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Forest Service

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Program

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Sixty Years of Innovation and Problem Solving

Technology and Development in the USDA Forest Service

Tools for Nurseries

Development and Testing of Fire Engines

Smokejumping Equipment

Aerial Ignition

Improved Logging Systems

Tools To Limit Invasive Species

Development and Testing of Fire Shelters

Tools for Healthy Forests

Evaluation and Testing of Wildland Fire Shelters

Tools To Reduce Road Impacts

Trail Maintenance

Traditional Tools

Apps for Chain Saw Safety

Accessibility

Employee Health and Safety

Water Road Tools

Spark Arrestor Testing

Facility Improvements

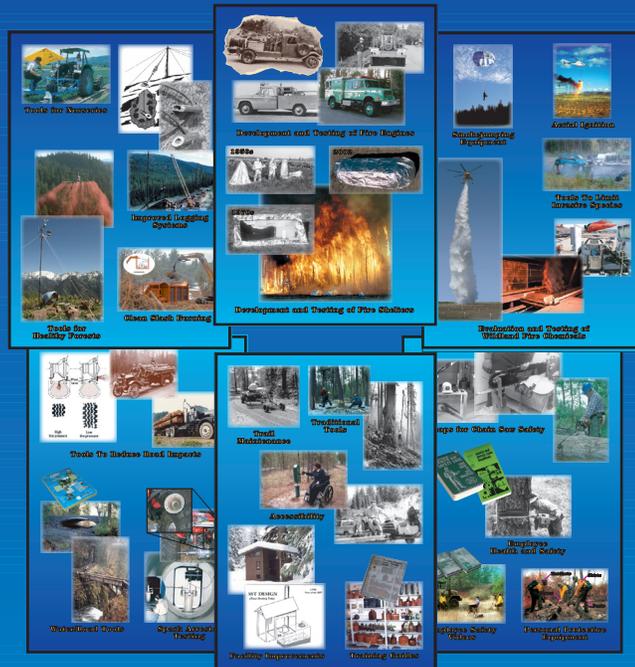
Training Guides

Employee Safety Videos

Personal Protective Equipment

Sixty Years of Innovation and Problem Solving

Technology and Development in the USDA Forest Service



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Technology and Development Program
Missoula, MT

January 2005

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For the past six decades, the U.S. Department of Agriculture (USDA) Forest Service's Technology and Development program has provided practical solutions to problems identified by employees and cooperators. The program helps the USDA Forest Service manage the Nation's natural resources more efficiently and more safely.

The Technology and Development Program relies on two centers, one in Missoula, MT, and the other in San Dimas, CA. Each center works on 80 to 150 projects every year. Most projects are completed within 18 months to 3 years.

Recent projects have:

- Tested and approved spark arresters that prevent chain saws and motorcycles from throwing sparks that can start fires
- Developed a campground water pump that can be used by people with disabilities
- Tested fire retardants that slow wildland fires
- Saved millions of dollars by establishing contract standards for firefighting equipment purchased at large-volume discounts, such as flame-resistant shirts and pants, shovels, gloves, and many other items

This variety of projects requires many different talents. The skills of the program's slightly more than 100 employees include engineering, forestry, machine tool operation, metal fabrication, drafting, contract administration, publication design, helicopter rappelling, smokejumping, explosives, recreation management, sociology, global positioning systems, equipment design, textile design, contracting, editing, photography, finance, Web design, safety, statistics, chemical analysis, reforestation, and video production.

Although the centers are funded specifically to solve problems for the USDA Forest Service, their solutions have been widely adopted by other agencies and by private groups in the United States and abroad.

Missoula Technology and Development Center

During the late 1940s, USDA Forest Service employees at the Aerial Fire Depot in Missoula, MT, began working on ways to use aircraft more effectively for fighting fires in remote areas.

When regular aircraft patrols detected a forest fire, smokejumpers and cargo were dropped at the fire. The

success of these techniques led to the establishment of the Missoula Aerial Equipment Development Center in 1953.

Center employees worked in a variety of locations in Missoula before offices were moved to Fort Missoula during the 1960s.

San Dimas Technology and Development Center

Also during the 1940s, USDA Forest Service employees were consolidating equipment development activities at the Arcadia Fire Equipment Development Center in Arcadia, CA. The southern California site was selected in 1945 because of frequent fire activity in the area, evolving industrial and academic centers there, and a Forest Service facility the center could move into.

Late in the 1940s, a conference of USDA Forest Service range management administrators and researchers recognized that equipment for range seeding and other improvements needed to be adapted or developed. Range became the second “sponsor” at Arcadia and the center’s name was changed to the Arcadia Equipment Development Center.

Expanding the Centers’ Role

The centers soon were solving other nationally important natural resource problems for the USDA Forest Service. In 1987, the names of both centers were changed from “Equipment Development Centers” to “Technology and Development Centers” in recognition of their expanded role.

Both centers were scheduled for new facilities during the 1960s. The USDA Forest Service purchased land near the Missoula airport for the new facility in Missoula.

The Arcadia center moved to its new facility at San Dimas, CA, in 1965, but the Missoula facility was not funded. Plans for a new facility were redrafted several times, but funding for construction wasn’t available until 2000.

In 2002, the Missoula center moved from seven buildings around Missoula to its new facility near the airport. The new facility includes offices, a chemistry laboratory for analyzing fire retardants, a photo studio, a video editing studio, a textile fabrication shop, an electronics shop, a machine shop, and a large meeting room for training.

Directors of the Missoula Technology and Development Center	Directors of the San Dimas Technology and Development Center
Herb Harris 1956 to 1969	Ira C. Funk..... 1945 to 1948
Farnum M. Burbank 1969 to 1974	Eugene E. Silva..... 1948 to 1970
Lee Northcutt 1975 to 1990	Charles W. Howard 1970 to 1974
Terry Solberg (Manager) 1990 to 1995	Boone Y. Richardson 1974-1984
John Steward (Manager)..... 1995 to 2000	Larry E. Matson 1984-1986
Dave Aicher (Manager) 2001 to present	Leon (Dick) R. Silberberger 1986 to 1997
	John D. Fehr (Manager)..... 1997 to present

Pictorial History of Technology and Development

The following 12 pages are reduced versions of six panels prepared for a display at the USDA Forest Service Centennial Congress in Washington, DC, during January 2005. The text on the page opposite each panel provides additional information about each group of photographs.

The panels show a sampling of work by the Technology and Development Program. Although some of the photos are historic, most of the work is ongoing.

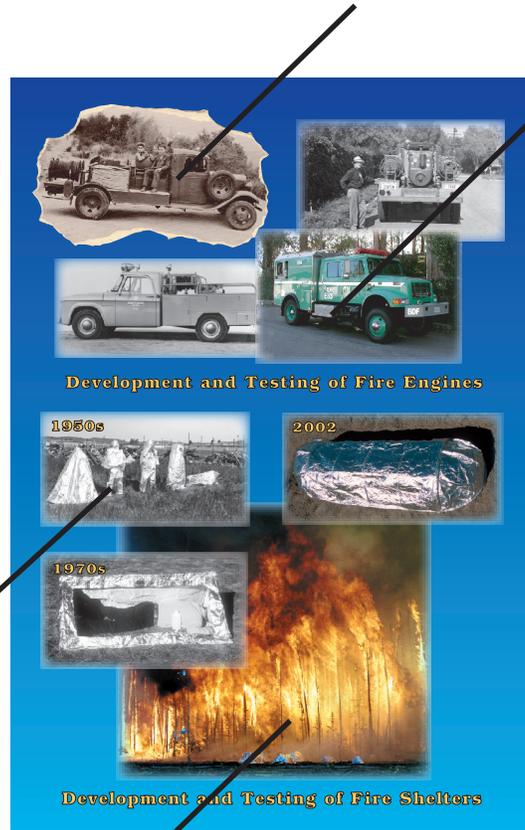


Development and Testing of Fire Engines

The Technology and Development Program's first projects involved improving firefighting equipment. Fire engines have made a lot of progress from the 1930s (upper left photo in the fire engine collage) to the 1990s (lower right photo, fire engine collage).

Today's engines can pump water more quickly, helping firefighters control wildland fires.

The San Dimas Technology and Development Center continues to improve fire engines.



Development and Testing of Fire Shelters

Testing during the 1950s led to development of the fire shelter carried by wildland firefighters since the 1970s. All but one of the designs in the 1950s photo have a flaw: the firefighter is standing up. Assuming that firefighters clear an area of fuel, temperatures at the surface of the ground will be much lower than temperatures even 1 foot above the ground when a fire passes over.

The fire shelter has saved the lives of more than 300 firefighters and has prevented many more injuries. The Technology and Development Program developed a new version of the fire shelter at the turn of the 21st century after laboratory and field testing. The new fire shelter, completed in 2002, provides additional protection, although no shelter can protect firefighters from all conditions. The use of a fire shelter is considered a wildland firefighter's last resort.

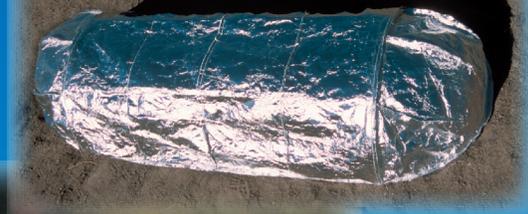


Development and Testing of Fire Engines

1950s



2002



1970s



Development and Testing of Fire Shelters

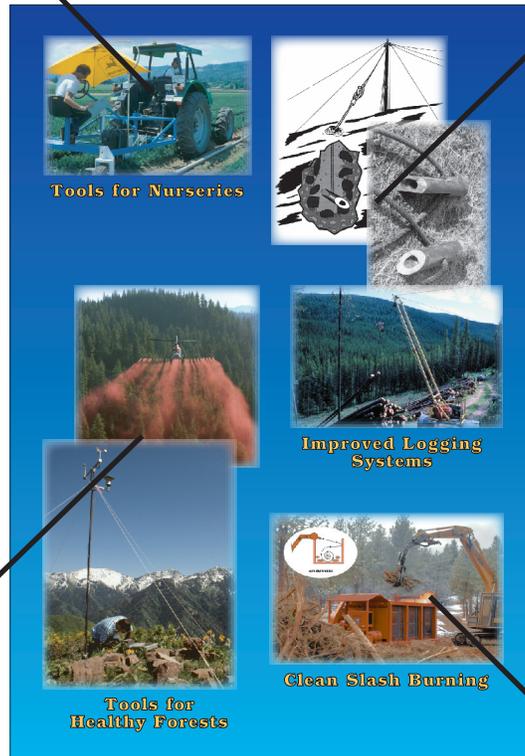
Tools for Nurseries

Trees grown in USDA Forest Service nurseries help reforest lands. The Technology and Development Program uses new technology, such as the electronic seedling counter pictured, to increase production and reduce the labor required for repetitive tasks.

Improved Logging Systems

Cable systems can reduce the environmental impacts of logging in steep terrain. These systems require sturdy anchors, such as large stumps, or, if they are not available, special anchors developed by the Technology and Development Program.

Unlike most commercial yarders, the Bitterroot Miniyarder is small enough to be hauled in the bed of a pickup truck. The Technology and Development Program developed the miniyarder to allow loggers to pull small-diameter logs from the forest more economically.



Tools for Healthy Forests

Aerial spraying is one of the tools used to control bug or weed infestations in forests. The Technology and Development Program's careful studies of spray technology and meteorological conditions allow forest managers to reduce spray drift outside the intended target area.

Clean Slash Burning

Thinning unhealthy forests generates a lot of slash. Piling and burning slash can create lots of smoke. Burning slash in an air-curtain burner increases combustion efficiency, dramatically reducing the amount of smoke.



Tools for Nurseries



Improved Logging Systems



Tools for Healthy Forests



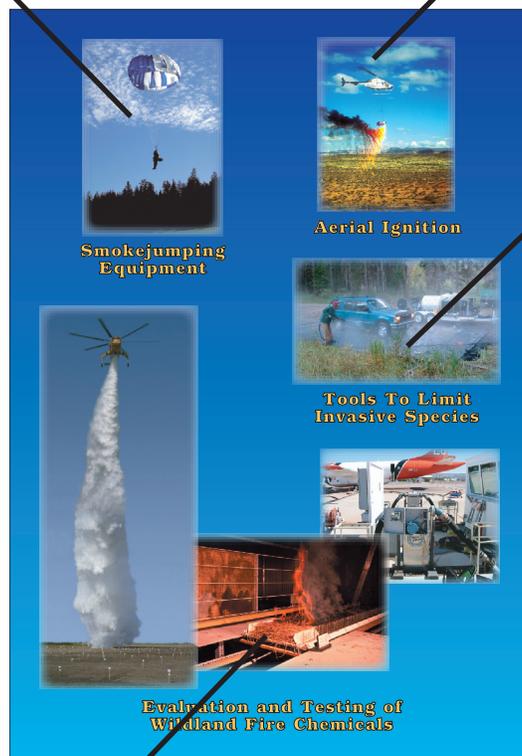
Clean Slash Burning

Smokeyumping Equipment

Smokeyumpers parachute into the forest after fires are first spotted. They can get closer to their target and have softer landings using the new parachute developed by the Technology and Development Program and a private contractor. All the equipment used by USDA Forest Service smokeyumpers and by firefighters who rappel from helicopters is tested and certified by the Technology and Development Program.

Aerial Ignition

The USDA Forest Service needs effective ways to start fires as well as to put them out. In some cases, it's safer and less expensive to start fires with gelled gasoline dispensed from a helitorch hanging below a helicopter than to have firefighters on the ground start the fires.



Tools to Limit Invasive Species

A portable power washer developed by the Technology and Development Program helps remove weed seeds and spores from vehicles entering or leaving fire camps and other remote locations. The washer can be pulled behind a ¾-ton pickup truck.

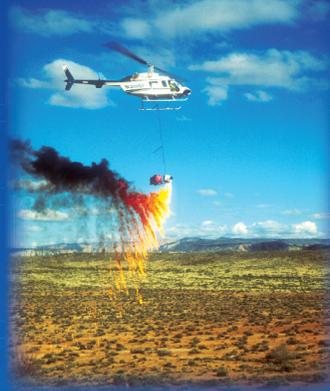
The washer conserves water by filtering and reusing wash water.

Evaluation and Testing of Wildland Fire Chemicals

Carefully conducted tests determine how much fire retardant, foam, or water enhancers will retard or suppress fires when helicopters (bottom left photo) and airtankers make their drops. All chemical products (such as retardants, foams, and water enhancers) for wildland firefighting must be proven safe and effective (bottom center photo) before the USDA Forest Service qualifies them for use. Special meters (bottom right photo) were developed to determine exactly how much retardant is loaded onto planes. These meters help ensure that planes will not be overloaded.



**Smokejumping
Equipment**



Aerial Ignition



**Tools To Limit
Invasive Species**



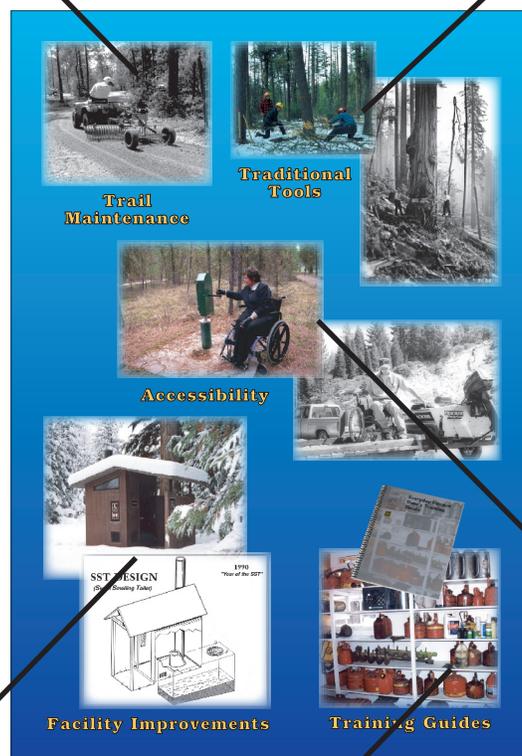
**Evaluation and Testing of
Wildland Fire Chemicals**

Trail Maintenance

With thousands of miles of trails to maintain, the USDA Forest Service needs the best possible tools to do its job. In some settings, one of these tools may be the miniature rock rake modified by the Technology and Development Program.

Traditional Tools

Power tools can't be used in wilderness areas. The Technology and Development Program makes sure that the skills to use and maintain traditional tools, such as crosscut saws, aren't completely lost.



Accessibility

Keeping facilities in remote areas accessible for people with disabilities requires imagination. A new rotary handpump developed by the Technology and Development Program allows anyone to pump water at a campground even if they don't have strong arms and a long reach. Special loading platforms allow persons to transfer from wheelchairs into boats. The Technology and Development Program maintains mechanical drawings that will allow anyone to build accessible loading platforms.

Facility Improvements

Since 1990, vault toilets at USDA Forest Service campgrounds have relied on a passive ventilation system that keeps most of the odor outside. The Sweet Smelling Toilet is just one example of the Technology and Development Program's innovations for facilities.

Training Guides

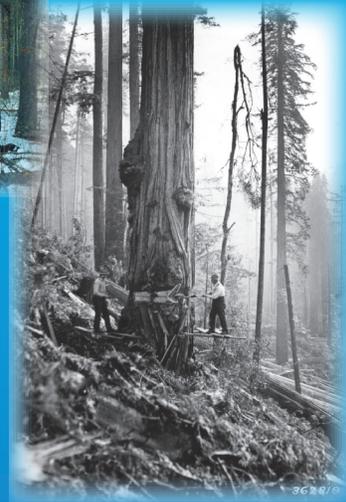
Storing hazardous materials properly requires understanding many laws and regulations. The Technology and Development Program and a private contractor condensed the laws and regulations into easy-to-understand guidebooks.



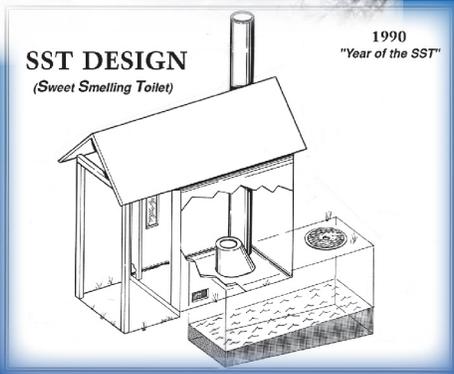
Trail Maintenance



Traditional Tools



Accessibility



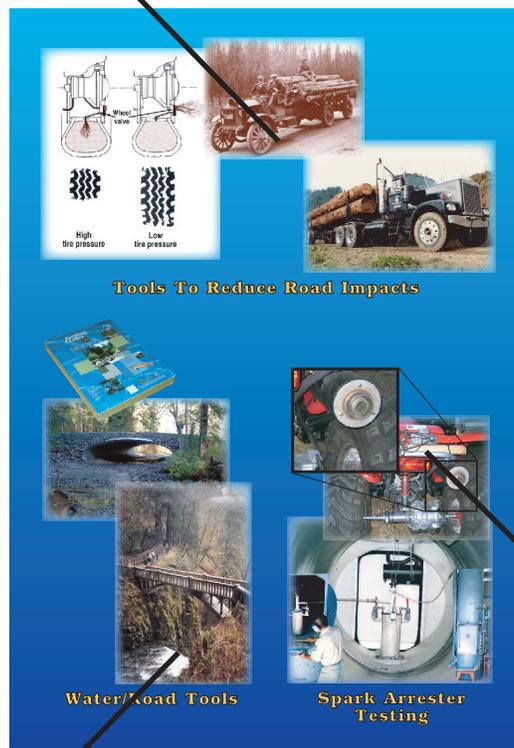
Facility Improvements



Training Guides

Tools To Reduce Road Impacts

Heavily loaded logging trucks are less likely to leave ruts in forest roads if their tire pressure is reduced, allowing more of the tread to contact the road. The Technology and Development Program helped develop central tire inflation systems that allow heavy trucks to deflate their tires when traveling on gravel roads and reinflate them before traveling on highways.

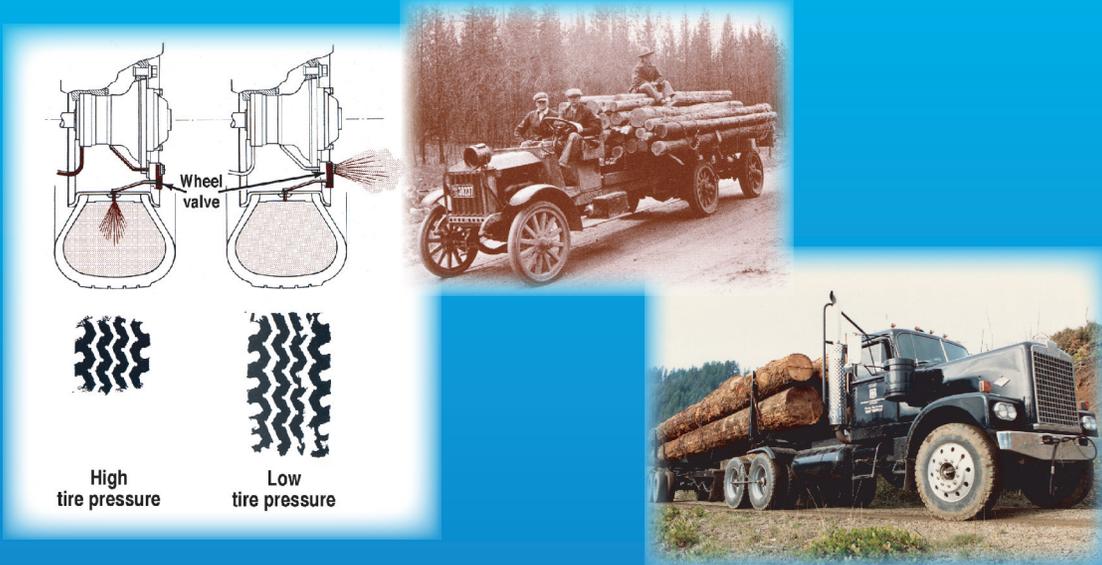


Water/Road Tools

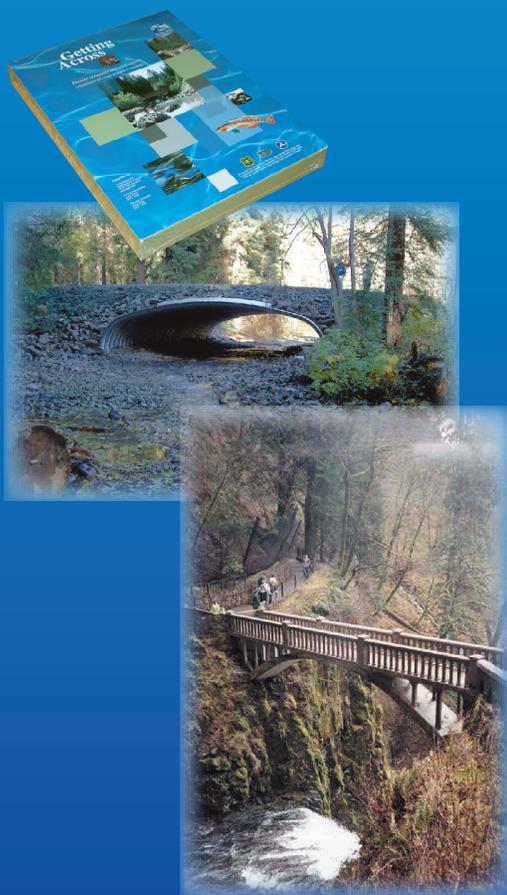
Careful design of roads, culverts, and bridges can reduce their environmental impacts on streams, lakes, and aquatic organisms. The Water/Road Interaction Series produced by the Technology and Development Program includes videos and reports on the topics of surface drainage, subsurface drainage, and drainage crossings.

Spark Arrester Testing

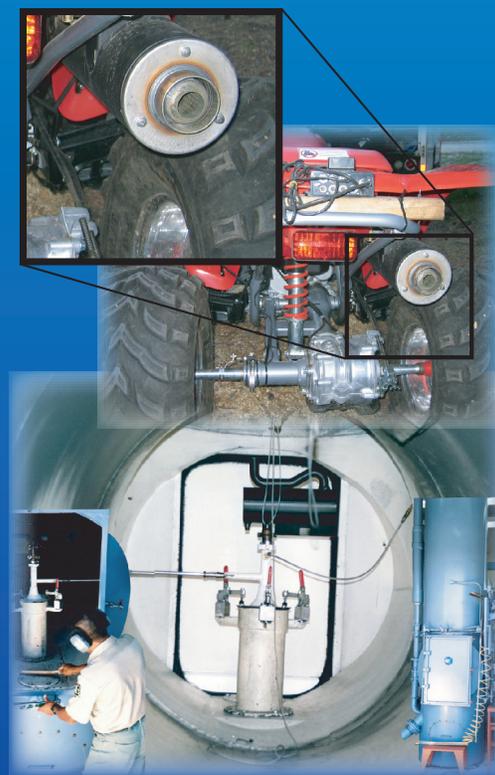
Off-highway vehicles, motorcycles, and chain saws can start forest fires if their exhausts throw sparks. Spark arresters used on these devices must be tested and certified by the Technology and Development Program before they can be used on lands administered by the USDA Forest Service and other Federal agencies.



Tools To Reduce Road Impacts



Water/Road Tools



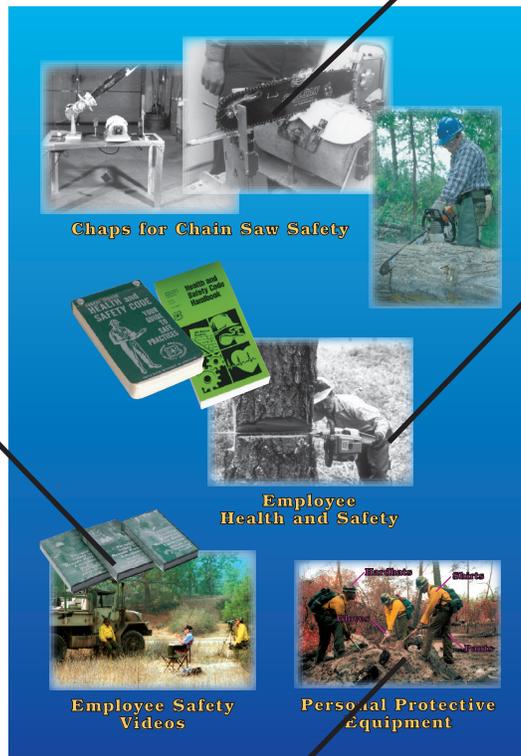
Spark Arrester Testing

Chaps for Chain Saw Safety

Kevlar fabric in chain saw chaps protects users from injuries. The chaps were developed during the 1960s. Testing allows the Technology and Development Program to ensure that the chaps continue to work even as chain saws are modified to run faster.

Employee Safety Videos

Sociologists and videographers collaborate to produce videos on employee safety. Sociologists interview employees to determine the most important issues. In these videos, employees use their own words as they describe solutions to common problems.



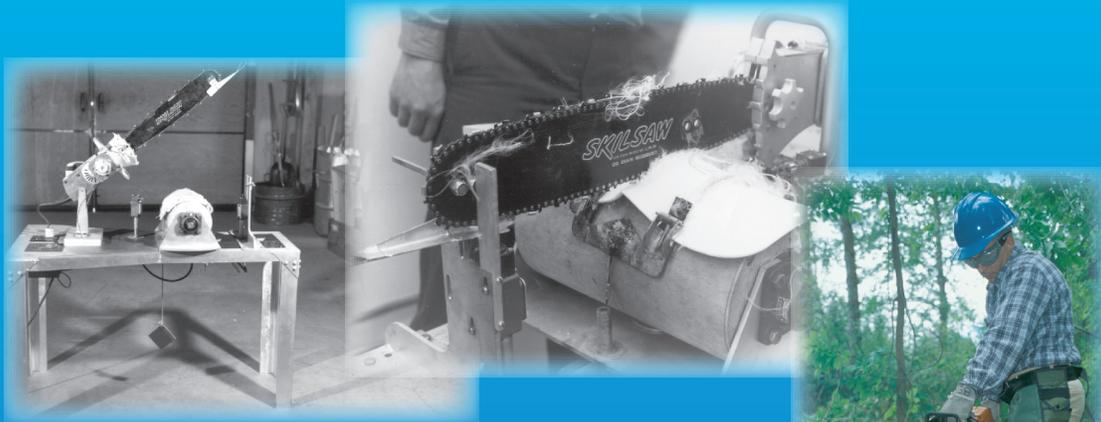
Employee Health and Safety

The USDA Forest Service's Health and Safety Code Handbook was completely revised in 1999 with the help of the Technology and Development Program. The program also has produced an accident investigation guide that helps agency officials investigate accidents properly, reducing the chance that mistakes will be repeated.

Personal Protective Equipment

One way employees can reduce the risk of injury on the job is to use the proper personal protective equipment, such as hardhats, chain saw chaps, or special clothing that does not continue burning after the heat source is removed. The Technology and Development Program tests, and in some cases, designs the personal protective equipment used by employees of the USDA Forest Service and other Federal and State agencies.

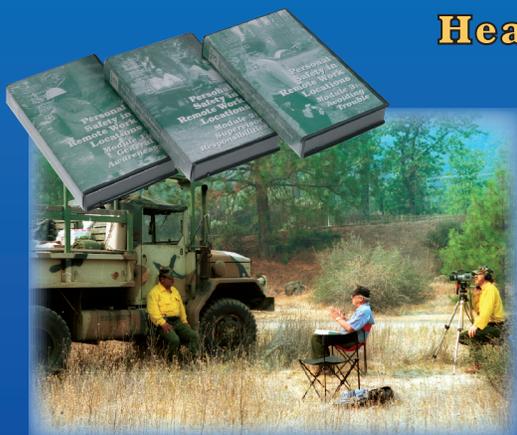
The program also maintains the specifications for personal protective equipment, handtools, and other equipment used by all Federal and State agencies that fight wildland fires. Large-volume purchases from contractors who produce that equipment to the program's specifications save enough money to pay the cost of the Technology and Development Program several times over.



Chaps for Chain Saw Safety



Employee Health and Safety

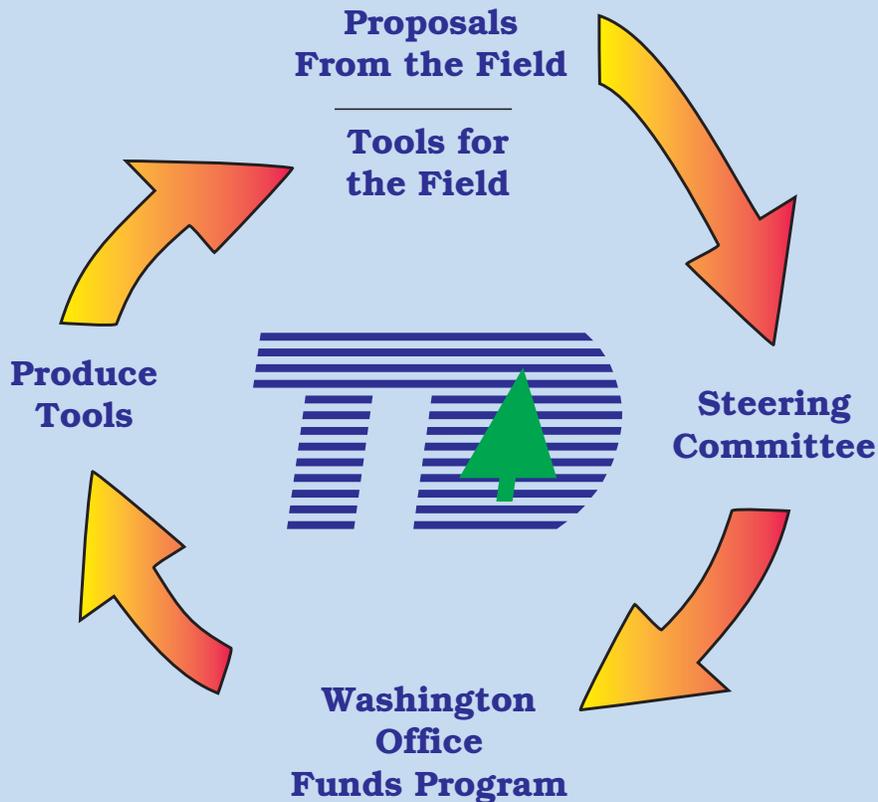


Employee Safety Videos



Personal Protective Equipment

How Proposals Become Tools



Solving Problems Identified by Proposals

Identify the Problems

USDA Forest Service employees submit project proposals.

Rank the Problems

National steering committees select the most important projects.

Build a Project Team

Project leaders tap resources within the Technology and Development Program, the USDA Forest Service, and outside.

Consider Alternative Solutions

Most problems have more than one solution. Finding solutions requires thorough analysis and imagination.

Test the Solutions

Compare the potential solutions.

If Everything Else is Equal, Choose the Simplest, Least-Expensive Solution

Simple solutions are usually better than complex solutions that aren't affordable or don't get used.

Implement the Solution

Find ways to produce the product, or share the knowledge through field trips, reports, videos, CDs, or Web sites.

Project Proposal Form

Forest Service Technology & Development Program

PROJECT PROPOSAL

Project Name/Title:



Date: _____

Submitted by: _____

Unit: _____

Address: _____

Phone: _____ E-mail: _____

OVERALL PROBLEM/OBJECTIVE STATEMENT *(Describe the problem, how the work is currently being done, and why improvement is needed):*

PROPOSED TECHNOLOGY & DEVELOPMENT WORK *(Describe your concept of the end product, such as a new equipment design, a PowerPoint presentation, a video, a handbook, Web site, CD, etc.):*

POTENTIAL BENEFITS *(Describe how this project will reduce cost, save time, improve safety, increase efficiency, or improve resource management):*

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Contacting the Technology and Development Program

Technology and Development Program Web Site

<http://www.fs.fed.us/t-d> (Username: t-d, Password: t-d)

USDA Forest Service and U.S. Department of the Interior Bureau of Land Management employees can search a more complete collection of the Technology and Development Program's documents, videos, and CDs at the centers' internal Web sites:

Missoula Technology and Development Center

<http://fsweb.mtdc.wo.fs.fed.us>

San Dimas Technology and Development Center

<http://fsweb.sdtc.wo.fs.fed.us>

Technology and Development Program Offices

Washington Office Engineering

Web Site: <http://www.fs.fed.us/eng>

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San Dimas Technology and Development Center



Missoula Technology and Development Center

Library Card

Lindler, Bert. 2005. Sixty years of innovation and problem solving: technology and development in the USDA Forest Service. Tech. Rep. 0571-2804-MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 18 p.

Provides a brief summary of the history of the Technology and Development Program in the U.S. Department of Agriculture Forest Service. This booklet was prepared as a companion to a panel display highlighting the program's accomplishments for the Forest Service Centennial in 2005. Reduced versions of the six panels in the display show some of the projects completed by the program. A project proposal form is included, along with the addresses and phone numbers of the USDA Forest Service Washington Office of Engineering and the technology and development centers in Missoula, MT, and San Dimas, CA.

Keywords: displays, histories, pictures, T&D

