Washington Support Office

National Park Service
U.S. Department of Interior

Channel Islands National Park

Glacier National Park

NPS National Transit Inventory and Performance Report, 2018

NPS National Transit Inventory and Performance Report
Executive Summary

2018

Glacier National Park, MT

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

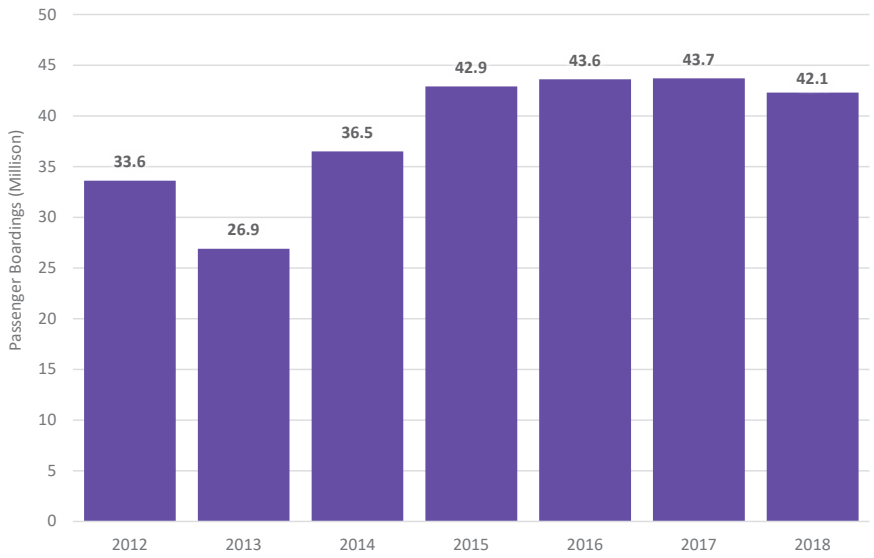
1. Identifies NPS transit systems across the country,
2. Tracks the operational performance (e.g. boardings) of each system, and
3. Inventories NPS and non-NPS owned transit vehicles and vessels, and collects detailed vehicle information.

42.1 Millon
Passenger Boardings

60 Parks
Represented

95 Transit Systems

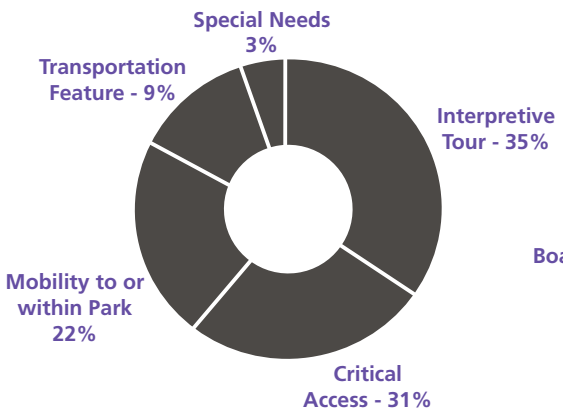
976 Vehicles and Vessels



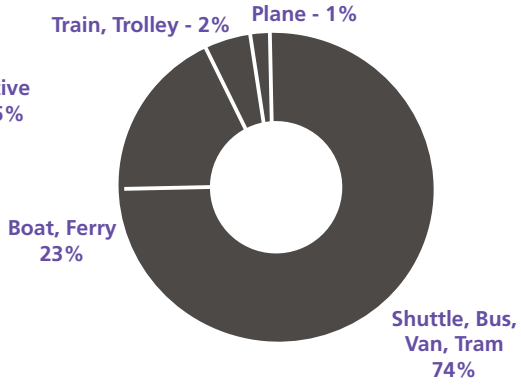
Of the 95 transit systems, the top ten transit systems accounted for 83% of the 42.1 million passenger boardings in 2018. The systems with the highest boardings are located at Ellis Island/Statue of Liberty National Monuments, Grand Canyon National Park, Zion National Park, Alcatraz Island in Golden Gate National Recreation Area, and Yosemite National Park. The top parks list has remained relatively stable over time.

NPS transit systems are modest in size. The majority (76%) of transit fleets have just 1 to 10 vehicles. Only one system has a fleet of greater than 40 vehicles (Denali National Park).

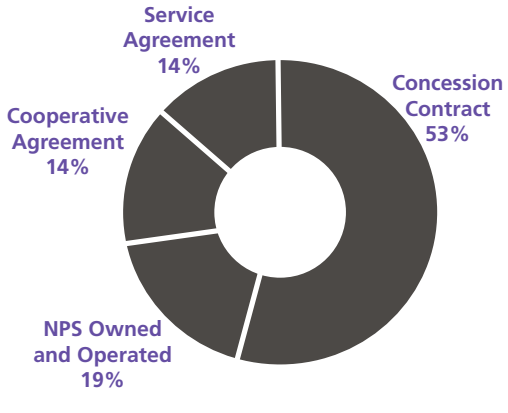
Purpose
(by % of transit systems)



Mode
(by % of transit systems)

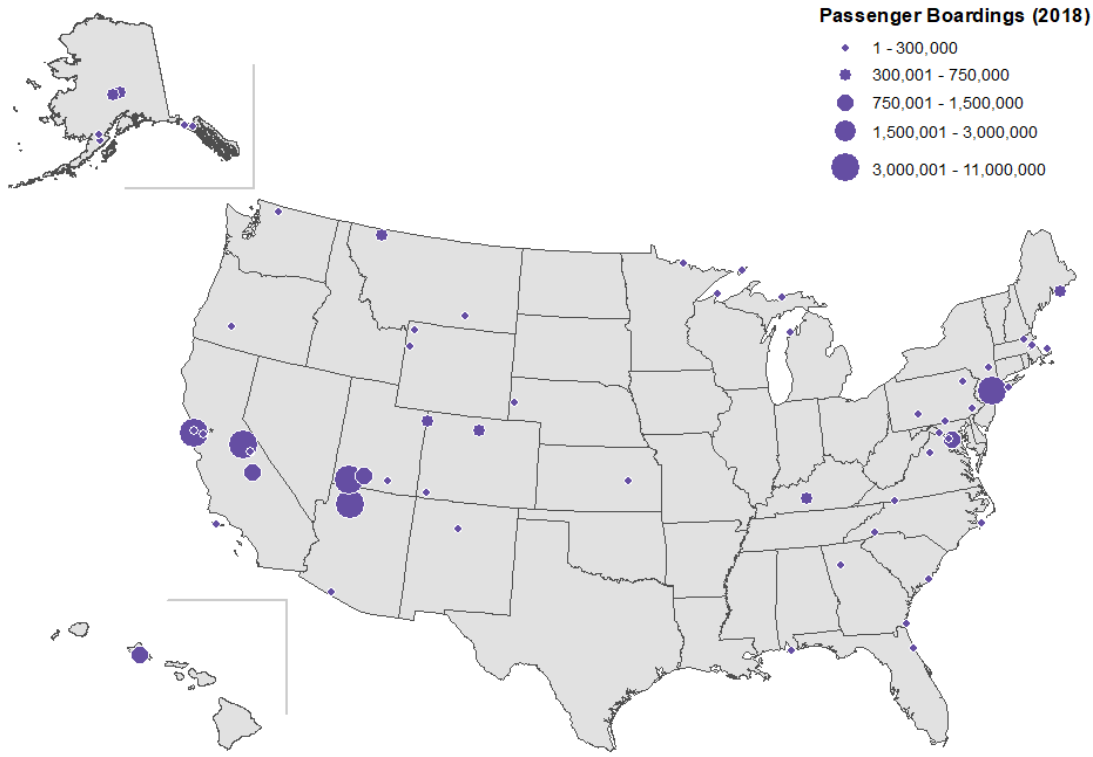


Business Model
(by % of transit systems)



58% of NPS-owned transit vehicles operate on alternative fuel, while 20% of non-NPS-owned vehicles operate on alternative fuel.

NPS Transit systems generally operate by seasonal visitation trends. 53% of the transit systems operate 3 to 6 months of the year, while approximately 34% of the NPS transit systems operate year-round. Additionally, 12% of systems operate 7 to 10 months of the year.



Performance Measures

Visitor Experience

The majority of the NPS-owned transit system vehicles and vessels are accessible for people with mobility impairments. 70% of NPS-owned vehicles are accessible to people with mobility impairments (e.g. require wheelchair lift).

Operations

NPS partners with private sector to provide the majority of transit services. Non-NPS entities operate 81% of NPS transit systems, which account for almost 99% of passenger boardings service-wide. NPS owns and operates the remaining 19% of transit systems, which account for the remaining 1% of passenger boardings.

Environmental Impact

NPS transit systems mitigate vehicle emissions. The net CO_2 emissions savings of the 976 transit vehicles and vessels evaluated (excluding planes, rail, snowcoaches, and vehicles with incomplete data) was equivalent to removing 16.7 million personal vehicle trips, and 223 million passenger vehicle miles from the road.

Asset Management

NPS-owned shuttle/bus/van/tram vehicles have an estimated $65 million in recapitalization needs between 2019 and 2028. Parks with estimated transit vehicle replacement costs over $1 million during the next ten years include Acadia National Park, Glacier National Park, Grand Canyon National Park, Yosemite National Park, and Zion National Park.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Acronyms

The following acronyms are used in this report:

ACAD	Acadia National Park
ADAM	Adams National Historic Park
AKR	Alaska Region
ALCA	Alcatraz Island
ALPO	Allegheny Portage Railroad National Historic Site
APIS	Apostle Islands National Lakeshore
ATP	Alternative Transportation Program
ATSLAM	Alternative Transportation Systems Lifecycle Asset Management
BAND	Bandelier National Monument
BLRI	Blue Ridge Parkway
BOHA	Boston Harbor Islands National Recreation Area
BRCA	Bryce Canyon National Park
BUIS	Buck Island Reef National Monument
CACO	Cape Cod National Seashore
CALO	Cape Lookout National Seashore
CARL	Carl Sandburg Home National Historic Site
CASA	Castillo de San Marcos National Monument
CHIS	Channel Islands National Park
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRLA	Crater Lake National Park
CUA	Commercial Use Agreement
CUIS	Cumberland Island National Seashore
CUVA	Cuyahoga Valley National Park
DENA	Denali National Park & Preserve
DEPO	Devils Postpile National Monument
DINO	Dinosaur National Monument
DRTO	Dry Tortugas National Park
EPA	Environmental Protection Agency
EISE	Eisenhower National Historic Site
ELIS	Ellis Island
ELRO	Eleanor Roosevelt National Historic Site
EPA	United States Environmental Protection Agency
EUON	Eugene O'Neill National Historic Site
EVER	Everglades National Park
FBMS	Financial and Business Management System
FIIS	Fire Island National Seashore
FOMA	Fort Matanzas National Monument
FOSU	Fort Sumter National Monument
GLAC	Glacier National Park
GLBA	Glacier Bay National Park & Preserve
GLCA	Glen Canyon National Recreation Area
GOGA	Golden Gate National Recreation Area
GUIS	Gulf Islands National Seashore
GRCA	Grand Canyon National Park
GRTE	Grand Teton National Park
HAFE	Harpers Ferry National Historic Park
HOFR	Home of Franklin D. Roosevelt National Historic Site

IMR	Intermountain Region
ISRO	Isle Royale National Park
JOFL	Johnstown Flood National Memorial
KATM	Katmai National Park & Preserve
KEMO	Kennesaw Mountain National Battlefield Park
LACH	Lake Chelan National Recreation Area
LIBI	Little Bighorn Battlefield National Monument
LOWE	Lowell National Historic Park
MACA	Mammoth Cave National Park
MEVE	Mesa Verde National Park
MOVES	Motor Vehicle Emissions Simulator (U.S. EPA)
MPG	Miles per Gallon
MUWO	Muir Woods National Monument
MWR	Midwest Region
NAMA	National Mall and Memorial Parks
NCR	National Capital Region
NER	Northeast Region
NLRTP	National Long Range Transportation Plan
NOCA	North Cascades National Park
NOx	Oxides of Nitrogen
NPS	National Park Service
O_3	Ozone
ORPI	Organ Pipe Cactus National Monument
PINN	Pinnacles National Park
PIRO	Pictured Rocks National Lakeshore
PM	Particulate Matter
PORE	Point Reyes National Seashore
PWR	Pacific West Region
ROLA	Ross Lake National Recreation Area
ROMO	Rocky Mountain National Park
SAJU	San Juan National Historic Site
SCBL	Scotts Bluff National Monument
SEKI	Sequoia & Kings Canyon National Parks
SER	Southeast Region
SHEN	Shenandoah National Park
SLBE	Sleeping Bear Dunes National Lakeshore
SOCC	Sustainable Operations and Climate Change
STEA	Steamtown National Historic Site
STLI	Statue of Liberty National Monument
TAPR	Tall Grass Prairie National Preserve
VALR	World War II Valor in the Pacific National Monument
VAMA	Vanderbilt Mansion National Historic Site
VAFO	Valley Forge National Historical Park
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound
VOYA	Voyageurs National Park
WOTR	Wolf Trap National Park for the Performing Arts
YELL	Yellowstone National Park
YOSE	Yosemite National Park
ZION	Zion National Park

Introduction

The 2018 National Park Service (NPS) Transit Inventory and Performance Report communicates the service-wide outcomes and status of NPS transit systems (Appendix A – Acknowledgments). 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 NPS comply with 23 U.S Code 203(c),[1] which requires "a comprehensive national inventory of public Federal lands transportation facilities;" and fulfills other internal needs.

The 2018 inventory is meant to assist the NPS:

- 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 Facility and Business Management System (FBMS) for NPS-owned vehicles;
- Inform the National Long Range Transportation Plan, Regional Long Range Transportation Plans, and the Capital Investment Strategy 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
- Communicate program information and projected vehicle recapitalization needs.

Updates in the 2018 Inventory

The Transit Inventory Report assists in the development of transit performance measures. These measures align with the NPS Alternative Transportation Program (ATP) goal areas (Appendix B – NPS Alternative Transportation Program (ATP) Goals and Objectives). This year includes a reorganization of the report with the introduction, inventory details, and performance measures as the three main sections of the report, and Appendices A through F providing supplementary detail.

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 criteria are included in this effort (Appendix C – Definition of Transit for more information):

1. Moves people by motorized vehicle on a regularly scheduled service;[2]
2. Operates under a 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;[3] and
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.

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[1] 23 U.S.C. 203 Federal lands transportation program: https://www.gpo.gov/fdsys/pkg/USCODE-2014-title23/pdf/USCODE-2014-title23-chap2-sec203.pdf.

[2] Services with a posted schedule and standard operating seasons/days of week/hours. Services which do not operate on a fixed route, or exist for the sole purpose of providing access to persons with disabilities, are not included.

[3] This report does not distinguish between memoranda of understanding or of agreement, or cooperative agreement. All are recorded as "cooperative agreement."

The 2018 NPS Transit Inventory is limited to systems in which the NPS either has a direct financial stake or has committed resources to develop a formal contract or agreement.

The majority of systems tend to collect information on a calendar year cycle (January through December), therefore the following information was collected for the 2018 calendar year:

- Transit system name and description;
- Passenger boardings;
- Business model;
- System purpose;
- System type/mode;
- Vehicle information including fuel type, capacity, service miles, engines, horsepower, accessibility, and age (individual vehicle information for NPS-owned vehicles and vessels, and system-level information for non-NPS vehicles and vessels);
- Vehicle information that is mandatory in the NPS's FBMS;
- Owner and operator type (NPS or non-NPS) and contact information;
- Operating schedule; and
- Participation of a local transit agency in the service.

For the 2018 inventory, 60 parks provided information primarily using an online form, or through email or phone. 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.

Appendix D – 2018 NPS National Inventory System List includes a full list of surveyed transit systems by region.

Inventory Results

Detailed findings of the 2018 inventory are presented in the following sections: Vehicle Inventory Statistics, System Characteristics, and Passenger Boardings.

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 2014 and 2018 inventories
Source: 2014 – 2018 NPS Transit Inventory data

Key Findings	2014	2015	2016[4]	2017	2018
Number of Systems	121	127	100	99	95
Number of Parks Represented	63	64	64	65	60
Passenger Boardings	36.5 million	42.9 million	43.6 million	43.7 million	42.1 million
Excluding 10 highest ridership systems	5.6 million	7.2 million	7.0 million	7.0 million	7.0 million
Number of Vehicles	982	1,022	843	873	976
NPS-Owned	274	275	278	262	281
Non-NPS	708	747	565	611	695
Systems operated by Local Transit Agency	12	13	13	13	9

Two new new systems were added to the inventory in 2018: ferry services at Gulf Islands National Seashore and Pictured Rocks National Lakeshore. Four systems that had previously operated did not operate in 2018, and are not accounted for in this inventory report. These systems include: Dry Tortugas National Park (DRTO) Key West Seaplane Adventures, Everglades National Park (EVER) Shark Valley Tram Tour, Pearl Harbor National Memorial (VALR) Ford Island Tour, San Juan National Historic Site (SAJU) San Juan Tram.

Two additional systems that did operate in 2018 are accounted for in the inventory, but were unable to provide 2018 boarding information so are not represented in boarding data. These system are excluded from any operations-related information presented (e.g. passenger boardings, service miles), but are included in general inventory data, since the vehicle type, system purpose, and business model did not change from previous years. These systems are Fire Island National Seashore (FIIS) Sailor's Haven Ferry and Pinnacles National Park (PINN) Pinnacles Shuttle. Accounting for these changes, there is a total of 95 systems in the 2018 inventory.

There were approximately 1.6 million fewer total boardings in 2018 compared to 2017, representing a 3.7 percent decrease. This corresponds to a similar decrease in visitation across the entire national park system. Three of the four parks that did not report boardings in 2018 – EVER, DRTO, and VALR – account for about 835,000, or about half, of this decrease. Several parks noted they are now more accurately capturing their boardings, so annual variability may be attributable to changing methods

[4] The list of systems in 2016 were re-evaluated to ensure that all of the systems met the definition of transit used for the report. As a result, 28 systems included in 2015 were removed from the 2016 report, contributing to the overall reduction in the number of systems between 2015 and 2016.

implemented for the 2018 inventory. Five parks experienced increases from roughly double to nearly five times as many boardings as in 2017. [5]

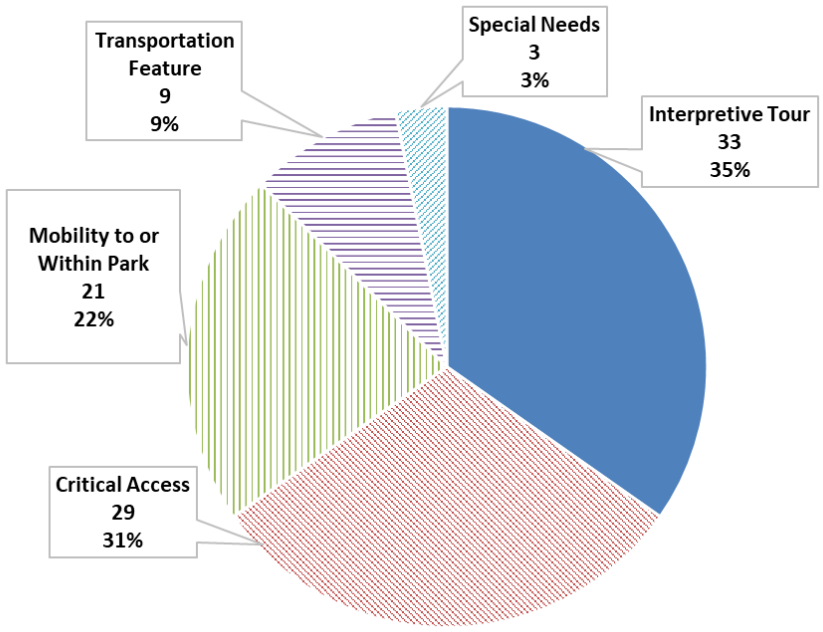
System Characteristics

The 2018 inventory identified 95 discrete transit systems in 60 NPS parks. Figure 1-Figure 3 place these systems in the context of primary system purpose, mode, and business model. Results for system characteristics in 2018 are similar to the results reported in 2017.

System Purpose
Park staff categorized each of their transit systems into one of five primary purposes (Figure 1):

- 33 systems are guided **interpretive tours;**
- 29 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;
- 21 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); and
- 3 systems are primarily designed to meet the accessibility needs of visitors with **special needs.**

Figure 1: Systems by primary purpose
(N=95 systems)
Source: 2018 NPS Transit Inventory data

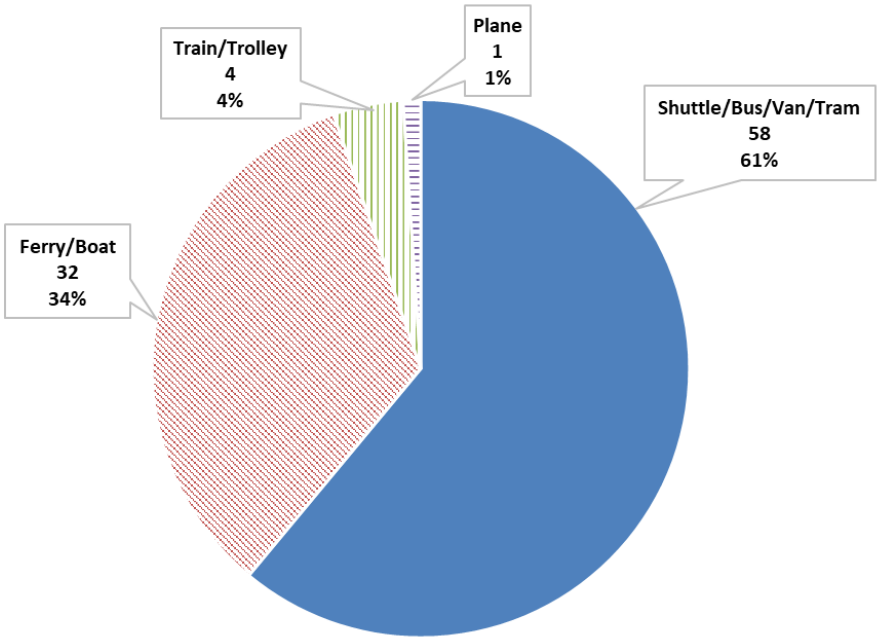


[5] The parks experiencing the largest boardings increases this year include: Fort Mantanzas/Castillo de San Marcos (FOMA/CASA) Ferry (382% increase), North Cascades/Lake Chelan (NOCA/LACH) Rainbow Falls Tours (142% increase), Crater Lake (CRLA) Boat Tour (108 percent increase), Dinosaur (DINO) Tram (97% increase), and Carl Sandburg Home (CARL) Shuttle (88% increase).

Mode

The 2018 transit inventory identified four modes operating in NPS transit systems. The majority of the transit systems are shuttle/bus/van/tram systems (61 percent), followed by ferry/boat (32 percent), train/trolley (four percent), and plane (one percent) (Figure 2).

Figure 2: Systems by mode
(N=95 systems)
Source: 2018 NPS Transit Inventory data



Business Models

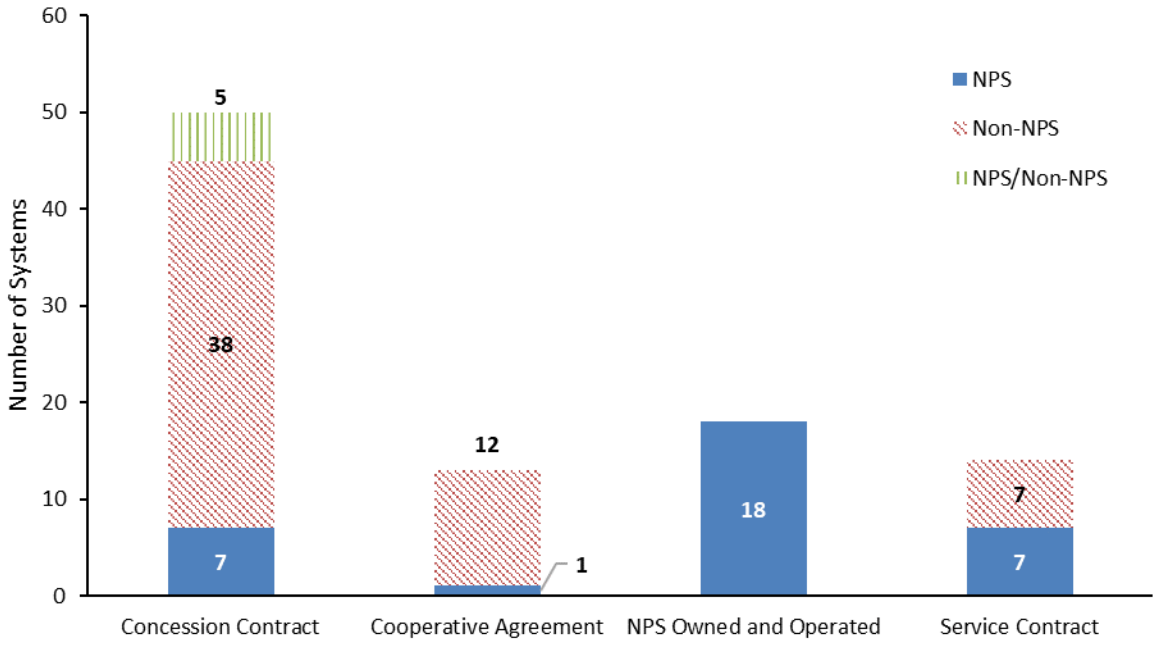
There are four types of business models under which NPS transit systems operate:

- **Concession Contracts**: The majority of transit systems in 2018 (50) operated through concession contracts in which a private concessioner pays the NPS a franchise fee to operate inside a park. Seven concession contract systems utilize vehicle fleets owned by the NPS.
- **Service Contracts**: Transit systems primarily owned and operated by a private firm utilize service contracts. In 2018, fourteen transit systems operated under a service contract. Seven service contract systems utilize vehicle fleets owned by the NPS.
- **Cooperative Agreements**: Thirteen transit systems operated under a cooperative agreement in 2018. Two cooperative agreement systems utilize vehicle fleets owned by the NPS.
- **NPS Owned and Operated**: In total, the NPS owns vehicle fleets for 34 systems, operating 18 of those systems. These owned-and-operated systems tend to be small and provide critical access to a park or park site, are interpretive tours, provide service for special needs visitors, or are not easily provided by a private operator.

Table 2: Systems by primary purpose
Source: 2018 NPS Transit Inventory data
(N = 95 systems)

	Concessions Contract	Cooperative Agreement	NPS Owned and Operated	Service Contract
Critical Access	12	3	6	8
Interpretitve Tour	25	2	6	0
Mobility to or within the Park	7	7	2	5
Special Needs	0	0	3	0
Transportation Feature	6	1	1	1
Total	50	13	18	14

Figure 3: Fleet ownership by business model
Source: 2018 NPS Transit Inventory data



Passenger Boardings

In 2018, there were 42.1 million passenger boardings across all NPS transit systems.[6] If the 95 reporting systems were considered one enterprise and compared to public transit agencies across the country, its boardings would be comparable to transit systems in cities such as Portland, OR, and St. Louis, MO .[7] Excluding concession contracts and cooperative agreements, NPS owned and operated systems and service contract systems reported 17.9 million trips in 2018.

Parks use various methodologies to count boardings. Most systems indirectly record passenger boardings through ticket sales (15 million) and manual counts (17.6 million). Estimated, automated, and other counter methodologies account for the remaining approximately 9.5 million passenger boardings.

Approximately 83 percent (34.8 million) of boardings on NPS transit systems in 2018 are attributable to ten systems (Table 3). Passenger boardings increased for four of these systems. Rocky Mountain National Park (ROMO) Bear Lake & Moraine Park Shuttle and Hiker Shuttle to Estes Park is new to the top ten list, replacing the World War II Valor in the Pacific National Monument (VALR) Ford Island Tour. The Mariposa Grove Transportation Service (YOSE) is new to the list this year as well.

Table 3: Passenger boardings for the 10 highest use transit systems
Source: 2018 NPS Transit Inventory data

Rank	Park	System Name	2018 Boardings	Business Model	System Purpose
1	STLI/ELIS	Statue of Liberty Ferries	10,555,677	Concession Contract	Critical Access
2	GRCA	South Rim Shuttle Service	7,536,189	Service Contract	Mobility to or Within Park
3	ZION	Zion Canyon Shuttle	6,601,022	Service Contract	Critical Access
4	GOGA/ ALCA	Alcatraz Cruises Ferry	3,363,308	Concession Contract	Critical Access
5	YOSE	Yosemite Valley Shuttle	2,189,437	Concession Contract	Mobility to or Within Park
6	VALR	USS Arizona Memorial Tour	1,417,230	Cooperative Agreement	Critical Access
7	SEKI	Giant Forest Shuttle	861,646	Cooperative Agreement	Critical Access
8	BRCA	Bryce Canyon Shuttle and Rainbow Point Shuttle	822,362	Service Contract	Mobility to or Within Park
9	ROMO	Bear Lake & Moraine Park shuttle and Hiker Shuttle to Estes Park	733,589	Service Contract	Critical Access
10	YOSE	Mariposa Grove Transportation Service	670,545	Cooperative Agreement	Transportation Feature

[6] A "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.

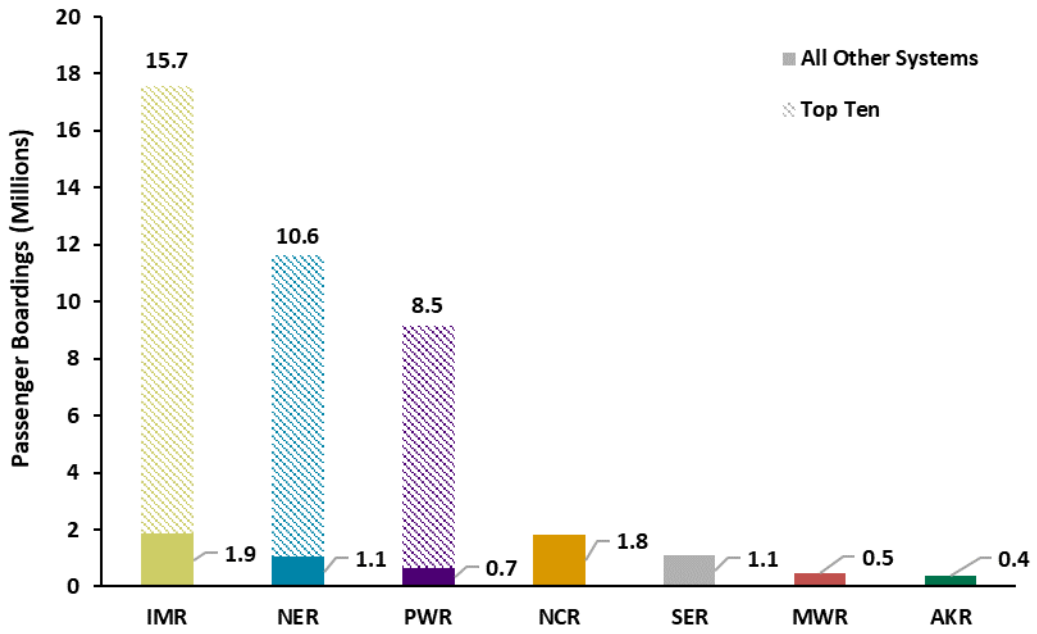
[7] Federal Transit Administration National Transit Database, 2017 data. https://www.transit.dot.gov/ntd.

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 NPS continued to partner with nine local transit agencies in 2018. Those partnerships accounted for 2.7 million passenger boardings in 2018. Passenger boardings among NPS owned and operated systems (eighteen systems) accounted for approximately 629,000 passenger boardings. Most of these systems provide either critical access to a site or an interpretive experience for visitors.

The Intermountain, Northeast, and Pacific West Regions each reported more than nine million passenger boardings in 2018, far exceeding other regions. However, if the ten highest use systems are excluded, each region ranged from 400,000 to 1.9 million passenger boardings in 2018 (Figure 4).

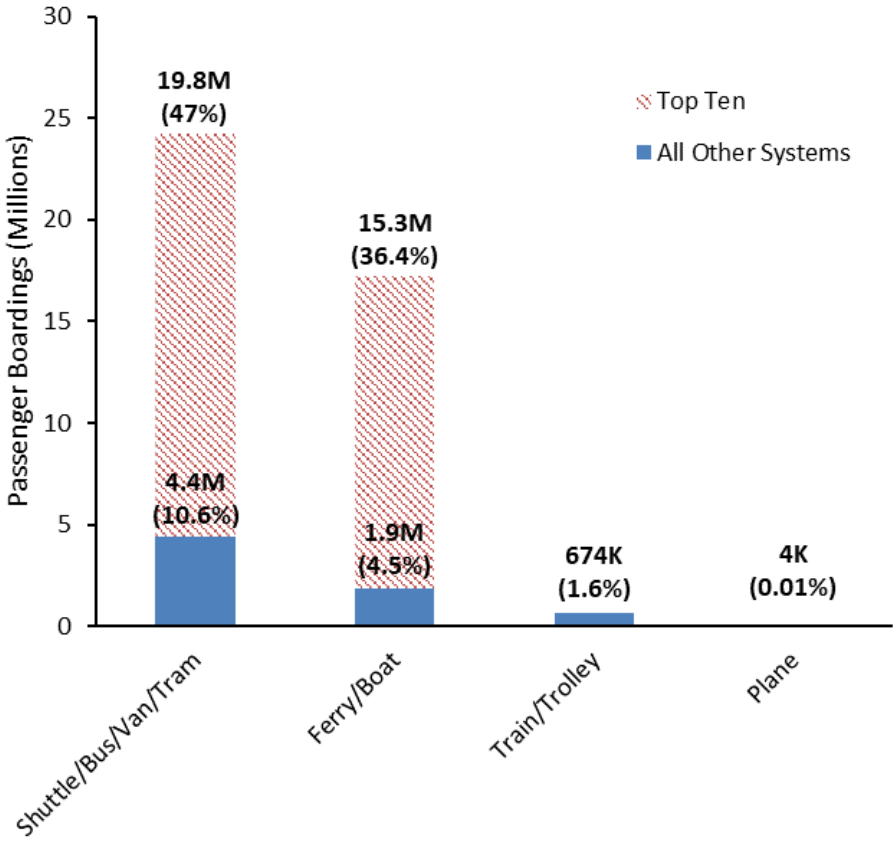
Figure 4: Passenger boardings by NPS region
(N=93 systems[8])
Source: 2018 NPS Transit Inventory data



[8] An N of 93 is used to exclude the two systems that did not provide boarding information for 2018.

Over half of passenger boardings were in systems that use shuttles, buses, vans, or trams (57.5 percent), and just under half in water-based systems that use boats and ferries (40.9 percent). Trains, trolleys, and aircraft accounted for only about 1.6 percent of all passenger boardings (Figure 5).

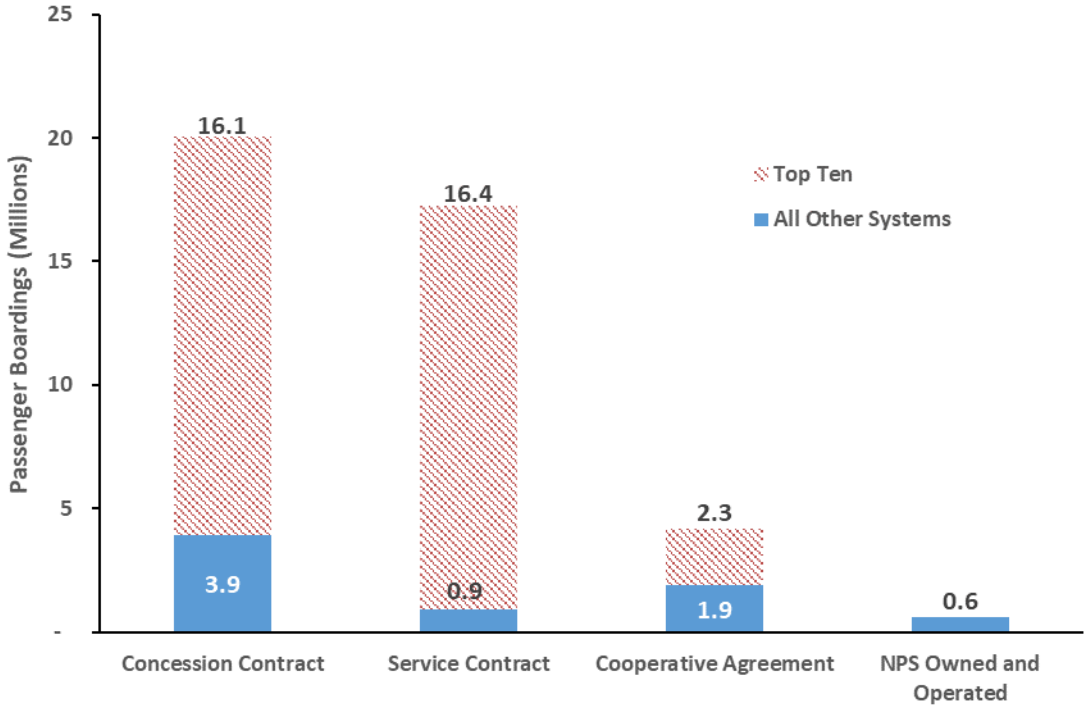
Figure 5: Passenger boardings by mode
(N=93 systems[9])
Source: 2018 NPS Transit Inventory data



[9] An N of 93 is used to exclude the two systems that did not provide boarding information for 2018.

Just under half of passenger boardings (47.6 percent) took place on systems operated using concession contracts. Service contracts carried 41 percent of passenger boardings, and 9.9 percent used cooperative agreements. NPS owned and operated systems carried 1.5 percent of boardings (see Figure 6). Excluding the 10 highest use systems, concession contracts accounted for the majority of boardings (53 percent).

Figure 6: Passenger boardings by business model
(N=93 systems[10])
Source: 2018 NPS Transit Inventory data



[10] An N of 93 is used to exclude the two systems that did not provide boarding information for 2018.

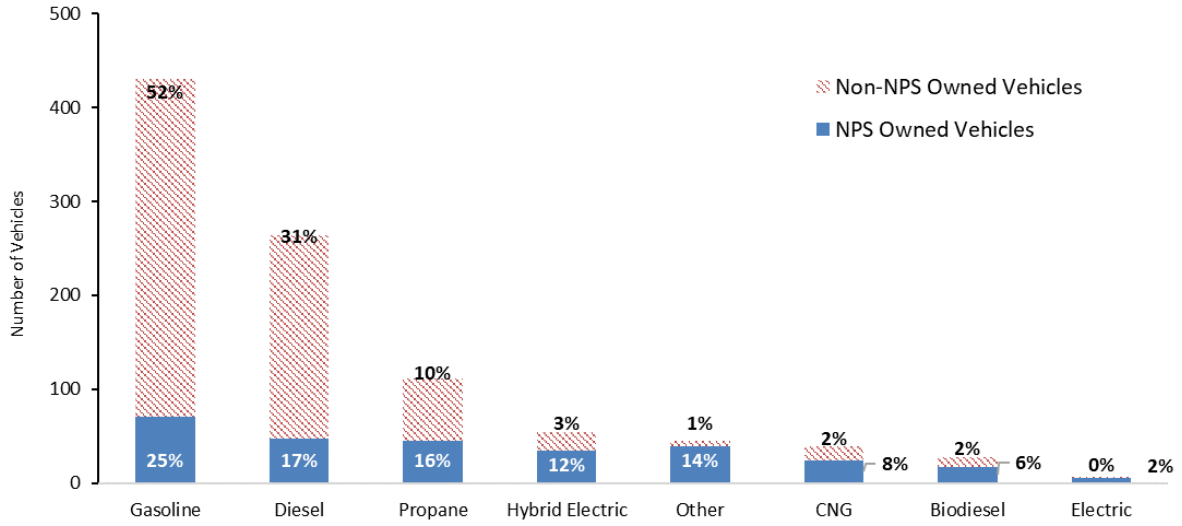
Vehicles and Vessels

Vehicle Fleets

Over half of the transit systems (50 systems, or 53 percent) operate under concession contracts, of which seven utilize fleets owned exclusively by the NPS.[11] These are among the 33 total fleets owned by the NPS. The NPS owned and operated eighteen of the transit systems (ninteen percent); these tend to be small and provide 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 thirteen of the systems (fourteen percent), of which only one utilizes vehicle fleets owned exclusively by the NPS. The remaining fourteen transit systems (fifteen percent) operate under service contracts, of which seven[12] utilize vehicle fleets owned by the NPS, including the large systems at Grand Canyon National Park and Zion National Park.

Service-wide, transit fleets operate on both conventional and alternative fuels.[13] The NPS-owned fleet has 284 vehicles, of which 58 percent use alternative fuels. The non-NPS-owned fleet is larger with 694 vehicles, of which seventeen percent of the fleet uses alternative fuels. Of the combined fleet's 978 vehicles, 29 percent use alternative fuels (Figure 7). 78.5 percent of systems utilize vehicles with capacity for no more than ten passengers. Only two systems use vehicles with capacities over 40.

Figure 7: Number of vehicles by fuel type
(N=978 vehicles and vessels)
Source: 2018 NPS Transit Inventory data



NPS Owned	71	47	45	35	39	24	17	6	284
Non-NPS Owned	359	217	66	19	6	15	11	1	694
Total	430	264	111	54	45	39	28	7	978

[11] The seven systems operating NPS-owned vehicles under a concession contract are: Cumberland Island Land and Legacies Tour, Glacier Red Bus Tours, Gulf Islands Ferry Service, North Cascades Rainbow Falls Tours, Yellowstone Historic Yellow Bus Tours, Yosemite Tuolumne Shuttle, and Yosemite Valley Shuttle.

[12] The seven systems operating NPS-owned vehicles under a service contract are: Adams Trolley, Grand Canyon South Rim Shuttle, Harpers Ferry Shuttle Transport, Kennesaw Mountain Shuttle Bus, Yosemite Badger Pass-Glacier Point Shuttle, Yosemite Mariposa Grove Transportation Service. and Zion Canyon Shuttle.

[13] Alternative fuels include electric and hybrid-electric systems, as well as propane, compressed natural gas (CNG), and biodiesel.

Average Age of Vehicles by Vehicle Type

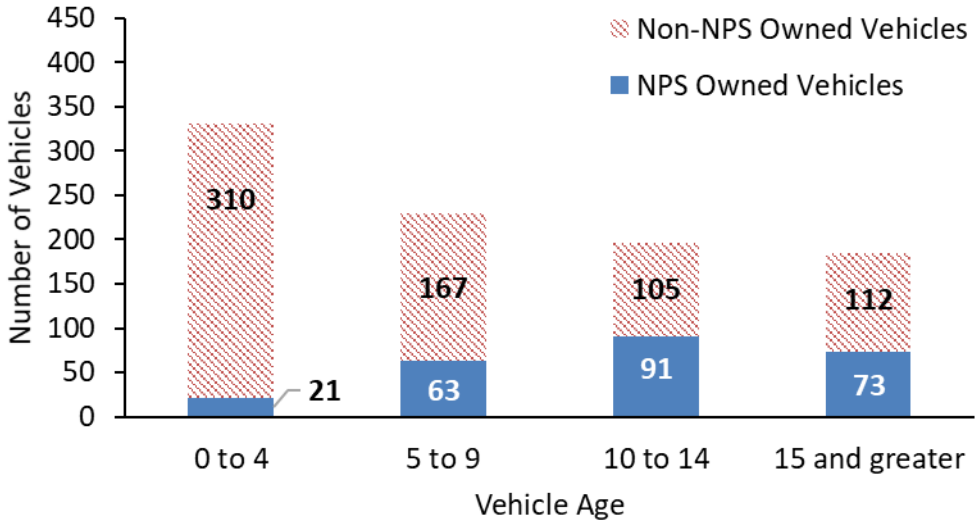
The majority of transit vehicles in the parks (59 percent) have been in service for less than ten years (Figure 8). The overall distribution of ages is fairly consistent, and a larger overall proportion of newer vehicles suggests that older vehicles have been retired at a higher rate in recent years.

The NPS fleet age is fairly evenly distributed, though the bulk of them (66 percent) are at least ten years old, putting them in the latter portion of their service lives; only eight percent of NPS-owned vehicles are less than five years old. The distribution implies that NPS-owned vehicles have typically been replaced on a regular schedule. However, the skew towards older vehicles suggests that this pattern may have changed in the last five years, with parks expecting longer service life from their owned vehicles.

By contrast, the non-NPS fleet is decidedly newer, with nearly 80 percent of their vehicles having operated for less than ten years, and a full 45 percent for less than five years. The proportions in the upper two bins are roughly consistent at about fifteen percent of the fleet each. These trends suggest that concessionaires replaced a large number older vehicles in the last five years, which may reflect in part a push to convert conventional fuel fleets towards more sustainable alternatives, including hybrid buses.

Nevertheless, transit vehicles operating in the parks are not utilized 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 utilization (see Asset Management and Appendix F – Vehicle Replacement Assumptions).

Figure 8: All vehicles by age class (years)
(N = 942 vehicles and vessels[14])
Source: 2018 NPS Transit Inventory data



[14] This N excludes the 36 Red Bus Tour vehicles (GLAC), which have been retrofitted using the original 1936 exteriors and newer chassis.

Performance Measures

The NPS Alternative Transportation Program 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, which correspond to ATP goals and the NPS National Long Range Transportation Plan (NLRTP): visitor experience; operations; environmental impact; and asset management. The ATP program goals are included in Appendix B – NPS Alternative Transportation Program (ATP) Goals and Objectives.

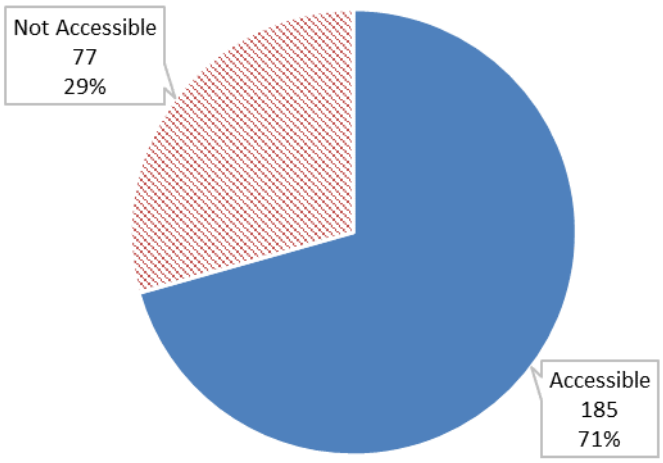
Visitor Experience

This performance area addresses how park transportation systems enhance the visitor experience. For 2018, the visitor experience performance measure includes accessibility for mobility-impaired park visitors.

Accessibility for Visitors with Disabilities

In 2018, the majority (65 percent, 185 vehicles) of NPS-owned transit vehicles and vessels are accessible for people with mobility impairments (Figure 9). This proportion is stable from 2017. Eight out of the 29 parks with NPS-owned vehicles or vessels do not have any vehicles or vessels that are accessible; this number did not change from 2017.

Figure 9: Accessibility of NPS-owned transit vehicles
(N = 262 vehicles and vessels)
Source: 2018 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.

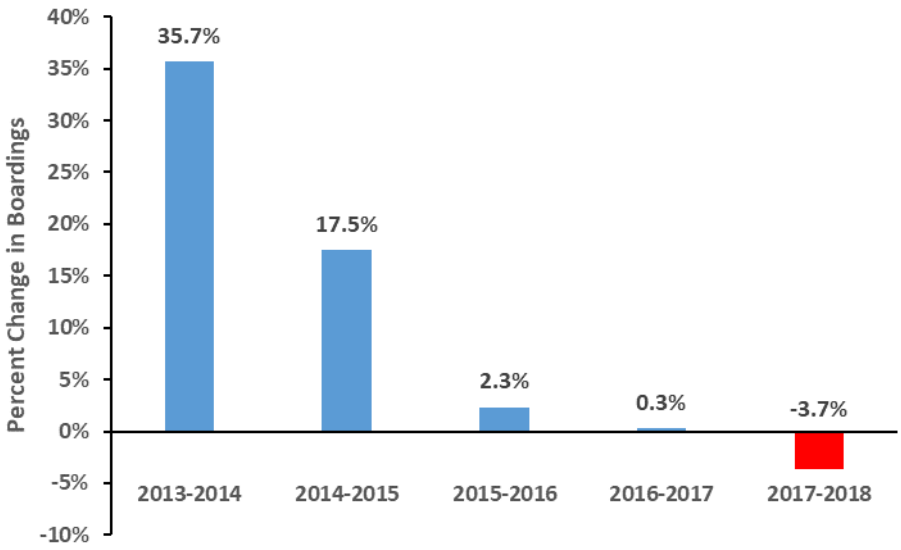
Year-to-Year Trends in Boardings

The graph below shows the percent change in boardings from 2013-2018 (Figure 10). Boardings increased significantly between 2013-2014, primarily due to significant boarding declines in the prior reporting year resulting from a government shutdown, temporary closures due to hurricanes, and the discontinuation and consolidation of several systems. In 2016, the list of systems was re-evaluated by more stringently applying the definition of transit. The result was the removal of several smaller systems and CUAs from the inventory, which in turn influenced the reported change in boardings between 2015 and 2016.

Although absolute boardings continued to increase in each of the prior several years (Table 1), the percent increase declined, and this year the absolute ridership dipped slightly. The decline in ridership growth since 2013-2014 is partially attributable to the stabilization of data collection processes for the NTI. 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.

Notably, visitation across the entire NPS system was down about 3.8 percent in 2018, which corresponds to the observed year-over-year decline in boardings. This may be attributable to hurricanes in the Southeast Region and the 2018 government shutdown; several parks reported these as primary causes of lower boardings in 2018. The contraction observed between 2017-2018 also likely reflects the absence of the non-reporting parks mentioned above. Several non-reporting parks altogether can have a sizeable effect. In particular, VALR's Ford Island Tour was the tenth most utilized system in the country in 2017, with 700,000 boardings – their absence would manifest in the reported growth rate.

Figure 10: Percent change in boardings from 2013 to 2018
Source: 2018 NPS Transit Inventory data



Service Schedule

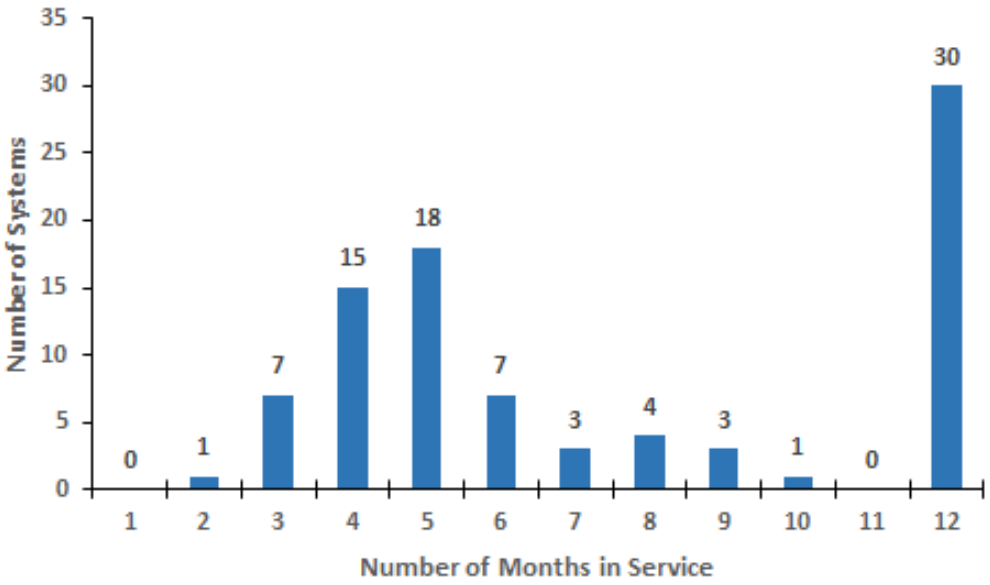
The 2017 inventory analyzed the service schedules the systems reported that year to understand the general calendar spread of NPS transit systems.[15] Although most seasonal service dates ranged primarily over the summer months and into early autumn (June to October), very few operate in the winter (December to February). The most common peak service months are July and August, though some begin as early as January and end as late as October. Peak season is defined as the period when the scheduled transit service is operating at its greatest frequency.

Systems operating year-round year- are among those with the highest annual ridership. The next most common service period is three months out of the year, followed by systems that are in service for five months.

Transit systems in colder climates tend to operate for shorter seasons than those in warmer areas. For example, systems in the Alaska Region usually operate no earlier than May and no later than September. Many Midwest Region transit systems also have shorter seasons. Conversely, many of the year-round systems are in the Southeast Region, as well as a few in the Intermountain and Pacific West Regions, where the climates are milder. The wide range of climates encompassed by the Pacific West—from Yosemite to Hawaii—leads to a wide range of schedules.

Figure 11: Distribution of service duration by number of months

Source: 2018 NPS Transit Inventory data



[15] Since transit operations are generally stable between years, the results should be considered currently representative.

Environmental Impact

As in 2017, the 2018 Inventory Report uses the U.S. Environmental Protection Agency's (EPA) Motor Vehicle Emissions Simulator (MOVES) for estimating emissions by NPS transit vehicles.[16] MOVES is a state-of-the-science emissions modeling software that uses pre-loaded measurement data to estimate emissions rates for different vehicle types, model years, fuel types, and road types across a number of Clean Air Act criteria pollutants "from the bottom-up" for both on- and off-road vehicles, including waterborne vessels. MOVES is also the regulatory standard for emissions inventory analyses under the Clean Air Act and related legislation.[17] MOVES bases emissions estimates on observations of actual vehicle operations.

This section describes the results of the 2018 emissions analysis with respect to carbon dioxide (CO_2). The results for the other criteria pollutants—nitrogen oxides (NOx), volatile organic compounds (VOCs), and particulate matter—as well as a detailed description of the analysis methodology, is in Appendix E – Air Quality and Emissions. Please note that, in addition to an overall increase in emitting activity (i.e., VMT and hours of operation), this year's inventory had significantly more complete vehicle data for this analysis, so values may differ from last year as a result. As was true with the introduction of other methodologies to the transit inventory, this will stabilize over the next few years.

Annual CO_2 Emissions

Figure 12 shows the results of MOVES CO_2 emissions modeling for NPS transit systems, aggregated to the regional level and split by ownership. Across all regions, NPS transit fleets emitted just over 25,000 metric tons of CO_2 in 2018. The Intermountain, Pacific West, and Northeast Regions emit the greatest amount of CO_2, with a large number of transit systems in each region and many operating in rural and hilly areas. In contrast, a substantial part of the National Capital Region's transit systems operations occur on relatively flat urban streets. Table 4 shows the distiribution of vehicles, miles traveled, and associated CO_2 emissions.

Table 4: Distribution of miles and CO_2 emissions by vehicle ownership
Source: 2018 NPS Transit Inventory data
(N = 747[18] vehicles and vessels)

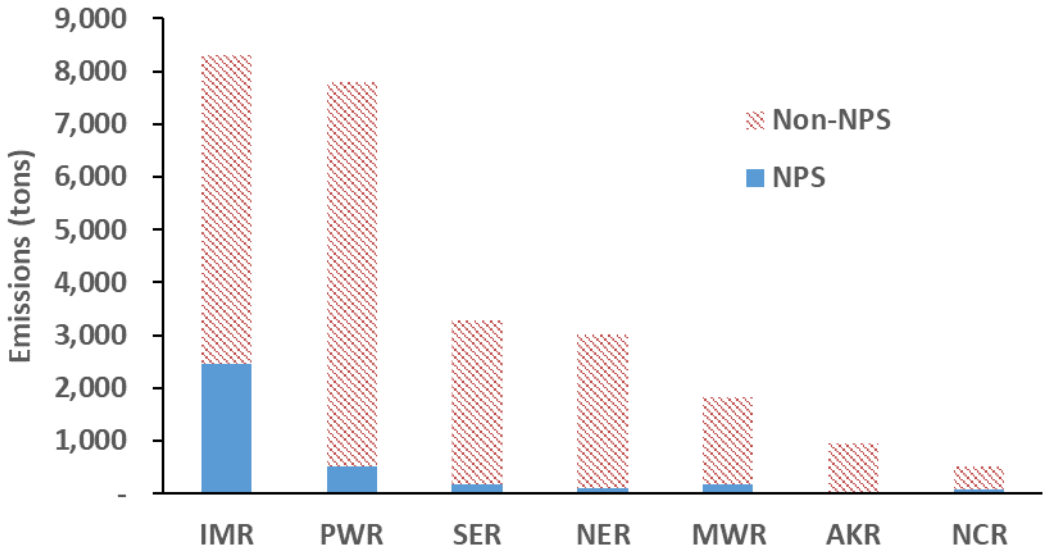
	Vehicles		Miles Traveled		CO_2 (metric tons)	
	#	%	#	%	#	%
NPS Owned	202	27	2,771,728	42	3,504.7	14
Non-NPS Owned	545	73	3,857,901	58	22,148.5	86
Total	747	100	6,629,629	100	25,653.2	100

[16] This NTI uses version MOVES2014b, which includes updates published in August 2018.

[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

[18] Due to data gaps, an N of 654 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.

Figure 12: Annual CO_2 emissions
(N = 747 vehicles and vessels)
Source: 2018 NPS Transit Inventory data



Diverted Passenger Vehicle Trips and CO_2 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 16.7 million private vehicle trips were eliminated in 2018, which but for transit service would have meant an additional 223 million miles driven in private vehicles and more than 123 million metric tons of CO_2; NPS transit systems emitted an approximate total of metric tons of CO_2 in 2018. As stated previously, regions with high transit use and more boardings divert more personal vehicles from the road.

Removing private vehicle trips from park roads has a positive effect on the visitor experience. Fewer vehicles means less waiting in traffic, less frustration finding a place to park, and less noise in natural places where cars are foreign objects. Transit offers more efficient means for visitors to move around and even between national parks, such as the connective service between sites at JOFR/ELRO/VAMA. It also helps minimize impacts on protected resources as well as visitors.

Asset Management

Performance measurement for assets help support the long-term financial viability of the NPS transit systems through tracking the age of NPS vehicle fleets, and estimating fleet recapitalization costs. Note that, in this context, "vehicles" refers only to on-road motorized vehicles and excludes non-road transportation, including ferries, locomotives, snowcoaches, and aircraft. Any of those described in Table 4 are shown only for reference, and were not analyzed for recapitalization estimates.

Average Age of NPS Vehicles

Table 5 reports the aggregate average age for NPS-owned transit vehicles service-wide. The average age of each NPS vehicle type is below the service life for most vehicles types, but all categories include vehicles older than their typical lifespan. In the case of electric trams, the average age exceeds the service life. Other vehicle categories with mostly older vehicles include medium- and heavy-duty shuttles, heavy-duty transit buses, and passenger vans. On average, medium-duty transit buses and school buses are the newest vehicles in the NPS-owned fleet.

Table 5: Vehicle age for NPS transit vehicle types
(N=239 vehicles and vessels)
Source: 2018 NPS Transit Inventory data

Vehicle Type	Average Age	Number of Vehicles	Service Life (Years)	Number of Vehicles Beyond Service Life
6-12 pax Electric Tram	12.2	5	11	3
Passenger Van	7.0	6	10	2
Light-Duty Shuttle	9.1	58	15	32
Medium-Duty Shuttle	13.8	52	15	31
Heavy-Duty Shuttle[19]	11.3	43	15	9
Medium-Duty Transit	3.3	6	18	2
Heavy-Duty Transit	15.3	45	18	9
Ferry/Boat	18	16	N/A	7
Train/Streetcar	49.8	5	N/A	2
School Bus	6	3	18	2
Total	-	239	-	99

Estimated Vehicle Recapitalization Needs

Estimates of NPS vehicle replacement needs begin with vehicle ages, along with the standard replacement costs and service life assumptions shown in Appendix F.[20] 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 upon utilization in addition to vehicle age; therefore, more detailed information is needed before determining if a vehicle is truly due for replacement.

[19] The GLAC Red Bus Tours vehicles were excluded from this category, as they have been extensively retrofit during their 80+ years in service.

[20] The service life assumptions used to estimate the recapitalization needs and costs were updated in 2015 to reflect more current cost estimates for the transit vehicles, and to reflect the way NPS transit vehicles are utilized. In addition, please note that the 2017 analysis used "unconstrained" cost assumptions unique to that year, and as a result cannot be compared to other years.

Based on an analysis using the methodology outlined in Appendix F – Vehicle Replacement Assumptions, the NPS is facing a large fleet replacement need over the next ten years, and faces an estimated $65.6 million in rolling stock capital costs. This includes rolling stock replacements for legacy transit systems at ACAD, ZION, YOSE, and GRCA. Projected costs are calculated in 2019 dollars and may vary from year to year as vehicles from different systems are replaced or rehabilitated to extend their service life.

Next Steps

In its seventh year, 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 enable the NPS 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:

- **Coordinate with relevant NPS stakeholders:** Continued coordination to share data and identify ways the transit data can be used to support program missions, goals, and outcomes across the NPS. 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 needs additional improvements to make it more user-friendly for park staff, and for the analysis of the transit data. There is also a need to incorporate data from the transit Inventory into the Alternative Transportation Service Life-cycle Management (ATSLAM) dashboard that is currently under development.
- **Continue to expand performance measures analysis:** Move towards quantifying additional performance measures to track progress over time of NPS transit systems, and include in this report.
- **Communicate 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 emssions from private vehicles. The positive impacts of transit use could be communicated in a variety of way 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 also include connections to multiuse trails. Considering opportunitites 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.
- **Revisit Transit Definition** (Appendix C) to reflect new laws and regulations.

Appendix

Appendix A – Acknowledgments

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

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Midwest Region

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Heather Brown
Tallgrass Prairie National Preserve

Justin Cawiezel
Scotts Bluff National Monument

Jennifer McMahon
Cuyahoga Valley National Park

Joe Hughes
Pictured Rocks National Lakeshore

Candida Braton
Voyageurs National Park

Chris E. Smith
Apostle Islands National Lakeshore

National Capital Region

Makayah Royal
National Capital Region

Larry Moore
Harpers Ferry National Historical Park

Duane Erwin
Wolf Trap National Park
for the Performing Arts

Karl Gallo
National Mall & Memorial Parks

Eliza Voigt
National Mall & Memorial Parks

Northeast Region

Amanda Jones
Northeast Region

Doug Bosley
Johnstown Flood National Memorial and
Allegheny Portage Railroad National Historic Site

Christine Bruins
Lowell National Historical Park

Jessica Weinman
Steamtown National Historic Site

Deirdre Gibson
Valley Forge National Historical Park

Ben Hanslin
Statue of Liberty National Monument

Karst Hoogeboom
Cape Cod National Seashore

Beth Jackendoff
Boston Harbor Islands National Recreation Area

Ahna Wilson
Eisenhower National Historic Site

Caroline Keinath
Adams National Historical Park

John Kelly
Acadia National Park

Jason Pristupa
Fire Island National Seashore

Scott Rector
Home of Franklin D. Roosevelt, Eleanor Roosevelt, and
Vanderbilt Mansion National Historic Sites

Tim Taglauer
Shenandoah National Park

Pacific West Region

Dianne Croal
Pacific West Region

Alicia Bowler
Pinnacles National Park

Greg Ballinger
Pinnacles National Park

Colleen Bathe
Sequoia and Kings Canyon National Parks

Darren Brown
Golden Gate National Recreation Area and
Muir Woods National Monument

Jacqueline Ashwell
World War II Valor in the Pacific National Monument

Trish Buffington
Channel Islands National Park

Brannon Ketcham
Point Reyes National Seashore

Sean Denniston
Crater Lake National Park

Jim Donovan
Yosemite National Park

Deanna Dulen
Devils Postpile National Monument

Tom Leatherman
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Annelise Lesmeister
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Recreation Area, and Ross Lake National Recreation Area

Stefanie Martin
Golden Gate National Recreation Area and Alcatraz Island

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Southeast Region

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Southeast Region

Jon Bergeron
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Dawn Leonard
Blue Ridge Parkway

Katherine Cusinberry
Cape Lookout National Seashore

William Gordon
Everglades and Dry Tortugas National Parks

Michelle Haas
Fort Sumter National Monument

Jill Hamilton-Anderson
Cumberland Island National Seashore

Steve Kovar
Mammoth Cave National Park

Bruce Powell
Mammoth Cave National Park

Sarah Perschall
Carl Sandburg Home National Historic Site

Lindsey Phillips
Gulf Islands National Seashore

Andrew Rich
Fort Matanzas and Castillo de San Marcos National Monuments

Nancy Walther
Kennesaw Mountain National Battlefield Park

Appendix B – NPS Alternative Transportation Program (ATP) 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. (Undecided as to whether this one should remain – as it might inhibit creative solutions that can replace existing that do not function or cost too much money)
- 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: NPS 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.
- Right-size and maintain needed transportation assets and services in a state of good repair.

- Develop transportation options with reciprocal benefits for NPS and gateway communities which 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: NPS 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 NPS ATP developed a definition for an "NPS transit system" prior to conducting the 2012 transit inventory. Only parks with systems that met each of these three criteria were considered for the inventory:

1. Moves people by motorized vehicle on a regularly scheduled service;[21]
2. Operates under one of the following business models: concessions contract; service contract; partner agreement including memorandum of understanding, memorandum of agreement, or cooperative agreement (commercial use agreements are not included); or NPS-owned and operated; and[22]
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 Service-wide 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 or not each should be included in the inventory.

The NPS ATP 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, the NPS ATP proposed the following criterion: "***moves people by motorized vehicle on a regularly scheduled service***."

Is important to the NPS mission: The importance of transit systems to fulfilling the NPS mission is a core tenet of the ATP, 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 NPS has a financial stake or has a formal contract or agreement in place, the answer seems clear: because the NPS has made an effort to provide the service, the service is assumed to be important to the mission. Other services, particularly those which are operated under commercial use agreement (CUA), are not as clearly essential to the mission. Thus, the NPS ATP 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 ATP used "cooperative agreement" as

[21] Services with a posted schedule that have standard operating seasons/days of week/hours. Services which 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.

[22] For the purposes of this inventory, no distinction was drawn between memoranda of understanding, memoranda of agreement, and cooperative agreement. All were recorded as "cooperative agreement."

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 NPS. Commercial use agreements are not included because prospective CUA operators request permission from NPS to operate. These agreements are not initiated by the NPS and the resulting services are inherently not "NPS" systems.

CUAs were not included because these services are owned and operated by private operators, and the NPS only provides oversight to ensure that the services are operated in accordance with NPS policies and requirements. There are hundreds of CUAs service-wide that provide visitors tours and transportation. Collecting and reporting information on all of 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 CUA is important versus non-essential to the NPS mission? This effort found only one sub-category of CUA that could be considered objective: services that provide sole access to an NPS resource. Second, should NPS represent as its own services for which it has no role in the acquisition, operations, or maintenance activities? Even for CUAs which provide sole access, this effort suggests not. This determination is not to suggest that the service is not important to the NPS, but rather to acknowledge that the service is not the responsibility of NPS – in other words, it 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 VMT 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 ATP 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 NPS having a financial stake. Thus, this would not contribute toward a simple, clear definition.

Tours versus transportation: There is a distinction 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 ATP sought not to prioritize one over the other. Although in daily life a transportation trip (often thought to be mandatory, for instance, to the grocery store) might be more important than a tour trip (often thought to be discretionary, for instance, 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 service-wide in counting the number of transit systems, the NPS ATP 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, the NPS ATP 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 Service-wide 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 – 2018 NPS National Inventory System List

Alaska Region (AKR)

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
DENA	Bus Tours and Shuttle Service	Shuttle/Bus/Van/Tram	366,127	NPS/Non-NPS	Concession Contract	Critical Access	Jim LeBel
GLBA	Day boat tour	Boat/Ferry	6,907	Non-NPS	Concession Contract	Interpretive Tour	Melanie Berg
GLBA	Airport Shuttle	Shuttle/Bus/Van/Tram	6,805	Non-NPS	Concession Contract	Transportation Feature	Melanie Berg

Intermountain Region (IMR)

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
BAND	Bandelier National Monument Shuttle	Shuttle/Bus/Van/Tram	110,034	Non-NPS	Service Contract	Critical Access	Dennis Milligan
BRCA	Bryce Canyon Shuttle and Rainbow Point Shuttle	Shuttle/Bus/Van/Tram	822,362	Non-NPS	Service Contract	Mobility to or Within Park	Kevin Poe
DINO	Tram transit	Shuttle/Bus/Van/Tram	404,296	Non-NPS	Service Contract	Critical Access	Dan Johnson
GLAC	Glacier Park Boat Company -interpretive boat tours	Boat/Ferry	79,322	Non-NPS	Concession Contract	Interpretive Tour	Jennifer Evans
GLAC	Hiker Shuttle	Shuttle/Bus/Van/Tram	4,835	Non-NPS	Concession Contract	Mobility to or Within Park	Jennifer Evans
GLAC	Red Bus Tours	Shuttle/Bus/Van/Tram	51,952	NPS	Concession Contract	Interpretive Tour	Jennifer Evans
GLAC	Sprinter Shuttles & Optima Shuttles	Shuttle/Bus/Van/Tram	196,391	NPS	Cooperative Agreement	Mobility to or Within Park	Jennifer Evans
GLAC	Sun Tours	Shuttle/Bus/Van/Tram	5,757	Non-NPS	Concession Contract	Interpretive Tour	Jim Foster
GLCA	Antelope Point	Boat/Ferry	65,755	Non-NPS	Concession Contract	Interpretive Tour	Eric Nikkel
GLCA	Boat tours	Boat/Ferry	115,852	Non-NPS	Concession Contract	Interpretive Tour	Eric Nikkel
GLCA	Flatwater tour	Boat/Ferry	41,659	Non-NPS	Concession Contract	Interpretive Tour	Eric Nikkel
GLCA	SR276 passenger ferry	Boat/Ferry	12,863	Non-NPS	Service Contract	Transportation Feature	Eric Nikkel
GRCA	Grand Canyon Railway	Trolley/ Train	388,714	Non-NPS	Concession Contract	Mobility to or Within Park	Pamela Edwards
GRCA	North Rim Hiker Shuttle	Shuttle/Bus/Van/Tram	1,050	Non-NPS	Concession Contract	Mobility to or Within Park	Pamela Edwards
GRCA	South Rim Bus Tours	Shuttle/Bus/Van/Tram	109,449	Non-NPS	Concession Contract	Interpretive Tour	Pamela Edwards

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
GRCA	South Rim Shuttle Service	Shuttle/Bus/Van/Tram	7,536,189	NPS	Service Contract	Mobility to or Within Park	Pamela Edwards
GRTE	Jenny Lake Shuttle Boat	Boat/Ferry	182,862	Non-NPS	Concession Contract	Mobility to or Within Park	Katy Canetta
LIBI	LIBI bus tours	Shuttle/Bus/Van/Tram	6,453	Non-NPS	Concession Contract	Interpretive Tour	Ken Woody
MEVE	Long House Trailhead tram and Half-day ranger guided	Shuttle/Bus/Van/Tram	10,606	Non-NPS	Concession Contract	Interpretive Tour	Allan Loy
ORPI	Ajo Mountain Drive tour	Shuttle/Bus/Van/Tram	1,172	NPS	NPS Owned and Operated	Critical Access	Cynthia Sequanna
ROMO	Bear Lake & Moraine Park shuttle, Hiker Shuttle to Estes Park	Shuttle/Bus/Van/Tram	733,589	Non-NPS	Service Contract	Critical Access	John Hannon
YELL	Historic Yellow Bus tours	Shuttle/Bus/Van/Tram	12,065	NPS	Concession Contract	Interpretive Tour	Dale Reinhart
YELL	Xanterra Parks & Resorts interpretive bus tours	Shuttle/Bus/Van/Tram	16,133	NPS/Non-NPS	Concession Contract	Interpretive Tour	Dale Reinhart
YELL	Xanterra Parks & Resorts interpretive snowcoaches tours	Shuttle/Bus/Van/Tram	13,994	Non-NPS	Concession Contract	Interpretive Tour	Christina White
YELL	YELL boat	Boat/Ferry	20,624	Non-NPS	Concession Contract	Interpretive Tour	Willie Burkhardt
YELL	YELL Snow Coach Contracts	Shuttle/Bus/Van/Tram	28,319	Non-NPS	Concession Contract	Interpretive Tour	William Burkhardt
ZION	Zion Canyon Shuttle	Shuttle/Bus/Van/Tram	6,601,022	NPS	Service Contract	Critical Access	Jack Burns

Midwest Region (MWR)

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
APIS	Excursion Boat	Boat/Ferry	37,090	Non-NPS	Concession Contract	Interpretive Tour	Chris E. Smith
CUVA	Cuyahoga Valley Scenic Railroad	Trolley/ Train	199,929	Non-NPS	Cooperative Agreement	Mobility to or Within Park	Jennifer McMahon
ISRO	MV Isle Royal Queen IV	Boat/Ferry	13,918	Non-NPS	Concession Contract	Critical Access	Chris Amidon
ISRO	MV Voyageur II and Sea Hunter III	Boat/Ferry	9,694	NPS/Non-NPS	Concession Contract	Critical Access	Chris Amidon
ISRO	MV Ranger III	Boat/Ferry	5,098	NPS	NPS Owned and Operated	Critical Access	Chris Amidon

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
ISRO	MV Sandy tour	Boat/Ferry	5,944	Non-NPS	Concession Contract	Interpretive Tour	Chris Amidon
ISRO	Royale Air Service Inc. float plane	Plane	3,958	Non-NPS	Concession Contract	Critical Access	Chris Amidon
PIRO	Pictured Rocks Cruises	Boat/Ferry	167,563	Non-NPS	Concession Contract	Interpretive Tour	John Patmore
SCBL	SCBL free shuttle service	Shuttle/Bus/Van/Tram	2,597	NPS	NPS Owned and Operated	Mobility to or Within Park	Justin Cawiezel
SLBE	Manitou Island Transit	Boat/Ferry	10,547	Non-NPS	Concession Contract	Transportation Feature	Phil Akers
TAPR	TAPR bus tour	Shuttle/Bus/Van/Tram	3,191	NPS	NPS Owned and Operated	Interpretive Tour	Heather Brown
VOYA	VOYA tour boat	Boat/Ferry	3,596	NPS	NPS Owned and Operated	Interpretive Tour	Tawnya Schoewe

National Capital Region (NCR)

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
HAFE	HAFE shuttle transport	Shuttle/Bus/Van/Tram	299,057	NPS	Service Contract	Critical Access	Larry Moore
NAMA	Big Bus Tours Washington DC	Shuttle/Bus/Van/Tram	1,037,020	Non-NPS	Concession Contract	Interpretive Tour	Karl Gallo
NAMA	DC Circulator	Shuttle/Bus/Van/Tram	497,112	Non-NPS	Cooperative Agreement	Transportation Feature	Eliza Voigt
WOTR	Fairfax Connectors Wolf Trap Express	Shuttle/Bus/Van/Tram	6,994	Non-NPS	Service Contract	Mobility to or Within Park	Duane Erwin

Northeast Region (NER)

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
ACAD	Island Explorer & Bicycle Express	Shuttle/Bus/Van/Tram	624,076	Non-NPS	Cooperative Agreement	Mobility to or Within Park	John Kelly
ADAM	Adams trolley	Shuttle/Bus/Van/Tram	62,888	NPS	Service Contract	Critical Access	Caroline Keinath
BOHA	Thompson Island Ferry	Boat/Ferry	24,781	Non-NPS	Cooperative Agreement	Mobility to or Within Park	Beth Jackendoff
BOHA	Boston Light Tour	Boat/Ferry	874	Non-NPS	Cooperative Agreement	Interpretive Tour	Beth Jackendoff
CACO	Coastguard Beach Shuttle	Shuttle/Bus/Van/Tram	73,000	NPS	NPS Owned and Operated	Critical Access	Karst Hoogeboom
EISE	EISE shuttle	Shuttle/Bus/Van/Tram	84,072	Non-NPS	Concession Contract	Critical Access	Ahna Wilson

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
FIIS	Sailors Haven Ferry	Boat/Ferry	---	Non-NPS	Concession Contract	Critical Access	Jason Pristupa
FIIS	Watch Hill Ferry	Boat/Ferry	17,257	Non-NPS	Concession Contract	Critical Access	Jason Pristupa
HOFR/ ELRO/ VAMA	Roosevelt Ride	Shuttle/Bus/Van/Tram	13,948	NPS	NPS Owned and Operated	Mobility to or Within Park	Scott Rector
HOFR/ ELRO/ VAMA	FDR Tram	Shuttle/Bus/Van/Tram	19,881	NPS	NPS Owned and Operated	Special Needs	Scott Rector
HOFR/ ELRO/ VAMA	Val-Kill Tram	Shuttle/Bus/Van/Tram	18,741	NPS	NPS Owned and Operated	Special Needs	Scott Rector
JOFL/ ALPO	Lakebed Tours	Shuttle/Bus/Van/Tram	596	NPS	NPS Owned and Operated	Interpretive Tour	Doug Bosley
LOWE	LOWE Historic Trolley	Train/ Trolley	62,760	NPS	NPS Owned and Operated	Mobility to or Within Park	Christine Bruins
LOWE	Canal Tours	Boat/Ferry	16,825	NPS	NPS Owned and Operated	Interpretive Tour	Christine Bruins
SHEN	Rapidan Camp bus	Shuttle/Bus/Van/Tram	1,007	NPS	NPS Owned and Operated	Interpretive Tour	Tim Taglauer
STEA	Scranton Limited & Live Steam Excursions	Train/ Trolley	22,708	NPS	NPS Owned and Operated	Interpretive Tour	Jessica Weinman
STLI/ ELIS	Statue of Liberty Ferries	Boat/Ferry	10,555,677	Non-NPS	Concession Contract	Critical Access	Ben Hanslin
VAFO	History of Valley Forge Trolley Tour	Shuttle/Bus/Van/Tram	10,711	Non-NPS	Cooperative Agreement	Interpretive Tour	Deirdre Gibson

Pacific West Region (PWR)

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
CHIS	Island Packers	Boat/Ferry	176,908	Non-NPS	Concession Contract	Critical Access	Trish Buffington
CRLA	Crater Lake Boat Tour	Boat/Ferry	19,162	Non-NPS	Concession Contract	Interpretive Tour	Sean Denniston
CRLA	Rim Drive Trolley Tour	Shuttle/Bus/Van/Tram	9,045	Non-NPS	Concession Contract	Interpretive Tour	Sean Denniston
DEPO	Reds Meadow Shuttle Bus	Shuttle/Bus/Van/Tram	71,583	Non-NPS	Cooperative Agreement	Critical Access	Deanna Dulen
EUON	NPS Shuttle	Shuttle/Bus/Van/Tram	4,496	NPS	NPS Owned and Operated	Critical Access	Tom Leatherman
GOGA/ ALCA	Alcatraz Cruises ferry	Boat/Ferry	3,363,308	Non-NPS	Concession Contract	Critical Access	Stefanie Martin

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
MUWO	Muir Woods Shuttle	Shuttle/Bus/Van/Tram	177,500	Non-NPS	Cooperative Agreement	Mobility to or Within Park	Darren Brown
NOCA/ LACH	Rainbow Falls Tours	Shuttle/Bus/Van/Tram	27,471	NPS	Concession Contract	Interpretive Tour	Annelise Lesmeister
NOCA/ ROLA	Ross Lake Hiker Shuttle	Boat/Ferry	529	Non-NPS	Concession Contract	Transportation Feature	Annelise Lesmeister
PINN	Pinnacle Shuttle	Shuttle/Bus/Van/Tram	-	NPS	NPS Owned and Operated	Mobility to or Within Park	Greg Ballinger
PORE	Headlands Shuttle	Shuttle/Bus/Van/Tram	-	Non-NPS	Service Contract	Critical Access	John A. Dell'Osso
SEKI	Gateway Shuttle	Shuttle/Bus/Van/Tram	13,488	Non-NPS	Cooperative Agreement	Mobility to or Within Park	Colleen Bathe
SEKI	Giant Forest Shuttle	Shuttle/Bus/Van/Tram	861,646	Non-NPS	Cooperative Agreement	Critical Access	Colleen Bathe
VALR	Ford Island Tour	Shuttle/Bus/Van/Tram	-	Non-NPS	Service Contract	Interpretive Tour	Patricia Brown
VALR	USS Arizona Memorial Tour	Boat/Ferry	1,417,230	Non-NPS	Cooperative Agreement	Critical Access	Patricia Brown
YOSE	Badger Pass-Glacier Point Shuttle	Shuttle/Bus/Van/Tram	-	NPS	Service Contract	Mobility to or Within Park	Jim Donovan
YOSE	Mariposa Grove Transportation Service	Shuttle/Bus/Van/Tram	670,545	NPS	Service Contract	Mobility to or Within Park	Jim Donovan
YOSE	Tram Tours and Hiker Shuttle	Shuttle/Bus/Van/Tram	69,760	Non-NPS	Concession Contract	Interpretive Tour	Jim Donovan
YOSE	Tuolumne Shuttle	Shuttle/Bus/Van/Tram	-	NPS	Concession Contract	Mobility to or Within Park	Jim Donovan
YOSE	Winter Ski Shuttle	Shuttle/Bus/Van/Tram	1,377	Non-NPS	Concession Contract	Mobility to or Within Park	Jim Donovan
YOSE	YARTS	Shuttle/Bus/Van/Tram	90,761	Non-NPS	Cooperative Agreement	Mobility to or Within Park	Jim Donovan
YOSE	Yosemite Valley Shuttle	Shuttle/Bus/Van/Tram	2,189,437	NPS	Concession Contract	Mobility to or Within Park	Jim Donovan

Southeast Region (SER)

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
BLRI	Sharp Top Mountain Shuttle	Shuttle/Bus/Van/Tram	4,098	Non-NPS	Concession Contract	Transportation Feature	Shawn Cloutier
CALO	Ferry service	Ferry/Boat	84,010	Non-NPS	Concession Contract	Critical Access	Katherine Cusinberry
CARL	Electric Shuttle	Shuttle/Bus/Van/Tram	5,216	NPS	NPS Owned And Operated	Special Needs	Sarah Perschall
CUIS	Ferry service	Ferry/Boat	77,747	Non-NPS	Concession Contract	Critical Access	Jill Hamilton-Anderson

Park Code	System Name	Vehicle Type	2018 Passenger Boardings	Vehicle Ownership	Agreement Type	Purpose	NPS Contact Name
CUIS	Land and Legacies Tour	Shuttle/Bus/Van/Tram	4,535	NPS	Concession Contract	Interpretive Tour	Jill Hamilton-Anderson
FOMA/CASA	Ferry service	Ferry/Boat	77,484	NPS	NPS Owned And Operated	Critical Access	Andrew Rich
FOSU	Ferry service	Ferry/Boat	293,539	Non-NPS	Concession Contract	Critical Access	Michelle Haas
GUIS	Ferry service	Ferry/Boat	11,068	NPS	Concession Contract	Transportation Feature	Lindsey Phillips
GUIS	Ship Island Ferry	Ferry/Boat	47,922	NPS/Non-NPS	Concession Contract	Transportation Feature	Lindsey Phillips
KEMO	Shuttle Bus	Shuttle/Bus/Van/Tram	10,160	NPS	Service Contract	Critical Access	Nancy Walther
MACA	Cave Tours Bus Shuttle	Shuttle/Bus/Van/Tram	179,805	NPS/Non-NPS	Concession Contract	Interpretive Tour	Bruce Powell
MACA	Green River Ferry	Ferry/Boat	296,248	NPS	NPS Owned And Operated	Transportation Feature	Steve Kovar

Appendix E – Air Quality and Emissions

Since 2017, the transit inventory uses an updated methodology to analyze the air quality and emissions impacts of NPS transit systems. The analysis uses the US Environmental Protection Agency's (EPA) Motor Vehicle Emissions Simulator (MOVES) for estimating emissions by NPS transit vehicles. MOVES is a state-of-the-science emissions modeling software that estimates airborne emissions from various on-road vehicles across a number of vehicle types at very fine scales. MOVES uses years of direct measurements inventorying the ways different vehicles, fuel types, road types (e.g., urban vs. rural, highways vs. local streets, etc.), and emission processes (e.g., running, starting, and idling) contribute to air pollution. This process allows MOVES to then model emissions from similar vehicles. MOVES also performs similar analysis for vehicles operating off-road, such as waterborne vessels.

Since MOVES is the EPA'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 methods used in years prior to 2017, please see the 2017 NPS Transit Inventory and Performance Report.[23]

The following pollutants are included in the 2018 air quality analysis:

Carbon Dioxide (CO_2)[24]
Carbon dioxide (CO_2) is a colorless gas produced through chemical combustion, including burning fuels to power automobiles and homes. Typically, gasoline combustion emits more CO_2 than other fuels.

Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOCs)
NOx is 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 NOx. While upper-atmospheric NOx can actually counteract the warming effects of greenhouse gases, ground-level NOx molecules react with other airborne chemicals to become particles that can cause respiratory conditions in humans.[25]

VOCs 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 VOCs. State, local, and federal institutions tightly regulate VOCs, as they are easily absorbed into human tissue and can have harmful health effects.[26]

NOx and VOCs can together form ozone (O_3), a highly reactive gas. Stratospheric ozone, very high up in Earth's atmosphere, deflects harmful solar radiation away from Earth's surface. However, NOx and VOCs interacting at the surface 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 ozone production.[27]

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[23]The 2017 NTI may be accessed at the following URL: https://rosap.ntl.bts.gov/view/dot/37306

[24] IPCC 2013, "Climate Change: The Phyiscal Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change."

[25] US Environmental Protection Agency, "NOx: How Nitrogen Oxides Affect the Way We Live and Breathe."

[26] US Environmental Protection Agency, "NOx: How Nitrogen Oxides Affect the Way We Live and Breathe."

[27] US Environmental Protection Agency, "Basic Information about Ozone | Ozone Pollution | US EPA."

Carbon Monoxide (CO)[28]
CO is a colorless and odorless gas released through burning fossil fuels, though the emissions quantities vary by fuel type. CO can be extremely dangerous in large quantities 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 summertime.

Particulate Matter (PM)[29]
PM encompasses solid and liquid particles emitted into the air, including dust, soot, and aerosolized chemicals. PM can come from construction sites, roadway wear as tires and heavy vehicles move over them, and from burning fuels. Diesel fuel combustion generally emits more PM than other fuels, and driving over unpaved surfaces can kick up PM10 particles. Two categories of PM concerning regulatory analyses of air quality include those with negative impacts on respiratory health, i.e. inhalable particles ten micrometers and smaller (PM10), as well as those 2.5 micrometers and smaller (PM2.5). Exposure to PM can cause and aggravate respiratory conditions such as asthma – this is especially true of PM10. PM2.5 particles are a major contributor to smog, which both obscures views and damages natural resources.

Results

Please note that, in addition to an overall increase in emitting activity (i.e., VMT and hours of operation), this year's inventory had significantly more complete vehicle data for this analysis, so values may differ from last year as a result. As was true with the introduction of other methodologies to the NTI, this will stabilize over the next few years.

Diverted Passenger Vehicle Trips and CO_2 Emissions Avoided
Though transit still contributes to emissions, the presence of transit has a net positive effect on air quality, as well as the visitor experience because transit use reduces the number of vehicle trips in parks. Transit buses carry more people per square foot of road space, relieving congestion on park roads and eliminating associated fuel-inefficient driving behaviors like extended idling and stop-and-go. In addition to the air quality benefits of burning less fuel per passenger transported, increasing 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 as a result of the presence of transit service in each region. NPS transit services eliminated an estimated 16.7 million passenger vehicle trips in 2018, which would have driven 223 million miles and emitted more than 123 million metric tons of CO_2. Regions with high transit use and more boardings divert more personal vehicles from the road.

Passenger vehicle diversion is calculated by dividing the total number of passenger boardings by 2.6, the assumed average occupancy of visitors' personal vehicles. Emissions avoided are calculated by first determining the avoided vehicle miles travelled (VMT), and then multiplying by a light-duty vehicle emissions factor for a given pollutant; it is assumed that the passenger vehicles use conventional gasoline fuel.

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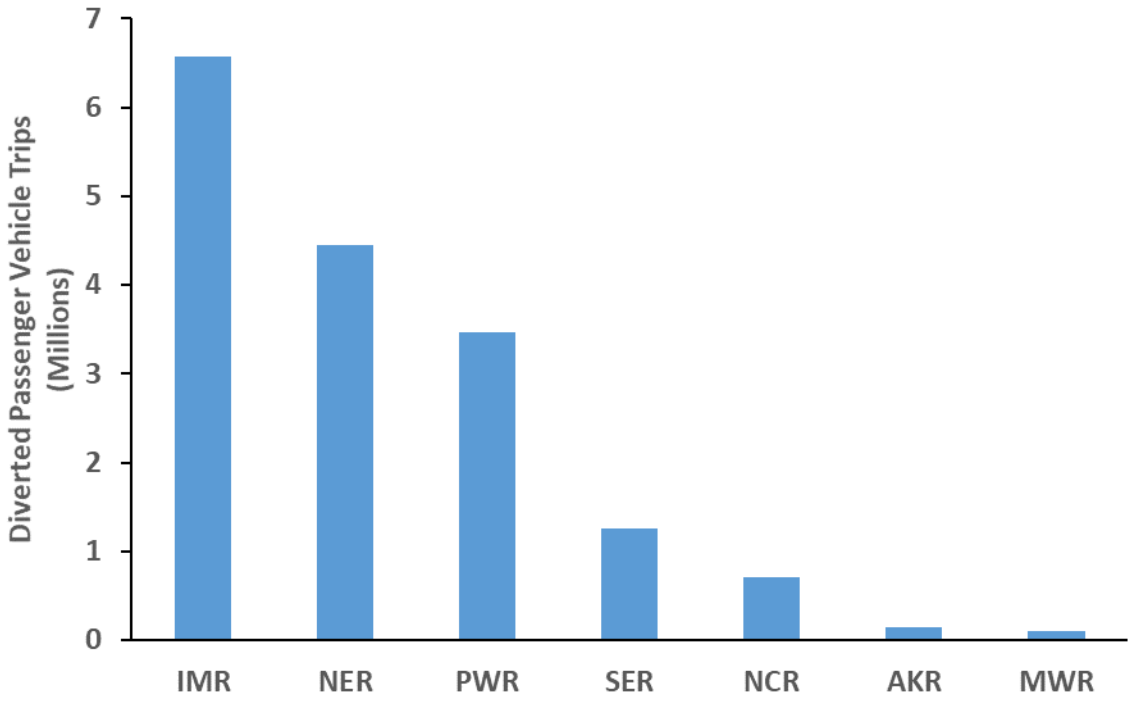
[28] US Environmental Protection Agency, "Basic Information about Carbon Monoxide (CO) Outdoor Air Pollution | Carbon Monoxide (CO) Pollution in Outdoor Air | US EPA."

[29] Ibid.

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

Figure 13: Vehicle trips avoided as a result of NPS transit systems
Source: 2017 NPS Transit Inventory data



IMR	NER	PWR	SER	NCR	AKR	MWR
6,600,000	4,400,000	3,400,000	1,300,000	708,000	143,000	100,000

Criteria Pollutant Emissions Inventories
The following details the emissions inventories for criteria pollutants and precursors across the fleet operating in national parks. As shown in the figures and tables, vehicle fuel and terrain type influence the emissions results. Diesel contributes 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. However, fewer vehicles burning fuel in the park has a net postive effect on local air quality.

Figure 14 shows the results of MOVES CO_2 emissions modeling for 2018 NPS transit system activity, aggregated to the regional level. The results are also split by ownership. Across all regions, NPS transit fleets emitted about 25,700 metric tons of CO_2 in 2018.

Figure 14: NPS transit system CO_2 emissions
Source: 2018 NPS NPS Transit Inventory data

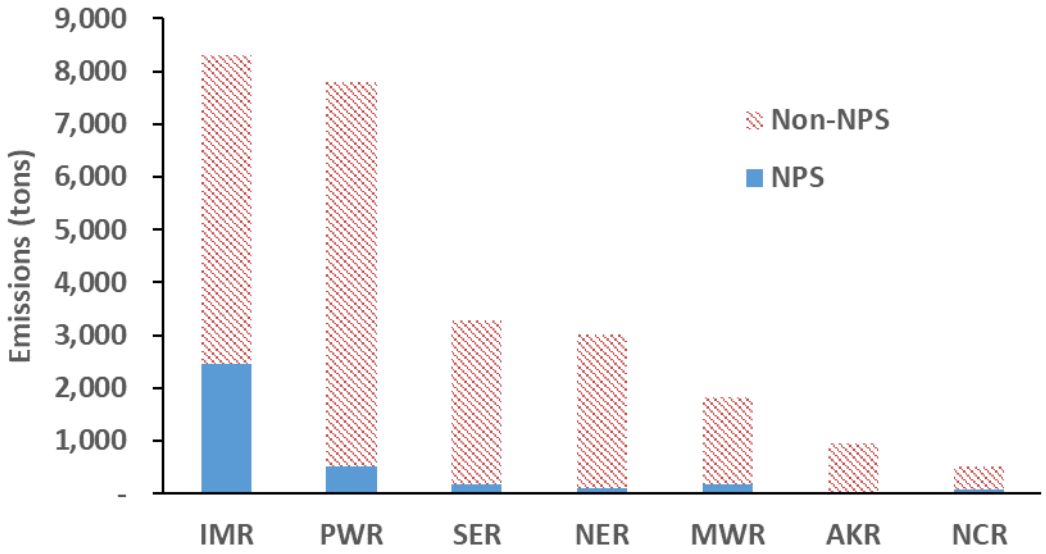


Figure 15 shows the results of MOVES NOx emissions modeling for 2018 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted 235 tons of NOx in 2018.

Figure 15: NPS transit system NOx emissions
Source: 2018 NPS Transit Inventory data

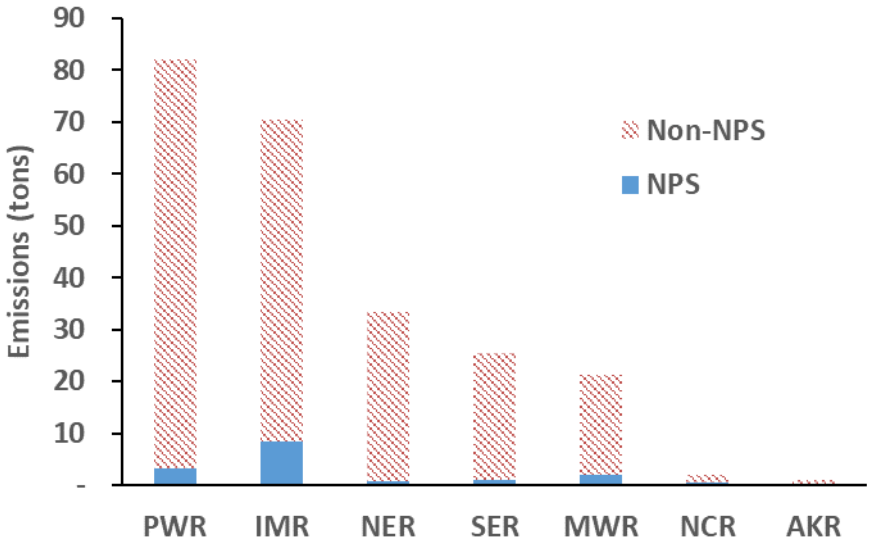
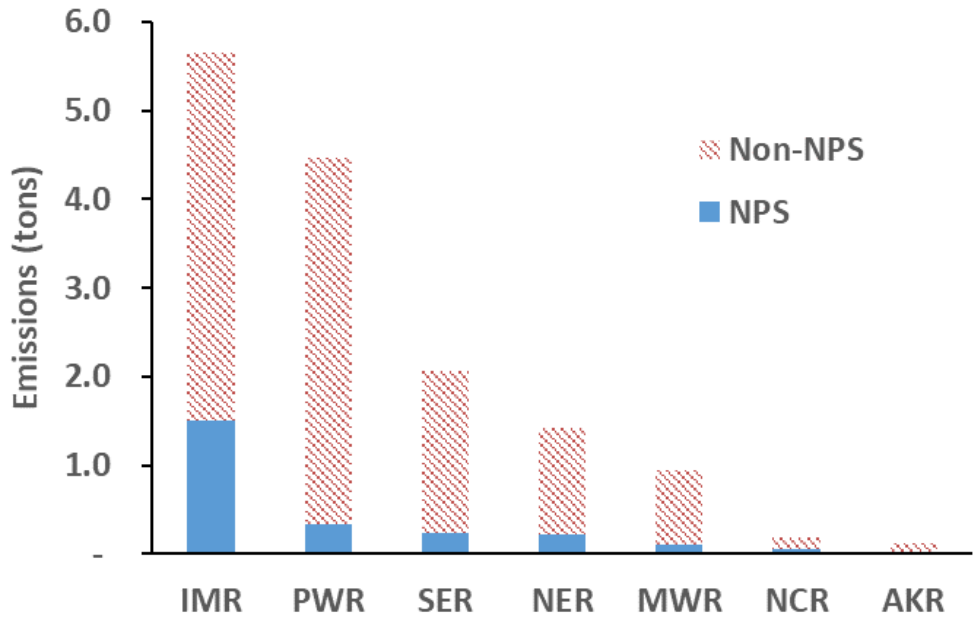


Figure 16 shows the results of MOVES VOCs emissions modeling for 2018 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted just over fifteen tons of VOCs in 2018. VOCs combine with other airborne compounds, including NOx, to produce ozone and smog. The Intermountain region has the largest VOCs as the region has a substantial proportion of vehicles powered by propane and marine diesel. Propane combustion becomes less chemically efficient at high altitudes, i.e., where there is less oxygen, and can therefore leave behind additional VOCs as well as CO.[30]

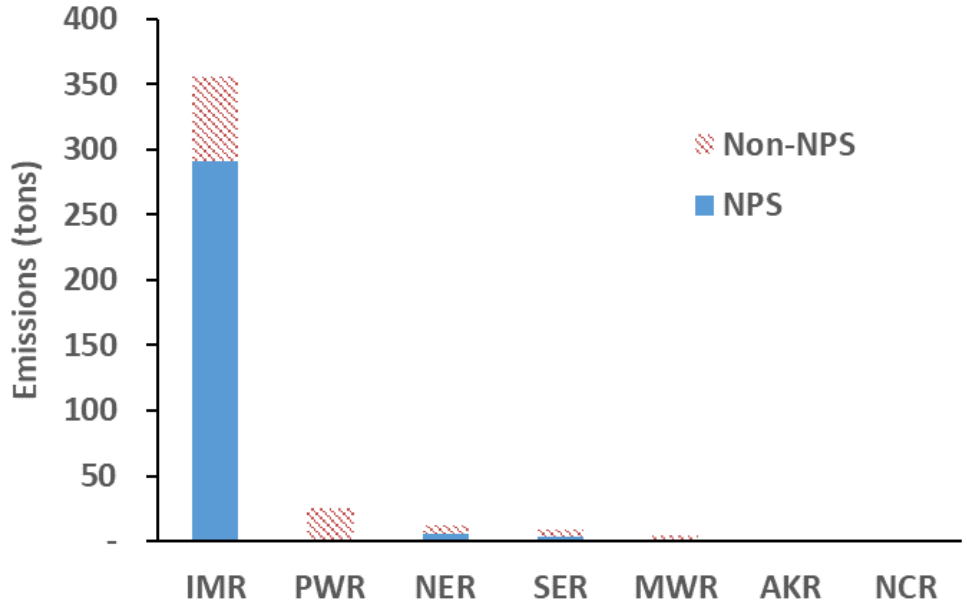
Figure 16: NPS transit system VOC emissions
Source: 2018 NPS Transit Inventory data



[30] S. McAllister et al., "Chapter 2: Thermodynamics of Combustion". *Fundamentals of Combustion Processes*, Springer (2011).

Figure 17 shows the results of MOVES CO emissions modeling for 2018 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted approximately 409 tons of CO in 2018. As discussed earlier, the Grand Canyon's heavy use of CNG-fueled buses contributes significantly to the Intermountain Region's high relative CO emissions. These buses emit substantially more CO than conventional fuels, but half the NOx. As NOx is an ozone precursor, the latter characteristic makes CNG-fueled vehicles ideal for minimizing smog – a key consideration in parks with long-distance viewsheds. In addition, Intermountain operates a large number of propane-powered transit vehicles at higher altitudes: without enough oxygen, inefficient propane combustion can leave behind CO.

Figure 17: NPS transit system CO emissions
Source: 2018 NPS Transit Inventory data



For PM emissions, ferries burning marine diesel and buses fueled by propane contribute significantly more than those powered by other fuels. Several parks in the Pacific West Region are exclusively marine transit fleets, and the Ellis Island ferry fleet contributes majority of the Northeast Region's PM emissions. In addition, the Intermountain Region's ferries at Glen Canyon, and the propane bus fleet at Zion increase their regions' emissions in this category.

Figure 18 shows the results of MOVES PM2.5 emissions modeling for 2018 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted about five tons of PM2.5 in 2018. The primary public health concern with PM2.5 is the pulmonary health risks posed by breathing very fine particles.

Figure 18: NPS transit system PM2.5 emissions
Source: 2018 NPS Transit Inventory data

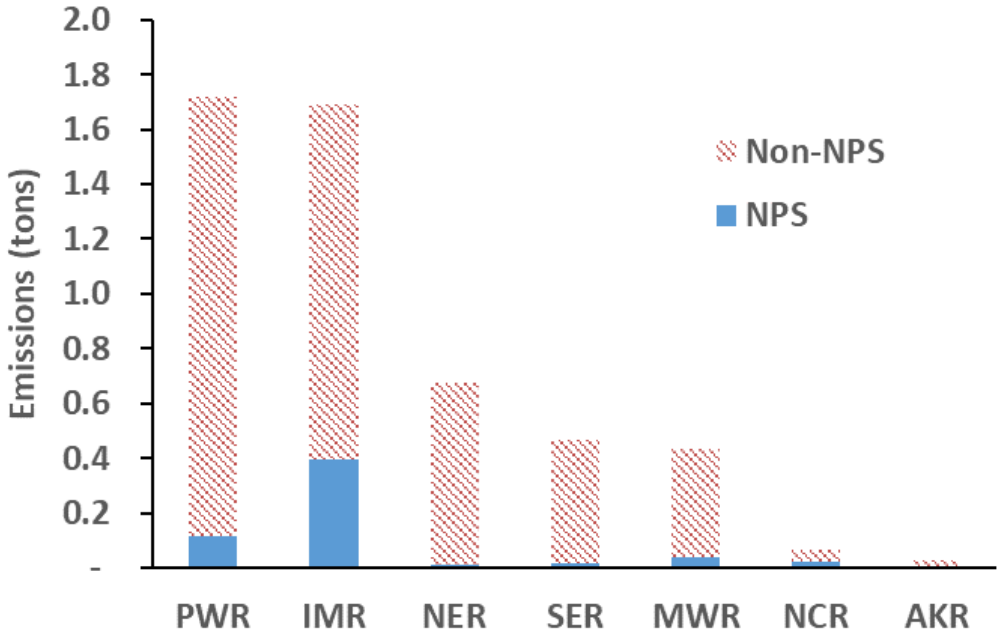
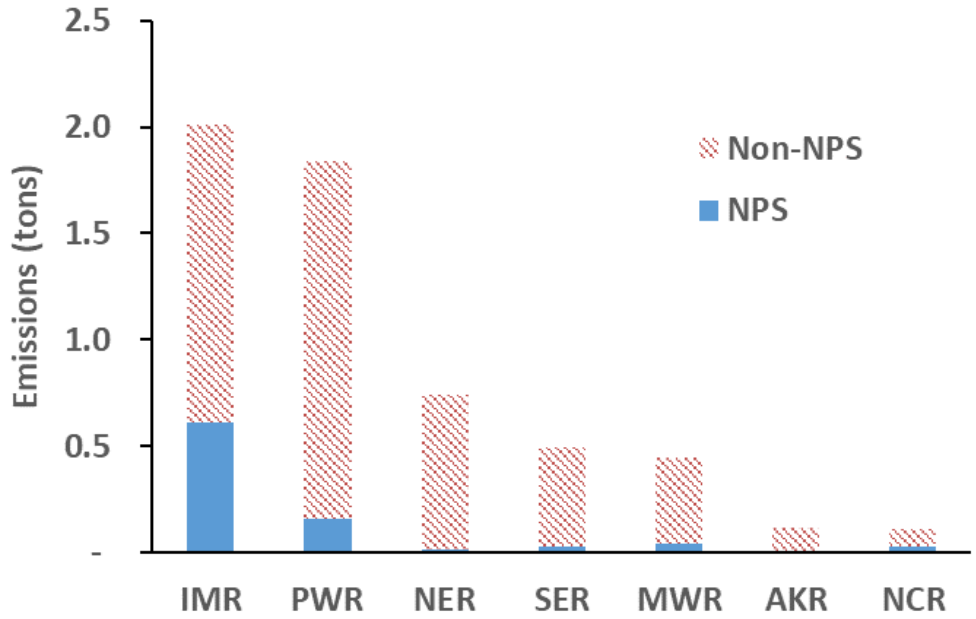


Figure 19 shows the results of MOVES PM10 emissions modeling for 2018 NPS transit system activity, split by ownership. Across all regions, NPS transit fleets emitted just under six tons of PM10 in 2018. The Alaska Region produces more PM10 than PM2.5, in part due to the unpaved roadways driven by systems in that region.

Figure 19: NPS transit system PM10 emissions
Source: 2018 NPS Transit Inventory data



Appendix F – Vehicle Replacement Assumptions

Uniform vehicle replacement costs and expected service lives were used to provide service-wide 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 inventories[31], to reflect the usage and operating characteristics of NPS vehicles (Table 6 and Table 7). In order to provide a more accurate replacement cost estimate, 2015 dollar amounts were inflated to reflect 2019 dollars. NPS vehicles are not utilized in the same way that city transit vehicles are; they are typically not used for the entire year, nor are they used as intensively as transit vehicles in an urban environment. Vehicle cost estimates were mostly taken from the General Service Administration's AutoChoice Database.

Table 6: Vehicle replacement costs (in 2019 dollars) and expected life for non-electric vehicles
Source: Transit standards[32] updated to reflect NPS typical usage and operating characteristics

Assumptions	Gas/Diesel/Biodiesel/Propane		CNG	
Vehicle Type	**Replacement Cost**	**Expected Life**	**Replacement Cost**	**Expected Life**
Passenger Van	$35,640	10	N/A	N/A
Light-duty Shuttle	$115,560	15	$130,140	10
Medium-Duty Shuttle	$158,760	15	$166,320	10
Heavy-Duty Shuttle	$158,760	15	$170,640	10
Medium-Duty Transit	$297,000	18	$356,400	20
Heavy-Duty Transit	$475,200	18	$516,240	20
School Bus	$136,620	18	N/A	N/A
6-12 pax Electric Tram	N/A	11	N/A	11

[31] 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.

[32] Ibid.

Table 7: Vehicle replacement costs (in 2019 dollars) and expected life for electric vehicles
Source: Transit standards[33] updated to reflect NPS typical usage and operating characteristics

Assumptions	Electric-Hybrid		Electric	
Vehicle Type	**Replacement Cost**	**Expected Life**	**Replacement Cost**	**Expected Life**
Passenger Van	N/A	10	$108,000	10
Light-duty Shuttle	$146,880	15	$426,600	15
Medium-Duty Shuttle	$356,400	15	N/A	15
Heavy-Duty Shuttle	$380,160	15	N/A	15
Medium-Duty Transit	$534,600	18	$540,000	18
Heavy-Duty Transit	$653,400	18	$810,000	18
School Bus	N/A	18	N/A	18
6-12 pax Electric Tram	$21,600	11	N/A	11

[33] 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.

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13. ABSTRACT

This document summarizes key highlights and performance measures relating to the National Park Service (NPS) 2018 National Transit Inventory, by presenting data for NPS transit systems and vehicles nationwide. These highlights and performance measures include ridership, business model, service life, and emissions information, along with business models and funding sources. Key findings include:

- 95 transit systems operated in 60 NPS parks
- 41 million total passenger boardings in 2018
- 53% of NPS transit systems operate under concession contracts
- 58% of NPS-owned transit vehicles operate on alternative fuel

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As the nation’s principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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