CTIP News

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U.S. Department of Transportation
Federal Highway Administration

The Coordinated Federal Lands Highway Technology Implementation Program (CTIP) is a cooperative technology deployment and sharing program between the FHWA Federal Lands Highway office and the Federal land management agencies. It provides a forum for identifying, studying, documenting, and transferring new technology to the transportation community. More information about the CTIP program is available online at www.ctiponline.org.

Aesthetic Pavement Treatments - Context Sensitive Pavements for Partner Agencies

Durable pavements do not have to be aesthetically unappealing. By using alternate materials it is possible to create a pavement that meets design engineering properties and is also aesthetically appealing, even in high profile locations such as Pennsylvania Avenue in front of the White House.

A landscape design was developed by Michael Van Valkenburgh Associates to transform the avenue in front of the White House into a pedestrian plaza that harmonizes with its surroundings. Eastern Federal Lands Highway Division (EFLHD) was charged with finding a paving material that would satisfy the criteria of being aesthetically pleasing and having acceptable engineering properties for anticipated traffic loading.

One means of satisfying the dual requirements of aesthetics and durability involved working with a transparent, amber colored synthetic binder produced by Neville Chemical Co. that could be placed using conventional

Aesthetic Pavement Treatments, Cont.

Hot Mix Asphalt processes. This synthetic binder with additional pigments has been used by designers in Europe to produce colored asphalt delineating between intersections, busways, bicycle paths, historic landmarks, and roundabouts.

EFLHD decided to explore the use of the synthetic binder to create a flexible pavement and to use specific aggregates to achieve the color and texture requirements. Various aggregate sources and job mix formula combinations were examined. Aggregate size varied from 9.5 mm to 19 mm in an effort to match the granular surface originally proposed by the architect. Various types of pavements such as Superpave and Stone Matrix Asphalt (SMA) were designed and reviewed for aesthetics.

For Pennsylvania Avenue, a 9.5 mm Superpave mix design containing salmon colored granite and pink quartzite aggregates was selected. To confirm mix durability, an extensive study by FHWA's Turner Fairbank Highway Research Center was conducted looking at rut resistance, weathering susceptibility, and binder properties. Mix volumetrics , plant production quality control, logistics, paving techniques, and aesthetics were confirmed for the 9.5 mm Superpave mix during a field test on a road in Rock Creek Park.

Paving in front of the White House on Pennsylvania Avenue was completed in October 2004. Pennsylvania Avenue was reopened to the public by the First Lady Mrs. Bush on November 9, 2004.

EFLHD continues to explore the use of synthetic binder emulsion based systems, and other approaches to further the options available to our Partner Agencies for Context Sensitive Pavements.

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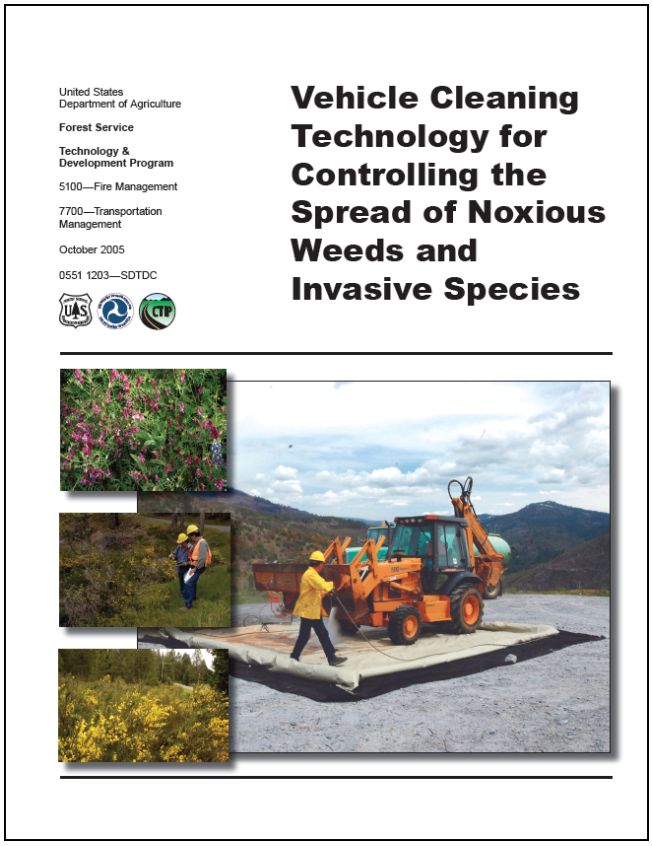
Vehicle Cleaning Technology

Many silvicultural and land management activities on national forest land involve moving vehicles and equipment at off-road locations. As a result, seeds and spores can be picked up, transported, and transplanted over great distances. Vehicles, as well as hand and power tools, transport seeds. The invasive and nonnative plant and fungi species become established in new areas, and the native ecosystem is affected. Some prolific plant species dominate new environments and upset the natural plant life and wildlife balance and endanger other species and resources. *Vehicle Cleaning Technology for Controlling the Spread of Noxious Weeds and Invasive Species* summarizes the concepts for removing seeds from vehicles and equipment to control the spread of noxious weeds, invasive species, and disease.



San Dimas Technology and Development Center (SDTDC) was tasked by the USDA Forest Service's Washington Office national engineering steering committee to research technologies available for cleaning vehicles and equipment after use in undeveloped areas. This 2-year effort included developing, fabricating, and testing concepts for remote-location washing facilities under real-time conditions.

Washing equipment before it leaves an area helps prevent transporting seeds and spores that are found in vegetation, dirt, and mud clinging to the undercarriage or underbody parts (such as wheels, wheel wells, drive train, and bumpers). No study has yet determined which washing method is best for remote locations or how clean vehicles must be to prevent the spread of invasive seeds and fungi. It is unknown whether all debris must be removed from equipment before it leaves an area or if eliminating the loose debris is sufficient.

Washing takes time, labor, clean water, energy, and in many cases containment and proper waste water disposal. Where clean water is not abundantly available and wastewater disposal is an issue, filter, treat, and recycle the washwater. Consider the cost of recycling washwater versus the cost of providing freshwater and hauling the waste to an appropriate sewage disposal facility. With short-term projects involving few pieces of equipment, it can be more economical to remove wastewater to a sewage disposal facility rather than to recycle. Wastewater containment is not mandatory for machinery used in emergency fire situations.

Field personnel can use this publication to decide whether to use contract services, or to purchase or rent equipment and assess resources available, equipment limitations, and prices. Anyone considering a washing system for weed management for a specific project, or as a general practice, can use this information to determine the most efficient strategy and hardware.

A copy of *Vehicle Cleaning Technology for Controlling the Spread of Noxious Weeds and Invasive Species* is available for download at: http://www.fs.fed.us/eng/php/library_card.php?p_num=0551%201203P.

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Deep Patch Repair

Thousands of miles of low-volume roads exist on National Forest System lands. Past design methods for roads across hillslopes emphasized achieving road width with balanced earthwork, that is, equalized cut-and-fill quantities. Settlement or consolidation of the inadequately compacted fill material and/or downslope fill creep often caused subsidence and cracking. As forest roads have aged, the effects of decomposing woody debris and fill consolidation have become increasingly apparent. A single road can have numerous areas of cracking and subsidence. Typical methods for repairing fillslope settlement problems, such as reconstruction, realignment, or retaining structures can be expensive.

The deep patch is a cost-effective technique for repairing and stabilizing the areas of roadways damaged by subsidence or cracking. The deep patch design is a shallow, road-fillslope repair. Crews excavate the upper 1.5 to 6 feet of the subsiding section of roadway, replace the fill material with compacted backfill, and reinforce the fill material with layers of geosynthetic material, typically geogrid. A typical deep patch repair is shown below.

USDA Forest Service and FHWA engineers have constructed at least 100 deep patch projects since the early 1990s in California, Oregon, Washington, and Colorado. Deep patches have been built on both graveled and paved roads, though primarily on paved ones.

The *Deep Patch Road Embankment Repair Application Guide* describes the history, design, construction, and performance of deep patches in repairing damaged and cracked low-volume roads. This report addresses the costs of deep patch repairs, as well as different techniques of construction, and the effectiveness of deep patches. Site selection, data collection, and design methodologies, are also discussed. Guidelines are provided for proper excavation, geogrid selection, backfill and compaction, and construction steps. Also included is an example design for a deep patch on a paved road that had a three inch AC overlay that was cracking.

A copy of *Deep Patch Road Embankment Repair Application Guide* is available for download at: http://www.fs.fed.us/eng/php/library_card.php?p_num=0577%201204P.

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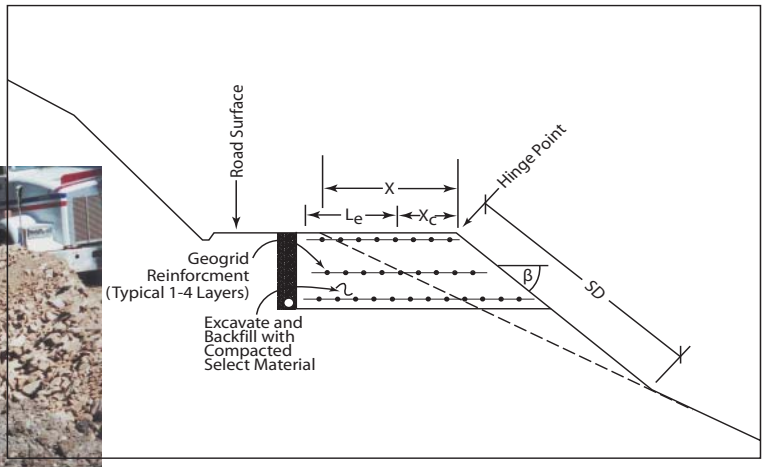


Protecting Sensitive Plants During Road Maintenance

There are several misconceptions regarding road maintenance and threatened or endangered (federally listed) plants. Two of the most important are:

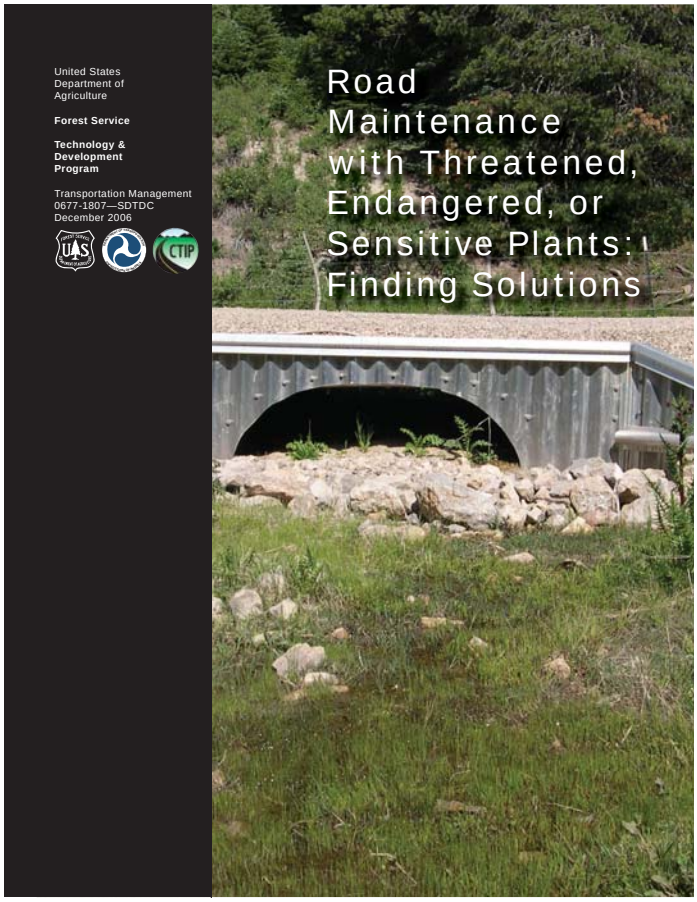
• The often-perceived requirement for a decision under the National Environmental Policy Act (NEPA) and Endangered Species Act (ESA) each time there is a need for routine or recurring maintenance on a road.

• The often-perceived conflict—or catch 22—between the laws and policy governing road maintenance.

Road Maintenance with Threatened, Endangered, or Sensitive Plants: Finding Solutions provides an overview of the process the U.S. Department of Agriculture (USDA) Forest Service—and other Federal agencies—must follow to comply with all the laws and policies for road maintenance when threatened, endangered, or sensitive (TES) plants exist or are discovered. It begins with a brief overview of the process, and then explains the directives, laws, misconceptions, and apparent conflicts that often arise when implementing road maintenance activities that may impact listed plant species.

Mitigations, or minimization measures, to road maintenance activities—best management practices (BMPs)—are often required to comply with environmental laws such as the Clean Water Act (CWA) and the ESA. This publication will be useful to land management practitioners responsible for road maintenance activities in areas with TES plants. It also will help guide you through the process when TES plants occur, and share successful solutions that can help avoid unnecessary delays because of perceived—and not necessarily real—conflicts. The appendixes provide excerpts from manuals and laws, definitions, contacts, and other sources of information.

A copy of *Road Maintenance with Threatened, Endangered, or Sensitive Plants: Finding Solutions* is available for download at: http://www.fs.fed.us/eng/php/library_card.php?p_num=0677%201807P.



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Clustered Lady Slipper Orchid is considered a sensitive plant.

FLH Partners for Geotechnical Asset Management

Federal Lands Highway (FLH) has begun to optimize its program delivery. By supporting the Transportation Pooled Fund (TPF) study TPF-5(111) "Development of Standards for Geotechnical Management Systems," standards of data collection and storage for geotechnical field information are being established.

Until now, data exchange across organizational boundaries has been extremely difficult due to differing and often incompatible forms of data collection and storage techniques. The standardization of data will allow geotechnical assets to be displayed geographically, enabling their use in the FLH Geographic Information System (GIS). Geotechnical assets comprise data associated with subsurface characterization such as geophysical analyses and laboratory testing results, structural assets such as foundations and retaining structures, and geo-hazards such as landslides and rockfalls.

The FLH Divisions as well as State and other Federal Agencies are constantly accumulating and using a tremendous amount of geotechnical data and information. However, previously collected geotechnical project data are not easily searchable or readily accessible; locating previous information is time consuming at best. Similar to State Departments of Transportation (DOT) and other federal agencies, rehabilitation projects comprise the vast majority of the current FLH program. With this trend expected to continue and increase, adequate data management systems are essential.

The development of a Geotechnical Management System (GMS) represents an important portion of the asset management network that will support our Federal Lands management agency partners. Anticipated benefits from the GMS include 1) enhanced decision making by FLH and our partners, 2) improved program selection and project scheduling, 3) cost savings related to fewer repeated field investigations, 4) increased productivity during the planning and design phases, and 5) improved information and records management.

In order to complete this multi-year pooled-fund study, FLH has joined 11 State Departments of Transportation, Federal Highway Administration, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, U.S. Geological Survey, and the United Kingdom (UK) Highway Agency , as well as academia, international professional societies, the private sector, and a public-interest nonprofit corporation funded by the National Science Foundation.

The study is creating frameworks, standards, and protocols to accelerate development of the GMS. Collaboration and information sharing across the industry will minimize redundancy. The project is designed to support two FLH technology strategies: reducing the time and cost associated with infrastructure monitoring, maintenance, and renewal; and incorporating new technology into daily work. It is scheduled for completion sometime in 2007.

Further detail concerning this effort is provided at the Data Interchange for Geotechnical and Geoenvironmental Specialists (DIGGS) and is available at http://www.diggsml.org/index.asp.

More information about the pooled-fund study can be found at http://www.pooledfund.org/projectdetails.asp?id=342&status=4.

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Riparian Restoration: Roads Field Guide

Riparian areas are degraded from improperly constructed or maintained roads. Roads can cause increased bank and channel erosion, increased sediment deposition into channels, increased flooding, and increased species mortality or injury. Impacts in riparian areas from improperly constructed roads are also indicated by a decrease in riparian vegetative cover, dewatered meadows, a decrease in water quality, and a compromised recreational experience. To cultivate an understanding of riparian areas, *Riparian Restoration: Roads Field Guide* begins with a discussion of riparian area considerations, which includes a listing of the various types of impacts one might observe in riparian areas.

Management strategies and restoration techniques can be used to protect riparian areas as a part of new road construction planning and design or as applied to existing roads. Some techniques are valid to only one or two ecoregions, but others are applicable nationwide. Techniques may be used singly or in concert with other techniques, depending on the road problem and the riparian objectives. The project checklist questions are intended to help you analyze your site for issues and prepare you to identify good solutions.

Identifying riparian impacts, issues, and solutions requires a measure or context for magnitude or significance. One way to arrive at such a context is to evaluate sites and solutions with respect to laws and regulations that apply to riparian areas. This guide addresses this topic by providing selected regulatory references from the U.S. Environmental Protection Agency (EPA) and directives from the U.S. Department of Agriculture (USDA) Forest Service Manuals (FSMs) and Forest Service Handbooks (FSHs).

This field guide presents information on management strategies and techniques but emphasizes also the importance of monitoring. As a result of its professional experience and site visits to several ecoregions, the National Riparian Roads Team recognizes that monitoring is an essential ingredient to a riparian restoration program. An explanation of monitoring and topics to consider when planning a monitoring program follows the section on laws and regulations.

A copy of *Riparian Restoration: Roads Field Guide* is available for download at: http://www.fs.fed.us/eng/php/library_card.php?p_num=0577%201801P.

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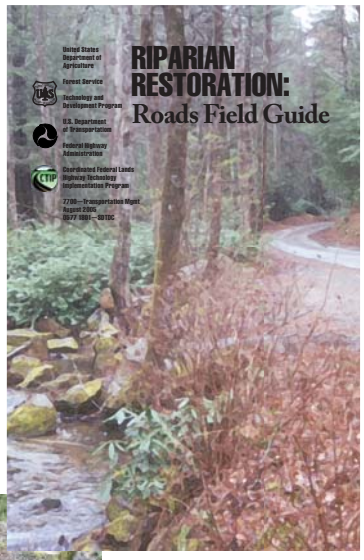

Natural streambed materials used to aid aquatic organism passage.

Engineered log jam installed to protect stream banks.

Permeable fill with culvert array constructed to cross the meadow.

Road Engineering and Construction Practices for Cold Regions

Got cold feet when trying to construct roads in cold regions? Feel the heat with Federal Highway Administration Western Federal Lands Highway Division's new interactive training software *Road Engineering and Construction Practices for Cold Regions* (FHWA-WFL/TD-07-001).

This two disk set was created as part of FHWA's commitment to providing convenient continuing education to its personnel, including field employees which are sometimes in remote locations and find it difficult to attend seminars held in the office. This training module was developed by Oregon State University with the funding from the Coordinated Technology Implementation Program.

More than 300 figures and photographs supplement this multi-media production of 275 slides of textual information. There are also several slideshows, internet resource links, downloadable software programs, and 175 complete reference documents included.

The information presented on these disks focuses on the three main climate differences that effect the construction of roads in cold regions. First, roads in cold regions are susceptible to distortion and faulting as a result of repeated frost heaving and thaw weakening. Traffic loading coupled with the cold environment can also cause the roads to crack. Thirdly, roads are also subjected to increased studded tire traffic loads, which reduce the integrity of the road by increasing the potential of water susceptibility and raveling.

With these disks you will be ready to tackle construction of roads in cold regions, and while you're there you could get out your tackle and go ice fishing.

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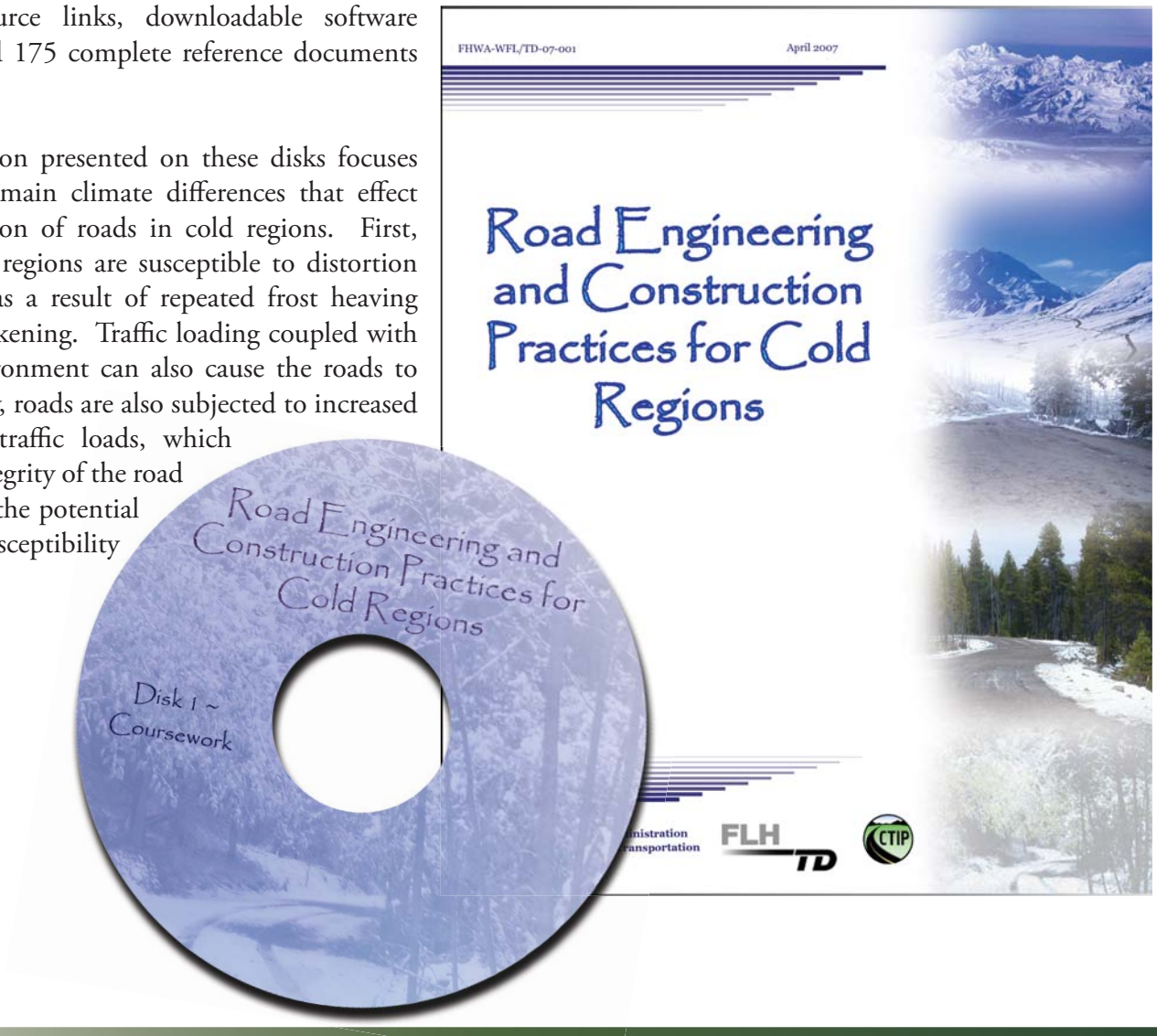

FishXing: Software and Learning Systems for Fish Passage Through Culverts

Streams and roads that cross affect each other in important, potentially destructive ways. Until recently, these two networks have been managed relatively independently by different groups of resource specialists. The sometimes destructive results have led to the realization that managing streams and roads must consider the needs and character of both, something best accomplished by interdisciplinary teamwork. A successful approach to these problems must draw from fish and wildlife biology, hydraulics, engineering, geomorphology, and hydrology.

Many stream crossings, especially culverts, impede or prevent safe passage for both upstream and downstream migration of fish. The FishXing software is intended to assist engineers, hydrologists, and fish biologists in the evaluation of culverts for fish passage. FishXing is intended to assist workers who are well grounded in the appropriate disciplines. Fish passage is an inherently interdisciplinary field and requires knowledge of fisheries, hydrology, open-channel hydraulics, fluvial geomorphology, and civil engineering. Before using FishXing, an analysis team must know the various fish species and sizes likely present at the site, the timing of their upstream movement, and possibly their swimming abilities. Additionally, it is necessary to determine the flow window for which passage must be accommodated, based on local hydrology and the timing of upstream fish movement. The results require proper interpretation and application, again requiring firm grounding in the relevant disciplines. Using FishXing without a thorough knowledge of the relevant science and technology of fish passage through culverts will likely produce incorrect analyses — rigorously calculated and documented, but wrong.

FishXing only addresses fish passage through culverts and does not furnish the user with a solution or design. Instead, FishXing offers insight into how the hydraulic environment created by a specific stream crossing design compares to the swimming abilities of particular fish. You can use the software to check the design of a new stream crossing through an iterative approach, or you can use it to analyze an existing stream crossing to determine if it meets desired fish passage criteria.

The updated version 3 of FishXing software includes a new biological module as well as support for adverse slopes, pressurized flow, and multiple culvert analysis. The FishXing software can be downloaded from http://www.stream.fs.fed.us/fishxing/index.html.

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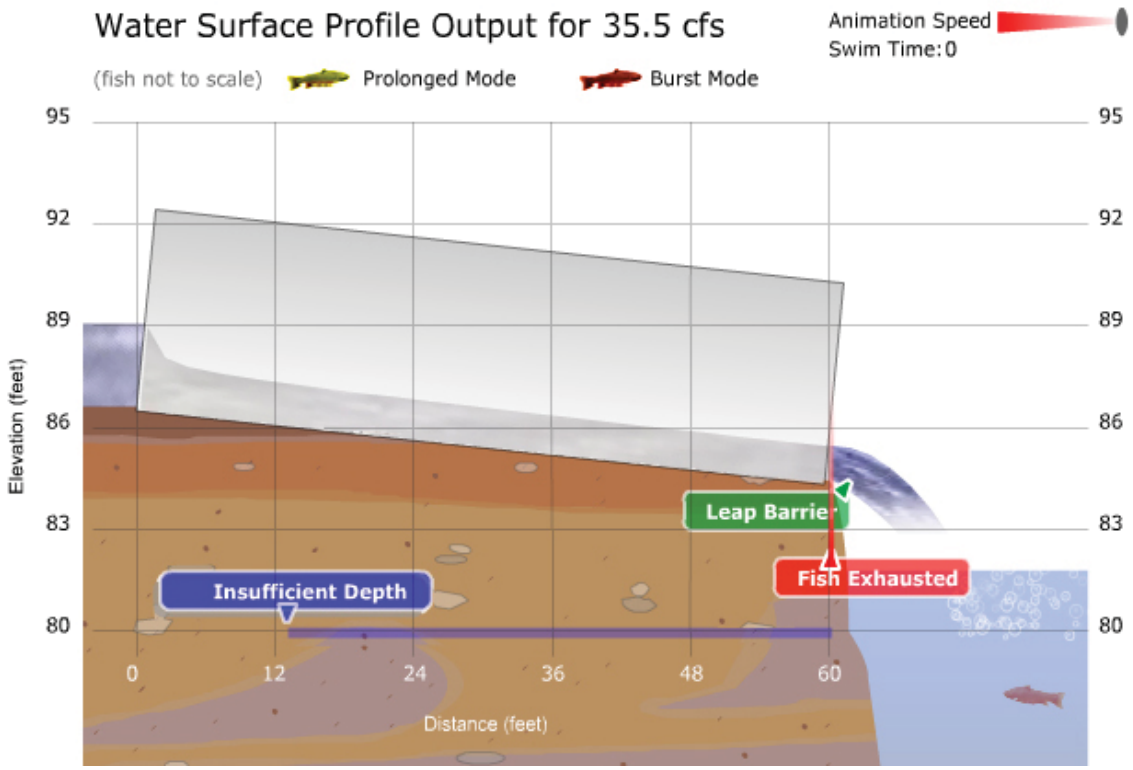

Using Design Visualization for Expedited Project Delivery

Design visualization tools are effective in conveying the real-world 3-D information to transportation stakeholders and the public. When a project involves complex engineering issues, these tools can be used to show proposed designs and to run a series of "what if" scenarios. Interaction and engagement with stakeholders enables them to provide constructive feedback, understand technical and engineering issues, and be involved in the decision making process.

Design visualization is the simulated representation of a concept and the contextual impacts of a new or rehabilitated highway. The visualization encompasses anything from a simple shaded view within a drawing, to a photo simulation, or even an animated 3-D model. In the past, use of design visualization techniques was limited to large or complex projects due to high cost and computing requirements. The advancement of computing power and availability of moderately inexpensive software, however, makes design visualization tools widely accessible to designers.

The Federal Highway Administration's (FHWA) Federal Lands Highway Division (FLHD) is working to integrate design visualization as a mainstream tool to address design issues and communicate with stakeholders. During an earlier effort, a Web-based design visualization guide (http://www.efl.fhwa.dot.gov/manuals/dv) was developed for FLHD. This guide documented available design visualization tools and presented a workflow so that the design staff could use such techniques more routinely. The current effort also explores the tools that are not currently available to FLHD staff and are used only by specialized design visualization consultants.

Currently, Western Federal Lands Highway Division (WFLHD) and the National Park Service (NPS) are cooperating on the rehabilitation of the scenic Going-to-the-Sun Road, a historic and civil engineering landmark roadway in Glacier National Park in Montana. The challenge and complexity associated with the design and reconstruction of this roadway prompted WFLHD to use this project as a case study for evaluating the role of design visualization technologies in improving project delivery time. The reason WFLHD chose the Going-to-the-Sun Road as a case study for design visualization is because the rehabilitation covers a wide range of project issues: road rehabilitation, visitor use improvements, public information, information technology improvements, and transit. The Going-to-the-Sun Road project also was optimal for the case study because the rehabilitation involved and affected multiple stakeholders, including WFLHD, the NPS, consultants, park concessionaires, the local tourism industry, gateway communities, and the public. Various changes and improvements to the Going-to-the-Sun Road itself and proposed transit stops needed to be shown to these diverse audiences with special attention to the scenic and historic qualities of the contextual environment.

A number of design visualization techniques were used on this project that range from simple photo simulation to a fully animated model for the loop area of the road. The visualizations will be used for further design evaluations and presentations to other Glacier National Park staff and to the public. The plan is to use some of the mapping tools developed to help visually track and illustrate bus and station locations for a transit control center. The case studies also were presented to the WFLHD design staff responsible for the rehabilitation work, with the goal of using some of the tools for further design studies.

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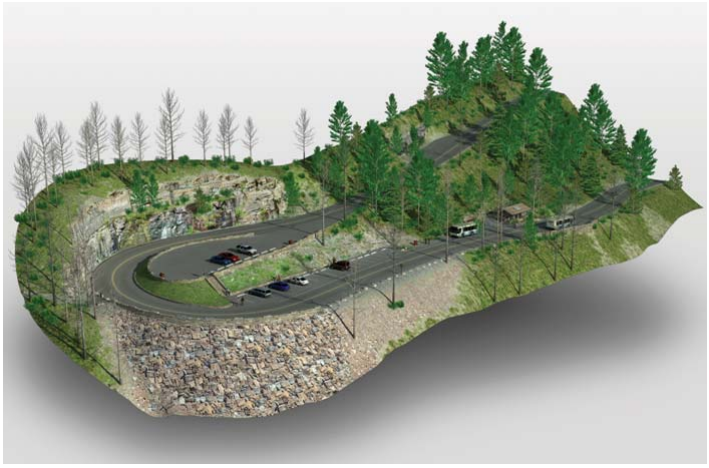

Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

On August 10, 2005, the President signed into law the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, known as SAFETEA-LU. The Federal Surface Transportation Program is amended every several years through multiyear authorization acts; such as TEA-21 (1998-2004) and now the current SAFETEA-LU (2005-2009). SAFETEA-LU is the largest surface transportation investment in our nation's history; totaling $244.1 billion. It authorizes Federal surface transportation programs for highways, bridges, public trails, enhancements, highway safety, and transit for the 5-year period 2005-2009. In addition, the Act substantially increases funding for a number of programs relevant to Federal Land Management Agencies.

The potential for partnerships is huge. However, employees may have difficulty locating the specific information they need because of the size and complexity of the program. The Forest Service (FS), Bureau of Land Management (BLM) and Federal Highway Administration (FHWA) have jointly developed training videos to show how the various programs authorized within SAFETEA-LU can benefit public lands and their neighboring communities. We have called upon the nation's best subject matter experts to help sort out the various programs in the Federal Surface Transportation Program and provide the specific information that fits the work being done in the field.

The training videos can be found at: http://www.fs.fed.us/eng/safetea-lu.

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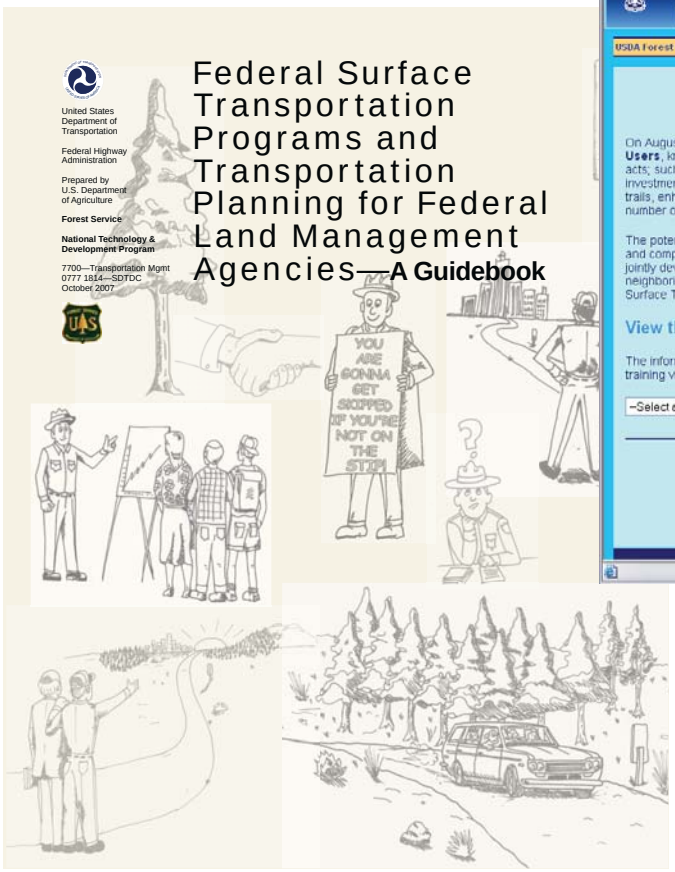

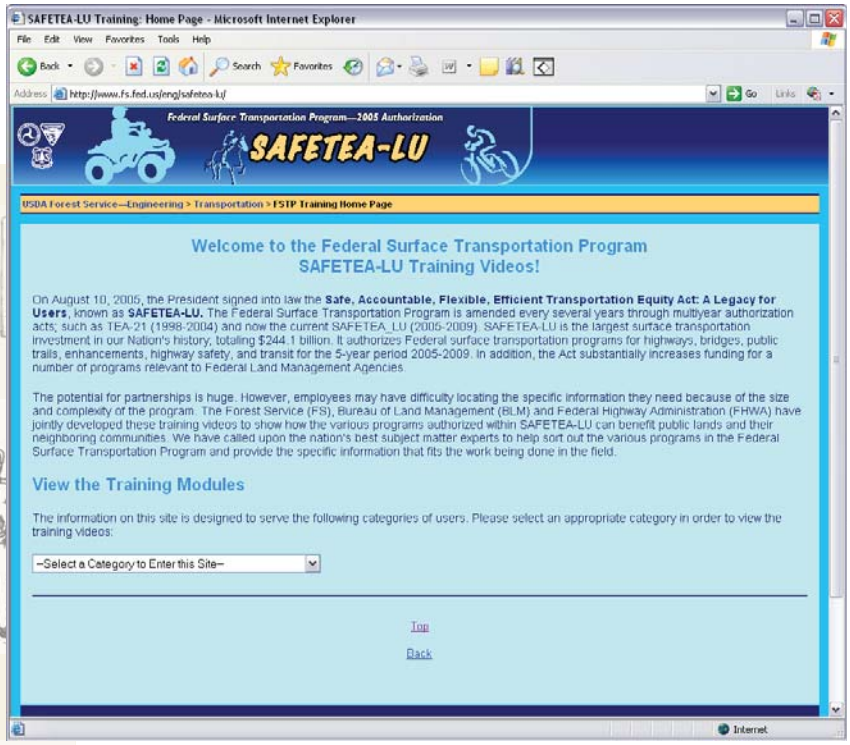

Recent CTIP Publications

Road Engineering and Construction Practices for Cold Regions	FHWA-WFL/TD-07-001
Application of Ground Anchors and Soil Nails in Roadway Construction	FHWA-WFL/TD-07-002
Pathways to Tomorrow: Transportation Education for Tribal Professionals	FHWA-WFL/TD-07-003
Endangered Species Act: Build Smart	FHWA-WFL/TD-07-004
A Manager's Guide to Roadside Revegetation Using Native Plants	FHWA-WFL/TD-07-006
Preserving a Landmark in the Sky	FHWA-WFL/TD-08-001
Path to Partnership: Rehabilitation of the Going-to-the-Sun Road	FHWA-WFL/TD-08-002

The Following Publications are Available at: http://www.fs.fed.us/eng/pubs/

Surface-Aggregate Stabilization with Chloride Materials
Erosion Control Treatment Selection Guide
Low-water Crossings: Geomorphic, Biological, and Engineering Design Considerations
Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings

For more information or copies of these publications, please contact
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