



National Digital Trails Project

US GEOLOGICAL SURVEY

NATIONAL GEOSPATIAL PROGRAM

NATIONAL TECHNICAL OPERATIONS CENTER



Why Trails?

- ▶ Trails are naturally inclusive.
- ▶ Access to our natural areas contributes to better health and increased economic development.
- ▶ Improving access for all communities promotes equity.
- ▶ Trails are an important part of our Nation's transportation system.



Why USGS?

- ▶ The National Geospatial Program
- ▶ The National Map: Topographic Information for the Nation
- ▶ Data Themes: Boundaries, elevation, hydrography, land cover, structures, and transportation
- ▶ Data Products: US Topo maps; 3DEP Elevation; National Hydrography Dataset



Objectives

- ▶ Project Overview
- ▶ Tools and data
- ▶ TRAILS Demo



Project Overview

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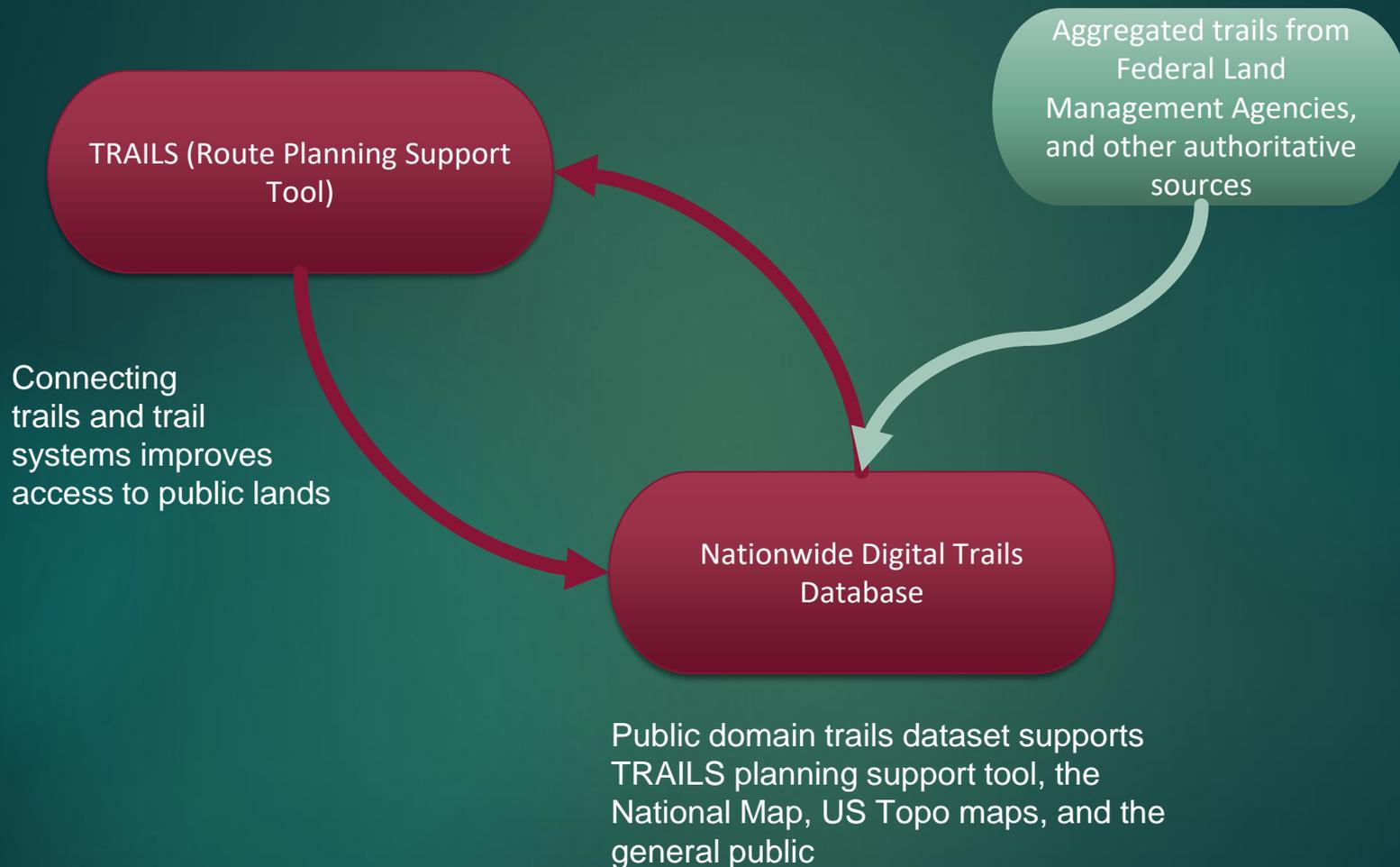
“Connecting trails systems to expand recreational opportunities on the Nation’s public lands.”



Centennial Mountains by Bureau of Land Management Montana and Dakotas

Primary Goals

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#1 - Web-based trail planning support tool (TRAILS) to help identify potential routes for connecting existing trails and trail systems

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- ▶ Released on GeoPlatform 12/2019
- ▶ Continuing refinements



The screenshot displays the TRAILS web application interface. On the left, there is a "Scenario Settings" tab and a "Filter" button. Below the filter, it says "Showing 47 of 77 proposed trails". A list of trails is shown, each with a checkbox, a title, terrain constraint, connector length, proposed network length, and scenario. The trails listed are:

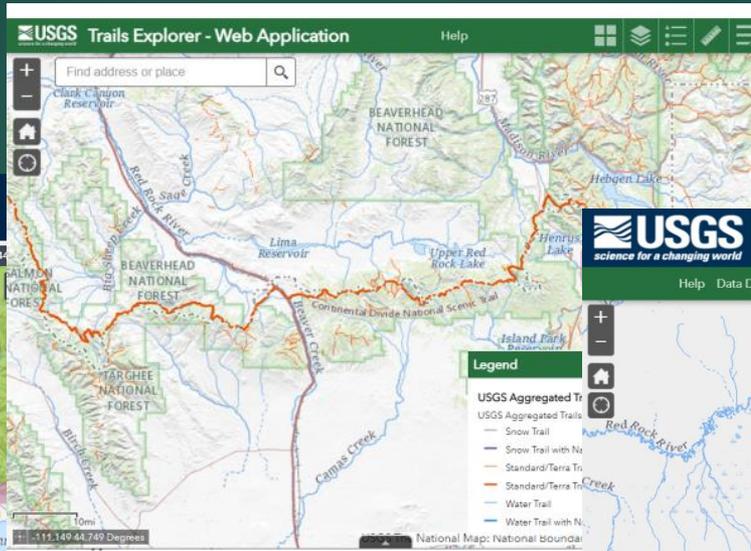
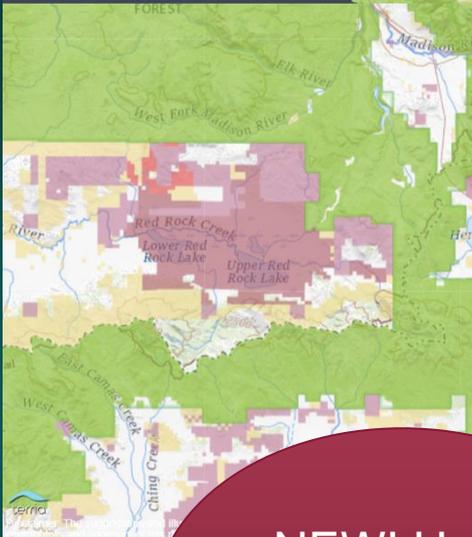
- Rock Creek Trail to Mt. Healy Overlook Trail**: Terrain Constraint: **Low**, Connector Length: 1.55 Miles, Proposed Network Length: 49.22 Miles, Scenario: Healy - Cantwell - Kesugi Ridge.
- Jack River Overlook to Null**: Terrain Constraint: **Low**, Connector Length: 0.96 Miles, Proposed Network Length: 5.40 Miles, Scenario: Healy - Cantwell - Kesugi Ridge.
- East Fork Chulitna to Null**: Terrain Constraint: **Low**, Connector Length: 1.07 Miles, Proposed Network Length: 3.10 Miles, Scenario: Healy - Cantwell - Kesugi Ridge.
- Savage Cabin Interpretive Trail to Null**: Terrain Constraint: **Low**, Connector Length: 1.33 Miles, Proposed Network Length: 8.09 Miles, Scenario: Healy - Cantwell - Kesugi Ridge.
- Jack River to Middle Fork Chulitna**: Terrain Constraint: **High**.

At the bottom of the list are buttons for "Check All", "Uncheck All", and "Delete Checked". On the right, a map of the region in Alaska is shown, with various rivers and trails highlighted in different colors (green, yellow, red, blue). The map includes labels for "ALASKA", "Tuklat River", "River", "Savage River", "Sanitaru River", "Lignite", "Suntrana", "Gamer", "Vaner Fork", "ALASKA", "West Fork Chulitna River", "Eldridge Glacier", "Chulitna River", "Tsuena Creek", "Susitna River", and "DENALI HA".

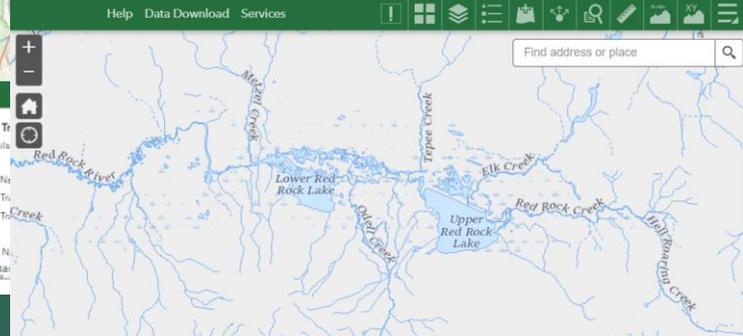
Geospatial Analysis: Input Layers



Protected Areas Database of the United States



USGS Home
Contact USGS
Search USGS
New: topoBuilder



NEW! User-defined custom layer



Candidate connector routes are ranked, displayed, and shared in a web-map interface

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USGS Trail Routing, Analysis, and Information Linkage System (TRAILS)
science for a changing world

3 Refine Scenarios and Explore Results

Scenario: First Go! (Default)

Scenario Settings Explore Trails

Filter Sort: Name

Showing 14 of 14 proposed trails

- Proposed Network Length: 38.64 Miles
Switchbacks: Not Analyzed
- ALAMO SPRING to Null**
Terrain Constraint: **Medium**
 Connector Length: 2.33 Miles
Proposed Network Length: 80.61 Miles
Switchbacks: Not Analyzed
- Trail to EAST FORK**
Terrain Constraint: **Low**
 Connector Length: 3.96 Miles
Proposed Network Length: 81.51 Miles
Switchbacks: Not Analyzed
- PERALTA CANYON to CERRO PELADO**
Terrain Constraint: **High**
 Connector Length: 5.48 Miles
Proposed Network Length: 24.54 Miles
Switchbacks: Not Analyzed
- CERRO PELADO to EAST FORK**
Terrain Constraint: **High**
 Connector Length: 5.06 Miles
Proposed Network Length: 24.54 Miles
Switchbacks: Not Analyzed

Find address or place

Elevation Profile

Hover over or touch the Elevations Profile chart to display elevations and show location on map.
DEM Resolution: 30 meters

Elevation in Feet

Distance in Miles

8,820.98 Feet

9,377.11 Feet, 11.49%

9,000

0 1

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Pro...
POWERED BY esri

Dashboard for External Collaboration

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TRAILS Review Da... Constraint All Constrains Manager Type All Manager Names None Network Length 0 1500 Scenario First Gol*

Proposed Trails by Network Length

West Ski Trail Loop & ALAMO SPRING

Low

Proposed Network Length: **89.02 Miles**
Connector Length: **2.82 Miles**
Number of Switchbacks:

Alamo Boundary Trail & ALAMO SPRING

Low

Proposed Network Length: **83.04 Miles**
Connector Length: **3.75 Miles**
Number of Switchbacks:

Trail & EAST FORK

Low

Proposed Network Length: **81.51 Miles**
Connector Length: **3.96 Miles**
Number of Switchbacks:

ALAMO SPRING & Null

Medium

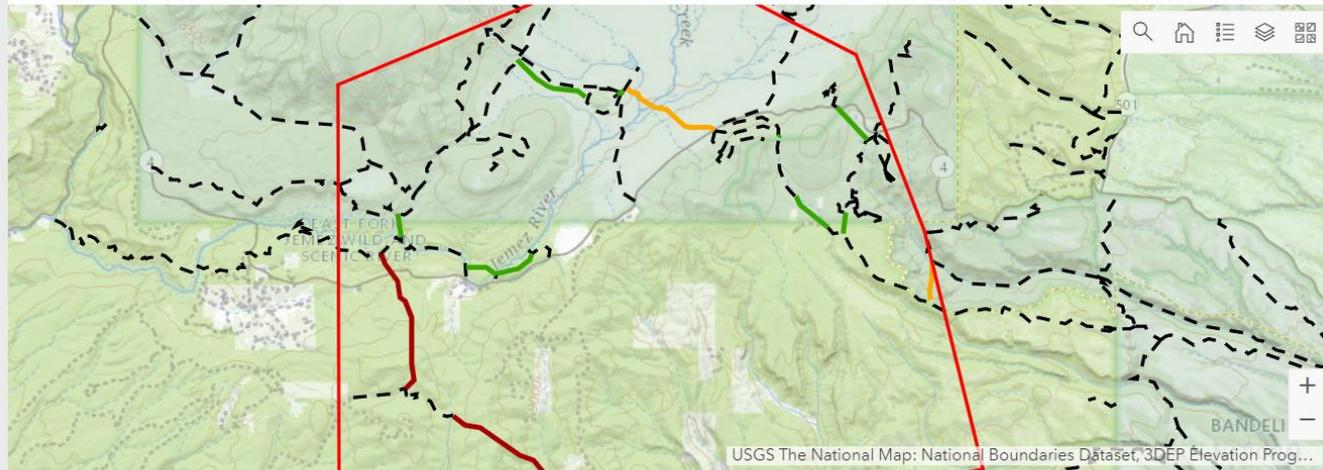
Proposed Network Length: **80.61 Miles**
Connector Length: **2.33 Miles**
Number of Switchbacks:

Last update: a few seconds ago

Proposed Network Length Terrain Constraint

Proposed Trails by Constraint

Low Medium High



Proposed Trails by Network Length



Proposed Network Length Terrain Constraint Elevation Profile

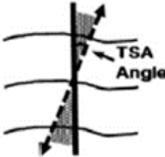


Recent Improvements

- ▶ Ability to add custom layers to the analysis
- ▶ Implementation of “switchback” recommendation
- ▶ Utilization of latest trail data

Current Development

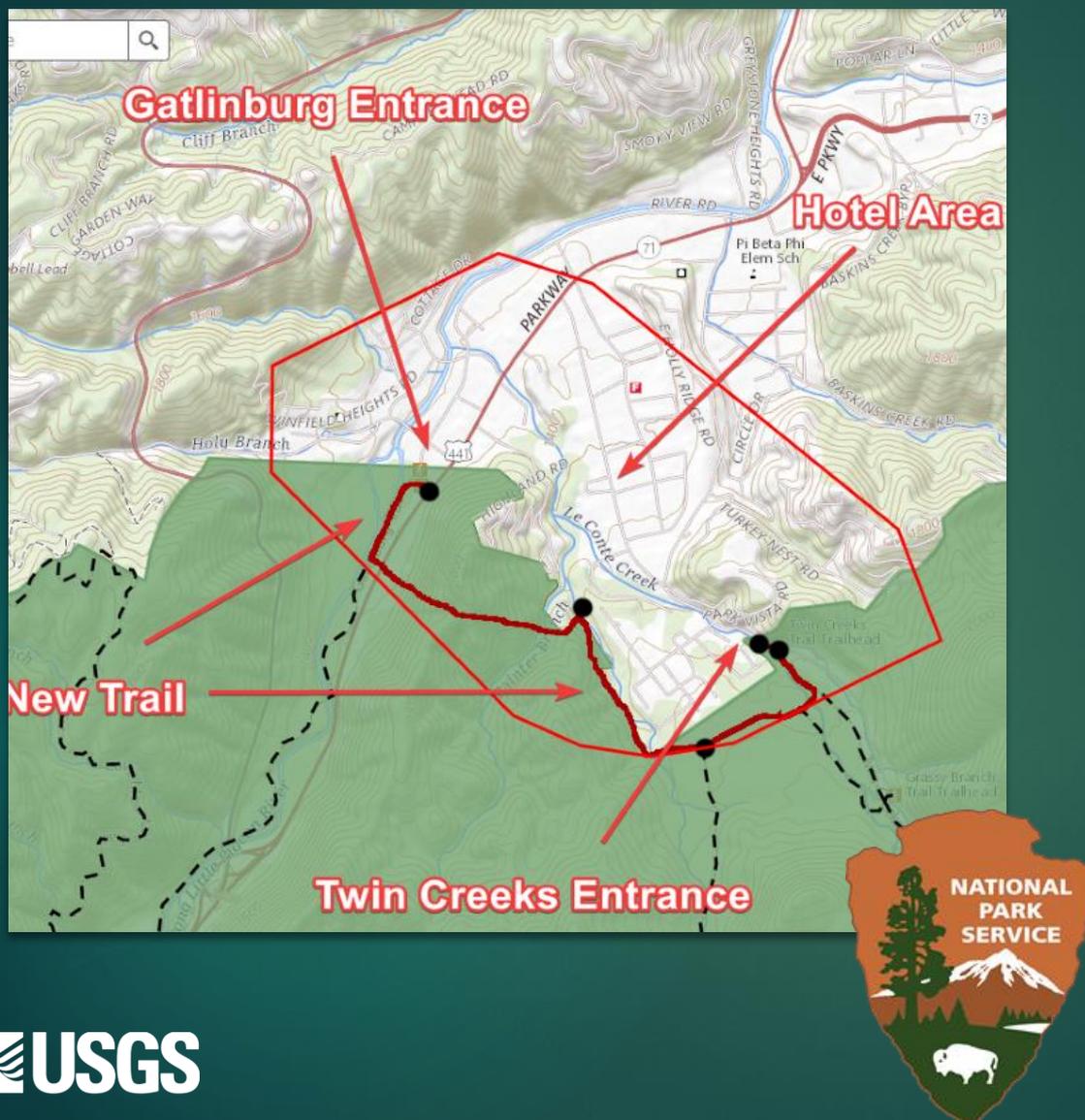
- ▶ Improving sustainable trail planning analysis
- ▶ Incorporate viewshed analysis
- ▶ Updated PAD-US 3.0

Trail Slope Alignment (TSA)	Degradation Potential	Trail Profile
<i>Fall-aligned Trails</i>		
0-22° 	Very High – tread drainage rarely possible; erosion, widening, & muddiness probable	
23-45° 	High – tread drainage is often difficult; erosion, widening, & muddiness are likely	
<i>Side-hill Trails</i>		
46-68° 	Low – tread drainage is possible; low potential for problems	
69-90° 	Very Low – tread drainage is easy; very low potential for problems	

Connecting FWS and USFS trail systems

- ▶ Canaan Valley NWR – 23 miles of trails and over 57,000 visitors per year.
- ▶ Dolly Sods Wilderness – 47 miles of trails.
- ▶ West Virginia.



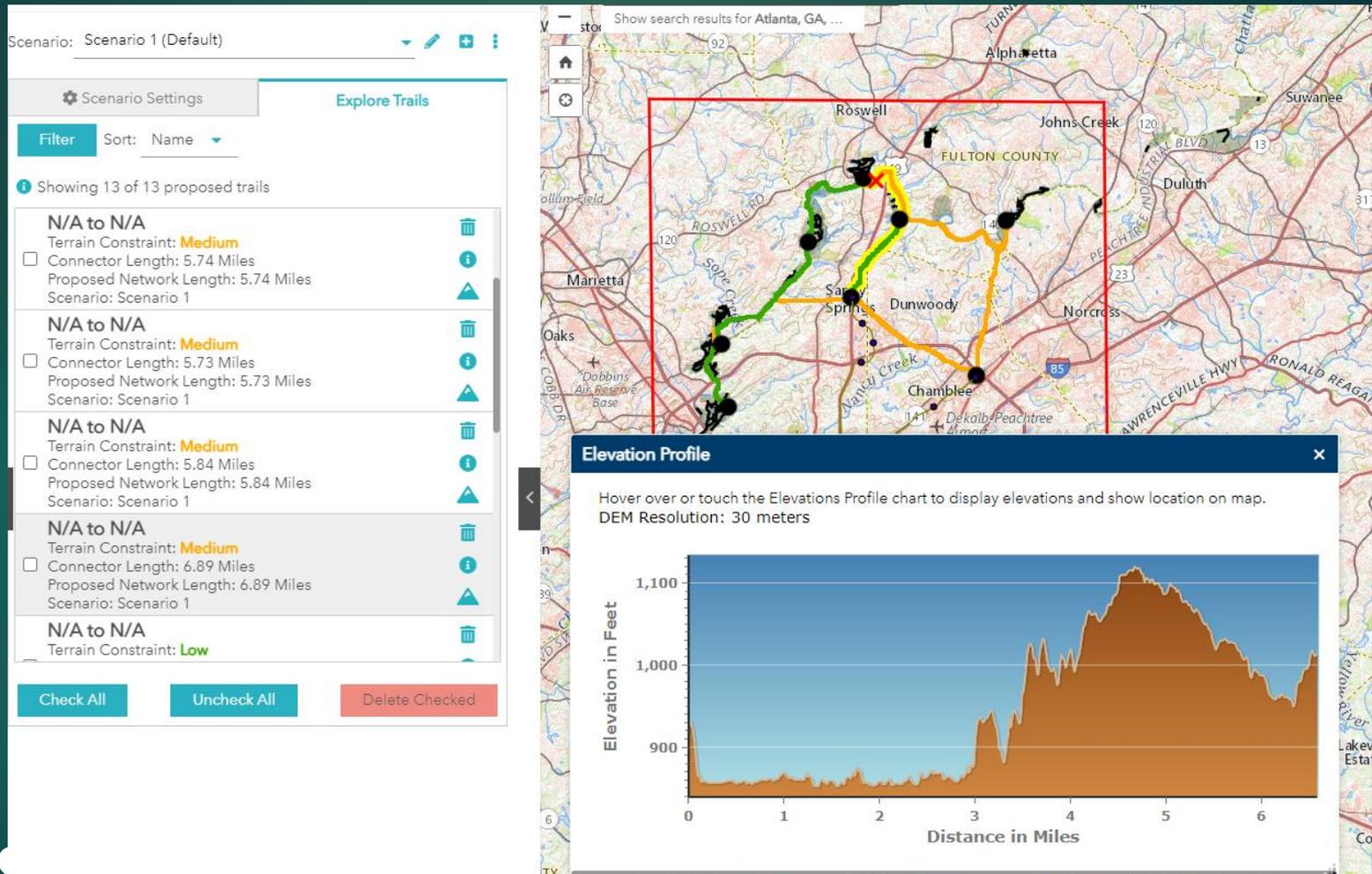


Great Smoky Mountains National Park

- ▶ 12.5 million visitors.
- ▶ Reduces congestion.
- ▶ Enhances visitor experience.
- ▶ Gatlinburg, TN.

Transit Connection in Atlanta

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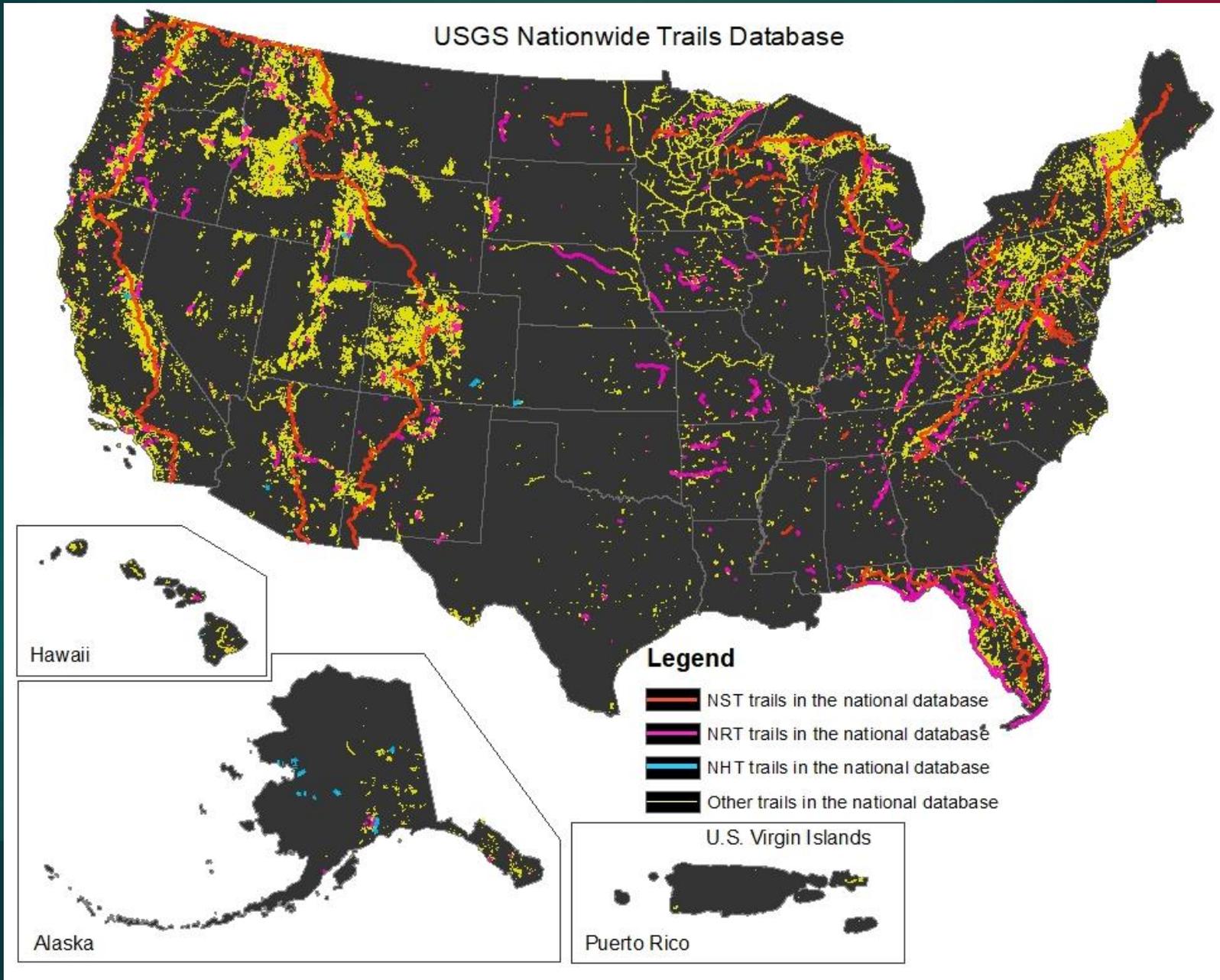
Benefits – Trail Planning Tool

- ▶ Supports efficient trail planning and visualization.
- ▶ Promotes collaboration between federal, state, and local agencies.
- ▶ Enhances ability to share information with stakeholders and decision makers.
- ▶ Web-based, no special software or advanced mapping skills required.
- ▶ Utilizes aggregated nationwide trail dataset.
- ▶ Supports advanced analysis.



Goal 2- Nationwide Digital Trails

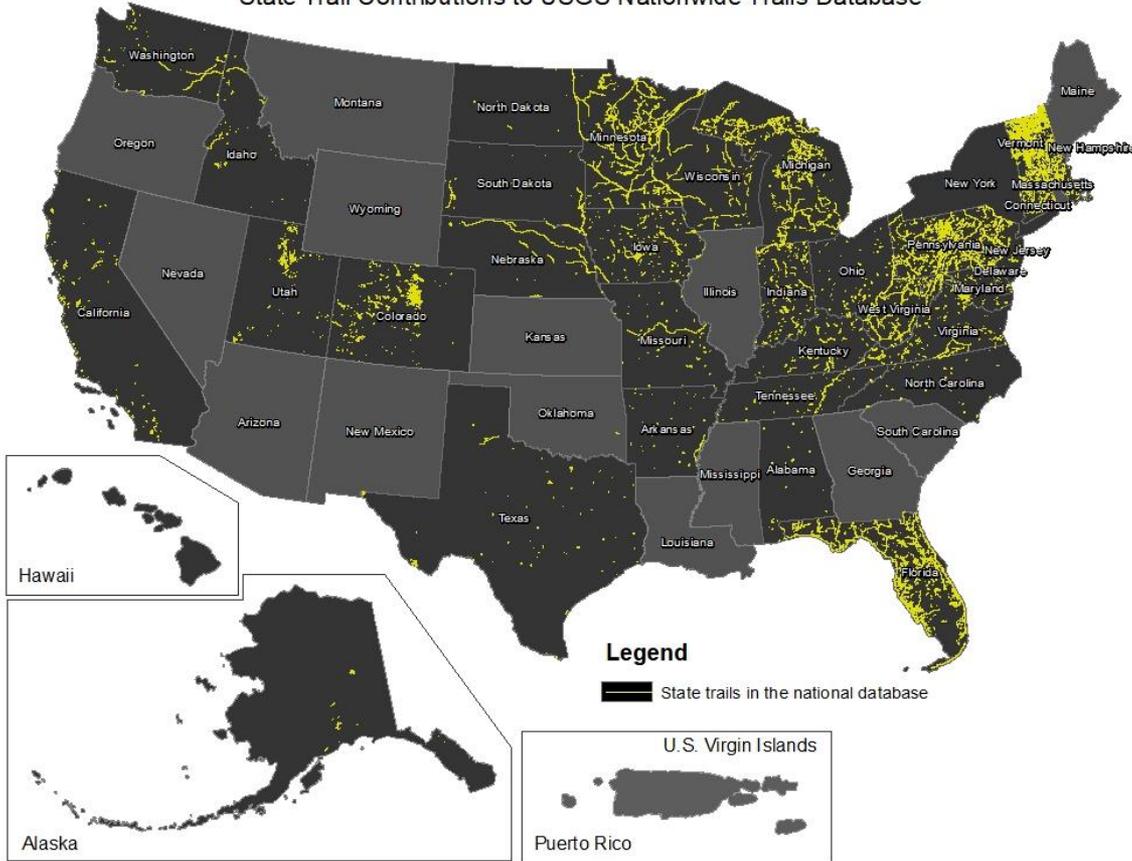
17



State Participation

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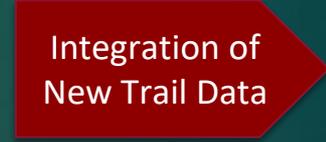
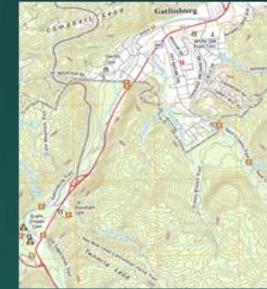
State Trail Contributions to USGS Nationwide Trails Database



- ▶ 36 States & counting.
- ▶ Federal GIS Trail Schema: promotes data interoperability.
- ▶ Trail Data Portal – streamlines data integration.
- ▶ USGS Trails Explorer.

Trail Data Portal

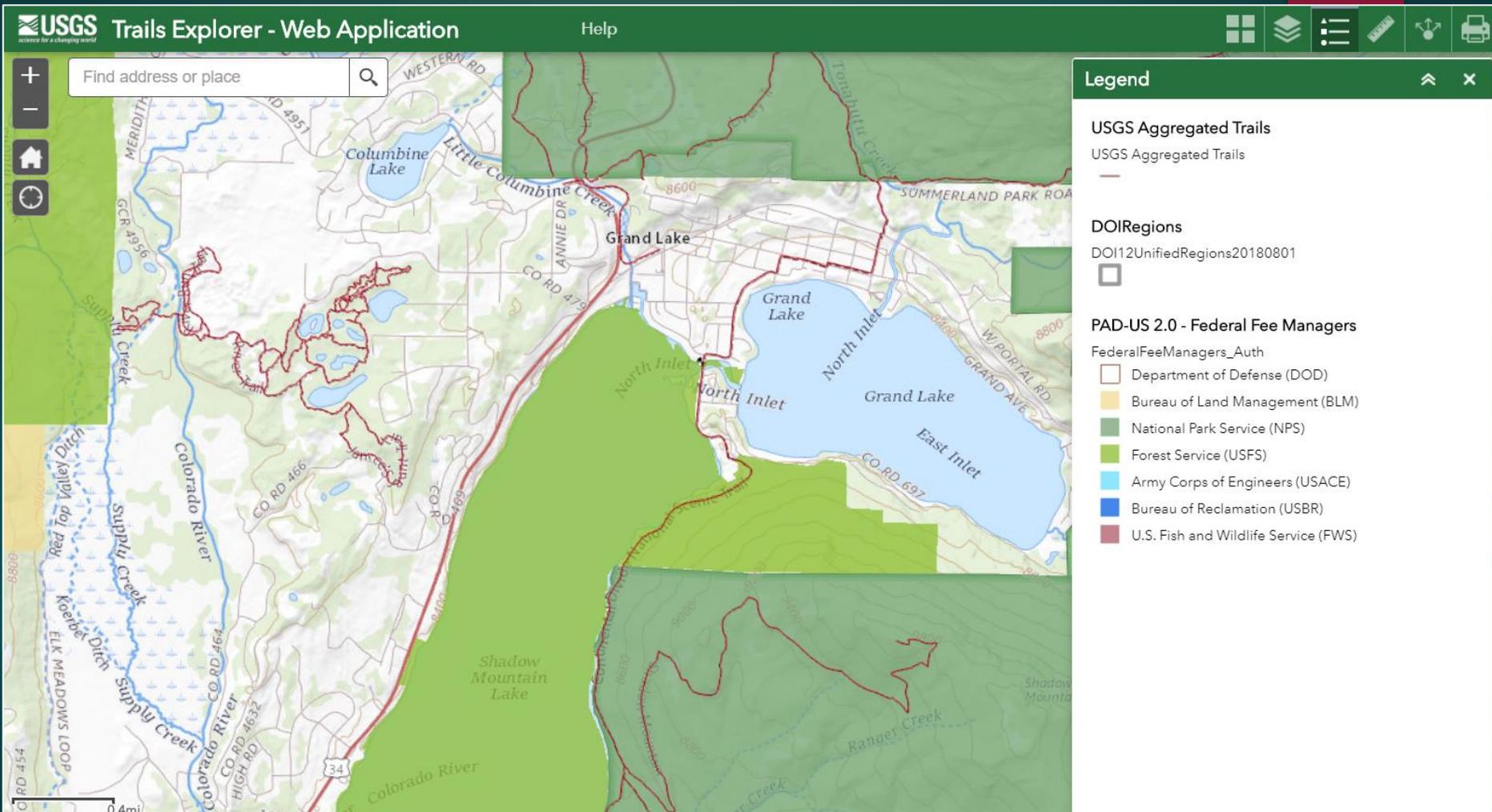
19



- ▶ Streamlines data aggregation workflow
- ▶ Improves communication between USGS and data providers
- ▶ Key to building and maintaining trails dataset

Benefits: Provides a Clear Picture of the “Trails Next Door”

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Benefits: Federal GIS Trail Schema Facilitates Data Sharing



*Caribou-Targhee National Forest,
US Forest Service*

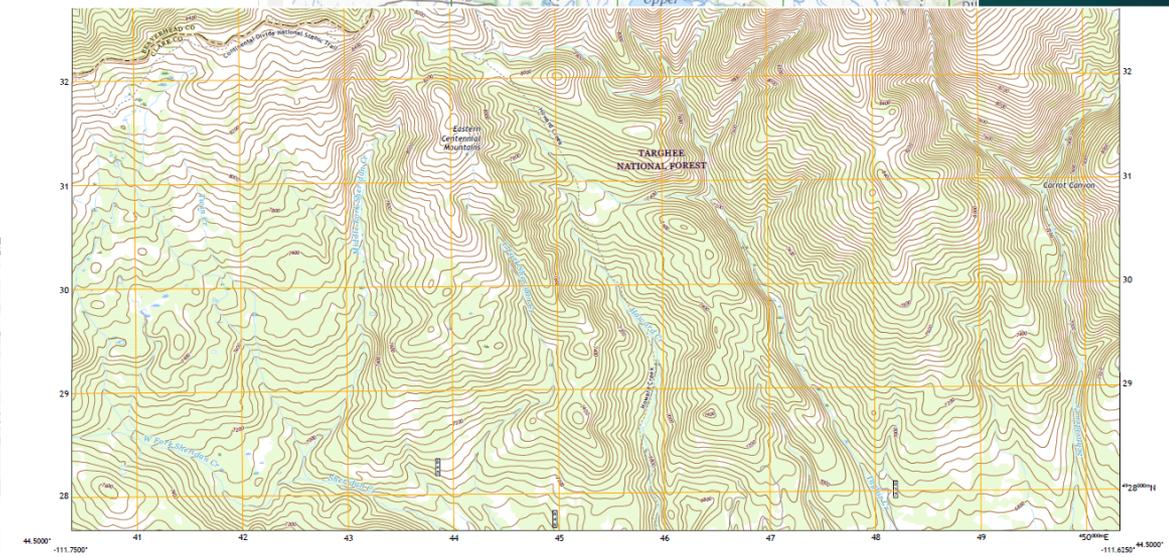
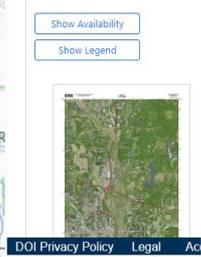
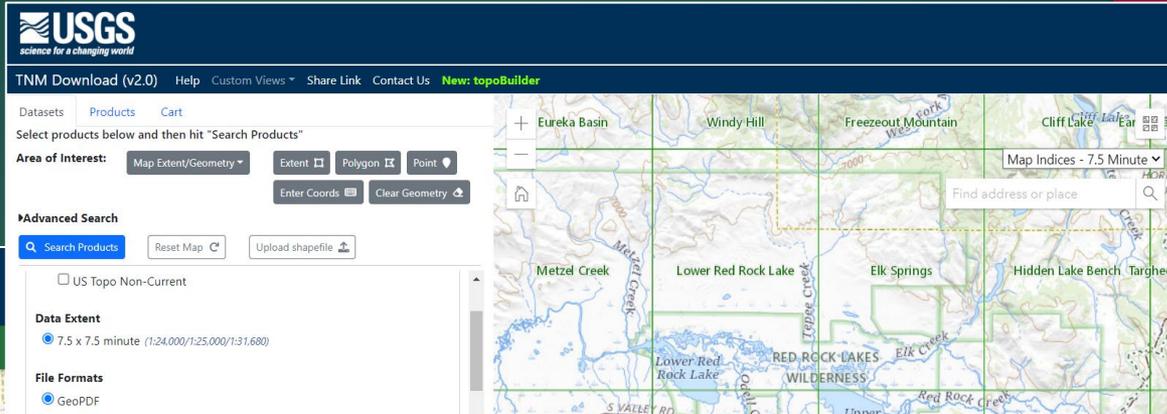
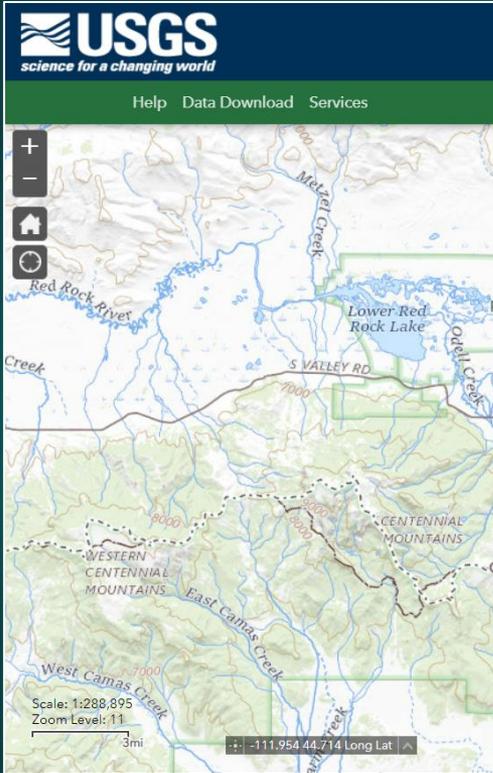


Field Name	Definition	Field Type	Field Length
Name	Trail Name	Text	45
Trail Type	Basic surface (Terra, Water, Snow)	Domain (choose 1)	N/A
Trail Use Type	Hike, bike, horse, etc.	Domain (choose 1 or more)	N/A
Data Source	Who provided the data?	Text	150



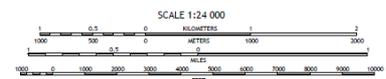
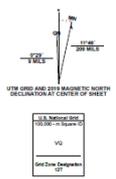
Name	Trail Type	Trail Use Type
Paddywhack Trail	Terra	Hiking

Benefits: Supports the National Map and US Topo Maps



Produced by the United States Geological Survey
 North American Datum of 1983 (NAD83)
 World Geodetic System of 1984 (WGS84) Projection and
 1:000,000 georeferenced Topographic Map, Zone 12T
 This map is not a legal document. Boundaries may be
 generalized for this map scale. Private lands with government
 reservations may not be shown. Obtain permission before
 entering private lands.

Imagery: U.S. NIP, October 2015; January 2018
 Roads: within US Forest Service Lands: FPOpen Data
 with limited Forest Service updates 2017
 Name: GNS, 1978-2020
 Hydrography: National Hydrography Dataset, 2002-2020
 Contours: National Elevation Dataset, 2001
 Boundaries: National Wetlands Inventory, 2018
 Public Land Survey System: BLM, 2018
 Wetland: PWS National Wetlands Inventory 1982-2009



1	2	3
4	5	6
7	8	9

QUADRANGLE COORDINATES

ROAD CLASSIFICATION

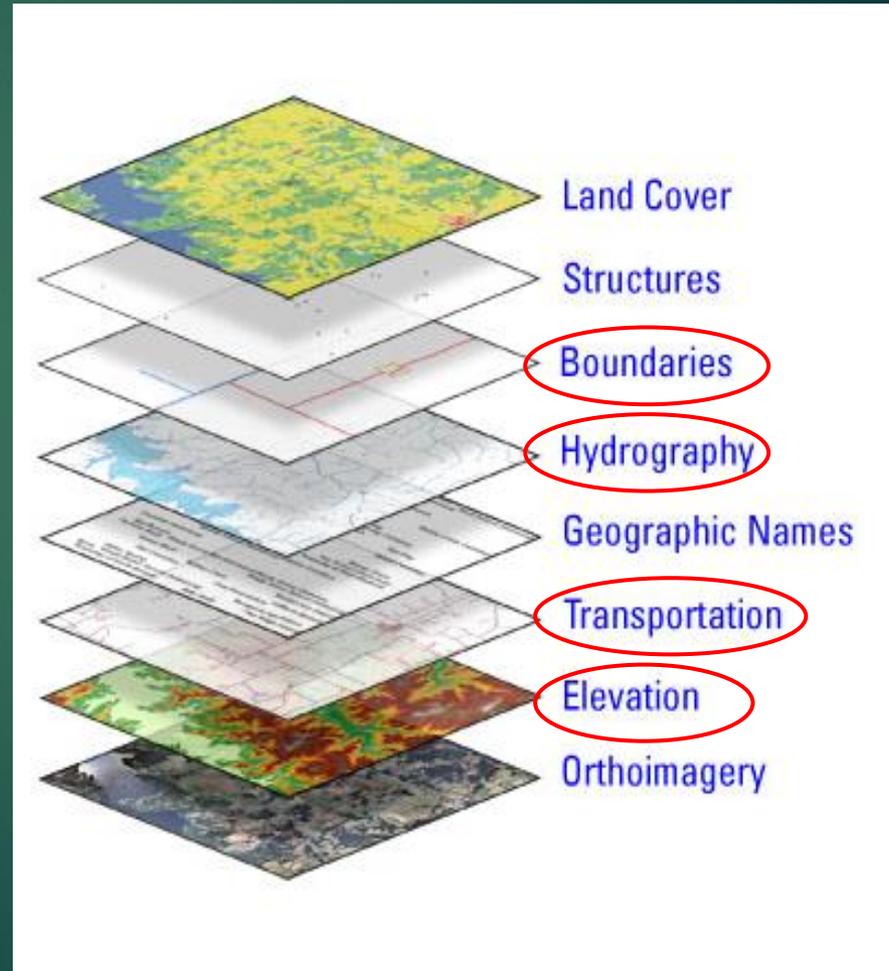
Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	and
Interstate Route	US Route
PS Primary Route	PS Passenger Route
	PS High Clearance Route

Check with local Forest Service unit for current travel conditions and restrictions.

UPPER RED ROCK LAKE, MT, ID
 2020

Benefits: Supports GIS analysis

“A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth’s surface.” [[National Geographic](#)]



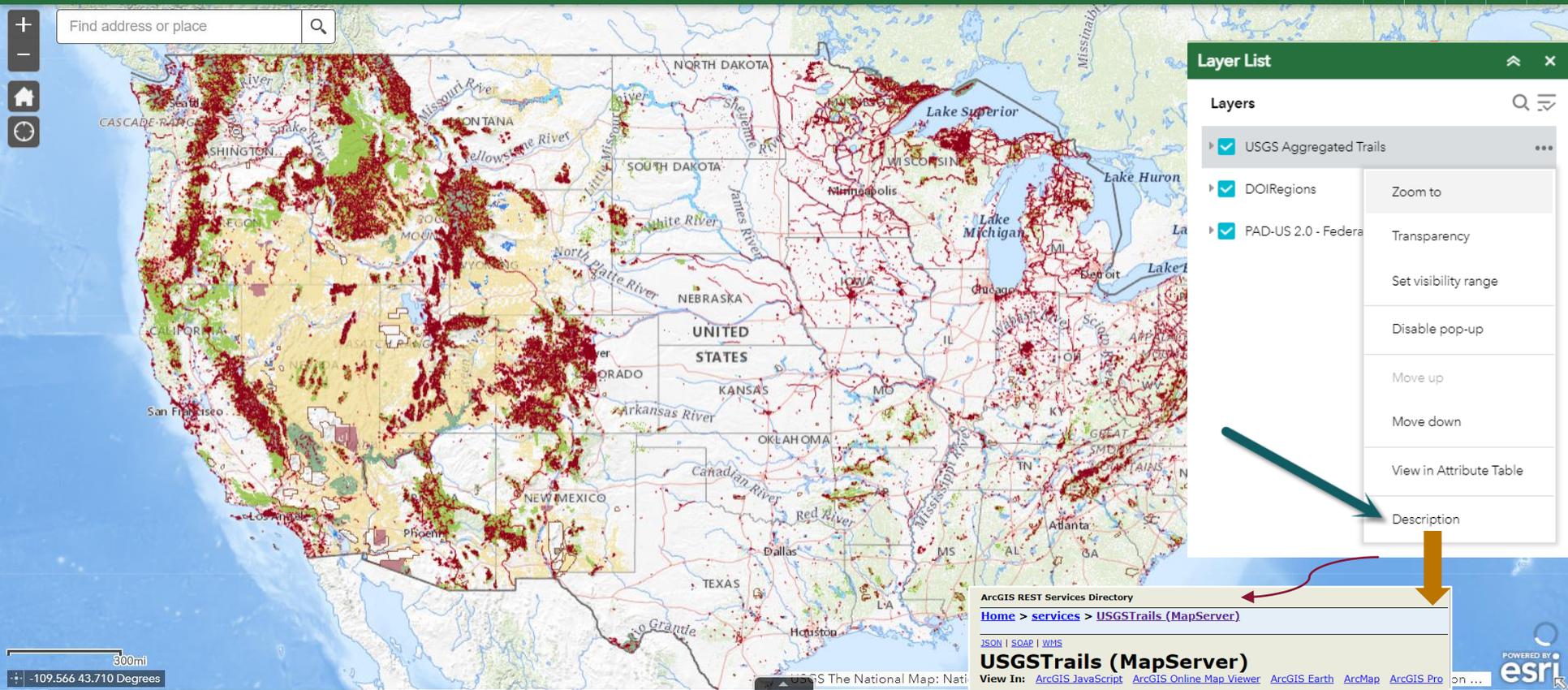
Accessing Trails & Other USGS Data

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USGS Trails Explorer

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Layer List

Layers

- USGS Aggregated Trails
- DOIRegions
- PAD-US 2.0 - Federal

Zoom to

Transparency

Set visibility range

Disable pop-up

Move up

Move down

View in Attribute Table

Description

ArcGIS REST Services Directory

[Home](#) > [services](#) > [USGS Trails \(MapServer\)](#)

[JSON](#) | [SOAP](#) | [WMS](#)

USGS Trails (MapServer)

View In: [ArcGIS JavaScript](#) [ArcGIS Online Map Viewer](#) [ArcGIS Earth](#) [ArcMap](#) [ArcGIS Pro](#)

View Footprint In: [ArcGIS Online Map Viewer](#)

Service Description: Recreational trails of the United States, including National Scenic Trails.

Map Name: Layers

[Legend](#)

[All Layers and Tables](#)

[Dynamic Legend](#)

[Dynamic All Layers](#)

Layers:

- [TrailsSegment](#) (0)



USGS National Map Data Services

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USGS *The National Map Viewer*

The National Map - Service Endpoints

[How To Use](#) [Custom Views](#) [Follow @USGSTNM](#)

Subscribe to SNS messages to receive emails regarding changes to the status of TNM services - [Get Notifications about Changes to our Services](#)

⚠ Notice: Service URLs are case-sensitive. All USGS services are available through SSL connections by using the https protocol.

[Expand All](#) [Collapse All](#) [Reset View](#) [Show Only These Categories](#)

USGS National Map publishes **41** services in the list below.

- Base Maps (Cached)
- Availability/Index Overlays (US Topo, 3DEP...)
- Theme Overlays (NHD, Names, Elevation, Transportation...)**
- Natural Hazards
- Other Featured Data
- Web Feature Services (WFS)**
- WCS Services
- Land Cover
- Other Services

[Accessibility](#) [FOIA](#) [Privacy](#) [Policies and Notices](#)

U.S. Department of the Interior | U.S. Geological Survey
URL: <https://viewer.nationalmap.gov/services/> Page Last Modified: 26-Jun-20
Page Contact Information: [The National Map](#)



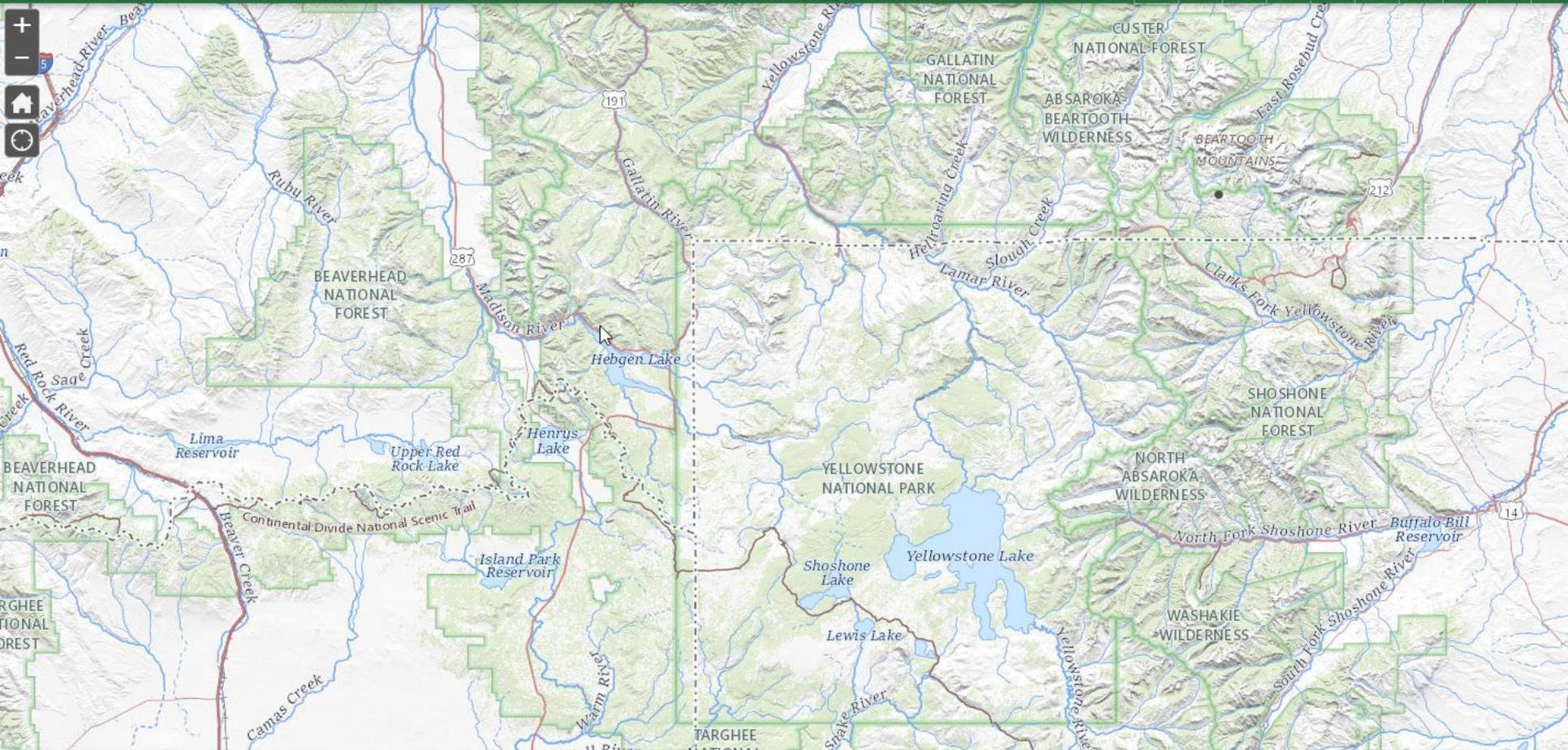
<https://viewer.nationalmap.gov/services/>

USGS National Map Data Viewer

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Help Data Download Services



Datasets

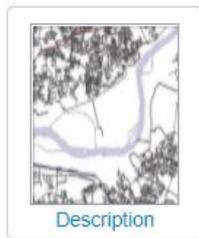
[Advanced Search Options](#)

Find Products

National Land Cover Database (NLCD) data can be downloaded at the MRLC website.

 Imagery - NAIP Plus (1 meter to 1 foot) Map Indices Names - Geographic Names Information System (GNIS) Small-scale Datasets Structures - National Structures Dataset Topo Map Data and Topo Stylesheet Transportation**Product Search Filter** All Subcategories National Transportation Dataset
[Show Preview](#)**Data Extent** National State**File Format** Shapefile FileGDB 10.1[Preview Legend](#)

Transportation

 Woodland Tint Elevation - Topobathy DEM Use Map Box/Point Current Extent Coordinates Located Point Polygon: Map Indices 1 Degree 15 Minute 7.5 Minute All

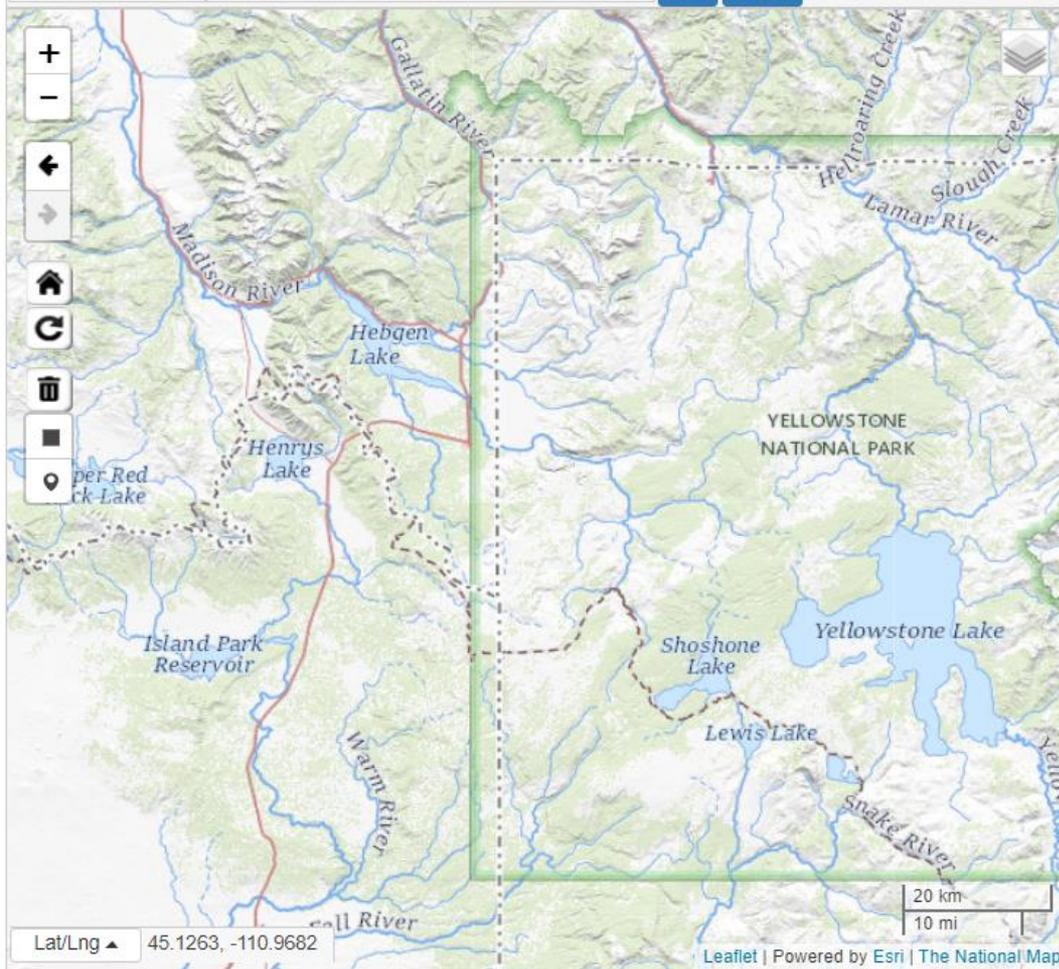
Address/Place ▾

Search location.

Go

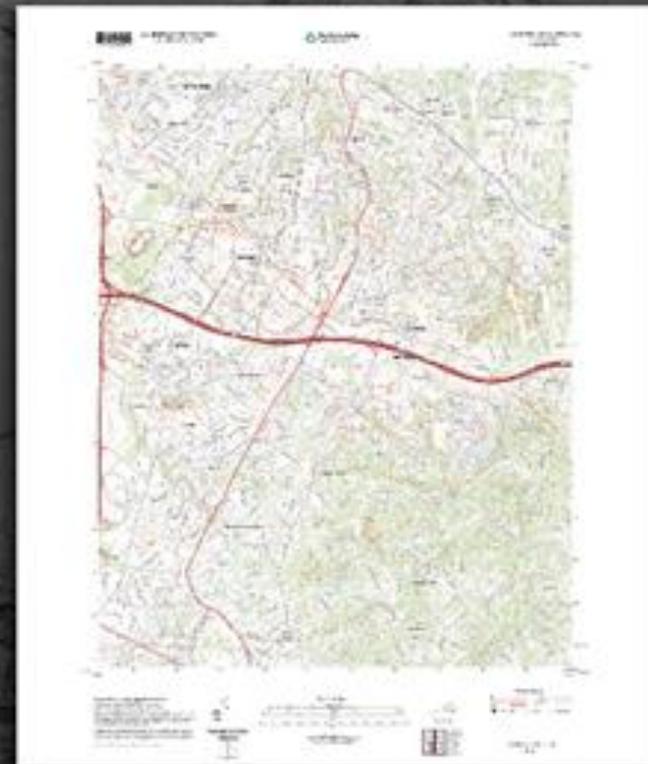
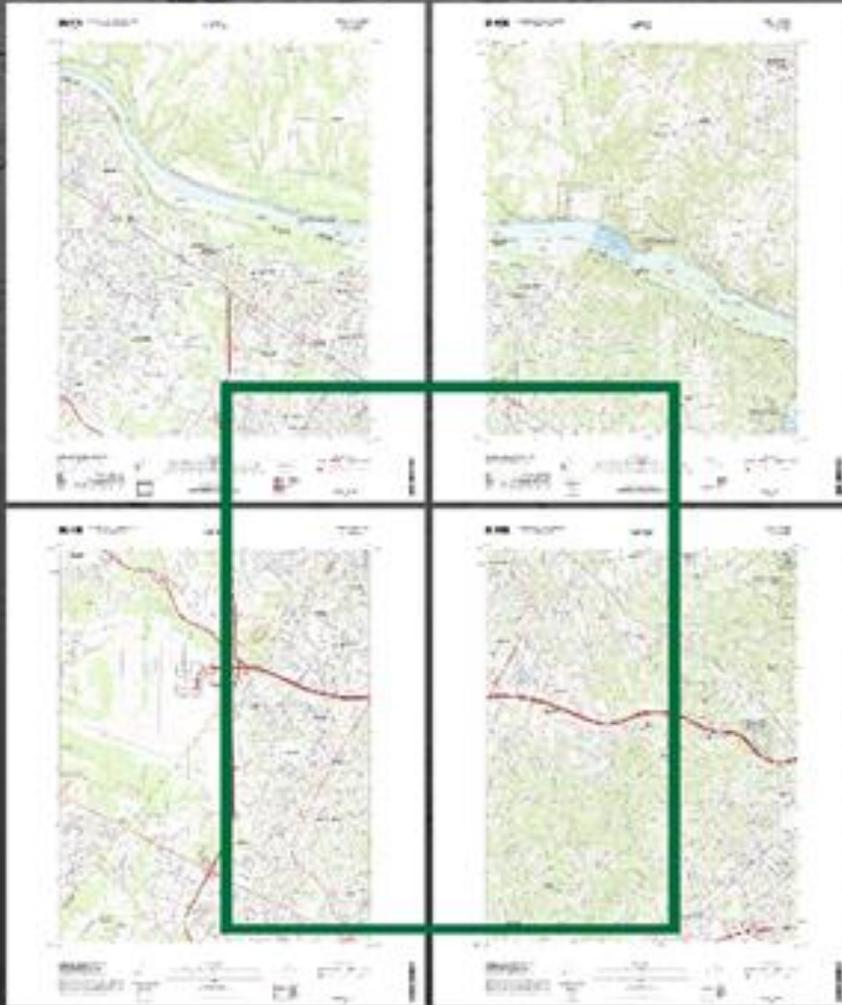
Clear

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USGS topoBuilder

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Protected Areas Database of the United States

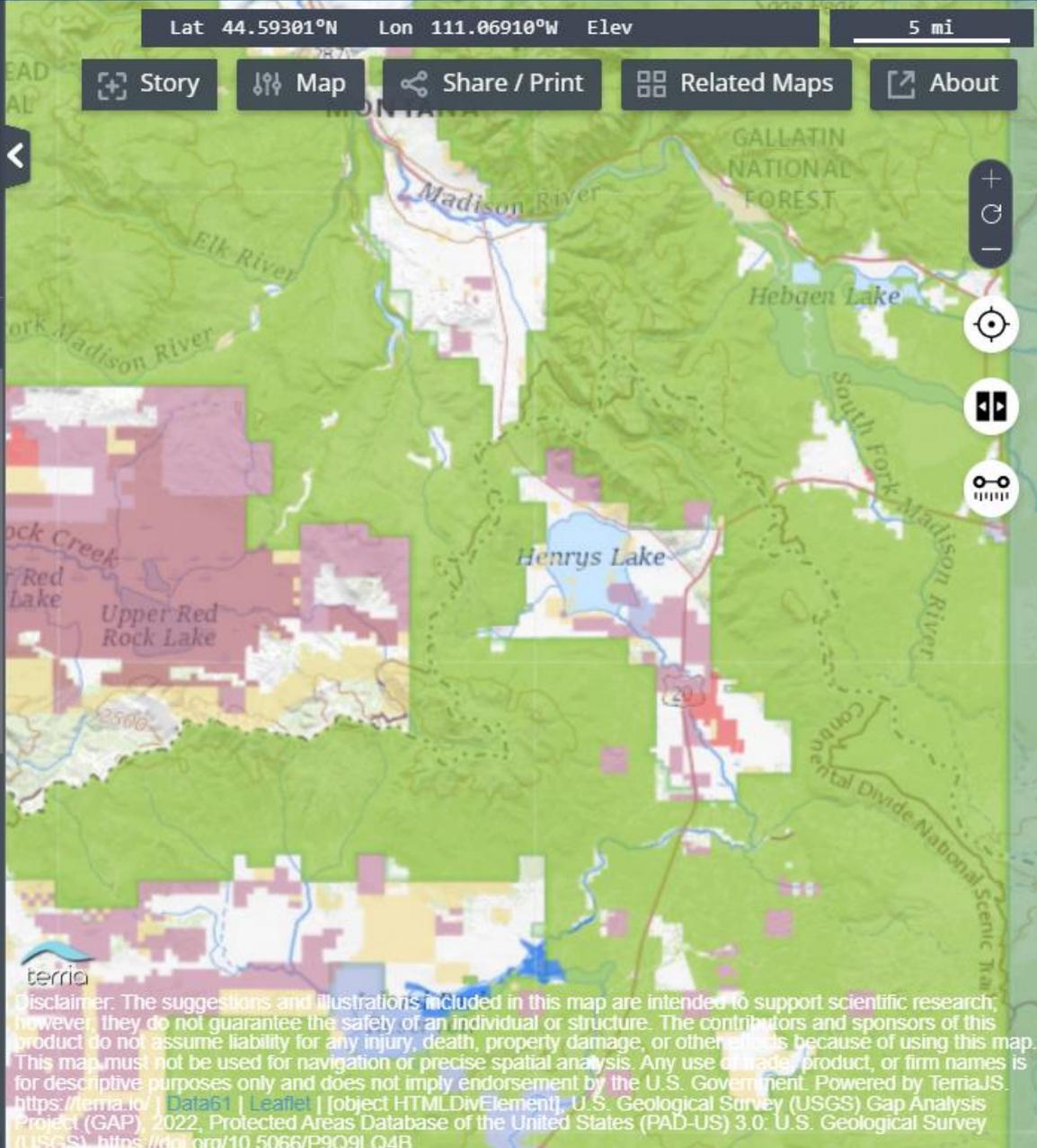
+ Add data

DATA SETS [11] Remove All

Fee Managers

Zoom To Extent About This Data Split Remove
 Opacity: 60 %

- Protected Areas Database of the United States (PAD-US) v3.0
- Department of Defense (DOD)
 - American Indian Areas (Census Bureau)
 - Bureau of Land Management (BLM)
 - National Park Service (NPS)
 - Forest Service (USFS)
 - Army Corps of Engineers (USACE)
 - Bureau of Reclamation (USBR)
 - U.S. Fish and Wildlife Service (FWS)
 - Natural Resources Conservation Service
 - Other Federal (TVA, ARS, BPA, DOE, etc.)
 - Non-Governmental Organization
 - State Trust Land
 - Other State (NHP, DOT, HS, etc.)
 - State Fish and Wildlife
 - State Park and Recreation
 - County / Regional Agency Land
 - City Land
 - Private Conservation; Private Corpora
 - Joint, Other, Unknown



Next Steps

- ▶ Better access for underserved communities
- ▶ Improve planning for sustainable trails
- ▶ Enhance trail data aggregation
- ▶ Support accessibility
- ▶ Expand nationwide trails dataset
- ▶ Engage mobile application providers
- ▶ Sustainable Recreation Data Initiative



How Can I Help?

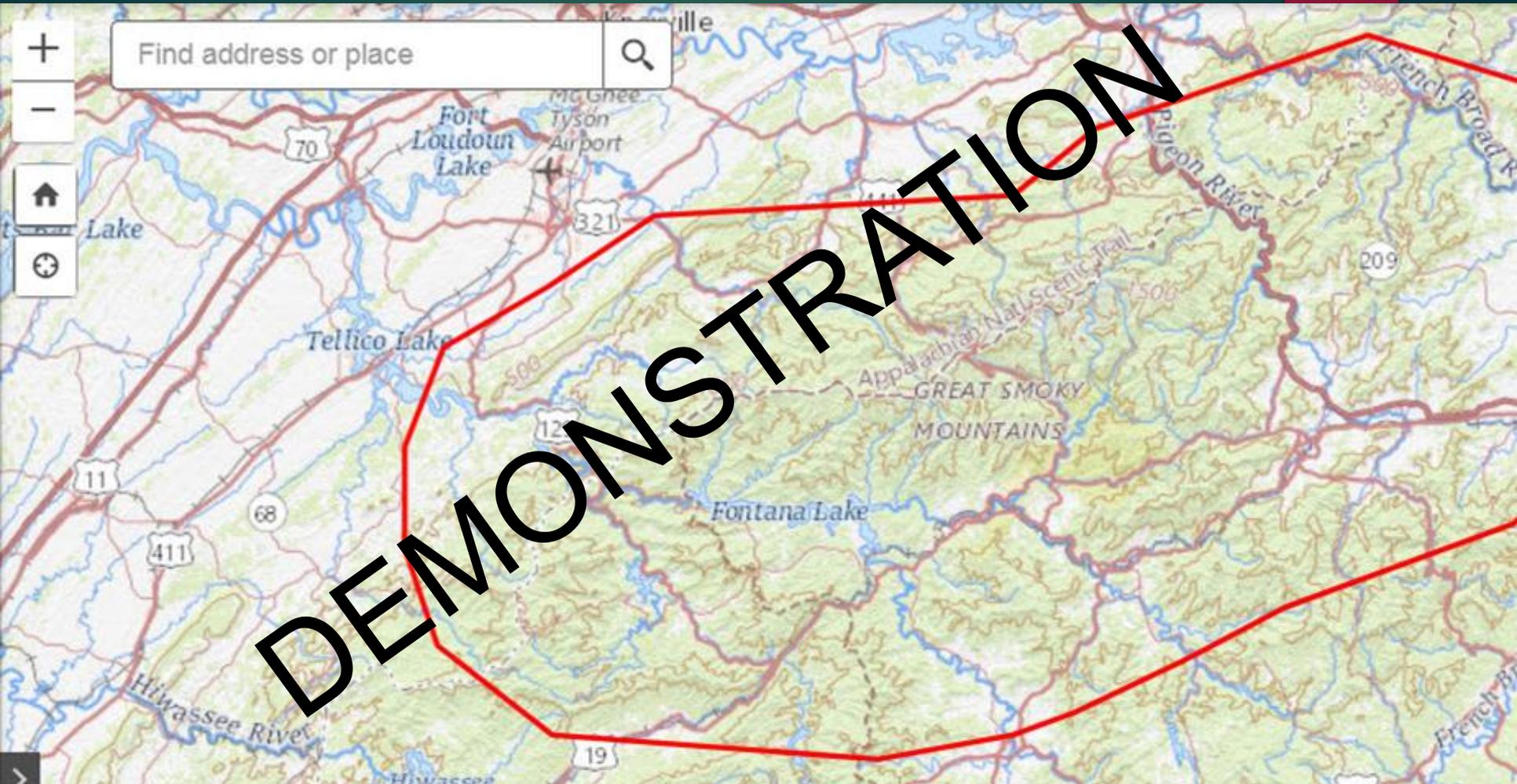
- ▶ Public Domain Trail Data
- ▶ Utilize the Federal Trail GIS Schema
- ▶ Collaborate with other outside of your organization
- ▶ Join a workshop
- ▶ Subscribe to our newsletter

Conclusion

- ▶ Provide data and tools to...
 - ▶ improve access to trails,
 - ▶ support sustainable trail planning,
 - ▶ and increase connectivity between trails and trail systems.
- ▶ Building partnerships and collaboration helps increase access to outdoor recreation for everyone.
- ▶ Freely available public domain data promotes economic opportunity.



TRAILS Decision Support Tool



Questions?



SCAN ME

Red Rock Lakes National Wildlife Refuge – Photo by Cortez Rohr, USFWS

Email trails@usgs.gov for more information, requests for training, or if you wish to sign up for our newsletter.



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Tatyana DiMascio, Technical Lead – tdmascio@usgs.gov