

Research Paper

Coordinating and Standardizing Outdoor Recreation Supply and Demand Databases to Facilitate Management and Promote Conservation, Health, and Accessibility

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Executive Summary

Recreation opportunities exist as a system at multiple scales. They are offered by a variety of public and private recreation providers sometimes with different objectives. Incremental and disparate planning across providers can lead to mismatched supply and demand, inefficient use of resources, and difficulty responding to emerging trends. Furthermore, traditional recreation supply and demand studies haven't systematically integrated many recreation land management benefits including biodiversity and wildlife conservation, ecosystem services, human health, and environmental justice.

Historically, the supply of outdoor recreation and conservation lands was assembled by different governmental and tribal agencies, non-governmental organizations, or private organizations with little systematic coordination. The USGS Protected Area Database (PAD-US) has emerged as a model for coordinated inventories of public lands. This program has developed a standardized data set with consistent protocols and methodologies for data collection to ensure consistency of inputs and future updates.

Demand assessments are currently conducted by federal and state governmental agencies, industry associations, and universities. These studies are independently conducted, rarely comparable, and largely inconsistent across scales and locations. Initiated in 1960, what became the National Survey of Recreation and the Environment (NSRE) collected consistent public recreation demand data for state and national level analysis. Many recreation planners used these data until it was discontinued in 2014. While there has been coordination and standardization of recreation supply data collection, no similar actions have occurred for demand.

Following the PAD-US supply-side model, we identify opportunities to coordinate and standardize the collection of recreation demand data to be useful for all agencies, across ownerships, and scales. A publicly available national recreation demand database with standardized protocols and methodologies could serve as a comprehensive and authoritative inventory of recreation demand. A new inte-

grated and holistic NSRE and new standardized baseline demand portion of all Statewide Comprehensive Outdoor Recreation Plans could recurrently contribute to the national database. A holistic systems approach could help to link local recreation supply and demand opportunities, frame recreation access and participation with health and equity data, and gauge supply and demand for wildlife and biodiversity conservation and other ecosystem services on recreation lands.

Keywords

Recreation, demand, supply, SCORP, protected areas

Introduction

Outdoor recreation is one of the primary ways we connect with our public lands and with nature more generally (Blahna, Valenzuela et al., 2020). To effectively and efficiently manage public lands, an understanding of both the available supply of lands providing recreation opportunities and the public demand for those opportunities is critical (Garber-Yonts, 2005). A multitude of public and private entities supplies a system of diverse recreation opportunities within a geographic region (McCool & Cole, 2001). This variety of recreation opportunity settings can facilitate different types of experiences (Driver & Brown, 1978). Assessments of the supply of outdoor recreation and conservation lands have been independently assembled and mapped by different governmental agencies (state, federal, county, municipal, tribal), non-governmental organizations, and private organizations for the lands they directly managed. Historically, there has been little integration or systematic coordination of mapping protocol or standards about what is mapped across the levels or groups (GreenInfo Network, 2016).

The assessment of public demand for these recreation opportunities has traditionally been conducted at the site level with visitor use data; this is often done by the land manager or conducted by the various agencies across their land holdings. In addition, recreation activity participation studies have been conducted at the national and state levels, but not linked to specific recreation lands. Like the supply assessments, there has been little integration or systematic coordination in the type of recreation demand data collected or data collection methods across levels or management entities. Reliable and consistent recreation supply and demand information is necessary to forecast future use, plan for appropriate supplies, ensure equitable access and use for all people, provide optimal health benefits, defend decision-making, anticipate problems, secure economic benefits, and justify funding (Hall et al., 2009; Selin et al., 2020).

A systems approach to outdoor recreation (McCool & Kline, 2020; Morse, 2020) is required for planning and managing sustainable recreation opportunities that provide: “desirable outdoor opportunities for all people, in a way that supports ecosystems, contributes to healthy communities, promotes equitable economies, respects culture and traditions, and develops stewardship values now and for future generations.” (Cerveney et al., 2020, p. 10). A systems focus shifts the paradigm from managing recreation of visitors to the management of social-ecological relationships (McCool et al., 2020, p. 155) and more broadly to the management of recreation lands for human well-being.

However, this requires more detailed, relevant, and consistent outdoor recreation lands demand data than is currently available.

This paper provides an overview of major recreation supply and demand data collection programs and identifies opportunities to provide the missing information required to address sustainable recreation planning and management goals. Our ability to systematically collect rigorous and consistent supply and demand data will require collaboration across scales and among public agencies and private enterprises (Cervený et al., 2020; GreenInfo Network, 2016; McCool & Cole, 2001). The systematic consolidation of consistent recreation supply data is currently being done by the United States Geological Survey (USGS) with the Protected Area Databased (PAD-US) (GreenInfo Network, 2016). However, no similar actions have occurred for demand data. The PAD-US supply consolidation effort provides an instructive example for how a publicly available national recreation demand database could be designed with standardized protocols and methodologies recurrently collected at multiple scales, to provide a comprehensive and authoritative inventory of recreation demand data essential for sustainable recreation planning.

A Renewed Focus on Outdoor Recreation Research and Collaboration

Over the last decade there have been numerous calls to improve data collection methods, expand the scope, standardize approaches, and coordinate outdoor recreation research initiatives. The America's Great Outdoors initiative proposed a 21st-century conservation and recreation agenda where health benefits and access equity were overriding themes along with developing collaborations across all levels of government to promote conservation and recreation (AGO, 2011). The National Association of Recreation Resource Planners (NARRP) echoed those suggestions and specifically recommended that federal agencies directly collaborate with states on their Statewide Comprehensive Outdoor Recreation Plans (SCORP) (NARRP, 2011). The NARRP report (2011) also recommend integrating other compatible planning efforts such as habitat for wildlife, watershed conservation, transportation, tourism, and with planning for public health and access for minority and disadvantaged populations. More recently, multiple federal land agencies established the Interagency Visitor Use Management Council (IVUMC) to develop a professional, standardized, and consistent approach for visitor use management with similarly expanded guidance to meet the needs of a more diversified public, address environmental justice issues, and maintain the natural resource base (IVUMC, 2019).

Two recent reports developed through an initiative led by the USFS that included researchers, managers, and policymakers were designed to “ignite the science of outdoor recreation” (Miller et al., 2020; Selin et al., 2020). The first is a collection of 17 working papers focused on high priority issues, research needs, and information requirements and why an investment in new knowledge is necessary (Selin et al., 2020). The papers highlight the issues of diversity and equity in access (Sanchez et al., 2020), connections to human health (Wolf et al., 2020), ecosystem services and the diversity of human-nature connections (Blahna, Cervený et al., 2020), and the need for a systems approach to recreation management (McCool & Kline 2020). As these papers note, the growth and diversification of U.S. population elevates the issues of equity, access, and environmental justice (Sanchez et al., 2020; Wolf et al., 2020). Consideration of equitable access is linked to human health with correlations of physical activity, poverty, obesity and lack of recreation opportunities in the wildland-urban interface (Wolf

et al., 2020). A focus on health and wellness benefits can help to establish new partnerships with public and private health agencies.

The second USFS-led effort was a research strategy that outlines the future direction of recreation and tourism research on public lands (Cervený et al., 2020; Miller et al., 2020). The strategy calls for coordination across agencies, managers, NGOs and industry to respond to changing demographics and visitor patterns and confront equity considerations. The document presents and outlines eight research focus areas, each of which have implications for a new national recreation demand database (Table 1). The strategy utilizes a systems approach that transcends agency boundaries. Focus areas highlight health, diversity, equity and inclusion, and ecosystem services. The authors call for, “A nationwide interagency visitation monitoring protocol and database” that can be used by managers across scales and agencies for visitor use monitoring, planning, and forecasting (Cervený et al., 2020, p. 45).

Table 1
Research Focus Areas (Cervený et al., 2020)

RFA 1:	Integrating outdoor recreation planning into a social-ecological planning framework
RFA 2:	Examining recreation-ecosystem interactions at multiple scales
RFA3:	Assessing new drivers and characteristics of demand for outdoor experiences
RFA4:	Measuring, monitoring, and forecasting visitor use
RFA 5:	Exploring connections among people, nature, and public lands
RFA6:	Integrating culture and place into land management and outdoor recreation experiences
RFA7:	Investigating the health and well-being benefits of outdoor experiences
RFA8:	Understanding tourism economics and systems for public lands planning

Furthermore, the 2012 Forest Service planning rule requires planning teams to identify key ecosystem services that are important to people in the region and likely to be impacted by the forest plan under consideration (Jaworski et al., 2018). Ecosystem services are the benefits that people receive from ecosystems and include supporting (soil formation, nutrient cycling), regulating (erosion control, carbon sequestration, pollination), production (timber, grazing), and cultural services (recreation, aesthetics, cultural heritage) (Millennium Ecosystem Assessment, 2003). Biodiversity and wildlife (the variety of plants, animals, and microorganisms) can be positioned within each benefits category as they provide direct benefits and influence and support ecosystem functioning. As part of a broader movement to assess the impacts on and benefits of ecosystem services, many public agencies are using the concept as an integrated approach to planning (Jaworski et al., 2018; Kline et al., 2013).

Collectively, these assessments have identified the need for coordinated and systematic collection of recreation data across scales and agencies that includes information on the supply of recreation opportunities, access to those settings, and demand for participation. Furthermore, they call for a more holistic understanding of the benefits of recreation lands to include wildlife and biodiversity conservation and ecosystem services. Finally, they indicate that issues of human health and environmental justice should be central elements of recreation analysis.

Sources of Information on Recreation Supply

Historically, federal, state, and local government agencies have independently developed recreation supply information for lands they manage.

Supply at the Federal Level

Even prior to the heavy use of GIS, the federal agencies have used maps of land boundaries, roads, facilities (e.g., offices, entrance gates, bathrooms), vegetative cover, and recreation infrastructure such as hiking and biking trails, campsites, boat docks, and fishing piers, and recreation amenities such as accessibility, viewsheds, natural quality, and landscape diversity. Most of these agencies also provide information about allowable activities at these settings. At the federal level, individual agencies such as the National Park Service, the US Forest Service (USFS), Bureau of Land Management (BLM), Army Corps of Engineers, US Fish and Wildlife Service (USFWS), and others have mapped recreation infrastructure and amenities. The USFS and BLM also define areas based on the Recreation Opportunity Spectrum (ROS), which is applied to demark experiential use zones across a spectrum of recreation opportunity settings from primitive to urban (Driver & Brown, 1978).

Supply at the State Level

At the state level, agencies that manage state parks, state forests, and other lands frequently provide similar recreation attribute and location information. Depending on the mission of the land management agency, they often have maps of types of natural land cover and for major natural provisioning resources such as forestry, mining, and grazing. At the local level, counties and municipalities often have boundary information for parks, lists of facilities, and activities that they support or allow. Historically, the collection, reporting, and management of the federal, state, and municipal recreation information was seldom systematic, coordinated, or compiled across levels or agencies that could facilitate analysis or planning across sites or ownerships.

One report where recreation information has historically been collected across federal and state agencies is for a Statewide Comprehensive Outdoor Recreation Plan (SCORP). The 1965 Land and Water Conservation Fund (LWCF) was created to assist states in acquiring and developing outdoor recreation resources and facilities (National Park Service, 2021a). To be eligible for these funds, a state must complete a SCORP every five years. SCORP reports are required to involve public participation, provide information on the statewide supply of facilities and resources, identify recreation issues, priority needs, and evaluate demand and activity participation (National Park Service, 2021a). The LWCF was enacted to “assist in preserving, developing, and assuring *accessibility to all citizens* ...such quality and quantity of outdoor recreation resources as may be available and are necessary and desirable for individual active participation in such recreation and to strengthen the *health and vitality* of the citizens of the United States” (National Park Service, 2008) (emphasis added). States’ must develop an Open Project Selection Process for targeting LWCF funds based on objective criteria and priority needs identified in their SCORP. The goals for the SCORP program are considerable and multifaceted and as a result, the implementation across states is highly variable in practice.

The supply inventories of recreation lands in SCORPs include park and protected areas facilities and resources on all public and private lands with public access statewide. In some states, the recreation inventories developed for the SCORP are spatially

mapped using GIS, providing an extensive digital database of recreation opportunities across ownerships while in other states little mapping occurred. Historically, supply inventory methodologies have not been consistent across state SCORPs and there is no explicit requirement to create a digital database. This makes comparisons across states and with federal inventories difficult.

Supply at Multiple Levels (PAD-US)

The collection of recreation supply data has been changing due to development of the national level Protected Area Databased (PAD-US) by the U.S. Geological Survey (USGS) (GreenInfo Network, 2016). Begun in 2008 as part of the National Gap Analysis Project (GAP), the PAD-US is a consolidation and systemization of the national and state recreation supply inventories outlined above (USGS, 2021a). PAD-US is designed to be a single, publicly available, authoritative, and comprehensive database of all protected lands with exact boundaries and core attributes from small municipal parks to national parks and marine reserves. This project has coordinated and organized federal agency data through the Federal Geographic Data Committee Federal Lands Working group. They are currently synchronizing with state data stewards to design SCORPs following consistent protocols for decentralized and recurrent data gathering. Inter-agency and state-level coordination was intended to ensure a comprehensive data set and to limit the time, effort, and financial waste from developing multiple independent and inconsistent data sets (GreenInfo Network, 2016).

The original focus of the Gap Analysis Program was to provide information about the conservation status of vertebrate species. To understand how much of a species habitat was conserved, the analysis consisted of mapping three layers; land cover, predicted distributions of species, and a stewardship layer of protected areas (USGS, 2021a). Because species habitat was not constrained by administrative boundaries, they needed to identify and include all protected areas managed by federal, state, and local agencies, non-profits, and private lands under conservation easements. In developing the stewardship layer, they recognized many reasons for protected areas beyond species habitat conservation including; recreation, resource production, economic contributions, cultural heritage, natural resource conservation, hazard mitigation, and human well-being (GreenInfo Network, 2016). Data from the national Recreational Information Database has already been integrated with the PAD-US and attributes such as entry points, facilities/amenities, activities, trail type and miles, and campsites can be independently added (GreenInfo Network, 2016). With standardized data sets and protocols the database is designed to be a living document that is updated by state stewards, national agencies, and other partners as conditions change (GreenInfo Network, 2016).

Sources of Information on Recreation Demand

Systematic methods for collection of recreation demand information from government institutions include; the USFS National Visitor Use Monitoring (NVUM) protocol and National Survey of Recreation and the Environment (NSRE), the USFWS's National Survey of Fishing, Hunting, and Wildlife Associated Recreation (NSF-HWAR), the NPS Visitor Services Project (VSP), Socioeconomic Monitoring Program (SEM), Comprehensive Survey of the American Public (CSAP), Statewide Comprehensive Outdoor Recreation Plans (SCORP), and the private Outdoor Industry Association's Outdoor Participation Report. Other important demand information sources are state agency initiatives and local site-specific studies. Each of these collect data on

Table 2
Sources of Recreation Demand

Survey (Agency)	Land studied	Population sampled	Method	Level of generalizability	Social science data	Data availability/ Reports	Approximate frequency
National Visitor Use Monitoring (NVUM-USFS)	USFS	Visitors	Exit interviews	National system Regional Individual unit	Activities Satisfaction Economics Settings visited Demographics	National system Regional Multiple units Individual unit	National & regional results every year Unit results every 5 years
National Survey of Recreation and the Environment (NSRE-USFS & multiple agencies)	None	General public	Phone Survey	National State Regions	Activities Attitudes Policy Demographics	National State	1960 - 2014 Annual rotation
National Survey of Fishing, Hunting, and Wildlife Associated Recreation (NSFHWAR-USF&WS)	FWS	General public	Phone Survey	National State	Activities Economics Public/private land Demographics	National	Every 5 years State level analysis ended in 2011
Visitor Survey Project (VSP-NPS)	NPS	Visitors	Hand-out mail back survey	Individual unit	Trip Characteristics Experience Evaluations Visitor Characteristics & Demographics	Unit	1982 - 2014
Socioeconomic Monitoring Program (SEM-NPS)	Individual NPS units	Visitors	Tablet-based front end questions with mail back survey	Individual unit Regional & national-level aggregate results	Trip Characteristics Experience Evaluations Visitor Characteristics & Demographics	Unit	Begins 2022 Annual rotation by park strata at 24 parks/year
Comprehensive Survey of the American Public (CSAP-NPS)	NPS lands Local communities	Visitors General public	Telephone survey	National Parks	Visitation Activities & leisure pursuits Attitudes on policies Demographics	Unit Policy	2002, 2008-9, & 2018
Statewide Comprehensive Outdoor Recreation Plan (SCORP-NPS/LWCE)	All recreation lands in state	Variable	Variable	State	Supply Participation Needs & issues	State	5 years
OIA (Industry)	None	General Public	On-line panel survey	National State	Participation Economic Distance Demographics	National State activity	Annual
State agencies	State lands	Visitors Activity groups	Surveys Variable	Site Agency lands	Participation Economic Variable	State Unit	Variable
Site	Specific unit	Visitors	Surveys Cards	Site	Participation Economic Variable	Site	Variable

participation in and demand for a variety of activities, but with different emphases, methods, samples, and protocols (Table 2).

Each survey has many strengths and provides useful information based on their intended goals. However, the data sets are largely incompatible and not designed to integrate supply and demand information across opportunity settings. These data collection tools are outlined to demonstrate that a new data collection approach may help to fill data gaps critical for planning and management. We are not suggesting that these surveys be discontinued.

U.S. Forest Service (NVUM and NSRE)

The National Visitor Use Monitoring (NVUM) program is a systematic study of recreation demand initiated in 2000 to assess recreation activities and use patterns on national forests and grasslands managed by the USFS. It was designed to be more systematic, generalizable, cost effective and reliable than the previous inventory system, while gathering data on use levels, length of stay, travel distance, activity participation, satisfaction, expenditures, crowding and demographics (English et al., 2002). The NVUM uses on-site intercept surveys of current visitors. A number of studies have used those data to estimate demand for USFS recreation, often for individual activities (e.g. biking or water activities) or specific land use types (e.g., Wilderness) (English et al., 2019). Sampling and estimates are stratified by land use types (wilderness, general forest, developed day use sites, developed overnight sites) that allow for nationally consistent estimates to be made at the forest, region, and national levels. However, the NVUM only collects data from visitors to USFS lands and was not intended as an indicator of demand for recreation on other lands or by the general public.

Until 2014, the National Survey of Recreation and the Environment (NSRE) was the primary recreation data collection tool for the USFS at the national level. It evolved from an earlier National Recreation Survey that began in 1960, with the first NSRE being conducted in 1994-95. The NSRE used telephone interviews to gather information from a representative national sample about participation in outdoor recreation activities over a year (81,000 phone interviews for the 2000-2004 assessment). Sampling intensity was sufficient to allow for national, state, and regional analysis (and 150 sub-state local areas) (Cordell, 2004). A long list of activities was investigated (80+) to gather overall participation rates, number of days of participation, general type of setting and trail use, and participation in different states. State-by-state comparisons were presented along with demographic and regional comparisons, providing some of the best data on long-term trends in recreation activity participation at these levels (Cordell, 2004; Cordell et al., 1999).

The NSRE's primary focus on recreation activity participation provided information on recreation trends, but the absence of links to specific forests, parks, or other protected areas limited applicability at the site level. Additional intermittent modules included attitudes and beliefs about forest management, environmental concern, and management preferences regarding recreation, wilderness, and natural resources use. Some individual questions pertained to production ecosystem services such as timber, grazing, and mining while others matched functional ecosystem services such as protecting streams and other sources of clean water and protecting ecosystems and wildlife habitat (USDA Forest Service, 2021). Data from this survey were frequently used for the demand analysis for state level SCORPs. The NSRE was discontinued in 2014 due to the retirement of the director and lack of future budget allocations (Personal

Communication with Gary Green, UGA, June 2021) and the Agency's decision to not pursue renewal of the OMB collection approval.

U.S. Fish and Wildlife Service

Another national systematic source of recreation demand data collection, the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR), is conducted by the U.S. Fish and Wildlife Service (USF & WS, 2017). Beginning in 1955, this national survey has been administered approximately every five years and gathers information on participation in fishing, hunting and wildlife viewing on public and private lands. It also gathers detailed information about expenditures on equipment, trips, and time commitments for these activities. The data set has been an excellent source of long-term participation and expenditures in wildlife-related recreation. The 2006 survey consisted of telephone (or follow-up in-person) interviews with over 22,000 sportspersons and more than 11,000 wildlife viewers (USF&WS, 2007). A large sample and spatially distributed stratification methodologies allowed for rigorous state by state and regional comparisons and partitioning into multiple user and activity sub-groups for comparison (USF&WS, 2007). However, while differentiation of participation rates, activities and expenditures is made for the two general categories of public and private lands, the survey is not conducted in a way that could be applied to management of specific settings. Furthermore, the survey focuses only on wildlife related recreation and provides no information on other activities. Finally, sampling was greatly reduced for the 2016 report (no explanation given) allowing for analysis of national trends, but not sufficient for state reports and those have ceased to be developed (USF&WS, 2017).

National Park Service

The NPS Social Science Program has had multiple participation and demand collection programs. In addition to collecting regular in-park visitor counts, economic impact, and park performance information, major research efforts include the Visitor Services Project (VSP), a new in-park Socioeconomic Monitoring program (SEM), and the SCORP through the LWCF.

The Visitor Services Project was primarily a collaboration between the NPS and the University of Idaho Park Studies Unit. The data collection effort gathered information via survey methods on visitor trip characteristics, experience evaluations, and visitor characteristics (including demographics) tailored to inform specific management considerations at individual park units. The surveys were run at hundreds of park units from 1982-2014 but were ended due to changes in funding and program structure with the NPS Social Science Program.

The in-park Socioeconomic Monitoring program is designed to build on visitor use data and was pilot tested from 2014-2017 and will be initiated in 2022. A questionnaire was "designed to gather system-wide information at NPS units about visitor and trip characteristics, visitor spending in gateway communities, visitor perceptions of park experiences, visitor attitudes toward park management, and visitor satisfaction with park services and facilities" (Resource Systems Group, 2019, p. 2). Their goal is a single, system-wide program, with standardized instruments and protocols, that can be used to collect, consolidate, and distribute quality visitor trend data for NPS managers and gateway communities (Pettebone & Meldrum, 2018).

The Comprehensive Survey of the American Public (CSAP) is a regionally stratified nation-wide general-public (visitors and non-visitors) telephone survey conduct-

ed in 2000, 2008-9, and 2018. This survey gathers information on National Park visitation, activities, factors inhibiting visitation, perceptions of parks, and public attitudes toward policies and programs (Resource Systems Group (RSG) and Wyoming Survey and Analysis Center (WYSAC), 2019). These surveys are primarily focused on NPS lands and related policies.

Statewide Comprehensive Outdoor Recreation Plan

Another source of recreation demand information is the state SCORPs. The background of the SCORP, legislation, and requirements were discussed earlier under supply information. Some states collect their own recreation participation/demand data, while others have used a variety of sources including the state data from the NSRE and FHWR. While many SCORPs are of high quality, state comparisons are not possible due to differences in methods of data collection, participant selection, time frame of analysis, classification of activities and other methodological and reporting issues (Hall et al., 2009). There is the potential for SCORP studies to link supply and demand spatially at the state level; however, there is nothing systematic in the legislation or observed in a number of state reports that would indicate that this is taking place (Garber-Yonts, 2005). Furthermore, while there is language in the LWCF legislation to ensure accessibility to all citizens and provide recreation opportunities to address health and vitality of the public, there is no indication that these issues are addressed consistently or systematically across state demand studies.

Outdoor Industry Association

Another source of outdoor recreation data has been developed by the Outdoor Industry Association (OIA), a group of recreation companies representing outdoor gear, recreational vehicles, campground concessionaires, and others (Outdoor Industry Association, 2018). The OIA conducts research, works to further pro-recreation policies and promote sustainable businesses, provides recreation industry consumer information, and advocates for outdoor recreation and sports. The OIA uses panel samples representative of the U.S. population and conducts online surveys to gather their data. In 2018, they sampled 20,069 individuals across the US on outdoor participation rates, frequency of visitation, and travel distance. The OIA also reports a variety of economic information including expenditures, employment, and taxes generated through outdoor recreation. Reports feature data at the national and state level with trend data dating back to 2007 for a number of activities. They also work with a variety of recreation industry organizations and associations to develop specific interest reports (Outdoor Foundation, 2019). Data are presented at the state, regional, and national level, but local level (county) participation information are not presented. While reports can be contracted, the methods and data are not available publicly and methodological details are proprietary.

State Agency Studies

State-level demand studies are often conducted by state natural resource agencies (i.e., parks, forests, or wildlife refuges), mirroring those at the national level. Studies often focus on land ownership/units. State studies for individual recreation activities such as hunting, fishing, birding, or by species are frequently conducted wildlife management purposes. Surveys are often conducted of on-site visitors or of hunting and

fishing license holders. Participation, economic expenditures, setting, and management preferences are frequently examined. State level studies are also conducted by the land management or recreation agencies, tourism bureaus, local academics, consultants, or industry groups using a variety of methods. These are often ad hoc studies and are seldom longitudinal and unlikely to use consistent methods or protocols.

Site-Specific Studies

Finally, recreation demand can also come from individual site-level studies; these are for any individual unit whether it is run by a federal or state land agency, non-profit, or private industry. Many of these studies address both supply and demand for different recreation activities and settings specific to their site. This is a primary method used by managers to understand visitor use, demand, travel, costs, economic impact, and setting and management preferences for specific management units. These studies are opportunistic and may be conducted by research teams at neighboring universities and often represent the synergistic interests of a particular land manager and researchers. However, these studies are rarely coordinated across regions, states, or nationally, and they are generally not longitudinal. Additionally, many of these studies only survey current visitors and miss public demand and displaced recreationists. Therefore, regional-scale information and long-term trends matching recreation opportunity setting supplies to demand is not available through these sources.

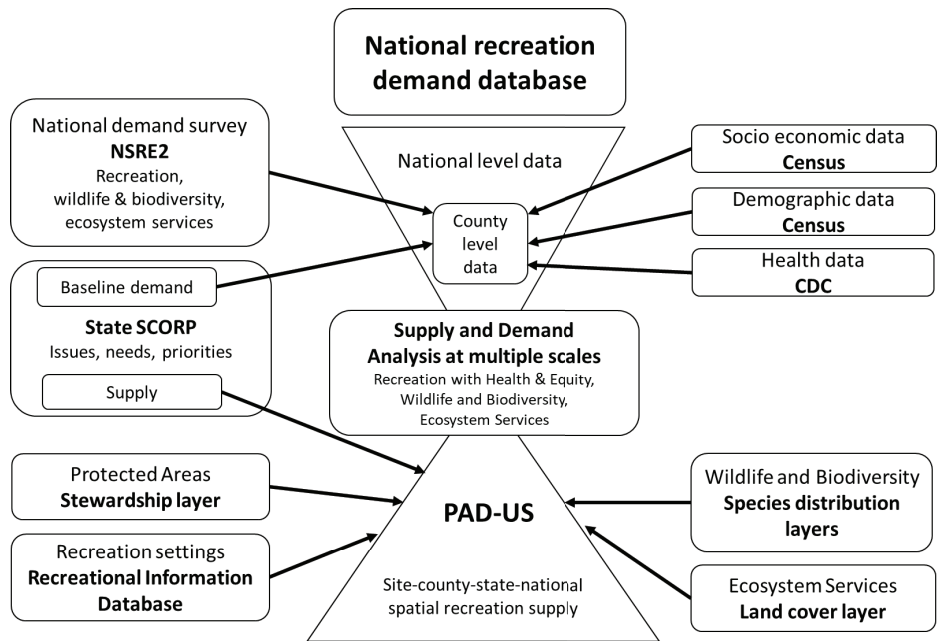
Linking Recreation Supply and Demand for Improved Recreation Lands Planning

We have presented a review of the many efforts to collect demand information for outdoor recreation conducted by the various agencies. The data sets are largely incompatible, conducted with different metrics and methodologies, spatially incongruent, and do not address the demand for the full system of lands and waters that provide recreation opportunities. With the exception of the NSRE and CSAP, the remaining state and federal studies are of current users (on-site visitor studies) and do not capture the interests of the general public. None of these studies systematically address equity in access, public health, or demand for wildlife and biodiversity conservation and the provision of ecosystem services identified as critical for the future of sustainable recreation planning and management. None of these studies provides publicly available data.

Outdoor recreation land management would benefit from a more systemic and holistic outlook on the benefits of recreation and recreation lands. Following lessons learned in the development of the PAD-US, we identify opportunities to coordinate, standardize, and systematize the collection of recreation supply and demand data to be useful for all agencies, across ownerships, and scales. A national, publicly available recreation demand database that mirrors the PAD-US model could be developed to provide a standardized data set with consistent protocols and data collection methodologies. Such a demand database could serve as a comprehensive and authoritative inventory of demand for recreation lands and waters across all jurisdictions that land managers and industry could rely on (Figure 1).

As most recreation occurs near the home (Outdoor Foundation, 2019), it is important to understand the socio-spatial context of where recreation opportunities are located. Collecting county-level data (in contrast to state-level) allows for analysis at the more variable local-level and the ability to hierarchically aggregate the data within or across state lines and up to the national-level. A collaboration between the US Census and the CDC for information on county-level socioeconomic, demographic, and

Figure 1
Components of a National Recreation Demand Database



health data would allow analysis of equity, access, and human health. The gaps identified above suggest the need for a new, more holistic national recreation survey, referred to here as “NSRE2,” to collect information on recreation demand as well as demand for wildlife and biodiversity conservation and ecosystem services. The PAD-US model features state-level collaboration on supply data. Similarly, by standardizing a baseline demand portion of all states’ SCORPs with the NSRE2 and collaborating with state partners to provide consistent and updatable data to a national recreation database, the integration of supply and demand data can be achieved (Figure 1).

Coordination among Agencies, State, and Private Partners

Coordination among federal agencies and other partners for recreation demand information could be designed parallel to the Federal Geographic Data Committee Federal Lands Working Group for the PAD-US (GreenInfo Network, 2016) and consistent with other interagency standardization initiatives such as the Interagency Visitor Use Management Council (IVUMC, 2019) and the Federal Recreation Council (whose goals are to improve visitor information and enhance the visibility of the benefits of outdoor recreation). Collaboration on the demand data collection strategy would ensure that the needs of multiple agencies and partners are being considered and would facilitate the development of consistent and commensurable datasets. Specific coordination for developing SCORP would ensure consistency of state demand datasets. Again, the PAD-US system that emphasizes direct collaboration with states and the use of state-wide partners, suggests a potential implementation system that could be emulated. Partnering with the Centers for Disease Control and Prevention and the US

Census would ensure access to current health and demographic information. Similar to PAD-US, other partners would include NGOs, industry, and professional organizations.

A National Recreation Demand Database Research Unit

The NSRE was historically funded by multiple federal agencies, led by the USFS Southern Research Station, and housed and in collaboration with the University of Georgia. The NSRE was part of the USFS renewable resource assessments (for analysis of use, demand, and supply of renewable resources) that is required under the Forest and Rangeland Renewable Resources Planning Act of 1974 and as amended in 1976 (RPA) (Cordell, 2004). This collaborative approach proved successful for the NSRE and led to widespread distribution of data. A similar collaborative research unit could be established with a federal land management agency and a university partner and designed to; build and maintain a publicly available national database, administer a national survey (NSRE2), incorporate state SCORP demand data, prepare demand reports, and coordinate with federal, state, nonprofit, and industry partners. Universal supply and demand data collection strategies can be hampered by funding restrictions on agencies that must demonstrate that research efforts are focused solely within their specific agency purview. The 2012 Forest Service Planning Rule on ecosystem services could further justify the expanded scope of a research unit. Given the broad utility of this more comprehensive database and public availability, collaborative financial support by agencies and partners (federal land agencies, health agencies, conservation organizations, and private industry) could help to ensure that development and maintenance costs remain manageable and issues of equity and health can be addressed.

Spatial Context Information Needs

Sociodemographic and Health Data

Strategic partnerships with the U.S. Census, the CDC, and other health and social service agencies could ensure rigorous data to address equity of access and health and vitality for all citizens as specifically mentioned in the LWCF legislation. County-level socio-demographic data can be acquired from the U.S. Census. Similarly, county level health data from the CDC could be collected on indicators most relevant to outdoor recreation such as rates of physical activity, obesity, type 2 diabetes, heart disease, and mental health (CDC, 2010; Larson et al., 2016). Some state SCORPs, such as Oregon, have collected county-level data and have developed new health metrics in association with recreation participation (Rosenberger & Dunn, 2018). To address racial and socioeconomic equity concerns, California developed a spatial tool to examine park availability down to the neighborhood level for their 2015 and 2021 SCORPs (California Department of Parks and Recreation: Office of Grants and Local Services, 2021; GreenInfo Network, 2021). Both sociodemographic and health data sets would enhance the value and utility of a national recreation demand database providing the information to directly analyze recreation opportunities in a nuanced local context for health and equity.

Providing the Direct Link to Local Recreation Opportunity Settings

The PAD-US system can be used to assess all available protected area recreation opportunities within a county, state, or any hierarchical aggregation from the national database. As the PAD-US completes its municipal park portion of the database, analy-

sis of access to recreation opportunities will be more comprehensive and localized. The updated PAD-US 2.1 released this year has already included many of these (USGS, 2021b). The PAD-US has already incorporated the Recreational Information Database to provide detailed setting information on recreation facilities and amenities that drives Recreation.gov, the national outdoor recreation and cultural site trip planning and reservations system (GreenInfo Network, 2016). These data can be used to understand how our current system of recreation opportunities serves the public and to identify both gaps and new opportunities.

Wildlife, Biodiversity, and Ecosystem Services

The spatial supply of wildlife and biodiversity conservation and the provision of ecosystems services can be developed from the PAD-US. Wildlife habitat and biodiversity conservation was the central focus of the original GAP program. The 2012 Forest Service Planning Rule requires ecosystem services be addressed in planning documents (Jaworski et al., 2018) and the land cover data layer from the PAD-US can be used to assess a variety of ecosystem services from protected areas. Therefore, the supply of wildlife and biodiversity habitat conservation and other ecosystem services can be evaluated regarding equity in access and health benefits from of a system of recreation lands (Figure 1).

Demand information needs

While we have seen coordination and systemization of data collection and a consolidation of supply information in the PAD-US, we have seen no similar actions for demand data. A new, holistic NSRE2 that includes health and social justice data, along with a baseline demand section of state SCORPs could provide the initial contributions to a consistent and authoritative national recreation demand database.

A New National Survey of Recreation and the Environment (NSRE2)

We suggest that the former NSRE provides a solid foundation for developing the demand assessment tool because it 1) was the only longitudinal data collection program covering a wide variety (80+) of recreation activities, 2) provided data at the state and national levels, 3) was used in some SCORP, and 4) had questions regarding biodiversity and wildlife and ecosystem services. A new national survey (NSRE2) founded on the NSRE will allow comparisons to earlier data sets, while creating new questions to meet current needs. Moreover, demand data collected at the county level would allow for comparison to local socio-demographic and health information.

Demand for Wildlife and Biodiversity Conservation and Ecosystem Services

Systems perspectives on outdoor recreation help us to recognize other ways that recreation lands contribute to human well-being such as wildlife and biodiversity conservation and the provision of ecosystem services (Blahna, Cervený, et al., 2020; Morse, 2020). Wildlife Value Orientation scales (measuring groups of values and basic beliefs about wildlife) are well established and have been used to identify and predict a person's policy, issue, and protected area management preferences (Manfredo et al., 2018). Surveys on ecosystem services have been developed with multiple indicator items for biodiversity, regulating, production, and cultural services (Asah & Blahna, 2020) and specifically for addressing the USFS 2012 planning rule regarding ecosystem services (Jaworski et al., 2018). Assessing demand for ecosystem services is consistent with fed-

eral mandates that agencies have adopted for planning (Kline et al., 2013) and currently there are no systematic demand studies on these issues. These surveys and scales and others identifying public attitudes and connections with nature such as the Nature of Americans report (Kellert et al., 2017) are key sources for developing measures of demand for wildlife and biodiversity conservation and ecosystem services for a new NSRE2.

Standardized National Demand Survey with a Baseline State-Level SCORP

Similar to the PAD-US working with state partners to develop consistent supply datasets on SCORP, a new national demand survey (NSRE2) that is standardized with state SCORPs could provide consistent and updatable demand data (Figure 1). A baseline demand section of the SCORP could be developed commensurate with a national demand survey and applied by all states in their planning process. The baseline demand section could be designed to systematically assess recreation demand without replacing or imposing on other aspects of individual state SCORPs. State-level SCORPs would retain the flexibility to address individual state needs, through demand data or otherwise. This would need to be developed in collaboration with the Federal Recreation Council, National Park Service, and LWCF administrators.

Timing of Surveys

SCORP are legislated to be conducted every 5 years. Previously, the NSRE was collected at approximately five-year intervals and provided demand data used by some state's SCORPs. The NARRP report (2011) recommended that federal agencies directly collaborate with states on SCORPs and that they be conducted every 10 years, but with a more rigorous planning effort (NARRP, 2011). Coordination of the surveys on 5- or 10-year cycles with consistent data collection tools, methodologies and protocols would ensure rigorous, consistent, and reliable information for an updatable multi-level (county-state-national) database. This directly parallels the PAD-US model leveraging state partners to collect consistent supply data that is updated regularly (GreenInfo Network, 2016).

Data Analysis and Utility

A complete national recreation demand database would include the social context data (demographic, socioeconomic, and health), and demand data (for recreation activities, wildlife and biodiversity conservation, and ecosystem services) at the county level. This data could be linked with the PAD-US supply data that can be assessed at any aggregation. In this way, analyses can explore recreation supply and demand and can examine issues of equity and health with a higher level of precision (county instead of state). Similarly, supply and demand for wildlife and biodiversity conservation and ecosystem services can be assessed together with equity, social justice, and health (Figure 1). With consistent county-level data nationally, any hierarchical aggregation at or above the county level could be conducted (county, multiple counties within or across state lines, state, etc.). Data maintained in the national recreation demand databased could be made publicly available on-line for transparency and for ease of access and use by managers, researchers, and industry to address issues most important to them.

Conclusion

In August of 2020, Great American Outdoors Act (GAOA) was passed that established permanent funding for the Land and Water Conservation Fund (LWCF) and established the National Parks and Public Land Legacy Restoration Fund (NPPLRF) that provides the funding for many future recreation projects and backlogged maintenance (National Park Service, 2021a). This legislation provides an opportunity to consider ways to explore how we might consolidate, integrate, and coordinate efforts to gather outdoor recreation data across agencies and levels for greater understanding of the benefits of recreation lands to all people (Blahna et al. this issue, Commentary). The Resource Planning Act (1976) and the USFS 2012 Planning Rule requires analysis of use, demand, and supply of renewable resources now including consideration of key ecosystem services. Directly integrating health, equity, and conservation as critical element of recreation research should broaden the constituencies interested and involved in supporting and using the data outlined in this paper.

We believe a holistic systems approach would better link local recreation supply and demand opportunities, assess recreation supply and demand with health and equity data, and gauge supply and demand for wildlife and biodiversity conservation and ecosystem services on recreation lands. Our assessment of national and state level surveys suggest that a national recreation demand database could move beyond the many visitor use studies to fill an important gap in information of value across government agencies and partners. The PAD-US spatial database provides a useful model for considering how this program could be designed and implemented. A new holistic national survey could collect data on demand for recreation, demand for wildlife and biodiversity conservation, and demand for ecosystem services. The inclusion of county level data could more directly link supply and demand and better address equity in access and contributions to human health at the local level. A baseline demand portion of state SCORP could contribute to a consistent and standardized national recreation database for a living document. A national recreation demand database could be the official standardized demand data set with consistent protocols for data collection. The data collection strategy we have outlined could provide all recreation land managers consistent, comprehensive, and authoritative data on local and regional recreation demand. It could facilitate recreation management, promote conservation, health, and accessibility, and provide a more holistic understanding of the many ways recreation lands contribute to our well-being.

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