appendix H. Average Annual Pesticide Application Rates by Crop by State
- Appendix I. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area
- Appendix J. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area



Appendix A. Common/Trade Names of Pesticides in NOAA's Pesticide Use Data Base

Pesticide	Common/Trade Names
Acifluorfen	Blazer*, Tackle*
Alachlor	Alanex*, Pillarzo, Lasso*
Atrazine	AAtrex*
Bensulide	Betasan*, Prefar*
Captafol	Difolatan*
Carbaryl	Carbamine, Sevin*
Carbofuran	Furadan*, Yaltox*
Chlorobenzilate	Acaraben*, Akar*, Benzilan*
Chlorothalonil	Bravo*, Daconil
Cyanazine	Bladex*, Fortrol
2,4-D	Agrotect*, Chloroxone*, Salvo*, Weed Tox
Diazinon	Diagran, Diazide*, Gardentox*, Spectracide*
Dinoseb	DNBP, Dinitro, Vertac*
Disulfoton	Di-Syston*, Solvirex*
Ethoprop	Ethoprophos, Mocap*
Fluometuron	Cotoran*, Cottonex*, Lanex*
Malathion	Cythion*, For-Mal*
Methamidophos	Monitor*, Pillaron*, Tamaron*
Methyl parathion	Folidol*, Gearphos*, Metacide*
Metiram	Carbatene*, Polyram*
Metolachlor	Bicep*, Codal*, Dual*, Primagram*
Parathion	Bladan*, Ethyl Parathion, Thiophos*, Paraphos*, Phoskil*
PCNB	Avicol*, Earthcide*, Quintozine, Terraclor*
Phorate	Agrimet*, Granutox*, Rampart*, Thimet*
Propanil	Drexel, Prop-Job* 3,4, Propanex*, Riselect*
Thiobencarb	Benthiocarb, Bolero*, Saturn*, Saturno*
Trifluralin	Digermis*, Ipersan*, Trellan*, Triflurex*
Vernolate	Surpass*, Vernam*

* Trade Name

Appendix B. Pesticide Use Estimation Methodologies

Source of Pesticide Use Estimates. The pesticide use estimates are part of the National Pesticide Use Inventory (NPUI) data base created by Leonard Gianessi of Resources for the Future (RFF). This data base was developed by RFF to provide information regarding the types and amounts of pesticides used in the country. Gianessi (1987) has noted that there is not a comprehensive set of pesticide use estimates for the country, and that none is under development either at the federal or state level. The NPUI data base does not contain actual pesticide use data with the exception of restricted use compounds in California. Instead, the data base contains estimates of use for 184 pesticides in the contiguous United States, circa 1982. For this project, pesticide use information was obtained for 28 of these active ingredients on 71 crops, in the coastal counties in NOAA's National Estuarine Inventory. RFF made estimates for each of the 28 pesticides only when the pesticide was estimated to be used on more than 1 percent of the acreage for a crop surveyed in a state.

The estimates are based on information taken from the 1982 Crop and Livestock Pesticide Usage Survey published by the U.S. Department of Agriculture, Economic Research Service (USDA/ERS), the 1982 Census of Agriculture published by the U.S. Department of Commerce, The Pesticide Use Report Annual published by the California Department of Food and Agriculture, and various other state data bases and information provided by local agricultural extension agents. The basic algorithm for each crop/pesticide combination is:

$$\begin{array}{ccccccc} \text{acres of crop} & \times & \text{percent of crop} & \times & \text{pounds/acre/year} & = & \text{yearly pesticide} \\ \text{in county} & & \text{receiving pesticide} & & \text{of active ingredient} & & \text{use for crop} \\ & & \text{application} & & \text{applied to crop} & & \text{in county} \end{array}$$

Information on the acres of crop in a particular county was obtained primarily from the 1982 Census of Agriculture. The Bureau of the Census performs this survey every five years to provide a statistical picture of the Nation's agricultural activities.

The percent of crop receiving pesticide application and the average annual application rates were gathered from a variety of sources. A primary source of information for both coefficients was the USDA/ERS 1982 Crop and Livestock Usage Survey. State reports and state extension personnel were also used to confirm the coefficients. If the ERS estimates were in rough agreement with the various state sources, the ERS estimates were retained. If however, the two sets of estimates were markedly different, the state estimates were used. California pesticide use estimates were obtained from the 1982 Pesticide Use Report Annual published by the California Department of Food and Agriculture. The average application rate (pounds/acre/year) for fruits and vegetables in the ERS survey was estimated by taking the national pesticide use estimates for that crop and dividing by the national estimate of harvested acres. RFF also found a number of crops (e.g. Brussels sprouts, sweet potatoes, sugar beets and rye) where the only estimates of pesticide use were contained in the 1982 Pesticide Use Report Annual published by the state of California. In these cases, annual application rates were calculated and subsequently multiplied by the number of harvested acres in other states where these crops were grown in order to obtain estimated amounts of pesticide applied.

Occasionally, both coefficients were estimated, due to a lack of information. In these cases, the percent of a particular crop receiving pesticide was estimated by either taking the average state crop pesticide usage for states where estimates were available and dividing this by the number of acres of crop for the particular state, or by assigning a value from a nearby state. If an annual application rate was not found, a coefficient was assigned from a nearby state. Once the estimates of pesticide use had been assigned for a particular crop, the data could then be organized as needed, for example by crop, pesticide, state or region, etc.

Proration of Pesticide Use Estimates to the EDA. The county pesticide use estimates received from RFF were prorated to the EDA by NOAA using information contained in Volume II of NOAA's National Estuarine Inventory Data Atlas Series entitled Land Use Characteristics. The land use estimates in the Atlas were based on data from the U.S. Geological Survey's Land Use and Land Cover (LU/LC) Program. In the Atlas, land use in each coastal county is divided into seven categories and 24 subcategories. Agricultural land area is divided into two subcategories, cropland and other, with the second subcategory consisting primarily of orchard acreage. The area of each land use type in the Atlas is summarized by the land area within the EDA, outside the EDA, and the total for the county. To prorate the agricultural acreage in the county to the EDA, the area of cropland or orchard by county within the borders of an EDA was divided into the total county acreage for those land use subcategories. In this way, two proration coefficients were generated for agricultural land area, one for cropland, and one for orchard acreage. The estimate of the yearly amount of pesticide applied to that portion of the EDA within the county could then be calculated using the following algorithm and the appropriate proration coefficient:

$$\begin{array}{ccccc} \text{yearly pesticide use} & & \text{X} & & \text{percent of total crop} & & = & & \text{yearly pesticide use} \\ \text{by crop in county} & & & & \text{acreage in county} & & & & \text{for crop in EDA} \\ & & & & \text{within EDA boundary} & & & & \end{array}$$

The total pesticide use for each EDA was calculated by summing each of these pesticide estimates for the EDA.

Appendix C. Physical Properties of Pesticides in NOAA's Pesticide Use Data Base

The physical and chemical parameters presented in this Appendix are useful in understanding the fate of pesticides in the environment. These properties govern the degree of compound partitioning between the aqueous and solid phases (water and soil), which determine how mobile the compound will be in the environment, and provide information on the persistence (half-life) of the compound once applied.

Each pesticide is listed with its Chemical Abstract Service (CAS) number, which provides an exact identification of the compound. The pesticides have also been grouped according to their chemical class, and those compounds within a class share certain structural and physical properties. The information was gathered from a variety of sources. Values for K_{oc} and K_{ow} were calculated if not found in the literature.

Water Solubility (WS) is the amount of pure pesticide (active ingredient) soluble in a volume of water. It is frequently expressed in milligrams (mg) of compound soluble in one liter (l) of water, or parts per million (ppm). The solubility of a pesticide is related to its molecular weight and the functional groups within the molecule. This property is extremely important when considering how a compound will partition in the environment. A pesticide that is soluble in water can be removed from the site of application as a result of runoff or percolation through the soil. A compound with a low water solubility will tend to remain at the site of application, bound to the soil, although these pesticides can enter the estuary as well, attached to wind blown or water eroded soil particles. Pesticides are often applied in a formulation, that is bound to some type of solid state carrier (wetable powder or granulation) or mixed with an emulsifier. The type of formulation will influence the movement of the pesticide in the environment, in addition to its water solubility. For example, a pesticide applied as a wettable powder will be more mobile than the same pesticide applied in an emulsion. In general, formulations can be ranked in terms of mobility from highest to lowest as aqueous being more mobile than wettable which is more mobile than granular which is more mobile than an emulsion.

The *Normalized Sorption Coefficient* (K_{oc}) provides a means for comparing the degree of sorption between compounds. Sorption is the partitioning of a compound between soil or sediment particles and water, and is often expressed as:

$$K_p = \frac{\text{mg pesticide/kg soil}}{\text{mg pesticide/l of water}}$$

where K_p is the sorption partition coefficient, or the ratio of pesticide associated with the soil to the amount remaining in the aqueous phase at equilibrium. Water solubility and K_p are inversely related. Compounds with low water solubilities are forced out of solution and subsequently attracted to the soil matrix due to charge and structural similarities. In general, the organic carbon content (percent oc) of the particular soil or sediment (which typically ranges from 0.1 to 5 percent), has a major influence on the degree of organic compound sorption. As a result, the coefficient K_p is usually normalized for organic carbon in the following manner:

$$K_{oc} = \frac{K_p \times 100}{\text{percent oc}}$$

The K_{oc} allows for the direct comparison of sorption coefficients between compounds by normalizing for organic carbon (percent oc). A pesticide with a lower K_{oc} value will be more mobile in the partitioning of a pesticide into octanol mimics the partitioning of the compound into lipid material and as a result, is a good estimator of bioaccumulation. A compound that has a high K_{ow} (> 5000) will readily partition into biota and soil.

The *Octanol/Water Partition Coefficient* (K_{ow}) is a measure of the equilibrium partitioning of the pesticide between a mixture of octanol and water and can be represented as:

$$K_{ow} = \frac{\text{concentration of pesticide in octanol phase}}{\text{concentration of pesticide in aqueous phase}}$$

The octanol/water partition coefficient has been correlated with water solubility, sorption coefficients, and particularly with the bioaccumulation (accumulation in biota) potential. The degree of organic compound bioaccumulation is directly related to the lipid or fat content of the organism. The partitioning of a pesticide into octanol mimics the partitioning of the compound into lipid material and as a result, is a good estimator of bioaccumulation. A compound that has a high K_{ow} (> 5000) will readily partition into biota and soil.

A pesticide's *Half-Life* ($T_{1/2}$) is the time it takes for one half of the pesticide to disappear from a particular medium such as soil or water. This value, usually given in days, is the result of a number of processes. In soils, microbial degradation, runoff, vaporization, hydrolysis (splitting of the compound using a molecule of water) and even photolysis (light-induced degradation) can be important. The rate of degradation will also depend on the nature of the compound and the temperature of the environment.

Aqueous half-life values are a function of the hydrolytic cleaving and volatilization of the molecule, although photolysis can be important for some compounds. The pH of the aqueous phase can also be important. For example, the hydrolysis of organophosphates and carbamates proceeds much faster at an alkaline pH (pH > 7) than at a neutral or acidic pH. The persistence of a compound is very important when determining what effect it will have in the environment. For example, the organophosphates have a higher acute (short-term) toxicity than the chlorinated hydrocarbon pesticides such as chlordane and DDT. However, the organophosphates are much less persistent in the environment and are therefore much less likely to accumulate to harmful levels in soils or organisms over time.

A series of mathematical relationships exist between parameters. Water solubility correlates fairly well with K_{oc} and K_{ow} and as might be expected, an inverse relationship exists between water solubility and K_{oc} . For example, the solubility of the dinitroaniline herbicide trifluralin is 1 ppm while the K_{oc} is almost 14,000. In comparison, the solubility of 2,4-D is 900 ppm while the K_{oc} is only 20. An inverse relationship also exists between solubility and K_{ow} . Trifluralin, has a K_{ow} value of 220,000 and a water solubility of 1 ppm, while the triazine herbicide cyanazine has a solubility of 171 ppm and a K_{ow} of only 150. It should be noted, however, that for compounds with low water solubilities, it is difficult to measure K_{ow} because very little compound remains in the aqueous phase at equilibrium. A positive correlation also exists between K_{oc} and K_{ow} . The soil half-life of a compound is somewhat related to its water solubility as well. A pesticide that has a low solubility (and high K_{oc}), will tend to bind tightly to soil or sediment, and be somewhat resistant to hydrolysis and even microbial attack.

Appendix C. Physical Properties of Pesticides in NOAA's Pesticide Use Data Base

Compound (Chemical Abstract No.)	Use	Water Solubility (mg/l)	Normalized sorption coefficient (Koc)	Octanol/water partition coefficient (Kow)	Half Life	
					in soil (days)	in water ^c (days)
<i>Organochlorines</i>						
Chlorobenzilate (510-15-6)	M	10 (58)	1,230 a	2,280 b	11 - 35 (63)	NF
PCNB (82-68-8)	F	0.44 (81)	6,060 (39)	10,000 (6)	468 (27)	NF
<i>Organophosphates</i>						
Bensulide (741-58-2)	H	25 (86)	740 (31)	1,100 b	120-180 (86)	NF
Diazinon (333-41-5)	I	40 (84)	570 (31)	1,350 (6)	65 (22)	30-180 (20)
Disulfoton (298-04-4)	I	25 (36)	1,600 (56); 1,780 (32)	10,000 (6)	9 (57)	NF
Ethoprop (13194-48-4)	N	750 (31)	110 a	70 b	3-56 (71)	NF
Malathion (121-75-5)	I	145 (32)	280 (31); 1,800 (56)	230 (56); 780 (32)	11 (1)	14 (20)
Methamidophos (10265-92-6)	I	2 x 10E6 (58)	2 a	< 1 b	1-5 (63)	30 (63)
Methyl parathion (298-00-0)	I	57 (32)	5,100 (56); 9,800 (32)	82 (32); 2,080 (56)	44 (2)	30 (18); 70 (40)
Parathion (56-38-2)	I	24 (36)	4,800 (32); 10,650 (56)	6,460 (32)	6 (60)	170 (39)
Phorate (298-02-2)	I	50 (36)	655 (5); 3,200 (32)	823 (56); 18,200 (5)	25 (7)	4 (9)
<i>Carbamates</i>						
Carbaryl (63-25-2)	I	30 (20)	230, 570 (31)	209 (5); 230 (32) 650 (56)	8 (33)	130 (23)
Carbofuran (1563-66-2)	I	415 (32); 700 (36)	40 (55); 160 (32)	40 (32); 207 (56)	46-115 (20)	30-40 (54)
Thiobencarb (408-27-5)	H	30 (86)	670 a	4,130b	14-21 (86)	NF
Vernolate (1929-77-7)	H	90 (86)	330 a	400 b	10-12 (48)	NF

Abbreviations: I, insecticide; H, herbicide; F, fungicide; N, nematocide; M, miticide; NF, not found

a) Calculated from Lyman et al., 1982 b) Calculated from Kenaga and Goring, 1980 c) Experiments performed at pH 6-7

() = Citation, see References

Appendix C. Physical Properties of Pesticides in NOAA's Pesticide Use Data Base (continued).

Compound (Chemical Abstract No.)	Use	Water Solubility (mg/l)	Normalized sorption coefficient (Koc)	Octanol/water partition coefficient (Kow)	Half Life	
					In soil (days)	In water ^C (days)
<i>Chloroacetamides</i>						
Alachlor (15972-60-8)	H	242 (36)	190 (32)	434 (56); 830 (32)	20-40 (86)	NF
Metolachlor (51218-45-2)	H	530 (86)	140 (31)	1,350 (14)	30-50 (86)	NF
<i>Triazines</i>						
Atrazine (1912-24-9)	H	33 (36)	102 (26); 149 (32)	476 (32)	130 (34)	66 (48)
Cyanazine (21725-46-2)	H	171 (84)	116 (55); 200 (32)	150 (32)	7 - 30 (20)	NF
<i>Chlorinated phenoxy compounds</i>						
2,4-D (94-75-7)	H	900 (84)	20 (32); 32 (26)	646 (80)	7 - 28 (20)	> 40 (10)
Acifluorfen (62476-59-9)	H	2.5 x 10E5 (58)	5 a	<1 b	14-28 (86)	>56 (63)
<i>Other</i>						
Captafol (2425-06-1) (phthalimide)	F	1.40 (31)	2,070 (5)	6,760 (5)	4 (73)	NF
Chlorothalonil (1897-45-6) (isophthalate)	F	0.6 (58)	5,800 (31)	21,650 b	30-60 (67)	>72 (67)
Dinoseb (88-85-7) (nitrophenol)	H	50 (86)	124 (32)	198 (56); 4,900 (32)	25 (57)	NF
Fluometuron (2164-17-2) (phenylurea)	H	90 (36)	66 (5); 175 (31)	22 (32); 263 (5)	30 (86)	730-1,010 (86)
Metiram (9006-42-2) (dithiocarbamate)	F	very insoluble (58)	NF	NF	28-91 (64)	NF
Propanil (709-98-8)	H	225 (31); 500 (86)	220 (31)	106 (56)	<30 (6)	NF
Trifluralin (98-16-8) (dinitroaniline)	H	1 (36)	13,700 (32)	220,000 (32)	81 (52)	>30 (65)

Abbreviations: I, insecticide; H, herbicide; F, fungicide; N, nematocide; M, miticide; NF, not found

a) Calculated from Lyman et al., 1982 b) Calculated from Kenaga and Goring, 1980 c) Experiments performed at pH 6-7

() = Citation, see References

Appendix D. Environmental Hazard Rating System (EHRS)

Toxicity

Low Toxicity:	$10 \geq 1,000$ ppm
Moderate Toxicity:	0.1 - 10 ppm
High Toxicity:	≤ 0.001 - 0.1 ppm

Soil Persistence

Low Persistence:	≤ 1 - 50 days
Moderate Persistence:	50 - 250 days
High Persistence:	$250 \geq 365$ days

Bioconcentration Potential

Low Accumulation Potential:	≤ 1 - 250
Moderate Accumulation Potential:	250 - 2,500
High Accumulation Potential:	$2,500 \geq 25,000$

Appendix E. Pesticides Applied to Selected Crops in NOAA's Pesticide Use Data Base

Pesticide	Crop													
	Alfalfa	Almonds	Apples	Avocado	Barley	Beans	Blueberries	Broccoli	Cabbage	Cantaloupe	Citrus	Com	Cotton	Cranberries
Acifluorfen														
Alachlor														
Atrazine														
Bensulfide														
Captafol														
Carbaryl														
Carbofuran														
Chlorobenzilate														
Chlorothalonil														
Cyanazine														
2,4-D														
Diazinon														
Dinoseb														
Disulfoton														
Ethoprop														
Fluometuron														
Malathion														
Mathamidophos														
Methyl parathion														
Metiram														
Metolachlor														
Parathion														
PCNB														
Phorate														
Propanil														
Thiobencarb														
Trifluralin														
Vernolate														

Appendix E. Pesticides Applied to Selected Crops in NOAA's Pesticide Use Data Base (continued).

Pesticide	Crop													
	Onions	Pasture	Peas	Peanuts	Pecans	Potatoes	Rice	Sorghum	Soybeans	Strawberries	Sugarbeets	Sugarcane	Sweet Corn	Tobacco
Acifluorfen				•			•		•				•	
Alachlor				•	•	•		•	•			•	•	
Atrazine								•				•	•	
Bensulfide	•													•
Captafol						•							•	•
Carbaryl			•	•	•	•	•	•	•	•	•	•	•	•
Carbوتران				•		•	•	•	•	•	•	•	•	•
Chlorobenzilate														
Chlorothalonil	•			•		•			•				•	
Cyanazine													•	
2,4-D		•		•			•	•		•		•	•	•
Diazinon	•				•		•	•	•	•		•	•	•
Dinoseb		•		•		•			•				•	
Disulfoton				•		•		•	•			•	•	•
Ethoprop				•					•			•		
Fluometuron												•		
Malathion	•				•		•		•	•	•	•	•	•
Methamidophos						•					•		•	•
Methyl parathion	•		•		•		•	•	•	•	•	•	•	•
Metiram						•							•	
Metolachlor			•	•		•		•	•			•	•	•
Parathion	•		•	•	•	•	•	•	•	•	•	•	•	•
PCNB				•						•				
Phorate				•		•		•	•		•		•	•
Propanil							•							
Triobencarb							•							
Trifluralin		•		•		•			•		•		•	•
Vernolate				•					•				•	

Appendix F. Area of Crops in Estuarine Drainage Areas

ESTUARY	CROPS						
	ALFALFA Area	ALMONDS Area	APPLES Area	AVOCADO Area	BARLEY Area	BEANS Area	BLUEBERRIES Area
NORTHEAST							
1.01 Passamaquoddy Bay	< 1	0	< 1	0	0	< 1	7
1.02 Englishman Bay	< 1	0	0	0	0	< 1	4
1.03 Narraguagus Bay	< 1	0	0	0	0	< 1	3
1.04 Blue Hill Bay	< 1	0	< 1	0	0	< 1	2
1.05 Penobscot Bay	4	0	< 1	0	0	< 1	2
1.06 Muscongus Bay	< 1	0	< 1	0	0	< 1	1
1.07 Sheepscot Bay	14	0	7	0	0	1	1
1.08 Casco Bay	3	0	< 1	0	0	< 1	< 1
1.09 Saco Bay	2	0	1	0	0	< 1	< 1
1.10 Great Bay	4	0	< 1	0	0	< 1	0
1.11 Merrimack River	9	0	3	0	0	0	0
1.12 Boston Bay	1	0	< 1	0	0	0	0
1.13 Cape Cod Bay	< 1	0	0	0	0	0	0
1.14 Buzzards Bay	1	0	0	0	0	0	0
1.15 Narragansett Bay	5	0	< 1	0	0	0	0
1.16 Gardiners Bay	< 1	0	< 1	0	0	< 1	0
1.17 Long Island Sound	44	0	6	0	0	< 1	0
1.18 Great South Bay	< 1	0	< 1	0	0	< 1	0
1.19 Hudson River/Raritan Bay	126	0	44	0	3	< 1	0
1.20 Barnegat Bay	1	0	1	0	1	< 1	0
1.21 Delaware Bay	47	0	6	0	43	23	0
1.22 Chincoteague Bay	< 1	0	0	0	< 1	< 1	0
1.23 Chesapeake Bay	87	0	1	0	209	17	0
TOTAL	357	0	77	0	259	45	23
SOUTHEAST							
2.01 Albemarle Sound	< 1	0	< 1	0	3	< 1	0
2.02 Pamlico Sound	< 1	0	< 1	0	< 1	< 1	0
2.03 Bogue Sound	0	0	0	0	0	< 1	0
2.04 New River	0	0	0	0	0	< 1	0
2.05 Cape Fear River	< 1	0	< 1	0	2	1	0
2.06 Winyah Bay	1	0	< 1	0	4	< 1	0
2.07 Charleston Harbor	< 1	0	0	0	0	< 1	0
2.08 North and South Santee Rivers	< 1	0	0	0	< 1	< 1	0
2.09 St. Helena Sound	< 1	0	0	0	< 1	1	0
2.10 Broad River	0	0	0	0	0	< 1	0
2.11 Savannah River	< 1	0	0	0	0	< 1	0
2.12 Ogeechee Sound	< 1	0	0	0	< 1	< 1	0
2.13 St. Catherine's / Sapelo Sound	< 1	0	0	0	0	0	0
2.14 Altamaha River	< 1	0	0	0	< 1	< 1	0
2.15 St. Andrew / St. Simons Sound	1	0	< 1	0	1	< 1	0
2.16 St. Johns River	1	0	0	0	0	< 1	0
2.17 Indian River	0	0	0	0	0	0	0
2.18 Biscayne Bay	< 1	0	0	11	0	16	0
TOTAL	5	0	< 1	11	12	21	0
EAST COAST TOTAL	363	0	77	11	271	66	23

CROPS						
BROCCOLI Area	CABBAGE Area	CANTALOUPE Area	CITRUS Area	CORN Area	COTTON Area	CRANBERRIES Area
0	0	0	0	< 1	0	0
0	0	0	0	< 1	0	0
0	0	0	0	0	0	0
0	0	0	0	< 1	0	0
0	0	0	0	9	0	0
0	0	0	0	< 1	0	0
0	0	0	0	38	0	0
0	0	0	0	3	0	0
0	0	0	0	3	0	0
0	0	0	0	4	0	0
0	0	0	0	10	0	0
0	0	0	0	< 1	0	0
0	0	0	0	< 1	0	< 1
0	0	0	0	4	0	5
0	0	0	0	9	0	7
0	< 1	0	0	< 1	0	0
0	< 1	0	0	104	0	0
0	< 1	0	0	1	0	0
0	1	< 1	0	196	0	0
0	< 1	< 1	0	6	0	< 1
0	2	1	0	284	0	3
0	0	0	0	23	0	0
0	< 1	1	0	1397	0	0
0	5	3	0	2100	0	18
0	2	< 1	0	402	20	0
0	< 1	< 1	0	450	7	0
0	< 1	< 1	0	30	0	0
0	< 1	< 1	0	17	0	0
0	< 1	< 1	0	270	6	0
0	< 1	< 1	0	361	122	0
0	0	0	0	12	0	0
0	0	0	0	10	< 1	0
0	0	0	0	31	< 1	0
0	0	0	0	23	< 1	0
0	0	< 1	0	21	< 1	0
0	0	< 1	0	45	< 1	0
0	0	0	0	< 1	0	0
0	< 1	0	0	37	0	0
0	< 1	0	0	132	< 1	0
0	16	0	96	6	< 1	0
0	0	0	141	3	0	0
0	0	0	15	8	0	0
0	20	1	253	1867	158	0
0	25	4	253	3967	158	18

* All values are in square miles
and circa 1982.

continued...

Appendix F. Area of Crops in Estuarine Drainage Areas.*

ESTUARY	CROPS						
	ALFALFA Area	ALMONDS Area	APPLES Area	AVOCADO Area	BARLEY Area	BEANS Area	BLUEBERRIES Area
GULF OF MEXICO							
3.01 Ten Thousand Islands	< 1	0	0	0	0	< 1	0
3.02 Charlotte Harbor	< 1	0	0	0	0	< 1	0
3.03 Tampa Bay	< 1	0	0	0	0	2	0
3.04 Suwannee River	1	0	0	0	0	< 1	0
3.05 Apalachee Bay	< 1	0	< 1	0	< 1	< 1	0
3.06 Apalachicola Bay	< 1	0	< 1	0	0	< 1	0
3.07 St. Andrew Bay	< 1	0	0	0	0	< 1	0
3.08 Choctawhatchee Bay	< 1	0	0	0	0	< 1	0
3.09 Pensacola Bay	1	0	0	0	0	< 1	0
3.10 Perdido Bay	< 1	0	0	0	0	< 1	0
3.11 Mobile Bay	1	0	0	0	0	< 1	0
3.12 Mississippi Sound	8	0	0	0	0	< 1	0
3.13 Mississippi Delta Region	< 1	0	0	0	0	0	0
3.14 Atchafalaya and Vermilion Bays	1	0	0	0	0	0	0
3.15 Calcasieu Lake	< 1	0	0	0	0	0	0
3.16 Sabine Lake	1	0	0	0	0	< 1	0
3.17 Galveston Bay	1	0	0	0	0	< 1	0
3.18 Brazos River	< 1	0	0	0	0	< 1	0
3.19 Matagorda Bay	4	0	0	0	0	0	0
3.20 San Antonio Bay	< 1	0	0	0	0	0	0
3.21 Aransas Bay	< 1	0	0	0	0	< 1	0
3.22 Corpus Christi Bay	< 1	0	0	0	0	< 1	0
3.23 Laguna Madre	1	0	0	0	0	< 1	0
TOTAL	28	0	< 1	0	< 1	5	0
WEST COAST							
4.01 San Diego Bay	< 1	< 1	< 1	1	< 1	0	0
4.02 San Pedro Bay	2	< 1	< 1	0	1	< 1	0
4.03 Santa Monica Bay	< 1	< 1	< 1	0	< 1	< 1	0
4.04 Monterey Bay	1	< 1	< 1	0	14	1	0
4.05 San Francisco Bay	71	51	2	0	41	40	0
4.06 Eel River	4	0	< 1	0	< 1	< 1	0
4.07 Humboldt Bay	1	0	0	0	< 1	< 1	0
4.08 Klamath River	< 1	0	0	0	< 1	< 1	0
4.09 Coos Bay	< 1	0	0	0	< 1	< 1	0
4.10 Winchester Bay	1	0	< 1	0	< 1	< 1	0
4.11 Columbia River	8	0	< 1	0	8	< 1	0
4.12 Willapa Bay	< 1	0	0	0	< 1	< 1	0
4.13 Grays Harbor	< 1	0	< 1	0	< 1	< 1	0
4.14 Puget Sound	15	0	1	0	11	1	0
TOTAL	108	51	5	1	79	43	0
NATIONAL TOTAL	499	51	82	13	350	114	23

CROPS						
BROCCOLI Area	CABBAGE Area	CANTALOUPE Area	CITRUS Area	CORN Area	COTTON Area	CRANBERRIES Area
0	0	0	11	< 1	0	0
0	< 1	0	318	< 1	0	0
0	< 1	0	106	< 1	0	0
0	0	0	< 1	41	0	0
0	0	< 1	< 1	102	5	0
0	0	0	0	7	< 1	0
0	0	0	0	< 1	< 1	0
0	0	0	0	30	< 1	0
0	0	0	0	45	15	0
0	0	0	0	40	< 1	0
0	0	0	0	60	7	0
0	0	0	0	47	< 1	0
0	0	0	0	< 1	< 1	0
0	0	0	0	21	17	0
0	0	0	0	< 1	0	0
0	0	0	0	< 1	0	0
< 1	< 1	< 1	< 1	17	10	0
< 1	0	< 1	< 1	35	29	0
0	0	< 1	0	150	21	0
0	0	0	0	3	< 1	0
0	0	0	0	60	71	0
0	0	< 1	0	56	66	0
9	16	18	114	112	392	0
9	16	18	551	836	639	0
< 1	< 1	0	< 1	< 1	0	0
< 1	< 1	0	1	< 1	< 1	0
< 1	< 1	0	< 1	0	0	0
8	< 1	0	< 1	< 1	0	0
< 1	< 1	0	< 1	213	0	0
0	0	0	< 1	< 1	0	0
0	0	0	< 1	< 1	0	0
0	0	0	0	< 1	0	0
0	0	0	0	< 1	0	0
0	0	0	0	< 1	0	0
< 1	0	0	0	9	0	< 1
0	0	0	0	< 1	0	1
0	0	0	0	< 1	0	0
1	0	0	0	23	0	0
11	0	0	2	248	0	1
20	42	22	807	5052	797	19

* All values are in square miles
and circa 1982.

continued...

Appendix F. Area of Crops in Estuarine Drainage Areas.*

ESTUARY	CROPS						
	CUCUMBERS Area	GRAPES Area	LETTUCE Area	OATS Area	ONIONS Area	OTHER HAY Area	PASTURE/RANGE Area
NORTHEAST							
1.01 Passamaquoddy Bay	0	0	0	< 1	0	2	< 1
1.02 Englishman Bay	0	0	0	< 1	0	1	1
1.03 Narraguagus Bay	0	0	0	< 1	0	< 1	0
1.04 Blue Hill Bay	0	0	0	< 1	0	1	12
1.05 Penobscot Bay	0	0	0	1	0	31	90
1.06 Muscongus Bay	0	0	0	< 1	0	8	15
1.07 Sheepscot Bay	0	0	0	1	0	126	325
1.08 Casco Bay	0	0	0	< 1	0	19	41
1.09 Saco Bay	0	0	0	< 1	0	14	47
1.10 Great Bay	0	0	0	0	0	14	24
1.11 Merrimack River	0	0	0	0	0	19	60
1.12 Boston Bay	0	0	0	0	0	0	15
1.13 Cape Cod Bay	0	0	0	0	0	0	1
1.14 Buzzards Bay	0	0	0	0	0	0	19
1.15 Narragansett Bay	0	0	0	0	0	4	63
1.16 Gardiners Bay	< 1	< 1	< 1	< 1	< 1	< 1	26
1.17 Long Island Sound	< 1	< 1	< 1	< 1	< 1	75	258
1.18 Great South Bay	< 1	< 1	< 1	< 1	< 1	< 1	44
1.19 Hudson River/Raritan Bay	< 1	1	2	11	10	147	756
1.20 Barnegat Bay	< 1	0	< 1	< 1	0	1	25
1.21 Delaware Bay	4	< 1	4	4	0	38	266
1.22 Chincoteague Bay	< 1	0	0	0	0	0	3
1.23 Chesapeake Bay	5	< 1	0	19	0	28	1059
TOTAL	11	2	7	39	11	526	3150
SOUTHEAST							
2.01 Albemarle Sound	< 1	0	0	2	0	2	68
2.02 Pamlico Sound	2	< 1	0	8	0	4	104
2.03 Bogue Sound	< 1	0	0	< 1	0	< 1	14
2.04 New River	< 1	< 1	0	< 1	0	< 1	2
2.05 Cape Fear River	8	< 1	0	5	0	11	53
2.06 Winyah Bay	2	< 1	0	23	0	35	251
2.07 Charleston Harbor	< 1	< 1	0	< 1	0	1	16
2.08 North and South Santee Rivers	< 1	< 1	0	< 1	0	< 1	6
2.09 St. Helena Sound	1	< 1	0	2	0	5	47
2.10 Broad River	1	0	0	1	0	3	23
2.11 Savannah River	< 1	< 1	0	1	0	4	14
2.12 Ogeechee Sound	< 1	< 1	0	2	< 1	6	31
2.13 St. Catherine's / Sapelo Sound	0	< 1	0	0	0	< 1	< 1
2.14 Altamaha River	0	< 1	0	1	< 1	5	46
2.15 St. Andrew / St. Simons Sound	< 1	< 1	0	4	0	13	94
2.16 St. Johns River	1	0	< 1	< 1	0	36	1349
2.17 Indian River	0	0	0	0	0	< 1	215
2.18 Biscayne Bay	< 1	0	1	0	0	1	201
TOTAL	19	< 1	1	55	0	126	2534
EAST COAST TOTAL	31	3	9	94	11	652	5684

CROPS						
PEACHES Area	PEANUTS Area	PEAS Area	POTATOES Area	RICE Area	SORGHUM Area	SOYBEANS Area

* All values are in square miles
and circa 1982.

0	0	< 1	< 1	0	0	0
0	0	< 1	< 1	0	0	0
0	0	0	< 1	0	0	0
0	0	< 1	< 1	0	0	0
0	0	< 1	4	0	0	0
0	0	< 1	< 1	0	0	0
0	0	< 1	3	0	0	0
0	0	< 1	1	0	0	0
0	0	< 1	< 1	0	0	0
0	0	< 1	< 1	0	0	0
0	0	0	< 1	0	0	0
0	0	0	< 1	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	2	0	0	0
0	0	< 1	10	0	0	0
0	0	< 1	4	0	0	0
0	0	< 1	14	0	0	0
0	0	< 1	5	0	0	55
3	0	0	< 1	0	0	11
15	0	7	11	0	0	329
0	0	0	< 1	0	0	30
< 1	28	7	13	0	0	1293
20	28	16	74	0	0	1721
< 1	122	< 1	9	0	6	432
< 1	29	< 1	5	0	< 1	471
0	< 1	0	1	0	< 1	31
0	< 1	0	< 1	0	< 1	17
< 1	5	< 1	< 1	0	< 1	309
3	10	< 1	< 1	0	4	1123
< 1	< 1	0	0	0	0	21
0	< 1	0	0	0	< 1	23
0	< 1	0	0	0	< 1	79
0	1	0	0	0	< 1	75
0	1	< 1	0	0	< 1	64
< 1	18	< 1	0	0	4	160
0	< 1	< 1	0	0	0	< 1
< 1	3	< 1	0	0	1	72
< 1	13	< 1	0	0	3	142
0	< 1	< 1	32	0	< 1	< 1
0	0	0	0	0	0	0
0	0	< 1	6	0	0	0
3	204	1	55	0	22	3028
24	232	17	129	0	22	4749

continued...

Appendix F. Area of Crops in Estuarine Drainage Areas.*

ESTUARY	CROPS						
	CUCUMBERS Area	GRAPES Area	LETTUCE Area	OATS Area	ONIONS Area	OTHER HAY Area	PASTURE/RANGE Area
GULF OF MEXICO							
3.01 Ten Thousand Islands	2	0	< 1	0	0	1	848
3.02 Charlotte Harbor	5	0	0	0	0	22	2520
3.03 Tampa Bay	2	0	0	0	0	24	1015
3.04 Suwanee River	< 1	0	0	11	0	26	217
3.05 Apalachee Bay	< 1	< 1	0	4	0	17	217
3.06 Apalachicola Bay	0	< 1	0	1	0	2	49
3.07 St. Andrew Bay	0	0	0	< 1	0	1	21
3.08 Choctawhatchee Bay	0	0	0	13	0	18	150
3.09 Pensacola Bay	< 1	0	0	8	0	19	180
3.10 Perdido Bay	< 1	0	0	10	0	4	14
3.11 Mobile Bay	< 1	0	0	9	0	15	143
3.12 Mississippi Sound	< 1	0	0	3	0	135	1444
3.13 Mississippi Delta Region	0	0	0	0	0	19	349
3.14 Atchafalaya and Vermilion Bays	0	0	0	< 1	0	28	434
3.15 Calcasieu Lake	0	0	0	0	0	2	168
3.16 Sabine Lake	< 1	0	0	< 1	0	26	643
3.17 Galveston Bay	< 1	0	< 1	< 1	0	31	1091
3.18 Brazos River	< 1	0	< 1	< 1	0	58	983
3.19 Matagorda Bay	0	0	0	< 1	0	96	3111
3.20 San Antonio Bay	0	0	0	< 1	0	< 1	118
3.21 Aransas Bay	0	0	0	< 1	0	25	1471
3.22 Corpus Christi Bay	0	0	< 1	< 1	0	33	1188
3.23 Laguna Madre	10	0	3	< 1	17	62	6142
TOTAL	20	< 1	3	66	17	664	22516
WEST COAST							
4.01 San Diego Bay	< 1	< 1	0	< 1	0	0	< 1
4.02 San Pedro Bay	< 1	< 1	< 1	< 1	< 1	0	1
4.03 Santa Monica Bay	< 1	< 1	< 1	< 1	< 1	0	17
4.04 Monterey Bay	< 1	9	19	1	< 1	0	281
4.05 San Francisco Bay	1	125	< 1	88	1	13	1886
4.06 Eel River	< 1	< 1	0	0	0	0	307
4.07 Humboldt Bay	< 1	< 1	0	0	0	0	81
4.08 Klamath River	< 1	< 1	0	0	0	0	11
4.09 Coos Bay	< 1	0	0	< 1	< 1	3	27
4.10 Winchester Bay	< 1	0	0	< 1	< 1	13	116
4.11 Columbia River	< 1	< 1	0	6	< 1	17	353
4.12 Willapa Bay	0	< 1	0	< 1	0	0	19
4.13 Grays Harbor	0	< 1	0	< 1	0	0	22
4.14 Puget Sound	1	< 1	0	1	0	0	688
TOTAL	3	135	20	100	2	46	3809
NATIONAL TOTAL	55	138	32	261	30	1362	32009

CROPS						
PEACHES Area	PEANUTS Area	PEAS Area	POTATOES Area	RICE Area	SORGHUM Area	SOYBEANS Area
0	0	< 1	< 1	0	0	0
0	< 1	< 1	0	0	< 1	0
0	< 1	< 1	< 1	0	< 1	0
0	3	4	< 1	0	5	29
< 1	16	1	< 1	0	5	93
0	5	< 1	< 1	0	< 1	38
0	< 1	< 1	< 1	0	< 1	9
0	19	< 1	< 1	0	5	120
< 1	17	< 1	< 1	0	4	189
0	< 1	< 1	2	0	1	95
< 1	< 1	< 1	3	0	2	107
< 1	0	< 1	1	0	8	209
0	0	< 1	0	< 1	< 1	85
0	0	< 1	0	137	21	805
0	0	0	0	40	0	92
< 1	< 1	< 1	< 1	66	< 1	49
< 1	2	< 1	< 1	204	21	247
< 1	3	< 1	< 1	46	49	27
< 1	< 1	0	< 1	279	467	58
0	0	0	0	1	20	< 1
< 1	< 1	0	0	0	287	0
< 1	< 1	1	0	0	281	0
< 1	< 1	10	5	0	1101	2
< 1	71	19	13	775	2287	2262
< 1	0	0	< 1	0	0	0
< 1	0	0	< 1	0	0	0
< 1	0	0	< 1	0	0	0
< 1	0	0	< 1	0	0	0
2	0	0	1	103	16	0
< 1	0	0	< 1	0	0	0
0	0	0	< 1	0	0	0
0	0	0	< 1	0	0	0
0	0	< 1	< 1	0	0	0
0	0	< 1	< 1	0	0	0
0	0	3	< 1	0	0	0
0	0	< 1	< 1	0	0	0
0	0	2	< 1	0	0	0
0	0	43	5	0	0	0
2	0	49	9	103	16	0
26	303	86	151	879	2325	7031

* All values are in square miles
and circa 1982.

continued...

Appendix F. Area of Crops in Estuarine Drainage Areas.*

ESTUARY	CROPS					
	SQUASH Area	STRAWBERRIES Area	SUGARBEETS Area	SUGARCANE Area	SWEET CORN Area	TOBACCO Area
NORTHEAST						
1.01 Passamaquoddy Bay	0	0	0	0	0	0
1.02 Englishman Bay	0	0	0	0	0	0
1.03 Narraguagus Bay	0	0	0	0	0	0
1.04 Blue Hill Bay	0	0	0	0	0	0
1.05 Penobscot Bay	0	0	0	0	0	0
1.06 Muscongus Bay	0	0	0	0	0	0
1.07 Sheepscot Bay	0	0	0	0	0	0
1.08 Casco Bay	0	0	0	0	0	0
1.09 Saco Bay	0	0	0	0	0	0
1.10 Great Bay	< 1	0	0	0	0	0
1.11 Merrimack River	< 1	0	0	0	1	0
1.12 Boston Bay	< 1	0	0	0	< 1	0
1.13 Cape Cod Bay	< 1	0	0	0	< 1	0
1.14 Buzzards Bay	< 1	0	0	0	< 1	0
1.15 Narragansett Bay	< 1	0	0	0	1	0
1.16 Gardiners Bay	< 1	< 1	0	0	< 1	0
1.17 Long Island Sound	< 1	< 1	0	0	1	0
1.18 Great South Bay	< 1	< 1	0	0	1	0
1.19 Hudson River/Raritan Bay	< 1	< 1	0	0	16	0
1.20 Barnegat Bay	< 1	0	0	0	2	0
1.21 Delaware Bay	3	< 1	0	0	15	< 1
1.22 Chincoteague Bay	0	0	0	0	< 1	0
1.23 Chesapeake Bay	< 1	< 1	0	0	24	44
TOTAL	6	1	0	0	65	44
SOUTHEAST						
2.01 Albemarle Sound	< 1	< 1	0	0	0	18
2.02 Pamlico Sound	< 1	< 1	0	0	0	85
2.03 Bogue Sound	0	< 1	0	0	0	3
2.04 New River	0	0	0	0	0	3
2.05 Cape Fear River	1	< 1	0	0	0	52
2.06 Winyah Bay	< 1	< 1	0	0	0	106
2.07 Charleston Harbor	0	0	0	0	0	< 1
2.08 North and South Santee Rivers	0	0	0	0	0	1
2.09 St. Helena Sound	0	0	0	0	0	< 1
2.10 Broad River	0	0	0	0	0	0
2.11 Savannah River	< 1	0	0	0	0	< 1
2.12 Ogeechee Sound	< 1	0	0	0	0	2
2.13 St. Catherine's / Sapelo Sound	0	0	0	0	0	< 1
2.14 Altamaha River	0	0	0	0	0	4
2.15 St. Andrew / St. Simons Sound	< 1	0	0	0	0	13
2.16 St. Johns River	< 1	< 1	0	0	5	< 1
2.17 Indian River	0	0	0	0	0	0
2.18 Biscayne Bay	5	< 1	0	62	7	0
TOTAL	7	< 1	0	62	13	291
EAST COAST TOTAL	13	1	0	62	78	336

CROPS					
TOMATOES Area	WATERMELONS Area	WHEAT Area	SUBTOTAL Area	OTHER CROPS Area	TOTAL Area
0	0	0	10	0	10
0	0	0	7	0	7
0	0	0	4	0	4
0	0	0	16	0	16
0	0	0	146	0	146
0	0	0	24	0	24
0	0	0	522	0	522
0	0	0	70	0	70
0	0	0	72	0	72
0	0	0	48	0	48
0	0	0	104	0	104
0	0	0	17	0	17
0	0	0	2	0	2
0	0	0	32	0	32
0	0	0	94	0	94
< 1	0	< 1	41	1	42
< 1	0	< 1	496	0	497
< 1	0	< 1	64	2	67
2	0	16	1402	7	1410
< 1	0	2	61	1	63
11	< 1	80	1209	15	1225
< 1	< 1	3	62	0	62
12	5	456	4715	6	4722
27	5	560	9230	36	9267
< 1	2	170	1266	1	1267
< 1	< 1	148	1320	4	1324
< 1	< 1	3	84	0	84
< 1	< 1	3	44	0	44
< 1	5	74	810	25	836
< 1	2	338	2392	18	2411
2	< 1	6	62	0	62
< 1	< 1	7	52	0	52
3	< 1	19	194	1	195
< 1	2	18	151	1	153
< 1	< 1	11	121	0	122
0	< 1	55	328	2	331
0	0	< 1	1	0	1
0	< 1	34	208	1	210
< 1	1	39	463	3	467
< 1	< 1	< 1	1547	11	1559
0	0	0	360	0	360
17	< 1	0	357	13	370
24	17	930	9771	86	9857
52	23	1490	19002	123	19125

* All values are in square miles
and circa 1982.

continued...

Appendix F. Area of Crops in Estuarine Drainage Areas.*

ESTUARY	CROPS					
	SQUASH Area	STRAWBERRIES Area	SUGARBEETS Area	SUGARCANE Area	SWEET CORN Area	TOBACCO Area
GULF OF MEXICO						
3.01 Ten Thousand Islands	1	< 1	0	31	1	0
3.02 Charlotte Harbor	2	< 1	0	19	< 1	0
3.03 Tampa Bay	1	5	0	0	< 1	0
3.04 Suwannee River	< 1	0	0	0	< 1	4
3.05 Apalachee Bay	< 1	0	0	0	< 1	1
3.06 Apalachicola Bay	< 1	0	0	0	< 1	< 1
3.07 St. Andrew Bay	< 1	0	0	0	< 1	0
3.08 Choctawhatchee Bay	< 1	0	0	0	< 1	0
3.09 Pensacola Bay	0	0	0	0	< 1	0
3.10 Perdido Bay	0	0	0	0	< 1	0
3.11 Mobile Bay	0	0	0	0	0	0
3.12 Mississippi Sound	0	0	0	30	0	0
3.13 Mississippi Delta Region	0	0	0	188	0	0
3.14 Atchafalaya and Vermilion Bays	0	0	0	174	0	0
3.15 Calcasieu Lake	0	0	0	0	0	0
3.16 Sabine Lake	< 1	0	0	0	0	0
3.17 Galveston Bay	< 1	0	0	0	0	0
3.18 Brazos River	< 1	0	0	0	0	0
3.19 Matagorda Bay	0	0	0	0	0	0
3.20 San Antonio Bay	0	0	0	0	0	0
3.21 Aransas Bay	0	0	0	0	0	0
3.22 Corpus Christi Bay	< 1	0	0	0	0	0
3.23 Laguna Madre	2	0	0	40	0	0
TOTAL	7	5	0	485	1	6
WEST COAST						
4.01 San Diego Bay	< 1	< 1	0	0	< 1	0
4.02 San Pedro Bay	< 1	< 1	0	0	< 1	0
4.03 Santa Monica Bay	< 1	< 1	< 1	0	< 1	0
4.04 Monterey Bay	< 1	1	1	0	< 1	0
4.05 San Francisco Bay	< 1	< 1	62	0	4	0
4.06 Eel River	0	0	0	0	< 1	0
4.07 Humboldt Bay	0	0	0	0	< 1	0
4.08 Klamath River	0	0	0	0	< 1	0
4.09 Coos Bay	< 1	< 1	0	0	< 1	0
4.10 Winchester Bay	< 1	< 1	0	0	< 1	0
4.11 Columbia River	< 1	1	0	0	4	0
4.12 Willapa Bay	0	0	0	0	< 1	0
4.13 Grays Harbor	0	0	0	0	< 1	0
4.14 Puget Sound	0	2	0	0	4	0
TOTAL	1	6	63	0	14	0
NATIONAL TOTAL	21	13	63	547	94	342

CROPS					
TOMATOES Area	WATERMELONS Area	WHEAT Area	SUBTOTAL Area	OTHER CROPS Area	TOTAL Area
16	5	0	921	8	930
10	8	0	2909	9	2919
18	1	< 1	1180	13	1193
0	10	7	364	6	371
< 1	3	20	492	8	501
< 1	< 1	10	115	0	116
< 1	< 1	< 1	33	0	33
< 1	1	24	387	1	388
< 1	< 1	53	536	4	540
< 1	< 1	27	198	1	199
< 1	< 1	23	375	15	390
< 1	1	43	1937	11	1948
0	< 1	14	659	1	660
0	< 1	50	1692	6	1699
0	0	2	306	0	306
< 1	< 1	2	792	0	792
< 1	< 1	1	1630	6	1636
< 1	< 1	2	1238	2	1241
< 1	< 1	12	4202	14	4216
0	0	< 1	146	0	146
0	< 1	8	1926	0	1926
< 1	< 1	11	1640	0	1640
3	13	13	8096	30	8126
50	48	331	31785	143	31928
< 1	< 1	< 1	6	0	6
< 1	< 1	< 1	11	0	11
< 1	< 1	< 1	21	1	22
2	0	< 1	344	15	359
121	1	196	3051	148	3199
< 1	0	0	313	0	313
< 1	0	0	82	0	82
< 1	0	0	11	0	11
0	< 1	< 1	31	0	31
0	< 1	2	134	0	135
0	0	10	426	3	429
0	0	< 1	21	0	21
0	0	< 1	26	0	26
0	0	10	816	5	821
125	1	221	5299	175	5474
228	73	2042	56086	441	56528

* All values are in square miles
and circa 1982.

**Appendix G. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by
Estuarine Drainage Area**

ESTUARY	HERBICIDES									
	ACIFLUORFEN		ALACHLOR		ATRAZINE		BENSULIDE		CYANAZINE	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	--	--	23	< 1	75	< 1	--	--	42	< 1
1.02 Englishman Bay	--	--	< 1	< 1	1	< 1	--	--	--	--
1.03 Narraguagus Bay	--	--	--	--	--	--	--	--	--	--
1.04 Blue Hill Bay	--	--	4	< 1	13	< 1	--	--	7	< 1
1.05 Penobscot Bay	--	--	3115	< 1	9971	6	--	--	5807	< 1
1.06 Muscongus Bay	--	--	241	< 1	769	< 1	--	--	432	< 1
1.07 Sheepscot Bay	--	--	12430	3	39786	25	--	--	22374	1
1.08 Casco Bay	--	--	1104	< 1	3541	2	--	--	1991	< 1
1.09 Saco Bay	--	--	997	< 1	2878	1	--	--	1435	< 1
1.10 Great Bay	--	--	788	< 1	1886	1	--	--	466	< 1
1.11 Merrimack River	--	--	2845	< 1	5417	3	176	< 1	646	< 1
1.12 Boston Bay	--	--	311	< 1	484	< 1	56	< 1	14	< 1
1.13 Cape Cod Bay	--	--	127	< 1	317	< 1	8	< 1	19	< 1
1.14 Buzzards Bay	--	--	1894	< 1	4656	3	330	1	280	< 1
1.15 Narragansett Bay	--	--	4257	1	10464	6	691	2	725	< 1
1.16 Gardiners Bay	--	--	752	< 1	1549	1	271	1	80	< 1
1.17 Long Island Sound	--	--	51948	15	126496	82	133	< 1	12515	1
1.18 Great South Bay	--	--	1079	< 1	2240	1	374	1	111	< 1
1.19 Hudson River/Raritan Bay	2726	< 1	157825	47	137045	89	4145	16	18144	1
1.20 Barnegat Bay	561	< 1	15064	4	4153	2	3497	14	404	< 1
1.21 Delaware Bay	12732	< 1	409527	123	271378	176	28727	116	89017	7
1.22 Chincoteague Bay	1002	< 1	32312	9	24159	15	42	< 1	7245	< 1
1.23 Chesapeake Bay	47348	1	1448682	437	1421657	924	16400	66	412759	33
TOTAL	64369	2	2145325	647	2068693	1344	54850	222	574313	46
SOUTHEAST										
2.01 Albemarle Sound	21754	< 1	713964	215	353729	229	138	< 1	19951	1
2.02 Pamlico Sound	21253	< 1	729759	220	387437	251	750	3	13191	1
2.03 Bogue Sound	1351	< 1	46517	14	26065	16	7	< 1	870	< 1
2.04 New River	740	< 1	26387	7	15377	9	17	< 1	513	< 1
2.05 Cape Fear River	13601	< 1	447818	135	232832	151	2787	11	7971	< 1
2.06 Winyah Bay	54275	2	642376	194	376343	244	507	2	32783	2
2.07 Charleston Harbor	1034	< 1	13175	3	13354	8	109	< 1	785	< 1
2.08 North and South Santee Rivers	1132	< 1	12946	3	11708	7	17	< 1	693	< 1
2.09 St. Helena Sound	3816	< 1	41198	12	34873	22	249	1	2141	< 1
2.10 Broad River	3749	< 1	36403	10	26165	17	220	< 1	1565	< 1
2.11 Savannah River	3068	< 1	23863	7	20595	13	76	< 1	779	< 1
2.12 Ogeechee River	7408	< 1	58153	17	41886	27	89	< 1	900	< 1
2.13 St. Catherine's / Sapelo Sound	25	< 1	414	< 1	800	< 1	--	--	15	< 1
2.14 Altamaha River	3349	< 1	26529	8	33409	21	158	< 1	706	< 1
2.15 St. Andrew / St. Simons Sound	6582	< 1	81471	24	119042	77	588	2	2819	< 1
2.16 St. Johns River	12	< 1	5493	1	13612	8	2367	9	--	--
2.17 Indian River	--	--	1713	< 1	2570	1	--	--	--	--
2.18 Biscayne Bay	--	--	7501	2	164578	106	944	3	--	--
TOTAL	143149	6	2915580	880	1874575	1218	9023	36	85482	6
EAST COAST TOTAL	207518	8	5060905	1528	3943268	2563	63873	259	659795	53

HERBICIDES									
2,4-D		DINOSEB		FLUOMETURON		METOLACHLOR		PROPANIL	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
960	< 1	199	1	--	--	12	< 1	--	--
657	< 1	12	< 1	--	--	1	< 1	--	--
425	< 1	9	< 1	--	--	< 1	< 1	--	--
502	< 1	9	< 1	--	--	--	--	--	--
2730	< 1	2253	18	--	--	283	< 1	--	--
505	< 1	47	< 1	--	--	5	< 1	--	--
9390	< 1	3477	28	--	--	434	< 1	--	--
1105	< 1	1134	9	--	--	78	< 1	--	--
1603	< 1	796	6	--	--	990	< 1	--	--
853	< 1	21	< 1	--	--	2358	< 1	--	--
1795	< 1	149	1	--	--	5984	< 1	--	--
290	< 1	48	< 1	--	--	150	< 1	--	--
25	< 1	6	< 1	--	--	70	< 1	--	--
352	< 1	296	2	--	--	1037	< 1	--	--
1234	< 1	3973	32	--	--	3009	< 1	--	--
838	< 1	12635	102	--	--	6244	1	--	--
5350	< 1	25815	218	--	--	39267	6	--	--
1304	< 1	17469	142	--	--	8645	1	--	--
29440	< 1	60472	492	--	--	59934	9	--	--
1512	< 1	3062	24	--	--	6503	1	--	--
37289	< 1	79838	649	--	--	202976	33	--	--
483	< 1	1022	8	--	--	16630	2	--	--
160963	1	83451	678	--	--	752232	122	--	--
259605	1	297193	2418	--	--	1106822	180	--	--
60258	< 1	121998	991	10623	< 1	139974	22	--	--
67638	< 1	41589	338	3871	< 1	133764	21	--	--
3321	< 1	1276	10	--	--	9212	1	--	--
1963	< 1	493	4	--	--	4975	< 1	--	--
39264	< 1	14059	114	3101	< 1	79635	13	--	--
159222	1	59470	483	50814	1	151733	24	--	--
4384	< 1	940	7	--	--	3794	< 1	--	--
3685	< 1	1030	8	30	< 1	3644	< 1	--	--
14665	< 1	3541	28	362	< 1	11508	1	--	--
11150	< 1	3977	32	168	< 1	10111	1	--	--
8220	< 1	2783	22	43	< 1	8295	1	--	--
28206	< 1	9684	78	76	< 1	20429	3	--	--
93	< 1	15	< 1	--	--	130	< 1	--	--
19867	< 1	2830	23	--	--	10391	1	--	--
32595	< 1	7702	82	182	< 1	26402	4	--	--
181938	1	43951	357	--	--	13758	2	--	--
28498	< 1	--	--	--	--	642	< 1	--	--
36839	< 1	9082	73	--	--	11595	1	--	--
701806	4	324420	2638	69270	2	640192	104	--	--
961411	6	621813	5056	69270	2	1747014	284	--	--

* All values are in pounds applied per year and circa 1982. Toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix G. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Estuarine Drainage Area.*

ESTUARY	HERBICIDES									
	ACIFLUORFEN		ALACHLOR		ATRAZINE		BENSULFIDE		CYANAZINE	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	—	—	743	< 1	76011	49	2641	10	—	—
3.02 Charlotte Harbor	5	< 1	817	< 1	46781	30	7441	30	—	—
3.03 Tampa Bay	2	< 1	954	< 1	3150	2	2633	10	—	—
3.04 Suwanee River	1920	< 1	51693	15	34126	22	239	< 1	—	—
3.05 Apalachee Bay	5152	< 1	108365	32	86341	58	201	< 1	2342	< 1
3.06 Apalachicola Bay	2462	< 1	39479	11	6092	3	12	< 1	46	< 1
3.07 St. Andrew Bay	594	< 1	8076	2	577	< 1	—	—	—	—
3.08 Choctawhatchee Bay	8898	< 1	113573	34	29119	18	41	< 1	124	< 1
3.09 Pensacola Bay	14188	< 1	150754	45	43910	28	28	< 1	1226	< 1
3.10 Perdido Bay	8176	< 1	54903	16	40485	26	66	< 1	220	< 1
3.11 Mobile Bay	9852	< 1	58277	16	63821	41	269	1	831	< 1
3.12 Mississippi Sound	15977	< 1	54440	16	47003	30	557	2	276	< 1
3.13 Mississippi Delta Region	5676	< 1	12823	3	19100	12	10	< 1	1	< 1
3.14 Atchafalaya and Vermilion Bays	54514	2	141765	42	60280	39	28	< 1	1762	< 1
3.15 Calcasieu Lake	6670	< 1	13801	4	4	< 1	—	—	—	—
3.16 Sabine Lake	1183	< 1	3508	1	1641	1	88	< 1	10	< 1
3.17 Galveston Bay	3628	< 1	18231	5	19146	12	1092	4	294	< 1
3.18 Brazos River	515	< 1	19240	5	37361	24	566	2	610	< 1
3.19 Matagorda Bay	860	< 1	87762	26	211648	137	73	< 1	2604	< 1
3.20 San Antonio Bay	3	< 1	2227	< 1	6643	4	—	—	55	< 1
3.21 Aransas Bay	—	—	37932	11	104469	67	2	< 1	1036	< 1
3.22 Corpus Christi Bay	—	—	36206	10	100855	65	513	2	980	< 1
3.23 Laguna Madre	62	< 1	92717	28	348462	226	293713	1192	1937	< 1
TOTAL	140337	5	1106295	334	1387035	901	310225	1259	14360	1
WEST COAST										
4.01 San Diego Bay	—	—	94	< 1	15	< 1	74	< 1	47	< 1
4.02 San Pedro Bay	—	—	402	< 1	59	< 1	229	< 1	180	< 1
4.03 Santa Monica Bay	—	—	106	< 1	3	< 1	51	< 1	10	< 1
4.04 Monterey Bay	—	—	951	< 1	72	< 1	68	< 1	217	< 1
4.05 San Francisco Bay	—	—	144466	43	22361	14	1523	6	62564	5
4.06 Eel River	—	—	213	< 1	32	< 1	—	—	102	< 1
4.07 Humboldt Bay	—	—	56	< 1	8	< 1	—	—	26	< 1
4.08 Klamath River	—	—	5	< 1	< 1 *	< 1	—	—	2	< 1
4.09 Coos Bay	—	—	96	< 1	99	< 1	1	< 1	39	< 1
4.10 Winchester Bay	—	—	109	< 1	283	< 1	10	< 1	20	< 1
4.11 Columbia River	—	—	4365	1	7083	4	210	< 1	293	< 1
4.12 Willapa Bay	—	—	7	< 1	13	< 1	—	—	—	—
4.13 Grays Harbor	—	—	201	< 1	337	< 1	—	—	—	—
4.14 Puget Sound	—	—	6861	2	10368	6	854	3	—	—
TOTAL	—	—	157940	47	40739	26	3024	12	63505	5
NATIONAL TOTAL	347855	13	6325146	1909	5371042	3491	377122	1530	737660	59

HERBICIDES									
2,4-D		DINOSEB		FLUOMETURON		METOLACHLOR		PROPANIL	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
114126	< 1	10	< 1	--	--	602	< 1	--	--
333300	2	98	< 1	--	--	309	< 1	--	--
138379	< 1	54	< 1	--	--	1234	< 1	--	--
41170	< 1	5444	44	--	--	14953	2	--	--
43552	< 1	12810	102	3403	< 1	28945	4	--	--
9784	< 1	8874	54	18	< 1	7696	1	--	--
3094	< 1	967	7	--	--	1576	< 1	--	--
29365	< 1	20507	166	72	< 1	25901	4	--	--
37855	< 1	23628	192	2523	< 1	33330	5	--	--
10524	< 1	8854	71	116	< 1	12089	1	--	--
18199	< 1	9441	76	2396	< 1	12003	1	--	--
118957	< 1	34348	279	1641	< 1	29850	4	--	--
55401	< 1	15536	126	9058	< 1	13809	2	555	< 1
92390	< 1	150695	1225	16993	< 1	162697	26	209014	15
10256	< 1	17107	139	--	--	16155	2	62251	4
11663	< 1	1566	12	--	--	23329	3	147936	10
16908	< 1	139	1	124	< 1	135964	22	460680	33
15251	< 1	62	< 1	359	< 1	34427	5	103876	7
57534	< 1	16	< 1	258	< 1	141853	23	630937	45
1886	< 1	--	--	10	< 1	3711	< 1	3213	< 1
25667	< 1	--	--	868	< 1	57101	9	--	--
23293	< 1	--	--	803	< 1	55005	8	--	--
98510	< 1	2916	23	4771	< 1	176523	28	--	--
1307076	9	310680	2525	43420	1	989271	161	1618465	116
206	< 1	11	< 1	--	--	62	< 1	--	--
1656	< 1	10	< 1	--	--	297	< 1	--	--
52	< 1	5	< 1	--	--	129	< 1	--	--
3326	< 1	602	4	--	--	979	< 1	--	--
91292	< 1	41310	335	--	--	131496	21	18474	1
1088	< 1	79	< 1	--	--	148	< 1	--	--
287	< 1	20	< 1	--	--	39	< 1	--	--
53	< 1	1	< 1	--	--	3	< 1	--	--
2368	< 1	11	< 1	--	--	11	< 1	--	--
10393	< 1	108	< 1	--	--	46	< 1	--	--
30868	< 1	3025	24	--	--	1819	< 1	--	--
1282	< 1	9	< 1	--	--	6	< 1	--	--
1608	< 1	371	3	--	--	195	< 1	--	--
51942	< 1	8966	72	--	--	4848	< 1	--	--
196427	1	54536	443	--	--	140085	22	18474	1
2464915	16	988829	8025	112690	3	2876371	468	1636940	118

* All values are in pounds applied per year and circa 1982. Toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix G. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Estuarine Drainage Area.*

ESTUARY	HERBICIDES						INSECTICIDES			
	THIOBENCARB		TRIFLURALIN		VERNOLATE		CARBARYL		CARBOFURAN	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	--	--	15	< 1	--	--	8	< 1	18	< 1
1.02 Englishman Bay	--	--	1	< 1	--	--	< 1	< 1	< 1	< 1
1.03 Narraguagus Bay	--	--	1	< 1	--	--	< 1	< 1	< 1	< 1
1.04 Blue Hill Bay	--	--	< 1	< 1	--	--	6	< 1	1	< 1
1.05 Penobscot Bay	--	--	215	1	--	--	267	< 1	1427	9
1.06 Muscongus Bay	--	--	5	< 1	--	--	26	< 1	97	< 1
1.07 Sheepscot Bay	--	--	413	3	--	--	2096	1	5164	33
1.08 Casco Bay	--	--	103	< 1	--	--	199	< 1	497	3
1.09 Saco Bay	--	--	100	< 1	--	--	500	< 1	513	3
1.10 Great Bay	--	--	1	< 1	--	--	159	< 1	533	3
1.11 Merrimack River	--	--	< 1	< 1	--	--	1797	1	1419	9
1.12 Boston Bay	--	--	< 1	< 1	--	--	446	< 1	76	< 1
1.13 Cape Cod Bay	--	--	< 1	< 1	--	--	385	< 1	37	< 1
1.14 Buzzards Bay	--	--	2	< 1	--	--	3662	2	576	3
1.15 Narragansett Bay	--	--	72	< 1	--	--	5970	4	1248	8
1.16 Gardiners Bay	--	--	1065	8	--	--	1950	1	9771	83
1.17 Long Island Sound	--	--	353	2	--	--	9400	7	14721	95
1.18 Great South Bay	--	--	1481	12	--	--	2994	2	13501	87
1.19 Hudson River/Raritan Bay	--	--	1467	12	2137	1	67456	54	36099	234
1.20 Barnegat Bay	--	--	595	4	439	< 1	5079	4	7995	52
1.21 Delaware Bay	--	--	18801	153	5411	3	52760	42	89936	584
1.22 Chincoteague Bay	--	--	1100	8	120	< 1	1109	< 1	5118	33
1.23 Chesapeake Bay	--	--	62760	510	59521	38	80572	65	347974	2262
TOTAL	--	--	88550	721	67628	43	236841	192	536721	3490
SOUTHEAST										
2.01 Albemarle Sound	--	--	42389	344	145775	94	154351	125	91976	597
2.02 Pamlico Sound	--	--	41468	337	53229	34	151095	122	95481	620
2.03 Bogue Sound	--	--	2572	20	1571	1	9417	7	6424	41
2.04 New River	--	--	1391	11	882	< 1	5224	4	3601	23
2.05 Cape Fear River	--	--	30553	248	20894	13	98510	80	60515	394
2.06 Winyah Bay	--	--	445238	3620	31291	20	290396	236	185718	1077
2.07 Charleston Harbor	--	--	8946	72	302	< 1	9456	7	3990	25
2.08 North and South Santee Rivers	--	--	9575	77	328	< 1	6193	5	4452	28
2.09 St. Helena Sound	--	--	32667	265	1177	< 1	24916	20	10421	67
2.10 Broad River	--	--	30650	249	2055	1	20857	16	8530	55
2.11 Savannah River	--	--	17356	141	4020	2	7564	6	8397	54
2.12 Ossabaw Sound	--	--	29719	241	23668	15	12258	9	20443	132
2.13 St. Catherine's / Sapelo Sound	--	--	107	< 1	35	< 1	12	< 1	372	2
2.14 Altamaha River	--	--	13445	109	6290	4	5444	4	18350	106
2.15 St. Andrew / St. Simons Sound	--	--	26494	215	18169	11	13957	11	58556	380
2.16 St. Johns River	--	--	1228	10	29	< 1	20053	16	16593	107
2.17 Indian River	--	--	653	5	--	--	308	< 1	1276	8
2.18 Biscayne Bay	--	--	2699	21	--	--	13340	10	7975	51
TOTAL	--	--	737150	5994	309715	201	843349	685	581168	3779
EAST COAST TOTAL	--	--	825700	6715	377343	245	1080190	878	1117889	7269

INSECTICIDES									
DIAZINON		DISULFOTON		MALATHION		METHANIDOPHOS		METHYL PARATHION	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	106	< 1	--	--	179	< 1	< 1	< 1
--	--	4	< 1	--	--	7	< 1	--	--
--	--	3	< 1	--	--	5	< 1	--	--
--	--	1	< 1	--	--	3	< 1	--	--
< 1	< 1	1742	4	--	--	2917	< 1	1	< 1
--	--	32	< 1	--	--	56	< 1	< 1	< 1
--	--	1606	4	--	--	2593	< 1	7	< 1
--	--	507	1	--	--	846	< 1	< 1	< 1
--	--	344	< 1	--	--	551	< 1	12	< 1
--	--	< 1	< 1	--	--	--	--	87	< 1
36	< 1	45	< 1	136	< 1	21	< 1	2677	2
14	< 1	7	< 1	71	< 1	11	< 1	918	< 1
716	< 1	6	< 1	8	< 1	2	< 1	461	< 1
5676	5	123	< 1	127	< 1	101	< 1	3871	3
7693	6	266	< 1	353	1	1152	< 1	6472	5
142	< 1	1321	3	67	< 1	5359	< 1	313	< 1
1258	1	2503	6	2987	12	2283	< 1	20919	17
200	< 1	1824	4	107	< 1	7404	< 1	1216	< 1
12970	11	4289	10	9434	38	2212	< 1	145277	118
667	< 1	209	< 1	265	1	670	< 1	7456	6
21664	18	8449	21	8726	35	8922	< 1	32607	26
14	< 1	707	1	561	2	266	< 1	235	< 1
20493	17	39324	98	79566	323	6522	< 1	14145	11
71743	62	63418	158	102408	416	42081	1	236674	192
4084	3	5254	13	12081	49	1376	< 1	11002	8
17359	15	12926	32	4272	17	449	< 1	17865	14
663	< 1	569	1	107	< 1	145	< 1	1014	< 1
701	< 1	476	1	106	< 1	10	< 1	667	< 1
12860	11	7360	18	2470	10	153	< 1	11814	9
37439	32	21115	52	1198	4	98	< 1	355567	289
613	< 1	81	< 1	37	< 1	--	--	426	< 1
767	< 1	375	< 1	--	--	--	--	869	< 1
2118	1	57	< 1	16	< 1	--	--	3855	3
1971	1	8	< 1	25	< 1	--	--	2345	1
733	< 1	81	< 1	12	< 1	< 1	< 1	8449	6
941	< 1	945	2	262	1	< 1	< 1	31404	25
5	< 1	< 1	< 1	< 1	< 1	--	--	111	< 1
2128	1	154	< 1	192	< 1	4	< 1	14984	12
5672	4	665	1	497	2	115	< 1	28187	22
1517	1	1439	3	68	< 1	12175	< 1	6306	5
1493	1	749	1	--	--	--	--	< 1	< 1
3276	2	1947	4	1263	5	48454	1	7200	5
94340	81	54201	135	22596	92	62979	2	502065	408
166083	144	117619	294	125004	508	105060	4	738739	600

* All values are in pounds applied per year and circa 1982. Toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix G. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Estuarine Drainage Area.*

ESTUARY	HERBICIDES						INSECTICIDES			
	THIOBENCARB		TRIFLURALIN		VERNOLATE		CARBARYL		CARBOFURAN	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	--	--	131	1	--	< 1	1613	1	1432	9
3.02 Charlotte Harbor	--	--	1068	8	34	< 1	4171	3	993	6
3.03 Tampa Bay	--	--	713	5	14	< 1	5418	4	599	3
3.04 Suwanee River	--	--	6252	50	4721	3	10109	8	17518	113
3.05 Apalachee Bay	--	--	19561	159	19377	12	31975	26	42226	274
3.06 Apalachicola Bay	--	--	5376	43	6737	4	3492	2	3162	20
3.07 St. Andrew Bay	--	--	1277	10	1277	< 1	816	< 1	322	2
3.08 Choctawhatchee Bay	--	--	17254	140	14081	9	11052	9	9260	60
3.09 Pensacola Bay	--	--	29450	239	17499	11	29389	23	12183	79
3.10 Perdido Bay	--	--	13983	113	2539	1	7974	6	7548	49
3.11 Mobile Bay	--	--	17245	140	1	< 1	73086	59	6658	43
3.12 Mississippi Sound	--	--	47562	386	--	--	59704	48	8330	54
3.13 Mississippi Delta Region	186	< 1	25083	204	--	< 1	10190	8	1936	12
3.14 Atchafalaya and Vermilion Bays	70254	65	187438	1523	--	--	63903	51	43294	281
3.15 Calcasieu Lake	20924	19	20450	166	--	--	5527	4	7032	45
3.16 Sabine Lake	20968	19	13954	113	--	--	6740	5	6808	44
3.17 Galveston Bay	62675	58	75882	617	91	< 1	30314	24	21038	136
3.18 Brazos River	14130	13	17643	143	144	< 1	20387	16	7454	48
3.19 Matagorda Bay	85840	79	23586	191	25	< 1	93391	75	41473	269
3.20 San Antonio Bay	436	< 1	301	2	--	--	1041	< 1	519	3
3.21 Aransas Bay	--	--	18206	148	< 1	< 1	14744	12	6577	42
3.22 Corpus Christi Bay	--	--	17143	139	< 1	< 1	14124	11	6277	40
3.23 Laguna Madre	--	--	134976	1097	26	< 1	124327	101	19904	129
TOTAL	275413	255	694534	5648	66566	43	623487	507	272543	1773
WEST COAST										
4.01 San Diego Bay	--	--	201	1	21	< 1	109	< 1	--	--
4.02 San Pedro Bay	--	--	338	2	82	< 1	864	< 1	125	< 1
4.03 Santa Monica Bay	--	--	155	1	4	< 1	253	< 1	24	< 1
4.04 Monterey Bay	--	--	5626	45	99	< 1	1400	1	353	2
4.05 San Francisco Bay	75600	70	148976	1211	29196	18	83257	67	14201	92
4.06 Eel River	--	--	363	2	48	< 1	20	< 1	--	--
4.07 Humboldt Bay	--	--	94	< 1	12	< 1	5	< 1	--	--
4.08 Klamath River	--	--	8	< 1	1	< 1	< 1	< 1	--	--
4.09 Coos Bay	--	--	1	< 1	31	< 1	14	< 1	6	< 1
4.10 Winchester Bay	--	--	30	< 1	126	< 1	372	< 1	39	< 1
4.11 Columbia River	--	--	675	5	7459	4	2187	1	636	4
4.12 Willapa Bay	--	--	2	< 1	16	< 1	300	< 1	7	< 1
4.13 Grays Harbor	--	--	121	1	460	< 1	196	< 1	3	< 1
4.14 Puget Sound	--	--	4935	40	14419	9	9187	7	1258	8
TOTAL	75600	70	161525	1314	51974	33	97964	79	16652	108
NATIONAL TOTAL	351013	326	1681759	13677	495883	322	1801641	1465	1407084	9150

INSECTICIDES

DIAZINON		DISULFOTON		MALATHION		METHAMIDOPHOS		METHYL PARATHION	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
2892	2	127	< 1	65	< 1	48444	1	1308	1
4978	4	195	< 1	159	< 1	31833	1	200	< 1
3897	3	221	< 1	77	< 1	50202	1	537	< 1
540	< 1	9671	24	195	< 1	4235	< 1	3942	3
849	< 1	13401	33	865	3	3055	< 1	23135	18
38	< 1	1409	3	18	< 1	500	< 1	5403	4
9	< 1	160	< 1	12	< 1	14	< 1	1259	1
112	< 1	5295	13	88	< 1	1237	< 1	13773	11
372	< 1	6281	15	566	2	301	< 1	34284	27
207	< 1	2171	5	74	< 1	805	< 1	6671	5
1302	1	60	< 1	1500	6	963	< 1	8131	6
725	< 1	3	< 1	4502	18	616	< 1	22752	18
55	< 1	--	--	1617	6	--	--	22798	18
418	< 1	--	--	14164	57	--	--	277653	225
2	< 1	--	--	2004	8	--	--	30472	24
37	< 1	42	< 1	956	3	2	< 1	19843	16
654	< 1	856	2	3044	12	65	< 1	60801	49
1205	1	1683	4	1642	6	125	< 1	14899	12
4837	4	7943	19	5949	24	21	< 1	77791	63
101	< 1	219	< 1	23	< 1	--	--	633	< 1
1917	1	3989	10	951	3	< 1	< 1	7466	6
1883	1	3846	9	962	3	170	< 1	7081	5
15921	13	68335	170	16434	66	39281	1	47110	38
42951	37	125907	315	55867	227	181669	6	687940	559
91	< 1	--	--	196	< 1	469	< 1	7	< 1
645	< 1	3	< 1	523	2	489	< 1	295	< 1
133	< 1	408	1	87	< 1	321	< 1	182	< 1
1966	1	9776	24	1044	4	4042	< 1	2334	1
77320	67	13886	34	18736	76	8895	< 1	20021	16
80	< 1	--	--	16	< 1	--	--	--	--
2	< 1	--	--	3	< 1	--	--	--	--
< 1	< 1	--	--	< 1	< 1	--	--	--	--
< 1	< 1	3	< 1	< 1	< 1	< 1	< 1	< 1	< 1
86	< 1	37	< 1	45	< 1	6	< 1	< 1	< 1
350	< 1	379	< 1	186	< 1	590	< 1	636	< 1
427	< 1	< 1	< 1	< 1	< 1	6	< 1	162	< 1
6	< 1	27	< 1	2	< 1	226	< 1	373	< 1
889	< 1	1961	4	244	1	5903	< 1	7515	6
81995	71	26480	66	21082	85	20947	< 1	31525	25
291029	252	270006	675	201953	821	307676	11	1458204	1185

* All values are in pounds applied per year and circa 1982. Toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix G. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Estuarine Drainage Area.*

ESTUARY	INSECTICIDES				FUNGICIDES					
	PARATHION		PHORATE		CAPTAFOL		CHLOROTHALONIL		METIRAM	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	23	< 1	23	23	30	1	209	8	265	< 1
1.02 Englishman Bay	< 1	< 1	< 1	< 1	1	< 1	9	< 1	5	< 1
1.03 Narragansett Bay	< 1	< 1	< 1	< 1	< 1	< 1	6	< 1	3	< 1
1.04 Blue Hill Bay	< 1	< 1	--	--	5	< 1	3	< 1	129	< 1
1.05 Penobscot Bay	382	13	376	376	545	22	3384	137	5711	< 1
1.06 Muscongus Bay	7	< 1	6	6	29	1	66	2	529	< 1
1.07 Sheepscot Bay	347	12	334	334	2049	83	3008	122	38595	2
1.08 Casco Bay	110	3	109	109	254	10	981	39	3778	< 1
1.09 Saco Bay	74	2	71	71	471	19	639	25	9154	< 1
1.10 Great Bay	--	--	--	--	--	--	--	--	1294	< 1
1.11 Merrimack River	271	9	50	50	2	< 1	918	37	7878	< 1
1.12 Boston Bay	105	3	6	6	< 1	< 1	299	12	1002	< 1
1.13 Cape Cod Bay	3	< 1	7	7	895	36	69	2	1	< 1
1.14 Buzzards Bay	62	2	119	119	7303	296	1942	78	45	< 1
1.15 Narragansett Bay	1367	49	333	333	11404	463	5322	216	2458	< 1
1.16 Gardiners Bay	5728	206	343	343	9213	374	8373	339	3356	< 1
1.17 Long Island Sound	5220	188	2825	2825	4223	171	3927	159	26703	1
1.18 Great South Bay	8012	289	474	474	12736	517	11588	470	5589	< 1
1.19 Hudson River/Raritan Bay	34871	1251	5800	5800	7528	305	68545	2782	167708	10
1.20 Barnegat Bay	7449	268	352	352	5295	214	8111	248	5037	< 1
1.21 Delaware Bay	35282	1273	10400	10400	26255	1065	75383	3060	17558	1
1.22 Chincoteague Bay	10	< 1	455	456	295	12	2396	97	--	--
1.23 Chesapeake Bay	2295	82	20793	20793	10600	430	68842	2794	9511	< 1
TOTAL	101428	3661	42885	42885	99143	4025	262031	10638	306316	19
SOUTHEAST										
2.01 Albemarle Sound	1537	55	35831	35831	387	15	123860	5028	79	< 1
2.02 Pamlico Sound	1210	43	17986	17986	1618	65	46556	1890	64	< 1
2.03 Bogue Sound	40	1	798	798	35	1	1556	63	--	--
2.04 New River	41	1	436	436	34	1	674	27	--	--
2.05 Cape Fear River	869	31	8779	8779	5435	220	24023	975	30	< 1
2.06 Winyah Bay	2346	84	5946	5946	1682	68	165356	6713	104	< 1
2.07 Charleston Harbor	25	< 1	62	62	422	17	9035	366	--	--
2.08 North and South Santee Rivers	< 1	< 1	55	55	73	2	4006	162	--	--
2.09 St. Helena Sound	11	< 1	162	162	937	38	20795	844	--	--
2.10 Broad River	15	< 1	120	120	739	30	16882	685	--	--
2.11 Savannah River	523	18	41	41	44	1	12676	514	--	--
2.12 Ogeechee Sound	6234	225	7	7	--	--	64942	2636	--	--
2.13 St. Catherine's / Sapelo Sound	3	< 1	--	--	--	--	79	3	--	--
2.14 Altamaha River	2086	75	--	--	< 1	< 1	19339	785	< 1	< 1
2.15 St. Andrew / St. Simons Sound	4889	176	18	18	4	< 1	50538	2051	5	< 1
2.16 St. Johns River	8463	305	4592	4592	42871	1740	50130	2035	289	< 1
2.17 Indian River	180	6	--	--	45925	1864	--	--	--	--
2.18 Biscayne Bay	8249	297	2863	2863	8291	336	83158	3376	8483	< 1
TOTAL	36729	1325	77723	77723	108505	4405	693613	28160	9036	< 1
EAST COAST TOTAL	138157	4987	120608	120608	207648	8430	955644	38799	315353	20

FUNGICIDES		NEMATICIDE		MITICIDE		TOTAL	
PCNB		ETHOPROP		CHLOROBENZILATE		ALL PESTICIDES	
Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	--	--	--	--	2219	35
--	--	--	--	--	--	715	1
--	--	--	--	--	--	481	< 1
--	--	--	--	--	--	695	< 1
--	--	--	--	--	--	40972	591
--	--	--	--	--	--	2880	12
--	--	--	--	--	--	144219	857
--	--	--	--	--	--	16380	181
--	--	--	--	--	--	21173	133
--	--	--	--	--	--	8272	5
--	--	--	--	--	--	32344	118
--	--	--	--	--	--	4314	25
--	--	--	--	--	--	3181	49
--	--	--	--	--	--	32692	520
--	--	--	--	--	--	88532	1133
--	--	--	--	--	--	69406	1448
--	--	--	--	--	--	360061	3813
--	--	--	--	--	--	98401	2007
--	--	25	< 1	--	--	1035835	11291
--	--	495	3	--	--	83045	1206
--	--	2855	20	--	--	1547000	17817
--	--	517	3	--	--	95840	654
--	--	122765	886	--	--	5289818	30583
--	--	126659	914	--	--	8958465	72280
2449	3	57899	418	--	--	2132819	44054
892	1	101111	730	--	--	1963202	22750
--	--	4453	32	--	--	118047	1014
--	--	3921	28	--	--	68670	560
714	1	75606	545	--	--	1202376	11766
6037	8	182470	1317	--	--	3239992	20429
--	--	1081	7	--	--	72123	584
2	< 1	3562	25	--	--	65241	381
34	< 1	1818	11	--	--	211295	1484
15	< 1	1019	7	--	--	178808	1234
1519	2	974	7	--	--	130226	843
17925	26	6554	47	--	--	382281	3500
9	< 1	20	< 1	--	--	2296	7
2967	4	5297	38	--	--	186097	1198
12595	18	18669	134	--	--	518448	3223
11	< 1	13	< 1	61545	80	488829	9280
--	--	--	--	90584	117	174603	2008
3	< 1	9969	71	9908	12	447679	7273
45177	86	474245	3424	162037	210	11581037	131588
45177	86	600904	4338	162037	210	20539503	203868

* All values are in pounds applied per year and circa 1982. Toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix G. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Estuarine Drainage Area.*

ESTUARY	INSECTICIDES				FUNGICIDES					
	PARATHION		PHORATE		CAPTAFOL		CHLOROTHALONIL		METIRAM	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	4219	152	331	331	7066	286	48229	1958	9007	< 1
3.02 Charlotte Harbor	4717	170	26	26	108082	4388	45733	1856	4891	< 1
3.03 Tampa Bay	1830	66	84	84	36054	1463	50410	2046	9005	< 1
3.04 Suwannee River	7086	255	81	81	4300	174	17072	693	--	--
3.05 Apalachee Bay	9553	344	457	457	1103	44	54722	2221	377	< 1
3.06 Apalachicola Bay	3486	125	88	88	68	2	15442	826	82	< 1
3.07 St. Andrew Bay	784	27	7	7	9	< 1	472	19	< 1	< 1
3.08 Choctawhatchee Bay	9613	347	300	300	646	26	49030	1990	115	< 1
3.09 Pensacola Bay	14998	541	523	523	199	8	44367	1801	18	< 1
3.10 Perdido Bay	5783	208	275	275	929	37	7820	317	23	< 1
3.11 Mobile Bay	6314	227	334	334	1130	45	10559	428	25	< 1
3.12 Mississippi Sound	2083	75	181	181	650	26	6073	246	22	< 1
3.13 Mississippi Delta Region	67	2	< 1	< 1	--	--	1391	56	--	--
3.14 Atchafalaya and Vermilion Bays	97	3	< 1	< 1	--	--	14787	600	--	--
3.15 Calcasieu Lake	3	< 1	< 1	< 1	--	--	1689	68	--	--
3.16 Sabine Lake	87	3	16	16	6	< 1	356	14	--	--
3.17 Galveston Bay	1203	43	606	606	184	7	2449	99	--	--
3.18 Brazos River	2522	91	1329	1329	237	9	1789	72	--	--
3.19 Matagorda Bay	16730	603	6124	6124	37	1	322	13	--	--
3.20 San Antonio Bay	700	25	180	180	--	--	--	--	--	--
3.21 Aransas Bay	10832	391	3322	3322	1	< 1	9	< 1	--	--
3.22 Corpus Christi Bay	10928	394	3172	3172	258	10	1193	48	--	--
3.23 Laguna Madre	61345	2214	10607	10607	43878	1781	261295	10608	--	--
TOTAL	174971	6316	28053	28053	204847	8316	635220	25789	22569	1
WEST COAST										
4.01 San Diego Bay	--	--	--	--	7	< 1	175	7	--	--
4.02 San Pedro Bay	199	7	--	--	21	< 1	332	13	--	--
4.03 Santa Monica Bay	125	4	--	--	9	< 1	1402	56	--	--
4.04 Monterey Bay	2383	86	< 1	< 1	30	1	10752	436	--	--
4.05 San Francisco Bay	39591	1429	1940	1940	34990	1420	23595	957	--	--
4.06 Eel River	--	--	--	--	17	< 1	--	--	--	--
4.07 Humboldt Bay	--	--	--	--	4	< 1	--	--	--	--
4.08 Klamath River	--	--	--	--	1	< 1	--	--	--	--
4.09 Coos Bay	4	< 1	4	4	1	< 1	< 1	< 1	--	--
4.10 Winchester Bay	143	5	2	2	11	< 1	< 1	< 1	--	--
4.11 Columbia River	1724	62	2187	2187	393	15	125	5	--	--
4.12 Willapa Bay	15	< 1	9	9	1029	41	610	24	< 1	< 1
4.13 Grays Harbor	533	19	292	292	50	2	3	< 1	33	< 1
4.14 Puget Sound	13067	471	7526	7526	1083	44	70	2	713	< 1
TOTAL	57789	2086	11964	11964	37653	1528	37069	1505	747	< 1
NATIONAL TOTAL	370917	13389	180625	180625	450149	18275	1627933	66093	338670	21

FUNGICIDES		NEMATOCIDE		MITICIDE		TOTAL	
PCNB		ETHOPROP		CHLOROBENZILATE		ALL PESTICIDES	
Use	Tox	Use	Tox	Use	Tox	Use	Tox
< 1	< 1	3045	21	7581	9	328662	2840
77	< 1	1867	13	203686	264	801324	6810
199	< 1	4	< 1	68389	88	374123	3786
2130	3	5421	39	12	< 1	242941	1538
14180	20	5114	36	1	< 1	530994	3853
3371	4	603	4	--	--	121613	1004
89	< 1	13	< 1	--	--	21424	80
12858	19	1537	11	--	--	373947	3163
11848	17	1413	10	--	--	511252	3574
40	< 1	1060	7	--	--	193378	1147
365	< 1	1055	7	--	--	301900	1441
22	< 1	34	< 1	--	--	456463	1392
--	--	46	< 1	--	--	195403	455
753	1	1069	7	--	--	1564280	4171
--	--	--	--	--	--	214365	498
11	< 1	< 1	< 1	--	--	260840	267
6025	8	--	--	6	< 1	922261	1746
9489	14	--	--	--	--	307067	1809
1774	2	--	--	--	--	1499527	7708
--	--	--	--	--	--	21942	220
22	< 1	--	--	--	--	295187	4027
77	< 1	--	--	--	--	284866	3926
1702	2	--	--	37085	48	1902006	28383
65041	96	22288	160	316763	411	11725775	83838
--	--	--	--	39	< 1	1848	10
--	--	--	--	3	< 1	6592	30
--	--	--	--	16	< 1	3518	65
--	--	--	--	--	--	46102	611
168	< 1	--	--	--	--	1104069	7832
--	--	--	--	--	--	2221	4
--	--	--	--	--	--	566	1
--	--	--	--	--	--	81	< 1
--	--	--	--	--	--	2706	5
--	--	--	--	--	--	11891	10
--	--	--	--	--	--	65282	2322
--	--	--	--	--	--	3914	78
--	--	--	--	--	--	5058	318
--	--	--	--	--	--	152700	8209
168	< 1	--	--	59	< 1	1406556	19495
110387	162	823192	4498	478860	621	33671635	307201

* All values are in pounds applied per year and circa 1982. Toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

Appendix H. Average Annual Pesticide Application Rates by Crop by State

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
2,4-D																
alfalfa	1.00	1.15	--	--	0.70	1.00	0.50	1.00	--	--	0.60	0.60	1.00	0.20	--	--
apples	--	--	--	--	--	--	--	--	2.00	--	0.80	--	--	--	--	--
asparagus	--	2.56	--	--	--	--	--	--	--	--	--	--	--	--	--	--
avocado	--	0.78	--	--	--	--	--	--	--	--	--	--	--	--	--	--
barley	--	1.01	--	--	0.40	--	0.50	--	--	0.20	--	--	0.50	--	0.50	0.40
blueberries	--	--	--	--	--	--	--	--	--	2.00	--	--	--	--	--	--
citrus	--	1.04	--	--	--	2.00	--	--	--	--	--	--	--	--	--	--
corn	0.50	0.68	--	--	--	0.50	0.50	1.00	--	--	--	0.50	0.50	--	0.50	0.50
filberts	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
oats	0.50	0.93	--	--	--	0.50	0.50	1.00	--	0.20	0.50	1.00	0.50	--	0.40	0.40
other hay	1.00	0.85	--	--	0.70	1.00	0.50	1.00	--	--	0.60	0.60	1.00	0.20	--	--
pasture/range	0.80	0.89	0.70	--	0.70	1.00	0.80	1.30	0.70	0.70	0.70	0.80	1.00	0.70	0.70	0.70
peaches	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
peanuts	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pears	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00
rice	--	0.87	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--
rye	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--
seed crops	0.50	--	--	--	--	1.00	--	--	--	--	--	--	0.70	--	--	--
sod	--	--	--	--	--	--	--	--	--	1.00	--	--	--	--	0.80	1.50
sorghum	0.40	0.17	--	--	--	0.50	0.50	0.90	--	--	--	0.40	0.50	--	--	--
strawberries	--	--	--	--	--	--	--	--	--	--	--	--	1.00	--	--	1.00
sugarcane	--	--	--	--	--	0.50	--	1.00	--	--	--	--	--	--	--	--
sweet corn	--	--	--	--	--	--	--	--	--	0.20	--	--	--	--	--	--
wheat	1.00	1.44	--	--	0.50	1.00	0.60	1.00	--	0.20	--	0.60	0.50	--	0.50	0.40
ACIFLUORFEN																
peanuts	0.40	--	--	--	--	0.40	--	--	--	--	--	--	0.30	--	--	--
rice	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--
soybean	0.35	--	--	--	0.34	0.38	0.45	0.29	--	0.34	--	0.29	0.40	--	0.45	--

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
1.00	--	1.00	1.50	0.50	--	--
1.50	2.00	--	--	--	2.00	1.00
--	--	--	--	--	--	--
--	--	--	--	--	--	--
0.50	0.30	--	0.50	--	0.50	0.60
--	--	--	--	--	--	--
--	--	--	--	--	--	--
0.50	0.40	--	0.40	0.70	--	0.80
1.50	--	--	--	--	--	--
0.50	0.20	--	0.50	0.80	0.50	0.50
1.00	--	1.00	1.50	0.50	--	--
1.00	0.70	0.70	1.00	0.50	2.00	1.00
--	--	--	--	--	0.80	--
--	--	--	0.30	--	--	--
--	1.00	--	--	--	--	1.00
--	--	--	--	0.90	--	--
--	0.25	--	0.50	--	--	--
1.00	0.20	--	0.70	--	0.70	0.60
--	--	--	--	1.00	--	--
--	--	--	0.50	0.80	--	--
--	1.50	--	--	--	--	--
--	--	--	--	--	--	--
0.80	0.40	--	--	--	--	0.60
1.00	0.20	--	0.50	0.50	0.40	0.80

Reference = Resources for the Future. 1988.
Use of Selected Pesticides in
Agricultural Crop Production by
State, Appendix Volume.

* -- = Not Applied.

--	--	--	0.50	0.30	0.50	--
--	--	--	--	--	--	--
--	0.50	--	0.30	0.45	0.50	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
ALACHLOR																
beans	--	3.00	--	--	1.50	--	--	--	--	--	--	--	--	--	--	--
corn	2.00	3.00	2.00	--	2.00	2.00	2.10	2.00	1.50	2.00	2.00	2.00	1.80	2.00	2.00	2.20
peanuts	2.70	--	--	--	--	2.50	2.60	--	--	--	--	--	2.00	--	--	--
potatoes	--	--	--	--	--	--	--	--	--	2.70	--	--	--	--	--	--
sorghum	2.00	--	--	--	--	2.80	--	2.00	--	--	--	2.00	1.50	--	--	--
soybean	1.45	--	--	--	1.94	2.00	1.50	2.91	--	1.94	--	1.97	2.21	--	2.00	--
sweet corn	--	3.00	--	--	1.50	2.00	--	--	2.20	1.50	--	--	--	--	1.50	2.20
ATRAZINE																
alfalfa	--	--	--	--	--	--	--	--	--	--	--	1.50	--	--	--	--
corn	2.00	1.50	2.00	--	1.60	2.00	1.80	2.00	1.50	1.60	2.00	1.00	1.40	2.00	1.00	1.00
other hay	--	--	--	--	--	--	--	--	--	--	--	1.50	--	--	--	--
seed crops	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sod	--	--	--	--	--	2.50	--	--	--	--	--	--	--	--	--	--
sorghum	2.00	1.40	--	--	--	1.20	1.20	2.00	--	--	--	1.20	1.00	--	--	--
sugarcane	--	--	--	--	--	4.00	--	1.50	--	--	--	--	--	--	--	--
sweet corn	--	1.50	--	--	1.00	2.00	--	--	1.00	1.00	--	--	--	--	1.00	2.50
BENSULIDE																
broccoli	--	3.86	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cabbage	--	4.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cantaloupes	--	--	--	--	--	--	--	--	--	6.00	--	--	--	--	6.00	--
cauliflower	--	4.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cucumbers	5.00	4.00	--	--	5.00	5.00	5.00	--	--	5.00	--	--	5.00	--	4.50	4.50
honeydew melons	--	4.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
hot peppers	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
lettuce	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.50	--
onions	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pumpkins	--	4.00	--	--	--	--	--	--	--	--	--	--	--	--	4.50	--
sod	--	--	--	--	--	--	--	--	--	7.50	--	--	--	--	8.00	--
squash	--	4.00	--	--	--	--	5.00	--	5.50	--	--	--	--	--	4.50	--
sweet peppers	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tomatoes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
watermelons	5.00	4.00	--	--	5.00	--	5.00	5.00	--	5.00	--	5.00	0.40	--	--	--

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
----	----	----	----	----	----	----

* -- = Not Applied.

1.90	--	--	--	--	--	2.80
3.00	3.00	2.00	2.00	2.00	1.70	3.00
--	--	--	1.70	3.00	2.10	--
2.72	--	--	--	--	--	--
--	--	--	--	2.00	--	--
--	2.00	--	1.19	2.00	1.93	--
3.00	2.20	--	--	--	--	3.00

--	--	--	--	1.00	--	--
1.50	2.00	2.00	2.00	1.50	1.50	2.00
--	--	--	--	1.00	--	--
2.00	0.20	--	--	--	--	--
--	--	--	--	1.50	--	--
--	--	--	1.20	1.50	--	--
--	--	--	--	2.00	--	--
2.00	1.50	--	--	--	--	2.30

--	--	--	--	5.50	--	--
--	--	--	--	5.50	--	--
--	--	--	--	5.50	--	--
5.50	--	--	--	--	--	5.50
--	--	--	4.30	5.50	4.00	--
--	--	--	--	5.50	--	--
--	--	--	--	5.50	--	--
--	--	--	--	4.90	--	--
4.50	--	--	--	5.50	--	--
--	5.50	--	--	--	--	--
--	--	--	--	--	--	--
5.50	5.50	--	--	5.50	--	--
--	--	--	--	5.50	--	--
--	--	--	--	3.16	--	--
--	--	--	0.40	4.50	0.40	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
CAPTAFOL																
apples	--	--	--	--	--	--	--	--	--	7.00	7.00	--	7.00	--	7.00	--
cantaloupes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cherries	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.50
citrus	--	--	--	--	--	6.50	--	--	--	--	--	--	--	--	--	--
cranberries	--	--	--	--	--	--	--	--	2.70	--	--	--	--	--	2.70	--
cucumbers	2.00	--	--	--	2.00	2.00	2.00	--	--	2.00	--	--	2.00	--	2.00	2.00
eggplant	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--
plums	--	3.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
potatoes	3.00	1.30	6.20	--	3.00	3.00	--	--	4.80	3.00	4.84	--	3.00	--	3.00	6.21
tomatoes	2.55	2.19	--	--	6.60	2.55	--	--	--	6.60	--	--	--	--	6.60	4.44
watermelons	--	--	--	--	--	3.30	--	--	--	--	--	--	--	--	--	--
CARBARYL																
alfalfa	--	0.98	1.00	--	--	--	--	1.00	1.00	--	1.00	1.00	--	1.00	1.00	1.00
almonds	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
apples	--	1.84	2.00	--	--	--	2.00	--	2.00	2.00	2.00	--	2.00	2.00	2.00	2.00
apricots	--	3.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--
asparagus	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	1.00	--
avocados	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--
barley	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
beans	3.80	1.00	--	--	1.50	--	3.80	--	--	1.50	1.50	--	3.80	--	1.50	1.50
beets	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
broccoli	--	2.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cabbage	--	--	--	--	--	--	--	--	--	--	--	--	4.13	--	--	4.13
cantaloupes	--	--	--	--	--	--	--	--	--	3.60	--	--	--	--	3.60	--
carrots	--	1.74	--	--	12.00	5.30	--	--	--	--	--	--	--	--	--	--
cauliflower	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.90
cherries	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
citrus	--	5.90	--	--	--	1.70	--	--	--	--	--	--	--	--	--	--
corn	--	2.50	1.00	--	1.00	--	--	1.00	1.00	1.00	--	--	1.00	--	1.00	1.00
cotton	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cranberries	--	--	--	--	--	--	--	--	1.90	--	--	--	--	--	1.90	--
cucumbers	--	--	--	--	3.50	--	--	--	--	3.50	--	--	3.50	--	0.70	0.70
filberts	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
grapes	--	1.60	--	--	--	--	5.70	--	--	--	--	--	5.70	--	--	5.70
honeydew melons	--	3.44	--	--	--	--	--	--	--	--	--	--	--	--	--	--
lettuce	--	1.79	--	--	--	--	--	--	--	--	--	--	--	--	--	--
nectarines	--	2.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
oats	0.70	--	--	--	--	0.70	--	--	--	--	--	--	--	--	--	--
peaches	7.50	2.82	--	--	--	--	7.50	--	--	--	--	--	1.30	--	--	--
peanuts	1.00	--	--	--	--	3.00	3.00	--	--	--	--	--	1.20	--	--	--
peas	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pecans	14.40	--	--	--	--	14.40	14.40	14.40	--	--	--	14.40	--	--	--	--
plums	--	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
--	--	--	--	--	7.00	--
--	--	--	--	7.30	--	--
--	9.50	--	--	--	--	--
--	--	--	--	1.00	--	--
--	--	--	--	--	--	2.70
--	--	--	2.00	--	2.00	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
1.46	3.00	6.20	--	--	3.00	2.32
--	3.96	--	--	7.03	--	--
1.40	--	--	--	2.90	--	--

* -- = Not Applied.

0.76	--	1.00	--	1.51	--	0.76
--	--	--	--	--	--	--
2.20	2.00	--	--	--	2.00	2.00
--	--	--	--	--	--	--
--	--	--	--	--	--	--
0.10	--	--	--	--	--	0.10
1.30	1.50	--	3.80	0.80	3.80	1.30
1.80	--	--	--	--	--	--
1.00	--	--	--	1.00	--	1.00
--	--	--	--	4.13	4.13	--
--	8.60	--	--	3.60	--	--
0.80	--	--	--	5.30	--	--
0.90	--	--	--	--	--	0.90
6.00	--	--	--	--	--	--
--	--	--	--	5.30	--	--
1.00	--	1.00	1.00	2.70	1.00	1.00
--	--	--	--	1.00	--	--
--	--	--	--	--	--	1.90
--	--	--	3.50	3.50	3.50	--
5.00	--	--	--	--	--	--
--	5.70	--	5.70	--	--	--
--	--	--	--	--	--	--
--	--	--	--	5.80	--	--
--	--	--	--	--	--	--
--	--	--	--	1.20	--	--
--	1.30	--	1.30	7.50	1.30	--
--	--	--	0.70	0.50	2.10	--
1.20	--	--	--	--	--	0.90
--	--	--	14.40	14.40	--	--
--	--	--	--	--	--	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
CARBARYL (continued...)																
potatoes	3.50	--	2.20	--	1.90	3.50	--	--	1.30	1.90	1.26	--	3.50	--	1.90	2.20
pumpkins	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.70	4.70
rice	--	1.23	--	--	--	--	--	0.80	--	--	--	--	--	--	--	--
sorghum	1.19	1.46	--	--	--	1.80	1.80	1.00	--	--	--	0.48	--	--	--	--
soybean	1.07	--	--	--	1.20	0.40	1.07	1.41	--	1.20	--	--	1.13	--	1.20	--
spinach	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
squash	--	--	--	--	--	4.70	4.70	--	4.70	--	--	--	--	--	4.70	4.70
strawberries	--	1.21	--	--	--	9.00	--	--	--	--	--	--	9.00	--	--	--
sugarbeets	--	1.31	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet corn	--	--	--	--	--	--	--	--	4.10	--	--	--	--	--	3.50	4.10
sweet peppers	--	3.46	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet potatoes	2.00	--	--	--	--	2.00	2.00	2.00	--	2.00	--	2.00	2.00	--	2.00	--
tobacco	--	--	--	--	--	1.00	1.00	--	--	1.00	--	--	2.00	--	--	--
tomatoes	--	1.59	--	--	2.39	--	5.04	--	--	2.39	--	--	4.23	--	2.39	4.06
walnuts	--	4.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
watermelons	0.70	--	--	--	2.60	--	0.70	0.70	--	2.60	--	0.70	2.60	--	--	--
wheat	1.60	--	--	--	--	1.60	--	1.60	--	--	--	--	--	--	--	--
CARBOFURAN																
alfalfa	0.50	0.60	0.50	--	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
artichokes	--	0.99	--	--	--	--	--	--	--	--	--	--	--	--	--	--
barley	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cantaloupes	--	--	--	--	--	--	--	--	--	1.20	--	--	--	--	1.20	--
corn	1.20	--	1.00	--	0.98	1.49	0.99	1.00	1.00	0.98	1.00	--	0.86	1.00	1.00	1.00
grapes	--	7.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--
hot peppers	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
mint	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
oats	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
peaches	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.00	--
peanuts	1.90	--	--	--	--	1.70	1.70	--	--	--	--	--	1.10	--	--	--
potatoes	1.60	--	--	--	1.40	1.60	--	--	0.60	1.40	0.62	--	1.60	--	1.40	3.61
rice	--	0.87	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--
sorghum	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
soybean	--	--	--	--	1.00	1.00	--	1.00	--	1.00	--	--	1.05	--	1.00	--
strawberries	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.40
sugarcane	--	--	--	--	--	0.60	--	--	--	--	--	--	--	--	--	--
sweet corn	--	--	--	--	2.30	2.30	--	--	2.30	2.30	--	--	--	--	2.30	2.30
sweet peppers	--	--	--	--	--	1.20	1.20	--	--	--	--	--	1.20	--	1.20	1.20
tobacco	--	--	--	--	--	2.00	2.00	--	--	3.00	--	--	4.40	--	--	--
wheat	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZILATE																
citrus	--	2.72	--	--	--	2.00	--	--	--	--	--	--	--	--	--	--

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
--	1.89	2.20	--	--	3.50	--
--	4.70	--	--	--	--	--
--	--	--	--	0.80	--	--
--	--	--	--	2.08	--	--
--	--	--	0.90	1.23	0.78	--
--	--	--	--	1.00	--	--
--	4.70	--	--	4.70	--	--
2.50	9.00	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	5.80	--	--
--	--	--	2.00	--	2.00	--
--	--	--	3.90	--	1.00	--
--	10.21	--	7.26	2.58	4.23	--
--	--	--	--	--	--	--
--	--	--	1.50	1.70	2.60	--
1.60	--	--	--	1.60	--	--

* -- = Not Applied.

0.51	0.75	0.50	0.50	--	0.55	0.51
--	--	--	--	--	--	--
0.20	--	--	--	--	--	0.20
--	1.20	--	--	--	--	--
--	1.02	1.00	1.21	1.06	1.73	--
--	--	--	--	--	--	1.00
--	--	--	--	1.20	--	--
0.70	--	--	--	--	--	--
--	--	--	--	0.20	--	--
--	--	--	--	--	--	--
--	--	--	2.80	0.60	1.90	--
--	1.40	--	--	--	1.60	--
--	--	--	--	0.60	--	--
--	--	--	--	0.57	--	--
--	--	--	1.00	--	1.82	--
1.40	--	--	--	--	--	1.40
--	--	--	--	0.60	--	--
--	2.30	--	--	--	--	--
--	--	--	--	1.20	--	--
--	0.80	--	3.90	--	3.00	--
0.18	--	--	--	--	--	--

--	--	--	--	4.20	--	--
----	----	----	----	------	----	----

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
CHLOROTHALONIL																
apricots	--	3.90	--	--	--	--	--	--	--	--	--	--	--	--	--	--
beans	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	1.00	--
broccoli	--	1.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Brussels sprout	--	1.34	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cabbage	--	1.10	--	--	--	1.95	2.32	--	--	--	--	--	2.84	--	1.97	2.69
cantaloupes	--	--	--	--	--	--	5.10	--	--	6.00	--	--	5.10	--	6.00	--
carrots	--	1.44	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cauliflower	--	1.01	--	--	--	2.00	--	--	--	--	--	--	--	--	--	2.00
celery	--	2.34	--	--	--	7.40	--	--	--	--	--	--	--	--	--	--
cranberries	--	--	--	--	--	--	--	--	2.00	--	--	--	--	--	2.00	--
cucumbers	3.20	--	--	--	3.20	3.20	3.20	--	--	3.20	--	--	3.20	--	4.40	4.40
garlic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
lettuce	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
mint	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
onions	--	1.30	--	--	--	--	9.10	--	--	--	--	--	--	--	--	8.90
peaches	--	--	--	--	--	--	--	--	--	--	--	--	2.00	--	2.00	--
peanuts	3.40	--	--	--	--	4.30	4.30	--	--	--	--	--	2.70	--	--	--
potatoes	5.00	0.90	5.00	--	6.20	5.00	--	--	4.10	6.30	4.11	--	5.00	--	6.30	5.09
pumpkins	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
soybean	2.85	--	--	--	2.85	--	2.85	2.85	--	2.85	--	--	2.85	--	--	--
squash	--	--	--	--	--	6.90	6.90	--	6.90	--	--	--	6.90	--	6.90	6.90
sweet potatoes	--	--	--	--	--	--	--	2.00	--	--	--	--	--	--	--	--
tomatoes	9.76	1.50	--	--	4.77	9.76	6.48	--	--	4.77	--	--	8.65	--	4.77	3.32
watermelons	4.10	--	--	--	2.10	1.60	4.10	4.10	--	2.10	--	4.10	2.10	--	--	--
CYANAZINE																
corn	1.00	1.50	2.00	--	1.60	--	1.00	--	2.00	1.60	2.00	1.00	1.50	2.00	1.50	1.60
cotton	0.56	1.50	--	--	--	1.00	0.64	0.73	--	--	--	--	1.00	--	--	--
sweet corn	--	1.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--

 Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
----	----	----	----	----	----	----

* -- = Not Applied.

--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	3.80	--	--
--	--	--	--	--	--	--
--	--	--	--	3.85	2.84	--
--	6.00	--	--	6.00	--	--
--	--	--	--	9.10	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	2.00
--	--	--	3.20	3.20	3.20	--
1.30	--	--	--	--	--	--
--	--	--	--	1.40	--	--
2.00	--	--	--	--	--	--
1.70	--	--	--	1.60	--	--
--	--	--	2.00	2.00	2.00	--
--	--	--	3.00	1.20	1.20	--
2.35	6.28	5.10	--	1.10	5.00	0.67
--	6.90	--	--	--	--	--
--	--	--	2.85	--	--	--
--	6.90	--	--	6.90	--	--
--	--	--	--	--	--	--
--	6.52	--	8.65	4.54	8.65	--
--	--	--	3.00	2.60	2.10	--

2.60	2.00	2.00	1.00	0.90	1.00	--
--	--	--	0.95	--	--	--
--	--	--	--	--	--	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
DIAZINON																
alfalfa	1.00	0.43	1.00	--	1.00	1.00	1.00	--	1.00	1.00	--	--	1.00	--	1.00	1.00
almonds	--	2.70	--	--	--	--	--	--	--	--	--	--	--	--	--	--
apples	--	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
apricots	--	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
asparagus	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	1.00	--
beans	--	0.97	--	--	--	--	--	--	--	--	--	--	--	--	1.40	--
broccoli	--	0.23	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Brussels sprout	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cabbage	--	0.69	--	--	--	0.59	0.59	--	--	--	--	--	--	--	0.95	0.95
cantaloupes	--	--	--	--	--	--	--	--	--	1.00	--	--	--	--	1.00	--
carrots	--	0.67	--	--	--	--	--	--	--	--	--	--	--	--	--	--
celery	--	0.59	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cherries	--	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
citrus	--	--	--	--	--	3.30	--	--	--	--	--	--	--	--	--	--
corn	--	--	1.00	--	--	--	--	--	1.00	--	--	--	--	--	1.00	1.00
cranberries	--	--	--	--	--	--	--	--	2.80	--	--	--	--	--	2.80	--
cucumbers	--	--	--	--	1.00	--	--	--	--	1.00	--	--	1.00	--	--	--
filberts	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
grapes	--	1.00	--	--	--	--	--	--	--	--	--	--	1.00	--	--	--
honeydew melons	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
lettuce	--	0.54	--	--	--	--	--	--	--	--	--	--	--	--	--	1.30
nectarines	--	15.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
onions	--	7.84	--	--	--	--	2.20	--	--	--	--	--	--	--	--	1.80
peaches	--	1.90	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pears	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pecans	0.60	--	--	--	--	0.60	--	0.60	--	--	--	0.60	--	--	--	--
plums	--	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pumpkins	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00
sorghum	--	--	--	--	--	0.25	0.25	0.25	--	--	--	--	--	--	--	--
soybean	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
spinach	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
squash	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
strawberries	--	0.80	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50
sugarbeets	--	0.52	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet peppers	--	--	--	--	--	1.00	1.00	--	--	--	--	--	--	--	--	--
sweet potatoes	3.00	--	--	--	--	3.00	3.00	--	--	3.00	--	3.00	3.00	--	--	--
tobacco	--	--	--	--	--	0.50	2.50	--	--	--	--	--	2.50	--	--	--
tomatoes	3.69	0.52	--	--	--	3.69	--	--	--	--	--	--	--	--	--	0.80
walnuts	--	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
watermelons	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
----	----	----	----	----	----	----

* -- = Not Applied.

1.00	--	1.00	1.00	--	--	1.00
--	--	--	--	--	--	--
2.00	--	--	--	--	--	2.00
--	--	--	--	--	--	--
--	--	--	--	--	--	--
1.40	--	--	--	--	--	1.40
--	--	--	--	1.00	--	--
--	--	--	--	--	--	--
--	--	--	--	0.95	--	--
--	--	--	--	1.00	--	--
--	--	--	--	0.90	--	1.00
--	--	--	--	--	--	--
2.20	--	--	--	--	--	2.20
--	--	--	--	2.50	--	--
--	1.00	1.00	--	1.00	1.00	--
--	--	--	--	--	--	2.80
--	--	--	1.00	1.00	1.00	--
3.00	--	--	--	--	--	--
--	1.00	--	1.00	--	--	1.00
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
0.50	--	--	--	0.30	--	--
--	--	--	--	2.00	--	--
2.50	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	2.00	--	--	--
--	--	--	--	1.00	--	--
--	--	--	--	1.00	--	--
0.50	0.50	--	--	--	--	0.50
--	--	--	--	--	--	--
--	--	--	--	1.00	--	--
--	--	--	3.00	--	3.00	--
--	--	--	2.50	--	--	--
--	--	--	--	2.95	--	--
--	--	--	--	--	--	--
0.50	--	--	--	0.80	--	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
DINOSEB																
alfalfa	--	0.38	1.50	--	--	--	--	--	--	--	--	--	--	--	1.50	1.00
almonds	--	1.26	--	--	--	--	--	--	--	--	--	--	--	--	--	--
apples	--	5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	1.90
barley	--	--	--	--	0.80	--	--	--	--	--	--	--	--	--	--	--
beans	4.00	0.80	--	--	3.00	--	4.00	--	--	3.00	3.70	--	--	--	3.00	3.70
blackberries	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cherries	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.90
citrus	--	1.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--
corn	--	1.74	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cotton	--	--	--	--	--	--	0.78	0.84	--	--	--	--	1.50	--	--	--
cucumbers	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
grapes	--	1.89	--	--	--	--	--	--	--	--	--	--	--	--	--	--
oats	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	1.00
other hay	--	--	1.50	--	--	--	--	--	--	--	--	--	--	--	1.50	1.00
peaches	--	2.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
peanuts	0.90	--	--	--	--	1.20	0.50	--	--	--	--	--	1.40	--	--	--
pears	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.90
peas	--	--	--	--	3.00	--	--	--	--	3.00	7.50	--	3.00	--	--	7.50
plums	--	0.29	--	--	--	--	--	--	--	--	--	--	--	--	--	--
potatoes	3.00	1.72	3.60	--	3.10	3.00	--	--	1.50	3.10	1.50	--	3.00	--	3.10	3.66
pumpkins	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.20
rye	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
seed crops	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--
soybean	0.91	--	--	--	--	0.91	0.80	0.74	--	--	--	0.87	0.72	--	--	--
squash	--	--	--	--	--	--	--	--	4.50	--	--	--	--	--	--	--
strawberries	--	2.74	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet corn	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.00	--
tomatoes	--	2.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--
walnuts	--	3.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--
watermelons	--	--	--	--	1.00	--	--	--	--	1.00	--	--	--	--	--	--
wheat	--	0.23	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
--	1.00	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	1.90	1.90
1.50	1.00	--	--	--	--	1.50
8.20	3.80	--	--	--	--	4.50
2.00	--	--	--	--	--	--
--	1.90	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	1.50	--	--	--
--	--	--	--	--	1.00	--
--	--	--	--	--	--	--
1.50	1.00	--	--	--	--	1.50
--	1.00	--	--	--	--	--
--	--	--	1.90	--	1.90	--
--	--	--	1.40	1.00	0.90	--
--	1.90	--	--	--	--	--
3.50	1.50	--	--	--	--	0.30
--	--	--	--	--	--	--
2.35	3.15	4.00	--	1.70	3.00	2.37
--	4.50	--	--	--	--	--
--	1.00	--	--	--	--	--
1.00	0.20	--	0.10	--	0.10	1.50
--	--	--	0.75	--	0.91	--
3.40	4.50	--	--	--	--	--
--	--	--	--	--	--	--
5.30	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
1.50	1.00	--	--	--	--	--

* -- = Not Applied.

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
DISULFOTON																
barley	--	0.77	--	--	--	--	--	--	--	--	--	--	1.00	--	--	--
beans	--	--	--	--	1.80	--	--	--	--	1.80	1.80	--	--	--	1.80	1.80
broccoli	--	1.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Brussels sprout	--	4.54	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cabbage	--	1.62	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cauliflower	--	1.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--
corn	--	0.81	1.10	--	1.10	1.00	--	--	1.10	1.10	--	--	--	--	--	1.10
cotton	0.62	--	--	--	--	0.74	0.74	--	--	--	--	--	--	--	--	--
grapes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
lettuce	--	1.83	--	--	--	--	--	--	--	--	--	--	--	--	--	--
oats	--	--	--	--	--	--	--	--	--	--	--	--	1.00	--	--	--
peanuts	1.90	--	--	--	--	1.00	1.00	--	--	--	--	--	1.50	--	--	--
potatoes	--	--	--	--	3.40	--	--	--	2.00	3.40	2.03	--	3.40	--	3.40	2.70
sorghum	--	0.85	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--
soybean	--	--	--	--	1.05	--	--	--	--	1.05	--	--	--	--	--	--
sugarbeets	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sugarcane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet peppers	--	2.18	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tobacco	--	--	--	--	--	--	--	--	--	4.00	--	--	2.20	--	--	--
tomatoes	--	1.00	--	--	--	--	1.07	--	--	--	--	--	--	--	--	--
wheat	--	0.77	--	--	--	--	--	--	--	--	--	--	0.80	--	--	--
ETHOPROP																
corn	--	--	--	--	1.00	--	--	--	--	1.00	--	--	1.50	--	--	--
peanuts	2.40	--	--	--	--	2.40	2.40	--	--	--	--	--	2.00	--	--	--
soybean	--	--	--	--	--	--	--	--	--	--	--	--	1.18	--	--	--
sugarcane	--	--	--	--	--	3.00	--	--	--	--	--	--	--	--	--	--
sweet potatoes	3.70	--	--	--	--	3.70	3.70	3.70	--	3.70	--	3.70	3.70	--	3.70	--
tobacco	--	--	--	--	--	5.80	5.80	--	--	6.00	--	--	6.30	--	--	--
tomatoes	--	--	--	--	--	--	2.07	--	--	--	--	--	--	--	--	--

 Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
----	----	----	----	----	----	----

* -- = Not Applied.

--	--	--	--	--	--	--
--	1.80	--	--	--	--	--
1.80	--	--	--	1.80	--	1.80
--	--	--	--	--	--	--
--	--	--	--	4.96	--	--
2.90	--	--	--	--	--	2.90
--	--	1.10	--	1.10	--	--
--	--	--	0.65	0.60	--	--
--	--	--	--	--	--	1.00
--	--	--	--	--	--	--
--	--	--	--	1.00	--	--
--	--	--	--	0.90	1.00	--
2.45	3.41	--	--	2.80	3.40	4.35
--	--	--	--	0.80	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	3.00	--	--
--	--	--	--	--	--	--
--	3.00	--	2.70	--	4.00	--
--	--	--	--	--	--	--
0.31	--	--	--	0.31	--	--

--	--	--	1.00	--	1.00	--
--	--	--	--	--	2.30	--
--	--	--	1.70	--	2.49	--
--	--	--	--	--	--	--
--	--	--	3.70	--	3.70	--
--	--	--	6.00	--	6.00	--
--	--	--	--	--	--	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
FLUOMETURON																
cotton	0.89	--	--	--	--	1.50	1.55	0.75	--	--	--	--	0.81	--	--	--
sugarcane	--	--	--	--	--	--	--	1.50	--	--	--	--	--	--	--	--
MALATHION																
alfalfa	1.00	1.32	1.50	--	--	--	--	--	1.50	--	--	1.00	--	--	1.50	1.50
asparagus	--	1.10	--	--	1.00	--	--	--	--	--	--	--	--	--	1.00	--
avocado	--	3.30	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--
barley	--	0.80	--	--	--	--	--	--	--	--	--	--	1.20	--	--	--
beans	--	1.29	--	--	--	--	--	--	--	--	--	--	--	--	--	--
broccoli	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cantaloupes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
carrots	--	0.93	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cherries	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00
citrus	--	2.90	--	--	--	--	--	--	--	--	--	--	--	--	--	--
corn	--	1.00	--	--	1.00	--	--	--	--	1.00	--	--	--	--	--	--
cotton	--	--	--	--	--	0.38	0.38	--	--	--	--	--	--	--	--	--
cranberries	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	--
cucumbers	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
filberts	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
grapes	--	--	--	--	--	--	--	--	--	--	--	--	1.00	--	--	--
lettuce	--	0.71	--	--	--	--	--	--	--	--	--	--	--	--	--	--
mint	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
oats	--	--	--	--	--	--	--	--	--	--	--	--	1.20	--	--	--
onions	--	1.65	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pasture/range	--	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pears	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.50
pecans	5.20	--	--	--	--	5.20	5.20	5.20	--	--	--	5.20	--	--	--	--
rice	--	--	--	--	--	--	--	1.40	--	--	--	--	--	--	--	--
soybean	--	--	--	--	1.10	--	--	1.05	--	1.10	--	--	--	--	1.10	--
spinach	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
squash	--	--	--	--	--	1.00	1.00	--	--	--	--	--	--	--	--	--
strawberries	--	1.50	--	--	--	--	--	--	--	--	--	--	3.10	--	--	3.10
sugarbeets	--	1.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet corn	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	1.40	--
sweet peppers	--	1.62	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet potatoes	--	--	--	--	--	--	--	0.80	--	--	--	--	--	--	--	--
tobacco	--	--	--	--	--	1.20	1.20	--	--	1.20	--	--	1.20	--	--	--
tomatoes	--	--	--	--	--	--	1.62	--	--	--	--	--	7.86	--	--	--
watermelons	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
wheat	--	1.00	--	--	--	--	--	--	--	--	--	--	0.69	--	--	--

Application (lbs/acre/year) By State						
OR	PA	RI	SC	TX	VA	WA
--	--	--	0.76	0.95	--	--
--	--	--	--	--	--	--

* -- = Not Applied.

1.25	1.06	1.50	--	1.00	1.86	1.25
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	4.20	--	--	4.20	--	--
--	--	--	--	--	--	--
1.00	1.00	--	--	--	--	1.00
--	--	--	--	1.40	--	--
--	1.00	--	--	--	--	--
--	--	--	--	0.97	--	--
--	--	--	--	--	--	--
--	--	--	--	1.00	--	--
5.00	--	--	--	--	--	--
--	1.00	--	1.00	--	--	1.00
--	--	--	--	3.70	--	--
0.70	--	--	--	--	--	--
--	--	--	--	--	--	--
3.30	--	--	--	1.10	--	--
--	--	--	--	--	--	--
--	2.50	--	--	--	--	2.50
--	--	--	5.20	5.20	--	--
--	--	--	--	1.40	--	--
--	--	--	--	--	1.10	--
--	--	--	--	1.00	--	--
--	--	--	--	1.00	--	--
--	3.10	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	1.20	--
--	--	--	--	7.86	--	--
--	--	--	--	2.90	--	--
--	--	--	--	0.69	--	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
METHAMIDOPHOS																
broccoli	--	0.70	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Brussels sprout	--	2.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cabbage	--	0.78	--	--	--	1.98	1.98	--	--	--	--	--	2.33	--	2.27	2.12
cantaloupes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cauliflower	--	0.64	--	--	--	2.00	--	--	--	--	--	--	--	--	--	2.60
celery	--	0.83	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cucumbers	1.00	--	--	--	--	1.00	1.00	--	--	--	--	--	--	--	--	--
grapes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
lettuce	--	0.62	--	--	--	--	--	--	--	--	--	--	--	--	--	--
potatoes	1.60	0.75	1.60	--	1.10	1.60	--	--	2.10	1.10	1.12	--	1.60	--	1.10	1.63
sugarbeets	--	0.68	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet peppers	--	--	--	--	--	1.00	1.00	--	--	--	--	--	--	--	--	--
tomatoes	4.09	0.92	--	--	1.88	4.09	--	--	--	1.88	--	--	--	--	1.88	--
watermelons	--	--	--	--	--	2.60	--	--	--	--	--	--	--	--	--	--
METHYL PARATHION																
alfalfa	--	0.36	0.50	--	--	--	--	--	0.50	--	--	0.50	--	--	0.50	0.50
apples	--	--	6.00	--	--	--	6.00	--	6.00	6.00	--	--	6.00	6.00	6.00	6.00
artichokes	--	2.08	--	--	--	--	--	--	--	--	--	--	--	--	--	--
barley	--	0.58	--	--	--	--	0.40	--	--	--	--	--	--	--	--	0.40
beans	--	0.18	--	--	--	--	--	--	--	1.00	1.00	--	--	--	1.00	1.00
broccoli	--	0.79	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cabbage	--	--	--	--	--	0.95	0.95	--	--	--	--	--	--	--	--	--
carrots	--	0.50	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--
celery	--	0.91	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cherries	--	--	--	--	--	--	--	--	--	--	--	--	--	2.00	--	2.00
corn	--	--	0.19	--	0.19	--	--	--	0.19	0.19	--	--	--	--	0.19	0.19
cotton	1.10	--	--	--	--	2.11	2.11	3.14	--	--	--	--	--	--	--	--
cranberries	--	--	--	--	--	--	--	--	1.00	--	--	--	--	--	1.00	--
cucumbers	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
grapes	--	--	--	--	--	--	1.50	--	--	--	--	--	1.50	--	--	1.50
lettuce	--	0.93	--	--	--	0.60	--	--	--	--	--	--	--	--	--	--
oats	0.40	--	--	--	--	0.40	0.40	--	--	--	0.04	--	--	--	0.40	0.40
onions	--	10.79	--	--	--	--	2.80	--	--	--	--	--	--	--	--	2.20
peaches	15.50	--	--	--	--	--	15.50	--	--	--	--	--	15.50	--	0.40	--
peas	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pecans	--	--	--	--	--	--	6.30	--	--	--	--	--	--	--	--	--
rice	--	0.62	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--
sorghum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
soybean	0.41	--	--	--	0.66	1.00	0.75	0.99	--	0.66	--	0.69	0.69	--	--	--
spinach	--	0.96	--	--	--	--	--	--	--	--	--	--	--	--	--	--
strawberries	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	1.00
sugarbeets	--	0.49	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet corn	--	--	--	--	0.90	3.60	--	--	0.90	0.90	--	--	--	--	2.40	0.90
sweet peppers	--	--	--	--	--	0.60	0.60	--	--	--	--	--	--	--	--	--
tobacco	--	--	--	--	--	--	--	--	--	1.00	--	--	3.80	--	--	--
tomatoes	--	0.99	--	--	--	--	--	--	--	--	--	--	--	--	--	--
wheat	0.58	--	--	--	--	0.58	0.58	0.58	--	--	--	--	--	--	0.58	0.58

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
1.00	--	--	--	1.00	--	1.00
--	--	--	--	--	--	--
--	7.88	--	--	3.00	2.33	--
--	--	--	--	1.00	--	--
2.60	--	--	--	--	--	2.60
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	1.00
--	--	--	--	--	--	--
1.18	1.12	1.60	--	--	1.60	1.72
--	--	--	--	--	--	--
--	--	--	--	1.00	--	--
--	1.88	--	--	--	--	--
--	--	--	--	2.60	--	--

* -- = Not Applied.

--	--	0.50	--	--	--	--
--	1.00	--	--	--	6.00	--
--	--	--	--	--	--	--
--	--	--	0.40	--	--	--
--	1.00	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	0.95	--	--
--	--	--	--	1.00	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	0.19	--	0.19	--	--
--	--	--	5.37	1.70	--	--
--	--	--	--	--	--	1.00
--	--	--	--	1.00	--	--
--	1.50	--	1.50	--	--	1.50
--	--	--	--	0.60	--	--
--	--	--	0.40	0.50	--	--
0.80	--	--	--	6.90	--	--
--	0.40	--	15.50	--	--	--
--	--	--	--	--	--	1.90
--	--	--	6.30	--	--	--
--	--	--	--	0.70	--	--
--	--	--	--	0.48	--	--
--	--	--	0.57	0.44	--	--
--	--	--	--	1.00	--	--
--	1.00	--	--	--	--	--
--	--	--	--	--	--	--
--	0.90	--	--	--	--	--
--	--	--	--	0.60	--	--
--	--	--	4.80	--	1.00	--
--	--	--	--	--	--	--
--	--	--	--	0.55	--	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
METIRAM																
apples	--	--	15.00	--	--	--	15.00	--	15.00	15.00	15.00	--	15.00	15.00	15.00	15.00
cabbage	--	--	--	--	--	0.68	0.68	--	--	--	--	--	--	--	--	--
potatoes	--	1.60	7.20	--	--	--	--	--	7.10	--	7.08	--	--	--	--	7.24
tomatoes	10.78	--	--	--	--	10.78	--	--	--	--	--	--	--	--	--	--
METOLACHLOR																
beans	1.50	2.50	--	--	1.20	1.00	1.50	--	--	1.20	1.50	--	--	--	1.50	1.50
corn	1.00	2.00	2.00	--	1.60	1.50	1.30	2.00	1.50	1.60	--	1.00	1.70	2.00	1.50	2.00
cotton	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--
peanuts	2.00	--	--	--	--	1.70	2.30	--	--	--	--	--	2.00	--	--	--
peas	--	--	--	--	--	1.00	1.50	--	--	1.00	--	--	1.00	--	--	--
potatoes	1.50	--	1.50	--	1.50	1.50	--	--	1.50	1.20	1.50	--	1.50	--	2.00	1.50
safflower	--	2.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sorghum	1.50	1.60	--	--	--	1.50	2.00	2.00	--	--	--	1.80	1.50	--	--	--
soybean	1.50	--	--	--	1.19	1.12	1.55	1.09	--	1.19	--	1.33	1.68	--	1.50	--
sweet corn	--	2.00	--	--	1.20	1.50	--	--	2.00	1.50	--	--	--	--	--	2.20

 Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
----	----	----	----	----	----	----

* -- = Not Applied.

--	3.40	--	--	--	15.00	--
--	--	--	--	--	--	--
--	--	7.20	--	--	--	2.20
--	--	--	--	--	--	--

--	2.20	--	--	--	--	--
2.20	2.50	2.00	1.10	2.00	1.30	2.30
--	--	--	--	0.50	--	--
--	--	--	1.70	1.50	1.10	--
--	--	--	--	--	--	--
2.20	1.20	1.00	--	--	1.80	2.20
--	--	--	--	--	--	--
--	--	--	1.50	1.20	--	--
--	2.40	--	1.32	2.00	1.10	--
4.80	1.80	--	--	--	--	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
PARATHION																
alfalfa	0.25	0.98	--	--	--	0.40	0.40	--	--	--	--	--	--	--	--	--
almonds	--	1.73	--	--	--	--	--	--	--	--	--	--	--	--	--	--
apples	--	--	5.00	--	--	--	--	--	5.00	--	--	--	--	--	5.00	5.00
apricots	--	2.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
barley	--	0.47	--	--	--	--	--	--	--	--	--	--	1.80	--	--	--
beans	--	0.67	--	--	0.50	--	--	--	--	0.50	0.50	--	--	--	0.50	0.50
broccoli	--	0.54	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cabbage	--	--	--	--	--	1.87	1.87	--	--	--	--	--	0.49	--	--	1.48
cantaloupes	--	--	--	--	--	--	--	--	--	1.00	--	--	--	--	1.00	--
carrots	--	0.81	--	--	0.50	1.00	--	--	--	--	--	--	--	--	--	--
celery	--	0.91	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cherries	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	1.10
citrus	--	3.54	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--
corn	--	0.96	0.76	--	--	--	--	--	0.76	--	--	--	--	--	0.76	0.76
cotton	0.45	--	--	--	--	0.65	0.65	--	--	--	--	--	0.30	--	--	--
cucumbers	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
garlic	--	0.54	--	--	--	--	--	--	--	--	--	--	--	--	--	--
grapes	--	1.16	--	--	--	--	1.50	--	--	--	--	--	1.50	--	--	1.50
lettuce	--	0.49	--	--	--	1.20	--	--	--	--	--	--	--	--	0.60	--
nectarines	--	0.86	--	--	--	--	--	--	--	--	--	--	--	--	--	--
oats	0.50	--	--	--	--	0.50	--	--	--	--	--	--	0.50	--	--	--
onions	--	1.82	--	--	--	--	1.70	--	--	--	--	--	--	--	--	2.00
peaches	2.30	0.79	--	--	--	--	2.30	--	--	--	--	--	1.80	--	1.80	--
peanuts	--	--	--	--	--	--	2.40	--	--	--	--	--	--	--	--	--
pears	--	1.69	--	--	--	--	--	--	--	--	--	--	--	--	--	1.80
peas	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pecans	2.90	--	--	--	--	2.90	2.90	2.90	--	--	--	2.90	--	--	--	--
plums	--	0.96	--	--	--	--	--	--	--	--	--	--	--	--	--	--
potatoes	--	--	2.40	--	--	--	--	--	1.10	--	1.10	--	--	--	--	2.45
pumpkins	--	7.61	--	--	--	--	--	--	--	--	--	--	--	--	--	--
radishes	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--
rice	--	0.22	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sorghum	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
soybean	1.68	--	--	--	--	1.68	--	--	--	--	--	--	--	--	1.68	--
spinach	--	0.47	--	--	--	--	--	--	--	--	--	--	--	--	--	--
squash	--	--	--	--	--	1.00	1.00	--	--	--	--	--	--	--	--	--
strawberries	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--
sugarbeets	--	0.70	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet corn	--	--	--	--	1.80	2.60	--	--	1.80	1.80	--	--	--	--	1.40	1.80
sweet peppers	--	--	--	--	--	1.00	1.00	--	--	--	--	--	--	--	--	--
tobacco	--	--	--	--	--	0.70	0.70	--	--	0.70	--	--	--	--	--	--
tomatoes	0.56	0.67	--	--	0.81	0.56	--	--	--	0.81	--	--	--	--	0.81	0.86
watermelons	--	--	--	--	--	1.30	--	--	--	--	--	--	--	--	--	--
wheat	0.96	0.49	--	--	--	0.96	--	--	--	--	--	--	0.96	--	--	--

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
----	----	----	----	----	----	----

* -- Not Applied.

0.40	--	--	--	--	--	0.40
--	--	--	--	--	--	--
5.00	4.40	--	--	--	--	5.00
--	--	--	--	--	--	--
1.80	--	--	--	--	--	1.80
--	0.50	--	--	--	--	--
--	--	--	--	--	--	--
--	2.00	--	--	--	0.49	--
--	--	--	--	1.00	--	--
--	--	--	--	1.70	--	--
--	--	--	--	--	--	--
1.10	1.10	--	--	--	--	1.10
--	--	--	--	--	--	--
0.50	--	0.76	--	0.16	--	--
--	--	--	--	0.88	--	--
--	--	--	--	1.00	--	--
--	--	--	--	--	--	--
--	1.50	--	1.50	--	--	1.50
--	--	--	--	4.90	--	--
--	--	--	--	--	--	--
0.30	--	--	--	0.50	--	0.30
0.70	--	--	--	1.90	--	--
--	1.80	--	1.80	--	1.80	--
--	--	--	--	1.50	--	--
--	1.80	--	--	--	--	1.80
0.50	--	--	--	--	--	2.30
--	--	--	2.90	--	--	--
--	--	--	--	--	--	--
1.11	--	2.40	--	1.10	--	1.08
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	0.42	--	--
--	--	--	--	--	--	--
--	--	--	--	1.00	--	--
--	--	--	--	1.00	--	--
--	1.00	--	--	--	--	--
--	--	--	--	--	--	--
--	1.80	--	--	--	--	--
--	--	--	--	--	--	--
--	0.70	--	--	--	0.70	--
--	--	--	--	1.09	--	--
0.50	--	--	--	1.40	--	--
0.25	--	--	--	0.96	--	--

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
PCNB																
Brussels sprout	--	50.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cotton	0.86	--	--	--	--	0.23	0.23	0.82	--	--	--	--	0.77	--	--	--
peanuts	8.00	--	--	--	--	8.40	8.40	--	--	--	--	--	--	--	--	--
strawberries	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--
PHORATE																
barley	--	1.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--
beans	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	--
corn	--	--	1.00	--	1.00	--	--	--	1.00	1.00	--	--	0.80	--	1.00	1.00
cotton	0.45	--	--	--	--	0.65	0.65	--	--	--	--	--	0.30	--	--	--
grapes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
peanuts	1.00	--	--	--	--	1.00	--	--	--	--	--	--	1.40	--	--	--
potatoes	3.00	--	2.80	--	2.70	3.00	--	--	2.70	2.70	2.75	--	3.00	--	2.70	2.75
sorghum	--	1.09	--	--	--	--	--	--	--	--	--	--	--	--	--	--
soybean	--	--	--	--	1.04	--	--	--	--	1.04	--	--	1.04	--	--	--
sugarbeets	--	0.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sweet corn	--	--	--	--	--	0.80	--	--	--	--	--	--	--	--	--	--
wheat	--	0.98	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PROPANIL																
rice	--	4.23	--	--	--	--	--	3.40	--	--	--	--	--	--	--	--
THIOBENCARB																
rice	--	3.99	--	--	--	--	--	4.00	--	--	--	--	--	--	--	--

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
----	----	----	----	----	----	----

* -- = Not Applied.

--	--	--	--	--	--	--
--	--	--	0.84	--	--	--
--	--	--	--	6.50	--	--
--	--	--	--	--	--	--

--	--	--	--	--	--	--
--	--	--	--	--	--	--
1.00	--	1.00	0.80	1.00	--	1.50
--	--	--	--	1.05	--	--
--	--	--	--	--	--	1.00
--	--	--	--	--	1.50	--
2.70	2.67	2.75	--	2.80	3.00	2.69
--	--	--	--	0.71	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--

--	--	--	--	3.60	--	--
----	----	----	----	------	----	----

--	--	--	--	3.20	--	--
----	----	----	----	------	----	----

continued...

Appendix H. Average Annual Pesticide Application Rates by Crop by State.

PESTICIDE/ CROP	Application (lbs/acre/year) By State															
	AL	CA	CT	DC	DE	FL	GA	LA	MA	MD	ME	MS	NC	NH	NJ	NY
TRIFLURALIN																
alfalfa	--	0.80	--	--	--	--	--	--	--	--	--	--	--	--	--	--
almonds	--	2.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
asparagus	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
barley	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
beans	0.50	0.50	--	--	0.50	0.50	0.50	--	--	0.50	0.50	--	0.50	--	0.80	0.50
broccoli	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Brussels sprout	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cabbage	--	0.50	--	--	--	0.50	0.64	--	--	--	--	--	0.53	--	0.75	0.62
carrots	--	0.48	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cauliflower	--	0.50	--	--	--	0.50	--	--	--	--	--	--	--	--	--	0.80
celery	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
citrus	--	--	--	--	--	2.50	--	--	--	--	--	--	--	--	--	--
collards	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--
corn	--	--	--	--	--	0.63	--	--	--	--	--	--	--	--	--	--
cotton	0.50	0.90	--	--	--	0.50	0.69	0.92	--	--	--	--	0.98	--	--	--
cucumbers	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
grapes	--	1.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--
guar	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
honeydew melons	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
lettuce	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
okra	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--
peanuts	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
peas	0.50	--	--	--	0.50	--	0.50	0.50	--	0.50	0.60	0.50	0.50	--	--	0.60
plums	--	3.90	--	--	--	--	--	--	--	--	--	--	--	--	--	--
potatoes	--	1.00	1.00	--	--	--	--	--	1.00	--	1.00	--	--	--	--	1.00
pumpkins	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
safflower	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
soybean	0.79	--	--	--	1.00	0.50	0.93	1.15	--	1.00	--	0.88	0.91	--	--	--
squash	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sugarbeets	--	0.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sugarcane	--	--	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--
sweet peppers	--	--	--	--	--	--	--	--	--	--	--	--	0.80	--	0.80	0.80
tomatoes	0.75	0.50	--	--	0.50	--	0.24	--	--	0.50	--	--	0.75	--	0.75	0.75
watermelons	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
wheat	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VERNOLATE																
corn	--	4.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--
peanuts	2.10	--	--	--	--	2.20	2.20	--	--	--	--	--	2.40	--	--	--
soybean	--	--	--	--	--	2.00	1.61	--	--	--	--	--	2.62	--	2.00	--
sweet corn	--	4.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Application (lbs/acre/year) By State

OR	PA	RI	SC	TX	VA	WA
----	----	----	----	----	----	----

* -- = Not Applied.

--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
0.50	--	--	--	--	--	--
0.60	--	--	0.50	0.50	0.50	0.80
0.80	--	--	--	0.60	--	0.60
--	--	--	--	--	--	--
--	0.50	--	--	0.75	0.53	--
0.80	--	--	--	0.80	--	0.80
0.80	--	--	--	--	--	0.80
--	--	--	--	--	--	--
--	--	--	--	1.70	--	--
--	--	--	0.50	--	--	--
--	--	--	--	0.50	--	--
--	--	--	0.77	0.75	--	--
2.40	--	--	--	--	--	2.40
--	--	--	--	--	--	1.50
--	--	--	--	0.50	--	--
--	--	--	--	--	--	--
--	--	--	--	1.00	--	--
--	--	--	--	0.75	--	--
--	--	--	--	1.00	--	--
1.10	--	--	--	0.80	--	0.50
--	--	--	--	--	--	--
0.52	--	1.00	--	0.75	--	0.76
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	0.75	0.91	0.69	--
--	--	--	--	0.80	--	--
--	--	--	--	--	--	--
--	--	--	--	1.00	--	--
--	--	--	--	--	--	--
--	0.75	--	2.06	1.08	0.75	--
0.80	--	--	--	0.80	--	--
0.50	--	--	--	--	--	--

3.00	--	--	--	--	--	3.30
--	--	--	2.60	3.10	2.80	--
--	--	--	2.10	--	2.14	--
3.00	--	--	--	--	--	3.60

**Appendix I. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop
by Estuarine Drainage Area**

ESTUARY	CROPS									
	ALFALFA		ALMONDS		APPLES		AVOCADO		BARLEY	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	< 1	< 1	--	--	127	< 1	--	--	--	--
1.02 Englishman Bay	< 1	< 1	--	--	--	--	--	--	--	--
1.03 Narraguagus Bay	< 1	< 1	--	--	--	--	--	--	--	--
1.04 Blue Hill Bay	< 1	< 1	--	--	146	< 1	--	--	--	--
1.05 Penobscot Bay	60	< 1	--	--	3721	6	--	--	--	--
1.06 Muscongus Bay	1	< 1	--	--	559	< 1	--	--	--	--
1.07 Sheepscot Bay	189	< 1	--	--	42570	72	--	--	--	--
1.08 Casco Bay	36	< 1	--	--	3558	6	--	--	--	--
1.09 Saco Bay	56	< 1	--	--	10157	17	--	--	--	--
1.10 Great Bay	137	< 1	--	--	1511	< 1	--	--	--	--
1.11 Merrimack River	483	1	--	--	11687	10	--	--	--	--
1.12 Boston Bay	115	< 1	--	--	2192	3	--	--	--	--
1.13 Cape Cod Bay	11	< 1	--	--	--	--	--	--	--	--
1.14 Buzzards Bay	209	< 1	--	--	--	--	--	--	--	--
1.15 Narragansett Bay	599	2	--	--	3644	6	--	--	--	--
1.16 Gardiners Bay	42	< 1	--	--	94	< 1	--	--	--	--
1.17 Long Island Sound	11759	74	--	--	55000	99	--	--	--	--
1.18 Great South Bay	58	< 1	--	--	2217	4	--	--	--	--
1.19 Hudson River/Raritan Bay	35698	230	--	--	375755	975	--	--	480	< 1
1.20 Barnegat Bay	849	6	--	--	18573	265	--	--	176	< 1
1.21 Delaware Bay	15310	88	--	--	62099	862	--	--	7767	2
1.22 Chincoteague Bay	36	< 1	--	--	--	--	--	--	102	< 1
1.23 Chesapeake Bay	16876	91	--	--	15862	23	--	--	23383	2
TOTAL	82524	498	--	--	609472	2355	--	--	31908	4
SOUTHEAST										
2.01 Albemarle Sound	2	< 1	--	--	131	< 1	--	--	917	1
2.02 Pamlico Sound	96	< 1	--	--	101	< 1	--	--	238	< 1
2.03 Bogue Sound	--	--	--	--	--	--	--	--	--	--
2.04 New River	--	--	--	--	--	--	--	--	--	--
2.05 Cape Fear River	104	< 1	--	--	48	< 1	--	--	606	1
2.06 Winyah Bay	718	1	--	--	162	< 1	--	--	1080	< 1
2.07 Charleston Harbor	54	< 1	--	--	--	--	--	--	--	--
2.08 North and South Santee Rivers	15	< 1	--	--	--	--	--	--	2	< 1
2.09 St. Helena Sound	399	< 1	--	--	--	--	--	--	5	< 1
2.10 Broad River	--	--	--	--	--	--	--	--	--	--
2.11 Savannah River	26	< 1	--	--	--	--	--	--	--	--
2.12 Ogeechee Sound	151	1	--	--	--	--	--	--	12	< 1
2.13 St. Catherine's / Sapelo Sound	< 1	< 1	--	--	--	--	--	--	--	--
2.14 Altamaha River	298	2	--	--	--	--	--	--	2	< 1
2.15 St. Andrew / St. Simons Sound	701	8	--	--	10	< 1	--	--	146	< 1
2.16 St. Johns River	765	6	--	--	--	--	--	--	--	--
2.17 Indian River	--	--	--	--	--	--	--	--	--	--
2.18 Biscayne Bay	6	< 1	--	--	--	--	1802	4	--	--
TOTAL	3335	20	--	--	452	< 1	1802	4	3008	4
EAST COAST TOTAL	85859	518	--	--	609924	2356	1802	4	34914	9

CROPS									
BEANS		BLUEBERRIES		BROCCOLI		CABBAGE		CANTALOUPE	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
21	< 1	910	< 1	--	--	--	--	--	--
11	< 1	824	< 1	--	--	--	--	--	--
8	< 1	422	< 1	--	--	--	--	--	--
1	< 1	265	< 1	--	--	--	--	--	--
566	4	377	< 1	--	--	--	--	--	--
24	< 1	170	< 1	--	--	--	--	--	--
2244	16	179	< 1	--	--	--	--	--	--
199	1	42	< 1	--	--	--	--	--	--
577	4	7	< 1	--	--	--	--	--	--
5	< 1	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
495	3	--	--	--	--	1222	21	--	--
139	1	--	--	--	--	312	5	--	--
691	4	--	--	--	--	1705	29	--	--
1644	91	--	--	--	--	1092	16	450	8
1182	93	--	--	--	--	247	2	387	7
79321	5325	--	--	--	--	1334	14	3668	69
68	< 1	--	--	--	--	--	--	--	--
39580	254	--	--	--	--	77	< 1	6343	120
126776	5802	2996	< 1	--	--	5989	91	10848	206
247	< 1	--	--	--	--	4007	19	468	19
23	< 1	--	--	--	--	1142	5	13	< 1
1	< 1	--	--	--	--	413	2	11	< 1
2	< 1	--	--	--	--	34	< 1	8	< 1
356	1	--	--	--	--	511	2	140	5
173	< 1	--	--	--	--	322	1	64	2
263	< 1	--	--	--	--	--	--	--	--
23	< 1	--	--	--	--	--	--	--	--
333	< 1	--	--	--	--	--	--	--	--
1	< 1	--	--	--	--	--	--	--	--
16	< 1	--	--	--	--	--	--	7	< 1
2	< 1	--	--	--	--	--	--	2	< 1
--	--	--	--	--	--	--	--	--	--
98	< 1	--	--	--	--	8	< 1	--	--
259	1	--	--	--	--	12	< 1	--	--
17	< 1	--	--	--	--	12788	273	--	--
--	--	--	--	--	--	--	--	--	--
12771	234	--	--	--	--	--	--	--	--
14585	240	--	--	--	--	19237	305	713	29
141361	6043	2996	< 1	--	--	25226	396	11561	235

* All values are in pounds applied per year and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

continued...

Appendix I. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	ALFALFA		ALMONDS		APPLES		AVOCADO		BARLEY	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	34	< 1	--	--	--	--	< 1	< 1	--	--
3.02 Charlotte Harbor	226	2	--	--	--	--	38	< 1	--	--
3.03 Tampa Bay	253	2	--	--	--	--	--	--	--	--
3.04 Suwannee River	951	8	--	--	--	--	--	--	--	--
3.05 Apalachee Bay	546	4	--	--	8	< 1	--	--	1	< 1
3.06 Apalachicola Bay	54	< 1	--	--	< 1	< 1	--	--	--	--
3.07 St. Andrew Bay	1	< 1	--	--	--	--	--	--	--	--
3.08 Choctawhatchee Bay	420	3	--	--	--	--	--	--	--	--
3.09 Pensacola Bay	885	6	--	--	--	--	--	--	--	--
3.10 Perdido Bay	74	< 1	--	--	--	--	--	--	--	--
3.11 Mobile Bay	372	1	--	--	--	--	--	--	--	--
3.12 Mississippi Sound	3554	6	--	--	--	--	--	--	--	--
3.13 Mississippi Delta Region	449	< 1	--	--	--	--	--	--	--	--
3.14 Atchafalaya and Vermilion Bays	805	1	--	--	--	--	--	--	--	--
3.15 Calcasieu Lake	72	< 1	--	--	--	--	--	--	--	--
3.16 Sabine Lake	227	< 1	--	--	--	--	--	--	--	--
3.17 Galveston Bay	193	< 1	--	--	--	--	--	--	--	--
3.18 Brazos River	110	< 1	--	--	--	--	--	--	--	--
3.19 Matagorda Bay	501	< 1	--	--	--	--	--	--	--	--
3.20 San Antonio Bay	< 1	< 1	--	--	--	--	--	--	--	--
3.21 Aransas Bay	32	< 1	--	--	--	--	--	--	--	--
3.22 Corpus Christi Bay	107	< 1	--	--	--	--	--	--	--	--
3.23 Laguna Madre	211	< 1	--	--	--	--	--	--	--	--
TOTAL	9877	43	--	--	8	< 1	38	< 1	1	< 1
WEST COAST										
4.01 San Diego Bay	20	< 1	45	< 1	5	< 1	8	< 1	11	< 1
4.02 San Pedro Bay	429	4	149	< 1	9	< 1	--	--	28	< 1
4.03 Santa Monica Bay	83	< 1	15	< 1	< 1	< 1	2	< 1	7	< 1
4.04 Monterey Bay	356	1	11	< 1	413	< 1	--	--	3051	< 1
4.05 San Francisco Bay	42895	275	122233	975	791	< 1	--	--	6591	125
4.06 Eel River	169	1	--	--	48	< 1	--	--	636	< 1
4.07 Humboldt Bay	44	< 1	--	--	--	--	--	--	167	< 1
4.08 Klamath River	4	< 1	--	--	--	--	--	--	15	< 1
4.09 Coos Bay	50	< 1	--	--	--	--	--	--	1	< 1
4.10 Winchester Bay	268	< 1	--	--	296	3	--	--	25	< 1
4.11 Columbia River	950	4	--	--	905	14	--	--	1096	6
4.12 Willapa Bay	17	< 1	--	--	--	--	--	--	< 1	< 1
4.13 Grays Harbor	6	< 1	--	--	79	1	--	--	19	< 1
4.14 Puget Sound	1114	9	--	--	6103	107	--	--	1412	9
TOTAL	46405	298	122453	976	8649	128	10	< 1	13059	143
NATIONAL TOTAL	142141	860	122453	976	618581	2484	1850	4	47974	152

CROPS									
BEANS		BLUEBERRIES		BROCCOLI		CABBAGE		CANTALOUPE	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
362	6	--	--	--	--	--	--	--	--
4	< 1	--	--	--	--	191	4	--	--
1730	31	--	--	--	--	444	9	--	--
< 1	< 1	--	--	--	--	--	--	--	--
747	8	--	--	--	--	--	--	5	< 1
76	1	--	--	--	--	--	--	--	--
< 1	< 1	--	--	--	--	--	--	--	--
8	< 1	--	--	--	--	--	--	--	--
65	< 1	--	--	--	--	--	--	--	--
18	< 1	--	--	--	--	--	--	--	--
98	< 1	--	--	--	--	--	--	--	--
174	< 1	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
12	< 1	--	--	--	--	--	--	--	--
72	< 1	--	--	98	1	106	1	586	14
25	< 1	--	--	25	< 1	--	--	235	6
--	--	--	--	--	--	--	--	21	< 1
--	--	--	--	--	--	--	--	--	--
13	< 1	--	--	--	--	--	--	--	--
2	< 1	--	--	--	--	--	--	10	< 1
380	< 1	--	--	65505	1055	174320	1994	189158	4723
3786	52	--	--	65628	1057	175061	2010	190015	4745
--	--	--	--	< 1	< 1	36	< 1	--	--
112	< 1	--	--	35	< 1	247	1	--	--
285	1	--	--	590	10	164	2	--	--
1639	11	--	--	10312	210	270	< 1	--	--
53967	69	--	--	116	1	658	5	--	--
21	< 1	--	--	--	--	--	--	--	--
5	< 1	--	--	--	--	--	--	--	--
< 1	< 1	--	--	--	--	--	--	--	--
4	< 1	--	--	--	--	--	--	--	--
55	< 1	--	--	--	--	--	--	--	--
432	2	--	--	169	< 1	--	--	--	--
< 1	< 1	--	--	--	--	--	--	--	--
5	< 1	--	--	--	--	--	--	--	--
3245	14	--	--	2299	6	--	--	--	--
59770	99	--	--	13521	229	1375	10	--	--
204917	6195	2996	< 1	79149	1286	201662	2417	201576	4980

* All values are in pounds applied per year and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix I. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	CITRUS		CORN		COTTON		CRANBERRIES		CUCUMBERS	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	--	--	149	< 1	--	--	--	--	--	--
1.02 Englishman Bay	--	--	1	< 1	--	--	--	--	--	--
1.03 Narraguagus Bay	--	--	--	--	--	--	--	--	--	--
1.04 Blue Hill Bay	--	--	25	< 1	--	--	--	--	--	--
1.05 Penobscot Bay	--	--	19938	15	--	--	--	--	--	--
1.06 Muscongus Bay	--	--	1537	1	--	--	--	--	--	--
1.07 Sheepscot Bay	--	--	79579	63	--	--	--	--	--	--
1.08 Casco Bay	--	--	7077	5	--	--	--	--	--	--
1.09 Saco Bay	--	--	6677	5	--	--	--	--	--	--
1.10 Great Bay	--	--	5819	5	--	--	--	--	--	--
1.11 Merrimack River	--	--	14454	61	--	--	--	--	--	--
1.12 Boston Bay	--	--	403	6	--	--	--	--	--	--
1.13 Cape Cod Bay	--	--	516	8	--	--	2449	38	--	--
1.14 Buzzards Bay	--	--	7595	120	--	--	19969	315	--	--
1.15 Narragansett Bay	--	--	17756	259	--	--	25952	409	--	--
1.16 Gardiners Bay	--	--	1153	21	--	--	--	--	579	13
1.17 Long Island Sound	--	--	242539	2866	--	--	--	--	150	3
1.18 Great South Bay	--	--	1596	29	--	--	--	--	801	18
1.19 Hudson River/Raritan Bay	--	--	320962	5049	--	--	--	--	1747	41
1.20 Barnegat Bay	--	--	12102	133	--	--	1713	48	2300	53
1.21 Delaware Bay	--	--	647826	2656	--	--	10507	299	18027	418
1.22 Chincoteague Bay	--	--	54291	182	--	--	--	--	116	2
1.23 Chesapeake Bay	--	--	3216909	8162	--	--	--	--	15042	218
TOTAL	--	--	4656904	19655	--	--	60590	1112	38762	769
SOUTHEAST										
2.01 Albemarle Sound	--	--	828263	2666	23386	528	--	--	454	10
2.02 Pamlico Sound	--	--	913910	3182	8516	192	--	--	3355	77
2.03 Bogue Sound	--	--	61522	214	--	--	--	--	32	< 1
2.04 New River	--	--	36300	126	--	--	--	--	75	1
2.05 Cape Fear River	--	--	546924	1911	6817	154	--	--	12109	276
2.06 Winyah Bay	--	--	799304	2774	428376	1068	--	--	3343	83
2.07 Charleston Harbor	--	--	27769	96	--	--	--	--	837	21
2.08 North and South Santee Rivers	--	--	24324	84	293	< 1	--	--	139	3
2.09 St. Helena Sound	--	--	72119	249	3551	5	--	--	1853	46
2.10 Broad River	--	--	53675	185	1648	2	--	--	1486	36
2.11 Savannah River	--	--	42081	107	423	< 1	--	--	85	2
2.12 Ossabaw Sound	--	--	82806	153	303	8	--	--	--	--
2.13 St. Catherines / Sapelo Sound	--	--	1631	3	--	--	--	--	--	--
2.14 Altamaha River	--	--	67393	125	--	--	--	--	9	< 1
2.15 St. Andrew / St. Simons Sound	--	--	241744	448	730	19	--	--	75	2
2.16 St. Johns River	94732	1354	14344	27	--	--	--	--	5582	134
2.17 Indian River	139481	1994	7473	14	--	--	--	--	--	--
2.18 Biscayne Bay	15243	218	19420	36	--	--	--	--	2215	53
TOTAL	249456	3567	3843002	12407	474043	1978	--	--	31609	752
EAST COAST TOTAL	249456	3567	8501906	32062	474043	1978	60590	1112	70371	1522

CROPS									
GRAPES		LETTUCE		OATS		ONIONS		OTHER HAY	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	--	--	30	< 1	--	--	6	< 1
--	--	--	--	1	< 1	--	--	4	< 1
--	--	--	--	< 1	< 1	--	--	3	< 1
--	--	--	--	4	< 1	--	--	6	< 1
--	--	--	--	558	1	--	--	117	< 1
--	--	--	--	1	< 1	--	--	22	< 1
--	--	--	--	367	1	--	--	483	< 1
--	--	--	--	24	< 1	--	--	75	< 1
--	--	--	--	1	< 1	--	--	100	< 1
--	--	--	--	--	--	--	--	308	< 1
--	--	--	--	--	--	--	--	490	< 1
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	59	< 1
420	2	30	< 1	31	< 1	343	12	24	< 1
25	< 1	8	< 1	183	< 1	78	2	14175	115
580	3	42	< 1	43	< 1	473	16	33	< 1
3965	20	772	1	2470	< 1	76703	2678	28175	212
--	--	240	2	5	< 1	--	--	411	3
223	< 1	3947	33	231	< 1	--	--	4944	29
--	--	--	--	--	--	--	--	--	--
443	1	--	--	939	1	--	--	1511	6
5656	28	5039	36	4868	5	77597	2709	48946	367
--	--	--	--	600	< 1	--	--	148	< 1
200	< 1	--	--	2628	2	--	--	254	< 1
< 1	< 1	--	--	88	< 1	--	--	7	< 1
198	< 1	--	--	105	< 1	--	--	8	< 1
1914	7	--	--	1654	1	--	--	754	< 1
351	1	--	--	6278	1	--	--	18176	< 1
11	< 1	--	--	123	< 1	--	--	831	< 1
4	< 1	--	--	67	< 1	--	--	301	< 1
10	< 1	--	--	526	< 1	--	--	3594	< 1
--	--	--	--	282	< 1	--	--	2333	< 1
9	< 1	--	--	425	< 1	--	--	1529	< 1
26	< 1	--	--	936	< 1	267	8	1559	< 1
< 1	< 1	--	--	--	--	--	--	9	< 1
11	< 1	--	--	591	< 1	6078	200	1308	< 1
36	< 1	--	--	1444	< 1	--	--	3042	< 1
--	--	1	< 1	< 1	< 1	--	--	7013	< 1
--	--	--	--	--	--	--	--	95	< 1
--	--	33	< 1	--	--	--	--	258	< 1
2770	11	34	< 1	15747	6	6345	209	41219	1
8426	40	5073	37	20615	11	83942	2919	90165	368

* All values are in pounds applied per year and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix I. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	CITRUS		CORN		COTTON		CRANBERRIES		CUCUMBERS	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	11664	166	1268	2	--	--	--	--	6204	150
3.02 Charlotte Harbor	313632	4484	1748	3	--	--	--	--	17472	422
3.03 Tampa Bay	105297	1505	1936	3	--	--	--	--	6184	149
3.04 Suwanee River	18	< 1	93583	176	--	--	--	--	560	13
3.05 Apalachee Bay	2	< 1	209591	393	13775	364	--	--	25	< 1
3.06 Apalachicola Bay	--	--	15208	28	241	3	--	--	--	--
3.07 St. Andrew Bay	--	--	1514	2	10	< 1	--	--	--	--
3.08 Choctawhatchee Bay	--	--	61610	94	1042	16	--	--	--	--
3.09 Pensacola Bay	--	--	89521	125	22766	301	--	--	4	< 1
3.10 Perdido Bay	--	--	74073	82	387	2	--	--	57	1
3.11 Mobile Bay	--	--	102080	82	8014	42	--	--	67	1
3.12 Mississippi Sound	--	--	82114	69	515	2	--	--	38	< 1
3.13 Mississippi Delta Region	--	--	2044	2	1	< 1	--	--	--	--
3.14 Atchafalaya and Vermilion Bays	--	--	62502	87	44989	72	--	--	--	--
3.15 Calcasieu Lake	--	--	7	< 1	--	--	--	--	--	--
3.16 Sabine Lake	--	--	1725	18	--	--	--	--	17	< 1
3.17 Galveston Bay	11	< 1	30818	462	3771	94	--	--	467	7
3.18 Brazos River	< 1	< 1	63970	959	10906	273	--	--	35	< 1
3.19 Matagorda Bay	--	--	272798	4090	7862	197	--	--	--	--
3.20 San Antonio Bay	--	--	5770	86	319	8	--	--	--	--
3.21 Aransas Bay	--	--	108623	1628	26370	661	--	--	--	--
3.22 Corpus Christi Bay	--	--	102668	1539	24397	611	--	--	--	--
3.23 Laguna Madre	75642	320	202999	3044	144976	3635	--	--	63375	1065
TOTAL	506266	6477	1588170	12985	310341	6288	--	--	94505	1815
WEST COAST										
4.01 San Diego Bay	98	< 1	127	< 1	--	--	--	--	60	< 1
4.02 San Pedro Bay	137	< 1	15	< 1	< 1	< 1	--	--	15	< 1
4.03 Santa Monica Bay	30	< 1	--	--	--	--	--	--	22	< 1
4.04 Monterey Bay	1	< 1	1042	< 1	--	--	--	--	13	< 1
4.05 San Francisco Bay	209	< 1	362813	307	--	--	--	--	611	3
4.06 Eel River	--	--	572	< 1	--	--	--	--	< 1	< 1
4.07 Humboldt Bay	--	--	148	< 1	--	--	--	--	< 1	< 1
4.08 Klamath River	--	--	11	< 1	--	--	--	--	< 1	< 1
4.09 Coos Bay	--	--	231	5	--	--	--	--	< 1	< 1
4.10 Winchester Bay	--	--	119	2	--	--	--	--	< 1	< 1
4.11 Columbia River	--	--	15607	1746	--	--	333	8	19	< 1
4.12 Willapa Bay	--	--	46	6	--	--	2506	87	--	--
4.13 Grays Harbor	--	--	1251	155	--	--	--	--	--	--
4.14 Puget Sound	--	--	37448	4617	--	--	--	--	99	< 1
TOTAL	475	1	419428	6841	--	--	2839	76	839	4
NATIONAL TOTAL	758197	10046	10509504	51889	784384	8268	63429	1188	165715	3342

CROPS									
GRAPES		LETTUCE		OATS		ONIONS		OTHER HAY	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	7	< 1	--	--	--	--	317	< 1
--	--	--	--	--	--	--	--	4292	< 1
--	--	--	--	--	--	--	--	4880	< 1
--	--	--	--	765	2	--	--	5044	< 1
27	< 1	--	--	914	< 1	--	--	3538	< 1
--	--	--	--	98	< 1	--	--	564	< 1
--	--	--	--	7	< 1	--	--	211	< 1
--	--	--	--	887	3	--	--	3251	< 1
--	--	--	--	570	2	--	--	2928	< 1
--	--	--	--	671	2	--	--	564	< 1
--	--	--	--	645	2	--	--	1474	< 1
--	--	--	--	237	< 1	--	--	34782	< 1
--	--	--	--	--	--	--	--	5507	< 1
--	--	--	--	50	< 1	--	--	9060	< 1
--	--	--	--	--	--	--	--	904	< 1
--	--	--	--	< 1	< 1	--	--	3392	< 1
--	--	140	1	17	< 1	--	--	2133	< 1
--	--	37	< 1	66	< 1	--	--	3949	< 1
--	--	--	--	26	< 1	--	--	6484	1
--	--	--	--	< 1	< 1	--	--	47	< 1
--	--	--	--	93	< 1	--	--	1715	< 1
--	--	--	--	26	< 1	--	--	2233	< 1
--	--	16886	193	109	< 1	85866	1059	4175	< 1
27	< 1	17070	195	5181	16	85866	1059	101204	5
52	< 1	--	--	30	< 1	--	--	--	--
69	< 1	4	< 1	< 1	< 1	428	1	--	--
4	< 1	120	< 1	< 1	< 1	82	< 1	--	--
4064	31	6318	45	53	< 1	612	11	--	--
67671	514	65	1	3394	< 1	768	19	580	< 1
27	< 1	--	--	--	--	--	--	--	--
7	< 1	--	--	--	--	--	--	--	--
< 1	< 1	--	--	--	--	--	--	--	--
--	--	--	--	2	< 1	< 1	< 1	511	< 1
--	--	--	--	27	< 1	1	< 1	2204	< 1
146	7	--	--	1459	12	27	< 1	2772	< 1
< 1	< 1	--	--	< 1	< 1	--	--	--	--
< 1	< 1	--	--	43	< 1	--	--	--	--
289	14	--	--	423	3	--	--	--	--
72309	570	6507	47	5431	16	1918	33	6067	< 1
80762	610	28650	279	31227	43	171726	4012	197436	373

* All values are in pounds applied per year and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

continued...

Appendix I. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	PASTURE/RANGE		PEACHES		PEANUTS		PEAS		POTATOES	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	16	< 1	--	--	--	--	91	< 1	831	34
1.02 Englishman Bay	28	< 1	--	--	--	--	< 1	< 1	28	1
1.03 Narraguagus Bay	--	--	--	--	--	--	--	--	19	< 1
1.04 Blue Hill Bay	219	< 1	--	--	--	--	6	< 1	11	< 1
1.05 Penobscot Bay	1620	< 1	--	--	--	--	227	1	13705	561
1.06 Muscongus Bay	278	< 1	--	--	--	--	1	< 1	255	10
1.07 Sheepscot Bay	5832	< 1	--	--	--	--	464	3	12174	499
1.08 Casco Bay	746	< 1	--	--	--	--	602	4	3971	162
1.09 Saco Bay	855	< 1	--	--	--	--	108	< 1	2584	106
1.10 Great Bay	446	< 1	--	--	--	--	17	< 1	--	--
1.11 Merrimack River	1074	< 1	--	--	--	--	--	--	55	2
1.12 Boston Bay	273	< 1	--	--	--	--	--	--	27	< 1
1.13 Cape Cod Bay	25	< 1	--	--	--	--	--	--	4	< 1
1.14 Buzzards Bay	352	< 1	--	--	--	--	--	--	294	10
1.15 Narragansett Bay	1125	< 1	--	--	--	--	--	--	10871	301
1.16 Gardiners Bay	476	< 1	--	--	--	--	60	< 1	59172	1323
1.17 Long Island Sound	4621	< 1	--	--	--	--	42	< 1	24858	605
1.18 Great South Bay	798	< 1	--	--	--	--	84	< 1	81741	1827
1.19 Hudson River/Raritan Bay	13553	< 1	2406	48	--	--	316	2	25268	1388
1.20 Barnegat Bay	450	< 1	8489	171	--	--	--	--	2811	185
1.21 Delaware Bay	4765	< 1	40593	824	--	--	15260	124	41937	2880
1.22 Chincoteague Bay	56	< 1	--	--	--	--	--	--	2557	147
1.23 Chesapeake Bay	79968	< 1	297	6	97278	9280	15546	125	38334	1782
TOTAL	117577	< 1	51785	1050	97278	9280	32824	266	321507	11833
SOUTHEAST										
2.01 Albemarle Sound	3759	< 1	569	3	558160	31706	36	< 1	20586	369
2.02 Pamlico Sound	4696	< 1	410	1	135247	7372	48	< 1	11992	215
2.03 Bogue Sound	642	< 1	--	--	49	2	--	--	2372	42
2.04 New River	101	< 1	--	--	116	6	--	--	< 1	< 1
2.05 Cape Fear River	2406	< 1	468	1	24370	1330	485	3	252	3
2.06 Winyah Bay	11269	< 1	20145	83	57258	1246	211	1	220	4
2.07 Charleston Harbor	725	< 1	34	< 1	80	1	--	--	--	--
2.08 North and South Santee Rivers	306	< 1	--	--	70	1	--	--	--	--
2.09 St. Helena Sound	2124	< 1	--	--	677	10	--	--	--	--
2.10 Broad River	1036	< 1	--	--	6177	92	--	--	--	--
2.11 Savannah River	767	< 1	--	--	12546	228	21	< 1	--	--
2.12 Ogeechee Sound	1936	< 1	3	< 1	126314	2374	56	< 1	--	--
2.13 St. Catherine's / Sapelo Sound	16	< 1	--	--	60	1	< 1	< 1	--	--
2.14 Altamaha River	2859	< 1	326	2	20884	393	43	< 1	--	--
2.15 St. Andrew / St. Simons Sound	5830	< 1	2	< 1	88737	1668	87	< 1	--	--
2.16 St. Johns River	172783	1	--	--	120	2	9	< 1	149007	5754
2.17 Indian River	27539	< 1	--	--	--	--	--	--	--	--
2.18 Biscayne Bay	25728	< 1	--	--	--	--	49	< 1	30817	1188
TOTAL	264522	1	21957	94	1030865	46440	1045	6	215246	7577
EAST COAST TOTAL	382099	2	73742	1144	1128143	55720	33869	273	536753	19411

CROPS									
RICE		SORGHUM		SOYBEANS		SQUASH		STRAWBERRIES	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	1530	38	--	--
--	--	--	--	--	--	489	12	--	--
--	--	--	--	--	--	67	1	--	--
--	--	--	--	--	--	2824	71	--	--
--	--	--	--	--	--	5922	149	--	--
--	--	--	--	--	--	368	11	148	< 1
--	--	--	--	--	--	705	18	65	< 1
--	--	--	--	--	--	509	15	204	< 1
--	--	--	--	77782	49	3731	104	358	< 1
--	--	--	--	16061	10	2302	56	--	--
--	--	--	--	429437	1753	27298	684	651	< 1
--	--	--	--	36629	277	--	--	--	--
--	--	--	--	1470886	8395	72	1	971	1
--	--	--	--	2030795	10486	46417	1167	2397	3
--	--	6732	2	618103	8497	76	3	32	< 1
--	--	967	< 1	716440	10987	53	2	1	< 1
--	--	10	< 1	47124	723	--	--	7	< 1
--	--	< 1	< 1	25842	396	--	--	--	--
--	--	887	< 1	470192	7212	4614	187	279	< 1
--	--	4112	1	1526013	13513	8	< 1	43	< 1
--	--	--	--	28692	217	--	--	--	--
--	--	10	< 1	31422	238	--	--	--	--
--	--	308	< 1	105482	800	--	--	--	--
--	--	576	< 1	100307	761	--	--	--	--
--	--	338	< 1	66211	476	54	1	--	--
--	--	2717	1	134300	912	17	< 1	--	--
--	--	--	--	473	3	--	--	--	--
--	--	995	< 1	60748	412	--	--	--	--
--	--	2203	< 1	119349	811	2477	71	--	--
--	--	98	< 1	311	1	1604	48	< 1	< 1
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	33960	1028	50	< 1
--	--	19953	8	4051009	45966	42863	1343	412	< 1
--	--	19953	8	6081804	56453	89280	2511	2809	4

* All values are in pounds applied per year and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix I. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	PASTURE/RANGE		PEACHES		PEANUTS		PEAS		POTATOES	
	Use	Use	Use	Use	Use	Use	Use	Use	Use	Use
GULF OF MEXICO										
3.01 Ten Thousand Islands	108625	< 1	--	--	--	--	< 1	< 1	32	1
3.02 Charlotte Harbor	322614	2	--	--	851	18	10	< 1	--	--
3.03 Tampa Bay	129940	< 1	--	--	367	8	79	< 1	31	< 1
3.04 Suwannee River	27773	< 1	--	--	25087	542	950	< 1	39	< 1
3.05 Apalachee Bay	24797	< 1	918	8	112103	2195	336	< 1	3	< 1
3.06 Apalachicola Bay	6101	< 1	--	--	34670	728	2	< 1	4	< 1
3.07 St. Andrew Bay	2748	< 1	--	--	1046	22	< 1	< 1	< 1	< 1
3.08 Choctawhatchee Bay	17277	< 1	--	--	108813	2254	49	< 1	35	1
3.09 Pensacola Bay	19265	< 1	418	3	95008	1957	55	< 1	660	28
3.10 Perdido Bay	1368	< 1	--	--	135	2	26	< 1	11478	488
3.11 Mobile Bay	8790	< 1	188	1	116	2	40	< 1	14063	573
3.12 Mississippi Sound	66080	< 1	44	< 1	--	--	83	< 1	8091	329
3.13 Mississippi Delta Region	9871	< 1	--	--	--	--	4	< 1	--	--
3.14 Atchafalaya and Vermilion Bays	10850	< 1	--	--	--	--	10	< 1	--	--
3.15 Calcasieu Lake	4194	< 1	--	--	--	--	--	--	--	--
3.16 Sabine Lake	6907	< 1	66	< 1	12	< 1	24	< 1	79	1
3.17 Galveston Bay	10478	< 1	56	< 1	8459	32	12	< 1	406	12
3.18 Brazos River	9435	< 1	161	1	13336	50	2	< 1	115	3
3.19 Matagorda Bay	29863	< 1	220	2	2480	9	--	--	31	< 1
3.20 San Antonio Bay	1141	< 1	--	--	--	--	--	--	--	--
3.21 Aransas Bay	14127	< 1	10	< 1	29	< 1	--	--	--	--
3.22 Corpus Christi Bay	11410	< 1	25	< 1	98	< 1	102	< 1	--	--
3.23 Laguna Madre	58961	< 1	12	< 1	2392	9	1050	8	9657	301
TOTAL	902615	6	2118	20	405002	7833	2834	11	44724	1724
WEST COAST										
4.01 San Diego Bay	--	--	1	< 1	--	--	--	--	150	< 1
4.02 San Pedro Bay	1630	< 1	261	1	--	--	--	--	4	< 1
4.03 Santa Monica Bay	44	< 1	8	< 1	--	--	--	--	< 1	< 1
4.04 Monterey Bay	298	< 1	1	< 1	--	--	--	--	532	6
4.05 San Francisco Bay	5362	2	2038	19	--	--	--	--	2907	21
4.06 Eel River	391	< 1	20	< 1	--	--	--	--	230	1
4.07 Humboldt Bay	103	< 1	--	--	--	--	--	--	60	< 1
4.08 Klamath River	35	< 1	--	--	--	--	--	--	5	< 1
4.09 Coos Bay	1761	< 1	--	--	--	--	< 1	< 1	< 1	< 1
4.10 Winchester Bay	7448	< 1	--	--	--	--	1	< 1	< 1	< 1
4.11 Columbia River	22605	< 1	--	--	--	--	2057	31	2135	460
4.12 Willapa Bay	1274	< 1	--	--	--	--	32	< 1	17	3
4.13 Grays Harbor	1434	< 1	--	--	--	--	1275	20	755	141
4.14 Puget Sound	44046	< 1	--	--	--	--	25438	402	16082	2990
TOTAL	86431	3	2329	21	--	--	28803	454	22857	3627
NATIONAL TOTAL	1371145	11	78189	1185	1533145	83553	65506	739	804334	24762

CROPS									
RICE		SORGHUM		SOYBEANS		SQUASH		STRAWBERRIES	
Use	Use	Use	Use	Use	Use	Use	Use	Use	Use
--	--	--	--	--	--	6357	192	3	< 1
--	--	515	< 1	--	--	13305	403	105	< 1
--	--	889	< 1	--	--	6545	198	3681	14
--	--	5460	2	44859	144	1245	37	--	--
--	--	4816	2	109987	496	2419	72	--	--
--	--	989	< 1	57568	191	295	9	--	--
--	--	104	< 1	14913	48	2	< 1	--	--
--	--	5953	3	157282	616	107	3	--	--
--	--	5000	3	233274	977	--	--	--	--
--	--	2287	1	87227	511	--	--	--	--
--	--	3558	2	80024	583	--	--	--	--
--	--	13554	5	170014	842	--	--	--	--
863	< 1	446	< 1	96470	378	--	--	--	--
327190	213	52896	22	963757	3687	--	--	--	--
97452	83	--	--	110827	424	--	--	--	--
195599	89	1352	< 1	47523	142	9	< 1	--	--
605860	274	10828	130	223797	618	1278	29	--	--
136601	61	24555	296	25273	69	247	5	--	--
829786	375	230718	2792	52747	145	--	--	--	--
4219	1	10097	122	197	< 1	--	--	--	--
--	--	142063	1719	--	--	--	--	--	--
--	--	138763	1679	--	--	48	1	--	--
--	--	544003	6584	2592	7	17066	391	--	--
2197570	1079	1198646	13370	2478331	9887	48923	1345	3789	15
--	--	--	--	--	--	45	< 1	138	< 1
--	--	--	--	--	--	34	< 1	1064	1
--	--	--	--	--	--	7	< 1	106	< 1
--	--	--	--	--	--	65	< 1	1021	4
114180	155	7650	188	--	--	371	2	156	< 1
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	1	< 1	< 1	< 1
--	--	--	--	--	--	11	< 1	5	< 1
--	--	--	--	--	--	51	< 1	629	2
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	905	5
114180	155	7650	188	--	--	585	3	4024	15
2311750	1235	1226249	13566	8560135	66340	138788	3859	10622	35

* All values are in pounds applied per year and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix I. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	SUGARBEETS		SUGARCANE		SWEET CORN		TOBACCO		TOMATOES	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	--	--	--	--	--	--	--	--	--	--
1.02 Englishman Bay	--	--	--	--	--	--	--	--	--	--
1.03 Narraguagus Bay	--	--	--	--	--	--	--	--	--	--
1.04 Blue Hill Bay	--	--	--	--	--	--	--	--	--	--
1.05 Penobscot Bay	--	--	--	--	--	--	--	--	--	--
1.06 Muscongus Bay	--	--	--	--	--	--	--	--	--	--
1.07 Sheepscot Bay	--	--	--	--	--	--	--	--	--	--
1.08 Casco Bay	--	--	--	--	--	--	--	--	--	--
1.09 Saco Bay	--	--	--	--	--	--	--	--	--	--
1.10 Great Bay	--	--	--	--	--	--	--	--	--	--
1.11 Merrimack River	--	--	--	--	2475	3	--	--	--	--
1.12 Boston Bay	--	--	--	--	784	1	--	--	--	--
1.13 Cape Cod Bay	--	--	--	--	88	< 1	--	--	--	--
1.14 Buzzards Bay	--	--	--	--	1404	2	--	--	--	--
1.15 Narragansett Bay	--	--	--	--	2518	4	--	--	--	--
1.16 Gardiners Bay	--	--	--	--	2093	2	--	--	413	12
1.17 Long Island Sound	--	--	--	--	4390	6	--	--	183	5
1.18 Great South Bay	--	--	--	--	3083	4	--	--	802	18
1.19 Hudson River/Raritan Bay	--	--	--	--	48972	126	--	--	6137	190
1.20 Barnegat Bay	--	--	--	--	7424	44	--	--	3453	107
1.21 Delaware Bay	--	--	--	--	41933	207	147	< 1	47174	1440
1.22 Chincoteague Bay	--	--	--	--	23	< 1	--	--	1450	43
1.23 Chesapeake Bay	--	--	--	--	40134	77	82424	485	51659	1409
TOTAL	--	--	--	--	153321	480	82571	486	111071	3227
SOUTHEAST										
2.01 Albemarle Sound	--	--	--	--	--	--	25252	132	415	8
2.02 Pamlico Sound	--	--	--	--	--	--	118359	619	21	< 1
2.03 Bogue Sound	--	--	--	--	--	--	4592	24	29	< 1
2.04 New River	--	--	--	--	--	--	4831	25	2	< 1
2.05 Cape Fear River	--	--	--	--	--	--	72437	379	1517	30
2.06 Winyah Bay	--	--	--	--	--	--	248953	1480	295	7
2.07 Charleston Harbor	--	--	--	--	--	--	1124	6	8943	236
2.08 North and South Santee Rivers	--	--	--	--	--	--	5178	31	793	21
2.09 St. Helena Sound	--	--	--	--	--	--	548	3	13075	345
2.10 Broad River	--	--	--	--	--	--	--	--	4202	111
2.11 Savannah River	--	--	--	--	--	--	460	2	243	6
2.12 Ogeechee Sound	--	--	--	--	--	--	4019	23	--	--
2.13 St. Catherine's / Sapelo Sound	--	--	--	--	--	--	24	< 1	--	--
2.14 Altamaha River	--	--	--	--	--	--	7114	42	--	--
2.15 St. Andrew / St. Simons Sound	--	--	--	--	--	--	24867	147	20	< 1
2.16 St. Johns River	--	--	--	--	20410	1829	13	< 1	51	< 1
2.17 Indian River	--	--	--	--	--	--	--	--	--	--
2.18 Biscayne Bay	--	--	160567	144	31437	2505	--	--	95973	1592
TOTAL	--	--	160567	144	51847	4134	517771	2918	125579	2382
EAST COAST TAL	--	--	160567	144	205188	4615	600342	3405	238650	5590

CROPS				TOTAL					
WATERMELONS		WHEAT		MAJOR CROPS		OTHER CROPS		ALL CROPS	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	--	--	2181	35	< 1	< 1	2181	35
--	--	--	--	697	1	< 1	< 1	697	1
--	--	--	--	452	< 1	< 1	< 1	452	< 1
--	--	--	--	683	< 1	< 1	< 1	683	< 1
--	--	--	--	40889	591	< 1	< 1	40889	591
--	--	--	--	2848	12	< 1	< 1	2848	12
--	--	--	--	144081	657	< 1	< 1	144081	657
--	--	--	--	16330	181	< 1	< 1	16330	181
--	--	--	--	21122	133	< 1	< 1	21122	133
--	--	--	--	8243	5	2	< 1	8245	5
--	--	--	--	32248	118	2	< 1	32250	118
--	--	--	--	4283	25	< 1	< 1	4283	25
--	--	--	--	3160	49	< 1	< 1	3160	49
--	--	--	--	32647	520	< 1	< 1	32647	520
--	--	--	--	68446	1133	< 1	< 1	68446	1133
--	--	18	< 1	67181	1424	2178	23	69359	1448
--	--	6	< 1	359218	3807	576	6	359794	3813
--	--	25	< 1	95285	1973	3048	33	98333	2007
--	--	2388	< 1	1026824	11240	8404	51	1035228	11291
--	--	380	< 1	79555	1193	3254	12	82809	1206
934	8	16193	1	1522127	17726	24232	90	1546359	17817
46	< 1	325	< 1	95699	653	91	< 1	95790	654
8398	86	52769	3	5275701	30540	13302	42	5289003	30583
9378	95	72104	5	8899900	72016	55089	261	8954989	72549
772	28	37143	42	2130258	44041	2309	13	2132567	44054
26	1	37617	48	1956351	22712	6374	38	1962725	22750
20	< 1	864	1	117783	1012	183	1	117966	1014
10	< 1	781	1	68413	559	205	1	68618	560
1386	50	18932	24	1172182	11586	29657	179	1201819	11766
1174	44	91427	10	3219475	20331	19919	97	3239394	20429
44	1	1657	< 1	71187	582	853	2	72040	584
5	< 1	2110	< 1	65062	381	60	< 1	65122	381
455	17	5259	< 1	210318	1481	792	2	211110	1484
1104	42	4997	< 1	177804	1232	920	1	178724	1234
452	15	4035	< 1	129728	843	359	< 1	130087	843
203	5	21428	< 1	377057	3490	5045	10	382102	3500
--	--	28	< 1	2241	7	< 1	< 1	2241	7
363	9	13240	< 1	182368	1190	3512	7	185880	1198
1056	26	15415	< 1	508242	3205	7920	17	516182	3223
554	17	2	< 1	480184	9253	8393	26	488577	9280
--	--	--	--	174588	2008	< 1	< 1	174588	2008
1079	32	--	--	431408	7040	16177	233	447585	7273
8703	294	254935	128	11474629	130963	102678	634	11577307	131598
18081	389	327039	134	20374529	202979	157767	895	20532296	204147

* All values are in pounds applied per year and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

continued...

Appendix I. Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	SUGARBEETS		SUGARCANE		SWEET CORN		TOBACCO		TOMATOES	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	--	--	81704	73	4639	370	--	--	90792	1506
3.02 Charlotte Harbor	--	--	49686	44	327	27	--	--	55394	919
3.03 Tampa Bay	--	--	--	--	1151	93	--	--	101908	1690
3.04 Suwannee River	--	--	--	--	72	6	8468	45	--	--
3.05 Apalachee Bay	--	--	--	--	221	18	3018	19	4211	70
3.06 Apalachicola Bay	--	--	--	--	29	3	40	< 1	922	15
3.07 St. Andrew Bay	--	--	--	--	45	4	--	--	14	< 1
3.08 Choctawhatchee Bay	--	--	--	--	330	28	--	--	1360	22
3.09 Pensacola Bay	--	--	--	--	664	53	--	--	254	4
3.10 Perdido Bay	--	--	--	--	259	21	--	--	257	4
3.11 Mobile Bay	--	--	--	--	--	--	--	--	288	4
3.12 Mississippi Sound	--	--	11393	10	--	--	--	--	298	4
3.13 Mississippi Delta Region	--	--	69418	61	--	--	--	--	--	--
3.14 Atchafalaya and Vermilion Bays	--	--	64174	56	--	--	--	--	--	--
3.15 Calcasieu Lake	--	--	--	--	--	--	--	--	--	--
3.16 Sabine Lake	--	--	--	--	--	--	--	--	51	1
3.17 Galveston Bay	--	--	--	--	--	--	--	--	869	26
3.18 Brazos River	--	--	--	--	--	--	--	--	231	7
3.19 Matagorda Bay	--	--	--	--	--	--	--	--	9	< 1
3.20 San Antonio Bay	--	--	--	--	--	--	--	--	--	--
3.21 Aransas Bay	--	--	--	--	--	--	--	--	--	--
3.22 Corpus Christi Bay	--	--	--	--	--	--	--	--	3	< 1
3.23 Laguna Madre	--	--	40730	67	--	--	--	--	16606	500
TOTAL	--	--	317305	314	7737	825	9526	65	273467	4780
WEST COAST										
4.01 San Diego Bay	--	--	--	--	117	< 1	--	--	338	1
4.02 San Pedro Bay	--	--	--	--	925	< 1	--	--	577	9
4.03 Santa Monica Bay	1	< 1	--	--	48	< 1	--	--	478	10
4.04 Monterey Bay	480	3	--	--	157	< 1	--	--	1120	28
4.05 San Francisco Bay	35943	406	--	--	6085	2	--	--	85617	1575
4.06 Eel River	--	--	--	--	43	< 1	--	--	< 1	< 1
4.07 Humboldt Bay	--	--	--	--	10	< 1	--	--	< 1	< 1
4.08 Klamath River	--	--	--	--	< 1	< 1	--	--	< 1	< 1
4.09 Coos Bay	--	--	--	--	42	< 1	--	--	--	--
4.10 Winchester Bay	--	--	--	--	379	< 1	--	--	--	--
4.11 Columbia River	--	--	--	--	8017	6	--	--	--	--
4.12 Willapa Bay	--	--	--	--	2	< 1	--	--	--	--
4.13 Grays Harbor	--	--	--	--	132	< 1	--	--	--	--
4.14 Puget Sound	--	--	--	--	5527	2	--	--	--	--
TOTAL	36424	410	--	--	21484	12	--	--	88130	1626
NATIONAL TOTAL	36424	410	477872	458	234389	5253	609668	3470	598247	11997

CROPS				TOTAL					
WATERMELONS		WHEAT		MAJOR CROPS		OTHER CROPS		ALL CROPS	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
10083	302	--	--	322091	2774	6476	65	328567	2840
15615	468	--	--	796225	6801	4950	8	801175	6810
2082	62	137	< 1	367314	3773	6659	12	373973	3786
17822	534	2743	9	233439	1526	9252	11	242691	1538
4827	143	7393	12	504028	3812	26692	41	530720	3853
284	8	3519	11	120664	1003	790	1	121454	1004
34	1	70	< 1	20719	80	617	< 1	21336	80
2729	81	8492	29	369645	3158	4062	5	373707	3163
645	19	18307	62	490289	3548	20665	26	510954	3574
127	3	9433	32	188441	1135	4843	12	193284	1147
552	13	8133	27	228502	1341	73193	100	301695	1441
1223	30	6741	3	398915	1311	57167	80	456082	1392
18	< 1	3684	< 1	188775	445	6477	9	195252	455
65	1	14210	1	1550358	4144	13698	26	1564056	4171
--	--	585	< 1	214041	487	294	< 1	214335	488
183	4	517	1	257695	263	2968	3	260663	267
531	13	180	2	901166	1725	20814	21	921980	1746
1966	50	382	4	291662	1794	15184	15	306846	1809
342	9	2097	22	1435985	7649	63279	58	1499264	7708
--	--	43	< 1	21833	220	39	< 1	21872	220
9	< 1	1542	16	294626	4027	423	< 1	295049	4027
2722	69	2051	21	284665	3926	4	< 1	284669	3926
52401	1333	2420	25	1771492	26324	130201	2058	1901693	28383
114260	3154	92679	287	11252570	81276	468747	2561	11721317	83838
4	< 1	173	< 1	1458	5	359	5	1817	10
25	< 1	21	< 1	6218	24	312	5	6530	30
4	< 1	4	< 1	2104	27	1352	37	3456	65
--	--	65	< 1	31894	356	14084	255	45978	611
698	3	69307	1434	993676	6114	110038	1718	1103714	7832
--	--	--	--	2157	3	42	< 1	2199	4
--	--	--	--	544	< 1	9	< 1	553	1
--	--	--	--	70	< 1	--	--	70	< 1
1	< 1	50	< 1	2654	5	20	< 1	2674	5
18	< 1	525	< 1	11382	9	468	1	11850	10
--	--	2288	1	61697	2309	3422	12	65119	2322
--	--	< 1	< 1	3894	78	--	--	3894	78
--	--	21	< 1	5020	318	4	< 1	5024	318
--	--	2604	< 1	146992	8185	5537	24	152529	8209
750	4	75058	1436	1269760	17433	135647	2057	1405407	19495
133091	3548	494776	1858	32896859	301688	762161	5513	33659020	307480

* All values are in pounds applied per year and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity Normalized Use; -- = Not Applied.

**Appendix J. Intensity of Agricultural Use and Toxicity Normalized Use For 28 Pesticides
by Major Crop by Estuarine Drainage Area**

ESTUARY	CROPS									
	ALFALFA		ALMONDS		APPLES		AVOCADO		BARLEY	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	13	< 1	--	--	5643	9	--	--	--	--
1.02 Englishman Bay	12	< 1	--	--	--	--	--	--	--	--
1.03 Narraguagus Bay	12	< 1	--	--	--	--	--	--	--	--
1.04 Blue Hill Bay	11	< 1	--	--	5617	9	--	--	--	--
1.05 Penobscot Bay	13	< 1	--	--	5621	9	--	--	--	--
1.06 Muscongus Bay	13	< 1	--	--	5625	9	--	--	--	--
1.07 Sheepscot Bay	13	< 1	--	--	5623	9	--	--	--	--
1.08 Casco Bay	13	< 1	--	--	5622	9	--	--	--	--
1.09 Saco Bay	21	< 1	--	--	5445	9	--	--	--	--
1.10 Great Bay	32	< 1	--	--	2022	< 1	--	--	--	--
1.11 Merrimack River	51	< 1	--	--	3092	2	--	--	--	--
1.12 Boston Bay	111	< 1	--	--	8451	15	--	--	--	--
1.13 Cape Cod Bay	112	< 1	--	--	--	--	--	--	--	--
1.14 Buzzards Bay	112	< 1	--	--	--	--	--	--	--	--
1.15 Narragansett Bay	116	< 1	--	--	8449	15	--	--	--	--
1.16 Gardiners Bay	244	1	--	--	8407	15	--	--	--	--
1.17 Long Island Sound	256	1	--	--	8396	15	--	--	--	--
1.18 Great South Bay	244	1	--	--	8407	15	--	--	--	--
1.19 Hudson River/Raritan Bay	282	1	--	--	8516	22	--	--	144	< 1
1.20 Barnegat Bay	448	3	--	--	10624	152	--	--	143	< 1
1.21 Delaware Bay	322	1	--	--	9447	131	--	--	176	< 1
1.22 Chincoteague Bay	170	1	--	--	--	--	--	--	105	< 1
1.23 Chesapeake Bay	192	1	--	--	7962	11	--	--	111	< 1
NORTHEAST	231	1	--	--	7878	30	--	--	123	< 1
SOUTHEAST										
2.01 Albemarle Sound	228	1	--	--	7646	2	--	--	253	< 1
2.02 Pamlico Sound	235	1	--	--	7754	2	--	--	277	< 1
2.03 Bogue Sound	--	--	--	--	--	--	--	--	--	--
2.04 New River	--	--	--	--	--	--	--	--	--	--
2.05 Cape Fear River	233	1	--	--	6719	4	--	--	276	< 1
2.06 Winyah Bay	708	1	--	--	7884	9	--	--	285	< 1
2.07 Charleston Harbor	795	1	--	--	--	--	--	--	--	--
2.08 North and South Santee Rivers	798	1	--	--	--	--	--	--	257	< 1
2.09 St. Helena Sound	794	1	--	--	--	--	--	--	257	< 1
2.10 Broad River	--	--	--	--	--	--	--	--	--	--
2.11 Savannah River	632	5	--	--	--	--	--	--	--	--
2.12 Ogeechee Sound	631	5	--	--	--	--	--	--	115	< 1
2.13 St. Catherine's / Sapelo Sound	640	5	--	--	--	--	--	--	--	--
2.14 Altamaha River	634	5	--	--	--	--	--	--	110	< 1
2.15 St. Andrew / St. Simons Sound	633	5	--	--	4497	2	--	--	114	< 1
2.16 St. Johns River	603	5	--	--	--	--	--	--	--	--
2.17 Indian River	--	--	--	--	--	--	--	--	--	--
2.18 Biscayne Bay	612	5	--	--	--	--	160	< 1	--	--
SOUTHEAST	591	3	--	--	7510	5	160	< 1	247	< 1
EAST COAST	237	1	--	--	7878	30	160	< 1	128	< 1

CROPS									
BEANS		BLUEBERRIES		BROCCOLI		CABBAGE		CANTALOUPE	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
1647	11	128	< 1	--	--	--	--	--	--
1642	11	128	< 1	--	--	--	--	--	--
1650	11	128	< 1	--	--	--	--	--	--
1279	10	128	< 1	--	--	--	--	--	--
1631	11	127	< 1	--	--	--	--	--	--
1624	11	127	< 1	--	--	--	--	--	--
1625	11	129	< 1	--	--	--	--	--	--
1621	11	130	< 1	--	--	--	--	--	--
1624	11	130	< 1	--	--	--	--	--	--
1554	10	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
1625	11	--	--	--	--	2081	36	--	--
1648	11	--	--	--	--	2082	36	--	--
1627	11	--	--	--	--	2081	36	--	--
2572	139	--	--	--	--	1037	15	3012	55
3567	278	--	--	--	--	569	5	3054	56
3390	227	--	--	--	--	577	6	3155	59
933	5	--	--	--	--	--	--	--	--
2287	14	--	--	--	--	1221	12	3196	60
2828	129	128	< 1	--	--	1103	16	3169	59
337	< 1	--	--	--	--	1508	7	1008	40
264	< 1	--	--	--	--	1506	7	1017	41
457	1	--	--	--	--	1513	7	821	33
457	1	--	--	--	--	1517	7	872	35
338	< 1	--	--	--	--	1513	7	1012	41
340	< 1	--	--	--	--	1500	7	1058	42
335	< 1	--	--	--	--	--	--	--	--
337	< 1	--	--	--	--	--	--	--	--
335	< 1	--	--	--	--	--	--	--	--
196	< 1	--	--	--	--	--	--	--	--
755	4	--	--	--	--	--	--	914	37
960	5	--	--	--	--	--	--	914	37
--	--	--	--	--	--	--	--	--	--
1012	5	--	--	--	--	540	8	--	--
1010	5	--	--	--	--	575	9	--	--
761	14	--	--	--	--	793	16	--	--
--	--	--	--	--	--	--	--	--	--
767	14	--	--	--	--	--	--	--	--
684	11	--	--	--	--	942	14	1008	40
2136	91	128	< 1	--	--	976	15	2796	57

* All values, including regional estimates, are in pounds applied per year / square mile and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

continued...

Appendix J. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	ALFALFA		ALMONDS		APPLES		AVOCADO		BARLEY	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	612	5	--	--	--	--	162	< 1	--	--
3.02 Charlotte Harbor	605	5	--	--	--	--	161	< 1	--	--
3.03 Tampa Bay	601	5	--	--	--	--	--	--	--	--
3.04 Suwannee River	603	5	--	--	--	--	--	--	--	--
3.05 Apalachee Bay	611	5	--	--	7680	2	--	--	106	< 1
3.06 Apalachicola Bay	602	5	--	--	7680	2	--	--	--	--
3.07 St. Andrew Bay	600	5	--	--	--	--	--	--	--	--
3.08 Choctawhatchee Bay	560	4	--	--	--	--	--	--	--	--
3.09 Pensacola Bay	516	4	--	--	--	--	--	--	--	--
3.10 Perdido Bay	435	2	--	--	--	--	--	--	--	--
3.11 Mobile Bay	378	1	--	--	--	--	--	--	--	--
3.12 Mississippi Sound	437	< 1	--	--	--	--	--	--	--	--
3.13 Mississippi Delta Region	492	1	--	--	--	--	--	--	--	--
3.14 Atchafalaya and Vermilion Bays	492	1	--	--	--	--	--	--	--	--
3.15 Calcasieu Lake	491	1	--	--	--	--	--	--	--	--
3.16 Sabine Lake	220	< 1	--	--	--	--	--	--	--	--
3.17 Galveston Bay	122	< 1	--	--	--	--	--	--	--	--
3.18 Brazos River	122	< 1	--	--	--	--	--	--	--	--
3.19 Matagorda Bay	123	< 1	--	--	--	--	--	--	--	--
3.20 San Antonio Bay	122	< 1	--	--	--	--	--	--	--	--
3.21 Aransas Bay	123	< 1	--	--	--	--	--	--	--	--
3.22 Corpus Christi Bay	121	< 1	--	--	--	--	--	--	--	--
3.23 Laguna Madre	121	< 1	--	--	--	--	--	--	--	--
GULF OF MEXICO	352	1	--	--	7680	2	161	< 1	106	< 1
WEST COAST										
4.01 San Diego Bay	350	1	2036	9	204	< 1	4	< 1	13	< 1
4.02 San Pedro Bay	157	1	2034	9	203	< 1	--	--	16	< 1
4.03 Santa Monica Bay	135	1	2034	9	242	< 1	133	< 1	18	< 1
4.04 Monterey Bay	259	< 1	2327	11	477	< 1	--	--	216	< 1
4.05 San Francisco Bay	599	3	2364	18	338	< 1	--	--	159	3
4.06 Eel River	35	< 1	--	--	202	< 1	--	--	6931	< 1
4.07 Humboldt Bay	35	< 1	--	--	--	--	--	--	6931	< 1
4.08 Klamath River	35	< 1	--	--	--	--	--	--	6931	< 1
4.09 Coos Bay	232	< 1	--	--	--	--	--	--	136	< 1
4.10 Winchester Bay	233	< 1	--	--	1933	25	--	--	136	< 1
4.11 Columbia River	119	< 1	--	--	2741	44	--	--	124	< 1
4.12 Willapa Bay	68	< 1	--	--	--	--	--	--	123	< 1
4.13 Grays Harbor	76	< 1	--	--	3374	58	--	--	123	< 1
4.14 Puget Sound	71	< 1	--	--	3368	58	--	--	120	< 1
WEST COAST	429	2	2364	18	1477	21	6	< 1	163	1

CROPS									
BEANS		BLUEBERRIES		BROCCOLI		CABBAGE		CANTALOUPE	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
768	14	--	--	--	--	--	--	--	--
777	14	--	--	--	--	799	17	--	--
767	14	--	--	--	--	795	17	--	--
640	11	--	--	--	--	--	--	--	--
879	10	--	--	--	--	--	--	992	40
768	14	--	--	--	--	--	--	--	--
800	14	--	--	--	--	--	--	--	--
895	9	--	--	--	--	--	--	--	--
863	9	--	--	--	--	--	--	--	--
828	13	--	--	--	--	--	--	--	--
1001	5	--	--	--	--	--	--	--	--
1013	5	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
564	1	--	--	--	--	--	--	--	--
523	1	--	--	7243	116	10737	124	10091	250
516	1	--	--	7243	116	--	--	10054	254
--	--	--	--	--	--	--	--	10676	273
--	--	--	--	--	--	--	--	--	--
543	1	--	--	--	--	--	--	--	--
490	1	--	--	--	--	--	--	10065	272
523	1	--	--	7199	115	10795	123	10166	253
754	10	--	--	7199	115	10310	118	10163	253
--	--	--	--	320	12	620	14	--	--
1248	1	--	--	1568	21	7305	33	--	--
1602	8	--	--	1371	23	1034	15	--	--
1528	10	--	--	1164	23	11836	25	--	--
1339	1	--	--	1626	22	1728	14	--	--
1248	1	--	--	--	--	--	--	--	--
1247	1	--	--	--	--	--	--	--	--
1248	1	--	--	--	--	--	--	--	--
2574	15	--	--	--	--	--	--	--	--
2574	15	--	--	--	--	--	--	--	--
2512	14	--	--	1450	4	--	--	--	--
1280	5	--	--	--	--	--	--	--	--
1280	5	--	--	--	--	--	--	--	--
1627	7	--	--	1446	4	--	--	--	--
1363	2	--	--	1220	20	2097	16	--	--

* All values, including regional estimates, are in pounds applied per year / square mile and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

continued...

Appendix J. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	CITRUS		CORN		COTTON		CRANBERRIES		CUCUMBERS	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	--	--	2048	1	--	--	--	--	--	--
1.02 Englishman Bay	--	--	2048	1	--	--	--	--	--	--
1.03 Narraguagus Bay	--	--	--	--	--	--	--	--	--	--
1.04 Blue Hill Bay	--	--	2047	1	--	--	--	--	--	--
1.05 Penobscot Bay	--	--	2048	1	--	--	--	--	--	--
1.06 Muscongus Bay	--	--	2049	1	--	--	--	--	--	--
1.07 Sheepscot Bay	--	--	2047	1	--	--	--	--	--	--
1.08 Casco Bay	--	--	2047	1	--	--	--	--	--	--
1.09 Saco Bay	--	--	1789	1	--	--	--	--	--	--
1.10 Great Bay	--	--	1425	1	--	--	--	--	--	--
1.11 Merrimack River	--	--	1425	6	--	--	--	--	--	--
1.12 Boston Bay	--	--	1725	27	--	--	--	--	--	--
1.13 Cape Cod Bay	--	--	1726	27	--	--	3501	55	--	--
1.14 Buzzards Bay	--	--	1726	27	--	--	3501	55	--	--
1.15 Narragansett Bay	--	--	1872	27	--	--	3501	55	--	--
1.16 Gardiners Bay	--	--	1477	26	--	--	--	--	4639	107
1.17 Long Island Sound	--	--	2329	27	--	--	--	--	4660	107
1.18 Great South Bay	--	--	1477	26	--	--	--	--	4639	107
1.19 Hudson River/Raritan Bay	--	--	1629	25	--	--	--	--	4661	107
1.20 Barnegat Bay	--	--	2001	22	--	--	2752	78	4639	107
1.21 Delaware Bay	--	--	2279	9	--	--	2755	78	3720	86
1.22 Chincoteague Bay	--	--	2302	7	--	--	--	--	1747	35
1.23 Chesapeake Bay	--	--	2301	5	--	--	--	--	2608	37
NORTHEAST	--	--	2218	9	--	--	3319	60	3264	64
SOUTHEAST										
2.01 Albemarle Sound	--	--	2055	6	1130	25	--	--	1424	32
2.02 Pamlico Sound	--	--	2030	7	1130	25	--	--	1428	32
2.03 Bogue Sound	--	--	2030	7	--	--	--	--	1453	33
2.04 New River	--	--	2030	7	--	--	--	--	1453	33
2.05 Cape Fear River	--	--	2030	7	1129	25	--	--	1428	32
2.06 Winyah Bay	--	--	2208	7	3502	8	--	--	1286	31
2.07 Charleston Harbor	--	--	2263	7	--	--	--	--	1271	31
2.08 North and South Santee Rivers	--	--	2263	7	3906	5	--	--	1274	31
2.09 St. Helena Sound	--	--	2263	7	3906	5	--	--	1272	31
2.10 Broad River	--	--	2263	7	3906	5	--	--	1273	31
2.11 Savannah River	--	--	1990	5	3906	5	--	--	1273	31
2.12 Ossabaw Sound	--	--	1820	3	2661	69	--	--	--	--
2.13 St. Catherines / Sapelo Sound	--	--	1821	3	--	--	--	--	--	--
2.14 Altamaha River	--	--	1820	3	--	--	--	--	1908	67
2.15 St. Andrew / St. Simons Sound	--	--	1820	3	2651	70	--	--	2015	68
2.16 St. Johns River	985	14	2234	4	--	--	--	--	3004	72
2.17 Indian River	985	14	2234	4	--	--	--	--	--	--
2.18 Biscayne Bay	985	14	2233	4	--	--	--	--	3007	72
SOUTHEAST	985	14	2057	6	2991	12	--	--	1588	37
EAST COAST	985	3567	2142	32062	2991	1978	3319	1112	2214	1522

CROPS									
GRAPES		LETTUCE		OATS		ONIONS		OTHER HAY	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	--	--	289	< 1	--	--	3	< 1
--	--	--	--	288	< 1	--	--	3	< 1
--	--	--	--	295	< 1	--	--	3	< 1
--	--	--	--	274	< 1	--	--	3	< 1
--	--	--	--	288	< 1	--	--	3	< 1
--	--	--	--	286	< 1	--	--	3	< 1
--	--	--	--	288	< 1	--	--	3	< 1
--	--	--	--	284	< 1	--	--	3	< 1
--	--	--	--	283	< 1	--	--	6	< 1
--	--	--	--	--	--	--	--	21	< 1
--	--	--	--	--	--	--	--	25	< 1
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	12	< 1
2297	12	288	< 1	221	< 1	7032	245	134	1
2297	12	294	< 1	222	< 1	7032	245	187	1
2297	12	289	< 1	221	< 1	7032	245	134	1
2301	12	316	< 1	218	< 1	7027	245	177	1
--	--	837	6	207	< 1	--	--	336	2
3109	12	831	6	58	< 1	--	--	127	< 1
--	--	--	--	--	--	--	--	--	--
3099	12	--	--	49	< 1	--	--	53	< 1
2374	12	649	4	125	< 1	7027	245	91	< 1
--	--	--	--	271	< 1	--	--	64	< 1
3123	13	--	--	303	< 1	--	--	63	< 1
< 1	< 1	--	--	302	< 1	--	--	64	< 1
3084	12	--	--	304	< 1	--	--	63	< 1
3107	12	--	--	303	< 1	--	--	63	< 1
3115	12	--	--	266	< 1	--	--	515	< 1
3245	13	--	--	258	< 1	--	--	624	< 1
3125	13	--	--	258	< 1	--	--	623	< 1
3386	13	--	--	258	< 1	--	--	623	< 1
--	--	--	--	258	< 1	--	--	623	< 1
4160	25	--	--	309	< 1	--	--	386	< 1
3429	20	--	--	322	< 1	8395	276	224	< 1
4159	25	--	--	--	--	--	--	224	< 1
4360	30	--	--	322	< 1	8410	276	224	< 1
3839	22	--	--	322	< 1	--	--	224	< 1
--	--	22	< 1	65	< 1	--	--	191	< 1
--	--	--	--	--	--	--	--	192	< 1
--	--	23	< 1	--	--	--	--	192	< 1
3128	13	23	< 1	286	< 1	8409	276	307	< 1
2581	40	545	37	219	11	7116	2919	134	368

* All values, including regional estimates, are in pounds applied per year / square mile and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

continued...

Appendix J. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	CITRUS		CORN		COTTON		CRANBERRIES		CUCUMBERS	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	985	14	2233	4	--	--	--	--	3008	72
3.02 Charlotte Harbor	985	14	2235	4	--	--	--	--	3008	72
3.03 Tampa Bay	985	14	2235	4	--	--	--	--	3008	72
3.04 Suwanee River	981	14	2233	4	--	--	--	--	3004	72
3.05 Apalachee Bay	1280	26	2045	3	2851	70	--	--	2032	68
3.06 Apalachicola Bay	--	--	2127	4	1894	25	--	--	--	--
3.07 St. Andrew Bay	--	--	2235	4	1894	25	--	--	--	--
3.08 Choctawhatchee Bay	--	--	2023	3	1690	25	--	--	--	--
3.09 Pensacola Bay	--	--	1960	2	1513	20	--	--	1983	78
3.10 Perdido Bay	--	--	1826	2	1030	5	--	--	2879	70
3.11 Mobile Bay	--	--	1700	1	1030	5	--	--	2948	71
3.12 Mississippi Sound	--	--	1726	1	1033	5	--	--	3040	72
3.13 Mississippi Delta Region	--	--	2646	3	2560	3	--	--	--	--
3.14 Atchafalaya and Vermilion Bays	--	--	2975	4	2505	4	--	--	--	--
3.15 Calcasieu Lake	--	--	2773	3	--	--	--	--	--	--
3.16 Sabine Lake	--	--	2091	21	--	--	--	--	5763	93
3.17 Galveston Bay	639	2	1810	27	369	9	--	--	6236	104
3.18 Brazos River	640	3	1810	27	369	9	--	--	6192	103
3.19 Matagorda Bay	--	--	1810	27	369	9	--	--	--	--
3.20 San Antonio Bay	--	--	1810	27	369	9	--	--	--	--
3.21 Aransas Bay	--	--	1810	27	369	9	--	--	--	--
3.22 Corpus Christi Bay	--	--	1810	27	369	9	--	--	--	--
3.23 Laguna Madre	657	2	1810	27	369	9	--	--	6176	103
GULF OF MEXICO	917	11	1899	15	485	9	--	--	4803	88
WEST COAST										
4.01 San Diego Bay	137	< 1	1529	< 1	--	--	--	--	384	2
4.02 San Pedro Bay	76	< 1	1568	< 1	464	1	--	--	388	2
4.03 Santa Monica Bay	537	4	--	--	--	--	--	--	384	2
4.04 Monterey Bay	73	< 1	1624	< 1	--	--	--	--	390	2
4.05 San Francisco Bay	770	< 1	1701	1	--	--	--	--	383	2
4.06 Eel River	--	--	1785	< 1	--	--	--	--	213	1
4.07 Humboldt Bay	--	--	1785	< 1	--	--	--	--	213	1
4.08 Klamath River	--	--	1785	< 1	--	--	--	--	213	1
4.09 Coos Bay	--	--	2413	52	--	--	--	--	38	< 1
4.10 Winchester Bay	--	--	2395	52	--	--	--	--	38	< 1
4.11 Columbia River	--	--	1627	181	--	--	2108	56	59	< 1
4.12 Willapa Bay	--	--	1563	193	--	--	2108	56	--	--
4.13 Grays Harbor	--	--	1563	192	--	--	--	--	--	--
4.14 Puget Sound	--	--	1563	192	--	--	--	--	61	< 1
WEST COAST	167	< 1	1685	27	464	1	2108	56	218	1

CROPS									
GRAPES		LETTUCE		OATS		ONIONS		OTHER HAY	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	23	< 1	--	--	--	--	192	< 1
--	--	--	--	--	--	--	--	191	< 1
--	--	--	--	--	--	--	--	191	< 1
--	--	--	--	65	< 1	--	--	192	< 1
3303	22	--	--	193	< 1	--	--	198	< 1
2986	25	--	--	89	< 1	--	--	193	< 1
--	--	--	--	65	< 1	--	--	191	< 1
--	--	--	--	65	< 1	--	--	177	< 1
--	--	--	--	66	< 1	--	--	153	< 1
--	--	--	--	65	< 1	--	--	128	< 1
--	--	--	--	65	< 1	--	--	95	< 1
--	--	--	--	64	< 1	--	--	256	< 1
--	--	--	--	--	--	--	--	286	< 1
--	--	--	--	64	< 1	--	--	319	< 1
--	--	--	--	--	--	--	--	319	< 1
--	--	--	--	45	< 1	--	--	126	< 1
--	--	5510	63	208	< 1	--	--	67	< 1
--	--	5510	63	210	< 1	--	--	67	< 1
--	--	--	--	209	< 1	--	--	67	< 1
--	--	--	--	195	< 1	--	--	67	< 1
--	--	--	--	215	< 1	--	--	67	< 1
--	--	3840	38	215	< 1	--	--	67	< 1
--	--	5555	63	215	< 1	4809	59	67	< 1
3297	22	5012	57	79	< 1	4809	59	149	< 1
397	3	--	--	56	< 1	--	--	--	--
459	3	40	< 1	29	< 1	13152	59	--	--
426	3	206	< 1	4	< 1	13297	60	--	--
438	3	332	2	32	< 1	3898	71	--	--
538	4	94	2	38	< 1	408	10	42	< 1
1254	10	--	--	--	--	--	--	--	--
1254	10	--	--	--	--	--	--	--	--
1254	10	--	--	--	--	--	--	--	--
--	--	--	--	122	< 1	2559	42	160	< 1
--	--	--	--	122	< 1	2559	42	160	< 1
1293	67	--	--	215	1	2972	30	159	< 1
640	2	--	--	236	2	--	--	--	--
1057	34	--	--	236	2	--	--	--	--
1294	67	--	--	238	2	--	--	--	--
533	4	318	2	54	< 1	920	16	126	< 1

* All values, including regional estimates, are in pounds applied per year / square mile and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

continued...

Appendix J. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	PASTURE/RANGE		PEACHES		PEANUTS		PEAS		POTATOES	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	17	< 1	--	--	--	--	5164	41	3201	130
1.02 Englishman Bay	17	< 1	--	--	--	--	5120	41	3162	114
1.03 Narraguagus Bay	--	--	--	--	--	--	--	--	3175	118
1.04 Blue Hill Bay	17	< 1	--	--	--	--	5119	41	2925	36
1.05 Penobscot Bay	17	< 1	--	--	--	--	5166	42	3203	131
1.06 Muscongus Bay	17	< 1	--	--	--	--	5120	41	3176	121
1.07 Sheepscot Bay	17	< 1	--	--	--	--	5179	42	3202	130
1.08 Casco Bay	17	< 1	--	--	--	--	5167	42	3201	130
1.09 Saco Bay	17	< 1	--	--	--	--	5174	42	3201	131
1.10 Great Bay	17	< 1	--	--	--	--	5180	41	--	--
1.11 Merrimack River	17	< 1	--	--	--	--	--	--	3766	130
1.12 Boston Bay	17	< 1	--	--	--	--	--	--	3902	42
1.13 Cape Cod Bay	17	< 1	--	--	--	--	--	--	3814	123
1.14 Buzzards Bay	17	< 1	--	--	--	--	--	--	3795	131
1.15 Narragansett Bay	17	< 1	--	--	--	--	--	--	4631	128
1.16 Gardiners Bay	17	< 1	--	--	--	--	5178	42	5795	129
1.17 Long Island Sound	17	< 1	--	--	--	--	5169	42	5230	127
1.18 Great South Bay	17	< 1	--	--	--	--	5178	42	5795	129
1.19 Hudson River/Raritan Bay	17	< 1	2619	52	--	--	5177	42	4245	232
1.20 Barnegat Bay	17	< 1	2623	52	--	--	--	--	3897	255
1.21 Delaware Bay	17	< 1	2587	52	--	--	1979	16	3724	255
1.22 Chincoteague Bay	18	< 1	--	--	--	--	--	--	3101	177
1.23 Chesapeake Bay	75	< 1	1148	23	3452	329	1948	15	2853	132
NORTHEAST	37	< 1	2576	52	3452	329	2042	16	4332	159
SOUTHEAST										
2.01 Albemarle Sound	55	< 1	3537	23	4560	259	1852	14	2228	39
2.02 Pamlico Sound	44	< 1	5641	22	4849	253	1842	14	2227	39
2.03 Bogue Sound	44	< 1	--	--	4634	245	--	--	2229	40
2.04 New River	44	< 1	--	--	4634	245	--	--	1280	4
2.05 Cape Fear River	44	< 1	5639	22	4649	253	1821	14	2151	23
2.06 Winyah Bay	44	< 1	5673	23	5852	123	1820	14	2219	40
2.07 Charleston Harbor	44	< 1	7253	20	5884	88	--	--	--	--
2.08 North and South Santee Rivers	44	< 1	--	--	5906	88	--	--	--	--
2.09 St. Helena Sound	44	< 1	--	--	5910	88	--	--	--	--
2.10 Broad River	44	< 1	--	--	5917	88	--	--	--	--
2.11 Savannah River	53	< 1	--	--	6668	121	748	1	--	--
2.12 Ogeechee Sound	61	< 1	6720	61	6821	128	776	1	--	--
2.13 St. Catherine's / Sapelo Sound	61	< 1	--	--	6820	128	780	1	--	--
2.14 Altamaha River	61	< 1	5795	49	6821	128	766	1	--	--
2.15 St. Andrew / St. Simons Sound	61	< 1	1279	46	6821	128	763	1	--	--
2.16 St. Johns River	127	< 1	--	--	8341	136	198	< 1	4560	176
2.17 Indian River	127	< 1	--	--	--	--	--	--	--	--
2.18 Biscayne Bay	127	< 1	--	--	--	--	193	< 1	4560	175
SOUTHEAST	104	< 1	5586	23	5039	226	1051	6	3888	136
EAST COAST	67	2	3068	1144	4847	55720	1982	273	4142	19411

CROPS									
RICE		SORGHUM		SOYBEANS		SQUASH		STRAWBERRIES	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	7503	189	--	--
--	--	--	--	--	--	7457	189	--	--
--	--	--	--	--	--	7545	190	--	--
--	--	--	--	--	--	7521	189	--	--
--	--	--	--	--	--	7519	189	--	--
--	--	--	--	--	--	5920	180	1049	1
--	--	--	--	--	--	7052	187	1057	2
--	--	--	--	--	--	5920	180	1049	1
--	--	--	--	1396	< 1	6541	183	1054	2
--	--	--	--	1396	< 1	7648	187	--	--
--	--	--	--	1301	5	7649	187	4798	5
--	--	--	--	1211	9	--	--	--	--
--	--	--	--	1136	6	7959	190	4781	5
--	--	--	--	1179	6	7465	187	2203	3
--	--	1040	< 1	1429	19	4421	179	1137	1
--	--	1039	< 1	1518	23	4416	179	1011	< 1
--	--	1034	< 1	1518	23	--	--	914	< 1
--	--	1034	< 1	1518	23	--	--	--	--
--	--	1040	< 1	1518	23	4416	179	1309	1
--	--	980	< 1	1357	12	4408	179	1185	1
--	--	--	--	1330	10	--	--	--	--
--	--	928	< 1	1330	10	--	--	--	--
--	--	928	< 1	1330	10	--	--	--	--
--	--	927	< 1	1330	10	--	--	--	--
--	--	789	< 1	1022	7	6765	185	--	--
--	--	669	< 1	835	5	6703	185	--	--
--	--	--	--	834	5	--	--	--	--
--	--	669	< 1	835	5	--	--	--	--
--	--	669	< 1	835	5	6381	184	--	--
--	--	1051	< 1	1541	4	6056	183	689	2
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	6047	183	668	2
--	--	875	< 1	1338	15	5828	182	1129	1
--	--	875	8	1280	56453	6578	2511	1929	4

* All values, including regional estimates, are in pounds applied per year / square mile and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

continued...

Appendix J. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	PASTURE/RANGE		PEACHES		PEANUTS		PEAS		POTATOES	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	127	< 1	--	--	--	--	193	< 1	4560	175
3.02 Charlotte Harbor	127	< 1	--	--	6343	135	193	< 1	--	--
3.03 Tampa Bay	127	< 1	--	--	6343	135	191	< 1	4053	89
3.04 Suwanee River	128	< 1	--	--	6341	136	191	< 1	4662	81
3.05 Apalachee Bay	113	< 1	5682	49	6660	130	230	< 1	1920	15
3.06 Apalachicola Bay	124	< 1	--	--	6439	135	190	< 1	4845	224
3.07 St. Andrew Bay	128	< 1	--	--	6341	137	202	< 1	5006	137
3.08 Choctawhatchee Bay	114	< 1	--	--	5477	113	224	1	4757	123
3.09 Pensacola Bay	106	< 1	5649	49	5392	111	212	< 1	4299	179
3.10 Perdido Bay	95	< 1	--	--	4522	86	210	< 1	4320	176
3.11 Mobile Bay	61	< 1	5707	48	4533	84	253	2	4320	175
3.12 Mississippi Sound	45	< 1	5672	49	--	--	255	2	4320	175
3.13 Mississippi Delta Region	28	< 1	--	--	--	--	256	2	--	--
3.14 Atchafalaya and Vermilion Bays	24	< 1	--	--	--	--	265	2	--	--
3.15 Calcasieu Lake	24	< 1	--	--	--	--	--	--	--	--
3.16 Sabine Lake	10	< 1	2346	27	3626	16	124	1	1806	39
3.17 Galveston Bay	9	< 1	2418	26	3630	13	103	< 1	1815	52
3.18 Brazos River	9	< 1	2450	26	3630	13	117	< 1	1812	51
3.19 Matagorda Bay	9	< 1	2391	27	3631	13	--	--	1913	39
3.20 San Antonio Bay	9	< 1	--	--	--	--	--	--	--	--
3.21 Aransas Bay	9	< 1	1904	26	3629	13	--	--	--	--
3.22 Corpus Christi Bay	9	< 1	2277	30	3631	13	102	< 1	--	--
3.23 Laguna Madre	9	< 1	1920	27	3632	13	102	< 1	1804	56
GULF OF MEXICO	40	< 1	4159	39	5671	109	144	< 1	3271	125
WEST COAST										
4.01 San Diego Bay	--	--	604	< 1	--	--	--	--	1067	6
4.02 San Pedro Bay	1483	< 1	740	5	--	--	--	--	720	2
4.03 Santa Monica Bay	2	< 1	740	5	--	--	--	--	720	2
4.04 Monterey Bay	1	< 1	4150	121	--	--	--	--	2202	25
4.05 San Francisco Bay	2	< 1	1019	9	--	--	--	--	2223	16
4.06 Eel River	1	< 1	597	< 1	--	--	--	--	431	3
4.07 Humboldt Bay	1	< 1	--	--	--	--	--	--	431	3
4.08 Klamath River	3	< 1	--	--	--	--	--	--	431	3
4.09 Coos Bay	63	< 1	--	--	--	--	2559	20	639	< 1
4.10 Winchester Bay	64	< 1	--	--	--	--	2559	20	639	< 1
4.11 Columbia River	64	< 1	--	--	--	--	803	9	2518	540
4.12 Willapa Bay	64	< 1	--	--	--	--	582	9	2858	532
4.13 Grays Harbor	64	< 1	--	--	--	--	582	9	2858	532
4.14 Puget Sound	64	< 1	--	--	--	--	582	9	2854	530
WEST COAST	22	< 1	971	8	--	--	583	9	2503	396

CROPS									
RICE		SORGHUM		SOYBEANS		SQUASH		STRAWBERRIES	
Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
--	--	--	--	--	--	6048	183	680	2
--	--	1053	< 1	--	--	6047	183	711	2
--	--	1053	< 1	--	--	6047	183	704	2
--	--	1053	< 1	1543	4	6050	183	--	--
--	--	918	< 1	1180	5	6168	183	--	--
--	--	1009	< 1	1503	5	6062	183	--	--
--	--	1052	< 1	1543	4	6054	183	--	--
--	--	1123	< 1	1303	5	5926	182	--	--
--	--	1235	< 1	1230	5	--	--	--	--
--	--	1306	< 1	911	5	--	--	--	--
--	--	1408	1	746	5	--	--	--	--
--	--	1585	< 1	810	4	--	--	--	--
2384	1	1396	< 1	1131	4	--	--	--	--
2384	1	2460	1	1196	4	--	--	--	--
2384	1	--	--	1196	4	--	--	--	--
2945	1	2446	1	954	2	8322	197	--	--
2969	1	493	5	906	2	8462	193	--	--
2969	1	493	5	906	2	8462	193	--	--
2969	1	493	5	906	2	--	--	--	--
2969	1	493	5	906	2	--	--	--	--
--	--	493	5	--	--	--	--	--	--
--	--	493	5	--	--	8463	193	--	--
--	--	493	5	906	2	8467	194	--	--
2832	1	524	5	1095	4	6794	186	704	2
--	--	--	--	--	--	383	2	751	2
--	--	--	--	--	--	384	2	1879	3
--	--	--	--	--	--	386	2	807	2
--	--	--	--	--	--	383	2	961	4
1103	1	454	11	--	--	384	2	731	2
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	550	4	407	1
--	--	--	--	--	--	550	4	407	1
--	--	--	--	--	--	541	4	380	1
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	319	1
1103	1	454	11	--	--	397	2	603	2

* All values, including regional estimates, are in pounds applied per year / square mile and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

continued...

Appendix J. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	SUGARBEETS		SUGARCANE		SWEET CORN		TOBACCO		TOMATOES	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
NORTHEAST										
1.01 Passamaquoddy Bay	--	--	--	--	--	--	--	--	--	--
1.02 Englishman Bay	--	--	--	--	--	--	--	--	--	--
1.03 Narragagus Bay	--	--	--	--	--	--	--	--	--	--
1.04 Blue Hill Bay	--	--	--	--	--	--	--	--	--	--
1.05 Penobscot Bay	--	--	--	--	--	--	--	--	--	--
1.06 Muscongus Bay	--	--	--	--	--	--	--	--	--	--
1.07 Sheepscot Bay	--	--	--	--	--	--	--	--	--	--
1.08 Casco Bay	--	--	--	--	--	--	--	--	--	--
1.09 Saco Bay	--	--	--	--	--	--	--	--	--	--
1.10 Great Bay	--	--	--	--	--	--	--	--	--	--
1.11 Merrimack River	--	--	--	--	1906	3	--	--	--	--
1.12 Boston Bay	--	--	--	--	1909	3	--	--	--	--
1.13 Cape Cod Bay	--	--	--	--	1906	3	--	--	--	--
1.14 Buzzards Bay	--	--	--	--	1906	3	--	--	--	--
1.15 Narragansett Bay	--	--	--	--	1906	3	--	--	--	--
1.16 Gardiners Bay	--	--	--	--	2798	3	--	--	1728	52
1.17 Long Island Sound	--	--	--	--	2404	3	--	--	1738	52
1.18 Great South Bay	--	--	--	--	2797	3	--	--	1730	52
1.19 Hudson River/Raritan Bay	--	--	--	--	2932	7	--	--	3048	93
1.20 Barnegat Bay	--	--	--	--	3305	19	--	--	3945	122
1.21 Delaware Bay	--	--	--	--	2695	13	510	2	3978	121
1.22 Chincoteague Bay	--	--	--	--	1561	2	--	--	4059	120
1.23 Chesapeake Bay	--	--	--	--	1655	3	1852	10	4304	117
NORTHEAST	--	--	--	--	2338	7	1843	10	3994	115
SOUTHEAST										
2.01 Albemarle Sound	--	--	--	--	--	--	1391	7	5558	111
2.02 Pamlico Sound	--	--	--	--	--	--	1390	7	4709	81
2.03 Bogue Sound	--	--	--	--	--	--	1390	7	5238	104
2.04 New River	--	--	--	--	--	--	1390	7	2560	2
2.05 Cape Fear River	--	--	--	--	--	--	1390	7	5814	114
2.06 Winyah Bay	--	--	--	--	--	--	2344	13	4188	106
2.07 Charleston Harbor	--	--	--	--	--	--	2602	15	4233	111
2.08 North and South Santee Rivers	--	--	--	--	--	--	2603	15	4233	111
2.09 St. Helena Sound	--	--	--	--	--	--	2603	15	4232	111
2.10 Broad River	--	--	--	--	--	--	--	--	4229	111
2.11 Savannah River	--	--	--	--	--	--	1781	10	4229	111
2.12 Ogeechee Sound	--	--	--	--	--	--	1780	10	--	--
2.13 St. Catherine's / Sapelo Sound	--	--	--	--	--	--	1779	10	--	--
2.14 Altamaha River	--	--	--	--	--	--	1780	10	--	--
2.15 St. Andrew / St. Simons Sound	--	--	--	--	--	--	1780	10	714	18
2.16 St. Johns River	--	--	--	--	3958	315	1460	10	5344	80
2.17 Indian River	--	--	--	--	--	--	--	--	--	--
2.18 Biscayne Bay	--	--	2579	2	3959	315	--	--	5475	90
SOUTHEAST	--	--	2579	2	3959	315	1776	10	5140	96
EAST COAST	--	--	2579	2	2608	59	1785	10	4530	107

CROPS					
WATERMELONS		WHEAT		MAJOR CROPS	
Use	Tox	Use	Tox	Use	Tox
--	--	--	--	204	3
--	--	--	--	89	< 1
--	--	--	--	109	< 1
--	--	--	--	43	< 1
--	--	--	--	278	4
--	--	--	--	118	< 1
--	--	--	--	276	1
--	--	--	--	231	2
--	--	--	--	292	1
--	--	--	--	169	< 1
--	--	--	--	309	1
--	--	--	--	248	1
--	--	--	--	1227	18
--	--	--	--	993	15
--	--	--	--	721	11
--	--	49	< 1	1636	34
--	--	50	< 1	723	7
--	--	49	< 1	1468	30
--	--	141	< 1	732	8
--	--	147	< 1	1300	19
1794	17	202	< 1	1259	14
1877	16	107	< 1	1532	10
1557	15	115	< 1	1118	6
1579	16	128	< 1	964	8
273	9	218	< 1	1682	34
255	9	254	< 1	1481	17
261	10	254	< 1	1396	12
261	10	254	< 1	1540	12
274	9	254	< 1	1446	14
470	17	270	< 1	1345	8
517	19	271	< 1	1146	9
507	19	271	< 1	1246	7
513	19	272	< 1	1082	7
514	19	272	< 1	1171	8
563	19	338	< 1	1067	6
739	18	387	< 1	1147	10
--	--	387	< 1	1189	4
742	18	387	< 1	873	5
742	18	387	< 1	1095	6
1783	53	344	1	310	5
--	--	--	--	484	5
1766	52	--	--	1208	19
493	16	274	< 1	1174	111
764	16	219	< 1	1072	11

* All values, including regional estimates, are in pounds applied per year / square mile and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

continued...

Appendix J. Intensity of Agricultural Use and Toxicity Normalized Use for 28 Pesticides by Major Crop by Estuarine Drainage Area.*

ESTUARY	CROPS									
	SUGARBEETS		SUGARCANE		SWEET CORN		TOBACCO		TOMATOES	
	Use	Tox	Use	Tox	Use	Tox	Use	Tox	Use	Tox
GULF OF MEXICO										
3.01 Ten Thousand Islands	--	--	2579	2	3959	315	--	--	5475	90
3.02 Charlotte Harbor	--	--	2579	2	3945	315	--	--	5476	90
3.03 Tampa Bay	--	--	--	--	3953	314	--	--	5475	90
3.04 Suwanee River	--	--	--	--	3847	309	1480	10	--	--
3.05 Apalachee Bay	--	--	--	--	3978	323	1609	10	5132	85
3.06 Apalachicola Bay	--	--	--	--	4060	329	1528	10	5207	88
3.07 St. Andrew Bay	--	--	--	--	4042	320	--	--	5745	128
3.08 Choctawhatchee Bay	--	--	--	--	3947	323	--	--	5812	93
3.09 Pensacola Bay	--	--	--	--	3930	312	--	--	5339	90
3.10 Perdido Bay	--	--	--	--	3956	316	--	--	5842	95
3.11 Mobile Bay	--	--	--	--	--	--	--	--	5914	95
3.12 Mississippi Sound	--	--	368	< 1	--	--	--	--	5759	91
3.13 Mississippi Delta Region	--	--	367	< 1	--	--	--	--	--	--
3.14 Atchafalaya and Vermilion Bays	--	--	367	< 1	--	--	--	--	--	--
3.15 Calcasieu Lake	--	--	--	--	--	--	--	--	--	--
3.16 Sabine Lake	--	--	--	--	--	--	--	--	3303	117
3.17 Galveston Bay	--	--	--	--	--	--	--	--	4238	128
3.18 Brazos River	--	--	--	--	--	--	--	--	4262	127
3.19 Matagorda Bay	--	--	--	--	--	--	--	--	2999	118
3.20 San Antonio Bay	--	--	--	--	--	--	--	--	--	--
3.21 Aransas Bay	--	--	--	--	--	--	--	--	--	--
3.22 Corpus Christi Bay	--	--	--	--	--	--	--	--	3899	123
3.23 Laguna Madre	--	--	1004	1	--	--	--	--	4280	128
GULF OF MEXICO	--	--	653	< 1	3955	315	1504	10	5373	93
WEST COAST										
4.01 San Diego Bay	--	--	--	--	1522	< 1	--	--	387	1
4.02 San Pedro Bay	--	--	--	--	1522	< 1	--	--	1350	23
4.03 Santa Monica Bay	124	1	--	--	1520	< 1	--	--	1498	33
4.04 Monterey Bay	440	3	--	--	1531	< 1	--	--	376	9
4.05 San Francisco Bay	575	6	--	--	1524	< 1	--	--	705	12
4.06 Eel River	--	--	--	--	1487	< 1	--	--	32	< 1
4.07 Humboldt Bay	--	--	--	--	1487	< 1	--	--	31	< 1
4.08 Klamath River	--	--	--	--	1487	< 1	--	--	32	< 1
4.09 Coos Bay	--	--	--	--	3580	3	--	--	--	--
4.10 Winchester Bay	--	--	--	--	3814	3	--	--	--	--
4.11 Columbia River	--	--	--	--	1831	1	--	--	--	--
4.12 Willapa Bay	--	--	--	--	1142	< 1	--	--	--	--
4.13 Grays Harbor	--	--	--	--	1138	< 1	--	--	--	--
4.14 Puget Sound	--	--	--	--	1118	< 1	--	--	--	--
WEST COAST	573	6	--	--	1492	< 1	--	--	699	12

CROPS					
WATERMELONS		WHEAT		MAJOR CROPS	
Use	Tox	Use	Tox	Use	Tox
1766	52	--	--	349	3
1766	52	--	--	274	2
1762	52	345	1	311	3
1766	52	345	1	640	4
1610	47	365	< 1	1023	8
1559	45	346	1	1041	9
1917	57	345	1	615	2
1686	50	345	1	955	8
1535	45	344	1	914	7
850	22	344	1	951	6
737	18	344	1	609	4
745	18	154	< 1	206	< 1
776	16	251	< 1	286	< 1
733	18	283	< 1	916	2
--	--	284	< 1	698	2
1000	25	233	< 1	325	< 1
3983	101	175	1	553	< 1
3975	101	175	1	235	< 1
4001	100	175	1	342	< 1
--	--	176	1	148	< 1
3979	100	175	1	152	2
3977	101	175	1	174	2
3977	101	175	1	218	2
2355	64	280	< 1	366	2
391	2	1534	< 1	270	< 1
385	2	23	< 1	612	2
385	2	23	< 1	102	< 1
--	--	202	< 1	92	< 1
389	2	351	7	346	2
--	--	--	--	6	< 1
--	--	--	--	6	< 1
--	--	--	--	6	< 1
650	17	209	< 1	84	< 1
650	17	209	< 1	84	< 1
--	--	222	< 1	146	4
--	--	249	< 1	182	2
--	--	249	< 1	192	12
--	--	256	< 1	180	10
393	2	338	6	251	3

* All values, including regional estimates, are in pounds applied per year / square mile and circa 1982; toxicity normalized values were generated using phorate LC50 data for estuarine / freshwater fish.

Abbreviations: Tox = Toxicity
Normalized Use; -- = Not Applied.

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Acronyms

AChE	Acetylcholinesterase
BCF	Bioconcentration Factor
CRT	Coefficient of Relative Toxicity
2,4-D	2,4-Dichlorophenoxyacetic Acid
DDT	Dichlorodiphenyltrichloroethane
EDA	Estuarine Drainage Area
EHRs	Environmental Hazard Rating System
EPA	Environmental Protection Agency
ERS	Economic Research Service
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
LC50	Lethal Concentration for 50 percent of the test organisms
NCPDI	National Coastal Pollutant Discharge Inventory
NEI	National Estuarine Inventory
NOAA	National Oceanic and Atmospheric Administration
NPUI	National Pesticide Use Inventory
PCNB	Pentachloronitrobenzene
RFF	Resources for the Future
USDA	United States Department of Agriculture

