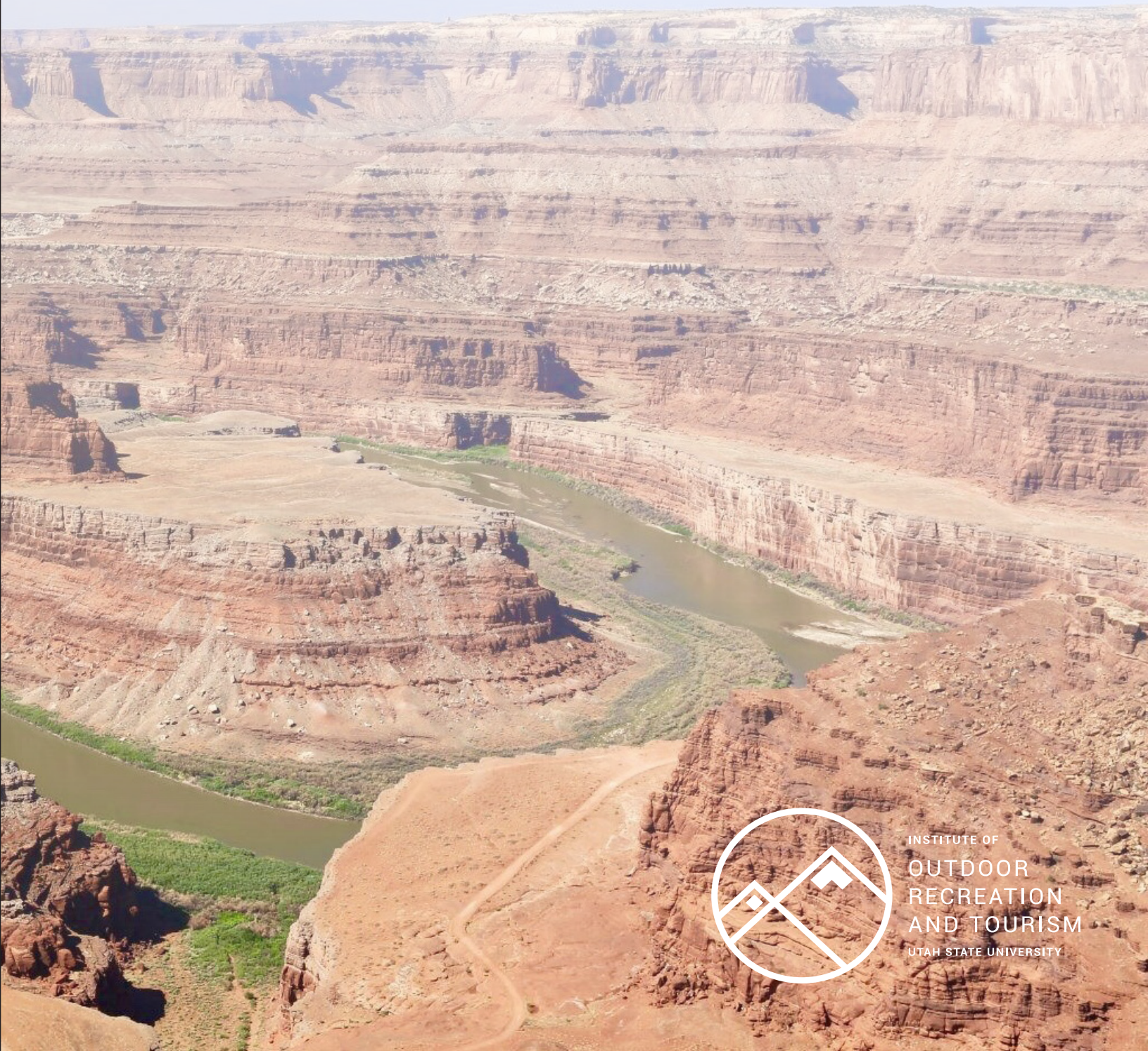# 2018 OUTLOOK AND ANALYSIS LETTER

The vital statistics of America's state park systems

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INSTITUTE OF
OUTDOOR
RECREATION
AND TOURISM
UTAH STATE UNIVERSITY

2018 OUTLOOK AND ANALYSIS LETTER

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AMERICA'S
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State Park Directors

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OVERVIEW

The annual Outlook and Analysis Letter presents the 'vital statistics' that characterize the operation and use of the nation's 50 state park systems. In the report, we detail historical trends relevant to state park system management using data within the Annual Information Exchange (AIX) archive. The Outlook and Analysis Letter illustrates annual values aggregated across the 50 state park systems between the years of 1984 and 2017 for each of the following measures:

- Attendance;
- Operating Expenditures;
- Capital Expenditures;
- Revenues;
- Labor; and
- Acreage.

In addition to the historical trends, we also present projected values for each measure into the near future (2018, 2019, and 2020). These projections are provided to give the leadership within the National Association of State Park Directors a better understanding of how park usage and management are likely to change in the years to come.

In the 'Analysis' section of the Outlook and Analysis Letter, we present the results of a statistical analysis designed to determine the historic and recent technical efficiency of each state park system. The analysis of state-specific technical efficiency allows individual state park systems to see how efficient they are at providing outdoor recreation opportunities within their state.

The analysis of technical efficiency, along with the presentation of recent trends in the park systems' 'vital statistics', gives national- and state-level leadership a better understanding of what the future has in store for the vast array of high-quality outdoor recreation opportunities offered throughout the nation's state park systems.

GENERAL FORECASTING METHODOLOGY

For each of the key variables reported in this outlook and analyses—attendance, operating expenditures, capital expenditures, revenue, labor and acreage—we forecast point estimates ahead for three years. This is accomplished through a weighted linear moving average. Data were estimated using the weighted linear trend over the previous 3 years, t-3. We assigned more weight to the observed data points closer to the year for which estimates are being calculated. Specifically, observed data for the year of estimation t was assigned a weight of 3, observed data at t-1 was assigned a weight of 2 and observed data at t-2 was assigned a weight of 1. For example the estimated attendance in 2018 was calculated as:

1/6 ((1 x observed_attendance_2015) + (2 x observed_attendance_2016) + (3 x observed_attendance_2017))

ATTENDANCE

Attendance refers to the total counts of day and overnight visitation to both fee and non-fee areas (Leung, Smith, & Miller, 2016). The long-term trends in attendance for all state park systems can be seen in Figure 1. Visitation to the states' parks systems has risen steadily since the beginning of our sampling period in 1984 when they received a total of 642.6 million visits. Attendance reached an all time high this past year (2017), when the states' park systems received 807.3 million visits. The record number of visits to the nation's state park systems is the result of a 2.01% increase over the 791.4 million reported in 2016.
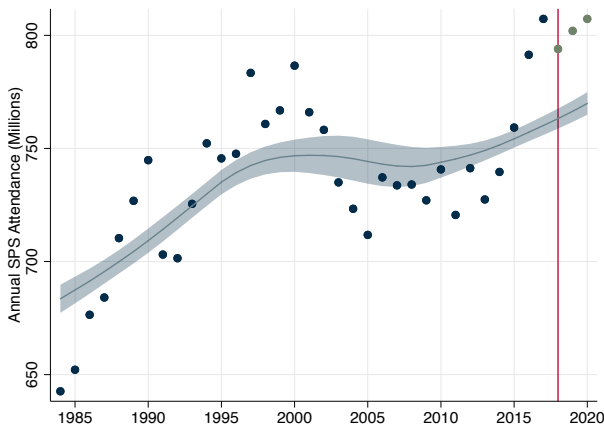
Attendance is expected to gradually increase over the next three years (Figure 1). Based on recent trends, annual attendance is expected to hover around 800 million visits (793 million in 2018, 802 million in 2019 and 807 million in 2020).

OPERATING EXPENDITURES

Operating expenditures are payments made for goods and services to manage a state park system (Leung et al., 2016). The long-term trends in operating expenditures, expressed as 2017 dollars, across all state park systems are illustrated in Figure 2. After controlling for inflation, the data reveal operating expenditures have risen over the past 33 years. On average, inflation adjusted operating expenditures have increased by $20.2 million dollars per year since 1984. More recently however, the states' park systems' inflation adjusted operating budgets have declined. For 2017 the states' park systems' inflation adjusted operating expenditures were $2.59 billion.

Recent trends suggest expenditures associated with providing the goods and services required to manage the states' park systems will continue to decline over the coming years (Figure 2). We expect total operating expenditures for 2018 to be $2.71 billion; this is expected to decrease to $2.64 billion in 2019 and to $2.59 billion in 2020.
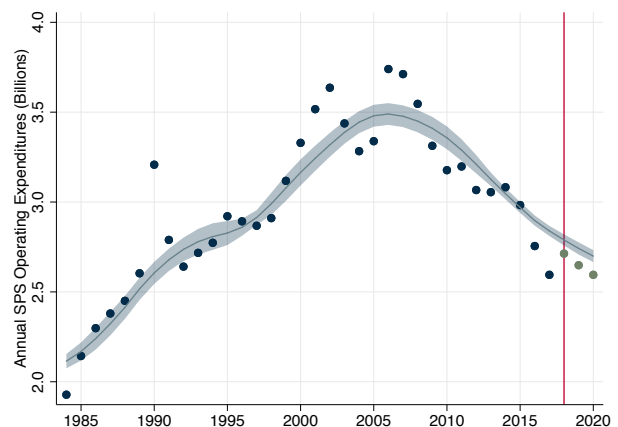

Figure 2. Total annual operating expenditures for the 50 state park systems. *All values adjusted to 2017 dollars.*

Figure 1. Total annual attendance to the 50 state park systems.

CAPITAL EXPENDITURES

Capital expenditures are non-recurring expenditures used to improve the productive capacity of a state park system (Leung et al., 2016). Typically, these are for land acquisition, periodic park improvements and construction. The long-term trend in inflation adjusted capital expenditures reveals a relatively stable pattern over the past 33 years (Figure 3) with the exception of a notable spike in 2005. Inflation adjusted capital expenditures declined notably after the 2008 recession, as would be expected given large-scale reductions in state appropriations, park-generated revenues, and other funding sources tied to the health of the states' economies (Siderelis & Smith, 2013). Since 2012 however, this downward trend in capital expenditures has stopped and began to trend upward again. The states' park system managers reported capital expenditure of $987.5 million in 2017, which is slightly less than the $1.05 billion reported in 2016; a 5.6% decrease.

Recent trends suggest capital outlays for improving the productive capacity of the states' park systems will remain relatively stable just above $1.0 billion per year over the next three years (Figure 3). We estimate total capital expenditures to be $1.0 billion in 2018 and 2019 before dropping to $987 million in 2020.
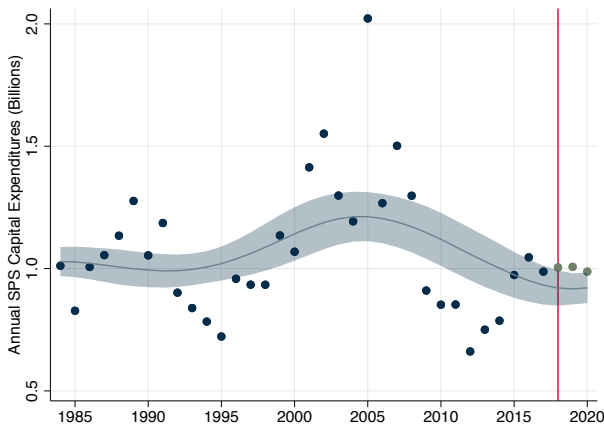

Figure 3. Total annual capital expenditures across the 50 state park systems. *All values adjusted to 2017 dollars*

REVENUE

Revenue is money generated from use fees and charges; it includes all revenue from entrance fees, camping fees, cabin/cottage rentals, lodge rentals, group facility rentals, restaurants, concessions, beaches/pools, golf courses and other sources such as donations (Leung et al., 2016). Revenue data within the AIX archive reveal steady increases throughout

the 33-year sampling frame (Figure 4). This past year (2017) however, total revenues dropped to $1.35 billion, a 2.78% decrease from the $1.39 billion reported in 2016.

Given the consistency of reporting in annual revenue data, we can be very confident in our forecasted values for the upcoming years (Figure 4). We estimate total revenues generated across all state park systems will be $1.37 billion in 2018, $1.36 billion in 2019, and $1.35 billion in 2020.
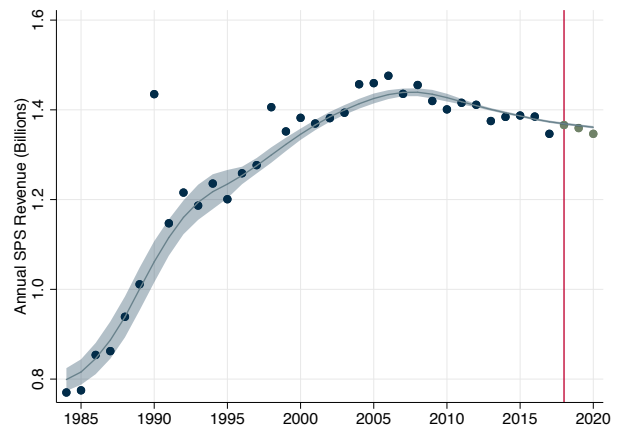
Figure 4. Total annual revenues generated by the 50 state park systems. *All values adjusted to 2017 dollars*

LABOR

The labor required to maintain the states' park systems saw increases from 1984 to the early 2000s (Figure 5). State park system operators reported a high of 57,815 employees in 1985. However since 2002, total employment across the states' park systems has declined. This is notable given the gradual increases in both attendance and acreage over the same time period. The trends illustrate a persistent demand placed upon state park operators to accommodate more users across larger areas with fewer and fewer personnel. Data from 2017 reveal a notable increase in the total number of employees. A total of 51,065 positions were reported for 2017, a 1.9% increase from the 50,116 reported in 2016.

Recent trends within the labor data suggest the states' park systems will begin to increase employment levels over the coming years (Figure 5). We expect total employment to be 50,473 in 2018, 50,748 in 2019 and 51,065 in 2020.
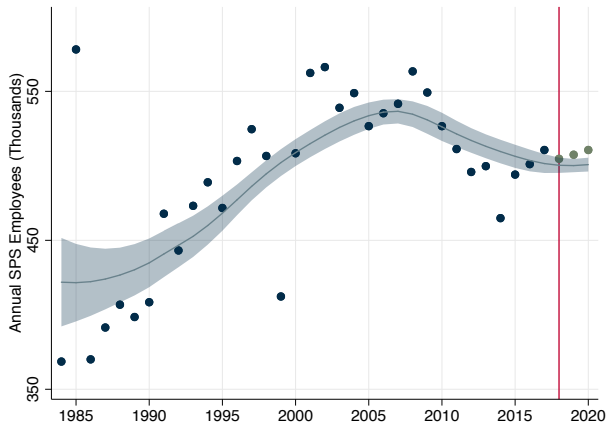
Figure 5. Total labor required to maintain outdoor recreation opportunities provided within the 50 state park systems.

ACREAGE

Acreage refers to the total acreage within the states' park systems managed as parks, recreation areas, natural areas, historical areas, environmental education areas, scientific areas, forests, fish and wildlife areas and other miscellaneous areas (Leung et al., 2016). The total area managed within the states' park systems has increased steadily since 1984 with notable expansions in recent years (Figure 6). Specifically, the year 2014

saw a 17.7% increase in acreage over 2013, growing from 15.25 million acres to 18.20 million acres. This past year (2017), the states' park systems continued to grow as total acreage increased to 18.70 million acres; this is a 0.52% increase over 2016.

We expect the total size dedicated to the states' park systems will remain stable over the coming years (Figure 6). Based on recent trends, total acreage in 2018 is projected to be 18.6 million acres. In 2019 and 2020, the size is expected to increase to 18.7 million acres.

Figure 6. Total acreage within the 50 state park systems.

ANALYSIS

DATA

We generated a longitudinal panel data set of key data collected through the AIX. Each of these variables is reported annually for the 50 state park systems between the years 1984 and 2017. All variables used in our analysis are expressed relative to the total acreage within their respective state park system; summary statistics for all variables are provided in Table 1.

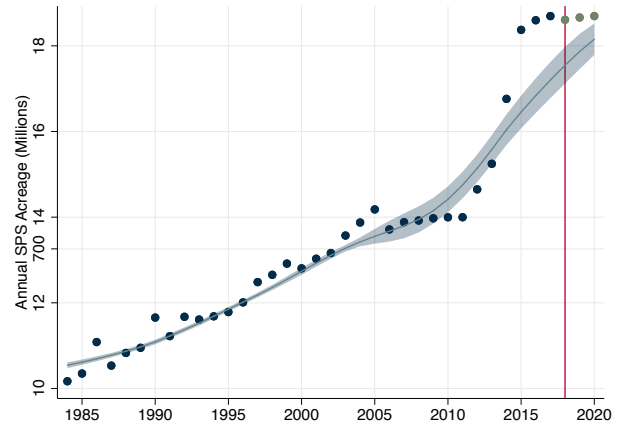Due to poor data collection standards or limited resources available to those responsible for the AIX archive in the past, not all state park systems reported data for each year. Consequently, the longitudinal panel data set has several missing data points. Given only a small proportion of the data were missing (<3.5% for any one variable used in our analysis), we used linear interpolation to fill missing values. For each panel (state), we interpolated missing values as a function of time (year). We also adjusted all monetary variables (operating expenditures, capital expenditures and revenue) to a 2017 base rate to compensate for inflation. The adjustments were made using the Consumer Price Index for all Urban Households (www.bls.gov).

MODELING TECHNICAL EFFICIENCY

We assume the states' park system managers are attempting to maximize public enjoyment of the resources they manage while minimizing costs associated with providing and managing those opportunities (i.e., minimizing operating expenditures). This allows us to fit a technical efficiency model by regressing annual operating expenditures on various output factors that affect operating expenditures (Aigner, Lovell, & Schmidt, 1977). The estimation process is grounded in the premise that a cost frontier exists which represents the maximum outputs that can be obtained given a controllable set of inputs (Greene, 2008). This theoretical maximum, the frontier, calculated by summing the estimated coefficients across the output factors of production after estimation, represents a theoretical measure of optimal efficiency. When observational units can be organized into a discrete classification scheme, such as states, comparisons regarding efficiency can be made across those classifications.

Table 1. Summary statistics of the longitudinal panel data set (1984 – 2017) for all 50 state park systems

Variable	Mean	SD
Attendance / Acre [a]	117.26	134.30
Attendance (visitor-hours) / Acre [a]	353.18	404.51
Operating Expenditures / Acre [b]	483.52	524.53
Capital Expenditures / Acre [b]	194.21	355.44
Revenue / Acre [b]	238.95	322.11
Labor (personnel) / Acre	0.009	0.011
Labor (person-hours) / Acre [c]	18.82	22.68

Notes.
[a] Using the assumption each visit is 3.010 hours long; this value was derived by taking the estimated 2.2 billion hours of outdoor recreation provided by the states' park systems (Siikamäki, 2011) and dividing it by the average annual attendance rates for all the states' park systems over the past 30 years (734,252,207).
[b] Operating expenditures, capital expenditures and revenue are adjusted to a 2013 base rate.
[c] Using the assumption each employee works 2,080 hours per year.

Our technical efficiency model is expressed as:

$$y_{jt} = \beta_1 a_{jt} + \beta_2 cx_{jt} + \beta_3 r_{jt} + \beta_4 l_{jt} + u_j + \varepsilon_{jt}$$

The dependent variable y refers to the operating expenditures per acre for the jth = 1,..., 50 park system in year t = 1,...,34. The independent variables are a (visitor-hours per acre), cx (capital expenditures per acre), r (revenue per acre) and l (person-hours per acre); these are also indexed to each park system and each year. The individual regression coefficients are expressed as βs. Within-panel (state) correlation is handled through the inclusion of the fixed effect u; this coefficient is time-invariant. Finally, ε refers to random error. All variables are transformed to their natural log (ln) before estimation. We fit the model using a true random effects specification (Greene, 2005). The model was estimated with the sfpanel command in the Stata statistical software package.

RESULTS

Results of applying the technical efficiency model to the longitudinal panel data are shown in Table 2. All of the output factors were highly significant (p ≤ 0.001). The β coefficients can be interpreted as point elasticities, meaning they indicate the percentage change in operating expenditures given a 1%

increase (decrease) in the independent variable. The β coefficients are also used to calculate the average marginal effect, the monetary change in operating expenditures corresponding to a 1% increase in a β coefficient's respective variable.

On average, a 1% increase in attendance (visitor-hours) is associated with a 0.250% or $25.47 increase in operating expenditures per acre. More intuitively, we can say that it costs about $25 for a state park system manager to produce an additional 3.59 hours of outdoor recreation within their state's park system. Similarly, the model revealed that a 1% increase in capital expenditures is associated with a 0.026% increase in operating expenditures. Every $1.94 spent on capital improvements is associated with a concomitant $6.05 increase in operating expenditures per acre. Our analysis also suggests a 1% increase in revenue corresponds to a 0.059% increase in capital expenditures. Every $2.39 generated by the states' park systems corresponds to $7.58 in operating expenditures per acre; this is logical given the states' park systems are quasi-public goods whose operating expenditures are only partially funded by generated revenues (state appropriations, dedicated funds and federal funds are also used to pay for operating expenditures). Finally, our model revealed a 1% increase in labor (person-hours) is associated with a 0.414% increase in operating expenditures. Every 11.29 minutes (MLabor (person-hours)/Acre = 18.82 x

Table 2. Results of the technical efficiency model fit to the longitudinal panel data set (1984 – 2013)

Independent Variable	β [a]	Std. Err.	z	p	95% C.I. U.B.	95% C.I. L.B.	Average Marginal Effect ($)[b]
ln Attendance (visitor-hours) / Acre	0.250	0.013	19.090	≤ 0.001	0.225	0.276	25.47
ln Capital Expenditures / Acre	0.026	0.004	6.620	≤ 0.001	0.018	0.034	6.05
ln Revenue / Acre	0.059	0.007	8.340	≤ 0.001	0.045	0.073	7.58
ln Labor (person-hours) / Acre[c]	0.414	0.015	28.010	≤ 0.001	0.385	0.443	9.89
Constant	3.213	0.060	53.640	≤ 0.001	3.096	3.330	
Other Parameters							
U^σ constant	-3.400	0.092	-37.090	≤ 0.001	-3.580	-3.220	
V^σ constant	-3.488	0.059	-59.560	≤ 0.001	-3.602	-3.373	
θ constant	0.296	0.015	19.930	≤ 0.001	0.267	0.325	
σ_u	0.183	0.008	21.810	≤ 0.001	0.167	0.200	
σ_v	0.175	0.005	34.150	≤ 0.001	0.165	0.185	
λ	1.045	0.011	91.000	≤ 0.001	1.022	1.067	

Notes. N = 1,700 (50 states × 34 years)
[a] The β coefficients can be interpreted as point elasticities, meaning they indicate the percentage change in operating expenditures given a 1% increase (decrease) in the independent variable.
[b] Average marginal effects are the monetary change in operating expenditures corresponding to a 1% increase in a β coefficient's respective variable; they are calculated as $\bar{x}^\beta \times \ln(\bar{x})$ where $\bar{x}$ is the variable mean.
[c] Using the assumption each employee works 2,080 hours per year.

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1% x 60 min./hr.) worked by employees of the states' park systems corresponded to $9.89 in operating expenditures per acre. This finding is intuitive, state park systems with larger labor pools also have larger costs associated with maintaining opportunities within their system.

We also calculate the state-specific average marginal effects; these values are reported in Table 3 and can be interpreted in the same way that we did for the entire sample in the previous paragraph.

HOW TECHNICALLY EFFICIENT IS EACH STATE PARK SYSTEM?

Analyses of technical efficiency are designed to produce a single ratio between input and output factors (Chambers, 1988). The input factor provides the reference for the technical efficiency ratio given it is both singular and the dependent variable in the analysis. The output factor measure, also referred to as the cost frontier (Greene, 2008), is generated by summing the β coefficients for all of the individual output factors. Values of 1.0 indicate optimal technical

Table 3. State-specific average marginal effects

State	Attendance (visitor-hours) / Acre	Capital Expenditures / Acre	Revenue / Acre	Labor (person-hours) / Acre [c]
Alabama	$ 24.63	$ 5.77	$ 10.20	$ 16.02
Alaska	$ 2.13	$ 0.59	$ (0.03)	$ (0.88)
Arizona	$ 16.99	$ 6.02	$ 7.32	$ 6.21
Arkansas	$ 28.13	$ 7.07	$ 9.14	$ 17.89
California	$ 18.04	$ 4.64	$ 5.92	$ 3.63
Colorado	$ 13.68	$ 4.82	$ 5.69	$ 3.04
Connecticut	$ 16.04	$ 5.02	$ 4.60	$ 5.04
Delaware	$ 31.39	$ 8.58	$ 9.65	$ 23.45
Florida	$ 14.48	$ 5.46	$ 6.03	$ 3.52
Georgia	$ 29.98	$ 6.77	$ 9.11	$ 14.23
Hawaii	$ 44.88	$ 6.95	$ 6.14	$ 6.14
Idaho	$ 20.10	$ 5.72	$ 6.64	$ 8.83
Illinois	$ 23.16	$ 6.34	$ 3.75	$ 3.01
Indiana	$ 25.81	$ 5.44	$ 8.38	$ 12.99
Iowa	$ 31.55	$ 6.02	$ 5.77	$ 5.98
Kansas	$ 28.46	$ 5.19	$ 7.21	$ 7.74
Kentucky	$ 36.62	$ 7.59	$ 11.82	$ 30.42
Louisiana	$ 15.83	$ 7.19	$ 7.25	$ 12.04
Maine	$ 12.67	$ 3.37	$ 4.77	$ 4.16
Maryland	$ 18.02	$ 5.38	$ 6.30	$ 6.40
Massachusetts	$ 19.17	$ 5.66	$ 4.88	$ 6.97
Michigan	$ 22.33	$ 4.49	$ 7.27	$ 6.91
Minnesota	$ 14.40	$ 4.61	$ 5.75	$ 4.31
Mississippi	$ 27.19	$ 6.35	$ 9.15	$ 16.55
Missouri	$ 24.81	$ 5.77	$ 5.73	$ 6.81
Montana	$ 18.72	$ 4.89	$ 5.30	$ 5.10
Nebraska	$ 20.78	$ 3.76	$ 6.97	$ 7.72
Nevada	$ 12.11	$ 3.86	$ 3.89	$ 1.92
New Hampshire	$ 16.79	$ 5.49	$ 7.39	$ 9.77
New Jersey	$ 15.54	$ 4.74	$ 4.66	$ 3.66
New Mexico	$ 16.08	$ 4.91	$ 5.36	$ 3.13
New York	$ 24.65	$ 5.72	$ 7.16	$ 12.17
North Carolina	$ 20.46	$ 5.94	$ 4.55	$ 5.64
North Dakota	$ 17.80	$ 5.27	$ 6.28	$ 9.94
Ohio	$ 37.64	$ 5.96	$ 7.44	$ 9.33
Oklahoma	$ 30.82	$ 5.76	$ 9.00	$ 11.26
Oregon	$ 43.09	$ 5.44	$ 7.76	$ 8.21
Pennsylvania	$ 26.43	$ 5.63	$ 5.79	$ 7.05
Rhode Island	$ 48.77	$ 8.52	$ 9.74	$ 32.90
South Carolina	$ 23.90	$ 5.39	$ 8.34	$ 10.59
South Dakota	$ 20.48	$ 4.90	$ 6.87	$ 6.54
Tennessee	$ 30.57	$ 5.85	$ 8.22	$ 11.31
Texas	$ 15.16	$ 4.92	$ 5.86	$ 3.82
Utah	$ 17.03	$ 5.05	$ 6.27	$ 3.66
Vermont	$ 9.25	$ 3.85	$ 6.65	$ 6.09
Virginia	$ 23.26	$ 6.85	$ 7.47	$ 13.26
Washington	$ 33.76	$ 6.05	$ 6.90	$ 6.24
West Virginia	$ 16.51	$ 3.60	$ 6.98	$ 8.34
Wisconsin	$ 24.17	$ 5.40	$ 6.91	$ 5.93
Wyoming	$ 11.85	$ 4.21	$ 3.04	$ 1.91

Notes.

efficiency; each additional input factor yields a 100% return across the output factors. Summing the β coefficients generated by our model (Table 2) yields an output factor measure of 0.750, which suggests the states' park operators are fairly efficient at developing and maintaining outdoor recreation opportunities within their systems.

Individual technical efficiency scores are computed following the specification proposed by Battese and Coelli (1988). The technical efficiencies are expressed relative to a theoretical maximum ratio of 1.0 between input and output factors. States with technical efficiency scores less than 1.0 are operating below the theoretical maximum. We calculated the state-level technical efficiency scores using the equation above and report the results in Table 2. To ease interpretation, we also rank individual states' park systems by their scores. The Alaska State Park System is the most efficient at jointly producing the output factors of visitation, capital expenditures, revenue and labor with minimal operating costs. The Virginia, Minnesota, North Dakota, and Hawaii state park systems round out the top five systems that most efficiently produced outdoor recreation opportunities in 2017.

Table 4. Individual state park systems' technical efficiency scores and rankings.

State	Technical Efficiency Score [a]	2017 Rank	State	Technical Efficiency Score [a]	2017 Rank
Alabama	0.722	34	Montana	0.861	13
Alaska	0.947	1	Nebraska	0.717	36
Arizona	0.820	19	Nevada	0.862	12
Arkansas	0.821	18	New Hampshire	0.870	9
California	0.866	10	New Jersey	0.000	50
Colorado	0.802	22	New Mexico	0.535	45
Connecticut	0.790	26	New York	0.445	49
Delaware	0.768	29	North Carolina	0.691	39
Florida	0.633	43	North Dakota	0.914	4
Georgia	0.754	31	Ohio	0.657	40
Hawaii	0.909	5	Oklahoma	0.655	41
Idaho	0.710	38	Oregon	0.789	27
Illinois	0.611	44	Pennsylvania	0.827	15
Indiana	0.858	14	Rhode Island	0.636	42
Iowa	0.798	24	South Carolina	0.719	35
Kansas	0.513	47	South Dakota	0.819	20
Kentucky	0.761	30	Tennessee	0.743	32
Louisiana	0.823	16	Texas	0.862	11
Maine	0.737	33	Utah	0.478	48
Maryland	0.877	8	Vermont	0.823	17
Massachusetts	0.773	28	Virginia	0.937	2
Michigan	0.792	25	Washington	0.896	6
Minnesota	0.925	3	West Virginia	0.799	23
Mississippi	0.811	21	Wisconsin	0.528	46
Missouri	0.878	7	Wyoming	0.714	37

Notes.
[a] A score of 1.0 is the theoretical maximum.

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AN OVERVIEW OF THE AIX

The AIX system is intended primarily for use by state park system operators and staff for: identifying program, facility and personnel needs; formulating budgetary requests for state legislatures; and comparing their programs with those of other states. Data collected by the AIX system include:

- An inventory of the number, acreage and type of areas managed by each state park system;

- An inventory of the number and type of facilities managed by each state park system;

- Annual attendance counts broken down by fee-areas, non-fee areas, day-use areas and overnight use areas;

- Annual capital and operating expenditures by each state park system;

- Annual revenue generated by source (e.g., entrance fees, cabin rentals, etc.) for each state park system; and

- An inventory of the number and type of personnel positions required to maintain each state park system, this includes salary ranges and an inventory of employee benefits.

VARIABLES PULLED FROM THE AIX

The variables we utilize in our analyses are described in Table A1. Each variable is reported annually for each state park system between the years 1984 and 2017.

MODIFICATIONS TO ORIGINAL DATA

Missing Data – Due to inconsistent data collection standards across state park systems, not all data are present in the AIX archive for each year. We used linear interpolation to fill missing values and create a fully balanced dataset.

Inflation – We adjusted all monetary variables (operating expenditures, capital expenditures and revenue) to a 2017 base rate to compensate for inflation. The adjustments were made using the Consumer Price Index for all Urban Households (www.bls.gov).

Aggregation – To complete the trend analysis for all state park systems, we collapsed the data by year across all states.

Table A1. Variables from the AIX archive used to construct the data set (1984 – 2017)

Variable	Definition	Location in annual AIX Excel spreadsheets
Attendance	The total counts of day and overnight visitation to both fee and non-fee areas.	Table 3 – L3:L52
Operating Expenditures	Payments made for goods and services to manage a state park system. Operating expenditures are funded through park generated revenue, general funds, dedicated funds, federal funds, and other funds such as interagency transfers and money generated through temporary leases.	Table 5 – G3:G52
Capital Expenditures	Non-recurring expenditures used to improve the productive capacity of a state park system. Typically, these are for land acquisition, periodic park improvements, and construction. Capital expenditures are funded through park-generated revenue, state appropriations, dedicated funds, bonds, federal funds, and other sources such as gifts, grants, and transfers.	Table 5 – Q3:Q52
Revenue	Monies generated from use fees and charges; this includes all revenue from 'entrance fees', 'camping fees', 'cabin/cottage rentals', 'lodge rentals', 'group facility rentals', 'restaurants', 'concessions', 'beaches/pools', 'golf courses', and 'other' sources such as donations.	Table 5 – DA3:DA52
Labor	The total count of full-time, part-time, and seasonal employees who maintain, operate, and protect a state park system.	Table 6 – U3:U52
Acreage	The total acreage within each state park system; this includes 'parks', 'recreation areas', 'natural areas', 'historical areas', 'environmental education areas', 'scientific areas', 'forests', 'fish and wildlife areas', and 'other miscellaneous areas'.	Table 1 – AN3:AN52

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