
Longitudinal changes in the outdoor recreation community's reaction to the COVID-19 pandemic.

Final report on a three-phase national survey of outdoor enthusiasts.

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The COVID-19 pandemic continues to alter daily life and lead to changes in the way we spend time outside. In an effort to gather timely and relevant data on national recreation patterns, the Leave No Trace Center for Outdoor Ethics and its academic partner, Pennsylvania State University, have been working to conduct a study that can offer guidance to land managers, recreation providers, and outdoor enthusiasts across the United States. Through three phases of survey-based data collection, ranging from April 9th to May 21st, 2020, a longitudinal perspective of how outdoor recreationists are reacting to the COVID-19 pandemic was developed from this research. The timing of this research was purposeful, as it intended to capture self-reported information related to outdoor recreation and COVID-19 during periods of time when the virus had been officially documented as a pandemic, resulting federal and state stay-at-home orders were implemented across the U.S., and many parks and protected closed or discontinued regular operations. Phases 1 and 2 of this assessment were detailed by previous reports¹. This report details the findings across all three phases of research. These findings track behaviors, psychosocial determinants of outdoor recreation decision-making, and future intentions across the study period. This report is intended to provide valuable information for managing the changing recreation use of public lands, predicting spikes in recreation, and offering insight for land managers as they work to protect the natural world.

The following tables, figures, and corresponding brief descriptions are intended to compare results across the three phases of this research effort.

Please note that not all respondents answered all questions.

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¹Rice, W. L., Mateer, T., Taff, B. D., Lawhon, B., Reigner, N., & Newman, P. (2020, May 6). The COVID-19 pandemic continues to change the way people recreate outdoors: A second preliminary report on a national survey of outdoor enthusiasts amid the COVID-19 pandemic [Pre-print]. SocArXiv. <https://doi.org/10.31235/osf.io/dghba>

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Study Schedule.

Phase 1:

48 hours of availability	29 days since pandemic declared
April 9 th launch at 9 AM MST	425,746 confirmed COVID-19 cases in the United States
	14,610 deaths caused by COVID-19 in the United States

Phase 2:

48 hours of availability	50 days since pandemic declared
April 30 th launch at 9 AM MST	1,062,675 confirmed COVID-19 cases in the United States
	57,137 deaths caused by COVID-19 in the United States

Phase 3:

48 hours of availability	71 days since pandemic declared
May 21 st launch at 9 AM MST	1,565,311 confirmed COVID-19 cases in the United States
	88,470 deaths caused by COVID-19 in the United States

Response Rate.

Phase 1:

63,890 recipients within the Leave No Trace Center for Outdoor Ethics' email listserv
3,005 recipients opened the email containing the survey link
1,012 recipients completed the survey

Phase 2:

63,864 recipients within the Leave No Trace Center for Outdoor Ethics' email listserv
8,046 recipients opened the email containing the survey link
823 recipients completed the survey
25.4% completed Phase 1 survey

Phase 3:

64,567 recipients within the Leave No Trace Center for Outdoor Ethics' email listserv
9,076 recipients opened the email containing the survey link
816 recipients completed the survey
8.1% completed Phase 1 survey only
9.4% completed Phase 2 survey only
15.6% completed both Phase 1 and Phase 2 surveys

Sample Demographics.

Gender

Phase 1:

Female: 57.8%
 Male: 39.0%
 Transgender: 0.2%
 Non-binary: 1.3%
 Other: 0.2%
 Prefer not to say: 1.5%

Phase 2:

Female: 57.0%
 Male: 39.6%
 Transgender: 0.6%
 Non-binary: 1.2%
 Other: 0%
 Prefer not to say: 1.5%

Phase 3:

Female: 54.7%
 Male: 42.4%
 Transgender: 0.1%
 Non-binary: 0.8%
 Other: 0.3%
 Prefer not to say: 1.6%

Age

Phase 1:

Mean: 45 years old
 Std. deviation: 15.6 years

Phase 2:

Mean: 47 years old
 Std. deviation: 15.6 years

Phase 3:

Mean: 48 years old
 Std. deviation: 15.1 years

Residency

Phase 1:

U.S. residents: 97.5%
 Non-U.S. residents: 2.5%

Phase 2:

U.S. residents: 97.4%
 Non-U.S. residents: 2.6%

Phase 3:

U.S. residents: 97.6%
 Non-U.S. residents: 2.4%

Table 1: Community of Residence

Community with a population of...	Phase 1	Phase 2	Phase 3
Less than 5,000 (rural area)	34.7%	31.5%	30.5%
Between 5,000 and 50,000 (urban cluster)	24.7%	25.2%	22.7%
More than 50,000 (urban area)	40.6%	43.3%	46.8%

Adapted from U.S. Census Bureau (2010)

Frequency of Outdoor Recreation.

Table 2: Amount of days per week in which respondents participated in outdoor recreation

	Phase 1: (n = 1118)	Phase 2: (n = 823)	Phase 3 (n=807)
Average days ^{a*}	4.75 ^{2,3}	5.08 ¹	5.17 ¹

Eta² = 0.01

*Difference between groups is statistically significant at a 99% confidence interval

¹Statistically significantly different than Phase 1 at a 95% confidence interval

²Statistically significantly different than Phase 2 at a 95% confidence interval

³Statistically significantly different than Phase 3 at a 95% confidence interval

^aEquality of variances can not be assumed

Frequency of outdoor recreation participation increased throughout the study period, with frequency in Phases 2 and 3 being significantly higher than in Phase 1 (Table 2). The effect size is small, however.

Distance Traveled to Participate in Outdoor Recreation.

Table 3: Average distance travelled by respondents to participate in outdoor recreation

	Phase 1: (n=877)	Phase 2: (n=698)	Phase 3 (n=791)
Average distance travelled ^{a*}	1.94 ³	2.07 ³	2.64 ^{1,2}

Scale: 1 = "0 to 2 miles", 2 = "3 to 5 miles", 3 = "6 to 15 miles", 4 = "16 to 50 miles, 5 = "≥ 50 miles"
Eta² = 0.06

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Distance travelled to participate in outdoor recreation increased throughout the study period, with distance travelled in Phase 3 being significantly longer than that seen in Phases 1 and 2 (Table 3).

Backcountry Distance Traveled During Outdoor Recreation.

Table 4: Approximate distance from roads ventured for outdoor recreation activities

	Phase 1: (n=728)	Phase 2: (n=594)	Phase 3: (n=636)
Average distance from roads ^{a*}	2.61 ³	2.71 ³	3.19 ^{1,2}

Eta² = 0.01

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Backcountry distance traveled increased throughout the study period, with backcountry travel in Phase 3 being significantly greater than that seen in Phases 1 and 2 (Table 4). The effect size is small, however.

Outdoor Recreation Group Size.

Table 5: Average outdoor recreation group size

	Phase 1: (n = 940)	Phase 2: (n = 720)	Phase 3 (n=788)
Average Group Size ^{ns, a}	1.85	2.15	2.19

^{ns}Difference between groups is not statistically significant at a 95% confidence interval

^aEquality of variances can be assumed

Average group size increased throughout the study period, however group sizes in each of the three phases were not significantly different (Table 5).

Change in Outdoor Recreation Area Use.

Table 6: Average change in use during the prior three weeks among respondents for various land and water designations

Land and/or Water Designation	Average Change in Use⁺			Eta²
	Phase 1:	Phase 2:	Phase 3:	
Private land or waters*	-0.68x ^{2,3}	-0.17x ¹	-0.12x ¹	0.02
Neighborhood or city streets*	+0.92x ³	+1.10x ³	+0.63x ^{1,2}	0.01
City or town parks*	-0.85x ^{2,3}	-0.54x ¹	-0.42x ¹	0.01
County or regional parks*	-1.15x ^{2,3}	-0.72x ^{1,3}	-0.43x ^{1,2}	0.02
Land trust or conservancy lands*	-1.07x ³	-0.85x ³	-0.38x ^{1,2}	0.02
State Parks*	-1.58x ^{2,3}	-1.27x ^{1,3}	-0.85x ^{1,2}	0.02
State Forests*	-1.35x ^{2,3}	-1.01x ^{1,3}	-0.61x ^{1,2}	0.02
State Game Management lands*	-1.04x ³	-0.89x ³	-0.54x ^{1,2}	0.01
National Forests*	-1.38x ^{2,3}	-1.09x ^{1,3}	-0.67x ^{1,2}	0.02
Bureau of Land Management lands*	-1.18x ^{2,3}	-0.89x ^{1,3}	-0.60x ^{1,2}	0.02
National Wildlife Refuges*	-1.19x ^{2,3}	-0.90x ^{1,3}	-0.53x ^{1,2}	0.03
Army Corps of Engineers recreation areas*	-0.94x ^{2,3}	-0.70x ¹	-0.49x ¹	0.01
National Park Service sites*	-1.62x ^{2,3}	-1.36x ^{1,3}	-0.91x ^{1,2}	0.03
Wilderness Areas*	-1.28x ^{2,3}	-0.97x ^{1,3}	-0.53x ^{1,2}	0.03
Ocean*	-1.05x ^{2,3}	-0.75x ²	-0.71x ²	0.01

*Difference between groups statistically significant at a 99% confidence interval

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³Statistically significantly different than Phase 3 at a 95% confidence interval

⁺“Please indicate by what amount you have changed your use of the following types of recreation areas.”

A considerable change in use of various types of public lands occurred throughout the study period (Table 6). Notably, change in use of neighborhood and city streets decreased in Phase 3 to a level significantly less than those seen in Phases 1 and 2. For all other designations, decrease in use was significantly less profound in Phase 3, as opposed to Phases 1 and/or 2. This may indicate a migration away from neighborhood and city streets and back to public lands, therefore reducing substitution behavior.

Reasons for Changing Outdoor Recreation Behavior.

Table 7: Reasons for changing outdoor recreation behaviors.

Reason	Level of Agreement [†]			Eta ²
	Phase 1:	Phase 2:	Phase 3:	
I wanted to honor social distancing recommendations/policies. ^a	4.24	4.18	4.33	N/A
I did not want to expose myself to individuals who may be carrying COVID-19. ^{a*}	4.03 ³	3.92 ³	4.24 ^{1,2}	0.01
I felt ill. ^{a*}	1.53	1.42	1.55	N/A
I was caring for an ill individual. ^{a*}	1.60 ²	1.45 ^{1,3}	1.67 ²	0.01
I did not want to risk injury that would require medical attention. ^{a*}	3.14 ³	3.17	3.39 ¹	0.01
The area(s) where I am able to participate in outdoor recreation was closed due to the COVID-19 pandemic. ^{a*}	3.15 ³	3.27	3.36 ¹	0.00
Other obligations in my life (e.g., childcare, household responsibilities) now occupy my recreation time. ^a	2.43	2.31	2.33	N/A
My economic situation has changed because of COVID-19. ^a	2.54	2.46	2.57	N/A
My access to transportation has changed because of COVID-19. ^{a*}	1.96 ^{2,3}	1.66 ¹	1.79 ¹	0.01
The friends or family with whom I recreated are no longer recreating and I don't want to/can't do it alone. ^{a*}	2.34 ³	2.18	2.13 ¹	0.01

^aEquality of variances can not be assumed

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²Statistically significantly different than Phase 2 at a 95% confidence interval

³Statistically significantly different than Phase 3 at a 95% confidence interval

[†]Scale: 1= Strongly Disagree, 3 = Neither, 5 = Strongly Agree

Reasons for changing outdoor recreation behaviors shifted throughout the study period (Table 7). Barriers including access to transportation and the lack of friends and family to recreate with became less prominent as the study period progressed. Barriers including closed recreation areas and fear of COVID-19 exposure became more prominent throughout the study period. Effect sizes are small, however.

Psychosocial Factors Influencing Outdoor Recreation Decisions.

Table 8: Importance of various items when making outdoor recreation decisions measured across all three phases

	Phase 1: Mean (Std. Dev.)*	Phase 2: Mean (Std. Dev.)*	Phase 3: Mean (Std. Dev.)*
How important are the following factors when making outdoor recreation decisions (e.g. frequency of outing, distance from home, activity) during the COVID-19 pandemic?			
How severe I perceive the COVID-19 pandemic to be in the area I am recreating. ¹	3.75 (1.18)	3.56(1.21)	3.55(1.21)
How likely I believe I am to contract COVID-19 while participating in my outdoor recreation activity. ¹	3.38 (1.33)	3.27 (1.35)	3.30 (1.35)
The likelihood that I will unintentionally spread COVID-19 to others while recreating outdoors. ¹	3.69 (1.28)	3.50 (1.33)	3.56 (1.30)
The outdoor recreation behaviors of my friends or family. ²	3.36 (1.31)	3.28 (1.30)	3.10 (1.25)
The outdoor recreation behaviors of my neighbors and surrounding community. ²	3.51 (1.24)	3.36 (1.24)	3.20 (1.30)
The discussion I see on social media about recreating outdoors during the COVID-19 pandemic. ²	3.02 (1.33)	2.78 (1.31)	2.59 (1.31)
The behavioral recommendations provided by the Center for Disease Control. ³	4.14 (0.95)	4.00 (1.06)	3.80 (1.15)
The behavioral recommendations provided by the World Health Organization. ³	3.94 (1.14)	3.72 (1.23)	3.46 (1.33)
The orders and regulations of my state of residence regarding allowed behavior during the COVID-19 pandemic. ³	4.27 (0.89)	4.14 (0.98)	3.97 (1.09)
Recommendations from land management agencies regarding outdoor recreation during the COVID-19 pandemic. ³	4.12 (0.95)	3.98 (1.07)	3.87 (1.12)
The open/closed status of public lands or public lands facilities. ³	4.42 (0.85)	4.32 (0.97)	4.26 (0.95)
The desire to support my physical health through exercise. ⁴	4.27 (0.92)	4.30 (0.85)	4.29 (0.85)
The desire to support my overall health by spending time in the outdoors. ⁴	4.35 (0.89)	4.44 (0.76)	4.41 (0.78)
The desire to relieve stress and support my mental health. ⁴	4.33 (0.89)	4.37 (0.86)	4.36 (0.83)
To fill the time I normally spent doing other recreation activities that I cannot do during the COVID-19 pandemic. ⁵	3.20 (1.26)	3.06 (1.30)	2.96 (1.31)
To have a reason to leave home during the COVID-19 pandemic. ⁵	2.99 (1.40)	3.02 (1.32)	2.84 (1.33)
The desire to partake in a safe leisure activities during the COVID-19 pandemic. ⁵	3.96 (1.06)	3.95 (1.08)	3.85 (1.09)

*Scale: 1 = Not at all important, 2=Slightly Important, 3=Moderately Important, 4=Very Important, 5 = Extremely important

¹Included in Perceived Risk Scale

²Included in Social Norms Scale

³Included in Orders from Authority Scale

⁴Included in Health Benefits Scale

⁵Included in Substitution Scale



Table 9: Trends in latent psychosocial constructs influencing outdoor recreation decisions during the COVID-19 pandemic, analyzed using Spearman rank-order correlation

Psychosocial Construct	Phase 1*	Phase 2*	Phase 3*	Correlation Coefficient	P-Value**
Perceived Risk	3.61	3.44	3.47	-0.050	0.011
Social Norms	3.30	3.14	2.97	-0.134	<0.001
Orders from Authority	4.18	4.03	3.87	-0.142	<0.001
Health Benefits	4.32	4.37	4.35	0.008	0.699
Substitution	3.39	3.34	3.22	-0.074	<0.001

*Scale: 1 = Not at all important, 2=Slightly Important, 3=Moderately Important, 4=Very Important, 5 = Extremely important

**Bonferroni Correction utilized for multiple comparisons (p<0.01)

Developed scales utilized in all three phases were grounded in relevant academic literature on psychosocial factors influencing outdoor recreation. This includes perceptions of risk (Green et al., 2009; Reis et al., 2012), messages from authority (Marion & Reid, 2007), social norms (Heberlein, 2012), health benefits (Kuo, 2015), and substitution processes (Hammit et al., 2004). Reliability analyses during Phase 1 showed all scales were appropriately reliable with Cronbach's Alpha scores greater than 0.65 (Vaske, 2008). Furthermore, a confirmatory factor analysis demonstrated appropriate fit with the following statistics: RMSEA=0.079; SRMR=0.0594; CFI=0.902. Average ratings across corresponding single-item measures in Table 8 were calculated to determine the scales displayed in Table 9. Spearman rank-order correlation analysis with a Bonferroni Correction was utilized to determine trends across the three points of measurement (Table 9). Social Norms, Orders from Authority, and Substitution ratings were all negatively correlated with time across the three measurement phases, implying individuals saw these factors as less important when making outdoor recreation decisions as the COVID-19 pandemic progressed. There was no significant change in ratings for Health Benefits and Perceived Risk across the three phases.

Likelihood of Returning to Preferred Outdoor Recreation Behavior and Patterns.

Table 10: How likely are you to continue or return to your preferred recreation behaviors/patterns when you perceive the threat of COVID-19 has become minimal?

	Phase 1: (n = 946)	Phase 2: (n = 656)	Phase 3: (n=743)
Not at all likely	1.2%	0.9%	0.5%
Slightly likely	3.9%	3.2%	4.6%
Moderately likely	10.3%	12.2%	10.2%
Very likely	23.2%	24.8%	24.6%
Extremely likely	61.5%	58.8%	60.0%

Difference between groups is not statistically significant at a 95% confidence interval

Likelihood to continue or return to preferred recreation behaviors/patterns when the perceived threat of COVID-19 becomes minimal did not significantly change between phases (Table 10). Likelihood remained relatively high throughout.

Perceived Long-Term Changes in Recreation Behavior.

Table 11: Do you perceive that your outdoor recreation behavior (i.e., where, when, how, and with whom) will change in the long-term following the World Health Organization's official announcement ending the COVID-19 pandemic?

	Phase 1: (n = 944) ^{2,3}	Phase 2: (n = 656) ¹	Phase 3: (n=746) ¹
Yes	37.7%	49.4%	51.6%
No	62.3%	50.6%	48.4%

Eta² = 0.02

Difference between phases is statistically significant at a 99.9% confidence interval

Equality of variances can be assumed

¹Statistically significantly different than Phase 1 at a 95% confidence interval

²Statistically significantly different than Phase 2 at a 95% confidence interval

³Statistically significantly different than Phase 3 at a 95% confidence interval

Table 12: If yes, please respond by indicating your agreement or disagreement with the following statements.

Following the World Health Organization's official announcement ending the COVID-19 pandemic, my long-term outdoor recreation participation will change from how I recreated before the pandemic by...	Phase 1: (n = 356)	Phase 2: (n = 320)	Phase 3: (n = 373)	Eta ²
...traveling further than I previously did to recreate. ^b	0.07	0.24	0.21	N/A
...utilizing my local public lands more often. ^b	0.69	0.82	0.77	N/A
...participating in more types of outdoor recreation. ^b	0.66	0.66	0.60	N/A
...participating in more fitness-based outdoor recreation activities. ^b	0.44	0.43	0.42	N/A
...changing the types of outdoor recreation I participate in. ^{b*}	0.13 ^{2,3}	0.35 ¹	0.34 ¹	0.01
...changing the time of day I recreate. ^b	0.09	0.19	0.28	N/A
...changing the days of the week I recreate. ^b	0.19	0.21	0.31	N/A
...recreating alone more often. ^a	0.12	0.23	0.23	N/A

Scale: -2 = Strongly disagree, 2 = Strongly agree, 0 = Neither agree nor disagree

^aEquality of variances can not be assumed

^bEquality of variances can be assumed

*Statistically significant difference between phases at a 95% confidence interval

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²Statistically significantly different than Phase 2 at a 95% confidence interval

³Statistically significantly different than Phase 3 at a 95% confidence interval

Respondents surveyed in Phases 2 and 3 were significantly more likely to perceive changes in their long-term outdoor recreation behaviors than those surveyed during Phase 1 (Table 11). Of the specific behaviors included in the surveys, only changing types of outdoor recreation saw significant differences between phases (Table 12). Effect sizes for both the omnibus and post-hoc comparison are small, however.

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