

# NPS: Mapping the next 100 years

NPS Symposium  
CSU Geospatial Centroid, 22 Mar 2016



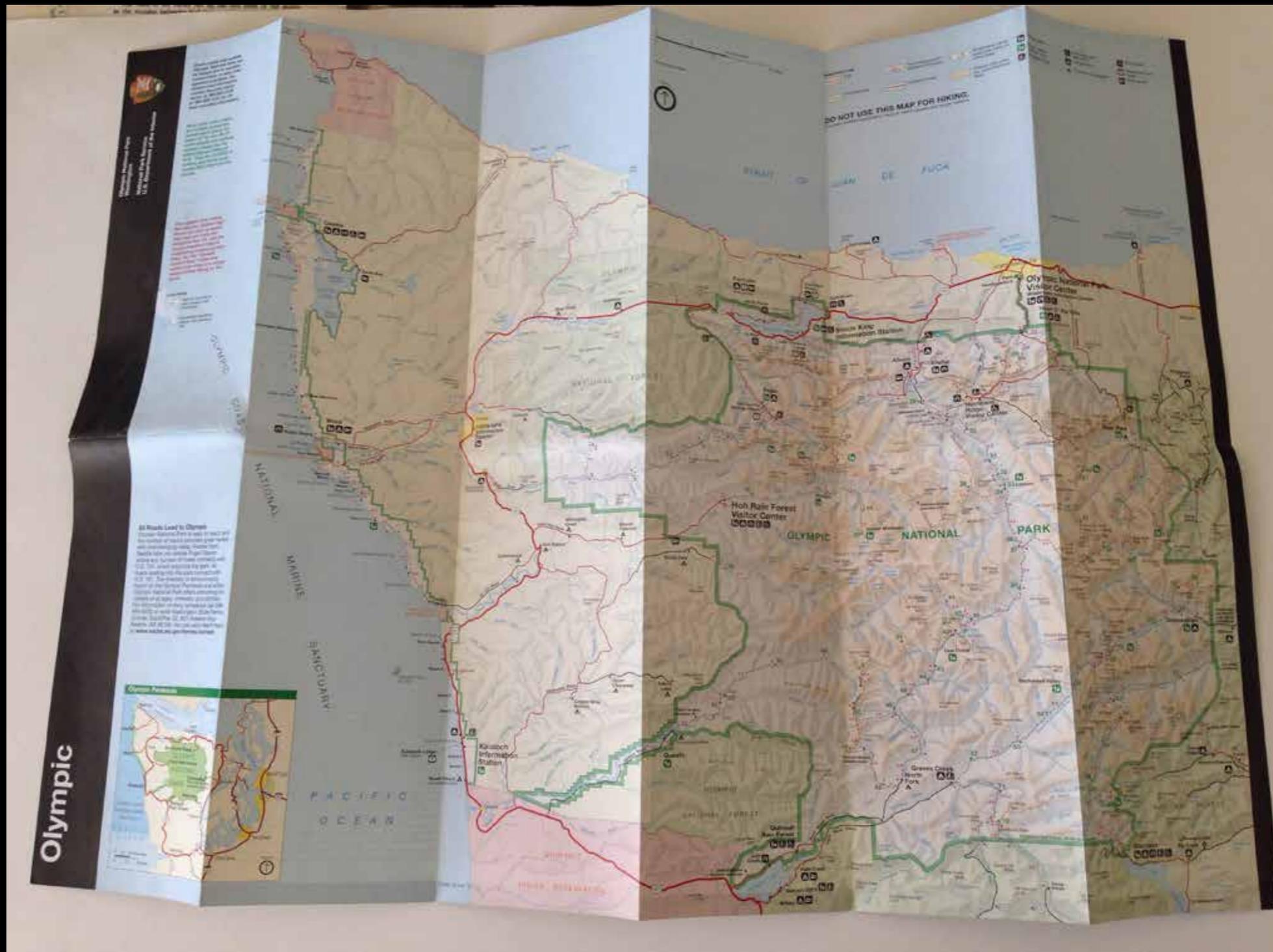
NPS: MAPPING THE NEXT 100 YEARS

# NPS print cartography and the move to digital

Jake Coolidge  
Cartographer  
NPMap



# NPS: MAPPING THE NEXT 100 YEARS





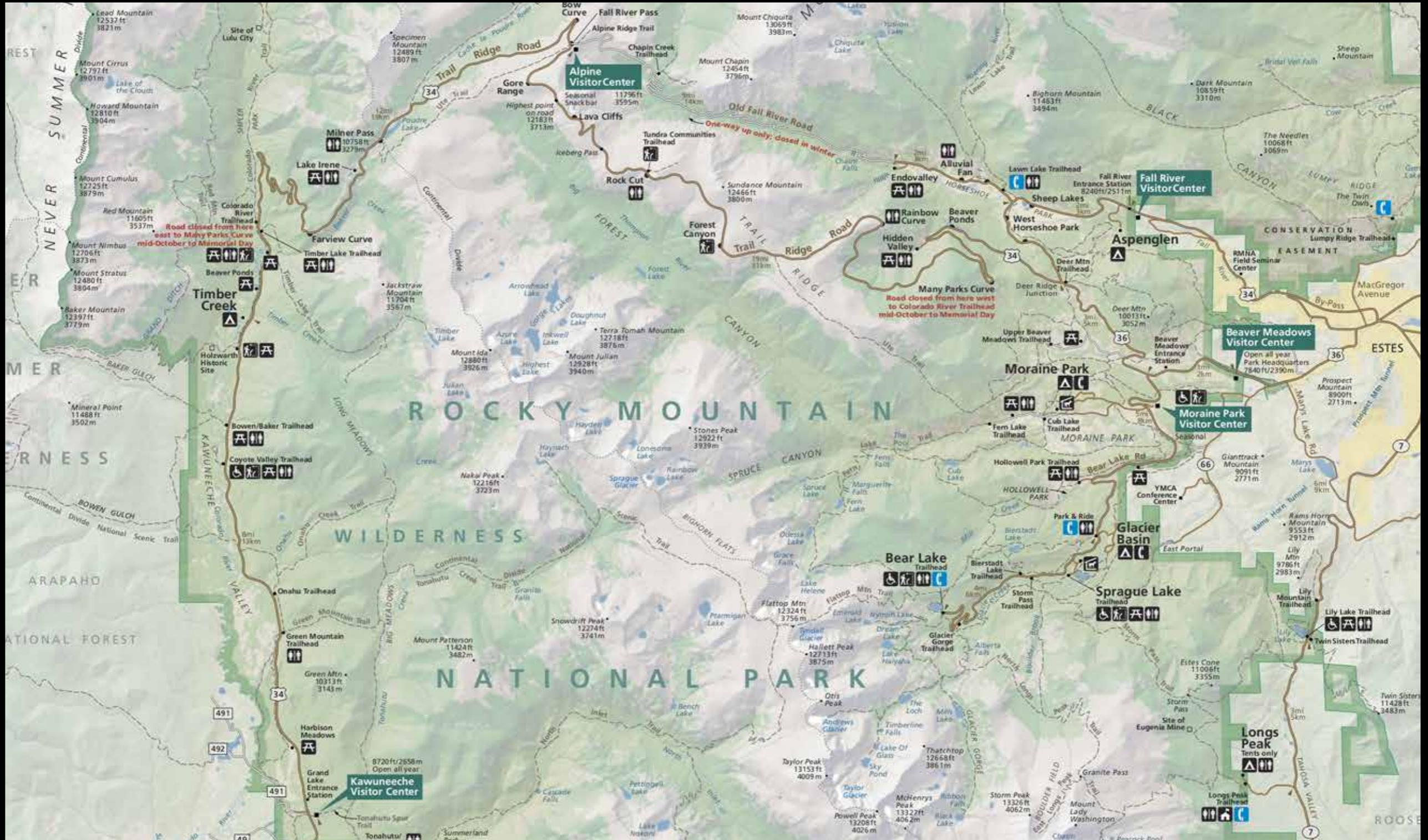
Produced by GATE - Elizabeth Thomas

Document Path: Y:\GIS\_Projects\ETHomas\GMP Base Map Redo\MXD\GATE\_GMP\_Miller Field.mxd

Date Saved: 8/4/2015



# NPS: MAPPING THE NEXT 100 YEARS





'Alenuihāhā Channel

PACIFIC OCEAN

'Alalākeiki Channel

'Au'au Channel

Pailolo Channel

### ISLAND OF MAUI



Kīpahulu Visitor Center

KĪPAHULU VALLEY BIOLOGICAL RESERVE (Closed to public)

HALEAKALĀ NATIONAL PARK

Haleakalā Visitor Center

Park Headquarters Visitor Center  
**YOU ARE HERE**

Kahului Bay

Mā'alaea Bay

PACIFIC OCEAN

Kahakuloa Head

Narrow rough road

Ka'uiki Head

Hāna Bay

HANA

Pa'i'ioa Bay

Hāna Highway

Waiohue Bay

Pauwahu Point

Ke'anae Point

Honomanū Bay

Honokalā Point

'Opāna Point

Pa'uwela Point

HA'IKU

PA'IA

Kahului Airport

PU'UNENĒ

KAHULUI

WAILUKU

WAIHEU

'Iao Valley

West Maui Mountains

Pu'u Kukui

5785ft 1762m

LAHAINA

KĀ'ANAPALI

KAHANA

KAPALUA

NĀPILI

Kanaloa

Pu'u Māhōe

2400ft 731m

ULUPALAKUA

WAILEA

MAKENA

Cape Hanamanioa

La Pérouse Bay

Cape Kīna'u

'Ahihi Bay

Pu'u Olē'i

3305ft 1010m

Kalaeoka'i'ilo Point

Mamalu Bay

Nu'u Bay

Summit

10023ft 3055m

Haleakalā Observatories (closed to public)

Kanahau

8227ft 2506m

Polipoli

6472ft 1972m

Kaupo Gap

Haleakalā

8301ft 2530m

Hanakouhi

8901ft 2715m

Kalahaku Overlook

7245ft 2228m

Leleiwi Overlook

8840ft 2694m

Halemau'u Trailhead

7960ft 2436m

Hosmer Grove

7000ft 2134m

MAKAWAO

PUKALANI

KULA

Haleakalā Highway

Haleakalā Highway

Haleakalā Highway

Kalapawili Ridge

Ko'olau Gap

Ke'anae Valley

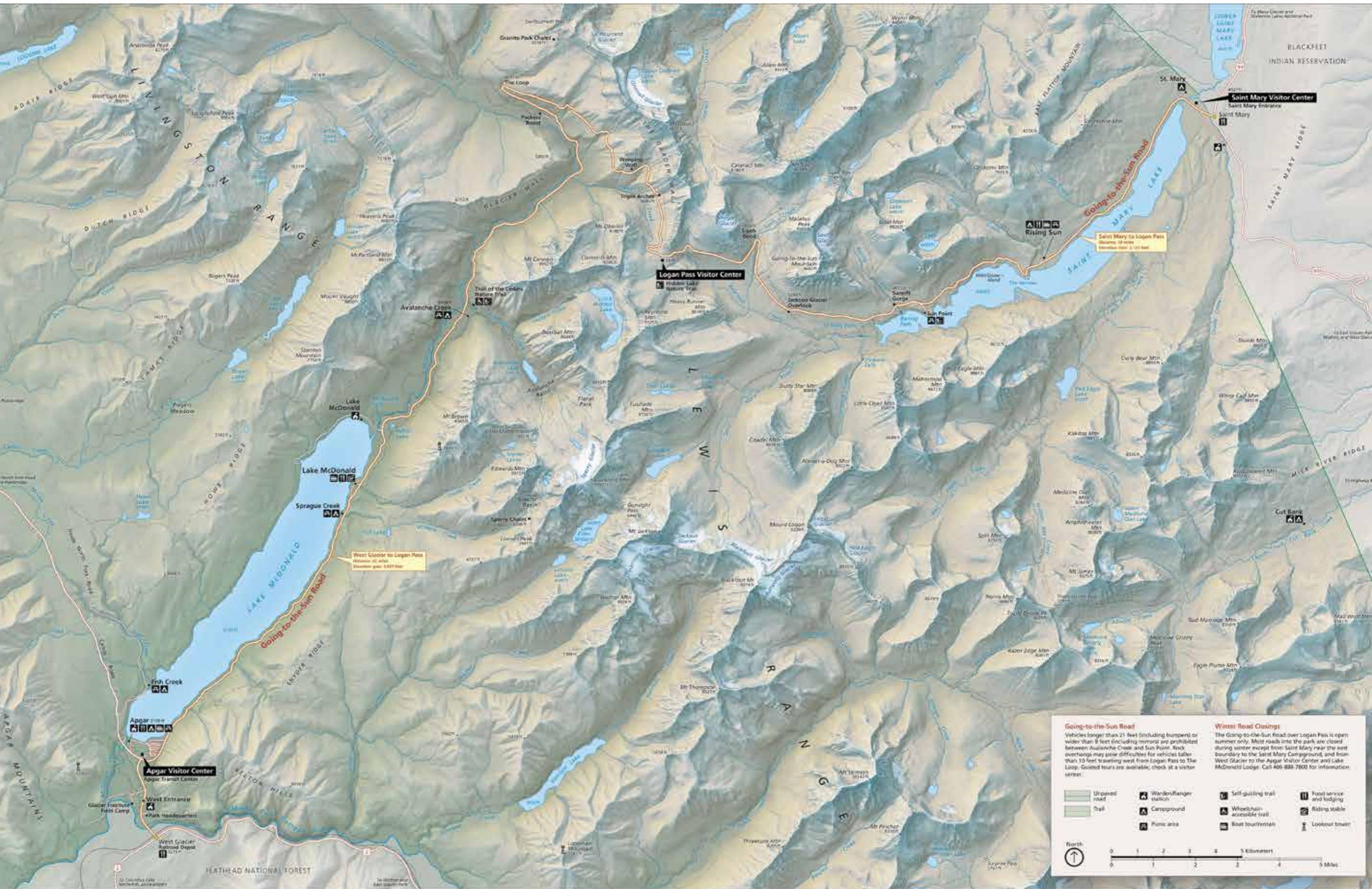
Narrow rough road

Kūhū Bay

# NPS: MAPPING THE NEXT 100 YEARS

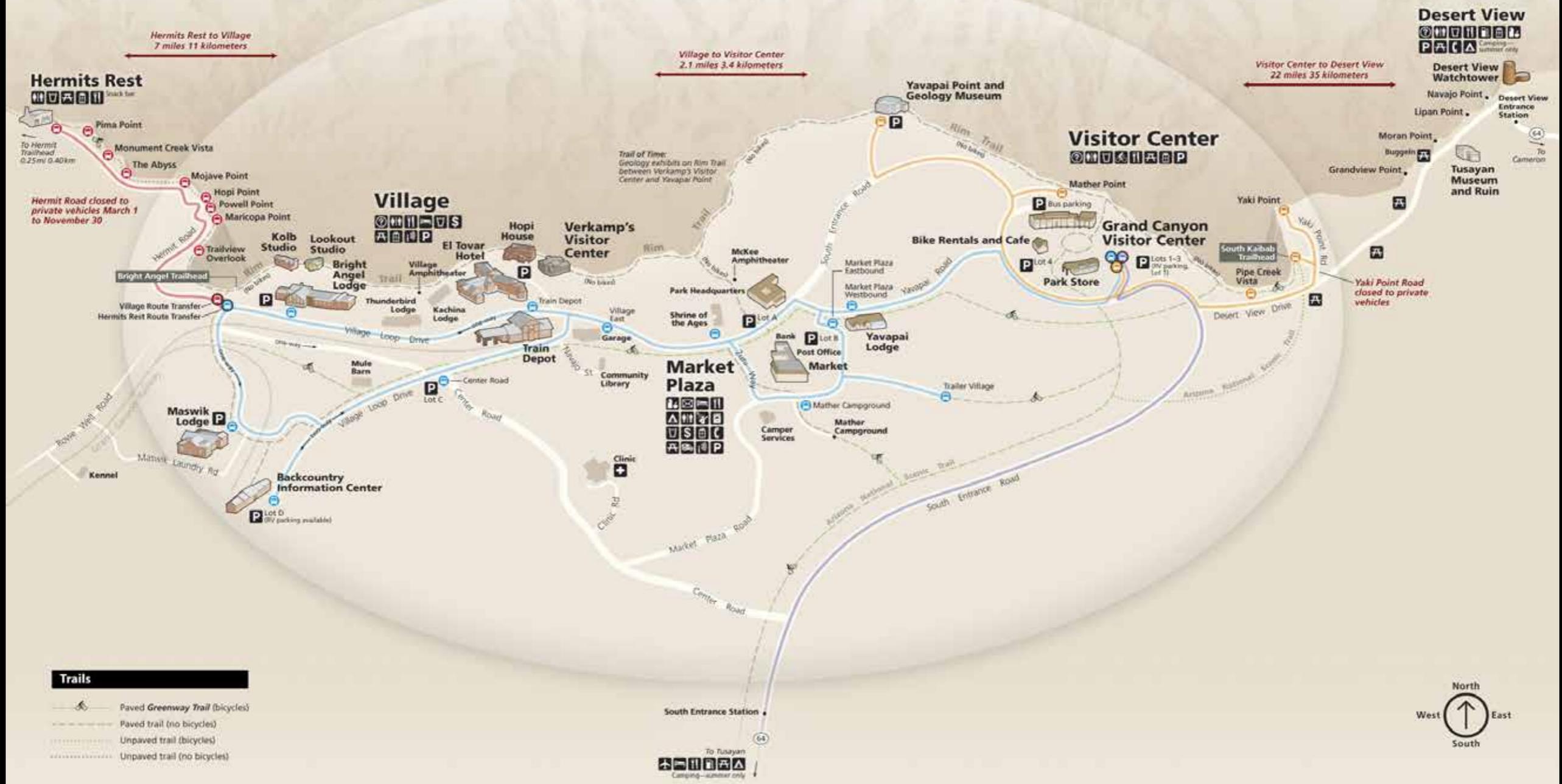


# Going-to-the-Sun Road • Glacier National Park, Montana

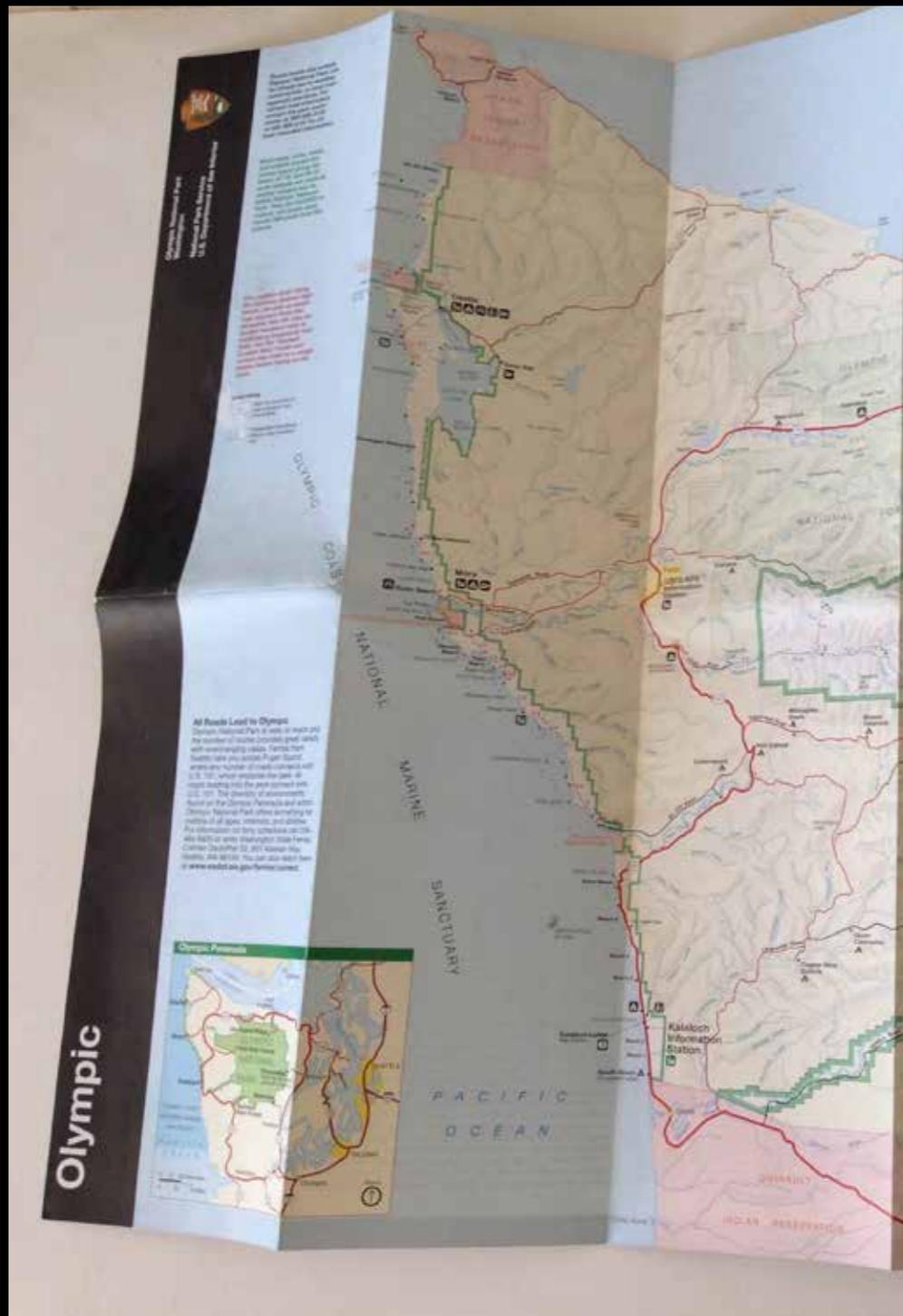


# Getting Around the South Rim

ENLARGED AREA—MAP NOT TO SCALE



# NPS: MAPPING THE NEXT 100 YEARS



Park Identity Custom Monolithic Base and Side Column with Brick V Arrowhead on Column



# Grand Teton N.P. by HFC



# Park Tiles 3 by NPMap

The screenshot displays a web browser window with the URL `insidemaps.nps.gov/park-tiles-3/#12/43.8693/-110.6531`. The browser's address bar shows the URL, and the page title is "Grand Teton National Park". The map interface includes a search bar with the text "Grand Teton National Park" and a "Points of Interest" toggle. The map itself shows the park's boundary in green, with several points of interest marked by black icons with white letters. Labeled locations include Jackson Lake, Teton Village, Moran, Elk, Lemmy Lake, and Loop Lake. The map also shows surrounding terrain, roads, and other lakes like Emma Matilda Lake. At the bottom of the map, there are three buttons: "About Park Tiles 3", "Submit Feedback", and "View In Places Editor".

insidemaps.nps.gov/park-tiles-3/#12/43.8693/-110.6531

Grand Teton National Park

Points of Interest

Jackson Lake

TETON VILLAGE

Emma Matilda Lake

MORAN

ELK

Loop Lake

GRAND TETON NATIONAL PARK

Lemmy Lake

About Park Tiles 3

Submit Feedback

View In Places Editor

Disclaimer | Geocoding by Eiri | © Mapbox © OpenStreetMap contributors

Park Tiles 3

# NPS: MAPPING THE NEXT 100 YEARS

The screenshot shows a web browser window with the URL `insidemaps.nps.gov/park-tiles-3/#11/46.8545/-121.6820`. The browser's address bar includes navigation icons (back, forward, refresh) and a search icon. The page features a map of Mount Rainier National Park with a green outline. Several black location pins are placed across the map, some with house icons and others with question marks. A search bar in the top right corner contains the text "Mount Rainier National Park" and a search icon. Below the search bar is a "Points of Interest" checkbox which is checked. On the left side of the map, there are navigation controls: a home icon, a plus sign for zooming in, a minus sign for zooming out, and a compass icon. At the bottom of the map area, there are three orange buttons: "About Park Tiles 3", "Submit Feedback", and "View in Places Editor". A small "NATIONAL PARK SERVICE" logo is in the top left corner. At the bottom right, there is a disclaimer: "Disclaimer | Geocoding by Esri | © Mapbox © OpenStreetMap contributors".

Park Tiles 3



# NPS: MAPPING THE NEXT 100 YEARS

insidemaps.nps.gov/park-tiles-3/#15/46.7837/-121.7407

Mount Rainier National Park

Points of Interest

Nisqually River

Paradise Valley Road

Nisqually-Paradise Road

Paradise Picnic Area Road

High Lakes Trail

Waterfall Trail

Alta Vista Trail

Deathhorse Creek Trail

Golden Gate Trail

Skyline Trail

Paradise Valley Road

Paradise Valley Road

Nisqually-Paradise Road

Paradise Canyon Road

High Lakes Trail

Lower Lakes

Mapbox OpenStreetMap contributors

About Park Tiles 3

Submit Feedback

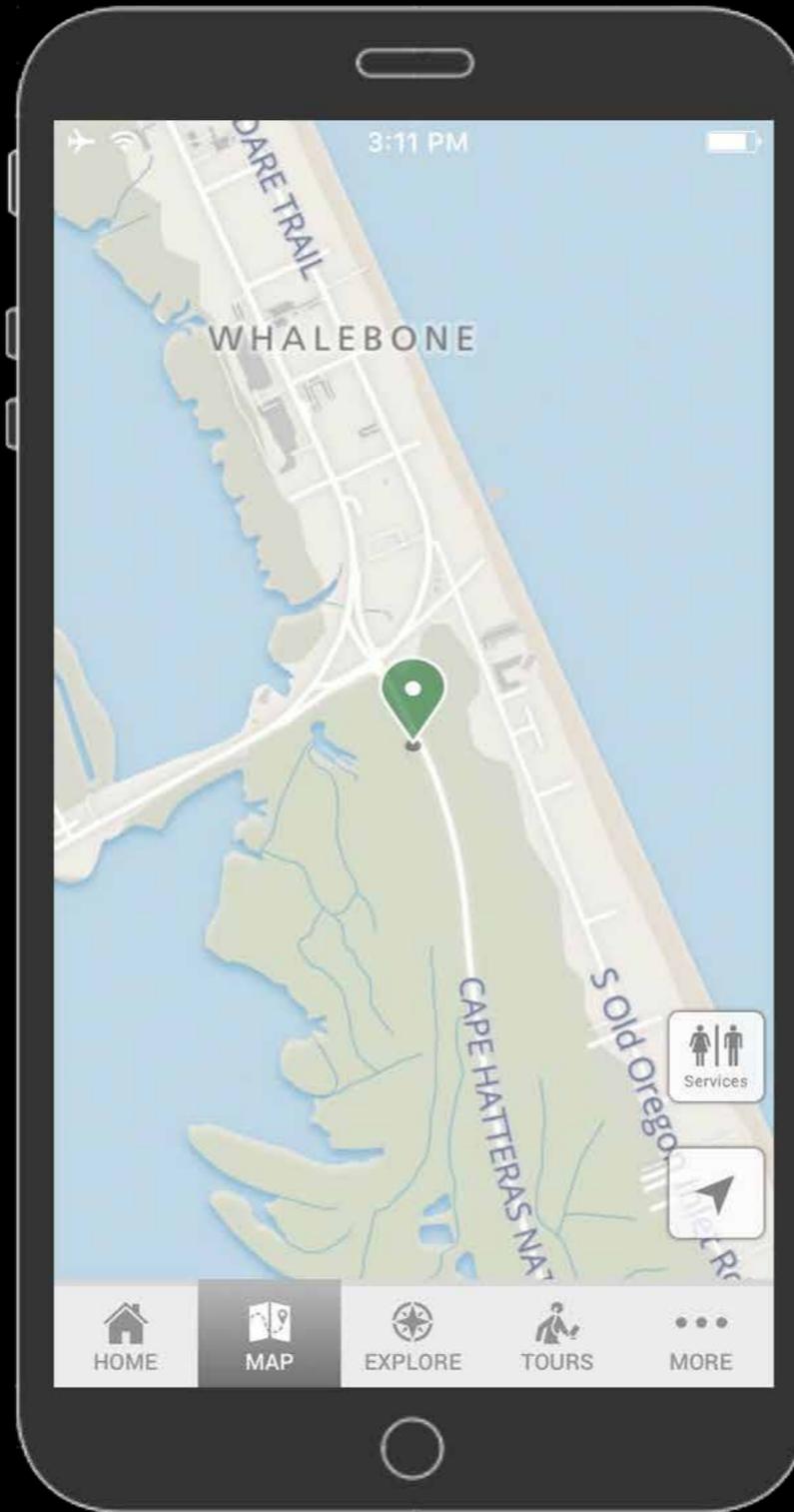
View in Places Editor

Disclaimer | Geocoding by Esri | Mapbox OpenStreetMap contributors

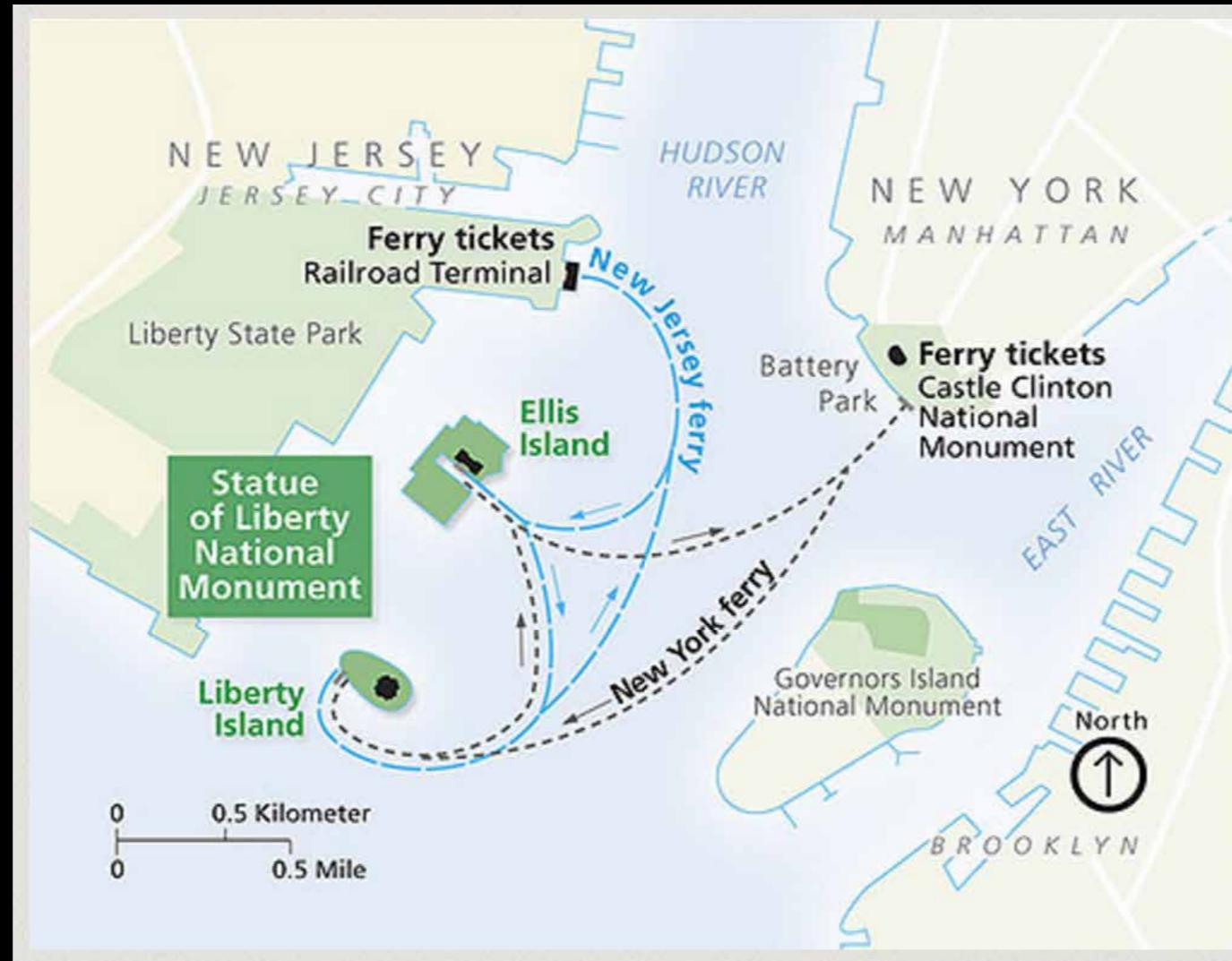
Park Tiles 3



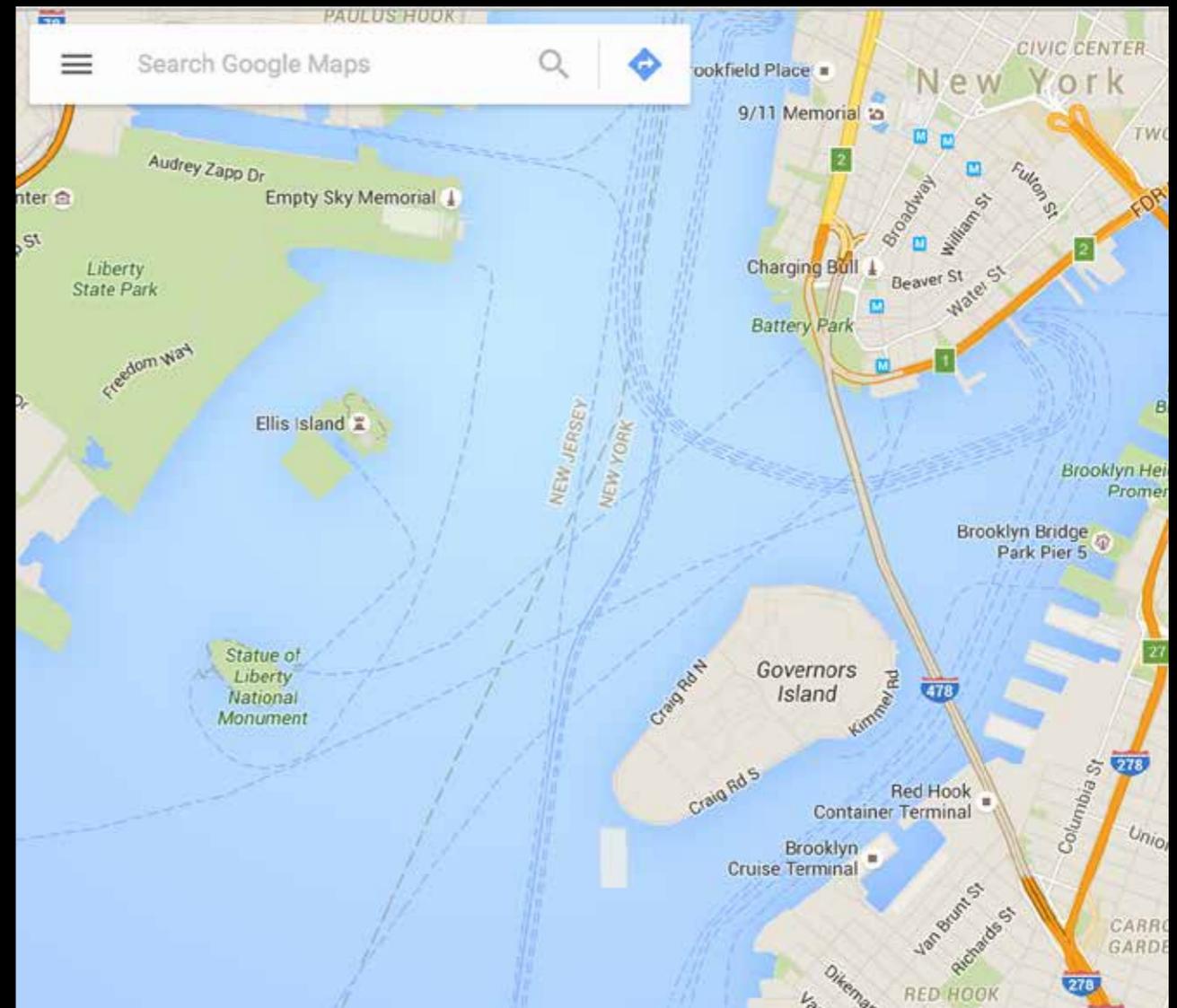
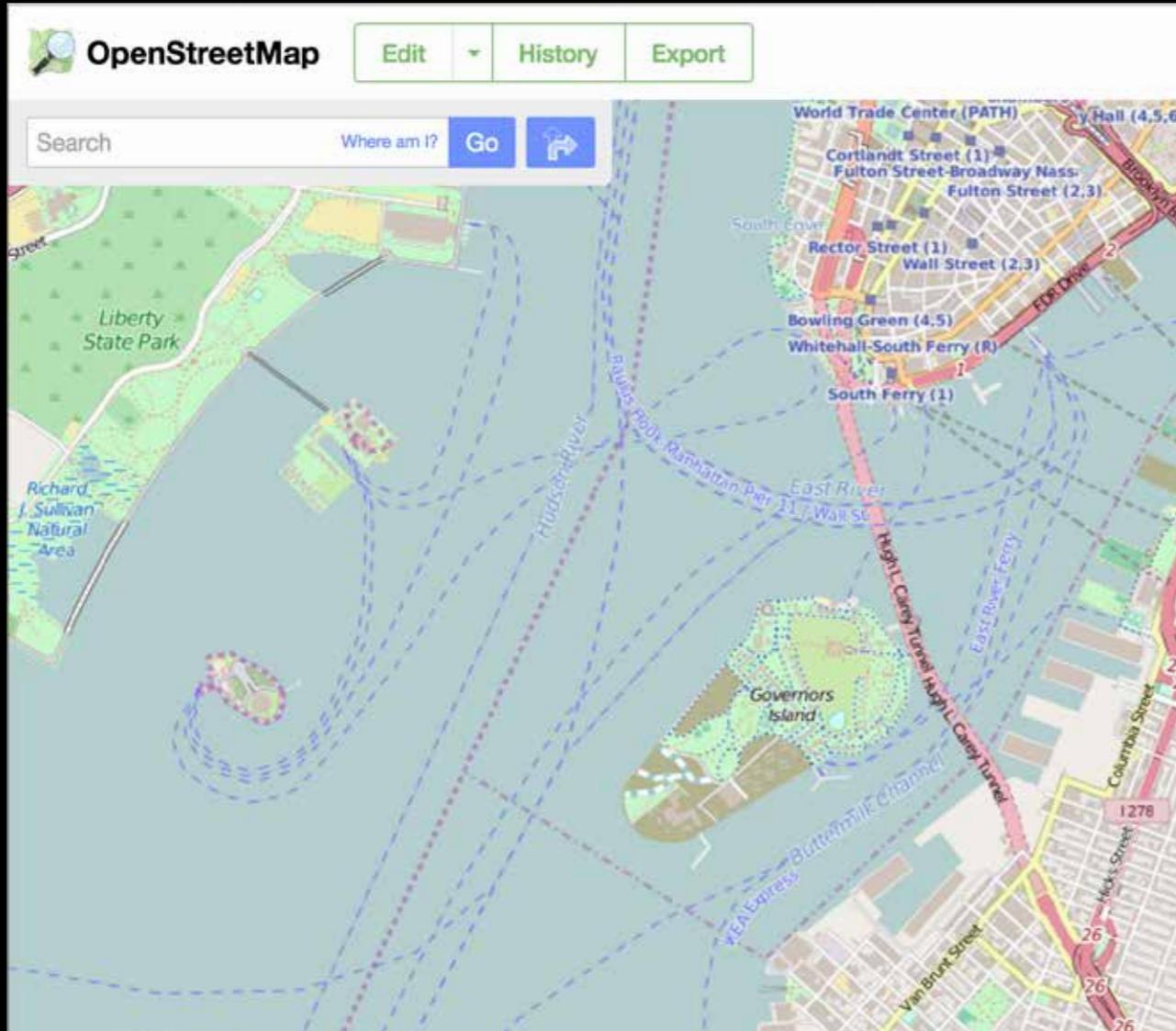
# NPS: MAPPING THE NEXT 100 YEARS



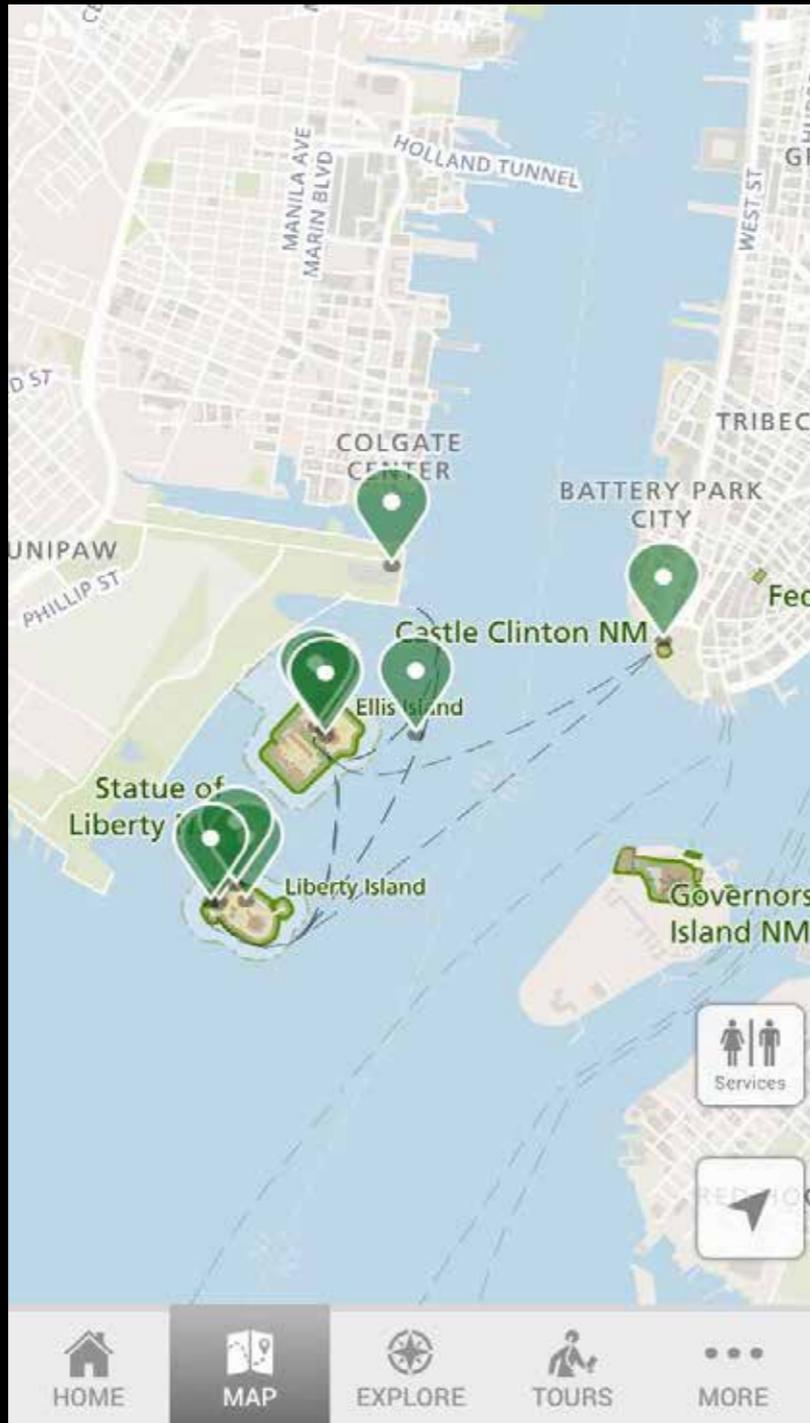
# NPS: MAPPING THE NEXT 100 YEARS



# NPS: MAPPING THE NEXT 100 YEARS



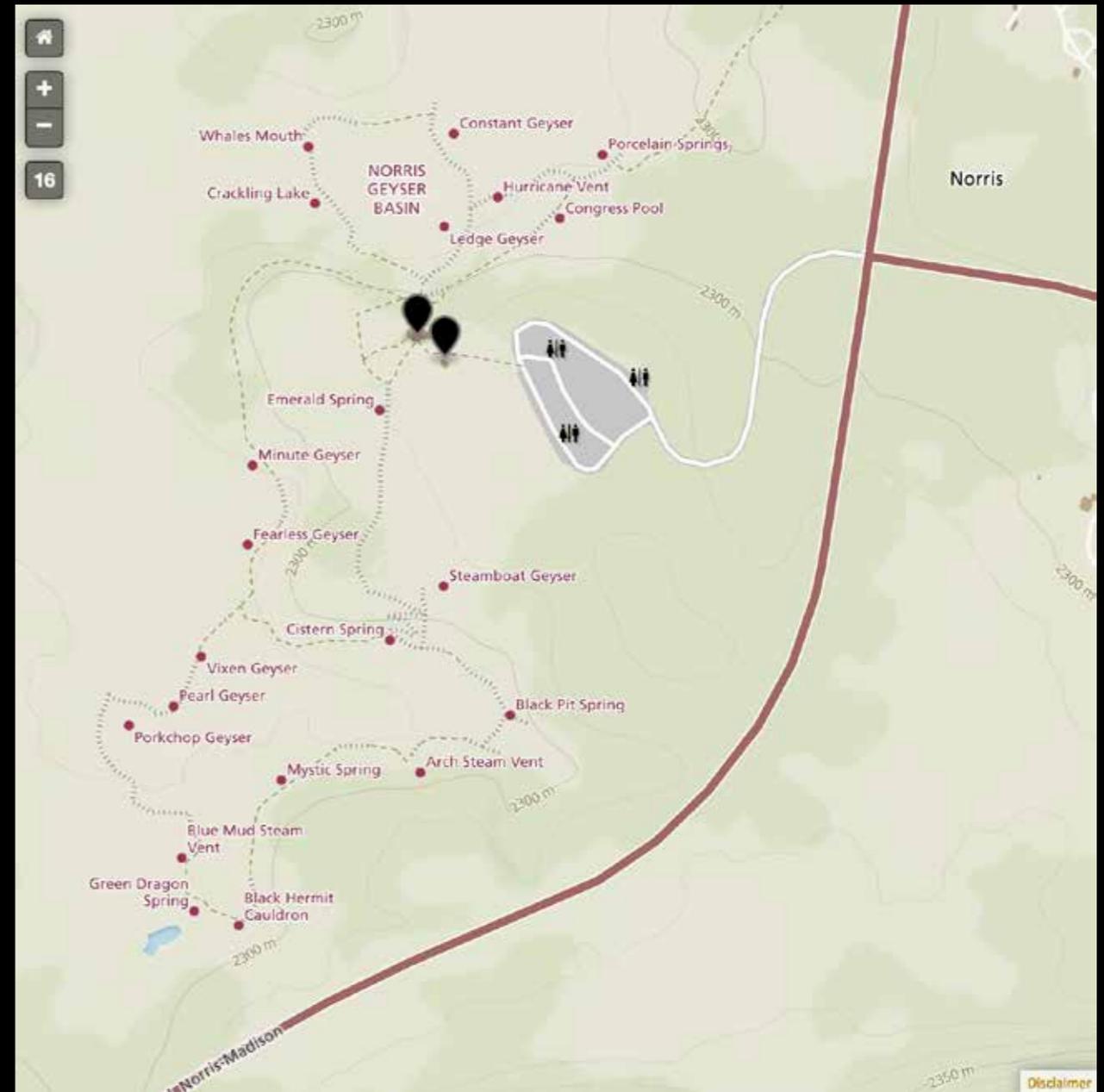
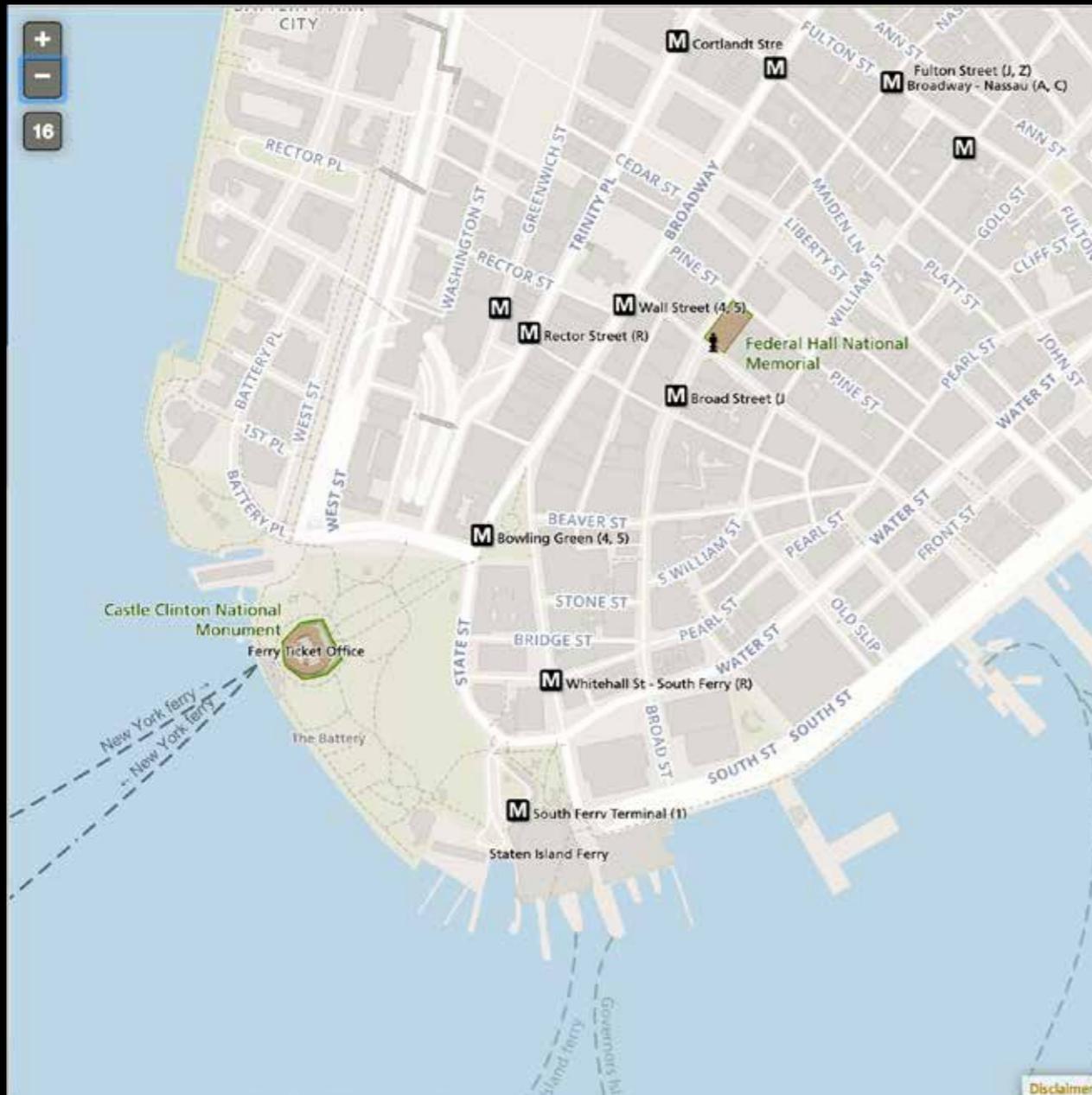
# NPS: MAPPING THE NEXT 100 YEARS



# NPS: MAPPING THE NEXT 100 YEARS



# NPS: MAPPING THE NEXT 100 YEARS



# NPS: MAPPING THE NEXT 100 YEARS

Places (OSM-based database)

JOSM

QGIS

CartoDB

Mapbox Studio Classic, Mapbox tile service  
graphic design software



NPS: MAPPING THE NEXT 100 YEARS

[www.nps.gov/npmap](http://www.nps.gov/npmap)

[npmap@nps.gov](mailto:npmap@nps.gov)

 [@npmap](https://twitter.com/npmap)

**Jake Coolidge**  [@jccartography](https://twitter.com/jccartography)



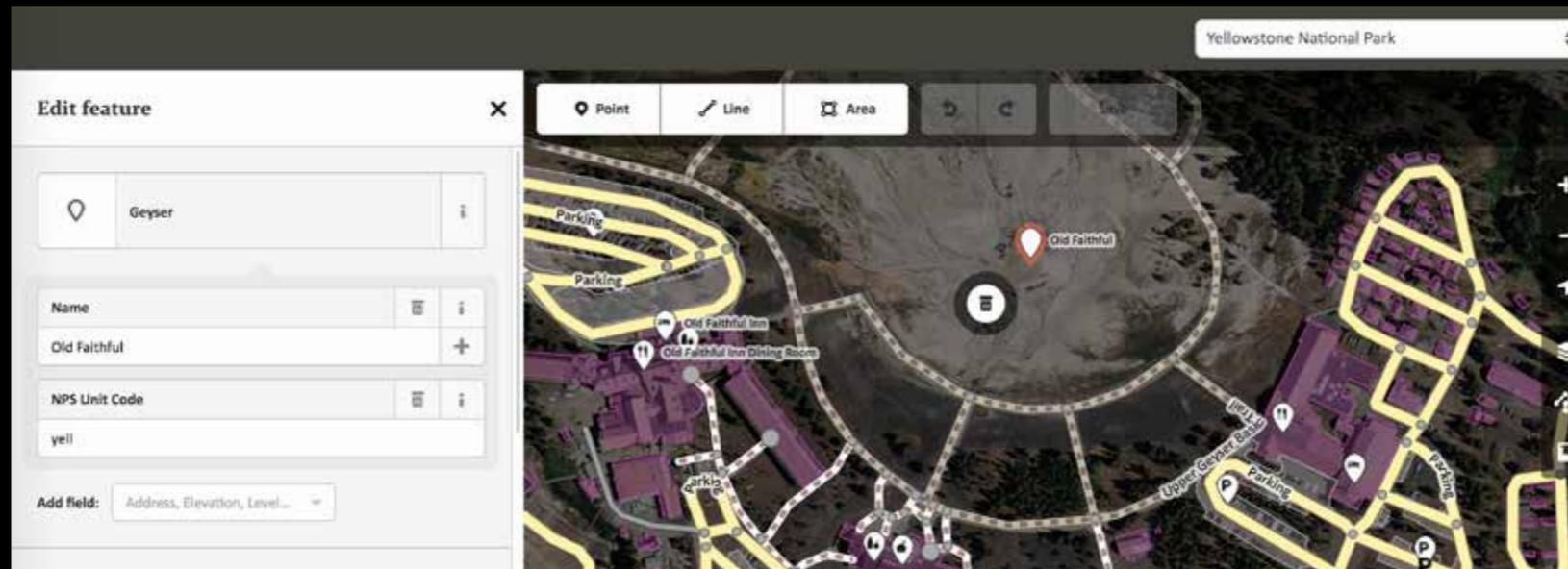
NPS: MAPPING THE NEXT 100 YEARS

# Digital Maps for the National Park Service

Chad Lawlis  
Data Engineer  
NPMMap



# NPS: MAPPING THE NEXT 100 YEARS



- What is Places?
- Why Places?
- Places Editor
- How is the data used?

NPS: MAPPING THE NEXT 100 YEARS

# What is Places?



NPS: MAPPING THE NEXT 100 YEARS

An **internal** spatial data  
collection system



NPS: MAPPING THE NEXT 100 YEARS

Focused on **visitor-**  
**facing data**



# NPS: MAPPING THE NEXT 100 YEARS

## Points of interest

Places Editor

National Park Service  
U.S. Department of the Interior



Stature Of Liberty National Monument

Point Line Area

Monument

Name  
Stature of Liberty

NPS Unit Code  
still

Add field: Address, Elevation, Level...

All tags (3)

name	Stature of Liberty		
historic	monument		
nps:unit_code	still		

View in Places

300 ft

Edits by Natalya Apostolou, Jake Cooldidge, David Hague and 3 others

1.7.4 Chad Lawlis Logout

Home | About NPSMap | Contact Us | Submit Feedback | View Tracing Guide

EXPERIENCE YOUR AMERICA™



# NPS: MAPPING THE NEXT 100 YEARS

## Buildings

Places Editor

National Park Service  
U.S. Department of the Interior



Zoom to a Park...

**Edit feature** X

Point Line Area

**Building Footprint** i

Name  
Common name (if any) +

NPS Unit Code  
prsf

Address  
123 Street  
City State Postcode

Levels  
2, 4, 6...

Add field: Elevation, Level, Note...

All tags (2)  
View in Places

Edits by Chad Lawlis, Nathaniel Irwin 1.7.4 Chad Lawlis Logout

Home | About NPMAP | Contact Us | Submit Feedback | View Tracing Guide

EXPERIENCE YOUR AMERICA™



# NPS: MAPPING THE NEXT 100 YEARS

## Roads

Places Editor

National Park Service  
U.S. Department of the Interior



The screenshot displays the NPS Places Editor interface. On the left, an 'Edit feature' panel is open for a 'Secondary Road'. The panel includes fields for Name (Hero Rd), NPS Unit Code (gate), Operator (Unknown), Surface (asphalt, unpaved, paved...), Width (Meters) (Unknown), and Speed Limit (40, 50, 60... mph). The main map area shows a satellite view of the Gateway National Recreation Area with various roads highlighted in red and pink. A toolbar at the top of the map area includes options for Point, Line, and Area. The bottom of the interface shows a scale bar (500 ft), edit history (Edits by James McAndrew, Jason, Jake Coolidge, David Hagun and 1 others), version (1.7.4), and user information (Chad Lawlis, Logout). Navigation links (Home, About NPSMap, Contact Us, Submit Feedback, View Tracing Guide) and the slogan 'EXPERIENCE YOUR AMERICA™' are also visible.



# NPS: MAPPING THE NEXT 100 YEARS

## Trails

Places Editor

National Park Service  
U.S. Department of the Interior



Great Smoky Mountains National Park

**Edit feature** X

Trail

Name: Rainbow Falls Trail

NPS Unit Code: grsm

Operator: Unknown

Track Type: Solid, Mostly Solid, Soft...

Surface: asphalt, unpaved, paved...

Width (Meters): Unknown

View in Places

Point Line Area

400 ft

Edits by Thomas Colson 1.7.4 Chad Lawlis login

Home | About NPSMap | Contact Us | Submit Feedback | View Tracing Guide

EXPERIENCE YOUR AMERICA™



# NPS: MAPPING THE NEXT 100 YEARS

## Parking

Places Editor

National Park Service  
U.S. Department of the Interior



Big Hole National Battlefield

Point Line Area Save

**Edit feature** X

**P** Parking Lot ⓘ

Name ⓘ  
Common name (if any) +

NPS Unit Code ⓘ  
Unknown

Operator ⓘ  
Unknown

Address ⓘ  
123 Street  
City State Postcode

Capacity ⓘ  
50, 100, 200...

Fee ⓘ

View in Places

150 ft

Edits by Nathaniel Trank, Chad Lawlis, James McAndrew Import 1.7.4 Chad Lawlis Logout

Home | About NPMAP | Contact Us | Submit Feedback | View Tracing Guide

EXPERIENCE YOUR AMERICA™



NPS: MAPPING THE NEXT 100 YEARS

# Why Places?



# NPS: MAPPING THE NEXT 100 YEARS

Designed to **eliminate barriers.**

Specifically, the **lack of:**

- Access to specialized software
- Technical knowledge
- Time and/or resources



# NPS: MAPPING THE NEXT 100 YEARS

**More contributors**  
=  
**better data**

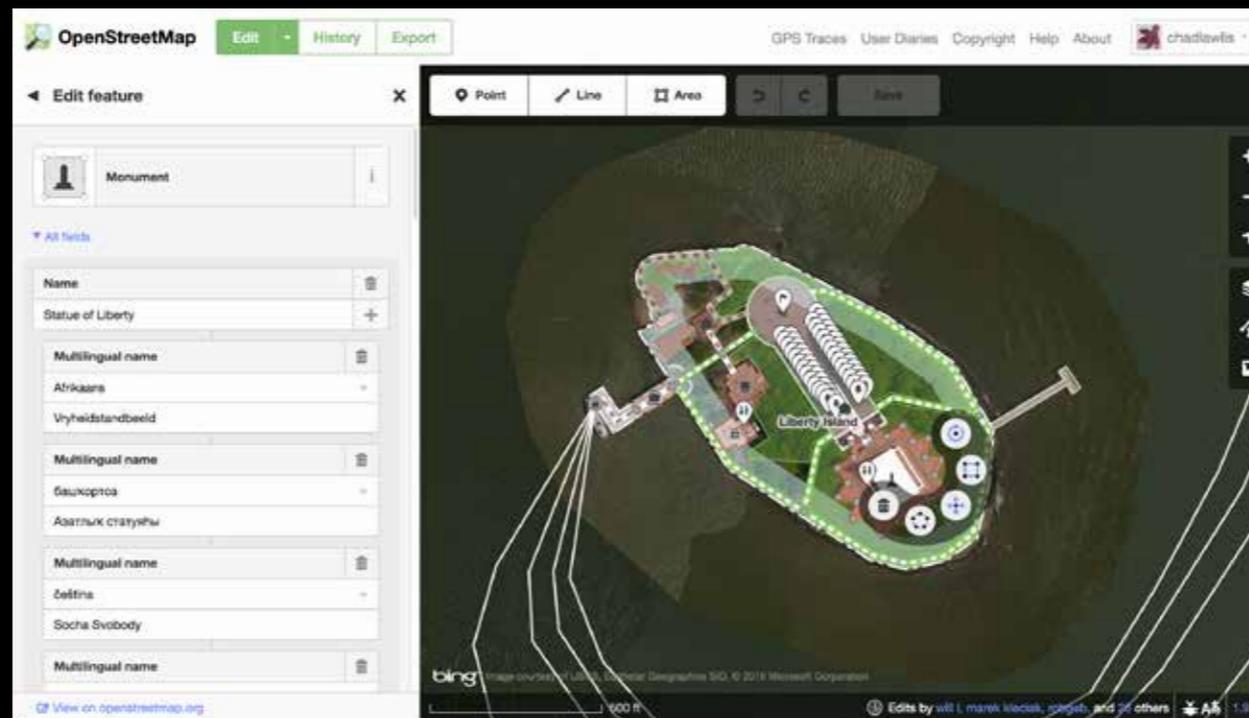


NPS: MAPPING THE NEXT 100 YEARS

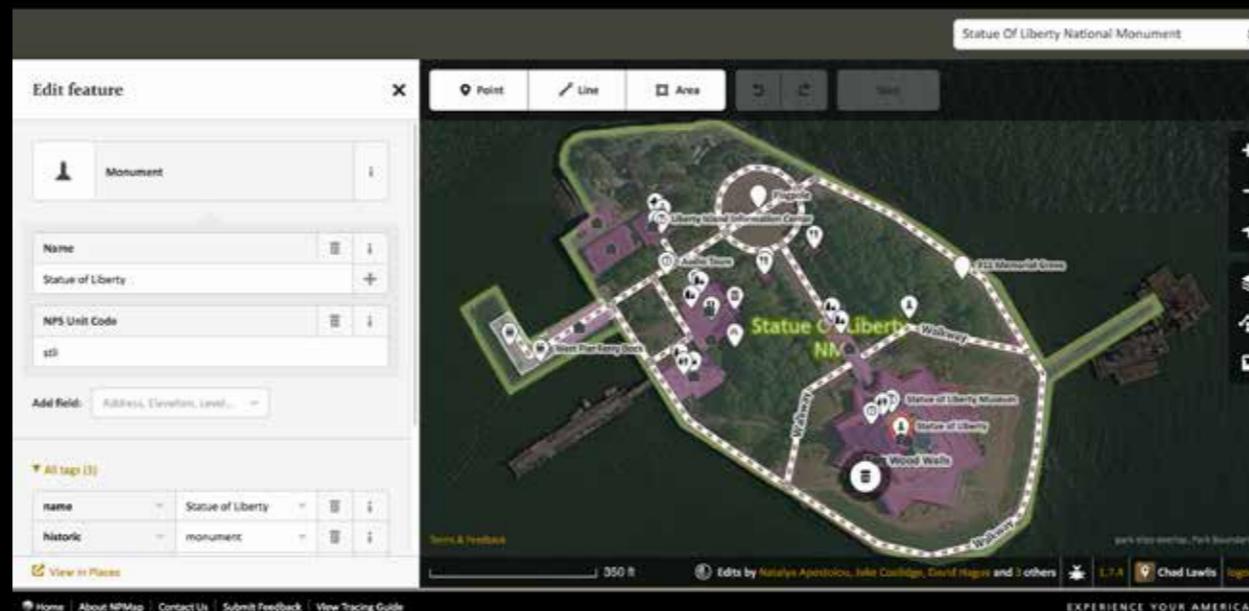
# Places Editor



# NPS: MAPPING THE NEXT 100 YEARS



## Places Editor



# NPS: MAPPING THE NEXT 100 YEARS

### Edit feature

Primary Road

Name: Rockaway Point Blvd.

NPS Unit Code: gate

Operator: Unknown

Surface: asphalt, unpaved, paved...

Width (Meters): Unknown

Speed Limit: 40, 50, 60... mph

One Way:  Yes

Lanes: 1, 2, 3...

Approved Uses: Motor Vehicles (Unknown)

[View in Places](#)

Point Line Area Save

Map showing road network with labels: Marine Parkway Bridge, Beach Channel Dr, Bridal Path, Risley To Beach, Davis Rd, Beach Joseph St, Hahn Rd, Theater Rd, Hano Rd. Scale: 500 ft.



**NPS: MAPPING THE NEXT 100 YEARS**

**How is the data used?**



## Park Tiles



The screenshot shows a web-based mapping interface for the Statue of Liberty National Monument. The map area is divided into several irregularly shaped 'tiles' by dashed lines labeled 'Walkway'. Numerous black location pins are scattered across the tiles, representing points of interest. The central text on the map reads 'STATUE OF LIBERTY NATIONAL MONUMENT'. The interface includes a search bar at the top right with the text 'Statue Of Liberty National Mon' and a magnifying glass icon. Below the search bar is a checkbox labeled 'Points of Interest' which is checked. On the left side of the map, there are three vertical buttons: a home icon, a plus sign for zooming in, and a minus sign for zooming out. At the bottom of the map, there are three orange buttons: 'About Park Tiles 3', 'Submit Feedback', and 'View in Places Editor'. A small disclaimer at the bottom right of the map area reads 'Disclaimer | Geocoding by Esri | © Mapbox © OpenStreetMap contributors'. To the left of the map, there is a vertical label 'Park Tiles 3' and a small NPS arrowhead logo.



# NPS: MAPPING THE NEXT 100 YEARS

## NPS.gov

The screenshot displays the National Park Service website for Fort Scott National Historic Site. At the top, the NPS logo and "National Park Service" text are visible, along with a search bar. A navigation menu includes "Find a Park", "Discover History", "Explore Nature", "Get Involved", "Working with Communities", "Teachers", "Kids", and "About Us". The main header features a photograph of a historic building with the text "Fort Scott National Historic Site Kansas". Below this is a section titled "Explore This Park" with a sidebar menu containing "Park Home", "Plan Your Visit" (with sub-items like "Basic Information", "Directions & Transportation", "Maps", "Getting Around", "Eating & Sleeping", "Places To Go", "Things To Do", "Calendar", "Safety", "Accessibility", "Nearby Attractions"), "Learn About the Park", "Get Involved", and "Park Tools" (with sub-items "FAQs" and "Contact Us"). The main content area is titled "Maps" and features a map of the Fort Scott National Historic Site. The map shows the site's boundaries in green, with various points of interest marked by icons. A "No Public Access" area is also indicated. The map includes standard navigation controls like zoom in (+) and zoom out (-) buttons. At the bottom of the map, there is a disclaimer and attribution to Mapbox and OpenStreetMap contributors, along with a link to "Improve Park Tiles".



# NPS: MAPPING THE NEXT 100 YEARS

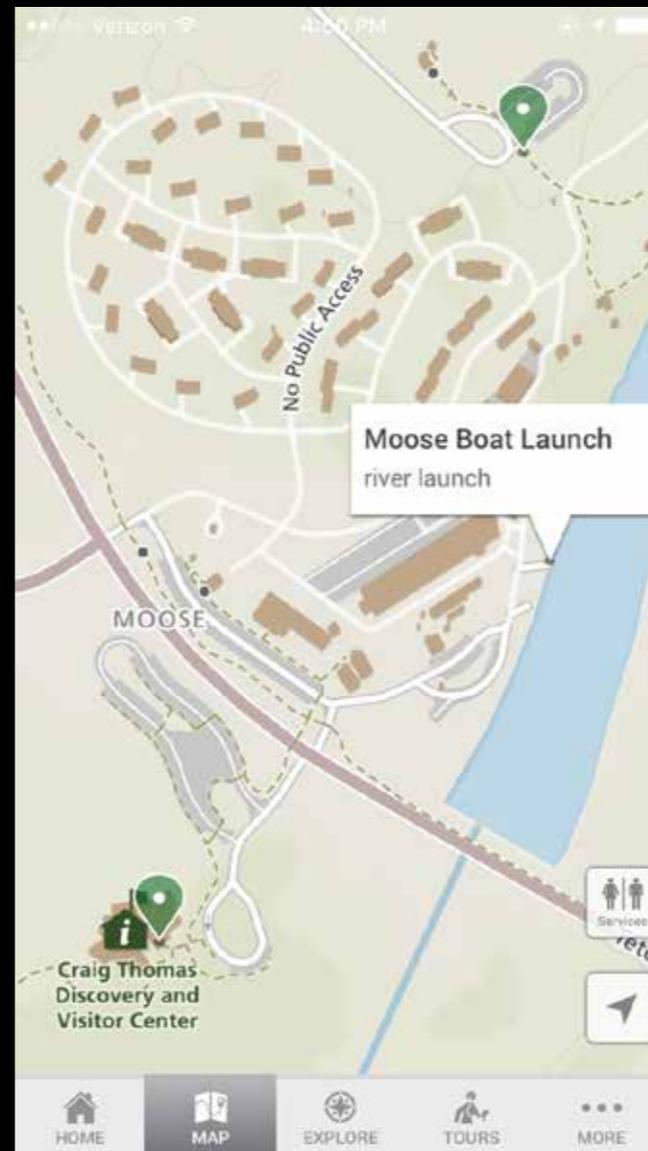
## NPMap Builder

The screenshot shows the NPMap Builder web application. At the top left is the NPMap logo and the word "Builder". To the right are three navigation tabs: "1. Set Center & Zoom" (which is highlighted), "2. Add & Customize Data", and "3. Tools & Behavior". Below the navigation is a dark header bar with the title "NPMap Builder" and a subtitle "This is NPMap Builder. Pretty cool, huh?". On the right side of the header bar are icons for home, settings, refresh, and code. The main content area is divided into a left sidebar and a central map. The sidebar contains a "1 Set Center & Zoom" section with a "Use map to..." label and four buttons: "Set Center to 39.06, -96.02", "Set Zoom to 4", "Set Center & Zoom", and "Restrict Bounds". Below these is a "Min and Max Zoom Levels" section with a slider and the text "Use the slider to restrict the map to a range of zoom levels." and "Initial Center: 39.00, -96.00". At the bottom of the sidebar is a yellow "Add & Customize Data" button. The central map shows a map of the United States with numerous green dots representing National Park locations. The map includes state abbreviations and labels for "Gulf of Mexico" and "Sargasso Sea". At the bottom of the map area is a footer with "Disclaimer | © Mapbox | © OpenStreetMap contributors | Improve Park Tiles" and a build number "Build: 1455837007156". At the very bottom of the page are navigation links: "Home", "About NPMap", "Contact Us", "Submit Feedback", and "View Help".



# NPS: MAPPING THE NEXT 100 YEARS

## Places Mobile



NPS: MAPPING THE NEXT 100 YEARS

[www.nps.gov/npmap](http://www.nps.gov/npmap)

[npmap@nps.gov](mailto:npmap@nps.gov)

 [@npmap](https://twitter.com/npmap)

**Chad Lawlis**  [@chadlawlis](https://twitter.com/chadlawlis)



NPS: MAPPING THE NEXT 100 YEARS

# Synchronizing Data between ArcGIS and OpenStreetMap

James McAndrew  
Software Developer  
NPMMap



# Outline

- **OpenStreetMap: Places**
- **ArcGIS: National Park Service GIS**
- **Getting OSM and ArcGIS to work together**
- **Translating Data**
- **Geometries**
- **Attributes**
- **Putting it on a schedule**
- **Keeping it synchronized**
- **Sync Process Detail**



# Places

- Built on OpenStreetMap
- Takes advantage of tools designed for OpenStreetMap
- Rendering
- Editing
- Uploading
- Built on Open Source Tools



# NPS: MAPPING THE NEXT 100 YEARS

## Places

### Places Editor

National Park Service  
U.S. Department of the Interior



Cape Cod National Seashore

**Edit feature** X

Point Line Area Save

Restroom i

**Name** i  
Common name (if any) +

**NPS Unit Code** i  
caco

**Operator** i  
Unknown

**Address** i  
123 Street

View in Places

400 ft



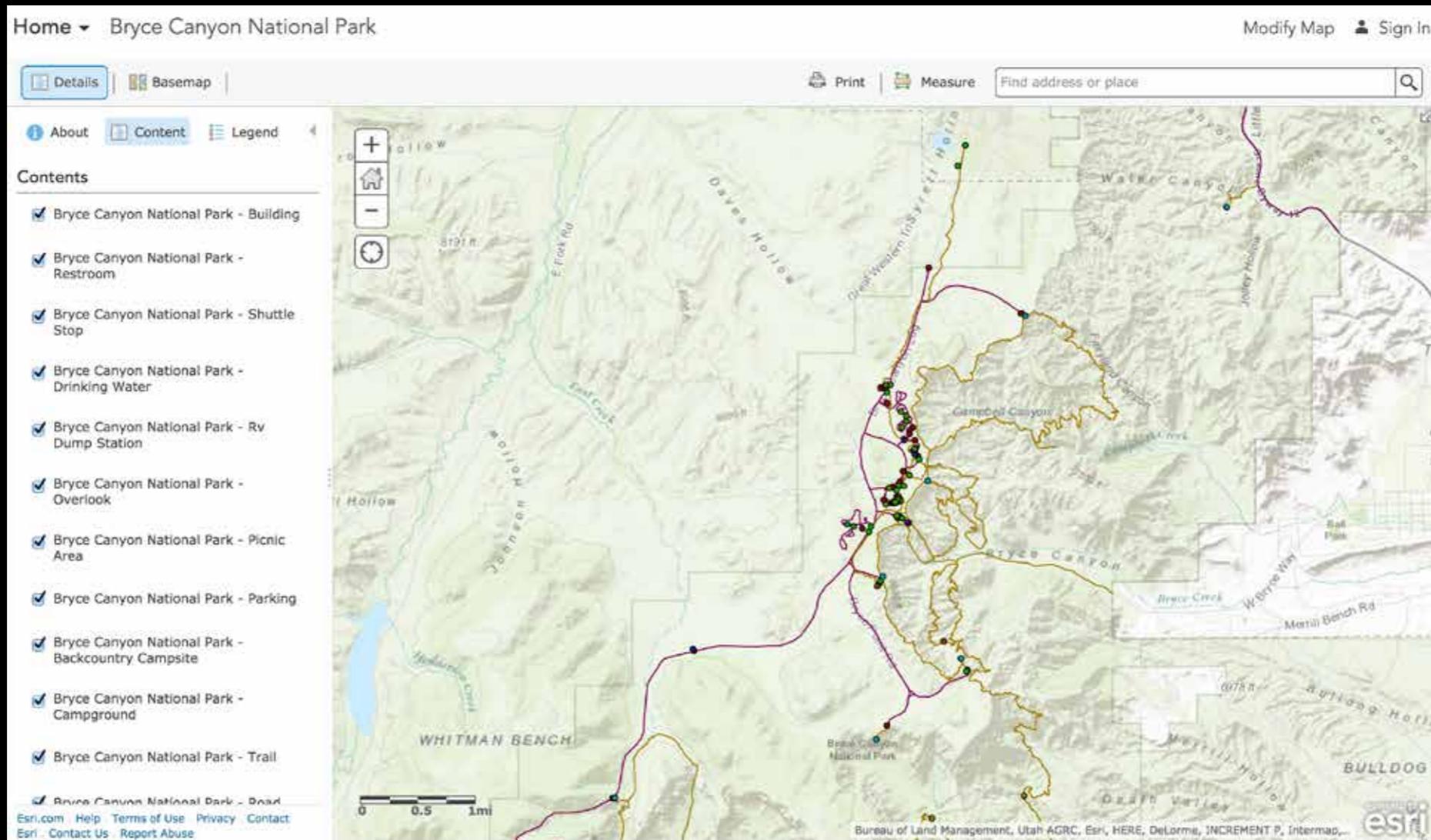
# **National Park Service GIS**

- **NPS GIS uses the ESRI ArcGIS Platform**
- **Some parks have their own GIS departments, many don't**
- **The country is split into regions**
- **Each region has a GIS department that helps to aggregate the data for each park**
- **The regions do a great job managing their data and we want to use their data in Places without interrupting their current workflows.**



# NPS: MAPPING THE NEXT 100 YEARS

## National Park Service GIS



# Translations

- ESRI ArcGIS and OpenStreetMap speak two different languages.
- We need to translate them to a common format.
  - Geometries
  - Attributes



# NPS: MAPPING THE NEXT 100 YEARS

## Translations ESRI JSON

```
{
  objectIdFieldName: "OBJECTID",
  globalIdFieldName: "GlobalID",
  geometryType: "esriGeometryPoint",
  - spatialReference: {
    wkid: 26913,
    latestWkid: 26913
  },
  fields: [ ],
  - features: [
    - {
      - attributes: {
        POINAME: "Elk Creek Showers"
      },
      - geometry: {
        x: 310891.2572999997,
        y: 4259639.201300001
      }
    },
    - {
      - attributes: {
        POINAME: "Lake Fork Shower"
      },
      - geometry: {
        x: 297191.64809999999,
        y: 4258863.07
      }
    }
  ]
}
```



# NPS: MAPPING THE NEXT 100 YEARS

## Translations OSM XML

```
<?xml version="1.0" encoding="UTF-8"?>
<osm version="0.6" generator="CGImap 0.0.2">
  <bounds minlat="54.0889580" minlon="12.2487570" maxlat="54.0913900" maxlon="12.2524800"/>
  <node id="298884269" lat="54.0901746" lon="12.2482632" user="SvenHRO" uid="46882" visible="true" version="1" changeset="676636" timestamp="2008-09-21T21:37:45Z"/>
  <node id="261728686" lat="54.0906309" lon="12.2441924" user="PikoWinter" uid="36744" visible="true" version="1" changeset="323878" timestamp="2008-05-03T13:39:23Z"/>
  <node id="1831881213" version="1" changeset="12370172" lat="54.0900666" lon="12.2539381" user="lafkor" uid="75625" visible="true" timestamp="2012-07-20T09:43:19Z">
    <tag k="name" v="Neu Broderstorf"/>
    <tag k="traffic_sign" v="city_limit"/>
  </node>
  ...
  <node id="298884272" lat="54.0901447" lon="12.2516513" user="SvenHRO" uid="46882" visible="true" version="1" changeset="676636" timestamp="2008-09-21T21:37:45Z"/>
  <way id="26659127" user="Masch" uid="55988" visible="true" version="5" changeset="4142606" timestamp="2010-03-16T11:47:08Z">
    <nd ref="292403538"/>
    <nd ref="298884289"/>
    ...
    <nd ref="261728686"/>
    <tag k="highway" v="unclassified"/>
    <tag k="name" v="Pastover Straße"/>
  </way>
  <relation id="56688" user="kmvar" uid="56190" visible="true" version="28" changeset="6947637" timestamp="2011-01-12T14:23:49Z">
    <member type="node" ref="294942404" role=""/>
    ...
    <member type="node" ref="364933006" role=""/>
    <member type="way" ref="4579143" role=""/>
    ...
    <member type="node" ref="249673494" role=""/>
    <tag k="name" v="Küstenbus Linie 123"/>
    <tag k="network" v="VWV"/>
    <tag k="operator" v="Regionalverkehr Küste"/>
    <tag k="ref" v="123"/>
    <tag k="route" v="bus"/>
    <tag k="type" v="route"/>
  </relation>
  ...
</osm>
```



# Translations

- **Geometries**
  - **ArcGIS uses a proprietary JSON format**
  - **OpenStreetMap uses a format based on individual nodes, and how each node relates with other nodes.**
- **Both of these formats can be readily converted to and from GeoJSON**



# Translations

- **Attributes**
  - NPS GIS uses fields that are predefined by the a standards committee
  - OpenStreetMap uses tags that are defined by its wiki.
- **Translation Guide**
  - We have worked to create a translation guide from the NPS Data Standard to Places / OSM and back



# Automation

- National Park Service GIS Data sources are not static.
- Places needs to be as update to date as possible.
- Updates need to be run on a regular basis.



# Synchronization Tool

- The sync tool works at the core between the two translations steps
- Compares to two data sources in a common format
- Keeps track of:
  - What has been added to Places from ArcGIS
  - What has been removed from ArcGIS that still remains in Places



# Synchronization Process

1. Connect to all sources
  - Synchronization Core Database
  - ArcGIS Source
  - Places Destination
2. Query the Core database for the last time a sync was run
3. Query ArcGIS for all data created since that time
4. Translate any updates into a common format
5. Query both ArcGIS and the Core database to compare which primary keys have been removed since the last Sync.
6. Create a list of what needs to be updated and removed from Places.
7. Translate these changes to the OpenStreetMap format
8. Close All Sources



# NPS: MAPPING THE NEXT 100 YEARS

## Synchronized Data

Editing Disabled for Bryce Canyon National Park

For more information, please contact [Intermountain Region GIS Program](#)



NPS: MAPPING THE NEXT 100 YEARS

[www.nps.gov/npmap](http://www.nps.gov/npmap)  
[npmap@nps.gov](mailto:npmap@nps.gov)  
 [@npmap](https://twitter.com/npmap)

**James McAndrew**  [@jimmyrocks](https://twitter.com/jimmyrocks)





**NPS: MAPPING THE NEXT 100 YEARS**

**thanks!**

**jake\_coolidge@partner.nps.gov**

**chad\_lawlis@partner.nps.gov**

**james\_mcandrew@partner.nps.gov**

