The Role of Herbicides in Preserving Biodiversity

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No data exist for private land, but the Bureau of Land Management (BLM) estimates that the United States is losing 6.000 acres of public land every day to invasive non-native plants (4,600 acres a day in the west alone), rendering land economically useless and biologically impoverished. The technologies for weed containment haven't keep pace with the advent and spread of rampant exotics, which have mushroomed because of a mobile and burgeoning human population. The upward trend of weed invasions and spread will likely cause loss of biological diversity and landscape homogenization-biological sameness on a global scale - and at an ever-increasing rate. Apathy in the face of the weed threat may be more apparent than real: nevertheless public awareness is well behind the curve. The need for education and changes in resource management is crucial.

In the frequently polarized debate over the use of herbicides in battling aggressive weeds, the subject of biodiversity is too often lost. Herbicides per se have become the focus of the debate. This is backwards - biological diversity should be front and center. This is the pivot on which the California Native Plant Society (CNPS) policy must turn. Does proper use of herbicides work for or against biodiversity? Herbicide critics usually isolate the subject. They neglect the differences between herbicides and fail to address the serious weed problem confronting the California flora. I am a proponent of judicious herbicide use, and favor their employment as a vital part of a weed management strategy.

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Our discomfort with chemicals began with revelations in Rachel Carson's Silent Spring in the 1960s. The use of chemicals as a quick fix for complex problems created a backlash resulting in a regulatory climate that protects the public against many of the dangerous substances used indiscriminately in the past. Herbicides became entangled in the reaction to chemicals, but evidence is skimpy regarding negative effects of today's available non-restricted products when used according to label directions. Some people want to prohibit all herbicide use, but they don't address benefits nor the level of risk; those striving to preserve natural communities feel threatened by attempts to deprive them of an essential tool.

In an article, "Killer Weeds" in the March-April 1997 Audubon, author Ted Williams excoriates those he calls chemophobes. The article epitomizes the frustration an anger felt by those stymied in their David-and-Goliath battle against overwhelming infestations. He cites a tragic case in Idaho's Craig Mountain Wildlife Management Area where a program of hand spot-spraying of yellow star thistle was stopped by a court injunction which resulted from a suit brought by the Northwest Coalition for Alternatives to Pesticides. The partnership between BLM and the U.S. Forest Service was successfully controlling the infestation: the injunction allowed the thistle to leap out of control, infesting tens of thousands of acres of priceless habitat that had previously supported a great diversity of wildlife such as bighorn sheep, grouse, elk, moose, deer an wintering bald eagles-habitat that is for all practical purposes gone, possibly forever. In a similar situation, a frustrated Don Schmitz of Florida's Department of Environmental Protection fumes at those "who are unwilling to accept a short-term environmental insult to avoid a long-term ecological catastrophe". Weed warriors are keenly aware that once native biological communities have been displaced by weeds, they find it difficult or impossible to restore them: losing them sometimes means losing them forever - a needless deeply painful loss.

Our present technologies for countering invasive non-native weeds are rudimentary and few: control by biological agents, manual eradication, mechanized removal, fire and herbicides. All have limitations: all are essential.

Options

1. Classical biological control offers he greatest, and perhaps only, hope for some plants and the single best means of reducing need for herbicides. A successful example of classical biocontrol is provided by Klamath weed (*Hypericum perforatum*) which was devastating rangelands in northern California and Oregon in the 1940s but which has been reduced to insignificant levels by the introduction of a predatory beetle which feeds exclusively on Klamath weed. On the downside, biocontrol is not feasible for some plants - such as those closely related to agricultural crops, or those which are attacked only by generalist predators which feed on a wide range of host plants. Developing a biological control agent is initially expensive and time-consuming, and there is no guarantee of success. Up to now it has been inadequately funded but there are now hopeful signs that this may change.

2. Manual eradication can achieve inspiring results in localized areas - exemplars are the stewardship programs of the Golden Gate National Recreation Area in the San Francisco Bay Area and the Wildlands Restoration Team in the Santa Cruz Mountains. With Increasing popularity of stewardship programs, use of this technique can be greatly enlarged. The value of this multi-dimensional approach to weed control cannot be overstated. Still, the fact of millions of acres of overrun wildland in California reveals the limitations of site-stewardship as a solution to either the California or the global problem.

3. With the paucity of available techniques, is it any wonder that careful use of herbicides has found acceptance by thoughtful people? This article addresses herbicide use only for the control of wildland weeds which are threatening biological diversity and does not address non-ecological uses such as increasing timber production. There are many examples of indigenous plant communities being saved at the last minute and restored to native stock by an integrated management program in which herbicides played a necessary role.

Even highly motivated volunteers have not attempted to save the state - and federally-listed endangered fountain thistle (*Cirsium fontinale ssp. fontinale*) - endemic to a small area on the San Francisco peninsula – because of its labor-intensive demands. At the request of CNPS, the California Department of Transportation and the San Francisco Water Department initiated a program of cutting an painting the invading pampas grass with glyphosate to prevent the thistle being overwhelmed in its serpentine seep habitat: this appears to be a success story in the making. Rich grassland/ wildflower areas in and around San Francisco – tiny but precious – are there today because herbicides provide crucial support to volunteers teetering on the brink of demoralization in the face of advancing fronts of fennel (*Foeniculum vulgare*), pampas grass (*Cortadeira jubata*), and French broom (*Genista monspessulana*) perceived as invincible.

An email appeal to activists for other successful examples where employment of herbicides displayed a crucial role resulted in an overnight torrent: saltcedar (*Tamarix* spp.) eradication projects in Afton Canyon near San Bernardino. The Nature Conservancy's Dos Palmas Reserve, and Lake Mead National Recreation Area: Cape ivy (*Delairea adorata*), artichoke thistle (*Cynara cardunculus*), eucalyptus (*Eucalyptus* spp.), and many other weedy species in Los Peñasquitos Canyon Preserve in San Diego; castor bean (*Ricinus communis*), pampas grass, myoporum (*Myoporum laetum*) et al in Newport Beach, in Big Sycamore Canyon Point Mugu State Park, Leo Carrillo State Park, Liberty Canyon and Malibu Lagoon (Malibu Creek State Park); Team Arundo's Santa Ana River restoration; pampas grass on Milagra Ridge in the Golden Gate National Recreation Area near San Francisco; ice plant *Carpobrotus edulis* at Astiomar State Park, the Marina dunes, and the Marine Lao at Bodega Head in Marin Country.

Plainly many of those who value biodiversity seriously enough to donate a large part of their lives to an effort to preserve it consider herbicides indispensable. Aside from cost-effectiveness and time-saving, employment of herbicides has the considerable advantage of not creating soil disturbance, which activates the weed-seed bank an favors weeds over natives. In the cited instance of Bodega Head, a project ongoing since 1985, dune natives were being buried under thick carpets of ice plant. Managers sprayed the ice plant, which decayed slowly over a long period. Native plants returned on their own without human help. A similar case is in process in the

Marine dunes, managed by the state parks department. This is an efficient and ecologically sound method which should be employed more often. Manual eradication of infestations better managed by the judicious use of herbicides is poor use of limited resources.

A Rational Dialogue

Difficulty in attaining rational dialogue is partly embedded in language. The word "toxic" can be defined in many ways. In addition to bearing a wide variety of meanings it also carries heavy emotional freight. It has meaning only in relation to something else; oxygen is lethal to some organisms out essential to others. Salt, chlorine and aspirin can be toxic to humans at high dosages but are willingly ingested in proper amounts. Modern herbicides have been improved in recent years and are cleverly designed to work on various highly specific ways to interfere with the functioning of a specific target: they may or may not be detrimental to organisms not targeted. It would be constructive to look at what is going on without attaching emotional labels to what may be a harmless process.

The first issue of an herbicide policy is safety – to humans, soil microorganisms, wildlife, and ecosystems. There are many chemicals on the market for controlling vegetation. As a practical matter when we talk of controlling wildlife weeds in California, we are referring primarily to two chemical compounds: glyphosate and triclopyr, usually marketed under the trade names of Roundup Pro/Rodeo an Garlon/Pathfinder II, respectively. The Environmental Protection Agency (EPA) classes herbicides and all pesticides according to four groups, with those considered dangerous enough to be restricted placed in Classes I and II, and graduating downward to Classes III an IV, which are non-restricted, bear only a Caution label, and which may be purchased retail. Glyphosate and triclopyr are in Class III.

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All herbicides, including surfactants which aid herbicide adherence and penetration and inert ingredients, are required to undergo rigorous testing to become registered in the United States. These tests typically include animal toxicity (carcinogenicity, teratogenicity, acute toxicity), effects on non-target organisms, and mode of degradation in the environment. These are extensive tests that take years to complete. It takes chemical companies seven to ten years an forty to eighty million dollars to satisfy EPA requirements and bring a new active ingredient to the market. California requires further tests that take an additional year or more to complete. This costs a company more money an delays the review and registration process in California. EPA an the California Department of Pesticide Regulation (CDPR) examine all tests results carried out by the manufacturer an have full audit authority over the results. There is not enough money in the EPA an CDPR budgets to do independent testing, but their ability to look into company records and to conduct on-site inspection keeps companies fairly honest. The research regarding safety of non-restricted herbicides is accepted by the World Health Organization.

Many people distrust assurances on herbicides by agencies or corporations. However, faulty data generated for EPA on chemical safety are easily detected if they are inaccurate, misleading, or incomplete and there are critics ready to pounce on this highly visible issue. EPA, the manufactures and the testing scientists have too much at stake to risk falsifying data or methodology. Non-profit organizations attempting to eliminate or reduce chemical use have zeroed in on herbicides and have succeeded in creating anxiety among some people. However, credible studies documenting negative effects have not been forthcoming. Studies reported in, for example, the *Journal of Pesticide Reform*, are not subjected to peer review by disinterested scientists. Popularized articles are widely read and believed by readers. This pseudoscientific reporting accounts for most of the controversy surrounding the subject and it places another obstacle to the formidable job of preserving biodiversity.

Classes III and IV herbicides have been in use for a long time by millions of people, including home gardeners, who may purchase them at their local nursery or hardware store. As a professional gardener in San Francisco's parks and botanic garden. I used glyphosate-formulated herbicides intensively over a period of twenty years. Specific areas were repeatedly and effectively

treated without diminution of productivity or indication of negative effects, including to the applicator. Herbicide use vastly increased my productivity. It would have been impossible to maintain these areas in an acceptable manner without spraying. Modern wage rates prohibit manual eradication of weeds on the scale required in our public parks and open spaces, to say nothing of natural resource management, where resource preservation is the primary concern. There is a long history of safe and economical maintenance using herbicides. In the face of this experience, wouldn't we have evidence by this time of negative or harmful effects? It is up to critics to identify and substantiate need for further studies.

Species extinction and loss of biodiversity are becoming weekly stories in the media. Indifference to the rending of nature's fabric while we deny ourselves a useful and apparently safe weapon is beyond understanding. It is misleading to say that herbicides should be used only as a last resort. On the scale of the larger landscape, we already passed the last resort stage. Critics would enhance their credibility if they devoted more thought to ways to preserve the miraculous diversity of life we have inherited. To date we have been poor stewards of this gift.

Reference:

SIGG, J. *California Exotic Plant Pest Council News*, Summer/Fall 1999. p. 10-13.