

SUMMER TRAIL ASSESSMENT

A Guide to Management of
Non-motorized Trails on the Jackson
Ranger District, BTNF

January 2020



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I. INTRODUCTION

Outdoor recreation is the primary way people connect with the National Forest and trails facilitate this access, providing multiple benefits. The Bridger-Teton National Forest receives approximately 2.2 million visits annually and non-motorized trails are the key facility used (NVUM 2008). Trails enhance people's life providing connection with nature, social bonding, adventure and release. Trails are part of the nation's wellness infrastructure, promoting physical and mental health. Trails also contribute to the economic vitality of communities, support outfitter-guide services, and are one of the key amenities that draw tourists as well as residents and businesses. To realize these benefits, trails need to be well-maintained and managed.

The Jackson Ranger District currently manages approximately 700 miles of summer trail, most of which provides access to backcountry experiences. This system of trails evolved over time, largely originating from game trails, and thus, was not designed with an eye towards sustainability to meet current recreation needs. To date, no comprehensive examination has been done to assess how well the current system of trails is working and what changes are needed to better meet the desired spectrum of recreation opportunities, minimize resource and wildlife impacts, and create a system that can be sustainably maintained and managed. This document is intended to fill this need. Indirectly, because the development and management of trails strongly influences where and what type of recreation use occurs, the guidance in this document is key to ensuring that the *"right use occurs in the right location at the right time"*.

Purpose and Need for Change

This document is intended to be a strategic assessment to guide future planning and management of the **non-motorized summer trail system** on the Jackson Ranger District, Bridger-Teton National Forest. The primary product from this assessment is guidance for nine distinct geographic areas with respect to each area's recreation management emphasis, trail development class, and priority trail system tasks. The document also provides background on what it takes to manage a trail system, the nature of trail-based recreation impact, trail-based recreation desires, and validates which trails are included as part of the Forest trail system. The following points define what the document does and does not do:

- This assessment is a strategic framework; not a decision document. Site-specific analysis is still necessary to approve a specific trail project. Additionally, Forest Plan Revision may change desired conditions and congressional passage of land designations may alter the direction for certain areas, necessitating a change in trail system guidance.
- With increasing use and evolving types of recreation use, change is inevitable. This assessment will guide where and how trail change occurs over time but will not stop change from happening.
- We all desire access and the ability to enjoy the outdoors, yet all recreation use causes impact. Solutions need to focus on our common goal for access to quality recreation experiences in natural environments where wildlife thrives, beauty abounds, water is clean, and there are places for quiet reflection, places for adventure, and places for social connection.
- Not all areas have the same emphasis; quality trails for every use cannot all be accommodated in the same area.
- The focus is on the non-motorized trail system. Motorized trail use is identified where it occurs but motorized trails were addressed in the 2009 North Zone Motor Vehicle Designated Route System decision and subsequent decisions. Those decisions will not be re-examined here.

- The focus is on summer use. Winter use is not part of this assessment.
- This effort is not about closing trails. It is about where effort will be focused in order to provide a quality trail system to support desired recreation experiences. Where trails are largely gone or where significant resource or public safety problems occur and no practical option exists to correct the problem, the trail may be removed from the system and allowed to fade back to a natural condition or physically closed where necessary to prevent further damage.

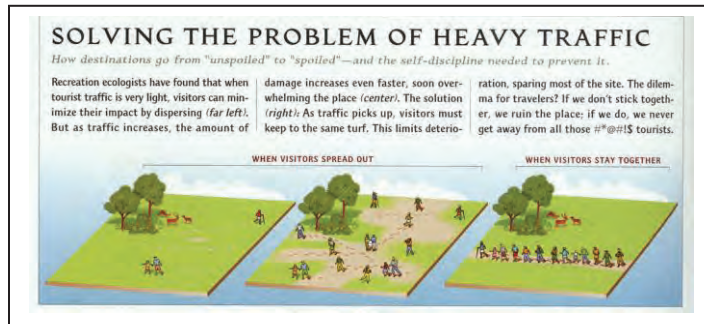
This assessment was developed primarily in response to increasing public interest to expand use-specific trail opportunities in accessible areas close-to-home combined with growing conflict among different uses and concern about the impact of increasing recreation use on wildlife. At the same time, Forest managers are concerned about resource impacts and the increasing challenge to address differing desires for recreation experiences as well as the challenge to maintain and manage trails in an era of declining federal budgets. The four factors driving the need for this trail system assessment are:

1. **Recreation use is increasing and public desires and expectations are changing:** There is more demand for close-to-home, easily-accessed, day use opportunities and more desire for use-specific and higher quality trails. Recreation is rapidly evolving due to new equipment, gear and information technology. There is increasing demand for quiet relaxing experiences as well as increasing demand for accessible adventures and social experiences. There is also more desire for real-time, area-specific information.
2. **Wildlife disturbance:** As bears and lions expand their territory and recreation use grows, there is concern about potential conflicts that could lead to injured people or pressure to re-locate animals. This same concern exists for moose, especially where sight distance is limited. The rich abundance and diversity of wildlife species is a primary value defining Jackson Hole that extends beyond megafauna to include owls, raptors, amphibians, fish and other non-game species. Thus, concern exists that spatial and temporal expansion of recreation use will increase disturbance and cause wildlife to avoid or leave areas either temporarily or permanently.
3. **Proliferation of user-created trails:** As recreation use grows, more user-created, non-system trails emerge. This is particularly true in day-use areas as well as near guest ranches. Some of these trails are becoming popular for a variety of uses, leading to interest in maintaining or reconstructing these trails and adding them to the Forest system.
4. **Changing funding picture:** Federal budgets are declining and are not expected to rebound. The Forest deferred trail maintenance backlog is estimated to be in the millions. Current work relies on grants, partnerships, donations, and volunteers. Grants sources are uncertain into the future and volunteers are often only able to work in easily accessed, day use areas due to limited time availability.

In response to these needs, this trail system assessment strives to:

1. Create a system that improves trail quality to support a spectrum of recreation opportunities by ensuring that trail design and development is consistent with the primary type of use and desired experience for a particular area.
2. Proactively reduce wildlife disturbance by emphasizing low-use, primitive recreation opportunities in backcountry areas, avoiding recreation activity in sensitive habitats such as winter range and riparian areas, incorporating trail design that reduces the potential for conflict, and promoting public education to encourage behaviors that minimize wildlife disturbance.

- Protect wild areas by concentrating recreation use in places where additional use can be more successfully managed rather than dispersing use across the landscape. This strategy helps reduce wildlife disturbance as well as provide opportunities for solitude and self-discovery. However, this strategy requires acceptance that limitations may be necessary in backcountry areas as well as acceptance of higher levels of use and greater personal responsibility to minimize use conflicts with people and wildlife in areas of concentrated use.

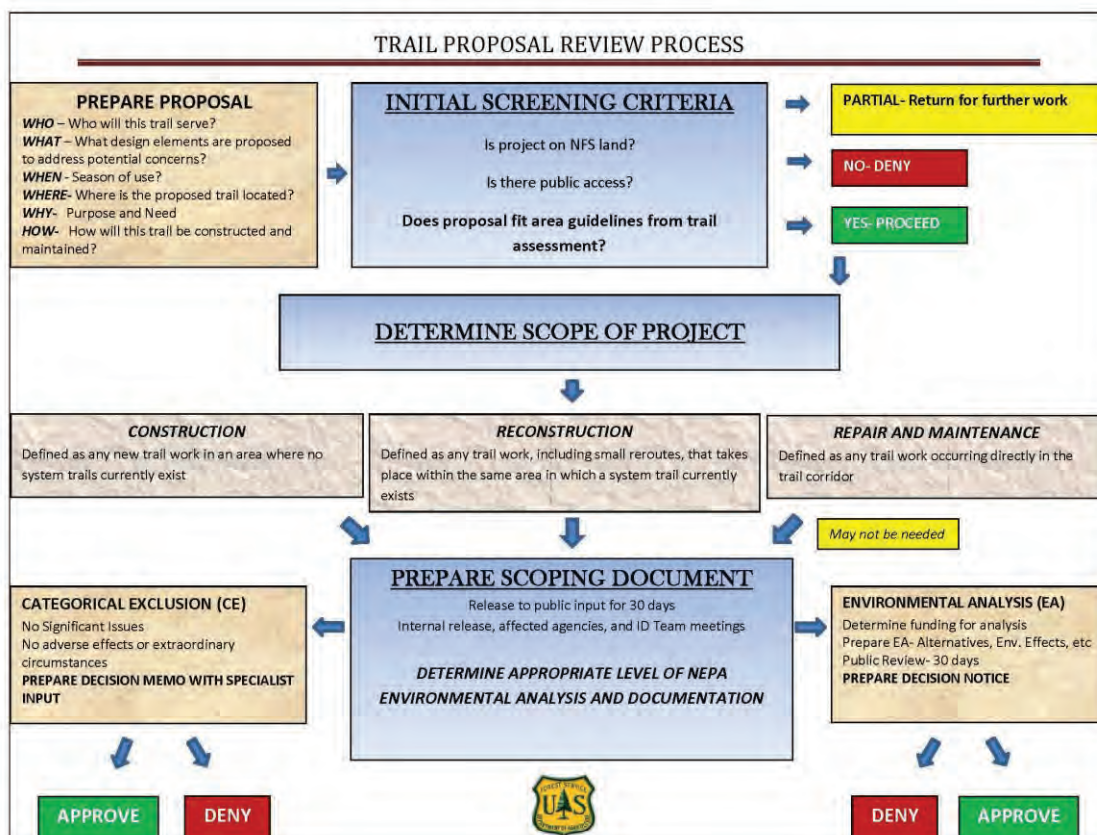


- Prioritize efforts to improve the sustainability of the trail system – environmentally, socially, and economically (minimize resource and wildlife impact, provide quality experiences, and reduce long-term maintenance costs).
- Provide a framework for the community to engage in all aspects of trail system stewardship.

How will this Document be Used?

This assessment provides a holistic picture to ensure change over time is compatible with trail system goals and with the guidance for each specific geographic area. As such, this document will be used to “screen” future trail proposals. The assessment will also help focus future Forest Service and partner investment in the trail system and will guide requests for grant-funded projects.

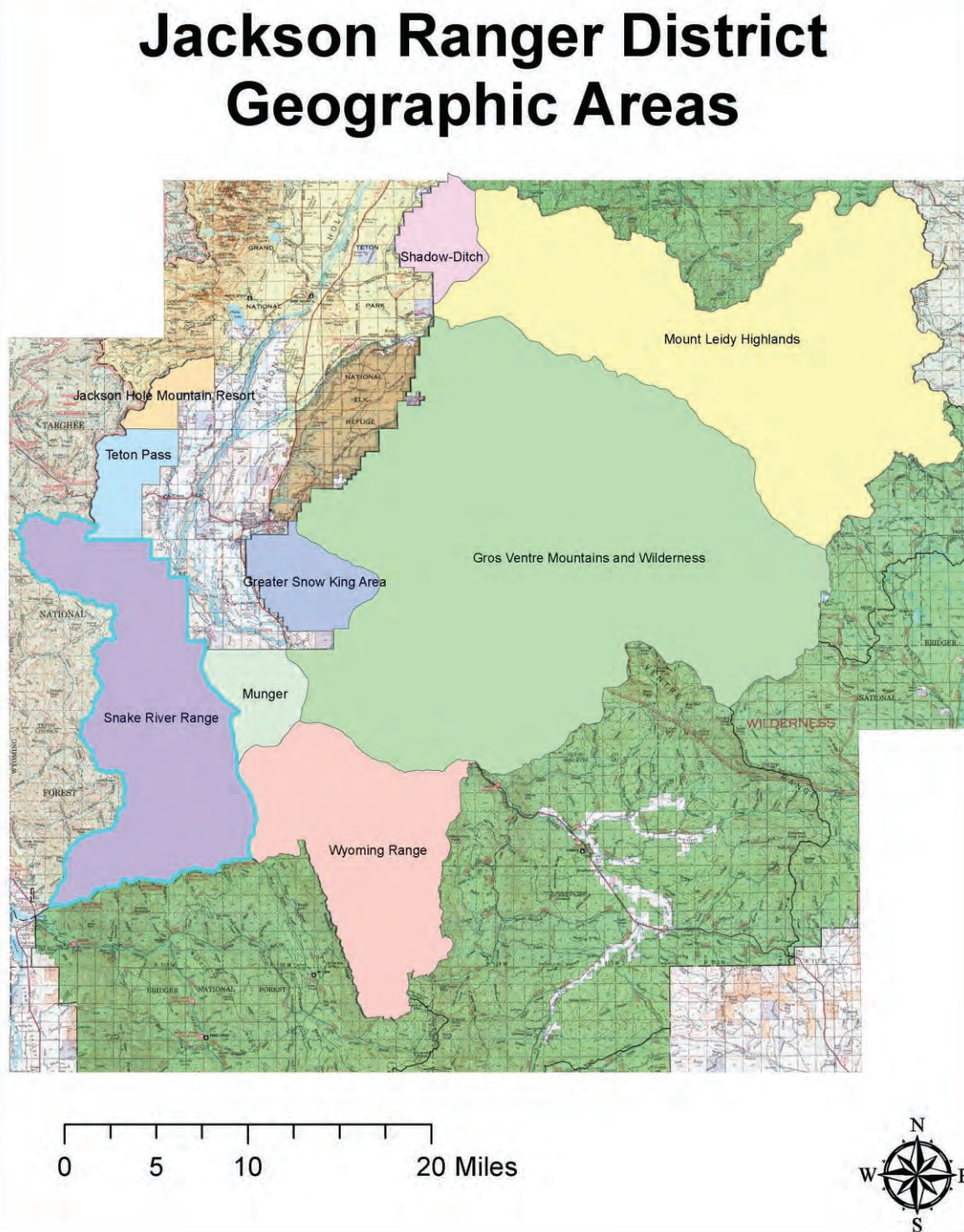
The following flowchart displays where the assessment fits into the process to evaluate a proposal for new trail construction, reconstruct an existing trail, add a non-system trail, or repair an existing trail.



Document Structure and Development

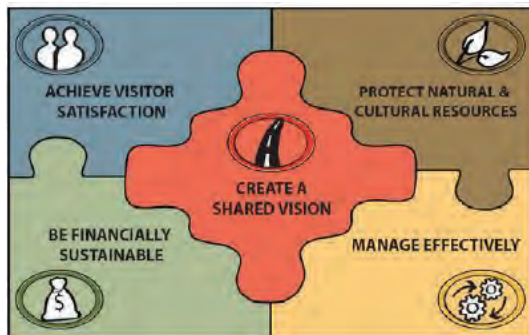
To structure this assessment, the Jackson Ranger District was divided into nine geographic areas, each of which has unique character, and differing uses, issues, and needs (Map 1). The primary product is guidance for each area regarding the area's recreation emphasis, the desired development level for trails and priority trail system needs. The geographic area guidance tiers to Forest Plan direction and was informed by public surveys, a public open house and comment period, a focused public design workshop, literature review, and analysis by resource specialists.

Map 1. Geographic Areas



Policy Framework

Policy direction for trail system planning and management is imbedded within National Forest policy that emphasizes sustainable recreation (National Forest 2012 Planning Rule). Sustainable recreation is defined as *“the set of recreation settings and opportunities on the National Forest System that is ecologically, economically, and socially sustainable for present and future generations.”* The Forest Service identified three focus areas: (1) the contribution of recreation to **economic** recovery, (2) the contribution of recreation to improving people’s physical and mental **health**, and (3) the contribution of recreation to enhancing community life – **connecting people** with their natural and cultural heritage.



A “Framework for Sustainable Recreation” (June 2010) lays out the agency’s strategic direction to build a program that integrates environmental, social and economic considerations. Central to sustainability is recognizing that, even with a multiple-use agency, we can’t be all things to all people. We must facilitate a shared vision and then ensure that the investment of time and funding is aligned with the vision for the area.

Within the umbrella policy of sustainable recreation, a sustainable trail system is achieved at the junction

where trails are social relevant and supported, ecologically resilient, and economically viable. Recently, the Forest Service has developed a *National Strategy for a Sustainable Trail System* to make progress towards this goal. Information can be found at: <http://www.fs.fed.us/recreation/programs/trail-management/strategy/index.shtml>. National Policy direction for trails contains the following objectives (Forest Service Manual 2350, Forest Service Handbook 2309.18):

1. Provide trail-related recreation opportunities that serve public needs and that meet land management and recreation policy objectives. Use the Recreation Opportunity Spectrum (ROS) as part of land management planning to ensure system trails offer a suitable diversity of outdoor recreation opportunities.
2. Provide trail-related recreation opportunities that emphasize the natural setting of NFS lands and that are consistent with land capability. Plan and develop trails based on decisions documented in the applicable land management plan.
3. Establish and document Trail Management Objectives and associated management requirements by assessing the interaction of resource use, recreation opportunities, and constraints of the area.

The Bridger-Teton Forest Land Management Plan (Forest Plan, 1990) provides goals, desired future conditions, and management standards and guidelines. Forest goals for trails are: (1) A safe trail system provides access to a range of recreation opportunities and settings (Goal 2.5) and (2) A safe transportation system meets the needs of commercial users (e.g. trails for the outfitting and guiding industry) (Goal 1.2).

Definitions

Note: All definitions are from Forest Service Manual 2309.18 except where noted otherwise

System trails: “Those trails that have been determined necessary for the protection, administration and use of National Forest System land.” System trails are numbered National Forest trails that have been included in the Forest transportation system and are eligible to receive maintenance funds. Such trails have often received some level of design and construction effort.

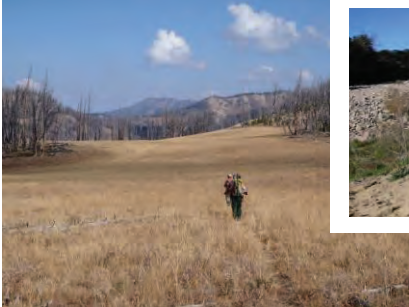
Non-system trails: “Trails that are not part of the Forest transportation system and thus, are not eligible to receive maintenance funds”. These trails may or may not be shown on USGS topo maps but are not numbered. They are typically trails created by human use or animals and thus have never received any design or construction effort to ensure their sustainability.

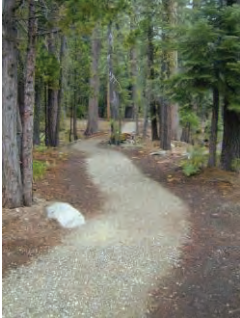
Sustainable trail: “The ability of the travel surface to support current and anticipated appropriate uses with minimal impact to the adjoining natural systems and cultural resources. Sustainable trails have negligible soil loss or movement. If well-designed, built and maintained, a sustainable trail minimizes braiding, seasonal muddiness and erosion. It should not normally affect natural flora and fauna adversely nor require re-routing and major maintenance over long periods of time.” (Duffy, et. al 2012).

Managed Use: The mode(s) of travel that are actively managed and appropriate on a trail, based on its design and management. There can be more than one Managed Use per trail. Managed uses are usually a subset of the allowed uses on a trail. Category for summer trails include: Hiker/pedestrian, pack and saddle, bicycle, motorcycle, ATV, and 4WD trail more than 50” in width.

Designed Use: The managed use of a trail that requires the most demanding design, construction, and maintenance parameters and that, in conjunction with the applicable Trail Class, determines which design parameters will apply to a trail. Although the trail may be actively managed for more than one use and numerous uses may be allowed, there is only one designed use per trail.

Trail Class: “The prescribed scale of development for a trail, representing its intended design and management standards”. There are five Trail Classes ranging from least developed (Class 1) to the most developed (Class 5).

Trail Class	Description	Photos
Class 1: Minimally developed	• Tread intermittent and indistinct • Obstacles common, often substantial • Constructed features non-existent • Route markers may be present • Recreation environment natural and unmodified (route-finding may be required) ➤ On BTNF, horse and pack stock are still appropriate in this class	 
Class 2: Moderately developed	• Tread continuous and discernable but narrow and rough • Obstacles may be common but blockages cleared to define route • Constructed features are of limited size, scale and quantity • Signing limited to junctions; route markers may be present • Recreation environment natural and essentially unmodified	 

Class 3: Developed	• Tread continuous and obvious • Obstacles may be common. Vegetation cleared outside of trailway • Trail structures may be common and substantial • Signs at junctions and as needed for user reassurance • Recreation environment natural and primarily unmodified	 
Class 4: Highly developed	• Tread wide and relatively smooth with few irregularities • Obstacles infrequent and insubstantial. Vegetation cleared outside of trailway • Constructed features frequent and substantial. Trailside amenities may be present • Wide variety of signs likely present with interpretive signs possible	 
Class 5: Fully developed	• Tread wide, firm, stable, uniform • Obstacles not present. Grades typically less than 8% • Constructed features frequent – may include bridges, boardwalks, handrails, trailside amenities • Wide variety of signs present with interpretive signs common • Recreation environment may be highly modified	 

II. TRAIL SYSTEM MANAGEMENT

Trail System Goals

1. Sustainable, Minimum Impact Trails

- Minimize erosion, trailside impacts and social trails
- Minimize wet areas and persistent bogs
- Minimize encroaching brush and maintain good sight distances consistent with setting
- Provide stable, functional, and predictable trail tread and structures consistent with setting
- Minimize trail intrusion in areas of crucial wildlife habitat
- Minimize the establishment and spread of noxious weeds
- Protect natural, historic, cultural and archaeological resources

2. Provide a spectrum of trail-based recreation opportunities

- Provide diverse types of trail designed and managed consistent with the recreation setting
- Encourage learning that helps connect people to the land
- Encourage and promote healthy lifestyles
- Provide quality, well-managed trails that enhance the local economy and community quality of life

3. Manageability

- Create a trail system that is in balance with Forest and partner capacity to maintain and manage to acceptable standards
- Gather and disseminate current information about on-the-ground trail conditions
- Provide accurate maps and trail descriptions to the public
- Provide accurate signage consistent with the recreation setting
- Monitor trail use and visitor feedback about the trail system

4. Address user safety and reduce conflicts

- Create a system that through good design and management, reduces trail hazards, use conflicts and potential collisions among different users and between users and wildlife
- Promote responsible and respectful use of trails and encourage unity among different type of trail uses

5. Community involvement

- Engage youth, community residents, and non-profit partners directly in the care and stewardship of public lands and trails
- Help create an open environment of learning, respect, and caring for the trail system

Trail System Tasks

Maintaining and managing a quality trail system on the National Forest requires many tasks beyond simply clearing trails of downfall. Ten specific trail system tasks have been identified to encompass the range of activities that must occur for trails to be functional, sustainable, and manageable. The following section includes several questions that need to be answered in order to perform the ten trail tasks effectively.

1. Planning

- Consistency with Trail Management Objectives and Forest Plan direction- Each trail on the National Forest System has a designated trail class which has certain guidelines that govern how the trail is managed. Each trail is also located within a certain Desired Future Condition (DFC) class under the Forest Plan which provides guidance on the resource, experiential, and managerial setting to be provided, identifies standards and guidelines for trails, and identifies appropriate uses.

Questions: What are the existing laws and policy that pertain to this trail? What Trail Class applies to this trail? Is the trail design and use consistent with the Forest Plan direction for the area?

- Developing trail system plans for specific areas to meet public needs- Our trail system is extremely diverse. Trails are used in very different ways depending on a variety of factors. This requires specific trail planning to best meet the needs for that area.

Questions: Who is the trail managed/designed for? What is the desired experience? How much use does or will the trail receive?

- Wildlife/Resource needs- There are nine different geographic areas on the Jackson Ranger District, and each area has unique characteristics and different kinds of wildlife populations. Resources and wildlife are affected in different ways depending on the location of use, type of use, frequency of use, and the season of use.

Questions: Are there threatened, endangered or sensitive wildlife present in the area? Are there particularly sensitive habitats such as crucial winter range, calving or nesting areas, or riparian habitats? How will a new trail, reconstruction of an existing trail, or closing old trails affect them?

- Non-system trails- Some trails on the National Forest are not part of the designated system, meaning they are not designed, maintained or managed by the Forest Service. These user-created trails need to be inventoried and documented in order to make informed decisions about their future.

Questions: Who is using the trail? Is there a need for a trail in this area? Is there environmental damage occurring? Is the trail consistent with Forest Plan direction and guidance in this trail assessment? Can the trail be effectively closed if necessary?



- Environmental analysis – Any proposed trail project must be analyzed through the NEPA (National Environmental Policy Act) process in order to disclose the potential effects on the land and on the human environment. This process includes opportunities for public input as well as consultation with forest hydrologists, archaeologists, and biologists.

Questions: How will the proposed trail project affect the land and people? Does the decision-maker have sufficient information to make an informed choice?

2. Information

- Getting accurate trail location data (GPS) - Many trails shown on topo maps were mapped in the 1960's and the location is not currently accurate. Trails move over time with landslides, changes in creek locations, or sometimes due to downfall. The only way to get current, accurate information is to travel each trail with a GPS unit and transfer the data directly to Forest Geographic Information Systems (GIS) to produce usable maps.

Questions: What is shown on the maps and is the trail location accurate? Who is available to obtain GPS data? What kinds of maps do people want and in what format?

- Providing trail condition and use reports- Trail condition reports provide information on the current status of the trail, whether it's been cleared, whether it is snow-free, or whether there are any safety hazards such as high river crossings that users may encounter. Use reports provide information on how much use a trail is receiving, what types of use, when use is occurring, and may provide visitor feedback on conditions.

Questions: How do we effectively provide current and accurate trail conditions to users before they travel on a trail? Who is available to consistently update the conditions as they change? What level of precision is needed to assess trail use? How should such information be collected, analyzed and interpreted?

- Maintaining a usable trail website- With over 700 miles of trails on the district, maintaining current and usable information on the trail system can be a significant workload. Public requests for accurate trail information and suggestions for use-specific opportunities is increasing as is the variety of media platforms people use to access trail information.

Questions: What kind of interface is best for people to find trail information easily and quickly? What kind of trail information is desired?

3. Access and Facilities

- Maintaining road access to trailheads- Roads can take even more maintenance than trails, yet Forest road budgets are decreasing rapidly. The conditions of the road to a trailhead can be a key factor in whether a trail is used or not.

Questions: With declining road budgets, how do we continue to provide access to distant trailheads on rough roads? How good does the road need to be? Will fixing a road invite more use and thus more conflicts?



- Trailhead facilities- Maintaining trailhead facilities requires attention to the parking area, information kiosk structure, signing, and upkeep of other facilities such as restrooms, mutt-mitt stations, or hitchrails.

Questions: What kinds of facilities are needed and can they be realistically maintained?

- Acquiring easements across private land- Many trails in the area cross through private land not owned by the Forest Service. To provide access to the area, an easement must be granted by the land owner.

Questions: What areas do we absolutely need to cross private land to access the National Forest? Is there an option to go around private land? Are there gates, signs, or other obstacles to the public and how do we provide relevant information?

4. Maintenance

- Clearing downed trees- Each year the trail crews clear nearly 2000 trees from the local trails. Without this service, trails often would not be passable. See section on “care and feeding” of trails for more information.

Questions: With over 700 miles of trail and areas of fire or bark beetle mortality and frequent wind events, how do we effectively clear every trail, every year, to ensure that the trail is passable? How do we prioritize which trails are cleared?

- Maintaining and installing drainage, brushing, bog holes- Trails require annual maintenance in order to be functional and safe. Clearing and installing drainage to keep the trail from eroding, cutting back brush to keep the trail open, hardening boggy areas and repairing bridges must be done every season. See section on care and feeding of trails for more information.

Questions: With limited people and limited time, what kinds of trail tasks do we focus on? How do we prioritize trail tasks? When is a trail beyond the point of repair and should be removed from the trail system?

5. Reconstruction

- Re-establishing disappearing tread- Many trails do not get enough use so they begin to grow in. This is especially true in large forb meadows.

Questions: Is it worth re-establishing tread if the trail is not seeing enough use to keep the tread discernable?

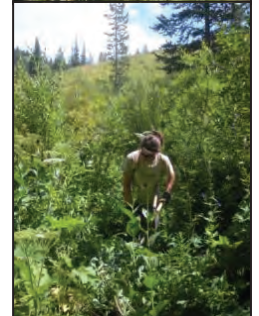
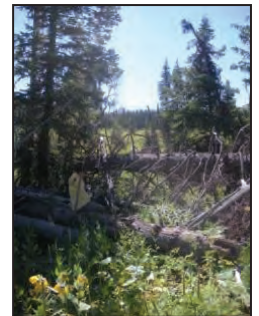
- Re-locating sections of trail- Most trail problems are caused from the trail being poorly located or having grades that are too steep to be sustainable. The manager must decide whether the problems are fixable with drainage or other structures, or whether the whole section must be re-located.

Questions: When is a reroute necessary? What kinds of design parameters do we follow for the reroute? What kinds of grades are sustainable in each location? Do we risk changing the experience by changing the trail (i.e. removing challenge)?

6. New Construction

- Constructing new trail connections- Building new trail connections can create new trail loops, help spread users out within the system, and provide more recreational options. However, new connections also increase trail density in an area and must be analyzed within the context of the Forest Plan.

Questions: Where are new connections needed and why? Can new trail sections be maintained into the future?



- Replacing trail structures- Trail structures such as rock walls, bridges, and turnpikes require maintenance after they are built. Sometimes the structure that was built did not effectively fix the problem and so it requires deciding whether to install a different kind of structure, or re-locate the trail.

Questions: When a structure fails, is it necessary to replace it? Will the structure be able to be maintained? Who uses the trail and what kind of structure will last the longest?



7. Rehabilitation

- Closing and re-planting old trails- Closing an existing trail requires analysis and public input to ensure the use can effectively be moved to another location. However, when a portion of trail is re-located, closing the old section is part of the project.

Questions: What method will work best to close a length or section of trail? How do we keep people from using the trail or re-opening a closed trail? Does the trail need re-planting or will it re-grow on its own?



- Evaluation- Trail closures require follow up work to ensure that the trail stays closed and begins to re-grow. Signs or patrols are often needed to effectively communicate the need for the closure with trail users.

Questions: If a trail does not appear to be staying closed or re-growing the following year, what should be done? Who is still using the closed trail and why?

8. Signing

- Producing and maintaining trailhead information signing- Signing is an on-going task that changes from season to season. Signs must reflect current information and accurately convey key messages. Kiosks and sign posts must also be maintained in good condition.

Questions: What kinds of signs will people pay attention to? How can information about regulations and responsibilities be conveyed in a way that gains compliance? Are interpretive signs needed? How much signing is too much?



- Installing and maintaining signs at trail junctions- Sign frequency and design vary depending on the management emphasis and desired setting for the area.

Questions: Should there be a sign at every trail junction? What is the sign plan and who is responsible for producing, installing, and tracking signing? Are directional signs needed on the highway to direct people to the trailhead?

9. Education/Use Management

- Patrols to assist visitors- Forest Service or non-profit ambassadors must have accurate, consistent and current information to convey to people they encounter. This requires a commitment to training and coordination to ensure adequate coverage in priority areas.

Questions: How many personnel do we need for effective coverage and what are the key messages? Who needs to be certified to enforce Forest regulations? What kind of training is needed and how should we keep patrollers up to date on current issues?



- Immediate on-the-ground response- The Forest Service frequently receives calls that require immediate action, whether for carcasses on busy trails, downed trees, a violation in process, or a lost or injured person, someone must be available to respond.

Questions: How do we respond to the variety of issues in a coordinated timely manner? What is the protocol for emergency situations or response to a carcass on a trail or a predator in the area?

- Use conflict- Most trails on our system are shared use allowing access by people using multiple modes of travel. These uses can conflict with one another or conflict can arise due to the behavior of a person towards another person.

Questions: How do we promote shared use and help unify trail users? How should we respond to conflicts? At what point, should separating use, restricting certain uses, or implementing some other management action be considered to reduce conflict?

10. Program Administration

- Funding- Every year, managers struggle with figuring out how to fund the staff necessary to support trail maintenance and improvement projects. Grant funding is an important part of the program but this requires determining which projects provide the best match with available grant sources and doing the work necessary to apply for the grants, secure the matching contributions, and complete the financial and accomplishment reporting.

Questions: What level of funding is needed? Where will funding come from? What grants are available, how do we get them, and who will prepare and administer the grant? What will we do if grant funding is not approved?

- Crew hiring, training and supervision- Qualified staff is critical to complete the annual trail maintenance and improvement projects including providing opportunities for youth and volunteer service organizations? Each year, managers must recruit and hire qualified individuals. New employees must be trained and certified, as well as supervised throughout the summer.

Questions: Who should get hired? How do we retain qualified people?

- Purchasing materials and supplies- Trail projects require well maintained tools as well as the proper materials for the job such as lumber, hardware, culverts, geotextile, etc.

Questions: What is the budget for supplies and how do we prioritize what is bought?

- Recruiting and guiding volunteer groups- Volunteer groups require months of planning before work is done on the ground as well as active supervision in the field. Trail projects must be matched to the volunteer group, depending on their experience level, age, and available time.

Questions: What projects are suitable for volunteer labor? Who is available to supervise the volunteer groups? How do we mobilize volunteers and ensure their safety?

- Maintaining databases and reporting accomplishments- The Forest Service maintains a nationwide database of every trail on the National Forest system. This database requires annual updates and annual reporting of all trail accomplishments.

Questions: How do we meet reporting requirements and maintain current information into the future?

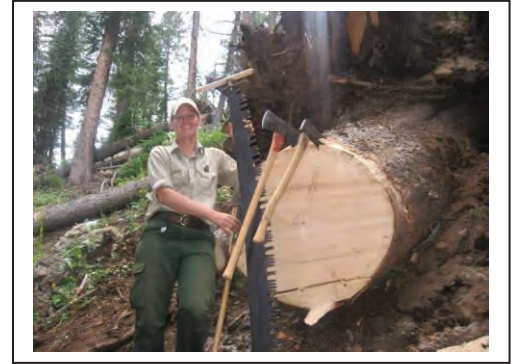


Trail Care on the Ground

Most trails require annual care and feeding to be well maintained and sustainable. The process of caring for trails is an ongoing one that is never fully completed, mainly due to the dynamic environment in which they exist. Nature is constantly changing and evolving, whether it is landslides, flooding, fires, drought, or large storms. Aside from natural events, recreation uses are evolving as well. As society evolves, use management on trails must evolve as well, whether it is by modifying trail design, adjusting signage, communicating with users, or providing information in new ways. In order to fully care for a trail system, certain jobs must be done on the ground either every year, or on a constant rotating

schedule of maintenance. The essential jobs for the care and feeding of trails are: Clearing, Brushing, Drainage, Creek Crossings, Tread Work, and Monitoring. Each will be discussed in further detail below.

1. **Clearing-** Clearing trees from trails is a full time job and is never finished, due to new trees constantly coming down in large storm or wind events, bark beetle mortality, large fires, or other factors. On the Jackson Ranger District alone, roughly 2000 trees are cleared from roughly 400 miles each year. This is only a portion of the whole trail system on the district, and each year that a trail is not cleared, the task becomes larger, more difficult and more time consuming. Many trail problems are caused by downed trees. Inevitably a route is created around the downed trees and the route is typically very unsustainable, either heading straight uphill or through muddy areas. Downed trees can be also extremely hazardous to get around, especially when in areas of high blow down or steep side hills. Clearing trees from the trails should be the top priority in the maintenance of any trail system.



2. **Brushing-** Heavy brush can make a trail impassable. Thick brush is often a sign of poor trail alignment. Thick brush typically exists in the bottom of drainages where there is more moisture in the soil, which is a poor place to locate a trail. Yet the reality is that most of our trails follow creeks where the brush is heavy, and the trail sections are so large, that relocating all of these trails is virtually impossible. So brush must be dealt with each year, cutting it back, only to have it grow in again. In areas where machinery is prohibited, this can be a monumental task.



3. **Drainage-** Water is the most destructive force on trails, and if left unchecked, it will completely wash out the trail tread, making the trail impassable. Drainage structures such as waterbars and drainage dips must not only be installed on every trail, they must be maintained on a yearly basis. The more velocity that the water carries down the trail surface, the more sediment it picks up and the faster the trail washes out. It is therefore extremely important that washouts are dealt with immediately or the entire trail will be compromised.



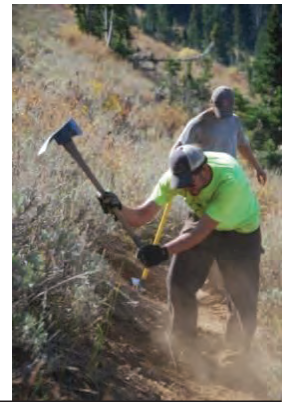
4. **Creek Crossings-** Many of our trails, particularly in the backcountry, do not have structures for crossing rivers and creeks. Creeks and rivers are constantly changing the course of their flow. In high water years, a creek can jump its banks, cut new channels, or dam up in places due to high amounts of debris. Creek crossings on trails can be very difficult to maintain and have the most potential to add sediment to the creek, affecting fish and other aquatic life. There is typically a steep grade dropping down to the creek, which coupled with the organic soils in creek bottoms, can wash out very easily. In addition to the approaches, the creek bed itself can have large boulders or large trees that get washed into the path of the trail. These crossings can be the most dangerous part of the entire trail, and they require yearly attention to ensure safety.



5. **Tread Work-** Tread work typically refers to re-establishing bench in areas where the trail has sloughed and the tread has narrowed, or re-establishing the tread itself in areas where the trail has disappeared. Tread work can usually only be done by hand, unless in areas where it is possible to bring in heavy machinery.

On the Jackson District, most trails are not accessible for machinery and, thus require the use of hand tools and hand crews. The time frame for effective tread work can be very narrow, since during the heat of the summer the trails turn to dust and are very difficult to shape.

6. **Monitoring-** An often neglected but important aspect of the care and feeding of trails is having personnel on the ground looking for more problems as they occur. Trails are changing constantly and new problems can pop up at any time and become larger problems if not dealt with immediately. With 700 miles of trail, problems can be overlooked unless someone is out there covering as much ground as possible and making future plans for how to solve trail issues.



The Nature of Trail Impact

When we discuss trail “impacts”, we are generally referring to the negative impacts associated with an undesired change, although there are obvious benefits such as economical, spiritual, health, social, and improved quality of life. However, to achieve a sustainable system, it is important to understand and assess the negative impacts associated with trails and the implications these effects have on the management of an area (Hammit and Cole, 1987). Federal land management agencies are tasked with finding the appropriate balance between providing access and diverse opportunities while at the same time protecting natural and cultural resources and providing quality experiences. In order to achieve this balance, impacts must be analyzed when managing a certain trail or recreational area. The two most common are environmental and social.

Common environmental impacts associated with recreational use of trails include: vegetation loss and introduction of weeds, soil compaction, erosion, muddiness, degraded water quality, and wildlife disturbance. Environmental impacts associated with the trail tread are primarily attributed to the steepness of the trail, soil type and moisture, and type of tread construction, surfacing, and drainage (Marion and Wimpey, 2007). Environmental impacts associated with the introduction of weeds and wildlife disturbance are primarily attributed to the recreation use of the trail, not the trail itself. Social impacts typically revolve around conflict between different types of recreation use. The principal conceptual foundation underlying recreational conflict research has been the “theory of goal interference” (Manning, 1986). This theory states that perceptions of conflict arise when the presence and or behavior of one group of users is incompatible with the social, psychological, or physical goals of another group (Jacob and Schreyer, 1980). This theory suggests that trail conflicts are not only possible between different user groups, but are also possible among different users within the same user group. However, when trail conflict situations are tackled head on and openly they can become an opportunity to build and strengthen trail constituencies and enhance outdoor recreation opportunities for all users (Moore, 1994). It is our hope that continued open discussions among the multiple recreation groups using the Jackson District trail system will serve to build a more knowledgeable, responsible, and mutually supportive community of trail users, where interactions with others become a positive part of the trail experience. This is achievable through intelligent planning, trail design, and education.

All recreational use causes impact, thus a certain amount of impact is inevitable. A key difficulty is that impact results from the cumulative effect of many recreationists, not from just one person. Years of managing recreation use have taught us that focusing simply on the number of people or just on the type of use is misguided. The challenge is to determine how much impact is acceptable, versus

unacceptable (Stankey, McCool, and Stokes, 1984). Five factors of recreation use influence the degree of impact; (1) amount of use, (2) timing of use, (3) location or distribution of use, (4) timing of use, and (5) behavior of users (Cole, et. al. 1987). Good visitor use management requires three essential components:

- A clear description of desired conditions for resources, visitor experiences, and facilities/operations,
- An understanding of how visitor use influences the achievement of desired conditions (i.e. good problem definition), and
- A commitment to active, adaptive management and monitoring (IVUMC 2016).

Managers must decide, based on desired conditions, what activities are compatible with the desired conditions, where to draw the line regarding acceptable versus unacceptable impact and then implement management actions to ensure impacts remain acceptable. Given the myriad of factors that determine the degree of impact, it is difficult to generalize which activities cause the most impact. According to recent studies, *trail design and management are much larger factors in environmental degradation than the type or amount of use*. In the end, our goal is to provide the diversity of recreational experiences desired by the public while minimizing overall environmental and social impacts in accordance with the concept of the “*right use in the right location at the right time*.”

Below is a summary of the basic effects associated with recreational trail use on soil and vegetation, on other people, and on wildlife. Several good literature syntheses are available on this topic within the discipline of recreation ecology (for example, see Hammit et. al. 2015; Hennings 2017; Monz et. al. 2013; Larson et. al 2016, Cole 2019; Marion 2019, Allen 2019).

Soil and Vegetation Impact-

The factors that most influence the impact of trails on soil and vegetation are primarily location and timing (trails are most easily damaged when soils are wet) followed by the type of use. Direct trail impacts, across the spectrum of uses, include soil compaction and loss, reduced soil moisture, loss of organic litter, loss of ground cover vegetation, introduction and spread of weeds, and changes in vegetation composition (Pickering et al., 2010). In addition, there can be damage to plants including reduction in vegetation height and biomass, changes in hydrology, and exposure of roots, rocks and bedrock. These impacts will vary greatly based on the specific location of the trail, but it is important to realize that a poorly-designed trail can erode and deteriorate even without any use. Wilson and Seney (1994) concluded that trail degradation occurred regardless of specific uses, and that this was more dependent upon geomorphic processes than the types and amount of activity. This emphasizes the need for planning and careful route scouting prior to any new construction or rerouting.

Comparative studies of different activities have shown that each has impact, but in different ways. Keller (1990) noted that bicycles create a linear track, compared to hikers and horses that leave behind distinct foot or hoof tracks, like pockets in the soil. A linear track tends to promote channeling of water, as opposed to puddling caused by foot or hoof tracks. This channeling of water can lead to increased velocities of water flowing down the trail, which allows the water to pick up more sediment and transport it away from the trail tread. Mountain biking typically produces U-shaped trails, mostly due to bikers displacing soil laterally and banking on turns. Horse and hike trails tend to be more rutted, mostly due to the higher amounts of sediment that are kicked up by feet and hooves, and typically create parallel trails due to people trying to avoid mud or stock walking side by side. Hikers are more likely to create trail shortcuts, damaging a switchback trail and horses are more likely to widen the trail tread and create muddy areas due to their greater weight.



The general consensus from most comparative studies was that trampling impact was greater on slopes than on level sites; on wet rather than dry surfaces; and that it tended to be greatest for hikers and horses moving downslope, and mountain bikes moving upslope (Cessford, 1995). This reiterates the idea that *managing impact has more to do with proper trail design and location*, as in minimizing excessive slope angles, aligning trails across slopes with proper out sloping, ensuring that effective drainage exists, and using natural features to keep the trail from widening. Minimizing impact from user created trails also relies on not only proper alignment and design, but on providing trails to locations that people want to go. Mitigating soil and vegetation trail impact relies heavily on the ability of the land manager to frequently assess the condition of the trail system and make necessary adjustments.

Social Impact-

The factor that overwhelming influences trail-related social impact is the behavior of users followed by the type of use. As mentioned above, social impacts tend to revolve around recreation conflicts and the “theory of goal interference”. This theory states that perceptions of conflict arise when the presence and/or behavior of one group of users is incompatible with the social, psychological, or physical goals of another group (Jacob and Schreyer, 1980). Conflict has been found to relate to activity style, focus of trip, expectations, attitudes toward the environment, level of tolerance of others, and different norms held by different users (Moore, 1994). Reducing social impact is much more than simply building more trails or separating uses. Social impact must be analyzed on a site specific basis in order to truly understand the sources of conflict in that area.



When designing a new trail, connection, or reroute, the human variables need to be incorporated into the trail design in order to minimize social impacts. Who is using the trail and why? What are the motivations of the people using that area and what do they expect to find there? If we design a trail for horses that is also desirable to mountain bikes in terms of grade, location, or technical features, we are potentially inviting conflict. If we design a trail for mountain bikes in a shared use area, we may inadvertently cause hikers and horses to create separate trails.



As long as shared use systems exist, social impacts and conflicts will occur. Existing literature, in particular *Conflicts on Multiple Use Trails* by Roger Moore (1994), identifies several principles for improving cooperation and sharing on multiple use trails.

1. *Provide adequate trail opportunities-* Offer adequate trail mileage based on Forest Plan direction, and offer a *variety* of trail experiences. This variety can help provide the setting that meets the expectations of different kinds of trail users.
2. *Minimize the number of contacts in a certain area-* Reduce the number of user contacts, for example at a congested trailhead try to disperse use as early as possible and provide separate trails where necessary after careful consideration of the environmental impact.
3. *Involve users in management decisions-* For proposed trails, involve the pertinent user groups in the planning process as early as possible to resolve conflicts before they occur.
4. *Understand user needs-* Try to determine the motivations, desires, norms, preferred settings, etc. before you design the trail
5. *Identify the actual source of conflict-* Bring together the affected user groups to find the specific tangible causes of the conflicts and move beyond the emotions and stereotypes to find the actual source. Much conflict can be mitigated through proper trail system design.

6. *Education and promotion of proper trail etiquette*- Use signage, public meetings, kiosks, and visitor patrols to try and get people to work together and be mutually respectful of each activity.
7. *Plan and act locally*- Address any issues on the local, site specific level. This provides better flexibility for addressing difficult issues on a case-by-case basis.
8. *Monitor progress*- Nothing is worth doing unless you follow up. Make informed decisions with the help of all the varying groups involved, and then monitor whether conflicts are being reduced, or if the problem just moved to another location.

Wildlife Impact-

The factors that influence trail-related impacts on wildlife are primarily timing and location of use (including off-trail versus on-trail use) followed by user behavior and type of use. Trails in and of themselves do not usually impact wildlife. In fact in some areas, animals may be using the trails more frequently than people. Trails can serve as an obstacle-free route through the forest which helps wildlife conserve their energy and for some animals, trails may serve as a refuge from predators (Miller 2016, Reilly et al. 2016). A conceptual model illustrating the relationship between recreation and wildlife effects provides a useful framework (Marion 2019). First, the nature of the impact must be determined. For trail use that doesn't involve camping, the primary concern is disturbance, including the potential for conflict (i.e. negative interactions that pose safety concerns for people and the animal). Disturbance can be intentional (harassment) or unintentional. Unintentional disturbance is the primary way that non-hunting recreational activities impact wildlife (Knight and Cole 1991). Human disturbance causes animals to increase stress hormones, change habitat use, and exhibit a flush response. Disturbance may eventually reduce reproductive success and increase mortality (Pauli et. al. 2016). These effects are typically due to the perception of humans (and dogs) as potential predators. All of these factors affect the amount of energy that the animals must expend in order to feel safe from the encounter.

The science around this complex topic is still evolving and generalizations are difficult since there are considerable differences based on the particular species involved, habitat characteristics, the timing of the encounter, as well as the need to differentiate between effects on individuals versus effects on populations or communities. This topic, more than any other, requires good problem analysis and clarity. Complicating the story is the fact that most recreationists do not realize their actions impact wildlife and, if they do, there is a strong tendency to blame other types of use for the impact (Hennings 2017). Despite this difficulty, a few findings are worth noting (Marion 2019).

- *Predictability* – off-trail use is more impactful than on-trail use (Miller and Knight 2001). If animals perceive an activity as spatially predictable and non-threatening, they may habituate to the activity (Whittaker and Knight 1998). Taylor and Knight (2003) found that bison, antelope, and mule deer reacted similarly to both hiking and biking, but that they all reacted more strongly to off-trail recreationists.
- *Timing* – recreation use during the winter season when animals must rely on fat reserves and during the spring when animals are giving birth is more impactful than during the summer season. For example with elk, if the additional energy required to flee reduces the percent body fat below 9% as animals enter winter, the probability of survival is greatly reduced (Cook et al., 2004). Time of day is also a factor with early morning or night-time use potentially impactful.
- *Location* (specialized habitats) – in the West, riparian habitats are particularly important for wildlife. Likewise, old-growth forests can be particularly important for nesting owls and raptors, and certain sagebrush habitats important for sage grouse. Encounters in these specialized habitats are more impactful than in non-specialized habitats. Additionally, frequent disturbance can lower reproductive success particularly for nesting birds (Bunnell et. al. 1981).
- *Behavior* – people who directly approach wildlife (e.g. photographers) are perceived as more threatening than people moving parallel or away from the animal (Klein 1993, Knight and Gutzwiller 1995). Likewise, hikers approaching bighorn sheep from above elicited a stronger

reaction than hikers approaching downslope from the sheep (Hicks and elder 1979). Other negative behaviors including feeding animals or wearing earbuds that reduce the ability to hear a nearby animal.

- *Type of use* – other factors being equal, activities that involve noise or higher speeds (e.g. motorized use, mountain biking, trail running) tend to result in greater flight distances. Dogs, particularly off-leash dogs, result in particularly high flush distances since dogs often run off-trail. Several studies of wildlife response to different types of use have been done but it has proven difficult to draw consistent conclusions. Factors such as the specific wildlife species, differing habitat attributes, different set of activities, differing recreation behavior conspire to make conclusions difficult. For example, a study on the Boise River in Idaho found that the highest frequency of bald eagle flushing was associated with walkers, however, bicyclists cause eagles to flush at greater distances (Marion and Wimpey, 2007). Herrero and Herrero (2000), found that mountain bikers are more likely to encounter bears, mainly because they travel more quietly and more quickly, with more attention focused on the tread itself. A study by Wisdom and others (2018) found that elk avoided areas where humans were recreating. All-terrain vehicle use was most disruptive to elk, followed by mountain biking, hiking, and horseback riding. In response, elk spent more time moving rather than feeding and resting.



When analyzing the potential effects of trails on wildlife, we must broaden our gaze to encompass the larger picture on wildlife populations in the long run, especially given the international importance of the Greater Yellowstone Ecosystem and the inherent value of wildlife to Jackson Hole's history and quality of life. A number of strategies are available to minimize the effect of trail use on wildlife. These strategies include seasonal restrictions during the winter or spring,

concentrating use rather than dispersing use, avoiding riparian areas and sensitive habitats, providing buffers around raptor nests, requiring leashes or prohibiting dogs, designing trails to slow speeds along with maintaining good sight distances, maintaining trailless core habitat areas, and education to promote giving wildlife plenty of space (Colorado State Parks 1998, Larson et.al. 2016, Marion 2019).

Conclusion

Soil, vegetation, wildlife and social impacts related to trails or trail use are, in reality, a sign that the trail is popular and that people enjoy being there. The vast majority of recreationists want to the “right thing” and don't want to impact the land, wildlife or other people. Although the term “conflict” can have a negative connotation, it can be seen in positive light when one considers conflict as a mechanism to bring people together to improve the area that they love. Open, honest dialogue regarding the impacts associated with trail use can build a stronger, more respectful community of trail users. It is our hope that as the agency charged with caring for the land and serving people, we can use these opportunities to learn and grow with the community and help foster broader conversations about the future of our area. By focusing on the many things users have in common and the many constructive trail-sharing efforts underway across the country, it will be easier to address the relatively few areas that tend to pull us apart (Moore, 1994).

Trail Recreation Desires

The following section is based on discussions with various recreationists and input received during public workshops during development of this trail assessment.

Day Hikers: 1-5 miles

1. *DESTINATION*- Lake, viewpoint, waterfall, etc
2. *CLOSE* - little to no drive to the trailhead
3. *SIGNAGE*- adequate signing so you don't get or feel lost
4. *LOOPS*- short loops instead of out-and-backs
5. *WIDE TREAD*- trails where you can walk side by side and talk with friends, bridges

Day Horseriders: (10-20 miles)

1. *PARKING/ROAD*- large turnarounds for trailers, good road, hitching posts
2. *LOOPS*- both short and long loop options
3. *INFORMATION*- adequate info available for the trail before going(maps, conditions, etc)
4. *MAINTAINED*- trails that are cut out, brushed out, lacking bogs or difficult river crossings
5. *SIGNAGE*- good junction and trailhead signing

Mountain Bikers (Cross Country): (5-20 miles)

1. *QUALITY*- well designed trail, single-track, good sight distance, good flow, views of undeveloped country
2. *DISTANCE/CLOSE*- long trails with loop options, close to town
3. *VARIETY*- technical/challenging sections along with easier more open sections for speed
4. *ONE WAY*- places to ride without having to worry about hitting others, good sight distance
5. *MAINTAINED*- good tread condition, places where trees have been cleared, or brush cut back

Trail Runners: (5-15 miles)

1. *GRADE*- trails with steep grades to provide challenge and elevate heart rate
2. *LOOPS*- both long and short loop options
3. *DISTANCE/CLOSE*- long trails close to town to hit before or after work
4. *SIGNAGE*- well marked junctions or maybe mile markers
5. *SIGHT DISTANCE/OPEN*- places where you can see wildlife from far off (bears, lions, etc)

Downhill bikers: (1-10 miles)

1. *GRADE*- steep grades
2. *FEATURES*- trails with constructed features that allow aerial stunts
3. *ONE WAY*- places with no other users coming up the trail
4. *SHUTTLE OPPORTUNITY*- places that are accessible by vehicle top and bottom for shuttling of bikes
5. *WIDE CORRIDOR*- feature landing zone has been cleared of objects

Outfitters (Stock): 15-30 miles

1. *MAINTAINED*- trails that are clear of trees, safe riding environment for clients
2. *WILD*- places that are further from town, not many people, good hunting or scenic rides
3. *WIDE CORRIDOR*- well cut corridor for pack stock
4. *GOOD ROAD/PARKING*- manageable road and large turnarounds for parking horse trailers, hitching posts
5. *DIRECT*- trails that don't wind around, get to the destination the most direct route

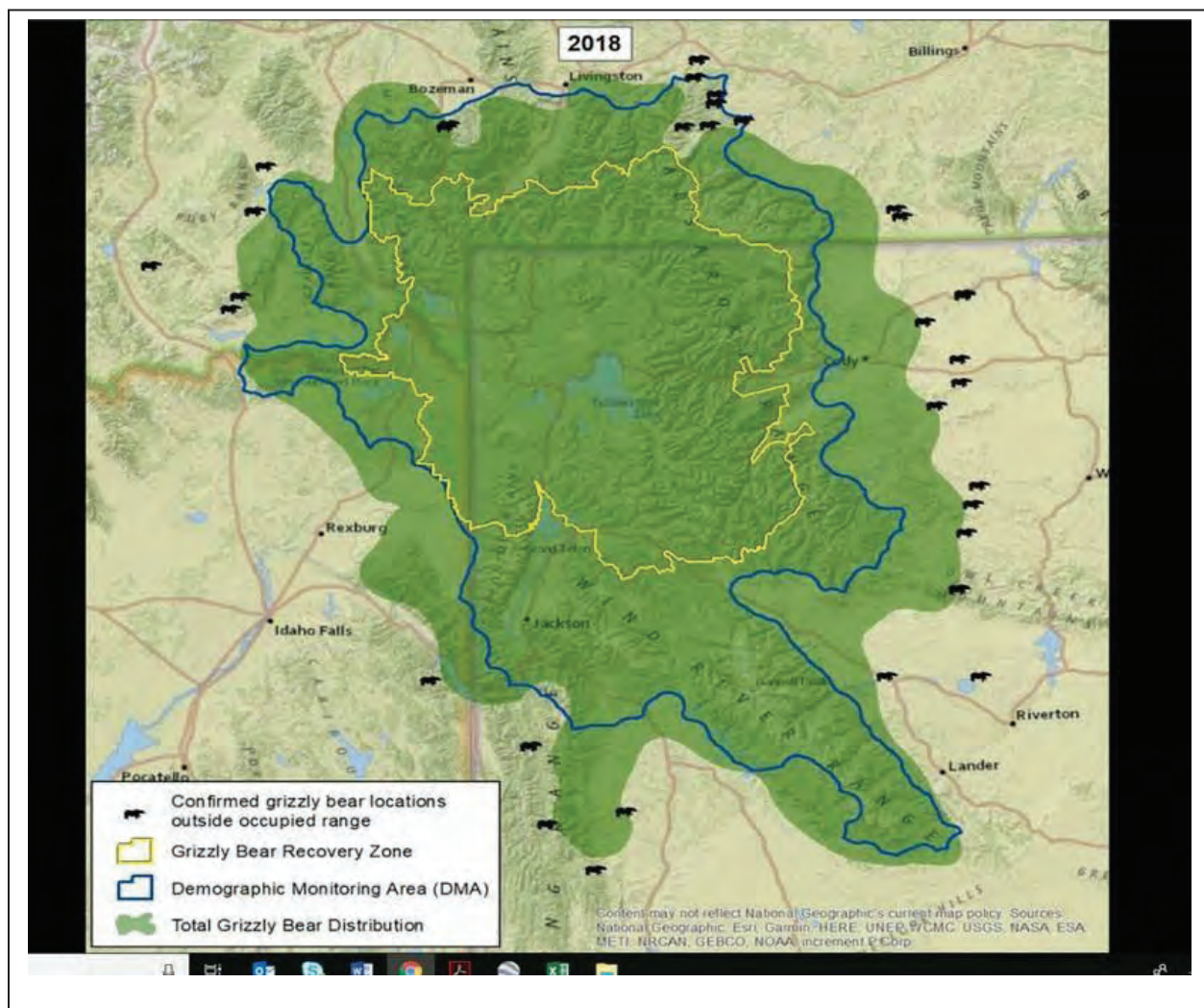
Backcountry/Wilderness Users: 10-20 miles

1. SOLITUDE/QUIET- trails with not a lot of people
2. SCENIC- trails that go to waterfalls, lakes, big peaks
3. CAMPING- trails with good camping spots near beautiful areas, vistas
4. WATER- trails with water close by for filtering, cooking, etc.
5. MAINTAINED- trails that are at least cut out, easier to get through with a big backpack

Wildlife Habitat Information

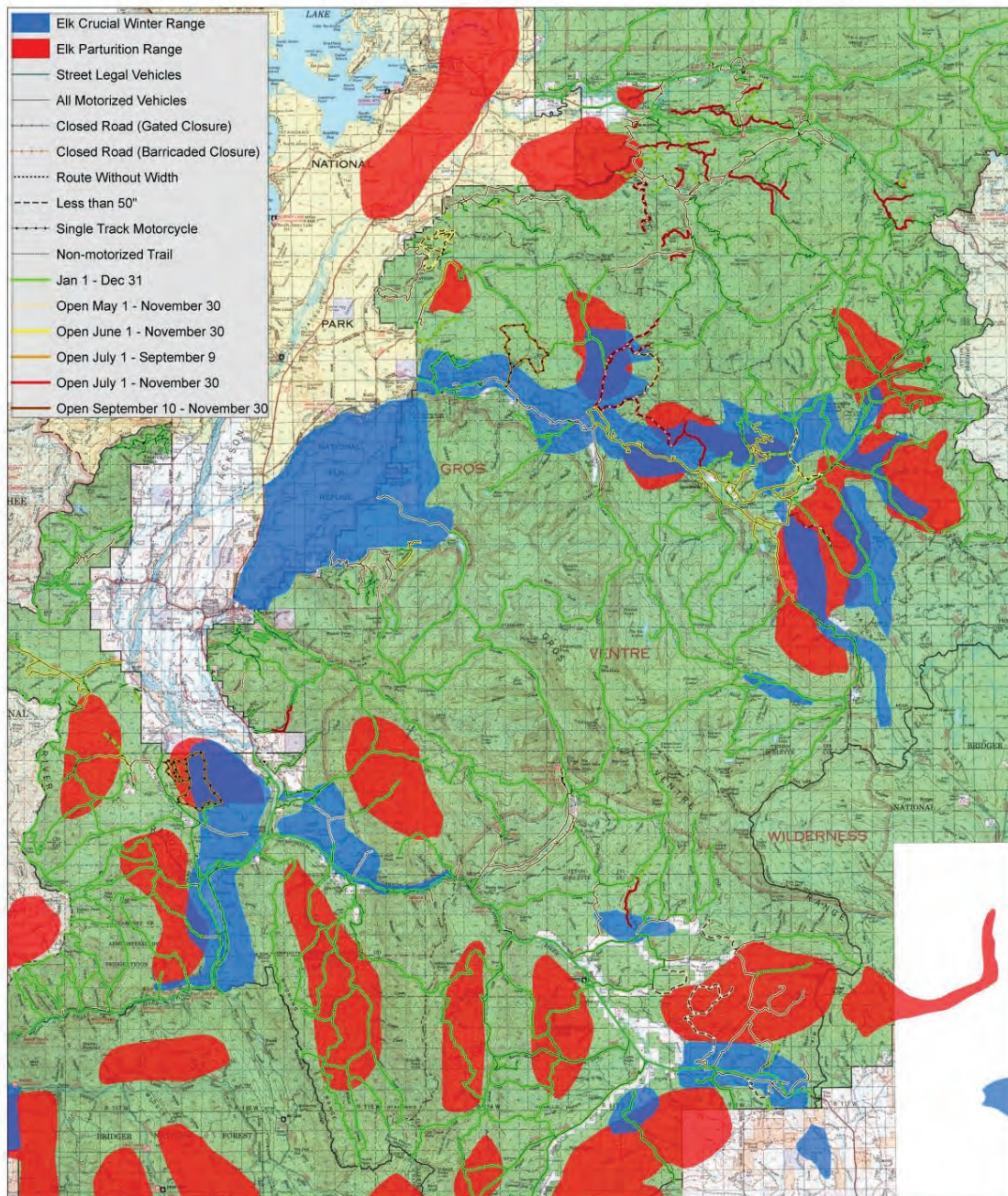
To help inform this trail assessment, two aspects of wildlife relevant to trails were compiled (conflict potential and disturbance of ungulated). Additional information on the potential for conflict is incorporated into the area recommendations (Chapter 4).

Grizzly bear distribution 2018. This map represents one aspect of the potential for conflicts (adverse encounters between people and bears). Recreationists can potentially encounter a grizzly bear anywhere on the Jackson District. Trails located in areas of higher bear density and trails used by mountain bikes or trail runners have greater potential for people-bear conflicts.



This map displays important winter and spring calving areas for elk which is one aspect of understanding the potential for disturbance at a broader spatial scale. Such maps help inform the need for seasonal restrictions on use. A trail density analysis was also conducted which found that the majority of area with restrictions on trail density within the Jackson District were within Forest Plan guidelines. The notable exception was the Phillips/Ski Lake area which has a high trail density.

Elk Habitat/Ranges (North Zone BTNF)



III. Overview of the Trail System

System Status

The current trail system on the Jackson Ranger District consists of 9 geographic areas, with a total of approximately 700 miles of summer trail (see map at end of this chapter). These miles include both motorized and non-motorized trails. In this section we will analyze only summertime non-motorized trails, which make up 678 miles, not including trails within the Shadow Mountain area and the Jackson Hole Mountain Resort. The Shadow Mountain trail system is the primary motorized area which is not part of this assessment. The Jackson Hole Mountain Resort does have an extensive trail system, but management and maintenance of this system are not performed by the Jackson Ranger District.

This analysis covers the years between 2010 and 2015. The data shown below was taken directly from daily use monitoring forms, filled out by trail and wilderness crews in the field. For the entire trail system, 5 year averages from monitoring data were used. Individual year data will be shown for each area. It is important to remember that these numbers do not represent the overall use of each area, but rather observations from crews in the field at that time. This data is from sight or actual contacts, not from trail counter data. The number of users observed and the hours of patrol time are then used to calculate encounters per hour in an area. Since project areas and user numbers vary by year with no particular pattern, 5 year averages were calculated to show the overall use in each geographic area. While not exact, this gives us our most comprehensive look at our overall trail system use to date.

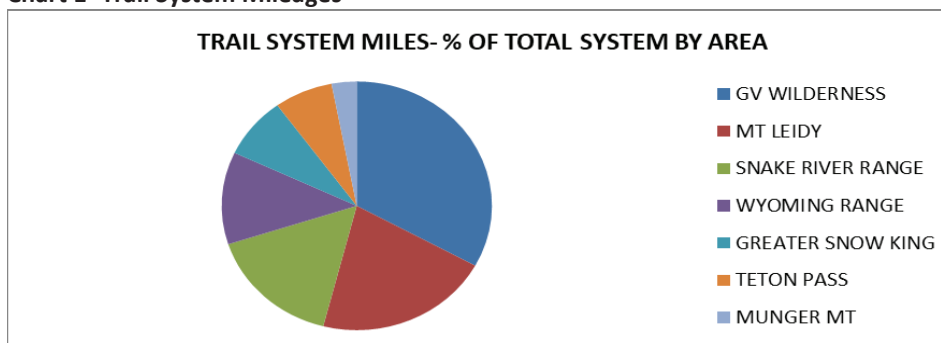
TOTAL SYSTEM- MILEAGE SUMMARY

The entire non-motorized trail system, consisting of about 678 miles can be divided into frontcountry and backcountry areas. The frontcountry consists of trail systems closest to the town of Jackson, and is made up of the Greater Snow King Area (GSKA), Teton Pass, and the Munger Mountain trail networks, which account for 18% of the total trail system on the district. The backcountry, which consists of the Gros Ventre Wilderness, Snake River Range, Mt Leidy Highlands, and the Wyoming Range or Willow Cr area trails, make up the remaining 82% of the trail system.

Table 1 Miles of Trail by Area

SNOW KING	TETON PASS	MUNGER MT	GROS VENTRE WILDERNESS	SNAKE RIVER RANGE	MT LEIDY HIGHLANDS	WYOMING RANGE (WILLOW CR)
53 miles (8%)	49.8 miles (7%)	16.8 miles (3%)	222.5 miles (33%)	105.6 miles (16%)	157.2 miles (21%)	89.6 miles (12%)

Chart 1- Trail System Mileages



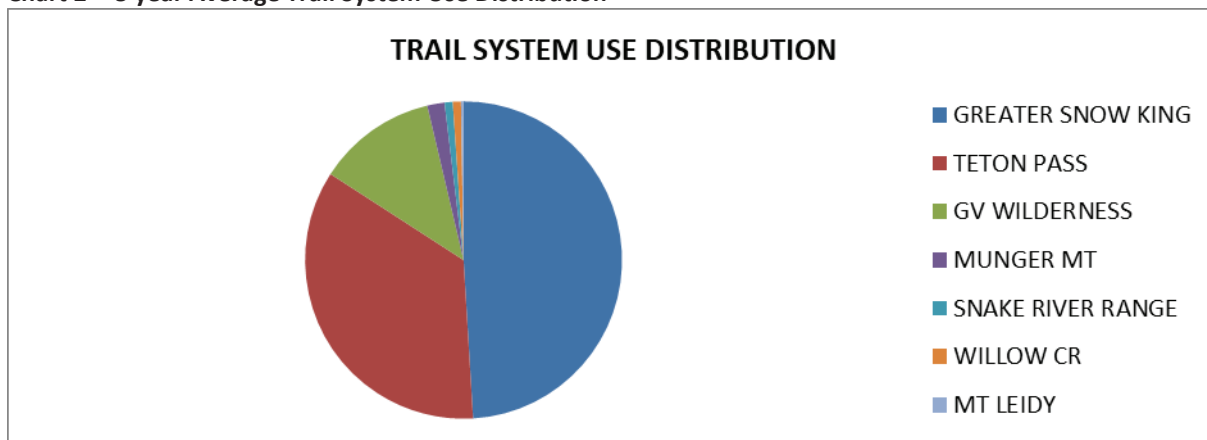
TOTAL SYSTEM MONITORING- USE SUMMARY

The size of each area clearly does not correspond to the amount of use that it receives as seen below. The Greater Snow King Area receives nearly half of all use on the district trail system, due to its easy access and close proximity to town. Teton Pass receives the second highest amount of use while the Gros Ventre Wilderness receives the next highest, mainly on the Goodwin Lake Trail. These three areas constitute 96% of the use on the Jackson District trail system.

Table 2 Total Use Numbers by Area- 5 year Average

AREA	# PEOPLE	% OF TOTAL USE
Greater Snow King	1532	49%
Teton Pass	1096	35%
GV Wilderness	381	12%
Munger Mt	55	2%
Snake River Range	26	.8 %
Wyoming Range (Willow Cr)	26	.8 %
Mt Leidy Highlands	8	.4 %

Chart 2- - 5 year Average Trail System Use Distribution

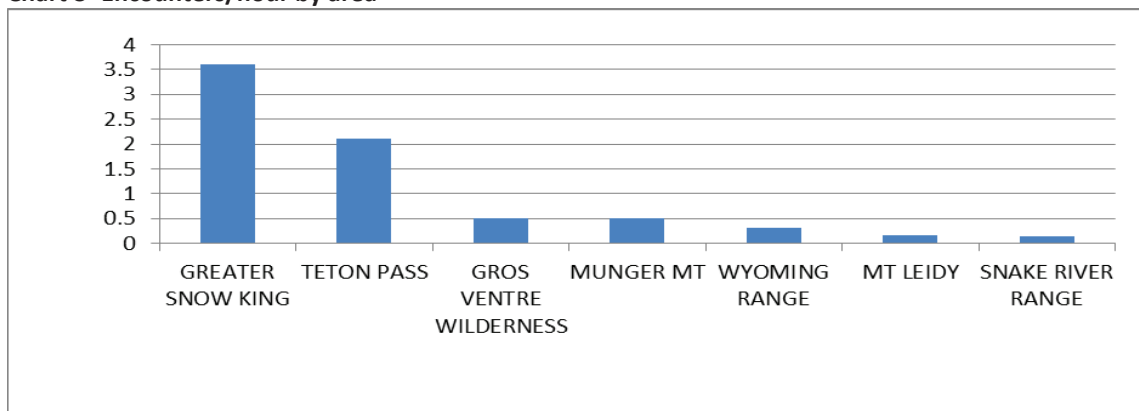


This data shows that 84% of the trail system use is occurring on 15% of the trail system miles, in the GSKA and Teton Pass area. It is no surprise then that the highest number of encounters per hour would occur in these two areas.

Table 3 Encounters (people) per hour

AREA	ENCOUNTERS/HOUR (5 YR AVG)
GREATER SNOW KING	3.6
TETON PASS	2.1
GROS VENTRE WILDERNESS	0.5
MUNGER MT	0.5
WYOMING RANGE	0.31
MT LEIDY	0.17
SNAKE RIVER RANGE	0.13

Chart 3- Encounters/hour by area



TOTAL SYSTEM- MAINTENANCE SUMMARY

The Jackson Ranger District employs three separate crews that work in the various geographic areas. The front country crew consists of 2 employees, working side by side with Friends of Pathways to maintain and perform project work in the GSKA and Teton Pass areas. The back country trail crew consists of 5 members, all of whom are funded by the Recreation Trails Program (RTP) through Wyoming State Trails. This crew performs maintenance and project work in the Gros Ventre Wilderness, Snake River Range, Wyoming Range, Mt Leidy, and Munger Mountain area. The Wilderness Ranger Crew, consisting of 3-4 employees, performs trail maintenance mainly in the Gros Ventre Wilderness. Maintenance refers to clearing trees and cleaning or installing drainage where needed, it does not include repair of bigger problem spots.

Front Country Trails

For the past 5 years, the front country trail system has been cleared of trees annually and greatly improved. Work consists of 101.5 miles of maintenance each summer, not to mention numerous miles of reroutes and structures that have been constructed (e.g. bridges). This work is completed in partnership with the non-profit Friends of Pathways. In addition, the district maintains 5 river access trails: Sheep Gulch, Kahuna, Lunch counter, Taco Hole, and Kings Wave in the Snake River Canyon. Recently the Lunch counter, Kahuna and Kings Wave trails were reconstructed. These trails all have structures such as stairs and railings which take annual maintenance, and see thousands of visitors.

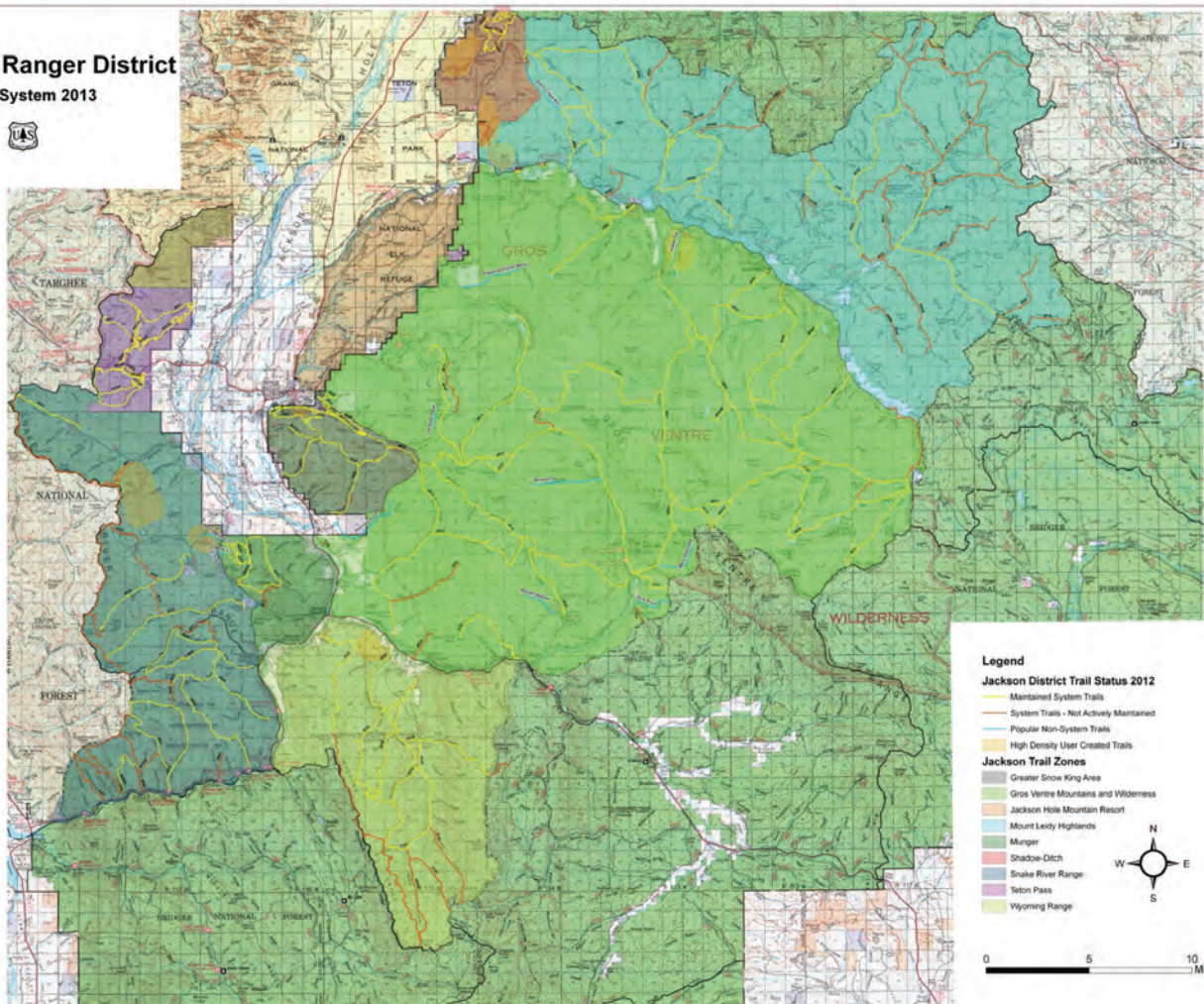
Back Country Trails

Over the past 5 years, roughly half (46%) of the backcountry trail system has been maintained each year. The same trails are not necessarily worked on each year, but many trails are consistently maintained each season, typically due to higher use numbers on those trails, for example the Goodwin Lake Trail or the Granite Cr Trail. In the past 5 years alone, the trails and wilderness crew have cleared over 8,000 trees from roughly 1300 miles of trails.

Table 4- Total Miles Maintained and Trees Cleared in Backcountry

YEAR	TOTAL BACKCOUNTRY MAINTENANCE MILES	% OF TOTAL BACKCOUNTRY SYSTEM- 556.47 miles	# TREES CLEARED
2014	250.15	45%	1981
2013	238.65	43%	1260
2012	257	46%	1946
2011	231.18	42%	1329
2010	301.05	54%	1540
5 YR AVERAGE	255.6	46%	1611

Jackson Ranger District Trail System 2013



Funding and Backlog

The Bridger-Teton National Forest contains 3,480 miles of trail. In 2009, the Forest received \$836,324 in Congressional appropriations towards trail program administration and maintenance of both motorized and non-motorized trails. By 2019, federal trail funds were reduced to \$596,914. In effect, funding for trail maintenance and improvement has declined nearly 30% in the past 10 years (not adjusted for inflation) at the same time that public use of trails has risen sharply. This level of funding supports some trail grant and program administration, a few vehicles, and some pack-stock support. However, the funding is not enough to support any on-the-ground trail crew workers or leaders. Grants, funds retained through the Federal Land Recreation Enhancement Act, partnerships, and volunteers are essential to address annual priority on-the-ground maintenance and improvement needs. Only about 20% of the trail system is considered to be sustainable, and the deferred maintenance backlog is estimated to be in the millions. More detailed condition surveys are needed to verify this estimate. The funding picture emphasizes the importance of ensuring that funding is invested in the right places.

IV. Geographic Area and Trail System Guidance

Overview of Trail System Needs



Public discussions between 2011 and 2013 suggested some key areas of focus for the trail system:

1. Planning and implementation in the Cache-Game (Greater Snow King) area to address growing use so that recreation use is well-managed and the potential for wildlife disturbance is reduced
2. Improve funding and capacity to maintain and manage the trail system including training and skill development with volunteers and partners
3. Improve information available to the public regarding trail opportunities, trail conditions, avoiding wildlife encounters, minimizing impacts, and use ethics to reduce conflict
4. Address areas of concentrated non-system trails especially where resource concerns exist

The table below displays the top 2-3 trail system tasks managers and partners should focus on for each geographic area (out of 10 possible trail system tasks – see chapter 2). The rank is based on public input regarding which areas should receive focused attention in the near term.

Rank	Area	Priority Trail System Needs		
1	Cache-Game (Greater Snow King)	Planning	Info, recreation use management	Rehabilitation
2	Teton Pass	Access / facilities	Info, rec use mgmt.	Maintenance
3	Palisades WSA / Snake River Range	Maintenance	Planning (non-system trails)	
4	Gros Ventre Wilderness	Maintenance	Info – bears, wilderness	Planning (non-system tr)
5	Wyoming Range / Willow Cr	Signing	Maintenance	Planning (non-system tr)
6	Shadow Mtn / Ditch Creek	Planning	Bear information	Recreation use mgmt
7	JH Mountain Resort	Planning	Information	
8	Munger Mountain	Maintenance	Info, rec use mgmt.	Weed treatment
9	Mount Leidy Highlands	Maintenance	Bear information	

Jackson Ranger District Geographic Areas

Shadow Mtn / Ditch Cr

Manage for semi-primitive day use to provide opportunity for multiple uses with use separation through trail design. Primary use = horse, hike, some motorized

Jackson Hole Mtn. Resort

Manage as high day use destination area with accessible visitor services catering to diversity of activities and events for visitors, families, and locals. Primary use = bike, hike

Mount Leidy Highlands

Manage for primitive non-wilderness backcountry experience that caters to horse use and hunting with some motorized opportunity in the Gros Ventre corridor. Primary use = horse, some motorized

Teton Pass

Manage for accessible day-use opportunities with emphasis on serving communities and visitors in Jackson Hole and Teton Valley. Primary use = hike, bike

Greater Snow King Area

Manage for accessible day-use opportunities with emphasis on promoting community stewardship, healthy lifestyles, and connection with nature. Primary use = bike, hike

Gros Ventre Wilderness

Manage to preserve wilderness character and for primitive wilderness experience that caters to hiking and horse use with emphasis on multi-day trips. Maintain some areas with no trails. Primary use = horse, hike

Munger Mountain

Manage as multi-shared-use area on north-west side with remaining area managed for wildlife security. Primary use = bike, hike, motorcycle

Palisades WSA / Snake Range

Manage WSA to maintain existing wilderness character and for primitive experience that caters to hiking, horse use, and hunting. In non-WSA area, provide semi-primitive day use opportunity. Snake River trails managed for high use while protecting river values. Primary use = horse, hike

Wyoming Range / Willow Cr

Manage for day horse/hike use in front-country portion with emphasis on scenery and fishing. Manage for multi-day horse riding, backpacking, and hunting in backcountry portion. Primary use = horse, hike

0 5 10 20 Miles



Area Recommendations

1. Gros Ventre Wilderness



Picture Location- Blue Miner Lake Trail, Gros Ventre River Headwaters

Existing Condition

- Current system contains 41 trails totaling 227.22 miles with 1 Class 4 trail (.43 miles), 8 Class 3 trails (56.32 miles) and 32 Class 2 trails (170.47 miles).
- Approximately 70% or 150 miles of trail are maintained each year.
- Dominant uses include day-use and overnight foot or horse travel, outfitted trips, guided and non-guided hunting.
- Despite its proximity to Grand Teton National Park and Jackson, the wilderness has retained its primitive nature and use numbers are relatively low, except in localized spots and during the hunt season.
- Soils have high clay component making them very slick when wet; landslides are common which can result in occasional mass failure of large trail segments
- High wildlife habitat value for species that favor old growth, boreal forest, or riparian areas.
- Crucial elk calving areas and summer habitat. Crucial bighorn sheep summer habitat
- Moderate to high habitat value for grizzly bears with moderate potential for conflict. Bears are expanding their range southward and sightings are becoming more common.

Trail Work

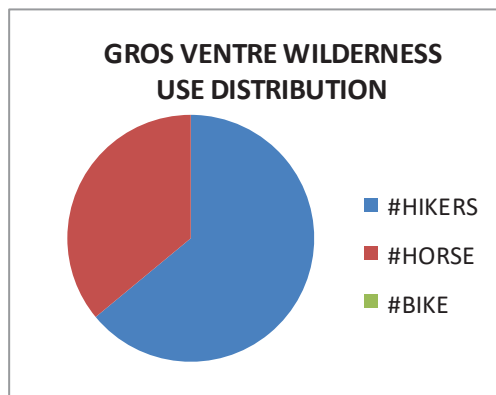
Major trail work to date includes rerouting, new bridges, new turnpikes, brushing and route definition on all of the primary trails. Noteworthy projects include: massive rerouting due to the Crystal Creek landslide, several new lengthy turnpikes and bridges installed on the Big Cow Cr Trail, several large turnpikes and reroutes constructed on the upper Horse Cr Trail, realignment and redefining the entire Highline Trail, redefinition of the Soda Lake Trail, reconstruction of the Blue Miner Lake Trail, rerouting on the Flat Cr Trail, and major rerouting on the Grizzly Lake and Little Granite Cr Trail. Trail work in the wilderness has largely been funded by Recreational Trail Program (RTP) grants through the State of Wyoming and has been bolstered by partnerships with service organizations such as Wilderness Adventures, Backcountry Horsemen and the Sierra Club as well as new partnerships with area outfitters, who have assisted with packing on many projects and clearing in several different areas.

Public Use

Wilderness use has remained fairly consistent over the past 5 years, with hiking being the predominant use, mainly on the Goodwin Lake Trail, which receives at least 75% of the hiking use. Other areas of the Wilderness that see the most summer use are: the Sleeping Indian, Horse Cr Trail (day use horseback rides), the first few miles of the Granite Cr Trail, Jackson Peak, Turquoise Lake, the first few miles of Crystal Cr Trail (fisherman), and the Upper Falls area. Access into the Wilderness is limited. The western and northwestern boundaries are “landlocked” by private lands with no public easements which keeps use numbers low. The majority of Wilderness use occurs during the fall hunting season. In general however, chances of encounters with other parties in the Gros Ventre Wilderness remain extremely low.

Forest Service Monitoring Data

GROS VENTRE WILDERNESS						
YEAR	#HIKERS	#HORSE	#BIKE	TOTAL USERS	TOTAL PATROL HOURS	ENCOUNTERS/HOUR
2010	194	228	0	422	880	0.48
2011	130	90	0	220	626	0.35
2012	216	85	0	301	705	0.42
2013	256	155	0	411	687	0.59
2014	418	134	0	552	883	0.62
AVERAGES	243	138	0	381	756	0.5
% OF TOTAL USERS	64%	36%	0			



Although this data offers a glimpse into the use in this area, it is based solely on patrols by FS personnel. The Gros Ventre Wilderness does however receive a high amount of patrol hours annually especially when compared with other backcountry areas on the system. This data shows that the majority of use is by hikers and horse riders.

Outfitted Use

Outfitted use in the Wilderness is mainly outfitted day use rides, day use hunting, and overnight backcountry hunting trips. Non-resident hunters are required to have a licensed guide so outfitted hunting is in high demand. There are eight assigned hunting camps and two permitted summer camps. The most intensive outfitted summer use occurs in the lower Horse Cr drainage. Two outfitter operations are based in Horse Cr that offer day use horseback rides. Other day use horse rides occur out of four different ranches that border the Wilderness affecting the Flat Creek, Crystal Creek, Goosewing Creek, and Gros Ventre River drainages. Outfitted use is typically expressed in service days, which equates to one person for any part of one day. Current use is 11,144 days total, with 8016 days for summer travel with stock and day use horse rides, 1241 days for hiking and backpacking, and 1887 days for hunting. Additionally, there is a cabin in the Sheep Cr drainage that is permitted to the Jackson Hole Ski Club for winter use as a ski cabin.

Tasks for the Future (From Public Input)

- *Trail Maintenance*- annual clearing and maintenance on all core trails
- *Information* – Provide better maps with more accurate information
- *Planning* – consider reducing duplicate trails with low use

Area Emphasis

- Forest Plan Direction- DFC 6, DFC 6S, DFC 12
- Direction is also tiered to the Wilderness Act of 1964, the Wyoming Wilderness Act of 1984, and the Gros Ventre Wilderness Action Plan of 1994
- Manage this area to preserve wilderness character and to offer a primitive wilderness experience that caters to hiking, horse use with an emphasis on multi-day trips. Maintain some portions to provide trail-less opportunities per the Gros Ventre Wilderness Plan direction.
- Provide minimal signing focusing on 6C and 6D areas with little to no signing in 6B areas.
- Promote map reading skills.
- Ensure trailhead signing and website information includes information about Wilderness and avoiding conflicts with bears.
- Provide patrol presence and monitoring.

Trail System Guidance

- Trails in Desired Future Condition 6C and 6D will be managed as improved trails (Class 3) with junction signing. Trails in Desired Future Condition 6B will generally be primitive (Class 2, with some trails that may have intermittent tread and require route-finding) while ensuring horse passage.
- Consider adding long-established non-system trails to the system if they can be sustained, provide a desired experience, and are consistent with Forest Plan direction. Strive for no net increase in trail mileage. Non-system trails causing resource damage will be closed. Don't add trails in 6A zone.
- **Core Trails** – Flat Cr Trail #4015, Goodwin Lake Trail #4015, Granite Cr Trail #4018, Highline Trail #4019, Swift Cr Trail #4020, Crystal Cr Trail #4021, Little Granite Cr Trail #4022, Gros Ventre River Trail #4081, Goosewing Cr Trail #4082, Big Cow Cr Trail #4083, Jagg Cr Trail #4084, Grizzly Lake Trail #4094, Blue Miner Lake Trail #4095, Teepee Cr Trail #4096, Dry Fork Trail #4098, Clear Cr Trail #4099, Shoal Falls Trail #4122, Kinky to GV River Trail #4195, Soda Cr Trail #4151- Clear trees and brush annually, ensure safe and passable tread, reroutes where necessary, install drainage, bridges and turnpikes where necessary, install and maintain junction signage.
- **Non-Core Trails** – Flat Cr Cutoff Trail #4015, Jackson Peak Trail #4016A, West Fork Crystal Cr Trail #4017, Swift Cr Cutoff Trail #4020A, Horse Cr Trail #4023, Little Horse Cr Trail #4024, Bear Cabin connector Trail #4084A, Six Lakes Trail #4084W, Alkali Cr Trail #4092, West Goosewing Cr Trail #4097, Ouzel Falls Connector Trail #4098A, Clear Cr Lake Trail #4100, Turquoise Lake Cutoff Trail #4113, Upper Shoal Cr Trail #4119, Cow Cr Trail #4120- GPS track to ensure accurate map data, clear trees every 3-5 years, small reroutes around problem spots, minor drainage work, define route but limit trail work to ensuring safe passage and limiting resource damage. Install posts where trail is non-existent rather than digging out new tread. Signage at major junctions. Structures not generally needed.

Rationale for Recommendations

Due to the Wilderness designation of this area, recommendations follow direction in the Gros Ventre Wilderness Action Plan. Several popular non-system trails will be assessed for addition to the system, granted that they do not lie within or cross the identified trail-less 6A areas. Trails will be cleared as often as possible to promote safety for the public, outfitters, and their clients, and to preserve the original locations of the trails, if they are sustainable. Areas of excess grade or erosion will be minimally rerouted to mitigate environmental damage. Primitive signing will maintained at junctions to ensure the safety of the public and prevent new non-system trails from forming, but signage will be minimal.

2. Mount Leidy Highlands



Picture Location - Cottonwood Creek, Dog Creek

Existing condition

- Current system contains 36 trails totaling 164.86 miles with 9 Class 3 trails (36.29 miles) and 27 Class 2 trails (128.57 miles). Roughly 36 miles of motorized trail exist.
- Approximately 30% or 54 miles of the trail system are maintained each year.
- Majority of the trails are located in the bottom of the drainage, making them very brushy, wet and difficult to follow.
- A portion (15.5 miles) of the Continental Divide National Scenic Trail runs through the area.
- Sheridan National Recreation Trail (proposed but not officially designated)- Historical significance: Thought to have been created by Native Americans originally, it was used in 1881 by General Philip H. Sheridan during an Army expedition, and again in 1883 by President Chester A. Arthur enroute from Fort Washakie to Yellowstone.
- Dominant uses include outfitted hunting, guided day use horse rides out of area ranches, motorized use including both dirt bike and ATV, and big game hunting.
- Soils are poor, very erosive and have a high clay content making the area prone to sluffs and landslides.
- High wildlife habitat value for species that favor old growth, aspen, or riparian areas. The resource area, especially the eastern zone, has remained extremely primitive and is prime wildlife habitat.
- Crucial elk calving areas, pronghorn migration corridor, bighorn sheep habitat, winter range.
- High habitat value for grizzly bears and high potential for conflict.
- Motorized routes have been defined, signed, improved and maintained, which has reduced off-route travel and resource damage.
- Major trail corridors have received a higher level of maintenance and construction, and historic routes are being revitalized slowly.

Trail Work

Major trail work to date includes rerouting, heavy brushing, new bridges, new turnpikes, drainage installation, new signage, route hardening, and route definition on primary routes. Noteworthy projects include: rerouting and route definition on Cottonwood Cr Trail, turnpike installation and rerouting on Sohore Cr Trail, new bridges and reroutes on the Horsetail Cr Trail, major rerouting out of willow bogs on the Slate Cr Trail along with geo-cell installation, clearing and marking of the new Continental Divide

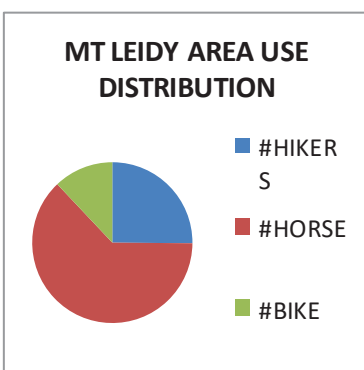
Trail alignment, and motorized trailhead work such as fencing and boulder placement to define routes and usage. Trail work in the area has been funded by RTP grants through the State of Wyoming, as well as the Wyoming State Trail Crew. In addition, work has been bolstered by a partnership with a local motorcycle group Dirt Bikers Investing in Riding Trails (D.I.R.T).

Public Use

Use in this area has remained fairly consistent with the primary use being summer stock use out of various area ranches, much of which is on non-system trails around the ranches. Other primary uses include fall hunting, Jeep/wildlife tours and day hiking and backpacking. The northern, western, and southern margins also offer abundant dispersed camping opportunities along the extensive road network. The eastern side of the area is road less and contains some of the most remote areas on the district. Use in this area is relatively low, with the exception of fall hunting.

Forest Service Monitoring Data

MT LEIDY HIGHLANDS						
YEAR	#HIKERS	#HORSE	#BIKE	TOTAL USERS	TOTAL HOURS PATROLLED	ENCOUNTERS/HOUR
2010	5	8	0	13	67	0.19
2011	1	0	2	3	60	0.05
2012	4	10	0	14	34	0.41
2013	0	5	0	5	14	0.36
2014	0	4	0	4	50	0.08
AVERAGES	2	5	1	8	45	0.17
% OF TOTAL USERS	25%	63%	12.00%			



Although this data offers a glimpse into the use in this area, it is based solely on patrols by FS personal and the number of patrol days is very low in comparison to other areas such as the Gros Ventre Wilderness which has an average of 756 patrol hours versus the 45 hours patrolled for this data. It does however help display that the majority of the use is with stock, and the daily encounters are extremely low.

Outfitted Use

There is one outfitter-guide special use permit that offers progressive covered wagon rides using dispersed outfitter camps. There is one outfitter-guide permit that authorizes wagon rides to an assigned camp. There are permitted summer progressive travel horseback trips but these are little used. In addition there are 7 assigned camps that offer guided hunts. Outfitted use is typically expressed in service days, which equates to one person for any part of one day. Current use is 21,019 days for summer stock use and fall hunting while 3,364 days are used for guided hiking, backpacking, biking and Jeep tours. It is important to note that this use data includes guest ranches in the Shadow Mountain Area, which are responsible for a large portion of this use.

Tasks for the future (from public input)

- *Trail Maintenance*- annual clearing and maintenance of core trails
- *Information*- opportunities and avoiding bear conflicts

Area Emphasis

- Forest Plan Direction – DFC 12, DFC 10.
- Manage this area to offer a primitive non-wilderness backcountry experience that caters to horse use and hunting
- Provide summer motorized trail riding opportunities focused on quality not quantity and fall motor vehicle access to campsites.
- Ensure trailhead signing and website information includes information about avoiding conflicts with bears.
- Maintain barriers and signage.
- Assess non-core trails in the eastern portion of area from the trail system and remove from database when non-existent. Allow outfitters to perform maintenance to prevent resource damage via permits where needed.

Trail System Guidance

- Manage the Continental Divide National Scenic Trail to provide quality long-distance non-motorized opportunities for those seeking remoteness and adventure. Clear trees and brush, install drainage, install minimal signage, do not install structures.
- Horsetail Cr Trail #4090 – Maintain with assistance from local dirt bike group D.I.R.T. – Clear trees, assess trail structures and replace when needed, maintain sight distances, reroute sections to achieve long term sustainability, maintain good signage.
- Slate Cr Loop Trails- Clear trees and maintain to high standard with assistance from Wyoming State Trails.
- **Eastern Portion Core:** Cottonwood Cr Trail #4079, Sheridan Cr #4110, Red Cr #4105, Spruce Cr #4106, Spruce Cr Cutoff #4107 - Continue work to clear trees annually, re-align and define original trail corridor with rerouting out of lower boggy/brushy areas and turnpike installation, install drainage, no new bridges, minimal but functional signage.
- **Eastern Portion Non-Core:** Sohare Cr Trail #4102, Dog Cr Trail #4104, Gunsight Pass Trail #4103, Maverick Cr #4107W, Hereford Cr #4108, Beauty Park #4109, Packsaddle #4110N, Purdy Basin #4111, Harness Gulch #4112- GPS track to ensure accurate map data, clear trees every 3-5 years, small reroutes around problem spots, define route but limit trail work to ensuring safe passage and limiting resource damage. Signage and structures not generally needed.
- Assess and remove old non-existent system trails from the database. Allow outfitters to perform maintenance to prevent resource damage via permits.

Rationale for Recommendations

Bear activity will likely increase in this area, and due to its relative remoteness, condition of existing roads to trailheads, and overall poor location of many of the trails, this is not a good area to promote large amounts of visitor use. Soils in this area are poor and prone to washing out, bark beetle kill is contributing to large amounts of downfall across trails, and due to the trail location in the bottom of the drainage it would require massive rerouting to bring these trails up to standard. Hunting use in the fall is heavy and so main corridors should be maintained for pack stock. Eastern portion core trails represent the sections of the Continental Divide Trail which are required to be maintained at a higher standard.

3. Wyoming Range/Willow Creek



Picture Location - Upper Willow Creek, Grayback

Existing condition

- Current system contains 17 trails totaling 89.62 miles with 3 Class 3 trails (24.06 miles) and 14 Class 2 trails (65.56 miles).
- Approximately 48 miles or 53% of the system trails are maintained each year.
- Partnerships with area ranches, outfitters and the Teton Backcountry Horseman are helping revitalize this trail system through improved access across private property, improved on-the-ground knowledge, pack support to remote locations, and volunteer labor for large reroutes or structure replacement.
- Major trail corridors have received a higher level of maintenance and construction, and each year more side trails are being cleared and mapped.
- Wyoming National Recreation Trail runs the length of this area and has seen an increase in maintenance in recent years with more potential opportunity for improvement.
- Dominant use includes day use horseback riding, hunting, outfitted services, and hiking.
- Access to the area is limited, with only one developed trailhead at Bryan Flats.
- Soils are good but prone to muddiness. Some trail washouts and boggy areas occurring mostly due to poor alignment/lack of design and lack of maintenance.
- Trails in the upper reaches of the drainage do not receive active use and have disappeared and are difficult to find and follow.
- High wildlife habitat value for species that favor old growth or aspen habitats.
- Moderate to high habitat value for grizzly bears with moderate potential for conflict.
- Overall the backcountry/wilderness feel of the area is very much intact.

Trail Work

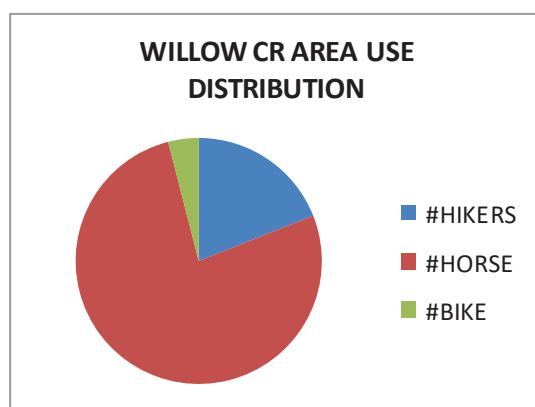
Major trail work to date includes rerouting, brushing, new bridges, new turnpikes, drainage installation, new signage, and route definition in areas where tread has disappeared. Noteworthy projects include: major 50 foot steel bridge installation across Willow Creek, rerouting on the lower Willow Cr Trail, major turnpike construction on the Mumford Creek Trail, rerouting of the WNRT around the major landslide in the upper drainage, clearing of hundreds of downed trees from the upper trail system, redefinition of the Grayback Parallel Trail, addition of the Anne's Pond Trail, the Middle Trail, and the Anne's Ridge Trail, and new signage installed by BCH at all lower trail junctions. Trail work in the area has been funded by RTP grants through the State of Wyoming which includes work from several volunteer organizations such as Backcountry Horsemen, Wilderness Adventures, Sierra Club, and City Kids Youth Project. In addition, work has been bolstered by partnerships with local ranches such as the Broken Arrow Ranch, which has provided FS trail crews and volunteer groups access through private property.

Public Use

The primary use in this area has been day use horseback rides and fall hunting, which has remained fairly consistent. The majority of use is occurring on the Willow Cr Trail which is also the designated Wyoming National Recreation Trail, which runs the length of the area to Pickle Pass where it crosses onto Greys River Ranger District. Heavy grazing by domestic sheep in past years caused issues with maintaining the trail corridor but sheep grazing no longer occurs. Other uses such as hiking/backpacking and educational use exist but are extremely low in comparison to the stock use. Additionally the slopes above Bryan Flats Trailhead are occasionally used by paragliders, and a small amount of mountain bike use also originates from this trailhead. There is only 4 miles of road in this entire resource area, half of which is closed to motorized travel. Overall, during the summer months, chances of encounters with others remains extremely low. During hunting season, the probability of encountering other parties rises significantly.

Forest Service Monitoring Data

WYOMING RANGE/WILLOW CREEK							
YEAR	#HIKERS	#HORSE	#BIKE	TOTAL USERS	TOTAL HOURS PATROLLED	ENCOUNTERS/HOUR	
2010	0	14	0	14	26	0.53	
2011	0	20	0	20	74	0.27	
2012	8	22	0	30	118	0.25	
2013	17	22	5	44	131	0.33	
2014	2	21	0	23	71	0.32	
AVERAGES	5	20	1	26	84	0.31	
% OF TOTAL USERS	19%	77%	4%				



Although this data offers a glimpse into the use in this area, it is based solely on patrols by FS personal and the number of patrol days is very low in comparison to other areas such as the Gros Ventre Wilderness which has an average of 756 patrol hours versus the 84 hours patrolled for this data. This data does show that the predominant use in the area is by stock and that the daily encounters are low.

Outfitted Use

Within this resource area there are two assigned outfitter camps that are used summer and fall, and three outfitter-guide permits that allow progressive travel camps during the summer months. Approximately ½ of the authorized use is based out of private ranches, which access the trail system out of their back gates. Outfitter use is typically expressed in service days, which equates to one person for any part of one day. Currently 4,228 days for progressive stock, day use horse rides, and fall hunting are being used by outfitters while 182 days for hiking, backpacking and education are being utilized.

Tasks for the future (from public input)

- *Planning*- inventory of non-system routes near the trailhead
- *Signing*- especially focused on the Wyoming National Recreation Trail
- *Trail Maintenance*- heavy focus on improving front country system and maintaining/defining back country portions

Area Emphasis

- Forest Plan Direction: (see Appendix X for DFC descriptions) DFC 12, DFC 10
- Plan and manage a high standard trail system with variety of loops that cater to day use horse riding in front-country core portion. Maintain non-core back country trails to ensure safe passage and minimal resource damage. Provide trail junction signing.
- Ensure trailhead signing and website information includes trail information, updates on conditions, and info on avoiding bear conflicts.

Trail System Guidance

- Manage the Wyoming National Recreation Trail to provide quality long-distance non-motorized opportunities for those seeking remoteness and adventure. Clear trees and brush, define route and install/maintain WNRT signage, maintain safe and passable tread, install drainage structures, install turnpikes through muddy areas, do not install bridges at large crossings.
- **Core Trails:** Palmer Cr Trail #4128, Middle Trail #4137, Rimrock Trail #4138, Lower Willow Trail #4142, Mumford Cr Trail #4144, Shepard Cr Cutoff Trail #4145, Anne's Ridge Trail #4148, Anne's Pond Trail #4149, Creekview Trail #4150. Clear trees and brush annually, ensure safe and passable tread, reroutes where necessary, install drainage and turnpikes, no new bridges, install and maintain junction signage.
- **Non-Core Trails:** Alder Cr Trail #4136, Adams Cr Trail #4139, Hunter Cr Trail #4140, Horse Heaven Trail #4141, Grayback Parallel Trail #4143, Lick Cr Trail #4146, Phosphate Cr Trail #4147. GPS track to ensure accurate map data, clear trees every 3-5 years, small reroutes around problem spots, define route but limit trail work to ensuring safe passage and limiting resource damage. Signage and structures not generally needed.
- **Note:** non-core trails are currently nearly impassable due to lack of maintenance and will require annual tree clearing for several years to re-establish original trail. After that can change to every 3-5 year rotation.
- Assess and remove old non-existent system trails from the database. Allow outfitters to perform maintenance to prevent resource damage via permits.

Rationale for Recommendations

This area has been identified as highly attractive for day and overnight horse and hiking use due to its proximity to town, the well maintained road and trailhead with ample parking and turnaround room for horse trailers, and the variety of short and longer loops available. Stronger soils here can support heavy horse use. Due to its location south of town, it provides a closer day use area for residents living south of town seeking day long horse rides. Large creek crossings lacking bridges are frequent making it difficult for hiking and biking use, and attractive for horse use. Hunting is heavy in the fall also making it far more attractive and safer for horse use than hiking and biking.

4. Snake River Range/ Palisades Wilderness Study Area



Picture Location- Snake River Range Crest, Cabin Creek

Existing Condition

- Current system contains 26 trails totaling 105.58 miles with 4 Class 4 trails (.49 miles), 10 Class 3 trails (50.3 miles) and 12 Class 2 trails (54.79 miles).
- Most trails are quite primitive. Approximately 74 miles or 70% of the system trails are maintained each year or bi-annually.
- Dominant uses include horse riding, hiking, guided and non-guided hunting.
- Partnerships with local volunteer groups and area outfitters have bolstered efforts to keep the trails in this area open and passable, despite inherent terrain limitations such as steep canyons with poor soils and extremely heavy brush. Older, lost routes such as the North Fork of Fall Cr Trail are being revitalized through these partnerships.
- New signage has been installed at major junctions, and the trails are cleared of trees annually. GPS mapping work is also being completed with assistance from the Teton Backcountry Horseman.
- Landslides are very common, Canyons are V-shaped with rocky outcrops, and flooding is common.
- Vegetation is dense and overgrown in summer months, making trails difficult to follow.
- High wildlife habitat value for species that favor old growth or riparian habitats.
- Moderate to high habitat value for grizzly bears with moderate potential for conflict.
- Despite consistent annual work on the trails, the area has retained a wilderness/backcountry feel and use numbers are low, with the exception of the fall hunting season.

Trail Work

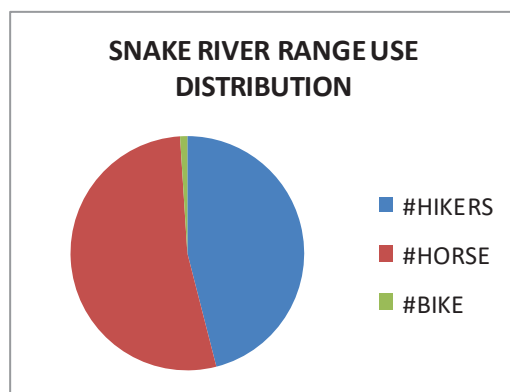
Major trail work to date includes major rerouting, reconstruction, new bridges, new turnpikes, heavy brushing, new drainage, new signage, stream crossing repair, and route definition. Noteworthy projects include: major rerouting and heavy brushing on Wolf Cr Trail, new bridges and rerouting on Cabin Cr Trail, major rerouting, reconstruction and turnpike construction on Dog Cr Trail, route definition and stream crossing repair on Coburn Cr Trail, major rerouting and route definition on North Fork Fall Cr Trail, major drainage and brushing work on Mosquito Cr Trail. Trail work in the area has been completed with funding from RTP grants through the State of Wyoming and been bolstered by partnerships with volunteer organizations such as Wilderness Adventures, Backcountry Horsemen and Red Top Meadows Treatment Center as well as partnerships with area outfitters, who have assisted with packing tools and gear to project locations.

Public Use

Overall recreation use numbers are relatively low; the busiest period is during the hunt season from mid- September through the first week of October. Recreation use on trails is dominated by horse travel and hiking, which according to monitoring forms accounts for 99% of the use. Mountain biking was once popular on the Dog Cr and Cabin Cr Trails, but since the creation of more mountain bike specific trails in the front country, use in these areas has declined. Recreational day use is expected to increase as residential growth occurs in Wilson and along the Fall Creek road and as increased attention is directed towards the future status of the WSA. Overall, chances of encounters with other parties in the Snake River Range remains very low.

Forest Service Monitoring Data

SNAKE RIVER RANGE/PALISADES WSA						
YEAR	#HIKERS	#HORSE	#BIKE	TOTAL USERS	TOTAL PATROL HOURS	ENCOUNTERS/HOUR
2010	26	27	2	55	218	0.25
2011	4	33	0	37	188	0.2
2012	7	2	1	10	180	0.05
2013	13	8	0	21	202	0.1
2014	8	0	0	8	210	0.04
AVERAGES	12	14	0.6	26	200	0.13
% OF TOTAL USERS	46%	53.00%	1%			



Although this data offers a glimpse into the use in this area, it is based solely on patrols by FS personal and the number of patrol days is very low in comparison to other areas such as the Gros Ventre Wilderness which has an average of 756 patrol hours versus the 200 hours patrolled for this data. This data does show that the predominant use in the area is by horse and hike, and that the daily encounters are low.

Outfitted Use

Five assigned outfitter camp sites are present during the hunt season to provide a base for guided hunting. Two are located at major trailheads, Dog Creek and East Table Creek. The other two are located in the Mosquito Cr drainage and the South Fork of Fall Cr drainage. Sheep grazing also exists in much of the area as well as cattle grazing in Mosquito Creek. Outfitted use is typically expressed in service days, which equates to one person for any part of one day. Currently 1,357 days for summer progressive stock travel and fall hunting are being used by outfitters while 399 days are used for hiking and biking. During the summer there are 9 permittees operating in the area while in the fall hunt season there are 11.

Tasks for the future (from public input)

- *Trail Maintenance*- maintain safe passage and minimize resource damage
- *Planning*- future of the WSA and dealing with non-system trails

Area Emphasis

- Forest Plan Direction: DFC 6S, DFC 9B, DFC 10, DFC 12
- Manage this area to offer a primitive backcountry experience that caters to horse use, hiking and hunting.
- Ensure trailhead signing and website information includes information about WSA and avoiding conflicts with bears.
- Focus some planning effort in the non-WSA portions of Mosquito Creek and North Fork of Fall Creek to assess non-system trails. Consider adding a few trails in front-country areas if removal of other trails within WSA results in net benefit to wildlife and WSA.
- Decisions on future area management may change due to current WSA planning efforts.

Trail System Guidance

- North Fork Fall Cr Loop Trail #4008- continue efforts to revitalize and maintain this trail with assistance from Red Top Meadows volunteers and local outfitters. This includes rerouting, small structures and improved signage.
- **Core Trails:** Mosquito Cr Trail #4005, South Fork Fall Cr Trail #4009, Coburn Cr Trail #4011, Dog Cr Trail #4069, Cabin Cr Trail #4064, East Table Cr Trail #4063, Wolf Cr Trail #4060, Crankshaft Trail #4980- Clear trees and brush annually, ensure safe and passable tread, reroutes where necessary, install drainage, bridges and turnpikes where necessary, install and maintain junction signage.
- **Non-Core Trails:** Divide Trail #4050, Red Creek Trail #4058, Station Cr Trail #4062, Dry Fork Wolf Cr Trail #4061, Wolf Mountain Trail #4067, Red Pass Trail #4068, Little Dog Cr Trail #4070, Pup Cr Trail #4071- GPS track to ensure accurate map data, clear trees every 3-5 years, small reroutes around problem spots, define route but limit trail work to ensuring safe passage and limiting resource damage. Signage at major junctions. Structures not generally needed.
- Assess and remove old non-existent system trails from the database. Allow outfitters to perform maintenance to prevent resource damage via permits.

Rationale for Recommendations

Due to the WSA designation of most of this area, management must be concurrent with WSA regulations. In addition, due to the nature of the topography and vegetation types, steep canyons with heavy brush, multiple stream crossings, erosion prone soils, and lack of any large attractions (waterfalls, lakes), this area is not used heavily in the spring or summer. Brush consists mainly of tall grasses, forbs, and nettles which cannot feasibly be cut back each year and tend to grow over the trail corridor making passage difficult. Fall conditions however are much better and hunting use is heavy so trail corridors should be maintained to provide safe passage. Due to public desire for more improved trails in the North Fork Fall Creek area, an assessment of the non-system trails is needed but decisions on potential improvements and adoption of these trails must be consistent with the legislative status of the area.

5. Shadow Mountain/Ditch Creek



Picture Location- Ditch Creek, Shadow Mountain

Existing condition

- Current system contains 9 trails totaling 20.27 miles with 7 Class 3 trails (12.24 miles) and 2 Class 2 trails (8.03 miles). Within this system is approximately 16.5 miles of low volume road.
- Currently the entire system is maintained each year.
- Motorized routes have been defined and signed along with new parking areas at trailheads.
- Numerous non-system trails concentrated in Shadow Mountain and lower Ditch Creek areas. One non-system trail is currently receiving high mountain bike use and is degrading.
- Dominant uses include motorized use, horse day rides, dispersed camping, field studies, mountain biking and hiking.
- Large wind event in 2008 brought down roughly 400 trees on the Middle Fork of Ditch Cr Trail. This trail was reconstructed in the lower sections in 2011 but the upper sections are nearly non-repairable. A landslide in 1997 also removed portions of the original trail.
- Soils are poor and landslides are common.
- High wildlife habitat value for species that favor old growth or aspen.
- High habitat value for grizzly bears and high potential for conflict.

Trail Work

Very little trail work has been done in this area. Currently the majority of designated trails are former roads, although many non-system, user-created trails exist. The majority of trail work completed in the area has been done by the Wyoming State Trail Crew. Minor work has been completed in lower Middle Fork Ditch Creek Trail clearing large blowdown, brushing, route definition, and new signage. Trail work in the area has declined due to an increase in grizzly bear activity, low use, and the proliferation of landslides.

Public Use

Use in the Shadow Mountain area includes motorized use on the >50" trails, firewood cutting, a high amount of dispersed camping, mountain biking, and hiking in the lower Ditch Creek area out of Teton Science School. A relatively new development in this resource area is the establishment of a new urban interface in Ditch Creek. With the expansion of the Teton Science School and increasing development in the Golf and Tennis suburb, residents are gravitating to this area as the nearest opportunity for recreation on public land. An extensive network of user-created trails are being established which pass through a portion of Grand Teton National Park to reach the forest.

Outfitted Use

Permitted activities include mountain biking, hiking, day use horseback rides and day use hunting. There is an intensive amount of outfitted day use stock based activities from resorts such as Lost Creek Ranch, Triangle X Ranch, Moosehead Ranch, and 4 U Outfitters. Additional ATV outfitted use occurs from Scenic Safaris and Jackson Hole Adventure Rentals which combine for roughly 400-500 user days in the North Shadow area per summer season.

Tasks for the Future (from public input)

- *Planning* – address non-system trails
- *Education* – improve information on conflicts with bears
- *Use Management*

Area Emphasis

- Forest Plan Direction- DFC 8, DFC 10
- Manage this area to offer a semi-primitive experience.
- Focus planning efforts for non-system trails in collaboration with Grand Teton National Park, Teton Science Schools, and Lost Creek Ranch.
- Ensure trailhead signing and website information includes adequate information about avoiding conflicts with bears. Provide patrol presence.

Trail System Guidance

- Manage existing motorized routes to high quality standard. Clear trees, install drainage and structures where needed to mitigate resource impacts.
- Assess non-system trails on Shadow Mountain to determine purpose and need for acceptance into trail system, potential to address conflicting uses, and possible need for rerouting to mitigate resource impact.
- Maintain trails in this area in primitive conditions, yet ensure that they are clear of trees, have safe and passable tread, good sight distance, and signage to keep users from getting lost.

Rationale for recommendations

Bear activity will likely increase in this area due to high quality habitat. The potential for conflict between people and bears suggests that this is not a good area to encourage visitor use especially for those who are not familiar with travelling in bear country. The clay soils become very slick when wet, limiting the manageability of the area for mountain bike use as well as limiting the ability to easily pull horse trailers up the steep roads typical in the area. Heavily used non-system trails will need to be addressed and either closed permanently or brought onto the system and repaired. Trail conditions in upper Ditch Creek are passable but would require a very large effort to bring up to standard. The lower Ditch Creek and Shadow Mountain areas offer some opportunity for sustainable trails.

6. Munger Mountain



Picture Location- Tuscany Ridge Trail

Existing Condition

- Current system contains 7 trails totaling 16.8 miles. All trails are Class 3 trails.
- Currently the entire system is maintained each year.
- Munger Mountain is designed as a multi-use system, and it is working well in terms of sustainability and low conflicts between user groups.
- The majority of trails in the system have been rerouted to more sustainable locations, new structures have been installed, signage is current, and drainage has been installed although more is needed.
- Dominant uses include mountain biking, motorcycle riding, hiking, horseback riding, and hunting. Motorcycles and eBikes are allowed on the system from July 1st to September 9th.
- Soils are quite good but prone to erosion or muddiness due to lack of rock.
- Noxious weed infestation and cattle impacts on trails are a problem.
- High wildlife habitat value for species that favor aspen or deciduous habitats. Important owl and seasonal songbird habitat. Important elk calving area.

Trail Work

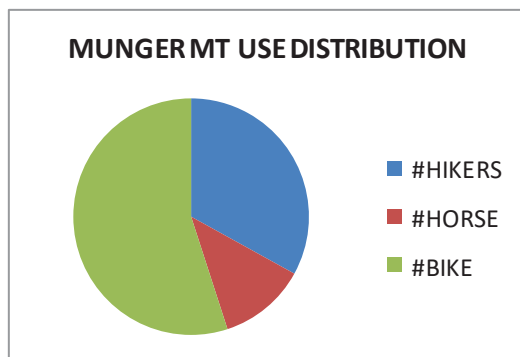
The decision to accept and reconstruct the formerly user-created Munger Mountain trail system was made in 2009. Major trail work occurred on this trail system from 2009-2012, with most system trails receiving large scale rerouting, structure replacement, closure of unsustainable routes, new drainage and new signage at all major junctions. Noteworthy projects include: rerouting, drainage work and new turnpike on Wally World Trail, major rerouting and turnpike construction on Poison Creek Trail, major rerouting and bridge construction on Squaw Creek Trail, major rerouting on the Big Munger Trail, and major rerouting and multiple bridge construction on Rock Cr Trail. Work was completed with a variety of groups including Wilderness Adventures, Red Top Meadows volunteers, a National Trails Day project with the Jackson Hole Ski Patrol, as well as crews from the St. Anthony work camp. Two large log benches were also constructed in 2013 and transported to various viewpoints via helicopter.

Public Use

Overall public use in the Munger area has been increasing since the trails were reconstructed, although use levels are lower than other front country areas. The system is accommodating mountain biking, dirt biking, horse use, and hiking/running. Conflicts between user groups do occur but remain low. The lower trail system consisting of Wally World, Poison Cr, Squaw Cr and Rock Cr sees the majority of the use during the summer and fall months. Recreation use on these trails is dominated by biking and hiking which account for 88% of the use. The Big Munger Trail is primarily used by dirt bikes due to its steepness and remoteness, but is only open from July 1st to September 9th, which keeps overall use on the summit very low for most of the year. Fall time brings an uptick in stock use for hunting, but is relatively low compared to other areas. Overall encounters with other parties remain low.

FS Monitoring Data

MUNGER MOUNTAIN						
YEAR	#HIKERS	#HORSE	#BIKE	TOTAL USERS	TOTAL HOURS PATROLLED	ENCOUNTERS/HOUR
2010	35	13	28	76	203	0.37
2011	13	12	29	54	153	0.35
2012	2	1	12	15	46	0.33
2013	15	5	35	55	73.5	0.7
2014	27	0	46	73	39	1.8
AVERAGES	<u>18</u>	<u>6</u>	<u>30</u>	<u>55</u>	<u>103</u>	<u>0.5</u>
% OF TOTAL USERS	33%	12%	55%			



Although this data offers a glimpse into the use in this area, it is based solely on patrols by FS personal and the number of patrol days is very low in comparison to other areas such as the Gros Ventre Wilderness which has an average of 756 patrol hours versus the 103 hours patrolled for this data. This data does show that the predominant use in the area is by bike and hike, and that the daily encounters are low. See below for alternate monitoring data from Headwaters which more accurately reflects use.

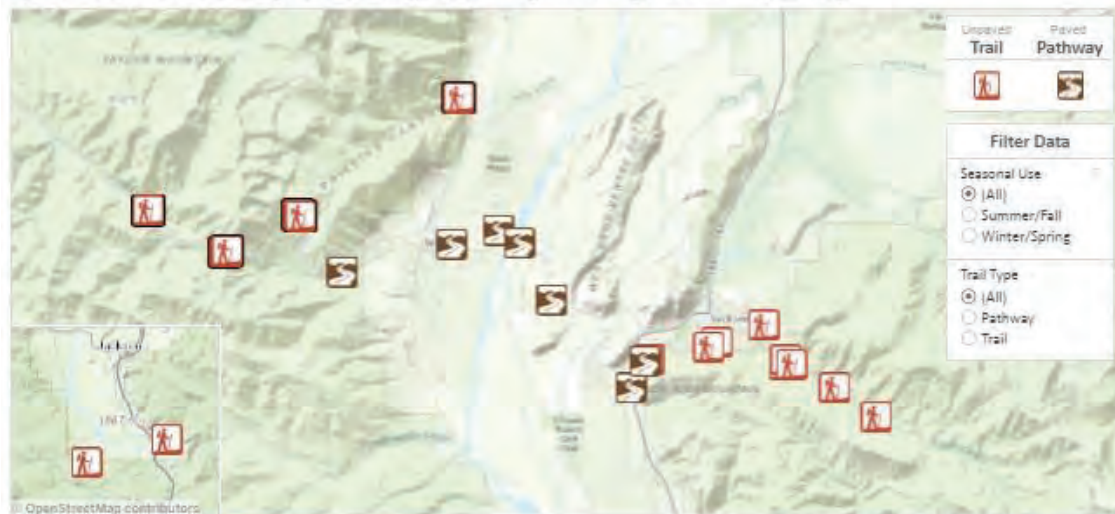
Outfitted Use

The Munger Mountain area has two main outfitters who operate during the summer months. The Hole Hiking Experience and Jackson Parks and Recreation Department. The majority of this outfitted use is for day hiking or mountain biking.

Headwaters Economics Monitoring Data

According to data gathered by Friends of Pathways, in conjunction with Headwaters Economics, through the use of trail counters and cameras, the Munger Mountain trail system had an average of 44 users per day, with 45% biking and 55% hiking/running. Use is highest on the weekends and is typically mid-day.

Explore seasonal use—including the amount, type, and timing—for 25 regional trails and pathways



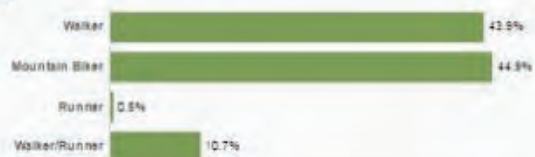
Munger Mountain

SELECT TRAIL OR PATHWAY

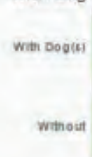
Munger Mountain

Camera data: 11 days sampled between September 4, 2015 (Fri) and September 14, 2015 (Mon)

User Type



With Dog



User Gender

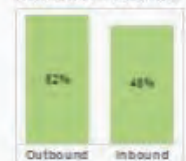


Counter data: 10 days sampled between September 5, 2015 (Sat) and September 14, 2015 (Mon)

Daily Use



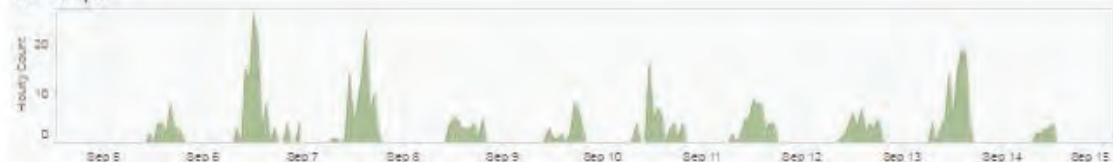
Direction Traveled



Hourly Use



Full Sample



Tasks for the Future (from public input)

- *Trail Maintenance*- rehabilitation of trails on east side
- *Use Management*- motorized use
- *Weed Treatment*

Area Emphasis

- Forest Plan Direction- DFC 10, DFC 12
- Manage area for shared multi-use.
- Focus attention on use management to promote trail ethics, dog control and avoid conflicts with wildlife particularly during spring. Provide trail ambassador presence.
- Annually address weed treatment needs.
- Ensure trailhead signing and website information includes multi-use information and responsible use.

Trail System Guidance

- Do not construct new trails in this area. Evaluate purpose and need for east side access to trail system incorporating wildlife restrictions as needed to retain security.
- **Core Trails:** All system trails in this area are considered core- Clear trees throughout summer season, continue installing and maintaining drainage (re-enforced drain dips), maintain sight lines by clearing brush, install/maintain and replace structures when necessary, perform reroutes, maintain signage and keep consistent with other front country areas.
- Big Munger Trail #4205- manage to provide more challenging trail, assess and perform reroutes where necessary to alleviate erosion problems.
- Remove old system trail to lookout and rehabilitate. Close other non-system trails as needed to ensure wildlife habitat security.

Rationale for Recommendations

Due to the high quality habitat for elk calving, as well as owl nesting and other songbirds, this area should not see a net increase in trail mileage in order to protect wildlife security. The current system is working well for multi-use recreation and is adequately supporting current use. Due to the presence of cattle grazing in this area, weed treatment to prevent their spread should be a high priority. The Big Munger Loop trail should be kept as an advanced trail, maintaining the difficult climbs on either end. This trail is remote and stays on the ridge top for many miles. Beginners without expert dirt bike skills or repair knowledge should not be on top of the ridge in the summer with the threat of lightning storms and lack of shelter. In addition, this loop fills the need for an advanced dirt bike ride in this area. Signage will be consistent with other front country areas to maintain connectivity.

7. Greater Snow King Area (Cache-Game)



Picture Location- Putt Putt Trail, Cache Cr boardwalk

Existing Condition

- Current system contains 43 trails totaling 56.04 miles with 3 Class 4 trails (4.21 miles) and 40 Class 3 trails (51.83 miles).
- Trails are annually maintained and managed to high quality standard. System planning occurred in 2003 and 2015.
- Dominant uses include hiking, biking, walking with dogs, trail running, and wagon rides.
- High recreation use, recreation events, and is very accessible. Also provides nature and wildlife education, mental and physical health and fitness, and overall high quality of life.
- According to the Jackson Hole Trails Economic Impact Study, conducted by University of Wyoming students in 2011, the total amount of dollars flowing through the local economy as a result of the local trail system can be estimated at \$18,070,123. Additionally, the study found that the trail system helped provide 141 jobs locally totaling over \$3,235,500 in 2010.
- The utilization of volunteer and partner labor has been extremely successful. Not only has large scale trail work and rehabilitation been completed but work on the trails has brought the community together, helped to educate users on a variety of issues, and has engaged the community youth in meaningful projects on public land.
- Soils are fairly stable and well drained.
- High wildlife habitat value for species that favor old growth or riparian areas (notably Game Creek)
- Moderate to low habitat value for grizzly bears with low potential for conflict
- High potential for conflict with mountain lions.

Trail work

The Greater Snow King Trail system has received considerable trail work since 2002, due to its close proximity to town and the abundance of volunteers and partners available and willing to help. The majority of the legacy trails on the system have been rerouted to more sustainable locations. All existing trail structures have been replaced or modified within the last 10 years, as well as many new structures recently constructed. New signage and several new kiosks have been constructed at all junctions and trailheads. According to the District Front Country Trail Assessment, completed by partner organization Friends of Pathways, the system has the following infrastructure: 330 waterbars, 17 turnpikes, 17 bridges, 115 sign posts and 70 check steps. In addition, several new trails have been constructed to help disperse recreational use, or to separate user groups. Most recently, newly constructed trails include the Skyline Trail, the Crystal Butte Trail, the Nelson Knoll Trail, the new bike specific Putt Putt Trail, and the new horse/hike specific Woods Canyon Trail. The GSKA system is a prime

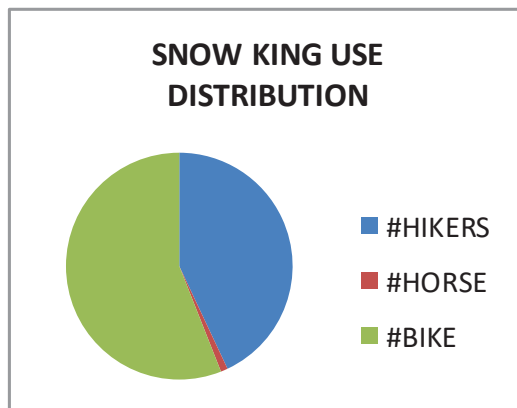
example of what can be accomplished when a community chips in to help maintain trails they love. Partner organization Friends of Pathways has been instrumental in organizing events to get boots on the ground, educating the public on ethical trail use, and most recently providing a youth trail crew to work with FS personal on trail projects. Funding for FS front country work comes from allocated dollars received through the Federal Land Recreation Enhancement Act.

Public Use

Use in the Greater Snow King area continues to grow each year, which can be attributed to the consistent growth of the local population, the increasing quality and accessibility of the trail system, and upgrades in recreational equipment. Typically, users are going out for short trips before or after work, and the heaviest use is concentrated on the trails closest to town. According to daily monitoring forms and trail cameras/counters, the majority of the use is hiking and mountain biking. Horse use has declined significantly, mainly due to the increasing numbers of people on the trails and lack of trailer parking. In general, chances of encounters in the GSKA are the highest of all the areas on the district.

FS Monitoring Data

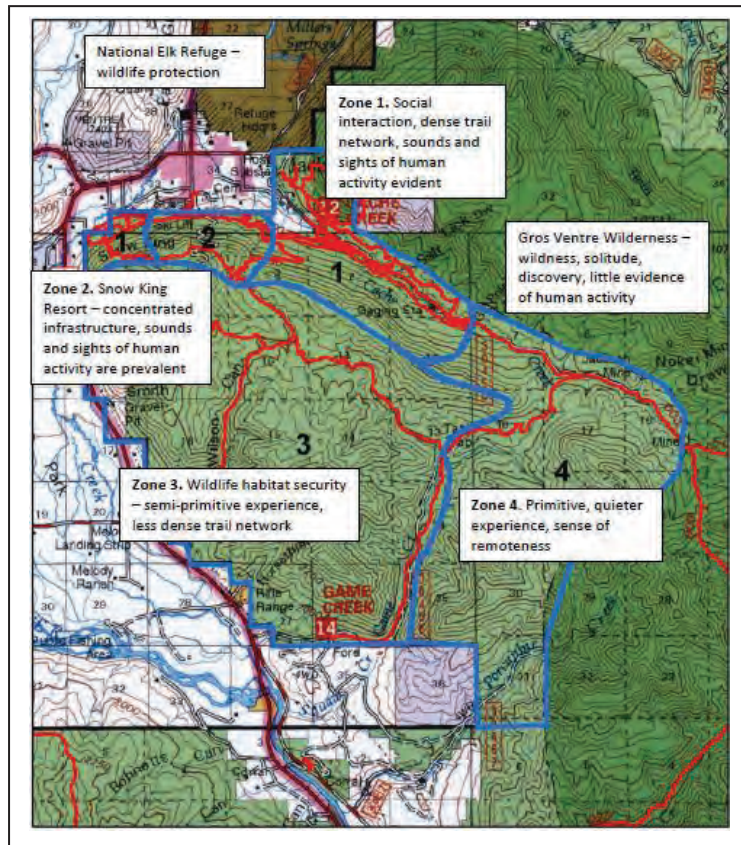
GREATER SNOW KING AREA						
YEAR	#HIKERS	#HORSE	#BIKE	TOTAL USERS	TOTAL PATROL HOURS	ENCOUNTERS/HOUR
2010	788	38	925	1751	460	3.8
2011	542	15	790	1347	400	3.4
2012	520	11	755	1286	379	3.4
2013	768	1	1014	1783	462.5	3.8
2014	651	10	830	1491	406	3.7
AVERAGES	654	15	863	1532	421	3.6
% OF TOTAL USERS	43%	1%	56%			



Although this data offers a glimpse into the use in this area, it is based solely on patrols by FS and FOP personal. A good amount of the use occurs in the early morning or evening when patrollers are not out on the trail system, and so in reality these numbers are higher. Additionally, trail work was concentrated in certain areas during certain years, and so monitoring data is only reflective of that specific area, and could be skewed if that area only receives a certain type of use. This data does however show that the majority of use is by hike and bike, and chances of encounters with others is fairly high.

Outfitted Use

The majority of outfitted use in the GSKA is through permitted wagon rides on Cache Creek road, up to the Bar T 5 cookout location, approximately ½ mile up the road from the trailhead. These wagon rides account for approximately 9% of the visitation in the area. See appendix A for more detailed wagon ridership numbers. In past years, an outfitter camp existed further up the Cache Creek drainage, but it has since been sold and is no longer in use. The only other outfitted use in the area is a very small amount of mountain biking available through local bike shop Hoback Sports.



Snow King Trail Zones 2015.

In an effort to better manage use in the Snow King area, the area has been further divided into 4 zones, each representing different desired characteristics. Zones 1 and 2 represent the urban interface areas and Snow King Ski Resort, which are directly adjacent to town and offer a more social experience with human sounds often audible. Zone 3 and zone 4 offer more semi-primitive, quieter backcountry experiences and more wildlife security.

GSKA USE BY ZONE 2010-2015							
ZONE 1+2							
	#HIKE	#BIKE	#HORSE	HRS PATROLLED	TOTAL PEOPLE	ENCOUNTERS/ HR	#DOGS
2010	576	535	29	188	1140	6	
2011	496	694	14	297.5	1204	4	323
2012	458	623	6	266	1087	4	227
2013	676	858	0	299	1534	5.1	307
2014	422	454	8	156	884	5.6	201
AVG	525.6	632.8	11.4	241.3	1169.8	4.8 AVERAGE	264.5
	45%	54%	1%				
ZONE 3							
	#HIKE	#BIKE	#HORSE	HRS PATROLLED	TOTAL PEOPLE	ENCOUNTERS/ HR	#DOGS
2010	212	195	9	180.5	416	2.3	
2011	46	48	1	68	95	1.4	30
2012	56	113	5	97.5	174	1.8	25
2013	89	111	1	128.5	201	1.6	24
2014	177	298	2	219	477	2.2	73
AVG	116	153	3.6	138.7	272.6	1.9 AVERAGE	38
	42.50%	56.00%	1.50%				

ZONE 4							
	#HIKE	#BIKE	#HORSE	HRS PATROLLED	TOTAL PEOPLE	ENCOUNTERS/ HR	#DOGS
2010	0	195	0	91.5	195	2.1	
2011	0	48	0	34.5	48	1.4	0
2012	0	19	0	15.5	19	1.2	0
2013	0	45	0	35	45	1.3	0
2014	0	78	0	31	78	2.5	0
AVG	0	77	0	41.5	77	1.7 AVERAGE	0
	0	100%	0				

The main observation from this zone model is that the overwhelming majority of the use in the GSKA is within Zones 1 and 2, meaning that people are taking shorter walks or rides directly from town portals and not venturing out more than a few miles. The more primitive zones are remaining quiet and are providing some level of secure wildlife habitat with minimal disturbance.

Explore seasonal use—including the amount, type, and timing—for 25 regional trails and pathways



All Trails and Pathways

Camera data: 80 days sampled between July 28, 2015 (Tue) and March 7, 2016 (Mon)



Counter data: 98 days sampled between September 16, 2015 (Wed) and March 7, 2016 (Mon)



Headwaters

Economics

Monitoring Data

According to data gathered by Friends of Pathways through the use of trail counters and cameras, overall use of the GSKA trail system is estimated at 1,526 people per day from June through August with an average of 205 users a day (67% hiking and running and 23% mountain biking). Use is highest on the weekends and is typically mid-day.

Tasks for the Future (from public input)

- *Planning* *Use Management*
- *Trail Maintenance* *Trail Rehabilitation*

Area Emphasis

- Forest Plan Direction - DFC 2A, DFC 9A, DFC 9B, DFC 10 and DFC 12.
- Focus more planning effort to design system that offers a variety of loop opportunities near town with an eye towards reducing conflict and promoting community connection to public lands and healthy lifestyles. To meet Forest Plan DFC emphasis and trail density guidelines, don't develop additional trails in DFC 10 and 12, and don't add more than 1.7 miles in DFC 2A.
- Strive for this area to serve as a model for integrating recreation and conservation; i.e. accommodate recreation use while promoting respect towards the land, wildlife and people.
- Focus attention on use management to promote trail ethics, dog control and avoid conflicts with lions and other wildlife. Provide visible trail ambassador presence.
- Promote active engagement of kids and community partners in stewardship of area. Build sustainable funding capacity for maintenance and management.
- Provide regularly updated information on current conditions and responsible use.
- Monitor change over time according to the following indicators:

Annually

1. Number of documented conflicts between people and lions, bears, moose (per WGFD)
2. Trail use (counter data) and number of trail encounters (by zone)
3. Number of dog waste piles in trailhead area and first 500 feet of trail

Every 5 years

1. % of on-site visitors reporting negative interaction with another trail user
2. Number of user-created trails accessing stream (per stream reach)
3. Presence and areal extent of noxious weed plants
4. Linear miles of trails (both system and non-system/user-created)

Other potential indicators

Soundscape - % of day free from human noise; Wildlife presence (Neighbors to Nature project)

Trail System Guidance

- **Core Trails:** All system trails in this area are considered core- Clear trees throughout summer season, install and maintain drainage (re-enforced drain dips), maintain sight lines by clearing brush, install/maintain and replace structures when necessary, perform reroutes to achieve sustainability, maintain signage consistent with other front country areas.
- Assess and reroute locations where multiple close junctions can be turned into single four way junctions to reduce signage and confusion.
- Close new user-created trails immediately and rehabilitate.

Rationale for Recommendations

This area has been identified as highly attractive for day use recreation due to its close proximity to town, the stability of the soils, the variety of trail types and loop opportunities, and the economic and lifestyle benefits the trail system provides. It also contains critical winter wildlife habitat and movement corridors for a variety of species, thus management must integrate wildlife security into trail decisions. With the high level of support from both local partners and volunteers seeking to engage in trail maintenance and management, a great deal of work can be accomplished, which will help ensure the system's sustainability. This area is an extremely valuable asset that can serve as an educational platform, a direct connection to nature, and a resource to promote healthy lifestyles. It has become part of the identity of the town and can continue to provide a range of recreational opportunities, as well as opportunities to build a conservation ethic that endures.

8. Teton Pass



Picture Location- Mt Elly, Black Canyon Trail

Existing Condition

- Current system contains 17 trails totaling 49.84 miles with 1 Class 4 trail (3.62 miles) and 16 Class 3 trails (46.22 miles).
- Trails are annually maintained and managed to high quality standard.
- Dominant uses include hiking, XC mountain biking, downhill biking, and horse riding. Trail system includes mix of horse/hike only trails, bike only trails, and multi-use trails.
- Southern portion of trail network lies within the Palisades Wilderness Study Area.
- High recreation use, recreation events, very accessible.
- Conflicts on the trail system have been greatly reduced in the last decade due to educational efforts, increased patrol and ambassador efforts, and the separation of use mainly between mountain biking and horse use. This separation has allowed the District to build and repair trails in accordance with the specific use, and therefore provide the highest quality and design for that use.
- Illegal trail building, which was rampant in the early 2000's, has been eliminated thanks to collaborative efforts with the downhill mountain bike community. Stewardship of the downhill trails has been passed over to the rider groups (Teton Freedom Riders), which has created a more "peer-enforced" environment.
- Soils are well drained, rocky, and hold up well to heavy use.
- High wildlife habitat value for species that favor old growth habitats.
- High habitat value for grizzly bears with high potential for conflict.
- Moderate potential for conflict with mountain lions.

Trail work

The Teton Pass trail network has received considerable work in the last decade due to planning efforts in 2004, its close proximity to the towns of Jackson and Wilson, and its easy access from Highway 22. The trail system is fully maintained each summer through a variety of partner and volunteer resources. All trail structures have been replaced, new signage installed, and many new structures as well as new system trails have been recently added. Noteworthy trail projects include: major reconstruction and rerouting on the Ski Lake Trail, heavy brushing and structure replacement on the Phillips Canyon Trail, major drainage work on the Phillips Pass Trail, bridge construction on the Black Canyon Trail, turnpike construction and drainage installation on the Big Rocks Trail, and repair of the Old Pass Road. Several new system trails have been constructed to accommodate the variety of uses, many of which are user specific trails. New trails include the History Trail (horse and hike), the Arrow Trail (bike and hike), and the Phillips Ridge Trail (multi-use). Additionally, several downhill mountain bike specific trails have been constructed through a partnership with the Teton Freedom Riders. Downhill bike specific trails include

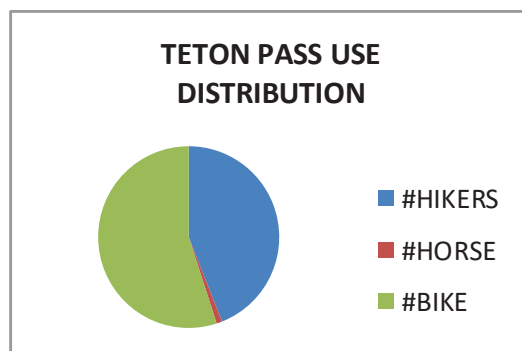
the Parallel Trail, Fuzzy Bunny, Jimmy's Mom, Powerline Jumps, and the Lithium Trail. These trails are overseen and maintained by the TFRs in an ongoing successful partnership. Additionally the Old Pass Road, which bisects the southern portion of the trail system and is part of the Millennium Trail, has received huge community investment and is a truly unique asset to the area.

Public Use

Use in the Teton Pass area continues to grow each year, which can be attributed to the growth of the local population, the increasing quality and accessibility of the trail system, upgrades in recreational equipment, and hotel/tourism attention on the area. The majority of the use is by hikers and mountain bikers which account for 99% of the use. Horse use does still occur on the History Trail and Big Rocks Trail, typically from riders out of the nearby Trail Creek Ranch, but that use remains relatively low. Overall chances of encounters are relatively moderate, although the use is very spread out on the variety of trails available. Additionally, although winter use is not part of this assessment, Teton Pass remains the most popular and heavily used backcountry skiing and snowboarding area on the district, and the winter use dwarfs the summer use numbers.

Forest Service Monitoring Data

TETON PASS AREA						
YEAR	#HIKERS	#HORSE	#BIKE	TOTAL USERS	TOTAL PATROL HOURS	ENCOUNTERS/HOUR
2010	291	3	711	1005	830	1.2
2011	625	6	546	1177	536	2.1
2012	536	4	679	1219	478	2.5
2013	274	0	551	825	398	2
2014	707	8	543	1258	360	3.4
AVERAGES	487	4	606	1096	520	2.1
% OF TOTAL USERS	44%	1%	55%			



Although this data offers a glimpse into the use in this area, it is based solely on patrols by FS and FOP personal. Additionally, trail work was concentrated in certain areas during certain years, and so monitoring data is only reflective of that specific area, and could be skewed if that area only receives a certain type of use. This data does however show that the majority of use is by hike and bike, and chances of encounters with others is moderate.

Outfitted Use

Outfitted use on Teton Pass is relatively low compared to the other areas on the district, although winter outfitted use is much higher. The only outfitter operating on Teton Pass is the Hole Hiking Experience, but the user days are low and do not add a significant amount of use to the system.

Headwater Monitoring Data

According to data gathered by Friends of Pathways through the use of trail counters and cameras, overall use of the Teton Pass trail system is estimated at 910 people per day from June through August with an average of 99 users a day (67% hiking and running and 32% mountain biking). Use is highest on the weekends and is typically mid-day.

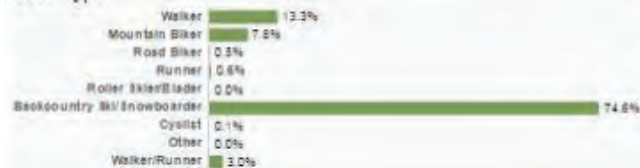
Explore seasonal use—including the amount, type, and timing—for 25 regional trails and pathways



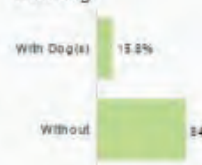
All Trails and Pathways

Camera data: 48 days sampled between August 7, 2015 (Fri) and January 3, 2016 (Sun)

User Type



With Dog

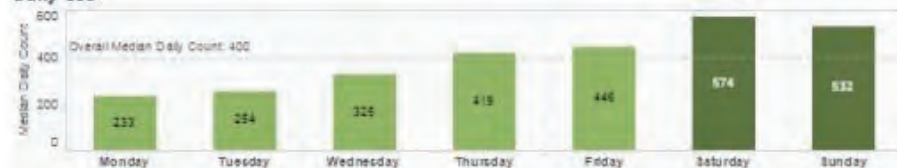


User Gender

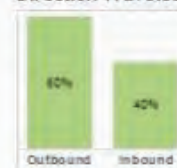


Counter data: 57 days sampled between August 27, 2015 (Thu) and January 4, 2016 (Mon)

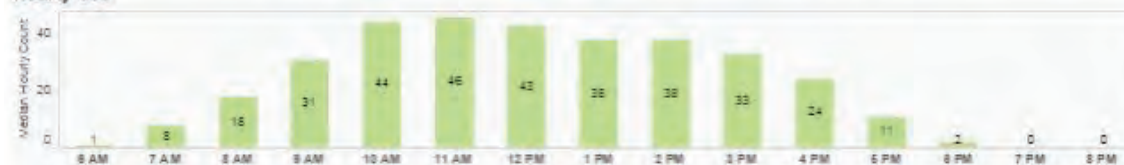
Daily Use



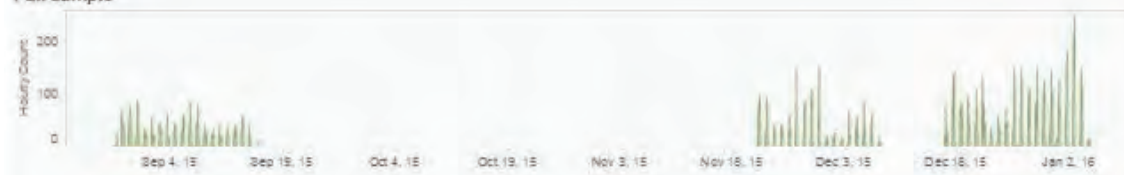
Direction Traveled



Hourly Use



Full Sample



Tasks for the Future (from public input)

- *Use Management*
- *Trail Maintenance*
- *Access- Trailhead design*

Area Emphasis

- Forest Plan Direction- DFC 2A, DFC 2B, DFC 6S, DFC 9A, DFC 10 and DFC 12
- Do not add new trails except potentially in DFC 9A. Trail system changes should result in no net gain in trail mileage and improve compliance with Forest Plan direction. Address user-created trails to improve sustainability (e.g. Glory summit trail).
- Focus attention on use management to promote trail ethics and avoid conflicts with wildlife. Provide visible trail ambassador presence.
- Remove closed roads in DFC 10 that are not needed for administrative use.
- Address access needs with priority on trailhead/highway crossing at Phillips Bench.
- Promote active engagement of kids and community partners in stewardship of area. Build sustainable funding capacity for maintenance and management.
- Provide regularly updated information on conditions and responsible use.

Trail System Guidance

- **Core Trails:** All system trails in this area are considered core- Clear trees throughout summer season, continue installing and maintaining drainage (re-enforced drain dips), maintain sight lines by clearing brush, install/maintain and replace structures when necessary, perform reroutes to achieve sustainability, maintain signage and keep consistent with other front country areas.
- Close new user-created trails as they develop and rehabilitate.
- Trails located in the Palisades WSA- Manage and maintain consistent with WSA guidelines- no machine work, keep trails fairly primitive but maintain to standard

Rationale for Recommendations

The Teton Pass Trail System is basically complete and should not require any large scale additions, although some legacy or user-created trails need to be addressed (e.g. Glory summit trail). A portion of the area lies within the Palisades WSA, thus restricts trail improvements that would increase bike use. The shared stewardship model has been extremely successful and should be continued to promote connections to nature, youth engagement, and healthy lifestyles. According to recent wildlife studies, grizzly bear populations are expected to increase in the Teton Mountain Range over time as the bears move south into potentially viable habitat. This potential for an increase in bear activity highlights the need to keep the trail system use numbers manageable, and to keep trail users well educated and aware of their surroundings.

9. Jackson Hole Mountain Resort (JHMR)



Picture Location- JHMR Bike Park, Top of Ariel Tram

Existing Conditions

- Current system contains approximately 15 miles of non-motorized trail and a network of low volume roads. Trails are actively maintained and managed to high quality standard.
- Dominant uses include hiking and mountain biking, along with other recreation amenities (e.g. bouldering, paragliding).
- High recreation use, recreation events, very accessible, high end visitor services.
- The lift service access and well-designed trail system is helping provide visitors an alternate trail experience on the Forest, which helps to spread out use in the area, and also boosts tourism.
- Soils are rocky and well drained.
- High habitat value for grizzly bears with high potential for conflict.
- Moderate potential for conflict with mountain lions.

Trail Work

Jackson Hole Mountain Resort has been expanding its summer trail system over the past decade, adding more mountain bike lift access trails as well as hiking trails from the Ariel Tram and Gondola. This work has been contracted under various companies out of Whistler and other mountain resorts and has been almost completely done by machine. The Jackson Ranger District trail crew has not been involved in any of these projects and future management and maintenance will be performed by resort trail crews.

Public Use

Summer use at the resort has been increasing consistently in the past few years due to the increasing amount of summer infrastructure in place, and the increase in visitation to Jackson. Although not managed by the Jackson Ranger District, this trail system is having an effect on the use numbers on the District particularly in the Teton Pass area which accommodates the majority of the downhill mountain biking. As the lift accessible mountain bike trail system continues to improve and grow, this could help ease the strain on the downhill system in place on Teton Pass.

Outfitted Use

Jackson Hole Mountain Resort offers four concessions as part of their operations including services for instructional paragliding, mountain climbing, naturalist-led hikes, and guided geology tours.

Tasks for the Future (from public input)

- *Planning*
- *Use Management*

Area Emphasis

- Forest Plan Direction- DFC 9B
- Focus more planning effort to design and construct sustainable system that offers high quality trails for walkers, hikers, XC mountain bikers and downhill mountain bikers. Focus mountain biking in areas that reduce potential for bear conflict and trespass into GTNP.
- Focus downhill mountain biking recreation events in this area.
- Focus attention on use management to prevent wildlife conflicts.
- Provide regularly updated information on opportunities and responsible use.

Trail System Guidance

- Provide maintenance and management presence and direction.

Rationale for Recommendations

Management and maintenance of this trail system is mostly guided and funded by the Jackson Hole Mountain Resort. The Jackson Ranger District will continue to serve as a trail resource for the area and help guide development according to Forest Plan direction. The resort offers a logical place to hold future downhill mountain bike events since it can handle larger crowds, provide better access, and can do so without interfering with other public trail use. With the movement of grizzly bears down the Teton Range, special care must be given to managing recreation within the ski resort boundaries.

V. References

- Allen, S. 2019. *The relationship between the amount of visitor use and social impacts*. Paper prepared for the IVUMC. <https://visitorusemanagement.nps.gov/VUM/Framework>
- Bunnell, F.L., Dunbar, D., Koza, L. and Ryder, G., 1981. *Effects of disturbance on the productivity and numbers of white pelicans in British Columbia: observations and models*. Colonial Waterbirds, pp.2-11.
- Chalfoun, A. (2011). *Effects of pathways within Grand Teton National Park on avian diversity, abundance, distribution, nesting productivity, and breeding behaviors*. Laramie, WY: USGS Wyoming Cooperative Fish & Wildlife Research Unit, Dept. of Zoology and Physiology, University of Wyoming.
- Cole, D.N. and R.L. Knight. 1990. *Impacts of recreation on biodiversity in wilderness*. In *Proceedings of a Symposium on Wilderness Areas: Their Impact*, 33–40. Logan, Utah: Utah State University.
- Cole, D.N., M.E. Petersen, and R.C. Lucas. 1987. *Managing Wilderness Recreation Use: Common Problems and Potential Solutions*. Gen. Tech. Report INT-230. USDA, Forest Service, Intermountain Region. Ogden, UT
- Cole, D.N. 2019. *The relationship between amount of visitor use and environmental impacts*. Paper prepared for IVUMC. <https://visitorusemanagement.nps.gov/VUM/Framework>
- Colorado State Parks. 1998. *Planning Trails with Wildlife in Mind: a handbook for trail planners*. Trails and Wildlife Task Force and Hellmund Associates.
- Cessford, G.R., 1995. *Off-road impacts of mountain bikes*. Science and Research series, 92.
- Cooke, A.S., 1980. *Observations on how close certain passerine species will tolerate an approaching human in rural and suburban areas*. Biological Conservation 18, 85-88
- Flather, C.H., Cordell, H.K., 1995. *Outdoor recreation: historical and anticipated trends*. In: Knight, R.L., Gutzwiller, K.J. (Eds.), *Wildlife and Recreationists*, Island Press, Washington, DC, pp. 3–16.
- Gulsby, W. D., Killmaster, C. H., Bowers, J. W., Kelly, J. D., Sacks, B. N., Statham, M. J., & Miller, K. V., 2015. *White-tailed deer fawn recruitment before and after experimental coyote removals in central Georgia*. Wildlife Society Bulletin, 39(2), 248–255.
- Hammitt, W.E., Cole, D.N. and Monz, C.A., 2015. *Wildland recreation: ecology and management*. John Wiley & Sons.
- Hennings, L. 2017. *Hiking, mountain biking, and equestrian use in natural areas: a recreation ecology literature review*. Technical Report. Metro Parks and Nature, Portland, OR
- Herrero, Jake, and Stephen Herrero (2000) *Management Options for the Moraine Lake Highline Trail: Grizzly Bears and Cyclists*. Unpublished Report for Parks Canada.
- Hicks, L.L. and Elder, J.M., 1979. *Human disturbance of Sierra Nevada bighorn sheep*. The Journal of Wildlife Management, pp.909-915.

Jacob, G.R. and Schreyer, R., 1980. *Conflict in outdoor recreation: A theoretical perspective*. Journal of leisure research, 12(4), p.368.

IVUMC (Interagency Visitor Use Management Council) 2016. *Visitor Use Management Framework: a guide to providing sustainable outdoor recreation* <https://visitorusemanagement.nps.gov/VUM/Framework>

Keller, K., 1990. *Mountain bikes on public lands: A manager's guide to the state of the practice*. Washington, DC: Bicycle Federation of America.

Klein, M.L. 1993. *Waterbird behavioral responses to human disturbances*. Wildlife Society Bulletin 21: 31-39

Knight, R. L., & Cole, D. N. 1991. *Effects of recreational activity on wildlife in wildlands*. In 56th Transactions of the North American Wildlife and Natural Resources Conference pp. 238–247.

Knight, R. L., & Gutzwiller, K. J. (Eds.). 1995. *Wildlife and Recreationists: Coexistence through management and research*. Washington, DC: Island Press.

Knight, S.K. and R.L. Knight. 1986. *Vigilance patterns of bald eagles feeding in groups*. Auk 103:263–272.

Larson, C.L., S.E. Reed, A.M. Merenlender, K.R. Crooks. 2016. *Effects of recreation revealed as widespread through a global systematic review*. PLOS ONE. DOI.10.1371

Marion, J.L. and Leung, Y.F., 2001. *Trail resource impacts and an examination of alternative assessment techniques*. Journal of Park and Recreation Administration, 19(3), pp.17-37.

Marion, J.L. and Wimpey, J., 2007. *Environmental impacts of mountain biking: science review and best practices*. Managing Mountain Biking, IMBA's Guide to Providing Great Riding. International Mountain Bicycling Association (IMBA) Boulder, pp.94-111.

Marion, J.L. 2019. *Impacts to Wildlife: Managing Visitors and Resources to Protect Wildlife*. Paper prepared for IVUMC. <https://visitorusemanagement.nps.gov/VUM/Framework>

McEwen, D. and S.R. Tocher. 1976. *Zone management: key to controlling recreational impact in developed campsites*. Journal of Forestry 74: pp. 90-93

Miller, A.B., 2016. *Impacts of Trail Building on Wildlife: A Before-After Control-Impact Experimental Study Using Camera Traps*.

Miller, J.R. and Hobbs, N.T., 2000. *Recreational trails, human activity, and nest predation in lowland riparian areas*. Landscape and urban planning, 50(4), pp.227-236.

Miller, S.G., Knight, R.L. and Miller, C.K., 2001. *Wildlife responses to pedestrians and dogs*. Wildlife Society Bulletin, pp.124-132.

Moore, R.L., 1994. *Conflicts on multiple-use trails: Synthesis of the literature and state of the practice*. FHWA–PD-94-031.

Monz, C.A., C.M. Pickering, W.A. Hadwen. 2013. *Recent advances in recreation ecology and the implications of different relationships between recreation use and ecological impacts*. Frontiers of Ecology and Environment. 11(8): 441-446.

- Papouchis, C.M., Singer, F.J. and Sloan, W.B., 2001. *Responses of desert bighorn sheep to increased human recreation*. The Journal of Wildlife Management, pp.573-582.
- Pauli, B. P., Spaul, R. J. and Heath, J. A. 2016. *Forecasting disturbance effects on wildlife: tolerance does not mitigate effects of increased recreation on wildlands*. Animal Conservation. doi:10.1111/acv.12308
- Phillips, G.E. and Alldredge, A.W., 2000. *Reproductive success of elk following disturbance by humans during calving season*. The Journal of Wildlife Management, pp.521-530.
- Pickering, C.M., Hill, W., Newsome, D. and Leung, Y.F., 2010. *Comparing hiking, mountain biking and horse riding impacts on vegetation and soils in Australia and the United States of America*. Journal of environmental management. 91(3): 551-562.
- Purdy, K.G., G.R. Goff, D.J. Decker, G.A. Pomerantzy, and N.A. Connelly. 1987. *A guide to managing human activity on National Wildlife Refuges*. Human Dimensions Resources Unit, Department of Natural Resources, Cornell University, Ithaca, New York, USA.
- Reilly, M.L., M.W Tobler, D.L. Sonderegger, P. Beier, 2016. *Spatial and temporal response of wildlife to recreational activities in the San Francisco Bay ecoregion*. Biological Conservation, 207, pp.117-126.
- Remacha, C., Delgado, J.A., Bulaic, M. and Pérez-Tris, J., 2016. *Human Disturbance during Early Life Impairs Nestling Growth in Birds Inhabiting a Nature Recreation Area*. PloS one, 11(11), p.e0166748.
- Singer, F.J. and J.B. Beattie. 1986. *The controlled traffic system and associated wildlife responses in Denali National Park*. Arctic 39: 195-203
- Skagen, S.K., R.L. Knight, and G.H. Orians. 1991. *Human disturbance of an avian scavenging guild*. Ecological Applications 1(2):215–225.
- Stankey, G.H., McCool, S.F. and Stokes, G.L., 1984. *Limits of acceptable change: a new framework for managing the Bob Marshall Wilderness complex*. Western Wildlands, 10(3), pp.33-37.
- Taylor, A.R. and Knight, R.L., 2003. *Wildlife responses to recreation and associated visitor perceptions*. Ecological Applications 13(4), pp.951-963.
- Wilson, J.P. and Seney, J.P., 1994. *Erosional impact of hikers, horses, motorcycles, and off-road bicycles on mountain trails in Montana*. Mountain research and development, pp.77-88.
- Wisdom, M.J., H.K. Preisler, L.M. Naylor, et. al. 2018. *Elk responses to trail-based recreation on public forests*. Forest Ecology and Management. 411:223-233
- Whittaker, D. and Knight, R.L., 1998. *Understanding wildlife responses to humans*. Wildlife Society Bulletin, 26, pp.312-317.
- Wood, A.K. 1993. *Parallels between old-growth forest and wildlife population management*. Wildlife Society Bulletin 21:91–95.
- Zaradic, P.A., Pergams, O.R. and Kareiva, P., 2009. *The impact of nature experience on willingness to support conservation*. PLOS One, 4(10), p.e7367.

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