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ECO-LOGICAL: AN ECOSYSTEM APPROACH TO DEVELOPING TRANSPORTATION INFRASTRUCTURE PROJECTS IN A CHANGING ENVIRONMENT

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**Abstract:**

The development of infrastructure facilities can negatively impact critical habitat and essential ecosystems. There are a variety of techniques available to avoid, minimize, and mitigate negative impacts of existing infrastructure as well as future infrastructure development. However, such techniques may not always provide the greatest environmental benefit or may do very little to promote ecosystem sustainability. Concern for ecosystem protection, along with legislation and policy initiatives aimed at fostering an ecosystem-based approach, led an Interagency Steering Team to collaborate over a three-year period to write Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects. The Steering Team shared a vision of an enhanced and sustainable natural environment combined with the view that necessary infrastructure can be developed in ways that are more sensitive to terrestrial and aquatic habitats. Eco-Logical encourages all partners involved in infrastructure planning, design, review, and construction to use existing flexibility in regulatory processes. The Eco-Logical publication puts forth a conceptual framework for integrating plans across agency boundaries and endorses ecosystem-based mitigation – an innovative method of mitigating infrastructure impacts in today's changing environment. To test the concepts presented in Eco-Logical, the Federal Highway Administration's



(FHWA) Office of Planning, Environment, and Realty initiated a grant program in 2007. Of the 40 applications from across the country, FHWA funded 14 cooperative agreements and 1 interagency agreement, totaling approximately \$1.4 million. The number and diversity of applications indicate a changing climate in the field of transportation with a shift to more ecologically sensitive planning.

The selected grant projects incorporate tools and techniques ranging from the integration of environmental considerations in the transportation planning process to the use of Geographic Information Systems (GIS) and public involvement to integrate infrastructure and conservation plans. For example, one project tests and demonstrates how interagency partnerships and a willingness to adapt existing processes can enhance cultural and environmental stewardship in the long-range transportation planning process. The grant recipients represent state and local departments of transportation, federal and state resource agencies, Metropolitan Planning Organizations (MPOs), local governments, Non-Governmental Organizations (NGOs), and one university. Initial findings from the grant program indicate a successful integration of ecologically sensitive principles into infrastructure planning and project development. By creating and using data-driven tools and processes, the Eco- Logical grant projects show that partnering with resource agencies and stakeholders early in the planning and project development processes enhances the preservation of high-functioning ecosystems.





## FHWA's Eco-Logical Program – Case Studies

### **Eco-LOGICAL: AN ECOSYSTEM APPROACH TO DEVELOPING TRANSPORTATION INFRASTRUCTURE PROJECTS IN A CHANGING ENVIRONMENT**

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#### **Abstract**

The development of infrastructure facilities can negatively impact critical habitat and essential ecosystems. There are a variety of techniques available to avoid, minimize, and mitigate negative impacts of existing infrastructure as well as future infrastructure development. However, such techniques may not always provide the greatest environmental benefit or may do very little to promote ecosystem sustainability. Concern for ecosystem protection, along with legislation and policy initiatives aimed at fostering an ecosystem-based approach, led an Interagency Steering Team to collaborate over a three-year period to write *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects*.

The Steering Team shared a vision of an enhanced and sustainable natural environment combined with the view that necessary infrastructure can be developed in ways that are more sensitive to terrestrial and aquatic habitats. *Eco-Logical* encourages all partners involved in infrastructure planning, design, review, and construction to use existing flexibility in regulatory processes. The *Eco-Logical* publication puts forth a conceptual framework for integrating plans across agency boundaries and endorses ecosystem-based mitigation – an innovative method of mitigating infrastructure impacts in today's changing environment.

To test the concepts presented in *Eco-Logical*, the Federal Highway Administration's (FHWA) Office of Planning, Environment, and Realty initiated a grant program in 2007. Of the 40 applications from across the country, FHWA funded 14 cooperative agreements and 1 interagency agreement, totaling approximately \$1.4 million. The number and diversity of applications indicate a changing climate in the field of transportation with a shift to more ecologically sensitive planning.

The selected grant projects incorporate tools and techniques ranging from the integration of environmental considerations in the transportation planning process to the use of Geographic Information Systems (GIS) and public involvement to integrate infrastructure and conservation plans. For example, one project tests and demonstrates how interagency partnerships and a willingness to adapt existing processes can enhance cultural and environmental stewardship in the long-range transportation planning process. The grant recipients represent state and local departments of transportation, federal and state resource agencies, Metropolitan Planning Organizations (MPOs), local governments, Non-Governmental Organizations (NGOs), and one university.

Initial findings from the grant program indicate a successful integration of ecologically sensitive principles into infrastructure planning and project development. By creating and using data-driven tools and processes, the *Eco-Logical* grant projects show that partnering with resource agencies and stakeholders early in the planning and project development processes enhances the preservation of high-functioning ecosystems.

#### **Writing About Eco-Logical**

The purpose of this study is to describe the origins of FHWA's *Eco-Logical* program and explain the progress and lessons learned so far from the FHWA *Eco-Logical* grant program. The reader will learn about the following subjects:

- The challenges to providing needed infrastructure in an environmentally sensitive manner and how the *Eco-Logical* publication offers solutions to these challenges.

- The ideological and legal precedent for *Eco-Logical*. Case studies illustrate how the *Eco-Logical* process can be used by different types of agencies.
- The impact of the *Eco-Logical* grant program on both the grant recipients and the agencies that signed *Eco-Logical*.

### **Identifying a Need for Eco-Logical**

#### **Addressing the Challenges**

America's infrastructure needs continue to grow and evolve. They include constructing new roads in response to changes in population and land use, maintaining and replacing obsolete facilities, and making infrastructure more robust in the face of catastrophic natural and manmade events. Every project – present and future – will have some impact on the surrounding environment.

Mitigation or avoidance of negative environmental impacts is federally mandated under the National Environmental Policy Act (NEPA), federal regulations implementing NEPA, and other laws and regulations. Balancing infrastructure development with environmental protection and stewardship can be difficult without regular interagency communication, with insufficient data, or with a historically narrow approach to mitigation (for example, prior to the U.S. Environmental Protection Agency (EPA) and U.S. Army Corps of Engineers (USACE) joint Final Rule on Compensatory Mitigation for Losses of Aquatic Resources).

#### *Communication Challenges*

Interagency communication and coordination should begin as early as practicable in the planning process and should continue throughout the project development process. However, communication can be impeded by limited resource agency staffing, differing agency missions and visions, and past miscommunications. Perceptions of certain agencies as inflexible or unwilling to collaborate with other agencies can lead to a standstill in communication. A past negative experience between agencies can result in a lack of interagency trust, making it difficult to open new lines of communication.

With the passage of the *Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU)* in 2005, Congress reconfirmed the value of early interagency communication in both the planning and project development processes. Federal regulations in 23 Code of Federal Regulations (CFR) 450 and 23 CFR 771 discuss the importance of coordination between resource and transportation agencies during both the planning process and the NEPA environmental review process. In addition, both CFR sections indicate that transportation funds may be used to fund resource agency liaisons to participate in the development of environmental mitigation and environmental stewardship opportunities in the transportation planning process as well as to provide input and regulatory review of NEPA project development documents. These agency liaisons provide a direct link between the transportation and resource agencies.

#### *Data Challenges*

Insufficient or incompatible data are often a challenge and can contribute to poor environmental outcomes:

- Data are collected and maintained separately across agencies and organizations, allowing projects to move forward without sufficient critical habitat or watershed data. Due to a lack of communication or collaboration among agencies, these data are rarely integrated or shared. In addition, different agencies collect, store, and process data in different ways, leading to technical limitations in combining data.
- Insufficient data make it nearly impossible for agencies to properly establish and prioritize environmental opportunities. Across the United States, there are large data gaps for current ecosystem information. Insufficient funding or not knowing that these data gaps exist can cause important environmental information to be excluded from infrastructure plans and environmental documents.

#### *Permitting Challenges*

NEPA and Section 404 of the Clean Water Act require that transportation projects take into account their indirect and cumulative environmental impacts. It can be difficult to identify impacts of individual projects without knowing current

infrastructure plans, using project visualization tools, or understanding how several proposed projects, transportation and others, interact within a watershed or ecosystem.

### *Mitigation Challenges*

Historically, agencies used a suite of techniques to avoid, minimize, and mitigate negative impacts of past and present infrastructure projects. These techniques often focused on environmental management at the project scale rather than at the ecosystem scale. Examining environmental impacts on a project scale or halting environmental exploration at jurisdictional boundaries does not always result in the best environmental outcomes or may do little to promote overall ecosystem sustainability.

While project-specific mitigation can be beneficial, performing mitigation based on the location and characteristics of a single project can miss opportunities for minimizing environmental impacts that could be achieved with broader mitigation techniques that operate at an ecosystem level. Without ecosystem-level mitigation, it is difficult for agencies to protect large areas and plan mitigation strategies many years in advance. When mitigation is done on a site-specific, project-by-project basis, permitting agencies must individually review multiple infrastructure and mitigation projects within the same watershed. This can be inefficient and ultimately might not provide the most ecologically sensitive results.

With these challenges in mind, transportation and resource agencies needed a better way of doing business using existing authorities. Through a new interest in environmental issues and collaborative conservation, a collective interest in developing an ecosystem-scale method for infrastructure planning began to surface. This effort and the group of resulting concepts came to be known as *Eco-Logical*.

### **An Eco-Logical Solution**

To address the challenges associated with infrastructure planning and construction, an Interagency Steering Team collaborated over a three-year period to produce the publication *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects*. *Eco-Logical* puts forth the conceptual framework for integrating plans across agency boundaries and endorses ecosystem-based mitigation, an innovative method of mitigating infrastructure impacts in today's changing environment.

To address the problems associated with implementing environmentally sensitive infrastructure, *Eco-Logical* uses an eight-step framework for integrated planning. This framework addresses near-, mid-, and long-term activities and can be altered to fit each unique situation. The eight steps are:

1. *Build and Strengthen Collaborative Partnerships*: Collaborative partnerships among diverse groups help to identify where interests and concerns overlap, and thus help to form the basis for an integrated planning process. Such partnerships can begin to be assembled today, and the effects can be both immediate and long-term.
2. *Identify Management Plans*: Management plans that agencies and partners have developed independently are important sources of information in the integrated planning process. Plans could include recovery plans; resource management plans; forest management plans; United States Army Corps of Engineers' (USACE) Special Area Management Plans, and community growth plans. Map products from gap analyses and Non-Governmental Organization (NGO) plans might also be helpful.
3. *Integrate Plans*: To identify the necessary work and determine where it will be done, a regional ecosystem framework (REF) is needed. Although there is no standard for creating a REF, *Eco-Logical* recommends that a REF consist of an "overlay" of maps of agencies' individual plans, accompanied by descriptions of conservation goals in the defined region(s). A REF can afford agencies a joint understanding of the locations and potential impacts of proposed infrastructure actions. With this understanding, they can more accurately identify the areas most in need of protection and better predict and assess cumulative resource impacts. A REF can also streamline infrastructure development by identifying ecologically significant areas, potentially impacted resources, regions to avoid, and mitigation opportunities before new projects are initiated.
4. *Assess Effects*: An early assessment of the effects of proposed infrastructure projects establishes a basis for project predictability as well as environmental stewardship. The REF relates proposed infrastructure actions to the distribution of terrestrial and aquatic habitat, or resource "hot spots." It helps agencies and partners to understand the types and distribution of proposed infrastructure projects so that potential impacts can be

listed in advance of their project implementation. In terms of integrated planning, once these impacts are listed, an interagency team can describe and assess these effects.

5. *Establish and Prioritize Opportunities:* This step combines data from steps 3 and 4 of creating a REF in order to establish and prioritize opportunities. Step 3 (Integrate Plans) helps to provide an understanding of where existing conservation areas are and where additional ones could be best located. The effects assessment from step 4 elevates awareness as to how proposed projects can impact ecologically important areas. By looking at these data together, the relative importance of a state's potential mitigation and/or conservation areas can be established and prioritized.
6. *Document Agreements:* To achieve success in integrating plans, including an evaluation of mitigation opportunities, it is important to have administrative records of agreements between agencies. Agreements help ensure commitment by endorsing agencies and can help encourage flexibility in fulfilling the requirements and intentions of environmental regulations.
7. *Design Projects Consistent with Regional Ecosystem Framework:* The benefits of integrated planning should be apparent at the project level. With this approach, planned infrastructure projects that go forward should not surprise resource agencies. If an action agency has been involved during REF development and is planning a project consistent with that framework, the resource agency response(s) should be predictable. Although new information about the ecosystem may have become available since the plans were integrated, site-specific project issues can be addressed as they arise (e.g., during the NEPA process); they do not have to slow down the entire project development process.
8. *Balance Predictability and Adaptive Management:* Predictability - the knowledge that commitments made by all agencies will be honored - is needed at the project level so resources can be allotted appropriately and schedules can be met. Predictability gives agencies assurance that progress over the term of a project can occur. However, while project development can occur over a short time frame, ecosystems typically change over longer periods. For this reason, agencies will need to work to balance short-term project predictability with long-term adaptive management.

Source: [Eco-Logical, FHWA]

## The Benefits

What sets *Eco-Logical* apart from other methods of project planning or mitigation is its emphasis on collaboration, data sharing, and developing an REF. The greatest benefit of the REF is that it identifies the most ecologically significant areas in a region and recognizes mitigation opportunities long before projects have been initiated. Having this foresight can help transportation and resource agencies tremendously, saving time and money in the project planning and development processes.

The *Eco-Logical* approach presents several advantages over a traditional approach:

- *Safer, improved infrastructure:* All agencies and stakeholders contribute to the delivery of infrastructure. The collective abilities and knowledge shared within an ecosystem approach should allow a more balanced understanding of ecological and social concerns.
- *Improved watershed and ecosystem health:* It provides systematic approach to the preventive, diagnostic, and prognostic aspects of ecosystem management and to the understanding of relationships between ecological issues and human activities.
- *Increased connectivity and conservation:* Since an ecosystem approach to infrastructure projects takes a broad view of interacting human and natural systems, it can help agencies plan and design infrastructure in ways that minimize habitat fragmentation and protect larger scale, multi-resource ecosystems.
- *Efficient Project Development:* Uncertainty during project development imposes a high cost on agencies and partners, in both time and money. An ecosystem approach fosters cost-effective environmental solutions that can be incorporated early in the planning and design of infrastructure projects.

- *Increased Transparency*: Infrastructure projects developed with an ecosystem approach provide opportunities for and encourage public and stakeholder involvement at all key stages of planning and development.

Source: [*Eco-Logical*, FHWA]

## Addressing Legislation, Regulation, Policy and Guidance

*Eco-Logical* is a new approach to infrastructure planning using existing authorities. The concepts within *Eco-Logical* draw from many sources, including the United States' first major environmental law, NEPA. NEPA inspired a host of other laws, regulations, and guidelines that emphasize environmental stewardship and mandate certain degrees of environmental protection. The Endangered Species Act and the Clean Water Act, among others, require transportation and infrastructure agencies at all levels of government to consider the environment during the permitting phase of an infrastructure project. From the late 1970s to present, legislation, regulation, several Memoranda of Understanding, and Executive Orders have called for a more cooperative ecosystem-focused approach to infrastructure planning.

- *Clean Water Act (CWA), December 28, 1977*: The CWA expanded upon the Federal Water Pollution Control Act, first passed in 1948 but later amended in 1972. This law set water quality standards and made it unlawful for any person to pollute navigable waters. The CWA was revised in 1981 and 1987, although other laws have changed portions of the CWA. Section 404 of the CWA is particularly relevant to *Eco-Logical* as it sets guidelines for permitting discharge of dredged or fill material into navigable waters and requires the permittee to perform compensatory mitigation.
- *Endangered Species Act (ESA), December 28, 1973*: This federal action provided for the conservation of ecosystems essential to threatened and endangered species of fish, wildlife, and plants. The ESA also authorized placing species on the endangered or threatened list and prohibited unauthorized take of endangered or threatened species. The ESA was amended in 1978, 1982, 1998, and 2004.
- *Memorandum of Understanding (MOU) to Foster the Ecosystem Approach, December 15, 1995*: Fourteen agencies signed this MOU that declared that the federal government “should provide leadership in and cooperate with activities that foster the ecosystem approach to natural resource management, protection and assistance” (MOU 1995).
- *Executive Order (EO) 13274 on Environmental Stewardship and Transportation Infrastructure Project Reviews, September 18, 2002*: This EO promotes environmental stewardship in the United States' transportation system. It emphasizes the importance of expediting transportation project delivery while still “being good stewards of the environment” (EO 13274 2002).
- *Executive Order 13352, Facilitation of Cooperative Conservation, August 26, 2004*: This EO ensures that resource agencies work together to implement laws relating to the environment and natural resources.
- *Safe, Accountable, Flexible, Efficient Transportation Equity Act: a Legacy for Users (SAFETEA-LU), August 10, 2005*: As with previous transportation legislation, this legislation addressed many of the challenges facing modern transportation systems such as public and interagency coordination and streamlining project reviews while providing for infrastructure needs as well as environmental stewardship. Particularly relevant are the implementing sections of 23 CFR 450, Planning Assistance and Standards, and 23 CFR 771, Environmental Impact and Related Procedures, which lay out critical approaches to managing environmental impact.
- *Final Rule on Compensatory Mitigation for Losses of Aquatic Resources, March 31, 2008*: The EPA and the USACE joint rule issued “revised regulations governing compensatory mitigations for authorized impacts to wetlands, streams and other waters of the United States under Section 404 of the Clean Water Act” (EPA 2009). This rule sets a preference for mitigation banking over other types of mitigation. The preference for mitigation banking draws from the premise that mitigation should be based on a watershed approach, an important aspect of *Eco-Logical*.

*Eco-Logical* is not only a response to the preceding legislation, regulation, policy, and guidance; it also supports the environmental stewardship goals of FHWA and demonstrates FHWA's commitment to environmental protection. While the *Eco-Logical* program fulfilled an obligation set forth in legislation, regulation, policy, and guidance, it also brought new awareness to FHWA's environmental goals.

## **Developing Solutions**

### **The Catalyst**

In the late 1990s, the Montana Department of Transportation (MDOT) and the Montana FHWA Division Office recognized a need for a new type of transportation planning. While reviewing a Long Range Transportation Plan (LRTP), both agencies noted that over the next 20 years, the LRTP called for many large infrastructure projects along the U.S. Highway 93 Corridor. The corridor, which traversed a large amount of critical habitat, was also the site of many wildlife-vehicle collisions. These issues created a sense of urgency for developing a new method for infrastructure planning within MDOT and FHWA.

Staff from MDOT and the Montana FHWA Division Office determined that many of the required infrastructure projects would need mitigation. However, they speculated that mitigation done “out of kind” (in a location other than the project site) or prior to constructing the infrastructure projects might have a greater environmental benefit than mitigation done on site and planned concurrent to or after the project. To test this theory, an interagency team comprised of state and federal agencies traveled the entire length of U.S. Highway 93 in Montana and mapped critical wildlife linkage areas. The group analyzed the location of critical wildlife habitat and the locations of the proposed projects and compared the cost and benefits of on-site mitigation against ecosystem level mitigation. From this research, the group concluded that infrastructure planning and construction that considers wildlife at an ecosystem level is beneficial for humans and wildlife. It reduces costs and addresses potential mitigation problems well in advance of infrastructure construction.

After the interagency team shared its results with agencies outside of the research group, some agencies expressed curiosity over the initial Montana research. Non-traditional mitigation solutions, such as out-of-kind and preemptive mitigation, could be permitted under the regulations of that time but had not previously been utilized for avoiding environmental harm and mitigation. Agencies raised the concern that the legal ramifications and necessary paradigm shift for planning and resource agencies to implement ecosystem-level solutions might prevent this new type of planning from being feasible. In spite of these concerns, FHWA decided to explore the ideas developed in Montana at the national level.

### **Writing *Eco-Logical***

FHWA assembled an Interagency Steering Team, including members of the original Montana team, to develop a method of integrated and ecosystem-based planning that came to be known as *Eco-Logical*. This team included the Bureau of Land Management (BLM), EPA, FHWA, the National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries Service), the National Park Service (NPS), USACE, the U.S. Department of Agriculture Forest Service (USDAFS), the US Fish and Wildlife Service (USFWS), the Volpe National Transportation Systems Center, the Knik Arm Bridge and Toll Authority, the North Carolina Department of Transportation, the Vermont Agency of Transportation, and the Washington Department of Transportation.

The Steering Team spent nearly three years developing the concepts and preparing the publication *Eco-Logical*. The group deliberated over the details to be included to ensure that the needs of all participating agencies were met and that the product would be helpful to infrastructure and environmental professionals across the country.

The group began with a shared vision that drew from the work in Montana. There was also a shared belief that it is possible to achieve “an enhanced and sustainable natural environment, combined with the view that necessary infrastructure can be developed in ways that are more sensitive to terrestrial and aquatic habitats” (*Eco-Logical* 2006).

The Steering Team established four goals that became the drivers for *Eco-Logical*:

- *Conservation*: Protection of larger scale, multi-resource ecosystems;
- *Connectivity*: Reduce habitat fragmentation;
- *Predictability*: Knowledge that commitments made by all agencies will be honored, i.e., that the results and outcomes of planning and conservation agreements will occur as negotiated; and
- *Transparency*: Better public and stakeholder involvement at all key stages in order to establish credibility, build trust, and streamline infrastructure planning and development.

Source: [*Eco-Logical*, FHWA]



From these initial four goals, the team established the major components of *Eco-Logical*. After years of conversation and deliberation, in October 2002, the team drafted the final *Eco-Logical* document. The authors of *Eco-Logical* believed in the importance of the document and reached out to the highest levels of their agencies to sign the *Eco-Logical* document. In April 2006, leadership from the Steering Team partner agencies, including representatives from USDAFS, FHWA, BLM, USACE, USFWS, NPS, EPA, and NOAA, signed the document. The recognition by leaders in each of these agencies signified a joint acceptance of the document and an agreement to promote and support *Eco-Logical* into the future.

### **Supporting *Eco-Logical***

In the years following the publication of *Eco-Logical*, many members of the original Steering Team continued to meet and discuss how to implement *Eco-Logical*. Together, this team and several other key individuals created a vision and implementation plan for *Eco-Logical*. Major components of this plan were outreach, promotion, and support. Through these efforts, the group believed that agencies would come to adopt *Eco-Logical* and incorporate its concepts into their planning and construction activities. The team also identified additional methods and locations to target in the future.

One such opportunity for interagency coordination came on March 31, 2008, with the release of the joint EPA-USACE Final Rule on Compensatory Mitigation for Losses of Aquatic Resources. The new rule contains revised regulations governing compensatory mitigation to offset negative impacts to wetlands, streams, and other waters that fall under Section 404 of the CWA. These regulations improve wetland restoration and protection policies, increase the effective use of wetland mitigation banks, and strengthen the requirements for the use of in-lieu fee mitigation. The new wetlands compensatory mitigation standards emphasize best available science, promote innovation, and focus on results. The rule also requires coordination between EPA, USACE, and FHWA to train staff on the application of the new rule.

The release of this Final Rule presented an opportunity to promote the many *Eco-Logical* concepts presented in the rule. Members of the *Eco-Logical* Steering Team conducted a joint webinar training session on the rule and its relationship to *Eco-logical*. The session was helpful in establishing links between the two items and made great strides toward the implementation of *Eco-Logical*.

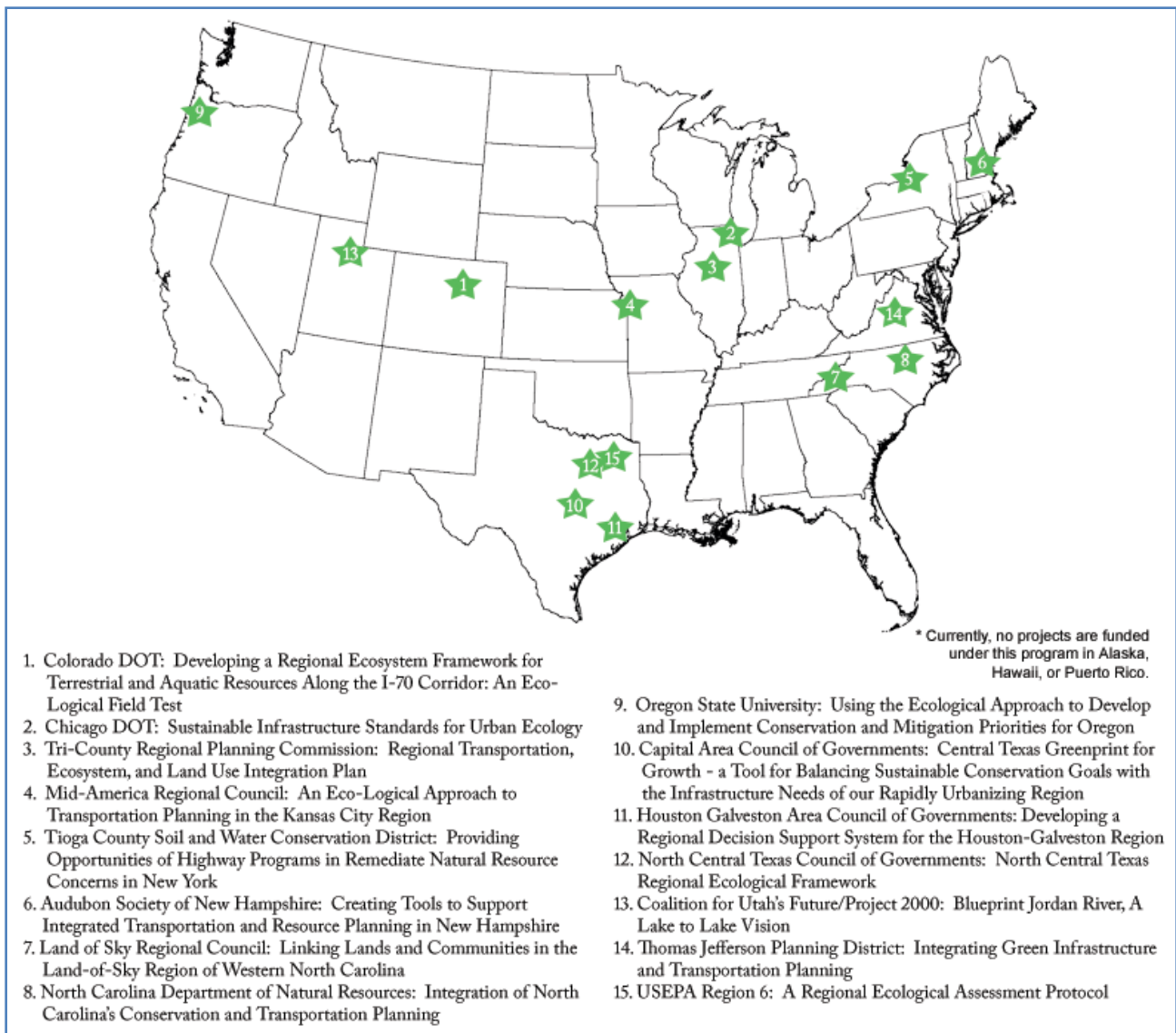
### **Testing *Eco-Logical* Concepts**

To test the concepts presented in *Eco-Logical* for infrastructure planning and project development, FHWA implemented the *Eco-Logical* grant program. This program awarded \$1.4 million in matching funds to organizations that planned to implement *Eco-Logical* in some aspect of the transportation planning, development, or construction process. To receive funding, FHWA required these projects to establish or assist in conducting an integrated planning effort and to implement ecosystem-based approaches to infrastructure projects. Federal, state, or regional agencies; universities; and NGOs were eligible to apply for funding. All applicants were required to provide a 50 percent match of non-federal funds or in-kind contributions.

On March 27, 2007, FHWA posted an advance notice for a grant solicitation entitled *Integrating Transportation and Resource Planning to Develop Ecosystem Based Infrastructure Projects*, based upon *Eco-Logical*. The official grant solicitation was open from May 9 to June 22, 2007. FHWA received 40 applications from across the country. This surprisingly high level of response indicated a growing interest in environmentally sensitive infrastructure planning and construction.

FHWA compiled an application review panel made up of 14 people representing several of the *Eco-Logical* signatory agencies. The panel embarked on a rigorous evaluation process to ensure that the projects receiving grants aligned with the goals and concepts of *Eco-Logical*. By participating in the grant review and recommendation process, agencies involved in writing *Eco-Logical* were able to share a stake in the future of the grant program.

Ultimately, the review team selected 15 pilot projects throughout the nation: 14 cooperative agreements and 1 interagency agreement. The grant recipients are state and local departments of transportation, state resource agencies, MPOs, local governments, NGOs, one federal resource agency, and one university. The grant recipients are distributed across the country as indicated in Figure 1.



**Figure 1: Distribution of Eco-Logical Grant Projects**

### **Case Studies**

Of the 15 grant projects, the three highlighted below were chosen to show the diversity of the grant projects. Each project has its own nuances, but as a group, the projects demonstrate how *Eco-Logical* can be applied to many different locations and situations at any scale.

- The North Central Texas Council of Governments (NCTCOG), the MPO for the Dallas-Fort Worth metropolitan area, is implementing an *Eco-Logical* grant project that will develop an REF to integrate transportation and resource agency conservation plans and to improve collaboration between transportation, planning, and resource agencies.
- The North Carolina Department of Environment and Natural Resources (NCDENR) grant project consists of a state agency forging multi-level partnerships, gathering extensive data, and making the infrastructure planning process accessible to the public.
- The Blueprint Jordan River grant project, led by the non-profit group Envision Utah, utilized a broad public involvement process to achieve a consensus vision for improvement, protection, and conservation of the Jordan River corridor.

## North Central Texas Council of Governments (NCTCOG)

### *The Problem*

NCTCOG is the MPO for the 16-county North Central Texas region centered around Dallas and Fort Worth. NCTCOG has “over 230 members including all 16 counties [in the region], numerous cities, school districts, and special districts” (NCTCOG 2007). NCTCOG staff recognized a disconnect in their region between the environmental analyses produced to meet NEPA requirements at the transportation project level and those produced to develop “long-range transportation plans, statewide and metropolitan Transportation Improvement Programs, planning-level corridor/subarea/feasibility studies, and the Federal Transit Administration’s planning alternatives analyses” (NCTCOG 2007). NCTCOG also wanted to enhance the coordination and consultation with relevant agencies during the transportation planning and implementation processes to develop a transportation plan that integrates environmental conservation planning resources and strategies.

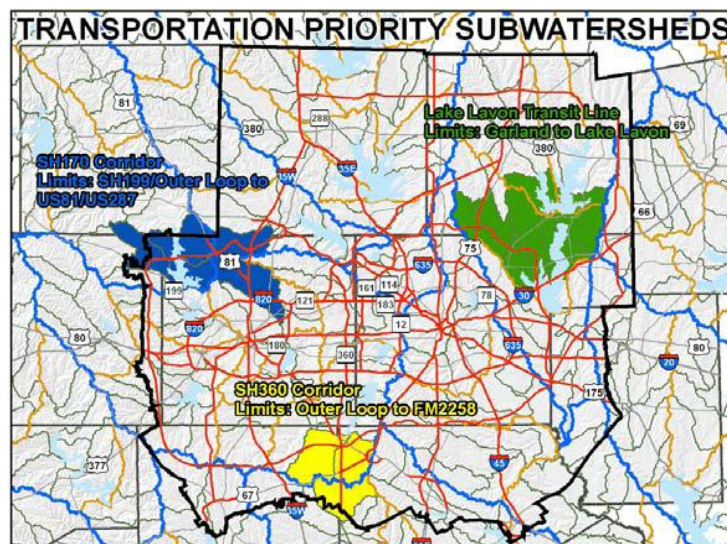
To encourage stronger consideration of environmental impacts and mitigation strategies during the long-range transportation planning process, NCTCOG recognized that working collaboratively with state transportation and environmental resource agencies would be required.

### *The Solution*

NCTCOG is developing a Regional Ecosystem Framework (REF) for the Dallas-Fort Worth region. The REF includes a description of conservation goals in the region and coordinating maps. Through the REF, NCTCOG is integrating transportation and resource agency conservation plans to improve collaboration between transportation, planning, and resource agencies. When complete, the REF will:

- Allow agencies to better assess the potential cumulative impacts of proposed infrastructure developments at a subwatershed scale;
- Provide agencies with a joint understanding of the areas most in need of preservation; and
- Help agencies identify opportunities for adaptive management and ecosystem enhancements to help agencies reach their conservation goals.

NCTCOG selected three transportation corridors (two highway and one transit) within the Dallas-Fort Worth region’s Metropolitan Transportation Plan to serve as pilot corridors. These corridors are State Highway 170 Outer Loop Interim corridor, State Highway 360 Southern Extension, and the Lake Lavon Transit Line. For each of these pilot projects, NCTCOG is carrying out “a cumulative effects analysis...at a subwatershed perspective versus the traditional project level” (NCTCOG 2009).



**Figure 2: Transportation Priority Subwatersheds, Graphic courtesy of NCTCOG.**

Through the REF, NCTCOG is characterizing the current conditions of the three pilot corridors' subwatersheds to gain a broader perspective of ecological issues facing the region. The corridor assessment portion of the REF involves a review of resource agency management plans and GIS data layers for social and environmental information. The MPO is utilizing a cumulative effects analysis to assess potential social, natural, and cultural environmental effects to the selected subwatersheds by the proposed transportation corridors. It will integrate the results of the cumulative effects analysis with the GIS data layers and develop maps that will be used to identify priority conservation areas. The REF will not be a static set of data layers but rather an ongoing collaboration between multiple partners to access and add new information.

NCTCOG will overlay the location of transportation projects included in the existing Metropolitan Transportation Plan on the new natural resource maps to assess the potential environmental impacts associated with transportation projects. Where environmental impacts are identified, NCTCOG will consult resource agencies to explore mitigation strategies that best meet the region's conservation goals. In the future, the REF will be integrated into long-range transportation planning activities to minimize environmental impacts and identify mitigation opportunities earlier in the planning process.

The REF is a critical tool for taking an ecosystem approach to infrastructure development. Through the REF, many agencies in the North Central Texas region will have greater access to the best geographic and scientific data available. This access will improve their planning processes and strengthen environmental stewardship.

### *The Results*

Thus far, NCTCOG has developed an inventory of social, cultural, and natural data through NCTCOG's role as the region's clearinghouse for GIS information. NCTCOG has used the goals of the REF to ensure that the identified cumulative effect categories collectively represent the resources that need to be considered as potentially impacted and, in addition, address the needs defined by regional stakeholders. Cumulative effects in the identified subwatersheds are currently being assessed with GIS technology. The initial GIS base maps are comprised of overlays that represent critical habitat and essential ecosystems, providing a definition of baseline conditions for these study areas. Establishing a baseline is a necessary step in identifying and completing a cumulative effects analysis for the subwatershed-level study areas.

In addition, NCTCOG is currently assessing what future development scenarios would best suit the goals of the REF. An evaluation of the ability of several development scenarios – other than "business (development) as usual" – to account for critical habitat and vital ecosystems is currently underway.

NCTCOG is on track to achieve its final objective of "NCTCOG's Executive Board approval of the Regional Ecosystem Framework in the fall of 2010 in concert with the completion of this grant and the anticipated release of an updated Dallas-Fort Worth Metropolitan Transportation Plan, Mobility 2035" (NCTCOG 2009). The MPO has also made significant strides in interagency communication by establishing new connections and creating an enhanced dialogue between transportation and resource agencies on transportation and conservation planning.

## **North Carolina Department of Environment and Natural Resources (NCDENR)**

### *The Problem*

The State of North Carolina is experiencing unprecedented population growth, with an anticipated 50 percent population growth by 2030. The projected increase in the state's population will require significant improvements to the state's infrastructure. These projects, if not properly planned, will fragment critical habitat and endanger sensitive ecosystems. To provide the needed protections for critical resources, the NCDENR *Eco-Logical* grant project will implement a program to address data gaps and foster collaboration and outreach. It will also enhance and further existing work that will help conserve natural and cultural resources.

In its *Eco-Logical* grant application, NCDENR expressed a concern that "if transportation decisions are not made with adequate consideration of impacts on both cultural and natural resources, it is likely that natural resources of state and national significance will be lost" (NCDENR 2007).

### *The Solution*

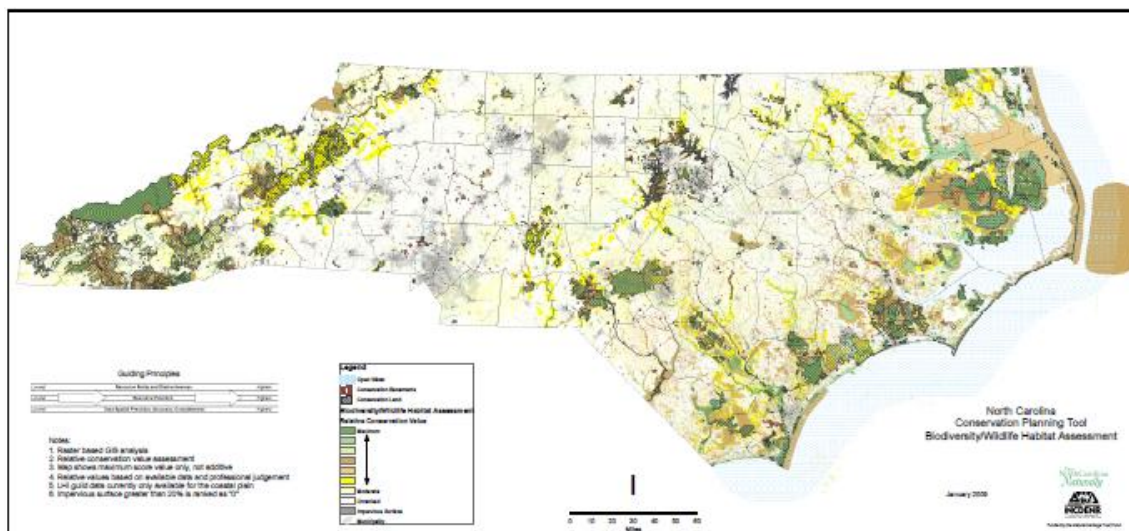
In 2004, several agencies came together to form the North Carolina Interagency Leadership Team (ILT). The ILT is comprised of 5 state agencies and 5 federal agencies. State agencies are North Carolina Departments of Transportation (NCDOT), Environmental and Natural Resources, Cultural Resources, Commerce and the Wildlife

Resources Commission. The federal agencies are USACE, USFWS, EPA, the National Marine Fisheries Service (NMFS), and FHWA. The ILT established two goals:

- Develop a comprehensive shared GIS database; and
- Develop local land use patterns and long-range transportation planning to meet “mobility, economic and environmental goals” (NCDENR 2007).

Through this *Eco-Logical* project, the ILT seeks to enhance its GIS database with new layers and to “facilitate planning for transportation projects” and “conservation of cultural and natural resources” (NCDENR 2007). The ILT has chosen Brunswick County as the test area for these principles because of its explosive growth and need for major infrastructure improvement.

To better reach its identified goals, the ILT developed an REF known as the Conservation Planning Tool (CPT). The CPT is an online resource that contains all available information about North Carolina’s most ecologically significant resources and integrates the resource information into a GIS dataset. In order to ensure that the CPT is complete and correct, NCDENR has divided the most important tasks into three major work areas: development of habitat maps, integration of the CPT into the transportation planning process, and digitizing cultural resource data.



**Figure 3: Map from the CPT, Graphic courtesy of NCDENR.**

For the CPT to be successful, NCDENR needs to address the major gap in natural resources data. To do this, the North Carolina Enhancement Program, a program of NCDENR, has entered into an agreement with its Natural Heritage Program to develop data about wetland and riparian species (this work was started under a previous grant). NCDENR is working with this partnership to collect data for all upland and inter-basin species.

NCDENR hopes to use the habitat maps to identify the intersection of habitat connectors and proposed transportation projects. Once these intersections are established, the transportation planning community can work to avoid these critical environmental areas. NCDENR aims to use the information provided by this analysis – along with other datasets incorporated into the state’s CPT – to avoid impacts to key landscape units or, where avoidance is not possible, to help minimize the impacts or select appropriate areas for compensatory mitigation (including both preservation and restoration projects).

NCDENR worked with NCDOT to redesign its transportation planning and project development processes, including the use of a more comprehensive environmental screening process. NCDENR believes that the data collected during the screening process would benefit state-, regional-, and metropolitan-level planning. It would also allow NCDENR to work collaboratively with other planning agencies to integrate the CPT.

For over 30 years, the North Carolina State Historic Preservation Office (SHPO) collected data and information about the state's historic properties. In the past 10 years, the SHPO began a long-term project to convert its paper maps into GIS data layers so that the information could be easily shared with other agencies. The NCDENR project builds upon this work and will accelerate the conversion of maps into GIS data layers, thus enabling infrastructure development to take into account historic resources as well as environmental resources in the planning and implementation processes.

In order to understand if the CPT is effective, NCDENR and NCDOT identified an MPO in the mountain region as a pilot site to test the CPT. NCDENR also embarked on a broader implementation of the CPT and regularly presents the CPT at meetings and events across North Carolina. At these meetings and events, NCDENR explains the CPT and encourages local governments and MPOs to utilize the CPT in their planning processes.

### *The Results*

NCDENR's promotion of the CPT has been quite effective; to date, at least eight planning groups, including MPOs, regional planning organizations, and local governments, have fully adopted the tool and committed to using it in upcoming plans. Through emphasizing voluntary utilization of the CPT, NCDENR is finding that communities and agencies are willing to consider and adopt the tool. Strategic partnerships between FHWA, NCDENR, NCDOT, and the Natural Heritage Program have been key to the project's early successes. With these four agencies endorsing the CPT and its integrated approach, NCDENR has gained stakeholder buy-in and plans to continue to develop the CPT throughout the life of the grant.

## **Blueprint Jordan River**

### *The Problem*

The Jordan River is 50 miles long, flowing from Utah Lake north to the Great Salt Lake wetlands. The river flows through 3 counties and 15 cities, each of which holds a major stake in the future of the river. The corridor surrounding the river was once rich with biodiversity. However, population growth throughout Utah demanded more of the river and degraded much of the natural environment surrounding it. These changes to the shape and flow of the river have displaced wetlands and native species. This lowland riparian environment is of critical importance in the region and is Utah's single most important type of habitat for birds. In addition, many citizens have come to view the river corridor as unappealing and efforts to complete a parkway trail have stalled.

### *The Solution*

The NGO Envision Utah began a "Blueprint" process through its *Eco-Logical* grant. This involved developing a media campaign to educate the broader community about river issues, leading committee meetings, running workshops, conducting technical analysis, and drafting a Blueprint report. Envision Utah assembled a steering committee made up of government and community leaders from all the cities and counties affected by changes to the river to make sure that all of the critical stakeholders would be represented in the Blueprint process. Envision Utah also convened a Technical Advisory Committee to ensure that its recommendations were technically correct.

Between May and June 2008, Envision Utah conducted workshops, focus groups, and an online survey to understand the public's preferences for the future of the river corridor. Overall, participants indicated that natural habitat, wildlife habitat, river health, and environmental protection along the corridor were the most important subjects. Participants also shared an interest in recreational opportunities and river-sensitive development in blighted areas that would attract people to the river and create a constituency for its revival.

During public workshops, Envision Utah mapped and prioritized the most ecologically sensitive areas along the Jordan River, identifying 7,800 acres of continuous nature preserve. Workshop participants identified areas appropriate for some regional activity centers. These areas were located in places where regional transportation could spur tourism and recreational activity. These activity centers encompassed 10 percent of all mapped items.

The consensus vision statement for the Blueprint River Jordan is a one-page description that envisions the river corridor as a 50-mile-long greenway with "river centers" that are spaces for "community gathering and neighborhood renewal" (Envision Utah 2009). For this vision to become a reality, all levels of government must work with the community to restore the river environment and update the recreational amenities. The vision statement helped to generate a set of 10 guiding principles that would help the community achieve its goals.

These guiding principles for the river corridor included restoring the hydrologic function of the river, conserving wetlands, and improving water quality. The project team hoped the vision would encourage environmental education, recreation, low-impact development, and reduced automobile access to the river and trails. The consensus visioning process led to a plan to build and strengthen collaborative partnerships between state and federal agencies and among the 3 counties and 15 municipalities along the river.

The Blueprint process devised a system to rate the environmental opportunity of different actions along the river corridor. There are three categories that use the Olympics-inspired names bronze, silver, and gold. Each category has a list of species that could inhabit the area with changes and policy recommendations that would ensure environmental stability. Using this rating system, future planners will be able to determine what environmental benefits each proposed environmental opportunity will bring to the river corridor.

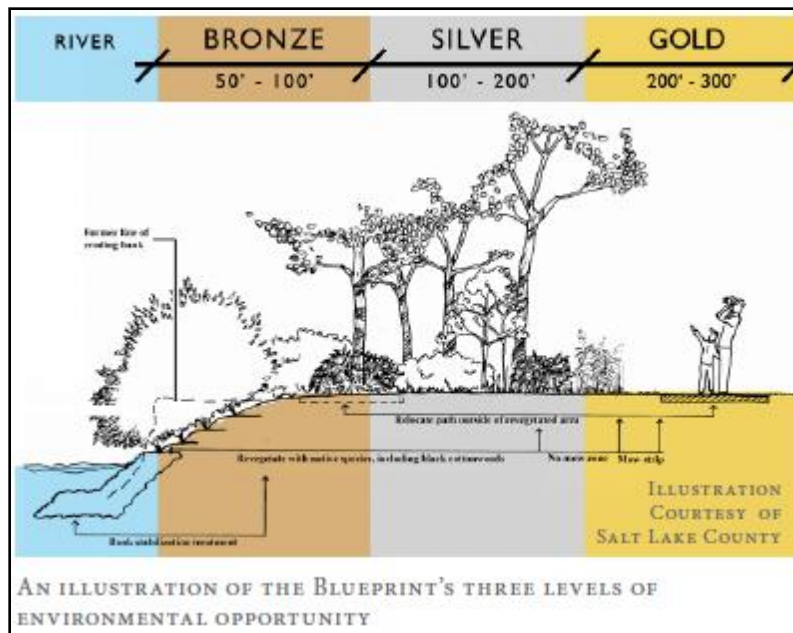
*The Results*

The Blueprint Jordan River developed a strong action plan aimed at rehabilitating a river that has great potential to improve the lives of those who live around it. The plan established goals and a vision shared by all stakeholders. The project allowed Envision Utah to determine what the region could be like if changes were made with conservation in mind. In the fall of 2008, an implementation committee explored methods to put the Blueprint into action. The committee balanced environmental, recreational, and development interests to identify feasible projects along the river in short and long terms.

Envision Utah views the Jordan River as a “valuable regional asset with unlimited potential” (Envision Utah 2007). The group hopes that the plan developed through the *Eco-Logical* project will preserve much of the river, while improving water quality and recreational opportunities, transforming the corridor into the ribbon that ties communities together. These steps should allow the river to reach its full potential as a resource for the community and regional ecology.

1.	Preserve and rehabilitate natural river features and functions to the greatest extent possible
2.	Establish buffers between the river and the built environment
3.	Restore riparian and in-stream habitats
4.	Replace structural water conveyance devices with alternatives that allow for flood management plus improvements for water quality, recreation, and habitat
5.	Reduce the use of hardscapes and impermeable surfaces in and near the corridor
6.	Manage stormwater on site
7.	Balance needs for development, recreation, and public access with river protection
8.	Incorporate the river’s natural and cultural history into designs for riverfront features, public art, education, and signage
9.	Apply design standards for complementary development and redevelopment in the corridor to support increased visibility and recreational use of the river
10.	Encourage regional transportation planning to connect communities to the river corridor, emphasizing non-automobile travel

**Figure 4: Blueprint Guiding Principles, Source: [Blueprint Jordan River]**



**Figure 5: Blueprint Jordan River Opportunity Assessment Source: [Blueprint Jordan River]**

Since completion of the *Eco-Logical* project, Envision Utah assembled an implementation committee made up of representatives from the Utah Department of Transportation, the FHWA Utah Division Office, elected officials, and representatives of other local interests. Together, this group plans to create a governance structure that will include a legal mechanism to allow these entities to work together and a funding mechanism to realize the public vision.

By implementing its plan, Envision Utah hopes to protect many acres of natural resources and make miles of recreational resources available to local users.

### **Conclusions**

The first cycle of the *Eco-Logical* Grant program has been an important activity for both the grant recipients and FHWA. Participating in the grant program has helped all agencies involved to experiment and often succeed in developing new channels of communication. Through the grants, plans and data that were previously housed in separate agencies have been integrated and will soon be available to a wider audience.

For FHWA, the grant program has brought new visibility to the agency's environmental role and helped the agency meet legal precedents set in legislation, MOUs, and EOs. The benefits experienced by both groups can be measured through a series of factors that will surely contribute to future environmental benefit.

### **Visibility**

In an interview, one grant recipient stated that the *Eco-Logical* grant program was a critical demonstration to those outside the U.S. Department of Transportation that FHWA holds a stake in environmental protection. While there are many FHWA programs aimed at environmental stewardship, few are as visible and tangible as *Eco-Logical*.

The broad visibility of *Eco-Logical* may, in part, be the result of the interagency involvement in the *Eco-Logical* grant program. Many agencies involved in the various stages of *Eco-Logical* have continued to implement and promote its concepts through newsletters, conferences, and trainings. Every agency has helped make *Eco-Logical* more prominent when planning for infrastructure.

Increased visibility of *Eco-Logical* concepts can help planners to understand which agencies must be involved in the development of infrastructure projects and that an environmentally sensitive method of planning might help agencies reduce costs and implementation time in the long term.



## **Process Improvement**

The *Eco-Logical* grant program not only serves as a mechanism to implement *Eco-Logical*, but it also improves partnerships and collaboration between agencies. Many of the grant recipients indicated that the grant projects helped create successful collaborations between partner agencies that had never worked together, or that had not successfully worked together. *Eco-Logical* aims to build these new relationships to ensure a multi-agency approach to infrastructure development and compensatory mitigation.

Many of the *Eco-Logical* grant projects found that working with historically difficult or argumentative stakeholders has strengthened relationships and laid a strong foundation for *Eco-Logical* work. Through the grant projects, agencies at all levels are now working together; FHWA division offices are working with regional planning agencies, and state resource agencies are making connections to local governments. The strength of new relationships resulting from the grant program will have to be measured over time and through future projects. However, these new ties will ensure that infrastructure planning decisions will be better supported by all relevant stakeholders in a region.

## **Meeting the Legal Precedents**

The FHWA *Eco-Logical* grant program both meets and exceeds the legal precedent outlined through NEPA and its subsequent environmental laws and through the series of EOs and MOUs that inspired the *Eco-Logical* publication. By surpassing these environmental standards, FHWA is setting a new standard in environmental consideration and stewardship.

By implementing the principles outlined in *Eco-Logical* through the grant program, FHWA stands out as an environmental leader, presenting a method to expedite transportation project delivery through planning and to work in coordination with other key agencies. In addition, the grant program extends these best practices across the country at all levels of planning and government. Since many of the projects focus on the early planning and data gathering stages of the *Eco-Logical* publication, one can assume that, if successful, these projects will use subsequent *Eco-Logical* principles in their project implementation process. The precedents set by *Eco-Logical* may help to ensure environmental sustainability surrounding infrastructure projects.

## **Filling Data Gaps**

Many of the *Eco-Logical* grant projects include data gathering and data synthesis components. The number of grant applicants who wanted to focus on these areas confirms *Eco-Logical's* assertion that in many parts of the United States information is spread thinly across agencies or is simply not available. By consolidating existing data and collecting new data, the *Eco-Logical* grant recipients are performing a service to their regions.

Reports from the grant projects indicate that data gathering thus far has been quite successful although there were some initial challenges in gaining stakeholder support for baseline data collection. Through intensive stakeholder involvement processes such as reoccurring meetings, collective visioning, and consistent interaction with stakeholders, most projects have been able to gain the needed support to collect and integrate data.

If agencies located in the regions of the *Eco-Logical* grant projects are able to tap into the consolidated data, future infrastructure projects and infrastructure improvements should be able to avoid environmentally sensitive areas, or should have a full view of appropriate mitigation within the project ecosystem or watershed. Several of the grant projects are creating online data-sharing tools accessible to the public, further ensuring that the collected data is available to all parties who may need it in their work.

## **Going Forward and Environmental Benefit**

The ultimate goal of the *Eco-Logical* publication is to protect and enhance the natural environment while performing necessary infrastructure expansion and improvement projects. Each of *Eco-Logical's* steps was designed to help infrastructure planning and construction achieve better environmental outcomes than in the current state of practice.

The environmental benefits of the *Eco-Logical* approach have already been demonstrated. The *Eco-Logical* grant program's intent to institutionalize the holistic approach nationally is an incremental process. The grants have shown themselves to be effective vehicles in spreading the implementation of *Eco-Logical* through building blocks of change in the grantee organizations and their partners. Future efforts will need to be focused on transferring the implementation knowledge and advancing the approach into a regular state-of-practice.

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**Julianne Siegel Schwarzer**, U.S. Department of Transportation, Volpe National Transportation Systems Center, is a Community Planner who specializes in environmental planning, policy, outreach and communications. At the Volpe Center, Ms. Schwarzer has worked on projects with federal agencies such as the Federal Highway Administration, Federal Transit Administration, the United States Fish and Wildlife Service and the United States Coast Guard. Ms. Schwarzer holds a Masters Degree in City Planning from the Massachusetts Institute of Technology, with a certificate in Environmental Planning, and a Bachelors of Fine Art Degree in Film and Television from New York University. For her graduate thesis, Julianne researched conflict and the public process surrounding urban wildlife management.

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