



Estimating the Economic Benefits of Recreational Visitation to Federally-Managed Lands

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1. INTRODUCTION

Federal lands and waters provide recreational opportunities to millions of visitors every year (Exhibit 1.1). These include areas managed by the Department of the Interior’s National Park Service (NPS), Bureau of Land Management (BLM), Fish and Wildlife Service (USFWS), and Bureau of Reclamation (Reclamation); the Department of Agriculture’s Forest Service (USFS); as well as the Department of Defense’s Army Corps of Engineers (USACE) (hereafter referred to as “federal land management agencies”). Approximately 875 million visits were made to lands managed by federal land management agencies last year. Given the diversity of public lands, visitors can enjoy a range of unique recreation experiences.

EXHIBIT 1.1. 2016 RECREATION VISITATION BY AGENCY¹

| AGENCY | RECREATION VISITATION ESTIMATE (IN MILLIONS) |
|---------------------------|--|
| National Park Service | 331 |
| Bureau of Land Management | 65 |
| Fish and Wildlife Service | 50 |
| Bureau of Reclamation | 30 |
| Forest Service | 149 |
| Army Corps of Engineers | 250 |
| Total | 875 |

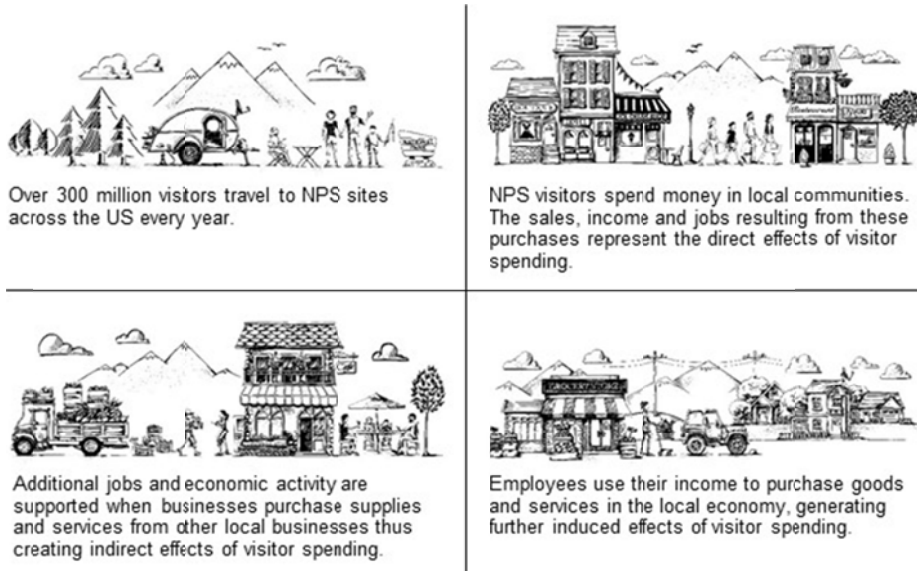
Individual recreationists, local communities, and businesses derive significant benefits from the experiences and economic activity associated with trips to public lands.² These benefits may include the economic value, or improved wellbeing gained by the recreationists themselves, as well as spending by recreationists that contributes to the economic health of communities. These categories are referred to as “**economic value**” and “**regional economic contributions**”.

¹ All visitation estimates are for the 2016 calendar year with the exception of the USFS, which is an annual estimate for the 2011-2015 period. Sources: Cullinane Thomas and Koontz (2017); BLM’s Recreation Management Information System; USFWS’s Refuge Annual Performance Plan database; Reclamation’s Recreation Use Data Report database; USFS (2016a); and Kathleen Perales, personal communication, February 2017.

² We use the term “benefit” in the general sense (i.e., providing something advantageous to individuals or the broader economy), not in the narrow sense of a cost-benefit analysis.

- **Economic value** is the difference between the maximum amount a recreationist would be willing to pay to participate in a recreation activity and the actual cost of participating in that activity. This is often referred to by economists as *consumer surplus* or *net economic value*. Put simply, this is the value of a trip to an individual after all expenses have been paid. For example, if a recreationist is willing to pay \$105 to visit a national park, but only incurs \$75 of expenses to visit that park, she receives \$30 of value from her trip.
- **Regional economic contributions** include economic activity within a specified geography (e.g., community, region, state, nation) supported by expenditures in gateway communities to public lands for recreation visitation. The contributions are often measured in terms of sales (spending), jobs, income, and value added, though other measures may be used (see Chapter 4). Suppose a recreationist spends \$75 on gas, food, and other supplies to visit a national park. Her expenditures in the local region affect the businesses from which she buys goods and services for her trip (“direct effects”). In turn, these businesses make purchases from other firms in the region to support their operations, and employees of these firms make additional purchases with their wages (“secondary effects”) (Exhibit 1.2).³ The summation of direct and secondary effects provides the total economic contributions to the region.

EXHIBIT 1.2. ECONOMIC CONTRIBUTIONS FROM VISITATION TO NATIONAL PARK SITES (ILLUSTRATION)⁴



Federal land management agencies require accurate estimates of recreation benefits for lands under their jurisdiction. These estimates are used to develop plans for transportation

³ Secondary effects are divided into spending by businesses (indirect effects) and by employees of those businesses (induced effects).

⁴ Illustration from Cullinane Thomas and Koontz (2017).

and infrastructure projects, make informed decisions regarding policies that potentially impact visitors, conduct natural resource damage assessments, meet agency reporting requirements, and efficiently allocate scarce resources across sites. Businesses, local governments, and other planning agencies located near federal lands also have an interest in these estimates for operations planning and scaling. Finally, researchers and academics use the estimates and underlying data to conduct research on a wide array of topics related to visitation.

Exhibit 1.3 summarizes the benefits produced by recreation visitation to federal lands in 2016. Only the USFS and USACE have recently estimated the aggregate economic value provided by their lands to recreationists.⁵ The total economic contributions across all six agencies were \$45.3 billion in spending, 752,821 jobs, \$31.1 billion in labor income, \$51.9 billion in value added, and \$95.1 billion in economic output. The two benefit categories are not additive (nor are the different measures of economic contributions). Instead, economic value and regional economic contributions represent different measures of benefits to individuals and communities from recreation on federal lands.

EXHIBIT 1.3. 2016 BENEFITS OF RECREATION VISITATION BY AGENCY⁶

| AGENCY | ECONOMIC VALUE TO RECREATIONISTS (BILLIONS) | ECONOMIC CONTRIBUTIONS (DOLLARS IN BILLIONS) | | | | |
|---------------------------|---|--|----------------|---------------|---------------|-----------------|
| | | SPENDING | JOBS | LABOR INCOME | VALUE ADDED | ECONOMIC OUTPUT |
| National Park Service | Not quantified | \$18.4 | 318,150 | \$12.0 | \$19.9 | \$34.9 |
| Bureau of Land Management | Not quantified | \$3.3 | 48,139 | \$2.1 | \$3.6 | \$6.7 |
| Fish and Wildlife Service | Not quantified | \$2.2 | 36,720 | \$1.6 | \$2.8 | \$5.1 |
| Bureau of Reclamation | Not quantified | \$1.4 | 23,368 | \$1.0 | \$1.8 | \$3.2 |
| Forest Service | \$14.4 | \$9.3 | 146,444 | \$6.3 | \$10.6 | \$19.5 |
| Army Corps of Engineers | \$2.0 | \$10.7 | 180,000 | \$8.1 | \$13.2 | \$25.7 |
| Total | Not quantified | \$45.3 | 752,821 | \$31.1 | \$51.9 | \$95.1 |

⁵ A recent study estimated the total value of NPS units (Haeefele et al., 2016), including non-use values, but these estimates are broader than values specifically for recreation use.

⁶ All estimates are for 2016, except the USACE *economic value* estimate, which is for 2015 (the latest year available). The economic value estimates are equivalent to consumer surplus. Economic contribution metrics are defined in Chapter 4. Sources: Cullinane Thomas and Koontz (2017); DOI (2017) draft statistics; Eric White, personal communication, June 2017; Susan Winter, personal communication, September 2017; USACE (2017); and Wen-Huei Chang, personal communication, August 2017.

PURPOSE AND OUTLINE OF REPORT

This report describes the range of available methodologies to estimate benefits provided by recreational use of federal lands. We highlight recent work by expert practitioners and summarize approaches currently used by federal land management agencies. We also provide a series of recommendations for improving the data and methods used by agencies.

Chapter 2 provides additional background on economic value and regional economic contributions. We use a demand curve illustration to describe how the two benefit measures flow from recreation visitation.

Chapter 3 summarizes methods for estimating the economic value of recreation. We review the travel cost method, stated preference methods, the hedonic pricing method, and benefits transfer.

Chapter 4 summarizes how regional economic contributions from visitation are measured. We review how to identify visitor spending, apply regional economic multipliers, and report the results.

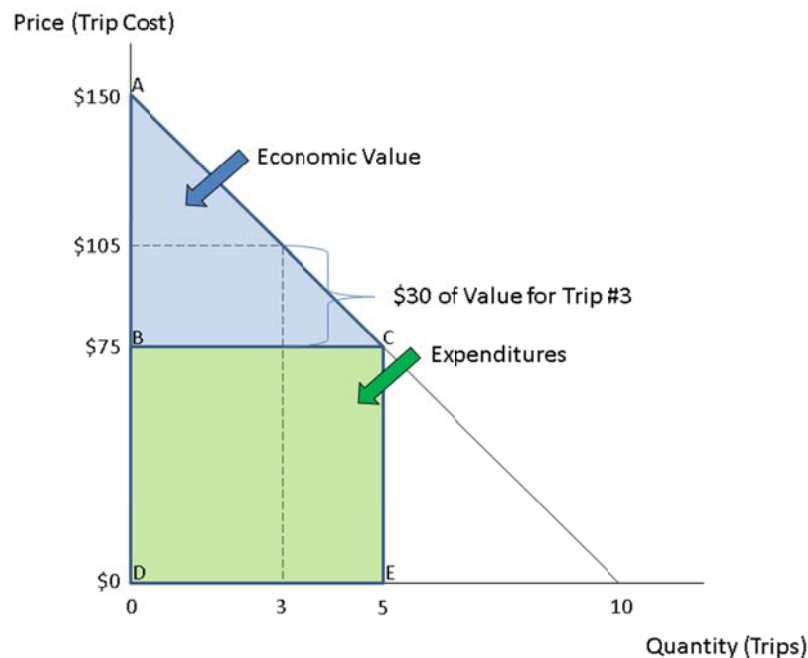
Chapter 5 focuses on federal agency data sources and methods. For each of the six agencies, we describe the methods currently used to estimate the benefits of recreation. The chapter also compares and contrasts the methods across agencies.

Chapter 6 provides a series of recommendations for improving agency data and methods, as well as the accessibility of benefit estimates. Specifically, the recommendations focus on: (1) improving estimates of visitation; (2) improving expenditure and visitor characteristics data collection; (3) applying best practices for benefits transfer; (4) guidance on when to conduct primary valuation studies; (5) raising the profile of estimating economic values for recreation; (6) enhancing inter-agency collaboration; (7) developing guidance documents for agency personnel on estimating recreation benefits; and (8) making the latest benefit estimates publicly-accessible and harmonizing how reporting is done across agencies.

2. OVERVIEW OF ECONOMIC VALUE AND REGIONAL ECONOMIC CONTRIBUTIONS

This chapter provides an overview of the two categories of benefits—economic value and regional economic contributions—and illustrates how these benefits flow from recreation visitation. Exhibit 2.1 shows an individual recreationist’s demand curve for trips to a federal recreation area, where the quantity of trips demanded is a function of the price.⁷ At a price of \$150 or greater, the recreationist will not take any trips (this is called the “choke price”). At a price of \$0, the recreationist will take 10 trips.

EXHIBIT 2.1. A RECREATIONIST’S DEMAND CURVE FOR TRIPS TO A FEDERAL RECREATION AREA⁸



ECONOMIC VALUE

Economic value is the difference between an individual’s maximum willingness-to-pay for recreation trips to a federal recreation area (i.e., the demand curve) and what is

⁷ The demand curve in Exhibit 2.1 is presented for an individual to simplify the illustration of economic benefits. An aggregate demand curve, which is the horizontal summation of all individual demand curves, would be used to estimate the aggregate economic value and expenditures.

⁸ Since an individual can only take whole numbers of trips, this demand curve would actually be a step function. However, we present a conventional linear approximation of the demand curve for simplicity.

actually paid.⁹ In Exhibit 2.1, the recreationist faces a cost of \$75 for each trip. The recreationist's willingness-to-pay for each additional trip is declining, resulting in the downward slope of the demand curve. This is consistent with economic theory, which says that most goods and services become less valuable at the margin (or provide less marginal satisfaction to the consumer) as more of them are consumed. Since the price for each trip is constant, but the willingness-to-pay declines with each additional visit, the recreationist receives the most value from the first trip taken. For that first trip, the recreationist is willing to pay a maximum of \$150 but the trip only costs \$75, thus providing \$75 in economic value, or "consumer surplus" ($\$75 = \$150 - \$75$). By the third trip, the recreationist is willing to pay only \$105 dollars for an additional trip. That third trip still costs \$75, however, so it provides only \$30 in economic value ($\$30 = \$105 - \75). After taking five trips, the willingness-to-pay for an additional trip is less than the cost (i.e., the trip provides no marginal value), so no additional trips are taken. The blue-shaded triangle (area represented by ABC) represents the value that accrues to the individual from taking trips to the recreation area above and beyond what they have paid for the trip.

REGIONAL ECONOMIC CONTRIBUTIONS

The green-shaded rectangle (area BCDE in Exhibit 2.1) represents the total expenditures associated with trips to the recreation area, including entry fees, travel costs, equipment, food, and lodging. There are two types of regional economic effects resulting from these expenditures: direct effects and secondary effects. Further, secondary effects are divided into indirect and induced effects. Definitions for these terms are provided in Exhibit 2.2 (see Exhibit 1.2 for an illustration of these effects).

EXHIBIT 2.2. TYPES OF REGIONAL ECONOMIC EFFECTS

| | |
|--------------------------|---|
| Direct Effects | Direct effects are the results of the money initially spent in the study region by recreationists. This spending supports sales, income, and jobs for the businesses directly selling goods or services to recreationists. |
| Secondary Effects | The summation of indirect and induced effects (defined below). |
| <i>Indirect Effects</i> | Indirect effects are generated when businesses selling goods or services to recreationists make purchases from support industries that supply them. In turn, the supporting businesses make purchases from firms that support them, and so on. |
| <i>Induced Effects</i> | Spending by recreationists and businesses supports an increase in income for employees of directly or indirectly affected businesses. These employees spend some of their additional income at local businesses, which generates induced effects. |

In considering regional economic contributions, analysts exclude expenditures that occur outside a region of interest (e.g., White and Goodding, 2015; Carver and Caudill, 2013).

⁹ Economic value is referred to by economists as *consumer surplus* or *net economic value*.

Further, durable goods, such as a camera or fishing boat, are also usually excluded because they might be used across a number of trips and perhaps for non-recreational purposes (e.g., White, 2017; Kasul et al., 2010).¹⁰ Given these considerations, total direct spending includes more of the green rectangle in Exhibit 2.1 when the region of analysis is large and expenditures on durable goods are low. The green rectangle (and the figure more broadly) does not include any secondary effects, including spending by businesses or their employees, nor does it capture contributions to jobs, income, and other metrics of interest. These effects stem from the initial spending on recreation, but are difficult to capture in a simple illustration.

¹⁰ These issues are revisited in Chapter 4 along with a broader summary of how regional economic contributions are measured.

3. METHODS USED TO MEASURE ECONOMIC VALUE

This chapter reviews the range of methodologies available for estimating the economic value of recreation, including the travel cost method, stated preference methods, the hedonic pricing method, and benefits transfer. All of these methods have been approved for use in recent agency guidance documents (DOI, 2015; USACE, 2016a) to support policy analyses, natural resource damage assessments, meet National Environmental Policy Act (NEPA) requirements, and meet other agency reporting requirements. While our summary of each method is brief, additional detail on these approaches can be found elsewhere (e.g., Freeman et al., 2014; Champ et al., 2017).

3.1 TRAVEL COST METHOD

The travel cost method is a “revealed preference” valuation methodology, as individuals reveal the value of recreation trips through decisions about where and how often to recreate. The cost of traveling from an individual’s home to a recreation site can be viewed as the price of access to that site. Using data on the number of trips taken at various price levels, a demand curve can be estimated that reflects each individual’s total willingness-to-pay for access to a site. The difference between this gross willingness-to-pay and the actual trip cost represents economic value, or consumer surplus, derived from the trip (refer to Exhibit 2.1).

Travel cost models have evolved over time (Parsons, 2017). The original models were primarily single-site zonal models, relating population trip rates to the cost of traveling to a recreation site from different zones (e.g., zip codes) and controlling for relevant demographic characteristics (e.g., Hellerstein, 1991; Hellerstein and Mendelsohn, 1993). Individual travel cost models relaxed the assumption of uniform demographics and travel costs by zone by estimating models using individual-level data. Further, models incorporating multiple sites have allowed analysts to understand how variation in site characteristics and prices of substitutes affect visitation to sites of interest (e.g., Bowker et al., 2009). The current state-of-the-art, multiple-site travel cost method is the random utility model (RUM), which can be used to value site access and changes in site quality (Haab and McConnell, 2003). RUMs use individual-level trip data to model trip frequency and site choice.

Travel cost models work well for recreation sites with a regional or national draw, but may be hampered by a lack of variation in travel costs and number of trips demanded for some local sites (e.g., a small urban park). Other challenges with the method include how to apportion travel costs for multiple-purpose (or multiple-day) trips, assigning a value to travel time, and ensuring accurate reporting of trip-level data by minimizing recall error and non-response bias (U.S. EPA, 2014; English et al., 2015; Groves, 2006; Chu et al.,

1992). Nonetheless, the travel cost method is perhaps the most-widely applied primary research method for natural resource damage assessments, one of the most contentious contexts for recreation use valuation (see English et al., 2009)

3.2 STATED PREFERENCE METHODS

Stated preference methods derive their name from the fact that they involve an analysis of hypothetical – as opposed to actual – choices by survey respondents. Commonly used stated preference methods include contingent valuation and choice experiments.

Contingent valuation studies present respondents with a scenario describing a program or policy where provision of the good or service is contingent upon payment, typically in a referendum format. For example, a recreationist might be asked on a survey if she would be willing to pay a specified amount to continue accessing a public recreation area.

Choice experiments are a variation of this method used to infer values based on the trade-offs survey respondents make among two or more hypothetical choices. The choice set usually includes variation in key resource attributes (e.g., miles of hiking trails, presence of a boat ramp) and a cost variable, which is used in the analysis to value the attributes.

The primary strength of stated preference methods is the ability to value sites or site attributes that do not currently exist. For example, one could evaluate how recreation levels and associated values would be affected by dam removal at a set of USACE sites. In this case, actual behavior at the affected sites in response to the change could not be observed and used to evaluate these questions. This is because the dams currently exist at the sites of interest and a significant amount of time has passed since their construction. Another strength of stated preference methods is that they can be used to elicit nonuse values (e.g., option, existence, and bequest values), though these values are beyond the scope of estimating the benefits of recreation trips.

The primary challenge with these methods is to carefully develop surveys that convey realistic scenarios, reduce hypothetical “feel”, and isolate the valuation question of interest. Limitations of some stated preference applications include inadequate sensitivity to scope (i.e., willingness-to-pay does not statistically differ for small vs. large environmental improvements), scenario or payment vehicle rejection (i.e., respondents do not find the scenario or payment vehicle to be credible or reject the notion of having to pay for the good), ad-hoc treatment of outlier or problematic observations (e.g., a respondent offered to pay more than her income), and other issues (see MacFadden and Train, 2017 and Desvousges et al., 2015 for recent critiques). NOAA convened a “Blue Ribbon Panel” of experts on contingent valuation in 1993 (Arrow et al., 1993) that provided guidance on best practices for several known challenges with the method. More recent guidance on best practices is also available (Boyle, 2017; Holmes et al. 2017; Johnston et al., 2017).

3.3 HEDONIC PRICING METHOD

The hedonic pricing method is a “revealed preference” approach that uses market transactions (e.g., for real estate, cars, wages) to reveal values for specific attributes associated with a good. Property transaction data have been used extensively to estimate values for clean air, living near access to recreation or open space, and other amenities (Nelson, 2010; McConnell and Walls, 2005). The basic approach is to model the price of a good – in this case, land or residential property – as a function of its attributes, and to identify the contribution of a certain attribute to the price (Taylor, 2017; Horsch and Lewis, 2009; Paterson and Boyle, 2002).¹¹

The method requires a significant number of transactions to ensure sufficient variation in the attribute of interest. It can also be sensitive to model specification, including the selection of variables and functional form (e.g., Chay and Greenstone, 2005; Cropper et al., 1988). Perhaps its greatest limitation for the purpose of valuing recreation use is that it derives benefits for a narrow subset of potential users—namely, property owners living near a recreation site. Further, the measured benefit of access to recreation may include other values that are comingled with use benefits, such as the amenity value of living near a natural area.

3.4 BENEFITS TRANSFER

Benefits transfer entails the application of existing information (e.g., value estimates or a benefits equation) to a new context. The context may be the same location and resource of interest, but at a different time period. More commonly, the context is an entirely different location, resource, and time period. Benefits transfer is not a primary valuation approach. Instead it relies on previous studies that used a primary method, such as those discussed above. The main strength of benefits transfer is the cost and time savings of applying existing information. Guidance on best practices for the method focuses on the similarity of the good or service valued in the literature to the good or service being considered, and the overall quality of the original estimate (OMB, 2003; U.S. EPA, 2014; Johnston et al., 2015).

There are two broad types of transfers: unit value transfers and function transfers. A unit value transfer (also called the unit day value (UDV) approach) uses a single value or a measure of central tendency (e.g., median, mean) from a set of estimates. The value is usually adjusted to control for inflation between the original study year(s) and the year of application (e.g., using the Bureau of Labor Statistics’ Consumer Price Index (CPI)). Several compendiums have been developed to support value transfers (Rosenberger, 2016; USGS, 2017; Boyle et al., 1998), which organize estimates by activity, region, and other characteristics to help the analyst select the most applicable value(s).

¹¹ The hedonic travel cost method, a related but less-commonly applied method, reveals how much users are willing to pay for recreation site attributes using travel cost as the price of accessing a site (e.g., Brown and Mendelsohn, 1984; Pendleton and Mendelsohn, 2000).

A function transfer relies on a statistical relationship between the value and observable characteristics of the original study site or population. This relationship is used to predict the value for a new context using the same observable site and population characteristics. The function may be adopted from a single study or developed using the results and characteristics of several underlying studies (i.e., meta-analysis). Most existing guidance (e.g., U.S. EPA, 2014; Rosenberger, 2015) recommends the use of function transfers over unit value transfers to reduce error in estimates, though in practice, unit transfers are perhaps most-commonly applied. This is likely because a common set of characteristics need to be observable at the previously-studied sites and the new site of interest.

The key assumption made in any benefits transfer for recreation use is that the selected study (or studies) for transfer has valued the same recreational activity in a similar context. This includes characteristics of the resource, user population, and availability of substitute sites (English et al., 2009). Further, valuation is typically done for changes at the margin, but it is often assumed that values for marginal changes are applicable for valuing non-marginal changes (e.g., the elimination of a large federal recreation area). As Kaval and Loomis (2003) point out, this is a necessary and practical assumption needed for the application of benefits transfer. However, it is likely that the total value of recreation to all public lands is much greater than the sum of values for recreation to all lands individually.

Benefits transfer is the primary method used by federal land management agencies to estimate values associated with recreation. Accordingly, we review the methods and data sources used by each agency to conduct benefits transfers as part of Chapter 5.

4. MEASURING REGIONAL ECONOMIC CONTRIBUTIONS

This chapter describes the methods for measuring regional economic contributions of recreation visitation. Federal land management agencies routinely estimate economic contributions associated with current visitation to a specific unit or their entire system. Other applications might consider changes in recreation use from an alternative management scenario (e.g., opening a new campground at a reservoir).

Additional analyses related to economic contributions are being explored by the federal government. The Outdoor Recreation Satellite Account (ORSA) is being developed by the Bureau of Economic Analysis to identify economic activity associated with outdoor recreation in the U.S. economy. The ORSA will provide a broader perspective of the outdoor recreation economy compared to federal agency economic contribution estimates. While federal agency estimates only capture spending that occurs during visits to federal lands and waters, the ORSA will capture visitation to federal, state, and local public lands, as well as private lands. Further OSRA may include spending on other recreation-related purchases that are not included in agency contributions analyses. Prototype statistics for ORSA are currently being developed, but have not been finalized (for additional information, see <https://www.bea.gov/outdoor-recreation/>).

Regional economic contributions analysis starts by identifying the relevant quantity of recreation visits. Estimating the amount of (or change in) visitation is the most significant challenge federal land management agencies face in estimating the economic benefits of recreation. Since that topic is addressed in a separate report (see Leggett et al., 2017), the focus of this chapter is on the subsequent analysis steps: (1) identify visitor spending (2) apply regional economic multipliers to the spending, and (3) report the results. We discuss each of these steps in separate sections below.

4.1 IDENTIFYING VISITOR SPENDING

The first step is to estimate the expenditures associated with the recreation visitation of interest. While counts of visitation can be obtained largely through observation, visitor spending data are typically collected through surveys. These surveys can be time-consuming to administer and complete, require the respondent to recall details of purchases across several spending categories, must be based on statistically representative samples, and may require approval from the Office of Management and Budget (OMB).¹² Data from expenditure surveys are often highly skewed, contain outliers or contaminant observations, and have high variances (White and Goodding, 2015; Stynes and White,

¹² Under the Paperwork Reduction Act, OMB clearance is required for federally sponsored data collection efforts involving interviews with 10 individuals or more.

2006). The analyst must develop and apply a set of data cleaning rules to ensure data quality (White, 2017). For example, outlier spending amounts may be removed from the data prior to analysis, along with data associated with unusually large party sizes (e.g., greater than eight people) or unusually long trips (e.g., greater than 30 days) (White, 2017).

Expenditure data are typically collected across several categories to help improve resolution and accuracy. Separate estimates are collected for lodging, restaurants and bars, groceries, gas and oil, and other relevant categories. Purchases of equipment or other durable goods are usually excluded (e.g., White, 2017; Kasul et al., 2010). Categories are selected so that they line up well with sector-specific multipliers that are applied to the spending data (White, 2017). Finally, respondents are asked to only include spending within a certain distance of the recreation site (e.g., 30-60 miles) that is related to the recreation trip. Generally speaking, the region should be large enough to capture spending in all gateway communities around the recreation area.

Expenditures can vary across categories of user groups. For example, most overnight visitors spend significantly more than day users. Therefore, expenditure surveys typically include questions that can be used to allocate visitation data to specific visitor segments. The number of segments can be determined by the analyst, though there is a tradeoff between the number of segments chosen and the sample sizes for each segment. A greater number of segments may enhance specificity in the spending data applied to the segment, but smaller sample sizes can increase variance and ultimately lead to more error in the results.

A simple matrix of visitor segments might include local day users, local overnight visitors, non-local day users, and non-local overnight users. Survey questions can be used to determine if the respondent is local (i.e., lives in the region of interest) and is a day user or overnight visitor. Analysts must decide how to treat respondents that do not fit directly into one of the four categories above (e.g., a visitor staying with friends and not paying for lodging or a visitor whose primary purpose is not for recreation). A common approach is to handle such visitors separately (i.e., placing them in a segment called “Other”) and to apply spending characteristics associated with a local day user (e.g., White, 2017; Cullinane Thomas and Koontz, 2017).

Average expenditures are usually calculated by spending category and visitor segment. These averages are applied to the fraction of visitation associated with each segment. To do this, the analyst must ensure a common basis is used for the spending averages and visitation data. Spending averages are often obtained on a party basis, so estimates of visitation need to be standardized by average party size. If party spending is summarized on a daily basis for day users and a nightly basis for overnight users (rather than per trip), party visits would be divided further by the number of days/nights spent in the local area. It is common practice to adjust the underlying data to current year dollars by sector using the CPI.

At sites where visitors enter and exit a park multiple times in the same day, re-entry rates must be incorporated so that neither visitation nor economic contributions are overestimated. Further, in locations where visitors can enter multiple public lands on one

trip, such as the monuments and parks in the Washington D.C. area, additional data are needed to avoid double-counting of spending.

4.2 APPLYING REGIONAL ECONOMIC MULTIPLIERS

The second step of contributions analysis is to trace visitor spending through the regional economy using a set of multipliers or a model. The six federal agencies use IMPLAN (Economic **IMP**act Analysis for **PL**ANing), which is a type of input-output model. Input-output models use data on the input and demand structure of the economy to simulate how visitor spending affects output, value added, employment, and income across the economy. IMPLAN was developed by the Forest Service in the 1970s, but is now maintained by IMPLAN Group LLC (IMPLAN, 2015a). The underlying data for IMPLAN are collected from multiple sources, including the Bureau of Economic Analysis, Bureau of Labor Statistics, and the U.S. Census Bureau. It is common practice to adjust the underlying data to current year dollars for analysis using Bureau of Economic Analysis (BEA) GDP deflators.

Other well-known input-output models include RIMS II (**R**egional **I**nput-**O**utput **M**odeling **S**ystem) by the Bureau of Economic Analysis (BEA, undated), EMSI (**E**conomic **M**odeling **S**pecialists **I**nternational) (EMSI, undated), and REMI (**R**egional **E**conomic **M**odels, **I**nc.) (REMI, 2016). RIMS II is essentially a set of multipliers that a user manually applies to spending in specific industries. EMSI is most similar to IMPLAN, but has greater spatial resolution, disaggregating the analysis into nearly twice as many industries.¹³ REMI is a regionalized input-output econometric model of the U.S. economy that is based on thousands of underlying equations. REMI is viewed as the most complex and expensive of the four well-known input-output models (IMPLAN, RIMS II, EMSI, and REMI), while RIMS II is generally seen as the least sophisticated and least expensive option. A full review of these models and other methods (e.g., computable general equilibrium models) is beyond the scope of this document (see DOI, 2015 for a brief description of other methods).

Regardless of the method used, the purpose of applying regional economic multipliers is to estimate the total direct and secondary effects of recreation expenditures, accounting for contributions to backward- and forward-linked industries, as well as any “leakages”.

- The **direct effects** include sales, income, and jobs for businesses directly selling goods or services to recreationists.
 - These expenditures are backward linked to support industries that supply goods and services to the directly impacted businesses (indirect effects). Further, household income associated with direct- and backward-linked expenditures supports additional economic activity (forward-linked induced effects).
- Secondary effects** include indirect and induced effects.

¹³ The current IMPLAN data set includes 517 private industry sectors (IMPLAN, 2015b), while the latest EMSI model has over 1,000 (EMSI, undated).

- At each stage of spending, **leakages** occur when goods and services are purchased from businesses located outside the region of interest. The magnitude of secondary effects depends on the characteristics of the region of interest, which impact the scale of leakages. Secondary effects are generally smaller in rural and less economically diverse regions because more spending by firms and employees is made outside the region (Stynes, 2005).

The regional economic multipliers attempt to account for these complex economic relationships and estimate the total contributions. A sales multiplier of 1.25, for example, means that for every dollar spent by a visitor, another 25 cents is generated within the region through indirect or induced effects. Separate multipliers are used to trace spending inputs into outputs of income, jobs, and other metrics of interest. Multipliers can be used for a range of geographic resolutions. The larger the region specified, the greater the multiplier because less money leaks out of the region at each stage of spending. For example, purchases from a food supplier in California by a restaurant near Rocky Mountain National Park would be treated as leakages in a state-level analysis, but not in a national-level analysis.

4.3 REPORTING RESULTS

The final step of economic contributions analysis is to report the results. There are several available metrics:

- **Spending** is equivalent to the sales by firms in the region. This can be expressed in terms of (1) recreation expenditures and/or (2) final demand, which is the total sales by firms in the region from all buyers, including recreationists, as well as businesses and households in subsequent rounds of spending.
- **Jobs** are the combined full- and part-time jobs on an annualized basis.
- **Labor income** includes employee wages, salaries and payroll benefits, as well as the incomes of sole proprietors. Sometimes total income is reported, which includes business profits and rents.
- **Tax revenues** include any combination of local, state, and federal taxes.
- **Value added** is the contribution of visitor spending to gross regional or national product, including personal income to households, business profits and rents, and indirect business taxes accruing to governments in the region. Simply put, value added is equal to the difference between the amount an industry sells a product for and the production cost of the product.
- **Economic output** is the total estimated value of the production of goods and services (i.e., the sum of all intermediate sales (business to business) and final demand (sales to consumers and exports)).

The results may be reported as the combined direct and secondary effects, or the analyst may wish to report these separately. Further, expenditures by residents of the region are included in an *economic contributions analysis*, but excluded from an *economic impact analysis*. An analyst might report the total contribution of visitor expenditures, but report

the impacts of non-local visitors separately since those expenditures would likely leave the region if the recreation area did not exist. Finally, the analyst can report results at different spatial scales depending on the multipliers applied (see Section 4.2). If separate multipliers were applied for the local region, the state level, and the national level, the results of all three analyses can be reported.

5. METHODS USED BY FEDERAL AGENCIES TO MEASURE ECONOMIC VALUE AND REGIONAL ECONOMIC CONTRIBUTIONS

The first section of this chapter summarizes the methods used by federal land management agencies to estimate the benefits of recreation. A separate summary is provided for each agency (NPS, BLM, USFWS, Reclamation, USFS, and USACE) and includes a discussion of methods related to valuation and economic contributions analysis.¹⁴ Each summary was developed using a combination of available documentation and conversations with agency staff. The second section of the chapter compares methods across agencies.

5.1 AGENCY SUMMARIES

NATIONAL PARK SERVICE

The National Park System is comprised of 417 units that cover more than 84 million acres across all 50 states, the District of Columbia, and several territories (Cullinane Thomas and Koontz, 2017). These units include national parks, monuments, battlefields, recreation areas, lakeshores, seashores, scenic rivers and trails, parkways, and preserves. 331 million recreational visits occurred at NPS sites in 2016 (Cullinane Thomas and Koontz, 2017). These visits supported an estimated \$18.4 billion in spending, 318,150 jobs, \$12.0 billion in labor income, \$19.9 billion in value added, and \$34.9 billion in economic output (Cullinane Thomas and Koontz, 2017). The NPS does not quantify the aggregate economic value provided by their system to recreationists.¹⁵

Estimates of visitation and benefits are used to inform a range of stakeholders, including NPS leadership, researchers, businesses, and members of the public. The information assists with operational planning, facilities design and management, economic contributions analysis, natural resource damage assessments, and other purposes (NPS, 2016). NPS economists rely on guidance from the Department of the Interior's (DOI) Agency Specific Procedures (ASP) (DOI, 2015) and the OMB Circular A-4 (OMB, 2003) for estimating the benefits of recreation. Specific agency guidance for valuation is provided for natural resource damage assessments (NPS, 2003, 2004).

¹⁴ Previous summaries of agency methods with a focus on economic contributions analysis can be found in DOI (2016) and English et al. (2013).

¹⁵ A recent study estimated the total value of NPS units (Haefele et al., 2016), including non-use values, but these estimates are broader than values specifically for recreation use.

Valuation

Valuation work is usually done by the NPS on a case-specific basis. Primary valuation methods have been applied in some cases, while benefits transfer has been used in others. For example, Richardson et al. (2014) used a dichotomous choice contingent valuation question to estimate willingness-to-pay for ensuring bears are allowed to remain along roads and provide viewing opportunities for visitors to Yellowstone National Park.¹⁶

Given the time constraints of NPS staff, much of the existing primary valuation work has been done by outside experts. For example, Neher et al. (2013) used onsite surveys conducted as part of the NPS Visitor Services Project (WSU, 2016) at more than 50 parks to estimate travel cost models for each park. The data include the number of trips to a given park in the last 12 months, respondent origin information, and other individual-level characteristics, which were used to construct the models. A meta-analysis equation was developed to predict results for non-surveyed parks, where willingness-to-pay was modeled as a function of NPS site characteristics. Estimates from this study have not yet been widely applied to quantify recreation values for NPS analyses, though the study remains a valuable source of comprehensive park-level estimates.

Benefits transfer is commonly used for natural resource damage assessments and rulemaking (Leslie Richardson, personal communication, May 2017). Estimates of visitation, usually in terms of visitor days, are provided by the NPS Social Science Program (see Leggett et al., 2017). Estimates of value per visitor day are typically selected from the Recreation Use Values Database (RUVD) (Rosenberger, 2016) or the USGS Benefits Transfer Toolkit (USGS, 2016, 2017), described in the bullets below.

- **The RUVD** is the result of seven literature reviews dating back to 1984. The most recent review, sponsored by the USDA Forest Service, was completed in 2016 and contains nearly 3,200 value estimates in per person per activity day units. These estimates are based on over 400 studies of recreation activities in the U.S. and Canada from 1958 to 2015.
- **The USGS Benefits Transfer Toolkit**, developed with support from The Bureau of Land Management Socioeconomics Program, the National Park Service Social Science Program, and the USGS Sustaining Environmental Capital Initiative, contains nearly 3,000 value estimates for outdoor recreation and total economic values for salmon; threatened, endangered, and rare species; and water quality. It is based on many of the same underlying studies found in the RUVD. The toolkit allows a user to find an average value for specific recreation activities by region or produce estimates for fishing, hunting, wildlife viewing, and trail use in certain regions using a meta-regression function transfer.

¹⁶ In addition, results from a contingent behavior question were combined with visitor expenditure data to estimate the decline in jobs associated with decreased visitation to the park (economic contributions analysis).

Both the RUVD and USGS Benefits Transfer Toolkit have detailed underlying databases with studies coded by type of recreation activity, location, and other useful dimensions for consideration in a benefits transfer.

The number of published estimates on the value of recreational visits to NPS units is limited (Duffield et al., 2007), and yet, many NPS parks provide a unique recreation experience. For this reason, the NPS sees a need for more valuation work on specific units and activities, and in some cases, how changes in site attributes (e.g., crowding) affect values for recreation. The values compiled in the RUVD and USGS Benefits Transfer Toolkit mostly focus on the “access” value of recreation rather than on changes in quality or characteristics of recreation.

Economic Contributions Analysis

The NPS generates annual estimates of economic contributions of visitor spending. The most recent annual report was produced in April 2017 for the 2016 calendar year (Cullinane Thomas and Koontz, 2017). In addition to the annual reports, the NPS produces analyses as needed for specific units (Cook, 2013, 2011), resources (Richardson et al., 2014), or to evaluate the effects of certain events (e.g., the 2013 federal government shutdown – see Koontz and Meldrum, 2014).

The annual reports use the Visitor Spending Effects (VSE) Model, which replaced the Money Generation Model (MGM) in 2014 for the 2012 analysis (see Cullinane Thomas et al., 2014). The VSE model combines visitation data from the NPS Social Science Program with expenditure data from the NPS Visitor Services Project (VSP) to estimate total visitor spending.¹⁷ IMPLAN is used to apply the regional economic multipliers. The results are reported in the annual reports and online (<https://www.nps.gov/subjects/socialscience/vse.htm>) as contributions to local gateway communities, as well as to states, NPS regions, and the national economy. The following bullets describe visitor spending, multipliers, and economic contributions results (see Leggett et al. (2017) for a description of the visitation data):

- **Visitor spending:** The expenditure and visitor characteristics data required for the analysis have been collected at the party level through past VSP surveys. A mail-in survey has been used as a follow-up to an onsite interview. Data are available for 57 parks. Spending in counties within or intersecting a 60-mile radius around each park is the focus of analysis. Spending is broken into eight categories: 1) hotels, motels, and bed and breakfasts, 2) camping fees, 3) restaurants and bars, 4) groceries and takeout food, 5) gas and oil, 6) local transportation, 7) admission and fees, and 8) souvenirs and other expenses. The NPS uses one local visitor segment (day use) and six non-local segments (one day use and five overnight

¹⁷ The NPS is currently piloting the Socioeconomic Monitoring (SEM) surveys program, which may replace the VSP in the future. SEM surveys collect expenditure data similar to those collected through the VSP.

segments).¹⁸ Average total expenditures are calculated by segment for each of the 57 parks. Segment-specific averages are calculated for four types of parks, and are applied to non-surveyed parks based on their type.¹⁹

Visitation data for the 57 sampled parks are converted from visits to party days for day user segments and to party nights for overnight visitor segments. This is done by dividing the number of visits by average party size and multiplying by the number of days or nights in the local area. Group size and trip length are calculated by segment using the VSP data. To control for multiple days of entry during a trip, estimates of party nights are adjusted further by the average number of days that a party entered the park during their trip.²⁰ Visitation data for the non-sampled sites are converted to party days and nights using average segment shares and other visitor characteristics from the sampled parks. This is done across four parks types as described above for the expenditure data.

To estimate visitor spending, average expenditures are calculated by visitor segment for each park and applied to the corresponding number of party days or nights at each of the 57 parks. For non-sampled parks, average spending profiles by visitor segment (based on park type) are applied to the corresponding estimates of party days or nights for each park.

- **Regional economic multipliers:** The NPS uses IMPLAN to apply regional economic multipliers for their analyses. Local gateway community multipliers are defined by the set of counties within or intersecting a 60-mile radius around each park. State, NPS region (seven nationwide), and national multipliers are also applied in separate analyses. The 2016 annual report used IMPLAN version 3.0 with 2013 data (Cullinane Thomas and Koontz, 2017). These data were adjusted to 2016 dollars using BEA deflators.
- **Results:** The annual reports contain a series of tables summarizing the contributions of visitor spending to local gateway communities (i.e., park economies), as well as to states, NPS regions, and the national economy. When a park spans multiple states, spending is allocated based on the proportion of visits occurring in each state. The contributions are expressed in terms of visitor spending, jobs, labor income, value added, and economic output (see Chapter 4 for definitions). The results are also available online via an interactive tool: <https://www.nps.gov/subjects/socialscience/vse.htm>.

¹⁸ Local visitors are from one of the counties within or intersecting a 60-mile radius around each park. There are four primary overnight segments: lodge or motel in park, camp in park, lodge or motel outside park, and camp outside park. The fifth category is for non-local visitors who do not have lodging expenses (e.g., stay with a friend).

¹⁹ The four park types include parks that have both camping and lodging available within the park, parks that have only camping available within the park, parks with no overnight stays, and parks with high day use (including National Recreation Areas, National Seashores and National Lakeshores). Some parks cannot be classified into one of four types (e.g., parks in Alaska). For these parks, the best available data are used.

²⁰ The NPS attempts to net out duplicate entries on a given day from their estimate of visits (see Leggett et al., 2017).

As mentioned above, the NPS is piloting a new survey program to improve the collection of data on visitor spending and other characteristics. Chief among the goals of these surveys is to improve the assignment of parties to certain visitor segments; increase the sample sizes of visitor segments; identify and account for trips where the primary purpose is unrelated to visiting a park for recreation; improve accuracy of responses; and collect additional data for dealing with special situations (e.g., to avoid double-counting of spending for visitors who enter multiple parks during the same trip). Staff economists would also like to collect data for more parks, given that data required for analysis are currently available for just 57 of 417 units.

BUREAU OF LAND MANAGEMENT

The BLM manages over 3,600 recreation sites on approximately 250 million acres located primarily in the western United States (BLM, 2016a). In 2016, BLM recreation sites hosted approximately 65 million visits (BLM’s Recreation Management Information System, or RMIS). These visits supported an estimated \$3.3 billion in spending, 48,139 jobs, \$2.1 billion in labor income, \$3.6 billion in value added, and \$6.7 billion in economic output (DOI, 2017; draft statistics). The BLM does not quantify the aggregate economic value provided by their system to recreationists.

BLM estimates of visitation and benefits are used to support resource management plans, project-level National Environmental Policy Act (NEPA) analyses, rulemaking, facilities management, and for communication purposes (Josh Sidon, personal communication, May 2017; David Baker, personal communication, December 2016). Instruction Memorandum (IM) No. 2013-131 provides guidance on estimating nonmarket environmental values, including those related to recreation (BLM, 2013a). The BLM does not have formal guidance related to economic contributions analysis.

Valuation

Per IM 2013-131, BLM managers and staff are encouraged to provide a quantitative analysis of nonmarket values where relevant and feasible (see also USGS, 2016). This IM discusses three methods for describing and analyzing nonmarket values, including a qualitative description, benefits transfer, and conducting primary research (travel cost, stated preference, and hedonic pricing). The IM recommends selecting “an approach to estimating environmental values that is appropriate for the decisions to be made, given the constraints of time, budget, available technical support, and the effort required to obtain and analyze the data.” The BLM often relies on benefits transfer for valuation work (see USGS, 2016 and examples in BLM, 2015, 2017). Valuation estimates are based on the RUVI and the USGS Benefits Transfer Toolkit (USGS, 2016). Relevant visitation data come from RMIS and are expressed in terms of visits (the entry of any person for any time period), visitor days (one visitor day is defined as 12 hours), and participants (a participant is a visitor on a single visit who engages in one or several recreational activities). Value estimates generally align with the BLM’s data on visits or participants rather than visitor days.

BLM economists recognize that resources for primary research are limited and a qualitative description of recreation values or a simple benefits transfer often provides

adequate information. Nonetheless, as demonstrated by IM 2013-131, the BLM recognizes the relevance and usefulness of communicating the importance of measuring value to agency managers and external stakeholders. The existing literature contains relatively few value estimates for BLM resources (USGS, 2016), so there is a potential need for more site-specific valuation studies. BLM economists recognize opportunities to improve how values from the literature are applied in benefits transfer. For example, as noted above, value estimates are most accurately applied to visits or participants. However, these data are not disaggregated by activity in RMIS and one participant may be counted multiple times if they engage in multiple activities. Therefore, collecting data on primary activity associated with visitation would allow for more precise benefits transfer analyses.

Economic Contributions Analysis

The BLM publishes economic contribution estimates on an annual basis in the “Sound Investment” brochure and in the DOI Economic Report (see BLM, 2016b and DOI, 2016 for the most recent versions).²¹ Additional economic contributions analyses have been completed for localized areas (e.g., as part of a resource management plan or project-level NEPA analysis; see BLM, 2013b). Visitation data for these analyses come from RMIS, while the BLM generally uses expenditure profiles and visitor segment distribution data from the USFS National Visitor Use Monitoring (NVUM) program (described below in the Forest Service section). It is common to use data associated with the closest National Forest or Grassland with similar characteristics to the BLM-managed land of interest. The BLM uses other sources of visitor expenditures if they are more appropriate for a particular analysis. For example, if the analysis is for recreation on a National Conservation Land unit, it might be more accurate to use expenditure and visitor characteristics associated with a nearby National Park. IMPLAN is used to model the regional economic contributions of visitor spending and results are usually provided in terms of jobs, labor income, and economic output.

BLM economists support the application of NVUM data for BLM analyses because visitors to BLM and USFS lands (excluding downhill skiing and snowboarding visits) have similar characteristics (White, 2012). However, a past pilot study applying NVUM-like procedures at a subset of BLM sites showed the types of visitors and their expenditures can differ from nearby National Forest or Grassland sites (Josh Sidon, personal communication, May 2017). Given resource constraints, the BLM has not pursued a more rigorous effort to collect agency-specific expenditure data and supporting visitation data. However, the agency believes the application of USFS data is currently adequate to support relatively accurate estimates of economic contributions associated with recreation.

²¹ The FY 2016 DOI Economic Report will be released later in 2017, and will contain the contribution estimates presented at the start of this BLM section (DOI, 2017).

FISH AND WILDLIFE SERVICE

The USFWS manages the National Wildlife Refuge System, which includes 560 national wildlife refuges and 38 wetland management districts. Together, these cover more than 150 million acres of land and water (USFWS, 2016a). The refuge system received approximately 50 million visitors in 2016 for hunting, fishing, wildlife observation, environmental education and interpretation, and other nonconsumptive activities (Refuge Annual Performance Plan (RAPP) database).²² This visitation supported an estimated \$2.2 billion in spending, 36,720 jobs, \$1.6 billion in labor income, \$2.8 billion in value added, and \$5.1 billion in economic output (DOI, 2017; draft statistics). The USFWS does not regularly quantify the aggregate economic value provided by their system to recreationists and no recent estimate is available.

Estimates of visitation to USFWS refuges and wetlands and the associated benefits are used to support operational planning, facilities management, recreational programming, budget requests, natural resource damage assessments, economic contributions analysis, and visitor satisfaction (Phil LePelch, personal communication, December 2016). USFWS economists do not rely on any formal guidance for estimating the benefits of recreation. Rather, the USFWS follows standard practices, and the type of analysis and level of detail depend on the situation or intended use.

Valuation

The USFWS primarily uses benefits transfer to develop valuation estimates for refuges. This is done in the Banking on Nature report series and for other case-specific analyses. The Banking on Nature reports are released approximately every five years and summarize the economic values and contributions from visitation to the National Wildlife Refuge System. The most recent report that quantified economic values was released in 2013 (Carver and Caudill, 2013). Economic valuation estimates were generated for 92 refuges using 2011 visitation data from the RAPP database and activity-specific user day values from the RUVD.

The RAPP database tracks the number of visits by activity (e.g., hunting, fishing, wildlife observation) for each USFWS site (Leggett et al., 2017). For the 92 refuges, site managers were asked to net out any duplicative counts of visits and to estimate the average time onsite for each activity. These estimates were used to convert unique counts of visits by activity to visitor hours. The estimates of visitor hours were then divided by eight to estimate the number of recreation visitor days (RVDs) by activity.

The user day values were selected from Kaval and Loomis (2003), which was an update to the RUVD in the early 2000s. A single nationwide value was selected for each activity and applied to the estimated RVDs for hunting, fishing, and non-consumptive uses. Values from the RUVD may be considered for future Banking on Nature reports (Erin Carver, personal communication, May 2017), and USFWS economists may consider

²² The USFWS defines “visitors” similar to how other agencies define “visits” (Leggett et al., 2017). Therefore, we use “visitors” here to present an analogous visitation statistic for USFWS.

regional values for each activity or some finer level of aggregation in the selected estimates.

Some other analyses have used a different source for user day values, namely, the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR). For example, Maillet (2011) estimated the economic value associated with waterfowl hunting and general wildlife viewing activities at Lower Klamath Lake and Tule Lake Refuges. USFWS (2008) estimated the nationwide value of waterfowl hunting, and evaluated the impact of proposed regulatory alternatives for the 2008-2009 season on this value estimate. Both studies relied on user day value estimates generated from the FHWAR.²³

The FHWAR is sponsored by the USFWS and conducted by the U.S. Census Bureau approximately every five years based on a stratified random sample of US households (USFWS, 2015). The survey focuses on recreation participation in fishing, hunting, and wildlife viewing throughout the United States, including but not limited to USFWS lands. The 2011 survey contained a contingent valuation question that asked recreationists at what cost per trip they would not have recreated at all because it was too expensive. Separate questions were presented to hunters, anglers, and wildlife viewers. The survey also asked respondents to report the cost of a typical trip in 2011. The responses to these questions were used to estimate average values for deer, elk, and moose hunting; bass, trout, and walleye fishing; and wildlife viewing (USFWS, 2016b).

Surveys conducted in 1980, 1985, 1991, 1996, 2001, and 2006 had similar questions, though the format has changed somewhat over time. Whitehead and Aiken (2007) summarize the question design and results through time. The contingent valuation question was not included on the 2016 survey due to budget constraints, but USFWS economists hope to include the question on future surveys (Richard Aiken, personal communication, May 2017). The values from the FHWAR were not used in the 2007 or 2013 Banking on Nature report because the questions focused on a particular species rather than the broader activity.

Moving forward, the USFWS hopes to refine how benefits transfer is done for the Banking on Nature reports and other analyses valuing recreation on USFWS-managed lands. The current approach relies on relatively broad estimates applied to specific refuges and activities. Staff economists expressed a desire to produce more site- and activity-specific value estimates. Primary research has been limited to the contingent valuations questions on the FHWAR, and those questions were not included on the 2016 survey. Although additional primary research would be beneficial, funding is not available at this time.

²³ Both studies used the 1985 survey for waterfowl hunting values, as more recent surveys did not provide updated results. Maillet (2011) used the 2006 survey for the wildlife viewing value.

Economic Contributions Analysis

The Banking on Nature reports are the main source of economic contribution estimates for the USFWS.²⁴ Other analyses have quantified expenditures, but did not apply multipliers to estimate the total economic contributions (e.g., Maillet, 2011; USFWS, 2008). The Banking on Nature reports combine visitation data from the RAPP database with expenditure data from the most recent FHWAR to estimate total visitor spending.²⁵ IMPLAN is used to apply the regional economic multipliers. The 2013 report provided estimates of economic contributions for 92 refuges, and for the overall National Wildlife Refuge System. The following bullets describe visitor spending, multipliers, and economic contribution results (see Leggett et al. (2017) for a description of the visitation data):

- **Visitor spending:** Per-person per-day expenditure data are collected as part of the FHWAR phone and in-person interviews. Respondents are asked to report the number of days spent fishing, hunting, and wildlife viewing in each state during the previous 4-12 months (i.e., separate estimates for each activity and state) and the total personal expenditures associated with those days (USFWS, 2012).²⁶ There are four spending categories: 1) food, 2) lodging, 3) transportation, and 4) other expenses.²⁷ The expenditure estimates are pooled by resident (state of residence matches state of activity) or non-resident and by one of six recreation activities for the Banking on Nature reports.²⁸ Due to small sample sizes, estimates are pooled further by USFWS Region (there are 8 total) and averages are calculated for each residency-activity combination.²⁹

Visitation data for each of the 92 refuges is apportioned into visits by residency-activity combination using input from refuge managers. For these data, a resident is defined as living within a 50-mile radius of the refuge. The apportioned visitation estimates are converted to RVDs for each activity using the average time onsite for each activity (see Valuation section above). It is assumed that all expenditures related to refuge visits occur within 50 miles of the refuge and that

²⁴ The 2016 economic contribution estimates presented at the start of the USFWS section were generated by the DOI's Office of Policy Analysis using visitation data from the RAPP database and spending information from the most recent FHWAR.

²⁵ For example, Carver and Caudill (2013) used 2011 data from the RAPP database and FHWAR. Data from the 2016 FHWAR are scheduled to be released later in 2017, and a new Banking on Nature report will be produced using those data.

²⁶ A 12 month recall period is used for big ticket items, such as motor homes and ATVs. Expenditures for other goods and services are collected using a shorter recall period of 4 to 8 months. Further, if the sample size is too small at the end of data collection years, additional respondents are surveyed using a 12 month recall period (Harry Fuller, personal communication, July 2017).

²⁷ Food includes food, drink, and refreshments. Lodging includes motels, cabins, lodges, and campgrounds. Transportation includes separate sub-categories for public transportation and the round-trip cost of transportation by private vehicle. Other expenses includes separate sub-categories for guide fees, pack trip or package fees, public land use or access fees, private land use or access fees (not including leases), and equipment rental.

²⁸ Activities include non-consumptive uses, big game hunting, small game hunting, migratory waterfowl hunting, freshwater fishing, and saltwater fishing.

²⁹ National averages (i.e., by residency-activity combination only) are used for regions with sample sizes less than 10.

visiting the refuge is the primary purpose of the visit. The average expenditures by residency-activity combination are applied to the corresponding visitor days to estimate visitor spending.

- **Regional economic multipliers:** The USFWS uses IMPLAN to apply regional economic multipliers for their analyses. Refuge-area multipliers are defined by the set of counties within a 50 mile radius around a refuge. Carver and Caudill (2013) used 2008 IMPLAN data and adjusted all monetary contributions to 2011 dollars (the year of the data underlying the report) using BEA deflators.
- **Results:** The Banking on Nature reports contain a series of tables that summarize the contributions of visitor spending to local refuge communities. These results are presented in terms of visitor expenditures, final demand, jobs, labor income, and total tax revenue. The results are presented in total and separately for residents and non-residents. Estimates of final demand, jobs, and labor income for the entire National Wildlife Refuge System are also presented. In Carver and Caudill (2013), the national estimates were generated using average ratios of final demand, jobs, and labor income per recreation visit for the 92 sampled refuges. The average ratios were applied to total recreation visits nationwide.

USFWS economists see opportunities for improvement in the visitation and expenditure data applied in economic contributions analyses. Estimates of total visits and the share of visits by visitor segment are based largely on professional judgment given the lack of onsite interviews. Expenditure data are collected at the state-level (averages are calculated at the USFWS region level) and applied to specific refuges. These data limitations primarily reflect limited budgets for data collection.

BUREAU OF RECLAMATION

Reclamation manages approximately 6.5 million acres of land and water in 17 western states, with over 200 recreation areas providing access for camping, day use, hiking, fishing, wildlife viewing, boating, and other activities (Reclamation, 2015a). These areas attracted approximately 30 million recreation visits in 2016 (Reclamation's Recreation Use Data Report (RUDR) database). These visits supported an estimated \$1.4 billion in spending, 23,368 jobs, \$1.0 billion in labor income, \$1.8 billion in value added, and \$3.2 billion in economic output (DOI, 2017; draft statistics). Reclamation does not quantify the aggregate economic value provided by their system to recreationists.

Estimates of visitation and benefits are used by Reclamation to support resource management planning, economic contributions analysis, and inquiries about public use (William Taylor, personal communication, May 2017). Reclamation economists rely on the revised Principles, Requirements, and Guidelines for estimating the benefits of recreation (DOI, 2015; CEQ, 2013, 2014). They expressed a desire for additional technical guidance on how these analyses should be done to ensure quality control and consistency (William Taylor, personal communication, May 2017).

Valuation

Reclamation primarily uses benefits transfer to develop recreation valuation estimates for case-specific analyses, though other methods may be considered. Visitation figures for these analyses come from the RUDR database (Leggett et al., 2017) and are converted to visitor days based on available information and conversations with site managers. Many valuation (and economic contributions) analyses involve forecasting changes in recreation use under alternative management scenarios. Reclamation strives to model those changes to the extent possible (e.g., Reclamation, 2013), but professional judgment is used in many cases (e.g., Reclamation, 2008).

Valuation estimates are based on the RUVD (e.g., Reclamation, 2010, 2015b, 2016), the USFWS FHWAR (Reclamation, 2011), or USACE published unit day values (USACE, 2016a; Reclamation, 2009). Separate values are typically selected for different recreation activities. For most Reclamation analyses, the value of recreation is just one of many costs or benefits considered. This is a reflection of the agency's mission to manage water supplies and produce hydroelectric energy. The provision of recreation (and the associated value) is often treated as a secondary priority.

Economic Contributions Analysis

Reclamation does not regularly publish system-wide estimates of economic contributions from recreation spending.³⁰ Instead, these analyses are done for a range of case-specific studies (e.g., Reclamation, 2008, 2011). In most cases, Reclamation does not collect expenditure data for their sites and usually relies on spending profiles developed by the USFWS from the most recent FHWAR. Visitation data from RUDR are allocated to visitor segments based on conversations with site managers, other available information, or professional judgment (e.g., Reclamation, 2008). In some cases, expenditure and visitation data come from other sources. For example, an analysis of Oregon and California salmon and steelhead anglers used expenditure data from a survey of those anglers conducted by the National Marine Fisheries Service, while fishing effort estimates came from a California Department of Fish and Game Klamath River creel survey (Reclamation, 2011).

IMPLAN is used to apply multipliers to the spending estimates by sector, and results are usually provided in terms of expenditures, jobs, and labor income. Recent case-specific analyses have focused on economic impacts (i.e., changes in nonlocal spending) rather than a broader contributions analysis (e.g., Reclamation, 2011). Reclamation economists expressed a desire to improve the collection of visitation data, including obtaining agency- or site-specific visitor characteristics data (e.g., spending), that could enhance the precision of economic benefit estimates.

³⁰ The 2016 economic contribution estimates presented at the start of the Reclamation section were generated by the DOI's Office of Policy Analysis using visitation data from the RUDR database and spending information from the most recent USFWS FHWAR.

FOREST SERVICE

The USFS manages 193 million acres of land in 42 states and Puerto Rico, including 403 wilderness areas; 155 national forests; 22 national grasslands; 20 national recreation areas; 9 national scenic areas; and 7 national monuments, volcanic monuments, and national preserves (CRS, 2014; USFS, 2016b). Any of these units may contain a number of “sites” as defined by the USFS, including campgrounds, alpine ski areas, picnic areas, boating sites, and swimming areas. Nearly 149 million recreation visits occur annually on national forests (USFS, 2016a).³¹ These visits supported an estimated \$9.3 billion in spending, 146,444 jobs, \$6.3 billion in labor income, \$10.6 billion in value added, and \$19.5 billion in economic output (Susan Winter, personal communication, September 2017). USFS economists estimate the aggregate annual economic value supported by recreation use is \$14.4 billion (Eric White, personal communication, June 2017).

Estimates of visitation and benefits are used to inform internal and external stakeholders, support Resources Planning Act Assessments (e.g., Bowker et al., 2012), meet NEPA requirements, support budgeting and forest planning, and to meet goals of the Forest Service Strategic Plan. Forest Service economists periodically update guidance documents for analysts to use when conducting economic analyses (see Rosenberger et al., 2017 for valuation and White, 2017 for contributions analysis).

Valuation

The USFS does not frequently value recreational visitation. When it is done, the primary method is benefits transfer using RUVd values and similar sources. As discussed earlier in this chapter, the USFS has been the main sponsor in keeping the RUVd up-to-date, and the latest update was made in 2016 (Rosenberger, 2016). The RUVd is designed to compile peer-reviewed and other reasonably-measured estimates of consumer surplus that can be applied to a range of locations (i.e., forest, regional, and national levels) and activities. Table 2 in Rosenberger et al. (2017) provides general descriptive statistics on recreation values by activity from studies contained in the RUVd.

Further, Rosenberger et al. (2017) used meta-regression analysis to develop average per person user day values by primary activity and Forest Service region (see Table 3 in that report). The regression specified the value per person day as a function of region, activity, resource type, and other factors. The estimated coefficients were used to predict average value estimates by activity and region. Since function transfers are preferred over value transfers, the USFS recommends using these estimates for benefits transfer.

The visitation data for valuation analysis comes from the National Visitor Use Monitoring (NVUM) program (English et al., 2002; Zarnoch et al., 2011; Leggett, et al., 2017). NVUM data are used to estimate the average number of calendar days per visit by recreation activity (see Table 4 in Rosenberger et al., 2017), which serve to convert visit estimates from the NVUM program to user day estimates for the benefits transfer.

³¹ An additional 300 million viewing occasions occur annually on scenic byways located on or near national forests. A “viewing occasion” occurs when an individual enjoys the scenery while simply passing by or through USFS-managed lands.

NVUM data are also used to calculate the distribution of primary activities for each national forest, which supports the estimation of user days by activity.

While USFS economists have limited budget available to conduct primary valuation studies, some work has been done to address unique resources or activities that are not well covered in the RUVI. One recent example of primary research is Bowker et al. (2012). This study used NVUM data to develop national- and regional-level travel cost models, specifying the number of visits as a function of travel costs, primary activity, and other trip and respondent characteristics. The models were used to estimate consumer surplus values by activity for each region and nationally. To date, the USFS has not applied these estimates extensively for benefits transfer purposes.

Estimating the value of recreation is a lower priority for the USFS than estimating economic contributions.³² This reflects stakeholder and forest management interest in the contribution of recreational activity to regional jobs, income, and the health of local economies. However, USFS economists expressed a desire to raise the profile of valuation work since it estimates a real benefit that is distinct from economic contributions. When valuation work is done, there is a desire for more guidance on how to do it and what approaches should be used for certain contexts. This would help to enhance consistency, given that valuation work is currently decentralized, performed by economists in different offices.

Economic Contributions Analysis

The USFS generates estimates of economic contributions of visitor spending in the annual NVUM National Reports. These estimates are also provided on the economic contribution website (<https://www.fs.fed.us/emc/economics/contributions/index.shtml>). The most recent annual report was produced in 2016 using NVUM data for the preceding five-year period (i.e., 2011-2015) (USFS, 2016a).³³ The NVUM program collects all the necessary information needed for contributions analysis, including visitation, visitor spending, the share of recreation visits by trip type, average people per party, and other visit characteristics. Input-output modeling using IMPLAN is used to estimate the regional economic multiplier effects. The following bullets describe visitor spending, multipliers, and economic contribution results (see Leggett et al. (2017) for a description of the visitation data):

- **Visitor spending:** The NVUM program collects detailed visitation and visitor characteristics data using onsite interviews at all National Forest System units over a five-year period. Spending data are collected at the party-level across 10 categories: 1) motels, 2) camping, 3) restaurant, 4) groceries, 5) gas and oil, 6) other transportation, 7) entry fees, 8) recreation and entertainment, 9) sporting

³² The latest National Forest System land management planning rule is not prescriptive about what economic benefits need to be measured, which grants the agency this flexibility (https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5362536.pdf).

³³ As described in Leggett et al. (2017), the NVUM assesses visitation at one-fifth of all National Forest System units every year, covering all units in the country every five years.

goods, and 10) souvenirs and other expenses.³⁴ Only spending within 50 miles of the interview site related to the current trip is included. Respondents are interviewed as they leave a site, but since multiple sites may be visited during a single trip, they are asked to report expenditures already made and any anticipated additional spending. Spending data are adjusted for inflation to the analysis year using a distinct Bureau of Labor Statistics price index for each spending category (White, 2017).

Survey questions are used to place visitors into one of seven visitor segments.³⁵ There are three segments each for non-local and local residents: one for day users, one for overnight visitors staying in a national forest, and one for overnight visitors staying in the local area. The seventh category is for visitors whose primary purpose is not for recreation in the national forest. Local users are those who traveled 60 miles or less to the site.

Sample sizes from the economic surveys are generally too small to develop spending averages by segment for each national forest. Therefore, forests are classified as low, average, or high spending based on a comparison of forest-level data to the national distribution of expenditures. Average spending profiles are then developed for each type of forest.

These profiles are applied to NVUM estimates of visitation. The estimates are first apportioned into visits by segment and then divided by average party size (calculated within segment) to calculate the number of party visits. Total spending is calculated by segment as the total average spending per party times the number of party visits. Finally, since visitors engaged in skiing or snowboarding spend significantly more than other visitors, estimates of party visits and spending are developed separately for this subset of users. Separate spending averages and associated parameters are also estimated for those engaged in wildlife-related activities (i.e., hunting, fishing, wildlife viewing) for use in analyses targeted at this visitor group

- **Regional economic multipliers:** The USFS uses IMPLAN to estimate contributions to the economic area around each National Forest and Grassland, at the regional level (eight nationwide), and at the national level. The economic areas were defined by USFS economists and can be found on the economic contribution website for each National Forest or Grassland.
- **Results:** The economic contributions of recreation spending are reported in annual reports and online. The annual reports present total spending, economic output, and jobs sustained for the entire National Forest System. These results are also presented separately for downhill skiing visits, wildlife-related visits, and other

³⁴ Respondents who report spending greater than \$500 on sporting goods are excluded in an effort to omit purchases of durable goods. Other similar data processing is also done to eliminate outliers. For example, respondents who report spending more than \$500 per night (calculated as total spending divided by nights in the local area) are excluded.

³⁵ A different number of segments may be used for some targeted analyses (White, 2017).

recreation use. The economic contribution website focuses on jobs and labor income and has results for each national forest or grassland, and for each USFS region. Estimates are apportioned into direct and secondary effects.

Although the USFS has a sophisticated program in place to collect visitation data and estimate the associated economic contributions, agency economists still see opportunities for improvement. Additional modeling approaches and data collection at a finer geographic scale could be used to estimate contributions for smaller geographic resolutions, such as a county or sub-sections of a forest. There can also be a mismatch between available data and questions from management about how a natural disaster (e.g., a flood or fire) or other change in forest amenities affects visitation and associated spending. Developing better solutions to problems like this would likely require additional staffing and budget resources that currently are not available. USFS economists would also like to develop a more comprehensive reporting system that is easily accessible to users and reports contribution figures at multiple spatial scales.

ARMY CORPS OF ENGINEERS

The USACE recreation program is comprised of 4,989 recreation sites (also called Project Site Areas, or PSAs) across 403 water resource projects on 12 million acres in 44 states (USACE, 2016b; Kathleen Perales, personal communication, February 2017).³⁶ These sites received about 250 million visits in 2016 for hiking, camping, boating, fishing, swimming, picnicking, and other recreation uses (Kathleen Perales, personal communication, February 2017).³⁷ These visits supported an estimated \$10.7 billion in spending, 180,000 jobs, \$8.1 billion in labor income, \$13.2 billion in value added, and \$25.7 billion in economic output (Wen-Huei Chang, personal communication, August 2017). The aggregate economic value supported by recreation use was estimated at \$2.0 billion for fiscal year 2015 (the most recent year available; USACE, 2017).

Estimates of visitation and benefits are used to support USACE managers with facilities management, recreation program evaluation, and economic contributions analysis (USACE, 2015; USACE, 2013b). USACE economists rely on the revised Principles, Requirements, and Guidelines for estimating the benefits of recreation (CEQ, 2013, 2014). Specific direction on how to estimate economic values is provided in the annual Economics Guidance Memorandum (USACE, 2016a).

Valuation

USACE economists can use one of three methods to value recreation use: the travel cost method, contingent valuation, or the unit day value method (USACE, 2016a). Benefits transfer (i.e., the unit day value method) is predominantly used, though a primary research method may be used if it is likely that the value falls outside the published range.

³⁶ Personal communication reflects information stored in the USACE Operations and Management Business Information Link (OMBIL) database, which is not publicly accessible.

³⁷ The 2016 estimate is lower than publicly-available estimates for previous years due to changes in data collection methods (Leggett et al., 2017).

The annual Economics Guidance Memoranda publish administratively approved unit day values based on value estimates from the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources, which are adjusted for inflation using the CPI (WRC, 1983).

Separate value estimates are provided for general and specialized recreation. General recreation includes swimming, picnicking, boating, and most warm water fishing. Specialized recreation includes big game hunting, salmon fishing, and other activities for which “a high degree of skill, knowledge, and appreciation” for the activity may be involved (USACE, 2016a, p. 1). A range of values is provided for each activity. The analyst must determine the appropriate value to apply in a benefits transfer by assigning weights, or “points”, to various attributes associated with the recreation activity. These include the recreation experience, availability of opportunity, carrying capacity, accessibility, and environmental quality (USACE, 2016a).

The user day values are applied to estimates of user days from the Operations and Maintenance Business Information Link (OMBIL) and Visitation Estimation and Reporting System (VERS) (Leggett et al., 2017). This calculation is usually done for each recreation area and then summed to generate a national-level estimate (USACE, 2013a). When estimating the values of alternative project management options, USACE economists primarily use demand models based on census data and visitation estimates at a range of projects to predict changes in visitation.

Moving forward, USACE economists would like to consider more recent studies for use in benefits transfers. The WRC 1983 guidance, which serves as the basis for the annual Economics Guidance Memorandum is based on outdated information. While USACE economists have considered the RUVI and USGS Benefits Transfer Toolkit, they have not been used because USACE management places a high value on consistency of analysis over time. Further, the estimation of economic values is generally considered secondary to estimates of economic contributions (Wen-Huei Chang, personal communication, June 2017), so this has not been a high priority topic for management to consider.

Economic Contributions Analysis

The Regional Economic Systems (RECONS) model is used to estimate economic contributions from recreation visitor spending. The model combines visitation data from OMBIL and VERS with information from the most recent visitor spending surveys (USACE, 2013a). Visitor surveys conducted at 150-200 sites in 2012-2013 and 2017 will provide the basis for developing spending profiles for future analyses (starting in late 2017). Spending profiles were previously updated using surveys conducted in 1999-2000 (Chang et al., 2003). Several analyses have used these profiles (e.g., Amsden et al., 2008; Perales et al., 2008; Probst et al., 2008), though other studies have relied on more recent targeted data collection efforts (e.g., see Kasul et al., 2010).

IMPLAN is used to apply the regional economic multipliers. The results are reported online (<http://www.corpsresults.us/recreation/recfastfacts.cfm>) as contributions to local project communities, states, the national economy, and other geographic levels. The

following bullets describe visitor spending, multipliers, and economic contribution results (see Leggett et al. (2017) for a description of the visitation data):

- **Visitor spending:** While Chang et al. (2003) document the spending categories and visitor segments from the 1999-2000 visitor spending surveys, documentation on spending profiles developed from online surveys in recent years is still being finalized. The new surveys will yield multiple spending categories covering gas and oil, groceries, restaurants and bars, boat expenses, sporting goods, hotels, and camping. Multiple visitor segments will be used, distinguishing locals from non-locals, day users from overnight visitors, and boaters from non-boaters.³⁸ Trip spending within 30 miles of a site that is associated with the recreation trip will be included in the contributions analysis. Spending that occurs beyond 30 miles will be analyzed separately. Since recent visitor surveys have been conducted at a subset of sites, generic visitor segment distributions and spending profiles are being developed based on site type, and will be applied to all sites for the national estimates.
- **Regional economic multipliers:** The USACE uses IMPLAN to apply regional economic multipliers for their analyses. The most recent county-level data are used and adjusted for inflation to the year of analysis using BEA deflators. Multi-county areas are specified by analysts for each project area and other geographic levels.
- **Results:** The economic contribution statistics are published online in a section of the USACE website called “Value to the Nation” (<http://www.corpsresults.us/recreation/recfastfacts.cfm>). The website provides state and national reports, as well as reports for individual water resource projects, 41 districts, and 8 divisions. Each report provides detailed visitation estimates for a recent fiscal year and the associated economic contributions in terms of spending, sales (final demand), jobs, labor income, and value added. The visitation and benefits information posted online at the time of this writing reflects 2012 data. An update with the most recent data is anticipated in the near future.

As mentioned above, the USACE is in the process of updating its collection of visitor use characteristics and spending profiles. While the new data will offer more recent insights into visitor behaviors, samples sizes are still relatively small, and data are collected for only a subset of project areas. USACE economists would like to collect these data on a periodic basis (e.g., every 5-10 years), and increase sample sizes and the number of sites sampled.

³⁸ Visitors who report a primary purpose for their trip as something other than for recreation to a USACE site will be assigned a day use visitor spending profile (Wen Wen-Huei Chang, personal communication, June 2017)

5.2 COMPARISON OF METHODS

As described in the previous section, federal land management agencies rely on different data sources and methods to estimate the economic benefits of recreation. The sections below compare the methods related to valuation and economic contributions analysis. All agencies rely on their own onsite data collection efforts to estimate visitation for these analyses. A full review of the methods and additional background information about these data collection efforts can be found in Leggett et al. (2017).

Valuation

All of the agencies rely primarily on benefits transfer to estimate the values supported by recreation use. However, the data sources and visitation units used to conduct a benefits transfer vary by agency (Exhibit 5.1). Our review identified the following differences:

- **Unit of visitation for benefits transfer:** All agencies use estimates of *visitor days* as the unit of visitation for benefits transfer, though the BLM also uses *visits* and *participants* for some analyses. The NPS, BLM, and USACE produce estimates of visitor days as part of their onsite visitation data collection programs. The USFWS, Reclamation, and the USFS use information from onsite interviews or professional judgement to convert estimates of visits or visitor hours to visitor days (e.g., divide number of visits by the average number of calendar days per visit; divide total hours by eight hours per day).
- **Source of value estimates:** There is significant variation across agencies in the source(s) relied upon for valuation estimates. All of the agencies other than the USACE rely, at least in part, on the RUVD. The NPS and BLM also consider the USGS Benefits Transfer Toolkit, which is based on many of the same underlying studies found in the RUVD. Both of these databases have been updated within the past few years. The USFWS and Reclamation use values from a past FHWAR for some analyses. The most recent survey that included valuation questions was conducted in 2011. Finally, Reclamation and the USACE rely on unit day values published in the annual USACE Economics Guidance Memorandum. This is the sole source of information relied upon by the USACE. The values are based on WRC (1983) with updates for inflation.

EXHIBIT 5.1. COMPARISON OF ECONOMIC VALUATION METHODS

| | NPS | BLM | USFWS | RECLAMATION | USFS | USACE |
|--|------------------------|---------------------------------------|---------------|---------------|-------------------|---------------------|
| Source of Visitation Data | Social Science Program | RMIS Database | RAPP Database | RUDR Database | NVUM Program Data | OMBIL and VERS Data |
| Unit of Visitation for Benefits Transfer | Visitor Days | Visitor Days, Visits, or Participants | Visitor Days | Visitor Days | Visitor Days | Visitor Days |
| Source of Value Estimates | | | | | | |
| Recreation Use Values Database | ✓ | ✓ | ✓ | ✓ | ✓ | |
| USGS Benefits Transfer Toolkit | ✓ | ✓ | | | | |
| USFWS FHWAR | | | ✓ | ✓ | | |
| USACE Unit Day Values | | | | ✓ | | ✓ |

Economic Contributions Analysis

The comparison of data sources and methods for economic contributions analysis includes a greater number of dimensions than for valuation (Exhibit 5.2). Our review identified the following similarities:

- **Exclusion of durable goods:** All agencies exclude durable goods, which might be used across a number of trips and perhaps for non-recreational purposes. This is a conservative assumption since a durable good might have been purchased in the region of interest and some portion of its cost could be attributed to the recreation visits of interest. Durable goods are excluded by omitting questions about them from expenditure surveys (NPS and USFWS) or omitting cases with high reported expenditures on sporting goods (USFS and USACE).
- **Model for applying regional economic multipliers:** All agencies use IMPLAN to apply regional economic multipliers for their analyses. In general, the most recent data are used and adjusted for inflation to current year dollars using BEA GDP deflators.

Our review identified substantive differences across agencies in the following areas:

- **Source of expenditure data:** The NPS, USFWS, USFS, and USACE collect their own expenditure data and supporting visitor characteristics information for contributions analyses. The NPS relies on surveys conducted at a subset of parks as resources allow through the Visitor Services Project. The USFWS collects these data every five years as part of the FHWAR. The USFS uses the NVUM program, which covers all units in the country every five years. The USACE implements visitor spending surveys at a subset of sites as resources allow. The

BLM primarily uses USFS NVUM program data and Reclamation primarily relies on information developed by the USFWS from the FHWAR.³⁹

- **Mode of expenditure data collection:** The mode of expenditure data collection varies by agency. The USFS is the only agency to collect data onsite during the trip. The NPS and USACE use mail and internet surveys, respectively, after a trip is completed. The USFWS uses phone and in-person surveys to collect information about all trips within the previous 4-12 months by state and activity. The method used by the USFWS is notably different from the other agencies in that spending data are not collected for a specific trip or even necessarily for visitation to refuges (the FHWAR collects information about recreation throughout the United States). Moreover, the survey uses a significantly longer recall period than for other agencies, though recent efforts have been made to shorten it (USFWS, 2012). The NPS and USACE use offsite data collection, but generally receive expenditure data within a week or two after a trip is completed (Wen-Huei Chang and Lynne Koontz, personal communication, June and July 2017).
- **Unit of expenditures for analysis:** Agencies differ in the way they collect and standardize spending data. The NPS, USFS, and USACE collect data on a per party basis. The NPS collects expenditures per day for day users and per night for overnight users. The USFS and USACE collect expenditures per trip. The USFWS collects data on a per-person, per-day basis. Each agency uses additional information or professional judgement to convert visitation data to match the units of expenditure data for analysis.
- **Geographic boundary for inclusion of expenditures in analysis:** Agencies differ in how they define the geographic scope of expenditures to include in analysis. The NPS includes spending in counties within or intersecting a 60-mile radius around each park. The USFS and USACE include expenses occurred within 50 miles of the interview site and 30 miles of the Corps operated facility, respectively.⁴⁰ The USFWS collects expenditures at the state level and assumes that all spending occurs within 50 miles of a given refuge for which economic contributions are estimated.
- **Number of expenditure categories:** Agencies differ in the number of expenditure categories used for most analyses. The NPS has eight categories, USFWS four, USFS 10, and USACE is still finalizing its categories. All agencies have (or will have) categories for food, lodging, and transportation, though the number of

³⁹ The BLM relies on the approach taken by the USFS for subsequent bullets, unless otherwise noted. The same is true for Reclamation, which relies on USFWS approaches. In cases where the BLM relies on other sources of visitor expenditures (e.g., NPS) the approach associated with that data source is used.

⁴⁰ The USFS defines local visitors as individuals who reside within 60 miles travel of the interview site. The other agencies use the same geographic boundary for including expenditures in analysis for defining local visitors.

categories differs. Additional categories are used to capture other expenses, such as souvenirs and entertainment.

- **Number of visitor segments:** Agencies differ in the maximum number of visitor segments that may be used for most analyses. The NPS and USFS use seven segments, though the definitions differ. Generally speaking, separate segments are designated for day use and overnight, local and non-local, and non-primary purpose or “other” visitors. The USFWS has 12 segments based on residency status (resident or non-resident of state where refuge is located) and recreation activity (six activity groups). The USACE is still finalizing its segments, but will distinguish locals from non-locals, day users from overnight visitors, and boaters from non-boaters. Much of the variation across agencies can be explained by types of visitors and activities specific to certain agency lands. For example, the NPS has a separate segment for overnight visitors who stay in lodges or motels in a park, a feature unique to NPS lands. Likewise, boating is a prominent activity for visitors to USACE lakes, which is why separate segments are used for boaters and non-boaters.
- **Metrics for reporting contributions:** All of the agencies use some combination of expenditures, final demand, jobs, labor income, tax revenues, value added, and economic output to describe the role their sites play in local and regional economies. However, the list of metrics used varies by agency.⁴¹

⁴¹ IMPLAN produces a common set of metrics, which are reported in Exhibit 1.3.

EXHIBIT 5.2. COMPARISON OF METHODS FOR MEASURING REGIONAL ECONOMIC CONTRIBUTIONS

| | NPS | BLM | USFWS | RECLAMATION | USFS | USACE |
|---|--|---|--|--------------------------------------|---|---|
| Source of Visitation Data | Social Science Program | RMIS Database | RAPP Database | RUDR Database | NVUM Program Data | OMBIL and VERS Data |
| Primary Source of Expenditure Data | Visitor Service Project visitor surveys | NVUM visitor surveys ⁴² | USFWS FHWAR | USFWS FHWAR | NVUM visitor surveys | Visitor spending surveys |
| Mode of Expenditure Data Collection | Mail-based survey after trip is completed | (see USFS) ⁴³ | Phone and in-person survey about all trips in the previous 4-12 months | (see USFWS) | Onsite interview during trip | Online survey filled out after trip is completed |
| Unit of Expenditures for Analysis | Per party per day (day use) or per party per night (overnight use) | | Per-person per-day | | Per party per trip | Per party per trip |
| Geographic Boundary for Inclusion of Expenditures in Analysis | All counties within 60-mile radius of park | | None; assume all expenditures made within 50 miles of refuge | | Within 50 miles of interview site | Within 30 miles of project |
| Number of Expenditure Categories | 8 | | 4 | | 10 | TBD |
| Exclude Durable Goods | ✓ | | ✓ | | ✓ | ✓ |
| Number of Visitor Segments | 7 | | 12 | | 7 | TBD |
| Geographic Boundary for Defining Local Visitors | Counties within 60-mile radius of park | | Counties within 50-mile radius of refuge | | Within 60 miles of interview site | Within 30 miles of lake |
| Model for Applying Regional Economic Multipliers | IMPLAN | | IMPLAN | | IMPLAN | IMPLAN |
| Metrics for Reporting Contributions | Expenditures, jobs, labor income, value added, and economic output | Jobs, labor income, and economic output | Expenditures, final demand, jobs, labor income, and tax revenue | Expenditures, jobs, and labor income | Expenditures, jobs, labor income, and economic output | Expenditures, final demand, jobs, labor income, and value added |

⁴² As discussed above, BLM relies on NPS expenditure data in some cases.

⁴³ In cases where the BLM relies on other sources of visitor expenditures (e.g., NPS) the approach associated with that data source is used.

6. RECOMMENDATIONS

This chapter provides a series of recommendations intended to improve the estimation of economic benefits associated with recreation visitation, enhance collaboration and consistency across agencies, and improve the accessibility of results from such analyses. The recommendations arose out of information gathered for this report and discussions with agency personnel. They were developed by Industrial Economics and do not necessarily reflect the views of DOI or agency personnel.

The specific recommendations are as follows:

1. **Improve estimates of visitation:** All of the agencies rely on their own onsite data collection efforts to estimate visitation for valuation and economic contributions analyses. Agencies differ in how comprehensive and rigorous their methods are, but all agencies identified estimating the quantity of visits as the largest source of error (e.g., USGS, 2016; Amsden et al., 2008).

Leggett et al. (2017) provide a series of recommendations for improving the collection of visitation data. The most significant improvement to current methods would involve the elimination of double counting of visitors who enter and leave a site multiple times within the same day. This is a known issue for many agencies, and an oft-used solution is to rely on professional judgment. Unfortunately, this approach can yield imprecise visitation estimates, leading to large uncertainty in estimates of economic benefits. A better approach would be to limit counts to “last-exiting recreationists”, which can be identified using onsite interviews (English et al., 2002). To limit costs, a rate of last-exiting visitors could be established by intercepting a sample of departing visitors at a subset of exit points (separate rates may be developed for different types of access points). Leggett (2017) and Horsch et al. (2017a) provide additional guidance on best practices for onsite recreation use data collection.

A closely-related issue is the need to avoid double-counting of visitors who visit multiple public lands on the same day, which can lead to overestimates of economic benefits. For example, the NPS is currently conducting a study in the Washington D.C. area to better estimate how many monuments and parks are visited as part of the same trip (with separate estimates for day use and overnight visitors) (Cullinane Thomas and Koontz, 2017).

When conducting valuation or contributions analyses, a common challenge for agencies is predicting *changes* in the amount of recreation under alternative management scenarios. If funding allows, additional data could be collected to better understand potential changes. More likely, a mixture of existing data and

professional judgement will be used. We recommend using model-based approaches, when feasible, to forecast changes in visitation. A recreation demand model can be estimated using existing data from a range of sites to understand how visits vary with key variables, such as population size, resource characteristics, and provision of facilities. The results can then be used to make predictions.

2. **Improve expenditure and visitor characteristics data collection:** Four of the six agencies—the NPS, USFWS, USFS, and USACE—collect their own data on visitor spending and other characteristics necessary for contributions analyses. While the BLM and Reclamation generally do not collect their own data due to cost constraints, we recommend periodic and targeted data collection be implemented at sites to evaluate how well data borrowed from other agencies comport to site-specific information. For example, a past pilot study applying NVUM-like procedures at a subset of BLM sites showed the types of visitors and their expenditures can differ from nearby National Forest or Grassland sites (Josh Sidon, personal communication, May 2017). Identifying such differences can help the BLM and Reclamation weigh the costs and benefits of collecting their own data, and perhaps assist in adjusting the borrowed data to better match particular sites. This recommendation also applies to the USFWS, which does not collect data specific to the National Wildlife Refuge System through the FHWAR.

The NPS and USACE collect data at a subset of sites. However, these data are not collected on a regular basis by either agency, and many NPS sites are selected for data collection based on convenience. Since expenditure information and visitor characteristics are extrapolated to sites where data are not collected, it is important to select representative sites for data collection (e.g., based on park type and geographic region). It may be preferable to collect data at all sites over a specific period (e.g., 10 years), rotating through different sets of sites in a given year. This is essentially what the USFS does through the NVUM program, though reduced-effort sampling approaches could be utilized.

In general, all of the agencies would prefer to have more site-specific data and larger samples, which could add spatial resolution to analyses. As an alternative, model-based approaches could be used to estimate relationships between spending (or other visitor characteristics) and key determinants (e.g., average visitor income levels) in order to fill data gaps with model-based predictions.

Aside from data coverage, a salient issue affecting data quality is recall error, which is relevant for agencies that collect data using offsite surveys. The NPS and USACE generally receive most responses within a week or two of trip completion and the questions are specific to the recently-completed trip. The USFWS has a longer recall period and the responses are not trip-specific. We recommend using shorter recall periods and collecting data that are trip-specific to improve accuracy of responses. Data received long after a trip is completed should be carefully evaluated and potentially dropped.

3. **Follow best practices for benefits transfer:** Since benefits transfer is far and away the most applied approach to estimate the economic value associated with recreation, it is paramount that best practices for the method are applied. Detailed guidance can be found in a range of sources, including OMB (2003), U.S. EPA (2014), and Johnston et al. (2015). The most important considerations for any transfer are 1) ensuring similarity of the good or service valued in the literature to the good or service being considered and 2) the overall quality of the original estimate.

Consistent with available guidance, we recommend the use of function transfers when possible to calibrate existing estimates to site-specific conditions. A function transfer is a two-step process: 1) first, the relationship between the value for recreation and the key determinants (e.g., region, activity, availability of substitutes, share of local/non-local visitors) is estimated or borrowed from existing literature; 2) second, variables for the key determinants are constructed for the site of interest and applied to the estimated function parameters. Since one or both of these steps may be infeasible (e.g., data on key determinants may be unavailable for the site of interest), a unit value transfer may be used. In these cases, we recommend considering region- and activity-specific values. Estimates in the RUVD and USGS Benefits Transfer Toolkit are organized by these two dimensions. We recommend selecting values from more-recent studies whenever possible. The USACE and Reclamation rely, at least in part, on unit day values supported largely by outdated literature (values are based on WRC, 1983).

As a first step, agencies could coordinate on developing an inter-agency manual that codifies best practices for benefits transfer. The manual could be developed using existing guidance and be used by analysts who implement the method.

4. **Conduct original valuation studies when feasible:** In some cases, conducting a primary valuation study may be appropriate. While benefits transfer is often used for policy analysis or to meet regulatory requirements, an original study may be needed to support a natural resource damage assessment or other potentially litigious situations. In these cases, a responsible party may be willing to fund a study (at least in part) to better understand their potential liability. Further, primary research may be needed to estimate values for unique resources or activities that are not addressed adequately in existing literature. For example, there is a particular need for valuation studies examining recreation on NPS and BLM lands (Duffield et al., 2007; USGS, 2016). Finally, values for changes in site quality are often site-specific and require a primary study.
5. **Raise the profile of estimating economic values:** When it comes to the economic benefits of recreation, jobs, income, and other metrics used in contributions analyses seem to get the most attention from agency managers and external stakeholders (recall Exhibit 1.3, which lacks valuation estimates for four of the six agencies). However, the economic value associated with recreation is a significant and quantifiable benefit that should be equally emphasized. We suspect that the notion of value, or consumer surplus, is less-understood by non-

economists and thus viewed with skepticism. While we concede that a job supported might seem more tangible than a dollar of value generated for an individual recreationist, there is no theoretical reason for prioritizing the reporting of either measure.

We recommend framing economic benefits as two-fold: 1) benefits to individual recreationists and 2) benefits to the regional or national economy. By focusing less on the abstract concept of consumer surplus and emphasizing that well-being benefits to recreationists exist (perhaps with some examples), agency managers and external stakeholders may take a greater interest in quantifying and reporting economic values.

6. **Enhance inter-agency collaboration:** Many agency personnel expressed a desire to better understand how other agencies estimate recreation benefits and to collaborate on challenging issues. The BLM and Reclamation work with the USFS and USFWS to obtain expenditure profiles and visitor characteristics for their analyses. Moreover, NPS, USFS, and USACE staff reported collaborating on a range of issues related to data collection (i.e., how to best capture spending patterns and classify visitors into unique segments) and processing (i.e., handling missing responses, outliers, and other inconsistent responses).

Agencies could collaborate on research into methodological issues related to spending studies, which include (1) how reported expenditures or characteristics used to place respondents in visitor segments vary with respect to question wording and (2) how spending reports compare across survey modes (i.e. onsite survey during trip vs. offsite survey after trip is completed). Funds are often scarce at any one agency to conduct research, so a multi-agency effort may be needed to pool sufficient resources. Further, effort required for Office of Management and Budget approval to collect data could be spread across agency personnel.

We recommend that agencies look for opportunities to convene on a regular basis to discuss approaches for measuring visitation and estimating economic benefits. This was a shared sentiment across the agencies after a March 2017 inter-agency workshop on estimating recreation visitation (Horsch et al., 2017b).

7. **Development of guidance documents for agency personnel:** Some agency personnel expressed a desire for agency-specific guidance on conducting analyses to estimate the benefits of recreation visitation. The primary purpose of such guidance would be to ensure consistency across analyses through a step-by-step user manual. Such a manual could save time and money since analysts could focus on implementation rather than determining the appropriate approach and methods. However, every analysis has idiosyncrasies that likely could not be fully addressed by a guidance document.

A guidance document might include three broad sections: 1) establishing the relevant quantity of recreation, 2) selecting and applying values (or conducting primary valuation research), and 3) a section on the relevant steps for estimating

economic contributions. Some of the agencies have already developed such documents. The BLM relies on a 2013 internal agency memorandum for estimating the benefits of recreation (BLM, 2013a); the USFS has Rosenberger et al. (2017) for valuation and White (2017) for contributions analysis; and the USACE gets direction on estimating economic values associated with recreation in their annual Economics Guidance Memorandum (USACE, 2016a). The remaining agencies could benefit from developing their own guidance, and could consider adopting one of the sources already in use.

8. **Post latest statistics on the web or in publicly available reports:** Agencies should use a common approach for reporting benefit estimates and make the statistics publicly-available. For example, valuation estimates might be reported for each unit and at the national level (i.e., fill in Exhibit 1.3 for all agencies). Economic contributions might be reported for local gateway communities and at the state and national levels. Establishing consistent reporting methods could facilitate the creation of a single website providing public access to visitation estimates and the associated benefits across all federal land management agencies (e.g., hosted by Recreation.gov; see Horsch et al., 2017b).

REFERENCES

- Amsden, B.L., W.H. Chang, R. Kasul, L. Lee, and K. Perales. 2008. Economic Impacts from Spending by Marina Slip Renters at Raystown Lake. U.S. Army Corps of Engineers. Available online at: <https://erdc-library.erdc.dren.mil/xmlui/bitstream/handle/11681/6856/EL-TR-08-5.pdf?sequence=1&isAllowed=y>. Accessed 7/11/2017.
- Arrow, K., R. Solow, P. R. Portney, E. E. Leamer, R. Radner, and H. Schuman. 1993. "Report of the NOAA Panel on Contingent Valuation." Federal Register, January 15, 58(10), 4601-4614.
- BEA. Undated. RIMS II - An Essential Tool for Regional Developers and Planners. Available online at: https://bea.gov/regional/pdf/rims/RIMSII_User_Guide.pdf. Accessed 7/11/2017.
- BLM. 2013a. Guidance on Estimating Nonmarket Environmental Values. Available online at: <https://www.blm.gov/policy/im-2013-131-ch1>. Accessed 8/1/2017.
- BLM. 2013b. Socioeconomic Baseline Report for the Rock Springs Field Office. Resource Management Plan and Associated Environmental Impact Statement. Available online at: https://eplanning.blm.gov/epl-front-office/projects/lup/13853/44112/47488/Rock-Springs-RMP_Socioeconomic-Baseline-Report_7-10-2013_SFS_webready.pdf. Accessed 7/11/2017.
- BLM. 2015. Proposed Resource Management Plan / Final Environmental Impact Statement. Western Oregon. Volume 1. Available online at: https://www.blm.gov/or/plans/rmpswesternoregon/files/prmp/RMPWO_Volume_1.pdf. Accessed 7/11/2017.
- BLM. 2016a. Recreation and Visitor Services. Available online at: <https://www.blm.gov/programs/recreation>. Accessed 7/11/2017.
- BLM. 2016b. The BLM: A Sound Investment for America 2016. Available online at: https://www.blm.gov/sites/blm.gov/files/AboutUs_SoundInvestmentsocioeconomicreport_lettersize.pdf. Accessed 7/11/2017.
- BLM. 2017. Socioeconomic Baseline Report - Eastern Colorado Resource Management Plan & Environmental Impact Statement. Available online at: https://eplanning.blm.gov/epl-front-office/projects/lup/39877/99896/121080/ECRMP_Socioeco_Baseline_Rept_3-15-2017.pdf. Accessed 7/11/2017.
- Bowker, J., C. Starbuck, D. English, J. Bergstrom, R. Rosenberger, and D. McCollum. 2009. Estimating the Net Economic Value of National Forest Recreation: An Application of the National Visitor Use Monitoring Database. Faculty Series Working Paper, FS 09-02, September, 2009, The University of Georgia, Department of Agricultural and Applied Economics.

- Bowker, J.M., A.E. Askew, H.K. Cordell, C.J. Betz, S.J. Zarnoch, and L. Seymour. 2012. Outdoor recreation participation in the United States—projections to 2060: a technical document supporting the Forest Service 2010 RPA Assessment. Gen. Tech. Rep. SRS-160. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 36 p.
- Boyle, K., R. Bishop, J. Caudill, J. Charbonneau, D. Larson, M. Markowski, R. Unsworth and R. Paterson. 1998. A database of sport fishing values. Prepared for Economics Division, US Fish and Wildlife Service. Cambridge, MA: Industrial Economics, Inc. Available online at: <http://www.indecon.com/fish/Sprtfish.pdf>. Accessed 7/11/2017.
- Boyle, K. 2017. “Contingent Valuation in Practice.” *A Primer on Nonmarket Valuation*. P.A. Champ, K. Boyle, and T.C. Brown (Eds.). 83-131. Print.
- Brown, G. and R. Mendelsohn. 1984. The Hedonic Travel Cost Method. *The Review of Economics and Statistics*, 66(3), 427-433.
- Carver, E. and J. Caudill. 2013. Banking on Nature - The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. U.S. Fish & Wildlife Service. Available online at: <https://www.fws.gov/refuges/about/refugereports/pdfs/BankingOnNature2013.pdf>. Accessed 7/11/2017.
- Council on Environmental Quality (CEQ). 2013. Principles and Requirements for Federal Investments in Water Resources. Available online at: https://obamawhitehouse.archives.gov/sites/default/files/final_principles_and_requirements_march_2013.pdf. Accessed 7/11/2017.
- Council on Environmental Quality (CEQ). 2014. Chapter III - Interagency Guidelines. Available online at: https://obamawhitehouse.archives.gov/sites/default/files/docs/prg_interagency_guidelines_12_2014.pdf. Accessed 7/11/2017.
- Champ, P.A., K.J. Boyle, and T.C. Brown (Eds.). 2017. *A Primer on Nonmarket Valuation*. 2nd ed. Boston, MA: Kluwer Academic Publishers. Print.
- Chang, W.H., D. Propst, D. Stynes, and R. Jackson. 2003. Recreation Visitor Spending Profiles and Economic Benefit to Corps of Engineers Projects. U.S. Army Corps of Engineers. Available online at: <https://erdc-library.erdc.dren.mil/xmlui/bitstream/handle/11681/7050/ERDC-EL%20TR-03-21.pdf?sequence=1&isAllowed=y>. Accessed 7/11/2017.
- Chay, K.Y. and M. Greenstone. 2005. Does Air Quality Matter? Evidence from the Housing Market. *Journal of Political Economy*, 113(2), 376-424.
- Chu, A., D. Eisenhower, M. Hay, D. Morganstein, J. Neter, and J. Waksberg 1992. Measuring Recall Error in Self-Reported Fishing and Hunting Activities. *Journal of Official Statistics*, 5, 13-39.
- Cook, P.S. 2011. Impacts of Visitor Spending on the Local Economy: Wind Cave National Park, 2010. National Park Service, Fort Collins, Colorado. Available online

- at: http://psu.sesrc.wsu.edu/vsp/economics/237_WICA_MGM2.pdf. Accessed 7/11/2017.
- Cook, P. S. 2013. Impacts of Visitor Spending on the Local Economy: Chickasaw National Recreation Area, 2012. Natural Resource Report NPS/NRSS/EQD/NRR—2013/666. National Park Service, Fort Collins, Colorado. Available online at: http://psu.sesrc.wsu.edu/vsp/economics/251_CHIC_MGM2.pdf. Accessed 7/11/2017.
- Congressional Research Service (CRS). 2014. Federal Land Ownership: Overview and Data. Available online at: <https://fas.org/sgp/crs/misc/R42346.pdf>. Accessed 3/1/2018=7.
- Cropper, M.L., L.B. Deck, and K.E. McConnell. 1988. On the Choice of Functional Form for Hedonic Price Functions. *The Review of Economics and Statistics*, 70(4), 668-675.
- Cullinane Thomas, C., C. Huber, and L. Koontz. 2014. 2012 National Park Visitor Spending Effects: Economic Contributions to Local Communities, States, and the Nation. Natural Resource Report NPS/NRSS/EQD/NRR—2014/765. National Park Service, Fort Collins, Colorado. Available online at: https://www.nature.nps.gov/socialscience/docs/NPSVSE2012_final_nrss.pdf. Accessed 7/11/2017.
- Cullinane Thomas, C., and L. Koontz. 2017. 2016 National Park Visitor Spending Effects: Economic Contributions to Local Communities, States, and the Nation. Natural Resource Report NPS/NRSS/EQD/NRR—2017/1421. National Park Service, Fort Collins, Colorado. Available online at: https://www.nps.gov/nature/customcf/NPS_Data_Visualization/docs/2016_VSE.pdf. Accessed 7/11/2017.
- Desvousges, W., K. Mathews, and K. Train. 2015. An Adding-up Test on Contingent Valuations of River and Lake Quality. *Land Economics*, 91(3), 556-571. Available online at: <http://eml.berkeley.edu/~train/addingup.pdf>. Accessed 7/11/2017.
- DOI. 2015. Agency Specific Procedures for Implementing the Council on Environmental Quality's Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies. 707 DM 1 Handbook.
- DOI. 2016. U.S. Department of the Interior Economic Report FY 2015. Available online at: https://www.doi.gov/sites/doi.gov/files/uploads/fy2015_doi_econ_report_2016-06-20.pdf. Accessed 7/11/2016.
- DOI. 2017. U.S. Department of the Interior Economic Report FY 2016. Forthcoming at: <https://www.doi.gov/ppa/reports-and-statistics>.
- Duffield, J., C. Neher, and D. Patterson. 2007. Economic Values of National Park System Resources Within the Colorado River Watershed: Phase II. Prepared for the National Park Service.

- EMSI. Undated. EMSI's Input-Output Model Multipliers: A Brief Overview and Comparison with Other Major Models. Available online at: http://www.economicmodeling.com/wp-content/uploads/2007/10/ed_multiplier_methodology_comparison.pdf. Accessed 7/11/2017.
- English, D.B.K., S.M. Kocis, S.J. Zarnoch, J. Stanley, and J. Ross. 2002. Forest Service National Visitor Use Monitoring Process: Research Method Documentation. United States Department of Agriculture, Forest Service, Southern Research Station, General Technical Report SRS-57.
- English, E., C. Peterson, and C. Voss. 2009. Ecology and Economics of Compensatory Restoration. Available online at: http://www.mopt.org.pt/uploads/1/8/5/5/1855409/doc_english_ecology_and_economics_of_compensatory_restoration_2009.pdf. Accessed 7/11/2017.
- English, D., S. Cline, W.H. Chang, B. Leeworthy, J. Sidon, K. Kilcullen, B. Meldrum, S. Winter, and C. Moyer. 2013. Federal Interagency Council on Outdoor Recreation - Outdoor Recreation: Jobs and Income. Available online at: <https://www.fs.fed.us/research/docs/outdoor-recreation/recreation-economy.pdf>. Accessed 7/11/2017.
- English, E., C. Leggett, and K. McConnell. 2015. E2- Value of Travel Time and Income Imputation.
- Freeman, A.M., J.A. Herriges, and C.L. Kling. 2014. *The Measurement of Environmental and Resource Values - Theory and Methods*. Third Edition.
- Groves, R. M. 2006. Nonresponse Rates and Nonresponse Bias in Household Surveys. *Public Opinion Quarterly*, 70, 646–675.
- Haab, T.C. and K.E. McConnell. 2002. *Valuing Environmental and Natural Resources: The Econometrics of Non-Market Valuation*. Edward Elgar Publishing.
- Haefele, M., J. Loomis, and L.J. Bilmes. 2016. Total Economic Valuation of the National Park Service Lands and Programs: Results of a Survey of the American Public. Available online at: <https://www.nps.gov/subjects/socialscience/tev.htm>. Accessed 7/11/2017.
- Hellerstein, D. 1991. Using Count Data Models in Travel Cost Analysis with Aggregate Data. *American Journal of Agricultural Economics* 73, 860-866.
- Hellerstein, D. and R. Mendelsohn. 1993. A Theoretical Foundation for Count Data Models. *American Journal of Agricultural Economics* 75, 604-611.
- Holmes, T. 2017. "Choice Experiments." *A Primer on Nonmarket Valuation*. P.A. Champ, K. Boyle, and T.C. Brown (Eds.). 133-186. Print.
- Horsch, E., M. Welsh, and J. Price. 2017a. Best Practices for Collecting Onsite Data to Assess Recreational Use Impacts from an Oil Spill. U.S. Dept. of Commerce, NOAA Technical Memorandum NOS OR&R 54. Silver Spring, MD: Assessment and Restoration Division, NOAA. 121 pp.

- Horsch, E., R. Unsworth, C. Smith, and C. Leggett, 2017b. March 20, 2017 Interagency Workshop on Recreation Visitation Data: Summary and Next Steps. Memorandum to Sarah Cline, Christian Crowley, and Benjamin Simon (DOI PPA); and Peter Grigelis (FWS). April 25.
- Horsch, E.J. and D.J. Lewis. 2009. The Effects of Aquatic Invasive Species on Property Values: Evidence from a Quasi-Experiment. *Land Economics* 85(3), 391-409.
- IMPLAN. 2015a. Key Assumptions of IMPLAN & Input/Output Analysis. Available online at: http://support.implan.com/index.php?option=com_content&view=article&id=377:377&catid=222:222. Accessed 7/11/2017.
- IMPLAN. 2015b. IMPLAN Data. Available online at: http://support.implan.com/index.php?option=com_content&view=article&id=330:330&catid=95:products-category&Itemid=1747. Accessed 7/11/2017.
- Johnston, R.J., K.J. Boyle, W. Adamowicz, J. Bennett, R. Brouwer, T.A. Cameron, W.M. Hanemann, N. Hanley, M. Ryan, R. Scarpa, R. Tourangeau, and C.A. Vossler. 2017. Contemporary Guidance for States Preference Studies. *Journal of the Association of Environmental and Resource Economists* 4(2), 319-405.
- Johnston, R.J., J. Rolfe, R.S. Rosenberger, and R. Brouwer (Eds.). 2015. *Benefit Transfer of Environmental and Resource Values: A Guide for Researchers and Practitioners*. Springer Netherlands. Print.
- Kasul, R., D. Stynes, L. Lee, W.H. Chang, R. Jackson, C. Wibowo, S. Franco, and K. Perales. 2010. Characterization of Park Visitors, Visitation Levels, and Associated Economic Impacts of Recreation at Bull Shoals, Norfolk, and Table Rock Lakes. U.S. Army Corps of Engineers. Available online at: <https://erdc-library.erdc.dren.mil/xmlui/bitstream/handle/11681/6943/EL-TR-10-18.pdf?sequence=1&isAllowed=y>. Accessed 7/11/2017.
- Kaval, P. and J. Loomis. 2003. Updated outdoor recreation use values with emphasis on National Park recreation. Final Report, Cooperative Agreement 1200-99-009, Project number IMDE-02-0070. Fort Collins, CO: Colorado State University, Department of Agricultural and Resource Economics.
- Koontz, L., and B. Meldrum. 2014. Effects of the October 2013 Government Shutdown on National Park Service Visitor Spending in Gateway Communities. Natural Resource Report NPS/EQD/NRSS/NRR—2014/761. National Park Service, Fort Collins, Colorado. Available online at: https://www.nature.nps.gov/socialscience/docs/Economic2013ShutdownReport_Final_nrss_VSE.pdf. Accessed 7/11/2017.
- Leggett, C.G. 2017. Sampling Strategies for On-Site Recreation Counts. *Journal of Survey Statistics and Methodology*, 5, 326-349.
- Leggett, C., E. Horsch, C. Smith, and R. Unsworth. 2017. Estimating Recreational Visitation to Federally-Managed Lands. Prepared for the Office of Policy Analysis, United States Department of Interior.

- MacFadden, D. and K. Train (Eds.). 2017. *Contingent Valuation of Environmental Goods - A Comprehensive Critique*. Edward Elgar Publishing, Inc. Print.
- Maillet, E. 2011. Refuge Recreation Economics Technical Report for the Secretarial Determination on Whether to Remove Four Dams on the Klamath River in California and Oregon. Lower Klamath Lake and Tule Lake National Wildlife Refuges. U.S. Fish and Wildlife Service. Available online at: https://klamathrestoration.gov/sites/klamathrestoration.gov/files/Klamath%20Refuge%20Recreation%202012%20dollars_Final%20Draft%20Report1%209_13_11.pdf. Accessed 7/11/2017.
- McConnell, V. and M. Walls. 2005. The Value of Open Space: Evidence from Studies of Nonmarket Benefits. *Resources for the Future*. Available online at: <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-REPORT-Open%20Spaces.pdf>. Accessed 7/11/2017.
- Neher, C., J. Duffield, and D. Patterson. 2013. Valuation of National Park System Visitation: The Efficient Use of Count Data Models, Meta-Analysis, and Secondary Visitor Survey Data. *Environmental Management*, 52, 683-698.
- Nelson, J. 2010. Valuing Rural Recreation Amenities: Hedonic Prices for Vacation Rental Houses at Deep Creek Lake, Maryland. *Agricultural and Resource Economics*, 39(3), 485-504.
- NPS. 2003. Damage Assessment and Restoration Handbook - Guidance for Damage Assessment and Restoration Activities in the National Park Service. Available online at: <https://www.nps.gov/policy/DOrders/DO-14Handbook.pdf>. Accessed 7/11/2017.
- NPS. 2004. Director's Order # 14: Resource Damage Assessment and Restoration. Available online at: https://www.nps.gov/policy/DOrders/DO_14.pdf. Accessed 7/11/2017.
- NPS. 2016. Visitor Use Statistics. Available online at: <http://www.nature.nps.gov/socialscience/stats.cfm>. Accessed 3/1/2017.
- Office of Management and Budget (OMB). 2003. Circular A-4: To the Heads of Executive Agencies and Establishments. September 17.
- Parsons, G.R. 2017. "Travel Cost Models." *A Primer on Nonmarket Valuation*. P.A. Champ, K. Boyle, and T.C. Brown (Eds.). 187-233. Print.
- Paterson, R.W. and K.J. Boyle. 2002. Out of Sight, Out of Mind? Using GIS to Incorporate Visibility in Hedonic Property Value Models. *Land Economics* 78(3), 417-425.
- Pendleton, L. and R. Mendelsohn. 2000. Estimating Recreation Preferences Using Hedonic Travel Cost and Random Utility Models. *Environmental and Resource Economics*, 17, 89-108.
- Perales, K., D. Propst, B. Amsden, W.H. Chang, R. Kasul, and L. Lee. 2008. Economic Impact from Spending by Community Dock Owners at Rough River Lake. U.S.

- Army Corps of Engineers. Available online at:
<http://www.dtic.mil/dtic/tr/fulltext/u2/a475751.pdf>. Accessed 7/11/2017.
- Probst, D., B. Amsden, W.H. Chang, R. Kasul, L. Lee, and K. Perales. 2008. Economic Impacts from Spending by Community Dock Owners at Pomme de Terre Lake. U.S. Army Corps of Engineers. Available online at:
<http://www.dtic.mil/dtic/tr/fulltext/u2/a475832.pdf>. Accessed 7/11/2017.
- Reclamation. 2008. Economics Technical Report for the Yakima River Basin. Technical Series No. TS–YSS–23. Available online at:
https://www.usbr.gov/pn/studies/yakimastoragestudy/reports/ts-yss-27/TS_YSS_27.pdf. Accessed 7/11/2017.
- Reclamation. 2009. Economic Consequences Methodology for Dam Failure Scenarios. Technical Memorandum Number EC-2009-01. Available online at:
<https://www.usbr.gov/tsc/techreferences/economics/TMEC200901.pdf>. Accessed 7/11/2017.
- Reclamation. 2010. Delta-Mendota Canal Recirculation Feasibility Study - Plan Formulation Report - Appendix J - Economic Analysis. Available online at:
https://www.usbr.gov/mp/dmcrecirc/docs/final/Volume%202%20Appendices/Appendix%20J/Appendix%20J_Economic_Jan2010.pdf. Accessed 7/11/2017.
- Reclamation. 2011. Benefit Cost and Regional Economic Development Technical Report. For the Secretarial Determination on Whether to Remove Four Dams on the Klamath River in California and Oregon. Available online at:
[https://klamathrestoration.gov/sites/klamathrestoration.gov/files/2013%20Updates/Econ%20Studies%20f.BCA_7-20-2012%20\(accessible\).pdf](https://klamathrestoration.gov/sites/klamathrestoration.gov/files/2013%20Updates/Econ%20Studies%20f.BCA_7-20-2012%20(accessible).pdf). Accessed 7/11/2017.
- Reclamation. 2013. Shasta Lake Water Resources Investigation - Modeling Appendix. Available online at:
https://www.usbr.gov/mp/nepa/documentShow.cfm?Doc_ID=14118. Accessed 7/11/2017.
- Reclamation. 2015a. Recreation Overview. Available online at:
<http://www.usbr.gov/recreation/overview.html>. Accessed 3/1/2017.
- Reclamation. 2015b. Shasta Lake Water Resources Investigation - Economic Valuation Appendix. Available online at:
<https://www.usbr.gov/mp/slwri/docs/feasibility/SLWRI-FINAL-FR-01-Economic-Valuation-Appendix.pdf>. Accessed 7/11/2017.
- Reclamation. 2016. Los Angeles Basin Study - The Future of Stormwater Conservation. Task 6 – Trade-Off Analysis & Opportunities. Available online at:
<https://www.usbr.gov/lc/socal/basinstudies/LABasinStudyTask6FinalReport.pdf>. Accessed 7/11/2017.
- REMI. 2016. The REMI Model. Available online at: <http://www.remi.com/the-remi-model>. Accessed 7/11/2017.

- Richardson, L., T. Rosen, K. Gunther, and C. Schwartz. 2014. The economics of roadside bear viewing. *Journal of Environmental Management*, 140, 102-110.
- Rosenberger, R. 2015. "Benefit Transfer Validity, Reliability and Error." *Benefit Transfer of Environmental and Resource Values: a Handbook for Researchers and Practitioners*. Johnston, R., J. Rolfe, R. Rosenberger, and R. Brouwer (Eds.). 307-326. Print.
- Rosenberger, R. 2016. Recreation Use Values Database (RUVD). Corvallis, OR: Oregon State University, College of Forestry. Available online at: <http://recvaluation.forestry.oregonstate.edu/>. Accessed 7/11/2016.
- Rosenberger, R.S., E.M. White, J.D. Kline, and C. Cvitanovich. 2017. Recreation Economic Values for Estimating Outdoor Recreation Economic Benefits From the National Forest System. Gen. Tech. Rep. PNW-GTR-957. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Stynes, D. 2005. Economic Significance of Recreational Uses of National Parks and Other Public Lands. *Social Science Research Review*, 5(1), 1-35.
- Stynes, D. and E. White. 2006. Reflections on Measuring Recreation and Travel Spending. *Journal of Travel Research*, 45, 8-16.
- Taylor, L. 2017. "Hedonics." *A Primer on Nonmarket Valuation*. P.A. Champ, K. Boyle, and T.C. Brown (Eds.). 235-292. Print.
- U.S. EPA. 2014. *Guidelines for Preparing Economic Analyses*. EPA 240-R-10-001. May.
- USACE. 2013a. Value to the Nation of the U.S. Army Corps of Engineers Civil Works Programs. 2013-R-09. Available online at: http://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/2013-R-09_vtn.pdf. Accessed 7/11/2017.
- USACE. 2013b. U.S. Army Corps of Engineer Visitor Use Surveys. Available online at: <https://corpslakes.erdc.dren.mil/visitors/VisitorSurvey/index.cfm>. Accessed 3/1/2017.
- USACE. 2015. Best Practices Guide for Selecting and Deploying Equipment to Meter Vehicular Traffic at USACE Project Site Areas. Available online at: <https://corpslakes.erdc.dren.mil/employees/usurveys/pdfs/2015-BPG.pdf>. Accessed 3/1/2017.
- USACE. 2016a. Economic Guidance Memorandum, 17-03, Unit Day Values for Recreation for Fiscal Year 2017. Available online at: <https://planning.erdc.dren.mil/toolbox/library/EGMs/EGM17-03.pdf>. Accessed 7/11/2017.
- USACE. 2016b. USACE Recreation. Available online at: <http://www.usace.army.mil/Missions/Civil-Works/Recreation/>. Accessed 3/1/2017.
- USACE. 2017. Value to the Nation of the U.S. Army Corps of Engineers Civil Works Programs. Draft report, in progress, for FY 2015.

- USFS. 2016a. National Visitor Use Monitoring Survey Results. Available online at: http://www.fs.fed.us/recreation/programs/nvum/pdf/508pdf2015_National_Summary_Report.pdf. Accessed 3/1/2017.
- USFS. 2016b. Recreation Quick Facts. Available online at: http://www.fs.fed.us/recreation/programs/facts/facts_sheet.shtml. Accessed 3/1/2017.
- USFWS. 2008. Economic Analysis of the Migratory Bird Hunting Regulations for the 2008-2009 Season. U.S. Department of the Interior, Washington, D.C. 33pp.
- USFWS. 2012. 2011 National Survey of Fishing, Hunting, & Wildlife-Associated Recreation Codebooks. Available online at: <https://www.census.gov/prod/www/fishing.html>. Accessed 4/15/17.
- USFWS. 2015. National Survey - Overview. Available online at: https://wsfrprograms.fws.gov/subpages/nationalsurvey/national_survey.htm. Accessed 3/1/17.
- USFWS. 2016a. About the U.S. Fish and Wildlife Service. Available online at: https://www.fws.gov/help/about_us.html. Accessed 4/11/17.
- USFWS. 2016b. Net Economic Values for Wildlife-Related Recreation in 2011. Addendum to the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Report 2011-8. Available online at: <https://digitalmedia.fws.gov/cdm/ref/collection/document/id/2125>. Accessed 7/11/2017.
- USGS. 2016. Facilitating the Inclusion of Nonmarket Values in Bureau of Land Management Planning and Project Assessments - Final Report. Prepared in cooperation with the Bureau of Land Management's Socioeconomics Program and National Operations Center. Open File Report 2016-1178. Available online at: <https://pubs.usgs.gov/of/2016/1178/ofr20161178.pdf>. Accessed 7/11/2017.
- USGS. 2017. Benefit Transfer Toolkit. Available online at: <https://my.usgs.gov/benefit-transfer/announcement/documentation>. Accessed 7/11/2017.
- Washington State University (WSU). 2016. National Parks Service Projects. Available online at: <https://sesrc.wsu.edu/national-park-service-projects/>. Accessed 3/1/2017.
- White, E.M. 2012. Brief Analysis of Visitor Characteristics from the BLM Pilot Test of the National Visitor Use Monitoring Process - DRAFT.
- White, E. 2017. Spending Patterns of Outdoor Recreation Visitors to National Forests - DRAFT. Gen. Tech. Rep. PNW-GTR. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- White, E. and D. Goodding. 2015. Spending and Economic Activity from Recreation at Oregon State Park Properties, Valleys Region and Select Mountain Region Properties, 2015 update. Oregon State University. Available online at: http://www.oregon.gov/oprd/PLANS/docs/scorp/2013-2018_SCORP/2015_Valleys_Region_Economic_Report.pdf. Accessed 7/11/2017.

- Water Resources Council (WRC).1983. Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.
- Whitehead, J.C. and R. Aiken. 2007. Temporal Reliability of Willingness to Pay from the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. *Applied Economics*, 39(6), 777-786.
- Zarnoch, S.J., White, E.M., English, D.B.K., Kocis, Susan M. and Arnold, Ross. 2011. The National Visitor Use Monitoring Methodology and Final Results for Round 1. United States Department of Agriculture, Forest Service, Southern Research Station, Gen. Tech. Rep. SRS-144, Asheville, North Carolina.