

## USU Extension Grant – Final Report

**Project Leader:** Jordan W. Smith, Ph.D.  
**Project Title:** Hydrologic Conditions and Demand for River Recreation in the North Fork of the Virgin River Wilderness Study Area  
**Project Duration:** August 1, 2016 – May 30, 2017  
**Total Requested:** \$9,999

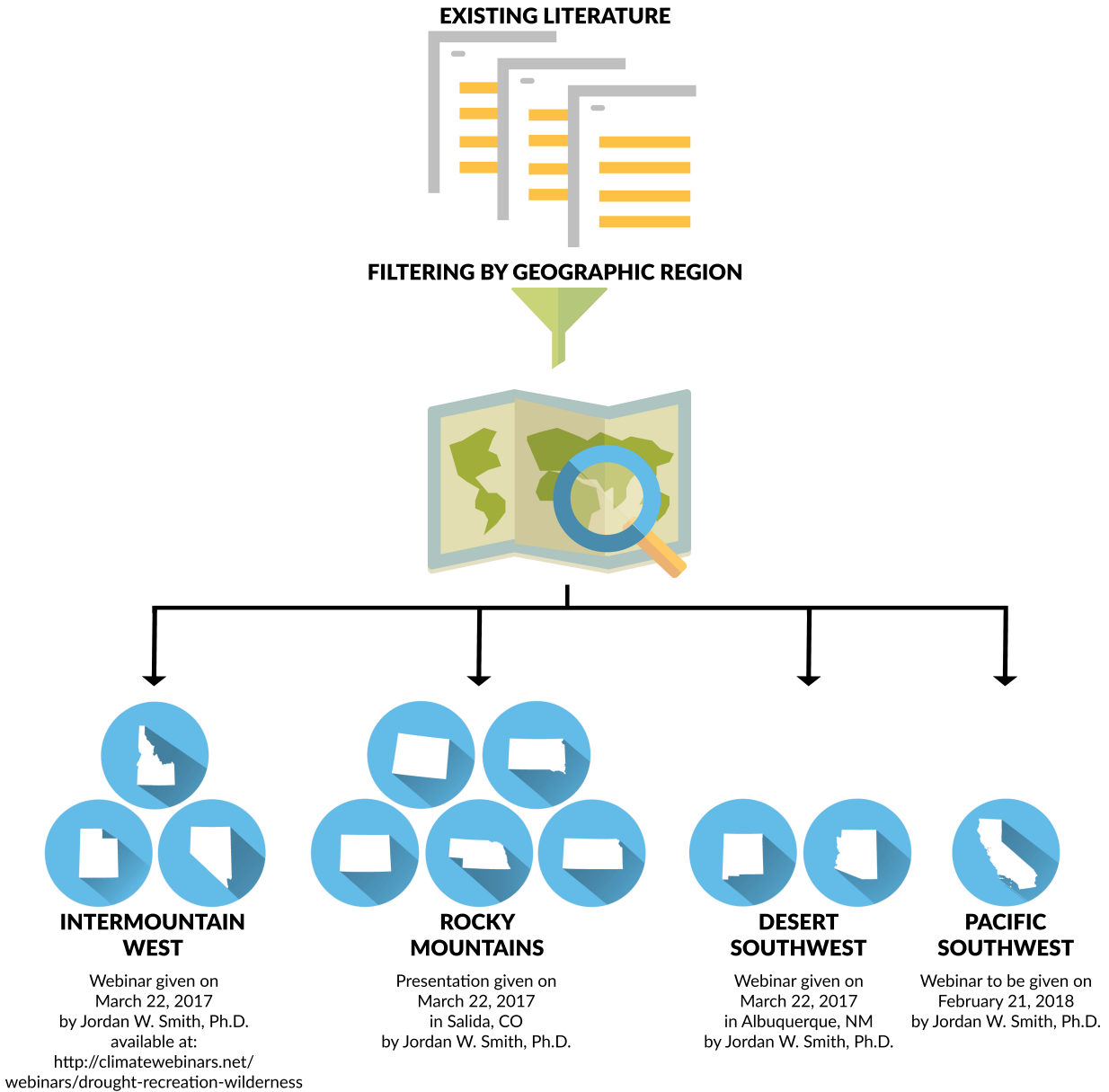
### Project Summary

One of the most direct mechanisms through which climate change will affect outdoor recreation systems in Utah’s high-desert arid ecosystem is through altering hydrologic systems. Climate change has already begun to exhibit intraannual effects on hydrologic systems, advancing the onset of runoff to earlier times of the year and decreasing the frequency of winter snowfall event. Despite the fact hydrologic dynamics as well as recreation use patterns are both driven by climatic conditions, many natural resource management agencies have a poor understanding of how changing hydrologic conditions affect the recreation systems which they manage. **In an effort to help resource management agencies understand and prepare for climate-altered shifts in the demand for water-based recreation, this project involved: 1) documenting and synthesizing previous research on the relationship between climate change and water-based outdoor recreation; and 2) collecting visitor use data on-site within a Bureau of Land Management Wilderness Study Area located adjacent to Zion National Park in southwestern Utah.**

### Project Results

Beginning in the fall of 2016, our project team began documenting and synthesizing previous research on the relationship between climate change and water-based outdoor recreation. We collected over 100 peer-review publications and technical/project reports. The literature spanned a diverse array of disciplines including the hydroclimatology, ecology, recreation resource management, and the policy sciences. We organized this literature by geographic region of the studied linkage between climate change, hydrologic dynamics, and outdoor recreation behavior. We conducted in-depth literature review and syntheses for four specific regions: 1) the Intermountain West; 2) the Rocky Mountains; 3) the Desert Southwest; and 4) the Pacific Southwest. Region-specific presentations were developed for and delivered to each of these regions (Figure 1).

In the spring of 2017, our project team began collecting publically-available climate and recreation use data for a variety of notable outdoor recreation destinations in southern Utah. We specifically focused on the state’s five national parks given the availability of consistently collected recreation use data for a long period of time (i.e., 1979-current). The climate and recreation use data were analyzed using a variety of time series regression techniques to determine if, and how, long-term changes in climate have affected use patterns. We found that a variety of climatic conditions, including temperature, precipitation, number of wet days per month, and frost day frequency, were significantly correlated with visitation to some, if not all, of the national parks within the state. We documented our results in a manuscript submitted, and accepted, for publication in the peer-reviewed journal *Tourism Geographies*.



**Figure 1.** Process of collecting and synthesizing literature on climate change and shifting patterns of water-based outdoor recreation use.

**Increased collaboration between on- and off-campus faculty.** Our project has resulted in increased collaboration between the Institute of Outdoor Recreation and Tourism and numerous county extension agents located throughout Utah. We have shared the results of our empirical analyses with each county agent whose county contains one of the state's five national parks (Emery, Garfield, Grand Iron, Kane, San Juan, Sevier, Washington, and Wayne counties). We are also in the process of preparing a fact sheet that will be distributed to each of these county Extension agents as well as other interested parties (e.g., recreation user groups, public lands managers, etc.).

**Outcomes, outputs, and impacts.** We accomplished our planned activities of 1) documenting and synthesizing previous research on the relationship between climate change

and water-based outdoor recreation; and 2) analyzing historical climate and recreation use data for several notable recreation destinations in Utah. In the process, we have delivered a variety of different deliverables (outputs) that have informed the resource management decisions of recreation managers throughout the state (outcomes), and ultimately led to resource management decisions informed by a better understanding of the current state of the science involving climate change and shifting patterns of water-based outdoor recreation use (impacts) (Figure 2).

**Efforts/plans to produce, publish, and disseminate scholarly materials.** We have developed and delivered a variety of different materials including a peer-reviewed publication, a peer-reviewed fact sheet published through USU Extension, three presentations at national and international research symposia, and four regional workshops focused on climate change and shifting patterns of water-based outdoor recreation use (Figure 2).

**Efforts/plans to secure extramural funds.** The Bureau of Land Management’s Utah office has been in contact with PI Smith and has expressed a strong desire to fund research that either enables them to better estimate use levels on National Conservation Lands within the state or explicitly addresses climate-related issues on those lands. We are currently developing and submitting a \$25,000 proposal to the state’s National Conservation System Research Support Program, an annual competition that funds research and education projects focused on National Conservation Lands.

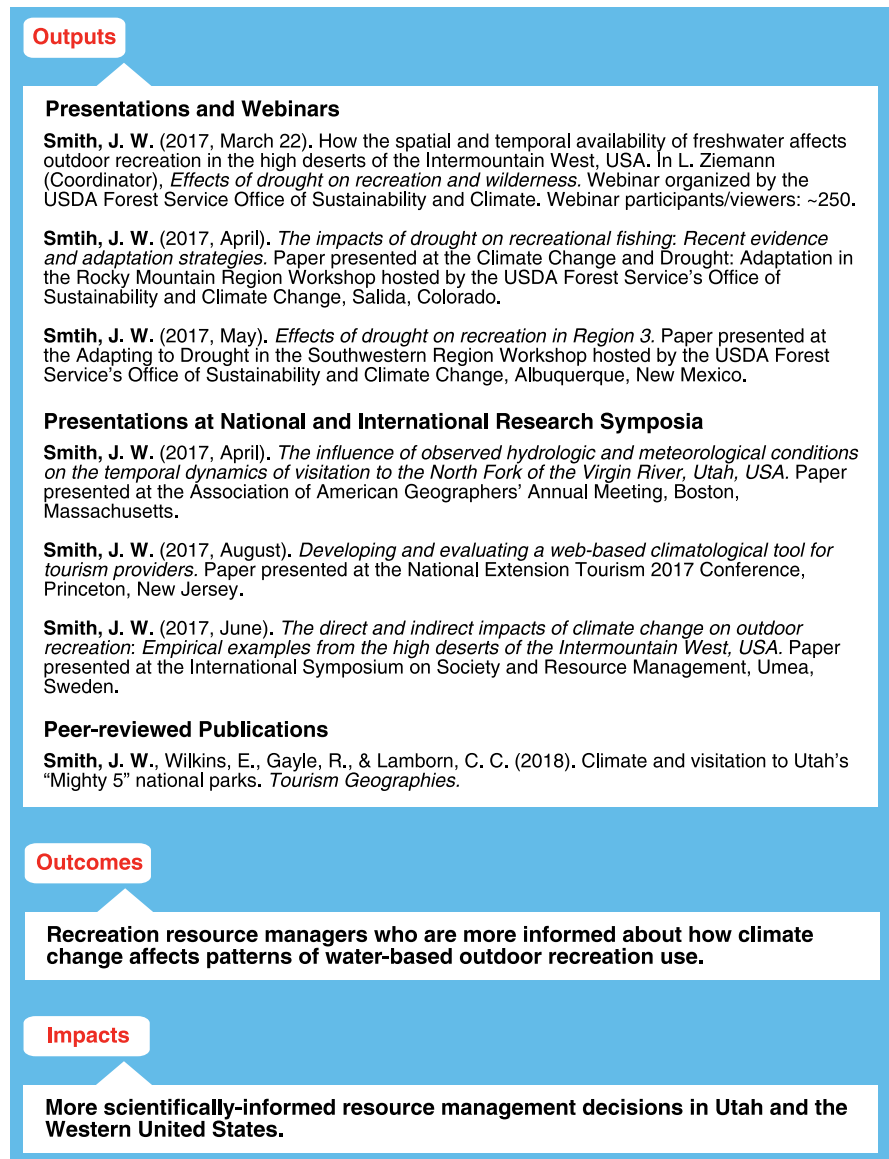


Figure 2. Project outputs, outcomes, and impacts.