Minimizing non-target effects of herbicide use

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There were approximately 60 people in attendance. Most of them were interested in learning new techniques to reduce impacts and improve public reaction when spraying around endangered species and to reduce impacts on sites with long term herbicide application.

General tips to reduce impacts:

- Use the minimal application rate
- Preclear the area. Don't have dead material laying around that can spread fire, or take up extra herbicide that can wash off.
- Limit the number of applications that you apply per year.
- If there is a change in policy of number of applications per year or lbs per year, then the decisions have to go through the board.
- Once a population has been controlled, follow-up treatments can be from mechanical means.
- Limit the amount of herbicide transported to a site. Don't carry it all, because if there is a crash, it all spills in.
- Have a spill response plan. Be prepared for your worst case scenario.
- Designate a dry stream crossing when working near waterways. If you have herbicide on your feet from walking through treated plants and then you cross a stream, the herbicide will run off.
- Pre/Post notification of herbicide application for visitors. By making them aware that the spraying is occurring, they can choose to avoid the area if they are concerned about personal health.
- Wear PPE and have a wash station setup.
- Mix and load herbicide in a protected area.
- Contain any spills
- Keep application standards.

Info on herbicides:

Glyphosate/Roundup

Bacteria, Fungi, and moisture break down glyphosate. Sunlight and hydrolysis also increase the rate of degradation. There are published reports of the half life of herbicides with and without sunlight. Glyphosate is easily biodegradable, even in the human body. In the past one applicator used to bring a jar of it to outreach sessions and drink it directly to show that it does not have a negative biological effect. Studies have been done using glyphosate with different surfactants to determine the rate that each degrades.

It takes a long time to get glyphosate runoff into streams. It adheres to the soil and needs to lose soil to erosion for it to get into streams.

Roundup has been reported to be an endocrine receptor, but the tests that were performed to do this appear to have reached conclusions not supported by their data. The experiment was done by a lab in France (Serloni) and has very unrealistic tests where they soak human cells in glyphosate. Arotemase

production goes down in the experiment, but they did not use any positive controls. Considering glyphosate is so widely used, you would probably already see reactions if it happened.

Glyphosate hits soil and it binds. The best way top avoid this is to apply it differently. Avoid spraying it into the air. Dow Agro online has different ways to get the herbicide into the plant.

Imazapyr

Imazapyr is not toxic to humans but highly to plants. It is long lived in terrestrial environments and has preemergent effects. It is short lived in water. When using near the coast, a foot difference in tidal zones can have an extremely different effect. It is hard to test Imazapyr in the lab, because it contaminates glassware.

Triclopyr can be absorbed through the skin. It is hazardous to women of childbearing age and has been shown to cause birth defects. You can use either an ester or a salt as a surfactant. The ester breaks down quickly to the the salt form of the herbicide, which then takes several months to a year to fully degrade.

Competitor is a vegetable oil based surfactant.

Garlon has the highest risk profile compared to glyphosate (Roundup products) and Transline

Clopyralid requires a very low application rate, but is quite persistent and can contaminate compost made from treated vegetation because of its persistence.

Alternative herbicides:

Matran and ***Scythe*** are short risk herbicides. They are made from clove oil and pelargonic oil respectively. They break down in about three days, but are somewhat more hazardous to the applicator. They are both burn-down herbicides and work most effectively on young plants, but need to be applied at high rates which increases costs.

Risk Assessment Examples

USFS Risk Assessment: www.fs.fed.us/foresthealth/pesticide/risk.shtml

Invasive Spartina Project: www.spartina.org – Risk assessment for project compared with gylphosate.

San Pablo National Wildlife Refuge: Perennial pepperweed and Imazapyr Risk Assessment. http://www.fws.gov/invasives/staffTrainingModule/pdfs/assessing/SPBNWR_Control_Plan_061807.pdf

New Zealand Environmental Risk Management Authority (NZERMA): NZERMA has a rating risk for human, risks, vertebrates, invertebrates, aquatics, etc. for all hazardous substances and new organisms in NZ. It also includes health and safety information and the type of PPE that you need to use chemical. This guides the storage, transport, use, and PPE of all substances in NZ. www.ermanz.govt.nz/

The United Nations is working on a Global Harmonization System for pesticide products and active ingredients to make sure data is available and comparable worldwide.

Marin Municipal Water District: Watershed around Mt. Tamalpais is used for drinking water for much of Marin County. There are invasive brooms, star thistle, and other invasives The residents are concerned about the potential herbicide effects on water supply. In order to reduce effects of spraying, they have assumed the worst possible outcome and have premitigated for scenarios. In a typical risk assessment, EPA assumes that everything goes correctly and label instructions are followed, and assess

the risk involved in the activity. Before beginning their work, MMWD did risk assessment for the worst case scenario (i.e. everything that they spray washes into the watershed, or a truck full of herbicide is turned over on the road) and determine how you would react and respond. This sets limits on how much contamination is possible from vegetation management activities and helps in planning for those events to NOT happen. www.marinwater.org/controller?action=menuclick&id=437

Planning:

Need to log your experiences at a site. Record what you see and analyze change over the course of 1 year, 3 years, and 5 years. Knowing what has happened in other areas will help minimize costs in the long term.

It's hard to get a true "cost" of herbicide application. If you remove insect populations during application, the long term ecosystem service loss may increase the price of your restoration. Generally the long-term costs of restoring an area after a monoculture of weeds has been removed will be greater than the short-term cost of removing them. Some sites can passively recover, while others have no capacity due either to reduced seedbank or slow growth of native species.

The other issue is funding long-term projects. Most money is for 5 years. You can get as much done as you can in the short term, but most of these projects will need long-term follow-up. Bramble and Burns wrote a paper on a utility road project that took place over the course of 20 years.

You also need to evaluate your project after 3 years. If you are not having success with your treatment, then you have to switch to other management options—a different chemical or technique. Consistent and long term monitoring will allow managers to implement adaptive management. Comparing restoration at similar sites can also improve results.

It would be useful for funding agencies to evaluate effectiveness of projects so that they are more likely to fund projects that have proven to be effective in the past.

Regulation limitations:

Some areas are limited by regulations against herbicides. In these instances, it is more difficult to manage your species. In one case, a manager is trying to control yellow starthistle with mowing with no effects. Fish and Wildlife will not allow herbicide on the land so they need another method. A manager from Yosemite said that they have done timed mowing of some of their star thistle plots and it had been effective. Another recommendation was to set up a demonstration plot using herbicide and to test whether or not the herbicide is an effective method.

If you have sufficient time, you can approach your problem experimentally and set up different methods to determine which is the most effective. You should also do research to determine what types of research have already been completed.

Application:

When herbicide companies set their maximum application rates, they are being conservative by an order of magnitude. The amount of poison is often in the dose, but Susan hasn't always found this to be true in her research—endocrine disruptor chemicals can have an effect at very low doses. 2,4-D and some of the surfactants in products (those that contain nonylphenol ethoxylates) are endocrine disruptors that you may encounter.

You should check independent sources when learning about the herbicides you use. Read the label for basic information, then check websites such as www.extoxnet.edu or www.pesticideinfo.org as well as some of the community sites where herbicide use is not favored, so that you know what people are concerned about when dealing with herbicides.

Secondary Impacts (Wildlife)

One of the risks involved with herbicide application is impacting wildlife. You can carry a spray bottle with you to try to make up for mistakes during spraying, but some of the collateral damage is unavoidable and has to be calculated into your assessment. You have to determine if minor take of wildlife is better than a course of no action.

Herbicide in wildlands

Wildlands use less than 1% of herbicides used nationwide. Some agricultural lands get up to 20 applications a year. The majority of effects on the environment are not from these wildland applications. Newspapers can make a big deal out of spraying on public land, but they don't take the scale into account. People are very unaware of what is happening and are out of touch with how their fruits and vegetables are grown. In order to make it palatable to the public, it is important to keep records of reduced herbicide use over time at a site so that the public can see the effectiveness of the treatment. People lose perspective of the goals of treatment.

It is important to have a plan to get the weeds out and keep them out. You have to be timely with your applications to reduce the number of times that you have to visit a site. If you miss an application, then you are instantly behind and will usually have to use additional herbicide to catch up. If you allow plants to go to seed, then you will quickly begin losing the battle. Providing a source of desirable plants to the area is important, so they can begin to out-compete the weeds.

Public Perception

People currently separate out herbicides used by other people from chemicals we use in everyday life. Much of what some people are resistant to the fact that it was not their choice to be exposed to an herbicide, whereas their use of medications, smoking, etc. is their own choice that presumably comes with some benefit to them. Whenever people hear that there is a chance of cancer that get scared. The fear of the unknown is the biggest enemy. Education can help, but there will always be a few people who are not able to hear the information and/or make the choice anyway to do what they can to prevent any exposures, no matter how benign they might appear to be in an isolated context (which is how they are tested).

Public Interactions:

When dealing with the public, it is important to remember that there will always be people who will not change their mind, and it will be impossible to get them to agree to treatment no matter how much data is presented. While it can be frustrating, it is very important to listen to them, because it will be possible to get ideas on alternative treatments and you may be able to quell some of their concerns. You must listen to their concerns and care about their view. Go into public meetings with your eyes open, stay off your high horse.

In addition to educating people about herbicides, it is important to share information with them. If you are approached by a visitor seeking information, some of the key things you should know are:

- The long term effects of the herbicide.
- If herbicide is going to be a regular part of maintenance
- Will the herbicide saturate the soil and have preemergent effects?

Dow Agro has a new DVD available called "How to Train a Trainer". It teaches applicators how to talk to different members of the public including farmers and people concerned about roadway spraying. It gives tips on how to positively react to public inquiries and prepares you for these interactions. It is important to train the entire crew so that things everyone is prepared to answer questions. This can prevent the situation from escalating from zero to bad very quickly.

Most applicators make plans to share their information with others, but there isn't always follow through.

Breakdown Products?

It is important to know what your herbicide breaks down into and where the breakdown products can be found. If you are going to test for AMPA after application, then it is necessary to pretest for it, so you have a baseline to compare it to. The Fish and Game office in Rancho Cordova does this test and accepts samples from outside organizations.

Some of our simple projects don't test for long-term aggregate effects. We need good science, and we need better than 1-year site studies.

Risk Assessment

We need to determine acceptable levels of risk. When you are dealing with cancer, there obviously is no acceptable level to the individual. As a society, we have determined an acceptable level of cancer risk in the population as one in one million people, but if you're the one who gets the cancer, you probably won't think it's acceptable.

It is important to make a list of alternative assessments.

- What is the risk of no action?
    - The plants in the ecosystem may not create habitat for other species.
- What is the risk of heavy equipment?
    - This can be serious for operators of the equipment, and failures of equipment might be worse than herbicide effects.
- Estimate costs without herbicides
    - Can be a factor of 10 or more higher using mechanical means.

Cal-IPC.org and herbicides

Cal-IPC is considering having links to herbicide information on their website, but in doing so may alienate some of their members due to differences in opinion. Even if they try to make it a clearinghouse of information, it risks inferring a position based on the articles and information chosen.

Because of this, it makes it a touchy subject and causes some people not to want it listed here

Sharing Information

The hardest part about sharing information about your weed projects, is finding the time to do it. Most managers are already busy enough and adding another "report" to a project gets difficult. CalWeedProjects tried to create a wiki site to share application information, but it wasn't used, so they shut it down.

Perhaps a web site with a form-like interface, so not much writing needs to be done.

Dow has a Techline Newsletter of field experiences. There is information available, but not an effective way to get it to people who need it.

CalWeedTalk (www.cal-ipc.org/resources/index.php**)** is a listserve where you can ask questions over email and be quickly answered by experts and your peers in the field. It is a great place to get feedback about a project or information about a new species in your area.