City of Oakland
Agenda Report

To: Public Works Committee
From: Councilmember Jean Quan
Date: March 8, 2005

Re: SUPPLEMENTAL REPORT REGARDING RESOLUTION AUTHORIZING A LIMITED EXEMPTION TO THE INTEGRATED PEST MANAGEMENT POLICY TO USE HERBICIDES ON CITY-OWNED LAND IN THE WILDFIRE PREVENTION DISTRICT AND OTHER CITY PROPERTIES IDENTIFIED BY THE FIRE MARSHAL AS AREAS OF HIGH FIRE HAZARD

SUMMARY

This report is supplemental to the report submitted to the Public Works Committee and the Pubic Safety Committee on February 22, 2005. It addresses concerns raised at both meetings by Councilmembers and the public about the proposed policy. In order to further address concerns raised about proposed revisions to the policy, the resolution has been revised to direct the preparation of changes to the policy, including the analysis of approaches, best management practices and protocols for the ten year strategic plan as part of the implementation of the Wildfire Prevention Assessment District (WPAD). This work will also include the necessary environmental documentation under the California Environmental Quality Act (CEQA). The proposed changes and all documentation will then be presented back to the City Council as part of the vegetation management plan.

KEY ISSUES AND IMPACTS

Current IPM protocols require change in order to allow for limited use of herbicides under certain conditions, requirements and restrictions. This change is necessary in order to develop an effective and integrated vegetation management plan for the WPAD. By directing that this work be initiated, the community will be able to review how and when the limited use of herbicides will occur. The resolution has been revised to clearly state that the Council is directing staff to prepare the necessary revisions and analysis for limited herbicide use. The next step will be for the Council to review the revised IPM policy and an annual vegetation management plan within the next year.

If direction is given to initiate this work, a consultant with IPM and vegetation management expertise will work with city departments and community stakeholders to finalize a revision of the City's current IPM protocols, prepare the required environmental documentation and frame an overall strategy for vegetation management for the WPAD. The vegetation management plan will provide an opportunity for the public to review, on a yearly basis, the fuel reduction work proposed for the WPAD. Utilizing protocols from the IPM policy, the consultant will propose a plan detailing where, how and when fuel reduction efforts will occur and how, when and where herbicide use would be appropriate. Opportunities to receive public comment will occur during the WPAD Board review process and during the review and approval process by the City Council. Herbicide use will only occur if the Council finds that the both plans adequately address safety and environmental concerns.

Integrated Pest Management (IPM) Policy

An IPM policy is a set of protocols and procedures for effective and safe management of vertebrate and invertebrate, insect, plant and fungi pests. In this case, it will define the most appropriate strategy to control plant pests and specifically reduce the fuel load within the WPAD, including when and how herbicides should be used on a species-by-species basis. There are many resources from which to draw on when identifying the best protocols for the plan. The Nature Conservancy (see attachment A) is one example of an available resource from which to model a policy concerning the appropriate procedures for herbicide use.

> Integrated pest management is a pest management strategy that focuses on long-term prevention or suppression of pest problems, with minimum impact on human health, the environment and non target organisms. Preferred pest management techniques include encouraging naturally occurring biological control, using alternate plant species or varieties that resist pests, selecting pesticides with a lower toxicity to humans or that reduce pest problems; or changing the habitat to make it incompatible with pest development. Broad spectrum pesticides are used as a last resort when careful monitoring indicates they are needed according to pre-established guidelines. When treatments are necessary, the least toxic and most target specific pesticides are chosen. Implementing an integrated pest management program requires a thorough understanding of pests, their life histories, their environmental requirements and natural enemies as well as establishment of a regular, system program for surveying pests, their damage and/or other evident of the presence. ["Establishing Integrated Pest Management Policies and Programs; A Guide for Public Agencies"; Flint, Daar, & Molinar]

The proposed resolution requires that standards already established in the City's current IPM policy will be reviewed, updated and amended to address fuel reduction work specific to the WPAD. Some of the IPM requirements include but are not limited to:

- Public notification;

- Signage;
- Dye markers to indicate exactly where herbicide was applied;
- Monthly reporting;
- Buffer zones;
- Compliance with all state and federal regulations for applying and dispensing herbicides, including training or certification of all city staff and contractors who handle herbicides;
- Monitoring areas where herbicides have been applied

An IPM establishes guidelines for the choice of formulation for each type of herbicide application based on environmental factors, such as wind and rain conditions, as well as the product's capabilities. The WPAD's IPM protocols will include a list of the highly flammable non-native plants considered "pests" (as identified in this Resolution) and those native plants species that will encourage natural biological control or are a protected native species.

The most important component of the IPM policy is the annual reporting requirement that details when and where herbicides have been applied in the past year, the type of herbicide used, quantities used, and the success rate of the application, if possible. This report not only is presented annually to the City Council, but also, by law, must be filed with the Alameda County Agriculture Commission.

Vegetation Management Plan

Before the limited use of herbicides is triggered, the IPM/vegetation management consultant, Fire Department and the WPAD Board will develop a vegetation management plan that incorporates IPM protocols and complies with CEQA requirements for City Council review and approval. The plan will literally map out the fuel reduction priority areas for the year, identify sensitive plant and habitat locations within the priority areas and identify the various non-native plant species and the methodologies planned for their eradication or suppression including when, where and how herbicides will be used. Additionally, if the high priority areas include a creek, watercourse, endangered species or habitat, the plan should detail the necessary permits required from agencies such as the Alameda County Clean Water Program or the City's Environmental Services Creek Protection Program and any mitigation measures that are deemed necessary.

The vegetation management plan will be developed using Best Management Practices (BMPs) garnered from other public agencies with vegetation management responsibilities. These include the East Bay Regional Park District, the University of California, and East Bay Municipal Utility District, and other public agencies in the greater Bay Area. The California Invasive Plant Council and The Nature Conservancy, and other conservation groups provide valuable research on their web sites. BMPs from the State Department of Fish and Game and the U.S. Fish and Wildlife Service will be adopted for areas containing endangered species.

Herbicide Application

Aerial or ground spraying is not permitted under this policy. When herbicides are needed for vegetation control, best management practices call for direct application to the plant or tree either by hand painting the herbicide directly on to the cambium of the freshly cut tree or plant stump or bottle spritzing, no further than six inches away, onto freshly cut grass clumps. In order to apply the herbicide to the stump or grass clump, all of the plant or tree's foliage (leaves, branches, trunks) must be hand or mechanically cut away until nothing is left but a stump or clump. When glysophate and triclopyr are applied in this manner, the herbicide is absorbed within the plant or tree's system and does not migrate into the surrounding soil.

Herbicide Formulations

The exemption will be limited to the use of two herbicides – glysophate (in formulations such as Roundup or Rodeo) and triclopyr (in formulations such as Garlon and Pathfinder). These are federally- and California-registered pesticides for the control of woody plant species and broad leaf plants in right of ways, forests, open space parks, ditch banks and maintenance of wildlife corridors. The U.S. Environmental Protection Agency categorically ranks herbicide toxicity on a scale of one to four as follows: Category One – highly toxic; Category Two – moderately toxic; Category Three – Slightly Toxic; Category Four – Not Acutely Toxic. Both glysophate and triclopyr have received the lowest ranking for toxicity or a Category Four. In accordance with the city's IPM policy and BMPs, the choice of formulation for each type of application will be determined based on environmental factors as well as the product's capabilities.

Glysophate and triclopyr will only be used when conditions and BMPs demonstrate that a chemical treatment would be the most effective approach and will only be applied to the list of plants previously identified in this report and those new non-native plants that may be identified in the Wildfire Prevention Assessment District's yearly report

A copy of the EPA Reregistration Eligibility Decision (R.E.D.) Facts document is attached to this report for your review (attachment B).

Certification and Training for Herbicide Applicators

The City currently has one staff member that has a Qualified Applicator Certificate issued by the State Department of Pesticides in the laws, regulations, and basic principles associated with pesticide application. This position supervises employees who work with Category Three and Category Four herbicides, such as Garlon or Roundup. Employees applying Category three and four herbicides do not require state certification, however state law does require employees to receive annual training in the following areas:

- Safe handling procedures;
- Proper cleaning and disposal of containers;
- Drift;

- Storage;
- First aid and contamination;
- Emergency medical contact information;
- Employee rights to receive information regarding pesticides;
- Location of documents such as access to Hazard Communication program, information, labels, pesticide use records, medical records and other documents;
- Heat stress recognition, treatment, prevention;
- Respiratory equipment fitting, use and maintenance;
- Reading labels;
- Proper use of protective gear.

The City is further required to maintain records of the annual training for each employee. Inspectors from the Alameda County Agriculture Department make scheduled inspections of records and employees in the field to monitor compliance with procedures for the safe handling and dispensing of herbicides. County inspectors also make frequent unscheduled inspections and cite employers if workers are found not complying with safety procedures.

The annual training is conducted in house by the City's State certified employee.

Environmental Impact

This resolution directs staff to prepare an Environmental Impact Report for the limited use of herbicides in the Wildfire Prevention Assessment District. The resolution does not authorize the actual change in policy but merely directs that the components of the policy change be prepared and brought to the public, WPAD Board and city Council for review.

RECOMMENDATION

That the City Council approve the attached revised resolution directing staff to prepare the information, revisions and analysis necessary to allow limited use of herbicides on City-owned land in the Wildfire Prevention Assessment District and other City properties identified by the Fire Marshal as areas of high fire hazard, including the preparation of an Environmental Impact Report, revised IPM policy and a Wildfire Prevention Assessment District vegetation management plan.

Respectfully submitted,

Jean Quan
Councilmember, District 4

OAKLAND CITY COUNCIL

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FILED
OFFICE OF THE CITY CLERK
OAKLAND

RESOLUTION NO._____ C.M.S.

INTRODUCED BY COUNCILMEMBER Jean Quan

2005 MAR -3 PM 5:21

RESOLUTION DIRECTING THE PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT FOR A LIMITED EXEMPTION TO THE INTEGRATED PEST MANAGEMENT POLICY TO USE HERBICIDES ON CITY OWNED LAND IN THE WILDFIRE PREVENTION DISTRICT AND OTHER CITY PROPERTIES IDENTIFIED BY THE FIRE MARSHAL AS AREAS OF HIGH FIRE HAZARD

WHEREAS, in 1997 the Oakland City Council approved the implementation of a comprehensive Integrated Pest Management (IPM) policy and passed Resolution No. 73968 C.M.S., that prohibits the use of pesticides on City property except as specifically exempted; and

WHEREAS, the Oakland Fire Department is responsible for reducing wild land fuels through vegetation management in Oakland's Wildfire Prevention District; and

WHEREAS, Oakland's Wildfire Prevention District includes City owned public open space such as Joaquin Miller Park, Knowland Park, King Estates Park, Dimond Canyon, Dimond Park, rugged canyons, public pathways, fuel breaks, roadsides, medians and steep hillsides; and

WHEREAS, there are a handful of other areas in Oakland with comparable topography and vegetation to the established Wildfire Prevention District with potentially the same high risk of fire danger; and

WHEREAS, the proliferation of non-native trees and shrubs such as blue gum eucalyptus, acacia, broom, and pampas grass creates a continuous fuel bed and fire hazard throughout the City's high fire hazard urban/wild land interface; and

WHEREAS, invasive, non-native trees and shrubs have few natural enemies, propagate readily in Oakland's climate and are resistant to eradication or control without the assistance of herbicides; and

WHEREAS, the offending trees and shrubs sprout profusely after hand or mechanical clearing and require cutting several times per year to fully abate growth; and

WHEREAS, the uncontrolled growth of non-native, invasive trees and shrubs constitutes a greater risk to native plant communities and wildlife habitat than does the use of selected herbicides as a component of a strategic vegetation management plan; and

WHEREAS, pulling or mechanically removing trees and shrubs may be ecologically damaging in some circumstances as it disturbs soil and creates an inviting seedbed for weeds. Herbicides leave soil intact and undisturbed, making it easier for native plants to survive as well as preventing erosion; and

WHEREAS, the Oakland City Council seeks to improve fire prevention and reduce wild land fuels within the City of Oakland in a cost effective and environmentally sensitive way; now therefore be it

RESOLVED: That the Oakland City Council hereby directs the preparation of an Environmental Impact Report consistent with CEQA regarding a limited exemption to the Integrated Pest Management policy for the selective use of glyphosate (in formulations such as Round-up or Rodeo) and triclopyr (in formulations such as Garlon and Pathfinder) on City owned land in the Wildfire Prevention District through rvisions to standard practices, protocols and developing a Wildfire Prevention Assessment District vegetation management plan; and be it

FURTHER RESOLVED: That whenever said herbicides are used, they shall only be painted or applied directly on the plant or tree stumps and shall only be used when conditions and best management practices demonstrate that a chemical treatment would be the most effective approach to control the following plant and tree species:

- all species of *Eucalyptus* (*E. globulus* (blue gum), red gum, and others)
- all species of Acacia (*A. dealbata* (silver wattle) and *A. melanoxylon* (blackwood acacia) and others); all non-native species of *Prunus* (plum and cherry)
- all species of *Ulmus* (elm)
- *Ilex aquifolium* (Holly)
- *Maytenus boaria* (Mayten)
- all species of *Cotoneaster* (*C. franchetii, C. lacteus, C. pannosa*)
- all species of broom and gorse: *Cytisus scoparius* (Scotch broom), *Genista monspessulana* (French broom), *Spartium junceum* (Spanish broom) and *Ulex europea* (gorse)
- *Crataegus monogyna* (Italian hawthorn)
- non-native species of blackberry: *Rubus discolor* (Himalayan blackberry) and *R. ulmifolius* (thornless blackberry)
- *Cortaderia selloana* and *C. jubata* (pampas grass, jubata grass), when these plants cannot be removed with a hand or power tools.
- other non-native, invasive species threatening native plant communities and wildlife habitat identified in the Wildfire Prevention District annual report;

and be it

FURTHER RESOLVED: That the selective use of herbicides on City owned land in the Wildfire Prevention District shall be implemented in accordance with best management practices, a strategic integrated vegetation management plan and other applicable local, state and federal requirements concerning the safe use of herbicides such as public notification, use of colored dye and return intervals; and be it

FURTHER RESOLVED: That the City's current IPM guidelines shall be revised and updated utilizing BMPs including buffer zones around creeks and wetland; and be it

FURTHER RESOLVED: That changes in protocols and practices shall include that all vegetation management service contracts shall be developed in accordance with the vegetation management plan and stipulate compliance with the City's IPM policies and procedures, including those specific to the use of herbicides, and shall require that contractors provide the City with a copy of their state herbicide use reports;

FURTHER RESOLVED: That the limited exemption to the IPM policy to selectively use herbicides on city owned land in the Wildfire Prevention District shall be expressly limited to undeveloped, non-landscaped areas (excluding developed fields, playgrounds, picnic, and other high use areas as currently stipulated in the City's IPM policy); and be it

FURTHER RESOLVED: That only certain strategic areas outside the Wildfire Prevention Assessment District shall have a limited exemption to the IPM policy if the Fire Marshal determines that the proliferation of a non-native, invasive plant species is contributing to the creation of fuel beds that are a high fire hazard;

FURTHER RESOLVED: That the Fire Department shall annually prepare a report to the Wildfire Prevention Assessment District Advisory Board and the City Council on vegetation management efforts over the past twelve months that includes a detailed account of amounts and types of herbicide used and a vegetation management plan for the upcoming year: and be it

FURTHER RESOLVED: That the City Planning Department shall prepare an Environmental Impact Report for the limited use of herbicides in the Wildfire Prevention Assessment District; and be it

FURTHER RESOLVED: That the Environmental Impact Report, a revised IPM policy and the vegetation management plan for the Wildfire Prevention Assessment District (WPAD) shall be approved by the the City Council prior to changes in practice and policy concerning the limited use of herbicides.

IN COUNCIL, OAKLAND, CALIFORNIA, _____, 20____

PASSED BY THE FOLLOWING VOTE:

AYES – BROOKS, BRUNNER, CHANG, DE LA FUENTE, NADEL, QUAN, REID, WAN

NOES-

ABSENT-

ABSTENTION-

ATTEST: _____
LATONDA SIMMONS
Interim City Clerk and Clerk of the Council
Of the City of Oakland, California

2nd Draft Revision
OAKLAND CITY COUNCIL

RESOLUTION N0._____C.M.S.

INTRODUCED BY COUNCILMEMBER Jean Quan

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IN COUNCIL, OAKLAND, CALIFORNIA, _____, 20_____

PASSED BY THE FOLLOWING VOTE:

AYES – BROOKS, BRUNNER, CHANG, DE LA FUENTE, NADEL, QUAN, REID, WAN

NOES-

ABSENT-

ABSTENTION-

ATTEST: _____
LATONDA SIMMONS
City Clerk and Clerk of the Council

Of the City of Oakland, California

Attachment "A"

The Nature Conservancy

SAVING THE LAST GREAT PLACES ON EARTH

Search

Asia Pacific · Caribbean · Central America · North America · United States · South America

Michigan

Home
About the Chapter
Places We Protect
Field Trips and Events
Press Releases
Ways of Giving
Volunteer
Real Estate Opportunities

how you can help
donate online
renew membership
estate planning
gift ideas
volunteer
activities
events
merchandise
magazine
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field guide
newsletter

Ask The Expert

There are many different opinions on the methods of invasive species control. Our 'Ask the Expert' Doug Pearsall, director of conservation science for the Michigan Chapter, takes a look at the pros and cons of some of the more controversial methods.

Dr. Doug Pearsall talks with volunteers at Sibley Road Preserve

Biological Control Methods

Biological control is an approach that entails introducing one organism to an ecosystem to control another problem species. The control agent could be a predator or herbivore that feeds on the target species or a disease agent that will cause a decline of the target species. Biological control has been used by public agencies and private individuals for more than a century, but for the Conservancy, whose goal is to conserve native ecosystems, there is an inherent controversy when you introduce a non-native species to control another species.

There are some famous cases of biocontrol agents feeding on native species, but those agents were never tested for host specificity—they were known to be generalists. One example is a beetle brought in by ranchers in the Great Plains to eat non-native thistles. As it turns out, the beetle also feeds on native species, and some rare thistles could be threatened. Recognizing this significant issue, the Conservancy instituted a policy years ago against introducing non-native species on our preserves. However, with recent advances in the testing of biocontrol agents, the chances of negative effects on non-target species are very low. Among biocontrol agents that have been introduced under the current testing methods, none have been found to be eating native plants. We are now reviewing our policy and developing a more flexible, yet still cautious, approach.

Another deterrent to biological controls is the high cost associated with it. Testing on average costs about $1 million per species. For example, five species of beetles are being tested as potential biocontrol agents for garlic mustard, one of our worst invaders. Garlic mustard was approved for testing due to the known high cost of allowing its invasion to proceed, the lack of other cost-effective control methods, and the likelihood that an effective biocontrol agent could be found. Many other species have been nominated for testing but did not meet these criteria. For species that do meet these criteria and that are serious threats to biodiversity, the Conservancy will maintain support for the cautious development and use of agents of biological control.

Herbicides

We've found that using herbicides significantly increases our effectiveness in controlling invasives. However, an obvious concern with the use of herbicides is that they are toxins that can kill native and non-native species alike. Whenever we use herbicides, we have to be very careful to use them in ways that don't put native species at risk. For example, we use herbicides (such as glyphosate—the active ingredient in Round Up) that degrade very rapidly and don't stay resident in the ecosystem for long periods of time. All Conservancy staff who use herbicides have a license to do so, and all volunteers using herbicides are under the direct supervision of licensed staff. Finally, we apply herbicides in very specific ways depending on the species, season, and preferred application methods such as spraying or dabbing with a sponge, and in all cases we take precautions to limit the herbicide to the target species and to minimize the amount used.

Fire

Fire can be an effective tool to control invasive species because it not only sets back non-natives that are not fire-adapted, it promotes native species that are fire-adapted. However, we must always be aware of the risks associated with using fire. It is always possible that a fire could escape and cause property damage or personal injury, and smoke from a controlled fire could create hazards for traffic or human health. Because of these risks, implementing a prescribed fire takes a lot of planning and preparation. Our fire program takes an ecological approach to the use of fire and puts a high priority on safety and smoke management. Also, controls on the use of fire can be stringent—you must have the right weather conditions and an approved fire plan. Prescribed burning often requires getting burning permits at the local level and sometimes an air quality permit from the Michigan Dept. of Environmental Quality.

The Conservancy maintains very high standards for training and fitness, and works with partners that maintain similar standards. In addition, there are some invasive plants that are fire-positive—that is, fire will make them expand under some conditions. One of these is the common reed (*Phragmites australis*) which can spread by sprouting from underground rhizomes after a fire. Prescribed burning is also expensive. A recent innovation in the use of fire is spot burning, which can be cheaper.

In many cases, fire is just one a sequence of control strategies Burning often follows cutting and application of an herbicide For example, seedlings of glossy buckthorn (*Rhamnus frangula*) will germinate by the thousands after the adult plants have been removed, and spot burning is the most effective way to kill these seedlings when there isn't enough fuel to carry a prescribed fire Invasive species often have a competitive advantage over native species due to lack of natural predators or other reasons, and fire is a way to level the playing field.

For more information on how to remove invasives in your backyard go to http://tncweeds.ucdavis.edu/

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Chapter 5 – GUIDELINES[1] FOR HERBICIDE USE

PURPOSE

These Guidelines are designed to ensure that you carefully consider the overall impacts of herbicide use on your conservation targets, other native species, and the ecological system. Base all decisions whether to control weeds, and whether to use herbicides instead of other methods, on the conservation targets and management goals for the site. In addition, the health and safety of applicators and others in the vicinity must be considered **BEFORE** pesticides are applied. Simply put, one should be confident that the proposed herbicide will do more conservation good than harm and not endanger the health of the applicators or others in the area.

TO SPRAY OR NOT TO SPRAY?

Determining the right course of action in weed management can be difficult. For many land managers, whether to apply herbicides is an ethical decision that is not taken lightly. Herbicides are often used as a last resort, when other attempts have failed, and action is imperative.

The following checklist summarizes the steps that need to be taken to ensure that proper consideration has been given to current weed problems, and that the use of herbicides is warranted for each individual case.

1. Determine whether invasive plants threaten conservation targets or management goals on the site. Use herbicides (versus other control methods) only if confidant they can be used safely and will do more conservation good than harm. If you decide to use herbicides, be sure to record your reasons for doing so. TNC's Site Conservation Program (http://www.consci.org/scp) can help you identify targets and threats, and make a Site Conservation Plan. TNC's Site Weed Management Plan Template (http://tncweeds.ucdavis.edu/products.html) can help you set control priorities and develop a plan to implement them.

2. Develop safety protocols for STORING, MIXING, TRANSPORTATING, HANDLING SPILLS, and DISPOSING OF UNUSED HERBICIDES & CONTAINERS **BEFORE** obtaining herbicides.

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[1] These Guidelines and TNC's Standard Operating Procedures were designed to make TNC use of herbicides meet or exceed the Worker Protection Standard for Agricultural Pesticides enacted by the U.S. EPA January 1 1995. Although the Worker Protection Standard does not cover pesticide use in natural areas, except on sites leased for agricultural production, TNC's operations should at the very least measure up to this Standard.

It is **NOT** the purpose of TNC's Standard Operating Procedures nor of these Guidelines to require stewards to produce lengthy herbicide use plans.

3. Follow all federal, state and local regulations regarding herbicide use. You **MUST** read and follow product labels. It is a violation of federal law to use an herbicide in a manner inconsistent with its label.

4. Contact your State Department of Agriculture or County Agriculture Commissioner for information about state and local regulations regarding applicator permits and posting requirements. (See the list of state regulatory agencies in the Appendix.)

5. Check with the legal staff for your program (State or Regional Office) **BEFORE** obtaining herbicides if you have any questions about regulations or liability issues.

6. Herbicides may be applied only by TNC employees or contractors who have all certificates and licenses required by the state and/or county. Volunteers may NOT apply herbicides unless they are properly licensed AND have signed a consent & release form.

7. Applicators MUST wear all protective gear required on the label of the herbicide they are using. Provide all safety and protective gear requested by the employee(s) applying the herbicide. The health and safety of the applicator are of foremost concern.

SITE CONDITIONS

Site conditions to be considered include accessibility, proximity to open water, depth to groundwater, the presence of rare species and other conservation targets, and the site's sensitivity to trampling that could occur when the herbicide is being applied.

To prevent contamination of water bodies, management plans should carefully consider the hydrology of the system that is being treated. Hypothesize potential runoff scenarios and take appropriate measures (such as buffer zones) to prevent them. Underground aquifers and streams should be considered as well.

The herbicides covered in this Manual are regarded as posing relatively low risk for use in natural areas because they are not likely to contaminate groundwater, have limited persistence in the environment, and are of low toxicity to animals. Critical reviews of several common herbicides are available at a small charge from the Northwest Coalition for Alternatives to Pesticides (NCAP, P.O. Box 1393, Eugene, OR 97440, (503) 344-5044, http://www.pesticide.org). Information is also available from the National Coalition Against the Misuse of Pesticides (NCAMP, 701 E Street SE #200, Washington DC 20003, (202) 543-5450, www.ncamp.org).

In addition to federal pesticide registration, some states also have their own registration procedures and requirements and almost all states have their own pesticide applicator licensing, certification, or registration. To find out if a particular herbicide is registered

for use on wildlands in your state, call the state pesticide regulatory agency (see the Appendix for a list of state regulatory agencies).

ENDOCRINE DISRUPTING COMPOUNDS

The presence of synthetic chemicals in the environment, especially those designed to control unwanted species (insecticides and herbicides), and the acute and long-term effects of those chemicals on wildlife and humans have been of concern since the publication of Rachel Carson's book "Silent Spring" in 1962. New evidence indicates that the functioning of animals (including humans) endocrine systems can be severely altered by low-level cumulative exposure to some synthetic chemicals. Many different classes of industrial chemicals released into the environment exhibit potential endocrine-disrupting activities, such as mimicking or blocking the action of natural animal hormones. Exposure to these compounds during critical periods of development (in utero, or early postnatal) can result in irreversible damage to wildlife and to humans. In general, the compounds found in insecticides are usually more toxic than those in most herbicides, as most herbicides block or alter biochemical processes found exclusively in plants.

Numerous studies have reported that agricultural and industrial waste chemicals adversely effect wildlife populations. Endocrine-altering compounds, however, can also be found naturally (such as the phytoestrogen genistein, that is found in soy protein). Some studies suggest that the effects of synthetic chemicals are negligible relative to those of naturally occurring plant estrogens. Many synthetic compounds are known to bioaccumulate, which may greatly magnify their effects. It has also been suggested that combinations of synthetic compounds act synergistically with effects far greater than those of any one compound.

Some studies suggest that synthetic endocrine-disrupting chemicals alter growth, development, and reproduction rates, and can cause abnormal behavior in various wildlife species. Further, there is increasing concern regarding potential effects of synthetic endocrine disruptors on human reproduction and development, including, but not limited to, increased breast and ovarian cancers, infertility, increased testicular cancer, decreased semen quality, and increased spontaneous abortion rates.

A review by CAST (Council for Agricultural Science and Technology) published in 2000, concluded that current scientific evidence does not clearly link endocrine-disrupting chemicals with decreased male reproductive capacity or increased rates of breast cancer in women. However, this review did not completely dismiss the potential role that these chemicals may have as causative agents for adverse human health effects. Herbicides are only a small subset of all synthetic chemicals produced, and thus far, only 2,4-D has been implicated for possible endocrine-disrupting impacts. Some reproductive and developmental problems in wildlife populations have been attributed to endocrine-disrupting chemicals, but evidence of other effects are far from conclusive.

For more information:

Colborn, T., Dumanoski, D. and J.P. Myers. 1996. Our Stolen Future: Are We Threatening Our Fertility, Intelligence and Survival. A Scientific Detective Story. Penguin Books, New York.

Cornell University Program on Breast Cancer and Environmental Risk Factors in New York State. 2000. Endocrine Disruption and Breast Cancer Risk.
http://envirocancer.cornell.edu/Bibliography/General/bib.endocrineDisruption.cfm

Lyons, G. 1999. Endocrine disrupting pesticides. Pesticides News 46: 16-19. Pesticide Action Network UK.

Safe, S.H., Foster, W.G., Lamb, J.C., Newbold, R.R. and G. Van Der Kraak. 2000. Estrogenicity and endocrine disruption. Council for Agricultural Science and Technology (CAST), Issue Paper no. 16.

HERBICIDE PROPERTIES

Consider the following herbicide properties when deciding which compound to use:

1. Effectiveness against the target species.
2. Mechanisms of dissipation (persistence, degradation, and likelihood of movement via air or water to non-target organisms).
3. Behavior in the environment (in soils, water, and vegetation).
4. Toxicity to birds and mammals, aquatic species, and to other non-target organisms (including algae, fungi, and soil organisms).
5. Application considerations
6. Safety
7. Human toxicology

In general for work in natural areas, it is best to select compounds that are effective against the weed, not likely to drift, leach to groundwater or wash into streams, nontoxic to people and other organisms, not persistent in the environment, and is easy to apply. In some circumstances, a single application of a more toxic or persistent chemical that kills the weed, however, may be preferable to a less persistent, less toxic compound that must be applied repeatedly. Strive to do the job with the smallest **total** negative impact to the environment.

PROTECTIVE GEAR FOR APPLICATORS

The health and safety of the applicator are of foremost concern. Applicators MUST wear all protective gear required on the label of the herbicide they are using. Any additional safety and protective gear requested by TNC applicators must be provided. See the following textbox (page 5.6) for additional information regarding personal protection needs.

Even if not required, all TNC or volunteer applicators should wear the following when mixing or applying herbicides:

1. Rubber boots,
2. Protective aprons or suits (e.g., disposable tyvek suits) or sturdy overalls that are not used for other activities,
3. Rubber gloves (tyvek and nitrile gloves are recommended - one study indicated that neoprene can be penetrated by herbicides under field conditions),
4. Safety glasses or goggles.

Some applicators may even wish to wear respirators where not required. A dust mask may be worn when a respirator is not required, but pesticide safety officers point out that dust masks usually fit loosely and do not stop volatile compounds. Furthermore, they can indirectly increase chances of exposure if they cause heating, sweating, and irritation, which induce the wearer to repeatedly wipe or scratch their face.

Some companies that supply protective gear include:

A.M. Leonard, Inc.
241 Fox Drive
Piqua, Ohio 45356-0816
Phone: 1-800-543-8955
Web Address: http://www.amleonard.com

Ben Meadows Company
190 Etowah Industrial Court
Canton, GA 30114
Phone: 1-800-241-6401
Web Address: http://www.benmeadows.com

Forestry Suppliers, Inc.
P.O. Box 8397
Jackson, MS 39284-8397
Phone: 1-800-647-5368
Web Address: http://www.forestry-suppliers.com

Gempler's Inc.
P.O. Box 270
Belleville, WI 5350
Phone: 1-800-382-8473
Web Address: http://www.gemplers.com

Lab Safety Supply Inc.
P.O. Box 1368
Janesville, WI 53547-1368
Phone: 1-800-356-0783
Web Address: http://www.labsafety.com

Safety Solutions, Inc.
6161 Shamrock Ct.
P.O. Box 8100
Dublin, Ohio 43016-2110
Phone: 1-800-232-7463
Web Address: http://www.safetysolutions.com

PERSONAL PROTECTION IN HERBICIDE HANDLING

Adapted from Ohio State University's Extension Publication #825 "Applying Pesticides Correctly"
by Jennifer Hillmer, The Nature Conservancy-Ohio

PERSONAL PROTECTIVE EQUIPMENT

Herbicide labels indicate the minimum protective equipment required. This may vary by application technique. Cotton, leather, canvas, and other absorbent materials are not chemical resistant, even to dry formulations.

- Always wear at least a long-sleeved shirt, long pants, sturdy shoes or boots, and socks. The more layers of fabric and air between you and the pesticide, the better the protection.
- A thick layer of spray starch on clothing will add some protection from pesticides.
- Hands and forearms usually receive the most pesticide exposure. Wear chemical-resistant gloves, and tuck shirt sleeves into gloves (gloves should reach up the forearm, with cuffs to catch runs and drips).
- Canvas, cloth, and leather shoes or boots are almost impossible to clean adequately. Wear chemical-resistant rubber boots that come up at least halfway to the knee if the lower legs and feet will be exposed to herbicides or residues.

AVOIDING CONTAMINATION

- Wear chemical-resistant gloves (rubber or plastic such as butyl, nitrile, or polyvinyl chloride are common types).
- Make sure gloves are clean, in good condition, and worn properly. Replace gloves often. Wash and dry hands before putting on gloves. Wash gloves before removing them.
- Wash hands thoroughly before eating, drinking, using tobacco products, or going to the bathroom.
- Cuff gloves if pesticide is expected to run down towards the sleeves. Tuck sleeves into gloves.

EYE AND RESPIRATORY PROTECTION

- PPE labeling might require goggles, face shields, or safety glasses with shields. Some formulas or handling activities pose more risks to eyes than others. Dusts, concentrates, and fine sprays have the highest risk of causing pesticide exposure.
- There are many types of dust-mist masks and respirators, all of which must fit and be used properly to be effective.
- Respiratory protection is most important in enclosed spaces or when the applicator will be exposed to pesticides for a long time.
- Pesticides that can volatilize require the use of respirators. Check label requirements.

PERSONAL CLEAN-UP AFTER HERBICIDE USE

- Wash gloves and footwear (if possible) with detergent and water before removing them.
- Change clothing and put clothes used during application in a plastic box or bag, and keep it away from children or pets Use a mild liquid detergent and warm water to wash your hands, forearms, face, and any other body parts that may have been exposed to pesticides. Take a warm shower and wash your hair and body at the end of the work day.

LAUNDRY

- Do not wash work clothing and personal protective equipment in the same wash water with the family laundry. Handle with care and wash your hands after loading the machine.
- If you have chemical-resistant items, follow the manufacturer's washing instructions. Wash boots and gloves with hot water and liquid detergent. Wash twice, once outside and once inside. Air-dry boots and gloves.
- Rinse clothes in a machine or by hand.
- Wash in plenty of water for dilution and agitation.
- If using a washing machine, using heavy-duty liquid detergent in hot water for the wash cycles.
- After washing the clothes, run the washer through one complete cycle with detergent and hot water, but no clothing, to clean the machine.
- Hang items to dry if possible in plenty of fresh air. Do not hang in living areas.
- Using a clothes dryer is acceptable, but over time the machine may become contaminated with pesticide residues.

EMERGENCY PRECAUTIONS AND EQUIPMENT

Applicators must have easy access to emergency decontamination and first aid kits whenever they are applying herbicides, even if they are out in the field. All applicators should have access to an eyewash kit and at least 2 gallons of clean water.

Decontamination kits are available from many suppliers or can be assembled independently. Rubber buckets or tubs with tight sealing lids are convenient for homemade kits and should include:

1. Two (or more) 1 gallon containers filled with potable water,
2. Eyewash kits or eyewash bottles with buffered isotonic eyewash,
3. Hand or body soap (bring enough for all workers to thoroughly wash their hands when in the field),
4. Paper or other disposable towels,
5. A full tyvek coverall with foot covers,
6. A map and directions to the nearest medical facilities. Such maps should be posted in prominent locations at all preserve offices and work buildings. Include a copy as an Appendix to your weed control plan.

POSTING TREATED AREAS

Federal requirements for posting treated areas, if any, are listed on the herbicide label. Glyphosate, triclopyr and most other herbicides used in natural areas have no federal posting requirements. Some municipalities and counties have stricter requirements (e.g., Boulder, Colorado). Always keep treated areas off limits to the public at least until the herbicide dries. Treated areas may be kept off limits for longer periods if the herbicide is persistent in the environment.

When posting areas that are accessible to the public (trails, visitor centers etc.), place notices at the usual points of entry or along the perimeter of treated sites. The posting should include a notice that the area has or will be treated, the name of the herbicide used, the date of the treatment, appropriate precautions to be taken, the date when re-entry is judged to be safe, and a phone number for additional information. The notices should be removed after it is judged safe to re-enter the area.

STORING HERBICIDES

Store herbicides in a well ventilated, cool, dry area where food and drinks are never stored or prepared. Most pesticides should not be stored for any length of time below 40° F. The floor should be concrete or lined with plastic or other impermeable material to prevent leaks from reaching the soil.

The area should be inaccessible to the public and/or locked except when chemicals are being removed or returned. Containers should be labeled to indicate the following: contents (ratio of herbicide, surfactant, water, etc.), date mixed, and approximate volume remaining when placed in storage. The containers must be stored carefully and never stacked.

Heavy plastic garbage bags, a shovel, and a soil absorbent (e.g., cat litter) must be available for use in cleaning-up small leaks or spills. For more information on spills see below.

MIXING HERBICIDES

USE EXTREME CAUTION WHEN MIXING HERBICIDES! Dermal exposure to a small amount of a concentrated herbicide can be equivalent to the exposure received after a full day of working in a treated field (Libich et al. 1984). Before mixing any herbicide, READ THE LABEL. Herbicide labels are legal documents and users are obligated to read and obey them.

Establish a mixing area. Herbicides should be mixed only in pre-designated areas - preferably either in an industrial sink near the storage site or in an area near the treatment site(s) in which damage from small spills or other herbicide contamination would be minimal. Field mixing sites should have relatively few native or other desirable species, not be susceptible to erosion or runoff, and rarely, if ever, be visited by the public or preserve staff. In addition, mixing sites should provide easy access for containment and clean up of spills.

At the mixing site, assemble the appropriate equipment including safety and clean-up gear and measuring and mixing utensils. Heavy plastic garbage bags, a shovel, and an absorbent (e.g. cat litter) must be easily available at field mixing sites in case of a larger spill. Remember to wear all protective gear while handling and mixing herbicides. Avoid metal measuring utensils as some pesticides can react with metal. Clearly label herbicide-measuring equipment to avoid confusion with equipment used for measuring food. Wash all utensils before storage to prevent contamination of future mixes.

Prior to mixing, determine the order that chemicals will be added to the mix. Generally, adjuvants are added prior to the herbicide, but consult the label for specific instructions. When mixing, start by filling the spray tank or other mixing vessel half to three-quarters full with water. The water should be clean and clear to prevent contamination of the mixture or clogging of tank nozzles and hoses. The water should have a neutral or slightly acidic pH, as alkaline water can cause the pesticide to breakdown prior to application. Add a buffer or acidifier to the water if necessary.

Carefully measure the herbicide concentrate and add it to the tank water. Small measuring errors can lead to large errors in the amount of pesticide applied. Be aware of if you are using the active ingredient (a.i.) or acid equivalent (a.e.) of the herbicide (see sidebar below for more details). The measuring container should be rinsed and the rinsate added to the tank solution. The container of liquid herbicides should be triple rinsed with ¼ container volume of water. Add rinsate to the tank solution or store it in a separate container labeled "WATER AND RINSATE FOR HERBICIDE ONLY, NONPOTABLE"

ACTIVE INGREDIENT (A.I.) VS. ACID EQUIVALENT (A.E.)

Labels on herbicide containers and instructions for mixing herbicides sometimes use units of herbicide active ingredient (a.i.) or acid equivalent (a.e.). The herbicide may be sold in different concentrations, but units of a.i. or a.e. provide standard measures, so the mixing instructions can apply in all cases. In order to follow these instructions, you will need to determine how many a.i. or a.e. are in an ounce, or quart or liter, of the concentrate on hand.

The "active ingredient" (a.i.) of an herbicide formulation is responsible for its herbicidal activity or ability to kill or suppress plants. The a.i. is always identified on the herbicide label by either its common name or chemical name, or both. Herbicide formulations available for sale commonly contain other so-called "inert" compounds too.

The "acid equivalent" (a.e.) of an herbicide is just the acid portion of the a.i., and it is this acid portion that is responsible for herbicidal effects. The acid portion (or parent acid) is generally associated with other chemical compounds to form a salt or an ester, which is more stable and better able to move through a plant's waxy cuticle, and into the plant. The salt or ester is the a.i.

Weak acid herbicides are formulated as salts or esters through the addition of a salt or ester molecular group to the parent acid molecule. This allows the herbicide acid to mix properly with adjuvants and enhances the compound's ability to move into plant tissue. Once the herbicide enters the plant, the salt or ester group is cleaved off the parent molecule, allowing the acid to affect the plant.

Because the salt or ester molecular group can vary dramatically in size, a measure of the percent a.i., especially in the case of a weak acid herbicide, does not adequately reflect the percentage of acid in the formulation. Thus, the a.e. is used to determine the amount of the product to be applied.

Product labels for weak acid herbicides will list the product's percentage of active ingredient, as well as other inert ingredients, at the top of the label. The percentage of acid equivalent in the formulation is usually listed below these percentages in a separate table or paragraph.

TRANSPORTING HERBICIDES

Herbicides should be transported in tightly sealed containers placed in a well-constructed and watertight carrying box or bucket, such as a Rubbermaid tub or cat litter bucket. A good container will prevent leaks in vehicles, onto applicators, or to the environment. Each program should develop techniques and use materials that will best serve the needs of a particular site or circumstance. In some cases, you may want to carry only a small amount of herbicide to treat weeds encountered while conducting daily activities in the field.

Jack McGowan-Stinski of TNC's Michigan program uses large five-gallon buckets with tight lids to transport herbicides and application equipment into the field. The buckets are large enough to hold all the necessary equipment and can be carried by groups of volunteers. Jennifer Hillmer of TNC's Ohio Program often treats weeds distributed over great distances while working in the field by herself. Jennifer keeps pesticides in a crook-necked squirt bottle for easy application and carries the squirt bottle and other application equipment in a four-liter, square, leak-proof, Nalgene bottle, which can be

carried in her backpack along with other field equipment. Jennifer recommends laboratory supply companies as a good place to find equipment for herbicide application and storage.

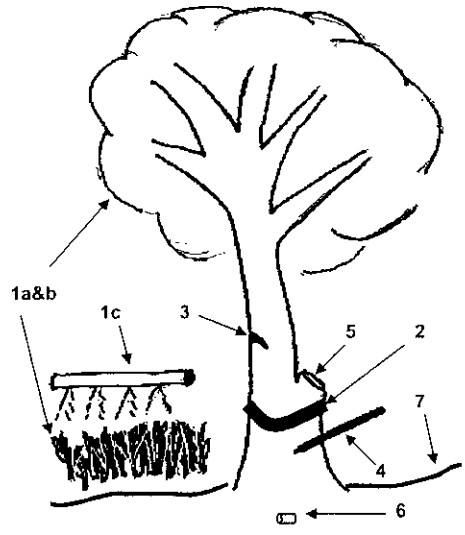
APPLICATION OF HERBICIDES

Application Methods

Herbicides can be applied in a variety of ways. The most appropriate application method is determined by the weed being treated, the herbicide being applied, the skills of the applicator, and the application site. Standard application techniques can sometimes be modified to better suit the needs of natural area management. A few land managers have come up with simple but ingenious techniques and tools that save money, are more effective and safer, and are easier to use than standard methods. We include some of these in the detailed descriptions of techniques below, and encourage you to innovate because there is still plenty of room for improvement.

Methods of application (diagrammed below) can be broadly classified as follows:

1) To intact, green leaves (foliar application)
    a. Spot application (backpack applicator, spray bottle);
    b. Wick application (wipe-on);
    c. Boom application;
2) Around the circumference of the trunk on the intact bark (basal bark);
3) To cuts in the trunk/stem (frill; hack and squirt);
4) Injected into the inner bark;
5) To cut stems and stumps (cut stump);
6) In pellet form at the plant's base (rarely used in natural areas);
7) To the soil before the target species seeds germinate and emerge (rarely used in natural areas).



1. Foliar Applications

These methods apply herbicide directly to the leaves and stems of a plant. An adjuvant or surfactant is often needed to enable the herbicide to penetrate the plant cuticle, a thick, waxy layer present on leaves and stems of most plants. There are several types of foliar application tools available.

A. Spot applicators – Spray herbicide directly onto target plants only, and avoid spraying other desirable plants. These applicators range from motorized rigs with spray hoses to backpack sprayers, to hand-pumped spray or squirt bottles, which can target very small plants or parts of plants. Crook-necked squirt bottles and similar equipment can be ordered from laboratory supply companies and are easy to carry over distances and through dense vegetation.

B. Wick (wipe-on) applicators - Use a sponge or wick on a long handle to wipe herbicide onto foliage and stems. Use of a wick eliminates the possibility of spray drift or droplets falling on non-target plants. However, herbicide can drip or dribble from some wicks.

   i. "Paint sticks" and "stain sticks" sold at local hardware stores have been used successfully for wick application. These sticks have a reservoir in the handle that can hold herbicide, which soaks a roller brush at the end of the handle. The brush is wiped or rolled across leaves and stems.

   ii. The "glove of death" is a technique developed by TNC land stewards for applying herbicide in an otherwise high quality site. Herbicide is sprayed directly onto a heavy cotton glove worn over a thick rubber/latex (or nitrile) glove. The wearer of the glove can then apply the herbicide with total precision and little or no runoff.

C. Boom applicator - A boom, a long horizontal tube with multiple spray heads, is mounted or attached to a tractor, ATV (or other four-wheel drive vehicle), helicopter, or small plane. The boom is then carried above the weeds while spraying herbicide, allowing large areas to be treated rapidly with each sweep of the boom. Offsite movement due to vaporization or drift and possible treatment of non-target plants can be of concern when using this method.

2. Basal Bark

This method applies a 6 to 12 inch band of herbicide around the circumference of the trunk of the target plant, approximately one foot above ground. The width of the sprayed band depends on the size of the plant and the species' susceptibility to the herbicide. The herbicide can be applied with a backpack sprayer, hand-held bottle, or a wick. Ester formulations are usually best for basal bark treatments, as esters can pass most readily through the bark (as compared to salts). Esters can be highly volatile, however, so basal bark treatments should be performed only on calm, cool days. During summer, treatment is best carried out in the mornings, which tend to be cooler. The basal bark treatment works best on young trees with smooth bark. It is usually not effective against older plants with thick corky bark.

3. Frill or Hack & Squirt

The frill method, also called the "hack and squirt" treatment, is often used to treat woody species with large, thick trunks. The tree is cut using a sharp knife, saw, or ax, or drilled with a power drill or other device. Herbicide is then immediately applied to the cut with a backpack sprayer, squirt bottle, syringe, or similar equipment. Because the herbicide is placed directly onto the thin layer of growing tissue in the trunk (the cambium), an ester formulation is not required.

Jack McGowan-Stinski (TNC-Michigan) recommends using the drill treatment rather than cutting, for trees with dbh (diameter at breast height) greater than three inches. He has volunteers use "tree steps" to drill holes into trees. Tree steps are large metal screws that can be screwed into a tree trunk by hand to provide steps for tree climbing. When applying herbicide, tree steps are lightweight drilling tools that can be easily carried into the field and used by untrained volunteers. These tools are available at most hunting stores and cost only a few dollars each.

Jack recommends drilling one hole for each inch in dbh. (A ten-inch dbh tree would require at least ten holes.) Holes should be drilled at a slight downward angle to prevent the herbicide from running out, and should be deep enough to penetrate the inner bark or *growing tissue*.

Some added recommendations made by Jack for using the drill method include: 1) Spray-paint tree steps with a neon color to prevent them from being lost if dropped in dense vegetation. 2) Spray-paint circles directly onto the trees around the drilled holes. This will ensure that no holes are overlooked by the herbicide applicator. After the hole is filled with herbicide, the applicator can spray paint a line through the hole to indicate that it was treated.

4. Injection

Herbicide pellets can be injected into the trunk of a tree using a specialized tool such as the EZ-Ject Lance. The EZ-Ject lance's five ft long, metal tube has "teeth" on one end that grip the trunk of the tree. A sharp push on the other end of the tube sends a brass capsule of herbicide into the tree trunk. It is a convenient way of applying herbicide and requires minimal preparation or clean up. In addition, it is an easy and safe way to apply herbicides with minimal exposure.

There are however, some serious drawbacks to this method. The lance and capsules are expensive ($425 per lance; approximately $500 per 4,800 capsules, depending on herbicide), and full-sized lances can be unwieldy, particularly in thickets. The lance furthermore, is difficult to thrust with enough power to drive the capsules far enough into thick barked trees to be effective. A large number of capsules placed close together are often necessary to kill large trees.

At the Albany Pine Bush Preserve in New York, glyphosate gel pellets were injected using an EZ-Ject Lance into trees with an average dbh of eight centimeters. In some

cases, crowns of treated trees later showed signs of stress, but most of these re-sprouted vigorously and none of the treated trees died (Hawver et al. 2000).

For information or to order an EZ-Ject Lance contact Odom Processing Engineering Consulting, Inc., 800 Odom Industries Road, Waynesboro, MS, 39367, (601) 735-2680, (888) 395-6732, www.ezject.com.

Herbicides can also be injected into herbaceous stems by using a needle and syringe. Jonathan Soll (TNC-Oregon) reports 100% control of small patches of Japanese knotweed (*Polygonum cuspidatum*) with no off-target effects, by injecting every single stem near the base with herbicide. He adds that this method may actually use more herbicide than foliar spraying (since you use high concentations of the herbicide), and caution with the needle and syringe is necessary since you are carrying around a sharp object.

5. Cut-Stump

This method is often used on woody species that normally re-sprout after being cut. Cut down the tree or shrub, and immediately spray or squirt herbicide on the exposed cambium (living inner bark) of the stump. The herbicide must be applied to the entire inner bark (cambium) within minutes after the trunk is cut. The outer bark and heartwood do not need to be treated since these tissues are not alive, although they support and protect the tree's living tissues.

Herbicide can be applied to cut stumps in many ways, including spray and squirt bottles, or even paint brushes. Care must be taken to avoid applying too much herbicide, and allowing it to run-off the stump and onto the ground. Herbicide can also dribble from bottles or brushes and fall on desirable plants or the ground. To help avoid these problems, Jack McGowan-Stinski (TNC-Michigan) developed an inexpensive and easy to assemble application tool using PVC pipe and a sponge through which the herbicide can be applied. See the Appendix for a diagram and instructions on how to build one.

Sometimes even treated stumps will re-sprout, so it is important to check them at regular intervals (2 to 6 months) for at least a year. Depending on the vigor of the re-sprouts, these can be treated by cutting, basal bark applications, or foliar applications. Even when foliar applications are called for, treating re-sprouts is usually far easier and requires much less herbicide than treating the tree (before it was cut down) with a foliar application.

The cut stump treatment allows for a great deal of control over the site of herbicide application, and therefore, has a low probability of affecting non-target species or contaminating the environment. It also requires only a small amount of herbicide to be effective. Black locust (*Robinia pseudoacacia*) and buckthorns (*Rhamnus* spp.) have been successfully controlled using this method (Hawver et al. 2000; J. McGowan-Stinski, pers. comm.).

Selecting a Method

Minimize

Select a technique(s) that (1) minimizes risks of contact to the applicator and others that may be in the area during and after herbicide application, AND (2) minimizes release of herbicide to the environment, particularly if the herbicide could contact non-target species. Avoid using boom application where possible (1c above) because it can result in a relatively high amount of herbicide contacting non-target species and bare ground. Also, avoid using pellets and pre-emergence herbicides (6 & 7 above, respectively) because they are relatively persistent in the environment.

Use a dye

Mix a dye with the herbicide so applicators can see which plants have been treated and if they have gotten any herbicide on themselves or their equipment. Some pre-mixed herbicides include a dye (e.g., Pathfinder II® includes the active ingredient triclopyr, a surfactant, and a dye). Ester based herbicides like Garlon 4® require oil-soluble dyes like colorfast purple®, colorfast red®, and basoil red® (for use in basal bark treatments), which are sold by agricultural chemical and forestry supply companies. Clothing dyes like those produced by Rit® will work in water-soluble herbicides such as Garlon 3A®. These dyes are inexpensive and available at most supermarkets and drugstores.

Who May Apply Herbicides?

TNC employees or contractors who apply herbicides must have all certificates or licenses required by the state. Each state has its own requirements. Some require applicators working in natural areas to be certified and others do only if compounds designated "restricted-use" by the EPA or the state are to be used. Most states conduct applicator training programs and in many areas local Agricultural Extension Agents give workshops on proper herbicide use.

Volunteers may NOT apply herbicides unless they are properly licensed AND have signed a consent & release form. An example of such a form produced by the Illinois Field Office is provided as an Appendix. **Check with the legal staff for your program before drafting one of these forms or using volunteers to apply herbicides.** TNC staff who supervise volunteers should be properly licensed or certified.

Protection Against Herbicides

When using herbicides, the safety of the applicator, to others, and to the environment is of utmost importance. Be sure to read the earlier textbox (page 5.6) on "Personal Protection in Herbicide Handling" regarding specific equipment requirements, how to avoid contamination, eye and respiratory protection, how to clean-up after herbicide use, and how to launder clothes and equipment used during herbicide application.

When to Apply Herbicides

The best time to apply an herbicide is determined primarily by the herbicide's mode of action and the physiology of the target plants. In seasonal climates, it is often best to apply herbicides in autumn or prior to the dry season, 3 to 6 weeks before the target plant

goes dormant for the season. This is because many plants apparently transfer sugars and nutrients from their stems and leaves to belowground storage organs at this time and will carry herbicides along to these areas as well. Contrary to assumptions that plants will be most vulnerable when weak, herbicides are usually ineffective when applied during a drought or other stressful conditions. This is because most herbicides work by attacking growing tissue and metabolic processes, which plants 'shut down' when stressed. In fact, late winter or early spring are often good times to apply herbicide because this is when plants begin growing again, and can efficiently translocate the herbicide throughout their tissues. Fosamine ammonium, the dormancy enforcer, is best applied in the late fall just before leaf drop. The herbicidal effects of fosamine ammonium however, are not observed until the following spring when treated plants fail to re-foliate.

In some cases, the site of application may determine the best time to apply a herbicide. For example, buckthorns (*Rhamnus* spp.) growing in wet, boggy areas are easiest to treat during winter when the ground is frozen. Check the label or consult your distributor for the best application time under the conditions at your site.

Note that with some herbicides there is a long time lag between time of herbicide application and the first evidence that they are working. This is particularly true of herbicides that work by inhibiting amino acid or lipid synthesis, because the plant(s) can rely on stored supplies to continue growing.

Record Keeping
When using herbicides it is critical (and, in some cases, required by law) to keep records of all plants/areas treated, amounts and types of herbicide used, and dates of application. This information will be important in evaluating the project's success, improving methodology, and identifying mistakes. In addition, it documents the procedure for future site managers and biologists. Records of abundance/condition of the targeted weeds and nearby desirable plants before and after treatment will also be valuable in evaluating the effectiveness of the herbicide.

HERBICIDE DISPOSAL

Equipment cleanup
Following use, application equipment and empty containers should be triple rinsed with clean water using 10% of the container volume for each rinse. If possible, rinse equipment in the treatment area and apply the wastewater to weeds or store for future use as a dilutant. Left over herbicide mix that will not be used later should be treated as hazardous waste.

Container disposal

Use the state herbicide container recycling program where available. In Minnesota, herbicide dealers are required to collect empty containers from customers. If no specific agri-chemical container recycling program is available, puncture the empty container to prevent anyone from using it as a container again, and then dispose of or destroy it. In most areas, small numbers of empty, triple-rinsed containers can be disposed in the trash for pick-up or taken to the local dump, unless the label states otherwise. In parts of California and some other states you may be required to get written permission from your County Agriculture Commissioner to dispose of containers. Call your local Commissioner for details. Some jurisdictions require containers to be burned, while others prohibit burning pesticide containers. If the herbicide label states that the container may not be disposed of in regular sanitary landfills, call your county or municipal waste department for information on Hazardous Material Collection dates.

Equipment and applicator clean-up

After use, first clean and store application equipment and then thoroughly rinse personal protection gear (gloves, boots, etc.) with cold water from a hose or container that is hand-held (gloves off) and was not used during application work. All personal protection gear should then be washed in mild soap and water. Finally, applicators should wash their hands and any herbicide-exposed areas of their bodies. Applicators should shower and change clothing as soon as possible. Clothes used during the application must be washed and dried separately from other clothing before it is worn again, even if it appears uncontaminated.

Contaminated clothing

If herbicide concentrate spills on clothing, the clothing should be discarded or, where permitted, burned immediately. Wrap contaminated clothing and other materials in newspaper before placing in trash or landfill. Clothing and other items contaminated with certain commercial products, such as technical grade 2,4-D or formulations in which 2,4-D is the only active ingredient, are classed as hazardous waste. Call your local hazardous materials center for instructions on how to dispose of this material. In cases where small quantities are involved it may be possible to dispose of contaminated clothing in the trash.

RESPONDING TO SPILLS

Rules and regulations regarding pesticide spills vary between states and counties. Therefore, before obtaining herbicides, call the local fire department or county Hazardous Materials Office for information on local regulations. In most cases, the proper response to a spill depends on the volume and concentration of herbicide released, location of the spill, and the chemical(s) involved. If possible, inquire as to whether a report would be required in a hypothetical situation in which all the herbicide was spilled (1) on the soil in the interior of the preserve and (2) along a public road. A rule of thumb employed by some public land management agencies is not to call for help from the local Hazardous Materials Office for herbicide spills unless they contaminate too much soil to dig up and place in plastic garbage bags. However, since our goal is to protect biodiversity, land

managers are expected to minimize damage to native populations. Hazardous Materials officers we spoke to considered spills under 100 gallons to be "small". Most emergency systems appear to be designed to deal with these larger volumes used in agriculture and industry, which are far larger than those typically used in natural areas.

Be sure to carry a "Pesticide Kit" for emergency spills (see the following Pesticide Spill Kit equipment list). If a spill occurs, keep people away from affected areas until the clean-up process is complete. When small volumes of dilute herbicide are spilled they may be treated by carefully digging up the affected soil and litter, and spreading this material at the legal rate or concentration. Small diesel (sometimes used as a crude surfactant) and gasoline spills may be treated by adding organic material (e.g., cow manure or compost) to the affected area and keeping it moist. It may take several years for the spilled material to degrade.

PESTICIDE KIT EQUIPMENT LISTS
adapted from work by Jack McGowan-Stinski and Jennifer Hillmer

PESTICIDE SPILL KITS
- Emergency phone numbers
- Labels and MSDSs of all pesticides on hand
- Personal Protective Equipment: gloves, footwear, apron, goggles, face shield, respirator
- Heavy plastic bags for material storage
- Containment "snakes" (chemsorb tubes or pads to contain & absorb spilled chemicals)
- Absorbent materials (cat litter, vermiculite, paper, etc.)
- Neutralizing agents (bleach and hydrated lime)
- Sweeping compound for dry spills
- Shovel, broom, dustpan
- Heavy duty detergent, chlorine bleach, and water
- Fire extinguisher certified for all types of fires
- Sturdy plastic container that closes tightly and will hold the largest quantity of pesticide on hand
- First aid supplies
- Fresh water (at least 3 gallons; bring extra for wash-up after application)
- Eyewash
- Soap (dish soap or hand soap)
- Towels
- Change of clothes
- Additional items required by labeling

ADDITIONAL HERBICIDE FIELD EQUIPMENT
- Extra application equipment (e.g., squeeze bottles, nalgene bottles, sponges)
- Funnel
- Herbicide dyes
- Herbicide in original containers
- Extra water, soap, towels, plastic bags

In any spill considered to be an emergency, call the local fire department. They may come to the site to help prevent further spread of the chemical but if the spill is large they will likely require a certified company to do the clean-up.

Companies often charge initial fees of roughly $2,000 plus hourly fees of $100/hour for the work to meet minimum legal clean-up requirements. If a spill occurs and there is uncertainty about legal requirements for reporting and clean-up, contact the program's legal staff immediately. They can ensure that all federal, state and local regulations are met.

REFERENCES

Hawver, C. A., S. B. Gifford, and J. Hecht. 2000. Comparison of methods to control invasive plant species in the Albany Pine Bush Preserve. Albany Pine Bush Preserve Commission, Latham, New York. 50 pgs.

Libich, S., J. C. To, R. Frank, and G. J. Sirons. 1984. Occupational exposure of herbicide applicators of herbicides used along electric power transmission line right-of-way. Am. Ind. Hyg. Assoc. J. 45(1):56-62.

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Attachment "B"

United States Environmental Protection Agency | Prevention, Pesticides And Toxic Substances (7508C) | EPA-738-F-98-007 October 1998

EPA R.E.D. FACTS

TRICLOPYR

Pesticide Reregistration

All pesticides sold or distributed in the United States must be registered by EPA, based on scientific studies showing that they can be used without posing unreasonable risks to people or the environment. Because of advances in scientific knowledge, the law requires that pesticides which were first registered before November 1, 1984, be reregistered to ensure that they meet today's more stringent standards.

Under the Food Quality Protection Act of 1996, EPA must consider the increased susceptibility of infants and children to pesticide residues in food, as well as aggregate exposure of the public to pesticide residues from all sources, and the cumulative effects of pesticides and other compounds with a common mechanism of toxicity in establishing or reassessing tolerances.

In evaluating pesticides for reregistration, EPA obtains and reviews a complete set of studies from pesticide producers, describing the human health and environmental effects of each pesticide. The Agency develops any mitigation measures or regulatory controls needed to effectively reduce each pesticide's risks. EPA then reregisters pesticides that meet the safety standard of the FQPA and can be used without posing unreasonable risks to human health or the environment.

When a pesticide is eligible for reregistration, EPA explains the basis for its decision in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for reregistration case 2710, that includes triclopyr acid, triclopyr triethylamine salt (TEA) and triclopyr butoxyethyl ester (BEE).

Use Profile

Triclopyr TEA and BEE products are used as selective herbicides to control broad leaf weeds and brush on a variety of sites-- rights-of-way, pasture and rangelands, forests, rice, and turf, including home lawns. Triclopyr products are formulated as soluble concentrates, emulsifiable concentrates, liquids (pressurized and ready-to-use), granulars, wettable powders and pellets.

Regulatory History

Triclopyr TEA was first registered in 1979 as an herbicide on non-crop areas and in forestry use for the control of broadleaf weeds and woody plants. Triclopyr BEE was subsequently registered in 1980 for use on the same sites. Both formulations were registered for use on turf sites in 1984. In 1985, triclopyr BEE was registered for use on rangeland and permanent grass pastures. Most recently (1995), triclopyr TEA was registered for use on rice

to control broadleaf weed species. A Data Call-In Notice (DCI) was issued in August 1991 requiring the submission of product chemistry, residue chemistry, ecological and environmental fate data for both TEA and BEE and toxicological data for TEA. At the time of the RED assessments, there were 12 registered products containing triclopyr BEE and 24 products containing triclopyr TEA.

Human Health Assessment

Toxicity

Technical triclopyr acid was found to be slightly toxic by oral and dermal routes and has been placed in Toxicity Category III for these effects. Acceptable studies for acute inhalation, primary eye irritation, primary dermal irritation and dermal sensitization were not available for the technical grade of triclopyr acid. Available data indicate that both BEE and TEA are slightly toxic by oral (Toxicity Category III) and dermal (Toxicity Category III) routes of exposure, and practically non-toxic by inhalation (Toxicity Category IV) and do not cause dermal irritation. In a primary eye irritation study triclopyr TEA was found to be corrosive while BEE was found to be minimally irritating. Both TEA and BEE were found to cause dermal sensitization in test animals.

The Agency has classified triclopyr as a Group D chemical (not classifiable as to human carcinogenicity). This decision was based on increases in mammary tumors in both the female rat and mouse, and adrenal pheochromocytomas in the male rat, which were considered to be only a marginal response, and the absence of additional support from structural analogs or genotoxicity.

The Reference Dose (RfD), the amount of triclopyr residues that could be consumed daily over a lifetime without adverse effects, was established at 0.05 mg/kg/day, based on the 2-generation reproduction toxicity study in rats with a NOEL of 5.0 mg/kg/day, the lowest dose tested. At the next dose level (25 mg/kg/day), an increased incidence of proximal tubular degeneration of the kidneys was observed in P1 and P2 parental rats in this study.

For the acute dietary risk assessment, the endpoint of concern was the maternal and developmental NOEL of 30 mg/kg/day from a developmental toxicity study in rabbits based on a decreased number of live fetuses and other effects at the 100 mg/kg dose.

Because reliable pre- and post-natal data indicate no special sensitivity of young animals to triclopyr residues, EPA finds that an uncertainty factor of 100 (10 for interspecies differences in response, and 10 for intraspecies differences) is adequately protective of infants and children. Therefore, for risk assessment purposes the chronic dietary (RfD) calculations include a factor of 100, and the acute dietary risk assessments assume that a margin of exposure (MOE) of 100 or greater is acceptable.

Dietary Exposure/Risk

People may be exposed to residues of triclopyr through the diet. Triclopyr tolerances have been established for grass forage and hay, meat, meat byproducts, milk and eggs, and rice. EPA's tolerance reassessment indicates only minor changes to the current tolerance expression and tolerance values are needed, provided the label restrictions required by this RED are implemented limiting grazing and application rates.

Calculations using existing triclopyr tolerances result in a TMRC (theoretical maximum residue contribution) which represents < 1% of the RfD for the general population and < 3% of the RfD for children less than one year old, considering food only. These small percentages of the RfD generally indicate little concern for dietary risk.

Chronic aggregate dietary risk estimates, including both food and an upper bound estimate of triclopyr residues in drinking water, account for 16% of the RfD for females 13+ years, and 49% of the RfD for children ages 1 to 6.

The acute dietary (food only) MOE for the most sensitive subgroup, females of child bearing age, is 2500. The acute aggregate dietary MOE for the sub-population of greatest concern (pregnant females 13+) including food and drinking water is 1250.

Both triclopyr and the insecticide chlorpyrifos produce the metabolite 3,5,6-trichloro-2-pyridinol (TCP). TCP is similar in toxicity to triclopyr and less toxic than chlorpyrifos. EPA's aggregate assessment of the known, likely sources of exposure to TCP from both triclopyr and chlorpyrifos uses results in an acute MOE of 600 for females 13 + years. Aggregate chronic exposures could account for up to 90% of the provisional RfD for TCP for non-nursing infants less than 1 year old. Because these estimates include many upper bound exposure assumptions and still fall within acceptable limits, EPA believes that the risks posed by dietary exposure to the metabolite TCP are not of concern.

Occupational and Residential Exposure/Risk

Dermal absorption is calculated to be < 2% based on a study with human volunteers and a rabbit dermal absorption study. Neither occupational nor residential risk assessments for short-term and intermediate-term dermal exposure to triclopyr have been conducted because no adverse effects were seen at the highest dose tested of 1000 mg/kg/day in a 21-day dermal toxicity study in rabbits.

Because the acute inhalation LC_{50} was determined to be > 2.6 mg/L, significant toxicity resulting from inhalation exposure would not be expected, and a separate risk assessment for the inhalation route of exposure is not warranted.

Homeowner exposure to triclopyr is expected to be minimal because of low dermal and inhalation toxicity, and because methods typically used by homeowners do not provide significant exposure (e.g., weed stick), and

treatment areas are usually limited in size. Also, the percent active ingredient and the application rates of homeowner products are less than those for agricultural or industrial use products. No chronic residential or occupational exposures are anticipated.

EPA is working with other agencies and the Native American tribes in California to determine the potential exposure to forestry herbicides that may be occurring to Native Americans through their use of forest plant materials in the making of baskets, for medicinal purposes and in other activities. Work currently underway will characterize the dissipation rate and frequency of occurrence of three herbicides (glyphosate, hexazinone, and triclopyr) in plants of interest to Native Americans. Because this work is ongoing, these unique exposures are not reflected in the triclopyr RED assessments.

FQPA Summary and Findings

Reliable data indicate no special sensitivity of infants and children to triclopyr residues. An uncertainty factor of 100 has been applied in both the chronic and acute dietary risk assessments. Both acute and chronic aggregate dietary (food + drinking water) risks are well within the acceptable range for triclopyr and for the identified sources of TCP, a metabolite common to both triclopyr and chlorpyrifos. EPA has not made a final determination regarding a possible common mechanism of toxicity for triclopyr and other substances or how to include this pesticide in a cumulative risk assessment. For the purposes of the tolerance reassessment in this RED, EPA considered only the risks of triclopyr and TCP in its assessments.

Environmental Fate/Ecological Risks

Triclopyr acid is somewhat persistent, and is mobile. The predominant degradation pathway for triclopyr in water is photodegradation. The predominant degradation pathway in soil is microbial degradation to the major degradate TCP, which is both persistent and mobile.

Triclopyr acid was found to be slightly toxic to birds and practically non-toxic to mammals, insects, freshwater fish and invertebrates. Triclopyr TEA was practically non-toxic to slightly toxic to birds and estuarine/marine invertebrates and practically non-toxic to freshwater fish, freshwater invertebrates and estuarine/marine fish. Testing with BEE indicated it to be slightly toxic to birds, moderately toxic to highly toxic to freshwater fish and estuarine/marine invertebrates, slightly to moderately toxic to freshwater invertebrates, and highly toxic to estuarine/marine fish.

Using current maximum permissible application rates (i.e., up to 12.12 lbs/ae/A), levels of concern (LOE) are exceeded for many species. However, calculating RQs at the revised, lower maximum rates established by the RED indicates that only chronic risk to mammals, acute risk to fish (BEE) and acute risk to non-target plants remain problematical.

Factors that lessen the Agency's concern for these LOC exceedances include several worst-case exposure assumptions that are unlikely under actual use conditions. For example: The screening level chronic assessment is based on 0-hour residues and does not take into account degradation--actual environmental concentrations would be less. Acute risks to fish were calculated assuming direct application to shallow aquatic habitat, which is not currently allowed--flowing water systems would result in rapid dissipation of triclopyr. Because triclopyr is an herbicide, risk to non-target plants is anticipated. However, potential damage to non-targets will be minimized by new spray drift management requirements and reduced application rates. Also, the registrant, Dow Agrosciences (formerly DowElanco), has provided the Agency with survey data indicating that typical application rates range from 0.5 to 4 lbs ae/A, generally much lower than the maximum rates allowed by current labels, and that more than 95% of triclopyr applications occur only once a year or less frequently.

EPA is concerned about the potential chronic toxicity and persistence of the triclopyr degradate, TCP, in the aquatic environment and is requiring additional confirmatory data to better characterize the fate of TCP and its chronic toxicity to fish, particularly salmonid species.

Risk Mitigation Measures

In order to reduce risk to non-target plants and animals, pesticide handlers and the environment, EPA is requiring the following changes to triclopyr use practices and labeling:

! The maximum application rate permitted on pasture and rangeland and all other sites where cattle can be grazed will be 1 lb/ae/A per year; for forestry applications the maximum will be 6 lbs/ae/A; for all other sites the maximum allowed rate will be 8 lb ae/A for the BEE and 9 lb/ae/A for the TEA.

! Labels must include best management practices for spray drift.

! A label statement warning users of the potential of triclopyr to leach to ground water in certain situations is required.

! A restriction against grazing lactating dairy animals until the following season is required. All conflicting grazing instructions must be removed. Labels must specify a 14 day PHI for grass hay, and retain the existing pre-slaughter interval of 3 days.

! An REI of 48 hours for triclopyr TEA, and 12 hours for triclopyr BEE is established for uses within the scope of the Worker Protection Standard; early entry PPE consisting of coveralls, chemical resistant gloves, protective eyewear--for TEA formulations, and shoes+sox) is required.

! Homeowner reentry is restricted until sprays have dried and dusts have settled.

! Additional confirmatory data are required to better characterize the fate of the degradate, TCP, in the aquatic environment and its chronic toxicity to fish. EPA is also requiring product-specific data including product chemistry and acute toxicity studies, and revised Confidential Statements of Formula (CSFs).

Regulatory Conclusion

EPA has determined that the reassessed tolerances for triclopyr meet the safety standard under the FQPA, and that there is a reasonable certainty that no harm will result to infants and children or to the general population from aggregate exposure to triclopyr or TCP residues. The use of currently registered products containing triclopyr in accordance with labeling required by this RED will not pose unreasonable risks of adverse effects to humans or the environment. Therefore, all currently registered uses of these products are eligible for reregistration.

Triclopyr products will be reregistered once the required product-specific data, revised Confidential Statements of Formula, and revised labeling are received and accepted by EPA. These products will be reregistered once any required confirmatory generic data, product specific data, CSFs, and revised labeling are received and accepted by EPA. Products which contain active ingredients in addition to triclopyr will be reregistered when all of their other active ingredients also are eligible for reregistration.

For More Information

EPA is requesting public comments on the Reregistration Eligibility Decision (RED) document for triclopyr during a 60-day time period, as announced in a Notice of Availability published in the Federal Register. To obtain a copy of the RED document or to submit written comments, please contact the Pesticide Docket, Public Response and Program Resources Branch, Field and External Affairs Division (7506C), Office of Pesticide Programs (OPP), US EPA, Washington, DC 20460, telephone 703-305-5805.

Electronic copies of the RED and this fact sheet are available on our website at www.epa.gov/REDs.

Printed copies of the RED and fact sheet can be obtained from EPA's National Center for Environmental Publications and Information (EPA/NCEPI), PO Box 42419, Cincinnati, OH 45242-0419, telephone 513-489-8190, fax 513-489-8695.

Following the comment period, the triclopyr RED document also will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone 703-605-6000.

For more information about EPA's pesticide reregistration program, the triclopyr RED, or reregistration of individual products containing triclopyr, please contact the Special Review and Reregistration Division (7508W), OPP, US EPA, Washington, DC 20460, telephone 703-308-8000.

For information about the health effects of pesticides, or for assistance in recognizing and managing pesticide poisoning symptoms, please contact the National Pesticides Telecommunications Network (NPTN). Call toll-free 1-800-858-7378, between 9:30 am and 7:30 pm Eastern Standard Time, Monday through Friday.

Attachment "B"

United States Environmental Protection Agency | Prevention, Pesticides And Toxic Substances (7508W) | EPA-738-F-93-011 September 1993

EPA R.E.D. FACTS

Glyphosate

Pesticide Reregistration

All pesticides sold or distributed in the United States must be registered by EPA, based on scientific studies showing that they can be used without posing unreasonable risks to people or the environment. Because of advances in scientific knowledge, the law requires that pesticides which were first registered years ago be reregistered to ensure that they meet today's more stringent standards.

In evaluating pesticides for reregistration, EPA obtains and reviews a complete set of studies from pesticide producers, describing the human health and environmental effects of each pesticide. The Agency imposes any regulatory controls that are needed to effectively manage each pesticide's risks. EPA then reregisters pesticides that can be used without posing unreasonable risks to human health or the environment.

When a pesticide is eligible for reregistration, EPA announces this and explains why in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for glyphosate.

Use Profile

Glyphosate is a non-selective herbicide registered for use on many food and non-food field crops as well as non-crop areas where total vegetation control is desired. When applied at lower rates, glyphosate also is a plant growth regulator.

Glyphosate is among the most widely used pesticides by volume. It ranked eleventh among conventional pesticides used in the U.S. during 1990-91. In recent years, approximately 13 to 20 million acres were treated with 18.7 million pounds of glyphosate annually. The largest use sites include hay/pasture, soybeans and field corn.

Three salts of glyphosate are used as active ingredients in registered pesticide products. Two of these active ingredients, plus technical grade glyphosate, are contained in the 56 products that are subject to this RED.

The isopropylamine salt, an active ingredient in 53 registered products, is used as a herbicide to control broadleaf weeds and grasses in many food and non-food crops and a variety of other sites including ornamentals, lawns and turf, residential areas, greenhouses, forest plantings and industrial rights-of-way. It is formulated as a liquid, solid or pellet/tablet, and is applied using ground or aerial equipment.

The sodium salt of glyphosate, an active ingredient in two registered pesticide products, is used as a plant growth regulator for peanuts and sugarcane, to modify plant growth and hasten the ripening of fruit. It is applied as a ground spray to peanut fields and as an aerial spray to sugarcane. Preharvest intervals are established for both crops.

The monoammonium salt of glyphosate is an active ingredient in an additional seven herbicide/growth regulator products. This form of glyphosate was initially registered after November 1984, so it is not subject to reregistration or included in this RED. However, in reassessing the existing glyphosate tolerances (maximum residue limits in or on food and feed), EPA included those for the monoammonium salt.

Regulatory History

EPA issued a Registration Standard for glyphosate in June 1986 (NTIS PB87-103214). The Registration Standard required additional phytotoxicity, environmental fate, toxicology, product chemistry and residue chemistry studies. All of the data required have been submitted and reviewed, or were waived.

Human Health Assessment

Toxicity

Glyphosate is of relatively low oral and dermal acute toxicity. It has been placed in Toxicity Category III for these effects (Toxicity Category I indicates the highest degree of acute toxicity, and Category IV the lowest). The acute inhalation toxicity study was waived because glyphosate is non-volatile and because adequate inhalation studies with end-use products exist showing low toxicity.

A subchronic feeding study using rats showed blood and pancreatic effects. A similar study with mice showed reduced body weight gains in both sexes at the highest dose levels. A dermal study with rabbits showed slight reddening and swelling of the skin, decreased food consumption in males and decreased enzyme production, at the highest dose levels.

Several chronic toxicity/carcinogenicity studies using rats, mice and beagle dogs resulted in no effects based on the parameters examined, or resulted in findings that glyphosate was not carcinogenic in the study. In June 1991, EPA classified glyphosate as a Group E oncogen--one that shows evidence of non-carcinogenicity for humans--based on the lack of convincing evidence of carcinogenicity in adequate studies.

In developmental toxicity studies using pregnant rats and rabbits, glyphosate caused treatment-related effects in the high dose groups including diarrhea, decreased body weight gain, nasal discharge and death.

One reproductive toxicity study using rats showed kidney effects in the high dose male pups; another study showed digestive effects and decreased body weight gain. Glyphosate does not cause mutations.

In one metabolism study with rats, most of the glyphosate administered (97.5 percent) was excreted in urine and feces as the parent compound; less than one percent of the absorbed dose remained in tissues and organs, primarily in bone tissue. Aminomethyl phosphonic acid (AMPA) was the only metabolite excreted. A second study using rats showed that very little glyphosate reaches bone marrow, that it is rapidly eliminated from bone marrow, and that it is even more rapidly eliminated from plasma.

Dietary Exposure

The nature of glyphosate residue in plants and animals is adequately understood. Studies with a variety of plants indicate that uptake of glyphosate or AMPA from soil is limited. The material which is taken up is readily translocated throughout the plant and into its fruit. In animals, most glyphosate is eliminated in urine and feces. Enforcement methods are available to detect residues of glyphosate and AMPA in or on plant commodities, in water and in animal commodities.

85 tolerances have been established for residues of glyphosate and its metabolite, AMPA, in or on a wide variety of crops and crop groups, as well as in many processed foods, animal feed and animal tissues (please see 40 CFR 180.364, 40 CFR 185.3500 and 40 CFR 186.3500). EPA has reassessed the existing and proposed tolerances for glyphosate. Though some adjustments will be needed, no major changes in existing tolerances are required. EPA also has compared the U.S. tolerances with international Codex maximum residue limits (MRLs), and is recommending certain adjustments to achieve greater compatibility.

EPA conducted a dietary risk assessment for glyphosate based on a worst-case risk scenario, that is, assuming that 100 percent of all possible commodities/acreage were treated, and assuming that tolerance-level residues remained in/on all treated commodities. The Agency concluded that the chronic dietary risk posed by glyphosate food uses is minimal.

A reference dose (RfD), or estimate of daily exposure that would not cause adverse effects throughout a lifetime, of 2 mg/kg/day has been proposed for glyphosate, based on the developmental toxicity studies described above.

Occupational and Residential Exposure

Occupational and residential exposure to glyphosate can be expected based on its currently registered uses. However, due to glyphosate's low acute toxicity and the absence of other toxicological concerns (especially carcinogenicity), occupational and residential exposure data are not required for reregistration.

Some glyphosate end-use products are in Toxicity Categories I or II for primary eye irritation or skin irritation. In California, glyphosate ranks high among pesticides causing illness or injury to workers, who report numerous incidents of eye and skin irritation from splashes during mixing and loading.

EPA is not adding any personal protective equipment (PPE) requirements at this time, but any existing PPE label requirements must be retained.

The Worker Protection Standard (WPS) for Agricultural Pesticides (please see 40 CFR 156 and 170) established an interim restricted entry interval (REI) of 12 hours for glyphosate. The Agency has decided to retain this REI as a prudent measure to mitigate risks to workers. During the REI, workers may reenter areas treated with glyphosate only in the few, narrow exceptions allowed in the WPS. The REI applies only to glyphosate uses within the scope of the WPS, so homeowner and commercial uses are not included.

Human Risk Assessment

EPA's worst case risk assessment of glyphosate's many registered food uses concludes that human dietary exposure and risk are minimal. Existing and proposed tolerances have been reassessed, and no significant changes are needed to protect the public.

Exposure to workers and other applicators generally is not expected to pose undue risks, due to glyphosate's low acute toxicity. However, splashes during mixing and loading of some products can cause injury, primarily eye and skin irritation. EPA is continuing to recommend PPE, including protective eye wear, for workers using end-use products that are in Toxicity Categories I or II for eye and skin irritation. To mitigate potential risks associated with reentering treated agricultural areas, EPA is retaining the 12 hour REI set by the WPS.

Environmental Assessment

Environmental Fate

Glyphosate adsorbs strongly to soil and is not expected to move vertically below the six inch soil layer; residues are expected to be immobile in soil. Glyphosate is readily degraded by soil microbes to AMPA, which is degraded to carbon dioxide. Glyphosate and AMPA are not likely to move to ground water due to their strong adsorptive characteristics. However, glyphosate does have the potential to contaminate surface waters due to its aquatic use patterns and through erosion, as it adsorbs to soil particles suspended in runoff. If glyphosate reached surface water, it would not be broken down readily by water or sunlight.

Ecological Effects

Glyphosate is no more than slightly toxic to birds and is practically non-toxic to fish, aquatic invertebrates and honeybees. Due to the presence of a toxic inert ingredient, some glyphosate end-use products must be labeled, "Toxic to fish," if they may be applied directly to aquatic environments. Product labeling does not preclude off-target movement of glyphosate by drift. EPA therefore is requiring three additional terrestrial plant studies to assess potential risks to nontarget plants.

EPA does not expect that most endangered terrestrial or aquatic organisms will be affected by the registered uses of glyphosate. However,

many endangered plants as well as the Houston toad (due to its habitat) may be at risk. EPA is deferring any use modifications or labeling amendments until it has published the Endangered Species Protection Plan and has given registrants guidance regarding endangered species precautionary labeling.

Ecological Effects Risk Assessment

Based on current data, EPA has determined that the effects of glyphosate on birds, mammals, fish and invertebrates are minimal. Under certain use conditions, glyphosate may cause adverse effects to nontarget aquatic plants. Additional data are needed to fully evaluate the effects of glyphosate on nontarget terrestrial plants. Risk reduction measures will be developed if needed, once the data from these studies are submitted and evaluated.

Additional Data Required

EPA is requiring three generic studies (Tier II Vegetative Vigor, Droplet Size Spectrum, and Drift Field Evaluation) which are not part of the target data base and do not affect the reregistration eligibility of glyphosate. The Agency also is requiring product-specific data including product chemistry and acute toxicity studies, as well as revised Confidential Statements of Formula and revised labeling.

Product Labeling Changes Required

All end-use glyphosate products must comply with EPA's current pesticide product labeling requirements. In addition:

- **Protection of Aquatic Organisms**

Non-Aquatic Uses - End-use products that are not registered for aquatic uses must bear the following label statement:

Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters and rinsate.

Aquatic Uses - End-use products registered for aquatic uses must bear the following label statement:

Do not contaminate water when disposing of equipment washwaters and rinsate. Treatment of aquatic weeds can result in oxygen loss from decomposition for dead plants. This loss can cause fish kills.

- **Worker Protection Standard (WPS) Requirements**

Any product whose labeling permits use in the production of an agricultural plant on any farm, forest, nursery or greenhouse must comply with the labeling requirements of:

- PR Notice 93-7, "Labeling Revisions Required by the Worker Protection Standard (WPS)," and

• PR Notice 93-11, "Supplemental Guidance for PR Notice 93-7."

Unless specifically directed in the RED, all statements required by these two PR Notices must appear on product labeling exactly as instructed in the Notices. Labels must be revised by April 21, 1994, for products distributed or sold by the primary registrant or supplementally registered distributors, and by October 23, 1995, for products distributed or sold by anyone.

- **Personal Protective Equipment (PPE)**

No new PPE requirements must be added to glyphosate labels. However, any existing PPE requirements on labels must be retained.

- **Entry Restrictions**

Products Not Primarily Intended for Home Use:

o Uses Within the Scope of the WPS - A 12-hour restricted entry interval (REI) is required for all products with uses within the scope of the WPS, except products intended primarily for home use. The PPE for early entry should be that required for applicators of glyphosate, except any applicator requirement for an apron or respirator is waived. This REI and PPE should be inserted into the standardized statements required by PR Notice 93-7.

• Sole Active Ingredient End-Use Products - Labels must be revised to adopt the entry restrictions set forth in this section. Any conflicting entry restrictions on current labeling must be removed.

• Multiple Active Ingredient Products - Registrants must compare the entry restrictions set forth in this section to those on their current labeling and retain the more protective. A specific time period in hours or days is considered more protective than "until sprays have dried" or "dusts have settled."

o Uses Not Within the Scope of the WPS - No new entry restrictions must be added. However, any entry restrictions on current product labeling with these uses must be retained.

Products Primarily Intended for Home Use:

o No new entry restrictions must be added. However, any entry restrictions on current product labeling must be retained.

Regulatory Conclusion

The use of currently registered pesticide products containing the isopropylamine and sodium salts of glyphosate in accordance with the labeling specified in this RED will not pose unreasonable risks or adverse effects to humans or the environment. Therefore, all uses of these products are eligible for reregistration.

These glyphosate products will be reregistered once the required *product-specific data, revised Confidential Statements of Formula and revised* labeling are received and accepted by EPA.

Products which contain active ingredients in addition to glyphosate will not be reregistered until all their other active ingredients also are eligible for reregistration.

For More Information

EPA is requesting public comments on the Reregistration Eligibility Decision (RED) document for glyphosate during a 60-day time period, as announced in a Notice of Availability published in the Federal Register. To obtain a copy of the RED document or to submit written comments, please contact the Pesticide Docket, Public Response and Program Resources Branch, Field Operations Division (7506C). Office of Pesticide Programs (OPP), US EPA, Washington, DC 20460, telephone 703- 305-5805.

Following the comment period, the glyphosate RED document will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone 703-487-4650.

For more information about EPA's pesticide reregistration program, the glyphosate RED, or reregistration of individual products containing glyphosate, please contact the Special Review and Reregistration Division (7508W), OPP, US EPA, Washington, DC 20460, telephone 703-308-8000.

For information about the health effects of pesticides, or for assistance in recognizing and managing pesticide poisoning symptoms, please contact the National Pesticides Telecommunications Network (NPTN). Call toll-free 1-800-858-7378, between 8:00 am and 6:00 pm Central Time. Monday through Friday.