

AASHTO PRACTITIONER'S HANDBOOK

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IMPLEMENTING ECO-LOGICAL: INTEGRATING TRANSPORTATION PLANNING AND ECOLOGICAL DECISION MAKING

This handbook is intended to introduce transportation practitioners to a method of integrating ecological interests into transportation planning to address natural resource conservation and restoration priorities at a regional scale, and to establish a more reliable and efficient delivery program for projects with partner agencies.

Issues covered in this Handbook include:

- Engaging resource and regulatory agencies as planning partners
- Adopting an ecological framework for planning
- Prioritizing resources for conservation and restoration
- Developing a future transportation program in partnership with agencies and stakeholders to minimize impacts and direct mitigation efforts
- Establishing programmatic agreements for project review, permitting, and mitigation crediting
- Maintaining the framework and the partnership

This Handbook has been produced through a cooperative agreement between the American Association of State Highway and Transportation Officials (AASHTO) and the Federal Highway Administration (FHWA) as part of the Second Strategic Highway Research Program (SHRP2). The Center for Environmental Excellence by AASHTO endorses this Handbook. The Center's Handbooks provide practical advice on a range of environmental issues that arise during the planning, development, and operations of transportation projects.

Each Handbook is developed in cooperation with an advisory group that includes representatives for the Federal Highway Administration (FHWA), state departments of transportation, and other agencies as appropriate.

The Handbooks are primarily intended for use by project managers and other who are responsible for coordinating compliance with a wide range of regulatory requirements. With their needs in mind, each Handbook includes:

- key issues to consider;
- a background briefing;
- practical tips for achieving compliance; and
- a list of reference materials.

In addition, key regulations, guidance materials, and sample documents for each Handbook are posted on the Center's web site at <http://environment.transportation.org>.



American Association of State Highway and Transportation Officials



Documents

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Overview



This Handbook assists transportation agencies in defining a path and realistic goals for implementing the Eco-Logical process for their programs.

In 2006, a team of representatives from eight Federal agencies, including the Federal Highway Administration (FHWA), published *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects*¹ to present a vision of early collaboration among transportation, natural resource, and regulatory agencies when planning infrastructure projects and programs. In that vision, the interagency collaboration during system-wide planning provides an opportunity for sustaining or restoring ecological systems and their functions and values on an ecosystem scale, while also identifying more context sensitive solutions for the transportation plan, and improving environmental compliance and documentation.

The goals of Eco-Logical are to:

- Help state and local transportation agencies improve decisionmaking;
- Minimize the time and costs associated with planning, environmental reviews, and permitting;
- Provide for more effective environmental mitigation;
- Capitalize on environmental enhancement opportunities; and
- Improve public perception of the transportation project delivery processes.

Many state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) have used some of the methods that make up the Eco-Logical approach. Eco-Logical broadens the scope of interagency cooperation with an overarching methodology to guide both transportation agencies (state DOTs and MPOs) and resource agencies in addressing natural resource issues system-wide. The Eco-Logical concepts for addressing natural resource avoidance, minimization, and mitigation on a broad scale have been organized into a systematic, step-wise process.

Background Briefing

There is a growing emphasis on resource conservation and planning at the regional level rather than the localized, project level. Recent studies recognize that consolidated, regional-level mitigation provides ecological economies of scale by lowering the cost per acre of restoration, improving the restoration success rate, and increasing the protection to resident species with larger, unfragmented habitats (Murcia 1995, Schwartz 1999, Drechsler and Watzold 2009).^{2,3,4}

Federal initiatives toward regional infrastructure planning include:

1. Since the late 1980s, there has been a trend toward watershed-level planning to address water quality in accordance with Sections 303 (impaired waters) and 402 (National Pollutant Discharge Elimination System) of the Clean Water Act (CWA)

1 Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects. DOT-VNTSC-FHWA-06-01, FHWA-HEP-06-011 (April 2006). https://www.environment.fhwa.dot.gov/ecological/eco_index.asp.

2 Murcia, C. 1995. "Edge effects in fragmented forests: implications for conservation." *Trends in Ecology and Evolution*. 10(2): 58-62. https://www.researchgate.net/publication/49757343_Edge_Effects_in_Fragmented_Forests_Implications_for_Conservation.

3 Schwartz, M.W. 1999. "Choosing the appropriate scale of reserves for conservation." *Annual Review of Ecology and Systematics*. 30:83-108. https://www.researchgate.net/publication/223995601_Choosing_the_Appropriate_Scale_of_Reserves_for_Conservation.

4 Drechsler, M. and F. Watzold. 2009. "Applying tradable permits to biodiversity conservation: Effects of space-dependent conservation benefits and cost heterogeneity on habitat allocation." *Ecological Economics*. 68(4): 1083-1092. https://www.researchgate.net/publication/239910711_Applying_Tradable_Permits_to_Biodiversity_Conservation_Effects_of_Space-Dependent_Conservation_Benefits_and_Cost_Heterogeneity_on_Habitat_Allocation.

at Federal, state, and local levels. Over the years, a number of Federal and state watershed management guidance documents have been published, such as the comprehensive Handbook for Developing Watershed Plans to Restore and Protect Our Waters (USEPA, 2008).⁵

2. In 2002, Executive Order 13274, “Environmental Stewardship and Transportation Infrastructure Project Reviews,” provided further direction for interagency coordination among Federal, state, tribal, and local governments. The order directs Federal agencies that conduct environmental reviews for transportation projects to implement administrative, policy, and procedural mechanisms that ensure completion of such reviews in a timely manner and advance environmental stewardship. The order created an interagency “Transportation Infrastructure Streamlining Task Force,” chaired by the U.S. DOT and including seven other Federal departments and agencies, to monitor and assist agencies in their efforts to expedite reviews of transportation infrastructure projects and issue permits, and to identify and promote policies to streamline the review and approval of transportation projects.
3. In 2005, FHWA issued guidance on linking the National Environmental Policy Act (NEPA) process with long-range transportation planning. In 2008, FHWA and the Federal Transit Administration (FTA) amended the transportation planning regulations to allow the adoption of transportation planning decisions and analyses for use in the NEPA process.⁶
4. In August 2005, Section 6001 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) amended 23 USC 134 and 135 to require every state and MPO to consult with state, tribal, and local resource agencies when developing long-range plans, and require this consultation to involve a “comparison of transportation plans with state and tribal conservation plans or maps, if available,” and a “comparison of transportation plans to inventories of natural or historic resources, if available.” Under Section 6001, statewide and metropolitan long-range plans must now include a discussion of “potential environmental mitigation activities and potential areas to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental functions affected by the plan.” This discussion must be developed “in consultation with Federal, state, and tribal wildlife, land management, and regulatory agencies.” The Eco-Logical regional approach to mitigation provides a mechanism for agencies to meet the SAFETEA-LU Section 6001 requirement related to identifying “activities that may have the greatest potential to restore and maintain the environmental functions.”
5. In 2008, the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency issued regulations clarifying the standards used for determining compensatory mitigation for impacts to waters of the United States.⁷ The regulations “establish performance standards and criteria for the use of permittee-responsible compensatory mitigation, mitigation banks, and in-lieu programs to improve the quality and success of compensatory mitigation projects for activities authorized by Department of the Army permits”.
6. In 2011, FHWA published the *FHWA Scenario Planning Guidebook*.⁸ FHWA established its scenario planning program in 2004 to promote scenario planning as a technique to help citizens and stakeholders in the public and private sectors understand how demographic and land-use changes could potentially impact transportation networks in a state, community, region, or study area. It identifies land use, demographic, economic, political, and environmental factors as variables that affect transportation networks and operations. Scenario planning is a key element in regional transportation system planning.
7. In 2012, Section 1310 of Moving Ahead for Progress in the 21st Century Act (MAP-21) established 23 USC 168, which provides an additional framework (independent of the existing process in 23 CFR 450) for linking the transportation planning process and the NEPA process. MAP-21 included a new provision that identifies scenario planning as an optional part of the metropolitan planning process.
8. In 2012, MAP-21 Section 1311 (23 USC 169) provided for the development of programmatic mitigation plans as part of the statewide or metropolitan transportation planning process. Programmatic mitigation plans may be developed on a

5 U.S. EPA Report 841-B-08-002, *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (March 2008).
<https://www.epa.gov/polluted-runoff-nonpoint-source-pollution/handbook-developing-watershed-plans-restore-and-protect>.

6 See 23 CFR 450.212 and 450.318, and 23 CFR Part 450 Appendix A; see also AASHTO’s Practitioners Handbook 10, *Using the Transportation Planning Process to Support the NEPA Process* (2008).

7 U.S. Army Corps of Engineers and U.S. Environmental Protection Agency, Final Compensatory Mitigation Rule, 73 Fed. Reg. 19670, Apr. 10, 2008 (codified in 33 CFR Part 332).

8 FHWA Report FHWA-HEP-11-004. *FHWA Scenario Planning Guidebook* (2011).
https://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/scenario_planning_guidebook/.

regional, ecosystem, watershed, or statewide scale and address one or more resources, as decided by the transportation agency in consultation with the resource agencies.

9. In 2012, Executive Order 13604, “Improving Performance of Federal Permitting and Review of Infrastructure Projects,” reinforced that Federal permitting and review processes be conducted with maximum efficiency and effectiveness, ensuring the health, safety, and security of communities and the environment while supporting vital economic growth. The Executive Order also directs that these processes must be transparent, consistent, and predictable, and that agencies should set and adhere to timelines and schedules for completing reviews, as well as set and track progress against performance goals.
10. In 2016, Fixing America’s Surface Transportation Act (FAST ACT) Section 1305 (23 USC 168) “Integration of Planning and Environmental Review” assert that agencies may adopt or incorporate by reference and use a planning product or decision in proceedings relating to any class of action in the environmental review process of the project.

The Eco-Logical process is closely linked to FHWA’s Planning and Environment Linkages (PEL) initiative. The PEL is a collaborative and integrated approach to transportation decision making that 1) considers environmental, community, and economic goals early in the transportation planning process, and 2) uses the information, analysis, and products developed during planning to inform the environmental review process. PEL is applicable to any sensitive natural or man-made resource.

Eco-Logical Technical Guide. In 2011, the Transportation Research Board’s (TRB) Second Strategic Highway Research Program (SHRP2), in cooperation with FHWA and AASHTO, funded the additional development of the *Manager’s Guide to the Integrated Ecological Framework*,⁹ a step-by-step technical guide to implement the concepts laid out in Eco-Logical (Table 1). The Integrated Ecological Framework (IEF) is

*...a nine-step technical framework that supports transportation/infrastructure planners and resource specialists in the use of a standardized, science-based approach to identify and integrate ecological priorities into transportation and infrastructure decision making.*¹⁰

The IEF applies individual project planning protocols at the higher, system planning level. Essentially, the IEF includes the project development process steps of mapping resources, alternatives analysis, justification, impact analysis, and mitigation before the project-level analysis begins. The IEF initially supports mid- to long-range transportation and infrastructure planning by establishing efficient communication and information-sharing with the resource agencies. Geographic Information System (GIS) mapping tools provide agencies with a means to share and visually place natural resource and infrastructure data at an ecosystem scale to gain consensus on the region’s ecological conservation and restoration priorities. Overlaying the transportation improvement plans (and possibly other land-use plans), the stakeholders identify the specific resources to be avoided, make system-level adjustments to avoid and minimize the impacts, and agree on a regional or subarea approach to mitigating unavoidable impacts.

Early commitments evolve into agreements with resource agencies (Memorandums of Agreement, Programmatic Agreements, standard coordination procedures, standard designs) that define and direct coordination, avoidance, minimization, and mitigation requirements that apply at the project level, in a predictable manner, to help control costs and preserve project schedules. Through the process, the highest priority restoration opportunities and most suitable and desirable mitigation sites can be identified. In this way, the process aligns transportation expenditures for environmental compliance and mitigation with conservation needs, achieving significant benefits for the ecology of the planning region.

9 TRB SHRP 2 Report S2-C06-RW-4, *Manager’s Guide to the Integrated Ecological Framework* (2014).
<http://www.trb.org/Main/Blurbs/170422.aspx>.

10 Ibid, p. 5.

Table 1. Summary of the Steps of the Integrated Ecological Framework¹¹

Step	Purpose
Step 1: Build and strengthen collaborative partnerships and vision	Build support among relevant stakeholders to achieve a statewide or regional vision and planning process that integrates conservation and transportation/infrastructure planning.
Step 2: Characterize resource status and integrate natural environment plans	Develop an overall environmental conservation strategy that integrates conservation priorities, data, and plans, with input from and adoption by all conservation and natural resource stakeholders identified in Step 1, addressing all species, habitats, and relevant environmental issues.
Step 3: Create a regional ecosystem framework (conservation strategy + transportation plan)	Integrate the conservation and restoration strategy (data and plans) prepared in Step 2 with transportation and land-use data and plans (Long-Range Transportation Plan [LRTP], State Transportation Improvement Program [STIP], and an MPO's Transportation Improvement Plan [TIP]) to create the spatial database known as the Regional Ecosystem Framework (REF).
Step 4: Assess effects on conservation objectives	Identify scenarios that meet both transportation/infrastructure and conservation goals by analyzing transportation and/or other land-use scenarios in relation to resource conservation objectives and priorities using the REF spatial database developed in Step 3 and models of priority resources.
Step 5: Establish and prioritize ecological actions	Establish mitigation and conservation priorities and rank action opportunities using assessment results from Steps 3 and 4.
Step 6: Develop crediting strategy	Develop a consistent strategy and metrics to measure ecological impacts, restoration benefits, and long-term performance for all projects to promote progressive restoration and mitigation, and more-accurate accounting of results.
Step 7: Develop programmatic consultation, biological opinion, or permits	Take advantage of identified regional conservation and restoration objectives to develop Memoranda of Agreement, programmatic agreements (404 permits or Endangered species Act (ESA) Section 7 consultations), or other CWA agreements for transportation/infrastructure projects in a way that documents the goals and priorities identified in Step 6 and the parameters for achieving these goals.
Step 8: Implement agreements, adaptive management, and deliver projects	Design transportation/infrastructure projects in accordance with ecological objectives and goals identified in previous steps (i.e., keeping planning decisions linked to project decisions), incorporating as appropriate programmatic agreements, performance measures, and ecological metric tools to improve the project.
Step 9: Update regional ecosystem framework and plan	Maintain a current REF spatial database that reflects the most recent knowledge of natural resources, conservation priorities, and mitigation opportunity areas that can support periodic updates to scenarios, and regional cumulative effects assessments.

It is likely that the transportation agency (e.g., state DOT or MPO) will initiate and lead the process because of the transportation agency's resources, as well as its interest in expediting the environmental review and permitting for transportation projects. But, in fact, the resource agencies or other entities could also initiate and lead the process. In any case, the transportation agency will be a key party because of its interests, its capacity for wide geographic implementation, and its potential to influence other transportation or other infrastructure agencies. In many cases, the transportation agency will also provide an important funding source for the Eco-Logical effort.

Key Issues to Consider

The following series of questions are posed to assist a practitioner in assessing available information and resources and to develop a strategy for implementing the IEF. Ideally, these questions will reveal priority information and administrative needs that must be addressed to engage the important stakeholders and make the IEF as efficient and functional as possible.

¹¹ TRB SHRP 2 Report S2-C06-RW-2, *An Ecological Approach to Integrating Conservation and Highway Planning*, Volume 2 (2012). <http://www.trb.org/Main/Blurbs/166938.aspx>.