



Deschutes Trails Coalition

THE ECONOMIC & SOCIAL IMPORTANCE OF
DESCHUTES
NATIONAL FOREST TRAILS
Contributions & Future Needs

ACKNOWLEDGMENTS

For over 45 years ECONorthwest has helped its clients make sound decisions based on rigorous economic, planning, and financial analysis. For more information about ECONorthwest: www.econw.com.

ECONorthwest prepared this report with support from the guidance and input of several partners, including members, staff and leadership of the Deschutes Trails Coalition, Discover Your Forest, Deschutes National Forest, and regional U.S. Forest Service (USFS) staff. Most notably we are appreciative of the involvement and input of Rika Ayotte, Nikola Smith, Dennis Benson, Alexander Enna, Lisa Machnik, Kileen Mitchell, Danielle MacBain, and Jana Johnson. Other firms, agencies, and staff contributed to other research that this report relied upon. This work was financially supported by the Innovative Finance for National Forests Grant Program, which is administered by the National Forests Foundation and funded by the USFS.

That assistance notwithstanding, ECONorthwest is responsible for the content of this report. The staff at ECONorthwest prepared this report based on their general knowledge of the economics of recreation, amenities, and regional economies. ECONorthwest staff contributing to this study included Mark Buckley, Jade Aguilar, Virginia Wiltshire-Gordon, Salma Huque, Egan Cornachione, Laura Marshall, and Shivangi Jain. ECONorthwest also relied on information derived from government agencies, private statistical services, the reports of others, interviews of individuals, or other sources believed to be reliable. ECONorthwest has not independently verified the accuracy of all such information and makes no representation regarding its accuracy or completeness. Any statements nonfactual in nature constitute the authors' current opinions, which may change as more information becomes available.

ECONorthwest

ECONOMICS • FINANCE • PLANNING

For more information about this report, contact:

Mark Buckley | 458.202.9016 | buckley@econw.com

KOIN Center | 222 SW Columbia Street | Suite 1600 | Portland, OR 97201

TABLE OF CONTENTS

EXECUTIVE SUMMARY	
1. INTRODUCTION	1
Report Overview and Motivation	1
Study Area and Scope	2
2. SUPPLY OF TRAIL RECREATION OPPORTUNITIES ON THE DESCHUTES NATIONAL FOREST	3
3. TRAIL USAGE ON DESCHUTES NATIONAL FOREST	7
Trail User Population	7
4. DEMAND FOR TRAILS	10
Oregon Resident Trail Demand	10
Deschutes National Forest Trail Usage	12
Forecasting Future Trail Demand on the DNF	19
5. ECONOMIC IMPACT OF THE DNF TRAIL NETWORK FOR LOCAL BUSINESSES	22
Spending on Trail Trips	22
Economic Impacts	23
6. COSTS OF TRAILS	30
Taxpayer Costs of USFS Trails	33
Taxpayer Burden of USFS Recreation and Trails Funding	34
Other Sources of Recreation Funding	35
7. SOCIAL CONTRIBUTIONS OF DESCHUTES TRAIL NETWORK	36
8. NET CONTRIBUTIONS OF THE DNF TRAILS TO LOCAL BUSINESSES AND THE COMMUNITY	43
9. KEY FUNDING IMPLICATIONS	44

REPORT FIGURES

FIGURE 1:	Statewide and Deschutes County Timber Harvest Trends _____	1
FIGURE 2:	Trail Density in Deschutes National Forest _____	3
FIGURE 3:	Managed and Acceptable Trail Miles on DNF _____	4
FIGURE 4:	Drive Times from Nearby Communities to DNF Trails _____	5
FIGURE 5:	Managed and Acceptable Trail Miles on DNF in 60 Minute Drive Time of Communities _____	5
FIGURE 6:	DNF Trail Miles by Width _____	6
FIGURE 7:	Campsite Reservations on DNF, 2019 _____	6
FIGURE 8:	Drive Times from Nearby Communities to DNF Trails _____	7
FIGURE 9:	Non-White Population Distribution in DNF-Adjacent Counties _____	8
FIGURE 10:	Population Growth Forecasts for Oregon _____	9
FIGURE 11:	Population Growth Forecasts for Hispanic and Asian Populations in Oregon, 2020 to 2030 _____	9
FIGURE 12:	Participation Rates for the Top 10 Outdoor Recreation Activities Statewide in Oregon _____	10
FIGURE 13:	Trail-Based User Occasions in Deschutes County, 2011 _____	12
FIGURE 14:	Trail-Based Trips in Deschutes National Forest, 2021 _____	14
FIGURE 15:	Trail Miles per Thousand Trips by Activity, DNF _____	15
FIGURE 16:	Trail Miles per User Occasions, Deschutes National Forest and 60 Minute Drive times of Cities _____	16
FIGURE 17:	Representative Trip Distance Ranges by Trail Activity _____	18
FIGURE 18:	Ratio of Trail Miles to Annual User Miles _____	18
FIGURE 19:	Economic Contributions from Expenditure Multipliers within a Local Economy _____	24
FIGURE 20:	Estimated Trail Costs to Meet Projected Demand and Maintenance Backlog, Deschutes NF 2020–2040 _____	31
FIGURE 21:	Estimated Trail Costs to Meet Projected Demand and Maintenance Backlog Including Volunteer Hours, Deschutes NF 2020–2040 _____	31
FIGURE 22:	US Forest Service Budget Appropriation, FY 2021 _____	33
FIGURE 23:	Gross Receipts for All Forest Service Activities in U.S.:1986–2017 _____	35
FIGURE 24:	Bend, Oregon Home Value Trends and Benchmarks _____	41
FIGURE 25:	Summary Economic Contributions of the DNF Trails _____	43

REPORT TABLES

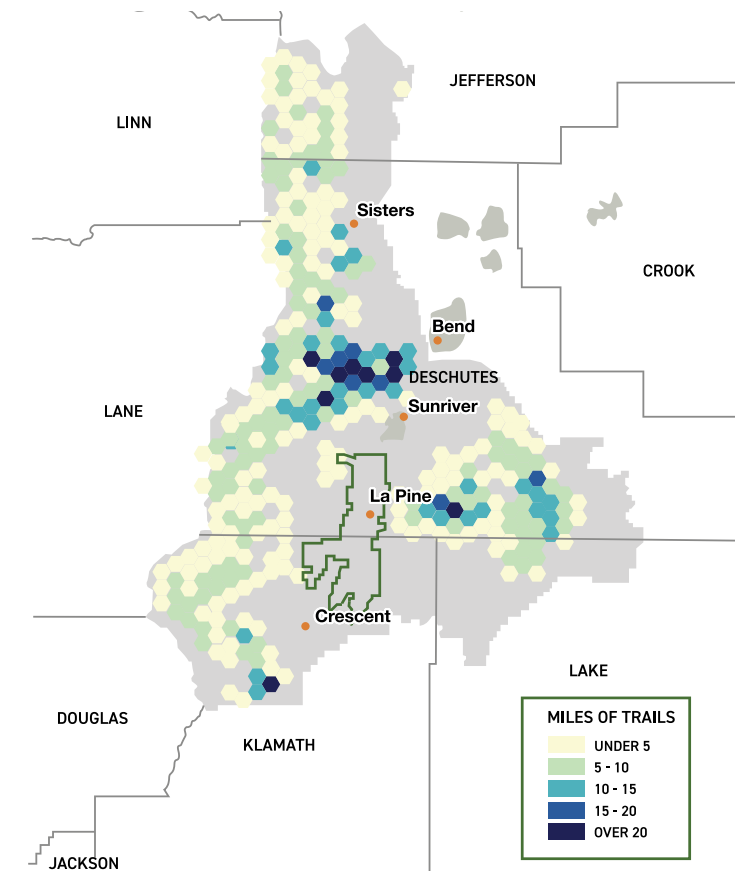
TABLE 1:	Deschutes County Population Growth Forecast within Urban Growth Boundaries (UGB) _____	8
TABLE 2:	Oregon Trail Activity Participation by Subgroup (Percent of Total Population) _____	11
TABLE 3:	Activity Participation, Deschutes National Forest, 2018 Visitor Survey	13
TABLE 4:	Forecast Trail Trips on Deschutes National Forest _____	19
TABLE 5:	Average Surplus Value of Recreation, USFS Region 6 _____	20
TABLE 6:	Trail Trip Consumer Surplus Forecast for the DNF _____	21
TABLE 7:	Spending Patterns and Spending Effects per \$1 Million, Deschutes National Forest, 2021 _____	22
TABLE 8:	Trail Trip-Related Spending for DNF _____	23
TABLE 9:	Visitor Spending Averages for Hiking/Biking, Dollars per Party per Trip (\$2021) _____	25
TABLE 10:	IMPLAN Sector Category Matching _____	26
TABLE 11:	Non-Local Day Hiking/Biking Results per \$1 Million in Spending, Deschutes County (\$2021) _____	26
TABLE 12:	Non-Local Overnight Hiking/Biking Results per \$1 Million in Spending, Deschutes County (\$2021) _____	26
TABLE 13:	Local Day Hiking/Biking Results per \$1 Million in Spending, Deschutes County (\$2021) _____	26
TABLE 14:	Local Overnight Hiking/Biking Results per \$1 Million in Spending, Deschutes County (\$2021) _____	26
TABLE 15:	Total Employment Impacts of Trail-Related Spending on the DNF _____	29
TABLE 16:	Total Economic Output of Trail-Related Spending on the DNF _____	29
TABLE 17:	Estimated Annual Costs for Trail Maintenance and Funding Gap, DNF _____	30
TABLE 18:	Estimation of Taxpayer Burden for USFS Recreation Funding _____	34



The Deschutes National Forest (DNF) supports an extensive network of over 2,000 miles of trails that provide outdoor recreation opportunities, encompassing a wide range of activities, to residents and visitors alike, near the communities of Central Oregon (Figure ES- 1). These amenities and opportunities supported by the DNF trail network host over 800,000 trips for trail-focused activities each year, and this number is expected to grow to over a million trips annually by 2040. DNF trails and the resources they access are an essential driver of the vitality and resilience of the Central Oregon economy and community, benefiting Deschutes County in particular. Demand from residents and visitors continues to grow rapidly, while the trail development and maintenance budget for DNF cannot keep pace. Timber harvest revenue and federal appropriations historically provided a financial basis to support the full range of uses on national forests, but they can no longer be relied upon. Volunteers provide a central and critical role in the creation, maintenance, and improvement of the DNF trail network, with over 30,000 hours contributed annually. But there are limits to the roles and capital requirements volunteer hours can address.

The Deschutes Trail Coalition, in coordination with the U.S. Forest Service, created the \$1 [Dollar] for Trails program to provide a means for local businesses to offer their customers, particularly visitors to the region, the opportunity to provide some financial contribution to the trail system. The Bend Sustainability Fund provides another pathway for visitor spending to contribute to trail system needs on the DNF. Collectively these efforts and others, capturing the full range of users and beneficiaries, will need to be harnessed for the DNF trail system to continue to provide its high level of services and benefits. This report compiles the best available information on the state of the trail network from a supply perspective, as well as the uses and users from a demand perspective. In conjunction, this information supports analysis of the benefits, spending, and economic impacts of DNF trails for the regional community and businesses. It also helps to highlight where

FIGURE ES-1
Trail Density in Deschutes National Forest (DNF)



Source: Created by ECONorthwest

and how investment is needed to keep pace with growing demand, while ensuring equitable access and opportunity. Trails on the DNF are generally categorized by their primary managed use as well as other activities that are accepted (as opposed to restricted or discouraged uses). Hiking has the most total miles available in terms of total accessible trail miles, although trail miles are most often 'managed for' horseback riders (Figure ES- 2). The practice of managing for a particular use reflects the design parameters (i.e., trail clearing width or overhead clearance) necessary for a particular use and is



Deschutes Trails Coalition

THE ECONOMIC & SOCIAL IMPORTANCE OF
DESCHUTES
 NATIONAL FOREST TRAILS
Contributions & Future Needs


2,000+
 MILES OF TRAILS


800,000+
 TRAIL-FOCUSED TRIPS


30,000+
 VOLUNTEER HOURS

not intended to prioritize that use over others. Equestrian users face particularly high challenges due to sharing trails with others. Their use of trails may be constrained by limited parking capacity for trailers at busy sites and encounters with trail users unfamiliar with stock. Hiking is the most common trail-based trip on the DNF, followed by biking (Figure ES- 3). When considering the proportion of trail miles by activity type to annual trips for that activity type, hiking, biking, and non-motorized snow-based trail activities see the scarcest supply of primary dedicated trail availability (Figure ES- 4). These are also the activities experiencing the most increase in use and participation, including among members of the growing Hispanic population.

These trail trips on the DNF provide direct benefit, or “surplus” value to trail users. We can estimate the surplus value based on

FIGURE ES-2
Trail Miles by Activity Type, DNF

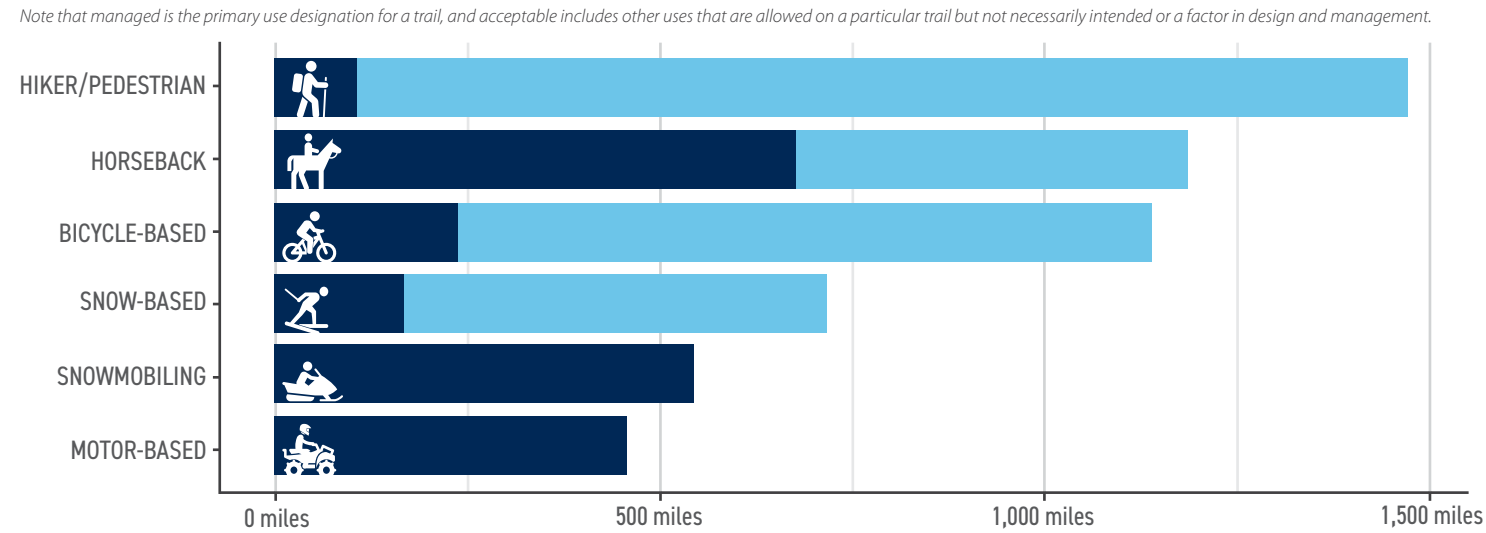
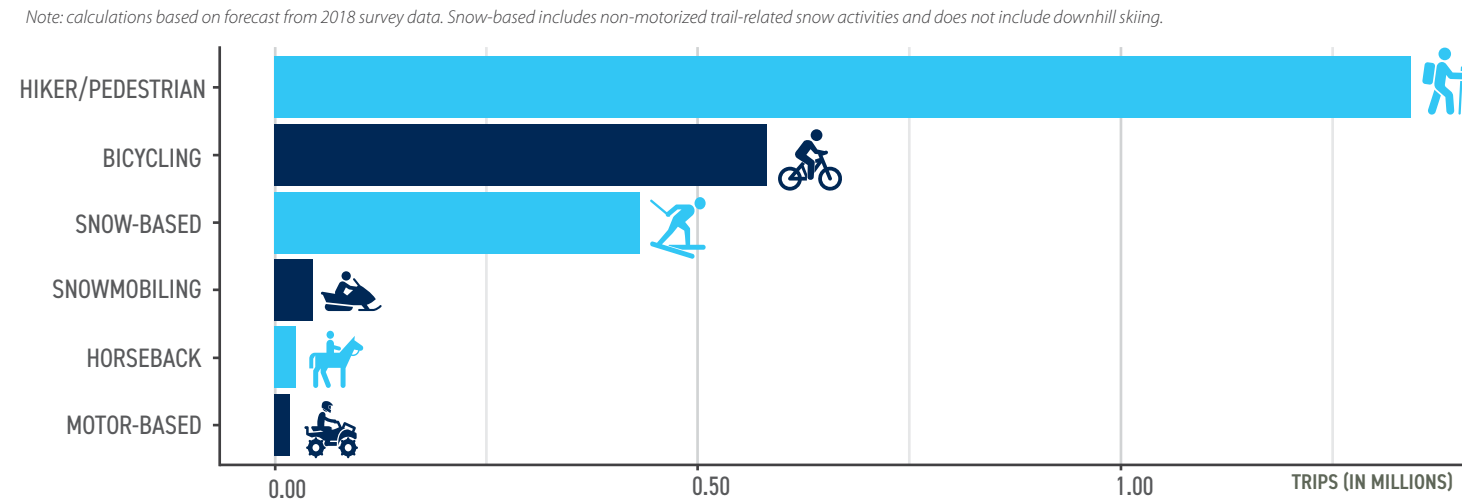


FIGURE ES-3
Trail-Based Trips on DNF, 2021



the difference between the cost of the trip in terms of expenses including travel and time, and the benefits in terms of how much a user might be willing to pay for such an experience. In total, this calculation finds approximately \$82.5 million in annual benefit to users from direct participation in the trail activities on the DNF (Figure ES- 5). Based on data from surveys of visitors to the DNF in terms of the frequency and type of activity, we can see the breakdown between Deschutes County residents (locals) and those from elsewhere (non-locals). Based on trip types and trip lengths, locals are responsible for over half the trail-related trips. At the same time, non-locals spend more in total than locals do on these trips, for a total across locals and non-locals of \$12.5 to over \$69 million annually (the range is based on the share of visitor expenses attributed to trail activities).

These expenditures support over 800 jobs in Central Oregon and engage several industry sectors. But these trip-specific expenditures and impacts do not fully capture the local impact on the economy. Many businesses, entrepreneurs, skilled workers, and others choose to live, work, and play in Central Oregon in part because of the opportunities and amenities offered and accessed by the DNF's trails. While long-term trends in the West show rural communities losing population and jobs to major cities, Central Oregon has seen the opposite

trend. Investing in the engines that drive the region's economic prosperity and vitality will be critical as past funding sources are no longer capable. The information in this report provides a basis for identifying the beneficiaries in terms of users, communities, and businesses. And these beneficiaries can provide the foundation to build a long-term, resilient funding strategy. The communities of Central Oregon must fully partner with the USFS for trail funding and trail management to maintain a resilient DNF trail network that achieves its potential in terms of meeting the growing needs in a sustainable manner.

FIGURE ES-4
Trail Miles per Thousand Trips, DNF

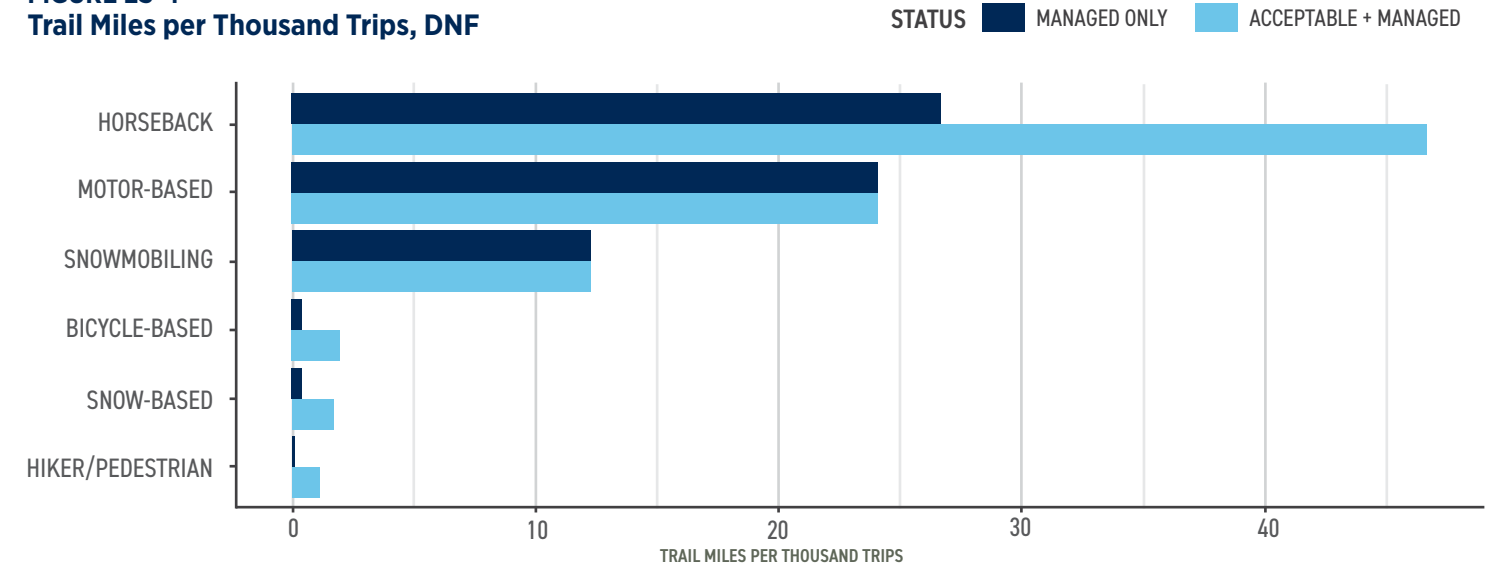
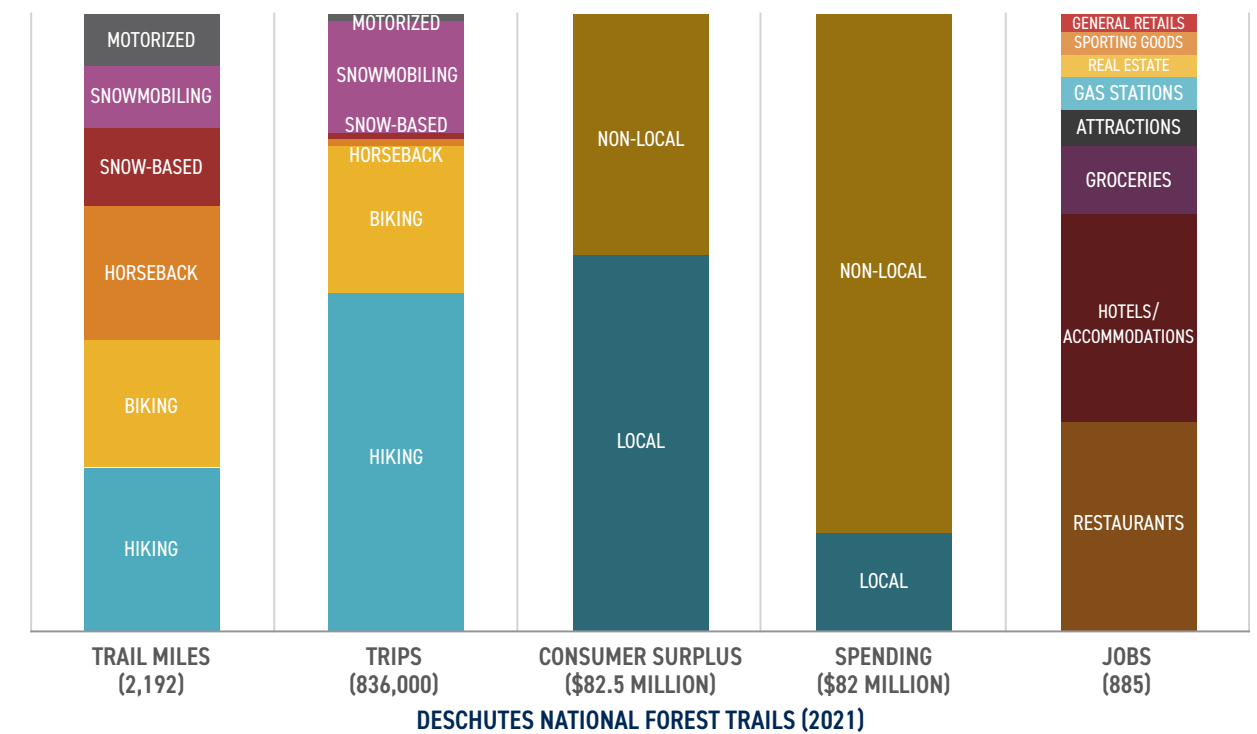
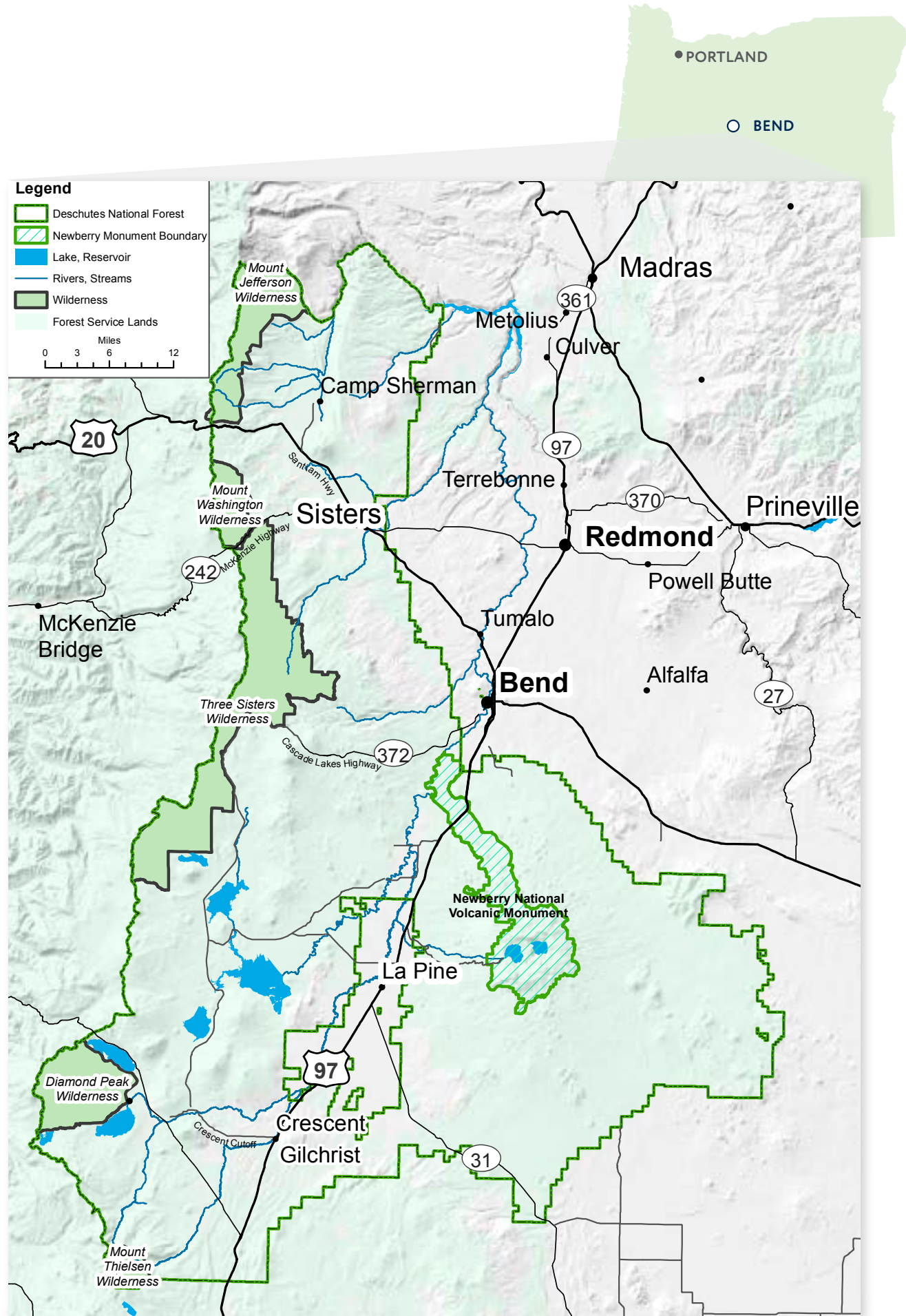


FIGURE ES-5
Summary of Economic Contributions of DNF Trails





Report Overview and Motivation

Trails are one of the most valuable resources provided by public lands in Central Oregon. Access to the incredible natural amenities of the region is a major factor in the quality of life for the area, directly benefiting residents and visitors alike, but also playing a key role in decisions by businesses to locate in the region and driving business opportunities. The Deschutes National Forest (DNF) is the centerpiece of Central Oregon’s identity, home to the mountains, rivers, lakes, and forests that draw so many residents, visitors, and businesses. Key to providing access to these amenities and opportunities is the forest’s trail system. While the forest hosts one of the most impressive and valuable trail networks in the country, it is under stress. Demand from residents and visitors continues to grow rapidly, while the budget for the DNF is continually spread thin. There are challenges to pay for basic maintenance of the trail network and associated infrastructure, let alone the improvements necessary to support growing populations, and provide a more equitable and sustainable trail experience. Volunteers provide a central and critical role in the maintenance and improvement of the DNF trail network, with over 30,000 hours contributed annually.

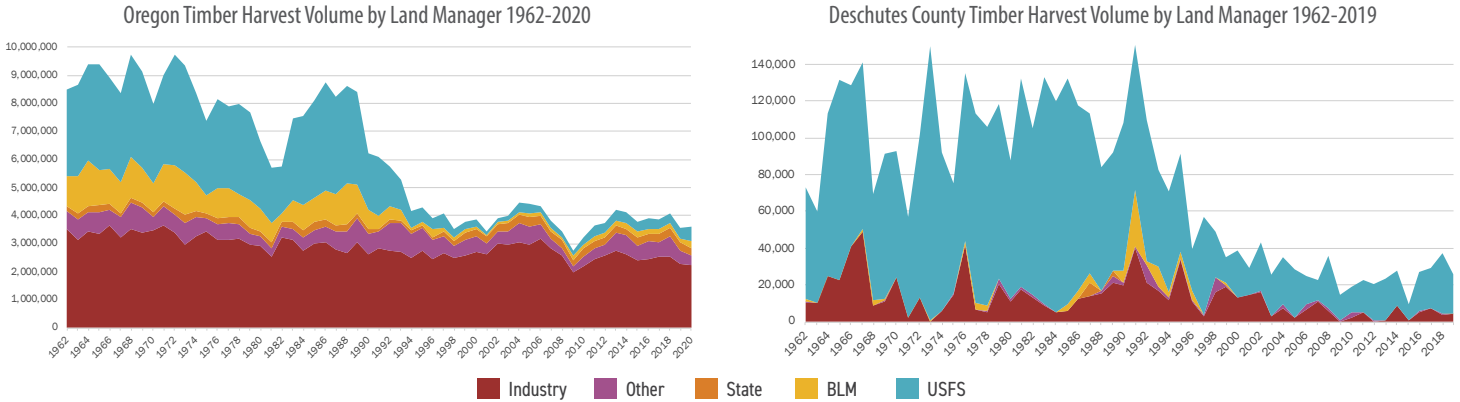
The \$1 for Trails program created by the Deschutes Trail Coalition (DTC) is an attempt to address this stress on the system. The DTC is a non-profit organization comprised of local and regional trail stakeholders dedicated to supporting the U.S. Forest Service in its efforts to manage the trail system in a sustainable manner.¹ The \$1 for Trails program intends to provide a system whereby local beneficiaries, particularly businesses and visitors to the region, can contribute to investments in the trail network. In



addition, the Bend Sustainability Fund, managed by Visit Bend, provides a means for hotel tourism tax receipts to be applied to tourism-related infrastructure needs, with DNF trails and facilities being eligible.² Ultimately for the DNF trail network to achieve and maintain its potential, all users and beneficiaries will need to play their part.

This report provides a detailed analysis of the trail system on the DNF, the value it provides, the economic contributions it makes to the regional economy, and what it will need to continue to resiliently serve the community and visitors in an equitable manner. There is currently a gap in the funding and support needed to maintain and improve the trail system and the resources available. The primary resource needs are financial, although staff and volunteer support are needed as well, as general trail project implementation capacity within the USFS is constrained. This study finds that the value the trail network

Figure 1 | Statewide and Deschutes County Timber Harvest Trends



Source: ECONorthwest with data provided by Oregon Department of Forestry.
¹ See <https://www.deschutestrailscoalition.org/> for more detail.
² Bend Sustainability Fund. Visit Bend. <https://www.visitbend.com/bend-sustainability-fund/>

contributes far outsizes these costs. Whereas timber harvest revenue historically supported recreation investments on public forests across Oregon, reduced harvests over the past several decades means this revenue source can no longer be relied upon to fund the DNF's trail maintenance needs (Figure 1). And while reduced harvests provide more space for recreation, they also necessitate that beneficiaries of the national forest take a more direct role in providing this valuable resource.

Statewide resident and national non-resident surveys show that environmental quality, natural amenities, and access to nature are some of the characteristics that Oregonians most appreciate about their state, and that non-residents see as fundamental to the image of Oregon.³ Wisely managing and making access more equitable are key responsibilities for the DNF trail system moving forward.



Study Area and Scope

This study focuses on the trails and trail-related amenities and resources of the Deschutes National Forest. We begin with an overview of the trails focused on the activities they support and the communities they serve. This is followed by an evaluation of the demand and use of these trails, the benefits to trail users, and the regional economic impact of trail-based trips. We then proceed to analyze and forecast the costs of providing and maintaining this trail network, and the contributions users are already providing. Finally, we consider the broader social aspects of the trail system and its users, and how best to develop equitable trail resources on the Deschutes National Forest.

The following research questions addressed in this study are relevant for the key issues facing the \$1 for Trails program and similar funding efforts, program partners, and potential participants both in terms of businesses and customers.

- What does the current trail network on the DNF supply in terms of valuable outdoor recreation opportunities and forest access? What is the extent and accessibility of this network?
- What is the trail usage pattern for the DNF trail network? How much use does it currently support? Where is demand greatest relative to available trails in terms of geography and type of trail use?
- What is the user population for the trail network? How is it expected to grow over time? What are the diversity and equity dimensions of this population and expected growth? How can the trail network grow into a more equitable resource with greater diversity among its users?
- What is the expected level of demand on the trail network in coming years? What is the value of this use, the spending associated with this trail usage, and the broader economic impact for the regional economy of this trail usage, including businesses?
- What is the current funding and effort that supports this trail network? Where does the funding originate and how much do users pay? What additional funding will be needed in the future?

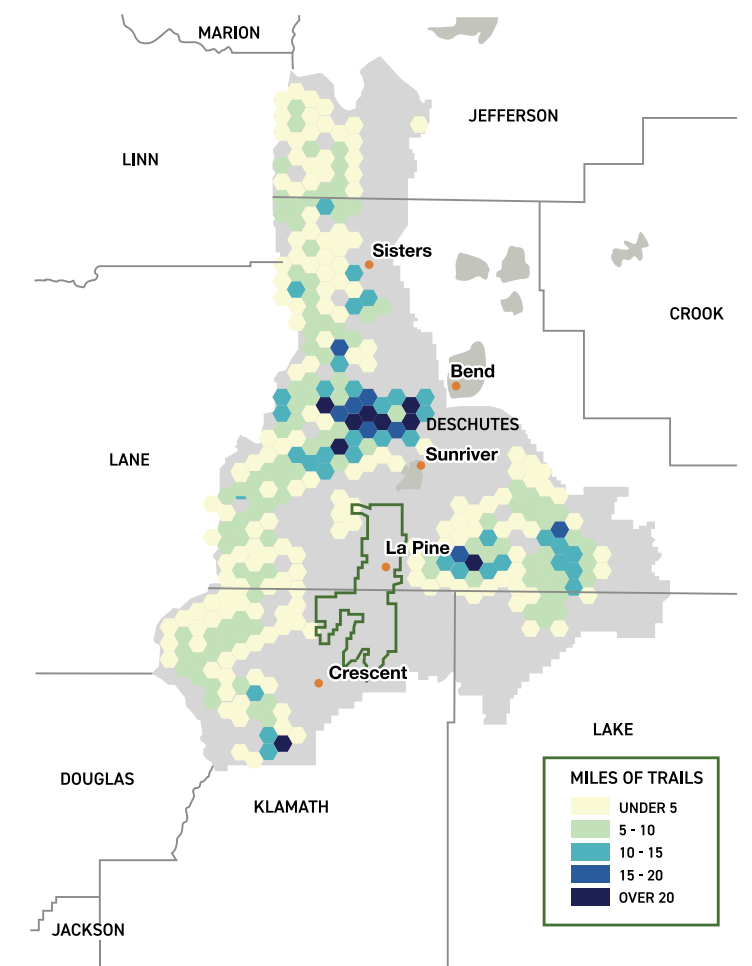
Collectively, this information is intended to support decision-making both in terms of why the DNF trail network should receive broader support from the communities that benefit from this resource, but also how those investments can be targeted to provide the most value to users, local businesses, the regional community, and the economy as a whole.

The DNF hosts approximately 2,190 miles of trails across 1.6 million acres, and extensive facilities to support use of these trails including over 300 toilets. Trail miles are managed for a variety of uses throughout the year, along with facilities to access and support trail usage. Trails can be found throughout the national forest but are concentrated most densely near Bend and within the Newberry Crater Volcanic Monument (NCVM) northeast of La Pine (Figure 2). The DNF categorizes trail miles by specific uses. Trails that are “managed” for a particular use are designed to accommodate that use seasonally or year round. Trails that are “acceptable” for a particular use are generally suitable for that use, and the use is permitted, but the trail isn’t designed or maintained for that use.

Hiking trails rank highest in total managed and acceptable trail miles on the DNF across activities, although packsaddle (horseback riding/equestrian) trails have the most managed trail miles (Figure 3). All trail miles generally receive some level of inspection and maintenance effort annually, particularly for managed uses. Removal of fallen trees from the trail is the most



Figure 2 | Trail Density in Deschutes National Forest



Source: ECONorthwest Analysis (2021), using data from USFS Trail Database (2020)⁴

common maintenance activity while brushing and drainage work occur less often and are completed to the extent needed. Although nearly all trail miles are managed for one particular use to comply with a primary design parameter, most trail miles are expected to cater to multiple uses. The use patterns set by various trail user types on shared-use trails do not always mirror the managed use. For example, a trail may be managed for equestrian use but, because it is a shared-use trail, the volume of mountain bike trail use may shift and exceed that of equestrians, therefore dissuading use by equestrians to avoid user conflicts.

An important question for evaluation is how these trail miles align with demand, both geographically and by use levels. And it is important to consider how this usage and demand is expected to change over time in order to develop and maintain a sustainable and equitable trail network. In addition, the DNF has hundreds of miles of gravel roads, and thousands of miles of dirt

³ DHM Research. 2013. Oregon Values and Beliefs Surveys. <http://oregonvaluesproject.org/findings/top-findings/>.

⁴ USDA U.S. Forest Service (2020). FSGeodata Clearinghouse: downloadable data. Retrieved from <https://data.fs.usda.gov/geodata/edw/datasets.php>

Supply of Trail Recreation Opportunities

on the Deschutes National Forest

roads, with mixed levels of suitability to support other activities. Gravel biking for example, has gained popularity in recent years as a means to find more seclusion and cover greater distances, further utilizing these gravel and dirt roads. These road miles are not included in the trail miles.

The geographic distribution of trails on DNF and their accessibility for various communities is a relevant factor when considering the overall usefulness, value, equity, and needs of the trail network. Just as the trail network generally provides good coverage and access across the DNF, the forest is relatively accessible from all the surrounding communities by the region's road system (Figure 4). For example, most of the DNF trail network in terms of nearest road access is within 60-minute drive time from Bend. Please see the appendix for drive time maps for each adjacent community. Later in this report, we analyze how the existing trail network corresponds geographically to the user population in terms of trail miles and user occasions (trips). In general, in terms of the existing road network and distribution of trails geographically, no major needs or areas of neglect stand out in terms of car access. However, there are few public transportation or other options for those who do not own a vehicle, and efforts are underway to improve accessibility to the DNF via public transit. For all groups, the availability of close-to-home trails is particularly important for frequent trips, opportunities to reduce vehicle traffic, road congestion, and emissions.

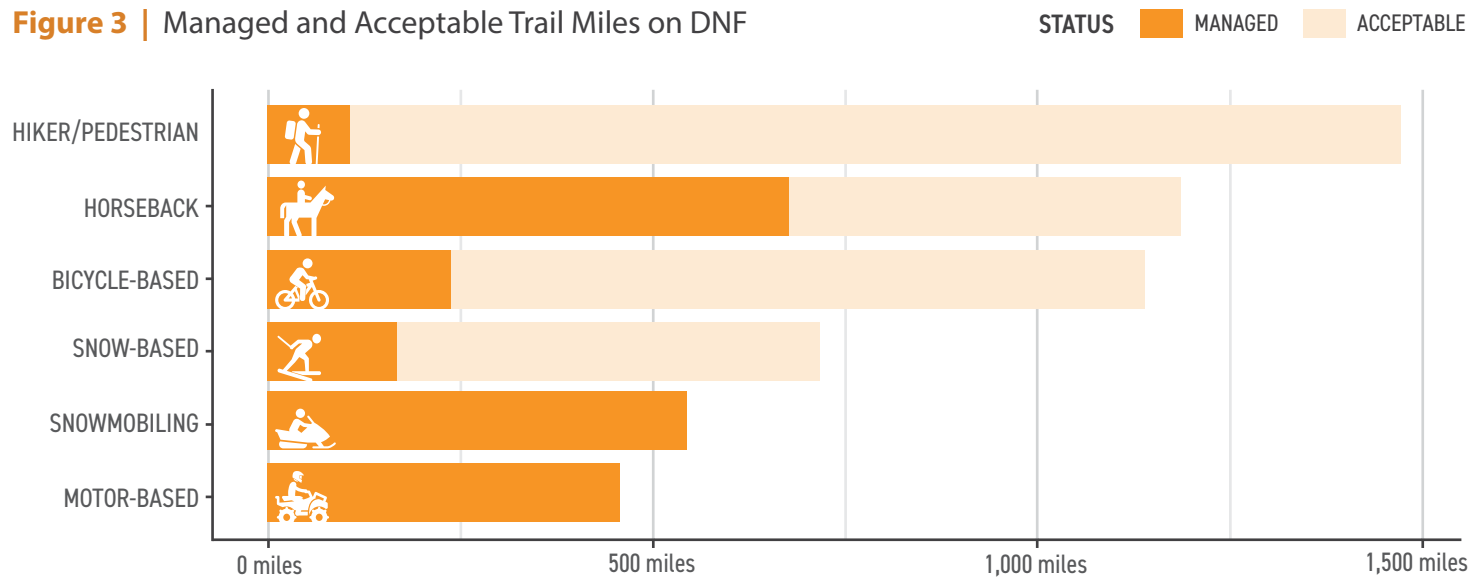
When considering the trails within a 60-minute drive time of the communities, variation in the type of trail and total miles



is notable (Figure 5). Trails accessible to bikers and hikers are generally the most abundant type for each community, followed by horseback. Crescent differs in that it does have slightly more snow-based (non-motorized) and snowmobiling trails than the generally more common trail types.

There are other important dimensions of trail management that help serve the diverse user base of the forest. Twenty-four miles are currently managed to the U.S. Forest Service's (USFS) guidelines to provide access for users with physical disabilities. These accessible trail miles are generally paved, with other trail surfaces either native soft material or snow corresponding to the managed use. Soft-surface trails are generally reported as the most preferred trail type by Oregonians.⁵ The USFS also categorizes trails by class on a scale from 1 to 5 based on level of development and obstacle removal. Class 1 is minimally developed with little modification from natural conditions, while

Figure 3 | Managed and Acceptable Trail Miles on DNF



Source: ECONorthwest Analysis (2021), using data from USFS Trail Database (2020).

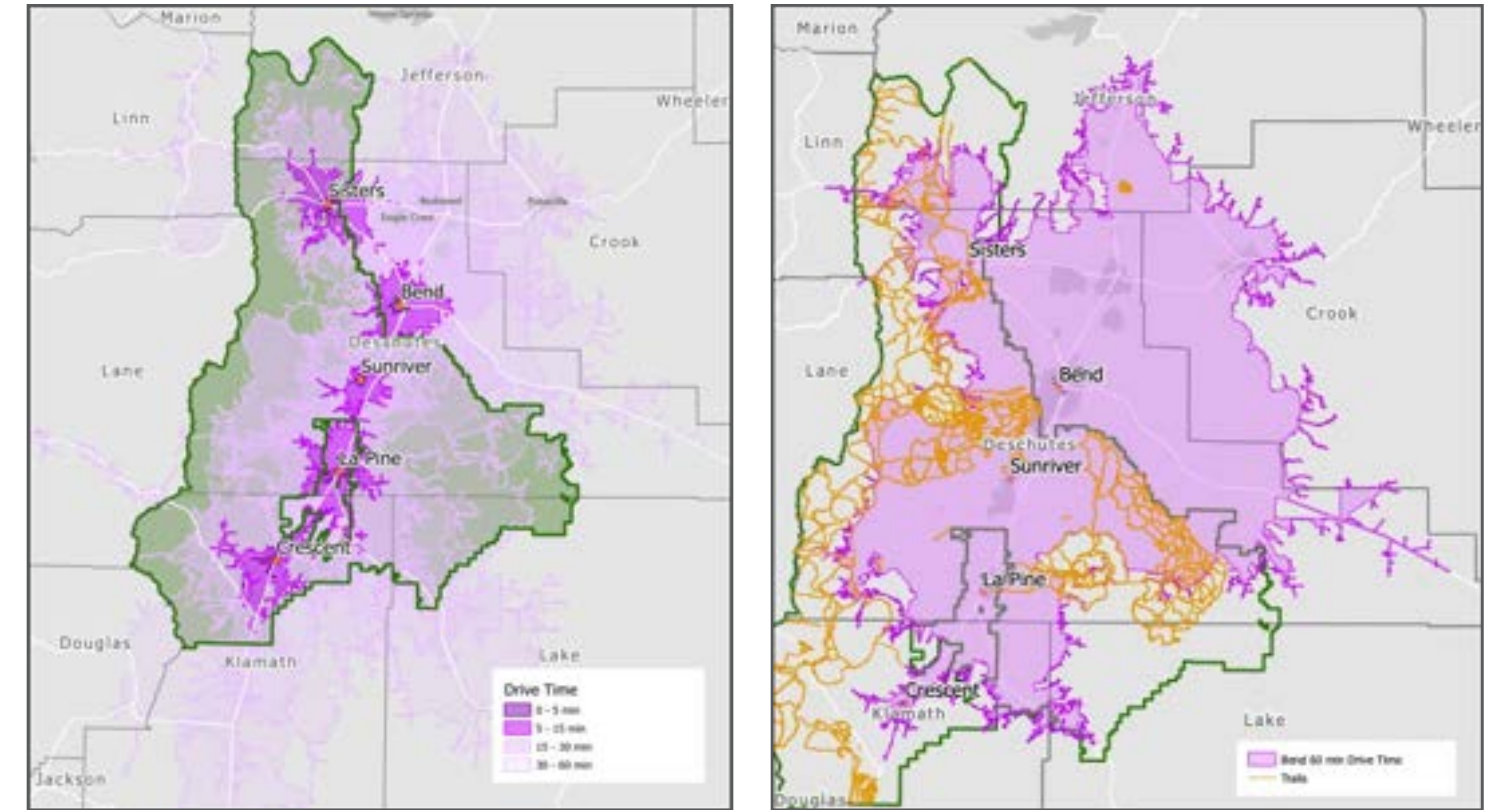
⁵ OPRD. 2012. 2013-2017 Statewide Comprehensive Outdoor Recreation Plan OPRD 2018. 2019-2023 Statewide Comprehensive Outdoor Recreation Plan.

Supply of Trail Recreation Opportunities

on the Deschutes National Forest

Figure 4

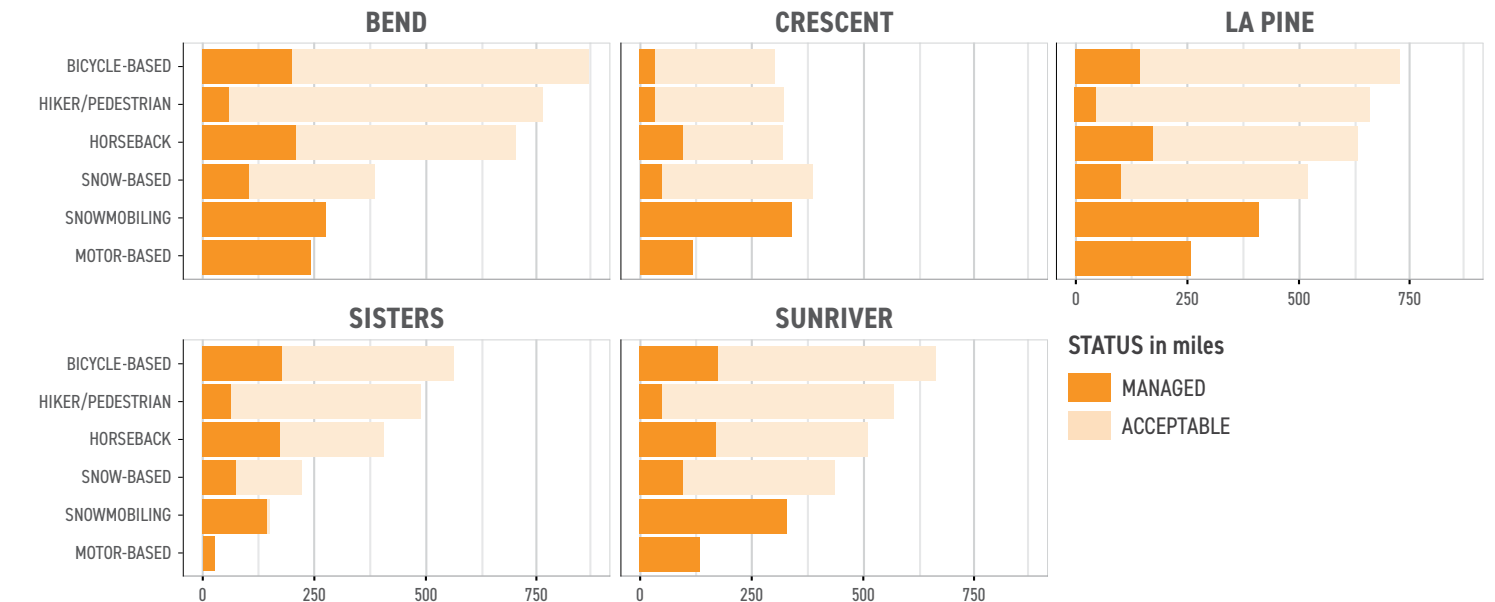
Drive Times from Nearby Communities to DNF Trails



Source: ECONorthwest Analysis (2021), using data from USFS Trail Database (2020) and AGOL/ESRI drive time analysis (2021).

Figure 5

Managed and Acceptable Trail Miles on DNF in 60-Minute Drive Time of Communities



Source: ECONorthwest Analysis (2021), using data from USFS Trail Database (2020). Note snow-based trails are for non-motorized trail use and generally include snowshoeing and Nordic skiing. It does not include lift-served downhill skiing.

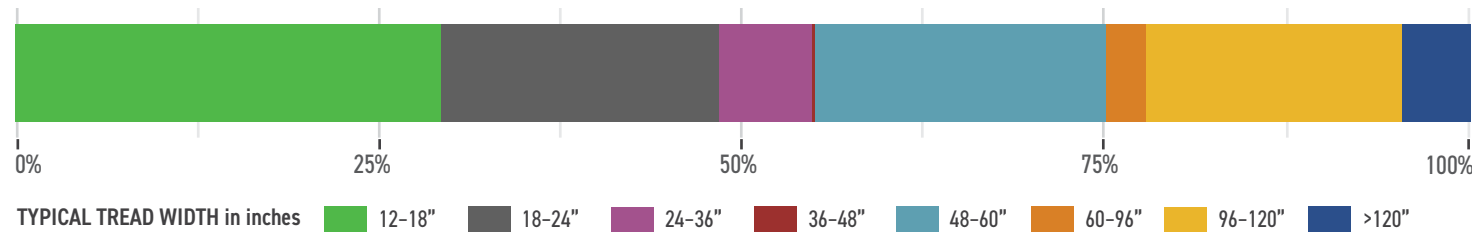
Class 5 has wide, firm, stable, and uniform trail conditions, no obstacles, and little slope. Seventy-nine percent of trails on the DNF are Class 3, characterized as trails with a single lane and some obstacles, but cleared of vegetation. Eighteen percent of DNF trails are Class 4, with even smoother conditions and frequently including double lanes in high traffic areas.

Trail width is an important characteristic on a variety of dimensions. Motorized trail users require the widest trails, and horseback riders also prefer wide trails, both for ease of passage but also for good sightlines to spot other users with sufficient time to move or prepare their animals for encounters. Hikers and mountain bikers tend to prefer more narrow single-track trails. Trail widths generally correspond to managed uses, with most trails under 24 inches in width (Figure 6). There is a relatively consistent distribution of trail miles above 24 inches in width for the balance of trails, providing a diverse set of trail experience opportunities. Studies have shown that trail width does positively correlate with level of usage (wider trails see more use, but also can be the result of heavy usage).⁶

We also considered trails in terms of proximity to campgrounds on the DNF. Campgrounds provide an important base for a variety of trips to the DNF, including trail-based, and an opportunity for visitors to spend multiple days in the region.



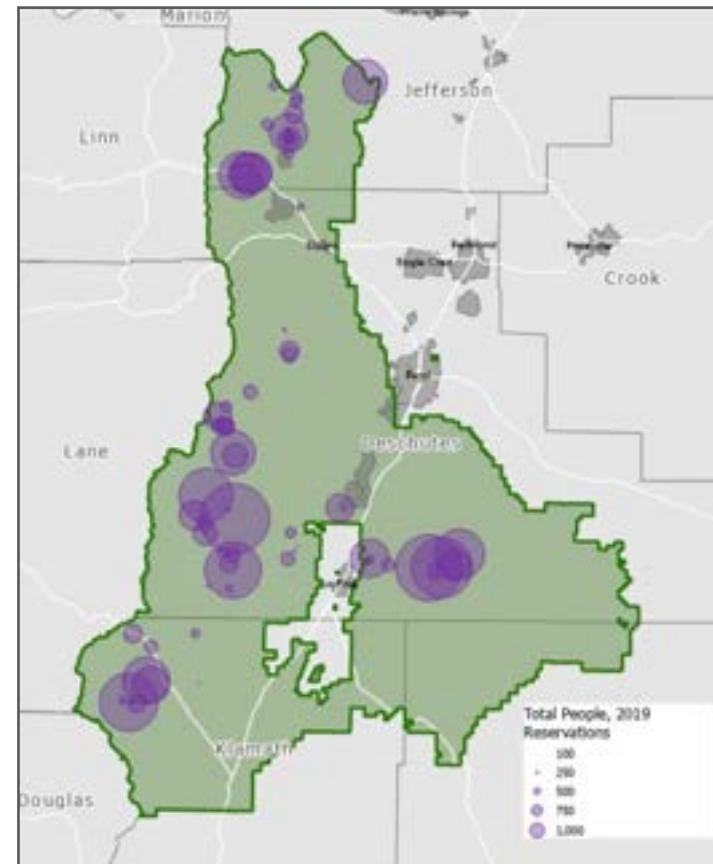
Figure 6 | DNF Trail Miles by Width



Source: ECONorthwest Analysis (2021), using data from USFS Trail Database (2020).

⁶ Zhai, Y., Baran, P.K. and Wu, C., 2018. Can trail spatial attributes predict trail use level in urban forest park? An examination integrating GPS data and space syntax theory. *Urban Forestry & Urban Greening*, 29, pp. 171-182.

Figure 7 | Campsite Reservations on DNF, 2019



Source: ECONorthwest Analysis (2021), using data from Recreation.gov (2019), Recreation Information Database, available at <https://ridb.recreation.gov/download>

In general, campgrounds are most densely concentrated and heavily used along the Cascades Lake Highway and in proximity to lakes of that region, as well as within the Newberry Crater Volcanic Monument (Figure 7). Campgrounds are an important complementary resource for trails. They provide a basis for extended trail access, as well as a way to attract people to the forest and bring them close to trails, potentially helping to create new trail users and expanding the extent and diversity of trail users in the community.

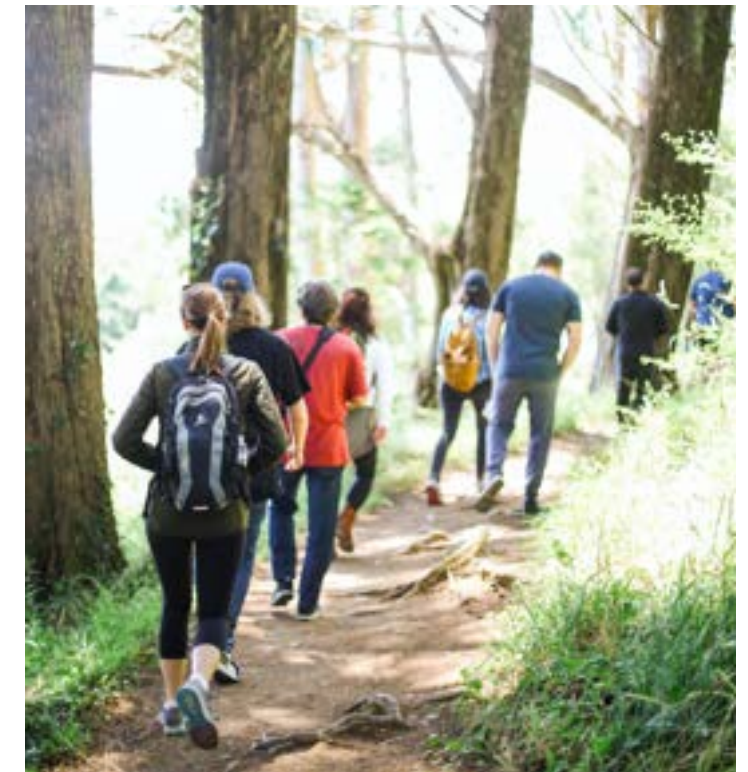
Trail User Population

The DNF trail network must be able to serve a large and growing user population. Understanding the user population is critical for properly designing and scaling the trail network in terms of total trail miles, types of trail and trail facilities required, geographic distribution of trails and access, and developing an equitable and accessible network overall. This means understanding the number of current and potential users, their preferences and participation rates in trail-based activities, where they live, and how these populations are expected to grow and develop over time across these dimensions. It also informs the funding and support strategy in terms of potential contributors.

Local Population

These diverse and widespread trails are used by residents of Central Oregon as well as visitors from across the state of Oregon and beyond. Bend is the primary population center with respect to the DNF by far, hosting over half of Deschutes County's population and a considerably greater resident population than the other four primary communities adjacent to DNF — Sisters, La Pine, Sunriver and Crescent — combined (Figure 8).

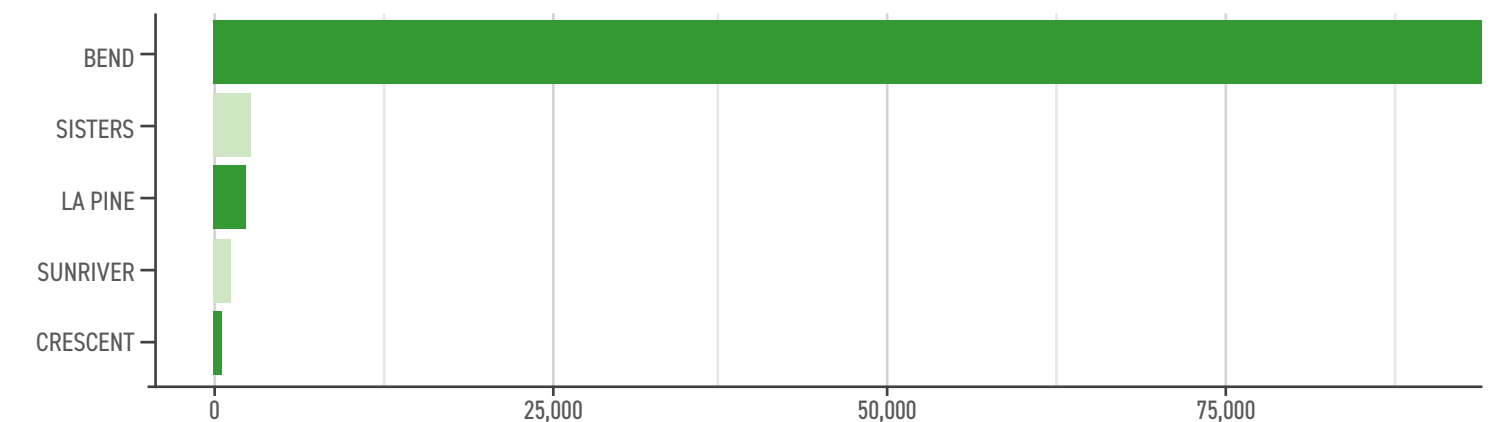
Communities in Central Oregon are strongly majority white/non-Hispanic, although there is a growing BIPOC and Hispanic population regionally and statewide. Hispanics are the largest minority group among Central Oregon counties adjacent to the DNF (Figure 9). In Deschutes County, Asians are the next most numerous single group, although an even greater number identify as representing two or more races. It will increasingly



be important to ensure the trail network and regional businesses are able to adequately serve the full range of interests and participants in outdoor recreation activities in Central Oregon.

Deschutes County and its cities are growing rapidly. From 2000 to 2010 Deschutes County grew at an average annual growth rate of 3.2 percent, with Bend growing at 4 percent annually, La Pine growing at 6.3 percent annually, and Sisters growing at 7.8 percent annually over the timeframe.⁹ Growth slowed slightly to

Figure 8 | Resident Population of Communities Near DNF



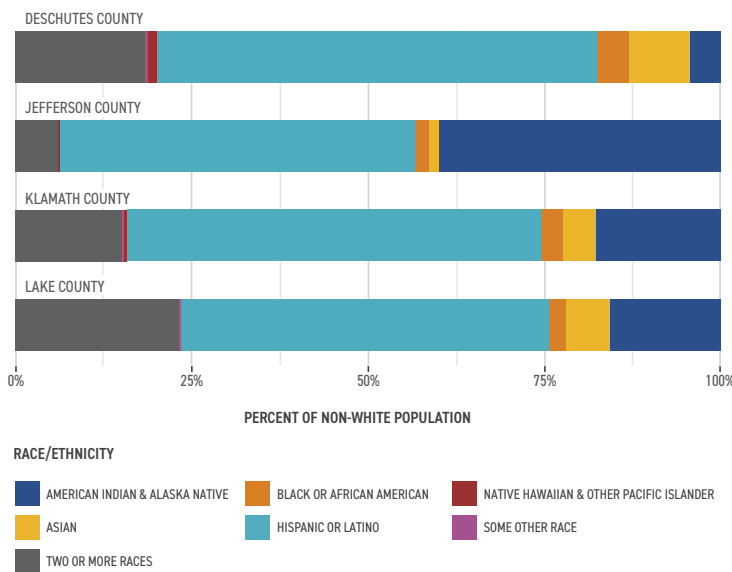
Source: ECONorthwest Analysis (2021), using data from U.S. Census Bureau (2020),⁷ and Kyle Walker (2020)⁸

⁷ U.S. Census Bureau (2020). Total Population. 2015-2019 American Community Survey 5-Year Estimates (Table B01003). Retrieved from American Community Survey API.

⁸ Kyle Walker (2020). tidy census: Load US Census Boundary and Attribute Data as 'tidyverse' and 'sf'-Ready Data Frames. R package version 0.9.5. <https://CRAN.R-project.org/package=tidycensus>.

⁹ U.S. Census Bureau, 2000 and 2010 Censuses.

Figure 9
Non-White Population Distribution
in DNF-Adjacent Counties



Source: ECONorthwest Analysis (2021), using data from U.S. Census Bureau (2020)¹⁰

2.4 percent annually from 2010 to 2020. This population growth is expected to continue, although at a slightly more modest rate of 1 to 2 percent annually for Deschutes County through 2068 (Table 1). It is important to recognize that Redmond and its community of residents, visitors, and businesses play an important role in using and supporting the DNF and its trails. They tend to access DNF for areas most proximate to Sisters and Bend, and are an important part of the user community, although not counted in community-based user estimates for either city later in this report.



¹⁰ U.S. Census Bureau (2020). Race and Hispanic Origin. 2015–2019 American Community Survey 5-Year Estimates (Table B01003). Retrieved from American Community Survey API.

¹¹ Population Research Center (2018). Coordinated Population Forecast, Deschutes County, 2018 through 2068. Portland, OR: Population Research Center, Portland State University.

Table 1
Deschutes County Population Growth Forecast within
Urban Growth Boundaries (UGB)

GEOGRAPHY	2010 Population	2020 Population	2045 Population	2068 Population
DESCHUTES COUNTY	157,733	199,793	310,827	432,930
BEND UGB	77,010	98,205	168,364	255,291
LA PINE UGB	1,653	2,081	3,739	5,894
REDMOND UGB	26,508	30,812	53,750	82,575
SISTERS UGB	2,038	3,018	5,380	8,431
Outside UGB Area	50,524	65,677	79,593	80,739

Source: Population Research Center (2018)¹¹

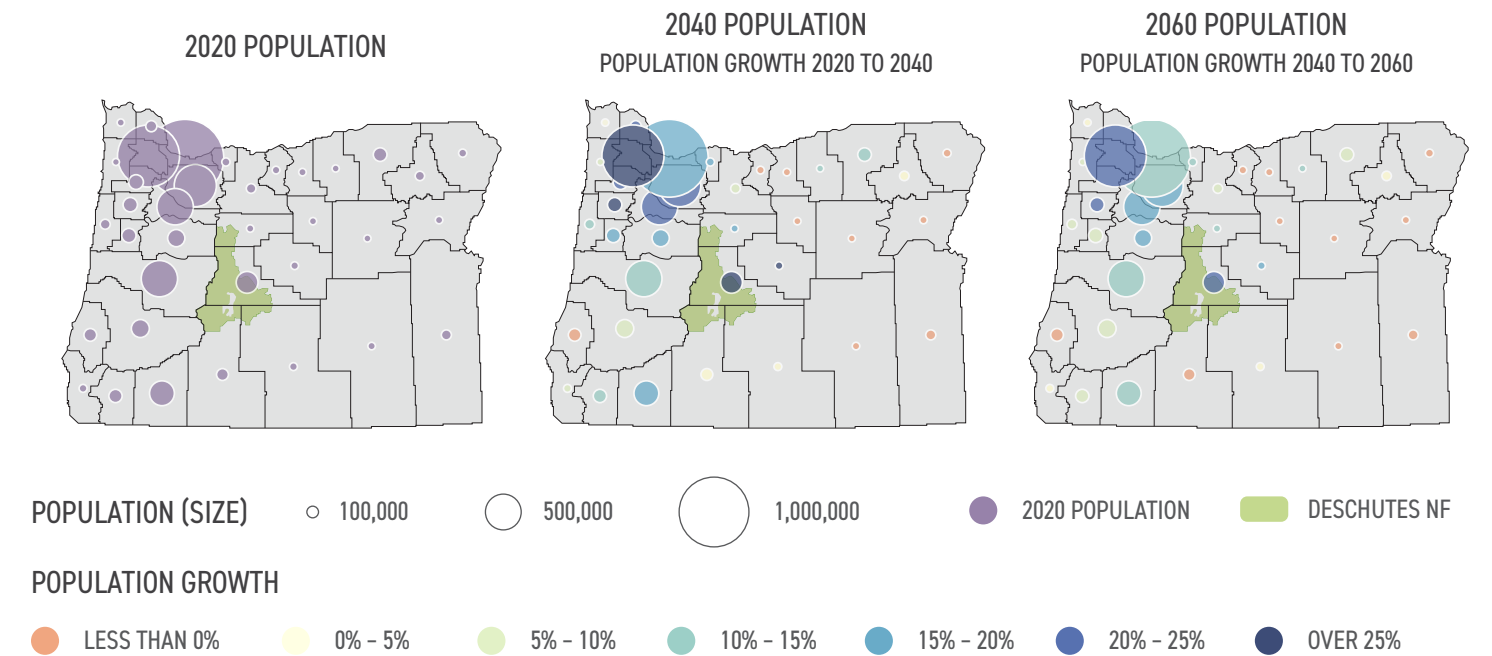
Note: 2020-2068 values are forecasts, and the most current available estimates as of this writing. UGB represents the area and population within each urban growth boundary.

State Population

The state of Oregon is also expected to see continued population growth, particularly in the urban centers of Willamette Valley, but also in southern and central Oregon (Figure 10). Growth rates are expected to be greatest over the next two decades, suggesting potential rapid increase in demand for trails and access to public lands over that timeframe.

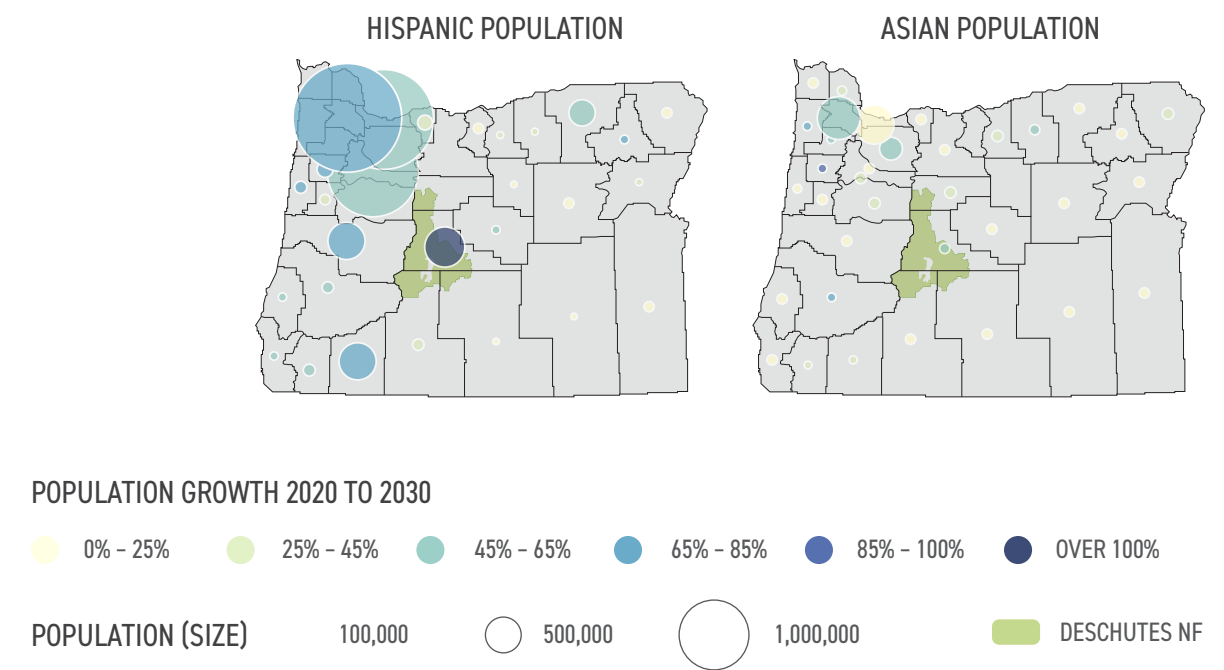
Minority populations are growing in areas of Oregon with proximity to the DNF. Hispanic and Asian populations in Oregon are expected to grow, particularly in the upper Willamette Valley, but Hispanic population growth in Central Oregon near the DNF is expected to have the highest rate of growth. It will be important to plan for outdoor recreational resources including trails on the DNF to be adequately responsive to the needs of this rapidly growing segment of the regional community.

Figure 10 | Population Growth Forecasts for Oregon



Source: ECONorthwest (2019), using data from Population Research Center (2018) and OPRD (2018)¹²

Figure 11 | Population Growth Forecasts for Hispanic and Asian Populations in Oregon, 2020 to 2030



Source: ECONorthwest (2019), using data from Population Research Center (2018) and OPRD (2018)

¹² OPRD. (2018). Resident Outdoor Recreation Survey: 2018-2022 Oregon Statewide Comprehensive Outdoor Recreation Plan Supporting Documentation. Oregon Parks and Recreation Department.

Demand for trail-based recreation on the DNF comes from residents of Central Oregon, visitors from across the state of Oregon, and beyond. The USFS regularly surveys visitors to each national forest through its National Visitor Use Monitoring program. The most recent survey for the DNF was conducted in 2018. The vast majority of those captured in the 2018 survey are residents of Oregon, with a strong majority from Deschutes County, the DNF's primary location. Though the DNF's location also intersects with Klamath, Jefferson, and Lake counties, the second largest majority of those surveyed were from Multnomah County and Lane County. After Oregon residents, the next most common visitors were California and Washington residents.



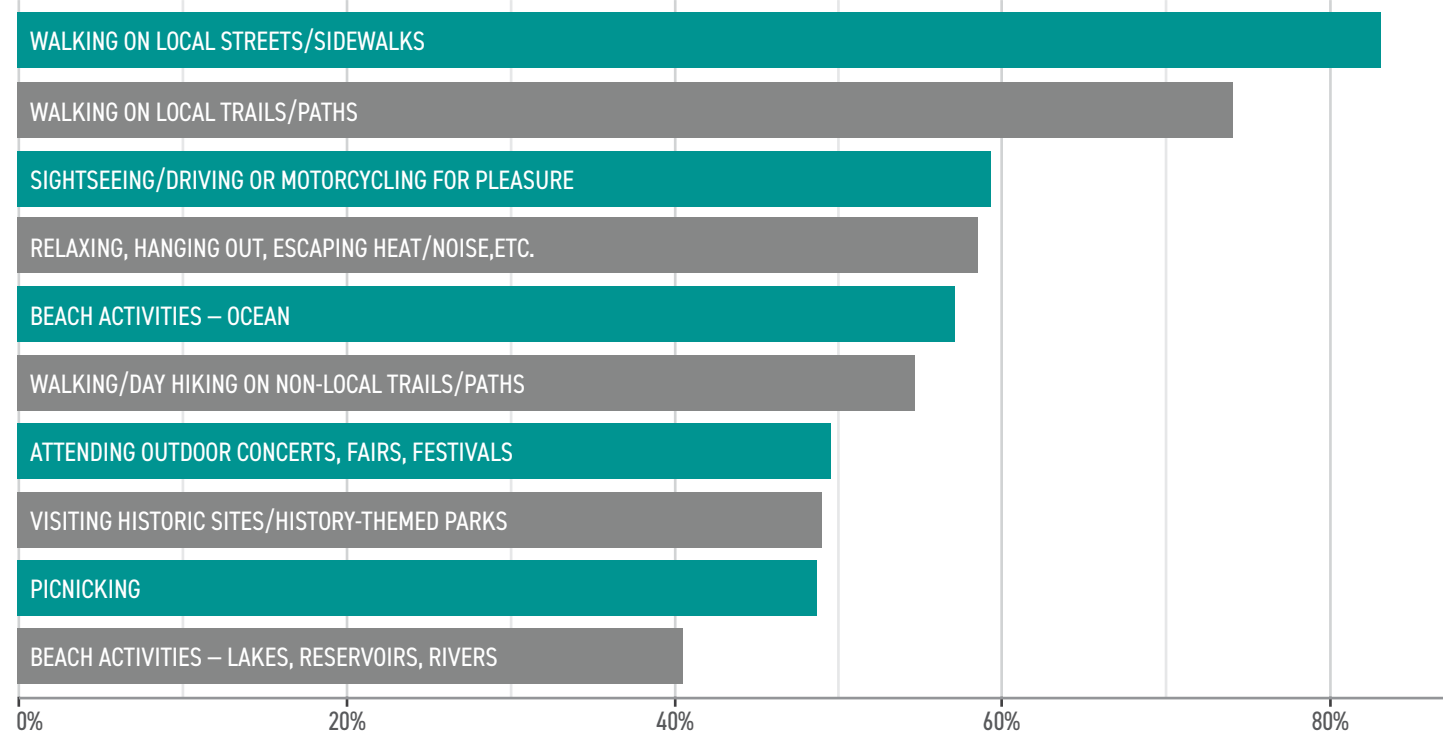
Oregon Resident Trail Demand

Oregonians appreciate and utilize trails for a number of activities. Walking on local sidewalks and paths are the outdoor activities practiced by the largest share of Oregonians statewide (Figure 12). Walking on trails is one of the easiest activities in terms of the availability to the largest portion of the population, and one of the healthiest options. Likely, more people would walk on local trails and paths if availability and accessibility were greater where they live, work, and travel. The Statewide Comprehensive

Outdoor Recreation Plan (SCORP) survey found Oregonians put the highest outdoor recreation priority for the future on increased dirt/soft trail development.¹³

The most recent survey of Oregonians as part of development of the SCORP analyzed demand and participation for activities among specific demographic subgroups as well. Table 2 provides a comparison of participation rates in trail-based activities across these analyzed subgroups at the state level. Walking

Figure 12 | Participation Rates for the Top 10 Outdoor Recreation Activities Statewide in Oregon



Source: ECONorthwest Analysis (2021), using data from OPRD (2018)

¹³ Rosenberger, Randall and Kreg Lindberg. 2012. Oregon Resident Outdoor Recreation Demand Analysis. Oregon State University, November available at: http://www.oregon.gov/oprd/PLANS/docs/scorp/2013-2018_SCORP/Demand_Analysis.pdf.

on local trails is the most popular trail-based activity across all measured groups, and families with children having the highest rate of participation statewide. Hispanics, the largest and fastest growing minority group in Central Oregon, generally have participation rates in trail-based activities at similar levels to state averages, although their walking on non-local paths is less. This suggests Hispanics might have or perceive less access to trail networks than the average Oregonian. Familiarity, experience, and sense of acceptance could be factors as well. Conversely, Hispanics do have higher rates of motorized trail activity participation than state averages.

Another important measurement is the substantially higher rate of participation for state residents as a whole and for each demographic subgroup for biking on paved trails in comparison to biking on unpaved trails. DNF is making progress in providing paved bike trails and has plans for more as well. Trail systems within communities such as Bend also provide paved biking options, while providing limited soft trail biking options. It's important to consider the full set of options facing residents and visitors alike across jurisdictions and recognize the most valuable niche that the DNF can address.

Table 2 | Oregon Trail Activity Participation by Subgroup (Percent of Total Population)

ACTIVITY	STATE OVERALL	HISPANIC	ASIAN	FAMILIES W/ CHILDREN	URBAN	SUBURBAN	RURAL	LOW INCOME	AGE 60-74	AGE 75-84	MALE	FEMALE
Walking on local trails/paths	74.0	73.3	68.8	84.0	74.9	76.0	68.0	58.5	63.0	37.3	73.3	74.7
Walking/day hiking on non-local trails/paths	54.7	45.3	47.4	61.9	57.7	54.1	51.9	40.3	43.3	19.8	56.3	53.1
Long-distance hiking (backpacking)	13.2	11.0	10.5	15.3	16.0	12.7	10.5	11.0	5.2	1.5	16.0	10.5
Jogging/running on trails/paths	21.2	24.1	24.3	29.8	25.8	22.6	11.6	11.8	5.8	0.8	22.0	20.5
Horseback riding	3.9	4.2	1.2	5.5	2.8	2.7	8.3	5.5	2.9	1.1	3.3	4.5
Bicycling on unpaved trails	14.9	13.4	8.1	22.0	16.0	15.3	12.6	9.5	7.8	1.1	19.6	10.3
Bicycling on paved trails	30.1	28.5	22.7	40.2	36.0	31.3	19.3	18.5	21.0	6.1	32.9	27.4
Class I: All-terrain vehicle riding	8.6	12.3	5.8	11.7	4.8	7.5	16.6	8.5	5.9	3.0	9.8	7.5
Class II: Off-road 4-wheel driving	10.1	11.3	7.0	13.9	8.7	8.4	15.9	11.3	6.6	2.7	12.9	7.3
Snowmobiling	2.2	2.6	1.7	2.7	1.9	2.0	2.8	1.7	1.2	-	2.8	1.5
Nordic skiing on groomed trails	5.8	4.7	5.2	7.5	7.6	5.8	3.4	3.5	3.4	-	5.0	6.6
Nordic skiing on ungroomed trails/off-trail	3.6	2.6	2.3	4.2	4.2	3.4	3.2	1.2	2.6	0.4	3.3	3.8

Source: ECONorthwest Analysis (2021), using data from OPRD (2018).

When considering Deschutes County specifically, we can use SCORP data from the 2011 survey which provided estimates at the county level (the most recent county-level data available). Grouping user occasions (trips) by trail activity type, we see that hiking is the most common, followed by bicycle-based trail use activity in Deschutes County (Figure 13).¹⁴ Statewide overall patterns are generally consistent from the 2011 to 2017 survey data, suggesting county-level results are likely still relevant as well.

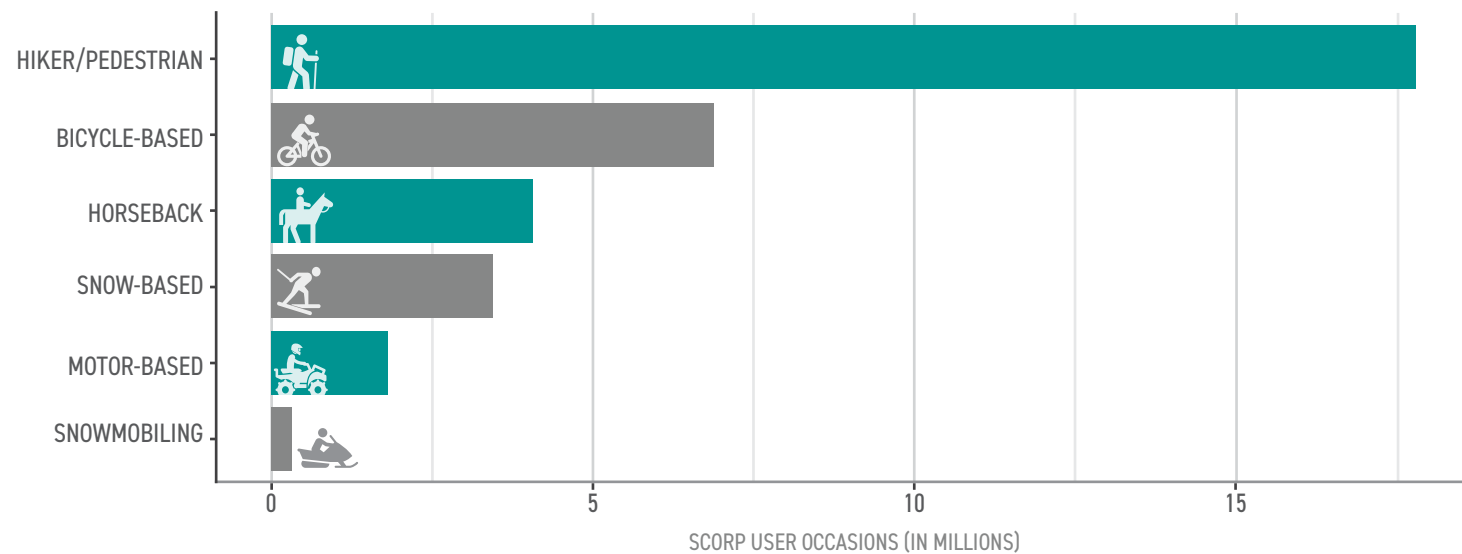
Deschutes National Forest Trail Usage

Fortunately, data exist specific to trail-based activity on the DNF. A 2018 survey of visitors to the DNF provides a basis for estimating current usage and support and forecasts future usage (Table 3). This survey of recreation use is regularly conducted for national forests as part of the National Visitor Use Monitoring (NVUM) program. Hiking/walking is the most common activity among all visitors for the DNF. Several of the other most common activities also utilize trails. We estimated future visitation by scaling visitation and trail usage on the DNF based on regional population growth forecasts and activity participation trend forecasts (both described in more detail later). The survey data show that hiking is by far the most common trail activity on the DNF, followed by bicycling (Figure 14). It is important to note that snow-based activity in this context refers to non-motorized trail activities, particularly Nordic skiing and snowshoeing, and does not include lift-served downhill skiing. Overall trail usage

patterns specific to the DNF are similar to those for Deschutes County as a whole but are substantially less for horseback trail usage on the DNF relative to the horseback trail riding for the county as a whole. Increasing traffic on trails in the DNF may dissuade equestrian users by limiting parking capacity for trailers and making management of stock in parking areas more



Figure 13 | Trail-Based User Occasions in Deschutes County, 2011



Source: ECONorthwest Analysis (2021), using data from OPRD (2012).

¹⁴ Note that the SCORP analysis focuses on user occasions, which can generally be considered equivalent to trips.

Table 3 | Activity Participation, DNF 2018 Visitor Survey

ACTIVITY	PERCENTAGE PARTICIPATION	PERCENTAGE MAIN ACTIVITY	AVG HOURS DOING MAIN ACTIVITY
Hiking / Walking	43.0	20.8	2.5
Viewing Natural Features	41.6	8.9	4.7
Viewing Wildlife	36.4	1.5	2.8
Relaxing	35.8	5.8	14.7
Driving for Pleasure	20.5	1.1	2.0
Downhill Skiing	19.4	18.2	3.5
Bicycling	13.4	9.1	2.6
Picnicking	12.2	1.1	20.1
Fishing	11.5	6.3	9.5
Non-motorized Water	11.0	6.1	5.7
Developed Camping	10.5	3.5	42.9
Nature Center Activities	9.5	0.9	2.7
Nature Study	8.2	0.6	3.3
Cross-country Skiing	8.2	6.8	2.2
Some Other Activity	6.7	3.1	2.5
Visiting Historic Sites	6.6	0.3	2.1
Motorized Water Activities	6.0	0.7	7.3
Other Non-motorized	5.8	1.0	4.3
Resort Use	2.5	0.2	14.6
Primitive Camping	1.9	0.2	26.7
Hunting	1.6	1.0	21.8
Snowmobiling	1.5	0.7	2.3
No Activity Reported	1.4	1.7	N/A
Backpacking	1.1	0.3	33.4
Gathering Forest Products	1.1	0.3	4.1
Horseback Riding	0.5	0.4	7.4
Motorized Trail Activity	0.5	0.2	1.9
OHV Use	0.5	0.1	3.0
Other Motorized Activity	0.1	0.0	10.0

Source: USDA Forest Service (2018).

challenging. This suggests potentially more desirable or accessible horseback opportunities outside of DNF in Deschutes County than on the DNF. It also can indicate the greater challenges for horseback use of more distant trail opportunities, given the greater transportation costs for horseback riding relative to other more common trail activities.

We can also consider how the overall supply and availability of trail miles by trail type compares to the corresponding demand. Figure 15 shows the trail miles for each trail type relative to the number of corresponding annual trips in terms of managed and acceptable designated uses on Deschutes National Forest. This information can be used to compare the relative abundance and scarcity of each trail type for each type of activity. Horseback, snowmobile, and motor-based trails are the most abundant in terms of available trail miles relative to number of trips. Hiking, (non-motorized) snow-based, and bike trails have the least abundant trails per thousand trips. This information suggests that hiking, biking, and snow-based trails are under-supplied relative to the number of trips they host compared to trails for other activities.



Of note though, horseback trail users face unique challenges than do other users when sharing trails. So, the sense of scarcity and abundance of trail miles might not correlate with these trail miles per thousand trips results.

Using the SCORP survey data in conjunction with the spatial trail database, we can approximate how resident trail use compares to trail use for neighboring communities. These estimates are also relevant from a visitor perspective, as the greatest visitor capacity generally corresponds to resident population size in terms of hotels, motels, rentals, and other short-term lodging options. That is, Bend has the highest resident population in the region and the most capacity for visitor accommodations. The resulting information in a series of charts in Figure 16 can be used to consider how trail type and trail geography scarcity and abundance compare across the DNF. Overall, this information further suggests that hiking trails are the scarcest relative to use, followed by biking trails.

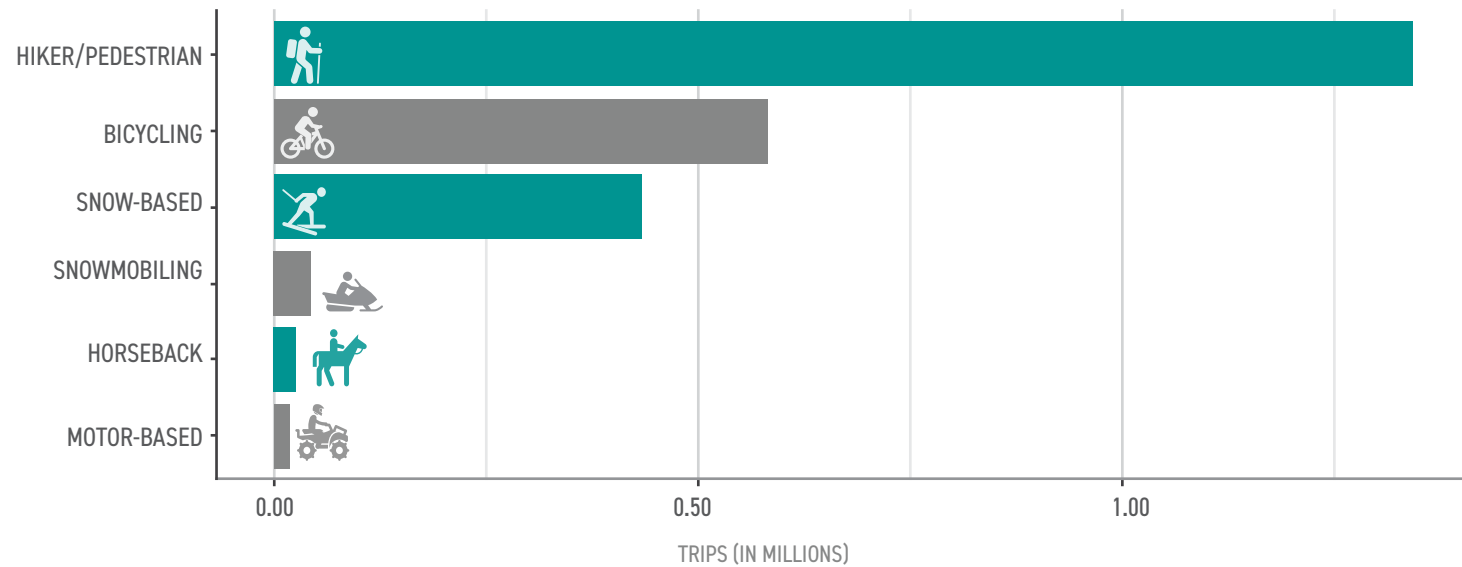
The patterns are not consistent across all communities though when considering a 60-minute drive time radius.¹⁵ For example, motorized trail use opportunities near Sisters

are the most scarce based on these metrics. And relatively speaking, snow-based trails for non-motorized activity are more abundant near communities than across the forest as a whole. Snowmobiling trails are generally abundant in terms of miles available at all geographic scales.

There are substantial differences in overall trail scarcity relative to trail use across the communities, however.¹⁶ Even though a large proportion of overall trails are within the vicinity of Bend, in comparison to its population, Bend has the least overall trail availability. This scarcity is even greater when considering visitors. In general, this suggests that even though it might appear that trail development effort is highly concentrated and successful within proximity to Bend on the DNF, demand relative to trail availability near Bend is the greatest across the DNF.

On-trail behavior does vary by activity type, with fast-paced users staying on trail (runners, cyclists) and slower users wandering from trails and into near-trail areas (walkers, dog-walkers).¹⁷ Mountain-bikers and horse riders seek different trail characteristics than hikers and other trail users, with varying trail-design elements important within each group.¹⁸ Therefore

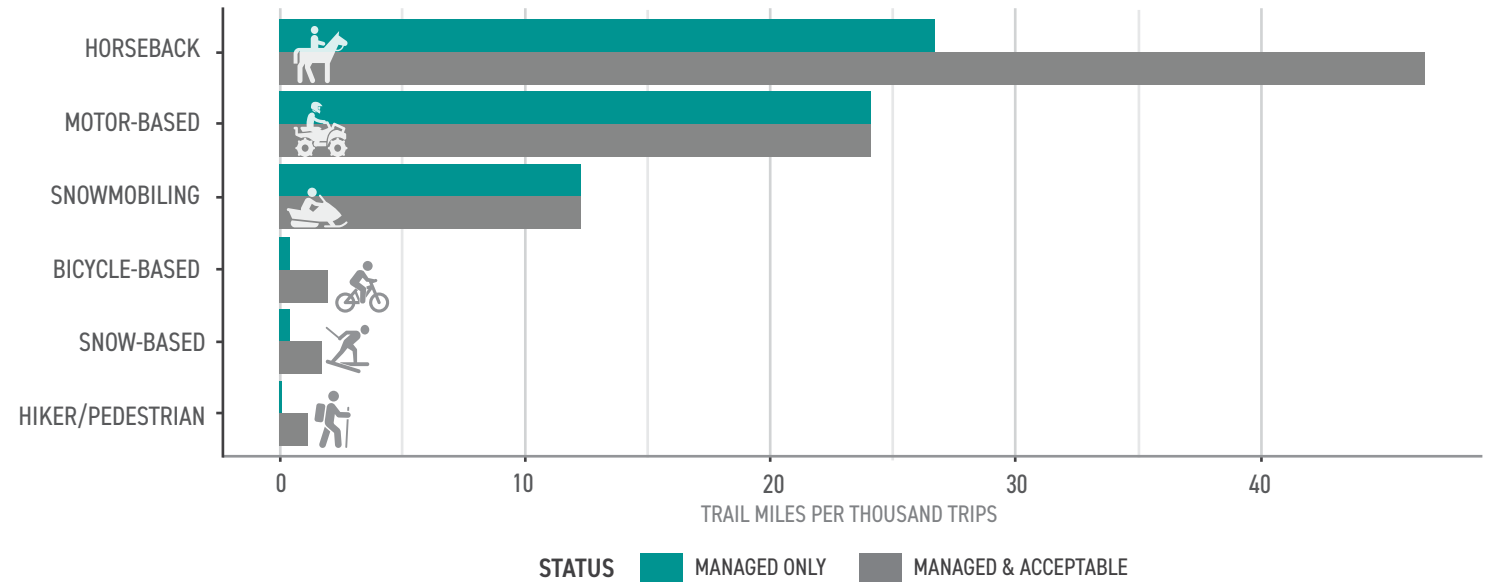
Figure 14 | Trail-Based Trips in Deschutes National Forest, 2021



Source: ECONorthwest Analysis (2021), using data from USDA Forest Service (2018). Note: calculations based on forecast from 2018 survey data. Snow-based includes non-motorized trail-related snow activities and does not include downhill skiing.

¹⁵ Community-specific participation rates by activity-type do not exist, so this does assume consistent proportionate participation patterns based on county-level data.
¹⁶ Note that this data set utilizes estimates of user occasions, which generally correspond to trips.
¹⁷ Korpilo, S., Virtanen, T., Saukkonen, T. and Lehvavirta, S., 2018. More than A to B: Understanding and managing visitor spatial behaviour in urban forests using public participation GIS. Journal of environmental management, 207, pp.124-133.
¹⁸ Wolf, I.D., Brown, G. and Wohlfart, T., 2018. Applying public participation GIS (PPGIS) to inform and manage visitor conflict along multi-use trails. Journal of Sustainable Tourism, 26(3), pp.470-495.

Figure 15 | Trail Miles per Thousand Trips by Activity, DNF



Source: ECONorthwest Analysis (2021), using data from USFS Trail Database (2020) and NVUM (2018)

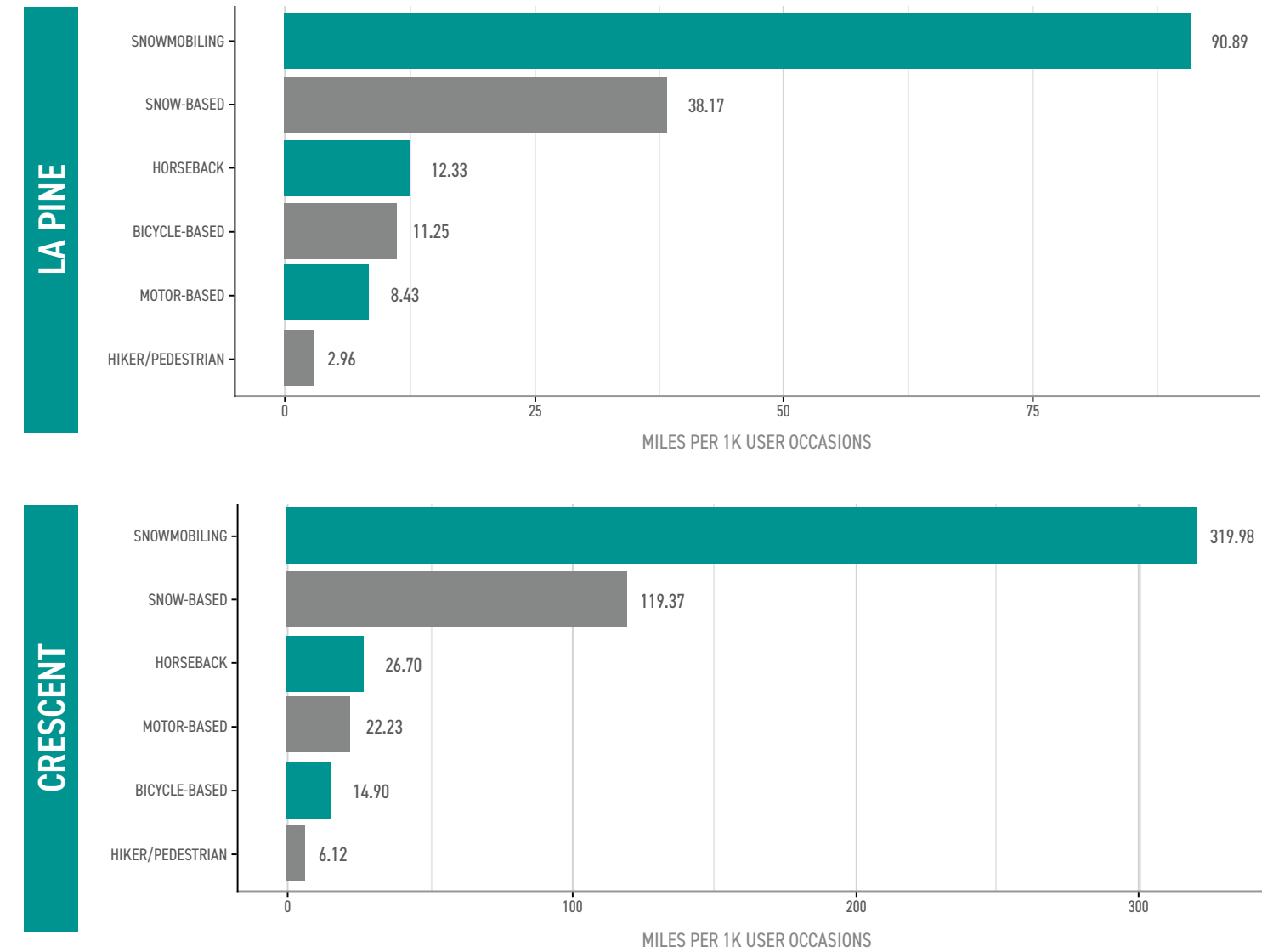
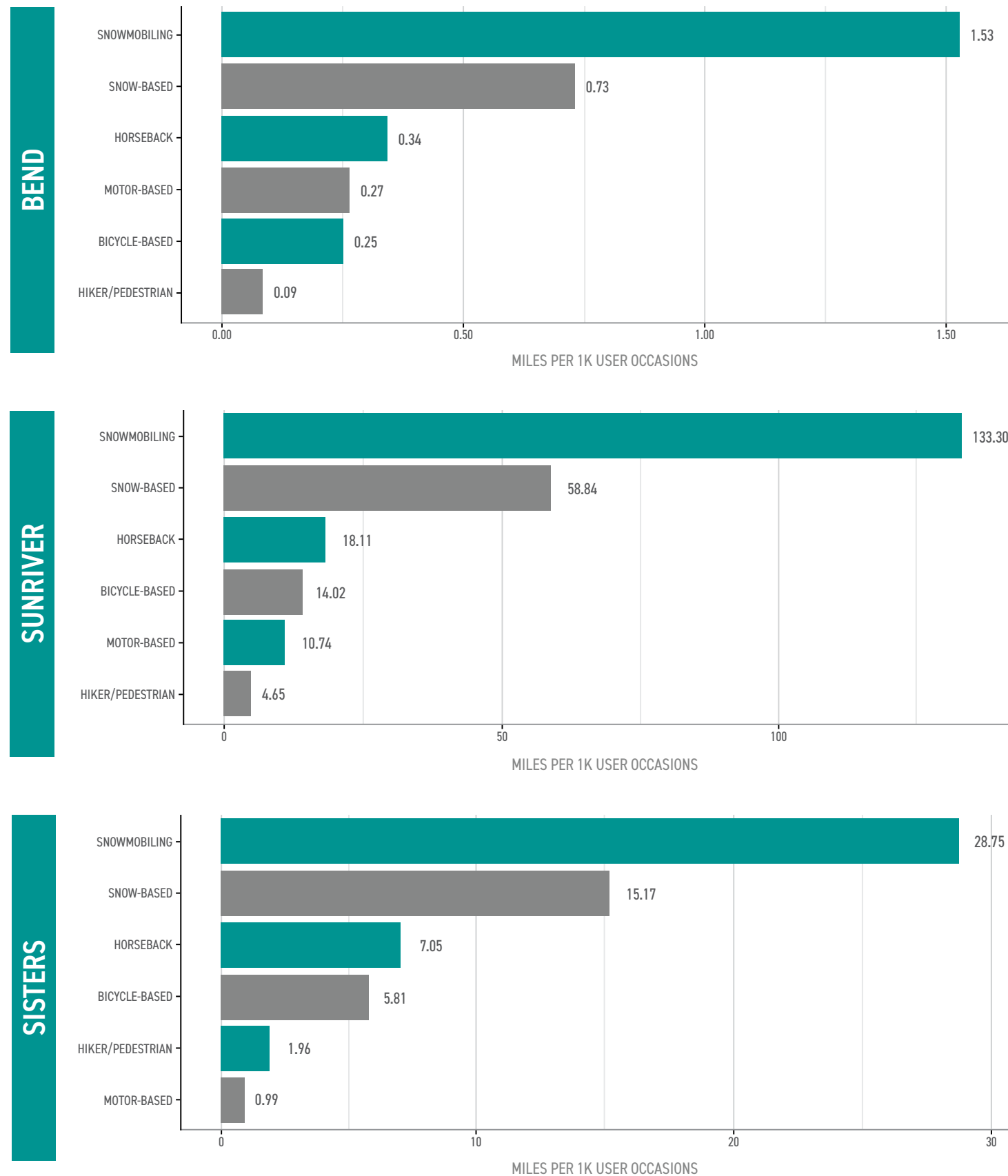
it can be useful to consider how differences in typical trip length might equate to relative scarcity and abundance of trails. If we assume a two-hour trip as representative, we can estimate a range of typical trip mileage required per trip. This can help with normalizing relative scarcity and abundance of trail types across activities with consideration for the much greater total mileage generally covered for some activities as compared to others. Snowmobile and other motorized trips can generally cover several times more total distance than hiking, non-motorized snow, and horseback trails trip (Figure 17). Biking falls in the middle of this distribution.

When accounting for typical trip mileage across the various activities, biking becomes the scarcest trail type on the DNF, but still closely followed by hiking trails (Figure 18). Trails designated for horseback riding show relatively high abundance across the activity types under this calculation. This assessment identifying the high scarcity of biking trails is consistent with the extensive volunteer contribution needed to build and maintain these trails, as well as the illegal creation of unauthorized user-built trails.



CONSIDERING NUMBER OF TRIPS AND AVERAGE TRIP MILEAGE, BIKING IS THE MOST SCARCE TRAIL TYPE ON DESCHUTES NATIONAL FOREST.

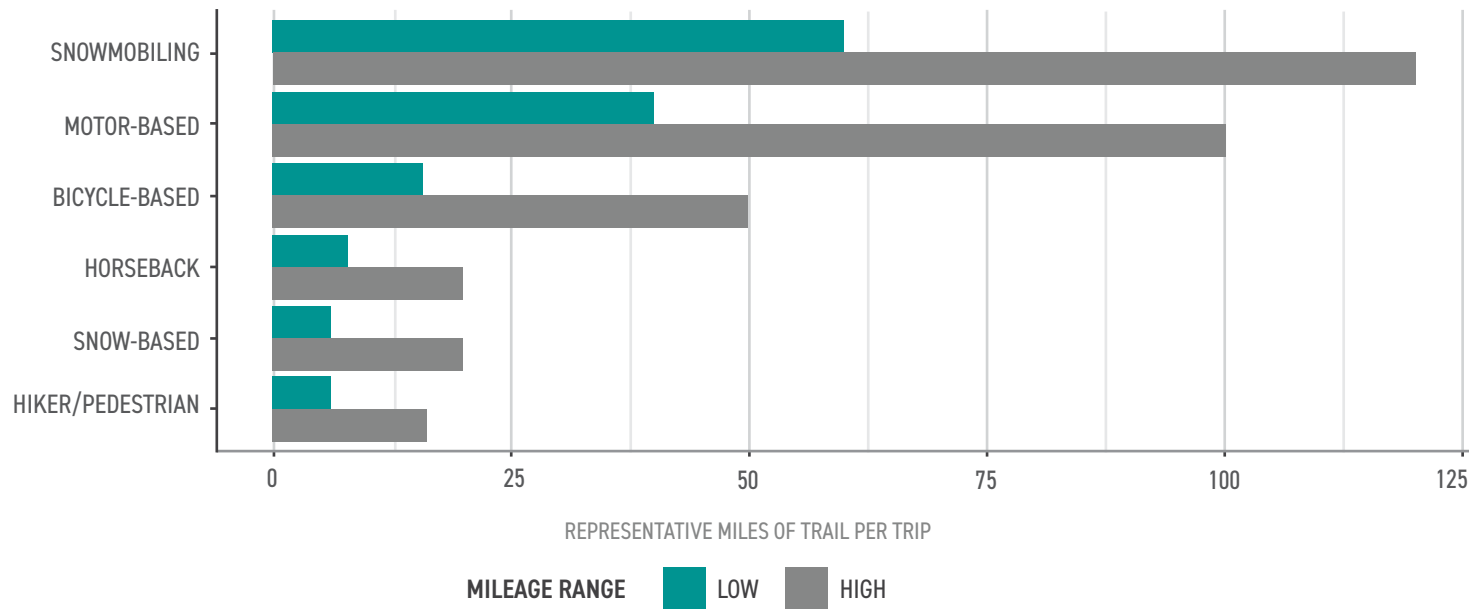
Figure 16 | Trail Miles per User Occasions, DNF and 60 Minute Drive times of Cities



Source: ECONorthwest Analysis (2021) using data from OPRD, (2018), USFS Trail Database (2020), and Census Bureau (2020)

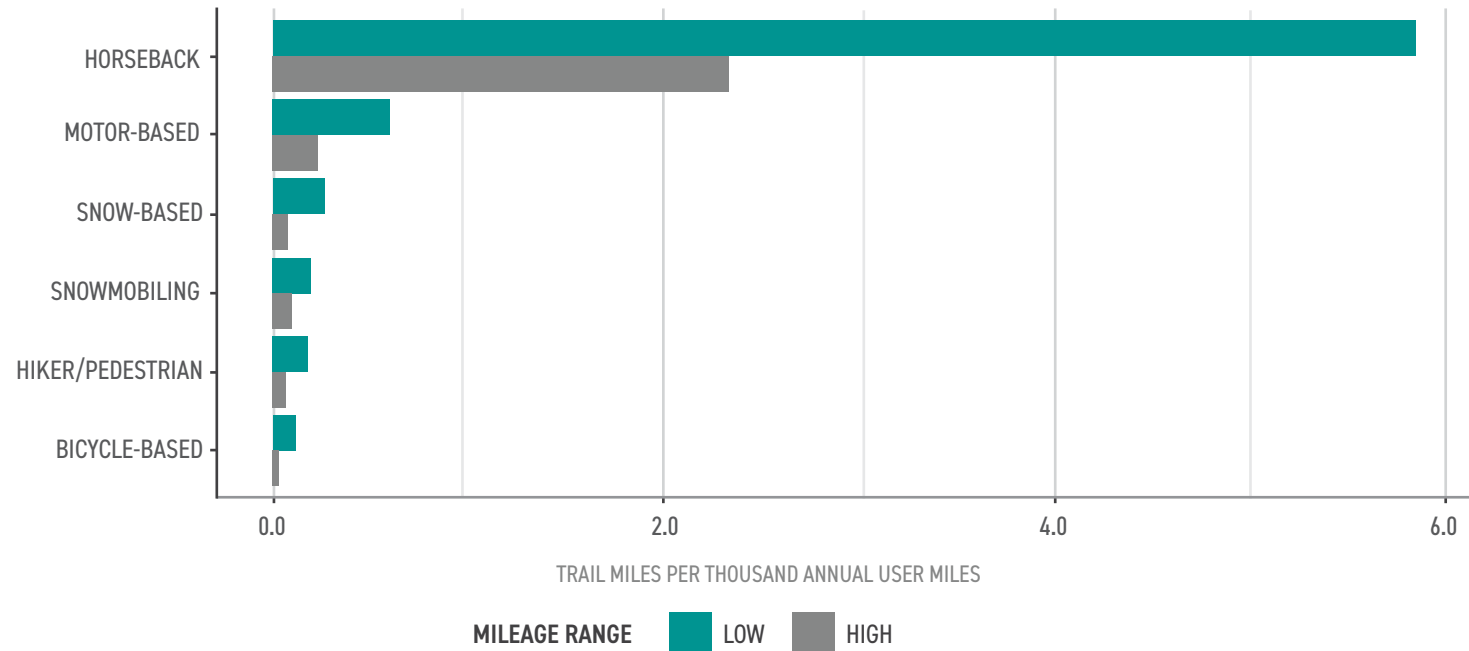


Figure 17 | Representative Trip Distance Ranges by Trail Activity



Source: ECONorthwest Analysis (2021) using data from literature review and interviews. Note: Based on average speed ranges of each activity and assuming a 2-hour trip.

Figure 18 | Ratio of Trail Miles to Annual User Miles



Source: ECONorthwest Analysis (2021) using data from USFS Trails Database (2020) and Average Trip Distance calculations.

Forecasting Future Trail Demand on the DNF

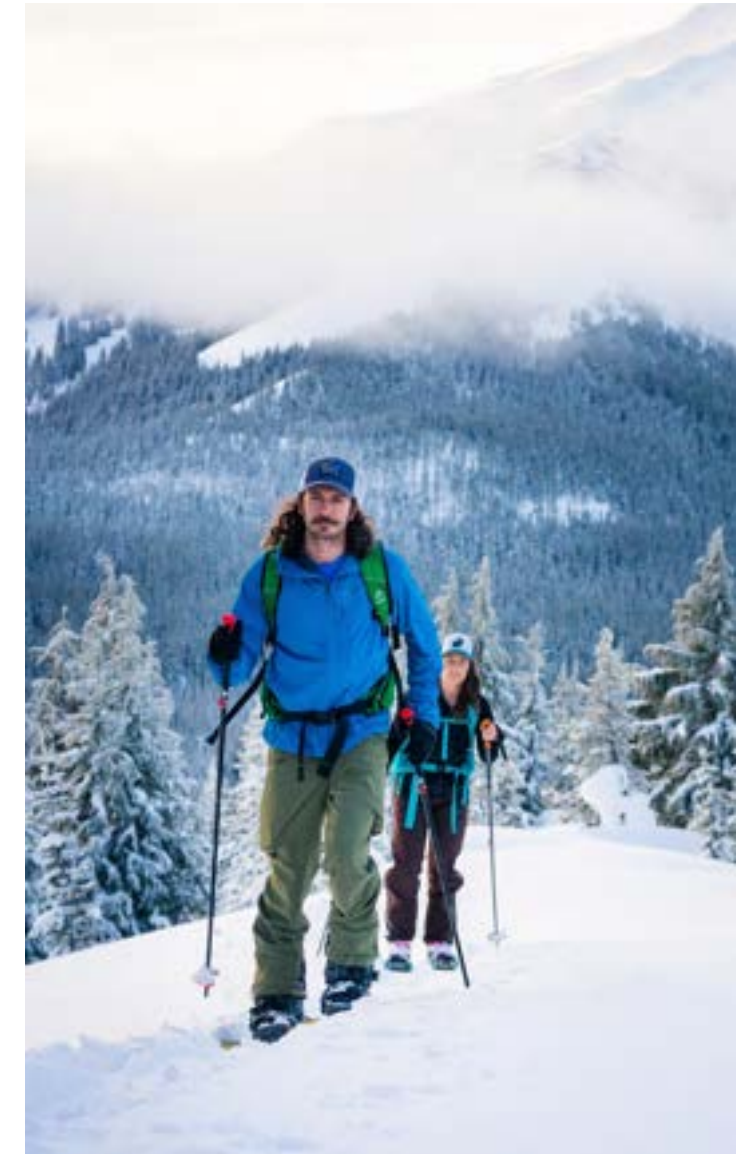
Using the visitor survey data for the DNF in combination with population forecasts for Deschutes County and the state of Oregon, we can project future expected demand for trail usage on the DNF in aggregate. We categorize visits by “local” and “non-local” based on the visitor segments for DNF in White (2017).¹⁹ We also incorporate expected trends in activity-specific usage rates developed by the USFS. These trends over the next twenty years suggest an increase from an estimated 836,000 trips on the DNF trails in 2021 to 1.15 million annual trips by 2040 (Table 4). In total this equates to 19.7 million trips on trails in the DNF from 2021 through 2040. Of these trips approximately 39 percent are expected to be by non-locals.

We use the term “trip” to represent a single day of trail usage by a single person. In some cases, an actual trip to the DNF involving trails can last multiple days, and the USFS NVUM survey data allow a breakdown of trip types that on average are greater than

Table 4 Forecast Trail Trips on DNF

ACTIVITY	TRIPS (THOUSANDS)		
	2021	2040	2021-40 SUM
Bicycling	197	268	4,618
Hiker/Pedestrian	459	636	10,851
Horseback	9	12	204
Motor-based	6	8	143
Snow-based	149	214	3,593
Snowmobiling	15	18	326
Local Subtotal	490	728	12,038
Non-local Subtotal	345	428	7,698
TOTAL	836	1,156	19,736

Source: ECONorthwest Analysis (2021) using data from OPRD (2018), Population Research Center (2018), White (2017),¹⁹ White et al. (2016),²⁰ U.S. Census Bureau (2020), USDA Forest Service (2018). Snow-based includes non-motorized trail-related snow activities and does not include downhill skiing. Local includes residents of Deschutes County.



¹⁹ White, E.M. (2017). Spending patterns of outdoor recreation visitors to national forests. Gen. Tech. Rep. PNW-GTR-961. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. “Table 19.” Note: All dollar values have been inflated from 2014 to 2021 values using the BLS CPI Inflation Calculator.

²⁰ White, Eric M.; Bowker, J.M.; Askew, Ashley E.; Langner, Linda L.; Arnold, J. Ross; English, Donald B.K. (2016). Federal outdoor recreation trends: effects on economic opportunities. Gen. Tech. Rep. PNW-GTR-945. Portland, OR

one day. We apply the appropriate trip net benefit (consumer surplus) and trip spending values by trip type and trip length when generating the trip value, trip spending, and trip economic impact forecasts in this section.

We calculate trip forecasts by origin (day, overnight, overnight in the DNF) and by trail-based activity. The base number of trips was the total visits to the forest in 2018 (~790,000). Using that as a sum, we distributed trips based on NVUM data using information on origin of visitors, party size, and trip length. We then calculated a combined growth rate based on trends in population and activity participation over twenty years. We used this to forecast trips yearly forward from 2021 out to 2040.

These trips generate benefit and value for the users, and spending on trip-related expenses that have impacts for local businesses. The benefit of a trip to participant net of the trip expenses is known as consumer surplus. This surplus value is the net value to a visitor. We can estimate the net benefit to trail users per trip by applying average consumer surplus estimates generated by the USFS for specific types of outdoor recreation activities applicable to the Pacific Northwest. These consumer surplus values are based on peer-reviewed studies applying empirical, well-established economic methods to estimate average value a visitor receives net of the travel expenses. This is done by modeling demand based on level of usage for different visitors experiencing different total trip costs. Actual benefit for any individual trip can vary dramatically, even for the same repeat participant. These methods strive to calculate an average value that is weighted for applicability across the full set of trips.

Table 5
Average Surplus Value of Recreation, USFS Region 6

PRIMARY ACTIVITY	AVERAGE CONSUMER SURPLUS per person/per activity day (\$)
Backpacking	\$33.15
Biking	\$86.74
Cross Country Skiing	\$56.52
Developed Camping	\$35.61
Downhill Skiing	\$82.23
Fishing	\$71.52
Hiking	\$84.46
Hunting	\$77.41
Motorized Boating	\$58.37
Nature-related	\$60.13
Nonmotorized Boating	\$108.93
OHV or Snowmobiling	\$50.45
Other Recreation	\$65.00
Picnicking	\$49.17
WEIGHTED AVERAGE	\$68.64

Source: Rosenberger et al (2017)



Table 6
Trail Trip Consumer Surplus Forecast for the DNF

ACTIVITY	CONSUMER SURPLUS (THOUSANDS)		
	2021 UNDISCOUNTED	2040 UNDISCOUNTED	2021-40 SUM DISCOUNTED
Bicycling	22,731	30,864	531,705
Hiker/Pedestrian	47,140	65,264	1,114,063
Horseback	875	1,197	20,540
Motor-based	466	578	10,391
Snow-based	10,240	14,742	247,083
Snowmobiling	997	1,194	21,844
Local Subtotal	48,394	71,730	1,186,722
Non-local Subtotal	34,055	42,109	758,906
TOTAL	82,449	113,839	1,945,628
DISCOUNTED TOTAL	N/A	64,921,075	1,466,115

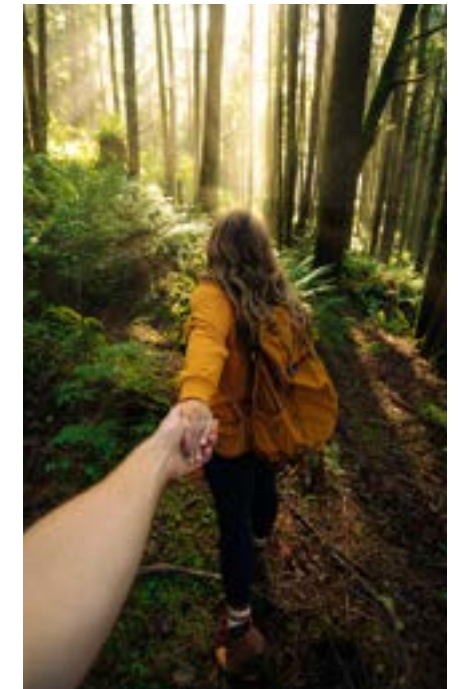
Source: ECONorthwest Analysis (2021) using data from White (2017).

The total consumer surplus supported by trails on the DNF is calculated by applying average regionally derived consumer surplus values for each activity type to the trip forecasts calculated above. The consumer surplus values are from Rosenberger (2017) as dollars per person per activity day (Table 5). We converted the consumer surplus value from 2016 dollars to 2021 dollars using the consumer price index. The consumer surplus values are per activity day, whereas some visits can last multiple days. We converted trips to activity days by applying a conversion coefficient provided in Rosenberger (2017). Note the activity categories for consumer surplus values (Table 5) do not perfectly match with the activity categories in the NVUM data, so we used the "Other Recreation" category where necessary.

Based on these methods, we can estimate the value to participants of the forecast trail trips calculated earlier. In total these trips currently provide approximately \$82.5 million in annual net benefit to participants, rising to \$113 million annually by 2040. These are values in 2021 dollars, not including inflation (or discounting). In total, with growth over time, the next twenty

years of trail-based recreation trips are expected to provide \$1.9 billion in user net benefit, or \$1.4 billion when discounting future values at 3 percent annually relative to 2021.²¹ These numbers should be interpreted as order-of-magnitude, rather than in a narrowly precise manner, due to the challenge of fully capturing the values that locals receive from convenient access to the trails of the DNF.

These dollar amounts can be considered and applied in numerous ways. Not only do they represent how valuable the trips are to participants, residents, and visitors alike, but they also speak to how valuable the trail investments are in comparison to the costs to provide these trail benefits. And in theory, participants should be willing to pay for this surplus value to provide these trail opportunities if they cannot be enjoyed otherwise.



²¹ This typical social discount rate is applied as a standard method to account for time preferences and opportunity costs associated with future values relative to present value. For more description see for example: U.S. Environmental Protection Agency. 2014. Discounting Future Costs and Benefits. Guidelines for Preparing Economic Analyses. Chapter 6.

Spending on Trail Trips

The trail-based trips provide benefits to users, and there are expenses to bear to enjoy these trips by the participants directly. The USFS provides trip spending profiles by visitor-type and trip type, generated from information compiled in visitor surveys. This spending has economic ripple effects throughout the community and regional economy, which we calculate and discuss later in this report. These spending totals and associated economic impacts do not capture the full spending of visitors to the region using the DNF trails. Specifically, these calculations do not include the spending of residents who in part choose to live in the region because of the DNF and its trail system, other than those immediate trip-specific expenditures.²²

We used IMPLAN and the spending patterns from White (2017) data to calculate the spending per party per visit by origin and time of day (Table 7). These values used 2017 as a base year so we used the CPI to convert them to 2021 values. We then joined the spending data to the trips data to calculate total spending. To do this we divided the spending per party by the average party size to get spending per person in the trip. That value was then multiplied by the number of trips to get the total spending in 2021. We differentiate overnight trips (OVN) that involve stays on the DNF from others. More detail on the composition of trip spending is provided in the next section of this report on economic contributions (e.g., Table 9).

Table 7

Spending Patterns and Spending Effects per \$1 Million, DNF, 2021

ORIGIN	LENGTH	SPENDING PER PARTY PER TRIP (\$)	EMPLOYMENT	LABOR INCOME (\$)	VALUE ADDED (\$)	OUTPUT (\$)
Non-local	Day	78.07	8	315,477	444,213	804,679
Non-local	OVN-NF	287.39	10	401,086	600,999	1,023,425
Non-local	OVN	661.83	12	472,900	739,220	1,277,488
Non-local	Non-Primary	481.92	12	474,001	737,901	1,274,474
Local	Day	41.11	7	287,209	399,711	725,669
Local	OVN-NF	205.35	8	345,836	490,832	824,791
Local	OVN	291.83	10	401,737	605,901	1,033,000
Local	All Visits	227.07	11	439,511	675,361	1,168,451

Source: White (2017), IMPLAN (2019), and ECONorthwest Analysis (2021)

Note: Spending per Party per Trip column is from White (2017), while employment, labor income, value-added and output are calculated by ECONorthwest as results per \$1 million recreation spending. Note table shows calculated values beyond significant digits for later application purposes.

²² Some portion of non-trip spending by residents using trails would be captured if their salary is in part attributable to induced effects of trip-related spending by others.



In total these methods applied to the trip estimates provide an estimate of \$81.6 million in spending associated with trail trips annually as of 2021, growing to \$104 million by 2040 in 2021 dollars, uninflated (Table 8.) In total this spending over the next twenty years is forecast to be \$1.8 billion, or \$1.4 billion discounted. This spending can then be traced based on the specific ways and geographies the dollars are spent, and the associated businesses and jobs that are affected. Note that this does not include the spending or impacts of activities to develop and maintain the trail network and associated facilities. It also does not include spending by locals separate from individual trip-specific expenditures.

Economic Impacts

For every \$1 million in spending on hiking/biking recreation the portion of funds that remains in the local economy supports jobs, labor income, and economic activity. Spending is highest for non-local overnight visitors compared to local or day visitors. For every \$1 million that non-local visitors spend when they engage in hiking or biking activities, approximately \$738,000 remains in Deschutes County. As those funds recirculate through the local economy, the total economic contribution of the \$1 million is \$1,269,000 in total output that supports \$737,000 in total values added, \$468,000 in labor income, and 12 total jobs.

Economic Contributions

Trails contribute to the economic activity of local communities by attracting people who spend money on things like gas, groceries, restaurants, lodging, and gear. To calculate the economic contribution that trails have in Deschutes County, we used the 2019 model version of IMPLAN, an economic input-output model.²⁴ The spending patterns in this analysis are for only hiking and biking, not all trail-based recreation. All spending is modelled as occurring within the local economy (i.e., Deschutes County),



Table 8

Trail Trip-Related Spending for DNF

ACTIVITY	SPENDING (THOUSANDS)		
	2021 UNDISCOUNTED	2040 UNDISCOUNTED	2021-40 SUM DISCOUNTED
Bicycling	19,295	24,177	432,829
Hiker/Pedestrian	44,877	57,337	1,016,949
Horseback	849	1,072	19,125
Motor-based	627	718	13,430
Snow-based	14,553	19,339	336,652
Snowmobiling	1,455	1,608	30,591
Local Subtotal	12,557	18,648	308,237
Non-local Subtotal	69,099	85,603	1,541,338
TOTAL	81,656	104,251	1,849,576
DISCOUNTED TOTAL	N/A	59,453	1,399,387

Source: ECONorthwest Analysis (2021) using data from IMPLAN (2019)²³ and White (2017). Note that including nonprimary non-local spending at full spending profile increases the 2021 total spending to \$224 million and 2040 to \$268 million.

²³ IMPLAN Group, LLC (2019). IMPLAN, Deschutes County. Huntersville, NC. IMPLAN.com.

²⁴ The term "economic contribution" is used throughout this memo to indicate that the analysis is quantifying the gross effects on the economy resulting from spending on trail-based recreation and not net effects ("economic impact"). An economic impact analysis would compare the economic activity resulting from spending on trail-based recreation with the alternative uses of the funds.



but due to retail margins and the broader supply chain, some of the spending does leave the local economy as 'leakages.' The spending from hiking/biking recreation that remains in the local economy has downstream supply-chain and consumption effects that ripple through other sectors of the economy. This circulation of spending throughout an economy is known as a "multiplier effect". Figure 19 provides a visual representation of how the multiplier effect is used to calculate the economic contributions resulting from an increase in spending.

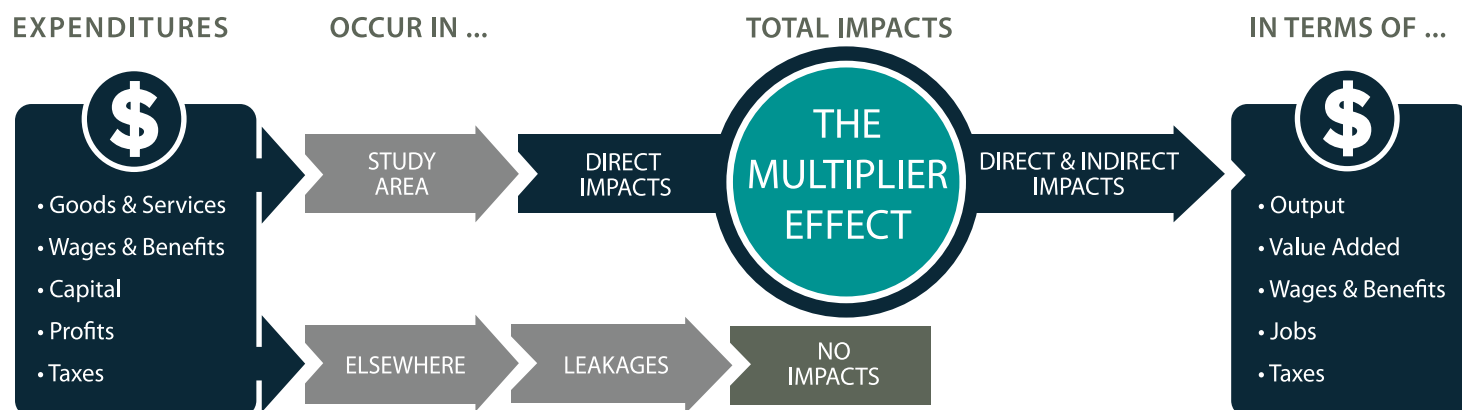
Economic contributions analysis estimates three categories of effects:

- 1. Direct effects** are the output, jobs, and employee compensation supported by the increase in spending directly attributable to trail-based recreation. These can be considered the "inputs" to the model.
- 2. Indirect effects** are the economic effects supported by trail-based recreation spending in the local economy due to increases in supply chain purchases. Increased purchases increase the demand for goods and services, which then leads to businesses purchasing more goods and hiring additional staff to meet this increased demand. These indirect effects are sometimes also referred to as "supply chain effects".
- 3. Induced effects** are the changes in regional household spending patterns caused by changes in household income. Employees and owners of the industries that experience increased economic activity from spending from trail-based recreation may increase their household spending, leading to further economic activity. These are typically referred to as "consumption effects."

Taken together, these combined economic effects (direct + indirect + induced) describe the total effect of the contribution to the economy in the region resulting from trail-based recreation. These effects are measured in terms of output, total value added, income, and jobs:

- **Output** represents the total value of all goods and services resulting from the spending and is the broadest measure of economic activity because it does not consider intermediate supply costs.
- **Total Value Added** is a measure of the additional value added through the production process and is a subset of economic output. It is the difference between the producer's total output and the cost of its intermediate inputs. Total Value Added can be interpreted as the increase in Gross Regional Product (GRP) attributable to the spending.
- **Labor Income** consists of employee compensation and proprietor income and is a subset of output. This includes workers' wages and salaries, as well as other benefits such as health, disability, and life insurance, retirement payments, and non-cash compensation.
- **Employment** is the measure of jobs which is expressed in terms of full-year-equivalents (FYE). One FYE job represents work over twelve months in an industry and can be either a part-time or full-time position. The FYE job measurement is the same definition used by the federal government's Bureau of Labor Statistics.

Figure 19 | Economic Contributions from Expenditure Multipliers within a Local Economy



Source: Created by ECONorthwest

Spending Patterns

To model the goods and services that participants in trail-based recreation purchase we relied on information from survey data collected by the U.S. Forest Service in White et al. (2017).²⁵ The U.S. Forest Service conducts a National Visitor Use Monitoring (NVUM) program which includes an economics survey that is used to construct spending profiles for outdoor recreators. The spending profiles used for our analysis are presented in Table 9.

Based on these total values, we then mapped the spending categories from Table 9 to IMPLAN categories to calculate the multiplier effects according to Table 10. Entry fees were excluded because they represent funds that flow to government. All local purchase percentages were set to 100 percent to represent spending occurring in that region, and gross retail margins were applied.

Per \$1 Million Results

We adjusted the spending patterns in Table 9 to be \$1 million total to demonstrate how spending on hiking and biking trail-based recreation recirculates through the local economy. We then used IMPLAN to estimate the direct, indirect, and induced effects of that \$1 million for each visitor type (local day, non-local day, local overnight, non-local overnight). The results are displayed in Tables 11, 13, 14, and 15 for each visitor type. Note that direct output does not total \$1 million due to leakage (e.g., entry fees that leave Deschutes County) and retail margins.

Table 9 | Visitor Spending Averages for Hiking/Biking, Dollars per Party per Trip (\$2021)

SPENDING CATEGORY	NON-LOCAL DAY TRIPS	NON-LOCAL OVERNIGHT TRIPS	LOCAL DAY TRIPS	LOCAL OVERNIGHT TRIPS
Motel	\$0.00	\$204.12	\$0.00	\$48.98
Camping	\$0.00	\$14.09	\$0.00	\$17.06
Restaurant	\$19.13	\$117.23	\$6.94	\$24.54
Groceries	\$8.52	\$71.12	\$4.64	\$59.39
Gas & Oil	\$26.92	\$72.83	\$11.27	\$33.99
Other Transportation	\$1.63	\$4.61	\$0.24	\$1.40
Entry Fees	\$4.06	\$8.61	\$1.67	\$5.03
Recreation & Entertainment	\$1.40	\$27.22	\$0.55	\$2.34
Sporting Goods	\$1.16	\$10.54	\$1.87	\$9.20
Souvenirs & Other Expenses	\$1.90	\$27.63	\$0.63	\$6.62
Total	\$64.73	\$557.99	\$27.80	\$208.57

Source: White (2017)



²⁵ White, E.M. (2017). Spending patterns of outdoor recreation visitors to national forests. Gen. Tech. Rep. PNW-GTR-961. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Economic Impact

of the Deschutes National Forest Trail Network for Local Businesses

Table 10 | IMPLAN Sector Category Matching

IMPLAN SECTOR	IMPLAN DESCRIPTION	WHITE (2017) CATEGORY
507	Hotels & Motels	Motel
508	Other Accommodations	Camping
509	Full-service Restaurants	Restaurant
406	Retail - Food & Beverage Stores	Groceries
408	Retail - Gasoline Stores	Gas & Oil
420	Scenic & Sightseeing Transportation	Other Transportation
501	Museums, Historical Sites, Zoos & Parks	Recreation & Entertainment
410	Retail - Sporting Goods, Hobbies, Musical Instruments & Bookstores	Sporting Goods
411	Retail - General Merchandise Stores	Souvenirs & Other Expenses

Source: Created by ECONorthwest using data from IMPLAN (2019)



Table 11 | Non-Local Day Hiking/Biking Results
per \$1 million in Spending, Deschutes County (\$2021)

IMPACT	EMPLOYMENT	LABOR INCOME	VALUE ADDED	OUTPUT
1 - Direct	6	\$220,149	\$286,405	\$495,202
2 - Indirect	1	\$55,662	\$86,162	\$184,701
3 - Induced	1	\$69,172	\$116,167	\$201,470
TOTAL	9	\$344,982	\$488,735	\$881,374

Source: ECONorthwest Analysis (2021) using data from IMPLAN (2019)

Table 12 | Non-Local Overnight Hiking/Biking Results
per \$1 million in Spending, Deschutes County (\$2021)

IMPACT	EMPLOYMENT	LABOR INCOME	VALUE ADDED	OUTPUT
1 - Direct	8	\$295,131	\$456,654	\$737,965
2 - Indirect	2	\$79,022	\$122,508	\$257,936
3 - Induced	2	\$93,691	\$157,358	\$272,895
TOTAL	12	\$467,843	\$736,519	\$1,268,795

Source: ECONorthwest Analysis (2021) using data from IMPLAN (2019)

Table 13 | Local Day Hiking/Biking Results
per \$1 million in Spending, Deschutes County (\$2021)

IMPACT	EMPLOYMENT	LABOR INCOME	VALUE ADDED	OUTPUT
1 - Direct	6	\$208,111	\$267,741	\$460,889
2 - Indirect	1	\$51,288	\$80,518	\$173,898
3 - Induced	1	\$65,182	\$109,465	\$189,847
TOTAL	8	\$324,581	\$457,723	\$824,634

Source: ECONorthwest Analysis (2021) using data from IMPLAN (2019)

Table 14 | Local Overnight Hiking/Biking Results
per \$1 million in Spending, Deschutes County (\$2021)

IMPACT	EMPLOYMENT	LABOR INCOME	VALUE ADDED	OUTPUT
1 - Direct	7	\$264,914	\$386,307	\$613,146
2 - Indirect	1	\$63,099	\$98,225	\$207,116
3 - Induced	2	\$82,380	\$138,358	\$239,947
TOTAL	10	\$410,392.81	\$622,889.72	\$1,060,209

Source: ECONorthwest Analysis (2021) using data from IMPLAN (2019)

Economic Impact

of the Deschutes National Forest Trail Network for Local Businesses

These results are normalized to reflect \$1 million in spending across the different visitor types. However, a reminder is that all visitor types have different spending patterns, as described in Table 9. Because non-local overnight trips have a much higher spending level there would be fewer trips required to achieve \$1 million in spending. For example, it would take only 1,792 trips by non-local overnight parties to spend \$1 million, but it would take 35,970 local day trips to spend that same level.

It is important to remember that these are gross, rather than net, impact estimates. A net analysis would require estimating and modeling how a dollar would be spent if these trail opportunities did not exist on the DNF, and measure the incremental local impact differences between those two scenarios. Trips by non-locals are most likely to represent spending that would not occur in Deschutes County if the trail-based trips did not occur, and rather be spent elsewhere.

Using this information on the spending profiles, we can estimate the impacts of spending for the full set of trail-related trips now and forecast over the next twenty years. The impact estimates in the near-term should be interpreted with more confidence than those in the future. IMPLAN does not measure long-term impacts, but rather looks at the economy at a single point in time. Applying these annual values to future estimates should be done with caution because the structural relationships of the local economy are likely to change in the future (e.g., there will be different suppliers and people will spend their wages on different items).



Given these caveats, in total the forecast trail-related trips on the DNF support 885 jobs as of 2021, rising to 1,121 by 2040 (Table 15). This means \$36 million in annual labor income in 2021, increasing to \$46 million by 2040 (in 2021 dollars, without inflation or discounting). The total labor income resulting over the twenty-year timeframe is \$809 million. This economic activity is responsible for \$5.4 million value added locally and \$49.7 million non-locally in 2021. Total output associated with the spending was \$96 million in 2021 and will reach \$1.6 billion by 2040 (in 2021 dollars, uninflated) (Table 16). Given the economic growth and diversification underway in Deschutes County and Central Oregon, it is likely that more and more of the spending for trail-related trips will occur local to the DNF and have local multiplier effects. If patterns at least maintain their current trajectories, these trips could have economic impacts of over \$1.6 billion over the next twenty years.

Overall, these employment effects are primarily attributable to visitors (non-locals), particularly when considering the full trip spending of all trips by non-locals. In an aggregate sense for the communities of Central Oregon as a whole, it is difficult to fully identify and quantify the job creation and regional economic



output of residents attributable to trails on the DNF. The extent, variety, accessibility, and quality of the trails are an important attraction to skilled, well-educated workers and business owners and executives. A 2017 evaluation of jobs in Bend by ECONorthwest in coordination with Oregon Employment Department found that “Lifestyle Industries” in Bend, identified as those professional positions compatible with choices to live where desired, had seen stronger and more stable growth than other industry categories on average, particularly the direct recreation and tourism industry service jobs that directly support visitors.²⁶ The study found more than twice as many businesses in Bend associated with these “Lifestyle Industries” than associated with the Recreation and Tourism Industry.

This Bend Parks and Recreation District (BPRD) study also showed that property values for homes in Bend are higher when they are close to trails, all else equal. This speaks not only to the value that residents receive from living near trails, but also all of the value captured by businesses involved in the construction and real estate industries. It isn’t feasible to identify the incremental contribution of the DNF trails, but they are certainly a large part of the equation, particularly looking at the rapid residential, commercial, and professional service businesses that have located in the rapidly-growing Northwest Crossing neighborhood near the DNF Phil’s Trail trailhead.

This analysis does not explicitly address event-related spending and impacts. Visit Bend produces reports on the local economic impact of regional outdoor recreation-related events, including several that utilize the DNF trails.²⁷ Events can attract large numbers of non-locals and generate high rates of spending, dollars that would not likely have been spent locally otherwise. The BPRD study also addressed the visitation and impacts associated with events in the region, several of which utilize trails and facilities on the DNF but have activities that extend into town. This included 130,000 annual event attendees and over \$3 million in annual spending for events utilizing BPRD facilities. Several outdoor events utilize trails on DNF, particularly races, including events captured in the BPRD study and more. It is not practical however to calculate the event-specific visitor spending and benefit values though, as the existing applied survey data should generally capture those numbers. It is an important category of regional economic impact to keep in mind though when considering the broader contributions of the DNF trails to the region.

²⁶ ECONorthwest. 2017. Economic Contributions of Bend Park and Recreation District. Bend Parks and Recreation District. <https://www.bendparksandrec.org/wp-content/uploads/2018/01/BPRD-Economics-ECONW-2017-Nov.pdf>.

²⁷ Visit Bend. Business Data. <https://www.visitbend.com/about-us/business-data/>.

Table 15 | Total Employment Impacts of Trail-Related Spending on the DNF

ACTIVITY	EMPLOYMENT			LABOR INCOME (THOUSANDS)		
	2021	2040	2021-40 SUM	2021	2040	2021-40 SUM
Bicycling	209	260	4,673	8,485	10,536	189,458
Hiker/Pedestrian	487	616	10,978	19,734	24,988	445,136
Horseback	9	12	206	373	467	8,371
Motor-based	7	8	145	276	313	5,879
Snow-based	158	208	3,634	6,399	8,428	147,355
Snowmobiling	16	17	330	640	701	13,391
Local Subtotal	96	142	2,355	3,861	5,733	94,767
Non-local Subtotal	790	978	17,612	32,046	39,700	714,824
TOTAL	885	1,121	19,967	35,906	45,433	809,591
DISCOUNTED TOTAL	N/A	N/A	N/A	N/A	25,910	612,820

Source: ECONorthwest Analysis (2021) using data from IMPLAN (2019) and White (2017). Note: jobs represent job-years; one job for one year. Sum of 2021 to 2040 represent a total number of job-years, undiscounted. Similarly, labor income is not discounted.

Table 16 | Total Economic Output of Trail-Related Spending on the DNF

ACTIVITY	VALUE ADDED (THOUSANDS)			OUTPUT (THOUSANDS)		
	2021	2040	2021-40 SUM	2021	2040	2021-40 SUM
Bicycling	13,041	16,166	290,944	22,566	27,987	503,563
Hiker/Pedestrian	30,331	38,340	683,577	52,484	66,374	1,183,129
Horseback	574	717	12,856	993	1,241	22,250
Motor-based	424	480	9,028	733	831	15,626
Snow-based	9,836	12,932	226,287	17,020	22,388	391,656
Snowmobiling	983	1,075	20,564	1,702	1,861	35,593
Local Subtotal	5,439	8,078	133,518	9,643	14,321	236,712
Non-local Subtotal	49,750	61,633	1,109,737	85,855	106,362	1,915,105
TOTAL	55,189	69,711	1,243,255	95,498	120,682	2,151,817
DISCOUNTED TOTAL	N/A	39,754,970	941,165,903	N/A	68,824	1,628,924

Source: ECONorthwest Analysis (2021) using data from IMPLAN (2019) and White (2017).

Providing the overall trail network on Deschutes National Forest is a concerted effort across thousands of volunteers, trail crews, the DNF staff, materials and heavy equipment, facility upkeep and capital improvement, design, planning, permitting, administration, and other efforts. It also must be coordinated with management objectives and investments to manage water quality, habitat, timber resources, and wildfire risk. This section provides a summary of available cost data specific to the DNF trail system, primarily for non-motorized trails. It includes a forecast of costs based on expected growth in trail demand and usage as described earlier. It does not include all capital investments that will likely be required over the next twenty years to keep pace with demand and maintain a high level of service. For example, new trailheads, bridges, erosion control, toilets, and potentially campgrounds are not directly included in these analyses. These costs should be interpreted as representative of the order-of-magnitude of costs necessary to maintain the current trail experience. The following costs also do not include investments in recreation infrastructure and its maintenance through federal appropriations under legislation such as the Great American Outdoors Act.

Below are summaries of estimated costs for trail maintenance in DNF to meet projected population growth and associated recreation demand through 2040 (Table 17). Costs are based

The Central Oregon Combined Off Highway Vehicle Operations (COHVOPS) program is responsible for maintenance and operations of motorized trails for Class I, II, and III off-highway vehicles.²⁸ The program is a partnership between Prineville Bureau of Land Management, Deschutes and Ochoco National Forests, and the Oregon Parks and Recreation ATV program. USFS contributes approximately \$75,000 while the BLM contributes approximately \$40,000 annually through staff, materials, and volunteer support.²⁹ The program primarily relies on the Oregon Parks and Recreation ATV grant funding, an estimated \$500,000 annually, collected from ATV user permit sales and a share of the gasoline tax revenue.³⁰

on data provided by DNF staff and data extracted from the trail management database. USFS currently invests approximately \$780,000 annually in maintenance and operations of trails and trailhead facilities on DNF. Approximately \$350,000 is used to maintain and operate trails including funds spent on permanent/seasonal employees, materials and supplies, and volunteer support.³¹ An additional \$281,000 is spent every year to maintain and operate trailhead facilities while an additional \$150,000 is used to employ planning and support staff.³² Volunteers

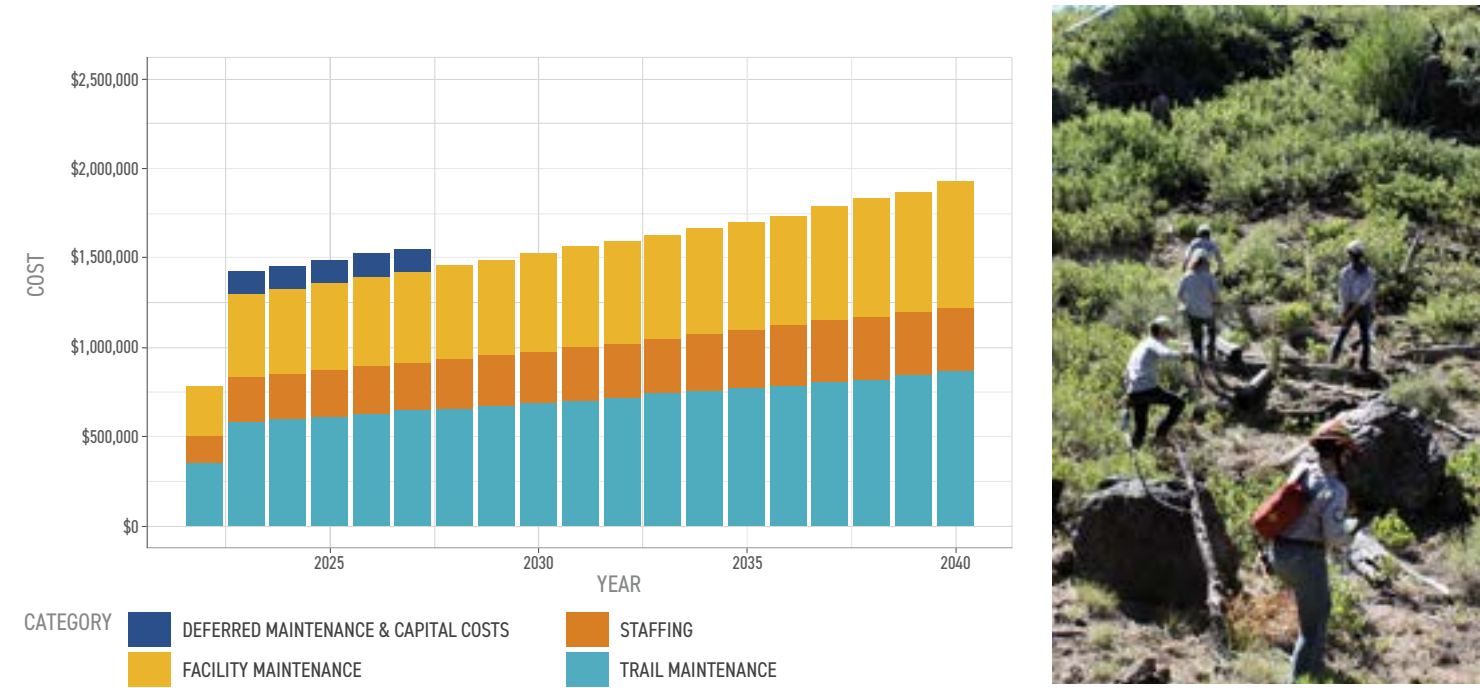
Table 17 | Estimated Annual Costs for Trail Maintenance and Funding Gap, DNF (in 2020 dollars)

COST ITEM	CURRENT ESTIMATED ANNUAL BUDGET	ESTIMATED BUDGET TO ADDRESS BACKLOG & REACH 100% MAINTENANCE	ESTIMATED IMMEDIATE FUNDING GAP	ESTIMATED ANNUAL FUNDING NEED BY 2040
Trail Maintenance	\$350,000	\$583,000	\$233,000	\$860,000
Facility Maintenance	\$281,000	\$468,000	\$187,000	\$690,500
Staffing	\$150,000	\$250,000	\$100,000	\$369,000
Total Budget	\$781,000	\$1,300,000	\$521,000	\$1,920,000
Volunteer Hours	32,500	54,200	21,700	80,000
Value of Volunteer Hours	\$826,000	\$1,380,000	\$551,000	\$2,036,000
Total Costs Including Volunteer Hours	\$1,607,000	\$2,681,000	\$1,071,000	\$3,956,000

Source: ECONorthwest Analysis (2021) using data from USFS Trail Database (2020).

²⁸ U.S. Bureau of Land Management. (n.d.) Millican Valley OHV Trail System. Available at: <https://www.blm.gov/visit/millican-valley-ohv-trail-system>. Accessed on April 1, 2022.
²⁹ Machnik, Lisa. (Staff, U.S. Forest Service). Personal Communication. March 2022.
³⁰ Oregon Parks and Recreation Department. (n.d.) All-Terrain Vehicle Grant Program. Available at: <https://www.oregon.gov/oprd/GRA/Pages/GRA-atv.aspx#:~:text=The%20ATV%20Grant%20Program%20provides,percentage%20of%20gasoline%20tax%20money>. Accessed on April 1, 2022.
³¹ Machnik, Lisa. (Staff, U.S. Forest Service). Personal Communication. February 2022.
³² Ibid.

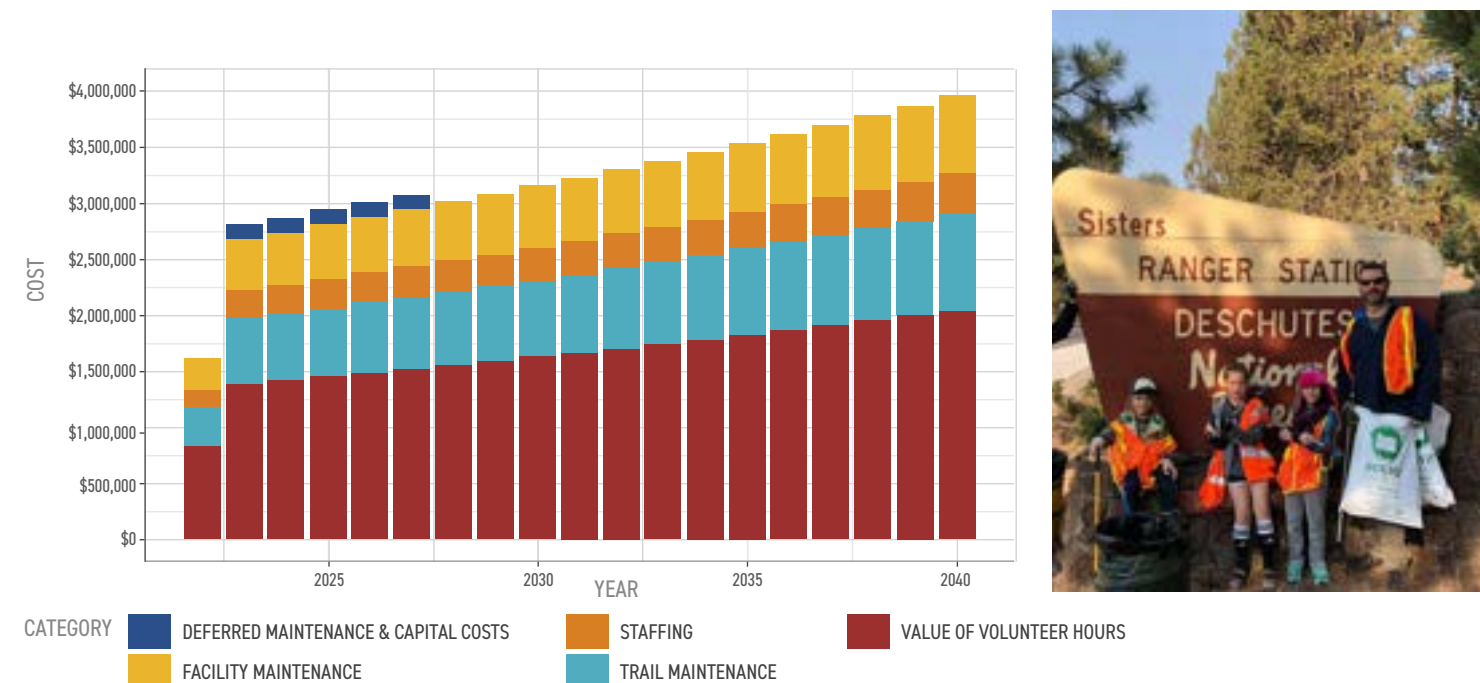
Figure 20 | Estimated Trail Costs to Meet Projected Demand and Maintenance Backlog, DNF 2022-2040



Source: ECONorthwest Analysis (2021) using data from USFS Trail Database
 Note: Estimates based on forecasts utilizing underlying data provided by DNF.



Figure 21 | Estimated Trail Costs to Meet Projected Demand and Maintenance Backlog Including Volunteer Hours, Deschutes NF 2022-2040



Source: ECONorthwest Analysis (2022) using data from USFS Trail Database
 Note: Estimates based on forecasts utilizing underlying data provided by DNF.



dedicate an estimated 32,500 hours to support trail and facility maintenance activities.³³

Maintenance activities on trails vary considerably with most trails (60-80%) being cleared for logs and only an estimated 30-60% of trails receiving substantial maintenance or improvements.³⁴ For our analysis, we assume the annual investment maintains 60% of trails to continue to meet USFS standards. The annual funding gap to approach the same maintenance standard on 100% of trails would require \$233,000 of which \$150,000 would be used to hire staff on a full-time, seasonal, and internship basis along with supplies, contract work, and crew/volunteer support.³⁵ An additional \$187,000 would need to be spent to scale activities to approach maintenance and operation of 100% trailhead facilities. Additional funds may be required to upgrade roads and parking lots or to employ additional planning and support staff, but these expenses would vary based on scope of the projects in the future.

The current best estimate of costs for identified deferred capital investments in trailhead facilities is \$351,000 but the actual investments are expected to be significantly higher to capture costs of paving such as asphalt repair and other intermittent investment needs.³⁶ Currently, there are no such estimates for capital investment needs in the trails themselves but the trail management database has \$280,000 of identified deferred maintenance and capital improvement needs for trails. The analysis uses this to project the capital investments required on trails in the future to ensure they meet maintenance standards.

The current trail budget estimate addresses basic maintenance like clearing fallen trees for less than 60 percent of the trail network, so additional funds or volunteer effort are necessary for more targeted maintenance like drainage and repair as well as expanding maintenance to the full trail network (100 percent). Volunteers provide significant support in maintenance activities, but more intensive and targeted activities require dedicated staff and materials. The backlog of facility and structural maintenance needs (e.g., bridges) must also be addressed before facilities and structures fail.

Based on current best estimates for maintenance and operation costs for trails and trailhead facilities, an immediate funding gap of approximately \$521,000 needs to be addressed for existing trails. In addition, trail usage overall is expected to grow by about 2.3 percent per year through 2040. To meet this increased demand, it is expected that the level of spending on trail and

³³ Ibid.

³⁴ Ibid.

³⁵ Ibid.

³⁶ Ibid.

facility maintenance will have to grow at an equivalent pace, with a total of \$46.5 million in additional funding (including capital investments) required for this growth (in time-discounted net present value (NPV) terms) through 2040 in total (2022-2040).

Looking at the annual distribution of these trail and trail facility maintenance costs, we can observe an upward trend (Figure 20). We assume the deferred maintenance and pending capital investments would be distributed over a 5-year timeframe. It is useful to observe these costs and trends with appropriate inclusion of the value of volunteer contributions as well (Figure 21). Considering the current annual maintenance spending of approximately \$1.6 million, this would mean the DNF needs about \$44.9 million in additional funding through 2040 to maintain all trail miles, address its maintenance backlog, and increase its service to meet increased trail demands.

These maintenance cost estimates do not include the costs of planning or building any new facilities such as visitor centers or trails. New capital investments will be necessary as well, but sufficient data do not currently exist to anticipate the level of investment that will be necessary for capital expenses. These funding needs also do not cover the cost of mitigation activities on user-created trails that are currently covered through partnerships with local organizations but would increase with an increase in trail users over time. Growth in the trail network to meet demand must adhere to the USFS's multiple use mission, including stewardship of natural resources and habitat, and account for staffing levels needed for maintenance. It can be expected though that capital expenses—if investment paces demand and continuation of a high level of service—would be millions of additional annual dollars. This can include trail reconstruction or improvement beyond feasibility for basic maintenance activities. For example, two trails in NCVM requiring reconstruction have costs of \$650k alone.

Furthermore, trail improvements frequently require planning and permitting efforts as well. Environmental Assessments or Environmental Impact Statements in compliance with the National Environmental Policy Act can range from a few thousand dollars (for a re-route or a simple bridge) to several hundred thousands of dollars for each large and complex new project in terms of staff and specialist professional service expenses. Continued investment in the trail network of the DNF to maintain current assets and keep pace with demand will require millions of additional dollars of funding annually. While

these costs are high, it is important to keep in perspective that they are two orders of magnitude less than the hundreds of millions of dollars of annual value generated by the trail network, calculated earlier.

Key data references and assumptions for this cost analysis are listed below.

- Current annual spending on trails and facilities by the USFS (estimated): **\$1.6 million.**
- Current percentage of trail miles maintained annually: **60–80%.**
- Current annual volunteer hours on trail maintenance: **32,500 hours.**
- Expected annual growth in trail usage through 2040: **2.31% per year** (population growth plus average annual growth in trail activity participation).
- Trail and facility maintenance backlog is addressed over first five years.
- Annual trail maintenance increases from 60% of all trails to 100% in 2023.
- Costs for trail maintenance increase across all categories at a constant ratio relative to existing spending proportionate to number of annual trips.
- The increase in annual trail maintenance over time is partly addressed by volunteers, at the same ratio as for overall existing maintenance.
- Value of volunteer time = \$25.43/hour (standard USFS estimate).
- Discount rate on future costs for net present value calculations = 3%.

Taxpayer Costs of USFS Trails

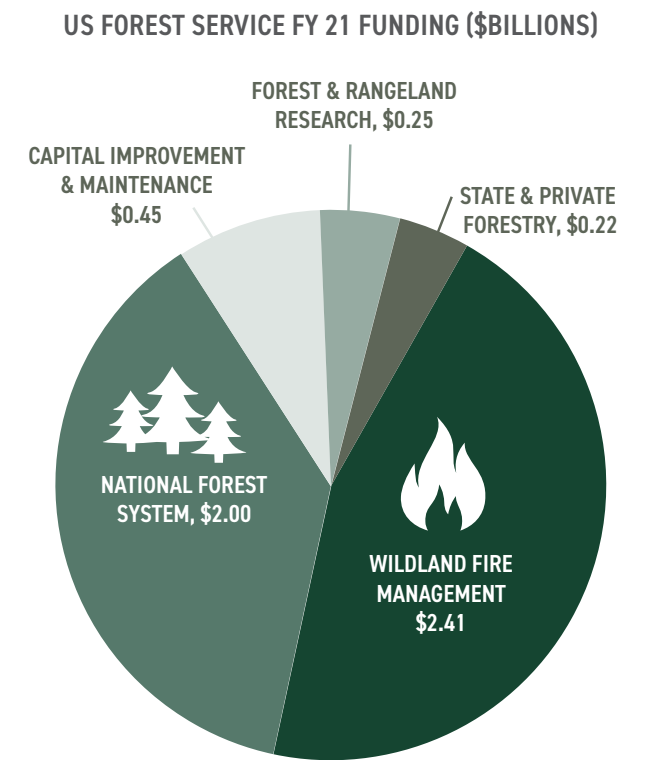
This section briefly summarizes U.S. Forest Service (USFS) budget allocations for recreation and trails and the burden placed on the average taxpayer for funding for these activities nationally. Annual discretionary funding for the USFS has ranged between \$4.9 billion and \$5.8 billion since 2011.³⁷ Funding for recreation and trails maintenance typically is provided by appropriations for the National Forest System and accounts for capital improvement and maintenance.

³⁷ Congressional Revenue Service. 2020. Forest Service Appropriations: Ten-Year Data and Trends (FY2011-FY2020). <https://crsreports.congress.gov/product/pdf/R/R46557/4>

³⁸ U.S. Dept. of Agriculture. 2020. FY 2021 Budget Justification. U.S. Forest Service. <https://www.fs.usda.gov/sites/default/files/2020-02/usfs-fy-2021-budget-justification.pdf>

³⁹ Headwaters Economics (2019). National Forest Gross Receipts from Commercial Activities, FY 1986-2017.

Figure 22
US Forest Service Budget Appropriation, FY 2021



Source: U.S. Dept. of Agriculture (2020). FY 2021 Budget Justification. U.S. Forest Service. Note that values in the chart are in \$ billions.

USFS Recreation Funding by the Numbers

- **\$342.4 million:** total amount to be spent nationally for USFS Recreation Program and Trail Improvement and Maintenance in FY21.³⁸
- **\$100 million:** average annual amount collected in USFS recreation user fees nationally.³⁹
 - **95 percent** of these go directly to the recreation site where they were collected.
- **\$1.26** estimated tax dollars the average individual paid in 2019 that went toward recreation and trail funding on all National Forest System lands.

The USFS was appropriated \$5.3 billion in discretionary funding in fiscal year 2021. Of this, 45 percent is for Wildland Fire Management, 38 percent is for the National Forest System, with the remainder going to capital improvement, research, and state and private forestry programs (Figure 22).



Table 18 | Estimation of Taxpayer Burden for USFS Recreation Funding

RECREATION-RELATED MAJOR BUDGET ITEMS	
ITEM	FY 2021 BUDGET
Recreation, Heritage & Wilderness	\$263,629,000
Capital Improvement & Maintenance-Trails	\$78,808,000
TOTAL Major Recreation & Trail Budget Categories	\$342,437,000

US GOVERNMENT SPENDING AND REVENUE STATISTICS	
ITEM	AMOUNT
Total Government Spending in 2019	\$4.4 trillion
Total Tax Revenue Collected by US Government	\$1.7 trillion
Total Social Security & Medicare Tax Revenue	\$1.2 trillion
Other Sources of Federal Revenue	\$0.6 trillion
Federal Deficit	\$0.9 trillion

ESTIMATED TAXPAYER CONTRIBUTIONS TO FEDERAL DISCRETIONARY SPENDING	
VALUE	CALCULATION OR AMOUNT
Total Spending Minus Social Security & Medicare Revenues	\$3.2 trillion
Implied Ratio of Individual Taxpayer Burden on Federal Spending	\$1.7/\$3.2=53%
Total Number of Individual Taxpayers	144 million

ESTIMATED TAXPAYER CONTRIBUTIONS TO FEDERAL DISCRETIONARY SPENDING	
VALUE	CALCULATION OR AMOUNT
Total Recreation Spending	\$342.4 million
Total Recreation Spending Funded by Taxpayers	\$342.4 million * 53% = \$181.5 million
Total USFS Recreation Spending per Taxpayer	\$181.5 million/144 million = \$1.26

Note: Calculations based on ECONorthwest Analysis from budget details described in text.



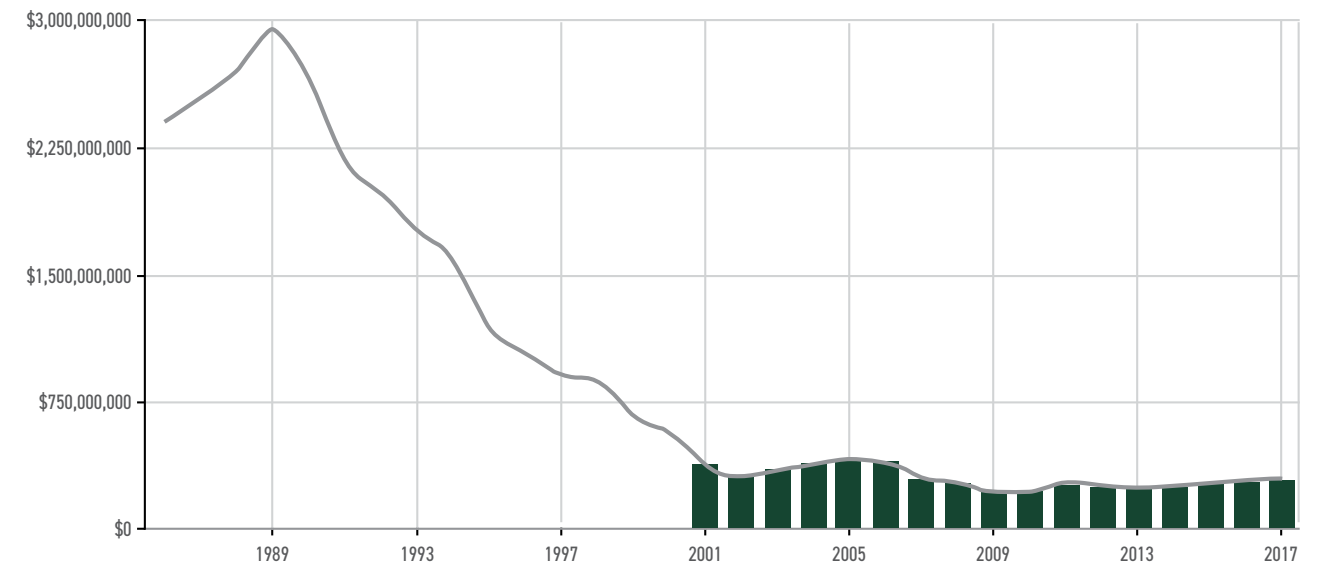
Taxpayer Burden of USFS Recreation and Trails Funding

Most recently (2021 budget) the USFS was allocated \$263.6 million for its recreation program, and \$78 million was designated for trails maintenance and capital improvements. While some improvements of facilities and roads may benefit trails and recreation programs, the agency does not explicitly state how much of this, and other funding sources, goes directly toward recreation-related activities. According to calculations based on U.S. revenue and budget data compiled by the Federal Reserve Bank of St. Louis, approximately 53 percent of discretionary funding for agencies comes from taxes paid by individuals.⁴⁰ At this rate, the implied taxpayer burden of USFS recreation and trail spending is \$1.26 per individual taxpayer (Table 18).⁴¹ This figure represents USFS funding nationally, so individual users of the DNF would, in theory, bear an even lower cost for the portion of funding that goes to the individual forest. Looking only at the portion identified as specific to trail capital improvement and maintenance, this drops to approximately 29 cents per individual taxpayer annually.

Other Sources of Recreation Funding

The USFS also funds its recreation projects through non-taxpayer revenue sources. The agency collects roughly \$100 million each year in recreation fees, of which 95 percent goes directly back to the site where fees were collected, while the remainder goes to regional offices.⁴² For DNF, a Northwest Forest Pass per vehicle is required for most trails and trail facilities. A day pass costs \$5 and an annual pass costs \$30. The USFS also puts 10 percent of receipts from certain forest service activities towards road and trail maintenance. The USFS receives 25 percent of revenues from the Timber Sales Pipeline Restoration fund to spend on backlogged recreation facility needs.⁴³ As shown in Figure 23, however, revenues from all USFS activities have declined dramatically since their peak in 1989, and as such the money allocated to recreation from these receipts has declined. In previous years the agency has also received funding from the Legacy Roads and Trails program to decommission roads and repair trails. One-time and short duration funding does become available through special Congressional appropriations at times, such as through the Great American Outdoors Act. Such funding is best seen as opportunity for new capital project investment, but generally cannot be relied upon in an annual manner for general maintenance, upkeep, and pacing growth in demand.

Figure 23 | Inflation-adjusted Gross Receipts for All Forest Service Activities in U.S.: 1986-2017



Source: Headwaters Economics (2019)⁴²
 Note: From 1986-2000 the U.S. Forest Service provides only total receipts. Beginning in 2001, receipts are broken out by source. These data do not include receipts deposited into special accounts and trust funds available to the Forest Service without additional appropriation by Congress.

⁴⁰ Flynn, C. 2019. Where Federal Revenue Comes from and How It's Spent. November 27. Federal Reserve Bank of St. Louis. <https://www.stlouisfed.org/open-vault/2019/november/where-federal-revenue-comes-from-how-spent>.

⁴¹ If we assume taxpayers bear the full burden of USFS funding, this max per-taxpayer payment for recreation is \$2.38.

⁴² Headwaters Economics (2019). National Forest Gross Receipts from Commercial Activities, FY 1986-2017.

⁴³ Congressional Research Service. 2019. Timber Harvesting on Federal Lands. <https://fas.org/sqp/crs/misc/R45688.pdf>

Social Contributions of Deschutes Trail Network

The DNF trail network provides benefits to users through many pathways. We don't attempt to put dollar values on these benefits, as there would likely be double-counting with the consumer surplus user benefits we calculated earlier. This section provides more detail on the means by which trails provide non-monetary benefits to users.

Physical Health

The physical health benefits of trail activity are a primary driver for trail use. Studies frequently link outdoor recreation to increased cardiovascular health, lower rates of obesity, lower health care costs, and increased longevity.⁴⁴ Studies suggest trails in an area increase weekly physical activity among residents.⁴⁵ Proximity to trails matters; the closer one lives to a trail the more likely one is to use that trail and use it frequently. This is true across age,⁴⁶ race and income⁴⁷ levels. Health outcomes in Deschutes County rank higher than other counties in the state and the percent of adults who claim to have "No Leisure-Time Physical Activity" is only 13.6 percent, compared to a national



average of 25.6 percent. This indicates that County residents prioritize physical activity and likely many use the trails for it.⁴⁸ Trails close to the workplace are not just an added amenity to the workforce, but also can help to support healthier, more productive employees.

Mental Health

There is a large and growing body of literature that shows spending time in nature is beneficial, even necessary, for maintaining or improving our mental health. In addition to providing the mental health benefits of any kind of physical activity, a study⁴⁹ of 20,000 people showed that being in nature for 2 hours a week has a substantial impact on psychological well-being. This and other studies point to how time in nature lowers blood pressure, reduces stress hormone levels, enhances immune systems functions, increases self-esteem, reduces anxiety, and improves mood and creativity. The calming power of nature has also been shown to reduce aggression and feelings of isolation. Physical activity can promote health and wellness as well as cognitive ability, that collectively can be beneficial for businesses near trails and in communities with ready trail access in terms of worker productivity.

Social Cohesion/Community Pride

Robust trail systems that attract new residents and visitors are a source of community pride. While the influx of new residents and visitors can create crowding and exacerbate congestion on both roads and trails, there are also benefits to living in a highly desirable destination. Beyond the numerous economic benefits discussed above, residents also enjoy more choices in restaurants and shops and increased social interactions with diverse visitors,⁵⁰ some of whom end up moving to the area. These are community level benefits even for those who don't use the trails. For trail users, social cohesion is even more pronounced. Studies show that green space is a powerful community connector. When community members and visitors engage in social interactions on the trails, even something as small as a casual "hello" or a smile to a passerby, good will and community are strengthened.⁵¹ The

⁴⁴ Mitchell, R., & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: an observational population study. *The Lancet*, 372(9650), 1655-1660.

⁴⁵ VanBlarcom, B., & Janmaat, J. (2013). Comparing the costs and health benefits of a proposed rail trail. *Journal of Policy Research in Tourism, Leisure and Events*, 5(2), 187-206.

⁴⁶ King, W. C., Brach, J. S., Belle, S., Killingsworth, R., Fenton, M., & Kriska, A. M. (2003). The relationship between convenience of destinations and walking levels in older women. *American Journal of Health Promotion*, 18(1), 74-82.

⁴⁷ RRC Associates. 2016. Enchanted Circle Trails: Final Survey Results. Prepared for Taos Land Trust; Headwaters Economics. Boulder, CO: RRC Associates.

⁴⁸ <https://www.usnews.com/news/healthiest-communities/oregon/deschutes-county>

⁴⁹ White, M. P., Alcock, I., Grellier, J., Wheeler, B. W., Hartig, T., Warber, S. L., ... & Fleming, L. E. (2019). Spending at least 120 minutes a week in nature is associated with good health and wellbeing. *Scientific reports*, 9(1), 1-11.

⁵⁰ Tsundoda, T., & Mendlinger, S. (2009). Economic and social impact of tourism on a small town: Peterborough New Hampshire. *Journal of Service Science and Management*, 2(02), 61.

⁵¹ Peters, K., Elands, B., & Buijs, A. (2010). Social interactions in urban parks: stimulating social cohesion? *Urban forestry & Urban greening*, 9(2), 93-100.

Social Contributions of Deschutes Trail Network



DNF is also the setting for several community events, inviting residents and visitors to participate in shared activity. Running, biking, and boating races, and events create an opportunity for community connection, celebration, and friendly competition as well as bringing revenue generating opportunities to nearby cities and towns.

Cultural Uses

The DNF offers more than a trail network for recreation. It also serves as an educational site on history, culture, and environment. There are many historical and cultural sites located within the boundaries of the forest that help visitors understand their place in natural and cultural environments. The wide range of interpretive signage and exhibits and educational events offers information on traditional and contemporary uses of forest products, explanations of how Native tribes, and later European settlers, lived on and used the land, and details on the flora and fauna in the area. The Cascade Lakes Welcome Center and the Lava Lands Visitor Center offer rotating exhibitions that cover a wide range of local topics. Local school groups, community groups, and visitor-focused groups all offer a range of learning opportunities within the DNF.

Interest/Awareness in Conservation

Spending time in nature correlates to an increased appreciation for, and thus behavioral changes, that improve environmental and conservation outcomes. On a personal level, those who enjoy spending time in nature want to see it protected so that they can continue to access it for their personal enjoyment, whether for recreation or for solitude. On a societal level,

understanding the role that green spaces play in habitat survival, climate change, and community health also lead to behaviors that increase motivation to protect and preserve. Thus, many communities offer programs targeted to children to get them comfortable in and learning about wild spaces with the assumption that as they grow older, they will work to protect those environments.

Some of the latest research to be published on this topic has looked at how the Covid-19 pandemic has caused more people to spend time in nature, which in turn has increased their awareness and appreciation for natural environments. This increase in time and experience with nature will likely influence people's valuation and commitment to protecting and preserving green space in their local communities.⁵²



⁵² Rousseau, S. and Deschacht, N., 2020. Public awareness of nature and the environment during the COVID-19 crisis. *Environmental and Resource Economics*, 76(4), pp.1149-1159.

Business Community

The DNF's trails are an important part of the culture, lifestyle and opportunities that attract business owners, entrepreneurs, and the highly-skilled staff that growing and successful businesses seek. This trend extends beyond the outdoor recreation product and service industries in Bend, including educational programs at Central Oregon Community College and Oregon State University-Cascades. As housing affordability and quality-of-life in urban areas declines, particularly during the COVID-19 pandemic, technical and professional businesses and their workforce look to establish in areas that provide the needed balance, and the opportunities to raise a family. The trails and associated amenities of the DNF have been important factors in Central Oregon's economic growth, bucking trends of declining population and economic activity in most areas of the rural West. Collectively the culture and attraction supported by the DNF and its trails provide a critical mass for businesses and working households to feel comfortable establishing and growing in Central Oregon. Professional lifestyle-related businesses and jobs were more resilient to the Great Recession than others for Central Oregon, and their foothold has only grown.⁵³ In this way the DNF and its trails are one of the critical drivers that allow regional communities to economically thrive and provide high-wage and high-skill job opportunities.



Diversity & Equity — Areas of Need

Trails have consistently been shown to have an overwhelming positive influence on the quality of life in the communities they are connected to. Trails provide people from all backgrounds, ages, abilities and income levels safe and inexpensive opportunities for outdoor physical activity, recreation, and contemplation. For many of the benefits mentioned above, from improved physical and mental health to community cohesion, a coordinated outdoor recreation plan has positive net benefits for a community. But, like most other community resources, the access to the benefits they provide is often inequitable. Lower income households, households of color, and households with less educated residents are often located further from the trail systems, with less public transportation access than wealthier, white households. This is in part due to the positive economic impact the investment in trails has on increasing property values, which, while good for homeowners, can price lower-income residents out of the neighborhoods closest to trails.

To address this disparity, a clear commitment to reducing the difference in park/trail access between wealthier neighborhoods and poorer neighborhoods is needed. This can be done by ensuring that cities are prioritizing equitable access to trails as part of their planning and development. Communities who recognize the critical contribution trails provide to public health, transportation, and economic resilience, and not simply as a recreational luxury, are more likely to prioritize parks and trails



⁵³ See analysis and discussion of Bend business data in ECONorthwest, 2017. Economic Contributions of Bend Park and Recreation District. November. Bend Parks and Recreation District, <https://www.bendparksandrec.org/wp-content/uploads/2018/01/BPRD-Economics-ECONW-2017-Nov.pdf>.

in their planning. Studies have shown that when lower income communities of color have easy access to trails (within a 10 min walk to their house), they are 50 percent more likely to use trails than when trails are further away, allowing those communities to benefit equally from the natural resource.⁵⁴ In the most recent Oregon Statewide Comprehensive Outdoor Recreation Plan (SCORP), several state priorities were named, including improving access for a growing aging population, for a more racially and ethnically diverse population, and for lower income Oregonians. Each of these groups may have different barriers to accessing and using trails and careful attention is required to address their distinct needs.

Racial & Ethnic Population Barriers & Needs

Working towards equity in proximity and access is critical, but not sufficient. Equally important is understanding the historical injustices that continue to impact disparities in trail/park usage. Nationally, the story of land conservation and park creation rests on a legacy of whiteness. The US's 400+ National Parks host predominantly white visitors and are staffed by the National Park Service, which is one of the least diverse agencies in the federal government in terms of staff.⁵⁵ The early creation of national parks, often referred to as "America's Best Idea" was pioneered by white male conservationists of the time who were seeking to



protect the country's natural wonders for the benefit of a wealthy white population who had the money and leisure time to enjoy them. The parks were created at the same time as the growth of cities was expanding, and parks were seen as a way for the white elite to "escape" from the industrial cities filled with increasingly diverse inhabitants. Even urban parks, like New York City's famous Central Park, was created through eminent domain, evicting a well-established neighborhood of free Black residents, called Seneca Village, for the enjoyment and recreation of others.



⁵⁴ TAOS study, RRC Associates. 2016. Enchanted Circle Trails: Final Survey Results. Prepared for Taos Land Trust; Headwaters Economics. Boulder, CO: RRC Associates.

⁵⁵ Ebbs, S. and D. Dwyer. 2020. America's National Parks Face Existential Crisis Over Race. ABC News. July 1, 2020. <https://abcnews.go.com/Politics/americas-national-parks-face-existential-crisis-race/story?id=71528972>.

Social Contributions of Deschutes Trail Network

When national and state parks, including public recreational sites, became more accessible to the general population, they were legally segregated in many states until after World War II, and up until the Civil Rights Act of 1964, many people of color were still barred from or continued to be segregated in those places.⁵⁶ Today, even though everyone can access public lands, the impact of the history has meant that park visitation is still predominantly white.

Because of the history of park creation and the continued prominence of white visitors, the interpretive exhibits, signage, and language in parks tend to also acknowledge and celebrate white Americans' history and heritage, further excluding communities of color. State and national parks and monuments have largely ignored important cultural sites of communities of color. The [Center for American Progress](#) found that less than 25 percent of park sites and national monuments focused on the cultures of minority or underrepresented groups.⁵⁷

A difficult reality is that Deschutes County, as with much of the rest of the nation, also has a history of racism and remains a predominantly white county. From the decimation of Native tribes through colonization, war, and disease, the forced removal and then the giving of Native land to white pioneers, the rise of the KKK in the 1920s (that included Bend's mayor as a prominent member) and Bend's history as a sundown town, it is not surprising that the county has remained predominantly white



⁵⁶ Scott, David & Lee, KangJae. (2018). People of color and their constraints to National Parks visitation. 35.

⁵⁷ <https://www.americanprogress.org/article/better-reflecting-our-countrys-growing-diversity/>

⁵⁸ Needham, M., and Rushing, J. 2017. Resident needs and behaviors in Portland parks and natural areas: Understanding communities of color. Portland Metro. In OPRD 2018. 2019-2023 Statewide Comprehensive Outdoor Recreation Plan.

⁵⁹ OPRD 2018. 2019-2023 Statewide Comprehensive Outdoor Recreation Plan. p. 65.

⁶⁰ Vamonos Outside. <https://vamonosoutside.org/>.

⁶¹ OPRD 2018. 2019-2023 Statewide Comprehensive Outdoor Recreation Plan.

and continues to be experienced as less welcoming to people of color. The forests surrounding the communities in Deschutes County, now the site of world-class recreation opportunities, are still likely deemed unsafe to some non-white residents because of their isolation. While data specific to Deschutes County isn't available, research done in Portland on the barriers to park access for residents of color found that, "the most important constraints that residents want managers to address are fear of crime and perceptions of not feeling safe in parks and natural areas in the Portland region."⁵⁸

While we cannot change this history, there are opportunities available to help redress the harms of the past. Through equitable investment in the trails and recreational opportunities in the Deschutes National Forest we can reprioritize communities who have historically been excluded. With appropriate funding and the right partnerships, the benefits of outdoor recreation can be enjoyed by all. One place to start is with programs that focus on getting youth of color interested in and comfortable in the outdoors, particularly given the costs of access including transportation and equipment. Programs that facilitate access to outdoor gear and provide knowledge about trail navigation, outdoor safety, and wildlife help to reduce the barriers that limit participation. Racial minorities often have less access to information about outdoor recreation and parks in terms of familiarity with content and information sources including peers and family members, and thus less exposure to outdoor recreation opportunities than their white counterparts.⁵⁹

Local programs such as Vamonos Outside in Bend, focused on improving Latinx access to the outdoors in Central Oregon, is a strong example.⁶⁰

Based on research that has been conducted both in Oregon and across the US, we know what diverse users of state and national forests and parks would like more of in their recreation areas. OPRD's SCORP surveys point to several key amenities that diverse groups are seeking in their recreational facilities that can differ from the general public. Many are seeking natural areas that allow for extended and multiple family gatherings, near urban centers, with high safety measures in place (patrolled and lighted parking lots, access to cell phone service, security cameras in key places, and diversity among the forest staff).⁶¹

Social Contributions of Deschutes Trail Network



year-old respondents indicated that they or someone in their household has a disability. While seniors indicate a desire to stay active in outdoor recreation activities, which comes with a myriad of health benefits, many find that current trail options are not accessible (too steep, not smooth, etc.) for safe and comfortable walking. Of 65 to 74 year-old Oregonians, 63 percent reported walking on local trails or paths, dropping to 37 percent for 75 to 84 year-old residents. This decline is likely a result of several factors but might stay higher if we could ensure that there are safe, accessible trails and accommodations for all ability levels. Most frequently mentioned disability accommodations needed were more handicapped parking, more benches along trails, more paved trails, and more accessible restrooms.

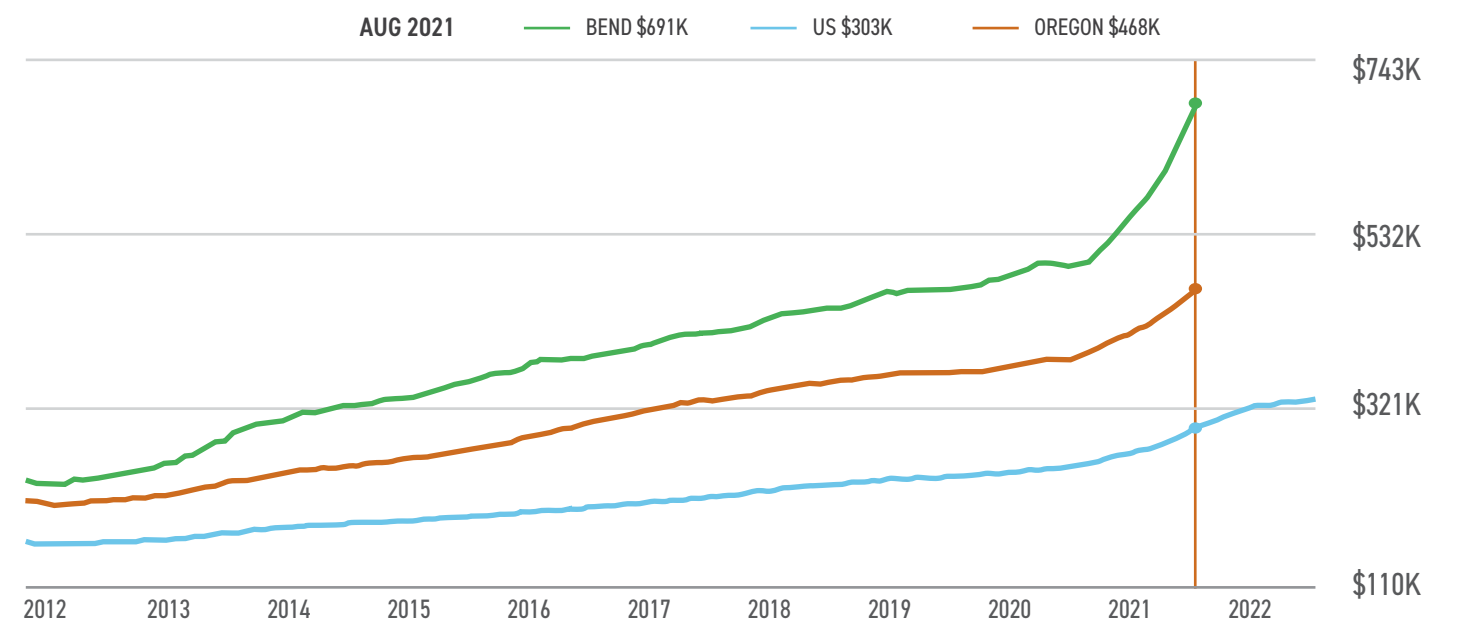
Lower Income Households Barriers & Needs

The percentage of people living below the poverty line in Deschutes County is 10%, slightly lower than the Oregon state average of 12 percent. In part because of the beauty and proximity to nature and outdoor recreation opportunities, the cost of living in the county is high and rising. This high cost of living makes it a difficult place to afford to live for many residents. According to the Economic Policy Institute, which used IRS Statistics of Income data through 2015, the incomes of Bend's top 1 percent compared to the bottom 99 percent, Bend ranked

Senior Adult Population Barriers & Needs

According to recent census data, 21 percent of Deschutes County residents are over the age of 65, which is 25 percent higher than the national average. The large number of aging boomers in Deschutes County presents a unique challenge because this group is more likely to face mobility impairments that limit their physical activity; SCORP data reveals that one third of 65 to 74

Figure 24 | Bend, Oregon Home Value Trends and Benchmarks



Note: Calculations based on ECONorthwest Analysis from budget details described in text.

Social Contributions of Deschutes Trail Network

108th out of 916 cities for inequality.⁶² In 2021, Bend home prices were greater on average than Oregon state and national averages, and over the past decade have grown faster as well, particularly since 2019 (Figure 24). To afford to live in the county, lower income neighborhoods are typically located farther away from trailheads, while the most affluent communities are located within walkable/bikeable distance to trails. Additionally, some low-income households don't have access to reliable cars and most trailheads are not serviced by public transportation. Those who can access trailheads may be deterred by recreation areas that require fees. A 2017 study found that low-income outdoor recreationists reported traveling over three times as far to reach non-fee areas when they were available, compared to areas which required a fee.⁶³ In terms of health, low-income households are less active than wealthier households and more prone to being overweight or obese. Increasing physical activity by allowing for better access to trails improves health outcomes for these households. The highest need for these communities is more trails located near their homes, public transportation available to more distant trails, and free/reduced fee access. DNF trails play an important and interdependent role in this network, and this highlights the importance of connections and cross-jurisdiction coordination for trail planning, design, and funding.



User Conflicts

Trail conflicts are typically uncommon but become increasingly frequent as trail use increases. Conflicts occur among different user groups as well as among different users within the same group. Conflict can also be nonreciprocal (one group dislikes or resents another group, but the reverse is not true.) The reasons for conflict can be quite diverse. According to a comprehensive literature review sponsored by The Federal Highway Administration and The National Recreational Trails Advisory Committee, conflicts can occur based on “activity style (mode of travel, level of technology, environmental dominance, etc.), focus of trip, expectations, attitudes toward and perceptions of the environment, level of tolerance for others, and different norms held by different users.”⁶⁴ The report offers a variety of solutions to mitigate conflict including the primary solution which is to invest in a sufficient number of miles of trails that are designed for a variety of trail experiences. This reduces congestion and gives users the trails conditions designed for the activity they desire. Other interventions include promoting trail education and etiquette so that users understand who should yield to whom or how to not spook horses when approaching. Another solution is inviting future users to participate and collaboratively design trails that serve the needs of multiple users and minimize user contacts during the trail design and development stage.



⁶² Brauns, L. 2020. Poverty with a View? January 8. The Source Weekly. <https://www.bendsource.com/bend/poverty-with-a-view/Content?oid=11765625>

⁶³ Lamborn, C., Smith, J., Burr, St. 2017. User fees displace low-income recreationists. *Landscape and Urban Planning*. 167, 165-176.

⁶⁴ Moore, R.L., 1994. *Conflicts on multiple-use trails: Synthesis of the literature and state of the practice*. Federal Highway Administration.

Net Contributions of the DNF Trails to Local Businesses and the Community

The available data paint a compelling picture of the breadth, magnitude, and growing economic and social importance of trails on Deschutes National Forest for the regional community and businesses, as well as visitors from across Oregon and beyond. These contributions are at risk in the future without a dedicated and focused effort to fill the funding and contribution gaps that exist and are expected to grow under a business-as-usual approach. Currently, the direct and indirect beneficiaries — namely local and non-local trail users as well as businesses — are asked to provide very little in terms of the overall financial resources necessary for the trail network and associated facilities they rely on. Volunteer contributions are substantial and critical, and hopefully this essential contribution will continue and keep pace with growing demand. But ultimately, structural investments are needed to meet trail demand while ensuring the surrounding habitat, ecosystems, and water resources are protected and healthy. Furthermore, future investments can help the overall system to better serve the full community in a more equitable way, addressing the needs of the diverse range of current and future community members and visitors. Upgrades to improve equity of use are needed in terms of the types of activities supported by trails, how the trails are maintained, how the trails are accessed, where the trails are

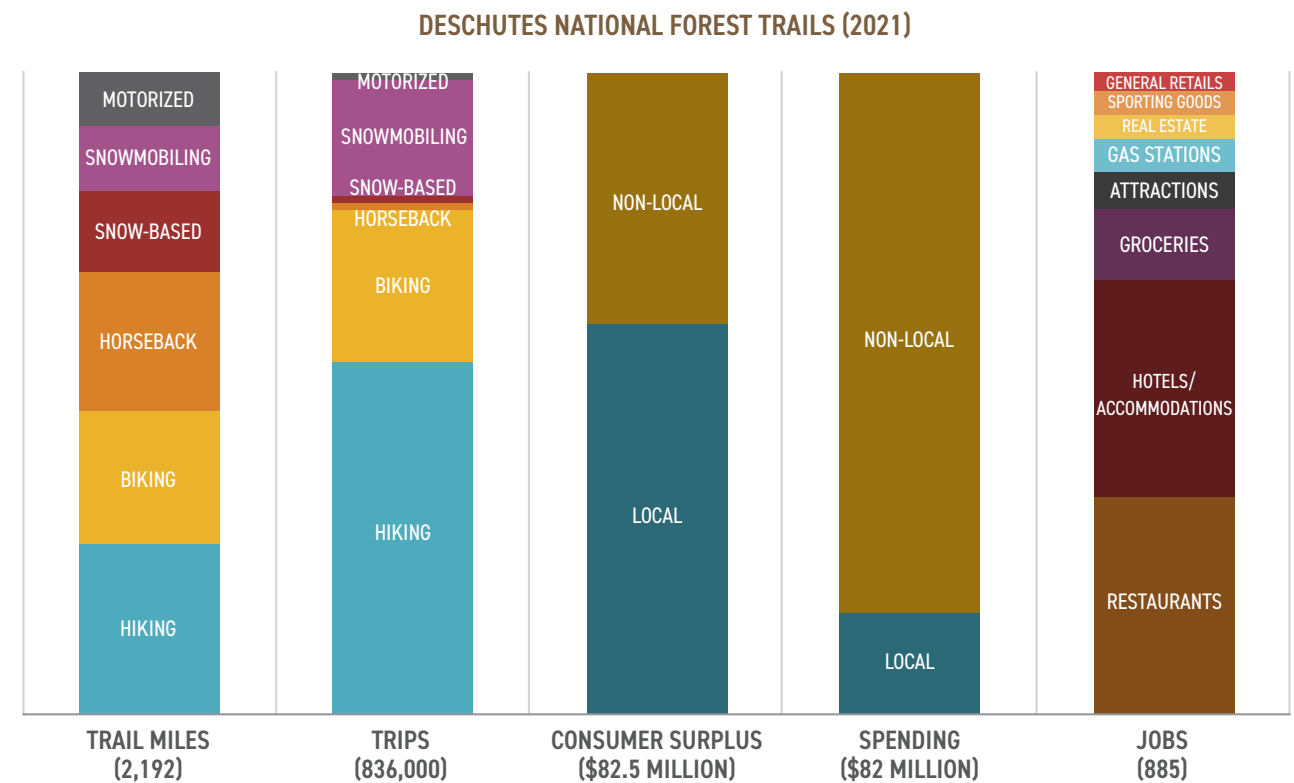
located, and systems to make all members of the community feel welcome and capable.

The DNF trail system also has wide-reaching effects for the nearby communities of Central Oregon that are difficult to isolate but evidently strong in magnitude. They include:

- unique natural amenities of the region including lakes, rivers and mountains
- means of attraction and retention to business owners, entrepreneurs, and skilled workers
- trip-related tourist spending
- equitable recreation, education, and cultural opportunities
- regional quality-of-life, public health, and community cohesion

Key snapshot details on the economic contributions of the DNF trails include ~840,000 annual trips providing ~\$82.5 million in value to trail users, ~\$82 million in trip-related spending, and 885+ jobs (Figure 25). If investments can keep pace with recreation demand while managing use to sustain other natural resource benefits, these economic contributions and drivers will continue to grow.

Figure 25 | Summary Economic Contributions of the DNF Trails



Source: ECONorthwest Analysis (2021)

Key Funding Implications

The benefits and contributions of the DNF trail system justify the investments needed to sustain this valuable resource. But the U.S. Forest Service does not have sufficient funding alone to adequately maintain the existing DNF trail network, let alone keep pace with increasing trends in trail-based recreation as well as population and visitor growth. Existing funding and volunteer resources will need to continue and expand in order to address backlog of maintenance and facility needs as well as keep pace with increasing demand and needs for equitable investments. These investments must be done in a way that ensures sustainability of uses in the face of potential impacts on habitat, water quality, wildfire risk, and other users and beneficiaries of the DNF. Focusing on areas of greatest scarcity can lead to the greatest benefit from these uses. This includes activities of highest usage and in communities of greatest demand, particularly considering user groups that might not have historically experienced equitable levels of access and service. Increasing involvement of the local community through their time and financial resources in maintaining the trail networks will entail a greater say of community members in how the trail network is managed.

In addition to the core trail, facility maintenance, and upgrades needed to keep pace with demand, investments also need to address access and safety issues, particularly for those who have historically had low participation rates. This includes providing areas, facilities, and services associated with trails that can improve transit options, public safety, and in some areas, basic



amenities such as clean bathrooms, paved trails, public transit, and information to guide new visitors. Again, this highlights the importance of coordinating trail access investments and planning across jurisdictional boundaries. The DNF and partners are making strides on these fronts, but efforts will need to continue and likely increase. Equity in trail access requires a new focus for investment in trail-based resources and facilities to better serve low-income households, the elderly, and communities of color.

Ultimately these investments should be stable and self-reinforcing, considering the high benefit relative to cost they provide. But historical funding and revenue sources can no longer be relied upon to address the needs. Users and beneficiaries will need to collectively provide the resources necessary to maintain the resource. Timber revenue and federal appropriations are no longer adequate to meet the needs.



ECONorthwest

ECONOMICS • FINANCE • PLANNING

www.ECONW.com

OREGON

KOIN Center

222 SW Columbia Street, Suite 1600
Portland, OR 97201
503-222-6060

OREGON

BRW Building

2863 NW Crossing Drive, Suite 100
Bend, OR 97703
458-202-9016

WASHINGTON

Park Place

1200 6th Avenue, Suite 615
Seattle, WA 98101
206-823-3060

IDAHO

Eagles Center

223 North 6th Street, Suite 430
Boise, ID 83702
208-515-3353