ABOVE AND BEYOND

The Environmental and Social Contributions of America's Highway Programs

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Center for Environmental Excellence

American Association of State Highway and Transportation Officials

AASHTO

The Voice of Transportation

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Letter from AASHTO's Executive Director

Dear Friends,

Transportation is more than just highways, bridges, trains, planes, and buses. Transportation connects people – to their jobs, to their communities, to each other. Transportation reaches across the nation to improve our quality of life and to ensure the well-being of our society, our economy, our environment, and our nation.

In 2001, AASHTO and FHWA created the Center for Environmental Excellence to promote environmental stewardship and encourage innovative ways to streamline the transportation delivery process. The Center has assisted state transportation agencies in developing numerous environmental stewardship practices, policies, and programs to help meet society's environmental, economic, and social goals for the future.

In 2003, AASHTO published the first *Taking the High Road* report which chronicled the important contributions that state transportation agencies were making across the country. This second report, *Above and Beyond*, documents new projects and programs that continue to advance both transportation and environmental stewardship. Within these pages you will find important facts on how transportation makes a real difference to our quality of life through investments in:

- context sensitive solutions,
- historic preservation,
- recycling,
- clean air,
- integrating transportation and land use,
- walking and biking trails,
- wetlands and water quality,
- wildlife preservation,
- sound barriers,
- scenic byways, and
- wildflowers and native vegetation.

For every good example shown here, there are hundreds more occurring all across our nation. Today, more than ever, transportation agencies are going "Above and Beyond" toward sustainable transportation.

John Horsley
AASHTO Executive Director

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Table of Contents

Native flowers in Utah blend in with the spectacular mountain scenery. *Photo courtesy of the Federal Highway Administration.*

Introduction

Transportation is about making connections. Transportation agencies connect both people and communities – reaching out across sectors of society and helping to ensure the health of our society, our economy, and our environment. With such an important role to play, a transportation agency's decisions touch all aspects of society on a long-term basis. Transportation agencies are going beyond compliance – to do the right thing for communities and the environment. They are working to ensure that transportation projects fit into and enhance their communities and the environment.

Transportation agencies are partnering with other agencies and the public to advance ecosystem- or watershed-based approaches, ensuring that transportation infrastructure is planned in a manner that preserves and increasingly enhances "green infrastructure" – the vital natural resources on which our communities depend.

At the same time, transportation agencies are taking increasingly positive steps – on-the-ground actions to preserve wildlife or to enhance communities – not because they are required, but because it is the right thing to do. These initiatives are helping transportation agencies bridge the gap and contribute to the environmental, social, and economic well-being of their communities.

A look at the numbers shows impressive trends:

- 27 state transportation agencies have implemented or are in the process of developing environmental management systems.

Did you know?

22,000 Transportation Enhancement projects have been funded to reinvigorate communities and improve the environment, including support for bicycle and pedestrian programs, historic preservation, and other improvements.

- 41 states have made significant progress in implementing context sensitive solutions.
- 43 transportation initiatives in 30 states have been identified as exemplary ecosystem initiatives.
- Agencies have identified more than 100 simple actions taken to help wildlife along roadways.
- Over 550 state stewardship and streamlining programs, policies, and initiatives have been documented by the Federal Highway Administration (FHWA).
- Thousands of environmental stewardship practices, policies, and programs are currently in use by state transportation agencies for highway construction and maintenance.
- More than 17,000 projects to reduce air pollution from motor vehicles have been funded with transportation dollars.

Transportation Finances to Environmental Improvements

Transportation agencies are typically the largest single public works investor in any community or region. Over the past decade, State and Federal transportation agencies have funneled vast amounts of money into environmental stewardship efforts. Programs including the Center for Environmental Excellence, created by the American Association of State Highway and Transportation Officials (AASHTO) in cooperation with FHWA, and FHWA's environmental initiatives have provided a wealth of resources and technical support to help advance environmental stewardship.

The Center for Environmental Excellence by AASHTO was created to promote environmental stewardship and to encourage innovative ways to streamline the transportation delivery process. The Center is designed to serve as a resource for transportation professionals seeking technical assistance, training, information exchange, partnership-building opportunities, and quick and easy access to environmental tools. A wide range of resources and original work products to advance the state of the practice have been produced by the Center and distributed through the Center's website at www.environment.transportation.org.

From 2001 to 2005, FHWA targeted more than $25 million dollars in Federal transportation funds designated for environmental streamlining to a range of environmental, planning, and realty programs and projects across the nation (*49*). These funds have advanced Federal and state efforts to address a range of environmental issues including:

- Air quality
- Context sensitive solutions
- Environmental process improvements
- Historic preservation

Travelers can stop to rest and learn about the local history at the Welcome Center on I-26 in western North Carolina.

- Water quality and wetlands
- Wildlife, vegetation, and habitat
- Land use and transportation
- Public involvement
- Planning process improvements
- Integrated approaches
- Geographic information systems
- Program management

On-the-Ground Efforts Promoted

On-the-ground actions have been promoted through an online database illustrating thousands of ongoing environmental stewardship practices, procedures, and policies for highway construction and maintenance. This database is located on the Center for Environmental Excellence website at www.environment.trasnportation.org (*16*).

Individual efforts include programs such as the New York State Department of Transportation Green and Blue initiative. In this program, the agency has charged its regional maintenance organizations with finding immediate environmental stewardship actions that can be taken along roadsides in the state, prompted by a worksheet that lists some of the many possible needs and stewardship "opportunities." These opportunities run the gamut from sediment control efforts, improved vegetation management, and wildlife habitat improvements to installation of historic markers for cultural resources.

The North Carolina DOT maintains a Monarch butterfly sanctuary along I-26 in the mountains of western North Carolina, an example of the many actions transportation agencies are taking to help protect natural habitat. Milkweed attracts a variety of butterflies at the sanctuary.

On the Road to Sustainability

The transportation industry has proposed a future vision in which the transportation network must meet the needs of a growing population and an expanding economy while simultaneously reducing the environmental footprint of the system (*1*). The vision advocates a "triple bottom line" approach to achieve sustainable transportation, giving equal weight to economic, social, and environmental factors.

"The transportation decision makers of the future should adopt the triple bottom line as a yardstick to evaluate the sustainability of surface transportation system policies and performance in order to ensure that transportation strategies and investments will result in

- Robust economic growth;
- Better-than-before health of the environment; and
- Improved quality of life for all citizens.

'The triple bottom line' is a term coined to encourage sustainable development by evaluating performance on the basis of social, economic, and environmental impacts. Applying it to assess projects, programs, and policies sends a message that financial, cost-benefit, and economic considerations are not the sole drivers of transportation projects. Under this approach, economic, social, and environmental factors are to be given equal consideration."

Look to Our Future Today – Above and Beyond

Today the transportation sector's mission goes beyond ensuring mobility to achieving the larger societal goal of economic, social, and environmental sustainability. Approaches such as context sensitive solutions and integrated planning provide transportation agencies the tools to consider economic, social, and environmental factors as they develop transportation solutions. The successes described in this report illustrate a few of the many ways transportation agencies are continuing to go "Above and Beyond" and advance down the path toward sustainable transportation.

Planning and Designing Transportation to Fit the Community

For almost a decade, transportation agencies have been advancing the concept of context sensitive solutions (CSS), in which transportation projects are planned, designed, and implemented to meet the needs of communities and the environment. CSS adds to the traditional methods of project development by emphasizing collaborative and interdisciplinary decision making and by insisting that the contexts of a project are thoroughly understood before design decisions are made.

The concept has evolved since 1998, when transportation agencies first promoted "context sensitive design" for projects at the influential Thinking Beyond the Pavement conference in Baltimore. Five pilot CSS programs were established in Connecticut, Kentucky, Maryland, Minnesota, and Utah. Today, this concept has expanded to additional states. Across the country, highway agencies are advancing a philosophy that involves all stakeholders in developing transportation "solutions" that go far beyond designing projects.

Transportation leaders agree that every transportation project offers a unique opportunity to enhance safety, mobility, economy, and the natural environment. With these goals in mind, state and Federal highway agencies have established context sensitive solutions as the way of doing business across the nation. Five pilot states began in earnest to apply the principles of CSS to their programs in the early 1990s, and the Federal Highway Administration (FHWA)

Did You Know?

By 2007, 41 states had made significant progress implementing context sensitive solutions in their standard practices.

has supported multiple programs to encourage the full implementation of CSS across the country. Numerous training courses, award programs, publications, and other initiatives advance the state of the practice. Today, every state can point to many projects that embody the goals of CSS.

A national "peer exchange" meeting held in the Fall of 2006 renewed focus on mainstreaming context sensitive solutions into transportation agencies. The event, sponsored by the Center for Environmental Excellence by AASHTO and FHWA, brought together representatives from 46 state transportation agencies and a range of Federal and private sector partners to share lessons learned and to develop a strategy to further integrate CSS concepts into day-to-day practice.

Following the peer exchange, FHWA and AASHTO partnered to establish strategic goals and initiate action plans to implement the goals. The focus of this successful partnership is to apply CSS not only to project design, but also to long-range transportation planning, acquisition, construction, and maintenance.

Vision Statement for Context Sensitive Solutions

In the year 2011, context sensitive solutions will

- be the way of doing business throughout the life cycle of a project from preplanning through maintenance, not just in state DOTs but throughout government agencies that are responsible for the development of transportation projects;
- result in solutions that provide a net improvement to the community and environment;
- meet needs and community goals as defined by a full range of stakeholders, including safety and mobility goals;
- include the full involvement of stakeholders throughout [the] decision-making [process] and be done in a way that is consistent with the broader vision for the community and environment; and
- include teams of multidisciplinary experts who all contribute to developing solutions together with stakeholders.

– Neil Pedersen, Administrator, Maryland State Highway Administration, presented at the 2006 CSS Peer Exchange

The States Move Forward

State transportation agencies are in different phases of CSS implementation, but all states are taking steps to implement context sensitive solutions at the project level or at the organizational level according to a national assessment conducted in 2007 by FHWA. The assessment found that 41 states have made significant progress with CSS implementation, including 16 states that have "mature" or "exemplary" programs or activities underway, meaning CSS is routinely incorporated into the agency culture. The remainder of the states initiated CSS efforts with many making some progress toward CSS implementation (*9*).

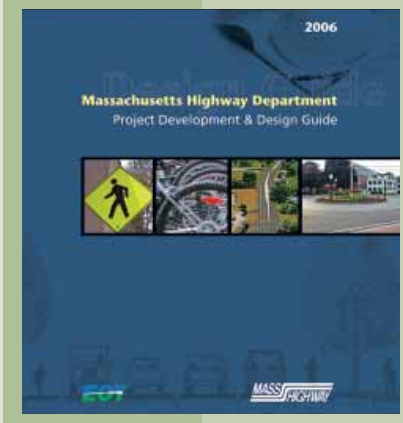
An AASHTO survey conducted in 2005 found that all 50 states are aware of the principles of context sensitive solutions. In addition, the survey found that

- 35 states had issued formal policies related to CSS;
- 37 states were undertaking steps to incorporate CSS into their project development process;
- 47 states had held seminars, workshops and/or provided CSS training to staff;
- 25 states developed or were developing public involvement plans or practice early stakeholder involvement;
- 25 states had taken specific steps to incorporate CSS into their agency culture;
- 23 states offered CSS training to consultants;
- 19 states developed CSS manuals or related website content;
- 14 states established CSS-related partnerships with university engineering departments for development and/or delivery of CSS training programs;
- 8 states had formed CSS-dedicated internal committees or teams; and
- 6 states had included CSS in their agency strategic plans.

Exemplary CSS Practices

The progress in implementing CSS is evident in the sheer number of examples of CSS policies, programs, guidelines, and manuals coming from the states. The Center for Environmental Excellence by AASHTO's Best Practices in Context Sensitive Solutions competitions garnered 75 applications from 33 states in 2005 and 62 applications from 31 states in 2006.

The following award-winning examples of CSS approaches illustrate how context sensitive solutions are truly becoming the way of doing business in transportation agencies across the nation.



Massachusetts Highway Department's 2006 design guide represented a change in approach to incorporate context sensitive solutions on all projects in the state.

State and Federal transportation officials and other stakeholders met in Portland, Oregon in October 2006 to develop a strategic plan for mainstreaming context sensitive solutions.

Massachusetts Project Development and Design Guide

The 2006 *Massachusetts Project Development and Design Guide* received numerous awards, including AASHTO's 2006 CSS competition and FHWA's 2007 Environmental Excellence Award. The guide establishes flexible design standards, is strongly multi-modal, explicitly incorporates community setting as a design factor, dramatically re-shapes the project development process, and supports early planning and coordination with all stakeholders to create safe, attractive roads (*15*).

Oregon Bridge Program

Also honored with AASHTO and FHWA awards, Oregon Department of Transportation's statewide bridge delivery program combines the concepts of CSS and sustainability, applying them to a program for repairing or replacing more than 300 bridges in the state. The approach includes a streamlined programmatic permit for all of the bridges, outcome-based environmental standards, and extensive stakeholder involvement. The approach will help meet the state's goals of maintaining mobility; stimulating the economy; employing efficient and cost-effective delivery practices; building projects that are sensitive to their communities and landscape; and capitalizing on funding opportunities (*14*).

Texas DOT Safety Rest Area Program

Texas DOT's 56 Safety Rest Areas are classic examples of how design elements can be context sensitive. Designers of these rest areas took great care to reflect the characteristics of the local environment and culture by customizing them with attractive structures, regional themes, exhibits, and information to educate travelers. Designed in collaboration with local officials and the public, each rest area is considered the "front door" for its community, promoting each region's unique features and invoking a sense of civic pride for those who live nearby. At the same time, the facilities meet the transportation agency's goal to provide safe rest stops for drivers (*15*).

The Donley County Safety Rest Area on U.S. 287 reflects a nearby town's historic role as a railroad hamlet. The Texas Department of Transportation's Safety Rest Area Program is helping to ensure driver safety while promoting tourism and civic pride across the state. *Photo courtesy of TxDOT.*

Washington State DOT CSS Policies, Procedures, and Standards

Washington State DOT's context sensitive solutions approach can be seen throughout all levels of the agency – from planning through construction and maintenance. WSDOT has coordinated efforts to develop context sensitive solutions from executives to technical staff. The agency encourages its employees to look beyond basic transportation issues and develop projects that are integrated within their unique contexts. These priorities are implemented through numerous policies, procedures, manuals, partnering agreements, training programs, liaison positions with resource agencies, and public involvement techniques (*15*).

This rendering helped visualize options for bike and passenger rail as part of the context sensitive long-range transportation plan for Ohio's Eastern Corridor. *Image courtesy of Meisner & Associates.*

New York State DOT CSS Implementation Initiative

NYSDOT is committed to improve the process by which it delivers projects and services, including a comprehensive effort to incorporate context sensitive solutions into its business practices. The initiative includes implementation guidelines, public involvement plans, training, and recognition of best practices (*14*).

Federal Lands Efforts

FHWA's Office of Federal Lands Highway (FLH) delivers projects from the Atlantic to the Pacific and from the tropics to the arctic, in partnerships with Federal land management agencies and Tribal governments. The FLH embraces a CSS approach for all projects from early planning through construction. As a part of the 2008 – 2012 Business Plan entitled "Improving Transportation to and within Federal and Tribal Lands," FLH is raising its self assessment to exemplary levels wherever FLH performance measures are set. Consequently, FLH helps to set the standards of the CSS philosophy for the rest of the nation.

Partnerships to Achieve CSS: Ohio's Eastern Corridor

A long-range transportation plan developed for the eastern corridor near Cincinnati, Ohio, demonstrates how wide-ranging partnerships can be used to develop solutions that integrate multi-modal solutions, land-use planning, and environmental stewardship. Nineteen separate political jurisdictions partnered to develop a transportation plan that includes highway, bus, rail, bicycle, pedestrian and local network projects. A key element in the plan was the use of land use vision planning, which involved citizens, elected officials, and other stakeholders to develop a "green infrastructure" program focusing on sensitive features of the Little Miami River Valley (*15*).

Research to Advance Context Sensitive Solutions

Numerous research efforts are underway to advance context sensitive solutions across the nation. Research being performed for state transportation agencies under the National Cooperative Highway Research Program will look at:

- CSS and its use of multidisciplinary teams; and
- quantification of the benefits of CSS in transportation.

FHWA efforts include the following initiatives planned under the Surface Transportation Environment and Planning Cooperative (STEP) Research program:

- establishing a CSS Clearinghouse for information and resources,
- advancing CSS implementation and stakeholder exchange, and
- utilizing a pooled-fund study to address challenges in implementing CSS.

Integrating Transportation and Land Use to Promote Sustainable Communities

The vital role that transportation plays in land use planning has been recognized nationwide in recent years. New strategies to integrate transportation planning with broader land use decisions are emerging as Federal, state, and local agencies work to find the best solutions to promote sustainable communities.

While land use planning is typically done at the local level, many transportation agencies are working to help communities develop a long-term vision for transportation and land use. Such visioning strategies bring together agencies, local elected officials, interest groups, and the public to help determine the values, goals, and objectives that are important for the community or region.

Transportation agencies are taking a variety of actions to support land use plans and visions developed for communities.

For example, transportation agencies are planning, designing, and implementing transportation projects that are consistent with community visions and goals.

In some cases, agencies are providing technical assistance to local governments for planning, acquiring right-of-way, or zoning revisions to support transit-oriented development or other local transportation options. Transportation agencies also are providing financial incentives for smart growth decisions, such as funding pedestrian and bicycle infrastructure in key areas.

Did You Know?

On its website, the FHWA lists 30 separate methods and strategies to assist state and local agencies to integrate transportation and land use.

Transportation projects are incorporating features to promote sustainable land uses and provide access to businesses and recreational opportunities.

Broader, landscape-level planning that incorporates transportation elements is advancing through various initiatives, including "green infrastructure" and "ecosystem-based" approaches to planning, such as the EcoLogical initiative promoted by the Federal Highway Administration and other Federal agencies. These initiatives focus on entire watersheds or ecosystems in an effort to preserve existing resources, reconnect natural systems, and focus economic growth in a sustainable manner.

Land Use in Transportation Planning

Provisions of the 2005 Federal transportation legislation underscore the importance of considering land use in transportation planning. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and statewide and metropolitan planning regulations require state and local transportation agencies to consult with resource agencies – including those responsible for land use planning – as part of the transportation planning process.

SAFETEA-LU also amends an existing provision that listed environmental factors that must be considered in the transportation planning process. The law requires States and MPOs to consider ways to promote consistency between transportation improvements and state and local planned growth and economic development patterns. The law does not mandate consistency between transportation and land use plans, but does require consideration of actions and strategies that would promote consistency.

In addition, the law requires state and local transportation agencies to use visualization techniques to help communicate statewide and metropolitan transportation planning concepts to the public. Such techniques may include artist renderings, models, maps, photo simulations, interactive geographic information system (GIS) tools, and computer simulations. GIS-based tools are available to help communities design, test, and visualize future land use scenarios.

The law also addresses land use considerations at the project level, stating that project purpose and need statements may include as an objective supporting land use, economic development, or growth objectives for an affected area.

Taken together, these new requirements are reinforcing an already increasing trend toward integration of transportation and land use considerations across the nation.

Federal Transportation Funds Available for Land Use Planning

Federal-aid highway funding programs that can be used to support coordinated transportation and land use planning and project development include:

- Transportation Enhancements – funding for transportation-related improvements, including sidewalks, curbs, trails, and restoration of historic structures
- Transportation and Community and System Preservation Program – funding for innovative programs to link transportation and land use
- Congestion Mitigation and Air Quality Improvement Program – funding for projects with demonstrated air quality benefits
- Metropolitan Planning – funding distributed to metropolitan planning organizations to conduct metropolitan planning activities can be used for transportation-land use coordination activities
- State Planning and Research – funding distributed to states for planning and research activities can be used for transportation-land use coordination activities

Transportation Contributions to Sustainable Land Use

A few of the many examples of transportation contributions to promote sound land use decisions are summarized below.

Illinois Tomorrow Corridor Planning Grants

This program, administered by the Illinois DOT, provides $15 million over 5 years to help local governments develop plans that integrate transportation and land use/development decision making (*52*).

Oregon Community Solutions Team

A team including representatives of Oregon DOT and four other state agencies provides quick-response technical assistance to communities that have a transportation-related land use issue, such as working with a major employer to stay downtown instead of moving to an undeveloped "greenfields" location (*52*).

State officials developed a statewide 30-year visioning process for a transportation system based on the community's values and priorities. *Photo courtesy of the Idaho Department of Transportation.*

Tools for Integrating Land Use and Transportation

Planning Activities

Corridor Planning
Interchange Area Planning
Linking Planning and NEPA
Planning for Transit-Oriented Development
Regional Agency Support for Local Planning
Regional Visioning and Scenario Planning
State DOT Support for Comprehensive Planning
Subarea/neighborhood Planning
Tier 1 EIS for Transportation Corridors

Public Involvement

Community Outreach Tools
Community Visioning Workshops and Charrettes
Land Use Scenario Development
Visualization/Simulation Techniques

GIS and Technical Analysis

CommunityViz
CorPlan
GIS Environmental Mapping/Analysis
MetroQuest
Paint the Town/Paint the Region
PLACE3S
Rural Traffic Shed Model
Smart Growth Index
Space Syntax/Ped-GRiD

Project Prioritization and Funding

Funding for Streetscape, Urban Design, and Multimodal Improvements
Project Screening and Selection Criteria
State Fiscal and Regulatory Incentives
Transit Corridor and Station Area Development Programs

Design Guidelines and Standards

Access Management
Context Sensitive Design/Solutions
Local and Regional Road Design Guidelines
Model Zoning and Subdivision Ordinances
Pedestrian and Bicycle Facilities Design Guidelines/Programs
Road Swaps and Transfers

Source: Federal Highway Administration, *Toolkit for Integrating Transportation and Land Use* website, http://www.fhwa.dot.gov/planning/landuse/tools.cfm

Seattle, WA: I-405 Corridor Program

The I-405 Corridor Program was a partnership among communities, elected officials, agencies, and advocacy groups to define a 20-year transportation vision for the 30-mile I-405 corridor in east suburban Seattle. Led by the Washington State DOT, the program undertook a streamlined environmental impact statement approach to reach consensus on a $7 billion transportation package to address mobility and access needs. The package includes multi-modal transportation projects and land use strategies (*52*).

Albany, NY: Community and Transportation Linkage Planning Program

The Community and Transportation Linkage Program helps to integrate land use and transportation decisions by providing metropolitan planning organization staff or private consultant support to local community planning initiatives. The funded planning studies are helping to implement key policies of the New Visions regional transportation plan through adoption by localities of land use plans, highway and transit designs, zoning ordinances, driveway, sidewalk, bicycle accommodation, and other standards (*52*).

Idaho Department of Transportation

Idaho Department of Transportation brought together more than 750 people from public and private sectors in the state to envision their preferred future by defining a statewide transportation system for the next 30 years. Recognized as a notable practice in AASHTO's 2004 Best Practices in Smart Growth and Transportation competition, the unique public outreach process developed a comprehensive vision statement for the movement of people, materials, products and information, based on the community's values and priorities (*13*).

New Jersey Future in Transportation Program (NJFIT)

New Jersey Future in Transportation Program (NJFIT) illustrates a new paradigm for developing transportation projects in partnership with municipalities and other agencies in the state. A winner of the FHWA and Federal Transit Administration's 2006 Transportation Planning Excellence Award, the program uses corridor studies – called Integrated Land Use and Transportation Planning Studies – and the potential for designation as Transit Villages to help communities make sound land use and transportation decisions (*55*). The initiative also was recognized as a notable practice in AASHTO's 2004 Best Practices in Smart Growth Competition.

Denver Regional Council of Governments

Denver Regional Council of Governments developed the Metro Vision 2030 as the Denver region's comprehensive 25-year plan for managing future growth while addressing development, transportation needs, and environmental quality. Through Metro Vision 2030 and the associated Regional Transportation Plan, Regional Open Space Plan, and Clean Water Plan, several unique and innovative planning and implementation tools are being used to integrate transportation and land use at the local and regional levels (*55*).

New Jersey's Integrated Land Use Program used an interactive community involvement process to help establish a vision for guiding transportation and land use changes. The process used visioning tools, such as this rendering for improvements to Route 9 in Ocean County. *Photo courtesy of the New Jersey Department of Transportation.*

New Jersey Department of Transportation

New Jersey Department of Transportation implemented a streamlined approach to the Route 1 and Route 9, Section 4T, project in the City of Elizabeth. Right-of-way design, acquisition, and relocation activities were accomplished with the highest regard for the impacted environmental, social and economic constituencies. The project involved the replacement of the Elizabeth River Viaduct to improve traffic flow. It impacted 11 businesses, 20 multi-family residential dwellings, a motel occupied by long-term tenants on public assistance, and a boarding house with 17 occupants. There were 82 residential occupants requiring relocation assistance. The project also necessitated the functional replacement of the city's public works facility. The project required that close coordination and integration be

maintained between numerous agencies and the public. Within two and a half years, the entire process was complete, and the occupants were relocated to decent, safe, and sanitary housing (*23*).

Federal Highway Administration

The Federal Highway Administration is supporting a range of efforts to improve transportation and land use, including development of the Toolkit for Integrating Land Use and Transportation website. The website lists 30 separate methods and strategies to assist state and local agencies in integrating transportation and land use, along with implementation examples for each. The agency also is working to promote use of geographic information systems, including development of a GIS in Transportation website.

Land Use and Transportation Research

A variety of research initiatives are underway to promote integration of land use and transportation planning. A project to look at approaches for transportation project land use forecasts is being done as part of the National Cooperative Highway Research Program. The project will identify best practices and methods to analyze population size and composition; land use distribution; and location and timing of growth (*59*).

In addition, FHWA's Surface Transportation Environmental and Planning Cooperative Research Program (STEP) will look at enhancing techniques to engage the public and policy-makers in land use and transportation decision making; effective applications of technical and non-technical approaches and tools; and addressing jurisdictional and institutional issues. The program also will also promote the use of scenario planning to provide a framework for developing a shared vision for the future. STEP research also will support a variety of initiatives to promote geographic information system technology (*42*).

Enhancing Our Quality of Life

Since 1992, transportation programs have provided more than $7.8 billion to fund more than 22,000 projects aimed at improving America's communities (*68*). Improvements funded by the Federal Transportation Enhancement activities can be seen across the nation on projects including bicycle and pedestrian lanes and trails, historic preservation efforts, landscaping and scenic beautification, transportation museums, and environmental mitigation.

The Transportation Enhancement activities have been funded continuously since 1992, when they were first established under the Intermodal Surface Transportation Act of 1991 (ISTEA). Most recently the program was reauthorized as part of Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), which provided $4 billion for the program from 2005 through 2009.

To receive Transportation Enhancement funds, activities must relate to surface transportation and must fall into one or more of 12 eligible categories:

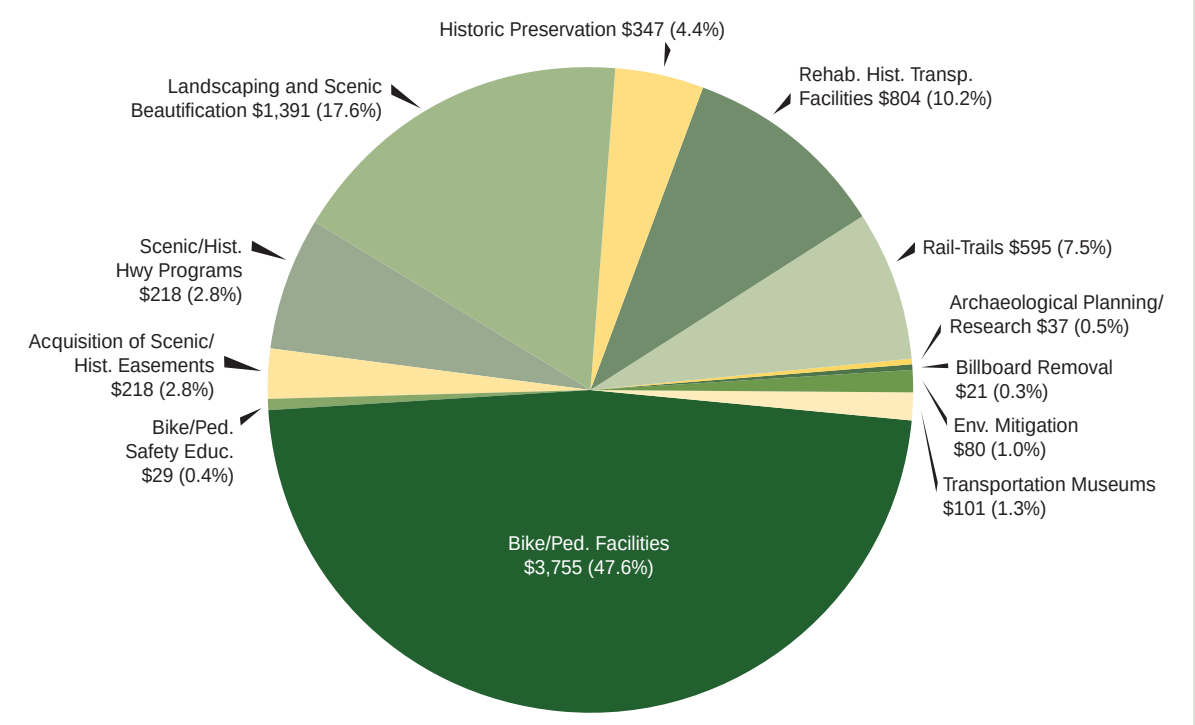
1. Provision of facilities for pedestrians and bicycles
2. Provision of safety and educational activities for pedestrians and bicyclists
3. Acquisition of scenic easements and scenic or historic sites (including historic battlefields)

Did You Know?

Transportation is enhancing Americans' quality of life, funneling billions of dollars to more than 22,000 projects that are reinvigorating communities and restoring the environment.

4. Scenic or historic highway programs (including the provision of tourist and welcome center facilities)
5. Landscaping and other scenic beautification
6. Historic preservation
7. Rehabilitation and operation of historic transportation buildings, structures, or facilities (including historic railroad facilities and canals)
8. Preservation of abandoned railway corridors (including the conversion and use of the corridors for pedestrian or bicycle trails)
9. Inventory, control, and removal of outdoor advertising
10. Archaeological planning and research
11. Environmental mitigation to
    - address water pollution due to highway runoff, or
    - reduce vehicle-caused wildlife mortality while maintaining habitat connectivity
12. Establishment of transportation museums

Distribution of Federal Funds by Transportation Enhancement Activity FY 1992 through FY 2006
(Federal funds in millions)



Source: National Transportation Enhancements Clearinghouse

Transportation Enhancement Project Contributions

Successful examples of Transportation Enhancement projects are seen across the nation, from main streets to remote scenic vistas. Wherever they are found, these projects truly are enhancing Americans' way of life. The National Transportation Enhancements Clearinghouse (NTEC), an information service sponsored by the Federal Highway Administration and Rails-to-Trails Conservancy, provides a wide range of documents, technical assistance, and project examples, all of which are available on the Internet at www.enhancements.org. The following examples are among the many Transportation Enhancement projects documented by NTEC.

With the help of Transportation Enhancement funding, the Galer Street Pedestrian Bridge provides safe passage over Aurora Ave. in Seattle, Washington. *Photo courtesy of the National Transportation Enhancements Clearinghouse, http://www.enhancements.org/*

Hearst Ranch Scenic Acquisition, San Luis Obispo County, California

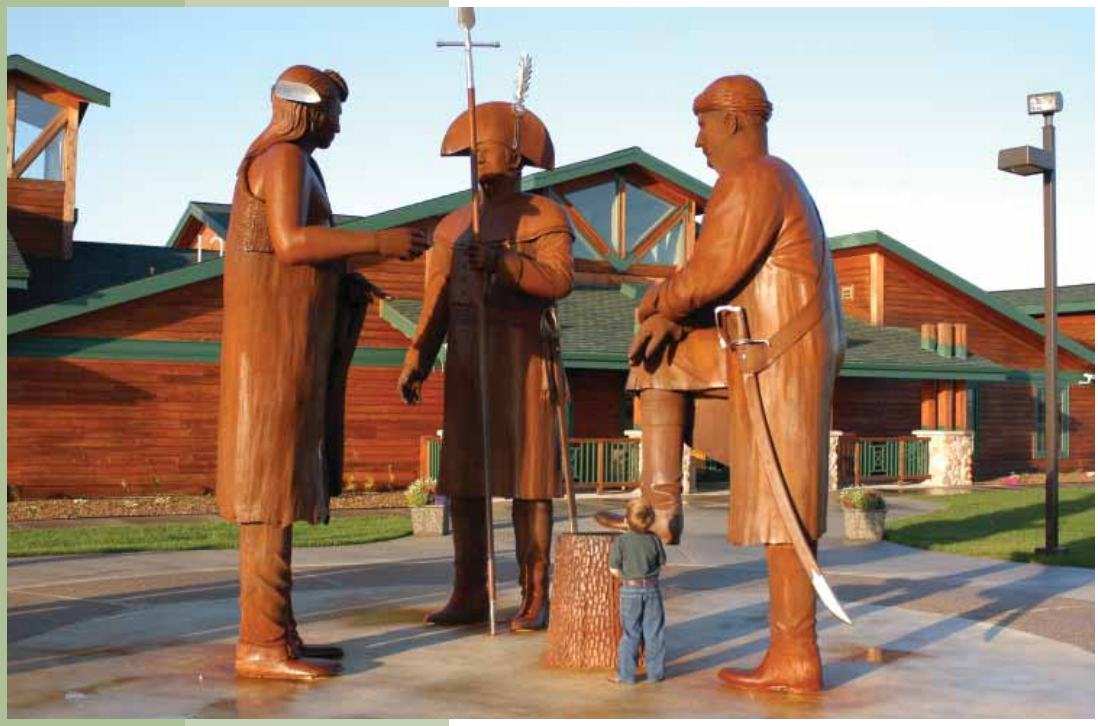
One of the largest Transportation Enhancement awards anywhere in the nation provided $21 million to establish a scenic easement to preserve a stretch of breathtaking coastal land along the Pacific Ocean and California's Highway 1. The easement agreement, reached between the Hearst Corporation and the California Department of Transportation, protected from development 1,445 acres of the Hearst Ranch while providing right-of-way access needed by the agency. The Hearst Corporation put the rest of the ranch (80,500 acres) under a conservation easement with the American Land Conservancy (*66*).

"With more than 20,000 projects on the ground around the country, transportation enhancements have proven that transportation projects can do more than efficiently move people. They can simultaneously improve local economies, enhance the environment, and create central community places."

– Enhancing America's Communities, A Guide to Transportation Enhancements, National Transportation Enhancements Clearinghouse

Lewis and Clark Interpretive Center, Washburn, ND

The Lewis and Clark Interpretive Center, located along U.S. 83 in North Dakota, provides an overview of the Lewis and Clark Expedition, with special emphasis on the explorers' time spent at Fort Mandan during the winter of 1804 – 1805. Many Native American artifacts are on display, including an authentic wood canoe carved from the trunk of a large cottonwood tree that demonstrates the winter preparations the expedition made while at Fort Mandan. There are also



The Lewis and Clark Interpretive Center, near U.S. 83 in North Dakota. *Photo courtesy of the Lewis & Clark Fort Mandan Foundation, http://www.fortmandan.com*

exhibits on the history of steamboat travel and fur trade that took place around Fort Clark, a trading post built in the 1830s. The Fort Mandan Lewis and Clark Foundation, working through the North Dakota Parks and Recreation Department, financed much of the interpretive center and its exhibits with two Transportation Enhancement awards. The first was used to construct the 5,500 square foot facility and the second provided funds to double its size, adding new exhibit space, an office area, and a large meeting room (*67*).

Keystone Ancient Forest Preserve, Sand Springs, OK

The Keystone Ancient Forest Preserve is a 1,170-acre woodland site located 15 miles west of Tulsa, Oklahoma. The Oklahoma Department of Transportation secured Transportation Enhancement funds to purchase this unique natural area that provides a spectacular vista for travelers on U.S. Highway 412. The city of Sand Springs, which now holds the deed to the property, is contracting with The Nature Conservancy to operate and maintain the preserve as a natural area. In addition to its scenic qualities, the preserve is a significant ecological site. It hosts an unparalleled concentration of ancient red cedar trees and the world's oldest known post oak tree. Trees of both varieties are estimated to be more than 400 years old. Tree ring chronologies developed from the ancient post oaks on the site have assisted climatologists in estimating the climatic record of the past four centuries. The preserve is also home to the state's largest known bald eagle roost (*67*).

Bike St. Louis, St. Louis, MO

With the help of a $214,525 Transportation Enhancement award, the Bike St. Louis program was developed to increase the public's participation in cycling by mainstreaming bicycle transportation. Key elements of their approach are the creation of safe and efficient bike routes and increased awareness of safe bicycling throughout the region through educational outreach. Bike St. Louis acts as a coordinating force between local citizens, advocates, city politicians,

The Springwater Trail, Three Bridges Transportation Enhancement project in Portland, Oregon, extends a multi-use path on an abandoned railroad line over McLoughlin Boulevard, the Union Pacific Railroad, and Johnson Creek. *Photo courtesy of the National Transportation Enhancements Clearinghouse, http://www.enhancements.org/*

Transportation Enhancement funds were used to construct sidewalks, bike lanes, curb/drainage, landscaping, and lighting along 92nd Avenue in Portland, Oregon. Recessed planting areas act as water infiltration points for street and sidewalk runoff. *Photo courtesy of the National Transportation Enhancements Clearinghouse, http://www.enhancements.org/*

The Central Railroad of New Jersey Terminal, in Jersey City, New Jersey, used Transportation Enhancement dollars for historic signs, exhibits, displays and refurbishment of the caboose and freight car as an information center. *Photo courtesy of the National Transportation Enhancements Clearinghouse, http://www.enhancements.org/*

city and county agencies, and the Great Rivers Greenway District. Given the overwhelmingly positive response to the Bike St. Louis project, the greenway district and the City of St. Louis are working on a second phase of the project. Funded with a second Transportation Enhancement award for $451,677, Phase 2 will provide an additional 57 miles of on-road routes (*66*).

Historic Goddard Covered Bridge, Goddard, KY

A Transportation Enhancement award of $573,000 helped to fund a unique approach to restore the historic Goddard Covered Bridge in Kentucky. Rather than dismantle and rebuild the bridge offsite with mostly new materials, the Kentucky Transportation Cabinet worked with the private sector consultant to honor the community's desire to restore the bridge on-site and took additional measures to retain its original look and character (*66*).

Covered bridge in Lancaster County, Pennsylvania.

Promoting Walking and Biking

Building a transportation infrastructure that encourages walking and biking is a vital role of the nation's transportation agencies. Transportation programs are continuing to support pedestrian and bicycle travel through increased funding, planning for walkable and bikeable communities, and promotion of healthy communities.

From 1999 to 2006, the Federal Aid Highway Program provided $2.9 billion in funding to bicycle and pedestrian programs. Two-thirds of these funds came from the Transportation Enhancement activities. More than half of all Transportation Enhancement projects are related to bicycle and pedestrian improvements (*41*).

The remaining Federal-aid funds for biking and walking programs came from programs including the Congestion Mitigation and Air Quality Improvement Program, Surface Transportation Program, National Highway System, Bridge Program, Interstate Maintenance, Federal Lands, Recreational Trails Program, National Scenic Byways, and congressionally earmarked funds.

New programs promoting bicycle and pedestrian improvements also were created as part of the 2005 surface transportation law, the Safe, Accountable, Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

Funds Walking, Biking Paths Pilot Program

SAFETEA-LU established a new pilot program aimed at demonstrating the extent to which bicycling and walking can

Did You Know?

Transportation programs provided almost $3 billion in funding for bicycle and pedestrian initiatives from 1999 to 2006.

Top Photo: Staying fit by bicycling can be a family affair with a tandem bicycle. *Photo by Dan Burden courtesy of www.pedbikeimages.org/*

carry a significant part of a community's transportation needs. The Nonmotorized Transportation Pilot Program provides $100 million to be divided equally among four communities to construct a system of bicycle and pedestrian facilities and programs. The communities are Marin County, California; Columbia, Missouri; Sheboygan County, Wisconsin; and Minneapolis-St. Paul, Minnesota.

The funds are provided to each community to construct a network of nonmotorized transportation infrastructure facilities – including sidewalks, bicycle lanes, and pedestrian and bicycle trails – that connect directly with transit stations, schools, residences, businesses, recreation areas, and other community activity centers.

A key element of the program is a before-and-after study to document travel habits in each community. Statistical information will be gathered on changes in use of motor vehicles, walking and bicycling, and public transportation. The study will assess how such changes decrease congestion and energy use, increase the frequency of bicycling and walking, and promote better health and a cleaner environment.

An interim report on the program is due to Congress by September 30, 2007, and a final report is due by September 30, 2010.

This distant shot of a pedestrian underbridge in Phoenix, Arizona, shows an open plaza that directs foot traffic into the underpass. *Photo courtesy of www.pedbikeimages.org/ photographer Mike Cynecki.*

Hundreds of students from Gilles-Sweet Elementary School, in Fairview Park, Ohio, walked or biked to school to celebrate International Walk to School Day on October 3, 2007. The local ice cream store gave free cones to all students who made a sign and the students met celebrity crossing guards. *Photo courtesy of www.iwalktoschool.org*

Safe Routes to School

A program to encourage children to walk and bike to school also was created by SAFETEA-LU. The law devotes $612 million for the Safe Routes to School program through fiscal year 2009. The funds can be used for a range of infrastructure and noninfrastructure activities. Infrastructure improvements to streets and sidewalks are eligible as are education and encouragement of children and parents, and increased enforcement of traffic laws. At least 70 percent of the funds must be used on infrastructure projects with the remaining to be used on noninfrastructure projects (e.g., education campaigns).

The funds are provided to state departments of transportation and are distributed based on student enrollment in grades K through 8, with no state receiving less than $1 million per year. Each state and the District of Columbia is required to appoint a full-time Safe Routes to School Coordinator to serve as a central point of contact for the state.

Programs can include:

- sidewalk improvements,
- traffic calming and speed reduction improvements,
- pedestrian and bicycle crossing improvements,
- on-street bicycle facilities,
- public awareness campaigns and outreach to press and community leaders, and
- traffic education and enforcement in the vicinity of schools.

Ensuring that children can walk and bike safely to school each day is the goal of the Federal Safe Routes to School program. *Photo courtesy of www.pedbikeimages.org/ photographer Dan Burden.*

Biking and Walking as Transportation Solutions

Nonmotorized modes of transportation are a key consideration as transportation agencies look to develop and implement transportation projects and programs in cooperation with stakeholders to best meet the needs of communities.

Increasingly, citizens expect their communities to offer a range of transportation options including sidewalks and bicycle lanes and trails for walking or biking to schools, stores, offices, parks and other destinations. Transportation planners can have a substantial impact on the health of communities by providing opportunities for physical activity through walking and biking.

As a result, transportation agencies are incorporating multi-modal options, including bicycling and walking as well as public transportation, as they plan transportation solutions for communities and regions.

Transportation Contributions to Biking and Walking

The following examples illustrate just a few of the many efforts to promote bicycle- and pedestrian-friendly communities that can be seen in projects and programs across the nation.

Massachusetts Highway Department

The *Massachusetts Project Development and Design Guide* received the Federal Highway Administration's Environmental Excellence Award for incorporation of nonmotorized transportation into all project design activities. The guidebook directs the project designers to first consider the needs of the pedestrians and bicyclists, ensuring consideration of safety and accessibility needs of nonmotorized facility users as well as automobiles (*29*).

New Jersey: Statewide Bicycle and Pedestrian Master Plan

The New Jersey Department of Transportation, in cooperation with the state's metropolitan planning organizations, has developed an exemplary statewide master plan for bicycle and pedestrian facilities. The plan includes a database of existing, proposed and potential bicycle and pedestrian facilities throughout the state; a list of priority locations for bicycle and pedestrian improvements; and opportunities for improving the bicycle or pedestrian compatibility of existing projects (*62*).

District of Columbia Develops Great Streets

The District of Columbia Department of Transportation has developed its Great Streets program to increase neighborhood livability and economic growth, and encourage community interactions. Also recognized in 2007 for environmental excellence by FHWA, the Great Streets program focuses on building safe, walkable communities with streetscape improvements that allow for a range

Bicycle trails like the Blackstone Bikeway in south-central Massachusetts are part of the state's emphasis on context-sensitive solutions. *Photo courtesy of the Massachusetts Highway Department.*

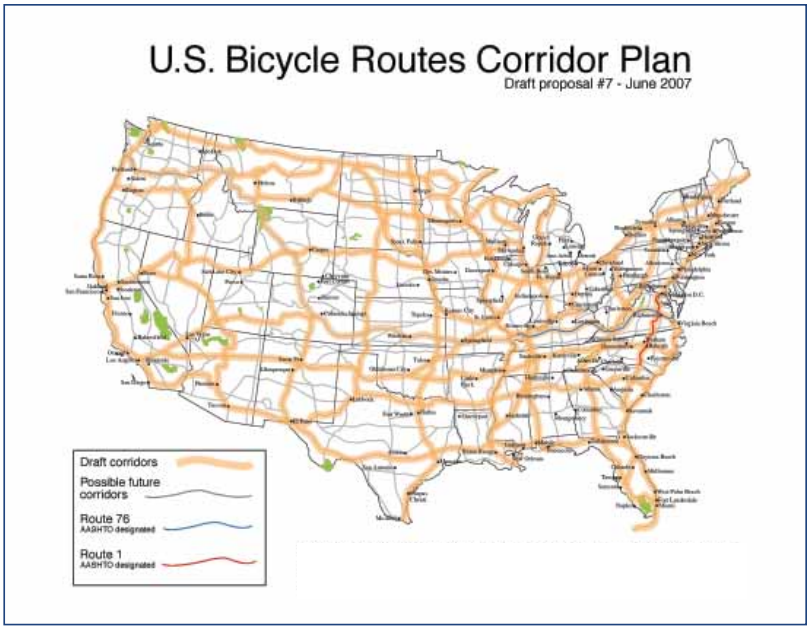
of transportation options. The initiative targets major boulevards in the city to improve the condition and function of the streets and roadways, improving neighborhood quality of life and enhancing pedestrian, bicycle, and transit mobility (*21*, *33*).

Development of a U.S. Bicycle Route Corridor Plan

In an effort to further promote bicycling, the American Association of State Highway and Transportation Officials (AASHTO) has teamed up with several other organizations, including Adventure Cycling Association, to develop a national interstate route system for bicycles. A task force has completed an inventory of state and national bike routes and trails across the United States, and this information will be use to develop recommended corridors for a national system of bicycle routes. The U.S. Bicycle Route Corridor Plan will be used as the basis for State Departments of Transportation to propose the designation of coordinated bicycle routes through multiple states, although the selection of specific paths, roads, and highways will be left to

Cyclists big and small enjoy the benefits of a dedicated bicycle lane in Santa Barbara, California. *Photo courtesy of www.pedbikeimages.org/ photographer Dan Burden.*

Corridors are defined as "desire lines" that link urban-rural communities, attractions, and recreational areas in a network. Roads or trails chosen for these corridors should be within ±50 miles of the recommended corridor. Defining the corridor is the first step to defining a bicycle route and focuses on the overall direction and natural landscape features of the route. *Source: Adventure Cycling Association, Draft Corridor Plan, http://www.adventurecycling.org/routesandmapping/NBRN-pp.pdf*



each State DOT working with other agencies and organizations. The Corridor Plan will be developed with feedback received from task force members and other important stakeholders (*3*).

Benefit-Cost Analysis of Bicycle Programs

Researchers have developed a tool to help transportation planners integrate bicycle facilities into their transportation plans and projects. The web-based guidelines provide a step-by-step worksheet for estimating costs, demands, and benefits associated with specific facilities under consideration (*60*).

Partnerships in Promoting Bicycling and Walking

Washington State's Active Community Environment Program illustrates how agencies are using partnerships to promote the benefits of nonmotorized transportation. The effort is a partnership between the State Departments of Transportation; Health; Community, Trade, and Economic Development; and regional and metropolitan planning organizations. The project seeks to incorporate transportation policy and infrastructure changes for communities throughout the state to help improve bicycle and pedestrian facilities and safety and use urban planning approaches related to zoning and land use that promote physical activity (*82*).

On the Road to Cleaner Air

Most people don't realize that since 1970, emissions of key "criteria" air pollutants from motor vehicles have dropped considerably, primarily as a result of cleaner vehicles and cleaner fuels. These reductions have been achieved despite increases in population, employment, and vehicle miles traveled.

Specifically, the U.S. Environmental Protection Agency (EPA) reports that volatile organic compound emissions are down 73 percent, nitrogen oxide (NOx) emissions are down 41 percent, coarse particulate matter (PM_{10}) emissions are down 50 percent, and carbon monoxide emissions are down 62 percent. These reductions – which are attributed primarily to more stringent Federal air quality standards for engines and fuels – have occurred despite a 41 percent increase in population, 167 percent growth in Gross Domestic Product (GDP), and 157 percent growth in vehicle miles traveled (*53*).

In addition to controlling pollutants such as hydrocarbons, particulate matter, and nitrogen oxides, EPA's recent regulations controlling emissions from highway vehicles and nonroad equipment also will help reduce toxic air pollutants, such as benzene, from motor vehicles. EPA also is finalizing new standards that would establish stringent new controls on gasoline, passenger vehicles, and gas cans to further reduce emissions of mobile source air toxics.

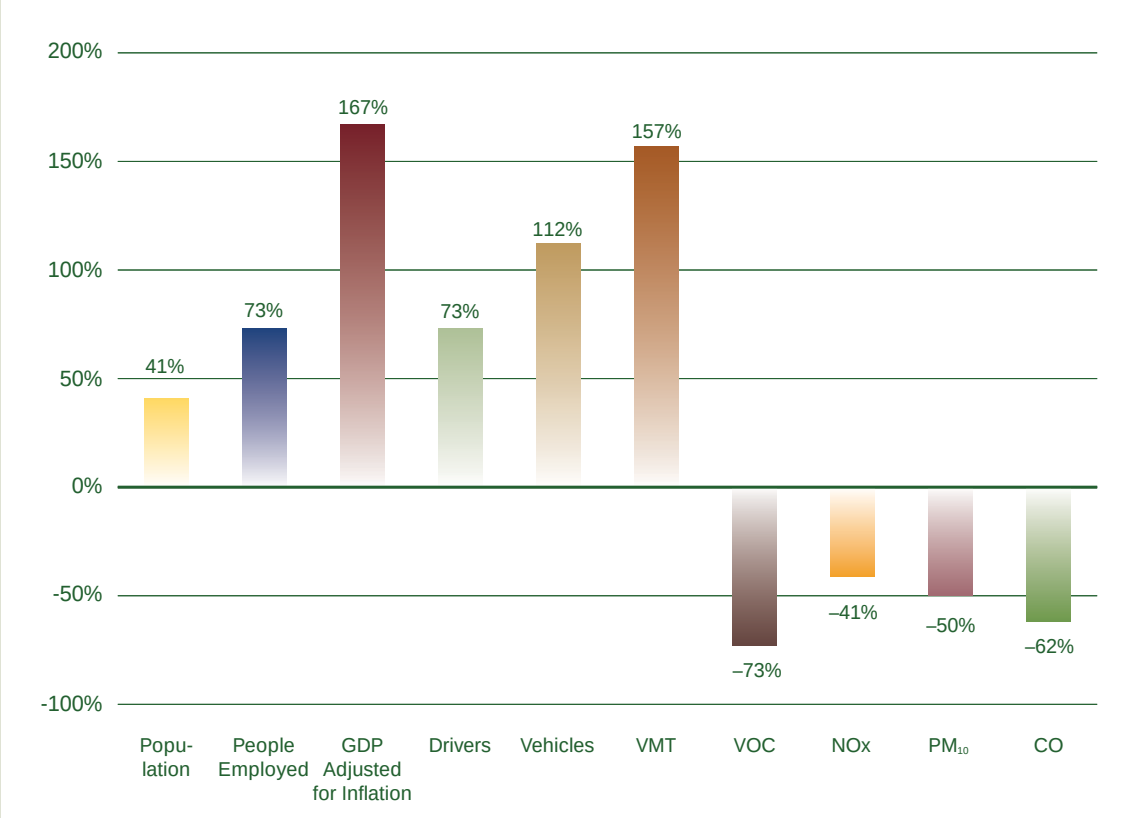
Did You Know?

Emissions of criteria air pollutants from motor vehicles have decreased substantially since 1970 because of cleaner vehicles and fuels; meanwhile, the transportation sector has invested upwards of $14 billion for more than 17,000 projects since 1992 to reduce air pollution from motor vehicles.

Despite this progress, air quality continues to be a concern facing the transportation sector. Transportation agencies nationwide have many efforts underway to further reduce emissions for criteria pollutants, air toxics, and greenhouse gas emissions.

The Congestion Mitigation and Air Quality Improvement (CMAQ) Program, funded by Federal transportation dollars, has provided billions of dollars for projects aimed at improving air quality. In 2005, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) authorized more than $8.6 billion for the program from 2005 to 2009. The program has supported nearly 17,000 transportation projects across the country since 1992 (*38*).

Percent Change in Motor Vehicle Emissions, Demographics, and Travel (1970 – 2000)



Source: Federal Highway Administration, www.fhwa.dot.gov/environment/aqfactbk/page05.htm

Wide Range of Projects Supported by CMAQ

CMAQ provides a flexible funding source for state and local governments to fund transportation projects and programs to help meet the requirements of the Clean Air Act. CMAQ money supports a wide range of transportation projects that reduce mobile source emissions in areas designated by EPA as in nonattainment or maintenance of national ambient air quality standards. These include:

- transit improvements,
- shared ride services,
- traffic flow improvements,
- demand management,
- bicycle and pedestrian projects,
- alternative fuels,
- inspection and maintenance programs,
- freight services,
- experimental pilots,
- public/private partnerships,
- diesel retrofits, and
- anti-idling facilities.

SAFETEA-LU encourages states and metropolitan planning organizations to give priority to cost-effective congestion-mitigation activities that provide air quality benefits, particularly projects and programs that finance diesel retrofits. The law includes expanded CMAQ eligibility to include projects and programs that:

- establish or operate advanced truck stop electrification systems;
- improve transportation systems management and operations that mitigate congestion and improve air quality;
- involve the purchase of diesel retrofits that are for motor vehicles or non-road vehicles and non-road engines used in construction projects located in ozone or particulate matter non-attainment or maintenance areas; and
- conduct outreach activities that provide assistance to diesel equipment and vehicle owners and operators regarding the purchase and installation of diesel retrofits (*38*).

Numerous examples illustrate ongoing transportation efforts to improve air quality across the nation, including CMAQ-funded programs and other initiatives.

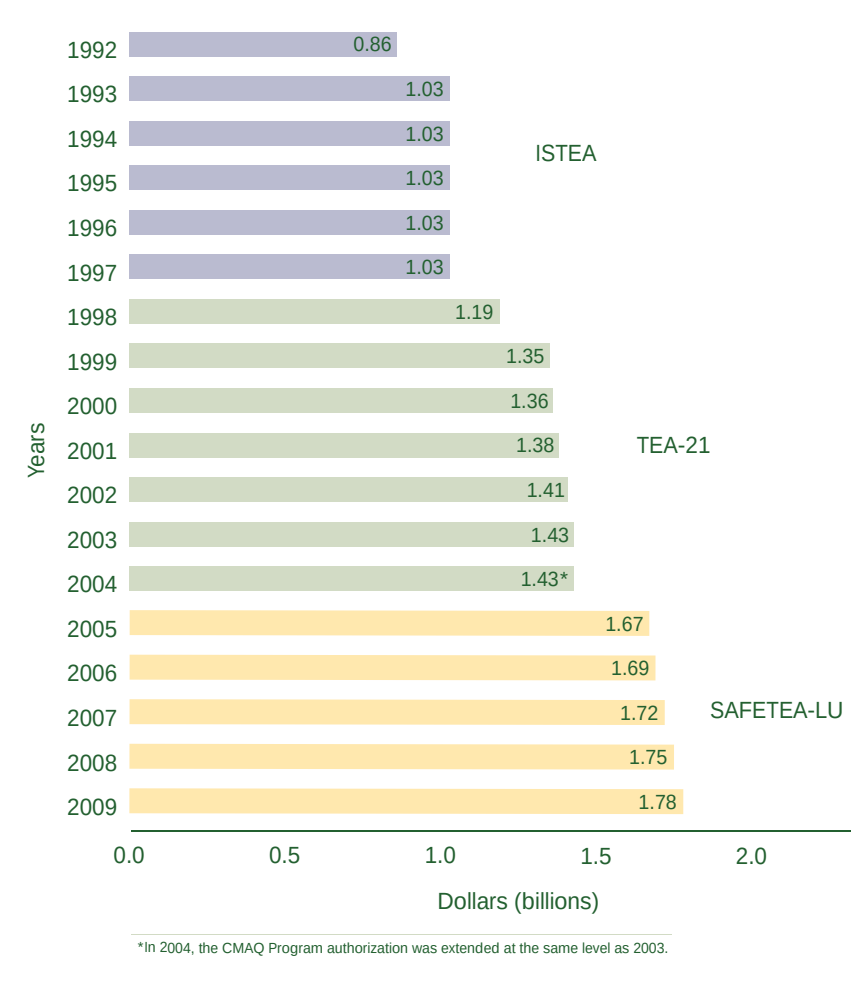
South East Texas Regional Planning Commission, Beaumont, TX

South East Texas Regional Planning Commission, based in Beaumont, TX, provided $5.2 million of CMAQ funds to install 532 advanced truck stop electrification units to stop diesel engine idling at four sites in the Beaumont Port Arthur Ozone non-attainment area. A private firm contributed $2.6 million (*35*).

Knoxville Regional Transportation Planning Organization

The Knoxville Regional Transportation Planning Organization used $1 million in CMAQ funds to install 100 advanced truck stop electrification units to stop diesel engine idling at the Petro Stopping Center along I-40/I-75 in Knoxville, TN (*35*).

CMAQ Authorization Levels



*In 2004, the CMAQ Program authorization was extended at the same level as 2003.

Source: Federal Highway Administration

Truck stop electrification technologies, shown here, allow trucks to eliminate air pollution from idling. *Photo courtesy of IdleAire Technologies, www.idleaire.com*

Oakland Metropolitan Transportation Commission and the Bay Area Air Quality Management District

The Oakland Metropolitan Transportation Commission and the Bay Area Air Quality Management District partnered with 26 Bay Area transit operators to offer free all-day rides on "Spare the Air" weekdays to increase transit ridership and reduce emissions (*33*).

Georgia NAVIGATOR

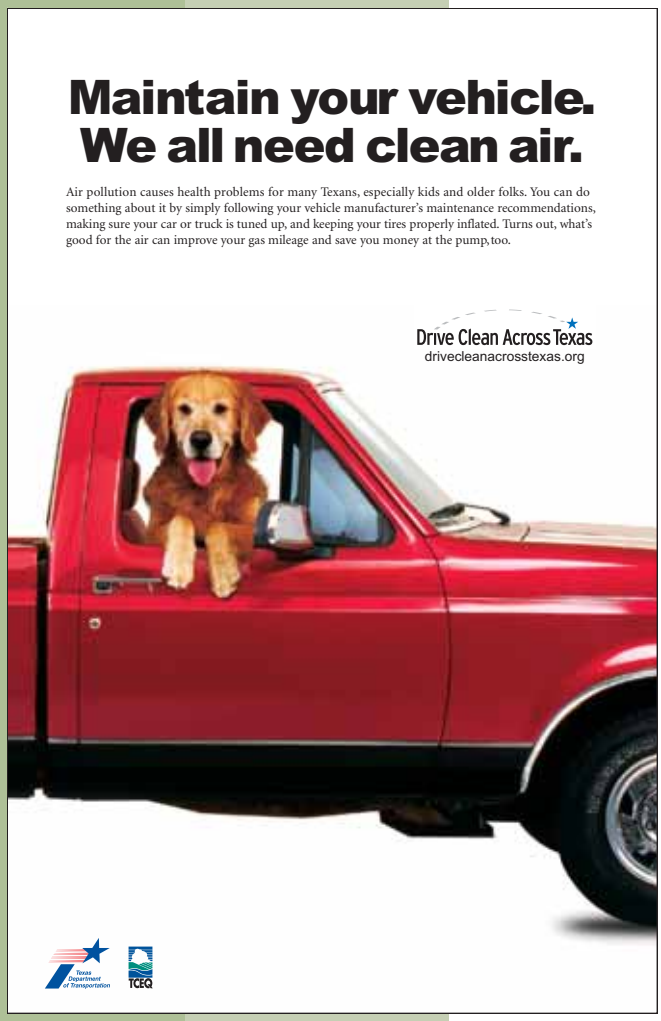
The Georgia NAVIGATOR is an Advanced Transportation Management System that monitors and manages traffic conditions on 90 miles of interstate highway in the Atlanta metropolitan area. The system was developed at a total cost of $140 million, of which $54 million were CMAQ funds (*35*).

Advanced Regional Traffic Interactive Management and Information System

The Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) is a transportation system management project designed to improve traffic flow. It was put in place by the Ohio-Kentucky-Indiana (OKI) Council of Governments to monitor and control traffic on 88 miles of regional freeways at a total cost of $57 million, of which $41 million were CMAQ funds.

New York Metropolitan Transportation Council-MPO

New York Metropolitan Transportation Council-MPO for New York City, Long Island, and the Lower Hudson Valley created the New York Best Practice Model. The model is the first traveler-activity-based model in the United States to have been used in air quality conformity analyses and major investment studies. It opens up new opportunities for transportation planners and policy-makers to better analyze transportation policies, including parking, congestion pricing, flexible work hours, and the impacts of demographic and land use changes (*26*).



The Texas Department of Transportation provides marketing materials such as this flyer to help promote its *Drive Clean Across Texas* campaign. *Image courtesy of TxDOT.*

Drive Clean Across Texas

The nation's first statewide public outreach and education campaign – sponsored by Texas DOT, the Federal Highway Administration, and the Texas Commission on Environmental Quality – is designed to raise awareness and change attitudes about air pollution. The goal of the campaign is to inspire changes in driving behavior through public outreach, media relations, and public education (*76*).

Red Hook Container Barge, New York, NY

CMAQ funds of $1.9 million were matched in a 50:50 ratio to purchase barge to ship freight containers via the Hudson River rather than on the highways, removing 54,000 truck trips from New York and New Jersey streets annually (*37*).

Houston Clean Air Action Program/Transit Subsidy

A reduced transit fare program was offered in August when ozone readings typically have been highest. CMAQ funds were $2,625,000 of the $3,500,000 total program cost (*39*).

Partnerships to Improve Air Quality: Regional Collaboratives

Transportation agencies across the nation are partnering with other agencies and the private sector to help address air quality concerns, such as the regional collaboratives developed as part of EPA's National Clean Diesel Campaign. Working together with businesses, government and community organizations, industry, and other stakeholders, the campaign uses proactive, incentive-based approaches to promote a wide range of measures to reduce diesel emissions, including retrofitting vehicles and equipment, upgrading or replacing older engines, supporting idle reduction programs, and using cleaner fuels. For example, Oregon's Clean Fuel for Bridge Construction Project – part of the West Coast Collaborative – promotes the use of ultra-low sulfur diesel fuel to reduce diesel emissions from non-road construction equipment involved in bridge improvement projects. Construction contractors that use ultralow sulfur diesel fuel will receive a 5 cents-per-gallon fuel subsidy (*22, 81*).

It All Adds Up to Cleaner Air is a public education initiative of the Federal Highway Administration and other partners. The initiative has developed marketing materials including posters designed for bus shelters that promote alternatives to driving.

Air Quality Research Planned

Extensive research is planned to further address transportation impacts on air quality. Efforts under the Federal Highway Administration's Surface Transportation Environment and Planning Cooperative Research Program (*42*) will look at:

- Testing and evaluation of EPA's new emissions model (MOVES);
- Conducting project-level analysis of particulate matter emissions;
- State and local climate change activities and dissemination of research and best practices;
- Developing strategies and improved information for future CMAQ project selection;

- Literature review of air toxics and particulate matter research;
- Support for DOT's Center for Climate Change and Environmental Forecasting; and
- Support for the Gulf Coast Study on Analyzing Impacts of Climate Change on Transportation Infrastructure.

Water Quality and Wetlands — Successful Legacies

Transportation agencies have exceeded goals to achieve a net gain in wetlands acreage, providing more than 23,000 acres of compensatory mitigation since 1996, including all forms of compensation (restoration, preservation, enhancement, and creation). In 2006, Federal Highway Administration (FHWA) data showed a continued positive trend, with the nation's highway programs providing 2.6 acres of wetlands mitigation for every acre impacted by highway projects (*79*).

Agencies also are looking to go beyond project-by-project mitigation for impacts to water quality and wetlands by focusing on broader ecosystem approaches that achieve better outcomes for the environment. For example, wetland banking has been an effective method to provide for mitigation in advance of project impacts. Efforts to incorporate natural resource inventories and data in transportation planning are providing new opportunities to help avoid sensitive water resources and determine the most effective mitigation for unavoidable impacts. FHWA has promoted these types of approaches through the interagency Eco-Logical framework for infrastructure projects (*40*).

As of fiscal year 2007, FHWA will begin tracking progress in addressing water quality and wetlands impacts by accounting for the increasing number of "Exemplary Ecosystem Initiatives" across the nation. These initiatives are actions or measures that will help sustain or restore natural

Did You Know?

Transportation agencies are providing 2.6 acres of wetland mitigation for every acre of wetlands impacted by Federal-aid highway projects. At the same time, improved technologies and broad-based watershed approaches are improving efforts to protect and restore water resources and address highway runoff.

Photo: Utah's Legacy Nature Preserve offers open water and emergent marsh wetland habitat, with the Oquirrh Mountains looming in the distance. *Photo courtesy of Mike Perkins, HDR, Inc.*

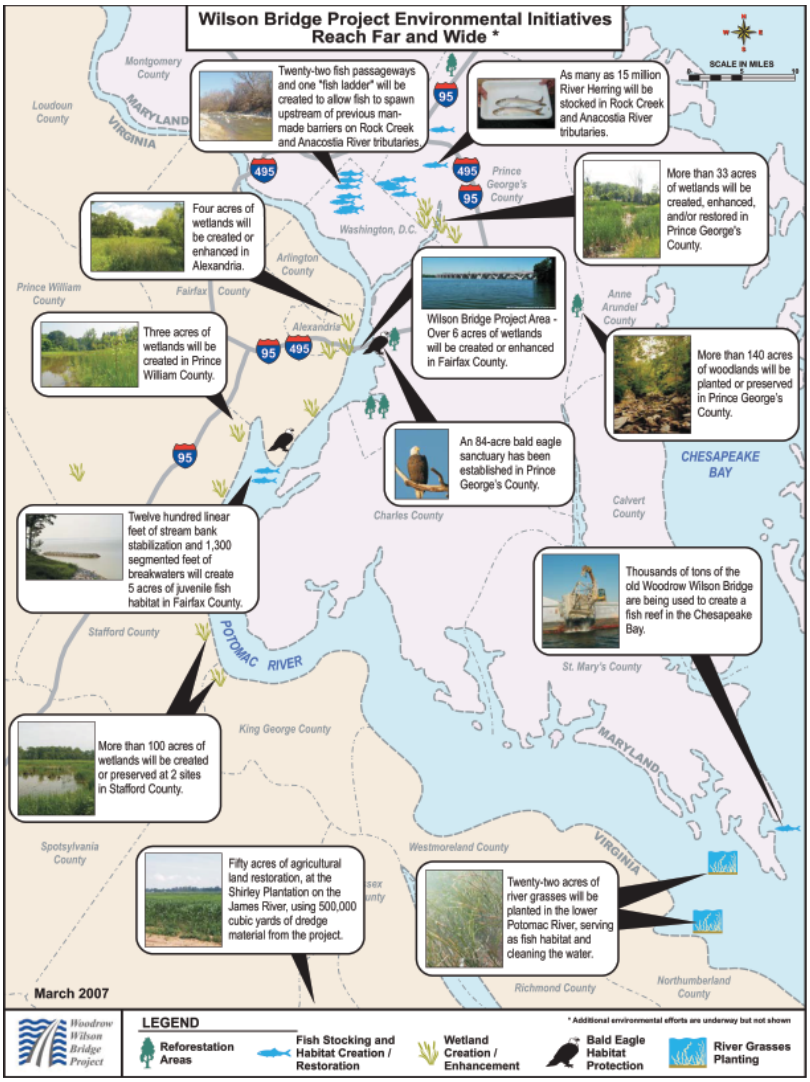
systems by looking at an entire ecosystem or landscape. Examples include the development of watershed-based environmental assessment and mitigation approaches, use of wetland banking, mitigation projects that support wildlife movement and habitat connectivity, and the use of special measures to prevent invasive species along highway rights-of-way. Some of these types of water quality and wetland related projects are eligible for support from Transportation Enhancement funds.

Transportation Contributions to Improving Water Quality and Wetlands

The following examples illustrate some of the many efforts highway agencies are implementing to address water quality concerns, in many cases going far beyond regulatory requirements to address the needs of watersheds and ecosystems.

Woodrow Wilson Bridge Environmental Mitigation Program, Maryland State Highway Administration

The environmental mitigation program for the $2.4 billion Woodrow Wilson Bridge Project in Maryland and Virginia was based on a holistic, watershed-based approach which links local and regional environmental needs to the project area. The new bridge spans the Potomac River near Washington, DC between Maryland and Virginia. One facet of the extensive mitigation program is a first-of-its kind fish passage restoration that has resulted in the removal of 23 man-made barriers to migration of anadromous fish, which spend their adult life in salt water and return to freshwater streams and rivers to spawn. Removal of these barriers has resulted in the reestablishment of over 26 miles of potential spawning habitat to migrating fish in the Washington, DC metropolitan area. Fish passage restoration was accomplished using natural-looking stone structures that were designed to mimic real stream features such as riffles, runs, and step pools. This was the first time that a fish passage project of this size, scale and type had been accomplished in an urban



Maryland DOT conducted unprecedented fish passage restoration project as part of the mitigation for the Wilson Bridge project. The photos in this spread show how scientists monitor for migrating fish, such as the Alewife herring, in Rock Creek using electroshocking, a relatively harmless technique which temporarily stuns the fish, making them easier to catch and identify. The chart shows all of the mitigation for the Woodrow Wilson bridge project. *Photos and chart courtesy of Maryland DOT.*

setting. Recent monitoring data have shown that the structures have exceeded expectations, and overall improvements to the surrounding environment are clearly evident.

The Wilson Bridge Project's fish passage program was developed through extensive cooperation and partnering with regulatory agencies, special interest groups, local governments, and quasi-government entities. In addition to barrier removal, the project also completed a five-year program that reintroduced river herring above the highest upstream blockages to genetically pattern these fish to return to these areas

to spawn. This program, known as hatchery restocking, resulted in the stocking of over 13 million herring fry back into the target streams through collaborating with the Metropolitan Washington Council of Governments and the Interstate Commission for the Potomac River Basin. In the spring of 2007, the first river herring in more than 100 years were able to migrate up Rock Creek past the Peirce Mill dam in Washington, DC.

Bob Jacobson Restoration Site, Minnesota Department of Transportation

A winner of FHWA's 2007 Environmental Excellence Award, Minnesota DOT's comprehensive approach to ecosystem restoration started when a number of state agencies combined their resources to restore well over a hundred wetland basins in an area that was historically tall-grass prairie. Their cooperative effort resulted in an 1,800-acre wetland restoration initiative situated on the flat expanse of historic Lake Aggasiz in the Red River Valley. Through these efforts the site is being restored to a natural condition that will benefit the local watershed in terms of water quality and flood storage. The restored area – former croplands – will one day resemble what the land looked like before it was farmed. This wetland bank was constructed to offset losses from Federally funded State highway projects as well as other local developments. The large ecosystem restoration area – achieved through a coordinated partnership effort – has produced valuable results in terms of habitat, wildlife, wetlands, and water quality. The success of the project can be documented by the wildlife already frequenting this area, including migratory waterfowl, moose, sand hill cranes, trumpeter swans, and bald eagles (*31*).

Water Quality Planning Tool, California Department of Transportation

A new tool developed by the California Department of Transportation (Caltrans) helps the agency manage stormwater effectively. The Water Quality Planning Tool inventories all Caltrans facilities in California – highways, park and rides, rest areas, and maintenance stations – and estimates stormwater runoff loads downstream from these facilities. Available only on the Internet, the tool is a database of water quality standards and possible pollutants from Caltrans facilities. It provides necessary information for each watershed to help advance watershed planning for all stakeholders. It was developed by Caltrans in conjunction with the California State University at Sacramento and the University of California at Davis as part of the Caltrans Stormwater Program (*12*).

Stormwater Best Management Practices: District of Columbia Department of Transportation

A range of practices are commonly used by transportation agencies during construction and ongoing operation of road projects. The District of Columbia Department of Transportation (DDOT) has taken strong steps to

advance stormwater management. Technologies used by the agency for construction projects include swales, dike sediment basins, silt fences, dams, flumes, riprap, fiber mats, gravel, and mulches. For permanent stormwater management structures, DDOT uses sand filters, bay savers, stormceptors, wet ponds, dry ponds, infiltration trenches, vegetative swales, detention ponds, and wetlands. DDOT also is testing the effectiveness of a range of innovative stormwater management practices including water quality catch basins, catch basin inserts or "snout inserts," bioretention, and porous pavement (*20*).

Top left and bottom right photos: Transportation Enhancement funds supported the Fletchers Creek Wetland Restoration, in Millford, Connecticut. The project involved retrofitting of culverts and tide gates to allow for additional tidal flow to help restore the marshes degraded from construction of a now-abandoned service road and a trolley line. *Photos courtesy of the National Transportation Enhancements Clearinghouse, http://www.enhancements.org/*

Partnerships in Water Quality and Wetlands

Maryland's State Highway Administration (MD SHA) has adopted a watershed-based approach to manage stormwater and mitigate impacts to other resources that relies heavily on partnerships with local governments, environmental resource agencies, and private groups. The approach calls for development of watershed improvement plans, reflecting a consensus among stakeholders and including a menu of possible environmental enhancement efforts. The approach also promotes integration of water and habitat resource protection into highway project development and project features. For example, numerous MD SHA projects have contributed to improvements within the Anacostia Watershed that go beyond regulatory requirements. These include stream and wetland restoration and enhancements and stormwater best management practices.

Research to Advance Water Quality and Wetlands Enhancements

Transportation agencies have underway a range of research efforts to advance the state of the practice in protecting and enhancing water quality and wetlands. Research projects underway through the National Cooperative Highway Research Program include a project on selecting appropriate methodologies for water quality analyses for National Environmental Policy Act documents.

The Federal Highway Administration's Surface Transportation Environment and Planning Cooperative Research Program research plans include:

- an analysis of wildlife usage of wetland mitigation areas;
- evaluation and updating of the 1990 FHWA Pollutant Loadings Model for highway stormwater runoff using new information and software; and
- support for the International Stormwater Best Management Practices Database.

Preserving Wildlife and Ecosystems for Future Generations

Transportation agencies across the nation are continuing to develop innovative ways to protect animal and plant species and foster ecosystem preservation as they deliver needed transportation improvements.

Great progress has been achieved by taking a broader ecosystem and watershed view as part of transportation project planning and development. As of 2006, the Federal Highway Administration (FHWA) identified 43 transportation-related initiatives in 30 states as "exemplary ecosystem" initiatives, exceeding the agency's performance goal.

In many cases, transportation projects and programs are providing the impetus for collaborative efforts to improve the natural environment on an ecosystem or watershed basis. This new trend – in which agencies are working to address conservation and environmental needs as part of planning transportation infrastructure – has been promoted by FHWA and other Federal agencies in an initiative dubbed EcoLogical.

New technology applications, such as customized geographic information systems (GIS) and data management systems, are helping to advance these efforts, providing additional tools to ensure that transportation solutions can coexist with and in many cases enhance the natural environment.

Did You Know?

Forty-three transportation initiatives in 30 states have been recognized as "exemplary ecosystem" initiatives, going beyond addressing project-specific environmental impacts to promote conservation and enhancement of entire ecosystems.

Keeping it Simple: Easy Ways to Help Wildlife along Roads

More than 100 examples of simple ways to help wildlife along the nation's roadways are documented on the Federal Highway Administration's *Keeping it Simple* website. The practices illustrate how transportation agencies are going beyond compliance to identify easy ways of helping fish and wildlife. It represents a commitment "to do the right thing just because it's the right thing to do and because one has an opportunity to do it." The following examples were added in 2006.

- Colorado: "Baffling Beavers" Promises Continued Fish Passage Through Culverts
- California: Using Gravel to Unblock Desert-Tortoise Culverts
- Oregon: "Special Management Areas" Preserve Endangered Butterfly Habitat
- Virginia: "Beaver Deceivers" Hide Moving Water from Dam-Building Beavers
- Iowa: "Critter Barrier" Protects Prairie Reptiles, Amphibians, and Small Mammals
- Oregon: "False Attraction" Gets Beavers to Build Dams Away from Fish-Passage Culverts
- Washington: "Fish Sticks" Help Protect Salmon Habitat
- Missouri: Angled Bars in Cave Gate Ease Travel for Bats
- Pennsylvania: Bridge-Site Fish Can Rest Easy, Thanks to Pools Made by Rock Vanes
- Vermont: Catching a Snake with Bare Hands
- New York: Composting Road-Killed Deer Keeps Scavengers at Bay
- Georgia: Diverting Low-Water Flows to a Culvert Enables Fish Passage
- Oregon: Donating Road-Killed Deer to Rescued White Wolves
- Washington: Dummy Eggs Replace Peregrine Eggs in Bridge-Painting Preparations
- Texas: Patience and Resourcefulness Protect Mexican Free-Tail Bats
- Alabama: Turning Old Bridges into Coral-Reef Fish Habitat
- Florida: Fixing Wildlife-Crossing "Ledges to Nowhere"
- Colorado: Plastic "Toad Wall" Guarantees Safe Trip to Wildlife Crossing
- Montana: Turning a Railroad Bed into a Wildlife Crossing
- Massachusetts: On Track with "Turtle Tracks"
- New York: Old Guide Rail is "Guide Fence" for Traveling Salamanders
- Arkansas: Not a Single Turtle Death on This Highway, Thanks to Turtle Fencing
- California: Median-Barrier Gaps Let Animals Cross the Highway
- Virginia: Making Drainage Pipes and Culverts Larger so Wildlife Will Use Them
- West Virginia: Looking for Mussels in All the Right Places
- South Carolina: Flexible Bridge-Lighting Design Helps Migratory Birds and Endangered Turtles
- Alaska: Turning a Construction Site into Wetland Habitat

Source: FHWA *Keeping it Simple* website, http://www.fhwa.dot.gov/environment/wildlifeprotection.

Federal surface transportation law also is encouraging these efforts. Enacted in 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) calls for early consideration of environmental and conservation needs – including natural resource and habitat maps and inventories – as part of transportation planning. The law also calls for a collaborative environmental review process for highway projects that will help weigh conservation needs early in project development. In addition, the law mandates a study of the effectiveness of wildlife crossings on roadways.

In addition to these broad-based approaches, transportation agencies also are working to address impacts to wildlife and the environment through everyday practices and straightforward solutions. FHWA has documented hundreds of examples of wildlife and habitat conservation practices on its "Keeping it Simple" database on the Internet (*45*).

Hundreds of examples of efforts to protect and enhance wildlife and habitat by state transportation agencies' construction and maintenance operations are underway. These practices are among those documented in an online database of environmental stewardship practices, procedures, and policies for highway construction and maintenance located on the Center for Environmental Excellence website at www.environment.transportation.org (*16*).

Some wildlife related projects also are eligible for Transportation Enhancement funds under the category environmental mitigation to reduce vehicle-caused wildlife mortality while maintaining habitat connectivity.

Transportation Contributions to Protect Wildlife and Ecosystems

The following examples provide a look at some of the many efforts underway by transportation agencies across the nation to improve wildlife and ecosystems.

Programmatic Consultation for the Indiana Bat, Ohio Department of Transportation

An interagency agreement for a new process to address potential transportation impacts to the endangered Indiana Bat was finalized in 2007 by the Ohio DOT and the U.S. Fish and Wildlife Service. The unprecedented agreement allowed for a streamlined review process to address impacts to the Indiana bat for all of the state's road projects over a 5-year period, ensuring compliance with Endangered Species Act and improving protections for the species. The programmatic agreement has greatly helped transportation and conservation goals by standardizing the review process and focusing avoidance and mitigation efforts where they are most effective. The new approach commits the transportation agency to specific actions that will ensure benefits to the species. Rather than focusing on impacts to species project-by-project, the agencies are working to determine what the consequences of those actions are for the species at a landscape scale – a more effective approach for biological conservation of the species as well as for transportation planning efforts (*10*).

Linking Colorado's Landscapes, Colorado DOT

In an effort to identify vital wildlife habitat linkages in Colorado, the Colorado Department of Transportation used funds from an FHWA streamlining grant to launch a collaborative scientific effort called Linking Colorado's Landscapes. The state agency asked the Southern Rockies Ecosystem Project (SREP), a non-profit conservation organization in Denver, to spearhead the effort because of its comprehensive database of wildlife and migration patterns in the Southern Rockies. The group worked to expand on CDOT's earlier work in identifying 13 key wildlife-crossing areas in the I-70 transportation corridor. First, SREP held a series of interagency workshops to analyze the effects of habitat fragmentation and restricted wildlife movement in Colorado. They identified and evaluated 176 wildlife linkages across the state and decided to study 12 that were located on stretches of seven highways: SH 13, I-25, U.S. 50, U.S. 285, U.S. 550, U.S. 160, and U.S. 24. In their decision making, the workshop participants used a "landscape approach" which considered land use and other regional factors. They were aided by technology – habitat connectivity models developed by Colorado State University for deer, elk, bobcat, black bear, Canada lynx, and mountain lion. Habitat information was combined with animal-vehicle collision statistics, traffic densities, land ownership, zoning, and other transportation-planning information, to enable the final recommendations phase. Together, SREP, CDOT, the Colorado Division of Wildlife, the Nature Conservancy, and the U.S. Forest Service, came up with site-specific recommendations, like escape ramps for elk that accidentally get trapped on the roadside. Using this information, transportation planners, engineers, community leaders, and conservationists can access and consider

Box culverts are among the techniques used to help link wildlife habitat near Colorado's I-70 transportation corridor. *Photo courtesy of Colorado DOT; Copyright Southern Rockies Ecosystem Project.*

Elk are among the wildlife that benefit from the Linking Colorado's Landscapes initiative. *Photo courtesy of U.S. Fish and Wildlife Service.*

recommendations for safer-passage mitigation measures in the areas with the greatest potential benefit to wildlife movement and the best opportunities for implementation (*25*).

Legacy Parkway and Nature Preserve, Utah DOT

The 14-mile, four-lane, limited access Legacy Parkway provides an important alternate route for Northern Utah commuters. The project resulted in a unique environmental mitigation project – the Legacy Nature Preserve. A winner of FHWA's 2007 Environmental Excellence Award, the project was the result of a collaborative design team working with the public to incorporate many unique and innovative features into the final parkway design. The Legacy Nature Preserve restores and preserves over 2,100 acres of important wetland and wildlife habitat from encroaching development and provides buffers that are important to the survivability of wildlife along the Great Salt Lake. Some of the parkway features include observation points and trailheads along with roadside pull-off lots, landscaping with native species, use of vegetated berms for screening, connections to other trails and communities and designing

narrower paved portions of the roadway. UDOT found that they could meet their safety standards while also designing a roadway which was aesthetically compatible with the local communities and protected the environmental integrity of the area. By enhancing and maintaining the wetlands, habitat values, and uplands to maximize their use by a diverse array of vegetation and migratory species, UDOT is ensuring that the outstanding environmental resources around the Great Salt Lake will be available for future generations (*27*).

Red-winged blackbirds nest in emergent marsh wetland habitat in the Legacy Nature Preserve. *Photo courtesy of Mike Perkins, HDR, Inc.*

Vermont Agency of Transportation Monitoring Eastern Racer Snakes

The Vermont Agency of Transportation (VTrans) launched a research project with the Vermont Department of Fish and Wildlife and Middlebury College to monitor Eastern Racer snakes that showed up on agency property. Eastern racers had not been seen in Vermont for 30 years. To learn how the snakes moved and used the property, researchers worked together to spot and catch several snakes onsite. After a volunteer veterinarian had inserted lipstick-sized transmitters into the racers' body cavities, the snakes were released back onto the property. Monitoring revealed the snakes moved a lot on the property and used it for foraging, basking, hunting, and travel – facts VTrans has used on easy-to-create snake-friendly habitats. The snakes also led researchers to a far-off den of six other adult racers – enough for a breeding population. The snake monitoring has helped guide the agency in the creation of new habitat for the species adjacent to a proposed VTrans project in southern Vermont (*34*).

The Wasatch Mountains can be seen through emergent marsh wetland habitat in the Legacy Nature Preserve. *Photo courtesy of Mike Perkins, HDR, Inc.*

Oregon DOT Special Management Areas

Oregon DOT is using "Special Management Areas" along King's Valley Highway in Oregon's Willamette Valley, to preserve the habitat of the Fender's blue butterfly, a species once thought to be extinct. The Special Management Area (SMA) is one of 60 across the state in which color-coded matrix signs inform maintenance crews of appropriate management activities and time frames. To protect the butterfly, crews perform late-season mowing and pruning to preserve Kincaid's lupine and sickle-keeled lupine – the host plants on which the butterfly depends. The strategy works like a controlled burn, mimicking the disturbance of fires that once scoured the upland prairie, removing underbrush and allowing the adaptable lupines and native vegetation to flourish (*47*). The SMA program is geared for species preservation within state managed lands. It covers 20 different plant and animal species listed as endangered or threatened at the state or Federal level (*75*).

The Vermont Agency of Transportation is working to monitor and create habitat for Eastern Racer snakes. *Photo courtesy of the Vermont Agency of Transportation.*

Oregon DOT biologists are using designated Special Management Areas to help preserve plants that serve as habitat of the Fender's blue butterfly. *Photo courtesy of Oregon DOT.*

Partnerships to Enhance Wildlife and Ecosystems

Planned improvements for a 15-mile stretch of Interstate 90 in Washington State were developed using a partnership approach to help restore habitat linkages within the corridor. I-90 is the main east-west route across the Cascades into Seattle and areas beyond. The Snoqualmie Pass section of the highway is infamous for its avalanche hazards, its dangerous curves, its deteriorating pavement, and its increasing traffic volumes. Plans for improving the highway integrated wildlife conservation with highway safety as well as improved hydrologic functions, water quality, erosion control, and woody debris redistribution. U.S. Forest Service researchers used GIS technology, snow-tracking, and other techniques to learn how animals got to the highway and where they crossed it. A working group of biologists and hydrologists

The Fender's blue butterfly.
Photo courtesy of Oregon DOT.

from the Washington State Department of Transportation and State and Federal resource agencies worked to identify where and how habitat connectivity structures should be built along I-90, with input from the Cascades Conservation Partnership, the Alpine Lakes Protection Society, the Mountains-to-Sound Greenway, and the Kongsberger Ski Club. The I-90 working group also recommended ecosystem-conservation strategies such as identifying "hydrologic connectivity zones." As part of the work in this 15-mile corridor, WSDOT plans to build more than 20 wildlife crossing structures (*24*).

Building Bridges to America's Past

Few people realize that transportation agencies are providing key support to preserve the nation's rich heritage. From archeological investigations to wide-scale mapping of historic resources, transportation agencies are contributing financial resources and expertise to historic preservation and archeology.

Transportation agencies are going beyond merely complying with Federal requirements for consideration of project impacts on historic resources. Consideration of cultural resources has become a key element in achieving context sensitive solutions on transportation projects and programs throughout the nation.

One of the most significant contributions has come from transportation dollars dedicated to historic preservation and archeology. A major source of funding has been the Transportation Enhancement activities. From 1992 through 2006, the Transportation Enhancement activities have provided $347 million for historic preservation, $804 million for rehabilitation of historic transportation facilities, $37 million for archeological planning and research, $101 million for transportation museums, $218 million for acquisition of scenic and historic easements, and $504 million for scenic and historic highway programs (*68*).

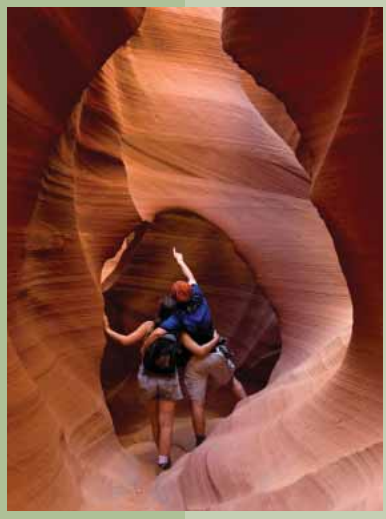
In 2005, the Federal Highway Administration (FHWA) received the Chairman's Award for Federal Achievement in Historic Preservation from the Advisory Council on Historic

Did You Know?

Transportation represents the largest single source of Federal funding for state and local historic preservation efforts.

According to the National Conference of State Historic Preservation Officers (NCSHPO), "This stellar partnership between a transportation and a preservation agency, unparalleled within Maryland and arguably nationwide, has resulted in exceptional benefits for historic preservation statewide."

– NCSHPO 2007 Awards for Excellence in Historic Preservation



Restoration work on the 1897 Shoreham Covered Railroad Bridge will begin soon and will also provide fishing access. *Image courtesy of Vermont Division for Historic Preservation.*

Preservation for implementation of the Transportation Enhancement activities. The agency was recognized for "outstanding commitment to the aesthetic, cultural, and historic aspects of surface travel in the United States" (*4*).

The Advisory Council described the Transportation Enhancement activities as the largest single source of Federal funding for historic preservation, provided through a partnership involving all 50 states and the District of Columbia.

The Advisory Council also presented partnership certificates for the program to the American Association of State Transportation and Highway Officials, the National Transportation Enhancements Clearinghouse (*69*), and the United States Congress.

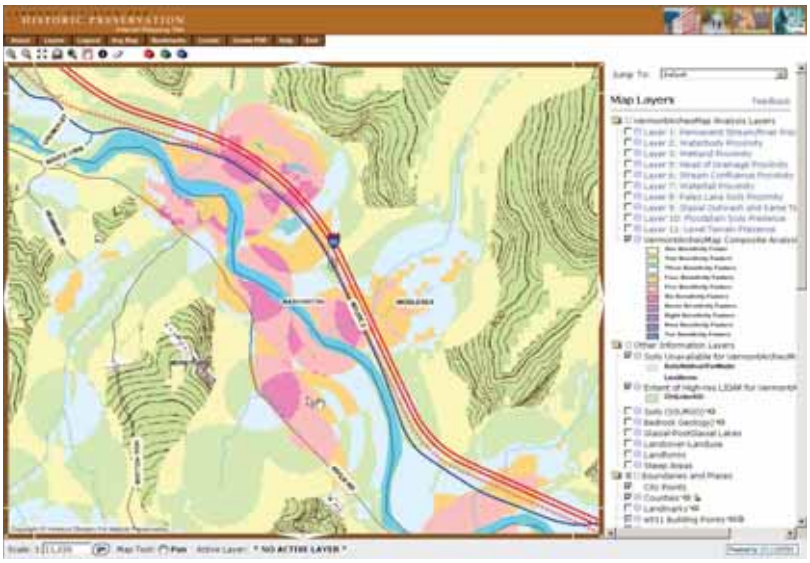
Transportation Contributions to Preservation

Examples of transportation agencies' contributions to advance historic preservation, archeology, and relationships with tribal governments are found throughout the country. Some of the many exemplary efforts include the following projects.

Vermont Agency of Transportation Creates Database

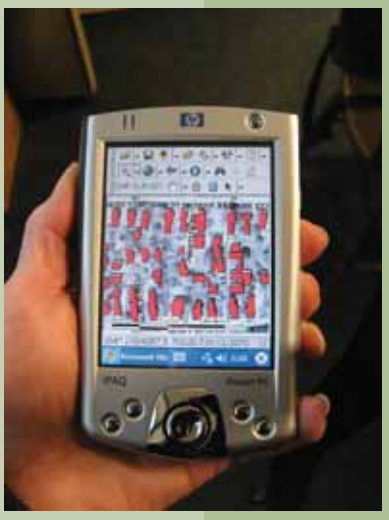
The Vermont Agency of Transportation provided over $150,000 for the development of a digital database for Vermont's historic resources, including software that allows data collection in the field on handheld computers. The database includes management fields for tracking actions related to historic resources, and will be linked directly to the transportation agency staff's workstations so that they can enter project review information for compliance with National Historic Preservation Act Section 106 requirements.

The Vermont Division for Historic Preservation owns seven historic bridges, but has no internal expertise to repair and maintain them. The Vermont Agency of Transportation does have the expertise, and has assumed responsibility for the maintenance, repair and restoration as funds allow. In addition, with $200,000 in funding from the Agency of



Left Image: Archeo Map, a GIS-based tool for locating archeological sites, was developed with support from Vermont's Agency of Transportation.

Photo Below: Vermont's Agency of Transportation provided funding for a digital database for the state's historic resources, including software that allows data collection in the field on handheld computers. *Image and photo courtesy of Vermont Division for Historic Preservation.*

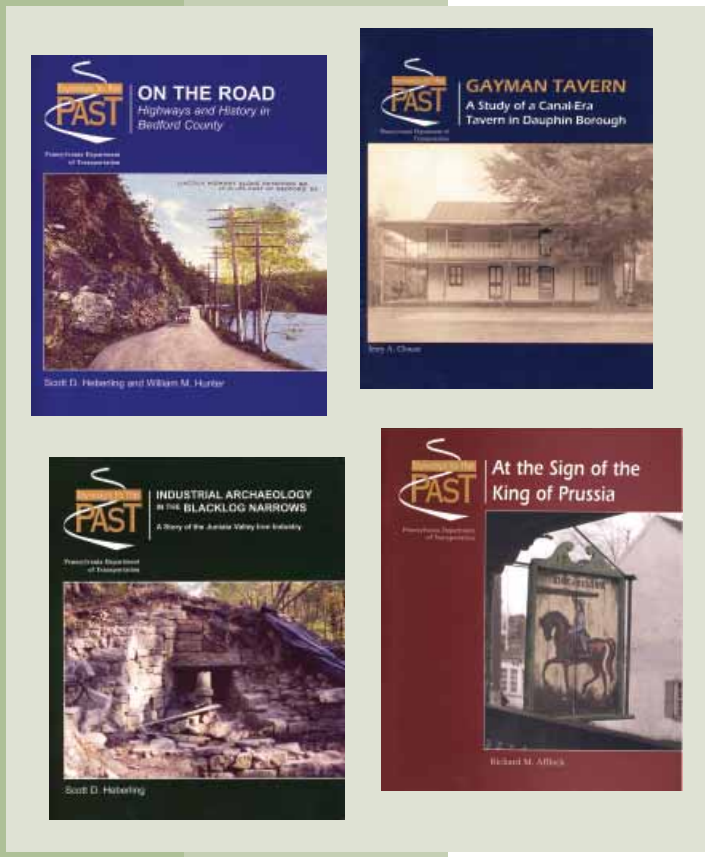


Transportation, the Division has converted archeological inventory forms to digital records, and developed Vermont Archeo Map, a GIS-based tool that overlays habitability fields with topographic maps, indicating where prehistoric archeological sites are likely to occur (*11*).

Pennsylvania DOT Launches Cultural GIS

Pennsylvania transportation officials have a very active cultural resources program that has contributed both expertise and funding to advance historic preservation and archeology. In 2005, PennDOT and the Pennsylvania Historical and Museum Commission launched a Cultural Resources Geographic Information System (CRGIS) that provides instant electronic access to a wealth of information about the Commonwealth's archaeological and historic heritage. The CRGIS includes topographic maps showing the locations of all of the state's recorded historic buildings and districts. The general public can view summary information on the general locations and types of archaeological sites in Pennsylvania, and qualified researchers are able to view specific locations. The maps are accompanied by information on Pennsylvania's over 150,000 recorded historic structures and 20,000 archaeological sites. Features like "Ask REGIS," an innovative custom software application, guides new users through the CRGIS and helps organize their requests for data. Transportation and other agency planners can use the system to help design roads and other infrastructure improvements (*72*).

The Cultural Resources GIS includes features like "Ask REGIS", an innovative and whimsical custom software application that guides new users. *Image courtesy of PennDOT.*



PennDOT's *Byways to the Past* publications, which document preservation and archeology projects in the state, have been in high demand. *Images courtesy of PennDOT.*

PennDOT also has produced a series of public information documents pertaining to historic preservation and archeology projects. The seven Byways to the Past publications produced to date have been in high demand by communities wanting to learn more about their heritage. The agency also has sponsored annual Byways to the Past conferences, bringing together cultural resources and transportation professionals to share information and best practices (*71*).

North Dakota DOT Scattered Village Exhibits and Curriculum

The discovery of a significant pre-historic village during the construction of a street in Mandan, North Dakota, resulted in a unique preservation effort. The Scattered Village Exhibits and Curriculum Project is an outreach program of the North Dakota DOT providing interpretive and educational materials for the community of Mandan, North Dakota. The site, adjacent to an elementary school, provided a unique opportunity to educate the local children about their heritage. The project sponsors involved a wide audience in the development of museum-quality displays and educational curriculum to honor the inhabitants of Scattered Village. The project was honored with the Federal Highway Administration's 2007 Environmental Excellence Award for excellence in cultural and historic resources (*30*).

Georgia DOT and FHWA: New Echota Traditional Cultural Property Study

Taking an unprecedented and proactive approach, the Federal Highway Administration Georgia Division (FHWA) and the Georgia Department of Transportation (GDOT) developed and documented an innovative tribal consultation process. The agencies conducted the New Echota Traditional Cultural Property study well in advance of potential project development and incorporated streamlining and stewardship into their transportation

planning process. In developing the 20-year, long-range transportation plan for northwest Georgia, FHWA and GDOT staff began to wonder whether the New Echota site – which is already listed on the National Register of Historic Places and is designated a National Historic Landmark – might also qualify as a Traditional Cultural Property, giving it another layer of significance and protection. A Traditional Cultural Property differs from other types of historic designations because it is determined by its "living significance," that is, the spiritual, cultural, and ceremonial significance to a living community of people. Recognition as a TCP was important to the Cherokee people to ensure they had input to any Federal action on the site, which is the former capitol of the Cherokee Nation. FHWA and GDOT hired a consultant, New South Associates, to conduct the study and arrange consultations with all three Federally recognized Cherokee tribal governments: the Cherokee Nation (Tahlequah, OK), the Eastern Band of Cherokee Indians (Cherokee, NC), and the United Keetoowah Band of Cherokees of Oklahoma (Tahlequah, OK). FHWA and GDOT also brought tribal leaders to New Echota for a final meeting to discuss proposed boundaries for the site. In the end, the consensus was unanimous – New Echota should be designated as a Cherokee Traditional Cultural Property. The Keeper of the National Register concurred and recognized the site as an eligible Traditional Cultural Property in November 2002. The entire study was also videotaped in an effort to share Georgia's experience with other states and to provide documentation of Cherokee oral history. The New Echota study and the subsequent efforts to share the experience were funded with approximately $300,000, primarily from preliminary engineering funds and an environmental stewardship and streamlining grant from FHWA as well as additional funding through the FHWA Resource Center. One of the most important lessons learned was to embrace Native American tribes as essential partners in the transportation planning and development process (*48*).

"Communities across America are using Transportation Enhancement funds to preserve their heritage, expand travel choices, strengthen local economies, and improve quality of life. Over the past 14 years, since Congress first wisely created this program, it has become the major source of Federal funding for local and state historic preservation efforts."

– John L. Nau, III, Chairman, Advisory Council on Historic Preservation

Partnerships to Advance Historic Preservation

Partnerships between transportation and cultural resource agencies can be seen across the nation. In 2007, the National Conference of State Historic Preservation Officers' (NCSHPO) Award for Excellence in Historic Preservation recognized the partnership between the Maryland State Highway Administration and the Maryland Historical Trust. "This collaborative alliance has directly advanced the stewardship of heritage resources throughout Maryland – promoting environmentally sensitive transportation planning efforts and enriching core components of Maryland's preservation programs," the group said.

"Maryland State Highway Administration's positive relationship with the Maryland Historical Trust ensures proper management of Maryland's cultural resources while balancing the construction of SHA projects. Our trust for one another encourages open dialogue that helps both agencies quickly resolve adverse effects and apply beneficial mitigation solutions."

– Julie Schablitsky, Cultural Resources Team Leader, Maryland Department of Transportation, State Highway Administration

Highlights of the partnership include the following:

- *When Main Street Is a State Highway – Blending Function, Beauty and Identity* – a handbook published for use by Communities and Designers;
- extensive survey efforts, including a statewide survey of historic highway bridges which resulted in historic context reports including *Historic Highway Bridges in Maryland: 1631 – 1960, Historic Context Report*;
- using Transportation Enhancement funds to enable the Maryland Historic Trust to design and post a dynamic website with capsule summaries and photos for National Register properties; and
- considerable outreach efforts to engage and inform the public including Maryland's marker program and Maryland Archeology Month.

Recycling — Transportation Agencies "Go Green"

Transportation agencies continue to increase their focus on recycling and reusing asphalt, concrete, and other materials used in road building, helping to preserve natural resources while cutting costs and ensuring quality performance of the nation's highway infrastructure.

Reuse of existing asphalt and concrete instead of virgin materials makes sense both from an environmental and economic standpoint. In fact, the Federal Highway Administration (FHWA) issued a policy in 2002 stating that recycled materials should be considered first in transportation agencies' selection of materials.

Recycled products and industrial by-product materials may be used in a variety of highway construction and maintenance applications, including asphalt concrete, Portland cement concrete, granular base, embankment or fill, stabilized base, and flowable fill. The long list of recycled materials and industrial by-products being reused includes the following:

- Baghouse fines
- Blast furnace slag
- Coal bottom ash/boiler slag
- Coal fly ash
- Flue gas desulfurization
- Scrubber material
- Foundry sand
- Kiln dusts
- Mineral processing wastes

Did You Know?

Transportation agencies continue to be nationwide leaders in recycling, including reusing road-building materials and incorporating recycled products into the nation's highway surfaces.

Highway Applications of Recycled Materials

APPLICATION – USE	MATERIAL
Asphalt Concrete – Aggregate (Hot Mix Asphalt)	Blast Furnace Slag • Coal Bottom Ash • Coal Boiler Slag Foundry Sand • Mineral Processing Wastes Municipal Solid Waste Combustor Ash • Nonferrous Slags Reclaimed Asphalt Pavement • Roofing Shingle Scrap Scrap Tires • Steel Slag • Waste Glass
Asphalt Concrete – Aggregate (Cold Mix Asphalt)	Coal Bottom Ash • Reclaimed Asphalt Pavement
Asphalt Concrete – Aggregate (Seal Coat or Surface Treatment)	Blast Furnace Slag • Coal Boiler Slag • Steel Slag
Asphalt Concrete – Mineral Filler	Baghouse Dust • Sludge Ash • Cement Kiln Dust Lime Kiln Dust • Coal Fly Ash
Asphalt Concrete – Asphalt Cement Modifier	Roofing Shingle Scrap • Scrap Tires
Portland Cement Concrete – Aggregate	Reclaimed Concrete • Slag • Scrap Tires – New Use
Portland Cement Concrete – Supplementary Cementitious Materials	Coal Fly Ash • Granulated Blast Furnace Slag
Granular Base	Blast Furnace Slag • Coal Boiler Slag • Mineral Processing Wastes Municipal Solid Waste Combustor Ash • Nonferrous Slags Reclaimed Asphalt Pavement • Reclaimed Concrete • Steel Slag Waste Glass • Scrap tires • Foundry Sand • Asphalt Shingles Dredge Materials with Glass
Embankment or Fill	Coal Fly Ash • Mineral Processing Wastes • Nonferrous Slags Reclaimed Asphalt Pavement • Reclaimed Concrete • Scrap Tires Foundry Sand • Dredge materials
Stabilized Base – Aggregate	Coal Bottom Ash • Coal Boiler Slag
Stabilized Base – Cementitious Materials (Pozzolan, Pozzolan Activator, or Self-Cementing Material)	Coal Fly Ash • Cement Kiln Dust Lime Kiln Dust • Sulfate Wastes
Flowable Fill – Aggregate	Coal Fly Ash • Foundry Sand • Quarry Fines
Flowable Fill – Cementitious Material (Pozzolan, Pozzolan Activator, or Self-Cementing Material)	Coal Fly Ash • Cement Kiln Dust • Lime Kiln Dust

Source: Federal Highway Administration, Turner-Fairbank Highway Research Center: User Guidelines for Waste and By-product Materials in Pavement Construction, http://www.tfhrc.gov/hnr20/recycle/waste/begin.htm

- Municipal solid waste incinerator ash
- Nonferrous slags
- Quarry by-products
- Reclaimed asphalt pavement
- Reclaimed concrete material
- Roofing shingle scrap
- Scrap tires
- Sewage sludge ash
- Steel slag
- Sulfate wastes
- Waste glass

Leaders in Recycling

Efforts to increase and promote recycling in the transportation industry can be seen on projects and programs throughout the nation. Just a few of the many examples are summarized below.

Texas Department of Transportation

Texas Department of Transportation (TxDOT) uses and recovers recycled materials throughout its operations. In 2006 alone, the agency recovered significant quantities of materials and products for reuse or recycling and extensively used recovered materials and products in constructing roadways. In addition, the agency purchased millions of dollars worth of recycled-content products (see table "Use of Recycled Materials, TxDOT Fiscal Year 2006") (*77*). As part of TxDOT's Road to Recycling initiative, a road construction industry panel identified 12 materials with great potential in road construction that are readily available in Texas in potentially large volumes, offer engineering

FHWA's Recycled Materials Policy

When appropriately used, recycled materials can effectively and safely reduce cost, save time, offer equal or, in some cases, significant improvement to performance qualities, and provide long-term environmental benefits. … The FHWA policy is

1. Recycling and reuse can offer engineering, economic, and environmental benefits.
2. Recycled materials should get first consideration in materials selection.
3. Determination of the use of recycled materials should include an initial review of engineering and environmental suitability.
4. An assessment of economic benefits should follow in the selection process.
5. Restrictions that prohibit the use of recycled materials without technical basis should be removed from specifications.

benefits, are cost-effective, and pose no increased environmental risks. TxDOT assembled information packets for each of these materials, including a material overview, research summaries, case studies, specifications currently allowing use of the material, a list of material sources, and a summary of TxDOT experiences with the material. In addition, the agency developed a recycled materials mapping application, which uses a geographic information system (GIS) to help locate recycling facilities that handle these recycled materials (*78*).

Equipment such as this allows for on-site recycling of asphalt pavement. *Photo courtesy of the Federal Highway Administration.*

Minnesota Recycles Topsoil Additives

Minnesota Department of Transportation developed a biomound treatment process that combines petroleum-contaminated soil, manure, and low-grade wood chips into a reusable material that can be used safely as a topsoil amendment. A winner of FHWA's 2007 Environmental Excellence Awards, the biomound remediation process has resulted in the reuse of large volumes of waste materials. Since 1991, Minnesota has used the biomound treatment process to successfully treat over 30,000 cubic yards of petroleum-contaminated soil excavated from more than 15 projects and has produced a video encouraging the use of this proven treatment technique. This successful process has been effective and accepted by local agencies and the general public. The innovative combination of waste materials that are remediated, recycled, and reused as topsoil amendments for use on future roadway construction projects provides a practical, cost-effective and environmentally sound approach to dealing with contaminated soil (*28*).

Use of Recycled Materials, TxDOT Fiscal Year 2006

Roadway Recycled Materials and Products Placed in FY06	Amount
Compost	311,000 cubic yards
Recycled Concrete Aggregate	1.1 million tons
Fly Ash	278,000 tons
Crumb Rubber	12,700 tons
Glass Traffic Beads	12,000 tons
Cellulose Fiber Mulch	6,600 tons
Ground Granulated Blast Furnace Slag	1,400 tons
Recovered Products and Materials	
Asphalt Pavement	3.2 million tons
Concrete Pavement, Slabs, Curbs, and more	1.8 million tons
Scrap Metal	8,500 tons
Scrap-Tire Rubber	4,200 tons
Office Paper	550 tons
Aluminum Traffic Signs	20,000
Automotive Batteries	7,200
Drums	1,800
Rechargeable Batteries and Cell phones	521 pounds
Purchases of Recycled-Content Products	
Glass Traffic Beads	$12 million
Compost Products	$9.8 million
Printing and Writing Paper	$4.7 million
Flexible Delineator Posts	$2.5 million
Cellulose Fiber Mulch	$2.5 million
Remanufactured Toner Cartridges	$707,000
Re-Refined Motor Oils and Lubricants	$697,000
Paper Towels and Tissues	$346,000

States Use Recycled Concrete Aggregate

Use of recycled concrete aggregate is on the rise in states, including California, Minnesota, and Texas. The most common use of recycled concrete aggregate is as an aggregate base. In a 2004 survey conducted by the Federal Highway Administration, 38 transportation agencies, said they used recycled concrete aggregate in aggregate base whereas 11 reported using the aggregate in portland cement concrete. Seventeen states use the aggregate in other miscellaneous applications. Many states have reported that recycled concrete aggregate performs better than virgin aggregate as a base. In California, most of the concrete pavement removed from existing highways and streets is processed and reused as aggregate base throughout the state. The California Department of Transportation's specification for aggregate base allows any mixture of recycled concrete aggregate and recycled asphalt pavement. This provides

the state's contractors with the freedom to choose the most economical base material available (*54*).

Contractors set up a crushing/pug mill at a site. Recycled asphalt pavement is brought to the site for blending, then hauled to a paver hopper for placement. *Photo courtesy of the Federal Highway Administration.*

Above photo: Recycled concrete aggregate, shown here, can produce strong, durable materials for use in highway infrastructure. Right photo: Recycled concrete aggregate is placed as base material on I-694, in Brooklyn Center, Minnesota. *Photo courtesy of the Federal Highway Administration.*

Partnerships to Advance Recycling

Transportation and resource agencies are partnering with industry groups to advance recycling and other environmental stewardship practices as part of the Mid-Atlantic Green Highways Partnership. The partnership includes the Environmental Protection Agency, FHWA, Maryland State Highway Administration and the other mid-Atlantic states, as well as a variety of other private and public-sector partners. A key element of the initiative is promoting the reuse and recycling of industrial by-products through a partnership with the Industrial Resources Council, which represents six separate industries: the American Coal Ash Association (coal ash and emission control residues); Construction Materials Recycling Association (recycled concrete, asphalt pavement, wallboard, shingles); Foundry Industry Recycling Starts Today (foundry sands); National Council for Air and Stream Improvement (residues from the wood and paper products industry); National Slag Association (iron and steel slag, ground granulated blast furnace slag); and Rubber Manufacturer's Association (tire derived aggregates). The partnership's Reuse/Recycling Team, with a grant of $50,000 from FHWA, plans to host technical workshops on the beneficial reuse of industrial by-products, targeting states in the Mid-Atlantic Region. The workshops will bring together experts from all stakeholder groups to discuss the benefits of and barriers to building and maintaining highways constructed from reused and recycled materials and industrial by-products (*56*).

Beautifying America's Roadsides

Wildflowers blooming along the nation's highways are the most visible of many efforts transportation agencies are undertaking to manage millions of acres of roadside right-of-way. In 1987, the Surface Transportation and Uniform Relocation Assistance Act required that a portion of each highway project's funds be reserved for planting of native wildflowers. Today, not only are state wildflower programs flourishing, but transportation agencies have become stewards in the fight against invasive species and re-establishment of native plant communities.

Officials report that state transportation agencies have expanded their tool box beyond the "mow and spray" days of the 1950s to include techniques such as targeted spraying, well-timed mowings, biocontrols, prescribed burns of native areas, grazing of goats and sheep, and more. This combined toolbox used in many states is referred to as Integrated Roadside Vegetation Management (IRVM) (*57*).

Transportation agencies increasingly are addressing environmental impacts and eradication and control of invasive species before, during, and after construction of road projects (*61*). Agencies are increasing efforts to control invasive species by performing species surveys on construction projects, controlling infestations, and revegetating with native, lower maintenance species.

Integrated roadside vegetation management plans are being developed, and more agencies are using state-of-the-

Did You Know?

Transportation agencies are beautifying some 12 million acres of land on America's roadsides, working to control invasive weeds and cultivate native grasses with wildflowers.

Wildflowers bloom along an Iowa highway. *Photo courtesy of the Federal Highway Administration.*

art tools such as geographic information systems (GIS). GIS systems allow agencies to digitally store the location of weed patches and track treatments over time. In addition, agencies are distributing posters and sharing information on vegetation management through professional meetings and through training of employees (*61*).

The latest highway and transit funding legislation (SAFETEA-LU) gave a boost to these efforts. Under the new law, activities eligible for Federal highway funds were expanded to include

- weed control,
- vegetation inventory,
- increased training of crews and contractors,
- planting of native plants (including native wildflowers, grasses, trees, shrubs, and vines), and
- creation of fuel breaks by elimination of fire-hazard plants and establishing fire-tolerant native plants (*43*).

Vegetation management has become a priority on individual projects as well through implementation of broader-based programs and partnerships.

In dealing with invasive species, Iowa has demonstrated that native grasses keep out weed invasions. New Mexico

Definition of Integrated Roadside Vegetation Management:

A long-term approach to vegetation management that systematically evaluates each area to be managed; determines which plant communities best fit the area; develops procedures that will encourage, enhance or reestablish desirable plant communities; provides self sustaining, diversified, visually interesting vegetation; keeps safety and an improved environment as priorities; and utilizes the most beneficial methods to prevent or correct undesirable situations caused by disturbance or less than optimum ground cover.

– Federal Highway Administration

has used sheep grazing, and Caltrans hosted a workshop to educate state and local officials on controlling the invasive Sahara mustard. In Montana, officials certify weed-free gravel pits, and many states now require weed-free mulches to use on erosion control seedings. Reduced mowings are also a key strategy. The trend is to determine how to prevent weeds in the first place, rather than spend decades of time and labor controlling them later (*57*).

Use of native vegetation also is a key strategy. Native revegetation of grassland and wetland plant communities provide function, aesthetics, biodiversity, wildlife habitat, and traveler safety in a practical way. These plantings are normally one time plantings that are self-reliant over time without investments of irrigation, fertilizers, or annual care.

More than half of the state transportation agencies are planting native vegetation for landscaping, wetland mitigation, erosion control, and treatment after weed control.

Common Roadside Invasive Plants

- Purple loosestrife
- Phragmites
- Leafy spurge
- Knapweeds
- Thistles (Canadian, Musk, Scotch)
- Star thistle
- Kudzu
- Russian Olive
- Black locust
- Ailanthus

Methods of Enhancing Roadsides

The following examples illustrate a variety of vegetation management efforts advanced by state and Federal transportation agencies across the nation.

Iowa Pioneers Integrated Roadside Vegetation Management

A pioneer in vegetation management strategies, Iowa DOT's Integrated Roadside Vegetation Management plan aims to address the transportation needs of travelers while at the same time promoting native vegetation, minimizing use of chemicals, and enhancing the scenic and habitat value of the roadsides. The plan follows an environmental management system-type approach that includes site inventory, determining management methods, implementing procedures at the proper time, evaluating results, and taking further action if needed (*17*).

Utah DOT's RoadVeg GIS system

Utah DOT's vegetation management professionals use RoadVeg, a geographic information system to inventory invasive plants along with other transportation-related data. Agency staff can track the spread of invasive plant species, monitor the progress of mitigation strategies, and query and display various vegetation attributes as needed. Utah State University assisted in the road and county land inventory process (*17*).

Illinois DOT Enhancement and Maintenance Projects Restore Prairie, Native Wildflowers

Illinois DOT established the "Wildflowers of Illinois" program using existing roadside enhancement and maintenance funding to plant native wildflowers and prairie plants in place of manicured turf along roadsides. Plant materials and labor are contributed to the program by the Illinois Department of Natural Resources and the Illinois Department of Corrections. Illinois and other vendors supply the balance of materials needed for successful planting, which will be funded by existing roadside maintenance budgets. State officials anticipate that the program will foster economic development and tourism, promote responsible stewardship, encourage environmental understanding, and reduce roadside maintenance costs (*17*).

Drivers may see a touch of color as they pass these native flowers along an Idaho highway. *Photos courtesy of the Federal Highway Administration.*

NYSDOT and the Adirondack Park Invasive Plant Program

In addition to its statewide focus on priority invasive species, NYSDOT is a key partner in the Adirondack Park Invasive Plant Program. Additional partners in the program include the Invasive Plant Council of New York State, the Adirondack Nature Conservancy, the New York State Adirondack Park Agency, and New York Department of Environmental Conservation. The agencies work together to advance regional, coordinated invasive plant species initiatives under the umbrella of the Adirondack Park Invasive Plant Program. Private landowners, local communities, and volunteers also participate to control invasive aquatic and terrestrial plants (*18*).

Tennessee DOT Roadscapes

The Tennessee Department of Transportation developed a statewide program that uses partnerships to integrate widely separate functions into a comprehensive roadside management plan for plantings, maintenance, and

environmental stewardship. The comprehensive program, winner of FHWA's 2007 Environmental Excellence Award for roadside resource management, focused on decreasing maintenance costs through the use of sustainable native vegetation, which requires less maintenance and mowing, and adding resources through community involvement and volunteers. Volunteers help with litter removal and plantings and commit to long-term maintenance agreements. Landscaping has helped promote tourism, developed community pride, enhanced economic development and improved the quality of life for the traveling public (*32*).

Meadow restoration efforts give wildflowers a chance to thrive along this highway in Maryland. *Photo courtesy of the Federal Highway Administration.*

U.S. Forest Service, Federal Highway Administration Produce Training Video

A training video to help road maintenance crews recognize and control invasive plants has been developed by the U.S. Forest Service in partnership with FHWA and other agencies. The video, titled "Dangerous Travelers: Controlling Invasive Plants along America's Roadways," outlines the best management practices that road crews should be following in their day-to-day operations. Best practices include how to work with botany professionals for plant identification, developing inventory systems, mapping infestations, mechanical removal, herbicide treatments, weed-free products, maintenance techniques to reduce risk of spreading weeds, and equipment cleaning (*80*).

Weeds Across Borders Conference

FHWA is a key sponsor of the biennial conference, Weeds Across Borders, which brings together experts on weed issues from the United States, Canada, and Mexico. The event includes scientists, practitioners, and policymakers to share their experiences and research reports. The conference encourages continental cooperation because weeds do not respect political boundaries.

Stewardship Opportunities Outlined on NYSDOT's Green and Blue Initiative Worksheet

Issue or need	Stewardship opportunity (project, activity or service)
Improve erosion control	Silt fence, mulch/reseed, composting Sediment control, such as check dams
Reduce salt pollution	Install living or engineered snow fence Control runoff near private wells
Reduce water pollution	Work with DEC to mark wetlands Install/maintain innovative stormwater treatment systems (e.g., Vortechnics)
Promote Integrated Pesticide and Vegetation Management (IVM/IPM)	Deliver vegetation activities consistent with long-term IVM principles Technology/practices to limit herbicide use Remove/contain invasive species Post signs for no spray areas Biological larvicides in drainage basins Insect eating fish in recharge ponds
Habitat connectivity	Connect ecosystems and habitat with animal crossings or fish passageways
Strengthen wildlife and forest conservation	Execute Conservation Alternative Mowing Plans (CAMPS) Birdhouses/nesting boxes Deer reflectors Enhance/create wetlands Plant wildlife friendly vegetation Leave tree trunks for habitat (if safe) Manage for natural reforestation Re-landscape vacant land/roadsides Habitat improvements Stream improvements
Improve public access to recreation by building or repairing:	Trailheads Vistas/wildlife viewing sites/pullouts Rest areas/parking areas Bike paths/lanes (improve shoulders) Rails to trails Boat launches/fishing access/parking Assets for people with disabilities
Enhance cultural and aesthetic resources along/near State highways	Landscape (e.g. street trees, flowers) Provide/replace details in streetscape Roadside screening Signs (gateway) or historic markers Signs to identify streams, rivers, lakes or watershed boundaries
Recycled and reused materials; litter control	Increase recycled/reused material use, including millings, wood chips or crushed glass for drainage Improve litter control

Wildflowers and pollinators coexist with a Missouri highway. *Photo courtesy of the Federal Highway Administration.*

New York State Department of Transportation Green and Blue Initiative

New York State Department of Transportation has charged its regional maintenance organizations with finding immediate environmental stewardship actions that can be taken along roadsides in the state, prompted by a worksheet that lists some of the many possible needs and stewardship "opportunities." In its first year, the initiative has produced numerous stewardship projects, making use of the experience and expertise of maintenance and operations staff. These include a range of actions to promote integrated pesticide and vegetation management (*70*).

Partnerships in Vegetation Management

Transportation agencies are supporting Cooperative Weed Management Areas, partnerships of Federal, state, and local government agencies, tribes, and others working with land owners to manage noxious weeds or invasive plants in a defined area. Transportation agencies in Montana, Wyoming, and Idaho have had success with such efforts. Idaho Transportation Department has involved its districts in Cooperative Weed Management Areas since 2002. Each district has target weeds, especially in their inventoried gravel pits, and some are using biocontrols to combat target species. FHWA is supporting efforts to encourage more partnerships across jurisdictional boundaries.

Native species are encouraged along roadways in New York. *Photo courtesy of the Federal Highway Administration.*

Research to Advance Vegetation Management

Research is underway to advance sound vegetation management practices. The FHWA's Surface Transportation Environment and Planning Cooperative Research Program (STEP) is planning research to gauge the economic and ecological benefits of reduced mowing. In addition, the agency is planning a research project on the development of a vegetation inventory tool and protocol specifically for highway corridors.

Sound Solutions Keep Down the Noise

Since 1995, state transportation agencies averaged spending more than $169 million per year of highway program funds annually on construction of noise barriers – the most common means to address noise originating from the nation's highways (*44*).

Federal Highway Administration's (FHWA) noise regulations, most recently revised in 2005, give each state department of transportation flexibility in determining the reasonableness and feasibility of noise abatement measures (*50*).

During the planning and design of a highway project, transportation agencies are required to

- identify highway traffic noise impacts,
- examine potential abatement measures,
- incorporate reasonable and feasible highway traffic noise abatement measures into the highway project,
- coordinate with local officials to provide helpful information on compatible land use planning and control, and
- identify and incorporate necessary measures to minimize or eliminate adverse construction noise impacts to the community.

Did you know?

Through the end of 2004, 45 state departments of transportation and the Commonwealth of Puerto Rico have constructed over 2,205 linear miles of noise barriers at a cost of over $2.6 billion.

In addition to construction of noise barriers, other means of acquiring Federal-aid funds for abatement of traffic noise impacts include traffic management techniques, alteration of a roadway's horizontal or vertical alignment, purchasing property or property rights to create buffer zones, and installing noise insulation in public or nonprofit institutional buildings.

This noise barrier was installed along New Hampshire Route 101 in the southern part of the state. *Photo courtesy of Vanasse Hangen Brustlin, Inc.*

Noise Compatible Planning

Avoiding a noise problem frequently is more effective than trying to correct an existing one using noise barriers. FHWA encourages developers, government officials, planners, and private citizens to consider ways to address highway traffic noise before – rather than after – frustrating problems arise. One solution is noise compatible planning.

Noise compatible planning shows promise for helping to avoid noise impacts by carefully considering and planning how land is used near highways. Such planning encourages the location of less noise-sensitive land uses near highways, promotes the use of open space separating roads from developments, and suggests special construction techniques that minimize the impact of noise from highway traffic. Noise-compatible planning also helps agencies to advance context-sensitive transportation solutions that best meet the needs of communities.

State highway agencies are required to provide the results of highway project noise studies to local planning officials. Local officials may use this information to determine a

noise impact zone along the highway that will help to guide appropriate decisions on land use and development.

In areas with undeveloped land near the roadway, officials may encourage commercial or industrial development rather than residential uses near roads or opt to preserve open space along the highway for recreational purposes. In urban areas, options may include zoning requirements for residential areas that mandate setbacks (added distance) from the highway or ordinances to create exterior or interior noise limits (*19*).

Federal and state transportation agencies are working to provide technical support for local agencies' efforts to advance noise compatible planning. In some states, transportation agencies will not consider noise abatement projects unless local authorities have adopted compatible land use controls (*73*).

This type of noise barrier obtains its stability from a structural shell, typically either concrete, wood, or plastic, which is filled with soil and then planted. *Photo courtesy of Federal Highway Administration, Noise Barrier Design Handbook.*

Barriers help cut down the noise for homes along Wakefield Highway in Wakefield, Massachusetts. *Photo courtesy of Vanasse Hangen Brustlin, Inc.*

The Quest for Quieter Pavements

Transportation agencies also are researching whether alternative pavement types could provide another means to avoid or abate noise impacts. The challenge is to design pavements that reduce noise, while still providing durable, smooth, and safe surfaces.

In 2005, FHWA and AASHTO sponsored a tour of European nations to investigate and document state-of-the-practice in quiet pavement systems. As a result, the team recommended development of protocols for measuring

Barriers can help shield surrounding areas from highway noise impacts. *Photo courtesy of Vanasse Hangen Brustlin, Inc.*

the performance of various types of "quiet" pavements and consideration of U.S. policy changes to allow quiet pavement as means to mitigate noise impacts (*46*).

Numerous states are conducting research to monitor and evaluate various quiet pavement technologies. Washington State DOT, for example, is testing open-graded friction course asphalt modified with an asphalt rubber binder or with polymer, as well as texturized concrete (*83*). Other states studying quieter pavements include Arizona, California, Colorado, Florida, and Texas.

In addition, a project of the National Cooperative Highway Research Program is working to develop procedures for measuring tire-pavement noise and demonstrating applicability of the procedures through testing of pavements currently in use (*58*).

Taking the Scenic Route to America's Treasures

The National Scenic Byways Program (NSBP), administered by the Federal Highway Administration (FHWA), oversees the designation of National Scenic Byways and All-American Roads, collectively known as America's Byways®. These roads are designated by the U.S. Secretary of Transportation for their outstanding archaeological, cultural, historic, natural, recreational, and scenic qualities.

America's Byways link Americans to the nation's natural and cultural treasures and promote tourism and education across the country.

The National Scenic Byways Program is a grass-roots program. Local citizen groups may nominate roads for designation as either a National Scenic Byway or an All-American Road. These roads must meet certain NSBP requirements and have support of the local community and the state. Designations are made by the U.S. Secretary of Transportation.

In September 2005, then-Transportation Secretary Norman Mineta announced 45 designations, bringing the total to 126 America's Byways in 44 states. This includes 99 National Scenic Byways, 27 All-American Roads, and 18 Multi-State Byways. As part of the National Scenic Byways Program, over $275 million of grant funding has been provided to 2,181 state and Federal projects in all 50 states, Puerto Rico, and the District of Columbia (*6*).

Did You Know?

Since 1992, the National Scenic Byways Program has provided over $275 million in funding for more than 2,100 state and nationally designated byway projects in 50 states, Puerto Rico, and the District of Columbia.

Enhancing Community and Visitor Experiences

Financial support for State byways, Indian Tribe scenic byways, National Scenic Byways and All-American Roads is provided through a national grant program financed by the Safe, Accountable Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The program provides funds annually on a competitive basis for enhancing community and visitor experiences along designated and prospective scenic byways. Funds may be used for corridor management plans, interpretive sites, byway facilities, access to recreation, resource protection, Tribal programs, safety improvements, and byways marketing efforts.

Many byway-related projects also are eligible for Transportation Enhancement funds under the categories of acquisition of scenic easements and scenic or historic sites, scenic or historic highway programs, or other Transportation Enhancement categories, or for Federal Lands Highway Program funds. Recreational trail projects related to Byways may be eligible for Recreational Trails Program funds.

Technical assistance and training for byways managers and others is provided through the America's Byways Resource Center in Duluth, Minnesota (*7*).

Benefits of designation as one of America's Byways are described as the four Ps: promotion, preservation, partnerships, and pride. Designated byways are promoted with the America's Byways brand and logo and are featured on the www.byways.org traveler website. Byways designations create opportunities to preserve the intrinsic qualities of the roadway, such as a unique historic site, natural resource, or scenic vista. Partnerships among citizens, government agencies, and other stakeholders are developed both in applying for the designation and in maintaining and promoting the byways (*64*).

"From the beginning the Byways program was community based. Communities are involved in the preservation, protection, promotion and pride of their byways. The strength of the program is in the local advocates that serve as stewards of their byways."

– Rick Capka, Federal Highway Administrator, at the 15th Anniversary celebration of the National Scenic Byways Program (*5*)

The Mountains to Sound Greenway curves around a forested mountainside in Snoqualmie Pass, Washington State. *Photo courtesy of National Scenic Byways Program, www.byways.org; photo by Mountains to Sound Greenway Trust*

15 Years of Byways

Scenic byways grants and technical assistance began in 1992, and the U.S. Secretary of Transportation designated the first 20 routes in 1996. The program was reauthorized and expanded significantly in 1998 under TEA-21 and again under SAFETEA-LU in 2005.

The 15th anniversary of the National Scenic Byways Program was marked on December 11, 2006, by top public and private sector leaders in Washington, DC. The event highlighted the following themes:

- The National Scenic Byways Program is a success because it empowers and unites grassroots efforts.
- America's Byways are integral to connecting Americans and visitors with our shared rich and diverse history, culture, values and natural resources.
- The program warrants new efforts to increase public awareness of opportunities along the byways.
- The merit-based FHWA byways grant program is a small investment that has provided huge returns and

is critical to the future of the National Scenic Byways Program.

- Americans will always be on the move, and scenic byways have the power to make the journey as important as the destination (5).

2005 America's Byways and Exemplary Projects

The www.byways.org website provides information on the FHWA's entire collection of America's Byways® as well as additional byways operated by individual states, Indian Tribes, the Bureau of Land Management, the U.S. Forest Service, and on U.S. Fish and Wildlife Refuges. The following examples illustrate a sampling of the nation's exemplary byway projects.

Historic Route 66

Decommissioned in 1985, Historic Route 66 is fragmented and sections of it no longer exist. Once known as "The Mother Road," the route is enjoying a restoration as part of the National Scenic Byways Program in Illinois, New Mexico and Arizona. Beginning in Chicago, the Illinois section takes you through the "windy city" before heading

America's Byways®

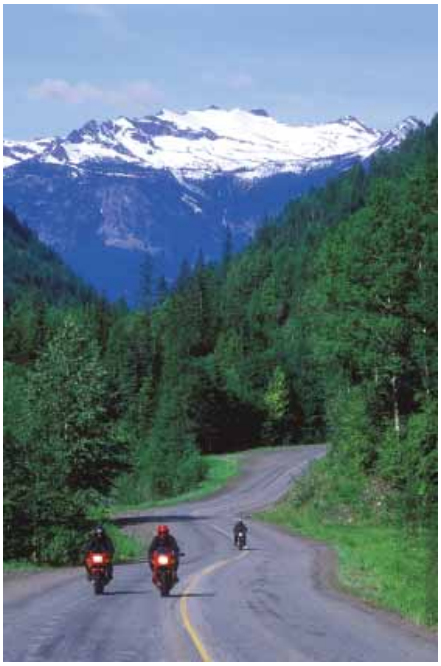
America's Byways® is the collection of 126 distinct and diverse roads designated by the U.S. Secretary of Transportation. Visit http://www.byways.org/explore/byways/ for a list of all these great roads.

A classic photo of locals Angel and Juan relaxing along Historic Route 66 in Arizona. *Photo courtesy of the National Scenic Byways Program, www.byways.org*

south to the rural farmland of southern Illinois. Along the way, travelers may visit eclectic restaurants and motels, some of which have been around since the route's inception (*63*).

The International Selkirk Loop

Curving through beautiful scenery in northeast Washington, north Idaho and southeast British Columbia, the International Selkirk Loop provides a spectacular setting. The route encircles the wild Selkirk Mountains for 280 miles. A vast, uncrowded playground of national forest and wilderness areas surrounds the Loop and offers visitors a myriad of opportunities for outdoor recreation. Nearly the entire route follows rivers and lakeshores. Historically used for transportation, today these waterways host a variety of year-round recreation. Visitors will find stories of the region's inhabitants – including Native Americans, fur trader David Thompson, settlers, miners, loggers, and newer immigrants – told in local visitor centers and museums, along with information about the natural environment at



Motocyclists enjoy the International Selkirk Loop, which runs through Idaho and Washington. *Photo courtesy Kootenay Rockies, David Gluns and the National Scenic Byways Program, www.byways.org*

many locations around the loop. The communities along the loop boast scenic attractions as well – beautiful parks, historic architecture, public gardens, fountains, sculpture, murals, colorful farmers' markets, and public squares (*65*).

2007 Scenic Byways Award Winners

The following nine Scenic Byway awards were announced in 2007 by America's Byways Resource Center, AASHTO, and the Federal Highway Administration (*8*).

- Resource Protection – Context Sensitive Solutions for Maryland
- Marketing – Arizona Scenic Roads Website
- Planning – Ohio Historic National Road Design Handbook
- Interpretation – "Journey's End" Interpretive Project, New Mexico
- Interpretation – Traveler Information Radio System, Kansas
- Interpretation – The Great Washington State Birding Trail Map – Coulee Corridor Scenic Byway, Washington
- Visitor Experience – Colorado Grassroots Training Program
- Sustainable Organizations – Illinois Alliance of Byways
- Leadership – Monte Hurley, Louisiana, Creole Nature Trail, All-American Road

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