

**The
Northeast
Transportation & Wildlife
Conference**

**Final Report:
Summary and Strategic Directions**

Northeast Transportation & Wildlife Conference
Lake Morey Resort
Fairlee, Vermont
September 13-14, 2004

Hosted by:
Vermont Agency of Transportation
Vermont Agency of Natural Resource
National Wildlife Federation

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HIGHLIGHTS

- First regional conference of its kind to address transportation-wildlife issues.
- Demonstrated a collaborative, pro-active spirit among transportation & conservation professionals.
- Recognized numerous successful project initiatives in Vermont, New Hampshire, and Maine.
- Identified common issues, opportunities and needs facing states in the region.
- Highlighted comparative strengths and resources of different states.
- Outlined priority tasks and strategies—for individual states and the region as a whole.
- Explored future collaboration among state agencies, consultants, and non-profit organizations.

MAJOR POINTS

- **Education** is fundamental—including education and training within state agencies, education and outreach to towns and regional entities, and awareness-building among the general public.
- Good **data** is essential. Basic habitat information, atlases of species occurrence, and assessments of habitat connectivity and potential linkages are particularly important (for both aquatic and terrestrial habitats). This information is critical for prioritizing implementation projects.
- **Funding** is an important issue, however, addressing conservation issues in transportation planning and through advance mitigation can help streamline project delivery and reduce costs. Wildlife enhancements can often be achieved at relatively low or no cost when incorporated into project design. Funding questions need to be addressed systematically in policy and planning decisions, not at project development stage.
- **Partnerships** are critical. No one agency or organization has the expertise, information, funding, authority, or capacity to adequately address this issue alone.
- State agencies have opportunities to **build on successful projects** to-date to make wildlife issues part of regular agency **policies**, long-range **planning**, and project development **programs**.

INTRODUCTION

The first ever Northeast Transportation & Wildlife conference was held on September 13th and 14th, 2004 at the Lake Morey Resort in Fairlee, VT. The two-day conference brought together over 120 transportation and conservation professionals—from policy-makers to project managers—to share successes and identify new opportunities to better integrate wildlife conservation and transportation.

This inaugural conference—hosted by the Vermont Agency of Transportation (VTrans), Vermont Department of Fish and Wildlife (VDFW), and the National Wildlife Federation (NWF)—focused on projects within the three northern New England states of Vermont, New Hampshire, and Maine. These three states comprised the largest share of attendees, with key representatives from other northeastern states and eastern Canada. Federal agency and congressional staff also participated and contributed national and international perspectives.

HISTORY & BACKGROUND

Efforts to integrate transportation and wildlife conservation have been gaining increased attention nationally and internationally for more than a decade. The U.S. Federal Highway Administration (FHWA) and numerous state transportation agencies have established substantial projects and programs to address wildlife issues—from enhanced wildlife crossings and fish passage to habitat restoration and mitigation, as well as a host of other measures. Wildlife agencies in many states, meanwhile, are creating new tools to help transportation agencies implement wildlife and habitat conservation strategies.

The International Conference on Ecology and Transportation (ICOET) is one of the leading gatherings of experts in this emerging field of “road ecology”. In 2003, this five-day 500-plus person event convened for the first time in the northeastern region of the U.S. at Lake Placid, New York. Many of the attendees from northeastern states, who had been working on this issue for years, had not been familiar with the work of their counterparts in nearby states until 2003 conference.

On the conference’s final evening, the northeastern contingent gathered for an informal discussion of issues particular to the region. That discussion highlighted the need for: more research applicable to the Northeast, greater communication among states and provinces, and increased cooperation among professionals working in the region. With its own assemblage of species and habitats, the Northeast cannot directly borrow from experiences and research drawn from other parts of North America. Even where species lists overlap, differences in behavior patterns and habitat needs still confound direct comparisons. The idea for a conference to address the unique challenges facing northeastern states and neighboring provinces emerged from this discussion.

The following January, the Maine Department of Transportation and Maine Audubon co-hosted a one-day conference in Falmouth, Maine that showcased some of the leading research and analysis related to the transportation and wildlife issue in Maine and elsewhere. The success of that event further increased interest in a northeastern regional conference. The Vermont Agency of Transportation (VTrans) and Vermont Department of Fish & Wildlife (VDFW), who together have pioneered new approaches to interagency collaboration, committed to hosting the event. With help from the National Wildlife Federation, a program committee was organized and a date was set. The initial focus would be on Maine, New Hampshire, and Vermont, with plans to expand the involvement of other northeast states in future years. VTrans, VDFW and NWF planned the program with input from colleagues in New Hampshire and Maine.

GOALS

The goals of the conference were to both look back at successes and lessons of different state initiatives and look forward at new opportunities, new partnerships, and strategic directions. In addition to exchanging information that attendees could take back to their respective states, the conference aimed to more clearly define issues and priorities facing the region as a whole. As summarized by the program committee, the conference’s goals were to:

- Share information, success stories, lessons, and ideas.
- Build a regional network of people working on transportation-conservation issues.
- Define scope of issues (both scientific/technical and policy/institutional issues).
- Lay groundwork for regional vision and strategy.

THE PROGRAM

The overall program was designed to showcase different approaches that states are taking to integrate conservation and transportation issues, and also allow participants to comment and build on information presented based on their own experiences and expertise. The bulk of the first day featured panels from each state describing different projects and initiatives from varying perspectives—transportation agencies, wildlife agencies, consultants, and non-profits. The second day featured presentations and discussions focused on specific issues and strategies. See program brochure for more information.

ISSUE OVERVIEW

Jan Mueller of National Wildlife Federation welcomed participants and gave an overview of the goals and the agenda for the two-day gathering (see attached program).

Agency Secretaries, Patricia McDonald of the Vermont Agency of Transportation and Elizabeth McLain of the Agency of Natural Resources, set a collaborative tone for the start of the conference. Like many states, these two agencies have had a history of battling over project permitting. Efforts of staff in each agency over several years, however, have opened new areas of cooperation that look beyond permit issues and each agency head reviewed the progress that their staffs have jointly achieved.

Secretary McDonald emphasized the development of environmental stewardship as one of the three primary missions of the agency. The idea of stewardship can be woven into many aspects of agency operations, she noted and described examples in three main areas: **analysis, education, and project implementation** (further described later in the program).

Secretary McLain highlighted the importance of **partnerships**. Agencies have “no choice” but to work across agencies, organizations, and disciplines, a theme that was echoed many times by other presenters. Cooperation begins with appreciation of the information, resources, expertise, and ideas that each partner can bring to develop new ways of doing business.

Change can seem slow, but Steve Wright, northeast regional representative of the National Wildlife Federation made the point that there has been **considerable progress**. He shared a humorous anecdote about how thirty years ago, when the question, “how do we improve the conservation performance of transportation projects”, was posed to a university ecology class, the answer was “shoot the engineer”. Today, engineers, planners, ecologists, biologists, hydrologists, and other transportation and natural resource professionals are trying to solve problems comprehensively. **“We need transportation and we need conservation, we might as well figure out how to do both better, together.”**

Transportation and conservation professionals need to understand each other’s perspectives and goals. When the conservationist cares about “system capacity” and the project engineer cares about “permeability” for snakes, the results can be powerful. Dave Scott, Director of Program Development for VTrans and a professional engineer, shared his experience of getting “converted” to the cause of integrating transportation & conservation. He was part of a Federal Highway Administration tour that looked at wildlife crossing projects across several European countries.

While Mr. Scott began the trip as a skeptic, the tour showed that wildlife crossings work, even under less than ideal conditions. A country need not have the biggest or most advanced economy to make wildlife crossings work (Slovenia has installed more than a dozen crossings for bear and other large mammals). A project also does not need to answer every research question with the utmost precision before moving forward (Germany installed a series of successful wildlife bridges based on a simple hunter survey).

The European tour also revealed the viability of different approaches and philosophies. For example, some countries have successfully mixed wildlife crossings with pedestrian paths; France has chosen to keep them strictly separate. Countries such as Germany also embrace a conservation ethic that believes wildlife and business are wholly compatible.

While wildlife crossing structures have been shown to be effective in different parts of the world, including the U.S., the long-term success of these crossings relies on the protection of **supporting habitat** and wildlife travel corridors that connect to wildlife crossings. Transportation departments only control the right-of-way. Mr. Scott introduced the central importance of performing **linkage analysis** as part of an overall strategy for wildlife crossings. A linkage analysis looks at habitat and land use factors over a large area to identify and evaluate road segments where wildlife crossings may be effective. Such an analysis focuses on answering two questions:

- 1) What habitats are we trying to connect or sustain?
- 2) Are there missing linkages and, if so, where are they?

This analysis becomes the basis for determining the most critical linkages and highest priority project sites, and is fundamental to evaluating conservation needs in long-range transportation plans. In addition to helping meet conservation goals, this information can be used to help meet transportation agency goals for:

- **Permit predictability**
- **Fiscal responsibility**
- **Increased safety**

Despite the practical applications for planning and project implementation, many people are unaware of or question the value of this work. As Mr. Scott highlighted, efforts by transportation and wildlife agencies will need broad public support as they continue to expand.

Public support may be stimulated by a better understanding of the magnitude and extent of interactions between wildlife and the road system. The emerging field of “road ecology” draws from landscape ecology, conservation biology, and other disciplines to explore how different species and habitats are affected, positively and negatively, by the presence of roads and automobile traffic. Dr. Richard Forman, one of the world’s leading authorities on road ecology provided an introduction to the subject and described some of its most pressing issues.

As the story of human history has unfolded, “**we (humans) have prospered while nature has suffered**”. “Isn’t there a better way?” Dr. Forman questioned. He believes we can “mesh” science and engineering with biodiversity; we can improve both roadside and roadway habitats; and we can improve connections among habitats, at the same time that we provide safe and efficient mobility. He focused on eight major issues to consider:

Roadkill

Roadkill, in many cases, is not a threat to the long-term survival of a given wildlife population—many species just reproduce faster than cars might kill them. However, for slow reproducers, local populations of amphibians and reptiles, and endangered species in general, roadkill mortality can be a significant problem. Dr. Forman noted that wildlife mortality can also be an important social issue as well as an ecological one.

Traffic Noise

Traffic noise is an underappreciated factor, but it is one of the primary contributing causes to the “road zone effect” where different species may not breed in or inhabit areas within a certain distance of a road.

Studies have shown that the extent of road zone effect is correlated with traffic volume. The road zone can be up to $\frac{3}{4}$ mile on each side of the road in areas with high traffic volume.

Roadside Vegetation

Roadside vegetation can have habitat value for many species; however roadsides are typically not managed for habitat and are often mowed on a regular basis. In New England, roadsides represent more than 100,000 acres of potential wildlife habitat. Many species are attracted to grassland, shrubland, and forest edge habitats common to roadsides—e.g. rabbits, hawks, and various songbird species.

Wildlife passages

Wildlife passages under or over roads have tremendous potential to facilitate animal movement, but they need to be used, not just where roadkill numbers are high, but to support a network of habitats and corridors that makes sense for the long-term. Many species have demonstrated an ability to adapt their movement and behavior to use wildlife crossing structures.

Waterways

Waterways are important habitats that have been more fragmented and disconnected by roads than by any other factor. Fish and other aquatic species do not generally have alternative routes when bridges, culverts, earthwork, and other road infrastructure block their passage. While many forest habitats in the Northeast are rebounding, the recovery of many river and stream habitats is lagging. Restoring upstream-downstream connectivity where roads cross waterways is a key part of that recovery.

Road Salt

Road salt is applied in countless tons to most major roadways in the Northeast. A large amount of road salt washes into streams, accumulates in surface soils, and changes fundamental soil and water chemistry. The long-term and cumulative effects of continuous seasonal road salting needs further study, while salt management practices need to be reviewed.

Road Network Form

The spatial and geographic form of the road networks matters. Where roads are located, how traffic is distributed, and how both fit into the broader landscape are important considerations for improving wildlife movement and habitat connectivity. Currently, road density is the most commonly used measure, but density is a crude measure of road network form. Planners need to think more in terms of habitat context—the same road density may have greater consequences in some areas than others. All roads are not created equal and road design and traffic volume can be as important to consider as density.

Regional approaches

Regional approaches are ultimately what are needed to adequately address cumulative impacts and overall large-scale wildlife needs. Current transportation law takes a regional approach to air quality (e.g. the CMAQ program). Developing a comparable program to account for and provide for regional wildlife and habitat needs is an idea worth exploring.

In summary, Dr. Forman suggested priorities are:

- **Get past roadkill (or at least see roadkill in context)**
- **Noise is an important area of concern worthy of much more study**
- **Establish connections among different habitats in the landscape, plan a system.**
- **Create a new vision for roadsides**
- **Disconnect roads from waterbodies**
- **Integrate conservation and transportation planning**

More Perspectives on Road Ecology

Later in the evening of Day 1, Dr. Stephen Trombulak, Professor of Conservation Biology at Middlebury College and a noted authority on ecological effects of roads, presented additional perspectives on road ecology in the Northeast. He shared an ecological framework for evaluating roads and provided additional perspectives on points made by Dr. Richard Forman earlier in the day. Dr. Trombulak is the author of a notable article that catalogues the multiple physical, chemical, and biological impacts of roads on wildlife and habitat. It is easy to focus on one or a few different impacts, but, as Dr. Trombulak discussed, it is important to consider the comprehensive and cumulative impacts of the road system.

Primary physical impacts include the physical removal or alteration of vegetation. Different vegetative structure and composition of plant communities will attract some species and deter others. The tendency of roads to absorb sunlight and act as heat islands often attracts various organisms, particularly cold-blooded organisms such as snakes. While roadkill may threaten extinction for some species, the physical impact (literally) of cars on common species should not be overlooked either. Roadkill has effects on both large and small organisms that have functions in the landscape. Roadkill reduces those functions and impacts to local populations and natural communities can be significant enough that roadkill effects should, at least, be considered as a potential impact in most cases.

In addition to habitat alteration, the presence of roads and increased road density has been shown to have an impact on animal behavior independent of traffic volume. Many species will use roads where they exist, but some species will also avoid roads because of lack of cover and increased risk of predation.

Conservation biology often looks at the landscape in terms of species **source** and **sink** areas. Source areas are areas where the reproduction rate for a given species exceeds its mortality rates. These areas will tend to be sources for populations to disperse and expand to other areas. Sink areas are areas where mortality rates exceed reproduction and represent a net population loss or sink for that species.

Applying the sink-source concept to roads, some species like and flourish in roadside habitats, but for most, road corridors are sink habitat. For example, Atlantic salmon might re-colonize stream habitats, even highly altered habitats, but there are many physical kill zones (sinks) along the way; many of which are associated with roads. Species may be observed as present and occurring near roads, but the population trends may tell a different story.

Chemical impacts of roads have occupied more space in the research literature than either physical or biological impacts. Salt, which is ubiquitous along most through roads in the Northeast, alters basic water and sediment chemistry. The secondary effects of road salt to stream habitat are not well studied. Roads are also primary sources of heavy metals to aquatic systems. One study of Otter Creek, a major river system in western-central Vermont, showed that most of the metals found in the stream were from roads.

Biological impacts of roads are largely associated with the geography of roads as linear habitat features in the landscape. The road network acts as an interstate transportation system for many other things besides cars. Organisms both good and bad use roads as dispersal corridors and vectors. For example, of the 153 species of grasses in Vermont, 40% are invasive, non-native species (about 30% in NH). Most of the grasses are found near and are spread by roads.

Overall, to evaluate the effects of roads and road projects, looking at roads and development as a system of sink and source habitats and as network of corridors/vectors provides a good starting framework. More generally, consider that most new roads or road expansion are associated with or stimulate increased development.

Projects and project reviews need to ask, “how will wildlife cross the road?”—e.g. how are fish going to move upstream or downstream—and be less concerned with why or whether organisms will cross the road. In the long-run, all organisms, even plants, move. Other questions, such as, “how will water quality be protected from salt, rusty vehicles, metals etc.?” also need to be asked and answered. In general, Dr. Trombulak recommended, the level of information that should be provided and the burden of proof ought to rise with the magnitude of potential ecological costs.

STATE PROJECTS & PROGRAMS

Each of the three focus states—New Hampshire, Maine, Vermont—organized a panel presentation on different aspects of the transportation and wildlife issue in their respective state. Panelists included a range of professional and organizational perspectives—including transportation and resource agencies, consultants, non-profits, policy directors, planners, biologists, and others. Together, they provided insights into successes to-date and potential future directions. Each state panel was asked to address five broad questions:

1. What is your VISION—for your state and the region—for integrating transportation and wildlife conservation?
2. What are the key challenges and opportunities—technical, procedural, policy, cultural, funding or other—to advancing this issue in your state?
3. What policies, programs, partnerships or other efforts related to transportation & wildlife are already underway or being developed in your state?
4. How have existing regulations and funding been used and how has your state gone beyond compliance & permit mandates?
5. What are useful indicators of success and progress?—for example, memos of understanding, new project review procedures, maintenance procedures; stewardship policies, better understanding of transportation needs within environmental organizations, etc.

New Hampshire

The New Hampshire Department of Transportation (NHDOT) and the New Hampshire Department of Fish & Game (NHDFG) have been addressing the transportation and wildlife issue through various individual projects over many years. More recently, they have examined how these different efforts might fit together and how the two agencies might coordinate their efforts more explicitly and systematically. Significantly, NHDOT has designated a staff position to address wildlife issues.

NHDOT's basic transportation goals for the agency are:

- **Mobility**
- **Connectivity**
- **Safety—including decreased wildlife-vehicle collisions and wildlife mortality**

NHDFG has similar goals in relation to transportation, only they would also apply to the mobility, connectivity, and safety of wildlife. In essence, the joint goal of the two agencies is to provide two intertwined transportation systems that move people and wildlife. The goal is simple and fundamental, however there are some important challenges and existing limitations that make implementation of these goals difficult. Some of these limitations include:

- Lack of understanding of how **large mammals** move through **developed landscapes**. Most research is radio telemetry in large undeveloped commercial forests. Little work has been done in the Northeast on the wide variety of habitat types in this region and how different wildlife species respond or adapt to the presence of people, buildings, roads, and cars. This would be a basic area for potential future research.

- Lack of information on **cumulative impacts of roads to aquatic systems**. Aquatic habitats are often small or linear and easily fragmented by roads when fish passage and movement of other taxa are blocked. There is inadequate information on how organisms such as stream salamanders respond to road crossings and what techniques are effective in helping different aquatic species move across road corridors. For example, for the Flatrock bridge project, many different techniques were considered to get spotted salamanders to cross under the road, but most had shortcomings.
- Lack of information on **furbearers**. Furbearers include many medium-sized mammals (mesocarnivores) that do not range as far as some larger mammals but can occupy and move through a variety of habitats for their survival. Little is known about how the relatively dense network of roads in the Northeast affects the spatial movement and habitat needs of fur-bearing mammals or how these species might respond to different mitigation techniques.
- Lack of a comprehensive **land use plan** that includes **wildlife habitat**. There has generally been little thought to explicitly including wildlife habitat information on local, regional, and state land use plans. Overall wildlife habitat concerns are often assumed to be addressed by protection of general forest types and avoiding natural heritage sites. The adequacy of this course approach is questionable.
- Lack of information on **wildlife movement** along or across **highways**. There is some information about wildlife-vehicle collisions, particularly for large mammals. Roadkill data can be helpful, but does not give a complete picture of wildlife crossings (successful and unsuccessful), avoidance behavior, or change in movement patterns.

These issues are mostly not particular to New Hampshire, but different states may be addressing them in different ways. A common thread is the need to give wildlife and habitat commensurate attention as other social, economic, and environmental considerations when planning and analyzing development. An important tool for reaching that level of attention is the development of a **Comprehensive Wildlife Conservation Strategy (CWCS)**, an effort that New Hampshire and other states are undergoing as part of federal requirements for State Wildlife Grants (SWG).

With the CWCS, New Hampshire will have, for the first time, a consolidated document to which wildlife agencies and other agencies can refer. There are some common requirements for the CWCS, but each state also has flexibility in how they fulfill them. CWCS's in different states will not necessarily be spatially explicit, but in New Hampshire, CWCS will aim to identify important habitat areas and identify and compare **measures of connectivity**.

The CWCS will provide an opportunity for New Hampshire to look comprehensively and inventory land use in terms of **three infrastructures**—green, built, social (ed. note: this would make an interesting conceptual map).

While the CWCS will help coordinate conservation and transportation planning, site-scale and project-level information becomes more critical when looking at specific mitigation measures. The use of **straight-line diagrams** is an important opportunity to incorporate wildlife and habitat information into project-level decision-making. Straight-line diagrams are already used by transportation project designers to organize information on road surface condition, maintenance history, safety issues, and other features. The straight-line diagram references this data for every point or segment along a road as if the road were completely straight—hence the name.

New Hampshire has initiated several important projects to address wildlife issues related to highways and roads. The NH Department of Transportation will be looking at ways that these separate projects can be linked and used to develop programmatic approaches to address wildlife issues in addition to project-specific efforts. To build on successful projects to date, the Department is exploring partnerships with local conservation commissions and conservation groups. Several major projects are representative of New Hampshire's work on this issue including:

Salamander Crossings for Roadway Project

A highway relocation project is scheduled for Route 111 in Windham, NH. The project presented an opportunity to enhance passage for aquatic species, in particular, a population of spotted salamanders who have significant habitat requirements on both sides of the road. The habitat was diffuse over the project area, however, and pre-construction surveys revealed no identifiable corridor. The project presented an important logistic and scientific question: how to strategically design and locate crossing structures for small, slow-moving species that are scattered across a large area. This situation does not fit the model of habituating larger mammals to use crossings with fencing and other measures. The project tested several alternatives, most of which did not appear to work at all, and none of which worked particularly well. The project will continue to be monitored and other design alternatives may be explored (ed. note: a potentially interesting research site).

Turtle Studies

Similar to salamanders, turtles are slow-moving, yet often have habitat needs that require them to cross roads. Some turtle populations are relatively small and may be particularly sensitive to roadkill losses. Blanding's turtle is a federally-listed endangered species found across parts central and north-central New England. Roadkill mortality is a significant impact on this species and road mitigation may be a critical factor in its recovery.

Other more common turtle species, such as snapping and painted turtles, are also sensitive to road impacts. In addition to mortality from collisions with cars, roads have been shown to also be a barrier that turtles avoid, limiting the dispersal of healthy turtle populations to colonize potential new habitats. The barrier effect also limits genetic mixing across different turtle populations.

Some studies also suggest that roads affect male and female turtles differently (this has been shown in bears and other species as well). Roads may substantially alter the long-term gender ratios and reproductive trends among turtle and other populations. Very little research has been done on this topic in the Northeast.

New England Cottontails and Roadside Habitat Conservation

The New England cottontail was once a common rabbit species of the region. The non-native eastern cottontail has displaced the similar, but genetically distinct, native species, across much of its habitat range. The New England cottontail is affected by road mortality, but the greater road-related impact on this species appears to be habitat changes induced by roadside vegetation management.

Remaining populations of New England cottontail populations find favorable habitat among mixed grassland-shrubland-forest habitats, which includes many such habitats near roads. Roadside management, however, can create dramatic changes in vegetation and canopy structure. The presence and reproductive success of New England cottontails appears to be affected by these factors—more so than by the effects of increased traffic volume and associated increases in road noise and mortality from automobile collisions.

Roadside management can also help control or facilitate the spread of invasive species that have degraded habitat quality for New England cottontails. Management can also attract or deter movement of the generalist predators that prey on cottontails.

Overall, New Hampshire has identified certain basic research questions and needs to address in order to address the transportation-wildlife issue comprehensively:

- Where do **species of concern** cross and likely to cross? (data exists for only a few species)
- Determine factors that affect the probability of **road crossings**. Initial information suggests crossing behavior depends on density of wildlife populations, home range, and width of habitat.
- Probability of **mortality** if and when wildlife need to cross (this may be more easily researched than determining where successful crossings are occurring).

Maine

Maine has had several project initiatives that together are forming the core of an emerging transportation & wildlife program. The Maine Department of Transportation (MDOT) and its Bureau of Environment is approaching the integration of transportation and conservation with three basic principles in mind:

1. A Systems Approach to Decision-Making

Individual projects to address site-specific problems are valuable and sometimes have their own imperatives (e.g. acute safety problems with moose). However, to address these issues in a cost-effective, long-term effective solution, a systems-level analysis is important and systems level solutions are required.

Systems solutions rely on planning tools that examine larger scale issues and evaluate regional and statewide priorities.

2. Be Proactive

Options for addressing a problem or issue after it has already been created are generally much more limited and much more expensive. Being proactive can provide more mitigation options and save agencies time and money in project delivery.

Proactive planning tools can also help anticipate problems versus reactive permitting tools that only check for problems and concerns after much work has already been done. A planning approach can also help identify and anticipate opportunities to maximize performance beyond meeting minimum permit requirements.

While permitting is generally reactive, incorporating planning information and linking planning more closely to permitting can enhance permitting and project reviews.

3. Bring Information from Conceptual Ideas into Decisions and Actions

There is a lot of existing information that would be useful to transportation agencies, but it is not readily available in practical form. While there are definite information gaps and research needs, bringing existing ideas, plans, and information into action at an operational and project level decision-making has been equally important and has been equally challenging.

Maine has applied these principles to the transportation and wildlife issues through two major practices:

- Interagency consultation and coordination; and
- Special or site-specific projects.

Maine DOT has convened regular interagency coordination meetings for a number of years. The Habitat & Transportation Working Group and the Community Preservation Advisory Group have both been helpful in addressing wildlife issues. The benefits of these meetings have been many. Early project screening, enhanced project scoping, and smoother project reviews have all originated from this regular interagency communication.

Interagency coordination has led to many specific design enhancements, particularly in roadway, bridge, and safety improvement projects. Regular meetings among agencies have also sparked several special interagency projects, such as the Interagency Moose Task Force and the Fish Passage Policy and Design Guide. Maine's experience suggests that interagency communication can produce unanticipated benefits and should be the norm not the exception, even when the outcome is not perfectly defined.

Early scoping and enhanced project reviews are important and helpful efforts. Maine DOT is working to further enhance interagency coordination through cooperative, integrated planning with other agencies.

Maine DOT has also undertaken several site-specific projects and programs, such as Gateway 1. This project is looking comprehensively at design improvements to a key section of US Route 1 on the central coast of Maine and will incorporate environmental, social, economic, and transportation considerations.

Particular species of concern, such as the endangered Blanding's Turtle, have also stimulated site-specific research studies and remediation projects. Many of these projects have been initiated by Maine DOT in collaboration with the Maine Department of Inland Fisheries & Wildlife, while other projects have been initiated by local and regional entities and supported through the transportation enhancements program.

Maine DOT has also partnered with many entities outside state government including land conservation organizations such as the Sheepscot Land Trust and federal agencies, such as the US Army Corps of Engineers.

Beginning With Habitat

Maine's "Beginning With Habitat" program (BWH) has been a particularly helpful resource and starting point for much of Maine DOT's transportation and wildlife work. BWH is a statewide program based somewhat on a similar program in Massachusetts. BWH engages the participation of a full range of state and federal agencies in a cooperative non-regulatory approach to conserving open space and habitat. BWH focuses on developed areas of the state and meeting the long-term needs of all native species within a developed landscape (long-term has meant looking ahead 50 to 100 years, a longer perspective than most town plans).

BWH emphasizes outreach to local communities. To date, the BWH program has been presented to more than 100 towns and supplied them with habitat maps and mylar overlays (Colleen Ryan is the program's town outreach coordinator, colleen.ryan@maine.gov). The primary data sets collected and presented by BWH are:

- **Water Resource and Riparian Habitats**
(Approximately 50% of species of concern use areas defined as "shoreline zones" under Maine's shoreline protection statute)

- **“High Value” Plant and Animal Habitats**
- **Large Undeveloped Blocks**—for area-sensitive species, many common species, and other species of concern to the local community.

Overall, existing programs in Maine present many opportunities, but other elements will help drive progress on the wildlife and transportation issue.

- **Assistance with management and use of resource data**
DOT is not an environmental specialist agency. Other agencies are better suited with more expertise and resources to manage, update, and enhance resource data for use by Maine DOT.
- **Technical assistance**
In addition to information resources, Maine DOT welcomes the direct assistance to apply this information to projects, planning, and program development
- **Proposals**
Maine DOT has initiated projects from within their agency, but ideas and project proposals from outside the agency will help multiply the opportunities and projects that DOT can help advance.
- **Advocates and Partners**
Advocates and partners can help DOT advance the issue overall and well as help initiate and sponsor specific project proposals

Other priority needs to help move this issue forward in Maine include:

1. **Raise public awareness**
Building public understanding and support is always helpful for a public agency
2. **Action plans for species**
Maine DOT’s priorities need to mesh with plans and priorities established by other agencies. Management and recovery plans for different species will guide and help justify mitigation measures developed by Maine DOT.
3. **Integrate BWH model into state, regional, and local transportation plans**
In lieu of, or in addition to, more specific species information, the BWH model provides a framework for protecting multiple species. The model and partnerships have been developed, but more work needs to be done to help transportation officials make practical and regular use of this information.
4. **Conduct connectivity study**
BWH provides a useful habitat framework, but it does not specifically evaluate habitat connectivity. A connectivity study would be an important tool for identifying and prioritizing wildlife crossing projects and other mitigation measures.
5. **Develop tool box for towns**
BWH can help towns identify significant habitats and develop conservation goals and priorities. Towns will also benefit from guidance on practical tools and strategies to help implement these goals. Many towns still lack basic wildlife habitat information for their towns. Despite imperfections and data gaps, it is important to get existing information out there.

While Maine is looking for opportunities to expand its activities, it will maintain and enhance its important core projects, such as its study of moose-car collisions and the effectiveness of different signage to reduce such collisions. This project demonstrates the importance of field work and how investigative thinking can be applied to a fundamental safety and wildlife problem. In this case, where moose collisions are thought to be associated with mud wallows where road salt collects, there is no substitute for driving every road segment of concern and recording (using GPS) the location of every roadside mud wallow and making site observations, such as counting and measuring skid marks.

Vermont

The Vermont Agency of Transportation (VTrans) has both developed its own capacity for addressing wildlife issues at the same time that it has, over the last six years or more, developed a strong, cooperative relationship with the Vermont Department of Fish & Wildlife (VDFW, part of the Vermont Agency of Natural Resources). These efforts have created a number of landmark projects. VTrans and VDFW are continuing to monitor, evaluate, and learn from its wildlife crossing and mitigation projects, while it is moving to expand its work to include new projects, additional species, and better tools for prioritizing projects (including a habitat linkage assessment that is near completion).

One of Vermont's first wildlife crossing projects was an underpass on a segment of State Road 289, also known as the "Circumferential Highway". The underpass was sited and designed to facilitate animal movement and was used by a variety of species initially. Development along the corridor, however, has reduced the use and effectiveness of this structure, which now serves mostly as a path for kids on bicycles and dirt bikes. This project underscored the importance of linking wildlife crossing strategies within an overall land conservation and habitat protection strategy.

As previously noted, VTrans, like most transportation agencies, does not generally control or manage lands beyond the public right-of-way. In some cases, VTrans has purchased land as part of project mitigation; but long-term ownership and management of such land is a challenging and unresolved question. VDFW and VTrans are working to resolve such issues regarding stewardship of lands conserved for wildlife crossings, habitat enhancements, or other road mitigation measures.

VTrans and VDFW have tried to apply the lessons it learned from early work on the Circumferential Highway to the Bennington Bypass, another new road project, located in southern Vermont. In close cooperation with wildlife scientists from the VDFW, VTrans has incorporated numerous wildlife crossing structures intended for a variety of species, primarily along riparian corridors. The comprehensive treatment of this project makes it a particularly important one to monitor. VDFW has secured a research grant from VTrans to evaluate the effect of this new road system on ecosystem functions and the efficacy of the crossing structures for enhancing wildlife movement. This project has been recently initiated as part of a graduate research project through the University of Massachusetts.

One of VTrans' and VDFW's marquis projects has been the Route 78 upgrade project. Route 78 runs across the Champlain Islands at the north end of Lake Champlain and crosses through the Missisquoi National Wildlife Refuge and other publicly conserved lands within the greater Missisquoi River wetland complex. The project involves replacing a section of existing roadway with a 500-foot span bridge that will help restore ecological connectivity in one of the largest and most significant wetland ecosystems in Vermont and the Northeast. The area is important for both aquatic and terrestrial species—frogs and turtles (including the endangered spiny soft-shell turtle) as well as moose, deer, and a myriad of unique and sensitive wetland-dependent wildlife species. A comprehensive roadway permeability plan was developed for this project by VDFW and a variety of smaller underpasses and tunnels are also planned.

US Route 2 also crosses into the Champlain Islands further south from Route 78, and also involves significant wetland and lakeshore habitat. At particular times of the year, thousands of frogs can be observed attempting to cross the highway en masse. The route is heavily traveled and single-day frog mortality counts numbered in the hundreds. Initially, silt fencing was used to prevent the fatal migration. The habitat on each side of the road is fairly large and potential for inbreeding suppression due to population isolation was thought to be less significant than the mortality factor. Other options to facilitate amphibian crossings may be considered for this area.

In cooperation with Middlebury College herpetology expert and researcher, Jim Andrews, VTrans and VDFW have made special efforts to address snake conservation in Vermont. Snakes are often underappreciated and misunderstood, but many northeastern snake species are of conservation concern and are sensitive to road mortality and other transportation-related impacts. The black racer is a rare snake in Vermont, partly because Vermont is at the northern end of its range, and road mitigation measures may offer significant habitat and survival improvements for this species. Black racer surveys along roads have been performed for a number of road segments in Vermont, and VTrans has been considering options to increase permeability for snake movement along southern parts of Interstate 91 (near the Connecticut River and New Hampshire border).

VTrans has also sought to develop better tools and information to integrate transportation and conservation planning and has commissioned larger statewide surveys. A bridge and culvert survey is a key project that will help the agency plan for maintenance and upgrade of its bridges and culverts, while it will provide key information on opportunities to enhance these structures for wildlife movement.

VTrans and VDFW are also incorporating other statewide habitat information, such as GIS layers of black bear habitat. Black bear must cross a number of roads when they move north and south along the Green Mountains—including Route 9 near Wilmington, Route 4 near Killington, and Interstate 89 near Waterbury. Bear collisions are also an increasing safety issue.

Species atlases as well as habitat maps are fundamental to planning efforts. Basic data is missing for many important groups of species, however—amphibians and reptiles for example. VTrans is continuing to work with VDFW to improve and update its wildlife resource data.

Perhaps most importantly, VDFW, in cooperation with VTrans, has developed a statewide GIS wildlife habitat linkage analysis. This analysis identifies potentially significant wildlife corridors and habitat linkage areas associated with roads throughout the state of Vermont. This project will serve as a foundation for future transportation planning decisions to consider potential impacts to wildlife movement, mortality, and habitat fragmentation. It will help identify appropriate and cost-effective sites for wildlife crossing infrastructure. It will also be used for wildlife conservation planning to identify and prioritize habitat areas that should be conserved to support wildlife crossings.

While good science and good data are fundamental to Vermont's efforts, the importance of developing conservation **ethics** to accompany the science was also underscored. Vermont wildlife experts Jim Andrews of Middlebury College and Sue Morse of Keeping Track Inc., together with VDFW, have been coordinating with VTrans to provide wildlife training workshops for VTrans staff and consultants. These training programs have not only increased agency capacity to address wildlife issues at the project level, but regular exposure to regional wildlife experts and wildlife issues has helped build a strong and enduring ethic among agency staff. VTrans has supported its multiple initiatives with an environmental stewardship policy that explicitly recognizes the importance of integrating wildlife and habitat issues into its planning and project development work.

Overall, VTrans and VDFW are learning to take advantage of different resources and expertise within the two agencies, which have different stated missions, but ultimately share many common goals including:

- **Safety**—for wildlife and humans
- **Budget efficiency**—economizing and maximizing the use of public funds
- **Meaningful mitigation**—with all the time, money, and effort that goes to develop mitigation measures, both agencies are interested in getting results
- **Improved planning**—for both conservation and transportation
- **Improved interagency coordination**

Both agencies are proud of their successes to date, but they also recognize the challenges that they will face as they move forward, such as limited budgets and limited staff. The realities of Vermont’s changing landscape, population pressures, and changing lifestyles will also shape opportunities and constraints for what can be done to address transportation and wildlife issues.

Other less tangible, but no less significant, challenges facing Vermont include: maintaining trust and respect among agencies over time and through changes in administrations; redefining organizational missions and managing cultural changes within agencies; and finding and building new partnerships to get the job done. These challenges will require continually defining and reinforcing the common issues, opportunities for mutual success, and win-win benefits of this work that unite different agencies:

- **Mobility enhancement AND ecosystem connectivity**
- **Sound public investment**
- **Safety improvement**
- **Enhanced environment**

PLANNING & POLICY

Federal Highway Administration

A large share of transportation is federally funded and a significant amount of policy directions also originate from federal transportation laws and regulations. The Federal Highway Administration (FHWA), the largest branch of the US Department of Transportation, is the primary agency overseeing the use of federal funds and implementation of federal policy by state transportation agencies. Alex Levy, senior ecologist and wildlife specialist for FHWA outlined key ways that FHWA has organized itself to support progress on transportation-wildlife issues and integrate these efforts into FHWA's mission.

Federal funding and other support for highways and roads come to states via two main federal transportation funding programs, the Federal-Aid Highway Program and the Federal Lands Highway Program. The Federal-Aid program makes funds available for interstate highways, U.S. routes, and state roads that are designated as part of the federal-aid system. The Federal Lands program applies to roads that travel through national forests, national wildlife refuges, national parks and other federal lands, which are often primary opportunities to benefit wildlife and habitat.

“Environmental stewardship and streamlining” is one of three FHWA's Vital Few Priorities—the two others being safety and congestions mitigation. To date, much of the work on environmental stewardship has focused on better and smoother implementation of requirements of the National Environmental Policy Act (NEPA), but other non-regulatory efforts are getting increased attention.

FHWA has several technical assistance programs and agency-wide efforts to encourage better integration of conservation and transportation. For specific on-the-ground projects, there are three main ways that wildlife projects receive federal transportation funding:

- **Projects** (as part of a proposed road, bridge, or safety improvement project)
- **Project mitigation** (measures that are related to, but not directly part of proposed project)
- **Transportation enhancements** (stand-alone projects initiated independent of proposed transportation projects).

Integrating features to benefit wildlife with proposed transportation projects can often be done at modest to no additional cost and should, at a minimum, be considered in most cases. Project mitigation funds seemingly represent an apparent cost increase, but may be well worth the line-item cost to avoid more costly transportation alternatives. Mitigation funding offers opportunities to complete projects beyond the scope of proposed road, bridge, and safety improvements. Transportation enhancements also provide funding for projects related to transportation but not strictly associated with a specific road or bridge project. Wildlife crossings are a specifically authorized category under the enhancements program (ed. note: actual use of enhancements funding for wildlife crossings has been notably low).

FHWA also supports transportation-wildlife research through a variety of programs including the Highway Research & Technology Program, the National Cooperative Highway Research Program (NCHRP), the Transportation Research Board, and the Transportation Pooled Funds Program. FHWA is a lead sponsor for the International Conference on Ecology & Transportation (ICOET), a bi-annual event featuring the latest research on a wide variety of road ecology topics (the next ICOET will be held in San Diego in August 2005, see www.icoet.info).

FHWA has also initiated several special projects and programs. The Center for Transportation and the Environment (CTE) at North Carolina State University is one of two “University Transportation Centers” (so designated in federal transportation legislation) that focuses on the environment and is charged with

servicing the entire eastern US states. CTE sponsors and coordinates research related to a variety of environmental concerns including wildlife and habitat. It provides a variety of educational services as well including a series of tele-conferences that can be viewed at locations within each state. CTE also hosts the WFT web gateway that connects to a number of other sources of information on wildlife (www.itre.ncsu.edu/cte Wildlife, Fisheries, and Transportation web gateway). FHWA also co-sponsors another web resource, the Wildlife Crossings Toolkit, at www.wildlifecrossings.info.

FHWA has directly produced a number of educational and technical resources itself. “Keeping It Simple” is a photo-rich booklet that showcases projects from all 50 states that exemplify simple but significant measures that states are taking to enhance wildlife and habitat (www.fhwa.dot.gov/environment/wildlifeprotection).

The “Guidelines for Design and Evaluation of North American Wildlife Crossing Systems” is currently the best compendium of guidance and techniques for planning and designing one or more wildlife crossing structures. The Guidelines provide a helpful checklist of issues for agencies and project designers to consider when developing a project. The NCHRP program also sponsored an important monitoring study: Evaluation of the Use and Effectiveness of Wildlife Crossings www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+25-27

As the guidelines discuss the physical and ecological issues associated with developing wildlife crossings, FHWA is also developing a manual for how to use existing regulations, policies, and procedures to facilitate and accelerate implementation of wildlife crossings. Currently referred to as the ‘Critter Book’, the manual is being developed with the input of professionals from inside and outside state agencies and is being coordinated by the Volpe National Transportation Systems Center. Cassandra Allwell of the Volpe Center provided more details on what the “Critter Book” will do (www.fhwa.dot.gov/environment/wildlifecrossings).

The “Critter Book” manual is intended to be a comprehensive, integrated, and collaboratively defined approach to building not just wildlife projects, but programmatic approaches to integration conservation into transportation. Development of the manual is based on an ecosystem approach, using ecological boundaries as a geographic framework. The project is intended to be adaptable to different ecosystem types in different geographic regions of the country. It is targeted to a wide audience, but will have specific how-to information.

An important focus of the Critter Book is building partnerships and cooperative agreements to accomplish program goals. Such partnerships are a departure from how most agencies approach their work. Cassandra posed the rhetorical question “why do agencies need to change or expand from the status quo?” The premise of the Critter Book is that current approaches, while commendable, fall short. More work needs to be done to protect the range of species and habitats affected by roads.

The Critter Book also represents an important shift in FHWA and state agencies to go **beyond permit requirements** and minimum criteria and aim to **maximize opportunities** to enhance wildlife and transportation objectives. Programs need to go beyond current site-specific and single species impacts to consider opportunities for larger scale ecosystems and multiple species and natural communities. Connectivity needs to be put into a large-scale habitat context, not just getting some species from one side of the road to the other.

In addition to enhancing wildlife conservation, the Critter Book has the overall goal of increasing predictability and helping agencies honor interagency commitments on which streamlining and enhanced project review efforts are based. The manual is based on real-world examples and uses three different states, Washington, North Carolina, and Vermont as pilot areas for applying the program.

Overall, the Critter Book will provide a step-by-step guide with techniques and tools that will show how to perform more integrated planning and involve multiple partners. It will provide guidance on how to set performance measures, make mitigation decisions, assess the economic value of mitigation, and compare ecological costs and benefits. It also reviews the advantages and disadvantages of different mitigation mechanisms—for example, project-by-project versus conservation banking versus payment-in-lieu.

Federal Transportation Reauthorization

Staff working with Senator James Jeffords on legislation to authorize federal transportation funding and policy for the next six years provided their perspectives on congressional actions, particularly in light of what they had learned about related activities at the state level. Tom Berry, natural resource coordinator in Senator Jeffords' Burlington office started off with a historical perspective on federal involvement in transportation and on transportation in New England and its effects on wildlife. He traced the present policy struggles from the time when rivers and lakes were the primary conduit for people and freight, through the heyday of railroads, and into the era of automobile dominance. The not-so-distant future transportation landscape may look very different than today. We need to be cognizant of the dynamic and ever-changing nature of transportation and look ahead while we also try to address current problems.

Mr. Berry also gave an overview of the broad jurisdiction of the Senate Environment and Public Works Committee of which Senator Jeffords is the ranking minority member. The EPW committee has oversight over the Environmental Protection Agency (EPA), US Fish & Wildlife Service, US Army Corps of Engineers, and the Federal Highway Administration. The EPW committee is well positioned to see and integrate the dual concerns of infrastructure and habitat. Alison Taylor and Jo Ellen Darcy, who work for Senator Jeffords as minority staff for the Committee, described the wildlife and habitat provisions that they worked to include in the Senate version of the transportation bill, and the politics of keeping those provisions in the final bill.

EPW minority staff drafted an entire chapter of the planning title of bill that addresses wildlife and habitat conservation in the context of transportation planning (Chapter 1, Sections 1501-1505). However, the “lovefest” demonstrated among transportation and conservation interests at this conference is not happening in Washington; majority staff and highway interests have opposed these provisions. This fact was noted with an undercurrent of humor and sadness.

Proposed changes to the planning title contains language that basically says that state and metropolitan transportation agencies will **consult with resource agencies and consider state conservation plans** and existing wildlife data (GIS mapping etc.) when they prepare transportation plans. One focus has been to build on Section 1309 to integrate wildlife considerations into existing processes for required 20-year Long-Range Plans and Transportation Improvement Programs (shorter range six-year and two-year plans). There are also provisions that wildlife issues would be considered as projects are being initiated.

The draft language in the bill does not require the creation of data that does not exist, nor does it mandate any particular mitigation requirement. Other sections also address options for pooled mitigation and mitigation funding mechanisms that would allow one large aggregate mitigation measure to serve as mitigation for more than one project. The goal was to provide more options enhance permit predictability and provide better mitigation in the end, but the idea is still suspect in some political circles.

There are other proposed changes related to NEPA that are both good and bad in the opinion of EPW minority staff. Technically, these changes are not amendments to NEPA requirements, but they would alter the environmental review process and how NEPA is applied. Some of these changes appear to conflict with the goal of better planning and better integration of planning and permitting.

Use of Science and Wildlife Information for Integrated Transportation & Conservation Planning

Patricia White, an expert on transportation issues who works with Defenders of Wildlife, reiterated and reviewed the importance and practical advantages of addressing wildlife concerns at the PLANNING stage. Ms. White, who coordinates Defenders of Wildlife's Habitats & Highways campaign, has been a tireless advocate in the road ecology field for improving transportation planning and using wildlife habitat information more directly and concretely in planning decisions. She outlined some of the important frontiers.

A key opportunity for better integrated transportation and conservation planning is the Comprehensive Wildlife Conservation Strategy (CWCS) that every state is now developing. States can, as a minimum step, carry **protection priorities** from the CWCS directly to transportation planners. The CWCS for many states may not include spatially explicit data for all species, but many states do have applicable spatial data and each CWCS will have geographic implications. To the extent possible, planning decisions should be directly based on "**The Map**" that summarizes all available habitat information. Most efforts at improving planning should focus on improving such a map. The Map can help integrate all three major goals of planning:

- **Avoid** or minimize impacts to significant habitat
- **Identify** potential crossing locations
- Plan and track all **mitigation** options

Planning typically involves many pieces and, ultimately, an effective planning process needs to have the right software, the right hardware, the right data, and the right people in one room at one time. This is not easy to do, but will ultimately pay huge dividends in the quality of projects and in the efficiency with which they are developed.

As an example of how good data and mapping can be applied to improve planning, Kevin Viani of the Vermont Department of Fish & Wildlife presented some of the preliminary findings from Vermont's Habitat Linkage Analysis. The project was designed to identify potential and priority road segments for enhanced wildlife crossing structures.

Some of the data for the analysis was drawn from VTrans district staff, who already gather assorted field data and may be able to provide ongoing information on roadkill and successful road crossings. The analysis will process, enhance, and return information to the districts for use by operations and project development staff. The project's goal is to provide a map to district staff that shows wildlife crossing "hotspots" and other related information.

The project takes advantage of an existing transportation information system known as **MATS** (Maintenance Activity Tracking System) and uses it as a basis for integrating habitat data. For this first phase of the project, the project used several **focus species** including bear, moose, deer, coyote, fox, beaver, other furbearers, and some amphibians and reptiles. Other species may be considered at a later date, but this selection of large and medium-sized mammals as well as reptiles and amphibians represents species groups that are most vulnerable and affected by roads in the Northeast.

The project used a simple but powerful **methodology** based on basic indicators of habitat quality and potential connectivity. The assessment combined three data layers:

- Land cover
- 911 building sites
- Core habitats

These three layers were used to assess relative levels of development and the relative habitat quality and potential connectivity along major roads across the entire state. Areas more than 100 meters from houses, roads, and industrial sites were classified as suitable for wildlife movement. The relative size of habitat patches (derived from the core habitat layer) was added to rank the quality of habitat beyond the road corridor.

The mapping of the results revealed many areas where suitable habitats become narrow and “neck down” as they get close to a major road. The map shows areas where wildlife moving from habitat patches on one side of the road to the habitat on other side would be likely to cross—based on the minimal distance of development and unsuitable habitat they would have to cross. Roadkill and wildlife crossing data were not used in the evaluation, but were overlaid following the analysis. Roadkill location densities correlated strongly with habitat linkages predicted by the model.

The next steps of the project are to look more closely at what is happening at these potential priority sites—verifying with biological field data and identifying opportunities to enhance existing infrastructure. The model should also be expanded to include other key species. Along with scientific and technical improvements to the project, continuing to build relationships and cooperation with VTrans district staff will be equally important.

An analogous inventory process is underway for aquatic habitats in Vermont. Christa Alexander, fisheries biologist with the Vermont Department of Fish & Wildlife has been coordinating a study of bridge and culverts crossing streams across the state. These structures can drive a loss of sediment and debris transport in streams, which leads to deposition, impassable structures, habitat fragmentation, and population isolation.

The study will create an inventory of the condition, site characteristics, and hydrologic performance of each bridge and culvert in the state. It will first develop a set of bridge & culvert “assessment protocols” for Vermont stream crossings that project designers can use to address aquatic habitat issues. Current design considers hydraulic capacity, but does not consider other stream functions—most importantly, transport of sedimentation and debris.

The project is benefiting greatly from a stream geomorphic assessment that the Vermont Agency of Natural Resources (ANR) has already completed. The geomorphic assessment will help determine potential fluvial incompatibilities (identifying bridges and culverts where combined flow and sediment transport capacity may be inadequate).

The project involves considerable field work due to the large number of structures, but the data collection requires only about 15 minutes per site and can be done by technician level staff.

The next steps in the assessment will be to: evaluate options to retrofit or replace structures, develop design options and technical standards, and address policy changes that may be required. (ed. note: this study could represent an interesting case of policy changes being developed from the ground up as opposed to most policy changes that are developed top-down).

OPPORTUNITIES, NEEDS, & PRIORITIES

Small groups comprising a cross-section of professional and agency perspectives met on the second day of the conference to discuss opportunities, needs, and priorities in different aspects of the transportation and wildlife issue including:

Education & Outreach
Agency Relationships & Cultural Change
Policy
Funding

Information, Data & Research
Planning & Process
Partnerships

Highlights from these initial “brain-storming” discussions are summarized below.

Education/Outreach

Education is key. It increases staff capacity in the short-term and changes agency culture and relationships in the long term. Education and outreach needs to connect with three target audiences:

State agency staff

- Involve and obtain state support at highest policy and decision-making levels
- Raise awareness at all levels of agency, especially planning staff
- Provide regular opportunities for short-term & long-term education, training, and info exchange

Towns and regional planning commissions

- Develop mechanism to share information, technical assistance, and funding options among towns and regional planning commissions, within and between states.
- Hold workshop(s) tailored to needs of local and regional entities
- Partner with organizations who are already working with local decision makers

General public

- Develop coherent message
- Choose the right messenger.
- Involve NGO’s in spreading message
- Develop website with resources and forum for info exchange

Information–Data--Research

Design guidance

- Need more basic info on structures/bridges/effective crossings/roadside vegetation
- Need mechanism for regional info sharing –the good, the bad, what works, what doesn’t
- Develop DOT standards that spells out design requirements for engineers
- Monitor crossings post-construction and have wildlife crossing management plans

Database coordination

- Make data available quickly, at right time, in form that planners/engineers can understand and use
- Make data GIS-friendly and available to public
- Help towns develop their own data (e.g. keeping track community programs)

Research

- Continue and expand culvert data/research and info on aquatic habitats
- Develop predictive models for wildlife road crossing behavior
- Validate information on effects of traffic volume.
- Need region-specific info on noise impacts and potential solutions such as pavement alternatives
- Develop research on forms of road network that encourage wildlife travel patterns

Agency Relationships & Cultural Change

- Make fish & wildlife passage part of doing business, not an add-on.
- Be proactive, go beyond permit conditions
- Focus on regional coordination—e.g. develop regional guidelines for use at state/local level.
- Focus on people, process, and events, with some regulation to make sure work gets done.

Planning & Process

- Prioritize resource needs and protection goals
- Help regulators, resource agencies, and DOT's understand each other's processes.
- Integrate transportation and conservation planning into project development, design, and review
- Enhance project scoping and early project review
- Integrate natural resource area planning with regional planning
- Ensure roadway design fits desired function and relevant land use plans

Partnerships

- Go beyond DOTs—include NGO's, public, towns, conservation commissions, planners, educators, drivers, feds
- Establish northeast planning and policy group focusing on wildlife/transportation
- Connect with universities—natural resources and engineering departments.

Policy

- Establish wildlife connectivity as a policy priority.
- Develop performance measures at all levels.
- Comprehensive Wildlife Conservation Strategy should include crossing & transportation issues.
- Develop policies between states
- Explore mechanisms to protect and manage adjacent habitat—use existing conserved land to start

Funding

- Create strategy for use of SPR (statewide planning and research) funds
- Address limitations of emergency construction funding
- Coordinate applications for enhancement program grants
- Develop cost-share strategies for local and other partners

STRATEGIC DIRECTIONS

From the lists of multiple ideas, action items, needs, and opportunities, the general discussion groups were asked to distill major priority areas. These priorities were condensed and summarized as:

- Education (media, decisionmakers, training, & info-sharing)
- Enhance relationships & communication—interagency and interstate
- Coordinate state data
- Develop research agenda and monitoring strategy
- Complete map and design of natural resource/habitat networks
- Maintain momentum & critical mass of regional cooperation—e.g. regional work groups for sharing data & results. Piggyback on existing interstate coordination.

Following the general discussion, groups were formed to focus on activities and strategies applicable to each state. Highlights of action steps prioritized by each state discussion group are summarized below.

Maine

Maine participants combined its initial assessment of opportunities, needs, and priorities with additional issues identified during the conference to come up with their *Six Point Plan*:

1. Integrate state transportation planning with Comprehensive State Wildlife Strategy
2. Develop and complete statewide connectivity study
3. Work with FHWA to develop and clarify mitigation options
4. Improve outreach to regional planning commissions and towns
5. Integrate state transportation planning with local planning (at least make data available, e.g. state provided fish passage study to towns)
6. Educate broader public (work on message development)

New Hampshire

New Hampshire described its priorities for immediate next steps. New Hampshire's long-term direction will partly draw from information, issues and goals developed at the conference, but *three focus areas* highlight steps that need to precede work in other areas.

1. Improve interagency relationships—move from cooperation on project-specific tasks to discussion of programmatic changes and coordinate long-range plans for transportation and environmental initiatives.
2. Create small interagency task groups
3. Have more specific conversations about funding and identify what each partner can bring to the table in terms of funding, staff resources, and data.

Vermont

VTrans and the Vermont Department of Fish & Wildlife are cooperating on a number of projects such as the habitat linkage analysis and fish passage work which have their own immediate needs to move forward. For the agencies overall, however, the most pressing priorities were described as:

1. Grow interagency working group(s) and add more training to the activities of these groups
2. Provide outreach on a larger scale—developers, political figures, local boards
3. Enhance coordination of parallel tracks—e.g. culvert-bridge study, conservation planning manual, CWCS
4. Address gaps in data and pursue federal funding to help address data needs.

CONCLUSIONS & NEXT STEPS

The Northeast Transportation and Wildlife Conference demonstrated that professionals within and outside state agencies are very much interested in and in need of information and guidance on how to better address transportation and wildlife issues. The energy and sense of opportunity around this issue were notably high with a significant degree of consensus on where efforts should focus.

The level of importance placed on **education** was surprising in some ways and not surprising in others. The program committee had planned and expected there to be less emphasis on education and more on outcomes. Education is not a result in and of itself, but education needs to precede or be integrated with most, if not all, other implementation measures. The general conclusion was that agency staff and others would always be empowered with more education—with the only qualification that educational opportunities should be prioritized by their connection to strategic outcomes.

Just as information is empowering in terms of education, the conference reinforced the importance of relevant **data** on wildlife movement and habitat conditions. The costs of data collection can be significant and, similar to education, strategic objectives need to determine what data is collected. The right data, however, can help agencies ultimately save money, so it often does not pay to skimp on data collection.

The practical benefit of improved education and better data accrues in increased capacity to identify and anticipate conservation issues early in the **planning** and **project development process**. The conference affirmed how wildlife crossings and other measures can be integrated into road and bridge projects. The challenge going forward is to expand these efforts, integrate conservation into long-range transportation planning, and make resolving wildlife issues a regular part of transportation practice.

Funding is, of course, an important issue for expanding all aspects of this work. The magnitude of funding issues, however, can be minimized by incorporating wildlife-friendly features into project designs from the beginning of the project development process. Increases in construction costs due to these features are often under 1-2% and sometimes negligible. The more challenging and complicated issue is funding wildlife improvements for existing roads and bridges that are not scheduled for other improvements. The most promising incentive to fund these types of projects is to link them to mitigation of other separate transportation projects. Several states have begun developing such mechanisms, but these programs are still in their infancy.

The importance of **partnerships** was stressed throughout the conference. Partnerships may be critical not only to bring information, expertise, and staff capacity to these efforts, but also to validate and reinforce the practical benefits of this work to decision-makers and the general public. Cooperation and comparison of experiences between states may be particularly useful for that purpose.

With this importance of partnerships in mind, the conference sponsors will endeavor to maintain communication among conference participants and others involved in transportation and wildlife issues. There are tentative plans for one of the other northeastern states to host the next iteration of this conference and to feature work from more states.

The support of the Federal Highway Administration has been instrumental to efforts to address wildlife and habitat needs associated with transportation. FHWA's support was critical to the success of this conference and will be again for future versions of the event. Northeastern states look forward to working with FHWA and other important federal, state, and local partners to advance and realize opportunities to integrate conservation and transportation for the benefit of people and wildlife.