Multimodal Catalog

Summary Report

August 2018

Prepared for:

FHWA Office of Federal Lands Highway

By the U.S. DOT Volpe Center

U.S. Department of Transportation

Federal Highway Administration

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	8/24/2018	Final Report (August 2013 - August 2018)

4. TITLE AND SUBTITLE	5a. FUNDING NUMBERS
Multimodal Catalog Summary Report	HW23A1 RD370
6. AUTHOR(S) Christopher Timmel, Haley Peckett, Erica Simmons, Ryan Yowell, Josh Prescott, Danielle Kittredge, Jaime Young, Anthony Lucivero, Lauren Deaderick, Michael Kay	5b. CONTRACT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology John A. Volpe National Transportation Systems Center 55 Broadway Cambridge, MA 02142	8. PERFORMING ORGANIZATION REPORT NUMBER DOT-VNTSC-FHWA-19-08
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Federal Highway Administration Office of Federal Lands Highway 1200 New Jersey Avenue, SE Washington, DC 20590	10. SPONSORING/MONITORING AGENCY REPORT NUMBER FHWA-FLH-19-001
11. SUPPLEMENTARY NOTES	
12a. DISTRIBUTION/AVAILABILITY STATEMENT Public Distribution/Availability	12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

This report details the project team's process to plan and develop the multimodal catalog, which is centrally located inventory of transit systems and trails that provide access to federal lands. The purpose of the catalog is to assist Federal, State, and local transportation agencies in planning, performance management, and project prioritization. The first part of this report describes the process for developing the first iteration of the catalog that was released in 2016. The addendum includes the project team's process to enhance the catalog through the development of an interactive map to display transit data, which was released in 2018, and concludes with intended next steps for the catalog. Lastly, the report concludes with a series of appendices that provide more detailed documentation of the project team's work to create the catalog.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Multimodal transportation, trails, transit, federal lands, planning, programming, database	59
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unlimited

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

298-102

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Introduction

For the millions of visitors to federal lands across the United States, multimodal transportation systems are not only a means of access but also an integral part of their recreation experience. Trails and transit systems help visitors get to and around parks, refuges, forests, and recreation areas, while also offering benefits such as reduced environmental impact and cost savings. However, due to disparate ownership, operation, and maintenance of these systems across 50 states, five Federal Land Management Agencies (FLMAs), and numerous partner agencies, there has never been a central database with information on all multimodal systems on federal lands.

To address this data need, the Office of Federal Lands Highway (FLH, part of the Federal Highway Administration, or FHWA) and the Federal Transit Administration (FTA) enlisted the Volpe National Transportation Systems Center (Volpe Center) to develop a tool that would help the USDOT, FLMAs, and partner agencies manage and communicate data for multimodal transportation systems providing access to or within federal lands.

This first part of this report includes a detailed description the project team's process to plan and develop the first iteration of the Multimodal Catalog that was released in 2016. The addendum includes the project team's process to enhance the Catalog through the development of an interactive map to display transit data; this new tool was released in 2018. Lastly, the report concludes with a series of appendices that provide more detailed documentation of the project team's work to create the Catalog.

Purpose

The purpose of the Multimodal Catalog is to gather data of all *existing* and *currently programmed* multimodal systems that provide access to or within FLMA lands. The Catalog establishes a common dataset for transit and transportation trails, which helps communicate the role that multimodal systems currently play in federal lands transportation.

Additionally, FHWA and FTA identified several needs for the Catalog:

1. Develop an inventory with condition information that can lead to the identification of high-priority multimodal systems and/or projects for each FLMA partner, and for each region.

2. Identify defensible program-level multimodal investment needs over a five-year time period to help with long-term planning, including planning for reauthorization of surface transportation legislation.

3. Establish baseline data for FLMAs to use in planning, performance management, and future reporting.

Goals and Objectives

FHWA and FTA set the following goals and objectives for the Multimodal Catalog:

A. Estimate program-level investment needs for multimodal systems under the Federal Lands Transportation Program (FLTP) and Federal Lands Access Program (FLAP), organized by region

and by agency. The estimates could be shared through a data-driven communications tool that quantifies the needs for multimodal systems across FLMAs.

B. Identify existing systems and their long-term needs for each region and for each agency. The goal of identifying these systems has several objectives:

   i. Assist FLMAs in identifying multimodal projects for FLTP and FLAP, at the national, regional, and unit levels.

   ii. Provide a planning tool for FLMAs to prioritize their key needs and aid in performance management.

   iii. Identify and prioritize multi-agency projects that meet joint DOT and FLMA goals, such as improving public access to public lands, with an emphasis on population centers, high-use recreation sites, and economic generators.

Project Team

FHWA and FTA managed the project, using FTA funds associated with the Paul S. Sarbanes Transit in Parks (TRIP) Program. The Volpe Center entered into an interagency agreement with FHWA to develop the Catalog, with direction and guidance from FHWA. The Volpe Center staff led initial outreach, developed definitions for inclusion in the Catalog, collected data from FLMAs and other sources, developed cost estimates, and created a database for searching and accessing the data. FHWA and FTA reviewed documents and data at key milestones, identified outreach opportunities, and provided direction through monthly meetings. The FHWA, FTA, and Volpe Center staff are referenced as "the project team" in this report.

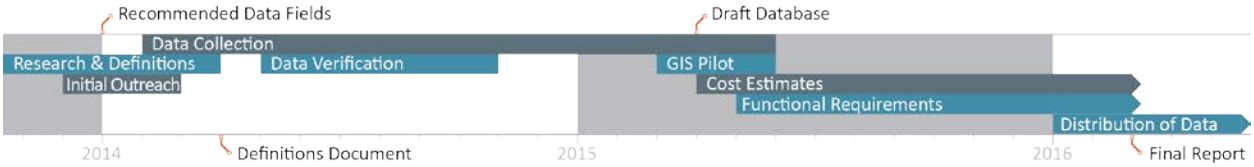
Externally, the project team engaged FLMA Headquarters staff during scoping stages of the Catalog to better understand their data needs and enlist their participation in the Catalog development. FLMA Headquarters staff provided baseline data on trails and transit systems and pointed the project team to additional data sources to populate the initial Catalog.

Once initial data collection was underway, the Volpe Center convened a Steering Committee composed of FLMA staff at the Headquarters and Regional or State Office levels. The Steering Committee served as a connection between FLMA staff and the project team for data verification and designing a product with the end user in mind. It also provided input on strategic direction, definition of multimodal systems, and review of draft products. The Committee met approximately quarterly by phone and contained representatives from the Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), and National Park Service (NPS). The U.S. Army Corps of Engineers (USACE) and the U.S. Forest Service (USFS) did not provide representatives to the Steering Committee but were informed about activities.

Overview of Multimodal Catalog Components and Key Milestones

Figure 1 and the following outline list the major activities and deliverables completed. The outline also serves as a map to the sections of this report, documenting the Catalog's development.

Figure 1: Timeline of Activities[1]



Catalog Completed Components and Milestones

A. Initial FLMA Outreach. The project team conducted individual outreach meetings with five FLMAs and all three FHWA divisions to introduce the Catalog, and to refine the purpose and need for the project. The project team also discussed criteria for inclusion in the Catalog and sought input on the Definitions Memo.

B. Data Fields for Inclusion. The project team worked with stakeholders to identify and prioritize data fields related to trails and transit assets for inclusion in the Catalog. See Appendix A for a list of data fields included in the Catalog.

C. Primary and Secondary Data Sources. The project team worked with stakeholders to identify multimodal data from existing inventories, studies, grants, and plans.

D. Data Organization and Management. The project team aggregated, filtered, and organized data into separate FLMA databases. After initial data collection efforts, assets were consolidated into databases for all trail and transit entries.

E. Data Verification. The project team verified data with USFS, USFWS, and BLM contacts at the regional level and conducted outreach for verification with other stakeholders.

F. State Trails Database Research. Non-FLMA transportation partners identified and provided trails data.

G. GIS Pilot. The project team used transit data from non-FLMA sources in a geospatial exercise to determine applicability in future Catalog iterations.

H. Cost Estimate – Trails and Transit. The project team estimated the costs of existing and planned systems, with separate methodologies for transit and trails.

I. Data Summary. The project team created a visual summary of the data contained in the Catalog.

J. Catalog Distribution. The project team developed the functional requirements for publishing the Catalog.

K. Upkeep and Maintenance. The project team will determine future processes to update the tool.

[1] See Addendum for post-2016 work and updated timeline.

Initial FLMA Outreach

Initial outreach to Multimodal Catalog stakeholders began in late 2013. Through early 2014, webinars and in-person meetings were held to brief both FLMA[2] and FHWA division staff on the project and to receive feedback. Table 1 provides an overview of the project team's initial outreach efforts. Materials used in stakeholder outreach efforts are available in Appendix B. The goals of initial stakeholder outreach were to:

1. Introduce the purposes of the Catalog and its value to FLMAs and FHWA;
2. Understand priority applications or potential uses of the Catalog for FLMAs;
3. Gain FLMA support and participation in the Catalog;
4. Identify existing data sources and points of contact for transit and trail assets; and
5. Prioritize data fields for inclusion in the Catalog.

Table 1: Initial Outreach Efforts

Date	Organization	Format
December 12, 2013	FHWA – Western Federal Lands Division	Webinar
January 8, 2014	FHWA – Eastern Federal Lands Division	Webinar
January 9, 2014	FHWA – Central Federal Lands Division	Webinar
January 16, 2014	TRIPTAC[3]	In-Person
February 18, 2014	BLM	Webinar
February 24, 2014	USFWS	In-Person
February 25, 2014	USACE	In-Person
February 25, 2014	USFS	In-Person

Conversations with FHWA and FLMA staff resulted in comments regarding (1) data collection and availability, (2) definitions, (3) Catalog applications, and (4) risks and opportunities. Stakeholder comments on these themes are listed below.

- **Data collection and availability.** Some FLMA staff expressed reluctance to reach out to the field for data collection. Instead, staff suggested starting with existing resources, identifying data "gaps," and then approaching specific regions or units for this data. Additionally, some staff noted that the quality and quantity of data available at a regional or national level varies widely between modes and agencies. It was also noted that FLMAs are most likely to have asset data, such as trails and vehicles, but may lack the service or condition details needed for cost

[2] Because the project team had access to existing NPS transit and transportation trail national databases, the project team did not meet with NPS staff during initial outreach efforts. NPS staff was included in regular updates on the status of the project.
[3] The Transit in Parks Technical Assistance Center (TRIPTAC) supported FTA and FLMAs in implementation of the TRIP program and served as a clearinghouse for resources on alternative transportation systems on public lands. The TRIPTAC convened regular meetings of FLMA representatives from 2012 to 2014.

estimates. Some FLMAs are cautious of releasing data publically (e.g., USACE noted security concerns with releasing their asset data) but agreed to share data initially with the project team.

- **Definitions.** Most FLMAs do not have formal definitions for multimodal systems, although TRIP did establish definitions for multimodal transportation for the purposes of its program. In many cases, transit and trail inventories do not distinguish assets that serve a purely recreational or interpretive purpose from those that serve a transportation purpose. Some FLMA staff initially expressed interest in a "three tiered" approach to categorizing the location of multimodal transportation system:

    1. Systems *within* FLMAs;
    2. Systems that offer direct *access to* FLMAs; and
    3. Systems that are *within a half mile* of a FLMA site boundary ("opportunities" or "missed connections").

    Others expressed concerns about the use of inconsistent definitions for inclusion in the Catalog.

- **Catalog applications.** FLMA staff expressed interest in multimodal projects being able to compete on a level playing field with roads projects for planning and project funding. A consolidated Multimodal Catalog could communicate the importance of multimodal systems within regions and to transportation partners. FLMA staff were interested in the possibility of a "living document." FLMA and FHWA staff mentioned the need for the convenience of a searchable database; some emphasized their interest in a spatial or GIS component of the final Catalog. Some FLMA staff suggested – and others responded positively to – the idea of using data in connection with project selection and performance management.

- **Risks and opportunities**. Through outreach, the project team realized that the "lowest common denominator" for data across agencies (in terms of what is currently available or easy to collect) would likely be lower than the level needed for accurate cost estimates. Some FLMA staff noted that the most valuable data is from systems that are within a half mile of the site, or the "missed connections." However, the project team determined that these assets are a lower priority from the standpoint of establishing a baseline of existing systems within and directly accessing FLMA units. FLMA staff also suggested exploring opportunities to collect data from partners. For example, USACE noted that its partners or friends groups regularly build trails to provide recreation access. Finally, FLMAs called for inclusion of national trails (including Scenic and Historic Trails) that can offer access to FLMA sites.

Initial outreach to stakeholders affected the rest of the project in a number of ways. Specifically, outreach to FHWA and FLMA staff:

1. Verified points of contact for each agency;

2. Provided the project team with initial data sources or directions to data sources without contacting additional FLMA staff;

3. Helped the project team identify and verify data fields to include in the Catalog;

4. Helped the project team understand the feasibility of working with FLMA staff in the field for data verification; and

5. Provided the project team with desired product deliverables.

Summary of Definitions Memo

Based on FHWA and FLMA feedback during the project team's initial outreach, the project team needed to create a definition for eligibility in the Multimodal Catalog. The project team developed the "Multimodal Definitions" memo (see Appendix C), which articulates criteria for inclusion that meet the Catalog's goals of estimating program needs for FLTP and FLAP, identifying FLTP and FLAP funding opportunities, and serving as a planning tool for FLMAs to prioritize their key needs.

Definitions Memo Considerations

In the Definitions memo, the project team developed a definition of multimodal transportation systems for inclusion that considered the following:

1. Previous efforts of Congress and FLMAs to define multimodal transportation systems;

2. The new funding landscape;

3. The needs and potential Catalog applications of a diverse stakeholder group; and

4. Limitations in data availability and staff capacity among FLMAs.

Although the project team recognized that a single, standard definition may not encompass all multimodal transportation systems across all agencies, the memo delineated how the Multimodal Catalog would define multimodal systems to accommodate sometimes-conflicting priorities and could be feasibly developed with existing resources.

Criteria for the Multimodal Catalog Definition

After reviewing pre-existing definitions and the Catalog's needs, the project team developed the following three criteria for eligibility in the Catalog:

1. **A clear and direct physical connection to the land:** The Catalog includes systems that operate within, directly connect to, or operate within close proximity to Federal Lands.

2. **The system serves a transportation purpose:** The Catalog definition differentiates between systems that are purely recreational versus ones that have a transportation component, while realizing that these categories are indistinct for most transportation on federal lands. All transit systems meet this criterion. Trails that provide an alternative to automobile travel, provide a

high degree of connectivity to or within FLMA lands, or improve safety for motorized and non-motorized users may be considered eligible under this criterion.

Because the most feasible way to gather trail data is to draw from existing FLMA databases, each FLMA defined its own parameters for identifying trails with a transportation focus (fitting with the Multimodal Catalog definition) from its own data set. Each FLMA applied the transportation purpose criterion to their own datasets differently, so the Multimodal Catalog's trail data does not reflect one uniform application of the data, but a snapshot of each agency's best approximation. As FLMAs refine their datasets for transportation trails, future updates to the Catalog may evolve.

3. **Connection to FLMA mission:** FLMAs have established multiple ways that their multimodal systems advance their missions and goals, including resource protection, visitor experience, congestion management, or safety improvements. The Catalog assumes that assets owned and operated by FLMAs have a mission connection. For non-FLMA-owned systems, the Multimodal Catalog includes both transit systems and trails whose owners have a formal agreement with an FLMA and other systems that the FLMA identifies that have a mission connection.

Definition Flexibility

The Multimodal Catalog recognizes the challenges in defining transportation systems across FLMAs, all of which have different missions, visitation patterns, and transportation needs. The multimodal systems definition provides a focus for the Catalog and bounds for the types of systems to prioritize for inclusion.

- **Any system that meets all three criteria listed above shall be included in the Catalog; and**
- **Any system that meets two of the criteria above *may* be included but shall be designated separately for inventorying and cost estimation purposes.**

The project team recognizes that FLMAs assign importance to a number of multimodal systems that do not fit within the Catalog's definition. The Catalog can provide a framework for data collection, as well as sources for information on multimodal systems. FLMAs can then use this framework to add additional systems that are not contained within the Catalog but that are priorities for the respective FLMA.

Because each FLMA applied the Multimodal Catalog definition differently to filter their existing datasets, the Catalog reflects the variation in agency interpretations of the definition criteria. It is also a living dataset that can be updated as FLMAs refine their definitions or asset data systems.

Data Fields for Inclusion

The project team reviewed existing transit and trail databases to develop a list of potential data fields for inclusion in the Multimodal Catalog. As feasible, each data field would be assigned a limited field of drop down options to facilitate standardized responses across all agencies. Applicable data fields are organized into seven themes:

1. Location and Context;

2. System Description;
3. Mode-Specific Questions;
4. Management Model;
5. Funding and Finance;
6. Relation (to the FLMA unit); and
7. Administration.

The project team shared the list of potential data fields with FLMA partners and asked them to prioritize and comment on their inclusion in the Multimodal Catalog. FHWA also provided extensive comments on potential data fields. With this feedback, the project team identified data fields that would be most useful to stakeholders and for estimating high-level costs. See Appendix A for a list of data fields included in the Catalog.

USFS, USFWS, and USACE prioritized data fields for inclusion in the Catalog. They preferred data fields that could be used to identify an asset, such as its location and owner. The project team also prioritized fields that would help determine funding eligibility, such as an asset's physical relation to federal lands.

Stakeholders commented that data for certain fields (e.g., current replacement value) would not be available across all FLMAs. Fields that would be incomplete across FLMAs but were still critical for the purposes of the Multimodal Catalog were ultimately included, in part to encourage all FLMAs to provide this data in future iterations of the Catalog. Fields that were not universally available and that required subjective responses (e.g., interpretive elements, uses permitted/prohibited) were ultimately excluded.

Primary and Secondary Data Sources

The project team collected data from all FLMAs between February 2014 and April 2015. The outreach efforts with FLMA staff resulted in the primary sources listed in Table 2 for each agency. Primary data sources are those provided directly from an agency database; these sources were critical for populating the majority of the Catalog. Since the data was provided in different formats and at various levels of detail and completeness, the project team reviewed and formatted the data to fit a consistent organizational structure that also met the definition provided at the outset of the project.

This definition (see Summary of Definitions Memo) of "multimodal transportation systems" was the basis for the type of assets and level of detail to include in the inventory. Each FLMA, however, has its own unique mission and system in place for defining "transportation purpose,"[4] so the project team largely left it up to the discretion of each organization to provide data that they felt met the needs and purpose of the Multimodal Catalog. The full Definitions Memo contains more detail on how agencies designated data for inclusion or exclusion.

[4] These are two criteria for defining "multimodal transportation system."

Additionally, during the preliminary conversations with each agency, it became clear that each FLMA has its own goals relating to both multimodal transportation and the Multimodal Catalog, whether it be emphasizing multimodal transportation investments as a method for mitigating impacts on sensitive habitats, or prioritizing access, seamless connections, and the overall user experience.

Table 2: Primary Data Sources

Organization	Source
BLM	AD_HOC Report
	BLM 2010 ATS Inventory
	2014 BLM Trails Data
USFWS	USFWS Trails Database, Cycles 2&3
	2010 USFWS Transit and Trail Connections Report
	USFWS Regional Alternative Transportation Evaluations
NPS	2013 NPS Transit Inventory
	2013 NLRTP Trails Database
USACE	FY13 USACE Facilities Database
	2013 USACE OMBIL
USFS	USFS Draft NFST TC3-5 Inventory
	RO Engineering, Recreation and Trails Programs
	2013 USFS Reauthorization White Paper
	2014 USFS Trails Database

Secondary data sources include previous reports, applications, and other documents that aggregated multimodal data separately from the Catalog. Secondary sources also include data sets provided by non-FLMA agencies, such as state trails databases. These secondary data sources are listed in Table 3.

Table 3: Secondary Data Sources

Organization	Source
BLM	2012 RRCNCA Transportation Feasibility Study
	2012 SR 159 Environmental Assessment
USFWS	2010 Transit Trail Connections
	TRIP Back Bay NWR Alternative Transportation Study
NPS	2014 NPS Transit Inventory
	National LRTP Trails Inventory (2015)
USACE	FY 2011-2012 Transit in Parks Discretionary Program
USFS	Volpe-FLAP Assessment for USFS
	Region 10 Engineering, Recreation and Trails Inventory
Multiple Agencies	National Recreation Trails
	FLAP Applications and Selected Projects (2013-2015)
	AmericanTrails.org
	TAG Reports
	Recreational Trails Program Database
	TRIP Applications (2007-2012)
	Idaho State Trails Inventory
	Colorado Trails Project

The first iteration of the comprehensive inventory was completed during summer 2014, at which time it was presented to the participating FLMAs. This was a chance to request feedback on the overall format, as well as to seek assistance in filling data gaps. As mentioned earlier, while some FLMAs preferred that field staff not be directly contacted, the project team reached out directly to BLM, USFS, and USFWS staff at the region and district levels to collect and verify data (see Data Verification for more detail).

Data Organization and Management

Data was initially organized for the Multimodal Catalog in a series of Excel workbooks by FLMA, with a transit and a trails workbook for each FLMA. The Excel format matched the format of most data received from FLMAs. In some cases, the project team had to edit the data in terms of units of measurement or standardizing data for consistent drop down options. The project team filtered out data fields not identified for inclusion in the Multimodal Catalog. Many data entries had missing data fields; the project team conducted additional research and added some missing data fields selectively throughout the Catalog development process. For the most part, this was based on Volpe Center staff knowledge of specific multimodal systems or need for additional information to develop cost estimates.

After the initial data gathering was complete, the project team combined the FLMA-specific workbooks into two consolidated databases: transit and trails. This helped the project team efficiently add secondary data sources that often included data from multiple agencies. The consolidated Excel workbooks also allowed for the project team to develop cost estimate frameworks for multimodal assets.

Interim Access Database

The project team planned to create an online database to be hosted on FHWA's website that would meet the data query needs of the Steering Committee. The functional requirements for this online database are described in the Catalog Distribution section of this report. However, because of the time required to meet FHWA's security measures, the project team decided to create an Access database designed with the same query and reporting functionality, and which could be distributed to the FLMAs and their partners in a timely fashion. (See Catalog Distribution for more information.)

Within this database, all transit and trails data is available in two unique tables. However, the database has options for users to run standard queries to locate the data that is most relevant to them. At a basic level, users will be able to manage queries by utilizing either the trails or transit "forms" available within the database. From here, users will be able to select one or more attributes from each provided field to build and run the query they need. The very basic, standard queries include the following fields: FLMA, State, Trail Surface (trail only), Trail Condition (trail only), Trail length (trail only), Transit Mode (transit only), and Transit Fuel Type (transit only). In addition to the basic query, the project team will continue working with FLMAs independently to develop customized queries, incorporating any of the 42 data fields (see Appendix A), to fill their needs. The project team sees these customized queries as more relevant and powerful tools to assist data users with planning and data analysis.

The user will then be able to run and publish a report in either Access or Excel depending on the user's needs and preferences. For Access, the report is designed to include only the fields available in the

original query. For Excel, the report can be exported and will include all the fields available within the complete database. The project team created an instructional video that provides guidance through the steps outlined above. In the future, FHWA may support the development of a basic online database to support a wide range of users. For access to the Access Database and instructional video, visit the FLH website.

Data Verification

The project team had over 35,000 entries from existing and readily available data sources, but some of those sources were known to be incomplete and/or outdated. Most of these entries had many missing data fields. Data verification with the FLMAs was intended to update existing data sources with new information and add new entries to the Catalog. The project team decided to only conduct verification with BLM, USFS, and USFWS state and regional staff. NPS used its Transit Inventory and National LRTP trails datasets, which were recently updated, and NPS did not want to ask its staff to re-verify this information. USACE requested that the project team not do outreach to its Division staff for workload management reasons.

The project team provided state or regional FLMA staff with known transit and trail systems specific to a state/region and FLMA. The staff was then asked to verify or add missing information. To reduce the burden on FLMA staff that did not have time to go through each data system, the project team asked for known trails, transit systems, or other multimodal systems in their regions, with enough basic information that the project team could do additional research to fill in the gaps.

Approximately 75 percent of regional FLMA offices had at least one staff member that responded to the data verification request. Of the 29 state and regional offices contacted, 11 of them (38 percent) provided actual data changes or suggestions. The remainder either had no changes or deferred to someone else.

The nature of responses varied by respondent. A small number of FLMA staff closely reviewed each transit and trail in their states and provided information on missing data fields and new entries for trails or transit systems not previously included. Many offered names of trails or transit systems and the FLMA unit that they accessed so that the project team could research and add to the Catalog. Still others provided ideas for additional data sources in their states or regions.

The project team was able to fill in hundreds of new data entries and identify many new data sources to research, but the new data was piecemeal and not uniform across FLMAs or regions. Ultimately, the project team was not able to complete all data fields for known systems nor update most systems that were known to be from data sources that were outdated. The project team hypothesizes reasons for the low response: the volume of entries at the state or regional office may have been too great for staff to thoroughly review; regional staff may not have had detailed knowledge on individual trail or transit systems (and soliciting field staff was unfeasible); and/or staff did not feel that multimodal data was critical to their mission or job duties.

In early 2015 the project team met with the Steering Committee and decided to move forward with a first iteration of the Catalog using this level of data verification. Additional outreach to FLMAs and other

stakeholders was not likely to yield a higher response rate or additional results. The Steering Committee suggested it would be more productive to get a working data set out to the field and allow them to submit changes in the future.

State Trails Database Research

To build a more comprehensive nationwide inventory of trails, the project team conducted a state-based research effort to identify the non-FLMA-owned trails that serve as critical links between communities and Federal lands for pedestrians and cyclists. These state-based trail systems are often eligible for funding under the Federal Lands Access Program (FLAP), providing a valuable management tools embedded in the Catalog. More data collected from each state results in greater functionality of the Catalog for prioritizing maintenance and capital improvement projects with available funding.

The project team selected a sample of twelve states, varying in size and geography, and conducted web-based research on the availability of public accessible trails data in tabular or geospatial formats. From this preliminary search, six states either had a geospatial file or some level of state trails/recreation database available to the public.[5] The project team contacted some of these states to gather more information on existing databases and the feasibility of transferring this data to the Catalog. The states highlighted in Table 4 are those states that the project team contacted and interviewed.

Interviewing state trail leads was valuable, but produced mixed results. For example, Idaho was able to provide an Excel database and accompanying KMZ file to visualize a comprehensive map of state-wide trails. However, it was evident that the data was inconsistently tracked and included many duplicative entries. While this produced 20 new trails for the Catalog with limited detail, the resources needed outweighed the benefits. For Kentucky, each region holds its own geospatial data, but due to this decentralized management, the acquisition and availability of detail was limited.

The state databases did not always clearly indicate a connection to Federal lands. Montana and California did not have comprehensive statewide trail databases but instead shared Recreational Trail Program (RTP) data, including a filter indicating Federal land connections. While the state directed research did not provide comprehensive results for non-FLMA-owned trails, it introduced valuable new data sources, like the RTP trails.[6]

The project team acquired the national RTP database, dating to the Program's initiation in 1993. Many of the RTP's recreational trails fall under the multimodal transportation definition, and its large scope and detailed information on funding, capital improvements, and managing organization provided a valuable national resource. Nearly 100 trails were either added or updated as a result of this effort.

[5] The project team searched for datasets in Arizona, California, Colorado, Idaho, Kentucky, Michigan, Montana, Nevada, South Carolina, Utah, Virginia, and Wyoming. Of these, CO, ID, KY, SC, UT, and VA had available data. The project team contacted CA, ID, KY, and MT for more information.

[6] Beyond collecting trail systems to populate the Catalog, the RTP database was also used to estimate trail cost maintenance. See the Cost Estimate – Trails section of this report.

GIS Pilot

The project team introduced a spatial analysis component to further identify non-FLMA-owned transit systems. This pilot, conducted only in Oregon and Washington, was also intended to assess the feasibility of adding a geospatial component to the Catalog nationally. The Steering Committee chose these states because they are the site of the Pacific Northwest Federal Lands Collaborative Long Range Transportation Plan (CLRTP), an initiative led by FHWA. Pilot results could be beneficial for the Catalog and the CLRTP.

Overview of GIS Pilot

Since individual transit agencies and state DOTs have limited GIS transit data, the primary data source for this analysis was the General Transit Feed Specification (GTFS). The GTFS is a national data standard, and the GTFS Data Exchange is a clearinghouse for data at a national scale. While most rural transit agencies do not have GIS data, this pilot is meant to visualize preliminary connections using the available data and gauge the feasibility of using this analysis on a national scale.

Data Sources

The project team used the following data sources for this analysis:

Table 4: Summary of data sources

Dataset	Description	Source
World Water Bodies, U.S. Federal Lands, & U.S. State Boundaries		ESRI (2010)
OR & WA Transit Routes[7]	All available public transit route shape files for Oregon and Washington. GTFS Data Exchange was used to collect available GTFS data for Washington. Oregon Department of Transportation (ODOT) manages its own GTFS database and was used for Oregon transit because of the ease of downloading aggregate data. Additionally, ODOT and Washington Department of Transportation (WSDOT) were used to fill in spatial data not available through GTFS. WSDOT was used solely to collect ferry routes.	GTFS Data Exchange (2015); ODOT (2015); WSDOT (2015)
OR & WA Transit Stops	All available public transit stops associated with the transit routes dataset for Oregon and Washington.	GTFS Data Exchange (2015); ODOT (2015); WSDOT (2015)
OR & WA Trails	Compilation data for multiple public lands agencies in Oregon & Washington, including federal, state, and local agencies.	BLM (2015)

[7] Washington and Oregon have approximately 145 public and private transit agencies, but only 60 of these have route and stops data available spatially.

By mapping all of these data layers, the project team could identify intersections between transit routes, trails, and FLMA boundaries. Where these intersections occurred, the project team added or verified data in the Catalog. Three maps showing results of the GIS pilot can be found in Appendix D.

Key Findings & Lessons Learned

- A total of nine new transit agencies were added to the existing inventory of 22 agencies for Washington and Oregon, resulting in an increase of 40% for this geographic subset.
- From these nine transit agencies, 23 new transit systems were added to the existing inventory of 25 systems for the two states, resulting in an increase of 92% for this geographic subset.
- GTFS is a useful resource for collecting and visualizing transit routes and stops not available in other GIS databases.
- GTFS can show stops in relation to FLMA boundaries to help with access planning.
- Only 45% of public transit agencies in Washington and Oregon have transit data available in a spatial format. Most rural transit agencies do not have available data (see Table 5). Therefore, GTFS cannot be used for comprehensive transit data at this time. Non-geospatial data could be valuable to supplement this analysis.
- The GTFS data that is available is inconsistently documented (e.g., agency sources, route descriptions, etc.), making the process of identifying transit routes and agencies more difficult.
- 68% of trails in the BLM's trails layer have limited to no data on ownership and use type, which makes the data far less valuable for the purposes of the Multimodal Catalog. Future research and data assurance and control would make this data more useful.

Table 5: Statistics on transit agency coverage by GTFS in Washington and Oregon

State	Transit Agencies	Transit Agencies with GTFS	% GTFS
WA	76	16	22%
OR	70	49	70%
Total	146	65	45%

Potential Next Steps

There are some additional steps that may be implemented to improve the usefulness of this analysis.

- Acquisition of spatial data on rural transit systems would fill data gaps to provide a more complete geospatial analysis. Alternately, Catalog managers could digitize data in high-priority locations where spatial data is unavailable. Both of these were seen as too time-intensive to complete as part of the initial Catalog.
- FHWA and FTA may consider conducting network analyses using streets data and GTFS transit stops to calculate more precise accessibility to FLMA lands.

Because of the time-intensive nature of this pilot and the limitations in data, the project team decided not to extend this work to other states and regions. However, it may be beneficial to add geospatial data to the Catalog in the future as it becomes available.

Cost Estimate – Trails

This section explains the assumptions and methodology used to develop a broad estimate of the cost to maintain all of the trail systems identified in the multimodal catalog at their current conditions. It is intended to help FLMA staff at the national, regional, and unit levels consider maintenance needs for new and existing trail projects. The project team consulted sources related to trail construction and maintenance from the Rails to Trails Conservancy, the National Trails Training Partnership, and the U.S. Forest Service, and found a range of approaches to defining and quantifying trail maintenance.[8]

For purposes of this analysis, the trail maintenance costs include all regular and routine maintenance of the trails managed by FLMAs. This includes ongoing cleaning, clearing, mowing, and minor repair of rutting and washouts. It also includes infrequent but expected rehabilitation and reconstruction of a trail due to natural degradation.

The project team calculated annual trail maintenance costs as the total cost of regular and routine maintenance, plus a fraction of the rehabilitation/reconstruction cost, based on the expected lifetime of the surface. For example, if a surface is expected to last 10 years, then the annual cost would be that of routine maintenance plus one-tenth of the rehabilitation/reconstruction cost. This means that FLMA annual maintenance budgets needs to account for planning and saving for the bigger expenses that they incur on a less frequent basis, so as to avoid deferring trail maintenance.

The project team conceptualized the following model for trail cost estimation:

$$Annual\ Trail\ Cost = \sum_{Suface\ Type} Miles_{Surface\ Type} \times Annual\ Cost\ per\ Mile_{Surface\ Type}$$

where

$$Annual\ Cost\ per\ Mile = Routine\ Maintenance + (Major\ Rehabilitation \times \frac{1}{Expected\ Lifetime})$$

Because every trail situation is unique and there is limited national data on trail maintenance, FLMA staff should be cautious if considering these estimates for specific projects. These estimates may be used for an initial order of magnitude to help guide more detailed analysis.

Note that the current version of the multimodal catalog does not include comprehensive or consistent data on trail surface condition; therefore, the cost estimate assumes that all assets are starting from at least "good" or "fair" condition, and are not in need of immediate, non-routine repair. Also note that this model does not account for other factors such as differences in typical trail usage, climate, topography, differences in materials and labor costs around the country, and availability of volunteer labor. FHWA is working to develop consistent condition data across FLMAs; in the future, it may be possible to use the improved data to support more detailed estimates.

[8] See the References section.

Maintenance Costs and Expected Lifetime by Surface Type

The project team developed a range of per-mile maintenance cost estimates for five trail types: native, gravel, paved, concrete, and boardwalk. Given the difference in maintenance needs, the estimate does not include costs for snow trails or water trails. The estimate also focuses only on the trail surface itself, and does not include bridges, culverts, or other facilities associated with parking areas, bathrooms, or trail heads.

The project team combined some categories in order to standardize the surface type calculations. Table 6 provides the trail surface types and mileage.

Table 6: Trail Surface Type Categories and Mileage

Surface Type Provided in MMC	Total Mileage	Revised Surface Type	Surface Type Provided in MMC	Total Mileage	Revised Surface Type
Admin Road	521	Gravel	Paved	2,085	Paved
Aggregate	489	Gravel	Paver Block	26	Paved
Asphalt	728	Paved	Puncheon	6	Gravel
Boardwalk	130	Boardwalk	Recycled tires	3	Gravel
Chunk Wood	10	Gravel	Riprap	7	Gravel
Concrete	116	Concrete	Snow	14,108	N/A
Gravel	1,146	Gravel	Unknown	5,869	Applied proportionally
Imported Compacted Material	857	Gravel	Unpaved	223	Native
Imported Loose Material	642	Gravel	Water	170	N/A
Hard surface	20	Paved	Wood Chip	19	Gravel
Mowed	325	Native	(blank)	11,127	Applied proportionally
Native	74,445	Native	N/A	2	Applied proportionally
Other	222	Applied proportionally	Total	**113,293**	

For the trail miles for which the surface was known, the project team calculated the percent coverage for each of the five trail types by FLMA, and then applied that to the trail miles listed as blank or unknown, again by FLMA. Table 7 displays trail mileage by surface type and FLMA.

Table 7: Trail Mileage by Surface Type and FLMA

Surface Type	BLM	USFWS	NPS	USACE	USFS	Total
Boardwalk	-	91	95	-	-	186
Concrete	4	40	108	-	7	160
Gravel	667	1,423	866	395	1,766	5,117
Native	16,442	10,434	3,567	-	57,806	88,248
Paved	317	1,198	458	1,713	1,617	5,303
Total	**17,430**	**13,187**	**5,094**	**2,108**	**61,196**	**99,014**

Trail Maintenance Data

In developing estimates for trail maintenance costs, the project team consulted local and national resources related to trail building, and the FHWA Recreational Trails Program (RTP) project grant database. While these sources differ in context from many FLMA trails, they provide useful information on comparable situations. Trail maintenance needs and costs will vary depending on typical trail usage, climate, topography, differences in materials and labor costs around the country, and availability of volunteer labor.

The RTP project database was most useful for estimating native trail costs (based on RTP native trails), as the typical RTP project is likely more complex or expensive than an FLMA context. The RTP database also included some data on whether the projects were for new construction, reconstruction, renovation, or maintenance, as well as a large variation in per-mile project costs.

Due to limited available data for comparable concrete and boardwalk trails, the project team used maintenance cost estimates based on other paved trails and rehabilitation cost estimates. Also note that the sources used to develop the cost estimates ranged from those developed very recently to those developed as early as the year 2000. The project team did not adjust for inflation to 2016 dollars or project inflation of maintenance and rehabilitation cost into the future.

Based on these data limitations, the project team decided that it would be most useful to provide a cost range for each trail type (see Table 8), which helps to provide a general order of magnitude estimate of the maintenance needs for individual trails and for the system as whole. FLMA staff looking to use these estimates for their own planning purposes can assess where in the range their trails might be, depending on factors such as topography, trail complexity, geographic location, and availability of volunteer labor. All referenced data sources are included in Appendix E.

Table 8. Trail Routine Maintenance Costs by Surface Type (Annual)

Surface Type	Native	Gravel	Paved	Concrete	Boardwalk
Range of Maintenance Cost per Mile	$1,000[9] - $5,000[9]	$1,000[10] - $11,000[10]	$1,000[11] - $2,000[11]	$1,000[5] - $2,000[11]	$1,000[5] - $2,000[11]
Range of Rehabilitation Cost per Mile	$1,500[10] - $40,000[10]	$2,000[10] - $80,000[10]	$7,000[10] - $150,000[12]	$150,000- $900,000[13]	$1,000,000 - $1,800,000
Expected Lifetime (years)[14]	9	9	17	25	12

[9] Estimated from "Rail-Trail Maintenance and Operation."
[10] Estimated from the Recreational Trails Program Database.
[11] Estimated from a survey of 100 trails in the northeastern United States. See "Rail-Trail Maintenance and Operation."
[12] Estimated from "Trail Maintenance & Management: Construction and Maintenance Costs for Trails."
[13] Based on construction cost for 8'-10' wide concrete trails. See Rio Grande New Mexico Study 2008: http://atfiles.org/files/pdf/RioGrandeSurfaceStudy.pdf.
[14] From "What's Under Foot? Multi-use Trail Surfacing Options."

Surface Type	Native	Gravel	Paved	Concrete	Boardwalk
Annual Cost/Mile (Range)	$1,000 – $9,000	$1,000 – $20,000	$2,000 – $10,000	$7,000 - $38,000	$89,000 - $156,000

Total Trail Cost

The above assumptions for trail cost and lifetime produce the following total trail cost for all the trails managed by FLMAs, as shown in Table 9.

Table 9. Total Annual Cost of Maintaining the FLMA Trail System in State of Good Repair

Surface Type	Native	Gravel	Paved	Concrete	Boardwalk	All
Total Miles	88,248	5,117	5,303	160	186	99,015
Min Maintenance	$88.2 M	$5.1 M	$5.3 M	$159,750	$186,154	$99 M
Max Maintenance	$441.2 M	$56.3 M	$10.6 M	$319,499	$372,308	$508.8 M
Min Replacement	$14.7 M	$1.1 M	$2.2 M	$958,498	$16.4 M	$35.3 M
Max Replacement	$92.2 M	$45.6 M	$46.8 M	$5.8 M	$28.7 M	$519 M
Total Lower Limit	$102.9 M	$6.2 M	$7.5 M	$1.1 M	$16.5 M	$134.4 M
Total Upper Limit	$533.4 M	$101.7M	$57.4 M	$6 M	$29 M	$1 B

Cost Estimate – Transit

The purpose of the transit cost estimates is to understand high-level needs across all FLMAs and communicate these needs with DOT and FLMA leadership. The estimates are not meant to serve as a site-level planning tool for FLMAs, but the project team will reference resources for FLMAs to estimate maintenance costs for current and future systems.

Transit costs include driver wages, fuel, and preventative and corrective maintenance (including parts replacement and repair). It also includes the price of the vehicle, aggregated over the vehicle's lifespan. Transit costs do not include marketing or administration costs, as these vary widely depending on the owner and operator of the system, the agreement with the FLMA, and other factors.

Developing cost estimates for the Multimodal Catalog is challenging due to incomplete data. The project team used best available information to fill in data gaps to calculate annual vehicle miles traveled and hours traveled, vehicle type, seasonality, and ridership. Very few systems in the Catalog contained complete and accurate information on all of these data fields needed to estimate cost.

Assumptions

To simplify the cost estimates, we have made several generalizations and assumptions. We also categorized transit system by vehicle types to come up with estimates.

- Vehicular (bus, tram, van) systems are calculated separately from water-based and air systems.

- We assume vehicle age is at half-life span when calculating average costs (rather than calculating individual cost estimates based on age of each vehicle).
- Maintenance and operating costs are similarly aggregated for an entire system, not individual vehicles.
- Maintenance facilities are not included in this estimate, as most operators have facilities that serve larger systems (of which FLMA components are only a small fraction).
- Where possible, the project team calculated costs separately for large buses (31 or more passengers) and small buses (30 or fewer passengers). Where data on capacity is not available, the project team calculated based on large bus costs.

The project team did not calculate costs for air-based systems (53 systems), trains (27 systems), or snow coaches (7 systems). The overall number of these modes is very low and lack sufficient data to make estimates that could be applied generally across FLMAs. Future iterations of the Catalog may include cost estimates for these modes if they would be valuable to FLMAs or partners.

Vehicular Systems

Data Sources

The primary data elements used to calculate vehicular maintenance and operating costs are route length, number of vehicles, vehicle hours per year, unlinked trips, and annual vehicle miles. The primary sources of this data were:

- Multimodal catalog data from FLMAs, planning studies, Volpe Center reports, and FLAP and TRIP applications;
- NPS Transit Inventory;
- Targeted research and/or discussion with public transit representatives and FLMA staff; and
- General Services Administration (GSA).

Additionally, the model includes the total capital cost of the vehicle divided by the vehicle's lifecycle. Average vehicle costs are from the American Public Transit Association.[15]

Conceptual Model for Vehicular Systems

The project team used the following equations in estimating transit maintenance and operating costs:

BUS

System Cost = [$18.95 / hr (driver wages) * Vehicle Hours] + [$1.00 / mile (O&M cost) * Vehicle Miles] + [(Vehicle Cost * # of Vehicles) / 12 years]

VAN

System Cost = [$18.95 / hr (driver wages) * Vehicle Hours] + [$0.75 / mile (O&M cost) *

[15] http://www.apta.com/resources/statistics/Documents/Table23-VehCostTransitLength-2015-Vehicle.pdf.

Vehicle Miles] + [(Vehicle Cost * # of Vehicles) / 7 years]

The equations above use seven data points to estimate system cost. Three of these are fixed costs, using standardized estimates across all transit systems. The other four data points are drawn from the multimodal catalog transit system data to create an individualized system O&M estimate. See Table 10 for these seven data points.

Table 10. Cost Drivers for Vehicular Transit O&M and Source

Cost Driver	Cost	Source
Driver wages	$18.95 / hour (Fixed)	Bureau of Labor Statistics (BLS) median annual wage for transit bus driver = $36,600 = $17.58 / hour. Local government bus driver median wage is $45,390 / year = $21.82 / hour. Source, BLS: http://www.bls.gov/ooh/transportation-and-material-moving/bus-drivers.htm#tab-5
Operations and maintenance cost per mile	$1 / mile (bus) $0.75 / mile (van) (Fixed)	Approximate breakdown: $0.158 (propulsion-related system maintenance) + $0.857 (fuel costs) + $0.003 (emissions equipment) + $0.049 (facility maintenance) = $1.067 Van costs of $0.75 / mile from Department of Interior (DOI) Bus Lifecycle Cost (https://rosap.ntl.bts.gov/view/dot/9548)
Lifecycle of Vehicle	12 years (bus) 7 years (van) (Fixed)	DOI Bus Lifecycle Cost: https://rosap.ntl.bts.gov/view/dot/9548 Note: Vans have a lifecycle of 4 years or 100,000 miles, but the vast majority of vans have estimated annual VMT of under 15,000 miles. Therefore, the project team used 7 years as a more appropriate lifecycle.
Vehicle hours of operation per year	Varies	Multimodal Catalog system data Calculated by multiplying hours per week (collected from FLMA or estimated from system description or Internet research) times weeks per year times number of vehicles
Vehicle miles traveled per year	Varies	Multimodal Catalog system data
Vehicle replacement cost	Varies	Multimodal Catalog system data
Number of vehicles	Varies	Multimodal Catalog system data

Validation

The project team validated this model through matching estimated costs with approximately a dozen systems for which annual O&M costs are available (such as through planning studies or FLMA data). The project team adjusted assumptions, calculations, and estimates so that the model produced a cost that was similar to the actual O&M costs.

The labor costs for the transit operator is one of the largest components of operating costs. However, many small-scale systems operated by FLMAs or friends groups use volunteer drivers or include bus tours as part of an interpretive responsibility of the FLMA staff. Therefore, they do not count staff or volunteer time in their operating expenses (or it is counted as a very minimal expense). In the case of larger systems or those owned and operated by private or non-profit partners, the driver's labor is important to include. Since the Catalog data does not include whether systems are run by volunteers, the model assumes all

systems have paid operators. The volunteer-operated systems all have much lower annual vehicle hours traveled (VHT) than paid-operator systems, so this assumption will not significantly affect overall cost estimates, but it should be considered by agencies with more volunteer labor available.

Conceptual Model for Water-Based Systems

The project team investigated a separate model to estimate ferry costs, based on a methodology established in the DOI Ferry Lifecycle Cost Model for Federal Land Management Agencies (2011). Please see the Ferry Lifecycle Cost Model User's Guide[16] for detailed rationale on the elements listed below.

System Cost =

LABOR	**[(Annual Vehicle Hours Traveled) * 1.25] ***
	[(Sailor wage)*(# sailors) + (Captain wage)*(# captains)] +
FUEL	**[(0.5 * Annual Vehicle Hours Traveled * Slow Service Fuel Efficiency) + (0.5 * Annual Vehicle Hours Traveled * Fast Service Fuel Efficiency)]*$2.03 + [Total Fuel Amount * 0.4% * $8]**
MAINTENANCE	**[3.5% * (60% * Vessel Cost)] + [[3.5% * (40% * Vessel Cost)]/(Annual Vehicle Hours Traveled / 1000)] +**
INSURANCE	**[(2% * Vessel Cost) + ($0.35 * Annual Ridership)] +**
INDIRECT COSTS	**[Annual ridership * $0.60]**

To simplify the equation for the purpose of this high-level analysis, the project team made the following assumptions or generalizations to the model:

- Annual maintenance costs do not increase based on age of the vessel (because vessel age is not available).
- Diesel costs remain constant at $2.03 per gallon.[17]
- Vessels operate at service speed for approximately half of their Annual Vehicle Hours and at a slow or idle speed for half of their Annual Vehicle Hours.
- All vessels purchased new and are "average" price for the vessel size and type.
- Average number of captains and deck hands.

The equation above uses 11 data points to estimate system cost. Six of these are fixed costs, using standardization based on the vessel size or type. The other four data points are drawn from the multimodal catalog transit system data to create an individualized system O&M estimate. All data is from the Ferry Lifecycle User's Guide, unless indicated otherwise.

[16] https://www.volpe.dot.gov/transportation-planning/public-lands/department-interior-bus-and-ferry-lifecycle-cost-modeling.
[17] Cost of diesel gasoline on February 1, 2016 (https://www.eia.gov/petroleum/gasdiesel/).

Table 11. Cost Drivers for Transit O&M and Source

Cost Driver	Cost	Source
Captain and sailor wages	Seaman/Deckhand $20 / hr Captain / Mate $35 / hr (Fixed)	Bureau of Labor Statistics 2014
Number of staff per vessel	1 captain, 1 deckhand for most vessels[18] (Fixed, based on vessel size)	Ferry Lifecycle Cost Model
Vessel type / size	Estimated based on system description	Multimodal Catalog data
Vessel cost	$195,000 to $12.5 million (Fixed, based on vessel size)	Ferry Lifecycle Cost Model
Fuel cost	$2.03 / gallon (Fixed)	Cost of diesel gasoline on February 1, 2016: https://www.eia.gov/petroleum/gasdiesel/
Fuel efficiency	6-20 gallons / hour slow to 18-354 gallons/ hour fast (Fixed, based on vessel size)	Ferry Lifecycle Cost Model
Lubricant cost and amount	0.4% of fuel amount at $8 / gallon	Ferry Lifecycle Cost Model
Vehicle hours of operation per year	Variable	Multimodal Catalog data
Vehicle miles traveled per year	Variable	Multimodal Catalog data
Annual ridership	Variable	Multimodal Catalog data
Number of vehicles	Variable	Multimodal Catalog data

The Catalog identifies 106 systems as boat/ferry. Of these, an estimated 60 are boat ramps or ferry terminals) without further detail about the type of boat service (if any) serving the FLMA.[19] The project team did not provide estimates on annual maintenance costs of docks or terminals. That leaves 46 ferry / boat systems with estimates included.

Total Costs

Table 12 contains the total annual cost for operations and maintenance of transit systems in the Multimodal Catalog, organized by vehicle type and by agency.

[18] For small boats (under 30 passengers), the staff is limited to a single captain. For a few of the larger vessels, there are up to five deckhands in addition to the captain.

[19] The project team distinguished these 60 systems because they have the word "boat launch," "boat ramp," or "ferry terminal" in the system name. Two additional systems are included as "Boater's Trails." The project team did not investigate or calculate ferry systems that use these ferry terminals, including the Alaska Marine Highway System.

Table 12: Summary Costs for Multimodal Catalog Transit Systems

Vehicle Type	Total O&M Cost	Average per System	NPS	FWS	FS	BLM	USACE
Van	$5.3 M	$89,671	$140,175[20]	$38,127	$187,851[21]	$18,269	$23,206
Small bus	$20.2M	$396,705	$436,720[22]	$219,449	$374,216	$628,819[23]	N/A
Large bus	$84.3 M	$685,218	$1,710,721	$394,194	$368,903	$624,967	N/A
Tram	$1.4 M	$80,456	$89,290	$27,670	$432,067[24]	N/A	N/A
Trolley	$513,000	$102,611	$93,822	$137,770	N/A	N/A	N/A
Ferry	$35.3 M	$784,771	$683,805	$55,000 - $6M[25]	$540,000	N/A	N/A

Grand total annual O & M: $147 million

Data Summary

The dataset includes information from all 50 states and five US territories, with trails and transit systems owned and operated by five FLMAs as well as their partners. The information below is a snapshot of the current catalog data, representing a baseline of all transit and trail systems operating to and within federal lands. In the following charts, the number of assets corresponds to the total number of trails and transit systems, not total mileage.

Figure 2: Number of Assets by FLMA

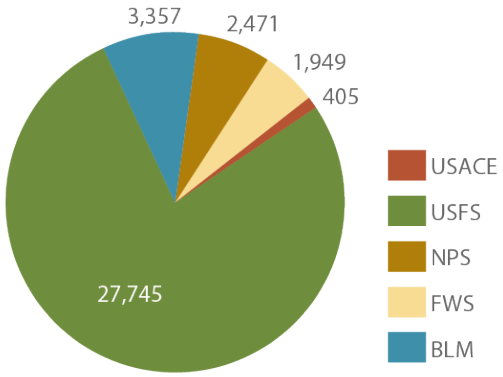
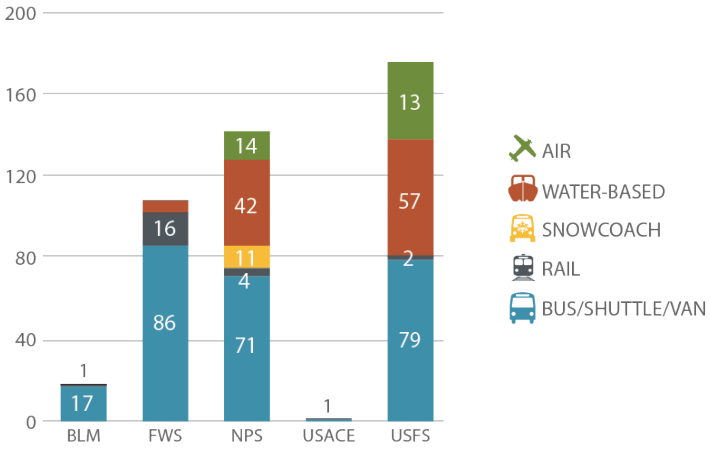


Figure 3: Transit Assets by FLMA



[20] This figure would be $107,803 if you remove Glacier National Park's very large, van-based transit system.
[21] This figure is high due to the large number of long-distance routes.
[22] This figure would be $233,315 if you remove Acadia National Park's large bus system.
[23] This number is high because most systems accessing BLM lands are public transit systems with higher annual vehicle hours and ridership.
[24] The only tram system in the Forest Service is Sabino Canyon.
[25] The only two ferry systems serving FWS lands ranged in annual costs from $55,000 to over $6 million.

Figure 4: Asset Relationship to FLMA Unit

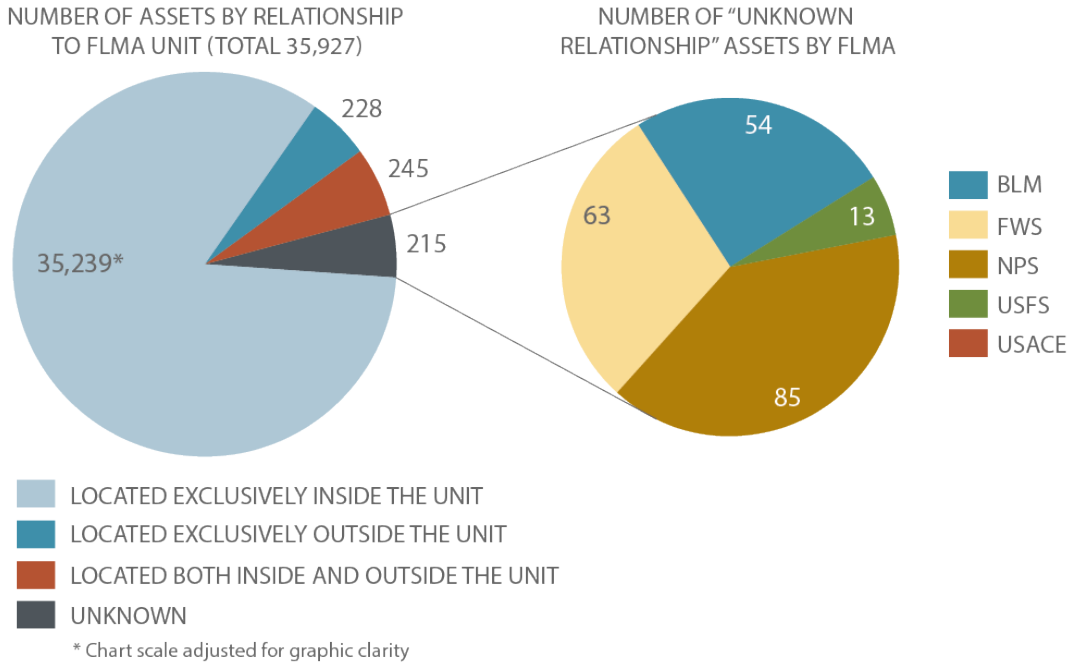


Figure 5: Number of Assets by Mode

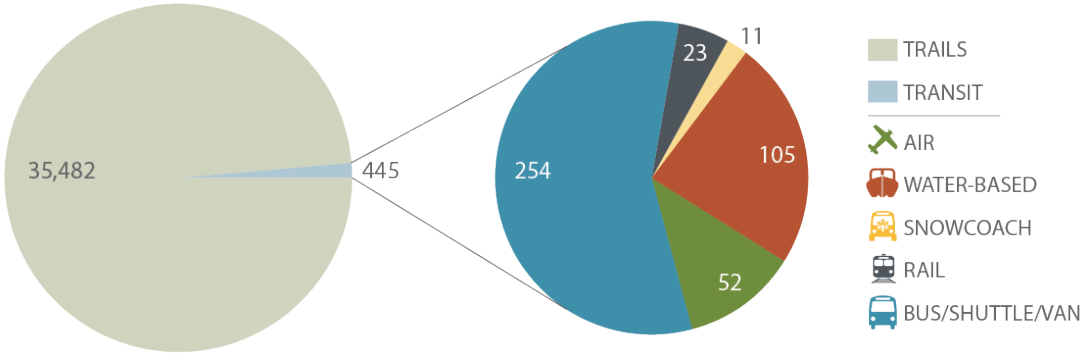


Figure 6: Distribution of Transit Systems by Mode and Vehicle Type

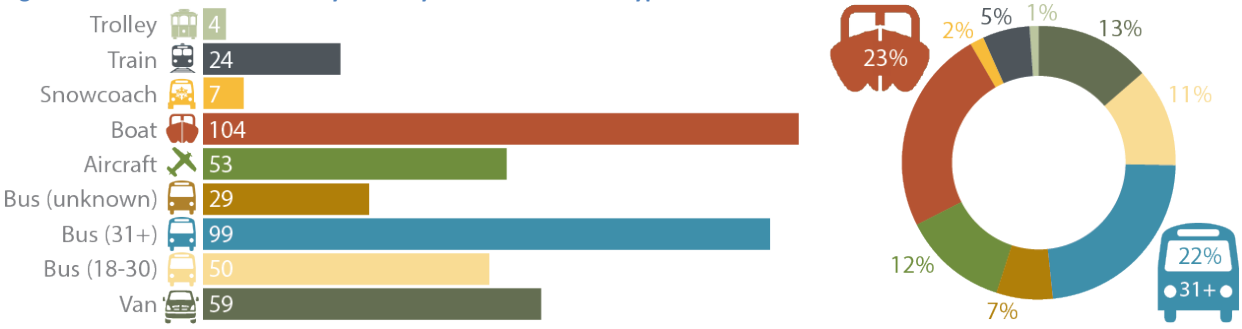


Figure 7: Number of Transit Systems by State

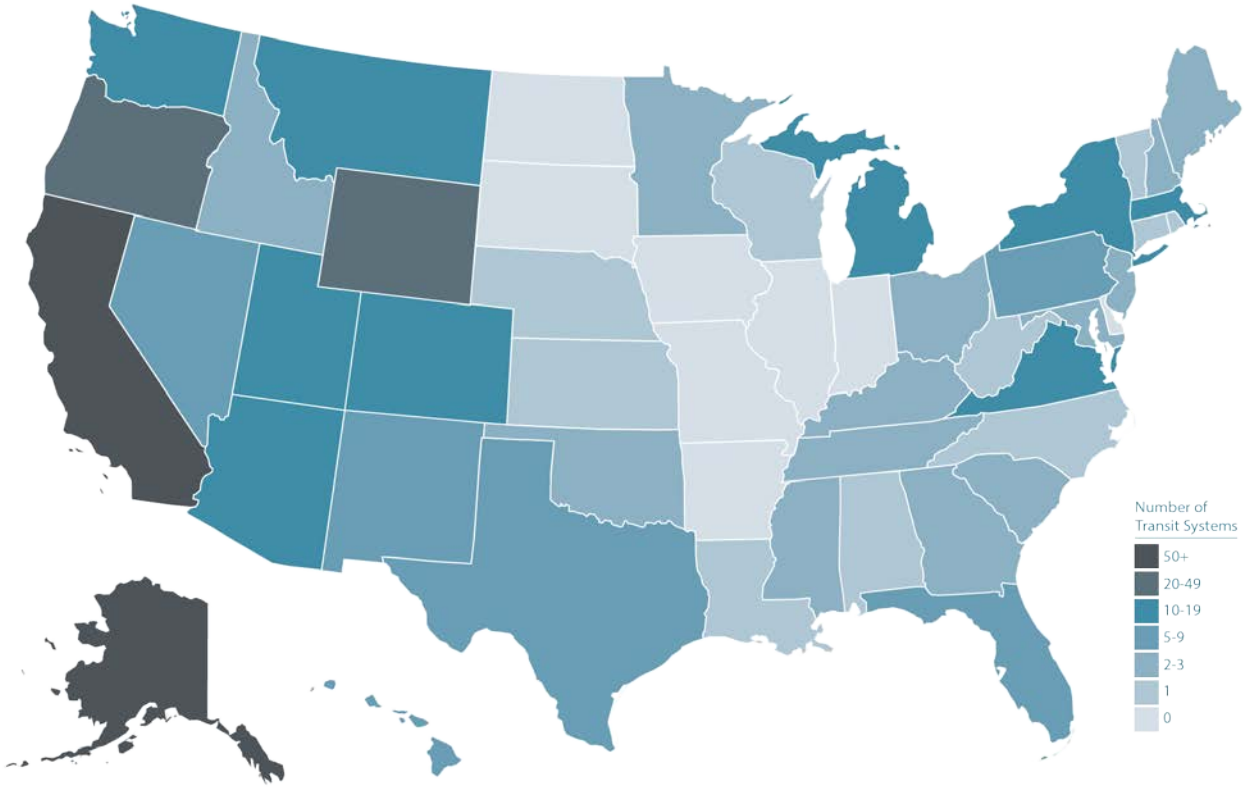
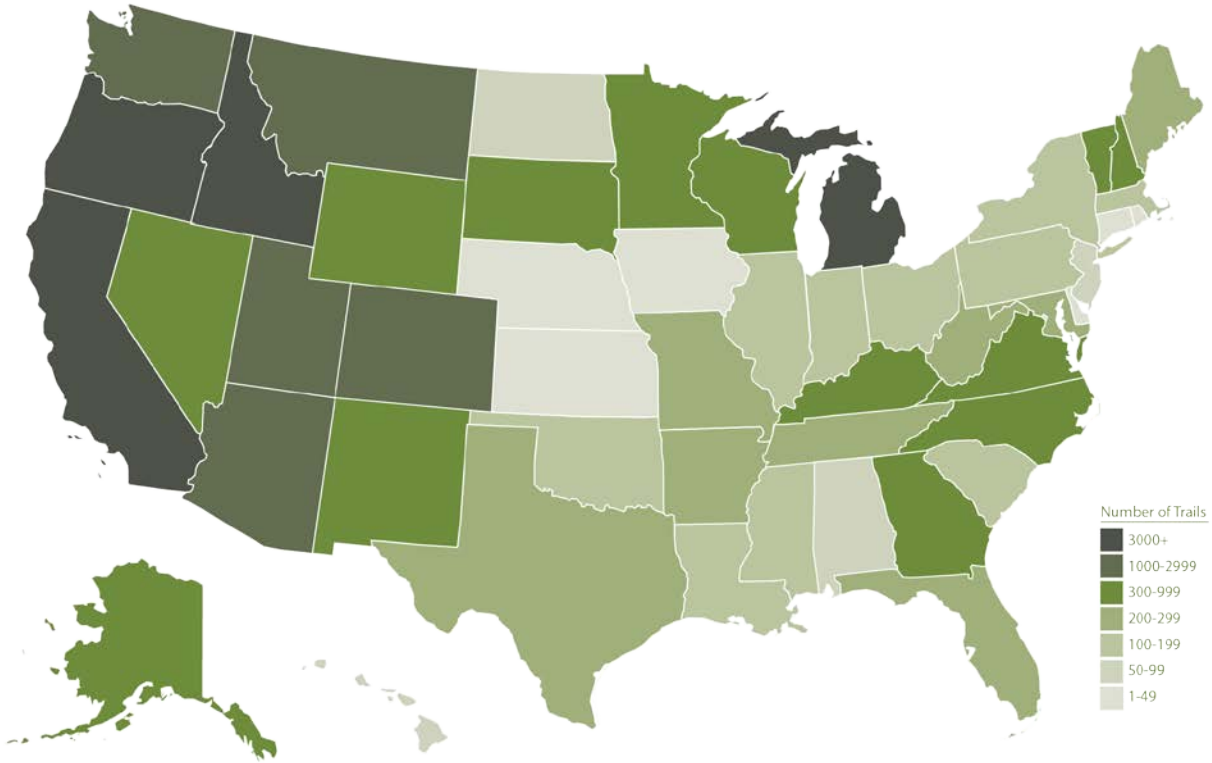
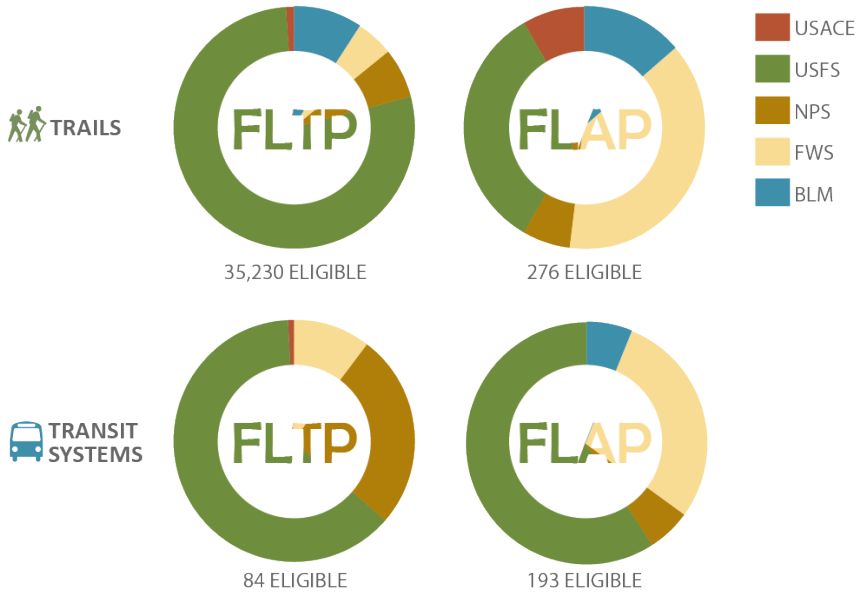


Figure 8: Number of Trails by State



Funding eligibility of transit and trail systems can help FLMA staff and state and local governments to plan for future upgrades and connection. The trails and transit systems that are owned or operated by a local or state government or public transit agency are eligible for FLAP funding, while those systems owned by an FLMA are eligible for FLTP funding.

Figure 9: Funding Eligibility of all Assets



Catalog Distribution

While developing the Multimodal Catalog, the project team needed to determine the format and means of distribution that would best meet users' needs. To understand available options and distinguish between required features and preferred features, the Volpe Center developed a memo detailing functional requirements and additional options for the Steering Committee. The memo reviewed the following options:

1. **Basic option:** an online database with a "simple" search option, which would allow users to filter the data by key fields and save results in an Excel or PDF format.

2. **"Advanced" search option:** This option would build off of the basic option, allowing users to use more complex search features, such as text field searches.

3. **Additional features considered included:**
    a. Summary Catalog data.
    b. Spatial component. Because the Catalog does not include GIS data, this would have to be in the form of a "pin on the map," either to the nearest town or FLMA unit included in the database.

The Steering Committee decided to pursue the most basic option, allowing users to perform simple searches. This choice would fulfill most users' needs while still being simple to use and maintain. This

would also give the Steering Committee the option to develop additional features in the future if desired.

However, creating an online searchable database posed additional challenges. The project team agreed that FHWA's website would be the preferred host for the website, but FHWA's review process for creating a new online database that complies with data security requirements would have prevented the project team from distributing the Catalog in a timely manner. Therefore, the project team decided to distribute the Catalog as an Access database, which meets the basic query options listed above. FHWA will continue to pursue the feasibility of an online database, subject to agency policies.

Upkeep and Maintenance

The Multimodal Catalog released in 2016 is a snapshot in time. It represents the best data that the project team could compile based on FLMAs' datasets and available resources. However, new multimodal transportation systems may be developed in the future, and agencies will update their datasets over time. There also may be a need to include different types of data if funding sources change. Therefore, there is a need for future updates for the Catalog to remain current.

The plan for future updates of the Catalog has not been developed but will depend on users' needs and opportunities for data upkeep and maintenance. When developing a plan for data updates, FHWA will consider:

- Frequency (e.g., every 1-2 years);
- New data sources (e.g., data from LRTPs or FLMA data updates, new FLAP application cycles); and
- Updating the catalog to reflect new funding or legislation.

Conclusion

The Multimodal Catalog is the first attempt to aggregate all FLMA transit and trail transportation systems into one database. While there are many future improvements needed, this baseline dataset offers valuable short- and long-term applications for FHWA, FTA, FLMAs, and partner agencies.

Using the current data, short-term applications may include:

1. Briefings to agency leadership, legislatures, Project Decision Committees (for FLAP), and other stakeholders about the current value of multimodal systems and the need for upkeep;
2. A planning tool at the unit, regional, and national level for FLMAs;
3. A tool for State DOTs and State trail coordinators (and transit agencies) for identifying needs and potential partnerships;
4. A tool to help identify new funding sources for transit and trail systems, or to identify eligible projects for discretionary funding programs; and

5. Data source for FLAP calls and project evaluation.

As a planning tool, the query features of the Catalog can help FLMAs, State DOTs, and trail coordinators identify transit and trail systems for funding eligibility, systems planning, and long-range planning. Table 10 shows a few examples of how Catalog data may be immediately put to use, including potential users and relevant data fields.

Table 13: Example Applications for the Multimodal Catalog

Application	User	Relevant Data Fields
Identify other transit agencies serving National Forests	Transit agency in small or medium city USFS unit or regional planners	Owner, Transit Agency, FLMA, State, System Description, FLMA Contact
Identify private or non-FLMA-owned transit systems within a region to coordinate routes and access public lands. The transit agency may want to coordinate data, GTFS coordinates, schedules, marketing, and trip planning.	Transit agency in small or medium city FLMA unit planners	State, Location, System Description, Owner, Operator
Identify trails eligible for a state-specific grant	FLMA state trails lead	FLMA, State, [depending on eligibility criteria: Surface Type, Ownership, Condition]
Identify trail connections between an FLMA unit and other FLMAs	State or National FLMA trails lead State DOT planners Trail NGO	State, Ownership, Distance from FLMA Unit, Relationship to FLMA Unit, FLMA Contact, Cost Estimate, Condition, Visitation
Identify all transit and trail systems serving FLMAs in one location	FLMA unit planner Local/county government	Location, State, System Description, Ownership, FLMA Contact
Identify comparable units elsewhere in the U.S. that have multiuse regional trails	FLMA state or unit planner	FLMA, Location (locations may be similar in geography/size to a target unit), Trail Length, Trail Surface, Relationship to FLMA Unit
Identify all existing trail systems within a state near population centers	State DOT planner FLMA state trails lead	State, Location, Relationship to FLMA Unit, System Description
Identify routes in a state best suited for road biking	State DOT planner FLMA state trails lead	State, Trail Surface, Length, System Description

Once the Catalog data is in use, FLMAs and other users will provide updates that will form a more complete data set. These data can then have additional applications in the long-term, such as:

- Formal communications from FLMAs to their leadership, partners, and lawmakers about assets and needs;

- A resource for FHWA to inform guidance on the FLTP and FLAP;
- Data to inform policy and investment strategies for FLMAs to meet their multimodal needs; and
- Online, multiagency trip planning tools (once FLMAs have added geospatial data to the Catalog).

Lessons Learned

In creating the first edition of the Multimodal Catalog, the project team recognized and overcame challenges with data availability and quality, FLMA engagement, geospatial components, and web-based publication. The original goals and needs of the Catalog evolved throughout the process, and the project team relied upon its Steering Committee and other partners to help determine the best direction in light of project constraints. The project team determined that publishing the Catalog as a best-available database of transit and trail systems, even while recognizing known gaps and inconsistencies, would offer significant value to transportation planners and managers working on federal lands.

The project team identified several lessons learned over the development of the Catalog:

1. **The consistency and completeness of the Catalog is strengthened by the full participation of FLMAs and the capacity of FLMAs to collect high-quality data**. FLMAs vary widely in their data availability and consistency across regions. Developing a fully consistent and comprehensive Catalog – especially one with spatial data available – will require more significant data updates and commitments from FLMAs. This first iteration of the Catalog asked for the FLMA's voluntary participation. Some FLMAs did not have the capacity to call for data updates that would be necessary for a more comprehensive Catalog. Also, many FLMA staff asked for a geospatial component, but agencies did not have capacity to consistently provide GIS data for all of their transit and trail systems.

2. **Defining transit and trails for inclusion in the Catalog is linked to agency priorities and values.** FLMAs vary in terms of what they want out of a Multimodal Catalog and how they see multimodal systems adding value to their agencies. For example, NPS frequently use transit systems to provide congestion relief, whereas USFWS seeks resource preservation and interpretation, and the BLM seeks access to "backyard" recreation. The types of systems that FLMAs want to include therefore vary. The project team tried to be as consistent as possible in systems to include. Where consistency was not possible due to FLMA data availability or priorities, then the project team tried to be transparent about why certain types of systems were included for each FLMA.

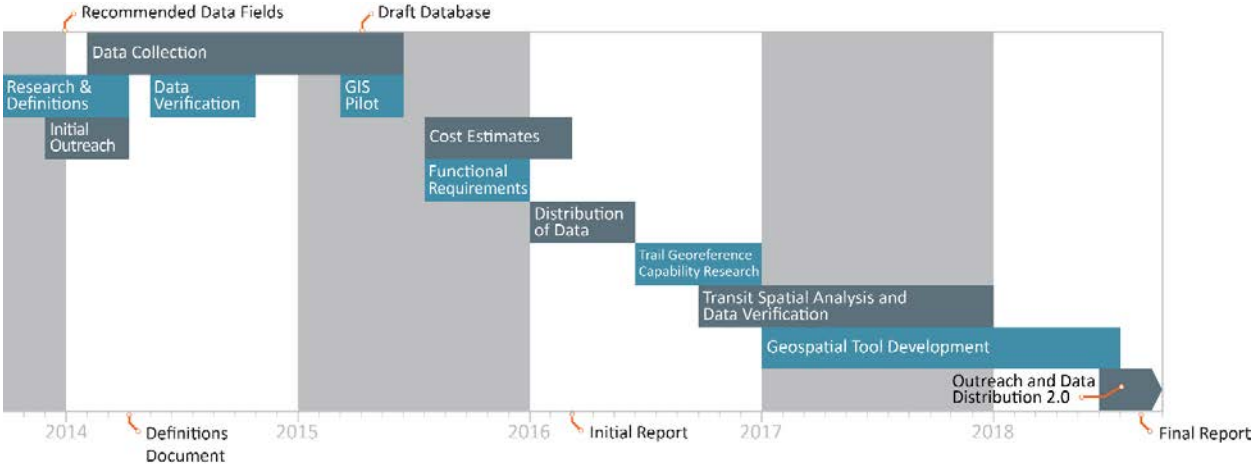
3. **The best tools and data sets are ones that can be put to use.** Transportation and land management agencies are both interested in improving data and making it consistent, but data will always be imperfect and incomplete. Data that agencies are using on a regular basis is more likely to be updated, verified, and useful. Ultimately, this lesson was the driver behind publishing the first edition of the Catalog in its current form, without geospatial data and with known inconsistencies and gaps in the data set.

With data shared among a wide user group, FLMAs and transportation agencies will discover new lessons about opportunities and constraints of the current data sets. This can result in future updates of the Catalog to improve upon the current features. Future editions of the Catalog will help FLMAs and their partners create robust, multimodal transportation systems to offer transportation choices to millions of visitors to America's public lands.

Addendum

After the first iteration of the Multimodal Catalog was released in 2016, the project team continued investigating ways to enhance the tool and make it more useful. Between 2016 and 2018, the project team conducted research on the capabilities of georeferencing the Catalog's data. Given the findings, the project team focused on developing an interactive map of geospatial transit data that provides access to FLMA boundaries. Figure 10 builds off the timeline of the Catalog's development in Figure 1, listing the major activities and deliverables completed to date.

Figure 10: Timeline of Activities (Extended)



Trail Geospatial Research

In 2016, Volpe Center staff assessed the viability of a GIS-based trails component to the MMC. The Volpe Center contacted trails leads and GIS specialists at each FLMA to determine the current status of their data, including coverage, storage, and maintenance regimes. High level findings are as follows:

1. Two agencies have developed very robust GIS systems for asset management, and two more are on similar trajectories towards standardized enterprise GIS (EGIS) asset management systems. USACE has limited current capability and no substantial change is foreseeable in the near future.

2. USFS and USFWS already maintain GIS trail inventories in EGIS, with planned updates in the next few years. It will take approximately five years for NPS and BLM to implement EGIS, as well as to publish national trails mosaic geospatial layers.

3. In the short term, it would be time- and resource-intensive to link agency geospatial data to the existing MMC tabular data without an additional data call due to the lack of a unique trail identification number shared between spatial and non-spatial data sets.

Based on these findings, the Volpe Center makes the following recommendations:

1. All near-future FLMA multimodal planning efforts that would have used the geo-enabled MMC should instead use local corporate data as they do now, and be sure to update emerging agency

EGIS systems throughout the process. This will cultivate the data underlying the future geo-enabled MMC over time.

2. In the long term, FHWA should maintain a script by which it may harvest component FLMA EGIS trails data on a case-by-case basis from appropriate data warehouse locations. These can include corporate EGIS servers, public-facing servers, GIS web services, and GIS data webstores (e.g., Data.gov).

Transit Geospatial Component

Building off of the GIS pilot in 2015, the Volpe Center worked with FHWA to georeference the transit data in order to develop an interactive spatial component of the Catalog. The goal was to use spatial analysis tools to verify the existing data while also adding new transit assets to enhance the dataset. The following provides a summary of the process used by the Volpe Center and FHWA to develop this tool.

Adding new transit assets

1. The project team created a central table of transit systems (i.e., Transit Agency Matrix). This table was used throughout the process to store all the qualitative data attributes, as well as technical and tracking information used during the development of spatial data.

2. The Transit Agency Matrix was initially populated with all transit systems from the National Transit Database (NTD). Additional sources of transit systems included the systems which previously had been captured under the Multimodal Catalog, systems from the National Transit Map, and the NPS Transit Inventory.

3. Any transit systems added from the additional sources were either matched to existing systems, or were created as new entries in the Transit Agency Matrix.

4. Transit systems which existed in the NTD used the unique identifiers from that dataset, prefixed with a “P”. Any systems which were added as new entries were given a new unique ID, prefixed with a “VOL”.

Building the geospatial dataset of transit systems

1. The project team acquired GTFS data from national clearing house and individual agency websites (see GIS Pilot for more information on GTFS).

2. If GTFS data was not available, shapefiles were acquired. If shapefiles were not available, then PDF/paper maps were acquired. In some cases, very small systems with limited stops only had a description of the stop location(s) and no map.

3. Data preparation for the interactive map in ArcGIS Online included the following:
    - GTFS URLs were added to the attributes for corresponding systems in the Transit Agency Matrix.
    - A python script was run which performed two primary tasks:
        - Build a directory for each transit system which was identified as having either a GTFS feed, shapefiles/feature classes, a PDF map, or other available spatial data.

    - For transit systems which had a GTFS URL listed in their attributes, download GTFS data, process it into spatial data, and copy to the appropriate directory.
  - Shapefiles or feature classes where no GTFS data was available, were downloaded manually and copied into the appropriate directory.
  - The following was implemented for PDF/paper maps, and text descriptions:
    - Digitized points manually using a template creating only enough points to roughly define the extent of the system. The FLMA boundaries were used as reference during this process, so that points were created where the transit systems were closest to the FLMAs. No route lines were built in this initial effort.
    - The intent, given the scope of this effort, was to create a spatial representation of the extent of a transit system, which was needed to perform the spatial analysis with the FLMA boundaries.

4. Developing an FLMA base layer and unique IDs
   - The project team reached out to the FLMAs to collect the best spatial data for their lands owned by that agency. These datasets were compiled into a single feature class representing the boundaries of individual federal land units, called the fla_boundaries feature class.
   - If the FLMA did not have a unique ID for each of their land units, the project team created one. Several FLMAs had unique IDs and names for their land units, and these were transferred to the fla_boundaries Unit ID field. Several of the FLMAs, however, did not divide their lands into individual units with unique IDs or names (e.g., BLM). In these cases, the project team divided the large swaths of land into parcels by county and assigned unique IDs based on the county and state Federal Information Processing Standard (FIPS) codes.
   - Projection used: USA Contiguous Albers Equal Area Conic USGS version.
   - Datum used: D_North_American_1983.

5. Spatial Analysis
   - With the transit agency spatial datasets, and the federal lands boundary feature class, the project team ran a second python script to perform a spatial analysis.
   - Any transit systems which had a component within at least ½ mile of a FLMA boundary or access point qualified for placement in the interactive map.
   - The output from this process was a many-to-many relationship table. This table uses unique IDs to identify which transit systems are within ½ mile of which FLMA.

6. Overview of ArcGIS Online Web Application
   - FHWA's Eastern Federal Lands Highway Division uploaded the Federal land boundaries feature class and transit systems point and line feature classes into an ArcGIS Online web application.

- The relationship classes the project team generated as part of the spatial analysis were loaded into the web application as well, enabling a natural connection and flow between attributes of the Federal lands and attributes of the transit systems.
- Queries and filters were built to allow users to specify either Federal lands of interest or transit systems of interest using a variety of attributes.
- The raw data behind the layers displayed in the web app can be downloaded, as can the tabular attribute data, for further analysis by the tool's users.

7. Data summary
    - The transit system spatial data search process resulted in the collection of spatial data for over 630 transit systems that provide access to Federal lands, out of 2,638 total transit systems added to the Transit Agency Matrix.
    - These transit systems were identified as 69 rural and 558 urban systems.
    - Federal lands for the BLM, NPS, USACE, USFS, and USFWS had a total of 3,276 individual land units identified.
    - The spatial analysis process identified 1,512 high-confidence relationships between federal lands and transit systems.

Next Steps

The 2018 release of the Multimodal Catalog focused on adding more descriptive information to the Catalog's existing transit inventory, adding additional transit systems, and building an interactive map to spatially display all transit systems across the country that provide access to FLMA lands. FHWA expects the Catalog to be continually updated and enhanced moving forward to better accommodate user needs. Intended next steps for the Catalog include, but is not limited, the following:

- **Integration**: FLMAs, along with State and local partners, could adopt this collaborative tool and integrate it into their ongoing planning and project development processes.

- **Maintenance:** The Multimodal Catalog is a living dataset that will require periodic updates to remain current and relevant. FLH will oversee maintenance, but will rely on FLMA participation for data updates. FHWA will work with FLMA partners to determine how to best leverage efforts to maintain complementary data sets and systems.

- **Enhancement:** FLH would like to transition the trails database to an ***interactive geospatial format*** like the transit database to make it a more valuable tool for FLMA partners.

Appendices

Appendix A: Complete List of Data Fields Included in the Catalog

The project team worked with stakeholders to identify and prioritize data fields related to trails and transit assets for inclusion in the Catalog. The final list is included below:

Table 14: Multimodal Catalog Data Fields

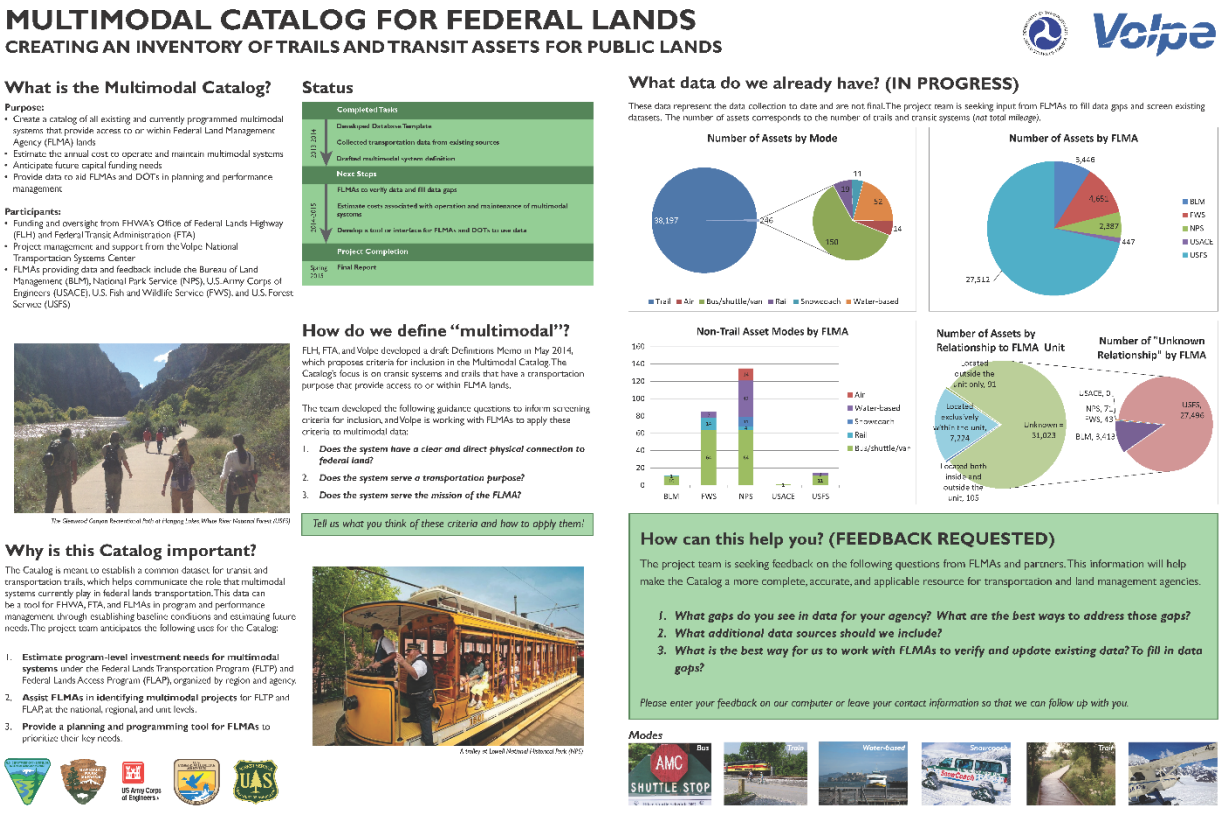
Theme	Components	Trail	Transit
Location & Context	FLMA	X	X
	Region / USACE Division	X	X
	District (USACE only)	X	X
	Unit Name / USACE Project Site Name	X	X
	Subunit / USACE Project Site Area Name	X	X
	Location (Closest City or County)	X	X
	Location (State)	X	X
	Unit Visitation per year	X	X
	FLMA contact	X	X
System Description	System Name	X	X
	System Description	X	X
	# Unlinked Trips per year		X
	Mode	X	X
	Total Length of trail or transit route	X	X
	Seasonal only? (Y/N)	X	X
	Planned improvements	X	X
	Status (Existing, Planned, Existing with Planned Improvements)	X	X
Mode-Specific Questions	Trail surface	X	
	Trail condition	X	
	Transit agency (if applicable)		X
	# Vehicles / Vessels		X
	Type of vehicles		X
	Fuel type		X
	Hours per week of operation		X
	Weeks per year of operation		X
Mgmt. Model	Owner		
	Operator / Maintenance	X	X
	Multi-agency partner 1/2	X	X
Funding & Finance	Private funding source(s)	X	X
	Public funding source(s)	X	X
	Funding eligibility	X	X
	Capital replacement cost (or current replacement value)	X	X
Relation	Relationship to FLMA unit	X	X
	Agreement with FLMA	X	X
	Distance from unit	X	X
Admin.	Information Source	X	X
	Year of Inventory	X	X
	Notes	X	X
	Field last updated	X	X

Appendix B: Stakeholder Outreach Presentations

- December 12, 2013 – "Multimodal Catalog: Presentation to Western Federal Lands Highway."
- January 8, 2014 – "Multimodal Catalog: Presentation to Eastern Federal Lands Highway."
- January 9, 2014 – "Multimodal Catalog: Presentation to Central Federal Lands Highway."
- January 16, 2014 – "Multimodal Catalog: Presentation to TRIP TAC Peer Group Meeting."
- February 2014 – "Multimodal Catalog: Status Meeting" *(individual presentations to all FLMA partners).*
- September 16, 2014 – Transit Research Board (TRB) ADA 40 Conference: Poster Presentation.
- October 29, 2015 – National Rural Transit Assistance Program (RTAP) Conference: "Presentation Federal Lands Multimodal Catalog: A Tool for Connecting Visitors to Federal Lands."
- December 17, 2015 – "Introducing…the Multimodal Catalog! Presentation to the Federal Agency Coordination Team (FACT)."
- August 2018 – Multimodal Catalog presentation for partners *(content prepared and presentation will be given at a future date).*

Sample of Outreach Materials

Transit Research Board (TRB) ADA 40 Conference: Poster Presentation



MULTIMODAL CATALOG FOR FEDERAL LANDS
CREATING AN INVENTORY OF TRAILS AND TRANSIT ASSETS FOR PUBLIC LANDS

Volpe

What is the Multimodal Catalog?

Purpose:
- Create a catalog of all existing and currently programmed multimodal systems that provide access to or within Federal Land Management Agency (FLMA) lands
- Estimate the annual cost to operate and maintain multimodal systems
- Anticipate future capital funding needs
- Provide data to aid FLMAs and DOTs in planning and performance management

Participants:
- Funding and oversight from FHWA's Office of Federal Lands Highway (FLH) and Federal Transit Administration (FTA)
- Project management and support from the Volpe National Transportation Systems Center
- FLMAs providing data and feedback include the Bureau of Land Management (BLM), National Park Service (NPS), U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (FWS), and U.S. Forest Service (USFS)

Status

Completed Tasks
- Developed Database Template
- Collected transportation data from existing sources
- Drafted multimodal system definition

Next Steps
- FLMAs to verify data and fill data gaps
- Estimate costs associated with operation and maintenance of multimodal systems
- Develop a tool or interface for FLMAs and DOTs to use data

Project Completion
- Final Report

How do we define "multimodal"?

FLH, FTA, and Volpe developed a draft Definitions Memo in May 2014, which proposes criteria for inclusion in the Multimodal Catalog. The Catalog's focus is on transit systems and trails that have a transportation purpose that provide access to or within FLMA lands.

The team developed the following guidance questions to inform screening criteria for inclusion, and Volpe is working with FLMAs to apply these criteria to multimodal data:

1. *Does the system have a clear and direct physical connection to federal land?*
2. *Does the system serve a transportation purpose?*
3. *Does the system serve the mission of the FLMA?*

Tell us what you think of these criteria and how to apply them!

Why is this Catalog important?

The Catalog is meant to establish a common dataset for transit and transportation trails, which helps communicate the role that multimodal systems currently play in federal lands transportation. This data can be a tool for FHWA, FTA, and FLMAs in program and performance management through establishing baseline conditions and estimating future needs. The project team anticipates the following uses for the Catalog:

1. **Estimate program-level investment needs for multimodal systems** under the Federal Lands Transportation Program (FLTP) and Federal Lands Access Program (FLAP), organized by region and agency.
2. **Assist FLMAs in identifying multimodal projects** for FLTP and FLAP, at the national, regional, and unit levels.
3. **Provide a planning and programming tool for FLMAs** to prioritize their key needs.

What data do we already have? (IN PROGRESS)

These data represent the data collection to date and are not final. The project team is seeking input from FLMAs to fill data gaps and screen existing datasets. The number of assets corresponds to the number of trails and transit systems (not total mileage).

Number of Assets by Mode

Number of Assets by FLMA

Non-Trail Asset Modes by FLMA

Number of Assets by Relationship to FLMA Unit

Number of "Unknown Relationship" by FLMA

How can this help you? (FEEDBACK REQUESTED)

The project team is seeking feedback on the following questions from FLMAs and partners. This information will help make the Catalog a more complete, accurate, and applicable resource for transportation and land management agencies.

1. *What gaps do you see in data for your agency? What are the best ways to address those gaps?*
2. *What additional data sources should we include?*
3. *What is the best way for us to work with FLMAs to verify and update existing data? To fill in data gaps?*

Please enter your feedback on our computer or leave your contact information so that we can follow up with you.

Modes

Multimodal Catalog Factsheet (4 pages)

Multimodal Catalog OVERVIEW

The multimodal catalog is a centrally located inventory of transit systems and trails across the country that provide access to or fall within Federal Land Management Agency (FLMA) lands. The multimodal catalog provides detailed data for Federal, State, and local transportation agencies to use for planning, performance management, and project prioritization.

Purpose

The Multimodal Catalog is designed to help Federal, State, and local partners:

- Identify gaps, opportunities, and potential partnerships to improve the multimodal transportation system, including connections to public lands.
- Improve data availability and consistency across FLMAs to assist with planning and programming for the multimodal transportation system.
- Use data to enhance grant applications for trail and transit improvements, such as the Federal Lands Transportation Program (FLTP) and Federal Lands Access Program (FLAP).
- Communicate with leadership on trail and transit needs and opportunities.

What Happens Next?

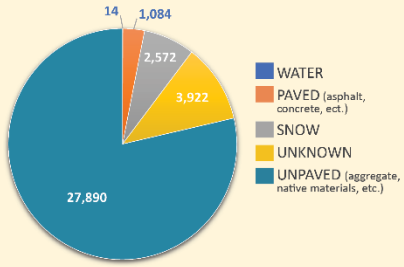
- FLMAs, along with State and local partners, should adopt this collaborative tool and integrate it into their ongoing planning and project development processes for identifying needs and coordinating with partners to address those needs.
- The multimodal catalog is a living dataset that will require periodic updates to remain current and relevant for use by FLMAs, State and local partners, transit agencies, and the general public.
- Federal Lands Highway (FLH) will oversee maintenance, but will rely on FLMA participation for data updates.
- In the future, FLH would like to transition the trails database to an interactive geospatial format like the transit systems.

What's Inside?

Multimodal is defined here as transit and trail systems that have a transportation purpose. This includes FLMA and non-FLMA owned systems providing access to FLMA lands.

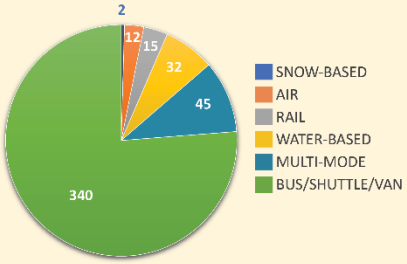
Trails

Over 35,000 trails, including ownership model, length, location, surface material, and condition.



Transit

Approximately 450 transit systems, including mode, vehicle type, location, and operation and ownership model.



Questions? Contact: Aung Gye Phone: (202) 366-2167 Email: Aung.Gye@dot.gov
Website: https://flh.fhwa.dot.gov/programs/flpp/

How might I use this data?

The following three pages walk through an example showing how to access both trails and transit information from the multimodal catalog in an applied scenario. This is one example of the many ways in which agencies may want to use this data in their planning efforts.

Example Scenario: An agency in Albuquerque, NM is performing a planning exercise to assess the gaps in transportation assets. Identify systems gaps will form the basis for potential future projects. The multimodal catalog, along with supplemental data, is used to map resources and identify projects that have a mutual benefit among agencies and offer opportunities to develop partnerships to implement improvements.

Trails

Note: The trails database can be accessed from the website at the bottom of the page.

Learn what trails in New Mexico provide access to FLMAs.

1. Under **Forms** on the left-hand side double click **Trails_Query_Form** to open the trails query tool.

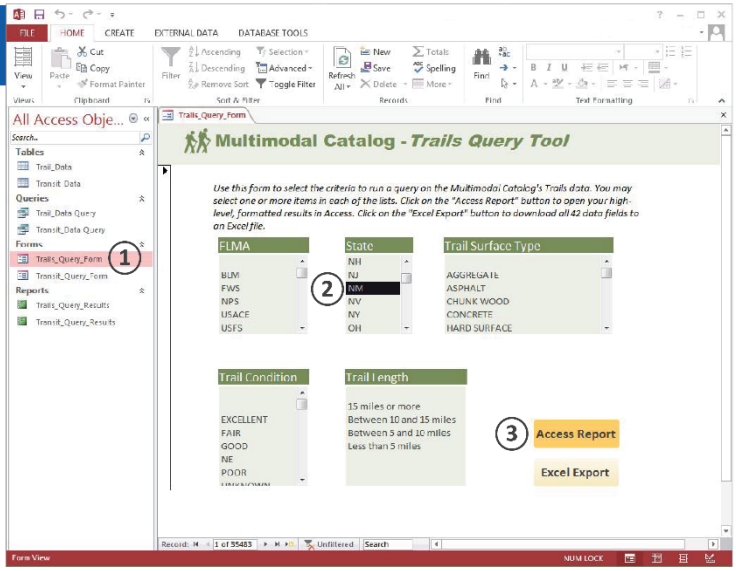
2. Under the **State** field scroll down to **NM** and select it so it becomes highlighted.

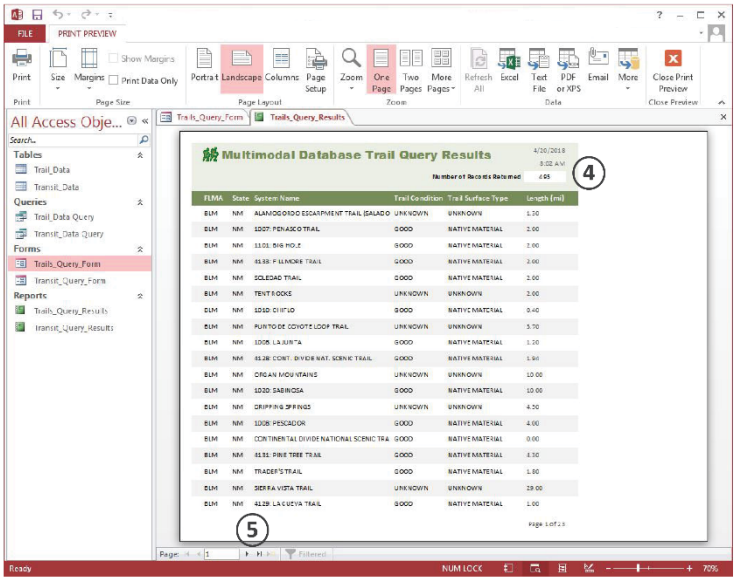
3. Select the **Access Report** button to output the results. Alternatively, you can select the Excel Export button to show the results in Excel.

4. Resulting Access Report* indicates the **Number of Records Returned**.

5. You can navigate between record pages with **arrow buttons** or by entering a page number.

*The query tool produces a report with six common attributes. To access the full table of attributes for any record double click **Trail_Data** located on the left hand side under **Tables**. While the trail data is only available in tabular form, the information here can be used as a base for identifying spatial data.





Questions? Contact: Aung Gye Phone: (202) 366-2167 Email: Aung.Gye@dot.gov
Website: https://flh.fhwa.dot.gov/programs/flpp/

Transit

Note: The transit database can be accessed from the website at the bottom of the page.

Learn what transit systems in Albuquerque, NM provide access to FLMAs.

(1) Select the **Query** button to display the query tool.

(2) Enter **NM** in the State field.

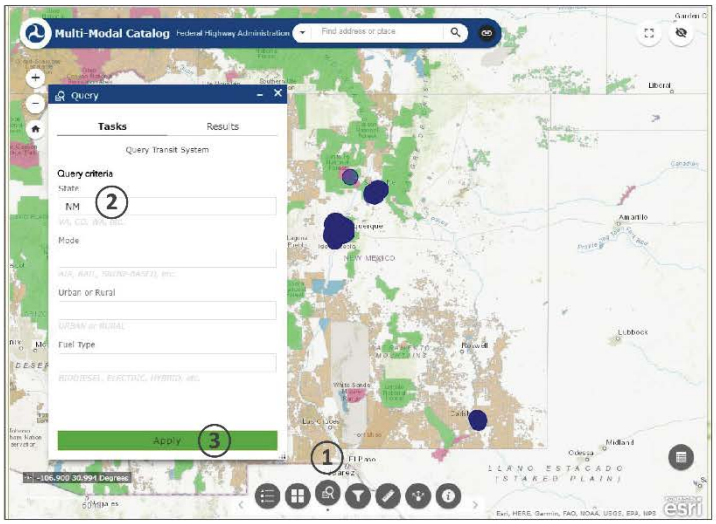
(3) Select **Apply**.
(Map result displayed.)

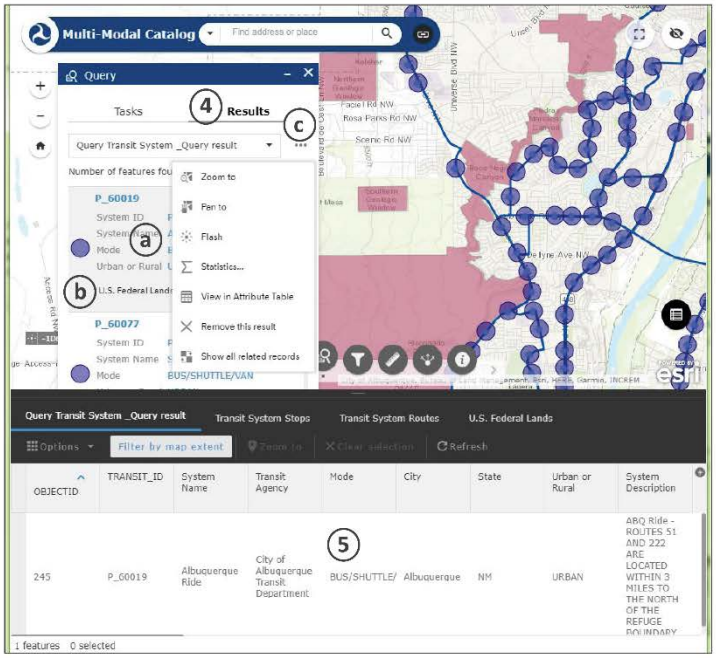
(4) The **Results** tab generates a list of all transit systems providing access to FLMAs in NM. You can click on:

- (a) The system to zoom in on it;
- (b) **U.S. Federal Lands** to see which FLMA the selected system provides access to; or
- (c) The **ellipses (...)** to access additional options such as **View in Attribute Table** which provides additional data on the system.

(5) The Attribute Table has many options for further exploring all available attributes of the transit systems and FLMAs within the tool.

There are other options for searching, filtering, and exploring the data within the tool not illustrated here. The tabular form of the transit data is also available in the Multimodal Catalog Access database.

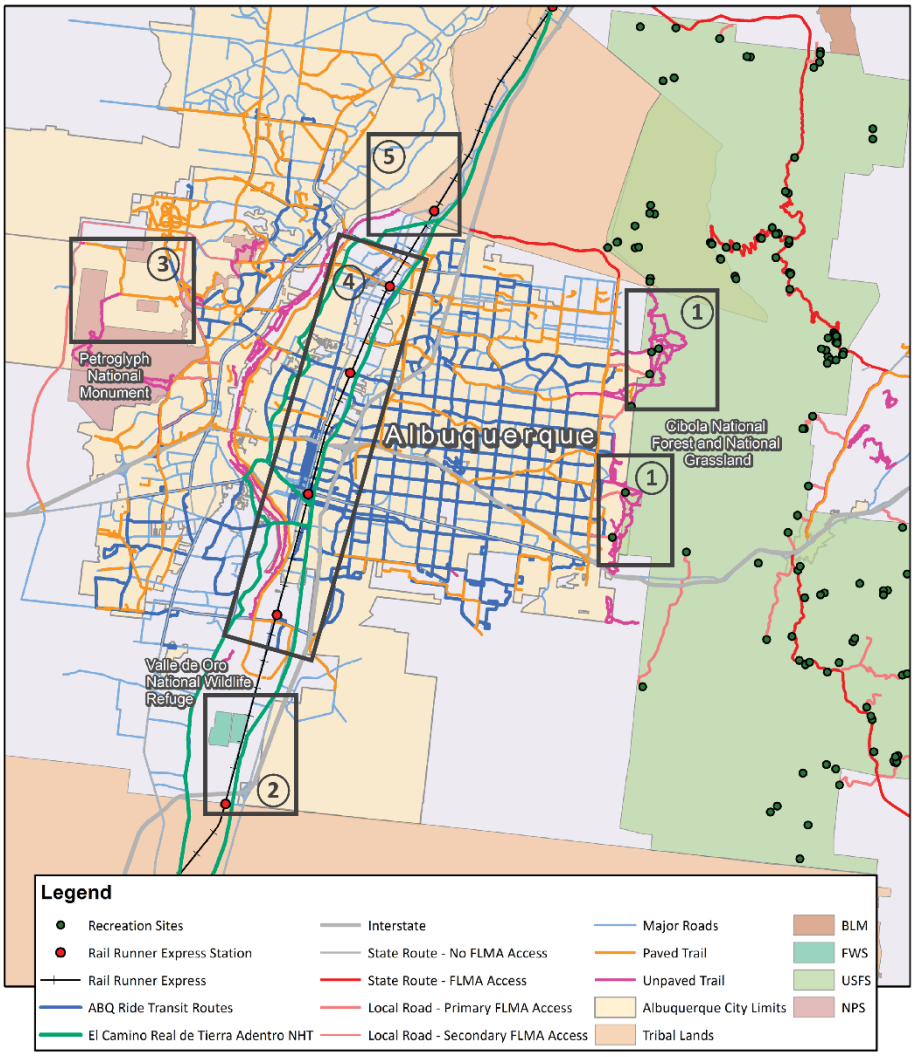




Questions? Contact: Aung Gye Phone: (202) 366-2167 Email: Aung.Gye@dot.gov
Website: https://flh.fhwa.dot.gov/programs/flpp/

Partnerships

Understanding the relationship of the transportation network is important for identifying opportunities and knowing which partners to engage.



Leverage the benefit of the information available in the Multimodal Catalog by combining identified trails and transit resources with other agency geospatial data (roads, public assets, recreation areas, etc.)

Albuquerque potential connectivity opportunity areas:

1. Facilitation of urban/federal trail connectivity with USFS.
2. Valle de Oro NWR transit/trail connectivity with Rail Runner.
3. NPS trail connectivity with new major subdivision.
4. Regional/statewide trail connectivity with statewide recreation trails and National Historic Trails (NHT) such as El Camino Real de Terra Adentro and the Rio Grande Trail.
5. Tribal trail connectivity linking Pueblos in the metro area.

Questions? Contact: Aung Gye Phone: (202) 366-2167 Email: Aung.Gye@dot.gov
Website: https://flh.fhwa.dot.gov/programs/flpp/

2018 Multimodal Catalog Presentation for Partners (17 slides)

The Multimodal Catalog

<Presentation>

<Date>

What is the Multimodal Catalog?

- A centrally located inventory of transit systems and trails across the country that provide access to or fall within FLMA Lands.
- A detailed database for planning, performance management, and project prioritization.
- Users:
  - FLMAs (National, Regional, and Unit level)
  - USDOT (FHWA, FTA)
  - State and local transportation agencies

What is its Purpose?

- **Identify** gaps, opportunities, and potential partnerships to improve the multimodal transportation system.
- **Improve** data availability and consistency across FLMAs to assist with planning and programming.
- **Enhance** grant applications for trail and transit improvements, such as FLTP and FLAP.
- **Communicate** with stakeholders on trail and transit needs and opportunities.

What is Multimodal Transportation?

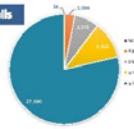
- Defined here as transit and trail systems with a transportation purpose. This includes FLMA and non-FLMA owned systems providing access to (and within) FLMA lands.
- Multimodal Transportation is tied to FLMA goals:
  - Resource Protection
  - Access
  - Visitor Experience
  - Livability
  - Safety

Maroon Bells Bus (USFS)

The Data: What's Inside?

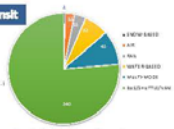
- Separate databases for transit and trails
  - Tabular data available for trails via Microsoft Access
  - Geospatial data available for transit via ArcGIS Online

Trails



Over 35,400 trails, including ownership model, length, location, surface material, and condition.

Transit



Approximately 450 transit systems, including mode, vehicle type, location, and operation and ownership model.

How Did We Get Here?

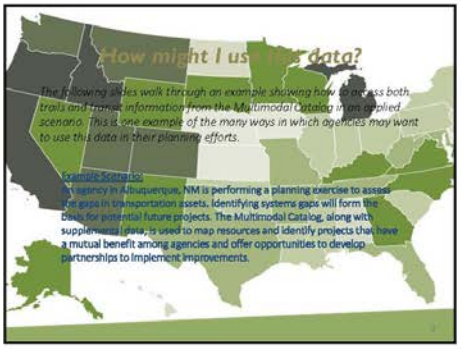
- 2013 – 2014:
  - Initial FLMA Outreach
  - Research & Definitions
- 2014 – 2015:
  - Initial Data Collection
  - Initial Data Verification
- 2015 – 2016:
  - GIS Pilot
  - Cost Estimate Framework for System O&M
  - Functional Requirements and Access Database Development
  - Initial Distribution of Multimodal Catalog
- 2016 – 2017:
  - Trail Georeference Capability Research
- 2017 – 2018:
  - Transit Geospatial Analysis and Database Development
  - Multimodal Catalog Version 2.0

Data Driven Decision-making

- The Multimodal Catalog informs system wide planning efforts, project selection and prioritization, long-term budgeting, and performance management:
  - Estimate program-level investment needs for multimodal systems under FLTP and FLAP.
  - Identify low-cost, high-value solutions ("low-hanging fruit").
  - Seek and leverage new funding opportunities for multimodal transportation.

Collaborative planning

- The Multimodal Catalog helps to identify potential partnerships and opportunities for inter-agency collaboration.
- It can be used in conjunction with other data sets and systems.
  - NPS Navigator
  - Transportation Investment Needs Analysis (TINA)
  - Annual FLTP Data
  - Environmental Screening



How might I use this data?

The following slides walk through an example showing how to access both trails and transit information from the Multimodal Catalog in an applied scenario. This is one example of the many ways in which agencies may want to use this data in their planning efforts.

Example Scenario:
An agency in Albuquerque, NM is performing a planning exercise to assess the gaps in transportation assets. Identifying systems gaps will form the basis for potential future projects. The Multimodal Catalog, along with supplemental data, is used to map resources and identify projects that have a mutual benefit among agencies and offer opportunities to develop partnerships to implement improvements.

Trails

Learn what trails in New Mexico provide access to FLMAs.

1. Under **Forms** on the left-hand side double click **Trails_Query_Form** to open the trails query tool.
2. Under the **State** field scroll down to **NM** and select it so it becomes highlighted.
3. Select the **Access Report** button to output the results. Alternatively, you can select the Excel Export button to show the results in Excel.

Trails

4. Resulting Access Report* indicates the **Number of Records Returned.**
5. Navigate between record pages with **arrow buttons** or by entering a page number.

*The query tool produces a report with six common attributes. To access the full table of attributes for any record double click **Trails_Data** on the left hand side under **Table**. While the trail data is only available in tabular form, the information here can be used as a base for identifying spatial data.

Transit

Learn what transit systems in Albuquerque, NM provide access to FLMAs.

1. Select the Query button to display the query tool. Then select **Query Transit System** within the tool.
2. Enter **NM** in the State field.
3. Select **Apply** (Map result displayed).

There are other options for searching, filtering, and exploring the data within the tool not illustrated here. The tabular form of the transit data is also available in the Multimodal Catalog Access database.

Transit

4. The **Results** tab generates a list of all transit systems providing access to FLMAs in NM. You can click on:
   a. The system to zoom in on it;
   b. **U.S. Federal Lands** to see which FLMA the selected system provides access to; or
   c. The **ellipses (...)** to access additional options such as **View in Attribute Table** which provides additional data on the system.
5. The Attribute Table has many options for further exploring available system and FLMA attributes within the tool.

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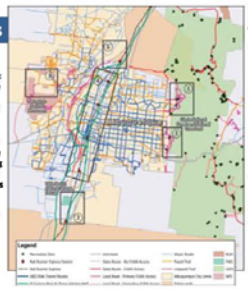
Partnerships

Understanding the relationship of the transportation network is important for identifying opportunities and knowing which partners to engage.

Leverage the benefit of the information available in the Multimodal Catalog by combining identified trails and transit resources with other agency geospatial data (roads, public assets, recreation areas, etc.)



Potential connectivity opportunity areas:

1. Facilitation of urban/federal trail connectivity with USFS.
2. Valle de Oro NWR transit/trail connectivity with Rail Runner.
3. NPS trail connectivity with new major subdivision.
4. Regional/statewide trail connectivity with statewide recreation trails and National Historic Trails (NHT) such as El Camino Real de Terra Adentro and the Rio Grande Trail.
5. Tribal trail connectivity linking Pueblos in the metro area.

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Opportunities

- The consistency and completeness of the Multimodal Catalog is strengthened by the full participation of FLMAs and the capacity of FLMAs to collect high-quality data.
- The best tools and data sets are ones that can be put to use.
  - Data will always be imperfect and incomplete. Data that agencies are using too on a regular basis is more likely to be updated, verified, and useful for the end user.

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What Happens Next?

- **Integration**: FLMAs, along with State and local partners, could adopt this collaborative tool and integrate it into their ongoing planning and project development processes.
- **Maintenance:** The Multimodal Catalog is a living dataset that will require periodic updates to remain current and relevant. FLH will oversee maintenance, but will rely on FLMA participation for data updates. FHWA will work with FLMA partners to determine how to best leverage efforts to maintain complementary data sets and systems
- **Enhancement:** FLH would like to transition the trails database to an ***interactive geospatial format*** like the transit database to make it a more valuable tool for FLMA partners.

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Thank you!

<Names>

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Appendix C: Multimodal Definitions

The project team conducted individual outreach meetings with FLMAs and FLH Divisions to introduce the Multimodal Catalog early in development process, and to refine the purpose and need for the tool. The project team also discussed criteria for inclusion in the Catalog and sought input on the Definitions Memo, included below.

Multimodal Definition

The project team must define the multimodal systems to be included in this Catalog in a way that serves the aforementioned needs and goals. The definition considers the following:

- Previous efforts of Congress and of FLMAs to define "alternative transportation systems;"[26]
- The new funding landscape;
- The needs and potential Catalog applications of a diverse stakeholder group; and
- Limitations in data availability and staff capacity among FLMAs.

The project team recognizes that a single, standard definition may not encompass all multimodal transportation systems across all agencies, due to the varying priorities, needs, and capacities of the FLMAs. This document delineates how the Multimodal Catalog will define multimodal systems to accommodate sometimes-conflicting priorities and can be feasibly developed using existing resources.

First, the project team lists previous definitions of alternative transportation and multimodal systems to establish a baseline. Second, the project team spells out three criteria for multimodal systems to be included in the Catalog. Finally, the project team builds flexibility into the criteria; it explains the prioritization of transportation systems for inclusion and how the Catalog (and its users) may treat systems that meet some, but not, all of the criteria.

Previous Definitions

Through the Safe, Accountable, Flexible Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), FTA defined multimodal transportation systems that were eligible for TRIP grants as:

> *"…transportation by bus, rail, or any other publicly or privately owned conveyance that provides to the public general or special service on a regular basis, including sightseeing service. Such term also includes non-motorized transportation systems (including the provision of facilities for pedestrians, bicycles, and non-motorized watercraft)."*[27]

The TRIP definition focuses on mode, schedule, and audience. FLMAs have developed complementary definitions that also focus on mode, as seen in Table 15.

[26] FHWA and FTA decided to use "multimodal" instead of "alternative transportation systems" (ATS) in this Catalog because this language is more consistent with transportation practitioners outside of federal lands. Many of the previous definitions refer to ATS but will be used here as synonymous with multimodal.
[27] SAFETEA-LU (49 U.S.C. 5320)

Table 15: Previous FLMA Multimodal Definitions

FLMA	Definition	Source
NPS	Alternative transportation systems integrate all modes of surface transportation, beyond traditional roadways and private vehicles, including motorized and non-motorized land and water-based transportation systems.	NPS Reauthorization Resource Paper 2013 (x), Alternative Transportation Program definition
FWS	Alternative transportation systems generally include any travel means other than personal automobile, such as: • Motorized transportation systems operating internally within stations • Shuttles and van transit connecting stations with other destinations • Regional transit connections (bus, light rail, trolley, commuter rail, passenger rail) • Bicycle and pedestrian infrastructure (sidewalks, paths, bicycle lanes, regional trails) • Water-based transportation • Publicly and privately operated systems	RATE Reports: http://www.volpe.dot.gov/transportation-planning/public-lands/us-fish-and-wildlife-service-regional-alternative-0
BLM	ATS include not only vans and shuttle services but also connections to regional transit systems, regular sightseeing tours, and non-motorized connections for transportation purposes.	BLM ATS Inventory Report, 2010 (x)
USFS	ATS refers to transit systems and transit or transportation enhancements eligible under Titles 49 and 23 that enhance transportation service or use and that are physically or functionally related to transit facilities, such as parking, pedestrian and bicycle access, walkways, and similar amenities that provide access to and within Forest Service lands. Transit vehicles identified in this study include trams, standard transit buses, small buses, historic trolleys, trolley cars, waterborne vessels, and aerial tramways. Other essential transit investments include maintenance and storage facilities and ferry piers. Transit enhancements identified include parking facilities, connections with non-motorized trails, shelters, and signage and information services.	Summary of Forest Service ATS Needs, Federal Lands ATS Study, 2004 (x)

Criteria for the Multimodal Catalog Definition

The multimodal definition used in the TRIP program applies to all FLMAs, but it may be too broad for the goals of this Catalog. The Catalog should focus on systems that are important to the missions of the FLMAs and that enhance access to and within federal lands. **The definition and prioritization of multimodal transportation systems for inclusion in the Catalog are based upon three criteria: (1) a clear and direct physical connection to federal land, (2) the transportation purpose, and (3) a connection with the FLMA mission.**

1. Does the system have a clear and direct physical connection to federal land?

Multimodal systems in the Catalog must be used to access Federal lands. Systems that are completely contained within federal lands and offer access to amenities around the site clearly facilitate visitor access and mobility within federal lands. Additionally, many multimodal systems located within Federal

lands also extend service beyond the FLMA boundary, whether offering a transit stop at an auxiliary parking lot or as part of a regional trail.

However, there are numerous transportation systems that operate completely outside of federal land boundaries but that help visitors to access the sites. These systems are seldom, if ever, owned or maintained by FLMAs, so data on these systems is less readily available. Under MAP-21, trails and transit that offer access to federal lands are eligible for funding under the Federal Lands Access Program, but the system owner (a local or state government) must apply for funds. One goal of the Catalog is to provide better data for making decisions about the Access Program, and therefore these systems must be considered.

The multimodal definition will consider area of service in the following three tiers:

i. **Systems that operate, fully or in part, within federal land boundaries.**

ii. **Systems that provide direct access to federal lands.** Examples include transit or ferry systems that provide service to a federal land access point and trails (or trail extensions) that terminate at a federal land. In most of these cases, the system owner is not a FLMA.

iii. **Systems that provide service within close proximity of a federal land.**[28] FLMAs recognize these systems as important opportunities to improve access to their lands, but the systems do not currently provide direct access.

Systems in the first two tiers will *always* be considered to meet the criteria of **clear and direct connection to federal lands.**

For systems in the third tier, the project team will include these systems if the data is readily available or provided by the FLMA. Additional data gathering efforts for these systems may be further evaluated after data for the first two tiers (that also meet the two criteria below) are included.

2. Does the system serve a transportation purpose?

FLMA transportation systems are often part of the visitor's recreation experience. However, the Multimodal Catalog definition must differentiate between systems that are purely recreational versus ones that have a transportation component, while recognizing that these categories are indistinct for most transportation on federal lands.

Transit

The Multimodal Catalog identifies a transportation purpose for any transit system operating in a federal land, as the system is either offering new access to visitors or providing access in lieu of the use of a private vehicle. **All transit systems meet the "transportation purpose" criteria.**

[28] Close proximity is defined as within one-half mile of the FLMA boundary.

Trails

The Catalog must differentiate transportation trails from those that are purely recreational; all FLMAs have numerous trails for hiking, biking, interpretation, and other recreational activities. The Alternative Transportation in Parks and Public Lands (ATPPL), a pre-cursor to the TRIP program, used the following three characteristics for non-motorized transportation system eligibility (simplified here as distinguishing between transportation and recreation trails):

1. Reduce or mitigate the number of auto trips by providing an alternative to travel by private auto;
2. Provide a high degree of connectivity within a transportation system; and
3. Improve safety for motorized and non-motorized transportation system users.[29]

Considering especially the first two characteristics of the ATPPL/TRIP eligibility, the project team identified types of trails that facilitate access to and within public lands by connecting critical visitor origins and destinations (see sidebar).

Sidebar: Examples of Transportation Trails

The following trail types usually meet the criteria of "transportation purpose" and should be included in the Catalog if the trail passes through or is adjacent to federal lands and meets the other two criteria.

- **Regional multi-use trails.** These trails are open to various non-motorized uses, such as walking, bicycling, and scooters. These trails offer safe travel and recreational corridors in both urban and rural areas.
- **FLMA-designated and supported national trails.** The National Trail System (NPS), National Scenic and Historic Trails (BLM), and National Recreation Trails. National Recreation Trails are designated by the Secretary of the Interior or the Secretary of Agriculture for local or regional significance but usually not federally owned.
- **FLMA trails that connect at least two vehicle-accessible amenities.** Trails that connect at least two amenities that are also accessible by private vehicle allow visitors to travel by non-motorized mode to access these amenities. The types of amenities that may be accessed by trails include parking lots, visitor centers, bird blinds, and picnic areas.
- **Trails that connect FLMA with gateway community.** If a trail offers access between a gateway community or city and a federal land, it can be a travel corridor for visitors.
- **Trails that connect FLMAs with each other.** Any trail that allows visitors to access two FLMA sites through non-motorized modes has a transportation purpose.

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[29] Hodges and Faulk. 2007. Alternative Transportation in Parks and Public Lands Program Manual. Federal Transit Agency. FTA-MA-20-1001-06.1. p. 22.

The most feasible way to gather trail data is to draw from existing FLMA databases. Each FLMA, therefore, has helped to define its own parameters for identifying trails with a transportation purpose (fitting within the ATPPL definition listed above) from its own data set (see Table 16).

Table 16: Trail Data from FLMA Data Sets

Agency	Criteria for Transportation Purpose	Notes
NPS	Front country, (usually) paved trails; class I and II trails with improved surfaces, most class III, IV, and V trails;[30] includes boardwalks, sidewalks, walkways, bike, multi-use, Americans with Disabilities Act (ADA) designated/compliant, all-terrain vehicle (ATV), four-wheel drive (4WD), Alaska dog, and snowmobile trails;[31] interface between modes[32]	Regional definitions may vary; see also ATPPL definition
BLM	Trail included in 2010 *Alternative Transportation Systems Inventory Report*[33]	Augmented with data from BLM State Offices
USACE	Trail designated in OMBIL as multipurpose or bicycle	
USFWS	Trail identified in second and/or third cycle of the FHWA National Trails Inventory effort	
USFS	Maintenance level 3-5 trails	USFS is currently developing criteria for FLTP-eligible trails, which may be included in future Catalog updates

The Multimodal Catalog will focus on the trails identified by FLMAs from their own datasets, as well as regional and national trails with data available to show their intersection with or adjacency to federal lands. The Multimodal Catalog also will work with FLMA representatives to identify any additional appropriate data sources.

3. Does the system serve the mission of the FLMA?

Through transportation plans and strategies, FLMAs have established how their multimodal systems advance their missions and goals. For example, FLMAs may use transit systems in connection with resource protection by controlling access to areas with sensitive species, or they may add a bicycle trail with interpretive kiosks to enhance the visitor's experience. To simplify the many complex ways that a

[30] See Federal Trail Data Standards for definitions of trail classes. Accessed 8 May 2014: http://www.nps.gov/gis/trails/Doc2/Appendix_A%20_Trail%20Class%20Matrix_11_08_2011_master.pdf.

[31] NPS transportation trails were determined by: (1) filtering out all backcountry trails, horse trails, portage trails, water trails, pack animal trails, cross-country trails, and frontcountry class I and II trails that are native or gravel surface in the NPS' national trails database, and (2) refining the resulting list using characteristics identified in Table 2. Description for trails included in the NPS National Long Range Transportation Plan provided in email by Charles Notzon, NPS Project Specialist (Economics). 2 May 2014.

[32] National Park Service. 2013. National Park Service Transportation Reauthorization Resource Paper. Accessed 8 April 2014: http://www.nps.gov/transportation/pdfs/NPS_Reauthorization_Resource_Paper.pdf.

[33] Bureau of Land Management. 2010. *Bureau of Land Management Alternative Transportation Systems Inventory Report*. Accessed 29 December 2015: https://www.volpe.dot.gov/transportation-planning/public-lands/bureau-land-management-alternative-transportation-systems.

system could serve the FLMAs mission and goals, **the Catalog assumes that assets owned and operated by FLMAs have a mission connection.**

For systems that are not owned and/or operated by an FLMA, the project team looks to the NPS transit systems definition in the NPS National Transit Inventory (2012):

i. *Moves people by motorized vehicle on a regularly scheduled service;*

ii. *Operates under one of the following business models: concessions contract; service contract; partner agreement including memorandum of understanding, memorandum of agreement, or cooperative agreement (commercial use authorizations are not included); or NPS owned and operated; and*

iii. *All routes and services at a given unit that are operated under the same business model by the same operator are considered a single NPS transit system.*

The second component focuses on a business model that demonstrates that the system is important to the NPS mission. **Transit systems in which the FLMA has a financial stake or a formal contract or agreement in place shows FLMA efforts to provide a service**; NPS considers the business model an objective way to demonstrate mission importance.

The Multimodal Catalog uses this as the baseline definition for systems that operate within FLMA lands. FLMAs may also identify transit systems outside of these business models that have a mission connection and communicate these systems with the project team.[34]

Definition Flexibility

The Multimodal Catalog recognizes the challenges in defining transportation systems across FLMAs, all of which have different missions, visitation patterns, and transportation needs. The multimodal systems definition provides a focus for the Catalog and bounds for the types of systems to prioritize for inclusion.

Any system that meets all three criteria listed above shall be included in the Catalog.

Any system that meets two of the criteria above *may* be included but shall be designated separately for inventorying and cost estimation purposes. FHWA and the FLMAs have less need for the cost estimates of capital, operations, and maintenance needs for those systems that are not owned or operated by – or through an agreement with – FLMAs. For these systems, the Catalog shall prioritize data that can help FLH and FLMA staff identify these systems and connect with the system owner/operator. This would include the following data fields:

- System name;
- Location;

[34] The project team anticipates that non-NPS FLMAs will have a small number of transit systems to include that do not meet this criterion but that the FLMAs will identify for inclusion in the Catalog.

- Organization and contact information for system owner, operator, and maintainer;
- FLMA unit connections;
- Other regional destination connections (including cities and towns); and
- Eligible funding sources.

FHWA recognizes that FLMAs assign importance to a number of multimodal systems that do not fit within the Catalog's definition. The Catalog can provide a framework for data collection, as well as sources for information on multimodal systems. FLMAs can then use this framework to add additional systems that are not contained within the Catalog but that are priorities for the FLMA.

Multimodal Definitions from FTA and FLMAs

I. FEDERAL TRANSIT ADMINISTRATION

Transit in Parks Program

"…transportation by bus, rail, or any other publicly or privately owned conveyance that provides to the public general or special service on a regular basis, including sightseeing service. Such term also includes non-motorized transportation systems (including the provision of facilities for pedestrians, bicycles, and non-motorized watercraft)."[35]

"…can help land managers maintain the balance between protecting natural resources and providing visitor access. …services and facilities that provide visitors with a viable alternative to their automobile for traveling through and experiencing a park or public land."[36]

"The goals of [TRIP/ATS] are to enhance the protection of national parks and federal lands and increase the enjoyment of those visiting them. This includes to:

- Conserve natural, historic, and cultural resources;
- Reduce congestion and pollution;
- Improve visitor mobility and accessibility;
- Enhance visitor experience; and
- Ensure access to all, including persons with disabilities."[37]

[35] SAFETEA-LU (49 U.S.C. 5320).
[36] TRIPTAC FAQ, http://www.triptac.org/AboutTRIPTAC/FAQs/Default.html#alter.
[37] Guidance for Project Proposals, TRIP, 2010, (x).

II. NATIONAL PARK SERVICE

Alternative Transportation Program

"Alternative Transportation Systems (ATS) integrate all means of travel within a park, including transit, bicycle and pedestrian linkages, and automobiles. Regardless of their size or location, parks follow the objectives of the Alternative Transportation Program (ATP): (1) improving the visitor experience, (2) protecting natural and cultural resources, (3) promoting economic development, (4) fostering strong partnerships, (5) enhancing visitor safety and security, and (6) enabling new services."[38]

"…contribute to preserving resources, including improvements to air quality, soundscapes, and reduced wildlife/auto collisions … reduce fossil fuel consumption and greenhouse gas emissions."[39]

2012 NPS National Transit Inventory

"[NPS transit]:

1. Moves people by motorized vehicle on a regularly scheduled service;
2. Operates under one of the following business models: concessions contract; service contract; partner agreement including memorandum of understanding, memorandum of agreement, or cooperative agreement (commercial use authorizations are not included); or NPS owned and operated; and
3. All routes and services at a given unit that are operated under the same business model by the same operator are considered a single NPS transit system."

III. FISH AND WILDLIFE SERVICE

Regional Alternative Transportation Evaluation Report

"Alternative transportation systems generally include any travel means other than personal automobile, such as:

- Motorized transportation systems operating internally within stations;
- Shuttles and van transit connecting stations with other destinations;
- Regional transit connections (bus, light rail, trolley, commuter rail, passenger rail);
- Bicycle and pedestrian infrastructure (sidewalks, paths, bicycle lanes, regional trails);
- Water-based transportation; and
- Publicly and privately operated systems"[40]

[38] NPS Accomplishments in Alternative Transportation, 2003 presentation (x).
[39] ATP Home Page, http://www.nps.gov/transportation/alternative_transportation.html.
[40] RATE Report Outline & Template.

"The three most popular alternative modes of travel are boats, offsite parking lots that provide trail access, and bus/trams that operate during special events to accommodate large, but infrequent influxes of visitors.

The access, mobility, and connectivity performance measure established in the National LRTP is the percentage of units accessible through alternative modes of transportation (such as transit, bicycle, pedestrian, or waterway)."

IV. BLM

"ATS include not only vans and shuttle services but also connections to regional transit systems, regular sightseeing tours, and nonmotorized connections for transportation purposes. ATS bring benefits to public lands, including conservation of natural and cultural resources, reduction of congestion and pollution, improvement of visitor mobility and accessibility, and enhanced visitor experience. These benefits align with the BLM's goals for visitor experience and resource preservation.

"In BLM sites with limited financial and staff resources and low or dispersed visitation, effective ATS capitalize on existing resources that may not require intensive transportation planning and management capacities from the agency. The most successful of the BLM's ATS, as captured in the previous sections, have looked to their current assets first before investing in new infrastructure or capital. These assets include:

- Transit service;
- Nonmotorized networks, often managed by local governments, adjoining public lands, or non-profit groups;
- Major BLM-owned trail infrastructure or corridors serve as nonmotorized regional transportation networks;
- Tour buses that include BLM sites or pass through BLM lands as part of existing tours; and
- Local residents preferences to access trails from home by bicycle or by foot" [41]

V. USFS

"ATS refers to transit systems and transit or transportation enhancements eligible under Titles 49 and 23 that enhance transportation service or use and that are physically or functionally related to transit facilities, such as parking, pedestrian and bicycle access, walkways, and similar amenities that provide access to and within Forest Service lands.

[41] BLM ATS Inventory Report, 2010.

"Transit vehicles identified in this study include trams, standard transit buses, small buses, historic trolleys, trolley cars, waterborne vessels, and aerial tramways. Other essential transit investments include maintenance and storage facilities and ferry piers. Transit enhancements identified include parking facilities, connections with non-motorized trails, shelters, and signage and information services."[42]

VI. USACE

"In a recent year, the top recreational activities were: [walking, driving for pleasure, swimming, picnicking, fishing, bicycling, viewing wildlife, camping, and hunting.]"[43]

[42] Summary of Forest Service ATS Needs, Federal Lands ATS Study, 2004 (x).
[43] A definition for "multimodal" or "ATS" has not been defined by USACE, but multimodal activities do take place on USACE lands. Retrieved from:
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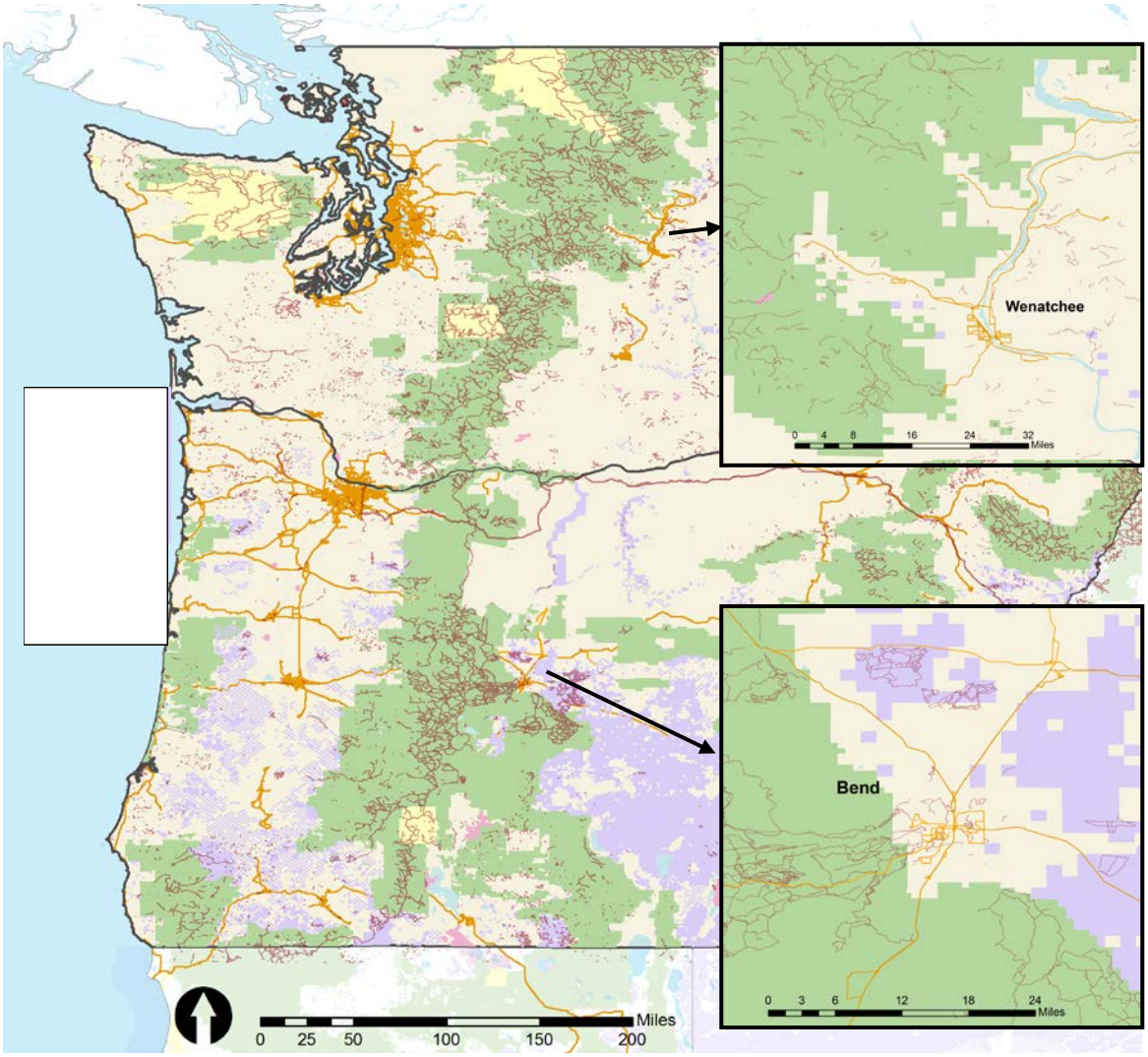
Appendix D: Maps from GIS Pilot



Appendix E: Trail and Transit Cost Estimate References

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