



University of Hawaii at Manoa

Environmental Center

A Unit of Water Resources Research Center

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February 13, 1992

Mr. Lou Erteschick, Chairperson
Roadside Spray Task Force
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Erteschick:

HCR 254 HD 1 SD 1
Roadside Spray Task Force
Sub-Committee Report

Enclosed please find the Roadside Spray Task Force: Sub-Committee Report covering tasks 3, 4, and 5 of the directives given under HCR 254 HD 1 SD 1. We trust that this information will be incorporated into your final report to the Legislature. If you have any questions regarding the content of this report, please call me at 956-7362.

Yours truly,

Jacquelin N. Miller
Associate Environmental Coordinator

cc: Carol Burgess
Marjorie Ziegler
Claudia Gauen
Roger Fujioka

HCR 254 HD 1 SD 1
SUB-COMMITTEE REPORT
ROADSIDE SPRAY TASK FORCE

February 13, 1992

BACKGROUND

During the 1991 legislative session the use of herbicides to control weeds along Hawaii's roadsides was brought to the attention of the State Legislature. At issue was the potential health risk posed by the unintended exposure of the public, specifically school children, to herbicides used along roadsides as well as concerns for environmental pollution, effects to non-target species, and aesthetic appearance of the roadways. After much discussion and several hearings, the legislature passed House Concurrent Resolution (HCR) 254 HD 1, SD 1 "Requesting the Director of Health to Appoint a Task Force to Assess the Effects of Roadside Spraying on Human Health and the Environment, and to Evaluate Alternative Methods of Controlling Roadside Plant Growth." The Resolution gave the task force specific instructions, "to review state and county policies and procedures for roadside spraying and to report the following:

- (1) Possible exposure of young children, pedestrians and community volunteers who come in direct contact with recently sprayed roadsides;
- (2) Possible health risks associated with roadside spraying;
- (3) Strategies to minimize human exposure including public notice of spraying schedules;
- (4) Findings and conclusions of other state studies and environmental assessments; and,
- (5) Exploration of alternatives to roadside spraying such as the State's Adopt a Highway Program; and,
- (6) An identification of the specific locations where herbicides are sprayed; a description of each herbicide used at each location, including type, quantity, and cost; and the rationale for the use of each; and,

... report its [the task force's] findings and efforts ...twenty days before convening of the Regular Session of 1992;...." (We must interject here that meeting this reporting date has not been possible given the volumes of material to be assembled and the work schedules of those on the task force. The task force apologizes for any inconvenience caused by the late report.)

Roadside Spraying Task Force

The task force was formed and the initial meeting was held on September 20, 1991. A list of the members is given in Table 1. At that time the group was divided into several sub-committees. Ours was assigned tasks numbered 3, 4, and 5. We have also compiled some information on task 2, possible health risks (Appendix A).

Members of our sub-committee include:

Carol Burgess	Hawaii Integrated Vegetation Management (IVM) Specialist, P.O. Box 517, Hawi, HI 96719
Marjorie Ziegler	Sierra Club Legal Defense Fund, 212 Merchant Street, Suite 202, Honolulu HI 96813
Claudia Gauen	Outdoor Circle, 338 Dune Circle, Kailua, HI 96734
Jacquelin Miller	Environmental Center, University of Hawaii, Honolulu, HI 96822

The following information has been compiled over the past three months. I would like to especially thank and acknowledge the extraordinary efforts of one member of our group, Ms. Carol Burgess. In addition to assisting in all aspects of the review and evaluation of various methods used for vegetation management along roadsides, she specifically took on the task of contacting other states for information on their roadside weed control practices pursuant to task number 4. The material she has compiled and her experience in working with Hawaii County roadside weed control managers relevant to this subject has been invaluable to the sub-committee's efforts.

Basic Assumptions

Before we discuss the specific tasks that we were assigned, ie. Strategies to minimize human exposure...(task 3); Findings and conclusions of other state studies...(task 4); and, Exploration of alternatives to roadside spraying...(task 5); it is important to delineate the basic assumptions made by our sub-committee in undertaking this review. We recognize that there are differences of opinion as to the significance of public health risks and environmental risks posed by the use of herbicides for road maintenance. We also recognize the concerns expressed by those responsible for highway maintenance with regard to costs of alternatives to the use of herbicides for weed control. However, it was our opinion that, if given a choice, most people would prefer to minimize their exposure to herbicide sprays and to promote a more visually pleasing roadside, i.e. green not brown, regardless of the published health risks since it is apparent that viable alternatives are available. Therefore, in accordance with the directives of the resolution, it was our responsibility to examine ways by which the state or county could eliminate or minimize the use of herbicide sprays on roadsides through the use of viable alternatives. We defined "viable alternatives" as those that minimize potential impacts to the public and to natural habitats and are economically responsible.

SUBCOMMITTEE REPORT ON
HOUSE RESOLUTION 254 HD 1, SD 1: DIRECTIVES 3, 4, AND 5

Task 3. STRATEGIES TO MINIMIZE HUMAN EXPOSURE, INCLUDING PUBLIC NOTICE OF SPRAYING SCHEDULES.

One of the primary concerns voiced during the hearings that led to the adoption of HCR 254 HD 1 SD 1 was the concern for public health as a result of human exposure to herbicides sprayed along roadsides. Testimony was provided at the hearings that called attention to paths being sprayed near schools where children could come into contact with the sprays and of cars receiving drift spray if they were adjacent or down wind to spray trucks (see Appendix A). In addition to concerns for public health, the potential for contamination of ground and surface waters and the potential for deleterious effects to non-target species, particularly given the number of threatened and endangered species in Hawaii, were also cited as major concerns. Yet another issue that was vigorously presented by both the Outdoor Circle as well as members of the tourist industry involved the aesthetics of the dead and browning roadsides following spraying. It was forcefully argued that Hawaii, of all the states, should be a leader in fostering environmental beauty of our roadsides. Given these concerns, the first item on the agenda for the task force was to examine ways to minimize human exposure to roadside sprays for weed control. Four procedures were considered:

- Public notification of spray schedules
- Posting of signs
- Establishment of buffer zones
- No spraying

Public Notification of Spray Schedules

One mitigative measure that might lessen the incidence and degree of public exposure to roadside sprays would be adequate notification of the pending spray schedules. What is not so obvious is the best method for carrying out that notification. Certainly it would be reasonable to use the already well established methods for notifying the public of general road repairs. The ongoing media announcements of the repairs along Kalaniani'ole highway in East Oahu are excellent examples. Proposed sites for spraying could be advertised through notices in the media and incorporating eye-catching formats and maps of the areas to be sprayed. Unfortunately, while media announcements of spray schedules may be informative to adults, they are unlikely to be noticed by children, the very population that may be most likely to come in contact with sprayed areas. Other potential problems that have been cited are the costs of media announcements and the difficulty in establishing specific spray schedule dates due to equipment availability and weather conditions. To minimize costs of public announcements we suggest that newspaper and/or TV notifications could be made quarterly and the notices cover a multitude of areas with tentative herbicide spraying schedules. Public service announcements might be another method to use to reduce public notification costs. To combat the problem of changes in

spraying dates due to weather conditions and equipment availability, published dates prior to spraying would need to give a range of possible dates, i.e. "Roadside weeds will be sprayed between 1-15 December."

The Posting of Signs

In our review of other state's programs, the "posting" of sprayed areas was cited as a practice in some states as well as a sign on the spray truck indicating the type of chemical being sprayed. The posting of temporary signs by the applicator, prior to spraying, to be repeated approximately every 300 feet may be the most efficient and effective method of public notification. Its debatable as to when the signs should be removed after the spraying has occurred due to varying opinions regarding degradation and persistence of herbicides. We recommend that the signs remain up for at least 48 hours after application. This should reduce vandalism yet will maintain the unobstructed scenic views of the roadsides. Our sub-committee suggests that signs stating "WARNING" and a simple symbolic logo (ie. a silhouette of an applicator spraying within a red circle), plus the trade name, chemical name, and an indication of the presence of unknown inert ingredients, should be created for spray trucks and backpack sprayers. The logo for roadside spraying should be designed similar to the international roadside and air terminal symbols. This same information and the logo could then be used on all signs, newspaper notices, or other media announcements.

Establishment of Buffer Zones

Other states have established buffer zones where no spraying of herbicides is done near especially sensitive areas. This would include ecologically sensitive areas such as wetlands, surface waters, or forest reserves, within 150 feet of a residence, or along high traffic, public pathways.

No Spraying

The fourth option considered to reduce public exposure was the "no spray" alternative. Many of the states reported that they simply had reduced or eliminated the use of sprays for roadside weed control. For example, Maine indicated that they received 40 to 50 protest calls per day when they were using herbicides. They have now reduced their herbicide application rates from 1-1/2 gallons per mile to 1/5 gallon (product formulation) and they do selective spraying on tree species only, once a year. Jefferson County, Washington, has not used herbicides for roadside vegetation control in 14 years. Some states establish "No Spray" areas at the request of the public in exchange for their agreement to maintain the area.

Recommendations of the Sub-Committee

The "No Spray" alternative is the most obvious solution to eliminate public exposure to herbicides. However, this may not be a viable alternative in and of itself. Any reduction in the use of herbicides must be accompanied by a plan of action to impose alternative methods of weed

control, such as the establishment of low-maintenance vegetation and paving, if we are to maintain safe roadways. The following procedure is suggested as a start in that direction:

Initiate the no spray alternative wherever possible by relying more on biological and mechanical means of vegetation control and encouraging the presence of naturally occurring low growing plant communities. Also an important consideration is to leave many areas just "as is." In other words, "leave well enough alone." Where it is determined that herbicides are still to be used, public notification should be implemented by announcements in the newspapers and signage on spray apparatuses and in areas of herbicide application as discussed previously.

Task 4. FINDINGS AND CONCLUSIONS OF OTHER STATE STUDIES AND ENVIRONMENTAL ASSESSMENTS

Contact has been made with 9 states and 17 counties to obtain information on their roadside weed control practices. Details of the telephone conversations with representatives of each of the states and counties contacted are given in Appendix B. We especially call attention to the progress of the state of Wisconsin and Jefferson County, Washington. In general, each state, county, municipality, or agency either is using or is in the process of developing an Integrated Vegetation Management (IVM) program. The IVM program involves more than minimizing or eliminating the use of herbicides, its goal is to reduce the need for subsequent treatments. Five major steps are involved in most IVM programs:

1. Survey. The initial requirement for all IVM programs is to undertake a survey to determine where the vegetation problems occur and the nature of the problematic vegetation. Once the problem areas and problematic species are identified, then the following questions need to be addressed:
 - what are the environmental and geographical conditions of the problem areas?
 - what are the growth (survival) requirements of the problematic vegetation?
 - what are the life cycles of problematic species and what are their limiting factors?
 - where are problematic species absent or under control and if so what are the conditions at these sites?
2. Determine the injury level of specific problem plant species on specific sites. What is the level of occupancy of the vegetation that is tolerable: In other words, how much of the plant can you have present before a problem is posed?

3. Determine the level at which action must be taken to prevent reaching the injury level. When do you need to take action to prevent the occurrence of a problem?
4. Select effective actions. Choose a course of treatment that addresses the cause of the occupancy of problematic vegetation, that least disrupts the environment, and poses the least threat to human health. Preventative actions are of primary importance.
5. Monitoring. After an IVM program is implemented, it must be evaluated continuously. This monitoring must consider the effectiveness of the program, whether changes in the program are needed, and must assess the long term (10 year) permanency of the solutions.

It is critical that for such a five-step IVM program to succeed that management understand the biology and environment of the area being treated. A program of ongoing monitoring is also essential. We have found that many states, counties, municipalities and agencies are now using IVM techniques to manage vegetation. Since there are many factors involved in a successful IVM approach to roadside vegetation maintenance, it appears that patience and a long term commitment to IVM are absolutely essential. This will allow for feedback to be incorporated into a revised and updatable program.

Task 6. EXPLORATION OF ALTERNATIVES TO ROADSIDE SPRAYING SUCH AS THE STATE'S ADOPT A HIGHWAY PLAN.

Vegetation control along roadways is clearly recognized as a necessary process to insure public safety by providing clear visual paths, by maintaining shoulder areas for pedestrian or bicycle use, and particularly in rural areas, maintaining adequate roadway widths for safe passage of vehicles. Prior to the introduction of the assortment of "weed killers" by the chemical industry, many of these roadway maintenance activities were carried out by manual labor. With the boom in the chemical industry and the extensive development of herbicides, chemical controls of vegetation have been touted as the end all method for vegetation control. More recently however, recognition has been surfacing that broad scale herbicide use along the miles and miles of roadways may be endangering not only the adjacent crop lands and natural environments, including rare or endangered species or their habitats, but also poses a risk to the nearby receiving waters, potable ground waters, and public health through unanticipated exposure. In addition, increased awareness of the aesthetic impacts of herbicide use has received nationwide attention. Furthermore, some alternatives that are considered very costly initially, may, in the long term, be more cost effective than chemicals. It is time to rethink and re-evaluate the roadside maintenance policies of the state and counties and to more fully examine viable alternatives to the current spraying practices.

There are several alternatives to herbicide spraying available. In many areas vegetation could be controlled manually and mechanically, especially if less money is spent on chemicals and their application. Certain ground covers, especially low growing, low maintenance species, could be planted that would eventually choke out undesired vegetation. In some locations

mowing alone may be totally adequate to keep vegetation from encroaching on the roadways. In some areas, such as around guard rails or sign posts, the use of a coarse mulch, such as wood chips, might provide sufficient material to retard weed growth and minimize the need for mowing or spraying. Paving under guardrails would eliminate the need for spraying. Encouraging low growing, existing or native groundcovers to proliferate by clearing away their competition is also a viable option; and in some areas it may become apparent that nothing at all needs to be done. The "adopt a highway" program has been very successful in other states and has been used in Hawaii to assist in litter control. Encouragement of community support to maintain neighborhood roadways, particularly in residential or rural areas may be yet another viable alternative, used singly or in conjunction with other alternatives for roadside weed control.

CONCLUSIONS

After considerable discussion, review of pertinent materials in the literature, and numerous telephone conversations with representatives of the public works organizations from other states and counties, we have concluded that an integrated vegetation management (IVM) program for the State of Hawaii would be a viable and economically responsible option for the safe control of roadside weeds. To move in this direction we suggest that the State consider adopting the following procedure:

1. Advisory Panel. Establish an advisory panel consisting of roadside maintenance officials, professional consultants and/or government agency personnel (including the University) and interested citizens to formulate an IVM plan based on reviews of similar programs elsewhere, taking special account of the unique features of Hawaii.
2. Survey Program. Collect data and map vegetation types, weed problems, soils, agriculture, native ecosystems, weather variables, and site-specific problems. This information may be augmented by information from the Departments of Agriculture, Land and Natural Resources or Health. Develop a computer database of all records.
3. Test Sites. Establish at least one, non-chemical test area, for each road maintenance district similar to those that have been established successfully in the County of Hawaii. These areas will serve as test plots for research into the benefits and problems associated with non-chemical alternatives to roadside weed control.
4. Formulate an IVM plan. Using the recommendations of the panel (paragraph 1, above); the data from the survey (2); and the results of the test sites (3); formulate a plan for integrated vegetation management for roadside management throughout the state. Note, the initial plan should be flexible to allow for both immediate implementation and the rapid assimilation of new data and results as they become available.

5. Monitoring. Regular monitoring of the effectiveness of the program is necessary to ensure that management strategies are optimized.

The adoption of such a program of Integrated Vegetation Management (IVM) provides a systematic approach to deciding when, where, and how the various techniques can be used to minimize or eliminate the use of herbicides for roadside weed control.

TABLE 1

Members of Roadside Spraying Task Force
September 13, 1991

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APPENDIX A

INFORMATION RELATIVE TO POSSIBLE
HEALTH EFFECTS ASSOCIATED WITH ROADSIDE SPRAYING

Some of the
Pesticides Used to Spray Roadside Rights-of-Way

Pesticide	Active Ingredient	Signal Word/ Route of Entry
Arsenal	Imazapyr salt	Caution / Skin and Eyes
Weed Hoe 108	MSMA	Caution / Swallow, Skin, Eyes Inhalation
→ Velpar	Hexazinone	Danger / Skin and Eyes
Hyvar	Bromacil	Warning / Swallow, Skin, Eyes Inhalation
Rodeo	Glyphosate salt	Caution / Eyes and Inhalation
Roundup	Glyphosate salt	Warning / Eyes, Skin, and Swallow
Dowpon	Dalapon salt	Warning / Eyes, Skin, and Inhalation
Lorox	Linuron	Caution / Swallow, Skin, Eyes Inhalation
Oust	Sulfometuron methyl	Caution / Eyes, Skin, Inhalation
Diuron 80 WDG	Diuron	Warning / Eyes, Skin, Swallow
MSMA 6 Plus	Monosodium Acid Methanearsonate	Caution / Swallow, Skin, Eyes Inhalation
MONOTAR	arsenical	Class III

SCHOOLS ALONG STATE HIGHWAYS

<u>School</u>	<u>Location</u>	<u>Herbicides Sprayed</u>	<u>Length</u>
<u>Hawaii</u>			
Mt. View Elementary	HWY 11, MP 14.25	No	--
Hookena Elementary	HWY 11, MP 101.75	No	--
Honaunau Elementary	HWY 11, MP 106.25	No	--
Kalaniana'ole Elem.	HWY 19, MP 7.0	No	--
Keaau Elem. & Inter.	HWY 130, MP 0.25	No	--
Pahoa High	HWY 130, MP 11.0	No	--
Honokaa High	HWY 240, MP 1.0	No	--
Hawaii Prep. Academy	HWY 250, MP 2.5	No	--
Kohala High	HWY 250, MP 22.0	No	--
Waiakea Elementary	Route 2000, MP 0.55	No	--
Waiakea Inter.	Route 2000, MP 0.75	No	--
<u>Maui</u>			
Sacred Hearts	Honoapi'ilani Highway, Lahaina	Yes	150 ft.
Baldwin High	Kaahumanu Avenue, Wailuku	Yes	500 ft.
Kula Elementary	Kula Highway, Kula	Yes	300 ft.
Kaunae Elementary	Hana Highway, Kaunae	Yes	200 ft.
Hana High	Hana Highway, Hana	Yes	500 ft.
Wailuku Elem.	S. High Street, Wailuku	No	--
<u>Kauai</u>			
St. Theresa's	Kekaha	No	--
Waimea Baptist			
Church PreSchool	Waimea	No	--
Waimea High	Waimea	No	--
Kauai CC	Puhi	No	--
Lihue Hongwanji			
Nursery School	Kupaia	Yes	50 ft.
King Kaumualii			
Elementary	Hanamaulu	No	--
Kapaa Missionary			
Church Preschool	Kapaa	No	--
All Saints Nursery			
School	Kapaa	No	--
Menehune School	Hanalei	No	--
Hanalei School	Hanalei	No	--

What Physicians Don't Know About Occupational Exposure to Pesticides

by Molly Joel Coye, MD, MPH

"Why hasn't my physician told me more about the pesticide hazards I am facing?"

"Why is s/he reluctant to diagnose my illness as pesticide-related when it seems at least an obvious possibility?"

These are questions frequently asked by workers when they first learn about the possible hazards they face from exposure to pesticides on their job. One answer is that their physician may not have been trained to investigate occupational exposure as a cause of illness.

In a 1979 survey of U.S. medical schools, 70% of the responding schools indicated they required no formal instruction in occupational or environmental medicine. Among the 30% that did require such instruction, the median time required was four hours during the four years of medical education. In a repeat survey conducted in 1984, 54% of the schools included such instruction, but the median time required was still four hours (Levy 1985).

Acute, Severe Poisoning

What most physicians know about pesticide toxicity is limited to the specific signs of acute, severe poisonings. Some chemicals produce characteristic physiologic changes which make diagnosis easier, but almost all of these signs and symptoms occur only after a substantial exposure. In cases of direct exposure to large amounts of a pesticide (e.g. following a spill, accidental ingestion, or direct spray by a helicopter), some effects will be so specific that they suggest the diagnosis of pesticide poisoning.

Not very many categories of pesticides have specific "signs," however, and even these signals may be misinterpreted if the link to pesticide exposure is not made. For example, a sign of moderately severe organophosphate or carbamate poisoning is miosis, or pin-point pupils. If pesticide exposure is not mentioned by the patient or by the person who brings the patient to the emergency room or clinic, most physicians would initially suspect narcotics abuse because it is the most common reason for this finding in a patient. When pesticide exposure is mentioned, and the symptoms are severe, many nurses and physicians will recognize the presenting symptoms as signs of pesticide poisoning or will make use of a poison control center and other resources to investigate the possibility of pesticide poisoning.

Chronic, Low-level Poisoning

Acute severe poisonings are relatively rare, however, in comparison with low-level pesticide exposures at work or in home and garden use. The effects of low-level exposure are much more difficult to diagnose, for a number of reasons:

Molly Coye has served the last five years as Medical Investigative Officer for the National Institute of Occupational Safety and Health (NIOSH) in San Francisco. This month she has begun a new job as Public Health Advisor to New Jersey's Governor.

1) The symptoms are almost always non-specific, meaning that they could be caused by many different chemicals, by an influenza or cold, by physical exhaustion or even psychological stress. Mild organophosphate exposure may only produce headache, fatigue, weakness, nausea and sweating, all those being classic signs of a beginning bout of flu. Dermatitis caused by a pesticide could easily be diagnosed as a reaction to a soap or plant at home rather than a pesticide in the workplace. Medical students learn to "look for the zebras" (i.e. think of exotic explanations for common findings) while they are in school, but everyday practice in the real world teaches most physicians that "if it looks like a horse, it probably is not a zebra." In other words, if there is a logical, common explanation for a set of symptoms, why try to dig up another explanation?

2) In most cases it will not be easy for the physician to "prove" the diagnosis. Making a diagnosis means both a) demonstrating the probability that a certain agent (e.g. a pesticide) caused the illness, and b) ruling out other causes (e.g. demonstrating that the patient doesn't have the flu or a cold). Since many illnesses like a cold or flu can't be conclusively ruled out in most situations, diagnosis depends upon making a strong case for the probability that pesticides caused the illness.

Biological testing for pesticides in the blood or urine is relatively difficult and very expensive (the usual method is gas chromatography and it may cost several hundred dollars per test), and not very helpful in low-level exposures. Exposure to organophosphate or carbamate compounds is measured by the activity of the enzyme cholinesterase in blood. The interpretation of this test is difficult in mild or moderate exposures, however, because there is a wide range of variation in enzyme activity between individuals. A mild effect in one person is almost impossible to detect without a baseline measurement for that person prior to the exposure for comparison. As a result, a physician who says "I think this patient has a headache and nausea because she worked on a railcar that was shipping pesticides" has no way of demonstrating why that patient didn't just have a mild case of flu.

3) In some cases the exposure occurred a long time before the onset of symptoms, or the symptoms have existed for a while before the patient realizes that a past exposure might have caused them. Again, unless there is some symptom or finding which clearly demonstrates the link with the pesticide exposure in the past (for example, a peripheral neuropathy developing several weeks after exposure to certain organophosphates), this is difficult to diagnose. Even the most sympathetic physician, one very interested in pursuing occupational etiologies (causes), has a tough time defending a diagnosis in cases like this.

4) Very little research has been done on the clinical toxicology of pesticides, and even less is published in medical journals and texts. When a physician is puzzled by a clinical situation, she or he turns first to textbooks in the office. If a case is very unusual

CHEMICAL EXPOSURE AND DISEASE Diagnostic and Investigative Techniques

By Janette D. Sherman

It is vitally important today that people understand the relationship between chemical exposure and disease better. This book helps professionals achieve that understanding. It begins with a general discussion of the scope of the problem, including a non-technical review of toxicology. The author then provides specific guidelines for obtaining an individual's work history that includes exposure to chemicals. Actual case reports are given along with state-of-the-art bibliographies for 14 major groups of chemicals, including arsenic, asbestos, chromium compounds, and epichlorohydrin. These bibliographies list important literature in chronological order--a significant aid to understanding how long the effects of a particular chemical on human health have been known or suspected. With *Chemical Exposure and Disease*, professionals will better be able to understand the risks associated with chemical exposure and be able to make more informed decisions to improve health and prevent future harm in the workplace and in the general environment.

CONTENTS:

Introduction. Clues to Chemically-Caused Diseases. Review-of-Systems Approach. Basis of Toxic Effects. Inherently Dangerous Industry Approach. Case Reports Based on the Review-of Systems Approach. Pesticidal Chemicals. Smoking, a Confounding Factor in Disease Causation. Cause-and-Effect Decisions Based upon Scientific Opinion. What Can I Do Now? Source of Information and Data Collection. Bibliography. Index.

272 pages, 6 x 9, illustrated.

ABOUT THE AUTHOR:

JANETTE D. SHERMAN, M.D., specializes in occupational medicine and toxicology. Currently running a private practice in Southfield, Michigan and Fairfax, Virginia, she evaluates cases involving chemical exposure and serves as a clinical assistant professor in the Department of Internal Medicine at Wayne State University, Detroit. Her experience includes teaching at Michigan State University, East Lansing, and working for the U.S. Navy Radiological Defense Laboratory and the Atomic Energy Commission. A staff member of Harper-Grace Hospitals and Maui Memorial Hospital, Dr. Sherman also lectures, does consulting, conducts research, and writes for several professional publications on issues related to chemically-induced diseases.

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APPENDIX B

INTEGRATED VEGETATION MANAGEMENT POLICIES AND PRACTICES

"OTHER" STATES AND COUNTIES

Notification and Posting

On June 21, 1991, the U.S. Supreme Court ruled that federal law permits local governments to regulate the manufacture, sale and use of pesticides. (The 9-0 decision is a victory for many towns and cities which have been challenged in court by pesticide applicants and lobbyists). Under the ruling, local ordinances can control when, where and how pesticides are used and require posting and notification.

VERMONT

"No Spray" areas are flagged along the highway, notification is published in the newspapers and broadcasted on the radio before spraying.

MAINE

The D.O.T. provides public notification of imminent spraying in the media, of a targeted locality, and puts signs on the spray trucks with the name of the pesticide being used.

In addition, the department will be installing 500 signs with the following message, "Warning--Brush Control, Herbicide Used On This Route" These signs will be permanently installed where herbicides are routinely used.

Lane County, Oregon

In an effort to allow individuals, including chemically sensitive individuals, to further reduce their exposure to chemical residues resulting from herbicide applications to the right-of-ways, the D.O.T. has been advised to post notices in the areas where applications are anticipated.

WISCONSIN

Spoke with James Ritzer, Landscape Development Program Manager, Division of Highways and Transportation Services.

They have approximately 150,000 acres of roadsides.

Wisconsin has always had a natural roadside philosophy and their maintenance policy has always been to preserve and regenerate native vegetation.

They have reduced herbicide use substantially and much of the reduction was prompted by employee input.

They are also interested in reducing mowing.

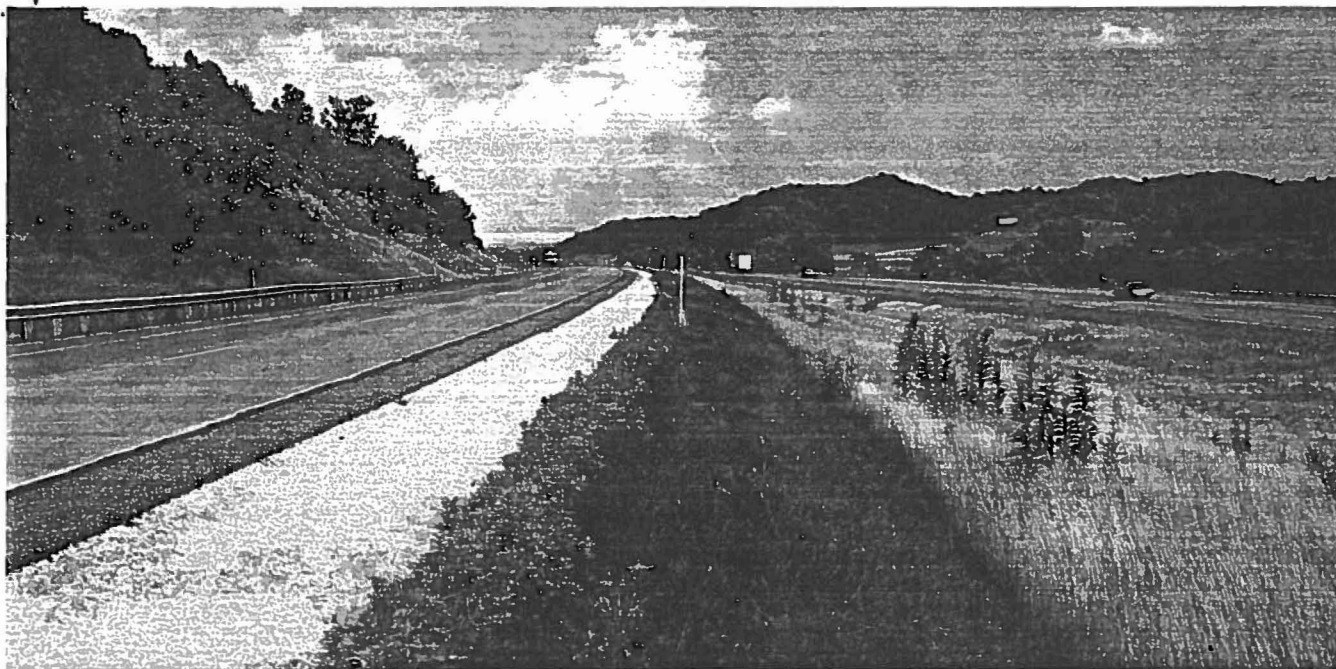
Please refer to attached article from Public Works Magazine, March 1990 for more information.

In 1983, the Department drastically reduced herbicide use in compliance with State ground water protection legislation and Federal hazardous material legislation.

The concept of "Natural Roadsides" is not new to Wisconsin. "Natural Roadsides" means roadsides that contain undisturbed or re-established native plant communities and land forms.

As early as 1975, the Department began implementing numerous pilot projects which reintroduced native vegetation back into roadsides. Fifteen counties have already benefited from these projects. Other Midwestern States such as Iowa, Minnesota and Illinois have joined Wisconsin in the search for answers to similar roadside vegetation challenges. Interestingly, each has returned to a native plant solution, looking to the past and discovering answers for the future.

The goal of Wisconsin's D.O.T. for the 1990's is preservation and re-establishment of "native vegetation" in support of highway needs. They feel that the benefits of pursuing this policy far exceed the labor, energy and environmental costs required to sustain a vegetation policy based largely on non-native plant species.



■ THE line between mowed and unmowed areas should be uninterrupted and flow smoothly to avoid visual distraction of motorists.

The What and Why of Natural Roadsides

JAMES RITZER

Mr. Ritzer is Roadsides Program Manager at the Wisconsin Department of Transportation, Division of Highways and Transportation Services, Madison, Wisconsin.

NATURAL roadsides are the result of preserving or restoring native vegetation — the plant life growing in an area at or before settlement time. For Wisconsin communities this includes a wide range of vegetation types subdivided under major headings such as forests, savanna, and prairie. Examples range from trees such as bur oak, sugar maple, and white pine, to grasses like big and little blue stem, Indian grass, and switch grass. Wisconsin natives also include wildflowers such as coneflower, prairie blazing star, compass plant, and in shady places, trillium and bloodroot.

Since limited mowing is associated with natural roadsides, some observers suggest that a "natural roadside" is an excuse for neglect. This may in part be due to the energy crisis of the 1970s when previously mowed areas were left unmowed to save fuel and maintenance funds. Truly "natural" roadsides do not just happen because mowing is curtailed. They are planned, and through prescribed management and culture continue to evolve over time.

Until recently, roadside vegetation management or maintenance in

many North Central States was generally patterned after turf or lawn maintenance programs. The principal activities were mowing for height control, and spraying or mowing to control broadleaf weeds and encroaching woody plants. Extensive roadside areas became turf grass monocultures sprinkled with invaders like quack grass. A program emphasizing controls can easily convey the negative image of roadsides as idle land.

Planning for Performance Under Adverse Conditions

Cool season lawn or turf grasses perform well in the home lawn and on golf courses where they usually receive sufficient water and nutrients. Over thousands of highway miles, however, soil types and growing conditions vary greatly. The several typically specified cool season lawn grasses do not necessarily adapt well to the range of conditions found along highways. In many areas the vegetation performs poorly so that under stress it may fail, and erosion occurs.

Native herbaceous vegetation, on the other hand, includes various grasses and broadleafed plants and tolerates a wide range of soil types and growing conditions. The limited mowing typical of natural roadsides allows for extensive root system development to resist erosion. The native vegetation's variety and adaptability provide a reserve to sustain the cover through adverse conditions.

Natural roadsides then, have the capacity to fulfill their intended highway function while providing a preserve of native flora and fauna for years to come. They offer the best known long term means to anchor soil and thereby prevent erosion. Their rich esthetic quality provides motorists with endless forms, textures, colors, and hues compounded by seasonal changes. They also possess an appropriateness earned by individual organisms evolving to fit their niche and interact with their surroundings. In addition to all these benefits associated with flora, they provide habitat for the wildlife we often take for granted.

Developing a satisfactory cover to hold soil in place and prevent erosion is a serious responsibility for land managers, who are accountable not only to contemporary masters, but to future generations. It is estimated that since settlement time, one-third of all the topsoil in the United States has been lost to erosion. This is significant and regrettable, but surely it is more important to concentrate on preserving the remaining two thirds than to fret over what is already lost.

Even though Aldo Leopold, a founder of the Wilderness Society and author of the environmental classic, *A Sand County Almanac*, made allowances for the mistakes of our ancestors, he would expect today's managers to profit from the lessons of history. In his essay, "The Round River" he wrote, "Our grandfathers did not,

could not know the origin of their prairie empire. They killed off the prairie fauna and they drove the flora to last refuge on railroad embankments and roadsides. To our engineers this flora is merely weeds and brush; they ply it with grader and mower. Through processes of plant succession predictable by any botanist, the prairie garden becomes a refuge for quack grass. After the garden is gone, the highway department employs landscapers to dot the quack with elms, and with artistic clumps of Scotch pine, Japanese barberry, and Spiraea. Conservation committees, en route to some important convention, whiz by and applaud this zeal for roadside beauty."

About 150,000 acres of the Wisconsin Trunk Highway System is devoted to roadsides. If only one percent of

maintenance responsibilities. To soften the impact of anticipated additional work, they recommended that selected areas be left unmowed. Subsequent policy changes replaced the control-based program that resulted in a mowed pure grass cover, with a program based on concern for the plant community and its performance.

Recognizing that a program requires more than reduced mowing, policies for natural roadsides began to evolve. It became evident that a natural roadside policy requires direction, including goals or objectives and the methods and means to achieve them. Three evident and important goals for roadside vegetation management are: 1) protection of the highway facility; 2) user safety; and 3) pleasing esthetics and ecological respect.

With concern and diligent application of our ever expanding knowledge, roadside vegetation can do an even better job of anchoring valuable topsoil. A roadside program dedicated to preserving the roadside resource should place as much or more importance on plant performance as on plant control. A program emphasizing controls presumes that there is something to control.

The management responsibilities of a natural roadsides program should include: sustaining and enhancing vegetation, repairing damage to the vegetation, and controlling vegetation.

Sustaining and Enhancing Vegetation. Matching vegetation to the site is an important cultural way to improve plant cover and restore native plant communities. Native vegetation is appropriate for most roadside areas, especially along rural highways. It is uniquely suited to sites within its range. Attempts to develop natural roadsides would be based on a native vegetation, an inventory of existing vegetation, soil information, site observations, specialists' recommendations, and a plan.

Changing the plant composition of vegetation immediately adjacent to the shoulder or curb may dramatically improve the cover and soil protection in these hostile areas. Mixes of low growing cool and warm season grasses and salt tolerant legumes performed quite well in tests. In these shoulder areas and in urban settings where regular mowings are permitted or required as an exception to a limited mowing policy, these plant mixes may be most appropriate. Although some of these plants may not be native to the area, they are cover that tolerates mowing and provides a transition from the highway to adjacent land uses.

For selected problem areas, changing the soil pH and adding nutrients may improve plant performance. In addition to modifying the plant community and improving growing conditions, mowing, selective weed control, burning, and even regrading will advance plant cover.

Repairing Damage to the Vegetation. On numerous roadside areas, vegetation has failed and erosion is a problem. Erosion may go unnoticed for years, compounding its effects with time. While erosion damages roadsides, off-site effects such as polluted waterways and inundated wetland are even more costly and lasting. Vigilance and timely repairs not only save money, but avert more serious damage and loss of topsoil. Again, attention to plant performance should drastically reduce erosion problems.



■ UNMOWED areas should appear to be left unmowed by design rather than by default. If limited mowing is performed with an appreciation for esthetics, the delineation between the mowed and unmowed sections can enhance the quality of natural roadsides.

that land were erodable, and if one inch of topsoil were lost from that one percent, it would be equivalent to the loss of over 200,000 cu yd of topsoil, a significant part of the precious remaining two thirds of this resource.

Managing Natural Growth

In the 1950s Wisconsin's highway planners and roadside specialists made a decision that was a significant turning point in the state's history and philosophy of roadside maintenance. As they envisioned the extensive roadside areas associated with the proposed interstate system, they became concerned by the prospective

Although often overlooked or taken for granted in roadside management programs, the principal way to protect the highway facility and provide user safety is the soil. It is carefully designed and placed around abutments and next to the pavement shoulder. Like modeling clay it is shaped and contoured to accept water and dissipate its energy. It is smoothed to carry errant vehicles safely and should be placed to provide pleasing transitions and facilitate plant growth.

Vegetation is relied upon as the best means to hold soil in place; it performs so well it is literally taken for granted.

Controlling Vegetation. In a natural roadside program, control measures must be governed by management requirements and geared to plant performance. The Integrated Pest Management (IPM) approach to vegetation maintenance is especially appropriate for natural roadsides. This approach, dating back to the 1920s, relies on naturally occurring checks and balances and cultural practices as well as mechanical and chemical controls. The great variety in natural roadside plant communities provides built-in controls that may effectively keep pests at "acceptable levels."

Roadside Design

Public response to natural roadside esthetics, especially negative response, is often directed at vegetation control practices. *Total control* usually applies to highway shoulders, judged inappropriate for vegetation. Shoulders, although part of the roadway, have a propensity for supporting plant growth. They should serve as a refuge where the motorist can slow down and stop if necessary and should look safe and stable with a smooth, uniform, unobstructed, vegetation-free surface. Grading, applying herbicides, or combining the two are the usual means of vegetation control.

Height control generally means mowing, but cultural methods and chemical growth regulators may also apply. Mowing is probably the most noticeable roadside vegetation management activity. Natural roadsides limit mowing, usually to the area adjacent to the shoulder and areas requiring height control for safety. A minimum cut height should be established at six inches or more. Since mowing weakens vegetation and actually reduces the root system of grasses and companion plants, increasing height of cut effectively improves cover and reduces erosion.

Although the cultural benefits of natural roadsides can be substantiated and the benefits of limited mowing and regenerating native vegetation outweigh those of a turf grass monoculture, the esthetics of natural roadsides are not universally accepted. Many motorists and roadside maintenance specialists still prefer the uniformly green, regularly mowed turf-like roadside. Personal taste and preference can change, however, especially if managers avoid practices that detract from natural roadside beauty. More motorists are recognizing the ecological benefit of natural roadside variety. They appreciate the multiple textures and colors and the typically uninter-

rupted transition from roadside to adjacent lands.

Perhaps the most significant visual element of limited mowing is the delineation line between mowed and unmowed areas, a possible distraction for motorists that may elicit complaints. Wherever the line crosses the motorist's field of vision, it is a strong visual element. Gently flowing curved lines that follow contours are restful and pleasing to the viewer, while jagged and interrupted lines are disturbing and unpleasant. Areas should appear to be left unmowed by design rather than by default. The mower operator should visualize unmowed areas as the positive rather than the negative part of the roadside scene. If limited mowing is performed with an appreciation for esthetics, the delineation between mowed and unmowed can enhance natural roadsides rather than detract from them.

Noxious weed control methods include mowing to reduce seed proliferation, cultural manipulation to favor more desirable native species, and chemical treatment to stop vegetative growth. Noxious weeds must be identified to focus control measures on the weeds rather than the entire roadside. Coupled with vegetation enhancement measures, selective weed control should see permanent native plants gradually replace noxious weeds. Wisconsin statutes consider the Canada thistle, leafy spurge, and field bindweed to be noxious weeds.

Woody plant control should reflect a basic understanding and respect for their physiology and culture. Woody plants cover large areas of Wisconsin and other mid-west states, adding important visual dimension to roadsides. Their extensive root systems bolster those of companion herbaceous plants and help prevent erosion. Their stems and leaves provide barriers that resist and diminish the harmful effects of wind on the land. Their sizes and shapes add variety to the landscape while providing shade, cover, food, and fiber for man and animals. Severe and improper pruning of woody plants leave them physically damaged and shocked. The visual effect of drastic control measures is akin to discord and lack of harmony. Woody plants deserve respect and control measures based on a considered management program and plan.

Many of Wisconsin's roadsides have benefited from reduced mowing and selective use of herbicides for noxious weed control. Policy changes evolving from decisions made in the late 1950s are manifesting in numerous and growing areas of naturally

regenerating native vegetation. Native grasses are proliferating from remnants left along roadsides at construction time or from adjacent lands. Native wildflowers are appearing in growing numbers. Sustained commitment, recognition, and growing respect for this resource are expected to ensure that the trend continues.

State Policy Evolves

With confidence in the commitment for natural roadsides and increasing evidence of the success of natural regeneration, Wisconsin is accelerating its restoration efforts. Under the direction of Ted Stephenson, P.E., state maintenance engineer for highways, the division is moving ahead with a broad based program. Until recently, carefully selected small areas were planted or seeded with native vegetation. In December 1987, however, the department contracted to seed and plant native trees, shrubs, grasses, and wildflowers along a 42-mile section of rural freeway in Wisconsin's central sands area. The project was designed by Professor John Harrington of the University of Wisconsin, assisted by Department of Landscape Architecture student's specializing in native vegetation restoration.

U.S. Highway 51 was selected because it was recently improved and because conventional seed mixes and some introduced plants do poorly in the sandy soils. The plan required planting 42 species of native woody plants in small to medium sizes. Native plants are sometimes in short supply in the nursery trade, so plant collection was permitted for selected species like bur oak and American hazelnut. Three different methods were used to seed over 11,000 lb of native and salt tolerant species. Seed was applied through a range land seeder to previously prepared seed beds and into existing cover with a no-till attachment. Seed was also applied in water by a conventional hydroseeder at selected sites. The contract allowed for or required planting and seeding during three seasons, spring and fall 1988 and spring 1989. This provided more time to acquire plants and seed (often in short supply) and broadened the range of seeding periods for performance evaluation.

This project is considered a demonstration area and formal evaluations will continue under Professor Harrington at least through 1994. The 1988 drought resulted in some plant loss and slowed development by at least a growing season. Remarkably, woody plant losses during 1988 were kept

below ten percent due primarily to faithful watering by the contractor, Tillman Landscape Nursery Inc., Green Bay, Wisconsin. More time is needed to evaluate seedling losses, but initial observations indicate that performance may have been set back rather than terminated.

A committee of specialists, public officials, interested groups, and private citizens are also sharing their knowledge and experience for the benefit of roadsides. A vegetation management plan will soon require an inventory of existing vegetation and will rely on input from the demonstration project and the committee. Since roadside vegetation is made up of complex evolving communities, the plan will be a dynamic vegetation management document.

Natural roadsides are appropriate not only because of cost savings and esthetics, but for the cultural benefits of mixed stands and because such programs stress plant cover perfor-

mance. They are more than neglected or unmowed turf, because they result from a plan built on sound and proven culture.

Natural roadsides, then, are stately trees. They are shrubs that provide habitat for birds, and foil the drifting snow. Natural roadsides will not look like a golf course or the home lawn because they are not expected to. They have color and texture, shades and hues. They have hidden rare gems. They have variety and a rich heritage of tall grasses that sway in the breeze and are warmly referred to as the "inland sea." This theme is eloquently stated in an excerpt of a presentation by nationally recognized landscape architect, Jens Jensen. Speaking to the Wausau Institute on July 13, 1940, he said, "I like to see our roadsides planted with such native plants as are indigenous to the region and in that way become a part of its environment. This is very important, and that is art."

"The roadside planting should be done in a way that views of the fields and farmsteads — of distant woods and hills should not be shut out. The fast disappearing prairie flowers must find a place along our highways, and our woodland flowers will be at home in the shady places. We hunger for color — look at the electric signs in our cities, the colony of small houses shooting up everywhere, a palette of gay colors — a new adventure in community life — typically American.

"You have a beautiful state gifted with all the charm and loveliness of nature. God has been good to you in giving you so much of his infinite beauty. You are its keepers, not its destroyers. Wisconsin speaks a noble language every day to you. Listen and learn. Follow that advice — it is sound. It is native. It is home. Enrich your roadsides, your parks, your schools, your home with this native beauty for yourself and for those that follow you." □□□

WASHINGTON

Spoke with Larry Rus, Senior Environmental Project Manager for D.O.T.

They are in the process of doing an E.I.S. now. They hired a consultant for this and started working approximately one year ago on it. The draft statement will be ready next spring and the final will be ready in approximately one year.

The reason they decided to do an E.I.S. was because of all the criticism they received from environmental groups due to the use of herbicides. They decided to make their programs available for public review and input.

They also have a State Environmental Policy Act with which they must comply.

They are already using biological methods of vegetation management including using native, low-growing plants along their roadways.

VERMONT

Spoke with Craig Lawson, Maintenance Engineer for Agency of Transportation.

Vermont, after much prodding from citizen groups, has taken one of the most progressive stances towards ROW maintenance. In 1986, the governor announced that their statewide policy would require both state agencies and private applicators to develop schedules that demonstrate movement toward less pesticide-dependence in ROW vegetation management.

They have a mowing policy and a wildflower planting program. They use very controlled amounts of herbicides on guardrails and airport lights, etc. They have nearly 3,000 miles of state roadways.

They have a full-time person that works in planting along ROWs. He is a landscape technician named Craig Dusablon who maintains a nursery and a greenhouse for flowers and trees. According to Mr. Dusablon, "Our goal as land stewards is to manage the roadsides in a manner that blends the role of functional vegetation management into the surrounding natural areas. Highway beautification itself is a by-product of this functional role."

Management tools such as site inventories, analysis of plant communities, habitats and successional predictions are used to get a clear understanding of the ecology and landscape dynamics, which aids in the development of planning strategies.

They have been able to cut back herbicide use 50% in past three years.

NEBRASKA

Spoke with Terry Cederstrom, Federal Environmental Protection Specialist.

Mr. Cederstrom envisions beautiful highways across the entire nation-all planted in native vegetation. He talked about former President Johnson's initiative from twenty years ago, the purpose of which was to get states involved in roadside beautification, especially with the use of wildflowers. A law was passed in 1987 to implement that initiative. The Federal Highway Administration has a manual out that instructs D.O.T.'s how to get involved in roadside beautification. Mr. Cederstrom indicated that all states should have looked into this already, and if our state hasn't yet, he encouraged us to do so as soon as possible. There is federal funding available for states to assist them in planting. Native vegetation is considered most desirable.

Mr. Cederstrom also stated that natives on rights-of-ways is cheaper to maintain than grasses such as bermuda.

MAINE

Spoke with Clyde Walton, Manager of Landscape and Environmental Mitigation for D.O.T.

Since the 1960's, Maine's D.O.T. has maintained a "No Spray" registry which identifies those residents of roadside properties who are exempt from the spray program. The department also furnishes the "No Spray" signs. In turn, those residents must appropriately manage their property.

The Department also provides public notification of imminent spraying in the media of a targeted locality and puts signs on the spray trucks with the name of the pesticide being used.

The state will be installing 500 signs stating, "Warning--Brush Control, Herbicide Used On This Route". These signs will be permanently installed where herbicides are routinely used. The cost to the state for the manufacture and installation is \$70,000.

They used to get 40-50 protest calls per day when they were using more herbicides. They have reduced their herbicide rates in last 10 years. They have gone from 1½ gallons per mile to 1/5 of a gallon (product formulation). They do selective spraying on tree species only, one time per year.

They have buffer zones for environmentally sensitive areas that have been identified.

If a home is less than 150 feet from the street, they do not spray.

They mow as much as they can to strengthen turf grasses and for erosion control.

They are also looking into sustainable ways to plant with crown vetch and other nitrogen-fixing legumes.

In 1984, a statewide group, the Maine Organic Farmers and Growers Assoc. began to keep a separate no-spray registry, making it available to all licensed applicators for reference when they are spraying ROW.

TEXAS

Spoke with Craig Steffens, Landscape Architect of Department of Transportation.

According to Mr. Steffens, they have one million acres of highway ROW's. (editorial remark--what else would Texas have! ha)

They've come along way in a short time--they have been implementing a program that was already in tact.

They have been working with nature instead of against it. Nature has a symbiotic plant community that works together and are basically maintenance free. They want to get away from monocultures.

They have a vegetation management plan that is very site specific and varies according to the location. When considering vegetation they always take advantage of what's already there, providing it is suitable.

They now use herbicides to take out invasive species, but their goal is to get back to native, environmentally sound, grass community. They are in the process of getting grasses established and then planting wild-flowers.

Mr. Steffens feels that using range-management techniques along roadways is a very wise approach.

IOWA

Spoke with Will Zitterich, Maintenance Services Engineer & Steve Holland, Integrated Roadside Management Co-ordinator

A law was passed two years ago, stating that the department shall mow weeds wherever possible and practical. The decision to mow or not to mow was not determined by whether it was economical or not.

From 1985 to the present time, they have reduced their herbicide use from 40,000 gallons to approximately 7,000 gallons. Herbicides are now used on perennial noxious weeds. They used to have approx. twenty court claims per year connected with herbicide use, now they have none to one.

Their mowing costs range from \$13 to \$22 per acre, their herbicide costs range from \$20 to \$30 per acre, but the mowing must be done more frequently, bearing in mind, the end result is totally different.

They have been planting native species for many years. One disadvantage is that some individuals feel that they need to be burned periodically in order to thrive, but there is some new evidence that this may not necessarily be so. One person indicated that burning them once every five years, if at all, might be totally adequate.

They have an Integrated Roadside Management Co-ordinator who feels that doing away with all chemicals all at once may not necessarily be the best way to go; phasing them out whenever and wherever possible, made more sense to him.

ILLINOIS

Spoke with Larry Stainton, Chief of Roadside Maintenance.

The State of Illinois has three road systems, State, County, and City. The D.O.T. maintains approximately 135,000 acres of roadsides.

In 1978, the Department of Transportation and the Department of Conservation started a cooperative seedling planting program which has been very successful in the beautification of state highway roadsides, in increasing wildlife habitat, and in contributing to a better environment. Since the inception of the program, this cooperative effort has resulted in the planting of more than one million seedlings along state highways throughout the State.

In 1980, the D.O.T. initiated a prairie restoration program and at the present time, approximately 2,400 acres of the roadsides are seeded with prairie grasses and wildflowers. The establishment of native plants, not only represents an attractive, low maintenance roadside planting alternative, but also is a pleasant visual reminder of the State's native grassland heritage.

Tied closely with the philosophy of prairie restoration is the D.O.T.'s "Operation Wildflower Program". The National Council of State Garden Clubs agreed to cooperate with the State Highway Department and the Federal Highway Administration in a program designed to promote the propagation and growth of wildflowers along their federal-aid highways.

The D.O.T. also plants wildflowers as part of highway landscaping projects to meet the program requirements of the Federal Surface Transportation and Uniform Relocation Assistance Act of 1987 (STURAA), which qualifies them for federal aid. At least one-quarter of one percent of funds expended for a landscaping project must be used to plant wildflowers, unless a waiver has been granted.

In 1976, the D.O.T. in cooperation with the Department of Conservation, initiated the current road management practices and reduced the mowing program on all interstate and primary highways under State jurisdiction. The purpose of the limited mowing is to conserve gasoline, prevent soil erosion, reduce maintenance costs, protect wildflower and tree seedlings along the highways and provide cover for nesting wildlife.

In addition, the Departments of Transportation and Conservation are members of a task force assisting the Illinois Natural History Survey in the research project "Corridors for Tomorrow: A Proposal to Use Highway Corridors to Restore Biodiversity in Illinois." Also included in the task force are representatives from the Department of Energy and Natural Resources, state universities, and other interested groups.

USING NATIVE VEGETATION FOR ROADSIDE PLANTINGS

LARRY STANTON, L.A.
Chief, Roadside Maintenance
and Emergency Services,
Illinois Department of Transportation,
Springfield, Illinois

WHEN circumstances dictated that Illinois scale-down its roadside mowing and seeding program, the state began to look for cost-effective vegetation alternatives to traditional grasses.

Roadside management policy along state maintained highways in Illinois during the 1950s and 1960s was to mow the entire right-of-way. The roadside was considered an extension of the motorist's front yard, and was maintained as such. A typical rural roadside during this era was mowed four to five times a year. In urban areas, six to ten mowings per year were common. Acres mowed exceeded 500,000 annually. Mowing costs surpassed \$5 million in 1968.

Reduced funds and manpower in 1969 gave birth to the Illinois Department of Transportation's (IDOT) first limited mowing policy. As part of this program, two-lane primary highways were generally mowed to ditch line in rural areas and to the right-of-way in urban areas and in front of residences. Interstate highways were mowed to the ditch line or followed selective or "architectural" mowing lines established by the district landscape architects. Mowing frequency was reduced to three mowings per year.

The success of this first reduced mowing program from 1969 to 1973 was somewhat limited, except on interstates where the architectural mowing concept was publicized and well received by the motorist. Annual acres mowed during this five-year period steadily decreased to 330,000 acres in 1973.

The 1974 nationwide energy crisis — along with additional maintenance budget cuts — created a need for further mowing reductions. As a result, the mowing guidelines along

interstates were reduced to an 8-ft swath beyond the shoulder break and on ramps at rural interchanges. Highway medians less than 80 ft wide were mowed. Urban areas were mowed according to each highway district office guidelines. Primary highways were generally mowed to the ditch line.

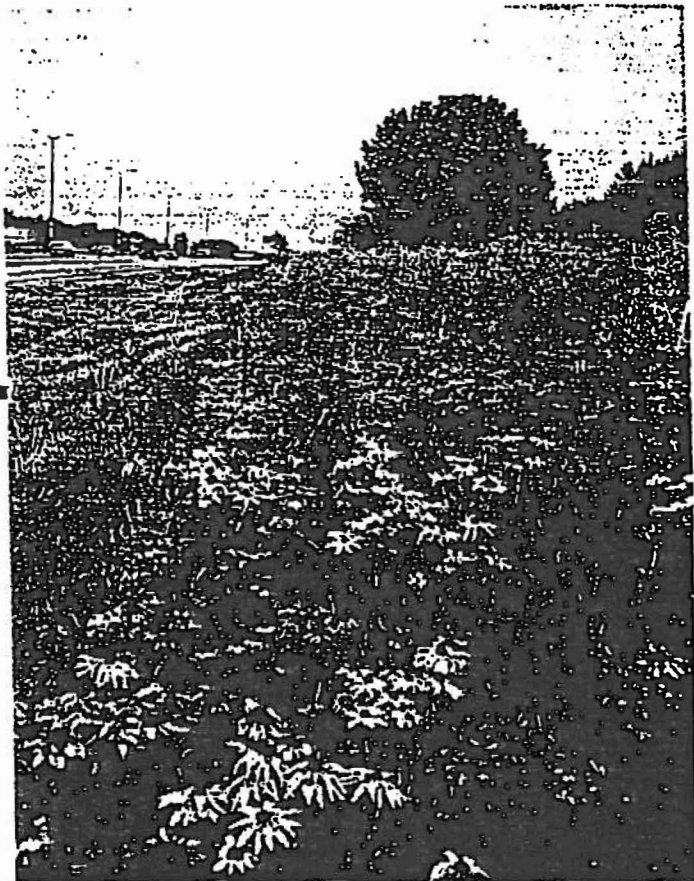
From 1974 through 1983, statewide mowed acres decreased to less than 200,000 mowed acres annually, but then began rising: 1984, 260,000 acres; 1985, 240,000 acres; and 1986, about 250,000 acres. An increase in undesirable weeds and woody vegetation along roadsides and public requests for more mowing were responsible.

The highway roadside environment, particularly in urban areas, has always been hostile to plant life. The soils along the roadsides are highly variable in structure, quality, and origin and usually contain a considerable admixture of rock and other types of debris. Often the soils are highly compacted, poorly drained, and saturated with road salt, motor oils, and fuels. The turf and other plants in a roadside environment are also exposed to salt spray, lead, and other airborne pollutants, drought, insect pests, and weed infestation. The combination of these environmental stresses and re-

duced maintenance often resulted in declining turf quality and unattractive roadside appearance.

Noting the declining turf grass quality, several district landscape architects started planting small areas of native prairie grasses in the 1970s. Initially, the prairie grasses were considered primarily decorative and a reminder of the "Prairie State" status that Illinois once held. However, since 1980, IDOT began looking at the state's native grasses and forbs (broad leaved flowering plants) for more utilitarian purposes such as broad application along highway roadsides.

In spring 1979, IDOT began reconstructing I-94, also known as Edens Expressway. Built in the 1950s as a parkway-type facility, I-94 runs parallel to Lake Michigan and stretches from Chicago north into the suburbs. The construction plans called for removing and replacing all pavement, using the adjacent roadside for all rebuilding functions, including stockpiling and processing of material from the recycled pavement. All this activity would destroy the existing roadside vegetation, making restoration difficult. Based on the recommendations of Charlie Gouveia, IDOT district landscape architect, and his staff, it was decided to use the I-94



■ NATIVE grasses and broad leaf flowering plants enhance the roadside vista of the Edens Expressway, a parkway-type facility.

and forbs could provide an economical and practical cover for problem roadside sites.

The first sites were seeded in July 1980 and completed in summer 1981. A total of eight acres was seeded in 1980 and 31 acres in 1981. Native grass seeds were placed with a special grass drill, manufactured by Truax Company, Minneapolis, Minnesota, at the rate of 21 lb of prairie grasses and 2 lb of forbs per acre. A cover crop of 25 lb of perennial rye, 50 lb of seed oats, and 1 lb of annual flowers was also planted to avoid soil erosion and a bare look the first year. The composition of forbs in the seed mix was variable according to seed availability at the time of planting. After seeding, the area was mulched with 2 tons of straw per acre.

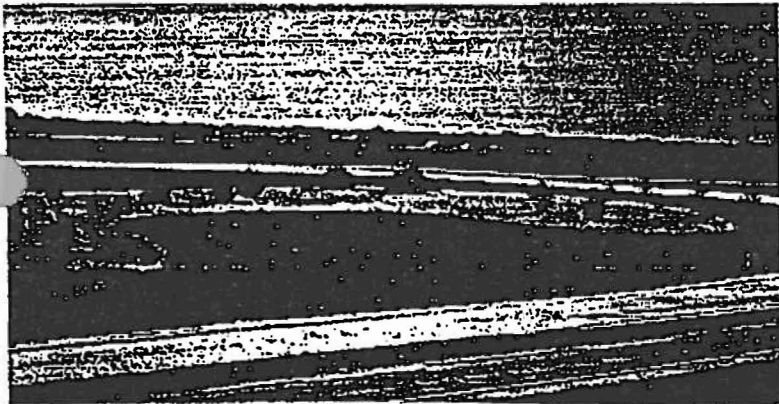
Promising Results

By the end of the 1981 growing season, the growth of the grasses and annual flowers were quite encouraging. During the last five growing seasons (1982-1986), the prairie grasses and forbs have become well established and now function as viable and attrac-

been quite successful, but not the forbs.

In the early 1980s, several prairie grass planting projects were completed throughout Illinois, including: I-474, Peoria Bypass; I-57, south of Mt. Vernon; I-57 rest area north of Kankakee; and portions of I-39 (U.S. 51), south of Rockford. In 1983, a Class IV Prairie Seeding Specification was added to IDOT's Standard Specifications for Highway Construction Book.

Another native grass being tested on Chicago expressways is buffalo grass. Known to thrive on dry, sandy soil, once established it spreads to form a low, tough turf that requires only occasional mowing due to its low natural height (6 in.) Buffalo grass can sustain extreme heat or cold and dry soils because its origins are in North Dakota. We hope to maintain an acceptable stand of turf on urban expressways with buffalo grass as the main ingredient. A mixture of buffalo grass and salt grasses was seeded in 1985 on about ten acres of I-90 (Kennedy Expressway) near the Chicago downtown loop area.



■ IN 1971, "architectural" mowing was used as a cost-cutting measure.

tive roadside plantings. The economics of using native grasses and forbs were also very good, based upon actual bid prices as compared to conventional highway seeding specifications used in the Chicago area.

Since the initial Edens Expressway project, prairie grasses have been planted along various routes in the Chicago metropolitan area, including the Kennedy Expressway, east of O'Hare Airport.

In 1981-1982, a 23-mile section of I-55 between Bloomington and Lincoln in central Illinois was overseeded with various prairie grasses and forbs. In this project, 300 acres of existing highway turf were overseeded from the edge of the outside highway shoulders to the right-of-way

During the past several years, we have been working on a specialized grass mixture for use on roadside areas of potential high salt concentrations. Thanks to the expertise and help from Northrup King Company, we were able to develop a salt-resistant grass blend for use on roadside areas within 25 ft from the edge of the pavement. Included in this seed mixture of Dawson red fescue and Scalds hard fescue, is *Fuhs puccinella distans* (fuhs alkali grass), a salt grass discovered growing along the Chicago expressways 15 years ago. This salt resistant grass mixture is also included in our Standard Specifications for Road Construction.

Complementing IDOT's various roadside native grass plantings are

cies. For several years, we have been working with the Illinois Department of Conservation in the planting of native prairie wildflowers along state roadsides (rest areas, etc.) During the past eight years IDOT has been working with the Garden Club of Illinois, Inc. on various "Operation Wildflower" roadside planting projects throughout the state. The Garden Club purchases the seeds or plants and IDOT plants the material at roadside locations chosen by both agencies.

To date, IDOT has been very satisfied with the results of the native vegetation planting projects. From a practical standpoint, native vegetation offers the following advantages:

- ◆ Genetically adapted to local climate and soil conditions.
- ◆ Tolerates adverse road conditions (poor drainage, soil compaction, pollution).
- ◆ Grows and responds to almost no post-planting care.
- ◆ Highly competitive in exposed areas to weed invasion.
- ◆ Unmowed mature grass is esthetically pleasing.
- ◆ Cost competitive with cool season grass mixtures.

On the other side of the coin there are some inherent problems and things to keep in mind when using native vegetation:

- ◆ Availability of seed in sufficient quantity for each project.
- ◆ Flexibility of varying forb (flower) species in seeding mixtures.
- ◆ Determining correct quantities of native grasses required per acre.
- ◆ Evaluating different seeding dates for forbs and grasses.
- ◆ When overseeding existing turf, determine most effective method of establishing forbs.

- ◆ Determine effective long-term management of native grasses/forbs.

IDOT's goal in its roadside native vegetation program is not to convert every single roadside acre to native vegetation. However, there are vast areas along Illinois roadsides, such as wide rights-of-way, interchange areas, steep cuts, and fills, etc., in which native vegetation can be planted. We believe the establishment of native grasses interspersed with prairie flowers along Illinois roadsides is not only suitable to the extreme conditions adjacent to the state's highways, but also a pleasant visual reminder of the state's grassland heritage. □□□

The preceding article is based on a presentation made at the 3rd Annual National Roadside Vegetation Management Association Conference, October 15 to 17, St. Louis, Missouri.

Background Information

The cooperative seedling planting program, started in 1978 by the Illinois Department of Transportation and the Illinois Department of Conservation, has been very successful in increasing wildlife habitat and the beautification of state highway roadsides. The purpose of this ongoing cooperative roadside planting program is as follows:

- Increase the scenic amenities along highway corridors on projects where landscaping funds are not available.
- Extending the amount of cover and edge available to wildlife.
- Prevent and/or diminish soil erosion.
- Improve the potential of future fiber reserves.
- Protect specific areas along highways from drifting snow.
- Reduce headlight glare in areas where this particular hazard is a problem.
- General educational benefits.

The Department of Conservation grows and supplies the seedlings while the Department of Transportation plants the seedlings along selected highway roadside locations. Since the inception of the program, this successful cooperative effort has resulted in the planting of more than one million seedlings along state highways throughout the state.

Other IDOT Roadside Planting Programs

• Prairie Planting Along State Highways

The Department of Transportation, one of the largest landholder of public lands in the state, has recognized the potential of the rights-of-way as sites to re-create the native Illinois prairie environment. During the past eight years, the Department has planted prairie grasses and wildflowers (forbs) during roadway construction on various sections of Illinois highways. An added benefit of prairie plants is their contribution to a reduction in maintenance costs because they require no mowing. Prairie plantings are ideal for erosion control because of their deep rooting systems. This, in turn, helps to keep roadside ditches and adjacent streams free from silt that could find its way into these water courses.

Some of the more noticeable prairie projects are along:

- Interstate 474 (Peoria Bypass)
- Interstate 94 (Edens Expressway, Chicago)
- Interstate 55 (Bloomington to Lincoln)
- Interstate 255 (East St. Louis Area)

The prairie grass plantings are specified along roadside areas (wide right-of-way, backslopes, interchanges, etc.) that are included in the limited mowing program. The use of herbicides is restricted from areas planted with prairie grasses and forbs.

At present, approximately 2,400 acres of the roadsides are seeded with prairie grasses and wildflowers. The establishment of native plants not only represents an attractive, low maintenance roadside planting alternative, but also a pleasant visual reminder of our state's native grassland heritage.

• "Operation Wildflower" Program

As a component of the natural landscape, wildflowers add visual character to a highway right-of-way to instill visual experience similar to undisturbed areas.

Tied closely with the philosophy of prairie restoration is the Department's "Operation Wildflower Program." The National Council of State Garden Clubs, Inc., agreed to cooperate with the state highway departments and the Federal Highway Administration in a program designed to promote the propagation and growth of wildflowers along our federal-aid highways. The Council, which has 14,500 clubs and approximately 375,000 members, operates in all 50 states and the District of Columbia.

Under this program, a State Federation of Garden Clubs or a member club of State Federation may wish to purchase or supply wildflower seeds, bulbs, and/or other propagative material for a cooperating state highway department. The state highway department then plants selected parts of their right-of-way on the federal-aid systems.

The cost of the seeding or planting process is borne by the Garden Clubs. The wildflowers planted are selected based upon their appropriateness to the area, if they are indigenous, or readily adapted to the climate and the environment. In Illinois, the Department of Transportation consults with area Garden Clubs on the selection of species planted. Seeding and planting of the wildflowers are confined to areas where normal mowing operations do not interfere with the plantings.

During the past ten years, the Department of Transportation has worked with the Garden Clubs of Illinois, Inc., in planting wildflowers along selected roadsides throughout Illinois. Each year, wildflower seeds costing approximately \$1,000 are purchased by the Garden Club for planting along Illinois highways. The planting is accomplished by highway personnel.

• Federal Wildflower Planting Program

The Department of Transportation also plants wildflowers as part of highway landscaping projects. Section 130 of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (STURAA) was amended to require that native wildflower seeds or seedlings or both be planted as part of any landscaping project undertaken on the federal-aid highway system. At least one-quarter of one percent of funds expended for a landscaping project must be used to plant wildflowers. This provision requires every landscaping project to include planting of native wildflowers unless a waiver has been granted.

Unlike the Operation Wildflower Program, the program requirements of the STURAA are mandatory. Subsequent to the STURAA of 1987, the Department has spent more than \$177,000 planting wildflowers along state highways. The Department has expanded this requirement to include the planting of wildflowers on state routes, as well as on the federal-aid system.

• IDOT - IDOC Prairie Forb (flowers) Planting Program

During the past few years, IDOC has made available to IDOT a quantity of prairie forbs that are grown at the two (2) state tree nurseries. The amount available to IDOT is dependent upon the yearly IDOC production of this material. The forbs are distributed, upon request by interested districts, for planting along roadsides and interstate rest areas.

During the spring of 1990, the following quantities were planted:

District 2 (Dixon)	5,525
District 3 (Ottawa)	3,500
District 4 (Peoria)	<u>9,050</u>
	18,075

- IDOT - IDOC Roadside Mowing Program

In 1976, the Illinois Department of Transportation, in cooperation with the Department of Conservation, initiated the current road management practice and reduced the mowing program on all interstate and primary highways under state jurisdiction. The purpose of the limited mowing is to conserve gasoline, prevent soil erosion, reduce maintenance costs, protect wildflowers and tree seedlings along the highways, and provide cover for nesting wildlife. An essential part of this program is to not mow backslopes and interchanges unless infested with undesirable weeds, as this is an area which provides excellent cover for birds and wildlife. Under this program, primary highways in rural areas are mowed to the ditch line twice each year and a supplemental mowing for sight distance is made during midsummer. Primary highways in front of residences, businesses, parks, and cemeteries are mowed to the right-of-way line three times a year. Interstate highways are mowed one swath (15') beyond the shoulder break two or three times each year depending upon growth. Highway medians 80 feet or less in width are mowed during each mowing cycle. Additional mowing is performed at interchanges for proper and safe sight distances. Areas with weed infestation are also mowed during each mowing cycle.

- "Corridors for Tomorrow" Planting Program

The Departments of Transportation and Conservation are members of a task force assisting the Illinois Natural History Survey in the research project "Corridors for Tomorrow: A Proposal to Use Highway Corridors to Restore Biodiversity in Illinois." Also included in the task force are representatives from the Department of Energy and Natural Resources, state universities, and other interested groups.

The principal objective of this project is to develop, demonstrate, and implement an effective strategy for revegetating Illinois' highway corridors using native plant species to 1) improve landscape vigor and appearance, 2) augment the habitat in existing preserves, parks, and natural areas, and 3) enhance the quality of our environment by capturing and storing carbon dioxide, filtering and diluting air pollutants, and reducing noise and glare. A secondary benefit of this work will be to strengthen existing and forge new cooperative, proactive linkages between and among public and private agencies.

Plan for Doubling the Cooperative Seedling Planting Program
(HR 1548)

IDOT and IDOC have planned a two-step, two-year process (springs 1991 and 1992) to double the plantings of seedlings pursuant to House Resolution 1548. This would allow for a reasonable, sustained commitment of IDOT resources (personnel and equipment) to the program and would also assist IDOC in their efforts to provide sufficient quantities of seedlings to the public and private sectors during the next two planting seasons. In 1990, IDOC state tree nurseries (Mason Nursery and Union County Nursery) produced and sold 4 million seedlings. Their production goal in 1991 is 5 million seedlings; for 1992 is 8 million seedlings. The Mason Nursery is being expanded to handle the increase in seedling production.

A breakdown, by highway district offices, of the two-step, two-year program is as follows:

	<u>Past Planting Program</u>			<u>3 Year Average</u>	<u>Proposed Seedling Planting Program</u>	
	1988	1989	1990		1991	1992
District 1 (Schaumburg)	2,000	900	4,250	2,385	10,000	15,000
District 2 (Dixon)	52,450	50,400	117,000	73,285	80,000	90,000
District 3 (Ottawa)	2,450	2,250	10,250	4,985	15,000	25,000
District 4 (Peoria)	5,000	13,050	11,000	9,685	15,000	25,000
District 5 (Paris)	0	0	0	0	10,000	15,000
District 6 (Springfield)	30,515	19,000	28,000	25,840	25,000	30,000
District 7 (Effingham)	0	0	0	0	10,000	15,000
District 8 (Collinsville)	0	12,700	0	4,235	10,000	15,000
District 9 (Carbondale)	<u>2,000</u>	<u>2,000</u>	<u>650</u>	<u>1,550</u>	<u>10,000</u>	<u>15,000</u>
	94,415	100,300	171,150	122,000	185,000	245,000

The above highway seedling planting program will have a very positive effect in increasing wildlife habitat, beautifying the state highway roadsides and contributing to a better environment.

ARKANSAS

Spoke with Bill Richardson, Assistant Division Head of D.O.T.

&

They started using herbicides ten years ago. Prior to that, there was an abundance of wildflowers along the rights-of ways. They are now interested in nurturing the wildflowers to get them to return. There will be no herbicides used in those areas. Also, they are interested in nurturing low-growing native plants, but haven't figured out how to keep other undesirable vegetation out.

They are looking to improve their maintenance program overall. One of the challenges they face is dealing with ^{the} public--one faction wants the roadsides to look like lawns and another wants a more natural look.

Also spoke with Wendy Welch, with the Environmental Division of D.O.T. (this division reviews and recommends)

Their state highway system consists of 100,00 acres not including the interchanges.

There is a research committee in the process of reviewing their roadside maintenance policy right now. Members are not involved with roadside maintenance.

Arkansas has a scenic enhancement policy. Natural vegetation and forestation are an important part of it.

Their bermuda grass when stressed by chemical application can die in the winter--there is concern about that. Also concerns about the use of Oust (a Pre-emergent)--nothing is left after using it. There are people in their department that are very pro-herbicide.

Aesthetic and health concerns are often expressed by the public, regarding the use of herbicides. Ms. Welch feels they have a right to be concerned. ^{the pre-emergent is} They are still working towards being responsible and trying to make changes to please the public.

They also have an environmentally-minded governor.

ARKANSAS (cont.)

They have 400 miles of ROW. Ms. Welch looks at the D.O.T. as stewards of roadside property. She feels that it is important to understand the ecology of roadsides.

"A good population of grasses and forbs is ideal. "Diversity is the name of the game--nature does the best with this", according to Ms. Welch.

Mowing is a good tool when you can call the shots--timing is very important.

Ms. Welch is frustrated with not being able to always follow up on planting projects--they are sometimes 300 miles away from her office.

FLORIDA

Spoke with Frank Day in the maintenance dept. of D.O.T.

They are in the process of exploring alternatives to herbicides and are interested in doing away with broadcast herbicide spraying. They have increased their mowing and are experimenting with propagating low-growing grasses such as bermuda. They are interested in promoting the use of wildflowers, also. Basically they do a lot of mowing and weed whacking and limited herbicide use. They are very interested in roadside beautification.

They also have an Adopt-A-Highway program for litter and many civic and non-profit organizations are involved in this program, as well as businesses such as McDonald's, etc.

They are interested in improving their roadside maintenance procedures to create aesthetically appealing corridors that are safe in all ways.



DEPARTMENT OF PUBLIC WORKS

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Gary A. Rowe, P.E., Director
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MR. Wells

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December 5, 1991

Ms. Carol Burgess
Hawaii Health Dept.
P.O. Box 517
Hawi, HI 96719

SUBJECT: Road Side Vegetation Control

Most herbicide is only sprayed from road edge to back of ditch along roads. This area takes in from 2 to 8 feet, seldom going much further. If brush grows outside of this area it has to be cut back anyway. This means that we'd have to have brush cutters even if we used roadside herbicides. Our cost of mowing shoulders is about all the cost we have. The biggest concern about spraying was roadside edge. We do have some change to roadside edge, but I do not think it's greater than anyone else's. When we reconstruct a road, pre-level or overlay an area, we take special care in making sure that compaction is beyond the edge of the blacktop and that the blacktop depth is as great at the edge as it is in the drive and middle lanes. You should have a 2 foot or more shoulder, if possible, beyond edge of blacktop.

In the heat of summer there is a slightly increased chance for fire damage along highways without herbicide. However, as more grass appears and fewer weeds, this danger becomes almost extinct. We do not seem to have a problem.

Jefferson County has not sprayed anything on it's roadsides for over 13 years. Much grass, salal, huckleberry, ivies, oregon grape, etc. We try to plant or encourage anything that is low growing to grow along the back of ditch and backslopes; some areas even to road edge. Definitely to get grass to grow to road edge.

Whenever we rebuild or make new roads we try to build them with less or very little ditch. Also, to not make the backslopes too steep. This allows mowers, both rotary and flails, to fit the contour of the road. This also allows these machines to operate along the road in the same spot where a ditch normally prevents this, getting more shoulder miles per day.

When growth gets above the shoulders of the road to the point it contains the water so it will not get away, we scrape that area clean to just below road depth. We try to plant a fescue or low growing grass to establish something to keep out the weeds. This is done with a Grade-All attachment on a road grader. This blade is at the rear of the grader and allows it to get into a ditch if needed. If you want the graded section over on the edge of the road you need to follow this grader with another one or the lead grader must back up and make one more pass. Behind this is a belt loader which picks it up off the ground and dumps it into a truck following it. Behind all of this is the broom. When they get to the end of the road they are finished. Most roads that dead end are done inside out. We only spot ditch each road that has been marked ahead of time, probably during a wet or stormy period.

Jefferson county owns two Ford 6610 Tractors with Tiger 14' boom rotaries. These two tractors drop their booms and mount two 65" flail grass cutters through the busy growing period in spring and early summer. We also own one Massey Ferguson diesel grass mower flail, which only operates in the summer. We have one ladder truck which tows a Brush Bandit chipper. This does our high limbing and street lights.

Up until last year when the spotted owl cut our budget, we hired a supervisor and three youths in high school or attending college from low income families, and two other local youths attending school. This crew cleared and weed ate around intersections, guardrails and stop signs. Cut alders and undesirable trees or danger trees from slopes and areas where sight distance was a problem. Our Brush Bandit Chipper was approved by State Labor and Industries for these kids to operate, as it is safer than a weed eater. We did not have the money in 1991 and 1992 to continue this program. Currently, our flaggers, with the rotary mower and operator, weed eat around stop signs, guardrails and sight distance problems as they go through.

We have also started a program similar to the states "Adopt a Highway" program. Various organizations agree to pick up litter along certain stretches of roads. We, in turn, agree to install a sign with their organization name and area they are responsible for. We also furnish two signs warning motorists of their activity. We have vests available if they wish to check them out. A few organizations have experimented with wild flowers on slopes. We try to identify this with a sign for their effort.

We take care of approximately 450 miles. Jefferson County runs from Port Townsend to the Pacific Ocean. Most of our area is in the Eastern part of the county with 50 miles on the ocean and a national park in the middle. We do nothing to the national park or wildlife area. Our roads get much truck traffic with log trucks, chip trucks, lumber trucks, dump trucks, cement trucks and other heavy equipment.

We are averaging a cost of approximately \$30 per shoulder mile for grass or roadside edge mowing. Approximately 1500 to 2000 shoulder miles each year. This cost would be almost eliminated with herbicide.

Our brush cutters do about 320 to 400 shoulder miles a year at a cost of approximately \$390 per shoulder mile. Maybe \$25,000 of this could be saved if we sprayed. Mechanical ditch cleaning has been slowly cut back to about \$50,000 a year. Approximately \$20,000 of this is due to not using herbicide. We spend approximately \$95,000 to \$100,000 a year extra by not using herbicide. However, my guess is we would have to spend from \$50,000 to \$65,000 to spray. The added cost is about \$30,000 to \$40,000 more using our methods. We enjoy no hassle from failed crops, lawns, gardens, parked vehicles, etc. However, we do get one or two windshields (rocks thrown from mower) a year and a few equipment breakdowns. We do not have any equipment now for spraying, add the cost of getting started and what we would save. I doubt if its worth it.

We have found that it works best if our vegetation control equipment is only operated by one operator for each machine. He who demonstrates skill, attitude and mechanical ability has the job. A new machine has bullet proof glass, a screen and reinforced cradle so nothing can reach the operator. The machine has AM/FM radio, tape deck, air conditioning and all hydraulics are so nothing can get to the operator.

We continue to look for new and safer methods. We will soon be having a demonstration on a weed burner that goes along the edge of the pavement and burns the grass. The idea is to slow it's growth or kill it. Boulton Pest Control Inc., 343 Adamson Dr., Penticton B.C. V2A7R7, Res. phone (604) 493-3932, answering svc. (604) 492-0296. Another company has designed a head for their large rotary tractors that travels at 750 R.P.M. All debris falls straight down, there is no danger to operator or passers by. They haven't yet scaled it down to the smaller machines such as ours. They claim they eventually will. I believe that at present they are enjoying the patent on certain equipment. This company is D&M Machinery Div., Hoquim WA 98550, (206) 533-0826. These people contract brush cutting.

* The ideal situation is to be able to inventory every road and slowly quit spraying as certain areas maintain low growth and become manageable at a cost near spraying. In some areas there is no reason to not spray. Chances are you already have areas that shouldn't be or you are not spraying now. Find out what works the best, what grows the best and start heading that direction. We, for instance, could get good use out of our own hydro-seeder. Maybe your own nursery to help speed up the growing of desired plants.

I recently received a draft on Caltrans's Vegetation Control Program for the California Dept. of Transportation, Jones and Stokes

Associates Inc., Sacramento, California. This draft only gives you alternate methods and their findings. Most of it is generic. However, it is a good source of information and someone to call.

I will send some extra slides I have and pictures. I do know that several other counties in the states of Oregon and Washington are getting away from herbicides along roads. I belong to the Washington Public Pesticide Operators Association and many operators are having to cut back and some are being eliminated.

Hope this helps and feel free to call me.

Sincerely,



Earl Wells,
Maintenance & Operations Manager
Jefferson County Public Works
P.O. Box 1200
Port Hadlock, WA 98339

XC

ALTERNATIVES TO HERBICIDES IN THE TREATMENT OF:

Guard rails, power poles and reflectors:

1. Weed whack 3 to 4 times per year and see if any low-growing ground covers volunteer.
2. Plant area with low-growing native vegetation.
3. Lay thick cardboard down first and then mulch with wood chips available from the county or state tree trimming procedures.
4. When repaving roads or making new ones, run blacktop ^{and} guardrai

Ditches and culverts:

1. Leave vegetation alone unless it becomes a problem.
2. Weed whack 3 to 4 times per year and see if low-growing ground covers will volunteer.
3. Experiment with non-toxic products such as vinegar or Safer's products for plant control.

Any area where vegetation obstructs vision:

1. Remove problematic vegetation with side-arms, mulchers, weed whackers, etc.

Bottom Line-- "Don't fix somethin' that don't need fixin'.

OR

Leave areas alone that don't present a problem.

JEFFERSON COUNTY, WASHINGTON

Spoke with Earl Wells, Operations Manager, Public Works

Jefferson County has developed a roadside vegetation management program based primarily on plant competition. The county identified competitive native or naturalized cover species, such as grasses and salal and designed a program to encourage growth and spread of these species while meeting control needs.

They haven't used herbicides in ^{over 13} ~~12~~ years--there is a moratorium on their use. It took four years to see that they could live without them. They did not use a professional consultant. Mr. Wells has been with the department for five years. He's responsible for re-designing the roads which makes it much easier to maintain them. Now when building new roads they are done with gentle slopes and made to fit the machinery used to maintain them.

Salal bushes are their salvation--they keep them down to 12 inches. Mr. Wells feels that if the county would have started encouraging the growth of salal years ago, the roadsides would be magnificent now.

The State has come out with a new grass--it doesn't get more than 6 inches high. They are planting it along the freeways.

Natural roadsides can cost more than roads maintained with herbicides but that doesn't always have to be; and furthermore the end result of "the herbicided look" versus the green natural look leaves little doubt as to which approach is aesthetically more pleasing.

The department is looking into a propane burner from Canada for stunting growth along pavement. It must be done during a certain time of the year, every 3 to 4 months.

Mr. Wells feels that it is better to phase herbicides out rather than to stop them all at once.

He said the phone calls start coming in to the office when the water trucks go out; people mistake them for herbicide trucks and become very upset. Mr. Wells stated emphatically that they will never go back to using herbicides.

People really appreciate being able to pick berries along the roads, and do

The department is cutting down on rotary mower use as vegetation fills in. Rotary mowers can be dangerous. They are interested in the new mowers that drive debris into the ground instead of out; no flagmen are needed when these are used.

There must be enough of the right equipment to do the roads properly. The roads look 10 times better than when they're sprayed.