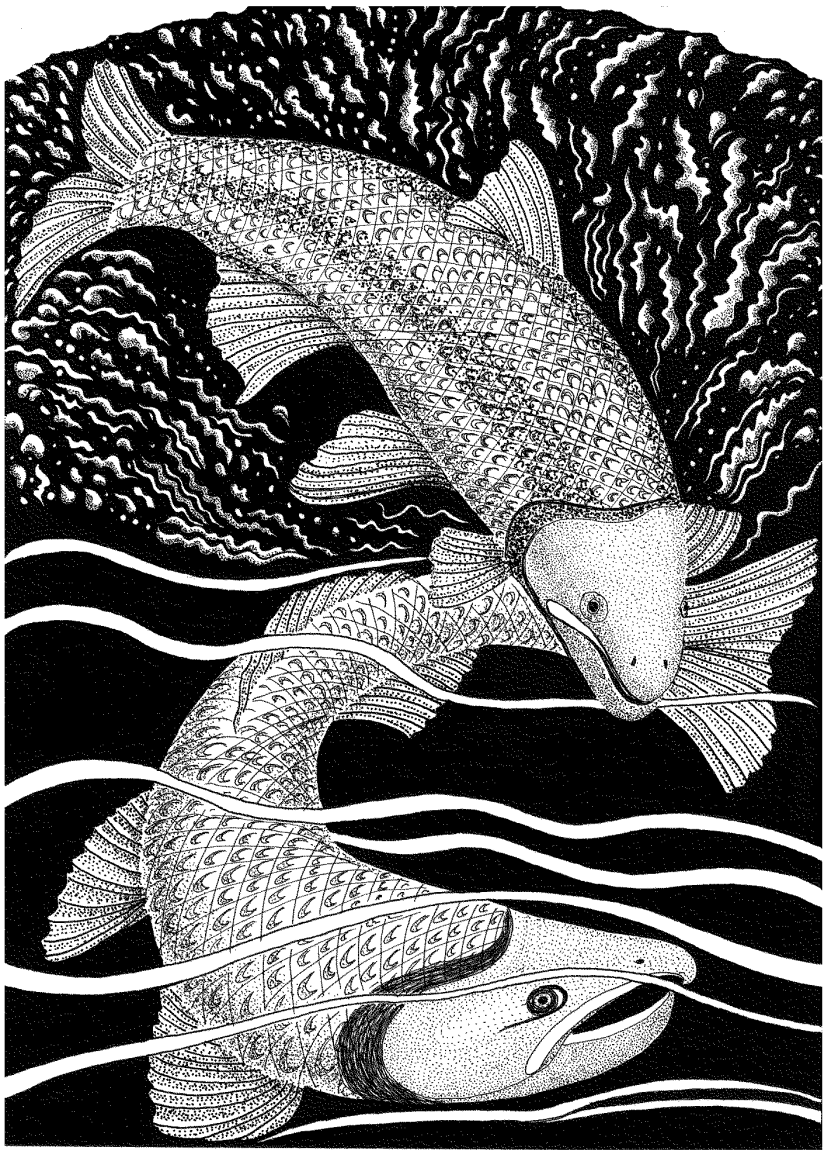
Poisoned Waters



Pesticide Contamination of Waters and Solutions to Protect Pacific Salmon

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- Northwest Coalition for Alternatives to Pesticides
- Washington Toxics Coalition

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Poisoned Waters

Pesticide Contamination of Waters and Solutions to Protect Pacific Salmon

by
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January 2002

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for the Northwest Coalition for Alternatives to Pesticides

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Executive Summary

Salmon are a cornerstone of our region's cultural and environmental heritage. In order to thrive, salmon need clean water. The use of pesticides by people in both rural and urban areas, however, pollutes our streams and rivers and poses a serious threat to the health of salmon runs and communities.

Salmon start and end their lives in inland waters from southwestern California through Oregon, east into Idaho, and up through northwestern Washington. In much of their range, pesticide-contaminated water is one of the major hurdles that salmon must overcome to survive.

Pesticides can kill salmon directly, or perhaps more commonly, cause subtle damage that reduces their chance of survival. Many pesticides cause reproductive harm, reduce survival of young salmon as they transition to seawater, impair migration, or cause behavioral changes that limit survival. Some pesticides also affect salmon indirectly by changing the abundance of food, cover, or other conditions of the aquatic environment.

Leif Studios

Three federal laws are in place to protect salmon and their habitat from pesticide contamination: the Endangered Species Act, intended to protect and promote the recovery of species in danger of becoming extinct due to human activities; the Federal Insecticide, Fungicide, and Rodenticide Act, the national pesticide law that governs pesticide use; and the Clean Water Act, meant to protect waters from contamination and degradation. However, as this report describes, government agencies have failed to use their full authority under these laws to protect salmon from pesticides.

The Endangered Species Act listing of twenty-six Pacific salmon runs is a wake-up call for urgent action to recover salmon. Government agencies, businesses, and individuals must all take action to ensure that pesticides no longer pollute waterways where salmon live.

Major Findings

Pesticide Contamination of Water is Widespread and Significant.

Surface-water testing shows five major watersheds in the Pacific states are contaminated by pesticides.
Pesticide pollution of surface water in Oregon, Washington, California, and Idaho is extremely widespread, exposing salmon and their habitat. The U.S. Geological Survey (USGS) detected 35 or more pesticides in each of the five watersheds studied in the region.

Sixteen pesticides contaminate the region's watersheds at harmful levels.
Sixteen currently used pesticides have been found in the region's watersheds at or above aquatic life criteria, indicating they are likely to cause harm to salmon. Many other pesticides have been detected for which no criteria have been established.

EPA identified at least 36 pesticides used in the Pacific states that threaten fish or their habitat.
The Environmental Protection Agency (EPA) findings in its pesticide registration documents reveal that approved, legal uses of at least 36 pesticides used in this region are expected to have a negative impact on salmon. These documents found that legal uses of various pesticides will exceed EPA hazard levels for aquatic organisms (i.e., invertebrates, aquatic and semi-aquatic plants, and endangered and non-endangered estuarine and freshwater fish).

Public Agency Response Fails to Address the Problem

EPA has not complied with its most basic legal responsibilities to protect salmon.
Current federal restrictions on pesticide use have not kept pesticides from contaminating water. Although agency documents show that current uses of at least 36 pesticides pose risks to salmon survival, the EPA has failed to take the most basic actions to protect endangered or threatened fish species. Since the first salmon run was listed under the Endangered Species Act more than ten years ago, the EPA has violated the Act by failing to consult with the National Marine Fisheries Service on its registration of pesticides that are likely to harm salmon. EPA ignores its own findings that allowed pesticide uses will exceed hazard levels for aquatic species and continues to allow pesticide uses that pollute water and threaten salmon.

Information on pesticide use is not systematically tracked or accessible to the public.
To be effective, those involved in research on the effects of pesticides on salmon, surface-water monitoring, and stream restoration efforts need to know what pesticides are being used when and where. California is the only state with listed salmon runs that has a required pesticide use tracking system in place. Oregon's program is not yet fully functioning, and Washington and Idaho have no systems for tracking pesticide use.

State and local governments fall short in protecting salmon from pesticides.
Action at the state and local level is necessary for salmon protection. All states with listed salmon runs recognize the need to adopt policies at the state level for the restoration of their rivers and salmon runs. However, no state has enforceable pesticide policies for

salmon protection in place. Each city and county has responsibility for reviewing its policies and practices to ensure that its actions do not result in harm to salmon. Some jurisdictions have taken steps to prevent pesticide use from harming salmon, but the majority have not.

Addressing Pesticide Threats to Salmon

The findings of this report show that current practices are creating serious water pollution problems for salmon survival. Regulations are failing to keep pesticides out of surface water, resulting in contamination levels known to be hazardous to aquatic organisms. With listed species of salmon in our waterways, pesticide contamination is no longer acceptable. There is precious little time left to restore the quality of the region's waters for salmon and the ecosystems and communities that depend upon them.

Solution:

Cleaning up our waterways to protect salmon from the impacts of pesticides will take sustained effort by government agencies, farmers, cities and counties, and individuals. For the health of the salmon and our way of life, we must take the following actions:

- **Phase out the use of pesticides that are hazardous to salmon and their habitat.**
- **Adopt measures to keep pesticides out of water needed for salmon survival.**
- **Establish pesticide use reporting to track pesticide use to aid in salmon recovery.**
- **Promote and adopt salmon-friendly practices that reduce reliance on pesticides.**

Recommendations:

1. **EPA must comply with the Endangered Species Act** by phasing out the use of pesticides that harm salmon and keeping all pesticides out of water. EPA must consult with the National Marine Fisheries Service to develop and implement methods to end pesticide uses that threaten salmon. EPA must also develop pesticide water quality criteria and use its authority to ensure they are not exceeded.
2. **The National Marine Fisheries Service (NMFS) must enforce the Endangered Species Act to ensure that pesticides are not used in ways that harm salmon.** NMFS should make sure that EPA acts to prevent pesticide use from harming salmon. NMFS must also ensure that local government agencies restrict and reduce pesticide use as part of salmon recovery.
3. **States should stop the use of pesticide products that harm salmon or their habitat** by phasing out or further restricting their use. Washington state has started this process and other states should act using state pesticide laws and the National Pollutant Discharge Elimination System permits now required for aquatic pesticide applications.
4. **Local jurisdictions should make pesticide use reduction a core element of salmon recovery.** Cities, counties, schools, and park districts should serve as models of salmon-friendly pest management by adopting strong policies to phase out pesticide use. Cities and counties should also promote salmon-friendly landscaping, gardening, and farming practices to reduce pesticide use by homeowners, businesses, and farms.

5. **Every state with listed salmon runs must develop a comprehensive pesticide use reporting system with publicly accessible data.** Information about what pesticides are used, where and when they are applied, and for what reason will ensure that salmon recovery efforts are more effective.
6. **Farmers should switch to effective organic and sustainable techniques** to reduce their use of pesticides.
7. **Land grant universities must provide resources for pesticide-free pest management.** Land grant universities should orient their research, education, and extension services toward sustainable pest management practices that reduce reliance on pesticide use.
8. **Legislative bodies must provide more resources for surface-water monitoring.** Comprehensive surface-water monitoring is necessary for a full understanding of the health of our waters and to determine if adopted measures are keeping pesticides out of salmon waters.
9. **Individuals should make the choice to end their use of hazardous pesticides** in their homes, gardens, lawns, and workplaces. Successful salmon-friendly practices are available that result in both reduced pesticide contamination in water and safer places for kids, pets, and communities.

Ken Steffenson

Introduction

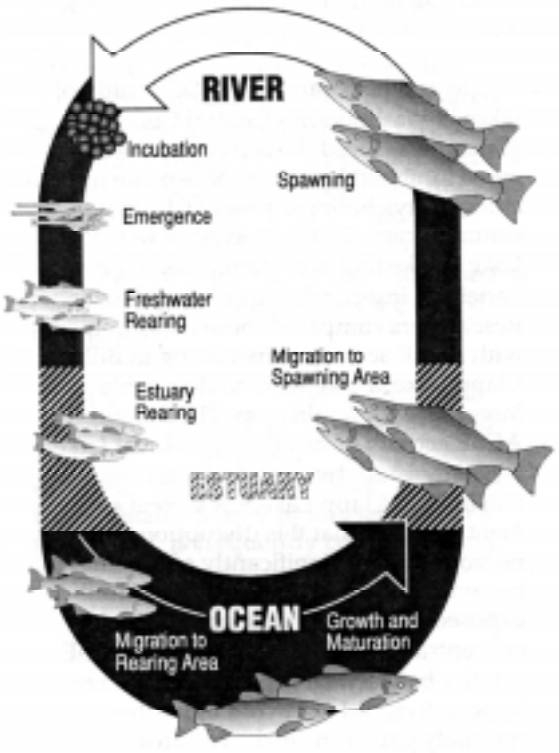
Pacific salmon are a lifeline for the people and the natural environment of the West Coast. For generations, salmon have been the living symbol of strength, abundance, and clean water. A vigorous salmon fishing industry was once the economic foundation for many communities. Salmon are integral to the culture and sustenance of many of the region's American Indian tribes. And legends of salmon-filled rivers once attracted people from around the world for recreational fishing.

Salmon returns today represent a small fraction of the historical populations that once inhabited western watersheds. Dams, overharvest, hatcheries, and habitat degradation have all been implicated in the decline of salmon runs.[1] Commercial fishing catches across the region are now less than half the levels of a century ago. Pacific salmon have disappeared from about 40% of their historical ranges in Washington, Idaho, Oregon, and California over the last century, and many of the remaining populations are severely depressed (National Research Council 1996). In the Columbia River, salmon numbers fell from between 10 and 16 million adults to about 2 million during the last 150 years (The Wilderness Society 1993).

In this report, the term salmon refers to western native anadromous salmonids, which include Chinook, coho, sockeye, chum, and pink salmon, as well as sea–run cutthroat and steelhead. Anadromous fish begin life in freshwater streams, make their way to the ocean where they spend one to several years, and then return to their freshwater breeding grounds to spawn. Whereas salmon die after spawning, steelhead may spawn more than once (NMFS n.d.).

The decline of Pacific salmon has far-reaching consequences, from causing fundamental changes in food webs to threatening economies and cultures. As an indicator species, they reflect the condition of our natural environment. Salmon are a key species in maintaining the balance of both aquatic and terrestrial ecosystems. Restoring salmon means protecting the region's quality of life for both the people and the ecosystems dependent on these fish.

Salmon Life Cycle



Public Interest GRFX

[1] A salmon run is a distinct population of salmon that spawn and rear in a specified habitat.

In the last twelve years, more than two dozen salmon runs have been listed as threatened or endangered under the Endangered Species Act. These salmon listings are significant in that they encompass a geographical expanse that includes both rural and urban areas (NOAA NMFS 2000a). Furthermore, water quality monitoring shows that pesticide contamination is a factor for salmon wherever they live. Harmful levels of pesticides are found in both the urban and rural watersheds that salmon depend upon.

Degraded water quality has long been considered a significant barrier for the survival of salmon. A growing body of science now shows pesticide contamination is part of this degradation and causes negative impacts on salmon survival. This report highlights dozens of pesticides that threaten salmon and are frequently detected or commonly used in western states. It exposes how public agencies are failing to use the laws meant to protect the region's waters and fish species from pesticide contamination. It also recommends action to protect Pacific salmon from the threats of pesticides.

What is a Pesticide?

Designed to kill or damage living things, pesticides are "perhaps the only toxic substances that are purposefully applied to the environment."[a] They are "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest."[b] Pesticide is an umbrella term that includes insecticides, herbicides, fungicides, and rodenticides. They are commonly used in schools, parks, homes and gardens, on farms and forests, in lakes and irrigation canals, along roads and railways, and in many other settings. Pesticides find their way into rivers and streams through storm water systems, agricultural and urban runoff, direct application to waterways, and drift from nearby applications.

[a] National Research Council. Board on Agriculture. Committee on Long-Range Soil and Water Conservation. 1993. *Soil and water quality.* Washington DC: National Academy Press: 334.

[b] Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) § 2(u).

Tom Quinn

Ocean-going salmon

Chinook Salmon (ocean-rearing)

- Juveniles migrate to the ocean the first fall after they hatch, rearing briefly in estuaries.
- They rear over a broad ocean area, ranging from northern California to the Gulf of Alaska.
- Adults, typically 3 to 5 years old, return to fresh water in the spring, summer or fall.
- Spring and summer migrants prefer deep, cool pools where they hold several months before fall spawning.
- Adults spawn in large concentrations on mainstem gravel bars; may use both upper and lower mainstems.

Chinook (stream-rearing)

- Juveniles migrate to the ocean as 1-year-olds, in the spring.
- Little is known about the ocean distribution of the area's stream-rearing chinook.
- Adults return to fresh water in the spring, when 3 to 5 years old, and require deep, cool pools to hold for several months over the summer before fall spawning.
- They spawn in concentrations on gravel bars in upper tributaries.

Chum Salmon

- Shortest freshwater residence of all salmon. Adults stay only about a week prior to spawning; juveniles migrate to the ocean hours after hatching.
- Juveniles rear briefly in estuaries.
- Adults spawn at 3 to 5 years of age.
- Spawning occurs in lower mainstems, concentrated on large gravel bars.
- Adults are unable to pass even minor barriers.

Coastal Cutthroat

- Some coastal cutthroats migrate to the ocean. But others may migrate only to the estuary or river mainstems, or they may not migrate at all.
- Those that do go to the ocean migrate out in the spring, stay only a few months close to shore, then return in the fall.
- The ones that migrate may rear in fresh water for several years before going to the ocean.
- They spawn in the winter and early spring, using small pockets of gravel. They may spawn more than once. The spawning age of cutthroats seems to vary over their distribution area.
- Cutthroat prefer the smallest, highest tributaries in a basin.

Coho Salmon

- Juveniles rear throughout watersheds and tend to live in pools in the summer.
- Juveniles migrate to the ocean at 1 year, in the spring.
- Adults return to fresh water in the fall and spawn in late fall and winter.
- Adults tend to spawn in concentrations on gravel bars in upper watersheds.
- Most adults spawn when they are 3 years old.

Sockeye/Kokanee Salmon

- There is both an ocean-going form (called sockeye), and a resident form (called kokanee).
- Juveniles rear in a lake, spending 1 to 2 years in fresh water before migrating to the ocean in the spring.
- Columbia Basin sockeye migrate to the Gulf of Alaska for ocean rearing.
- Adults typically spend 2 years in the ocean.
- Loss of Oregon sockeye resulted from blocked access to lakes. Kokanee are thriving in some lakes.

Steelhead

- There are two subspecies of steelhead in the Northwest. Each also has a resident form. Coastal steelhead are closely related to rainbow trout. Inland steelhead are closely related to redband trout.
- Most juveniles rear in fresh water for 1 or 2 years and migrate to the ocean in the spring.
- Most steelhead spend 2 years in the ocean. Their distribution is poorly known but appears to be further offshore than other salmon.
- Most inland steelhead return to fresh water in the summer while most (but not all) coastal steelhead return in the winter.
- Summer-run steelhead require cold, deep pools where they hold until spawning. All steelhead spawn in the winter and may spawn more than once.

Background on the Salmon and Pesticide Issue

Rory Banyard/Johnson Creek Watershed Council

How Pesticides Harm Salmon

Pesticides have profound effects on salmon and may be a serious factor in their decline. Pesticides can directly harm fish by killing them outright or by altering their behavior and reproductive success at sublethal concentrations. Indirect effects on fish habitat are also a factor.

Pesticides do not necessarily disappear into the environment with time. They transform into other compounds that may be more, equally, or less toxic than the original compound. Like humans, fish and other aquatic organisms must continually cope with pesticide compounds.

Pesticides Can Kill Fish Directly

Pesticides are capable of killing salmon directly and within a short period of time. For example, in 1996 the Talent Irrigation District's use of the herbicide acrolein resulted in the death of almost 100,000 salmon and thousands of other fish in Bear Creek in southern Oregon (Evenson 1996).

Sublethal Effects of Pesticides are a Serious Factor in Salmon Decline

Even when exposure to pesticides does not result in an immediate fish kill, pesticides can have subtle but devastating effects on behavior, immune systems, and hormonal systems. These effects are less visible but are likely to ultimately reduce survival of salmon, resulting in diminished populations. Following are several examples.

Pesticides can impair swimming performance. Swimming ability is crucial for feeding, avoidance of predators, and defense of territories. A number of studies have found that pesticides reduce swimming speed and

stamina. Little et al. (1990) found that five different pesticides — carbaryl, chlordane, 2,4-D amine, methyl parathion, and pentachlorophenol — reduced rainbow trout swimming activity and stamina.

Pesticides can increase predation. Scholtz et al. (2000) found that diazinon at very low concentrations can impair the salmon's sense of smell, resulting in a decreased ability to avoid predators. Salmon need their sense of smell to detect alarm pheromones that direct them to hide.

Diazinon at very low concentrations can impair the salmon's sense of smell, resulting in a decreased ability to avoid predators.

Pesticides can harm the immune system. Pesticides have been shown to depress the immune systems of rainbow trout (O'Halloran et al. 1998; Dunier et al. 1995) and other fish species (El-Gendy et al. 1998; Shea and Berry 1984).

Pesticides can disrupt the hormonal system. The endocrine, or hormonal system, is particularly susceptible to disruption because of the low concentrations at which hormones operate. Pesticides at low concentrations interfere with the production and activity of sex hormones in salmon, causing decreases in the production of sperm. (Moore and Waring 1996; Moore and Waring 1998).

Indirect Effects of Pesticides Harm Salmon

Pesticides can indirectly affect fish by interfering with their food supply or altering the aquatic habitat, even when the concentrations are too low to affect the fish directly. Pesticides may reduce the abundance of food organisms which in turn reduces growth and the probability of survival. In addition, damage to aquatic vegetation decreases habitat suitability and increases the salmon's susceptibility to predation. These effects are subtle, but evidence suggests that indirect effects can be even more harmful than direct effects.

For more detailed information see: Diminishing Returns: Salmon Decline and Pesticides. *By Richard D. Ewing, PhD. February 1999. Copies of the entire report are available at: http://www.pesticide.org. Paper copies can be ordered from the Northwest Coalition for Alternatives to Pesticides.*

Laws Designed to Protect Salmon

The United States has several laws that are relevant to the protection of salmon from harmful pesticide contamination. Three laws deserve particular attention: the federal law to protect threatened and endangered species (Endangered Species Act), the national pesticide law (Federal Insecticide, Fungicide, and Rodenticide Act), and the federal statute protecting surface waters from pollution and degradation (Clean Water Act). A brief description of each law and its role in salmon and water quality protection follows.

The Endangered Species Act

The federal Endangered Species Act (ESA) provides a framework for identifying species that are in danger of extinction, and imposes restrictions on activities that could harm those species.

The National Marine Fisheries Service listed the first Pacific salmon run under the Endangered Species Act in 1989. Now, more than a dozen years later, twenty-six salmon runs are listed and several others are currently candidates for listing. These salmon depend on habitat stretching from northwestern Washington, through Oregon, east into Idaho, and down into southwestern California (NOAA NMFS 2001).

Species may be listed as either "endangered," meaning in danger of extinction throughout all or a significant portion of its range, or "threatened," meaning likely to become endangered within the foreseeable future (ESA 16 U.S.C. 35 Secs 1532 (6) and 1532 (20)) (USFWS 2001). Of the twenty-six salmon runs listed in the West, fourteen are listed as threatened and twelve are listed as endangered[1] (NOAA NMFS 2001).

Federal Agency Actions Must Not Harm Listed Salmon.

Under the Endangered Species Act, each federal agency is obligated to:

- ensure that its actions will not jeopardize the survival and recovery of listed species;
- consult with the listing agency[2] to ensure that its actions do not jeopardize listed species, and that they minimize harm to listed species and promote their recovery; and
- use its programs to conserve listed species (USFWS 2001).

Since registering pesticides is a federal action, the U.S. Environmental Protection Agency must consult with the listing agency on its pesticide registrations in order to identify pesticide uses that jeopardize salmon.

Areas of Threatened and Endangered Pacific Salmon and Steelhead Species

(Gray areas on the map)

http://research.nwfsc.noaa.gov/cbd/trt/

[1] For a summary of salmon and steelhead listings see: http://www.nwr.noaa.gov/1salmon/salmesa/pubs/1pgr.pdf.

[2] The National Marine Fisheries Services is responsible for all listed marine species, including salmon and steelhead. The U.S. Fish and Wildlife Service has the responsibility for conserving all other species.

State and Local Governments Have a Role in Protecting Salmon.
The implications of the Endangered Species Act listing of Pacific salmon are profound because these species listings span major human population centers. Thus, every household, business, landowner, and government shares responsibility for restoring the habitat and populations of these species.

Once a species is listed as endangered, any action resulting in a "take"[1] is automatically prohibited. "Take" is defined broadly and intended to encompass actions that harm species including habitat modification that impairs essential life functions such as breeding and feeding. For threatened species, the agency must issue what are known as 4(d) rules[2] that provide for the conservation of the species, including by prohibiting harmful activities that cause take (NOAA NMFS 2000b).

These 4(d) rules emphasize on-the-ground change at the local and state level as a key part of salmon recovery efforts. The rules for threatened salmon species obligate local and state jurisdictions to evaluate and alter their own activities for salmon recovery. In the rules, NMFS stresses providing "incentives for local conservation efforts" (NOAA NMFS 2000b).

The rules for threatened salmon species obligate local and state jurisdictions to evaluate and alter their own activities for salmon recovery.

The Federal Insecticide, Fungicide and Rodenticide Act

The federal law that governs pesticide use is the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). FIFRA registers pesticides by weighing the risks of using that pesticide against its benefits (FIFRA Sec. 2(bb)) (EPA OPP 1997). This is fundamentally different from federal environmental laws that are health- or safety-based.

Under FIFRA, EPA administers a registration process in which manufacturers seek pesticide product registrations allowing specific uses of a pesticide. In this process, manufacturers provide information about the health and environmental effects of the pesticide to the agency. EPA then evaluates the submitted information based on standards in FIFRA and approves a label specifying how the product can be used. Pesticides already on the market prior to the adoption of current standards must be reregistered, since standards have changed over time and no environmental standards were in place before 1972. However, pesticides may be used under their current registration until they are reregistered.

Congress established a strict timeline for reviewing and reregistering pesticides in 1988

[1] Take" is defined in the ESA as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" (16 U.S.C. 35 sec. 1535 (19)). "Harm" is an act that may include habitat modification or degradation (NOAA. NMFS. 2000b).
[2] These rules are known as the 4(d) rules because of the section of the Endangered Species Act that requires them to be developed.

because many registered pesticides were not in compliance with 1972 testing requirements. EPA's progress in reregistering pesticides to comply with new standards has been extremely slow. Of the 28 pesticides used in the greatest quantities in the United States (Aspelin 1999), EPA has completed reregistration documents for only ten.

In order to reregister a pesticide for use, EPA develops a risk assessment that is incorporated into a Reregistration Eligibility Decision (RED). The REDs are summaries of the hazards of each pesticide and probability of risks to non-target organisms, human health, and the environment. EPA uses REDs to outline risk reduction measures necessary for continued registration.

Examples of Statements from Reregistration Documents

"All uses of methidathion exceed the endangered species LOC for all forms of endangered animal species."

(EPA 1999 Methidathion RED)
Methidathion is a commonly used insecticide in California.

"All uses at all labeled rates resulted in high risks to all terrestrial and aquatic animals, except for turf slit-placement uses."

"Given the extent and magnitude of LOC exceedences, EFED (Environmental Fate and Effects Division – EPA) does not believe the risks from the use of ethoprop can be mitigated effectively."

(EPA 1998 Ethoprop RED)

These registration documents include environmental risk assessments in which EPA considers adverse impacts on fish and their habitat. To make these assessments, EPA first establishes a level of concern (LOC) above which the agency believes that pesticide contamination can pose potential harm. EPA also estimates likely environmental contamination levels when the pesticide is used as directed. If the environmental contamination levels exceed the LOC, EPA may consider regulatory action (EPA 1999 Captan RED; EPA 2001 Lindane RA). However, as described below in the findings, EPA in many cases has not initiated regulatory action even when exceedences were found.

The Clean Water Act

The federal Clean Water Act provides a framework of standards, technical tools and financial assistance to address the many causes of polluted water, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction. The Act has far more stringent standards and regulations for point sources, such as industrial discharges, than it does for non-point pollution such as pesticide use.

As part of the Act's implementation, numeric water quality criteria are established by EPA and used by states to develop state water quality standards which are intended to protect both aquatic life and human health (EPA OW 1999a). National numeric water quality criteria exist for only about a dozen currently used pesticides (EPA OW 1999b). Because of the lack of standards as well as the difficulty of addressing non-point sources using the framework of the Clean Water Act, the law has had little success mitigating pesticide pollution. Additionally, EPA has no policy to ensure that its restrictions

on pesticide use prevent violations of water quality standards.

A recent court decision changed the way that applications of pesticides to surface water are regulated under the Clean Water Act as well as FIFRA. On March 12, 2001, a federal appeals court issued a decision concerning the application of pesticides to surface waters in nine western states (Headwaters, Inc. v. Talent Irrigation District). The court found that National Pollutant Discharge Elimination System (NPDES) water pollution permits are required for pesticide applications made directly to waters considered "waters of the state" (WSDOE 2001a). Under this permit system, polluters must meet water quality standards or standards based on best available technology. Most state governments have primary responsibility in implementing the permit system.

Major Findings

Regulatory agencies are failing to protect both our water and salmon from harmful pesticide contamination. Thousands of pesticide products are currently used legally in and around salmon habitat in Oregon, Washington, Idaho, and California (Gianessi 1995a, 1995b, 1995c; Gianessi 2000). As a result, many pesticides contaminate surface water used by salmon at harmful levels.

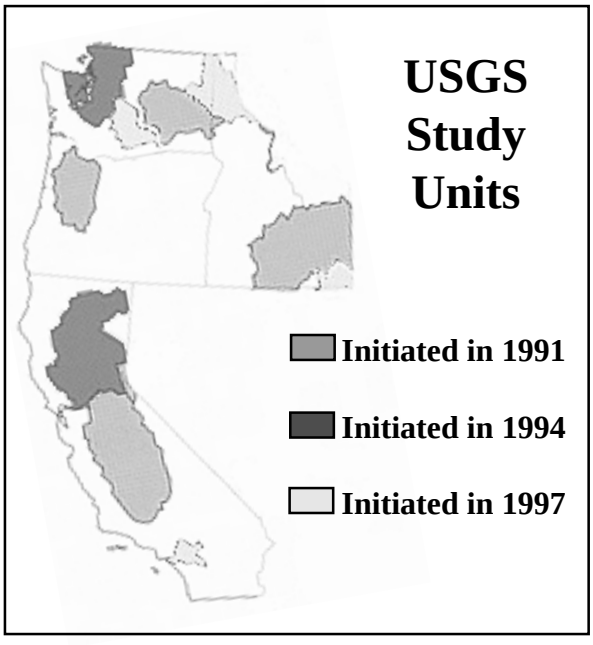
Pesticide Contamination of Water is Widespread and Significant

Surface-water testing shows five major watersheds in the Pacific states are contaminated by pesticides.

Pesticides widely contaminate rivers and streams, exposing salmon and their habitat to the hazards associated with them.

The U.S. Geological Survey (USGS), which has undertaken a targeted survey of our nation's water quality, has completed comprehensive studies of five major western basins that contain salmon habitat. The USGS looked for a minimum of 83 of the several hundred pesticide active ingredients registered for use in each of the river basins (USGS PNSP 1999). Even with this limited search of selected herbicides and insecticides, USGS detected 35 or more pesticides in each of the western basins studied (USGS 1999; USGS 2001; Anderson, Wood, and Morace 1997; Williamson et al. 1998; Wentz et al. 1998; Dubrovsky et al. 1998; Domagalski et al. 2000; Ebbert et al. 2000). Thus, the USGS found nearly half of the pesticides it looked for in every basin in the region. Many pesticides that are used throughout the region were not included in the USGS sampling, so the full extent of contamination of our waterways is not known.

The USGS studies reveal that pesticides used in urban landscapes as well as in agricultural settings greatly impact water quality. In urban areas, storm-drain systems carry pesticide-contaminated runoff directly to streams. For example, a study conducted in Palo Alto, California suggests that ordinary use of the insecticide diazinon could release into the



Adapted from Ebbert et al. 2000.

environment, through storm water runoff, amounts of this insecticide harmful to aquatic life. The study found that less than a tablespoon of diazinon in one day's worth of creek flow during a storm resulted in contamination of the creek with harmful amounts of the insecticide (Cooper 1996).

Water quality testing in our region provides definitive evidence that pesticides are present at harmful levels in waters salmon need to survive.

Sixteen pesticides contaminate the region's watersheds at harmful levels.

Water quality testing in our region by the USGS in the last decade provides definitive evidence that pesticides are present at harmful levels in waters salmon need to survive. The exceedence of standards by so many pesticides is serious cause for alarm since aquatic life criteria are set at levels above which harm is presumed to occur.

As Table 1 shows, sixteen different pesticides have been detected at levels above criteria set to protect aquatic life.

All types of pesticide users are responsible for pollution of salmon streams. For example, diuron and trifluralin are herbicides typically used by public agencies to maintain roadsides and other public property. Azinphos-methyl is an agricultural insecticide used primarily for controlling insect pests in fruit orchards. The herbicide 2,4-D is an ingredient in the popular fertilizer/herbicide combination products used extensively by homeowners. Three insecticides commonly used in the home and garden as well as in agriculture — chlorpyrifos, diazinon, and carbaryl — all pollute salmon waters at harmful levels.

Table 1

Pesticides detected above criteria set to protect aquatic life

	Watersheds of the region monitored for pesticide contamination that contain salmon habitat				
Pesticide Name	Puget Sound, Washington	Central Columbia, Washington-Idaho	Willamette (phase I, II, or III), Oregon	Sacramento, California	San Joaquin-Tulare, California
2,4-D	X		X		
atrazine			X		
azinphos methyl		X	x		X
carbaryl	X		X	X	X
carbofuran			X		
chlorpyrifos	X	X	X	X	X
diazinon	X	X	X	X	X
dicamba			X		
diuron			X		X
lindane (alpha or gamma)	X	X	X		X
malathion	X		X	X	X
metribuzin			X		
parathion		X			
simazine					X
triallate		X			
trifluralin					X

An X indicates that the USGS document reporting the detection noted an exceedence of an aquatic life criterion

USGS 1999; USGS 2001; Anderson, Wood, & Morace 1997; Williamson et al 1998; Wentz et al. 1998; Dubrovsky et al. 1998; Domagalski et al. 2000; Ebbert et al. 2000.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Studies of contamination of the Willamette River in Oregon reveal impacts from both agriculture and urban uses. In the Willamette Basin, agriculture makes up about 22% of the land use, urban uses are about 6%, and about 70% of the basin is forested (Wentz et al. 1998). Approximately 70% of Oregon's population lives in the Willamette Basin. In the USGS Phase I study conducted from 1991 to 1995, 50 different pesticides were detected in the basin out of a total of 86 pesticides analyzed in streams. Ten of these pesticides were detected at levels exceeding criteria for the protection of aquatic life (two others were detected in later studies). USGS also studied fish communities in the basin, and found that water chemistry (including pollution and oxygen levels) was the most important factor in small urban and agricultural streams in determining whether fish communities were dominated by native salmon and other fish or by introduced species. Introduced species were more prevalent in polluted streams.

> EPA has not completed even the basic preparation needed to engage in the consultation process to assess risks to salmon.

The EPA has developed water quality criteria for only about a dozen pesticides (EPA OW 1999b). Because of the lack of criteria, the USGS recognized other internationally accepted aquatic standards in evaluating the pesticide detections in their studies (USGS 1999; USGS 2001; Andersen, Wood, and Morace 1997; Williamson et al. 1998; Wentz et al. 1998; Dubrovsky et al. 1998; Domagalski et al. 2000; Ebbert et al. 2000). Other pesticides detected in surface waters may also be at levels that pose a hazard to salmon, but have not had criteria established.

EPA identified at least 36 pesticides used in the Pacific states that threaten fish or their habitat.

The EPA findings in its pesticide registration documents (risk assessments and REDs) reveal that legal uses of at least 36 commonly used and/or frequently detected pesticides are expected to have a negative impact on aquatic species, their habitat, or their food sources.[1] Legal uses of various pesticides are expected to exceed EPA

[1] For the purpose of this report, "commonly used" pesticides are ones for which uses are estimated as 100,000 pounds of active ingredient per year in a state (Gianessi 1995a, 1995b, 1995c; Gianessi 2000). "Frequently detected" pesticides are those detected 20 percent of the time or more in a United States Geological Survey report prepared under the National Water-Quality Assessment program for the Willamette Basin in Oregon; the San Joaquin-Tulare and Sacramento River Basins in California; and the Puget Sound Basin in Washington (USGS 1997; USGS 1999; USGS 2001; Andersen, Wood, & Morace 1997; Williamson et al. 1998; Wentz et al. 1998; Dubrovsky et al. 1998; Domagalski et al. 2000; Ebbert et al. 2000).

Table 2

Pesticides Exceeding EPA Hazard Level for Fish and Fish Habitat

	EPA documents reveal expected risk to aquatic organisms from registered pesticide use.									
Pesticide Name	fresh-water fish	endangered fresh-water fish	fresh-water aquatic invertebrates	semi-aquatic plants	aquatic plants	estuarine fish	endangered estuarine fish	estuarine invertebrates	common use	frequent detect
acephate (degradate = methamidophos) (R.A.)			x						x	
alachlor (RED)	x		x	x	x				x	
bensulide (RED)	x	x	x						x	
bentazon (RED)				x						x
bromoxynil (RED)		x	x	x					x	
captan (RED)	x		x						x	
chlorothalonil (RED)	x	x	x		x				x	
dichlobenil (RED)		x		x	x					x
1,3-dichloropropene (RED)	x	x	x						x	
dimethoate (RA)			x						x	
disulfoton (RA)	x	x	x			x	x	x	x	
ethoprop (RA)	x	x	x			x		x	x	x
fenamiphos (RA)	x	x	x			x		x	x	
fenbutatin-oxide (RED)	x	x	x			x	x	x	x	
iprodione (RED)	x		x				x		x	
methamidophos (RA)			x					x	x	
methidathion (RA)	x	x	x			x	x	x	x	
methomyl (RED)	x	x	x						x	
methyl parathion (RA)	x	x	x			x	x	x	x	
metolachlor (RED)		x							x	x
naled (RA)	x	x	x			x		x	x	
norflurazon (RED)				x	x				x	
oryzalin (RED)	x	x	x		x	x	x	x	x	x
paraquat dichloride (RED)				x	x				x	
pebulate (RED)				x	x				x	
pendimethalin (RED)	x	x			x				x	
phorate (RA)	x	x	x			x	x	x	x	
phosmet (RA)	x	x	x					x	x	
prometryn (RED)		x					x		x	
propargite (RA)	x	x	x			x	x	x	x	x
triclopyr (RED)	x		x	x	x					x
thiobencarb (RED)	x		x						x	x
thiodicarb (RED)	x	x	x					x	x	
terbacil (RED)					x					x
tebuthiuron (RED)				x	x					x

EPA OPP 1994-2001; Gianessi 1995a, 1995b, 1995c; Gianessi 2000; USGS 1999; USGS 2001; Anderson, Wood, & Morace 1997; Williamson et al. 1998; Wentz et al. 1998; Dubrovsky et al. 1998; Domagalski et al. 2000; Ebbert et al. 2000.

RED = Registration Eligibility Decisions
RA = Risk Assessments

hazard levels (known as a Level of Concern) for a range of aquatic species, including invertebrates, aquatic and semiaquatic plants, and endangered and non-endangered estuary and freshwater fish (EPA OPP 1994 - 2001).

Table 2 lists the pesticides expected to threaten fish or their habitat. Many pesticides can harm more than one aspect of the complex habitat necessary for salmon survival (Ewing 1999).

Of the hundreds of pesticides registered for use

in salmon habitat, only some have undergone an environmental risk assessment review process. Thirty-nine percent of pesticides that qualified as commonly used or frequently detected pesticides in the states with listed Pacific salmon species do not have an EPA review document assessing risks to aquatic species (Gianessi 1995a, 1995b, 1995c; Gianessi 2000; EPA OPP 1994 - 2001). Thus, EPA has not completed even the basic preparation needed to engage in the consultation process to assess risks to salmon.

Public Agency Response Fails to Address the Problem

EPA has not complied with its most basic legal responsibilities to protect salmon.

Pesticide users must apply a pesticide according to the use restrictions both printed on the product's label as well as any restrictions required by state law or regulations (FIFRA Sec. 12(a)(2)(G)) (EPA. OPP 1997). EPA's current use restrictions are clearly not adequate for salmon protection. In its final 4(d) rules issued July 2000 for protecting the fourteen threatened runs, the National Marine Fisheries Service summarizes concerns about current pesticide use regulation:

> *[C]oncentrations of pesticides may affect salmon behavior and reproduction. Current EPA label requirements were developed without information about some of the subtle but real impacts on aquatic species such as salmon. And they were not developed with the intent of protection or recovering threatened salmon.*
> (NOAA NMFS 2000b)

Since current federally approved pesticide use restrictions are not sufficient to prevent pesticides from contaminating water, salmon and their habitat continue to be exposed to pesticides.

The Endangered Species Act requires each agency to ensure its actions will not jeopardize survival and recovery of listed species. This obligation applies to EPA's actions of allowing pesticide use through the pesticide registration process. Since the first salmon run was listed under the Endangered Species Act more than twelve years ago, however, EPA has violated the law by failing to consult with the National Marine Fisheries Service and take action to protect salmon. Although its own documents show that current legal uses of at least 36 pesticides pose risks to aquatic species including salmon, EPA has failed to consult with NMFS about needed action to protect endangered or threatened fish species.

Information on pesticide use is not systematically tracked or accessible to the public.

To be effective, scientific research on how pesticides affect salmon, surface water monitoring, and stream restoration efforts require knowledge of what pesticides are being used when and where. California is the only state with listed salmon runs that has mandatory state-level pesticide use tracking. Oregon will begin implementing a pesticide tracking system in 2002, with the first public information published in the summer of 2003. Washington and Idaho do not yet have any

pesticide use reporting systems in their states.

Pesticide use reporting has many practical applications in salmon recovery efforts. For example, the USGS correlated pesticide use reporting information to pesticide applications in the San Joaquin-Tulare Basins. Seventy percent of the pesticides with known applications were detected. They noted that "detection frequency also is related to the amount of pesticide applied; 4 of the 6 most commonly detected pesticides were among the 10 most heavily applied" (Dubrovsky et al. 1998).


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The data generated from pesticide use reporting programs can also be mapped together with salmon habitats, allowing fish biologists to determine which pesticides pose the greatest threat to salmon in a specific watershed. Agencies and others involved in salmon recovery can then target their efforts more effectively to address the threat that pesticides pose.

State and local governments fall short in protecting salmon from pesticides.

States with salmon runs listed as threatened or endangered have recognized the need to adopt policies at the state level for the restoration of their rivers and salmon runs. However, their policies and actions have been insufficient to protect salmon from the impacts of pesticides. Washington state has created the Washington State Pesticide/ESA Task Force, which is developing an innovative process designed to identify pesticides that will require further enforceable use restrictions (WSDA 2001). This process has the potential to protect salmon, but it is not yet known whether it will result in the pesticide phaseouts necessary for protection.

The California Department of Pesticide Regulation has developed the California Interim Measures bulletins for endangered species. The program is intended to protect endangered and threatened species from harm due to pesticide use. It offers site-specific information on pesticide-use restrictions, such as increased buffer sizes and application guidelines, to reduce runoff and drift (EPA OPTS 2000). These protective measures, however, are completely voluntary. Both Oregon and Idaho encourage voluntary salmon restoration efforts but neither has enforceable policies for salmon protection.

The ESA's 4(d) rules prohibit everyone from causing death or injury to listed fish. This applies to businesses, local governments, tribes, and individuals. Therefore, each city and county must ensure that its actions or actions undertaken under its regulations do not result in take or harm to listed salmon (NMFS 2001). One area in which cities and counties may impact salmon is through their pesticide use in parks, streets and roads, and public facilities such as libraries and fairgrounds. In order to determine whether their activities and regulations comply with the Endangered Species Act, local governments may submit salmon recovery plans to NMFS and seek to obtain a "limit" under the 4(d) rule, meaning that regulations and actions under the recovery plan are compliant. This "limit" provides protection from lawsuits alleging harm to salmon. To date, few jurisdictions have made changes in pesticide use as part of salmon recovery plans.

An In-Depth View of One Urban Watershed with Salmon

Thornton Creek, Seattle

by Erika Schreder, Staff Scientist
Washington Toxics Coalition

The city of Seattle is home to a number of watersheds with struggling salmon populations. The largest watershed within the city limits, the Thornton Creek watershed, is emblematic of the challenges of restoring salmon in an urban setting. Chinook salmon, listed as threatened under the Endangered Species Act, persist in the creek, despite problems including poor water quality, low stream flows, elevated temperature, and impassable culverts that prevent access to some sections. Small populations of coho salmon also persist, as do larger populations of steelhead and cutthroat trout. The USGS has completed a significant amount of testing for pesticides in the watershed, and pesticides are one of the primary factors threatening the recovery of Thornton Creek salmon.

The Thornton Creek watershed, draining approximately 11.6 square miles, is located in northeast Seattle and the southern part of the city of Shoreline. The watershed is highly urbanized, with a population of approximately 75,400 people. Just over half the watershed's land consists of impervious surfaces (such as roads, parking lots, and rooftops). Fairly typical of Seattle average land uses, residential use comprises 51% of the land area, with 23% rights-of-way, 8% commercial, 4% parks, 4% schools, 4% vacant, and 3% other uses.

Pesticide Pollution in Thornton Creek Watershed

The U.S. Geological Survey tested Thornton Creek for pesticides in two studies, one conducted between 1996 and 1998, and the other in 1998. The first consisted of 45 samples collected in March 1996 and April 1998, which were analyzed for 83 pesticides and degradation products. The second was a smaller set of samples that were taken during storm events and tested for 98 pesticides and degradation products.

> Three pesticides–carbaryl, chlorpyrifos, and diazinon–were detected at levels exceeding criteria set to protect aquatic life.

In the first study, three pesticides — carbaryl, chlorpyrifos, and diazinon — were detected at levels exceeding criteria set to protect aquatic life. A total of 19 pesticides and one degradation product were detected. Diazinon was detected in 39 of 45 samples, with four

Table 3

Pesticides Detected in Thornton Creek

Pesticide Name	# detections	Maxiumum concentration[a] (micrograms per liter)	Acute criterion (micrograms per liter)	Chronic criterion (micrograms per liter)
atrazine	19	0.006	70	7
carbaryl	4	**E0.044**	0.17	0.017
chlorpyrifos	3	**0.074**	0.083	0.041
DCPA	1	0.002	(none)	(none)
deethylatrazine	2	E0.002	(none)	(none)
diazinon	39	**0.501**	0.16	0.04
dichlobenil	21	E1.2	(none)	(none)
diuron	4	0.45	(none)	(none)
EPTC	1	0.005	(none)	(none)
lindane	1	0.02	0.95	0.08
malathion	10	0.042	(none)	0.1
MCPA	2	0.07	(none)	(none)
napropamide	2	0.054	(none)	(none)
oryzalin	1	0.43	(none)	(none)
prometon	44	0.201	(none)	(none)
pronamide	1	0.008	(none)	(none)
simazine	2	0.37	100	10
tebuthiuron	1	0.025	(none)	(none)
triclopyr	1	0.82	5600	560
trifluralin	2	0.007	(none)	(none)

All data from Loudon 2001, taken from U.S. Geological Survey, unpublished data of pesticide detections in Thornton Creek. Provided 1999.

[a] **Bold** indicates an exceedence of an aquatic life criterion.

detections exceeding the acute toxicity criterion and fourteen exceeding the chronic toxicity criterion. Of the pesticides detected, aquatic life criteria have been established for only seven. Several of the pesticides that lack aquatic life criteria were found at some of the highest levels: the herbicides dichlobenil, diuron, oryzalin, and triclopyr.

Four of the pesticides detected in Thornton Creek are among those identified as hazards for salmon in EPA findings (see the "Major Findings" section). Others have known sublethal effects. For example, lindane and trifluralin are persistent and known to bioaccumulate, or increase in concentration as they go up the food chain (WSDOE 2001b). Prometon is also highly persistent (Oregon State University n.d.). The herbicide 2,4-D, which was detected in the 1999 study, is associated with endrocrine disruption and impaired swimming ability and orientation (Rawlings et al. 1998; Dodson and Mayfield 1979).

Carbaryl, which was detected at levels above water quality standards, has a number of sublethal effects on fish. Direct effects include impaired growth and reproductive success, bone abnormalities, and disruption of hormonal systems (Arunachalam and Palanichamy 1982; Carlson 1971; Weiss and Weiss 1976). Carbaryl is also known to cause behavioral effects such as disruption of schooling behavior (Weiss and Weiss 1974). Finally, since carbaryl kills aquatic insects, it harms salmon indirectly by reducing their food supply (Burdick, Dean, and Harris 1960).

Sources of Pesticide Pollution in Thornton Creek

Although public agencies and other pesticide applicators are not required in Washington state to report their pesticide use to a central authority, they are required to keep detailed records of pesticide use. These records can be obtained for applications made by public entities, and this use information was collected for Thornton Creek Watershed in a 2001 study (Loudon 2001). The study also collected summary information provided by some private users, and national sales information was used to estimate residential use. Average yearly use was determined based on applications during the four year period (1996-1999) for which records were received.

The highest average annual uses were as follows:

- Jackson Park Golf Course used 2,688 liquid ounces of herbicides[1]; 14,880 liquid ounces plus 1,179 pounds of fungicides; and 250 pounds of insecticides;
- Washington State Department of Transportation used 957 liquid ounces of herbicides;
- St. Matthew's Church and School had a contract with Chemlawn/Trugreen and had the highest per acre use of any reporting user; and
- Residents used approximately 7,500 pounds per year (active ingredient only).

Several of the pesticides known to be used in large quantities by public entities are among those detected at relatively high levels. For example, the Washington State Department of Transportation was a heavy user of diuron, which was detected in water at 0.45 micrograms per liter. Triclopyr was detected at an even higher concentration, 0.82 micrograms per liter. This active ingredient is present in consumer products but had relatively low retail sales; on the other hand, the Jackson Park Golf Course reported an annual average use of 512 ounces of a product containing triclopyr.

Other pesticides are heavily used by individual consumers, professional applicators, as well as institutional users. Chlorpyrifos (product name Dursban), detected above an aquatic life criterion, was among the top ten consumer use pesticides. Chemlawn/Trugreen used an average of 98.6 gallons per year of this chemical on one church/school property. And Jackson Park Golf Course used an average of 250 pounds per year.

Finally, contamination with some pesticides appears to be due entirely to consumer uses. Carbaryl is an insecticide that was detected at levels exceeding an aquatic life criterion, but none of the institutions reported using it. Since EPA is phasing out consumer uses of the two insecticides most commonly applied to lawns for crane fly control — diazinon and chlorpyrifos — it is likely that carbaryl use for this purpose will increase unless its use is also restricted. This likelihood raises a serious concern for increasing carbaryl pollution in urban streams, posing a hazard for salmon and their habitat.

[1] Quanities are based on ready-to-use product unless otherwise noted.

The results of the USGS testing in Thornton Creek point to a bleak future for salmon unless pesticide use is significantly reduced. Several pesticides contaminate the stream at levels known to cause harm to aquatic life. Four more have been identified by EPA as hazards for salmon. With a total of 19 pesticides detected, several of which are known to impair the nervous system via the same mechanism, additive and even synergistic toxic effects are a serious concern.

The time of greatest pesticide pollution–late spring–is also a time when salmon are particularly sensitive to the effects of pesticides.

Also of concern is the timing of peak pesticide uses and pollution. Chinook salmon in this basin rear in streams from January through mid-July; coho go through the intragravel development phase from January through mid-May, and rear in streams for an entire year. Juveniles of both species migrate to sea from March until mid-July. Based on the application patterns reported by surveyed users along with retail sales patterns, the peak pesticide usage period coincides with juvenile rearing for Chinook, part of the period of intragravel development for coho, and juvenile out-migration for both. Thus, the time of greatest pesticide pollution — late spring — is also a time when salmon are particularly sensitive to the effects of pesticides.

Efforts to Reduce Pesticide Use in Thornton Creek Watershed

The two cities that own and/or manage property within the Thornton Creek Watershed, Seattle and Shoreline, both have policies in place aimed at reducing pesticide use and putting safer alternatives in place. Seattle adopted a policy in 1999 that phased out the use of the most hazardous herbicides and insecticides, including those linked to cancer and other health problems as well as those likely to pollute water and harm fish and wildlife. Since then, Seattle has mounted an aggressive effort to develop and implement alternatives to pesticides.

The city of Shoreline recently adopted an Integrated Pest Management policy based on a model policy developed as part of the "Tri-County" salmon recovery planning process. Shoreline's policy does not contain strong restrictions on the use of the most toxic pesticides. However, it may reduce water pollution by restricting the use of pesticides near water.

King County and Seattle have both made significant investments in attempting to reduce residential use of pesticides by providing consumers with information about alternatives, by training nursery staff, through media advertising, and by other means. King County has produced two brochures urging consumers to specifically avoid using diazinon and "weed and feed" products. The effectiveness of these efforts, however, is somewhat unclear. Random telephone surveys of county residents over the past several years have tended to show modest reductions in self-reported pesticide use. Preliminary analysis of pesticide unit sales through large chain home improvement stores tends to show an opposite trend, with sales of most pesticides increasing. More data and better analysis are needed, but it seems unlikely that any significant pesticide reduction by consumers is occurring yet within the county.

Addressing Pesticide Threats to Salmon

The findings of this report show that current practices are creating serious water pollution problems for salmon survival. Regulations are failing to keep pesticides out of surface water, resulting in contamination levels known to be hazardous to aquatic organisms. With listed species of salmon in our waterways, pesticide contamination is no longer acceptable. There is precious little time left to restore the quality of the region's waters for salmon and the ecosystems and communities that depend upon them.

Solution:

Cleaning up our waterways to protect salmon from the impacts of pesticides will take sustained effort by government agencies, farmers, cities and counties, and individuals. For the health of the salmon and our way of life, we must take the following actions:

- **Phase out the use of pesticides that are hazardous to salmon and their habitat.**
- **Adopt measures to keep pesticides out of water needed for salmon survival.**
- **Establish pesticide use reporting to track pesticide use to aid in salmon recovery.**
- **Promote and adopt salmon-friendly practices that reduce reliance on pesticides.**

Recommendations:

1. **EPA must comply with the Endangered Species Act** by phasing out the use of pesticides that harm salmon and keeping all pesticides out of water. Through consultation with the National Marine Fisheries Service, EPA must develop clear methods for evaluating all the subtle effects of pesticides on salmon, and immediately restrict or eliminate pesticide uses when hazards are found. Additionally, EPA must develop pesticide water quality criteria to protect aquatic life and human health, and use the pesticide registration process to ensure that these standards are not exceeded.
2. **The National Marine Fisheries Service (NMFS) must enforce the Endangered Species Act to ensure that pesticides are not used in ways that harm salmon.** NMFS should engage in a comprehensive consultation with EPA and make sure that EPA fully examines all the mechanisms with which pesticides harm salmon, including the sublethal effects that it does not currently analyze. NMFS must also ensure that salmon recovery plans developed by local government agencies address the need to restrict and reduce pesticide use.
3. **States should stop the use of pesticide products that harm salmon or their habitat** by phasing out or further restricting their use. States have authority under state pesticide laws to regulate pesticide use more stringently than federal restrictions. Washington state has started this process and other states should act quickly to protect salmon from pesticides. State

Lori Mudge

The city of Seattle has made six parks pesticide-free.

authorities should also establish a strong National Pollutant Discharge Elimination System permitting process that effectively protects waters from pesticide pollution.

4. **Local governments should make pesticide use reduction a core element of salmon recovery.** Cities, counties, schools, and park districts should serve as models of salmon-friendly pest management, but most continue to rely on pesticides for landscape management. Some jurisdictions are successfully implementing smart practices that phase out the use of harmful pesticides, creating healthier landscapes for people and salmon. Other communities should follow suit by adopting strong policies to phase out pesticide use. Cities and counties should also promote salmon-friendly landscaping, gardening, and farming practices to reduce pesticide use by homeowners, businesses, and farms.
5. **Every state with listed salmon runs must develop a comprehensive pesticide use reporting system with publicly accessible data.** Information about what pesticides are used, where and when they are applied, and for what reason will ensure that salmon recovery efforts are more effective. Specific data will give researchers, citizens, and decision-makers accurate information to identify water quality priorities, set targets for identifying alternatives to pesticides, and assist in development of strategies to protect and restore water quality.
6. **Farmers should switch to effective organic and sustainable techniques** to reduce their use of pesticides. More and more farmers are transitioning to techniques that reduce or eliminate pesticide use, as a means to ensure their own safety, that of their workers and those who eat their food, and to protect the environment. Certified organic food can receive a price premium and can help small farmers maintain profitability.
7. **Land grant universities must provide resources for pesticide-free pest management.** Land grant universities have tremendous influence over farming and gardening practices. They should orient their research, education, and extension services toward sustainable pest management practices that reduce reliance on pesticide use.
8. **Legislative bodies must provide more resources for surface water monitoring.** The U.S. Geological Survey data provide a "snapshot" of the pesticide pollution in surface waters. For an understanding of the whole picture of the health of our waters, more monitoring must be done. Comprehensive surface water monitoring is also necessary to determine if measures adopted in the future are successfully keeping pesticides out of salmon waters.
9. **Individuals should choose to end their use of hazardous pesticides** in their homes, gardens, lawns, and workplaces. Successful salmon-friendly practices are available that result in both reduced pesticide contamination in water and safer places for kids, pets, and communities.

Key Elements for a Salmon-Friendly Pest Management Policy

Phase out the use of pesticides that pose hazards to the health and habitat of salmon, contaminate water, and threaten human and environmental health.
Pest management policies must ensure that local governments do not use pesticides that:

- are likely to pollute water or have been detected at levels exceeding standards to protect aquatic life.
- have been shown to harm salmon either directly, such as by harming reproduction or behavior, or indirectly by affecting their food supply or other important habitat elements; or
- cause serious health effects in people such as cancer, reproductive damage, nervous system harm, or hormone disruption.

Adopt safeguards to help keep all pesticides out of water.
Policies should include measures to limit runoff of pesticides into water. Pesticide use should be eliminated within streamside buffers, and in the vicinity of lakes, wetlands, and groundwater recharge areas in order to reduce transport of pesticides to water. Other measures may include restoration of riparian and lakeside vegetation.

Develop a means of reducing use by preventing pest problems and track pesticide use.
Policies should include a mechanism for ensuring that actions are taken to prevent problems, and that alternatives to pesticides are predominately used. A yearly progress report should be required as part of a process whereby solutions are developed for recurring pest problems and applied in a systematic way in order to reduce overall reliance on pesticides. Local governments should establish a comprehensive database to track their pesticide applications and make the information readily accessible to staff and the public.

Involve the public in pest management decisions. Notify the public about pesticide use.
Pesticide notification signs should be posted at least 72 hours in advance of pesticide applications. Pesticide reduction policies should have a strong public input component including a public review of the yearly progress report.

Promote adoption of salmon-friendly landscape management by households, farmers, businesses, and private pest control operators.
Local governments should provide educational and other programs to promote practices that restore salmon habitat and do not degrade water quality.

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Glossary of Terms

Acronyms:

ALC – aquatic life criteria
CWA – Clean Water Act
EPA – Environmental Protection Agency
EPA OPP – EPA Office of Pesticide Programs
EPA OPTS – EPA Office of Pesticides and Toxic Substances
EPA OW – EPA Office of Water
ESA – Endangered Species Act
FIFRA – Federal Insecticide, Fungicide, and Rodenticide Act
IESPP – Interim Endangered Species Protection Program
LOC – level of concern
NAWQA – National Water-Quality Assessment Program
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NOAA NMFS – National Oceanic and Atmospheric Administration, National Marine Fisheries Service
PNSP – Pesticide National Synthesis Project
RED – Reregistration Eligibility Decision
USFWS – U.S. Fish & Wildlife Service
USGAO – U.S. General Accounting Office
USGS – United States Geological Survey
USGS PNSP – United States Geological Survey, Pesticide National Synthesis Project
WSDA – Washington State Department of Agriculture
WSDOE – Washington State Department of Ecology

Terms:

4(d) – Section of the Endangered Species Act that requires adoption of regulations that are deemed necessary and advisable for the conservation of species listed as threatened.
Active ingredient – A pesticide ingredient that will prevent, destroy, repel, or mitigate any pest. Also includes ingredients that act as plant regulators, defoliants, dessicants, and nitrogen stabilizers.
Acute toxicity – Toxicity that causes injury or death from a single dose or exposure.
Anadromous – Fish species which migrate from the sea upriver to freshwater for breeding.
Aquatic – Living, growing, or taking place in or on water.
Aquatic life criteria (ALC) – Water quality guidelines or criteria for protection of aquatic life.
Consultation – With regards to the Endangered Species Act: under Section 7 of ESA, every agency whose activities may harm a listed species must participate in formal consultations with the agency charged with the restoration of that species.
Ecosystem – The interacting populations of plants, animals, and microorganisms occupying an area, plus their physical environment.
Endocrine disprutors – Substances which disrupt the endocrine system, which is a collection of glands that secrete hormones into the bloodstream for transport to tissues and organs throughout the body.
Estuarine – Pertaining to an estuary (where the sea meets the mouth of a river and salt and freshwater mix).
Freshwater – non-saline waters.
Fungicide – A substance or mixture of substances intended to destroy or repel fungi.
Herbicide – A substance or mixture of substances intended to control, suppress, or kill plants, or to severely interrupt their normal growth.
Insecticide – A substance or mixture of substances intended to destroy or repel insects.

Label – All printed material attached to or part of a pesticide container. Use restrictions printed on pesticide labels are enforceable under FIFRA.

Level of concern (LOC) – The level at which EPA judges pesticide contamination to pose potential harm to a non-target organism.

Pesticide – Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.

Pesticide use reporting – A comprehensive system to accurately track pesticide use that is accessible to researchers and the public.

Reregistration Eligibility Decision (RED) – An EPA document that summarizes the hazards and probability of risks associated with a pesticide to non-target organisms, human health, and the environment.

Risk Assessment – The process of identifying risks to estimate the probability of increases of harm, disease, or death based on exposure to a substance.

Rodenticide – A substance or mixture of substances intended to destroy or repel rodents.

Runoff – Excess water from irrigation, rain or snowmelt that is transported to streams by overland flow, tile drains, or storm water systems.

Salmon – For the purpose of this report, western native anadromous salmonids (chinook, coho, sockeye, chum, and pink salmon, sea–run cutthroat, and steelhead).

Salmon-friendly practices – Pest management practices that result in restored salmon populations and habitat and no degradation of water quality.

Stormwater – Runoff water that is controlled through a system of drains and pipes (storm drain system), generally in urban areas.

Semi-aquatic – Adapted for living or growing in or near water; not entirely aquatic.

Surface water – An open body of water such as a lake, river, or stream.

Toxicity – The harmful effects produced by a substance or the capacity of a substance to cause any adverse effects, as based on scientifically verifiable data.

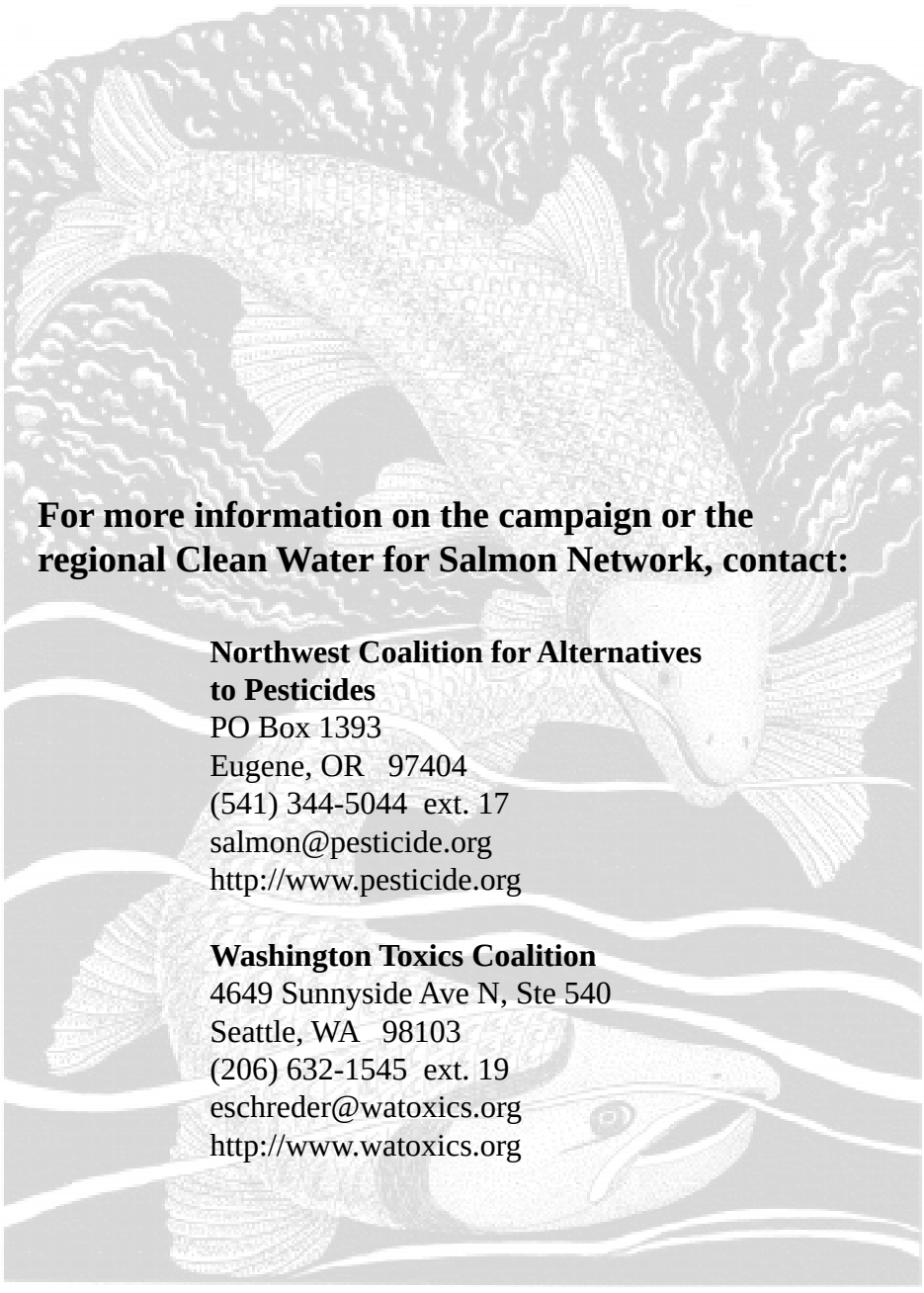
Water quality criteria – Numeric and narrative expressions of amounts of certain pollutants allowed in particular waterways based on the protection of aquatic life or human health. Commonly refers to water-quality criteria established by the U.S. EPA.

Water quality standards – State-adopted and U.S. EPA-approved enforceable standards for water bodies. Standards include the designated use of the water body and the water-quality criteria that must be met to protect the designated use or uses as well as other policies and exceptions.

Watershed – The geographical area that contributes water to a stream through overland runoff.

Clean Water for Salmon Campaign

www.pesticide.org/CleanWaterSalmon.html



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