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Engineering Field Notes

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Engineering Technical Information System

Engineering Field Notes
Guidelines for Authors

Proposed articles should be double-spaced text in 10- or 12-point Arial or Helvetica type fonts, left margin justified. To ensure that design layout conforms to Forest Service publication standards, submit graphic elements, such as tables, charts, and photographs as separate files. Submit manuscripts as Microsoft Word documents (either Macintosh or Windows format) on 3.5-inch floppies, Iomega products (ZIP 100), or recordable CDs, or send by e-mail.

When soliciting photographs for your document, encourage photographers to capture the sharpest image possible by moving close to the primary subject, so that it fills at least three quarters of the frame. Request vertical and horizontal photos in at least three different exposures for each subject to allow maximum design flexibility. (For cameras that lack adjustable f-stop lens settings, use the +/- exposure adjustment for different exposures.)

Photographers must use digital cameras that provide print or publication quality images. Provide 1-megabyte .jpeg files (for electronic use) or 5-megabyte .tif files for print publications. Designers can convert .jpegs into .tif files for professional page layout.

Use of Kodak photo CDs, Agency-provided desktop scans, or images from online sources are not recommended. Such images often have insufficient clarity (required minimum resolution is 300 dpi or dots per inch.) Internet photos generally have a 72-dpi resolution.

Provide sources for all photographs and have written permission for use of non-USDA Forest Service material. (Standard permission forms are available.) Photographs must be cleared through the USDA Forest Service–Office of Communication and USDA Photo Division.

Follow USDA guidelines on including photographs in your document.
See www.usda.gov/agency/oc/design/.

1. **Slides** (originals or first-generation duplicates, preferably multiple frames of each subject) should be housed in a protected box or archival slide sheet.
2. **Transparencies** (4 by 5 inches or larger, preferably multiple frames of each subject) should be housed in archival slide sheets.
3. **Prints** (4 by 5 inches or larger, glossy finish, black-and-white format) are preferred for *Engineering Field Notes* and other one-color publications

For additional information on preparing documents for the Engineering Management Series, contact Sandy Grimm, Engineering Publications. Phone: 703-605-4503, E–mail: Sandra Grimm/wo/usdafs@fsnotes or sgrimm@fs.fed.us.

Deadline for issue 1, Vol. 36, 2004 EFN submissions: April 15, 2004.

Director's Update

Searching for a New Paradigm: No More Business as Usual

Vaughn Stokes
Director of Engineering
Washington Office

Another field season has come and gone. The impact on each of you has been heavy this year. The fire situation across the national forests continues to dominate and disrupt the way we traditionally do business. We must do our jobs more efficiently and complete projects in a more timely manner. Again this field season, we supported fire with $120 million from our construction accounts. Supporting fire efforts is a top Agency priority. At the same time, however, we are obligated to serve the public through funding a wide array of projects. In the near future, we will be working with the regional engineers to look at ways to obligate funds more efficiently and effectively.

Among this year's major accomplishments are the January completion of the Roads Analysis Process (RAP) and the September completion of master facilities plans. I hear about good results from these efforts, and I hope they were not just exercises to keep you busy. I hear how people used these efforts to focus their work and priorities. Units are identifying up to 25 percent of their facilities as unnecessary and adjusting their inventory to meet current needs. Such actions will help reduce our fixed costs and deferred maintenance requirements.

We continued work toward reauthorizing the transportation bill. The President's bill reflects our success in obtaining a designated Public Forest Service Road (PFSR) category. The designated PFSR category will establish funding, as yet undetermined, where no funding existed before. The program will enhance our seamless network with States and counties, enabling the public to better access their national forests.

In this issue we announce the 2002 *Engineering Field Notes* article award winners. Congratulations to these winners. I encourage all of you to look at the unique work that you are doing. If your efforts make projects more effective and save the Agency funds, please take time to write an article and submit it for *Engineering Field Notes*. Sharing this information can save the Agency considerable funds if other units use or adapt your techniques. Please contact *Engineering Field Notes* Editor Sandy Grimm at SandraGrimm/wo/usdafs@fsnotes for help on submitting articles.

Efforts to further the competitive sourcing initiative have demanded a lot of hard work from all of you. The thorough analysis and documentation have already shown positive results by more clearly identifying the quality, characteristics, and volume of the work that is currently being performed by USDA Forest Service employees. Many of the studies have already demonstrated that, in fact, the Agency's employees are providing valuable, appropriate services at a reasonable cost to the public. I especially value

the efforts of individuals in the engineering organization in supporting this initiative with their time, energy, and dedication to providing sound data.

I want to re-emphasize my commitment to valuing all of our employees. In my experience, treating others as we would like to be treated works well. We will have new challenges in 2004. How we address these challenges is up to us. I am very pleased with the innovative hard work you demonstrate time and again in all our programs to better serve the public and maintain or exceed our standards of excellence in our stewardship of natural resources. I encourage you to use your experience, your creative energy, and your mastery of evolving technology to establish new benchmarks for improving our processes and procedures.

The summer field season is behind us. The days are shorter and the air is a little bit crisper. It's time to think about your driving habits and what new safety issues you may encounter in the winter season that brings black ice, rain, snow, sleet, and other challenging weather conditions. Know the weather forecast, carry adequate safety equipment, and be prepared to slow down to meet the unexpected. Your safety is our number one priority, and it should be yours!

EFN Forum

Now that an electronic *Engineering Field Notes* is a reality, WO Engineering is continuing to add new features to better serve our readers. The publications staff of the Missoula Technology and Development Center (MTDC) has been invaluable in supporting this transition to electronic media. Selecting your top three *Engineering Field Notes* authors electronically, which is reflected in this issue, is one example of the MTDC's efforts. Establishing the electronic mailing list for subscribers was another project that required significant cooperation with MTDC.

I was privileged to visit the MTDC staff in August to view their publication work firsthand and to garner many ideas to refine *Engineering Field Notes*. Despite the center's lengthy and intense involvement in supporting fire efforts, the staff graciously accommodated my visit, answered my questions, and made time to pioneer work on templates for future issues that will help us streamline the publication process.

Discussions with Bert Lindler and Jerry Wolf led to an editorial decision to incorporate keywords for each of the articles in this issue. This feature should better enable readers to conduct online searches.

If you have suggestions for helping us better tailor *Engineering Field Notes* to serve your needs more effectively, please contact us by phone at 703-605-4503 or by e-mail at SandraGrimm/wo/usdafs@fsnotes or sgrimm@fs.fed.us. We welcome your suggestions.

Leading-Edge Engineering Technology at the Georgia Tri-State Crematory

Kent Schneider
Heritage Program Coordinator
Southern Region
Atlanta, GA

In early March 2002, Region 8's staff used Global Positioning System (GPS) and ground-penetrating radar (GPR) to help the Georgia Bureau of Investigation (GBI) search for human bodies buried at the Tri-State Crematory. Regional GPS Coordinator Douglas Luepke and Regional Archeologist Kent Schneider assisted the GBI and the Georgia Emergency Management Agency by obtaining radargrams (radar plots) of crematory areas likely to contain mass burials. Fortunately, they found none.

Using GPS to georeference the areas likely to have human bodies in pits rather than graves, staff members began the project by selecting the target areas, traversing the areas on foot with a Trimble GPS Pathfinder® Pro XR, and creating the map shown in figure 1.

Figure 1.

Staff then connected the Pro XR to a GSSI SIR2000 radar control unit with a 400-megahertz antenna, which permitted the collection of radar data to be georeferenced to its exact location at the crematory. By towing the antenna across the ground, continuous radargrams were generated for the length of each profile. The radar was set to penetrate 3 to 6 feet into the ground on the assumption that mass graves dug no later than 4 years previously would be visible in the clayey soils. Staff specialists created and studied more than 30 radar profiles, noting and subsequently examining small pits representing tree falls, but they neither detected nor found any bodies.

Radargrams clearly show whether a pit exists in the ground (figure 2). The dip in the radargram delineates where original soil was removed and other fill was used to replace it.

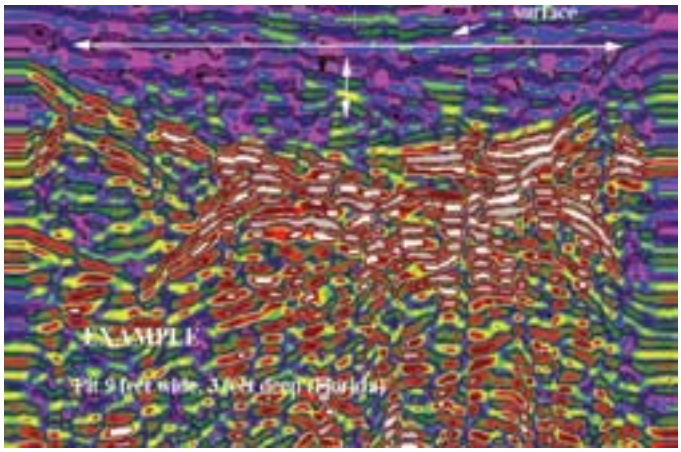

Figure 2.

Although the GPR revealed no burials (it was later determined that no burials occurred in the areas surveyed), this technique, coupled with GPS, has been used successfully to locate subsurface features on archeological and historic sites throughout the Southeastern United States. To save time and expense in locating archeological and historic finds before projects begin, the USDA Forest Service plans to routinely use these and other high-tech tools for heritage management.

Keywords: archeological sites, georeferencing, Global Positioning Systems, ground-penetrating radar, historic sites

2002 Engineering Field Notes Article Award Winners

Thank you for voting for your favorite *Engineering Field Notes* (EFN) articles. Nominating the top three articles is one way to recognize the authors who wrote those articles.

It takes time and energy for busy engineers to write articles for *Engineering Field Notes*. We rely on our authors to share their time, knowledge, and experience. The articles continue to save the U.S. Department of Agriculture (USDA) Forest Service time and resources.

The following winning authors will receive cash awards for 2002 EFN articles:

Andrew Orlemann for "Supporting the Burned Area Emergency Response (BAER) Program with Remotely Sensed Imagery"

Thomas L. Moore for "Public Forest Service Roads: A 'Service First' Approach To Managing Our National Forests"

Paul H. Greenfield for "Satellite Remote Sensing for the 2002 Winter Olympics"

Congratulations to the winners and to the authors who contribute articles. For tips on how to submit your article to EFN, see the *Engineering Field Notes* Guidelines for Authors on inside front cover.

Packable Trail Bridges

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Transportation Structures Group Leader
Northern Region
Missoula, MT

INTRODUCTION

As the Northern Region bridge engineer, I enjoy inspecting trail bridges in wilderness areas, some as far as 30 miles from the trailhead. Region 1 has a number of large suspension trail bridges in the wilderness, but most of the native-log–stringer bridges are less than 40 feet long and are built with materials (trees) from the bridges' immediate vicinity. A native-log–stringer bridge in Region 1 has a life span of 10 to 20 years, and after several replacement cycles, stands of trees near the bridges are noticeably depleted.

In the fall of 1999, Nez Perce National Forest wilderness recreation managers and engineers met with local wilderness protection groups to discuss long-term plans for some of their wilderness trail bridges. All agreed that the 10-to-20–year replacement cycle and the impacts around the bridges were unacceptable. They also agreed that they should construct new bridges for a long-term life span (50 years or more) with low-maintenance requirements to minimize the need for frequent wilderness construction.

Building a bridge in the wilderness without native materials requires transporting materials to the site, accomplished in the past mostly by helicopter. Could they build a bridge without using a helicopter? Could they build it with exclusively packable materials? We decided to find out. Our objective was to develop a trail bridge for a long-term life built of exclusively packable materials with common construction practices and tools for spans up to 40 feet.

DESIGN CRITERIA

Experienced packers have some rule-of-thumb sizes and weights that mules can safely transport. Typically, a mule can carry a 200-pound load (100 pounds per side) with a maximum length per piece of 8 feet. For example, a mule could carry two 8-foot pieces, each weighing a maximum of 100 pounds. Under certain conditions the maximum length of a piece could be extended to 12 feet and weigh more than 100 pounds, but the load would need to be transported with mules in tandem. For our initial study, we chose to maintain a maximum 8-foot member length and weight of 100 pounds (figure 1).

Figure 1. *Packable stringer pieces.*

Most wilderness bridges in Region 1 are built by seasonal force account crews or are constructed in cooperation with special-interest groups familiar with the typical bridge configuration of longitudinal stringers with plank decks. Tools and equipment may range from shovels and wrenches to hi-lines and pulleys, employed to move heavy pieces. Because we wanted to design a bridge that would accommodate the skills and tools of these crews, we selected a packable bridge that the crews would assemble into a longitudinal stringer with a plank deck. Although we considered a truss bridge, which may be more efficient with respect to materials, we decided it would be more complicated, have higher labor costs, and in many instances, be beyond the skills of our crews.

For our design we chose timber materials that were esthetically suited to the environment. Also, our crews were familiar with timber, and treated timber has a long-term life expectancy. We considered steel and concrete to be too heavy, and the suitability of fiberglass is still unproven.

STAGGERED SPLICE STRINGER DESIGN

We designed a 6- by 15-inch longitudinal timber stringer with 8-foot glulam member pieces by doubling 3- by 15-inch pieces together, staggering the joints, splicing with steel plates, and stitch bolting the entire assembly together (figure 2). A single 40-foot staggered spliced stringer will have nine 8-foot pieces, two 4-foot pieces, nine steel splice plates, and approximately 170 bolts. By using the steel splice plates, the full section of both stringers can be developed to resist the forces caused by pedestrians, snow load, and other stresses. In a conventional design, the stringer size can be increased or varied so that only three or four stringers are used. With the packable design, the stringer size can vary only slightly due to size and weight constraints. The design depends on the number of stringers needed, according to the design load (typically snow load in Region 1). Usually the deck is 2-inch thick planking, with curbs or railing added.

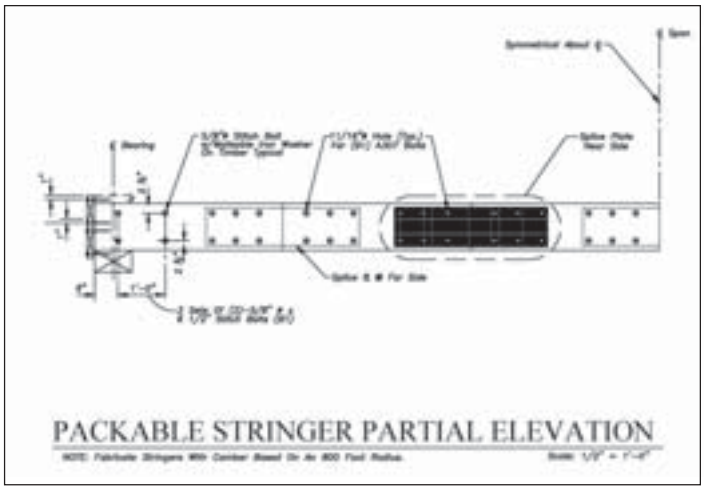

Figure 2. *Stringer detail.*

Currently, the packable-piece size restriction, combined with the splice capacity and allowable deflections, limits the maximum span to approximately 40 feet. At this length, an upward camber or deflection of approximately 3 inches can be fabricated into the stringers. Although providing upward camber is not required structurally, it is considered esthetically and functionally desirable.

CONSTRUCTION

In the past 2 years, we have designed and built five packable bridges in Region 1. All five bridges were built with force account crews on conventional spread-footing abutments with sills or short timber walls.

Dome Mountain, Kootenai National Forest (figure 3)
- 20-foot span, 300 pounds per square foot snow load, seven 5- by 10.5-inch stringers
- Packed 6 miles, ~ 30 mule trips
- Materials cost ~ $12,000

Figure 3. *Dome Mountain.*

North Fork Rumble Creek, Flathead National Forest (figure 4)
24-foot span, 215 pounds per square foot snow load,
six 5- by 12-inch stringers
Packed 1.5 miles, ~ 35 mule trips
Materials cost ~ $12,000

Figure 4. North Fork Rumble Creek.

The following three bridges were designed and constructed under a single project and built on the Moose Creek Ranger District in the Selway Wilderness on the Nez Perce National Forest. The project won the 2002 National USDA Forest Service Chief's Award for "Traditional Skills and Minimum Necessary Leadership." (For more information on the costs and logistics of constructing these three bridges, contact JohnKattell/R1/usdafs@fsnotes).

Ditch Creek (figures 5, 6, and 7)
36-foot span, 100 pounds per square foot snow load,
four 6.25- by 15-inch stringers
Packed 1.0 mile, ~ 60 mule trips
Materials cost ~ $10,000

Figure 5. *Ditch Creek (before construction).*

Figure 6. *Ditch Creek (new trail bridge during construction*).

Figure 7. *Ditch Creek (new finished construction).*

Goat Creek

36-foot span, 100 pounds per square foot snow load,
four 6.25- by 15-inch stringers
Packed 3.5 miles, ~ 60 mule trips
Materials cost ~ $10,000

Pettibone Creek

40-foot span, 100 pounds per square foot snow load,
five 6.25- by 15-inch stringers
Packed 5.0 miles, ~ 60 mule trips
Materials cost ~ $10,000

Correct fabrication of the stringers is critical. The last thing a crew needs is to pack all the materials to the site, only to find that the pieces do not fit. The contract plans require the timber stringer fabricator to build the stringers full length with the appropriate camber, cut each member into pieces, match drill all holes, and ship the stringers fully assembled. Requiring that the stringers be shipped fully assembled, ensures that they fit, and work crews gain experience by disassembling the stringers in preparation for packing before reassembling them at the remote site.

Complete piece markings are provided on the drawings, and the fabricator is required to mark each piece accordingly. Also provided is a bill of materials for the total bridge with estimated weights.

WHAT IS NEXT?

In proceeding with this packable design, we have been cautious about adding design refinements before we could monitor the final product's performance in place and talk to the packers and construction crews. So far, all comments from the packers and construction crews have been positive. This winter we also load tested our staggered, spliced stringers (figure 8) and compared the results with full-length stringers. The favorable results encouraged us to incorporate some modifications into future bridge designs. With the success of the first five bridges and our load testing, we are making this packable bridge a standard trail bridge design with appropriate drawings and specifications. This design should be a viable alternative for wilderness bridges or anywhere access is limited and only light equipment can be used. In the future, we also plan to consider developing plans for longer spans by using post-tensioning bars beneath the stringers to increase strength and stiffness and to accommodate our snow and stock loading, while keeping deflections within allowable limits.

Figure 8. *Staggered stringer load test.*

Keywords: log stringers, longitudinal stringers, plank decks, spread-footing abutments, staggered-splice steel stringer design, timber, traditional construction fabrication, wilderness construction

Awards for Environmental Excellence

The U.S. Department of Transportation Federal Highway Administration (FHWA) recognized a host of public transportation agencies for outstanding environmental streamlining and stewardship efforts, including projects in two USDA Forest Service regions. Region 5 and Region 6 representatives accepted tributes for partnering with other agencies to provide a balance between environmental protection and mobility at the Environmental Excellence Awards ceremony held on Earth Day 2003.

COLORADO'S SHORTGRASS PRAIRIE SYSTEM

Region 5's John Sidle received the Agency's award for contributions to a multiagency effort to promote environmental excellence in ecosystems, habitat, and wildlife in the shortgrass prairie system. The Colorado Department of Transportation, FHWA, and a host of public transportation agencies are working to conserve from 15,000 to 50,000 acres of Colorado's shortgrass prairie habitat, via easements and management agreements in perpetuity, to mitigate environmental impacts from proposed transportation projects over the next 20 years. This integrated, comprehensive multispecies recovery effort will promote the recovery of listed species, help prevent listing additional species, more efficiently use public funds to develop projects, and offset permanent habitat loss through large-scale habitat protection.

SCENIC BYWAYS IN OREGON

Richard Sowa, Becky Hutchins, Phil Hirl, and Bill Kolzow took the honors for Region 6 for another partnership effort with Federal, State, and county agencies for excellence in scenic byways. The partner agencies voluntarily established the Oregon Forest Highway Enhancement Program to implement critical improvements by annually setting aside up to 10 percent of the authorized Oregon Forest Highway funds through a simple Memorandum of Understanding (MOU). The MOU guides and streamlines a program to rate projects according to established criteria to plan, develop, design, and implement forest highway enhancement projects, such as improved signing, interpretive sites, trailheads, and roadside facilities to accommodate the increasing volume of recreational highway users.

Is There a Fuel Cell in Your Future?

Kathie Snodgrass
Project Leader
Missoula Technology and Development Center
Missoula, MT

Fuel cells hold promise for U.S. Department of Agriculture (USDA) Forest Service use, especially in areas where commercial electric power is unavailable. Within a few years, fuel cells will provide a clean, quiet alternative supply of power in areas where it is impractical to use renewable energy sources such as solar, microhydroelectric, or wind power. Fuel cells can provide power for any size application from a single clock to an entire city. Possible future applications of fuel cells in the USDA Forest Service include providing power for lights, showers, cooking, and computers at remote fire camps; providing battery-type power for portable field equipment; powering water pumps at recreation sites; and even providing electric power for remote ranger stations.

Fuel cells are similar to large batteries with constant fuel input (figure 1). They are energy-conversion devices that electronically transform energy stored within hydrogen into electricity, heat, and water. Unless fuel cells use pure hydrogen for fuel, they produce small amounts of carbon dioxide. Fuel cells have no moving parts. Because they do not burn their fuel, they produce virtually no pollution. Fuel cells convert around 30 percent of the energy in their fuel to electricity, compared to 20 percent for a typical power plant. The heat produced by fuel cells can be used to provide domestic hot water and to heat or cool buildings, raising the total potential efficiency of fuel cells above 80 percent.

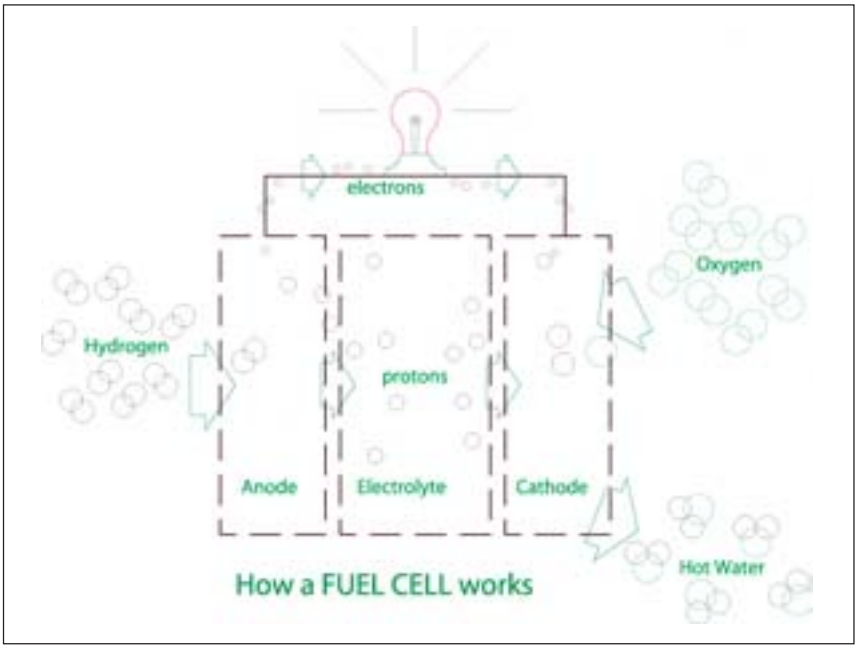

Figure 1. *This schematic drawing shows how fuel cells produce electricity.*

Fuel Cells are Coming (0371-2307-MTDC), a tech tip produced by the USDA Forest Service Technology and Development Program, explains how fuel cells work, the types and uses of fuel cells, and the current state of fuel cell development. The tech tip is available from Missoula Technology and Development Center (MTDC) either electronically (http://www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03712307/) or in print (call 406–329–3978).

Currently, most fuel cells are far more expensive to purchase and use than conventional power sources. Stationary fuel cells for domestic or light commercial use (figure 2) cost about $20,000 per kilowatt. Very large units (100 kilowatts or more) cost about a fourth to half as much per kilowatt. These units are cost effective only when electricity costs exceed 15 cents per kilowatt-hour or when electric power failure or fluctuations can cause expensive losses to businesses or government installations. Fuel cell manufacturers expect the medium-to-large units to become viable commercially when the cost drops below $1,000 per kilowatt. Major fuel cell manufacturers expect costs to reach that level between 2007 and 2010.

Figure 2. *This 5-kilowatt fuel cell manufactured by Plug Power is being tested by the U.S. Department of Defense at the Concurrent Technologies Corp. test facility. It is intended for residential use or small commercial installations. —Photo courtesy of Concurrent Technologies Corp., Johnstown, PA.*

Small fuel cell systems (under 100 watts) cost less than $100 per watt, a cost comparable to some battery systems. Portable battery replacement fuel cell units (figure 3) are much lighter and last longer than battery systems with similar power output. These systems are available from manufacturers, but they must be specially built for each application.

Figure 3. *The black box (foreground) attached to this commercial video camera is a fuel cell manufactured by Jadoo Power Systems. The fuel cell replaces much heavier batteries and is used whenever a portable power source is needed. —Photo courtesy of Jadoo Power Systems, Folsom, CA.*

Some vehicle manufacturers producing limited quantities of fuel-cell-powered vehicles have tested fuel cells under commercial conditions. In December 2002, Honda delivered the first commercial fuel cell automobiles to the United States for fleet use in Los Angeles (figure 4). Toyota delivered a fuel cell vehicle to the University of California at Irvine for use by employees. These vehicles are still extremely expensive to produce. They use compressed hydrogen fuel, which is also expensive.

Figure 4. *This Honda FCX is one of the first commercially available automobiles to be powered by fuel cells in the United States. —Photo courtesy of American Honda Motor Co., Torrance, CA.*

For the past 35 years, commercial fuel cell development has been characterized as "about 5 years away." It appears that the state of fuel cell development has finally caught up to the promises. In anticipation of commercial availability, the USDA Forest Service Technology and Development Program, along with other agencies and private industry groups, will install a fuel cell as a demonstration project at the Big Goose Ranger Station (figure 5) on the Tongue Ranger District of the Bighorn National Forest. The Big Goose Ranger Station is located at about 7,800 feet elevation, 7 miles from the nearest power line. The project's goal is to learn how fuel cells can be installed in the future and used effectively within the USDA Forest Service.

Figure 5. *Big Goose Ranger Station, Tongue Ranger District, Bighorn National Forest.*

The project, which began in late 2002, will replace an aging propane generator with a 10-kilowatt fuel-cell system in the summer of 2004. A core project team, which includes personnel from cooperating agencies and organizations as well as USDA Forest Service staff, has faced significant challenges in implementing the project. Besides funding from the USDA Forest Service, funding will come from diverse sources including the U.S. Department of Defense (DOD), the U.S. Department of Energy, and the Propane Education and Research Council. The design is a joint effort by the USDA Forest Service and an engineering and technology firm contracted by DOD. Because fuel cells of this size are still in the precommercial development stage, design parameters assure that the ranger district will have a functioning electrical system, even if the fuel cell system expires. A major challenge has been locating a fuel cell system that will operate efficiently on propane at high elevation without much operator attention and that will not be damaged during the station's winter shutdown.

Steady progress has been made on the fuel cell demonstration project as the project team has solved each new challenge. Installation is expected to occur on schedule next summer. Besides the tech tip, other reports will share what is learned as the project progresses and the fuel cell system begins operation. For more information about fuel cells or the fuel cell project, contact Kathie Snodgrass, project leader at the MTDC, or Anna Jones-Crabtree, forest engineer for the Bighorn National Forest.

Keywords: distributed energy production, electricity generators, electric power, electricity supplies, energy sources, facilities, hydrogen

Washington Office Engineering Helps Achieve USDA Forest Service's First Clean Audit

Claudine Bodin
Marketing and Communication Specialist
Geospatial Applications Infra
Washington Office Engineering

On June 12, 2003, the Washington Office Engineering staff received a plaque "for outstanding support to the FY 2002 Financial Statement Audit leading to the Forest Service's first unqualified opinion."

History was made on December 17, 2002, when the USDA Forest Service received word that it had successfully achieved the "clean" audit opinion it had strived so hard to obtain. Auditors from the accounting firm KPMG and the U.S. Department of Agriculture (USDA), Office of Inspector General, verbally informed the USDA Forest Service that the Agency would receive an unqualified opinion for the fiscal year 2001 financial statements — the best possible opinion auditors can give.

Upon hearing the good news, Infra's Program Manager Tah Yang was quick to share the praise and thank the Infra user community for the "…endless hours of work and tireless support. The hard work and perseverance of the Infra community and financial staff has [sic] paid off."

For several years the USDA Forest Service had received disclaimed opinions; that is, the worst possible rating of its fiscal accountability. Thanks to the efforts of dedicated employees from across the USDA Forest Service and throughout the Department, the Agency made the unprecedented accomplishment of moving straight from a disclaimed audit opinion to an unqualified opinion, the best possible rating!

According to Department personnel, no Federal agency ever went from a disclaimer to a clean opinion. The monumental accomplishment of the USDA Forest Service is a strong contrast to the much-publicized revelations of criminal accounting performance in the private sector. Those who have worked in personal and real property management are aware of the work and dedication that was necessary to help the USDA Forest Service and the Department establish this historic milestone.

Make a Difference Through Online Mentoring

Deb Beighley
Transportation Planning Program Manager
Washington Office

The growing demand for civil engineers and technicians, coupled with no significant growth in supply, poses a significant challenge for both the private and public sectors.

According to "The Crisis in Human Capital," the Senate Subcommittee on Oversight of Government Management report published in December 2000, more than 53 percent of the Federal Government workforce (that is, 900,000 employees) will be eligible for retirement or at retirement age by 2004. Recent estimates indicate that the U.S. Department of Agriculture (USDA) Forest Service will experience similar attrition through retirements, with more than 25 percent of the engineering workforce retiring in the next 3 to 5 years. National estimates indicate no net growth in engineering bachelor's degrees nationwide since 1981. The Senate report is posted on the Internet at http://voinovich.senate.gov/humancapital.pdf.

Along with local opportunities to get involved with science fairs and career days to promote interest in engineering and science, more organized national efforts include the USDA mentoring program and the National Society of Professional Engineers online mentoring forum to discuss areas of mutual interest between students and professionals in the engineering field. (See http://www.nspe.org/discuss.asp.)

Before developing new tools to more effectively attract and retain a competent and productive workforce, we must first focus on increasing the size of the applicant pool. By participating in programs such as MentorNet, you can make a difference.

In the spirit of e-Government initiatives, MentorNet is an e-mentoring network for women in engineering and science. The one-on-one mentoring program pairs women students (protégés) with male or female engineering professionals (mentors) for e-mail–based relationships. The program provides women with often-hard-to-come-by "real world" information, encouragement, advice, and networks. From 1998 to 2003, MentorNet matched nearly 20,000 protégés and mentors. According to MentorNet, protégés report a greater confidence and desire to pursue their field of study and work in the public or private sector. Similarly, mentors gained personal satisfaction from helping protégés, improved their mentoring skills for assisting employees in their workplace, and increased their own commitment to their field and employer.

As a MentorNet mentor, I have seen the valuable impact that listening and providing a few encouraging words can make in someone's life. I have gained a better understanding of the issues and concerns facing today's women as they pursue engineering degrees, as well as a renewed appreciation for my own personal mentors.

For more information on the MentorNet program and how you can get involved, log onto http://www.mentornet.net. It takes only a little time to make a big difference.

Keywords: MentorNet, women, engineering, training

Engineering Bulletin Board

To share noteworthy engineering information, please send your contributions to Sandy Grimm at SandraGrimm/wo/usda@fsnotes or sgrimm@fs.fed.us.

CAREER CHANGES

(June to December 2003)

GEOSPATIAL SERVICES AND TECHNOLOGY CENTER (GSTC)

Dreama Pitman was promoted from lead purchasing agent to contract specialist with the departure of **Bryce Eddy** and was succeeded by **Nelda Montgomery**. Purchasing agent **Debbie Lucero** assumed Nelda's former position. In the GIS group, **David Watkins** became the training and technology integration unit leader as **Bruce Williams** moved to the Bureau of Land Management in Roseburg, OR; **Aaron Stanford** assumed duties as applications and technical assistance unit leader; and GIS Analyst **Michelle Harley-Lloyd** earned a career promotion. Both **Don Johnson** and **Robert Coulter** are now cartographers (project leaders) in the digital mapping group. Information Technology Specialist **Dianna Openshaw** earned a promotion and Property Technician **Ron Gow** was promoted for assuming additional property management responsibilities. **Michael Courtney** transferred from Oracle DBA in the IRM Unit to the U.S. Department of Transportation, Federal Aviation Administration.

REMOTE SENSING APPLICATIONS CENTER (RSAC)

Everett Hinkley, Region 10 regional photogrammetrist, joined the RSAC staff as the liaison and special group leader in early November. **Dave Vanderzanden**, assistant program leader for training and technology awareness program and national geospatial applications helpdesk manager, left RSAC in June to become the assistant remote sensing specialist for Region 6.

MISSOULA TECHNOLOGY AND DEVELOPMENT CENTER (MTDC)

Kristen Thall, formerly with the content analysis team in the Northern Region office, became the MTDC's new information assistant in early September. In mid-August, Ian Grob joined the staff as a phototechnologist after serving in the same capacity with the Harley-Davidson Company in Wisconsin. In November, **James Scott Groenier** joined MTDC as a structural engineer after serving as a civil engineer in Region 9. Scott supports the T&D and Wood in Transportation programs, as well as the Forest Products Laboratory. **Scott Kesler**, a geography and business student at the University of Montana, is now working as an editorial assistant at MTDC. **Mary Trankel** accepted the newly created webmaster position at MTDC in November.

SAN DIMAS TECHNOLOGY AND DEVELOPMENT CENTER (SDTDC)

SDTDC welcomed two new watershed specialists: **Dan Cenderelli** from the Olympic National Forest and **Carolyn Napper** from the Lassen National Forest. **Dale Dague** was promoted to branch chief for disaster operations on the Washington Office Fire and Aviation staff. Maintenance Worker **Gail Lisko** resigned. **Greg Napper** left the Lassen National Forest to become a civil engineer with SDTDC.

WASHINGTON OFFICE (WO)

In June, **Misty Alvarez**, formerly a project manager for engineering and air tanker bases at SDTDC, assumed program manager responsibilities for engineering information management. Also in June, **Wilbur Martinez** became a budget coordinator for the programs and budget staff. **Marcia Thomas**, who hails from RSAC, served a short detail to handle the intense budget activity in December. **Bill Hamele** continues as the acting facilities program manager following **Josiah Kim**, who accepted a position as deputy director of engineering in Region 9. In September, former budget coordinator **Craig Lasser** succeeded **Leslie Walrath**, who returned to the private sector, as the water and waste management program manager. **Sherrie Clark** left the environmental management position for a challenging position with the U.S. Environmental Protection Agency and **Donna Kim**, of the WO Rocks and Minerals staff, is temporarily detailed to help until Sherrie's position is filled. While **Deb Beighley** was detailed to the Chief's Process Predicament Team, **Lyn Gillespie** from Region 5 handled her duties. Deb has resumed her WO Engineering functions while she continues to support the team. Two new employees joined the capital resources staff in the fall of 2003: Environmental Engineer **James Demby** succeeded retiree **Jim Padgett** as the geotechnical dams engineer and **Ellen LaFayette**, formerly of Region 9, joined the staff as the transportation development engineer. **Rosana Barkawi** assumed bridge engineer responsibilities for the capital resources staff in December. **Lou Leibbrand** succeeded **Ron Skillings** in early January 2004 as the new T&D program manager.

Bibliography of Publications from Washington Office Engineering and Service Centers

This bibliography contains information on publications and other materials produced by the Washington Office Engineering staff and its service centers. Arranged by series, the list includes the title, author or source, document number, and date of publication.

This issue lists material published since our last bibliography (*Engineering Field Notes*, Volume 34, July–December 2002). Copies of *Engineering Field Notes* and most Engineering Management Series documents can be obtained from the Washington Office Engineering staff or from the Forest Service Intranet at http://fsweb.wo.fs.fed.us/eng/pubs/efn/efn.cont.htm. Copies of reports, Tech Tips, videotapes, compact disks, and digital video disks can be obtained from the center listed as the source. A number of special reports sponsored by the Geospatial Executive Board and authored by Geospatial Advisory Committee teams are available through the Geospatial Services and Technology Center and the Remote Sensing Applications Center.

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Publications

ENGINEERING MANAGEMENT SERIES AND OTHER PUBLICATIONS

The Engineering Management (EM) Series contains publications serving a purpose or reader and publications involving several disciplines that are applied to a specific problem.

ENGINEERING FIELD NOTES (EFN)

This publication, published every 6 months, provides a forum for the exchange of information among U.S. Department of Agriculture (USDA) Forest Service personnel. It contains the latest technical and administrative engineering information and ideas related to forestry.

EFN BY TITLE (VOLUME 35)

2002 *Engineering Field Notes* Article Award Nominations	Editor (Issue 1 2003): 45
2002 *Engineering Field Notes* Article Award Winners	Editor (Issue 1 2003): 7
2002 Forest Service Engineer of the Year Awards	Editor (Issue 1 2003): 24–40
2002 USDA Forest Service Engineering Special Recognition Award	Editor (Issue 1 2003): 41–42
Awards for Environmental Excellence	Editor (Issue 2 2003): 15
Bibliography of Publications from Washington Office Engineering and Detached Units	Editor (Issue 2 2003): 27-36
EFN Forum	Editor (Issue 1 2003): 3
EFN Forum	Editor (Issue 2 2003): 3
Engineering Bulletin Board	Editor (Issue 1 2003): 43–44
Engineering Bulletin Board	Editor (Issue 2 2003): 25-26
Fish Passage in Alaska, Oregon, Washington, California, and a State Near You!	Sowa, Richard W. and Horstmann, Ken L. (Issue 1 2003): 21–23
Is There a Fuel Cell in Your Future?	Snodgrass, Kathie (Issue 2 2003): 17-20

EFN BY AUTHOR (VOLUME 35)

Sowa, Richard W. and Horstmann, Ken L.	Fish Passage in Alaska, Oregon, and Washington, California, and a State Near You! (Issue 1 2003): 21–23
Stokes, Vaughn	Mandate to Work Effectively and Efficiently, A (Issue 1 2003): 1–2
Stokes, Vaughn	Searching for a New Paradigm: No More Business as Usual (Issue 2 2003): 1-2

OTHER EM PUBLICATIONS

PROJECT REPORTS

Title	Number	Source	Date
Assessing Abandoned Mines with Geospatial Technologies (by Denise Laes, Paul Maus, Henry Lachowski, Jess Clark, Beau Jarvis, Haans Fisk)	RSAC-37-RPT1	RSAC	03/03
A Checklist for Lidar Users (by Paul Maus, Beau Jarvis, Vicky Johnson, and Denise Laes)	RSAC-39-RPT1	RSAC	04/03
Technology Evaluation for Mapping Roads and Trails in the Ocala National Forest, Florida (by Michael Williamson, Don Evans, Henry Lachowski, Laura Lowery, William Clerke, Dexter Meadows, and L'Tanga Watson)	RSAC-41-RPT1	RSAC	04/02
Characterizing Meadow Vegetation with Multitemporal Landsat Thematic-Mapper Remote Sensing (by Karen Owens, Henry Lachowski, Alan Ager, and Colin Grizwald)	RSAC-42-RPT1	RSAC	03/03
Monitoring Rangeland Utilization and Trends with Remote Sensing (by John Gillham, Vicky Johnson, Haans Fisk, Tom Mellin, Cameron Tongier, and Bill Krausmann)	RSAC-44-RPT1	RSAC	03/03
Anadromous Fish Strainers for Use in Wildland Drafting Operations (by Lois Sicking)	0351 1203	SDTDC	03/03
Synopsis of Biomechanical Analysis of Grubbing Technique in the Use of Fire Handtools (by Lois Sicking)	0351 1204	SDTDC	09/03

	BAER Necessities for Hydrologists and Engineers: A Guide to Basic Burned Area Emergency Rehabilitation Treatments (by Jeff Moll)	0377 1205	SDTDC	09/03
	Remote Internet Protocol Communication Flight Testing (by Thomas Zajkowski)	RSAC-1307-RPT1	RSAC	04/03
	Remote Sensing Tips Visualizing Past and Present Mining Activities Using Geospatial Technologies (by Denise Laes, Paul Maus, and Linda Lanham)	RSAC-37-TIP1	RSAC	04/03
	Kodak DCS Pro Back 645C Color Infrared Digital Camera (by Paul Ishikawa, Jr.)	RSAC-1505-TIP1	RSAC	04/03
	Characterizing Upland Meadows with Multitemporal Landsat Thematic Mapper Remote Sensing (by Karen Owens, Henry Lachowski, and Alan Ager)	RSAC-42-TIP1	RSAC	03/03
	Mapping Potential Bare Soil Areas Using Digital Orthophotography Quadrangles (DOQs) (by Vicky Johnson, Henry Lachowski, and Robert Davidson)	RSAC-47-TIP1	RSAC	02/03
	Processing MODIS Imagery of Major Wildfires (by Richard Warnick, Mark Finco, John Gillham, Dmitriy Kostyuchinko, John Norton, Brad Quayle, and Keith Lannom)	RSAC-2002-TIP1	RSAC	01/03

TECH TIPS

	Title	**Number**	**Source**	**Date**
	Crosscut Saw Underbucking Tool (by Chuck Whitlock and Chuck Harding) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm02232330	0223-2330	MTDC	12/02
	Whitebark Pine Seed Scarifier (by Dave Gasvoda, Andy Trent, Chuck Harding, and Karen Burr) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm02242332	0224-2332	MTDC	11/02
	Windshields for Precipitation Gauges and Improved Measurement Techniques for Snowfall (by Seth Hansen and Mary Davies) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm02252325	0225-2325	MTDC	10/02
	Remote Telemetry System for Particulate Monitoring (by Andy Trent) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm02252329	0225-2329	MTDC	11/02

Title	Number	Source	Date
Your Hardhat: Inspection and Maintenance (by Chuck Whitlock) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm02672331	0267-2331	MTDC	11/02
Bar-Code Tracking Systems Overview (by Jasen Neese and Kathie Snodgrass) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm02712333	0271-2333	MTDC	12/02
Wildlife Toolkit Launched (by Sandra Jacobson)	0323 1301	SDTDC	03/03
Two-Cubic-Yard Bearproof Dumpster (by Lester Sinclair)	0323 1302	SDTDC	03/03
SST Installation Guide (by Brenda Land)	0323 1303	SDTDC	03/03
Wilderness Permit Systems and the Forest Service's Infra Database (by Ann Suter)—electronic only http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03232330	0323-2330	MTDC	09/03
Hardwood Cuttings Saw and Clamping System (by Gary Kees) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03242317	0324-2317	MTDC	09/03
An Introduction to Spark Arresters (by Ralph Gonzales)	0351 1304	SDTDC	06/03
Multiposition Small-Engine Spark Arresters (by Ralph Gonzales)	0351 1305	SDTDC	06/03
General-Purpose Spark Arresters (by Ralph Gonzales)	0351 1306	SDTDC	06/03
Off-Highway Vehicle Spark Arresters (by Ralph Gonzales)	0351 1307	SDTDC	06/03
Railroad Locomotive Spark Arresters (by Ralph Gonzales)	0351 1308	SDTDC	06/03
Draft Hose Comparison Study (by Lois Sicking)	0351 1309	SDTDC	06/03
New Generation Fire Shelter Developed for Wildland Firefighters (by Leslie Anderson and Tony Petrilli) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03512313	0351-2313	MTDC	05/03
Transporting Aluminum Fuel Bottles Inside Aircraft (by Wes Throop) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03512315	0351-2315	MTDC	05/03

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Retrofit Harness for the Firefighter's Yellow Field Pack (by Bill Kilroy and George Jackson) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03512324	0351-2324	MTDC	07/03
Fuel Cells Are Coming (by Kathie Snodgrass and Longchaw Lee) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03712307	0371-2307	MTDC	04/03
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Title	Number	Source	Date
Managing Degraded Off-Highway Vehicle Trails in Wet, Unstable, and Sensitive Environments (by Kevin Meyer) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm02232821	0223-2821	MTDC	10/02
MTDC Air Program News #3 (by Andy Trent)—electronic only http:fsweb.mtdc.wo.fs.fed.us/program/wsa/air_news/issue3.htm	0225-2838	MTDC	12/02
MTDC Portable Vehicle Washer: Interim Report (by Andy Trent, Dick Karsky, and Scott Gilmour) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm02342836	0234-2836	MTDC	12/02
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Assembling a Bar-Code Tracking System (by Kathie Snodgrass and Jasen Neese) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm02712834	0271-2834	MTDC	03/03
The New Generation Fire Shelter (by Leslie Anderson)—electronic only http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03512803	0351-2803	MTDC	03/03
Evaluating the Potential for Risk Compensation with the New Fire Shelter (by J.D. Schindler)—electronic only http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03512804	0351-2804	MTDC	06/03
Work Capacity Test: Administrator's Guide (by Chuck Whitlock and Brian Sharkey)—electronic only http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03512805	0351-2805	MTDC	04/03

Title	Number	Source	Date
Wildland Firefighter Health & Safety Report No. 7 (by Brian Sharkey) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03512818	0351-2818	MTDC	08/03
Fire Level 1 (by Dale Dague)	0352 1801	SDTDC	09/03
FS-14 Parachute Packing Instructions (by Pat Wilson) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03572806	0357-2806	MTDC	04/03
Accident Investigation Guide: 2003 Edition (by Chuck Whitlock) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03672808	0367-2808	MTDC	05/03
Investigative Methods for Controlling Groundwater Flow to Underground Mine Workings (by Phyllis Hargrave, John Metesh, Ken McBridge, and Steve Oravetz)—electronic only http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03712801	0371-2801	MTDC	08/03
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Sign Installation Guide (by Andy Trent and Donna Sheehy) http:/www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03712812	0371-2812	MTDC	08/03
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VIDEOTAPES (VHS), COMPACT DISKS (CD), AND DIGITAL VIDEO DISKS (DVD)

Title	Number	Source	Date
Forest Roads and the Environment (VHS produced by Alan Yamada, Anthony Edwards, and Jerry Firth) *Winner of the 2003 Chief's Award for Technology Transfer*	0277 1401	SDTDC	01/02
Reading the Traveled Way (VHS produced by Alan Yamada, Anthony Edwards, and Jerry Firth) *Winner of the 2003 Chief's Award for Technology Transfer*	0277 1402	SDTDC	01/02
Reading Beyond the Traveled Way (VHS produced by Alan Yamada, Anthony Edwards, and Jerry Firth) *Winner of the 2003 Chief's Award for Technology Transfer*	0277 1403	SDTDC	01/02

Title	Number	Source	Date
Smoothing and Reshaping the Traveled Way (VHS produced by Alan Yamada, Anthony Edwards, and Jerry Firth) *Winner of the 2003 Chief's Award for Technology Transfer*	0277 1404	SDTDC	01/02
Maintaining the Ditch and Surface Cross Drains (VHS produced by Alan Yamada, Anthony Edwards, and Jerry Firth)	0277 1405	SDTDC	01/02
Ground-Based Harvesting–A Tool for Resource Management VHS	0324 1401	SDTDC	02/03
Personal Safety in Remote Locations: Avoiding Trouble (by Jon Driessen and Lisa Outka-Perkins) VHS http://www.fs.fed.us/eng/t-d.php?link=pubs/htmlpubs/htm03672323	0367-2323	MTDC	07/03
Water/Road Interaction Series CD	0377 1402	SDTDC	02/03
Aquatic Species Road–Stream Crossings (Brief Introduction) VHS	0377 1403	SDTDC	05/03
Aquatic Species Road–Stream Crossings (General Overview) VHS	0377 1404	SDTDC	05/03
NRIS: Getting Field Work Done … Better, Faster, Cheaper VHS	0319 1405	SDTDC	09/03
NRIS: Getting Field Work Done … Better, Faster, Cheaper CD	0319 1406	SDTDC	09/03
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Engineering Field Notes

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