



National Mall and Monuments



Delaware Water Gap National Recreation Area



Alcatraz Island



Tallgrass Prairie National Preserve

NPS National Transit Inventory and Performance Report, 2021



Zion National Park

This is a summary of the 2021 National Park Service Transit Inventory and Performance Report. This effort:

1. identifies NPS transit systems across the country,
2. tracks the operational performance (e.g., boardings) of each system, and
3. inventories NPS- and non-NPS-owned transit vehicles and vessels and collects detailed vehicle information.

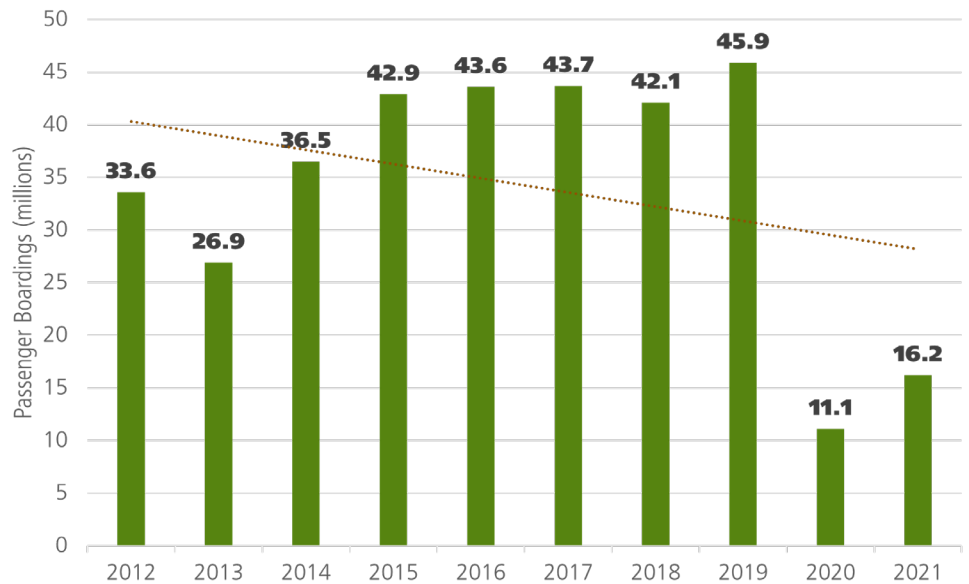
16.2 Million Passenger Boardings

62 Systems Operated

43 Parks Represented

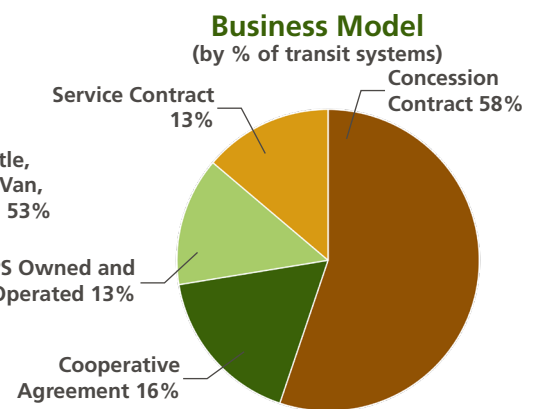
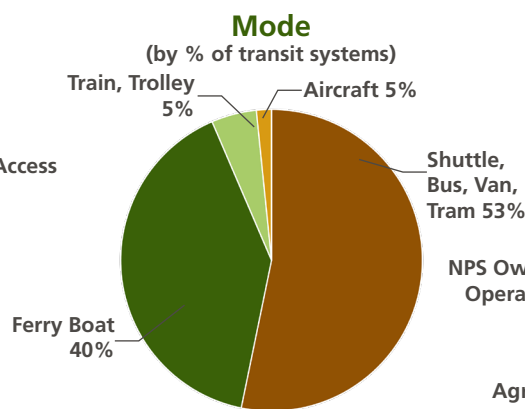
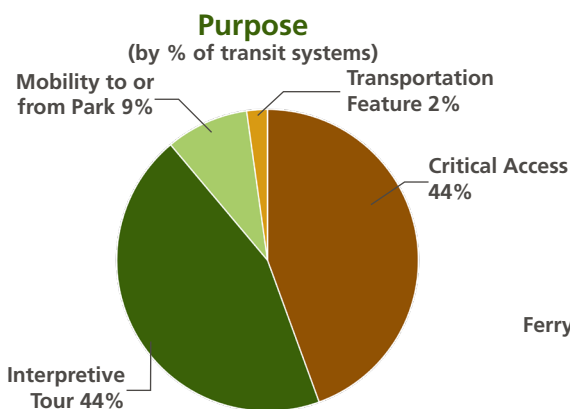
722 Vehicles & Vessels

*Reflects systems that operated during the fiscal year 2021 only.



Of the 62 transit systems that operated, the top 10 transit systems accounted for 85% of the passenger boardings in 2021. The systems with over a million boardings are located at Zion National Park, Ellis Island/Statue of Liberty National Monuments, Grand Canyon National Park, and the National Mall and Monuments. The top parks list has remained relatively stable over time.

The National Park Service owns and operated 8 systems and owns the fleet for 31% of the systems. NPS-operated systems account for 356,045 passenger boardings—about 1% of total boardings.





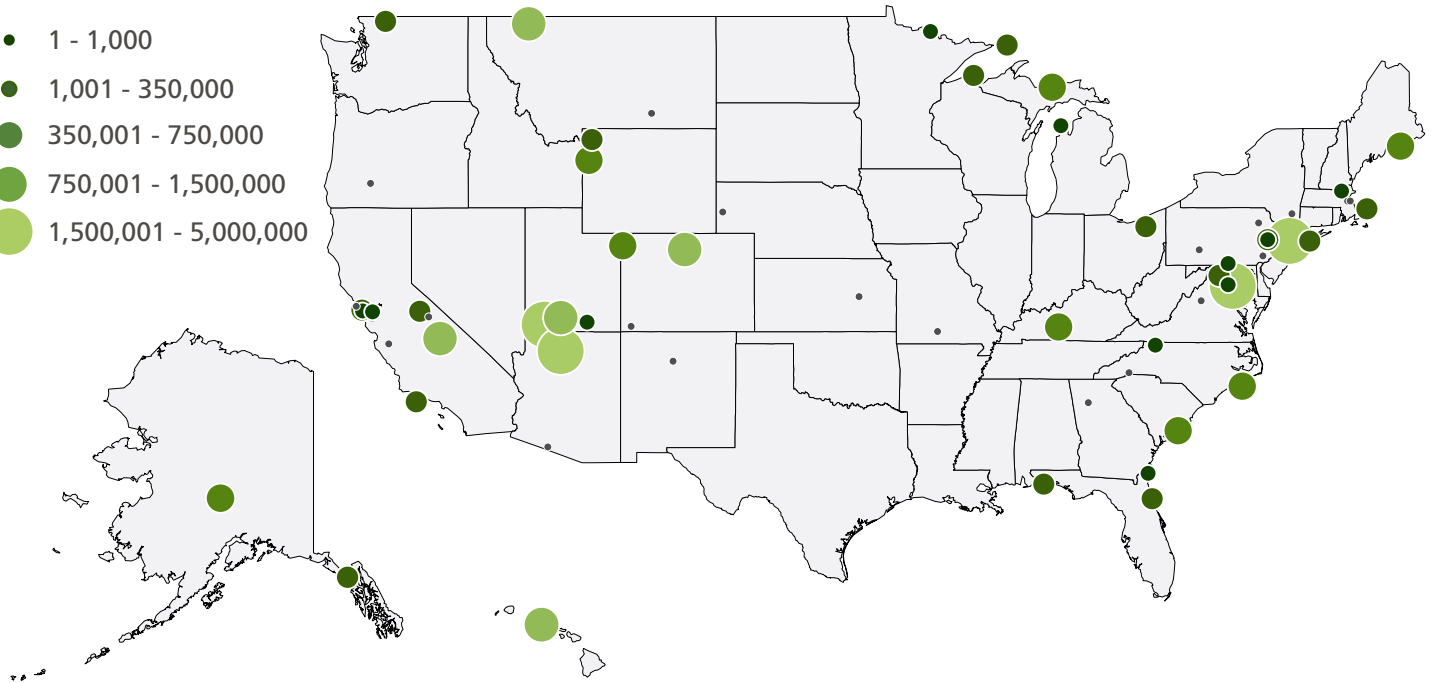
45% of NPS-owned transit vehicles operate on alternative fuel, while 24% of non-NPS-owned vehicles operate on alternative fuel.



62 NPS Transit Systems operated in fiscal year 2021. Of those, 47 operated for six months or more and 22 operated year-round.

Passenger Boardings by Park

- 1 - 1,000
- 1,001 - 350,000
- 350,001 - 750,000
- 750,001 - 1,500,000
- 1,500,001 - 5,000,000



Performance Measures

Visitor Experience

The majority of the NPS-owned transit system vehicles and vessels are accessible for people with mobility impairments. 56% of NPS-owned vehicles are accessible to people with mobility impairments (e.g., require a wheelchair lift).

Operations

The National Park Service partners with the private sector to provide the majority of transit services. Non-NPS entities operate 79% of NPS transit systems, which account for 99% of passenger boardings servicewide. The National Park Service owns and operates the remaining 21% of transit systems, which account for the remaining 1% of passenger boardings.

Environmental Impact

National Park Service transit systems mitigate vehicle emissions. The net CO₂ emissions savings of the 722 transit vehicles and vessels evaluated (excluding planes, rail, snowcoaches, and vehicles with incomplete data or that did not operate) was equivalent to removing 5.6 million personal vehicle trips and 107 million passenger vehicle miles from the road.

Asset Management

National Park Service-owned shuttle/bus/van/tram vehicles have an estimated \$157 million in recapitalization needs between 2022 and 2032. Parks with estimated transit vehicle replacement costs over \$5 million during the next 10 years include Acadia National Park, Grand Canyon National Park, Isle Royale National Park, and Yosemite National Park.



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Cover Photos:

Alcatraz Island Ferry, Golden Gate National Recreation Area. Photo: Amanda Calhoun (lower left)

Big Bus Tours, National Mall and Monuments. Photo: NPS/Chantae Moore (upper left)

Hiker Shuttle, Delaware National Recreation Area. Photo: Monroe County Transit/Rich Schlameuss (upper right)

Bus Tours, Tallgrass Prairie National Preserve. Photo: NPS (lower right)

Executive Summary Photos:

Zion Canyon Shuttle, Zion National Park, Photo: NPS



Introduction

The *2021 National Park Service (NPS) Transit Inventory and Performance Report* communicates the servicewide outcomes and status of NPS transit systems. This comprehensive listing has been compiled annually in this format since 2012 and covers surface, waterborne, and airborne systems. The inventory establishes a working definition of NPS transit systems for the purpose of this document; helps the National Park Service comply with 23 United States Code (USC) 203(c),¹ which requires “a comprehensive national inventory of public Federal lands transportation facilities”; and fulfills other internal needs.

The 2021 inventory is meant to assist the National Park Service with the following:

- Measure NPS transit performance.
- Capture asset management and operational information not tracked in current NPS systems of record.
- Integrate transit data with NPS systems of record, including asset management data in the Financial and Business Management System for NPS-owned vehicles.
- Inform the *National Long-Range Transportation Plan*, regional long-range transportation plans, and the Annual Accomplishments Report by providing key transit statistics, which can also be used to track progress towards goals.
- Comply with Executive Order 13693, which requires federal agencies to measure, manage, and reduce greenhouse gas emissions and Executive Order 14057, with a goal of 100% zero-emission vehicle acquisitions by 2035.
- Communicate program information and projected vehicle recapitalization needs.

Updates in the 2021 Inventory

As part of the reporting, the National Park Service developed an online reporting tool using Microsoft Power BI that compiles the inventory data into a coherent and interactive report. The national transit inventory and performance report will continue to be updated annually so that transit managers can gain insight to transit trends over time.

Beginning in 2020, the collection period was shifted from calendar year (January 2020–December 2020) to fiscal year (October 2019–September 2020) to better align with other NPS data collection, systems of record, and reporting efforts.

Data Collection and Methodology

Each year, the same definition of NPS transit systems is used to ensure consistent data collection across the nation and over time. Only parks with systems that meet each of the following three criterion listed below are included in this effort (see appendix C for more information).

¹ 23 USC 203 Federal lands transportation program: <https://www.gpo.gov/fdsys/pkg/USCODE-2014-title23/pdf/USCODE-2014-title23-chap2-sec203.pdf>.



1. The NPS transit systems move people by motorized vehicle on a regularly scheduled service.²
2. The NPS transit systems operate 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 agreements are not included); or is NPS-owned and operated.³
3. All routes and services at a given park that are operated under the same business model by the same operator are considered a single NPS transit system.

The 2021 NPS transit inventory is limited to systems in which the National Park Service has either a direct financial stake or committed resources to develop a formal contract or agreement.

The following information was collected for the 2021 fiscal year:

- transit system name and description
- passenger boardings
- business model
- system purpose
- system type/mode
- system level safety metrics (accident occurrence and property damage)
- vehicle information including fuel type, capacity, service miles, engines, horsepower, accessibility, and age
- owner and operator type (National Park Service or non-National Park Service) and contact information
- operating schedule
- participation of a local transit agency in the service

For the 2021 inventory, 49 parks provided information. Some parks reported incomplete information because they do not track the requested service information or they could not provide the information before the end of the data collection period. Specific to the 2021 inventory, the data collection period occurred from November 1 to December 31, 2021, to better align with other National Park Service reporting efforts. Some parks reported that they were unable to collect data from concessioners during this period. For the purposes of this report, 62 of 97 identified transit systems operated in fiscal year 2021. Nonoperating transit systems and associated vehicles have not been included unless specifically stated.

Appendix D includes a full list of surveyed transit systems by region.

² This criterion includes services with a posted schedule and standard operating seasons/days of week/hours. Services that do not operate on a fixed route—charter services for individual groups or services that exist for the sole purpose of providing access to persons with disabilities—are not included.

³ This report does not distinguish between a memorandum of understanding, memorandum of agreement, or cooperative agreement. All are recorded as “cooperative agreement.”



Inventory Results

Detailed findings of the 2021 inventory are presented in the Vehicle Inventory Statistics, System Characteristics, and Passenger Boardings sections below.

Vehicles Inventory Statistics

Table 1 summarizes the differences in key results of the NPS transit inventories over the last five years.

Table 1: NPS transit systems changes between inventories (2017 to 2021)

Note: NPS=National Park Service

Source: 2017–2021 NPS transit inventory data

Key Findings	2017	2018	2019	2020 ⁴	2021
Number of Systems	99	95	95	66	97
Number of Parks Represented	65	60	60	49	62
Passenger Boardings (millions)	43.7	42.1	45.9	11.1	16.2
• Excluding 10 Highest Ridership Systems	7.0	7.0	7.1	1.1	2.3
Number of Vehicles					865
• NPS-Owned Vehicles	873	976	835	673	269
• NPS-Owned Vehicles that Operated	262	281	236	149	215
• Non-NPS Vehicles	611	695	599	524	596
• Non-NPS Vehicles that Operated					508
Systems Operated by Local Transit Agency	13	9	9	3	5 ⁵

The Hiker Shuttle at Delaware Water Gap National Recreation Area was the only system added in 2021.⁶ In the NPS 2021 inventory, there are a total of 97 systems, 63 of which operated in some capacity, and 33 systems did not operate because of the COVID-19 pandemic.

Passenger boardings increased by 5.1 million, 46%, reflecting continued closures and limited operations. Visitation across the national park system increased as a whole 25%, with some parks setting monthly visitation records. The moderate increase possibly indicates that visitors were beginning to choose to use transit systems if they were available.

⁴ The information for fiscal year 2020 only includes data from systems that operated.

⁵ The DC Circulator, Giant Forest Shuttle, Fairfax Connections Wolf Trap Express, Hiker Shuttle (Delaware Water Gap National Recreation Area), and Shuttle Transport (Harper's Ferry) are the five systems that were operated by a local transit authority.

⁶ The Akers Ferry previously existed but had not participated in the inventory.



System Characteristics

The 2021 inventory identified 62 operating systems in 43 parks. Figures 1 and 2 place these systems in the context of the primary system purpose, mode, and business model. Results for system characteristics in 2021 are similar to the results reported in 2019 and 2020 except for the number of systems that operated.

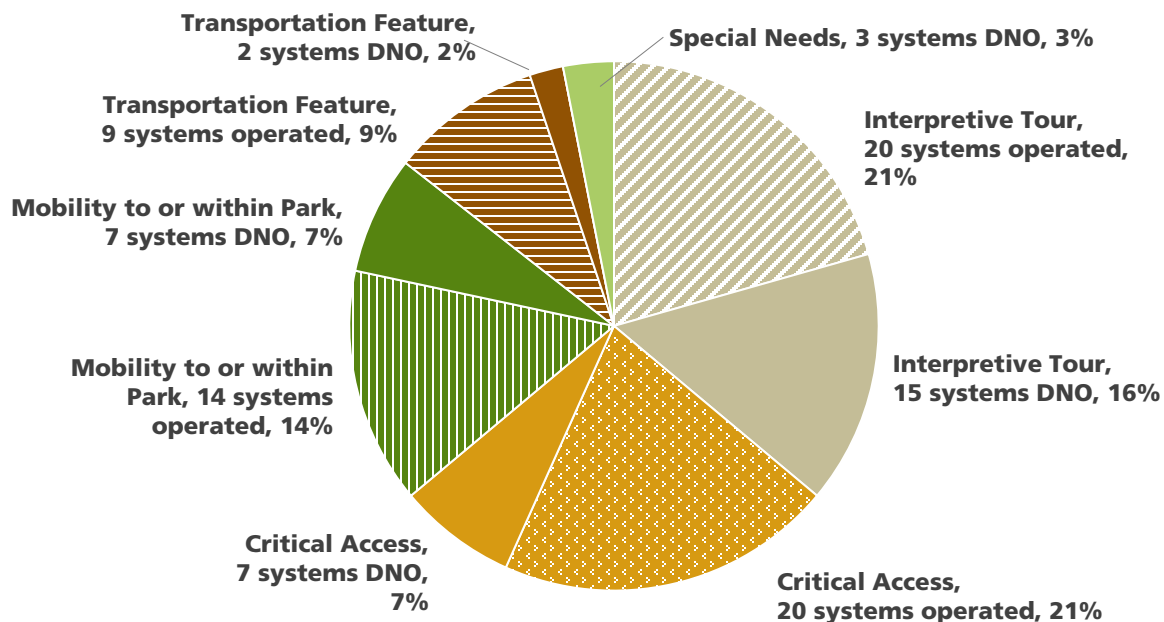
System Purpose

Park staff categorized each of their transit systems into one of the five following primary purposes (figure 1):

- 20 systems are guided **interpretive tours**.
- 20 systems provide **critical access** to an NPS park or site that is not readily accessible to the public due to geographic constraints, park resource management decisions, or parking lot congestion.
- 14 systems provide **mobility to or within a park** as a supplement to private automobile access.
- 9 systems are considered a **transportation feature** (a primary attraction of the park).

Figure 1: Systems by primary purpose

Note: (N=97 systems); DNO=did not operate
Source: 2021 NPS transit inventory data



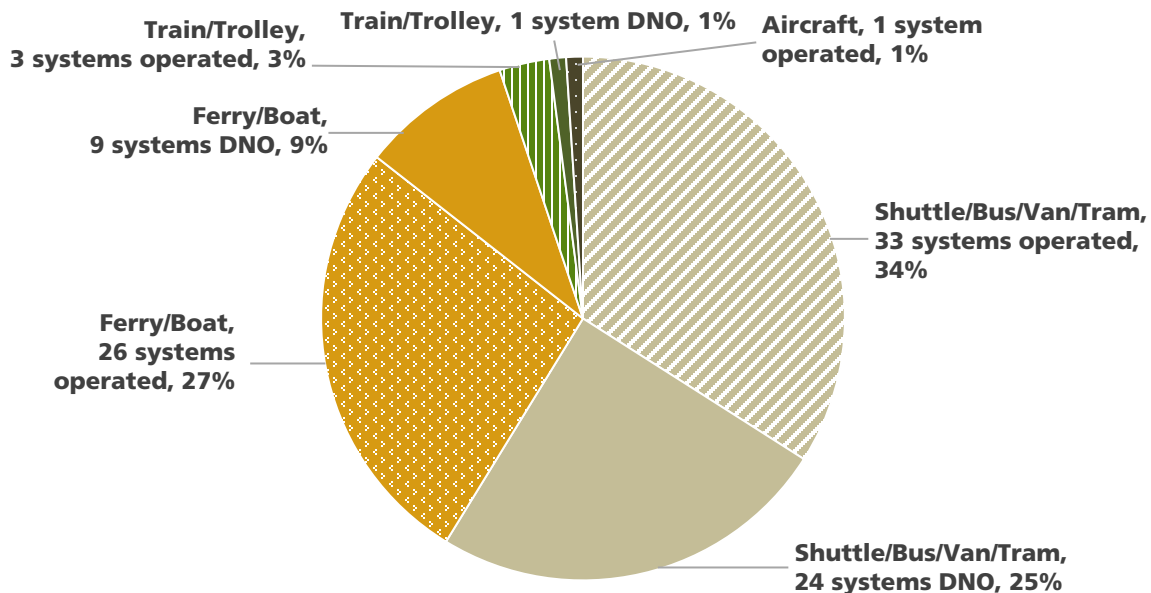
Mode

The 2021 transit inventory identified four modes operating in NPS transit systems. Most of the transit systems are shuttle/bus/van/tram systems (33 systems, 34%), followed by ferry/boat (25 systems, 26%), train/trolley (3 systems, 3%), and plane (1 system, 1%) (figure 2).

Figure 2: Systems by vehicle mode

Note: N=97 systems; DNO=did not operate

Source: 2021 NPS transit inventory data



Business Models

NPS transit systems typically operate under one of four types of business models (table 2, figure 3).

- **Concession Contracts:** In 2021, 37 of the transit systems operated through concession contracts in which a private concessioner pays the National Park Service a franchise fee to operate inside a park. Six concession contract systems used vehicle fleets exclusively owned by the National Park Service. Three systems have a mixed ownership fleet.
- **Service Contracts:** Transit systems that are owned and/or operated by a private firm use service contracts. In 2021, 8 transit systems operated under a service contract. Out of the 8 service contract systems, 3 service contract systems used vehicle fleets owned by the National Park Service.

- **Cooperative Agreements:**⁷ Ten transit systems operated under an agreement in 2021. None of those systems are owned by the National Park Service.⁸
- **NPS Owned and Operated:** In 2021, the National Park Service owned vehicle fleets for 20 system and operated 8 of those systems.⁹ These owned-and-operated systems tend to be small and provided critical access to a park or park site, were interpretive tours, or provided service for special needs.

Table 2: Systems by primary purpose

Notes: N=97 systems; DNO=did not operate; NPS=National Park Service
Source: 2021 NPS transit inventory data

System	Concession Contract	Cooperative Agreement	NPS Owned and Operated	Service Contract	Total
Critical Access	12	2, 1 DNO	4, 2 DNO	2, 4 DNO	20,7 DNO
Interpretive Tour	16, 9 DNO	3, 1 DNO	1, 5 DNO	0	20,15 DNO
Mobility to or within Park	3, 4 DNO	4, 1 DNO	2, 2 DNO	5	14, 7 DNO
Special Needs	0	0	3 DNO	0	3 DNO
Transportation Feature	6, 1 DNO	1	1	1, 1 DNO	9, 2 DNO
Total	37, 14 DNO	10, 3 DNO	8, 12 DNO	8, 5 DNO	63, 34 DNO

⁷ The National Park Service Alternative Transportation Program uses “cooperative agreement” as a general term, encompassing all qualifying partner agreements (memorandum of understanding, memorandum of agreement, and cooperative agreement).

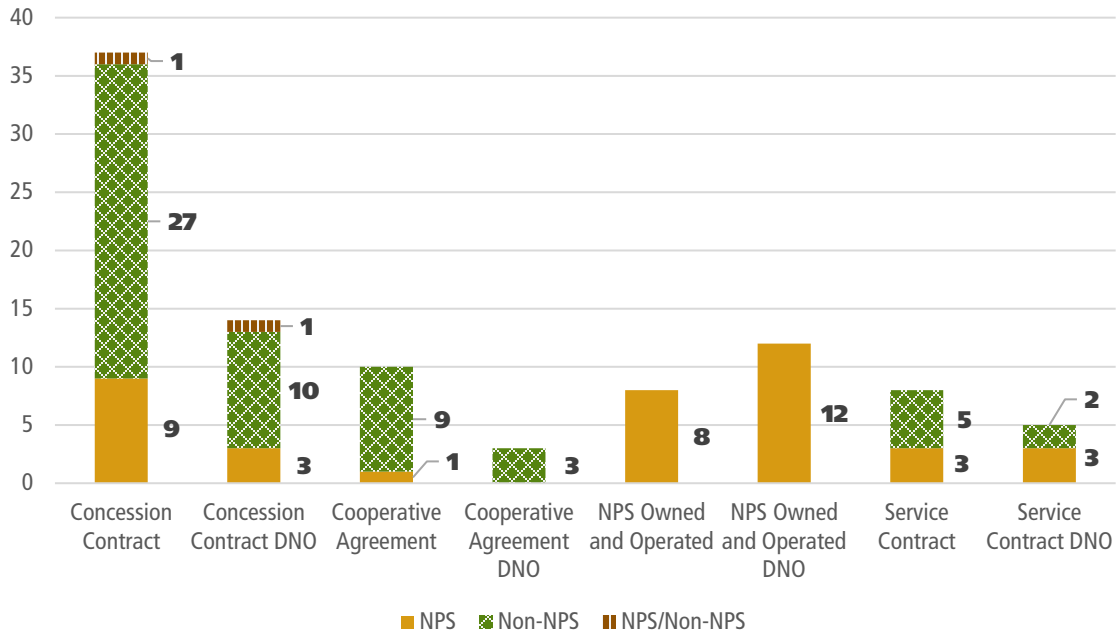
⁸ The Hiker Shuttle (Glacier National Park) changed business models from cooperative agreement to concession contract in 2021. The Hiker Shuttle was last operated under a cooperative agreement in 2019. In 2020, the park entered a two-year labor hour contract. The shuttle system did not operate in 2020, so the second year was opted in 2021. In 2022, the park is entering into a 5-year IDIQ contract for operation.

⁹ The National Park Service maintained ownership of vehicle fleets for 39 systems in 2021. Eighteen systems with NPS-owned vehicle fleets were idle in 2021.



Figure 3: Fleet system ownership by business model

Source: 2021 NPS transit inventory data



Passenger Boardings

In 2021, 16 million passenger boardings occurred across all NPS transit systems.¹⁰ If the 62 reporting systems were considered one enterprise and compared to public transit agencies across the country, its boardings would be comparable to transit systems in Miami, Florida.¹¹ Excluding concession contracts and cooperative agreements, NPS-owned and operated systems and service contract systems reported 8.1 million trips (50% of total boardings) in 2021.

Parks use various methodologies to count boardings. Most systems indirectly record passenger boardings through ticket sales (6.5 million) and manual counts (8.1 million). Estimated, automated, and other counter methodologies account for the remaining approximately 1.6 million passenger boardings.

Table 3: Count methodology

Source: 2021 NPS transit inventory data

Count Methodology	Number of Systems	Passenger Boardings
Ticket Sales	31	6,535,322
Manual	25	8,114,154
Estimated	3	756,383
Automatic	3	752,160
Other	1	152,830

Approximately 85% (13,933,762 million) of boardings on NPS transit systems in 2021 are attributable to 10 systems (table 4). Two systems from the 2020 top 10 list did not make the top 10 list in 2021.¹² The Giant Forest Shuttle (Sequoia & Kings Canyon National Parks) and Island Explorer & Bicycle Express (Acadia National Park) are new to the top 10 list in 2021. Boardings increased in 2021 for 8 of the 10 top 10 systems.

¹⁰A “passenger boarding” or “unlinked trip” occurs each time a passenger boards a vehicle. This is an industry-standard measure used in the Federal Transit Administration’s National Transit Database.

¹¹“Transit Ridership Report Fourth Quarter 2019” (pdf). American Public Transportation Association. February 27, 2020. Retrieved April 4, 2020.

¹² The Tram Transit (Dinosaur National Monument) and Jenny Lake Shuttle Boat (Grand Teton National Park) were not in the top 10 list in 2021.



Table 4: Passenger boardings for the 10 highest-use transit systems

Source: 2021 NPS transit inventory data

Rank	Park	System Name	2021 Boardings	Business Model	System Purpose
1	ZION	Zion Shuttle	3,984,575	Service Contract	Critical Access
2	STLI	Statue of Liberty Ferries	3,686,081	Concession Contract	Critical Access
3	GRCA	South Rim Shuttle Service	2,660,438	Service Contract	Mobility to or within Park
4	NAMA	DC Circulator	1,201,986	Cooperative Agreement	Transportation Feature
5	PERL	USS Arizona Memorial Tour	544,217	Cooperative Agreement	Interpretive Tour
6	BRCA	Bryce Canyon Shuttle and Rainbow Point Shuttle	458,243	Service Contract	Mobility to or within Park
7	ROMO	Rocky Mountain National Park Visitor Shuttle	455,852	Service Contract	Mobility to or within Park
8	SEKI	Giant Forest Shuttle	348,263	Cooperative Agreement	Critical Access
9	GRCA	Grand Canyon Railway	178,524	Concession Contract	Mobility to or within Park
10	ACAD	Island Explorer & Bicycle Express	293,583	Cooperative Agreement	Mobility to or within Park

Notes: ACAD=Acadia National Park; BRCA=Bryce Canyon National Park; ELIS=Ellis Island; GRCA=Grand Canyon National Park; NAMA=National Mall and Memorial Parks; NPS=National Park Service; PERL=Pearl Harbor National Memorial; ROMO=Rocky Mountain National Park; SEKI=Sequoia & Kings Canyon National Parks; STLI=Statue of Liberty National Monument; ZION=Zion National Park

High-ridership shuttle systems are typically provided via service contracts, concession contracts, and cooperative agreements. A greater proportion of the water-based systems are provided through concession contracts and either provide critical access to parks and park sites or serve as interpretive tours.

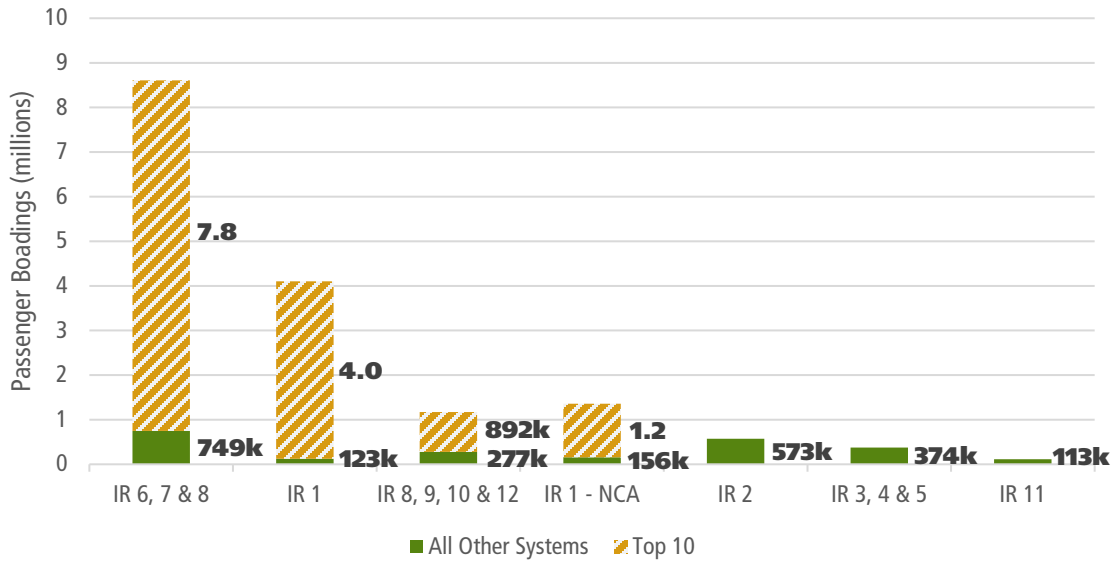
The National Park Service partnered with four local transit agencies in 2021; those partnerships accounted for just 1.5 million passenger boardings in that year. Passenger boardings among NPS-owned and operated systems (eight systems) accounted for 356,045 passenger boardings. Most of these systems provide either critical access to a site or an interpretive experience for visitors.

Interior Regions 6, 7, and 8 and Interior Region 1 each reported more than 3 million passenger boardings in 2021, exceeding other regions. Interior Region 1 – National Capital Area and Interior Regions 8, 9, 10, and 11 reported more than 1 million passenger boardings. However, if the 10 highest-use systems are excluded, each region ranged from 110,000 to 750,000 passenger boardings in 2021 (figure 4).



Figure 4: Passenger boardings by NPS region

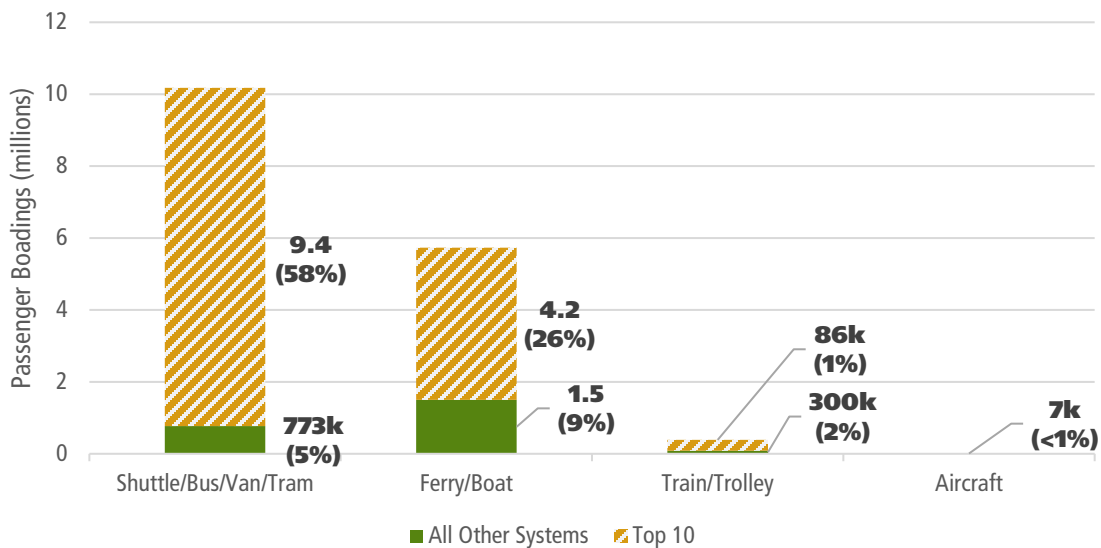
Notes: N=63 systems; IR=Interior Region; NCA=National Capital Area; NPS=National Park Service
 Source: 2021 NPS transit inventory data



Over half (63%) of passenger boardings were in systems that use shuttles, buses, vans, or trams, and 35% were in water-based systems that use boats and ferries. Trains, trolleys, and aircraft accounted for only about 3% of all passenger boardings (figure 5).

Figure 5: Passenger boardings by mode

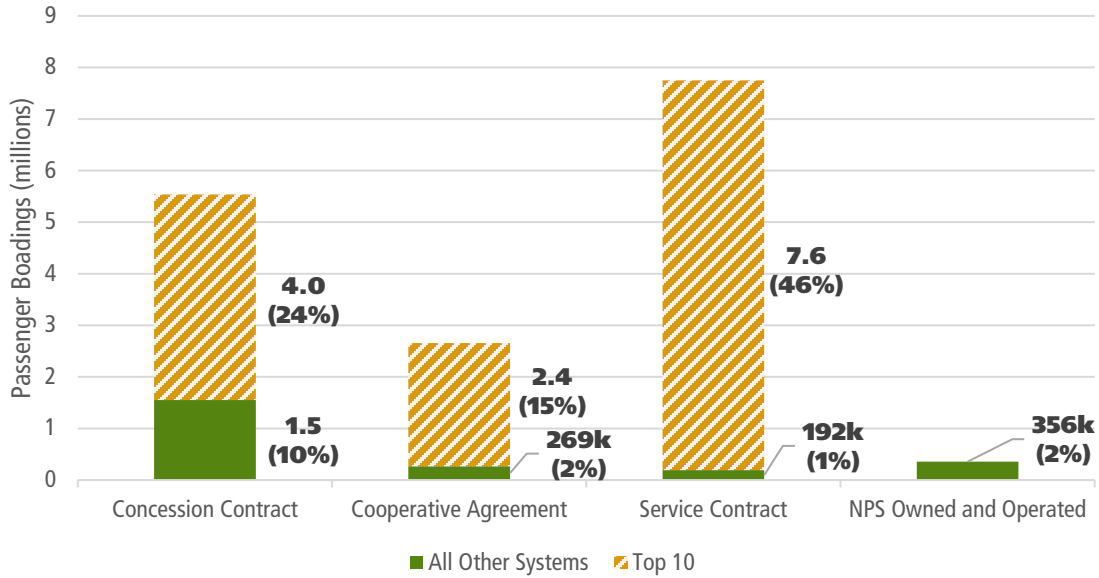
Note: N=63 systems
 Source: 2021 NPS transit inventory data



Less than half of passenger boardings (34%) took place on systems operated using concession contracts. Service contracts carried 47% of passenger boardings and 17% used cooperative agreements. NPS-owned and operated systems carried 2% of boardings (see figure 6). Excluding the 10 highest-use systems, concession contracts accounted for the most boardings (10%), followed by cooperative agreements (2%) NPS-owned and operated (2%), and services contracts (1%).

Figure 6: Passenger boardings by business model

Notes: N=63 systems; NPS=National Park Service
 Source: 2021 NPS transit inventory data



Vehicles and Vessels

After the 2019 inventory, the Washington Program Office worked with Financial and Business Management System managers and the Volpe Center to clearly define on-road vehicle types used in the inventory. Each on-road vehicle included in the 2019 National Transit Inventory was reviewed to confirm the vehicle type based on the following standards:

- Passenger van chassis: Standard or extended passenger vehicle
 - Light-duty passenger van: Gross vehicle weight rating (GVWR) of less than 10,000 pounds
- Truck chassis: Work truck chassis, front cab included
 - Light-duty shuttle GVWR of less than 10,000 pounds
 - Medium-duty shuttle GVWR between 10,000–25,999 pounds
- Transit bus chassis: longer width with no front cab
 - Medium-duty transit GVWR between 10,001–25,999 pounds
 - Heavy-duty transit GVWR greater than 26,000 pounds

Please see Appendix F – Vehicle Replacement Assumptions for more information. The reclassification may result in different counts of vehicle types compared to previous inventories.

Vehicle Fleets

In 2021, over half of the transit systems (36 systems, or 58.1%) operated under concession contracts, of which 8 used fleets owned exclusively by the National Park Service. The National Park Service owned and operated 8 transit systems (12.9%); these tend to be small and provided critical access, interpretive tours, or mobility to or within the park in ways not easily provided by a private operator. Systems managed through cooperative agreements account for 10 of the systems (16.1%). The remaining 8 transit systems (12.9%) operate under service contracts; of these, 3 use vehicle fleets owned by the National Park Service,¹³ including the large systems at Grand Canyon National Park and Zion National Parks.

For the active fleet reporting in 2021:

- NPS owned:
 - 20 systems used National Park Service owned fleets.
 - 215 vehicles operated 54 vehicles did not operate. Of the systems with NPS-owned fleets, 3 systems had a capacity for no more than 10 passengers, 8 systems had capacity for 11–20 passengers, 10 systems had capacity for 21–40 passengers, and 9 systems had capacities over 40 passengers. Two systems with five vehicles between them did not report vehicle capacity information.

¹³ The three systems operating 83 NPS-owned vehicles under a service contract are: Grand Canyon South Rim Shuttle, Harpers Ferry Shuttle Transport, and Zion Canyon Shuttle.



- Non-NPS owned:
 - 42 systems had non-NPS-owned and 1 mixed-ownership fleets.
 - 508 vehicles operated 88 vehicles did not operate. Of the systems with non-NPS-owned or mixed-ownership fleets, 3 systems had a capacity for no more than 10 passengers, 5 systems have capacity for 11–20 passengers, 7 systems have capacity for 21–40 passengers, and 31 systems had capacities over 40 passengers.

Figure 7: Number of vehicles by fuel type

Notes: N=722 active vehicles and vessels; DNO=did not operate; CNG=compressed natural gas; NPS=National Park Service
 Source: 2021 NPS transit inventory data

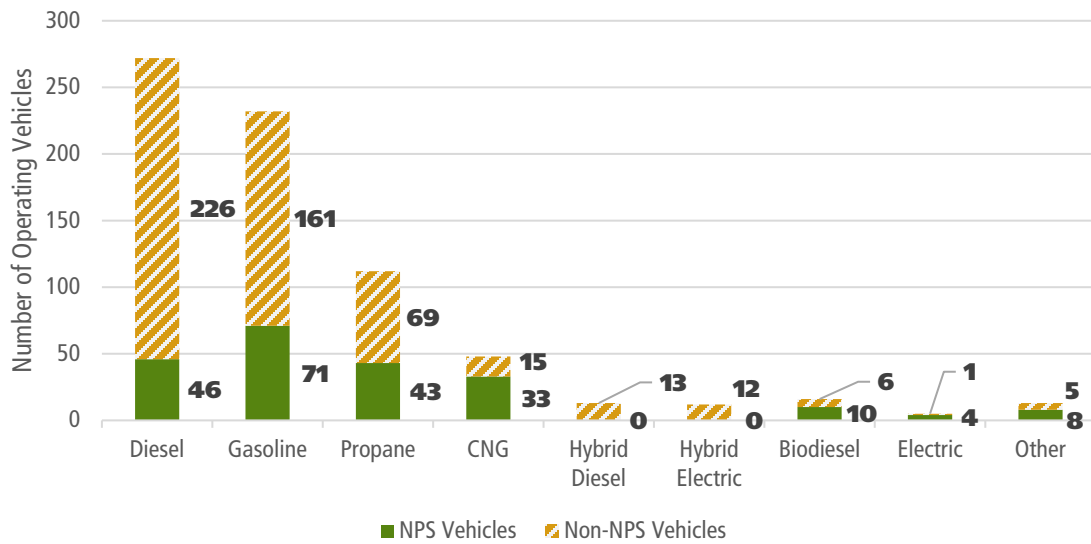


Table 5: Number of vehicles by fuel type

Notes: N=722 active vehicles and vessels; CNG=compressed natural gas
 Source: 2021 NPS transit inventory data

Fuel Type	NPS-Owned	Non-NPS Owned	Total
Diesel	46	226	272
Gasoline	71	161	232
Propane	43	69	112
CNG	33	15	48
Hybrid Diesel	0	13	13
Hybrid Electric	0	12	12



Fuel Type	NPS-Owned	Non-NPS Owned	Total
Biodiesel	10	6	16
Electric	4	1	5
Other	8	5	13
Total	214	508	722
% Alt Fuel	45%	24%	30%

Age of Vehicles

Vehicle age data was provided by 214 active NPS-owned vehicles and 506 active non-NPS owned vehicles.

Table 6: Vehicle ownership by age class

Note: N=689 active vehicles and vessels¹⁴
Source: 2021 NPS transit inventory data

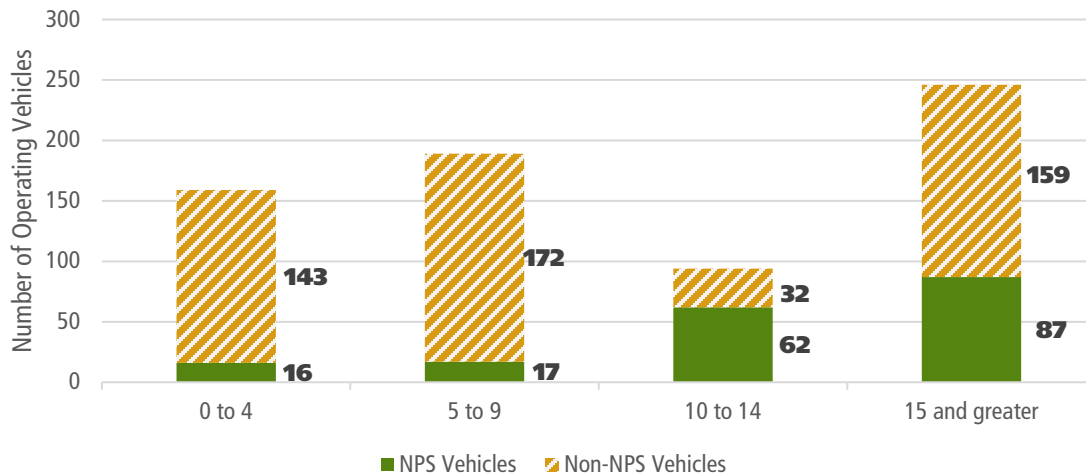
Vehicle Ownership	0 to 4 Years Old	5 to 9 Years Old	10 to 14 Years Old	15 Years and Older	Total
National Park Service	16 8.8%	17 9.3%	62 34.1%	87 47.8%	182
Non-National Park Service	143 28.3%	172 34.0%	32 6.3%	159 31.4%	506
Total	159 23.1%	189 27.5%	94 13.7%	246 35.8%	688

¹⁴ The age analysis excludes the 33 Red Bus Tour vehicles (Glacier National Park), which have been retrofitted using the original 1936 exteriors and newer chassis. Given these parameters, the age analysis includes 689 vehicles (95% of reported vehicles).



Figure 8: All vehicles by age class (years)

Notes: N=689 active vehicles and vessels; NPS=National Park Service
Source: 2021 NPS transit inventory data



The non-NPS fleet is decidedly newer. A larger overall proportion of newer non-NPS vehicles suggests that older vehicles have been retired at a higher rate in recent years. The replacement of older vehicles may reflect contract language requiring vehicles to be within a certain age range.

The active NPS-owned fleet, with more than 80% that are 10 years old or greater, puts many of the vehicles in the latter portion of their service lives. This suggests an enormous need for vehicle replacements in the next 10 years. In addition, parks must invest in the maintenance of older vehicles to not only keep them operating but extend the service life.

Transit vehicles operating in the parks are not used in the same way as urban transit vehicles. Park transit vehicles are typically not used for the entire year, nor are they used as intensively as vehicles operated in an urban environment. As a result, they may be in service for considerably longer lifespans, and recapitalization estimates should rely on park-specific estimates that depend on their specific use (see the Asset Management section and appendix F).

Vessels

The National Park Service had 25 operating systems that use ferries or boats: 11 are for critical access to park sites, 8 are for interpretive tours, 4 are transportation features, and 2 provide mobility to or within the park. The National Park Service owns 10 of these vessels, and there are 63 non-NPS owned ferries or boats that operated in 2021. Vessels typically have a life cycle of 40–50 years.

- Gulf Islands National Seashore recently purchased two ferries in 2017 using funds from the Gulf oil spill. These boats were damaged during Hurricane Barry in 2019 and did not operate in 2020. They operated in 2021 from Pensacola to Pensacola Beach but were unable to operate the Fort Pickens route due to damaged docks from Hurricane Sally.



- Fort Matanzas National Monument ordered one replacement boat in 2021 for delivery in 2022 and will order a second replacement boat in fiscal year 2023.
- The Ranger III at Isle Royale National Park is over 60 years old and has outlived its useful service life. A value analysis completed in 2019 indicates the need for a new Ranger IV at a cost of \$40–\$60 million.

Performance Measures

The NPS Alternative Transportation Program (ATP) seeks to use meaningful, reliable data. The objective is to use measurable, applicable, and achievable performance measures and metrics to guide and support decision-making and management of NPS transit systems.

The performance measures below are split into the following sections that correspond to ATP goals and the *NPS National Long-Range Transportation Plan*¹⁵: visitor experience, operations, environmental impact, and asset management. The Alternative Transportation Program goals are included in appendix B.

Visitor Experience

This performance area addresses how park transportation systems enhance the visitor experience. For 2021, the visitor experience performance measure includes accessibility for mobility-impaired park visitors.

Accessibility for Visitors with Disabilities

In 2021, half of operating NPS-owned transit vehicles and vessels (58.41%, 125 operating vehicles and vessels) were accessible for people with mobility impairments (figure 10). Overall, 60% (164 vehicles and vessels) of the entire NPS-owned fleet is accessible. Of the 62 operating systems with NPS-owned vehicles or vessels, 7 did not report having vehicles or vessels that are accessible. These systems include Cave Tour Bus Shuttle (Mammoth Cave National Park), Cape Cod Coastguard Beach Shuttle (Cape Cod National Seashore), Green River Ferry (Mammoth Cave National Park), Historic Yellow Bus Tours (Yellowstone National Park), MV Ranger III (Isle Royale National Park), Red Bus Tours (Glacier National Park), and Xanterra Parks and Resorts Bus Tour (Yellowstone National Park). Including the systems that did not operate in 2021, that number increases to 15 systems and includes, Ajo Mountain Drive Tour (Organ Pipe National Monument), Akers Ferry (Ozark National Scenic Riverways), Canal Tours (Lowell National Historical Park), FDR Tram (Home of Franklin D Roosevelt National Historic Site), Hiker Shuttle (Glacier National Park), Lakebed Tours (Johnstown Flood National Memorial), Scranton Limited & Live Steam Excursions (Steamtown National Historic Site), and the Val-Kill Tram (Home of Franklin D Roosevelt National Historic Site).

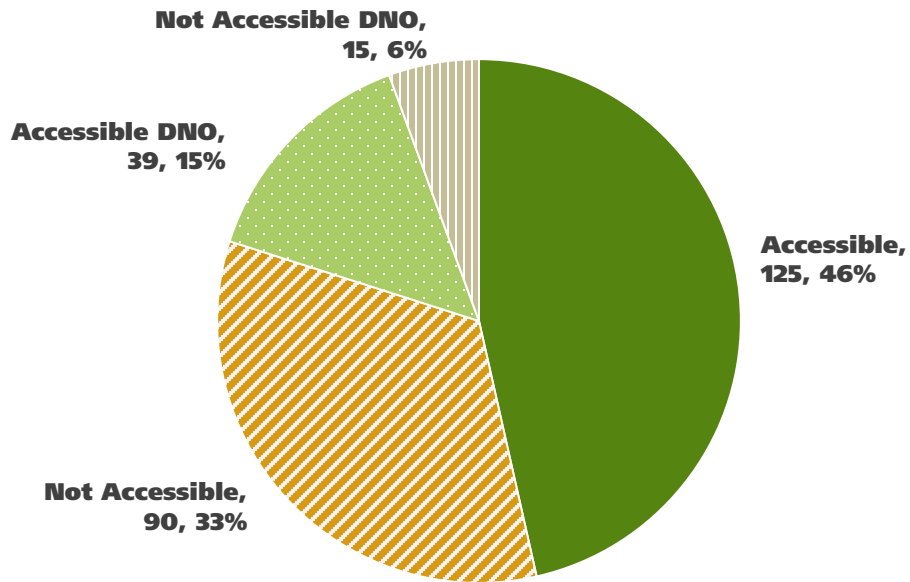
¹⁵ The NPS *Long-Range Transportation Plan* can be accessed at <https://parkplanning.nps.gov/document.cfm?parkID=551&documentID=82749>.



Figure 9: Accessibility of NPS-owned transit vehicles (entire fleet)

Notes: N=271 vehicles and vessels; DNO=did not operate; NPS=National Park Service

Source: 2021 NPS transit inventory data



Operations

This section evaluates the operational performance of the NPS transit systems by measuring the annual percent change in boardings over the last five years. In 2018, the reduced number of boardings may be attributed to a more-intense-than-usual hurricane season and the 2018 government shutdown, along with impacts from nonreporting parks. In 2020 and 2021, the reduced number of boardings is attributed to park closures and limited or no transit system operations due to the COVID-19 pandemic.

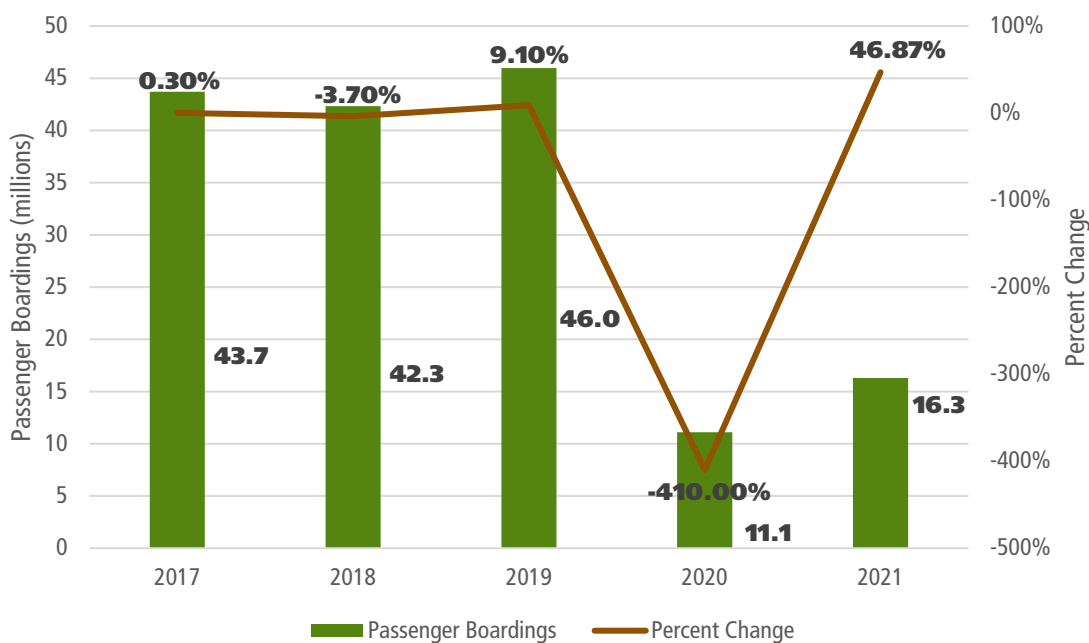
Year-to-Year Trends in Boardings

Figure 11 shows the percent change in boardings from 2017 to 2021. Absolute boardings continued to increase in most of the prior years, except in 2018 when the absolute ridership dipped slightly due to the government shutdown and in 2020 and 2021 due to the pandemic (table 1). Since the first inventory, parks have acquired more sophisticated methods for counting system boardings and have refined their boardings estimates over time. A less volatile rate of change may simply indicate an improvement in the reliability of more recent estimates.

The National Park Service saw a 25% increase in visitation overall and a number of parks experienced record crowds and welcomed new visitors. Overall, 32 parks set new visitation records in 2021, two of those parks, Apostle Islands National Lakeshore and Eugene O'Neill National Historic Site, also have transit systems.

Figure 10: Percent change in boardings from 2017 to 2021

Source: 2017–2021 NPS transit inventory data



Service Schedule

The 2021 inventory analyzed the reported service schedules of the 62 operating systems to understand the general calendar spread of NPS transit systems. Although most seasonal service dates ranged primarily over the summer and into early autumn (June to October), very few operate in the winter (December to February), with 35% of systems (22 systems) operating year-round (figure 10).

Peak season is defined as the period when the scheduled transit service is operating at its greatest frequency. The most common peak service months are July and August, with shoulder peak seasons extending May through September. For year-round systems, many parks report peak seasons beginning as early as March and extending into September.

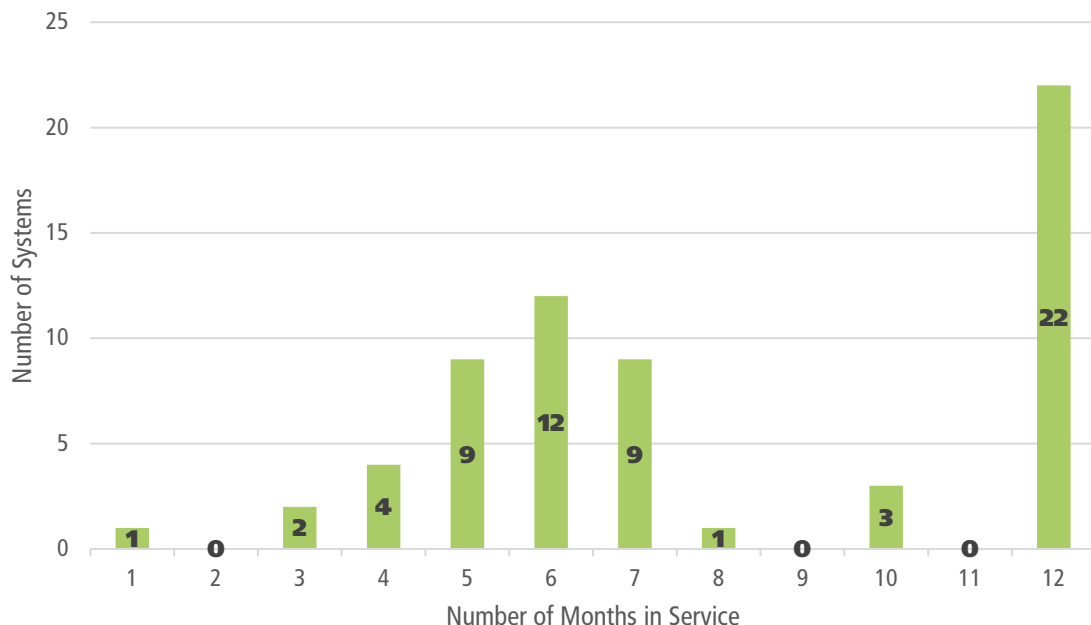
Systems operating year-round are among those with the highest annual ridership, representing 57% of total boardings. Of the 22 systems that operated year-round, 7 provide critical access, 6 are interpretive tours, 6 provide mobility within the park, and 3 are transportation features. The next most common service period is 6 months out of the year (12 systems), followed by systems that are in service for 5 or 7 months (9 systems each).

Transit systems in colder climates tend to operate for shorter seasons than those in warmer areas. For example, systems in Interior Region 11 (Alaska) operate through September. Conversely, many of the year-round systems are in the southern and western parts of the country where the climates are milder. The wide range of climates encompassed by Interior Regions 8, 9, 10, and 12—from Yosemite to Hawaii—leads to a wide range of schedules.

Figure 11: Distribution of service duration by number of months

Note: N=63 systems

Source: 2021 NPS transit inventory data



Safety

The 2021 inventory included questions regarding safety at the system level. Visitor and workforce safety are among the highest NPS priorities, and transportation is a significant source of risk to the safety of NPS transportation system users. Collecting safety and crash information for transit systems informs the *NPS National Long-Range Transportation Plan's* transportation safety goals and performance metrics.

In 2021, three NPS transit systems reported a traffic accident; of those, one had passengers on board during the accident (table 7). None of these accidents resulted in an injury or fatality nor involved pedestrians or bicyclists. Two systems reported minor vehicle damage and two systems had multiple accidents with varying level of damage. All three systems reported accidents due to driver error and one system reported an accident due to the error of others.

- **Harpers Ferry Shuttle Transport:** Bus driver ran off the road at about 25 miles per hour and sideswiped a rock wall. The mirror broke off and the fiberglass cab cracked. No visitors were on the bus at the time and there were no injuries.
- **Red Bus Tours:** The red buses experienced 11 incidents that resulted in minor damage to the buses. Incidents included damage to side mirrors and minor bumps and scratches to the body of the vehicles. Some incidents occurred while passengers were onboard, but there were no injuries, and service was not disrupted.
- **Zion Shuttle:** Minor accidents required little to no down time.

Table 7: Response to safety and operational questions

Note: HAFE=Harpers Ferry; GLAC=Glacier National Park; ZION=Zion National Park
Source: 2021 NPS transit inventory data

Park	System Name	Passengers on Board	Injuries or Fatalities	Bicycles or Pedestrians	Accident Occurred on Route	Result of Driver Error	Real Property Damaged
HAFE	Harpers Ferry Shuttle Transport	No	No	No	No	Yes	No
GLAC	Red Bus Tours	Yes	No	No	Yes	No	No
ZION	Zion Canyon Shuttle	No	No	No	No	No	No



Environmental Impact

Since 2017, the transit inventory uses the US Environmental Protection Agency's Motor Vehicle Emissions Simulator (MOVES) for estimating NPS transit vehicle emissions.¹⁶ The Motor Vehicle Emissions Simulator is a state-of-the-science emissions modeling software that uses preloaded measurement data to estimate emissions rates for different vehicle types, model years, fuel types, and road types across several Clean Air Act criteria pollutants “from the bottom-up” for both on- and off-road vehicles, including waterborne vessels. MOVES software is also the regulatory standard for emissions inventory analyses under the Clean Air Act and related legislation.¹⁷ MOVES software bases emissions estimates on observations of actual vehicle operations.

This section describes the results of the 2021 emissions analysis with respect to carbon dioxide (CO₂). The results for the other criteria pollutants—nitrogen oxides, volatile organic compound, and particulate matter—as well as a detailed description of the analysis methodology, are presented in appendix E.

Similar to 2020, the COVID-19 pandemic had a significant impact on vehicle miles traveled and transit system operation in parks in 2021. Vehicle miles traveled across all regions increased 45% from 2020 levels but did not rebound those observed in 2019, showing a 58% decrease compared with 2019. In 2021, 63 of 97 transit systems in the national inventory were operational; in 2020, 74 of 96 systems operated; in 2019, 93 of 97 systems operated. Across all regions and pollutants, emissions were between 2% and 42% lower than 2019 levels.

Annual CO₂ Emissions

Figure 12 shows the results of MOVES carbon dioxide emissions modeling for transit systems, aggregated to the regional level and split by ownership. Across all regions, NPS-owned transit fleets emitted just over 4,500 metric tons of CO₂ in 2021. Regions 3, 4, and 5 emitted the greatest amount of CO₂ due to a high proportion of ferries using marine diesel, which produces more CO₂ than diesel used in on-road vehicles. Table 8 shows the distribution of vehicles, miles traveled, and associated CO₂ emissions.

¹⁶ This national transit inventory uses version MOVES 3.0.3, which was released in January 2022.

¹⁷ “Official Release of the MOVES2014 Motor Vehicle Emissions Model for SIPs and Transportation Conformity.” Federal Register 79:194 (October 7, 2014), p. 60343. Available from the Government Publishing Office at: <https://www.gpo.gov/fdsys/pkg/FR-2014-10-07/pdf/2014-23258.pdf>.



Table 8: Distribution of miles and CO₂ emissions by vehicle ownership

Note: N=722¹⁸ vehicles and vessels

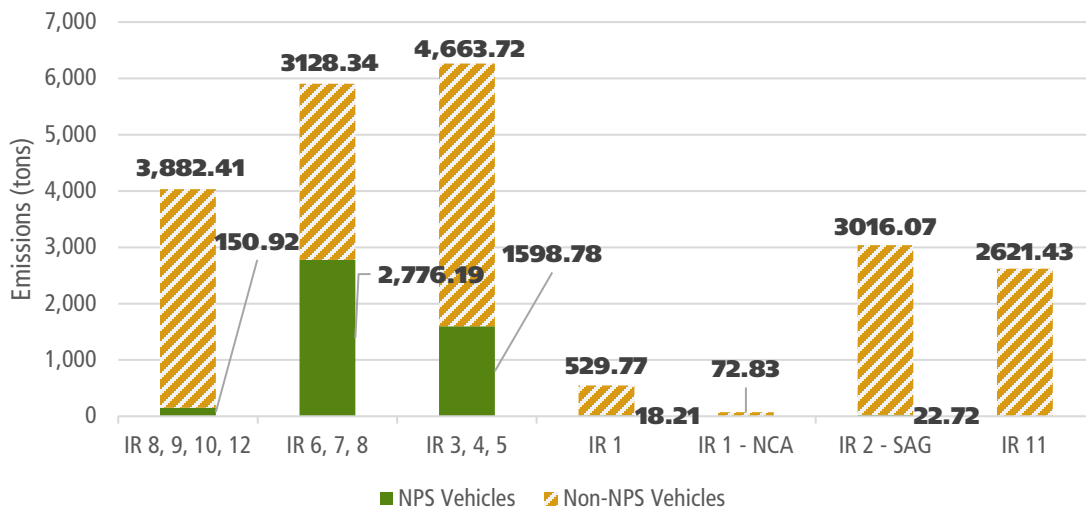
Source: 2021 NPS transit inventory data

Ownership	Vehicles (number)	Vehicles (percent)	Miles Traveled	Miles (percent)	CO ₂ (metric tons)	CO ₂ (percent)
NPS Owned	215	30%	3,443,697	47%	4,566.82	20%
Non-NPS Owned	508	70%	3,910,868	53%	17,914.57	80%
Total	723	100%	7,354,565	100%	22,481.39	100%

Figure 12: Annual CO₂ emissions

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Source: 2021 NPS transit inventory data



¹⁸ Due to data gaps, an N of 673 vehicles is used for the emissions analysis. In addition to excluding vehicles with missing data, snow coach, aircraft, and rail operations are not analyzed in the emissions analysis. This data also only counts vehicles that operated in 2020.



Diverted Passenger Vehicle Trips and CO₂ Emissions Avoided

The benefits of using transit include:

- reduction of the number of vehicle trips in parks,
- congestion relief on park roads by carrying more people per square foot of road space,
- elimination of associated fuel-inefficient driving behaviors like extended idling and stop-and-go,
- potential to influence how visitors spend their time in the park, and
- removal of long lines of cars from viewsheds.

Service-wide, an estimated 5.6 million private vehicle trips were eliminated in 2021, with a reduction in of nearly 41,358 metric tons of CO₂ emissions; without transit service, there would have been an additional 107 million miles driven in private vehicles. Transit systems emitted 22,481 metric tons of CO₂ in 2021. As stated previously, regions with high transit use and more boardings divert more personal vehicles from the road.

Asset Management

Performance measurement for assets helps support the long-term financial viability of the transit systems through tracking the age of NPS-owned vehicle fleets and estimating fleet recapitalization costs. In this context, “vehicles” refers only to on-road motorized vehicles and excludes nonroad transportation, such as ferries, locomotives, snow coaches, and aircraft. Any of those described in table 9 are shown only for reference and were not analyzed for recapitalization estimates.

Average Age of NPS Vehicles

Table 9 reports the aggregate average age for NPS-owned transit vehicles service-wide and includes all NPS-owned vehicles regardless of whether they operated or not in 2021. The average age of each NPS vehicle type is below the service life for most vehicle types, but many categories include vehicles older than their typical lifespan. In the case of medium-duty transit, the average age is the anticipated service life. Notably, 69 vehicles will exceed their service life in next five years; of these, 58 are heavy-duty transit or medium-duty shuttles. On average, heavy- and medium-duty shuttle buses are the newest vehicles in the NPS-owned fleet, which is reflective of the fleet replacements occurring at Glacier, Grand Canyon, Yosemite, and Zion National Parks.



Table 9: Vehicle age for NPS transit vehicle types¹⁹Notes: N=236 vehicles and vessels²⁰; N/A=not applicable

Source: 2021 NPS transit inventory data

Vehicle Type	Average Age	Number of Vehicles	Service Life (years)	Number of Vehicles Beyond Service Life	Number of Vehicles Exceeding Service Life in Next Five Years
Tram/Golfcart	9	10	11	8	0
Passenger Van	13	31	10	25	5
Light-Duty Shuttle	11	13	15	3	4
Medium-Duty Shuttle	11	38	15	5	17
Medium-Duty Transit	18	36	18	26	0
Heavy-Duty Transit	12	66	18	0	41
Ferry/Boat	27	16	N/A	N/A	N/A
Train/Streetcar	54	5	N/A	N/A	N/A
School Bus	16	7	18	1	2
Snowmobile/Snow Coach	52	12	N/A	N/A	N/A
Van	8	2	10	2	0
Total	–	236	–	70	69

Estimated Vehicle Recapitalization Needs

Estimates of NPS-owned vehicle replacement needs begin with vehicle ages, along with the standard replacement costs and service life assumptions shown in appendix F. Each park is responsible for determining when a vehicle needs to be replaced, which is dependent on funding availability and other factors. Service life is highly dependent on vehicle use, in addition to vehicle age; therefore, more detailed information is needed before determining if a vehicle is truly due for replacement.

Based on an analysis using the methodology outlined in appendix F, the National Park Service is facing a large fleet replacement need over the next 10 years and an estimated \$158 million in NPS-owned transit vehicle capital costs. These fleet replacements include legacy transit systems at Acadia, Yosemite, and Grand Canyon National Parks. The 10-year estimated cost does not include the ongoing fleet replacement at Zion National Park or Electric Vehicle Service Equipment and other infrastructure upgrades to accommodate transitioning to electric vehicles. Projected costs and escalation are calculated based on 2022

¹⁹ The 2020 recategorization of the NPS fleet vehicles resulted in new categories and shifting vehicles to more appropriate vehicle type categories compared to past inventories. See appendix F for more information.

²⁰ The Glacier National Park Red Bus Tours vehicles were excluded from this analysis, as they have been extensively retrofitted during their 80-plus years in service.



dollars and may vary from year to year as vehicles from different systems are replaced or rehabilitated to extend their service life.

Next Steps

The inventory continues to provide essential information on NPS transit systems at the park, regional, and national levels. This effort allows stakeholders to understand the basic characteristics of NPS transit systems, including how many visitors are served, the number and types of transit systems, vehicle service life and fuel types, the business models under which these systems operate, and performance measures (including emissions).

The transit inventory collects annual operational information to supplement other data initiatives that focus on NPS fixed real property assets. This effort provides a consistent platform to efficiently gather information that can be compared through time and enables the National Park Service to examine disparate transit systems as a whole and evaluate their benefits and impacts. As visitation at national parks increases, transit systems remain important assets for reducing resource impacts from personal vehicles while improving access and enhancing the visitor experience.

The following lessons will be incorporated to improve future transit data calls:

- **Continued Coordination with Relevant NPS Stakeholders:** Continue sharing data and identifying ways the transit data can be used to support program missions, goals, and outcomes across the National Park Service. Consider stronger coordination with concessions and service contracts to include data requirements in new contracts.
- **Create New and/or Refine Existing Data Elements:** Continue to refine the number of fields in the data call, adding or removing data fields as necessary to gather only necessary information while limiting the burden of data collection on the park staff.
- **Improve the Data Collection Online Tool:** The online data collection tool moved to the Microsoft PowerApps platform in 2019, and user interface enhancements were updated for the 2020 inventory. A limitation of this tool is that it is restricted to NPS users only and concessioners are not able to access the tool. The option for concessioners to submit their data via spreadsheet was provided again for 2021. The interactive web report was also updated for the 2021 analysis and report and efforts to include all historic inventory data in the web report are ongoing. The transition also opens opportunities to incorporate data from the transit inventory into the Alternative Transportation Service Lifecycle Asset Management dashboard and to connect to the Financial and Business Management System.
- **Continue to Expand Performance Measures Analysis:** Continue including additional performance measures to track progress of NPS transit systems over time and include in this report. Collaborate with other NPS planning efforts to provide measurable data. Shift safety questions to a quantitative input.
- **Communicate the Benefit and Impact of NPS Transit Systems to Visitors:** Consider communicating to visitors how their choice to use transit has a positive impact on park resources through reducing congestion and emissions from private vehicles. The positive impacts of transit use could be communicated in a variety of ways, such as consistent signage throughout the national park system, through social media, or on the NPS website.



- **Consider Multimodal Connections to Transit:** The transit inventory could be expanded to include connections to transportation trails.²¹ Considering opportunities for bicycling and walking in national parks and connections to transit could give a better picture of the opportunities for exploring national parks without using a private vehicle.
- **Coordinate with the Vehicle Health Index to Refine Recapitalization Analysis and Anticipated Service Life:** Developed from industry standard approaches to fleet condition assessment, the Vehicle Health Index (VHI) provides a data-driven approach to understanding fleet condition across the National Park Service’s portfolio of fleet assets. The Vehicle Health Index consists of a series of rapid-visual and diagnostic tests, scored 0–10, for each subcomponent of a vehicle (e.g., engine, drivetrain, interior) to generate a “Total Vehicle Score,” the official VHI metric. Data collected from VHI assessments will enhance existing asset management practices by providing consistent, point-in-time assessments of fleet condition. The assessment will inform both the expected service life for vehicles on public lands and the recapitalization analysis.
- **Explore Count Methodology Standardization:** Eighty-five percent of boardings are attributed to 10 systems. Understand the count methodology for these ten systems and develop standardization in count methodology. Consider developing standard operating procedures/business practices for the remaining types of count methodologies or consider automating manual counts, where appropriate.

²¹ NPS Definition of a “Transportation Trail”: Multimodal trail that accommodates pedestrians and/or bicycles and connects to a larger transportation system, including land- and water-based transit and/or regional trail systems or direct connections to a community (not solely recreational trails).



Appendix

Appendix A – Acknowledgments

The National Park Service would like to thank the numerous NPS transit system contacts who graciously provided their time, knowledge, and guidance in the development of this inventory and new web application.

Special thanks to each park and park contact who provided data for the 2021 inventory year. A list of each park contact is included in appendix D.

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Appendix B – National Park Service Alternative Transportation Program Goals and Objectives

GOAL: Cultivate improvements in transportation connectivity, convenience, and safety for visitors and workforce.

OUTCOME: Access to, from, and within national parks is convenient, safe, and well-connected via appropriate and integrated transportation solutions.

- Develop transportation options that meet the diverse needs of park visitors and NPS workforce.
- Connect and enhance existing transportation options.
- Minimize injuries, fatalities, and crashes associated with all modes of transportation.
- Participate in local, regional, and statewide transportation planning processes to ensure appropriate integration of NPS transportation infrastructure, systems, and services.

GOAL: Provide quality transportation experiences that enhance park visits.

OUTCOME: NPS transportation systems contribute to the positive experience of park visitors.

- Improve visitor access to appropriate destinations.
- Use transportation to educate and inform visitors about park resources and services.
- Reduce disruptions to the visitor experience related to vehicle traffic congestion.
- Design and adapt transportation systems to complement each park's unique context and mission.

GOAL: Demonstrate leadership in environmentally responsible transportation.

OUTCOME: The National Park Service is recognized as a leader in environmentally responsible transportation.

- Prioritize investments and operations that reduce vehicle emissions, noise and light pollution, traffic congestion, and unendorsed parking.
- Educate park visitors and workforce about the environmental benefits of transportation options within and beyond park boundaries.
- Contribute to NPS and park greenhouse gas emissions reduction goals.
- Implement proven green transportation innovations and best practices, where appropriate.



GOAL: Ensure the long-term financial viability of NPS transportation infrastructure, systems, and services.

OUTCOME: Funding is adequate to maintain transportation infrastructure, operate transportation systems, and manage transportation services now and into the foreseeable future.

- Consider the full range of business models and associated lifecycle costs (direct and indirect) before making investments.
- Increase the flexibility of funding mechanisms to better support transportation options.
- Rightsize and maintain needed transportation assets and services in a state of good repair.
- Develop transportation options with reciprocal benefits for NPS and gateway communities that can be collaboratively funded and/or operated.
- Seek to enhance or develop partnerships with public, private, and philanthropic organizations that are aligned with the NPS mission.

GOAL: Manage the transportation program based on meaningful, reliable data.

OUTCOME: The National Park Service demonstrates accountability in the management of transportation resources.

- Use measurable, applicable, and achievable performance measures and metrics to guide and support decision-making and management of the transportation program.
- Invest in and maintain data that supports performance measures aligned with program goals.
- Continually evaluate transportation options to ensure they meet program goals and adjust operations to optimize system performance.



Appendix C – Definition of Transit

The National Park Service Alternative Transportation Program (ATP) developed a definition for an “NPS transit system” prior to conducting the 2012 transit inventory. Only parks with systems that met each of the three criteria listed below were considered for the inventory:

1. Moves people by motorized vehicle on a regularly scheduled service.²²
2. Operates under one of the following business models: concession contract; service contract; partner agreement including memorandum of understanding, memorandum of agreement, or cooperative agreement (commercial use agreements are not included); or is NPS owned and operated.²³
3. All routes and services at a given park that are operated under the same business model by the same operator are considered a single NPS transit system.

This definition was based on a review of past efforts, analysis of the existing transit portfolio, and individual and group conversations with the Regional Transportation Program coordinators and the Federal Lands Highway Program Servicewide Maintenance Advisory Committee. In response to challenges encountered during the course of the inventory, small changes were made to the original draft definition to improve clarity. The definition was uniformly applied to all potential systems to determine whether each should be included in the inventory.

The NPS Alternative Transportation Program investigated several potential criteria that stemmed from existing ATP documents and conversations with ATP stakeholders, as presented below.

Provides transit service: An “NPS transit system” should provide transit service. In the glossary of the National Transit Database, the Federal Transit Administration defines transit as synonymous with public transportation and public transportation is defined as follows in the Federal Transit Act: “. . . transportation by a conveyance that provides regular and continuing general or special transportation to the public, but does not include school bus, charter, or intercity bus transportation or intercity passenger rail transportation provided by [Amtrak].” Conversations with NPS regional transportation coordinators further specified transit service should be limited to motorized conveyances. Based on this information, the NPS Alternative Transportation Program proposed the following criterion: “*moves people by motorized vehicle on a regularly scheduled service.*”

²² This criterion includes services with a posted schedule that have standard operating seasons/days of week/hours. Services that do not operate on a fixed route, are charter services for individual groups, or exist for the sole purpose of providing access to persons with disabilities are not included.

²³ For the purposes of this inventory, no distinction was drawn between a memorandum of understanding, memorandum of agreement, or cooperative agreement. All were recorded as “cooperative agreement.”



Is important to the NPS mission: The importance of transit systems to fulfilling the NPS mission is a core tenet of the Alternative Transportation Program, as established in previous program plans and extensively discussed at program meetings. However, the simple question, “Is this system important to the NPS mission?” is subjective and would return inconsistent results. For many systems, particularly those for which the National Park Service has a financial stake or has a formal contract or agreement in place, the answer seems clear: because the National Park Service has made an effort to provide the service, the service is assumed to be important to the mission. Other services, particularly those that operate under a commercial use agreement (CUA), are not as clearly essential to the mission. Thus, the NPS Alternative Transportation Program proposed the following criterion: *“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 agreements are not included); or NPS owned and operated systems.”* The NPS Alternative Transportation Program used “cooperative agreement” as a general term, encompassing all qualifying partner agreements (memorandum of understanding, memorandum of agreement, and cooperative agreement).

Concession contracts were included because they require resources and desire by the NPS to initiate. Also, after the bid and award process, concession contracts limit competition with other private operators and thus generally result in close working relationships with the National Park Service. Commercial use agreements are not included because prospective CUA operators request permission from the National Park Service to operate. These agreements are not initiated by the National Park Service, and the resulting services are inherently not “NPS” systems.

Commercial use agreements were not included because these services are owned and operated by private operators, and the National Park Service only provides oversight to ensure that the services are operated in accordance with NPS policies and requirements. Hundreds of commercial use agreement exist servicewide that provide visitors tours and transportation. Collecting and reporting information on all these systems could be burdensome to parks and regions. If information were to be collected and reported on CUA services at all, an objective measure of importance would need to be identified and two key questions would need to be addressed. First, how does one objectively determine whether a service operated under a commercial use agreement is important versus nonessential to the NPS mission? This effort found only one subcategory of commercial use agreement that could be considered objective: services that provide sole access to an NPS resource. Second, should the National Park Service represent as its own services for which it has no role in the acquisition, operations, or maintenance activities? Even for commercial use agreements that provide sole access, this effort suggests not. This determination is not to suggest that the service is not important to the National Park Service but rather to acknowledge that the service is not the responsibility of the National Park Service—in other words, the service is not an “NPS transit system.” These systems could be tracked separately but would not be included in the inventory.



Reduces vehicle miles traveled (VMT): In theory, reducing vehicle miles traveled reduces emissions. However, the simple question of “Does a system reduce VMT?” was tested on candidate NPS transit systems, and answers tended to be complex and debatable. The NPS Alternative Transportation Program determined that “reduces VMT” is not an objective criterion. Although reducing VMT can be a goal of NPS transit systems, it should not be a defining characteristic.

Provides critical access: The question, “Does a system provide critical access?” was tested on candidate NPS transit systems. However, not all NPS transit systems provide critical access, and not all systems which provide critical access meet other likely criteria of a definition, such as the National Park Service having a financial stake. Thus, this criterion would not contribute toward a simple, clear definition.

Tours versus transportation: A distinction exists between interpretive tours and transportation, the former being a recreational activity itself and the latter being the conveyance of a passenger to or between activities. Whether a system is a tour or provides transportation was tested on candidate NPS transit systems. The distinction was often ambiguous. Many “transportation services” also provide interpretation or offer an experience on board. Many “tours” transport people to activities, allow people to get on and off, and/or take passengers to places in national parks that they could not access in their cars (for example, to a point on a body of water). Furthermore, both tours and transportation services further the visitor experience component of the NPS mission, and the NPS Alternative Transportation Program sought not to prioritize one over the other. Although in daily life a transportation trip (often thought to be mandatory—e.g., to the grocery store) might be more important than a tour trip (often thought to be discretionary—e.g., a historical tour of a battlefield), in a recreational setting such as national park, both types of trips may be vital to providing high-quality visitor experiences.

Is part of a connected, multimodal network: Several stakeholders suggested this criterion. However, it is vague and requires further definition of the term “connected, multimodal network.”

Identifying unique systems: In order to be consistent servicewide in counting the number of transit systems, the NPS Alternative Transportation Program investigated methods for defining where one transit system stops and another starts and tested these with candidate NPS transit systems, particularly at parks thought to have more than one system. Based on this investigation, the NPS Alternative Transportation Program proposed a final criterion: *“all routes and services operated by the same operator under the same business model at a given park are considered a single transit system.”*



Once developed, the pilot definition was shared individually with the transportation program coordinators from each of the seven NPS regions. Feedback from each region was generally supportive. The definition was also presented at the May 2012 Federal Lands Highway Program Servicewide Maintenance Committee. Again, reaction by meeting participants was generally supportive. The associate director, Park Planning, Facilities, and Lands, formalized the draft definition in August 2012 in a memo titled, “National Park Service Transit Inventory Definition and Next Steps.”



Appendix D – 2021 NPS National Inventory System List

Interior Region 1

Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
ACAD	Island Explorer & Bicycle Express	Shuttle/Bus/ Van/Tram	293,583	Non-NPS	Cooperative Agreement	Mobility to or within Park	John Kelly
ADAM	Adams Trolley	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	Service Contract	Critical Access	Kevin Kelly
BOHA	Boston Light Tour	Ferry/Boat	Did Not Operate	Non-NPS	Cooperative Agreement	Interpretive Tour	Beth Jackendoff
BOHA	Thompson Island Ferry	Ferry/Boat	Did Not Operate	NPS	Concession Contract	Mobility to or within Park	Beth Jackendoff
CACO	Coastguard Beach Shuttle	Shuttle/Bus/ Van/Tram	65,907	NPS	NPS owned and operated	Critical Access	John DeFoe
DEWA	DEWA Hiker Shuttle	Shuttle/Bus/ Van/Tram	1,621	Non-NPS	Cooperative Agreement	Critical Access	Brittany Salapek
EISE	EISE Shuttle	Shuttle/Bus/ Van/Tram	7,926	Non-NPS	Concession Contract	Critical Access	Jonathan Holdsworth
FIIS	Sailors Haven Ferry	Ferry/Boat	26,367	Non-NPS	Concession Contract	Critical Access	Jason Pristupa
FIIS	Watch Hill Ferry	Ferry/Boat	15,241	Non-NPS	Concession Contract	Critical Access	Jason Pristupa
HOFR	FDR Tram	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	NPS Owned and Operated	Special Needs	Charles Bullock
HOFR	Roosevelt Ride	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	NPS Owned and Operated	Critical Access	Charles Bullock
JOFL	Lakebed Tours	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	NPS Owned and Operated	Interpretive Tour	Charles Bullock
LOWE	Canal Tours	Ferry/Boat	Did Not Operate	NPS	NPS Owned and Operated	Interpretive Tour	Douglas Bosley
LOWE	LOWE Historic Trolley	Train/Trolley	5,562	NPS	NPS Owned and Operated	Mobility to or within Park	Michael Curran
SHEN	Rapidan Camp Bus	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	NPS Owned and Operated	Interpretive Tour	Michael Curran
STEA	Scranton Limited & Live Steam Excursions	Train/Trolley	Did Not Operate	NPS	NPS Owned and Operated	Interpretive Tour	Tim Taglauer
STLI	Statue of Liberty Ferries	Ferry/Boat	3,686,081	Non-NPS	Concession Contract	Critical Access	Garret Lisak
VAFO	History of Valley Forge Trolley Tour	Shuttle/Bus/ Van/Tram	272	Non-NPS	Cooperative Agreement	Interpretive Tour	Ben Hanslin



Interior Region 1 – National Capital Area

Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
HAFE	HAFE Shuttle Transport	Shuttle/Bus/Van/Tram	79,720	NPS	Service Contract	Mobility to or within Park	Larry Moore
NAMA	Big Bus Tours Washington DC	Shuttle/Bus/Van/Tram	76,794	Non-NPS	Concession Contract	Interpretive Tour	Karl Gallo
NAMA	DC Circulator	Shuttle/Bus/Van/Tram	1,201,986	Non-NPS	Cooperative Agreement	Transportation Feature	Minh Tran
WOTR	Fairfax Connectors Wolf Trap Express	Shuttle/Bus/Van/Tram	454	Non-NPS	Service Contract	Mobility to or within Park	Janette Lemons

Interior Region 2 – South Atlantic Group

Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
BLRI	Sharp Top Mountain Shuttle	Shuttle/Bus/Van/Tram	9,660	Non-NPS	Concession Contract	Transportation feature	Gail Fox
CALO	CALO Ferry Service	Ferry/Boat	113,356	Non-NPS	Concession Contract	Critical Access	Katherine Cusinberry
CARL	Electric Shuttle	Shuttle/Bus/Van/Tram	Did Not Operate	NPS	NPS Owned and Operated	Special Needs	Sarah Perschall
CUIS	CUIS Ferry Service	Ferry/Boat	96	Non-NPS	Concession Contract	Critical Access	Jill Hamilton-Anderson
CUIS	Land and Legacies Tour	Shuttle/Bus/Van/Tram	1,185	NPS	Concession Contract	Interpretive Tour	Jill Hamilton-Anderson
FOMA	FOMA Ferry Service	Ferry/Boat	14,954	NPS	NPS Owned and Operated	Critical Access	Andrew Rich
FOSU	FOSU Ferry Service	Ferry/Boat	225,456	Non-NPS	Concession Contract	Critical Access	Michelle Haas
GUIS	Ship Island Ferry	Ferry/Boat	Did Not Operate	Non-NPS	Concession Contract	Transportation Feature	Richard Devenney
GUIS	GUIS Ferry Service	Ferry/Boat	18,099	NPS	Concession Contract	Transportation Feature	Richard Devenney
KEMO	KEMO Shuttle Bus	Shuttle/Bus/Van/Tram	Did Not Operate	NPS	Service Contract	Transportation Feature	Ladrick Downie
MACA	Cave Tours Bus Shuttle	Shuttle/Bus/Van/Tram	37,122	NPS	Concession Contract	Interpretive Tour	Steve Kovar
MACA	Green River Ferry	Ferry/Boat	152,830	NPS	NPS Owned and Operated	Transportation Feature	Steve Kovar



Interior Regions 3, 4, and 5

Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
APIS	Excursion boat	Ferry/Boat	48,261	Non-NPS	Concession Contract	Interpretive Tour	Elizabeth Lowthian
CUVA	Cuyahoga Valley Scenic Railroad	Train/Trolley	80,778	Non-NPS	Cooperative Agreement	Mobility to or within Park	Jennifer Vasarhelyi
ISRO	MV Isle Royale Queen IV	Ferry/Boat	11,325	Non-NPS	Concession Contract	Critical Access	Chris Amidon
ISRO	MV Voyageur II and Sea Hunter III	Ferry/Boat	10,266	Non-NPS	Concession Contract	Critical Access	Chris Amidon
ISRO	Royale Air Service Inc. float plane	Aircraft	7,448	Non-NPS	Concession Contract	Critical Access	Chris Amidon
ISRO	MV Sandy Tour	Ferry/Boat	Did Not Operate	Non-NPS	Concession Contract	Interpretive Tour	Chris Amidon
ISRO	MV Ranger III	Ferry/Boat	3,308	NPS	NPS Owned and Operated	Critical Access	Chris Amidon
OZAR	Akers Ferry	Ferry/Boat	334	NPS	Concession Contract	Transportation Feature	Peggy Tarrence
PIRO	Pictured Rocks Cruises	Ferry/Boat	202,134	Non-NPS	Concession Contract	Interpretive Tour	Joseph Hughes
SCBL	SCBL Free Shuttle Service	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	NPS Owned and Operated	Mobility to or within Park	Justin Cawiezal
SLBE	Manitou Island Transit	Ferry/Boat	9,644	Non-NPS	Concession Contract	Transportation Feature	Phil Akers
TAPR	TAPR Bus Tours	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	NPS Owned and Operated	Interpretive Tour	Heather Brown
VOYA	VOYA Tour Boat	Ferry/Boat	1,141	NPS	NPS Owned and Operated	Interpretive Tour	Tawnya Schoewe

Interior Regions 6, 7, and 8

Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
BAND	Bandelier National Monument	Shuttle/Bus/ Van/Tram	Did Not Operate	Non-NPS	Service Contract	Critical Access	Dennis Milligan
BRCA	Bryce Canyon Shuttle and Rainbow Point Shuttle	Shuttle/Bus/ Van/Tram	458,243	Non-NPS	Service Contract	Mobility to or within Park	Kevin Poe
DINO	Tram Transit	Shuttle/Bus/ Van/Tram	108,020	Non-NPS	Service Contract	Critical Access	Jeffrey Pate
GLAC	Glacier Park Boat Company	Ferry/Boat	156,142	Non-NPS	Concession Contract	Interpretive Tour	Hayley Bahr



Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
	interpretive boat tours						
GLAC	Sun Tours	Shuttle/Bus/ Van/Tram	5,507	Non-NPS	Concession Contract	Interpretive Tour	Jennifer Evans
GLAC	GLAC Hiker Shuttle	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	Concession Contract	Mobility to or within Park	Patrick M Glynn
GLAC	Red Bus Tours	Shuttle/Bus/ Van/Tram	30,009	NPS	Concession Contract	Interpretive Tour	Jennifer L Evans
GLAC	Sun Tours	Shuttle/Bus/ Van/Tram	5,507	Non-NPS	Concession Contract	Interpretive Tour	Jennifer L Evans
GLAC	Visitor Transportation System	Shuttle/Bus/ Van/Tram	110,779	NPS	NPS Owned and Operated	Mobility to or within Park	Patrick M Glynn
GLCA	Antelope Point	Ferry/Boat	Did Not Operate	Non-NPS	Concession Contract	Interpretive Tour	Gregory Owen
GLCA	Boat Tours	Ferry/Boat	Did Not Operate	Non-NPS	Concession Contract	Interpretive Tour	Gregory Owen
GLCA	Flatwater Tour	Ferry/Boat	Did Not Operate	Non-NPS	Concession Contract	Interpretive Tour	Gregory Owen
GLCA	SR276 Passenger Ferry	Ferry/Boat	3,502	Non-NPS	Service Contract	Transportation Feature	Gregory Owen
GRCA	South Rim Bus Tours	Shuttle/Bus/ Van/Tram	971	Non-NPS	Concession Contract	Interpretive Tour	Pamela E Edwards
GRCA	Grand Canyon Railway	Train/Trolley	300,524	Non-NPS	Concession Contract	Mobility to or within Park	Pamela E Edwards
GRCA	South Rim Shuttle Service	Shuttle/Bus/ Van/Tram	2,660,438	NPS	Service Contract	Mobility to or within Park	Pamela E Edwards
GRTE	Jenny Lake Shuttle Boat	Ferry/Boat	285,658	Non-NPS	Concession Contract	Mobility to or within Park	Patrick C Mcgaugh
LIBI	LIBI Bus Tours	Shuttle/Bus/ Van/Tram	Did Not Operate	Non-NPS	Concession Contract	Interpretive Tour	Ken R Woody
MEVE	Long House Trailhead tram and Half-day ranger guided	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS; Non-NPS	Concession Contract	Interpretive Tour	Allan P Loy
ORPI	Ajo Mountain Drive Tour	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	NPS Owned and Operated	Critical Access	Cynthia R Sequanna
ROMO	Rocky Mountain National Park Visitor Shuttle	Shuttle/Bus/ Van/Tram	455,852	Non-NPS	Service Contract	Mobility to or within Park	John P Hannon
YELL	Xanterra Parks & Resorts interpretive snowcoaches tours	Shuttle/Bus/ Van/Tram	14,918	Non-NPS	Concession Contract	Interpretive Tour	Matthew Mankowski
YELL	Historic Yellow Bus Tours	Shuttle/Bus/ Van/Tram	149	NPS	Concession Contract	Interpretive Tour	Matthew Mankowski
YELL	Xanterra Parks & Resorts interpretive bus tours	Shuttle/Bus/ Van/Tram	4,360	NPS	Concession Contract	Interpretive Tour	Matthew Mankowski



Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
YELL	YELL Boat	Ferry/Boat	12,185	NPS	Concession Contract	Interpretive Tour	Matthew Mankowski
YELL	YELL Snow Coaches	Shuttle/Bus/ Van/Tram	16,909	NPS; Non-NPS	Concession Contract	Interpretive Tour	Jennifer Staroska

Interior Regions 8 (Southern California and Southern Nevada), 9, 10, and 12

Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
CHIS	Island Packers	Ferry/Boat	44,011	Non-NPS	Concession Contract	Critical Access	John Hansen
CRLA	Crater Lake Boat Tour	Ferry/Boat	Did Not operate	Non-NPS	Concession Contract	Interpretive Tour	Sean Denniston
CRLA	Rim Drive Trolley Tour	Shuttle/Bus/ Van/Tram	Did Not operate	Non-NPS	Concession Contract	Interpretive Tour	Sean Denniston
DEPO	Reds Meadow Shuttle Bus	Shuttle/Bus/ Van/Tram	Did Not operate	Non-NPS	Cooperative Agreement	Critical Access	Kevin Killian
EUON	NPS Shuttle	Shuttle/Bus/ Van/Tram	1,768	NPS	NPS Owned and Operated	Critical Access	Thomas Leatherman
GOGA/ALCA	Alcatraz Cruises Ferry	Ferry/Boat	2,696	Non-NPS	Concession Contract	Critical Access	Alice Young
MUWO	Muir Woods Shuttle	Shuttle/Bus/ Van/Tram	20,000	Non-NPS	Cooperative Agreement	Mobility to Or Within Park	Darren Brown
NOCA/LACH	Rainbow Falls Tours	Shuttle/Bus/ Van/Tram	9,452	NPS	Concession Contract	Interpretive Tour	Annelise Lesmeister
NOCA/ROLA	Ross Lake Hiker Shuttle	Ferry/Boat	655	Non-NPS	Concession Contract	Transportation Feature	Annelise Lesmeister
PORE	Headlands Shuttle	Shuttle/Bus/ Van/Tram	Did Not Operate	Non-NPS	Critical Access	Service Contract	Brannon Ketcham
PERL	Ford Island Tour	Ferry/Boat	104,146	Non-NPS	Cooperative Agreement	Interpretive Tour	Daniel Brown
PERL	USS Arizona Memorial Tour	Ferry/Boat	544,217	Non-NPS	Cooperative Agreement	Interpretive Tour	Daniel Brown
PINN	Pinnacle Shuttle	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	NPS Owned and Operated	Mobility to or within Park	Kevin Brothers
SEKI	Giant Forest Shuttle	Shuttle/Bus/ Van/Tram	348,263	Non-NPS	Cooperative Agreement	Critical Access	Joshua Handel
SEKI	Gateway Shuttle	Shuttle/Bus/ Van/Tram	Did Not Operate	Non-NPS	Cooperative Agreement	Mobility to or within Park	Joshua Handel
YOSE	Tram Tours and Hiker Shuttle	Shuttle/Bus/ Van/Tram	Did Not Operate	Non-NPS	Concession Contract	Interpretive Tour	Jim Donovan
YOSE	Winter Ski Shuttle	Shuttle/Bus/ Van/Tram	Did Not Operate	Non-NPS	Concession Contract	Mobility to or within Park	Jim Donovan
YOSE	YARTS: Yosemite Area Regional Transportation System	Shuttle/Bus/ Van/Tram	55,751	Non-NPS	Cooperative Agreement	Mobility to or within Park	Jim Donovan



Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
YOSE	Mariposa Grove Transportation Service	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	Service Contract	Critical Access	Jim Donovan
YOSE	Yosemite Valley Shuttle	Shuttle/Bus/ Van/Tram	Did Not Operate	NPS	Concession Contract	Mobility to or within Park	Jim Donovan

Interior Region 11 – Alaska

Park Code	System Name	Vehicle Type	2021 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
DENA	Bus Tours and Shuttle Service	Shuttle/Bus/ Van/Tram	102,784	Non-NPS	Concession Contract	Critical Access	Jim LeBel
GLBA	Day Boat Tour	Ferry/Boat	6,515	Non-NPS	Concession Contract	Interpretive Tour	Melanie Berg
GLBA	Airport Shuttle	Shuttle/Bus/ Van/Tram	4,055	Non-NPS	Concession Contract	Transportation Feature	Melanie Berg



Appendix E – Change in Vehicle Types

Table 10: Recategorization of vehicle types

Note: Includes all fleet data regardless of 2021 active operational status

Sources: 2020 and 2021 NPS transit inventory data

Vehicle Type	2020 Vehicles	2021 Vehicles	Difference
Ferry/Boat	118	118	0
NPS Owned	15	16	+1
Non-NPS Owned	103	102	-1
Van/SUV/Sedan	6	15	+9
NPS Owned	2	2	0
Non-NPS Owned	4	13	+9
Passenger Van	126	125	-1
NPS Owned	29	31	+2
Non-NPS Owned	97	94	-3
Light-Duty Shuttle	27	35	+8
NPS Owned	7	13	+6
Non-NPS Owned	20	22	+2
Medium-Duty Shuttle	97	93	-4
NPS Owned	71	71	0
Non-NPS Owned	26	22	-4
Heavy-Duty Shuttle	0	0	0
NPS Owned	0	0	0
Non-NPS Owned	0	0	0
Light-Duty Transit (Bus)	0	0	0
NPS Owned	0	0	0
Non-NPS Owned	0	0	0
Medium-Duty Transit (Bus)	74	80	+6
NPS Owned	34	36	+2
Non-NPS Owned	40	44	+4
Heavy-Duty Transit (Bus)	279	226	-53
NPS Owned	69	66	-3
Non-NPS Owned	210	160	-50
School Bus	115	115	0
NPS Owned	7	7	0
Non-NPS Owned	108	108	0
Snowmobile/Snow coach	20	12	-8
NPS Owned	12	12	0
Non-NPS Owned	8	0	-8
Tram/Golfcart	3	21	+18
NPS Owned	2	10	+8
Non-NPS Owned	1	11	+10
Train/Trolley/Streetcar	20	21	+1
NPS Owned	5	5	0
Non-NPS Owned	15	16	+1
Aircraft	3	3	0
NPS Owned	0	0	0
Non-NPS Owned	3	3	0
Total	888	864	-24
NPS Owned	253	269	+16
Non-NPS Owned	635	595	-40



Appendix F – Vehicle Replacement Assumptions

Uniform vehicle replacement costs and expected service lives were used to provide servicewide consistency in estimates of vehicle age, remaining service life, and recapitalization costs. The assumptions below provided the basis for the recapitalization analysis, which was also validated by regional staff to reflect variations in timelines, vehicle types purchased, and growth in vehicle fleets. These assumptions were updated for the 2015 inventory from previous inventories²⁴ to reflect the usage and operating characteristics of NPS vehicles (tables 10 and 11). National Park Service vehicles are not used in the same way that city transit vehicles are used; they are typically not used for the entire year and are not used as intensively as transit vehicles in an urban environment. Vehicle cost estimates were mostly taken from the General Service Administration’s AutoChoice Database.

In January 2022, the National Park Service requested an updated expected service life for vehicles on public lands and a discussion on shuttle bus versus transit bus configurations from the Volpe Center (US Department of Transportation).

Shuttle Bus versus Transit Bus Configurations and Expected Service Life

The on-road vehicle types common to the NPS transit systems are passenger vehicles, passenger vans, light- and medium-duty shuttle buses, medium- and heavy-duty transit buses, and school buses. Table 11 shows common transit vehicle types and essential information on size, cost, and life expectancy. The general information and delineations between categories discussed below are generic descriptions for vehicle type classification.

A key distinction among light- and medium-duty buses are the “shuttle” versus “transit” configuration.

Shuttle Bus Configuration

A shuttle bus is built of a mass-produced “stripped chassis” or “cutaway” platform that is derived from a domestic truck or van chassis (such as Dodge, Ford, General Motors). These chassis include a cab, powertrain, frame, suspension, wheels, brakes, and driveline but do not have a typical truck or van body built over the back of the frame. Instead, a specialty manufacturer will build a shuttle bus passenger compartment on the stripped chassis. Shuttle buses are sometimes referred to as “high floor buses” or “cutaways” due to having the passenger compartment built on top of the stripped chassis.

The raised passenger compartment requires steps to enter and exit, and accessibility compliance is commonly achieved with a wheelchair lift at the back of the vehicle. The

²⁴ The 2014 inventory used replacement costs and expected life assumptions based on the Federal Transit Administration: Useful Life of Transit Buses and Vans – April 2007.



shuttle bus typically has a shorter rated life expectancy than an equivalent capacity transit bus option. However, the shuttle bus options are less expensive to build and buy, offering an economical choice for transit systems.

Transit Bus Configuration

The transit bus is built as a dedicated platform by the vehicle manufacturer for transit operations. Typical manufacturers include Build Your Dream, El Dorado, Gillig, Bluebird, New Flyer, NA Bus Industries, and Proterra. The frame, engine, drivetrain, suspension, brakes, and other Significant components, like the frame, engine, drivetrain, suspension, and brakes, and detail components, like doors and electronics, are built to a more robust standard to survive operations in urban, continuous transit environments.

The frame and chassis are more costly to build due to their lower volume,²⁵ dedicated design, robust construction, and a “low floor” configuration. The lower floor provides access to the vehicle for most uses, and most vehicles have a deployable accessible ramp. As a result of their construction, transit buses are nearly twice as expensive as an equivalently sized shuttle bus. However, transit buses have a longer rated life expectancy and can survive harder more continuous use.

Some vehicles may cross boundaries between categories. For example, some passenger vans are built with a transit chassis, and configurations and smaller "light-duty" shuttle-bus categories are built with transit-style features and even dedicated chassis for battery-electric options.

Battery-Electric Buses

Given the new nature of battery-electric configurations in shuttle bus and transit bus applications, there remain critical unknowns as they pertain to long-term performance, durability, reliability or “uptime,” and their expected life. Electric vehicle manufacturers promise lower maintenance requirements and longer life expectancies than an internal combustion engine-powered vehicle.

However, battery-electric transit buses have only become available within the past decade, and most in operation are yet to reach their rated lifespans. Foothill Transit has operated battery-electric buses since 2010, partnering with the National Renewable Energy Laboratory to evaluate the performance of their buses, for which a final report was published in 2021.²⁶ Unfortunately, the transit operator has contacted the Federal

²⁵ Lower production volumes compared to commercial trucks.

²⁶ <https://www.nrel.gov/docs/fy21osti/80022.pdf>.



Transit Administration requesting to retire several buses early due to costly repairs and poor reliability, stating their buses were not able to achieve their rated life of 12 years.²⁷

Given the uncertainties surrounding component replacement costs and the long-term durability of battery-electric buses, their expected life in public lands applications is equivalent to their rated lifespan. A longer life expectancy for public lands use is not anticipated at this time, as it is often achieved with traditionally fueled vehicles.

Table 11: Summary of vehicles on public lands

Notes: CNG=compressed natural gas; N/A=not applicable

Source: Transit standards²⁸ updated to reflect NPS typical usage and operating characteristics

Vehicle Type	Purchase Cost	Rated Life	Expected Life in Public Lands (years)	Capacity	Fuels
Electric/Small Tram	\$25,000 – \$35,000	N/A	3–5	6–12	Electric (battery), Gas Small Engine
Passenger Van, Car, Truck, SUV	\$25,000 – \$85,000	5 years 100,000 miles	5–10 (gas/diesel) 5–7 (electric)	6–15	Diesel, Gas, Electric
Light-Duty Shuttle	\$75,000 – \$120,000	7 years 200,000 miles	7–10 (gas/diesel hybrid) 7 (electric)	12–28	Diesel, Gas, Hybrid,
Light-Duty Low-Floor	\$400,000 – \$475,000	7 years 200,000 miles (anticipated)	8–10* (electric) *8-year warranty on bus and batteries	25–31	Electric
Medium-Duty Shuttle	\$100,000 – \$175,000	7 years 200,000 miles	7–10 (gas/diesel hybrid) 7 (electric)	28–36	Diesel, Gas, Hybrid
Medium-Duty Transit	\$200,000 – \$300,000	10 years 350,000 miles	15–20 (Diesel, Gas, Propane)	28–40	Diesel, Gas, Hybrid
Heavy Duty Transit	\$475,000 – \$1,200,000	12 years 500,000 miles	20+ (Diesel, CNG, Hybrid) 12 (electric)	35–45	CNG, Diesel, Hybrid, Electric

²⁷ <https://www.dailybulletin.com/2021/07/22/with-50-of-its-buses-inoperable-foothill-transit-searches-for-a-way-to-fix-its-fleet/>.

²⁸ Ibid.



Concurrently, a review of vehicle costs on the General Services Administration was completed to look for current actual costs of vehicles. A comparison with Volpe’s findings was completed, and the conservative life expectancies and costs were used in the national transit inventory and are included in the below tables.

Table 12: Vehicle replacement costs (in 2019 dollars) and expected life for nonelectric vehicles

Notes: CNG=compressed natural gas; N/A=not applicable

Source: Transit standards²⁹ updated to reflect NPS typical usage and operating characteristics

Vehicle Type	Gas/Diesel/ Biodiesel/ Propane Replacement Cost	Gas/Diesel/ Biodiesel/ Propane Expected Life (years)	CNG Replacement Cost	CNG Expected Life (years)
Passenger Van, Car, Truck, and SUV	\$35,640	5–10	N/A	N/A
Light-Duty Shuttle	\$110,000	7–10	\$115,000	10
Medium-Duty Shuttle	\$150,000	7–10	\$150,000	10
Medium-Duty Transit	\$350,000	15–20	\$350,000	20
Heavy-Duty Transit	\$500,000	20+	\$1,250,000	20
School Bus	\$150,000	15–20	N/A	N/A
Tram/Golf Cart	N/A	3–5	N/A	11

²⁹ Ibid.



Table 13: Vehicle replacement costs (in 2021 dollars) and expected life for electric vehicles

Note: N/A=not applicable

Source: Transit standards³⁰ updated to reflect NPS typical usage and operating characteristics

Vehicle Type	Electric-Hybrid Replacement Cost	Electric-Hybrid Expected Life (years)	Electric Replacement Cost	Electric Expected Life ³¹ (years)
Passenger Van, Car, Truck, and SUV	\$25,000 – \$85,000	5–7	\$108,000	10
Light-Duty Shuttle	\$150,000	7	\$225,000	12
Medium-Duty Shuttle	\$500,000	7	\$700,000	12
Medium-Duty Transit	\$700,000	15	\$1,000,000	12
Heavy-Duty Transit	\$1,250,000	12	\$1,250,000	12
School Bus	N/A	8–10	\$500,000	12
Tram/Golf Cart	\$25,000 – \$35,000	3–5	\$25,000 – \$35,000	11

A major recapitalization baselining effort was undertaken as part of the 2019 transit inventory. The National Park Service vehicle data was exported from the inventory to determine a calculated replacement year based on the life expectancy and age of each vehicle. From there, the Parks Transportation Allocation and Tracking System and Project Management Information System was reviewed for planned replacement and/or refurbishment projects (tables 12 and 13). Regional coordinators reviewed the plan and consulted on the draft recapitalization plan presented in this report.

³⁰ The 2014 inventory used replacement costs and expected life assumptions based on the Federal Transit Administration: Useful Life of Transit Buses and Vans – April 2007.

³¹ The batteries will need to be replaced prior to the end of the expected life.



Table 14: Recapitalization totals by year

Sources: Estimated recapitalization needs based on transit inventory data, transit standards, Project Management Information System, Parks Transportation Allocation and Tracking System, and region and park input

Year	Total Vehicles	Cost
2022	36	\$15,262,504
2023	35	\$51,009,656
2024	33	\$13,762,273
2025	39	\$16,728,706
2026	19	\$19,351,421
2027	20	\$15,364,110
2028	15	\$11,526,235
2029	6	\$1,011,965
2030	12	\$3,994,878
2031	2	\$171,917
2032	14	\$9,267,501
Total	231	\$157,451,172



Appendix G – Air Quality and Emissions

Since 2017, the transit inventory has used an updated methodology to analyze the air quality and greenhouse gas impacts of NPS transit systems. The analysis uses the US Environmental Protection Agency’s Motor Vehicle Emissions Simulator (MOVES) for estimating emissions by transit vehicles.³² MOVES is a state-of-the-science emissions modeling software that estimates airborne emissions from various on-road vehicles across several vehicle types at very fine scales. MOVES uses years of direct measurements to account for how different vehicles, fuel types, road types (e.g., urban versus rural, highways versus local streets), and emission processes (e.g., running, starting, and idling) contribute to air pollution. This process allows MOVES to calculate emissions from both on-road vehicles, such as transit buses, and off-road vehicles, such as waterborne vessels and trams. Emissions from ferries, boats, and trams were estimated by using similar on-road engines in MOVES. The latest version of MOVES, MOVES 3.0.3, was released in January 2022.

Since MOVES is the Environmental Protection Agency’s regulatory standard for emissions analysis, NPS units may use the results to engage directly with other local, state, and national air quality initiatives, as well as make informed programmatic decisions that improve resource management and visitor experience in the parks. For a discussion of the differences between the emissions modeling methods used in years prior to 2017, please see the *NPS Transit Inventory and Performance Report 2017*.³³

Pollutants

The following pollutants are included in the 2021 air quality analysis:

*Carbon Dioxide (CO₂)*³⁴

Carbon dioxide is a colorless gas produced through chemical combustion, including burning fuels to power automobiles and homes. Typically, gasoline combustion emits more carbon dioxide than other fuels.

Nitrogen Oxides (NO_x) and Volatile Organic Compounds

Nitrogen oxides are a collection of gaseous molecules containing one nitrogen atom and a number of oxygen atoms. As with the other pollutants described here, fuel combustion emits nitrogen oxides. While upper-atmospheric nitrogen oxides can actually counteract the warming effects of greenhouse gases, ground-level NO_x

³² Latest version of MOVES: <https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves>.

³³ The 2017 national transit inventory may be accessed at: <https://rosap.ntl.bts.gov/view/dot/37306>.

³⁴ Intergovernmental Panel on Climate Change (IPCC) 2021, “Climate Change: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.”



molecules react with other airborne chemicals to become particles that can cause respiratory conditions in humans.³⁵

Volatile organic compounds are a broad category of organic molecules that evaporate at very low temperatures. Flammable solvents like paint thinners and some household cleaners, as well as other aromatics including vehicular fuels, all contain volatile organic compounds. State, local, and federal institutions tightly regulate volatile organic compounds, as they are easily absorbed into human tissue and can have harmful health effects.³⁶

Nitrogen oxides and volatile organic compounds can together form ozone (O₃), a highly reactive gas. Stratospheric ozone, high up in Earth's atmosphere, deflects harmful solar radiation away from Earth's surface. However, nitrogen oxides and volatile organic compounds interact at the surface and produce ground ozone, causing a variety of negative health effects. Ground-level ozone can also severely harm plants and wildlife, and because ozone can travel long distances by wind, rural areas may experience high exposure even with little O₃ production.³⁷

*Carbon Monoxide (CO)*³⁸

Carbon monoxide (CO) is a colorless and odorless gas released through burning fossil fuels, though the emissions quantities vary by fuel type. In large quantities, carbon monoxide can be extremely dangerous for animals and humans because it inhibits the absorption of oxygen into the bloodstream. While CO toxicity is ordinarily only a concern indoors, where such quantities easily accumulate, the elderly and those with certain cardiovascular are at risk of serious health impacts at higher outdoor concentrations. This often occurs at hot outdoor locations in the presence of numerous running motors, such as parking lots in summer.

*Particulate Matter (PM)*³⁹

Particulate matter (PM) encompasses solid and liquid particles emitted into the air, including dust, soot, and aerosolized chemicals. Two categories of particulate matter concerning regulatory analyses of air quality include those with negative impacts on respiratory health—inhalable particles 10 micrometers and smaller (PM₁₀)—as well as those 2.5 micrometers and smaller (PM_{2.5}). Particulate matter can come from construction sites, roadway wear as tires and heavy vehicles move over them, and burning fuels. Diesel fuel combustion generally emits more particulate matter than other fuels, and driving over unpaved surfaces can emit PM₁₀ particles. Exposure to

³⁵ US Environmental Protection Agency, "NO_x: How Nitrogen Oxides Affect the Way We Live and Breathe." September 1998.

³⁶ Ibid.

³⁷ US Environmental Protection Agency, "Basic Information about Ozone | Ozone Pollution | US EPA."

³⁸ US Environmental Protection Agency, "Basic Information about Carbon Monoxide (CO) Outdoor Air Pollution | Carbon Monoxide (CO) Pollution in Outdoor Air | US EPA."

³⁹ Ibid.



particulate matter can cause and aggravate respiratory conditions such as asthma; this is especially true of PM₁₀ particles. PM_{2.5} particles are a major contributor to smog, which both obscures views and damages natural resources.

Results

Similar to 2020, the COVID-19 pandemic had a significant impact on vehicle miles traveled (VMT) and transit system operation in parks in 2021. Vehicle miles traveled across all regions increased 45% from 2020 levels, but did not rebound those observed in 2019, showing a 58% decrease compared with 2019. In 2021, 63 of 97 transit systems in the national inventory were operational; in 2020, 74 of 96 systems operated; in 2019, 93 of 97 systems operated. Across all regions and pollutants, emissions were 2% to 42% lower than 2019 levels.

Table 15 shows transit system VMT and ferry hours by region in 2021. The sections below describe passenger vehicle trips avoided because of transit use, as well as individual pollutant emissions from transit system fleets by region.

Table 15: Total transit system vehicle miles traveled and ferry hours by region

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Interior Region	Vehicle Miles Traveled	Ferry Hours
Regions 6, 7, 8	3,060,240	9147
Region 1 – NCA	43,680	0
Regions 3, 4, 5	74,000	2021
Region 2	91,981	17,964
Region 11	363,536	800
Region 1	404,012	0
Regions 8, 9, 10, 12	887,838	4756
Total	9,850,574	69,376

Diverted Passenger Vehicle Trips and CO₂ Emissions Avoided

Although transit systems contribute to emissions, transit in NPS units typically has a net positive effect on air quality, as well as the visitor experience. Transit use reduces the number of vehicle trips in parks—for example, transit buses carry more people per square foot of road space, relieving congestion on park roads and eliminating associated fuel-inefficient driving behaviors, such as extended idling and stop-and-go. In addition to the air quality benefits of reduced fuel use per visitor, expanded transit use influences how visitors spend their time in the park and removes long lines of cars from viewsheds.

Figure 13 shows the estimated number of vehicle trips eliminated because of transit use in each region. The number of passenger vehicle trips diverted is calculated by dividing the total number of passenger boardings by the average occupancy of visitors' personal vehicles (assumed to be 2.6). Emissions avoided are calculated as the vehicle miles



traveled avoided multiplied by a passenger vehicle emissions factor (EF_p) for a given pollutant, assuming that the passenger vehicles use conventional gasoline fuel.⁴⁰

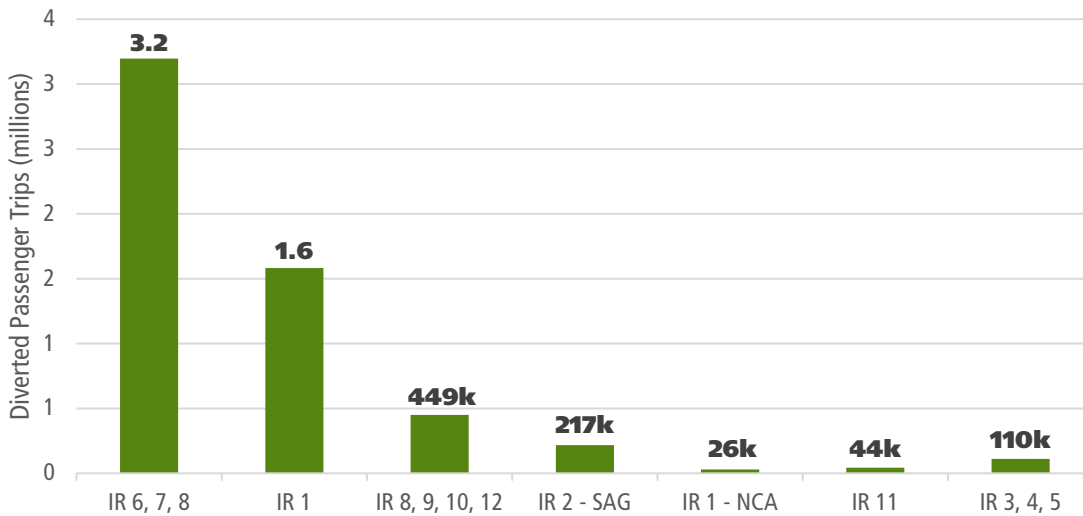
$$Emissions\ Avoided = EF_p * \frac{\left(\frac{total\ transit\ VMT}{total\ transit\ runs}\right) * total\ transit\ boardings}{2.6\ occupants\ per\ vehicle}$$

National Park Service transit services eliminated an estimated 5.6 million passenger vehicle trips in 2021, which equates to 107 million fewer miles driven and a reduction in carbon dioxide emissions of 41,358 metric tons.⁴¹ Regions with higher transit use and more boardings, namely the Intermountain and Northeast Regions, experience more personal vehicles diverted from the road. Figure 13 shows the carbon dioxide emissions avoided per region.⁴²

Figure 13: Vehicle trips (in millions) avoided as a result of NPS transit systems

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Source: 2021 NPS transit inventory data



⁴⁰ Total transit VMT is calculated as the on-road VMT only, while total transit runs includes runs for all vehicle types.

⁴¹ Transit systems helped divert nearly 44,000 metric tons of CO₂ in 2020 and 177,000 metric tons in 2019.

⁴² The average vehicle miles traveled per run across all regions was used to calculate region-specific CO₂ emissions avoided.



Table 16: Diverted passenger trips and CO₂ emissions avoided

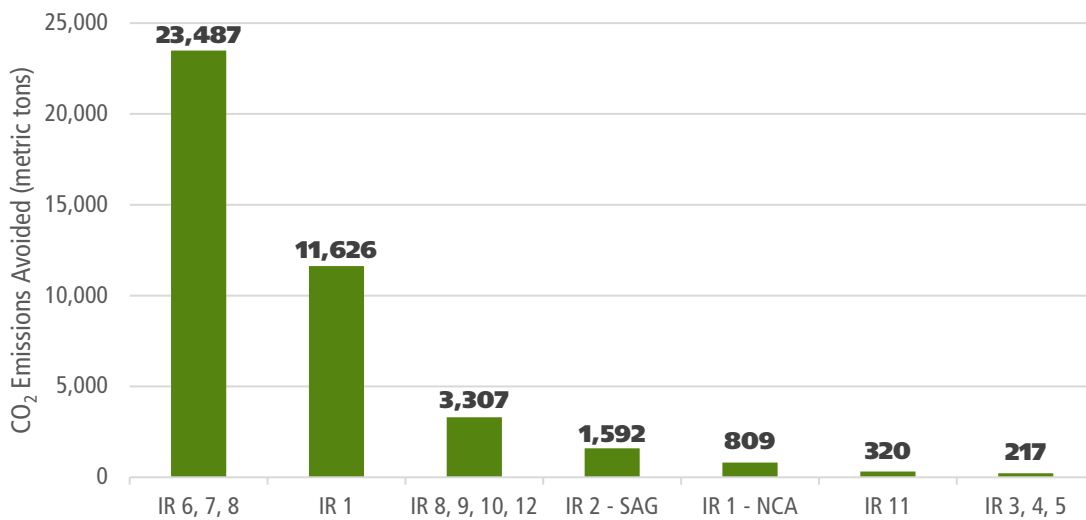
Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Interior Region	IR 6, 7, 8	IR 1	IR 8, 9, 10, 12	IR 2	IR 1 – NCA	IR 11	IR 3, 4, 5
Diverted Passenger Vehicle Trips	3,195,468	1,581,798	449,940	216,576	29,536	43,598	110,030
CO ₂ Emissions Avoided (metric tons)	23,487	11,626	3,307	1,592	809	320	217

Figure 14: Carbon dioxide emissions avoided (in metric tons) per regions

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Source: 2021 NPS transit inventory data



Criteria Pollutant Emissions Inventories

The following section details the emissions inventories for criteria pollutants and their precursors across the fleets operating in national parks. Vehicle fuel type and terrain type were observed to influence the emissions results. Diesel use results in a different pollution profile than alternative fuels, buses contribute differently than cars, heavy-duty ferries pollute differently than automobiles, and heavy engine loads on unpaved surfaces require more fuel and generate more road dust from brake and tire wear compared to paved roads. However, fewer vehicles burning fuel has a net positive effect on local air quality in national parks.

Figure 14 shows the results of MOVES carbon dioxide (CO₂) emissions modeling for 2021 NPS transit system activity, aggregated to the regional level. The results are also split by ownership (NPS versus non-NPS systems). Across all regions, NPS transit fleets emitted 4,567 metric tons of CO₂ in 2021. Regions 6, 7, 8 (Intermountain Region) have the highest vehicle miles traveled of all regions, thus resulting in high CO₂ emissions. However, Regions 3, 4, 5 (Midwest Region) have the highest CO₂ emissions, due to a high proportion of ferries using marine diesel, which produces more CO₂ than diesel used in on-road vehicles (all the vehicles operating in 2021 in Regions 3, 4, 5 were ferries). In comparing CO₂ emitted by transit systems versus CO₂ emissions from passenger vehicles avoided due to transit use, there is a total net reduction in CO₂ of 18,867 metric tons across all regions.

Figure 15: NPS transit system carbon dioxide emissions

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Source: 2021 NPS transit inventory data

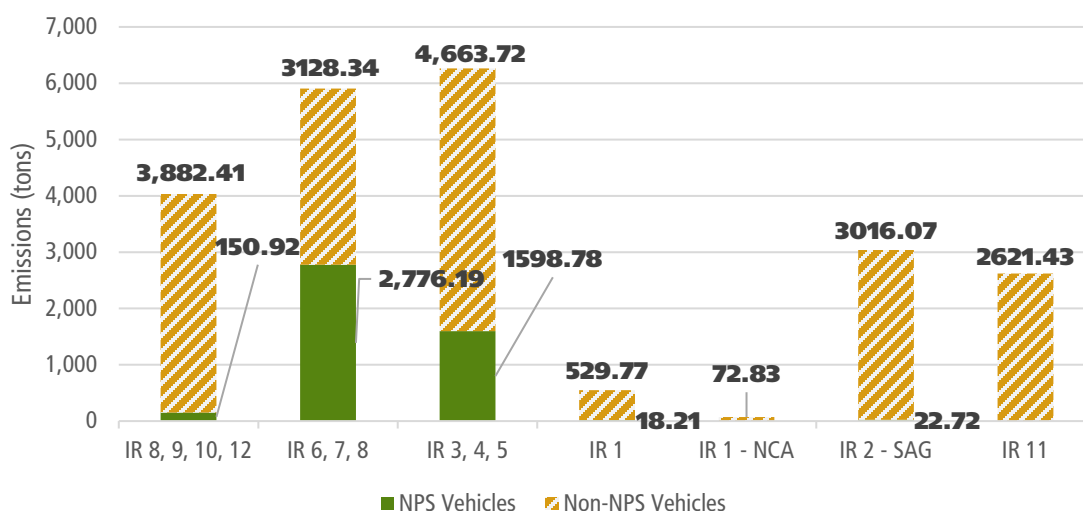


Figure 16 shows the results of MOVES nitrous oxide (NO_x) emissions modeling for 2021 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted 30.9 metric tons of NO_x in 2021. As for the CO₂ emissions, Regions 3, 4, 5 (Midwest Region) have the highest NO_x emissions, due to the large number of ferries operating in the region, while Regions 7, 8, 9 (Intermountain Region) have the second highest NO_x emissions, due to the region having highest overall vehicles miles traveled.

Figure 16: NPS transit system nitrogen oxide emissions

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service
 Source: 2021 NPS transit inventory data

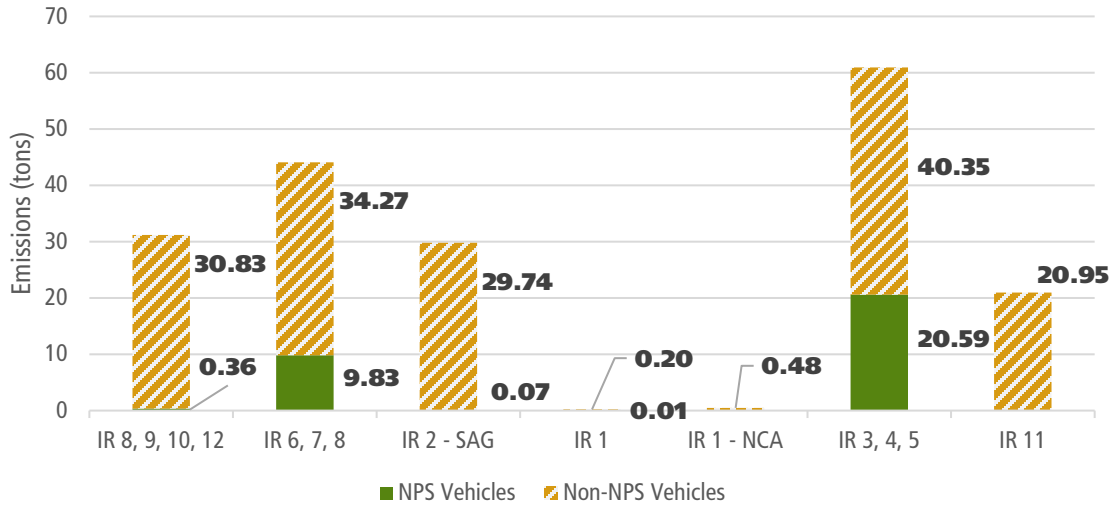
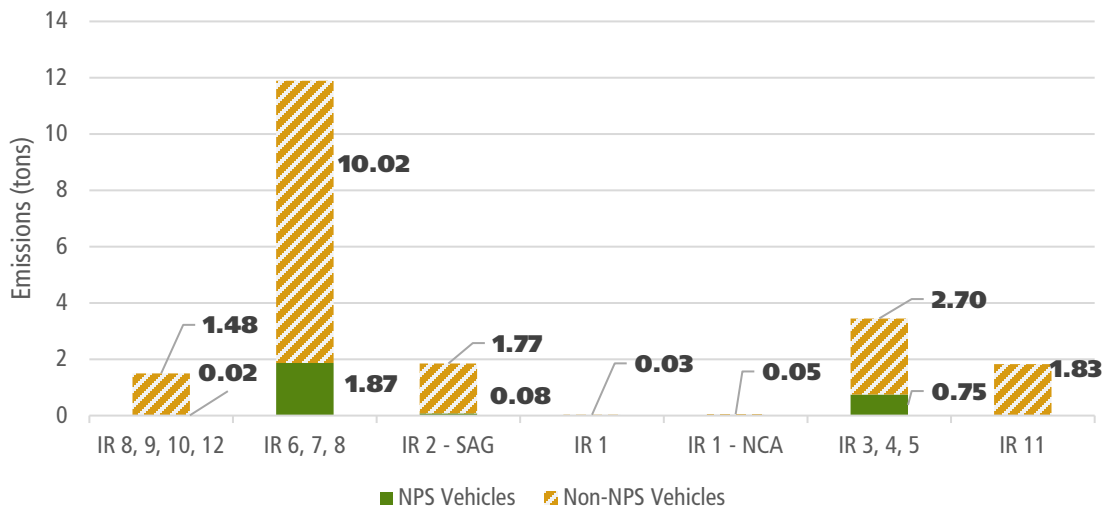


Figure 17 shows the results of MOVES volatile organic compound emissions modeling for 2021 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted 2.72 metric tons of volatile organic compounds in 2021. Volatile organic compounds combine with other airborne compounds, including NO_x, to produce ozone and photochemical smog. The NPS fleet in Regions 6, 7, 8 (Intermountain Region) emit the highest amounts of volatile organic compounds, as this region has a substantial proportion of vehicles powered by marine diesel and propane. Regions 3, 4, 5 (Midwest Region) transit fleets consist of a substantial proportion of marine diesel as well. Note that propane combustion is less efficient at high altitudes (i.e., where there is less oxygen) and can therefore result in greater volatile organic compounds, as well as carbon oxide emissions in certain regions—especially in Regions 6, 7, 8.⁴³

Figure 17: NPS transit system volatile organic compound emissions

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Source: 2021 NPS transit inventory data



⁴³ S. McAllister et al., “Chapter 2: Thermodynamics of Combustion”. *Fundamentals of Combustion Processes*, Springer (2011).



Figure 18 shows the results of MOVES carbon monoxide (CO) emissions modeling for 2021 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted approximately 25 metric tons of carbon monoxide in 2021. The Grand Canyon’s heavy use of compressed natural gas (CNG)-fueled buses and shuttles contributes significantly to Region 6, 7, 8’s (Intermountain Region’s) high relative carbon monoxide emissions. Compressed natural gas buses emit substantially more carbon monoxide than conventional fuels but 50% less NO_x. Since NO_x is an ozone precursor, CNG-fueled vehicles are ideal for minimizing smog—a key consideration in parks with long-distance viewsheds. The large number of propane-powered transit vehicles operated at higher altitudes in Regions 6, 7, 8 (Intermountain Region) also contributes to increased carbon monoxide emissions.

Figure 18: NPS transit system carbon monoxide emissions

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Source: 2021 NPS transit inventory data

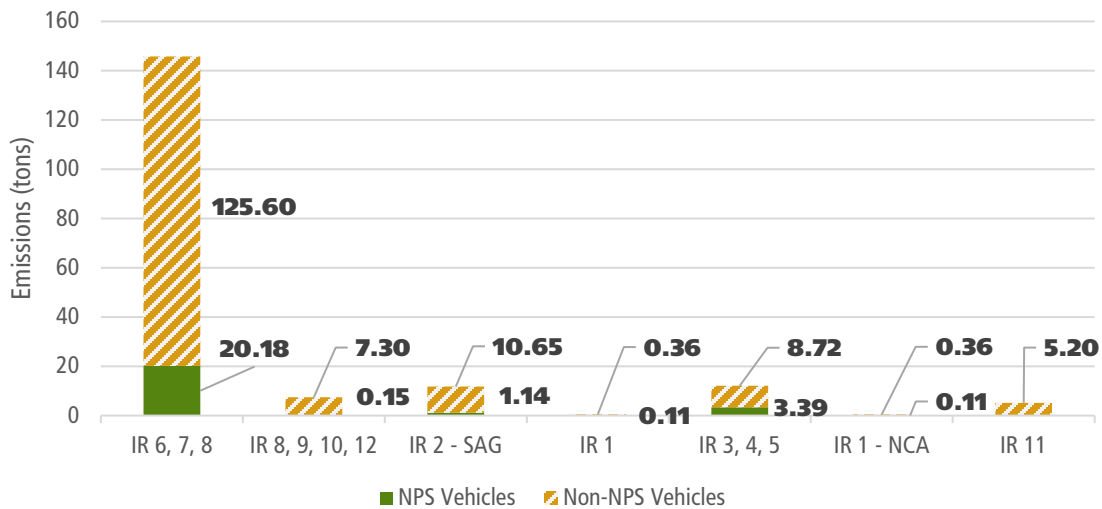


Figure 19 shows the results of MOVES PM_{2.5} emissions modeling for 2021 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted approximately 1 metric ton of PM_{2.5} in 2021. Breathing air with high levels of PM_{2.5} can result in adverse health impacts, including increased risk of cardiovascular disease and asthma.

Ferries that run on marine diesel, as well as buses fueled by propane, emit significantly more particulate matter than vehicles powered by other fuels. Several parks in Regions 8, 9, 10, 12 (Pacific West Region) include exclusively marine transit fleets, and the Pictured Rocks Cruises ferry fleet contributes the majority of the Region 3, 4, 5 PM_{2.5} emissions. In Regions 6, 7, 8, ferries at Glen Canyon and Grant Teton and the propane bus fleet at Zion increase PM_{2.5} emissions in this region.

Figure 19: NPS transit system PM_{2.5} emissions

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Source: 2021 NPS transit inventory data

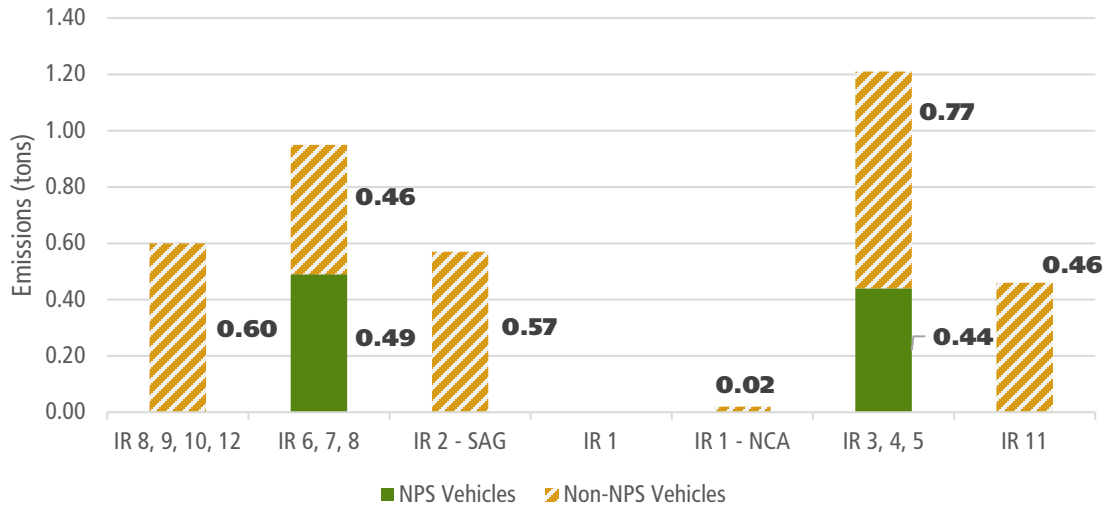
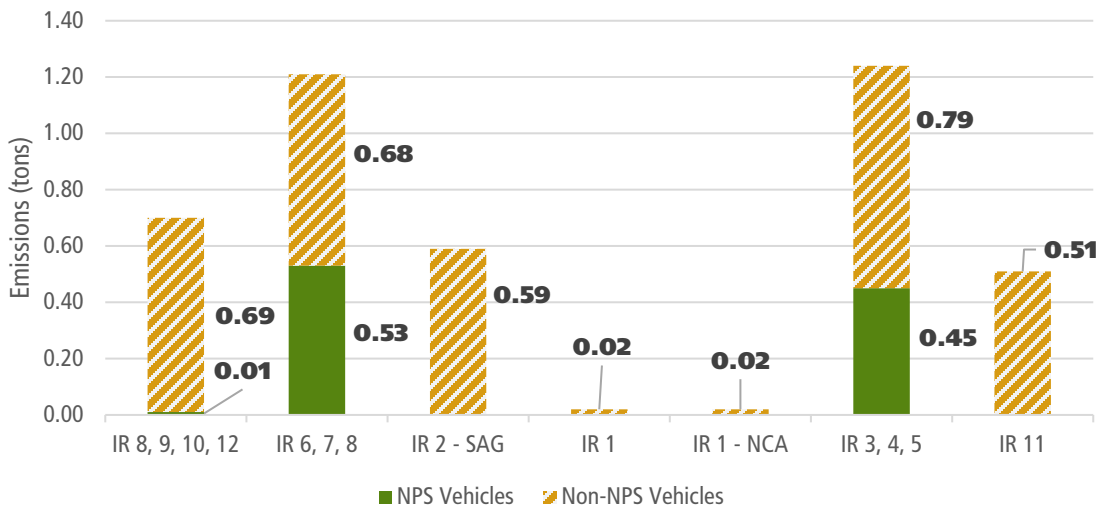


Figure 20 shows the results of MOVES PM₁₀ emissions modeling for 2021 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted about 1.1 metric tons of PM₁₀ in 2021. Some regions produce more PM₁₀ than PM_{2.5}, in part due to transit systems operating on unpaved roads, which can result in release of larger particles as fugitive dust.

Figure 20: NPS transit system PM₁₀ emissions

Notes: IR=Interior Region; NCA=National Capital Area; NPS=National Park Service

Source: 2021 NPS transit inventory data



Across all pollutant types, the majority of emissions came from non-NPS vehicles rather than NPS vehicles. Additionally, the Intermountain and Pacific West Regions generally had the highest emissions compared to the other regions. CO₂ emissions were far greater than any of the other pollutants on the basis of mass, which is consistent with the Environmental Protection Agency’s 2017 National Emissions Inventory.⁴⁴ Nonetheless, emissions from NPS vehicles in 2021 had a minimal impact on the national inventory. In particular, volatile organic compounds, PM_{2.5}, and PM₁₀ emissions from NPS vehicles were negligible compared to any other sector and major emitting source in the national emissions inventory (e.g., agriculture, power generation).

⁴⁴ US Environmental Protection Agency. 2017 National Emissions Inventory Data: <https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data>.



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