

TECHNICAL REPORT

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For the project entitled:

Assessing the improvement of access to nature provided by the proposed expansion of San Gabriel Mountains National Monument

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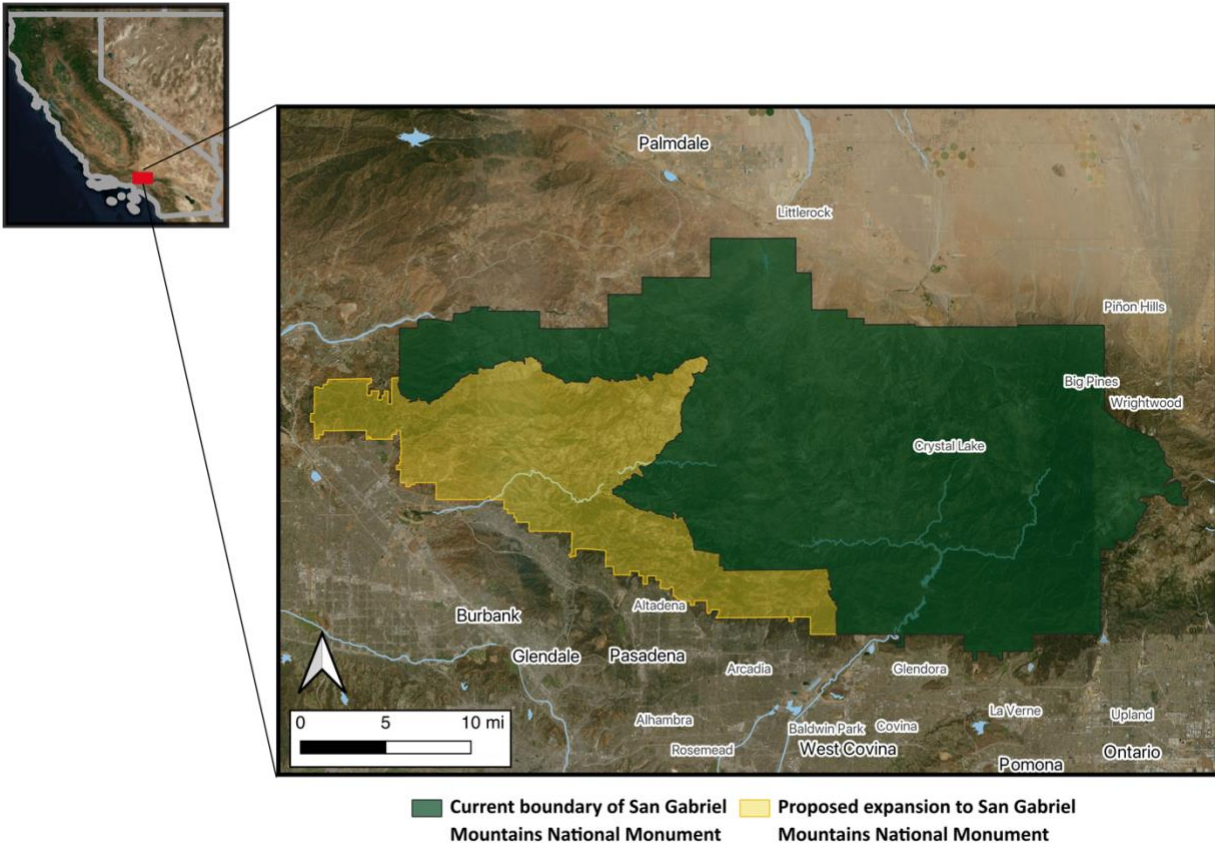
1. Introduction

In October 2014, President Barack Obama established the San Gabriel Mountains National Monument in southern California, providing protections for 342,177 acres of the Angeles National Forest and 4,002 acres of the San Bernardino National Forest under the management of the U.S. Forest Service. The national monument boasts expansive natural and cultural resources including exemplary chaparral habitat, critical habitat areas for threatened and endangered species including the California condor (*Gymnogyps californianus*) and Nelson's bighorn sheep (*Ovis canadensis nelsoni*), and over 600 archeological sites documenting human activities spanning over 8,000 years. The national monument is also unique in that it is situated near one of America's largest urban centers and is within 90 minutes of some 15 million people in the Los Angeles Basin. As such, it supports an almost unparalleled degree of access to nature for recreation activities like hunting, fishing, camping, and hiking in addition to supporting key ecosystem services to the region including the provisioning of nearly a third of the freshwater resources for Los Angeles¹.

A campaign is currently underway to expand the national monument westward by an additional 115,957 acres (Map 1). This expansion would improve protections for critical wildlife habitat, protect key freshwater sources, and ensure and expand equitable access to nature for urban and culturally diverse communities. Racial and economic disparities in nature access are well-documented, with more low-income and minority communities living in areas that are disproportionately developed and farther from natural areas ([Landau et al. 2020](#); [CSP, 2022](#)). However, increased protection of natural areas near urban areas can provide more equitable access to nature-deprived communities.

We undertook two related analyses to quantify the proposed expansion's ability to improve access to nature for the region's communities. Our analysis focused specifically on the degree to which nearby minority, low-income, and 'nature-deprived' communities stand to benefit from the proposed expansion (Landau et al. 2020, CSP 2022; Table 1). For this report, we defined communities as 'nature-deprived' if they experienced greater rates of human modification than the median census tract in California. The first approach evaluated improvement to access by estimating how many more people of different status groups would be within three, progressively larger buffer distances from the expanded national monument relative to the same buffer distances applied to the boundary of the current national monument following CSP, 2022. The second approach estimated changes in driving time to access the expanded national monument relative to the current boundary. We summarize our results for all census tracts and separately for tracts classified by their proportional make-up of key underserved status groups (Table 1).

¹ <https://www.fs.usda.gov/visit/san-gabriel-mountains-national-monument>



Map 1. The existing boundary of the San Gabriel Mountains National Monument (green) and the area within the proposed expansion (gold). Basemap: MapTiler.

3. Methods

Our analyses focused on how the national monument expansion could improve access for racial and ethnic minorities, low-income, and nature-deprived communities. Specifically, we focused on the status groups identified in Table 1.

Table 1. Status groups for which we estimated changes in access to the San Gabriel Mountain National Monument with and without the proposed expansion.

Race & ethnicity	Household income	Child poverty	Human modification
American Indian/Native Alaskan	Low-income	Families with children	Nature-deprived
Asian American	Moderate-income	< 18 with household	Not nature-deprived
Black/African American	High-income	income at or below	
Hispanic/Latinx		the poverty line	
Non-white		Families with children	
White (non-Hispanic)		< 18 with household	
		income above the	
		poverty line	

Identifying nature-deprived census tracts

In 2016, Conservation Science Partners (CSP) and the Center for American Progress (CAP) concluded work on the [Disappearing West Project](#), which measured the loss and fragmentation of natural lands in the western United States between 2001 and 2011. The principal product of that analysis was a map of the intensity and extent of human modification (or ‘HM’), a metric falling between 0 and 1 that describes the intensity of human land use on a per-pixel basis. In 2019, CSP developed [an update of HM for the conterminous U.S. for 2017](#). For all the following analyses, we first calculated the mean HM value for all census tracts in California. We classified tracts as ‘nature-deprived’ if their mean HM value exceeded the median of tract-level mean HM values and ‘not nature-deprived’ otherwise.

Analysis 1: Population changes

In our first analysis, we estimated improvements in access provided by an expanded national monument by estimating the total population of different status groups (Table 1) within increasing buffer distances from the national monument plus the proposed expansion, relative to the existing national monument boundary following CSP, 2022.

For estimates of total population numbers, we leveraged the results from the 2020 decennial census (U.S. Census Bureau, 2023) as it provides the most accurate data on population counts at the time of our analysis. We obtained tract-level population count data using the *tidycensus* R package (Walker and Herman 2023). We performed this analysis for all nature-deprived census tracts within the successive buffer distances.

We buffered both the existing national monument and the boundary of the national monument including the proposed expansion using three successive distances of 5, 15, and 30 miles. For each buffered distance, we intersected the buffer polygon with the census tracts and retained all tracts whose centroid was contained within the buffer. For each status group, we summed the total number of individuals across all retained census tracts. We then calculated the percent change in population within the respective buffer distances for the expanded national monument boundary relative to the existing national monument boundary.

Analysis 2: Driving time analysis

In our second analysis, we asked how the proposed monument expansion could reduce driving times for the region’s residents. The analysis consisted of two stages. In the first stage, we used a thresholding approach to determine whether a tract fell into a given status group based on the results of the 2017-2021 American Community Survey (ACS, U.S. Census Bureau 2022), following Landau et al. (2020). In the second stage, we estimated the changes in driving time from status group census tracts to the current and expanded national monument boundary.

Classifying census tracts

The five-year ACS summaries enable tracking of demographic changes between decennial surveys and provide the most up-to-date sample of demographic characteristics for communities across the country. To classify census tracts based on their racial or ethnic status groups, we calculated the proportion of each tract’s surveyed population for each status

group². Tracts belonging to a given status group were defined as those with a proportion of the status group population that was greater than or equal to the 75th percentile across all tracts in California. In other words, these tracts were among the top 25% of tracts in the state with the highest proportion of the status group population. We used the same approach for child poverty, but we calculated the proportion of families in the status group tract and compared that to the state-level 75th percentile. Census tracts were classified as having higher child poverty if the proportion of families with children < 18 years of age with household income below the federal poverty line was greater than the 75th percentile calculated for all census tracts in California and were classified as having lower child poverty otherwise. In general, inclusion in a racial, ethnic, or family status group does not necessarily mean that a majority of families or individuals in the tract fall into that group. Rather, it means that the tract has a high proportion of families or individuals in that group relative to other census tracts in California.

We identified low-income tracts as those with a median household income less than or equal to the 10th percentile of median income at the tract level across California. We identified high-income tracts as those with median household income greater than or equal to the 90th percentile of median income at the tract level across their state. Finally, we identified moderate-income tracts as those with median household income falling between the 10th and 90th percentile of median household income at the tract level across their state.

Census tracts could also be classified as multiple status groups (e.g., Asian American and low-income). We examined driving time changes for census tracts with key status-group combinations focusing specifically on census tracts that were classified as non-white, were low-income, had high child poverty, and experienced nature deprivation (Table 3).

Hereafter, we refer to classified census tracts as, for example, "non-white census tracts" or "low-income census tracts".

Driving time analysis

We first identified access points to the national monument with and without the proposed expansion and then calculated driving times between census tracts and their nearest access point (hereafter, simply 'driving time'). To identify access points, we sourced road data based on the TIGER line database maintained by the U.S. Census Bureau and accessed using the *tigris* R package (Walker, 2023). We retained primary, secondary, and local roads and only considered driving times using these roads. In the absence of a comprehensive spatial dataset describing designated staging areas within the national monument that would demarcate formal points of access by vehicle, we considered any point where a primary, secondary, or local roadway intersected the boundaries of the current monument (or the current monument plus its expansion) to be an access point. We assumed that the majority of visitors to the national monument would access it through the use of a personal vehicle.

² The ACS is a regularly-occurring sample of approximately 3.5 million households across the country. Unlike the decennial census, it provides only an estimate of the total number of individuals in each census tract.

We limited our analysis of driving time to census tracts within 50 km (approximately 32 mi). To estimate driving time for each census tract, we first identified the centroid of the tract and its nearest access point to the national monument. We then used the *gmapsdistance* R package (Zarruk and Melo 2023) to access the Google Maps API to calculate the driving distance between the nearest geolocated address to the tract centroid and the nearest national monument access point. This approach resulted in valid driving time estimates for 95 percent of the 3,446 tracts within 50 km of the national monument. For the remaining 180 tracts, the Google Maps API could not find valid routes to connect starting and endpoints. For these 180 tracts, we applied a modification to the start and end points for drive time estimates such that the origin was assigned to the nearest named location (usually a building or collection of buildings with a common name) located near the census tract centroid and the destination was set to the centroid of the current San Gabriel Mountains National Monument or the centroid of the expanded national monument, respectively. This approach resulted in adequate drive time estimates for an additional 168 tracts. For 12 census tracts (<1% of all census tracts within 50km of the national monument), driving time estimates could not be calculated due to the inability of the Google Maps API to identify a valid route connecting the start and ending points and were excluded from the driving time analysis. The vast majority of these 12 census tracts were in largely rural areas or had centroids that were within the national monument itself. Their exclusion from our driving time calculations is unlikely to have a significant impact on our results.

To estimate the potential reduction in driving time for residents of census tracts of different status groups resulting from the monument’s proposed expansion, we calculated the percent change in median driving time to the current national monument’s access points relative to the expanded national monument.

2. Results

If the San Gabriel Mountains National Monument were expanded, it could result in a 90% increase in the total number of people within 5 miles of the national monument’s boundary relative to current conditions.

Our analysis indicates that the proposed expansion of the San Gabriel Mountains National Monument could significantly expand access to the monument for the region’s residents. The expansion of the national monument means approximately 757,000 more people would be within 5 miles of the monument (90% more than without the expansion), 1,287,500 more people would be within 15 miles (22% more than without the expansion), and approximately

451,000 more people would be within 30 miles (3% more than without the expansion; Table 2).

Non-white residents would benefit significantly from the proposed national monument expansion. Nearly 464,000 more non-white residents would be within 5 miles of the expanded monument relative to without the expansion.

Non-white residents in particular would benefit significantly from the proposed expansion. An additional 463,744 non-white residents from surrounding census tracts would be within 5 miles of the national monument’s boundary if it were expanded (a 93.0% increase relative to without the expansion), compared to an additional 293,207 white residents (an 86.3% increase relative to without the expansion; Table 2). Similar statements of this form can be constructed for different status group-buffer distance combinations by referring to the results presented in Table 2. An example statement supported by these results could be: “The expansion of the national monument would result in approximately 260,000 more Black residents being within 5 miles of the monument relative to without the expansion - a nearly 60% increase over current conditions.”

Table 2. Changes in total estimated residents in census tracts within 5, 15, and 30 miles of the current San Gabriel Mountain National Monument boundary compared to the proposed expanded boundary.

Status group	Current National Monument Boundary	Expanded National Monument Boundary	Percent increase
5-mile buffer distance			
Total population	838,938	1,595,889	90.2%
White	339,870	633,077	86.3%
Non-white	499,068	962,812	93.0%
American Indian/Native Alaskan	13,084	23,735	81.4%
Asian American	108,078	238,496	120.7%
Black/African American	44,586	70,703	58.6%
Hispanic/Latinx	386,707	720,306	86.3%
15-mile buffer distance			
Total population	5,651,474	6,938,923	22.3%
White	1,896,827	2,394,544	26.2%
Non-white	3,759,137	4,548,869	21.0%
American Indian/Native Alaskan	89,624	112,903	26.0%

Status group	Current National Monument Boundary	Expanded National Monument Boundary	Percent increase
Asian American	994,095	1,175,429	18.2%
Black/African American	271,367	347,870	28.2%
Hispanic/Latinx	2,768,294	3,320,809	20.0%
30-mile buffer distance			
Total population	14,348,744	14,799,729	3.1%
White	4,723,308	4,923,149	4.2%
Non-white	9,625,436	9,876,580	2.6%
American Indian/Native Alaskan	240,632	245,394	1.2%
Asian American	2,132,442	2,209,730	3.6%
Black/African American	1,031,366	1,054,238	2.2%
Hispanic/Latinx	7,049,003	7,200,916	2.2%

If the San Gabriel Mountains National Monument were expanded, it would reduce the driving time necessary to access the national monument by 17.8% for residents within 50 kilometers.

Our driving time analysis focused on census tracts within ~32 mi (50 km) of the current national monument. Our results suggest that across the board, the monument’s expansion would reduce driving times for nearly all of the region’s residents, particularly those in census tracts closest to the monument’s western border. Across the 3,626 census tracts within ~32 mi (50 km) of the current national monument, the median drive time would decline by 17.8% from around 47.5 minutes to 39.0 minutes.

If the San Gabriel Mountains National Monument were expanded it would reduce the driving time necessary to access the national monument for people living in census tracts with a high proportion of non-white residents by 26%.

The largest reductions in driving times were for minority census tracts that were low-income, had high child poverty rates, and were nature-deprived (Table 3, Figs. 1-9). Our findings suggest that the national monument’s expansion could have outsized positive impacts on members of these communities that would benefit the most from increased access to the natural resources within the San Gabriel Mountains National Monument.

Based on our analysis, people living in tracts with relatively large non-white populations could see a 26.0% reduction in median driving time relative to current conditions. This is a greater reduction in driving time than the 14.0% expected reduction that would be experienced for census tracts with a high proportion of white residents relative to other census tracts in California (Table 3, Fig. 1).

If the San Gabriel Mountains National Monument were expanded it would reduce the driving time necessary to access the national monument for residents of low-income census tracts and those experiencing high rates of child poverty by 34.7% and 25.9%, respectively.

The proposed national monument expansion could also disproportionately benefit individuals living in low-income census tracts and those experiencing higher rates of child poverty. We observed a reduction in median driving time of around 34.7% for people living in low-income census tracts if the national monument were expanded relative to a 10.9% reduction in median driving time for people living in high-income census tracts (Table 3, Fig. 2). For census tracts classified as both non-white and low-income, expansion of the national monument could result in a 35.0% decline in median driving time to access the national monument (Table 3, Fig. 3). The expansion of the national monument could result in a reduction in median driving time for residents in census tracts with high rates of child poverty of around 25.9% (Table 3, Fig. 4). In census tracts classified as having relatively high non-white populations and relatively high rates of child poverty, residents could see a similar decline in median driving time of around 26.4% (Table 3, Fig. 5).

Driving time for residents in tracts jointly classified as having high non-white populations, being low-income, and being nature-deprived could decline by 38.2% if the San Gabriel Mountains National Monument were expanded.

Importantly, expanding the national monument could improve access to nature for people in census tracts that are nature-deprived. If the national monument were expanded, our analysis suggests that residents living in these nature-deprived census tracts could see a 22.2% reduction in median driving time (Table 3, Fig. 6). Non-white census tracts that are also nature-deprived could see a decline in median driving time of 29.1% if the monument were expanded (Table 3, Fig. 7). Residents in tracts classified as having high non-white populations and are relatively low-income could experience a decline in median driving time of 37.3% relative to current conditions (Table 3, Fig. 8). Finally, residents in tracts classified as having high minority populations, being low-income, *and* being nature-deprived - tracts that could benefit the most from expanded increase to nature - could see a substantial decrease in driving time. Our analysis indicates that median drive times from these census tracts to access points would decrease by 38.2% if the national monument were expanded from over one hour to around 37 minutes (Table 3, Figure 9).

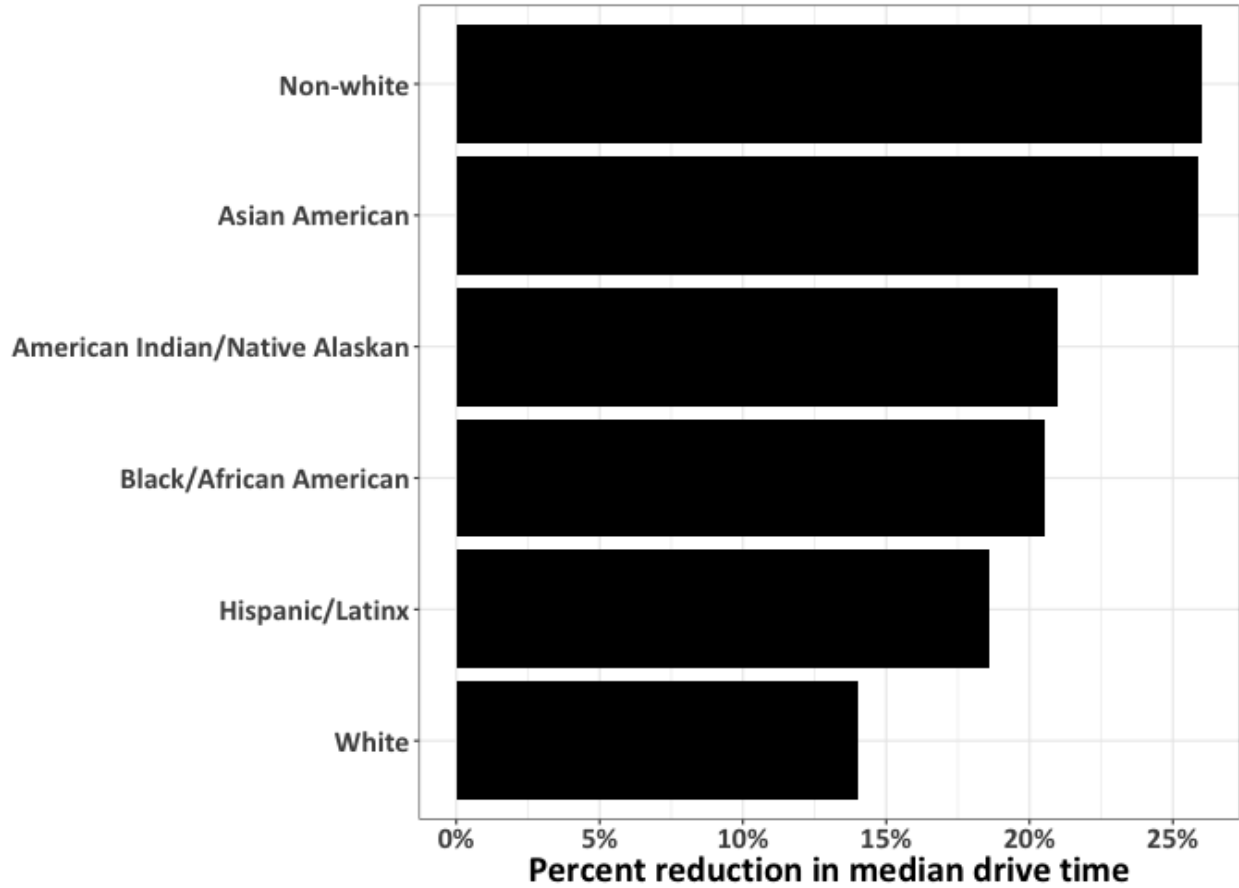


Figure 1. The percent reduction in the median driving time for residents of race and ethnicity-based status-group census tracts within ~32 mi (50 km) of San Gabriel Mountains National Monument. The comparison in driving time is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

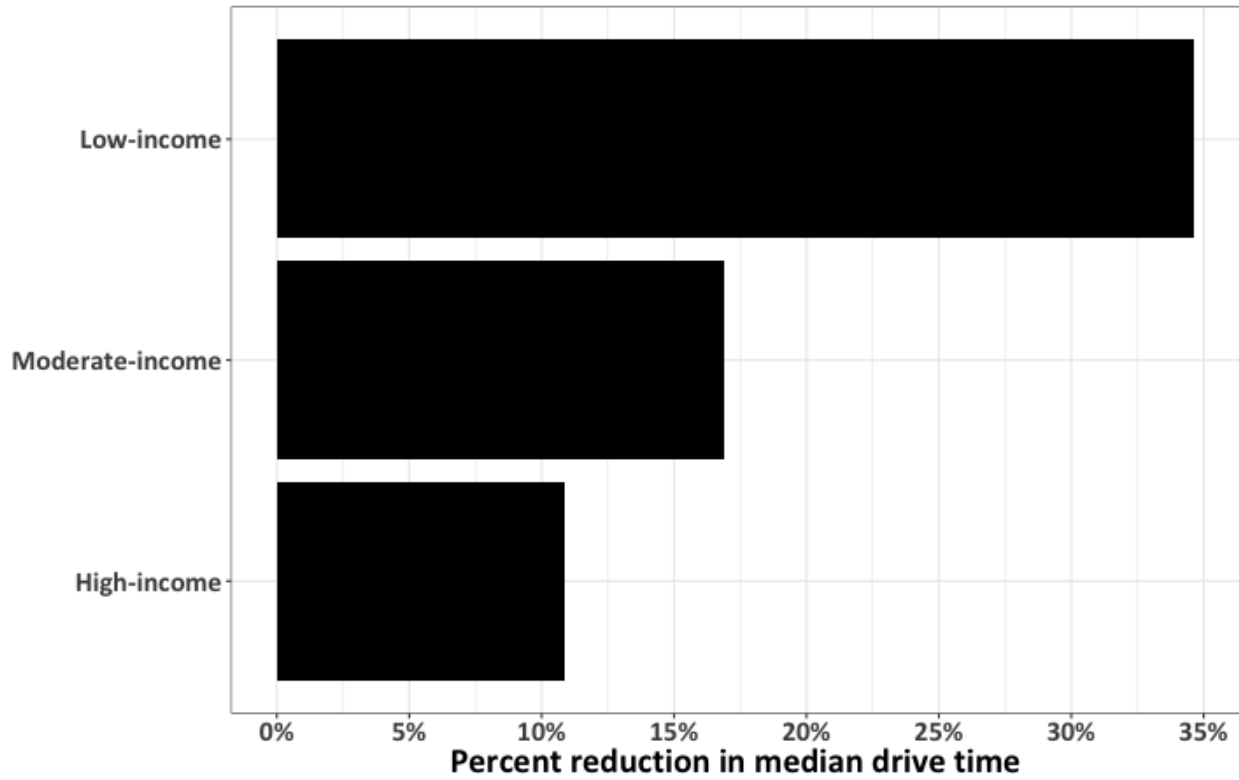


Figure 2. The percent reduction in the median driving time for residents of income-based status-group census tracts within ~32 mi (50 km) of San Gabriel Mountains National Monument. The comparison is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

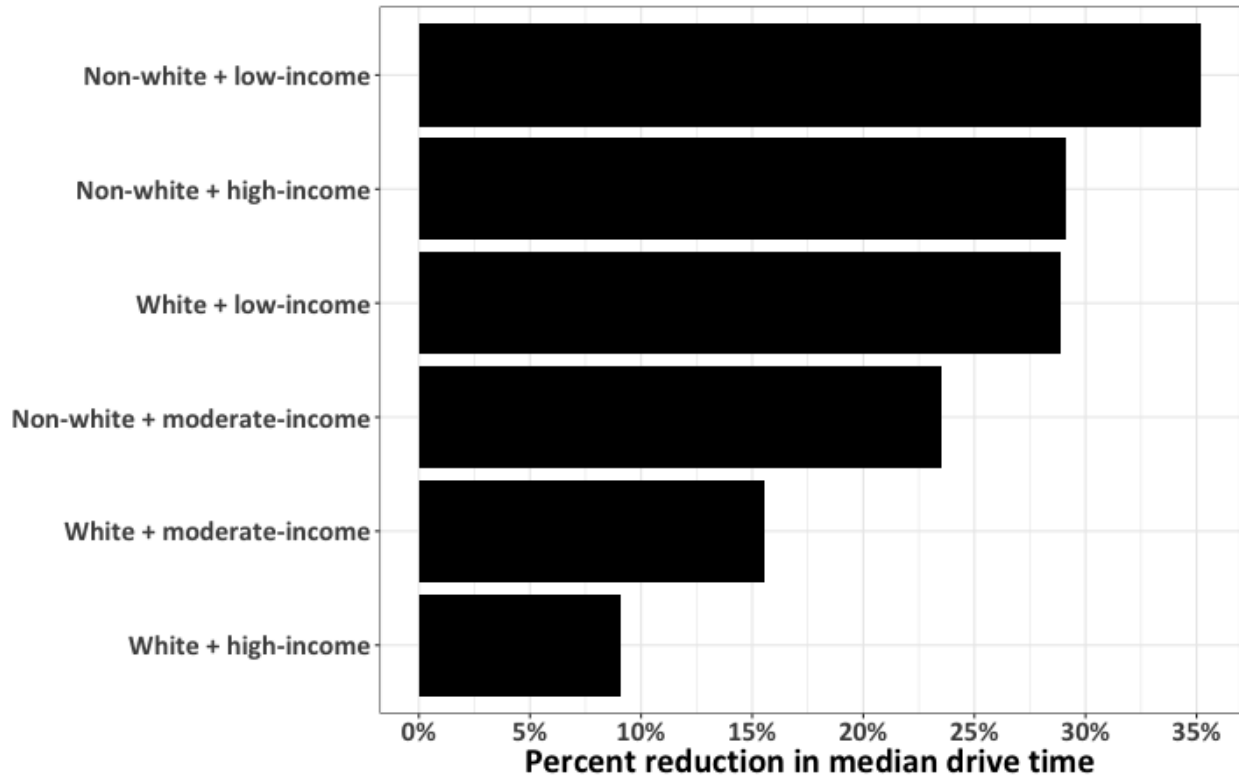


Figure 3. The percent reduction in the median driving time for residents of census tracts within ~32 mi (50 km) of San Gabriel Mountains National Monument jointly categorized by race and ethnicity and household income. The comparison in driving time is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

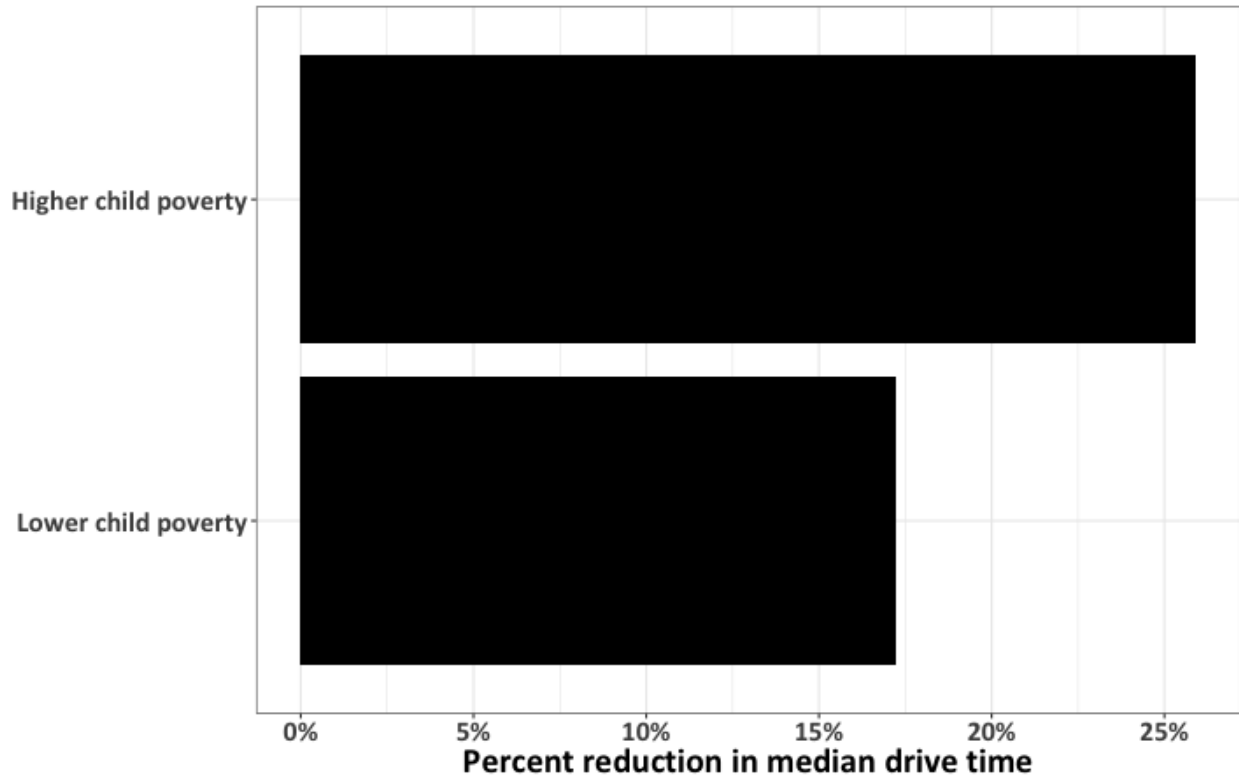


Figure 4. The percent reduction in the median driving time for residents of child poverty-related status-group census tracts within 32 mi (~50 km) of San Gabriel Mountains National Monument. The comparison in driving time is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

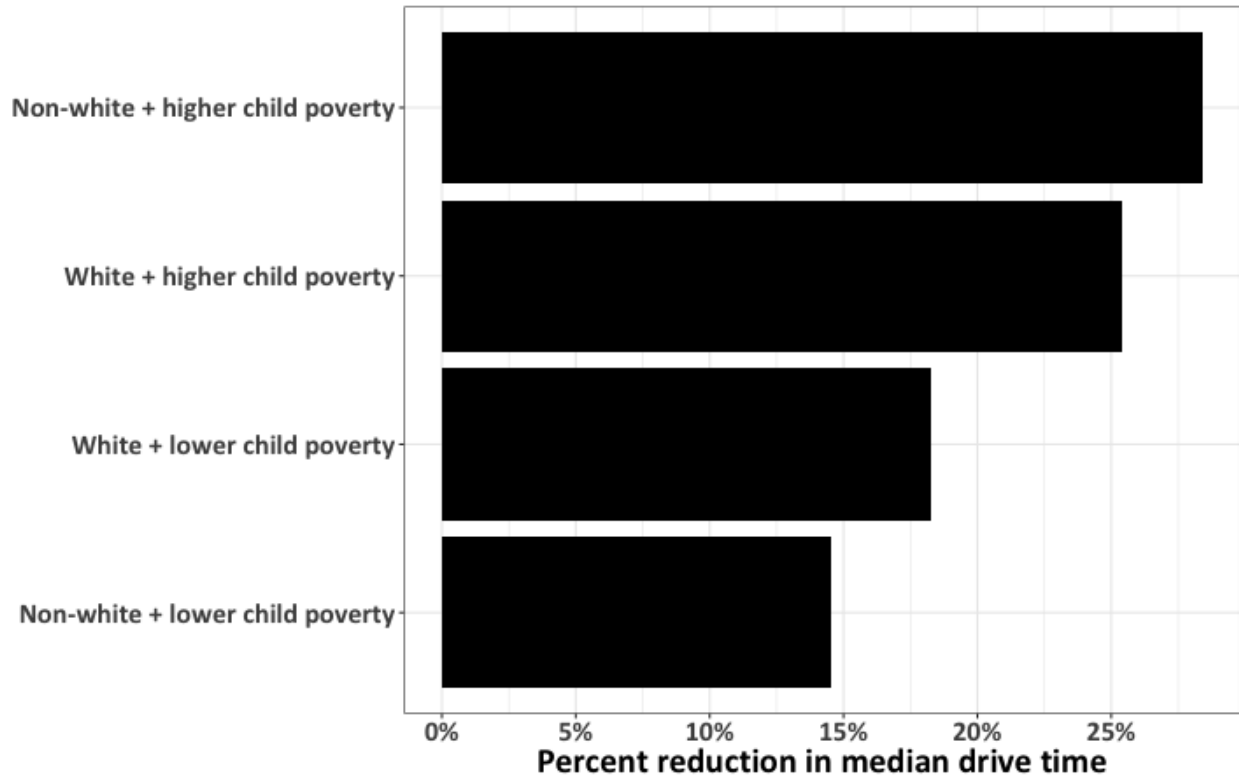


Figure 5. The percent reduction in the median driving time for residents of census tracts within ~32 mi (50 km) of San Gabriel Mountains National Monument jointly categorized by race and ethnicity and the proportion of families with children < 18 years experiencing poverty. The comparison in driving time is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

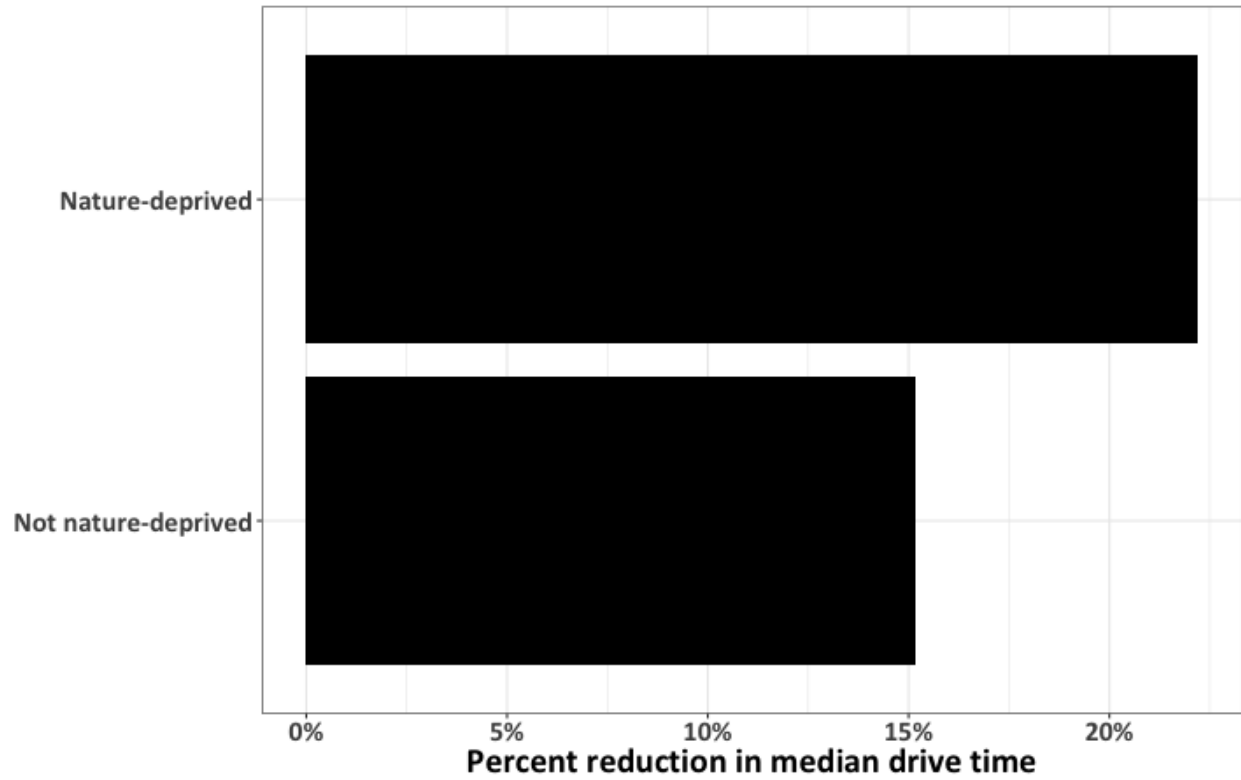


Figure 6. The percent reduction in the median driving time for residents of census tracts within 32 mi (~50 km) of San Gabriel Mountains National Monument classified by their degree of nature deprivation. The comparison in driving time is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

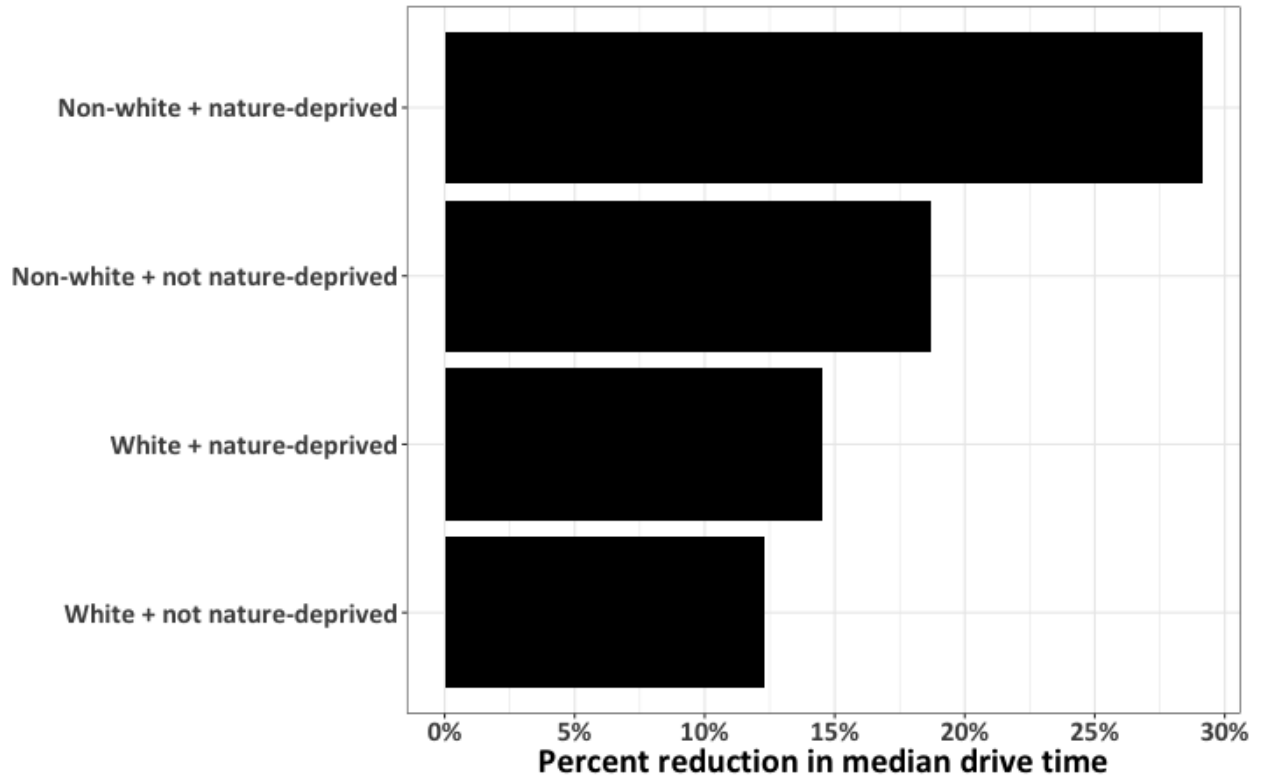


Figure 7. The percent reduction in the median driving time for residents of census tracts within 32 mi (~50 km) of San Gabriel Mountains National Monument jointly categorized by race and ethnicity and nature deprivation. The comparison is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

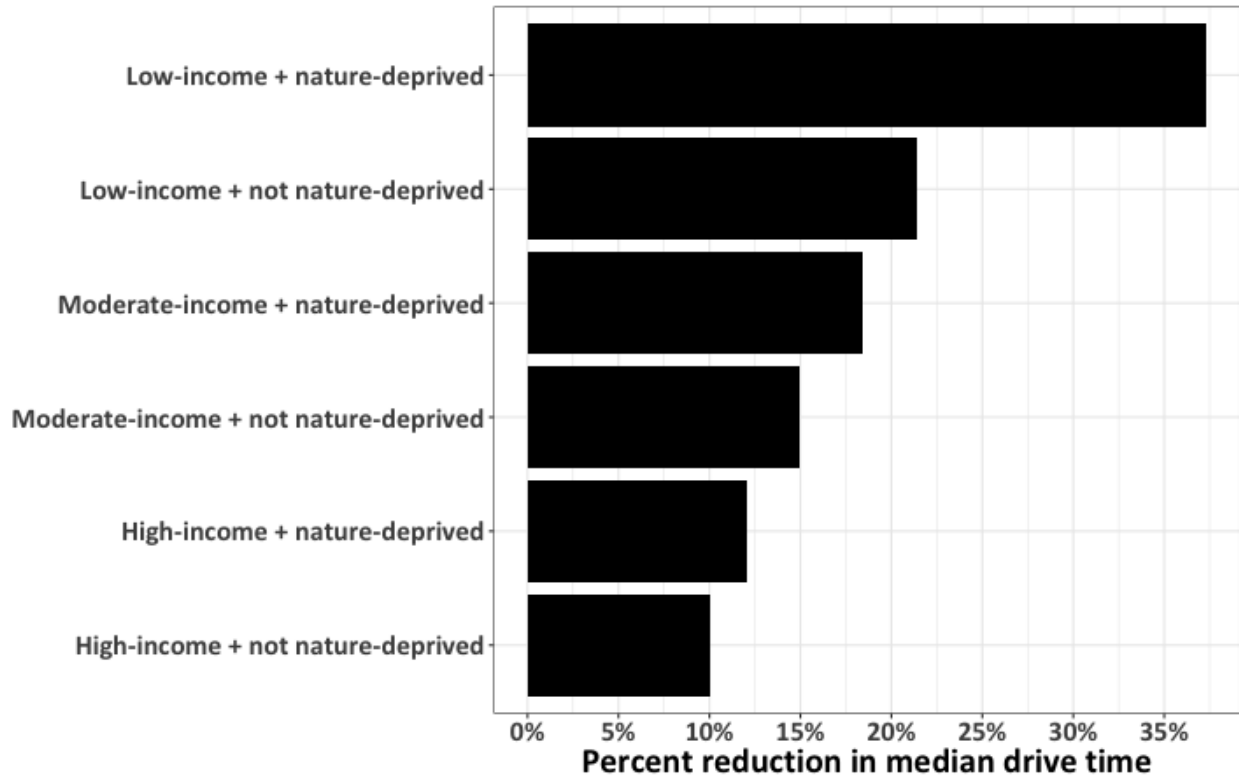


Figure 8. The percent reduction in the median driving time for residents of census tracts within ~32 mi (50 km) of San Gabriel Mountains National Monument jointly classified by household income and nature deprivation. The comparison in driving time is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

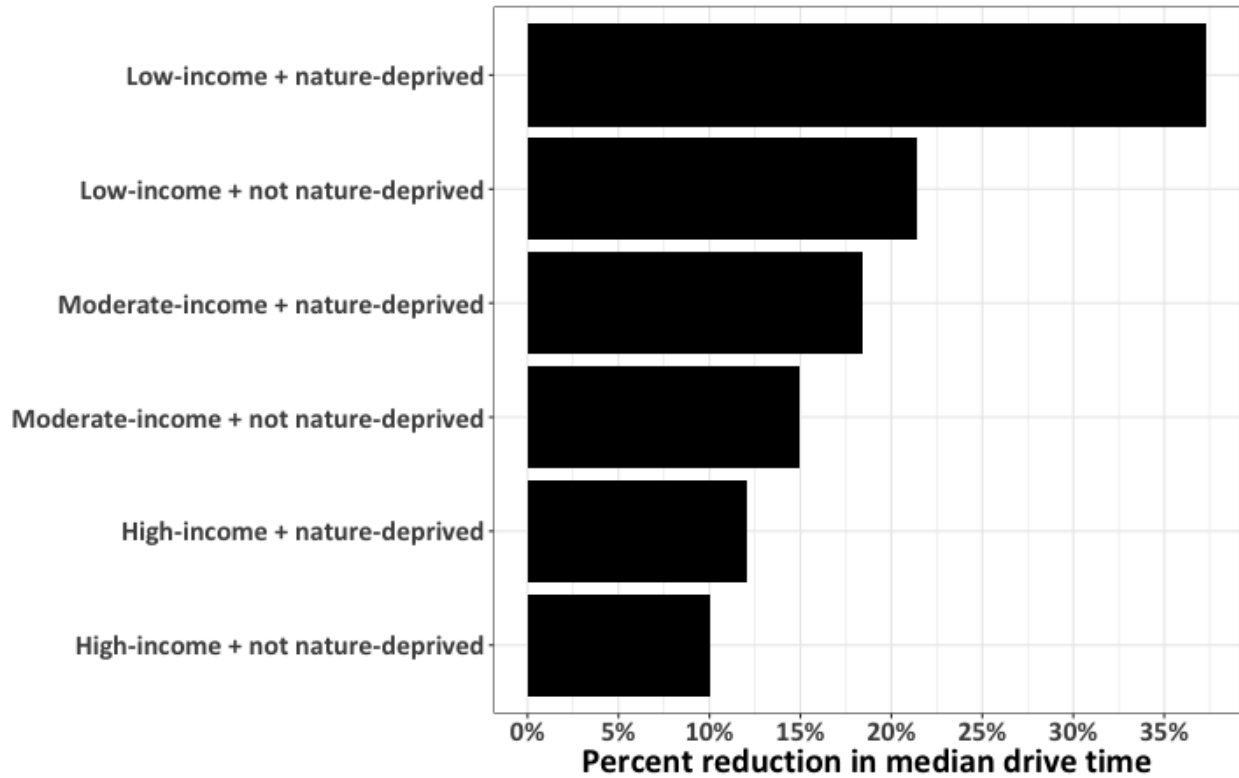


Figure 9. The percent reduction in the median driving time for residents of census tracts within ~32 mi (50 km) of San Gabriel Mountains National Monument jointly categorized by income and nature deprivation. The comparison in driving time is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

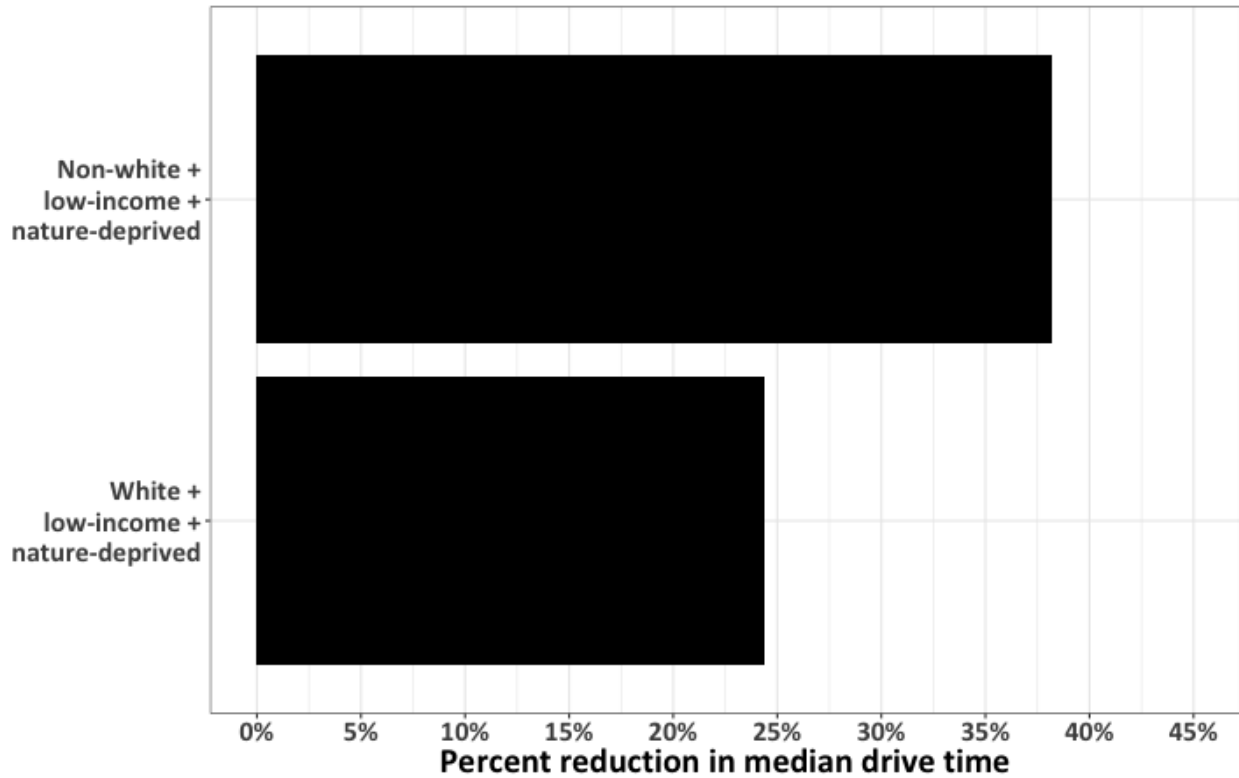


Figure 8. The percent reduction in the median driving time for residents in census tracts within ~32 mi (50 km) of San Gabriel Mountains National Monument jointly categorized by race and ethnicity, household income, and nature deprivation. The comparison in driving time is made between the current conditions and the improved accessibility resulting from the proposed expansion of the San Gabriel Mountains National Monument.

Table 3. For select status groups, the estimated changes in median driving time (in minutes) to the nearest San Gabriel Mountains National Monument access point for both the existing boundary and the proposed expanded boundary. Census tracts were limited to only those within 50km of the current national monument boundary.

Status group	Median driving time to access existing NM boundary (minutes)	Median drive time to access expanded NM boundary (minutes)	Percent decrease in median drive time to access NM
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Racial & ethnic groups

Non-white	52.6	38.9	26.0%
White alone	45.5	39.1	14.0%
American Indian/ Native Alaskan	47.8	37.8	21.0%
Asian American	49.2	36.5	25.9%
Black/African American	54.4	43.2	20.5%
Hispanic/Latinx	48.1	39.1	18.6%

Status group	Median driving time to access existing NM boundary (minutes)	Median drive time to access expanded NM boundary (minutes)	Percent decrease in median drive time to access NM
<i>Income groups</i>			
Low-income	60.7	39.4	34.7%
Moderate-income	46.5	38.7	16.9%
High-income	46.3	41.2	10.9%
Non-white + low-income	60.7	39.4	35.2%
White + low-income	43.0	30.6	28.9%
Non-white + moderate-income	50.8	38.9	23.5%
White + moderate-income	45.0	38.0	15.6%
Non-white + high-income	51.3	36.3	29.2%
White + high-income	47.5	43.2	9.0%
<i>Child poverty</i>			
Higher child poverty	54.4	40.3	25.9%
Lower child poverty	45.9	38.0	17.2%
Non-white + higher child poverty	53.9	39.6	26.4%
White + higher child poverty	43.0	35.1	18.2%
Non-white + lower child poverty	50.0	37.3	25.4%
White + lower child poverty	45.6	39.0	14.5%
<i>Nature deprivation</i>			
Nature-deprived	51.2	39.8	22.2%
Not nature-deprived	43.6	37.0	15.1%
White + nature-	46.4	38.7	16.6%

Status group	Median driving time to access existing NM boundary (minutes)	Median drive time to access expanded NM boundary (minutes)	Percent decrease in median drive time to access NM
deprived			
Non-white + nature-deprived	55.5	39.4	29.1%
Low-income + nature-deprived	60.7	37.5	37.3%
Low-income + not nature-deprived	51.4	40.4	21.4%
Moderate-income + nature-deprived	48.9	39.9	18.4%
Moderate-income + not nature-deprived	42.2	35.9	15.0%
High-income + nature-deprived	51.1	45.0	12%
High-income + not nature deprived	42.7	38.5	10.1%
Non-white + low income + nature-deprived	60.7	37.5	38.2%
White + low income + nature-deprived	48.7	36.8	24.4%

4. Acknowledgments

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