

The Effects of Drought on Recreation and Wilderness



A synopsis of presentations from the March 2017
Effects of Drought on Recreation and Wilderness Webinar



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Introduction

The Forest Service hosted a webinar on *The Effects of Drought on Recreation and Wilderness* in March 2017 to share knowledge and resources on the effects of drought on recreation and Wilderness. Presentations highlighted the direct and indirect effects of drought and how they affect the demand for recreation activities.

This document summarizes presentations and management options, and provides additional research as supporting documentation.

Background

Among many of the nation's natural treasures found on public lands, recreational opportunities are among one of the most valued by our public. With 148 million visitors each year, people seek refuge in the woods to relax, engage in physical activities, and connect to America's heritage ([2017 NVUM Report](#)).

Recreation is the single greatest use of national forests and generates economic growth, supports resilient communities (particularly in rural areas), and improves quality of life by connecting people with nature. In FY 2011 outdoor recreation supported more than 205,000 jobs and added more than \$13.6 billion to the nation's gross domestic product. ([U.S. Forest Service Strategic Plan](#)).



Wildernesses provide economic, ecosystem, social, and cultural benefits.

Wilderness, Wild and Scenic Rivers, and Drought

Wilderness and Wild and Scenic rivers were designated by law to preserve their natural conditions and values. Benefits of these areas include ecosystem services; cultural and recreational resources; and habitat and biological values.

With drought, the characteristics of Wilderness areas and Wild and Scenic rivers change, along with their benefits and values. For example, values such as refugia and wildlife habitat connectivity are becoming increasingly more important.



The Middle Fork of the Salmon River was one of the original eight rivers designated by the Wild and Scenic Rivers Act of 1968.

Drought, Ecosystem Functions, and Recreation

Drought conditions present challenges for managing recreation opportunities on national forests and grasslands by affecting ecosystem functions that drive demand for recreation. For recreationalists, **direct effects** of drought are expressed in the reduction of snowpack and runoff, or lower stream flow and water levels in reservoirs and lakes.

The **indirect effects** include changes in site characteristics and quality, such as changes in vegetation, wildlife habitats, disturbances (e.g., fire or insect outbreak), and unique features (e.g., glaciers). These direct and indirect effects will likely change demand for **drought-sensitive recreation**.



However, drought also provides opportunities for the evolving and adaptable recreationalist and outdoor recreation industry. For example, ski areas in Colorado have shifted from providing only winter skiing and snowboarding opportunities to becoming all-season resorts that offer a suite of year-round activities.

Warm Weather Recreation

Warm weather recreation includes activities such as hiking, camping, biking, backpacking, viewing natural features, fishing, and visiting Wilderness areas.

In the Rocky Mountains, snowmelt and spring runoff have been occurring earlier in the spring due to lower snow-water equivalent, warmer spring temperatures, and greater solar absorption from dust on snow (Lukas et al., 2014). These conditions create more days without snow and ice, with more suitable temperatures for warm weather recreation.

This shifting shoulder season for warm weather activities may change visitors' site preferences. As conditions change, people shift where they are recreating based on trail conditions, the presence of unique features (e.g., wildflowers) or smoke from wildfire, and vegetation cover.



With warming climates, recreationists may shift their use to higher elevation areas (photo courtesy of Ed Cannaday).

Expected Effects on Warm Weather Recreation

- » Overall increase in demand for warm weather activities as shoulder seasons shift and site characteristics change.
- » Warmer and drier weather patterns at lower elevations can lead to increased visitation at higher elevations.
- » Use restrictions based on road and trail conditions may no longer be applicable in drier and warmer spring and fall seasons.

Adaptation strategies

- Use predictive modeling that incorporates changing climate conditions when developing recreation plans.
- Track trends through surveys such as the National Visitor Use Monitoring program (NVUM) to determine how drought is affecting use patterns.
- Inform the public about changing recreation opportunities and the impacts from climate change.
- Consider if flexibility, based on dry conditions, can be incorporated into travel management decisions.
- Explore creative staffing and partnerships to accommodate changes in use due to drought. For example, develop partnerships with local governments, other agencies, tribes, or volunteer groups to help manage sites in shoulder seasons.

Wilderness Case Study: Uptick in Wilderness Visits from Urban Areas

Drought is projected to become more severe between 2050 and 2099 in the southwestern U.S. (Figure 1). Along with an increase in the severity of drought is the increased urbanization near southwestern forests (i.e., Albuquerque, Denver, Salt Lake City, Las Vegas, Phoenix, and Tucson). There is a direct, linear relationship between drought severity, increased population growth of these metropolitan areas, and increased visits to nearby Wilderness areas. In southwestern



forests, higher temperatures may shift recreational visitation patterns because people's thermal tolerances affect their recreation decisions (Fisichelli et al., 2015).

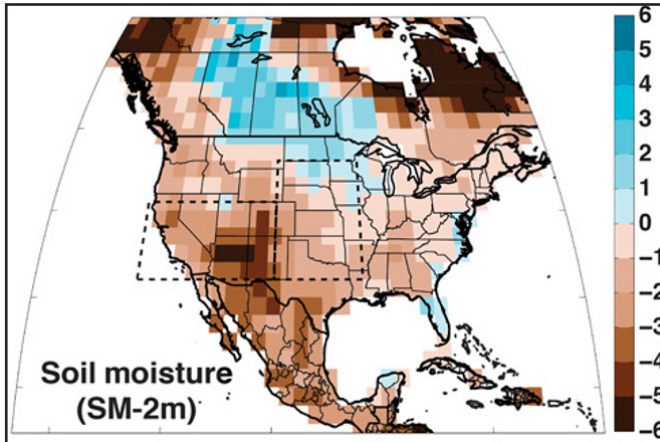


Figure 1 - Projected change in standardized soil moisture at 2-meter depth by 2050-2099, based on average of 17 different models (CMIP5, RCP 8.5 emissions scenario) (Cook et al., 2015).

There is a significant relationship between monthly temperatures and visitation numbers. When temperatures are above 88-90 degrees Fahrenheit, recreation visits decline (Fisichelli et al., 2015). However, visitation will likely increase in managed forest areas with high elevation recreation sites—often Wilderness areas—because these sites will provide a cool refuge from extreme heat in urban areas (J. Smith, n.d.).

Snow Based Winter Recreation

Snow based winter recreation includes activities such as downhill and cross country skiing, snowmobiling, and snowshoeing. Climate projections predict a decrease in snowpack and viable snow sports seasons, especially at lower and mid elevations (Wobus et al., 2017) (Figure 2).

Snow drought will have negative impacts on skiing and snowmobiling. These impacts may include shorter recreation seasons; shifts in activities to higher elevations; decreased recreation use in snow-dominated areas in early and late winter; and new management challenges for ski resorts.

Expected Effects on Snow Based Winter Recreation Ski Areas

- » Ski seasons will be more variable; there may be years when resorts have less terrain available.
- » Greater temperature variability will increase avalanche danger and rain-on-snow events.
- » Small business resorts that have fewer resources to utilize improved snowmaking technologies and four season opportunities may experience the greatest impact.

Adaptation Strategies for Ski Areas

In response to drought conditions, ski resorts have made significant investments in resort

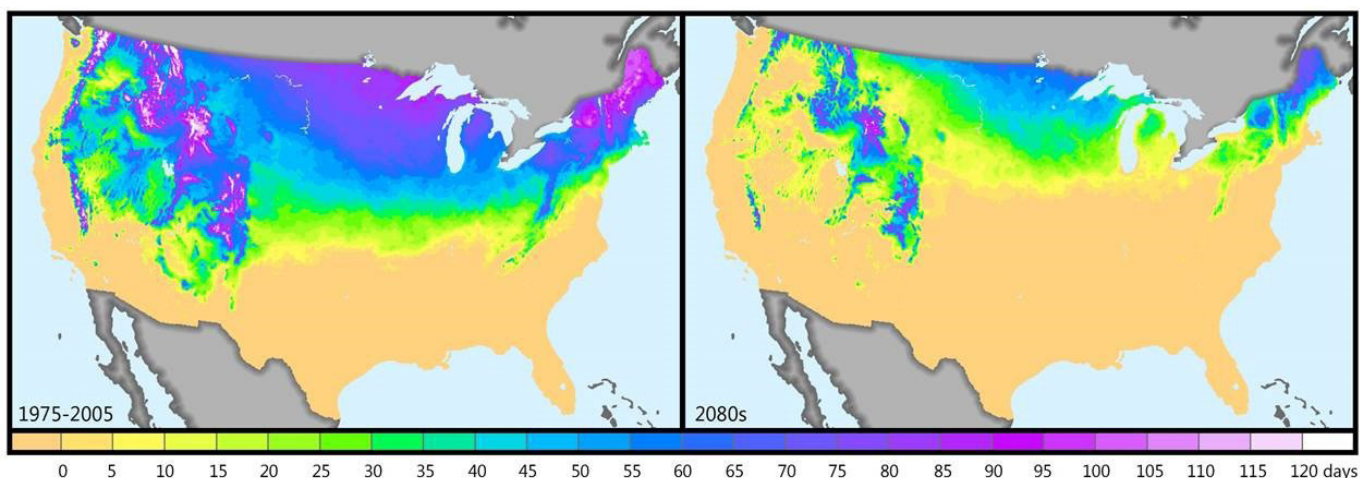


Figure 2 - [Snow Residence Days](#) comparison maps show days with snow residing between 1975 and 2005 versus a projected map of 2080 (Click for an interactive version).

infrastructure by expanding their snowmaking capabilities and diversifying recreational offerings to include summer uses (e.g., alpine coasters, mountain bike trails, zip lines, and camping). Other strategies for ski area managers include:

- Recognize the need for four season opportunities in planning documents.
- Partner with ski areas to integrate their opportunities into forest recreation master plans.
- When evaluating water resources, consider the needs and impacts from snowmaking.

Trail Based Activities (Snowmobiling, Cross country Skiing)

- » The snow base appropriate to the various activities may have a shorter season or occur at higher elevations. When this happens, developed trailheads and staging areas may be stranded at lower elevations with no access to snow.
- » Damage to trails and vehicles can occur without sufficient snow depth.
- » Snowplowing contracts and agreements may not be sufficient to reach higher elevations.

Adaptation Strategies for Trail-Based Activities

- Analyze location of trailheads and staging areas and locate alternative temporary or permanent parking areas at higher elevations as needed.
- Identify potential partnerships and grant opportunities to develop multiple use trailheads at higher elevations that can serve needs for both winter and summer use.
- Work with partners and volunteers to monitor snow conditions, and widely share information about suitable locations for snowmobiling and other snow-based activities.
- Identify funding opportunities or partnerships for potentially increased costs of snow plowing.

Vail Resorts Case Study

In 2016, the 26 ski areas on National Forest System lands in Colorado were visited by 13

million skiers and received \$25 million in fee receipts. The ski industry in Colorado generates \$3 billion in skier expenditures and \$4.8 billion in direct and indirect economic output; supports 46,000 year-round equivalent jobs; and generates \$1.88 billion in labor income (RRC Associates, 2015).

Given the magnitude of this growing economic driver on Colorado's economy, the Forest Service and the ski industry have developed climate adaptation strategies by developing new technologies, policies, and management options.

The Ski Area Recreational Opportunity Enhancement Act of 2011 amended the Ski Area Permit Act of 1986 to allow seasonal and year-round natural resource-based recreation activities and associated facilities to be authorized at ski areas on National Forest Systems lands. Activities and facilities are evaluated based on the degree to which they are natural resource-based, encourage outdoor recreation and enjoyment of nature, and harmonize with the natural environment.

Vail Resorts is transitioning to four seasons by:

- » Continuing to invest in snowmaking systems to ensure a reliable skiing surface in the absence of natural snowfall;
- » Diversifying activities to maximize return on investments; and
- » Attracting new and non-traditional visitors to the managed settings that ski resorts provide.



Vail Resorts has added alpine coasters as a way to expand into four seasons.



Wildlife Related Recreation

Wildlife related recreation includes activities such as hunting, fishing, and wildlife viewing. As drought increases, hunting and fishing patterns may change in response to decreases and increases of wildlife and fish populations.

A reduction of cold water fish species (e.g., bull and cutthroat trout) is projected due to warmer stream temperatures, decline in summer flow, and retreat of suitable habitat. Fishing for warm water fish might experience the opposite effect with greater recreational opportunities for brook and rainbow trout, and smallmouth bass fishing.

Drought effects on hunting terrestrial game (e.g., elk, whitetail and mule deer) are uncertain given the pattern of abundance, distribution, and available forage. For mule deer, poor nutrition associated with drought-affected vegetation makes fawns more susceptible to parasites, diseases, and predation (Friggens et al., 2013).

Expected Effects on Wildlife Related Recreation

- » River closures for recreation users may increase due to high temperatures and/or low stream flows.
- » Decreased diversity and abundance of fish will impact anglers' recreation opportunities.
- » There will be decreased opportunities for cold water angling.
- » Hunting seasons may become less desirable because of less or no snow.

Adaptation Strategies

- Coordinate closely with state agencies that manage hunting and fishing licenses.
- Provide up-to-date information on the impacts of drought and extreme weather to recreation sites (e.g., flash floods in popular fishing areas).
- Be flexible in moving recreation patrols.
- Work with partners to share information about changes to fishing and hunting season.



Anglers face an unknown future for their sport in the face of a changing climate.

River Based Fishing: A Case Study of Proliferative Kidney Disease in Fish

An example of how drought directly affects fish populations and the subsequent recreational opportunities of anglers can be understood by examining the outbreak of **Proliferative Kidney Disease (PKD)** in whitefish in Idaho, Oregon, Montana, and Washington. PKD is caused by a microscopic parasitic spore that attacks the spinal cartilage of young fish, leading to skeletal deformities and nerve damage. This results in mortality rates of 20 to 90 percent (Hedrick et al., 1993).

In 2016, near-record low water flows, summer high temperatures, and recreation activities stressed the fish, allowing the disease to strike hard and fast. That summer, an emergency closure of a 183-mile stretch of the Yellowstone River was enacted, placing economic stress on all fishing outfitters and guides in that area.

Conclusion

This document highlights the challenges drought places on some recreational activities. Drought also presents opportunities for recreationists and the outdoor recreation industry. Both are highly adaptable to climatic changes, through changes in behavior and preferences in response to the development and evolution of recreational offerings.

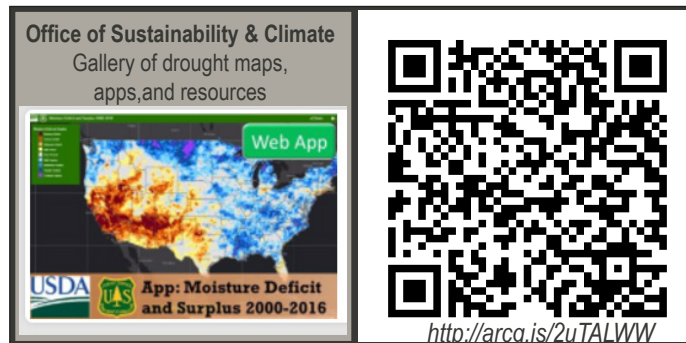
The management of recreation by the U.S. Forest Service depends heavily on ecological process and function. It is critical to understand changing recreational trends and prepare our infrastructure development for long term drought conditions.



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A recording of *The Effects of Drought on Recreation and Wilderness* webinar is available [here](#).



This fact sheet was written by Aurora Cutler, Cynthia West, Joe Meade, Sue Spear, Michael Hand, Jordan Smith, Rebecca Rasch, Scott Fitzwilliams, Rick Cables, and Nancy Brunswick. Any errors or omissions remain the responsibility of the authors.

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