

San Francisco's Pesticide Phase-Out

What happens after the law is passed

by Gregg Small and Deborah Raphael

Three years after its passage in 1996, the San Francisco pesticide ordinance has effectively achieved its primary goal — reducing the health and environmental impacts associated with the use of pesticides by San Francisco City departments. The use of the most hazardous pesticides has been reduced to practically zero, the public's right-to-know has increased significantly though the posting of signs prior to and after an application, and public awareness of pesticide problems and alternatives has increased. This article is designed to provide an update on what has been learned over the past three years so that people in other communities can learn from San Francisco's successes and challenges.

The History

On October 8, 1996, the San Francisco Board of Supervisors voted unanimously to pass a cutting-edge ordinance that would significantly reduce the use of hazardous pesticides by all city departments. The policy, among other things, immediately banned the use of pesticides linked to cancer, reproductive harm, and those that are most acutely toxic; increased the public's right-to-know by requiring posting of most pesticide applications 72 hours before and after an application; established Integrated Pest Management (IPM) as the pest management framework for all departments; and, banned all pesticides except for a list of approved pesticides effective January 1, 2000. This policy was the strongest local policy in the nation and has successfully contributed to a movement to adopt similar policies through cities and school districts across the nation.

Why Pesticide Reform Was Needed in San Francisco

In 1995, staff from Green Corps and Pesticide Watch Education Fund (PWEF) undertook an audit of pesticide use by the San Francisco Recreation and Parks Department (Rec/Parks). Concerned about the public's exposure to pesticides in areas managed by the department, including Golden Gate Park and San Francisco's heavily used public golf courses, as well as potential pesticide run-off into the San Francisco Bay, staff from the organizations poured through reams of pesticide use reports, and found some shocking information. From December 1994 through November 1995, Rec/Parks used over 60 different pesticides, including 26 linked to cancer and 20 suspected of causing reproductive harm. Although

Rec/Parks was thought to be the largest user, with over 80 other departments within the city, their use of pesticides was just the tip of the iceberg.

Like many cities and school districts across the country, San Francisco City staff were caught on the pesticide treadmill. Very few staff were aware of the health and environmental impacts of their pesticide use. In addition, little or no training was offered to encourage staff to seek less harmful pest management practices such as monitoring, beneficial insects, and changing conditions to prevent pest problems from developing in the first place. Successive budget cuts reduced funding for preventive maintenance programs further tightening the grip of chemical pesticides.

Measuring Change: Has the Program Worked?

In terms of reducing product toxicity and risk, San Francisco has achieved concrete successes. All spray applications

of pesticides used within public buildings have been replaced with baits, insect growth regulators, exclusion, sanitation, and education. Pesticides linked to cancer and reproductive harm, and those that have been identified as the most acutely toxic, are prohibited from use unless an emergency one-time application is approved by the citywide IPM Coordinator. Broadcast applications of pesticides have been eliminated from playing fields



Flowers planted on a median strip outcompete roadside weeds in San Francisco.

and parks.

Prior to the ordinance, public access to information had been nearly non-existent - even the building managers had no idea what was being applied at their sites though they authorized payment of the pest control bills. Now, a comprehensive system of Integrated Pest Management (IPM) Coordinators and site managers has been created. These individuals are responsible for maintaining records and establishing phone numbers for public access to pesticide use information. Landscape staff are required to scrutinize and justify each application of a pesticide and mandated annual reports to the County Board of Supervisors will hold whole departments accountable for their pesticide use.

Despite these successes, San Francisco's pest management program is not a finished product and still has a long way to go to achieve all of its goals. Many pesticides of concern, including glyphosate (RoundUp™) and several pre-emergent herbicides, continue to be used at relatively high levels. Col-

lecting data about what pesticides are being used remains a challenge. However, changes in behavior begin slowly and build in momentum as each barrier falls.

Integrated Pest Management (IPM): A Good Approach to Pest Management?

Many people are well aware of the abuse of the term IPM over the past decade. Although the term has been used inappropriately by people who continue to emphasize the use of hazardous pesticides, the basis of IPM is sound, and many departments within San Francisco are using IPM appropriately.

IPM, at its core, is about changing pest management practices to prevent problems from occurring in the first place, making the use of pesticides unnecessary. IPM programs require more than simply banning certain pesticides, although this is an important component. They require a paradigm shift within large bureaucracies. Institutional inertia must be overcome, and innovation encouraged. Changes must be adopted in how purchasing decisions are made, products are used, contracts are written, people are trained, information is provided to the public, and how staff at various levels and in various departments work together to find long term solutions instead of the usual short fixes.

While IPM in San Francisco does not mean the elimination of all chemical pesticides, the city's IPM program embraces a new paradigm for city workers around pest management decisions and tactics. City staff are not just replacing one toxic pesticide with another, but are taking the time to determine what is causing the pest problem and identifying the steps needed to prevent the problem from occurring in the future.

Protecting the Public's Right-to-Know

There are two major elements of the San Francisco right-to-know provisions: record-keeping and notification.

Notification: Under the ordinance, nearly all pesticide use requires 72-hour notification before and after application. Generally, city staff who plan to apply pesticides post signs with information including pesticide name, active ingredient, target pest, area to be treated, date and time of application, and who to contact for more information. The notification system has worked well in achieving its goal of providing warning to the public about pesticide use. The primary problem with this system has been vandalism of signs.

The only pesticide applications that are exempted from the prior notification are baits. If baits are used as part of a pest management program, a permanent sign indicating the use of the bait and who to contact for more information, is posted in a conspicuous location within the building.

Record-keeping: Under the ordinance, each department is responsible for keeping detailed information of each pesticide application, including details on the target pest, the name of the applicator, the application equipment used, the type and quantity of pesticide used, and the site and date of the application.

This has turned into one of the more challenging aspects of program implementation. In fact, not one department has been able to provide complete information for its pesticide use for the past three years. There have been two primary barriers to accomplishing this important component of the policy. First, in most departments, pest management has not been centralized or coordinated. This means that many people, from the janitor to an outside pest control company to gardeners, are responsible for managing pests within any one department. Now there are IPM coordinators in each department, which should improve the situation.

The second major problem has been designing an easy-to-use system for tracking records. With multiple departments and multiple staff responsible for pest management within most of those departments, designing a system that is user-friendly and accessible to everybody who needs it has been quite a task.

The first step to addressing this problem was designing a database program to track pesticide use with the software program Access. The database is based on a state mandated pesticide reporting form that each department must submit monthly to the County Agricultural Commissioner's office. Training sessions were given to appropriate supervisors and applicators and, in several cases, landscape staff were outfitted with computers in order to participate. The data system is designed to transmit the pesticide use information via e-mail to the citywide IPM Coordinator's office where a central database is compiled.

However, this data collection program has faced some hurdles. First, the old saying "garbage in garbage out" becomes a real issue when many people in a department are authorized to use pesticides. Staff may not be comfortable with computers and some still do not have workable systems accessible to them. In addition, the program is well-designed to track pesticide use but does not track prevention activities or non-chemical controls such as exclusion and vacuuming. The city is working to expand the database to better reflect the range of options important to an IPM program.

To address the problems with the tracking of pesticide use and pest problems, the city recently designed a computer tracking system and form for structural pest control staff. The form is easy to use and requires pest control staff to note not only pesticide use, but also other pest management practices that they use, including monitoring, beneficial insects, and baits. In addition, all new structural pest control contracts will require timely electronic submission of pesticide uses.

City staff are taking the time to determine what is causing the pest problem and identifying the steps needed to prevent the problem from occurring...

Coordinating a Large City Program

For a program to succeed in a city the size of San Francisco, effective coordination between city departments is critical. Coordination has worked well and departments are working together on issues such as training, hiring of personnel, and testing of equipment.

The key components to its success have been:

Technical Advisory Committee (TAC): The basic idea of the TAC is simple — bring together the major players involved in implementation of the policy for regular meetings to share information and find creative solutions to challenges.

Within the first few months of the passage of the ordinance, the Director of the San Francisco Department of the Environment, and the San Francisco Agricultural Commissioner, called the first meeting of the TAC. For the past three years, this group has met on a monthly basis. Attendance at these meetings ranges from 15-30 people, and usually includes: the seven major departments within the city who traditionally used the most pesticides;

pest control companies who hold contracts with the city for services; IPM experts; public interest advocates, and staff from the Department of the Environment and the County Agricultural Commissioner's office.

The TAC has provided for regular, productive meetings which help to provide a sense of teamwork, and offers the opportunity for on-the-ground pest managers in different departments to share information and chronicle challenges. It also provides an opportunity to identify shared problems and possible solutions. For example, early in the process, departments recognized a need for increased funding, primarily for staff in some departments and training in all departments. After identifying this need within the group, Pesticide Watch worked with public interest, health, and environmental advocates within the city to successfully lobby Mayor Willie Brown to provide increased funds for these needs.

Pesticide Reduction Coordinator: The City of San Francisco has one full-time staff person who oversees the IPM program for the entire city. This person is responsible for coordinating all elements of the IPM program including development of the approved list of pesticides, data collection and pesticide tracking, contractor oversight, public relations, and training.

The existence of a single staff person accountable for program success is a critical part of any IPM program. The exact qualifications for this position will depend on the program, but certain skills have proven invaluable. The most important is the ability to coordinate and motivate a wide range of people who represent disparate viewpoints, each with their own set of barriers and challenges. The second is a firm understanding of IPM principles and the ability to access tech-

nical information and professional expertise when needed.

IPM Coordinators: As required under the ordinance, each of the 80 departments within the city must appoint one person to serve as an IPM Coordinator. For most departments this "coordinator" is really a contact person. Current IPM educational efforts have focused on the seven "biggest user" departments. Each of these departments has designated several IPM point people and one coordinator. The IPM Coordinators are responsible for data collection and for communication between the citywide coordinator and department employees. For example, when a particular department experienced a mouse infestation, fact sheets were distributed to the office staff through the department's IPM Coordinator.



Flowers on a median strip in San Francisco.

Training at All Levels

A common theme to most IPM programs is the importance of training. It is often said that all members of an institution must receive training to ensure the success of IPM efforts. San Francisco has demonstrated an on-going commitment to training from the level of the

Department Head to the groundskeepers, custodians, and office staff who usually drive the pest control process by issuing the complaints.

"Non-Technical Training": Working closely together, the office of the County Agricultural Commissioner and the Department of the Environment put together a training program aimed at building occupants, custodians, and site managers. Roughly 17 of these "non-technical" training sessions have been conducted so far. Outside consultants are hired to lead the sessions and a specialized IPM workbook for structural pest control was developed as a companion to the presentations. Participants are taught the basics of IPM including the specific role each individual plays in the pest identification and prevention process. These training efforts have been well received and are given to staff throughout the city including the public hospitals, libraries, Public Works and MUNI (public transit). Training also occurs in the form of presentations at regularly scheduled staff meetings.

Mayor Willie Brown helped to facilitate training of high-level staff by sponsoring a special training for department heads. The training was aimed at improving awareness of the specific requirements mandated by the city's ordinance as well as increasing the high level buy-in necessary for program success. The San Francisco Airport offers an IPM component as part of the regular safety training required of all new employees. Airport staff also developed a training manual to broadly describe the pests commonly found on airport property, as well as some of the exotics brought in by unsuspecting foreign travelers.

Other non-technical training has occurred in the form of fact sheets on the major insect pests, and the development of

a web site whose goal is to link interested parties to the myriad of information on less toxic pest control now available on the world wide web. Training can involve a combination of tactics that include written materials and actual control. For example, when the Station Agents (ticket collectors) in the subway stations complained about mice in their booths, the response was two-fold. First, educational materials (fact sheets) were distributed on the habits of rodents and the importance of sanitation and exclusion. Second, station maintenance staff placed traps and installed door sweeps on the bottoms of all booth doors, techniques mentioned as part of the training materials.

Technical Training: In San Francisco, like most other cities, nearly all structural pest control is done by outside contractors while in-house staff perform landscape pest control. Thus training has tended to focus on landscape issues, particularly weed and rodent control. For structural pest control, the applicators are outside contractors, making the bid process, rather than city-sponsored training, the crucial step in ensuring compliance with the IPM ordinance. A discussion of the bid process and working with outside contractors appears below in the section "Outside Contractors."

Technical training of landscape staff consists of presentations and product demonstrations in both large conference-like venues and smaller group workshops. Outside experts are brought in to discuss control issues relevant to landscape maintenance in San Francisco's often foggy and windy climate. In addition, training manuals prepared by outside IPM experts have become a significant tool for communicating control options other than chemical pesticides.

One unexpected consequence of these citywide training programs has been the opportunity for grounds-keepers with similar concerns and challenges to network with their peers across departmental boundaries, something that is very rare in large bureaucracies.

In-house staff were responsible for some of the training materials, like the fact sheets, while experts in the IPM field were contracted to create a variety of manuals and workbooks. The Public Utilities Commission worked with the Bio Integral Resource Center and experts to create a series of workbooks on pests of particular concern to the department. Each workbook walks the reader through an IPM decision making process and offers a number of control options from mechanical and reduced-risk chemicals to prevention and exclusion. Each workbook was part of a hands-on training session. Topics include Gophers, Yellow Star Thistle, Argentine Ants, Gorse, Brooms, and General Vegetation Management. While the Public Utilities Commission (PUC) developed the workbooks for their own staff, they have made them available throughout the city further fostering a sense of interdepart-

mental teamwork in our IPM efforts.

Budgetary Requirements

Limited resources often present the most significant barrier to implementing an IPM program. IPM programs emphasize long term solutions to on-going problems, yet most budget processes reflect short-term fixes. Training, equipment purchases, and additional labor all cost money and department heads do not give priority to pest control in their allocation of existing resources, given competing needs and budgets.

In San Francisco, roughly 35,000 employees fall under the ordinance. In addition, the IPM ordinance affects not only the 49 square miles of land within San Francisco's city and county borders, but also the city-owned property in seven surrounding counties, covering hundreds of miles.

San Francisco is utilizing an effective system to fund the IPM program. Even departments, identified as "big users" of pesticides, were each asked by the Mayor to transfer \$17,900

to the Department of the Environment for program coordination and development. This money is being used to fund the position of the citywide IPM Coordinator as well as to fund training, expert consulting fees, and materials for all seven departments and outreach to the remaining 70 city departments.

Other funding sources include a start-up grant awarded to the County Agricultural Commissioner's Office by the Environmental Protection Agency and private grants used to fund

specific projects. In addition, individual departments have drawn upon existing budgets to implement specialized training and pilot projects.

It is still too early to tell whether the short-term start-up costs will result in long-term cost savings for the city in terms of real dollars. It is likely that it will save the city very difficult to quantify but very real benefits including decreased costs for health care for poisonings and clean-ups, increased morale of city staff who are proud of an effective program, and decreased costs in pesticide purchases.

The Year 2000 List: Developing a List of Approved Use Pesticides

Under the ordinance, all pesticides are banned from use by San Francisco City departments effective January 1, 2000, except for a list of approved use pesticides. Compiling this list has been one of the major challenges in implementation. The intent of the ordinance was never to ban all pesticides. Because the definition of pesticides is so broad, many materials and methods that are defined as pesticides are critical components of an effective pest management program, including some safer oils, biological controls, and others. Rather, the

**IPM is about changing
pest management
practices to prevent
problems from occurring,
making the use of
pesticides unnecessary.**

intent of the list is to contain only those pesticides that are low risk to humans and safe for non-target pests.

In the first year of the ordinance, all acutely toxic category I, labeled "Danger," (as defined by EPA) pesticides and those identified by government agencies as linked to cancer and reproductive harm were banned. By the end of the second year, all acutely toxic category II, labeled "Warning," pesticides were banned except under specific exemption by the citywide Pesticide Program Coordinator. Now a four-step process has been established to compile a list that not only defines which pesticides may be used on city property but also sets parameters for how those pesticides are used.

Step 1 - Assembling a potential pesticide list (completed): Each city department was asked to submit a list of pesticides they wished to be considered for inclusion on the approved list, excluding the most hazardous pesticides that had been eliminated by previous bans.

Step 2 - Scientific review (in process): The city will assess the ecological impacts and human health concerns of each pesticide requested for use. A scientifically defensible evaluation tool was needed to conduct such a review. Philip Dickey of the Washington Toxics Coalition has developed an excellent system for assessing the potential effects of many commonly used urban pesticides, which is being used in both the City of Seattle and King County, Washington. San Francisco will run each of the "desired" pesticides through this rigorous analysis. Once the analysis is complete pesticides will be grouped according to the risk and hazard factors.

Step 3 - Combining science with need: A small committee composed of community members, city staff, and public interest advocates will be charged with reviewing the scientific analysis and sorting pesticides into tiers of relative toxicity (see below). The committee will need to weigh the environmental and human health impacts with the need for a particular pest management tool. Available alternatives will be considered as well as mitigating factors such as self-contained bait stations or the ability to exclude public access, and hence reduce exposure, on a golf course. The public will be invited into the process through publicly held meetings.

Step 4 - Final adoption: The San Francisco Commission on the Environment will then make the final decision on what will be included on the approved list. The list will be revisited every six months to determine if new, safer pesticides should be added and if some more hazardous pesticides can be dropped or their use further limited.

At the end of this process, a three-tier system for using pesticides will be established:

Allowed Products: This list will include products that are considered non-toxic, such as beneficial insects and bio-

logically-based pesticides, as well as those defined by the city as reduced risk. Products on this list will likely include insecticidal gels and containerized baits, some soaps and oils, organic acids, and inorganic salts like borates.

Limited Use: This list will include products that are of possible environmental and public health concern but whose use is required under the financial constraints and/or performance requirements of building and landscape maintenance. The list will dictate the specific circumstances under which a product may be used. For example, Roundup Pro™ will most likely be found on this list. However, use of this product would be limited to such situations as cracks in asphalt where use of a scraping tool would only expand the weakened areas of the surface and so increase the available area for future weed establishment.

Requiring Exemptions: Some products are considered to be of significant enough concern that their use must be restricted to emergency situations. For example, a fungal outbreak on golf course greens can

require a swift solution that is usually chemically based. For a product on this list to be used, a written request must be submitted to the citywide Pesticide Program Coordinator for approval. There currently is a debate within the Technical Advisory Committee (TAC) about whether this list should actually include specific pesticide products or whether it should simply be the process for exemption requests.

Compiling this list and developing a protocol has been extremely challenging. City staff have made tremendous strides in eliminating the use of many highly hazardous pesticides and have altered their practices to reduce the need for using pesticides in many other cases. Yet many still believe that they should have access to pesticides that Pesticide Watch and other public interest advocates have serious concerns about, including glyphosate, the active ingredient in Roundup™. The challenge facing the subcommittee charged with assembling the list can not be underestimated. IPM programs must balance the need for tools to cover a wide range of pest control problems with the imperative responsibility of protecting human health and the environment.

Compiling this list and developing a protocol has been extremely challenging. City staff have made tremendous strides in eliminating the use of many highly hazardous pesticides and have altered their practices to reduce the need for using pesticides in many other cases. Yet many still believe that they should have access to pesticides that Pesticide Watch and other public interest advocates have serious concerns about, including glyphosate, the active ingredient in Roundup™. The challenge facing the subcommittee charged with assembling the list can not be underestimated. IPM programs must balance the need for tools to cover a wide range of pest control problems with the imperative responsibility of protecting human health and the environment.

Outside Contractors and Tenants on City Property

Ensuring compliance with an IPM ordinance means making sure all in-house staff are on board as well as any outside contractors who are hired for pest management purposes. We have discussed in detail the mechanisms for oversight of in-house staff, largely training and reporting. Outside contractors, usually structural pest control operators, can offer a special challenge when procurement of these services is spread across a large number of departments or even individual sites



Mulch effectively curbs weeds on a median strip in San Francisco.

throughout a city. In San Francisco, a citywide pest control contract has greatly aided consolidation of the oversight of both procurement and contractor performance. No department may hire a pest control contractor outside of the citywide bid. This type of restriction is quite common in municipal purchasing and so most departments have little trouble understanding the contracting procedure and following it closely.

Several sample contracts for IPM services are available (City of Santa Monica, National Capitol Region (Washington, DC), Santa Clara County) and San Francisco will be refining its contract in the first part of 2000. An effective contract must specify which pest management methods are allowable and preferable for each target pest. In addition, the contract must address pest-proofing as either the responsibility of the contractor or the contracting department. For example, is caulking or screen repair a reimbursable use of the pest control contractor's time? Finally, the contract must spell out the reporting requirements of the IPM program. Most contractors are not used to filling out detailed reporting forms for their clientele or submitting monthly summaries of pesticide products used. If these elements are viewed as important, they must be spelled out in the contract document.

Oversight of the contractor's performance is best achieved by tracking customer satisfaction along with the pest monitoring and control activities performed at each site. In large institutional settings, such as cities and school districts, the Quality Assurance Form (QAF) becomes the key communication and oversight tool for the IPM Coordinator. The QAF lists the number of traps, monitors, bait stations, etc. in place at a given site and documents any lapses in sanitation or structural deficiencies contributing to pest infestations.

One particularly successful program is at San Francisco's International Airport, which includes roughly 2.5 million square feet of building space on 7,000 acres, and is visited by about 40 million passengers a year. Pest control on such a large scale is no small feat. The Airport's IPM Coordinator receives the QAF's generated by the pest control contractor throughout the airport. In addition, each week the Coordinator performs a detailed monitoring tour of the entire airport facility. Combining the information on the QAF with his own observations, the IPM Coordinator generates a "Monitoring Form" detailing problem areas that require immediate attention. This form is forwarded to the Head of Environmental Services who then designates individual tasks to the appropriate maintenance staff members. Because of this system, rat infestations were curtailed by placing lids on all the trash cans at an open field used by the public for viewing airplane landings and takeoffs. Also, increased street sweeping has reduced the need for herbicides or labor for mechanical methods to

control weeds growing in curb areas.

San Francisco faces a tremendous challenge in implementing the IPM ordinance within city-owned properties that are leased by private tenants. Both the Port and Airport house hundreds of private tenants (each airline and shipping company is considered a private tenant). The IPM ordinance does specify that when an individual's lease comes up for renewal, the tenant must comply with all aspects of the ordinance. We hope to develop a tenant education program some time next year.

Oversight of individual tenants will most likely be on a complaint basis. In terms of outside contractors, the final challenge will be to implement the IPM ordinance for city operations that occur in non-city owned buildings. Again, the lease is the point of opportunity to establish pest management related requirements.

San Francisco has demonstrated an on-going commitment to training from the level of the Department Head to the groundskeepers, custodians, and office staff...

It Takes A Team to Succeed: Acknowledgements

The authors of this article are only two voices in a large collection of individuals who are responsible for the IPM program in San Francisco. The authors would like to acknowledge the following individuals for their dedication and leadership in crafting and implementing San Francisco's IPM program: Dave Frieders and Jay Seslowe of the San Francisco County Agricultural Commissioner's Department, Al Hom and Beryl Magilavy of the Department of the Environment, California State Assemblyman Kevin Shelley and San Francisco County Supervisor Leslie Katz, and current Director of the Department of the Environment, Francesca Vietor. We would also like to acknowledge the many members of the TAC who have shown strong leadership in taking new approaches to pest management within their departments.

Gregg Small is the Executive Director of Pesticide Watch and Pesticide Watch Education Fund and the President of the Beyond Pesticides/NCAMP Board of Directors. Gregg has served on the San Francisco Technical Advisory Committee since its inception. Gregg can be reached Pesticide Watch, 450 Geary Street, San Francisco, CA 94102, 415-292-1488, greggsmall@earthlink.net, or www.pesticidewatch.org.

Deborah Raphael is the Pesticide Reduction Program Coordinator for the Department of the Environment, City of San Francisco. Deborah can be reached at the Department of the Environment, 1540 Market Street, Suite 160, San Francisco, CA 94102, 415-554-6399 or debbie_raphael@ci.sf.ca.us.

One of the most successful elements of the San Francisco ordinance has been the change in pest management practices that have occurred in a number of city departments. Knowing that many of the traditional chemical tools were no longer available, many staff have experimented with new and innovative ways to reduce their reliance on chemical pesticides. Below is a summary of some of these changes.

Weeds

Annual Flowerbeds in Golden Gate Park: The Rec/Parks Department eliminated the use of pre-emergent herbicides in the highly visible flowerbeds outside the park's conservatory. First, staff experimented with solarization, a technique that failed in this site because the over-spray from sprinklers kept the plastic wet which cooled the soil below. The gardeners have since developed a successful system where the empty beds are watered and allowed to sit for two weeks to let weed seeds germinate. A flamer is then used to kill the seedlings as they surface. The system works so well that only occasional hand weeding is required to maintain the bed once the annuals are planted.

Public Utility Commission: On the steep slopes that surround one of the city's remote reservoirs a herd of goats is being used to clear brush including Poison Oak and Yellow Star Thistle to reduce fire hazard. Robin Bruer, the department's IPM Coordinator has contracted the services of the goats along with two dogs and a herder for 18 months.

The herd will circle the reservoir three times creating an open growth pattern in the vegetation. Using goats to clear vegetation will both reduce the risk of fire and protect the water supply from potential pesticide contamination.

A series of pilot projects from installing weed barriers to an intensive gopher and mole monitoring and trapping program have all reduced the need for chemical controls. In one heavy brush area, a fire road is being maintained by a set of experimental plots to test various mowing regimes and dozer blade removal techniques (in combination with and without pesticides). The project goal is to convert the vegetation pattern within the fire access area from dense brushland to perennial grasses and wildflowers using the most efficient and chemical-free methodology.

Golf courses

Recreation and Parks: San Francisco owns and operates a number of golf courses both within our county limits and in neighboring areas. Golf courses have traditionally been the most difficult settings to manage without the use of chemical controls such as herbicides and fungicides. The supervisor for Sharp Park and Golf Course, John Farley, has proved a willing partner in the search for less toxic management practices. John and his staff well understand that healthy turf means disease resistant turf and that means less of a need for pesticides. They are experimenting with the use of slow-release organic fertilizers and various aeration methods to im-

prove turf health. In addition, the staff have set up a monitoring system to track weather conditions at various points in the course as well as the presence of disease and prevalence of weeds such as English Daisy. John hopes that such detailed records will allow him to better understand when a disease outbreak can be waited out and when a chemical control is needed. Staff use mulch to prevent weeds in flowerbeds and selects plants sturdy enough to handle the nearly continuous stream of salt air that blows in from the ocean adjacent to the course. John's experiences on the golf course will be translated to turf areas throughout the city's neighborhood parks.

Cockroaches

MUNI (public transit): "There's no roaches in these coaches" is the word from Victor Lee and the maintenance division overseeing the "rolling stock" (buses, trains, trolleys, etc). Several years ago, buses were routinely sprayed with insecticides, whether insects were present or not. Now improved sanitation has been combined with a baiting program and the results have proved a success. Baits are applied only twice a year so the cost of pest control has been drastically reduced and the buses are filled with happy monitors (i.e. the passengers) who would definitely let staff know if cockroaches were riding along with them.

Roadsides

Public Works: Median strips are a very common challenge for an IPM coordinator. For beautification, many miles of these narrow planted areas are cropping up but rarely are resources planned for their maintenance and upkeep. Applying herbicides to medians carries an additional risk for the applicator - moving vehicles. The spray operator, Ralph Montana, charged with maintaining San Francisco's medians, and a great many other areas as well, decided to try planting wildflowers in several areas that seemed heavily prone to weed infestations. Three mixes of wildflowers were selected to match local climatic conditions and the resulting blooms require little maintenance. In addition, any volunteer weeds blend in with the less manicured look of the flowers and so no herbicides have been needed to remove them.

In addition to the examples cited above, outside vendors are invited to present information on their "alternative" products and train San Francisco staff to implement pilot studies to determine the efficacy of these technologies within the constraints of our microclimate and bureaucracy. Products that have been tested include "flamers" and hot water systems for weed control, corn gluten meal based products, and several predatory insects released as a means of biological control in our greenhouses and nurseries. The city is now exploring opportunities for working closely with local research institutions to act as an experimental demonstration site for new reduced risk technologies and products.

– Gregg Small and Deborah Raphael