

Environmental Planning GIS Tools



Integrating Transportation
and Resource Conservation

Executive Overview

**Environmental Planning
GIS Tools**



Overview

The American Association of State Highway and Transportation Officials (AASHTO) Technology Implementation Group (TIG) Program identifies and champions nationwide use of new, high-payoff, ready-to-use technologies. The Program selected Maryland and Texas as a Lead States Team (LST) to showcase, through national outreach and education strategies, innovative methods that facilitate and improve quality in environmental aspects of transportation project development. This LST promotes the expanded use of Environmental Planning GIS Tools (EPGT) by sharing their knowledge and shortening the learning time of prospective users. In both states, transportation and natural resource planners worked collaboratively to develop decision-support tools designed to deliver critical transportation services in an environmentally protective and restorative manner.



The use of EPGT facilitates the planning and design process for transportation projects. These tools highlight the importance of an integrated, multi-scale planning process to facilitate the development of transportation infrastructure within the context of interconnected networks of ecologically important lands.

Maryland is continuing to expand the use of its Green Infrastructure (GI) Approach, integrating cutting-edge GI assessment tools with the transportation project development process to promote sustainable transportation solutions that seek to protect critical habitats and ecosystems from the encroachment of highway infrastructure. GI encompasses “strategically planned and managed networks of natural lands, working landscapes, and other open spaces that conserve ecosystem functions and provide associated benefits to human populations.” GI assessment tools attempt to recognize a variety of natural resources, how one system fits into the big picture, the significance of open space in rural and developed areas, and the importance of an integrated planning process at all levels of government. These

tools also provide the opportunity to support strategic mitigation and conservation efforts at multiple scales in support of federal, state, and local initiatives.

Texas, in partnership with EPA Region 6, has implemented a Geographic Information System Screening Tool (GISST), which evaluates environmental vulnerability and impact of project alternatives using multiple types of environmental resource and stressor criteria. The system derives aggregate scores for each alternative that reflect the “potential for significant environmental risk.” Information from the statewide Texas Ecological Assessment Protocol (TEAP) has been integrated with the GISST for early identification and consideration of regional areas with high ecological importance, based on the diversity, rarity and sustainability of species and habitats.

NEPAssist, another EPGT created by EPA and used by TX DOT, is a web-based screening tool that provides resource information on multiple environmental media in support of National Environmental Policy Act (NEPA) compliance. NEPAssist is now available on a national basis.

What Environmental Planning GIS Tools are available?

Many EPGTs are readily available for use or replication. Information related to available EPGTs is provided in the following list, which is not all-inclusive:

- EPA NEPAassist: <http://www.epa.gov/oecaerth/nepa/nepassist-mapping.html>
- Texas GISST Manual: <http://nepis.epa.gov - document #906B05003>
- Maryland GI assessment: <http://www.dnr.state.md.us/greenways/gi/gi.html>
- FHWA (searchable list of GIS transportation and environmental practices by state): <http://gis.fhwa.dot.gov/statepracs.asp>

How do these tools differ from other GIS-based tools?

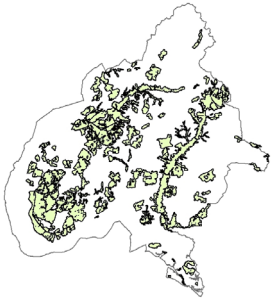
EPGTs are systematic, geospatial tools that enable users to analyze environmental impacts and prioritize environmental protection measures. These GIS tools go well beyond simply mapping resources by using spatial technology merged with ecological science to analyze and prioritize environmental assets. EPGTs are useful in considering single media and cumulative environmental concerns. The tools are also scalable and can be customized for almost any application.

For example, GISST performs complex spatial analyses and imposes a scoring structure on GIS data coverage. By using this approach, GISST allows users to prioritize environmental resources and compare transportation alternatives. The GISST scoring structure eliminates the subjectivity of a typical GIS application to create a more objective decision-making process.

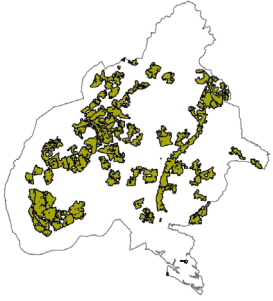
Other EPGTs, such as Maryland's GI assessment and Texas' TEAP applications, are useful as screening-level planning tools. Through the use of available GIS and field-level inventory data, these tools aid in identifying important ecological resources to help decision makers focus on conservation and restoration efforts. An optimization component of the GI Approach also allows a cost benefit analysis of potential mitigation efforts to maximize ecological benefit while minimizing cost.



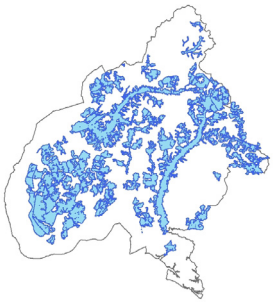
U.S. 301 Green Infrastructure - Core wetlands



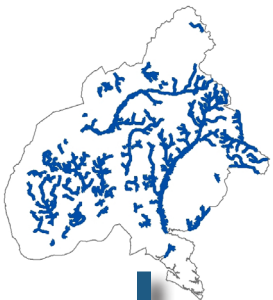
U.S. 301 Green Infrastructure - Core forest



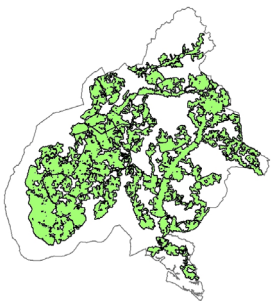
U.S. 301 Green Infrastructure - Core aquatic areas



U.S. 301 Green Infrastructure - Core streams



U.S. 301 Green Infrastructure - Hubs and corridors



Can these tools be used at any scale or for any type of project?

One of the greatest benefits of EPGTs is that they are scalable and can be adjusted and modified to meet the needs of a specific project or program. The tools can be used at national, state, regional, and local levels.

Can the tools assist land and resource conservation efforts?

Use of EPGTs can help transportation agencies, in partnership with resource agencies and/or environmental organizations, identify and strategize resource conservation efforts. The tools rely on accepted natural resource scientific approaches to identify important resource features with high ecological value based on multi-media considerations (vegetation, wetlands, surface waters, habitat, etc.). This approach provides a well-founded basis for identifying key conservation land priorities.

Why should transportation agencies preserve natural lands?

Goods provided by natural ecosystems, or ecosystem services, are the basic building blocks of human welfare. Increasingly, the value of natural lands to provide services such as stormwater filtration and detention, soil retention, and reduced energy consumption, while increasing recreation opportunities and overall aesthetics, is being recognized as a common good. EPGTs can help transportation agencies integrate mobility improvements while supporting ecosystem services.

Can the tools help to develop more efficient and effective natural resource mitigation?

The environmental mitigation strategy of EPA and other regulatory agencies is evolving toward the use of a broader ecosystem approach. Unlike the traditional approach, which emphasizes on-site mitigation, this approach emphasizes the development of more effective resource improvements at a watershed level. Application of EPGTs in the transportation development and design process allows transportation and resource agencies to identify strategic mitigation opportunities that may provide a greater overall benefit to

U.S. 301 Waldorf Area Transportation Improvements Project - Composite GI based on defined Core Areas



U.S. 301 Waldorf Area Transportation Improvements Project - GI Ecological Rankings

the environment. Cost-benefit analysis of mitigation opportunities, using a watershed or landscape approach to the valuation of environmental improvements, helps ensure that mitigation provides optimal return from both an ecological and economic perspective.

What is needed to implement the tools?

A key consideration for organizations contemplating the implementation of EPGTs is communication with local, state, and national planning, environmental, and transportation organizations to gain an understanding of existing tools and readily available data. There are numerous examples around the country of federal and state agencies, often working with local agencies and non-governmental environmental interests, collaboratively implementing EPGTs. EPGTs highlighted here can be modified and applied to almost any type of program or project, regardless of its scale and the user's GIS experience.

From a technology perspective, in-depth knowledge of GIS is beneficial but not imperative. It is necessary, however, to have established and verified digital GIS data layers. Many organizations within the transportation and environmental industries offer downloadable GIS data layers. Field reconnaissance may be necessary to bridge gaps in existing spatial data. Resources for obtaining basic resource and transportation GIS data include:

- Federal OneStop Geospatial Center: <http://geo.data.gov/>
- FHWA GIS in Transportation Data Sources: <http://www.gis.fhwa.dot.gov/gisData.asp>
- AASHTO Center for Environmental Excellence: http://www.environment.transportation.org/environmental_issues/gis/organizations.aspx
- EPA National Geospatial Program datasets: <http://www.epa.gov/geospatial/data.html>
- EPA Environmental Dataset Gateway: <https://edg.epa.gov/metadata/> (requires EPA authorization)

Are funding and training opportunities available?

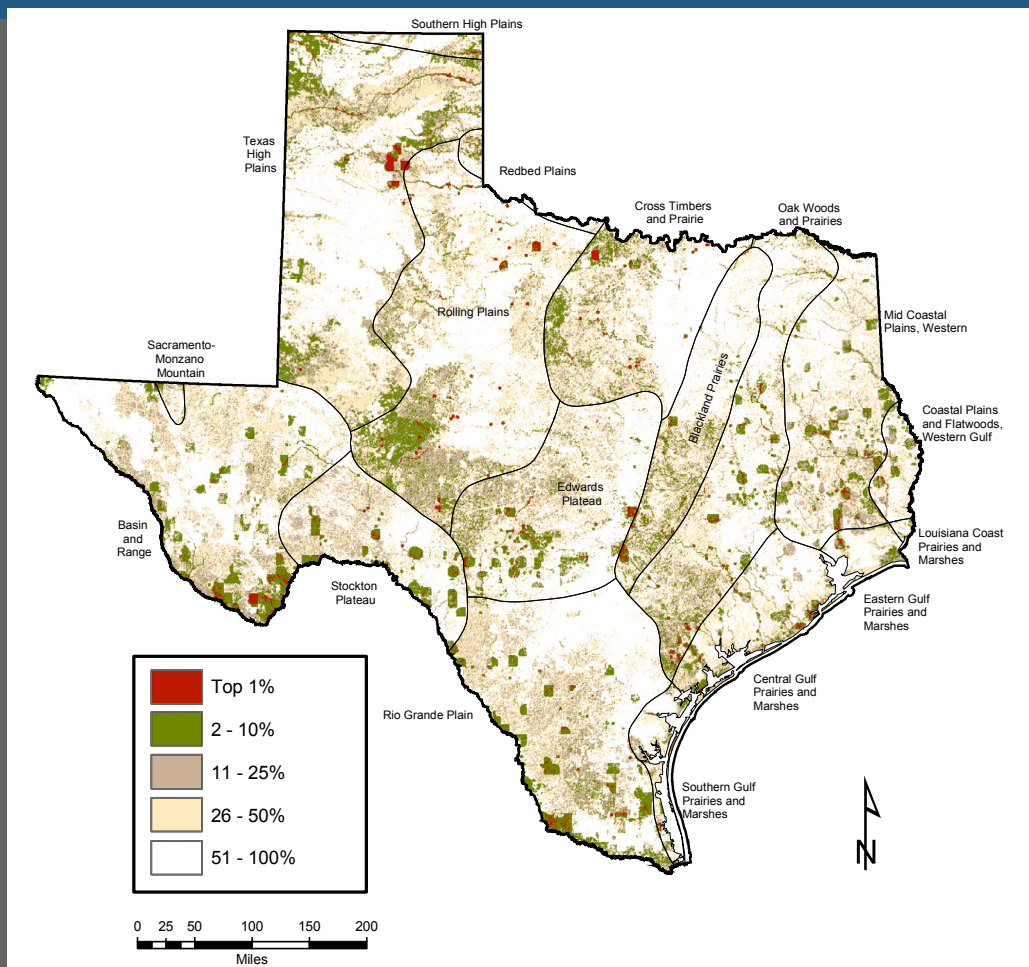
To help initiate or further develop EPGTs for transportation, states should consider seeking additional funding and technical assistance through a variety of governmental and non-governmental partners. Those opportunities include:

Potential Funding Sources:

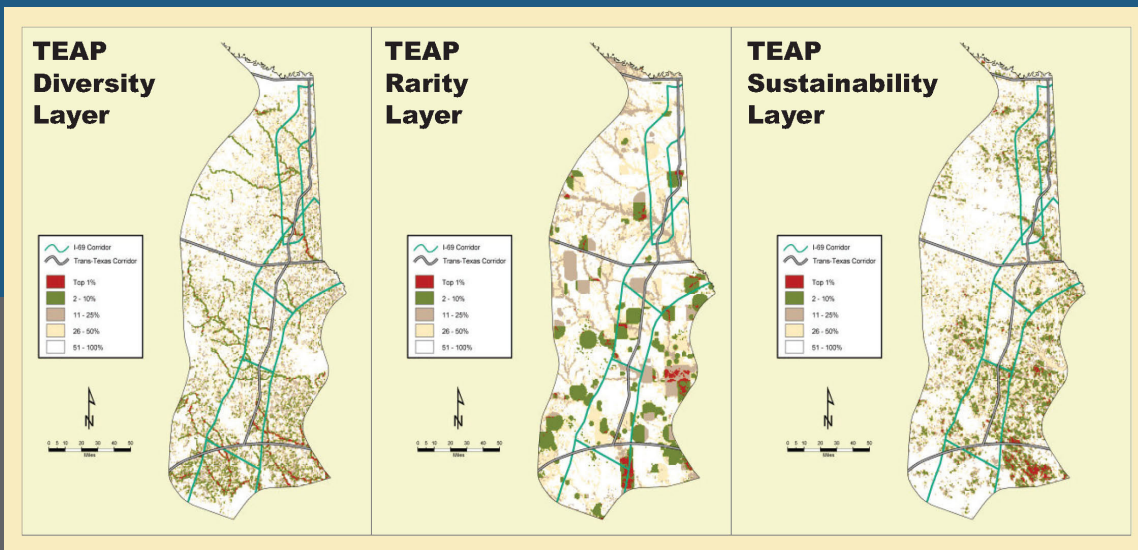
- FHWA Eco-Logical Grant: http://environment.fhwa.dot.gov/ecological/eco_entry.asp
- FHWA Transportation, Community and System Preservation Program: <http://www.fhwa.dot.gov/tcsp/index.html>
- FHWA Surface Transportation Environment and Planning Cooperative Research Program (STEP): <http://www.fhwa.dot.gov/hep/step/>

Potential Training Opportunities:

- FHWA GIS in Transportation: <http://gis.fhwa.dot.gov/training.asp>
- The Conservation Fund, Conservation Leadership Network: <http://www.conservationfund.org/our-conservation-strategy/major-programs/conservation-leadership-network/>
- USFWS National Conservation Training Center: <http://nctc.fws.gov/learn/trainingprograms.htm>



Texas Ecoregions TEAP Composite Map



TEAP Criteria Layers

What role do partnerships play in implementing Environmental Planning GIS Tools?

Establishing partnerships with local, state, federal, and/or industry non-profit organizations is crucial to the successful implementation of EPGTs.

For example, GISST was developed by the EPA Region 6 and was successfully used on the Texas Department of Transportation I-69 Trans-Texas Corridor Study through an Interagency Agreement between the parties. Two key components of this interagency agreement included provisions for technical assistance and training in the use of GISST.

In Maryland, the Maryland State Highway Administration, The Conservation Fund, the Maryland Department of Natural Resources, and the U.S. Fish

and Wildlife Service formed a partnership to develop and implement the GI Approach and assessment tools on the US 301 Waldorf Area Transportation Improvements Project. Using an existing base layer of GIS data, members of this partnership completed enhanced field reconnaissance, data collection, and scientific analysis to provide detailed refinement of the GIS data.

Creating partnerships in the development and use of EPGTs improves transparency, increases stakeholder confidence in the data and the process, streamlines decision making, and ultimately saves time.

How do I learn more?

This EPGT initiative is a joint effort between the Maryland State Highway Administration and the Texas Department of Transportation through the AASHTO Technology Implementation Group program.

The Lead States Team includes state transportation representatives, EPA experts, and environmental conservation leaders who can help you evaluate and promote the use of EPGTs in your organization. The team can provide assistance in the development of data-driven GIS support systems, the building of multi-agency partnerships, and the incorporation of an environmental systems approach to support sustainable transportation decision-making for your state, region, or community.

For more information or to contact team members for insight, expertise, and advice, visit: <http://tig.transportation.org/Pages/EnvironmentalPlanningGISToolsforTransportationPlanning.aspx>.