

Linking Environmental Resource and Transportation Planning

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Prepared by:

Cambridge Systematics, Inc.
4800 Hampden Lane, Suite 800
Bethesda, Maryland 20814

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Executive Summary

Transportation agencies and conservation agencies are working actively to build effective, mutually beneficial approaches to planning and project development. While these efforts are driven in part by new regulatory requirements, an increasing number of transportation and conservation professionals are finding that integrated planning is helping both sectors achieve their missions more effectively. Interdisciplinary collaboration “up front” – as part of planning processes – enables agencies to address complex environmental and mobility challenges early, establishing the framework for programs that will achieve both transportation objectives and environmental stewardship. These initiatives are led by State Departments of Transportation (DOTs), Metropolitan Planning Organizations (MPOs), state resource agencies, and conservation nongovernmental organizations (NGOs).

The results of a survey of practitioners, conducted in 2008, demonstrate that the philosophy of “better than before” transportation and conservation planning and stewardship is taking root. The survey findings were supplemented by a literature review and follow-up interviews. Profiles of successful collaborative processes were developed that illustrate the range of approaches underway.

■ Surveys of Transportation and Conservation Practitioners

The objective of the study survey was to determine from both the environmental and transportation communities how, and to what extent, environmental and transportation planning currently is being integrated. The surveys focused on answering the following questions:

- How well do the transportation and environmental communities understand the need for and purposes of integrated planning?
- What degrees of success are agencies experiencing?
- How is each community incorporating plans and data from the other in their specific planning and project activities? What tools and expertise are useful in supporting these efforts?
- What barriers and potential solutions are being identified?
- What examples of innovation are available that may be useful to other agencies?

Information was collected by two parallel surveys, conducted for six weeks in the spring of 2008. One survey was geared towards environmental practitioners (state and Federal resource agencies, nonprofit organizations) and the other to transportation practitioners (state DOTs, regional/local planning organizations, and Federal agencies). The content of both surveys was consistent, with similar questions asked of each sector. A total of 288 unique responses were assessed, reflecting a roughly equal number of responses from the environmental (137) and transportation (151) communities.

■ Findings

This research identified several key themes in the evolving practice of collaborative decision-making:

- **Respondents understand the potential benefits of integrated planning, and many are beginning to achieve success.** Most respondents believe that there can be significant benefits from integrated planning for both communities. The survey repeatedly documented how decision-making at the local transportation project level is positively influenced by the information that comes out of the integrated planning process. Most respondents agree that early evaluation and decision-making processes at a statewide or regional scale allows both transportation and resource agencies to take a more practical and efficient approach to project-level decisions.
- **Collaboration develops incrementally, often building on project-level success.** Over time interagency partners are developing ways to adapt their traditional planning and implementation processes to support integrated, mutually beneficial planning. These innovations are often incremental, building on the success of specific interagency efforts that address specific project-level or environmental protection concerns. Collaboration that integrates planning and NEPA processes supports the development of integrated cross-disciplinary planning processes.
- **Locally tailored approaches are most effective.** Agencies that are succeeding in integrated approaches have developed processes tailored to the needs and unique characteristics of their particular location and organizational relationships.
- **Initiating cross-agency dialogue is key - and challenging for many agencies.** The primary factor to success is the willingness of both transportation and environmental resource agencies and organizations to “come to the table” - to start to talk about the challenges and issues they are facing and begin to discuss potential approaches to integrating the planning processes. An increasing number of agencies are breaking through historic barriers and building mutually beneficial professional collaborations.
- **Leadership and organizational commitment are essential.** The need for political and executive management-level support is a critical element to the overall success of integrated planning. Strong, high-level support is essential to set the stage for integrated approaches.

- **Agencies benefit from case examples and technical support.** Many respondents cited the value of learning from the experience of other agencies, and credited the leadership of Federal agencies in helping them initiate interagency dialogue through workshops, summits, and interdisciplinary meetings. A continuing focus on information sharing, cross-agency workshops, and case examples of successful innovation will help organizations build effective collaborative processes.
- **High-quality data integration supports collaborative decision-making.** Respondents stressed the importance of having consistent and accurate data, regularly updated and augmented, that is commonly available and used by all partners. Many respondents gave examples of joint work underway to improve data and supporting tools, using geospatial frameworks.
- **Expertise and staff capacity are essential.** Effective integrated approaches are grounded in the ability of technical experts – in both conservation science and transportation – to help organizations develop common and mutually beneficial program goals and objectives. The availability of well-trained environmental experts is essential to resolve problems and develop proactive stewardship plans. Similarly, transportation planning experts are needed to engage with conservation agencies to explain mobility objectives; transportation planning and regulatory process; and investment, siting, and design options.
- **Resources are needed to support collaboration.** Financial and staff capacity constraints were often cited as a barrier to collaboration. Resource agencies often reported that they had insufficient staff to actively participate in interagency planning. The investment by state DOTs in staff details from resource agencies has facilitated interagency collaboration and have helped build trust and improved communication among agencies. Other sources of financial support, such as the FHWA *Eco-Logical* grants, are instrumental. Respondents reported the need for substantial and ongoing investments to improve and standardize data.

Examples of the approaches taken by respondents are provided in the report. Overall, the study documents that the shift to integrated planning among transportation and conservation organizations is well underway. Continued leadership and support at all levels of government – Federal, state, and regional – will ensure that the state of practice in integrated planning continues to grow.

1.0 Introduction

A growing number of transportation planning agencies and conservation organizations are exploring opportunities to achieve their respective missions through interagency collaboration. This trend has accelerated in recent years, spurred by several factors, including:

- Passage of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) “raised the bar” for state departments of transportation (DOT) and metropolitan planning organizations (MPO) – calling for interagency consultation and incorporation of environmental factors in long-range plans;
- Innovations in landscape-scale mitigation are demonstrating the ability to achieve better ecological results – often at lower cost – than achieved through project-level mitigation;
- Transportation agencies are seeking ways to reduce project-level conflicts that result in costly project delays and public ill will.
- Advancements in technology facilitate the use of environmental data in systems-level planning, and in integrating transportation and conservation information; and
- Federal level initiatives – including the development of the *Eco-Logical* interagency report describing the process and benefits of an integrated, ecosystem-based approach to planning – are providing leadership and support to cross-disciplinary approaches.

In response to these drivers, MPOs, state DOTs, resource agencies, conservation organizations, and Federal agencies are working to design new, more effective approaches to integrated planning – approaches that will enhance environmental stewardship while fulfilling transportation objectives.

The purpose of this research is to provide an assessment and case studies on how to do collaborative planning. The research team conducted a literature search and analysis, surveys of transportation and environmental professionals, and interviews with selected agencies who have implemented a variety of collaborative approaches. Together, the results of this analysis provide a picture of the current level and types of activity in integrated approaches, identifies barriers and potential strategies to achieve fuller implementation, and suggests next steps that can be taken to promote further progress in this work. This report summarizes the findings of this research.

2.0 Critical Analysis and Literature Review

■ 2.1 A Changing Planning Environment

In recent years the concept of linking conservation and transportation planning has gained significant ground. Planners, decision-makers, and policy-makers are frequently recognizing and voicing the need for a more holistic, systematic approach to planning. Practitioners and the broader public are often finding traditional conservation and transportation planning practices to be inadequate for the environmental and mobility challenges facing the nation – standard planning practices are increasingly considered overly costly, inefficient, and shortsighted. To better understand the current state of practice of linking conservation and transportation planning, material in the fields of both conservation planning and transportation planning was reviewed. The purpose of this literature review and critical analysis is to assess the current state of practice of linking conservation and transportation planning, since the passage of the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Federal surface transportation legislation. The review focused on material published after 2004, supplementing and updating previous studies. An annotated bibliography including web site links is available in Appendix A.

SAFETEA-LU

The passage of SAFETEA-LU has driven significant change in transportation planning practice. Building on the themes found in earlier authorization bills, SAFETEA-LU codified the integration of conservation planning elements into the transportation planning process in two notable sections of the legislation, Sections 6001 and 6002. These sections instruct transportation agencies to consider conservation plans when planning for transportation infrastructure, and require them to consider environmental factors at the long-range, systems planning stage in addition to the project design and construction stage. Specifically, Section 6001 states that “consultation under clause (i) shall involve comparison of transportation plans to state and tribal conservation plans or maps, if available, and comparison of transportation plans to inventories of natural and historic resources if available.” Section 6002 requires better streamlining between the transportation planning process and the National Environmental Policy Act (NEPA). As a result of SAFETEA-LU, transportation officials have been working to identify ways to fulfill these new mandates,

while conservation agencies have been working to incorporate this shift in approach to enhance their own planning processes.

Major Themes in Literature Following SAFETEA-LU

Overall the literature indicates a strong and growing state of practice in integrated planning. The advantages to integrated planning are becoming widely recognized, and government, nonprofit, and academic institutions are taking steps to make integrated planning a reality. Three key advantages of integrated planning are discussed throughout the literature. Integrated planning approaches enable agencies to:

- Incorporate transparency and early engagement in the planning process;
- Coordinate and expand benefit/cost approaches on a broader scale; and
- Strategically invest scarce resources and maximize benefits.

Nevertheless, barriers to integration remain. These challenges include: the traditional separation of planning efforts and timelines among multiple agencies; inadequate continuity and knowledge transfer through the various stages of transportation decision-making, from long-range planning through project development and delivery; and the need for longer and broader visioning and planning horizons. Some of the major advances in integrated planning have occurred by promoting a culture of integration *within* individual agencies, and finding ways to institutionalize shifts in organizational cultural that are often spearheaded initially by individual leaders. One of the most tangible ways agencies are attempting to institutionalize the process of linking conservation and transportation planning is through the practice of data sharing and developing decision-support tools. This review of literature will address each of these main content areas.

NCHRP Report 541

Prior to the passage of SAFETEA-LU in 2005, the National Cooperative Highway Research Program published *NCHRP Report 541: Consideration of Environmental Factors in Transportation Systems Planning*, which focused on ways to integrate transportation and environmental planning. Specifically, the report “describes the transportation planning process and discusses where and how environmental factors can be addressed effectively at the state and metropolitan levels.” (NCHRP Report 541.)

NCHRP Report 541 includes an extensive review of literature related to linking conservation and transportation planning. Researchers review a wide array of material focusing on four main topics: the environmental perspective (biology, ecology, and sustainability), context-sensitive solutions, transportation planning, and international practice. Ultimately, it concludes that the “common theme throughout much of this literature is that nature, society, and technology are related in many complex and interconnected ways.” Furthermore, the “two key ideas emerging from [the] literature are that the physical

environment should be considered as an ecosystem, and that ecosystems have a carrying capacity that determines their ability to sustain life.” (NCHRP Report 541, 11-12.)

Five overarching principals, essential to the concept of planning for sustainability, are identified by the authors and are echoed in much of the literature since 2005. The principals include:

- Identifying and avoiding environmentally sensitive areas;
- Using system-level design and management to balance the societal needs and those of the natural environment;
- Designing “with nature” – designing built infrastructure to support and enhance environmental systems;
- Using investment to proactively enhance ecological health and stewardship, rather than only to avoid further damage; and
- Relying on interdisciplinary skills and expertise to address fully the wide range of issues. (NCHRP Report 541, 12-13.)

Despite heightened awareness of the need to integrate conservation and transportation planning, the study found that integration of the two fields was not typically a priority of either discipline. *NCHRP 541* notes, “although many articles and books have developed “new” approaches to transportation systems planning, very few have specifically examined the role that environmental considerations should play in the process other than as part of evaluation.” (NCHRP Report 541, 15.) This is a significant point of departure from recent literature and material available over the past few years. While the integration of the two fields remains in its infancy, it has grown tremendously over the past two years, with practitioners actively searching for better ways to integrate the two planning realms.

Previous Survey Findings

NCHRP 541 surveyed state and regional conservation and transportation planners to gain a better understanding of the state of practice in linking conservation and transportation planning before passage of SAFETEA-LU. The response rate to the survey is indicative of the evolving state of practice at the time. State departments of transportation (DOT) had the highest response rate at 82 percent, followed by metropolitan planning organizations (MPO), with only a 13 percent response rate. Of this 13 percent, MPOs serving large population centers provided the majority of responses. Only four percent of resource agencies returned the survey. According to the authors, “many resource agency officials had not considered how to better integrate environmental considerations into transportation system planning, and, in many cases, did not know what the system planning process was.” (NCHRP Report 541, 25.)

In general, the survey results of *NCHRP 541* found that while practitioners were conscious that integrated planning might be beneficial, there had not been significant strides made

toward making it a reality. In particular, the authors state that “competing priorities that detract from environmental issues and a lack of appropriate planning analysis tools were identified by DOTs, MPOs, and environmental resource agencies as the most significant obstacle to considering environmental factors in transportation planning.” Furthermore, respondents indicated that given competing priorities, the need to meet regulatory requirements tends to be the catalyst for incorporating environmental considerations into the transportation planning process. Simply put, although past planners might have seen the need for integrated systems planning, in the absence of a mandate this was rarely addressed.

■ 2.2 Recent Approaches to Systems-Level Integrated Planning

There are numerous ways of approaching systems-wide planning integration. Government agencies, academic institutions, and nongovernmental organizations are all working toward defining and developing integrated planning methods

EO 13274. Executive Order 13274 Integrated Planning Work Group Baseline Report and Preliminary Gap Analysis (IPWG Analysis) is a Federal government report which framed the need for integrated planning. The deliberative draft, published on March 15, 2005, summarizes the need for, and challenges to, integrated planning in response to the Executive Order issued by President George W. Bush on September 18, 2002. Since that time leaders from the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), Environmental Protection Agency (EPA), U.S. Fish and Wildlife (USFWS), Council on Environmental Quality, U.S. Forest Service, Advisory Council on Historic Preservation, Office of the Secretary of Transportation, Department of Defense, Federal Aviation Administration (FAA), and Army Corps of Engineers (USACE) have worked together to develop a conceptual framework for better integrated planning. The framework suggested in the IPWG Analysis includes a number of elements, one of which is the need for “Integration of the transportation system with other human and natural systems.” Specifically, the report indicates that “systems that constitute our rural and metropolitan areas, such as urban, economic, ecological, and other infrastructure, needs to be addressed in a more holistic fashion by using integrated institutional arrangements and more collaborative and better-coordinated decision-support processes.” (IPWG Analysis, 5.)

The Integrated Planning Work Group (IPWG) updated its work plan in 2007. The Work Plan identifies high-priority areas for work, and forms three subgroups to advance coordination under these areas: 1) outreach and training on new transportation planning regulations; 2) outreach and training on Eco-logical and addressing implementation barriers; and 3) state of the practice on tiering, corridor, and subarea studies. (IPWG Work Plan 2007). The IPWB subsequently conducted a series of six case studies of effective integrated planning activities in the United States. (IPWG Case Studies 2007).

Eco-Logical. Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects (Eco-Logical), published in April of 2006, provides substantial guidance to infrastructure planners on how to better integrate ecological systems-based planning in their work. The

report is a result of an interagency Federal steering team comprised of leaders from the Bureau of Land Management (BLM), EPA, FHWA, National Oceanic and Atmospheric Administration (NOAA), National Park Service (NPS), USACE, USFWS, and the U.S. Department of Agriculture (USDA). It outlines an eight-step framework for integrated planning:

1. Build and Strengthen Collaborative Partnerships;
2. Identify Management Plans;
3. Integrated Plans;
4. Assess Effects;
5. Establish and Prioritize Opportunities;
6. Document Agreements;
7. Design Projects Consistent with Regional Ecosystem Framework; and
8. Balance Predictability and Adaptive Management.

The report defines a goal driven, collaborative vision of desired future conditions that integrates ecological, economic, and social factors. This vision, referred to as the ecosystem approach, is defined as “a method for sustaining or restoring ecological systems and their functions and values...applied within a geographic framework defined primarily by ecological boundaries.” (Eco-Logical, vii.) The report recommends that planners develop a regional ecological framework (REF) – a series of overlaid ecologically based plans and maps. The report argues that an REF can help planners more accurately identify the areas most in need of protection, and better predict and assess cumulative resource impacts.” The REF would be a first-tier action item in a multitiered process of integrated planning. *Eco-Logical* suggests a number of plans that planners can begin to think about overlaying. The list, outlined below, is similar to the list of integration plans suggested by the EO 13274 working group, including plans incorporating air quality, fish and wildlife conservation, historic preservation, watersheds, and land use:

- Recovery Plans;
- Resource Management Plans;
- Forest Management Plans;
- USACE’s Special Area Management Plans;
- Community Growth Plans;
- Bird Conservation Plans (Partners in Flight);
- Eco-Regional Plans (Nature Conservancy);
- State Wildlife Action Plans;
- State Coastal Management Programs;
- State Coastal Nonpoint Pollution Programs;

- National Estuarine Research Reserves;
- Fishery Rebuilding Programs; and
- Watershed Plans (Eco-Logical, 14-16).

The REF provides a basis for thinking about ecosystem mitigation, which approaches mitigation actions in the context of the entire ecosystem, not just the project area.

The Road Ecology Center. The Road Ecology Center, located at the University of California-Davis, provides academic examples of current approaches to integrated planning and research on ways to advance integration. According to the Center's web site, the Road Ecology Center "integrates ecological sciences, engineering, and social sciences to study the interactions between roads and the surrounding natural and human environment, and to develop sustainable transportation solutions that are environmentally and socially friendly." A wide selection of publications regarding the integration of conservation and transportation planning are available on its web site, and both systems-level planning and project planning issues are addressed.

Defenders of Wildlife. Defenders of Wildlife, a nonprofit organization, is actively promoting the integration of conservation and transportation planning through influencing transportation-related policies that support conservation and disseminating essential information how to support conservation as it relates to highways. The organization published a report titled *Linking Conservation and Transportation: Using the State Wildlife Action Plans to Protect Wildlife from Road Impacts* (Defenders) in May 2007. The report reviews all 50 State Wildlife Action Plans, and provides a summary of issues addressed in the plans. In addition, the report provides initial guidance to conservation planners on how to take advantage of the new Federal transportation legislation. Defenders also recently published *Getting Up to Speed: A Conservationist's Guide to Wildlife and Highways* (2007) – a valuable resource to conservation planners attempting to coordinate with transportation agencies. Additional information and links to various on-line resources are available on the organization's web site.

Advantages to Systems-Level Integrated Planning

Three advantages of systems-level integrated planning repeatedly appear in the literature. First, integrated planning promotes early engagement and communication between parties, which ultimately leads to more transparency and fewer surprises during project implementation. Second, integrated planning provides opportunities to think strategically, reduce impacts, and prioritize projects to maximize benefits. This is particularly important in the context of scarce resources for infrastructure and mitigation projects. Third, integrated planning allows planners and the public the ability to analyze data and consider costs and benefits in a comprehensive way.

Early Engagement and Transparency to the Planning Processes

Several documents note the inefficiency of the ways agency partners currently conduct business. Typically conservation planners do not enter the world of transportation planning until projects are ready for an environmental impact assessment. At this point, it is often too late in the process to contribute to the project other than challenging specific components or initiating litigation. This process tends to be costly to both sides and promotes an adversarial relationship between transportation and conservation planners. In contrast, integrated planning allows for early communication, which limits surprises in the project stage and increases the likelihood that projects go forward with relative ease. Furthermore, early collaboration provides an opportunity to create more ecologically effective and sustainable outcomes while at the same time meeting transportation objectives.

Both the Defenders of Wildlife report and *Eco-Logical* emphasize that early engagement in the planning process typically results in major benefits later in the project implementation stage. According to the authors, *Eco-Logical* was driven by four goals: conservation, connectivity, predictability, and transparency. It emphasizes the need for trust building, commitment making, and establishing trust. (*Eco-logical*, vi.) The Defenders report encourages state wildlife and conservation agencies to get involved early in the transportation planning process: “by creating good faith partnerships between transportation and wildlife agencies, both sides have the opportunity to find workable solutions without litigation.” (Defenders, 13.)

Indeed, one of the main purposes of the Defenders report is to encourage and facilitate conservation planners to make inroads into the transportation planning world. Through its review of State Wildlife Action Plans, it is clear that conservation planners see coordination and integration as worthy goals, but methods for effectively integrating the two fields remain elusive. The Defenders report takes a first step towards introducing conservation planners to the integrated planning process by describing in detail the resources available to do so.

Strategic Investment of Scarce Resources

A critical goal in any sort of planning is optimizing the system to ensure that chosen investments reap the most benefits. Typically, mitigation efforts connected to infrastructure projects occur either near or directly adjacent to the site being impacted. *Eco-Logical* makes the argument that there may be more ecological benefit to using mitigation resources elsewhere. For example, when looking comprehensively at a region’s ecological resources, an agency is able to identify areas in which to concentrate its efforts, thus achieving a much greater impact on the entire system’s ecological vitality. In particular, *Eco-Logical* stresses that time is of the essence when it comes to preserving and restoring our ecological landscape. Ecosystem-based mitigation allows planners and communities to take advantage of available resources and to act immediately where action is needed.

Eco-Logical suggests a number of ecosystem-based mitigation options, including multiple-project mitigation, mitigation banking, in-lieu-fee mitigation, and conservation banking. It emphasizes that systems such as mitigation banking allow more immediate action and facilitate monitoring of results. The authors encourage planners to “look for synergistic opportunities – adding a cumulative value to these systems.” (Eco-Logical, 38.)

Coordinated Benefit/Cost Assessment

A consistent point made throughout the literature is the need for a clear and comprehensive assessment of the costs and benefits related to transportation and conservation investments. A report published by the Transportation Research Board in 2005, *Conference Proceedings 37: Integrating Sustainability into the Transportation Planning Process* (TRB 37), notes that environmental costs will be present in any sort of infrastructure investment. The report documents the proceedings of a conference sponsored by the Transportation Research Board, Federal Highway Administration, and the U.S. Environmental Protection Agency in Baltimore, MD in July of 2004. Participants were asked to explore how to make the U.S. transportation system more sustainable.

The TRB Conference Proceedings suggest conducting a “triple-bottom line” analysis on infrastructure projects, giving 1) environmental quality, 2) societal benefits, and 3) economic considerations equal weight in the benefit/cost process. (TRB 37, 5.) Likewise, *Eco-Logical* notes that there are always tradeoffs in planning for transportation infrastructure, and suggests that “taking an ecosystem approach to mitigation can help maintain large-scale functionality, with the realization that total preservation is not an option and that tradeoffs are necessary.” (Eco-Logical, 40.) Similarly, *Defenders of Wildlife* notes that a broader, longer-term view of transportation investments allows conservation planners to consider transportation alternatives such as investments in mass transit, which could benefit conservation interests by reducing emissions and relieving pressure to build more roads. (*Defenders*, 21.)

Barriers to Systems-Level and Integrated Planning

Despite the advantages of systems-level planning, there continues to be challenges. Three main challenges surface in the literature: separation of traditional planning agencies, incomplete communication between planning and project stages, and insufficient length of planning horizons.

Agency Functional Separation

A number of documents indicate that the current institutional structure of our planning agencies is a barrier to integrated planning. Individual state and regional agencies are responsible for the development of discrete plans for wildlife and ecosystem preservation, habitat restoration, watershed protection, coastal restoration, land use, economic development, and transportation, among others; these plans are typically uncoordinated and indeed may contain conflicting strategies. *EO 13274* points out that “agencies are often

unaware of the planning of other agencies; resource agency structures and cultures do not actively support involvement in integrated planning process; and local land use is sensitive to fiscal, economic, and political constraints.” A report prepared for the Federal Highway Administration, by the National Policy Consensus Center, in June 2006, *Transportation Collaboration in the States* (Trans Collaboration) also notes that divided governance and siloed transportation agencies detract from a collaborative environment. Furthermore, the Defenders report is acutely aware of the functional divisions occurring in the transportation and land use fields. It states, “the fragmented governing structures of current land use and transportation planning systems seriously hinder sustainable conservation efforts. Despite the logical connection between land use and transportation decision-making about these related processes often occur in isolation.” (Defenders, 35.) It is clear from the literature that much larger issues of integrated planning must be addressed even within individual fields. Transportation planners should begin thinking on a multimodal level, land use and transportation planning should become priorities, and conservation plans should be coordinated.

Lack of Continuity and Transfer of Knowledge

A certain level of collaboration already occurs between transportation and conservation professionals at the project planning stage. Indeed, the conservation and transportation practitioners involved at the project development and implementation level typically know each other and collaborate on NEPA issues. One of the goals of integrated planning is to promote interaction between conservation and transportation planners well before the project stage. However, even if integration is fully achieved at the long-range planning stage, there must still be an effort to ensure that knowledge is transferred to the project stage. As noted in the *Integrating Sustainability into the Transportation Planning Process* conference proceedings, “early consultation among agencies may not make a significant difference unless it also involves institutional mechanisms for ongoing coordination and dispute resolution.” (TRB 37, 27.)

Need for Longer and Broader Planning Horizons

Both the *EO 13274 IPWG* report and *Integrating Sustainability into the Transportation Planning Process* note the need for longer and broader planning horizons. Typically transportation planning horizons include a 20-year forecast. As we broaden the planning perspective to evaluate and address a broader range of environmental and land use related issues, it also becomes important to extend the time horizon for developing long-range visions and plans. Agency partners are increasingly using timeframes of 40 years or longer to consider longer-term effects of potential scenarios. Additionally, the conference proceedings report suggests that agencies might consider backcasting: developing goals for a target year and then using models and tools to test scenarios and policies that could lead to the desired outcome.

■ 2.3 Initiating Cultural Changes and Institutionalizing Integrated Planning

The literature indicates four areas where agencies are taking action to influence the planning culture: 1) coordinating interagency cooperation; 2) establishing a means of exchanging information; 3) providing training and educational opportunities; and 4) developing leaders who will push forward with steps to integrate conservation and transportation planning.

Interagency Cooperation

As mentioned previously, there have been recent efforts to coordinate interagency cooperation at the Federal level. These efforts include the Executive Order 13274 Integrated Planning Work Group and the guiding leadership team behind the report *Eco-Logical*. At the state level, *Transportation Collaboration in the States* gives examples of coordinated interagency cooperation. For example, North Carolina has established a North Carolina Interagency Leadership Team (ILT) to better plan, develop, and implement transportation projects across the State. The team involves representatives from Federal and state resource and transportation agencies. (Trans Collaboration, 17.)

Information Exchange

A number of agencies and organizations offer information on their web sites. Many provide clearinghouses of information, examples of best practices, links to other resources, and technical assistance from trained professionals:

Center for Environmental Excellence. The American Association of State Highway and Transportation Officials' (AASHTO) Center for Environmental Excellence is designed to assist transportation planners with ways to integrate environmental considerations into the transportation planning processes. The center provides a wealth of information, including reports, technical assistance, toolkits, handbooks, peer-exchange opportunities, and example documents such as interagency Memorandums of Understanding.

Green Highways. The U.S. Environmental Protection Agency makes resources available through its Green Highways Partnership web page, including reports, examples of model projects, and podcasts with discussion topics related to green highways. The Green Highways partnership started in 2002 and utilizes similar concepts to those mentioned above, including integrated planning, regulatory flexibility, market-based rewards, and environmental streamlining and stewardship. There are three teams associated with the Green Highways partnership program: watershed driven storm water management; recycle/reuse; and conservation and ecosystem protection.

Green Infrastructure Program. The nonprofit Conservation Fund has partnered with the U.S. Department of Agriculture and other state, regional, and local supporters to manage the Green Infrastructure program. Similar to previously mentioned web sites, the Green Infrastructure program web site contains information regarding case studies, projects, and training. The Conservation Fund's Green Infrastructure program began in 1999 to help integrate green infrastructure concepts into community plans. More recently, other organizations such as the nonprofit American Forests have focused attention on integrated planning. For example, in May of 2008, they hosted an Urban Ecosystems Conference called "Nature and the Network: Building a new framework to work together."

Planning and Environmental Linkages. A valuable information exchange initiative is managed by FHWA's Planning and Environmental Linkages program (PEL). PEL is specifically focused on integrating transportation and conservation planning. According to FHWA, the PEL initiative "seeks to change the way that transportation decisions are made, by promoting a new approach that considers environmental, community and economic factors early in the transportation planning stage and carries them through project development, design, and construction." (PEL web site.) The PEL provides technical assistance and training, and maintains a clearinghouse of information.

Training and Education

Educating and training planning professionals is essential to making integrated planning a reality. As the *Integrating Sustainability into the Transportation Planning Process* conference concluded, "planning professionals need to be provided with the information, resources, and skills that can enable them to deal with the complex and interrelated issues associated with sustainability." (TRB 37, 6.) Many of the information exchange programs mentioned above provide structured training to planning professionals in the form of workshops or classes. For example, the Conservation Fund provides a four-and-a-half-day class for professionals on how the green infrastructure approach "can be used to connect environmental, social, and economic health across urban, suburban, and rural settings." (Conservation Fund web site).

As part of the PEL program, FHWA offers two useful workshops to state departments of transportation and regional planning organizations. PEL's Linking Conservation and NEPA workshops are designed to better integrate conservation and transportation planning at the project-level stage, in order to streamline and facilitate implementation. Focused at the planning level, FHWA's Linking Conservation and Transportation Planning (LCTP) workshops bring together representatives of transportation agencies, Federal and state resource agencies, and environmental advocates to explore how to develop collaborative planning processes that effectively promote both environmental and transportation goals. To date six LCTP workshops have been held across the country, hosted by MPOs, FHWA Divisions, or state DOTs.

Leadership

The literature indicates the need for strong leadership to institutionalize integrated planning. The *EO 13274* IPWG Report notes that to have integrated planning, several institutional issues must be addressed, including:

- Executive-level leadership;
- Reserving a seat at the transportation planning table;
- Mechanisms to share staff resources across agencies; and
- Stronger institutional linkages to local land planning (*EO 13274*, 52-55).

Furthermore, it strongly states that “it is imperative that the vision for integrated planning come from the top, and that those responsible for crafting goals and objectives can hold those responsible for implementing strategies and tactics” (*EO 13274*, 12). Echoing this call for strong leadership, two major themes were highlighted in the *Transportation Collaboration in the States* report: the critical role of political leadership in promoting collaboration on transportation issues and the development and institutionalization of collaborative systems (*Trans Collaboration*, 1).

The potential role of MPOs was highlighted in the literature as the type of agency able to bridge the divide between conservation and transportation planning and foster integration. MPOs already approach planning from a regional perspective and typically coordinate efforts with multiple governments, agencies, and stakeholders. According to the *EO 13274* IPWG report, “MPOs already are well-suited to host regional dialogues about growth and its impacts, and many have done so” (*EO*, 53-54).

■ 2.4 Integration through Tools and Data

The literature reflects a desire on the part of planners to use data and tools to better integrate conservation and transportation planning. Two of the most frequently mentioned tools include mapping applications that allow users to overlay geospatial data, and decision-making support tools that allow users to organize data in a centralized place and track progress.

Geospatial Data

In 2006, the Transportation Research Board held a peer exchange to consider environmental geospatial information for Transportation. The results of the exchange were published in *Transportation Research Circular E-C106: Environmental Geospatial Information for Transportation* (GIS Circular). The peer exchange focused on reviewing the data perspectives of both conservation and transportation agencies, evaluating data needs, reviewing

challenges for coordinating and sharing data, and discussing ways to further build capacity for data management and data sharing between agencies. It was agreed that the legislative intent of SAFETEA-LU Sections 6001 and 6002 likely could not be fulfilled without using advanced geospatial applications (GIS Circular, 3).

FHWA also recently sponsored a peer-exchange, through their PEL program, focused on sharing geospatial information, in order to facilitate integrated planning. This exchange, *Applications of Geographic Information Systems for Planning and Environmental Linkages* (Portland Exchange) was held in October of 2007 in Portland, Oregon. The peer-exchange brought together planners from state departments of transportation and FHWA division offices to better understand how the use of geographic information systems can advance the goal of integrated planning and streamlined project development.

Several clearinghouses and technical consortiums provide networked data, resources and technical support, and standardized interface development support. For example, Geo-Spatial One Stop provides a data clearinghouse and computer network of data servers/portals, coordinated with the National Spatial Data Infrastructure (NSDI) and Federal Geographic Data Committee (FGDC). The OpenGIS - Open Geospatial Consortium (OGCO) supports the development of publicly available interface specifications. The National States Geographic Information Council (NSGIC) and the National Biological Information Infrastructure (NBII) support access to data and information.

NatureServe and its international network of member programs (including state natural heritage programs in each state) collect and provide reliable scientific information about species and ecosystems of the Western Hemisphere. The NatureServe web site serves as a portal for accessing data on threatened and endangered species, and ecological systems.

Decision-Making Support Tools

Understanding what decision-support tools will facilitate planning integration is a work in progress. Some agencies have developed tools which provide useful examples of how tools can be used to support information sharing, process management, interagency and public review, and commitment tracking. Some of these emerging were discussed throughout the literature. In particular, the Portland peer-exchange provides examples of model decision-making support tools and *NCHRP 25-22* and the subsequent *Research Result Digest 304: Technologies to Improve Consideration of Environmental Concerns in Transportation Decisions* provide detailed information on decision-support tools available to planners, as well as the limitations in use of these tools in current practice. *Digest 304* presents the results from the final phase of *NCHRP Project 25-22*, an effort to identify and showcase emerging technologies that support integration of environmental considerations in design, maintenance, and other elements of transportation planning.

One tool highlighted often in the literature is Florida's Environmental Screening Tool (EST). The EST helps decision-makers make better informed decisions as part of the Florida DOT's Efficient Transportation Decision-Making (ETDM) process. Florida's tool

is an “Internet accessible, interactive database tool that allows the public greater access to information and the ability to comment on areas of concern” (Portland Exchange, 12).

The Ecosystem-Based Management (EBM) Tools Network provides environmental organizations and resource agencies various EBM tools to assist in system-level management decisions. EBM tools are software or other highly documented methods that can help implement EBM by: 1) providing models of ecosystems or key ecosystem processes; 2) generating scenarios illustrating the consequences of different management decisions on natural resources and the economy; and 3) facilitating stakeholder involvement in a planning processes. One example of an EBM tool is the NatureServe Vista program. To support watershed-level analysis and protection are provided by Placematters and by the U.S. Environmental Protection Agency.

■ 2.5 State of the Practice

The literature strongly indicates that activities aimed at integrated planning are growing. SAFETEA-LU’s mandate to link conservation and transportation planning has given planners the incentive to push integrated planning toward the top of their priority list. Although planning professionals continue to struggle with logistics, they have made considerable progress over the past few years. Concepts are being defined, practices are being tested, information is being exchanged, people are being trained, and leaders are making integrated planning a priority. A cultural shift in the way we approach planning is underway.

3.0 Key Findings

The objective of this survey was to determine from both the environmental and transportation communities how, and to what extent, environmental and transportation planning currently is being integrated. The surveys focused on answering the following questions:

- How well do the transportation and environmental communities understand the need for and purposes of integrated planning?
- What degrees of success are agencies experiencing?
- How is each community incorporating plans and data from the other in their specific planning and project activities? What tools and expertise are useful in supporting these efforts?
- What barriers and potential solutions are being identified? and
- What examples of innovation are available that may be useful to other agencies?

The responses to this survey provide a “snapshot” of what these communities are doing now, what successes are being achieved, what is working and what is not, and what next steps are needed to support better integrated planning.

Information was collected by two parallel surveys, conducted for six weeks in the spring of 2008. One survey was geared towards environmental practitioners (state and Federal resource agencies, nonprofit organizations) and the other to transportation practitioners (state DOTs, regional/local planning organizations, and Federal agencies). The content of both surveys was consistent, with similar questions asked of each sector. A total of 288 unique responses were assessed, reflecting a roughly equal number of responses from the environmental (137) and transportation (151) communities. A summary of the survey methodology, responses, and the complete survey questions are provided in Appendices B through F.

The responses to the survey indicate a significant level of activity among many state and regional agencies in various types of integrated planning, although in some areas the need for additional information and resources are required in order to implement an integrated planning approach. Overall there is a keen awareness among both disciplines of the need to integrate environmental and transportation planning processes. But the results also indicate that the development of integrated planning is very much a work in progress. Some respondents express skepticism about the feasibility of meeting both transportation and ecological objectives through an integrated process, and note the

“...Once understood and having worked well together, we will never be able to go back to poor planning.”

– Environmental Respondent

difficulties inherent in merging the work of organizations with seemingly distinct missions. The survey responses paint a picture of increasing awareness and innovation among both sectors, tempered by challenges that hamper a comprehensive shift in approach:

- Over 88 percent of transportation respondents reported having successful outcomes from the integration of environmental resource and transportation planning. These successful outcomes ranged from developing awareness and building working relationships, to process efficiencies gained by identifying and resolving environmental issues earlier in the transportation process;
- A large majority of the environmental survey respondents (96 percent) said that there were successful outcomes resulting from efforts to integrate planning processes;
- There is a growing understanding of the principles underlying an integrated approach to environmental and transportation planning;
- A significant majority of transportation and environmental agencies who responded are engaged in some form of integrated planning;
- Cultural and institutional barriers continue to be important obstacles to broader implementation; and
- The state of practice is rapidly developing. Many agencies report success in their integrated planning efforts and provide useful examples of processes and lessons learned that will benefit other organizations.

The following sections summarize the findings from these surveys. Section 3.1 provides an overview of the state of integrated planning activity; Section 3.2 discusses key factors that are supporting agencies' success; and Section 3.3 presents the barriers agencies have experienced as well as potential solutions to these obstacles gleaned from survey responses.

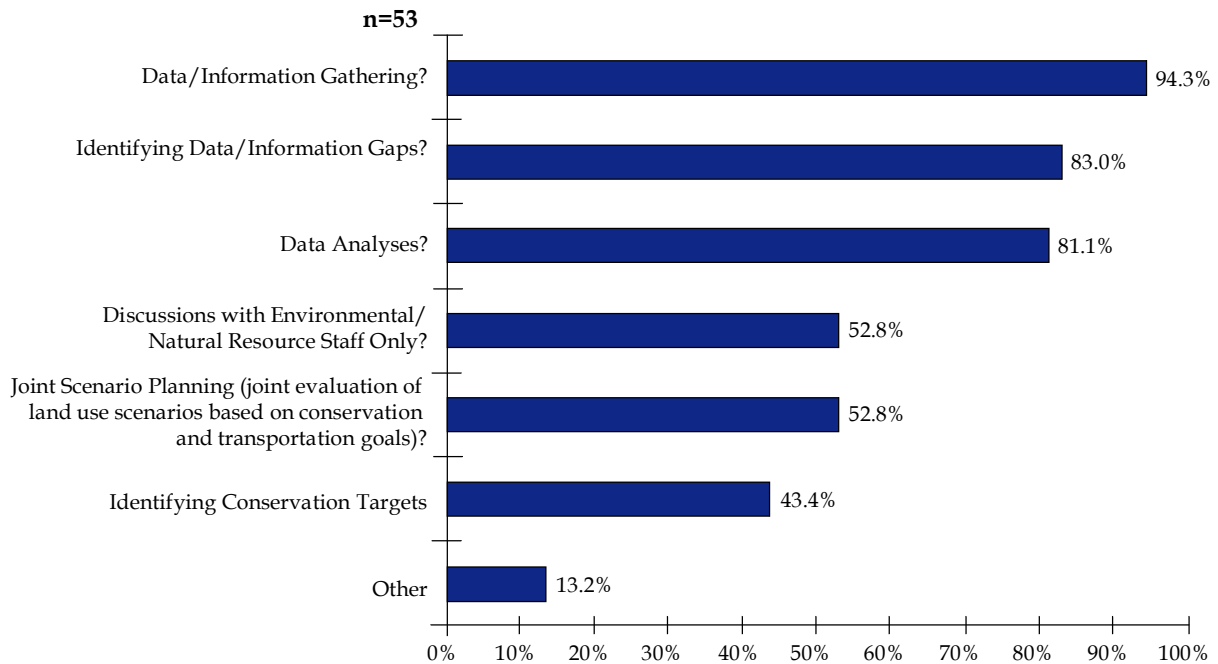
■ 3.1 Growing Understanding of Integrated Environmental and Transportation Planning

Awareness of Purposes and Potential Benefits of Integrated Planning

Agencies are taking a variety of specific actions to integrate environmental resource and transportation planning, as illustrated in Figure 3.1. An overwhelming number of transportation respondents (94.3 percent) undertook data and information gathering to lay the groundwork for their process, and conducted subsequent data analysis (81.1 percent), and identified data and information gaps (83.0 percent). Nearly 53 percent of transportation respondents reported participating in joint scenario planning and in discussions with

environmental/natural resource staff; nearly half had participated in identifying conservation targets (43.4 percent). Respondents also reported involving local governments, public outreach, and establishing relationships with other agencies in their integrated planning efforts.

Figure 3.1 Transportation Actions to Integrate Environmental Resource and Transportation Planning



Many of the environmental survey respondents, who had been actively engaged with transportation agency staff, felt that it was too early in their processes to assess whether the planning integration efforts were successful. Still, several examples were provided by a range of respondents that illustrate clear benefits resulting from an integrated approach to transportation planning.

Another strong message from environmental respondents is that although all respondents were interested in collaborating with transportation agencies, many lacked the staff resources and/or managerial support necessary to fully engage in this collaboration. This was most readily seen in the responses from a major nonprofit conservation planning organization; almost none of the respondents from this organization felt they had the staff resource to appropriately engage with transportation agency staff.

“Integration of transportation and environmental planning is in the early stages in [our state] so it’s really too early to tell. As the state develops more corridor plans for state highways and the surrounding road networks, taking into account the environmental resources, much better understanding and projects will result.”
 - DOT Respondent

Examples of Integrated Processes

Respondents were asked to describe their experience linking environmental and transportation planning and to list both successful and negative outcomes resulting from their efforts. A total of 46 transportation respondents described their experience with integrated planning. State agencies provided 22 examples; regional organizations provided 21; and Federal agencies cited three examples. A wide variety of examples of integrated planning efforts were reported, ranging from early screening to identification of key resources (e.g., STEP UP), sharing plans and data, coordination and collaboration among agencies, tools to streamline the process (e.g., CETAS), and specific initiatives (e.g., CA Regional Blueprint Planning Program).

Examples of innovation and successful integration were provided by DOTs and MPOs from throughout the country. In some cases, it was difficult to know at what stage of the planning or project decision-making process the integration was happening or how successful the efforts were – and in many cases, it was simply too early to tell. In addition to the profiles provided in Section 4.0, other efforts of integration include:

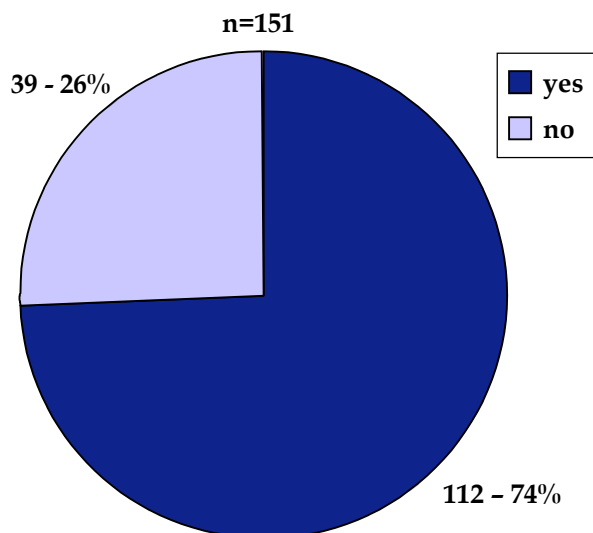
- Development of a fully **integrated Transportation Project Development Process** in Pennsylvania (<http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1066&context=jmie/roadeo>);
- Participation by Arkansas, Arizona, Colorado, Kansas, Maine, Missouri, New Hampshire, Texas, and Vermont in **state or regional workshops** (funded by FHWA except for the northeast region workshop that was funded by the Kendall Foundation). These workshops focus emphasized building relationships and developing an ongoing process for integrating conservation and transportation planning between the transportation community, and the resource and regulatory agencies at the local, state, regional, and national levels (<http://environment.fhwa.dot.gov/strmlng/es2conflict.asp>);
- Puget Sound Regional Council works with environmental agencies during “**critical points**” during the process of developing statewide transportation plans (<http://www.psrc.org/projects/vision/sepa.htm>);
- A **round robin data sharing exercise** with MPOs and resource agencies (agency not specified);
- The **Integrated Transportation Decision-Making Process** developed by Maine DOT for incorporating and streamlining state and Federal agency processes (see profile in Section 4.3 and <http://www.environment.fhwa.dot.gov/strmlng/itdstat.asp>);
- **Strategy Refinement** for the North Jersey Transportation Planning Authority with a series of 20 reports, including environmental screening for each location, outlining suggested strategies to address multimodal transportation needs around the region (<http://www.njtpa.org/Plan/Need/SE/default.aspx>);

- **Joint scenario planning process** in the Denver Regional COG evaluating a set of scenarios through a set of 12 performance measures (see profile in Section 4.1 and <http://www.drcog.org/index.cfm>);
- Long-range planning in New Hampshire through the **Critical Corridor Initiative** (<http://www.nh.gov/dot/municipalhighways/documents/NHLRTPExecSummMay01-08PublicDraft.pdf>);
- California Regional **Blueprint Planning Program** which integrates land use, transportation, and environmental issues (<http://calblueprint.dot.ca.gov/>);
- Federal and state jurisdictional agencies providing **input to Regional Transportation Plans** in Oregon MPO (<http://www.oregon.gov/ODOT/TD/TP/docs/newStipCmte/stipGuide/apr06guide/apdxC.pdf>);
- Interagency collaboration in Utah to plan the **Jordan River Corridor**, involving 15 cities, three counties, Utah DOT, Salt Lake County Natural Resources, Utah Natural Resources, FHWA Division Office, Envision Utah, and local elected officials and planners (<http://planning.utah.gov/jrnaf.htm>);
- Bexar County MPO held an **interagency summit** where they invited agencies to share data and plans (<http://www.sametroplan.org/>);
- North Front Range MPO has used **STEP UP** to support early screening prior to project submission (<http://www.dot.state.co.us/Publications/PDFFiles/step2.pdf>);
- Connecticut DOT works with data from Department of Environmental Program to **early screening of projects** for threatened and endangered species, and conduct consultation with staff as needed (<http://www.ct.gov/dot/lib/dot/govcomm/permitting110107.ppt>);
- The Houston-Galveston Area Council has made significant strides towards developing an integrated planning process through a **visioning exercise** and inclusion of data on environmentally sensitive areas in the long-range transportation plan – highlighting large continuous ecosystems that should be left intact and identifying roadways that needed to be realigned before moving into short-range plans (<http://www.h-gac.com/home/>);
- A **significant investment in data** by MoDOT and other agencies in Missouri have greatly contributed to improved decision-making at the project and planning level. In addition, training of MPO staff and a **checklist** provided to transportation planners ensure that this data and other environmental considerations are fully utilized in decision-making (http://epg.modot.mo.gov/files/4/46/104.6_Environmental_Checklist.doc);
- In Texas, a **data sharing agreement** was developed between TxDOT and Texas Parks and Wildlife in order to coordinate statewide impacts to natural resources (http://www.gis.fhwa.dot.gov/documents/GIS_ESS.htm#Texas);

- A **statewide assessment of wildlife linkages** in several states, including Arizona, Colorado, Idaho, Oregon, and Wyoming (http://www.azdot.gov/Highways/OES/AZ_WildLife_Linkages/assessment.asp);
- New Hampshire DOT is **collaborating with environmental agencies** to integrate planning (<http://cms.transportation.org/sites/environment/docs/2005/NH%20DOT-Linking%20Planning%20and%20NEPA.pdf>); and
- **Statewide culvert inventory and prioritization** of fish and/or wildlife barriers to inform resource allocations; underway in several states, including Maine, Massachusetts, and New York (see New York Profile, Section 4.4 and http://www.environment.fhwa.dot.gov/strmlng/FWS_NOAA.asp).

74 percent of transportation respondents reported that they were engaged in some aspect of integrated planning (Figure 3.2). This conceptual understanding extends to those respondents who have not yet initiated joint planning efforts. Of the transportation respondents who said they are not yet working to integrate environmental resource planning into transportation planning, 64 percent report that they have a good understanding of what it means to successfully link environmental and transportation planning. The remaining 36 percent feel they do not have a good understanding.

Figure 3.2 Transportation Respondents Working with Environmental/Natural Resource Agency Staff to Integrate Environmental Resource Planning into Transportation Planning



Specific concerns were expressed regarding the connection between system-level long-range planning and project-level integration. As one DOT respondent reported, they “understand how to link environmental and transportation planning at the project level, but are unclear on how to integrate them sooner.” This respondent cites the need to involve the state resource agency and other conservation groups during the Long-Range

Transportation Plan development process to accomplish a better integration between environmental and transportation planning.

Understanding of integrated planning concepts was lower among environmental respondents. Slightly more than half of environmental respondents reported that they have a solid understanding of the transportation planning process (or at least specific pieces of this process), and feel that they have an understanding of what it would take to successfully link environmental and transportation planning processes.

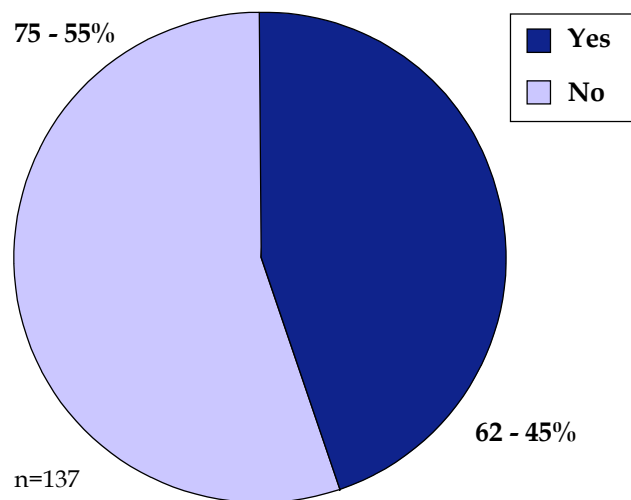
A few environmental respondents also lack confidence that their input and recommendations would be seriously considered or result in changes to transportation projects, even when transportation agencies engage them in the planning process. There is a strong desire by environmental respondents for a transparent decision-making process that holds transportation agencies accountable for the final outcomes in every stage of transportation decision-making.

Activity in Integrated Planning Approaches

As noted above, nearly three-quarters of transportation respondents reported that they are working to integrate environmental resource planning into transportation planning. Further, a large majority of those who have not yet engaged in integrated approaches understand the benefits of integrated planning and are working to develop effective actions. A few agencies reported that it is not feasible for them to incorporate integrated planning. One DOT representative stated that integrated planning was not a priority for the organization, and that additional staff resources would be required to undertake this approach.

A lower percentage of environmental respondents (45 percent) reported that they have been actively working with local transportation agencies (Figure 3.3). Of these, however, 70 percent believed they had been successful in their efforts at integration; a minority (27 percent) said that no progress had been made.

Figure 3.3 Environmental Respondents Working with Transportation Agency or Organization Staff to Integrate Transportation Planning Efforts with Environmental Planning Efforts



The new SAFETEA-LU requirements spurred many of these integrated planning efforts; other efforts focused on development of regional air quality plans, state DOT Long-Range Transportation Plans, and participating in a joint FHWA/DOT Linking Planning and NEPA Workshop. Transportation respondents cited support from upper management and good working relationships as significant factors which helped start the integrated planning process. These integrated planning efforts ranged in geographic scale from statewide-, MPO area-, county-, and corridor-level projects. A mix of Federal, state, and local agencies (both transportation and nontransportation) had major roles in the integrated planning process examples.

“The requirement in SAFETEA-LU to consult with agencies regarding environmental planning has opened doors not previously available. In previous planning cycles, [the] DOT simply allowed [the] Natural Resource agency to view and comment during the public review stage. Now, agencies are commenting on the plan before being released to public so that the plan can be adjusted prior to dealing with public comments. We are able to discuss natural resource mitigation opportunities in relation to how resource agencies prioritize needs on the landscape. Process is not complete, but outcomes look promising.”

– Environmental Respondent

Successful Outcomes

Successful outcomes ranged from developing awareness and building working relationships, to process efficiencies gained by identifying and resolving environmental issues earlier in the transportation process.

Overall, these respondents felt they had been successful because they were working with the transportation agencies at large landscape scales and were looking at issues and data in a more holistic way. The success stories that were documented included a wide variety of environmental benefits, including looking statewide at wildlife crossings, areas containing sensitive natural resources, impact analyses related to alternative routes, mitigation options, and long-term revegetation plans. Some respondents also documented positive quantitative results, such as an increase in the numbers of specific threatened species in areas where road improvements were made to better support the species.

Some of the successful outcomes noted by either transportation or environmental respondents include:

Institutional/Cultural/Process Improvements

1. Increasing awareness of environmental planning processes within the (transportation) agency.
2. Facilitating better communication, coordination, and collaboration among agencies.
3. Developing a framework for interagency collaboration (Memorandum of Agreement to include resource agency participation in project and planning development).
4. Establishing relationships between transportation and environmental planners, especially among organizations that have not historically worked together.
5. Bringing together stakeholders to discuss future goals and identify regionally significant environmental resources to incorporate into the long-range transportation planning process, resulting in greater “buy in” from both participants and the public.
6. Greater understanding and realistic expectations among all partners of what can be achieved by both transportation agencies and resource agencies.

“[The] DOT now understands the benefit of early coordination and planning, it saves them time and money, and they appreciate the benefits, it also is good PR for them to show they are willing to be responsive to sensitive resources.”

- Environmental Respondent

“Environmental concerns are highlighted earlier in the process, therefore increasing the opportunity to avoid and minimize those impacts. Success can be attributed to the reduced impacts to fish and wildlife and their habitats, impacts that are the direct result of transportation infrastructure as well as secondary and cumulative impacts.”

- Environmental Respondent

“One outcome of our integrated decision making process was] improved habitat of Niagua Darter (U.S. Federal Listing: Threatened) [and a] modified method of road building to promote growth of Missouri bladder pod (U.S. Federal Listing: Threatened).”

- Environmental Respondent

Improved Environmental Stewardship/Protection/Compliance

7. Creating a regional strategy to identify relative importance of ecological, historical, and cultural assets and to develop regional-level mitigation approaches in consultation with Federal, state, and local resource agencies.
8. Early identification of environmental issues and conflicts to identify where projects should not occur (nonstarters). This process saves resources and time when projects have been eliminated early and encourages mitigation steps earlier in the planning process.
9. Obtaining attainment status for ozone pollutants.
10. Reduction in levels of adverse impacts.

Improved Transportation Outcomes

11. Better designed roads resulting from an early-in-the-planning process and holistic approach to transportation planning.

Process Efficiencies and Financial Savings

12. Time and money savings.
13. Improved cost-sharing.

Technical/Tool Advancements

14. Building a tool to compile and share environmental and transportation datasets to better identify major conflict areas early in the planning process.

Some respondents were in the early stages of implementing integrated planning. One such DOT reported that, while the results were yet to be shown, the DOT anticipates improvements in project scheduling and costing; improvement in quality of projects; reduction in project impacts; predictable decision-making; and better integration of land use, transportation, and environmental plans.

Negative Outcomes

Few transportation respondents – only 22 percent – reported negative outcomes resulting from the integration of environmental resource and transportation planning. Similarly, a low number of environmental respondents specified negative outcomes (35 percent). While most of the problems cited were related to process complications or communication issues, some concerns about not meeting program objectives also were reported. A few respondents cited increased costs and time involved in implementing an integrated approach to planning, and no clear benefits. This lack of positive measurable outcomes, however, resulted from either the lack of follow-through in implementing recommendations to minimize environmental impacts, or the inability to measure positive outcomes quantitatively.

The negative experiences or outcomes reported by respondents include:

Institutional/Cultural/Process Concerns

1. The need to work more effectively with diverse stakeholders, especially those with agendas.
2. Lack of a clear project “owner” who will keep the project moving when various agencies are involved.
3. Difficulty for environmental and transportation planners in understanding each others’ goals and coming to consensus.

Resource Constraints/Inefficiencies

4. Keeping all agencies involved with the process when staff and funding commitments are voluntary.
5. Needing to increase staff and environmental expertise in the planning sector because of integrated planning.

Negative Outcomes re: Environmental Stewardship/Protection/Compliance

6. Natural resources are not conserved as intended.

Project versus System-Level Activity

The examples of integrated planning reported by transportation respondents ranged from early consultation with natural resource agencies to full integration of environmental resource and transportation planning in developing a Long-Range Transportation Plan (LRTP). There were a few examples of integrated planning efforts at the state or MPO level during the LRTP process, however the majority of the integrated planning examples from respondents occurred at the project or corridor level. One factor in this difference is the time needed to implement the policies and structure within an organization. At the project-level integration of environmental and transportation planning is well established because of NEPA requirements and other environmental statutes. Conversely, it is a new paradigm for planning. The SAFETEA-LU requirements for environmental planning during the LRTP process are still being disseminated and discussed by state DOT and MPOs to develop effective strategies.

“The integration of planning processes resulted in clear road objectives that supported development of long-term and holistic revegetation plans that could be successfully implemented, and development of guidelines for roadside monitoring protocols, site restoration, and native plant establishment techniques. Revegetation efforts resulted in an increase in native plant establishment on over a dozen road projects.”

- Environmental Respondent

The lack of familiarity with system-level, long-range planning integration was equally apparent among resource agencies. Environmental survey respondents reported that they

are accustomed to being asked by the transportation agencies to respond to specific corridors or projects, and some of the efforts to integrate planning continue to be done at the project level. However, those involved in a more holistic, statewide approach to planning commented on the increase in efficiencies and effectiveness.

It is clear from the survey results that there is much more progress to be made in developing system-level integrated planning. However, it is important to recognize that the increasing amount of collaborative work that transportation and environmental agencies are doing on a project or corridor level contributes to the development of strong and effective working relationships that lay the groundwork for integrated work at the system level.

■ 3.2 Factors Contributing to Successful Integrated Processes

Over 78 percent of the transportation practitioners and 71 percent of the environmental practitioners who responded to this survey reported that they felt they had been successful overall in improving the effectiveness of the transportation planning process by integrating transportation and environmental resource planning. This indicates a substantial increase in integrated planning efforts; just three years earlier, the NCHRP 541 survey of transportation practitioners conducted in 2005 found that although they were conscious that integrated planning might be beneficial, little progress had been made.

This section outlines key factors that respondents feel have contributed to this progress, including leadership; institutional and regulatory factors; interagency collaboration; technical expertise; access to partners' planning documents; resources; and the analysis, data and tools that have emerged as a result of new collaborations.

Leadership – The Catalyst for Change

A consistent theme throughout the survey responses was the significance of strong leadership. Specific individuals or agency offices often played the critical role in initiating new forms of collaboration. In some instances this leadership was provided by a state DOT transportation professional or MPO planner; in other cases a resource agency or NGO championed the new approach. Typically the **presence of “champions”** in several partner agencies provided staff a consistent message and mandate to focus on interagency collaboration as an organizational priority. Technical support from FHWA was frequently cited as a key catalyst in bringing agencies together to open up lines of communication and begin to explore opportunities for collaboration. The roles of national organizations – including AASHTO's Center for Environmental Excellence, the NatureServe Natural Heritage Programs, and Defenders of Wildlife – also were noted as valuable to state and regional agencies in initiating collaborative processes.

The literature specially identified MPOs as having the potential to serve a pivotal role in fostering integrated conservation and transportation planning. This view was highlighted by some respondents; when asked what factor was most responsible for its success in integrating environmental concerns in the planning process, one state DOT specifically cited an MPO that had been “very active in consulting with resource agencies during the development of their long-range transportation plans.”

Leadership *within government agencies* has played a key part in fostering integration. One state DOT environmental office reported that the proactive adoption of an internal DOT policy was responsible for its success. In addition, the office cited a working environment that nurtures “staff that appreciate the value of an ecosystem approach.” Another state DOT credited the creation of a Management Steering Committee charged with overseeing the integration of environmental work in its planning as key to their success.

Institutional Factors and Regulatory Drivers

In addition to leadership within agencies, institutional factors at all levels of government have helped further the integration of environmental concerns in transportation planning. **Most significantly, the passage of Sections 6001 and 6002 of SAFETEA-LU** – which instruct transportation agencies to consider environmental factors in the long-range planning stage and to streamline transportation planning with the National Environmental Policy Act (NEPA) – has been instrumental. In contrast to the findings of previous surveys conducted prior to SAFETEA-LU implementation, respondents to this survey clearly indicated that these mandates had served as a key catalyst for success in their jurisdictions. One respondent noted that MPOs were more willing to consult with resource agencies as a direct result of SAFETEA-LU.

When asked what factor most contributed to its success in integrating conservation in the planning process, another agency cited the creation of a new environmental affairs division within the DOT. Several MPOs noted that they have hired environmental liaison position designed to lead the process of improved integrated planning. Several respondents to this survey were representatives of environmental offices also tasked with carrying out and integrating Federal mandates stipulated by SAFETEA-LU and NEPA.

Interagency Collaboration

The review of existing literature reveals that interagency cooperation has grown in recent years. Respondents to this survey indicated that cooperation between agencies has continued to flourish. Above all, officials cited new and growing interagency collaboration as one of the most important factors leading to successful integration of environmental concerns in transportation planning. At the heart of this collaboration is the willingness of natural resource agencies to understand transportation agency constraints and procedures, coupled with the willingness of transportation agencies to commit to the reduction of impacts to natural resources and proactive environmental stewardship.

The experience of Houston-Galveston Area Council is illustrative of the importance of collaboration. During H-GAC's last long-range planning process, the agency used a committee of environment professionals from Federal and state resource agencies, as well as other environmental experts, to identify areas of environmental concern, focusing on contiguous and intact ecosystems as well as resources that provide flood and storm protection. An H-GAC respondent noted:

“The primary reason for our success has been the willingness of various resource agencies to collaborate during the integration process. This collaboration has laid the foundation for ongoing efforts to improve the effectiveness of the transportation planning process. Having a committed, energetic, and informed group of participants helps to provide a voice and energy to the process.”

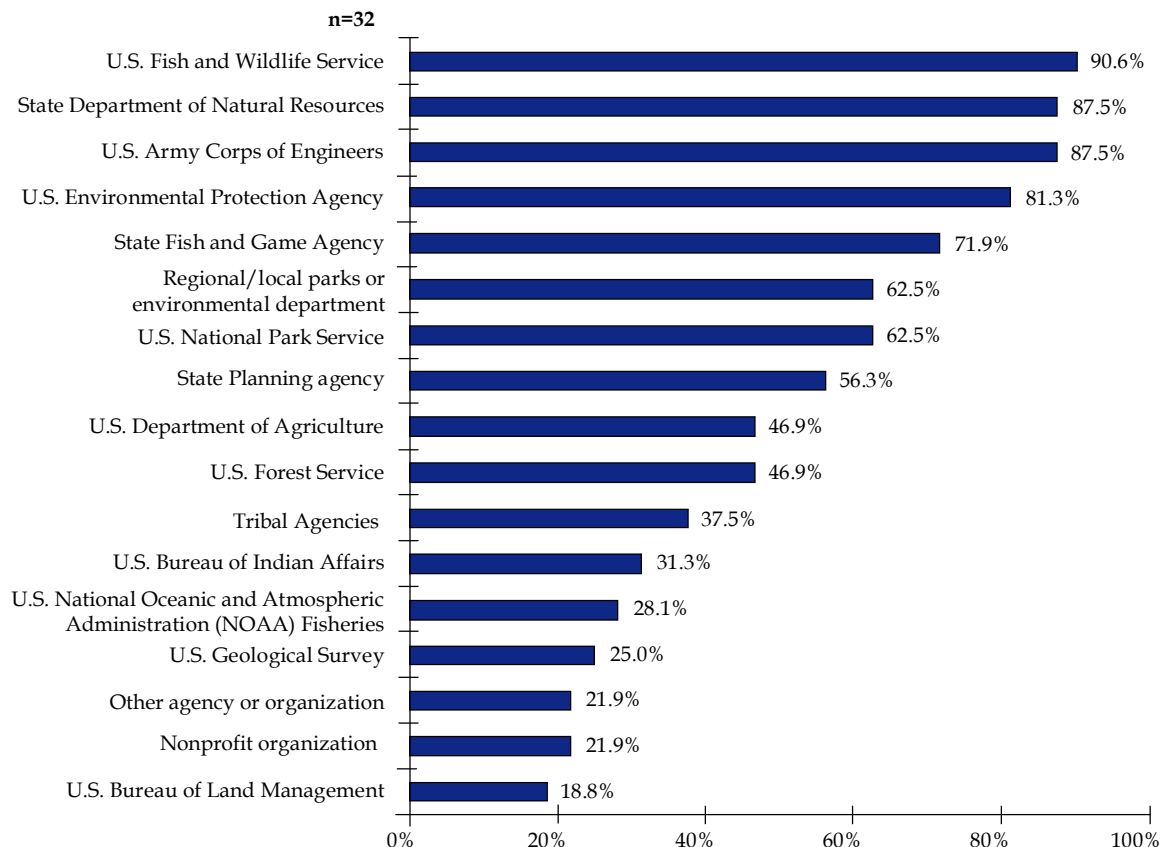
Early Consultation

The importance of early consultation was stressed by many respondents – providing the ability to identify issues early in the process facilitated agencies' ability to resolve effectively these concerns. When asked which environmental and natural resource agencies should be consulted in the planning process, 90.6 percent of transportation respondents reported collaborations with the U.S. Fish and Wildlife Service, followed by state Departments of Natural Resources (DNR) (87.5 percent), the U.S. Army Corps of Engineers (87.5 percent), the U.S. Environmental Protection Agency (81.3 percent), state fish and game agencies (71.9 percent) state planning agencies (62.5 percent), and local and regional parks or environment departments (62.5 percent). Other collaborators included the U.S. Department of Agriculture, the U.S. Bureau of Indian Affairs, the U.S. Geological Survey, the U.S. National Park Service, tribal planning agencies, state historic preservation offices, and local environmental nonprofit organizations (Figure 3.4).

“...collaboration and consultation with Federal Land Management Agencies...and environmental groups has improved shared understanding of environmental impacts and the ability to provide more robust public involvement opportunities earlier in the transportation planning process.”

– MPO Respondent

Figure 3.4 Environmental and/or Natural Resource Agencies Consulted by Transportation Respondents



Interdisciplinary Meetings

Environmental respondents emphasized the usefulness of interdisciplinary meetings as one means of routinely sharing information and building working relationships. One example cited was the annual meetings with partners and stakeholders sponsored by the Washington State DOT. Another approach is illustrated by the San Antonio – Bexar County MPO, which hosted an interagency Summit to develop an interagency Action Plan. The Summit drew together the MPO and key partners, including the Bexar County Public Works, U.S. Army Corp of Engineers, U.S. Fish and Wildlife, and Texas Parks and Wildlife.

“Washington State DOT has annual meetings with tribes and DOT staff outlining plans for the 5 to 10 years, new procedures and policies, and new construction methods. This has been amazingly efficient at getting everyone on a page, helping us all understand what’s going on, and letting staff interact in nonstressful situations rather than only when a problem arises. The meetings are about six hours long but well worth the effort.”

– Environmental Respondent

As a result of these collaborations, agencies responsible for transportation planning widely reported an enhanced understanding of environmental concerns. One MPO respondent noted that “increased communication and dialogue with Federal, state, and local resource management and regulatory agencies in developing the region’s long-range plan really provided a solid foundation for improving the effectiveness of the transportation planning process.” Numerous respondents cited the early presence of these collaborative efforts in the long-range planning process as key elements of success. One environmental respondent noted that “integration of transportation and natural resource programs gives each program more credibility, and provide more opportunities for funding.”

[Collaborations with environmental resource agencies are giving] “our agencies a foundation to begin moving away from site-specific mitigation approaches and move towards regional ecosystem-level approaches that will be more effective in meeting common environmental goals.”

– Transportation Respondent

Interagency Agreements

Many respondents have found that the development of interagency agreements is useful to clarify roles, define common objectives, and agree on agency commitments and responsibilities. For example, Florida DOT has developed interagency agreements with 23 different Federal, state, and regional agencies to facilitate use of the Efficient Transportation Decision-Making (ETDM) process designed to integrate environmental resource agencies into the early stage of the planning process.

Incremental Approach

Overall, the respondents’ experience in successful integration points to a gradual, and often incremental, process of forging new working relationships, establishing trust, and designing new approaches to integrated planning. Respondents stressed the need to take the long view in building effective collaborative partnerships. As one DOT representative stated:

“Integration of planning and environmental review processes is an evolutionary process at ODOT. We are seeing what appear to be “successful” efforts with some of our pilot refinement planning and long-range projects. Jurisdictional agencies are appreciative that they are solicited for their input during long-range and refinement planning efforts, which we are doing more often. We believe that integration of environmental review and traditional planning efforts is leading to reduced overall timelines (to construction) and increased trust. More experience is needed to reach informed conclusions.”

Technical Expertise

The importance of access to technical expertise was another key theme among respondents. And although it was widely documented that having the right data was essential, it also was noted that the collaboration between experts in various agencies and organizations in the transportation and conservation communities is essential to effectively utilizing available data and tools.

“Better/more data is always a good thing, but there is already quite a bit of data available. In my opinion, a better process for integration and collaboration is really the key.”

– Environmental Respondent

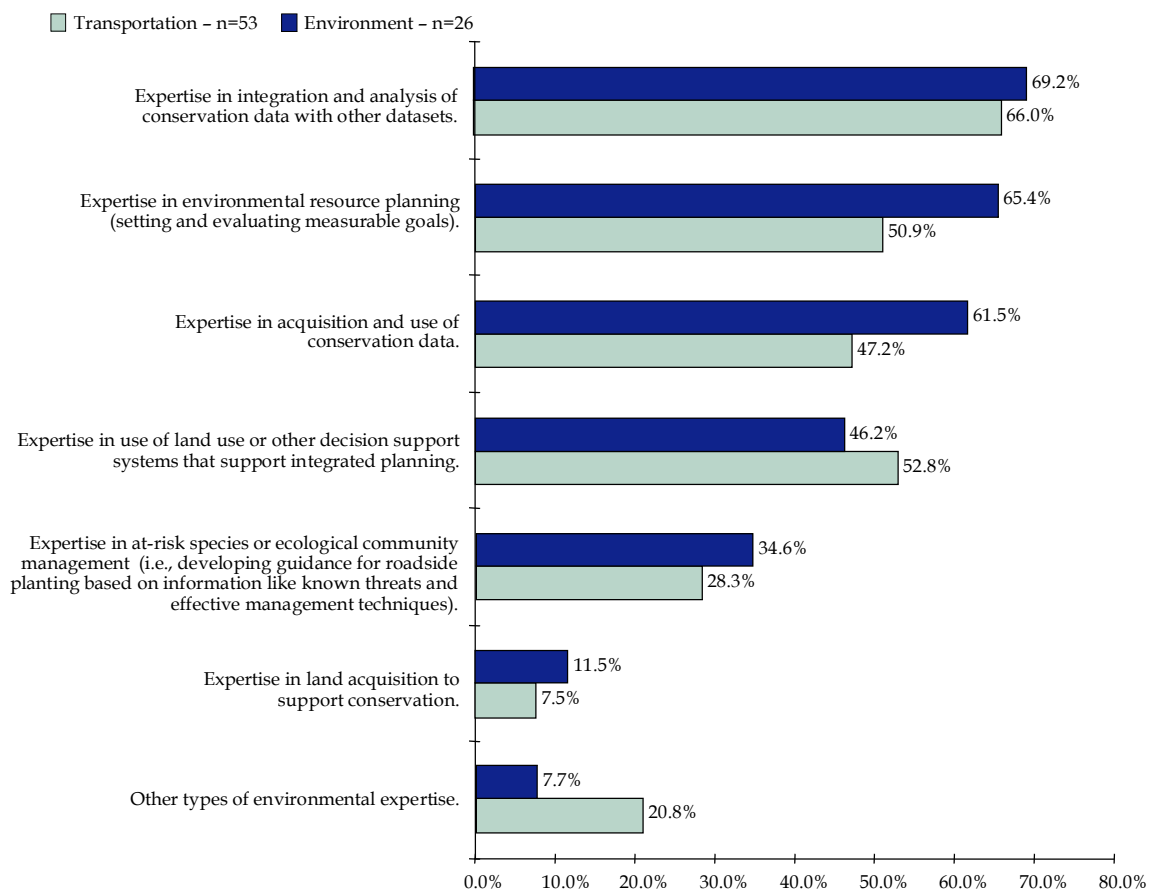
The survey showed that of the types of *environmental expertise* that were most useful, both survey groups selected “Expertise in the integration and analysis of environmental data with other datasets” as the most important type of expertise. The other two types of expertise that both groups agreed were high-priority were “Expertise in environmental resource planning (setting and evaluating measurable goals)” and “Expertise in acquisition and use of environmental data.”

Interestingly, the transportation survey respondents ranked “Expertise in use of land use or other decision support systems” very high while the conservation survey respondents did not, and the conservation survey respondents ranked “Expertise in at-risk species or ecological community management” very high while the transportation communities did not.

In terms of the type of *transportation expertise* needed, both survey groups ranked “Expertise in transportation corridors and projects proposed in long-range plans” as the top choice, but conservation respondents ranked “Expertise in road maintenance plans and programs” as their second highest priority while transportation respondents ranked “Expertise in transportation routes proposed in other plans (such as modal, subarea, or corridor)” as the second highest priority to have available for integrated planning efforts.

Figure 3.5 provides a detailed breakdown of the survey responses on useful environmental expertise.

Figure 3.5 Respondents' Choices of Helpful Environmental Expertise



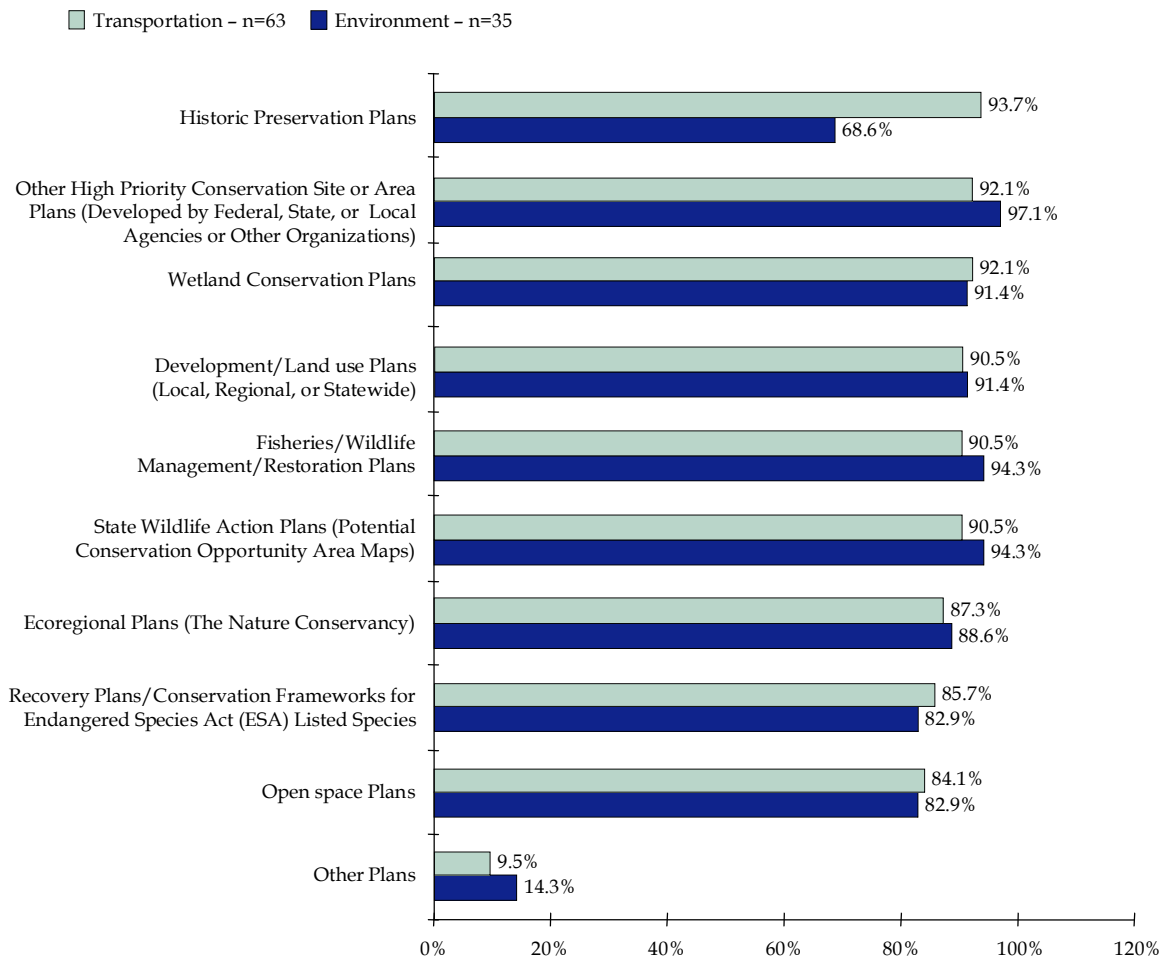
Access to Partners' Planning Documents

For years the transportation and environmental communities have been developing, refining, and implementing plans to carry out their priorities. Until recently, these efforts were done in parallel – with little coordination. Transportation plans were typically developed with little consultation with the environmental agencies and vice versa; state DOT offices developed transportation plans separately from local MPOs; and different environmental agencies within and between states developed multiple plans that addressed different conservation issues or areas or used different approaches for carrying out similar environmental conservation goals. As indicated by the literature review of earlier studies and by the results of this survey, collaboration has greatly improved among all these different agencies and organizations in many areas across the country. However there is still a need for more coordination: 1) to develop an integrated set of environmental conservation priorities and actions that the transportation agencies can integrate into their planning process; and likewise; 2) to define transportation priorities that can be

integrated into conservation plans (see Profile of Oregon experience, in Section 4.6, as one example). To meet current Federal legislation and to achieve shared conservation priorities, both the transportation and environmental communities are increasingly working to coordinate their planning efforts within states and across regions.

All the various types of environmental and transportation plans that were listed in the survey were ranked by respondents as being important for consideration, Figure 3.6 show the breakdown of plans that are considered useful by both survey groups in supporting integrated planning. In addition, the survey results show that plans listed in the survey were mostly available in some format, although generally not in a format readily usable for GIS analyses.

Figure 3.6 Environmental/ Natural Resource Plans Most Useful in Achieving Integrated Planning



The full summary of barriers in the use of plans are summarized in the section on barriers below (Section 3.3). Overall, it is more common for environmental data to be integrated into transportation plans, while transportation plans and data are less frequently incorporated into conservation plans. For comprehensively integrated plans to be developed a process of ongoing dialogue between the transportation and environmental communities needs to be further developed.

Resources

The availability of dedicated staff to facilitate integrated approaches to planning was frequently reported as a key factor of success by both transportation and environmental respondents. In particular, agencies cited the state DOT's funding of position in key natural resource agencies as a significant asset that enabled resource agencies to more fully participate in transportation planning processes. One resource agency respondent cited the leadership of the Arizona DOT in facilitating collaboration with their organization through a dedicated funding.

Federal resources were cited as instrumental in initiating interagency processes. For example, Federal planning funds supported the New York MTC in conducting pilot sustainable development studies to inform strategies related to a new regional goal on land use and transportation. Collaborators included the MPO, local counties, and the New York DOT.

“...We have made great strides in the communication realm and the Arizona Department of Transportation has come up with innovative ways to fund a BLM position that can dedicate their time and focus to dealing with the transportation issues. This has helped a great deal. In addition ADOT has made great efforts and strides to get us involved in the very earliest stages of project design and development to try to get our concerns and needs identified up front prior to even going out for bids on the projects. This has helped focus our efforts so that there is not so much wasted effort and there is a clear understanding of the BLM's environmental issues.”

– Environmental Respondent

Data, Information, and Tools

Existing literature reflects a strong desire on the part of transportation planners to use data and tools that support better integration of conservation into transportation planning. The ability to map and overlay transportation planning and environmental geospatial data is specifically mentioned, as are on-line tools that support centralized organization and access to key datasets, and decision-support tools that facilitate a collaborative and scientifically based planning process that can document progress. Responses to this survey confirmed that many jurisdictions have begun to work together and are realizing both geospatial data and decision support tool collaborations.

Ability to Acquire Data

Of the transportation survey respondents, 78.8 percent reported success in obtaining environmental plans, data, and maps. Whereas, only 50 percent of the environmental survey respondents reported success in obtaining transportation plans and data (although some commented that they have not made the effort to acquire these plans and data). Overall there seemed to be a trend for transportation agencies to integrate conservation data and expertise into their planning processes rather than the other way around.

Most Useful Data Types

Some MPOs considered environmental GIS data to be the most critical element of their integration successes. One MPO reported that overlaying environmental GIS information allowed it to “evaluate the amount of stress various investment scenarios would have on a given resource or conservation opportunity area as a result of development pressure over the long term. Working with these agencies we were able to identify a strategy to further develop an environmental framework and decision-making tools that will ultimately support the integration of environmental planning into our transportation planning process.” Another MPO noted that the use of GIS allows its two-person office “to integrate environmental data from other sources with transportation planning efforts. This allows us on the “front-end” to avoid environmentally areas, thus saving time and money in programming.”

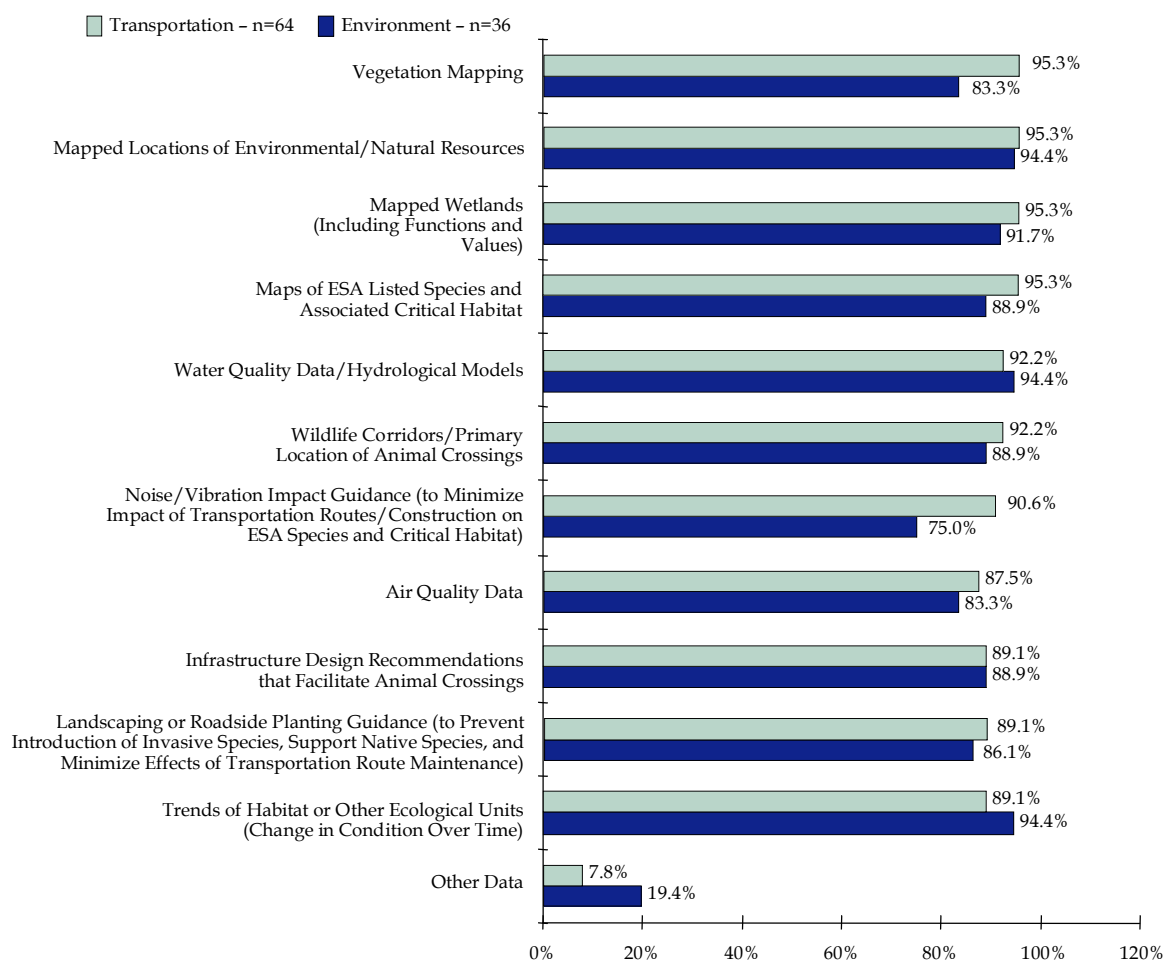
One environmental survey respondent stated a common sentiment among environmental survey respondents: One of the keys to successful integrated planning is keeping pace with the availability of improved ecological data. Because environmental data is constantly being updated, the transportation planning process must be flexible enough to allow new data and environmental metrics to be integrated as they become available.

[A key to successful planning is] “linking the constantly improving data on species locations, habitats, and conservation priorities being developed into ongoing transportation agency plans and systems.”

– *Environmental Respondent*

Data, and especially spatially explicit data, is clearly critical to both transportation planning and conservation efforts. When asked what datasets would be most useful in achieving integrated planning, 95.3 percent of transportation agency respondents and 94.4 percent of environmental agency/organization respondents selected as their top choice “GIS-mapped locations of natural resources.” Other key datasets that both communities identified as high-priority included “wetlands maps (including functions and values),” “maps of Endangered Species Act (ESA) protected species and critical habitats,” and “locations of animal crossings and wildlife corridors” (Figure 3.7).

Figure 3.7 Environmental/Natural Resource Data Most Useful in Achieving Integrated Planning



Trends of habitats or other ecological units, wildlife corridors/animal crossings, and plans for roadside plantings were ranked as the least available of the datasets listed in the survey.

Table 3.1 summarizes additional types of information or datasets that were not listed in the survey, but were identified as high-priority by survey respondents.

“Alternative routes for proposed transportation projects can now be more easily evaluated due the development of a comprehensive database for the Sandhills region.”

– Environmental Respondent

Table 3.1 Additional Information/Datasets Identified as Priority Resources

-
- Herpetofauna Atlas data and aquatic barrier data.
 - Higher resolution terrain models, and next generation landscape habitat maps which fully incorporate, species, vegetation, size and structure, transportation, hydrology, soils, demographics and current aerial imagery.
 - The VINP General and Resource Management Plans will help to establish use areas and visitor thresholds, areas of previous impact verses Areas of Particular Concern, etc.
 - Invasive species of concern for the state/region. Prevention practices to curb accidental introductions. Early detection protocols. Recommendations for plantings/revegetation/landscape along roadways.
 - The items listed above [in survey] would be very helpful relative to rural areas. But transportation planning in urban areas could use different datasets (e.g., information on impervious surfaces, neighborhood connectivity, income, and racial makeup of neighborhoods, alternative transportation options, pedestrian and bicycle safety, etc.).
 - Local planning and zoning actions.
 - Better guidance on criteria for what transportation routes/changes are proposed and why.
-

Availability of Modeling Outputs

In addition, the survey asked if specific modeling outputs would be useful in supporting integrated planning. Most respondents said that all of the listed modeling outputs would be useful, but that generally this type of data is not readily available. The most available modeling outputs that were cited as useful were models of potential species/habitat locations (predictive range maps), land use, population dynamics, storm water runoff, and travel demands. A few other type of modeling outputs were noted: “Higher resolution terrain models; and next generation landscape habitat maps which fully incorporate, species, vegetation, size and structure, transportation, hydrology, soils, demographics and current aerial imagery” were specifically cited as useful. More research and funding would be required to enable both the environmental and transportation communities to develop more advanced modeling data, especially given the lack of complete inventories of at-risk natural resources.

How Data Is Used

What kind of decisions can the data support? How does the data support the integrated planning process? The following are a few examples from the survey of how data is being used to support integrated planning:

- To plan for future Desert Tortoise protective measures and support the development of roadside exhibits;
- To help inform mitigation measures for wildlife in individual transportation projects;
- To create on-line planning information and tools;
- To try to mitigate fragmentation and direct road kill impacts on sensitive fish and wildlife;
- For teaching/instruction in wildlife crossings training courses and printed and on-line materials;
- To identify areas of concern in planning stages and work with natural resource agencies to determine how to avoid or modify the project, or to change how or when agencies plan to take action to avoid or minimize impacts to the resources or areas identified on the land for long-term protection;
- To provide information on plant and animals species occurring in prairie areas, informing the evaluation of new restoration techniques and their effectiveness for future projects;
- To inform ranking of barriers, location of barriers, priorities for mitigation, transportation strategies to use for mitigation planning, road and culvert upgrade planning, and outreach to towns;
- To understand environmental baseline conditions and trends, and assess reasonably foreseeable projects, vegetation mapping, species locations, best management practices, and guidelines to guide road and bridge design; and
- To guide statewide wildlife connectivity using statewide wildlife-highway mortality data.

“We have been able to complete a wildlife-highway linkage analysis for all state and Federal roads in [our state]. We have also developed and implemented a state-wide wildlife-highway mortality database to better document wildlife-highway-related [information]. Information from these two projects will be given to the [state] Transportation Department for integration into their transportation planning process so wildlife values are taken into account.”

- DOT Respondent

Tools and Systems

In addition to the availability of data and expertise, tools and systems that support the use of the data in consultation with experts in both communities were cited by respondents as key elements in their success in integrated planning. The survey illustrated the following types of tools that were considered useful:

- **Data Access Tools** – Web-enabled data access tools that allow the user to select and download current data into their own systems (“central data portal,” “one-stop shopping”);
- **Analytical Tools** – Tools that support various types of analyses, including land use forecasting/visualizing, decision support, environmental impact and screening, potential species and habitat modeling, climate change related modeling, travel demand models, watershed modeling, CO₂ emissions modeling, etc.;
- **Peer-to-Peer Support Tools** – Tools that facilitate peer-to-peer discussion on various integrated planning topics and allow the communities to learn from each other based on successes and failures; and
- **Basic Tools** – Tools that support documentation of projects underway, scheduling tasks among agencies, and timelines, etc.

Through collaborations with environmental organizations in its jurisdictions, one MPO developed an integrated land use forecasting and travel demand model “to better understand how investments identified in the region’s long-range plan might impact the region’s environmental, historic, and cultural resources.” This model allowed them to evaluate the resource and conservation consequences of various investment and development scenarios (refer to the East-West Gateway Council of Governments profile in Section 4.2).

As indicated in the literature, barriers to integration often occur within agencies as well as between them. To resolve this problem, one state DOT created a Planning Resources Handbook to share resources used during the planning process with DOT staff across all disciplines. In addition, it credited the development of DOT-wide scheduling templates for use in its database of planning and construction projects for “increased communication and sharing of information” throughout the department. Similarly, another DOT “implemented project tracking software to indicate to the rest of [the Department] all the planning and environmental activities to deliver.”

As part of the integrated planning examples documented in the survey, the respondents were asked to list all the tools they found to be useful in their efforts. The top ranking tools are listed in order in Table 3.2.

Table 3.2 Tools Used in Integrated Planning

Tools Used in Integrated Planning	Number of Respondents	
	Environmental	Transportation
GIS/ ArcGIS Software to Support Many Types of Analyses	16	37
Integrated Land Use Forecasting (UrbanSim)/Travel Demand Model (CUBE, Citilabs TP+, Viper, EMME/2)	0	6
Access Database	2	1
Excel	2	1
NatureServe/Natural Heritage Database (Biotics - Missouri, Oregon, Arizona)	3	0
TransCAD	0	2
GPS (Trimble GeoXT)	0	2
On-Line Project Identification Form	0	2
EPA Region 6 Screening Tools	1	0
TEAP	1	0
NEPAssist	1	0
NRCS Web Site (Soils)	1	0
National Weather Bureau (Climate Change)	1	0
Revegetation Monitoring Assistant	1	0
Observation Data System (Agency-Supported)	1	0
Paint the Town	1	0
On-Line Environmental Review Tool (Arizona)	1	0
Wetland Mapping Database	1	0
Standard Basic Computer and Software Programs	0	1
Environmental Data Management System (EDMS)	0	1
Environmental Screening Tool (EST) - FDOT	0	1
GRANIT - Statewide GIS System	0	1
Historic Preservation Database	0	1
Efficient Transportation Decision-Making (ETDM) Process - FDOT	0	1
OziExplorer	0	1
Google Earth	0	1
ProjEX	0	1
STEP UP	0	1

The survey also asked respondents to identify what other tool functions - that currently do not exist - would be helpful in supporting an integrated planning process. In some cases respondents listed functions that are available, but perhaps have not been utilized such as three-dimensional GIS capability and web-based decision support tools. Examples of additional desired functionality that respondents identified include:

- Tools that include information about ecosystem services.
- Quick access to best management practices by species and transportation-related impacts (where available); Searchable web-based tools to disseminate results/case studies, including both successes and failures.
- Peer-to-peer information sharing technology that all stakeholders can use to quickly go through the planning process and focus and address on key issues.
- Modeling of watersheds – a simple, inexpensive technique to measure sediment load in strategic places along streams.
- Integration of mapping options (i.e., overlay of data layers, soils, wetlands, species data, etc.).
- A centralized computer database that all the state resource agencies could access, communicate with, and provide updated resource data input.
- Travel Demand Models that are sensitive to land use.
- Climate change tools: A more reliable and sensitive emissions forecasting model for carbon dioxide. Tools that would help MPOs (in the context of the Long-Range Transportation Plan) evaluate climate changes.
- Ability to model freight and industrial transportation demand at the parcel level.
- A decision web-based tool that can be used prior to project submittal – an early scoping tool.

■ 3.3 Barriers to Success and Potential Solutions

The reported barriers experienced by respondents as they work to develop integrated processes differed between transportation and environmental professionals. Among the transportation respondents, 72.2 percent cited communication or process barriers as primary obstacles to integrating environmental resource and transportation planning efforts. In contrast, among environmental respondents only 42.6 percent cited communication or process barriers as the primary obstacle. Instead, most environmental respondents (60 percent) considered inadequate funding to be the primary obstacle they face in more effectively integrating environmental resource and transportation planning. Barriers reported by respondents included concerns about organizational commitment; inter-agency trust and organizational cultural barriers; inadequate expertise; numerous process barriers; limitations of existing plans, inadequate data, information and tools; and resource constraints.

Organizational Commitment and Guidance

Whereas institutional mandates and other directives were often cited as key catalysts for environmental and transportation linkages among successful agencies, other agencies noted that – without institutional commitment and direction – formal guidance was of minimal use. Although a call for Federal guidance came out in the survey, respondents also felt that absent the organizational commitment and corresponding mandates that support a true collaborative planning process, that guidance would not likely cause an increase in integrated planning across the country. One environmental agency states that a “top down directive in all agencies must exist in order to facilitate an integrated planning process.” A respondent from one DOT indicated that in his state, “there’s pretty much an abundance of resources [but] there doesn’t seem to be any state or Federal agencies pushing for establishing conservation areas.” Another state DOT official suggested that “identification of state transportation and local government’s desires” and “developing buy-in on the plan from state and local governments” would be the most helpful in linking environmental and transportation planning.

“...leadership and organizational culture are key. If the agencies ‘buy-in’ and leaders drive it, then the rest falls into place.”

– Transportation Respondent

“Upper-level management of the natural resource and transportation agencies must be behind the integration of transportation planning and environmental resource planning.”

– Environmental Respondent

One respondent suggested that resource agencies designate specific staff as transportation liaison in key agencies or organizations to bring leadership in conservation and/or land use planning to their transportation partners.

Interagency Trust and Organizational Cultural Barriers

While an increasing number of transportation and environment professionals report positive and constructive working relationships, the level of trust and respect among agencies varies considerably among respondents. Some transportation respondents expressed a lack of confidence that environmental organizations would engage in good faith in the transportation long-range planning process; similarly, environmental respondents expressed doubt that their input and expertise would be valued and incorporated in planning decisions. Often successful integrated approaches were attributed to the commitment and professionalism of specific individuals capable of reaching across organizational divides. Environmental respondents felt that “the makeup of the transportation advisory committees [should be] more inclusive of the natural resource community and ensure transparency in decision-making.”

It was a common sentiment among environmental respondents that there “should be an integrated element of transportation that does not change with political changes.” Some environmental respondents called for mandates that reduce the impact of politics; one respondent stated that “politically influenced transportation projects always override environmental considerations, and therefore integrated planning efforts do not result in positive outcomes.”

Environmental respondents cited several times the concern that some transportation agencies focus on the reduction of impacts to a select group of species or habitats – driven by regulatory requirements – to the exclusion of other at-risk species or habitats. They felt that a more proactive and holistic approach would provide more benefits and potentially contribute to the prevention of future Federal and state listing of species currently in decline. In addition, it was suggested that guidance and training for transportation staff on conservation concepts and issues could increase the “understanding by transportation agencies of the importance of rare species and stresses caused from road building and maintenance.”

“...natural resources and impacts to wildlife populations and habitat [needs to be] a higher priority in the transportation planning process.”

– Environmental Respondent

Lack of coordination between and among agencies also was cited as a key barrier to success. One practitioner cited “turf issues and history of distrust” as the biggest obstacle to successful integration. Another practitioner stated that “in some areas, transportation agencies have a culture of not being willing to participate with environmental agencies in a collaborative decision-making process.” An environmental practitioner said that there was a “perception that input from environmental agencies is ignored (which results in) damaging opportunities for future collaboration.” One environmental practitioner noted that the level of “mistrust between the agencies improved with ongoing communication.”

A DOT respondent noted the importance of resource agencies recognizing that “some DOT’s share an environmental ethic and are Federally mandated to do many of the avoidance/minimization measures already... [and that resource and transportation agencies have different] fiscal and administrative boundaries and conflicting missions.” Another state DOT respondent expressed concern that “transportation agencies are required to coordinate with environmental agencies, but that is not required in reverse.” An official at FHWA reported that better coordination between local FHWA and Federal Land Management agency personnel would be most helpful in linking conservation and transportation planning efforts. A state DOT reported that the greatest need is coordination “between MPO, DNR, and local government conservation programs.”

Process Improvements

Coordination among Agencies

Comments indicated that “the roles of each agency is not clear and therefore responsibilities related to work and funding is sometimes unclear and can lead to tension in working relationships.” This could be addressed with guidance on how best to define roles as part of the integrated planning process.

Early Consultation

While considerable progress has been made, the issue of how best to conduct early consultation continues to be a concern. Although most transportation agencies see the overall benefit and resource saving that early consultation can provide, there is still resistance by some transportation agency staff. Full implementation of early consultation was the key process change cited by environmental respondents as critical to improved integrated planning. It was clear from the survey comment that in many parts of the country a commitment to true integration of planning was needed. Respondents commented that the pathway for starting communication was not always clear but was essential to begin identifying and making the processes changes that are needed in order to implement integrated planning, along with guidance on how to begin this integration process.

“...regular communication, an introduction of appropriate staff between the appropriate organizations (transportation and conservation/open space planners) is one way to overcome some of these process barriers.”

– Environmental Respondent

Respondents also had varying understanding of the meaning of “consultation.” Some of the examples of integrated planning provided by the transportation respondents described their “consultation” as including integration of data only, or provision of transportation plans to environmental agencies with little or no dialogue. For example, one transportation respondent stated that their effort to integrate planning involved “solicitation and information sent to resource agencies for comment in transportation planning studies.” While information sharing is a valuable first step, the results indicate that guidance and education about the intent of consultation could be useful. Others suggested that some specified level of dialogue/collaboration should be included in Federal mandates. That being said, based on the survey results the type of guidance that most respondents ranked as useful were documented case studies – specific examples from areas where integrated planning is working.

Shifting from Project to System-Level Collaboration

Both transportation and environmental respondents are challenged by the need to move from project-level to system-level consideration of environmental factors in transportation planning. Transportation agencies have traditionally gotten input from environmental agencies on a project by project basis, as part of the conventional environmental review process.

“Transportation agencies must revise their process to be more holistic and bring environmental agencies into these broader discussions.”

– Environmental Respondent

Models of Success and Performance Tracking

Several respondents believed a lack of exposure to successful processes was the greatest barrier to success in their jurisdictions. 57.8 percent of transportation respondents believed that a process to ensure environmental considerations are incorporated at all levels of transportation

[there is a] “need to develop measures to track potential successes and to be able to continually evaluate the process for its effectiveness.”

– Transportation Respondent

decision-making was highly useful in supporting integrated planning. Over 42 percent of self-described “unsuccessful” agencies reported that annual statewide workshops and regular access to experts in the environmental field were key missing links. When asked what would be most helpful in linking environmental and transportation planning efforts, one Federal official responded “examples of where considerations of the environment in the planning phase proved to be a success.” Another state DOT noted that supplemental training was the most critical missing variable in incorporating environmental concerns. Furthermore, agencies articulated the need for ways to assess their relative progress in implementing effective processes.

Expertise

Many respondents on the environmental as well as the transportation side of these efforts highlighted the importance of technical expertise as an essential ingredient to successful integration of planning. The main obstacle identified in the survey in this regard was availability of and access to appropriate expertise. Generally the environmental agencies reported that they did not have adequate resources to provide the type of staffing oversight and involvement needed to support an ongoing dialogue related to planning, or even sufficient staff to complete project reviews in a timely manner. In several states, this has resulted in transportation agencies funding liaison positions in the environmental agencies. The Wisconsin example (see Section 4.7) is a good illustration of how this type of funding can influence the ability to successfully integrate information and decision-making. While there is a high degree of interest by environmental agencies to participate in an integrated planning process, most report that resource limitation is a major obstacle to their level of activity.

Similarly, while transportation agencies have transportation expertise, some respondents report that they do not have the appropriate organizational structures and processes in place that support their involvement in integrated planning. One Federal Highway Administration (FHWA) representative noted that the state DOT in her jurisdiction still lacked an environmental section, and that “staff responsible for planning and environment are weak at best in understanding environmental laws.”

Suggestions to broaden the availability of expertise across disciplines include development of “traveling teams” of experts that can support multiple regions in developing integrated plans; technical training in environmental planning targeting transportation engineers and planners; and continued sponsorship of multiagency workshops. A combination of funding, a collaborative mindset, ongoing dialogue, and training are the ingredients to making the most of the expertise that is available in the transportation and environmental communities.

Limitations of Existing Plans

Spatially Explicit Data: The survey results show that the various plans listed in the survey are mostly available to agencies in some format. However, these plans often lacked spatially-specific data or were not available in a format that was easy to integrate with other

plans and data. These limitations hampered agencies' ability to apply the information in the plans to their own planning process. While the level of detail provided in state wild-life action plans (SWAP) varies considerably among states, the lack of spatially explicit or precise information in SWAPs was frequently cited as a limitation in their use.¹

Varying Timeframes: The issue of appropriate timeframes for plans was another obstacle identified in the survey.

Several actions could contribute to overcoming these barriers:

- **Spatially Explicit Environmental and Conservation Data and Transportation Data -** Continued work, and investment of resources, in data and geospatial tools will contribute to more effective integrated planning. The Oregon profile (Section 4.6) illustrates why a coordinated effort among the conservation agencies and organizations, along with investment of resources, to build a common map of conservation areas that is utilized by all. Also, continued work by transportation agencies to make their plan, project and maintenance activities as spatially explicit as possible will better enable consideration of that information as integrated plans are developed.
- **Timeframes -** The timeframe issues identified above can largely be addressed by developing a process of ongoing dialogue between the transportation and conservation community. This dialogue will help agencies meet legislative requirements and management-level mandates, while supporting a flexible planning process able to incorporate changes as new information is made available.

Data, Information, and Tools

The availability of accurate, complete data and information is fundamental to informed, integrated decision-making - and both transportation and environmental respondents noted problems in this area. As one respondent reported, "A previous coordination meeting sponsored by [the DOT] had the right intent but failed due to lack of adequate information on data and transmittal needs and transportation plans so that we could project possible significant wildlife impacts." Several issues were reported by respondents, including concerns about data quality and availability; accuracy and currency of data; security constraints; and inconsistent data formats. Some respondents also suggested the need for additional models and tools to support analysis and information sharing.

"WOW! If all this was available here in a GIS, it would be a snap in corridor plans to get a look at potential environmental conditions to help in long-range planning of the corridors. We are heading in that direction and some of the listed items are in early stages of development. If the state could afford to pay for a full-time staff person/biologist to work on wildlife movement and road permeability issues that would help us all tremendously."

- State DOT Respondent

¹ Analyses of SWAPs are available at natureserve.org and defenders.org.

Data Quality and Availability

Almost all respondents cite data and tools as an important component of integrated planning. In particular, as stated above, spatially explicit data from both the transportation and environmental side are considered particularly important. It is clear from the survey results that generally the environmental data is less accessible than the transportation data. Some environmental respondents noted that they had trouble getting access to some types of transportation data; in particular Transportation Improvement Programs and roadside planning and maintenance plans were mentioned as useful information sources that were not readily available to them. On the environmental data side, issues of data sensitivity (due primarily to land owner and species protection issues) – as well as basic resources limitations – sometimes undercut the transportation communities’ ability to access relevant data. Many officials specifically reported sporadic or incomplete access to GIS data. One state DOT long-term planner reported receiving only “limited GIS information.” Another transportation respondent reported difficulty in gathering all the datasets needed by the agency.

In addition to getting information from state and Federal agencies, environmental non-governmental organizations are interested in being more involved in data provision to transportation agencies.

Data Accuracy and Currency

Although much high-quality natural resource data exists, the landscape is constantly changing and new information is always being discovered; data is continually being updated and therefore is never 100 percent complete and current. But in some cases resource limitations have contributed to significant data gaps. For example, although the survey identified some high-priority data gaps for data that transportation agencies would like to use – such as habitat and environmental impact data – resource agencies’ have been unable to provide these data outputs due to resource constraints. All these factors together can make reliance on data and tools challenging in some places. One environmental practitioner states that the “use of vegetation and ecosystem-based maps in combination with individual species maps is necessary to have a more accurate impact assessment.” The survey also revealed that there is a “lack of complete historic/archeological data” and although the response rate from the historical/archeological community was sparse it seemed evident that there were efforts by the transportation community to utilize this type of data in their planning process.

The survey responses illustrate the need to identify what the key datasets are and what the minimum standards should be for completeness and quality of these datasets, and then identify the resources necessary to meet these standards. Thus, continual investments in environmental and historical archeological data and the tools that support their use are necessary in order to support a credible decision-making process.

Security and Liability Concerns

Liability concerns appeared to be one barrier to data sharing. One MPO noted that agencies in its jurisdiction were “concerned with inaccurate interpretation of the data.” Furthermore, the MPO acknowledged that “some data is sensitive and should not be released to the public.” Said another, “some information is considered protected by the agencies and is not available for use outside of the agency.” Another respondent noted that “archeological data is “close hold” to prevent looting, [and] therefore difficult to widely distribute.” This security issue could be addressed by developing procedures for authorized interagency access and use of data by transportation personnel.

Most liability issues can be addressed through dialogue about use of data and the collaborative development of data sharing agreements that enable agencies to meet their data needs while protecting data sensitivity. In addition, most resource agency that supply data were cited as being willing and interested in providing training about the appropriate use of the data; this type of cross-disciplinary training could alleviate concerns about data misuse. That said, it is clear from the survey that environmental agencies and organizations view it as essential for an ongoing collaboration to exist along side data provision. This close coordination helps ensure that the data is accurately interpreted and that environmental expertise is incorporated in the decision-making process.

Appropriate and Consistent Data Formats

In addition to data access and data gap issues, transportation practitioners noted that in some cases the data was not available in a format that is readily utilized. An MPO noted that in addition to reluctance to release information, agencies in its jurisdiction simply did not have the information available in GIS format:

“Getting access to transportation data is somewhat ad hoc...would be nice for a “one-stop” GIS portal.”

– *Environmental Respondent*

“There should be a central web portal for this data. Accessibility should be web-based with the ability to download the data for local use; metadata should be provided, and the quality of the data should be checked by each agency providing the data along with a methodology for corrections to be made when errors are found.” Another respondent expressed the need to have GIS shapefiles “all digitized and registered in the same projection so they can be analyzed in one workspace. There should be one big geodatabase where all the different environmental layers for a specific area can be viewed simultaneously.” The interests and needs expressed were reflected in the survey by natural resource agencies, and most are working toward the development of on-line data access.

Unclear Points of Contact

Finally, some respondents experienced difficulty contacting the correct personnel within each agency, even if they were aware that such data existed. A planner for FHWA reported, “If I can find the right person at the right agency, then [I will have access to GIS data]. If that person cannot be found, then [I won’t].”

Tools

Generally tools were not identified as a major obstacle to successful integrated planning but rather that there were some analytical and data access functions currently not available that would make various parts of the integrated planning process easier. Many mentioned the need to have data available on-line using technologies that allow the user to select and download the data into their local GIS or other analytical software. The specific functions and needs identified in the survey are summarized under the “Tools” part of Section 3.2.

“Modeling of environmental data-ability to project changes and impacts land use projections would be beneficial as well, since the transportation projects always have associated land use impacts that are not projected with the travel demand model.”

– Transportation Respondent

Resource Constraints

Concerns about insufficient staff and funding were shared by both transportation and environmental respondents. Environmental respondents ranked inadequate funding as the number one barrier to success (60 percent). In addition, 55.6 percent of the transportation respondents and 42.6 percent of the environmental respondents reported insufficient staff availability in their jurisdictions as a key barrier to success. One official at a DOT environmental office reported that a “shortage of staff at all key agencies, MPO, DOT, and DNR, make[s] it difficult to maintain the level of communication necessary to be successful.” One transportation official cited barriers caused by the under funding of environmental staff: “they expressed the inability to keep coming to our meetings because of lack of funding/staff/time.”

4.0 Example Profiles of Effective Integrated Processes

Both transportation and environmental respondents offered many examples of effective collaboration and integrated planning. These experiences ranged from new multipartner long-range planning processes to more discrete efforts focused on specific corridors or projects. Some agencies also described their efforts to build tools and data that can be used across agencies – providing a common framework of data and parameters for transportation and conservation planning. The seven cases profiled below illustrate the broad range of activity and innovation underway across the country, involving state DOTs, MPOs, resource agencies, Federal sponsors, and the nonprofit community. The examples provided describe initiatives undertaken by the following organizations:

- Denver Regional Council of Governments: The 2035 Metro Vision Regional Transportation Plan;
- East-West Gateway Council of Governments (EWGCOG) - The Blueprint Model;
- Maine Department of Transportation and Maine Department of Inland Fisheries and Wildlife - Beginning with Habitat;
- New York State Department of Transportation and the New York Natural Heritage Program;
- Oregon State University's Institute for Natural Resources;
- Ohio Department of Transportation: The Eastern Corridor Project; and
- Wisconsin Department of Transportation and Wisconsin Department of Natural Resources - Interagency Collaboration.

■ 4.1 Denver Regional Council of Governments: The 2035 Metro Vision Regional Transportation Plan *A Multimodal Corridor Vision Plan for 35 Regional Corridors*

Overview

The Denver Regional Council of Governments (DRCOG), as the Metropolitan Planning Organization (MPO) for transportation planning in the Denver region, works with the Colorado Department of Transportation, the Regional Transportation District and others to prepare transportation plans and programs.

The *2035 Metro Vision Regional Transportation Plan (RTP)* is an integrated planning effort for the Denver Metropolitan Area and was adopted by the DRCOG Board in December 2007. The RTP guides the development of a multimodal transportation system over the next 28 years and addresses the environmental concerns posed by growth and development. The RTP contains a multimodal corridor vision plan for 35 individual corridors of regional significance. Each corridor vision plan includes:

- A vision statement, goals and objectives;
- Description of the corridor context, consisting of projected growth and congestion within a one-mile buffer surrounding each corridor;
- Discussion of select environmental resources that are located within that same one-mile buffer; and
- Strategies and projects necessary to influence and respond to future growth and development.

The environmental resources covered in the corridor plans are intended to serve as the foundation for future NEPA studies and cover: Land Use, Environmental Justice, Parks and Recreation Areas, Hazardous Materials, Water Resources, Wildlife and Historic and Archaeological Resources.

Catalyst

This integrated planning process started because DRCOG felt that “environmental analyses produced to meet the requirements of NEPA have sometimes been disconnected from the analyses used to develop long-range transportation plans.” The RTP is an attempt to close that gap. The corridor plans identify the mix of transportation improvements that would be most effective in moving people and goods in specific travel corridors. As part

of the studies, transportation improvements are balanced with available funding, and neighborhood and community concerns.

Leadership and Participants

The Colorado Department of Transportation (CDOT) sponsored a statewide environmental forum in which each of the State's MPOs and Transportation Planning Regions (TPR) met with representatives of selected resource agencies. As described by DRCOG, representatives of these resource agencies identified key environmental issues relating to future transportation projects. "While this forum helped to initiate the integrated planning process statewide and was successful overall, this forum represents only the beginning of efforts to integrate transportation planning and environmental resource planning on a more consistent basis."

Resources

- **Plans and Data** - A variety of environmental resource plans and data were available to DRCOG to conduct the integrated planning process. CDOT provided DRCOG with substantial base GIS data which were utilized in the analysis. Some of the available resources include historic preservation plans, open space plans, development/land use plans, air quality data, and EPA Superfund locations, among others. DRCOG used the available plans and data to create high-level transportation planning goals in consultation with environmental resource staff and to conduct new independent analyses to inform the transportation planning process. The integrated planning process utilized by DRCOG included data/information gathering, identifying data/information gaps, data analyses, and discussions with environmental/natural resource staff.
- **Access to Environmental Staff and Expertise** - DRCOG cites the primary reason for their success to date as the close working relationship DRCOG has with many resource agencies.

Obstacles and Solutions

- **Development of Effective Working Relationships** - DRCOG feels it has been successful in improving the effectiveness of transportation planning by integrating environmental resource planning. For air quality issues there have been extensive collaboration between DRCOG and the responsible agency; however collaboration with other resource agencies, such as CO Division of Wildlife, could be strengthened. DRCOG held periodic meetings with CDOT and some of the environmental/natural resource agencies throughout the RTP process. Overall the agency reported that both transportation and environmental resource planning has benefited from a stronger linkage between the two. However the agency wrote that there could be even greater integration between the two fields.

- **Data Inventory Development** – Other successful outcomes reported is the establishment of a comprehensive inventory of environmental datasets, GIS layers, and plans within the region and meeting SAFETEA-LU recommendations to more closely link transportation planning and the environment. The agency did not report negative outcomes as a result of integrating the transportation and environmental resource planning processes.

Next Steps

A successful outcome DRCOG anticipates is minimizing “the groundwork for future NEPA studies that will be undertaken on these corridors” by integrating environmental data into the corridor visions of the RTP.

DRCOG has made available to environmental/natural resource agencies all the information used in preparing the RTP although “it is too early to assess how the environmental agencies have used or will use the RTP information in their respective planning processes.”

DRCOG stressed the importance of regular meetings with environmental resource agencies that make transportation planning consultation more effective. They cited the Transportation Environmental Resource Council, convened by CDOT. “Meetings are held every few months, and the group’s main purpose is to discuss pertinent environmental issues as they relate to transportation.”

For More Information

David Heller
Denver Regional Council of Governments
Phone: (303) 480-6775
E-mail: dheller@drcog.org
Web Site: <http://www.drcog.org/>

■ 4.2 East-West Gateway Council of Governments (EWGCOG) – The Blueprint Model for St. Louis *Tool Development to Support Integrated Planning*

Overview

The East-West Gateway Council of Governments (EWGCOG) has developed extensive experience working collaboratively with multiple local governments, resource agencies, and transportation agencies. Building on this foundation, EWGCOG developed a geospatial tool to support integrated planning with these partners.

The St. Louis region’s “Gateway Blueprint” initiative is intended to encourage long-term regional design by providing a framework for public officials to evaluate and prioritize public investments. Its guiding principles are to 1) encourage energy and resource efficiency; 2) promote transportation accessibility; 3) protect natural resources; and 4) develop intergovernmental collaborations.

The Blueprint Model is an integrated geospatial tool which integrates multiple plans and data sets to:

- Create high-level transportation planning goals in consultation with environmental resource staff;
- Overlay environmental resource and transportation plans;
- Evaluate land use scenarios; and
- Inform the transportation planning process. Ultimately, the data was used in an analysis of development pressures relative to various investment scenarios.

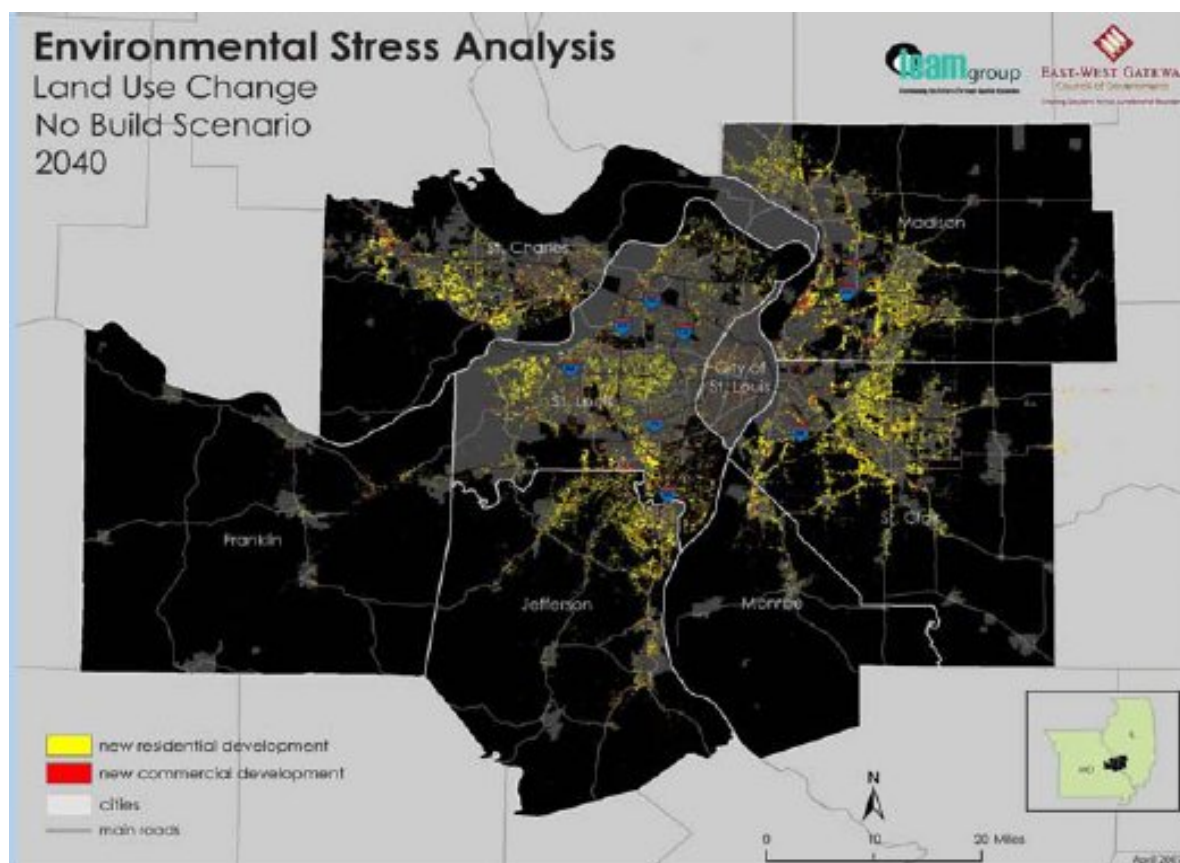
EWGCOG staff developed the Blueprint Model by collaborating with the University of Illinois at Urbana Champaign to gather local data, develop a set of land use drivers, identify and run transportation and land use policy scenarios, and analyze potential consequences for the region. With this information they were able to run up to 50 scenarios of agreed upon policies and investments, develop an analysis of the social, environmental, and economic impacts that emerged from model scenarios, and display the information using GIS.

Land use data was combined with several environmental datasets in order to derive meaningful model output relevant to long-term planning concerns. For example, using integrated land use and water quality models, the Blueprint process was able to isolate areas of the Richland Creek Basin that were most susceptible to flooding and pollutants resulting from regional urban growth. Land use and dispersal models were integrated to predict those areas most sensitive to habitat fragmentation. Similarly, an air quality model was linked to the land use data to detect future emission hotspots, the sensitivity of

emissions distribution to land use change and planning policies, and the varied emissions patterns resulting from different pollutants.

Ultimately, the Blueprint Model and GIS allowed EWGCOG to evaluate the amount of stress various investment scenarios would have on a given resource or conservation opportunity area as a result of development pressure over the long term (Figure 4.1). Coordinating with various agencies enabled the MPO to identify a strategy to further develop an environmental framework and decision-making tools that support the integration of environmental planning into the long-term transportation planning process.

Figure 4.1 Example Environmental Stress Analysis Conducted Using the EWGCOG Blueprint Model



Catalyst

The impetus for these collaborations formed when the FHWA initiated a meeting between resource agencies and all MPOs in the State of Illinois to explain new SAFETEA-LU requirements. When developing the LRTP, EWGCOG staff expanded on this effort to seek input from all Federal, state, and local agencies in the area that were responsible for resource management. Staff spent many hours communicating with agencies, discussing

their challenges, and recruiting the most appropriate staff from various resource agencies to participate in the planning and consultation efforts.

The development of the EWGCOG long-range transportation plan (LRTP) provided the opportunity for increased communication and dialogue with Federal, state, and local resource management and regulatory agencies, and a strong foundation for improving the effectiveness of the transportation planning process in the St. Louis area. The requirement to develop the LRTP necessitated communication with these agencies, which improved data and information sharing and allowed stakeholders to better understand one another's organizational structure, objectives, and authority. In addition, it allowed EWGCOG to work with these partners to test the use of the Blueprint Model.

Leadership and Participants

Created in 1965, the East-West Gateway Council of Governments is a Metropolitan Planning Organization that serves an area encompassing 2 states, 8 counties, and over 200 local governments in the St. Louis region. Led by EWGCOG, nearly 20 Federal, state, and local resource management and regulatory agencies participated in development of the region's LRTP. Key agencies included the U.S. EPA Regions 7 and 5, U.S. FWS, the Natural Resources Conservation Service (NRCS), the U.S. Army Corps of Engineers (USACE), the Illinois Department of Natural Resources, the Illinois Historic Preservation Agency, the Illinois Department of Agriculture, the U.S. National Park Service, the Missouri Department of Conservation, the Missouri and Illinois State Departments of Transportation, FHWA, and FTA. In addition, a number of local agencies involved in greenway planning and resource conservation were also involved in the process. Research and technical expertise to the tool development effort was provided by the University of Illinois at Urbana Champaign.

Resources

- **Plans and Data** - In order to integrate environmental concerns in its LRTP, EWGCOG utilized State Wildlife Action Plans, conservation site or area plans, air quality data, mapped locations of natural resources, maps of ESA listed species and associated critical habitats, mapped wetlands, metropolitan parks and greenway plans, and the U.S. Army Corps of Engineers East St. Louis ecosystem and storm water management plan.

Next Steps

According to Caroline Twenter, Transportation Planning Manager for EWGCOG, the early involvement of resource agencies in the LRTP process will ultimately "improve decision-making, enabling investment decisions that are more harmonious with regional efforts to conserve and preserve various environmental resources. It will give our agencies a foundation to begin moving away from site-specific mitigation approaches and

move towards regional ecosystem-level approaches that will be more effective in meeting common environmental goals. It will also allow more effective use of limited financial and human resources.”

For More Information

Caroline Twenter, Transportation Planning Manager

East-West Gateway Council of Governments

One Memorial Drive, Suite 1600

St. Louis, MO 63102

Phone: (314) 421-4220

E-mail: Caroline.twenter@ewgateway.org

Web Site: <http://www.ewgateway.org/>

■ 4.3 Maine DOT and Maine Department of Inland Fisheries and Wildlife –Beginning with Habitat *Integrated Habitat and Transportation Planning*

Overview

Beginning with Habitat (BWH) is a habitat-based landscape approach to assessing wildlife and plant conservation needs and opportunities. The program intends to provide each Maine locality with a collection of maps and accompanying information depicting and describing various habitats of significance. By overlaying maps of Maine’s animal habitats and primary land cover types in GIS, BWH can indicate to planners the relative ecological sensitivity to potential transportation projects.

The BWH landscape model provides GIS layers such as riparian habitats; high-value plant and animal habitats; public and conservation lands; and undeveloped habitat blocks. Riparian habitat refers to a transitional zone between open water or wetlands and dry or upland areas, including banks and shores of streams, rivers, and lakes. Undeveloped habitat blocks include forest, grassland, agricultural land, and wetland areas that are separated by few roads, and experience little development and human habitation. Incorporating these and other geospatial data in the planning process helps participating Maine localities preserve and plan around areas where seemingly inconsequential development could have a heavy toll on sensitive ecosystems.

The Maine Department of Transportation (MDOT) and the Maine Department of Inland Fisheries and Wildlife (MDIFW) co-sponsored a conference on integration in 2004 resulting in the Maine Habitat and Transportation Working Group. The Working Group was tasked with:

- Integrating Maine’s Comprehensive Wildlife Conservation Strategy with MDOT’s 20-year, 6-year, and work-plan scoping efforts;
- Promoting an ecosystem-based approach to decision-making; developing a resource guidebook for localities; and
- Providing education and outreach.

Catalyst

Representatives of MDOT credit the need to develop a process for incorporating and streamlining state and Federal agency processes as an impetus for integrating BWH data in the planning process. In addition, close coordination among various state and Federal government agencies is cited as a key reason for their success in implementation thus far.

Leadership and Participants

Chief government participants in the integration and use of BWH in the transportation planning process include representatives of MDIFW, the Maine Natural Areas Program (MNAP), the State Planning Office, the Maine Forest Service, and the MDOT Environmental Office. Other partners include Maine Audubon, Maine Coast Heritage Trust, regional planning commissions, and The Nature Conservancy.

Resources

- **Plans and Data** - Through BWH, Maine's towns and land trusts have access to ecological education, data, tools, and resources aimed at conservation. In addition, MDOT shares transportation corridor and project information, roadside planting plans, and road maintenance plans and programs. Data on plants, natural communities, and wildlife habitats were provided by MNAP and the U.S. Fish and Wildlife Service (USFWS).
- **Expertise** - The BWH landscape model was developed by the University of Maine's Cooperative Fish and Wildlife Research Unit (CFWRU), under the direction of MDIFW.

Next Steps

Beginning with Habitat and MDOT have identified several future goals, including:

- Expanding the geographic scope of collaboration by developing relationships with neighboring states and Canadian provinces to synergize the use of BWH data for early transportation scoping; and
- Linking transportation and open-space components of municipal land use plans.

Furthermore, BWH partner agencies are continuing with several other initiatives, such as a statewide study identifying the key elements of habitat connectivity, and developing additional educational materials on roads and wildlife for the general public.

For More Information

Raymond E. Faucher, P.E., Manager
Major Studies Unit
Maine Department of Transportation
16 State House Station
Augusta, ME 04333-0016
Phone: (207) 624-3300
E-mail: raymond.faucher@maine.gov

Judy C. Gates, Director
Environmental Office
Maine Department of Transportation
16 State House Station
Augusta, ME 04333-0016
Phone: 207) 624-3097
E-mail: judy.gates@maine.gov

Web Site: <http://www.beginningwithhabitat.org/>
Web Site: <http://www.state.me.us/mdot/index.php>

Additional Information

Bostwick, R. and Charry, B., 2006. *Maine's Beginning with Habitat Program and Transportation Partnership*. In Proceedings of the 2005 International Conference on Ecology and Transportation, Editors: Irwin, C.L., Garrett, P., McDermott, K.P. Center for Transportation and the Environment, North Carolina State University, Raleigh, North Carolina, pages 86-89.

■ 4.4 New York State Department of Transportation, New York Natural Heritage Program, and The Nature Conservancy *Collaborative Development of Data and Guidelines to Inform Conservation Action at the Project Level*

Overview

The New York Natural Heritage Program (NYNHP) is modeling conservation areas around known locations of rare species and developing descriptive information in the form of online Conservation Guides for natural communities, and on rare plants and animals for the Hudson Valley. The models and associated information are packaged in digital format and used in planning and conservation activities by New York State Department of Transportation (NYSDOT) staff. These conservation tools will help NYSDOT understand the implications of transportation activities on rare species and significant ecosystems at different sites and to put them into a broader context for planning across the State. The result will be better decisions on how to design and modify activities that might affect some of the most imperiled species and ecosystems in New York.

In addition, NYSDOT is funding The Nature Conservancy and NYNHP to incorporate aquatic Species of Greatest Conservation Need (SGCN) requirements and conservation objectives into state transportation planning. They will accomplish this by: 1) prioritizing streams across New York State using models for SGCN and their habitats as criteria; 2) identifying the most important culverts, dams, and bridges for improving and restoring SGCN habitat and ecosystem functions; and 3) prioritizing results based on the existing DOT five-year transportation plan and maintenance program.

These projects are breaking new ground, building a strategic interagency partnership around conservation and transportation in NYS.

Conservation Guides Project

The conservation guides project will support re-mapping of known locations that are to imprecisely mapped, as well as create new data by using GIS models to delineate conservation areas around existing locations. These conservation areas are designed to protect the habitat of rare species, as well as the land around the locations needed to sustain ecological processes and buffer against disturbances. Conservation guides will be written for each species or natural community modeled, and will incorporate information on status, habitat, trends, threats, and management considerations.

Aquatic Connectivity Project

The aquatic connectivity project will review the current five-year transportation program against the habitat and ecosystem of “species of greatest conservation need,” and identify the most important culverts, dams, and bridges in the State for improving and restoring this habitat and ecosystem. In addition, management guidance based on work done in neighboring states will be provided to help guide decision-making at the planning and project level. For instance, the New England District of the Army Corps of Engineers recently adopted road crossing standards for new construction developed in Massachusetts (MA River Continuity Partnership 2006).

Catalyst

NYSDOT’s partnership with the New York Natural Heritage Program and The Nature Conservancy (TNC) grew out of discussions and shared views based on conversations with the Heritage Program and the Adirondack Chapter of TNC.

Leadership and Participants

NYSDOT provided strong leadership to this effort. The NYSDOT Section Head for Water and Ecology was one of the main points of contact on work with the environmental organizations, guiding ongoing interagency dialogue that produced the work plans now underway. The Director of the Hudson River Estuary Landscape of TNC’s Eastern New York Chapter and the Director of the New York Natural Heritage Program, along with key staff of the Adirondack Chapter of TNC, worked with NYSDOT to design a product that would meet the needs of each of the three partners. In addition, these core partners reached out to other planning and conservation programs to include them in identifying needs that the initiative could address. These included the Adirondack Chapter of the NYS Department of Environmental Conservation, and the NYS Interagency Aquatic Connections Team (InterACT) – itself made of 10 members agencies. The partners are also beginning to work with neighboring states to develop standardized guidelines.

Resources

- **Funding** - NYSDOT provided \$500,000 (over five years) through the Statewide Planning and Research program for delineating conservation areas and conservation guides for all of the species and natural communities that occur on Long Island. Additionally, NYSDOT provided \$100,000 of Statewide Planning and Research program funds to supplement NYSDEC’s \$100,000 State Wildlife Grant program funds to The Nature Conservancy to address incorporating aquatic species need requirements and conservation objectives into state transportation planning.

Obstacles and Solutions

The environmental data and management guidance being developed through this effort can benefit long-range planning. Much of the work being done so far is being applied at the project implementation level; these efforts will help guide a more comprehensive approach to mitigation in the State. The challenge at this point is to determine the best approach to integrating these tools and approaches into the long-range planning process in New York.

Next Steps

It was suggested by a transportation practitioner in New York that – given the progress made in integrating conservation and transportation at the project level – the time may be ripe to engage long-range planners in the interagency discussions. This would likely result in some relatively straight-forward benefits to a more integrated planning process, contributing to improvements in the overall decision-making processes at the planning and project level.

For More Information

Debra Nelson
Water/Ecology Section Head
NYSDOT Environmental Science Bureau
50 Wolf Road, POD 41
Albany, NY 12232
Phone: (518) 485-5479
E-mail: dnelson@dot.state.ny.us
Web Site: <https://www.nysdot.gov/index>

DJ Evans
Director
New York Natural Heritage Program
625 Broadway Avenue, 5th Floor
Albany, NY 12233-4757
Phone: (518) 402-8948
Cell: (518) 598-9981
E-mail: dxevans@gw.dec.state.ny.us
Web Site: <http://www.dec.ny.gov/animals/29338.html>

David VanLuven
Director of the Hudson River Estuary Landscape
Eastern New York Chapter

195 New Karner Road, Suite 201
Albany, NY 12205
Phone: (518) 690-7843

Dirk Bryant
Director of Conservation Programs
Adirondack Nature Conservancy
P.O. Box 65, 8 Nature Way
Keene Valley, NY 12943
Phone: (518) 576-2082, x 114
E-mail: dbryant@tnc.org
Web Site: <http://www.nature.org>

Michelle Brown
Conservation Scientist
Adirondack Nature Conservancy
P.O. Box 65, 8 Nature Way
Keene Valley, NY 12943
Phone: (518) 576-2082, x 122
E-mail: michelle_brown@tnc.org
Web Site: <http://www.nature.org>

■ 4.5 Ohio Department of Transportation: The Eastern Corridor Project *Integrating Local Plans with Transportation*

Overview

The Eastern Corridor Project (ECP) is a “comprehensive locally led land use study that fully integrated local plans and community goals with regional perspective, land capability, natural and cultural resource preservation, and various market factors.” The ECP evaluated long-term transportation solutions to meet the needs in the region - which spans from downtown Cincinnati and eastern Hamilton County to western Clermont County. This was accomplished through a land use visioning process. The outcome of this process provides a template for future land use which incorporates existing land use, land capability, environmental concerns, planned transportation improvements, market conditions, and public input.

Catalyst

The ECP involved transportation improvements in a well known and environmentally sensitive area: the Little Miami River (LMR). The LMR is Ohio’s first State Scenic River, a National Recreational and Scenic River, and one of Ohio’s most biologically diverse ecosystems. The LMR is important to many stakeholders, including the National Park Service; the ECP was designed to carefully considered options to minimize impacts to this resource as it developed plans for a new multimodal crossing of the river and other improvements. Throughout the project ODOT and the local task group had to consider factors such as the regional economy, land use needs, and environmental goals when evaluating transportation improvement options.

Leadership and Participants

Led by Ohio DOT, the ECP “was ODOT’s first Tiered EIS project and one that had truly remarkable local stakeholder involvement and commitment.” All of the communities in the region were involved with the concept plan for transportation improvements and in land use visioning. A 65 member local task group ensured that the ECP benefited everyone in the region and included representatives from the 18 jurisdictions with land use/zoning responsibility.

Resources

- **Green Infrastructure Plan** - In addition to the involvement of the local jurisdictions working with ODOT on the ECP, a Green Infrastructure Plan (GIP) for the region was utilized to address environmental concerns. The GIP was developed separately by the local jurisdictions and is a “comprehensive assessment of future land use issues and desired environmental outcomes. It proactively establishes a vision of the preservation and enhancement goals of the LMR corridor in concert with other land use actions and community investments.” The GIP includes tools such as: Conservation Easement/Banking, Mitigation Opportunities/Funding, Special Environmental Studies, and preservation of river buffer and floodplain areas. The ECP incorporated the GIP to evaluate environmentally sensitive areas of concern.
- **Plans and Data** - Historic preservation plans, wetland conservation plans, conservation frameworks for Endangered Species Act listed species, and other high-priority site plans were cited by ODOT as the most useful environmental/natural resource plans for achieving integrated planning.

Obstacles and Solutions

- **Multiple Stakeholders** - One of many challenges this project faced were the number of jurisdictions and stakeholders involved. The use of a large task group with diverse membership helped to ensure input and engagement by the full range of stakeholders.
- **Comprehensive Stewardship with Inconsistent Data** - ODOT finds it challenging to ensure that all environmental areas are addressed equally. This barrier is due in part to the varying level and quality of data available about different regions and species. When one agency has strong data, then the focus of environmental stewardship tended to turn to “trying to reduce impacts to that one, well documented area, while accidentally impacting others.” With the ECP and the Green Infrastructure Plan, “ODOT and the locals have an opportunity to not only offset any minor short-term negative impacts that (the LMR) crossing will have, but by improving the environment for the region as a whole by implementing a comprehensive land use and environmental enhancement plan.”

Next Steps

The ECP is in the Tier 2 study stage - a long way from final approval and construction. However because this project incorporated the local jurisdictions in the concept and land visioning process to addresses the transportation needs, local land use, and environmental impacts across the region, ODOT has laid the groundwork to meet these goals through the integrated planning approach.

For More Information:

Timothy M. Hill

Office of Environmental Services

The Ohio Department of Transportation

Phone: (614) 644-0377

E-mail: Tim.Hill@dot.state.oh.us

Web Site: <http://www.easterncorridor.org/>

Web Site: <http://www.dot.state.oh.us/Divisions/Planning/Environment/Pages/OESTITLEPAGE.aspx>

■ 4.6 Oregon State University's Institute for Natural Resources *Creating an Integrated Map of Conservation Opportunity Areas*

Overview

In Oregon, there have been many efforts to identify the areas in the state that are of conservation concern, starting from the Oregon Biodiversity Project. These efforts include the Oregon Conservation Strategy, The Nature Conservancy's ecoregional plan, the President's forest plan (FEMAT), the Coastal Landscape Assessment and Modeling Study, The Oregon's Greatest Wetlands project, and the Pacific Northwest Ecosystem Research Consortium's Willamette River Basin futures study. While these initiatives provide valuable data-rich information, they are not consistent. The different groups have used different datasets and approaches, resulting in slightly different maps of conservation opportunity areas. To date no one has integrated all the available environmental data on known and potential resources of concern, nor created a common map in collaboration with all the experts in the state. The lack of a consistent picture of conservation opportunities and sensitive areas is problematic for transportation planners and other planning initiatives.

The Institute for Natural Resources at Oregon State University (OSU) plans to undertake this challenge. Supported by an FHWA Eco-Logical grant, OSU will work collaboratively to integrate all available environmental data working with Federal and state agencies, and conservation organizations. The work will start in the Willamette Basin, addressing wetland and riparian habitats, other conservation strategy habitats, at-risk species, and all conservation strategy species. The project will then expand to include the other basins, and all species and habitats once the process has been established. The initial map will be created from original data layers as a geodatabase, and will be automatically updated as new information is available. Once completed, the map can be used by Oregon DOT to address long and mid-range corridor planning, statewide mitigation planning, and project level decisions.

Catalyst

Both transportation and conservation planners in Oregon recognized the need for a common set of data and maps that could be used consistently across all planning efforts. The availability of consensus-based information will provide a common framework for all disciplines.

Leadership and Participation

Led by the Institute for Natural Resources at OSU, this effort will engage conservation experts, resource agencies, and planning organizations across Oregon. The Oregon

Department of Transportation has been a major cooperator in this effort, providing staff time and leadership to assure the products meet transportation agency needs.

Resources

The support of an *Eco-Logical* grant through the FHWA was instrumental in initiating this project. The availability of a range of high quality data sets and maps from various resource agencies, conservation organizations, and planning organizations provide the foundation for this next phase of integrated work.

Significant resources have been invested in conservation planning in the Willamette Basin, the focus of the initial work, since it has both important conservation issues and major transportation needs. Federal agencies, state agencies and conservation organizations, have developed important conservation plans, information, and tools for this area.

Obstacles and Solutions

- **Scaling Effort to Local Needs** – It was noted by Oregon practitioners that the approach taken with integrated planning depends on the specific landscape involved as well as staffing constraints. In regions where new transportation capacity is the primary focus, a broad-scale approach is appropriate – working collaboratively to identify locations to avoid and providing guidance on how to reduce impacts. In other areas where expansion and maintenance of existing roads are of primary concern, more detailed guidance at each level of the decision-making process may be needed. In both cases, an integrated conservation areas map is essential. In Oregon, aquatic issues are the primary focus of attention. Some of these, such as vernal pools, can generally be addressed through broad guidance on areas to avoid. Others that are specifically related to listed salmon and fish passage, need more detailed or site specific guidance regarding construction and design that can be approved by the Federal regulatory agencies.
- **Resource Constraints** – As is the case in many places, one of the biggest challenges in Oregon is the limited funding available to some of the natural resource agencies and research/conservation organizations to participate in integrated approaches. ODOT practitioners are confident that the high level of interest and leadership in Oregon will continue to promote integrated planning efforts.

Next Steps

The Integrated Map initiative is just beginning. The work will be conducted incrementally, with different regions, species, and habitats incorporated over a multi-year period.

This project will not initially address climate change issues, which will be essential for long range planning, but the integrated conservation area map is a first step in the

development of a more comprehensive way of addressing integrated planning. When climate change models are incorporated into conservation opportunity areas or other portfolios, these updated base layers will be automatically become part of the integrated map.

For More Information

Jimmy Kagan
Information Program Manager and Heritage Director
Institute for Natural Resources
1322 SE Morrison Street
Portland, OR 97214
Phone: (503) 731-3070, ext. 111
Web Site: <http://inr.oregonstate.edu/>

Melinda Trask
Conservation Programs Coordinator
Geo-Environmental Section
Oregon Department of Transportation
Salem, OR 97202
Phone: (503) 986-3504
Web Site: <http://www.oregon.gov/ODOT/>

■ 4.7 Wisconsin Department of Transportation and Wisconsin Department of Natural Resources *Interagency Collaboration*

Overview

The Wisconsin Department of Transportation (WDOT) and the Wisconsin Department of Natural Resources (WDNR) developed a collaborative process to integrate data and expertise into every aspect of planning, project development and implementation, and road maintenance on a statewide basis. Key outcomes have included:

- Helping towns and villages include transportation and protection of important natural resource in their plans;
- Avoidance of sensitive natural areas and endangered resources;
- Creation of new culverts or bridges to provide wildlife and aquatic species passage, or retrofit of existing structures to protect natural resources; and
- Identification of roadside prairies that require special management and develop guidance for roadside maintenance.

Catalyst

WDOT recognized that transportation projects were often impacting or potentially impacting natural resources. These conflicts were causing project delays and increases in costs. In response, WDOT funded several liaison positions in the WDNR. These liaisons brought the various types of environmental expertise needed to accomplish integrated planning statewide.

Leadership and Participants

This was a collaborative process between WDOT's Highways and Airports Divisions and WDNR's Water, Wetlands, Fish, Wildlife, and Endangered Resources Programs. WDOT initiated the dialogue. Both agencies are committed to early planning and integration of conservation and transportation efforts in Wisconsin.

Resources

The success of this process was supported by:

- **Agency Commitment** – Both WDOT and WDNR were willing to work collaboratively.
- **Liaison Funding** – WDOT funded transportation liaison positions in WDNR at a total about \$600,000 annually including positions for central office and regional coordination, endangered resource and wetlands review, air quality, and brown fields.
- **Plans and Data** – All collaboration was informed by transportation and environmental plans provided by WDOT and expertise and data from WDNR including fishery and wildlife resources, wetlands, contaminated sites and local planning documents. Information on sensitive resources and locations of endangered species was provided by the Wisconsin Natural Heritage Database.

Obstacles and Solutions

Initially both agencies needed to take time to educate each other on their needs and processes; this up-front investment has helped build a very productive collaboration. The agencies developed a formal conflict resolution process to assist the agencies when decisions cannot be resolved in a timely manner. This has helped foster a solid collaboration and success in the efforts to integrate conservation into transportation decision-making at all levels.

The biggest ongoing challenge is the lack of continuity in project staffing. WDOT uses consultants to complete much of their project work, and turn-over in assigned consultants is common. The education and orientation of new consultants slows the project development process, and sometimes results in missed opportunities for integration as consultants are unaware of the need to collaborate with WDNR. Overall, both WDOT and WDNR find that the interagency process is working very well.

Next Steps

The overall collaboration and dialogue will continue between WDOT, WDNR, and other agencies which will support ongoing improvements to the integrated planning and project development processes. WDNR is presently working on refining its internal policies related to aquatic organism passage for construction and improvement of culverts and bridges so that these policies can ultimately be incorporated by WDOT to ensure all stream crossings provide stream connectivity and adequate passage for organisms.

For More Information

Lisie Kitchel
Environmental Review Specialist
Wisconsin Department of Natural Resources
101 South Webster Street
Madison, WI 53715
Phone: (608) 266-5248
E-mail: Lisie.Kitchel@wisconsin.gov
Web site: www.dnr.wi.gov

Gary Birch
Policy Analyst-Biologist
Wisconsin DOT
4802 Sheboygan Avenue
Madison, WI 53707-7965
Phone: (608) 266-1017
E-mail: gary.birch@dot.state.wi.us
Web site: <http://www.dot.wisconsin.gov/>

5.0 Conclusions and Recommendations

Overall, the literature review, survey responses, and follow-up interviews demonstrate that both transportation and conservation agencies are actively engaged in building interdisciplinary, collaborative approaches to planning and project development. New regulatory requirements have sparked much of this activity. It is also clear, however, that many transportation and conservation professionals are motivated by the desire for a fresh approach. Planners and researchers in both communities are seeking more efficient and effective processes to achieve both transportation objectives and environmental stewardship – and recognize the potential benefits of integrated planning to foster creative solutions to difficult environmental and mobility challenges. The philosophy of “better than before” transportation and conservation planning and stewardship is taking root.

This research identified several key themes in the evolving practice of collaborative decision-making:

- **Respondents understand the potential benefits of integrated planning, and many are beginning to achieve success.** Most respondents believe that there can be significant benefits from integrated planning for both communities. The survey repeatedly documented how decision-making at the local transportation project level is positively influenced by the information that comes out of the integrated planning process. Conversely, the integration of decision-making at the project level supports how well-integrated planning goals are achieved. Most respondents agree that if you start the evaluation and decision-making processes at a statewide or regional scale, before projects are developed, a broader array of issues can be considered and addressed. This allows both transportation and resource agencies to take a more practical and efficient approach to local project-level decisions that are made in the context of the larger landscape.
- **Collaboration develops incrementally, often building on project-level success.** Over time interagency partners are developing ways to adapt their traditional planning and implementation processes to support integrated, mutually beneficial planning. These innovations are often incremental, building on the success of specific interagency efforts that address particular project-level or environmental protection concerns. This observation underscores the importance of work that integrates planning and NEPA processes – even as agencies work to develop integrated cross-disciplinary planning processes.

- **Locally tailored approaches are most effective.** The broad range of examples provided by respondents illustrate that although there are key elements that must be included in integrated planning, there is no single “boiler plate” approach. In fact, agencies who are succeeding in integrated approaches have developed processes tailored to the needs and unique characteristics of their particular location and organizational relationships. The approach individual agencies select is dependent on numerous factors, including the leadership, interest, expertise, availability, and even personality of staff in the agencies and organizations; transportation needs and priorities; the biological landscape; data quality and availability; the political environment; level of resources; and past and present land use development, among other variables.
- **Initiating cross-agency dialogue is key – and challenging for many agencies.** It is clear from the results of this survey and past research that the primary factor to success is the willingness of both transportation and environmental resource agencies and organizations to “come to the table” – to start to talk about the challenges and issues they are facing and begin to discuss potential approaches to integrating the planning processes. This first step is often in itself difficult to accomplish – while some agencies report that they have had collegial working relationships with partners for decades, others express distrust and a lack of confidence that collaboration is at all feasible. Overcoming this cultural and historical divide remains a significant barrier to integrated planning – one that will take time, leadership, and commitment to resolve.
- **Leadership and organizational commitment are essential.** The need for political and executive management-level support was stressed as a critical element to the overall success of integrated planning. Although many survey respondents requested Federal guidance on how to conduct integrated planning, respondents also noted that the planning process is influenced by multiple political and economic factors, including political goals that undercut the transparency of planning decisions. Many environmental respondents in particular reported their experience that some transportation offices are resistant to developing a collaborative relationship with the environmental agencies, and that this is the major factor blocking planning integration. These respondents stress the necessity of first establishing strong, high-level support to set the stage for integrated approaches before technical guidance can be useful. In turn, some transportation respondents expressed reservations about the willingness of environmental agencies to engage during the planning process, believing that regulatory agencies are unwilling to discuss system-level approaches that might limit their influence at the project level. The wariness expressed by both communities points again to the need for committed and creative leadership able to promote a “win-win” philosophy in planning choices.
- **Agencies benefit from case examples and technical support.** Many respondents cited the value of learning from the experience of other agencies, and credited the leadership of Federal agencies in helping them initiate interagency dialogue through workshops, summits, and interdisciplinary meetings. An ongoing focus on information sharing, facilitating cross-agency workshops, and case examples of successful innovation will help organizations develop the fundamental processes and technical tools required to maintain an ongoing and effective collaborative process.

- **High-quality data integration supports collaborative decision-making.** Respondents stressed the importance of having consistent and accurate data, regularly updated and augmented, that is commonly available and used by all partners. Many respondents gave examples of joint work underway to improve data and supporting tools, using geospatial frameworks. These efforts are works in progress, and a high priority among agencies who have established collaborative working relationships and are seeking tools to facilitate their joint work.
- **Expertise and staff capacity are essential.** Effective integrated approaches are grounded in the ability of technical experts – in both conservation science and transportation – to help organizations develop common and mutually beneficial program goals and objectives. The availability of well-trained environmental experts is essential to explain issues and discuss options to resolve potential environmental problems and develop proactive stewardship plans. Similarly, transportation planning and environmental experts are needed to engaged with conservation agencies to explain mobility objectives; transportation planning and regulatory process; and investment, siting, and design options.
- **Resources are needed to support collaboration.** Financial and staff capacity constraints were often cited as a barrier to collaboration. Resource agencies often reported that they had insufficient staff to actively participate in interagency planning. The investment by state DOTs in staff details from resource agencies has facilitated interagency collaboration; further, these assignments have helped build trust and improved communication among agencies. Other financial support, such as the FHWA *Eco-Logical* grants, are instrumental in moving integrated approaches forward, and in developing improved tools. Secondly, respondents across all agency types – DOTs, MPOs, resource agencies, and conservation organizations – reported the need for substantial and ongoing investments to improve and standardize data.

The shift to integrated planning among transportation and conservation organizations is well underway, and we can expect to see continued progress as agencies build working relationships, clarify roles, and gain knowledge and experience in collaborative processes. Continued leadership and support at all levels of government – Federal, state, and regional – will ensure that the state of practice in integrated planning continues to grow.

Appendix A

*Critical Analysis and Literature Review
Annotated Bibliography*

Critical Analysis and Literature Review Annotated Bibliography

Applications of Geographic Information Systems for Planning and Environmental Linkages, Peer Exchange Summary, Federal Highway Administration, November 2007.

Summarizes GIS applications for integration of planning and environment presented in a FHWA-sponsored peer-exchange held in Portland, Oregon in October 2007.

Center for Environmental Excellence (web site), American Association of State Highway and Transportation Planners (AASHTO). <http://environment.transportation.org/>.

Promotes environmental stewardship and encourages innovative ways to streamline the transportation delivery process. 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.

Conference Proceedings 37: Integrating Sustainability into the Transportation Planning Process. Transportation Research Board, 2005.

Documents conference proceedings and suggests that a “triple-bottom line” analysis (considering environmental quality, social justice, and finance equally) should be conducted on infrastructure project cost-benefit analyses.

Context Sensitive Solutions in the Transportation Planning Process. Federal Highway Administration, February 2006. <http://www.fhwa.dot.gov/planning/csstp/cssqa.htm>.

Contains a set of frequently asked questions and answers that address how context sensitive solutions can be better incorporated into the transportation planning process.

Defenders of Wildlife (web site), Defenders of Wildlife. http://www.defenders.org/programs_and_policy/habitat_conservation/index.php.

Contains information and resources on integrated planning. This web site is being updated during 2008 with input from many agencies and organizations involving in Linking Conservation and Transportation Planning workshops.

Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects. Office of Project Development and Environmental Review, Federal Highway Administration, April 2006. <http://www.environment.fhwa.dot.gov/ecological/ecological.pdf>.

Outlines a conceptual framework for integrating plans across agency boundaries, and endorses ecosystem-based mitigation. Encourages Federal, State, tribal, and local partners involved in infrastructure planning, design, review, and construction to use flexibility in regulatory processes.

EBM Tools Network (web site), Ecosystem-Based Management Tools Network. <http://www.ebmtools.org/>.

EBM Tools Network is an alliance of EBM tool developers, practitioners, and training providers. The Network web site provides tools and data to support ecosystem based management.

Environmental Spatial Information for Transportation: A Peer Exchange on Partnerships. Transportation Research Board, 2004.

Details a 2003 peer exchange focused on evaluating data needs, reviewing challenges for coordinating and sharing data, and discussing ways to further build capacity for data management and data sharing between agencies. *Transportation Research Circular E-C106* (below) was a follow-up exchange to this meeting.

Geo-Spatial One Stop (web site). <http://www.geodata.gov>.

Provides geospatial data clearinghouse and computer network of data servers/portals.

Getting Up to Speed: A Conservationist's Guide to Wildlife and Highways. White, Patricia A. Defenders of Wildlife 2007. http://www.defenders.org/programs_and_policy/habitat_conservation/habitat_and_highways/resources/getting_up_to_speed.php.

Resource guide targeted to conservation planners about integrating habitat planning and surface transportation planning. Includes compendium of relevant legislation and regulatory agencies and an overview of the transportation planning and environmental review processes.

Green Highways Partnership (web site), U.S. Environmental Protection Agency. <http://www.greenhighways.org/>.

A public-private partnership that utilizes integrated planning, regulatory flexibility, market-based rewards to incorporate environmental streamlining and stewardship in highways.

Interim Guidance for Implementing Key SAFETEA-LU Provisions in Planning, Environment and Air Quality for FHWA and joint FHWA/FTA Authorities. Federal Highway Administration, September 2, 2005. <http://www.fhwa.dot.gov/hep/igs1pja.htm>.

Summarizes key changes to the statutory requirements for planning and environmental reviews. Establishes guidelines for how FHWA Division and FTA Region Offices should administer and oversee highway and transit programs during the TEA-21/SAFETEA-LU transitional period. Covers planning, air quality, and environmental requirements.

The IPWG Work Plan. Federal Highway Administration 2007. http://www.environment.fhwa.dot.gov/integ/ipwg_workplan.asp.

Established by EO 13724 to ensure coordination and process improvement for transportation projects during the environmental review process, the Integrated Planning Work Group (IPWG) updated its work plan in 2007. The Work Plan identifies high-priority areas for work, and forms three subgroups to advance coordination under these areas: 1) outreach and training on new transportation planning regulations; 2) outreach and training on *Eco-logical* and addressing implementation barriers; and 3) state of the practice on tiering, corridor, and subarea studies. A work group was formed for each one of these areas consisting of representatives from each of the Task Force agencies.

IPWG Case Studies. Federal Highway Administration 2007. <http://www.environment.fhwa.dot.gov/integ/eo13274.pdf>.

In this publication, the IPWG outlines and analyzes a series of six case studies of effective integrated planning activities in the United States. Each case incorporated resource consideration in planning; provided a catalyst for early interagency consultation; had a transferable technical approach; and integrated resource agencies with data, staff time, and stakeholder communications.

“Linking Conservation and Transportation Planning Workshops,” *Successes in Stewardship Monthly Newsletter*, Federal Highway Administration, January 2007. <http://www.environment.fhwa.dot.gov/strmlng/newsletters/jan07nl.asp>.

Presents an overview of a three-part series of facilitated workshops hosted by the FHWA Office of Project Development and Environmental Review, NatureServe, and Defenders of Wildlife, which focused on identifying the current process for performing planning and NEPA studies in support of project-level decisions, and developing strategies for achieving greater integration in this work. Includes links to resources.

Linking Conservation and Transportation: Using the State Wildlife Action Plans to Protect Wildlife from Road Impacts, Defenders of Wildlife, May 2007. <http://www.defenders.org/resources/publications/>.

Reviews all 50 State Wildlife Action Plans, provides a summary of issues addressed in the plans, and provides initial guidance to conservation planners on taking advantage of new Federal transportation legislation.

National Biological Information Infrastructure (NBII) (web site).
<http://www.nbio.gov/portal/server.pt>.

NBII is a broad, collaborative program to provide increased access to data and information on the nation's biological resources.

National States Geographic Information Council (NSGIC) (web site). <http://www.nsgic.org/>.

NSGIC is an organization committed to efficient and effective government through prudent adoption of geospatial information technologies. State summaries and contact person for each state available at:

NatureServe (web site). <http://www.natureserve.org/getData/index.jsp>.

NatureServe and its international network of member programs (including state natural heritage programs in each state) are a leading source for reliable scientific information about species and ecosystems of the Western Hemisphere. The NatureServe web site serves as a portal for accessing data on threatened and endangered species, and ecological systems.

NCHRP Report 541: Consideration of Environmental Factors in Transportation Systems Planning, National Cooperative Highway Research Program, Transportation Research Board, August 2005. http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp_rpt_541.pdf.

Includes an extensive review of literature related to linking conservation and transportation planning. Identifies five overarching principles essential to the concept of planning for sustainability. Finds that integration of conservation and transportation planning is not typically a priority of either discipline.

NCHRP Project 25-22: Technologies to Improve the Environmental Decision-Making Process, National Cooperative Highway Research Program, Transportation Research Board, September 2000. <http://trb.org/publications/nchrp/cd-14/>.

Identifies, critiques, and showcases current and emerging technologies that support the integration of environmental considerations into transportation planning, design, construction, maintenance, and operations.

NCHRP Research Results Digest 304: *Technologies to Improve Consideration of Environmental Concerns in Transportation Decisions*. National Cooperative Highway Research Program, Transportation Research Board, June 2006.

Presents summary of findings presented in NCHRP Project 25-22 (above).

OpenGIS (web site), Open Geospatial Consortium (OGC). <http://www.opengeospatial.org/>.

An international industry consortium of more than 300 companies, government agencies, and universities participating in a consensus process to develop publicly available interface specifications. [OpenGIS® Specifications](#) support interoperable solutions.

Placematters (web site). <http://www.placematters.org>.

Provides information and resources on land use and watershed-based planning.

Planning and Environmental Linkages (web site), Federal Highway Administration. <http://www.environment.fhwa.dot.gov/integ/index.asp>.

Offers a clearinghouse of information developed and compiled by the FHWA and its partners to assist in strengthening planning and environment linkages.

Road Ecology Center (web site), University of California-Davis. <http://roadecology.ucdavis.edu/>.

Provides examples of integrated planning and researches ways to advance various approaches. Provides wide selection of publications on integrating conservation and transportation planning, and addresses both systems-level and project planning issues.

State and Metropolitan Planning Agencies Report Using Varied Methods to Consider Ecosystem Conservation, U.S. General Accounting Office, May 2004.

Surveys 36 transportation planning agencies and finds that 31 consider ecosystem conservation but with a wide array of approaches.

Strategic Conservation Planning Using the Green Infrastructure Approach, The Conservation Fund, January 2007. <http://www.conservationfund.org/node/16>.

Provides “why” and “how to” information on planning, designing, and implementing interconnected green space systems in conjunction with existing grey infrastructure.

Transportation Collaboration in the States, The National Policy Consensus Center for the Federal Highway Administration, June 2006.

Focuses on the use of collaborative practices to address a range of transportation planning and development issues. Notes that divided governance and siloed

transportation agencies detract from a collaborative environment. Provides examples of states that are coordinating interagency cooperation.

Transportation Research Circular E-C106: Environmental Geospatial Information for Transportation, Transportation Research Board, November 2006.

Details a 2006 peer exchange in Washington focused on reviewing the data perspectives of both conservation and transportation agencies, evaluating data needs, reviewing challenges for coordinating and sharing data, and discussing ways to further build capacity for data management and data sharing between agencies. The event was the second such exchange; the first was held in Massachusetts in 2003 (above). It was agreed upon that the legislative intent of SAFETEA-LU section 6001 and 6002 could not likely be fulfilled without using advanced geospatial applications.

Waterspace (web site), U.S. Environmental Protection Agency. <http://www.epa.gov/waterspace/toolpage.html>.

Provides tools aimed at watershed protection and planning.

Appendix B

Survey Overview

Survey Overview

The objective of this survey was to determine from both the environmental and transportation communities how, and to what extent, environmental and transportation planning currently is being integrated. The surveys focused on answering the following questions:

- How well do the transportation and environmental communities understand the need for and purposes of integrated planning?
- What degrees of success are agencies experiencing?
- How is each community incorporating plans and data from the other in their specific planning and project activities? What tools and expertise are useful in supporting these efforts?
- What barriers and potential solutions are being identified?
- What examples of innovation are available that may be useful to other agencies?

The responses to this survey provide a “snapshot” of what these communities are doing now, what successes are being achieved, what is working and what is not, and what next steps are needed to support better integrated planning.

■ Survey Design

Information was collected by two parallel surveys, conducted for six weeks in the spring of 2008. One survey was geared towards environmental practitioners (state and Federal resource agencies, nonprofit organizations) and the other to transportation practitioners (state DOTs, regional/local planning organizations, and Federal agencies). The content of both surveys was consistent, with similar questions asked of each sector. (The complete survey questions are provided in Appendices E and F.) The surveys were designed to direct respondents to different parts of the survey based on their answers to key questions – asking distinct sets of questions of those who had experience with integrated planning and of those who did not have such experience.

The survey gathered both quantitative data and qualitative responses from survey respondents to provide a better understanding of the extent and depth of integrating environmental and transportation planning. Respondents were asked questions about their experience linking environmental and transportation planning efforts, the degree of success of these efforts, and what concerns or barriers exist. They also were asked to provide specific examples of how they successfully integrated environmental resource and

transportation planning. Information also was gathered on the type of expertise, data, plans, models, and tools respondents felt were most useful for integrated planning. Respondents were given the option to include comments where appropriate.

A variety of question formats were used in order to solicit information from both practitioners with in-depth understanding of planning integration practice as well as those with less familiarity with these concepts. The format of the survey responses ranged from simple yes or no responses, discrete choice selections from a list of options, ranking the importance of various tools and data, and open ended text boxes for descriptions and comments. Tabulation of the survey included a count of respondents for each available response (such as ranking based on a scale of 1 to 5 with 1 being less useful and 5 being most useful).

■ **Survey Distribution**

To encourage wide distribution the surveys were developed in an Internet-based format and the link to the survey was sent out in e-mail messages to targeted constituencies. The survey links were e-mailed to the membership of a number of transportation and resource planning agencies, nonprofit organizations, and individuals. The research team consulted with various organizations – including AASHTO, AMPO, FHWA, AFWA, and NatureServe’s network – to ensure broad distribution to relevant stakeholders. The surveys also were publicized on select conservation and transportation web sites. Respondents were encouraged to forward the survey to other practitioners with experience in the topic. This forwarding appeared to occur frequently – an indication of the interest and enthusiasm among practitioners regarding integrated planning approaches. This indirect distribution helped in casting a broader net to collect information and valuable examples of success. However, it is important to note that because respondents were self-selected the survey results do not provide a statistically accurate representation of the state of practice.

■ **Limitations of Survey Results**

A total of 376 survey responses were submitted. Some of these responses were duplicates or provided no substantive information and were not included in the analysis. In addition, some stakeholders were underrepresented among the survey respondents.

Of the 376 surveys submitted 55 percent were completed fully; in addition many incomplete responses provided some substantive information and were included in the analysis. Over 16 percent of respondents provided only demographic information; these responses were excluded in the analysis. Lastly, few respondents provided information on latter questions in the survey, which allowed respondents to provide additional examples of successful integration. The low response to these optional questions does not detract from the information that was provided.

In order to analyze the survey results, the number of responses was changed by filtering out incomplete and duplicate respondent entries. The exclusion of incomplete responses and duplicate entries permits an accurate accounting of the survey responses for the subsequent analysis and discussion. In the case of duplicate entries, responses were filtered so only the latest and most complete response was included in the analysis.

In a few instances, respondents inadvertently filled out the survey that was not geared for them (e.g., DOT agency staff completed the environmental survey instead of the transportation survey). The quality check of survey responses, therefore, included moving 10 responses from the environmental survey to the transportation survey and moving two responses from the transportation survey to the environmental survey.

The survey did not require respondents to provide contact information; this was an optional field. Less than 50 percent of respondents (184) provided contact information. Of these 13 were duplicate respondent entries. In instances where duplicate responses were identified, the research team consolidated the related responses and verified their accuracy with the respondent.

The range of respondents was fairly comprehensive; however, some stakeholder groups were not well represented among the survey responses. For example, from some Federal agencies only a few individuals responded; one response from a tribal agency was received.

Despite these limitations, the surveys generated substantial useful information – providing a valuable overview of the state of practice, insights into the issues that agencies are confronting, and specific examples of agency success. These findings are discussed in Section 3.0.

■ Survey Respondents

A total of 288 unique responses were assessed, reflecting a roughly equal number of responses from the environmental (137) and transportation (151) communities. This strong cross-section of respondents enabled the research team to compare the perspectives and experiences of practitioners in both disciplines – examining both commonalities and diverging opinions about the State of integrated planning practice. Tables B.1 and B.2 summarize the organizational affiliations of respondents.

Table B.1 Environmental Respondents by Category

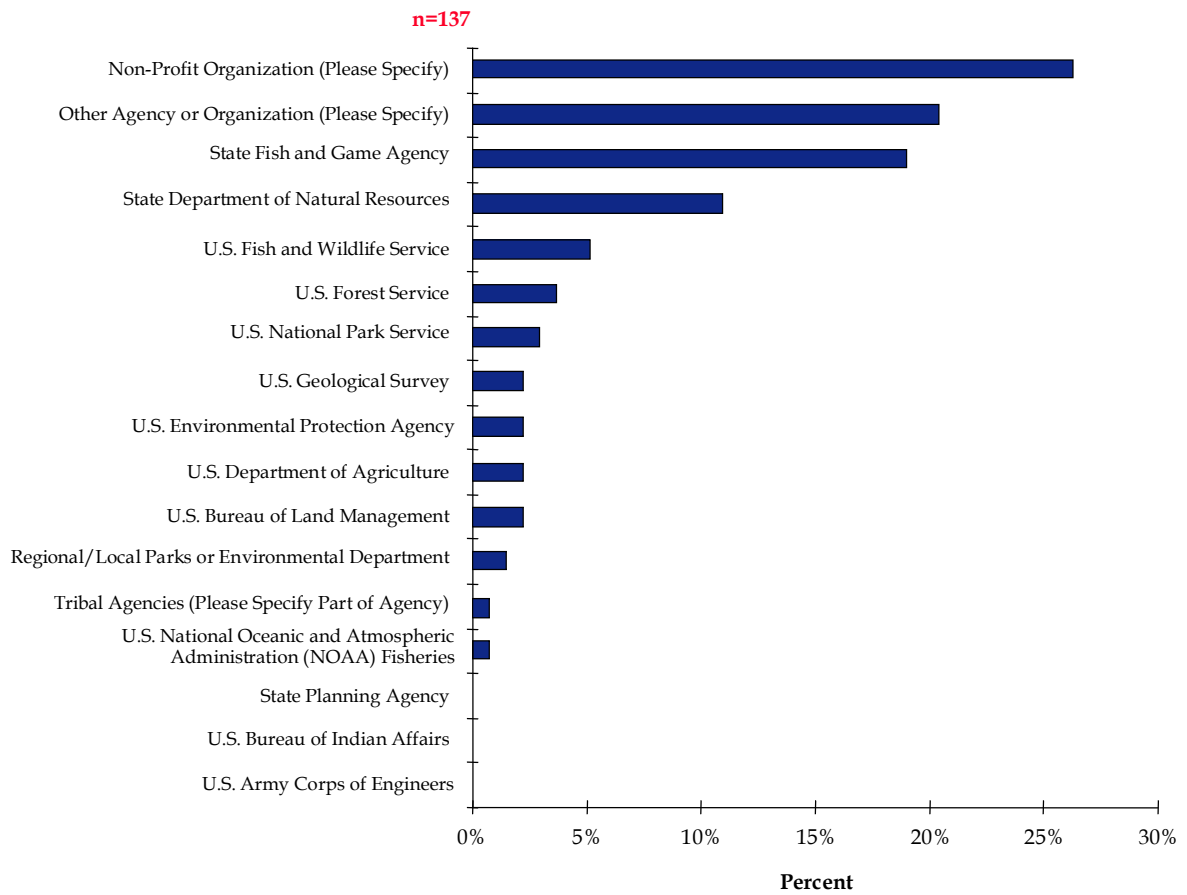
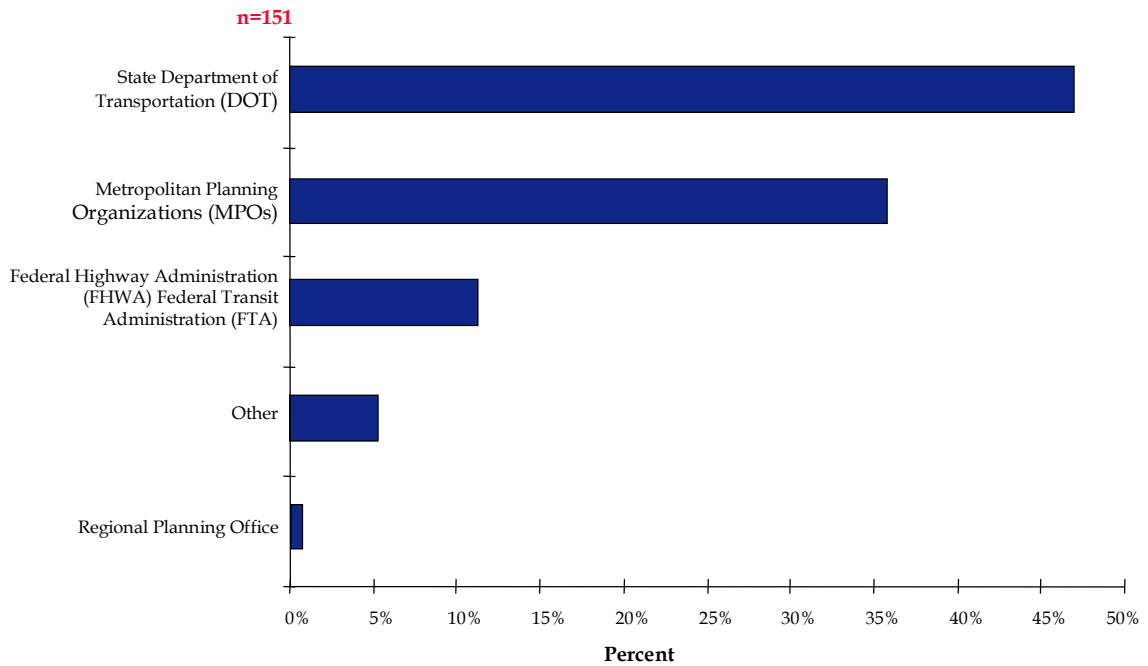


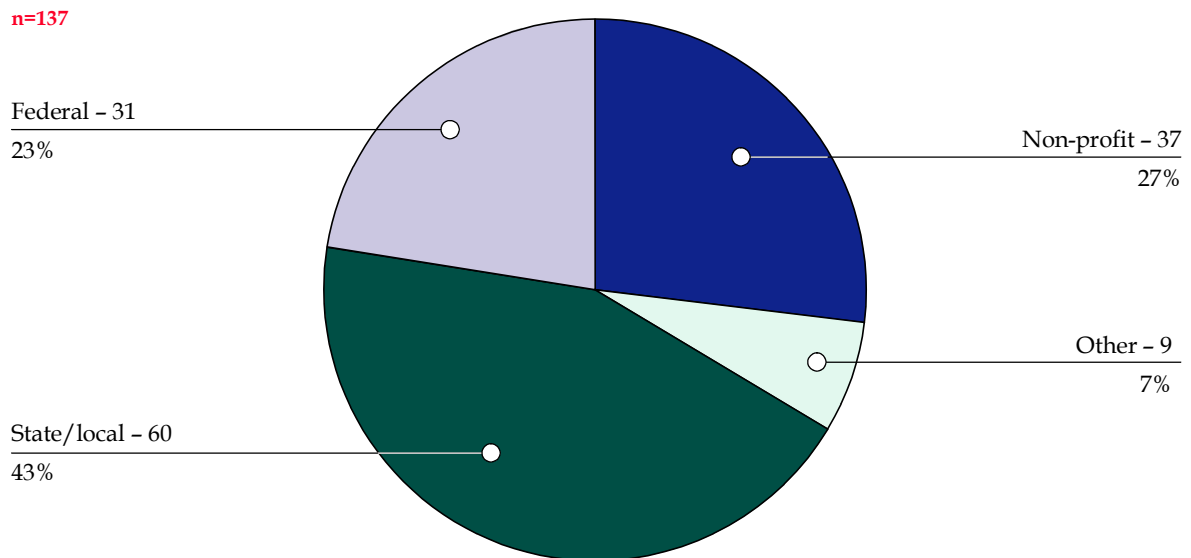
Table B.2 Organizational Affiliation of Transportation Respondents



Environmental Respondents

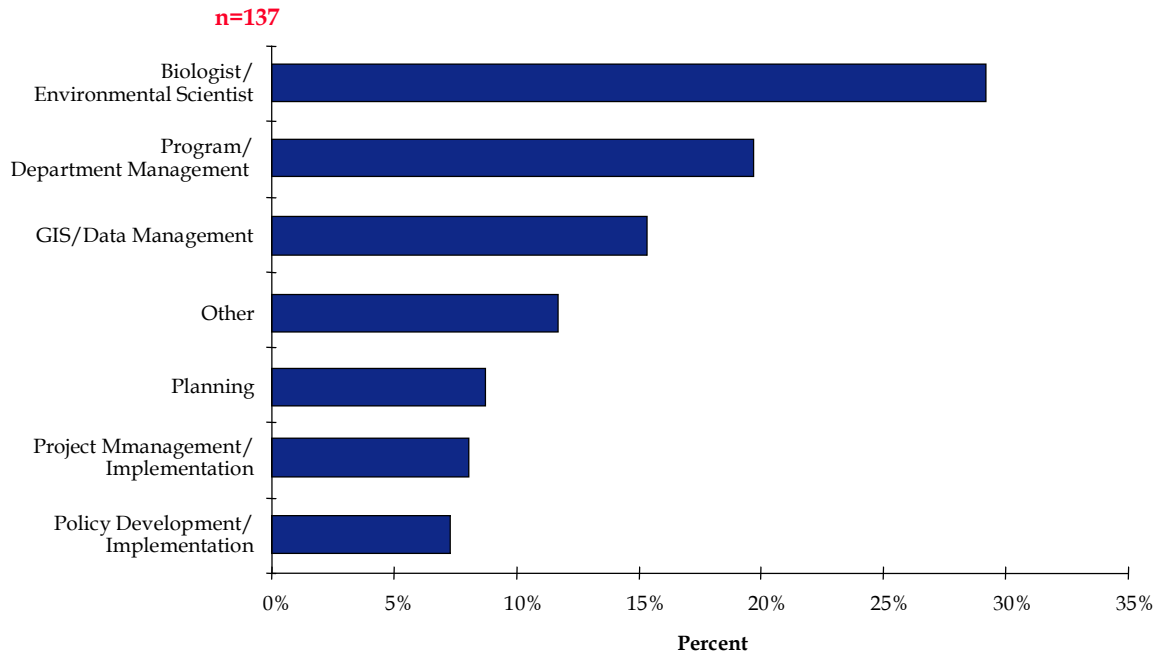
There were a total of 137 unique responses from the environmental agencies and organizations (Figure B.1). Of that total most of the respondents were from state and local agencies (43 percent) followed by nonprofit organizations and Federal agencies. There were a handful of respondents that fell into the “other” category; these include representatives from universities, contractors, and a Tribal agency. The state and local agencies represented were primarily state fish and game and state natural resource agencies, and the nonprofit organization respondents consisted mostly of staff from The Nature Conservancy.

Figure B.1 Environmental Respondents by Category



About 55 percent (75) of respondents were identified by location, with 30 states and the District of Columbia (D.C.) represented among the responses. Other respondent locations included one each from Manitoba, Canada; Switzerland; and the Virgin Islands. Of the states represented, Wisconsin had the highest number of responses followed by Colorado and Virginia. Over 45 percent of the 137 respondents answered that they are actively working with transportation agency staff to integrate transportation planning efforts with environmental planning efforts. Over 29 percent of respondents identified their primary role as Biologist/Environmental Scientist; 20 percent identified themselves as Program/department management staff. Table B.3 summarizes the professional roles of the environmental respondents.

Table B.3 Professional Roles of Environmental Respondents



Transportation Respondents

There were a total of 151 unique responses grouped by four categories (Figure B.2). Respondents from state agencies make up 49 percent of the survey audience. The two responses in the “other” category include a representative from a national preservation policy group and from a university. Over 63 percent of respondents (96) were identified by location, with 38 states and D.C. represented among the responses. The other respondent location was Yukon, Canada. Texas leads with the highest number of responses, followed by Utah respondents. Over 74 percent of the 151 respondents answered that they are working with environmental/natural resource agency staff to integrate environmental resource planning into transportation planning. Over 40 percent of respondents identified their primary role in transportation as in long-range planning; 26 percent identified themselves as environment-related staff. Table B.4 summarizes the professional roles of the transportation respondents.

Figure B.2 Transportation Breakdown

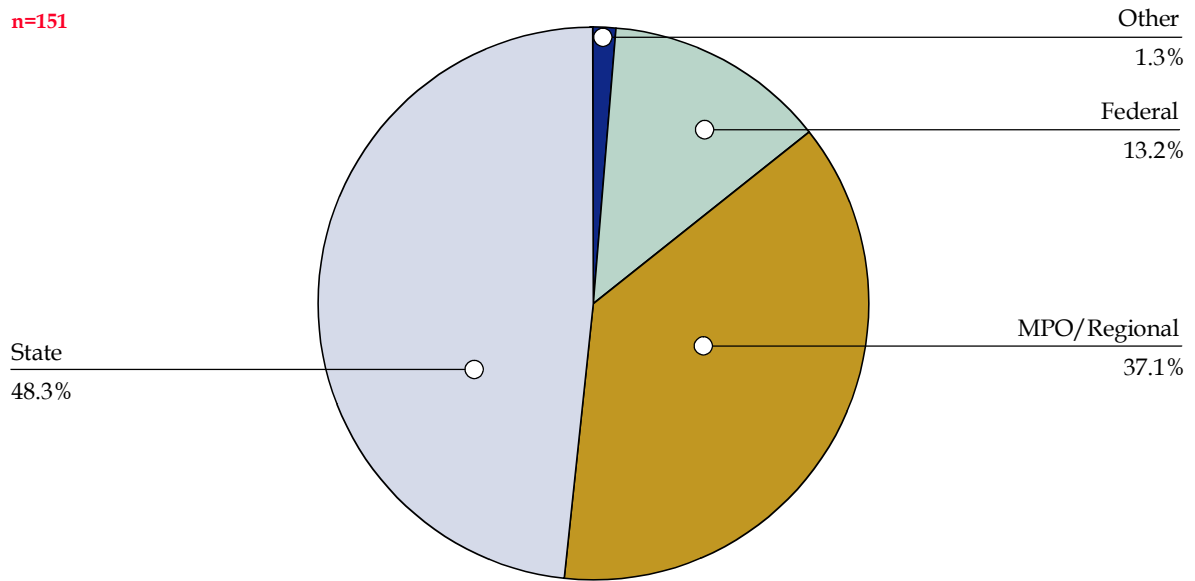
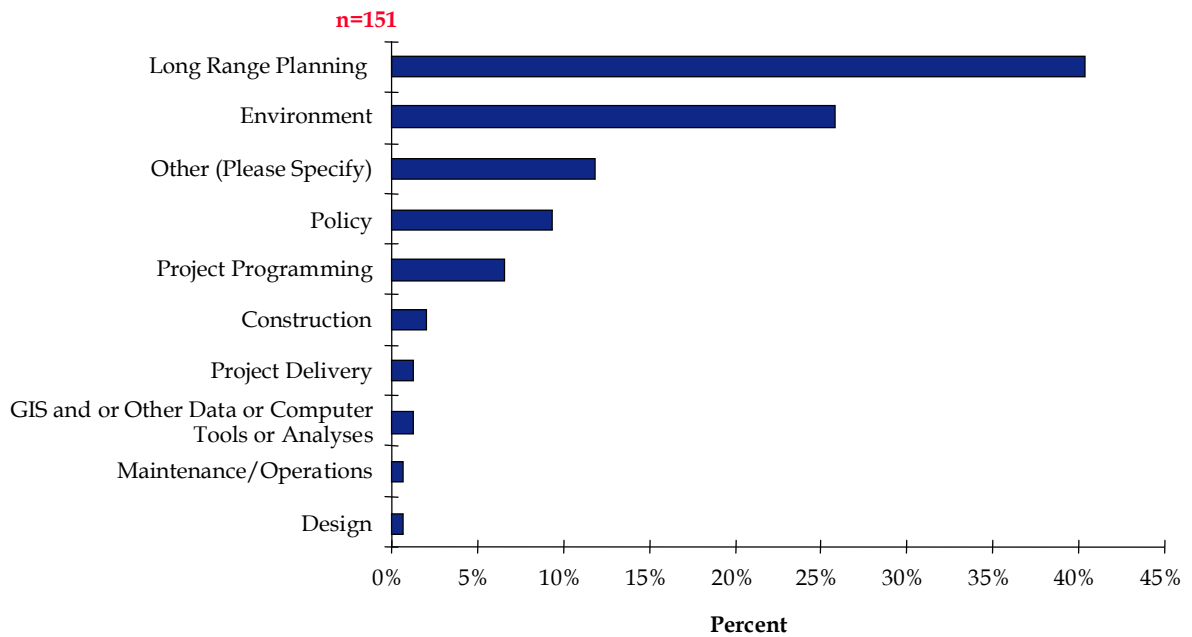


Table B.4 Professional Roles of Transportation Respondents

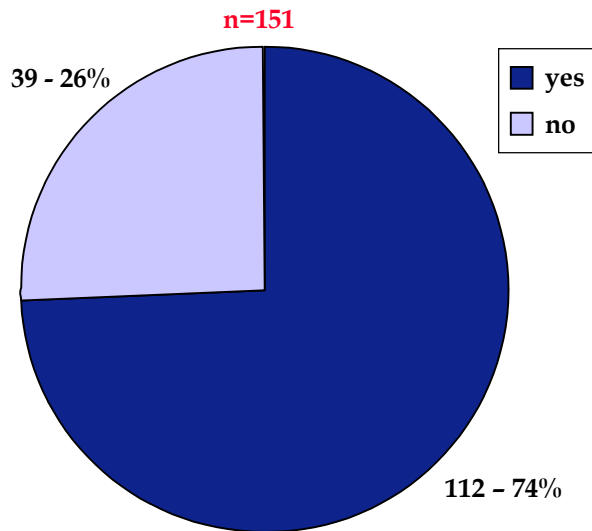


Appendix C

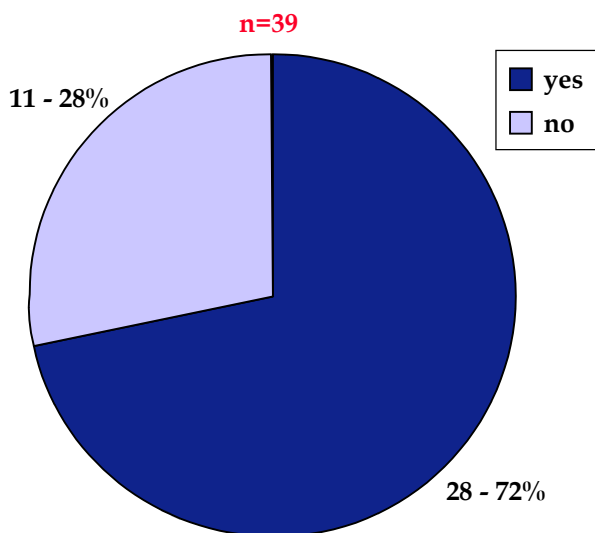
*Summary of Survey Responses from
Transportation Community*

Summary of Survey Responses from Transportation Community

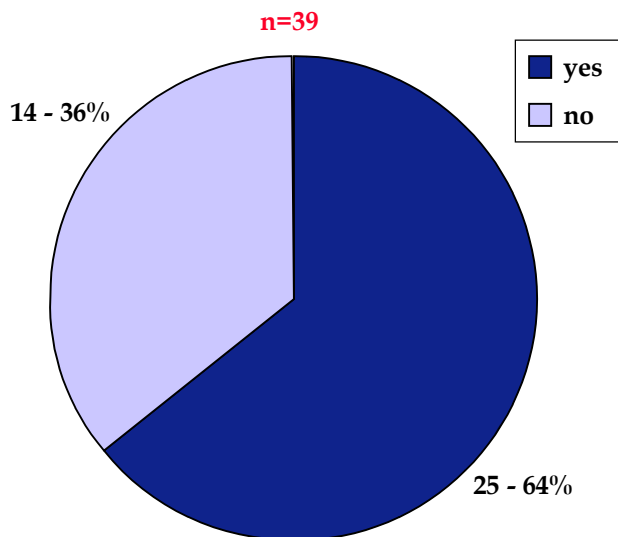
Question 1: Are you working with environmental/natural resource agency staff to integrate environmental resource planning into transportation planning including the integration of data and involvement of agency personnel? (QT4)



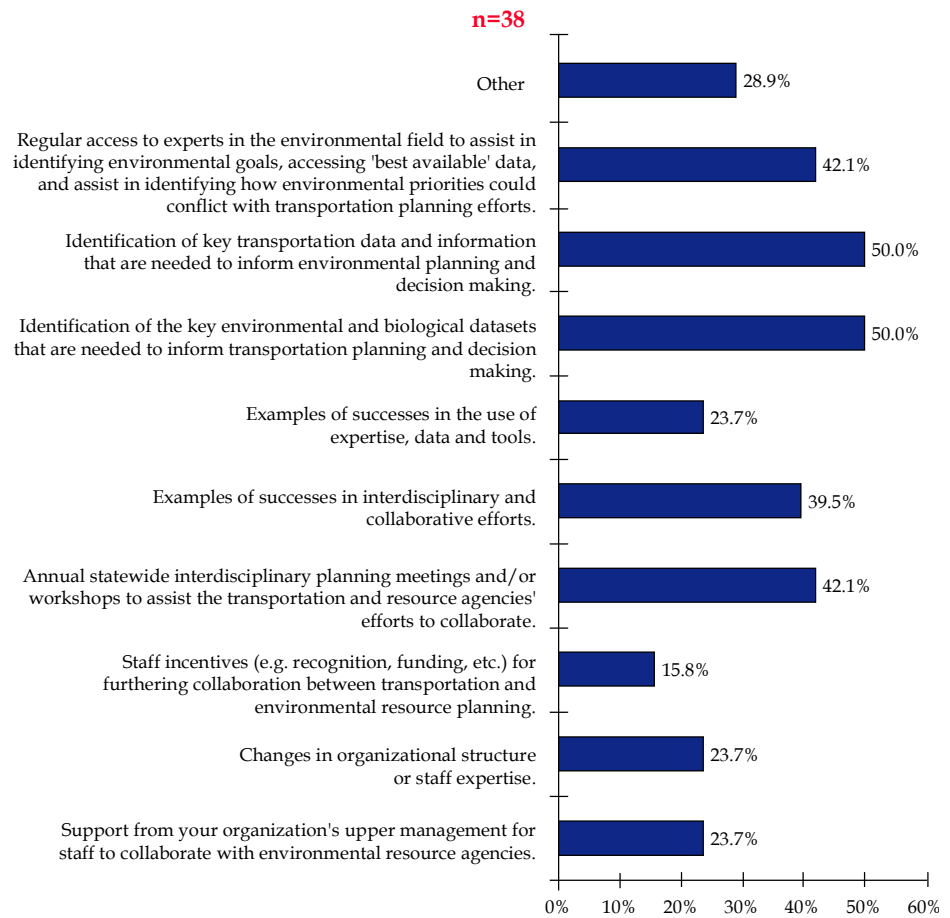
Question 2: Are you familiar with the processes and outcomes involved in environmental resource planning? (QT5)



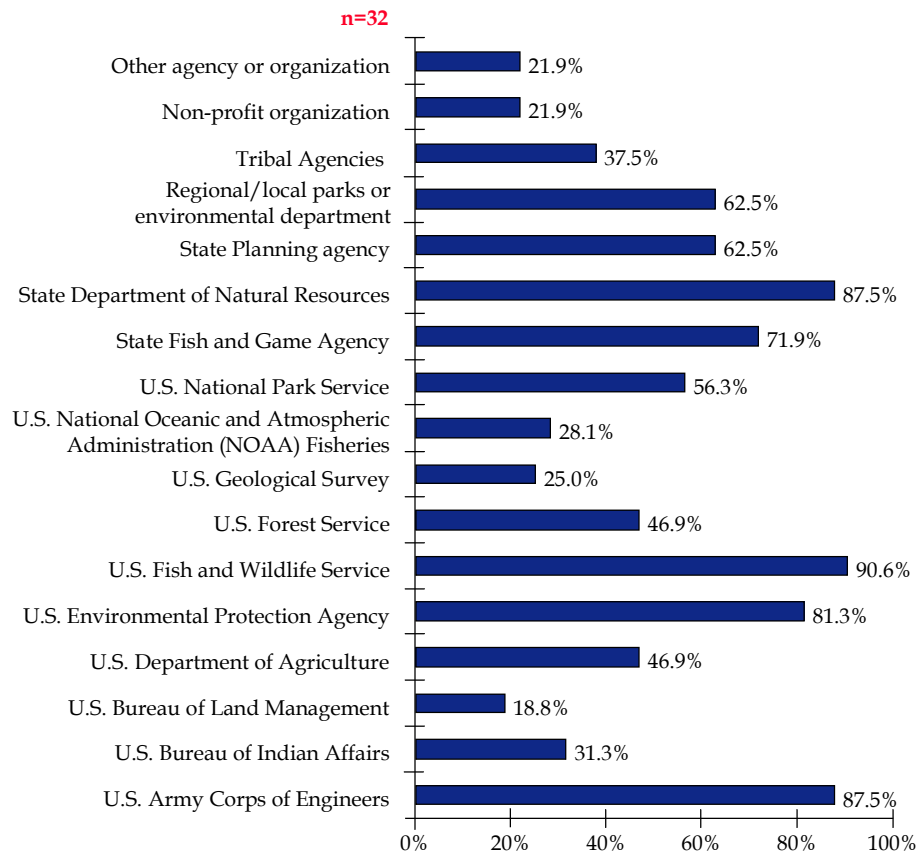
Question 3: Do you have a good understanding of what it means to successfully link environmental and transportation planning? (QT6)



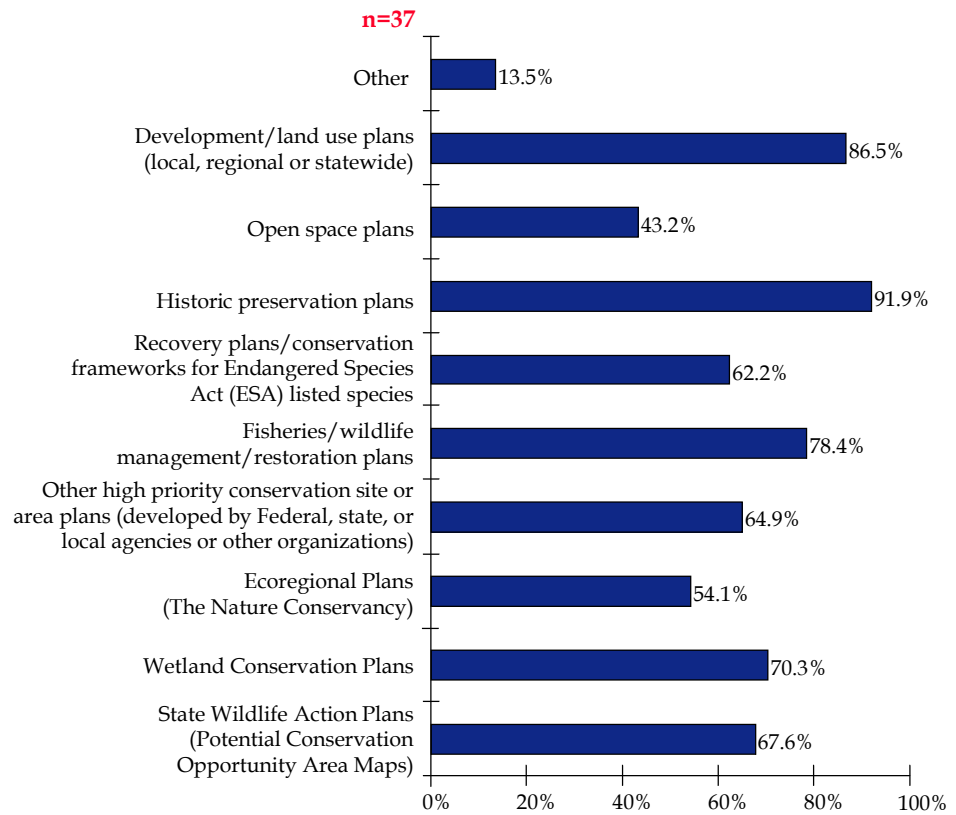
Question 4: What would help you the most in starting the process of linking environmental and transportation planning? (QT7)



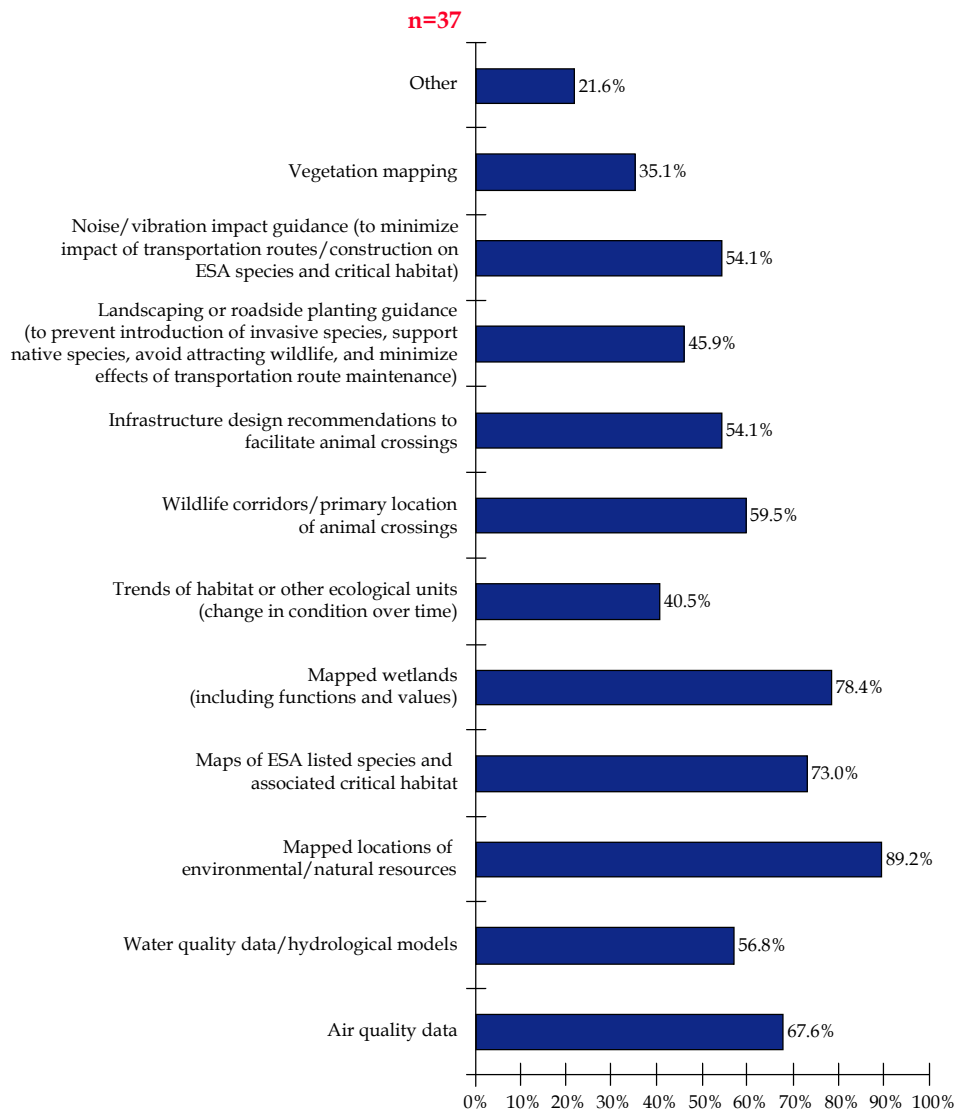
Question 5: Which environmental and/or natural resource agencies or organizations would you consult with as part of your transportation planning process? (QT8)



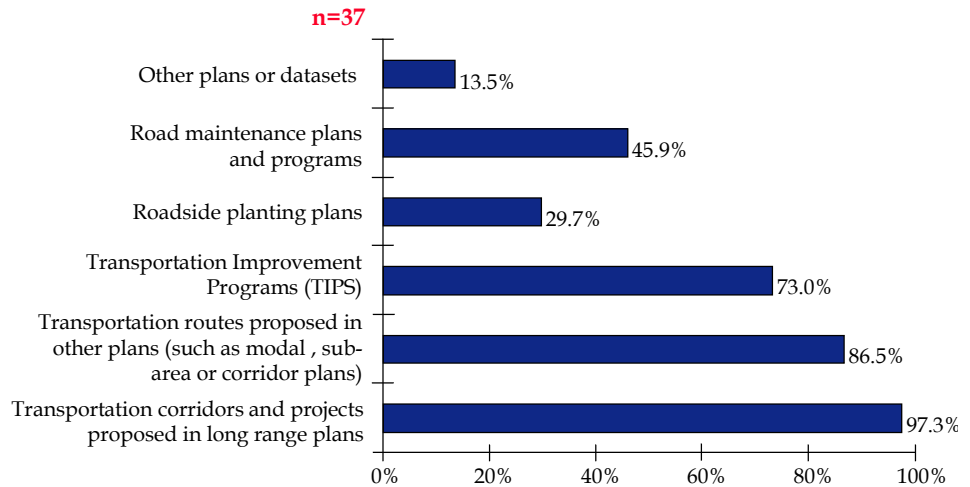
Question 6: What environmental/natural resource plans do you think would be most useful to inform the transportation planning process? (QT9)



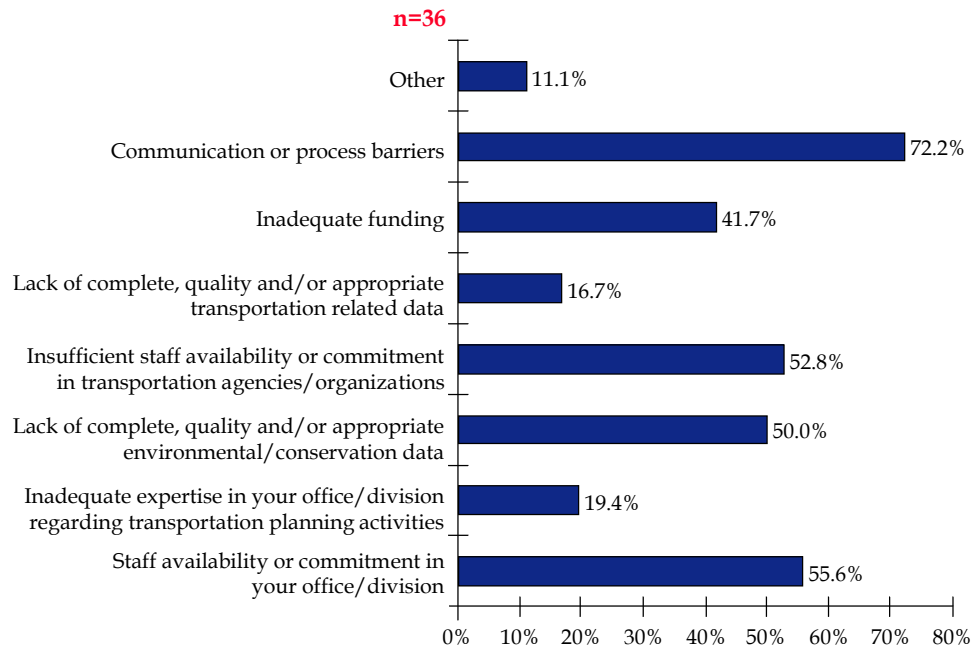
Question 7: What environmental/natural resource data do you think would be most useful to inform the transportation planning process? (QT10)



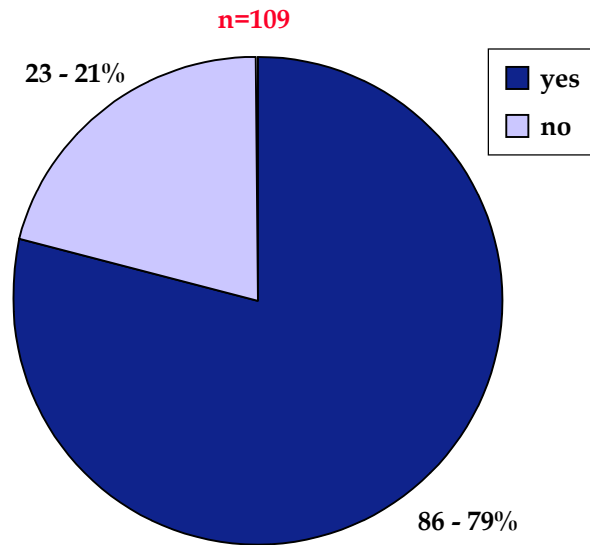
Question 8: What types of transportation plans and/or information do you think would be useful to environmental/natural resource agencies to inform their planning process? (QT12)



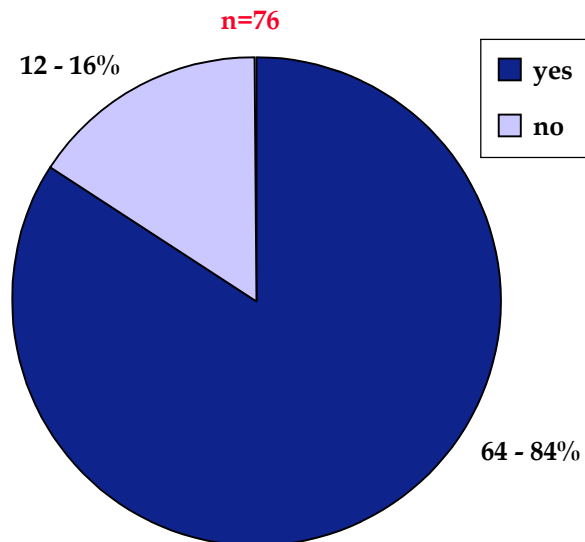
Question 9: What do you perceive as the primary obstacles to integrating environmental resource and transportation planning efforts? (QT14)



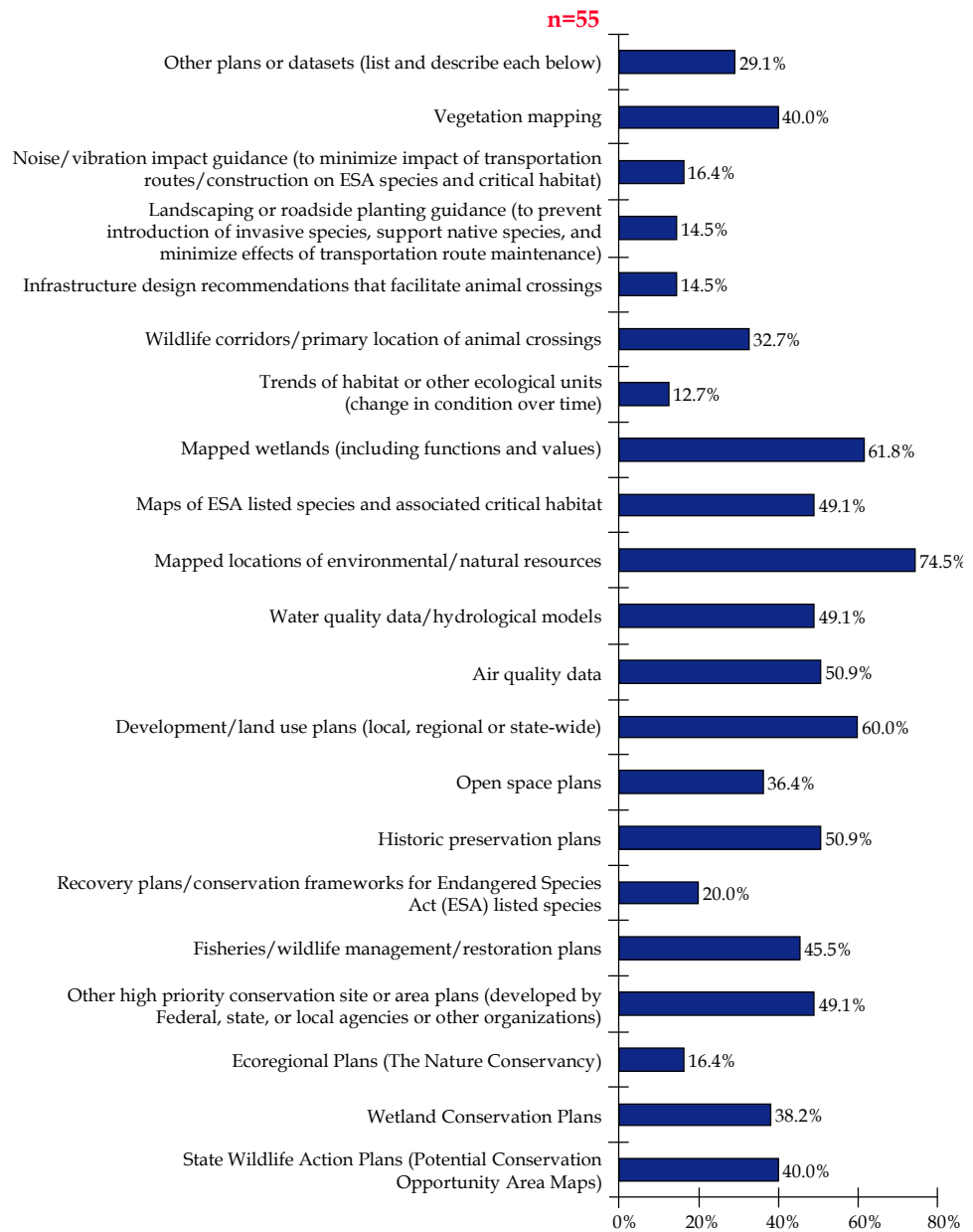
Question 10: Overall, do you think you have been successful in improving the effectiveness of your transportation planning process by integrating environmental resource planning? (QT17)



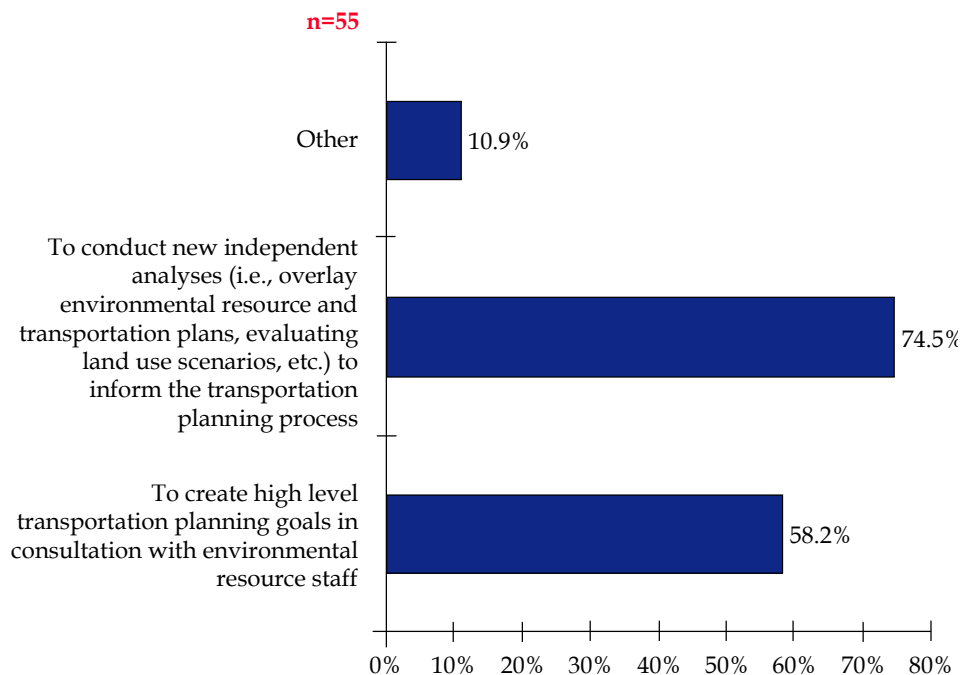
Question 11: Do you think that environmental resource planning in your area has been informed and improved by integrating transportation planning? (QT19)



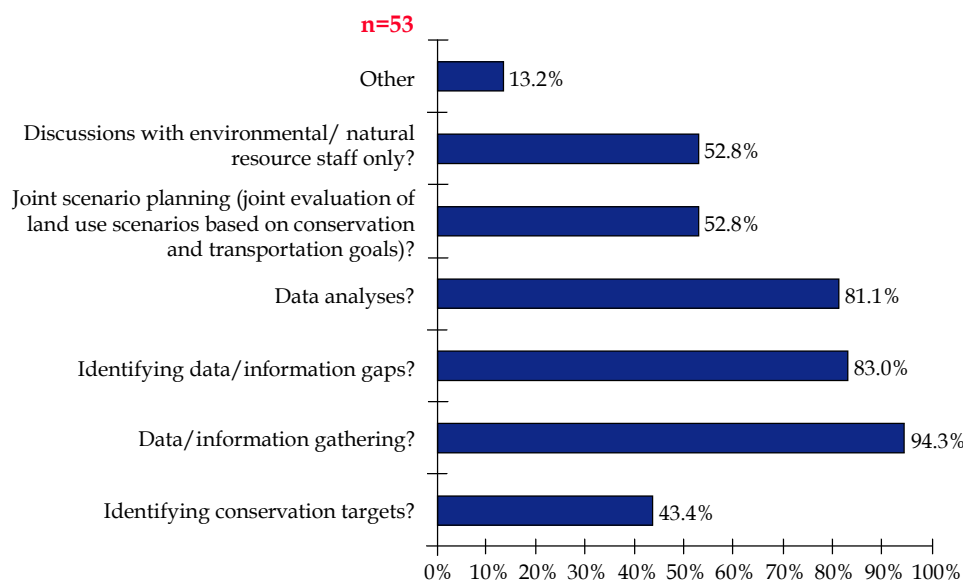
Question 12: What type of environmental resource plans and data were available to you? (QT22)



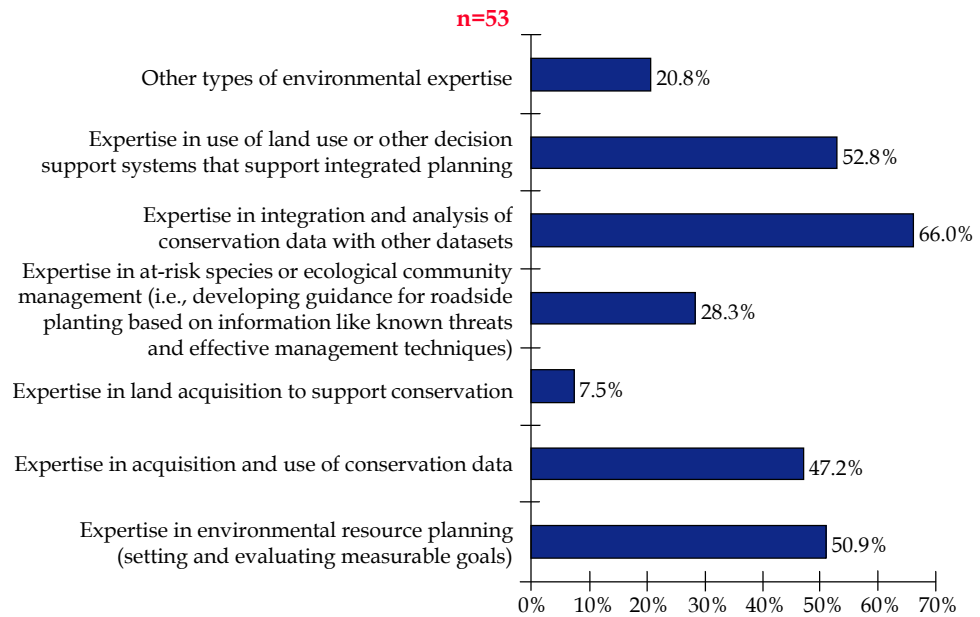
Question 13: How did you use the environmental resource plans, data, and/or maps? (QT24)



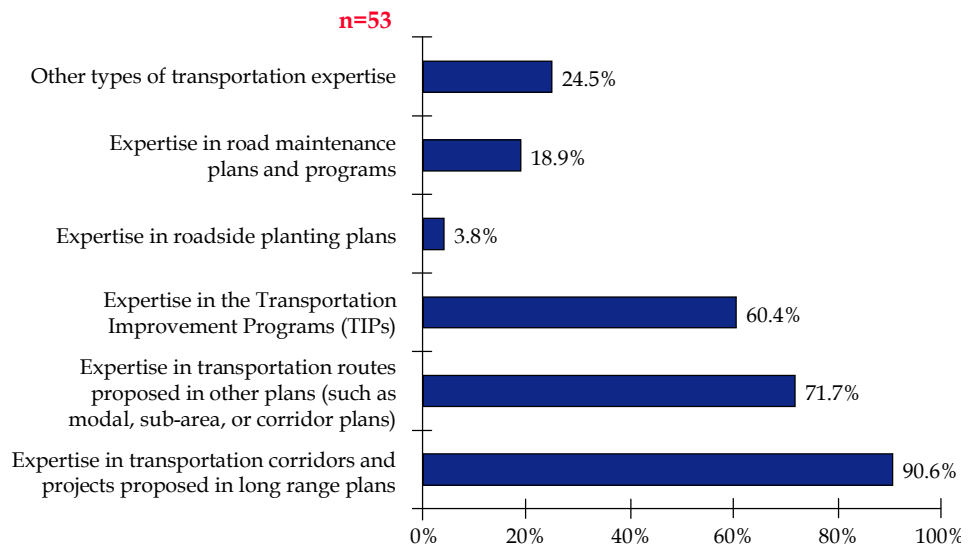
Question 14: Describe the integrated planning process that you used. Did the process involve (QT25)



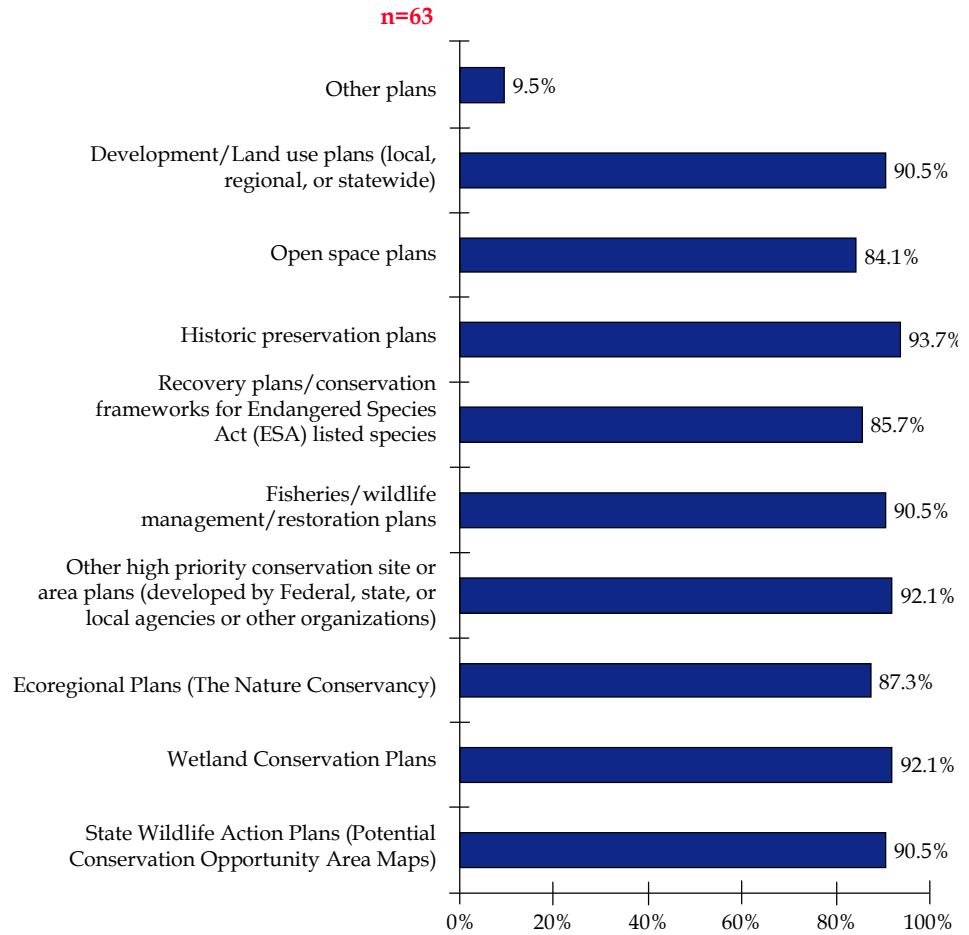
Question 15: What are your top choices of environmental expertise that were most helpful in your success of integrating environmental and transportation planning? (QT33)



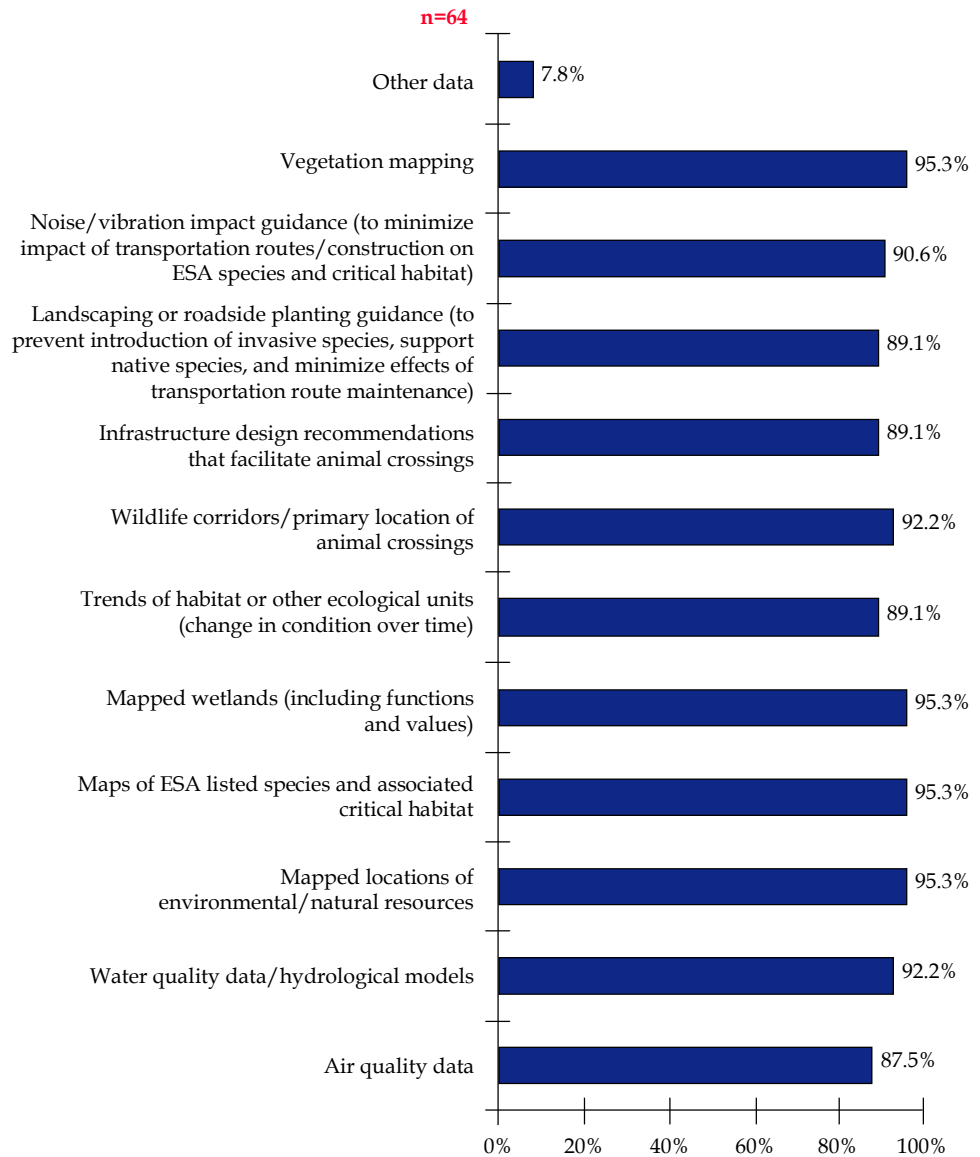
Question 16: What are your top choices of transportation expertise that were most helpful in your success of integrating environmental and transportation planning? (QT34)



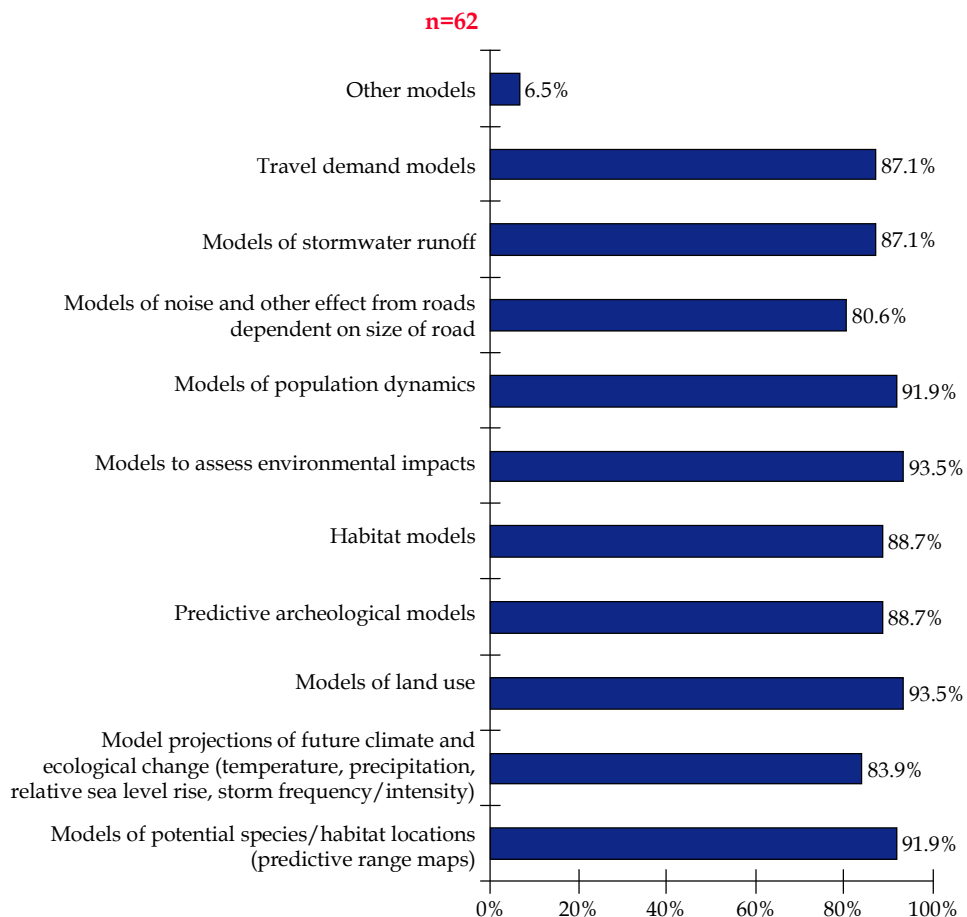
Question 17: Which of the environmental/natural resource plans listed below are (would be) most useful in achieving integrated planning? (QT35)



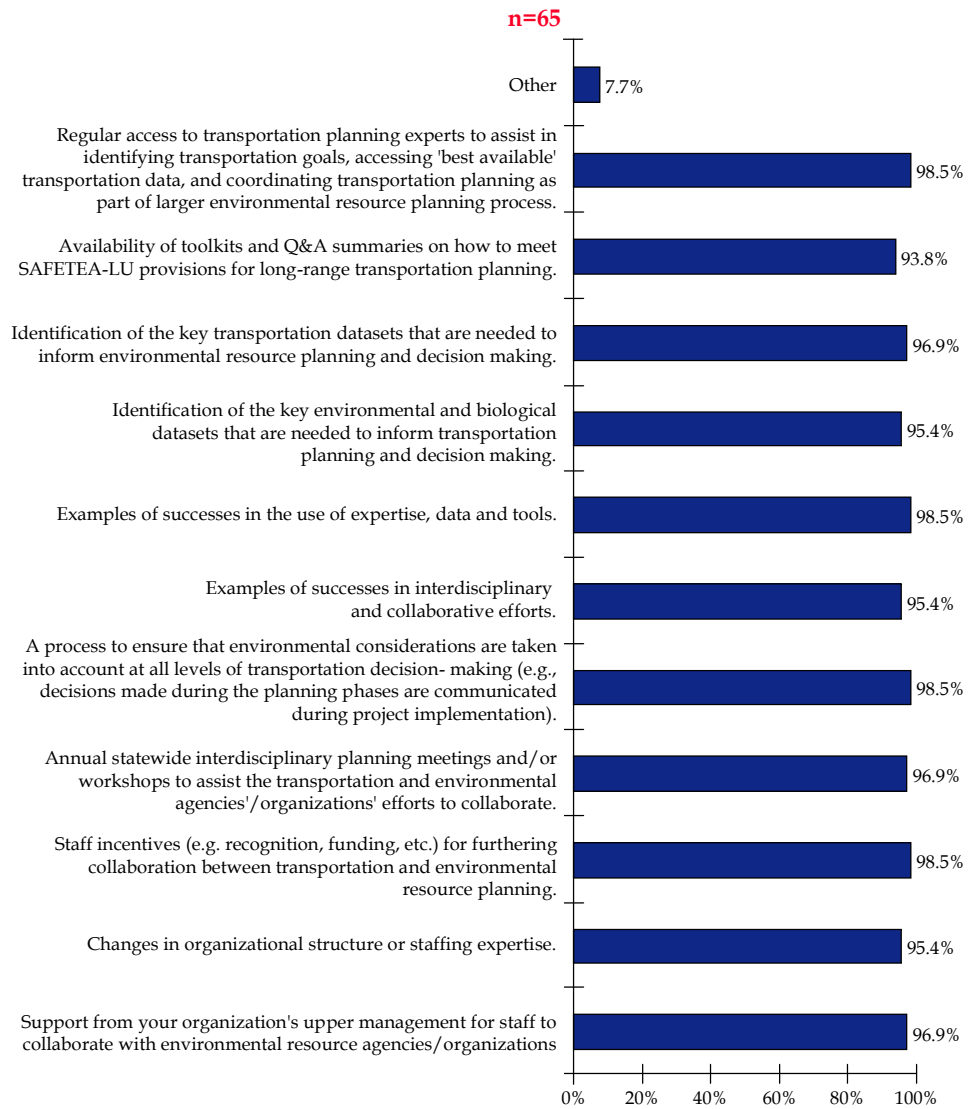
Question 18: Which of the environmental/natural resource data listed below are (would be) most useful in achieving integrated planning? (QT36)



Question 19: Are there any specific modeling outputs (spatial and temporal scales) that are (would be) useful in achieving integrated planning? (QT37)



Question 20: Which of the following are most useful in supporting integrated planning? (QT38)

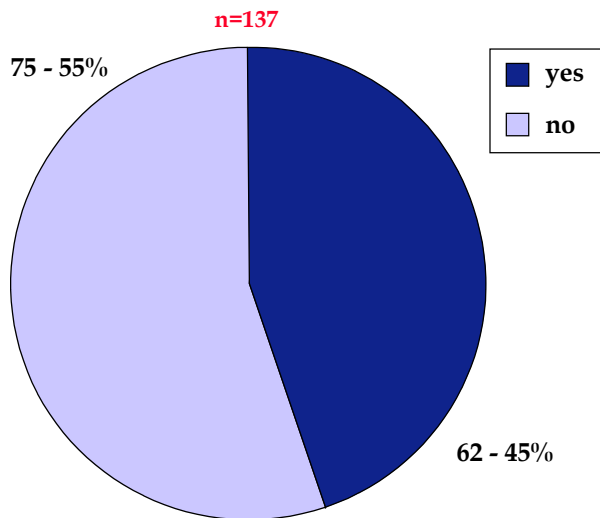


Appendix D

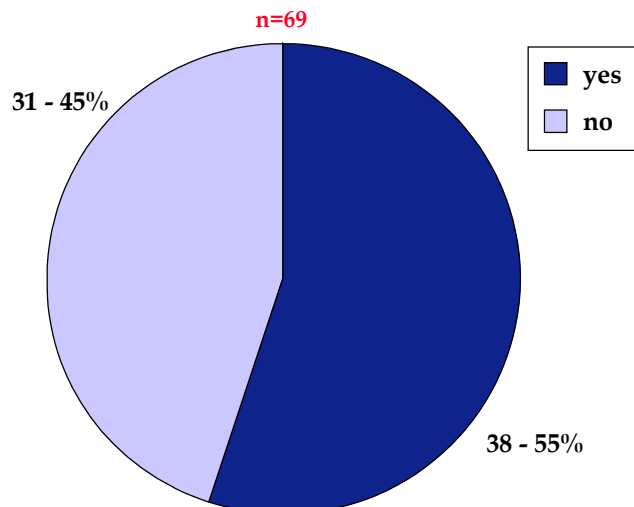
*Summary of Survey Responses from
Environmental Community*

Summary of Survey Responses from Environmental Community

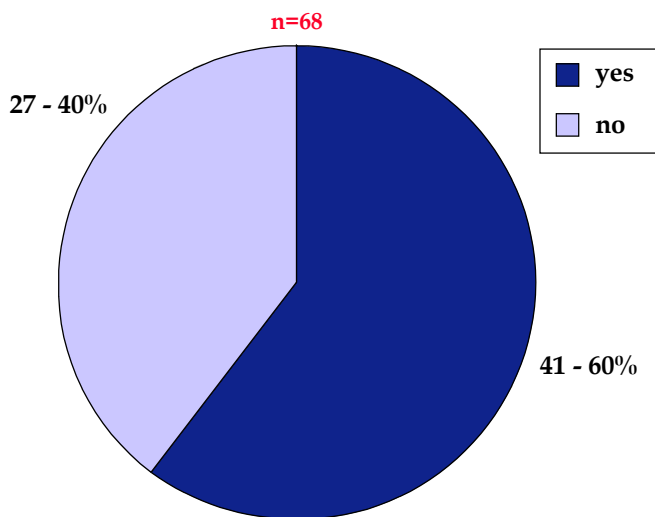
Question 1: Are you actively working with transportation agency or organization staff to integrate transportation planning efforts with your environmental planning efforts including the integration of data and involvement of agency personnel? (QE4)



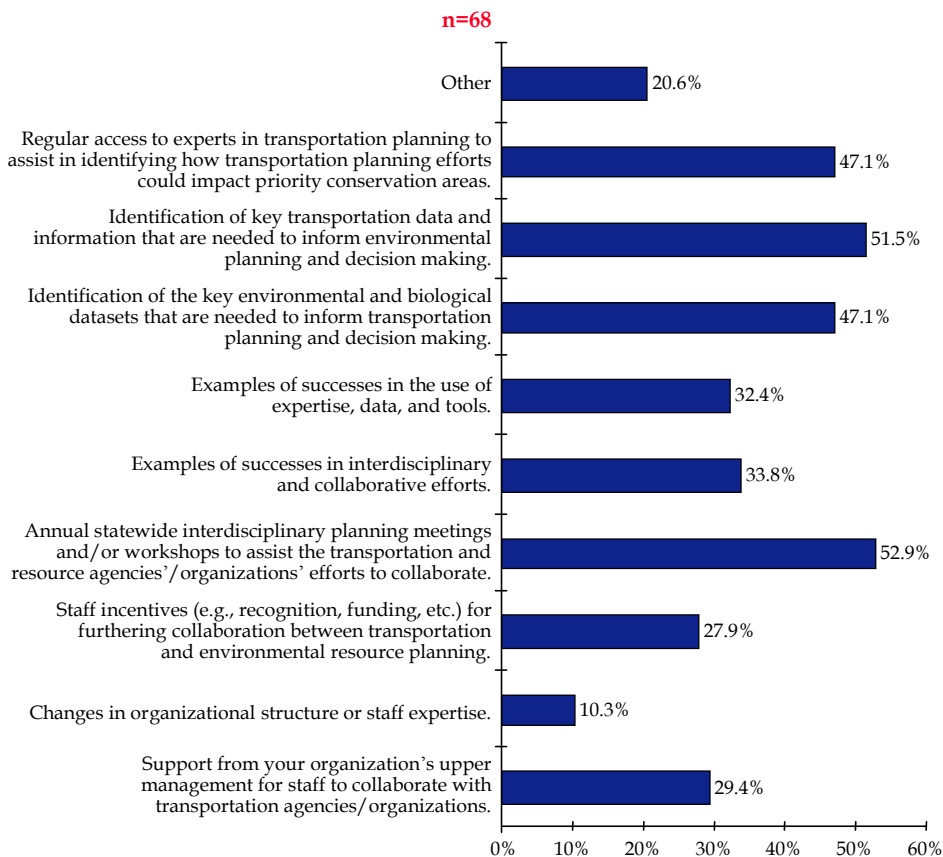
Question 2: Are you familiar with the processes and outcomes involved in transportation planning? (QE5)



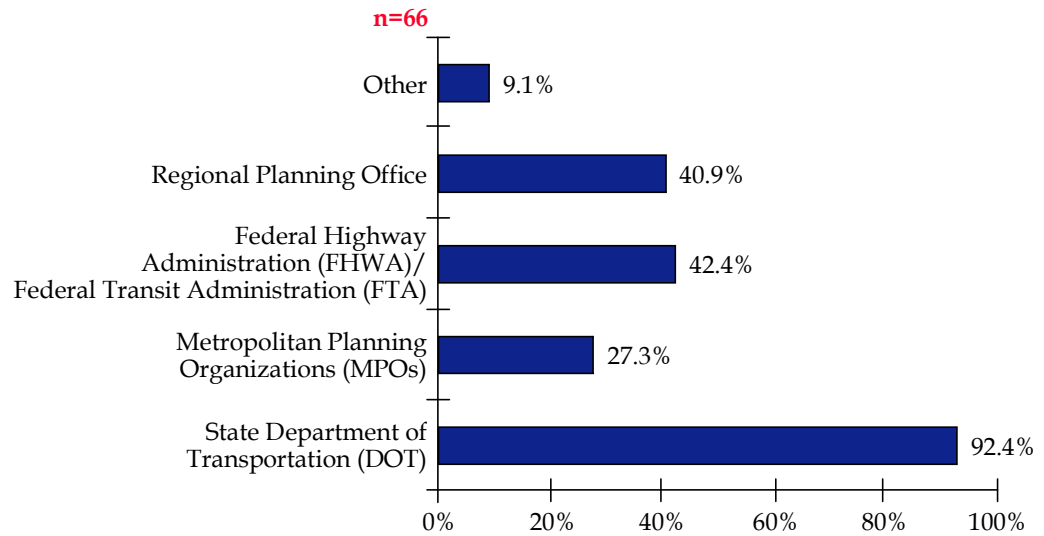
Question 3: Do you have a good understanding of what it means to successfully link environmental and transportation planning? (QE6)



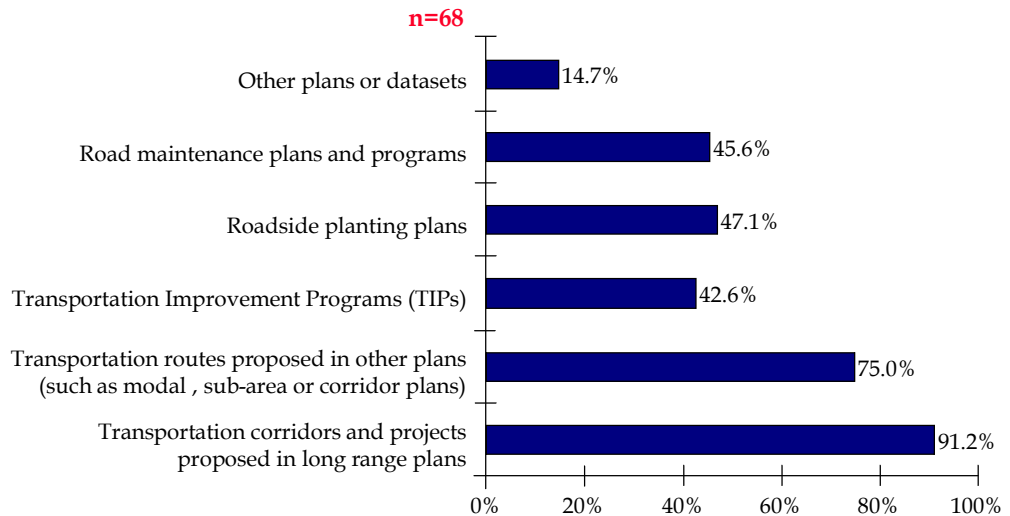
Question 4: What would help you the most in starting the process of linking environmental and transportation planning? Please select your top three or four choices. (QE7)



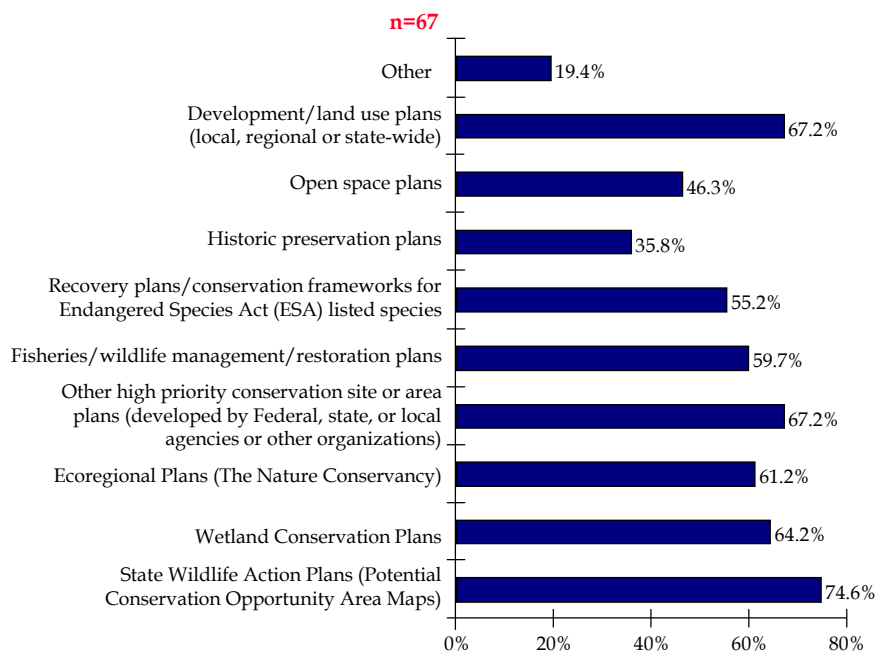
Question 5: Which transportation agencies or planning organizations would you consult with as part of your environmental/natural resource planning process? Please check all that apply. (QE8)



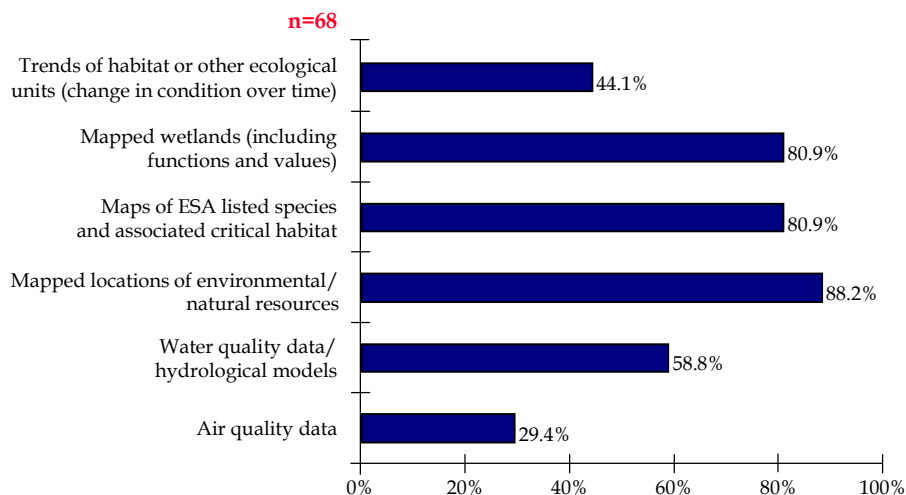
Question 6: What transportation plans and/or data do you think would be most useful to inform environmental planning? Please check all that apply. (QE9)



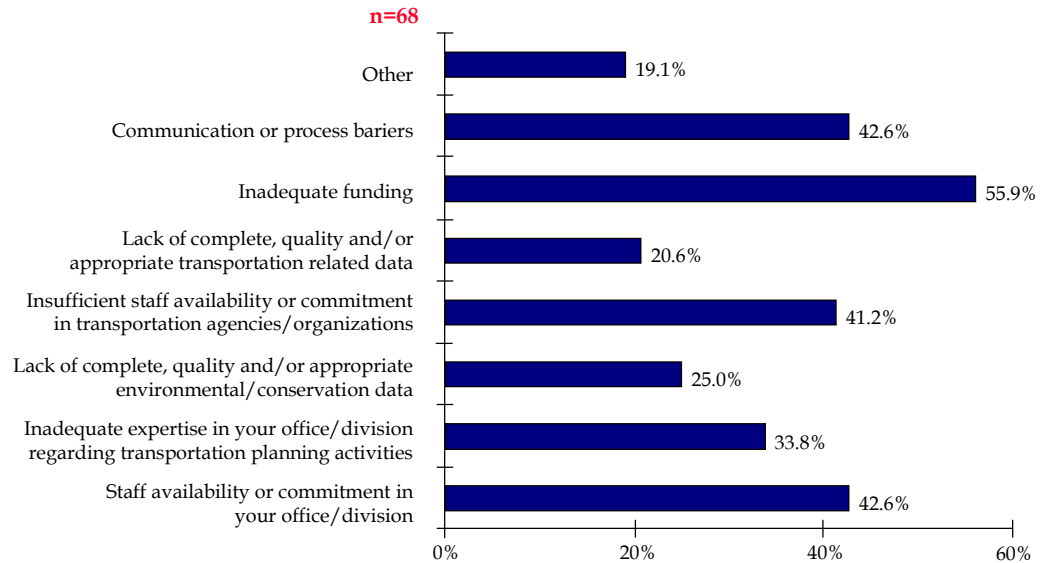
Question 7: What environmental/natural resource plans do you think would be most useful to inform the transportation planning process? Please check all that apply. (QE11)



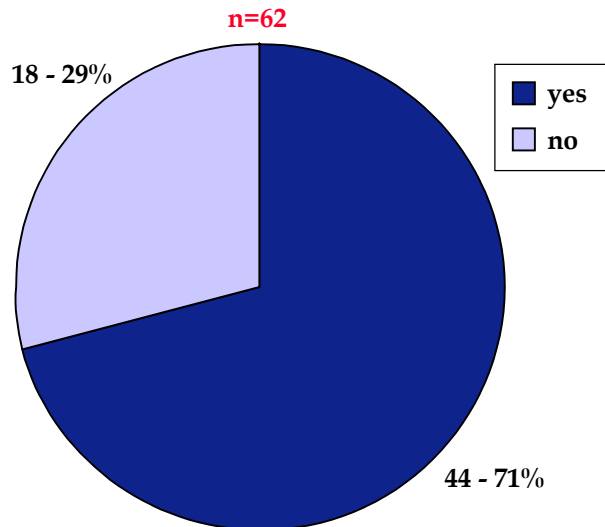
Question 8: What environmental/natural resource data do you think would be most useful to inform the transportation planning process? Please check all that apply. (QE12)



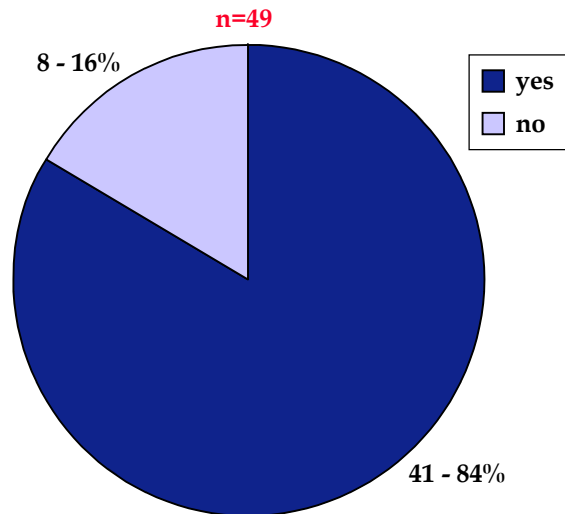
Question 9: What do you perceive as the primary obstacles to integrating environmental resource and transportation planning efforts? Please check all that apply. (QE14)



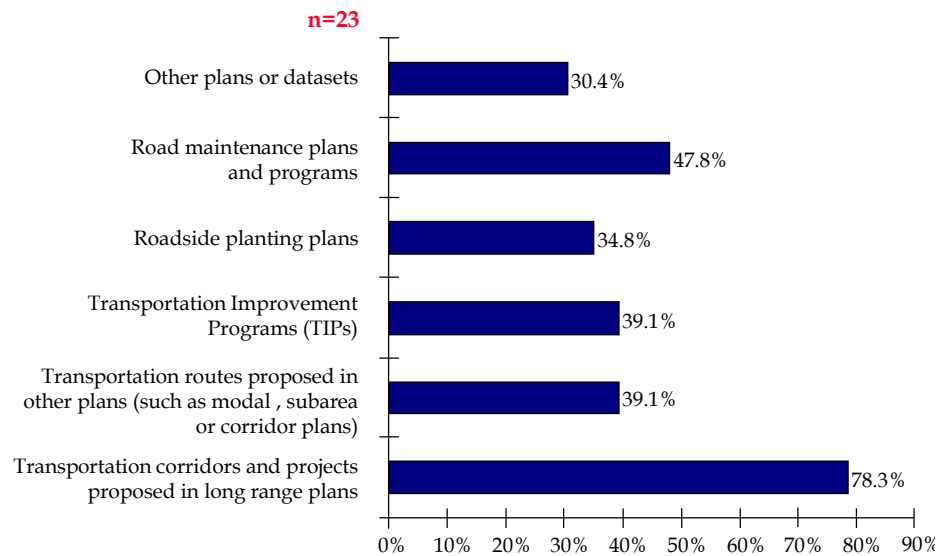
Question 10: Overall, do you think you have been successful in improving the effectiveness of your environmental/environmental resource planning process by integrating transportation planning? (QE17)



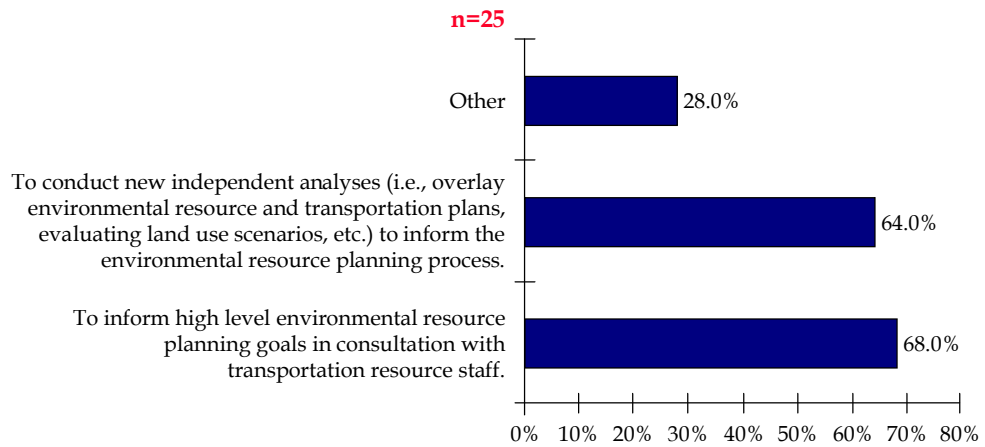
Question 11: Do you think that transportation planning in your area has been informed and improved by integrating environmental resource planning? (QE19)



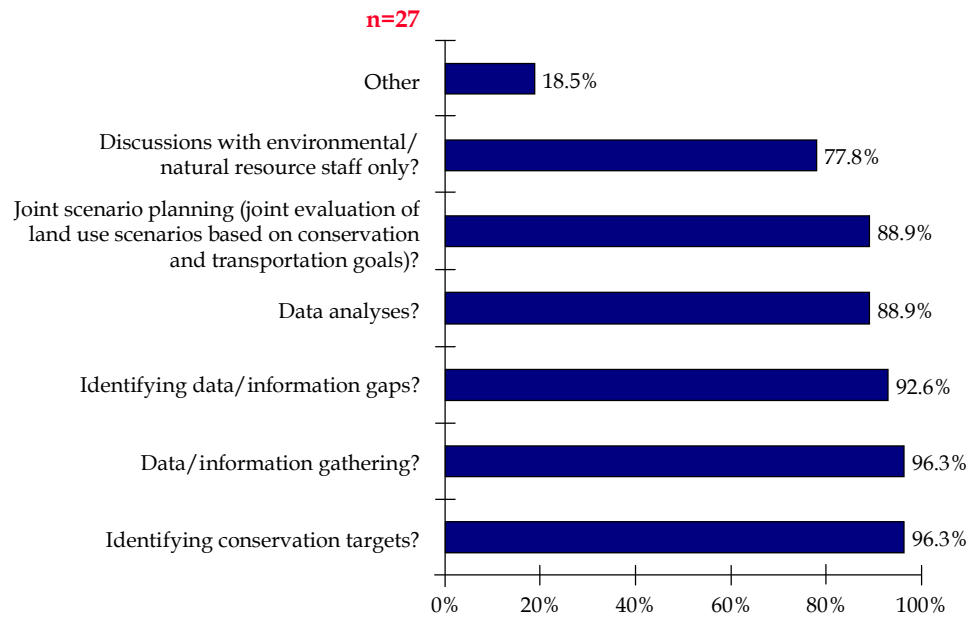
Question 12: What type of transportation plans and data were available to you? Please check all that apply. (QE22)



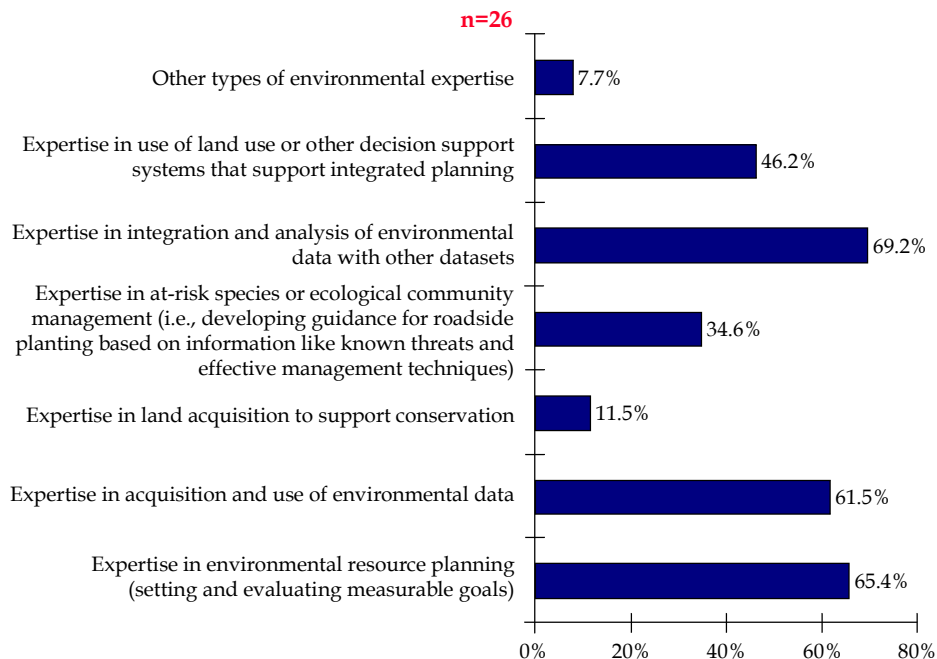
Question 13: How did you use the transportation plans, data, and/or maps? Please check all that apply. (QE24)



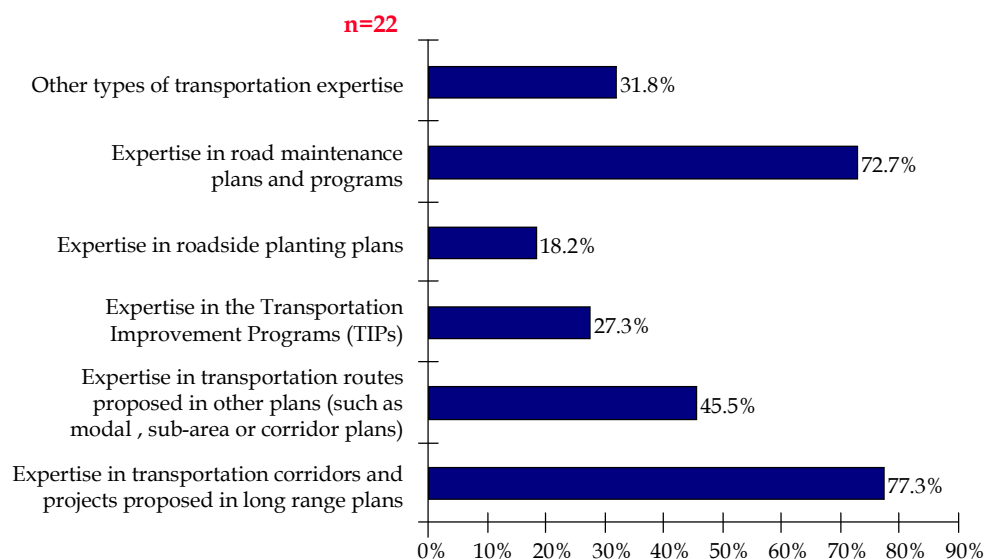
Question 14: Describe the integrated planning process that you used. Did the process involve: (QE25)



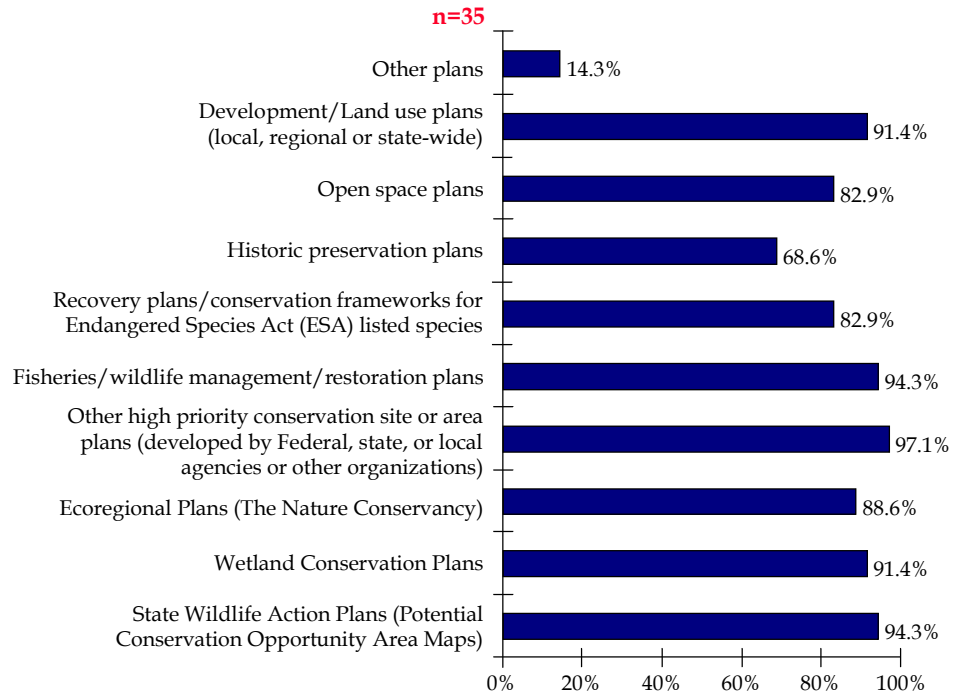
Question 15: What are your top choices of environmental expertise that were most helpful in your success of integrating environmental and transportation planning? Please rank in order (with 1 being highest) by choosing one selection for each number. (QE33)



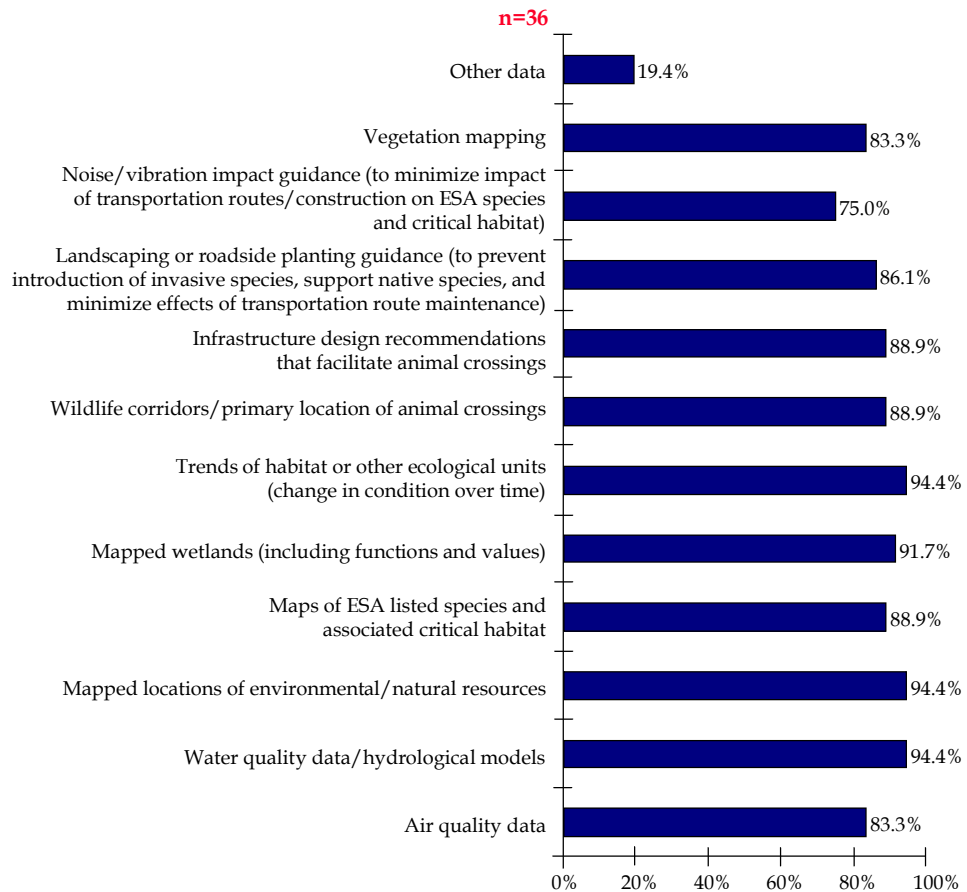
Question 16: What are your top choices of transportation expertise that were most helpful in your success of integrating environmental and transportation planning? Please rank in order (with 1 being highest) by choosing one selection for each number. (QE34)



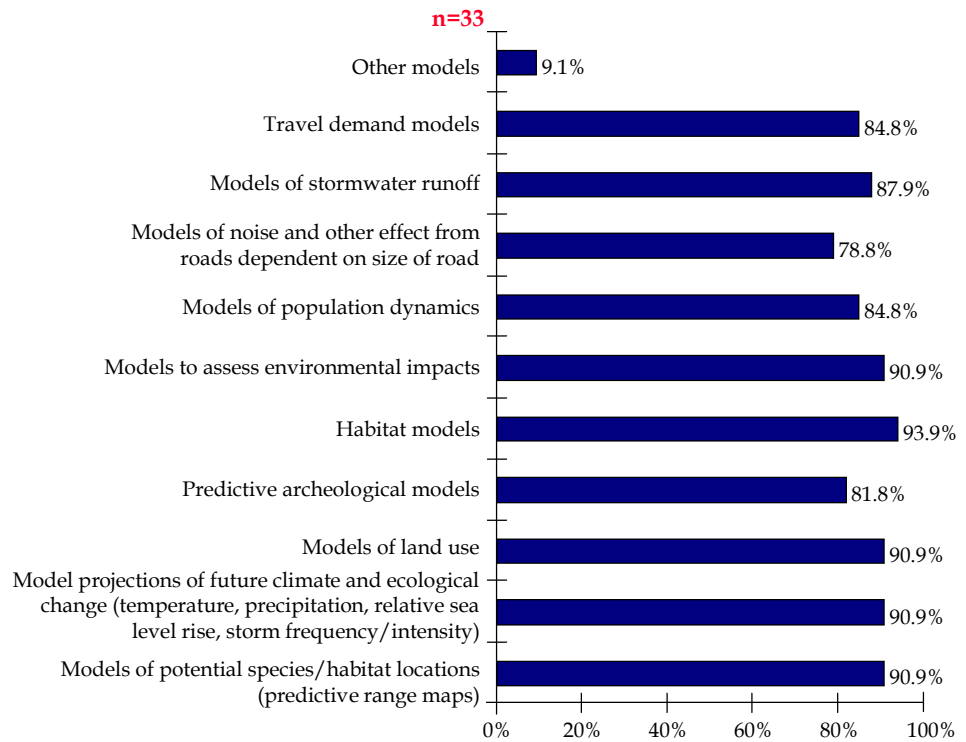
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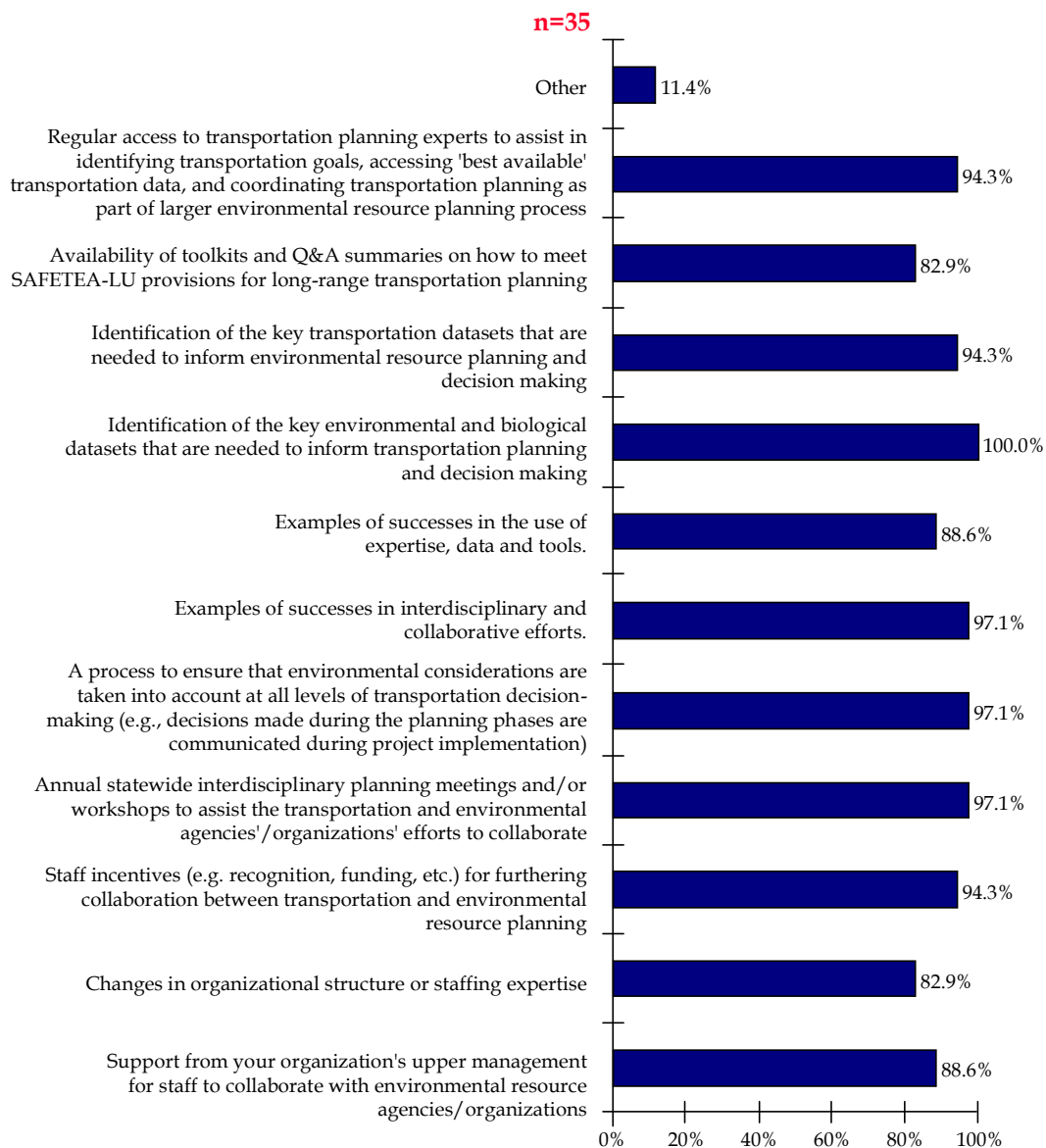
Question 18: Which of the environmental/natural resource data listed below are (would be) most useful in achieving integrated planning? (QE36)



Question 19: Are there any specific modeling outputs (spatial and temporal scales) that are (would be) useful in achieving integrated planning? (QE37)



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Appendix E

Survey Distributed to Transportation Community

Appendix F

Survey Distributed to Environmental Community