Volume 36
Issue 1—2004

United States
Department of
Agriculture

Forest Service

Engineering Staff

Washington, DC

Engineering Field Notes

Engineering Technical Information System

—Deadline for *Engineering Field Notes* submissions for Volume 36, Issue 2—2004: August 10, 2004

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Washington Office Engineering is always looking for potential articles for *Engineering Field Notes* (EFN). If you or someone on your staff has information or technology that other field units can put to good use, contact Sandy Grimm by phone at 703–605–4503 or by e-mail at *sgrimm@fs.fed.us.*

One goal of *Engineering Field Notes* is to help you do your job better by building on the work that others have accomplished. As you read about the Engineer of the Year awardees in this issue, you will notice a recurring pattern of individuals who use their particular talents well and share that expertise with others year after year. The large number of engineers and technicians nominated for these awards highlights the excellent work that is being done.

Whatever your area of expertise, you probably rely on particular individuals for assistance, guidance, inspiration, innovation, troubleshooting, or problem solving. Encourage those experts to share their knowledge and wisdom through *Engineering Field Notes.* Help us create a flexible resource that broadcasts technical expertise from region to region and to districts and individual forests.

When you are excited about innovations in your field, others probably will be, too. Sharing that excitement can stimulate creative thinking and ingenuity to help others plan, develop, and improve engineering projects.

Director's Update: Managing Real Property and Improving Access to Corporate Data

—Vaughn Stokes, director of engineering, Washington Office

Recently, I submitted the USDA Forest Service Fiscal Year 2004 Pilot Facilities Conveyances to the U.S. Department of Agriculture, Office of Management and Budget (OMB), and the Senate and House Appropriation staffs. The consensus is that the forests have submitted very good projects, and I'm confident that those projects will move through the clearance process rapidly. I was able to visit each of the five construction conveyances to see the results of the excellent work that the forests and regions have done on their master facilities plans. Units are positioning themselves by identifying, consolidating, and working to get rid of unneeded offices, warehouses, and other administrative facilities. On one unit, disposing of unneeded facilities and investing those funds in needed offices will generate as much as 4 percent of their annual budget. Working on ways to make this pilot conveyance permanent and to identify and realign facilities in the master facilities plans and in regional reports will be an important and ongoing part of Engineering's work.

The President's Executive Order 13327 on real property management, signed in February 2004, will impact our business. I am pleased to report that I believe that more that two-thirds of the requirements of that Executive Order is addressed with the information available in Infra, and we are working to further align our programs. Please make sure your data are reliable, complete, and meet the appropriate standards. It is becoming increasingly important that our corporate databases and official records are accurate, up-to-date, and free of errors and oversights.

The Infra Warehouse will be revised and renamed the Corporate Data Warehouse. The warehouse will meet E-Government requirements by providing Web-based access to the public, USDA, Office of Management and Budget, and Congress to answer questions pertaining to the USDA Forest Service. The warehouse will provide a single corporate data set to meet our business and reporting needs, as well as summary reports from Infra, NRIS (Natural Resource Information System), TIM (Timber Information Manager), and ALP (Automated Lands Project) at district, forest, congressional district, State, regional, and national levels of the organization. Each of you will be able to view and compare information and trends down to a single asset at the forest or district level. We are working to integrate the applications with the first release coming in September. For up-to-date information on the Corporate Data Warehouse, visit *http://infra.wo.fs.fed.us/warehouse/*

I would like to end my comments with a few words about safety. I hope we are never too busy for safety. We must follow safe practices in our offices, workplaces, and homes. We need to talk about safety. Safety must be everyone's business. We

never know when our actions can help a coworker, friend, spouse, child, or ourselves avoid a serious accident. We do know that embracing a proactive personal philosophy about safety has reduced the industrial accident rate by 55 percent. I would challenge each of you to think of safety and to act proactively at the job site or at home. We ***can*** make a difference.

Have a great summer.

Traffic Signs for Wildland Fire Incidents: Meeting National Standards

—Donna Sheehy, Northern Region traffic management engineer; and Charles Showers, program leader, Missoula Technology and Development Center

In the past, signs for USDA Forest Service wildland fire incidents were created from whatever supplies were readily available, including cardboard, paper plates, glow sticks, and flagging. Each fire season since 2000, the Northern Region Traffic Safety Teams have procured commercially produced signs that meet the standards required for highway temporary traffic control zones. Standard signs help motorists and incident personnel recognize incident activities so they can slow down and pass safely through the area. Lessons learned by the Northern Region during the past 3 years regarding signing and other traffic control devices for incident management have national implications. Several projects are underway that will provide national standards and program direction for temporary traffic control for all incidents, including wildland fires.

The USDA Forest Service is responsible for fire management and suppression activities on 192 million acres of National Forest System lands. The last several years have seen some of the most extreme wildland fire behavior in recent history. Numerous traffic and congestion problems, especially in the wildland-urban interface (figure 1), pose a major threat to the safety of fire personnel and motorists. Their lives depend on being able to recognize traffic hazards associated with incident activities and passing safely through areas affected by the incident. These areas, known as Temporary Traffic Control (TTC) zones, are created by using temporary traffic control devices, flaggers, uniformed law enforcement officers, or other authorized personnel to notify motorists of the zones. Some of the TTC zones created during incident management activities include:

Figure 1—Standard signs are especially important at incidents near the wildland-urban interface. This sign pointed to the incident base for the 2003 Robert Fire in Columbia Falls, MT, at the intersection of Highway 2 and the North Fork Road. This design has been replaced by one saying *INCIDENT BASE.*

- Locations where large volumes of incident-related traffic enter and exit highways at intersections that otherwise would have little or no traffic
- Areas where suppression operations are conducted on or adjacent to roads open to traffic
- Facilities for incident personnel, such as the incident base, spike camps, helispots, fueling sites, and dropoff locations
- Stretches of road where smoke from wildland fires impairs visibility
- Road and area closures in and around incidents

More than 40,000 people are injured and more than 1,000 are killed each year by motor vehicle crashes in TTC zones. These zones are among the most dangerous areas on roads. Traffic-related accidents account for a disproportionate share of incident injuries and fatalities.

According to national studies, TTC zone crashes tend to be more severe than other crashes. Federal statistics indicate that more than 80 percent of those killed in TTC zone crashes are drivers or passengers, not road workers. These statistics also show that rear-end crashes are by far the most common type of fatal accident in TTC zones. Too many motorists fail to reduce their speed enough to drive safely through TTC zones.

Proper use of standard signs (figure 2) and other appropriate temporary traffic control devices can help mitigate the risk of accidents by providing for the reasonably safe and efficient movement of traffic through or around TTC zones.

Figure 2—The illustration shows proper sign placement with a warning sign before the guide sign. These signs served a helibase near the Blackfoot Fire in northwestern Montana during 2003.

Requirements of the Manual on Uniform Traffic Control Devices

By law, traffic signing for incident operations must comply with Part VI of the Manual on Uniform Traffic Control Devices (MUTCD). All 50 States have adopted the MUTCD for public roads under their jurisdiction. Federal law (23 CFR 655.603) requires all Federal agencies to follow the MUTCD for all roads open to public travel.

USDA Forest Service policies in the Forest Service manual (FSM 7103.3, 7731.15 and 7730.04 [9]) require adhering to the MUTCD for all warning and regulatory signs on all National Forest System roads, regardless of their maintenance level. Guide signs on maintenance level 3, 4, and 5 roads (all maintained for passenger cars) must conform to the MUTCD. Guide signs on maintenance level 1 (closed to highway vehicles) and level 2 roads (maintained for high-clearance vehicles) may deviate from the MUTCD.

All signs intended to guide motorized traffic must meet certain standards (figure 3). These standards are based on the latest highway safety research and are the result of a rulemaking process that included extensive public comment. Signs shall:

Figure 3—Often signs erected during the early stages of an incident don't provide adequately for the safety of motorists or incident personnel. These signs were at a blind intersection near a helibase serving more than two-dozen helicopters near the Ninemile Fire in western Montana during 2003.

- Be retroreflective. This means that the signs shall be designed to reflect the light from a vehicle's headlights back to the motorist, making the sign relatively easy to read at night or when fog or smoke reduce visibility.
- Have a consistent standard shape, color, and message.
- Be sized according to the speed of the approaching traffic.
- Be crashworthy.
- Meet installation standards for mounting height and distance from the edge of the road.

Incident Management Requirements—Chapter 6B of the 2003 MUTCD is a new section for incident management. This chapter requires that "The control of road users through a temporary traffic control zone ***shall be*** an essential part of highway construction, utility work, maintenance operations, and incident management."

The safety of road users and incident personnel, as well as the efficiency of traffic flow, are integral elements of every TTC zone, from their planning through their installation. The safety of the public traveling through TTC zones and the safety of

personnel performing tasks within the zones are equally important. TTC zones, especially those involving fire incidents, present constantly changing conditions that are unexpected by the road user. The unexpected and unpredictable nature of TTC zones heightens the vulnerability of incident management personnel working on or near the roadway. Effective use of TTC zones also can provide for efficient completion of whatever activity interrupted normal use of the roadway.

Many incident facilities are located in remote rural locations. Darkness, smoky conditions, and vegetation often make it hard to see intersections clearly, especially if they are marked with small, paper signs that are not retroreflective. Standard signs can help crews, delivery personnel, support staff, and other incident personnel find their destinations safely, even under adverse conditions.

Incident Management Signing—The Beginning

During 2000, wildfires in the Northern and Intermountain Regions burned 1.6 million acres and more than 400 structures. These incidents triggered one of the largest firefighting mobilizations in history as 25,000 personnel were brought in from as far away as Australia. More than 50 major fire camps were established in the Northern Region alone.

Large fires began escaping control during July. As the situation continued to worsen through August and into September, the Northern Region engineering staff became concerned about the haphazard signs appearing on many of the major highways and the city streets of affected communities. Staging areas and fire camps were in the middle of some cities and towns. Fire activities and large amounts of traffic affected State highways, county roads, city streets, and USDA Forest Service roads, posing an ongoing threat to the safety of incident personnel and motorists.

The Northern Region asked Donna Sheehy, regional traffic and transportation management engineer, to organize a response. Two technical sign experts were brought in from other regions (Greg Watkins from the Pacific Southwest Region and Jim Abernathy from the Pacific Northwest Region). Dave Neeley, formerly of the Intermountain Region, was brought out of retirement.

These experts were assigned to work with a local member of the engineering staff who knew local contacts and the areas where fires were burning. Teams were organized to visit incident sites and develop sign plans in coordination with the incident logistics or ground support staff. Sign plans were faxed back to the Northern Region offices in Missoula, MT.

The need for signs and traffic control devices for road closures and for incident facilities quickly exceeded agency and commercial inventories in western Montana. Several local sign manufacturers and construction companies and the USDA Forest Service's Sign Shop in Redding, CA, were contacted so they would be ready to start manufacturing additional signs. Orders were grouped according to the type of sign and material (such as vinyl) used to produce the sign. Orders were rotated among manufacturers to ensure quick production.

Signs were received within 1 or 2 days after orders were placed. The sign teams picked up the signs, delivered them to the incident, and installed them within a few days of their initial visit.

Sign manufacturers and the Redding Sign Shop personnel put in a lot of overtime while providing signs for the incidents. Several companies shipped signs overnight or delivered them to sign teams at meeting points partway to the incident. By the end of August, all incidents were marked with standard signs.

After the 2000 fire season ended, the sign teams and the regional traffic and transportation management engineer reviewed the season's work, including the types of signs that had been ordered and provided to the incidents. Standard messages were developed for the signs. Sign sizes were consolidated to make signs easier to order, manufacture, store, and ship. The group developed a draft incident sign catalog.

The 2001 and 2002 fire seasons saw little fire activity in the Northern Region. The Northern Region's engineering staff easily handled the few incidents that did occur. The draft incident sign catalog was used to determine sign needs at the incidents. Incident management teams became more familiar with the signs that were available or that could be provided for special situations. Additions and changes were made to the draft catalog, further standardizing signs for incident management. This catalog will be available to USDA Forest Service and U.S. Department of the Interior, Bureau of Land Management employees over the USDA Forest Service's internal computer network at: http://fsweb.r1.fs.fed.us/e/signs/signs_index.shtml.

During the 2003 fire season, Montana and northern Idaho had more than 30 major wildland fire incidents. Missoula, MT, where the Northern Region has its headquarters, was surrounded by large fires that threatened local subdivisions and surrounding communities. The traffic safety teams went back into action with members from the Northern and Pacific Northwest Regions. Teams visited each incident several times over the course of 2 months. Some incident facilities were in place for much of that time.

Signing needs changed almost daily. Signing also changed when incident management teams rotated and were replaced by new teams. Some incident teams took the standard signs with them so they would have them at their next assignment.

Additional sign vendors were used in 2003 because of the quantity of signs being ordered. Many of the signs were produced on the same day they were ordered. This extraordinary response from the vendors allowed the traffic safety teams to respond immediately to requests for critical warning signs. Incident management teams appreciated this effort to provide for their safety. The vendors, who responded nearly immediately to the growing number of sign orders, deserve much of the credit.

Safety Issues

Through the course of the 2000 to 2003 fire seasons, several traffic safety issues were identified. They include road signing, road closures, and flagging.

Road Signing—Before standard signs were provided, most traffic signs (including

signs on roads approaching the incident and signs used within the incident facility itself) did not meet even the minimum mandatory requirements of the MUTCD. Improvised signs were made from cardboard boxes and paper plates using felt-tip markers (figure 4).

When teams received a set of MUTCD standard signs (figure 5), the signs tended to stay with the team. In one instance, a Type II Incident Management Team from the Pacific Northwest arrived at an incident with a trailer full of MUTCD standard traffic control signs. When the team demobilized after 14 days, it took the signs home. This left the incident without appropriate signing, even though the incident's traffic and signing needs continued for several weeks after the team left.

Road Closures—Many of the initial road closures related to the incidents were not implemented with proper signs and traffic control devices (figure 6). Persons staffing roadblocks sometimes set up camp in the center of the road they were closing. People sat or stood in front of barricades. Often military vehicles were parked in the middle of the road with no signs installed to warn traffic approaching the vehicle from the rear. Signs were blocked by messages and fire notices.

Many barricades were simple sawhorse structures with no retroreflective signs or markers for night visibility. Others were wire gates with little or no signing. The barricades were not designed to stay upright during the high winds typically found during extreme fire behavior.

Figure 4—Cardboard signs are typical at incident bases.

Figure 5—Standard signs are easier to read at an incident base during the day and especially at night, when much of the base's activity takes place.

Figure 6—Standard signage is important at barricades. Here, notices cover the message explaining the barricade. Another problem illustrated here is that the road guard will have to cross an open lane of traffic to speak to motorists who stop at the barricade.

Flagging—In some situations, individuals with little or inadequate training were flagging traffic on major roads, without the required safety equipment or signs. Flagging is one of the most dangerous temporary traffic control jobs. Construction traffic-control supervisors and flaggers are the workers most likely to become work zone casualties. All personnel working near traffic need to be trained, but training for flaggers should be a priority. The MUTCD, part VI, section 6E-2, states that flaggers should be trained in safe traffic control practices and shall have the proper equipment.

Figure 7 shows a flagger at great risk of being struck by a vehicle because standard safety procedures were not followed. The flagger is not wearing mandatory high-visibility safety apparel as required by the MUTCD. Nomex firefighting clothing is not approved high-visibility safety apparel.

Figure 7—This flagger is not complying with standards established to increase motorists' safety without unnecessarily endangering flaggers.

High-visibility safety apparel is fluorescent orange-red or fluorescent yellow-green background material with retroreflective material that is orange, yellow, white, silver, yellow-green or a fluorescent version of those colors. It is visible for at least 1,000 feet, and it is designed to identify the wearer as a person. The flagger's stop/slow paddle in figure 7 is homemade and does not meet mandatory standards. This paddle is not acceptable!

Stop/slow paddles are at least 18 inches wide, have letters at least 6 inches high, have a *STOP* red background with white letters and border on one side, have a *SLOW* orange background with black letters and border on the other side, are octagonal, and are retroreflective.

Furthermore, the flagger in figure 7 is not using proper flagging technique. The paddle face should be aimed toward road users in a stationary position with the flagger's arm extended horizontally away from the body.

The flagger should not be standing in the lane with moving traffic. Instead, he should be on the other side of the guardrail so he could escape if necessary. The flagger should use a long pole to steady the paddle and provide support when he is holding the paddle out to the side.

All warning signs in figure 7 are behind the flagger. No warning signs are in front of the flagger. Drivers have not been alerted that a flagger is ahead and that they need to be prepared to stop.

Finally, there should be two flaggers—one for each side of the intersection. Most States require that flaggers on State roads be certified. Flagger certification might have prevented some of the unsafe practices shown in figure 7.

Incident Management Traffic Control Projects and Recommendations

National Coordination—The USDA Forest Service is working on several projects to help supply MUTCD-approved signs for all incident management traffic control activities and to help train incident managers in their use.

The USDA Forest Service is coordinating with the American Association of State Highway Transportation Officials (AASHTO), the Western Association of State Highway Transportation Officials (WASHTO), and the U.S. Department of Transportation, Federal Highway Administration (FHWA). National and State agreements are being developed to assure that signs and traffic control devices meeting MUTCD standards are in place on public roads during incident operations as soon as possible.

New incident management traffic sign standards will be incorporated into the 2004 revision of the USDA Forest Service Signing Standards and Guidelines. These standards will be incorporated in a supplement to the MUTCD, with FHWA cooperation.

The Local Technical Assistance Program at Montana State University in Bozeman, MT, has produced the first incident management signing course in cooperation with the USDA Forest Service. This course is available to all local, State, and Federal agencies involved in incident management. For further information on the course, contact Steve Jenkins, director of the Local Technical Assistance Program at Montana State University (406–994–6671, stevenj@coe.montana.edu).

Sign Catalog—An incident sign catalog has been developed with standard and custom messages and with sizes appropriate for most signs needed at incidents, including wildland fires and prescribed burns. The catalog shows standard signs that should be used for marking approach roads, internal camp roads, pedestrian crosswalks, facility locations, or staff offices (figure 8). Sign teams use this catalog when working with

Figure 8—Standard signs for incident offices help incident personnel locate the right trailer or tent at the incident base.

incident personnel to determine an incident's sign needs.

Several of the new sign messages developed for specific incident-related needs include: *INCIDENT BASE, HELIBASE, FIRE TRAFFIC ENTERING ROAD,* and *FIRE ACTIVITY AHEAD*. Blank plates are provided for naming the incident. The incident name can be critical when an area has more than one incident. Work is continuing to make the sign messages appropriate for all types of incidents, not just fires.

Some of the more important and popular road signs are the *DROP POINT* and the *DROP POINTS* signs. Drop points are places where fire personnel and supplies are dropped off or picked up. Traditionally, drop points have been numbered and marked using paper plates, cardboard, or flagging (figure 9). These materials are not visible on high-speed roads, at night, or in smoky air. Such signs also can be confused with local notices in urban areas. Without proper signing of drop points (figure 10), incident personnel can get lost, and supplies can be delayed or delivered to the wrong location.

Figure 9—Vendors and incident personnel need to be able to find drop points, where personnel and supplies are dropped off or picked up. Motorists traveling on Highway 93 outside of Missoula, MT, during the 2003 fire season could not see this pie plate easily.

Figure 10—The standard orange drop point sign helps vendors and incident personnel find the drop point in Upper Miller Creek on the outskirts of Missoula, MT. Standard signs are much easier for motorists to see at night or in smoky air near a wildland fire and are less likely to be obscured by other notices. The paper plate that had first served as a drop point sign was covered with notices.

Hundreds of drop point signs have been delivered to incidents. They have been ordered either with printed drop zone numbers or with blank areas where the number can be filled in with a grease pencil or felt-tip marker. Testing is underway to determine how best to remove marker ink so a sign can be reused for several incidents.

Additional messages are being developed and standardized. These include: *VEHICLE WASH STATION, SAFETY ZONE, HELICOPTER OPERATIONS,* and *FUELING STATIONS.*

Sign Kits for Initial Attack Engines—Typically, USDA Forest Service fire engines are responsible for the initial attack on fires adjacent to public roads. Most of these engines do not carry standard warning signs. These engines need to have rollup sign kits that include warning signs and collapsible tripods. Such kits would allow the crew to set up the signs quickly to warn oncoming traffic that fire engines are working next to roads.

Technology and Development Projects—Three projects affecting signing at incidents have been approved for the USDA Forest Service Technology and Development Program during the 2005 fiscal year: fire cache sign kits, incident base sign installation guides, and flagging and temporary traffic control during roadside fire management activities.

Field Testing of the New Color for Incident Management Signs

The FHWA worked with the Northern and Pacific Northwest Regions to experiment with a proposed new incident sign color.

Incident signs are normally retroreflective orange or fluorescent orange. Orange may not be the most effective color for incident signs. If a wildland fire incident occurs near or in conjunction with an existing highway work zone (figure 11), motorists may be unable to differentiate between incident signs and work zone signs.

Also, motorists may not believe signs in areas where work zone signing has not been faithfully covered or removed before or after a project. Drivers tend to ignore signs when they are left up after an activity has been completed.

Methodology—The 2003 wildland fire season in western Montana provided an opportunity to experiment with the proposed incident sign color, coral (fluorescent pink), and compare it with the standard fluorescent orange color (figure 12).

Figure 11—Coral (fluorescent pink) traffic signs related to incident management are easy to distinguish from orange road construction signs.

Figure 12—Fluorescent orange signs were compared with new fluorescent pink signs in Northern Region field tests during the 2003 fire season.

The USDA Forest Service distributed the following questionnaire to foremen of two engine crews and to incident managers.

1. What color are your signs? ___ Orange ____ Coral
2. In what situation did you use signs? ___ Initial Attack ____ Incident ____ Both
3. Have you used work zone-type warning signs for warning of your engine's activities in the past? If so, please describe the signs and their use.
4. How effective were the signs for warning motorists of your engine's activities?
5. Have you had any positive reaction/comments to your signs?
6. Have you had any negative reaction/comments to your signs?
7. Is there a preference to one color over the other based on your experience?

Signing and Responses—The signs were placed at major wildland fire incidents along U.S. Highways 93 and 200, and Interstate 90 in western Montana. The following fires were involved: Gold1, Cooney Ridge, Big Creek, Black Mountain, and the Fish Creek Complex. Fabric signs were provided to two engine crews for use during the incidents, and questionnaires were provided to the crew foremen.

General comments from all individuals involved with camp management or transportation and deliveries praised the improved signing at the incidents. Most individuals had never worked on an incident that had proper signing before, regardless of the colors used. They appreciated working in a safer environment.

Incident signing was the responsibility of three to five two-person teams who evaluated the need for signing at incidents and ordered and installed the correct signs. Local sign companies made the signs to MUTCD specifications on short notice, usually overnight and sometimes on the same day.

Anecdotal evidence suggests that fluorescent pink signs are very effective. The incident management teams who used them in western Montana took them to their next incidents because they knew they would be unlikely to have such signs otherwise. Signs are not stocked in the fire cache for regular deployment.

Peter Odegard, who retired as the sign coordinator for the Lolo National Forest, observed separate incidents signed with fluorescent orange (the standard color for construction and maintenance signs) and fluorescent pink signs. His observations were that fluorescent pink signs made it much easier to find the incident bases and associated incident locations than orange signs.

"Driver reaction to the fluorescent pink signs was noticeable and incident traffic management was easier and safer. Wildfire activities are so unpredictable and in [such] remote locations that travel to these camps can be very confusing and often results in drivers being lost or confused, leading to potentially erratic operator behavior. Vehicle operators will notice the fluorescent pink signs and actually read the messages, making it easier for operators to get to the incident locations more efficiently and safely." Odegard said.

Doug Mueller, maintenance chief for the Montana Department of Transportation, is responsible for approving all signing used on Montana highways in the Missoula area. He believes that having a separate color for emergency incidents is a good idea.

"Having good, adequate, appropriate signing really increases the level of safety on the roadway for both the traveling public and the traffic associated with the incident," Mueller said.

Gary "Stan" Benes, Deputy Forest Supervisor on the Custer National Forest, was the incident commander for a number of 2003 wildland fire incidents, including the Fish Creek and Cathedral Fires. Benes believes that "good professional-looking signs significantly increase safety." He did not have firsthand experience with coral signs, but felt confident that the use of a "good, highly visible, reflective sign, different from the standard road construction orange, would be a very positive step toward safer incident signing." He also said that having good, professional signs elicits only positive comments from the public, while handwritten signs on paper plates and cardboard elicits only negative responses.

Kathy McAllister, Deputy Regional Forester for the Northern Region, said: "Complete, appropriate, professional signing is a necessary part of incident operations. This year, because of the magnitude of the wildfires, it was critical to have really good signing." McAllister didn't feel that color was as important as the consistency, visibility, and placement of the signs. "Good signing early in the incident is very important to the early operations," she said. Incident signs appear to be most effective where regulatory speed signs and police monitoring are used.

Sign Color Recommendation—Based on the information gathered from participants in wildland fire incidents near Missoula, MT, the USDA Forest Service recommended that the FHWA designate coral as the national standard color for incident management. The color was officially recognized as an optional color for incident management signing in chapter 6 of the 2003 MUTCD.

Other Recommendations

Emergency Sign Plans—Forests should develop emergency sign plans for sites that are frequently used for incident management. There are several major benefits:

- Signs could be stored at the site and installed before the incident team arrives, to help team members find the site.
- Sign locations can be predetermined and underground cable located before an incident occurs.
- Sign mounts, such as polyvinyl chloride pipe, can be installed in the ground in advance.
- Sign posts can be dropped in and bolted when needed and removed easily at the end of the incident.
- Unsafe intersections—those with limited sight distance, inadequate turning radius, located on curves, and so forth—can be redesigned or relocated to assure maximum safety at all sites.

Training—Training needs to be incorporated at the appropriate levels in the engineering and fire organizations.

Potential Benefits

These projects and recommendations will have major impacts on temporary traffic control zones related to incident traffic management. They will improve employee and public safety and reduce property damage, injuries, and fatalities from collisions and other accidents. Also, their use will result in USDA Forest Service compliance with regulations and policy contained in the MUTCD and USDA Forest Service regulations.

Cost of Construction Materials Soaring

—Bob Harmon, transportation engineer, Southern Region

The construction industry is reeling from the dramatic increase in the cost of steel. Prices started to climb in the fourth quarter of 2003 after they had been relatively flat earlier in 2003. Prices rose dramatically, by 40 to 60 percent, from December 2003 through March 2004.

Steel is used in many facets of construction, including building construction (structural framing, piping, ductwork, and other applications), bridge construction (girders, rebars, and fasteners) and road construction (guardrails, culverts, and other applications). For many years, the United States was the largest producer of steel in the world and was able to use the world's excess steel production. Over the past 15 years, China climbed from being the fifth-largest world steel producer to being the largest consumer and manufacturer in 2003.

The following factors are contributing to the dramatic cost increases for steel:

- Iron ore deposits in the Pittsburgh, PA, and Birmingham, AL, regions are nearly depleted.
- Some ore deposits exist in the Lake Superior region of the United States and in West Virginia, but these resources are expensive to develop.
- Available coke resources, used in steel production, have been significantly reduced due to regulations restricting environmental emissions. As a result, the United States is forced to buy raw materials on the world market.
- The U.S. steel industry has been operating with old technology and has been saddled with high retiree costs. Since 1999, 46 U.S. steel companies have filed for bankruptcy.
- China has long-term contracts with the three largest ore producers (Spain, Australia, and Brazil). To expand steel production, China has subsidized steel production to expand the production capacity.
- The U.S. dollar is currently weak against some forms of foreign currency, such as the euro and the pound.

Effects on the Construction Industry

Steel suppliers and fabricators, faced with higher prices imposed by steel producers, are passing the price increases on to contractors, who are passing the increases on to project owners. Price quotes of 30 days or less are common.

Many steel suppliers are requiring escalation clauses of 4 to 6 percent in their contracts and some suppliers are demanding (and getting) open-ended escalation clauses. The recent sharp increases in steel prices also have forced many steel suppliers, fabricators, and contractors into bankruptcy.

Future Predictions

Industry analysts believe that steel pricing will follow cyclic trends of the past. John Anton of *Global Insight* expects the cyclical increase to abate in late 2004. However, steel prices will remain higher (figures 1, 2, and 3) than in the past.

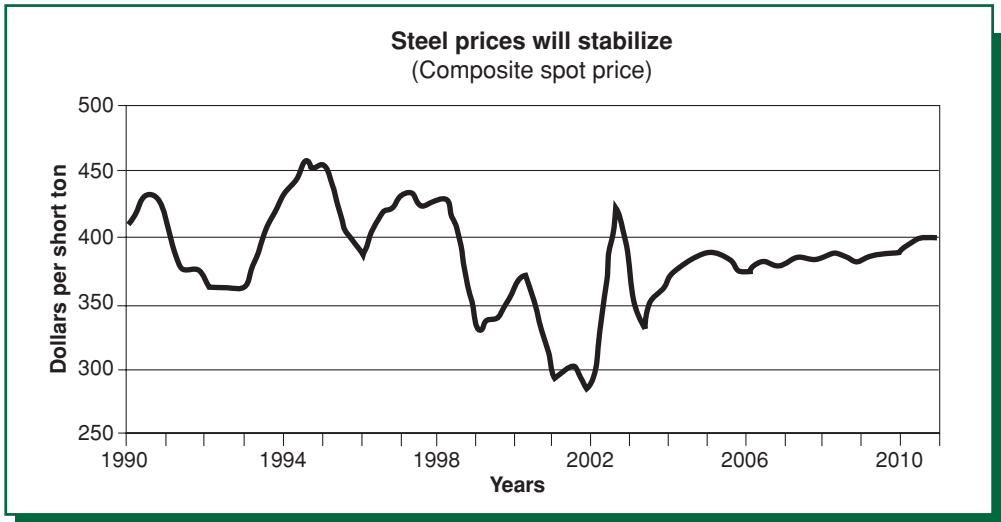

Figure 1—U.S. Steel Prices Rising as Consolidation Aids Market Discipline.—*Global Insight Perspectives, John Anton.*

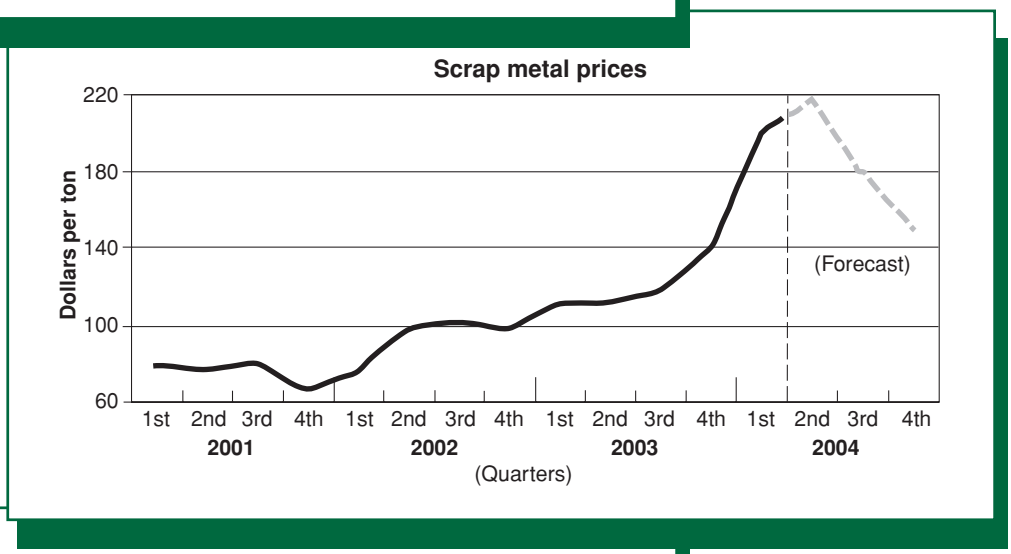

Figure 2—Spot Price of Steel Scrap, No. 1 Heavy Melt, Three-City Average.—*Global Insights, Inc., in Engineering News Record, March 22, 2004.*

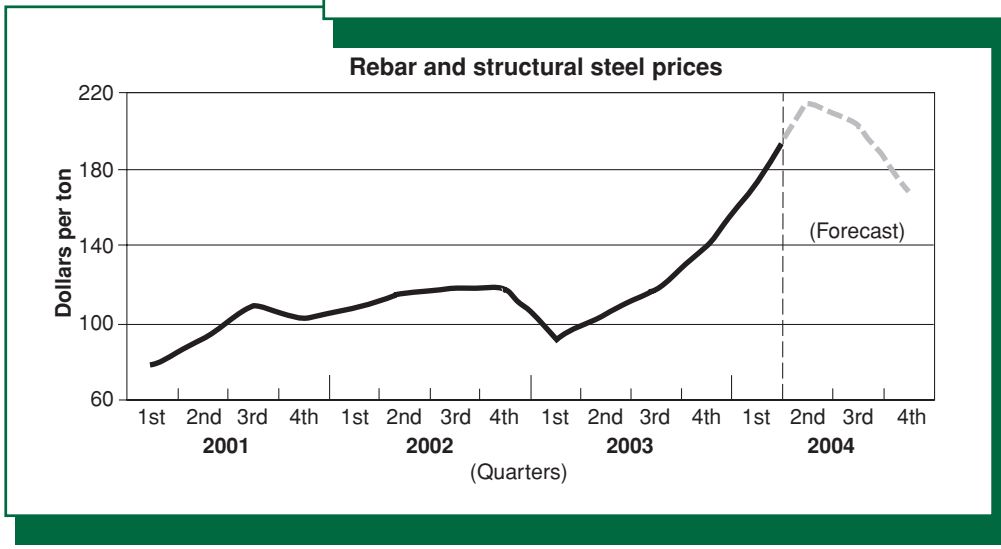

Figure 3—Composite Price of All Long Products.—*Global Insights, Inc., in Engineering News Record, March 22, 2004.*

Costs of Other Construction Materials

Strong market demands are also causing increased costs of other construction materials such as lumber, plywood, cement, copper, insulation, and gypsum products (drywall). Reduced oil production by the Organization of the Petroleum Exporting Countries (OPEC) is increasing the cost of crude oil, which affects the cost of asphalt and other petrochemical products, as well as transportation-related costs of all construction materials.

Effects on USDA Forest Service Construction Projects

The USDA Forest Service will not escape the effect of sharply rising costs of construction materials. Accurately estimating material costs will be nearly impossible for the next year or so. When material costs do settle down, expect higher costs. It's important to check with material suppliers for current pricing and availability rather than relying on past contract bids or regional cost guides. When using commercially available cost estimating guides, check with representatives or Web sites for the latest updates. Construction projects currently under contract may also experience some problems as contractors encounter difficulties in locating available materials and in coping with escalating costs and delays in deliveries.

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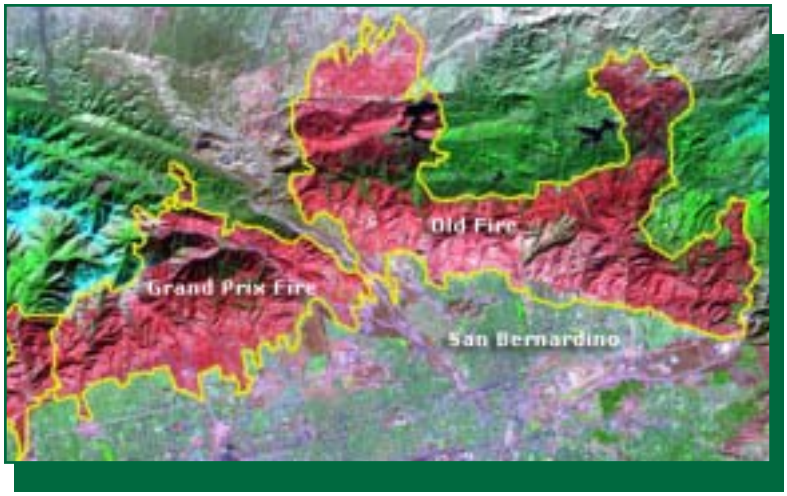
RSAC Receives Prestigious Awards

—Jess Clark, remote sensing/GIS specialist; and Keith Lannom, operations program leader, Remote Sensing Applications Center, Salt Lake City, UT

The USDA Forest Service Remote Sensing Applications Center (RSAC), a National Service Center of the Washington Office Engineering unit, earned the 2003 Forest Service Chief's Award for Internal Technology Transfer. RSAC was recognized "For excellent support of the Burned Area Emergency Response (BAER) program through the development and integration of remote sensing technologies for post-fire mapping and analysis." In March 2004, RSAC also received the "Excellence in Rehabilitation and Restoration" group award from the Department of the Interior and USDA Forest Service's National Fire Plan organization.

RSAC provides remotely sensed imagery and burned area reflectance classification (BARC) data to BAER teams so they can develop a burn severity map, identify values at risk, and set priorities for rehabilitation treatment areas. The BARC data and other geospatial technologies help the BAER team develop rehabilitation and restoration plans more rapidly and to perform much of their postfire analysis in an office environment. Consequently, operations are less expensive and markedly safer. The team spends less time gathering extensive amounts of field data by flying in smoky conditions over the burned area or by hiking through acres of burnt snags.

RSAC began supporting Forest Service BAER teams during the 2001 fire season. Since the program's inception, RSAC has supported 142 BAER teams in 15 States by mapping more than 4.6 million acres of burned areas. The fires ranged in size from a few thousand acres to the nearly half-million-acre 2002 Biscuit Fire in southwestern Oregon. RSAC continues to provide image and technical support to BAER teams in their efforts to produce the burn severity map.



Satellite imagery of the Grand Prix and Old Fires near San Bernardino, CA, shows the wildfires' proximity to large urban populations. In the fall of 2003, many of the more than 700,000 burned acres were close to large populations, generating a critical need for Burned Area Emergency Response (BAER) teams.

2003 Forest Service Engineer of the Year Awards

Congratulations to the following winners of the 2003 Engineer of the Year awards:

- Managerial Engineer William G. Schleining, Black Hills National Forest, Custer, SD.
- Technical Engineer Stephen D. Sichau, Pacific Northwest (R6) Regional Office, Portland, OR.
- Engineering Technician Joseph D. Fleming, San Dimas Technology and Development Center, San Dimas, CA
- Engineering Applications employee Robert A. Gubernick, Tongass National Forest, Petersburg, AK.

The winners, selected from a list of excellent candidates, were honored at the U.S. Department of Agriculture (USDA) 2003 Forest Service Engineer of the Year award luncheon in the Secretary of Agriculture's Dining Room in Washington, DC. On April 5, 2004, National Forest System Associate Deputy Chief Gloria Manning of the USDA Forest Service welcomed the winners and applauded their achievements. The winners' families also attended the ceremony. Director of Engineering Vaughn Stokes presented a special plaque and cash award to each winner, commending them for their outstanding contributions. A summary of the winners' accomplishments appears on the following pages.

Congratulations to the regional candidates for the 2003 USDA Forest Service Engineer of the Year awards. The finalists in all categories included:

2003 Engineer of the Year Awards	
Managerial	Paul Stantus, R1; Lou Leibbrand, R3; Doug Macdonald, R6; William Speer, R8; Randall Biller, R9; Brian Goettler, R10; and Alan Yamada, SDTDC
Technical Engineering	Brenda Christensen, R1; Michael Lane, R2; Eli Curiel, R3; James Madron, R5; Dave Kissel and Lois Mamak, R9; and Bill Crane, SDTDC
Technician	Terry Morton, R1; Ernest Nauman, Jr., R2; Carol Linn, R3; Rodd Kubitza and Terry J. Terry, R6; and Anthony Wilson, R8
Engineering Applications	Philip Sjursen, R1; Candace Bogart, R3; James Pace, R8; Midewin Demo Team, R9; and Dexter Meadows, SDTDC

William G. Schleining, 2003 Managerial Engineer of the Year

William G. Schleining was the engineering/lands/recreation/heritage/minerals staff officer with the Black Hills National Forest staff in the Rocky Mountain Region (R2). Bill spent his entire professional career working for the Black Hills National Forest in Custer, SD. He retired in January 2004. Throughout his 33 years of service, Bill dedicated himself to helping coworkers rise to their full potential. He excelled at harnessing individuals' skills and abilities to achieve the USDA Forest Service's long-term goals. As a result, he was instrumental in developing an engineering program that supports an annual timber program of 70 million board feet, a $2.5 million roads program, and a facilities improvement and deferred maintenance program that has averaged $2 million annually for several years.

William G. Schleining, 2003 Managerial Engineer of the Year

Bill's USDA Forest Service career began as a laborer on the construction and maintenance crew. After earning bachelor's and master's degrees in civil engineering at the South Dakota School of Mines and Technology, he returned to the USDA Forest Service. His engineering career includes experience in roads, facilities, hazardous waste, minerals, surveying and landlines, water and wastewater systems, and campground development. From 1999 until 2003, Bill led a staff of 41, including 32 engineers and technicians. He was a member of the Forest Leadership Team and routinely served as the acting forest supervisor.

Bill was instrumental in developing and executing a long-range plan for consolidating district offices, including construction of new office buildings. He helped draft legislation to authorize the sale of excess buildings to fund a portion of the construction costs for consolidated facilities. He completed acquisition of land and contracted for fast-track design of the Mystic District Office buildings.

The region directed additional long-range planning toward developing a recreation strategy. Bill led the effort for future development and capital improvement with an emphasis on sustainable development and service to the public.

Bill was a key supporter on the Forest Leadership Team for increasing tribal consultation and for a cost-share partnership with four tribal governments in South Dakota to support a Tribal Youth Conservation Corps Program.

He helped establish the Black Hills National Forest as the regional leader in responding to compliance issues regarding special-use recreation residence evaluations. He was also instrumental in drafting a supplement to standardize special uses administration.

Bill fostered professional development for the forest's engineering staff, initiating recruitment efforts at area universities and vocational/technical schools and with other agencies and private firms. These efforts resulted in placing several high-quality entry-level candidates. Bill's support of the Cooperative Education Program landed several program candidates in leadership positions on other forests. These individuals' fresh perspectives and unique experiences created a more professional, diverse, highly productive engineering organization.

As manager of the largest engineering program in the Rocky Mountain Region, Bill encouraged his employees to pursue professional registration. Six were registered

as professional engineers and four as land surveyors. Bill is a registered engineer in the State of South Dakota. All of the young engineers have passed the Engineer-in-Training exam and are continuing their professional development.

During his career, Bill fostered staff training to take advantage of technological advances. He dedicated key staff positions to managing new technologies, including software programs such as AutoCAD, Infra, ArcView, Lumberjack, and RoadEng. Bill's ability to lead discussions, to understand the needs of every resource involved in the project, to consider unique and varied aspects of projects, and to develop innovative well-integrated solutions to meet the full range of resources proved invaluable in training his staff. As an advocate for continually monitoring and improving employee morale, Bill provided timely and positive job performance review, and actively supported career enhancement through training or career advancement opportunities.

His extensive knowledge of procurement regulations and strategies helped Bill achieve cost-effective streamlined contracting and procurement of services, supplies, and construction contracts. He and his staff used Indefinite Delivery Indefinite Quantity (IDIQ) contracts, additive bid items, requests for proposals, and other tools effectively.

Bill was known for his timely review of issues and documents and thorough sharing of information. He set the example and strongly encouraged his staff to keep communication flowing. For example, he kept employees thoroughly informed of the process and significant data collection and analysis steps during the Competitive Sourcing Maintenance Studies.

An exceptionally good relationship with the South Dakota Department of Transportation helped Bill to resolve a long-standing difference of opinion with a county road department. He implemented regular meetings to resolve mutual issues and problems as they arose. Cooperation with these organizations is imperative for providing a seamless transportation system, fire suppression, public safety, and landowner and visitor access.

His relationships with the South Dakota Department of Game, Fish, and Parks in developing the 114-mile Mickelson Trail Rails-To-Trails project enabled forest engineering staff to improve skills in bridge design and trail construction and maintenance. These individuals also advised other rails-to-trails project teams. Bill guided final resolution of rights-of-way and land management issues along the trail.

Bill also had a pivotal role in the forest's land consolidation program. He led staff in working closely with Rocky Mountain Elk Foundation and The Nature Conservancy to identify and acquire key parcels of land within the forest's boundary. He recently directed a large acquisition of properties owned by Homestake Mining Company.

His leadership skills also encompassed community roles. Bill has served as Chief of the Custer Volunteer Fire Department and as Director for Custer All Drug, a drug and alcohol education program. He also served as President of the Rocky Knolls Golf Association.

William G. Schleining affirmed repeatedly that the greatest asset of an organization is its people. He leaves a cadre of well-trained USDA Forest Service employees to continue his efforts.

Stephen D. Sichau, 2003 Technical Engineer of the Year

Stephen D. Sichau is the regional electrical engineer for the Pacific Northwest Region (R6) in Portland, OR. Steve is known for his ability to distill his knowledge and experience into practical engineering guidance, especially in the realms of electrical design, operation and maintenance, and water and wastewater systems. He strives unceasingly to equip the wide variety of engineers throughout the USDA Forest Service with access to new and effective technology and tools. He offers his troubleshooting expertise to resolve urgent problems 365 days a year.

Technical Engineer of the Year for 2003, Stephen D. Sichau.

From 1998 to 2000, Steve served on a national workgroup to oversee and administer the Year 2000 conversion analysis for all potentially affected systems and equipment. Under tight time constraints, he developed and administered the contract and led the selection team for the consultant for assessments and corrections to control systems that were adopted nationally. He was recognized as a national expert during the Year 2000 assessments, both for his technical ability and practical approach to the process. He received the Presidential Award for the Year 2000 conversion project.

His national awards include a special performance award for involvement and extra effort with the environmental engineering group in troubleshooting for water and wastewater control systems and training operators in engineering in 2002, an award for supplying technical assistance in developing specifications for Global Information System (GIS) hardware and Local Area Network (LAN) technology advice for the geometronics group leader, and an award for developing computer-aided drafting and design use in facility designs in 1987.

At the regional level, Steve was recognized for his outstanding contributions to planning and implementing the regional office's relocation in 1992, as Pacific Northwest Region Technical Engineer of the Year in 1994, and for negotiating a direct graphics communication linkage to the University of California to develop a spatial disaggregation model for forest planning in 1990. Steve earned a 1988 cash award for outstanding customer service to the Oregon Department of Education.

Steve also received formal recognition from the Job Corps director in 1990 for technical assistance in specifications, timely service, and exceptional assistance in completing a Job Corps dining hall electrical design.

Numerous phone messages and written expressions of gratitude chronicle his timely responses to critical problems. He was commended for:

- Developing a temporary solution to maintain temperature control in a seed storage facility after a fire destroyed a nursery building and power supply
- Solving a water system failure which had temporarily shut down a major visitor center
- Providing a recommendation to correct a safety hazard (generator wiring) and to get the system running
- Keeping the electrical engineering Web site up-to-date with current information and easily understood drawings
- Outstanding willingness to share information and answer questions

Time and time again, Steve has demonstrated his ability to master cutting-edge technology, especially in the realms of electrical controls and computer technology. For example, he used stainless steel submersible level (pressure) transducers and set point controllers to monitor water levels and control pumping cycles in water storage tanks. The transducer eliminates the need for float switches containing mercury that could harm water quality.

After alerting the Oregon Department of Environmental Quality that its sewage lift station requirements did not meet the National Electrical Code, Steve provided information and assistance to help the department revise its design requirements. He also worked with the State electrical inspector to help define the hazards associated with electrical wiring in wet wells.

In 1983, Steve wrote a 600-page manual, *Electrical Design, Operation and Maintenance*, that included information on a wide variety of electrical engineering topics commonly found in USDA Forest Service facilities. This reference for project

design, operations, and maintenance of systems was tailored to civil engineers with a limited knowledge of electrical systems. Steve revised this manual in 2002 and prepared and posted an electronic version (http://www.fs.fed.us/database/acad/elec/greenbook/greenbook.htm) on the USDA Forest Service's Internet Web site.

In 2003, Steve wrote a second manual, *Control Systems Operation: Maintenance and Reference Manual for Water and Wastewater Systems,* for systems operators. It includes design tables, cut sheets, photographs, specifications, vendor lists, and a troubleshooting guide.

In coordination with the Oregon Department of Environmental Quality and the State electrical inspector, Steve developed standards for designing sewage pump stations in accordance with the National Fire Protection Association 820 standard for fire protection in wastewater treatment and collection facilities and with State wastewater disposal requirements.

Steve initiated use of computer-assisted drawings (CAD) in the Pacific Northwest Region during 1986 when he administered a $375,000 contract to convert the region's standard engineering paper drawings into electronic versions, and establishing the CAD regional library. He developed regional CAD drawing standards for all disciplines, including roads, trails, recreation development, and mechanical, electrical, and civil engineering. Steve transferred the entire CAD library to the Internet in 1995. Engineers from around the world access the library.

Another pioneering effort was Steve's development of the first USDA Forest Service engineering Web site, which is heavily used by USDA Forest Service engineers. He continues to maintain this site and his electrical engineering Web site (http://www.fs.fed.us/database/acad/elec/electrical.htm), which contains software he created for electrical design analysis, construction inspection, condition surveys, and operation and maintenance assistance.

Steve established and maintains a library of all regional office project designs from 1972 to the present. He converted drawings created before 1972 to Autocad, indexed all the drawings, and placed them on the Intranet to allow field engineers remote access.

Steve developed the Pacific Northwest Region standards for installing wiring and protection systems for the Data General and IBM system computers, including computer rooms and building wiring associated with computer installations. Many other regions now employ these standards.

In conjunction with electrical engineers from the Intermountain and Eastern regions, Steve developed the first national policy direction for electrical engineering standards in the USDA Forest Service *Electrical Engineering Manual*, FSM 7600, in 1995.

To provide emergency troubleshooting coverage on water and wastewater system controls, Steve voluntarily obtained a pager and a cell phone, allowing him to be reached after office hours, 365 days a year. He often diagnoses problems over the phone and talks operators through procedures to get systems running. His dedication and troubleshooting skills have eliminated many safety problems and saved tens of thousands of dollars in repair costs.

Patience, understanding, and encouragement characterize Steve's approach to training students and new employees, some with diverse backgrounds. He participates in several annual sessions to train operation and maintenance personnel in facilities, drinking water systems, and wastewater treatment plants. Steve works to ensure that all regional operations and maintenance people have the tools to do their jobs efficiently. He handles operator training in electrical safety, control system condition surveys, reading electrical control panel diagrams, and troubleshooting, isolating, and correcting problems.

Steve was a member of the design team for the $22 million Coldwater-Johnston Ridge Observatory visitor complex at the Mount St. Helens National Volcanic Monument from 1990 through 1995. The $4 million, 25-mile, 25,000-volt buried power line is the longest of its kind in North America. Many of the animated display controls and the automated building control systems in this world-class, state-of-the-art facility are direct results of Steve's ingenuity and guidance. A 1993 special performance award recognized his expertise in the planning, design, and inspection of the visitor center complex.

The design and construction of the $2 million, state-of-the-art, Multnomah Falls Wastewater Treatment Plant in the Columbia River Gorge National Scenic Area was another project in which Steve played a key role. The plant meets the Oregon Department of Environmental Quality discharge requirements and serves as a treatment plant prototype.

Steve is the primary reviewer of the $2.3 million Quinault Sewage Treatment Plant project on the Olympic National Forest, one of the largest treatment plants in R6. The contractor relied heavily on Steve for designing the electrical control systems.

In his community, Steve has devoted much of his time to the Boy Scouts of America. For more than 12 years as assistant scoutmaster of one of the largest troops in the Portland, OR, area, Steve provided logistical support for outings, a computer donation and training effort, newsletter production, a database roster, and many other functions. He accompanied scouts on as many as 30 overnight trips in 1 year. As a member of the Cascade Pacific Council facilities committee, Steve produced as-built drawings and electrical condition surveys and corrected serious electrical violations at many scout camps in the Pacific Northwest.

Steve organized a scouting exchange program with a military youth group in eastern Russia. He accompanied the troop to Russia and helped establish an ongoing program for Russian students to visit the United States.

To satisfy his intellectual curiosity, Steve attends schools sponsored by vendors and voraciously reads trade journals and research documents on the Internet. He freely shares computer innovations and new technology with his colleagues and has written articles for professional journals.

Stephen D. Sichau continues to earn the respect of his peers inside and outside the USDA Forest Service by striving to share practical engineering guidance, improve project quality, and respond thoroughly, effectively, and quickly to requests for assistance with electrical design, operation and maintenance, and water and wastewater systems.

Joseph D. Fleming, 2003 Engineering Technician of the Year

Joseph D. Fleming is a mechanical engineering technician for the San Dimas Technology and Development Center (SDTDC), San Dimas, CA. Joe's many awards testify to his long history of innovative engineering designs that are widely used throughout USDA Forest Service programs:

Engineering Technician of the Year for 2003, Joseph D. Fleming stands by the patented hose winding device he designed and built. The device helps fire crews wind fire hose.

- Extra effort award (2002) for the Burned Area Emergency Response project on the Prescott National Forest. Joe suggested using a whole tree chipper to apply ground cover using native materials. The project used a test site where fire had ravaged a pine forest. Silt fences captured runoff from four adjacent test plots where wood chips were compared to straw mulch, palletized straw, and an untreated control plot. The forest leadership also wanted to chip the remaining 15 acres to protect the watershed that provides residential water in the area. Joe traveled to and from Prescott weekly to keep the equipment running through the weekends. The project was completed on time. So far, results from the test plots indicate that chipping can be an effective, economical alternative to straw mulch.
- Spot award (2002) for extra effort in facilitating completion of tests for a wye valve that was critically needed by the National Interagency Cache Center.
- Extra effort award (1998) for developing a new air purification system for central tire inflation systems. Joe also provided technical expertise for high-level personnel at

the General Services Administration so trucks equipped with central tire inflation systems could be available under the standard contract.

- Special act (1994) for assistance developing hardware that facilitated implementation of laser survey technology. Joe designed and built portable reflector targets with strobe lights to assist surveyors in sighting targets.
- Special act (1992) for assistance to the SDTDC roads program for providing outstanding support on the Commensurate Share/Environment Effects field studies in the Pacific Northwest Region, including repair and maintenance of large trucks used in the test, and driving a log truck day after day in adverse conditions for 2 months without returning home.
- Cash award (1990) for superior performance supporting all SDTDC programs. Joe was instrumental in developing a central tire inflation system with internal-drive axle seals. He gave professional system demonstrations at equipment shows throughout the Western United States and assisted with video production, while keeping project work running, organized, and on schedule.

Joe first demonstrated his technical engineering ability on USDA Forest Service projects in 1982 while working for Foster Miller, Inc., a private engineering company. While there, Joe worked independently to design an anchor for yarding equipment guy lines. At that time, tree stumps were used as anchors. His design was the simplest, most reliable, most economical, and handled the largest loads most consistently.

Leadership comes naturally to Joe as he initiates project solutions, interfaces with other disciplines, staffs, and external groups, and shares his knowledge and skills with all interested parties. He communicates regularly with all levels of the USDA Forest Service, routinely providing technical project support and hands-on training to demonstrate and implement new technologies.

Some additional accomplishments include:

- Patented hose-winding device (2003). U.S. Patent No. 6,622,957. Joe designed and built an innovative hose-winding device with an easy, reliable release mechanism that allows the hose to be removed after winding (photo).
- Fire hose jacket adhesion test fixture (2003). Working from verbal instructions, Joe designed and fabricated an improved test fixture for fire hose jackets.
- Osborne Firefinder (2002 to 2003). Joe worked with a private tooling company to create new casting patterns and parts for replicas of the firefinder most commonly used in fire lookouts. The firefinder had been out of production for more than 20 years.
- Backpack archeology screen (2002). Joe designed and fabricated a portable archeologist's screen that can be collapsed to fit in a backpack.
- Repair and improvement of central tire inflation systems. As the project leader for correcting deficiencies in preproduction prototype systems that were installed on heavy USDA Forest Service fleet vehicles, Joe coordinated work with forests throughout the United States and with manufacturers to provide and implement solutions. Several of his innovations provided a cleaner, more reliable air system.

- Development of an improved fire retardant mixing system. Joe assisted with developing, testing, delivering, installing, and training for a high-shear mixing system installed at the West Yellowstone Airtanker base in 1999. After five successful fire seasons, the prototype is now the model for future fire retardant mixers. The fire management staff required a nonproprietary fire retardant mixing system capable of mixing all known commercially manufactured and anticipated new products for use at airtanker bases.
- Log-load accountability strapping system. Joe worked with an engineering firm to meet a forest management staff request for an economical alternative to log branding and painting that would provide accountability for logs harvested from national forest lands. Together, they developed a sealed strap adjusting mechanism to provide adequate tension around the load that could be retensioned enroute and could not be released until the load was ready to be scaled. The Intermountain and Pacific Northwest Regions are currently using the mechanism.
- Remotely activated structure protection pump (2001). Joe developed this pump technology, which has been deployed on several fires. A private company will produce similar systems based on Joe's prototypes.
- Portable noxious-weed wash system. Joe worked with environmental consultants and water treatment system manufacturers to develop and test a prototype lightweight, affordable, portable wash system suitable for road engineering, recreation construction, and firefighting applications. The Williams, AZ, prototype was successfully tested in August 2003 and awaits further field testing.
- Pump endurance test lab (1999). Joe led an effort to restore and upgrade the fire pump endurance test lab at SDTDC. The lab is used regularly now.
- Expanding-axle utility trailer (1997). Joe designed and built a two-position axle for utility trailers. The axle could be shortened so that the trailer's width was narrow enough for trail work or lengthened so that the track width was wide enough for stability. The axle was developed for trailers used to transport archeologists' hardware to remote locations.
- High-volume air drying system (1996). Joe contributed heavily to developing a successful, effective air-drying system for trucks with high-volume air systems.
- Testing a locomotive spark arrester (2002). To meet the requirements of the Maine Department of Conservation, Joe prepared hardware (often creating parts from scratch) and procedures for performing a "hot" test of a locomotive spark arrester in accordance with established standards. Based on the test results, the spark arrester's substandard performance was determined to be the cause of several fires over the previous 2 years. It has been replaced with a compliant arrester.

Over the past 10 years, Joe has worked with other members of the American Bikers Aimed Toward Education of California, a motorcyclist organization that sponsors charity rides throughout the year, to plan, promote, and administer events that provide underprivileged children with toys for Christmas and needy families with food. He also participates in similar events run by other chapters and organizations.

Joseph D. Fleming's long history of contributions to technical engineering breakthroughs has earned the respect of his coworkers and peers within the USDA Forest Service, with other agencies, and throughout the private sector.

Robert A. Gubernick, 2003 Engineering Applications Employee of the Year

Robert A. Gubernick is the Alaska Region (R10) engineering geologist responsible for the Tongass National Forest Aquatic Organism Passage program in Petersburg, AK. With more than 20 years of USDA Forest Service experience, Bob is a premier fish passage design specialist. He applies sound engineering and effective contracting to achieve state-of-the-art fish passage design while he continues to refine and communicate his knowledge and skills to engineers and biologists throughout the USDA Forest Service and to external agencies.

Engineering Application Employee of the Year for 2003, Bob Gubernick (right) and a contractor prepare to work on fish passage design in Alaska's Chugach and Tongass National Forests.

In January 2001, Bob assisted with the organization and presentation of a Water/Road Interaction workshop, sponsored by the hydrology and engineering staffs of the Alaska Region and the San Dimas Technology and Development Center. He helped develop and disseminate the Fish-Xing software. Bob strives to equip every engineer on the Tongass National Forest staff, and others, to use the software for sound culvert design. The center gave him a cash award for his efforts.

Bob was asked to participate in the San Dimas center's aquatic organism passage project, which included writing a national USDA Forest Service fish passage crossing manual. His work with the center produced a state-of-the-art method for culvert design to provide passage for fish.

Efforts by Bob to incorporate research and experience into this standard have generated overwhelming acceptance of the Tongass National Forest fish passage protocols within the Alaska region, throughout the USDA Forest Service, and by agency partners and cooperators. He also was instrumental in developing the Alaska Region's unified approach to the design and construction of fish crossing structures. In cooperation with fish biologists and engineers from the USDA Forest Service and the Alaska Department of Fish and Game, Bob worked to negotiate the objectives of the Title 16 concurrence required for installing stream-crossing structures for road construction and reconstruction. He also continues to work with the Pacific Northwest Research Station on habitat valuation criteria.

Bob receives high praise for sharing his fish passage expertise throughout the USDA Forest Service. The fish passage improvement projects have included:

- Analysis of the road condition survey data to determine how to identify crossings that need improvement.
- Working with fish biologists and engineers to develop economically viable crossing structures. To best use deferred maintenance money dedicated to project construction, Bob developed a contract that provided biologists to perform upstream habitat assessments.
- Planning Alaska Region annual projects to support and track accomplishments of a $2-million-per-year fish passage improvement program. About 50 sites per year are designed and constructed across the Tongass National Forest.
- Developing contracts in various survey/design/build combinations that are crucial to accomplishing the program of work. Bob is also training architectural engineering firms in developing and implementing fish passage design.
- Serving as designer of record and COR (Contracting Officer's Representative) for riverbank stabilization projects, and as designer/COR on numerous bridge replacement projects.
- Training USDA Forest Service engineers at the forest and district level to design and install fish passage structures that meet design requirements.
- Serving as engineering liaison to external agencies on geomorphic, geologic, and hydrologic assessments for roads, all hydraulic engineering, fish passage, and channel restoration projects, and remote sensing issues. The Alaska Department of Fish and Game and the U.S. Department of the Interior, Fish and Wildlife Service and Bureau of Indian Affairs, rely on Bob for technical support and review on the proposed Alaska Department of Transportation (DOT) fish passage project.

Bob assisted in developing the National Inventory and Assessment Protocol, served as lead technical member in the development of the stream simulation design guide (under development), and lectured all over the country about fish passage at USDA Forest Service and external agency-sponsored workshops. He is the primary author of the geomorphic assessment chapter of the *Stream Simulation Design and Site Assessment Guidelines* and coauthor of other sections.

Throughout Alaska, Bob has worked as a geologist and project/design engineer for the Tongass and Chugach National Forests. He has administered contracts on trail, bridge, and channel restoration projects.

Bob provided technical assistance in many remote Alaskan sites for large and costly (from $2 to $7 million) construction projects, reducing cost overruns and claims by implementing sound engineering techniques and effective contract administration. Bob developed the methodology/equation on calculating the fish passage flow for southeastern Alaska that is used by the Alaska DOT and the Department of Natural Resources Habitat Division. He helped craft the memorandums of understanding between agencies.

For the last 3 years, Bob has managed and served as the COR for the $2.5 million contract for the acquisition, processing, and development of products from Lidar, a laser-based sensor used to collect extensive (more than 1,300 square miles) data on spatial ground elevations and structural forest characteristics of the Tongass National Forest. In conjunction with forest and regional office specialists and vendors (URS Corp. and Spectrum Mapping), Bob and his associates have overcome many technical obstacles. Bob developed the methodology to define road prisms using the Lidar data. He developed training for forest and regional personnel on using and applying Lidar data for timber sale layout, karst delineation studies, and more recently for forest highway preliminary design work. He teaches Lidar applications along with URS Corp. instructors.

Bob is a member of the forest and interagency technical team that is assessing the impacts of potential closure of the Hubbard Glacier and its effects on the Situk River and the city of Yakutat. Bob collected and assessed Lidar data in the area, pursued geophysical investigation on the terminal moraine, and worked with the State of Alaska on the flood plain assessment.

Although Bob grew up in Brooklyn, NY, and Trenton, NJ, he developed a passion for outdoor activities—hunting, trapping, and fishing—and a fascination for remote places in Alaska and the Western United States. From 1988 to 1995, he was a part-time sport fishing guide and a commercial fisherman for halibut and salmon on weekends and during vacations, using his own 36-foot commercial fishing boat.

For many years, Bob has taught rifle safety, trapping, and outdoor survival skills to local youth. He had a stint as a disc jockey at a local public radio station and even did a father and son show.

Bob received a bachelor's degree in geology from Utah State University in 1983. During 1996 and 1997, he spent a year working with the Pacific Northwest Research Station while conducting graduate research in geomorphology and remote sensing at the University of Washington. His research focused on monitoring a management-induced landslide propagating through the North Fork of the Bradfield River in central southeast Alaska. The study used time-series analysis and analytical photogrammetry to measure morphologic changes in the river to determine sediment slug position.

Bob is a registered geologist in the state of Washington and is working to become registered in Alaska.

Robert A. Gubernick has made long-lasting contributions to achieving state-of-the-art fish passage design through applying sound engineering, mastering technological innovations, practicing effective contract administration, and sharing those concepts and practical applications with engineers and biologists throughout the USDA Forest Service and external agencies.

2003 Engineering Field Notes Article Award Nominations

Thank you to our authors and readers for helping us pioneer an electronic *Engineering Field Notes* in 2003. Authors discussed landslide computer modeling, wildland fire mapping, fish passage, online access to innovations in technology and development, packable trail bridges, fuel cell technology, and online mentoring. Once again, authors shared their knowledge, experience, and insight as USDA Forest Service engineers at all levels and from all regions.

Please select the top three articles for 2003. In this one-person, one-vote system, your vote counts. Tell us which articles you found the most informative, beneficial, and interesting; which articles helped your unit save money; and which articles helped you develop more effective ways of accomplishing your work.

Rate the articles from 1 (best) to 3 (third best). Note whether you believe an article has helped or will help the USDA Forest Service save money or resources. Follow the instructions on the electronic form to send your vote to EFN Editor Sandy Grimm. Please vote by Friday, July 30, 2004.

Remember to share your engineering expertise with the EFN audience. Project reports, papers prepared for professional meetings, and training handouts are all potential EFN articles.

Award Nominations Form

Article	Author	Choice (1, 2, 3)	Dollars Saved
Landslide Computer Modeling Potential *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03713804/index.php*	Michael D. Dixon	_____	_____
Rapid Mapping of Active Wildland Fires Integrating Satellite Remote Sensing, GIS, and Internet Technologies *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03713805/index.php*	Brad Quayle	_____	_____
Technology and Development Innovations Now on the Internet *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03713806/index.php*	Bert Lindler	_____	_____
Fish Passage in Alaska, Oregon, Washington, California, and a State Near You! *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03713807/index.php*	Richard W. Sowa and Ken L. Horstmann	_____	_____
Leading-Edge Engineering Technology at the Georgia Tri-State Crematory *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03713815/index.php*	Kent Schneider	_____	_____
Packable Trail Bridges *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03713817/index.php*	John Kattell	_____	_____
Is There a Fuel Cell in Your Future? *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03713819/index.php*	Kathie Snodgrass	_____	_____
Washington Office Engineering Helps Achieve USDA Forest Service's First Clean Audit *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03713820/index.php*	Claudine Bodin	_____	_____
Make a Difference Through Online Mentoring *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03713821/index.php*	Deb Beighley	_____	_____

Engineering Bulletin Board

To share noteworthy engineering information, please send your contributions to Sandy Grimm at *sgrimm@fs.fed.us*.

Career Changes and Enhancements, January to June 2004

Geospatial Services and Technology Center (GSTC)—January retirements included Secondary Base Unit Leader **Don Olsen**, Program Coordination Analyst **Barbara Larsen**, and Civil Engineer **Paul Simmons** from the Advanced Systems Center from Reston, VA. **Reed Wheeler**, a GIS analyst, received a temporary promotion to Digital Production Unit Leader in the Digital Mapping Group, not to exceed 1 year. **Janice Whitehouse**, GSTC Secretary, became a purchasing agent for the GSTC Contracting Unit. **Trevor Lewis**, a Student Temporary Employment Program supply technician, was promoted. **Brittany Rhodes** is now a computer assistant in the IRM unit under the Student Temporary Employment Program.

Remote Sensing Applications Center (RSAC)—Jule Caylor, the inventory, analysis, and accuracy assessment program leader, retired in January after more than 33 years with the USDA Forest Service. **Karen Owens**, formerly with Red Castle Resources, joined RSAC as the assistant program leader for the training and technology awareness program and the national geospatial applications helpdesk manager. **Ken Brewer**, who was a remote sensing specialist with the regional engineering geospatial group in Missoula, MT, and the 2002 Engineering Applications Employee of the Year, was selected as the new Inventory Analysis and Accuracy Assessment Program Leader for RSAC.

Missoula Technology and Development (MTDC)—Two MTDC employees served summer details. **Maggie Pittman**, support program leader, is the acting Missoula District Ranger on the Lolo National Forest for 4 months. She will return to MTDC at the end of September. **Andy Trent**, a mechanical engineer, spent a 4-week detail as an air quality specialist at the Northern Region regional office.

The MTDC Wildland Fire Chemical Systems group has two temporary physical science technicians helping with burning and lab tests from April through October. **Jeff Kennedy** previously worked as a hydrologic technician for the USDA Agricultural Research Service in Tombstone, AZ; **Lance Collister** owns Creative Resources International in Missoula, MT, a firm that provides product design, development, marketing, consulting, and project management services.

San Dimas Technology and Development Center (SDTDC)—Civil Engineer **Jim Bassel** and Forestry Technician **Cecil Stinson** retired in January. In April, **Rhonda Zamora**, formerly with the USDA Agricultural Research Service, succeeded **Jackie Meeker** as the business management assistant. **Ralph Taylor**, fire program leader, retired in April. **Greg Napper** was promoted to GS-12 civil engineer.

Washington Office (WO)—Susan DeLost was detailed to the Southern Region to help with geospatial activities in mid-February and was temporarily promoted to acting deputy regional engineer in early May. According to **Elizabeth McMullen**, who is temporarily acting for Regional Engineer **George Kulick**, Susan did an awesome job as acting deputy regional engineer. Susan returns to the Geospatial Applications staff in mid-July.

Spring was a busy season in WO Engineering. In March, **Ed James**, formerly a program budget coordinator for engineering and recreation in the Pacific Southwest Region, as well as the 2001 Managerial Engineer of the Year, joined the Capital Resources staff. Also in March, former budget coordinator **Wilbur Martinez** transferred to the Environmental Compliance and Protection staff. **Dorothy Dorville**, from the Missoula Technology and Development Center (MTDC) budget shop, served a short detail in Wilbur's position.

April brought **Kathy Kreyns** from the San Dimas Technology and Development Center to the WO to continue budget support. In the same month, **Deb Beighley** moved from the Capital Resources staff to the Ecosystem Management staff.

Tom Reynolds was on loan from the Army Corps of Engineers to handle asset management issues through early May. **Tom Moore** shouldered those responsibilities, shedding his Environmental Compliance and Protection Program duties. The Northern Region's Computer Specialist and Infra Coordinator **Janet Kekich** helped out the WO Infra staff for the first 2 weeks in May. **Beverly Thackary**, a systems management specialist in the Pacific Southwest Region, assisted the Infra staff for the entire month of June. At the end of May, more interagency cooperation came from the U.S. Department of Transportation, Federal Highway Administration, when John Harding was detailed to the Capital Resources staff to help hammer out a sound transportation policy. Administrative Director of Technology and Engineering Support **Gary Campbell** resumed his duties after a 4-month detail with the U.S. Department of Defense. **Dave Aicher**, MTDC's manager, handled Gary's responsibilities during his absence.

In the summer of 2004, two more detailees agreed to help out in the WO Engineering budget shop for 3 weeks each: **Alex Gavrisheff** from the Northern Region and **Jerry Mortenson** from the Southwestern Region. WO Engineering Deputy Director **Sam Morigeau** became the Eastern Region regional engineer. **Gary Campbell** was named as his successor.