4. Environmental Considerations

2045 Supported Goals

Preserve and enhance the natural environment, improve air quality, and promote active lifestyles.

Encourage livable communities which support sustainability and economic vitality.

Develop cost-effective projects and programs aimed at reducing the costs associated with constructing, operating, and maintaining the regional transportation system.

Introduction

North Central Texas is not only economically and socially diverse, but it is also environmentally diverse. The environment provides services millions of people rely on for clean air, water, and recreational opportunities. The environment is key not just for supporting quality of life for humans, but also for preserving essential habitat for wildlife.

Mobility 2045 defines the “environment” as the natural, human-made (or built), historic, cultural, or archaeological components that comprise our surroundings. Environmental considerations, therefore, range from streams and wetlands to artifacts left behind by prehistoric people.

How and where the transportation system is built can negatively impact the environment. Therefore, public health, air quality, and the natural and built environments must be considered when planning and implementing transportation projects.

ENVIRONMENTAL CONSIDERATIONS AT A GLANCE:
Implementing infrastructure projects for a growing region is necessary; however, major infrastructure improvements such as highways and transit lines can negatively impact habitat and ecosystems. Similarly, many small improvements can have cumulative impacts on a scale larger than the size of individual projects. Creating infrastructure more sensitive to wildlife and ecosystems through integrated planning and interagency cooperation is an initiative promoting conservation priorities and sustainable uses while exploring a variety of mitigation options.

Mobility 2045 supports expediting the process to approve transportation projects while maintaining compliance with all applicable laws and while promoting safety, environmental health, and effective public involvement.

IN THIS CHAPTER:
- Healthy Communities
- Air Quality
- National Ambient Air Quality Standards and Ozone Nonattainment Status
- Comprehensive Air Quality Measures
- Air Quality Policies and Programs
- Natural Environment
- Environmental Policies and Programs
- Coordination with Environmental Resource and Regulatory Agencies
- Programs and Projects
- Extreme Weather Vulnerability and Resilience
- Stormwater Impacts
- Potential Mitigation Activities and Locations

DID YOU KNOW ...

... since 2009, local fleet efforts tracked by the Dallas-Fort Worth Clean Cities Coalition have reduced over 134 million gasoline-equivalent gallons of fuel and over 307 thousand tons of greenhouse gas emissions through the use of clean vehicle technologies and alternative fueled vehicles? The greenhouse gas impact is similar to reducing the carbon dioxide emissions of 1,676 railcars’ worth of coal, according to the Environmental Protection Agency Greenhouse Gas Equivalencies Calculator.

... a 60 percent reduction in nitrogen oxide emissions from on-road mobile sources is expected to occur between 2017 and 2045?
4.1. Healthy Communities

Many factors influence the health of individuals and communities. These include health behaviors, access to health care, income, employment, air pollution, water quality, access to housing, and the characteristics of an individual's commute to work. The County Health Rankings & Roadmaps project measures how counties score for these factors. The factors listed below are influenced by the transportation system:

- Access to exercise opportunities
- Alcohol-impaired driving deaths
- Driving alone to work
- Income inequality
- Injury deaths
- Long commute – driving alone
- Unemployment

Exhibit 4.1-1 displays how counties in North Central Texas score in relation to the state of Texas on these transportation-related factors. Exhibits C-1 to C-7 in appendix C. Environmental Considerations describes how each county in North Central Texas scores for each of these factors.

Supporting and Promoting Healthy Communities

Strategically improving the transportation system can positively affect these factors and help improve the health of the community. The Centers for Disease Control and Prevention’s Transportation Health Impact Assessment identifies six transportation-related strategies to support and promote healthy communities. Exhibit 4.1-2 describes efforts included in Mobility 2045 that support these strategies.

Appendix C. Environmental Considerations also lists policies and programs in Mobility 2045 that support these strategies.

Designing Transportation Facilities to Support Healthy Communities and the Environment

The way people travel impacts their quality of life in many ways. Reducing the use of motor vehicles, which contribute pollution to the air, promotes healthy communities. Lowering the number of cars and trucks on roadways can help lessen congestion and improve safety. Improving roadway design to accommodate bicycles and pedestrians can help reduce accidents and injuries. Opportunities to use transit, to walk, or to bicycle instead of driving are linked to healthy communities. For example, walking – whether for utilitarian or recreational purposes – can help improve personal health, reduce traffic congestion, and reduce travel costs.

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1 County Health Rankings & Roadmaps, http://www.countyhealthrankings.org/
Exhibit 4.1-1 Public Health Factors by County
Through its policies and programs, Mobility 2045 encourages the use of Federal Highway Administration-endorsed principles for context-sensitive solutions (CSS) and supports the development and implementation of local Complete Streets policies on both new and reconstructed streets. The design of a roadway should depend on the community and context of the street. CSS is a collaborative, interdisciplinary approach that involves all stakeholders to provide a transportation facility that fits its setting.

Complete Streets are those designed and operated to enable access and travel for users of all ages and abilities, including pedestrians, bicyclists, transit users, motorists, and freight operators. In addition to travel lanes for motor vehicles, Complete Streets can include some or all of the following components: sidewalks, bicycle lanes (or wide, paved shoulders in certain contexts), shared-use paths, accessible transit stops, designated bus lanes, and frequent pedestrian crossings.

Different elements may be needed in rural, suburban, and urban areas. For example, in a rural area, providing wide, paved shoulders can accommodate bicyclists and improve safety for motorists. But in suburban areas, separate multi-use paths and sidewalks may be needed to separate motor vehicles, pedestrians, transit users, and/or bicyclists. In urban areas, denser development and a higher number of users may necessitate the addition of marked or separated bicycle lanes, transit accommodations, and on-street parking. The goal is to balance the safety and convenience of all road users, regardless of development density. Applying CSS and Complete Streets principles as projects are developed helps promote safety, mobility, and health, and improves infrastructure conditions for all users while preserving and enhancing scenic, aesthetic, historic, community, and environmental resources.

“We know that the transportation choices we make play an important role in building and maintaining healthy communities. For example, safer roadways and traffic patterns reduce crashes. Streets where walkers and bikers are protected from motor vehicles encourage people to get more exercise as part of their daily routines. Increasing the transportation options available in a community helps reduce congestion and air pollution even as it ensures that communities have access to necessary services like full-service grocery stores and doctors’ offices.”

Former Transportation Secretary Ray LaHood

Transportation-related businesses also can support healthy communities and the environment. For example, byproducts of transportation that may otherwise be dumped in the natural environment or stored at landfills can be recycled into new transportation sources, such as crumb rubber asphalt or...
railroad ties. This process promotes healthy communities by eliminating a potential breeding ground for mosquitoes when rainwater collects in abandoned transportation byproducts, such as tires.
4.2. Air Quality

The negative impacts of poor air quality on health are of great concern in North Central Texas. Air quality is vital to a community’s overall quality of life, but the negative impacts of polluted air can more adversely affect sensitive populations such as children and the elderly. For example, a 2015 update from the Center for Children’s Health found 18 percent of children in the six-county area of Denton, Hood, Johnson, Parker, Tarrant, and Wise were reported to have an asthma diagnosis at some point in their lifetime.³

While regional air quality has improved in recent years, continued progress is necessary to further benefit both people who have asthma or respiratory problems and those who could also experience health effects when exposed to air pollution.

Beyond health effects, air pollution can have negative economic impacts. North Central Texas is a leader in global and domestic trade (for further discussion, see the Freight section in the Mobility Options chapter). This trade, while creating approximately 20 percent of the region’s employment, has serious implications for regional air quality. Generally, the trucks and trains employed in goods movement are fueled by diesel and, therefore, are major contributors to air pollution. Failure to meet federal air quality standards could result in additional emission control requirements negatively impacting local businesses. It may also result in a freeze on all federally funded transportation projects, costing the region millions of dollars in federal transportation funding and ultimately affecting jobs in the region.

Because the transportation sector is a significant source of air pollutants, the North Central Texas Council of Governments (NCTCOG) monitors air quality impacts attributable to transportation and administers a variety of programs to improve air quality in the region. Efforts that monitor and target pollutants result in reductions to regulated and nonregulated pollutants alike. Further description of regulated pollutants and required technical analyses is found in the Required Technical Analyses section of this chapter, while the Air Quality Strategies and Voluntary Initiatives section discusses NCTCOG’s efforts to go above and beyond required air quality activities, as well as the numerous projects and programs administered in the North Central Texas region.

Required Technical Analysis

National Ambient Air Quality Standards and Ozone Nonattainment Status

The federal Clean Air Act requires the United States Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for outdoor air pollutants considered harmful to public health and the environment. The EPA refers to these pollutants as criteria pollutants and include carbon monoxide, nitrogen dioxides, ground-level ozone, sulfur dioxide, particulate matter, and lead. Each county in the nation is assessed according to the standards for each criteria pollutant. An area with attainment status has pollutant concentrations within the limits established by the EPA as being protective of human health and the environment. An area with nonattainment status has pollutant concentrations exceeding those limits. Based on the magnitude of a pollutant in a given area, the EPA classifies counties into one of the following categories, listed in order of increasing severity: attainment/unclassifiable, marginal, moderate, serious, severe 15, severe 17, and extreme.

Since the NCTCOG 10-county region is designated nonattainment for ozone, most of the air quality efforts focus on reducing ozone precursor pollutants from the transportation sector, the largest contributor to ozone formation. Ground-level ozone pollution is caused by a photochemical reaction of volatile organic compounds (VOC) and nitrogen oxides (NOₓ), which are known as ozone precursors, in the presence of sunlight and heat. In 1991, the region’s first designation classified four counties in the region as nonattainment under the 1-hour ozone NAAQS. The Clean Air Act requires the EPA to reevaluate criteria pollutant standards periodically, resulting in a change in the ozone

³ The Center for Children’s Health, www.centerforchildrenshealth.org/en-us/Healthissues/asthma/Pages/Asthma.aspx
Despite making significant strides toward improving air quality, the region faces challenges in meeting increasingly stringent air quality standards, especially in consideration of the region’s rapid population growth, which is forecasted to grow to 11.2 million residents by 2045. As population grows, vehicle miles traveled (VMT) also increase, resulting in more vehicle emissions.

Exhibit 4.2-2 illustrates progress made in reducing ambient ozone concentrations despite population growth. Exhibit 4.2-3 provides additional detail on the region’s success in reducing ambient ozone concentration since 1998 in efforts to meet the 1997, 2008, and 2015 ozone NAAQS.

Exhibit 4.2-2: Demographic and Design Value Historical Trends in the Dallas-Fort Worth 10-County Ozone Nonattainment Area
Air Quality Conformity

NCTCOG participates in a cooperative, collaborative process with local, state, and federal agencies to improve air quality across the region. This partnership includes close coordination as the Texas Commission on Environmental Quality (TCEQ) develops the State Implementation Plan (SIP). The SIP, a regional air quality plan required by the Clean Air Act, outlines how ozone concentrations will be reduced in the nonattainment area to a level that complies with the federal standard.

In North Central Texas, the Regional Transportation Council (RTC) has taken a proactive role in helping TCEQ revise the SIP for the region. NCTCOG assists with air quality technical planning and implements emission reduction control strategies at the local level to enhance federal and state efforts. Numerous other stakeholders throughout the region, including local governments and business coalitions, also support this process and facilitate local implementation.

The federal government requires projects and programs in nonattainment areas, including the 10 counties in North Central Texas, to be analyzed for transportation conformity in order to be approved and implemented. Transportation conformity air quality analysis must be conducted on federally funded projects; projects requiring federal approval; transportation improvement programs; or projects, programs, and policies identified in transportation plans. The conformity analysis does not measure ozone directly, but instead measures ozone precursors: VOC and NOx. Motor Vehicle Emissions Budgets (MVEB) for NOx and VOC are established in the regional SIP. Under the MVEB test, vehicle emissions for each analysis year must be less than the applicable air quality budgets.

A conformity determination is a two-step process in metropolitan areas. First, the RTC, as the policy body of the region’s Metropolitan Planning Organization, is responsible for conducting the local-level transportation conformity determination for the North Central Texas counties designated as nonattainment. Second, the Federal Highway Administration and Federal Transit Administration make a federal-level transportation conformity determination. Only after receiving this federal determination can the region’s long-range transportation plan and Transportation Improvement Program be implemented.

Vehicle emission results documented below demonstrate the 10-county Dallas-Fort Worth ozone nonattainment area meets the regional air quality conformity requirements of the budget test. Conformity analysis results are shown in Exhibits 4.2-4 and 4.2-5.

RTC initiatives, such as bicycle and pedestrian facilities, traffic signal improvements, high-occupancy vehicle/managed lanes, and park-and-ride facilities are important to ensuring a successful conformity determination and assist with the region reaching or maintaining attainment for the EPA’s criteria pollutants.

Exhibit 4.2-3: 8-Hour Ozone NAAQS Trend Line, 1998 to 2017

*Revised Goal—According to the U.S. EPA National Ambient Air Quality Standards, attainment is reached when, at each monitor, the Design Value (three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration) is equal to or less than 70 parts per billion (ppb). Source: NCTCOG TAP Data
The results of the conformity determination demonstrate that Mobility 2045 meets the specific transportation air quality conformity requirements of the Clean Air Act (42 USC 7504, 7506(c) and (d)) and amendments, the applicable revision to the air quality plan (2017 Attainment Demonstration SIP, including the approved 2017 MVEBs⁴), and the transportation conformity rule (40 CFR Parts 51 and 93). This conformity determination was approved by the RTC in 2018. For additional transportation conformity information, refer to the 2018 Transportation Conformity document.⁵

Mobile Source Air Toxics

In addition to the criteria air pollutants under NAAQS, the EPA also regulates Mobile Source Air Toxics (MSAT). MSATs account for 7 of the 187 air toxics defined by the Clean Air Act Amendments of 1990. All refineries or importers of gasoline for passenger vehicles must meet specific compliance baselines, established by the EPA, for conventional and reformulated gasoline. The remaining air toxics come from point and area sources.

Of the seven MSATs, some toxic compounds are present in fuel and are emitted into the air when fuel evaporates or passes through an engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. MSATs also result from engine wear or from impurities in oil or gasoline. Exhibit 4.2-6 shows that national MSAT

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⁴ Adequacy Status of the Dallas-Fort Worth, Texas Attainment Demonstration 8-Hour Ozone Motor Vehicle Emission Budgets for Transportation Conformity Purposes, 81 FR 78591

emissions are expected to decline drastically over time, despite vehicle miles traveled dramatically increasing. Reductions in MSAT emissions can be attributed to the use of cleaner fuels and more efficient engines.

Non-Regulated Pollutants

Greenhouse gases (GHG) trap heat in the atmosphere and create a naturally occurring warming phenomenon called the greenhouse effect. This warming may affect the built and natural environment in ways that are potentially broad reaching and unpredictable at a regional level. The North Central Texas region could experience changes in precipitation levels, impacts to human health, and impacts to natural ecosystems.

Some GHGs occur naturally in the atmosphere, while others result from human activities. Naturally occurring GHGs include water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and ozone. Certain human activities associated with transportation, however, add to the levels of most of these gases:

- CO₂ is released to the atmosphere when fossil fuels (oil, natural gas, and coal) are burned.
- CH₄ is emitted during the production and transportation of coal, natural gas, and oil.
- N₂O is emitted during combustion of fossil fuels.

GHGs that are not naturally occurring include chlorofluorocarbons and hydrofluorocarbons, which are by-products of foam production, refrigeration, and air conditioning; and perfluorocarbons, which are generated by industrial processes. In the United States, however, transportation is second only to electricity generation as a source of greenhouse gas emissions. According to the EPA, in 2015, the transportation sector accounted for 27 percent of national GHG emissions. As Exhibit 4.2-7 shows, CO₂ emissions from the transportation sector peaked in 2006 and have remained relatively flat since 2008.

Air Quality Strategies and Voluntary Initiatives

The programs and policies supported by Mobility 2045 not only seek to improve the efficiency of the transportation system, which in turn improves air quality by reducing regulated pollutants, but also serve to reduce non-regulated pollutants (e.g. greenhouse gases) and petroleum use. Aside from monitoring impacts, the RTC has taken a proactive stance in supporting implementation of projects and programs designed specifically to improve air quality rather than for transportation purposes.

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8 Ibid
Air Quality Policies and Programs

According to the US Energy Information Administration (EIA), in 2016, 71 percent of total US petroleum consumption was from the transportation sector. Exhibit 4.2-8 depicts the substantial increase in petroleum consumption for transportation since 1949, but also shows this consumption has leveled off somewhat in recent years. Some of the increase in consumption expected from higher vehicle miles traveled is offset by increases in fuel efficiency and use of electricity.

There is a potential to see further reduction in petroleum consumption and a continued reduction in emissions from the transportation sector depending on the rates of adoption of alternative fuel vehicles, including electric vehicle (EV) and autonomous vehicles (AV). In particular, EVs have the potential to gain great market share and help continue the petroleum and CO₂ reduction trend. Current EV deployment forecasts predict EVs to make up between 6 percent and 50 percent of the light-duty vehicle market by 2045 and vary based on policy and technology assumptions. As suggested by the range of deployment forecasts, the extent alternative fuel vehicles will displace gasoline-powered vehicles is yet to be seen, which is why local strategies and programs are needed to facilitate such a transition.

The emergence of AVs could have a positive impact on transportation sector emissions. Most AVs will be built on electric or hybrid powertrains and are likely to be first deployed in large numbers through fleets managed by shared mobility providers. The percentage of trips/vehicle miles traveled in the region through shared mobility fleet vehicles may exceed 30 percent by 2030 and be

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10 US Energy Information Administration, December 2017 Monthly Energy Review, https://www.eia.gov/totalenergy/data/browser/?tbl=T03.07C#/?f=A

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significantly higher by 2045.\textsuperscript{13} The intensive use of electrified fleet vehicles to handle a substantial portion of trips in the region would mean that the share of trips handled by cleaner electric vehicles may be significantly higher than the percentage of EVs in the overall vehicle fleet.

**DALLAS-FORT WORTH CLEAN CITIES (DFWCC) COALITION**, which was established in 1995, became one of the first Clean Cities established under an Energy Policy Act provision for an organization that promotes the use of alternative fuels and advanced vehicle technologies to lessen American dependence on foreign sources of petroleum. DFWCC collaborates with local fleets in both the public and private sectors to increase the use of alternative fuels and advanced technology vehicles, improve fuel economy and the use of technologies that reduce idling, and reduce vehicle miles traveled. To support the national Clean Cities goal of reducing 2.5 billion gallons of petroleum by 2020, DFWCC has a target of reducing petroleum consumption among local fleets by 15 percent each year; this is documented in the DFWCC Annual Report.

The air quality benefits of AVs will be much higher if shared ride and microtransit forms of shared mobility gain a significant market share. There is a real possibility that automated surface transportation may result in an increase in vehicle miles traveled due to 1) greater convenience, 2) lower cost, 3) the ability to work and consume media while traveling instead of driving, and 4) use by persons unable to drive a conventional car. Increasing average vehicle occupancy levels will be key to counteracting this possibility.

Regional planning goals such as increasing mobility, supporting economic vitality, enhancing the environment, promoting energy conservation, and improving the quality of life also influence air quality impacts. Many programs, policies, and projects described in other chapters of this document improve air quality by increasing efficiency in the transportation system. The following efforts are among those that reduce transportation-related emissions:

- Mitigating congestion
- Reducing the number of vehicles driven by individual commuters through the use of alternative transportation options or technology advancements
- Improving roadway design to facilitate traffic flow

These strategies are discussed in the Operational Efficiency chapter. Many of these programs and projects are included as voluntary control strategies in the region’s SIP. These strategies improve how the transportation system operates and have a secondary benefit of improving air quality.

In addition, the RTC has instituted many programs and policies with the primary goal of improving air quality. NCTCOG is responsible for coordinating air quality planning in the federally classified nonattainment area. As the majority of ozone-forming emissions can be attributed to mobile sources and other transportation-related activities, NCTCOG and other stakeholders, including local governments and various public and private associations and coalitions, have taken a proactive approach toward improving regional air quality. These stakeholders have implemented policies and programs to support and enhance federal and state planning efforts intended to reduce emissions and air quality impacts. A wide variety of programs seek to reduce NO\textsubscript{x}, VOC, and criteria pollutant emissions by expediting the use of advanced technologies, as well as implementing demonstration programs to study the feasibility of control measures that could be used across the region.

NCTCOG staff also make policy recommendations, participate in partnerships, and provide support for other stakeholders who are working to reduce emissions. Moreover, funding initiatives are offered to directly facilitate transition to cleaner vehicle technologies. *Exhibit 4.2-9* illustrates the total number of activities and total funding awarded to local fleets through competitive funding programs for the 2006 to 2017 period.

Numerous communication strategies help explain the importance of these measures to stakeholders and the public, including Air North Texas, education campaigns, newsletters, and social media. This comprehensive approach to reduce emissions will become increasingly important as the region balances

\textsuperscript{13} *Ibid*
All air quality policies, programs, projects, and maps are included in appendix C. Environmental Considerations.

**AQ3-001**: Pursue successful transportation conformity determinations of the Metropolitan Transportation Plan and Transportation Improvement Program consistent with federal and state guidelines.

**AQ3-002**: Provide technical assistance and analysis to attain and maintain National Ambient Air Quality Standards and reduce negative impacts of other air pollutants.

**AQ3-003**: Support and implement educational, operational, technological, and other innovative strategies that improve air quality in North Central Texas, including participation in collaborative efforts with local, regional, state, federal, and private sector stakeholders.

**AQ3-004**: Support and implement strategies that promote energy conservation, reduce demand for energy needs, reduce petroleum consumption, and/or decrease greenhouse gas emissions.

**F3-002**: Incorporate sustainability and livability options during the project selection process. Include additional weighting or emphasis as appropriate and consistent with Regional Transportation Council policy objectives including, but not limited to, demand management, air quality, natural environment preservation, social equity, or consideration of transportation options and accessibility to other modes (such as freight, aviation, bicycle, and pedestrian). *(While this is listed as a financial policy, it has specific implications for the air quality portion of the plan.)*

**Mobility 2045** supports the following air quality programs:

- **AQ2-001**: Air Quality Communication Program
- **AQ2-002**: Air Quality Demonstration Program
- **AQ2-003**: Air Quality Enforcement Program
- **AQ2-004**: Air Quality Partnerships and Collaborations
- **AQ2-005**: Air Quality Regional Policies
- **AQ2-006**: Air Quality Technology Improvements
- **AQ2-007**: Air Quality Technical Planning and Analysis
4.3. Natural Environment

Transportation rules and regulations\textsuperscript{14} require the long-range transportation planning process to:

- Take place in consultation with environmental resource and regulatory agencies
- Consider and implement programs and projects that protect and enhance the environment and improve quality of life
- Improve the resiliency and reliability of the transportation system
- Reduce or mitigate stormwater impacts
- Discuss potential mitigation activities and locations

Mobility 2045’s Environmental Policies and Programs support these requirements.

Environmental Policies and Programs

Mobility 2045 supports the following environmental policies:

**ER3-001:** Enhance quality of life by protecting, retaining, restoring/mitigating, or enhancing the region’s environmental quality during planning and implementation of transportation programs and projects.

**ER3-002:** Work cooperatively with regulatory and conservation partners to develop innovative approaches that meet their conservation priorities and facilitate the delivery of transportation projects.

**ER3-003:** Promote transportation programs and projects that encourage healthy lifestyles including, but not limited to, providing appropriate access to the natural environment.

**F3-002:** Incorporate sustainability and livability options during the project selection process. Include additional weighting or emphasis as appropriate and consistent with Regional Transportation Council policy objectives including, but not limited to, demand management, air quality, natural environment preservation, social equity, or consideration of transportation options and accessibility to other modes (such as freight, aviation, bicycle, and pedestrian). (While this is listed as a financial policy, it has specific implications for the environmental considerations portion of the plan.)

Mobility 2045 supports the following environmental program:

**ER2-001:** Environmental Data Collection and Resource Agency Consultation Program

Coordination with Environmental Resource and Regulatory Agencies

Federal, state, regional, and local agencies are tasked with regulating and ensuring the health of both human and natural environments. For example, the Clean Water Act and its regulations are monitored and regulated by agencies, including the Environmental Protection Agency, US Army Corps of Engineers, and the Texas Commission on Environmental Quality. Agencies such as the Texas Parks & Wildlife Department and the US Fish & Wildlife Service regulate other state and federal laws, such as the Texas Parks and Wildlife Code and the Endangered Species Act.

Long-range transportation plans are developed in coordination\textsuperscript{15} with agencies such as these, in addition to local municipalities, special districts, and non-governmental organizations. **Exhibit C-15** in appendix C. Environmental Considerations provides a summary of federal and state resource agencies that are stakeholders in the transportation planning process.

NCTCOG uses the Planning and Environment Linkages (PEL) process to engage stakeholders in the planning process. PEL seeks to include environmental, community, and economic priorities early in transportation planning.

\textsuperscript{14} 23 CFR 450.306(b)(5), 23 CFR 450.306(b)(9), 23 CFR 450.316(b), and 23 CFR 450.324(f)(10)

\textsuperscript{15} While federal regulations call for consultation, in Texas, that word is generally reserved for the National Environmental Policy Act process. Mobility 2045 uses the term coordination instead of consultation.
planning. More than 150 stakeholders were invited to the environmental coordination meeting for Mobility 2045 conducted in November 2017. Feedback received during this meeting has been incorporated into Mobility 2045, resulting in the revision of two policies and the definition of “environment”.

Federal regulations state that consultation should include comparison with state conservation plans or maps, and inventories of natural or historic resources. Comparisons to this information, where available, are included in appendix C. Environmental Considerations and incorporated into the Natural Environment Screening in appendix C. Environmental Considerations.

Natural Environment Screening

Roadway and public transportation recommendations from Mobility 2045 were screened to identify potential future needs for environmental coordination. The Natural Environment Screening can assist in achieving federal goals to sustain and restore the health of ecosystems through an ecosystem-based approach and to promote environmental stewardship in the transportation system. The Natural Environment Screening provides a preliminary tool to identify potential impacts to natural environment resources that may result from the roadway and transit recommendations made in Mobility 2045. Early consideration of environmental effects may assist in identifying resource agencies that may be of interest for ongoing environmental coordination and collaboration throughout the planning and project development process. Potential opportunities for mitigation activities may also be identified through preliminary screening. The methodology and results of the Natural Environment Screening are found in appendix C. Environmental Considerations.

Coordination with Federally Recognized Tribal Nations

In February 2018, the Texas Department of Transportation (TxDOT) invited NCTCOG staff to attend a TxDOT-Tribal Planning Group meeting to seek guidance on how to improve communications with tribal nations. To honor the feedback received, NCTCOG will build relationships with interested tribal nations through active dialogue, formalized consultation agreements, and collaborative grant writing as opportunities arise. NCTCOG recognizes that tribal nations have enduring interests in the region. The agency is interested in working with tribal nations to raise public awareness of tribal interests and histories, gather input from tribal nation members living in the Metropolitan Planning Area, support tribal participation in National Environmental Policy Act and National Historic Preservation Act studies, and identify additional opportunities for tribal nations to be involved in transportation planning and project development. Exhibit C-15 in appendix C. Environmental Considerations lists federally recognized tribal nations with areas of interest within North Central Texas.

Programs and Projects

Consultation with environmental resource and regulatory agencies goes beyond developing the long-range transportation plan. These agencies participate in North Central Texas Council of Governments programs and projects that protect and enhance the environment and improve quality of life.

Regional Ecosystem Framework: An Ecosystem Approach

Federal agencies encourage transportation and conservation planning agencies to collaborate to restore or sustain the health of ecosystems. This ecosystem approach also expands the agencies’ focus to a broader, ecosystem scale as opposed to one confined by project boundaries, allowing for more efficient and cost-effective avoidance and minimization strategies. Agencies also can identify more meaningful mitigation and conservation opportunities.

North Central Texas’s Regional Ecosystem Framework (REF) is a preliminary screening tool developed to streamline efforts to identify opportunities for mitigating the impact of infrastructure projects at an ecosystem level, opportunities that may not have been evident using a traditional project-level approach.


17 US DOT/Volpe National Transportation Systems Center, 2006, Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects
NCTCOG collaborated with the Environmental Protection Agency, Texas Parks and Wildlife Department, and other resource and regulatory agencies to identify 10 factors that indicate the relative environmental value of subwatersheds, which are surface water drainage basins at the tributary scale. These factors were grouped into three categories:

- **Water Considerations**, including the REF layers flood zones, impaired water segments, surface water density, and wetlands
- **Green Infrastructure**, including the REF layers agricultural lands, natural areas, and wildlife habitat
- **Ecosystem Value**, including the REF layers diversity, rarity, and ecosystem sustainability

NCTCOG acquired data on these environmental factors from federal and state agencies, including the Federal Emergency Management Agency, Texas Commission on Environmental Quality, and the United States Geological Survey’s National Land Cover Database.

Each of the region’s 281 subwatersheds received a score for the 10 REF layers based on the quantity of the environmental factor present in the subwatershed, as shown for wetlands in Exhibit 4.3-1. Additional REF maps can be found in appendix C. Environmental Considerations. A detailed description of the REF methodology can be found at [www.nctcog.org/REF](http://www.nctcog.org/REF).

Information from the REF is incorporated into the preliminary environmental screening of roadway and transit projects included in Mobility 2045. More information can be found in the Natural Environment Screening section of appendix C. Environmental Considerations.

**INVEST**

Transportation infrastructure reduces and fragments wildlife habitat. On roadways crossed by wildlife, the safety of motorists and animals is at stake.

Addressing these issues early in the transportation planning process can reduce the impacts projects have on the environment.¹⁹

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¹⁸ Environmental Protection Agency, EnviroAtlas Hydrologic Unit Codes: HUC 4, HUC 8, and HUC 12, [https://enviroatlas.epa.gov/enviroatlas/DataFactSheets/pdf/Supplemental/HUC.pdf](https://enviroatlas.epa.gov/enviroatlas/DataFactSheets/pdf/Supplemental/HUC.pdf)

An online tool, created by the Federal Highway Administration (FHWA), is being used by planners to identify sustainability and environmental stewardship best practices that can be incorporated into planning for the roadway. The project is being funded by a grant from FHWA. More information can be found at www.nctcog.org/REF.

The Infrastructure Voluntary Evaluation Sustainability Tool, or INVEST, has been used previously by NCTCOG to identify sustainability focus areas to add to the long-range planning process. This resulted in new programs and projects on infrastructure resiliency, PEL, and the link between asset management and planning.

Section 214 Program

NCTCOG has entered into an agreement with the US Army Corps of Engineers to expedite permits for regionally significant transportation projects. The increased communication resulting from this program has reduced the impact of transportation projects on the aquatic environment and reduced the cost for mitigation efforts.

Wetland and Stream Mitigation Assessment

Federal laws require agencies that construct transportation projects to mitigate for unavoidable impacts those projects have on wetlands and streams that are Waters of the United States. Under Section 404(b)(1) of the Clean Water Act, the preferred form of mitigation to compensate for unavoidable impacts is the purchase of mitigation bank credits. If appropriate mitigation bank credits are not available, agencies building transportation projects may create their own mitigation sites; this can be financially risky and delay construction.

In 2016, NCTCOG assessed whether sufficient credits existed to meet the potential demand for credits that may be generated by roadway projects planned for North Central Texas through the years 2027 and 2040. The project was funded by FHWA’s Strategic Highway Research Program Implementation Assistance Program. The project also identified potential locations for mitigation banks that could compensate for planned transportation projects while providing the greatest ecological benefit. More information on this project can be found in the Potential Mitigation Activities and Locations section of this chapter and at www.nctcog.org/REF.

Environmental Stewardship Program

NCTCOG’s Environmental Stewardship Program provides $1.6 million to fund private-sector efforts related to mitigating the effects of transportation infrastructure. These efforts include restoring wetlands, planting and tracking trees to reduce the urban heat island effect, and educating the private sector about environmental stewardship. The education component seeks to help members of the private sector understand ways they can enhance and preserve the natural environment and address effects created by infrastructure projects.

More information on the Environmental Stewardship Program can be found at www.nctcog.org/trans/environmentalstewardship/.

Quantifying the Benefits of Non-Regulatory Mitigation

Mitigation is not mandatory for all effects to the environment. But voluntary environmental stewardship efforts can help mitigate for the non-regulated effects of transportation infrastructure and provide a benefit to the communities that engage in the stewardship.

NCTCOG is gathering information to identify these benefits, known as ecosystem services, and their qualitative or financial value. The information will be used in a tool that will allow political subdivisions in North Central Texas to:

- Quantify the benefits, including economic return-on-investment, of ecosystem services associated with voluntary environmental stewardship
- Plan which non-regulatory mitigation activities are appropriate and where these activities should be implemented

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20 Federal Highway Administration, INVEST, https://www.sustainablehighways.org/

21 40 CFR 230 Subpart J
Stormwater Impacts

The Transportation integrated Stormwater Management (TriSWM) framework was created to address regional issues with stormwater management by creating common stormwater criteria to address runoff from the region’s roadway system.

TriSWM provides planning, design guidance, and frameworks for incorporating environmentally sensitive designs into standard stormwater management for roadway systems. The program was developed for cities, counties, and the private sector.

The goals of TriSWM:
- Provide safe driving conditions
- Minimize downstream flood risk to people and properties
- Minimize downstream bank and channel erosion
- Reduce pollutants in stormwater runoff to protect water quality

The primary pollutants from roadway runoff include:
- **Particulates**: pavement wear, sediment disturbance
- **Nitrogen and phosphorus**: roadside fertilizer
- **Metals**: gasoline and diesel, rusting automotive metals, engine wear, oil
- **Sodium and calcium**: de-icing salts, grease
- **Chloride**: de-icing salts
- **Sulfate**: roadway beds, fuel, de-icing salts
- **Petroleum**: spills and leaks, antifreeze, hydraulic fluids, asphalt surface
- **Pathogenic bacteria**: soil litter, bird droppings, livestock from hauling

To reduce the pollution entering the water system and address excessive stormwater runoff, TriSWM provides three levels of stormwater practices based upon traffic volumes on a roadway facility and the sensitivity of the receiving water system. These practices include grass channels, filter strips, bioretention areas, enhanced swales, stormwater wetlands, and infiltration trenches.

Potential Mitigation Activities and Locations

Major transportation infrastructure allows residents to travel to conduct business, transport goods, and carry out daily activities, including recreation. As the region’s human population grows, new infrastructure must be constructed and can negatively affect the environment. Efforts must be made to avoid these impacts. However, some impacts are unavoidable, and laws and rules can require mitigation for unavoidable impacts to some environmental resources.

Exhibit C-19 in appendix C. Environmental Considerations summarizes regional mitigation strategies that transportation agencies can employ to minimize, rectify, reduce, or compensate for transportation project impacts that cannot be avoided. These strategies are intended to be regional in scope; however, mitigation may address and be applied to project-level impacts.

NCTCOG coordinates with federal, state, and local resource agencies to develop a regional, ecosystem-based mitigation approach that expedites the delivery of transportation projects while encouraging preservation and restoration of high-priority ecosystems. Programs such as the Regional Ecosystem Framework, Wetland and Stream Mitigation Assessment, Environmental Stewardship Program, and Quantifying the Benefits of Non-Regulatory Mitigation provide examples of NCTCOG’s efforts to integrate conservation priorities early in the planning process.

As individual transportation projects advance toward further planning and development, the federal government requires a detailed environmental analysis consistent with the National Environmental Policy Act. During this analysis, project features may be narrowed and refined, and environmental impacts and mitigation strategies will be appropriately ascertained for individual projects.

Potential Mitigation Locations

The Wetland and Stream Mitigation Assessment identified potential locations for mitigation activities, such as restoration or enhancement, to compensate...
for unavoidable impacts to wetlands or streams. These locations, displayed in appendix C. Environmental Considerations, were identified as providing the greatest ecological benefit to the region. Ecological factors were identified with feedback from federal, state, and local resource agencies.

Mitigation Assessment of Mobility 2045

Potential credit demand and availability were reanalyzed for roadway projects in Mobility 2045 that are expected to be constructed by 2028. This interim year was chosen because it reflects the time scale on which mitigation banks operate better than the plan’s horizon year of 2045. Exhibit 4.4-1 estimates which subbasin-level watersheds in the region may face the greatest demand for mitigation credits. It also identifies the number of wetland and stream credits available in each subbasin at the time the data was downloaded from the Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITS), which was developed by the US Army Corps of Engineers. The number of available credits can change daily as credits are purchased from or made available for sale by mitigation banks. RIBITS also does not reflect credits that have been purchased but are not yet associated with a permit.

<table>
<thead>
<tr>
<th>Subbasin-Scale Watersheds Reflecting Ecoregion Divisions</th>
<th>Wetlands</th>
<th>Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Available Credits*</td>
<td>Potential Demand</td>
</tr>
<tr>
<td>11140301 Sulphur Headwaters</td>
<td>1,298.45</td>
<td>None</td>
</tr>
<tr>
<td>12010001 Upper Sabine Blackland Prairies</td>
<td>6,827.94</td>
<td>High</td>
</tr>
<tr>
<td>12010001 Upper Sabine East Central Texas Plains</td>
<td>7,334.24</td>
<td>Medium</td>
</tr>
<tr>
<td>12010003 Lake Fork Blackland Prairies</td>
<td>6,827.94</td>
<td>Low</td>
</tr>
<tr>
<td>12010003 Lake Fork East Central Texas Plains</td>
<td>7,334.24</td>
<td>None</td>
</tr>
<tr>
<td>12030101 Upper West Fork Trinity</td>
<td>421.76</td>
<td>None</td>
</tr>
<tr>
<td>12030102 Lower West Fork Trinity Blackland Prairies</td>
<td>438.54</td>
<td>Medium</td>
</tr>
<tr>
<td>12030102 Lower West Fork Trinity Cross Timbers</td>
<td>438.54</td>
<td>Medium</td>
</tr>
<tr>
<td>12030103 Elm Fork Trinity Blackland Prairies</td>
<td>436.46</td>
<td>High</td>
</tr>
<tr>
<td>12030103 Elm Fork Trinity Cross Timbers</td>
<td>436.46</td>
<td>Low</td>
</tr>
<tr>
<td>12030104 Denton Blackland Prairies</td>
<td>421.76</td>
<td>Low</td>
</tr>
<tr>
<td>12030104 Denton Cross Timbers</td>
<td>421.76</td>
<td>Low</td>
</tr>
<tr>
<td>12030105 Upper Trinity Blackland Prairies</td>
<td>438.54</td>
<td>High</td>
</tr>
<tr>
<td>12030105 Upper Trinity East Central Texas Plains</td>
<td>438.54</td>
<td>None</td>
</tr>
<tr>
<td>12030106 East Fork Trinity Blackland Prairies</td>
<td>436.46</td>
<td>High</td>
</tr>
</tbody>
</table>
NCTCOG will analyze potential credit demand and availability with each Metropolitan Transportation Plan. This will identify a potential lack of credits early in the planning process and allow NCTCOG to coordinate with mitigation bankers, transportation partners, and the US Army Corps of Engineers as necessary.
4.4. Extreme Weather Vulnerability and Resilience

Existing federal statutes and regulations require Metropolitan Transportation Plans to assess capital investment and other strategies to reduce the vulnerability of existing transportation infrastructure to natural disasters. The metropolitan planning process also must consider and implement projects, strategies, and service to improve the resiliency and reliability of the transportation system. These regulations are further supported by Executive Order 13653 and FHWA Order 5520, which states that “Resilience or resiliency is the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.”

The recent succession of major tropical weather systems (Harvey, 2017; Alex, 2010; Ike, 2008; Rita, 2005; Emily, 2005; Allison, 2001,) as well as droughts, flooding, and wildfires that have inflicted casualties, property damage, and transportation disruptions throughout the state of Texas underscore the need for resilience planning for extreme weather events.

NCTCOG staff has incorporated resilience into its transportation planning and asset management processes in the following ways:

**Resilience Studies:** FHWA has developed a pilot program to assist Metropolitan Planning Organizations (MPO) in identifying transportation systems’ vulnerability to extreme weather and enhancing their resiliency. Under this program, the North Central Texas Council of Governments participated in a pilot study with the University of Texas at Arlington, the city of Dallas, and the Fort Worth Transportation Authority to assess the current and future vulnerability of roads, passenger rail, and airports in Dallas and Tarrant counties. Other resilience studies with regional implications include

Dallas Area Rapid Transit’s Severe Weather Action Plan (2008) and TxDOT’s Statewide Freight Resiliency Plan (2011).

**Texas Resilience and Planning Workshop:** In 2017, North Central Texas Council of Governments staff exchanged information about extreme weather vulnerability assessments, data sources, and other resilience strategies with TxDOT and other metropolitan planning agencies in this Federal Highway Administration-organized workshop.

**Statewide Flood Plan:** NCTCOG is coordinating with the Texas Water Development Board to develop the first statewide plan to ensure that the cumulative effects of and impacts to transportation, urban development, and other infrastructure are fully integrated.

**North Central Texas Emergency Management Working Group:** NCTCOG hosts this group of local stakeholders.

**Advocacy Committees:** As a participant in FHWA’s Transportation Asset Management Expert Task Group, NCTCOG staff coordinates with other MPOs, state Departments of Transportation, other transportation providers, and resource agencies to integrate extreme weather vulnerabilities and resilience into asset management practices and performance measurement processes. NCTCOG plays a similar role with advocacy committees associated with the Transportation Research Board and the American Association of State Highway Transportation Officials.

Suggested resilience strategies are listed in appendix C. Environmental Considerations. These strategies were derived from the March 2015 report, “Climate Change/Extreme Weather Vulnerability and Risk Assessment for

23 23 USC 134(d)(3) and (i)(2)(G); 23 CFR 450.324(g)(7); and 23 CFR 450.306(b)(g)
Transportation Infrastructure in Dallas and Tarrant Counties”, and the June 2017 Texas Resilience and Planning Workshop: Summary Report.

Additional information about emergency preparedness and response to natural disasters is included in the Transportation System Security section of the Operational Efficiency Chapter.

Summary

Mobility 2045 supports policies and programs that adhere to federal air quality conformity requirements and will improve the region’s air quality through comprehensive strategies and partnerships. In addition, Mobility 2045 supports and presents initiatives to facilitate project delivery while enhancing stewardship for key environmental resources in North Central Texas. This process will support healthy communities and habitats and a high quality of life for all residents. NCTCOG will continue to coordinate with resource and regulatory partner agencies to develop innovative approaches to infrastructure development that are sensitive to environmental resources. In addition, NCTCOG will continue to collaborate with other public agencies and private entities to share data and strategies for transportation infrastructure resiliency.

All environmental resource policies, programs, projects, and maps are included in appendix C. Environmental Considerations.