metroplan orlando
A REGIONAL TRANSPORTATION PARTNERSHIP

2050 Metropolitan Transportation Plan

Chapter 6 | Environmental Stewardship & Resilience

August 22, 2025

Draft

WHAT IS IN THIS DOCUMENT?

This chapter describes the environmental considerations and strategies that inform the 2050 Metropolitan Transportation Plan (MTP). This includes evaluations of the region's existing natural and built environmental conditions, outlines the process used to coordinate with agencies and stakeholders, explains the screening methods applied to identify potential environmental impacts, and identifies the vulnerabilities of the built environment. Additionally, this chapter presents strategies for mitigating wetland impacts, reducing transportation-related emissions, and how to support the resilience of the transportation infrastructure against natural disasters and other extreme weather conditions.

HOW TO GET INVOLVED IN THE 2050 PLAN

Online at MetroPlanOrlando.gov
Learn more about how long range transportation planning works and sign up for our e-newsletter to get updates on comment opportunities

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Questions?
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6.1 Introduction

Central Florida's unique natural environment plays a crucial role in fostering economic growth and improving the lifestyles of the residents of the MetroPlan Orlando region. The region's abundant environmental resources, coupled with its picturesque landscape and dynamic communities, provide a significant competitive edge in the global market. By focusing on maintaining a healthy balance between economic development and environmental stewardship, Central Florida can continue to leverage its natural assets to drive progress while pursuing long-term sustainability and prosperity. Maintaining this advantage is vital for economic benefits, public health, community well-being, sustainable practices, and environmental stewardship.

While it is important to consider the role transportation development has on the environment, it is also important to consider the impact that the environment has on our transportation infrastructure. "Resilience" is the ability to withstand, bounce back, or quickly recover from shocks or stresses. Many different parts of the community can be resilient, including transportation infrastructure. Resilience is important in Central Florida for many reasons, including the region's fast rate of growth and its frequent exposure to extreme weather events and natural disasters. As a metropolitan planning organization, it is important for MetroPlan Orlando to plan ahead for resilient roads, bridges, public transit, and other transportation infrastructure throughout Orange, Osceola, and Seminole Counties.

As an initial step in the long-range planning process, the 2050 MTP established five long-term goals (identified in Chapter 2) – Safety, Reliability, Connectivity, Community, and Prosperity – that together advance the vision for *a regional transportation system that safely and reliably moves people and goods through a variety of options that support the region's connectivity, vitality, and economy.* The Community goal was established to *enhance the health and vitality of our region's communities and environments*. To support this goal, the following objectives were identified:

- Provide transportation solutions that contribute to improved public health, including reducing adverse health impacts associated with physical inactivity
- Reduce air quality pollutants and emissions per capita from transportation sources
- Provide transportation solutions that enhance the natural and built environments

Through this goal, environmental stewardship and resilience has been incorporated through the 2050 MTP, including early review of potential projects for environmental factors, project descriptions, and future implementation strategies, and project cost estimations for the cost feasible plan.

6.2 Existing Conditions

MetroPlan Orlando's planning area covers 1.8 million acres across Orange, Osceola, and Seminole counties. Additionally, the region boasts significant water bodies, including rivers, lakes, creeks, and many springs. To understand current conditions affecting transportation and the environment, MetroPlan Orlando compiled publicly available geospatial data and summarized key findings below.

6.2.1 CONSERVATION LANDS

Conservation lands in Central Florida encompass state and federal parks, wildlife management areas, conservation areas, preserves, mitigation banks, and conservation easements. Roughly 295,000 acres (~16% of the region) are managed for conservation under federal, state, local, or non-governmental organization (NGO) ownership. Significant conservation areas in the region include the Tosohatchee Wildlife Management Area and Three Lakes Wildlife Management Area. A map of conservation lands is included in Appendix G.

6.2.2 SPECIAL DESIGNATION AREAS

The Florida Department of Environmental Protection (FDEP) established a special category of waterbodies within the State to be designated as Outstanding Florida Waters (OFWs), which have special protection due to their natural attributes. There are fifteen OFWs within the region including lakes, river segments, and aquatic preserves.

Wild and Scenic Rivers are designated by Congress or through administrative action by the Secretary of the Interior to include a river already protected by a state upon the request of that state's governor. Two rivers in Florida are currently designated as Wild and Scenic Rivers. One of these rivers is the Wekiva River, which is located within the MetroPlan Orlando region.

In addition, the Econlockhatchee and Wekiva River Hydrologic Basins have enhanced vegetated areas next to the waterways that act as a transition zone between the aquatic ecosystem and the surrounding land and have additional mitigation obligations. The southern portions of Osceola County overlap the Everglades Headwaters National Wildlife Refuge and Conservation Area.

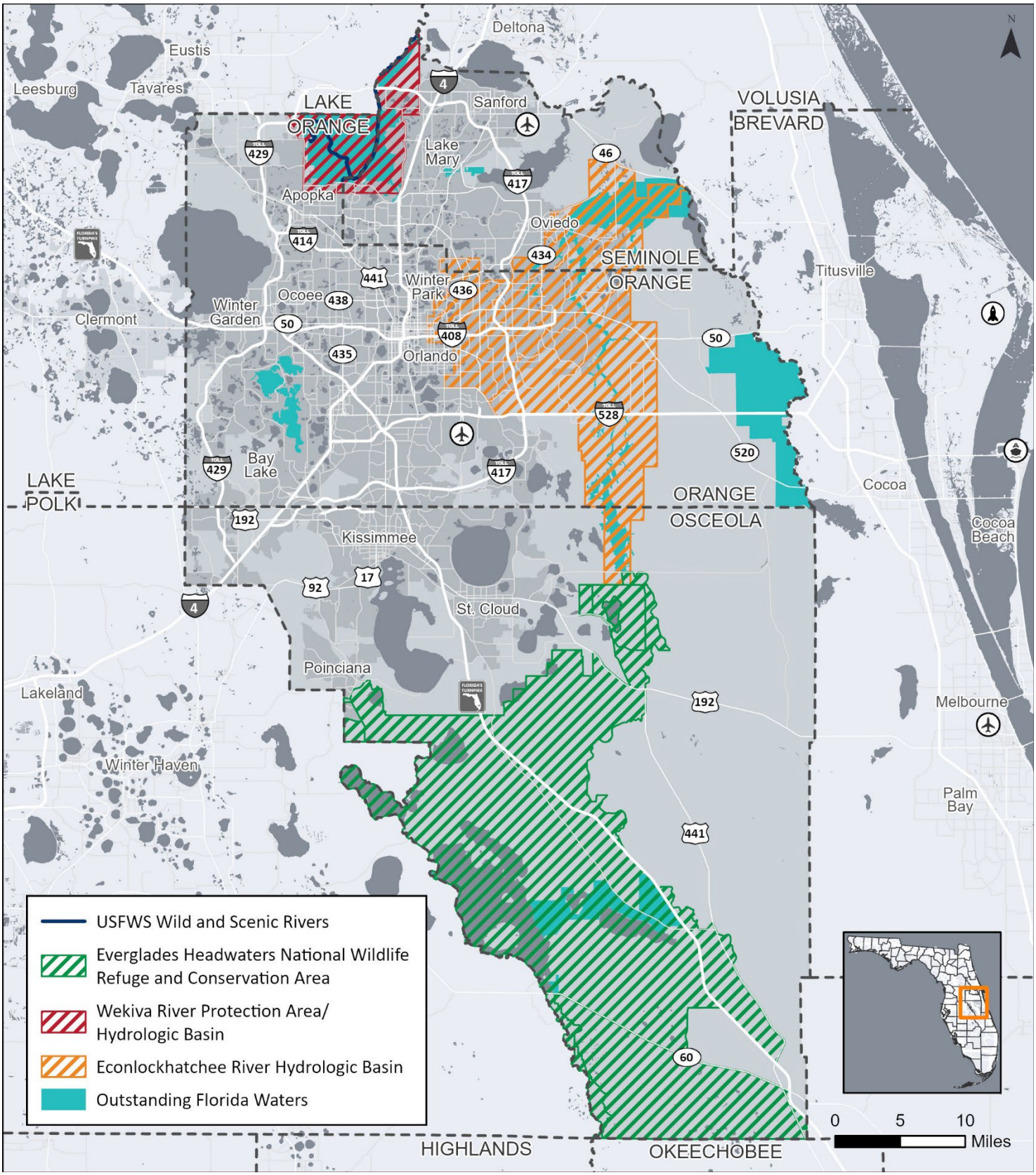
The northern reach of the 17.7-million-acre Florida Wildlife Corridor is located in much of the southern and eastern parts of the region. The Florida Wildlife Corridor is vital for conserving Florida's biodiversity and ecosystem services and connecting South Florida's large national parks and preserves, including the Everglades, with the Ocala and Osceola National Forests, and to those in Northern Florida and Georgia. In addition, one of the region's notable geographical features is the Lake Wales Ridge, which gives way to the Kissimmee and St. Johns River Valleys, providing a rich variety of ecosystems.

The location of these special designation areas are shown in Figure 6-1. A map of the Florida Wildlife Corridor is included in Appendix G.

6.2.3 PROTECTED SPECIES AND HABITATS

The MetroPlan Orlando region provides habitat for several state and federally protected species, as well as critical habitats and consultation areas. Within the region, there are several federally listed species, including six mammals, eight birds, eight reptiles, two insects, twenty-five flowering plants, and one lichen. There are also designated U.S. Fish and Wildlife Services (USFWS) consultation areas for seven species and critical habitats for two others. The gopher tortoise, sandhill crane, and the black bear are a few of the 147 imperiled species listed on *Florida's Endangered and Threatened Species List* which includes fish, amphibians, reptiles, birds, mammals, and invertebrates. Additionally, 576 plant species are listed on the *Endangered, Threatened and Commercially Exploited Plants of Florida* list. A map of designated consultation areas, designated critical habitats, and protected species occurrences is included in Appendix G.

Figure 6-1 | Special Designation Areas in the MetroPlan Orlando Planning Region



Sources: USFWS, 2024; U.S. Geological Survey (USGS), 2024; SJRWMD, 2024; FDEP, 2024

6.2.4 FLOODPLAINS

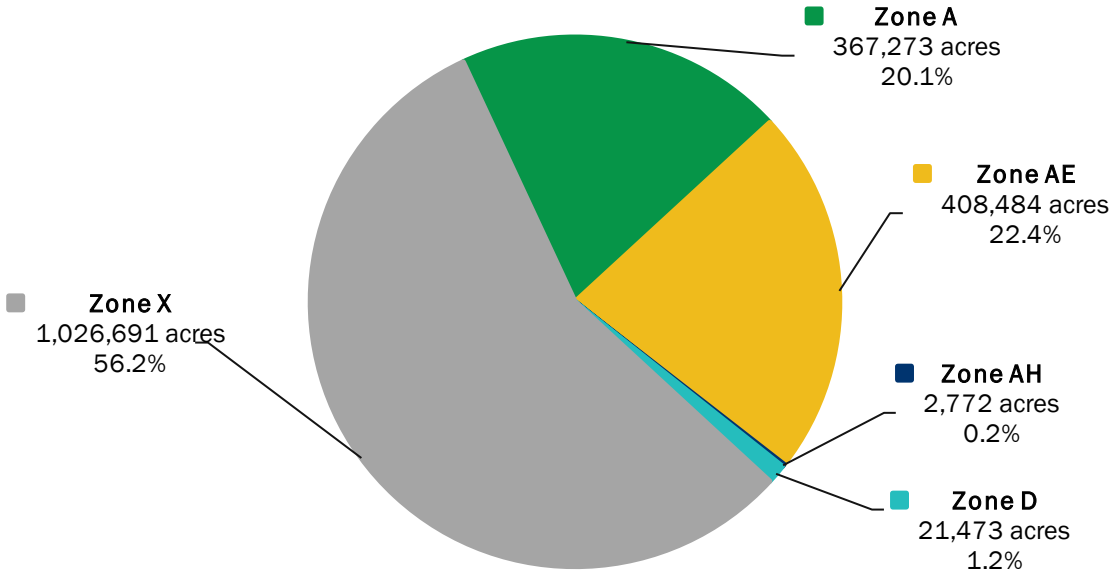
Floodplains in Florida are vital because they reduce flood risks, improve water quality, support wildlife habitats, enhance economic and social value by providing stormwater filtration, and are essential for maintaining the overall health and welfare of natural and human systems. As shown in Figure 6-2, approximately 44% of the region is located within one of the Federal Emergency Management Agency (FEMA) high-hazard zones (Zone A, Zone AE, and Zone AH), 56% is in low-to-moderate risk zones (Zone X), and about 1% undetermined (Zone D).

FEMA floodplain zones can be defined as:

- **Zone A:** Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
- **Zone AE:** The base floodplain where base flood elevations are provided.
- **Zone AH:** Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
- **Zone D:** Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.
- **Zone VE:** Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
- **Zone X:** Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. Used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1-square mile.

A map of identified FEMA Floodplain zones is included in Appendix G.

Figure 6-2 | Floodplains in the MetroPlan Orlando Planning Region



Source: FEMA, 2023

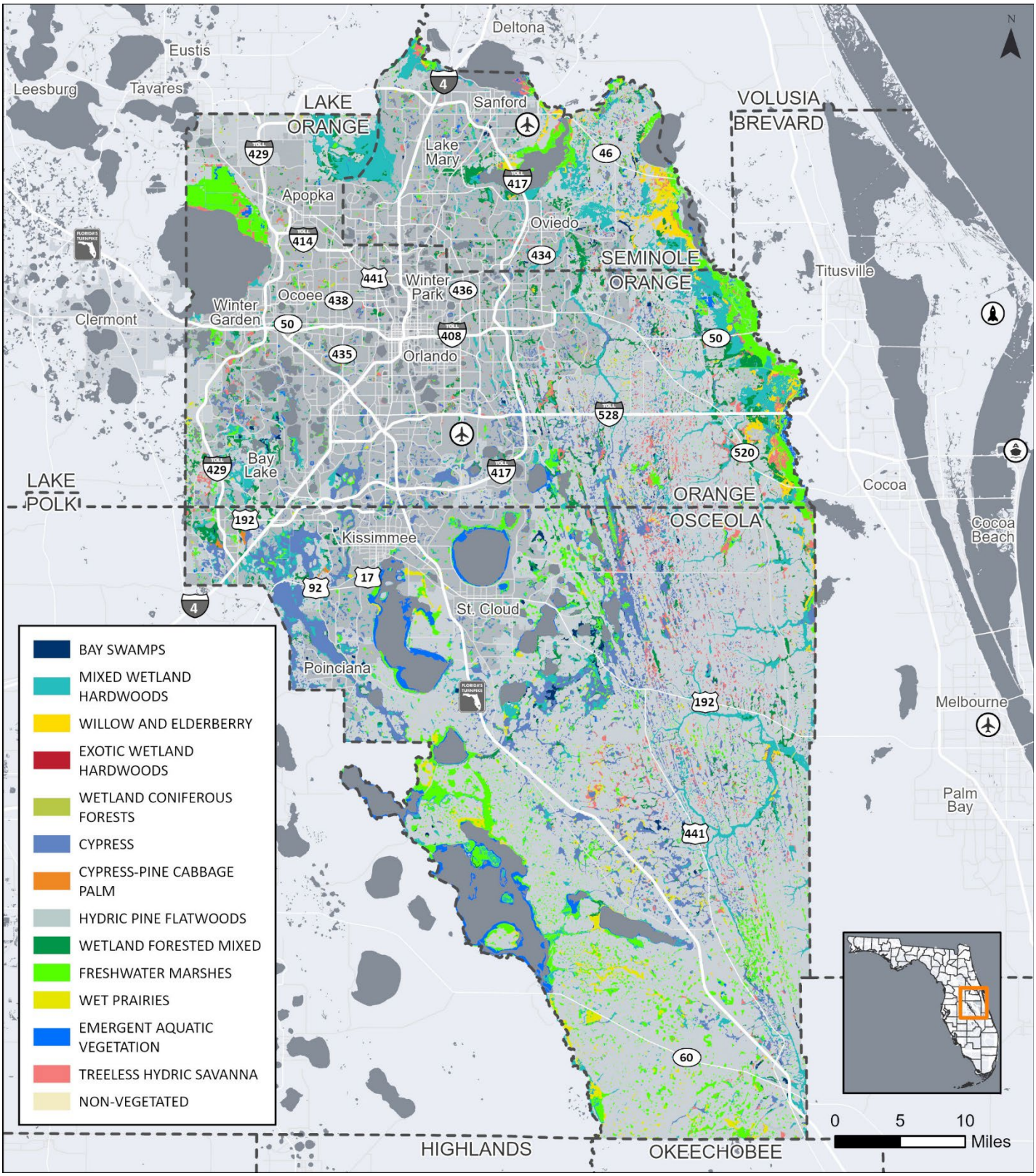
6.2.5 WETLANDS

Wetlands contribute significantly to flood control, water quality, groundwater recharge, create habitat for wildlife and fish, nutrient cycling, and provide sites for recreation and education. The importance of wetlands as natural resources is widely recognized, with federal and state agencies imposing regulations to protect these vital ecosystems. Wetlands are a significant land feature of Central Florida, constituting nearly 28% of the area, and include types such as mixed wetland hardwoods, cypress, forested mixed wetlands, and marshes (Figure 6-3).

6.2.6 GROUNDWATER AND AQUIFER RECHARGE AREAS

High recharge zones are located within and around the Orlando, Lake Wales, and Mount Dora Ridges and feed the Floridan Aquifer, which serves as the region's principal potable-water source. Aquifers are underground layers of water-bearing rock, sand, or gravel that store and transmit groundwater. Recharge zones are the surface areas where rainfall or surface water infiltrates the ground to replenish an aquifer. Protecting these zones is critical, as contamination or excessive conversion to impervious surfaces can reduce water quality and limit the aquifer's ability to supply clean drinking water. Most of Osceola County and southern Orange County lay within the U.S. Environmental Protection Agency (EPA)-designated Biscayne Sole Source Aquifer. A sole source aquifer is an underground water source that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas have no alternative drinking water sources that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water. A map of acquirers and recharge areas is included in Appendix G.

Figure 6-3 | Wetlands in the MetroPlan Orlando Planning Region



Sources: SFWMD, 2017-2019; SJRWMD, 2014

6.2.7 AIR QUALITY CONDITIONS

Our transportation decisions significantly impact the air we breathe. As our region continues to grow, understanding the key sources of air pollution will continue to be essential to maintain and improve our air quality and promote a healthy environment. Air pollution refers to harmful substances released into the atmosphere, affecting human health and the environment.

To understand the key sources of air pollution, identify where and when the worst air pollution is happening, and investigate strategies to reduce emissions, MetroPlan Orlando partnered with the University of Central Florida (UCF) to prepare an Ozone Contingency Study. The study determined that in Central Florida, emissions from vehicles — including cars, trucks, and boats — are major contributors to air pollution, posing potential health risks to residents and visitors. In addition, the MetroPlan Orlando region is approaching federal non-attainment thresholds for ozone and rising emissions from vehicles and approaching these thresholds underline the significance of proactive planning.

6.3 Agency Coordination

MetroPlan Orlando pursued a comprehensive coordination process throughout the development of the MTP that involved seeking input from a wide range of stakeholders, including federal and state agencies, and non-governmental organizations (NGOs). The goal of the coordination process for the environment and resilience efforts was to identify and address key regional environmental issues through the development of avoidance or mitigation strategies. Three coordination meetings were held focusing on wetlands, protected species, and wildlife. Below are the meetings conducted, and entities represented, with additional information included in the Environmental Stewardship Technical Report (available under separate cover):

Wetlands and Regulatory Coordination Meeting – August 30, 2024

- U.S. Army Corps of Engineers (USACE)
- Natural Resources Conservation Service (NRCS)
- U.S. Environmental Protection Agency (EPA)
- U.S. Federal Highway Administration (FHWA)
- St Johns River Water Management District (SJRWMD)
- South Florida Water Management District (SFWMD)

Protected Species Coordination Meeting – August 29, 2024

- National Marine Fisheries (NMFS)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Federal Highway Administration (FHWA)
- Florida Department of Transportation (FDOT)
- Florida Fish and Wildlife Conservation Commission (FWC)

Non-Governmental Organizations Coordination Meeting – August 29, 2024

- East Central Florida Regional Planning Council (ECFRPC)
- Florida Audubon Society
- The Nature Conservancy

Key themes of these meetings include:

- Wetland mitigation credits are limited in several basins, so early planning is recommended.
- The mitigation hierarchy prioritizes bank credits, with in-lieu fee and permittee-responsible options considered as needed. Out-of-basin purchases may increase costs.
- Expanding existing road corridors is generally preferred where appropriate.
- Forthcoming critical wetland inventories should inform avoidance and corridor selection.
- Early protected-species coordination through a single contact point is preferred, especially near the Florida Wildlife Corridor.
- Agencies noted interest in wildlife crossings where roads bisect conservation lands.
- Habitat protection near the Kissimmee Chain of Lakes is a priority.
- Stakeholders encouraged high-capacity transit and alternative fuels, and use of the new state stormwater rule and updated rainfall data to link nature-based treatment with flood resilience.

6.4 Wetlands Assessment & Land Suitability Analysis

To determine appropriate wetland mitigation strategies for the region, it is necessary to understand the extent that wetlands may be impacted by future transportation projects. Preliminary impacts were estimated by overlaying an assumed project footprint, as determined based on the proposed project work type, on the most current, available geographic information systems (GIS) spatial wetland dataset developed by state planning agencies. This assessment was conducted to evaluate proposed projects for wetland impacts and used to estimate the cost of potential wetland mitigation required for these projects.

6.4.1 WETLANDS ASSESSMENT METHODOLOGY

This assessment used GIS data of the potential project footprints and a buffer area at a set distance based on the type of transportation improvement. Table 6-1 lists the project buffer for the proposed improvements that were used in the High-level Wetland Assessment. The wetland impacts in acres were then estimated from the GIS analysis of the project footprint buffer. The projects were then separated by their locations within the St. Johns River Water Management District (SJRWMD) and South Florida Water Management District (SFWMD) jurisdictional boundaries. Based on the total length of the evaluated projects and the 2024 wetland mitigation costs, an average mitigation cost per mile of project was calculated and applied to the transportation projects included in the Cost Feasible Plan (Chapter 19).

Table 6-1 | Project Buffer Distance and Proposed Improvement Types

Project Buffer Distance	Proposed Improvement Types
50-foot	Sidewalk, shared-use paths, trails, on street bike facility, trail bridge/tunnel, pedestrian hybrid beacon
100-foot	Complete Streets, drainage improvements, intersection improvements, 2 to 4 lane widenings, capacity & safety, geometric improvements, urban interchange, transit center, park and ride facility, new 2 and 4 lane roadways
200-foot	2 to 6 lane widenings, 4 to 6 lane widenings
500-foot	6 to 8 lane (interstate) widenings, widenings to 10 lanes, 4 to 8 lane widenings, new commuter rail corridor
No buffer	Resurface& restripe, intersection crossing improvement, access management, signal improvements, communication, ITS, intersection TSMO, roadway lighting, enhanced service area, on-demand zones, extension of rail service, various transit routes, priority bus corridor, bus rapid transit corridors, rectangular rapid flashing beacon

6.4.2 WETLANDS ASSESSMENT RESULTS

The results of the analysis conducted determined the average wetland mitigation cost is estimated to be $207,325 per mile based on the over 2,900 projects within the MetroPlan Orlando planning region. The results of this assessment are summarized in Table 6-2.

Table 6-2 | Summary of Estimate of Wetland Impacts Per Mile by SJRWMD and SFWMD

Water Management District	Length of Transportation Improvements (Miles)	Average Wetland Mitigation Cost Per Credit	Estimated Wetland Impacts (Acres)	Total Estimated Cost of Wetland Mitigation	Estimated Cost Per Mile
SJRWMD	2,520.46	$157,000	2,008.81	$315,383,875.36	$125,129.69
SFWMD	1,490.01	$177,500	2,907.53	$516,087,120.83	$346,366.27
Total	**4,010.47**	**$173,044***	**4,916.34**	**$831,470,996.19**	**$207,325.08****

**Average cost estimate of wetland mitigation for the entire MetroPlan Orlando planning region*

***Average cost estimate of wetland mitigation per mile for all proposed projects in the region*

6.4.3 LAND SUITABILITY ANALYSIS

A comprehensive land suitability analysis of the MetroPlan Orlando region was conducted to identify areas most suitable for wetland mitigation purposes. The analysis divided the MetroPlan Orlando region into a grid, and ranked each cell as high (3), moderate (2), or low (1) suitability for wetland mitigation. This analysis was based on several environmental factors:

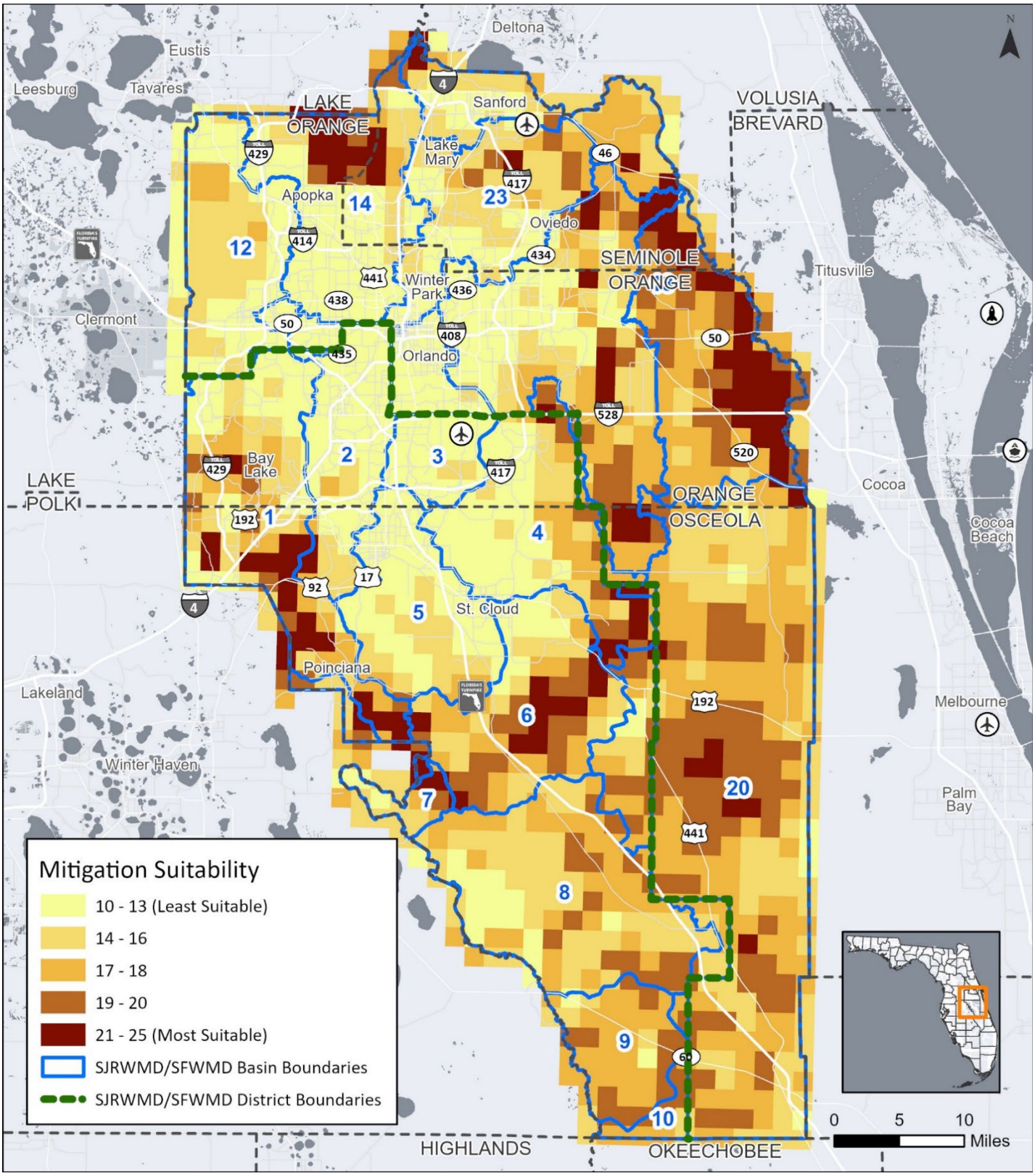
- Mitigation Need;
- Habitat Connectivity;
- Watershed Protection;
- Floodplains;
- Wetlands;
- Conservation Priority;
- Protected Species Habitat;
- Florida Forever Board of Trustees Acquisition Projects;
- Aquifer Recharge; and
- Habitats.

Each environmental factor was ranked for each cell in the grid. At the end of the analysis the scores of each cell analysis were added up to obtain an overall suitability score between 10 and 30. A table discussing the scoring methodology in more detail is included in Appendix G.

6.4.4 LAND SUITABILITY ANALYSIS RESULTS

The analysis revealed that approximately 442,080 acres of land within the study area is very highly or highly suitable for mitigation. Another 469,440-acres of the study area was rated as being moderately suitable. Altogether, potentially suitable mitigation land accounts for just over half of the MetroPlan region. The mitigation suitability analysis results can be seen on Figure 6-4.

Figure 6-4 | Mitigation Suitability Analysis



Source: Wetland Mitigation Strategy Technical Memorandum, VHB, 2024

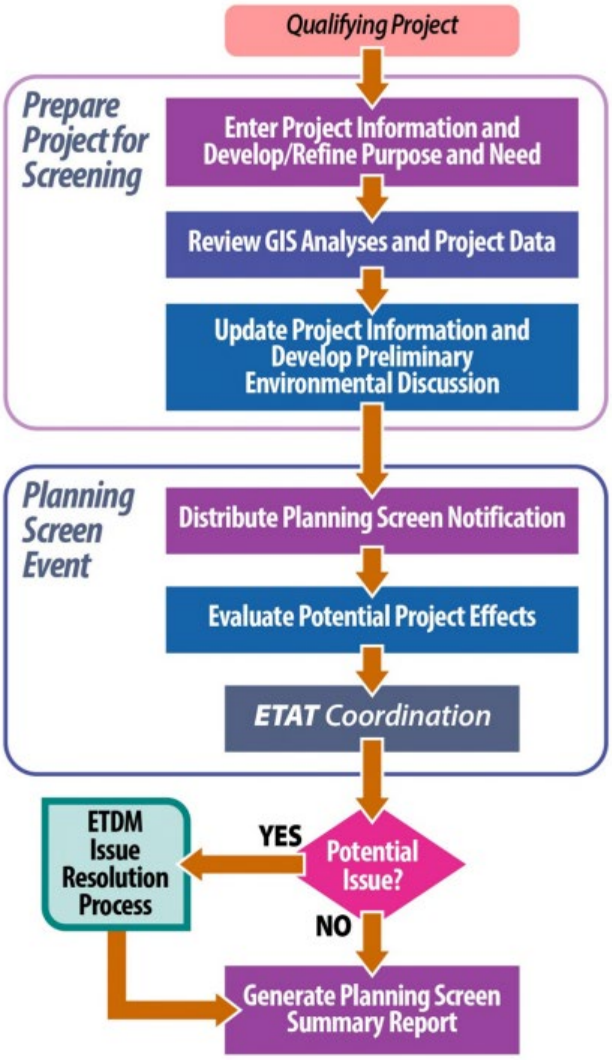
6.5 Efficient Transportation Decision Making Process

FDOT's Efficient Transportation Decision Making (ETDM) process was used to screen eligible projects for environmental reviews. ETDM is carried out with the Environmental Screening Tool (EST), a mapping tool that provides information about proposed transportation projects and their potential environmental impacts.

The ETDM process consists of two stages of screening: Planning Screen and Programming Screen. Qualifying projects under review at the long-range planning process phase would begin with a Planning Screen, and are identified based on criteria including project type, transportation system designation, potential funding source (federal, state, or local), and responsible agency. The ETDM screening process includes Geographic Information System (GIS) analyses using the data sets included in the EST, such as wetlands, floodplains, protected species and their habitat, contaminated sites, historical and archeological resources, and more. An overview of the ETDM Planning Screen Process is shown on Figure 6-5.

Projects that do not require ETDM screening at this time will still be reviewed for any potential environmental impacts if/when the project moves into a formal planning or design phase.

Figure 6-5 | Overview of ETDM Planning Screen Process



Source: FDOT, ETDM Manual

For the purpose of the 2050 MTP development, projects that qualify for an ETDM screening but have not previously been screened, will be prepared for a Planning Screen. The 2050 MTP planning screening process includes the following steps:

- **Identify Qualifying Projects:** The 2050 MTP candidate projects were screened to determine if they qualify for the preliminary ETDM screening process. Example qualifying projects include widening or new roadway projects.
- **Further Refine List of Qualifying Projects:** The list of qualifying projects was refined based on their funding source and phase of development. Only projects with the upcoming PD&E Study phase were considered for screening.
- **Utilize the ETDM Environmental Screening Tool**: Approximately 20 near term projects were screened using the ETDM Environmental Screening Tool. This is to identify potential environmental impacts comprehensively.
- **Identify Potential Environmental Impacts**: Once projects are screened, a Preliminary Environmental Discussion document will be developed to identify potential environmental impacts.
- **Schedule for Screening**: A timeline was created for when these projects should undergo the formal ETDM process, which includes state and federal regulatory agencies initial comments on these projects.

The Preliminary Environmental Screening documents for the 20 projects undergoing the pre-screening ETDM, in addition to a project release schedule that identifies the projects, type of screening, and the anticipated screening release date for each project are included in the Environmental Stewardship Technical Report, published under a separate cover.

6.6 Environmental Stewardship Strategies

Enhancing the natural and built environments and reducing air quality pollutants and emissions from transportation sources are key objectives of the 2050 MTP. The strategies below can be considered to reduce environmental impacts and increase resilience while still supporting our region's mobility needs.

6.6.1 WETLANDS MITIGATION STRATEGY

Federal and state regulations aim to protect Florida's valuable ecosystems by requiring avoidance and minimization from impacts to wetlands whenever possible. When projects impact wetlands, they must undergo mitigation processes to compensate for the loss, which can significantly influence the overall cost and viability of the projects. The objective is to develop effective mitigation strategies that can be applied throughout the lifespan of the 2050 MTP. Identifying the availability and strategic use of wetland mitigation opportunities early in the project planning process will support sustainable development while protecting vital wetland ecosystems.

The preferred method for mitigating unavoidable wetland impacts is through the purchase of mitigation credits from established mitigation banks. However, the rapid development in the region, coupled with the lengthy permitting process for new mitigation banks, has resulted in a scarcity of available credits in several basins. To address this shortage and facilitate progress on future projects, alternative mitigation strategies must be explored. Wetland mitigation strategies include:

- **Purchase of Mitigation Credits:** Projects that enhance, restore, and/or preserve the designated wetlands that serve to offset wetland impacts.
- **In-Lieu Fee Mitigation:** This involves paying a fee to an approved entity that will undertake the necessary mitigation activities.
- **Permittee-Responsible Mitigation:** The permit applicant is responsible for completing the mitigation, either on-site or off-site.

- Purchase and Donation of Natural Areas: Acquiring natural areas and donating them to state or federal agencies for conservation. Some acquisitions may serve a dual purpose of wetland impact mitigation and enhance community well-being by providing recreational opportunities.

6.6.2 HABITAT AND ECOSYSTEM STRATEGY

Local governments, transportation operators, and other transportation maintaining agencies can implement additional strategies to promote environmental stewardship and mitigate impacts on the region's environmental resources. These strategies arose throughout the Environmental Coordination Process and included promoting habitat connectivity, wildlife-friendly native landscapes, and nature-based stormwater practices. These strategies should be considered on a case-by-case basis and coordinated with state and local partners.

6.6.2.1 MAINTAIN AND RESTORE HABITAT CONNECTIVITY

Project development should consider habitat and wildlife movement corridors early through the environmental screening process, and strategies can be incorporated early into the planning process to mitigate potential impacts, if applicable. Where roads intersect important habitats, additional evaluations should be included to consider wildlife crossings and directional fencing, so appropriate structures are proactively included within project plans. Alignment choices, context-sensitive access, vegetated buffers, and careful site selection of stormwater facilities can also reduce habitat fragmentation. Additional coordination with resource agencies and land managers would also minimize or avoid conflicts with prescribed fire and other management needs.

6.6.2.2 SUPPORT NATIVE ECOSYSTEMS THROUGH WILDLIFE-FRIENDLY LANDSCAPES

Healthy native plant communities are the foundation of Central Florida's biodiversity. FWC emphasizes that native plants are adapted to local soils and climate, and they support the complex insect communities that feed birds, mammals and other wildlife, and impacts should be avoided or mitigated. Mitigation strategies, if impacts are unavoidable, could include using transportation rights of way as significant opportunities to enhance native ecosystems. Roadside planting, medians, and stormwater areas may be planted with locally adapted native species while avoiding invasive species. Maintenance practices may allow flowering and seed set, and herbicide use may be limited to targeted applications to invasive species. Plant palettes may provide forage across seasons, and safe habitat features can be retained where appropriate. Partnerships with counties, cities, nurseries, and community groups may expand native plant use on state and local roads.

6.6.2.3 INCORPORATE NATURE-BASED STORMWATER MANAGEMENT

Central Florida's high rainfall and sandy soils offer opportunities to manage stormwater in ways that emulate natural systems, and several strategies are available to enhance stormwater management. Maintaining agencies of transportation facilities should integrate nature-based green stormwater infrastructure where site conditions allow. Examples include swales, rain gardens, shallow wetland shelves, tree canopy, and permeable surfaces. These practices keep stormwater run-off near its source to reduce pollutant loads, improve groundwater recharge, and add small habitat patches. Designs can integrate native vegetation, limit fertilizers and pesticides, and align with landscape maintenance to support long-term performance and complement connectivity goals.

6.6.3 EMISSION REDUCTION STRATEGY

The UCF Ozone Contingency Study identified several key pathways for reducing transportation-related emissions in Central Florida, addressing regulatory and complementary strategies. These strategies, while outside of MetroPlan Orlando's service offerings, are listed here as tools for decision-making partners to consider.

6.6.3.1 HIGH-IMPACT REGULATORY APPROACHES:

- **Inspection and Maintenance (I/M) Programs:** A region wide I/M program would require motorists to pass periodic tailpipe tests before renewing registration.

- **Vehicle Emissions Standards:** Stricter standards for vehicle emissions, such as mandatory catalytic converters on small off-road engines and tightening new-vehicle certification levels.

6.6.3.2 COMPLEMENTARY INITIATIVES

- **Active Transportation Infrastructure:** Promoting walking, biking, and other forms of non-motorized transportation.
- **Electric Vehicle (EV) Support:** Streamlining EV permitting processes and incentivizing EV adoption.
- **Public Transit Improvements:** Expanding and enhancing public transportation options to reduce individual car use.

The effective implementation of these strategies must consider their costs, feasibility, and overall impact. Some strategies, such as active transportation and EV infrastructure, can be initiated more rapidly, while others require more extensive preparation and community engagement. The implementation of these strategies would enable the development of interventions that balance mobility demands with environmental and health goals.

6.7 Resilience

Resilience is the ability to withstand, bounce back, or quickly recover from shocks or stresses. Many different parts of our community can be resilient, including transportation infrastructure. The Central Florida area experiences weather events like hurricanes, which can cause damage to homes, businesses, and infrastructure from flooding and high winds. Weather events like hurricanes are "shocks" and are usually short-term. The Central Florida area is also one of the fastest-growing areas in the country. This type of fast growth can be a "stress" which is usually long-term. A "shock" like a hurricane, or a "stress" like fast-paced growth, are events that can be planned for to protect our people and places from harm.

When planning 25 years ahead, it is important to understand what communities in the MetroPlan Orlando region need, both now and into the future. By assessing resilience in planning, MetroPlan Orlando can create a vision for the 2050 transportation system that meets the needs of the communities that use it and can adapt to the effects of shocks, like hurricanes, or stressors, like fast growth.

This vision for resilience includes:

- Understanding the environmental hazards which pose risks to transportation infrastructure
- Review and identification of critical transportation assets within the region
- Development of strategies to mitigate the risks associated with environmental hazards for critical transportation assets and infrastructure

6.7.1 ENVIRONMENTAL HAZARDS IN CENTRAL FLORIDA

Resilience should be planned for at all times, not only in the event of a shock or stress. Planning for resilience in "blue skies", or during normal, everyday life, can make a community even stronger. Not only will a community be more prepared when needed the most, but public health and quality of life may improve.

Within Central Florida, environmental hazards can take many forms, but are generally considered to be natural events, like hurricanes or flooding, or other conditions in the environment that have the potential to cause harm to human health, ecosystems, or property and infrastructure. The community's exposure or sensitivity to those hazards refers to the degree of harm or impacts from those hazards that could be generated.

Five impactful environmental hazards for the region were identified and detailed in Table 6-3.

Table 6-3 | Top Five Environmental Hazards and their Potential Impacts

Environmental Hazard	People	Places	Transportation Assets
Extreme Heat or Heat Waves	Health-related impacts like heat stroke for individuals, especially for people with outdoor-based professions, the young or the elderly	Stresses air conditioning systems, which increases energy usage, as well as impacts to natural resources such as trees	Can cause cracks and damage to roads and highways, and warp railroad tracks
Thunderstorms or Lightning	Potential loss of connection or access to essential services and direct health impacts with lighting strikes	Electrical network losses or damage to the built and natural environment due to high winds, hail, or lighting	Damage to transportation infrastructure such as street lights or temporary closing of critical roadways
Sinkholes	Potential loss of life, loss of property, or temporary loss of access	Potential loss of physical and natural infrastructure	Potential loss of physical or natural infrastructure or temporary closing of roads
Tropical Storms and Hurricanes	Potential loss of property, life, or connection to essential services and health-related impacts following power outages	Potential loss of physical and natural infrastructure, and impacts to local business or tourism	Damage to or complete loss of roadways, accumulated debris and limited drainage blocking or closing roadways
Inland Flooding	Damage to or loss of property, transmission of disease via flood water, or mold-related health impacts	Potential loss of physical and natural infrastructure, and economic impacts to local business or tourism	Potential washout of pavement, loss of infrastructure, or temporary closing of critical roadways

6.7.2 RISK ASSESSMENT

After identifying the most likely environmental hazards within the region, a risk assessment was performed to determine which transportation infrastructure elements could be most at risk to the respective hazards. The transportation assets and community services included are summarized below:

- **Asset Protection:** MetroPlan Orlando's planning area is home to many critical assets which the community depends on. Each strategy was qualitatively rated on a scale ranging from low to high based upon the level of increased resilience that would be provided to each of the following ten critical assets:
    - Roadway and roadway infrastructure
    - Railroad, railyards, and transit
    - Water/wastewater treatment facilities
    - Hospitals and ambulatory healthcare facilities
    - Emergency operations centers
    - Airports

- Fire departments
- Police departments
- Schools and Post secondary institutions
- Energy supply

- **Service Protection:** In addition to physical critical assets, there are several essential services that are necessary in supporting thriving services. The following twelve key services were evaluated as a benchmark of qualitative analysis for each resilience strategy:

  - Supply chain and resource availability
  - Parks and recreation
  - Education
  - Waste management
  - Access to basic services
  - Law and order
  - Economic development
  - Public health care
  - Access to public information/transparency
  - Water supply and sanitation
  - Childcare
  - Emergency management

For these assets and services, two map series were developed to visualize the outcomes of the risk assessment:

- Regional exposure and sensitivity to environmental hazards
  - Includes the evaluation of exposure/sensitivity to each of the five environmental hazards
  - The Federal Emergency Management Agency (FEMA) National Risk Index (NRI) data set was used to evaluate the MetroPlan Orlando Planning area roadways for risk. A total of 24 data sets were mapped to provide an understanding of exposure and sensitivity to environmental hazards.
- Regional estimated adaptive capacity (or the ability to withstand environmental hazards)
  - Illustrates the natural resources and features unique to the MetroPlan Orlando planning area that assist in people's ability to bounce back quickly following a major disaster event and improve quality of life.

Two example maps from this analysis depicting FEMA NRI rating by roadway and expected annual loss by roadway are displayed as Figure 6-6 and Figure 6-7. The associated table identifying the "Very High" risk roadways for both datasets are displayed as Table 6-4 and Table 6-5 | FEMA "Very High" Expected Annual Loss (EAL) Roadways. The remainder of the maps and associated tables are located in Appendix G.

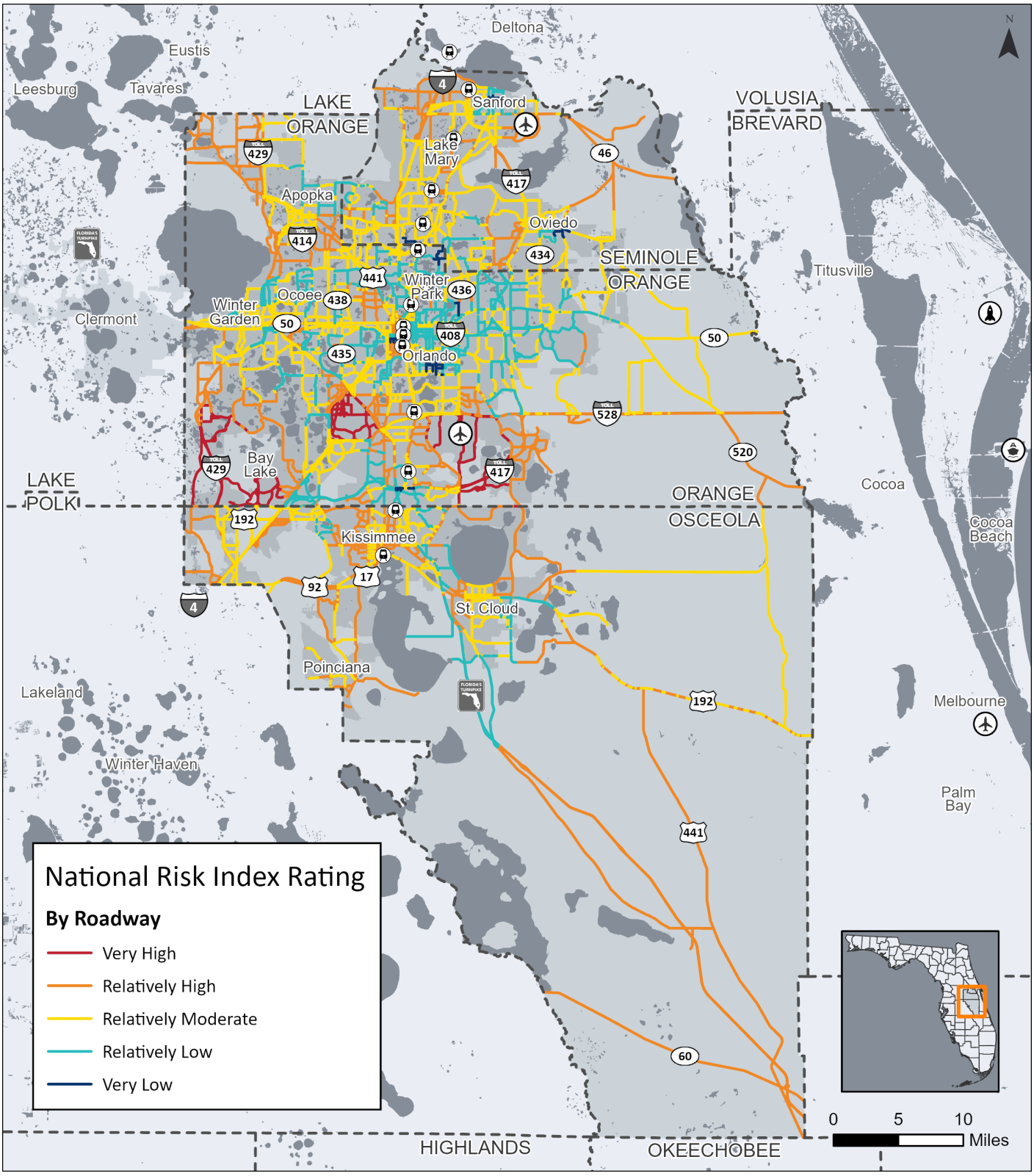
Table 6-4 | FEMA NRI "Very High" Risk Roadways

NRI Risk Index Rating	Roadway Description	County
Very High	McCulloch Rd. from SR 434 to Lockwood Blvd.	Seminole/Orange County Line
Very High	Avalon Rd. from Porter Rd. to Space Coast Pkwy.	Orange County
Very High	Airport Rd./Jeff Fuqua Pkwy. from SR 528 to SR 417	Orange County
Very High	Universal Blvd from I-4 to SR 528	Orange County
Very High	Lake Nona Blvd. from Boggy Creek Rd. to Narcoossee Rd.	Orange County
Very High	Sand Lake Rd./McCoy Rd. from I-4 to Florida's Turnpike	Orange County
Very High	Narcoossee Rd. from SR 528 to Savannah Park Dr.	Orange County
Very High	Tradeport Dr. from McCoy Rd. to Boggy Creek Rd.	Orange County
Very High	Heintzelman Blvd. from SR 528 to Jeff Fuqua Pkwy.	Orange County
Very High	Western Way from Hartzog Rd. to West Buena Vista Dr.	Orange County

Table 6-5 | FEMA "Very High" Expected Annual Loss (EAL) Roadways

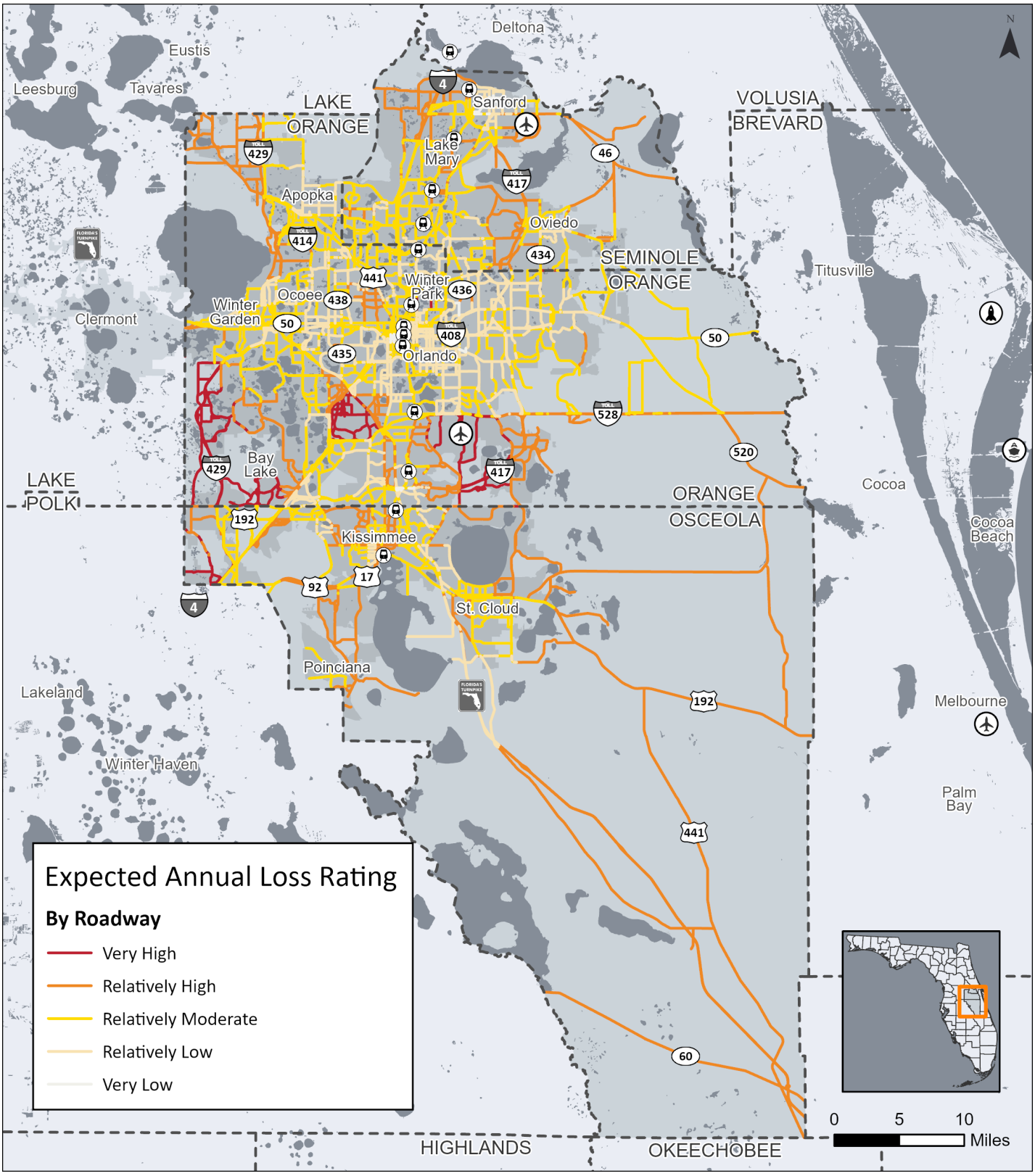
FEMA EAL Rating	Roadway Description	County
Very High	N Goodman Rd/Masters Blvd from Monaco Blvd to Champions Gate Blvd	Osceola County
Very High	Bella Cita Blvd from Goodman Rd to Osceola County Line	Osceola County
Very High	Sand Lake Rd/Mccoy Rd from Interstate 4 to Florida's Turnpike	Orange County
Very High	Avalon Rd from Tilden Rd to Space Coast Pkwy	Orange County
Very High	Tradeport Dr from Boggy Creek Rd to McCoy Rd	Orange County
Very High	Heintzelman Blvd from Jeff Fuqua Blvd to SR 528	Orange County
Very High	Seidel Rd from Summerlake Park Blvd to Avalon Rd	Orange County
Very High	Mills Ave from Nebraska St to Nottingham St	Orange County
Very High	Lake Nona Blvd from Boggy Creek Rd to Narcoossee Rd	Orange County
Very High	McCulloch Rd from SR 434 to Lockwood Blvd	Seminole/Orange County Line

Figure 6-6 | FEMA NRI Rating by Roadway



Source: FEMA, 2024

Figure 6-7 | Expected Annual Loss (EAL) Rating by Roadway



Source: FEMA, 2024

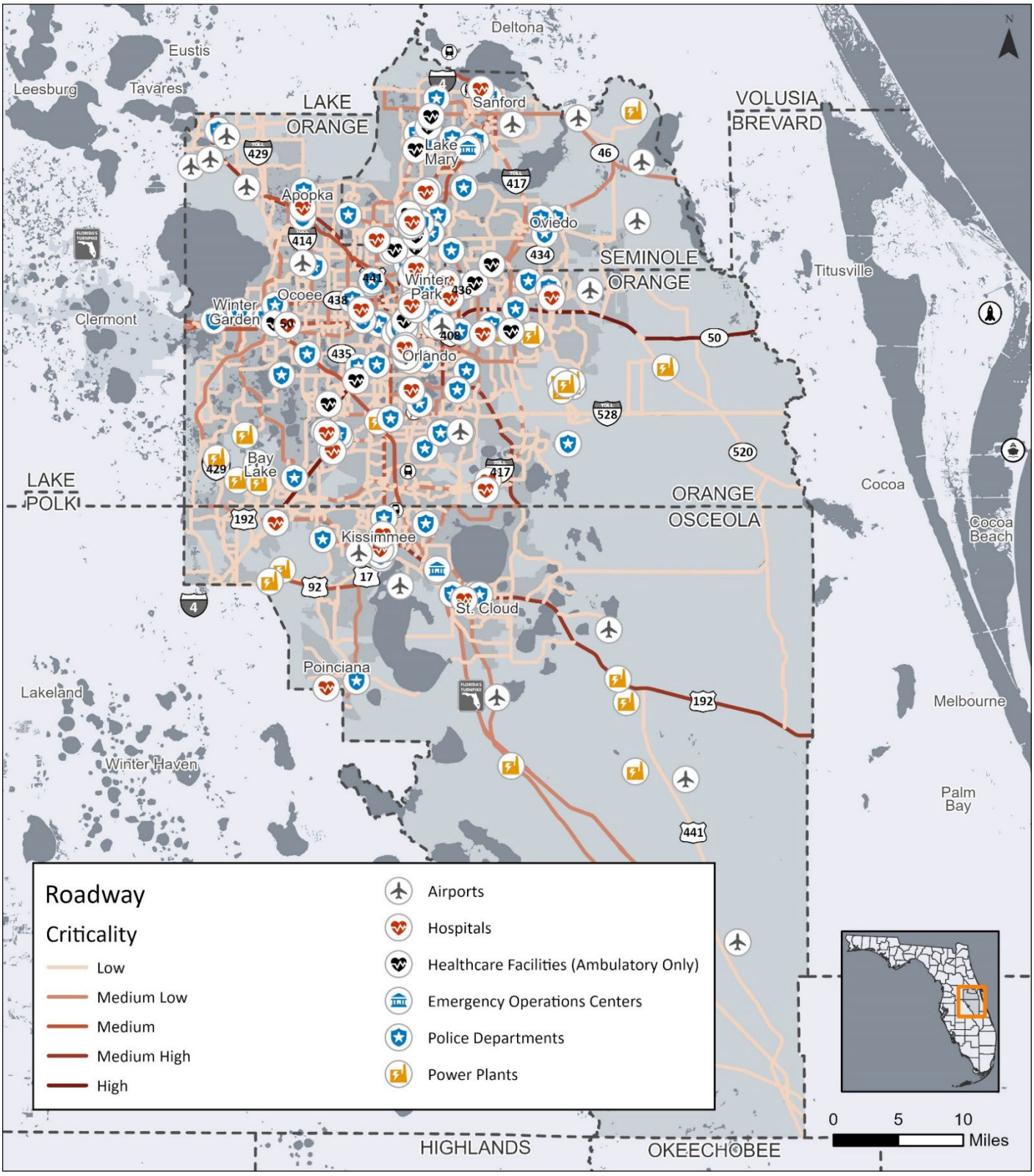
6.7.3 CRITICAL ASSET ASSESSMENT

Critical assets are essential community services or infrastructure that are essential to everyday life and are critical during or after a natural. Critical transportation assets are those which provide access to these essential services.

These critical transportation assets were identified as those within a 5-minute drive time from each critical asset. As those route overlap when looking at all critical assets throughout the region, a "level of criticality" score was developed to determine which transportation infrastructure is of the utmost importance to the region. For example, where a road provides direct access to just one asset, the "level of criticality" score would be low. Where, if a road provides direct access to six or more critical assets, the road would receive a higher score. A map depicting critical assets and level of criticality of roadways is displayed as Figure 6-8.

This analysis reveals that the most critical roadways are major arterials such as Interstate 4 (I-4), State Road (SR) 50/Colonial Drive, SR 527/426, and Space Coast Parkway/Irlo Bronson Memorial Highway.

Figure 6-8 | Critical Assets and Level of Criticality of the Roadway Network



Source: FDEP, 2024

6.7.4 COMPOSITE RISK ASSESSMENT AND CRITICALITY

A variety of roadways were identified as having the highest level of risk to environmental hazards and highest level of criticality. Within this assessment, risk consisting of exposure or sensitivity to environmental hazards was reviewed first to filter for those roadways most in need of further analysis. This was supplemented with the understanding of the level of criticality. Additional consideration was given to distribute the resilience strategy roadways across the region, inclusive of Seminole, Orange, and Osceola County. Table 6-6 reflects the top 20 critical roadways in the MetroPlan Orlando planning area that may be considered for future resilience improvements.

Table 6-6 | Top 20 Critical Roadways in the MetroPlan Orlando Planning Area

Roadway	County	Environmental Risk Assessment				Level of Criticality
		EH	T/L/S/W/H	TS/H	IF/FP	
W Seminole Blvd from Interstate 4 to Marbella Ln	Seminole	✓	✓	✓	✓	Medium High
SR 46/1st St from S Persimmon Ave to Interstate 4	Seminole	✓	✓	✓	✓	Medium
Tuskawilla Rd from SR 434 to SR 426	Seminole	✓	✓		✓	Medium Low
SR 434 from Integra Land Way to US 17-92	Seminole	✓	✓		✓	Medium
Lake Mary Blvd from S County Club Rd to Interstate 4	Seminole	✓	✓			Medium
Grand National Dr/Oak Ridge Rd from Carrier Rd to Orange Ave	Orange	✓	✓	✓	✓	Medium Low
International Drive from Oak Ridge Rd to Interstate 4	Orange	✓	✓	✓		Medium Low
Airport Rd/Jeff Fuqua Pkwy from SR 528 to SR 417	Orange	✓	✓	✓	✓	Low
Avalon Rd from Tilden Rd to Space Coast Pkwy	Orange	✓	✓	✓	✓	Medium Low
Lake Nona Blvd from Boggy Creek Rd to Narcoossee Rd	Orange	✓	✓	✓	✓	Low
Tradeport Dr from McCoy Rd to Boggy Creek Rd	Orange	✓	✓	✓		Medium Low
Sand Lake Rd/McCoy Rd from Interstate 4 to Florida's Turnpike	Orange	✓	✓	✓		Medium

Roadway	County	Environmental Risk Assessment				Level of Criticality
		EH	T/L/S/W/H	TS/H	IF/FP	
Universal Blvd from SR 528 to Interstate 4	Orange	✓	✓	✓	✓	Medium Low
N Goodman Rd/Masters Blvd from Monaco Blvd to Champions Gate Blvd	Osceola	✓	✓		✓	Low
Simpson Rd from Fortune Rd to Boggy Creek Rd	Osceola	✓	✓		✓	Medium
Boggy Creek Rd from Simpson Rd to Quail Park Ter	Osceola	✓	✓	✓	✓	Medium
N Poinciana Blvd from Irlo Bronson Memorial Hwy to Orange Blossom Tr	Osceola	✓		✓	✓	Medium Low
Narcoossee Rd from Orange/Osceola County Line to Space Coast Pkwy	Osceola	✓			✓	Medium Low
Nova Rd from Space Coast Pkwy to 6th St	Osceola	✓			✓	Medium Low
Cypress Pkwy from Poinciana Blvd to Old Pleasant Hill Rd	Osceola	✓			✓	Low

*Key: **EH:** High Risk to Extreme Heat; **T/L/S/W/H:** High Risk to Thunderstorms, Lightning and associated assessment of Strong Winds and/or Hail; **TS/H:** High Risk of Tropical Storms or Hurricanes; **IF/FP:** High Risk to Inland Flooding or proximate to identified Flood Hazard Zones*

6.7.5 RESILIENCE STRATEGIES

With the understanding of the environmental hazards within the region and the locations of transportation infrastructure, additional strategies were developed to identify best practices to improve the resilience of the transportation system. These strategies are organized to align with 2050 MTP Goals (Chapter 2), and represent opportunities to support continued, safe use of critical transportation networks, and reduce future risk to environmental hazards and are prese. MetroPlan Orlando will explore methods to support the implementation of these strategies by the maintaining agencies.

6.7.5.1 SAFETY

Best practices under this goal are intended to increase transportation network safety by decreasing exposure to risks. The top safety strategies identified include the following:

- Encourage policies concerning the relocation, retrofitting, or modification of evacuation routes.
    - Explore extreme heat mitigation measures such as continuous tree canopy and/or shade structures along transportation corridors that support active transportation options such as transit, walking, or bicycling.
    - Encourage investment in infrastructure to improve transit stations and reduce the risk of heat-related illness, such as the installation of reflective materials, structured shade, and fans
- Identify and evaluate social and economic data to better understand where the impacts of major weather events may be felt the greatest.
- Provide external technical support guidance on incorporating resilience into transportation plans and projects.

6.7.5.2 RELIABILITY

These strategies focus on learning from past disasters to better prepare for the future and establish reliability of transportation systems. The top reliability strategies include the following:

- Encourage information sharing throughout the region, including “lessons learned” from significant natural disaster events that occur in the MetroPlan Orlando planning area.
- Encourage the deployment of smart technologies including sensors and warning devices for early detection of risk such as flooding, congestion, or unsafe conditions, and/or increase ITS/TSM&O strategies to manage the transportation system in real time and share traveler information with the community on a real time basis.
- Encourage the effective use of data and information related to hazard mitigation planning and programming.

6.7.5.3 CONNECTIVITY

These strategies aim to make communities safer and less vulnerable to environmental hazards by working with local governments to improve facilities and connectivity between places and spaces. The top connectivity strategies include the following:

- Support the evaluation of environmental hazards and risk assessments in relation to transportation infrastructure and support the development of strategies to mitigate the identified risks.
- Support the incorporation of resilience strategies into comprehensive planning efforts and/or design guidelines to proactively mitigate risks from environmental hazards.
- Support the improvement of the frequency, service, and accessibility of public transportation and shared mobility services.
- Support the implementation of smart technologies and warning systems like stage, flow gauged, and rainfall monitors to alert the public to the potential for flooding, especially in areas that are known to be prone to inundation.

6.7.5.4 COMMUNITY

These strategies aim to protect the environment and communities, particularly those most affected by transportation challenges. The top community strategies include the following:

- Support the implementation of natural infrastructure such as bioswales, permeable streets, green space, urban street trees, and other natural features that reduce impacts of flooding and the urban heat island effect in locations with the most vulnerable travelers, such as transit riders, pedestrians, bicyclists, and other such populations.
- Support methodologies that prioritize future resilience improvements on routes to and from critical facilities and evacuation routes.
- Share information with the public and technical professionals to increase awareness of hazard mitigation planning.
- Encourage information sharing on environmental vulnerability, potentially through peer exchanges or meetings.

6.7.5.5 PROSPERITY

These strategies focus on building a strong financial foundation and assessing available grant opportunities to implement resilience strategies. The top prosperity strategies include the following:

- Routinely identify grant programs that could be used to fund or support resilience improvements for transportation infrastructure.
- Share information about technical and financial resources available from federal and state agencies, as available and relevant for the region.
- Coordinate with federal agencies, FDOT, and/or local governments to support sustained and coordinated action(s) to further resilience efforts and mitigate risks from environmental hazards.

6.8 Conclusion

The 2050 MTP reflects MetroPlan Orlando's commitment to enhancing the health and vitality of our region's communities and environments. By integrating robust data collection on existing conditions, coordinating closely with environmental stakeholders and agencies, and employing forward-thinking strategies, this plan sets a blueprint for responsible infrastructure development through 2050. These efforts culminate in a visionary plan that respects the balance between economic growth and environmental preservation. By maintaining a collaborative spirit, focusing on informed decision making, and deploying adaptive, cost-effective solutions, the region will remain poised to address evolving mobility demands while safeguarding Central Florida's rich natural assets.

Additionally, resilience, or the ability to withstand, bounce back, or quickly recover from shocks or stresses, is important to the people and places of the Central Florida region. Resilience assessments in long-range transportation planning help to guide organizations like MetroPlan Orlando in their vision for the future in which the safety, reliability, connectivity, community, and prosperity of the transportation system, and the people and businesses it connects, are resilient to a changing future.

In this way, the 2050 MTP supports a future in which thriving communities, healthy ecosystems, and a robust economy all coexist in harmony—further solidifying Central Florida as a national leader in sustainable, forward-looking transportation planning.

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