

# Non-Consumptive Activities on a Public Hunting and Fishing Area

Greg Simpson, Michael E. Barnes\*, Timothy M. Parker, Jill Voorhees

South Dakota Department of Game, Fish and Parks, Rapid City, South Dakota, USA  
Email: [\\*mike.barnes@state.sd.us](mailto:mike.barnes@state.sd.us)

Received 30 August 2014; revised 4 October 2014; accepted 21 October 2014

Copyright © 2014 by authors and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

---

## Abstract

The activities of all 1513 individuals who visited a public hunting and fishing area near Spearfish, South Dakota, USA, were recorded from May 16 to August 16, 2006. Over the entire period, slightly less than 60% of the visitors were engaged in fishing, and they accounted for nearly 80% of the total visitation time. Over 40% of the visitors were primarily there for non-consumptive (not hunting or fishing) reasons, including touring (sight-seeing), dog training and exercising, and swimming. Less than 1% of the visitors were there for photography. The percentage of visitors fishing decreased from a high of over 65% in the first 31-day period to less than 50% in the third 31-day period, with nearly all of the non-consumptive activities showing a reverse trend. The percentage of visitors swimming or conducting dog activities doubled from the first to third periods. The percentage of time that visitors spent fishing decreased over time, while the time spent on non-consumptive activities increased. However, the increase in non-consumptive activity time was not necessarily in proportion to the increase in the number of visitors involved with non-consumptive activities. By the final period, more visitors were at the area for touring, dogs, and swimming, than for fishing, but fishing still accounted for most of the visitation time. These results indicate an abundance of non-consumptive activities on a public area purchased and maintained with revenue from consumptive hunting and fishing activities, creating the opportunity for user conflicts and potentially threatening the user-pay model of natural resource conservation.

## Keywords

Public Land, Fishing, Hunting, Non-Consumptive Activities, Dogs, Visitation

---

## 1. Introduction

Approximately 730 Game Production Areas (GPAs) encompassing 119,382 ha are located within the state of

---

\*Corresponding author.

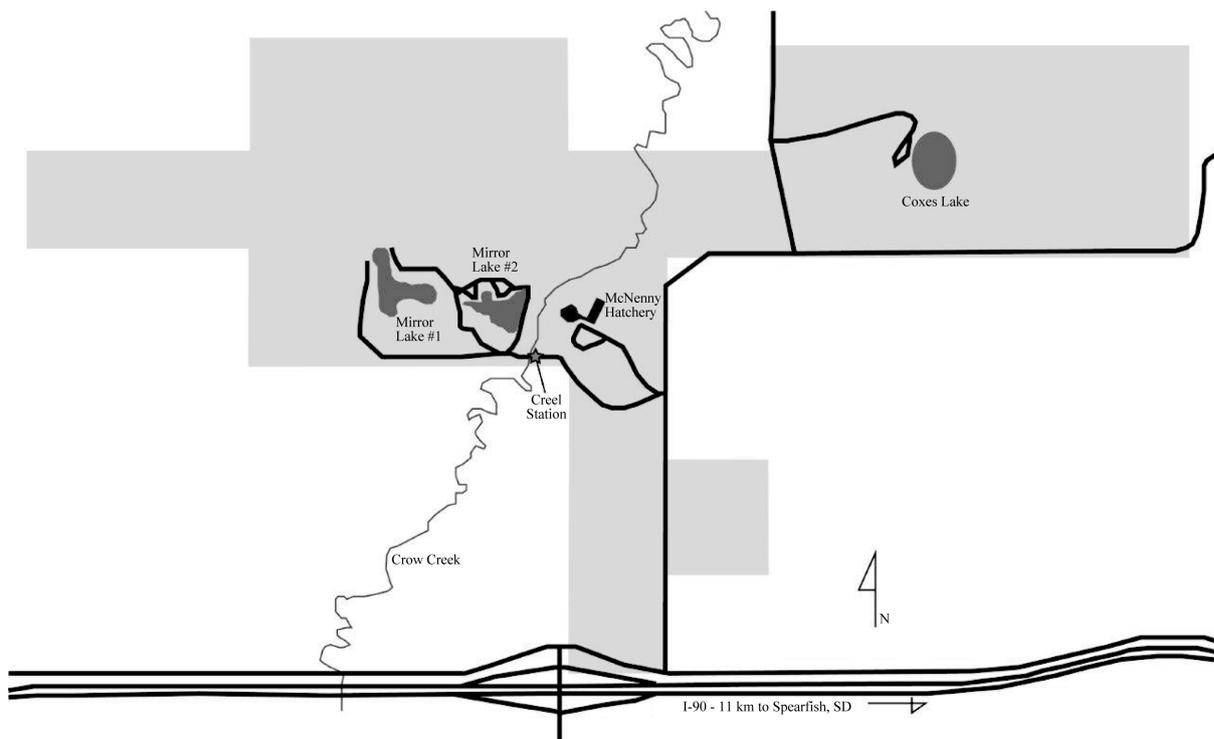
South Dakota, USA [1]. These areas were purchased, and are maintained, by the South Dakota Department of Game, Fish and Parks with funds from hunting and fishing licenses and federal excise taxes on guns, ammunition, and fishing equipment. The excise taxes were authorized by the United States Federal Aid in Wildlife Restoration Act of 1937, which is more commonly referred to as the Pittman-Robertson (PR) Act, and the Sport-Fish Restoration Act of 1950, which is more commonly referred to as the Dingell-Johnson (DJ) Act. Since its inception, more than 62% of PR funds have been used to purchase, develop, or maintain wildlife management areas in the USA [2], with over 1.6 million ha of public hunting land purchased with PR funding during the first 50 years of the program [3].

The procurement and management of public hunting lands via license sales and PR/DJ funds is a user-pay, user-benefit system. However, non-consumptive activities also occur, and have rarely been documented. Belyea and Lerg [4] found that 72% of the use of public game and wildlife areas in Michigan involved non-hunting activities, and 70% to 90% of the people using lands purchased with PR funding are not engaged in hunting activities. Nelson *et al.* [5] observed that non-consumptive use may be seasonal in nature, and noted that during fall hunting seasons, over 90% of public hunting land use involved hunting, trapping, fishing, and wildlife viewing.

The Mirror Lakes GPA was purchased in 1943 and is located eight miles west of Spearfish, South Dakota. It is unique among South Dakota GPAs because it contains McNenny State Fish Hatchery within its borders. In addition, the Mirror Lakes GPA contains three small fishing lakes. A complete creel census was conducted at two of these lakes during the summer of 2006 [6], which provided an opportunity to document use of the GPA by nearly every visitor. Thus, the objective of this study was to determine the use of the Mirror Lakes GPA during the summer in the absence of any hunting seasons.

## 2. Methods

The Mirror Lakes GPA is located approximately eight miles west of Spearfish, South Dakota (Figure 1). As public land, Mirror Lakes GPA can be accessed on foot anywhere along its border with permission from the adjoining private landowners. However, nearly all people enter through one of two roads. One road provides access to the two Mirror Lakes and Crow Creek, while the other road provides access to Coxes Lake. While an-



**Figure 1.** Map of mirror lakes game production area, with the entrance of the road to mirror lakes, location of survey station, and study area indicated.

gling occurs at all of the lakes, this study focused on the area around Mirror Lakes where non-consumptive activities have historically been concentrated. To document all of the activities occurring in proximity to Mirror Lakes, a creel station was set up adjacent to the single-lane bridge which crosses Crow Creek on the road to Mirror Lakes in 2006 [6]. All vehicles were stopped prior to crossing the bridge and the vehicle occupants were interviewed as to their primary reason for visiting the GPA. The clerks recorded the number of occupants per vehicle, vehicle entry and exit times, and verified the activities performed by the individuals during their visit to the GPA.

Activities on the GPA were classified into five categories. Angling at either of the Mirror Lakes or Crow Creek was labelled as fishing. Sight-seeing activities where people just came out to the lakes for a drive or to park and just look at the scenery were classified as touring. Dogs was the label used for any dog-related activities, including dog training (both in and out of the water), playing with unleashed dogs, or just allowing the dogs to run un-leashed. Any water-related recreational activities, such as swimming, wading, or just playing in the water, were recorded as swimming. The photography category included anyone whose primary purpose was to use a camera on the GPA. Lastly, any other activities were categorized as miscellaneous.

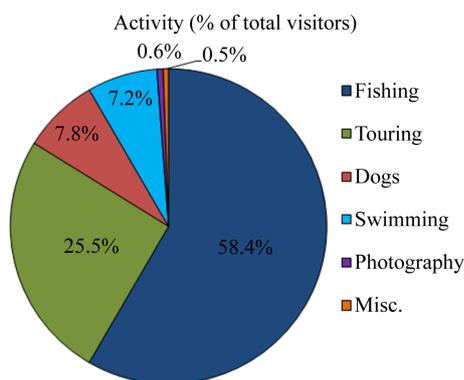
This study ran from May 16 to August 16. To observe activity changes over time, the data was separated into three, 31 day periods: May 16 to June 15, June 16 to July 15, and July 16 to August 16.

### 3. Results

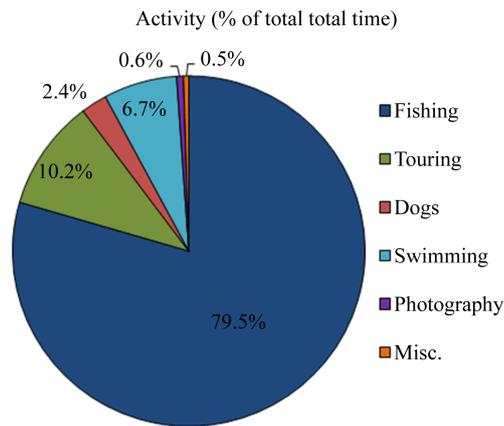
The activities of a total of 1513 individuals were recorded during the study period. While fishing was the predominant activity, over 40% of the visitors to the GPA were primarily there for non-consumptive reasons (Figure 2). Touring, dogs, and swimming were relatively popular, but less than 1% of the visitors were there for photography. Miscellaneous activities included two individuals bird-watching, two individuals writing, and one individual each identified their primary activity as having lunch, partying, riding horse, and checking soil. While slightly less than 60% of the GPA visitors were engaged in fishing, that activity accounted for nearly 80% of the total time that visitors spent (Figure 3). Although a relatively large percentage of visitors performed touring and dog activities, they spent relatively less time in these activities compared to those visitors who were swimming or fishing.

The percentage of visitors fishing decreased from a high of over 65% in the first 31 day period to less than 50% in the third period (Figure 4). However, nearly all of the non-consumptive activities showed a reverse trend, increasing with each subsequent time period. All of the photography and miscellaneous activities were recorded in the first 31 days; those categories were absent in the final two periods. The percentage of visitors swimming or conducting dog activities doubled from the first to third periods. The percentage of time that visitors spent fishing also decreased over time, from over 80% in periods one and two, to approximately 65% in period three (Figure 5). The percentage of time spent on the other categories increased, although not necessarily in proportion to the increased percentage of visitors involved with those activities.

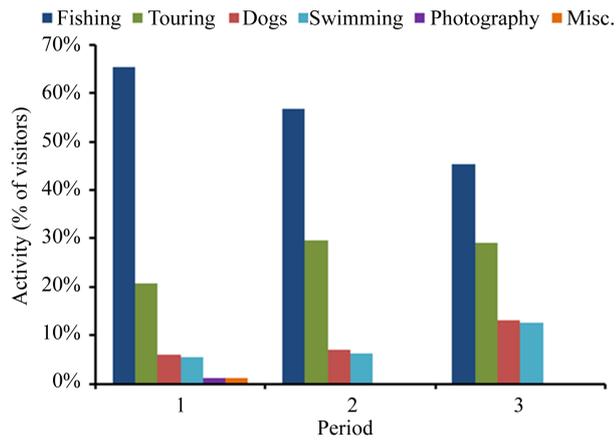
With all of the non-consumptive activities combined, the number of visitors increased over the summer while the number of visitors fishing decreased (Figure 6). By the final period, more visitors were at the GPA for tour-



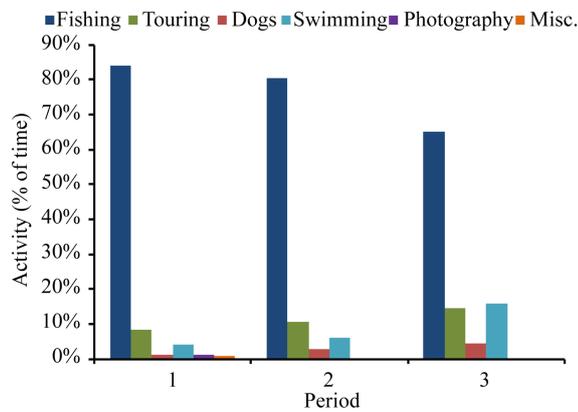
**Figure 2.** Percentage of visitors primarily engaged in different activities at the Mirror Lake Game Production Area in summer of 2006.



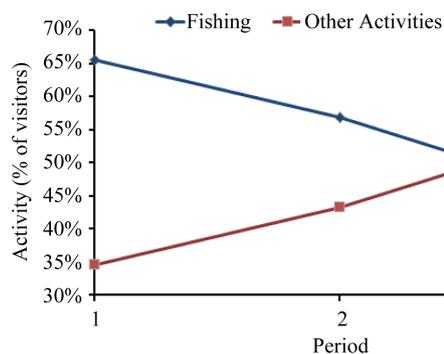
**Figure 3.** Percentage of time that visitors engaged in different activities at the Mirror Lake Game Production Area in summer of 2006.



**Figure 4.** Percentage of visitors, by 30-day period, primarily engaged in different activities at the Mirror Lake Game Production Area in the summer of 2006. Period 1 = May 16 to June 15, Period 2 = June 16 to July 15, Period 3 = July 16 to August 16.



**Figure 5.** Percentage of time that visitors engaged in different activities, by 30-day period, at the mirror lake game production area in the summer of 2006. Period 1 = May 16 to June 15, Period 2 = June 16 to July 15, Period 3 = July 16 to August 16.



**Figure 6.** Percentage of visitors engaged in either fishing or other activities (all-combined), by 30-day period, at the Mirror Lake Game Production Area in the summer of 2006. Period 1 = May 16 to June 15, Period 2 = June 16 to July 15, Period 3 = July 16 to August 16.

ing, dogs, and swimming, rather than for fishing. However, fishing still accounted for the most of the time that people spent at the GPA (Figure 7). In the final 31-day period, over 55% of the visitors were at the GPA for non-consumptive activities, but they accounted for only 35% of the visitation time (Figure 8).

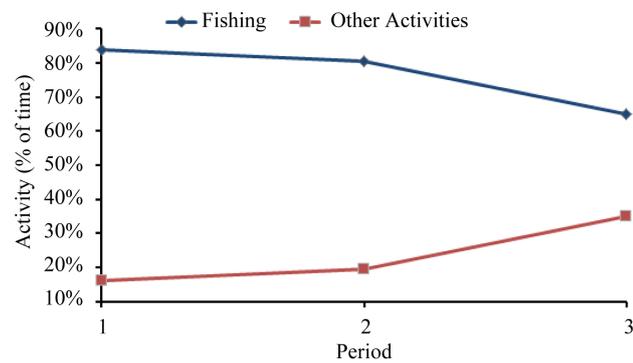
#### 4. Discussion

It is difficult to compare the results from the census of activities at the Mirror Lakes GPA to the few published studies concerning non-consumptive activities on public hunting lands which did not contain fishing lakes. For example, Nelson *et al.* [5] surveyed use of public hunting land only in the fall and noted that less than 10% of visitors were primarily engaged in non-consumptive activities. Fishing and water-based recreation were not part of the Nelson *et al.* [5] study. An earlier study in the same geographical area indicated that up to 90% of the visitors to public hunting areas were there for non-consumptive activities [4]. Raphael and Jaworski [7] determined that fishing activities in the coastal wetlands of Michigan had an economic value of over double that of non-consumptive recreation. In contrast, on the Mirror Lakes GPA during the summer, most of the visitors came to fish early in the summer, and even when the number of anglers declined below the number of non-consumptive visitors as the summer progressed, the amount of time spent fishing was still greater than that spent on all other activities.

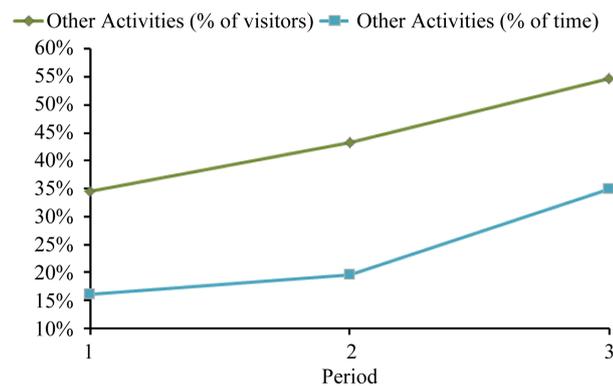
Although it contains three small fishing lakes (two Mirror Lakes and Cox Lake), the primary purpose of the Mirror Lakes GPA is to provide access for hunting opportunities [1] for species such as white-tailed deer (*Odocoileus virginianus*), sharp-tailed grouse (*Tympanuchus phasianellus*), wild turkey (*Meleagris gallopavo*), mourning dove (*Zenaidamacrourea*), and various waterfowl species. Although non-consumptive recreational activities affect wildlife populations [8], the degree to which the relatively large number of visitors involved in non-consumptive activities, such as running dogs and touring, during the summer may be impacting wildlife species on the Mirror Lakes GPA is unknown. Blanc *et al.* [9] stated that dogs, especially those allowed to run off-leash, are a major wildlife perturbation, and dogs confined to trails have also been shown to negatively impact wildlife populations [10]. Banks and Bryant [11] observed substantial reductions in bird diversity and abundance as a result of dog walking. Touring in vehicles can also disturb wildlife, although likely to a lesser extent than people sight-seeing outside of a motorized vehicle [12] [13]. In addition to direct effects on wildlife, non-consumptive activities may have indirect effects through habitat degradation [14].

The small number of individuals using the area for photography, and the very limited amount of time spent on the activity, was somewhat surprising. Wildlife photography is a popular activity [15] [16]. On some public lands, more individuals may be involved with wildlife photography than with day hikes [17]. However, the expense of the required equipment may limit the number of people involved [18], and household income is lower in South Dakota in comparison to other states [19]. It is also possible that the large amount of dog activity is reducing the visibility of wildlife available to be photographed [9]-[11].

The large number of individuals involved in non-consumptive activities at the Mirror Lakes GPA could possibly be due to exposure to the area during their youth [20] [21]. The popularity of the fishing experience at



**Figure 7.** Percentage of time that visitors engaged in either fishing or other activities (all-combined), by 30-day period, at the mirror lake game production area in the summer of 2006. Period 1 = May 16 to June 15, Period 2 = June 16 to July 15, Period 3 = July 16 to August 16.



**Figure 8.** Percentage of non-fishing visitors and the percentage of time spent on non-fishing activities at the mirror lake game production area in the summer of 2006. Period 1 = May 16 to June 15, Period 2 = June 16 to July 15, Period 3 = July 16 to August 16.

Mirror Lakes later in the summer by families and young anglers may be influencing subsequent visits [22]. Place attachment can be an important reason for individuals to revisit natural areas [21].

Although the Mirror Lakes GPA was purchased and is maintained using revenues obtained from licenses and consumptive activity excise taxes, during the summer it is used extensively for non-consumptive activities. The disconnect between the user-pay system and non-consumptive use has been identified for quite some time [23] [24]. We did not ask the non-consumptive users of the Mirror Lakes GPA if they had purchased hunting or fishing licenses, so it is possible that they were financially supporting GPA management. Those individuals that were not licensed anglers or hunters could possibly be induced to volunteer time or financially contribute to GPA management, such as road improvements or habitat restoration, which would benefit them personally [25].

## 5. Conclusion

In conclusion, the predominant activity on the Mirror Lakes GPA during the summer months was fishing, supporting the user-pay, user-benefit system that provided the funding to purchase and maintain the public land. However, the proportionally large number of non-angling visitors during the summer months presents both challenge and potential opportunities to public land managers.

## Acknowledgements

We thank Sarah Austin, Rick Cordes, Anna Gusse, Lori Jennings, Erik Klinckman, Eric Krebs, Kelsey Prosser-Tiesen, Brandie Radigan, Rodney Wasche, and Keith Wintersteen for their assistance with this study.

## References

- [1] South Dakota Department of Game, Fish and Parks (SDGFP) (2014) Hunting Areas. <http://gfp.sd.gov/hunting/areas/>
- [2] United States Fish and Wildlife Service (USFWS) (2014) Federal Aid Division—The Pittman-Robertson Federal Aid in Wildlife Restoration Act. <http://www.fws.gov/southeast/federalaid/pittmanrobertson.html>
- [3] Williamson, L.L. (1987) Evolution of a Landmark Law. In: Kallman, H., Ed., *Restoring America's Wildlife 1937-1987*, United States Department of Interior, Fish and Wildlife Service, Washington, DC, 1-18.
- [4] Belyea, G.Y. and Lerg, J.M. (1976) Public Use of Southern Michigan Game and Recreation Areas. Michigan Department of Natural Resources Wildlife Division Report 2754.
- [5] Nelson, C.M., Steffey, E. and Clark, E. (2006) State Game and Wildlife Area Recreation Use Assessment: Michigan's Maple Rive State Game Area, Fall 2005. *Proceedings of the 2006 Northeastern Recreation Research Symposium*, United States Department of Agriculture, Forest Service, Northern Research Station General Technical Report NRS-P-14.
- [6] Barnes, M.E., Simpson, G., Carreiro, J. and Voorhees, J. (2014) A Comparison of a Creel Census to Modeled Access-Point Creel Surveys on Two Small Lakes Managed as Put-and-Take Rainbow Trout Fisheries. *Fisheries and Aquaculture Journal*, **5**, 086. <http://dx.doi.org/10.4172/2150-3508.1000086>  
[http://astonjournals.com/manuscripts/Vol\\_5\\_2014/FAJ\\_Vol5\\_1\\_a-comparison-of-a-creel-census-to-modeled-accesspoint-creel-surveys-on-two-small-lakes-managed-as-putandtake-rainbow-trout-fisheries.pdf](http://astonjournals.com/manuscripts/Vol_5_2014/FAJ_Vol5_1_a-comparison-of-a-creel-census-to-modeled-accesspoint-creel-surveys-on-two-small-lakes-managed-as-putandtake-rainbow-trout-fisheries.pdf)
- [7] Raphael, C.N. and Jaworski, E. (1979) Economic Value of Fish, Wildlife, and Recreation in Michigan's Coastal Wetlands. *Coastal Zone Management Journal*, **5**, 181-194. <http://dx.doi.org/10.1080/08920757909361805>
- [8] Boyle, S.A. and Samson, F.B. (1985) Effects of Nonconsumptive Recreation on Wildlife: A Review. *Wildlife Society Bulletin*, **13**, 110-116.
- [9] Blanc, R., Guillemain, M., Mouronval, J-B., Desmots, D. and Fritz, H. (2006) Effects of Non-Consumptive Leisure Disturbance to Wildlife. *Revue D Ecologie-La Terre Et La Vie*, **61**, 117-133.
- [10] Lenth, B.E., Knight, R.L. and Brennan, M.E. (2008) The Effects of Dogs on Wildlife Communities. *Natural Areas Journal*, **28**, 218-227. [http://dx.doi.org/10.3375/0885-8608\(2008\)28\[218:TEODOW\]2.0.CO;2](http://dx.doi.org/10.3375/0885-8608(2008)28[218:TEODOW]2.0.CO;2)
- [11] Banks, P.B. and Bryant, J.V. (2007) Four-Legged Friend or Foe? Dog Walking Displaces Native Birds from Natural Areas. *Biology Letters*, **6**, 611-613. <http://dx.doi.org/10.1098/rsbl.2007.0374>
- [12] Freddy, D.J., Bronaugh, W.M. and Fowler, M.C. (1986) Responses of Mule Deer to Disturbance by Persons Afoot and Snowmobiles. *Wildlife Society Bulletin*, **14**, 63-68.
- [13] Taylor, A.R. and Knight, R.L. (2003) Wildlife Responses to Recreation and Associated Visitor Perceptions. *Ecological Applications*, **13**, 951-963. [http://dx.doi.org/10.1890/1051-0761\(2003\)13\[951:WRTRAA\]2.0.CO;2](http://dx.doi.org/10.1890/1051-0761(2003)13[951:WRTRAA]2.0.CO;2)
- [14] Liddle, M.J. (1975) A Selective Review of the Ecological Effects of Human Trampling on Natural Ecosystems. *Biological Conservation*, **17**, 183-206. [http://dx.doi.org/10.1016/0006-3207\(80\)90055-5](http://dx.doi.org/10.1016/0006-3207(80)90055-5)
- [15] Aney, W.W. and Cowan, C.D. (1974) Oregon Wildlife Preferences and Activity Survey, Summary Report. Oregon Wildlife Commission, Corvallis, Oregon.
- [16] Langenau, E. (1975) Appreciative Uses of Michigan White-Tailed Deer: Progress Report. Michigan Department of Natural Resources, Lansing, Michigan.
- [17] Betz, C.J. and Cordell, H.K. (1989) Trends in Recreation Participation on Public Lands. In: Watson, A.H., Ed., *Compiler Outdoor Recreation Benchmark: Proceedings of the National Outdoor Recreation Forum*, United States Department of Agriculture Forest Service, Southeastern Forest Experiment Station General Technical Report SE-52, Asheville, North Carolina.
- [18] More, T.A. (1979) The Demand for Nonconsumptive Wildlife Resources: A Review of the Literature. United States Department of Agriculture, Forest Service, Northeastern Forest Experiment Station General Technical Report NE-52.
- [19] United States Census Bureau (USCB) (2014) State Median Income, Annual Social and Economic Supplement, Current Income of Households by State. <https://www.census.gov/hhes/www/income/data/statemedian/>
- [20] Stedman, R.C. (2002) Toward a Social Psychology of Place Predicting Behavior from Place-Based Cognitions, Attitude, and Identity. *Environment and Behavior*, **34**, 561-581. <http://dx.doi.org/10.1177/0013916502034005001>
- [21] Ewert, A., Place, G. and Sibthorp, J. (2005) Early-Life Outdoor Experiences and an Individual's Environmental Attitudes. *Leisure Sciences*, **27**, 225-239. <http://dx.doi.org/10.1080/01490400590930853>
- [22] Bilgic, A., Florkowski, W.J., Yoder, J. and Schreiner, D.F. (2008) Estimating Fishing and Hunting Leisure Spending Shares in the United States. *Tourism Management*, **29**, 771-782. <http://dx.doi.org/10.1016/j.tourman.2007.09.001>
- [23] Hay, M.J. and McConnell, K.E. (1984) Harvesting and Nonconsumptive Wildlife Recreation Decisions. *Land Economics*, **60**, 388-396. <http://dx.doi.org/10.2307/3145715>

- [24] Heberlein, T.A. (1991) Changing Attitudes and Funding for Wildlife—Preserving the Sport Hunter. *Wildlife Society Bulletin*, **19**, 528-534.
- [25] McFarlane, B.L. and Boxall, P.C. (1996) Participation in Wildlife Conservation by Birdwatchers. *Human Dimensions of Wildlife*, **1**, 1-14. <http://dx.doi.org/10.1080/10871209609359066>

Scientific Research Publishing (SCIRP) is one of the largest Open Access journal publishers. It is currently publishing more than 200 open access, online, peer-reviewed journals covering a wide range of academic disciplines. SCIRP serves the worldwide academic communities and contributes to the progress and application of science with its publication.

Other selected journals from SCIRP are listed as below. Submit your manuscript to us via either [submit@scirp.org](mailto:submit@scirp.org) or [Online Submission Portal](#).

