1 CARTOGRAPHY IN THE NATIONAL PARK SERVICE

BRENDAN M. BRAY, NPS HARPERS FERRY CENTER FOR MEDIA SERVICES

THE EVOLUTION OF PARK MAPS

National Park Service (NPS) cartographic maps are a common feature found in park brochures, exhibits, and other interpretive media. Just as every park is different, so too are park maps. These maps are custom designed to emphasize park symbols of national significance and critical safety and stewardship information, such as roads, trail heads, campgrounds, or restrooms. Regardless of the size and location of the park, maps are often the first piece of information that visitors receive as they begin their experience.

NPS maps are specially designed to offer quick utility and convey complex geographic information in an easy-to-read, visually appealing way. But these maps don't just look beautiful; they are highly technical and aim to seamlessly integrate layers of geographic information with the aesthetic look and interpretive themes inherent in these special places.

NPS cartographers at the Harpers Ferry Center for Interpretive Media use a variety of GIS tools to generate accurate maps using satellite and aerial imagery, national land cover data, and georeferenced park features. Cartographers also employ various artistic techniques, such as hand-drawn waves crashing along coastlines or cubed buildings in towns and villages to capture recognizable features of a park. On these next pages, you will see examples of pieces created to orient and immerse visitors in a park experience without simultaneously overwhelming them with information.

In the site maps for Salem Maritime and Booker T. Washington (see chapter 3, "Visitors and resource protection") historic sites, cartographers used a combination of GIS and graphic design software to generate axonometric, pseudo-3D projections to show buildings on a standard street grid base layer. In this photo-realistic view of the park, buildings seemingly leap off the page and illustrate the architectural complexities of ornate historic structures. In the Grand Canyon trail map (see chapter 2, "Recreation"), cartographers used terrain texture shading and natural land colors to create a natural look and feel to help hikers easily find their way across complex terrain and understand the physical demands of descending below the canyon rim. The *Stehekin* map (see chapter 2, "Recreation") is a full 3D natural land-color representation of an incredible landscape where cartographers combined elevation data with natural features and texture shading to generate this eye-popping map that is highly artistic and extremely informative. The *Congaree National Park* map is a planimetric map built with

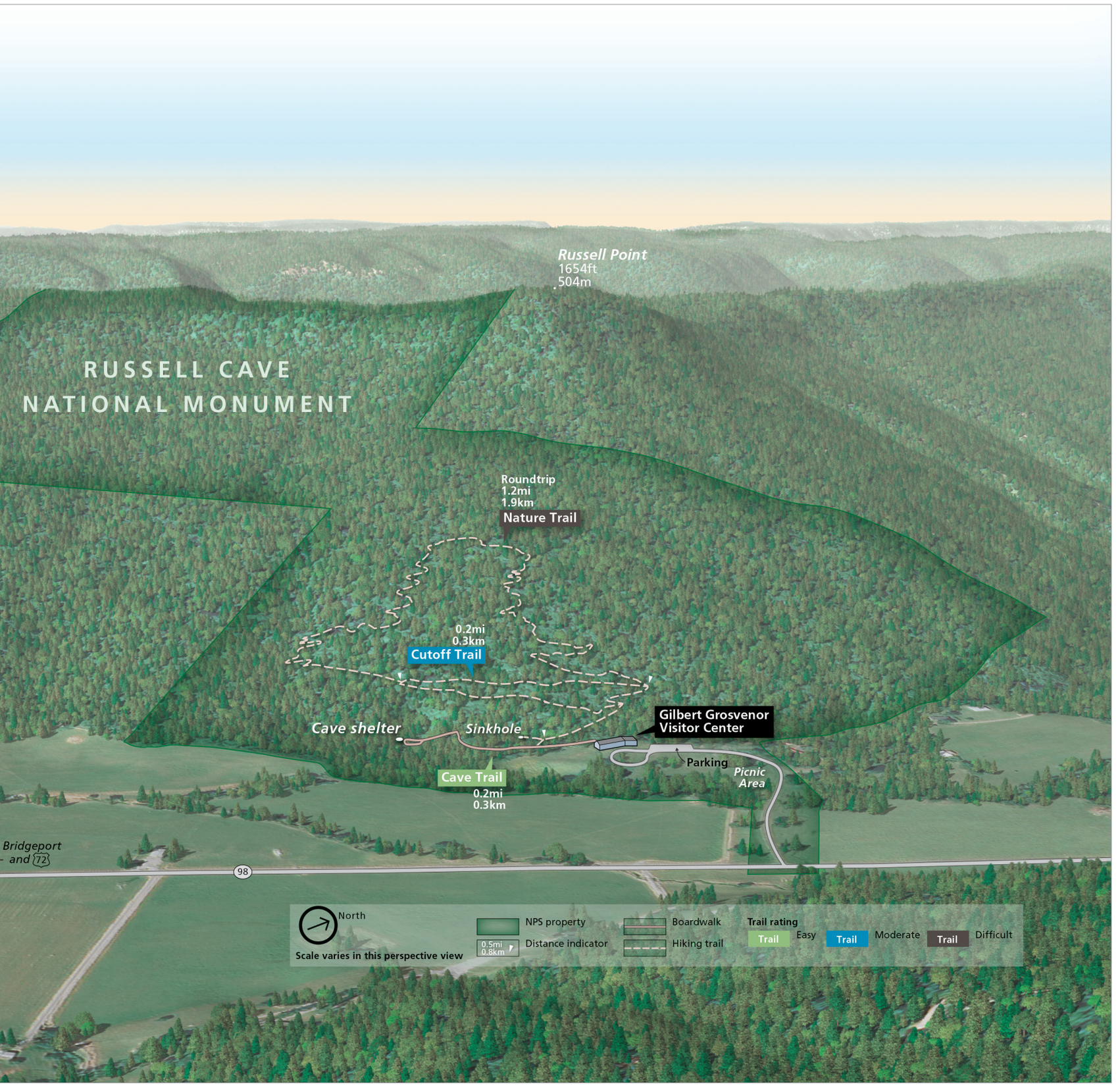
lidar-derived elevation data. This high-resolution data teases out every bend and meander of hydrology and unveils a complex network of drainages within the park boundary.

More than 300 million people visit US national parks every year. National parks will continue to see rapid growth in visitation over the coming decades. To meet this growing demand, NPS cartographers will continue to explore new ways to blend traditional cartography, graphic design, and digital mapping to generate highly useful and beautiful products for our visitors.

RUSSELL CAVE NATIONAL MONUMENT 3D PARK MAP

JOSEPH MILBRATH, NPS HARPERS FERRY CENTER FOR MEDIA SERVICES

This 3D map of the park was created for a new park brochure in 2016. The map shows the park's location along the valley and ridge topography of northeast Alabama. National Agricultural Imagery Program (NAIP) imagery was draped on a digital elevation model (DEM) in 3D software, Natural Scene Designer, and 3D trees were "planted" where forested areas were present in the imagery. Geospatial data was used for the park's trails, roads, and buildings.

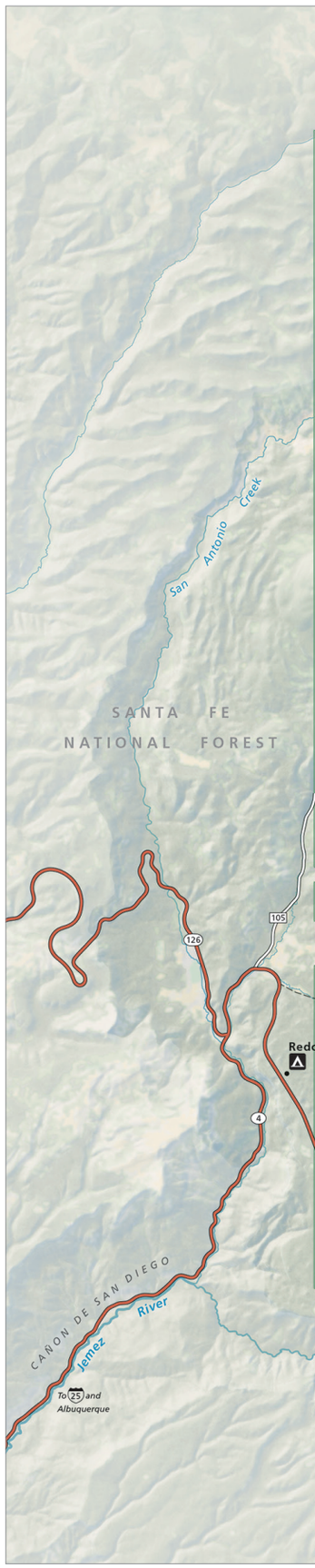


This 3D map shows the park's location along the valley and ridge topography of northeast Alabama. Data sources: USGS, NPS, and NAIP.

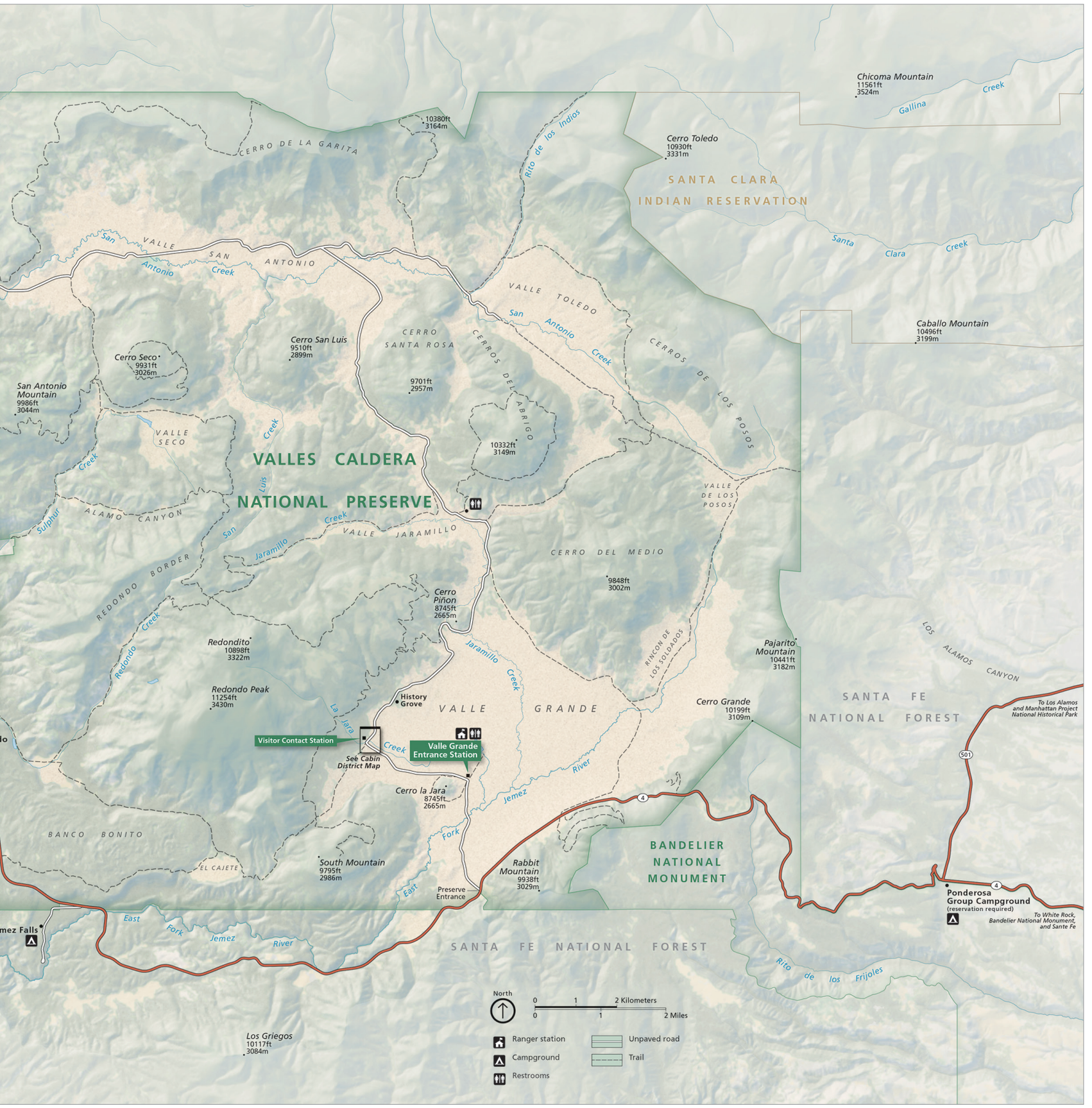
VALLES CALDERA NATIONAL PRESERVE PARK MAP

JOSEPH MILBRATH, NPS HARPERS FERRY CENTER FOR MEDIA SERVICES

The map of Valles Caldera National Preserve was created for the preserve's first brochure in 2017. The map's relief was built by blending a United States Geological Survey (USGS) DEM with lidar data collected to study volcanic flows in the Banco Bonito portion of the preserve. National land cover data was used to determine forested and meadow areas. The two land cover classifications illustrate the park's inverted *Sky Island*, where high elevations are forested, and low elevations contain open meadows. The map also includes geospatial data of the park's rivers, roads, and trail networks.

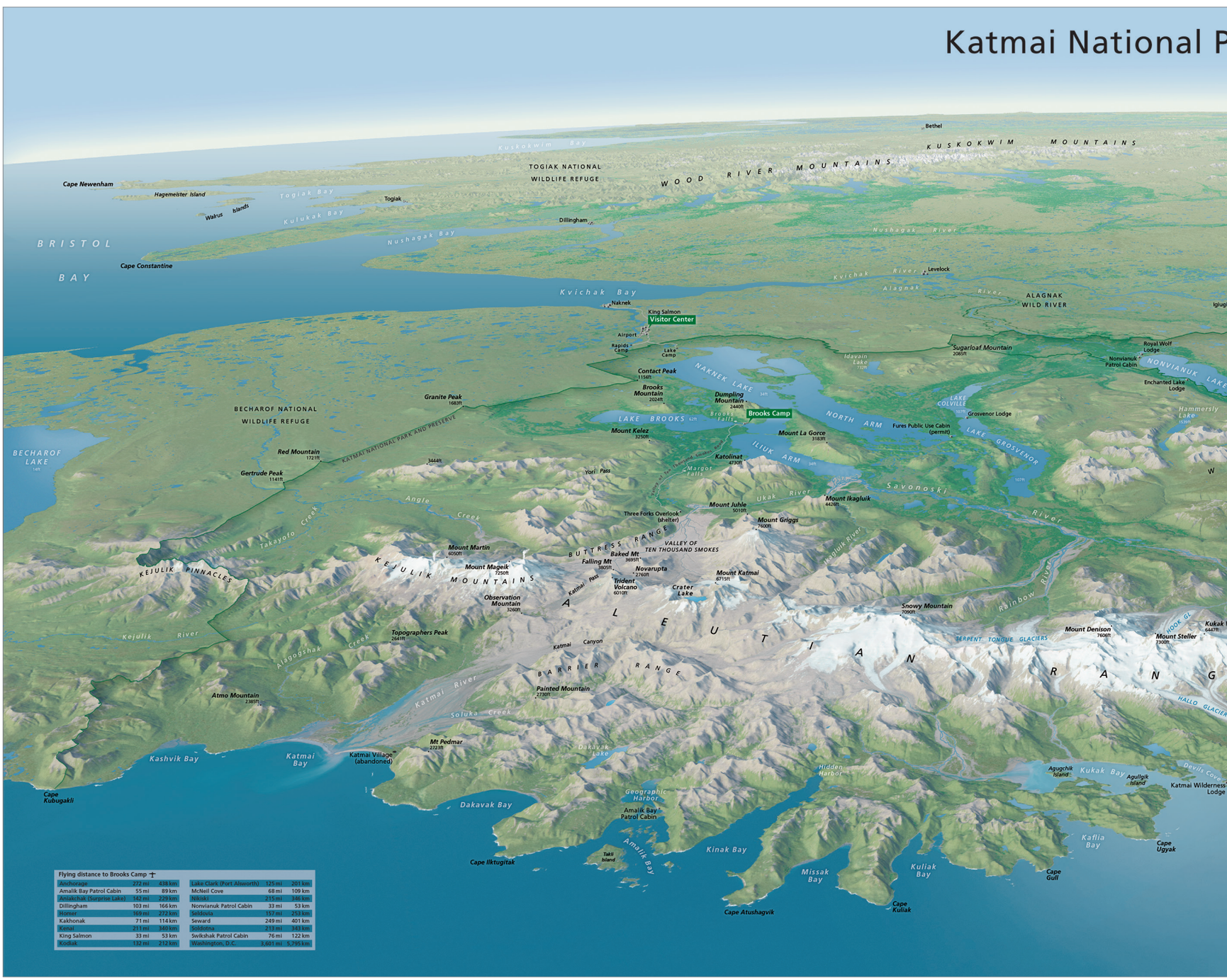


The map of Valles Caldera National Preserve was created for the preserve's first brochure in 2017. Data sources: USGS and NPS.



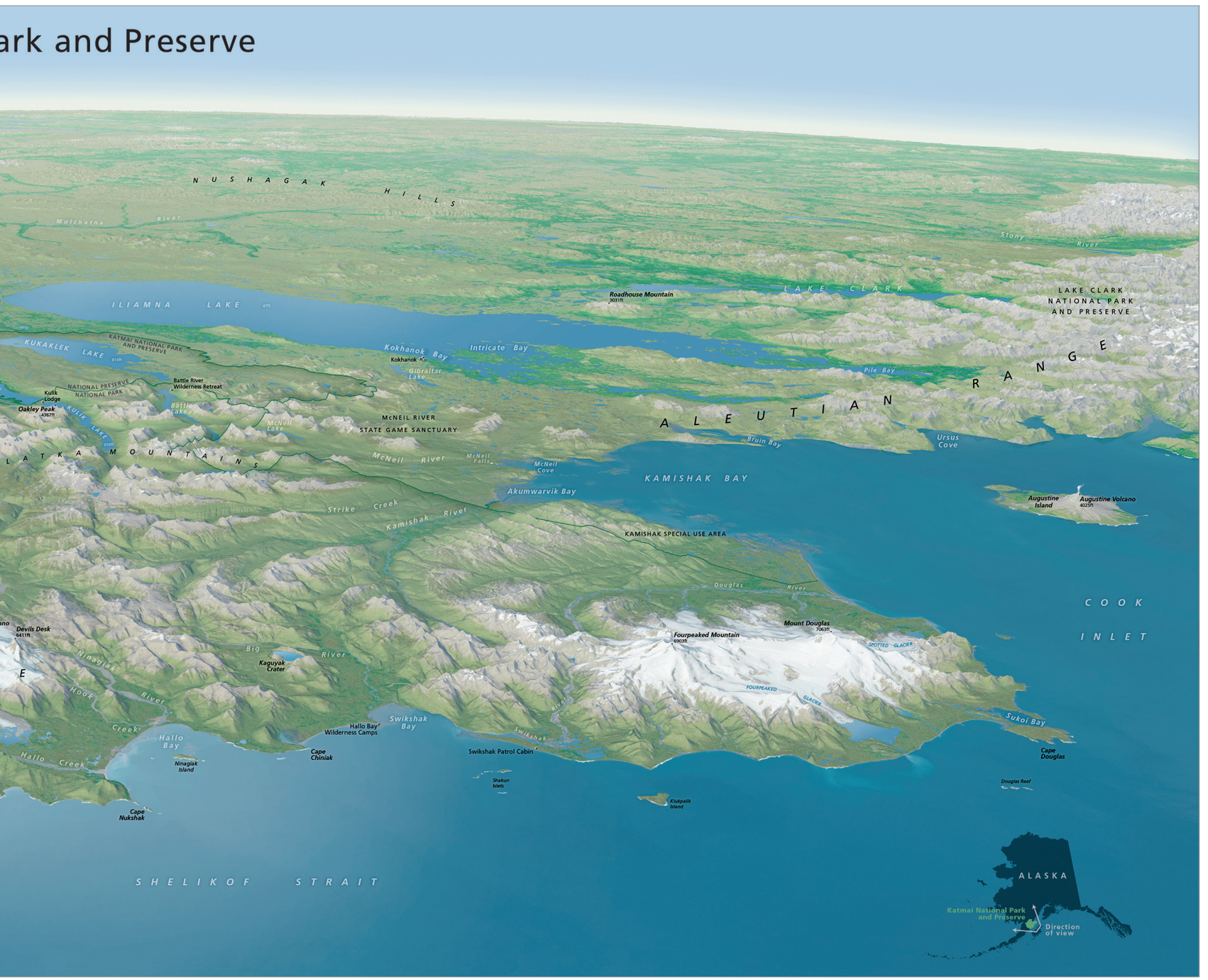
KATMAI NATIONAL PARK AND PRESERVE PANORAMA

JOE MILBRATH AND JIM EYNARD, NPS HARPERS FERRY CENTER FOR MEDIA SERVICES



This panorama of Katmai National Park and Preserve in Alaska was created to give visitors a perspective of the park's features outside of Brooks Falls, a popular destination where tourists can view brown bears feasting on trout and salmon. The map's relief was created using 3D software, Natural Scene Designer, and combines a DEM, Landsat imagery, and national land cover data. As a result, the terrain combines blue water features through dense forests and shrubs skyward to rocky ridgelines and glaciated peaks. Hand-drawn plumes vent from the range's active volcanic peaks, and waves crash along coastlines. The maps rivers, lakes, roads, and trails were derived from geospatial data.

This map shows a panorama of Katmai National Park and Preserve. Data sources: USGS DEM, USGS National Hydrography Dataset, NPS lands Boundary, NPS trails and roads.



SALEM MARITIME NATIONAL HISTORIC SITE

JIM EYNARD, NPS HARPERS FERRY CENTER FOR MEDIA SERVICES

This map of Salem Maritime National Historic Site and the surrounding area in Salem, Massachusetts, was designed to be used as part of a brochure and as a wall map in the visitor center. There are three levels of buildings in the visual hierarchy, with the most important buildings shown as pseudo-3D axonometric buildings. Buildings of medium importance are shown as dark orange, and all other buildings on the map are shown in light gray. This map could be used as part of a walking tour as visitors navigate this park site and the surrounding area.

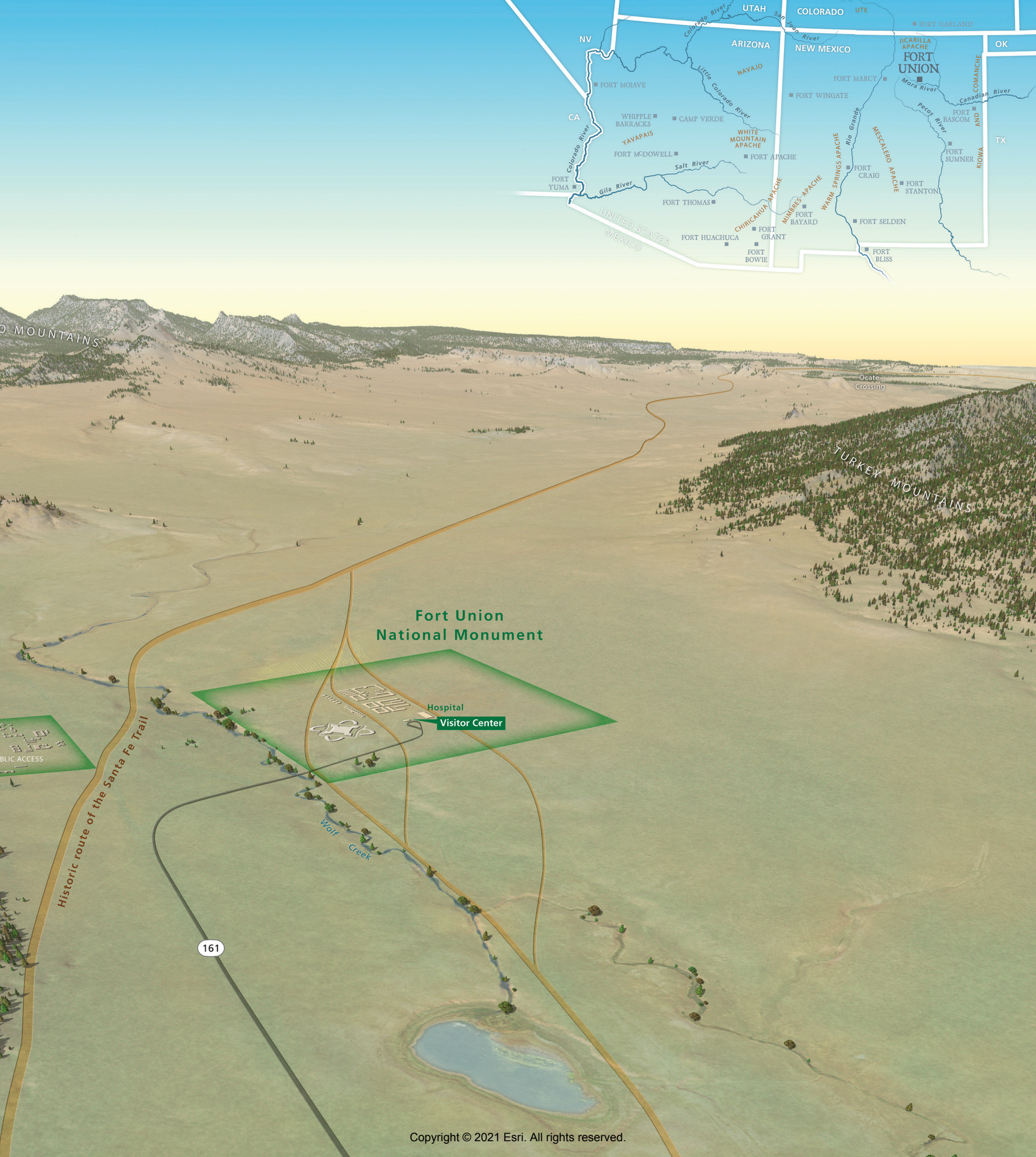
This map shows the Salem Maritime National Historic Site and the surrounding area in Salem, Massachusetts. Data sources: NPS lands boundary, NPS, and Open Street Map.

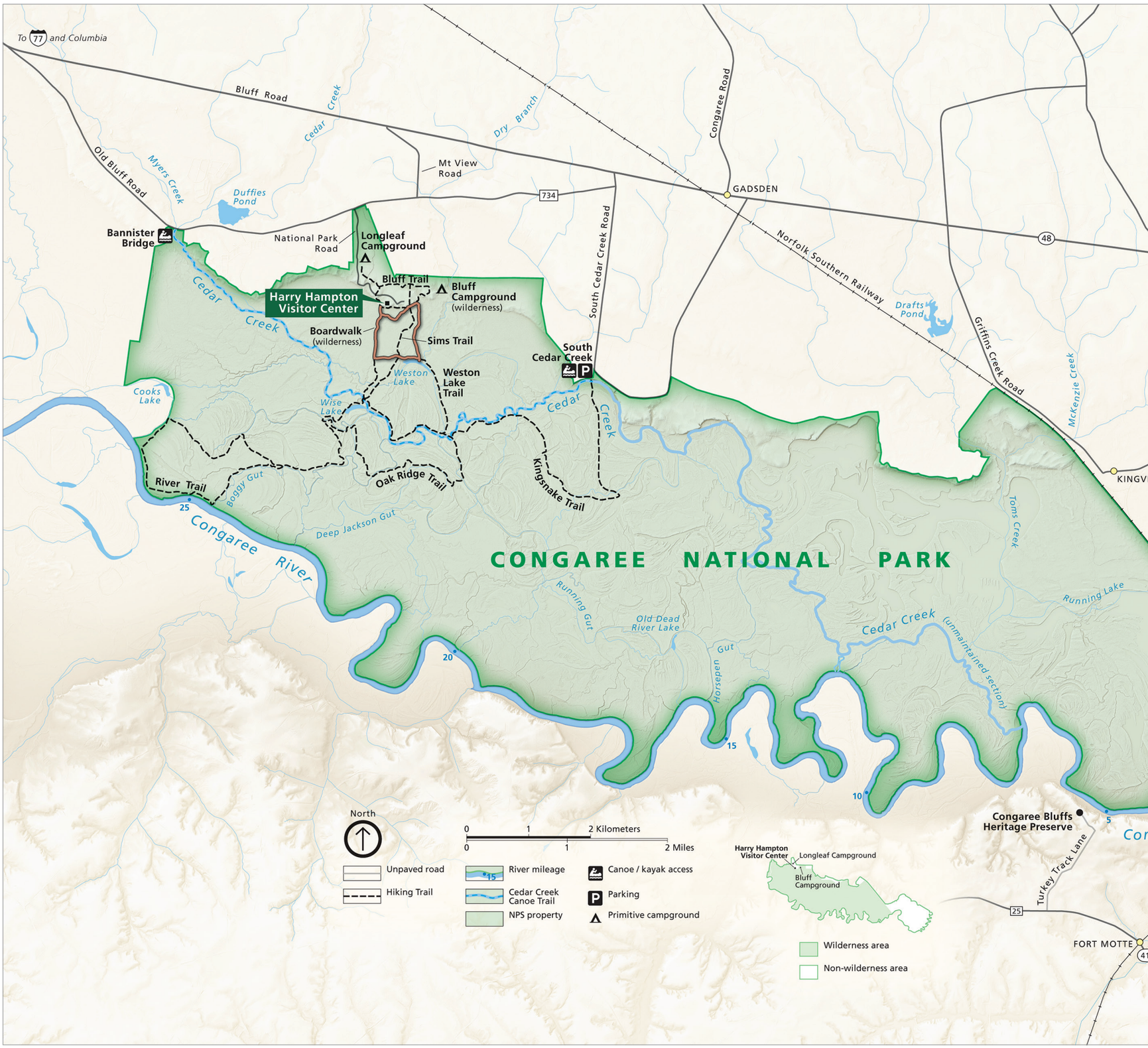
FORT UNION NATIONAL MONUMENT

JIM EYNARD, NPS HARPERS FERRY CENTER FOR MEDIA SERVICES

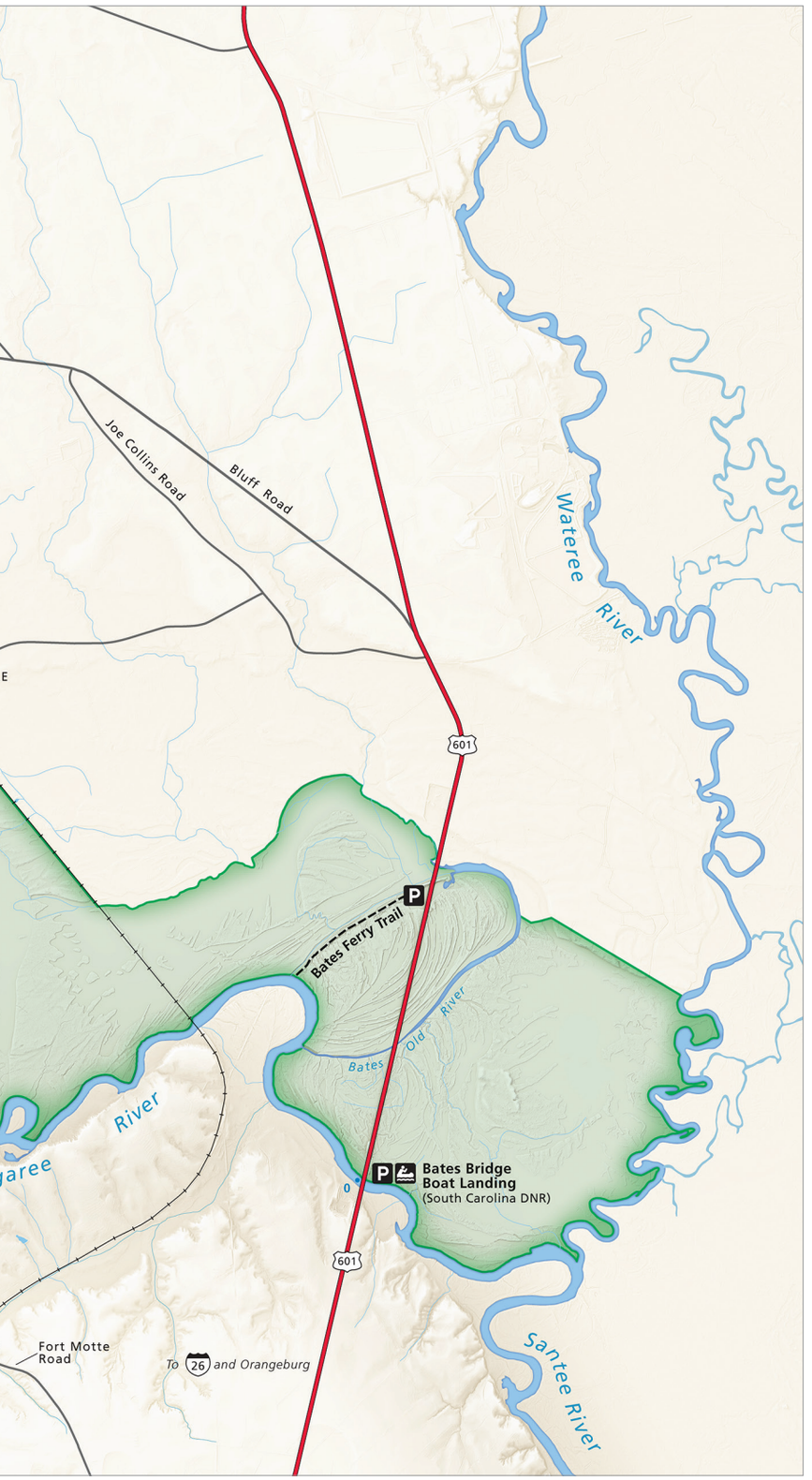
This 3D perspective view of Fort Union National Monument in New Mexico shows how the 19th-century fort was strategically located along the Santa Fe Trail. The wide-angle view shows the many natural resources in the area that were once utilized by the people at the fort including the forest on Turkey Mountain, adobe fields at the northern edge of the park boundary, and the water resources in the area. Overlaid on the 3D map is a map of the extensive fort network in the southwestern United States during the time period.

This 3D perspective view of Fort Union National Monument in New Mexico shows the nineteenth-century fort strategically located along the Santa Fe Trail. Data sources:USGS, NPS, and NAIP.





Congaree National Park's brochure map. Data sources: USGS, NPS.



CONGAREE NATIONAL PARK

JIM EYNARD, NPS HARPERS FERRY CENTER FOR MEDIA SERVICES

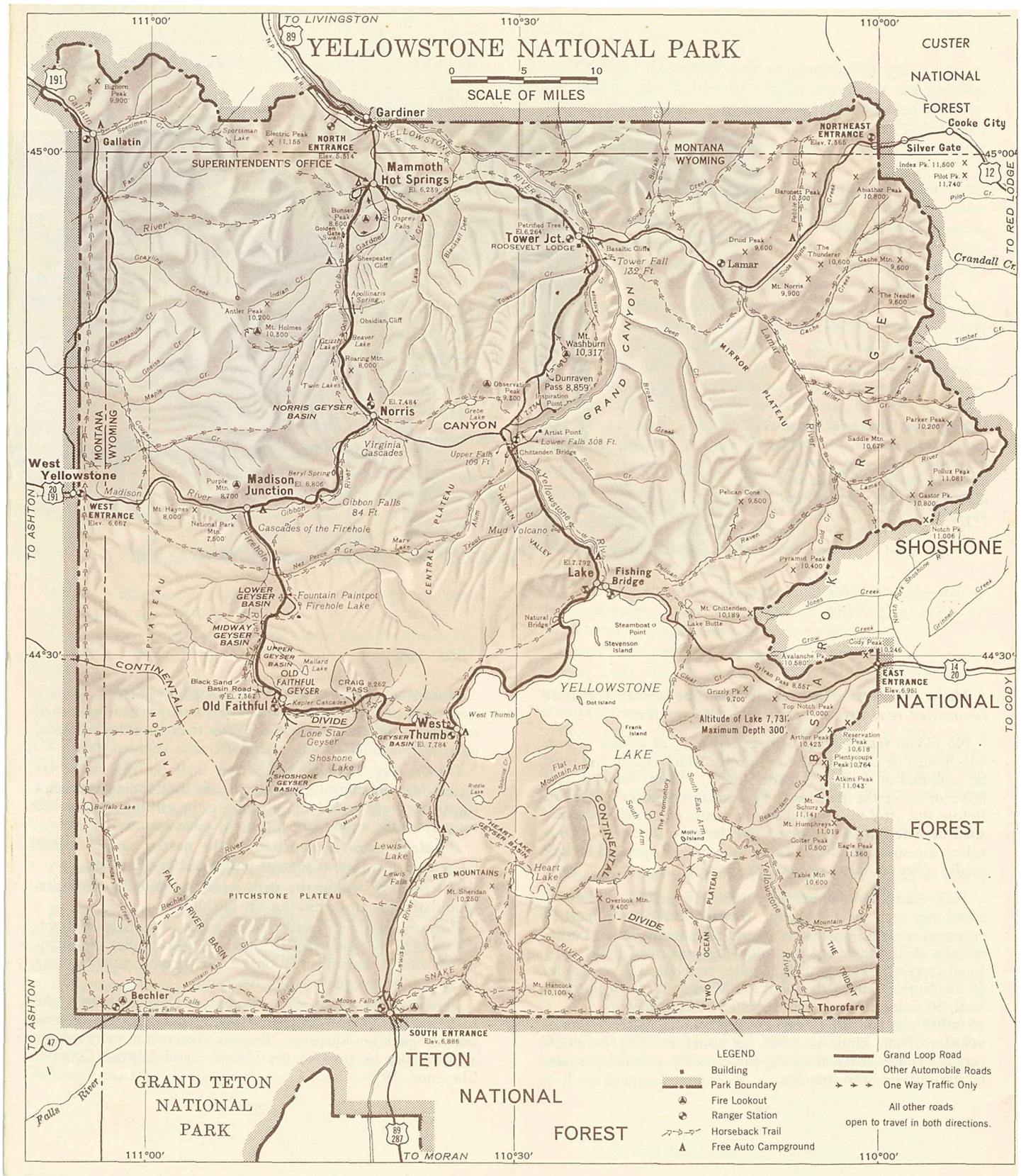
Congaree National Park's brochure map uses high-resolution lidar derived elevation data to show the intricate network of waterways within this relatively flat area and highlights the wilderness area that makes up much of the park in South Carolina. Congaree National Park protects over 11,000 acres of old growth floodplain forest, the largest remaining parcel of this ecosystem that once included 52 million acres throughout the southeastern United States.

EVOLUTION OF A NATIONAL PARK SERVICE MAP

TOM PATTERSON (RETIRED), JIM EYNARD, AND JOE MILBRATH, NPS HARPERS FERRY CENTER FOR MEDIA SERVICES

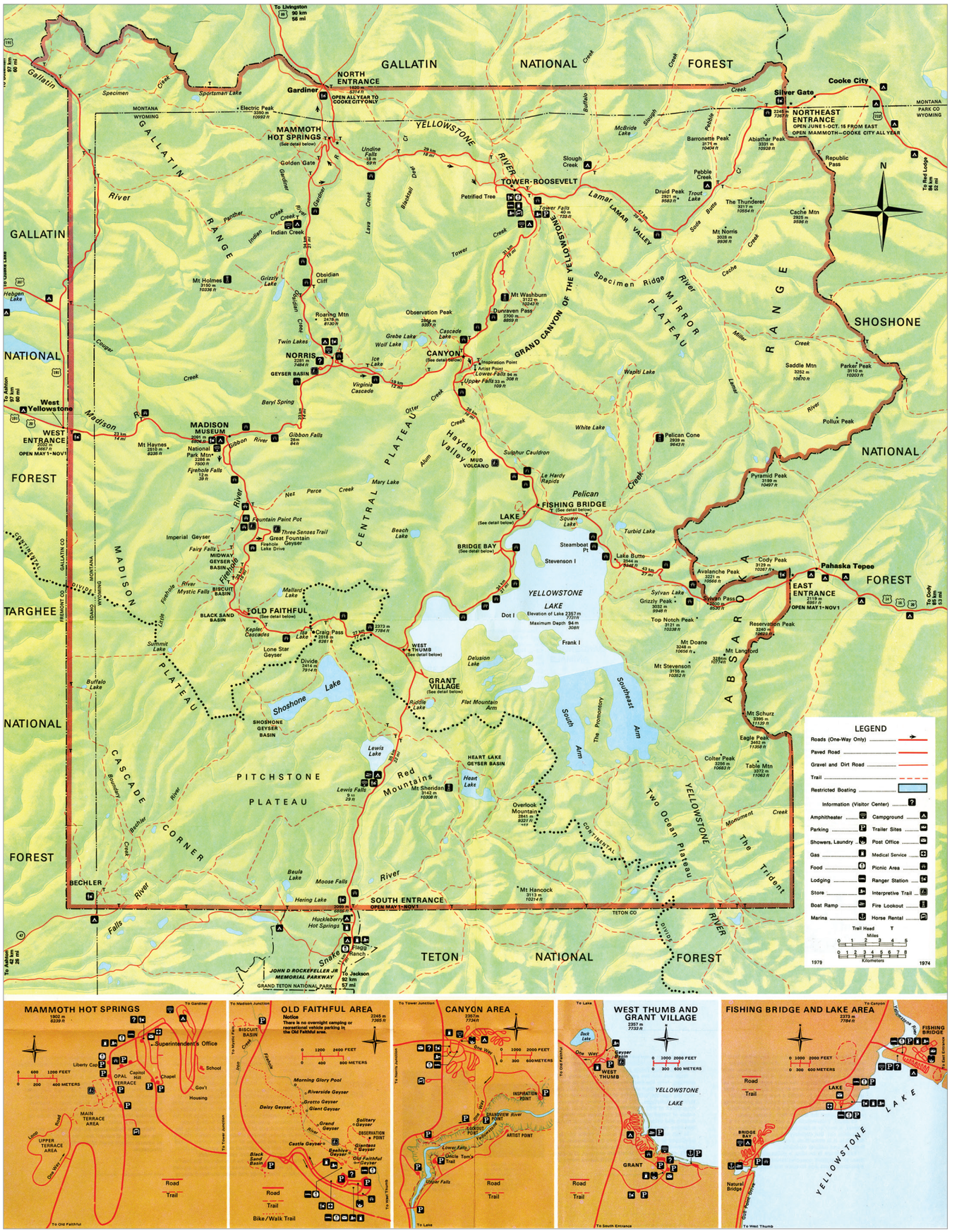
National Park Service maps have oriented visitors to Yellowstone National Park's fabled beauty since the park transitioned to the NPS in 1917. This series of five maps illustrates the evolution of NPS cartography from traditional hand-drawn relief to the present-day digital maps composed of GIS data. First, the *Yellowstone* map from 1957 depicts a clear visual hierarchy of roads, points of interest, and physical features. A dominant, monochromatic, hand-drawn shaded relief softly highlights the park's topography. The first infusion of color can be found in the 1967 park map where a green park fill would become a defining trait in NPS maps. In its infancy, however, the dark-green fill overpowers the park's relief and roadways, making important features difficult to read. Symbols also begin to appear in the maps of the 1960s as spiky tents pointing visitors to campgrounds, and quadrant-circles peculiarly indicate ranger stations. In the 1979 map, NPS map symbology shifts to recognizable black pictographs, now an identifying feature of NPS maps. The map's shaded relief is restored to prominence with warm yellow highlights and cool blue shadows. In 1987, a green fill and boundary ribbon distinguishes the park from neighboring federal lands and becomes another defining characteristic of NPS maps. A black border and title banner, signature elements from designer Massimo Vignelli's retooled layout of the *Unrigid* brochure in 1977, frame a map that would go largely unchanged for nearly 30 years.

Finally, the 2018 map highlights park features with shaded relief generated using GIS data. Two important land cover classifications, meadows and forested areas, were delineated from the national land cover dataset to replicate the natural environment. With meadows clearly highlighted, visitors can identify areas to safely view wildlife from their vehicles or spotting scopes. The map also features a generalized terrain, closely resembling its hand-drawn predecessors, blended with hypsometric tints that range from snowy alpine peaks to darker dense valleys and streams. The park's road network, visitor centers, and points of interest are styled to a visual identity that has been developing over the past 50 years. NPS cartography continues to evolve with improvements in GIS technology and the availability of data, while maintaining the artistic qualities of previous generations.

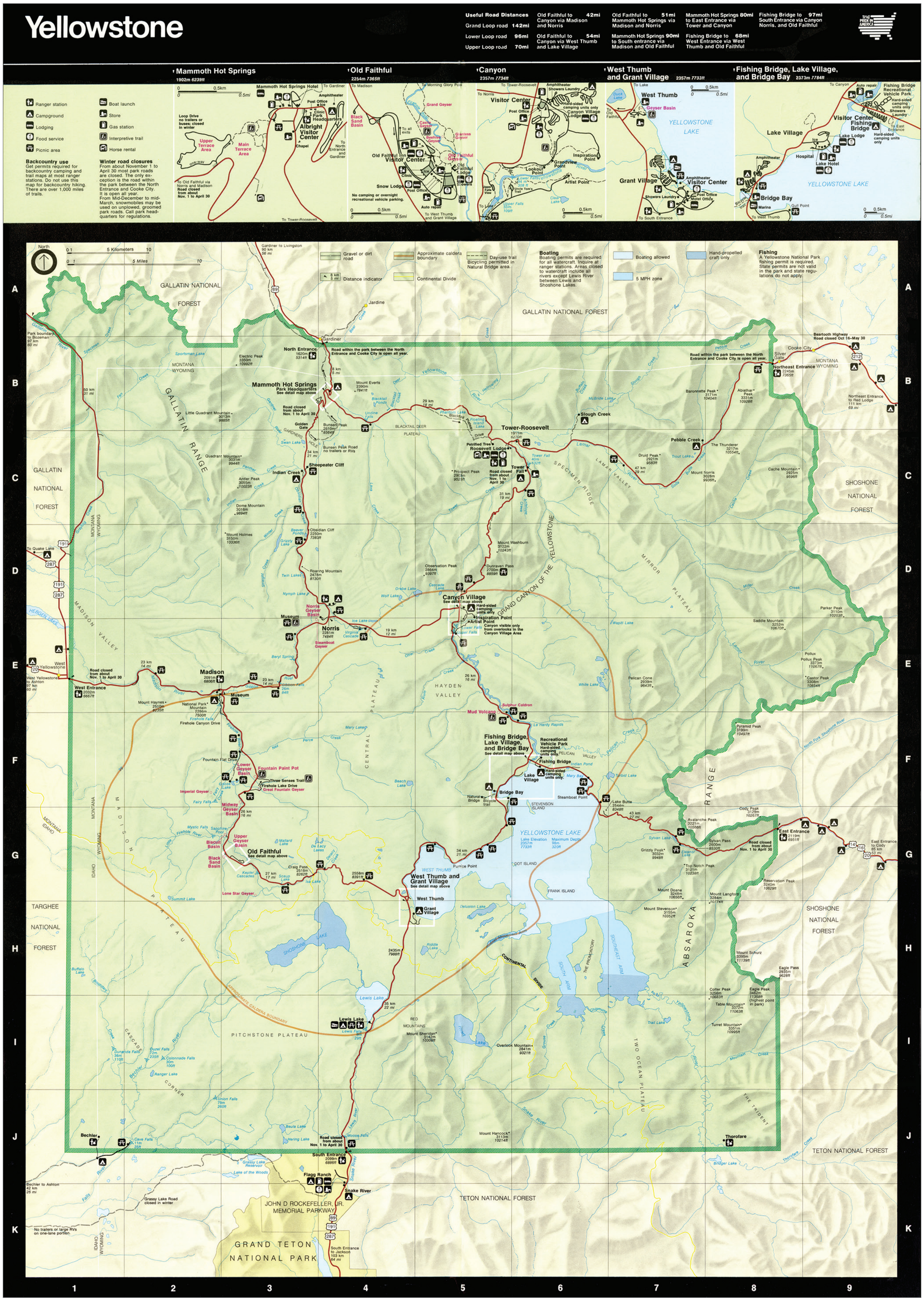


The 1957 map of Yellowstone depicts a clear visual hierarchy of roads, points of interest, and physical features.

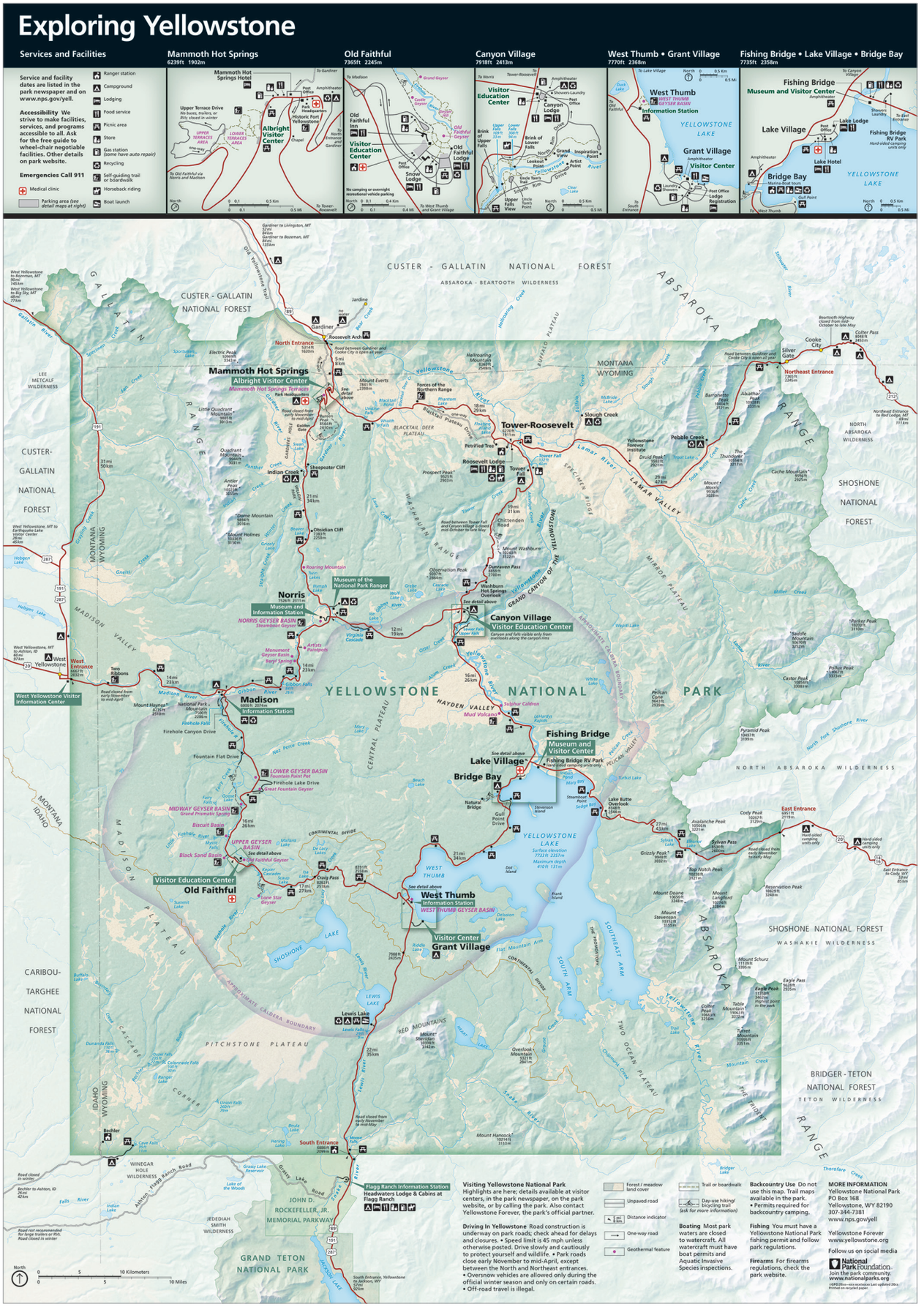
The first infusion of color can be found in the 1967 park map where a green park fill would become a defining trait in NPS maps.



In the 1979 map, NPS map symbology shifts to recognizable black pictographs, now an identifying feature of NPS maps. Data sources on pages 15-18: NPS, Harpers Ferry Center.



In 1987, a green fill and boundary ribbon distinguishes the park from neighboring federal lands and becomes another defining characteristic of NPS maps.



The 2018 *Exploring Yellowstone* map highlights park features with shaded relief generated using GIS data. Data sources: USGS, NPS.