# Reference Links

- Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects, FHWA(Direct to: http://www.environment.fhwa.dot.gov/ecological/eco_index.asp)
- An Ecological Approach to Integrating Conservation and Highway Planning, Volume 2, TRB(Direct to: http://www.trb.org/Publications/Blurbs/166938.aspx)
- Environmental Review Toolkit: Eco-Logical, FHWA(Direct to: http://www.environment.fhwa.dot.gov/ecological/eco_entry.asp)

# Overview

## The PlanWorks Approach

- Helps to better avoid and minimize impacts on natural resources through early and ongoing collaboration.
- Can result in more predictable, streamlined, and transparent permitting.
- Assures resource agencies that mitigation investments will be implemented and transportation agencies that mitigation investments will be counted.
- Focuses time and money on the protection of critical natural resources.
- Facilitates assessment of cumulative impacts.
- Helps establish monitoring and performance measures.

## Working with Resource Specialists

Transportation practitioners rely on input from natural resource specialists. More information about the interests and roles of natural resource specialists is available in the Partner Portal.

**Why do transportation practitioners care about the natural environment?**
Federal regulations require transportation planners to "protect and enhance the environment." During environmental review, transportation practitioners must ensure their federally-funded projects comply with the National Environmental Policy Act (NEPA) and other environmental laws, and are permitted by resource agencies.

**How can PlanWorks help transportation practitioners consider the natural environment?**
PlanWorks provides tools to step up the level of collaboration among transportation practitioners and natural resource specialists to:

- Avoid impacts on priority conservation areas
- Locate mitigation for the greatest benefit to multiple resources
- Better achieve the goals of resource protection laws

The goal is streamlined transportation decisions with better outcomes for the natural environment.

**Four areas of information support this integration:**

1. Natural Environment and the Decision Guide is a quick, high-level, summary of how information about the natural environment informs transportation key decisions.
2. The Integrated Ecological Framework (IEF) is a detailed, step-by-step, technical process that guides you through the integration of transportation and ecological planning.
3. Linking the IEF and the Decision Guide shows how data, analysis, and decisions from the IEF inform transportation key decisions.
4. Examples from Practice show how the IEF approach has been applied.

# Decision Guide

## Natural Environment and the Decision Guide

The Decision Guide is the foundation of Planworks. It consists of all of the key decisions in four phases of transportation decision making: long range planning,programming,corridor planning and environmental review. For each key decision Planworks provides:

- Purpose and outcome
- Data inputs
- Questions that decision makers ask
- Connections among transportation decision making and other processes (like ecological planning)
- Connections among the phases of transportation decision making

**For a snapshot of natural environment inputs at each Key Decision, roll over the Decision Guide graphic below. Click on any Key Decision for detailed information.** The inputs are based on a robust ecological planning process like the IEF. Key Decisions that are grayed-out have no specific inputs from the natural environment.

**Long Range Transportation Planning**

- LRP-1 - Approve Scope of LRTP Process
  Available data, goals, and relationships from ecological planning are gathered. Resource and transportation specialists decide to work together and determine a supporting process.
- LRP-2 - Approve Vision and Goals
  Goals and priorities identified in ecological planning are considered and a shared transportation and ecological vision is approved.
- LRP-3 - Approve Evaluation Criteria, Methods and Measures
  Evaluation criteria, methods, and performance measures identified in ecological planning (including any associated with a crediting strategy) inform this key decision.
- LRP-4 - Approve Transportation Deficiencies
  This key decision is not associated with application.
- LRP-5 - Approve Financial Assumptions
  Funding strategies and mitigation costs identified through ecological planning inform this key decision.
- LRP-6 - Approve Strategies
  Transportation strategies that would impact priority areas for conservation and restoration identified through ecological planning are avoided.
- LRP-7 - Approve Plan Scenarios
  Transportation plan scenarios and ecological data are mapped together to identify potential impacts and opportunities for joint action on conservation and restoration priorities.
- LRP-8 - Adopt Preferred Plan Scenario
  A preferred scenario from an ecological perspective is considered. Analysis and information about potential direct and cumulative effects and mitigation needs inform the adoption of a preferred scenario.
- LRP-9 - Make Conformity Determination by MPO
  This key decision is not associated with application.
- LRP-10 - Adopt LRTP by MPO
  A joint decision is made about a conservation and mitigation strategy for the preferred scenario. Agreements are put in place.
- LRP-11 - Make Conformity Determination
  This key decision is not associated with application.

**Programming**

- PRO-1 - Approve Revenue Sources
  Consider how identified revenue sources may support advance mitigation.
- PRO-2 - Approve Methodology for Identifying Project Costs and Criteria for Allocating Revenue
  Ecological planning can provide information about the cost and value of mitigation and conservation.
- PRO-3 - Approve Project List Drawn from Adopted Plan Scenario or Solution Set
  This key decision is not associated with application.
- PRO-4 - Approve Project Prioritization
  Prioritized mitigation projects from ecological planning inform this key decision.
- PRO-5 - Reach Consensus on Draft TIP
  This key decision is not associated with application.
- PRO-6 - Adopt TIP by MPO
  The adopted TIP informs the ecological plan.
- PRO-7 - Approve TIP by Governor and Incorporate into Draft STIP
  This key decision is not associated with application.
- PRO-8 - Reach Consensus on Draft STIP
  This key decision is not associated with application.
- PRO-9 - Approve STIP with respect to Fiscal Constraint
  This key decision is not associated with application.

**Corridor Planning**

- COR-1 - Approve Scope of Corridor Planning Process
  Available data, goals, and relationships from ecological planning are gathered. Resource and transportation specialists decide to work together and determine a supporting process.

- COR-2 - Approve Problem Statements and Opportunities
  Relevant opportunities to enhance the natural environment in the corridor identified through ecological planning inform this key decision.
- COR-3 - Approve Goals for the Corridor
  Goals and priorities identified in ecological planning are considered and a shared transportation and ecological vision is approved.
- COR-4 - Reach Consensus on Scope of Environmental Review and Analysis
  Determine the availability of data from the ecological plan to support the scope of environmental review and analysis.
- COR-5 - Approve Evaluation Criteria, Methods and Measures
  Evaluation criteria, methods, and performance measures identified in ecological planning (including any associated with a crediting strategy) inform this key decision.
- COR-6 - Approve Range of Solution Sets
  Use the priority areas for conservation and restoration identified through ecological planning to avoid transportation solution sets that would impact these areas.
- COR-7 - Adopt Preferred Solution Set
  A preferred solution set from an ecological perspective is considered. Analysis and information about potential direct and cumulative effects and mitigation needs inform the adoption of a preferred solution set. A joint decision is made about a conservation and mitigation strategy for the preferred solution set.
- COR-8 - Approve Evaluation Criteria, Methods and Measures for Prioritization of Projects
  Use evaluation criteria, methodology, and performance measures from ecological planning to prioritize transportation and ecological actions in support of the preferred solution set.
- COR-9 - Adopt Priorities for Implementation
  Prioritized ecological actions inform this key decision. Agreements are put in place.

**Environmental Review/NEPA Merged with Permitting**

- ENV-1 - Reach Consensus on Scope of Environmental Review
  Available data, goals, and relationships from ecological planning are gathered. Resource and transportation specialists work together and determine a supporting process and/or decide to implement earlier agreements.
- ENV-2 - Approve Notice of Intent
  This key decision is not associated with application.
- ENV-3 - Approve Purpose and Need/Reach Consensus on Project Purpose
  Ecological goals and priorities are analyzed to inform a compatible and/or complementary project purpose and need.
- ENV-4 - Reach Consensus on Study Area
  The ecological planning region informs the study area for environmental review.
- ENV-5 - Approve Evaluation Criteria, Methods and Measures
  Evaluation criteria, methods, and performance measures identified in ecological planning (including any associated with a crediting strategy) inform this key decision.
- ENV-6 - Approve Full Range of Alternatives
  Use the priority areas for conservation and restoration identified through ecological planning to avoid transportation strategies that would impact these areas.
- ENV-7 - Approve Alternatives to be Carried Forward
  Through joint analysis, the amount and relative degree of potential impacts of alternatives in relation to resource conservation priorities are determined.
- ENV-8 - Approve Draft EIS with Conceptual Mitigation
  Ecological impacts and mitigation needs for alternatives carried forward for detailed study are determined. Any advance mitigation strategies implemented according to early agreements are validated.
- ENV-9 - Approve Resource Agency Public Notice
  This key decision is not associated with application.
- ENV-10 - Approve Preferred Alternative / LEDPA
  This key decision is not associated with application.
- ENV-11 - Approve Final Jurisdictional Determination
  The final jurisdictional determination is used to update ecological plans.
- ENV-12 - Reach Consensus on Avoidance and Minimization for the LEDPA
  Determine avoidance and minimization measures that are consistent with the conservation priorities identified in the ecological plan.
- ENV-13 - Approve Final EIS
  This key decision is not associated with application.
- ENV-14 - Approve the Record of Decision
  Update the ecological plan and ensure any early agreements are reflected in special conditions.
- ENV-15 - Render Permit Decision and Approve Avoidance and Minimization
  Update the ecological plan and ensure any early agreements are reflected in permit conditions.

# Integrated Ecological Framework (IEF)

## More about the Integrated Ecological Framework

- Eco-Logical, drafted and signed by eight federal agencies in 2006, put forth a conceptual groundwork for integrating transportation and conservation plans and endorsed ecosystem-based mitigation. The IEF supports implementation of this approach.
- Access the Practitioner's Guide to the Integrated Ecological Framework.

The IEF is a step-by-step, peer-reviewed, and science-based process that guides transportation and resource specialists in the integration of transportation and ecological decision making.

The IEF responds to two critical needs:

- Identify potential impacts on regulated resources very early in the planning process so they can be avoided or minimized.
- Assure that any mitigation that must occur will provide effective, measurable, and high-quality environmental outcomes.

The IEF process addresses key questions:

- What areas and resources will be directly impacted by transportation?
- What are the cumulative impacts on those resources?
- What areas could be used for mitigation? Which areas would maximize benefits for multiple resources?
- Can anticipated long-range mitigation needs for a region be combined to maximize ecological benefits instead of project-by-project mitigation?

**The nine steps in the IEF are depicted below. Hover over each step to discover its purpose. Click on a step to access detailed information about implementation,including: anticipated outcomes; sub-steps; technical guidance; and supporting tools,decision-making questions, data and case studies.**

- Step 1 - Build and Strengthen Collaborative Partnerships and Vision
  Build a vision of what is most needed for natural resources in the region.
- Step 2 - Characterize Resource Status and Integrate Natural Environment Plans
  Develop an overall conservation/restoration strategy that integrates conservation/restoration priorities, data, and plans.
- Step 3 - Create Regional Ecosystem Framework (Conservation Strategy + Transportation Plan)
  Integrate the conservation and restoration strategy with transportation and land use data and plans to create the Regional Ecosystem Framework (REF).
- Step 4 - Assess Effects on Conservation Objectives
  Identify preferred alternatives that meet both transportation and conservation goals using the regional ecosystem framework.
- Step 5 - Establish and Prioritize Ecological Actions
  Establish mitigation and conservation priorities and rank action opportunities.
- Step 6 - Develop Crediting Strategy
  Develop a consistent strategy and metrics to measure ecological impacts, restoration benefits, and long-term performance.
- Step 7 - Develop Programmatic Consultation, Biological Opinion or Permit
  Develop memoranda of understanding, agreements, programmatic 404 permits or ESA Section 7 consultations for transportation projects.
- Step 8 - Implement Agreements, Adaptive Management and Deliver Projects
  Design transportation projects in accordance with ecological objectives and goals, incorporating as appropriate the programmatic agreements, performance measures and ecological metrics to improve project outcomes.
- Step 9 - Update Regional Ecosystem Framework and Plan
  Update the effects assessment to determine if resource goal achievement is still on track.

# Linking the IEF and the Decision Guide

The IEF represents the technical process of integrating transportation and ecological planning. IEF steps and key decisions are linked through the two-way flow of data, analysis, and decisions.

Ideally, the IEF process is conducted in conjunction with long range planning. However, it is possible to begin at any key decision and use the IEF to support better environmental and transportation decision making.

A printable summary, An Ecological Approach to Integrating Conservation and Highway Planning, Volume 1, is available on the web.

- Step 1 - Build and Strengthen Collaborative Partnerships and Vision
  Relationships formed through IEF Step 1 and decisions about an ecological study area; high-level goals and funding for conservation, restoration, or mitigation projects inform the transportation process.
- Step 2 - Characterize Resource Status and Integrate Natural Environment Plans
  The combined map of natural resource data and plans from IEF Step 2 informs transportation decisions as early as possible so that transportation scenarios/strategies/alternatives can avoid priority areas for conservation and restoration.
- Step 3 - Create Regional Ecosystem Framework (Conservation Strategy + Transportation Plan)
  This is a key link between transportation decision making and ecological planning through which the map of natural resource data is combined with transportation scenarios, strategies or alternatives being considered.
- Step 4 - Assess Effects on Conservation Objectives
  Information is exchanged between IEF Step 4 and transportation key decisions in order to inform evaluation criteria, methods and measures used for transportation decision making and to evaluate the potential direct and cumulative impacts of different scenarios, strategies or alternatives on conservation and restoration priorities.

- Step 5 - Establish and Prioritize Ecological Actions
  Preferred transportation scenarios, strategies or alternatives inform this IEF step in order to compare conservation, restoration or mitigation options. Information about the cost of mitigation is also generated and informs programming.
- Step 6 - Develop Crediting Strategy
  Information generated through IEF Step 6 about a specific crediting strategy for mitigation, along with data that can be used to determine the cost and value of mitigation, informs transportation key decisions. This information can be used to measure ecological impacts and estimate the cost of mitigation.
- Step 7 - Develop Programmatic Consultation, Biological Opinion or Permit
  MOUs and programmatic agreements are put in place to document agreed-upon relationships and strategies in order to guide subsequent decision making.
- Step 8 - Implement Agreements, Adaptive Management and Deliver Projects
  If an ecological planning process has been completed, IEF Step 8 is an implementation step where data, decisions, agreements and strategies inform transportation decision making.
- Step 9 - Update Regional Ecosystem Framework and Plan
  Changes in transportation and ecological data, relationships and decisions are used to update the regional ecosystem framework, which in turn informs subsequent transportation decisions.

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# Examples from Practice

## IEF Success Stories

Comparing three test applications of the IEF process to actual practice showed that:

- The IEF process results were similar to actual practice for the identification and mitigation of direct ecological impacts in all three tests
- The IEF process results were better than actual practice for the identification and mitigation of cumulative ecological impacts
- The IEF process was efficient and resulted in early information about ecological resources and impacts

The IEF process was initially tested in three pilot programs. Examples from those pilots are summarized on this page. See An Ecological Approach to Integrating Conservation and Highway Planning Volume 2 for details. Additional Eco-Logical Successes are summarized on FHWA's website.

- Colorado Pilot Project: South I-25 Corridor

  Steps 1-5 of the IEF process were used to identify priority natural resource areas,avoid impacts, and select mitigation for the South I-25 Corridor in the Denver,Colorado area. An EIS for the South I-25 Corridor had been completed and results were compared to the pilot approach. The IEF approach promoted a more accurate assessment of cumulative impacts by including spatially explicit analyses using data not included in the original assessment, and by defining a larger, ecologically based assessment area.

  Step 1: Build & Strengthen Collaborative Partnerships and Vision

  Pilot efforts were focused on Step 1a - *identify a preliminary planning region.*The pilot project is within the Denver Regional Council of Governments (DRCOG) planning area. The DRCOG spans two very different eco-regions: the forested, mountainous areas of the Southern Rockies and the remaining fragments of the Shortgrass Prairie.The boundary used for the analysis was the Shortgrass Prairie portion of the DRCOG area.

  Step 2: Characterize Resource Status and Integrate Natural Resource Plans

  Existing sources provided spatial data representing baseline conditions. Data from DRCOG captured changes in transportation, urban growth, and other planned infrastructure at a landscape scale. Natural resources data included key wildlife areas, natural heritage occurrences, priority conservation areas, wildlife corridors and highway crossing areas, and wetlands. NatureServe Vista was used to combine all layers representing land use into three broad categories: species occurrences, natural communities,and priority conservation areas.

  Step 3: Create Regional Ecosystem Framework

  To spatially represent the source, type, and magnitude of current and anticipated transportation impacts, pre-construction and post-construction scenarios were identified.NatureServe Vista was used to compare resources in both scenarios and view the results against predetermined resource retention goals.

  Step 4: Assess Effects on Conservation Objectives

  The scenario evaluation produced a report and several visualization layers. The report summarizes the performance of each scenario in terms of the number of acres and percentage of resources that met conservation goals. The raster layers identified locations where natural resources intersect with potentially harmful land uses.The tool identified the expected direct impacts of the South I-25 Corridor and the cumulative impacts of the corridor project when combined with other infrastructure projects and anticipated land use changes.

  Step 5: Establish & Prioritize Ecological Actions

  NatureServe Vista's Site Explorer was used to examine the effects of alternative land uses and policies on a site or set of sites. It provides an inventory of natural resources, the number and percentage of compatible occurrences, and the achievement of resource retention goals, with which transportation planners can develop multiple alternate off-site mitigation scenarios that meet goals and can be shared with stakeholders and decision makers.

- Oregon Pilot Project: US 20 Pioneer Mountain to Eddyville

  Steps 1-6 of the IEF process were used to identify priority natural resource areas, avoid impacts, and select mitigation for improvements to a section of US 20 between Pioneer Mountain and Eddyville in Oregon. An EIS for the US 20 project had been completed and results were compared to the pilot approach. The IEF process recommended mitigation in larger priority-wetland areas in the watershed that would provide opportunities to create or enhance salmon habitat.

  Step 1: Build & Strengthen Collaborative Partnerships and Vision

  Pilot efforts were focused on Step 1a - *identify a preliminary planning region*.The project is in the Oregon Coast Range within the Yaquina Rive watershed. The relatively small Yaquina watershed was selected for analysis, allowing for a focused look at species, habitats, and impacts.

  Step 2: Characterize Resource Status and Integrate Natural Resource Plans

  The ecological resources to be considered in the analysis were "adopted" from analyses available from the Oregon Biodiversity Information Center. This included data for at-risk species, habitats, and vegetation and from two regional assessments and one watershed assessment. Salmon are the only federally listed aquatic species present in the site and managed by NOAA Fisheries. NOAA provided Internal models of fish habitat presence and importance.

Steps 3 and 4: Create Regional Ecosystem Framework and Assess Effects on Conservation Objectives

ArcGIS and the Envision DSS tools were used to create the REF and assess effects.Because the ecological targets within the transportation project area were limited,the focus of the analysis was on the changes in the particular species and habitats,based on the project area footprint.

The conservation assessment identified two significant habitats in the region affected by the project: coastal Sitka spruce forest and dry Douglas-fir forest. Moving the highway out of the Yaquina River watershed into young upland forest that had recently been clear-cut achieved as much conservation benefit as would be possible by a highway project in the basin.

Step 5: Establish & Prioritize Ecological Actions

The pilot revealed that the onsite wetlands proposed as mitigation in the project EIS were not high-priority wetlands. Using the data and methods of this project,three high-priority wetland sites in the basin were identified as suitable mitigation,based on their size and overall importance to the at-risk fish in the watershed

Step 6: Develop Crediting Strategy

Existing tools were used to evaluate the potential credits from two of the three potential mitigation sites. Pilot staff determined that the lands already in conservation ownership had little priority for restoration, while the private lands in these sites had significant potential, and would easily meet project mitigation needs.The crediting analysis included analysis of regulated resource crediting, analysis of credit markets, and recommendations based on future needs

- Michigan Pilot Project: US 131 Corridor

The goals of this pilot were to evaluate the efficacy of the IEF when applied to an alternative corridor assessment; evaluate NatureServe Vista's efficacy for building an REF without a spatially based local, regional, or statewide conservation plan in place; and evaluate the efficacy of utilizing several wetland datasets for mitigation.The IEF approach was compared to a 1997 corridor analysis for US 131. The IEF process indicated a different alternative that had fewer impacts and would have reduced mitigation requirements. The IEF's use of more detailed ecological data and a decision support tool that allowed for a very precise and quantitative impact assessment for each resource made the difference.

Step 1: Build & Strengthen Collaborative Partnerships and Vision

Pilot efforts were focused on Step 1a - *identify a preliminary planning region*.The US 131 Corridor is within the St. Joseph River watershed. A watershed approach was already being used to develop a wetland functional assessment database and was therefore adopted to define the planning region for this study.

Step 2: Characterize Resource Status and Integrate Natural Resource Plans

Spatial data used to identify conservation priorities in the region comprised federal and state listed species, rare and/or exemplary natural communities, large contiguous natural landscapes, potential high quality natural vegetation patches, potential unique or high quality lakes, potential unique or high quality stream segments,and existing wetland functions.
All data layers were imported into Vista as individual conservation elements in a simple overlay without weights. The results showed that conservation values differ significantly from place to place within the pilot region, and that the majority of natural resources are highly fragmented and scattered across the landscape.

Step 3: Create Regional Ecosystem Framework

The 1997 corridor study of five alternatives was used as the transportation plan to determine which alternative corridor would have the least impact on the region's natural resources. The five 1-mile wide corridors analyzed were incorporated into Vista as five different scenarios.

Step 4: Assess Effects on Conservation Objectives

Each corridor was evaluated to measure its impact on each of the resource types.The GIS analysis showed that Corridors A and B would have the least negative impact on the priority conservation areas in the pilot region, but Corridor B performed slightly better overall. Yet Corridor A had been chosen in the original corridor study. The Vista tool and the accompanying natural resource data allowed relatively quick analysis. If these had been available for the original US 131 corridor study, environmental concerns may have been addressed more easily and earlier in the decision making process.