Continued longitudinal analysis of avid outdoor recreationists during the COVID-19 pandemic and sensitivities to new outdoor recreationists.

William L. Rice¹, Timothy J. Mateer², B. Derrick Taff^{2*}, Ben Lawhon^{3*}, and Peter Newman²

¹University of Montana Parks, Tourism, and Recreation Management Program

²The Pennsylvania State University Department of Recreation, Park, and Tourism Management

³Leave No Trace Center for Outdoor Ethics

The COVID-19 pandemic has altered outdoor recreation behaviors in the United States for over one year. In an effort to continue gathering timely and relevant data on national outdoor recreation patterns, the Leave No Trace Center for Outdoor Ethics and its academic partners, Pennsylvania State University and the University of Montana, conducted a four-phase study to offer guidance to land managers, recreation providers, and outdoor enthusiasts across the United States. This report details findings from Phase 4, occurring one year into the pandemic. By comparing survey results from April 2020 (Phase 1) and April 2021 (Phase 4), we provide a longitudinal perspective of how avid outdoor recreationists' reported behaviors and perspectives are evolving with the ever-changing pandemic. Phases 1, 2, and 3 of this assessment were detailed by previous reports¹. In addition to examining differences between April 2020 (Phase 1) and April 2021 (Phase 4), this report details how avid outdoor recreationists have been impacted by and reacted to influxes of new outdoor recreationists during the pandemic. This report is intended to provide valuable information for managing changing recreation use of public lands and offer 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.

*Corresponding Authors: ben@lnt.org (B. Lawhon) and bdt3@psu.edu (B. D. Taff)

¹Rice, W. L., Mateer, T., Taff, B. D., Lawhon, B., Reigner, N., & Newman, P. (2020). 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 [Pre-print]. SocArXiv
Rice, 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.
Rice, W. L., Meyer, C., Lawhon, B., Taff, B. D., Mateer, T., Reigner, N., & Newman, P. (2020, April 18). The COVID-19 pandemic is changing the way people recreate outdoors: Preliminary report on a national survey of outdoor enthusiasts amid the COVID-19 pandemic [Pre-print]. SocArXiv.

Study Schedule.

April 2020:

48 hours of availability	29 days since pandemic declared
April 9 th launch at 9 AM MST	480,667 cumulative confirmed COVID-19 cases in the U.S.
	14,610 total deaths caused by COVID-19 in the U.S.

April 2021:

48 hours of availability	393 days since pandemic declared
April 8 th launch at 9 AM MST	31 million cumulative confirmed COVID-19 cases in the U.S.
	560,360 total deaths caused by COVID-19 in the U.S.

Response Rate.

April 2020:

63,890 recipients within the Leave No Trace Center for Outdoor Ethics' email list
1,012 recipients completed the survey

April 2021:

≈63,890¹ recipients within the Leave No Trace Center for Outdoor Ethics' email list
803 recipients completed the survey
6.4% completed the April 2020 survey

¹Only those emails that were on the Leave No Trace Center for Outdoor Ethics' email list prior to April 9th, 2020 were sent the April 2021 survey. It is possible and likely that some individuals unsubscribed prior to April 2021.

Sample Demographics.

Gender¹

April 2020

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

April 2021

Woman: 50.6%
Man: 44.7%
Non-binary: 2.1%
Prefer not to disclose: 2.0%
Prefer to self-describe: 0.7%

¹Gender measures were adapted for April 2021 survey to be more inclusive

Age

April 2020:

Mean: 46 years old
Std. deviation: 15.4 years

April 2021:

Mean: 50 years old
Std. deviation: 15.8 years

Table 1: Community of Residence

Community with a population of...	April 2020	April 2021
Less than 5,000 (rural area)	34.6%	27.0%
Between 5,000 and 50,000 (urban cluster)	24.8%	28.5%
More than 50,000 (urban area)	40.7%	44.4%

Adapted from U.S. Census Bureau (2010)

Frequency of Outdoor Recreation.

Table 2: Days per week in which respondents participated in outdoor recreation

	April 2020: (n = 1053)	April 2021: (n = 773)
Average days*	4.77 ¹	5.03

Eta² = 0.03

*Difference between groups is statistically significant at a 98% confidence interval

¹Statistically significant difference between rural, urban-cluster, and urban residents at a 95% confidence interval

Equality of variances cannot be assumed

Frequency of outdoor recreation participation increased significantly from April 2020 to April 2021, returning to pre-pandemic levels (see Rice, Meyer, et al., 2020). Importantly, while the April 2020 survey showed significant disparities in frequency of outdoor recreation across community types, no such differences were found in April 2021 (Table 2) (see Rice, Mateer, et al., 2020), following the lifting of most major lockdowns in the U.S. (Killeen et al., 2020).

Distance Traveled to Participate in Outdoor Recreation.

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

	April 2020: (n = 847)	April 2021: (n = 773)
Average distance travelled*	1.96 ¹	2.78

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 = 0.091

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

¹Statistically significant difference between rural, urban-cluster, and urban residents at a 99.9% confidence interval

Equality of variances cannot be assumed

Distance traveled to participate in outdoor recreation increased significantly from April 2020 to April 2021, but not approaching pre-pandemic levels reported in Phase 1 (3.52 miles). This may signify a long-term trend toward recreating closer to home (Salama, 2020). Importantly, while the April 2020 survey showed significant disparities in distance traveled to participate in outdoor recreation across community types (see Rice, Mateer, et al., 2020), no such differences were found in April 2021 (Table 3), following the lifting of most major lockdowns in the U.S.

Backcountry Distance Traveled During Outdoor Recreation.

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

	April 2020: (n = 706)	April 2021: (n = 721)
Average distance from roads ^{ns}	2.61 miles ¹	2.57 miles

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

¹Statistically significant difference between rural, urban-cluster, and urban residents at a 99.9% confidence interval

Equality of variances can be assumed

Average backcountry distance travelled did not significantly change from April 2020 to April 2021. Average backcountry distance travelled remains substantially lower than the average distance traveled prior to the pandemic reported during Phase 1 (4.77 miles; Rice, Meyer, et al., 2020). Importantly, while the April 2020 survey showed significant disparities in average distance travelled into the backcountry while participating in outdoor recreation across community types (see Rice, Mateer, et al., 2020), no such differences were found in April 2021 (Table 4).

Outdoor Recreation Group Size.

Table 5: Average outdoor recreation group size

	April 2020: (n = 905)	April 2021: (n = 771)
Average Group Size*	1.85	2.64

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

Eta² = 0.035

Equality of variances cannot be assumed

Average group size increased significantly from April 2020 to April 2021 (Table 5), likely the result of shifting safety guidance concerning group activities outdoors and continuing vaccination efforts (Parker-Pope, 2021).

Change in Outdoor Recreation Area Use.

Table 6: Average change in use over the past year for various land and water designations reported by April 2021 survey respondents

Land and/or Water Designation	Change from April 2020 to April 2021 ^a
Private land or waters*	-0.14x
Neighborhood or city streets*	+0.61x
City or town parks*	+0.01x
County or regional parks*	-0.18x
Land trust or conservancy lands*	-0.09x
State Parks*	0.00x
State Forests*	+0.03x
State Game Management lands*	-0.18x
National Forests*	-0.02x
Bureau of Land Management lands*	-0.04x
National Wildlife Refuges*	-0.15x
Army Corps of Engineers recreation areas*	-0.26x
National Park Service sites*	-0.37x
Wilderness Areas*	-0.09x
Ocean*	-0.39x

^a“Please indicate by what amount you have changed your use of the following types of recreation areas in the last year.”

Ocean and national park settings saw the largest decreases in use among this population of avid outdoor recreationists from April 2020 to April 2021 (Table 6). This is contrary to well-documented increases in use in some prominent national parks—though perhaps more indicative of changes in use across the national park system (Templeton et al., 2021)—and is interesting given guidance from the Centers for Disease Control and Prevention concerning the relative safety of beach-centered recreation (Kane et al., 2020). Neighborhood and city streets saw the largest increase in use among this population.

Perceived Long-Term Changes in Recreation Behavior.

Table 7: 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?

	April 2020: (n = 909)	April 2021: (n = 756)
Yes*	37.0%	43.0%
No	63.0%	57.0%

Eta² = 0.004

*Difference between perceived long-term behavior is statistically significant at a 98% confidence interval
Equality of variances cannot be assumed

Table 8: 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...	April 2020: (n = 328)	April 2021: (n = 314)	Eta²
...traveling further than I previously did to recreate. ^{b,1}	0.09	0.80	0.08
...utilizing my local public lands more often. ^{b,2}	0.68	0.84	0.01
...participating in more types of outdoor recreation. ^{b,1}	0.66	0.90	0.01
...participating in more fitness-based outdoor recreation activities. ^b	0.43	0.47	N/A
...changing the types of outdoor recreation I participate in. ^{b,1}	0.12	0.48	0.03
...changing the time of day I recreate. ^{b,2}	0.08	0.25	0.01
...changing the days of the week I recreate. ^b	0.19	0.30	N/A
...recreating alone more often. ^a	0.13	0.18	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

¹Statistically significant difference at a 99.9% confidence interval

²Statistically significant difference at a 95% confidence interval

The portion of avid outdoor recreationists indicating that their long-term outdoor recreation behavior would change following the end of the pandemic increased significantly between April 2020 and April 2021 (Table 7). Specific perceived behavioral changes also shifted (Table 8). Of those indicating that they would change their behavior long-term, respondents in April 2021 were significantly more in agreement concerning changes to the time of day, types of activities, diversity of activities, types of public lands, and distance traveled to recreate compared to their outdoor recreation participation prior to the pandemic. Of these perceived changes, the largest increase occurred concerning traveling further to recreate than prior to the pandemic.

Displacement and Substitution in response to Increased Visitation.

Table 9: Did you change your outdoor recreation participation (i.e., places you recreate, frequency you recreate, how you recreate, etc.) in response to an observed or perceived increase(s) in visitation by others in the place(s) you regularly recreated prior to the COVID-19 pandemic?

	April 2021: (n = 772)
Yes	59.6% (460)
No	40.4% (312)

Table 10: Displacement behaviors in response to increased visitation *and* differences between those who perceived long-term changes in recreation behavior (see Table 7)

Displacement behavior**	Total Mean (n=440)	Perceived Long-Term Change (n=238)	No Perceived Long-Term Change (n=202)	Eta ²
I visited recreation areas earlier in the day.	1.67	1.63	1.71	N/A
I visited recreation areas later in the day.	1.10	1.13	1.07	N/A
I changed location(s) within the areas I regularly recreate instead of my preferred location(s).	1.99	2.03	1.94	N/A
I went to alternate area(s) to recreate instead of my preferred area(s).	2.41	2.36	2.47	N/A
I reduced the amount of areas that I regularly recreate within. [‡]	1.80 ²	1.94	1.64	0.01
I reduced the frequency that I regularly recreate. [‡]	1.34 ¹	1.60	1.03	0.03
I changed from my preferred activity to a less favorable activity.	1.15 ¹	1.29	1.00	0.01

**“If Yes, how did you change your outdoor recreation participation (i.e., places you recreate, frequency you recreate, how you recreate, etc.) in response to an observed or perceived increase(s) in visitation by others in the place(s) you regularly recreated prior to the COVID-19 pandemic?”

*0 = Not at all true, 1 = Slightly true, 2 = Moderately true, 3 = Very true, 4 = Completely true

‡Equality of variances cannot be assumed

¹Statistically significant difference at a 99% confidence interval

²Statistically significant difference at a 95% confidence interval

Table 11: Reasons for displacement behaviors in response to increased visitation

Reason for displacement**	Total Mean (n=440)	Perceived Long-Term Change (n=238)	No Perceived Long-Term Change (n=202)	Eta ²
I changed participation in response to the density of other people.	2.93	2.95	2.91	N/A
I changed participation in response to crowding.	2.88	2.92	2.85	N/A
I changed participation in response to others not wearing masks.	2.45	2.57	3.31	N/A
I changed participation in response to others not practicing social distancing.	2.48 ¹	2.61	2.33	0.01

I changed participation in response to influxes of perceived new recreationists causing new impacts to the resources.	2.19	2.27	2.09	N/A
---	------	------	------	-----

*“If Yes, why, specifically, did you change your outdoor recreation participation (i.e., places you recreate, frequency you recreate, how you recreate, etc.) in response to an observed or perceived increase(s) in visitation by others in the place(s) your regularly recreated prior to the COVID-19 pandemic?”

*0 = Not at all true, 1 = Slightly true, 2 = Moderately true, 3 = Very true, 4 = Completely true

¹ Statistically significant difference at a 95% confidence interval

Nearly 60% of April 2021 respondents indicated that they changed their outdoor recreation participation over the last year in response to an observed or perceived increase(s) in visitation by others in the place(s) they regularly recreated prior to the COVID-19 pandemic (Table 9). In terms of displacement behaviors, the highest levels of agreement were found for recreating earlier in the day, changing the location of recreation, and reducing the amount of areas that are used for recreation (Table 10). The highest levels of reporting for reasons leading to this displacement included dense conditions and crowding (Table 11).

Of those indicating a change in participation, there were significant differences in how and why they changed their participation based on whether they perceived long-term changes in recreation behavior, following the conclusion of the COVID-19 pandemic (see Table 7). Those who perceived long-term changes in their behavior reduced both the amount of areas that they regularly recreate within and the frequency with which they recreate significantly more than those who did not perceive long-term changes. The former group also reported changing activities at a greater level than the latter group. Concerning reasons for displacement, those perceiving long-term changes reported changing their participation in response to others not practicing social distancing at a significantly greater level.

Expected Agency Management Actions.

Table 12: What operational practices do you expect public land agencies to implement in response to the COVID-19 pandemic?

	April 2021: (n = 771)
Require visitors to present vaccination cards (or vaccination passports)	1.15
Require certificate of immunity (signed by licensed physician) due to the fact that a visitor has recovered from an infection or has been vaccinated (once vaccines are available)	0.96
Require employees to wear masks	2.80
Encourage visitors to wear masks	2.82
Require visitors to wear masks	2.45
Use timed entries (whether through entrance gates, trailheads, etc.)	1.92
Implement capacity limits	2.52
Place signage encouraging people to stay six feet apart from one another in high traffic areas	2.58
Place indicators on paths to remind visitors to stay six feet apart in normally crowded areas	2.23
Enforce social distancing	1.94

*0 = Not at all agree, 1 = Slightly agree, 2 = Moderately agree, 3 = Strongly agree, 4 = Completely agree

April 2021 respondents had highest levels of expectations for public land agencies concerning enforcing and encouraging the wearing of masks by visitors and employees (Table 12). Expectations were lowest for requirements concerning vaccine passports and certifications of immunity.

Differences based on Sensitivity to New Outdoor Recreationists.

Table 13: Differences in COVID-19-related expectations for public land agencies, support for opening home communities to tourists, and displacement behaviors by level of sensitivity to new outdoor recreationists

What operational practices do you expect public land agencies to implement in response to the COVID-19 pandemic? ^a	Level of Sensitivity to New Outdoor Recreationists ^d			Eta ²
	Not at all (n=78)	Slightly to Moderately (n=157)	Very to Completely (n=205)	
Require visitors to present vaccination cards (or vaccination passports)	.92 ^{2,3}	1.36 ¹	1.44 ¹	0.02
Require certificate of immunity (signed by licensed physician) due to the fact that a visitor has recovered from an infection or has been vaccinated (once vaccines are available)	.73 ^{2,3}	1.18 ¹	1.19 ¹	0.02
Require employees to wear masks [±]	2.77 ³	3.04	3.30 ¹	0.03
Encourage visitors to wear masks [±]	2.88	2.99	3.24	N/A
Require visitors to wear masks [±]	2.26 ³	2.65 ³	3.04 ^{1,2}	0.05
Use timed entries (whether through entrance gates, trailheads, etc.)	1.82 ³	2.06 ³	2.46 ^{1,2}	0.04
Implement capacity limits [±]	2.47 ³	2.62 ³	3.11 ^{1,2}	0.07
Place signage encouraging people to stay six feet apart from one another in high traffic areas [±]	2.55	2.76	2.99	N/A
Place indicators on paths to remind visitors to stay six feet apart in normally crowded areas [±]	2.14 ³	2.45	2.61 ¹	0.02
Enforce social distancing	1.82 ³	2.15	2.41 ¹	0.03
Support for opening home community to tourists^b				
How supportive are you to open your community to tourists with no restrictions?	-0.58 ³	-0.76 ³	-1.19 ^{1,2}	0.06
How supportive are you to open your community to tourists if there are restrictions on capacity?	0.63	0.80	0.77	N/A
Displacement behavior among those responding to an observed or perceived increase in visitation by others in the place(s) regularly used for recreation prior to the COVID-19 pandemic^c				
I visited recreation areas earlier in the day. [±]	1.14 ³	1.60 ³	1.93 ^{1,2}	0.04
I visited recreation areas later in the day. [±]	0.74	1.12	1.23	N/A
I changed location(s) within the areas I regularly recreate instead of my preferred location(s).	1.45 ^{2,3}	1.90 ^{1,3}	2.28 ^{1,2}	0.05
I went to alternate area(s) to recreate instead of my preferred area(s). [±]	2.03 ³	2.17 ³	2.76 ^{1,2}	0.06

I reduced the amount of areas that I regularly recreation within.	1.68	1.55 ³	2.05 ²	0.03
I reduced the frequency that I regularly recreation. [‡]	1.17	1.24	1.49	N/A
I changed from my preferred activity to a less favorable activity. [‡]	1.26	1.10	1.16	N/A

^a0 = Not at all agree, 1 = Slightly agree, 2 = Moderately agree, 3 = Strongly agree, 4 = Completely agree

^b-2 = Extremely unsupportive, -1 = Unsupportive, 0 = Neither supportive or unsupportive, 1 = Supportive, 2 = Extremely supportive

^c0 = Not at all true, 1 = Slightly true, 2 = Moderately true, 3 = Very true, 4 = Completely true

^d"I changed participation in response to influxes of perceived new recreationists causing new impacts to the resources."

¹Significantly different than not at all sensitive outdoor recreationists

²Significantly different than slightly to moderately sensitive outdoor recreationists

³Significantly different than very to completely sensitive outdoor recreationists

[‡] Equality of variances cannot be assumed

Significant differences were found for COVID-19-related expectations for public land agencies, support for opening home communities to tourists, and displacement behaviors based on reported levels of sensitivity to new outdoor recreationists (Table 13). Those most sensitive to new outdoor recreationists had significantly higher expectations for 8 of the 10 management actions included in the survey. Additionally, this same group was significantly less supportive of opening up their home communities to tourists without restrictions and reported significantly higher levels of spatial displacement.

References.

- Kane, B., Zajchowski, C. A. B., Allen, T. R., McLeod, G., & Allen, N. H. (2021). Is it safer at the beach? Spatial and temporal analyses of beachgoer behaviors during the COVID-19 pandemic. *Ocean & Coastal Management*, 205, 105533. <https://doi.org/10.1016/j.ocecoaman.2021.105533>
- Killeen, B. D., Wu, J. Y., Shah, K., Zapaishchykova, A., Nikutta, 614 P., Tamhane, A., Chakraborty, S., Wei, J., Gao, T., Thies, M., & Unberath, M. (2020). A County-level Dataset for Informing the United States' Response to COVID-19. *arXiv preprint arXiv:2004.00756*.
- Parker-Pope, T. (2021, April 22). Do We Still Need to Keep Wearing Masks Outdoors? *New York Times*. <https://www.nytimes.com/2021/04/22/well/live/covid-masks-outdoors.html>
- Rice, W. L., Mateer, T. J., Reigner, N., Newman, P., Lawhon, B., & Taff, B. D. (2020). Changes in recreational behaviors of outdoor enthusiasts during the COVID-19 pandemic: Analysis across urban and rural communities. *Journal of Urban Ecology*, 6(1), 1–7. <https://doi.org/10.1093/jue/juaa020>
- Rice, W. L., Meyer, C., Lawhon, B., Taff, B. D., Mateer, T., Reigner, N., & Newman, P. (2020). The COVID-19 pandemic is changing the way people recreate outdoors: Preliminary report on a national survey of outdoor enthusiasts amid the COVID-19 pandemic. OSF Pre-print. <https://doi.org/10.31235/osf.io/prnz9>
- Salama, A. M. (2020). Coronavirus questions that will not go away: interrogating urban and socio-spatial implications of COVID-19 measures. *Emerald Open Research*, 2(14), 1–14. <https://doi.org/10.35241/emeraldopenres.13561.1>

- Templeton, A. J., Goonan, K., & Fyall, A. (2021). COVID-19 and its impact on visitation and management at US national parks. *International Hospitality Review*.
<https://doi.org/10.1108/IHR-08-2020-0039>
- U.S. Census Bureau (2010). *2010 urban area FAQs*. Retrieved from <https://www.census.gov/programs-surveys/geography/about/faq/2010-urban-area-faq.html>