

Heritage Conservation  
and Recreation Service

July/August 1980  
Volume 24/Number 4

## Occupational Hazards and Industrial Hygiene

by Connie Villar

Employees report becoming sick and nauseated while on the job. Other workers develop sores on their hands. Still others complain of burning eyes and throat.

Hazardous occupational exposures occurring in general industry you say. Not anymore. These incidents and more like them occur throughout our parks with increasing frequency.

Parks of today are complex operations and have become like miniature industrial factories and plants. Because of our nature-oriented work environment, there is a tendency to think that exposures to agents such as carbon monoxide, benzene, and asbestos, to name a few, remain strictly confined to industrial sites. However, employees in park and recreation areas increasingly are subjected to the same occupational hazards and diseases as their counterparts in industry.

These incidents indicate the need to generate a knowledgeable awareness of the occupational hazards in our work environment and to take aggressive actions toward abating those hazards. This awareness should be fostered at all employment levels. Workers not only need to know how to do the job, they also need to know the potential hazards associated with it.

Industrial occupational hazards generally can be associated with particular productions or jobs. For example, a cotton mill can be expected to have cotton dust problems which upon chronic exposure can produce a lung condition known as byssinosis. Welders are subject to various injurious gases and metal fumes. Control of these hazards in industry is facilitated because of their limited scope and more manageable work environment.



*The personal sampling device being secured to employee will monitor samples and measure exposure to various industrial vapors.*

Bill Davis, NPS

This control problem is magnified in the parks because we have such diverse work environments (i.e., outdoors, indoors, temperature extremes, and regional differences) and types of jobs (i.e., chemists, carpenters, landscapers, mechanics, conservators, printers, etc.). It is no wonder that occupational exposures in our parks can run the entire gamut of hazards.

### Chemical Stress

The greatest potential for occupational exposure comes from the use of chemicals. It is not only in a laboratory that employees are exposed to chemicals. Almost every job involves some contact with them. Mechanics use oils, degreasers, and gasoline; plumbers and carpenters work with adhesives, caulking compound, and acids; landscapers handle fertilizers and pesticides. Even office workers can be ex-

posed to chemical stress. The use of chemicals in our maintenance and special production shops is common practice.

A large percentage of these chemicals falls into the organic solvent class. These are used as cleaning agents, drying agents, paint thinners, chemical reagents in the laboratories, and in pesticides and wood preservatives.

### Solvents

A few of the more commonly used solvents are benzene, toluene, trichloroethylene, turpentine, and naphtha. These agents can pose a potentially high health hazard if they are used incorrectly or without the proper controls and protections.

The best control method is to assure sufficient ventilation to dilute or carry away the solvent vapors before they

(continued on p. 29)

# Safety and . . .

## GRIST

**A publication of the Park Practice Program** The Park Practice Program is a cooperative effort of the Heritage Conservation and Recreation Service and the National Recreation and Park Association.

Chris Therral Delaporte, Director  
Heritage Conservation and Recreation Service

John H. Davis, Executive Director  
National Recreation and Park Association

### Editorial Staff

Heritage Conservation and Recreation Service  
Division of Park and Recreation Technical Services  
U.S. Department of the Interior

James A. Burnett, Editor, *Design and Grist*

Kathleen A. Pleasant, Editor, *Trends*

### Contractors to the Program

Maureen Palmado, Consulting Editor, *Trends, Grist and Design*

Graphichouse Ltd., Design Consultant

District Lithography Company, Inc., Printer

The Park Practice includes: *Trends*, a quarterly publication on topics of general interest in park and recreation management and programming; *Grist*, a bi-monthly publication on practical solutions to everyday problems in park and recreation operations; and *Design*, a quarterly compendium of plans for park and recreation structures which demonstrate quality design and intelligent use of materials.

Membership in the Park Practice Program includes a subscription to all three publications and selected back issues in vinyl binders with indices and all publications for the calendar year.

The initial membership is \$80; annual renewal is \$20. A separate subscription to *Grist* is \$15 initially, and \$7.50 on renewal. Subscription applications and fees, and membership inquiries should be sent *only* to: National Recreation and Park Association, 1601 N. Kent Street, Arlington, Va. 22209.

The information presented in any of the publications of the Park Practice Program does not reflect an endorsement by the agencies sponsoring the program or the editors.

Articles, suggestions, ideas and comments are invited and should be sent to the Park Practice Program, U.S. Department of the Interior, Heritage Conservation and Recreation Service, Division of Park and Recreation Technical Services, Washington, D.C. 20243.

### FOR SAFETY'S SAKE

All ideas and suggestions shared in the pages of *GRIST* are presented as guidelines, not final working blueprints. Be sure to check any device or plan you want to adapt for compliance with national, state and local safety codes.



## Emergency First Aid for Poison Victims



The National Naval Medical Center in Bethesda (MD) offers the following emergency first aid tips for treating victims of poisoning:

1. Small children most often are the victims of accidental poisoning. If a child has swallowed or is suspected of having swallowed any substance that might be poisonous, assume the worst and *take action*.
2. Call your local Poison Control Center. If there are none located nearby, call your emergency medical rescue squad. Bring the suspected item and container with you if you take the victim to a hospital.
3. If the victim is unconscious, make sure he or she is breathing. If not, tilt

## Morning Weather Broadcasts from Base Station Increase Visitor Safety

Because Byron B. Brown, park technician at Buffalo National River (AR), pointed out that field personnel would benefit greatly from a regular morning weather broadcast from the base station, they now receive it each morning at 9:00 A.M.

Knowledge of upcoming weather helps the field personnel plan their day better and gives them valuable information for making decisions regarding visitor safety. Where used, such broadcasts have reduced accidents, particularly on rivers,

the head back and perform mouth-to-mouth breathing. Do not give anything by mouth. Do not attempt to stimulate the person. *Call the emergency rescue squad immediately.*

4. If the victim is vomiting, *roll him onto the left side* so he will not choke on what is brought up.

A drug overdose is a poisoning. Alcohol is as much a poison as stimulants, tranquilizers, narcotics, hallucinogens, or inhalants. Don't take drunkenness lightly. Too much alcohol can kill.

1. Call for emergency help at once.
2. Check the victim's breathing and pulse. If breathing has stopped or is very weak, give rescue breathing. Caution: reviving victims of alcohol poisoning can be violent; they can harm themselves and others. So be careful.
3. While waiting for help: watch breathing; cover the person with a blanket for warmth; *do not* throw water on the victim's face; *do not give liquor* or a stimulant.

Remember: alcohol in combination with certain other drugs can be deadly!



lakes, mountains, and in wilderness areas.

In addition, visitors frequently request weather information from field personnel; it is most useful to have up-to-date forecasts for them.

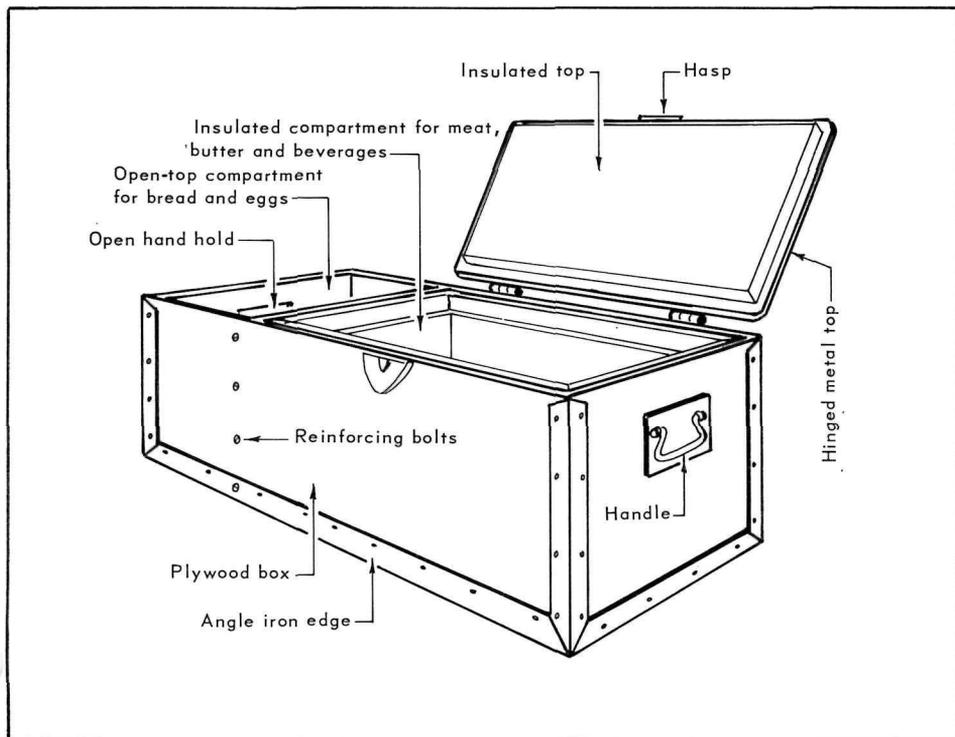
# Ingenuity

## Improved Food Box for Pack Animals

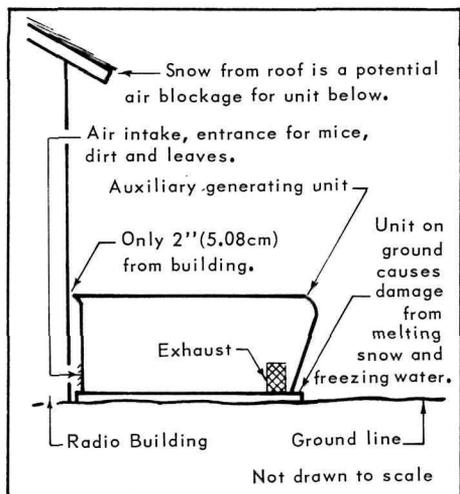
Guides and other park personnel who use pack animals often find that standard size packing coolers are too short to fit easily and comfortably onto the creatures' backs. Difficulties increase when odd weight pairs of loads are involved. Consequently, much trip time is spent in stopping to readjust slipping loads.

Stuart Sorenson, an animal packer at Glacier National Park (MT) shares a practical solution to this problem. Sorenson has designed a longer container with an insulated main compartment and a separate end section for bread and eggs.

The added length proves much easier to balance and can be adjusted easier when loads are unequal in weight. This design also protects the eggs and butter from getting crushed and leaves more room for perishables in the main part of the cooler.

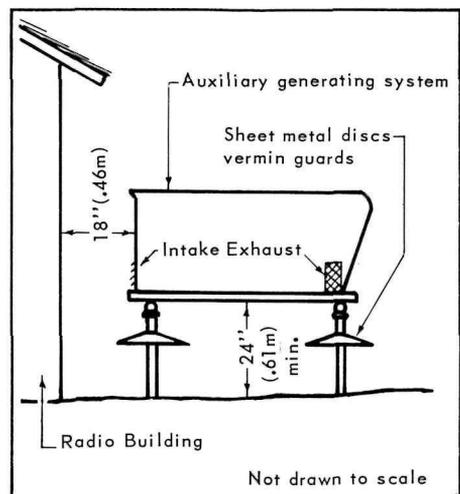


## Modifications Protect Auxiliary Generating System



SIDE VIEW(before)

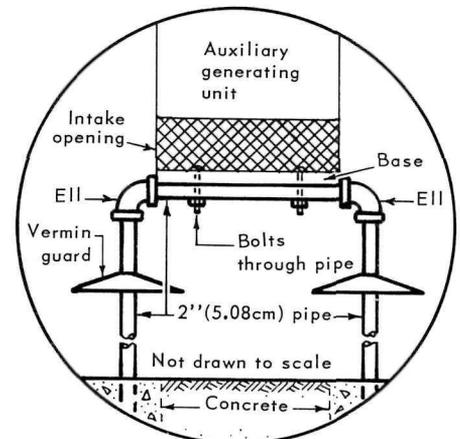
Poor installation of the auxiliary generating system at the Boat Mountain Tower along the Buffalo National River



SIDE VIEW(after)

(AR) had left the system vulnerable to many problems. When Maintenance Worker Robert Stanford assumed responsibility for the facility he realized these problems and reinstalled the system, making several improvements.

Stanford's modifications, shown here, prevent premature burnout of the system due to overheating, eliminate a vermin problem without harming the environment, and increase the reliability of a vital radio communications system powered by the generator.



DETAIL OF END VIEW

# Recycling and . . .

## Heat with Waste Oil!

Disposing of waste oil which accumulates on park and recreation area premises can represent a significant expense. Handling this disposal in an ecologically acceptable manner can pose an even greater problem. Now, the Dravo/Hastings Thermoflo Waste-Oil Heater provides a solution to both these problems.

The Thermoflo is a fully automatic, self-contained, space heating system capable of burning untreated, unprocessed, unblended waste oil. The basic unit is a freestanding, floor-mounted air heater with a nominal heating output capacity of 450,000 btu per hour.

Certified testing by ETL Testing Laboratories, Inc. and Enviro-Test Ltd. found the heater's stack emissions in full compliance with federal EPA standards in field tests burning waste oil with 76 percent carbon and a lead content of

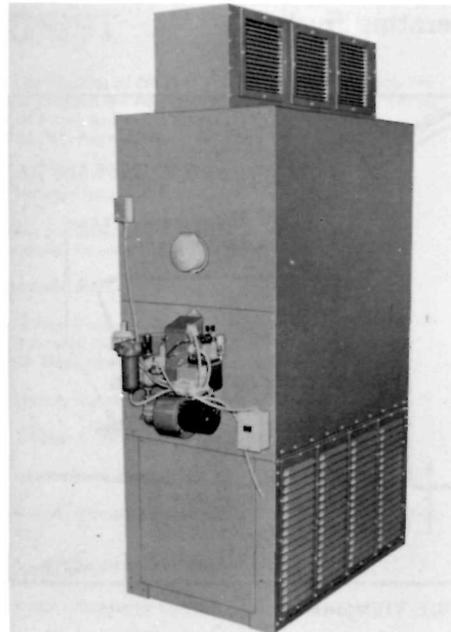
6,000 ppm. However, since waste oil is a fuel of variable composition, applications in strict air quality regions should be coordinated with the factory to assure compliance.

The unit operates on 115-volt power supply. Its heavy-duty construction features a stainless steel combustion chamber and the whole unit is simple to clean and maintain. Furthermore, it offers minimum heating efficiency of 80 percent.

Among the advantages of the Thermoflo are point-of-generation combustion, true energy conservation, and one-step recycling into measurable savings.

The initial premium for the waste-oil heater over a virgin fuel heater can be recovered within two years from fuel savings. Another plus, the waste-oil heater also can burn virgin fuel in the event that waste-oil accumulation is less than anticipated.

Further information about the Thermoflo can be obtained from Ron Dornetta at Dravo Corporation, P.O. Box 9305, Pittsburgh, PA 15225 or by phoning (412) 777-5932.

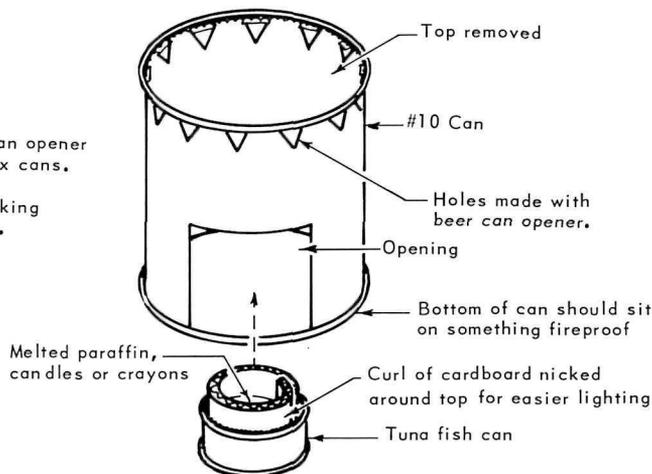


## Homemade Cooking Stove

### NOTE:

You will need a can opener and tin snips to fix cans.

Use gloves or cooking mitt when cooking.



Here's a handy Girl Scout design for a simple homemade cooking stove. All you need to make it are a can opener, tin snips, a #10 can, and a tuna fish can.

A curled piece of cardboard, pinked at the top for easy lighting, is used as a wick. This sits in an open tuna fish can,

partially filled with melted paraffin, candles, or crayons.

As a safety precaution, be sure to wear gloves or cooking mitt while using the stove. Set the stove on a fireproof surface when using.

## "No Cost, Low Cost"

The U.S. Department of Energy offers some helpful advice on cutting fuel oil, gas, and electrical costs in this new, illustrated booklet. The publication's 11 suggestions attempt to give consumers the "greatest return for the least effort and expense." For an investment of \$100 or less, the government estimates, consumers can effect these relatively simple, energy-saving measures and reduce their annual utility bills by as much as 25 percent.

Suggestions included range from a thimble-size, plastic "flow controller" for the shower, available for about \$2, to caulking or insulating gaps under baseboards and around electrical outlets and pipes.

To obtain a free copy of "No Cost, Low Cost," write to the Technical Information Center, P.O. Box 62, Oakridge, TN 37830.

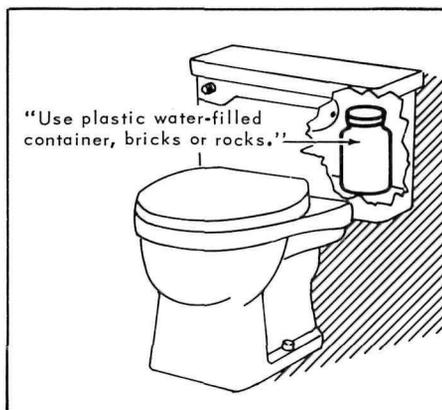
# Energy Saving

## Save Water With Each Flush

Diana Hwang, park technician at Independence National Historical Park (PA), reminds readers of an old water conservation measure that's still effective and easy to implement—cut down the amount of water used per flush in your toilets!

The standard toilet uses 7 gallons (26.6 l) or more water per flush, far more than is needed to do the job effectively. To reduce the amount of water used, simply displace some space in the water reservoir that allots and holds water for the next flush.

Anything from plastic water-filled containers salvaged from the office to bricks and/or rocks can be used to displace the water. The size and shape of the objects will depend upon the size and shape of your water reservoir and



where the objects can be placed within it.

Depending upon the size of your recreation area or park, the water savings from such a simple step can be substantial.

## OCCUPATIONAL HAZARDS AND INDUSTRIAL HYGIENE

(continued from p. 25)

are inhaled. When ventilation is inadequate to bring vapor levels below the federal standards, is not feasible, or while the controls are being instituted, the employee should be given adequate and proper personal protective equipment such as respirators, safety goggles, and protective clothing.

In the absence of these controls, inhalation of harmful vapors can affect the central nervous system and cause nausea, headaches, intoxication, and sometimes even death. Prolonged, repeated contact with a liquid solvent can remove the natural oils from the skin, producing a dry, fissured, skin inflammation.

Too often, workers use solvents with bare hands and with insufficient ventilation or protection. One should never degrease parts using bare hands, or remove paint from the hands with solvents. Yet, in many parks, these practices are widespread.

Although not the most serious effect, industrial dermatitis is the most prevalent injury resulting from exposure to solvents. These skin problems can be avoided by observing good, safe work habits, by the use of protective barrier creams and clothing.

Some of these solvents can be very toxic and produce far-reaching effects. For example, chronic exposure to benzene has been proven to cause changes in the blood-forming organs. Long latency periods of 10 to 15 years from time of exposure to development of disease are possible.

This brings up another consideration in occupational hazards. Many of the ill effects will show up only after years of exposure or years after an exposure. An employee may not realize the potential harm of these agents when working with them because he or she is not immediately affected.

(continued on p. 30)

## Regulate Your Hot Water Temperature

Peter R. Amodei shares another good energy-saving tip involving the regulation of hot water temperature.

Amodei, an air conditioning equipment mechanic at Independence National Historical Park (PA), felt it was wasteful to keep hot water temperature at a constant 190 degrees F. at all times, regardless of the outside air temperature. So he reset the hot water temperature to correlate with that of the outside air. For example, when the outside temperature dropped to 0 degrees F., the water was heated to 190 degrees F. However, when the outside temperature rose to 60 degrees F. or more, the hot water needed only to be heated to 120 degrees F.

Amodei regulated the temperature by adapting the Honeywell Receiver Controller and Temperature Transmitter to work automatically. This adjustment, lowering the hot water temperature, resulted in a reduction of steam usage, yet the hot water temperature can be increased whenever needed, as the outside temperature drops. Amodei can provide more specifics to readers who would like them. Contact him at (215) 597-7622.

## Institute for Local Self-Reliance

The Institute for Local Self-Reliance, a Washington, DC-based organization, now offers services and publications that the park and recreation community might find useful.

Formed to provide technical assistance to urban dwellers working toward community-based and community-controlled development, the organization has projects underway on energy, urban agriculture, and waste utilization. It also has published a number of inexpensive booklets and reports. The following two publications were noted in a recent issue of *Conservation News*: "Economic Feasibility of Recycling," a 26-page report describing recycling activities nationwide from 1970 to the present (\$4.00); and "Garbage to Energy Packet," a collection of articles and letters summarizing the Institute's negative position on high-technology resource recovery plants (\$3.00). Both are written by Dr. Neil Seldman of the Institute's staff.

For more information on the Institute, write: Institute for Local Self-Reliance, 1717 18th Street, NW, Washington, DC 20009.

**Asbestos**

A prime example of this is asbestos. For years, asbestos was used by the shipbuilding industry as lining for the ship's bulkheads and as heat insulation around pipes and boilers. Asbestos is also used in brake linings, asbestos tile, gaskets, and as heat and acoustical insulation. Workers who were exposed to airborne respirable asbestos 10 to 30 years ago now are exhibiting its ill effects. These can include chronic cough, difficulty in breathing, respiratory infections, cancer of the stomach and lungs, and a rare cancer form which involves the linings of the chest and abdominal cavities.

As long as the asbestos fibers remain bonded together or encased, they pose no threat. However, when an asbestos-containing product is cut, ground, sanded, or in a friable state, the fibers can become airborne and respirable.

Employees working with or exposed to asbestos now must be fully informed of the potential hazard and, where indicated, provided with the necessary protective equipment. In conjunction with the protective equipment, there are specific work practices that will help reduce dispersion of the fibers.

**Physical Stress—Noise**

Physical stresses in the park include oscillatory vibration (noise, vibration), atmospheric stresses, (heat, cold, and air pressure), and radiation (ionizing and non-ionizing). Band saws, chain saws, tractors, snowmobiles, and com-

pressors all can produce excessive noise.

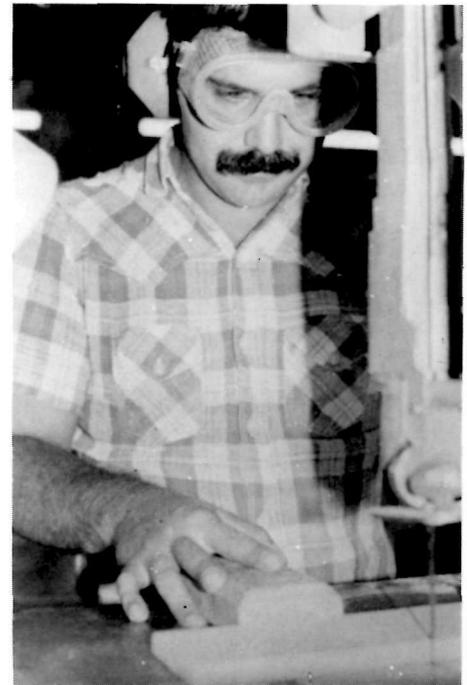
If the employee is subjected to high levels of noise over a sufficient period of time, temporary or permanent hearing loss can occur. Hearing loss also can be caused by a sudden, loud explosion. Other factors which can affect the extent and degree of loss are the type of noise, the age of the individual, and prior injury.

The intensity or loudness of noise is measured in units of decibel (dB). For comparison, the loudness of normal conversation is about 60 dBA, lawn mowers register 91 dBA, chain saws range between 100–115 dBA, and a pneumatic tree chipper tips at 120 dBA. Table 1 shows the allowable

Duration per day Hours	Sound level dBA Slow response
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼	115

decibel exposure limits in the work place.

Engineering controls such as mufflers, shock absorbers, or enclosures and administrative controls like reducing duration of exposure are preferred. However, when they are inadequate to reduce the noise levels to acceptable limits, hearing attenuators such as ear plugs or muffs should be worn.



Personal protective equipment varies with the work equipment. Bill Davis, NPS

**Radiation**

Non-ionizing radiation includes ultraviolet and infrared rays. Ultraviolet or UV radiation is produced naturally by the sun and artificially by arcs operating at high temperatures. These invisible rays can cause a painful irritation to the unprotected eye known as "welder's flash." In addition to the welder, there also is danger to his co-workers and to passersby who might look at the arc accidentally. Therefore, it is very important that all such work be shielded.

Other effects of UV radiation include sunburns. Sunburns are of consequence to employees who spend the majority of their time outdoors or who are chronically exposed, for a dry, thickened, leathery skin can result. This actinic skin is a warning that other more serious conditions may develop. Chronic exposure to infrared radiation (IR) has been known to cause cataracts.

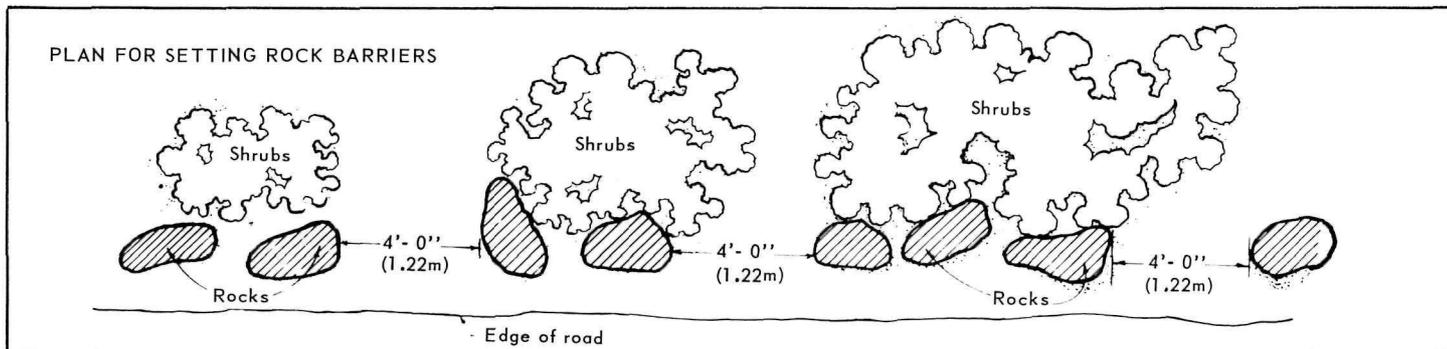
Although direction and initial support come from management, it is the first line supervisor and the employee who make controls functional. It is at this level that the directives and guidelines must live and breathe. Spurred by management, each individual must take an active interest in the safety of his or her own job surroundings.

Connie Villar is an Industrial Hygiene Specialist in the National Park Service Division of Safety Management.

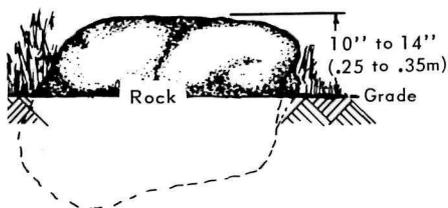


Ear muffs protect laborer from 120 dBA intensity of tree chipper.

# Maintenance



## Protect Fragile Shrubs with a Rock Barrier



ELEVATION OF ROCK SET IN GROUND

Canada's Department of Natural Resources shares this idea for protecting shrubs that lie near roads or walkways by placing rock barriers strategically in front of them.

Use the largest rocks you can handle practically and set them in a natural, irregular pattern rather than a straight line. Each rock should project at least 10" (25 cm) above the ground; but only

about 1/3 of the rock should be visible, the rest should be buried. For a solid, natural appearance and to prevent removal, set the rocks on their natural bed, avoiding sharp corners and points above the ground.

It is recommended that the rocks not be painted and that their naturally weathered appearance be preserved.

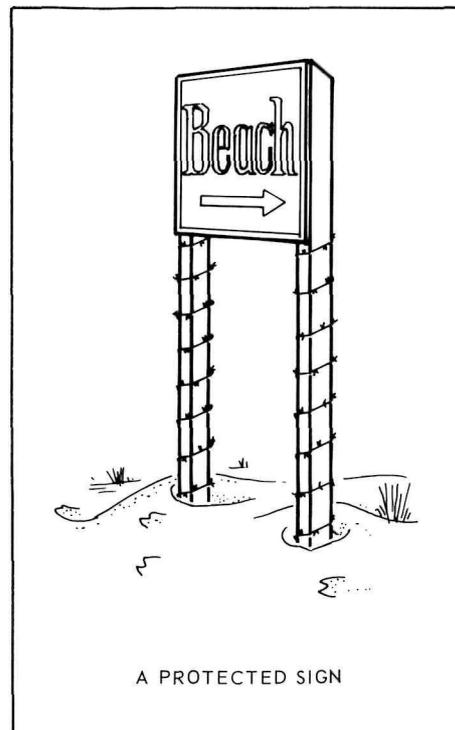
## Protecting Signs in Places Where Animals Graze

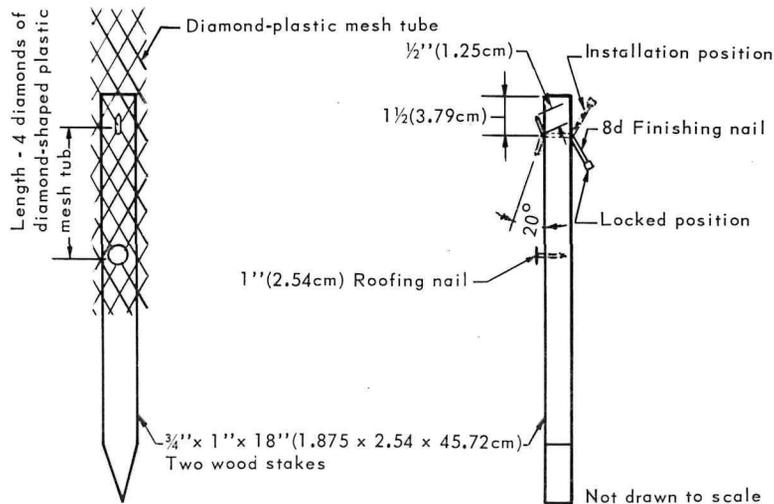
Maintaining signs in areas where cows, horses, elk, or other animals graze can be difficult. The animals rub against the signs and their posts; this results in bent or tipped signs that look bad and are hard to read.

Now Richard L. Jackson, sign maker at Point Reyes National Seashore (CA), offers a simple solution to this problem. Wrap barbed wire around sign posts or other posts that are placed in pasture areas. And place the sign higher than the grazing stock that frequent the area.

Fasten the barbed wire to the post with fence staples, starting at the top and winding down. Leave approximately 4" to 6" (10 × 15 cm) between wraps and be sure to wear gloves to pull the wire taut. For the posts, Jackson recommends rough redwood 4 × 4s (10 × 10 cm). Jackson has used signs like these in

large fields where 20 to 30 head of horses run and has found them successful. As an added bonus, the barbed wire also deters vandals from tampering with the signs. This idea not only improves the appearance of an area and assures that visitors can read essential messages and directions, it also saves the government the cost of replacing defaced posts and bent signs.





ATTACHMENT OF MESH TO STAKE

## How to Protect Western Conifer Seedlings

From the Forest Service's *Equip Tips* comes a simple but effective way of protecting conifer seedlings in areas subjected to animal browsing. Cooperative field investigations by the U.S. Fish and Wildlife Service and the Missoula Equipment Development Center found that plastic mesh tubes placed over seedlings kept browsing creatures away from the terminal leaders.

Diamond-shaped polypropylene mesh tubes proved to be the most rigid and offered the best seedling support. *Equip Tips* recommends a 3/8" (.94 cm) mesh opening since this size permits lateral branch growth. The tubes should be 2" to 3" (5 to 7.5 cm) in diameter and about 3' (90 cm) long. Longer tubes may be needed where elk browse.

Sunlight does degrade the plastic protectors. Just how fast they break down depends on their color and the amount of ultraviolet inhibitor in the plastic. The best choice seems to be black plastic tubes which last more than 10 years.

During installation, the protector must be carefully secured over the seedling to insure that the terminal leader remains within the tube as the seedling grows. This can be done in many ways.

For rigid tubes of diamond-shaped mesh, straight or spiral pins of 9-gage wire offer adequate support. Hook the straight wire pins through the mesh and drive or press them into the ground. Spiral pins, cut from fence stays, can be

woven through the mesh and pressed into the ground with a nut driver; leave about 2" (5 cm) protruding above the mesh so the tube cannot work loose. Both kinds of wire pins should be 14" (36 cm) long. They cost about 3¢ each.

Another way to secure and support the tubes is by using wooden laths with twist ties. Periodic inspections should be scheduled after installation, however, since they often break or rot.

On steep or rocky ground, wooden stakes are recommended. They should measure 18" x 1" x 3/4" (45 x 2.5 x 1.8 cm). Two nails hold the tube to each stake: a 1" (2.5 cm) roofing nail driven partially into each stake and, above this, a 2 1/2" (6.25 cm) 8 penny finishing nail, bent at both ends. Drive the stakes into the ground beside the plastic tube. Hook the lower nail onto the mesh; then rotate the top nail to secure the tube. These wooden stakes, with the necessary nails, cost about 10¢ each.

These plastic mesh seedling protectors are manufactured by Conwed Corp. in Minneapolis, MN; DuPont, Inc. in Wilmington, DE; and Nalle Plastics, Inc. in Austin, TX. Prices vary from 4¢ to 19¢ per foot (12¢ to 57¢ per m), depending on the manufacturer, quantity, diameter size, and freight charges.

## Install a Trailhead Register and Reduce Graffiti

Trail managers having graffiti problems might try this suggestion shared by James O. Stiles, park technician at Arches National Park (UT).

Stiles and other park employees were appalled to find so many visitors leaving their names all over the canyon walls along the Delicate Arch and Devils Garden Trails. Since people have such a strong urge to immortalize their visits in



this way, Stiles felt the solution was to provide them with a nondestructive means of doing so. Accordingly, he suggested placing registers at the trailheads.

Besides offering visitors an acceptable way to record their presence, the registers can serve as a useful park record. Stiles points out that many parks that have installed such a register have found it to be effective in substantially reducing graffiti.

**HCRS**

U.S. Department of the Interior  
Heritage Conservation and Recreation Service