



Forest Service
U.S. DEPARTMENT OF AGRICULTURE



Daniel Boone National Forest Transportation Resiliency Planning Project

Promoting resilient transportation infrastructure to protect communities and forests.

USDOT PROTECT Grant Program FY 2023





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1.0 Basic Project Information – Description, Location, and Parties

1.1 Project Description

The Daniel Boone National Forest (DBNF) includes over 700,000 acres of managed forest in eastern Kentucky (See **Figure 1**). The forest includes natural, human, and economic systems making it one of the most valuable resources in the region. Nearly 1 million people visit the forest each year enjoying it’s 600 miles of trails, 250 recreational sites, and some of the country’s most unique rock formations, including Red River Gorge a Federally-designated National Natural Landmark. The forest is also central to the region’s economy with data from the 2019 Economic Contributions Report for DBNF (included as **Appendix C** which has been submitted with this application) indicating that the forest supports 940 jobs and \$38.7 million annual labor income in local communities. The central element connecting and supporting the natural, human, and economic ecosystems is the transportation network. Roadways connect visitors to

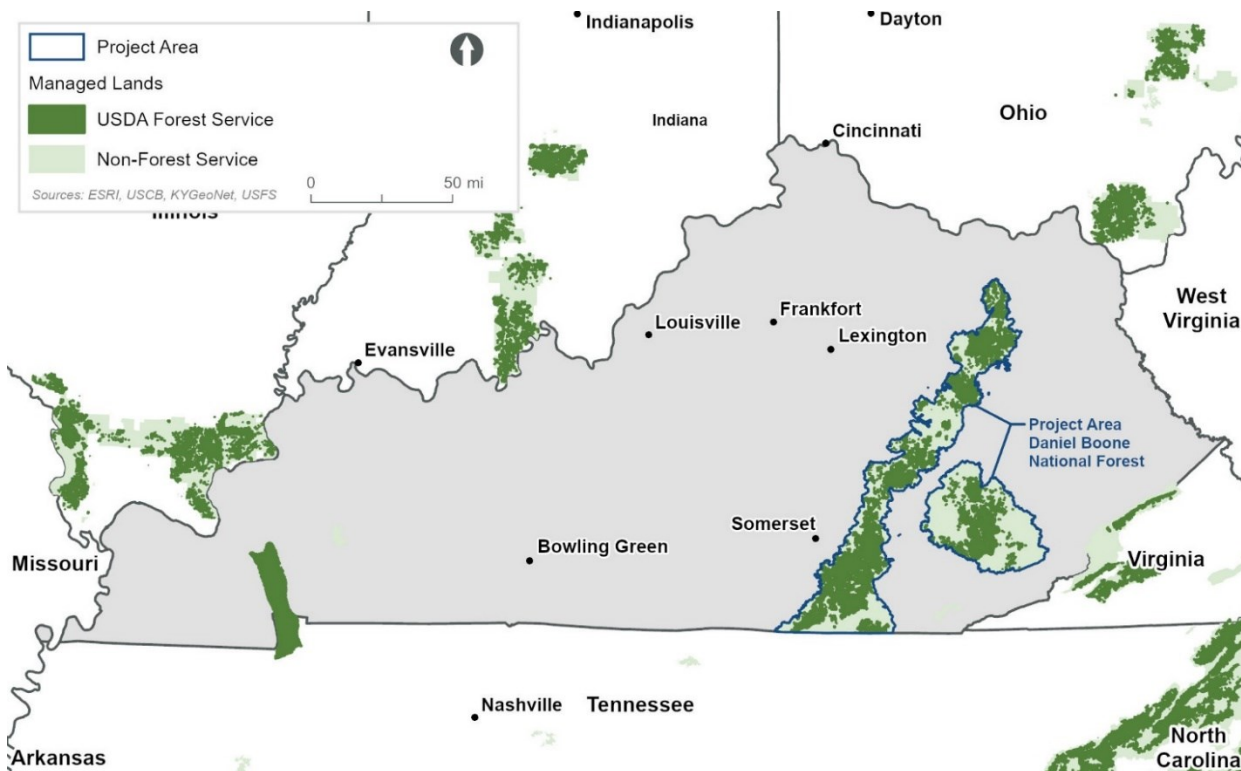


Figure 1: Map of Project Area



recreational sites in the forest, connect people in local communities to forest related jobs and connect rural eastern Kentucky to the state’s broader transportation network and larger economies across the state and nation.

Throughout recent years, natural disasters have caused significant impacts to the transportation system in eastern Kentucky. The DBNF has experienced numerous culvert and bridge washouts and roadway slope failures such as the one shown in



Figure 2: Slope failure resulting from a 2019 natural disaster event along Elster Road in DBNF

Figure 2 which was documented in a 2019 Federal Highway Administration, Federal Lands Highway Damage Survey Report. In March of 2021, the region experienced heavy rainfall prompting evacuations in some locations. In July of 2022, an estimated 12 inches of rain fell across portions of eastern Kentucky, most of which fell during a 12-hour period. The complex topography of Appalachia funneled these heavy rains into steep ravines and waterways, leading to the state’s worst flooding disaster in decades with 42 fatalities and over \$1 billion in damages.

In 2018, the Kentucky Transportation Cabinet (KYTC) completed a risk-based vulnerability assessment of the state’s transportation system to extreme weather and nature hazards as part of KYTC’s Transportation Resiliency Improvement Plan (RIP) (Included in **Appendix D** submitted with this application). Results from that assessment concluded that the severity of **consequences could be catastrophic for flooding and major for landslides for Highway Districts 10, 11 and 12 where the DBNF is located**. The scale of the forest including over 700,000 acres and numerous rural, disadvantaged communities reinforces the significance of the assets within the forest and the need to improve the resiliency of the transportation infrastructure. Completing a planning study to identify and evaluate the transportation system for potential risks and vulnerabilities will be a key first step to support the continued operation of key local, regional, and national surface transportation assets.



This PROTECT Discretionary Grant Program application **includes Resilience Planning for the DBNF Transportation System**. The United States Forest Service (USFS) is serving as the lead applicant, with the KYTC as co-applicant, for this PROTECT grant application. Given the geographic size of the area and the interdependencies of the forest and state transportation system, KYTC is pleased to offer their partnership on this project.

The **Daniel Boone National Forest Transportation Resiliency Planning Project** (the project) will include completing a **needs-based planning study to identify vulnerabilities and develop strategies to improve the resiliency of the transportation infrastructure** within the forest. The study will include the DBNF managed lands while also considering interdependencies related to the larger Proclamation Boundary (including the Redbird District) and county/state-owned roadways. The scope of the study includes the key tasks identified below. Additional details for the project scope can be found in **Appendix B** submitted with this application.



Project Administration including grant administration and oversight of the planning study will be provided by KYTC with the Forest Service working in partnership as part of the project team.



Visioning and baseline documentation including data collection and development of a GIS database including transportation infrastructure, population, natural resources, geologic hazards, and floodplains.



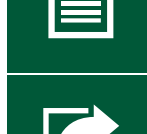
A Risk and vulnerability assessment of the transportation system will be completed along with development of climate scenarios. The assessment will be based on sensitivity of assets, adaptability, and the probability of an event.



Identification and evaluation of mitigation strategies such culvert upgrades, roadway related improvements, and nature-based strategies. Projects will be evaluated based on key metrics such as benefit cost and feasibility.



Recommendations and an implementation plan will be developed serving as a resiliency master plan that will include prioritized projects and next steps.



Early Environmental Action will include completing environmental reviews for higher priority areas to advance to implementation.



1.2 Project Location

The Daniel Boone National Forest is located in a rural section of eastern Kentucky. The forest includes more than 700,000 acres of land managed by the Forest Service (See **Figure 3**). The forest is located along the western side of the Appalachian foothills spread across 21 counties in eastern Kentucky, beginning just north of Interstate 64 (I-64) and ending at the Tennessee border. The lands managed by the Forest Service are inside a boundary defined by the original Proclamation Boundary and also the Redbird District. A GIS shape file identifying the proclamation boundary and area of managed lands has been included with this application in accordance with the Notice of Funding Opportunity requirements.

1.3 Project History

With land acquisition beginning in 1933 the Proclamation Boundary for the Cumberland National Forest was established on February 26, 1937. The separated Redbird Purchase Unit became part of the National Forest in 1965. The forest was later renamed in 1966 to Daniel Boone National Forest to honor the explorer/frontiersman who contributed greatly to the exploration and settlement of Kentucky.

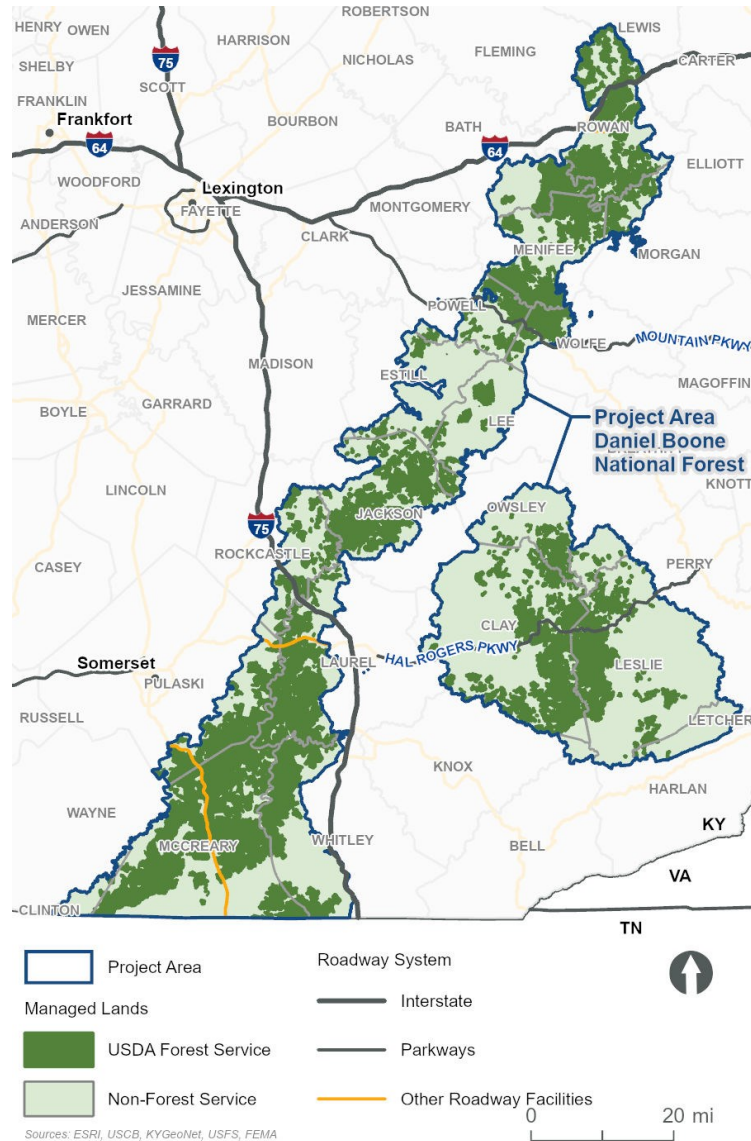


Figure 3: Project Location Map



1.4 Connections to the Existing Transportation Infrastructure

DBNF is located at the western edge of the Appalachian region on the Cumberland Plateau and functions as an entryway to eastern Kentucky. The forest has an extensive local roadway network that is also interdependent with county, state, and federal routes (See **Figure 4**). The collective network provides critical connections to residents, schools, and essential services located within and adjacent to the forest.

Roadbuilding in the region began before the forest was established with United States Routes being constructed through the area in the 1920s and 30s and State Routes following in the later part of the 1920s and continuing into the early 1960s.

The forest has two interstates that pass through, Interstate 75 (I-75) and Interstate 64 (I-64). I-75 is the nation’s second longest north-south interstate and carries local and regional traffic through the central part of the state. I-64 runs east-west providing regional connectivity from eastern Missouri to Virginia and local connectivity in north-central Kentucky. There are also two parkways that support east-west travel: the Hal Rogers Parkway (which passes through two DBNF Districts) and the Mountain Parkway.

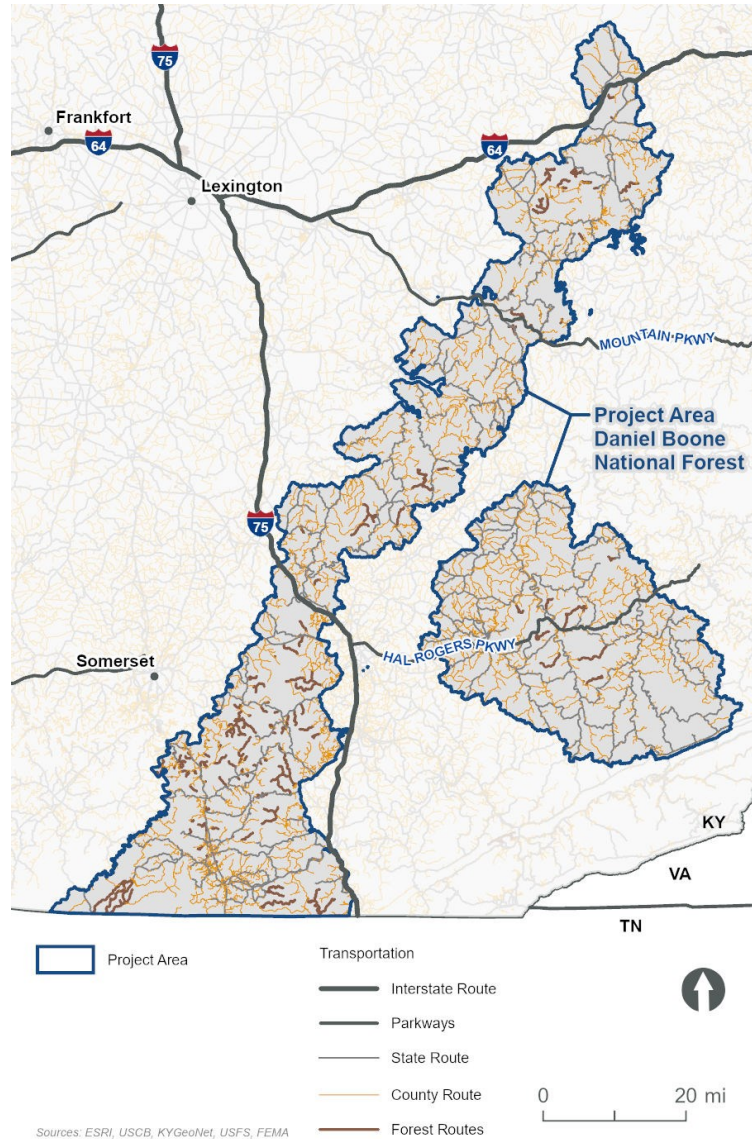


Figure 4: Transportation Routes inside and connecting to the Project Area



1.5 Additional Considerations for the Project Area

The project area of the Daniel Boone National Forest (including the broader area defined by the Proclamation Boundary) is classified as rural as defined by the United States Department of Transportation (USDOT) since it is located outside of a U.S. Census-designated urban area with a population of 200,000 or more.

a) Transportation Disadvantaged Census Tracts

There are 82 census tracts located inside or overlapping the project area. As shown in **Figure 5**, there are many disadvantaged communities within and near the project area. For this application, the Climate and Economic Justice Screening Tool (CEJST) was used as the primary tool to assess the Justice40 status in the project area. The CEJST considers eight categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. A review of the census tracts data shows that 88% of the census tracts are considered disadvantaged. The most prevalent categories of burdens are associated with health (84%) transportation (62%) and pollution (57%).

The Transportation Disadvantaged Census Tract Tool (TDCTT) was also used to assess the components of the project benefits and identify

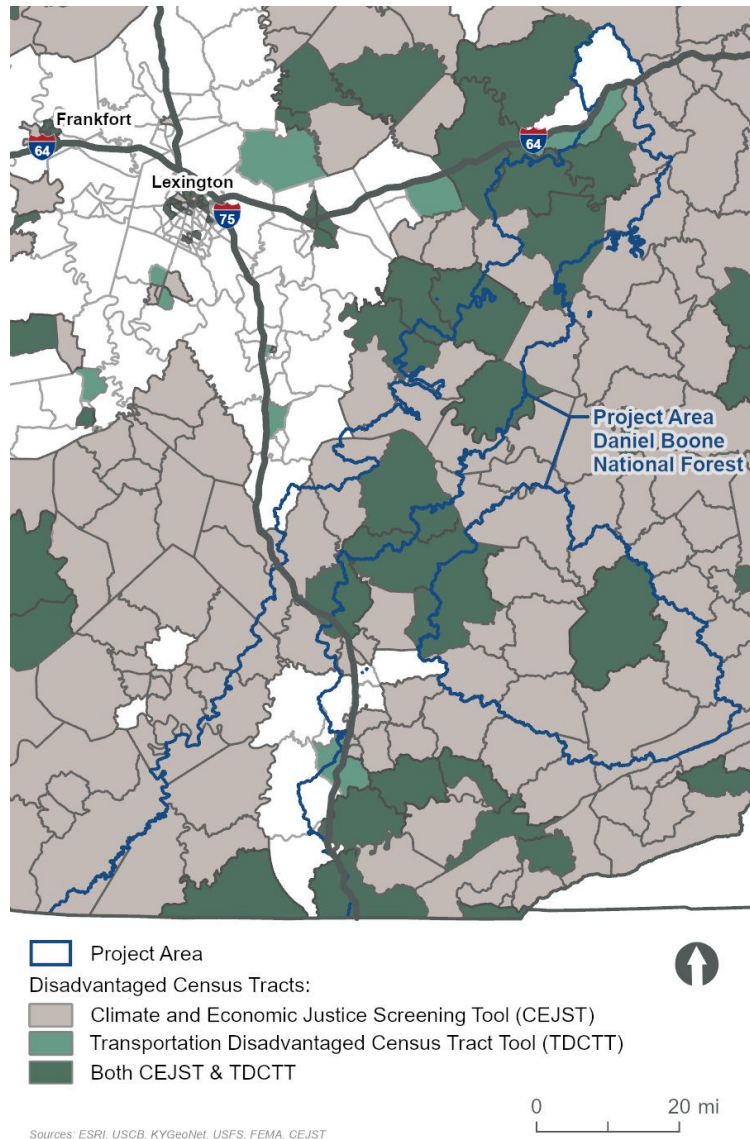


Figure 5: Disadvantaged Census Tracts in Project Area



the burdens facing the area. The TDCTT considers six categories of burden: transportation, health, economy, equity, resilience, environmental. The most prevalent categories of burdens in the DBNF project area are associated with transportation (99%), economy (95%) and health (89%).

The ***Daniel Boone National Forest Transportation Resiliency Planning Project*** will help improve the resiliency of the transportation infrastructure in an area that includes many communities that experience burdens related to transportation. This project aligns strongly with the USDOT's [Justice40 Initiative](#) and PROTECT Discretionary Program which aims to remove transportation related disparities.

b) Applicable Resilience Improvement Plan

After the DBNF vulnerability and risk assessment is completed, mitigation strategies will be developed which will likely include upgrading roadway culverts. That is a significant need already identified in the DBNF's current [Land and Resource Management Plan](#). A key action item related to bridges and culverts references "*partnering with the state to upgrade roadsides and culverts.*" Additional plans with key elements informing the criticality of the forest transportation network include KYTC's recently approved Resilience Improvement Plan (July 2023) (see **Appendix D** submitted with this application), [KYTC's Transportation Asset Management Plan](#), [KYTC Long Range Statewide Transportation Plan](#), [KYTC Freight Plan](#), and [Commonwealth of Kentucky Enhanced Hazard Mitigation Plan](#).

c) Floodplains & Watersheds within Project Area

There are several floodplains and watersheds within the project area (See **Figure 6** next page). The forest includes several major river systems that flow into the Ohio River including the Licking River, Kentucky River, and Cumberland River. The project also includes four reservoirs; Cave Run Lake, Buckhorn Lake, Lake Cumberland and Laurel River Lake which are all managed by the United States Army Corp of Engineers. Thousands of smaller streams, many of which only see flow after heavy rain events are also present throughout the forest.



As reported in KYTC’s RIP, damages from natural hazards on federal-aid routes between 2009-2021 were concentrated most heavily in the eastern, mountainous areas of the state. This area is particularly vulnerable to storm-related damage due to the rugged topography, which, during a heavy rain event, funnels runoff down slopes and into stream channels that run along valley bottoms. This results in a rapid rise of water levels and swift currents. Due to the topography, highways are commonly built alongside these streams in the valleys. Consequently, flash flooding in such areas is particularly destructive and can lead to roadway flooding, embankment failures, rockfall slides, and washouts.

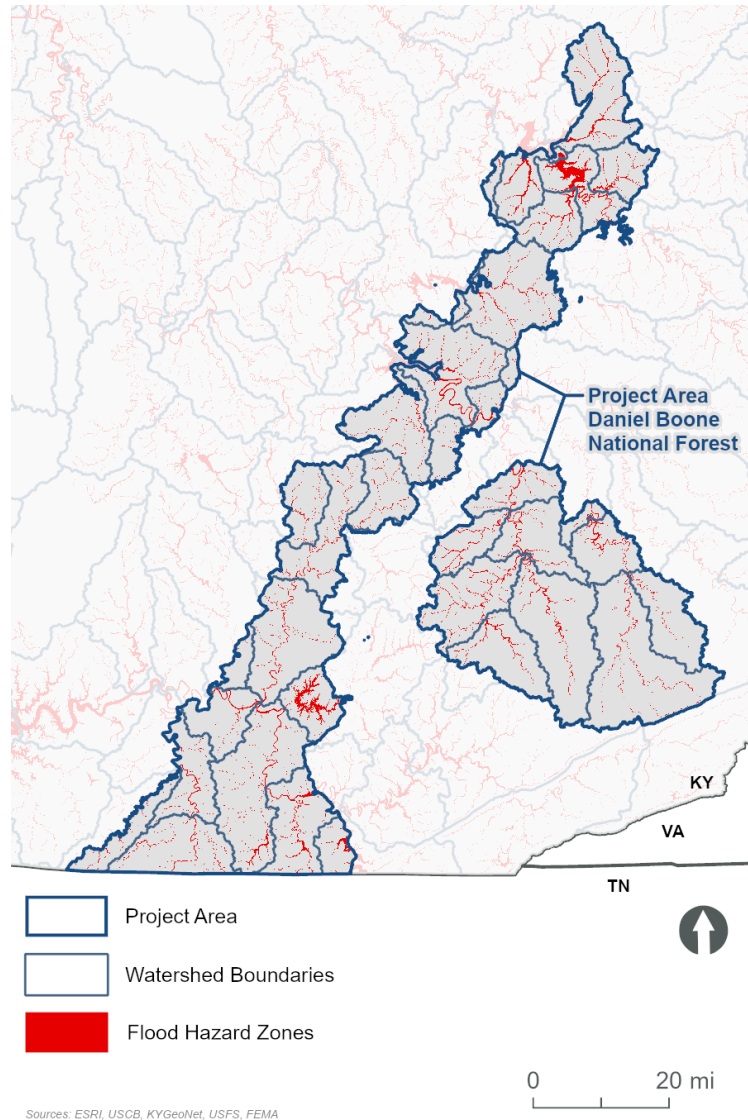


Figure 6: Floodplains and Watersheds in Project Area

1.6 Projected Changes in Development Patterns and Extreme Weather Events

Between 2010 and 2020, nearly half of the 54 Kentucky Counties in the Appalachian Regional Commission (ARC) lost population. Overall, the population of Appalachian Kentucky counties increased by 23,000 to a total of 1,184,278 with the highest numeric gains concentrated around Lexington, Lake Cumberland, and Laurel and Rowan Counties ([ARC Data Report, based on US Census data](#)).



Based on a review of [KYTC's traffic data](#) on major roadways, regional traffic has increased on the Interstates and Parkways around DBNF. In the 15 years for which data are available prior to the pandemic (2020), traffic increased most substantially on north-south (I-75) and east-west I-64. More recent data showed the largest increase in traffic is north of the forest, close to Lexington where Average Annual Daily Traffic (AADT) nearly doubled from 24,500 in 1994 to 50,000 in 2022. On the segment of I-75 that runs along the eastern border of the DBNF traffic increased from a range of 28,000 to 34,000 AADT in 1994 to between 39,500 to 45,000 AADT in the most recent counts for stations on the corridor between Tennessee and where the interstate crosses the forest.

Traffic increased in Wolf County along Bert T. Combs Mountain Parkway by 70% (4,900 to 8,800) while AADT east of the forest in Powell County has increased by approximately 15% (7,800 to 9,100). The Hal Rogers Parkway which runs east-west across the southern portion of the state and through both sections (Proclamation Boundary and Redbird District) of the DBNF saw modest increase in traffic over this time. The most significant traffic on the Parkways in the vicinity of the DBNF is in Pulaski County near Somerset where traffic exceeds 15,000 AADT in a typical year.

Recent decadal trends indicate that Kentucky's climate is becoming warmer and wetter. The July 2022 extreme rainfall event was over [600% compared to normal precipitation](#). From a [Kentucky Climate Center](#) (KCC) review of climate records dating back to 1895, five of the top ten warmest years in the state's history have occurred since 2007 and five of the top ten wettest years have occurred since 2011. More high-impact, flash flooding events are expected due to these large-scale climatic changes. A review of ten years of [Kentucky Mesonet](#) observations from a single station (located in Bowling Green) show that the frequency occurrence of high rainfall rates occurs two to five times more frequently than is currently estimated by [National Oceanic and Atmospheric Administration Atlas 14 Precipitation Frequency Data Server](#) (NOAA's Atlas 14) estimates, and this discrepancy reflects the much warmer, wetter period over the last decade.

When extreme weather hits and the DBNF experiences flooding, landslides, or other severe weather effects, this impacts the area's transportation system (two interstates, two parkways, and numerous state and county routes) that provide crucial transportation to residents and tourists within the region. If these transportation systems, along with the natural health of the forest's ecosystems are disrupted, this will



interfere with the normal operations of DBNF and result in negative economic and safety consequences.

1.7 Contributions to the Function and Growth of the Economy

A healthy DBNF supports local economies through the recreation, timber, energy, and minerals industries. As noted in the 2019 Economic Contributions Report for DBNF (See **Appendix C** submitted with this application), the forest supports a total of 940 jobs and \$38.7 million annual labor income in local communities. Employment related to forest recreation generates approximately 670 jobs and an estimated \$23 million in total labor income. This resource provides economic and social sustainability for the local communities, many of which are lower income and disadvantaged rural areas. See [Section 1.5](#) of this application for more detailed information on the project area.

The economic contributions generated by recreation within the DBNF face increasing risks from severe flooding and impacts of climate change that disrupt the forest’s services, tourism contributions, and transportation infrastructure. If the transportation systems, along with the natural health of the forest’s ecosystems are disrupted, this will interfere with the normal operations of DBNF and result in negative economic consequences. The ***Daniel Boone National Forest Transportation Resiliency Planning Project*** will help develop mitigation strategies to reduce the potential impacts from natural hazards and ultimately improve the resiliency of the forest transportation system.

Land Resources

National Forests were originally established to manage forests for multiple uses. This mandate has continued to be reinforced throughout the years and includes responsible management of timber as an economic and natural resource. The DBNF actively manages the sale of timber to help preserve this resource and its role of supporting the local economy.

The forest land also supports recreation which brings over a million people to the DBNF each year enjoying a wide range of recreational activities including nearly 250 developed recreation sites, 600 miles of trails, rock climbing, boating, and fishing. Notable attractions in the forest include the Red River Gorge which is designated as a National Natural Landmark. There are also three state managed parks within the



boundaries of the Daniel Boone National Forest: Buckhorn Lake, Cumberland Falls and Natural Bridge (which is one of the most well-known parks in the region).

Transportation System

I-64, I-75 and the Hal Rogers and Mountain Parkways carry significant freight traffic and connect eastern Kentucky to larger economies in central Kentucky and surrounding states. Other key transportation facilities in the project area include coal haul extended truck routes, facilities on the National Truck Network, the Appalachian Development Highways, and Truck Weight Class AAA highways.

Critical Infrastructure

Eleven water treatment plants are located within the DBNF, extracting water from various sources including rivers and reservoirs. Just outside the forest boundary many more water treatment plants exist extracting water from Laurel River Lake, the Cumberland River, and Cave Run Lake (See **Figure 7: Location of Water Intake Sites in/near Project Area**). While most homes and developed land within the DBNF rely on septic systems, there are seven wastewater treatment plants that serve small towns and communities within the forest and several smaller wastewater treatment facilities that serve facilities such as state parks.

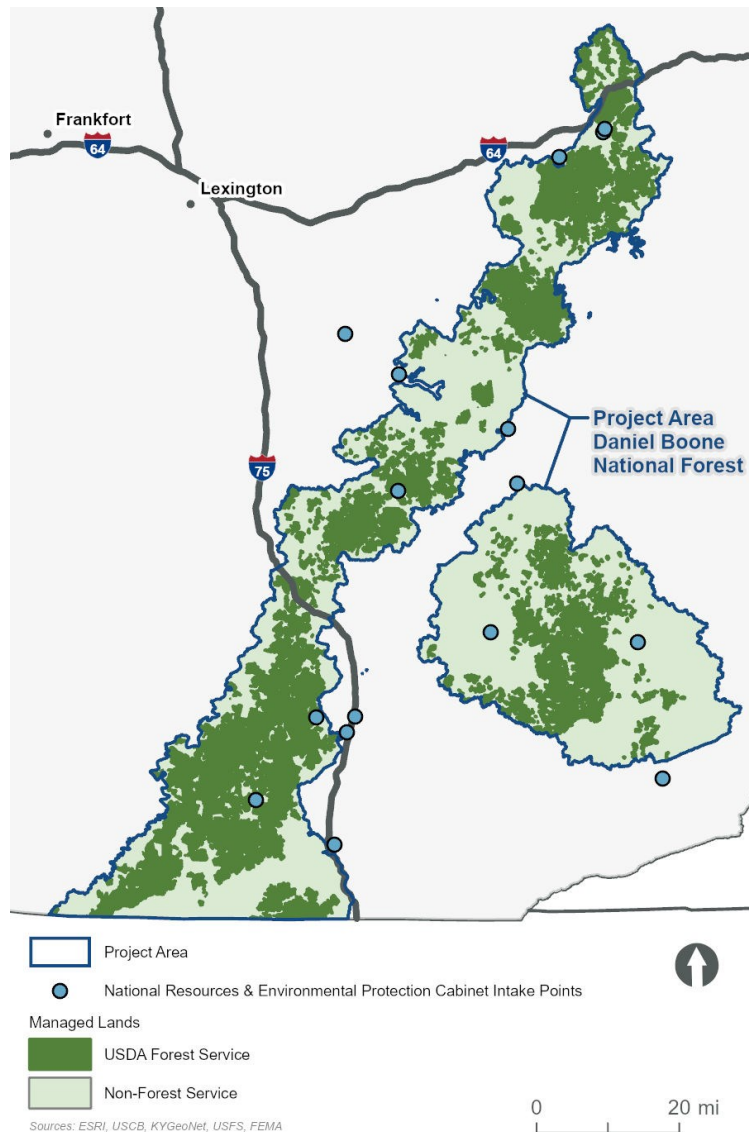


Figure 7: Location of Water Intake Sites in/near Project Area





Within the forest, electric service is provided by ten different companies, most of which are rural electric co-ops. There are two natural gas providers, six telecommunication companies, and dozens of small rural water companies. The mountainous terrain of eastern Kentucky presents challenges for the location of utilities. Both overhead and underground utilities tend to parallel roadways and streams that run along the low points of this terrain. This makes them more susceptible to damage incurred by flooding and hill slides caused by extreme weather.

1.8 Lead Applicant



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

The United States Forest Service is the lead applicant for this project. The Forest Service is responsible for managing nearly 193 million acres of land across the United States. They manage public lands in the form of national forests and grasslands, provide technical and financial assistance to state, private, and tribal forestry agencies and make up the largest forestry research organization in the world. The ***Daniel Boone National Forest Transportation Resiliency Planning Project*** directly aligns with the Forest Service’s mission which is to **“sustain the health, diversity, and productivity of the nation’s forests and grasslands to meet the needs of present and future generations.”**

Should the project be awarded PROTECT grant funding, the Forest Service will work closely with KYTC to complete the planning study. That will include providing resources and personnel who will participate in the project by attending project meetings, assisting with engagement and outreach, reviewing milestone deliverables, and supplying additional subject matter experts to assist with the project.

1.9 Additional Parties

The Kentucky Transportation Cabinet (KYTC) is a co-applicant for this grant. KYTC is Kentucky’s department of transportation and employs more than 4,000 staff members who are responsible for overseeing construction and maintenance of nearly 28,000 miles of roadways across the state. KYTC staff have experience in delivering projects from planning and environmental approvals through design, permitting, and construction. This project directly aligns with KYTC’s mission which is to **“provide a safe, efficient, environmentally sound and fiscally responsible transportation system that delivers economic opportunity and enhances the quality of life in Kentucky.”**



If the project is successful and is awarded PROTECT grant funding, KYTC will be the direct recipient of the funds, will administer the grant, and will also serve as the lead for administering the project. KYTC and the Forest Service anticipate utilizing a consultant to complete the planning study with KYTC providing management oversight of the contract. The Kentucky Transportation Cabinet has significant experience with Federal-aid highway program funds, completing planning studies and administering USDOT grants. Since FY 2014, they have been awarded and successfully administrated over \$250M of United States Department of Transportation grant funding.

2.0 Grant Funds, Sources and Uses of All Project Funding

The total estimated cost of the proposed ***Daniel Boone National Forest Transportation Resiliency Planning Project*** is \$1.74 million. The estimated cost is based on a proposed scope of work and budget which is included in **Appendix B** submitted with this application. The budget was developed based on estimated labor hours required for each task. Given the geographic size and extensive transportation systems within the project area, the budget includes a 10% contingency. **Table 1** presents the costs by task element, adjusted for year of expenditure. These costs include the project administration by KYTC staff and Forest Service staff.

Table 1: Cost by Project Element

Element	Cost	%
Project Administration	\$146,000	8%
Stakeholder and Public Outreach	\$236,000	14%
Visioning and Baseline Documentation	\$169,000	10%
Risk and Vulnerability Assessment	\$226,000	13%
Identification of Mitigation Strategies and Projects	\$229,000	13%
Recommendations and Implementation Plan	\$215,000	12%
Early Environmental Action	\$315,000	18%
Expenses	\$29,000	2%
Contingency	\$174,000	10%
Total	\$1,739,000	100%

To fund the proposed planning study, the Forest Service is requesting \$1.74 million from the PROTECT Discretionary grant program (see **Table 2** next page). The **Forest Service’s operating budget does not have sufficient funding for a planning study of this size and scope**. Because this study is critical to help develop a path for



improving the resiliency of the transportation system within the forest, the Forest Service is seeking 100% of the project funding from the federal PROTECT Discretionary grant program.

Table 2: Funding Amounts by Source

Funding Source	DBNF Transportation Resiliency Planning Project Funding Amount	Total Funding
PROTECT Funds	\$1,739,000	\$1,739,000
Other Funds	\$0	\$0
Non-Federal Funds	\$0	\$0
Total	\$1,739,000	\$1,739,000

3.0 Merit Criteria

3.1 Criterion #1: Program Alignment

3.1.1 Contribution to Near and Long-term Resilience Plans

As noted in [Section 1.8](#) of this application, National Forests were intended to provide oversight and management of forest resources for multiple uses. In 2012, [Federal Rule 36 CFR Part 219](#) provided updated guidance for forest land management plans to include the consideration of long-term sustainability of ecosystems within National Forests related to climate change impacts. In response to that guidance the DBNF began considering changes in their forest plan. Information in the forest’s [2021 Biennial Monitoring Evaluation Report](#) includes *Theme 5* which recommends developing a method for analyzing and summarizing climate data collected by the KCC and Kentucky Mesonet to help assess measurable changes. This project will help advance near and long-term resiliency plans in the Daniel Boone National Forest.

KYTC has completed several statewide plans that include recommendations to improve the resiliency of the state’s transportation system. The ***Daniel Boone National Forest Transportation Resiliency Planning Project*** will help advance those statewide initiatives by completing a more detailed assessment of vulnerabilities within the DBNF area and developing potential mitigation strategies focused on improving resiliency. Related statewide resiliency initiatives include:



- KYTC’s RIP (included in **Appendix D** submitted with this application) identified the eastern region of the state -where the DBNF is located- as an area with a higher risk for flooding, dam failure and landslides.
- Transportation infrastructure in the project area include items such as bridges which are identified as assets most at risk within the KYTC Transportation Asset Management Plan (TAMP).
- Key activities that will be completed as part of this project also support the vision and actions identified in KYTC’s Long Range Transportation Plan (LRSTP) including considering resiliency and vulnerability in areas that have experienced historical disasters. KYTC’s RIP has been incorporated into the LRSTP.

3.1.2 Impacts to Operations of Local and Regional National Surface Transportation Assets

As discussed in previous sections of this application, the project area includes numerous transportation assets that provide critical connectivity within the forest and region. Disruptions to these assets cause significant impacts to local and regional operations, adversely impacting an area of the Commonwealth where most of the communities are considered disadvantaged.

3.1.3 Source of Information Resources / Development of GIS Tool

One of the early tasks of this study will include establishing a database of assets in the project area. This will include a GIS database (see **Figure 8**) developed using Esri’s ArcGIS Pro software and ArcGIS Online (AGOL) platform for inventory, mapping, visualization, and analysis. ArcGIS Pro software will enable the development of spatial

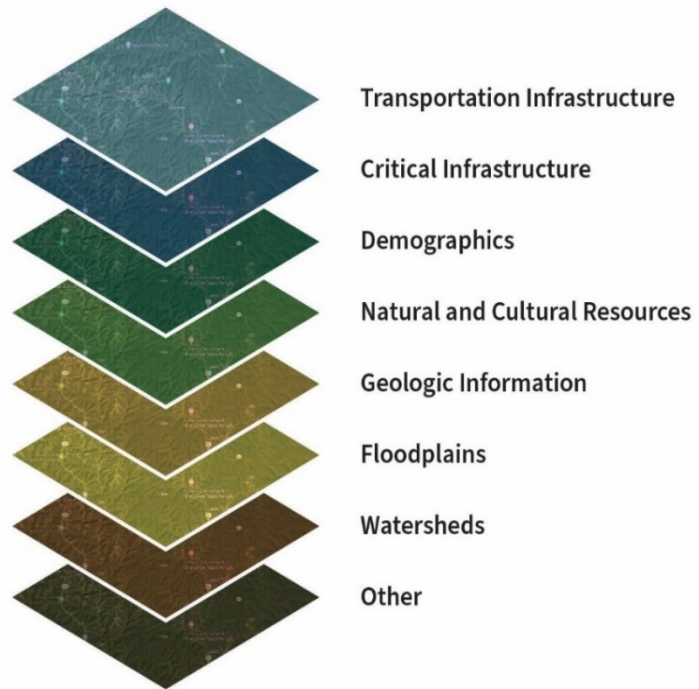


Figure 8: GIS Database Spatial Overlay



overlay comprehensive datasets for streamlined assessments. The project will additionally leverage the AGOL platform to provide a web-based map application of the particular site layout being evaluated, surrounding features, and overlaid datasets.

The web map will enable the Forest Service to dynamically engage with project data in a centralized site that also promotes transparency throughout the project lifecycle. It will also be accessible to state agencies and key stakeholders as a shared resource.

3.1.4 Description of Relevant Climate Data Sets

Recent decadal trends indicate that Kentucky’s climate is becoming warmer and wetter. In review of records dating back to 1895, five of the top ten warmest years in the state’s history have occurred since 2007 and five of the top ten wettest years have occurred since 2011. To help develop climate scenarios this project will incorporate recent historical data by engaging the KCC at Western Kentucky University (WKU).

The Kentucky Mesonet is a Division within the KCC that was established in 2006 to provide local, real-time environmental data for various applications. They provide statewide weather monitoring and climate monitoring infrastructure with an operations center housed at WKU’s Innovation Campus. Now numbering over 80 stations statewide, the Kentucky Mesonet measures precipitation (See **Figure 9**: Kentucky Mesonet Precipitation Data), air temperature, relative humidity, wind speed and direction, atmospheric pressure, soil temperature and moisture at every station across the state every five minutes. These data are provided to National Oceanic and Atmospheric Administration (NOAA) in real-time for use in warning operations and model forecasts.

A review of ten years of Kentucky Mesonet observations from a single station (located in Bowling Green) showed that the frequency occurrence of high rainfall rates occurs two to five times more frequently than is currently estimated by NOAA's Atlas 14 estimates and this discrepancy substantiates the much warmer, wetter period over the last decade. DBNF has

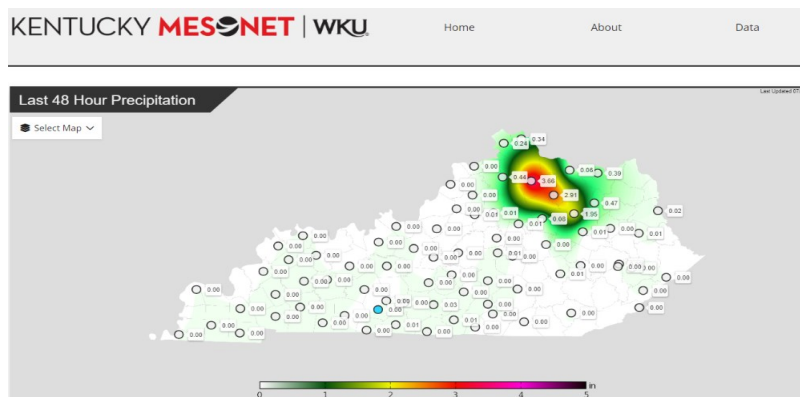


Figure 9: Kentucky Mesonet Precipitation Data



an established working relationship with the Kentucky Mesonet program including an existing agreement permitting two stations to be located on forest property. Observations and climate projections from these stations will provide a strong foundation for climate data for this project.

3.1.5 Decision Support Tools / Conducting a Risk and Vulnerability Assessment

The Risk and Vulnerability Assessments (RVA) (see **Figure 10**) will be conducted to identify and quantify risk associated with the impacts of climate change to the DBNF area with considerations for the surrounding community. It will be a desktop GIS based analysis overlaying exposure to identified climate risk to asset locations critical to roadway systems.

The RVA will be based on “exposure” to climate hazards considering historic events and projected climate change scenarios. Vulnerability of assets will be assessed as a function of exposure determined by historic climate events (past) and projected climate scenarios (future). Risk will be assessed as a function of the consequences of an asset failing and the probability that failure will occur. The approach is based on best practice as outlined by the National Highway Institute’s Publication [Addressing Climate Resilience in Highway Project Development and Preliminary Design](#), in the [Federal Highway Administration Climate Change Adaptation Guide](#), and the [Environmental Protection Agency Climate Change Impacts and Risk Analysis](#). The assessment will pinpoint transportation system vulnerabilities helping identify priority needs for prospective design development and implementation within the DBNF. Future PROTECT formula or discretionary grant funding could potentially help fund these projects.

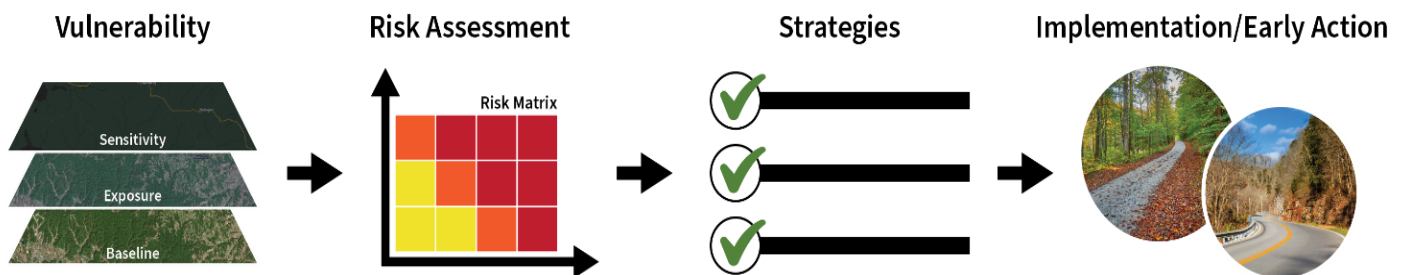


Figure 10: Risk Vulnerability Assessment



3.1.6 Considerations of Nature Based Strategies

Aligned with the DBNF mission and their current practices, this project will seek to consider nature-based strategies during the development of conceptual mitigation strategies. One approach that will be considered involves the use of Aquatic Organism Passages (AOP's) to improve culverts. The Forest Service has had significant success utilizing AOP's which is discussed in more detail in [Section 3.4.3](#). Another strategy that may be considered relates to utilizing the eastern red cedar tree harvest agreement between KYTC and the United States Department of Fish and Wildlife. This existing [Memorandum of Agreement](#) incorporates harvesting red cedar trees from KYTC's existing right of way for use in stream stabilization applications.

3.1.7 Coordination with Existing State and Local Hazard Mitigation Plans

[Kentucky's Hazard Mitigation Plan](#) (KHMP) was developed by Kentucky's Division of Emergency Management. In Kentucky, Local Hazard Mitigation plans are developed by Area Development Districts (ADDs). Four ADDs are in the project area: Gateway, Cumberland Valley, Bluegrass, and Lake Cumberland. These four groups have been identified as agency stakeholders for this project and will be invited to participate in agency stakeholder meetings where they can provide relevant local information and coordinate mitigation strategies. The KHMP and appendices include thorough documentation of assets most at risk for events such as landslides and flooding. The KHMP's database will be integrated into the ***Daniel Boone National Forest Transportation Resiliency Planning Project*** and in coordination with key stakeholders, reviewed with projected climate scenarios.

3.1.8 Approach to Design Strategies

The project team will consider focused strategies for a resilient roadway system while also considering larger scale, regional strategies engaging key partners in local and state governments. Recommended strategies will be evaluated by their technical feasibility, stakeholder acceptance, benefit cost evaluation, and projected impact. To perform the benefit cost analyses for mitigation strategies, the project team will consider the latest guidance provided in the Draft Guidance for [Assessing Changes in Environmental and Ecosystem Services In Benefit-Cost Analysis](#) recently released by the United States Office of Information and Regulatory Affairs / Office of Management and Budget.



3.2 Criterion #2: Schedule and Budget

3.2.1 Detailed Schedule

The overall schedule for the planning study is shown in detail in **Figure 11**. Each line item represents a major task of the study. Upon successful award of the PROTECT grant, anticipated in late 2023, funds could be obligated and ready for expenditure by January 15, 2024. The initial task comprising of administrative activities that includes consultant procurement will begin at that time and is expected to take approximately three months to complete. Work will then commence in full during the second quarter of 2024 and will be completed by October 31, 2025, or the fourth quarter of 2025.

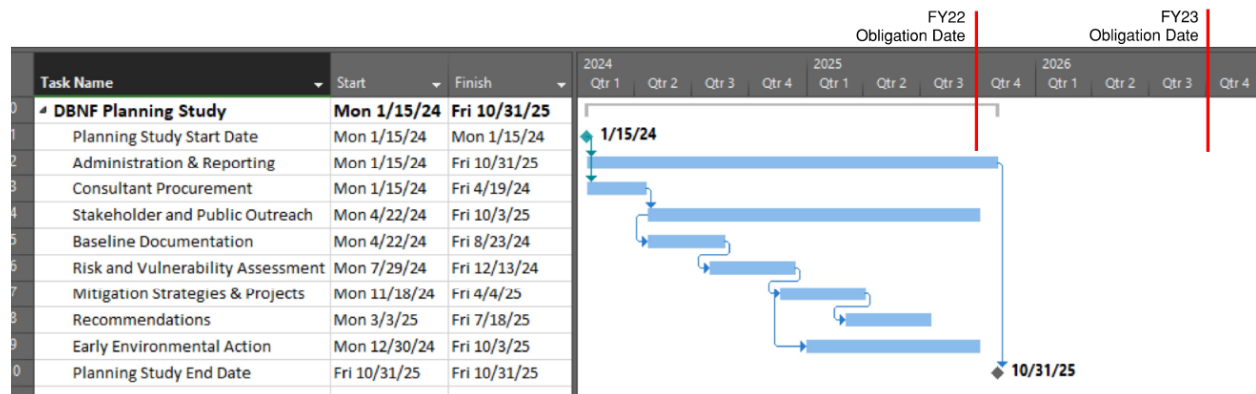


Figure 11: Project Schedule

Therefore, the funding obligation of September 30, 2026 (assuming FY 23 funding source) can be met. If FY22 funding source is used, the September 30, 2025, obligation deadline could also be achieved.

3.2.2 Detailed Budget

The Forest Service is seeking \$1.74 million in PROTECT grant funds to complete the **Daniel Boone National Forest Transportation Resiliency Planning Project**. [Section 2.0](#) of this grant application provides a detailed budget that shows each major task that will be completed as part of this planning study.

3.2.3 Schedule and Budget Feasibility

A planning study for a project area the size of the DBNF is expected to take approximately 24 months to finish. After completing procurement activities associated with selecting a consultant, the main item influencing project schedule will be related to developing the stakeholder engagement and public outreach plan. Identifying target



dates for agency stakeholder meetings, community stakeholder meetings and in-person community focus meetings will be completed at the beginning of the planning study to maintain the project schedule.

The cost of planning studies can vary widely depending on scope and scale. The budget for this project includes estimated costs for project administration, completing the planning study and includes a 10% contingency.

3.2.4 How the PROTECT Discretionary Planning Grant will Contribute to Short, Intermediate, and Long-term System Resilience

The *Daniel Boone National Forest Transportation Resiliency Planning Project* will help contribute to the Forest Service and KYTC’s near and long-term resiliency goals by completing a planning study that incorporates a risk-based vulnerability assessment identifying areas of the transportation system that are critical for routine operations while also identifying segments that are vulnerable for extreme events. This will be used to develop a plan that will include a prioritization of projects and strategy for implementation. Specific actions include:

- **Short-term** - Creating a GIS database that will be a living database the Forest Service and KYTC can continue to use and update into the future. Advancing recommendations toward implementation by performing environmental reviews of selected high priority projects.
- **Intermediate** - Identifying specific strategies to be advanced to conceptual and final design. Developing policy and design standard recommendations that can be incorporated.
- **Long-term** - Developing systemwide strategies might require long-term planning and include more complex projects.

3.3 Criterion #3: Public Engagement, Partnerships and Collaboration

3.3.1 Strategies and Actions for Engagement and Outreach

The *Daniel Boone National Forest Transportation Resiliency Planning Project* will include engagement with agency stakeholders, community stakeholders (See **Figure 13** for a representative list) and the public. Outreach actions will include a combination of



virtual meetings, in-person meetings and online activities. Additional details regarding outreach groups and key actions are summarized below.

Agency Stakeholders - The Forest Service has identified a large group of agency stakeholders who will be invited to participate in meetings during the development of the plan. Letters of support from many of these groups can be found in **Appendix A** included with this application.

Community Stakeholders – The project team has identified several community groups whose focus is related to this project and whose input could help inform potential mitigation strategies. Letters of support from these groups can also be found in **Appendix A** included with this application.

Public – One of the early tasks to be completed in this project includes the development of a Public Engagement strategy. This will include a more detailed summary of actions related to public engagement and identify target audiences and methodologies for outreach. The plan will also determine specific activities to better reach underserved communities within the project area including Community Focused meetings which is discussed in more detail below.

Project Communication – The project will utilize the Forest Service’s existing website (See **Figure 12**) and the Forest Service and KYTC standard communication outreach practices to help notify the public about the planning study. Communications will also include the use of flyers and mailers to reach disadvantaged community members who may lack access to the internet.

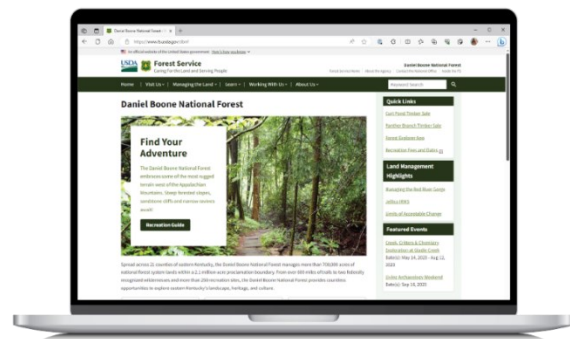


Figure 12: Daniel Boone National Forest website

Stakeholder Meetings - Outreach with stakeholder groups will occur through virtual meetings. The project budget accounts for two virtual meetings with each group. It is anticipated that the first meeting would occur shortly after the RVA is completed and when the project team is beginning to develop potential mitigation strategies. The second meeting would likely occur after the mitigation strategies have been developed and evaluated. This would allow for feedback regarding feasibility and prioritization of strategies.



Community Focused Meetings – The project team will host three smaller in-person community meetings to discuss the project, expected outcomes, and goals. The purpose of these meetings will be to collect feedback from the public on the planning study and on potential future outreach strategies that may be utilized during implementation of study recommendations. Using the CEJST to assess census tracts in the project area indicates that many communities face burdens related to transportation and economics. The project team will consider those factors when evaluating potential locations for meetings to try to provide equitable access by holding meetings in central locations.

3.3.2 Applicable Partners, Stakeholders and Public Collaboration

Implementing projects that are identified as part of this planning study will require broad coordination and collaboration. As mentioned above, feedback from stakeholders and local community populations will play a key role during this planning study. Stakeholders who offered letters of support (See **Appendix A** submitted with this application) associated with this project are shown in **Figure 13**.

Agency and Community Stakeholders
<ul style="list-style-type: none"> • Kentucky Department of Fish and Wildlife Resources • Kentucky Division of Forestry • Office of Kentucky Nature Preserves • Kentucky Division of Abandoned Mine Lands • Kentucky Waterways Alliance • Kentucky Forest Industries Association

Figure 13: Agency and Community Stakeholders

3.3.3 Engagement of Relevant Experts

The **Daniel Boone National Forest Transportation Resiliency Planning Project** will include numerous resources that cover a variety of technical subject matters. These subject matter experts will come from the Forest Service, KYTC and other parties that will participate in the project. Key examples include:

- **Forest Service** - Environmental Specialists, GIS Specialists, Stakeholder Engagement and Outreach, Engineering Design
- **KYTC** - Planning, Programming, Project Development, Environmental Specialists, Construction, Federal Grant Administration, Stakeholder Engagement and Outreach



- **WKU Climate Scientists** - Climate Data
- **Consultant** - Stakeholder Engagement and Outreach, GIS Specialists, Vulnerability and Risk Assessments, Engineering Planning and Design

3.3.4 Inclusion of Disadvantaged Populations

The project area includes many rural, disadvantaged communities (See [Section 1.5](#)), many with reduced access to transportation and internet. To help reach these groups, the project team anticipates holding three in-person community focused meetings to maximize communication and reach the broader public. Some of the goals of those meetings would be to discuss potential mitigation efforts and develop a strategy to facilitate outreach and continued engagement as future projects develop.

3.3.5 Method of Receiving Input

The project will seek to incorporate information and input from the public regarding the project. The project will incorporate the use of either an online story map and/or online survey that could be used to provide an opportunity for the public and stakeholders to provide input. As mentioned in the previous sections, input and feedback will also be solicited during in-person community-focused meetings using in-person activities for those without access to the internet.

3.4 Criterion #4: Innovation

3.4.1 Climate Change Projections

As discussed in [Section 3.1](#), this planning study will incorporate the use of current best practices for developing climate change projections by using historical data with assistance from the Kentucky Climate Center (KCC) at Western Kentucky University. This project will leverage research and academic resources to:

- Use a 10-year detailed weather database from the Kentucky Mesonet to inform planning.
- Integrate climate data into DBNF transportation resiliency best practices or resiliency development initiatives.

This approach is aligned with current strategies for climate change and **could be a model nationally for NOAA partnership with local research entities** for testing how



observed local climate change can be used to develop more focused projections in developing strategic resiliency strategies.

3.4.2 Data Management

One important outcome of this project will be the development of a GIS database to be used by the Forest Service staff going forward to help maintain an inventory of assets including criticality and needs. **This could be a model nationwide as communities with limited resources are struggling to access the best available information.**

3.4.3 Nature-based Resiliency Strategies

The *Daniel Boone National Forest Transportation Resiliency Planning Project* will investigate best practices and innovative nature-based strategies including utilizing concepts such as Aquatic Organism Passages (AOP's) shown in **Figure 14**. These culverts focus on restoring the ability of fish to move freely and provide added benefits by reducing erosion and sediment delivery into streams during storms. The Forest Service has had strong success using this approach to improve or upgrade undersized culverts. Since 2008, the Forest Service and partners have removed or upgraded over 1,000 culverts and road-stream crossings with AOP's. To learn more about the Forest Service's success with AOP's, visit ["Celebrating One Thousand Culverts"](#) documenting various case studies.



Figure 14: Example of a completed AOP culvert

4.0 Economic Analysis

Since this is a planning grant and per the Notice of Funding Opportunity, an economic analysis is not required and therefore has not been included.



5.0 FHWA Priority Considerations

5.1 Project Benefits from Public Engagement, Partnership and Collaboration

The *Daniel Boone National Forest Transportation Resiliency Planning Project* will incorporate engagement and outreach to facilitate partnership with agencies and the public. The teamwork involved with this project will benefit the region which includes numerous disadvantaged communities.

- The project will **include agency and community stakeholder engagement** (including Counties, State Agencies and Community Groups) whose participation will be central to helping develop effective mitigation strategies that can be advanced towards implementation. More than 25 letters of support from those stakeholders have been received and can be found in **Appendix A** submitted with this application.
- The project will include the **development of an engagement plan** outlining specific outreach activities. The plan will consider the assessment of the community offered by the CEJST and TDCTT to inform the specific strategies that will be used to facilitate engagement with underserved parts of the community.
- The project **includes technical resources** from the Forest Service, KYTC and the KCC that bring relevant expertise in many key areas. These key areas of expertise include transportation planning, environmental science, and climate data applications that bring the latest approaches to this project.

5.2 Funding Need

As stated in earlier sections of this application, the Forest Service has a broad range of responsibilities covering over 700,000 acres in DBNF. The Forest Service has limited resources due to a fixed operating budget that is primarily obligated for existing responsibilities associated with management of the forest land. That budget does not include the funding that is needed to complete this study. **PROTECT grant funding is needed to allow for the completion of this important resiliency planning project.**

