PHOTO BY TAYLOR BERRY-MARAIST

Mountain Loop Highway Trail System Vision: South Loop

2023-2033

Report prepared by
Washington Trails Association
for the Mt. Baker-Snoqualmie
National Forest

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Land Acknowledgment

It is recognized that the research, planning effort and recommendations contained in this report concern lands central to the culture, history and present day lives of many Coast Salish people, specifically the Stillaguamish, Tulalip and Sauk-Suiattle Tribes. The trails in the South Fork Stillaguamish River Valley, accessed from the Mountain Loop Highway, traverse lands ceded by the Stillaguamish, Sauk-Suiattle and Tulalip Tribes in the 1855 Treaty of Point Elliott. Under the treaty, important rights to fish in all usual and accustomed places and to hunt and gather on all open and unclaimed lands were reserved to maintain the tribes' livelihood and cultures. The Mt. Baker-Snoqualmie National Forest and Washington Department of Natural Resources lands within the South Fork Stillaguamish River Valley are simultaneously within tribal "usual and accustomed" areas and "open and unclaimed" lands on which the tribes maintain these treaty rights. These areas remain important to the vitality of indigenous peoples' lifeways and communities.

Acknowledgments

The existence of this report is thanks to staff from Washington Trails Association, Mt. Baker-Snoqualmie National Forest, U.S. Forest Service Pacific Northwest Research Station and University of Washington Outdoor Recreation & Data Lab. The information included in the report was gathered thanks to community connections and insights provided by the cadre of stakeholders who represented local organizations with an interest in the area, as well as people who love and visit the Mountain Loop Highway and provided input via the Visitor and Resident Use Survey.

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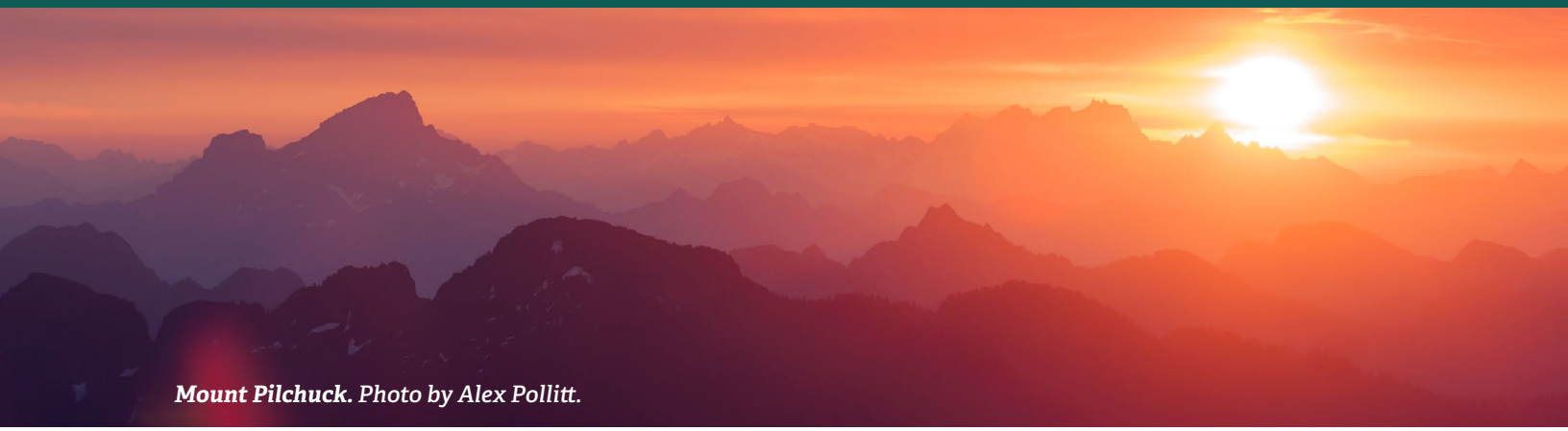
Mountain Loop Highway.
Map by Lisa Holmes of Yulan Studio.

Executive Summary

The Mountain Loop Highway provides recreational access for many people, including more than 4 million people who live within an hour's drive of the area. As interest in outdoor recreation continues to grow and the population of the Puget Sound Area swells, a long-term, comprehensive vision for management of the recreation opportunities on the Mountain Loop Highway is necessary. This plan seeks to tackle a portion of this needed long-term vision: trail-based recreation on the south loop of the Mountain Loop Highway.

Deferred maintenance needs on national forest lands on the Mountain Loop Highway exceed $42 million for roads, trails and campgrounds. A majority of the recreation facilities along the Loop were not designed for their current frequency of use. This is especially true on the southern half of the highway, which is the most accessible to the greater Seattle metropolitan area. Trails and recreation sites need to be re-designed, enhanced and expanded to steward natural resources and meet planned-for demand.

To help address these challenges and prepare for the future, WTA convened a cadre of land managers, community stakeholders, nonprofit organizations and researchers from the University of Washington and U.S. Forest Service Pacific Northwest Research Lab. The cadre set out to solicit input from the public about their values and interests, identify opportunities and challenges and make data-informed recommendations about priority investments in trail-based recreation opportunities on the south Mountain Loop Highway.



***Mount Pilchuck.** Photo by Alex Pollitt.*

This report offers a set of recommendations to improve upon user experiences and the health of the south Mountain Loop Highway trail system. Priority recommendations include:

- Complete all heavy trail maintenance, trailhead and road improvements on the most visited trails on the Mountain Loop (Big Four Ice Caves, Lake 22, Heather Lake and Mount Pilchuck).
- Invest in improving and expanding wheelchair-friendly trails.
- Establish a Regional Recreation Council to ensure long-term coordination, funding and investments into trails and recreation along the Mountain Loop.
- Enhance trail opportunities and road access in the Coal Creek drainage.
- Restore trail access to the Monte Cristo Townsite and trail complex.
- Restore or re-envision trail access for the Three Fingers trail complex.
- Repair and improve forest roads that access multiple trails.

Find more detail throughout this report for the full recommendations and context on how those recommendations were reached.

Purpose

This report was prepared by the Washington Trails Association in partnership with a cadre, researchers and Mt. Baker-Snoqualmie National Forest Service staff. The recommendations in this report serve to inform future decisions made by the Mt. Baker-Snoqualmie National Forest to prioritize, plan and implement investments in the Forest. It is a product of close collaboration with local and regional stakeholders to reflect needs of the south Mountain Loop Highway trail system. Through compiling this information, the Forest Service and implementation partners can explore solutions as they are prioritized, including opportunities to continue collaboration. The goal of providing these recommendations is to offer insight into stewarding the south Mountain Loop Highway's recreation system, as to be considered alongside other interests on the land. Stakeholders were convened around the purview of considering potential for enhancing recreation opportunities on the land.

The recommendations within this report are conceptual and require additional planning and analysis to determine feasibility, alignment with federal law and policies and consistency with protection of reserved treaty rights for affected tribes. Implementation of any projects on federal lands will be subject to environmental analysis, tribal consultation and public involvement per the National Environmental Policy Act.

Background

Between 2010 and 2020, Snohomish (Snohomish County, 2020) and King (Balk, 2021) counties' populations have grown by 16%. By 2044, Snohomish County's population is expected to reach 1.1 million (Yaw, 2022).

All those people need somewhere to decompress. To do that, many of them head for the hills. Recreation is a core part of living in Washington; it's been proven over decades. In 2022, the Washington State Recreation and Conservation Office found that 90% of Washington residents hike (Eastern Washington University, 2022). Ninety-six percent of people shared that they participate in outdoor recreation to relax, with 95.2% citing they do so to enjoy or spend time in nature and 93.4% to improve physical or mental health. The same study found that within the five year span of 2017 to 2022, the percentages of people who participated in activities like backpacking and camping nearly doubled. Trails closest to the greater Seattle metropolitan area receive the bulk of this foot traffic.

North and slightly east of Puget Sound, the Mountain Loop is a narrow highway lined with towering evergreen trees, winding along the crashing, glacier-fed South Fork Stillaguamish and Sauk rivers. Rugged trails lead to mountain lakes and peaks soaring to more than 7,000 feet. The scenery of the Mountain Loop Highway is one of the main draws for people who recreate in the area (see Appendix A). This special place is important for more than its recreation experience. As folks get out into the area, they stop in local towns like Granite Falls and Darrington. It is also, and foremostly, a place of deep tribal history and practice. Tribes use and protect this land as a vital landscape for livelihood and culture tradition.

In 2019, Washington Trails Association (WTA) launched Trails Rebooted, a campaign centered on supporting Washington's popular recreation areas by improving existing trails, championing the construction of new ones and helping hikers see the role they play in the future of trails. Because the Mountain Loop Highway is home to several of the most popular trails in Washington, including Lake 22, Big Four Ice Caves and Mount Pilchuck, it was an ideal focus area for Trails Rebooted efforts.

Simultaneously, the Mountain Loop Highway corridor received a Treasured Landscape priority designation by the National Forest Foundation. The designation came with a 5-year fundraising campaign, with enhancing recreation facilities as a key objective.

With resources available, it was time for action to be visionary about this place's recreation future. In late 2019, WTA convened a cadre of stakeholders including the Forest Service, the Department of Natural Resources and several others, including nonprofits and community leaders, to discuss the future of the Mountain Loop Highway. The cadre came together to produce a vision for the trail system on the Mountain Loop and to identify priority needs and opportunities for the next 10 years. The cadre focused on the southern half of the Mountain Loop where use levels and the concentration of trails is highest, with a goal of addressing the trail system on the northern half of the loop in the near future.

While the cadre originally intended to conduct a series of in-person public workshops in 2020, the COVID-19 pandemic required shifting gears. We decided to engage the public virtually by creating an online survey with the help of the Pacific Northwest Research Station to evaluate recreational use and visitor and resident values on the Mountain Loop (see Appendix A). Our planning and engagement process was entirely online with the

exception of two field tours. The University of Washington Outdoor Recreation and Data Lab supported the project by collecting and summarizing data on recreation site attributes, modeling visitor use levels across the trail system and examining the "revealed preferences"[1] of visitors along the Mountain Loop for trails and facilities with varying attributes (see Appendix B). Considering findings from the survey, visitor preference analysis and information gleaned from cadre members, we collectively developed a vision statement, guiding principles and goals to inform opportunities to improve the trail system along the southern Mountain Loop Highway corridor.

We developed recommendations utilizing multiple sources of information including trail condition surveys, trip reports, visitor use analysis and survey results and staff knowledge of conditions on the ground.

Environmental Considerations

The South Fork Stillaguamish River Valley is a rich and productive environment. The river provides critical spawning and rearing habitat for coho, chinook, chum and pink salmon. The riparian areas and upland forests include stands of old-growth forest as well as younger stands of previously logged forest. The valley provides critical habitat for endangered species such as marbled murrelet and northern spotted owl, as well as core habitat for grizzly bear recovery. This dynamic environment makes the development and maintenance of trails, roads and recreation sites adaptive and variable. The glacially-fed river changes course, impacting travelways and recreation areas. Creek crossings are often overwhelmed by unstable soils sloughing off of steep slopes and flood events. The trails and roads in this valley wear the marks of the elements. Meanwhile, visitor use of trails and recreation sites in the valley is growing along with the regional population. Emerging reports (Conservation Northwest, 2022; Tulalip Tribes Natural Resources Department, 2021) summarizing scientific literature indicate negative impacts to wildlife species and their habitat from trail-based recreational use at a general level. More research is needed to understand these interactions and the efficacy of various management strategies to reduce impacts. The recommendations within this report have not yet been subject to robust environmental analysis, nor have the effects of current recreational use on wildlife in the valley been quantified. Exploration of impacts specific to this landscape are needed to understand the recreation and wildlife relationship better on the Mountain Loop. Each project will need site-specific analysis to determine feasibility and to quantify the costs and benefits of potential implementation.

This place is important for many reasons beyond recreation. The Forest Service, Washington Trails Association and others involved in this report appreciate feedback from the Tulalip Tribes about the impact of recreation on wildlife, tribal treaty rights and the environment. While acknowledging these discussions, recreation stakeholders and the Forest Service recognize the need to plan for investments that better steward use the area receives and will continue to receive for recreation purposes. Therefore, a vision was created to explore recreation opportunities on this landscape. This vision is meant to work alongside further conversations and efforts to meet other Forest Service goals, including consistency with the protection of tribal rights. This report expands upon what is possible and desirable from the perspective of the recreating public.

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[1] *A revealed preference analysis is based on the economic theory that people reveal their preferences through their actions. Therefore, a location with a large number of visitors must have desirable attributes. This type of analysis relates the number of visitors to the attributes of individual sites to learn about why visitors are choosing to go to particular locations.*

Mt. Dickerman. *Photo by B Winn.*

Sustainable Trail System Vision, Principles, Goals and Opportunities

The cadre developed a vision statement, principles and goals to describe the desired future conditions for the trail system. Principles are the foundational philosophies that should guide partners as they work together on trail stewardship in the area. Goals identify desired outcomes of trail stewardship initiatives over the next 10 years. By documenting information about the current status of the trail system relative to these principles and goals, WTA and the Forest Service, with support of the cadre, identified opportunities to reach these goals.

VISION STATEMENT:

Nature, deep cultural connection, history and recreation define the character of the South Fork of the Stillaguamish River Valley, a key part of the landscape on the Mountain Loop Highway. A robust, well-maintained trail system here will continue to provide a way for people to sustain and grow connections to the landscape in a way that is sensitive to and respects the land itself and all who live here.

PRINCIPLE 1

Enduring treaty rights are held on this landscape. Tribal members continue cultural practices and fulfill treaty rights without interference from trail users.

Goals

- **The design and location of any new trails incorporate feedback from tribal consultation.**
- **Visitors are aware of the cultural context for the lands they are visiting and asked to adjust their behavior accordingly.**
- **Research and monitoring supplements our knowledge of visitor use, visitor experiences and environmental impacts caused by recreation.**
- **Visitor use of the trail system is managed in a way to reduce impacts to treaty rights and culturally-important places.**

Current status

The Forest Service regularly consults with tribes on decisions affecting the planning area. Tribal representatives have expressed concerns that the current and increasing volume of visitors to the Forest are having detrimental impacts to wildlife species and habitat.

Currently, the casual visitor may have little awareness of the cultural importance of lands they are visiting within the South Fork Stillaguamish River Valley. Interpretive signage along the Mountain Loop Highway highlights the colonial settler history in the region, particularly mining history, with limited information about current and historic uses and values of the area by tribes' whose territory the highway traverses.

Opportunities

1. **Decisions about recreation opportunities should continue to be informed by consultation with Stillaguamish, Tulalip Tribes and Sauk-Suiattle Tribe.**
2. **We recommend that the Forest Service make a critical review of current interpretive signage and materials related to sites along the Mountain Loop Highway. Where interpretation is centered on resource extraction and pioneer accomplishments, tell a more complete story about the impact of this history on the original people of the South Fork Stillaguamish River Valley. With input and agreement from the tribes, incorporate land acknowledgments and references to indigenous place names. Highlight information to help hikers understand how their behavior can affect cultural and natural resources.**
3. **Work with Tribes, partners and researchers to invest in and explore recreation impacts on this landscape. Consider monitoring of conditions, including ecological and visitor experience impacts.**

PRINCIPLE 2

A trail system should reflect the diversity of opportunities and experiences sought by visitors.

Goals

- **An abundance of trail options exists, including loops and trails of varying lengths and elevation gain.**
- **Wheelchair-friendly trails exist to provide opportunities for visitors with a range of abilities.**
- **Trails continue to facilitate opportunities to experience the unique natural beauty, cultural connections and history of the South Fork Stillaguamish River Valley.**
- **A consistent and proactive education and enforcement presence promotes resource protection and visitor safety.**

Current status

The trail system on the south Mountain Loop Highway provides a range of trails with varying lengths and elevation gain. However, there are no opportunities for mountain biking and stock use on trails on this half of the Mountain Loop. The majority of summer visitors on the Mountain Loop hike on one of four trails: Big Four Ice Caves, Lake 22, Heather Lake and Mount Pilchuck.

Results from the Mountain Loop Highway Visioning Survey done by the Pacific Northwest Research Station suggest that trail experiences on the whole of the Mountain Loop trails[2] may not always be satisfactory. A majority of respondents (69%) were concerned about a "high volume of users". Respondents also cited "litter and human waste" (61%), "ecological impacts" (53%), "lack of enforcement of rules and regulations" (46%), and "visitor behavior" (42%) as major concerns on Mountain Loop trails.

Most trails are designed for out-and-back experiences, with several popular trails providing a "lollipop" design allowing circumnavigation of a lake at the end of the trail (like Heather Lake Trail). Very few trails are interconnected, limiting opportunities for loops or longer excursions. The out-and-back trail design may also exacerbate a sense of crowding reported at high-visitation trails because hikers have to pass each other more often.

The south Mountain Loop Highway lacks wheelchair-friendly trails[3]. Wheelchair-friendly trails are limited to the Ice Caves Loop Trail and two sites that have been in disrepair for years: the Gold Basin Mill Pond wildlife viewing site and the Youth-On-Age interpretive trail.

[2] The survey data collected information on all trails in the Mountain Loop Highway, not just the southern half. [3] Wheelchair-friendly trails, in aspiration, are developed trails with consistent tread, a <5% grade, that lack obstacles such as rocks, roots, stairs, steps or excessive brush, and potentially modified features to allow for better access.

The visitor preference analysis found that hikers have a strong preference for trails that access views of waterfalls; however, only a handful of trails on the south Mountain Loop are noted as featuring waterfalls in the WTA trails database (Lake 22, Perry Creek Trail, Big Four Ice Caves and Old Monte Cristo townsite trails). There are opportunities to access other waterfalls in the Mountain Loop Highway through new trails.

While there is interest and opportunity to develop new trails within the south Mountain Loop area, the inability to maintain the current trail system is a limiting factor to adding new mileage in the near term; therefore, the pursuit of the following opportunities is reliant on funding.

Opportunities

A. Expand hiker education efforts to address concerns about visitor behavior, litter and human waste and lack of enforcement of rules and regulations.

- In 2022, Glacier Peak Institute launched a pilot Trailhead Ambassador program with the support of the National Forest Foundation and WTA. The program reached at least 1,300 people and brought back insightful observations about use at the various Mountain Loop Highway trailheads where Trailhead Ambassadors were present; for example, trends on the type of education needed from users at one trailhead versus another. We recommend expanding this program to reach hikers at heavily visited trails.

B. Improve existing wheelchair-friendly trails and explore opportunities to make existing trails more wheelchair-friendly.

TABLE 1 - WHEELCHAIR-FRIENDLY TRAIL OPPORTUNITIES

Trail(s)	Description
Big Four Ice Caves Trail	Adjust trail surface and grade, as needed, to provide better access for wheelchairs to the trail terminus overlooking Big Four Ice Caves.
Coal Lake	Evaluate opportunities to reconstruct the short trail between Coal Lake and the trailhead, which would allow wheelchair-friendly access to the lakeshore.
Gold Mill Pond	Repair existing trail and overlook area to restore wheelchair-friendly access to this wildlife-viewing site. Redesign the end of the trail to adjust for removal of the failed dock.
Youth-On-Age	Rehabilitate existing trail and redesign to account for loss of the original loop feature to erosion. Replace cracked asphalt with fine gravel to improve wheelchair-friendly access. Revitalize interpretive signage.

Youth-On-Age Interpretive Trail signage. *Photo by trip reporter CantFeelMyLegs.*

Bald Mountain. *Photo by trip reporter Maddy.*

C. Re-establish trail connections and explore opportunities for loops

TABLE 2 - LOOP AND INTERCONNECTED TRAIL IMPROVEMENTS AND OPPORTUNITIES

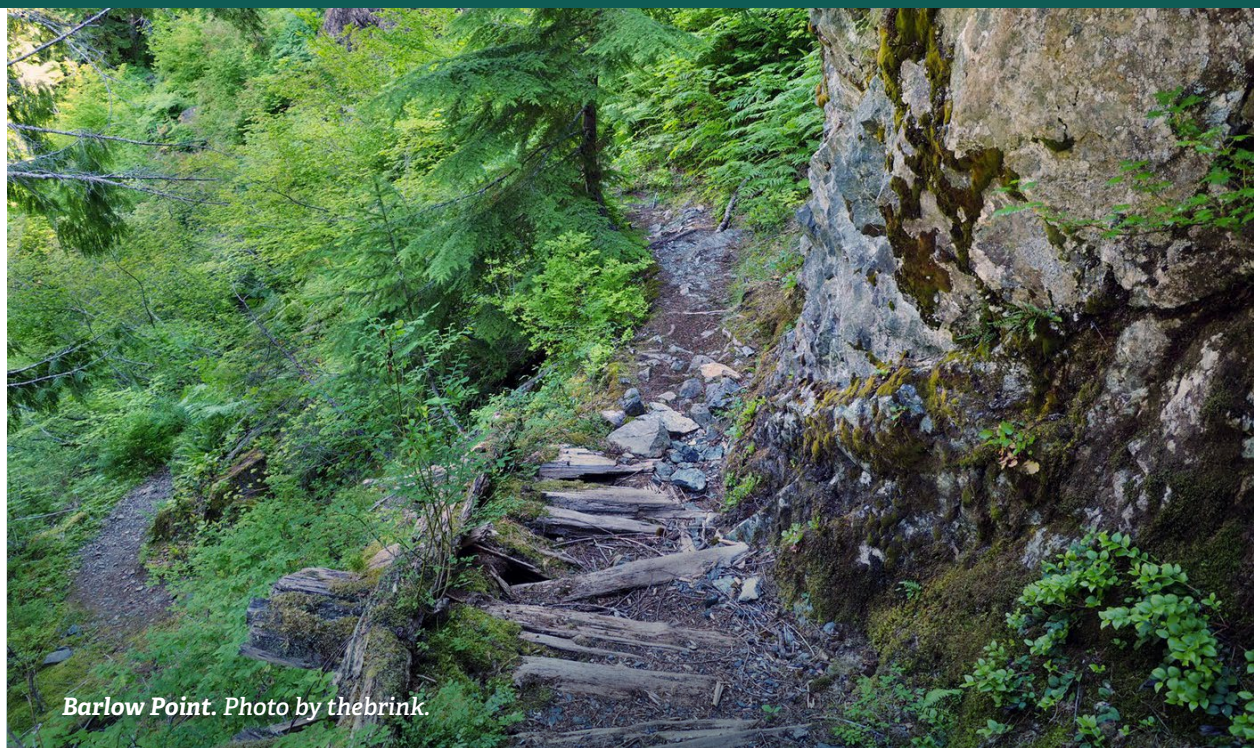
Trail(s)	Description
Bald Mountain Ridge Trail #706.1	Reestablish the Bald Mountain Ridge Trail connection between the Ashland Lakes Trail and Mallardy Ridge/Walt Bailey Trail. This opportunity was also identified in the DNR Morningstar National Resources Conservation Area (NRCA) Trails Plan.
Barlow Point and Old Government Trail	WTA trip reports indicate the presence of a boot path between the Barlow Point and Old Government Trails. Evaluate the feasibility of re-establishing the Old Government Trail route and connecting it to the Barlow Point Trail to create a loop opportunity accessible from the Mountain Loop Highway.  ***Old Government Trail.*** *Photo by George and Sally.*
Meadow Mountain and Three Fingers trails	These trails are infrequently maintained due to access challenges with the 41 Forest Road closed more than 2 miles below the Meadow Mountain trailhead where the Canyon Creek bridge is washed out. The closed 41 Road connects the Meadow Mountain trailhead to the Three Fingers trailhead for approximately 6.3 miles. To date, the Forest has not made a decision about the future of the Canyon Creek road bridge, nor the 41 road that remains beyond the washout. The Forest Service should explore options to restore access, including potential road restoration. If road access cannot be restored, consider road-to-trail conversion or alternate routes to link these two trails and improve the hiking experience on this loop.
Independence/North Lake and Falls Creek/ Pass Lake	The Falls Creek/Pass Lake Trail is a Forest Service trail that has effectively been abandoned. Evaluate options to rehabilitate and restore tread on this route. Explore options to rehabilitate the trail to North Lake and extend the trail along the south shore to follow the north fork of Falls Creek down to intersect with the trail corridor for Falls Creek/Pass Lake Trail in order to create a loop opportunity.
Big Four Ice Caves	Establish a loop at the end of the trail in an attempt to help direct hiker traffic away from the dangerous ice caves. A loop would help promote better traffic flow on this popular trail where hikers report a high volume of visitors.

***Heather Creek.** Photo by trip reporter mato.*

D. Evaluate opportunities to connect established trails and roads to known waterfalls. The following list was developed using the Northwest Waterfalls Database for waterfall locations along the Mountain Loop and consulting the WTA trip report database for information about informal access to these sites. These waterfalls are all receiving some level of visitation, but conditions have not been evaluated on the ground. Formal trail development could help avoid resource damage if visits increase in the future.

TABLE 3 - POTENTIAL TRAIL CONNECTIONS TO WATERFALLS

Trail(s)	Description
Heather Creek and First falls	These two waterfalls are along the old Monte Cristo Grade Road/Forest Service Road 4201, accessed by crossing a bridge across the South Fork Stillaguamish River from 342nd Drive NE in Verlot. Hikers report that Heather Creek falls is visible from the road and that First Falls is approximately 200 yards down on the closed portion of road.
Triple Creek falls	This waterfall is accessed from the 42 Forest Road by following the abandoned Forest Road 4220. The distance to the falls is estimated at 0.2 miles in WTA trip reports.
Old Government falls	This cascading waterfall on an unnamed stream is visible from an abandoned section of the Old Government Trail. Explore opportunities to re-establish the Old Government Trail to this waterfall.



Barlow Point. Photo by thebrink.

E. Invest in similar trail opportunities located outside of wilderness areas, where visitation levels are less of a concern. We looked at overall trail visitation estimates as well as trail and road conditions. We suggest the following trails could accommodate more visitors if the limiting factors we assume are present are addressed. Improvements to these trails would concentrate use outside of congressionally designated wilderness areas.

TABLE 4 - LIMITING FACTORS TO TRAIL USE

Trail(s)	Limiting Factor(s)
Ashland Lakes	Road and trail conditions. Road is rough and only passable to high-clearance vehicles. Trail conditions planned to be addressed in the Department of Natural Resources' Morning Star Trails Plan.
Coal Lake	Road and trail conditions. Currently the road is only passable to high-clearance vehicles. A network of user-created trails connects to the lake. Erosion needs to be addressed.
Barlow Point	Trail conditions. Hikers commonly report "obstacles on trail" in WTA trip reports.
Independence and North Lakes	Road and trail conditions. Currently the road is only passable to high-clearance vehicles. Trail conditions to Independence Lake are reported as being good, but there are blowdowns and some trail damage reported on the route to North Lake.
Boardman Lake Trail	Road conditions. Currently the road is only passable to high-clearance vehicles.
Bear/Pinnacle Lake Trail	Road and trail conditions. Currently the road is only passable to high-clearance vehicles. The trail needs to be regraded in places due to severe trenching.

PRINCIPLE 3

Maintained trails are sustainable trails.[4]

Goals

- **Trails receive routine maintenance and consistent investments to support use and preserve the natural environment, including restoration, reconstruction, reroutes and/or major capital improvements for infrastructure where necessary.**
- **Trails that are not meeting the needs of visitors or are susceptible to chronic failure or resource damage are decommissioned and restored to natural conditions.**
- **Where appropriate, trail system mileage increases as maintenance resources and capacity increase.**

Current status:

Limited routine trail maintenance funds are spread across trails along the Mountain Loop Highway on a rotating schedule that prioritizes the most popular trails. While annual trail maintenance is an important component to keeping trails open and passable, the forces of nature and the effects of thousands of visitors eventually take their toll on trails. Many of the trails on the Mountain Loop were not designed for the level of trail use they currently receive. In the Mt. Baker-Snoqualmie's 1990 Forest Plan, trails were categorized by use levels at the time. The trail system was designed to accommodate those relative use levels. The University of Washington's Outdoor Recreation & Data Lab's trail use modeling suggests that the range of relative use levels has expanded significantly. For instance, what was once considered "extra heavy" use would be a "medium" level of trail use by today's standards. The trail visitation analysis also suggests there is a wide disparity in visitation between the most popular trails and the lesser-visited ones. On the south Mountain Loop, four of the 21 trails where summer use levels were modeled were found to have "extra heavy" use, seven were "medium," and ten were "low." Trails in the "extra heavy" category are receiving anywhere from 10,300 visits (Mount Pilchuck Trail) to an estimated 90,000+ visitors[5] (Big Four Ice Caves).

Thanks to recent funding from the Great American Outdoors Act and investments from the National Forest Foundation, the four most-frequently visited trails (Big Four, Heather Lake, Mount Pilchuck and Lake 22 trails) will receive major investments to address deferred maintenance. However, dozens of trails throughout the planning area also have improvement needs such as trail reconstruction, reroutes and bridge repairs or replacements. Meanwhile, a handful of trails have all but disappeared over time. While there is interest and opportunity to develop new trails within the planning area, the inability to maintain the current trail system is a limiting factor to adding new mileage in the near term.

[4] Sustainable trails are defined as trails that can be manageably accessed, are well-built and maintained, have consistent funding and cultivate a welcoming and respectful community.

[5] This visitation estimation accounts for day use and scenic viewing at the trailhead in addition to trail use.

Opportunities

A. Prioritize heavy maintenance and reconstruction on the heavy and extra heavy use trails to prevent resource damage. The below list incorporates the information about trail conditions from Forest Service staff as well as WTA trip reports. The list of maintenance and reconstruction needs will grow as staff complete condition surveys.

TABLE 6 – KNOWN TRAIL MAINTENANCE AND RECONSTRUCTION NEEDS

Trail/Route	Relative Use Level	Reconstruction & Maintenance Needs
Big Four	Extra Heavy	Conduct heavy maintenance to establish wheelchair-friendly access to the end of the trail (planned for 2023-2024). Redesign terminus to discourage off-trail travel. Consider creating a loop to keep traffic flowing on the trail.
Lake 22	Extra Heavy	Harden and reconstruct trail to stand up to high levels of use; repair footbridge (planned for 2023-2024).
Pilchuck	Extra Heavy	Reconstruct trail to stand up to high levels of use. Intensive trail work is planned for the lower third of the trail in 2023-2024 but additional funding is needed to complete the upper two-thirds of the trail, including rock work.
Heather Lake	Extra Heavy	Harden and reconstruct trail to stand up to high levels of use; reconstruct warped trail bridge at lake outlet (planned for 2025-2026).
Dickerman	Heavy	Address trenching and braided trail in meadows; relocate trail to reduce damage.
Weden Creek/ Gothic Basin	Heavy	The Weden Creek Trail is an old miners' trail. Annual maintenance is needed to sustain heavy use. The DNR Morning Star Trails Plan identified braided user trails in Gothic Basin as a concern.
Monte Cristo Mine-to-Market Road	Heavy	Evaluate creek crossing options to restore family-friendly access to one of the top favorite places reported by survey respondents.
Sunrise Mine	Medium	Evaluate potential for bridges at two challenging fords where fatalities have occurred.
Perry Creek	Medium	Implement the road-to-trail conversion included in the 2019 South Fork Stillaguamish Environmental Analysis.
Pinnacle Lake and Bear Lake	Medium	Regrade trail in places with severe trenching. Analyze opportunities to protect wetland areas on trail (for example, adding a puncheon or bridge).
Barlow Point	Low	Upgrade puncheon.
Kelcema Lake	Low	Repair bridge and reconstruct the turnpike. The trail needs heavy maintenance. Formalize camping and day use at lake to reduce social trails.
Coal Lake	Low	Reconstruct trail and evaluate opportunities to provide wheelchair-friendly access. Close and restore social trails. Formalize picnic area at the lake.
Independence Lake Trail	Low	Conduct heavy maintenance between Independence Lake and North Lake.

PRINCIPLE 4

Maintained and accessible roads and trailheads are critical to sustain the trail system.

Goals

- **Roads to trailheads receive routine maintenance and are accessible for low-clearance passenger vehicles.**
- **Where roads can no longer be maintained due to chronic failures or other resource concerns, roads are converted to trails to maintain non-motorized access to the existing trail network.**
- **Trailhead facilities receive routine maintenance and meet federal Architectural Barriers Act (ABA) standards, which improves wheelchair accessibility, including bathrooms and informational kiosks.**
- **Trailheads are designed to optimize available parking spaces and limit roadside parking.**
- **Connector trails link nearby campgrounds, day use sites and overflow parking opportunities to trailheads.**
- **Trailheads adjacent to the Mountain Loop Highway are evaluated for the potential to accommodate shuttle or bus service.**

Current status

The analysis of the user survey and Outdoor Recreation and Data Lab study found that visitors strongly prefer trails that can be accessed from the paved Mountain Loop Highway. However, the majority of trails on the loop in this area are accessed from gravel roads in poor condition. Road maintenance budgets for the Forest Service have drastically declined over the years. Road improvements are often tied to timber sales, which happen infrequently within the planning area and may not fund improvements to the entire length of road needed to access trailheads. For example, the 41 Road, which provides access to multiple system trails including the Three Fingers Lookout in the Boulder River Wilderness, is closed at a bridge wash out 9 miles below where the road ends at Three Fingers trailhead. The Forest Service does not have plans to replace the bridge. As a result, over 12.5 miles of interconnected trails are extremely challenging to access, much less maintain. Additionally, parking lots at popular trailheads regularly overflow to the roadsides, restricting access for visitors and emergency services, creating hazards for pedestrians and causing resource damage along the road corridor. Visitors camping along the Mountain Loop have limited opportunities to reach nearby trails and day use sites without driving from where they are camped.

Opportunities

A. Invest in lesser-used trails that are accessed directly from the paved section of the Mountain Loop Highway such as Barlow Point, Old Government and Marten Creek trails.

B. Prioritize repairs and improvements on forest roads with access to multiple trails.

TABLE 7 – ROAD CONDITION IMPROVEMENTS

Forest Service Road #	Trails Accessed	Rationale & Recommendations
42	Pilchuck and Heather Lake trailheads	The 42 Road is in poor condition and accesses two of the most highly visited and valued trails on the Mountain Loop. The road is receiving repairs and heavy maintenance in 2023. Long-term, we recommend evaluating road location and design and considering paving to reduce annual maintenance needs.
4020/4021	Bear and Pinnacle Lake trails, Ashland Lake Trail, Boardman Lake Trail and Lake Evan Trail	The 4020 and 4021 Roads are currently only passable for high-clearance vehicles. The 4021 accesses two trailheads and provides entry to the DNR Morningstar NRCA. The 4020 road accesses the Boardman and Lake Evans trails. We recommend maintaining the road to allow passenger vehicle access.  ***Ashland and Boardman Lake.*** *Photo by SnyderK.*
4060	Coal Lake, Independent and North Lake and Falls Creek/Pass Lake trails	The 4060 Road is washed out ¾ mile from the Coal Lake trailhead. This road accesses a diverse complex of trails offering many of the experiences that visitors seek on the Mountain Loop, such as alpine lakes, overnight destinations and accessible day-use areas outside of designated wilderness. These trails are currently lightly visited relative to other area trails, but road conditions may be a limiting factor. Coal Lake Trail has the potential to be redesigned to allow for wheelchair-friendly access to an alpine lake. We recommend repairing the current washout and maintaining the road to allow for passenger vehicle access.
4032	Walt Bailey/ Cutthroat Lakes	The Washington State Department of Natural Resources Morningstar National Resource Conservation Area Trails Plan identified renovation of the Cutthroat Lakes Trail and backcountry campsites as high priority. This trail connects to the traverse on Bald Mountain Ridge, providing an opportunity for a longer backcountry hike. The 4032 Road is in poor shape but expected to receive some road maintenance after a timber harvest in 2022. We recommend maintaining the road to allow for passenger vehicle access.
4052	Kelcema Lake, Deer Creek Pass and Deer Creek cross-country ski route	The 4052 Road is only accessible to high-clearance vehicles. It accesses a short, family-friendly hike into the Boulder River Wilderness at Kelcema Lake, as well as a more primitive trail experience at Deer Creek Pass. The road also serves as a winter cross-country ski route. We recommend repairing the current washout and maintaining the road to allow for passenger vehicle access.
41	Meadow Mountain, Three Fingers/Saddle Lake, Forks of Canyon Creek and Canyon Lake trails	Develop a long-term plan for the trail system located behind the 41 Road closure. If bridge reconstruction to restore vehicle access is not feasible due to environmental and/or financial constraints, develop a trailhead and establish new trail connections to the Meadow Mountain and Three Fingers trails and/or road-to-trail conversion of the remaining 41 Road.

Mt Pilchuck. Photo by Bill Edwards.

C. Expand trailheads where parking overflow is causing a risk to visitor safety and resource damage.

TABLE 8 - PRIORITY TRAILHEAD IMPROVEMENTS

Trail	Rationale & Recommendation
Lake 22	Overflow from the Lake 22 parking lot creates resource damage and puts hikers in danger as they park along the Mountain Loop Highway. Explore providing auxiliary parking at Hemple Creek Picnic Area by redesigning the site to accommodate additional parking and formalize a crosswalk across Mountain Loop Highway. Establish a connector trail from Gold Basin Campground so that campers do not have to drive to access the trail.
Big Four Ice Caves	Replace the missing double vault toilet at the Big Four Picnic Area.
Heather Lake	Expand the existing parking lot to absorb overflow and reduce congestion on 42 Road (planned for 2023).
Pilchuck	Replace or repair the damaged toilet. Formalize a picnic area at the far end of the trailhead parking lot to accommodate visitors who want to enjoy the view without the workout on trail. Explore opportunities to expand or create auxiliary parking to accommodate overflow.
Sunrise Mine	This trailhead was an old logging area and provides limited parking. The Forest Service decided to construct a new trailhead in 2019 after completion of the South Fork Stillaguamish Environmental Analysis. The decision included a plan to convert part of the existing road to a trail between the new parking lot and the current trailhead.
Mallardy Ridge/ Walt Bailey Trail	This trailhead was an old logging area and provides limited parking. The Forest Service included a decision to construct a new trailhead in the 2019 South Fork Stillaguamish Environmental Analysis. A new connector trail would need to link the new trailhead to the existing trail.
Three Fingers and Meadow Mountain trails	The trailheads for these trails are inaccessible because the 41 Road is washed out at the bridge across the South Fork of Canyon Creek. If the bridge cannot be repaired, establish a new trailhead to formalize parking and access to this trail system. Survey respondents identified Three Fingers as a highly valued place along the Mountain Loop Highway.

PRINCIPLE 5

Reliable funding for trails is essential to ensure consistent maintenance as well as progress toward strategic investments in capital improvements and restoration.

Goals

- **Sufficient funding is available for annual maintenance needs.**
- **Road maintenance for trailhead access is no longer dependent upon sporadic emergency repairs and funding sources linked to timber sales.**
- **A long-term maintenance strategy is developed utilizing new and creative funding streams and the capacity of multiple partners and agencies, including local communities, to steward trails and support recreation opportunities along the Mountain Loop Highway.**
- **Recreation opportunities on the Mountain Loop Highway contribute to the economy of the Mountain Loop area.**

Current status

Trail maintenance is funded in part through Northwest Forest Pass sales, but a significant amount of funding comes from Washington State Recreation & Conservation Office grants. Partnerships with organizations like WTA have maximized incoming funds to accomplish important work and contribute to annual maintenance. However, the trails, roads and other recreation facilities along the Mountain Loop Highway were not designed for current use levels. Mountain elements, like rain and wind, also take their toll on trails over time. Major investments are needed to upgrade and sustain this trail system. Deferred maintenance needs on National Forest lands along the Mountain Loop Highway exceed $42 million for roads, trails and campgrounds. Visitation will continue to increase and these needs will continue to grow. The trail and recreation destinations along the Mountain Loop have the opportunity to lift up local economies through intentional planning that prompts recreationists to spend time in the local area along the journey to their destinations, providing economic benefit to nearby communities.

Opportunities

A. **Establish a Regional Recreation Council to build capacity for communities, agencies, and other stakeholders in the Mountain Loop Highway region to jointly fund and finance trail and recreation projects.**

Priority Recommendations

Among the many opportunities we have identified, we wish to highlight a few of the more pressing recommendations for implementation in the next 10 years. These recommendations are not listed in any order.

- **Complete all heavy trail maintenance, trailhead and road improvements on the most visited trails on the Mountain Loop** (Big Four Ice Caves, Lake 22, Heather Lake and Mount Pilchuck). While some of this work is underway or planned in 2023-2024, there are still outstanding needs, including but not limited to: overflow parking at Lake 22, heavy trail maintenance and terminus design on the Big Four Ice Caves Trail and additional trail work on Mount Pilchuck *(Principle 3, Opportunity A)*.

- **Invest in improving and expanding wheelchair-friendly trails** *(Principle 2, Opportunity B)*.

- **Establish a Regional Recreation Council** to ensure long-term coordination, funding, and investments into trails and recreation along the Mountain Loop *(Principle 5, Opportunity A)*.

- **Enhance trail opportunities and road access in the Coal Creek drainage.** Repair the 4060 Road to restore access for passenger vehicles to this diverse trail network *(Principle 4, Opportunity B)*. Upgrade and explore opportunities for wheelchair-friendly access on the Coal Lake Trail *(Principle 2, Opportunity B)*. Restore the Falls Creek/Pass Lake Trail and explore opportunities to connect with the Independence/North Lake Trail *(Principle 2, Opportunity C)*.

- **Restore trail access to the Monte Cristo Townsite and trail complex.** Re-establish creek crossings on the Monte Cristo Mine-to-Market Road to restore the original access to the Monte Cristo Townsite and the trail network beyond *(Principle 3, Opportunity A)*.

- **Restore or re-envision trail access for the Three Fingers trail complex.** Evaluate options for re-establishing the bridge across South Fork Canyon Creek on the 41 Road *(Principle 4, Opportunity B)*. If bridge access cannot be reasonably restored, conduct planning to establish a new trailhead *(Principle 4, Opportunity C)* and re-connect the existing trail system *(Principle 2, Opportunity C)*.

- **Repair and improve forest roads that access multiple trails.** Invest in roads in places where improved conditions could lead to greater trail access, like the 4060 Road that, when fully repaired, would offer diverse trail experiences to many kinds of users *(Principle 4, Opportunity B)*.

Other Considerations

This report focused on opportunities to create a sustainable trail system in the south Mountain Loop Highway. However, the work that informed this process surfaced topics relevant to the broader sustainability of the Mountain Loop Highway. For instance, elements of behaviors and social conditions that impact recreation. These findings produce the following additional recommendations:

- **Users who participated in the 2021 Pacific Northwest Research Station user survey** indicated that "safety" and "lack of enforcement of rules and regulations" were areas of concern for them both at specific trailheads and generally about trails in the Mountain Loop Highway area. We recommend that land managers work with community members to identify solutions that address these concerns.

- **A Trailhead Ambassador program was piloted in the Mountain Loop Highway** during the development of this report to spread awareness of responsible hiking practices. Ambassador programs offer opportunities to provide education to hikers and utilize the existing expertise of local communities. In evaluating the success of this pilot, we recommend local stakeholders continue supporting a program that empowers local communities and organizations to educate and interact with hikers in the Mountain Loop Highway.

- **Recreation can offer major economic benefits to local communities.** To see the most of these benefits, those traveling to places to recreate must spend money and time in areas close to their recreation destinations rather than simply pass through them. We recommend working closely with local communities and recreators to elevate the value of exploring the nearby towns, neighborhoods and cities as part of a recreation experience.

- **Many of the on-the-ground projects recommended in this vision will undergo environmental analysis** that assess a decision's impact on the land; the goal of this report is to provide a vision for a trail system to be considered in conjunction with these other opportunities for analysis. Washington state is beginning to explore the relationship between wildlife, recreation and tribal treaty rights. As more research and literature emerges on location-specific data related to wildlife or impacts to tribal treaty rights, these findings should be considered.

References

1. Balk, G. (2021, Dec 21). "Seattle ended decade with faster growth than suburbs, reversing a 100 year trend". *The Seattle Times*. https://www.seattletimes.com/seattle-news/data/seattle-ended-decade-with-faster-growth-than-suburbs-reversing-a-100-year-trend/

2. Conservation Northwest (2022). *Recreation and Wildlife in Washington: Considerations for Conservation.*

3. Eastern Washington University for the Washington State Recreation and Conservation Office (2022). *State of Washington 2022 Assessment of Outdoor Recreation Demand Report.*

4. Snohomish County (2020). *Population Growth Trends.* Snohomish County Tomorrow 2020 Growth Monitoring Report. https://www.snohomishcountywa.gov/DocumentCenter/View/77541/Population-Growth-Trends-section?bidId=

5. Tulalip Tribes Natural Resources Department (2021). *The "Recreation Boom" on Public Lands in Western Washington: Impacts to Wildlife and Implications for Treaty Tribes A Summary of Current Literature.*

6. Yaw, C. (2022, Mar 5). "By 2044, Snohomish County population projected at 1.1 million". *The Everett Herald.* https://www.heraldnet.com/news/by-2044-snohomish-county-population-projected-at-1-1-million/

Appendix

A. Mountain Loop Highway Visioning Survey Data Summary by the Pacific Northwest Research Station

B. Visitor Preferences in the Mountain Loop Highway Region by University of Washington's Outdoor Recreation & Data Lab

C. Forest Service Mountain Loop Highway Map

A.

Mountain Loop Highway Visioning Survey Data Summary

Prepared by the USDA Forest Service, Pacific Northwest Research Station

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July 20, 2021

PACIFIC NORTHWEST RESEARCH STATION

Executive Summary

The Mountain Loop Highway Visioning Process seeks to formulate a vision for sustainable recreation management in the Mountain Loop area of the Mount Baker-Snoqualmie National Forest. The collaborative team leading the process, including Washington Trails Association and the USDA Forest Service, sought input from user groups, communities, and stakeholders to envision a future state for recreation that reflects the diversity of public values, desires, and concerns for the area. One way of gathering input was through a survey, designed to learn about important activities, values, and places. This report summarizes survey results to assist the core and cadre groups with the on-going process.

We received 1,241 survey responses in total. The vast majority (93%) were Washington residents with a high concentration from northern Snohomish County, including Granite Falls, Arlington, Darrington, Lake Stevens, and Everett. About 58 percent of respondents have been visiting outdoor spaces in the Mountain Loop area for more than 10 years, and nearly 40 percent have been visiting for more than 20 years. Nearly half said that they visited the area 1 to 5 times per year and one-fifth visited more than 10 times per year. The most popular times to visit the area is in the summer and fall.

Respondents visit the Mountain Loop area for many reasons; main reasons include enjoying the scenery (89%), the variety of recreation opportunities (60%), and seeing plants and wildlife (55%). While visiting, nearly all respondents reported that they like to hike or walk (93%); backpacking, camping, and viewing nature/wildlife are also popular activities.

Favorite places were reported throughout the Mountain Loop area, but the southern section of the Mountain Loop area between Verlot and Barlow Pass saw the highest concentration. The top eight sites included: Mt. Dickerman / Perry Creek, Gothic Basin, Lake 22, Mt. Pilchuck, Monte Cristo, Headlee Pass/Vesper Lake, Big Four Ice Caves, and Elliot Creek/Goat Lake. Hiking, photography nature viewing, and backpacking were the most popular activities at these sites. Big Four Ice Caves was noted for picnicking, while Monte Cristo was popular as an historic site. The five most common landscape values mentioned included: adventure/recreation, fitness/wellness, relaxation, ecological, and family.

Survey respondents identified areas with needs for greater access, including new or improved trails, improved roads, and trail connections. Access needs focused on road improvements (60%), trail access (45%), new trail connections (18%), motorized access (14%), and parking (13%). The most frequently identified places for access needs include: Three Fingers Trailhead (road access), Big Four Ice Caves (trail access), and the Monte Cristo area (trail improvements).

Survey respondents also identified areas where they had management concerns. The highest concentration of responses was on the southern half of the loop. Respondents were most concerned about: 'high volume of users' (69%), 'litter and human waste' (61%), 'ecological impacts' (53%), 'lack of enforcement of rules and regulations' (46%), and 'visitor behavior' (42%). Places that were most often identified for management needs include: Lake 22 (visitor volume), Gothic Basin (visitor volume), Mount Pilchuck (visitor volume), Big Four (visitor volume) and Monte Cristo (litter, waste).

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I. Introduction

The Mountain Loop Highway Visioning Process seeks to formulate a vision for sustainable recreation management in the Mountain Loop area of the Mount Baker-Snoqualmie National Forest (MBS NF) in the northern Cascades range of Western Washington. The collaborative effort was led by the USDA Forest Service (USFS) and Washington Trails Association (WTA), and included a planning team of community and regional partners. The Mountain Loop Highway Visioning Process sought to learn from a range of user groups, communities, and other stakeholders to envision a future state for recreation that reflects the values, desires, and concerns of wide range of people who are invested in the area. Throughout the Mountain Loop Visioning Process, USFS and WTA have drawn on the principles of sustainable recreation management, which seeks to provide 'desirable outdoor opportunities for all people, in a way that supports ecosystems, contributes to healthy communities, promotes equitable economies, respects culture and traditions, and develops stewardship values now and for future generations' (Cerveny et al., 2020, p. 10). To achieve these goals, we needed to learn from a wide range of people about their uses of and relationships with the area.

In early 2020, USFS and WTA assembled a core group of 12 participants that included representatives from the MBS NF, Pacific Northwest Research Station, Washington Department of Natural Resources, and WTA. This core team then assembled an extended 'cadre' representing stakeholder organizations, including 15 groups that included conservation organizations, recreation user groups, historical preservation groups, nature centers, science organizations, city officials and community members. While the group originally intended to inform the visioning process through a series of in-person engagements in 2020, it shifted gears due to the COVID-19 pandemic and implemented the Mountain Loop Highway Visioning Survey.

The online survey results presented in this report represent one way the group sought to inform its efforts. The purpose of the survey was to learn from the public about the activities, values, and places that are important to them in the area of the Mountain Loop Highway (Mountain Loop area), and the concerns and desires they have for the area in the future. The survey also sought to gather information about future access needs that would increase public enjoyment of the area. The survey was designed to encourage participation from a variety of people and took advantage of the extended network of the cadre to solicit responses from a wide variety of visitors, residents, and other stakeholders. This report shares a summary of results from the survey and is designed to assist the core and cadre groups with the on-going visioning effort.

a. The Mountain Loop area

The Mountain Loop area is defined by the 55-mile Mountain Loop Highway, a National Scenic Byway designated in 1991. The area is accessed from Highway 92 leading along the Stillaguamish River from Granite Falls in the southwest or from Highway 530 along the Sauk River from Darrington in the northwest. These communities are 'looped' together by Forest Road 20, which is paved from the southwest through Barlow Pass and includes a 13-mile unpaved section (Figure 1).

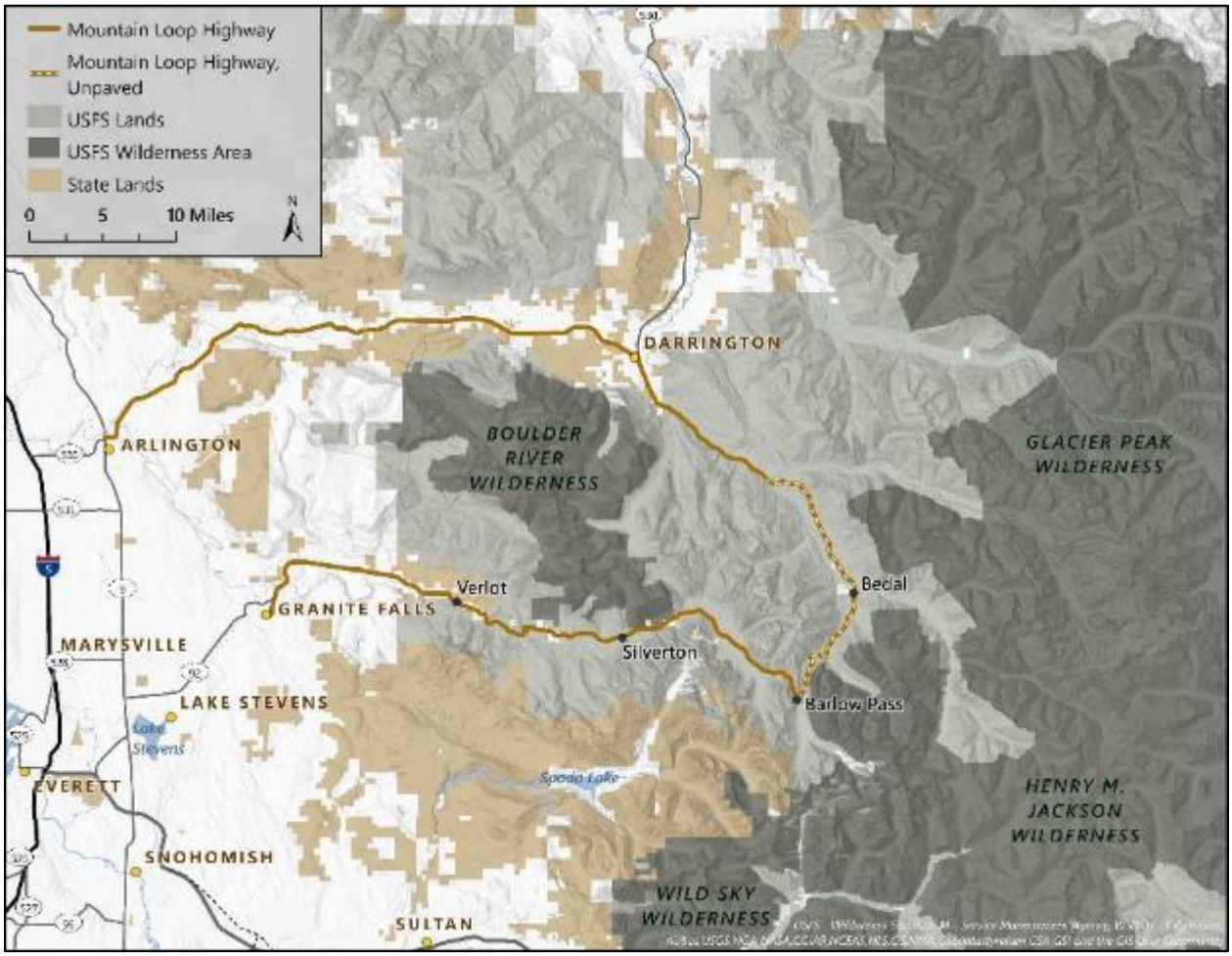


Figure 1. Map of the Mountain Loop area

The Mountain Loop area includes the homelands of Indigenous tribes of the Pacific Northwest, including the Sauk-Suiattle Indian Tribe and Tulalip Tribes. The Sauk-Suiattle Reservation is located near the Sauk Prairie off Highway 530 and tribal members actively use the area. In recent history, the area was a used as a site of mining and logging by European settlers. An historic silver mine at Monte Cristo is now an abandoned town site and heritage destination. Today, the Mountain Loop area is a popular recreation destination for hikers, climbers, fishers, rafters, campers, and skiers. Many visitors also drive through the loop for scenic vistas, picnicking, or accessing the Sauk or Stillaguamish Rivers. The area is managed by several agencies, including the USFS (Mount-Baker Snoqualmie National Forest), the Washington State Parks (Mount Pilchuck State Park), and Washington Department of Natural Resources (Morning Star Natural Conservation Area), and also includes several private landholdings. The area includes numerous developed and group campgrounds, trailheads, and developed sites as well as a USFS visitor center. Trails in the Mountain Loop area connect with three federally designated wilderness areas (Boulder River, Glacier Peak, and Henry M. Jackson), and trails provide a connection to the Pacific Crest National Scenic Trail.

II. Study Approach

a. Survey design and composition

The core team designed the survey using an iterative process and incorporating input from cadre members. The survey contained open-ended, categorical, and Likert-scale questions that asked respondents to share how they relate to, use, and value outdoor spaces in the Mountain Loop area. The survey contained seven sections:

(1) Relationship with the area
(2) Visitation behaviors
(3) Favorite places
(4) Places with access issues
(5) Places of concern
(6) Non-visitor information (only for those who have never visited the Mountain Loop area)
(7) Socioeconomic and demographic information

The survey was designed to take about 10-20 minutes to complete (though some respondents shared detailed comments and may have taken more time). Washington Trails Association administered the survey online using ESRI's ArcGIS Survey123, a web-based survey application. The survey instrument used skip logic and loops, which directed respondents through the survey contingent on how they responded to key questions. We had two main tracks. For those familiar with the Mountain Loop area, we asked the full array of questions about places, issues, and access needs, including the mapping components. Those not familiar with the area responded to a series of questions about their interest in outdoor activities and barriers to visitation. We also created a physical version of the survey, in case anyone requested a paper version, though no requests were made (Appendix A).

b. Sampling, recruitment, and distribution

The link was distributed through relevant Facebook groups (e.g. local climbing/running/hiking/ biking groups, local community forums, etc.); non-profit/government Facebook pages, Instagram accounts and/or Twitter pages (e.g. WTA Facebook & Instagram pages, USFS Twitter & Facebook, Friends for Public Use Facebook, etc.); newsletters (e.g. local homeowners associations, local recreation newsletters, city communications, etc.), and through local city council meeting agendas. To reach a diverse user base, the link was shared through Facebook groups and organizations with missions to help encourage people of color to participate in outdoor recreation (e.g. Outdoor Asian Washington Facebook, Outdoor Professionals of Color – Seattle Facebook, Latino Outdoors Facebook, POC Native Group Facebook, etc.). A flyer was posted with a link to the survey at trailheads with kiosks in the Mountain Loop area, on bulletin boards at ranger stations in the area, and in select businesses in the Mountain Loop area. The survey opened in late July 2020 and closed in mid-September 2020.

c. Data management and quality control

We used ESRI's ArcGIS Survey123 to collect the data, performed spatial analyses in ESRI ArcGIS Pro 2.8, and performed additional analyses in R. ArcGIS Survey123 organizes responses as a set of related features in a geodatabase. We exported the data as .csv files for ease of editing.

Three sections of the survey had a spatial component (sections 3 – 5). In addition to identifying points on a map, respondents were asked to name and describe the location of a place, using special landmarks or trailheads in their descriptions. We linked the submitted place names and descriptions to known locations in the MLH are (we call these 'reference places'). If we were unable to link a response to a reference place, we classified it as a non-spatial response and assigned it to a general type of place; non-spatial responses were commonly too general to be linked to a specific location (e.g. trailheads generally, roads generally, all of the Mountain Loop area, etc.) or they didn't include enough details to be linked to a specific location (e.g. waterfall with the flat rock). We used a set of decision rules to help with consistency in linking the responses; all responses where there was uncertainty (including misspellings, responses where we used context clues to assign a location, and any responses that didn't align with our decision rules) were reviewed by at least one person who could be considered an expert in the area. Our process for linking place descriptions to spatial points is described in detail in our spatial location methods documentation (Appendix B).

d. Mapping spatial responses

To visualize the spatial components of the survey, we created density maps to show the concentration of place responses across the Mountain Loop area. These maps help distinguish areas with a high density of responses from those with lower density of responses in the Mountain Loop area. Visualizing responses as densities helps to highlight areas, trail systems, and sets of places that are of particular interest to the question topic (e.g. favorite places, access issues, or concerns). We used the kernel density tool in ArcGIS Pro (Spatial Analyst extension) to create maps of the concentrations of responses across the Mountain Loop area. This tool creates a grid showing the density of point responses across an area; each place was weighted by the number of respondents who identified the place (e.g. if a place was submitted by 100 respondents, it was weighted heavier than a place that only 5 people submitted). We then classified each of these density maps into 5 categories[1], ranging from Low Density to High Density. Because the number of responses differ between questions, the density values that define each of the categories differ depending on the question we are mapping. Instead of using a numeric scale, we used a low-to-high color scale to highlight areas of relative response density for each question.

[1] In the 'places of concern' density map, we used more than 5 categories to distinguish between high- and low-density areas. Because one place had so many more responses than other places of concern, increasing the number of categories allowed us to show a gradation of densities across the area, in a similar way to the 'favorite place' and 'access issues' density maps.

III. Findings

a. Respondent characteristics

We received 1,241 survey responses in total. Respondents lived in places as far east as Maine and as far south as southern California, but most (93%) lived in Washington (Figure 2). Two ZIP codes captured the highest density respondents, including 98252 (Granite Falls area, ~5% of respondents) and 98103 (a north Seattle neighborhood, ~5% of respondents). Other Washington respondents were located around the state, with the highest concentrations in the counties adjacent to the Mountain Loop area as well as nearby Seattle (Table 1).

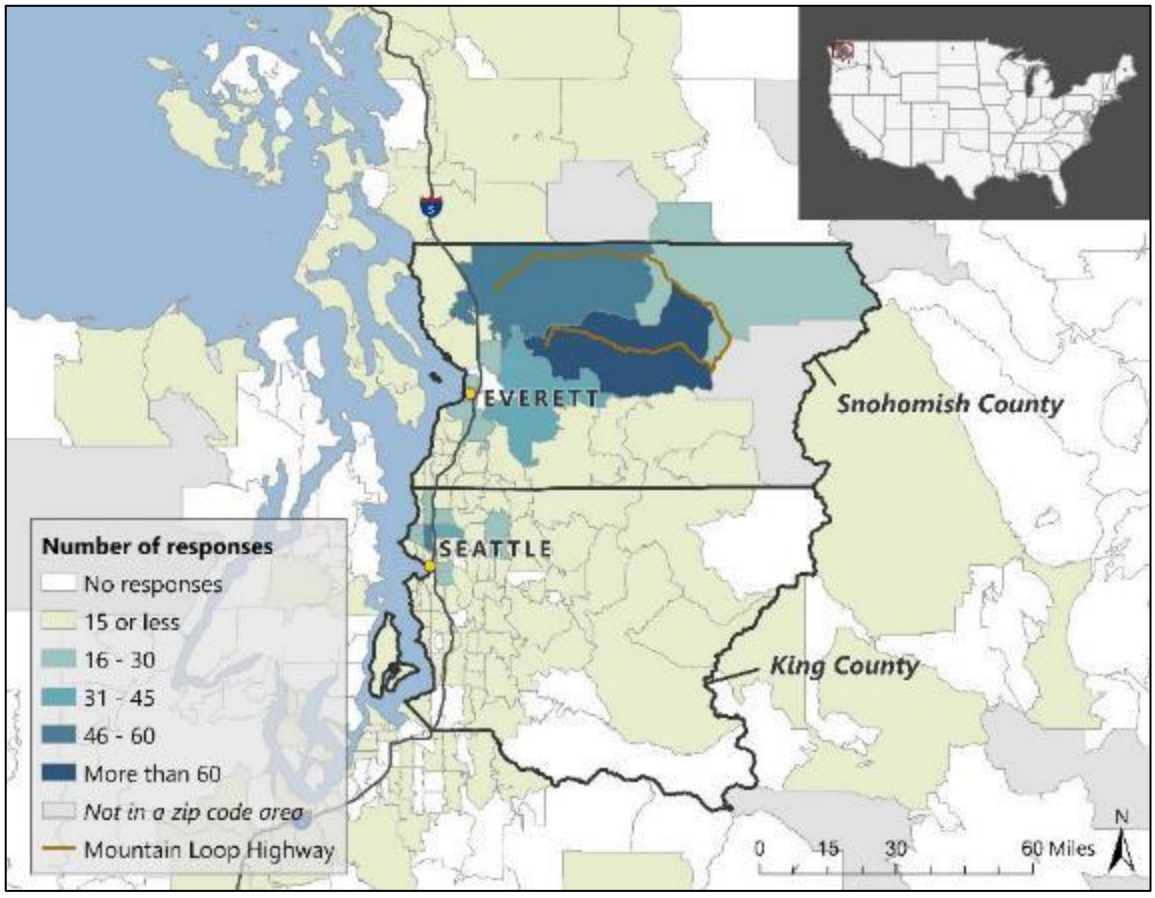


Figure 2. ZIP codes with the highest number of survey respondents (1,184 respondents provided their ZIP codes)

Table 1. ZIP code areas with the highest number of survey respondents

ZIP code	County, State	City/Cities that the ZIP code overlaps	Responses (#)
98252	Snohomish County, WA	Granite Falls, Verlot, Pilchuck, Silverton, Bedal	62
98103	King County, WA	Seattle	60
98223	Snohomish County, WA	Arlington, Oso, Swede Heaven, and others	51
98258	Snohomish County, WA	Lake Stevens, Machias, Cavalero, and others	44
98290	Snohomish County, WA	Snohomish, Everett, Lake Roesiger, and others	38
98115	King County, WA	Seattle	35
98117	King County, WA	Seattle	26
98107	King County, WA	Seattle	24
98201	Snohomish County, WA	Everett	24
98203	Snohomish County, WA	Everett	23

Respondents' ages ranged from 16 to 84[2], with nearly a quarter of respondents falling between the ages of 30 and 39 (Figure 3). Just over 50 percent of respondents identify as female, while 41.5 percent identify as male, and 0.5 percent identify as Non-binary, Trans or Gender Fluid. (The remaining chose not to respond to the question.) Over 70 percent of respondents hold a bachelor's degree or higher (Figure 4). Over 40 percent had a household income of $100,000 or higher (Figure 5).

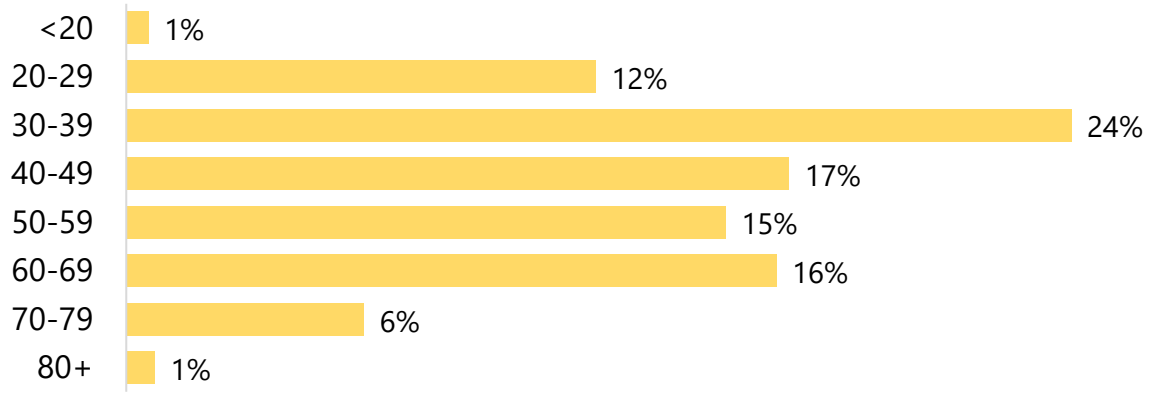


Figure 3. Age distribution of respondents (N = 1,241; 8% of participants did not respond)

[2] We did not include two respondents in the age summary – one stating they were born in 1900 and another stating they were born in 2019. These were outside of a reasonable age range to respond to this survey.

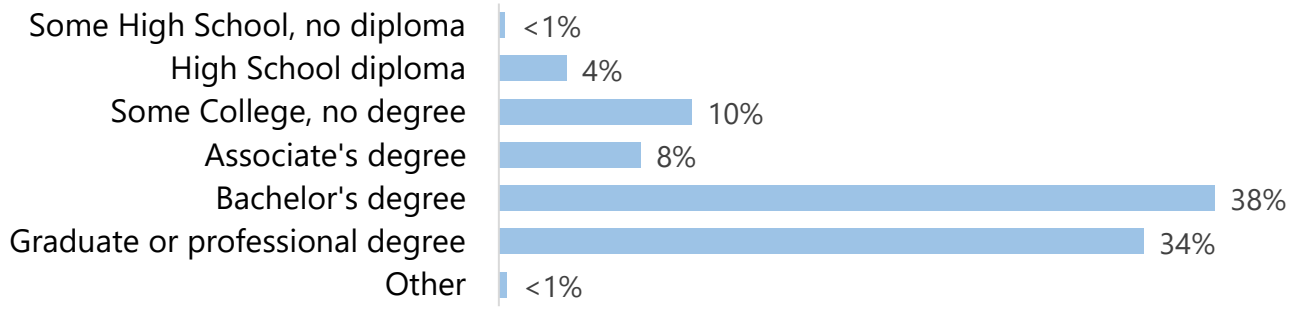


Figure 4. Responses to the question 'What is the highest level of schooling you have completed?' (N = 1,241; 5% of participants did not respond)

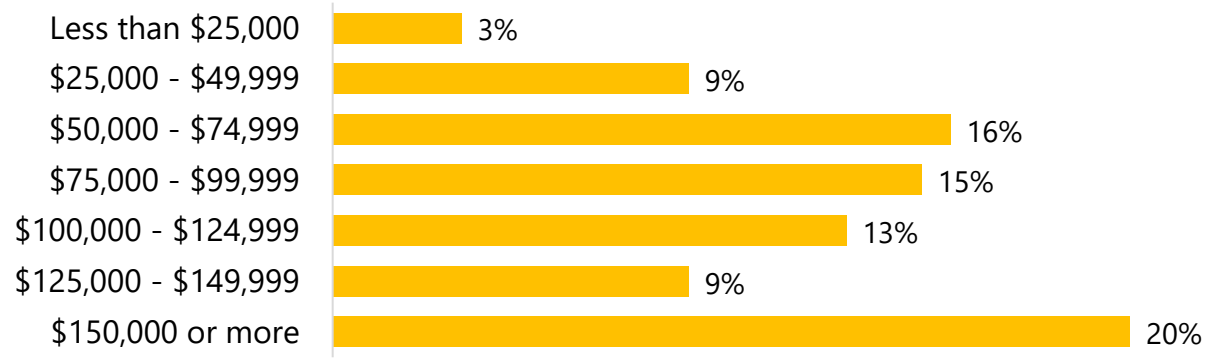


Figure 5. Responses to the question 'What is your annual household income?' (N = 1,241; 14% of participants did not respond)

We asked respondents to describe their race/ethnicity in an open-ended question and report responses here as census race categories (Figure 6). Because we collected this information through an open-ended, unstructured question, the answers did not align precisely with the census race categories. We considered a person to be a given race/ethnicity if they listed the race/ethnicity in their response. For example, if a person responded as 'White, Chinese' they would be represented in 'White', 'Asian', and 'Two or more races' categories. About 73 percent identified as White, about 5 percent identified as Asian, and less than 3 percent identified as each of the following: American Indian or Alaskan Native (1.1%), Black or African American (0.2%), Native Hawaiian or Pacific Islander (0.2%), Two or more races (3.1%), Hispanic or Latino (2.7%). Nearly 20 percent of respondents chose not to answer this question.

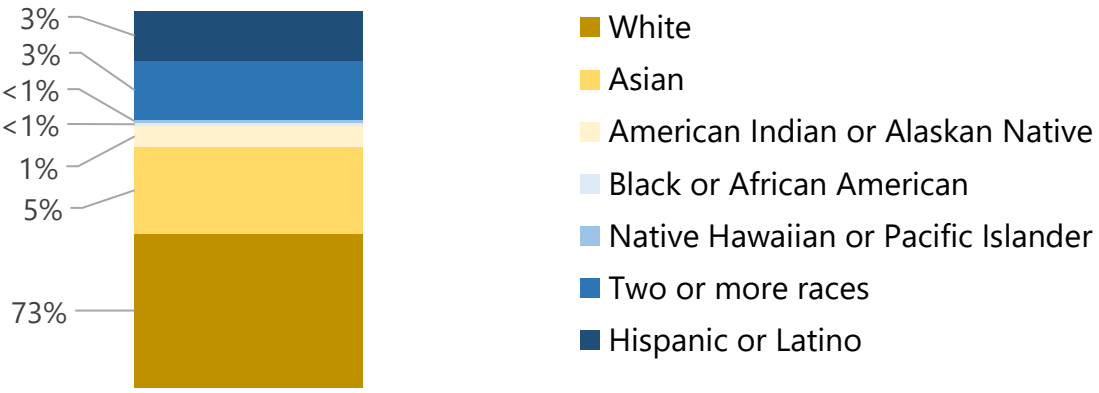


Figure 6. Responses to the question 'What is your race and/or ethnicity?' (N = 1,241; 19.2% of participants did not respond)

We were interested in determining whether participants were representative of visitors or potential visitors to outdoor spaces in the Mountain Loop area (e.g. those who live in Washington and, more specifically, those who live in the counties closest to the Mountain Loop area). Compared to the state population, Black or African American and Asian populations are under-represented in our sample. This is especially true for the counties closest to the Mountain Loop area (Snohomish County and King County), where a higher proportion of the population is Black or African American and Asian than Washington overall[3].

Hiker near Glacier Peak

[3] Data retrieved via U.S. Census Bureau QuickFacts, for WA, Snohomish County, and King County (https://www.census.gov/quickfacts/fact/table/US/PST045219); (1) Washington: White alone – 78.5%, Black or African American, alone – 4.4%, American Indian and Alaskan Native – 1.9%, Asian alone – 9.6%, Native Hawaiian or Pacific Islander alone – 0.8%, Two or more races – 4.9%, Hispanic or Latino – 13.0%, White alone, not Hispanic or Latino – 67.5%; (2) Snohomish County, WA: White alone – 77.0%, Black or African American, alone – 3.8%, American Indian and Alaskan Native – 1.6%, Asian alone – 12.0%, Native Hawaiian or Pacific Islander alone – 0.7%, Two or more races – 4.9%, Hispanic or Latino – 10.6%, White alone, not Hispanic or Latino – 68.1%; (3) King County, WA: White alone – 66.2%, Black or African American, alone – 7.0%, American Indian and Alaskan Native – 1.0%, Asian alone – 19.7%, Native Hawaiian or Pacific Islander alone – 0.8%, Two or more races – 5.2%, Hispanic or Latino – 9.9%, White alone, not Hispanic or Latino – 58.1%

The survey respondents, on average, are more educated than King County, Snohomish County, and Washington overall, where the percentage of people over 25 with a bachelor's degree is 52.5%, 32.8%, and 36.0%, respectively[4]. While it's difficult to directly compare reported income, because respondents selected the income range that best represented their household income, about 57 percent of respondents reported an income higher than the median WA household income (about $73,775), and 20 percent of respondents reported an income of $150,000 or higher. The median income is higher in King County and Snohomish County ($94,974 and $86,694, respectively).

It also is useful to compare our respondents with recreation visitors to the MBS NF, as measured by the National Visitor Use Monitoring (NVUM) data (2015). [5] Compared to MBS NF visitors, our sample had a slightly higher proportion of women, lower proportion of visitors with a household income of $100,000[6] and lower proportion of visitors who are white.[7] We do not have information about educational attainment in the NVUM data to compare.

Considerations

While our sample was reflective of the demographics of typical MBS NF visitors, it does not reflect the demographics of Snohomish or King Counties whose residents use the area. In future outreach, extra steps to reach under-represented groups (including Black and Asian populations, those with lower household incomes, and those with lower educational attainment) will provide a more complete picture of the priorities and concerns of current and future MLH visitors. In addition, future work may target potential MLH visitors to identify barriers, preferences, and perceptions about visiting outdoor spaces to generate information that will help to ensure that these public spaces feel accessible to all.

[4] Data retrieved via U.S. Census Bureau QuickFacts, for WA, Snohomish County, and King County (https://www.census.gov/quickfacts/fact/table/US/PST045219); Race and Hispanic Origin – 2019, U.S. Census Bureau, Population Estimates Program (PEP). Updated annually; Education – (2015 – 2019), U.S. Census Bureau, American Community Survey (ACS). Updated annually; Income – (2015 – 2019) U.S. Census Bureau, American Community Survey (ACS). Updated annually.
[5] Data retrieved via National Resource Manager National Visitor Use Monitoring (NRM NVUM) Results for Mt. Baker-Snoqualmie NF, 2015: https://apps.fs.usda.gov/nvum/results/A06005.aspx/FY2015
[6] 52% of MBS NF visitors make more than $100,000 (compared to 42% of MLH respondents).
[7] 94% of MBS NF visitors identify as White, compared to 73% of MLH respondents; 7% of MBS NF visitors identify as Asian, compared to 5% of MLH respondents; 0.9% of MBS NF visitors identify as Black, compared to 0.1% of MLH respondents; 2% of MBS NF visitors identify as American Indian or Alaskan Native, compared to 1.1% of MLH respondents; 3.7% of MBS NF visitors identify as Hispanic or Latino, compared to 3% of MLH respondents; 1.7% of MBS NF visitors are Native Hawaiian or Pacific Islander, compared to 0.1% of MLH respondents.

b. Place connections and relationship to the Mountain Loop area

We asked respondents to characterize their connections to the Mountain Loop area. More than two-thirds like to spend their free time there (68%) and more than half consider it a special place (56%) (Figure 7). Most respondents identify themselves as visitors to the area, but 11 percent currently live in the Mountain Loop area and 7 percent grew up in the area or lived there in the past; for those current or former residents the average length of residency was 19 years.

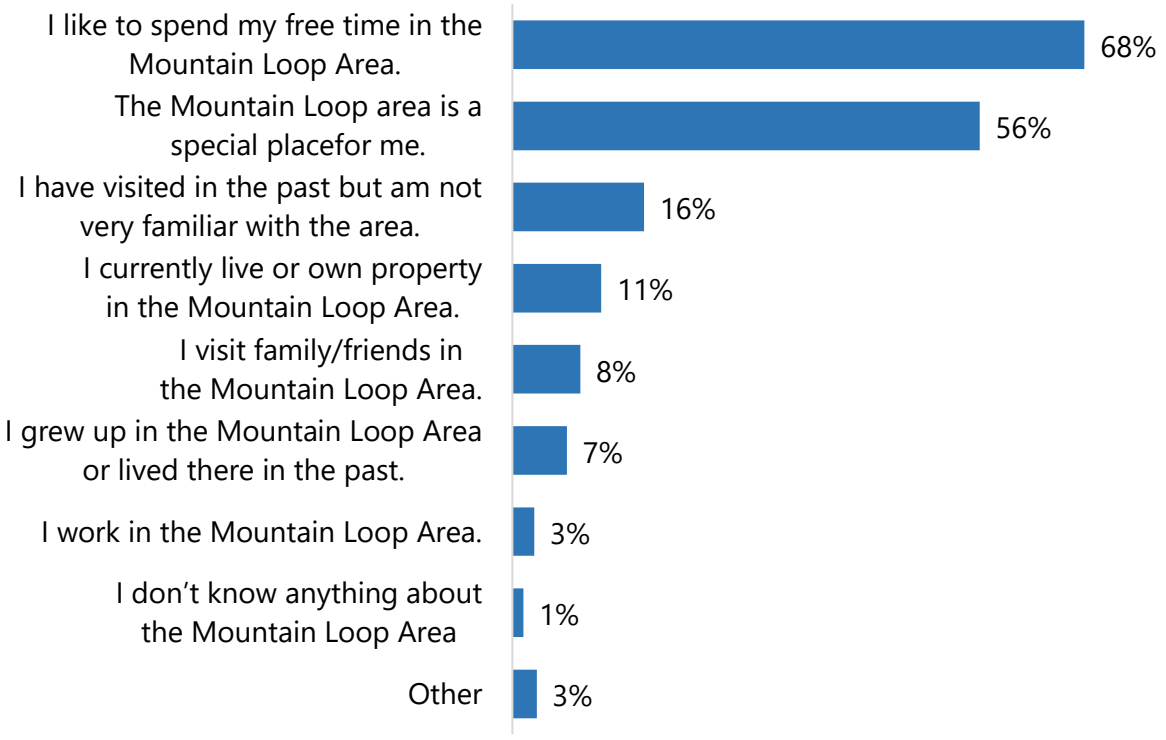


Figure 7. Responses to the question 'What is your relationship with the Mountain Loop area? Respondents were able to select more than one statement. (N = 1,214; less than 1% did not respond to this question)

We asked about the frequency of visits to the Mountain Loop area (Figure 8). Nearly half (49%) said that they visited 1 to 5 times per year. About one in five (19%) visited outdoor spaces in the Mountain Loop area more than 10 times per year. Fewer than 7 percent visited less than once per year. The most popular time to visit the area is in the summer (91%) and fall (77%), but a quarter of respondents visit in all seasons (Figure 9).

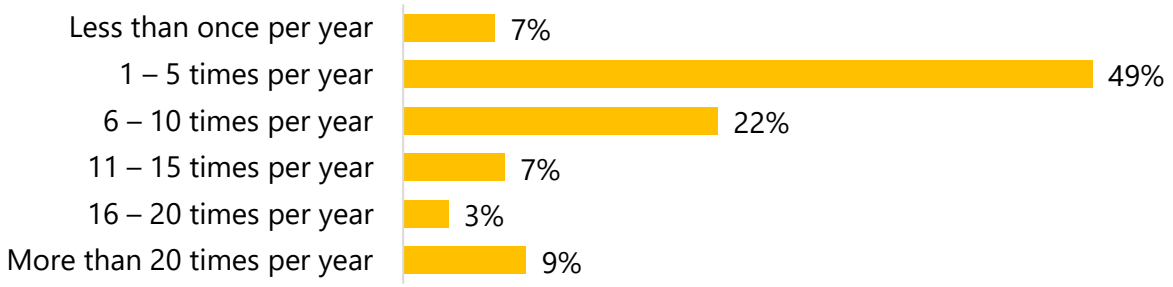


Figure 8. Responses to the question 'In a typical year, how often do you visit outdoor spaces in the Mountain Loop area?' (N = 1,214; 5% of participants did not respond to this question)

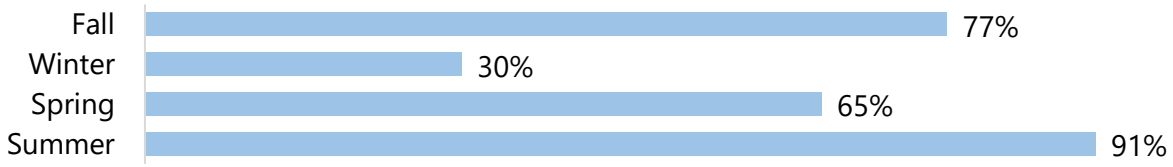


Figure 9. Responses to the question 'Which seasons do you usually visit the Mountain Loop area?' Respondents were able to select multiple seasons. (N = 1,214; 3% of participants did not respond to this question)

Many respondents have been visiting the area for decades: about 58 percent of respondents have been visiting outdoor spaces in the area for more than 10 years, and nearly 40 percent have been visiting for more than 20 years. Only 5 percent of respondents are newer visitors, visiting outdoor spaces in the area for a year or less.

Respondents visit the Mountain Loop area for many different reasons, but the main reasons include enjoying the scenery (89%), the variety of recreation opportunities the area supports (60%), seeing plants and wildlife (55%); and, more than half said that they appreciated that it is close to home or convenient (Figure 10). We were interested in the activities that people seek out in the Mountain Loop area. While visiting, nearly all respondents said that they like to hike or walk (93%), but backpacking, camping, and viewing nature and wildlife are also popular activities (Figure 11).

Considerations

Long-time, sustained visitors have likely developed connections to places around the Mountain Loop area and can offer critical insights into how the area or their feelings about the area have changed over time. Meanwhile, understanding patterns of more recent visitors or non-visitors provides a sense of what might attract future visitors.

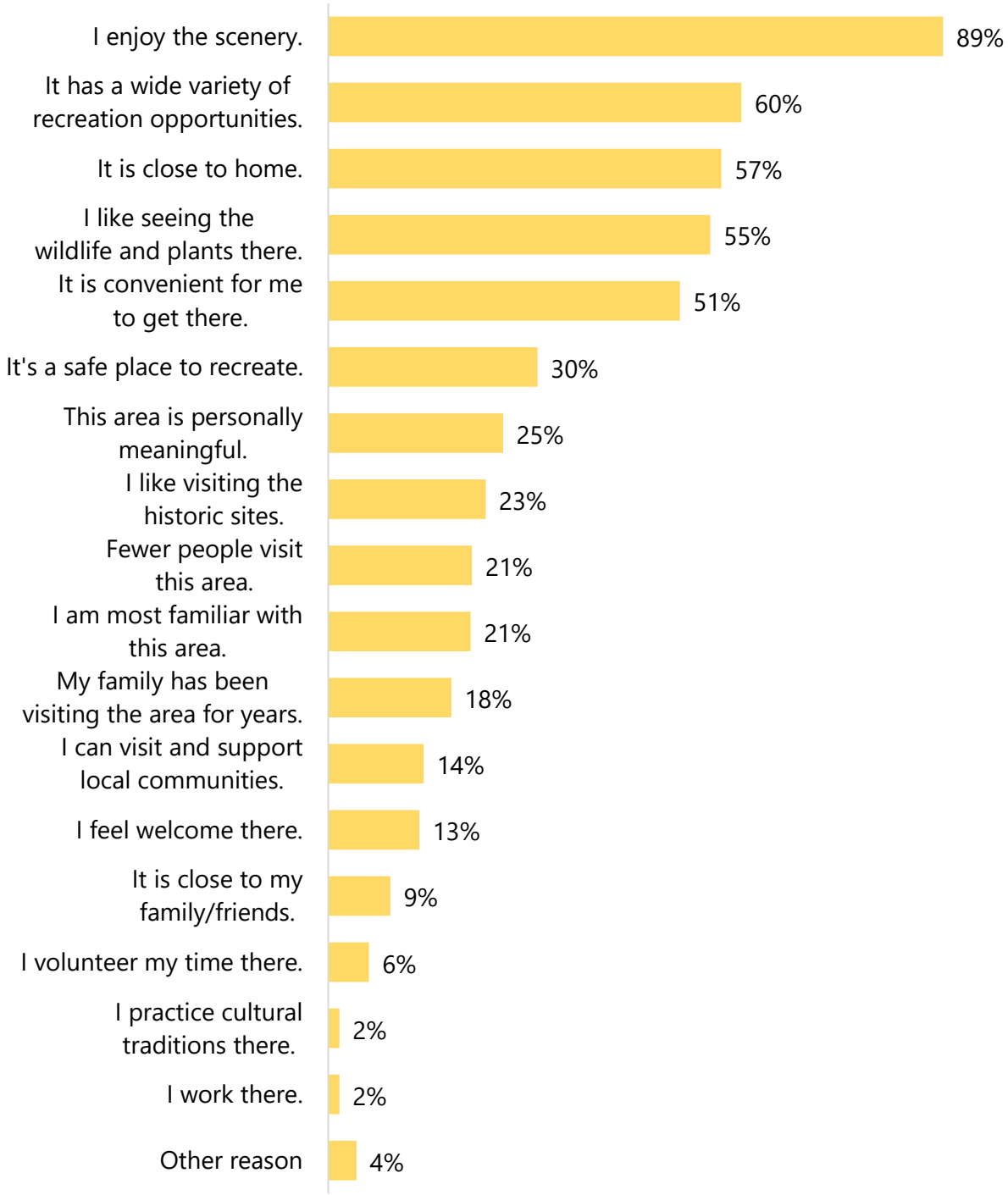


Figure 10. Top responses to the question 'Why do you visit outdoor spaces in the Mountain Loop area?'; Respondents were able to select multiple responses (N = 1,213; 3% of participants did not respond to this question).

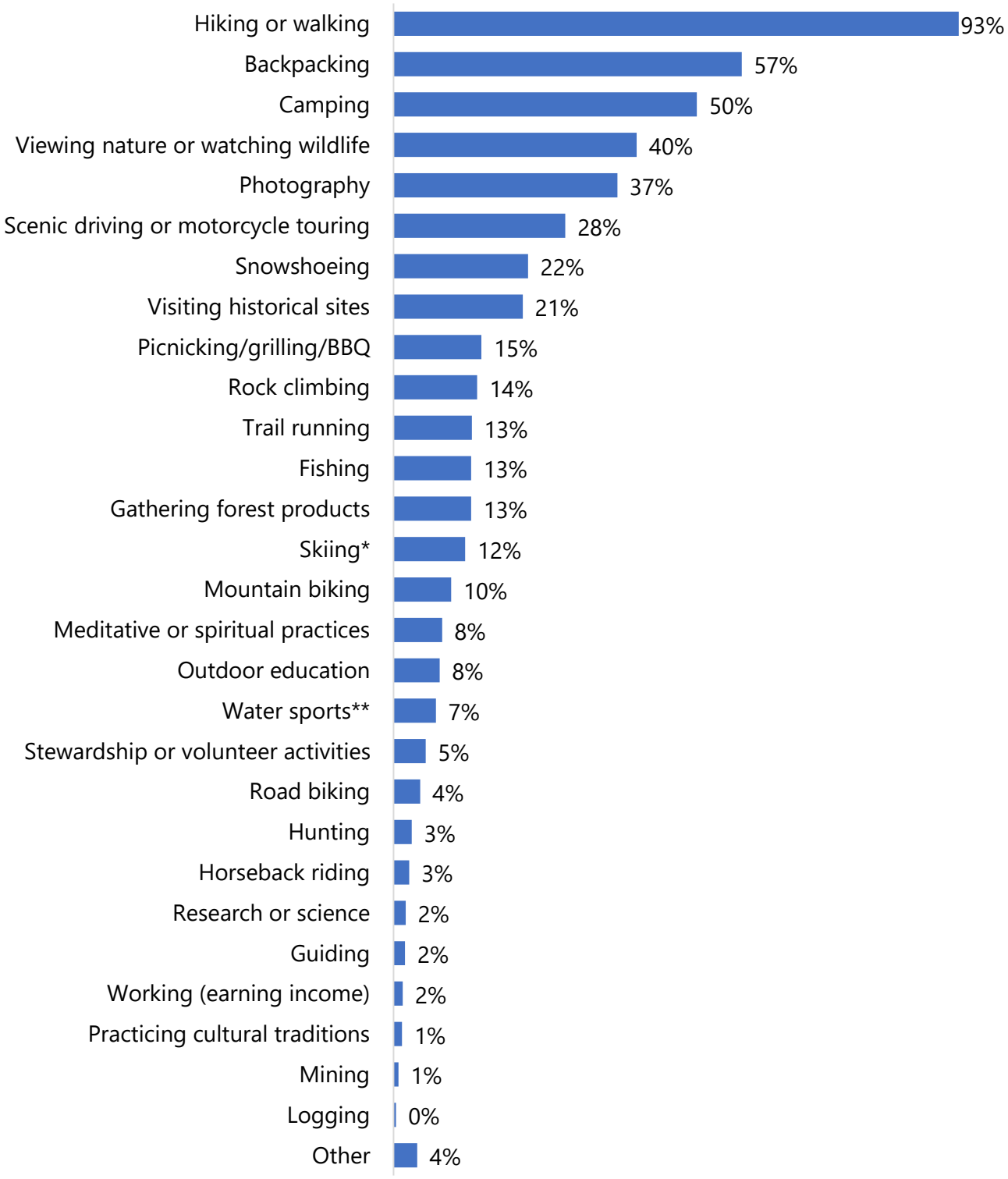


Figure 11. Top responses to the question 'What activities do you do in outdoor spaces in the area?' Respondents were able to select all activities they engage in. *Includes backcountry and cross-country skiing; **Includes rafting, kayaking, and canoeing; (N = 1,213; ~3% of participants did not respond to this question)

We were interested in hearing from non-visitors to the Mountain Loop area. Overall, just 2 percent of respondents had never visited the Mountain Loop area. Most non-visitors are interested in visiting in the future. It is important to note that this is a small sample of non-visitors that's not representative of all who choose not to visit the Mountain Loop area. Top reasons listed for not visiting the area include: *'I don't know what the area is.' 'I don't have enough time to visit.' 'I don't have the information I need*'. ` and '*I don't know what I can do there.*' (Figure 12).

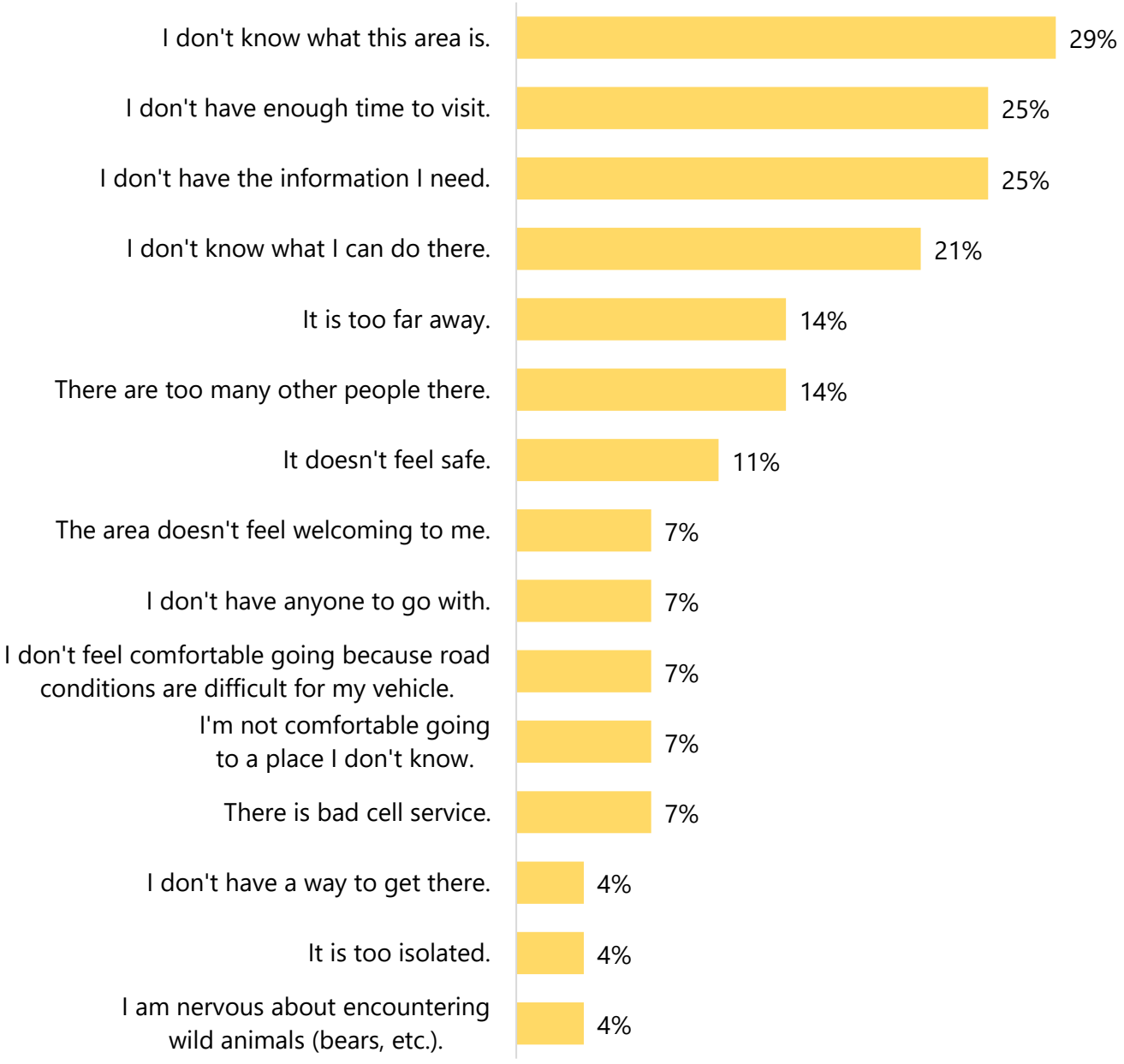


Figure 12. Responses to the question 'What are the three main reasons you do not visit the Mountain Loop area?'; Respondents were able to select up to three reasons; (N = 28; only those who responded that they have never visited the Mountain Loop area). No respondents selected the following answer choices: The activities there don't interest me; I can't do my preferred activities there; I don't have the gear I need; I don't think I'd fit in; I can't afford to go.

We also asked what would motivate them to visit the area in the future (Figure 13). The highest proportion of non-visitors stated that a friend's invitation and knowing the area is safe are the likeliest motivators to visit the Mountain Loop area. This small sample suggests that sharing information about the area (including how to visit safely and the diverse recreation opportunities the area supports) could help to encourage new visitors.

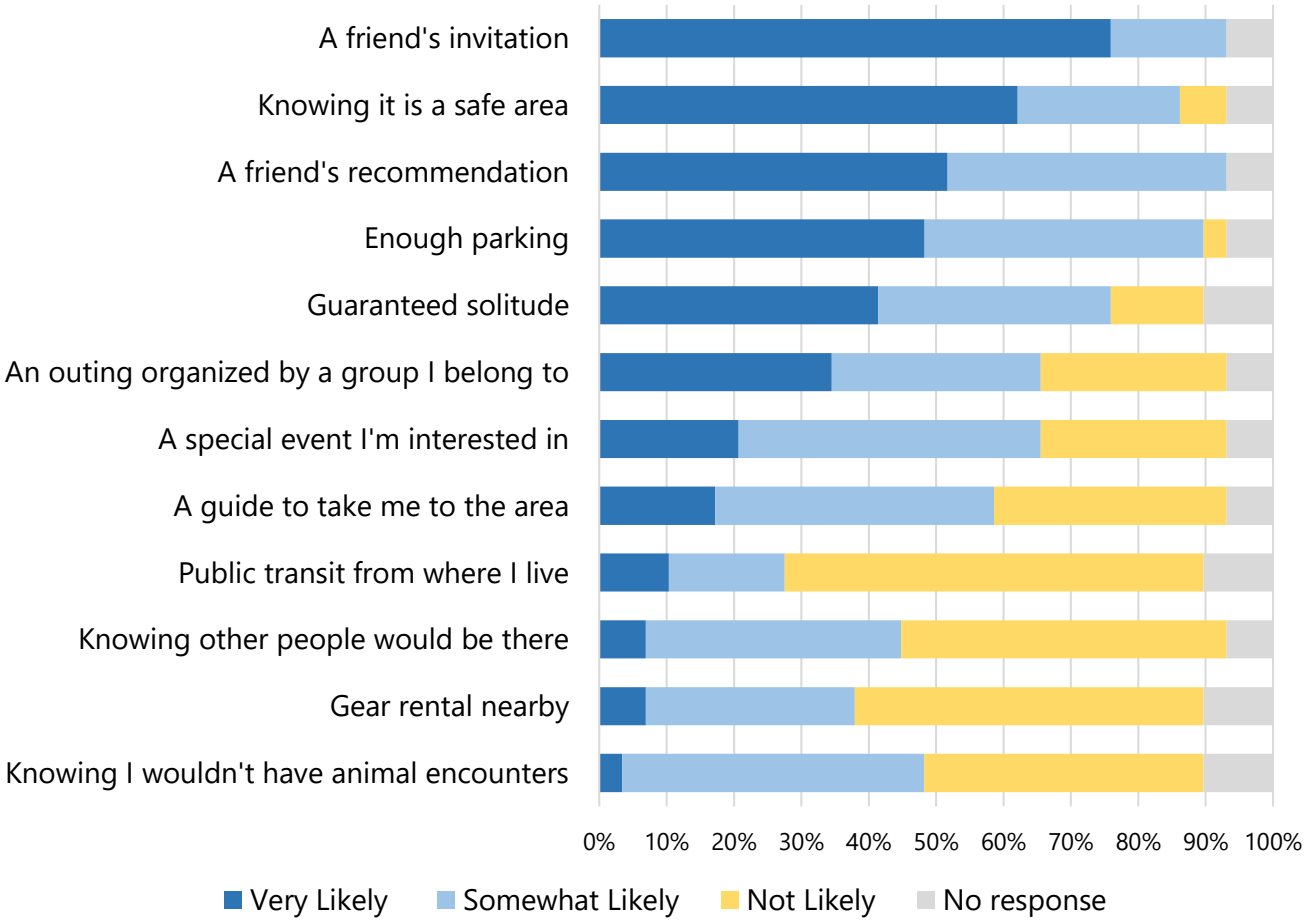


Figure 13. Responses to the question 'How likely is it that each of the following factors would motivate you to visit the Mountain Loop Area?' (N = 28)

c. Mapping favorite places in the Mountain Loop area

Favorite places may be places that are visited frequently, places that were visited once but were marked by a unique experience, or they may be strictly symbolic and not visited at all (such as a mountain peak viewed from the back porch). Though collecting information about the places that people find special in the Mountain Loop area does not provide a complete illustration of visitation patterns in the area, it does allow us to understand how people value places around the Mountain Loop area. Knowing which places or areas that many people find special can help inform future planning and infrastructure investment in the Mountain Loop area.

Respondents were able to name up to four favorite places around the Mountain Loop area and give details about the activities and values that they associate with these places. In total 1,079 respondents (about 90% of respondents) submitted 1,708 favorite places. Favorite places were reported all around the Mountain Loop area, but the southern section of the Mountain Loop area saw the highest concentration of responses (Figure 14). Eight places were named by 100 or more respondents (Figure 15; Table 2), all located on the southern section of the Mountain Loop area. These popular places vary in their appeal, but shared similarities in how people enjoy spending their time when visiting and the values they associate with the places.

Outdoor activities. Knowing the activities that visitors engage in at well-loved places can help tailor future planning efforts or target future investments that support outdoor activities. Understanding how people interact with their favorite places can be helpful in efforts to mitigate potential issues at these sites (Figures 16a – 16h). Hiking or walking was overwhelmingly the top activity that people mentioned in the Mountain Loop area. When looking across the top 10 places, between 81% and 96% reported '*Hiking/walking'* as the predominant activity (Table 3).

Other common activities mentioned included photography, rock climbing, visiting historic sites, and viewing nature or wildlife. '*Photography'* was the second most popular activity at Mt. Dickerman/Perry Creek, Lake 22, Mt. Pilchuck, and Elliot Creek/Goat Lake. '*Rock climbing'* was the second most identified activity for Headlee Pass/Vesper Lake (where there are many popular climbing routes), while '*Visiting historic sites'* was second in Monte Cristo (a former mining town). For Weden Creek/Gothic Basin, '*Backpacking'* was the second most identified activity, and at Big Four Ice Caves, *'Viewing nature or wildlife'* was the second most identified activity. Other activities mentioned in the popular areas include *Camping, Snowshoeing, Trail-running and Skiing.*

Considerations

As we look at the favorite places identified, we see trends in the constellation of activities associated with each site. This reminds us that people enjoy a place for a variety of reasons and are not typically focused on a single activity during any given visit. Potentially, sites that offer a greater variety of activities or diversity of values may be more attractive than sites suitable to a single activity. More analysis is needed to understand these trends. These data urge us to think about common features of favorite places selected and how visitors might substitute across their favorite places when making decisions about where to go.

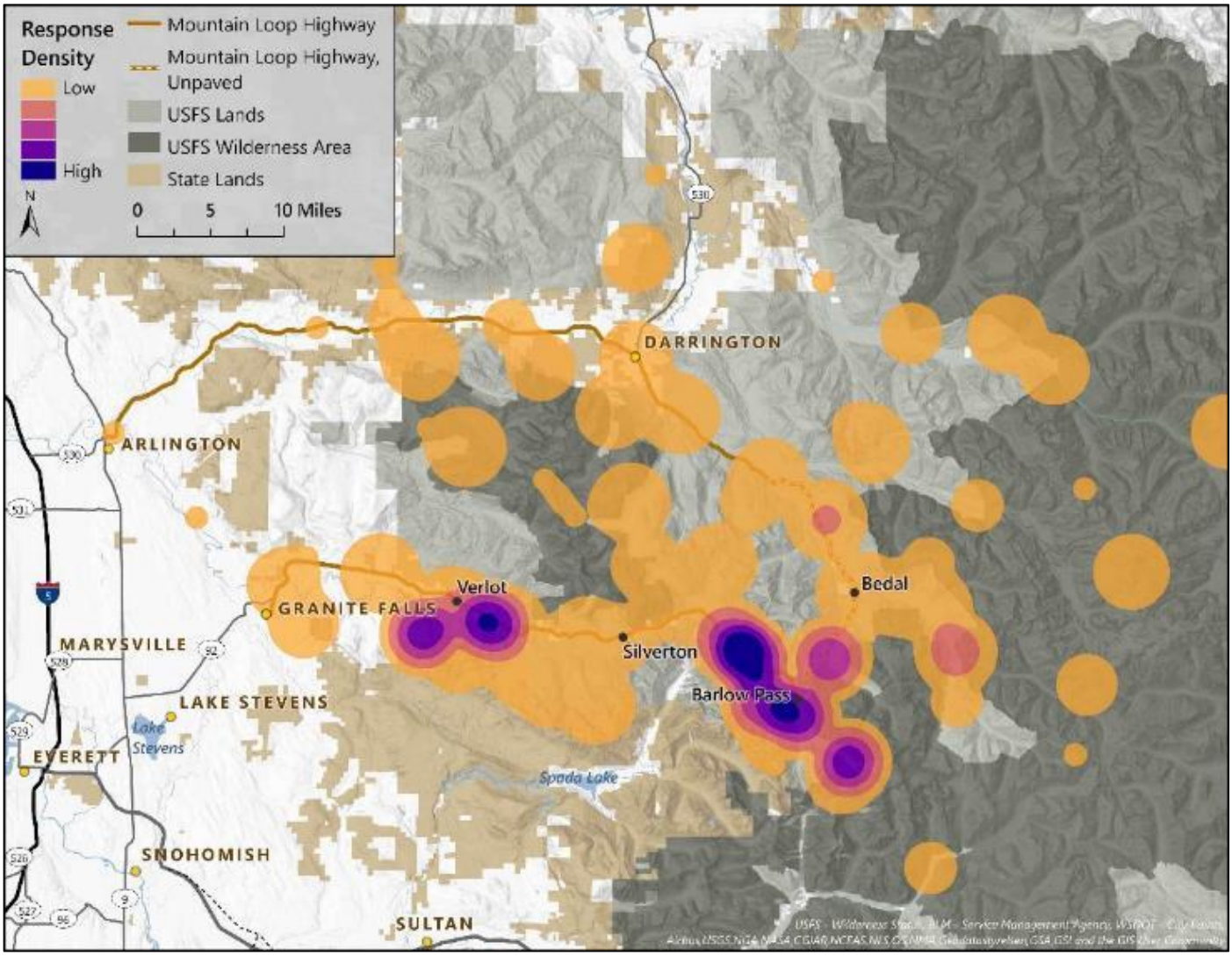


Figure 14. Density map of all favorite place responses (1,079 people submitted a total of 1,708 places. We grouped 1,568 of these responses into 101 specific places across the area. The remaining 140 responses were general and couldn't be linked to a location on the map; these responses are not included in the density maps).

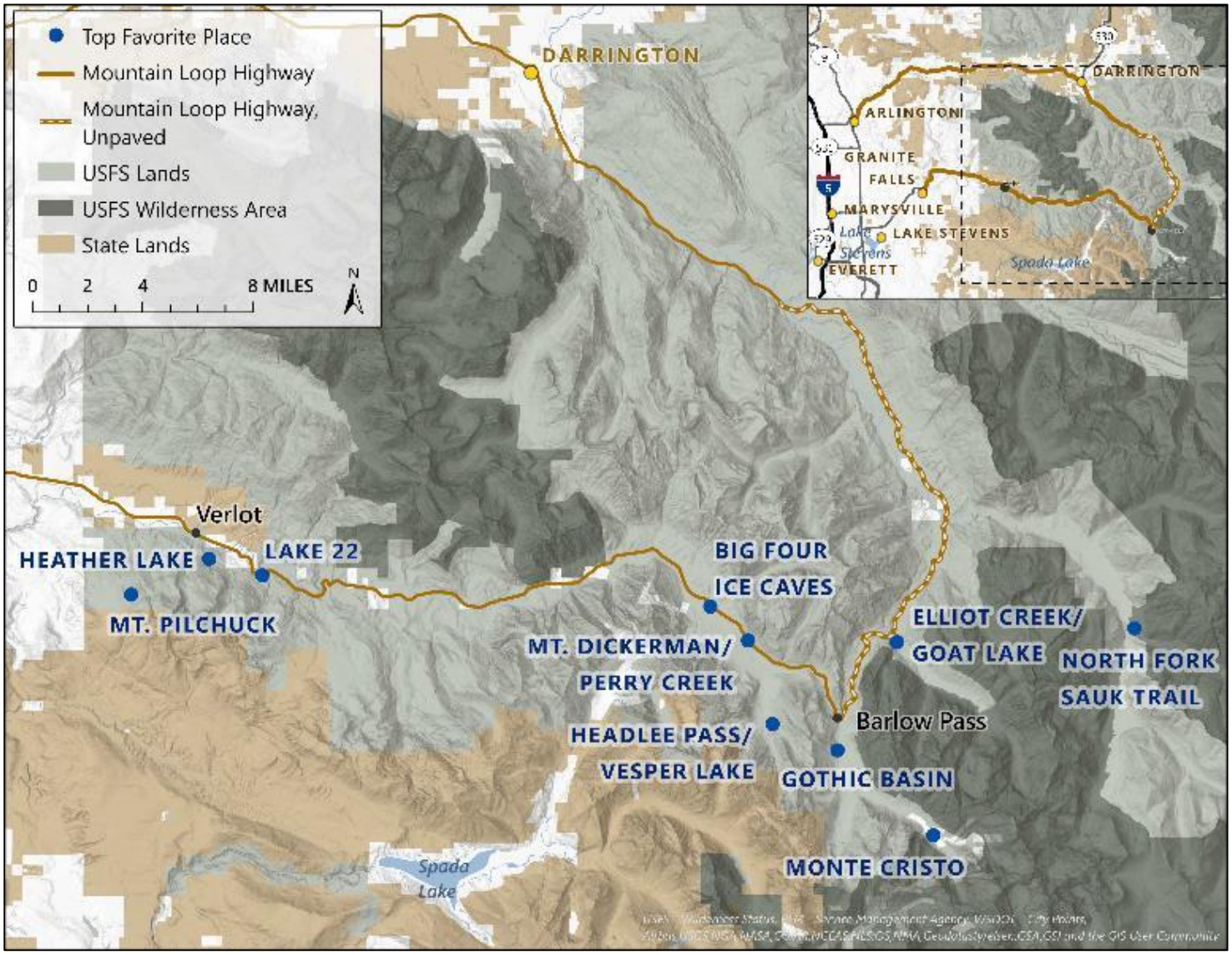


Figure 15. Top 10 most frequently identified favorite places.

Table 2. Top Favorite place response descriptions

	Name	Includes responses for:	Highlights
1	Mt. Dickerman/ Perry Creek	*Mt. Dickerman, Mt. Forgotten Meadows, Mt. Forgotten, Perry Creek Trail and Perry Creek Falls*	Respondents overwhelmingly referenced the scenic beauty, the rewarding challenge, the diversity and abundance of plant life, and the lack of people relative to other hikes.
2	Gothic Basin	*Del Campo, Gothic Basin, and the Foggy Lake Trail*	Respondents described the area as beautiful and unique, but many referenced worries of overcrowding and the influence of increasing visitors in the area (though many also remark enjoying that it's relatively crowd-free).
3[a]	Lake 22	*Lake 22 (trail/trailhead) and the lake itself*	Respondents remarked about Lake 22's beauty, noting that the hike is not too difficult. Many noted increased use over the years.
3[a]	Mt. Pilchuck[b]	*Mt. Pilchuck Trail, Mt. Pilchuck Lookout and references to the peak or summit*	Respondents found Mt. Pilchuck a challenging hike and appreciated the beauty of the area, the lookout tower, area history and scenery.
5	Monte Cristo	*Town site[c] (e.g. mining area) and the general Monte Cristo area*	Many referenced hiking here with their families and at different life stages. The historic value was often noted. Monte Cristo serves as a gateway to many alpine trails.
6	Headlee Pass/ Vesper Lake	*Sunrise Mine Trail, Headlee Pass, Sperry Peak and Vesper Peak*	Respondents praised the area's rugged trails, summit views, relative remoteness, and diverse opportunities (e.g. historic mining sites, accessible climbing routes, skiing).
7	Big Four Ice Caves	*Ice Caves, Big Four, and Big Four Picnic Area*	Many respondents described an easy but beautiful hike, appropriate for kids and other new or inexperienced hikers or those with limited mobility.
8	Elliot Creek/ Goat Lake	*Elliot Creek and Goat Lake*	Respondents remarked about the beauty of the area, the ease of hiking, and relative solitude.
9[d]	Heather Lake	*Heather Lake and Heather Lake Trail*	Respondents referred to this hike as family-friendly and appreciated its year-round accessibility. Many mentioned experiencing the changing seasons at the lake.
9[d]	North Fork Sauk Trailhead	*Glacier Peak Wilderness; Pilot Ridge Loop; Red Pass; White Pass*	Respondents found beauty in the old growth along this trail and value the access to remote wilderness areas and the Pacific Crest Trail.

a. Lake 22 and Mt. Pilchuck tied for the 3rd most frequently identified favorite place. b. Does NOT include references to Mt. Pilchuck State Park. c. The region was a 19th century mining district. The Monte Cristo town site was largely abandoned by the 1920s. d. Heather Lake and North Fork Sauk Trail tied for the 9th most frequently identified favorite place.

Table 3. Top activities at the most frequently identified favorite place responses

	N	#1	#2	#3	#4	#5
Mt. Dickerman/ Perry Creek	172	Hike/walk (91%)	Photography (21%)	View Nature (19%)	Backpack (8%)	Snowshoe* (5%) Trail Run* (5%)
Gothic Basin	139	Hike/walk (87%)	Backpack (59%)	Photography (35%)	View Nature (20%)	Camp (19%)
Lake 22	132	Hike/walk (93%)	Photography (30%)	View Nature (27%)	Backpack (9%)	Snowshoe (6%)
Mt. Pilchuck	132	Hike/walk (92%)	Photography (33%)	View Nature (24%)	Backpack (17%)	Camp (10%)
Monte Cristo	114	Hike/walk (93%)	Visit Historical Sites (45%)	**Backpack (38%) **Photography (38%)		View Nature (28%)
Headlee Pass/ Vesper Lake	108	Hike/walk (81%)	Climb (47%)	Backpack (30%)	Photography (27%)	Ski (23%)
Big Four Ice Caves	105	Hike/walk (95%)	View Nature (45%)	Photography (44%)	Picnic/BBQ (25%)	Visit Historical Sites (23%)
Elliot Creek/ Goat Lake	102	Hike/walk (96%)	Photography (38%)	View Nature (26%)	Backpack (25%)	Camp (12%)
Heather Lake	42	Hike/walk (90%)	Photography (43%)	View Nature (40%)	Backpack (7%)	Gather forest products (5%)
North Fork Sauk Trailhead	42	Backpack (76%)	Hike/walk (64%)	View Nature (24%)	Camp (21%)	Photography (19%)

*Tied for 5th; **Tied for 3rd

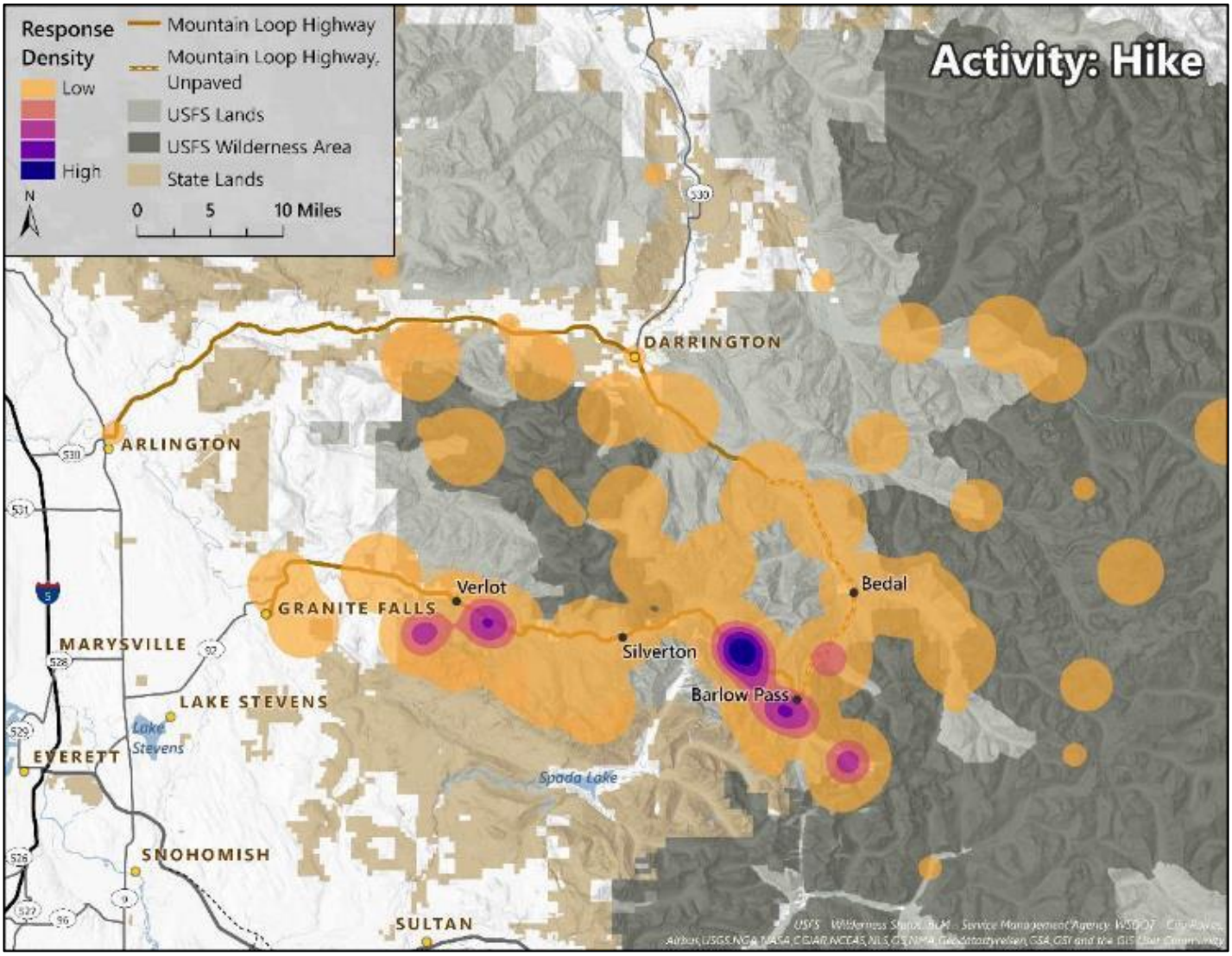


Figure 16a. Hiking response density across favorite places (Hiking/walking was reported by at least one respondent at 87 places)

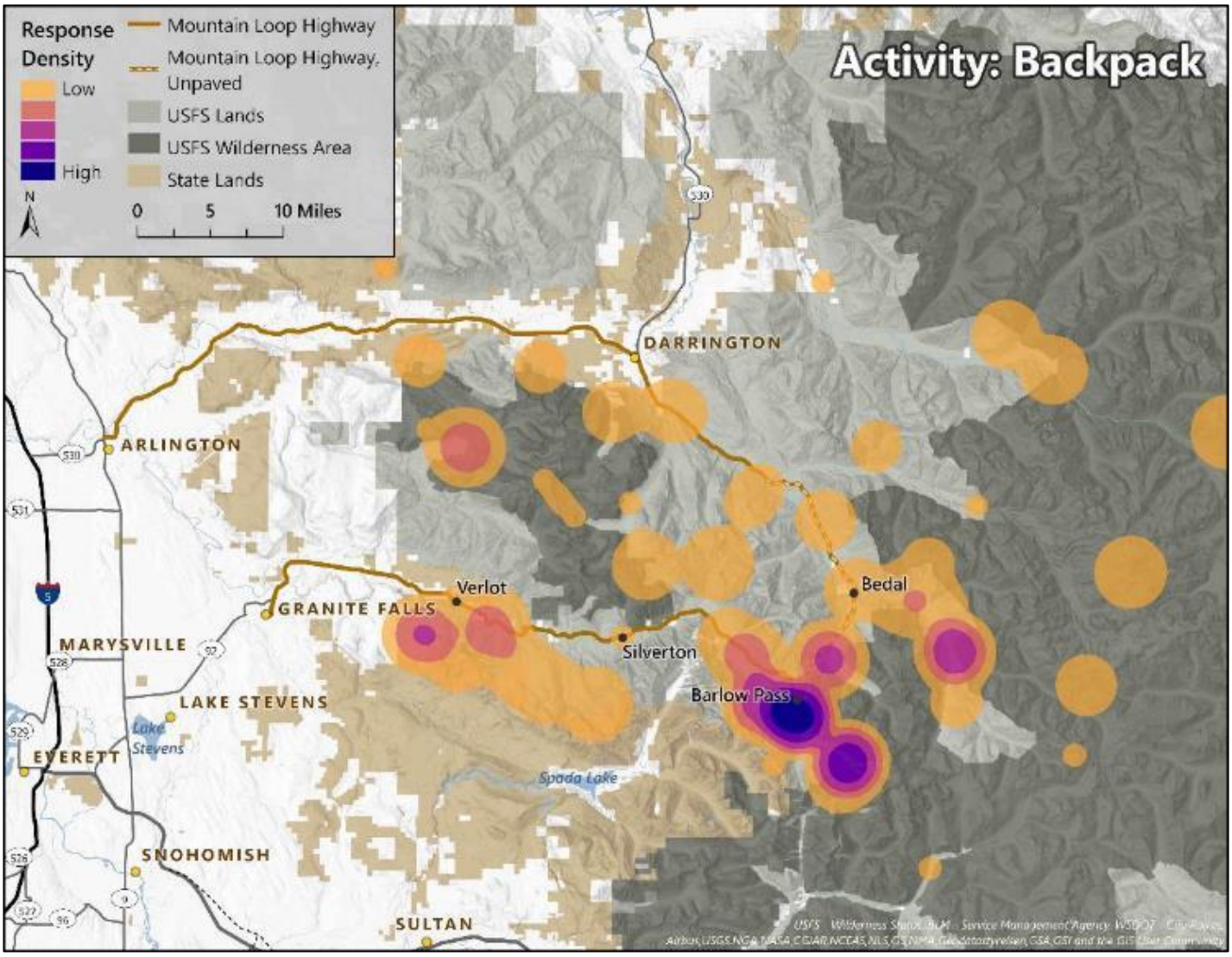


Figure 16b. Backpacking response density across favorite places (Backpacking was reported by at least one respondent at 59 places)

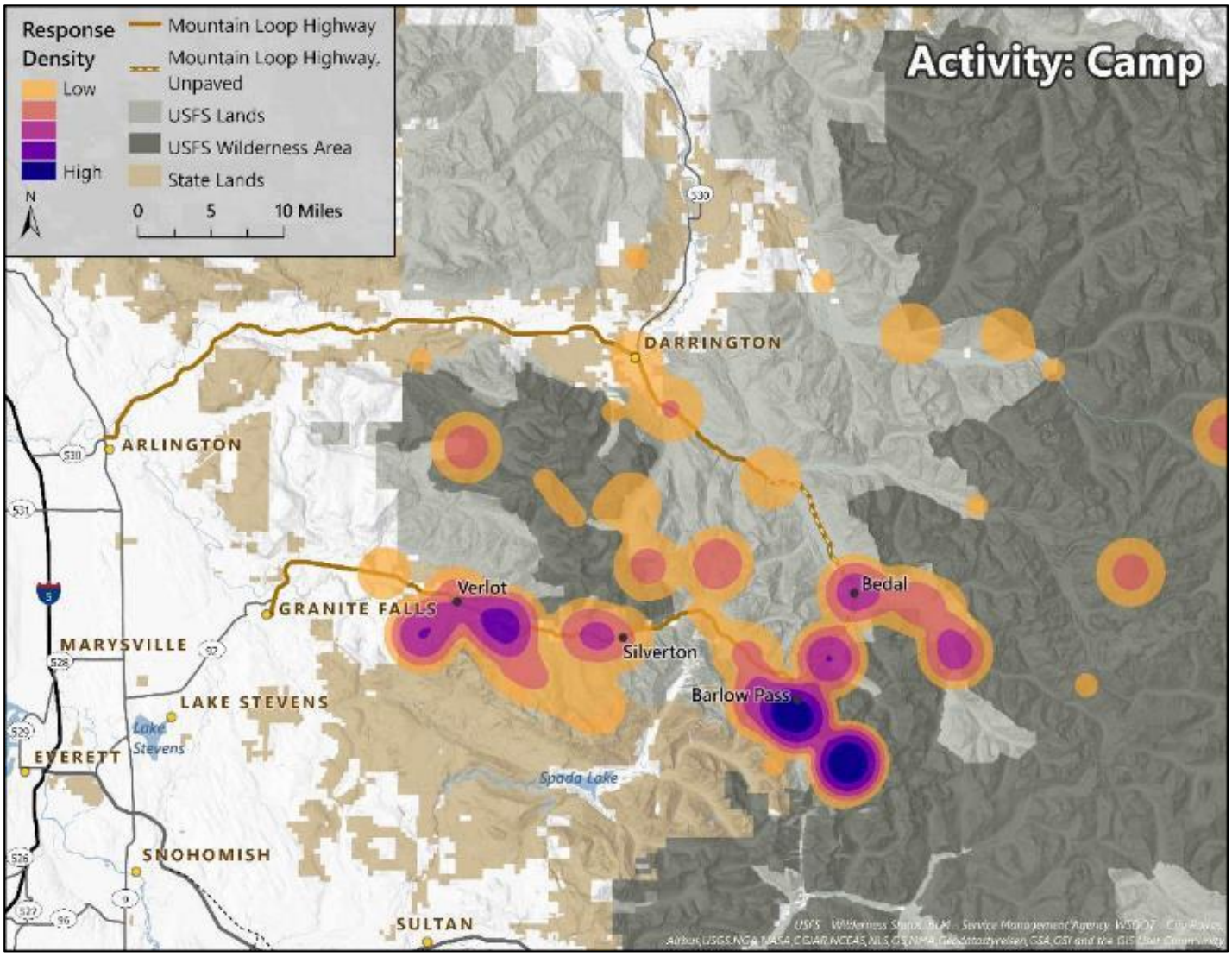


Figure 16c. Camping response density across favorite places (Camping was reported by at least one respondent at 61 places)

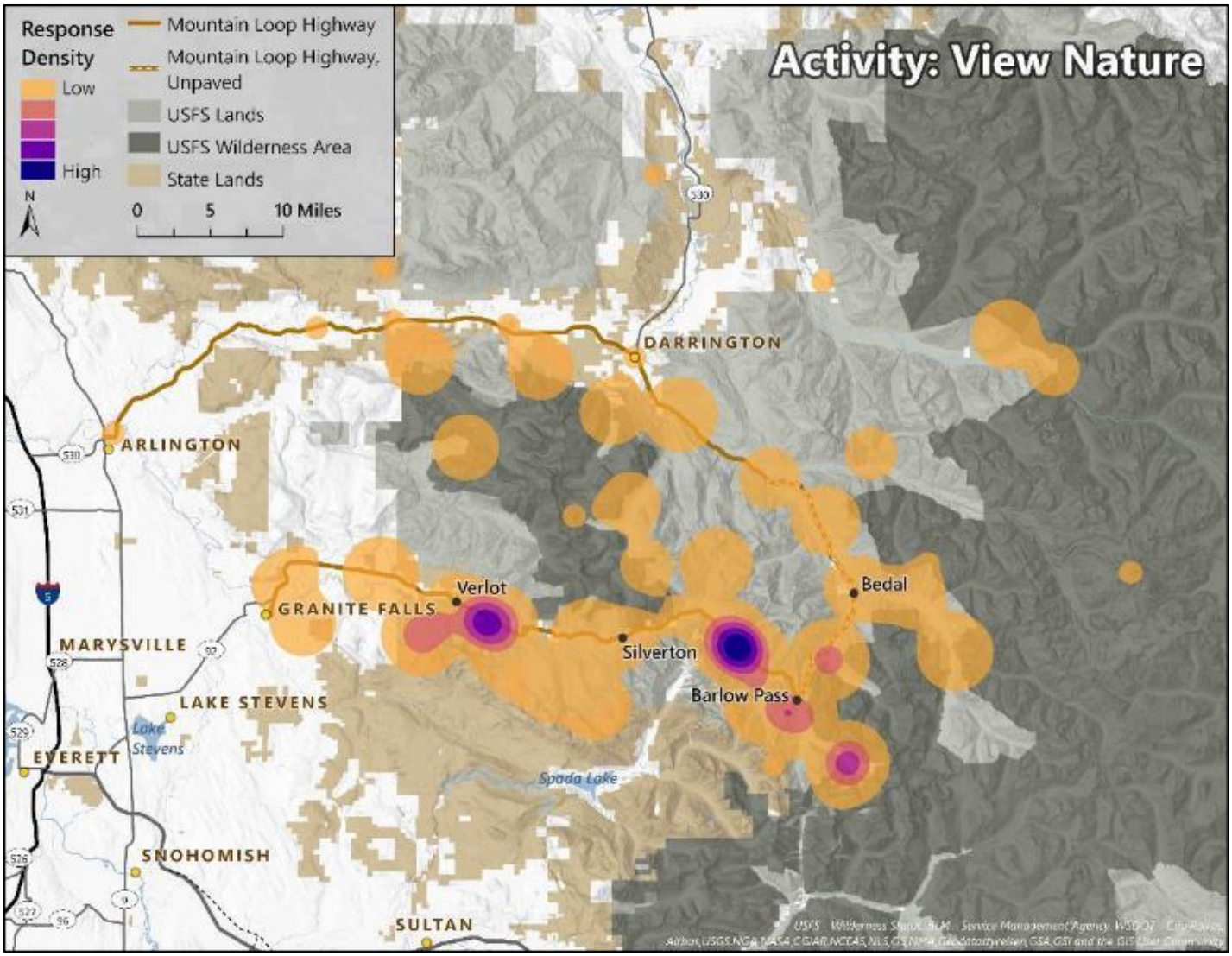


Figure 16d. Viewing nature or wildlife response density across favorite places (Reported by at least one respondent at 66 places)

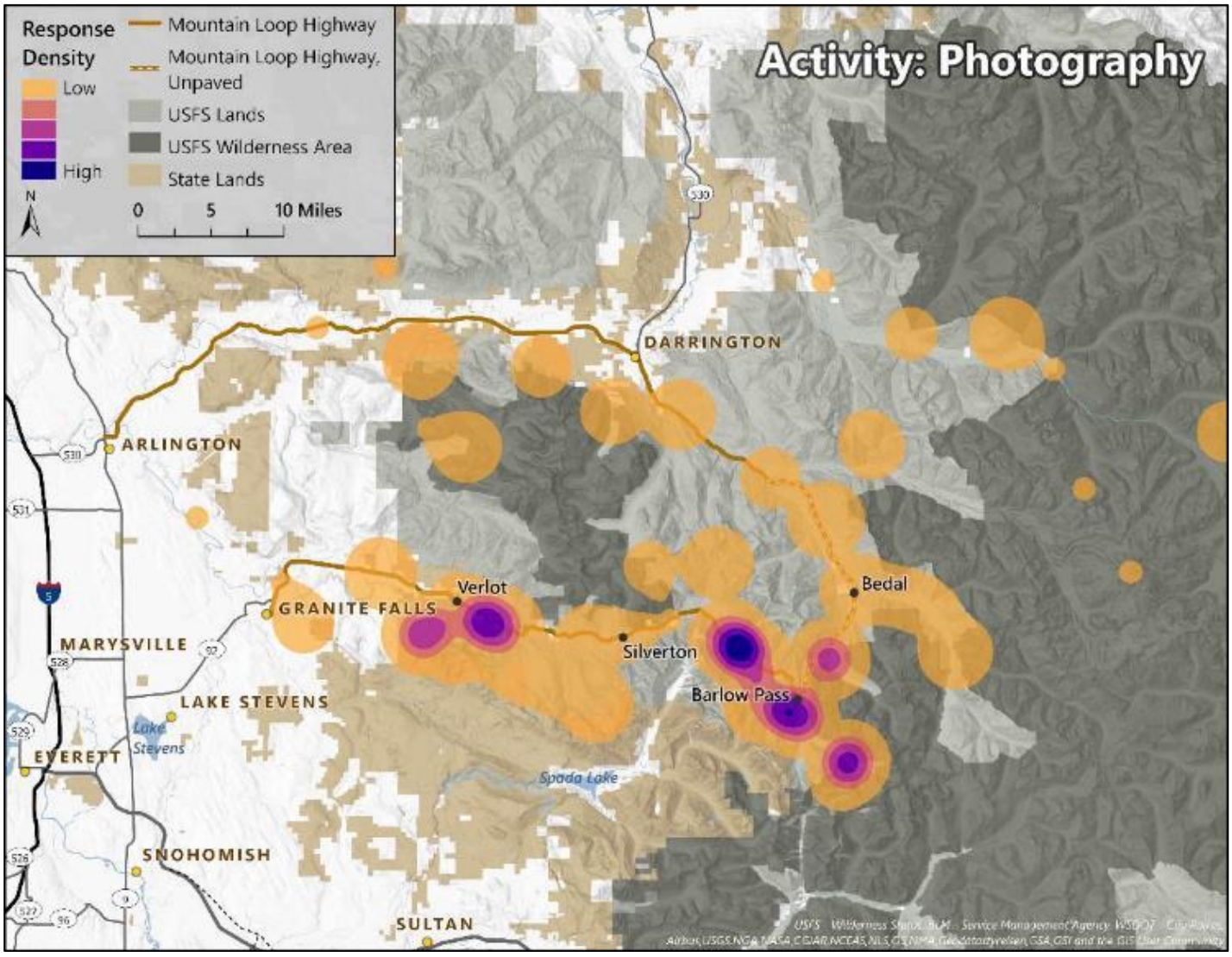


Figure 16e. Photography response density across favorite places (Reported by at least one respondent at 64 places)

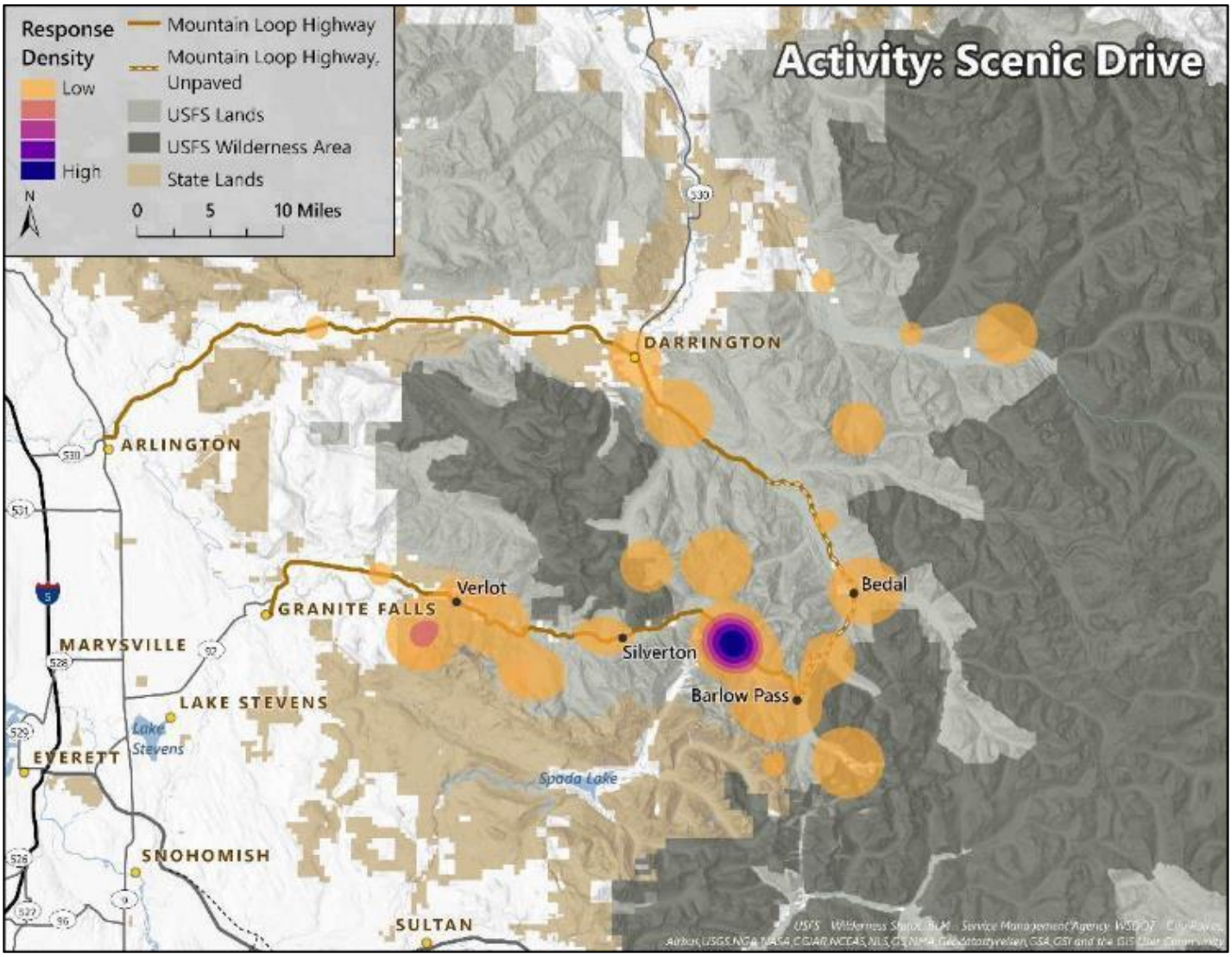


Figure 16f. Scenic Driving/Motorcycle touring response density across favorite places (Reported by at least one respondent at 33 places)

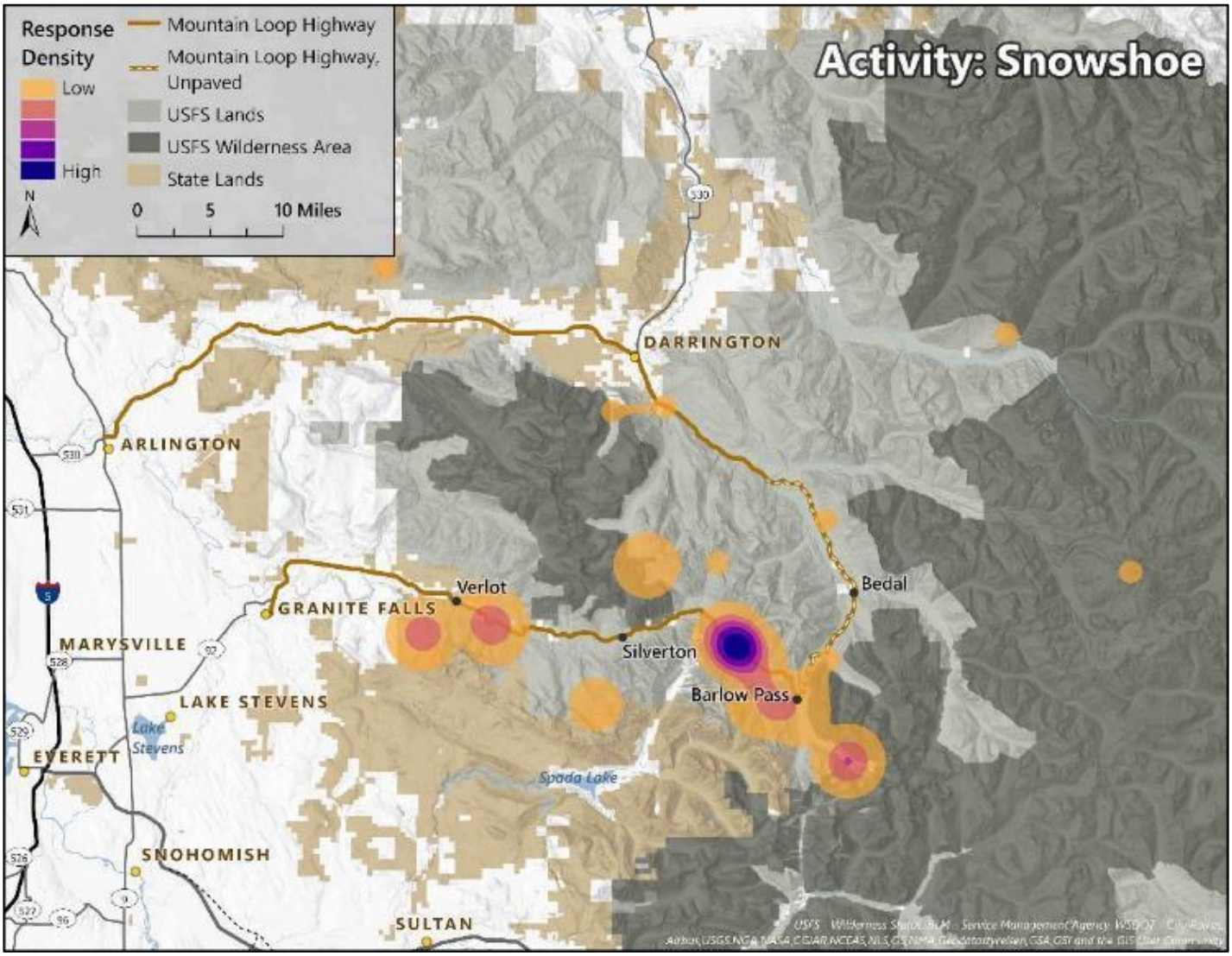


Figure 16g. Snowshoeing response density across favorite places (Reported by at least one respondent at 21 places)

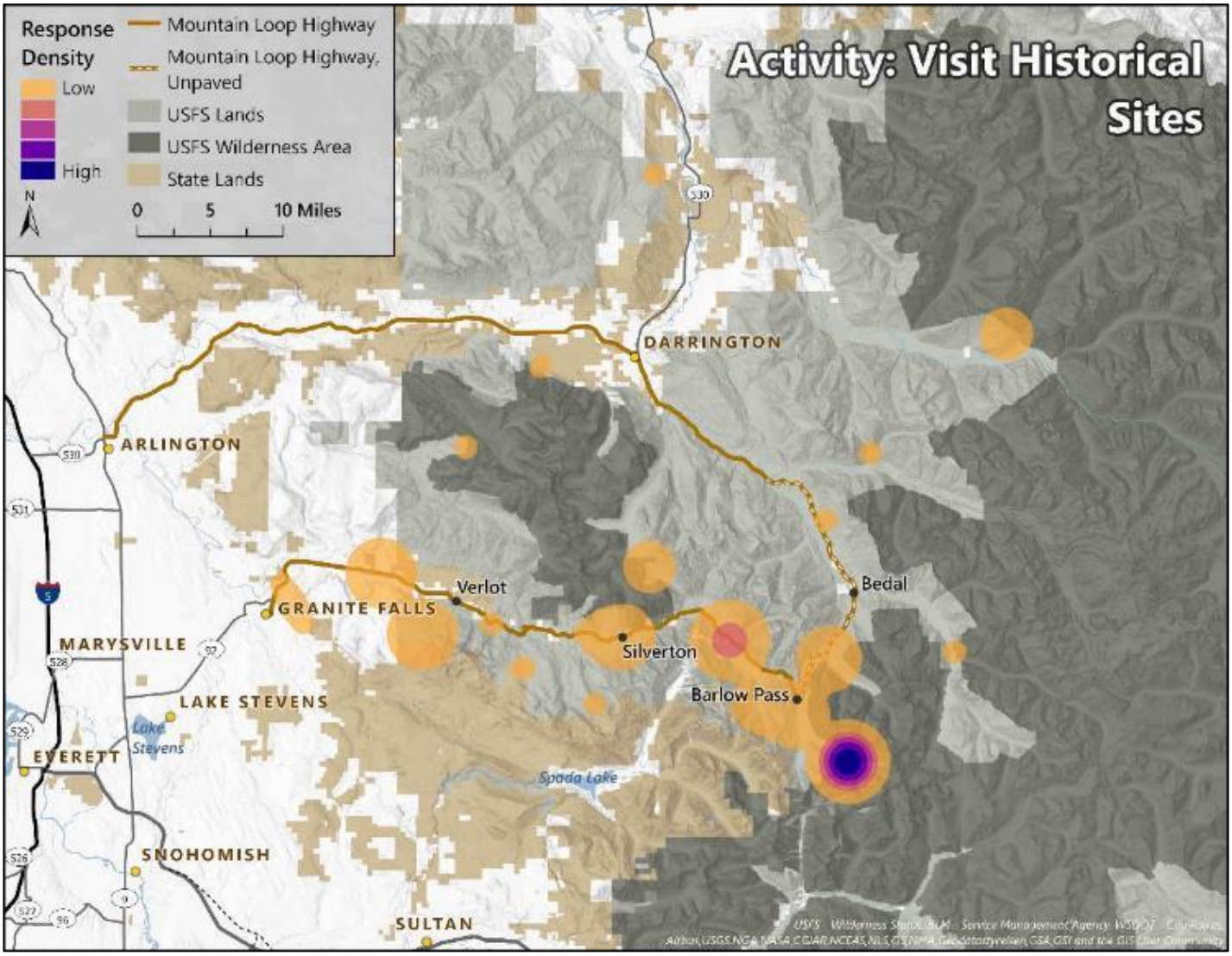


Figure 16h. Visiting historical sites response density across favorite places (Reported by at least one respondent at 25 places)

Landscape values. Values help us understand how respondents relate to a place, beyond the activities they engage in while there. Values are associated with the benefits, meanings, or attachments that people hold. The types of values that respondents associate with the top favorite places were similar across places. '*Adventure/recreation*' was the top value associated with each place, while '*fitness/wellness*' was the second most frequently identified value for six of the eight top places (Table 4). Monte Cristo and Big Four Ice Caves were the exception. '*Historic*' was the second-most identified value for Monte Cristo and *'relaxation'* was the second-most frequently identified activity for the Big Four Ice Caves. Monte Cristo is a former mining site with historical appeal, while Big Four Ice Caves is both a relaxed hike and a place for visitors of all abilities to gather (the site includes a popular picnic area).

Table 4. Top values identified for the most frequent favorite place responses

	N	#1	#2	#3	#4	#5
Mt. Dickerman/ Perry Creek	172	Adventure or Recreation (91%)	Fitness or Wellness (65%)	Relaxation (39%)	Ecological (31%)	Family (1%)
Gothic Basin	139	Adventure or Recreation (96%)	Fitness or Wellness (60%)	Relaxation (53%)	Ecological (37%)	Historic (10%)
Lake 22	132	Adventure or Recreation (86%)	Fitness or Wellness (64%)	Relaxation (61%)	Ecological (31%)	Family (23%)
Mt. Pilchuck	132	Adventure or Recreation (90%)	Fitness or Wellness (66%)	Relaxation (50%)	Family (23%)	Ecological (19%)
Monte Cristo	114	Adventure or Recreation (84%)	Historic (75%)	*Fitness or Wellness (46%) *Relaxation (46%)		Education (42%)
Headlee Pass/ Vesper Lake	108	Adventure or Recreation (97%)	Fitness or Wellness (56%)	Relaxation (31%)	Ecological (19%)	Family (10%)
Big Four Ice Caves	105	Adventure or Recreation (79%)	Relaxation (62%)	Family (53%)	Fitness or Wellness (35%)	Historic (31%)
Elliot Creek/ Goat Lake	102	Adventure or Recreation (90%)	Fitness or Wellness (58%)	Relaxation (52%)	Ecological (29%)	Family (16%)
Heather Lake	42	Adventure or Recreation (83%)	Relaxation (67%)	Fitness or Wellness (57%)	Family (38%)	Ecological (29%)
North Fork Sauk Trailhead	42	Adventure or Recreation (98%)	Fitness or Wellness (57%)	Relaxation (55%)	Ecological (38%)	Spiritual or Meditation (17%)

*Tied for #4

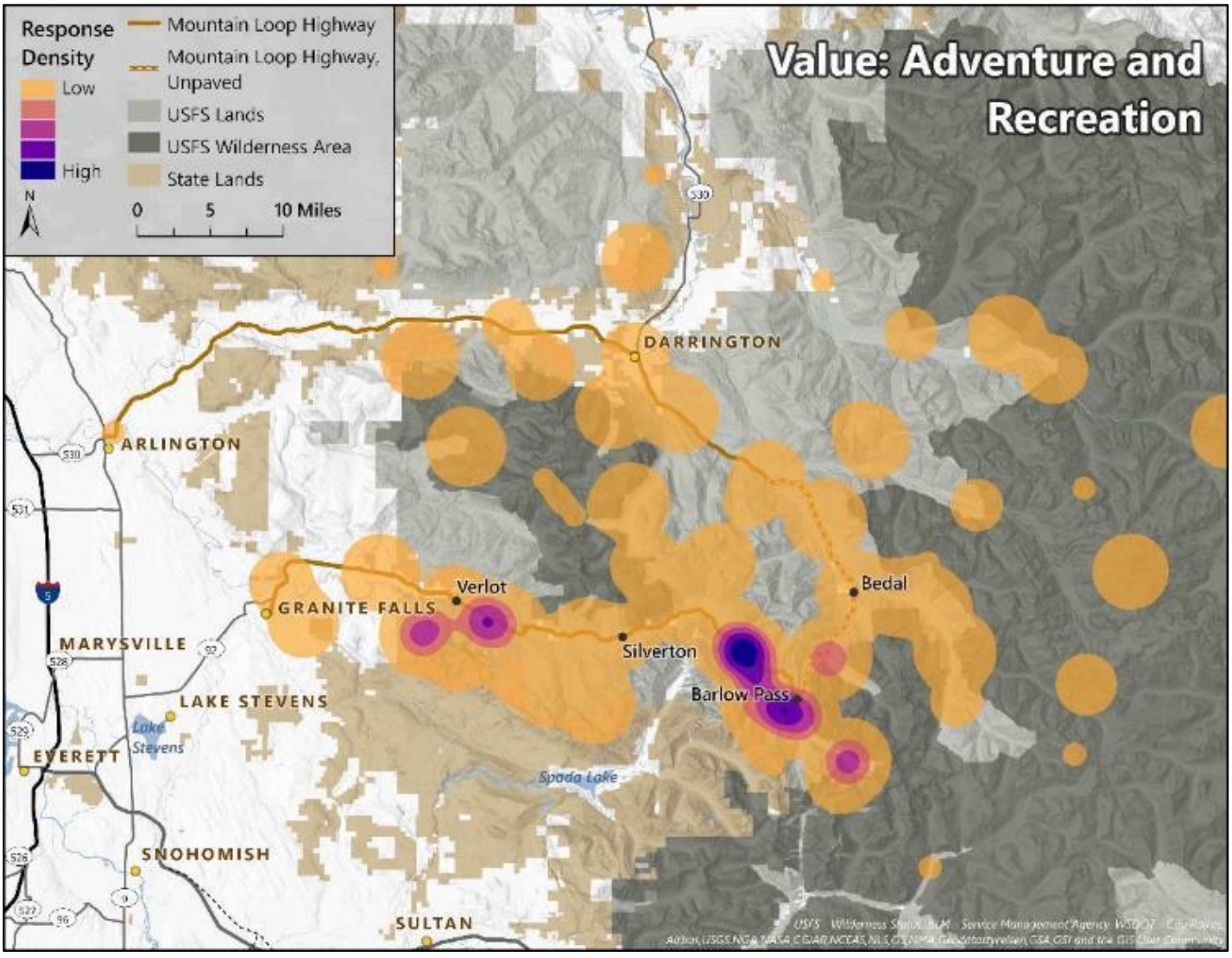


Figure 17a. Adventure or Recreation response density across favorite places (Reported by at least one respondent at 90 places)

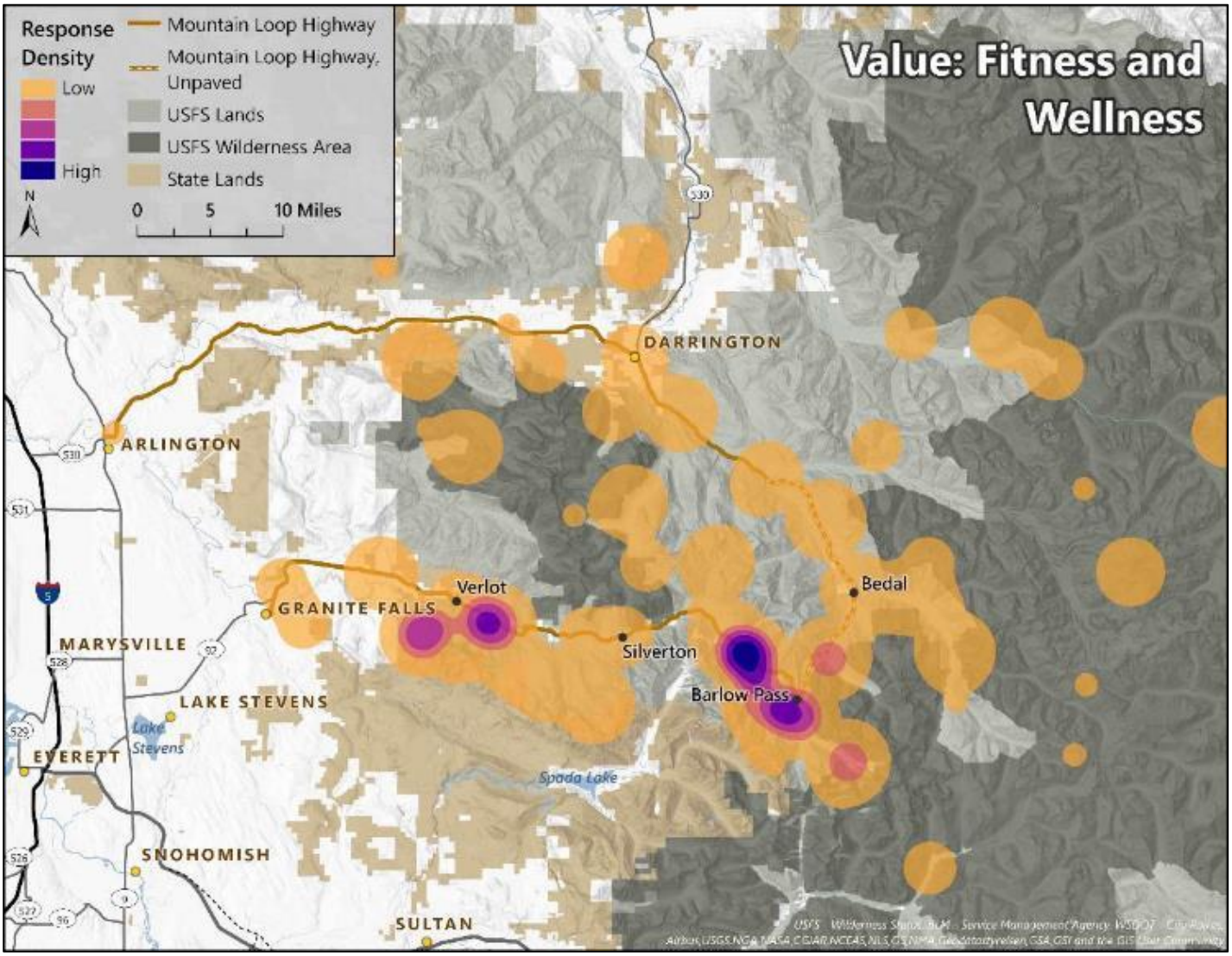


Figure 17b. Fitness or Wellness response density across favorite places (Reported by at least one respondent at 73 places)

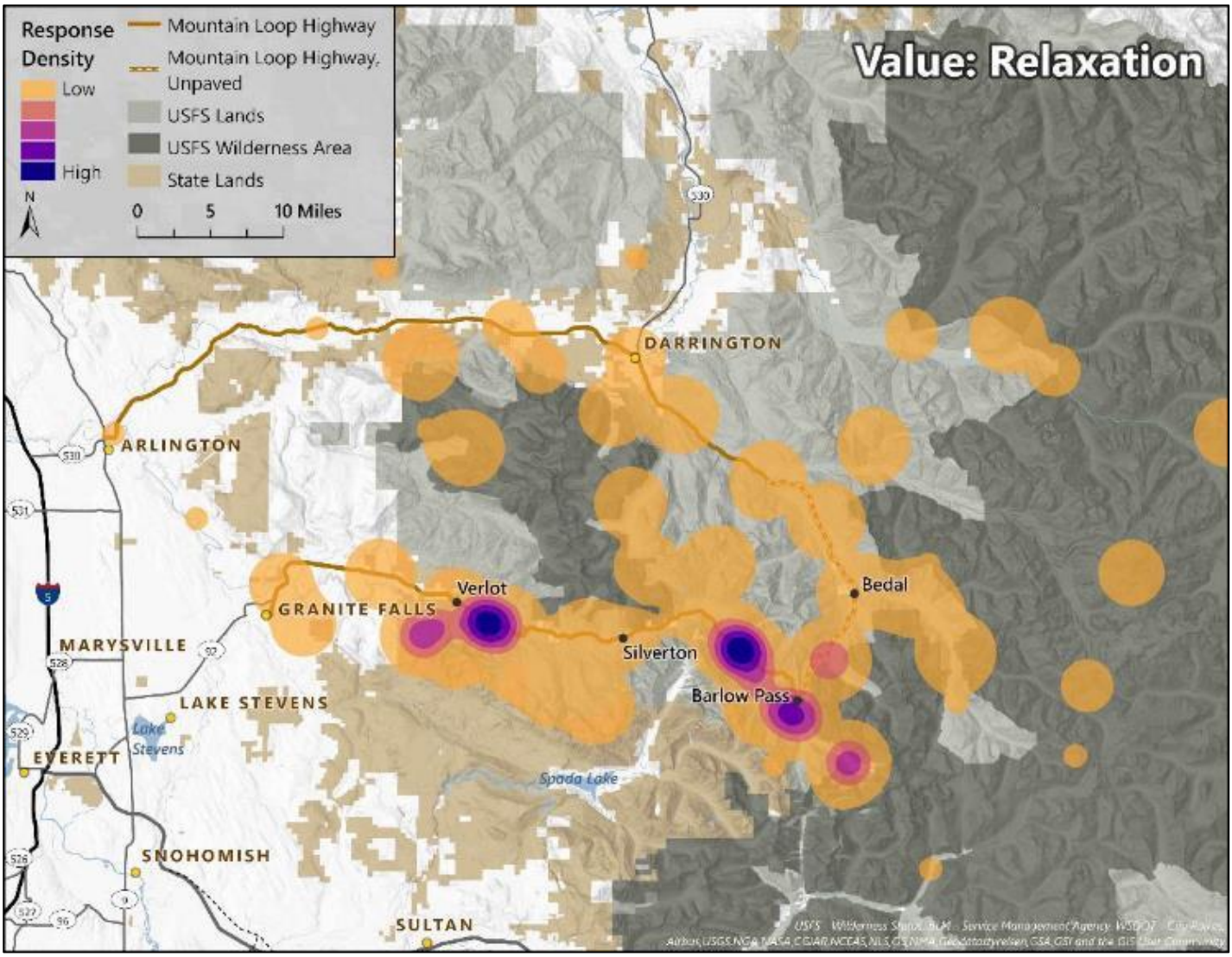


Figure 17c. Relaxation response density across favorite places (Reported by at least one respondent at 80 places)

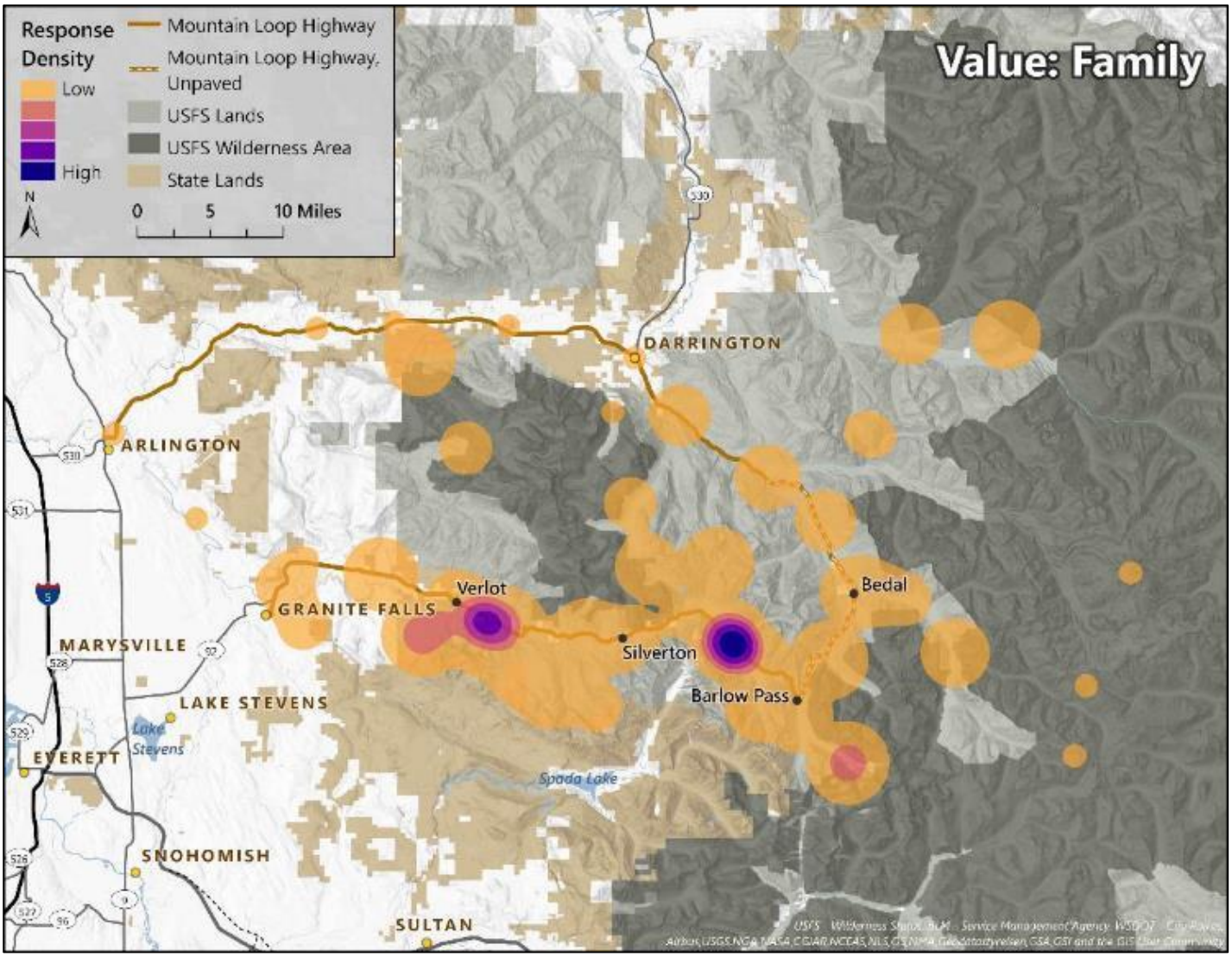


Figure 17d. Family response density across favorite places (Reported by at least one respondent at 64 places)

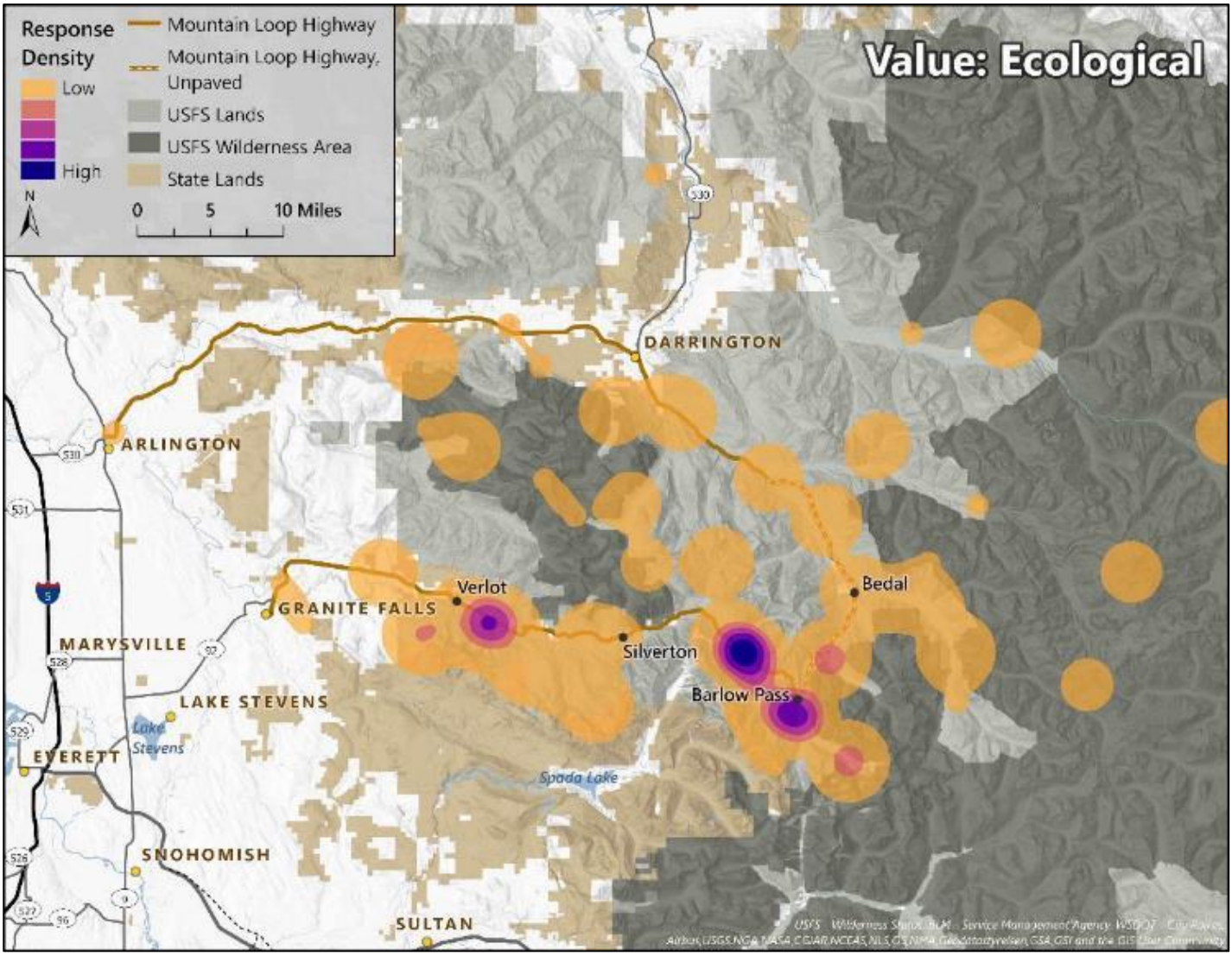


Figure 17e. Ecological response density across favorite places (Reported by at least one respondent at 68 places)

d. Using maps to understand needs for greater access in the Mountain Loop area.

We asked respondents to identify places in the Mountain Loop area where they wanted to see improved access. In total, 395 places with access needs were identified by 339 respondents (28% of all respondents). Responses were linked to a specific location in the area about 83 percent of the time; the remaining 17 percent of responses were either general types of places (e.g. the entire Mountain Loop area, all roads in the area, non-existing mountain bike trails, etc.) or did not contain enough specificity to link to a known place (e.g. 'flat rock waterfall').

Places with access needs were distributed across the Mountain Loop area, with the highest density in the area near Three Fingers trailhead and Boulder Creek Wilderness, as well as sites along the highway between Verlot and Barlow Pass (Figure 18). Overall, respondents believed '*Road improvement*, '*New trail access*,' and '*Trail connections'* would make places around the Mountain Loop Highway more accessible (Figure 19). Of responses that could not be linked to a place, most respondents had access issues with roads in the area, such as damaged or closed roads. The most frequently identified places with access needs included: Three Fingers Trailhead (50 responses; Figure 20), Big Four Ice Caves (33 responses; Figure 21), and the Monte Cristo area (28 responses; Figure 22). (See Table 5 for overall patterns in access issues across the sites.)

The access issues identified at Three Fingers trailhead include '*Road improvement'* and *'Trail* or *motorized access'* to the area. The road to Three Fingers is rough and a bridge washed out, requiring visitors to hike or bike an extra 8 miles to access the start of the strenuous trail. Respondents hope for more accessibility to the area, but some acknowledge that providing more accessibility for those without the proper preparation might exacerbate safety issues in a remote area. Though most respondents indicated they wanted the road fixed to improve access, others suggest a new trail or improving older trails in the region to allow for easier access.

The most frequently identified access issues at the Big Four Ice Caves include *'New or improved trail access'* and '*Trail connections.'* A bridge washed out in the area, eliminating easy access to the base of the ice caves and the area around the ice caves. Nearly all comments requested a bridge be rebuilt to enable the river crossing. This is especially noteworthy considering the Big Four Ice Caves was a popular favorite place, valued as a place for family; people talked about accessing the area with small children, over time, and across generations. Access issues might be amplified, in part, because it is a popular destination to take small children.

Considerations

Many factors raise concerns about access needs. Storms, floods, landslides and other natural events have washed out roads or closed trails in the Mountain Loop area. Some seek these roads to be rebuilt to allow easy access to trails. Yet, many respondents noted that when roads are rebuilt, trails receive increased use, which can change the nature of visitors' experiences. In other cases, visitors may seek to connect trails or create loops allowing a greater variety of hiking modes and options. And, for others, access means increasing opportunities for people with different abilities, ages, or for families to enjoy the outdoors.

The most frequently identified access issues in the Monte Cristo area also involve trail issues. The trail to access the town site is a long, former vehicle road; many visitors to the area suggested this road (or other former vehicle roads in the area) be improved to allow for vehicle access to the site. Some respondents also noted that there's a tricky river crossing in the area that could be enhanced with a bridge or a new trail route.

Waterfall in the Mount Baker-Snoqualmie National Forest

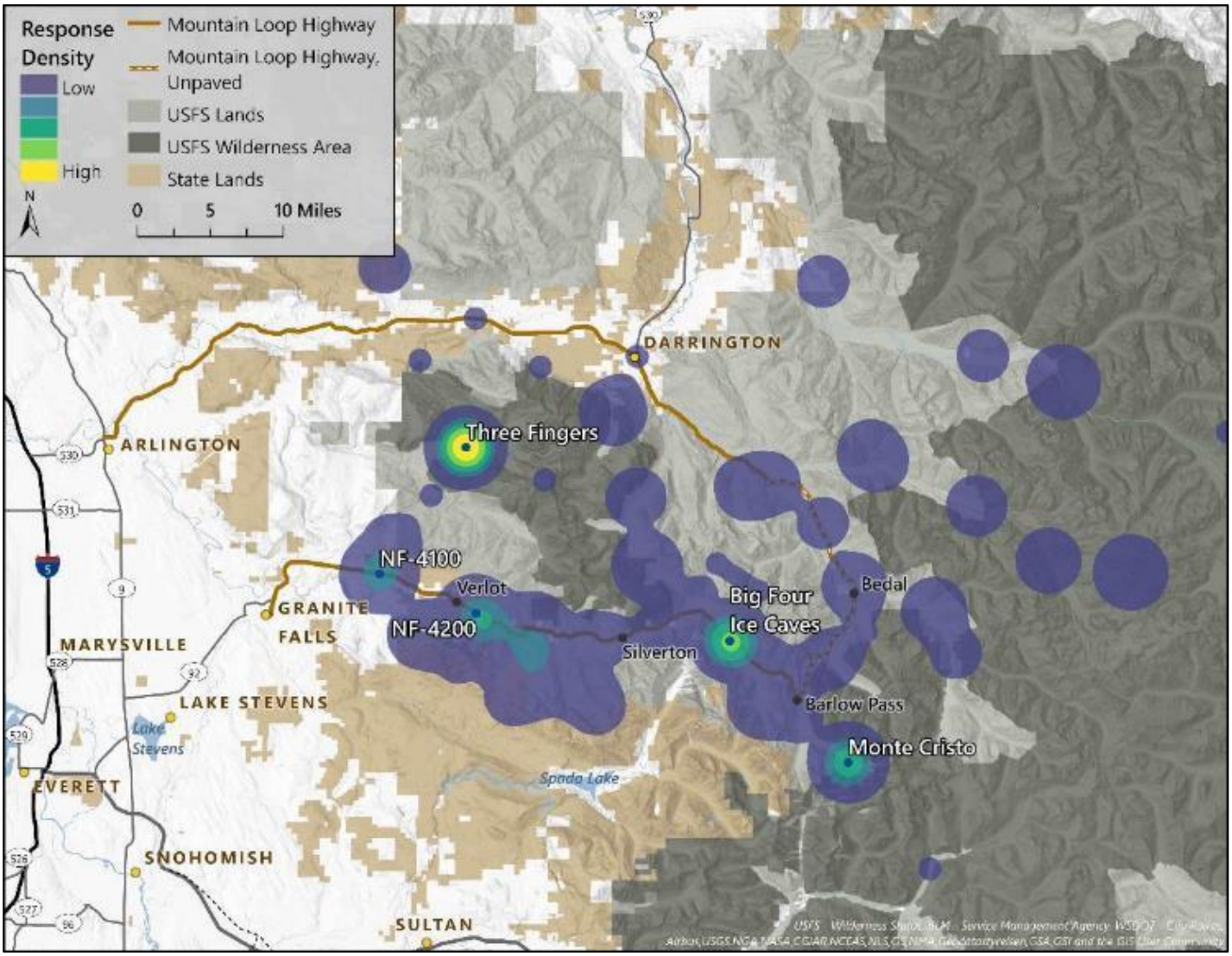


Figure 18. Density map of all specific places with access issues responses (We grouped 326 submitted responses into 70 places with access issues across the Mountain Loop area)

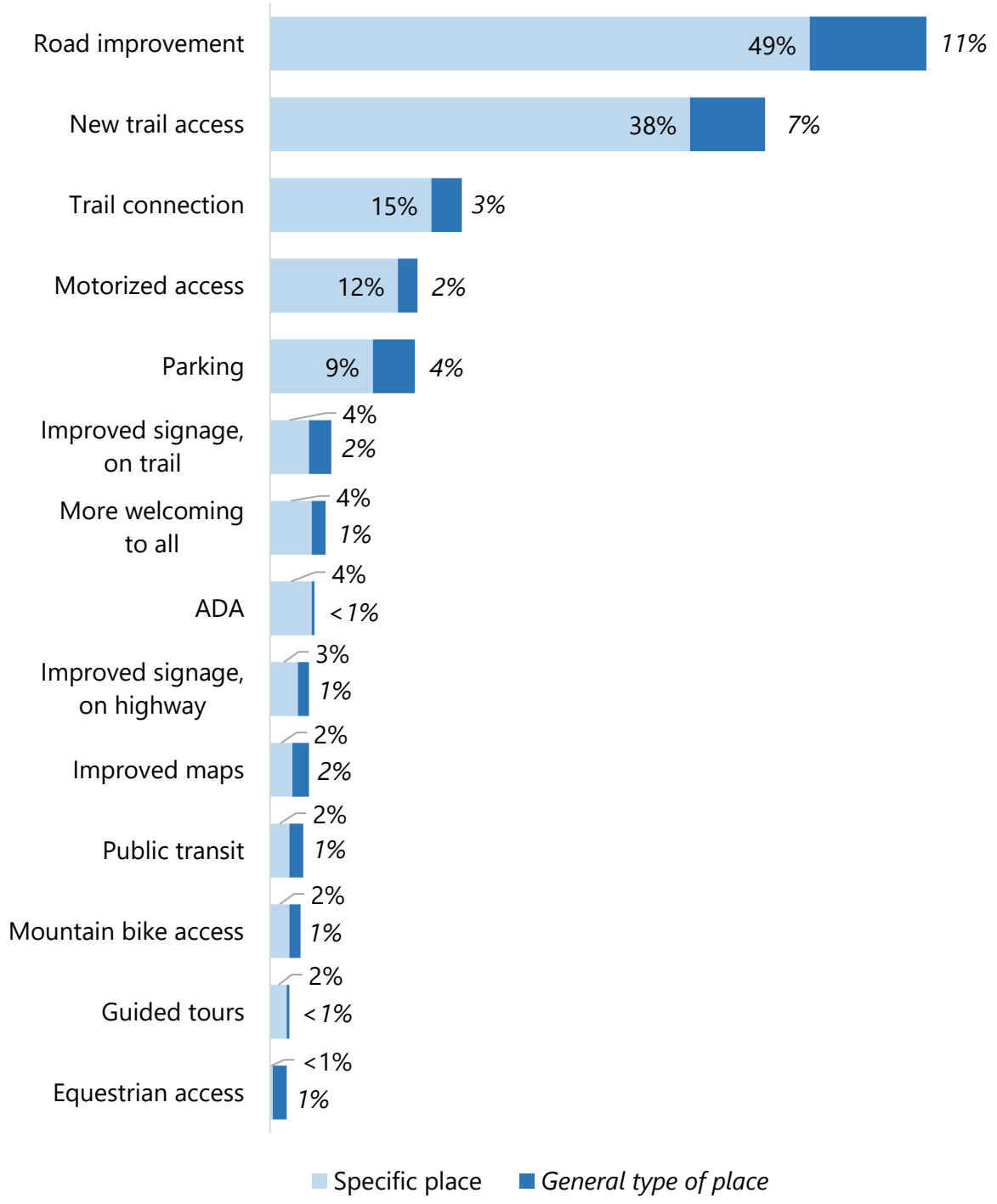


Figure 19. Responses to the question 'What would help make this place more accessible?' Responses are divided by the type of place referenced. Specific place responses can be linked to a place on a map, while general responses often refer to a type of place (e.g. 'Trailhead') or don't have enough details to be linked to a place on a map (e.g. 'scenic view at end of road'); (N = 395, 2% did not respond)

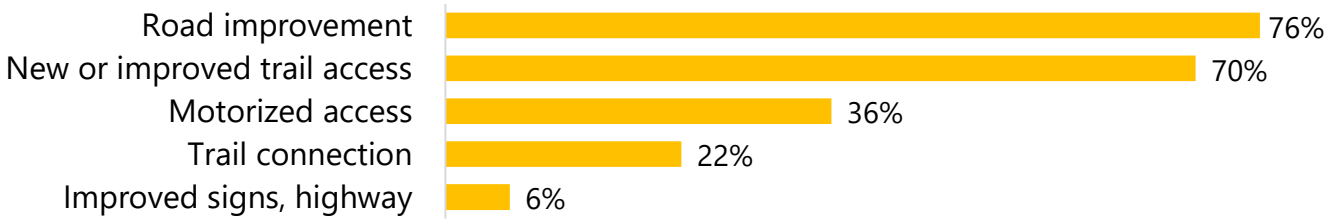


Figure 20. Three Fingers most frequently identified access issues (N = 50)

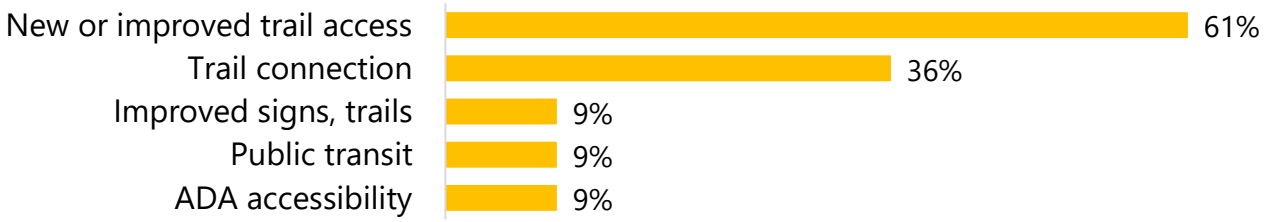


Figure 21. Big Four Ice caves most frequently identified access issues (N = 33)

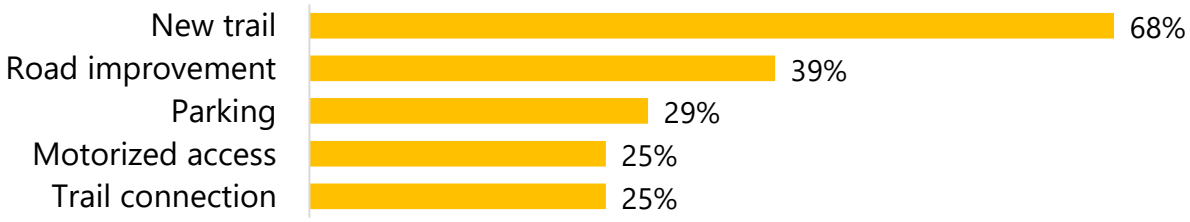


Figure 22. Monte Cristo most frequently identified access issues (N = 28)

Table 5. Top access issues identified for the most frequent places with access issues

	N	#1	#2	#3	#4	#5
Three Fingers TH	50	Road improvement (76%)	New Trail (70%)	Motorized access (36%)	Trail connection(s) (22%)	Improved signage (Highway) (6%)
Big Four Ice Caves	33	New Trail (61%)	Trail connection(s) (8%)	ADA accessibility (9%)	Public transit option(s) (9%)	Improved signage (Trail) (9%)
Monte Cristo	28	New Trail (68%)	Road improvement (39%)	Parking (29%)	Trail connection(s) (25%)	Motorized access (25%)

e. Management concerns in the Mountain Loop area

We asked people to identify any places in the Mountain Loop area where they had concerns about how the area is being managed or to identify persistent issues that have arisen. In total, 592 respondents (about 50% of respondents) submitted 658 places of concern. A large proportion of these responses referred to a type of place or a general area and were unable to be linked to a specific place. These general, non-spatial responses accounted for about 37 percent of responses in this section (Table 6). Within the general type of responses (non-placed-based) respondents were most concerned about large sections of the Mountain Loop area as a whole, trails/trailheads, dispersed camping areas, and roads in general in the area.

Places of concern that could be linked to a place on a map were distributed across the Mountain Loop area, with the highest density of responses on the southern half of the loop (Figure 23). Across all submitted places, respondents were most concerned about: '*High volume of users'* (69%), *'Litter and human waste'* (61%), *'Ecological impacts'* (53%), *'Lack of enforcement of rules and regulations'* (46%), and/or '*Visitor behavior'* (42%) (Figure 24).

The top eight places of concern were each identified by at least 20 respondents and represent about 79 percent of concern responses (Table 7). Lake 22 was the most frequently identified place of concern, with almost twice the number of responses compared to the second most frequently identified place. At Lake 22, respondents were most frequently concerned about '*High volumes of people'* in the area, '*Litter and/or human waste*,' '*Ecological impacts'*, '*Visitor behavior'* and/or '*Lack of enforcement of rules and regulations.' 'Litter and/or human waste'* appeared in all places' top five concerns, though it was only the most frequently selected concern for the Monte Cristo region. Notably, '*Safety'* is the top concern for those who responded that trailheads (generally) were places of concern in the Mountain Loop area. '*Safety'* only appeared as a top concern for one other of the most frequently identified places (Big Four Ice Caves).

Considerations

The general nature of many of these responses suggests that concerns across the Mountain Loop area might apply across types of places, rather than specific sites, indicating the potential benefits of a system-wide approach for addressing management concerns. In addition, the types of concerns identified were frequently shared across different types of places and sites across the Mountain Loop area. Some mitigation strategies could be applied broadly across the area to help alleviate some concerns across different types of places (e.g. interpretation, signage, or educational programs).

Table 6. General responses to 'Name a place in the Mountain Loop area that you are concerned about'

General type of place	# of responses	% of general type of place responses	% of all responses (general and specific)
All of the Mountain Loop area	73	29.8%	11.1%
Trailheads	42	17.1%	6.4%
Trails	29	11.8%	4.4%
Roads	19	7.8%	2.9%
Dispersed camp sites	18	7.3%	2.7%
No specific location	16	6.5%	2.4%
Parking areas	15	6.1%	2.2%
MLH sub-section*	11	4.5%	1.7%
Campgrounds	6	2.4%	0.9%
MLH gravel section	5	2.0%	0.8%
Closed areas	3	1.2%	0.5%
Rivers	3	1.2%	0.5%
Logging areas	2	0.8%	0.3%
Bridges	1	0.4%	0.2%
Climbing areas	1	0.4%	0.2%
Cultural sites	1	0.4%	0.2%
TOTAL	**245**	**100%**	**37.2%**

*Includes any reference to a large section of the Mountain Loop area that could not be reduced to a specific location. NOTE: These responses could not be linked to a specific place in the Mountain Loop area, and are represented instead as a general type of place.

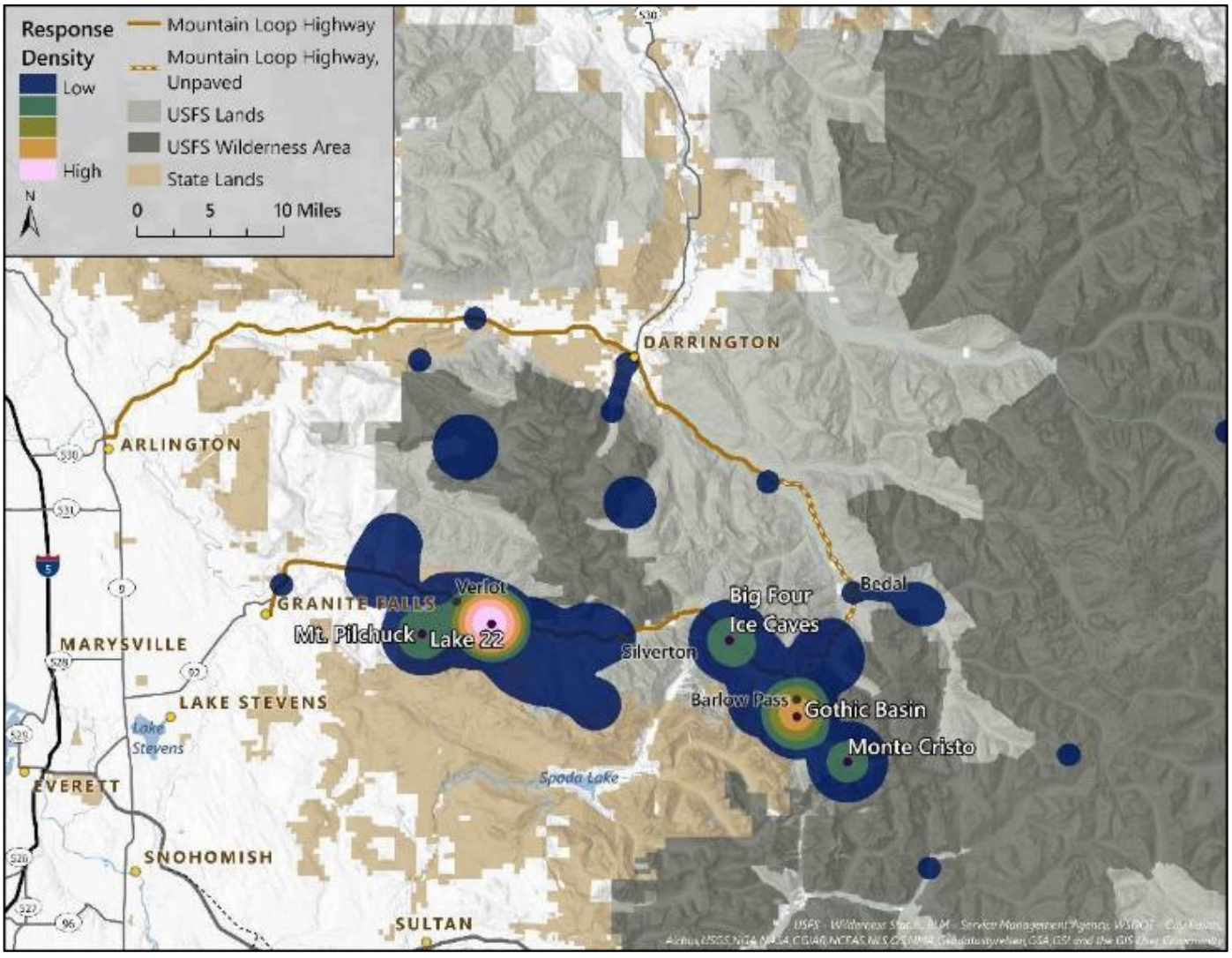


Figure 23. Density map of all specific places of concern responses. (592 people submitted a total of 658 places of concern. We grouped 413 of these responses into 48 specific places across the area. The remaining 245 responses were general and couldn't be linked to a location on the map; these responses are not included in the density map.)

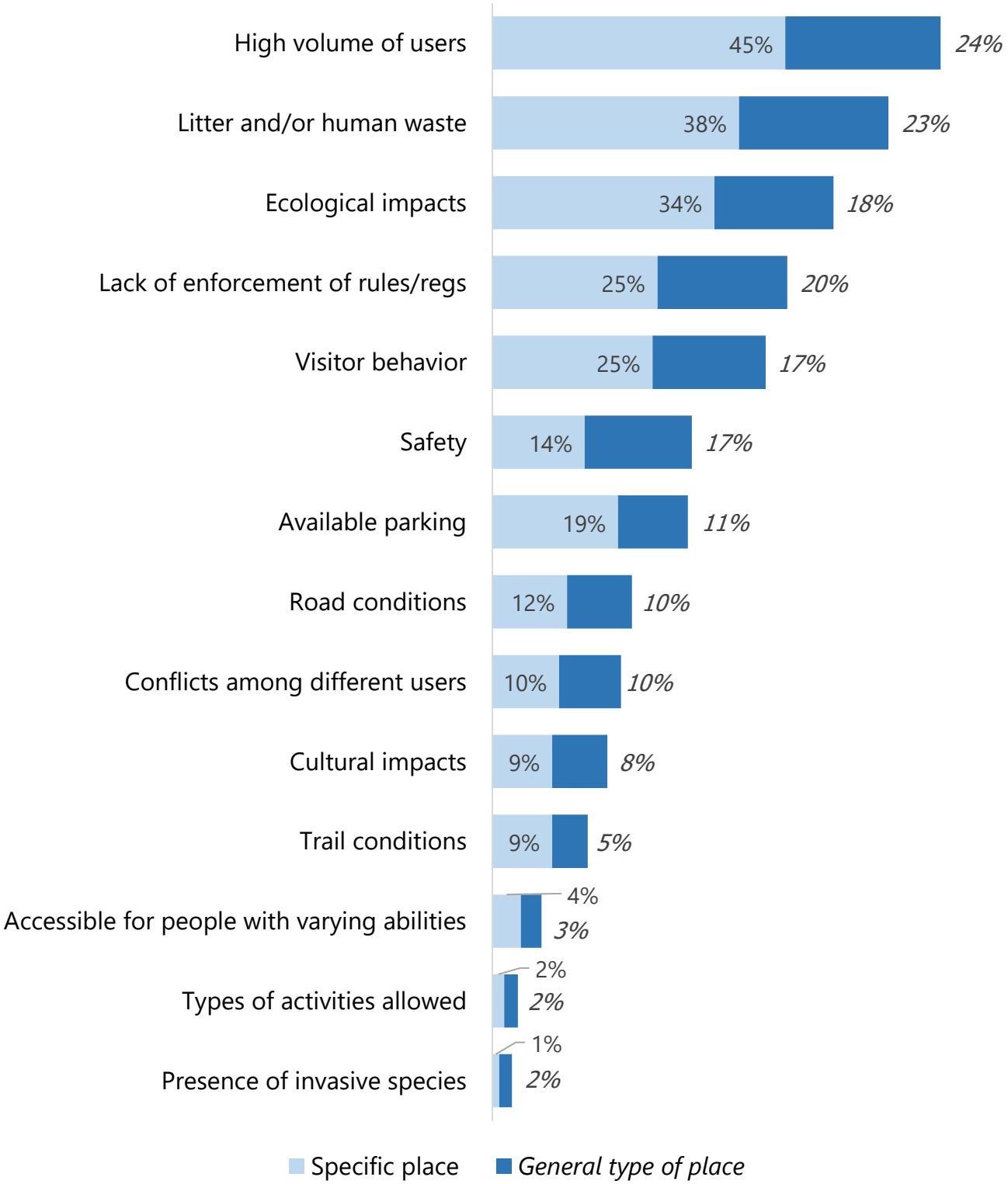


Figure 24. Responses to the question 'What concerns do you have about this place?' Respondents were able to select all answers that apply. (N = 658; 3% did not respond)

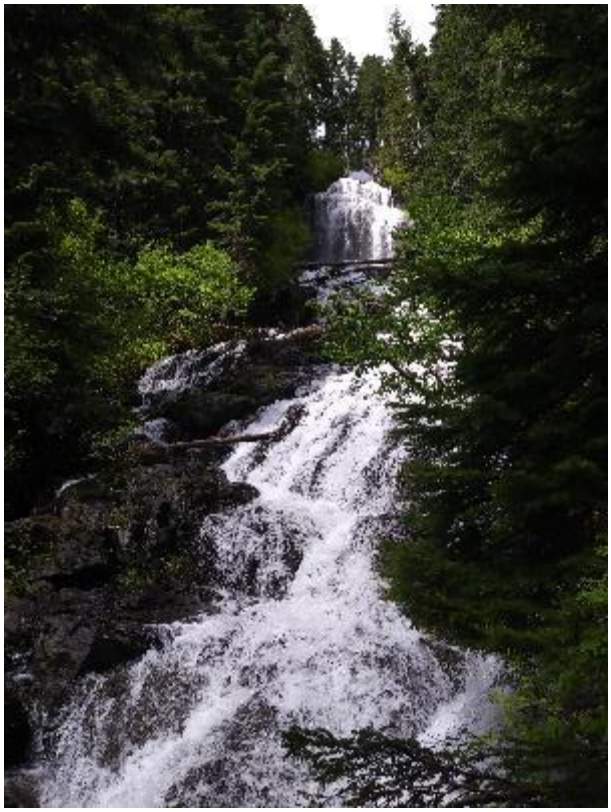
Table 7. Top concerns identified for the most frequent places of concern

	N	#1	#2	#3	#4	#5
Lake 22	155	High volume of people (97%)	Litter/human waste (70%)	Ecological impacts (66%)	Visitor Behavior (50%)	Lack of enforcement (47%)
MLH (generally)	73	Litter/human waste (82%)	High volume of people (74%)	Lack of enforcement (68%)	Ecological impacts (66%)	Visitor behavior (63%)
Gothic Basin	66	High volume of people (83%)	Ecological impacts (80%)	Litter/human waste (79%)	Lack of enforcement (45%)	Visitor behavior (39%)
Trailheads (generally)	42	Safety (71%)	High volume of people (59%)	Lack of enforcement (59%)	Litter/human waste (48%)	Visitor behavior (33%)
Mt. Pilchuck	31	High volume of people (90%)	Litter/human waste (68%)	Ecological impacts (65%)	Visitor behavior (55%)	Road conditions (42%)
Trails (generally)	29	High volume of people (86%)	Litter/human waste (62%)	Ecological impacts (55%)	Visitor behavior (55%)	Parking (48%)
Monte Cristo	24	Litter/human waste (54%)	Parking (50%)	Access for varying abilities (38%)	Trail conditions (38%)	*Ecological impacts (33%) *Cultural impacts (33%)
Big Four Ice Caves	23	High volume of people (65%)	Visitor behavior (61%)	**Ecological impacts – (48%) **Lack of enforcement – (48%) **Safety – (48%)		

IV. Limitation and Cautions

The Mountain Loop Highway Visioning Survey data provide a snapshot of how a set of visitors and residents feel about places around the Mountain Loop area, but there are some limitations to the data and the kinds of conclusions that can be drawn from them. The survey data only represent a subset of users of the Mountain Loop area; this limits the generalizability of these results to the full set of potential users of the Mountain Loop area. We acknowledge that those who take the time to fill out the survey are more likely to have strong ties to the area and may be more frequent visitors. Many casual or infrequent visitors and their favorite places may not be included. Additionally, we are missing those people who visit the area but are unlikely to respond to a survey or participate in a public engagement process. There are certain activity categories that we know are common in the Mountain Loop area, but do not show up in results, such as fishing, rafting/boating, target shooting, and water play. For some of the response categories, such as non-visitors to the Mountain Loop area, the number of responses was low and results may be viewed as indicative of a trend, but a more robust sample would be needed to provide a definitive response.

Our survey asked respondents to share their favorite places; yet we acknowledge that a focus on favorite places may omit places that respondents frequently visit, but don't consider a favorite place (e.g. places where respondents walk the dog or running routes, etc.) or places that respondents would prefer not to share (e.g. special fishing holes, berry patches, or places that feel remote or private). We recognize that some respondents may not feel comfortable navigating maps or using the mapping application, potentially resulting in some errors or inconsistencies. While we followed a strict data management protocol to address these concerns, there may be some places erroneously named or identified. Finally, the survey was administered in 2020, during the COVID-19 pandemic when public spaces experienced especially high use pressure. Some responses might reflect the unique conditions of the year.



V. Conclusions

This report summarizes the major findings from the 2020 survey of Mountain Loop area visitors and residents (n=1,241) conducted to inform the Mountain Loop Highway Visioning Process for the Mount Baker-Snoqualmie National Forest. This online survey was collaboratively designed and administered by WTA. The purpose was to learn about the places, activities, and values important to a wide variety of people, as well as to identify the management concerns and access needs people identify in the Mountain Loop area. The survey's mapping interface allowed us to observe the patterns in responses both topically and spatially.

Favorite outdoor activities in the Mountain Loop area included: hiking/walking, backpacking, camping, and viewing nature. The most important places identified by respondents were Mt. Dickerman/Perry Creek, Gothic Basin, Lake 22, Mt. Pilchuck, and Monte Cristo. Access needs were identified at the Three Fingers trailhead (road improvement), Big Four Ice Caves (bridge repair), and Monte Cristo (trail improvement). When asked to identify management concerns, respondents most often mentioned high visitor volumes (especially Lake 22, Gothic Basin, Mt. Pilchuck), litter and waste, and ecological impacts. These findings offer important perspectives on how the USFS and its partners, such as WTA, can allocate resources to ensure the provision of valued facilities and services, protect people's favored places, and commit to enhancing outdoor experiences for all people who spend time in the Mountain Loop area. By providing a glimpse of survey respondents' perspectives on the Mountain Loop area, this report provides an important source of information to inform our future visioning, planning, and investment in this highly valued and visited area.

Visitor Preferences in the Mountain Loop Highway Region

Prepared by Sama Winder and Grace McGrady
Outdoor Recreation and Data Lab, University of Washington
August, 2022

Background

The Mt. Baker-Snoqualmie National Forest (MBS), the Washington Trail Association (WTA), and a cadre of interested stakeholders are working together to develop a Comprehensive Trail System Vision for the Mountain Loop Highway (MLH) region. This Vision aims to guide future investments in the region, while emphasizing collaborative trails planning and design with an end goal of sustainable growth benefiting local communities.

Understanding visitor preferences and existing site characteristics is a crucial first step in implementing this vision. In 2020, WTA and the USFS PNW Research Station conducted a survey of visitors and potential visitors to the MLH region in order to gain a better understanding of what they value about the area. To complement the survey, the University of Washington Outdoor Recreation & Data Lab (Outdoor R&D) created estimates of current visitation to 45 recreation sites in the MLH and compared these estimates to characteristics of the sites in order to determine whether visitors' actions revealed similar preferences to those that they stated on the survey.

This work drew on prior research by Outdoor R&D scientists which shows that visitation at recreation sites can be approximated based on the popularity of the same sites on social media platforms. The team has leveraged this finding by developing a statistical model that estimates visitation to outdoor recreation sites based on the number of social media posts shared from each site. The model uses data from 86 non-motorized trails ("sites") in the Mt. Baker-Snoqualmie National Forest in Western Washington, and has been tested and applied on public lands across Washington, Colorado, and New Mexico (Wood et al. 2020). The model estimates total weekly visitation based on the relationship between on-site visitor counts gathered in Western Washington and the volume of social media that is posted to Washington Trails Association (WTA), AllTrails, Flickr, Twitter, and eBird from the same trails. It also includes information about seasonality, holidays, precipitation, and estimated use-levels provided by USFS staff.

We identified 45 non-motorized, trail-based recreation sites in the MLH to include in our analysis and modeling. These sites were selected in correspondence with the USFS and WTA and include

a diverse range of trail types and opportunities. We estimated average snow-free summer visitation to all 45 sites, as well as collecting information on a suite of characteristics of those same sites. We then explored whether visitation patterns across the region could be explained by each of the site characteristics, in order to learn about visitors' preferences based on their actions (see Arkema et al. 2021, Donahue et al. 2018, Fisher et al. 2019 for examples of this approach). Below, we present some of the results of these comparisons.

Baseline visitation

Visitation levels vary widely across the recreation sites we considered in the Mountain Loop Highway region. We estimated total visitation during the generally snow-free summer season (May 1 - Oct 31) to each site from 2018 - 2021, then averaged across years to create an estimate of the number of visitors to each site over the course of an average snow-free summer season (Figure 1, Table S1). The choice to estimate snow-free summer visitation stemmed from the complexity of MLH visitation patterns and changes in trailhead accessibility during months with registered snowfall. The MLH region is a popular winter recreation destination as well, but access to sites is dramatically different because much of the Mountain Loop Highway is closed during the winter. Additionally, we made extensive use of WTA trip reports and hiking guide information for this study, and the majority of this information is focused on summer recreation. We further chose to look at average summer-season visitation over four years (2018-2021).

According to our estimates, **the majority of summer visitors to the MLH region visit one of four sites: Big Four Ice Caves[1], Lake 22, Heather Lake, or Mount Pilchuck.** As a result, these sites are substantially busier than other sites in the region, with more than 10,000 visits to each during the snow-free season. In particular, our model estimates that Lake 22 receives approximately 46,000 visits over the course of the summer season, followed by Heather Lake with 22,000 visits. Based on feedback from USFS partners, we manually modified the estimate for Big Four Ice Caves to be double the number of visits to Lake 22, so we have less confidence in its accuracy as a measure of total use. On the opposite end of the spectrum, we estimate that **23 sites (more than half of the sites we considered) receive 2,000 or fewer visitors over the course of the snow-free summer season** (see Table S1 for estimates to individual sites).

[1] *Big Four visitation was manually modified from the model estimate, following feedback from USFS staff.*

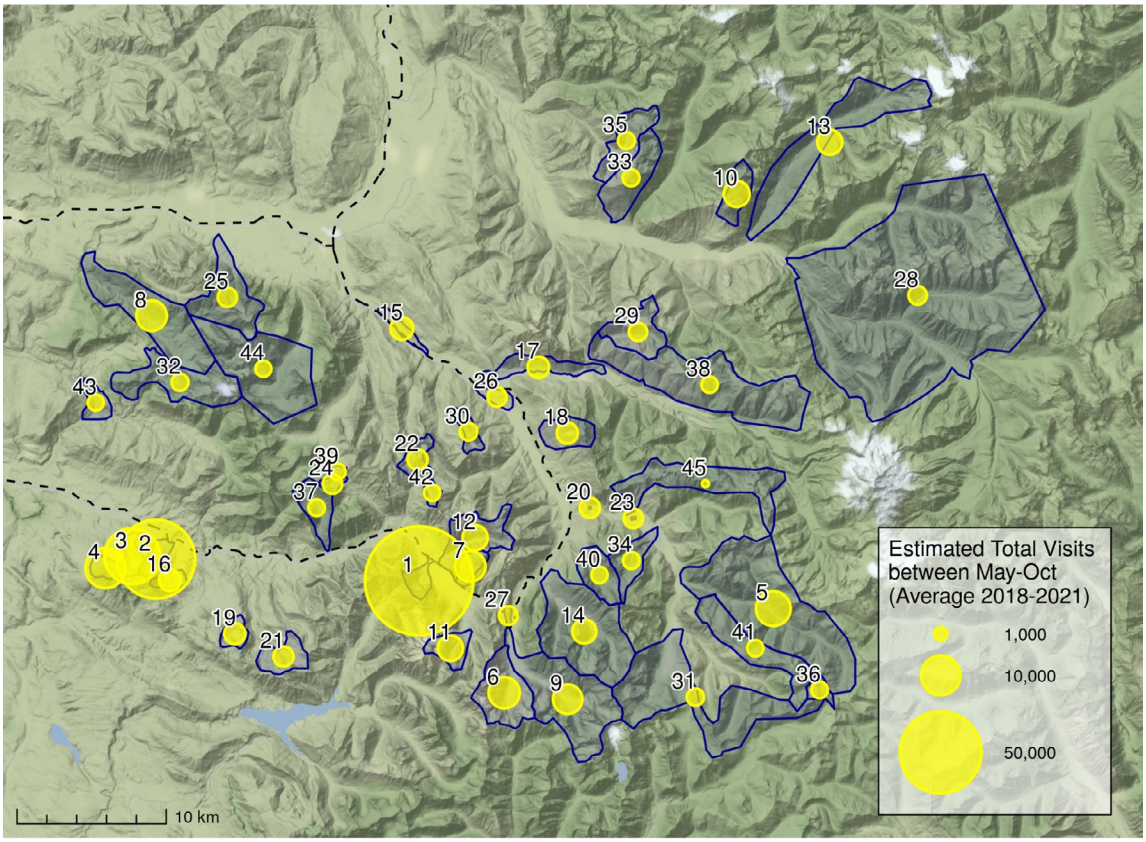


Figure 1. Estimated average snow-free summer (May 1 - Oct 31) visitation between 2018 and 2021 to 45 non-motorized recreation sites in the Mountain Loop Highway region. Sites are delineated by blue lines, numbered by relative visitation, and named in Table S1.

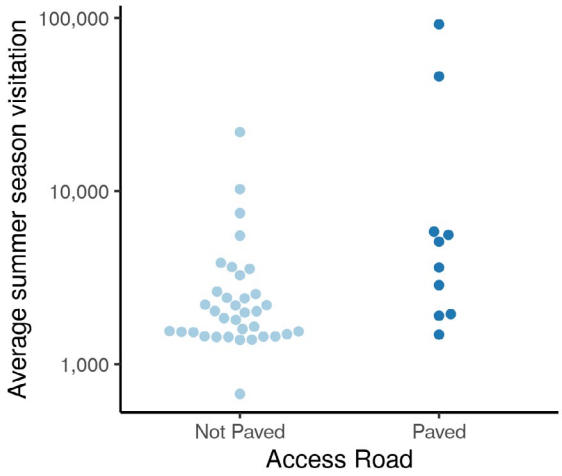
Site characteristics and visitation

The Mountain Loop Highway region provides a diverse range of recreation opportunities across the 45 recreation sites where Outdoor R&D estimated visitation. In the section below, we discuss individual site characteristics that we hypothesized might influence visitor behavior in the region. We grouped these site characteristics into three categories: ease of access, built infrastructure, and intrinsic characteristics. Ease of access includes factors related to getting to the site such as road conditions, built infrastructure represents characteristics of a site that a manager can change such as restrooms or trail length, and intrinsic characteristics are attributes of the site that are unlikely or difficult for managers to change such as waterfalls or historic sites. A full list of the site characteristics we considered can be found in Table S2.

Ease of Access

This category includes road conditions (whether or not the access road is paved, as well as the road condition that was most frequently reported in WTA trip reports between 2018 and 2021) and driving distance to Everett, the nearest city with more than 50,000 residents.

Across the MLH, visitors showed a preference for trails that could be accessed from paved roads. The figure to the right illustrates this trend by showing the average snow-free summer season visitation to each site (represented by a dot), according to whether the access road is paved or not. The two most popular sites in the region, Big Four Ice Caves and Lake 22, both have paved access, while the majority of the less popular trails (fewer than 2,000 visitors in an average summer season) can only be accessed from unpaved roads. In the Mountain Loop Region, fewer than one quarter of the sites we considered (10 out of 45) are accessible from paved roads.

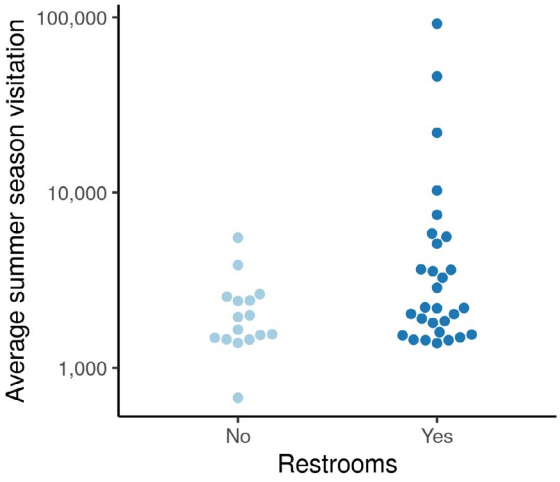


We also gathered information on the most commonly reported road condition in trip reports shared on WTA between 2018 and 2021. Beyond the result about paved roads, we did not find any significant relationship between visitation rates and whether the road was “suitable for all vehicles”, “rough but passable”, or “recommended for high clearance only” (Figure S1).

Likewise, we did not find a significant relationship between the distance to Everett and visitation rates across the region. However, it is notable that **the most popular sites are all on the southwestern side of the Mountain Loop, with some of the shortest drive times from Everett and the Seattle metro area** (see Figure 1, above).

Built infrastructure

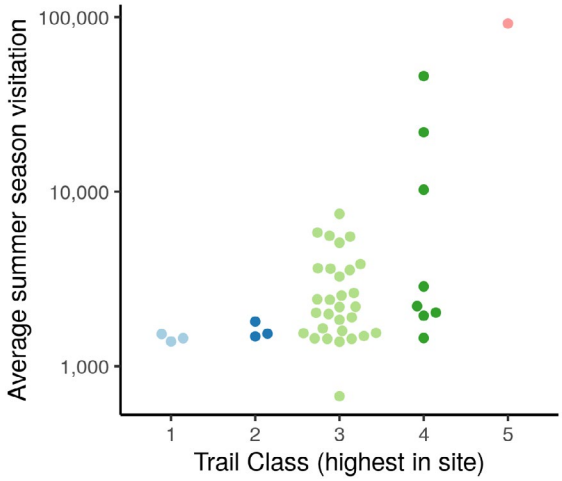
This category includes whether or not a site has a restroom and several characteristics that describe the type of trail opportunities available within the site. These opportunities include trail mileage, steepness, difficulty, trail class, trail type (loop, out-and-back, interconnected), and the most commonly reported trail condition in WTA trip reports between 2018-2021. Details about these categories are included in Table S2, here we highlight only the site characteristics which we found to have a significant relationship with visitation levels.



Across the region, there were **significantly more visitors at sites with restrooms**. This was a commonality between the four most popular sites, all of which provide restrooms. Overall, nearly two-thirds of the 45 sites we considered in the MLH provide restrooms for visitors.

When we considered the most commonly reported trail condition in WTA trip reports between 2018 and 2021, we found that trails at the majority of sites were described as "in good condition". We also found that there were **significantly more visitors to sites where the most common trail condition was "in good condition"** than to sites where the most common trail condition was "obstacles on trail" or "minor obstacles posing few problems". This held true for the four most popular sites in the region as well, the trails at these four destinations were most commonly reported to be "in good condition". It is important to note that when submitting a trip report to WTA, visitors who reported that there were "obstacles on trail" were able to then specify what that obstacle was. This information may have prevented other hikers from visiting this trail until the condition improved.

The majority of the sites that we considered contain trails belonging to the USFS Trail Class 3. We found that there were more visitors at sites with higher trail classes, though the limited number of sites at the extremes (only the Big Four Ice Caves site contains Trail Class 5) did not allow us to confirm that this relationship was statistically significant. However, the four most popular sites are all classified as either Class 4 or Class 5.



The finding that there were more visitors to sites with restrooms, to sites where the trails were described as "in good condition", and to sites with higher trail classes may indicate a preference by visitors for sites with more infrastructure, but it may also simply reflect the fact that managers often prioritize developing and maintaining

infrastructure at busier sites. In other words, we are not able to say whether the infrastructure drew the visitors, or whether the large number of visitors led to developing more infrastructure.

Beyond these three site characteristics, we did not find any other significant relationships between the number of visitors and the built infrastructure opportunities at sites across the MLH.

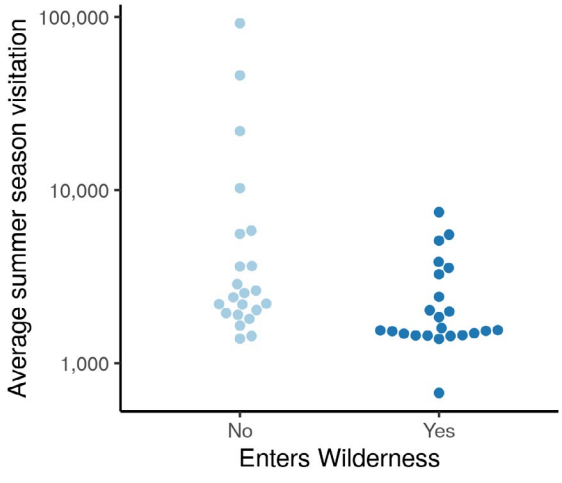
However, there are some similarities between the four most popular sites. In particular, these sites are all designated as trail class 4 or 5, and each access single destinations before returning on the same trail (in-and-outs). Big Four is different from the others in that it is a relatively short, flat, and easy hike. The other three very popular trails are all classified as steep (more than 400 ft/mile gain on average) and medium length (4-8 miles round trip).

Intrinsic site characteristics

This category pertains to the natural and less manageable characteristics of a site. This includes whether a site includes trails that access a waterfall, lake, river, summit, ridge or pass, an important historical feature, or enter designated wilderness. Although these characteristics are less manageable at existing sites, understanding visitor preferences for intrinsic site characteristics can be informative for building future trails or management of existing sites.

Across the MLH, we observed a **preference for sites that accessed waterfalls**. The two most popular sites in the region both include waterfalls, but only 20% of all considered sites in the region include the opportunity to view a waterfall.

We found that there were **significantly fewer visitors to sites that entered designated wilderness areas**. None of the four most popular sites in the region enter wilderness areas, but just over half of all sites that in the MLH that we considered do enter designated wilderness. While this result does not indicate a preference for wilderness areas by the average visitor, it does support the idea that designated Wilderness provides opportunities for quieter and less-traveled hikes for those visitors who are seeking out this opportunity.



Beyond these two characteristics, we did not find any other significant relationships between intrinsic site characteristics and visitation patterns in the region. Likewise, there was no single

intrinsic site characteristic that was shared between all four of the most popular sites. However, the three most popular sites all included access to water of some kind, with rivers and waterfalls both present at Big Four and Lake 22, and lakes at Lake 22 and Heather Lake.

Opportunities

Lesser-used trails with paved access

There are **four sites that we estimate receive fewer than 3,000 visitors** during the snow-free summer season, **despite being accessible via paved roads**. These sites are the Old Sauk ADA Loop / River Trail, Beaver Lake Trail, Barlow Pass Trail, and Marten Creek. Trail conditions may be a factor in the relative unpopularity of Beaver Lake and Marten Creek, as both trails are most frequently described as having "obstacles on trail" in WTA trip reports between 2018 and 2021. Additionally, neither of these trails have restrooms at the trailheads. Old Sauk and the Barlow Pass Trail, on the other hand, each provide restrooms and their trails are most commonly described as "in good condition".

Lesser-used trails outside of wilderness

There are 14 trails that do not enter designated wilderness that we estimate receive fewer than 3,000 visitors during the snow-free season. These trails are listed in the table below. While use could be promoted at any of these trails, North Fork Sauk Falls, in particular, provides access to a waterfall, which we found to be a draw for visitors to the region.

Lesser-used trails outside of wilderness	
Estimated Visitors	**Trails**
< 2,000	Forks of Canyon Creek, Coal Lake Trail, Peek-A-Boo Lake Trail, Circle Peak Trail, Barlow Pass Trail, Beaver Lake Trail
2,000 - 2,500	Harold Engles Memorial Grove Trail, Independence and North Lakes, Walt Bailey Trail, North Fork Sauk Falls, Boardman Lake Trail
2,500 - 3,000	Whitechuck Bench Trail, Bear / Pinnacle Lake Trail, Old Sauk ADA Loop / River Trail

Conclusions

Overall, we found that the four most popular sites in the MLH region received the vast majority of visitors to the region. We found that the moderately popular sites received varying levels of use (ranging between about 2,200 and 7,500 estimated visits in the average snow-free summer season), and that use was relatively evenly distributed across the less popular sites.

Our analysis led us to a few key insights into what is driving these patterns of use. In particular, we found that visitors revealed a preference for sites accessible by paved roads or that accessed waterfalls. We also found that sites with more infrastructure (such as restrooms, trails maintained "in good condition" according to WTA trip reports, and trails with higher Trail Class designations) tended to have a greater number of visitors, though this relationship does not necessarily indicate a preference, since the investment in infrastructure may have been a result of the greater visitation numbers, rather than vice versa. Finally, we found significantly fewer visitors to trails that accessed designated wilderness. Wilderness designation may not be the primary driver of this relationship, however, since these trails also tend to be remote and difficult to access and may have characteristics not included in this analysis.

Beyond the insights above, many of the site characteristics that we hypothesized would be important (listed in Table S2) did not have a significant relationship with visitation patterns at these sites. This should not necessarily be taken as evidence that those characteristics are not important, only that we were unable to quantify those preferences using this analysis. A few salient limitations of this approach are that the MLH region is a relatively small recreation area, meaning that our sample size of 45 recreation sites is fairly small. If we expanded the geographic scope of this study, we may have been able to see preferences of visitors to the larger region by comparing a greater number of individual sites. Secondly, we relied on estimates of visitation created using a statistical model. Our confidence in the estimates for individual trails varies, depending on whether on-site data was available for each trail (see Table S2). With additional information, such as more on-site counts from individual trails, estimates of visitation to individual trails could change.

Technical details

The visitation model described above was developed by measuring how the popularity of 86 trails in Western Washington (24 of which are in the MLH region) corresponds with the popularity of those same trails on several social media platforms. On-site visitor counts were collected between August, 2016 and December, 2021. These total daily counts were generated by counting pedestrians on the trail with infrared counters (IR; at 37 trails) or vehicles in the parking lot (an additional 49 trails). Using the relationships that we find between on-site data and the

various predictors (social media posts, precipitation, seasonality, holidays, and estimated use-levels provided by MBS staff) at these trails from 2016 - 2021, we then estimated weekly visitation for the sites in the MLH region for the period between May, 2018 and October, 2021.

We tested whether each site characteristic had a statistically significant effect on (log-transformed) average snow-free summer-season visitation across the 45 trails by conducting individual one-way ANOVA tests for each characteristic.

The full dataset is available by contacting Sama Winder (sgwinder@uw.edu).

About Outdoor R&D

Outdoor R&D is the University of Washington's Outdoor Recreation and Data Lab. We do data-driven research on the benefits of outdoor recreation and nature-based tourism. Our studies meld methods from environmental science, social science, and computer science – combining visitor surveys and other on-site data with big volunteered data from community scientists, social media, and mobile applications. We develop open-source software and reproducible approaches that make big geographic data and models more accessible for decision-makers. The Outdoor R&D team looks for partnerships where novel and innovative methods and data can inform management and improve opportunities for outdoor recreation.

Further Reading

Arkema, K. K., Fisher, D. M., Wyatt, K., Wood, S. A., & Payne, H. J. (2021). Advancing Sustainable Development and Protected Area Management with Social Media-Based Tourism Data. Sustainability, 13(5), 2427.

Donahue, M. L., Keeler, B. L., Wood, S. A., Fisher, D. M., Hamstead, Z. A., & McPhearson, T. (2018). Using social media to understand drivers of urban park visitation in the Twin Cities, MN. Landscape and Urban Planning, 175, 1–10.

Fisher, D. M., Wood, S. A., Roh, Y.-H., & Kim, C.-K. (2019). The Geographic Spread and Preferences of Tourists Revealed by User-Generated Information on Jeju Island, South Korea. Land, 8(5), 73.

Wood, S. A., Winder, S. G., Lia, E. H., White, E. M., Crowley, C. S. L., & Milnor, A. A. (2020). Next-generation visitation models using social media to estimate recreation on public lands. *Scientific Reports*, 10(1), 15419.

Supplement

Table S1. Sites where we estimated average May - Oct visitation in the MLH based on social media posts, seasonality, weather, and estimated use-levels provided by USFS staff. Site Number corresponds to the labels on the map. The Confidence column describes Outdoor R&D's confidence in each estimate. "High" indicates that the estimate was informed by IR counts collected at the site, "Medium" includes that the estimate was informed by vehicle counts at the parking lot, but no (or limited) IR counts (the Lake 22 estimate includes three weeks of IR counts), and "Low" indicates that the estimate was generated without any on-site data. *The estimate for Big Four was modified from the model estimate, following input from USFS partners, so should only be considered as a relative measure of use as compared to the other sites.

Site Number	USFS Trail #	Site Name	Average May - Oct Visitation (Estimated)	Confidence in Visitation Estimate
1	723, 723.1	Big Four Ice Caves*	92,000*	Lower
2	702	Lake 22	46,000	Medium/High
3	701	Heather Lake	21,900	High
4	700	Mount Pilchuck	10,300	Medium
5	649, 651	North Fork Sauk Trail	7,500	Medium
6	724	Gothic Basin / Weden Creek	5,800	Lower
7	710	Mt. Dickerman	5,600	Lower
8	734	Boulder River	5,500	High
9	708, 708.1, 719	Old Monte Cristo Townsite Trail	5,100	Lower
10	782	Green Mountain	3,900	Medium
11	707	Sunrise Mine / Vesper Peak	3,600	Lower
12	711	Perry Creek Trail	3,600	Lower
13	768	Downey Creek	3,600	Medium
14	647, 647.1	Elliot / Goat Lake	3,300	High
15	728, 728.1	Old Sauk ADA Loop / River Trail	2,900	Medium
16	703, 703.1	Bear / Pinnacle Lake Trail	2,600	Medium
17	731	Whitechuck Bench Trail	2,500	Medium
18	644	Mt. Pugh Trail	2,400	Medium
19	704, 704.2	Boardman Lake Trail	2,400	Lower

Site Number	USFS Trail #	Site Name	Average May - Oct Visitation (Estimated)	Confidence in Visitation Estimate
20	660	North Fork Sauk Falls	2,200	Medium
21	706	Walt Bailey Trail	2,200	Lower
22	712	Independence and North Lakes	2,200	High
23	642	Harold Engles Memorial Grove Trail	2,000	Medium
24	718	Kelcema Lake	2,000	High
25	653	Neiderprum	2,000	High
26	783	Beaver Lake Trail	1,900	Medium
27	709	Barlow Pass Trail	1,900	Lower
28	784, 785, 785.1, 788, 790, 795, 797, 2000.02	Suiattle	1,800	Lower
29	638, 638.1	Circle Peak Trail	1,800	Lower
30	656	Peek-A-Boo Lake Trail	1,600	Lower
31	650	Bald Eagle Mountain	1,600	Lower
32	641, 715	Three Fingers / Saddle Lake Trail	1,600	Lower
33	780	Huckleberry Mountain	1,500	Lower
34	648	Sloan Peak	1,500	Lower
35	740	Boulder Lake Trail	1,500	Lower
36	652.1	Blue Lake High	1,500	Lower
37	713	Marten Creek	1,500	Lower
38	657, 657.1, 657.2	Meadow Mountain Trail	1,500	Lower
39	717	Deer Creek Pass	1,400	Lower
40	705	Bedal Creek	1,400	Lower
41	652, 652.2	Pilot Ridge	1,400	Lower
42	632	Coal Lake Trail	1,400	Lower
43	633	Forks of Canyon Creek	1,400	Lower
44	654, 654.02	Squire Creek	1,400	Lower
45	646, 646.1	Lost Creek Ridge	700	High

Table S2. List of site characteristics considered.

Category	Site Characteristic	Data Source	Description
Ease of Access	Distance to Nearest City	WTA trailheads + routing software	Driving distance to the nearest city >50k people
	Road paved / not paved	USFS shapefile and satellite imagery	Whether or not the trailhead is within 500m of a paved road
	Road condition	WTA Trip reports from 2018 - 2021	Condition of road most frequently reported by hikers
Built Infrastructure	Possible activities	USFS data, WTA	Rock climbing, biking
	Trail mileage	WTA Characteristic	Grouped into 3 categories: short (< 4 mi), medium (4-8 mi), long (>8 mi)
	Trail steepness: Elevation gain / mile	WTA Characteristic	Grouped into 2 categories - under 400 ft/mile average elevation gain, more than 400 ft/mile elevation gain
	Trail type: loop, out and back, interconnected	Manual classification	Type of trip direction, categorized loop/out-and-back/interconnected
	Trail class	USFS Trail Inventory	Trail class - barrier free trails are generally Class 5
	Trail condition	WTA Trip reports from 2018 - 2021	The most common condition of trails as reported by hikers
	Restrooms	WTA and USFS data on fee sites	Fee sites assumed to have bathrooms
Intrinsic Site characteristics	Waterfalls	WTA Feature	Where or not a waterfall is located in the site
	Lakes	WTA Feature	Whether or not a lake is located in the site
	Rivers	WTA Feature	Whether or not a river is located in the site
	Summits	WTA Feature	Whether or not a summit is located in the site
	Ridges/Passes	WTA Feature	Whether or not a ridge/pass is located in the site
	Historical	Drive Tour and USFS	Whether or not a historical site is located in the site
	Wilderness	Manual classification using WTA, USFS and RCO data	Whether or not a trail enters designated wilderness

Table S3. The number of sites in the MLH area that include each opportunity that we considered as well as the percent of total sites that this represents.

Category	Site Characteristic	# of Sites	Percent
	Overall Number	45	100%
Intrinsic Characteristic	Wilderness	23	51%
	Rivers	21	47%
	Lakes	20	44%
	Waterfalls	9	20%
	Summits	14	31%
	Ridges/passes	17	38%
	Historical sites of interest	12	27%
Built Infrastructure	Climbing	6	13%
	Biking	1	2%
	Bathrooms	29	64%
	Steep Hikes	28	62%
	Not Steep Hikes	17	38%
	Short Hikes	11	24%
	Medium Hikes	14	31%
	Long Hikes	20	44%

Note that there are very few sites that offer the opportunity to bike or rock climb in the MLH region.

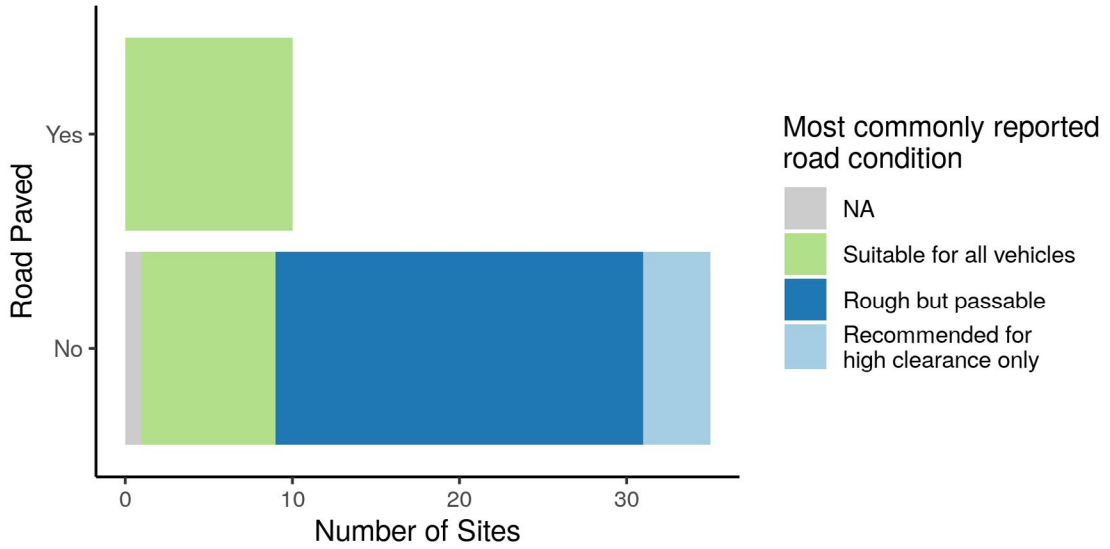


Figure S1. The number of sites that are accessible from paved / unpaved roads, colored by the most commonly reported road condition on WTA between 2018 and 2021.

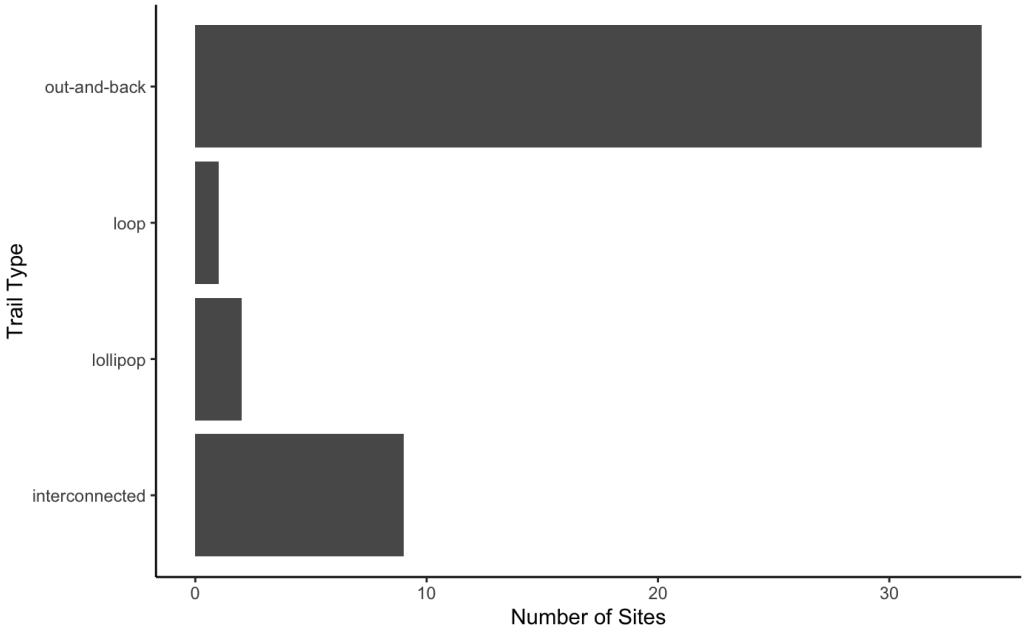
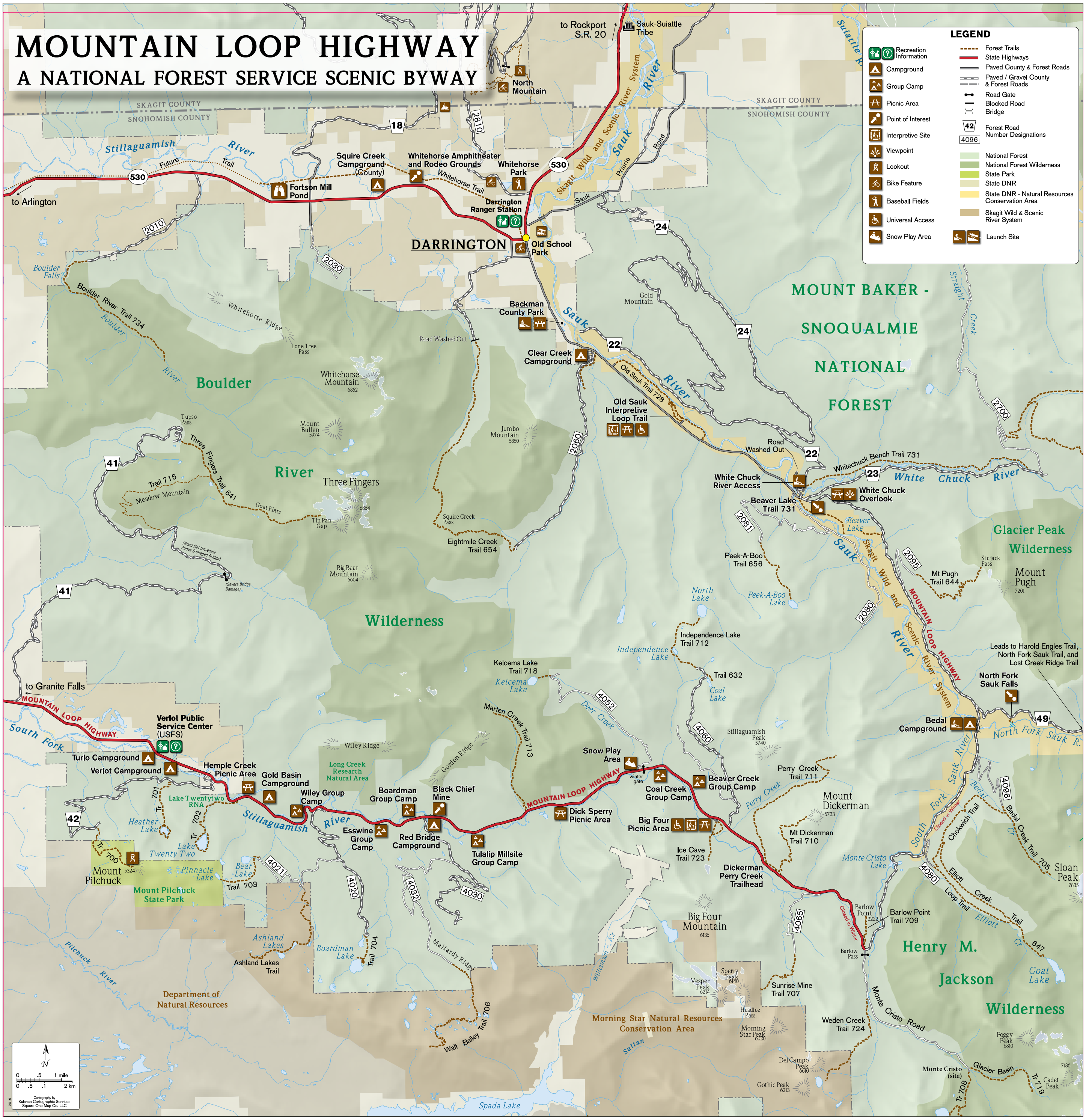


Figure S2. The number of sites in the MLH that include various types of trails.

C.


MOUNTAIN LOOP HIGHWAY
A NATIONAL FOREST SERVICE SCENIC BYWAY
LEGEND
Recreation Information
Campground
Group Camp
Picnic Area
Point of Interest
Interpretive Site
Viewpoint
Lookout
Bike Feature
Baseball Fields
Universal Access
Snow Play Area
Launch Site
Forest Trails
State Highways
Paved County & Forest Roads
Paved / Gravel County & Forest Roads
Road Gate
Blocked Road
Bridge
Forest Road Number Designations
National Forest
National Forest Wilderness
State Park
State DNR
State DNR - Natural Resources Conservation Area
Skagit Wild & Scenic River System
MOUNT BAKER - SNOQUALMIE NATIONAL FOREST
Boulder River Wilderness
Glacier Peak Wilderness
Henry M. Jackson Wilderness
DARRINGTON
SKAGIT COUNTY
SNOHOMISH COUNTY
to Rockport S.R. 20
Sauk-Suiattle Tribe
North Mountain
to Arlington
Fortson Mill Pond
Squire Creek Campground (County)
Whitehorse Amphitheater and Rodeo Grounds
Whitehorse Park
Darrington Ranger Station
Old School Park
Backman County Park
Clear Creek Campground
Old Sauk Interpretive Loop Trail
Road Washed Out
White Chuck River Access
White Chuck Overlook
Beaver Lake Trail 731
Whitechuck Bench Trail 731
Peek-A-Boo Trail 656
Mt Pugh Trail 644
Mount Pugh
Leads to Harold Engles Trail, North Fork Sauk Trail, and Lost Creek Ridge Trail
North Fork Sauk Falls
Bedal Campground
Independence Lake Trail 712
Trail 632
Kelcema Lake Trail 718
Snow Play Area
Beaver Creek Group Camp
Coal Creek Group Camp
Perry Creek Trail 711
Mount Dickerman
Mt Dickerman Trail 710
Big Four Picnic Area
Ice Cave Trail 723
Dickerman Perry Creek Trailhead
Big Four Mountain
Barlow Point Trail 709
Sunrise Mine Trail 707
Weden Creek Trail 724
Sloan Peak
to Granite Falls
MOUNTAIN LOOP HIGHWAY
Verlot Public Service Center (USFS)
Turlo Campground
Verlot Campground
Hemple Creek Picnic Area
Gold Basin Campground
Wiley Group Camp
Boardman Group Camp
Black Chief Mine
Esswine Group Camp
Red Bridge Campground
Tulalip Millsite Group Camp
Dick Sperry Picnic Area
Mount Pilchuck
Mount Pilchuck State Park
Ashland Lakes Trail
Trail 703
Department of Natural Resources
Morning Star Natural Resources Conservation Area
Spada Lake
Whitehorse Mountain
Three Fingers
Eightmile Creek Trail 654
Boulder River Trail 734
Stillaguamish River
Sauk River
White Chuck River
Monte Cristo Road
Wall Bailey Trail 706
Trail 704
Glacier Basin
Monte Cristo (site)