Growing Trends

Successful Strategies for Reducing Pesticides in Public Places

A Washington Toxics Coalition Report

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Authors

Philip Dickey
Erika Schreder
Angela Storey
Austin Walters
Anne Marie Winter

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The Washington Toxics Coalition is a non-profit, nonpartisan, 501(c)(3) organization that works to protect public health and the environment by preventing pollution.

Washington Toxics Coalition
4649 Sunnyside Ave. N. Suite 540
Seattle, WA 98103
206-632-1545
info@watoxics.org
www.watoxics.org

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October 2002

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Introduction

When Thurston County adopted a pesticide phaseout policy nearly ten years ago, the county was truly breaking new ground. The county was the first government in the state to end the use of pesticides linked to health and environmental problems and adopt safer pest management strategies in every part of its operations.

Today, Thurston County's program is thriving and many more school districts, cities, counties, and other institutions have made the decision to put public health and the environment first by replacing pesticides with safer practices. We now have a growing body of landscapers, administrators, and structural pest specialists that have expertise in implementing programs that reduce or eliminate reliance on toxic chemicals. Most frame their programs with the principles of Integrated Pest Management (IPM), which is a method that focuses on preventing pest problems, uses monitoring and thresholds to determine when action is needed, and prioritizes mechanical, cultural, and biological controls over chemical controls. Least-toxic pesticides are used as a last resort.

These government agencies and other institutions have reduced their pesticide use in response to growing evidence that pesticides, including herbicides, insecticides, and other pest-control chemicals, are harmful to human health and the environment. Scientific studies continue to link pesticides to devastating health effects including cancer, harm to the nervous system, disruption of the hormonal system, and birth defects. Recent information also shows that pesticides widely contaminate the waterways of the Northwest, and that even low levels of pesticides can harm salmon and other aquatic life.

Because federal and state agencies have failed to take the actions needed to ensure that pesticides that are legally available are also safe, local agencies and businesses have taken the lead in making sure the landscapes they manage are safe for people, water, and wildlife. Many of the agencies profiled in this report have strong policies that prevent the use of pesticides linked to serious health problems, water pollution, or harm to fish and wildlife. Others have adopted policies to eliminate all use of pesticides.

This report profiles ten successful programs, including cities, counties, school districts, forest lands, and other institutions. While all of these programs face ongoing challenges, they have shown that landscapes and buildings maintained without pesticides can be beautiful, functional, and sustainable. The ten case studies in this report describe how these models came about and share their secrets on overcoming challenges.

A number of themes emerge from these case studies:

Community support and involvement are crucial. The programs that have been the most successful over the long term are those that were requested by members of the community and that have regular public involvement. Community support means that the programs get public recognition and draw on the resources of the community. Regular public involvement allows members of the community to monitor the success of the program and develop resources when lack of resources is limiting success.

An ounce of prevention is worth a pound of cure. Programs that couple the use of alternative controls such as mechanical methods with aggressive prevention programs develop sustainable approaches that do not increase resource needs. In case after case, it is clear that appropriate design — for example, using native and/or pest-resistant plants in thick plantings that crowd out weeds — can save countless hours of labor, provide attractive landscapes, and reduce frustration.

What is Integrated Pest Management (IPM)?

Since the time that the concept of IPM was established decades ago, many definitions have been developed, to the point that the term has been used to describe a full range of pest-management practices. The Washington Toxics Coalition believes in least-toxic IPM, which focuses on prevention and non-chemical controls, and uses least-toxic chemicals as a last resort. We have adopted a definition of IPM that was originally developed by the Bio-Integral Resource Center. We define IPM as follows:

"Integrated Pest Management (IPM) is an approach to pest control that utilizes regular monitoring to determine if and when treatments are needed and employs physical, mechanical, cultural, biological and educational tactics to keep pest numbers low enough to prevent intolerable damage or annoyance. Least-toxic chemical controls are used as a last resort."

While many programs that use toxic pesticides claim to use IPM, the programs profiled in this report adhere generally to least-toxic IPM and use pesticides either not at all or only as a last resort.

Successful programs are backed by strong policies. Policies are crucial to establishing that eliminating the use of the most hazardous pesticides and reducing all pesticide use are priorities at all levels of the institution. The best programs are guided by a policy that has been approved by the highest levels of leadership, such as elected officials, and implemented by staff members that are highly motivated and well-trained. High-level support, formalized in policy, leads to consistency in the program as well as greater resources for implementation.

Strong leadership is essential to get programs off the ground. Particularly in a large bureaucracy, leadership in the early part of implementation is critical to change behavior by providing needed training and information and by developing written guidelines and IPM plans. Investing resources in coordinating a program early-on can greatly reduce the resources needed later.

Pesticide-free landscapes are healthier and more attractive. The ten case studies show how plants can be maintained without pesticides to result in beautiful landscapes of many kinds. From roadsides where native plants are used to crowd out weeds to intensively managed grounds such as at Woodland Park Zoo or Seattle University, smart design and a focus on plant health have led to very attractive, thriving landscapes that are healthy for both people and plants.

The ten programs profiled in this report represent just a handful of the many institutions that have successfully reduced or eliminated pesticides in favor of safer alternatives. The report's appendices list other successful programs, along with resources for establishing and maintaining programs. As these case studies and other programs demonstrate, pesticides can be successfully reduced in small or large institutions. Many resources are available to ease the transition, and we hope that the future will bring many more examples of landscapes and buildings that are maintained in a healthy, sustainable way, without toxic pesticides.

Chapter 1:

Thurston County: A County-wide IPM Program

When residents of Thurston County started pressing for reduced pesticide use in the late 1980s, they had few models to look to. It took two years for a Citizens' Advisory Committee to develop a Pest and Vegetation Management Policy for the county, but once they did, Thurston County became a true pioneer in developing an IPM program and reducing pesticide use. Today, the county has one of the most comprehensive IPM programs in the country, and county departments use few to no pesticides.

Building Political Support

In the 1980s, a number of individuals and organizations banded together to convince Thurston County to reduce its pesticide use on roadsides, in parks, and on other county property. Leaders included members of the Audubon Society as well as the Sierra Club, who built a base of support with the assistance of the Washington Toxics Coalition. Jean McGregor, who represented the Black Hills Audubon Society, said, "We wanted to break the cycle of chemical dependence in the county around herbicide use."

As a result, then-county executive Tom Fitzsimmons (and current director of the state Department of Ecology) created a Citizens' Advisory Committee and charged them with developing a policy. A key breakthrough in the process occurred when the county surveyed residents about its attitudes toward herbicide use. According to Jean, "there was overwhelming interest in reducing herbicides and moving toward alternatives." The committee passed a policy after two years of intense work, and with minor changes, that policy guides the county today.

Creating an IPM Program

Shortly after the policy was adopted, the county hired Mark Swartout to serve as its IPM Coordinator. Despite the lack of models in other cities and counties to look to, Mark led county departments in the process of developing comprehensive IPM programs. Mark now has a four-inch-thick binder containing the written programs of each county department, together with specific prescriptions for each department on how it will deal with certain pest problems. The "IPM programs" provide general guidance to the department on how it will manage pests and vegetation. For example, for roads and transportation, the program

Under Thurston County's IPM program, plum trees that were previously sprayed every year with insecticides are now thriving with better plant care and no pesticide treatment.

lists goals such as protecting water quality and encouraging native plants; provides a full description of the road system and associated vegetation; presents policy statements on how wildlife, water quality, and other benefits will be protected; and details the techniques and decision-making process for the use of mechanical, biological, cultural, and chemical controls.

Procedures associated with the program include public notification, communicating with the public on the use of pesticides, and handling of pesticides. The roads program also developed specific "prescriptions" or techniques that will be used for certain problems. The department developed a number of these prescriptions for noxious weeds, in addition to prescriptions that detail what controls will be used for what portions of the roadside. The department now uses no pesticides for regular vegetation management, using mowing instead, and applies pesticides only to control noxious weeds.

> "There was overwhelming interest in reducing herbicides and moving toward alternatives."
>
> *–Jean McGregor*
> *Black Hills Audubon Society*

Other county departments that have similar IPM programs and prescriptions include the Solid Waste Division, which manages a landfill as well as transfer stations; the Noxious Weed Control Board, which provides chemical-free removal of noxious weeds for private property owners (for a fee); the Storm and Surface Water Utility; Facilities, which manages structural pest problems in county buildings; Parks, which manages 2,595 acres of parks and other landscapes; and two lake management districts managed by the county.

Once the programs and prescriptions were developed, departments found that in most cases they could manage with no pesticides or least-toxic pesticides. One striking example is Parks' management of a group of plum trees that had persistent infestations of scale, aphids, and whiteflies. These pests were "managed" through yearly applications of insecticides, but the applications did not solve the problem. After the policy was passed, the applications were stopped, as was harsh pruning that was stressing the trees. Since the trees regained health, there have been no problems with insect pests, and no pesticide applications have been made.

The Facilities department found that the best way to deal with indoor pest problems is to correct the structural problems that are allowing the infestation. In one building, a carpenter ant nest was located and removed to solve an ongoing problem. In a covered walkway, rotten wood that was harboring ants was removed, and boric acid was applied to prevent future problems. According to Mark, "Unless you deal with the structural problem, you can spray until you're blue in the face and you won't get rid of insects."

Restrictions on Pesticide Use

Any pesticide proposed for use must be approved by the Thurston County Environmental Health Division or the Board of Health, according to criteria in the policy. The policy states that pesticides may not be used if they are linked to

cancer, reproductive or developmental toxicity, or if they are mutagenic; if they are mobile or persistent, or if they have high acute toxicity. Other factors that are considered are degradation products, aquatic toxicity, bioaccumulation, and "inert" ingredients. No product may be used if its inert ingredients (which are all ingredients besides the active ingredient) are considered to have a known or suspect toxicological concern by the Environmental Protection Agency. The policy gives preference to pesticides whose manufacturers disclose the identity of inert ingredients. Under this policy, nine pesticides are currently approved for use within the prescriptions developed by departments.

Accountability and Public Involvement

Since the policy was first established, the county has made a practice of releasing annual reports detailing pesticide use. Mark says, "We shine a bright light on what we do because public advocates are the way we can keep the political will to continue the program." The report for 2001 details each pesticide use by the roads and transportation department, including the purpose of the application, with similar information for parks and recreation. In 2001, the other departments made no pesticide applications. To provide ongoing citizen oversight to the program, the policy created the Pest and Vegetation Management Advisory Committee, which includes representatives from the agricultural and environmental communities as well as citizen representatives. According to Mark, the committee has provided important expertise and has served as a key body for developing solutions for persistent management problems.

Mark Swartout, Thurston County's IPM Coordinator, has made the county's program a model with detailed written IPM plans for each department.

Ten years after the policy's implementation, community members involved in establishing it are pleased with its progress and hopeful that the model will spread. "The county is only one of many public entities that need to deal with weeds and other pest problems," says Jean McGregor. "We have state government, we have city government, ports, and schools, all of which could be doing more to reduce pesticide use. With more public entities learning the ropes of IPM, more sharing can occur and we can continue to build up these good practices."

Chapter 2:
The City of Seattle

The City of Seattle has long prided itself on being a leader in protecting the environment. In 1999, however, the listing of the region's salmon as endangered served as a wake-up call that existing efforts weren't enough to prevent harm to the environment. When it came to pesticides, the City found that it needed to walk its talk and take its own advice to stop using pesticides that could harm salmon. As a result, Seattle adopted one of the strongest pesticide reduction programs in the region, phasing out the use of the most hazardous pesticides and reducing all pesticide use by 30%.

On the Green Lake shoreline, coconut fiber logs and native plantings were used to combat shoreline erosion and provide habitat. To suppress weeds and provide a healthy growing medium, high quality soil was brought in and compost was incorporated, then coconut fiber mats were placed on top and covered with a thick layer of wood chips.

Tackling Challenges

Since making its commitment in 1999, Seattle has used research, creativity, and hard work to meet its goals. To make the program successful, the city council appropriated $360,000 to implement the program by evaluating the hazards of pesticides, establishing pilot projects to test and demonstrate alternatives, and coordinating the efforts of the various departments. The City started its efforts by engaging those responsible for landscape maintenance, conducting interviews to identify the biggest problems, and developing an inventory of pesticides currently used. It also established a database to accurately track all pesticide use and to determine a baseline of past pesticide use.

The main challenges faced by Seattle were a lack of coordination between departments, since the City has a number of departments with landscape management responsibilities, and lack of resources to replace the labor saved by pesticide use. To solve these problems, the City's Office of Sustainability and Environment hired a city-wide Pesticide Reduction Coordinator to implement pilot projects, and established a committee of IPM Coordinators from various departments. The pilot projects were

designed to test and demonstrate novel approaches to common or particularly difficult pest problems. In addition, a committee of landscapers from different departments created a set of landscape guidelines to ensure that important prevention methods including the use of pest-resistant plants and mulch were used. The Office of Sustainability and Environment has trained grounds staff, designers, and project managers on these guidelines, and conducts an annual training on integrated pest management.

This walkway at Seward Park serves two functions: it showcases native plants in a natural setting, and provides wheelchair access to the second floor of an education building.

Seattle Parks

Since the Pesticide Reduction Policy was adopted in 1999, the Seattle Department of Parks and Recreation (excluding golf courses) has succeeded in reducing overall pesticide use by 45%. Parks has achieved this short-term success primarily through replacing pesticide use in shrub beds with the heavy use of wood chips and bark mulch and increased hand weeding. At Green Lake, for example, gardeners use 1000 cubic yards of mulch each year. When possible, landscapers replace turf around trees with mulch so that regular spraying, trimming, or mowing isn't necessary.

The Parks Department has also undertaken some novel long-term solutions to landscape problems. In several parks, grounds staff have converted turf areas to meadows and other naturalized areas. At Seward Park, for example, several areas are mowed only once every few years to keep invasive blackberries from establishing, and native trees and shrubs have started to establish. This approach creates habitat while reducing water used in irrigation and energy used in mowing. Labor saved is used in other areas of the park or to control invasive plants.

The department is finding that the most important long-term approach for both naturalized and highly maintained landscapes is excellent site preparation. To replant areas dominated by weeds, Parks Department employees cleared the site then put geotextile cloth in place for a year to kill existing weeds. This approach was successful for a shoreline restoration at Green Lake, where reed canarygrass (*Phalaris arundinacea*), morning glory (*Convolvulus arvensis*), and other weedy species dominated. After the tarp was used to kill weeds,

At Seward Park, several areas are mowed only once every few years to keep invasive blackberries from establishing, and native trees and shrubs have started to establish. This approach creates habitat while reducing water used in irrigation and energy used in mowing.

Ongoing weeding has been reduced at the pesticide-free Meridian Park by removing turf around trees and replacing it with heavy mulch. This treatment ends the need for string trimming around trees while maintaining an attractive appearance.

landscapers brought in high-quality soil compatible with native plants as well as compost, installed drip irrigation, and planted native shrubs including sword fern (*Polystichum munitum*), salal (*Gaultheria shallon*), ocean spray (*Holodiscus discolor*), and snowberry (*Symphoricarpos albus*). A local high school helps maintain the site by monitoring plant establishment and weeding. Near Lake Washington, geotextile fabric has been placed on a shoreline site dominated by Japanese knotweed (*Polygonum cuspidatum*) and will stay in place for two years to kill the knotweed before other plants are planted.

At Bradner Gardens, a new pesticide-free park in Seattle's Mt. Baker neighborhood, all of the planning and design was geared toward long-term sustainable maintenance. Raised beds were created for plantings and were separated by crushed rock trails. To keep weeds from growing in the trails, designers used relatively fine (3/8 inch minus) crushed rock, which contains particles that help it compact easily and resist weeds. Four different organizations, including a neighborhood group (Friends of Bradner Gardens), Seattle Tilth, Master Gardeners, and the Seattle Department of Parks and Recreation collaborate on the park's maintenance.

Bradner is one of fourteen parks that have been designated as pesticide-free. These parks are now places that anyone can enjoy without fear of pesticide exposure. Besides providing this benefit to the public, the parks also serve as demonstration projects for the use of techniques to reduce long-term maintenance. In some of these parks, hard borders have been placed around shrub beds, and plant density has been increased. The Parks Department plans to track labor use in these parks to better understand the cost associated with reducing pesticide use.

Golf Courses: A Major Challenge

Managing the city's four golf courses to reduce pesticide use has been one of the city's biggest challenges. In 2001, a total of 893 pounds of pesticides were

used in the golf courses, making up over half the City's total pesticide use. Much of this use comes in the form of fungicides, used to treat Fusarium patch and other fungal diseases on putting greens. To reduce the use of pesticides on golf courses, The Parks Department has piloted the use of a turf-management program designed to optimize turf growing conditions. The program includes the extensive use of soil analysis on organic matter content, available nutrients, and soil chemistry in order to tailor fertilizer applications. The goal of the program is to provide the grass with the healthiest possible growing conditions so that it can withstand the fungal infection. So far, golf superintendents have found that by creating healthy turf, they can reduce the severity of the disease and in many cases avoid treatment. Jackson Park Golf Course in North Seattle has been able to reduce its pesticide applications by 59% using this approach coupled with stringent IPM practices.

Putting Beneficial Insects to Work

The heaviest insecticide use occurs in the City's greenhouses, which include a production greenhouse for parks and the Volunteer Park Conservatory. Greenhouse managers reduced their pesticide use by researching which beneficial insects would control the specific pest problems they were facing, and introducing those insects into the greenhouse. On a larger scale, the Parks Department has released beneficial wasps to control a new pest, the cherry bark tortrix, which can affect a wide range of trees in the rose family by burrowing into the cambium and girdling the tree. With assistance from Washington State University and the U.S. Department of Agriculture, the department is releasing 200,000 native wasps each week around the city. The tiny wasps, the size of a pinhead, lay their eggs in cherry bark tortrix eggs, and the wasp larvae eat the eggs when they hatch.

Pesticide Phaseout

Because Seattle aimed to protect not only people but also water quality and wildlife, the phaseout of the most hazardous pesticides included a relatively comprehensive list of criteria. The City chose to end its use of pesticides linked to human health problems including cancer, hormone disruption, and high acute toxicity, as well as those likely to pollute water because they are mobile or persistent, and those highly toxic to fish, birds, bees, and other wildlife. Once these criteria were applied to the City's pesticide inventory, 40% of insecticides, 61% of

Colman Park is the site of a public-private partnership that has had excellent results. The Starflower Foundation designed, planted, and maintains a number of park features including this island densely planted with native plants.

herbicides, and 78% of fungicides received the highest hazard ranking and were placed into "Tier 1." These products are off limits unless a gardener makes a specific exception request and obtains permission. Tier 2 products are those that pose a moderate hazard, and Tier 3 products are those that pose a low hazard. The City's goal is to continue to reduce the use of Tier 2 products. The initial phaseout of Tier 1 products included herbicides and insecticides, but not fungicides. This means that, unfortunately, fungicides that are linked to serious health and environmental problems are still used on City landscapes. Fungicides were not included primarily because of lack of alternatives for golf courses that were considered sufficiently effective.

Bradner Gardens is a pesticide-free park that proves that beautiful landscapes can be maintained without pesticides. It includes a children's garden, native plant garden, as well as other demonstration gardens.

Keys to Success

Tracy Dieckhoner, who oversees the pesticide use reduction policy for the City, says the key to Seattle's success has been the combination of commitment from grounds staff together with commitment from high-level management. Grounds staff have been trained for nearly a decade on alternatives to pesticides, and in many cases welcomed the challenge to further reduce pesticide use. High-level support from the mayor and the city council gave the program the staff support it needed, including development of a comprehensive data base and creation of a Pesticide Reduction Coordinator position.

In the future, Seattle hopes to continue its pesticide reductions and completely eliminate use of the most-hazardous products. Seattle has seen benefits from its program in providing a safer environment for people and wildlife, in serving as a model for the community, and in making its operations more sustainable. According to Phil Renfrow, the pesticide reduction coordinator, "It's a huge benefit to the bottom line of any management agency to conserve resources." Phil advises other agencies considering how to transition away from pesticide use to focus on designing sustainable landscapes. "Get into the front end of the project development," he said. "That's where tomorrow's landscapes are being developed."

Chapter 3:
Seattle University

The 54-acre campus of Seattle University is located on Capitol Hill in the heart of Seattle. The transition to an IPM program was instigated by James "Ciscoe" Morris roughly halfway through his tenure as manager of grounds and landscaping, which lasted from 1980 to 2002. During that period, the campus served as Ciscoe's laboratory, where he and his staff experimented with various approaches to plant care and pest control. The results are obvious today in the beauty of the campus — which was the first state-designated Wildlife Sanctuary on a college campus — the documented reduction in pesticide use, and the commitment of the landscape staff, which has continued since Ciscoe's departure. Perhaps even more importantly, Ciscoe has inspired thousands of landscapers and amateur gardeners through his entertaining and insightful writing and public appearances. The department is now headed by John Wright, who manages a team of 11 gardeners and assistant gardeners, supplemented by a handful of work-study students.

When wasp and hornet nests are left alone, this sign warns students and faculty.

Mission Statement

The Seattle University Grounds Department mission statement seeks to "maintain the most attractive, safe and environmentally conscious campus in the Pacific Northwest, to continue to be the leader in developing sustainable grounds maintenance practices, to create an original landscape that identifies the university as an inviting, exciting and well-cared-for campus." Upon visiting the campus, it is immediately obvious that the program begins with careful plant selection that emphasizes pest and disease resistant cultivars, native plants, and appropriate plant placement. The statement also stresses research, staff continuing education, and an unusual emphasis on outreach by playing "a key leadership role in outreach through sharing our knowledge and enthusiasm for sustainable gardening practices with members of our whole community — this university, its neighbors and other institutions." Since Ciscoe's departure, the department staff have begun to share more of the responsibility for IPM planning. One of the current needs is to write up detailed procedures for dealing with the range of pest problems that are routinely encountered.

Pesticide Reduction

Prior to implementing the IPM program, the department used an assortment of chemical methods, including

broad-spectrum herbicides, pre-emergence herbicides, various insecticides, and horticultural oils. Today, pesticides are rarely used on the campus. Money that used to be spent on chemicals has been invested in equipment, such as steam weeders, flame weeders, and compost tea brewers.

Improvised mow strip provides a path for the mower wheel, allowing mowing right up to the edge. Photo also shows use of mulch.

Weed control also includes dense plantings, repeated mowing or chopping of horsetail and other difficult weeds, extensive mulching with wood chips supplemented with cardboard or newspaper barriers underneath, and use of vinegar-based herbicides. Considerable numbers of weeds such as horsetail are tolerated or hidden with dense plantings of rock rose *(Cistus)*, rugosa rose *(Rosa rugosa)*, or other perennials. In turf areas, weeds are tolerated to a considerable degree, and control focuses mainly on lawn health. All lawnmowers on campus are mulching mowers. Fertilizing, top dressing, and aeration are performed on a regular basis. Many ornamental beds have paving stones laid as mowing strips to eliminate the need for string trimmers.

Raising insect tolerance levels and educating faculty, staff, and students has reduced the need for treatments. Insect pests have also been reduced by careful plant selection, siting, and maintenance, as well as beneficial-insect releases. This latter approach is being utilized with the cherry bark tortrix (CBT), a new insect pest in western Washington that threatens the campus' extensive cherry trees. Seattle University is working with Washington State University to monitor CBT and test the use of parasitic wasps as a natural control. Stinging insects are tolerated as much as possible, and nests that can be left in place are roped off or identified with signs. If necessary, nests are removed or, rarely, exterminated.

Keys to Success

From a technical perspective, soil building and preventing drought-stress are two keys to success. A great deal of attention is paid to building soil quality. Generous amounts of compost (2 to 3 inches) and wood chips (3 to 4 inches) are used on planting beds. Compost tea is used to improve plant health and prevent disease. A lot of time and money is put into improving irrigation systems to make them more efficient and to monitor moisture levels. Drip systems are used wherever possible.

Gardener Janice Murphy credits "tolerance, persistence, and determination" as critical elements contributing to the success of the program. In addition, ongoing staff education, a willingness to encourage experimentation, and "the support of administrators and faculty and staff and students as well as neighborhood approval" have also been important.

Chapter 4:
Bainbridge Island School District

The residents of Bainbridge Island learned the hard way about how devastating the effects of toxic chemicals can be on children's health. In 1993, during the renovation of an elementary school, the use of a toxic solvent to remove tiles led to widespread illness among the students. Many students and teachers became ill, with symptoms including nosebleeds, rashes, increased asthma, and headache. Some students and teachers are still experiencing some of these symptoms.

Since that time, the Bainbridge Island School District, parents, and community members have made environmental health a priority when designing, building, and maintaining schools and school grounds. In 1994, the Association of Bainbridge Communities asked the school board to provide them with information on pesticide use in the school district, and discovered that pesticides were being used with few protections for children's health or the environment. For example, pesticides were used while children were present. Kären Ahern, a parent, said, "Most parents assume that poisonous things wouldn't be used in schools. There were no rules for less-toxic materials, and no laws related to keeping dangerous pesticides away from children, so we had take action locally to protect our own backyard."

To address this problem, the school district agreed to join the Washington Toxics Coalition's Model Schools Program in 1996. School district administrators, groundskeepers, maintenance staff, parents, and representatives of the Association of Bainbridge Communities, EPA and the Washington Toxics Coalition formed an IPM Committee that worked together to develop an IPM policy. Through a series of regular meetings, the committee agreed on a policy that was adopted by the school board in 1996. The committee also collected information on the most-serious pest problems the district was facing, and researched least-toxic solutions. Throughout the process, the parents and community members involved built community support by informing the media, doing presentations at schools and elsewhere, and publishing newsletter articles.

Making the Transition

One of the first things that grounds staff did was to load up a truck with nearly all of the pesticides in the inventory and dispose of them through the state Department of Agriculture's pesticide disposal program. Since the policy was passed, the district has stepped up its efforts to prevent pest problems, and when they occur it relies almost exclusively on physical methods or least-toxic products. For example, when wasp or yellowjacket nests become problematic, staff remove them manually if it's cool enough that the insects are not active, or they use a mint-oil product. These strategies eliminate the need to use neurotoxic insecticides to kill stinging insects.

To deal with indoor insect problems, the district contracts with a biologically-based company called Extermination Services. They focus on finding the root of the problem and creating long-term

solutions such as blocking entry points. They have also used biological controls as well as least-toxic chemicals, such as using nematodes to address termites and applying a mixture of boric acid and diatomaceous earth to control carpenter ants. The use of these products prevents students from being exposed to hazardous insecticides used inside the schools.

Protecting Streams and Salmon

Bainbridge's first pesticide-free school was Woodward Middle School, which was designated pesticide-free when it was built because of its proximity to a salmon stream that bears coho. The biggest challenge that grounds staff have faced at Woodward is maintaining the track, which tends to develop weeds when the track isn't used heavily enough to prevent them. To address this problem, the district purchased new equipment that uproots the weeds without the use of pesticides.

Turf and other outdoor areas at Woodward Middle School are maintained without pesticides to protect a nearby salmon stream.

Stubborn Challenges

The ongoing challenge for grounds staff is to maintain school grounds in an aesthetically appealing condition with limited resources for manual labor. The staff is working toward a long-term solution that includes using native plantings and making sure new landscapes are designed with an eye toward reduced maintenance need. At Sakai Elementary School, a new school that is also pesticide-free because it is near a salmon stream, high-maintenance areas such as thinly planted shrub beds were minimized.

Sustaining Over the Long Term

Jack Evans, the district's maintenance foreman, cites community support as the number-one reason that their program has been successful over the long term. "When word got out on what we were doing, there was more support from the community than most people had imagined," he said. He also advises other districts not to try to make the switch without help, but to use organizations like the Toxics Coalition and resources within the community to develop a committee. Today, the district's IPM committee continues to meet to serve as a forum for identifying problems and developing long-term solutions so that the district will be able to maintain its policy of very low pesticide use over the long haul.

Chapter 5:
Leavenworth Knapweed Control Program

Many counties throughout the state of Washington struggle to control noxious weeds along roadsides and on other public lands. When noxious weeds spread, they can rapidly displace native plant species that provide habitat for wildlife and food for people and livestock. In the town of Leavenworth, a volunteer hand pulling program for the past six years has alleviated some major problems with a common noxious weed called diffuse knapweed (*Centaurea diffusa*). With the help of inmates from the Chelan County Jail, the volunteer program has grown to serve many areas throughout Chelan County, helping to restore native plant species and natural habitat for birds and animals. The hands-on approach of this program is a great example of a simple and successful IPM program that is managed and run by volunteers and concerned citizens.

The 10-Foot Rule

The town of Leavenworth lies at the base of the spectacular Icicle Canyon, just east of the Cascade crest in the north-central Cascades. The town and surrounding areas bring in more than 1,000,000 visitors per year, and the local waterways provide important habitat for endangered salmon. Knapweed is a fearsome weed in its ability to spread quickly along roadsides by lodging in car tires and clinging to hikers' backpacks and equipment, making it a severe threat to places with the amount of traffic common to Leavenworth.

In 1996, the U.S. Forest Service decided to attempt eradication of knapweed in Icicle Canyon by spraying herbicides ten feet on either side of the roadside, creating a buffer so that the weed seeds would not enter the roadway and be transported by tires. However, concerned citizens and organizations argued that there had to be a better, less-toxic approach to taking care of the problem, one that would not kill all of the other species growing along the roadsides. With this in mind, French teacher turned forest activist Pat Rasmussen solicited the support of Leavenworth Audubon Adopt-a-Forest and began a volunteer-based IPM program to combat knapweed through hand pulling and native plant restoration.

Hand pulling, together with restoration with native plants, are at the core of the successful knapweed control program. Here, Pat Rasmussen pulls toadflax, another noxious weed.

The Plan

As Pat began to develop a hands-on IPM approach to combating knapweed, she took what is called a stronghold approach. The group focused on eliminating knapweed in specific areas as a pilot project to see if their ideas would work, establishing strongholds of success. Eventually, this approach allowed Pat and her volunteers to connect the stronghold areas

to make one large area that is successfully controlled. Pat also knew that they would learn many tips along the way that would help the overall effort.

The Doubt

From the start, this program faced a considerable amount of opposition and resistance from the Forest Service, which felt the spraying of herbicides would be the easiest and fastest way to approach the problem. Federal officials also doubted the level of commitment that Pat and her crew could give to the project in the long term.

Because of this lack of support from the Forest Service, Pat was vigilant to prevent sprays and ensure that no rules related to sprays were violated. On one memorable afternoon, Pat walked along a roadside stretch that was scheduled to be sprayed earlier in the day but had been spared, and she saw a tiny frog on the tip of a knapweed plant. Pat understood then more than ever why she was devoting her life to this cause. She felt even better about the incredible amount of work that she and her crew were doing, because of saving the life of that tiny forest frog.

Community Support

In the beginning, Pat motivated groups and individuals to adopt half-mile stretches of the roadside that led into Icicle Canyon. These groups became responsible for hand pulling all of the knapweed in their stretch. In especially infested areas and the larger car turnouts, the first step was mowing to weaken the plants, followed by regularly scheduled hand pulling sessions. As the project progressed, the groups learned more about the life cycle of the weed, as well as the native species and landscape that surrounded their homes. Volunteers are now spending time saving seeds of native plants for use in the areas that they have pulled, learning about life-cycles of other noxious weeds in the area, and learning how to plant cover crops.

Local newspapers and radio stations played a large part in promoting the program and enlisting the support of the community, which continues to be strong. This year, the employees at Key Bank will donate an entire workday to planting native species in a pulled area. This help comes through the Make A Difference Day program, through which businesses donate time and energy to a worthy cause. In this case, Pat has received a $2,000 donation of plants and will use the 17 employees of Key Bank to install them.

Inmate Involvement

When Pat first began the IPM program through the half-mile adoption program, one group was able to bring in a crew of 4-6 inmates from the Chelan County Jail and have them work for the entire day. Pat immediately saw this as an incredible resource for her project, and found out what she needed to do to be able to supervise her own crew. Pat now counts on a crew of 4-6 inmates three days a week, and sometimes in the evenings for about three hours. Pat completed a training that allowed her to be solely in charge of a crew of inmates for the course of a workday. In the time that the group is in her care, Pat feeds them healthy and hearty food, and makes an effort to make their time as worthwhile for them as it is for the project.

Pat has had incredible success with the County Jail program, and inmates now scramble to be on her team. Many have made comments during interviews explaining that they now have a greater appreciation for nature, and a better understanding of the importance of restoration. Alonso, one of the hand pullers, said "I feel like I am doing good for my fellow man. I thank Pat for showing me all this and thank Karen for cooking for us." Another hand puller, John Henry, is more explicit. "By pulling the knapweed we avoid herbicides that won't end up in up in the river to harm the salmon, so that the orca whales will have a better life. It's peaceful out here and by doing this I'm making things better for myself and everyone else."

The Budget

In 2002, the cost of the program was about $12,800, much of which was obtained via in-kind donations. Local restaurants have willingly donated delicious food for the inmate crew, while other donors have given money for supplies and gas. As the hand pulling areas have expanded to cover more public areas, business owners have donated water to maintain the new native plantings.

Successful Expansion

After six years of hard work, the knapweed problem in the Icicle Canyon is so controlled that activity is now limited to careful monitoring and well-timed hand pulling sessions. this success has spurred other efforts in the county. Pat and her team have moved on to do work on county roads; a high profile stretch of the Hi-Line Canal through Wenatchee; an 11-mile loop trail along the Columbia River in Wenatchee; along the watershed in Tumwater Canyon and Blewett Pass; and on a private 22,000-acre ranch called Hay Canyon Ranch. The Public Utility District, which manages the loop trail and other lands, has now established a three-year pilot program to document the recovery of natural ecosystems through hand pulling. The owners of Hay Canyon Ranch have also signed a three-year agreement with the hand pulling team, in which they document their time and experience in restoring natural habitat on that specific piece of land.

The success of the Leavenworth knapweed control program depends on community involvement, including from inmates at the Chelan County Jail.

Conclusion

What began as a small volunteer project in the small town of Leavenworth has evolved to become a very successful and ambitious IPM program to eradicate noxious weeds from natural places and restore native communities in Chelan County. As Pat often says, "Nature was doing a fine job of controlling knapweed, and we should just let that work to our advantage." Perseverance has been the ultimate key to success, as well as strong community involvement and support.

Chapter 6:
All-Organic Port of Seattle

Since 1998, the waterfront properties, parks, bike trails, greenbelts and habitat restoration sites that make up the Port of Seattle have all been maintained using organic methods. This might seem surprising because seaports are generally highly toxic, chemical-laden areas, reeking of oil and the exhaust of commercial spaces. Craig Chatburn, head of the landscape department at the Port, has simply adopted a different philosophy that looks at landscapes as opportunities to benefit the public and the environment. This requires that other factors be taken into consideration along with traditional landscape aesthetics, such as increasing water conservation and wildlife habitat, and eliminating the use of toxic pesticides and synthetic fertilizers.

> "We do not miss using pesticides, and none of our landscapers would go back to using them."
>
> *–Craig Chatburn*
> *Head of Landscape Department*
> *Port of Seattle*

The Hard Sell

When Craig made the decision to switch from a chemically dependent program at the Port to an all-organic one, he was met with some resistance and doubt from his staff. His team of landscapers had spent their careers depending on chemicals to solve their problems. Many of the experienced members of the landscape crew were skeptical that the new mechanical and cultural means to solve pest, weed and disease problems would be successful. Through the success of the program over time, however, the group has come to fully support the organic approach. The crew now regularly attends the annual Green Gardening seminar, which offers alternatives to pesticides for professional landscapers, as well as courses offered through the University of Washington's ProHort program.

The Big Switch

To implement the organic approach, Craig put together a plan based on information obtained from Seattle Tilth and the Soil Food Web on alternatives to pesticides and then began to educate his crew. They took things slowly and tried the new practices on smaller park areas to prove that there was no noticeable change in the quality of appearance of the landscapes and no added cost. After this test period, they made the commitment to eliminate all toxic pesticides and synthetic fertilizers in the 70-plus acres that they maintain, using only least-toxic pesticides such as insecticidal soap.

The Way it Works

The landscapers at the Port have become more knowledgeable in identifying pest or disease problems and in using this information to indicate the changes that can be made to avoid the problem in the future. This also means that new plantings are done with drought tolerant, disease-resistant exotic species and native plants, with the goal of Craig and his staff being that ultimately all plantings will be made up of at least 70% native plants. The Port crew suppresses weeds

with a thick layer of coarse wood-chip mulch, obtained from chipping woody material from the trees on the Port and park landscapes. In using this mulching method, the crew aims to simulate the ecosystem of the forest floor, insulating the soil and increasing organic matter. The focus is more on controlling weeds than on eradicating them, making for a far more realistic form of maintenance.

Money Matters

While the Port of Seattle has eliminated all pesticide use, the cost of labor has stayed the same. All of the changes that had to be made to accommodate the new organic methods were done within the operating budget. For the calendar years of 2000 and 2001, zero dollars were spent on pesticides or pesticide use. In the beginning, all unopened pesticides were returned to the distributor and the money was used to buy needed equipment.

The Port crew is currently conducting experiments to make use of other resources that are already on site, including grass and weed clippings, as well as sediment picked up in sweeping of the storm drains. The crew hopes that some of these projects might help to make the port even more IPM focused and environmentally sound.

The Real Reason

When asked what suggestions he could make for other groups or landscapes that were considering the organic option, Craig stated that going 100% at the very beginning is the only way to go, despite its challenges. He states, "we do not miss using pesticides, and none of our landscapers would go back to using them."

Smart design means easier maintenance in the long term: Port shrub beds are designed with a high percentage of native and pest-resistant plants, and planted densely to crowd out weeds.

While Craig was well supported by the public and Port officials, he worked hard to get his crew behind the rigid 100% organic policy. By being proactive in being completely organic, the program eliminates any gray areas, and promotes alternative strategies as the only option. This is important in a landscape like a city port, in that both industry and the public can see the success of the program.

Chapter 7:
Woodland Park Zoo

The Woodland Park Zoo, perched on a hillside between the neighborhoods of Fremont and Wallingford in Seattle, is well known for its large, natural exhibits. The zoo also deserves recognition, however, for its healthy and innovative landscaping practices: for many years now, the 92 acres of the Zoo landscapes have been virtually pesticide free. Today, the zoo staff is a leader in developing and applying new solutions in managing challenging landscapes.

No pesticides are used in the Woodland Park greenhouse, which supplies plants for the zoo's landscapes. Here greenhouse manager Allen Howard shows some of the plants in the greenhouse.

Commitment to Safer Pest Management

Some very strict rules set the standards for landscapes at the zoo. To ensure the health of zoo animals, absolutely no pesticides and only veterinary-approved synthetic fertilizers are used in the any of the indoor or outdoor exhibits. The landscapers use a philosophy of "plant health care," putting plant needs and care first and foremost, and then using cultural, biological and mechanical IPM methods to control pests. Beyond this, the landscapers try to anticipate problems and stop them before they start: preventive methods include a vigorous mulching program to suppress weeds, a conscious effort to grow the right plants in the right place, and smart landscape design that considers use patterns to avoid problems.

Compost tea plays a large part in zoo maintenance. Landscapers use regular applications in exhibits and greenhouses to prevent disease and improve soil fertility. The staff is able to produce a viable batch of tea in 24 hours by slightly tweaking the normal recipe and timing schedule for a standard Soil Soup brewer. They start the temperature of the water at 85 degrees in the morning, and they use 8 pounds of compost to make up the ideal brew. Two tea bags containing 2 pounds of compost each are placed at the bottom of the brewer, and two on either side, allowing for a well-distributed nutrient release. The zoo staff has also found that by using a different type of tea bag (larger mesh sacks found at hardware stores), they can get more air and water circulation, thus allowing them to produce faster and better tea.

Minimal, carefully timed, sprayings of RoundUp are conducted in very specific places like the Rose Garden, which is part of the Park, but is outside of the actual zoo area. E. J. Hook, the new landscape manager, and his 18 staff members are eager to adopt policies that would eliminate all use of chemicals from the zoo landscapes, as well as to develop written IPM plans. As anyone can see here, it is

ironic that the areas set aside for animals are toxic-free, but areas where people go still contain some chemicals. As E. J. says, "I'm an animal too!"

The Biggest Issues

The zoo is a very large space with many delicate landscapes and unusual inhabitants that require careful attention. Besides managing the interior of the exhibits, landscapers face the challenge of the incredible amount of human traffic that flows through the grounds on a regular basis. Frequently, these factors create some substantial aesthetic and physical challenges for the landscape crew, including dealing with rodents, stinging insects, powdery mildew and other plant diseases, as well as weeds in high-traffic turf areas. Sometimes the landscapers are asked to fast-track installation of an animal exhibit, forcing them to be creative in their IPM tactics.

Rodents and Stinging Insects

Rodents are a constant issue with open food containers in animal exhibits. The zoo prevents rodent problems with physical barriers to keep rodents from food and water sources and out of buildings, along with constant monitoring of troublesome areas. Stinging insects are dealt with on a priority basis, where nests or infested areas that are a direct threat to the public are often sprayed with a low-toxicity pesticide, while nests that are far enough from public areas are left alone.

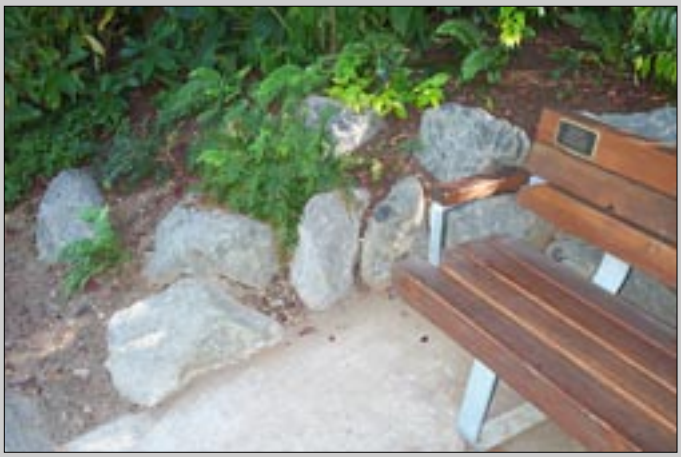
Powdery Mildew and other Plant Diseases

Powdery mildew is the largest plant-care issue that plagues the zoo. For the most part, landscapers prevent mildew using regular compost tea applications, as well as with the efforts of the grounds crew to always put plants in the places where they will be the most successful. Inside the greenhouse and in any of the animal enclosures, plant diseases are dealt with using careful monitoring and a risk-benefit analysis that considers the importance to the overall exhibit and the likelihood that the disease might infect other plants. Under the motto of "eliminate the battle rather than fight it," landscapers will remove and dispose of a plant if no least-toxic method can alleviate the problem.

E. J. Hook explains how substituting a more porous "sock" to hold the compost speeds up the brewing of compost tea. The brewer is shown at the right of the photo.

Greenhouses

One of the Zoo's most remarkable successes is the near-elimination of pesticides from its greenhouses. The Zoo has been able to accomplish this through careful monitoring combined with least-toxic techniques when a problem develops. For example, staff have found that since plants can withstand water immersion longer than insects can, immersing plants in water for twenty minutes is an effective mea-



By installing the rocks first and then pouring concrete right up to the edge, E. J. Hook eliminated a common weed problem.

sure for insect control. The staff has also stopped preventive pesticide applications that were made in the past, finding them unnecessary for successful pest management.

Weeds

A long list of mechanical, cultural, and physical controls are used to manage weeds at the Woodland Park Zoo. Some examples include thickly planted beds, a rigorous mulching program, planting the right plants in the right place, smart watering, developing and maintaining healthy soil, removal of flower and seed heads, and mowing turf to the correct height at the right times.

The key to the successful IPM program at the Woodland Park Zoo is a well-trained, highly motivated and caring staff, as well the support of the community and conservation-oriented groups.

High-Traffic Turf Areas

Every summer, the zoo hosts a summer concert series called Zoo Tunes, which takes place on a large lawn area at the Park. During these events, there is high foot traffic of 3000-6000 people on the lawn, as well as vehicle traffic. Amazingly, E. J. and his team are able to maintain this turf in excellent condition with a care regime that inlcudes spring and fall aerating, overseeding, and top dressing with compost. During the summer, watering is done around a busy events schedule and for a program called "visitor enrichment," when the sprinklers are turned on in small areas to cool off the crowd. Some weeds and imperfect patches are accepted in turf areas, highlighting the fact that there are no chemicals used and that the space is safe for all living creatures.

Roaring Success

The key to the successful IPM program at the Woodland Park Zoo is a well-trained, highly motivated and caring staff, as well the support of the community and conservation-oriented groups. In addition, E. J. and his landscape crew are never afraid to try new things and potentially make mistakes. To any group or organization that is thinking about moving toward an IPM program, E. J. and his crew suggest that they use open-minded thinking to tackle all problems and issues. This mindset includes a willingness to try new things, and to research new ideas that might help solve pest problems.

Chapter 8:
Carl Sandburg Elementary School

All too often, the places where children go to play and learn are riddled with chemicals, from pressure-treated wood to the lush grass that pads them as they tumble through parks and school playgrounds. Children don't seem to notice weeds in turf, or weather stains on their play structures. So why are we exposing their developing bodies to some of the most-toxic substances? At Carl Sandburg Elementary School in the Lake Washington School District, one parent asked herself this same question when she heard that toxic pesticides were used on school grounds. Jill Albinger found out that the district had sprayed 60 gallons of herbicides at her son's school in July of 1999, a few short months before students returned from summer vacation. She decided that she was going to start a project to protect her son and his friends from this type of exposure, thus beginning a very simple and successful herbicide-free program at Carl Sandburg.

New School Rules

Jill began her quest to find an alternative to the herbicides at Carl Sandburg by proposing an arrangement that would give her primary responsibility for grounds keeping, with the help of volunteers and work parties. The principal and assistant superintendent agreed to let Jill try it for one year on the condition that she maintain the landscape to the standards that were already in place. Jill felt confident that with the help of volunteers, she could not only maintain the grounds to existing standards but also make Carl Sandburg a model for schools everywhere.

Through site assessments, the help of professional landscaper and Sandburg parent E. J. Hook (see Chapter 7: Woodland Park Zoo), and input from the Washington Toxics Coalition, they were able to develop a successful program. They started by establishing a maintenance and improvement plan to eliminate the need for any herbicide treatment in the future and to reduce the amount of staff time needed to control the problem.

At Carl Sandburg Elementary, parents and community members took over groundskeeping. They have abandoned herbicides and instead use corn gluten, heavy mulching, and flame weeding to keep weeds under control.

Examples of tactics used at Sandburg include hand pulling, flame weeding, mulching, cementing weed-laden cracks in the hard surfaces (see photo on next page), and raising fence lines. All of these tactics proved extremely successful for future maintenance, as hand-pulling can be done by individual volunteers at

Weeds that grow in sidewalk cracks are often treated with herbicides because they are tough to tackle with manual controls. Here, cracks that were filled in have been maintenance-free for three years.

their convenience, or in large organized groups during work parties. Flame weeding works well as a maintenance tool for hard-to-reach areas on the edges of portable classrooms, in sidewalk cracks and in gravel areas.

Mulching has been a primary tool for shrub beds. The mulching process at Carl Sandburg was systematic and successful in that areas were weeded, then treated with corn gluten to prevent weed germination, and then covered with a dense layer of wood chip mulch. This has made these beds and plantings easy to maintain and aesthetically pleasing.

Another trouble spot — fence lines — were addressed with a creative solution. Fence lines are always difficult to manage when weeds become strongly tangled in the links from the bottom. By raising the fence just a few inches off the ground, they have made it much easier to control weeds using a string trimmer. Finally, the perennial problem of weeds in sidewalk cracks was addressed with the long-term solution of sealing sidewalk cracks and seams to prevent the establishment of weeds.

Jill and the volunteers also worked to maintain a butterfly garden where they planted densely to suppress weeds and to encourage beneficial insects. This garden is managed by students during the year, and is used as a teaching tool by the staff.

Difficult Classes

The main challenges in this project were recruiting volunteers and getting support from the school staff and parents. Jill had high hopes that the school administration and her fellow parents would be a great help in making the project a success, but this aspect proved more difficult than she had anticipated. While the school administration supported her efforts, they did not promote and expand the program to other schools. In addition, the school still uses pesticides to deal with indoor pests when a problem arises. Jill is still working to expand this herbicide-free program to the entire district, but the district has not yet adopted the practices on a district-wide basis. And while most parents supported her efforts, it is difficult to

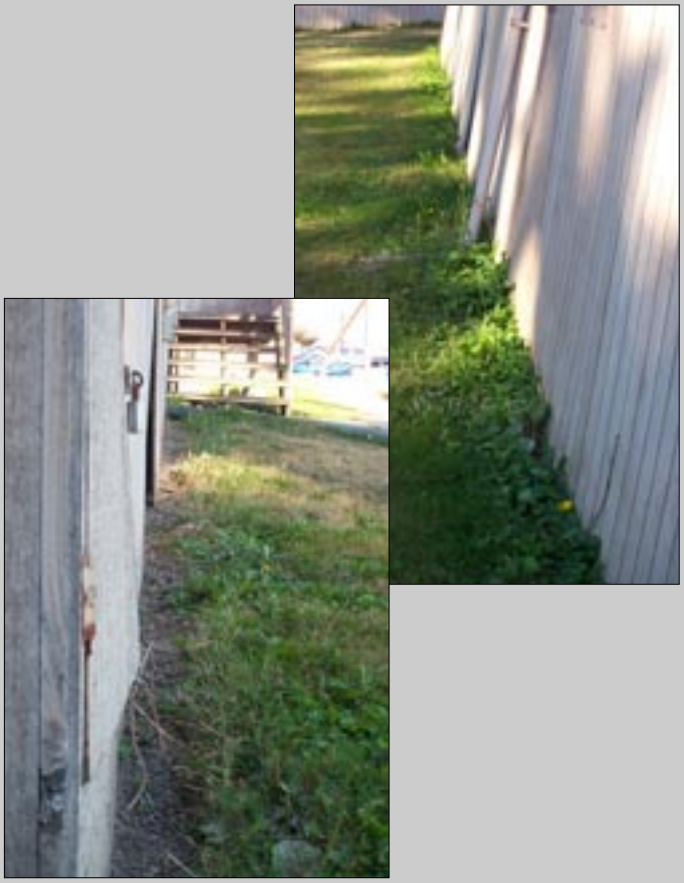
maintain an all-volunteer effort on a long-term basis. E. J., who now has a child attending classes at the school, is hopeful that district staff will take over more maintenance responsibilities at the school, such as filling in cracks in sidewalks and pavement to prevent weeds.

Accounting

In the beginning, the school agreed to give the herbicide-free project $165 dollars, which was approximately the amount the district spent in the past to purchase herbicides and to pay for the labor to spray. In addition, Jill received funds from the school district and from the PTA groups of both the elementary and the middle schools. Jill used the start-up money to buy the flame weeder, the propane needed to operate the machine and a pre-emergent, corn-gluten product to suppress weeds in beds and below mulched areas. Now the program is virtually sustainable so that Jill and E. J. need only minimal funds to purchase corn gluten, tools for volunteers, and propane for the flame weeder. Overall, the herbicide-free project was simple and inexpensive to introduce, and is now almost free to maintain, making it an asset to the school, and, most importantly, to the students.

Graduation Goals and Continuing Education

Now that the herbicide-free program at Carl Sandburg Elementary School is a permanent part of the maintenance procedures, Jill can easily make some suggestions to other schools that are considering adopting IPM programs. The most important of these suggestions is to do research and get training from people who know what they are doing before jumping in. At Carl Sandburg, Jill feels that she would have struggled more without the help of the Washington Toxics Coalition and E. J.'s professional advice. However, there is ample documentation available about other schools and entire districts that have extremely successful, well-established IPM programs that can serve as excellent models for groups that might be thinking about making a switch. The IPM program at Carl Sandburg is an example of a simple, yet effective, project that is managed with almost no cost and makes the school grounds much safer for children.



Controlling weeds that grow alongside portable buildings (top photo) has been a major challenge at Carl Sandburg. Along some portables, a girl scout troup did a thorough initial handweeding (results shown in bottom photo) that has allowed for control with a flame weeder ever since.

Chapter 9:

Jefferson County's Roadside Vegetation Program

Managing vegetation along roadsides is a task faced by every county in Washington. While most counties rely on regular herbicide sprays to manage roadside vegetation, more and more counties are successfully managing roadsides without the use of herbicides. Jefferson County has set a very strong example by managing their roadside vegetation without chemicals for 23 years. Jefferson County has been extremely thorough in researching and implementing the most appropriate techniques to replace herbicides. All the hard work has paid off over the years, making Jefferson's program an excellent model for counties throughout the state.

Brushing machines are used to control woody plants, such as the alder that has been leveled here. The machine takes the tree down in the first pass and mulches it in the second.

The "No Spray" Program

In the late 1970's, many Jefferson County residents became concerned about the hazards of herbicides for humans and aquatic life. Community groups asked the county commissioners to investigate the use of alternatives to pesticides. As a result, a moratorium was put in place, and the county commissioners asked the road maintenance division to develop a plan to manage roadsides without herbicides. Based on this request, the crew accepted the challenge and began a two-year transition that resulted in a mechanical weed-management program that is still going strong today.

The Science of the Road

The Jefferson County road crew maintains approximately 400 miles of roads within the county, which equates to about 800 miles of shoulders. The responsibilities of the crew include pavement-crack sealing, road-shoulder maintenance, roadway sweeping, culvert cleaning and repair, storm-drain systems maintenance, slope repair, litter pickup, control of vegetation, bridge-deck repair, and snow and ice control.

Most of Jefferson County has high rainfall, creating an ideal ecosystem for woody trees and shrubs. In the drier regions, annual broadleaf weeds pose an additional challenge. Before the no-spray program was created, the county performed yearly sprayings along the roadsides. Today, the county uses no herbicides at all, but instead employs an aggressive mechanical program based on a vegetation study done by Dr. Roger del Moral of the University of Washington's Department of Botany. This study, conducted in 1979, was

conducted to identify plant communities with the low-growing, spreading characteristics that are the most desirable for low maintenance, and to find ways to encourage their survival through continued mowing and other mechanical controls.

Dr. del Moral found that the most common problem plants were common horsetail (*Equisetum arvense),* Douglas-fir (*Pseudotsuga menziesii)* red alder (*Alnus rubra*), and salmonberry (*Rubus spectabilis).* To address the problems, the report outlined a non-chemical approach to control based on manipulation of natural plant succession. The goal of this manipulation was to keep plants at the successional stage that would provide for relatively easy roadside maintenance and road safety. Thus, Jefferson County adopted a strategy that replaced routine herbicide spraying with selective actions based on extensive knowledge of the ecology of common species.

Success Today

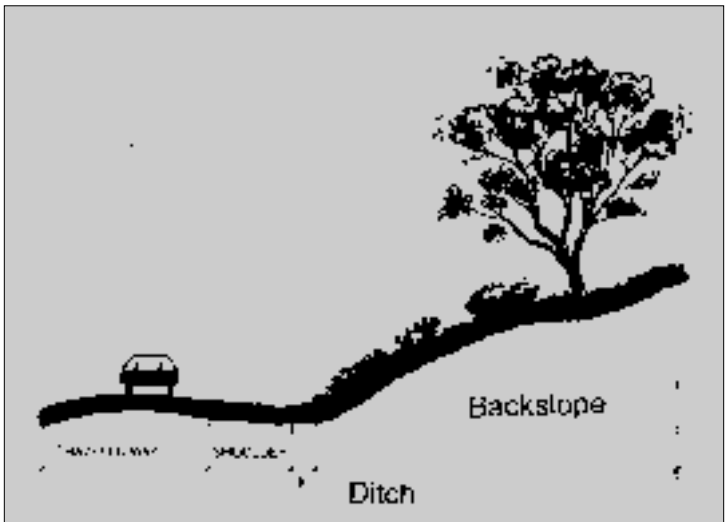
The primary goal suggested by Dr. del Moral was to produce relatively stable plant communities that require little maintenance and possess other desirable traits. The roadside program elaborated upon this general philosophy to establish the following goals:

1. To economically insure the efficient and safe operation of roads;
2. To produce naturalized vegetation on the right-of-way that is self-sustaining and which blends into the surrounding vegetation;
3. To control erosion from slopes and cutbanks;
4. To produce an aesthetically pleasing right-of-way;
5. To provide cover for desirable species of wildlife; and
6. To reduce the opportunities for the migration and distribution of undesirable weeds.

Jeff Ackerman, lead mower operator, shows off one of the mowers that are the backbone of Jefferson County's no-pesticide roadside vegetation management.

To achieve these goals, the road crew uses a number of different methods. Machine mowing is a key tool to control grasses, broadleaf weeds, and immature woody vegetation. The mowing height is set at six to eight inches to favor plants such as salal (*Gaultheria shallon*) and Oregon grape (*Berberis nervosa*), which have a low-growing growth habit that allows good visibility while keeping out weeds. The road crew generally mows from April to September, skipping sections where desirable low-growing native vegetation already dominates.

The mowers are often followed by mechanical brooms, which in addition to cleaning the pavement can remove soil and vegetation at the edge of the pavement and thus allow for better water



This figure illustrates road maintenance zones along a highway.

Illustration courtesy of CA Dept. of Transportation

drainage. Machine brush cutting is conducted approximately annually where woody plants need to be controlled to maintain visibility along the roadsides. Other techniques include manual control of weeds, tree trimming with a pneumatic saw, periodic grading of roadside shoulders, annual clearing of ditches, and hydroseeding grasses and wildflowers in bare and disturbed soils to discourage the establishment of problem vegetation, prevent erosion, and add to the aesthetics of the roadside.

All of the above methods require an alternative base of knowledge for the crew to match the philosophy of the program. This has given the machine operators an added degree of respect for the precision and care that they employ in using IPM methods.

Crew members are also encouraged to continue to develop non-chemical methods to control any new problem that might develop.

Future Plans

Ultimately, the IPM program for vegetation management along roadsides in Jefferson County took a long time to evolve to what it is today, but it is an incredibly inspiring and encouraging model for other counties and jurisdictions. Aubrey Palmer, Operations Manager for the Maintenance Division, sums it all up: "It took a major change of an ingrained mindset for our maintenance crews to initiate and support a non-chemical vegetation-management program. However, we consider it to be extremely successful. Vegetation control without chemicals is doable."

Jefferson County's program aims to promote low-growing, native vegetation that outcompetes weeds. Here, Oregon grape and the native rhododendron will be skipped by the mower.

Chapter 10:
The Good Shepherd Gardener

The Good Shepherd Center, with its 11 acres of grounds, is a refuge for residents of the busy urban Wallingford District in Seattle. The building houses a school, senior center, artists' residences, and many non-profit organizations. It is surrounded by a park with play and picnic areas, Seattle Tilth's organic demonstration garden and children's garden, and extensive organic lawns and gardens. The building's grounds serve as an important demonstration of the value of healthy soil and plant diversity in maintaining a beautiful and healthy pesticide-free landscape.

The Center was built in 1906 by the Sisters of the Good Shepherd to provide a residence for the housing, education, and training of young women in need. The grounds through this period consisted of an orchard and minimal conventional landscape plantings. Today, the building is owned by Historic Seattle Preservation and Development Authority and is used as a multi-purpose community center. The building is on the national register of historic places and in 1984 it gained official City of Seattle Landmark status.

Good Shepherd as Gardening Center

In the spring of 1978, Seattle Tilth established a demonstration garden and education center for organic gardening at the Good Shepherd Center annex. This organization drew creative and innovative gardeners from around the city to participate in a new vision of how to create sustainable agriculture and landscapes. One of these gardeners was Gil Schieber, who was president of Tilth in 1985-86.

Gil was hired as the Good Shepherd's groundskeeper in 1985. His background in horticulture as well as in commercial agriculture gave him the experience to implement a plan of sustainability. He brought the focus of the organic gardening ethic to the total maintenance of the Good Shepherd Center's grounds.

The plant collection is extensive and diverse, including some 500 species that thrive with minimum water and no pesticides.

Gil aimed to give the grounds a residential welcoming feel to match the building's philosophy of public engagement. Taking ideas from his travels in Europe, Chile, and Japan, he has tried to create "room areas" in the garden. The garden explorer may find a sunny bed filled with the deep red of raspberries leaning over brightly colored perennial flowers in one "room" only to round a corner and find a shade garden of quiet green respite behind an old brick wall traced with vines. Schieber has tried to recreate the "controlled wildness" he discovered in the pine and bamboo

gardens of Japan and in his favorite British public gardens.

Diversity in the Garden

The top priorities that allow for chemical-free, low-maintenance landscape management at the Good Shepherd Center are: developing good soil full of organic matter that fosters diverse living organisms; reducing lawn areas by increasing perennial beds; putting the right plant in the right place; using plants with low water needs; and increasing diversity of plant species that in turn encourage more diversity (such as beneficial insects, fungi, soil microbes, etc.).

The Good Shepherd Center grounds have many fine old trees. All leaves are gathered and used as mulch.

Before Gil took over groundskeeping, the Good Shepherd Center had not established a fully developed landscape to compliment the beautiful building. The minimal traditional landscape features installed by the nuns were still in place. In total, Gil estimates the property had 15-20 species of standard landscape plantings that were the substance of the building's landscape design.

Since 1985, Gil has tried out more than 1,500 different species of landscape and edible plants. Today about 500 species are maintained on the grounds. Through trial and error he has found the plants that work with no (or low) water, and no pesticide or fertilizer use.

The goal for the landscape has been garden diversity not only of plant species but of micro-organisms and insect species as well. To this end, for ten years 25-30 cubic yards of compost and manure were applied each year. In the late 1980s and early 1990s one could see 50-foot-long elaborately constructed odor-free compost piles lining unobtrusive edges of the grounds. Carl Elliot (currently KUOW's radio gardener), who worked as assistant groundskeeper during this time, created these piles using expertise gained from his university training in ecological agriculture.

For the Public: Combining Edible and Ornamental Landscapes

Another high priority for Gil was to grow food for the human and animal residents of the city. Although he does not intentionally follow permaculture, the result has been so good an example of permaculture that permaculture classes regularly use the garden as a teaching tool. Some of the edible plants one finds scattered throughout the ground's ornamental garden beds are: several species of serviceberry, several types of raspberries, strawberries, boysenberries, wineberries, numerous apple species, Asian pears, European pears, kiwis, hazelnuts, table and wine grapes, kale, parsley, and various herbs. Browsing in the garden is encouraged and is a good way to move from "room" to "room" and get to know the garden.

With great plant diversity on the grounds, plant identification classes also regularly visit the garden. Some of the plant species to be identified are a challenge to the professor as well as the student. Gil says he identifies some plants only by the public garden the cuttings or seeds came from rather than by the Latin name (e.g. *Amelanchier sissinghurst* after British Sissinghurst Gardens).

Professional and amateur photographers can often be found staging shots for catalogues or family portraits along the picturesque cobblestone paths overflowing with a wide diversity of foliage colors, textures, and shapes. Numerous butterflies feeding on bright colored flowers and birds foraging for seeds and insects are an additional attraction.

Landscape Management for a Sustainable Natural Cycle

In established garden beds Gil no longer continually applies compost. Rather, he uses the bed's own plant litter as a sort of natural compost. By chopping stems and woodier material into small pieces and leaving behind leaf, flower, and seedheads to coat the ground, he has tried to imitate nature. The goal is to establish good soil health and permanent plant cover so that the bed can reach its own sustainable cycle.

In 1985, the remaining orchard on the east side of the building was removed to create the existing parking lot. The construction of the lot compacted what was left of the remaining already poor glacial till soils in terrible condition. That first year, Gil planted potatoes, clover, and rye as cover crops in heavily composted new beds in an attempt to enrich and loosen the soil. Today, the parking lot beds are a dense stand of ornamental and food grasses and perennial flowers, partially shaded by gnarled old orchard trees or the vigorous vines of sweet table grapes climbing the electrical utility poles. With the shade of the deciduous trees and dense understory plantings (as well as the "right" drought tolerant plants), the beds thrive without irrigation. Another benefit is that dense plantings need little weeding. These beds make even the parking lot a place to enjoy the feel of nature and browse at the same time.

Conclusion

Today the Good Shepherd Center is a fine example of what can be done with a public garden when there is commitment to creative, sustainable management practices that use what works best for both people and the environment. This vision has created a garden that combines the sustainability of organic gardening with the urban population's need for natural green spaces. The grounds reflect the mission of the Good Shepherd Center itself, which is to foster community building and citizen involvement. The result is an evolving, diverse landscape that encourages intimate human-nature interaction. It has become a different sort of place since the Sisters of the Good Shepherd left, but it remains a sanctuary in this busy urban setting.

Gil Schieber, the Good Shepherd gardener and its closest observer, states, "The garden's constantly changing landscape over many years has been an ongoing education in how nature works. My goal has been to approach nature's balance."

Recommendations

These case studies show that buildings and landscapes can be successfully managed without hazardous pesticides. Moreover, they provide excellent models for all cities, counties, school districts, and other institutions that would like to reduce pesticide use and adopt safer alternatives.

For Schools, Cities, and other Public Institutions

To any jurisdiction that is considering a program to reduce pesticide use, we recommend the following.

1. Start with a strong policy. The best programs are grounded in clear policy that puts forward the principle of making health and the environment priorities, and sets clear guidelines for pesticide reduction and elimination.

Policies should have the following elements:

- Eliminate the use of the most-hazardous pesticides, including those linked to cancer, nervous system harm, and other health problems, as well as those that cause water pollution or harm fish and wildlife.
- Use least-toxic pesticides as a last resort, and never for solely aesthetic purposes.
- Track pesticide use, report it to the public, and provide notification in advance of pesticide applications.

2. Devote resources to make the program successful. An early investment in strong coordination of a program and staff training has excellent long-term payoffs. Using alternatives to pesticides often necessitates a deeper understanding of how to create a healthy landscape and how to address specific problems when they occur. Designating funds during the transition period to develop guidelines and to train staff will have benefits for many years to come.

3. Notify and involve the public. For public institutions, it is the community that provides the support necessary for pesticide reduction to be successful. Institutions can maintain that support by notifying the public whenever pesticides are used and meaningfully obtaining input on proposed practices.

4. Establish contacts with other successful programs. Now that a number of programs have successfully switched from pesticides to safer practices, a wealth of information is available. Institutions looking for new solutions should contact other programs for information exchange, problem solving, and mutual support.

In the appendices we have provided two model policies — one for school districts and one for cities and counties — that can be adopted or tailored to any jurisdiction's needs. Washington Toxics Coalition staff members are available to help develop policies and identify other resources that can smooth the transition.

For Members of the Public

Anyone can act to make his or her own landscape healthier and to convince public agencies to reduce pesticide use.

We recommend that members of the public do the following:

1. Stop using pesticides at home. Healthy, sustainable solutions abound for pest problems in the home and garden. Many resources are available to learn about these solutions, including the Washington Toxics Coalition's Toxics Hotline, the Natural Lawn and Garden Hotline, and others. If you hire professionals for maintaining your lawn and garden or to address pest problems, you can hire pest control companies that use least-toxic methods.

2. Work for change in your community. With the growing number of school districts, cities, counties, and other agencies that have turned from pesticides to safer pest management practices, it is now easier than ever before to show that your local agencies can reduce pesticide use. You can find out what pesticides are used in your local schools, parks, and other pubic spaces, and work to pass a policy to reduce their use. The Washington Toxics Coalition has Pesticide Action Kits available for school districts as well as for cities and counties, and our staff is available to help you plan and execute a campaign to win a local policy. Contact us at 206-632-1545 or info@watoxics.org, or see our website at www.watoxics.org.

The Seattle Tilth demonstration garden, a highlight of the grounds of the Good Shepherd Center, is maintained with volunteer labor. See Chapter 10 for more about the Good Shepherd Center's pesticide-free groundskeeping.

Appendices

Appendix A: Schools

Passing Policies

To assist parents and other community members in reducing pesticide use in schools, the Washington Toxics Coalition has created a Healthy Schools Pesticide Action Kit. It contains fact sheets, reference tables, and resource lists to help pass strong policies in your local district. Copies are available from Washington Toxics by calling 800-844-SAFE or as downloadable PDF files at www.watoxics.org.

For further information about school pesticide use, or for assistance in passing a local pesticide reduction policy, contact the Washington Toxics Coalition.

Why a pesticide policy?

Pesticides can harm children's health. With the amount of time children spend in school, pesticide use at school poses a particular threat. Because children's bodies are still developing, they are more susceptible to the risks from pesticide exposure. Scientific studies link pesticides to cancer, birth defects, nervous system disorders, reproductive problems, endocrine (hormone) disruption, and immune deficiency.

Decreasing pesticide use is key to protecting human health and the environment, but despite good intentions to simply reduce pesticides, experience shows that adopted policies are necessary to ensure best practices in the long run. Adopted policies outline specific steps to solving pest problems, ensure complete implementation, and guarantee that pesticides will not be used even when changes in the staff occur.

Schools policies in Washington

A growing number of Washington school districts are implementing effective, least-toxic pest-management programs that eliminate or minimize toxic pesticide use. Districts with strong school policies in place include:

1. **Bainbridge Island School District**
   Contact: Jack Evans, Maintenance Department, 206-842-4117
   Background: Passed originally in 1997, and then revised to include a ban on high-hazard pesticides in 2001, BISD has a strong dedication to least-toxic pest management. The policy includes an IPM committee and a 24-hour hotline with information about any pesticide use on school grounds. See profile on page 15.
2. **Sedro-Woolley School District**
   Contact: Mike Riddle, Maintenance Department, 360-855-3505
   Background: Sedro-Woolley's policy is one of the strongest in the state, with a comprehensive ban on high-hazard pesticides, IPM committee, and dedication to least-toxic pest management. The policy does not allow calendar-based applications, fertilizer use when children are present, or pesticide use for aesthetic reasons.
3. **Vancouver School District**
   Contact: George Bryant, Facilities Department, 360-313-4777
   Background: The Vancouver School Board unanimously passed their policy in the spring of 2002. The policy requires written notification of all parents and staff members 48

hours before any pesticide application. It also includes a high-hazard ban, IPM committee, and primary use of least-toxic pest-management practices.

4. **Oak Harbor School District**
   Contact: Bruce Worley, Operations Department, 360-279-5007
   Background: Oak Harbor's policy bans the use of high-hazard pesticides and calendar-based applications. It includes creation of an IPM committee and dedication to least-toxic pest management.
5. **Mercer Island School District**
   Contact: Tom Otto, Maintenance Department, 206-230-6388
   Background: Spearheaded by Maintenance Director Tom Otto, Mercer Island passed their policy in spring 2002. The policy includes a high-hazard ban and a dedication to least-toxic pest management.
6. **South Whidbey School District**
   Contact: John Turner, Facilities Department, 360-221-1897
   Background: Based in strong community support for least-toxic pest management, South Whidbey adopted a policy that bans the use of all high-hazard pesticides and indicates their dedication to least-toxic methods.

Model Schools Policy

The following policy captures the main elements of a successful, least-toxic pest management for schools. These include:

- Ban the use of high-hazard pesticides on school grounds, including pesticides linked to cancer, nervous-system damage, endocrine (hormone) disruption, or reproductive damage.
- Establish least-toxic pest management as official district policy, and ensure that pesticides will not be used for purely aesthetic purposes.
- Notify all parents, teachers, and staff members prior to any pesticide use on school grounds.
- Establish a pest-management committee consisting of parents, teachers, school staff, and public-health organizations to oversee policy implementation.

Model IPM Policy for Schools:

POLICY _____: Least-Toxic Integrated Pest Management (IPM) and Pesticide Use Minimization

Because the health and safety of students and staff is our first priority, and a prerequisite to learning, the _____ School District manages vegetation and pests using a minimum of least-toxic pesticides. The district utilizes physical, mechanical, cultural, biological and educational tactics as primary controls. Least-toxic chemical controls are used as a last resort.

Pesticide Use and Selection

Pesticides will only be used if necessary for the health and safety of students and staff. No high-hazard pesticides will be used. To ensure that no high-hazard pesticides are used, any pesticide used by the school district must meet the following criteria:

a. Pesticide is not classified as highly acutely toxic (Hazard Category I or II) by the Environmental Protection Agency (signal word for Hazard Category I products = DANGER; signal word for Hazard Category II products = WARNING);

b. Pesticide is not a restricted use pesticide (use of the product is restricted to certified pesticide applicators);

c. Ingredients in product have been evaluated by the U.S. EPA and found to include no possible, probable, known or likely carcinogens;

d. Ingredients in product include no reproductive toxicants (CA Prop 65 list);

e. Ingredients in product not listed by Illinois EPA as known, probable or suspected endocrine disruptors;

f. Ingredients in product include no nervous system toxicants (i.e. ingredients that are cholinesterase inhibitors and/or are listed as neurotoxic by the Toxics Release Inventory);

g. Ingredients have soil half-life of 30 days or less;

h. Ingredients have extremely low or very low mobility in soil, according to Groundwater Ubiquity Score (GUS) index;

i. Product is not labeled as toxic to fish, birds, bees, wildlife, or domestic animals.

No pesticide will be used if the school district does not have information on all pesticide ingredients.

No routinely scheduled (e.g. seasonal, monthly, or weekly) pesticide applications will be made. No pesticide fogging or space spraying will be done. Insecticides will be used only in containerized baits, or for spot treatments targeted to insect nests or problem areas where a minimal amount of material will be used. Pesticides will not be used solely for aesthetic purposes. Cost and staffing are not sufficient justification for use of a pesticide.

Notification and Timing

Pesticide notification signs shall be posted at the treatment site, at a prominent place in the main office, and at primary entrypoints to the site of application prior to any pesticide application. Signs shall remain in place for one week after pesticide application, or a longer period of time if specified by the pesticide label.

In addition, written notice shall be provided to students, parents, guardians and employees 48 hours in advance of any pesticide application.

Posted notices shall begin with a header containing the words "NOTICE: Pesticide Application; THIS AREA (or "LANDSCAPE" for outdoor applications) HAS BEEN RECENTLY SPRAYED OR TREATED WITH PESTICIDES BYYOUR SCHOOL."

Notices shall be at least 8-1/2 by 11 inches, and shall include the following information: the signal word from the pesticide label, alongside the product name (e.g. "DANGER: Confront"); the pesticide's active ingredient; the intended date and time of application; the location and area to which the pesticide is to be applied; the rate of application; the pest to be controlled; the name and phone number of the responsible party where the pesticide label and material safety data sheets may be obtained; a footer including "FOR MORE INFORMATION PLEASE CALL" and name and phone number of the contact person for the application; and a boxed-off warning stating: "CAUTION: Individuals taking medication, pregnant women, infants, children, and individuals with respiratory or heart disease, chemical sensitivities, or weakened immune systems may be particularly susceptible to adverse health effects due to pesticide exposure."

Notification signs shall be printed in colors contrasting to the background.

Any pesticide application will be timed for maximum protection of human health and beneficial organisms. Any pest control activities will be conducted in consideration of effects on classroom activities.

Recordkeeping

The school district will maintain records of all pesticides used and their active ingredients, amounts and locations of treatments, and target pests. Alternative pest control measures will also be documented. Pesticide use and pest control records, pesticide Material Safety Data Sheets (MSDS), pesticide product labels, and manufacturer information about all pesticide ingredients will be on file at each school as well as at school district headquarters.

School staff, parents and students will have access to all records upon request, including an annual summary of pesticide use records for each school and for the district as a whole.

Pest Management Committee

Any proposals for pesticide use must be approved by a Pest Management Committee or other

committee consisting of parents, staff, and community members.

The Pest Management Committee will be responsible for the progress review described below, and carry out other activities as needed to oversee the implementation of the least-toxic IPM policy.

Progress Review

At the beginning of each school year, the district will provide written information to staff, students, and parents regarding pest control activities within the school district. This information will include the names of all compounds that may be used, and a description of the district's pest control policies and methods, including all posting and notification policies.

The district will annually review its pest management program to evaluate how well its pest prevention and control objectives are being met, and to identify areas where improvement is needed. The district will prepare a report containing the following information:

a. Quantities of each pesticide applied during the previous year;

b. Target pest for each pesticide used;

c. Non-chemical pest prevention and control measures used;

d. Pest management plan for the coming year.

The report will be provided to members of the school board of directors, all district parents, and made available to the public upon request.

Note: These reporting specifications satisfy the annual notification and reporting requirements of the Children's Pesticide Right-to-Know Act (SB 5533), including the required annual summary of pesticide use, and the required notice of pest control policies and methods.

Right to Appeal

Parents, staff, and neighbors may appeal pesticide use plans to the Pest Management Committee. Notification of this right will be provided at the beginning of the school year, as well as with any additional notification of a particular planned use of pesticides during the school year. The Pest Management Committee will consider all appeals received up to three days prior to the planned pesticide application. Appeals received within three days prior to the application will be considered by the superintendent.

Identification and Notification of Sensitive Individuals

The district will maintain a registry of chemically-sensitive students, staff, or others requesting special consideration in the event of the use of pesticides. The district will provide personal notification to these individuals two weeks prior to any planned pesticide use, and will make an effort to address their concerns and special needs relative to such pesticide applications.

Appendix B: Cities, Counties, and Roadsides

Passing a policy

For community members interested in reducing pesticides in their municipality, the Washington Toxics Coalition and the Northwest Coalition for Alternatives to Pesticides have created a Pesticide Action Kit. The kit was developed as a part of the local work in our Clean Water for Salmon campaign. It contains fact sheets, reference tables, and resource lists to help pass a strong policy in your city or county. Copies are available from Washington Toxics Coalition by calling 800-844-SAFE or as downloadable PDF files at www.watoxics.org.

For further information about municipal pesticide use, or for assistance in passing a local pesticide-reduction policy, contact the Washington Toxics Coalition.

Why a policy?

In order to thrive, salmon need clean water. The use of pesticides in both rural

and urban areas pollutes our streams and rivers, posing a serious threat to the health of salmon runs as well as communities. Pesticides can kill salmon directly, or perhaps more commonly, cause subtle damage that reduces their chance of survival. Cities and counties should make pesticide-use reduction a core element of salmon recovery. Local jurisdictions can serve as models of salmon-friendly pest management by adopting strong policies to phase out pesticide use in parks and on municipal land.

Adopted policies are necessary to ensure best practices in the long run. They outline specific steps to solving pest problems, ensure complete implementation, and guarantee that pesticides will not be used even when changes in the staff occur.

Strong policies and programs in Washington

Cities and counties around Washington have adopted policies that implement effective, least-toxic pest-management programs that eliminate or minimize toxic pesticide use.

CITY policies

1. Seattle
   Contact: Tracy Dieckhoner, Office of Sustainability and Environment, 206-386-4595, www.cityofseattle.net/environment/Pesticides.htm
   Background: Seattle's policy eliminated the use of the most hazardous herbicides and insecticides on city property, and set a goal of reducing overall pesticide use by 30% by 2002. Seattle also has 14 pesticide-free parks, where landscapes are maintained using no toxic chemicals at all, and alternatives are being utilized. See profile on page 8.
2. Lynnwood
   Contact: Craig Larsen, Parks and Recreation, 425-744-6475
   Background: Passed in summer 2002, Lynnwood's city policy eliminates the use of the most hazardous pesticides, requires 24-hour prior posting of all application sites, and creates a pesticide-free park program.

COUNTY policies

3. Thurston
   Contact: Mark Swartout, Natural Resources Program, 360-709-3079
   Background: Thurston County's Pest and Vegetation Management Policy requires use of non-toxic pest and vegetation controls by all county departments, and eliminates the use of high-hazard pesticides on county property. The policy also establishes record-keeping, requires IPM "prescriptions" for any problem, requires IPM plans for aquatically sensitive areas, and calls for public education. See profile on page 5.
4. King
   Contact: Ann Peacock, Local Hazardous Waste Management Program, 206-263-3088
   Background: King County's policy eliminates the use of the most-hazardous pesticide and focuses on least-toxic pest management. The county reports a decrease in herbicide use of 65% and a decrease in insecticide use of nearly 90% in the first two years of the policy.

COUNTY ROADSIDE no-spray programs

5. Jefferson
   Contact: Mark Lopeman, Public Works, 360-385-0890

Background: Twenty-three years ago, Jefferson County implemented a "no-spray" policy for controlling roadside vegetation. They use a combination of preventive measures, such as mowing and brushing practices, as well as encouraging low-growing native plants, to keep roadsides well maintained. See profile on page 28.

6. Snohomish
   Contact: Steve Pratt, Road Maintenance Department, 360-862-7501
   Background: For 10 years, Snohomish County has maintained their roadsides without the use of pesticides. With more than 1650 miles of county roads, they use a combination of mowing and grading in order to keep their roadsides clear and ditches growing and green.
7. Island
   Contact: Bill Oakes, Public Works Department, 360-321-5111
   Background: Community support caused the Island County commissioners to commit the county roadside program to pesticide-free management in early 2002.
8. Clallam
   Contact: Public Works Department, 360-417-2319
   Background: Clallam County has maintained county roads without the use of pesticides for more than a decade. Road maintenance crews mow the shoulders of the roads, cut brush, grade gravel roads, and clean ditches.
9. San Juan
   Contact: Russ Harvey, Roadsides Maintenance Department, 360-378-2114
   Background: For more than 20 years, San Juan County has used mowing as its means of roadside vegetation control. The roads are on a 7-year cycle for sealing, which includes grading them for sod removal to prevent vegetation encroachment and pooling of water.

Model city/county policy

The following policy captures the main elements of a successful, least-toxic pest-control program for cities and counties. This includes:

1. High-hazard pesticides — those that are documented to threaten human and environmental health, pose hazards to the health of salmon, or contaminate water — should be phased out.
2. Pesticides should not be used for purely aesthetic purposes, or without documentation of an existing pest problem.
3. Overall pesticide use should be reduced, and alternatives to pesticides should be used unless none are available.
4. Safeguards should be put in place to keep pesticides out of water.
5. Use of pesticides by or for the city/county should be reported to a central office and the data released to the public.
6. Notification signs should be posted at least 72 hours prior to any pesticide application. Signs shall remain in place for at least one week after pesticide application.

Model IPM Policy for Cities and Counties:

Section I: Purpose

The City/County of _____ is committed to using its operations and authority to protect water quality and human health. The City/

County recognizes that using integrated pest management practices that reduce pesticide use can result in improved salmon habitat and survival rate, reduced levels of toxic chemicals entering the water, and benefit human and environmental health. Pesticides pollute water and can threaten salmon survival via lethal and sublethal effects as well as harm to their food supply and habitat. Pesticides are linked to adverse human health effects including cancer, neurological harm, birth defects, reproductive harm, endocrine disruption, and acute poisoning.

The City/County of _____ hereby adopts the Pest Management Policy for Salmon and Human Health as its official pest management policy. Prevention is the primary tool for solving all pest management problems on city/county property including, but not limited to, landscaping and building maintenance. When pest problems occur, mechanical, physical, biological, and other alternative methods are the preferred control methods. Use of pesticide products will be decreased or eliminated as prevention and alternative controls are increased.

This policy concerns all pest management practices on property owned and/or maintained by the City/County of _____ whether practices are carried out by the City/County or by its contractors. This policy does not concern pest management practices on property that is not owned or maintained by the City/County.

Section II: Pest Management Program

II.a. Pest Prevention
Prevention creates conditions that encourage desired plants, animals, and other organisms and discourage unwanted vegetation, insects, and other organisms.

The City/County of _____ will:

- Design and construct indoor and outdoor areas to reduce potential for pest habitats.
- Use management practices, including waste management and food storage, to reduce potential for excessive development of pest populations.
- Plant pest-resistant plants (native where appropriate) in newly landscaped and re-landscaped areas.
- Maintain plant health through use of compost, and appropriate irrigation and timing of planting.
- Establish new plantings using proper plant selection, soil preparation, planting techniques, plant density, irrigation practices, mulch application, monitoring, and follow-up maintenance.
- Use mulch to enhance soil fertility, inhibit weed growth, and reduce erosion.
- Maintain healthy turf through appropriate mowing, fertilization, and irrigation practices.
- Modify existing landscapes to reduce potential for pest habitats.
- Match cultural and environmental requirements of plants with site conditions.
- Eliminate planting of non-native invasive species.

II.b. Biological, Mechanical, Physical, and Other Alternative Pest Control Methods
To evaluate and address existing pest problems or problems that may develop in spite of prevention techniques, all City/County departments shall follow the approach outlined below.

- Routinely monitor sites for optimal health and sanitation conditions.
- Routinely monitor populations of potential pests and their natural enemies to determine if and when control is needed.
- Establish threshold levels of pests below which the population does not require control.
- Use physical, mechanical, biological, and other alternative methods to keep pest numbers low enough to prevent intolerable damage or annoyance.

II.c. Use of Pesticide Products

1. In order to use a pesticide product the City/County will document its need to address a specific pest problem considering prevention and alternatives to pesticides first. This documentation will be made available to the public. Pesticide products may only be used if no economically feasible or effective alternative is available. The result of this process will be a limited-use list that details currently allowed pesticide uses in a specific problem area.
2. The City/County will conduct an annual review of the limited-use list. This list is included in the annual use of pesticide products by the City/County and therefore is also subject to reduction goals.
3. Within one year of passage of this policy the City/County of _____ will have reduced pesticide use by at least 35%. In the second

year, use will be reduced an additional 25%; in the three years following, use will be reduced an additional 15, 10, and 5% respectively. Pesticide use will be measured by quantity of the ready-to-use pesticide product.

4. Upon passage of this ordinance:
   a. All aesthetic uses of pesticides will end immediately.
   b. All calendar-based pesticide product applications will end immediately.
   c. No pesticides will be applied within at least 100 feet (ground applications) and 200 feet (aerial applications) of a lake, stream, wetland, groundwater recharge area, or storm drain.
5. Within six months after passage of this act, the City/County of _____ will end all uses of known high-hazard pesticides listed in Appendix A. Pesticide application timing and amount will be determined according to the efficacy of the product and impact to the surrounding environment. Considerations will include pest biology, weather, seasonal changes in wildlife use, and local conditions.

Generally, all pest management techniques must avoid disrupting natural pest controls present and aim to suppress the pest population, not eliminate it. In many cases a portion of the pest population must remain to sustain natural enemies.

Section III: Training, Education, and Research

III.a. Training and Education
City/County permanent and seasonal staff shall be trained in prevention and the other pest management techniques outlined in this policy if appropriate to their area of work. Trainings should occur on topics such as: sanitation in the office space, food storage for kitchens, pest biologies, landscaping and re-vegetation with pest resistant and native plants, using compost tea, mechanical and other new pest control strategies applicable to the pest problems in existence, and toxicology of pesticides. Training of landscape and maintenance staff shall occur at least once a year. All other city staff shall receive education about prevention of pest problems in the workplace.

III.b. Research Project
Each year the City/County will establish a research project with the goal of developing and implementing new alternative strategies to prevent/control pest problems. A research project will be undertaken if there is a problem for which all prevention and alternative controls have proved ineffective or too costly and pesticide products are being used. Priority of project selection will go to the reduction of pesticides that have major uses as indicated by amount used, number of applications, or cost of product.

Section IV: Public Notification and Involvement

IV.a. Notification
Within 120 days of the effective date of this ordinance, any City/County department that uses a pesticide shall comply with the following notification procedures:

Notification signs shall be posted at least 72 hours prior to any pesticide application. Signs shall remain in place for at least seven days after pesticide application. Signs shall be posted (i) at the treatment site, at a central area in the building, and at every entry point if the pesticide is applied in an enclosed area, and (ii) in highly visible locations around the perimeter of the application area if the pesticide is applied in an open area. If the application is to a linear landscape, such as along a path or roadside, signs shall be posted at 100-foot intervals.

Notices shall begin with a header containing the signal word from the pesticide label alongside the words "Pesticide Application." For example, "WARNING: PESTICIDE APPLICATION." Notices shall be at least 8-1/2 by 11 inches, and shall include the following information: the pesticide's active ingredient; the date and time of pesticide application; the area treated; the rate of application; the name and phone number of the contact person for the application; the name and phone number of the responsible party where the pesticide label and material safety data sheets may be obtained; and a boxed-off warning stating: "CAUTION: Individuals taking medication, pregnant women, infants, children, and individuals with respiratory or heart disease, chemical sensitivities, or weakened immune systems may be particularly susceptible to adverse health effects due to pesticide exposure."

Material Safety Data Sheets (MSDS), pesticide product labels, and manufacturer information about all pesticide ingredients used on City/County property will be readily accessible to the public.

The City/County shall notify the public prior to any aerial pesticide application via notices in widely read newspapers and postings, the content of which meets the above requirements. Notices shall be posted throughout the area affected by the aerial application. If an immediate pesticide application of any kind is necessary for the protection of public health, signs meeting the requirements of this section shall be posted.

The City/County should further educate the public by designing and implementing public education about changing landscaping and pest management practices. Education may also include signs in public places explaining the benefits of the city's pest management practices for salmon restoration and protection of human health.

IV.b. Public Involvement
The Pest Management Coordinator will ensure a formal process to obtain public input when determining:
1. Selection of research projects,
2. Creation and updating of the limited-use list,
3. Achievement of goals for pesticide reduction,
4. Format of data in the annual report.

Section V: City and Departmental Pest Management Coordinators

V.a. City/County Pest Management Coordinator
Effective 120 days after the passage of this Act, the City/County council shall appoint a Pest Management Coordinator dedicated to promotion of prevention and alternative pest controls. The Pest Management Coordinator is charged with implementing this policy, including:
1. Ensuring appropriate steps are taken to direct the City/County towards pest prevention and alternative controls.
2. Ensuring annual landscape and maintenance staff trainings occur.
3. Ensuring education occurs for all other City/County staff.
4. Ensuring the unified database that compiles information provided by each department has inter-departmental consistency and is kept up to date.
5. Ensuring that all departments are achieving the yearly goals of this ordinance.
6. Ensuring the end-of-the-year report is written.
7. S/he leads the pest management coordinators.
8. Ensuring that questions by both departments and by the citizens of _____ receive prompt responses.

V.b. Departmental Pest Management Coordinators
Effective 180 days after the passage of this Act, each department with pest management responsibilities, together with the City/County Pest Management Coordinator, shall identify a departmental Pest Management Coordinator. This person is responsible for:
1. Educating department staff about the policy.
2. Ensuring that her/his department is achieving the goals set forth by the Committee to comply with this policy.
3. Assuring tracking of all pest management activities conducted or contracted by the department.
4. Actively participate in the review of the limited-use list.

Effective 180 days after the passage of this Act, all Pest Management Coordinators shall form a committee to oversee implementation of this policy.

Section VI: Record Keeping

The City/County of _____ will maintain publicly accessible information with records of pesticides used by all departments. The information will be maintained in a database that will include records of each pesticide application including the EPA registration number of the pesticide, amount of each ready-to-use pesticide product used, exact locations of each treatment, and the target pest. The City/County shall also record and report the quantity of the pesticide product used (pre mixing).

The City/County will also maintain records of prevention and control methods utilized, rationale for their use, their effectiveness, the presence and extent of pest problems, and the populations of natural enemies.

Data on prevention or treatment techniques will be added to the database within 30 days of the action. Data on pesticide applications will be recorded within five working days of the application.

Section VII: Program Evaluation

On a yearly basis, the City/County of _____

will review its pest management program to evaluate how well its pest prevention and control objectives are being met, and to identify areas where improvement is needed. Evaluation of the following is required:

a. Alternative pest prevention and control measures used; efficacy of control measures; rational for their use or discontinuation.
b. Pest management plan for the coming year along with the plan for achieving the next year's goals.
c. Results of research and demonstration projects of the previous year.
d. Research and demonstration projects for the coming year.
e. Quantities of each ready-to-use pesticide product applied during the previous year.
f. An assessment of the city's compliance with this policy.
g. An assessment of the limited-use list as well as the criteria list for the known high-hazards.

A report will be prepared that includes all of the above information. The report will be made available to the public upon request, through the Internet, and notices to interested parties will be sent out prior to release. Additionally, the information in the report will be presented to the city council or county commissioner at a public meeting in which the public has an opportunity to comment.

Definitions

Aesthetic use – pesticide applications made solely for cosmetic reasons rather than for public safety or improved plant health.

Calendar based – applications of pesticides that are made on a monthly, bi-monthly, or quarterly basis rather than when a need is demonstrated and as a last-resort measure.

Known high-hazard –
The following list of resources shall be used to determine if a pesticide is a known high-hazard pesticide. If any active ingredients or other ingredients in a product meet one of these criteria, then the product is a known high-hazard pesticide.

This list of criteria is subject to change with the availability of additional resources. Therefore, this list shall be reviewed annually to determine whether new resources should be used.

1. Acutely toxic to humans
   - ❖ Classified as Toxicity Category I or II by the United States Environmental Protection Agency (EPA). Danger or Warning will be listed on the label.

2. Acutely toxic to aquatic insects, fish, aquatic and semi-aquatic plants, wildlife, or domestic animals
   - ❖ The Environmental Hazards Section of the label will state toxic, highly toxic, or extremely toxic.
   - ❖ The U.S. EPA Office of Pesticide Programs Reregistration Eligibility Decisions (REDs, IREDs, and TREDs) states that the level of concern is exceeded or the risk quotient is greater than one.
     http://www.epa.gov/pesticides/reregistration/status.htm
     U.S. EPA Office of Pesticide Programs. Tolerance Reassessment & Reregistration. "Pesticide reregistration status." [REDs, IREDs, and TREDs]

3. May cause cancer in humans
   - ❖ Classified as a known, likely, probable, or possible carcinogen by the U.S. EPA.
     http://www.epa.gov/pesticides/carlist
     U.S. EPA Office of Pesticide Programs. "List of Chemicals Evaluated for Carcinogenic Potential"
     - *To request hard copy, call or write*
   - ❖ Classified as a known, likely, probable, or possible carcinogen by the International Agency for Research on Cancer (IARC).
     http://193.51.164.11/monoeval/grlist.html
     IARC
     "Lists of IARC Evaluations"
     - *Click on 'List of all agents, mixtures and exposures evaluated to date' for an alphabetic list of chemical names, CAS numbers, and volume number.*
     - *Click on 'Complete List of all Monographs and Supplements published to date' for complete text*
   - ❖ Classified as known or reasonably anticipated to be human carcinogen by National Toxicology Program; listed by State of California.
     http://www.oehha.org/prop65/prop65_list/Newlist.html
     California. Office of Environmental Health Hazard Assessment. "Proposition 65"

- *Scroll down to: 'Download the (month day, year) list in PDF format.'*
- *Document is titled: "Chemicals known to the State to cause cancer or reproductive toxicity."*

4. Nervous system toxicant in humans
   - ❖ Cholinesterase inhibitor
     http://www.pesticideinfo.org
     - *Search for chemical, then click More for more information, then scroll down to Toxicity Information. A skull and crossbones under cholinesterase inhibitor indicates it is a cholinesterase inhibitor.*
   - ❖ Listed as neurotoxic in U.S. EPA Toxics Release Inventory.
     http://www.epa.gov/tri/chemical/index.htm

5. Reproductive toxicant in humans
   - ❖ Classified as known or reasonably anticipated to be reproductive toxicant by National Toxicology Program; listed by State of California.
     http://www.oehha.org/prop65/prop65_list/Newlist.html
     California. Office of Environmental Health Hazard Assessment. "Proposition 65"
     - *Scroll down to: 'Download the (month day, year) list in PDF format.'*
     - *Document is titled: "Chemicals known to the State to cause cancer or reproductive toxicity."*

6. Disrupts hormonal systems
   - ❖ Listed by Illinois EPA as a chemical associated with endocrine system effects.
     http://www.nihs.go.jp/hse/environ/illiepatable.htm
     "Illinois EPA endocrine disruptors strategy. Table 1 Preliminary List of Chemicals Associated With Endocrine System Effects in Animals and Humans (*) or In Vitro (+)"

7. Persists in the environment
   - ❖ Soil half-life of 100 days or greater as listed by Agricultural Research Service.
     http://wizard.arsusda.gov/acsl/ppdb1.html
     Agricultural Research Service "U.S. Department of Agriculture Pesticide Properties Database"
   - ❖ Soil half-life of 100 days or greater as listed by OSU Extension Pesticide Properties Database.
     http://ace.orst.edu/info/npic/ppdmove.htm
     Vogue, PA, Kerle, EA, and Jenkins, JJ "OSU Extension Pesticide Properties Database"

8. High or very high mobility in soils
   - ❖ Groundwater Ubiquity Score of 3.0 or as listed by Oregon State University Extension Pesticide Properties Database.
     http://ace.orst.edu/info/npic/ppdmove.htm
     Vogue, PA, Kerle, EA, and Jenkins, JJ "OSU Extension Pesticide Properties Database"
   - ❖ The Environmental Hazards Section of the label warns about leachability or detections.

9. Detected in salmon waters at an amount hazardous to aquatic species
   - ❖ Using the most recent pesticide detection data from salmon habitat determine if at levels that exceed U.S. EPA or Canadian aquatic life criteria.
     http://www.epa.gov/waterscience/criteria
     U.S. EPA Water Quality Criteria.
     - *Click on 'Aquatic Life' AND 'Criteria Table'*

Appendix C: Resources

I. Organizations

A. Washington Toxics Coalition
4649 Sunnyside Ave N, Suite 540
Seattle, WA 98103
Phone: 206-632-1545
Email: info@watoxics.org
Website: www.watoxics.org
The Washington Toxics Coalition works to protect public health and the environment by preventing pollution in industry, agriculture, schools, public places, and the home. Its website and hotline (see below) have information on pesticides, least-toxic products, and alternative solutions.

B. Northwest Coalition for Alternatives to Pesticides (NCAP)
PO Box 1393
Eugene, OR 97440
Phone: 541-344-5044
Email: info@pesticide.org
Website: www.pesticide.org
NCAP works to protect people and the environment by advancing healthy solutions to pest problems. NCAP has a wealth of information on pesticides and least-toxic alternatives, including comprehensive fact sheets on specific pesticides and pests.

C. Washington Sustainable Food and Farming Network
PO Box 6054
Bellingham, WA 98227
Phone: 360-527-9426
Email: info@wsffn.org
WSFFN promotes community environmental, social, and economic well-being by joining together and mobilizing residents and organizations of Washington in creating a sustainable food and farming network.

D. Green Gardening Program, King County
c/o Joanne Jewell, Seattle Tilth
4649 Sunnyside Avenue North, Rm 1
Seattle, WA 98103
Phone: 206-547-7561
Website: http://www.cityofseattle.net/util/proipm/default.htm
The Green Gardening Program is a collaborative effort of Seattle Tilth, WSU Cooperative Extension King County, and Washington Toxics Coalition, promoting environmentally sensitive landscaping. The program provides training and resources for homeowners, professional landscapers, nursery staff, and garden tours. Green Gardening is managed by Seattle Public Utilities and is funded by the Local Hazardous Waste Management Program in King County.

E. Seattle Tilth
4649 Sunnyside Avenue North, Rm 1
Seattle, WA 98103
Phone: 206-633-0451
Email: tilth@seattletilth.org
Website: www.seattletilth.org
Seattle Tilth provides hands-on education about organic gardening, supports local farms, and works to explore more sustainable ways of using the world's resources. Seattle Tilth runs a hotline (see below) for the City of Seattle to answer gardening questions.

F. Washington Tilth Association
3830 S 530 E
Greenbank, WA 98253
Email: Chris Greendale, President, echance@wolfenet.com
Website: http://www.tilthproducers.org/wta.htm
The Washington Tilth Association comprises the five Tilth organizations in the state: Seattle Tilth, Washington Tilth Producers, Spokane Tilth, South Whidbey Tilth Association, and the Vashon Island Growers Association.

G. Pesticide Action Network North America (PANNA)
49 Powell Street, Suite 500
San Francisco, CA 94102
Phone: 415-981-1771
Email: panna@panna.org
Website: www.panna.org
PANNA works to replace pesticide use with ecologically sound and socially just alternatives. As one of five PAN Regional Centers world-

wide, PANNA links local and international consumer, labor, health, environment, and agriculture groups into an international citizens' action network.

H. Beyond Pesticides/National Coalition Against the Misuse of Pesticides (NCAMP)
701 E Street SE
Washington, DC 20003
Phone: 202-543-5450
Email: info@beyondpesticides.org
Website: www.beyondpesticides.org
Beyond Pesticides is a national pesticide-activist network that promotes pesticide safety and adoption of pest-control alternatives to reduce or eliminate dependency on toxic chemicals. It provides useful information on pesticides and alternative pest management, including fact sheets on pesticides, pesticide policy, and least-toxic alternatives.

I. Bio-Integral Resource Center (BIRC)
PO Box 7414
Berkeley, CA 94707
Phone: 510-524-2567
Email: birc@igc.org
Website: www.birc.org
BIRC specializes in finding non-toxic and least-toxic Integrated Pest Management solutions to urban and agricultural pest problems. Their staff has a sophisticated knowledge of least-toxic programs for home and garden, and consults with institutions and the public for a small fee.

II. IPM Consultants

- Integrated Solutions
  E. J. Hook
  425-681-6758
  integratedone@aol.com

- Ciscoe Morris
  206-726-6300
  ciscoe@ciscoe.com

- Green Gardening Program, King County
  c/o Joanne Jewell, Seattle Tilth
  206-547-7561
  joannejewel@seattletilth.org

III. Hotline Help

Washington Toxics Coalition Hotline: 800-844-SAFE ext. 7
(Information on pesticides and alternatives for the home and garden)

Northwest Coalition for Alternatives to Pesticides: 541-344-5044
(Information on pesticides and alternatives for the home and garden)

Natural Lawn and Garden Hotline: 206-633-0224
(IPM expertise, composting, and plant pathology)

IV. Websites

Washington Toxics Coalition
http://www.watoxics.org
This website provides access to Home Safe Home fact sheets about safer solutions for common household pest problems as well as information on other household toxics issues.

Northwest Coalition for Alternatives to Pesticides (NCAP)
http://www.pesticide.org
NCAP's website has many detailed fact sheets on the hazards of specific pesti-

cides as well as on safer pest-management practices.

Green Gardening Program ProIPM Fact Sheets
http://www.ci.seattle.wa.us/util/proipm
Green Gardening's ProIPM fact sheets provide professional-level management solutions for common landscape problems ranging from annual weeds to tent caterpillars.

University of California Integrated Pest Management online
http://www.ipm.ucdavis.edu
This website is primarily directed at agricultural pests, but is a good resource for descriptions of pathogens, diseases, and weeds (with photos for identification).

King County Local Hazardous Waste Management Program: Keys to Integrated Pest Management
http://www.metrokc.gov/hazwaste/house/garden/index.htm
King County's website has excellent, user-friendly information on non-chemical controls of home and garden pests from aphids to whiteflies.

Pesticide Action Network of North America Pesticide Information Database
http://www.pesticideinfo.org
PANNA's Pesticide Information Database is an easy-to-use, searchable database with extensive information on the hazards of pesticides.

ExToxNet
http://www.ace.orst.edu/info/extoxnet
This website has somewhat detailed information on the hazards of a broad range of pesticides.

V. Publications

1. *Common Sense Pest Control: Least-Toxic Solutions for Your Home, Garden, Pets, and Community.* 1991. Olkowski, William, et al., Newtown, CT, The Taunton Press.
2. *Ecologically Sound Lawn Care for the Pacific Northwest: Findings from the scientific literature and recommendations from turf professionals.* 1997. McDonald, David. Seattle Public Utilities. http://www.cityofseattle.net/util/lawncare/LawnReport.htm
3. *Common Sense Pest Control Quarterly* and *The IPM Practitioner,* both published by the Bio-Integral Resource Center (BIRC).
4. *Building Blocks for School IPM: A Least-toxic Structural Pest Management Manual*. 2002. Beyond Pesticides.
5. *IPM for Schools: A How-to Manual.* 1997. Darr, Sheila, et al. Environmental Protection Agency.
6. ProIPM fact sheets. Green Gardening Program, available at: http://www.ci.seattle.wa.us/util/proipm/.
7. *Poisoned Waters: Pesticide Contamination of Waters and Solutions to Protect Pacific Salmon.* 2002. Lind, Pollyanna. Northwest Coalition for Alternatives to Pesticides.
8. *Grow Smart, Grow Safe: A Consumer Guide to Lawn and Garden Products.* 2002. Dickey, Philip. Local Hazardous Waste Management Program in King County.

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