



Resources Planning Act Regional Assessment of Outdoor Recreation Demand and Trends, 2020 to 2070

Ashley E. Askew, Eric M. White,
and Gary T. Green



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Authors

Ashley E. Askew is a senior research associate and **Gary T. Green** is the assistant dean of academic affairs and a professor of natural resources, recreation, and tourism management, Warnell School of Forestry and Natural Resources, University of Georgia, 180 East Green Street, Athens, GA 30602; **Eric M. White** is a quantitative research social scientist, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 1220 SW 3rd Avenue, Suite 1410, Portland, OR 97204.

Abstract

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Understanding recent and potential future trends in recreation demand can help inform natural resource managers and decision makers as they plan for investments that support sustainable recreation and plan how to manage forests and rangelands that provide a diversity of goods and ecosystem services. We focus on participation and engagement for 17 recreation activities common in forests and rangelands across the United States. For each activity, within each U.S. region and for all ownerships collectively, we project the number of adult participants and the number of days of recreation in 2040 and 2070. We provide projections for recreation demand under four potential futures, with varying levels of U.S. socioeconomic growth and atmospheric warming, that were used in the 2020 Resources Planning Act (RPA) Assessment. Each RPA assessment is a federally mandated and multidisciplinary effort that (1) periodically evaluates the status and trends of the nation's renewable resources,

including those closely connected to outdoor recreation (via access and opportunities); and (2) yields long-term projections on the future availability, condition, and demand of forest and rangeland resources. We describe how three factors—U.S. socioeconomic change, atmospheric warming, and climate future—influence demand for each recreation activity and, within each region, identify those activities where future recreation demand is thought to be most stable and most dynamic.

KEYWORDS:

Outdoor recreation
Resources Planning Act assessment
Recreation demand
Climate
Socioeconomic growth
Atmospheric warming
Recreation planning

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Introduction

Forests and rangelands, whether publicly or privately owned, provide a diversity of goods and ecosystem services that are central to sustaining social, economic, and community vitality and resilience. Recreation is one of the most important uses of these places. More than half of the U.S. population engages in outdoor recreation (including exercise), and over the past decade, the popularity of the recreation activities that we most commonly associate with forests and rangelands—such as day hiking and camping—has increased (Outdoor Foundation 2021).

The growth in popularity of forest- and rangeland-based recreation activities, coupled with continued U.S. population increase, means that the number of people engaging in outdoor recreation has markedly increased in recent years. That strong and growing interest in recreating outdoors translates to significant economic activity. The spending on gear and recreation trips by those who engage in outdoor recreation (including outdoor sports) accounts for about 2.3 percent of gross domestic product (GDP) (USDC BEA 2024). That economic activity is greater than the share of GDP associated with the U.S. agriculture, forestry, fishing, and hunting; mining; or utilities sectors (each accounting for less than 2 percent of GDP) (USDC BEA 2024).

Engagement in outdoor recreation requires access to a place to recreate and, typically, some recreation infrastructure, such as trails or paths, picnic tables, boat ramps, viewing platforms, campsites, or roads. Investing in recreation use of forests and rangelands requires that managers and policymakers tasked with stewardship are intentional in their actions and choices. The potential for ecological damage from recreation and conflict between recreation user groups or recreationists and neighboring landowners further necessitates informed decision making about the types of, and places suitable for, different recreation activities. Decision making about what recreation opportunities to provide is further complicated by the presence of recreation infrastructure that was built decades ago and no longer meets recreation needs, is unsafe, or contributes to ecological damage (Laninga et al. 2022).

Resources Planning Act Assessment

The Forest and Rangeland Renewable Resources Planning Act (1974) requires a national report on the conditions, trends, and projected futures of renewable resources on all forests and rangelands every 10 years. Following implementation in 1975, the Resources Planning Act (RPA) assessment is published approximately each decade by the U.S. Department of Agriculture, Forest Service (1979, 1989, 2000, 2010, and 2020). In response to a Congressional mandate, the RPA assessment (1) informs decision making by policymakers, land managers, industry, and the public, across multiple focus areas; (2) reports on the availability

and condition of forest resources, forest product markets, rangeland resources, water resources, biodiversity, outdoor recreation and wilderness, and the U.S. land base; and (3) describes the effects of economic, social, and biophysical drivers of change on these resources. The Forest Service has produced RPA assessments consistently for almost 50 years. The 2020 RPA Assessment was the sixth cycle to fulfill the aforementioned legislative mandate, update timelines and projections, and continue collaborative research across multiple focus areas under purview of the Forest Service and other organizations (private and public).

Although information about past and current recreation participation and engagement is helpful to managers and policymakers, understanding how recreation demand may shift across a diversity of recreation activities in the future is also important, especially considering that recreation planning, infrastructure development, and accessibility may take years to accomplish. This report supports management and policy efforts by providing regional projections of participation and engagement under a range of alternative socioeconomic and climate futures and describing key factors of recreation demand within four U.S. regions across a suite of recreation activities. This information can help managers and policymakers plan for the future by knowing which recreation activities have the strongest growth potential in each region. To meet these growing demands, greater investments in infrastructure development and accessibility may be needed. The ability to make long-term, data-informed decisions may help mitigate future conflicts, incompatible uses, and environmental damages associated with recreation.

Modeling Future Recreation Demand

We project demand for 17 recreation activities and activity aggregates (hereafter, activities) for all land ownerships (table 1). These activities are common on forests and rangelands and are consistent with the sets of activities considered in the U.S. Department of Agriculture, Forest Service, National Visitor Use Monitoring program and reported in the Outdoor Foundation's annual recreation participation reports (Outdoor Foundation 2018, 2021; USDA FS 2012, 2016, 2023; White et al. 2023).

To describe how demand for recreation might change in the coming decades, we first constructed statistical models for each activity/region combination. These models relate an individual's stated recreation participation and frequency (on any land ownership) to independent variables describing their demographic characteristics, including income and education, and the contemporary climate conditions and recreation supply of their home county.¹ The data that we used for individual recreation behavior and demographic and socioeconomic characteristics came from the National Survey on Recreation and the Environment (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes.) between 2006 and 2012, establishing 2012 as the baseline year for trend comparisons in projections. The data that we used for contemporary climatic conditions (Coulson and Joyce 2020) and recreation supply were developed in support of the 2020 RPA Assessment (White et al. 2023). Using the statistical models that we constructed, we substituted into our independent variables the potential future population demographics and socioeconomic patterns (Langner et al. 2020, Wear and Prestemon 2019a), climatic conditions (Abatzoglou and Brown 2012, Joyce et al. 2018, Langner et al. 2020), and recreation supply (White et al. 2023) to project decadal estimates of recreation participation and engagement through 2070. Askew and Bowker (2018) and Bowker et al. (2012) described the statistical models that we used in more detail, and White et al. (2023) provided further information about the datasets and variables that we used for modeling.

¹ In modeling and simulation (projections), we incorporate supply variables as proxies of resource availability or accessibility relevant to each activity (in total or per capita) using the Federal Information Processing Standard codes for the origin of the respondent. Examples include forest land acres plus rangeland acres per capita, aggregated federal lands per capita, and water acres per capita within predefined zones from the origin of the respondent (i.e., county centroids). These measures can convey availability of resources within a travel distance and are available as projections decades into the future.

Table 1—Recreation activities and definitions of activity aggregates

Activity or activity grouping
Developed site recreation
Developed site use—family gatherings, picnicking, etc.
Camping in developed campgrounds
Viewing/photographing nature
Viewing nature—related to fauna, flora, natural settings
Birding—viewing or photographing birds ^a
Nonmotorized, undeveloped activities
Day hiking
Primitive area activities—undeveloped area camping, backpacking, visiting wilderness
Mountain biking
Horseback riding on trails—riding horses or mules on trails
Motorized activities
Motorized water use—motor boating, water skiing, personal watercraft use
Motorized off-road use
Snowmachining
Fishing and hunting
Fishing—anadromous, cold-water, saltwater, warm-water
Hunting—small game, big game, migratory bird, other
Nonmotorized winter activities
Developed skiing—downhill skiing, snowboarding
Undeveloped skiing—cross-country skiing, snowshoeing
Nonmotorized water activities
Swimming—swimming, snorkeling, scuba diving
Floating—canoeing, kayaking, rafting

^a Birding is also a subset of the viewing nature aggregate.

Our projections and findings correspond to the four RPA assessment regions within the conterminous United States (fig. 1). Use of these regions allows us to capture broad-scale patterns in socioeconomic and forest and rangeland conditions and processes. The North and South RPA Regions correspond roughly to the Forest Service’s Eastern and Southern Regions, respectively. The Rocky Mountain RPA Region encompasses the Forest Service’s Northern, Rocky Mountain, Southwestern, and Intermountain Regions, and the Pacific Coast RPA Region covers the Forest Service’s Pacific Southwest and Pacific Northwest Regions. The Alaska Region and the U.S.-affiliated islands and territories are not included in this analysis because we lacked sufficient data on current recreation participation and engagement in those regions.

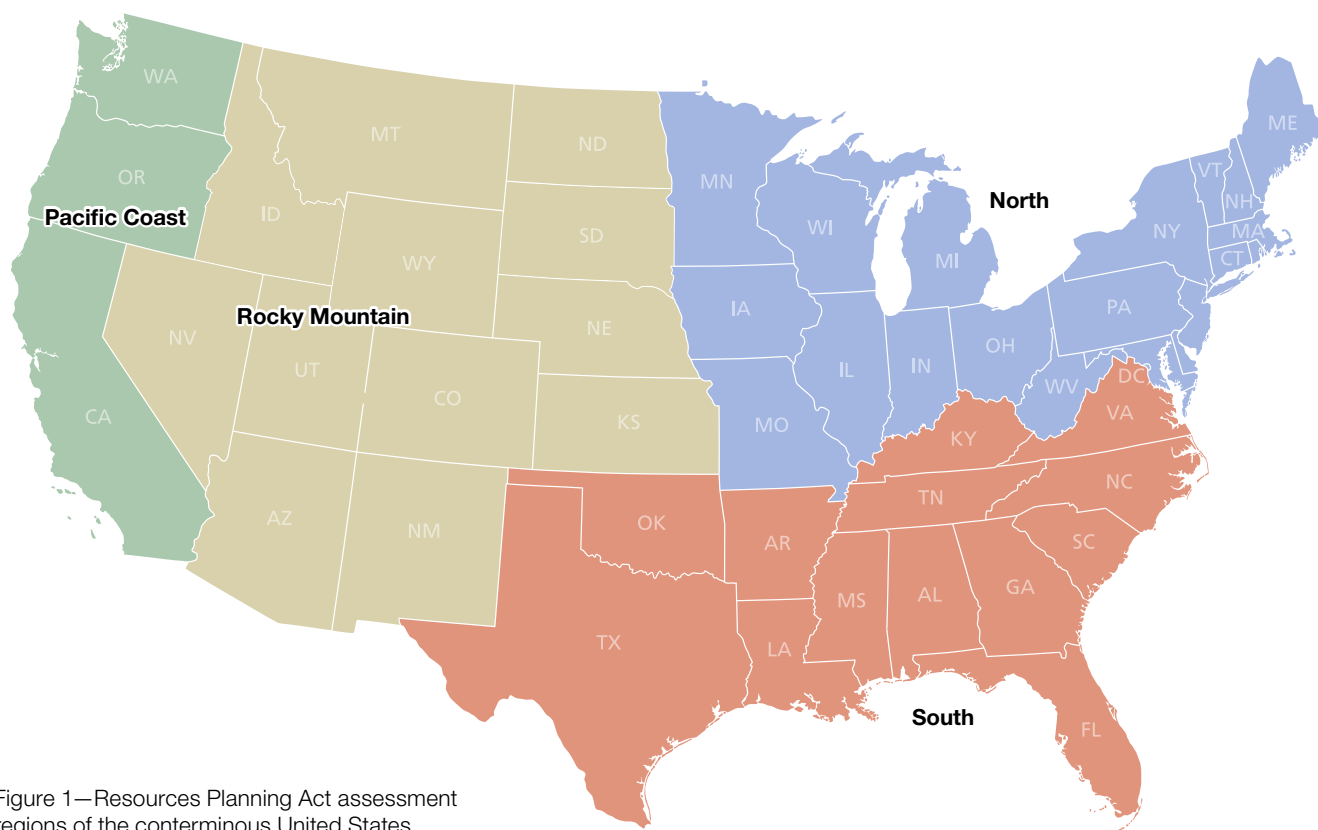


Figure 1—Resources Planning Act assessment regions of the conterminous United States.

Measures of Recreation Demand

We describe potential future recreation demand on all land ownerships using complementary measures of participation (number of participants) and engagement (number of days of recreation):

1. The number of participants is the total number of adults (≥ 16 years of age) out of a population (for a region or nation) who engage in a recreation activity at least once a year on any land ownership. In our projections of future recreation demand, we calculate this measure by combining our modeled estimate of future per capita participation at a given point in time with our projection of the future adult population at the same point in time.
2. The number-of-days-of-recreation metric is defined as the total number of days that adult participants engage in recreation in a year (on any land ownership) and is calculated by combining our modeled estimate of the average number of days per year that participants recreate in an activity and the total number of participants in that activity. The number-of-days-of-recreation metric is a good indicator of the potential number of visits in the future to places providing opportunities for a specific recreation activity; this metric can support planning efforts and infrastructure investments.

In the main text of this report, we present the projected number of adult participants and number of days of recreation for each activity. Changes projected in per capita participation (2012 to 2040 and 2012 to 2070) and projected participation rates are available in the appendix (see tables A.5 and A.6 for the North RPA Region, tables A.9 and A.10 for the South RPA Region, tables A.13 and A.14 for the Rocky Mountain RPA Region, and tables A.17 and A.18 for the Pacific Coast RPA Region).

Scenarios for Analysis

We develop projections of future recreation demand under the four scenarios used for the 2020 RPA Assessment (fig. 2). These scenarios represent alternative futures that combine different levels of atmospheric warming based on two global Representative Concentration Pathways (RCPs) and future U.S. socioeconomic growth (hereafter, socioeconomic growth) based on four global Shared Socioeconomic Pathways (SSPs) (see “Resources Planning Act Assessment Scenarios”). These RCPs and SSPs (along with climate models) were developed in parallel by climate change researchers to explore multiple “mitigation and adaptation” policies (Moss et al. 2010, van Vuuren et al. 2011), creating a “scenario matrix architecture” (Riahi et al. 2017: 154). These scenarios “vary across dimensions of variables characterizing uncertainty about the future: population trajectories, economic growth, technology, trade, and governance” (Langner et al. 2020: 11).

In modeling future recreation demand, we focus on SSP patterns for population, demographics, educational attainment, and income. The RCPs are projections of future global radiative forcing (the future change in radiative flux in the upper atmosphere measured in watts of energy per square meter) developed in the *Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (IPCC 2013). The RCP 4.5 and 8.5 projections differ in the assumed level of radiative forcing at the end of the 21st century, with the latter pathway implying a larger change in climate (Langner et al. 2020). More information about the 2020 RPA Assessment scenarios (hereafter, RPA scenarios) is available in O’Dea et al. (2023) and Langner et al. (2020).

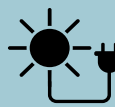
RPA scenario (RCP-SSP)	Global temperature rise	U.S. population growth	U.S economic growth rate	Bioenergy demand	Energy sector focus	Global energy usage	International trade openness
LM Lower warming- moderate growth <i>RCP4.5-SSP1</i>	 Lower	 Medium	 Medium-high	 High	 Renewables	 Low	 Medium
HL High warming- low growth <i>RCP8.5-SSP3</i>	 High	 Low	 Low	 Low	 Fossil fuels	 Medium	 Low
HM High warming- moderate growth <i>RCP8.5-SSP2</i>	 High	 Medium	 Medium	 Medium	 Mixed	 Medium	 Medium
HH High warming- high growth <i>RCP8.5-SSP5</i>	 High	 High	 High	 High	 Fossil fuels	 High	 High

Figure 2—Characterization of the 2020 Resources Planning Act (RPA) Assessment scenarios with four underlying RCP-SSP combinations. In the RPA scenarios, growth refers to U.S. socioeconomic growth. Representative concentration pathway (RCP) refers to the level of future atmospheric warming (Lower = RCP 4.5, High = RCP 8.5), and Shared Socioeconomic Pathway (SSP) refers to the level of future socioeconomic growth (Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

Resources Planning Act Assessment Scenarios

The Representative Concentration Pathways (RCPs) define varying trajectories of future global radiative forcing, which affect global temperature rise. The Shared Socioeconomic Pathways (SSPs) define the “socioeconomic and environmental trends at the level of the world and large world regions,” distinct mitigation and adaptation policies, and “input assumptions by integrated assessment models of the global energy-economy-land use system, or by global-scale

climate impact models of different sectors” (O’Neill et al. 2014: 394). The SSPs allow us to simulate futures varying in demographics (population growth), economic development (global and regional gross domestic product, international trade, technology change), resources (fossil fuel resources and renewable energy—including energy from wood), nonclimate policies, and general perspectives on the environment and sustainability initiatives (O’Neill et al. 2014). We explore differing levels of challenges to mitigation and adaptation through the SSPs (Riahi et al. 2017).

Three RPA scenarios—high warming-low socioeconomic growth (HL), high warming-moderate socioeconomic growth (HM), and high warming-high socioeconomic growth (HH)—incorporate a consistent level of atmospheric warming (RCP 8.5), but different levels of potential socioeconomic growth. The fourth scenario—lower warming-moderate socioeconomic growth (LM)—assumes a lower level of atmospheric warming (RCP 4.5) but a level of socioeconomic growth (SSP1) that is similar to that used in the HM scenario (SSP2). In figure 3, we compare the regional population compositions projected under the scenarios of high socioeconomic growth (HH) versus low socioeconomic growth (HL). By 2040, we project that the South RPA Region will become the most populous region, overtaking the North RPA Region.

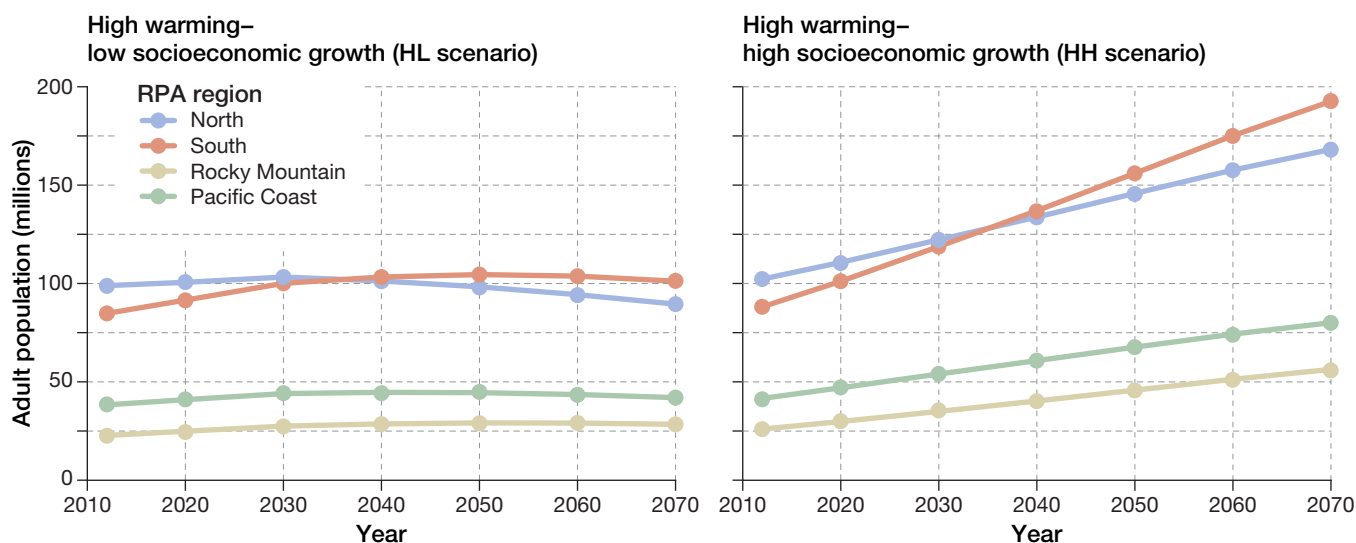


Figure 3—Comparisons of regional population trajectories projected under the Resource Planning Act (RPA) HL and HH scenarios from 2012 and decades 2020 through 2070. Adult refers to people ≥16 years of age.

The characteristics of the RPA scenarios allow us to isolate the influence of different levels of socioeconomic growth and atmospheric warming on recreation demand. Because a consistent RCP is used across scenarios HL, HM, and HH (all high warming—RCP 8.5), it is possible to isolate how socioeconomic growth influences demand for each recreation activity by comparing outcomes across the three scenarios (fig. 4). Similarly, because the socioeconomic conditions in scenarios LM and HM are similar, it is possible to compare outcomes between those two scenarios to isolate the influence of atmospheric warming on recreation demand for that activity.

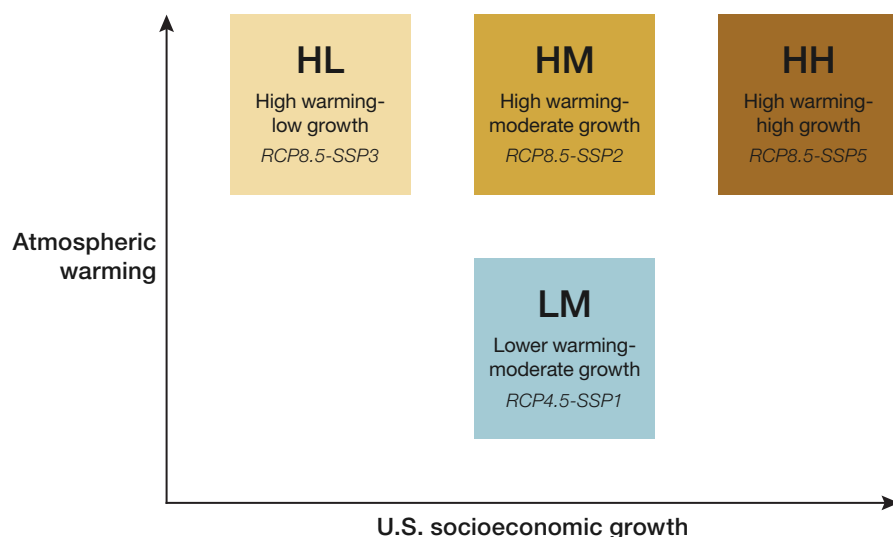


Figure 4—Comparisons of the 2020 Resources Planning Act Assessment scenarios in evaluating projected impacts of U.S. socioeconomic growth and atmospheric warming. Representative concentration pathway (RCP) refers to the level of future atmospheric warming (Lower = RCP 4.5, High = RCP 8.5), and shared socioeconomic pathway (SSP) refers to the level of future socioeconomic growth (Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

Within each of the four scenarios, we project demand for outdoor recreation under five associated potential climate futures (fig. 5). These climate futures capture the full range of temperature and precipitation projections across the United States in the coming decades under the respective RPA scenarios (Joyce and Coulson 2020). These climate futures represent the least (Least Warm) and greatest (Hot) change in temperature, the largest decrease (Dry) and greatest increase (Wet) in precipitation, and the mean change (Middle) in temperature and precipitation across commonly used models. We used the same models to project climate futures for both RCP 4.5 and RCP 8.5 for all variables (table 2). In the regional sections below, we frequently identify which climate future(s) is (are) associated with the highest (or lowest) levels of recreation demand within or across RPA scenarios. These patterns can provide insight into the sensitivity of recreation demand to potential changes in temperature and precipitation.

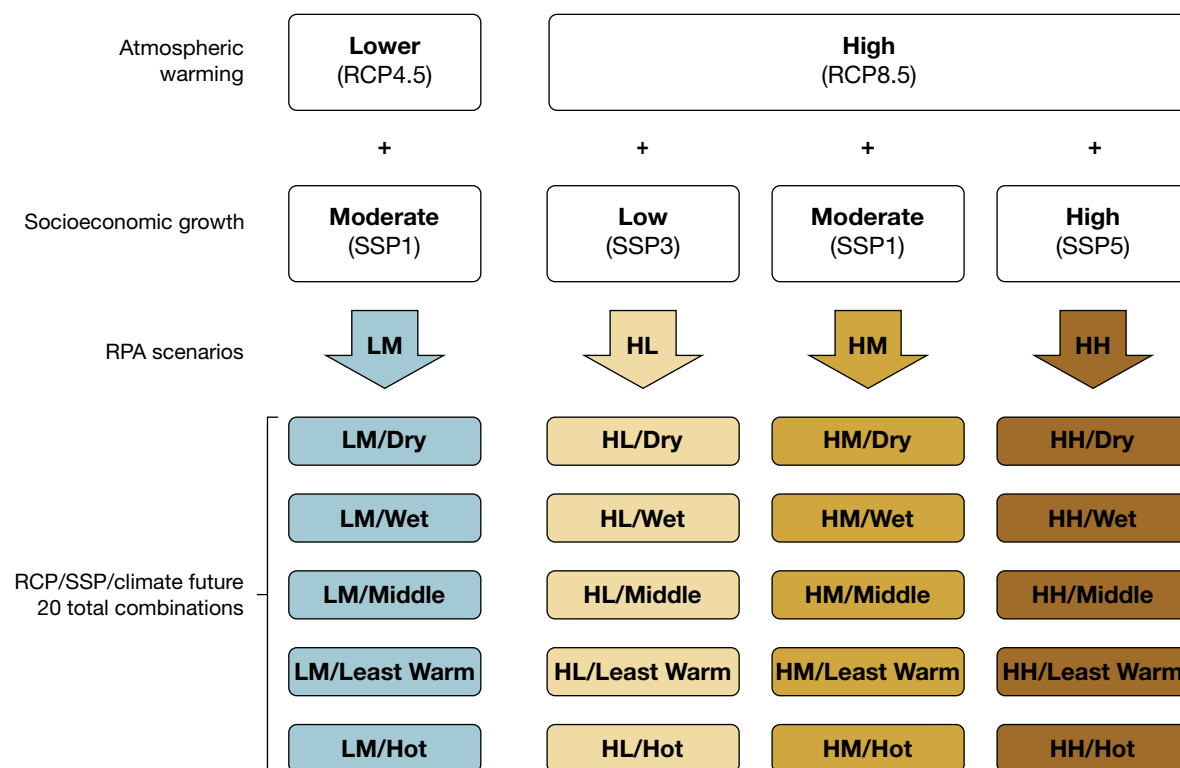


Figure 5—Four Resources Planning Act (RPA) Assessment scenarios (LM, HL, HM, and HH) in combination with 5 climate futures (Dry, Wet, Middle, Least Warm, and Hot) for total of 20 futures in projections. Representative concentration pathway (RCP) refers to the level of future atmospheric warming (Lower = RCP 4.5, High = RCP 8.5), and shared socioeconomic pathway (SSP) refers to the level of future socioeconomic growth (Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

Table 2—Five climate futures of the 2020 Resources Planning Act Assessment and their exemplar climate models

	Dry	Wet	Middle	Least Warm	Hot
Climate model	IPSL-CM5A-MR	CNRM-CM5	NorESM1-M	MRI-CGCM3	HadGEM2-ES
Institution	Institut Pierre Simon Laplace, France	National Centre of Meteorological Research and European Centre for Advanced Research and Training, France	Norwegian Climate Center, Norway	Meteorological Research Institute, Japan	Met Office Hadley Centre, United Kingdom

Note: Each model was run under Representative Concentration Pathway (RCP) 4.5 and RCP 8.5, providing a range of different U.S. climate projections.

Source: Joyce and Coulson (2020).

Organization of Report

Projections and changes in recreation demand

Below, in sections dedicated to each RPA region, we present our projections of recreation demand in the years 2040 and 2070 for the 17 activities. For each activity, we estimate and project two measures of participation (per capita participation and number of participants) and one measure of engagement (number of days of recreation), across four RPA scenarios with associated climate futures. For discussion, we focus on the two measures potentially most informative to managers and planners—the number of participants and the number of days of recreation by activity—as indicators of usage, resource conditions and availability, and crowding potential. The corresponding per capita participation estimates and projections are in the appendix.

For each activity, we describe contemporary estimates (year 2020) and percentages of change (from 2012 to 2040 and from 2012 to 2070) in the number of participants and the number of days of recreation. Within the main text, we focus on percentages of change from the baseline year 2012 for each of our measures (e.g., we project the number of participants to increase by as much as 42 percent by 2040 from 2012). In the appendix, we present the projected values (per capita participation, the number of participants, and the number of days of recreation) on the set of activities for each RPA region. These values are aggregated across climate futures for each scenario and used to generate intervals. They may be useful for planning, management, or research applications where specific demand levels are needed.

Identifying driving factors of recreation demand

For each activity, we evaluate up to three drivers of recreation demand in participation and engagement: socioeconomic growth, atmospheric warming, and climate future. These assessments are based on percentages of change in projected recreation demand—from 2012 (baseline) to 2070—in numbers of participants and numbers of days of recreation. For socioeconomic growth (HH versus HL) and atmospheric warming (HM versus LM), we compute differences of percentages of change across relevant pairs of RPA scenarios (matched by climate future). Each pairwise comparison produces a set of five differences in percentages by Dry, Wet, Middle, Least Warm, and Hot climate futures, conveying the effects of varying the factor on percentages of change. We determine the magnitudes of effects using the classification scale outlined in table 3. To classify the influence of climate future, we compute the range (maximum minus minimum) of percentages of change within each RPA scenario. A driver is classified into an influential category if there is sufficient difference in projected changes across climate futures per RPA scenario, using the scale in table 3. If projected changes from 2012 to 2070 are similar under an RPA scenario, regardless of climate future, then the range is close to zero and thus indicative of a climate future that does not drive recreation demand. As climate futures have greater influence, there is potentially more differentiation of outcomes, translating to increased range and thus justifying the framework we describe here.

White et al. (2023) previously applied this modeling and projection methodology to the conterminous United States. National-level findings are presented in the “Outdoor Recreation and Wilderness” chapter of the 2020 RPA Assessment, indicating projections and drivers in the same set of activities for the conterminous United States (White et al.

Table 3—Classification scales for magnitudes of change (in absolute value), computed on (1) percentage of change in metrics between two time points or (2) pairwise differences of percentages of change for impact assessment

Classification	Percentage of change (absolute value)	Symbols of change (magnitude and direction)	
Slight	<15	↔	
Moderate	15 to 50	↓	↑
Extensive	50 to 75	↓	↑
Marked	≥75	▼	▲

Note: This scale is used to describe and classify percentages of change in the two recreation metrics (i.e., number of participants or number of days of recreation). The symbols are used to indicate magnitude of change as well as direction. We apply this scale to discussions of percentages of change in each recreation metric from baseline (2012) to 2040 and 2070. Another application is to classify which of three factors in the study are drivers of participation or engagement: U.S. socioeconomic growth, atmospheric warming, or climate futures. We make these determinations based on relevant comparisons (i.e., pairwise differences) of percentages of change from 2012 to 2070—for example, comparing projections under HH versus HL for U.S. socioeconomic growth impacts.

2023). Here we shift analyses and simulations from a national focus to regional applications. We begin with a general summary and overview of notable regional findings in participation and engagement. Then, we follow with region-specific sections for detailed discussions: respective key findings, projections of numbers of participants and numbers of days of recreation, and drivers indicated from projections of change (2012 to 2070).

Limitations

While these projections contribute informative findings here and at the national level (White et al. 2023), there are inherent limitations. The National Survey on Recreation and the Environment, sponsored by the Forest Service, was formerly a consistent household survey with multiple years of data collection. However, the nature of sampling (random digit dialing) imposes a significant limitation—responses are origin-based rather than destination-based. While this allows us to estimate per capita participation, respondents to engagement questions (i.e., number of visits for recreation) may be sparse or inefficiently sampled. Additionally, no information is collected on where recreationists are traveling for outdoor recreation opportunities. This amount of data can quickly become difficult to manage and summarize, unless they are collected from focused study areas, such as a set of ski resorts, for a region. Nevertheless, “the majority of popular activities are undertaken relatively near to the home, as past and current research continues to reiterate,” even with “increased mobility of recreationists” (Hall and Page 2014: 100). Destination-based data may be more appropriate for specialized activities requiring certain conditions and resources. In these instances, the user base may have different underlying patterns of recreation demands, such as those traveling long distances to ski resorts and other destinations. These recreationists may consider destination-based weather patterns, disturbances, and seasonal conditions to determine their recreation plans.

The most recent National Survey on Recreation and the Environment data collection used in our modeling is from 2012. The data collection was conducted with landlines (excluding mobile phones), which has become potentially problematic with the fast pace of technology and widespread mobile use. Historical estimates are now outdated, and while we maintain this as a baseline year for comparisons, we add a contemporary estimate for 2020 by averaging projections across RPA scenarios. Over the years, the set of activities and aggregate definitions may change; we have modified some that were used in the 2010 RPA Assessment and the Update to the 2010 RPA Assessment (USDA FS 2016). Activities themselves may also evolve over time with the fast pace of technology, social media, and integration in outdoor recreation. There are significant challenges in accounting for technology influences in modeling and simulation, especially decades in the future. For example, mountain biking as we discuss in this report does not include e-bikes, but e-bikes may influence the recreation market and increase accessibility.

The county level was the finest spatial scale for responses from the National Survey on Recreation and the Environment. This allowed convenient linkage to other county-level (or higher spatial scale) datasets or projections. We used external supply data, such as socioeconomic and demographic variables, population, land use changes, and climate change proxies, with historical and projected values. These input datasets can present limitations from quality, varying assumptions, or scope, but we have used sources from RPA research specialists, government data scientists, the U.S. Census, and climate science researchers. However, there are limitations from the modeling phase. For example, we considered a

limited set of supply variables, and we used a single climate change proxy (e.g., maximum temperature in the summer). This may not fully capture the interactions among supply, climate, and outdoor recreation demand, but the benefit of the compromise is an easily constructed model, especially in the case of sparse engagement data. In certain activities, such as fishing and hunting, we do not incorporate such factors as underlying species distribution, biodiversity, migration patterns, and food/water availability. It would be difficult to fully project these for the 50-year projection, and the intricacies of interactions may be difficult to capture in modeling and simulation. We opt for simplicity and general applicability; incorporating additional sources can introduce greater potential for errors and noise.

Summary of Notable Regional Findings in Participation and Engagement

We present region-level projections of numbers of recreation participants and days of recreation for the years 2040 and 2070. We consider these outlooks across 17 outdoor recreation activities, with three winter activities excluded for the South RPA Region. Projections are generally most sensitive to differences in projected population and economic change within the region and less sensitive to the extent of atmospheric warming and associated changes within the region. In general, the numbers of participants and days of recreation are highest under the HH scenario and lowest under HL. Next, we discuss regional overview summaries of the projected numbers of participants and days of recreation.

Participants

In 2012, the activity with the greatest number of participants for each RPA region was developed site use. Some of the most popular activities across regions included swimming in natural settings (for all regions) and day hiking (for all but the South RPA Region). The three least popular activities in 2012 were horseback riding on trails and mountain biking (for all regions) and snowmachining (for all but the South RPA Region). Other activities that were frequently low in popularity within regions were primitive area activities, floating, and undeveloped skiing.

With sufficient socioeconomic growth (moderate or high growth), we project the number of participants in all activities to increase through 2070 in all regions except the North RPA Region. Although the North RPA Region had the largest population in 2012, its population growth projections to 2070 are the lowest among the RPA regions. In our participant projections, the North RPA Region has (1) the most activities (all but three) projected to undergo participant declines by 2070 under the HL scenario; (2) the only subset of activities (four) that is regionally associated with participant declines to 2070 even under the HM scenario; and (3) the most extensive projected declines in numbers of participants for many activities across the regions. In the South and Pacific Coast RPA Regions, we project no declines greater than 15 percent—the threshold established as the transition from slight to moderate change (table 3)—in participant numbers to 2070. In the Rocky Mountain RPA Region, we project declines in participants only under the HL scenario and only in two activities: snowmachining from 2012 to 2040 (Dry climate future) and from 2012 to 2070 (Dry, Wet, and Hot climate futures), and hunting (Hot and Dry climate futures) from 2012 to 2070. For those activities, the negative influences on underlying participation rates from those climate futures become large enough to overcome any increase in the number of participants as a result of population increase (table A.13).

Influence of socioeconomic growth

As anticipated, socioeconomic growth is a significant, positive driver for numbers of recreation participants in all activities and all RPA regions. Across all projections to 2070, socioeconomic growth has the greatest effect on participation in developed skiing in the Rocky Mountain RPA Region (across all climate scenarios). Additionally, projections show some of the greatest effects of socioeconomic growth on mountain biking, motorized water use, and horseback riding on trails in the Rocky Mountain RPA Region, and developed skiing in the Pacific Coast RPA Region. In the North RPA Region, socioeconomic growth has the most influence on number of participants projected for horseback riding on trails (under the Hot and Middle climate futures) and developed skiing (all climate futures). In the South RPA Region, we project the greatest positive effects of population and income on number of participants in motorized water use and horseback riding on trails.

Influence of atmospheric warming

Atmospheric warming generally has a slight, negative relationship with outdoor recreation participation. In most cases, comparing the number of participants in 2012 and projections for 2070 shows some reductions under high warming (HM) relative to lower warming (LM). While generally slight in magnitude, the effects can be moderate or, rarely, extensive in select activities. Atmospheric warming has the most significant (negative) effect on the number of participants in snowmachining in the Rocky Mountain RPA Region, ranging from moderate to extensive in magnitude—especially under the Wet and Hot climate futures. Numbers of participants are especially responsive to atmospheric warming for snowmachining (especially under the Dry climate future) and undeveloped skiing (under the Dry and Wet climate futures) in the North RPA Region, and for horseback riding on trails (all climate futures) in the Rocky Mountain RPA Region. There may be a few slight, positive differences in the projected number of participants under HM versus LM, although these are small enough to represent essentially similar outcomes. However, an exception occurs with horseback riding on trails in the North RPA Region, where we project positive effects under high atmospheric warming. Carrying over from per capita projections for number of participants, the most positive responses occur under the Middle and Hot (moderate) climate futures, and the Least Warm and Wet (slight) climate futures.

Influence of climate future

The strength of the influence of climate future on projected number of participants varies widely across our 17 activities and across RPA regions. Potential climate future has the most pronounced effects on projected number of participants in snowmachining, horseback riding on trails, developed skiing, and undeveloped skiing. Conversely, potential climate future has negligible influence on projected number of participants for developed site use, viewing nature, primitive area activities, and fishing. However, there is little consistency across regions in which specific potential climate futures promote the greatest (and lowest) projected number of participants by 2070. Because the future conditions associated with each climate future differ by region (Joyce et al. 2018), it follows that patterns would differ across regions. Furthermore, even within activities and regions, the climate futures that lead to the most growth in participant numbers can vary by atmospheric warming level.

Overall, the climate futures that most commonly yield participant projections uniquely different from the other climate futures tend to be the Dry, Hot, and Least Warm climate futures. For example, in the Rocky Mountain RPA Region, the Dry and Hot climate futures

show the greatest participant growth for day hiking and primitive area activities—distinctly above the other three climate futures—under the high warming scenarios. However, within the same region, the Dry and Hot climate futures are associated with the lowest participant projections for horseback riding on trails, motorized water use, and mountain biking. The Least Warm climate future often emerges as the setting which promotes the most participant growth. For instance, participant projections for snowmachining in the North RPA Region are uniquely high under the Least Warm climate future. However, this positive influence does not hold across all region/activity combinations; floating activities in the South RPA Region is one example of a uniquely negative influence of the Least Warm climate future.

Days of Recreation

Developed site use is associated with the most days of recreation in 2012 (similar to the dominance of this activity for numbers of participants), especially in the North and South RPA Regions. Among activities with the most days of recreation are swimming and fishing (all regions) and day hiking (except for the South RPA Region). The activity with the fewest days of recreation in 2012 is primitive area activities (all regions), followed by horseback riding on trails (outside of the Rocky Mountain RPA Region), undeveloped skiing and snowmachining (outside of the South RPA Region), and floating activities (all RPA regions).

The North RPA Region has the most activities projected to decline in the number of days of recreation by 2070. For that region, under the HL scenario, we project declining numbers of days of recreation in all but two activities—horseback riding on trails and motorized water use. The North RPA Region is also the only region with the number of days of recreation projected to decline even under the HH scenario: snowmachining and undeveloped skiing (all but the Least Warm climate future) and hunting (all climate futures). We project the steepest declines in number of days of recreation in the North RPA Region, across all scenarios, for snowmachining, undeveloped skiing, and hunting. Conversely, the South RPA Region has just five activities with potential declines in number of days of recreation, all under the HL scenario; when those declines are possible, we project that they will be minor (of slight magnitude or negligible). The Rocky Mountain and Pacific Coast RPA Regions show potential for moderate declines in three activities, especially under the HL scenario. In the Rocky Mountain RPA Region, these activities (horseback riding on trails, snowmachining, and hunting) show decreasing number of days of recreation even under moderate socioeconomic growth (HM), albeit to a reduced (slight) extent. Under sufficiently high population and income growth (HH), we project quite variable increases in number of days of these activities by 2070—from slight (horseback riding on trails) up to marked (snowmachining)—depending on the level of responsiveness to socioeconomic growth. In the Pacific Coast RPA Region, we project moderate declines in the numbers of days under HL for horseback riding on trails, motorized off-road use, and snowmachining. However, horseback riding on trails—associated with the greatest declines projected in the region by 2070—remains as the only activity with declines projected under HM (Hot and Dry climate futures, the settings of most decline under HL). All three activities show growth when socioeconomic growth is high (HH), and the projections to 2070 are similar for horseback riding on trails and snowmachining (all climate futures), and motorized off-road use (Hot and Dry climate futures only).

Influence of socioeconomic growth

For all activities, high levels of future population and income lead to greater numbers of projected days of recreation by activity. We project higher numbers of days of recreation by 2070 under the HH scenario versus the HL scenario. Overall, the positive effects of socioeconomic growth on the number of days of recreation are most pronounced for developed skiing and motorized water use. The projected number of days of recreation show the most positive (marked) effect of socioeconomic growth on developed skiing in the Rocky Mountain RPA Region, followed by the Pacific Coast RPA Region. Motorized water use also shows notable impacts from socioeconomic growth, across all regions and most so in the South RPA Region. In the North RPA Region, in addition to motorized water use and developed skiing, another activity which responds notably to socioeconomic growth is horseback riding on trails. In the South RPA Region, the most significant effects of population and income are on horseback riding on trails, mountain biking, and swimming (in addition to motorized water use). Alongside developed skiing and motorized water use, the Rocky Mountain RPA Region has especially pronounced effects from socioeconomic growth on number of days of mountain biking and day hiking. In the Pacific Coast RPA Region, socioeconomic growth has the most influence on undeveloped skiing, mountain biking, developed skiing, and motorized water use.

The North RPA Region has three activities associated with lower levels of influence from population and income (under most or all climate futures): hunting, snowmachining, and undeveloped skiing. Hunting in the Pacific Coast RPA Region and horseback riding on trails in the Rocky Mountain RPA Region also show relatively limited response to population and income yet are still moderate in magnitude.

Influence of atmospheric warming

In general, greater atmospheric warming has a negative influence on projected numbers of days of recreation. However, that pattern does not hold for hunting days in the South and Pacific Coast RPA Regions with the most positive effects projected by 2070 under the Hot and Wet climate futures (South) or the Wet climate future (Pacific Coast). Although additional activities show more days of recreation under high (versus lower) warming, the gains remain slight in most cases, and the outcomes vary by climate future within a given activity. We found that camping in developed campgrounds, fishing, viewing nature, and developed site use are mostly unresponsive to the assumed level of atmospheric warming in all regions. The level of atmospheric warming also has little influence on projected number of days of recreation for mountain biking and primitive area activities (Pacific Coast RPA Region), motorized off-road use (South RPA Region), day hiking (Rocky Mountain RPA Region), and motorized water use (North RPA Region).

We project the greatest effect of high atmospheric warming for snowmachining in the Rocky Mountain RPA Region—with negative influence on number of participants and number of days of recreation, mostly under Hot and Wet climate futures. There are also notable effects of warming (with negative effects) on projected number of days of developed skiing (Rocky Mountain and North RPA Regions), horseback riding on trails (North and South RPA Regions), and undeveloped skiing (North RPA Region). In addition to those previously mentioned, the following activities are most affected (negatively) by atmospheric warming, in terms of number of days of recreation: (1) snowmachining and swimming in the

North RPA Region; (2) swimming, day hiking, and primitive area activities in the South RPA Region; (3) undeveloped skiing and hunting in the Rocky Mountain RPA Region; and (4) snowmachining, motorized water use, undeveloped skiing, and horseback riding on trails in the Pacific Coast RPA Region.

Influence of climate future

As with number of participants, the influence of climate future on projected number of days of recreation is highly variable. Differences in climate future lead to the largest differences in projected number of days of recreation for snowmachining (Rocky Mountain and North RPA Regions), horseback riding on trails (South RPA Region), undeveloped skiing (North RPA Region), and developed skiing (Rocky Mountain RPA Region). Additionally, other activities with relatively high impacts within their respective regions include developed skiing and motorized water use (North RPA Region), swimming (North and South RPA Regions), horseback riding on trails (Pacific Coast RPA Region), primitive area activities (South and Rocky Mountain RPA Regions), and day hiking and undeveloped skiing (Rocky Mountain RPA Region).

In the Pacific Coast RPA Region, projections of number of days of recreation for the 17 activities are frequently similar across the assumed climate futures (in all but 5 activities with moderate effects). The conclusion is not necessarily that the activities are invariable to climate futures but that perhaps the modeling and simulation approach does not sufficiently explain or structure the recreation engagement patterns attributable to climate futures. Those activities that show responsiveness to climate futures in the Pacific Coast RPA Region are horseback riding on trails, snowmachining, undeveloped skiing, motorized water use, and mountain biking.

Regional Overviews of Participant Changes from 2012 to 2070 and Drivers

In tables 4–7, we graphically summarize the extent of percentages of change from 2012 (baseline) to 2070 in number of participants by activity, under each of the four RPA scenarios—LM, HL, HM, and HH. We apply the scale in table 3 to classifying the magnitudes of these changes as well as to the determination of drivers among the three factors under consideration—socioeconomic growth (HH versus HL), atmospheric warming (HM versus LM), and climate futures. Because we assess the climate futures using ranges of percentages of change within an RPA scenario, the classifications do not have a negative direction. The corresponding tables for the number of days of recreation are in the appendix (tables A.1–A.4).

Table 4—Classifications of percentages of change in the projected number of participants for the North Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections in 2070

Activity or activity grouping	Projected change in total participants from 2012 to 2070 ^a				Potential drivers of participation ^a			Variation across climate futures ^b	
	LM ^c	HL	HM	HH	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^d	Climate future(s) leading to the highest projected number(s) of participants in 2070	Climate future(s) leading to the lowest projected number(s) of participants in 2070
Developed site recreation									
Developed site use	↑	↔	↑	↑	▲	↔	↔	↔	↔
Camping in developed campgrounds	↔↑	↓↔	↔	↑↑	↑	↔	↔	↔	↔
Viewing/photographing nature									
Viewing nature	↑	↔	↑	↑	▲	↔	↔	↔	↔
Birding ^e	↑	↓↔	↔↑	↑↑	↑▲	↔	↔↑	Least Warm and Wet (all); Dry and Middle (high warming)	Hot (all); Middle (lower warming)
Nonmotorized, undeveloped activities									
Day hiking	↔↑	↓↔	↔↑	↑↑	↑▲	↔	↔↑	Least Warm and Wet (all); Dry and Middle (high warming)	Hot (all); Middle (lower warming)
Primitive area activities	↑	↓	↔	↑↑	↑	↔	↔	↔	↔
Mountain biking	↑↑	↔	↑	▲	▲	↓↔	↔↑	Dry (all); Hot (high warming)	Wet, Middle, and Least Warm (all); Hot (lower warming)
Horseback riding on trails	↑▲	↔↑	↑↑▲	▲	▲	↔↑	↔↑↑▲	Hot and Middle (all)	Least Warm and Wet (all)
Motorized activities									
Motorized water use	↑↑	↔	↑	▲	▲	↔	↔	↔	↔
Motorized off-road use	↑	↔	↑	↑	↑▲	↔	↔	↔	↔
Snowmachining	↓↔	↓↓	↓↓	↓↑	↑↑	↓↔	↑↑	Least Warm (all)	Dry (high warming); Hot (all)
Fishing and hunting									
Fishing	↑	↓↔	↔↑	↑	↑▲	↔	↔	↔	↔
Hunting	↓	↓	↓	↓	↑	↔	↔	↔	↔

Table 4—Classifications of percentages of change in the projected number of participants for the North Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections in 2070 (continued)

Activity or activity grouping	Projected change in total participants from 2012 to 2070 ^a				Potential drivers of participation ^a			Variation across climate futures ^b	
	LM ^c	HL	HM	HH	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^d	Climate future(s) leading to the highest projected number(s) of participants in 2070	Climate future(s) leading to the lowest projected number(s) of participants in 2070
Nonmotorized winter activities									
Developed skiing	↑	↔	↑↑	▲	▲	↓↔	↔↑	Wet, Middle, and Least Warm (all); Hot (lower warming)	Hot (high warming); Dry (all)
Undeveloped skiing	↓↔↑	↓	↓↔	↔↑↑	↑	↓↔	↑↑	Least Warm (all)	Hot (all); Wet and Dry (high warming)
Nonmotorized water activities									
Swimming	↑	↓↔	↔↑	↑↑	▲	↓↔	↔↑	Least Warm and Wet (all)	Hot and Middle (all); Dry (lower warming)
Floating	↔↑	↓	↔	↑↑	↑▲	↓↔	↔↑	Least Warm and Wet (all)	Hot and Middle (all); Dry (lower warming)

^a The arrows designate both direction and magnitude of the respective percentage of change comparisons, using the scale outlined in table 3. The directions and magnitudes of percentages of change in number of participants may span multiple categories, as projections consider 20 scenario and climate future combinations (four RPA scenarios each with five associated climate futures).

▲▼ = 75-percent or greater increase or decrease (marked change); ↑↓ = 50- to 75-percent increase or decrease (extensive change); ↑↑ = 15- to 50-percent increase or decrease (moderate change); ↔ = less than 15-percent increase or decrease (slight change)

^b Climate futures are identified (by lower and/or high warming scenarios) when their associated impacts are moderate or higher under at least one RPA scenario.

^c The first letter of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]); Lower (L) = RCP 4.5, High (H) = RCP 8.5. The second letter denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]); Low (L) = SSP3, Moderate (M) = SSP1 and SSP2, High (H) = SSP5.

^d Because these classifications are made with respect to the range across climate futures per RPA scenario, quantifying the responsiveness of climate future is non-negative.

^e Birding is also a subset of the viewing nature aggregate.

Table 5—Classifications of percentages of change in the projected number of participants for the South Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections in 2070

Activity or activity grouping	Projected change in total participants from 2012 to 2070 ^a				Potential drivers of participation ^a			Variation across climate futures ^b	
	LM ^c	HL	HM	HH	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^d	Climate future(s) leading to the highest projected number(s) of participants in 2070	Climate future(s) leading to the lowest projected number(s) of participants in 2070
Developed site recreation									
Developed site use	↑	↑	↑	▲	▲	⇔	⇔	⇔	⇔
Camping in developed campgrounds	↑↑	⇔	↑	↑▲	↑▲	⇔	⇔↑	Dry (all)	Least Warm and Middle (all); Wet and Hot (lower warming)
Viewing/photographing nature									
Viewing nature	↑	↑	↑	▲	▲	⇔	⇔	⇔	⇔
Birding ^e	↑	⇔↑	↑↑	▲	▲	↓⇔	⇔	⇔	⇔
Nonmotorized, undeveloped activities									
Day hiking	↑▲	⇔↑	↑↑	▲	▲	↓⇔	⇔↑	Least Warm and Wet (all)	Hot and Dry (all); Middle (lower warming)
Primitive area activities	↑	⇔	↑	▲	▲	↓⇔	⇔	⇔	⇔
Mountain biking	↑▲	⇔	↑↑	▲	▲	↓⇔	⇔↑	Least Warm and Wet (all); Middle (high warming)	Dry (all); Hot (high warming); Middle (lower warming)
Horseback riding on trails	↑▲	⇔↑	↑▲	▲	▲	↓⇔	⇔↑	Least Warm and Middle (all); Wet and Hot (lower warming)	Dry (all)
Motorized activities									
Motorized water use	▲	↑	↑▲	▲	▲	⇔	⇔↑	Hot (all); Middle and Dry (lower warming)	Least Warm (all); Wet (lower warming)
Motorized off-road use	↑	⇔	↑	↑	↑	⇔	⇔	⇔	⇔
Fishing and hunting									
Fishing	↑	↑	↑	▲	▲	⇔	⇔	⇔	⇔
Hunting	↑	⇔	↑	↑	↑	⇔	⇔	⇔	⇔

Table 5—Classifications of percentages of change in the projected number of participants for the South Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections in 2070 (continued)

Activity or activity grouping	Projected change in total participants from 2012 to 2070 ^a				Potential drivers of participation ^a			Variation across climate futures ^b	
	LM ^c	HL	HM	HH	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^d	Climate future(s) leading to the highest projected number(s) of participants in 2070	Climate future(s) leading to the lowest projected number(s) of participants in 2070
Nonmotorized water activities									
Swimming	▲▲	↔↑	↑	▲	▲	↓↔	↔	↔	↔
Floating	▲▲	↑	↑	▲	▲	↔	↔↑	Hot (all); Middle and Dry (lower warming)	Least Warm (all); Wet (lower warming)

^a The arrows designate both direction and magnitude of the respective percentage of change comparisons, using the scale outlined in table 3. The directions and magnitudes of percentages of change in number of participants may span multiple categories, as projections consider 20 scenario and climate future combinations (four RPA scenarios each with five associated climate futures).

▲▼ = 75-percent or greater increase or decrease (marked change); ▲↓ = 50- to 75-percent increase or decrease (extensive change); ↑↓ = 15- to 50-percent increase or decrease (moderate change); ↔ = less than 15-percent increase or decrease (slight change)

^b Climate futures are identified (by lower and/or high warming scenarios) when their associated impacts are moderate or higher under at least one RPA scenario.

^c The first letter of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]); Lower (L) = RCP 4.5, High (H) = RCP 8.5. The second letter denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]); Low (L) = SSP3, Moderate (M) = SSP1 and SSP2, High (H) = SSP5.

^d Because these classifications are made with respect to the range across climate futures per RPA scenario, quantifying the responsiveness of climate future is non-negative.

^e Birding is also a subset of the viewing nature aggregate.

Table 6—Classifications of percentages of change in the projected number of participants for the Rocky Mountain Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections in 2070

Activity or activity grouping	Projected change in total participants from 2012 to 2070 ^a				Potential drivers of participation ^a			Variation across climate futures ^b	
	LM ^c	HL	HM	HH	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^d	Climate future(s) leading to the highest projected number(s) of participants in 2070	Climate future(s) leading to the lowest projected number(s) of participants in 2070
Developed site recreation									
Developed site use	▲	↑	↑	▲	▲	↔	↔	↔	↔
Camping in developed campgrounds	↑	↔↑	↑	▲	▲	↔	↔	↔	↔
Viewing/photographing nature									
Viewing nature	▲	↑	↑	▲	▲	↔	↔	↔	↔
Birding ^e	↑	↑	↑	▲	▲	↔	↔	↔	↔
Nonmotorized, undeveloped activities									
Day hiking	▲	↑	▲▲	▲	▲	↓↔	↔↑	Dry (all); Hot (high warming)	Wet, Middle, and Least Warm (all); Hot (lower warming)

Table 6—Classifications of percentages of change in the projected number of participants for the Rocky Mountain Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections in 2070 (continued)

Activity or activity grouping	Projected change in total participants from 2012 to 2070 ^a				Potential drivers of participation ^a			Variation across climate futures ^b	
	LM ^c	HL	HM	HH	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^d	Climate future(s) leading to the highest projected number(s) of participants in 2070	Climate future(s) leading to the lowest projected number(s) of participants in 2070
Primitive area activities	▲▲	↑	↑	▲	▲	↔	↔	↔	↔
Mountain biking	▲	↑↑	▲	▲	▲	↓↔	↔↑	Wet, Middle, and Least Warm (all); Hot (lower warming)	Dry (all); Hot (high warming)
Horseback riding on trails	▲	↑	↑▲	▲	▲	↓	↔↑	Wet and Least Warm (all); Middle (lower warming)	Hot and Dry (all)
Motorized activities									
Motorized water use	▲	↑	▲	▲	▲	↓↔	↔↑	Wet, Middle, and Least Warm (all); Hot (lower warming)	Dry (all); Hot (high warming)
Motorized off-road use	▲	↑	↑▲	▲	▲	↔	↔↑	Dry (all); Hot (high warming)	Wet, Middle, and Least Warm (all); Hot (lower warming)
Snowmachining	↑▲	↓↔↑	↔↑	↑▲	▲	↓↓	↔↑▲▲	Least Warm (all)	Dry (all); Wet and Hot (high warming)
Fishing and hunting									
Fishing	↑	↑	↑	▲	▲	↔	↔	↔	↔
Hunting	↑↑	↔	↑	↑▲	↑	↓↔	↑	Least Warm (all); Wet (lower warming)	Hot and Dry (all); Middle (lower warming)
Nonmotorized winter activities									
Developed skiing	▲	↑↑	▲	▲	▲	↓↔	↑↑	Dry (all)	Wet, Middle, and Least Warm (all); Hot (lower warming)
Undeveloped skiing	↑▲	↑	↑	▲	▲	↔	↔	↔	↔
Nonmotorized water activities									
Swimming	↑▲	↑	↑	▲	▲	↔	↔	↔	↔
Floating	▲	↑	↑▲	▲	▲	↔	↔↑	Wet, Middle, and Least Warm (all); Hot (lower warming)	Dry (all); Hot (high warming)

^a The arrows designate both direction and magnitude of the respective percentage of change comparisons, using the scale outlined in table 3. The directions and magnitudes of percentages of change in number of participants may span multiple categories, as projections consider 20 scenario and climate future combinations (four RPA scenarios each with five associated climate futures).

▲▼ = 75-percent or greater increase or decrease (marked change); ↑↓ = 50- to 75-percent increase or decrease (extensive change); ↑↑ = 15- to 50-percent increase or decrease (moderate change); ↔ = less than 15-percent increase or decrease (slight change)

^b Climate futures are identified (by lower and/or high warming scenarios) when their associated impacts are moderate or higher under at least one RPA scenario.

^c The first letter of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]); Lower (L) = RCP 4.5, High (H) = RCP 8.5. The second letter denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]); Low (L) = SSP3, Moderate (M) = SSP 1 and SSP2, High (H) = SSP5.

^d Because these classifications are made with respect to the range across climate futures per RPA scenario, quantifying the responsiveness of climate future is non-negative.

^e Birding is also a subset of the viewing nature aggregate.

Table 7—Classifications of percentages of change in the projected number of participants for the Pacific Coast Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections in 2070

Activity or activity grouping	Projected change in total participants from 2012 to 2070 ^a				Potential drivers of participation ^a			Variation across climate futures ^b	
	LM ^c	HL	HM	HH	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^d	Climate future(s) leading to the highest projected number(s) of participants in 2070	Climate future(s) leading to the lowest projected number(s) of participants in 2070
Developed site recreation									
Developed site use	↑	↔	↑	▲	▲	↔	↔	↔	↔
Camping in developed campgrounds	↑	↔	↑	▲	▲	↔	↔	↔	↔
Viewing/photographing nature									
Viewing nature	↑	↔	↑	▲	▲	↔	↔	↔	↔
Birding ^e	↑↑	↔	↑	▲	▲	↔	↔	↔	↔
Nonmotorized, undeveloped activities									
Day hiking	↑	↔	↑	▲	▲	↔	↔	↔	↔
Primitive area activities	↑	↔	↑	▲	▲	↔	↔	↔	↔
Mountain biking	↑	↔	↑↑	▲	▲	↔	↔	↔	↔
Horseback riding on trails	↑▲	↔	↑↑	▲	▲	↓	↔↑	Wet, Middle, and Least Warm (all)	Hot (all)
Motorized activities									
Motorized water use	↑▲	↔↑	↑	▲	▲	↔	↔	↔	↔
Motorized off-road use	↑	↔	↑	↑	↑	↔	↔	↔	↔
Snowmachining	↑	↔↑	↑↑	▲	▲	↓↔	↔↑	Least Warm, Wet, and Middle (high warming)	Hot (high warming)
Fishing and hunting									
Fishing	↑	↔	↑	▲	▲	↔	↔	↔	↔
Hunting	↑	↔	↑	↑↑	↑	↔	↔	↔	↔

Table 7—Classifications of percentages of change in the projected number of participants for the Pacific Coast Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections in 2070 (continued)

Activity or activity grouping	Projected change in total participants from 2012 to 2070 ^a				Potential drivers of participation ^a			Variation across climate futures ^b	
	LM ^c	HL	HM	HH	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^d	Climate future(s) leading to the highest projected number(s) of participants in 2070	Climate future(s) leading to the lowest projected number(s) of participants in 2070
Nonmotorized winter activities									
Developed skiing	▲	↔↑	↑▲	▲	▲	↓	↔↑	Least Warm, Wet, and Middle (high warming)	Hot and Dry (high warming)
Undeveloped skiing	↑▲	↔↑	↑	▲	▲	↓↔	↔↑	Least Warm, Wet, and Middle (high warming); Dry and Hot (lower warming)	Hot and Dry (high warming); Wet and Middle (lower warming)
Nonmotorized water activities									
Swimming	↑	↔	↑	▲	▲	↔	↔	↔	↔
Floating	↑	↔	↑	▲	▲	↔	↔	↔	↔

^a The arrows designate both direction and magnitude of the respective percentage of change comparisons, using the scale outlined in table 3. The directions and magnitudes of percentages of change in number of participants may span multiple categories, as projections consider 20 scenario and climate future combinations (four RPA scenarios each with five associated climate futures).

▲▼ = 75-percent or greater increase or decrease (marked change); ↑↓ = 50- to 75-percent increase or decrease (extensive change); ↑↑ = 15- to 50-percent increase or decrease (moderate change); ↔ = less than 15-percent increase or decrease (slight change)

^b Climate futures are identified (by lower and/or high warming scenarios) when their associated impacts are moderate or higher under at least one RPA scenario.

^c The first letter of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]); Lower (L) = RCP 4.5, High (H) = RCP 8.5. The second letter denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]); Low (L) = SSP3, Moderate (M) = SSP 1 and SSP2, High (H) = SSP5.

^d Because these classifications are made with respect to the range across climate futures per RPA scenario, quantifying the responsiveness of climate future is non-negative.

^e Birding is also a subset of the viewing nature aggregate.

Outdoor Recreation Trends from 2012 to 2070 in the North RPA Region

Key Findings

- Among RPA regions, the North RPA Region has the most activities where number of participants and number of days of recreation are projected to decline by 2070, especially under low or moderate socioeconomic growth.
- Snowmachining and hunting are associated with declining numbers of participants and days of recreation to 2070, projected under some or all climate futures for all RPA scenarios.
- Socioeconomic growth is the leading (positive) driver for numbers of participants and days of recreation. Atmospheric warming generally has slight (inverse) effects on projections, with moderate magnitude in some activities.
- We project the highest long-term increases in numbers of participants and days of recreation for horseback riding on trails, developed skiing, and motorized water use; these activities are also most positively responsive to socioeconomic growth.
- Comparing both recreation metrics (number of days of recreation versus number of participants) projected to 2070 reveals some distinctive patterns among certain activities in relation to the others. These activities include the following:
 - Developed site use—notably high number of participants with relatively fewer days of recreation, potentially indicating more frequent visitation with short duration
 - Viewing nature—the greatest number of days of recreation among activities with relatively low number of participants, possibly indicating more frequent visitation relative to the fewer participants
 - Birding—similar to viewing nature, the second greatest number of days of recreation with relatively low number of participants
 - Mountain biking, primitive area activities, and horseback riding on trails—slightly elevated numbers of days of recreation among the relatively low numbers of participants

The North RPA Region

The North RPA Region consists of 20 states and the District of Columbia, coinciding with the most urban Forest Service region, the Eastern Region (fig. 1), which includes part or all of 10 of the nation's 25 largest metropolitan areas (U.S. Census Bureau, n.d.). In 2012, the North RPA Region had the largest population among RPA regions, with more than 40 percent of the U.S. population. Among RPA scenarios from 2040 to 2070, projections show that the North RPA Region is second in population to the South RPA Region (fig. 3) (Wear and Prestemon 2019b). By 2070, the area could experience a slight downturn in population under low socioeconomic growth (HL scenario), the only regional decline projected, or the lowest growth under moderate to high socioeconomic growth.

In this section, we focus on regional projections for two metrics—participation (number of participants) and engagement (number of days of recreation). Number of participants and number of days of recreation are “complementary measures [in estimation and projection] of outdoor recreation markets” for each activity. “Participation [number of participants] can indicate market size and public interest,” whereas the number of days of recreation is

a measurement of how frequently recreationists are participating in that activity (Askew and Bowker 2018: 103). Additionally, managers and planners benefit from understanding how responsive these measures are to a set of external factors or conditions, to be identified as drivers. We consider the effects on projected changes in recreation demand from three factors—socioeconomic growth, atmospheric warming, and climate futures.

Projected trends in recreation demand

For the North RPA Region, we project outdoor recreation demand for all ownerships for 17 activities under four RPA scenarios (table 1). From the baseline year of 2012, we make projections on a decennial basis from 2020 to 2070. For each activity and metric, we compute contemporary estimates as the average of projections for 2020, across all RPA scenarios and associated climate futures (20 projected values). In addition to contemporary estimates, we show projected changes from baseline year 2012 to 2040 and from 2012 to 2070 as intervals per RPA scenario, defined by minimum to maximum outlooks, for number of participants (table 8) and number of days of recreation (table 9). These intervals span projections across five associated climate futures (Dry, Wet, Middle, Least Warm, and Hot) under each RPA scenario (table 2). We report projected values for each scenario and climate future assessment in the appendix: for per capita participation see tables A.5 and A.6, for numbers of regional participants see table A.7, and for numbers of regional days of recreation see table A.8.

Drivers of recreation demand

The underlying assumptions of RPA scenarios permit pairwise comparisons across sets of projections for the numbers of participants and the numbers of days of recreation. The HL and HH scenarios assume high atmospheric warming but have differing levels of assumed socioeconomic growth. This comparison can reveal whether socioeconomic growth is a driving influence for recreation demand. Similarly, the LM and HM scenarios overlap in assumed future socioeconomic growth (moderate socioeconomic growth), but comparisons can indicate the strength of atmospheric warming as a driver of recreation demand. Lastly, comparisons across climate futures within and across RPA scenarios can provide insight into how different climate futures may influence the number of participants and the number of days of recreation in the coming decades.

Developed Site Recreation

Developed site use (gatherings, picnicking, and visiting developed sites)

PARTICIPANTS—In 2020, about 40 million participants in the North RPA Region engaged in developed site use, the most popular activity in our study. We define developed site use as an aggregate of five activities: (1) gathering of family or friends in an outdoor area away from home; (2) picnicking; (3) visiting an outdoor nature center, a nature trail, a visitor center, or a zoo; (4) visiting a prehistoric structure or archaeological site; and (5) visiting historic sites, buildings, or monuments. We project increases in the number of participants to grow with time under all RPA scenarios except HL. Under the HL scenario, projections show 9 percent fewer participants in 2070 than in 2012, after many decades of stability. In comparison, projections under the HH scenario indicate 68 percent more participants from 2012 to 2070. This notable difference reveals socioeconomic growth to be a significant and positive driver.

Table 8—Changes in the number of participants (millions) in outdoor recreation for the North Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
	PARTICIPANTS (MILLIONS)		PERCENTAGE OF CHANGE							
Developed site recreation										
Developed site use	38.0	40.0	18–19	29	2	(9)	16	23	32	68
Camping in developed campgrounds	9.1	9.4	7–11	10–16	(5)–(2)	(18)–(12)	6–10	7–15	19–23	40–50
Viewing/photographing nature										
Viewing nature	7.8	8.2	18–19	28–29	2–3	(10)–(9)	16	22–23	32–33	67–69
Birding ^e	5.1	5.6	15–26	16–31	3–6	(20)–(8)	16–20	8–24	32–36	47–70
Nonmotorized, undeveloped activities										
Day hiking	12.3	13.2	10–22	12–29	(3)–2	(24)–(10)	10–15	4–22	26–32	44–70
Primitive area activities	2.7	2.8	8–17	17–22	(4)–(2)	(19)–(16)	8–11	9–13	23–26	49–54
Mountain biking	2.8	3.0	11–22	37–52	(2)–4	(8)–1	12–18	27–40	29–36	84–103
Horseback riding on trails	1.2	1.3	17–41	44–92	5–26	6–50	20–45	49–110	39–67	122–211
Motorized activities										
Motorized water use	11.4	12.1	21–26	41–51	4–7	1–8	18–22	38–49	35–40	103–118
Motorized off-road use	8.0	8.2	5–19	16–24	(6)–(1)	(12)–(7)	6–11	18–24	20–26	61–69
Snowmachining	2.9	2.8	(22)–8	(47)–8	(33)–(22)	(70)–(38)	(24)–(12)	(59)–(16)	(13)–0	(42)–20
Fishing and hunting										
Fishing	12.2	12.8	11–17	18–26	(3)–(1)	(18)–(12)	10–12	11–19	26–28	55–67
Hunting	5.0	4.7	(25)–5	(29)–(17)	(23)–(15)	(48)–(40)	(18)–(9)	(38)–(29)	(12)–(3)	(29)–(19)
Nonmotorized winter activities										
Developed skiing	6.6	6.8	17–27	52–67	(2)–3	1–10	14–20	47–60	34–41	138–159
Undeveloped skiing	4.1	4.1	(4)–23	(22)–34	(19)–(9)	(45)–(19)	(8)–3	(25)–10	5–17	7–56
Nonmotorized water activities										
Swimming	20.2	21.1	10–18	18–33	(6)–0	(28)–(13)	7–15	2–21	24–32	49–72
Floating	4.4	4.5	1–12	6–28	(13)–(5)	(35)–(19)	(1)–9	(10)–13	14–25	32–64

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation participants are based on the products of per capita participation estimates and the regional adult (≥16 years of age) population projections, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of participants by activity (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of participants are computed as averages of all projections under the LM, HL, HM, and HH scenarios in 2020.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP 1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table 9—Changes in the number of days (millions) of recreation for the North Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
	DAYS OF RECREATION (MILLIONS)		PERCENTAGE OF CHANGE							
Developed site recreation										
Developed site use	446	471	14–21	23–36	(2)–3	(19)–(10)	12–17	11–24	29–35	58–76
Camping in developed campgrounds	65	67	4–18	4–16	(4)–1	(18)–(9)	7–12	7–19	20–26	39–56
Viewing/photographing nature										
Viewing nature	125	131	8–16	5–19	(5)–1	(29)–(18)	6–13	(5)–9	20–28	27–47
Birding ^e	74	80	5–21	(11)–14	(7)–3	(42)–(21)	4–15	(24)–3	17–30	1–37
Nonmotorized, undeveloped activities										
Day hiking	182	192	1–16	(8)–14	(9)–(2)	(37)–(19)	1–10	(18)–6	14–23	7–38
Primitive area activities	4	4	2–16	2–21	(11)–(3)	(34)–(21)	0–10	(11)–6	14–25	21–45
Mountain biking	54	57	8–18	29–43	(5)–0	(14)–(8)	8–14	19–26	23–30	71–81
Horseback riding on trails	11	13	23–109	132–165	25–63	49–67	42–86	106–130	63–113	213–247
Motorized activities										
Motorized water use	126	134	21–34	41–66	4–14	4–26	19–30	43–74	36–49	116–160
Motorized off-road use	109	110	5–17	5–23	(8)–0	(16)–(7)	4–12	12–24	17–27	53–69
Snowmachining	23	21	(30)–8	(62)–2	(42)–(28)	(78)–(45)	(34)–(19)	(71)–(27)	(25)–(8)	(58)–5
Fishing and hunting										
Fishing	188	196	1–14	6–17	(9)–(4)	(29)–(20)	3–8	(4)–7	17–23	32–47
Hunting	90	87	(30)–8	(36)–(17)	(26)–(15)	(53)–(40)	(20)–(9)	(44)–(29)	(15)–(3)	(37)–(19)
Nonmotorized winter activities										
Developed skiing	37	38	(19)–33	20–58	(18)–(4)	(38)–(20)	(3)–15	(5)–21	17–38	65–111
Undeveloped skiing	22	21	(36)–42	(46)–22	(31)–(19)	(69)–(47)	(21)–(7)	(57)–(26)	(9)–7	(38)–6
Nonmotorized water activities										
Swimming	211	220	3–18	9–40	(13)–(1)	(40)–(16)	0–14	(14)–18	16–32	32–77
Floating	26	27	4–17	6–30	(13)–(4)	(35)–(17)	(1)–10	(11)–14	14–26	29–65

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation engagement are based on the products of mean (annual) number of days of recreation estimated per participant and the projected regional adult (≥16 years of age) population, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional number of days of recreation (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of days of recreation (by activity) are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP 1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Projections under the LM and HM scenarios show notable increases in the numbers of participants from 2012 to 2070. Comparisons reveal a slight, negative response to high warming levels—we project 29 percent more participants in 2070 (than in 2012) under the LM scenario versus 23 percent more under the HM scenario. Thus, atmospheric warming has a minor effect on the number of participants in this activity. Within each RPA scenario, there is little variability across climate futures. This indicates that the numbers of participants are not especially responsive to climate future.

DAYS OF RECREATION—Being the most popular activity, developed site use also had the most days of recreation among the activities in this study. In 2020, participants in the North RPA Region engaged in 471 million days of this activity. Projections to 2070 indicate declines only under the HL scenario, with 10 to 19 percent fewer days of recreation than in 2012. The most growth in the number of days of recreation occurs under the HH scenario (58 to 76 percent more than 2012). Thus, there is a strong and positive response from number of days of developed site use to socioeconomic growth.

Projections for 2070 show increases of 23 to 36 percent in number of days of recreation (from 2012) under the LM scenario, compared to 11 to 24 percent under HM. Although higher atmospheric warming has a negative influence on the number of days of recreation, the small magnitude of change does not qualify it as a driving factor. Climate futures have slight or moderate effects on the number of days of recreation for developed site use, increasing with socioeconomic growth. The Hot, Middle, and Dry climate futures are associated with the fewest projected days of recreation across RPA scenarios, reflecting a negative or dampening effect from those settings. The Least Warm and Wet climate futures promote the most days of recreation for each RPA scenario, while the intermediate outcome occurs under the Dry climate future.

Camping in developed campgrounds

PARTICIPANTS—In 2020, about 9.4 million regional participants went camping in developed campgrounds. The projected number of developed campground campers is especially responsive (in the long term) to changing U.S. population and income—developed campground camper totals respond positively to moderate to high socioeconomic growth and negatively to low socioeconomic growth. There is a notable temporal effect as socioeconomic growth progresses over decades. Under the HL scenario, we project declines in number of participants by 2 to 5 percent from 2012 to 2040 and by 12 to 18 percent from 2012 to 2070. Projections under the HH scenario show the most significant increases for the number of participants using developed campgrounds from 2012—19 to 23 percent by 2040 and 40 to 50 percent by 2070.

In comparing LM to HM scenarios, contrasting atmospheric warming levels yield relatively small differences in participant numbers. Both scenarios indicate similar magnitudes of increase in number of participants from 2012 to 2040 and from 2012 to 2070—6 to 16 percent more than 2012. Furthermore, across RPA scenarios, climate futures do not meaningfully alter projected numbers of participants through 2070.

DAYS OF RECREATION—Regional participants engaged in 67 million days of developed campground camping in 2020. As with developed site use, the HL scenario is associated with the only projections of decline from 2012 to 2070, down by 9 to 18 percent. The projections of developed campground camping days under the HH scenario (growth of 39 to 56 percent from baseline) indicate a strong and positive influence from socioeconomic growth.

Projections under the LM and HM scenarios indicate slight or moderate growth similar in magnitude (4 to 19 percent), indicating that atmospheric warming is not a significant driver.

Climate futures have slight or moderate effects on projected number of days of developed campground camping. The Hot and Middle climate futures yield the greatest numbers of projected developed campground camping days across RPA scenarios. Under lower warming levels (LM), projections under the Dry climate future become increasingly similar to those under the Middle climate future by 2070. The minimum outlooks for numbers of days of developed campground camping occur under the Least Warm and Wet climate futures.

Viewing and Photographing Nature

Viewing nature

PARTICIPANTS—Regionally, about 8.2 million participants engaged in viewing nature in 2020. Participating in this activity involves (1) viewing, identifying, or photographing nature (birds, other wildlife, wildflowers, trees, other natural vegetation, or natural scenery) or (2) gathering mushrooms, berries, firewood, or other natural products. Initially quite stable, projections under the HL scenario follow a decreasing (minor but magnifying slightly) trend for decades beyond 2040—we estimate that nature viewers in 2070 will be 9 to 10 percent below the 2012 level. In comparison, the HH scenario is associated with substantial participant growth from 2012 by 2040 (32 to 33 percent more) and especially by 2070 (67 to 69 percent more). Thus, socioeconomic growth is an important and positive driver of participants in viewing nature.

Both LM and HM scenarios indicate moderate growth to 2070—28 to 29 percent more participants in the former scenario and 22 to 23 percent more in the latter. There is a consistently slight, negative response to high warming levels. Across RPA scenarios, projections show similar outcomes across all climate futures. Therefore, atmospheric warming and climate futures are not driving factors for numbers of participants for viewing nature.

DAYS OF RECREATION—Regional participants engaged in viewing nature for about 131 million days in 2020. Under the HL scenario, we project that the number of days of recreation could decline by 18 to 29 percent from 2012 to 2070. In contrast, the HH scenario outlooks are notably stronger, with an increase of 27 to 47 percent possible. A significant driving factor, socioeconomic growth can promote additional days of recreation at high levels (as assumed under the HH scenario).

Under the HM scenario, the projected change in total days of viewing nature ranges from a 5-percent decrease to a 9-percent increase from 2012 to 2070. In comparison, projections under the LM scenario indicate slight or moderate growth in the number of days of viewing nature, by 5 to 19 percent. This reinforces the slight, negative influence of high atmospheric warming, which tends to depress growth in the number of days of recreation even to the point of small decline. Climate futures have slight or moderate effects on the number of days of viewing nature across RPA scenarios. The general tendency is for maximum outlooks to occur under the Least Warm and Wet climate futures (across all RPA scenarios). The Hot, Middle, and Dry climate futures yield fewer viewing nature days.

Birding (viewing or photographing birds)

PARTICIPANTS—About 5.6 million participants in the North RPA Region went birding in 2020. We project downturns in the number of birding participants by 2070 only under the HL scenario, where population growth is insufficient to offset per capita declines. Under

the HL scenario, projections from 2012 suggest minor increases in the number of birding participants by 2040 (3 to 6 percent), followed by a downturn of 8 to 20 percent by 2070. In contrast, under high U.S. population and income (HH), gains in the number of participants (relative to 2012) are 32 to 36 percent by 2040 and 47 to 70 percent by 2070. The extensive increase in outlooks from HL to HH scenarios suggests an increasingly positive response to socioeconomic growth as a significant driver.

Projections indicate a weak negative relationship between the number of birders and atmospheric warming, as there is a slightly greater increase in the projected number of birders by 2070 under the LM scenario (16 to 31 percent) compared to the HM scenario (8 to 24 percent). The minimum projection of the number of birders consistently appears under the Hot climate future for all RPA scenarios, and the Middle climate future under the LM scenario. For high warming scenarios, the Hot climate future projects increasingly distinct outlooks from other climate futures alongside increasing socioeconomic growth.

DAYS OF RECREATION—In 2020, participants in the region engaged in about 80 million days of birding. Under low socioeconomic growth (HL scenario), we project 21 to 42 percent fewer days of birding in 2070 than in 2012. In comparison, projections under high socioeconomic growth (HH scenario) indicate stability or moderate growth—1 to 37 percent more birding days from baseline to 2070. Thus, regional birding strongly benefits from socioeconomic growth as a positive and significant driver of number of days of recreation.

On the surface, projections show ambiguous shifts to 2070 in number of days of recreation under moderate socioeconomic growth (LM and HM scenarios). However, closer comparisons show responses varying by atmospheric warming levels as well as climate future. High levels of atmospheric warming have negative effects on the number of days of recreation—approaching moderate levels in Wet and Hot climate futures and slight levels in Dry, Middle, and Least Warm climate futures. Across all RPA scenarios, we project the most birding days under the Least Warm and Wet climate futures. Conversely, we project the lowest levels of birding days in 2070 under the Hot and Middle climate futures followed by the Dry climate future. Climate futures have a notable and moderate effect as a driver of number of days of birding in the region.

Nonmotorized, Undeveloped Activities

Day hiking

PARTICIPANTS—The North RPA Region had about 13.2 million day hikers in 2020. The projected number of day hikers progressively falls below baseline values from 2040 and beyond under the low socioeconomic growth (HL) scenario. For 2070, we project 10 to 24 percent fewer day hikers than at baseline under the HL scenario, compared to 4 to 22 percent more under HM or 44 to 70 percent more under HH. Thus, socioeconomic growth is a significant and positive driver of total day hikers. Comparing projections under LM to HM, there is not sufficient magnitude to designate atmospheric warming as a driver of day hiker participant numbers.

Across the four RPA scenarios, climate future has significant effect—namely, whether the climate future is Hot or otherwise, especially under high atmospheric warming. A hotter climate future can either dampen growth in comparison to others (LM, HM, and HH scenarios) or magnify declines somewhat (HL scenario). Under lower atmospheric warming (LM scenario), the projections under the Middle and Hot climate futures become increasingly similar after 2060.

DAYS OF RECREATION—In 2020, regional participants engaged in about 192 million days of day hiking. Under the HL scenario, we project slight changes from 2012 to 2040: 2 to 9 percent fewer days of day hiking annually. Projections show increasingly declining engagement over time, with 19 to 37 percent fewer days of day hiking annually in 2070 than in 2012. In comparison, projections under the HH scenario show slight to moderate growth from 2012: 14 to 23 percent more days of recreation in 2040, versus 7 to 38 percent more by 2070, showing that socioeconomic growth is a driver. Projections under the LM and HM scenarios have similar rates of (slight) growth to 2040 (1 to 16 percent) but become different through 2070. By 2070, the number of days of recreation responds slightly more negatively to high levels of atmospheric warming. Under the LM scenario, projections for the number of days of recreation for 2070 are 8 percent below to 14 percent above 2012 levels, compared to 18 percent below to 6 percent above 2012 under HM.

Climate futures have an especially notable effect on number of days of recreation across RPA scenarios, more so as socioeconomic growth progresses. The Least Warm and Wet climate futures promote the most days of day hiking within RPA scenarios. The Hot climate future is associated with the lowest end of projections, indicating higher temperatures could be a deterrent to day hikers. We project intermediate outcomes under the Middle and Dry climate futures.

Primitive area activities (undeveloped area camping, backpacking, and visiting wilderness)

PARTICIPANTS—In 2020, the region had about 2.8 million participants in primitive area activities. Under the HL scenario, we project slight declines in the number of participants from 2012 to 2040 (by 2 to 4 percent), attaining moderate levels by 2070 (by 16 to 19 percent). We project the numbers of participants to increase from 2012 to 2070 under HM (by 9 to 13 percent) and under HH (by 49 to 54 percent). Socioeconomic growth is a significant and positive driver of participant numbers in primitive area activities. While the LM scenario indicates slightly more participants than HM (across all climate futures), atmospheric warming does not have a meaningful effect on participant number projections. Climate futures also have minor effects across all RPA scenarios, leaving socioeconomic growth as the primary driver in our study.

DAYS OF RECREATION—Participants in the North RPA Region engaged in about 4 million days of primitive area activities in 2020—the fewest days of recreation among the activities considered. Under the HL scenario, we project moderate declines from 2012, with 21 to 34 percent fewer days of recreation by 2070. In contrast, the HH scenario is associated with around the same magnitude of change but in the positive direction: 21- to 45-percent increase in the number of days of primitive area activities. Again, socioeconomic growth has a positive and notable influence on projected number of days of recreation for primitive area activities.

Under the LM scenario, we project slight or moderate increases in days of recreation by 2070 (2 to 21 percent above 2012). In comparison, changes in the number of days of recreation under the HM scenario are ambiguous, ranging from a minor decline to a slight increase (–11 to 6 percent). Projections show a consistently negative response to high warming levels, with variation across climate futures.

Climate futures are a significant driving factor for the number of days of primitive area activities. The maximum projected number of days of recreation per RPA scenario consistently occurs under the Least Warm and Wet climate futures. The minimum projected number of days of recreation corresponds to the Hot and Middle climate futures. The Dry climate future results in intermediate projections; however, under the LM scenario, it is increasingly similar in outlooks to the Hot and Middle climate futures. Participants tend to engage in more days of primitive area activities when the climate future is Least Warm or Wet, and in fewer days when Hot or Middle.

Mountain biking

PARTICIPANTS—In 2020, there were about 3 million participants in mountain biking in the region. Under the HL scenario, we project slight changes in the number of participants from 2012 to 2070 (by –8 to 1 percent). However, high socioeconomic growth (HH) has a marked and positive effect on projections of the number of participants, with 84 to 103 percent more participants in 2070 than in 2012. In comparing projections under LM and HM, the effects of atmospheric warming (as a driver) differ by climate future. With the exception of the Hot climate future, atmospheric warming has slight or moderate negative impacts on the projected number of mountain bikers in the region. This difference is most pronounced under the Dry and Wet climate futures. Under the Hot climate future, the projected numbers of mountain bikers are generally similar in the LM and HM scenarios.

The influence of climate futures on the numbers of mountain bikers is more pronounced under moderate to high levels of socioeconomic growth. The projected number of mountain bikers is greatest under the Dry climate future across all scenarios and the Hot climate future in the high warming scenarios (HH, HM, and HL). In high warming scenarios, the smallest projected numbers of mountain bikers occur under the Wet climate future, followed by the Middle and Least Warm climate futures. For the LM scenario, lower projections of the number of participants occur across all climate futures except Dry.

DAYS OF RECREATION—There were about 57 million days of mountain biking from regional participants in 2020. Projections reflect a strong and positive driver from socioeconomic growth. From 2012 to 2070, projections show 8 to 14 percent fewer days of recreation under the HL scenario, versus 71 to 81 percent more under the HH scenario. Projections of the number of days of mountain biking under LM and HM are quite similar through 2040 but diverge in later decades. By 2070, we project a 29- to 43-percent increase in the number of days of recreation compared to 2012 under LM, versus 19 to 26 percent more days of recreation under HM. This also affirms atmospheric warming as a moderate driver, with the number of days of mountain biking responding negatively to high atmospheric warming. Closer comparisons reveal some variation by climate future, as the response is most pronounced under the Dry and Wet climate futures and least under the Hot climate future.

There is slightly more differentiation by climate future under lower warming versus the high warming scenarios. The lower projections occur under the Middle (across all scenarios), Hot (LM), and Wet (across high warming scenarios) climate futures. The number of days projected for 2070 are maximized under the Least Warm and Hot climate futures for the high warming scenarios, and the Dry climate future for all scenarios.

Horseback riding on trails

PARTICIPANTS—About 1.3 million participants engaged in horseback riding on trails in 2020. Associated with the fewest participants in 2012, we project the activity to have the most growth in total participants among activities in our study, especially under the HH scenario. However, despite marked growth, the number of participants in this activity remains small relative to other activities considered. There is an especially strong, positive response to socioeconomic growth; the potential is 6 to 50 percent growth under HL and 122 to 211 percent growth under HH. Additionally, the positive response to socioeconomic growth varies across climate futures, with effects most pronounced under the Hot and Middle climate futures. Comparing LM and HM across climate futures, there are inconsistent patterns for atmospheric warming effects on projected participant numbers.

In projections to 2070, the greatest projected numbers of participants are generally associated with the Hot and Middle climate futures. The lowest projected numbers of participants are generally associated with the Wet and Least Warm climate futures, with the Dry climate future as intermediate.

DAYS OF RECREATION—Regional participants engaged in horseback riding on trails for 13 million days in 2020. Of all the activities we considered, we project horseback riding on trails to increase the most (in number of days of recreation) from 2012 to 2040 and from 2012 to 2070, especially under the highest socioeconomic growth scenario (HH). Even under the HL scenario, associated with low socioeconomic growth, projections for 2070 indicate 49 to 67 percent more days of recreation than in 2012. In comparison, projections under the HH scenario are more than triple the number of days of recreation in 2012, as the number of days of horseback riding on trails increases by 213 to 247 percent between 2012 and 2070. The jump in number of days of recreation from HL to HH underscores the positive, marked effect of socioeconomic growth. There is also a significant driving influence from atmospheric warming, with negative response of number of days of recreation to high warming levels.

As with mountain biking, the climate effect is significant but also varies by the level of atmospheric warming. We project the lower end of growth under the Least Warm climate future (across high warming scenarios) and the Wet and Dry climate futures (across all scenarios). We project the maximum growth under the Hot climate future (across all scenarios), and Middle and Least Warm climate futures (only the LM scenario). The Least Warm climate future diverges most notably depending on atmospheric warming level—under the LM scenario, the maximum projection associates with this climate future, whereas it has the fewest number of days projected under high warming scenarios.

Motorized Activities

Motorized water use (motor boating, water skiing, and personal watercraft use)

PARTICIPANTS—About 12.1 million regional participants engaged in motorized water use in 2020. We project growth in the number of participants in all RPA scenarios. We project stability or slight growth under the HL scenario and significant growth in participant numbers under all other scenarios. Under the HL scenario, we project similar rates of growth for 2040 and 2070—less than 10 percent over the number of participants in 2012. In comparison, we project moderate or marked increases in participant numbers by 2070 in the other scenarios, especially HH where doubling over 2012 levels is possible (103 to 118 percent growth). This highlights socioeconomic growth as a significant and positive driver of the number of participants in motorized water use. Comparing LM to HM, there is little effect to indicate atmospheric warming as a driver of the number of participants.

The climate future has slight to increasingly moderate effects across RPA scenarios, especially at higher levels of socioeconomic growth. We project the most participants in 2070 under the Hot and Middle climate futures across all scenarios and the Dry climate future under the LM scenario. The HH scenario shows the most pronounced differences between the Wet/Least Warm group and the other climate futures.

DAYS OF RECREATION—Regionwide, participants engaged in motorized water use for 134 million days in 2020. All RPA scenarios indicate growth from 2012 to 2040 and from 2012 to 2070. Under the HL scenario, we project the number of days to increase by 4 to 26 percent from 2012 to 2070. Under the HH scenario, we project a marked increase in number of days of recreation—a 116- to 160-percent increase from 2012 to 2070. Differing levels of socioeconomic growth have the most influence on number of days of recreation under the Hot and Middle climate futures. Thus, socioeconomic growth is a significant and positive driver for the number of days of motorized water use alongside climate future. The level of atmospheric warming has limited influence on the projected number of days of motorized water use.

Projections show climate future to be a significant driver, particularly alongside socioeconomic growth. Across all RPA scenarios, the Least Warm and Wet climate futures correspond to the low end of projected growth to 2070. We project the most growth to occur under the Hot and Middle climate futures (across all scenarios) and the Dry climate future (across the lower warming scenario).

Motorized off-road use

PARTICIPANTS—In the North RPA Region, about 8.2 million participants engaged in motorized off-road use in 2020. There is a magnification of change in projections across the decades leading to 2070, most notably so in the HH scenario. Only in the HL scenario do we project declines in the number of participants from 2012 to 2040 (by 1 to 6 percent) and from 2012 to 2070 (by 7 to 12 percent). In contrast, under the HH scenario, we project notable growth from 2012 to 2040 (by 20 to 26 percent) and from 2012 to 2070 (by 61 to 69 percent).

Comparison of LM to HM does not yield any significant differences, as both scenarios show similar projections for 2070—16 to 24 percent more participants than in 2012. Therefore, atmospheric warming does not appear to be a driving factor for the number of participants in motorized off-road use. Within RPA scenarios, the influence of climate future is minor overall.

DAYS OF RECREATION—In 2020, regional participants engaged in about 110 million days of motorized off-road use. We project increasing number of days of motorized off-road use in the case of moderate or high socioeconomic growth. Relative to 2012, the number of days of recreation projected under the HH scenario is 17 to 27 percent greater by 2040, compared to 53 to 69 percent greater by 2070. Under the HL scenario, relative to 2012, we project an unchanging or slightly declining number of days in 2040 (at most 8 percent), or 7 to 16 percent fewer days in 2070. Atmospheric warming has negligible effect on the number of days of recreation by 2070 across all climate futures except Dry, where there is a slight, negative influence from high warming by 2070.

Climate futures have slight or moderate roles in projected days of motorized off-road use in the region, increasing with socioeconomic growth and lower atmospheric warming. The Dry climate future (across all scenarios) and the Hot climate future (across the high warming scenarios) yield fewer projected days of recreation. Under high atmospheric warming

scenarios, we project the most growth in the number of days for the Middle and Wet climate futures. In contrast, the lower warming scenario (LM) shows the most growth under the Hot and Middle climate futures.

Snowmachining

PARTICIPANTS—There were about 2.8 million participants in snowmachining in 2020. From 2012 to 2070, we project moderate to extensive declines in the numbers of participants under the HL and HM scenarios—scenarios with the lowest projected future population in the North RPA Region. Projections of the numbers of participants under LM and HH result in ambiguous intervals of change, but any projected increases are confined to the Least Warm climate future. Comparing HL to HH reveals a notably positive response in the projected number of participants to socioeconomic growth. Under the HL scenario, we project a 38- to 70-percent decrease in the number of participants in 2070 from 2012. In comparison, under the HH scenario, we project a smaller decrease in the number of participants (reductions of 15 to 42 percent) in most climate futures and even growth (up to a 20-percent increase) under the Least Warm climate future.

There is a negative relationship between the number of participants in snowmachining and atmospheric warming, as LM generally indicates a more positive future than HM. Under the HM scenario, projections show 16 to 59 percent fewer participants in 2070 than in 2012. In contrast, the LM scenario is associated with slight growth of 8 percent (Least Warm) or declines of 20 to 47 percent (otherwise) in number of participants. The LM and HM scenarios are most similar in the number of participants in 2070 under the Hot climate future and most disparate under the Dry climate future.

Climate change influences the number of participants engaging in snowmachining. We project the least negative outcomes under the Least Warm climate future, but there is extensive variation across RPA scenarios. For example, in 2070, the number of participants could be 8 or 20 percent above 2012 counts under the LM and HH scenarios, respectively, or they could be 62 or 84 percent of the 2012 value under the HL and HM scenarios, respectively. Under lower atmospheric warming (LM), the Hot climate future is associated with the lowest number of participants in snowmachining. The moderate declines under the Middle, Wet, and Dry climate futures are intermediate among projections under LM. For the high warming scenarios, participant counts are lowest under the Dry climate future, followed by the Hot, Wet, and Middle climate futures.

DAYS OF RECREATION—In 2020, regional participants engaged in 21 million days of snowmachining. In general, we project declines in the number of days of snowmachining in the coming decades. Two exceptions to that general pattern are the Least Warm climate future in conjunction with lower atmospheric warming (LM scenario) and a climate future with sufficiently high socioeconomic growth (HH scenario). Under the HL scenario, we project 45 to 78 percent fewer days of snowmachining in 2070 than in 2012. In contrast, projections under the HH scenario indicate a slight growth in the number of days under the Least Warm climate future (5 percent) or declines ranging from 33 to 58 percent under the other climate futures.

Atmospheric warming has a significant effect on the number of days of snowmachining, which can become magnified under different climate futures. Under a Hot climate future, there is little difference between the LM and HM scenarios in projected number of days of snowmachining, and both scenarios yield a steep decline from 2012 to 2070 (62 and 67 percent, respectively). For the other climate futures, high atmospheric warming levels are

associated with greater declines in the projected number of days for snowmachining. Under the Least Warm climate future, we project a slight increase in the number of days of recreation under the LM scenario (2 percent). The differences in projected number of days of recreation between the LM and HM scenarios are greatest under the Dry climate future, followed by the Least Warm and Wet climate futures. In the Dry climate future, the number of days of snowmachining is 70 percent of the 2012 value under LM versus 29 percent under HM.

Climate future is an important driver for the number of days of snowmachining. For 2012 to 2070, we project the number of days of snowmachining to decline to its most vulnerable levels under the Hot climate future (across all RPA scenarios) and the Dry and Wet climate futures (across the high warming scenarios). Within each RPA scenario, the projections with the most days of snowmachining appear under the Least Warm climate future, either as slight increases (HL, HH) or reduced declines (LM, HM).

Fishing and Hunting

Fishing

PARTICIPANTS—In 2020, about 12.8 million regional participants engaged in anadromous, cold-water, saltwater, or warm-water fishing. The projected numbers of anglers vary significantly across RPA scenarios. Under the HL scenario, we project mostly stable angler numbers from 2012 to 2040 (1 to 3 percent decline), or 12 to 18 percent fewer anglers from 2012 to 2070. In comparison, the HH scenario is associated with notable growth from 2012, with projections of 26 to 28 percent more anglers in 2040 and 55 to 67 percent more anglers in 2070. The comparison of HL to HH reveals a significant and positive driver from socioeconomic growth.

Projections under LM indicate slightly more growth in participant numbers than under HM. From 2012 to 2070, the projected growth in the number of anglers ranges from 11 to 19 percent under HM, compared to 18 to 26 percent under LM. Although there is a negative relationship between the number of anglers and atmospheric warming level, the overall small effect does not qualify it as a driving factor. Lastly, climate future per RPA scenario shows some variation across projections, but the magnitude is not pronounced enough for classification as a leading influence in number of participants in fishing.

DAYS OF RECREATION—Regional participants engaged in about 196 million days of fishing in 2020. The number of days of fishing increases substantially with socioeconomic growth. Relative to 2012, the projections of numbers of fishing days for 2070 are 20 to 29 percent lower under HL versus 32 to 47 percent greater under HH. There is a negative relationship between the number of days of fishing and atmospheric warming—we project slight changes from 2012 to 2070 under the HM scenario (–4 to 7 percent), versus slight or moderate increases under LM (6 to 17 percent). The differences between scenarios are not substantial enough for atmospheric warming to qualify as a driver of the number of days of fishing. There are consistent patterns in the projected number of days with respect to certain climate futures. However, within each RPA scenario, the differentiation by climate future is modest.

Hunting

PARTICIPANTS—In 2020, 4.7 million regional participants hunted big game, small game, or migratory birds. The outlooks over time show increasingly fewer hunters, especially under a scenario of low population and income growth (HL scenario). Socioeconomic growth has

a significant mitigating effect on declines, as seen in comparing HL to HH. From 2012 to 2070, we project a reduction of 40 to 48 percent in the number of hunting participants under HL compared to 19 to 29 percent under HH. This is likely because of projected population growth, which can offset declines (to some extent) in the relative popularity of hunting.

Contrasting LM to HM, there is a slight mitigating effect with lower atmospheric warming on declining number of participants. Under the LM scenario, we project 17 to 29 percent fewer hunting participants from 2012 to 2070 compared to 29 to 38 percent under HM. Slight differences between the two scenarios indicate that atmospheric warming is not a driving factor. Additionally, projections show variations across climate futures within an RPA scenario, but these have a minor effect overall.

DAYS OF RECREATION—About 87 million days of hunting occurred in 2020 from regional participants. The future of hunting, as indicated by number of days of recreation, is that of significant downturn—regardless of RPA scenario or climate future. Comparing outlooks from 2012 to 2040 and 2012 to 2070 shows a magnification of declines over time. The changes projected in the number of days of hunting follow a similar pattern to those for the number of participants. As with the number of participants, socioeconomic growth offsets the downturn somewhat, but the net effect is still a reduction in the number of hunting days. The higher socioeconomic growth mitigates the declines from 2012 to 2070 of 40 to 53 percent (HL) to 19 to 37 percent (HH). With these moderate effects, socioeconomic growth is a driving factor for the number of days of hunting.

Contrasting LM to HM shows a slight, negative response to high atmospheric warming levels. Under the HM scenario, we project 29 to 44 percent fewer hunting days annually in 2070 than in 2012. The LM scenario mitigates the decline somewhat, yielding 17 to 36 percent fewer days below baseline for 2070. As with the number of participants, atmospheric warming does not have the influence of a driver for the number of days of hunting.

Climate future is a moderate driver of the number of hunting days to 2070, with slightly more effect than on the number of participants. Regardless of RPA scenario, the numbers of hunting days are at risk of long-term decline, but within each scenario, climate futures yield different outcomes. We project the most annual hunting days for 2070 under the Least Warm and Wet climate futures (across all RPA scenarios), and Dry climate future (across high warming scenarios). We project the number of days of hunting to be lowest under the Hot and Middle climate futures (across all RPA scenarios), and Dry climate future (lower warming).

Nonmotorized Winter Activities

Developed skiing (downhill skiing and snowboarding)

PARTICIPANTS—In 2020, there were about 6.8 million regional participants in developed skiing. We project the smallest changes in participant numbers under the HL scenario, where the numbers of participants remain stable from 2012 initially and then see slight growth in the long term: a change of –2 to 3 percent by 2040, and an increase of 1 to 10 percent from 2012 to 2070. All other scenarios indicate significant growth by 2070, with the most gains in number of participants under HH at 138 to 159 percent. The extensive increases from HL to HH indicate that socioeconomic growth is a positive driver.

Atmospheric warming is a slight or nearly moderate driver of the number of participants, varying by climate future. From 2012 to 2070, there are 47 to 60 percent more participants under HM versus 52 to 67 percent more under LM. Upon closer comparison, the HM and LM projections are similar under the Dry and Wet climate futures. For the remaining climate futures, high atmospheric warming levels are associated with slightly to moderately fewer participants, especially in the Hot climate future. Hot conditions coupled with high atmospheric warming may translate to less available snow or a shortened snow season.

The influence of climate future varies by atmospheric warming scenario. In the LM scenario, the climate futures other than Dry indicate 65- to 67-percent growth from 2012 to 2070. The Dry climate future has the relatively lowest but still strong outlook of 52-percent growth to 2070. Scenarios of high atmospheric warming indicate reduced growth outcomes for the Hot and Dry climate futures. The Wet climate future has the highest growth outcome, followed by the Middle and Least Warm climate futures.

DAYS OF RECREATION—In 2020, there were about 38 million days of developed skiing from regional participants. The activity strongly benefits from the driving effect of socioeconomic growth, especially over time. Declines of 20 to 38 percent projected from baseline under HL for 2070 contrast with marked growth of 65 to 111 percent under the HH scenario.

Higher atmospheric warming has a dampening effect on growth for the number of developed skiing days, in some cases enough to induce very slight declines from 2012 to 2070 (e.g., Hot and Middle climate futures). Under HM, we project the number of days to shift by –5 to 21 percent from 2012 to 2070—compared to the significant growth of 20 to 58 percent under LM. Closer comparisons reveal notable variation by climate future—the responses of HM versus LM differ most under the Least Warm, Middle, and Hot climate futures. There is also negative effect from high warming on projected number of days under the Wet and Dry climate futures, albeit to a slight or barely moderate degree.

Climate future is another important driver for the number of days of developed skiing through 2070. The impacts increase alongside socioeconomic growth, at most under HH. The numbers of days are relatively lowest under the Hot (across all scenarios), Middle (across high warming scenarios), and Dry (lower warming scenario) climate futures. In the Hot climate future, the temperatures could be sufficiently high to reduce snowy conditions. Likewise, the Dry climate future could result in less snow. We project the most growth in number of days under the Wet (across high warming scenarios) and Least Warm (across all scenarios) climate futures. All other climate futures have intermediate outcomes for their respective levels of warming.

Undeveloped skiing (cross-country skiing and snowshoeing)

PARTICIPANTS—There were about 4.1 million regional participants in undeveloped skiing in 2020. Projections are seemingly variable across RPA scenarios, but there is a significant, underlying connection with socioeconomic growth. Under low levels of socioeconomic growth (HL), we project the number of participants to fall below 2012 levels by 9 to 19 percent in 2040 and by 19 to 45 percent in 2070. The next level of socioeconomic growth (moderate) shows dampening of participant declines or even offsets for overall increases from 2012 to 2070, under both levels of atmospheric warming: –22 to 34 percent under LM and –25 to 10 percent under HM. The HH scenario is associated with increases of 7 to 56 percent (from 2012 to 2070) for the number of participants. Therefore, socioeconomic

growth is an extensive and positive driver for number of participants. The gains (HH versus HL) are most extensive under the Least Warm and Middle climate futures.

Under the LM and HM scenarios, we project ambiguous changes from 2012 to 2070, but there are notable patterns and variations by climate future. Generally, there is a negative response from the number of participants to high warming, ranging from slight to moderate. The effects are moderate and greatest under the Dry, Wet, and Least Warm climate futures. Projections from the two scenarios are similar under the Hot climate future, with a slight difference under the Middle climate future. Therefore, atmospheric warming is a notable driver for the number of participants alongside climate effects.

Lastly, climate futures have effects that range up to the “extensive” classification for the number of participants in undeveloped skiing. Within RPA scenarios, the differentiation of outcomes increases alongside socioeconomic growth or lower warming. For all RPA scenarios, we project the greatest numbers of participants under the Least Warm climate future. Under high warming scenarios, projections to 2070 are similar and lowest across the Dry, Hot, and Wet climate futures. Under LM, the smallest projected numbers of participants are associated with the Hot climate future alone. Excluding the Hot climate future result would have created a positive interval of change under the LM scenario (i.e., growth of 2 to 34 percent).

DAYS OF RECREATION—In 2020, there were about 21 million days of undeveloped skiing from regional participants. Projections under the HL and HM scenarios indicate declines in the numbers of days of undeveloped skiing by 2070. Under LM and HH scenarios, we also project a decrease in the number of days from 2012 to 2070, apart from moderate (LM) and slight (HH) growth in Least Warm climate futures. Comparisons reveal a strong, positive effect on the number of days of undeveloped skiing associated with socioeconomic growth—the number of days under HH are double the respective values under HL. Projected number of days for 2070 is 47 to 69 percent less than 2012 under HL. In contrast, projections under the HH scenario yield more positive outcomes: either an increase of 6 percent (Least Warm) or a decline of 21 to 38 percent.

As expected, atmospheric warming has extensive effect on the number of days of undeveloped skiing. Under high warming levels, there are notable accelerations of declines projected to 2070. Under the HM scenario, projections indicate 26 to 57 percent fewer days from 2012 to 2070—compared to an increase of 22 percent (Least Warm) or decreases of 14 to 46 percent (otherwise) under LM. The most negative response to high (versus lower) atmospheric warming occurs under the Least Warm climate future.

Climate future emerges as a third, notable driver of the number of days of recreation for the activity. As socioeconomic growth progresses, the distinctions increase among climate futures. We project the number of days of undeveloped skiing to be best positioned under the Least Warm climate future, which shows the lowest declines or even growth (LM and HH) projected from 2012. The Hot climate future emerges as the least conducive climate setting across all RPA scenarios. The Dry, Middle, and Wet climate futures are intermediate settings for the number of days of recreation in undeveloped skiing.

Nonmotorized Water Activities

Swimming (swimming, snorkeling, and scuba diving)

PARTICIPANTS—The activity saw about 21.1 million swimming participants in 2020. Directions of change differ significantly across RPA scenarios. By 2070, the HL scenario yields slight or moderate declines in the projected number of swimming participants, between 13 to 28 percent from 2012. In contrast, extensive growth is possible under the HH scenario, 49 to 72 percent more participants in 2070 than in 2012. This highlights the positive driving influence of socioeconomic growth.

Under the HM scenario, we project that growth could be from 2 to 21 percent from 2012 to 2070. Likewise, we project moderate growth under the LM scenario, higher than HM, at 18 to 33 percent, which suggests a negative response to high atmospheric warming. There are also notable climate effects in projections compared across all RPA scenarios. The lowest projection for number of participants consistently occurs for the Hot climate future, followed by the Middle climate future. Within each RPA scenario, we project the greatest number of participants in the Least Warm and Wet climate futures. The Dry climate future also emerges as an intermediate projection of the number of participants under the high warming scenarios or part of the lower outcomes under LM. Thus, both atmospheric warming and climate future are drivers of numbers of swimmers in the region.

DAYS OF RECREATION—In 2020, regional participants engaged in swimming for 220 million days. The number of days of swimming increases significantly from socioeconomic growth—from 2012 to 2070, the moderate declines under HL (16 to 40 percent) shift to moderate to marked increases under HH (32 to 77 percent). In fact, the values projected under the HH scenario are more than double those of the HL scenario. The number of days increases from 2012 to 2070 under LM, improving over the growth or slight declines under HM. Comparing LM and HM scenarios suggests that atmospheric warming is a significant driver, negatively related to the number of days of swimming. Between 2012 and 2070, we project the number of days of swimming to change by –14 to 18 percent under HM, versus increasing by 9 to 40 percent under LM. High atmospheric warming has a somewhat reduced negative effect under the Dry climate future.

Climate future is a significant driver for number of days of swimming, one of the most extensive in its differentiation of outcomes. The Hot climate future represents the lowest outlook within RPA scenarios, followed by projections under the Middle and Dry climate futures. The activity experiences the most days of participation (projected) under the Least Warm and Wet climate futures, which may present conditions that are comfortable for swimmers. The Wet climate future would supply additional precipitation for outdoor swimming water bodies.

Floating (canoeing, kayaking, and rafting)

PARTICIPANTS—In 2020, there were about 4.5 million regional participants in floating. The outlooks across RPA scenarios are quite variable. By 2070, two scenarios have clear indications of growth from 2012—the LM scenario with slight or moderate increases (6 to 28 percent) projected, versus the HH scenario with moderate to extensive increases (32 to 64 percent) projected. The HL scenario corresponds to the activity's maximum downturn of 19 to 35 percent possible from baseline. Lastly, the HM scenario yields the ambiguous interval of –10- to 13-percent change from 2012 levels for 2070.

Comparing HL to HH scenarios, a highly pronounced, positive effect emerges from socioeconomic growth. Declines across the board under HL contrast with moderate to extensive increases under HH. Additionally, there is a negative influence from the high level of atmospheric warming, albeit to a lesser extent in comparison to socioeconomic growth. Finally, influences from climate underscore the intervals by RPA scenario. Regardless of underlying scenario assumptions, there are lower numbers of floating participants under Hot and Middle climate futures, followed by the Dry climate future. We project the most participants when the climate future is Least Warm or Wet.

DAYS OF RECREATION—There were about 27 million floating days for regional participants in 2020. The trajectory of the number of floating days is similar to that of swimming in terms of changes from baseline. The projected number of floating days is greatest under the highest levels of socioeconomic growth (HH), regardless of climate future, followed by lower atmospheric warming (LM). There is a strong positive influence from socioeconomic growth, as seen in declines under HL and significant increases under HH to 2070. Under HL, we project 17 to 35 percent fewer days in 2070 than in 2012 compared to 29 to 65 percent more days under HH.

The HM scenario is the only one with a mixture of positive and negative changes projected from 2012 to 2070 (–11 to 14 percent). This can be attributed to the moderate growth (14 percent) under the Least Warm and Wet climate futures, as well as the declines under the remaining three climate futures (most notably under the Hot climate future). In comparison, we project slight or moderate growth (6 to 30 percent) under the LM scenario, which indicates a significant and negative relationship with high atmospheric warming.

In terms of climate futures, the highest projected growth to 2070 (within RPA scenarios) occurs under the Least Warm and Wet climate futures. The Hot, Middle, and Dry climate futures correspond to the lowest outlooks for number of days of recreation in 2070, although rankings and differentiations vary across lower and high atmospheric warming scenarios. Climate future qualifies as an important driver for number of days of floating in the region.

Outdoor Recreation Trends from 2012 to 2070 in the South RPA Region

Key Findings

- Between 2040 and 2070, the South RPA Region is projected to become the most populous region because of high regional population growth and population losses in the North RPA Region (Wear and Prestemon 2019b). While we project mostly stable or declining per capita participation in all 14 activities, this level of population growth supports stability or increases in the number of participants by 2070—even under low socioeconomic growth (HL scenario).
- Of the 14 activities, motorized water use and horseback riding on trails are associated with the greatest increase in projected numbers of participants and days of recreation by 2070 (relative to baseline).
- Socioeconomic growth is the leading (positive) driver of numbers of participants and days of recreation, with mostly marked levels of effects. Atmospheric warming generally has slight or moderate (inverse) influences on projections, with the greatest effect (moderate to extensive) on the number of days of recreation for horseback riding on trails.

- Climate futures generally have slight or moderate influence on numbers of participants and days of recreation. We project the greatest and most variable effects (moderate to marked) on number of days of recreation for horseback riding on trails, with influence greatest under the HH scenario and lowest in the HL scenario.
- Comparing both recreation metrics projected to 2070 (number of days versus number of participants) reveals some distinctive patterns among certain activities in relation to the others. These activities include the following:
 - Developed site use—notably high levels of participation with relatively fewer days of recreation, indicating a popular activity but with low-frequency engagement
 - Viewing nature—the most days of recreation among activities with relatively low numbers of participants, possibly indicating more frequent visitation relative to the fewer participants
 - Birding—similar to viewing nature, the second highest number of days of recreation with a relatively low number of participants
 - Mountain biking and primitive area activities—slight increases in their numbers of days of recreation among relatively lower numbers of participants

The South RPA Region

The South RPA Region consists of 13 states, coinciding with the Forest Service Southern Region, excluding Puerto Rico (fig. 1). In 2012, the South RPA Region was second in population to the North RPA Region. With the second highest growth rate under all scenarios considered in the 2020 RPA Assessment, the South RPA Region could lead the United States in population starting between 2040 and 2070 (fig. 3) (Wear and Prestemon 2019b).

In this section, we focus on regional projections for two metrics—participation (number of participants) and engagement (number of days of recreation). Number of participants and number of days of recreation are “complementary measures [in estimation and projection] of outdoor recreation markets” for each activity. “Participation [number of participants] can indicate market size and public interest,” whereas the number of days of recreation is a measurement of how frequently recreationists are participating in that activity (Askew and Bowker 2018: 103). Additionally, managers and planners benefit from understanding how responsive these measures are to a set of external factors or conditions, to be identified as drivers. We consider the effects on projected changes in recreation demand from three factors—socioeconomic growth, atmospheric warming, and climate futures.

Projected trends in recreation demand

For the South RPA Region, we project outdoor recreation demand to 2070 for 14 activities on all land ownerships collectively (table 1). Three snow-based winter recreation activities—considered in other regions—are not included. From the baseline year of 2012, we make projections on a decennial basis from 2020 to 2070. For each activity and metric, we compute the contemporary estimate as the mean of all projections for 2020, across all RPA scenarios and associated climate futures (20 projected values). In addition to contemporary estimates, we show projected changes from baseline year 2012 to 2040 and from 2012 to 2070 as intervals per RPA scenario, defined by minimum to maximum outlooks, for number of participants (table 10) and number of days of recreation (table 11). These intervals span projections across five associated climate futures (Dry, Wet, Middle, Least Warm, and Hot climate futures), under each RPA scenario (table 2). We report projected values for each scenario and climate future assessment in the appendix: for per capita participation see tables A.9 and A.10, for numbers of participants see table A.11, and for number of days of recreation see table A.12.

Table 10—Changes in the number of participants (millions) in outdoor recreation for the South Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
	PARTICIPANTS (MILLIONS)		PERCENTAGE OF CHANGE							
Developed site recreation										
Developed site use	31.8	35.5	41–42	70–71	21–22	19–20	38	62–63	57	123–124
Camping in developed campgrounds	7.3	7.9	20–33	34–55	6–16	(1)–12	19–30	30–47	33–45	69–92
Viewing/photographing nature										
Viewing nature	6.5	7.3	41–43	71–72	21–22	19–20	38–39	62–64	58	125–126
Birding ^e	4.0	4.6	40–44	62–72	21–25	10–16	37–41	49–57	57–61	105–116
Nonmotorized, undeveloped activities										
Day hiking	8.4	9.4	35–44	65–83	16–22	4–16	33–40	47–62	54–62	110–132
Primitive area activities	2.1	2.3	31–35	55–63	13–16	4–9	29–32	42–50	47–51	98–108
Mountain biking	1.7	1.9	28–35	62–76	10–14	3–11	26–32	46–57	46–52	113–130
Horseback riding on trails	1.2	1.4	34–46	73–97	10–20	12–26	29–41	64–85	52–65	155–187
Motorized activities										
Motorized water use	9.5	10.5	41–52	89–104	18–23	24–39	35–42	75–95	57–64	166–196
Motorized off-road use	7.2	7.7	18–20	32–37	3–6	(3)–1	15–17	25–30	27–30	62–69
Fishing and hunting										
Fishing	12.0	13.2	31–39	56–63	18–22	19–25	32–36	55–63	47–52	109–120
Hunting	5.0	5.3	12–19	20–31	3–9	(1)–6	11–17	17–27	19–26	39–50
Nonmotorized water activities										
Swimming	16.1	17.9	36–40	71–80	15–19	9–16	33–37	55–64	54–59	131–141
Floating	3.2	3.4	28–37	68–80	11–16	20–33	24–29	57–74	39–45	127–152

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation participants are based on the products of per capita participation estimates and the regional adult (≥16 years of age) population projections, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of participants by activity (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of participants are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table 11—Changes in the number of days (millions) of recreation for the South Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
	DAYS OF RECREATION (MILLIONS)		PERCENTAGE OF CHANGE							
Developed site recreation										
Developed site use	366	400	38–47	73–86	19–24	23–37	33–39	62–80	50–56	117–141
Camping in developed campgrounds	58	61	9–21	24–41	(2)–4	(9)–(3)	9–16	20–28	22–31	56–67
Viewing/photographing nature										
Viewing nature	103	113	34–43	62–69	17–21	12–17	32–36	49–57	49–54	98–108
Birding ^e	63	70	31–44	47–64	14–22	(2)–9	28–37	30–45	44–54	73–92
Nonmotorized, undeveloped activities										
Day hiking	130	139	22–32	47–63	8–14	(2)–11	19–27	27–44	34–42	72–94
Primitive area activities	3	4	17–37	27–64	1–16	(14)–5	16–33	21–48	34–54	71–109
Mountain biking	29	32	35–44	80–93	13–16	16–20	30–34	64–70	51–55	141–150
Horseback riding on trails	17	19	31–53	90–134	0–18	4–32	19–40	56–99	41–65	178–262
Motorized activities										
Motorized water use	169	189	49–50	124–125	24–25	43–44	45–46	109–110	71–72	254–256
Motorized off-road use	152	159	14–24	34–39	6–11	11–18	15–21	36–44	25–31	64–74
Fishing and hunting										
Fishing	217	234	28–38	53–63	17–24	24–34	29–37	56–69	42–50	99–116
Hunting	106	111	14–31	27–50	8–20	13–30	17–30	33–54	25–38	56–81
Nonmotorized water activities										
Swimming	221	239	21–34	55–82	4–13	(8)–8	20–30	32–53	40–52	103–134
Floating	21	22	24–31	68–76	7–11	18–24	19–22	52–59	33–37	121–131

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation engagement are based on the products of mean (annual) number of days of recreation estimated per participant and the projected regional adult (≥16 years of age) population, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of days of recreation (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of days of recreation (by activity) are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Drivers of recreation demand

The underlying assumptions of RPA scenarios permit pairwise comparisons across sets of projections for the numbers of participants and the numbers of days of recreation. The HL and HH scenarios assume high atmospheric warming but have differing levels of assumed socioeconomic growth. This comparison can reveal whether socioeconomic growth is a driving influence for recreation demand. Similarly, the LM and HM scenarios overlap in assumed future socioeconomic growth (moderate socioeconomic growth), but comparisons can indicate the strength of atmospheric warming as a driver of recreation demand. Lastly, comparisons across climate futures within and across RPA scenarios can provide insight into how different climate futures may influence the number of participants and the number of days of recreation in the coming decades.

Developed Site Recreation

Developed site use (gatherings, picnicking, and visiting developed sites)

PARTICIPANTS—In 2020, about 35.5 million participants in the South RPA Region participated in developed site use, which we define as an aggregate of five activities: (1) gathering of family or friends in an outdoor area away from home; (2) picnicking; (3) visiting an outdoor nature center, a nature trail, a visitor center, or a zoo; (4) visiting a prehistoric structure or archaeological site; and (5) visiting historic sites, buildings, or monuments. Under the HL scenario, we project similar numbers of participants for 2040 (21 to 22 percent above baseline) and 2070 (19 to 20 percent above baseline), whereas the remaining scenarios show additional and noteworthy increases. Projections under the HH scenario show significant increases in numbers of participants from 2012 to 2040 (57 percent) and from 2012 to 2070 (123 to 124 percent). Comparing HL to HH indicates that socioeconomic growth is a significant and positive driver of demand for this activity.

Atmospheric warming has less effect on participation in developed site use. While there is a consistent, negative response to high warming levels, the magnitude is slight. From 2012 to 2070, projections indicate 70 to 71 percent more participants under LM, compared to 62 to 63 percent more under HM. Projections by climate future show very little variation, indicating it is not a driving influence for number of participants.

DAYS OF RECREATION—In 2020, regional participants engaged in 400 million days of developed site use. The number of days of recreation could experience moderate to marked growth from 2012 to 2040 and from 2012 to 2070, especially under the HH scenario. Comparing HL to HH underscores a significant and positive driver from socioeconomic growth—we project 23 to 37 percent more days of recreation in 2070 than in 2012 under HL compared to 117 to 141 percent more under HH. The potential level of atmospheric warming has a slight (negative) influence on the number of days of developed site use recreation. We project a 73- to 86-percent increase in the number of days of recreation in 2070 (above baseline) under the LM scenario, compared to a 62- to 80-percent increase under HM.

The potential climate futures have slight or moderate effects on the projected number of days of recreation, especially as socioeconomic growth progresses. Within each RPA scenario, the greatest projected numbers of days of recreation in 2070 are associated with the Hot climate future. In comparison, the fewest days of recreation occur under the Least Warm climate future (across all scenarios) and the Wet climate future (LM scenario). We project intermediate outcomes under the Wet (across high warming scenarios) and the Middle

and Dry (across all scenarios) climate futures. Under the LM scenario, projections become increasingly similar by 2070, under two pairings of climate futures—the Wet and Least Warm climate futures with the fewest days of recreation, and the Dry and Middle climate futures with more days of recreation (second to the maximum outlooks under the Hot climate future).

Camping in developed campgrounds

PARTICIPANTS—In 2020, about 7.9 million regional participants engaged in developed campground camping. The HL scenario, with its low population growth, could see the fewest participants. Projections under the HL scenario show 6 to 16 percent more participants than baseline in 2040 and shifts of –1 to 12 percent in the number of participants from 2012 to 2070. In comparison, under the HH scenario, we project marked growth in number of participants, especially by 2070 (69 to 92 percent more than baseline). This indicates socioeconomic growth as a primary and positive driver of the number of participants in developed campground use. Projections under LM and HM do not show a pattern with respect to atmospheric warming.

Potential climate future shows a clear influence on projected number of participants in developed campground use. Across RPA scenarios, the participant projections for 2070 are highest under the Dry climate future. The lowest projections of numbers of participants are associated with the Least Warm climate future (across all scenarios), and the Hot and Wet (LM scenario) and Middle (across high warming scenarios) climate futures.

DAYS OF RECREATION—In 2020, regional participants engaged in about 61 million days of developed campground use in the South RPA Region. The number of days could increase moderately or extensively by 2070 across all RPA scenarios except HL. Under the HL scenario, we project that the number of developed campground use days remains steady from 2012 to 2040 (changing by –2 to 4 percent), followed by slight decline to 2070 with 3 to 9 percent fewer days relative to 2012. In comparison, projections under the HH scenario show potential for significant growth from 2012 in number of developed campground use days—from 22 to 31 percent more days of recreation in 2040 to 56 to 67 percent more days of recreation in 2070. Therefore, the number of days for this activity responds significantly and positively to socioeconomic growth. Comparing the LM and HM scenarios, we project the number of days of recreation for 2070 to be similar under the Hot climate future. All other climate futures show a slight, negative response to high warming. With this magnitude, atmospheric warming is not a driver of number of days of developed campground use.

The impact of climate future on projected developed campground use days is greatest (moderate) under the LM scenario and slight otherwise. The Dry (across all scenarios) and Hot (across high warming scenarios) climate futures yield the greatest projected increases in the number of developed campground use days from 2012 to 2070 within each scenario. The lower warming scenario (LM) shows intermediate projections associated with the Least Warm and Middle climate futures. All other climate futures in conjunction with remaining scenarios indicate the lower levels of engagement (i.e., number of days of recreation) projected for the activity.

Viewing and Photographing Nature

Viewing nature

PARTICIPANTS—The South RPA Region had about 7.3 million viewers of nature in 2020. Participating in this activity involves (1) viewing, identifying, or photographing nature (birds, other wildlife, wildflowers, trees, other natural vegetation, or natural scenery) or (2)

gathering mushrooms, berries, firewood, or other natural products. The population increase associated with socioeconomic growth is a key factor in the number of viewing nature participants. Under low socioeconomic growth (HL), we project participant numbers to increase by 19 to 20 percent, but this increase is much greater (125 to 126 percent) under high socioeconomic growth (HH) from 2012 to 2070. In the scenarios with moderate or higher levels of socioeconomic growth, the rate of increase in participant numbers is especially pronounced from 2040 to 2070. Higher atmospheric warming (HM versus LM) tends to reduce growth by a slight extent (from 2012). Within RPA scenarios, there is negligible variation in projected participant numbers across climate futures.

DAYS OF RECREATION—There were 113 million days of viewing nature in the South RPA Region in 2020. There is a strong and positive effect on the number of days of viewing nature from socioeconomic growth. Under the HL scenario, we project a 17- to 21-percent increase in the number of days of recreation between 2012 and 2040, with less growth, 12 to 17 percent, from 2012 to 2070. In comparison, under the HH scenario, the number of days of recreation could increase by 49 to 54 percent from 2012 to 2040 and by 98 to 108 percent from 2012 to 2070 (about double the 2012 quantities).

There are negative influences on number of days of recreation from greater atmospheric warming, slight yet trending to moderate in extent. We project increases of 62 to 69 percent in the number of days by 2070 under the LM scenario, compared to a 49- to 57-percent increase in the number of days under the HM scenario. Climate future has a slight impact on projected number of days of viewing nature. The Least Warm and Wet climate futures consistently correspond to the greatest increases in number of days within each RPA scenario.

Birding (viewing or photographing birds)

PARTICIPANTS—In 2020, there were about 4.6 million birders in the South RPA Region. Socioeconomic growth is an important and positive factor in the number of birders. The projected numbers of birders in the South RPA Region are greatest under the HH scenario (with its high levels of projected population growth). Under the HL scenario, there is a reduction of growth in numbers of birders over time. In that scenario, between 2012 and 2040, the number of birders could increase by 21 to 25 percent, compared to a smaller increase of 10 to 16 percent between 2012 and 2070.

Atmospheric warming emerges as a moderate driver in birder participant numbers. There are more projected birders in the LM scenario (62 to 72 percent growth from 2012 to 2070) compared to the HM scenario (49 to 57 percent growth from 2012 to 2070). Projections indicate an interaction of atmospheric warming with climate future. The negative response to high warming has varying magnitude depending on the climate future—the response is greatest under the Wet and Hot climate futures and least under the Middle, Dry, and Least Warm climate futures. In evaluating climate future alone as a driver, the projections indicate slight influence on participant numbers within scenarios. We project maximum numbers of participants under all Least Warm and Wet climate futures, and the Middle climate future for high warming scenarios.

DAYS OF RECREATION—In 2020, there were about 70 million days of birding in the South RPA Region. The projected number of birding days is very responsive to future socioeconomic growth. Under the HL scenario, the number of birding days may increase by 14 to 22 percent between 2012 and 2040 but then shift to a slight decrease or increase (–2- to 9-percent change relative to 2012) by 2070. In contrast, under the HH scenario, we project an

increase of 44 to 54 percent in the number of birding days in 2040 compared to 2012, with additional growth by 2070 (a 73- to 92-percent increase from 2012).

Atmospheric warming, coupled with different climate futures, is also a moderate driver of birding days. Under the LM scenario, we project a 47- to 64-percent increase in the number of birding days from 2012 to 2070, compared to a 30- to 45-percent increase under HM. The negative response to high warming levels is greatest under the Wet and Hot climate futures. Across RPA scenarios, climate future has a meaningful effect on the projected number of birding days. The greatest levels of growth are associated with the Least Warm and Wet climate futures (all RPA scenarios).

Nonmotorized, Undeveloped Activities

Day hiking

PARTICIPANTS—Regionwide, there were about 9.4 million day hikers in 2020. There could be significantly more day hikers in the South RPA Region under moderate and high socioeconomic growth. We project the number of day hikers to more than double (110- to 132-percent increase) between 2012 and 2070 under the HH scenario. However, under the lower growth HL scenario, we project the day hiker numbers to increase by 16 to 22 percent from 2012 to 2040, followed by some participation decline (with 4 to 16 percent more participants projected in 2070 than in 2012).

Projections of the numbers of day hikers are slightly to moderately lower under high levels of atmospheric warming. We project the increase in day hiker numbers (from 2012 to 2070) to be 65 to 83 percent in the LM scenario but 47 to 62 percent in the HM scenario. In all five climate futures, we project negative responses of number of participants to high warming levels, with the most notable emerging under the Wet and Hot climate futures.

Climate future also has a notable effect, particularly when atmospheric warming is lower or population growth is moderate or high. For all RPA scenarios, we project the greatest numbers of day hikers under the Least Warm and Wet climate futures. We project the lowest numbers under the Hot and Dry climate futures for all scenarios and under the Middle climate future for the lower warming scenario.

DAYS OF RECREATION—In 2020, there were about 139 million days of day hiking in the South RPA Region. We project the number of days of day hiking to increase for all RPA scenarios except HL. Under the HL scenario, we project the number of days of day hiking to first increase between 2012 and 2040 (by 8 to 14 percent) but then reduce after 2040, with the number of days of hiking in 2070 at 2 percent below or 11 percent above the 2012 value. Under high levels of socioeconomic growth, the increase in the number of days of day hiking becomes unambiguous. The number of days of day hiking under the HH scenario could be 34 to 42 percent greater in 2040 and 72 to 94 percent greater in 2070, than that observed in 2012.

Atmospheric warming is a moderate driver of the number of days of day hiking, which negatively respond to high warming levels. Projections from 2012 to 2070 show a 47- to 63-percent increase in the number of days of day hiking under LM compared to a 27- to 44-percent increase under HM. Atmospheric warming also reveals variation in projections by climate future. The projected number of days of day hiking is most responsive to varying warming levels under the Wet climate future, followed by the Dry, Hot, and Least Warm climate futures.

Climate futures also influence the projected number of days of day hiking as a moderate driver. The highest projected number of days of day hiking consistently corresponds to the

Least Warm climate future across all RPA scenarios and the Wet climate future under the LM scenario. We project the fewest days (relatively) of day hiking under the Hot and Dry climate futures (all scenarios) and the Middle climate future (LM scenario).

Primitive area activities (undeveloped area camping, backpacking, and visiting wilderness)

PARTICIPANTS—About 2.3 million regional participants engaged in primitive area activities in 2020. We project the number of participants to increase from 2012 to 2070 in all scenarios. Significant and positive effects from socioeconomic growth emerge in projections. Under HL, the increase in the number of participants relative to 2012 is 13 to 16 percent by 2040 but only 4 to 9 percent by 2070. Conversely, the HH scenario could be associated with participant growth of 47 to 51 percent by 2040 and 98 to 108 percent by 2070, relative to the 2012 value.

Under the LM scenario, we project the number of participants in primitive area activities to grow by 55 to 63 percent by 2070 compared to 2012. In comparison, the growth in the number of participants under the HM scenario is 42 to 50 percent. There are slight or moderate effects from atmospheric warming, where the number of participants responds negatively to high warming levels. The responsiveness to atmospheric warming is greatest under the Wet and Hot climate futures. Across RPA scenarios, the climate future alone has a slight effect and does not qualify as a driver for the number of participants in primitive area activities for the region.

DAYS OF RECREATION—The South RPA Region had 4 million days of recreation in primitive areas in 2020. For all RPA scenarios except HL, projections to 2070 indicate moderate to marked increases in the number of days of primitive area recreation. Under HL, the slight growth projected from 2012 to 2040 (1 to 16 percent) becomes ambiguous by 2070 (14-percent decrease to 5-percent increase relative to 2012). We project nearly moderate decline by 2070 in the Dry climate future, with stability or slight changes (positive or negative) otherwise. Under the HH scenario, we project clear indications of growth, namely an increase of 71 to 109 percent in 2070 over 2012 levels. The positive response to higher population and income is most bolstered under the Least Warm, Wet, and Middle climate futures.

Atmospheric warming also has an inverse influence on projected numbers of days of recreation in primitive areas. Under the LM scenario, we project a 27- to 64-percent increase in the number of days of recreation from 2012 to 2070 versus a 21- to 48-percent increase under the HM scenario. The numbers of days of primitive area recreation respond negatively to high warming levels, ranging from slight to moderate in magnitude across climate futures. The Hot and Wet climate futures show the most negative responses to high atmospheric warming, while we project slight differences under the Middle and Dry climate futures.

The projected number of days of recreation in primitive area activities is also very responsive to potential climate future. In the lower warming scenario, the highest projection in number of days of recreation corresponds to the Wet climate future, followed by the Least Warm climate future. In the high atmospheric warming scenarios, the Least Warm climate future leads with the highest projected number of days of recreation. Dry climate futures generally lead to lower projected numbers of days of recreation across all scenarios. Additionally, the Hot climate future shows relatively lower projected numbers of days of primitive area recreation under the high atmospheric warming scenarios.

Mountain biking

PARTICIPANTS—About 1.9 million regional participants engaged in mountain biking in 2020. The activity could see additional mountain bikers out to 2070, with growth lowest under the HL scenario and highest under HH. The projections under HL for 2040 show 10- to 14-percent growth from 2012, compared to 3- to 11-percent growth from 2012 to 2070. In comparison, the marked increase of 113 to 130 percent by 2070 under HH indicates socioeconomic growth as a positive and important driver for the number of participants in mountain biking.

Atmospheric warming qualifies as a moderate (inverse) driver of the number of participants in mountain biking. High levels of atmospheric warming reduce growth in the number of mountain bikers, especially under the Wet and Hot climate futures. Projections to 2070 under LM and HM scenarios diverge in growth from 2012: 62 to 76 percent under LM and 46 to 57 percent under HM.

Climate future has slight or moderate effects, increasing alongside socioeconomic growth and warming level and reaching maximum extent under the HH scenario. Across RPA scenarios, the highest projections generally occur under Least Warm and Wet climate futures, as well as the Middle climate future in high warming scenarios. We project the lowest numbers of participants under the Hot and Dry climate futures for all RPA scenarios, as well as the Middle climate future for the lower warming scenario.

DAYS OF RECREATION—In the South RPA Region, mountain bikers engaged in 32 million days of recreation in 2020. We project growth in the number of days of mountain biking across all RPA scenarios. Projected growth in the number of days of mountain biking is notably greater under high levels of socioeconomic growth, with projected increases of between 141 and 150 percent from 2012 to 2070 under the HH scenario. Under the HL scenario, we project growth of 16 to 20 percent for the same time frame. The comparison indicates that socioeconomic growth is a highly significant and positive driver for the number of days of mountain biking.

Growth in mountain biking days is dampened under high atmospheric warming. Under the LM scenario, we project the number of days of mountain biking to grow between 80 and 93 percent from 2012 to 2070. Under the HM scenario, we project growth over the same period to be 64 to 70 percent. Atmospheric warming has slight or moderate (inverse) effects on the number of days of recreation, plus notable interaction with climate future—the response of number of days of recreation to varying warming levels is most pronounced under the Hot, Wet, and Least Warm climate futures.

Across RPA scenarios, the effect of climate future is slight under high warming and slight but approaching moderate under lower warming. Under the high warming scenarios, while there are slight differences across projections for 2070, the Dry climate future is associated with somewhat reduced growth in comparison. Projections under the lower warming scenario (LM) indicate the maximum numbers of days of recreation under the Hot, Wet, and Least Warm climate futures, with the lowest numbers under the Middle and Dry climate futures.

Horseback riding on trails

PARTICIPANTS—There were about 1.4 million participants in horseback riding on trails in 2020. We project extensive to marked growth from 2012 to 2070 under all RPA scenarios except HL (which could still experience moderate increases). The marked differences between HL and HH indicate socioeconomic growth as a significant and positive

influence on the number of horseback riders on trails. From 2012 to 2070, we project a 12- to 26-percent increase in the number of participants under the HL scenario, compared to a 155- to 187-percent increase under HH.

Comparing HM to LM, projections indicate an inverse driver in atmospheric warming, varying from slight to moderate with climate future. Under the LM scenario, we project a 73- to 97-percent increase in the number of participants by 2070, whereas the outlooks under HM indicate a 64- to 85-percent increase for the same time period. The dampening of growth in the number of participants that is attributed to high warming (compared to lower warming) is moderate under the Wet and Hot climate futures and slight for other climate futures.

Across all the RPA scenarios, climate future has a moderate effect on projections of the number of participants. The highest participant totals are associated with the Least Warm and Middle climate futures for the high warming scenarios, versus Wet, Least Warm, and Hot climate futures for the lower warming scenario. The lowest projection for the number of horseback riding on trails participants distinctly corresponds to the Dry climate future for all scenarios.

DAYS OF RECREATION—In 2020, regional participants engaged in 19 million days of horseback riding on trails. The activity could have some of the greatest increases in number of days of recreation among the activities considered (particularly under the HH scenario). We project slight or moderate growth in number of days of recreation under HL from 2012 to 2070 (4 to 32 percent), in comparison to the marked growth under HH (178 to 262 percent). This contrast indicates socioeconomic growth as an influential and positive driver for the number of days of recreation for horseback riding on trails, one of the most affected activities that we studied. Additionally, there are underlying interactions with climate—in varying levels of U.S. population and income (high versus low), the greatest difference by far in projections occurs under the Least Warm climate future, followed by the Wet climate future.

For HM versus LM, the number of days of horseback riding on trails responds negatively to high levels of warming. The increase in number of days from 2012 to 2070 is 90 to 134 percent under LM and 56 to 99 percent under HM. There are notable interactions of climate with atmospheric warming in terms of number of days of recreation. The effects of atmospheric warming are greatest under the Wet climate future, followed by the Hot climate future.

Across RPA scenarios, the projected number of days of horseback riding on trails is very sensitive to assumed climate future. The differences across climate futures are among the largest for activities in this study. The highest projections of the number of days correspond to the Least Warm (all scenarios) and Wet (LM scenario) climate futures. The lowest projections occur under the Dry climate future, followed by Middle and Hot climate futures, for all RPA scenarios.

Motorized Activities

Motorized water use (motor boating, water skiing, and personal watercraft use)

PARTICIPANTS—In 2020, about 10.5 million regional participants engaged in motorized water use. We project the activity to experience moderate to marked growth in number of participants by 2070, especially under HH with potential for 166- to 196-percent growth from 2012. The HL scenario has moderate growth projected of 24 to 39 percent from 2012 to 2070. Examining HH versus HL shows that socioeconomic growth has a positive and substantial effect on the projected number of participants.

There is an inverse relationship between projected number of participants and atmospheric warming (HM versus LM), varying from slight to moderate across climate futures. We project an 89- to 104-percent increase in the number of participants under LM, versus a 75- to 94-percent increase under HM. Varying atmospheric warming has a moderate effect under the Least Warm and Middle climate futures (slight otherwise).

Climate future has a pronounced effect on the projected number of participants, especially under the HM and HH scenarios. We project the greatest number of participants in the Hot climate future (all scenarios) and in the Middle and Dry climate futures for the LM scenario. The lowest projections of the numbers of participants are associated with the Least Warm climate future (all scenarios) and the Wet climate future for the LM scenario.

DAYS OF RECREATION—Regional participants engaged in about 189 million days of motorized water use in 2020. By 2070, there could be moderate to marked growth in the number of days of motorized water use. Under HL, the number of days of recreation could be 43 to 44 percent greater in 2070 than in 2012, compared to 254 to 256 percent under HH, which is among the largest increases in our study for this region.

Atmospheric warming has a moderate influence on the projected number of days of recreation. Under the LM scenario, there could be a 124- to 125-percent increase in number of days of recreation by 2070, compared to 109 to 110 percent under HM. Overall, high (versus lower) atmospheric warming reduces the number of days of recreation by about 15 percent by 2070. Alternative climate futures yield no meaningful differences in the projected numbers of days of recreation across all the RPA scenarios.

Motorized off-road use

PARTICIPANTS—Motorized off-road use had 7.7 million participants in 2020 for the South RPA Region. Projections show a strong future under moderate to high socioeconomic growth. Under low socioeconomic growth (HL), projections indicate stability in the numbers of participants for decades—at 3 to 6 percent above 2012 in 2040 and –3 to 1 percent from 2012 levels in 2070. In comparison, we project extensive growth under HH, with a 62- to 69-percent increase in the number of participants from 2012 to 2070. There are significant and positive effects from higher levels of U.S. population and income on the numbers of participants.

Projections indicate slight (inverse) effects from atmospheric warming for the number of participants from 2012 to 2070. While we project a 25- to 30-percent increase in the number of participants by 2070 under HM, the projected growth under LM ranges from 32 to 37 percent. Across RPA scenarios, climate future has minor effects in differentiating projections. Thus, the number of participants in this activity does not respond significantly to either atmospheric warming or climate future.

DAYS OF RECREATION—The South RPA Region saw 159 million days of recreation from motorized off-roading participants in 2020. Growth from 2012 to 2070 could range from slight to extensive. Under low socioeconomic growth, the region could see an 11- to 18-percent increase in the number of days of recreation from 2012 to 2070, compared to a 64- to 74-percent increase under HH. These differences show the significant and positive influence of socioeconomic growth.

From 2012 to 2070, we project a 34- to 39-percent increase in the number of days of recreation under the LM scenario, compared to a 36- to 44-percent increase under HM.

Varying the future levels of atmospheric warming yields minor differences in the projected numbers of off-roading days. Likewise, the climate future has slight effect on projections of the numbers of days of recreation within RPA scenarios.

Fishing and Hunting

Fishing

PARTICIPANTS—In 2020, about 13.2 million participants engaged in anadromous, cold-water, saltwater, or warm-water fishing in the South RPA Region. Projections under the HL scenario show similar projected numbers of anglers from 2012 to 2040 (an 18- to 22-percent increase) and from 2012 to 2070 (a 19- to 25-percent increase). In comparison, we project significant growth under the HH scenario in both time frames—a 47- to 52-percent increase in the number of fishing participants from 2012 to 2040 and a 109- to 120-percent increase from 2012 to 2070. Socioeconomic growth motivates this increase with a positive and significant influence. Atmospheric warming and climate future generally have minor effects on the number of fishing participants. Under the LM and HM scenarios, we project similar growth in the numbers of participants from 2012 to 2070—a 56- to 63-percent increase in number of participants under LM and a 55- to 63-percent increase under HM.

DAYS OF RECREATION—Regional participants engaged in 234 million days of fishing in 2020. Growth to 2070 could range from moderate to extensive (HL, LM, and HM) to marked (HH). Socioeconomic growth has a notable and positive effect on the number of fishing participants. Under the HL scenario, we project a 24- to 34-percent increase in the number of days of fishing in 2070 than in 2012, compared to a 99- to 116-percent increase under HH. Under the LM and HM scenarios, we project similar patterns of growth in the number of days of fishing from 2012 to 2070—increases between 53 and 63 percent under LM and between 56 and 69 percent under HM. Both levels of atmospheric warming generally show minor effects on projections of number of days of fishing to 2070.

Across RPA scenarios, the effects of climate future on the projected number of days of fishing range from slight to moderate, increasing in magnitude alongside socioeconomic growth. Projections indicate the highest number of days in 2070 under the Middle climate future, followed by the Dry and Hot climate futures. The (relatively) lowest numbers of days of fishing occur in projections under the Least Warm and Wet climate futures.

Hunting

PARTICIPANTS—In 2020, about 5.3 million participants in the region engaged in hunting big game, small game, or migratory birds. Under the HL scenario, we project only slight changes in the number of hunters from 2012 to 2070 (–1 to 6 percent). In comparison, under the HH scenario, we project the number of hunters in 2070 to be 39 to 50 percent greater than that observed in 2012. Thus, socioeconomic growth is a positive and significant driver for the number of hunters to 2070.

Neither atmospheric warming nor climate future has appreciable effect on the number of hunters. From 2012 to 2070, we project moderate and similar growth in the number of hunters under the LM (20 to 31 percent) and HM (17 to 27 percent) scenarios. Across RPA scenarios, there are slight differences among projections by climate future for 2070.

DAYS OF RECREATION—In 2020, regional participants hunted for 111 million days. Under the HL scenario, we project the least growth (among RPA scenarios) from 2012 to 2070, with a 13- to 30-percent increase in the number of days of hunting. In comparison, projections indicate a 56- to 81-percent increase in the number of days of hunting from 2012 to 2070 under HH. There is a notable, positive effect from socioeconomic growth for the number of days of hunting in the region.

The effect of atmospheric warming ranges from slight to nearly moderate, depending on the climate future. Projections indicate moderate growth in the number of days of hunting from 2012 to 2070—a 27- to 50-percent increase under LM versus a 33- to 54-percent increase under HM. Atmospheric warming has nearly moderate effects under the Hot and Wet climate futures, and slight otherwise.

Climate future has a significant effect on the number of days of hunting, and this influence can grow with lower atmospheric warming and increasing socioeconomic growth. We project the greatest numbers of days of hunting for 2070 under the Dry and Middle (across all scenarios) and Hot (across high warming scenarios) climate futures. The (relatively) lowest increases in the numbers of days of hunting are associated with the Least Warm and Wet climate futures (across all scenarios), with intermediate growth in the Hot climate future under lower warming.

Nonmotorized Water Activities

Swimming (swimming, snorkeling, and scuba diving)

PARTICIPANTS—In 2020, there were about 17.9 million swimmers in the South RPA Region. Under all RPA scenarios except HL, we project significant growth in the numbers of swimmers from 2012 to 2040 and from 2012 to 2070. Under the HL scenario, we project the number of swimmers to be 15 to 19 percent above 2012 by 2040 and 9 to 16 percent above 2012 by 2070. Relative to 2012, the HH scenario could see a 54- to 59-percent increase in the number of swimmers by 2040, compared to a 131- to 141-percent increase by 2070. Socioeconomic growth has a strong and positive influence on the number of swimmers for the region.

The level of atmospheric warming has a moderate (inverse) influence on swimmer numbers. We project the number of swimmers to increase between 2012 and 2070 by 71 to 80 percent under the LM scenario or by 55 to 64 percent under HM. Projections show the most negative response to high warming (i.e., dampening of growth in the number of participants from 2012 to 2070) under the Wet and Hot climate futures, followed by the Dry and Least Warm climate futures. Climate future does not qualify as a driver for the number of swimmers, as there are minor differences in projections across alternative climate futures (within each RPA scenario).

DAYS OF RECREATION—Regional participants engaged in 239 million days of swimming in 2020. We project strong increases from 2012 to 2040, with additional increases projected to 2070 in all RPA scenarios except HL. Under the HL scenario, projections show a 4- to 13-percent increase in number of days of swimming by 2040, then an ambiguous shift of ± 8 percent from 2012 to 2070. Under the HH scenario, we project a 40- to 52-percent increase in the number of days of swimming for 2040 over 2012 levels, compared to a 103- to 134-percent increase for 2070 over 2012 levels. Socioeconomic growth thus has an important and positive effect on the number of days of swimming, with interaction from

climate future. Varying the level of population and income has the greatest influence on number of days of swimming under the Least Warm climate future.

The projected number of swimming days responds negatively to high levels of atmospheric warming. Under the LM scenario, we project a 55- to 82-percent increase in number of days of swimming from 2012 to 2070, compared to 32 to 53 percent under HM. Climate future also has notable interaction with atmospheric warming—the response of the number of days of swimming to varying warming levels is most pronounced under the Wet and Hot climate futures and relatively less so under the Middle climate future.

Climate future has significant effect and is a third driver for the number of days of swimming for the region. The greatest number of swimming days projected for 2070 occurs under the Least Warm (all scenarios) and Wet (LM scenario) climate futures. The lowest outlooks are connected to the Hot and Dry climate futures (all scenarios) and the Middle climate future (LM scenario). The projections associated with the Wet climate futures become more distinctly intermediate among outlooks as socioeconomic growth progresses.

Floating (canoeing, kayaking, and rafting)

PARTICIPANTS—About 3.4 million regional participants engaged in floating in 2020. We project moderate to marked growth in the number of floating participants from 2012 to 2070. Evaluating HL against HH scenarios indicates a significant and positive response to socioeconomic growth—under the HL scenario, the projected increase in number of participants for 2070 is 20 to 33 percent above 2012, compared to 127 to 152 percent above 2012 under HH. Comparing projections under LM and HM reveals a slight inverse response to warming levels. For outlooks in 2070 (relative to 2012), we project a 68- to 80-percent increase in the number of floating participants under LM, compared to a 57- to 74-percent increase under HM.

Climate future has slight or moderate influence on the number of floating participants across RPA scenarios. The projected numbers of participants become more variable across climate futures alongside higher levels of socioeconomic growth. We project the greatest increase in the number of participants by 2070 under the Hot climate future (all RPA scenarios), and the Middle and Dry climate futures (LM scenario). The lowest growth in the numbers of floating participants could occur under the Least Warm climate future (all RPA scenarios) and the Wet climate future (LM scenario).

DAYS OF RECREATION—Regional participants engaged in 22 million days of floating in 2020. Projections show notable and positive responses to higher levels of socioeconomic growth. From 2012 to 2040, the number of days of floating could experience slight or moderate increases, accelerating to extensive or marked growth by 2070 in all RPA scenarios except HL. Under the HH scenario, we project a 121- to 131-percent increase in the number of days of floating from 2012 to 2070, compared to an 18- to 24-percent increase for HL.

Projections show a moderate, inverse influence of atmospheric warming on the number of days of floating. Under the LM scenario, there could be a 68- to 76-percent increase in the number of floating days from 2012 to 2070, whereas HM shows potential for a 52- to 59-percent increase. Climate future does not have a notable effect on the number of floating days for the region.

Outdoor Recreation Trends from 2012 to 2070 in the Rocky Mountain RPA Region

Key Findings

- The Rocky Mountain RPA Region had the smallest regional population in 2012. It is projected to remain the least populated region in 2070 despite having the highest projected percentage of population growth.
- We project growth in the numbers of participants and days of recreation to 2070 for all but three activities (declines are only projected under the HL scenario). Socioeconomic growth is the leading (positive) driver for the numbers of participants and days of recreation.
- We project the highest growth in the numbers of participants and days of recreation in developed skiing, followed by motorized water use and mountain biking.
- While horseback riding on trails is associated with high growth in the number of participants to 2070, the numbers of days of recreation either decline (under HL and HM) or change slightly from 2012.
- Atmospheric warming generally has slight or moderate (inverse) effects on projections to 2070. The activities most responsive to atmospheric warming levels are snowmachining (numbers of participants and days of recreation), horseback riding on trails (number of participants), and developed skiing (number of days of recreation).
- Climate future generally has slight or moderate influence on projections by 2070. The activities with participation and engagement most responsive to climate future are snowmachining (moderate to marked magnitudes) and developed skiing (moderate to extensive magnitudes).
- Comparing both recreation metrics (number of days of recreation versus number of participants) projected to 2070 reveals some distinctive patterns among certain activities in relation to the others. These activities include the following:
 - Developed site use—notably high number of participants with relatively fewer days of recreation, potentially indicating less frequent visitation
 - Viewing nature—the highest level of engagement (number of days of recreation) among activities with relatively low participation, possibly indicating more frequent visitation relative to the fewer participants
 - Birding, primitive area activities, and mountain biking—elevated numbers of days of recreation, respectively, relative to fewer participants
 - Motorized water use—lower number of days of recreation by intermediate number of regional participants

The Rocky Mountain RPA Region

The Rocky Mountain RPA Region consists of twelve states, aggregating the Forest Service Northern, Rocky Mountain, Southwestern, and Intermountain Regions (fig. 1). The Rocky Mountain RPA Region includes some of the most sparsely populated states (i.e., North Dakota, South Dakota, and Wyoming). Among the regions we assessed, the Rocky Mountain RPA Region had the lowest regional population in 2012, with the highest percentage of growth in population projected from 2012 to 2070 under all RPA scenarios (fig. 3) (Wear

and Prestemon 2019b). Under the HH scenario, which shows the greatest projected population increase for the Rocky Mountain RPA Region, population growth is nearly 10 percent greater than for the highly urban North RPA Region. Even with this expansive growth, Wear and Prestemon (2019b) project the lowest 2070 population levels in the Rocky Mountain RPA Region among the regions we assessed because of the relatively low 2012 population. However, the region's population projections are significantly closer to those of the Pacific Coast RPA Region (Wear and Prestemon 2019b).

In this section, we focus on regional projections for two metrics—participation (number of participants) and engagement (number of days of recreation). Number of participants and number of days of recreation are “complementary measures [in estimation and projection] of outdoor recreation markets” for each activity. “Participation [number of participants] can indicate market size and public interest,” whereas the number of days of recreation is a measurement of how frequently recreationists are participating in that activity (Askew and Bowker 2018: 103). Additionally, managers and planners benefit from understanding how responsive these measures are to a set of external factors or conditions, to be identified as drivers. We consider the effects on projected changes in recreation demand from three factors—socioeconomic growth, atmospheric warming, and climate futures.

Projected trends in recreation demand

For the Rocky Mountain RPA Region, we project outdoor recreation demand for all land ownerships to 2070 for 17 activities (table 1). From the baseline year 2012, we make projections on a decennial basis from 2020 to 2070. For each activity and metric, we compute contemporary estimates as the mean of all projections for 2020, across all RPA scenarios and associated climate futures (20 projected values). In addition to contemporary estimates, we show projected changes from baseline year 2012 to 2040 and from 2012 to 2070 as intervals per RPA scenario, defined by minimum to maximum outlooks, for number of participants (table 12) and number of days of recreation (table 13). These intervals span projections across five associated climate futures (Dry, Wet, Middle, Least Warm, and Hot climate futures), under each RPA scenario (table 2). We report projected values for each scenario and climate future assessment in the appendix: for per capita participation see tables A.13 and A.14, for numbers of regional participants see table A.15, and for numbers of days of recreation see table A.16.

Drivers of recreation demand

The underlying assumptions of RPA scenarios permit pairwise comparisons across sets of projections for the numbers of participants and the numbers of days of recreation. The HL and HH scenarios assume high atmospheric warming but have differing levels of assumed socioeconomic growth. This comparison can reveal whether socioeconomic growth is a driving influence for recreation demand. Similarly, the LM and HM scenarios overlap in assumed future socioeconomic growth (moderate socioeconomic growth), but comparisons can indicate the strength of atmospheric warming as a driver of recreation demand. Lastly, comparisons across climate futures within and across RPA scenarios can provide insight into how different climate futures may influence the number of participants and the number of days of recreation in the coming decades.

Table 12—Changes in the number of participants (millions) in outdoor recreation for the Rocky Mountain Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPANTS (MILLIONS)			PERCENTAGE OF CHANGE							
Developed site recreation										
Developed site use	8.7	9.8	47	80	26	26	43	72	63–64	137
Camping in developed campgrounds	3.5	3.9	36–38	60–67	16–21	13–19	30–36	51–58	47–54	105–116
Viewing/photographing nature										
Viewing nature	1.8	2.0	46–47	79–80	25–26	24–25	42–43	69–71	62–63	135–137
Birding ^e	1.0	1.2	47–51	70–75	28–30	23–27	43–46	63–69	62–64	119–126
Nonmotorized, undeveloped activities										
Day hiking	3.9	4.5	40–55	88–105	26–32	26–39	44–51	74–92	66–73	151–175
Primitive area activities	0.8	0.9	36–45	72–81	22–25	20–28	37–41	62–72	56–61	124–138
Mountain biking	0.7	0.8	52–60	118–127	29–32	47–55	48–52	107–117	72–76	213–228
Horseback riding on trails	0.4	0.4	44–61	106–120	19–26	23–36	37–46	75–92	59–69	171–197
Motorized activities										
Motorized water use	2.7	3.1	46–59	95–108	22–26	27–38	42–47	84–100	66–73	186–209
Motorized off-road use	2.7	3.0	37–46	82–92	22–25	25–33	38–42	70–81	58–63	145–160
Snowmachining	0.7	0.7	27–53	59–109	(12)–17	(27)–15	1–35	4–62	17–56	59–147
Fishing and hunting										
Fishing	3.0	3.4	38–40	65–72	19–21	16–21	33–37	54–61	51–54	113–122
Hunting	1.7	1.8	23–35	38–56	3–14	(7)–10	14–27	19–40	26–40	55–83
Nonmotorized winter activities										
Developed skiing	1.6	1.8	39–65	133–167	25–35	41–68	47–59	109–148	75–89	252–313
Undeveloped skiing	1.0	1.1	37–47	68–79	16–20	16–22	33–37	60–69	53–58	136–149
Nonmotorized water activities										
Swimming	3.8	4.2	39–40	73–78	18–20	17–21	35–37	62–67	55–57	134–140
Floating	1.0	1.1	38–46	83–93	18–21	28–36	34–38	75–86	54–58	161–176

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation participants are based on the products of per capita participation estimates and the regional adult (≥16 years of age) population projections, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of participants by activity (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of participants are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table 13—Changes in the number of days (millions) of recreation for the Rocky Mountain Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
DAYS OF RECREATION (MILLIONS)			PERCENTAGE OF CHANGE							
Developed site recreation										
Developed site use	120	135	40–47	72–80	20–24	16–23	36–40	58–68	55–60	118–131
Camping in developed campgrounds	31	35	35–37	58–63	18–22	20–25	31–35	54–61	47–51	106–114
Viewing/photographing nature										
Viewing nature	26	29	37–41	53–66	18–23	6–16	32–38	39–52	48–54	85–101
Birding ^e	12	14	41–57	44–60	23–33	2–19	35–45	28–49	48–60	51–75
Nonmotorized, undeveloped activities										
Day hiking	53	60	34–49	75–98	25–36	25–44	41–54	69–95	61–75	139–174
Primitive area activities	1	2	18–38	52–72	9–17	2–20	23–33	39–63	41–52	93–127
Mountain biking	22	25	48–53	105–111	27–29	41–46	45–47	96–102	67–69	185–194
Horseback riding on trails	14	14	2–9	(5)–0	(12)–(7)	(33)–(29)	(4)–2	(16)–(11)	6–12	3–9
Motorized activities										
Motorized water use	28	31	46–59	95–108	22–26	27–38	42–47	84–100	66–73	186–209
Motorized off-road use	45	51	32–44	69–80	12–19	11–19	27–35	52–63	46–54	118–134
Snowmachining	3	3	22–54	48–105	(19)–15	(36)–9	(7)–32	(11)–53	8–53	37–133
Fishing and hunting										
Fishing	37	40	31–35	49–64	11–18	2–13	25–32	34–49	41–49	85–105
Hunting	23	24	10–23	12–31	(10)–2	(28)–(12)	0–13	(8)–12	11–26	20–46
Nonmotorized winter activities										
Developed skiing	10	11	62–80	203–239	28–40	59–81	56–70	155–191	92–109	408–475
Undeveloped skiing	5	6	30–54	54–74	8–18	(6)–11	23–35	30–53	42–55	92–126
Nonmotorized water activities										
Swimming	37	41	34–36	63–71	13–16	9–15	29–32	51–59	48–52	118–128
Floating	5	5	30–40	60–83	9–16	7–23	23–31	45–66	41–50	115–146

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation engagement are based on the products of mean (annual) number of days of recreation estimated per participant and the projected regional adult (≥16 years of age) population, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of days of recreation (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of days of recreation (by activity) are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Developed Site Recreation

Developed site use (gatherings, picnicking, and visiting developed sites)

PARTICIPANTS—In 2020, about 9.8 million regional participants engaged in developed site use—the most participants for any activity in our study of this region. We define developed site use as an aggregate of five activities: (1) gathering of family or friends in an outdoor area away from home; (2) picnicking; (3) visiting an outdoor nature center, a nature trail, a visitor center, or a zoo; (4) visiting a prehistoric structure or archaeological site; and (5) visiting historic sites, buildings, or monuments.

The level of socioeconomic growth is an important and positive driver for the number of participants in this activity. Projections for all scenarios except HL indicate growth in participant numbers over time as the regional population increases. Under the low population growth projected in the HL scenario, participant numbers fluctuate slightly after 2040, ultimately returning to 2040 levels by 2070. Under HL, the increase projected from 2012 to 2070 is 26 percent, compared to an increase of 137 percent under the HH scenario.

Under LM, the projected number of participants grows by 80 percent from 2012 to 2070, compared to 72 percent under HM. The slightly negative response from the number of participants to high warming levels does not qualify atmospheric warming as a driving factor. Additionally, climate future has a negligible effect, with slight response to climate projected across RPA scenarios.

DAYS OF RECREATION—In 2020, regional participants engaged in developed site use for 135 million days. The leading driver in the number of days of developed site use is socioeconomic growth. The HL scenario corresponds to the lowest growth in the number of days, with increases of 16 to 23 percent from 2012 to 2070. Under the HH scenario, we project increases of 118 to 131 percent from 2012 to 2070. This comparison underscores the highly positive influence from socioeconomic growth.

Under the HM scenario, we project a 58- to 68-percent increase in number of days of recreation in 2070 compared to 2012. The projected growth shifts upward to 72 to 80 percent under the LM scenario, indicating a negative response to high warming. Atmospheric warming has a slight effect on the number of days of recreation, interacting with climate future. Loss in the number of days of developed site recreation between the LM and HM scenarios is greatest under the Hot climate future (nearly moderate effect), followed by the Wet and Least Warm climate futures. Climate future has slight effects overall, especially under lower warming or low socioeconomic growth. There is greater differentiation (approaching moderate extent) of projected number of days of recreation by climate future alongside high socioeconomic growth. Regardless of RPA scenario, the projected numbers of days of recreation in developed site use are greatest under the Least Warm and Wet climate futures.

Camping in developed campgrounds

PARTICIPANTS—In 2020, about 3.9 million participants engaged in camping in developed campgrounds. Socioeconomic growth is a significant and positive driver of participant numbers. Under all scenarios except HL, projections indicate increased growth in the numbers of participants between 2040 and 2070. Projected participant numbers fluctuate over time under HL such that 2070 levels, while greater than in 2012, fall slightly below the numbers projected for 2040. We project that the number of participants in 2070 will more than double the 2012 quantities (growth of 105 to 116 percent) under the HH scenario, compared to the growth of 13 to 19 percent from 2012 to 2070 under HL.

Projected participant totals show slight responsiveness to atmospheric warming and climate future. Under the LM scenario, we project the participant numbers to increase by 60 to 67 percent from 2012 to 2070. Projected growth is slightly lower (51 to 58 percent) under the corresponding high warming scenario, HM. While we project reduced participant growth under high atmospheric warming, the effect remains minor throughout the decades leading to 2070. Within each RPA scenario, specific climate futures have negligible to slight effects on participant numbers.

DAYS OF RECREATION—There were about 35 million days of camping in developed campgrounds by regional participants in 2020. The number of days of developed campground camping responds significantly and positively to socioeconomic growth. As with the number of participants, effects increase with time under moderate or high levels of population and income growth. Under the HL scenario, we project similar increases in the number of days of camping in developed campgrounds from 2012—18 to 22 percent from 2012 to 2040 and 20 to 25 percent from 2012 to 2070. In contrast, projections under the HH scenario indicate increases of 47 to 51 percent in the number of days of recreation from 2012 to 2040, compared to increases of 106 to 114 percent from 2012 to 2070.

For the decades leading to 2070, neither atmospheric warming nor climate future are clear drivers of the number of days of developed campground camping. Projections to 2040 and 2070 are similar under the LM and HM scenarios, indicating no notable effect from atmospheric warming. We project the number of days of developed campground camping to increase from 2012 to 2040 by 35 to 37 percent under the LM scenario, compared to 31 to 35 percent under the HM scenario. We project increases in the number of days from 2012 to 2070—58 to 63 percent under the LM scenario and 54 to 61 percent under the HM scenario. Although the differentiation of projections by climate future increases somewhat alongside socioeconomic growth, the extent remains slight through 2070.

Viewing and Photographing Nature

Viewing nature

PARTICIPANTS—In 2020, about 2.0 million regional participants engaged in viewing nature. Participating in this activity involves (1) viewing, identifying, or photographing nature (birds, other wildlife, wildflowers, trees, other natural vegetation, or natural scenery) or (2) gathering mushrooms, berries, firewood, or other natural products. At high levels of socioeconomic growth, we project the number of viewing nature participants to increase significantly—relative to 2012, projections under HH indicate an increase in the number of participants of 62 to 63 percent by 2040, or 135 to 137 percent by 2070. In comparison, we project approximately a quarter more participants above 2012 for 2040 (25 to 26 percent) and 2070 (24 to 25 percent) under low future socioeconomic growth (HL). Thus, socioeconomic growth (and its associated population increase) has a significant and positive effect on the numbers of viewing nature participants.

Lower atmospheric warming has a slight inverse influence on viewing nature participant numbers. Projections indicate that the number of viewing nature participants increases by 79 to 80 percent under the LM scenario, versus 69 to 71 percent under HM. Across each RPA scenario, no major distinctions in projected participant numbers appear under different climate futures. Thus, atmospheric warming and climate future have limited influence on projected numbers of participants in viewing nature for this region.

DAYS OF RECREATION—In 2020, regional participants engaged in 29 million days of viewing nature. Projections under HL and HH diverge over time as the differences in projected population and income levels between the two scenarios increase. Projections of the numbers of days of viewing nature show the lowest growth under the HL scenario, fluctuating across decades—from 2012 levels, we project increases of 18 to 23 percent in the number of days of recreation by 2040, versus the smaller increase of 6 to 16 percent by 2070. Under HH, we project the number of days of viewing nature to increase by 48 to 54 percent between 2012 and 2040, and by 85 to 101 percent between 2012 and 2070.

Projections of the number of days of viewing nature reveal mostly slight (inverse) responses to atmospheric warming levels, tending toward moderate effect (all climate futures except Hot) or reaching moderate extent (Hot climate future). Under the LM scenario, we project additional days of viewing nature by 2070 that range from 53 to 66 percent above 2012 depending on climate future. The corresponding high warming scenario (HM) is associated with somewhat reduced growth of 39 to 52 percent more days of viewing nature between 2012 to 2070.

The projected number of days of viewing nature becomes more sensitive to climate future as socioeconomic growth becomes greater. Generally, climate futures slightly alter projections of the number of days of recreation, although the differences under the HH scenario are more pronounced. With respect to climate future, there are consistent patterns across all RPA scenarios—the Least Warm climate future yields projections of the greatest numbers of days of recreation, followed closely by the Wet climate future. The lowest growth in the projected number of days is associated with the Hot and Dry climate futures, with the Middle climate future as intermediate.

Birding (viewing or photographing birds)

PARTICIPANTS—About 1.2 million regional participants engaged in birding in 2020. Like viewing nature, projected growth is moderate under the HL scenario but quite large under the HH scenario. Additionally, the high U.S. population and income level is associated with increasing growth in the number of participants over time, diverging from HL even more. Projections under HL show a 28- to 30-percent increase in the number of participants birding from 2012 to 2040, followed by a slightly reduced number of participants in 2070 (23 to 27 percent above 2012 in 2070). Under the HH scenario, the growth projected from 2012 indicates a 62- to 64-percent increase in the number of participants birding by 2040, or a 119- to 126-percent increase by 2070.

Atmospheric warming has a slight, inverse effect on the number of birders within the region. Projections show a 70- to 75-percent increase in the number of participants birding by 2070 under the LM scenario, compared to a 63- to 69-percent increase under the HM scenario. Climate future does not significantly alter the projected numbers of participants within RPA scenarios.

DAYS OF RECREATION—Regional participants engaged in 14 million days of birding in 2020. Socioeconomic growth has a strong and positive influence on the number of birding days. Under the HL scenario, we project the number of days of birding within the region to increase 23 to 33 percent by 2040 then decline from those levels by 2070 (to 2 to 19 percent above 2012 values). Under the HH scenario, projected growth in the number of birding days is more linear and continuous, increasing to 51- to 75-percent growth by 2070.

The lower atmospheric warming scenario (LM) indicates an increase in the number of days of birding of 44 to 60 percent by 2070, nearly the same value as in 2040 (a 41- to 57-percent increase over that of 2012). High atmospheric warming has a dampening effect on the number of days of birding, with projections under HM showing increases of 28 to 49 percent for the number of days of birding by 2070. Atmospheric warming level has slight or moderate influence on the number of days of birding, varying by climate future—the greatest effect occurs under the Hot climate future (moderate), with slight magnitudes otherwise.

Relative to other activities considered here, the projected number of days of birding is highly sensitive to climate future. This is especially true under the moderate and high socioeconomic growth scenarios. Within all scenarios, the Least Warm and Wet climate futures are associated with the highest projected number of birding days. The Hot and Dry (across all scenarios) and Middle (lower warming scenario) climate futures lead to the lowest projected number of birding days. This pattern becomes more pronounced under high levels of future socioeconomic growth. Across the high warming scenarios, we project intermediate levels for the number of days of birding under the Middle climate future.

Nonmotorized, Undeveloped Activities

Day hiking

PARTICIPANTS—In 2020, there were about 4.5 million day hikers in the region. Socioeconomic growth is a highly positive driver of the number of day hikers in the coming decades for the Rocky Mountain RPA Region. Growth in day hiker numbers to 2070 could range from 26 to 39 percent under the HL scenario to 151 to 175 percent under the HH scenario.

Under comparable levels of socioeconomic growth, projections show slightly dampened growth in day hiker numbers under high atmospheric warming levels (74 to 92 percent) versus lower atmospheric warming levels (88 to 105 percent). The projections under the LM and HM scenarios are mostly similar under a Hot climate future, with dampening of growth under the high warming scenario otherwise. We project the maximum effects (moderate) from lower warming under the Wet and Middle climate futures, followed closely by the Dry climate future.

Climate future, alongside different levels of socioeconomic growth, does yield slight or moderate differences in the projected numbers of day hikers. Under lower warming (LM), the Dry climate future leads to uniquely high projected numbers of day hikers (projections are lower and similar within the other climate futures). Under the high warming scenarios, the Dry and Hot climate futures yield the highest projected numbers of day hikers, moderately higher than the lowest levels of growth (Wet and Middle climate futures, followed by the Least Warm climate future).

DAYS OF RECREATION—In 2020, regional participants engaged in 60 million days of day hiking. Projections show notably more days of day hiking within the region by 2070—between 25 and 44 percent more than in 2012 under the HL scenario and between 139 and 174 percent more under the HH scenario. This difference in increases reflects a highly positive and strong influence from socioeconomic growth. The positive response of the number of days of recreation to population growth is strongest under the Dry and Hot climate futures. Atmospheric warming levels have a limited influence on the projected number of days of day hiking in the coming decades, with similar projections of growth to 2070 under the LM (75 to 98 percent) and HM (69 to 95 percent) scenarios.

Although atmospheric warming has, at most, a slight effect on the projected numbers of days of day hiking, climate future does have a strong influence. Within each RPA scenario, a Dry climate future yields the greatest projected growth in the number of days of day hiking. For high warming scenarios, the Hot climate future is a close second in level of projected growth. For each scenario, the remaining climate futures establish the settings on which the number of days of day hiking could be moderately dampened in comparison to the Dry climate future.

Primitive area activities (undeveloped area camping, backpacking, and visiting wilderness)

PARTICIPANTS—About 900,000 regional participants engaged in recreation in primitive areas in 2020. High levels of socioeconomic growth (and associated large projected increases in population) in the future promote extensive to marked increases in projected numbers of participants in primitive area activities. Under the HH scenario, we project participant numbers to increase by 124 to 138 percent from 2012 to 2070. Low socioeconomic growth yields more moderate increases in participant numbers. Under the HL scenario, we project the number of participants to grow moderately through 2040 (22 to 25 percent above the 2012 level) and then generally stabilize thereafter through 2070 (20 to 28 percent above the 2012 level).

Participant numbers are slightly sensitive to the future level of atmospheric warming. We project participant numbers to increase by 72 to 81 percent from 2012 to 2070 under the LM scenario compared to projected 62- to 72-percent increases under the HM scenario. Projections are also slightly responsive to climate future, increasingly distinguished by climate future alongside socioeconomic growth (nearly moderate by the HH scenario). There is consistency across RPA scenarios, with the projected growth in the number of participants greatest under the Dry (across all scenarios) and Hot (across high warming scenarios) climate futures. All other climate futures for the respective RPA scenarios establish the lower projected numbers of participants in relation to Dry or Hot climate futures.

DAYS OF RECREATION—In 2020, regional participants engaged in about 2 million days of primitive area recreation. This is the smallest number of days of recreation among the activities that we studied for the Rocky Mountain RPA Region. With the relatively small number of days of recreation in 2012, slight changes in future projections can translate to percentage shifts that seem large. Generally, however, the projected changes in numbers of days of recreation for these activities are modest relative to those seen for other activities. Large percentage increases here translate to an additional 2 to 3 million days of recreation within the region (table A.16).

Socioeconomic change is a notable and positive driver of the projected number of days of recreation for primitive area activities. Under the HH scenario, we project increases from 2012 to 2070 (93 to 127 percent) in the number of days of recreation in primitive areas. Projected increases in the number of days of recreation are much smaller (2 to 20 percent) under lower socioeconomic growth (the HL scenario). The positive effects of population and income on the number of days of recreation have a moderate spread across climate futures with number of days of recreation (relatively) lowest in the Least Warm, Wet, and Middle climate futures and highest in the Dry and Hot climate futures.

Atmospheric warming has slight or moderate (inverse) effects on the number of days of recreation for primitive area activities, with variation by climate future. While we

project increases of 52 to 72 percent by 2070 under the LM scenario, the corresponding HM scenario is associated with gains of 39 to 63 percent. The effect from atmospheric warming is generally slight, with moderate magnitude under the Wet and Middle climate futures and slight otherwise.

Climate future has significant effect as a driver for the number of days of recreation for primitive area activities, especially as socioeconomic growth increases. The projected numbers of days of recreation in primitive areas are greatest under the Dry climate future, with the Hot climate future as intermediate for high warming scenarios. All other climate futures establish the lower projected number of days of recreation for the respective RPA scenarios. The differences in projections between these groupings of climate futures widen as socioeconomic growth increases.

Mountain biking

PARTICIPANTS—In 2020, about 800,000 regional participants engaged in mountain biking. Even under low socioeconomic growth (HL), we project the number of mountain biking participants to increase by 47 to 55 percent by 2070. Under high levels of socioeconomic growth (HH), the number of mountain biking participants may increase by 213 to 228 percent. However, like primitive area recreation, the number of mountain biking participants is relatively small, so these large percentage increases translate into more modest increases in numbers of individuals (table A.15).

There is slight or moderate dampening of growth in the number of participants under high atmospheric warming levels in the future, with variation by climate future. The projections under the LM scenario indicate a 118- to 127-percent increase in the number of participants mountain biking by 2070 compared to a 107- to 117-percent increase under the HM scenario. The inverse effect from atmospheric warming is greatest under the Hot climate future (moderate) and slight otherwise.

Under low or moderate socioeconomic growth, climate future slightly influences the number of mountain biking participants. The high socioeconomic growth (HH) scenario indicates the greatest influence (moderate in magnitude). Projected growth is greatest under the Wet, Middle, and Least Warm climate futures for all scenarios, and the Hot climate future for the LM scenario. The Dry (across all scenarios) climate future leads to lower projected participant numbers, followed by the Hot climate future under high warming scenarios.

DAYS OF RECREATION—In 2020, regional participants engaged in 25 million days of mountain biking each year. This activity shows potential for substantial growth to 2070, especially under moderate and high socioeconomic growth. Under the HL scenario, we project the number of days of mountain biking in the region to increase by 41 to 46 percent from 2012 to 2070. The potential growth in the projected number of days of mountain biking under the HH scenario is much larger: an increase of 185 to 194 percent. The marked and positive effect from socioeconomic growth on the number of days of mountain biking is reflected in the near tripling for 2070 levels relative to 2012.

We project that the number of days of mountain biking will decrease slightly in scenarios with high levels of atmospheric warming. However, both the LM and HM scenarios show a strong future for mountain biking—we project the numbers of days of mountain biking will increase by 105 to 111 percent from 2012 to 2070 under the LM scenario and by 96 to 102 percent under the HM scenario. Climate future has a slight influence on the projected numbers of days of mountain biking regardless of RPA scenario.

Horseback riding on trails

PARTICIPANTS—In 2020, about 400,000 participants in the region engaged in horseback riding on trails. Projections indicate substantial percentage increases in the numbers of participants in horseback riding on trails by 2070, especially under moderate to high socioeconomic growth—significant growth is a consequence of the relatively low 2012 starting values. Under the HL scenario, we project participant numbers to increase by 23 to 36 percent by 2070. In comparison, under higher socioeconomic growth (HH), we project participant numbers to increase by 171 to 197 percent. There is a significant and negative response in participant numbers in scenarios with high atmospheric warming—one of the largest responses found in this region. Under the lower atmospheric warming scenario (LM), we project participant numbers to more than double (by 106 to 120 percent). In the corresponding high atmospheric warming scenario (HM), we project the number of participants to increase by 75 to 92 percent by 2070. Projections indicate that atmospheric warming is a moderate and inverse driver of the number of participants in horseback riding on trails.

Climate future has slight or moderate effects in conjunction with socioeconomic growth. Across all RPA scenarios, projected growth in participant numbers is greatest under the Wet and Least Warm (across all scenarios) and Middle (LM scenario) climate futures. Projected participant numbers are lowest, across all RPA scenarios, under the Hot and Dry climate futures. These differences are especially pronounced under the HH scenario. The Middle climate future corresponds to intermediate projected values for the high warming scenarios.

DAYS OF RECREATION—In 2020, regional participants engaged in 14 million days of horseback riding on trails. The projected number of days of recreation in horseback riding on trails shows quite variable outcomes from 2012 to 2070, depending on RPA scenario—whether it matches 2012 quantities or undergoes slight (positive or negative) or moderate (negative) changes. Under the HL scenario, we project the largest declines in the number of days of recreation, 29 to 33 percent lower in 2070 than in 2012. In comparison, the HH scenario is associated with mostly stable numbers, increasing by just 3 to 9 percent relative to 2012. This offset of substantial declines qualifies socioeconomic growth as an important driver for the number of days of horseback riding on trails in the region.

Scenarios LM and HM both project declining numbers of days of horseback riding on trails from 2012 to 2070. Under high atmospheric warming (HM), there is a decline of 11 to 16 percent in the number of days of recreation from 2012 to 2070. Under the lower warming scenario (LM), the declines in the number of days of recreation are less pronounced, ranging from no change to declines of 5 percent from the 2012 level. Atmospheric warming has a slight (inverse) influence on the number of days of horseback riding on trails, increasing toward moderate magnitude, but the factor does not qualify as a driver for the number of days of recreation in this activity by 2070. Specific climate futures in the coming decades have even less influence on the projected number of days.

Motorized Activities

Motorized water use (motor boating, water skiing, and personal watercraft use)

PARTICIPANTS—In 2020, about 3.1 million regional participants engaged in motorized water use. Under the HL scenario, we project participant numbers to increase by 27 to 38 percent from 2012 to 2070. In comparison, projections under HH indicate a tripling of the number of participants (186- to 209-percent increase) in connection with high socioeconomic growth.

High atmospheric warming has slight or moderate dampening effects on the increase in the number of participants. Under the LM scenario, the increase in the number of participants from 2012 to 2070 ranges from 95 to 108 percent, in comparison to 84 to 100 percent under HM. Atmospheric warming has the greatest (moderate) effect on growth in the number of participants under the Hot climate future, with slight extent otherwise.

The effects of climate future on the number of participants range from slight (under low socioeconomic growth or lower atmospheric warming) to moderate (under moderate or high socioeconomic growth). By 2070, the highest projected increases are associated with the Wet, Middle, and Least Warm climate futures (across all RPA scenarios), and the Hot climate future (LM scenario). The lowest projection occurs under the Dry climate future, especially under HH. While the Hot climate future promotes additional participation under LM, it is associated with the second lowest increase in the number of participants for the high warming scenarios.

DAYS OF RECREATION—In 2020, regional participants engaged in motorized water use for 31 million days. Socioeconomic growth is a notably positive driver of the number of days of recreation. Under the HL scenario, projections indicate a 27- to 38-percent increase in the number of days of motorized water use for 2070 compared to 2012 levels. In comparison, the HH scenario is associated with a 186- to 209-percent increase in number of days of recreation from 2012 to 2070—about triple that of the 2012 level. This large increase under the HH scenario underscores the powerful effect of expanding U.S. population and income on the number of days of motorized water use.

Atmospheric warming effects on projected days of recreation range from slight to moderate across climate futures. Under the LM scenario, we project 95 to 108 percent more days of activity from 2012 to 2070, versus the somewhat dampened 84 to 100 percent under HM. Projections show the greatest difference—and the only change of moderate magnitude—from atmospheric warming (HM versus LM) under the Hot climate future. All other climate futures are associated with slight to increasingly moderate effects.

Climate futures have slight or moderate effects on the number of days of motorized water use, similar in patterns to the number of participants. The projected numbers of days of recreation are greatest under the Wet, Middle, and Least Warm climate futures across all RPA scenarios, and the Hot climate future in the lower warming scenario (LM). Conversely, we project the lowest numbers of days of recreation, across all RPA scenarios, for the Dry climate future. The positioning of the Hot climate future is dependent on the level of atmospheric warming, as expected from previous findings. While projections for the Hot climate future show a boost toward more days of recreation under LM, we project the second lowest number of days of recreation within high warming scenarios under that climate future.

Motorized off-road use

PARTICIPANTS—About 3.0 million regional participants engaged in motorized off-road use in 2020. Projections to 2070 show increases in participant numbers for the activity, especially under the HH scenario. Under the HL scenario, we project a 25- to 33-percent increase in the number of participants from 2012 to 2070. In comparison, the projected number of participants increases under the HH scenario by 145 to 160 percent. This underscores the significant and positive driving influence of socioeconomic growth.

Atmospheric warming has less effect on participant numbers—although not negligible. Under high warming levels (HM), we project a 70- to 81-percent increase in the number of participants from 2012 to 2070, compared to an 82- to 92-percent increase under LM. Climate future has increasing effects (slight or moderate) alongside socioeconomic growth. We project numbers of participants in motorized off-road use to be greatest under the Dry (across all scenarios) and Hot (across high warming scenarios) climate futures.

DAYS OF RECREATION—In 2020, there were about 51 million days of motorized off-road use by regional participants. Under the HL scenario, projections indicate an 11- to 19-percent increase in the number of days of recreation from 2012 to 2070. In contrast, projections under HH are more than double the 2012 values (a 118- to 134-percent increase from 2012 to 2070). This projected growth reinforces the positive effect of higher socioeconomic growth.

Atmospheric warming has an inverse and moderate effect on the number of days of recreation in this activity. Under the LM scenario, we project a 69- to 80-percent increase in the number of days of recreation from 2012 to 2070 compared to a 52- to 63-percent increase under the HM scenario.

Climate future has a minor effect on the number of days of recreation at low levels of socioeconomic growth and a somewhat moderate effect under the HH scenario. Across RPA scenarios, the highest projected numbers of days of motorized off-road recreation correspond to the Least Warm, Dry, and Wet climate futures. The Hot and Middle climate futures show the (relatively) lowest projected numbers of days of recreation within each RPA scenario, especially at high levels of population and income.

Snowmachining

PARTICIPANTS—In 2020, about 700,000 regional participants engaged in snowmachining. We project socioeconomic growth to have marked influence on the number of participants in coming decades—among the greatest in magnitude projected for activities in this study. However, it is important to consider these changes in conjunction with the relatively low starting value. The shift from low to high socioeconomic growth transforms an ambiguous future into a strongly positive one—under the HL scenario, projections indicate 27 percent fewer to 15 percent more participants from 2012 to 2070. In that same time frame under high socioeconomic growth, the projected numbers of participants increase by 59 percent to 147 percent, most notably for Least Warm and Middle climate futures.

The numbers of participants in snowmachining projected from 2012 to 2070 respond with less growth under high warming levels, with notable variation across climate future. Projections under the LM scenario show a 59- to 109-percent increase in the number of participants in snowmachining in 2070 compared to 2012. In comparison, under the HM scenario, we project increases of 4 to 62 percent in the number of participants to 2070. Divergence in projected numbers is greatest under Wet and Hot climate futures and least under the Middle climate future.

Climate future has an especially notable influence on projections of snowmachining participant numbers. Across all RPA scenarios, the Least Warm climate future corresponds to the highest numbers of participants in snowmachining. In the high warming scenarios, the next greatest increase in the number of participants occurs under the Middle climate future, with the lowest projected participant numbers under the Dry, Hot, and Wet climate futures. Under the LM scenario, the Dry climate future yields the lowest projected participant numbers, followed by the Middle, Hot, and Wet climate futures.

DAYS OF RECREATION—In 2020, regional participants engaged in 3 million days of snowmachining. Our projections for the number of days of snowmachining show sensitivity to assumed levels of socioeconomic growth, atmospheric warming, and climate future. Under the HL scenario, we project decreases in the number of days of recreation of between 34 and 36 percent from 2012 to 2070 for the Dry, Wet, and Hot climate futures. We project the more positive outcomes under HL to yield slight growth in the Middle (3 percent) and Least Warm (9 percent) climate futures. In contrast, under the HH scenario, we project increases in the numbers of days of recreation across all climate futures—ranging from 37 to 133 percent from 2012 to 2070. We project the greatest numbers of snowmachining days under high socioeconomic growth (HH) under the Least Warm (133 percent) and Middle (121 percent) climate futures. These two climate futures also establish settings where the positive effect of socioeconomic growth maximizes alongside high levels of population and income (versus HL).

Atmospheric warming has a significant, inverse effect on the number of days of recreation in 2070, with strong dependence on climate future that emerges in the wide projection intervals. Under the LM scenario, we project growth in the number of days to be 48 to 105 percent from 2012 to 2070. Under HM, the changes in projected number of days range from a loss of 11 percent to a gain of 53 percent. Varying the atmospheric warming level (HM versus LM) has the greatest effects under the Wet and Hot climate futures and lowest under the Middle climate future.

Climate future is another driver of marked effects on the number of days of snowmachining. The highest level occurs under the Least Warm climate future for all scenarios and the Middle climate future for high warming scenarios. Under the high warming scenarios, we project the lowest numbers of days of recreation under the Dry, Wet, and Hot climate futures. The lower warming scenario has the lowest projection under the Dry climate future, followed by intermediate projections under the Middle, Hot, and Wet climate futures.

Fishing and Hunting

Fishing

PARTICIPANTS—In 2020, about 3.4 million participants in the region engaged in anadromous, cold-water, saltwater, or warm-water fishing. Under the HL scenario, projections indicate growth of 16 to 21 percent in the number of anglers from 2012 to 2070. Under the high socioeconomic growth scenario (HH), we project the number of anglers to increase by 113 to 122 percent. There is a significantly favorable response from the projected number of fishing participants to higher levels of socioeconomic growth.

There is a slight, inverse influence from atmospheric warming on angler numbers. Under the LM scenario, we project increases of 65 to 72 percent from 2012 to 2070, compared to increases of 54 to 61 percent under HM. Within RPA scenarios, climate future has a relatively limited influence on projections of the numbers of participants.

DAYS OF RECREATION—In 2020, participants within the Rocky Mountain RPA Region engaged in fishing for about 40 million days. Projections indicate that socioeconomic growth is a significant and positive driver for the number of days of fishing. Under the HH scenario, we project a 41- to 49-percent increase in the number of days of fishing from 2012 to 2040. With additional population and income expansion to 2070 (under HH), we project 85 to 105 percent more fishing days relative to 2012. In contrast, projections under the HL scenario

indicate an 11- to 18-percent increase in the number of days of fishing in 2040 over 2012, then declining by 2070 (to just 2 to 13 percent above 2012 levels).

Projected increases in the number of days of fishing are lower under the high atmospheric warming scenario (HM) compared to the LM scenario. Under the LM scenario, we project a 49- to 64-percent increase in the number of days of fishing from 2012 to 2070, versus a 34- to 49-percent increase under HM. Across RPA scenarios, climate future has moderate effects on projections, with increasing influence alongside increasing population and income. The highest projections for number of days of fishing occur under the Least Warm and Wet climate futures, and the lowest occur under the Hot and Dry climate futures.

Hunting

PARTICIPANTS—In 2020, there were about 1.8 million participants in the region who hunted big game, small game, or migratory birds. Projected increases in population in the coming decades are generally great enough to overcome the projected declines in per capita participation rates for hunting. Under HL, projections from 2012 to 2070 show potential for a loss in participant numbers (up to 7 percent) to growth of 10 percent. In contrast, under the HH scenario, projections show potential for a 55- to 83-percent increase in the number of hunters compared to 2012. The most positive response to socioeconomic growth occurs under the Least Warm climate future.

High levels of atmospheric warming yield lower projected numbers of participants in hunting, in comparison to lower warming. We project a 38- to 56-percent increase in the number of participants hunting under LM compared to 19 to 40 percent under HM. The effects of varying atmospheric warming are greatest under the Hot and Wet climate futures and lowest under the Middle climate future.

Climate future has moderate influence that increases as socioeconomic growth progresses. Regardless of RPA scenario, the greatest projected increase in the number of participants from 2012 to 2070 occurs under the Least Warm climate future, followed by the Wet climate future. The lowest projected participant numbers occur under the Hot and Dry climate futures (across all scenarios) and the Middle climate future (LM scenario). The projections under the Middle climate future vary in relation to other climate futures, depending on the RPA scenario assumptions. The Middle climate future is similar in lower participation to the Dry and Hot climate futures under lower atmospheric warming or low socioeconomic growth. As socioeconomic growth advances from moderate to high, the Middle climate future results in intermediate numbers of participants.

DAYS OF RECREATION—Regional participants went hunting on 24 million days in 2020. Projections of the number of hunting days under the HL scenario indicate a 12- to 28-percent decrease in the number of days from 2012 to 2070. These projected declines are offset as socioeconomic growth increases, with projections of increasing numbers of hunting days. Under the HH scenario, we project increases of 20 to 46 percent from 2012 to 2070. Atmospheric warming has moderate (inverse) effects on projected numbers of hunting days to 2070. The lower atmospheric warming scenario (LM) projects growth of 12 to 31 percent from 2012 to 2070. Under the HM scenario, conversely, the projected numbers of hunting days in 2070 range from 8 percent less to 12 percent greater than in 2012.

The projections show significant variation by climate future within each RPA scenario. Regardless of scenario, we project the greatest numbers of hunting days under the Least Warm climate future, followed by the Wet climate future. The lowest projected numbers of

hunting days correspond to the Hot and Dry climate futures, and the Middle climate future for the LM scenario. In the high warming scenarios, the Middle climate future represents an intermediate outcome.

Nonmotorized Winter Activities

Developed skiing (downhill skiing and snowboarding)

PARTICIPANTS—In 2020, there were about 1.8 million regional participants in developed area skiing. We project the number of developed skiing participants to increase, regardless of scenario. HL scenario projections show a 41- to 68-percent increase in the number of participants from 2012 to 2070. Under the HH scenario, the projected number of participants in developed skiing is up to four times greater in 2070 than in 2012 (growth of 252 to 313 percent). This underscores the highly positive driving influence of socioeconomic growth on the number of participants in developed skiing. We project the most gains in the number of participants under higher population and income to occur under the Dry and Hot climate futures.

Atmospheric warming levels have a moderate (inverse) influence on projected numbers of participants, dependent on climate future. Under the LM scenario, projections indicate a 133- to 167-percent increase in the number of participants in developed skiing in 2070, compared to 109 to 148 percent more under HM. These differences are most pronounced under the Middle and Wet climate futures, and relatively minor under the Hot climate future.

Numbers of participants in developed skiing have one of the most divergent and extensive responses to climate future among the activities considered. Regardless of RPA scenario, projections of participant numbers are greatest under the Dry climate future, followed by the Hot climate future for high warming scenarios. Projected growth in participant numbers tends to be lower under the Wet, Middle, and Least Warm climate futures for all scenarios, as well as the Hot climate future for LM. The differences in projections by climate future become more pronounced with greater projected population and income growth.

DAYS OF RECREATION—In 2020, participants within the region went developed skiing on about 11 million days. We project the number of days of developed skiing to experience some of the greatest increases in the numbers of days of recreation of the activities considered here. Under the HL scenario, we project a 59- to 81-percent increase in the number of days of recreation in developed skiing in 2070 compared to 2012. Under the HH scenario, we project the number of days of developed skiing to experience a fivefold to nearly sixfold increase by 2070 (growth of 408 to 475 percent). The projected number of days of developed skiing shows the most positive response to increasing population and income under the Dry climate future.

We project that atmospheric warming will also have a pronounced (inverse) effect on the number of days of developed skiing. With lower levels of atmospheric warming, there is additional growth in the number of days by 2070. Under the LM scenario, there could be a tripling of the number of days of developed skiing by 2070 (growth of 203 to 239 percent), while under the high atmospheric warming scenario (HM), we project the number of days of developed skiing to increase 155 to 191 percent. The outcomes are generally similar across climate futures, except for a somewhat reduced effect under the Hot climate future.

Climate future has a highly significant effect within RPA scenarios, among the greatest observed on projections of the numbers of days of developed skiing for the region. For all RPA scenarios, the greatest projected increase in the number of days of developed skiing is

associated with the Dry climate future. Under the LM scenario, the Hot, Least Warm, and Wet climate futures are associated with the lowest projected increase in the number of days of developed skiing, followed by the Middle climate future. Under the high warming scenarios, the Middle, Wet, and Least Warm climate futures are associated with the lowest projected increase in the number of days of developed skiing (with the Hot climate future as intermediate).

Undeveloped skiing (cross-country skiing and snowshoeing)

PARTICIPANTS—In 2020, there were about 1.1 million regional participants in undeveloped skiing. Under the HL scenario, projected growth in the number of participants in undeveloped skiing is 16 to 20 percent from 2012 to 2040, with similar growth from 2012 to 2070 (16 to 22 percent). Projections under the HH scenario indicate a 53- to 58-percent increase in the number of participants over 2012 in 2040, with growth increasing to 136 to 149 percent over 2012 by 2070. This indicates a strong and positive response from the numbers of participants to higher levels of socioeconomic growth.

The projected numbers of participants in undeveloped skiing in the LM scenario are 68 to 79 percent greater in 2070 than in 2012, compared to a projected increase of 60 to 69 percent under HM. Comparing projections under the LM and HM scenarios reveals slightly less growth in the numbers of participants in response to high warming levels. Varying atmospheric warming generally has similar effects across climate futures, with the exception of slight, additional changes under the Hot and Least Warm climate futures. Climate future has slight to increasingly moderate effects across RPA scenarios, progressing alongside socioeconomic growth.

DAYS OF RECREATION—In 2020, participants within the region engaged in about 6 million days of undeveloped skiing. We project positive increases in the number of days of undeveloped skiing across all RPA scenarios except HL. Under the HL scenario, we project the number of days of undeveloped skiing to increase by 8 to 18 percent in 2040 but then decline to 2070 outcomes that range from a 6-percent loss to an 11-percent increase relative to 2012. Conversely, under the HH scenario, we project growth to continue through the coming decades with a 42- to 55-percent increase in number of days of undeveloped skiing from 2012 to 2040 and a 92- to 126-percent increase from 2012 to 2070. Projections show interactions with climate future across the varying levels of population and income. The effects reach the greatest extent under the Wet climate future and the lowest under the Hot climate future.

Atmospheric warming is a moderate (inverse) driver of the number of days of undeveloped skiing for the region. Under the HM scenario, we project a 30- to 53-percent increase in the number of days of recreation in undeveloped skiing by 2070 compared to 2012. In comparison, the LM scenario is associated with a 54- to 74-percent increase in the number of days of recreation in undeveloped skiing from 2012 to 2070. These differences show a somewhat reduced effect from atmospheric warming under the Wet climate future, versus the greatest magnitudes projected under the Least Warm and Hot climate futures.

Climate future has a moderate influence on projections of the number of days of undeveloped skiing to 2070. The effects are more pronounced with increasing levels of socioeconomic growth. Across all scenarios, the projected numbers of days of undeveloped skiing are greatest under the Wet and Least Warm (across all scenarios) and Middle (LM scenario) climate futures. The lowest projected growth in the number of days of undeveloped skiing occurs under the Hot and Dry climate futures.

Nonmotorized Water Activities

Swimming (swimming, snorkeling, and scuba diving)

PARTICIPANTS—In 2020, there were about 4.2 million participants in natural-setting swimming in the region. Projected numbers of participants are strongly influenced by the amount of socioeconomic growth. Under the HL scenario, we project the number of swimmers to increase by 17 to 21 percent from 2012 to 2070. In contrast, under the HH scenario, we project the number of swimmers to grow by 134 to 140 percent from 2012 to 2070.

Generally, projections indicate slight (inverse) effects from atmospheric warming on participation. Under the LM scenario, projections from 2012 to 2070 indicate a 73- to 78-percent increase in the number of participants in swimming, versus a 62- to 67-percent increase under HM. Within RPA scenarios, climate future has very slight influence on projected participant numbers.

DAYS OF RECREATION—In 2020, regional participants engaged in about 41 million days of swimming in natural settings. Under the HL scenario, we project the number of swimming days to increase by 9 to 15 percent from 2012 to 2070. Under the HH scenario, projected increases in the number of days of swimming range from 118 to 128 percent from 2012 to 2070. Thus, socioeconomic growth is a significant driver for the number of days of swimming.

Projections show an inverse relationship between the level of atmospheric warming and the number of days of swimming—slight in magnitude although approaching moderate levels. Under the lower warming scenario (LM), we project a 63- to 71-percent increase in the number of days of swimming from 2012 to 2070, versus a 51- to 59-percent increase under HM. Within RPA scenarios, climate future has a minor influence on the projected number of days of swimming.

Floating (canoeing, kayaking, and rafting)

PARTICIPANTS—In 2020, about 1.1 million regional participants engaged in floating. Under the HL scenario, we project moderate growth of 28 to 36 percent in the number of participants by 2070. Projected growth in the number of participants under the HH scenario is much greater at 161 to 176 percent more in 2070 than in 2012, indicating that socioeconomic growth is a notable, positive driver for the number of participants in floating. In comparison, atmospheric warming is not a driver of participation in this activity, as projections show slight (inverse) effects in HM versus LM. We project growth in the number of floating participants (from 2012 to 2070) to be slightly greater in the LM scenario (83 to 93 percent) compared to the corresponding HM scenario (75 to 86 percent).

For each RPA scenario, projected numbers of total participants show slight or moderate effects of climate future. The magnitude increases as socioeconomic growth progresses, from slight (across all scenarios except HH) to moderate (HH). The highest projected numbers of floating participants occur under the Wet, Middle, and Least Warm (across all scenarios), and Hot (LM) climate futures. We project the lowest growth in participant numbers under the Dry (across all scenarios) and Hot (across high warming scenarios) climate futures.

DAYS OF RECREATION—In 2020, regional participants engaged in about 5 million days of floating. Under the HL scenario, we project the number of floating days to increase by 7 to 23 percent from 2012 to 2070. In comparison, the number of floating days could more than double the 2012 level by 2070 (115- to 146-percent increase) under the HH scenario. Comparison of HL and HH shows slight, additional gains under high population and income for the Least Warm, Wet, and Middle climate futures. Thus, socioeconomic growth is a marked and positive driver for the number of days of floating.

Projected growth in the number of days of floating by 2070 is greater under LM (60 to 83 percent) compared to high atmospheric warming (45 to 66 percent). The differences between levels of atmospheric warming are greatest for the Hot climate future. Atmospheric warming is a moderate (inverse) driver for the number of days of floating.

The projection of growth in the number of floating days is moderately sensitive to the assumed climate future. Outcomes vary across climate futures more so with increasing socioeconomic growth. The minimum levels of growth are distinctly projected under the Hot and Dry climate futures for all scenarios. We project the maximum growth from 2012 to 2070 under the Least Warm and Wet climate futures, with intermediate growth under the Middle climate future.

Outdoor Recreation Trends from 2012 to 2070 in the Pacific Coast RPA Region

Key Findings

- Developed site use was the most popular activity (determined by number of participants and days of recreation) in the region in 2012. We project this popularity to continue through 2070.
- We project no significant declines (i.e., moderate or higher in magnitude) in the number of participants across 17 activities by 2070. Three activities are associated with moderate declines in the number of days of recreation under the HL scenario—horseback riding on trails (also declining slightly under HM in Hot and Dry climate futures), motorized off-road use, and snowmachining (Hot and Dry climate futures).
- The highest growth in the numbers of participants to 2070 is associated with the two nonmotorized winter activities—developed skiing and undeveloped skiing. Developed skiing is projected to have the largest increase in the number of days of recreation by 2070, with the number of days of recreation in 2070 over triple the 2012 count.
- Socioeconomic growth is the leading (positive) driver for the numbers of participants and days of recreation, especially in the nonmotorized winter activities.
- Atmospheric warming generally has slight or moderate (inverse) effects on projections. However, some projections indicate a positive effect—for example, we project slight or moderate positive responses in the numbers of days of hunting to high atmospheric warming, especially under the Wet, Middle, and Least Warm climate futures.
- Climate future generally has slight effects on the numbers of participants and days of recreation by 2070, although we project moderate effects in certain activities—horseback riding on trails, snowmachining, and undeveloped skiing (numbers of participants and days of recreation); developed skiing (number of participants); and mountain biking and motorized water use (number of days of recreation).
- Comparing both recreation metrics projected to 2070 (number of days of recreation versus number of participants) reveals some distinctive patterns among certain activities in relation to the others. These activities include the following:
 - Developed site use—notably high number of participants sustained with relatively fewer days of recreation, potentially indicating less frequent visitation with short duration

- Viewing nature—the highest number of days of recreation among activities with relatively low number of participants, possibly indicating more frequent visitation by fewer participants
- Birding—similar to viewing nature, the second highest number of days with relatively low number of participants
- Mountain biking, primitive area activities, and horseback riding on trails—slightly elevated number of days among the relatively fewer participants

The Pacific Coast RPA Region

The Pacific Coast RPA Region consists of three states, in part or all from the Forest Service Pacific Northwest and Pacific Southwest Regions (fig. 1). The RPA assessment conducts resource analysis and projections with respect to the conterminous United States. Thus, the Pacific Coast RPA Region does not include the Forest Service Alaska Region or Hawaii. Additionally, San Juan County, Washington (Federal Information Processing Standard code 53055) is excluded from the regional geography because of its significantly unique island economy. The Pacific Coast RPA Region is known for its natural resource policies and management (and mitigation) actions, such as protecting threatened and endangered species, global climate change mitigation, and critical habitat management. In 2012, the Pacific Coast RPA Region had the third highest regional population. This ranking is maintained under all RPA scenarios to 2070 (fig. 3) (Wear and Prestemon 2019b). Wear and Prestemon (2019b) project the highest population growth under the expanding HH scenario—after modest growth from 2012 to 2020, they project a doubling of the 2012 population by 2070.

In this section, we focus on regional projections for two metrics—participation (number of participants) and engagement (number of days of recreation). Number of participants and number of days of recreation are “complementary measures [in estimation and projection] of outdoor recreation markets” for each activity. “Participation [number of participants] can indicate market size and public interest,” whereas the number of days of recreation is a measurement of how frequently recreationists are participating in that activity (Askew and Bowker 2018: 103). Additionally, managers and planners benefit from understanding how responsive these measures are to a set of external factors or conditions, to be identified as drivers. We consider the effects on projected changes in recreation demand from three factors—socioeconomic growth, atmospheric warming, and climate futures.

Projected trends in recreation demand

For the Pacific Coast RPA Region, we project outdoor recreation demand to 2070 for 17 activities (table 1) for all land ownerships collectively. From the baseline year of 2012, we make projections on a decennial basis from 2020 to 2070. For each activity and metric, we compute contemporary estimates as the mean of all projections for 2020, across all RPA scenarios and associated climate futures (20 projected values). In addition to contemporary estimates, we show projected changes from baseline year 2012 to 2040 and from 2012 to 2070 as intervals per RPA scenario, defined by minimum to maximum outlooks, for the number of participants (table 14) and the number of days of recreation (table 15). These intervals span projections across five associated climate futures (Dry, Wet, Middle, Least Warm, and Hot climate futures), under each RPA scenario (table 2). We report projected values for each scenario and climate future assessment in the appendix: for per capita participation see tables A.17 and A.18, for numbers of regional participants see table A.19, and for numbers of regional days of recreation see table A.20.

Table 14—Changes in the number of participants (millions) in outdoor recreation for the Pacific Coast Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPANTS (MILLIONS)			PERCENTAGE OF CHANGE							
Developed site recreation										
Developed site use	14.5	16.1	36	57	17	11	32–33	50	51	104
Camping in developed campgrounds	5.3	5.8	25–27	39–41	9–10	0–2	22–23	31–34	37–39	77–81
Viewing/photographing nature										
Viewing nature	3.0	3.3	35	54–55	16–17	9–10	31–32	47	49–50	100–101
Birding ^e	1.8	2.0	35–36	49–53	17–18	6–9	31–33	40–43	48–50	88–92
Nonmotorized, undeveloped activities										
Day hiking	6.3	6.9	33–36	51–56	13–18	5–10	28–33	40–46	45–51	92–101
Primitive area activities	1.2	1.3	29–32	46–49	13–16	5–7	27–30	40–43	45–48	92–95
Mountain biking	1.0	1.1	30–31	59–62	11–13	9–12	26–29	48–52	44–47	111–116
Horseback riding on trails	0.6	0.6	34–39	60–75	10–15	2–13	27–33	42–58	47–55	119–142
Motorized activities										
Motorized water use	3.9	4.3	37–40	73–75	15–17	15–19	32–35	59–65	53–56	137–145
Motorized off-road use	3.4	3.6	17–20	28–35	2–5	(8)–(2)	13–16	18–26	25–29	56–66
Snowmachining	0.5	0.5	25–32	63–70	7–14	7–20	20–27	38–55	34–42	93–116
Fishing and hunting										
Fishing	3.8	4.1	31–33	53–57	13–14	7–10	27–29	43–46	44–46	99–103
Hunting	1.0	1.1	13–25	17–26	5–17	(9)–0	16–29	15–26	28–42	47–61
Nonmotorized winter activities										
Developed skiing	2.8	3.1	38–43	87–97	10–17	14–23	29–37	66–78	53–62	173–192
Undeveloped skiing	1.1	1.3	30–43	62–75	14–27	10–21	32–47	56–71	54–72	143–166
Nonmotorized water activities										
Swimming	8.3	9.2	34–35	64–65	14–15	13–14	30–31	54–56	50–51	119–121
Floating	1.5	1.6	26–28	50–57	6–8	0–5	21–23	37–43	38–42	100–108

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation participants are based on the products of per capita participation estimates and the regional adult (≥16 years of age) population projections, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of participants by activity (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of participants are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table 15—Changes in the number of days (millions) of recreation for the Pacific Coast Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
	DAYS OF RECREATION (MILLIONS)		PERCENTAGE OF CHANGE							
Developed site recreation										
Developed site use	187	209	37–40	62–69	15–18	8–12	32–35	49–54	52–55	116–123
Camping in developed campgrounds	44	47	24–28	32–38	6–10	(7)–(1)	19–23	20–28	33–38	60–71
Viewing/photographing nature										
Viewing nature	43	46	25–27	31–36	9–11	(4)–(1)	21–23	23–27	35–38	60–66
Birding ^e	22	25	33–36	38–46	14–19	(6)–(1)	28–33	24–31	45–50	67–75
Nonmotorized, undeveloped activities										
Day hiking	110	118	31–35	47–57	8–16	7–9	21–29	39–42	36–45	85–88
Primitive area activities	2	2	28–31	48–53	15–17	10–13	29–32	46–50	46–49	97–103
Mountain biking	20	22	31–37	64–81	14–20	21–34	29–37	64–82	48–56	133–158
Horseback riding on trails	4	4	17–33	12–40	(10)–10	(36)–(14)	2–25	(14)–16	17–43	30–74
Motorized activities										
Motorized water use	43	48	36–51	83–96	9–15	6–17	28–35	53–69	51–59	153–179
Motorized off-road use	44	45	10–12	11–21	(6)–(1)	(21)–(14)	4–9	0–10	15–21	31–43
Snowmachining	3	3	10–31	31–51	(9)–7	(18)–2	0–17	2–26	10–28	38–70
Fishing and hunting										
Fishing	58	64	26–29	39–49	7–11	(4)–2	20–24	25–33	35–39	69–81
Hunting	19	21	8–17	12–25	12–20	8–14	18–27	24–30	24–34	39–46
Nonmotorized winter activities										
Developed skiing	23	26	45–49	117–121	16–20	34–37	38–44	101–105	66–73	259–265
Undeveloped skiing	6	7	32–50	65–79	13–29	5–18	32–51	51–70	55–77	138–168
Nonmotorized water activities										
Swimming	113	122	26–29	52–55	7–9	6–8	22–24	44–46	39–42	102–105
Floating	9	10	25–29	49–54	6–9	(1)–4	21–24	35–42	39–42	97–107

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for description of survey and data collection process).

^b Initial values of outdoor recreation engagement are based on the products of mean (annual) number of days of recreation estimated per participant and the projected regional adult (≥16 years of age) population, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of days of recreation (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of days of recreation (by activity) are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Drivers of recreation demand

The underlying assumptions of RPA scenarios permit pairwise comparisons across sets of projections for the numbers of participants and the numbers of days of recreation. The HL and HH scenarios assume high atmospheric warming but have differing levels of assumed socioeconomic growth. This comparison can reveal whether socioeconomic growth is a driving influence for recreation demand. Similarly, the LM and HM scenarios overlap in assumed future socioeconomic growth (moderate socioeconomic growth), but comparisons can indicate the strength of atmospheric warming as a driver of recreation demand. Lastly, comparisons across climate futures within and across RPA scenarios can provide insight into how different climate futures may influence the number of participants and the number of days of recreation in the coming decades.

Developed Site Recreation

Developed site use (gatherings, picnicking, and visiting developed sites)

PARTICIPANTS—In 2020, about 16.1 million participants in the Pacific Coast RPA Region engaged in developed site use, defined as an aggregate of five activities: (1) gathering of family or friends in an outdoor area away from home; (2) picnicking; (3) visiting an outdoor nature center, a nature trail, a visitor center, or a zoo; (4) visiting a prehistoric structure or archaeological site; and (5) visiting historic sites, buildings, or monuments. Under the HL scenario, projections of the number of participants show moderate growth from 2012 to 2040 (17 percent), with a slight decline from 2012 to 2070 (11 percent). Under the HH scenario, we project half as many more participants in 2040 than in 2012 (51 percent growth), with a doubling of 2012 participants by 2070 (104 percent growth). The level of socioeconomic growth is a significant and positive driver for the number of participants in this activity.

High atmospheric warming levels promote slightly fewer participants. The number of participants projected for 2070 is 57 percent above the 2012 level under the LM scenario versus 50 percent under the HM scenario. Like atmospheric warming, climate future has only a slight influence on the number of participants for this activity.

DAYS OF RECREATION—Regional participants engaged in 209 million days of developed site use in 2020. Under the HL scenario, projections show moderate growth (15 to 18 percent) from 2012 to 2040, then slight declines to 2070 when the number of days is 8 to 12 percent above the 2012 level. In comparison, we project 52 to 55 percent more days of recreation in 2040 than in 2012 under HH, with a doubling of 2012 values by 2070 (116 to 123 percent growth). The positive effect of socioeconomic growth is extensive, qualifying as a driving factor for the number of days of developed site use.

Under the LM scenario, we project a 62- to 69-percent increase in the number of days of recreation from 2012 to 2070, compared to a 49- to 54-percent increase under HM. Projections show that the number of days of developed site use is somewhat lower under high warming levels. The negative effect of atmospheric warming is slight yet bordering on moderate for the Dry and Least Warm climate futures. Across RPA scenarios, climate future has negligible to slight effects on the number of days of recreation for this activity.

Camping in developed campgrounds

PARTICIPANTS—In 2020, about 5.8 million regional participants engaged in camping in developed campgrounds. Socioeconomic growth has an extensive, positive influence on the number of participants in this activity. In projections under the HL scenario, the number of participants returns to 2012 levels in 2070, following slight growth from 2012 to 2040 (9 to 10 percent). In comparison, under the HH scenario, we project marked growth to 2070, with a 77- to 81-percent increase in the number of participants over 2012.

Under the LM scenario, we project the number of participants to increase by 39 to 41 percent from 2012 to 2070. In comparison, the growth in the number of participants projected under the HM scenario is slightly lower, 31 to 34 percent from 2012. While there is a generally consistent and negative effect from high atmospheric warming, the magnitude remains slight through 2070. Climate future also has little effect on the increase in the number of participants.

DAYS OF RECREATION—In 2020, there were about 47 million days of camping in developed campgrounds by regional participants. Only the HL scenario is associated with slight declines projected in the number of days of recreation from 2012 to 2070, likely a product of low socioeconomic growth—we project slight gains in the number of days (6 to 10 percent) to 2040, then declines of 1 to 7 percent below 2012 levels by 2070. In association with high levels of U.S. population and income (HH), we project a 33- to 38-percent increase in the number of days of recreation in developed campgrounds from 2012 to 2040, compared to 2070, which is 60 to 71 percent above 2012. These projections show that socioeconomic growth has significant, positive effects on the number of days of developed camping for the region.

Under the LM scenario, the projections for 2070 show a 32- to 38-percent increase in the number of days of recreation from 2012. In comparison, the projections under HM increase by 20 to 28 percent relative to 2012. There is a consistent and negative relationship between the number of days of recreation and atmospheric warming level, but the magnitude remains slight for decades to 2070. Climate future also demonstrates minor effects on the number of days of developed campground camping.

Viewing and Photographing Nature

Viewing nature

PARTICIPANTS—In 2020, about 3.3 million participants in the region engaged in viewing nature. Participating in this activity involves (1) viewing, identifying, or photographing nature (birds, other wildlife, wildflowers, trees, other natural vegetation, or natural scenery) or (2) gathering mushrooms, berries, firewood, or other natural products. Under the HL scenario, we project slight growth (9 to 10 percent) in the number of participants from 2012 to 2070. In comparison, we project double the 2012 number of participants for the HH scenario, with growth of 100 to 101 percent from 2012 to 2070. Overall, socioeconomic growth combines the static per capita participation in viewing nature with dynamic population shifts, for an overall strong and positive effect.

Projections under the LM scenario indicate a 54- to 55-percent increase in the number of participants in 2070 over 2012. The number of participants under HM is slightly lower (47 percent above 2012). Although high levels of atmospheric warming reduce growth in the number of participants somewhat, the effect remains slight for the projection time frame. In assessing the factor of climate future, there is negligible variation within RPA scenarios for the projected number of participants.

DAYS OF RECREATION—In 2020, there were about 46 million days of viewing nature activities by regional participants. Projections under HL show slight growth (9 to 11 percent) by 2040, followed by declines to 2070 when the number of days is 1 to 4 percent below that of 2012. High socioeconomic growth (and thus population growth) sufficiently offsets these declines for substantial increases under the HH scenario. Projections under HH indicate that the number of days of viewing nature in 2040 is 35 to 38 percent above that of 2012, then 60 to 66 percent above 2012 in 2070. This underscores socioeconomic growth as a positive and notable driver for the number of days of viewing nature.

In projections under the LM scenario, there is a 31- to 36-percent increase in the number of days of recreation from 2012 to 2070. Growth is slightly less under the HM scenario, with 23 to 27 percent more days than in 2012. According to these projections, there is a negative response of the number days of recreation to high warming levels, albeit slight in magnitude. Climate future has negligible effects across differing conditions of socioeconomic growth and atmospheric warming level.

Birding (viewing or photographing birds)

PARTICIPANTS—There were about 2.0 million regional birders in 2020. Under the HL scenario, the projected number of birders increases by 6 to 9 percent from 2012 to 2070. At high levels of socioeconomic growth, projections show 88- to 92-percent more participants birding than in 2012. This extensive effect qualifies socioeconomic growth as a leading and positive driver for the number of birders.

Projections under the LM scenario show a 49- to 53-percent increase in the number of participants birding in 2070 over 2012. The HM scenario projects a 40- to 43-percent increase in the number of participants birding for the same period. There is a slight (inverse) effect on the number of participants projected under HM versus LM, although not sufficient to qualify as a driver. Climate future has even less effect as a factor, indicating little variability among projections for each RPA scenario.

DAYS OF RECREATION—In 2020, regional participants went birding for about 25 million days. Like its complementary activities in viewing nature, there are declines in the number of birding days from 2012 to 2070 under one scenario (HL), although slight in magnitude (1 to 6 percent). Conversely, projections under HH suggest a marked increase of 67 to 75 percent. Therefore, the factor of socioeconomic growth qualifies as a significant and positive driver of this metric for the region.

Under the LM scenario, projections indicate a 38- to 46-percent increase in the number of days of birding from 2012 to 2070. The number of birding days under the HM scenario increases by 24 to 31 percent from 2012 to 2070. Minor variations occur across climate futures but do not signal a significant interaction. The inverse effects of atmospheric warming on the number of days of birding range from slight to moderate. Lastly, the influence of climate future remains slight and does not qualify as a driver.

Nonmotorized, Undeveloped Activities

Day hiking

PARTICIPANTS—In 2020, about 6.9 million regional participants engaged in day hiking. Under the HL scenario, we project a 5- to 10-percent increase in the number of participants day hiking in 2070 over 2012. There is approximately double the number of participants under the HH scenario in the same time frame (92 to 101 percent growth). The

marked increase qualifies socioeconomic growth as a primary and positive driver for the number of day hikers.

Under the LM scenario, projections show a 51- to 56-percent increase in the number of participants day hiking from 2012 to 2070. The HM scenario is associated with somewhat reduced growth, a 40- to 46-percent increase. There is a consistent, inverse relationship between atmospheric warming and the number of day hikers, but the magnitude remains slight (trending toward moderate) to 2070. For the projection period, neither atmospheric warming nor climate future qualify as drivers for the number of day hikers.

DAYS OF RECREATION—In 2020, regional participants engaged in 118 million days of day hiking. Projections show significant increases under all scenarios except HL, which is associated with low population growth. Under HL, number of days of recreation only increases 7 to 9 percent from 2012 to 2070. In contrast, projections under HH show an 85- to 88-percent increase in number of days of day hiking. This comparison highlights socioeconomic growth as a significant and positive driver for the number of days of day hiking.

Projections under the LM scenario show extensive growth in the number of days of day hiking from 2012 to 2070 (47- to 57-percent increase). Under the HM scenario, projections show somewhat lower growth in comparison, increasing by 39 to 42 percent from 2012. There is a generally negative response to high warming levels—atmospheric warming has moderate (inverse) effect as a driver only when the climate future is Wet, with slight influence otherwise. As a stand-alone factor, the climate future has a slight effect, especially under high warming scenarios.

Primitive area activities (undeveloped area camping, backpacking, and visiting wilderness)

PARTICIPANTS—In 2020, about 1.3 million regional participants engaged in primitive area activities. Under the HL scenario, we project slight (trending to moderate) growth of 13 to 16 percent from 2012 to 2040. This declines over time as projections in 2070 are just 5 to 7 percent above the 2012 number of participants. Under the HH scenario, we project a 45- to 48-percent increase in the number of participants from 2012 to 2040 and nearly double that of 2012 in 2070 (growth of 92 to 95 percent). Thus, projections show a significant and positive response to socioeconomic growth for the numbers of participants.

Both the LM and HM scenarios are associated with moderate increases in the number of participants from 2012 to 2040; we project a 29- to 32- percent increase in the number of participants over 2012 under LM versus a 27- to 30-percent increase under HM. By 2070, there is a slight divergence of outlooks under the two scenarios—we project a 46- to 49-percent increase in the number of participants over 2012 under LM, versus a 40- to 43-percent increase under HM. There is a consistently negative response to high warming. Across RPA scenarios, the climate future shows negligible effects on the number of participants in primitive area activities. Thus, neither atmospheric warming nor climate future qualifies as a driver of the number of participants in primitive area activities.

DAYS OF RECREATION—Regional participants engaged in primitive area activities for 2 million days in 2020. Under the HL scenario, we project slight growth in the number of days of recreation from 2012 to 2070 (10- to 13-percent growth). In contrast, the number of days increases by 97 to 103 percent under the HH scenario. This indicates a marked and positive response of the number of days of recreation to socioeconomic growth.

Under the LM and HM scenarios, we project roughly half as many more days of primitive area activities for 2070 than in 2012—48 to 53 percent under LM and 46 to 50 percent under HM. Likewise, climate future does not show notable influence across RPA scenarios. Atmospheric warming and climate future have negligible effect in projections, leaving socioeconomic growth as the sole driver in our study for the number of days of recreation in primitive area activities in the region.

Mountain biking

PARTICIPANTS—In 2020, there were about 1.1 million mountain bikers in the Pacific Coast RPA Region. Projections for 2040 and 2070 show similar growth rates under the HL scenario for the number of participants from 2012—11 to 13 percent in 2040, then 9 to 12 percent in 2070. In contrast, under the HH scenario, we project nearly half as many more mountain bikers in 2040 than in 2012 (44- to 47-percent growth), compared to more than double the 2012 count in 2070 (111- to 116-percent growth). Socioeconomic growth is an important and positive driver with an effect that increases over time.

Atmospheric warming has a slight effect on the projected number of mountain bikers by 2070. Under the LM scenario, we project a 59- to 62-percent increase in the number of participants over 2012. There is a slight and negative response to high warming levels. The HM scenario shows a 48- to 52-percent increase in the projected number of participants from 2012. Similarly, different climate futures do not lead to meaningfully different projections within each RPA scenario. Therefore, atmospheric warming and climate future do not qualify as drivers for the number of participants in mountain biking.

DAYS OF RECREATION—In 2020, regional participants engaged in mountain biking for 22 million days. The number of days of mountain biking from participants has a strong projected future, especially under high population and income growth. Under the HL scenario, we project a 21- to 34-percent increase in the number of days of mountain biking from 2012 to 2070. The number of days of mountain biking in 2070 more than doubles the 2012 quantity under HH, with an increase of 133 to 158 percent. The comparisons of participation under HL and HH vary somewhat across climate futures, with the maximum difference under the Hot climate future and the two lowest under the Wet and Middle climate futures. Socioeconomic growth is a positive and significant driver, alongside moderate dependence on climate future. Atmospheric warming has negligible influence on the number of days of mountain biking, as underscored in the similarity of projections under LM and HM. Under both scenarios, we project 64- to 82-percent increase in the number of days of mountain biking in 2070 over 2012.

Within each RPA scenario, there are consistent patterns and rankings of projections across climate futures. However, the extent to which outcomes differ depend on the level of U.S. population and income. Climate future has slight influence on the number of days of mountain biking until socioeconomic growth attains moderate or high levels. For all but HL, climate-related effects reach up to moderate magnitude under certain climate futures. Regardless of RPA scenario, the maximum projection occurs under the Hot climate future. Within each RPA scenario, we project the lowest growth under the Wet and Middle climate futures. Intermediate outcomes are associated with the Least Warm and Dry climate futures.

Horseback riding on trails

PARTICIPANTS—In 2020, about 600,000 regional participants engaged in horseback riding on trails. This has one of the lowest number of participants in 2012 that we recorded among activities in this study. All three factors in this study classify as drivers to 2070 because of the extent of their respective effects. However, an important consideration is that percentages are expressed in relation to the low starting value.

Under the HL scenario, we project modest increases in the number of participants (10 to 15 percent) from 2012 to 2040, followed by slight declines; projections in 2070 are only 2 to 13 percent above 2012. The extensive, positive influence of socioeconomic growth can be seen when compared to the HH scenario. Projections indicate a 47- to 55-percent increase in the number of participants in 2040 over 2012, followed by increases over time such that the number of participants in 2070 more than doubles that of 2012 (growth of 119 to 142 percent). Population growth shows slight interactions with climate future in projections, tending toward moderate in magnitude. The greatest gains from high population growth are associated with the Wet and Middle climate futures, and the lowest (relatively) under the Hot climate future.

We project 60 to 75 percent more participants in horseback riding on trails in 2070 than in 2012 under the LM scenario. In comparison, we project the number of participants under HM to increase by 42 to 58 percent from 2012 to 2070. This is a moderate and negative response to high warming, indicating that atmospheric warming is a driver for the number of participants in horseback riding on trails.

Climate future has further effects alongside increasing socioeconomic growth. The Hot climate future corresponds to the lowest projection within each RPA scenario, followed by the Dry climate future. For the remaining three climate futures, the Middle and Wet climate futures lead in growth in the number of participants, trailed by Least Warm. This activity is one of the most responsive to climate future in growth in the number of participants.

DAYS OF RECREATION—In 2020, there were about 4 million days of horseback riding on trails by regional participants. Outcomes differ extensively across RPA scenarios, with patterns distinct from other backcountry activities in this study. All three factors in this study qualify as significant drivers.

Under the HL scenario, projections show ambiguous changes for 2040—the number of days of recreation is within 10 percentage points of that in 2012. By 2070, there are moderately fewer days of horseback riding on trails than in 2012 (14 to 36 percent fewer). However, under HH, the number of days of recreation instead increases from 2012 to 2040 by 17 to 43 percent and from 2012 to 2070 by 30 to 74 percent. Socioeconomic growth thus qualifies as a strong and positive driving factor. There is also notable interaction by climate future. The gains from high socioeconomic growth are most pronounced for the Middle, Wet, and Least Warm climate futures. Variation in socioeconomic growth levels has relatively lower effect under the Hot and Dry climate futures, although still extensive.

Atmospheric warming has a moderate and negative effect on the number of days of recreation. Projections under the LM and HM scenarios fluctuate over the decades through 2070. Under the HM scenario, projections show slight or moderate growth (2 to 25 percent) from 2012 to 2040. However, the projected number of days of recreation becomes more variable in time, with the number of days in 2070 ranging from 14 percent below the 2012 value to 16 percent above. Under LM, the projected numbers of days of recreation in 2040 and 2070

show similar magnitudes of growth from 2012, ranging from slight to moderate—between 17 to 33 percent by 2040 and 12 to 40 percent by 2070.

For the region, horseback riding on trails has the most pronounced effect from climate future among activities in this study, especially under the HH scenario. Within each RPA scenario, we project the maximum number of days of recreation under the Middle and Wet climate futures, followed by the Least Warm climate future. Projections indicate the fewest days (by far) under the Hot climate future, followed by the Dry climate future. Under the HH scenario, there are nearly 44 percentage points differentiating the projected changes under the Middle and Hot climate futures.

Motorized Activities

Motorized water use (motor boating, water skiing, and personal watercraft use)

PARTICIPANTS—In 2020, about 4.3 million regional participants engaged in motorized water use. Under the HL scenario, we project similar numbers of participants in 2040 (15 to 17 percent more than 2012) and 2070 (15 to 19 percent more than 2012). In contrast, under the HH scenario, projections show that the growth in the number of participants from 2012 to 2040 ranges from 53 to 56 percent, with growth from 2012 to 2070 about 137 to 145 percent. This indicates a marked and positive connection to socioeconomic growth.

Under the LM scenario, we project a 73- to 75-percent increase in the number of participants from 2012 to 2070. Growth in the number of participants as projected under HM ranges from 59 to 65 percent above the 2012 level. There are slight or increasingly moderate, negative responses from the numbers of participants to high warming levels with maximum effects under the Dry and Hot climate futures. Across RPA scenarios, projections indicate minor influence of climate future, particularly under the LM scenario in which the influence is negligible.

DAYS OF RECREATION—In 2020, regional participants engaged in motorized water use for 48 million days. Under the HL scenario, projections indicate slight or moderate increases from 2012 to 2040 (9 to 15 percent). We project stability or only minor fluctuations through 2070. Under the HH scenario, the projected numbers of days by 2040 are 51 to 59 percent more than 2012, compared to 153 to 179 percent above the 2012 baseline in 2070. There is notable interaction of socioeconomic growth with climate future, as seen in comparisons of HH versus HL. We project the largest effects of varying socioeconomic growth on the number of days of recreation under the Wet, Least Warm, and Middle climate futures. The Dry and Hot climate futures associate with the lower effects, although still extensive overall.

Under the LM scenario, the number of days of recreation in 2070 is nearly double that of 2012 with growth of 83 to 96 percent. In contrast, the HM scenario indicates a 53- to 69-percent increase in the number of days of recreation for 2070 over 2012. The number of days of recreation in this activity has a negative and moderate relationship with atmospheric warming.

Climate future has slight or moderate influence, especially as socioeconomic growth advances. Within each RPA scenario, we project the most days of recreation under the Wet, Least Warm, and Middle climate futures and the fewest under the Dry and Hot climate futures. Projections within each RPA scenario indicate some sensitivity to climate, which increases with socioeconomic growth.

Motorized off-road use

PARTICIPANTS—In 2020, there were about 3.6 million regional participants in motorized off-road use. We project 2 to 8 percent fewer participants in 2070 than in 2012 under the HL scenario. The strong and positive driver of socioeconomic growth is reflected in the extensive growth under the HH scenario—56 to 66 percent from 2012 to 2070.

As projected under the LM scenario, there is a 29- to 35-percent increase in number of participants in motorized off-road use in 2070 than in 2012. Projections under HM indicate slightly reduced growth, an 18- to 26-percent increase in number of participants from 2012 to 2070. There is a consistently negative response to high warming, although the slight magnitude does not qualify as a driver.

Climate futures increasingly differentiate projections to 2070 as socioeconomic growth expands. Nonetheless, the factor does not attain sufficient influence with respect to the number of participants. This leaves socioeconomic growth as the sole driver of the number of participants in motorized off-road use by 2070.

DAYS OF RECREATION—In 2020, there were about 45 million days of motorized off-road use by regional participants. Only the HL scenario, which is affiliated with low U.S. population and income growth, projects decline by 2070. We project that the number of days of motorized off-road use in 2040 is just 1 to 6 percent below that of 2012, followed by 2070 levels which are 14 to 21 percent below that of 2012. Under the HH scenario, the projected number of days of recreation increases over the 2012 level by 15 to 21 percent in 2040 and by 31 to 43 percent in 2070. Factoring in high socioeconomic growth sufficiently offsets the potentially moderate declines under HL, indicating it is a strong and positive driver.

Under the HM scenario, we project that the numbers of days of recreation in 2040 and 2070 are above that of 2012 but within 10 percent. The LM scenario is associated with slight or moderate growth (11 to 21 percent) in the number of days of recreation from 2012 to 2070. Projections show slight or increasingly moderate effects from varying atmospheric warming (HM versus LM) across climate futures. Although high atmospheric warming reduces the number of days of recreation somewhat, the effect is not sizeable enough to qualify as a driver. Projections of the number of days of motorized off-road use in 2070 differ across climate futures to a slight degree. Overall, socioeconomic growth is the only factor examined that has a notable effect.

Snowmachining

PARTICIPANTS—In 2020, about 500,000 regional participants engaged in snowmachining, the lowest total for an activity in this study for the region. Projections of the numbers of participants show a stable or increasingly positive future, especially in conjunction with high socioeconomic growth. Under the HL scenario, projections show 7 to 20 percent more participants in 2070 than in 2012. In contrast, we project approximately double the number of participants under HH (increase of 93 to 116 percent). The projections of the number of participants show significant and positive responses to high levels of socioeconomic growth—slightly more so under the Least Warm, Wet, and Middle climate futures.

Under the LM scenario, we project gains in the number of snowmachining participants of 63 to 70 percent from 2012 to 2070. Increases projected to 2070 under the HM scenario range from 38 to 55 percent. Comparisons reveal that atmospheric warming has slight or moderate, negative relationships with the number of participants. The number of participants responds most negatively (and distinctly) to high warming under the Hot climate

future, followed by the Dry climate future. Therefore, atmospheric warming is a significant driver, but the interaction with climate future adds an important consideration.

Across RPA scenarios, climate future is impactful under certain conditions—when socioeconomic growth is sufficient (at moderate or high levels). Under lower atmospheric warming (LM) or low socioeconomic growth (HL), there is only slight distinction of projections across climate futures. Under moderate or high levels of socioeconomic growth, however, the projected number of participants is greatest under the Least Warm, Wet, and Middle climate futures. The Hot climate future is distinctly associated with the lowest projection of the number of participants, followed by the Dry climate future.

DAYS OF RECREATION—In 2020, regional participants engaged in about 3 million days of snowmachining. All three factors in this study have significant effect on projections. Under the HL scenario, we project changes of –18 to 2 percent in the number of snowmachining days from 2012 to 2070. Upon closer examination, projections under HL show moderate declines occurring in the Hot and Dry climate futures. The remaining climate futures show slight changes in participation, by no more than 3 percent. In comparison, projections associated with the HH scenario show a 38- to 70-percent increase in the number of days of snowmachining from 2012 to 2070. There is notable and positive influence from socioeconomic growth, which sufficiently offsets declines under HL for overall growth (moderate to extensive) under HH. Additionally, projections indicate interaction with climate future—effects related to socioeconomic growth are greatest under the Least Warm, Middle, and Wet climate futures.

Under the HM scenario, we project 2- to 26-percent increase in the number of days of snowmachining from 2012 to 2070. In contrast, outlooks under LM show a 31- to 51-percent increase in the number of days in 2070 over that of 2012. Comparing LM and HM reveals that atmospheric warming is a moderate and negative driver for the number of days of recreation for this activity. Additionally, there is notable interaction between atmospheric warming and climate future. Variation of atmospheric warming levels is by far most influential for the Hot climate future, followed by Dry, Least Warm, and Wet climate futures. Lastly, the Middle climate future has the lowest effect under atmospheric warming, although it still differentiates outcomes under LM and HM to a moderate extent.

Climate future is a notable driver for the number of days of snowmachining. For each RPA scenario, outcomes differ across climate future, especially with progressing socioeconomic growth. In high warming scenarios, the maximum outlooks occur under the Least Warm, Middle, and Wet climate futures. The minimum projections are associated with the Hot and Dry climate futures. Under lower warming (LM), projections show three distinct groupings by climate future: (1) maximum projected number of days of recreation under the Least Warm climate future; (2) intermediate outlooks under Wet, Hot, and Middle climate futures; and (3) the lowest growth projected under the Dry climate future, which shows 20 percent fewer days of recreation from 2012 to 2070 compared to the maximum projected under the Least Warm climate future. Regardless of atmospheric warming, the Least Warm (across all scenarios) and Middle (across high warming scenarios) climate futures have the greatest number of days of snowmachining per RPA scenario. The Dry climate future ranks among the climate futures having the two lowest (relative) growth outcomes across all RPA scenarios.

Fishing and Hunting

Fishing

PARTICIPANTS—In 2020, about 4.1 million regional participants engaged in anadromous, cold-water, saltwater, or warm-water fishing. Under the HL scenario, the projected number of participants decreases somewhat from 2040 to 2070. We project the number of participants fishing to be 13 to 14 percent above 2012 counts in 2040, versus just 7 to 10 percent above 2012 in 2070. In comparison, under the HH scenario, the number of participants fishing could increase 44 to 46 percent from 2012 to 2040 and double that from 2012 to 2070 (increase of 99 to 103 percent). Growth in the number of participants responds positively to high socioeconomic growth, which is linked to larger population and greater income.

Projections under the LM scenario show a 53- to 57-percent increase in the number of participants fishing from 2012 to 2070. Under the HM scenario, projections of the number of participants fishing are between 43 and 46 percent above those of 2012 for 2070. Lower atmospheric warming realizes the greater outcome projected, although the advantage is slight. At this point, atmospheric warming does not qualify as a driver. Additionally, the climate future has slight effects on projections per RPA scenario and is not a driving factor.

DAYS OF RECREATION—In 2020, there were 64 million days of fishing by regional participants. Participation intensity remains stable or changes slightly under the HL scenario, with moderate growth otherwise. Under the HL scenario, we project a 7- to 11-percent increase in the number of days of fishing by 2040 over 2012. We project that the number of days of recreation will return to near-2012 levels, changing by -4 to 2 percent from 2012 to 2070. Projections under HH show extensive to marked growth for 2070, 69 to 81 percent more than in 2012. Therefore, socioeconomic growth is an important driver with a positive effect on the number of days of fishing.

Atmospheric warming has a negative relationship with the number of days of fishing. Under the LM scenario, we project a 39- to 49-percent increase in the number of days of fishing in 2070 over 2012. Under the HM scenario, the increase from 2012 to 2070 ranges from 25 to 33 percent. The effects from atmospheric warming are moderate under the Dry and Least Warm climate futures and slight otherwise. Across RPA scenarios, the projections of the numbers of days show slight distinctions by climate future. Although effects increase along with socioeconomic growth, the climate future does not classify as a driver for the number of fishing days.

Hunting

PARTICIPANTS—In 2020, about 1.1 million regional participants hunted big game, small game, or migratory birds. The number of hunters is most strongly linked to socioeconomic growth. Projections under the HL scenario show slight or moderate growth for the number of participants hunting by 2040—5 to 17 percent above 2012 levels. However, the projections for 2070 show slight declines (≤ 9 percent) or no changes from 2012. The outlooks projected under HH continue to increase with time over the 2012 baseline, from 28 to 42 percent more hunters in 2040 to 47 to 61 percent more in 2070. Socioeconomic growth is thus a driving factor of total participants in hunting, with positive and extensive impact.

Projections under the LM and HM scenarios show comparable growth in the number of hunters. Both scenarios indicate similar, moderate increases over time—from 2012 to 2040 and 2012 to 2070. We project the number of hunting participants in 2040 to increase from

2012 by 13 to 25 percent (LM) or by 16 to 29 percent (HM). From 2012 to 2070, we project the number of participants to increase from baseline by 17 to 26 percent (LM) or by 15 to 26 percent (HM). However, a closer comparison of projections (HM versus LM) does not reveal consistent patterns. Coupled with slight differences, this indicates that atmospheric warming does not classify as a driver for the number of participants in hunting.

DAYS OF RECREATION—In 2020, regional participants engaged in 21 million days of hunting. We project slight to moderate growth for number of days of hunting, mainly from the primary driving factor of socioeconomic growth. By 2070, projections under the HL scenario show an 8- to 14-percent increase in number of days of hunting over 2012 levels. Projections under HH show an increase in the number of hunting days of 39 to 46 percent. This moderate magnitude of change qualifies socioeconomic growth as an important and positive driver.

Under the LM scenario, we project a 12- to 25-percent increase in the number of days of hunting for 2070 over 2012. Under HM, the number of hunting days increases by 24 to 30 percent from 2012. High warming matches or adds to growth in the number of days of hunting, which differs from other activities. There are variations across climate future in effects of high versus lower warming. The differences are greatest under the Wet climate future, followed by the Least Warm and Middle climate futures. The recreation patterns do not change significantly under Dry or Hot climate futures. Across RPA scenarios, climate future does not demonstrate significant influence on the number of hunting days. However, the influence is greatest in the LM scenario. Under the LM scenario, we project the most growth in the number of days by 2070 in the Dry and Hot climate futures.

Nonmotorized Winter Activities

Developed skiing (downhill skiing and snowboarding)

PARTICIPANTS—In 2020, 3.1 million regional participants engaged in developed skiing. Socioeconomic growth is a significant and positive driver of participation in developed skiing. Under the HL scenario, we project a 14- to 23-percent increase in the number of participants in developed skiing in 2070 over 2012. Projections under high socioeconomic growth show a near tripling of the number of participants relative to 2012 (173 to 192 percent more).

Under the LM scenario, projections indicate an 87- to 97-percent increase in the number of participants in developed skiing for 2070, nearly doubling the 2012 count. In comparison, projections under HM show a 66- to 78-percent increase in the number of participants over 2012. Therefore, atmospheric warming shows a moderate, negative effect on the number of participants.

Climate future has a moderate influence with socioeconomic growth progressing over time. The effect of climate future is greatest when U.S. population and income growth are high (HH). From 2012 to 2070, the minimum growth within RPA scenarios occurs under the Hot and Dry climate futures. We project the maximum growth under the Middle, Wet, and Least Warm climate futures.

DAYS OF RECREATION—In 2020, there were 26 million days of developed skiing from regional participants. In terms of the number of days, projections for this activity indicate the most growth for the region. The primary driver, having marked influence, is socioeconomic growth. The growth increases over time, especially when socioeconomic growth is moderate or high.

Relative to 2012, projections under the HL scenario show a 34- to 37-percent increase in the number of days of recreation in developed skiing for 2070, up from a 16- to 20-percent increase projected for 2040. Under the HH scenario, projections by 2040 undergo notable increases from baseline, 66 to 73 percent. This growth markedly intensifies by 2070, with a 259- to 265-percent increase in the number of days of recreation from 2012.

Projections under the LM scenario indicate a 45- to 49-percent increase in the number of days of recreation for 2040 over 2012. By 2070, the increase from 2012 ranges from 117 to 121 percent. Under the HM scenario, relative to 2012, the projected growth is 38 to 44 percent by 2040 and doubles by 2070 (growth of 101 to 105 percent). Atmospheric warming has a moderate and negative relationship with the number of days of developed skiing, varying slightly by climate future. Across RPA scenarios, there is only slight differentiation of growth in the number of days of recreation across climate futures, which does not qualify as a driver. Overall, the most extensive influences come from socioeconomic growth.

Undeveloped skiing (cross-country skiing and snowshoeing)

PARTICIPANTS—There were about 1.3 million regional participants in undeveloped skiing in 2020. The HL scenario shows slight to moderate increases (10 to 21 percent) projected in the number of participants from 2012 to 2070. Under the HH scenario, participant growth by 2070 ranges from 143 to 166 percent, demonstrating the marked positive effect of U.S. population and income. The effects are greatest under the Wet, Middle, and Least Warm climate futures and somewhat smaller under the Hot and Dry climate futures.

Under lower atmospheric warming (LM), the number of participants increases by 62 to 75 percent from 2012 to 2070. The HM scenario shows roughly a 56- to 71-percent increase in the number of participants projected for 2070 over 2012. Initially, the ranges appear comparable, but a closer examination across climate futures reveals notable variation with mixed effects. Under the Least Warm climate future, projected growth in the number of participants is similar for both lower and high atmospheric warming. Slight differences by warming level occur when climate future is Middle or Wet. In those cases, high warming levels encourage marginally more growth in the numbers of participants. However, a moderate difference occurs for Hot and Dry climate futures in which the projected number of participants increases more under lower warming levels.

There is increasing distinction of the projected number of participants by climate future alongside socioeconomic growth to 2070. For high warming scenarios, minimum growth in the numbers of participants occurs under the Hot and Dry climate futures, with maximum growth occurring under the remaining three climate futures (Wet, Middle, and Least Warm). Under the HH scenario, projections show 23 percentage points distinguishing the minimum and maximum number of participants. The lower warming scenario shows a reversal, with the maximum growth under the Hot and Dry climate futures. The minimum participant growth occurs under the Wet and Middle climate futures, with the Least Warm climate future as intermediate.

DAYS OF RECREATION—In 2020, regional participants engaged in undeveloped skiing for 7 million days. Projections show significant growth by 2070 when socioeconomic growth is moderate or high. We project the number of days of recreation under HL to increase by 5 to 18 percent from 2012 to 2070. This is a decline relative to changes projected for 2040 (13 to 29 percent above baseline). In comparison, under the HH scenario, we project gains of 55 to 77 percent in the numbers of days of recreation for 2040 and 138 to 168 percent

for 2070 compared to 2012. The Middle, Wet, and Least Warm climate futures see the greatest increases in the numbers of days from high versus low socioeconomic levels. The other two climate futures (Hot and Dry) are moderately lower in comparison yet still show notably positive effects from socioeconomic growth. Overall, there is positive and significant momentum from socioeconomic growth, with magnitudes of increases varying by climate future.

Under the LM scenario, we project a 65- to 79-percent increase in the number of days of recreation in undeveloped skiing from 2012 to 2070. For the same time period, we project a 51- to 70-percent increase in the number of days of recreation under the HM scenario. At first glance, the aforementioned intervals appear to show greater growth with lower warming levels. However, there are notable differences across climate futures. High warming reduces growth in the number of days of recreation under the Hot and Dry climate futures (to a moderate extent) and the Least Warm climate future (to a slight extent). High warming has a minor advantage in increasing the number of days of recreation under the Wet climate future, while both levels of warming show little difference under the Middle climate future.

In evaluating climate future as a driver, there is a notable effect alongside certain levels of socioeconomic growth and atmospheric warming. There is slight differentiation of projections across climate futures under lower warming (LM scenario) or low socioeconomic growth (HL scenario). For high warming scenarios alongside moderate or high population growth, the Hot and Dry climate futures see the comparatively lowest growth in the number of days of recreation. The greatest increases in the number of days of recreation occur under the remaining three climate futures (Middle, Wet, and Least Warm). The distinction between these two groups of climate futures broadens as socioeconomic growth increases, maximized by the HH scenario.

Nonmotorized Water Activities

Swimming (swimming, snorkeling, and scuba diving)

PARTICIPANTS—In 2020, about 9.2 million regional participants engaged in outdoor swimming activities. The HL scenario shows slight growth to 2040, with a 14- to 15-percent increase in the number of participants swimming in 2040 over 2012. We project roughly the same level of participation in 2070, with a 13- to 14-percent increase in the number of participants over 2012. Under the HH scenario, projections show a 50- to 51-percent increase in the number of participants over 2012 levels by 2040. By 2070, the projected number of participants is more than double that of 2012 (119 to 121 percent more).

Projections under the LM scenario indicate a 64- to 65-percent increase for 2070 over 2012. Under high warming (HM), that growth falls somewhat to 54 to 56 percent. This reduced growth in the number of participants indicates a negative response to high warming levels. While systematic in response, atmospheric warming as a factor does not progress beyond slight effects and fails to qualify as a driver. For each RPA scenario, there are no more than 2 percentage points distinguishing the minimum and maximum growth in the projected numbers of participants to 2070. The number of swimmers is stable across climate futures for a given scenario, leaving socioeconomic growth as the only significant (positive) driver for this metric.

DAYS OF RECREATION—Regional participants went swimming for 122 million days in 2020. Under the HL scenario, the increase in the number of days of recreation from 2012 to 2040 or from 2012 to 2070 does not exceed 10 percent. The projected number of days of recreation is mostly static under low levels of U.S. population and income. However, the HH scenario shows a doubling of the number of days of recreation, increasing by 102 to 105 percent from 2012 to 2070. This significantly improves on the growth projected from 2012 to 2040, which is 39 to 42 percent. Thus, socioeconomic growth is a notable driver for the number of swimming days.

Under the LM scenario, we project a 52- to 55-percent increase in the number of days of swimming from 2012 to 2070. The growth projected under HM instead ranges from 44 to 46 percent. By climate future, there is a consistently negative response to high warming. This magnitude tends toward moderate levels yet remains slight overall. Thus, atmospheric warming does not emerge as a driving factor for the number of days of swimming. Additionally, the projections of the number of days of swimming show little differentiation across climate futures per RPA scenario (3 percentage points at most).

Floating (canoeing, kayaking, and rafting)

PARTICIPANTS—About 1.6 million regional participants engaged in floating in 2020. In projections to 2070, the number of participants is significantly and positively linked to U.S. population and income. Overall, the future is quite positive, apart from stability under low socioeconomic growth. Under the HL scenario, we project roughly the same number of participants in 2070 as in 2012, just 0 to 5 percent above baseline. In contrast, there is a doubling of the number of participants under HH, with 100 to 108 percent more in 2070 than in 2012.

Under the LM scenario, projections show gains of 50 to 57 percent in the number of participants by 2070 relative to 2012. Projections under the HM scenario indicate somewhat reduced participant growth, 37 to 43 percent from 2012 to 2070. There is a consistent, inverse response to high warming levels, although the magnitude is not sufficient as a driver for the number of participants in floating. While atmospheric warming has slight (trending to moderate) effect under the Dry and Least Warm climate futures, the differences are slight otherwise. Within each RPA scenario, the projections of the number of participants in floating vary slightly across climate futures. Thus, climate future does not qualify as a driver for the number of participants in floating.

DAYS OF RECREATION—In 2020, regional participants engaged in about 10 million days of floating. Like swimming, the future for this activity is especially strong under high levels of socioeconomic growth. Under the HL scenario, the number of days of recreation remains mostly stable, changing by just –1 to 4 percent from 2012 to 2070. Under the HH scenario, the number of days of floating is about double that of 2012 (growth of 97 to 107 percent).

Under the LM scenario, we project 49 to 54 percent more days of floating from participants in 2070 than in 2012. In comparison, we project the number of floating days to increase by 35 to 42 percent under HM, reflecting the negative response to high warming. The greatest effects of differences from varying warming levels occur under the Dry (nearly moderate), Least Warm, and Hot (slight yet tending toward moderate) climate futures. While not an influential factor like socioeconomic growth, atmospheric warming approaches the scope of a moderate driver. Within each RPA scenario, there are slight distinctions of outcomes by climate future. For the projection period to 2070, climate future does not qualify as a driving factor for the number of days of floating.

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Appendix: Projections of Per Capita Participation, Number of Participants, and Number of Days of Recreation from 2012 to 2040 and from 2012 to 2070 for Four RPA Regions

Table A.1—Classifications of percentages of change in the projected number of days of recreation for the North Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections of the number of days of recreation in 2070

Activity or activity grouping	Projected change in the number of days of recreation from 2012 to 2070 ^a				Potential drivers of engagement ^a			Variation across climate futures ^b	
	Lower warming-moderate U.S. growth (LM)	High warming-low U.S. growth (HL)	High warming-moderate U.S. growth (HM)	High warming-high U.S. growth (HH)	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^c	Climate future(s) leading to the highest projected number of days of recreation in 2070	Climate future(s) leading to the lowest projected number of days of recreation in 2070
Developed site recreation									
Developed site use	↑	↓↔	↔↑	↑▲	▲	↔	↔↑	Least Warm and Wet (all)	Hot, Middle, and Dry (all)
Camping in developed campgrounds	↔↑	↓↔	↔↑	↑↑	↑	↔	↔↑	Middle and Hot (all); Dry (lower warming)	Least Warm (all); Wet (high warming)
Viewing/photographing nature									
Viewing nature	↔↑	↓	↔	↑	↑	↔	↔↑	Least Warm and Wet (all)	Hot and Middle (all); Dry (lower warming)
Birding ^d	↔	↓	↓↔	↔↑	↑↑	↔	↔↑	Least Warm and Wet (all)	Hot and Middle (all); Dry (lower warming)
Nonmotorized, undeveloped activities									
Day hiking	↔	↓	↓↔	↔↑	↑↑	↔	↔↑	Least Warm and Wet (all)	Hot (all); Middle and Dry (lower warming)
Primitive area activities	↔↑	↓	↔	↑	↑	↓↔	↔↑	Least Warm and Wet (all)	Hot and Middle (all); Dry (lower warming)
Mountain biking	↑	↔	↑	↑▲	▲	↓↔	↔	↔	↔
Horseback riding on trails	▲	↑↑	▲	▲	▲	↓↓	↔↑	Hot (all); Least Warm and Middle (lower warming)	Least Warm and Dry (high warming); Wet (all)
Motorized activities									
Motorized water use	↑↑	↔↑	↑↑	▲	▲	↔	↔↑	Hot and Middle (all); Dry (lower warming)	Least Warm and Wet (all)
Motorized off-road use	↔↑	↓↔	↔↑	↑	↑▲	↔	↔↑	Middle and Wet (all); Hot and Least Warm (lower warming)	Dry (all); Hot (high warming)
Snowmachining	↓↓↔	▼↓↓	↓↓	↓↓↔	↑↑	↓↔	↑↑	Least Warm (all)	Hot (all); Dry and Wet (high warming)
Fishing and hunting									
Fishing	↔↑	↓	↔	↑	↑	↔	↔	↔	↔
Hunting	↓	↓↓	↓	↓	↑	↔	↔↑	Least Warm and Wet (all); Dry (high warming)	Hot and Middle (all); Dry (lower warming)
Nonmotorized winter activities									
Developed skiing	↑↑	↓	↔↑	↑▲	▲	↓↔	↔↑	Least Warm (all); Wet (high warming)	Hot (all); Middle (high warming); Dry (lower warming)
Undeveloped skiing	↓↔↑	↓↓	↓↓	↓↔	↑↑	↓↔	↔↑↑	Least Warm (all)	Hot and Middle (all); Dry (high warming)
Nonmotorized water activities									
Swimming	↔↑	↓	↔↑	↑↑▲	↑▲	↓↔	↔↑	Least Warm and Wet (all)	Hot and Middle (all); Dry (lower warming)
Floating	↔↑	↓	↔	↑↑	↑▲	↓↔	↔↑	Least Warm and Wet (all)	Hot and Middle (all); Dry (lower warming)

^a The arrows designate both direction and magnitude of the respective percentage of change comparisons, using the scale outlined in table 3. The directions and magnitudes of percentages of change in number of participants may span multiple categories, as projections consider 20 scenario and climate future combinations (four RPA scenarios each with five associated climate futures).

▲▼ = 75-percent or greater increase or decrease (marked change); ↑↓ = 50- to 75-percent increase or decrease (extensive change); ↑↑ = 15- to 50-percent increase or decrease (moderate change); ↔ = less than 15-percent increase or decrease (minimal/slight change)

^b Climate futures are identified (by lower and/or high warming scenarios) when their associated impacts are moderate or higher under at least one RPA scenario.

^c Because these classifications are made with respect to the range across climate futures per RPA scenario, quantifying the responsiveness of climate future is non-negative.

^d Birding is also a subset of the viewing nature aggregate.

Table A.2—Classifications of percentages of change in the projected number of days of recreation for the South Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections of the number of days of recreation in 2070

Activity or activity grouping	Projected change in number of days of recreation from 2012 to 2070 ^a				Potential drivers of engagement ^a			Variation across climate futures ^b	
	Lower warming-moderate U.S. growth (LM)	High warming-low U.S. growth (HL)	High warming-moderate U.S. growth (HM)	High warming-high U.S. growth (HH)	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^c	Climate future(s) leading to the highest projected number of days of recreation in 2070	Climate future(s) leading to the lowest projected number of days of recreation in 2070
Developed site recreation									
Developed site use	↑▲	↑	↑▲	▲	▲	⇔	⇔↑	Hot (all); Middle and Dry (lower warming)	Least Warm (all); Wet (lower warming)
Camping in developed campgrounds	↑	⇔	↑	↑	↑	⇔	⇔↑	Dry (lower warming)	Hot, Wet, Least Warm, and Middle (lower warming)
Viewing/photographing nature									
Viewing nature	↑	⇔↑	↑↑	▲	▲	⇔	⇔	⇔	⇔
Birding ^d	↑↑	⇔	↑	↑▲	↑▲	↓	⇔↑	Least Warm and Wet (all)	Hot, Middle, and Dry (all)
Nonmotorized, undeveloped activities									
Day hiking	↑↑	⇔	↑	↑▲	↑▲	↓⇔	⇔↑	Least Warm (all); Wet (lower warming)	Hot and Dry (all); Middle (lower warming)
Primitive area activities	↑↑	⇔	↑	↑▲	▲	↓⇔	⇔↑	Least Warm (all); Wet and Hot (lower warming)	Dry (all); Hot (high warming)
Mountain biking	▲	↑	↑	▲	▲	↓⇔	⇔		
Horseback riding on trails	▲	⇔↑	↑▲	▲	▲	↓↓	⇔↑↑▲	Least Warm (all); Wet (lower warming)	Dry (all)
Motorized activities									
Motorized water use	▲	↑	▲	▲	▲	↓⇔	⇔	⇔	⇔
Motorized off-road use	↑	⇔↑	↑	↑	↑	⇔	⇔	⇔	⇔
Fishing and hunting									
Fishing	↑	↑	↑	▲	▲	⇔	⇔↑	Middle, Dry, and Hot (high warming)	Least Warm and Wet (high warming)
Hunting	↑	⇔↑	↑↑	↑▲	↑↑	⇔↑	⇔↑	Dry and Middle (all); Hot (high warming)	Least Warm (both); Wet (lower warming)
Nonmotorized water activities									
Swimming	↑▲	⇔	↑↑	▲	▲	↓	⇔↑	Least Warm (all); Wet (lower warming)	Dry (all); Hot (high warming); Middle (lower warming)
Floating	↑▲	↑	↑	▲	▲	↓⇔	⇔	⇔	⇔

^a The arrows designate both direction and magnitude of the respective percentage of change comparisons, using the scale outlined in table 3. The directions and magnitudes of percentages of change in number of participants may span multiple categories, as projections consider 20 scenario and climate future combinations (four RPA scenarios each with five associated climate futures).
▲▼ = 75-percent or greater increase or decrease (marked change); ↑↓ = 50- to 75-percent increase or decrease (extensive change); ↑↑ = 15- to 50-percent increase or decrease (moderate change); ⇔ = less than 15-percent increase or decrease (minimal/slight change)

^b Climate futures are identified (by lower and/or high warming scenarios) when their associated impacts are moderate or higher under at least one RPA scenario.

^c Because these classifications are made with respect to the range across climate futures per RPA scenario, quantifying the responsiveness of climate future is non-negative.

^d Birding is also a subset of the viewing nature aggregate.

Table A.3—Classifications of percentages of change in the projected number of days of recreation for the Rocky Mountain Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections of the number of days of recreation in 2070

Activity or activity grouping	Projected change in number of days of recreation from 2012 to 2070 ^a				Potential drivers of engagement ^a			Variation across climate futures ^b	
	Lower warming-moderate U.S. growth (LM)	High warming-low U.S. growth (HL)	High warming-moderate U.S. growth (HM)	High warming-high U.S. growth (HH)	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^c	Climate future(s) leading to the highest projected number of days of recreation in 2070	Climate future(s) leading to the lowest projected number of days of recreation in 2070
Developed site recreation									
Developed site use	▲▲	↑	↑	▲	▲	↔	↔	↔	↔
Camping in developed campgrounds	↑	↑	↑	▲	▲	↔	↔	↔	↔
Viewing/photographing nature									
Viewing nature	↑	↔↑	↑↑	▲	▲	↓↔	↔↑	Least Warm and Wet (high warming)	Hot and Dry (high warming)
Birding ^d	↑↑	↔↑	↑	↑▲	↑↑	↓↔	↔↑	Least Warm and Wet (all)	Hot and Dry (all); Middle (lower warming)
Nonmotorized, undeveloped activities									
Day hiking	▲▲	↑	▲▲	▲	▲	↔	↔↑	Dry (all); Hot (high warming)	Least Warm, Middle, and Wet (all); Hot (lower warming)
Primitive area activities	↑	↔↑	↑↑	▲	▲	↓↔	↔↑	Dry (all)	Wet, Middle, and Least Warm (all); Hot (lower warming)
Mountain biking	▲	↑	▲	▲	▲	↔	↔	↔	↔
Horseback riding on trails	↔	↓	↓↔	↔	↑	↔	↔	↔	↔
Motorized activities									
Motorized water use	▲	↑	▲	▲	▲	↓↔	↔↑	Wet, Middle, and Least Warm (all); Hot (lower warming)	Dry (all)
Motorized off-road use	▲▲	↔↑	↑	▲	▲	↓	↔↑	Least Warm, Dry, and Wet (high warming)	Hot and Middle (high warming)
Snowmachining	↑↑▲	↓↔	↔↑↑	↑▲	↑▲	▼↓↓	↔↑↑▲	Least Warm (all)	Dry (all); Hot and Wet (high warming)
Fishing and hunting									
Fishing	↑↑	↔	↑	▲	▲	↓↔	↔↑	Least Warm and Wet (all)	Hot and Dry (all); Middle (lower warming)
Hunting	↔↑	↓↔	↔	↑	↑↑	↓↔	↔↑	Least Warm and Wet (all)	Hot and Dry (all); Middle (lower warming)
Nonmotorized winter activities									
Developed skiing	▲	▲▲	▲	▲	▲	↓↓	↔↑↑	Dry (all)	Middle, Wet, and Least Warm (all); Hot (lower warming)
Undeveloped skiing	↑	↔	↑↑	▲	▲	↓	↔↑	Least Warm and Wet (all); Middle (lower warming)	Hot and Dry (all)
Nonmotorized water activities									
Swimming	↑	↔	↑	▲	▲	↔	↔	↔	↔
Floating	▲▲	↔↑	↑↑	▲	▲	↓↔	↔↑	Least Warm and Wet (all); Middle (high warming)	Dry (all); Hot (high warming)

^a The arrows designate both direction and magnitude of the respective percentage of change comparisons, using the scale outlined in table 3. The directions and magnitudes of percentages of change in number of participants may span multiple categories, as projections consider 20 scenario and climate future combinations (four RPA scenarios each with five associated climate futures).

▲▼ = 75-percent or greater increase or decrease (marked change); ▲↓ = 50- to 75-percent increase or decrease (extensive change); ↑↑ = 15- to 50-percent increase or decrease (moderate change); ↔ = less than 15-percent increase or decrease (minimal/slight change)

^b Climate futures are identified (by lower and/or high warming scenarios) when their associated impacts are moderate or higher under at least one RPA scenario.

^c Because these classifications are made with respect to the range across climate futures per RPA scenario, quantifying the responsiveness of climate future is non-negative.

^d Birding is also a subset of the viewing nature aggregate.

Table A.4—Classifications of percentages of change in the projected number of days of recreation for the Pacific Coast Resources Planning Act (RPA) Region (from 2012 to 2070), associated drivers, and climate futures corresponding to the highest and lowest projections of the number of days of recreation in 2070

Activity or activity grouping	Projected change in number of days of recreation from 2012 to 2070 ^a				Potential drivers of engagement ^a			Variation across climate futures ^b	
	Lower warming-moderate U.S. growth (LM)	High warming-low U.S. growth (HL)	High warming-moderate U.S. growth (HM)	High warming-high U.S. growth (HH)	Responsiveness to socioeconomic change (HH-HL)	Responsiveness to atmospheric warming (HM-LM)	Responsiveness to climate future (range) ^c	Climate future(s) leading to the highest projected number of days of recreation in 2070	Climate future(s) leading to the lowest projected number of days of recreation in 2070
Developed site recreation									
Developed site use	↑	↔	↑↑	▲	▲	↔	↔	↔	↔
Camping in developed campgrounds	↑	↔	↑	↑	↑	↔	↔	↔	↔
Viewing/photographing nature									
Viewing nature	↑	↔	↑	↑	↑	↔	↔	↔	↔
Birding ^d	↑	↔	↑	↑▲	↑▲	↓↔	↔	↔	↔
Nonmotorized, undeveloped activities									
Day hiking	↑↑	↔	↑	▲	▲	↓↔	↔	↔	↔
Primitive area activities	↑↑	↔	↑↑	▲	▲	↔	↔	↔	↔
Mountain biking	↑▲	↑	↑▲	▲	▲	↔	↔↑	Hot (all)	Wet and Middle (all)
Horseback riding on trails	↔↑	↓↔	↔↑	↑↑	↑▲	↓	↔↑	Wet and Middle (all); Least Warm (lower warming)	Hot (all)
Motorized activities									
Motorized water use	▲	↔↑	↑	▲	▲	↓	↔↑	Wet, Least Warm, and Middle (high warming)	Dry and Hot (high warming)
Motorized off-road use	↔↑	↓↔	↔	↑	↑	↔	↔	↔	↔
Snowmachining	↑↑	↓↔	↔↑	↑↑	↑	↓	↔↑	Wet and Least Warm (all); Middle (high warming)	Dry (all); Hot (high warming)
Fishing and hunting									
Fishing	↑	↔	↑	↑▲	↑▲	↓↔	↔	↔	↔
Hunting	↔↑	↔	↑	↑	↑	↔↑	↔	↔	↔
Nonmotorized winter activities									
Developed skiing	▲	↑	▲	▲	▲	↓↔	↔	↔	↔
Undeveloped skiing	↑▲	↔↑	↑	▲	▲	↓↔	↔↑	Least Warm (all); Wet and Middle (high warming); Hot and Dry (lower warming)	Hot and Dry (high warming); Wet and Middle (lower warming)
Nonmotorized water activities									
Swimming	↑	↔	↑	▲	▲	↔	↔	↔	↔
Floating	↑↑	↔	↑	▲	▲	↔	↔	↔	↔

^a The arrows designate both direction and magnitude of the respective percentage of change comparisons, using the scale outlined in table 3. The directions and magnitudes of percentages of change in number of participants may span multiple categories, as projections consider 20 scenario and climate future combinations (four RPA scenarios each with five associated climate futures).
▲▼ = 75-percent or greater increase or decrease (marked change); ↑↓ = 50- to 75-percent increase or decrease (extensive change); ↑↑ = 15- to 50-percent increase or decrease (moderate change); ↔ = less than 15-percent increase or decrease (minimal/slight change)

^b Climate futures are identified (by lower and/or high warming scenarios) when their associated impacts are moderate or higher under at least one RPA scenario.

^c Because these classifications are made with respect to the range across climate futures per RPA scenario, quantifying the responsiveness of climate future is non-negative.

^d Birding is also a subset of the viewing nature aggregate.

Table A.5—Changes in per capita participation in outdoor recreation for the North Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
	PARTICIPATION RATE (PERCENT)		PERCENTAGE OF CHANGE							
Developed site recreation										
Developed site use	38.1	38.1	0	1	0	0–1	0	0–1	0	1
Camping in developed campgrounds	9.1	8.9	(10)–(6)	(14)–(9)	(7)–(4)	(9)–(3)	(8)–(5)	(12)–(6)	(10)–(6)	(16)–(10)
Viewing/photographing nature										
Viewing nature	7.8	7.8	0–1	0–1	0	(1)–1	0–1	0–1	0–1	0–2
Birding ^e	5.2	5.3	(3)–7	(9)–2	0–4	(12)–2	0–4	(12)–2	0–3	(12)–2
Nonmotorized, undeveloped activities										
Day hiking	12.4	12.6	(7)–3	(12)–1	(5)–(1)	(16)–(1)	(5)–0	(15)–0	(4)–0	(13)–2
Primitive area activities	2.7	2.6	(9)–(2)	(8)–(5)	(6)–(4)	(10)–(7)	(6)–(4)	(11)–(8)	(7)–(4)	(10)–(7)
Mountain biking	2.8	2.9	(6)– 3	7–19	(4)–1	1–12	(3)–2	4–15	(2)–3	11–22
Horseback riding on trails	1.2	1.3	(2)–19	12–50	2–23	17–66	4–25	22–72	6–27	33–87
Motorized activities										
Motorized water use	11.4	11.5	2–6	11–18	1–5	11–20	2–6	13–22	3–7	22–31
Motorized off-road use	8.0	7.8	(11)–0	(9)–(3)	(8)–(3)	(2)–3	(8)–(4)	(4)–1	(9)–(5)	(3)–2
Snowmachining	2.9	2.6	(34)–(9)	(59)–(16)	(34)–(24)	(67)–(32)	(34)–(24)	(67)–(32)	(34)–(24)	(65)–(28)
Fishing and hunting										
Fishing	12.2	12.2	(6)–(1)	(8)–(2)	(5)–(3)	(10)–(3)	(5)–(3)	(9)–(2)	(5)–(3)	(7)–0
Hunting	5.0	4.5	(37)–(12)	(45)–(35)	(25)–(17)	(42)–(34)	(29)–(22)	(50)–(42)	(33)–(27)	(58)–(52)
Nonmotorized winter activities										
Developed skiing	6.6	6.5	(1)–7	19–30	(4)–0	12–22	(1)–4	20–31	2–7	43–56
Undeveloped skiing	4.1	3.9	(19)–4	(39)–5	(21)–(11)	(39)–(11)	(20)–(11)	(39)–(10)	(20)–(11)	(36)–(7)
Nonmotorized water activities										
Swimming	20.2	20.1	(7)–(1)	(8)–4	(8)–(2)	(20)–(3)	(7)–(1)	(17)–(1)	(6)–0	(10)–3
Floating	4.4	4.3	(14)–(5)	(17)–0	(15)–(7)	(28)–(10)	(14)–(6)	(26)–(8)	(13)–(5)	(20)–(1)

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment (NSRE) data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial per capita participation values are based on activity-matched Outdoor Foundation (2018) estimates and/or NSRE responses from the years 2006–2012.

^c Contemporary estimates of per capita participation are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.6—Per capita participation in outdoor recreation for the North Resources Planning Act (RPA) Region (all land ownerships) as projected in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPATION RATE (PERCENT)										
Developed site recreation										
Developed site use	38.1	38.1	38.1–38.2	38.3–38.5	38.0–38.1	38.1–38.3	38.1	38.2–38.4	38.1–38.2	38.4–38.6
Camping in developed campgrounds	9.1	8.9	8.2–8.5	7.8–8.3	8.5–8.8	8.3–8.8	8.3–8.6	8.0–8.6	8.2–8.5	7.7–8.2
Viewing/photographing nature										
Viewing nature	7.8	7.8	7.8–7.9	7.8–7.9	7.8–7.9	7.8–7.9	7.8–7.9	7.8–7.9	7.8–7.9	7.8–7.9
Birding ^e	5.2	5.3	5.0–5.5	4.7–5.3	5.2–5.3	4.5–5.2	5.2–5.3	4.5–5.2	5.2–5.3	4.6–5.3
Nonmotorized, undeveloped activities										
Day hiking	12.4	12.6	11.4–12.8	10.9–12.5	11.8–12.3	10.4–12.3	11.8–12.3	10.5–12.4	11.8–12.4	10.7–12.6
Primitive area activities	2.7	2.6	2.4–2.6	2.5	2.5–2.6	2.4–2.5	2.5–2.6	2.4–2.5	2.5–2.6	2.4–2.5
Mountain biking	2.8	2.9	2.7–2.9	3.1–3.4	2.7–2.9	2.9–3.2	2.8–2.9	3.0–3.3	2.8–2.9	3.2–3.5
Horseback riding on trails	1.2	1.3	1.2–1.4	1.4–1.8	1.2–1.5	1.4–2.0	1.3–1.5	1.5–2.1	1.3–1.5	1.6–2.3
Motorized activities										
Motorized water use	11.4	11.5	11.7–12.1	12.6–13.5	11.5–12.0	12.7–13.7	11.6–12.1	12.9–13.9	11.7–12.2	13.9–14.9
Motorized off-road use	8.0	7.8	7.1–8.0	7.3–7.7	7.4–7.7	7.8–8.2	7.3–7.7	7.7–8.1	7.3–7.6	7.7–8.1
Snowmachining	2.9	2.6	1.9–2.7	1.2–2.5	1.9–2.2	1.0–2.0	1.9–2.2	1.0–2.0	1.9–2.2	1.0–2.1
Fishing and hunting										
Fishing	12.2	12.2	11.5–12.0	11.3–12.0	11.6–11.8	11.0–11.8	11.6–11.8	11.1–11.9	11.6–11.9	11.4–12.2
Hunting	5.0	4.5	3.1–4.4	2.8–3.2	3.7–4.1	2.9–3.3	3.5–3.9	2.5–2.9	3.3–3.6	2.1–2.4
Nonmotorized winter activities										
Developed skiing	6.6	6.5	6.5–7.1	7.8–8.6	6.3–6.6	7.4–8.0	6.5–6.8	7.9–8.6	6.7–7.0	9.4–10.2
Undeveloped skiing	4.1	3.9	3.4–4.3	2.5–4.3	3.3–3.7	2.5–3.7	3.3–3.7	2.5–3.7	3.3–3.7	2.7–3.9
Nonmotorized water activities										
Swimming	20.2	20.1	18.8–20.1	18.6–21.0	18.5–19.8	16.2–19.5	18.8–20.0	16.8–20.0	19.0–20.2	18.1–20.9
Floating	4.4	4.3	3.7–4.1	3.6–4.4	3.7–4.1	3.1–3.9	3.7–4.1	3.2–4.0	3.8–4.1	3.5–4.3

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment (NSRE) data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial per capita participation values are based on activity-matched Outdoor Foundation (2018) estimates and/or NSRE responses from the years 2006–2012.

^c Contemporary estimates of per capita participation are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.7—Projected numbers of participants in outdoor recreation for the North Resources Planning Act (RPA) Region (all land ownerships) in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPANTS (MILLIONS)										
Developed site recreation										
Developed site use	38.0	40.0	45.0–45.1	48.9–49.1	38.5–38.6	34.1–34.3	43.9–44.0	46.6–46.8	50.5–50.6	64.3–64.6
Camping in developed campgrounds	9.1	9.4	9.7–10.1	10.0–10.6	8.6–8.9	7.4–7.9	9.6–10.0	9.8–10.5	10.9–11.3	12.9–13.8
Viewing/photographing nature										
Viewing nature	7.8	8.2	9.2–9.3	10.0–10.1	7.9–8.0	7.0–7.1	9.0–9.1	9.5–9.6	10.4	13.1–13.3
Birding ^e	5.1	5.6	5.9–6.5	6.0–6.7	5.2–5.4	4.1–4.7	6.0–6.2	5.5–6.4	6.8–7.1	7.6–8.8
Nonmotorized, undeveloped activities										
Day hiking	12.3	13.2	13.5–15.1	13.9–16.0	11.9–12.4	9.3–11.0	13.6–14.2	12.8–15.1	15.7–16.4	17.9–21.1
Primitive area activities	2.7	2.8	2.9–3.1	3.1–3.2	2.5–2.6	2.1–2.2	2.9–3.0	2.9–3.0	3.3–3.4	4.0–4.1
Mountain biking	2.8	3.0	3.2–3.5	3.9–4.3	2.8–2.9	2.6–2.9	3.2–3.4	3.6–4.0	3.7–3.9	5.3–5.8
Horseback riding on trails	1.2	1.3	1.4–1.7	1.7–2.3	1.3–1.5	1.3–1.8	1.5–1.8	1.8–2.5	1.7–2.0	2.7–3.8
Motorized activities										
Motorized water use	11.4	12.1	13.8–14.3	16.1–17.2	11.7–12.1	11.4–12.2	13.4–13.9	15.7–17.0	15.6–16.1	23.3–25.0
Motorized off-road use	8.0	8.2	8.4–9.5	9.3–9.9	7.5–7.8	7.0–7.4	8.5–8.9	9.4–9.9	9.7–10.1	13.0–13.6
Snowmachining	2.9	2.8	2.3–3.2	1.5–3.2	2.0–2.3	0.9–1.8	2.2–2.6	1.2–2.4	2.6–3.0	1.7–3.5
Fishing and hunting										
Fishing	12.2	12.8	13.6–14.2	14.4–15.3	11.7–12.0	9.9–10.6	13.4–13.7	13.5–14.5	15.4–15.7	19.1–20.5
Hunting	5.0	4.7	3.7–5.2	3.5–4.1	3.8–4.2	2.6–2.9	4.1–4.5	3.1–3.5	4.4–4.8	3.5–4.0
Nonmotorized winter activities										
Developed skiing	6.6	6.8	7.7–8.3	10.0–10.9	6.4–6.7	6.6–7.2	7.5–7.9	9.6–10.5	8.9–9.3	15.7–17.1
Undeveloped skiing	4.1	4.1	4.0–5.1	3.2–5.5	3.3–3.7	2.3–3.3	3.8–4.2	3.1–4.5	4.4–4.9	4.5–6.5
Nonmotorized water activities										
Swimming	20.2	21.1	22.2–23.7	23.8–26.8	18.8–20.1	14.5–17.5	21.6–23.1	20.5–24.4	25.2–26.8	30.4–35.0
Floating	4.4	4.5	4.4–4.9	4.6–5.6	3.7–4.1	2.8–3.5	4.3–4.7	3.9–4.9	5.0–5.5	5.8–7.2

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation participants are based on the products of per capita participation estimates and the regional adult (≥16 years of age) population projections, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of participants by activity (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of participants are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.8—Projected numbers of days of recreation for the North Resources Planning Act (RPA) Region (all land ownerships) in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
DAYS OF RECREATION (MILLIONS)										
Developed site recreation										
Developed site use	446	471	510–538	549–605	435–455	357–398	500–523	496–552	579–605	710–791
Camping in developed campgrounds	65	67	68–77	67–75	62–65	53–59	69–73	69–78	79–83	92–102
Viewing/photographing nature										
Viewing nature	125	131	136–145	132–150	118–125	89–102	133–141	118–137	152–161	161–185
Birding ^e	74	80	78–90	66–85	69–76	43–58	77–86	57–77	88–97	76–103
Nonmotorized, undeveloped activities										
Day hiking	182	192	183–211	168–206	163–177	113–146	184–199	149–193	208–226	196–252
Primitive area activities	4	4	4	4	3–4	2–3	4	3–4	4–5	4–5
Mountain biking	54	57	58–64	70–77	51–54	47–49	58–62	65–68	68–71	94–99
Horseback riding on trails	11	13	14–23	26–29	14–18	16–18	16–21	23–26	18–24	35–39
Motorized activities										
Motorized water use	126	134	154–169	178–210	130–143	131–159	150–164	181–220	174–190	275–332
Motorized off-road use	109	110	114–128	115–135	100–108	91–101	113–122	122–135	129–139	169–186
Snowmachining	23	21	16–24	9–23	13–16	5–12	15–18	7–17	17–21	10–24
Fishing and hunting										
Fishing	188	196	189–215	199–220	171–179	133–149	194–204	181–201	222–233	251–280
Hunting	90	87	63–97	58–75	67–77	42–54	72–83	50–64	77–89	58–74
Nonmotorized winter activities										
Developed skiing	37	38	30–49	45–58	30–35	23–29	36–43	35–45	44–51	62–79
Undeveloped skiing	22	21	14–31	12–26	15–17	7–11	17–20	9–16	20–23	13–23
Nonmotorized water activities										
Swimming	211	220	217–249	230–295	182–207	126–177	211–240	181–250	248–280	281–376
Floating	26	27	27–30	28–34	22–25	17–21	26–29	23–30	30–33	34–43

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation engagement are based on the products of mean (annual) number of days of recreation estimated per participant and the projected regional adult (≥16 years of age) population, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of days of recreation (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of days of recreation (by activity) are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.9—Changes in per capita participation in outdoor recreation for the South Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
	PARTICIPATION RATE (PERCENT)			PERCENTAGE OF CHANGE						
Developed site recreation										
Developed site use	37.1	37.1	0	0–1	0	0	0	0	0	0
Camping in developed campgrounds	8.6	8.3	(15)–(6)	(21)–(9)	(13)–(5)	(17)–(6)	(14)–(6)	(20)–(9)	(15)–(8)	(24)–(14)
Viewing/photographing nature										
Viewing nature	7.6	7.6	0–1	1	0	(1)–0	0	0–1	0–1	1–2
Birding ^e	4.7	4.8	(1)–2	(5)–1	0–2	(8)–(3)	0–2	(8)–(3)	0–2	(8)–(3)
Nonmotorized, undeveloped activities										
Day hiking	9.8	9.9	(5)–2	(3)–8	(5)–0	(13)–(3)	(3)–2	(10)–0	(2)–3	(6)–4
Primitive area activities	2.5	2.4	(7)–(4)	(9)–(4)	(7)–(5)	(13)–(8)	(7)–(4)	(12)–(8)	(7)–(4)	(11)–(7)
Mountain biking	2.0	1.9	(9)–(5)	(5)–3	(10)–(6)	(14)–(7)	(8)–(5)	(10)–(3)	(7)–(3)	(4)–3
Horseback riding on trails	1.4	1.4	(5)–4	2–16	(9)–(1)	(6)–6	(6)–2	1–14	(3)–5	14–29
Motorized activities										
Motorized water use	11.1	11.0	0–8	11–20	(3)–1	4–17	(2)–3	8–20	0–4	20–33
Motorized off-road use	8.4	8.0	(17)–(15)	(23)–(19)	(15)–(13)	(19)–(15)	(17)–(15)	(23)–(20)	(19)–(17)	(27)–(24)
Fishing and hunting										
Fishing	14.1	13.8	(7)–(2)	(8)–(4)	(3)–0	0–5	(5)–(2)	(4)–1	(6)–(3)	(6)–(1)
Hunting	5.9	5.5	(21)–(16)	(30)–(23)	(15)–(11)	(17)–(11)	(19)–(15)	(28)–(22)	(24)–(20)	(38)–(33)
Nonmotorized water activities										
Swimming	18.8	18.7	(4)–(1)	0–6	(5)–(2)	(8)–(2)	(4)–(1)	(4)–1	(2)–1	4–8
Floating	3.7	3.6	(10)–(3)	(1)–6	(9)–(5)	1–12	(10)–(6)	(3)–7	(11)–(8)	2–13

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment (NSRE) data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial per capita participation values are based on activity-matched Outdoor Foundation (2018) estimates and/or NSRE responses from the years 2006–2012.

^c Contemporary estimates of per capita participation are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.10—Per capita participation in outdoor recreation for the South Resources Planning Act (RPA) Region (all land ownerships) as projected in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPATION RATE (PERCENT)										
Developed site recreation										
Developed site use	37.1	37.1	37.0–37.2	37.2–37.3	37.0–37.1	37.0–37.2	37.0–37.1	37.0–37.2	37.0–37.1	37.1–37.3
Camping in developed campgrounds	8.6	8.3	7.3–8.0	6.7–7.8	7.5–8.2	7.1–8.1	7.4–8.0	6.9–7.8	7.3–7.9	6.5–7.4
Viewing/photographing nature										
Viewing nature	7.6	7.6	7.6–7.7	7.7	7.6	7.6	7.6	7.6–7.7	7.6–7.7	7.7
Birding ^e	4.7	4.8	4.7–4.8	4.5–4.8	4.7–4.8	4.3–4.6	4.7–4.8	4.3–4.6	4.7–4.8	4.3–4.6
Nonmotorized, undeveloped activities										
Day hiking	9.8	9.9	9.4–10.0	9.6–10.6	9.4–9.9	8.6–9.5	9.5–10.0	8.9–9.8	9.6–10.1	9.3–10.2
Primitive area activities	2.5	2.4	2.3–2.4	2.3–2.4	2.3–2.4	2.2–2.3	2.3–2.4	2.2–2.3	2.3–2.4	2.2–2.3
Mountain biking	2.0	1.9	1.8–1.9	1.9–2.0	1.8	1.7–1.8	1.8–1.9	1.8–1.9	1.8–1.9	1.9–2.0
Horseback riding on trails	1.4	1.4	1.3–1.5	1.4–1.7	1.3–1.4	1.3–1.5	1.3–1.5	1.4–1.6	1.4–1.5	1.6–1.8
Motorized activities										
Motorized water use	11.1	11.0	11.0–11.9	12.3–13.3	10.7–11.2	11.5–12.9	10.9–11.4	11.9–13.3	11.0–11.5	13.2–14.7
Motorized off-road use	8.4	8.0	7.0–7.2	6.5–6.8	7.2–7.3	6.9–7.2	7.0–7.2	6.5–6.7	6.8–7.0	6.1–6.4
Fishing and hunting										
Fishing	14.1	13.8	13.1–13.8	12.9–13.5	13.6–14.0	14.0–14.7	13.4–13.8	13.5–14.2	13.2–13.6	13.2–13.9
Hunting	5.9	5.5	4.7–5.0	4.1–4.5	5.0–5.2	4.9–5.2	4.7–5.0	4.2–4.6	4.5–4.7	3.7–4.0
Nonmotorized water activities										
Swimming	18.8	18.7	18.1–18.7	18.9–19.9	17.8–18.4	17.2–18.4	18.1–18.7	18.0–19.0	18.4–19.0	19.5–20.3
Floating	3.7	3.6	3.3–3.6	3.6–3.9	3.4–3.5	3.7–4.1	3.3–3.5	3.6–4.0	3.3–3.4	3.8–4.2

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment (NSRE) data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial per capita participation values are based on activity-matched Outdoor Foundation (2018) estimates and/or NSRE responses from the years 2006–2012.

^c Contemporary estimates of per capita participation are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.11—Projected numbers of participants in outdoor recreation for the South Resources Planning Act (RPA) Region (all land ownerships) in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPANTS (MILLIONS)										
Developed site recreation										
Developed site use	31.8	35.5	44.7–45.0	54.1–54.3	38.2–38.3	37.4–37.6	43.7–43.8	51.4–51.7	50.3–50.4	71.4–71.7
Camping in developed campgrounds	7.3	7.9	8.8–9.7	9.8–11.4	7.7–8.4	7.2–8.2	8.7–9.5	9.5–10.8	9.9–10.8	12.5–14.2
Viewing/photographing nature										
Viewing nature	6.5	7.3	9.2–9.3	11.2	7.8–7.9	7.6–7.7	9.0	10.5–10.6	10.3–10.4	14.7–14.9
Birding ^e	4.0	4.6	5.7–5.8	6.5–6.9	4.9–5.0	4.4–4.6	5.6–5.7	6.0–6.4	6.4–6.6	8.4–8.8
Nonmotorized, undeveloped activities										
Day hiking	8.4	9.4	11.4–12.1	13.9–15.4	9.7–10.2	8.7–9.6	11.2–11.8	12.3–13.7	13.1–13.7	17.9–19.7
Primitive area activities	2.1	2.3	2.8–2.9	3.3–3.5	2.4	2.2–2.3	2.7–2.8	3.0–3.2	3.1–3.2	4.2–4.5
Mountain biking	1.7	1.9	2.2–2.3	2.7–3.0	1.8–1.9	1.7–1.9	2.1–2.2	2.5–2.6	2.5–2.6	3.6–3.9
Horseback riding on trails	1.2	1.4	1.6–1.8	2.1–2.4	1.3–1.5	1.4–1.5	1.6–1.7	2.0–2.2	1.9–2.0	3.1–3.5
Motorized activities										
Motorized water use	9.5	10.5	13.3–14.4	17.9–19.3	11.0–11.6	11.7–13.1	12.8–13.4	16.5–18.5	15.0–15.7	25.4–28.3
Motorized off-road use	7.2	7.7	8.5–8.7	9.5–9.9	7.4–7.6	7.0–7.2	8.3–8.5	9.0–9.4	9.3–9.5	11.8–12.3
Fishing and hunting										
Fishing	12.0	13.2	15.8–16.7	18.8–19.6	14.1–14.5	14.2–14.9	15.8–16.3	18.7–19.7	17.9–18.5	25.4–26.7
Hunting	5.0	5.3	5.6–6.0	6.0–6.6	5.1–5.4	4.9–5.3	5.6–5.9	5.9–6.4	6.0–6.4	7.0–7.6
Nonmotorized water activities										
Swimming	16.1	17.9	21.8–22.6	27.5–29.0	18.4–19.0	17.5–18.6	21.4–22.1	25.0–26.4	25.0–25.8	37.5–39.1
Floating	3.2	3.4	4.0–4.3	5.3–5.7	3.5–3.6	3.8–4.2	3.9–4.1	5.0–5.5	4.4–4.6	7.2–8.0

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation participants are based on the products of per capita participation estimates and the regional adult (≥16 years of age) population projections, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of participants by activity (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of participants are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.12—Projected numbers of days of recreation for the South Resources Planning Act (RPA) Region (all land ownerships) in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
DAYS OF RECREATION (MILLIONS)										
Developed site recreation										
Developed site use	366	400	504–538	633–679	433–451	447–496	487–508	592–657	553–576	801–889
Camping in developed campgrounds	58	61	64–71	72–83	56–60	53–56	64–68	70–75	72–77	92–98
Viewing/photographing nature										
Viewing nature	103	113	138–146	167–174	119–123	113–120	135–140	153–161	154–159	205–215
Birding ^e	63	70	82–91	92–103	71–76	61–68	80–86	81–91	91–98	109–121
Nonmotorized, undeveloped activities										
Day hiking	130	139	158–171	191–211	138–147	126–143	155–164	165–187	175–186	226–254
Primitive area activities	3	4	4–5	4–6	3–4	3–4	4–5	4–5	5	6–7
Mountain biking	29	32	39–42	52–56	33	33–35	38–39	48–50	44–46	71–73
Horseback riding on trails	17	19	22–26	32–39	17–20	17–22	20–24	26–34	24–28	47–62
Motorized activities										
Motorized water use	169	189	253–255	379–381	208–209	241–242	245–247	354–356	291–293	604–607
Motorized off-road use	152	159	174–189	204–212	160–167	168–178	176–184	206–219	192–201	252–268
Fishing and hunting										
Fishing	217	234	277–300	334–354	253–267	267–289	280–297	339–368	312–330	437–474
Hunting	106	111	120–139	135–159	114–126	118–137	124–137	141–163	133–148	167–194
Nonmotorized water activities										
Swimming	221	239	268–295	343–402	228–248	201–236	266–288	291–339	312–338	453–521
Floating	21	22	25–27	35–36	22	24–25	24–25	31–33	27–28	46–48

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation engagement are based on the products of mean (annual) number of days of recreation estimated per participant and the projected regional adult (≥16 years of age) population, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of days of recreation (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of days of recreation (by activity) are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.13—Changes in per capita participation in outdoor recreation for the Rocky Mountain Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
	PARTICIPATION RATE (PERCENT)			PERCENTAGE OF CHANGE						
Developed site recreation										
Developed site use	37.8	37.9	1	1–2	0–1	1	0–1	1–2	1	2
Camping in developed campgrounds	15.2	14.9	(6)–(5)	(10)–(6)	(8)–(4)	(9)–(5)	(8)–(4)	(11)–(7)	(9)–(5)	(12)–(7)
Viewing/photographing nature										
Viewing nature	7.8	7.8	0–1	1–2	0	0	0	0–1	0–1	1–2
Birding ^e	4.6	4.6	1–4	(4)–(2)	2–3	(1)–2	1–2	(4)–(1)	0–1	(6)–(3)
Nonmotorized, undeveloped activities										
Day hiking	17.1	17.3	(4)–7	6–15	0–5	1–11	1–6	3–13	2–7	8–18
Primitive area activities	3.6	3.6	(6)–(1)	(3)–2	(3)–0	(4)–2	(3)–(1)	(4)–2	(4)–(1)	(4)–2
Mountain biking	3.0	3.0	4–10	22–28	2–5	18–24	4–7	22–28	6–8	35–41
Horseback riding on trails	1.7	1.7	(1)–10	16–24	(6)–0	(1)–9	(4)–3	3–13	(2)–4	16–28
Motorized activities										
Motorized water use	11.9	11.9	0–9	10–17	(3)–1	2–11	0–4	8–18	2–6	23–33
Motorized off-road use	11.7	11.7	(6)–0	3–8	(3)–0	0–6	(3)–0	0–7	(3)–0	5–12
Snowmachining	2.9	2.9	(13)–5	(11)–17	(30)–(7)	(41)–(8)	(29)–(5)	(39)–(4)	(28)–(4)	(32)–6
Fishing and hunting										
Fishing	13.2	13.0	(5)–(4)	(7)–(3)	(6)–(3)	(7)–(3)	(6)–(4)	(9)–(5)	(7)–(5)	(9)–(4)
Hunting	7.4	7.1	(16)–(8)	(22)–(12)	(18)–(9)	(25)–(12)	(20)–(11)	(30)–(17)	(22)–(14)	(33)–(21)
Nonmotorized winter activities										
Developed skiing	7.0	7.1	(5)–13	31–50	(1)–8	13–34	3–12	23–46	8–16	51–77
Undeveloped skiing	4.3	4.2	(6)–1	(5)–1	(7)–(4)	(7)–(2)	(7)–(4)	(6)–0	(6)–(3)	2–7
Nonmotorized water activities										
Swimming	16.5	16.3	(4)	(2)–0	(6)–(5)	(6)–(3)	(5)–(4)	(4)–(2)	(5)–(3)	1–3
Floating	4.3	4.2	(6)–0	3–9	(6)–(3)	2–9	(6)–(3)	3–9	(5)–(3)	12–19

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment (NSRE) data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial per capita participation values are based on activity-matched Outdoor Foundation (2018) estimates and/or NSRE responses from the years 2006–2012.

^c Contemporary estimates of per capita participation are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.14—Per capita participation in outdoor recreation for the Rocky Mountain Resources Planning Act (RPA) Region (all land ownerships) as projected in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPATION RATE (PERCENT)										
Developed site recreation										
Developed site use	37.8	37.9	38.0	38.3–38.4	37.9–38.0	38.2–38.3	38.0	38.3–38.4	38.0–38.1	38.5–38.6
Camping in developed campgrounds	15.2	14.9	14.3–14.4	13.7–14.3	14.1–14.7	13.8–14.5	14.0–14.6	13.5–14.2	13.8–14.5	13.4–14.2
Viewing/photographing nature										
Viewing nature	7.8	7.8	7.9	7.9–8.0	7.8–7.9	7.8–7.9	7.8–7.9	7.8–7.9	7.9	7.9–8.0
Birding ^e	4.6	4.6	4.6–4.7	4.4–4.5	4.6–4.7	4.5–4.6	4.6–4.7	4.4–4.5	4.5–4.6	4.3–4.4
Nonmotorized, undeveloped activities										
Day hiking	17.1	17.3	16.4–18.2	18.1–19.7	17.1–17.9	17.2–19.0	17.3–18.1	17.6–19.3	17.4–18.2	18.4–20.2
Primitive area activities	3.6	3.6	3.4–3.6	3.5–3.7	3.5–3.6	3.5–3.7	3.5–3.6	3.5–3.7	3.5–3.6	3.5–3.7
Mountain biking	3.0	3.0	3.1–3.3	3.6–3.8	3.0–3.1	3.5–3.7	3.1–3.2	3.6–3.8	3.1–3.2	4.0–4.2
Horseback riding on trails	1.7	1.7	1.7–1.9	2.0–2.2	1.6–1.7	1.7–1.9	1.7–1.8	1.8–2.0	1.7–1.8	2.0–2.2
Motorized activities										
Motorized water use	11.9	11.9	11.9–12.9	13.0–13.9	11.5–12.0	12.1–13.2	11.8–12.3	12.9–14.0	12.2–12.7	14.7–15.8
Motorized off-road use	11.7	11.7	11.1–11.8	12.0–12.7	11.4–11.7	11.7–12.5	11.4–11.8	11.8–12.6	11.4–11.8	12.4–13.1
Snowmachining	2.9	2.9	2.5–3.0	2.6–3.4	2.0–2.7	1.7–2.7	2.1–2.7	1.8–2.8	2.1–2.8	2.0–3.1
Fishing and hunting										
Fishing	13.2	13.0	12.5–12.7	12.3–12.8	12.5–12.8	12.2–12.8	12.4–12.7	12.0–12.5	12.3–12.6	12.1–12.6
Hunting	7.4	7.1	6.2–6.8	5.7–6.5	6.0–6.7	5.5–6.5	5.9–6.6	5.2–6.1	5.7–6.4	4.9–5.8
Nonmotorized winter activities										
Developed skiing	7.0	7.1	6.6–7.9	9.2–10.5	6.9–7.5	7.9–9.4	7.2–7.8	8.6–10.2	7.5–8.1	10.6–12.4
Undeveloped skiing	4.3	4.2	4.0–4.3	4.0–4.3	3.9–4.1	4.0–4.2	4.0–4.1	4.0–4.2	4.0–4.1	4.3–4.6
Nonmotorized water activities										
Swimming	16.5	16.3	15.7–15.9	16.1–16.5	15.5–15.7	15.5–15.9	15.6–15.8	15.8–16.2	15.7–16.0	16.6–17.0
Floating	4.3	4.2	4.0–4.3	4.4–4.6	4.0–4.1	4.4–4.6	4.0–4.1	4.4–4.7	4.0–4.1	4.8–5.1

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment (NSRE) data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial per capita participation values are based on activity-matched Outdoor Foundation (2018) estimates and/or NSRE responses from the years 2006–2012.

^c Contemporary estimates of per capita participation are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.15—Projected numbers of participants in outdoor recreation for the Rocky Mountain Resources Planning Act (RPA) Region (all land ownerships) in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPANTS (MILLIONS)										
Developed site recreation										
Developed site use	8.7	9.8	12.7–12.8	15.7	10.9	10.9	12.4–12.5	14.9–15.0	14.3	20.8
Camping in developed campgrounds	3.5	3.9	4.8	5.6–5.8	4.0–4.2	3.9–4.1	4.6–4.8	5.3–5.5	5.2–5.4	7.3–7.6
Viewing/photographing nature										
Viewing nature	1.8	2.0	2.6–2.7	3.2–3.3	2.2–2.3	2.2	2.6	3.1	3.0	4.3
Birding ^e	1.0	1.2	1.5–1.6	1.8	1.3	1.3	1.5	1.7–1.8	1.7	2.3–2.4
Nonmotorized, undeveloped activities										
Day hiking	3.9	4.5	5.5–6.1	7.4–8.0	4.9–5.1	4.9–5.4	5.7–5.9	6.8–7.5	6.6–6.9	9.9–10.9
Primitive area activities	0.8	0.9	1.1–1.2	1.4–1.5	1.0	1.0–1.1	1.1–1.2	1.4	1.3–1.4	1.9–2.0
Mountain biking	0.7	0.8	1.0–1.1	1.5	0.9	1.0	1.0	1.4–1.5	1.2	2.1–2.3
Horseback riding on trails	0.4	0.4	0.6	0.8–0.9	0.5	0.5	0.5–0.6	0.7–0.8	0.6–0.7	1.1–1.2
Motorized activities										
Motorized water use	2.7	3.1	4.0–4.3	5.3–5.7	3.3–3.4	3.4–3.8	3.9–4.0	5.0–5.5	4.6–4.8	7.9–8.5
Motorized off-road use	2.7	3.0	3.7–3.9	4.9–5.2	3.3	3.3–3.6	3.7–3.8	4.6–4.9	4.3–4.4	6.7–7.1
Snowmachining	0.7	0.7	0.8–1.0	1.1–1.4	0.6–0.8	0.5–0.8	0.7–0.9	0.7–1.1	0.8–1.1	1.1–1.7
Fishing and hunting										
Fishing	3.0	3.4	4.2	5.0–5.2	3.6–3.7	3.5–3.6	4.1–4.2	4.7–4.9	4.6–4.7	6.5–6.8
Hunting	1.7	1.8	2.1–2.3	2.3–2.7	1.7–1.9	1.6–1.8	1.9–2.1	2.0–2.4	2.2–2.4	2.7–3.1
Nonmotorized winter activities										
Developed skiing	1.6	1.8	2.2–2.6	3.7–4.3	2.0–2.2	2.2–2.7	2.4–2.6	3.4–4.0	2.8–3.1	5.7–6.7
Undeveloped skiing	1.0	1.1	1.3–1.4	1.6–1.8	1.1–1.2	1.1–1.2	1.3	1.6–1.7	1.5–1.6	2.3–2.5
Nonmotorized water activities										
Swimming	3.8	4.2	5.3	6.6–6.7	4.4–4.5	4.4–4.5	5.1–5.2	6.2–6.3	5.9–6.0	8.9–9.2
Floating	1.0	1.1	1.3–1.4	1.8–1.9	1.1–1.2	1.2–1.3	1.3–1.4	1.7–1.8	1.5–1.6	2.6–2.7

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation participants are based on the products of per capita participation estimates and the regional adult (≥16 years of age) population projections, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of participants by activity (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of participants are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.16—Projected numbers of days of recreation for the Rocky Mountain Resources Planning Act (RPA) Region (all land ownerships) in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
DAYS OF RECREATION (MILLIONS)										
Developed site recreation										
Developed site use	120	135	168–176	207–216	142–147	138–147	163–169	189–201	188–194	264–280
Camping in developed campgrounds	31	35	42–43	49–51	37–38	37–39	41–42	48–50	46–48	65–68
Viewing/photographing nature										
Viewing nature	26	29	35–36	40–43	30–32	27–30	34–36	36–39	38–40	48–52
Birding ^e	12	14	17–19	17–19	15–16	12–14	16–18	15–18	18–20	18–21
Nonmotorized, undeveloped activities										
Day hiking	53	60	71–78	92–104	65–71	65–75	74–81	89–102	85–93	127–145
Primitive area activities	1	2	2	2–3	2	2	2	2	2	3
Mountain biking	22	25	32–33	45–46	27–28	30–31	31–32	42–44	37	63–64
Horseback riding on trails	14	14	14–15	13–14	12–13	9–10	13–14	11–12	15	14–15
Motorized activities										
Motorized water use	28	31	40–44	54–57	33–34	35–38	39–41	51–55	46–48	80–86
Motorized off-road use	45	51	60–65	77–82	50–53	50–54	58–61	69–74	67–71	100–107
Snowmachining	3	3	4–5	5–6	2–4	2–3	3–4	3–5	3–5	4–7
Fishing and hunting										
Fishing	37	40	48–49	54–60	40–43	37–41	46–48	49–54	52–55	68–76
Hunting	23	24	25–28	26–30	20–23	16–20	23–26	21–25	26–29	28–34
Nonmotorized winter activities										
Developed skiing	10	11	16–18	30–33	12–14	15–18	15–17	25–28	19–21	50–57
Undeveloped skiing	5	6	7–8	8–9	6	5–6	7	7–8	8	10–12
Nonmotorized water activities										
Swimming	37	41	49–50	60–63	41–42	40–42	48–49	56–58	55–57	81–85
Floating	5	5	6	7–9	5	5–6	6	7–8	7	10–12

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation engagement are based on the products of mean (annual) number of days of recreation estimated per participant and the projected regional adult (≥16 years of age) population, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of days of recreation (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of days of recreation (by activity) are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.17—Changes in per capita participation in outdoor recreation for the Pacific Coast Resources Planning Act (RPA) Region (all land ownerships) projected from 2012 to 2040 and from 2012 to 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
	PARTICIPATION RATE (PERCENT)			PERCENTAGE OF CHANGE						
Developed site recreation										
Developed site use	37.6	37.6	1	2	0	1	1	2	1	2
Camping in developed campgrounds	13.8	13.5	(7)–(6)	(10)–(9)	(7)–(5)	(9)–(7)	(8)–(6)	(11)–(9)	(9)–(7)	(12)–(9)
Viewing/photographing nature										
Viewing nature	7.7	7.7	0	0–1	0	0	0	0	0	0
Birding ^e	4.6	4.6	0–1	(3)–(1)	0–1	(3)–(1)	(1)–1	(5)–(3)	(1)–0	(6)–(4)
Nonmotorized, undeveloped activities										
Day hiking	16.3	16.2	(1)–1	(2)–1	(3)–1	(5)–0	(3)–1	(5)–(1)	(3)–1	(4)–1
Primitive area activities	3.1	3.1	(4)–(2)	(5)–(3)	(3)–(1)	(4)–(2)	(3)–(1)	(5)–(3)	(4)–(1)	(4)–(2)
Mountain biking	2.6	2.5	(4)–(3)	3–5	(5)–(3)	0–2	(4)–(2)	1–3	(4)–(2)	5–8
Horseback riding on trails	1.5	1.4	(1)–3	4–14	(6)–(1)	(7)–3	(4)–1	(3)–7	(2)–3	9–21
Motorized activities										
Motorized water use	10.0	10.1	1–4	12–14	(2)–0	4–8	0–2	8–12	2–4	18–22
Motorized off-road use	8.8	8.4	(13)–(11)	(17)–(13)	(13)–(10)	(16)–(11)	(14)–(12)	(20)–(15)	(16)–(14)	(22)–(17)
Snowmachining	1.3	1.3	(7)–(2)	6–10	(8)–(2)	(2)–9	(9)–(3)	(6)–5	(11)–(6)	(4)–8
Fishing and hunting										
Fishing	9.7	9.7	(3)–(2)	(1)–2	(3)–(2)	(2)–0	(3)–(2)	(3)–(1)	(4)–(2)	(1)–2
Hunting	2.6	2.6	(16)–(8)	(24)–(18)	(10)–0	(17)–(9)	(12)–(2)	(22)–(15)	(15)–(5)	(26)–(19)
Nonmotorized winter activities										
Developed skiing	7.2	7.2	2–6	21–28	(6)–0	4–12	(2)–4	13–21	2–8	37–46
Undeveloped skiing	2.8	3.0	(4)–6	5–14	(2)–9	0–10	0–12	6–16	3–15	21–33
Nonmotorized water activities										
Swimming	21.5	21.4	0	6–7	(2)–(1)	3–4	(1)–0	4–6	0–1	9–11
Floating	3.9	3.8	(7)–(5)	(3)–2	(9)–(7)	(8)–(4)	(9)–(6)	(7)–(3)	(8)–(6)	0–4

Note: Parentheses denote negative number.

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment (NSRE) data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial per capita participation values are based on activity-matched Outdoor Foundation (2018) estimates and/or NSRE responses from the years 2006–2012.

^c Contemporary estimates of per capita participation are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.18—Per capita participation in outdoor recreation for the Pacific Coast Resources Planning Act (RPA) Region (all land ownerships) as projected in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPATION RATE (PERCENT)										
Developed site recreation										
Developed site use	37.6	37.6	37.8	38.2	37.7	38.0–38.1	37.8	38.1–38.2	37.8	38.3–38.4
Camping in developed campgrounds	13.8	13.5	12.8–13.0	12.5–12.6	12.9–13.1	12.6–12.9	12.8–13.0	12.3–12.6	12.6–12.8	12.2–12.5
Viewing/photographing nature										
Viewing nature	7.7	7.7	7.7	7.7–7.8	7.7	7.7	7.7	7.7	7.7	7.7
Birding ^e	4.6	4.6	4.6–4.7	4.5–4.6	4.6–4.7	4.5–4.6	4.6	4.4–4.5	4.6	4.3–4.4
Nonmotorized, undeveloped activities										
Day hiking	16.3	16.2	16.1–16.4	15.9–16.5	15.8–16.4	15.5–16.3	15.8–16.4	15.4–16.2	15.8–16.4	15.7–16.4
Primitive area activities	3.1	3.1	3.0–3.1	3.0	3.0–3.1	3.0–3.1	3.0–3.1	3.0	3.0–3.1	3.0–3.1
Mountain biking	2.6	2.5	2.5	2.6–2.7	2.4–2.5	2.6	2.5	2.6	2.5	2.7–2.8
Horseback riding on trails	1.5	1.4	1.4–1.5	1.5–1.7	1.4	1.4–1.5	1.4–1.5	1.4–1.6	1.4–1.5	1.6–1.8
Motorized activities										
Motorized water use	10.0	10.1	10.1–10.4	11.2–11.4	9.8–10.1	10.5–10.8	10.0–10.2	10.8–11.2	10.2–10.4	11.9–12.2
Motorized off-road use	8.8	8.4	7.6–7.8	7.3–7.7	7.6–7.9	7.4–7.8	7.5–7.7	7.0–7.5	7.3–7.6	6.8–7.3
Snowmachining	1.3	1.3	1.2–1.3	1.4	1.2–1.3	1.3–1.4	1.2	1.2–1.4	1.1–1.2	1.2–1.4
Fishing and hunting										
Fishing	9.7	9.7	9.5–9.6	9.6–9.9	9.4–9.6	9.5–9.7	9.4–9.5	9.4–9.6	9.4–9.5	9.7–9.9
Hunting	2.6	2.6	2.2–2.4	2.0–2.1	2.3–2.6	2.2–2.4	2.3–2.5	2.0–2.2	2.2–2.5	1.9–2.1
Nonmotorized winter activities										
Developed skiing	7.2	7.2	7.4–7.6	8.7–9.2	6.8–7.2	7.5–8.1	7.1–7.5	8.1–8.7	7.4–7.8	9.8–10.5
Undeveloped skiing	2.8	3.0	2.7–3.0	3.0–3.2	2.8–3.1	2.9–3.1	2.8–3.2	3.0–3.3	2.9–3.3	3.4–3.8
Nonmotorized water activities										
Swimming	21.5	21.4	21.4–21.5	22.8–23.0	21.1–21.2	22.1–22.3	21.3–21.4	22.4–22.7	21.5–21.6	23.5–23.7
Floating	3.9	3.8	3.6–3.7	3.8–4.0	3.5–3.6	3.6–3.7	3.6–3.7	3.6–3.8	3.6–3.7	3.9–4.1

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment (NSRE) data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial per capita participation values are based on activity-matched Outdoor Foundation (2018) estimates and/or NSRE responses from the years 2006–2012.

^c Contemporary estimates of per capita participation are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.19—Projected numbers of participants in outdoor recreation for the Pacific Coast Resources Planning Act (RPA) Region (all land ownerships) in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
PARTICIPANTS (MILLIONS)										
Developed site recreation										
Developed site use	14.5	16.1	19.7	22.8	16.9	16.0	19.2–19.3	21.7	22.1	29.9–30.0
Camping in developed campgrounds	5.3	5.8	6.7–6.8	7.5	5.8	5.3–5.4	6.5–6.6	7.0–7.2	7.4–7.5	9.5–9.8
Viewing/photographing nature										
Viewing nature	3.0	3.3	4.0	4.6	3.4	3.2	3.9	4.4	4.5	6.0
Birding ^e	1.8	2.0	2.4	2.7	2.1	1.9	2.3–2.4	2.5–2.6	2.7	3.4–3.5
Nonmotorized, undeveloped activities										
Day hiking	6.3	6.9	8.4–8.6	9.5–9.8	7.1–7.3	6.5–6.8	8.0–8.3	8.8–9.2	9.2–9.6	12.2–12.8
Primitive area activities	1.2	1.3	1.6	1.8	1.4	1.3	1.5–1.6	1.7	1.8	2.3–2.4
Mountain biking	1.0	1.1	1.3	1.6	1.1	1.1	1.3	1.5	1.4–1.5	2.1–2.2
Horseback riding on trails	0.6	0.6	0.8	0.9–1.0	0.6	0.6	0.7–0.8	0.8–0.9	0.8–0.9	1.2–1.4
Motorized activities										
Motorized water use	3.9	4.3	5.3–5.4	6.7–6.8	4.4–4.5	4.4–4.6	5.1–5.2	6.2–6.4	6.0–6.1	9.3–9.6
Motorized off-road use	3.4	3.6	4.0–4.1	4.3–4.6	3.4–3.5	3.1–3.3	3.8–3.9	4.0–4.3	4.3–4.4	5.3–5.7
Snowmachining	0.5	0.5	0.6–0.7	0.8	0.5–0.6	0.5–0.6	0.6	0.7–0.8	0.7	1.0–1.1
Fishing and hunting										
Fishing	3.8	4.1	5.0	5.8–5.9	4.2–4.3	4.0–4.1	4.8–4.9	5.4–5.5	5.5–5.6	7.5–7.7
Hunting	1.0	1.1	1.1–1.2	1.2–1.3	1.0–1.2	0.9–1.0	1.2–1.3	1.2–1.3	1.3–1.4	1.5–1.6
Nonmotorized winter activities										
Developed skiing	2.8	3.1	3.8–4.0	5.2–5.5	3.0–3.2	3.1–3.4	3.6–3.8	4.6–5.0	4.3–4.6	7.7–8.2
Undeveloped skiing	1.1	1.3	1.4–1.6	1.8–1.9	1.2–1.4	1.2–1.3	1.4–1.6	1.7–1.9	1.7–1.9	2.7–2.9
Nonmotorized water activities										
Swimming	8.3	9.2	11.2	13.6–13.7	9.4–9.5	9.3–9.4	10.8–10.9	12.8–12.9	12.5–12.6	18.3–18.5
Floating	1.5	1.6	1.9	2.3–2.4	1.6	1.5–1.6	1.8–1.9	2.1–2.2	2.1–2.2	3.0–3.2

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation participants are based on the products of per capita participation estimates and the regional adult (≥16 years of age) population projections, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of participants by activity (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of participants are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

Table A.20—Projected numbers of days of recreation for the Pacific Coast Resources Planning Act (RPA) Region (all land ownerships) in 2040 and 2070, summarized as intervals across the climate futures within each RPA scenario

Activity ^a	Baseline ^b	Contemporary estimate ^c	Lower Moderate (LM) ^d		High Low (HL)		High Moderate (HM)		High High (HH)	
	2012	2020	2040	2070	2040	2070	2040	2070	2040	2070
DAYS OF RECREATION (MILLIONS)										
Developed site recreation										
Developed site use	187	209	257–261	303–316	214–218	201–208	247–252	279–289	287–293	407–421
Camping in developed campgrounds	44	47	54–56	58–60	46–48	40–43	52–54	52–56	58–61	70–75
Viewing/photographing nature										
Viewing nature	43	46	53–54	56–58	46–47	40–42	52–53	52–54	58–59	69–71
Birding ^e	22	25	30	31–33	25–26	21–22	29–30	28–29	33–34	37–39
Nonmotorized, undeveloped activities										
Day hiking	110	118	143–148	161–172	118–126	116–119	133–141	153–156	150–160	204–208
Primitive area activities	2	2	3	3	2	2	3	3	3	4
Mountain biking	20	22	26–27	32–35	22–23	23–26	25–27	32–36	29–31	46–51
Horseback riding on trails	4	4	5	4–6	4	3	4–5	3–5	5–6	5–7
Motorized activities										
Motorized water use	43	48	58–65	79–84	46–49	45–50	55–58	66–73	65–69	110–121
Motorized off-road use	44	45	48–49	49–53	41–43	34–37	46–48	44–48	51–53	58–63
Snowmachining	3	3	3	3–4	2–3	2–3	3	3	3	4
Fishing and hunting										
Fishing	58	64	73–75	81–87	62–64	55–59	70–72	73–78	79–82	99–106
Hunting	19	21	21–22	21–24	21–23	21–22	23–24	24–25	24–26	27–28
Nonmotorized winter activities										
Developed skiing	23	26	34–35	51–52	27–28	31–32	32–34	47–48	39–41	85–86
Undeveloped skiing	6	7	8–9	10–11	7–8	6–7	8–9	9–10	9–11	14–16
Nonmotorized water activities										
Swimming	113	122	143–146	172–175	120–122	119–121	138–140	162–164	158–161	230–233
Floating	9	10	11	13–14	9	9	11	12	12–13	17–18

^a Activities are individual or activity composites derived from the National Survey on Recreation and the Environment data (see Teasley et al. 1997 and Zarnoch et al. 2010 for descriptions of survey and data collection processes).

^b Initial values of outdoor recreation engagement are based on the products of mean (annual) number of days of recreation estimated per participant and the projected regional adult (≥16 years of age) population, for the respective RPA scenarios. This column presents the average of four scenario-dependent estimates of regional numbers of days of recreation (millions) in 2012 (LM, HL, HM, HH).

^c Contemporary estimates of numbers of days of recreation (by activity) are computed as averages of all projections under the LM, HL, HM, and HH scenarios.

^d Intervals per RPA scenario (Lower Moderate, High Low, High Moderate, and High High) are formulated across climate considerations (five models each). The first word of the RPA scenario denotes the level of future atmospheric warming (i.e., global representative concentration pathway [RCP]; Lower = RCP 4.5, High = RCP 8.5). The second word denotes the level of future socioeconomic growth (i.e., global shared socioeconomic pathway [SSP]; Low = SSP3, Moderate = SSP1 and SSP2, High = SSP5).

^e Birding is also a subset of the viewing nature aggregate.

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