

Draft Compatibility Determination

Title

Draft Compatibility Determination for Environmental Education and Interpretation, Shawangunk Grasslands National Wildlife Refuge.

Refuge Use Category

Environmental Education and Interpretation

Refuge Use Type(s)

Environmental education (not conducted by National Wildlife Refuge System staff or authorized agents), Environmental education (National Wildlife Refuge System staff and authorized agents), Environmental education (general), Interpretation (National Wildlife Refuge System staff and authorized agents), Interpretation (Not conducted by National Wildlife Refuge System staff or authorized agents), Interpretation (commercial)

Refuge

Shawangunk Grasslands National Wildlife Refuge (NWR)

Refuge Purpose(s) and Establishing and Acquisition Authority(ies)

The primary purpose of the refuge is to provide "... particular value in carrying out the National Migratory Bird Management Program" (16 U.S.C. § 667b, An Act Authorizing the Transfer of Certain Real Property for Wildlife).

National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System, otherwise known as Refuge System, is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans (Pub. L. 105-57; 111 Stat. 1252).

Description of Use

Is this an existing use?

Yes. This compatibility determination reviews and replaces the June 2006 compatibility determination for Wildlife Observation, Nature Photography, Environmental Education and Interpretation. The use is consistent with the May 2006 Final Comprehensive Conservation Plan and associated Environmental Assessment

(USFWS 2006) and Finding of No Significant Impact (USFWS 2006).

What is the use?

The uses under this Compatibility Determination (CD) are Environmental Education and Interpretation conducted by Refuge System staff, interns, and volunteers, and authorized agents which may include state and non-governmental organization partners. These are priority public uses identified by Executive Order 12996 (March 25, 1996) and legislatively mandated by the Refuge System Administration Act of 1966 (16 U.S.C. sections 668dd-668ee), as amended by the Refuge System Improvement Act of 1997 (Public Law 105-57).

These uses entail a variety of programs and activities including self guided interpretation (informational kiosks), birding field trips, and guided tours about the refuge's management practices. Refuge staff coordinate all on- and off-site environmental education programs with refuge volunteers and partners, and programs are delivered as time and volunteer availability allow.

Refuge staff and volunteers conduct interpretive programs by way of personal presentations and guided tours; and at special events and displays.

Refuge staff provide educational and interpretive information via signage, kiosks, printed information, websites, social media, and other methods to reach targeted audiences.

Is the use a priority public use?

Yes

Where would the use be conducted?

Interpretation and environmental education are limited to existing facilities and the current trail system. Existing facilities to support these activities include a maintenance shop that can hold presentations indoors, a small parking lot, two observation platforms, the current trail system and an informational kiosk. Please visit (<https://www.fws.gov/refuge/shawangunk-grasslands>) for a map of the refuge.

The current trail system is 3.6 miles, with two interconnected loop trails winding through the refuge's open grasslands. The trail has been supplemented with two observation platforms, a wildlife and photography observation blind and interpretive signs. The refuge trail has been connected to the adjacent Galeville Town Park. Additional signage is planned for the entrance at Galeville Town Park.

Refuge staff annually erect signs and symbolic fencing limiting the use of the current trail system from December to March to limit visitor access and disturbance for Short-Eared owls, a New York State endangered species.

When would the use be conducted?

The refuge is open each day from sunrise to sunset, unless otherwise specified. Refuge staff and/or partners may conduct interpretive programs on topics such as nocturnal wildlife, guided night/day walks and astronomy outside of normal refuge operational hours. These programs occur infrequently and require the issuance of a Special Use Permit (SUP) by the Refuge Manager.

Refuge staff open the entire trail system to interpretation and environmental education during the non-migratory season, approximately December 1 through March 31, for short-eared owls. Symbolic fencing restricts the use on the trails during the time the short-eared owls use the refuge. These dates may be adjusted annually at the discretion of the Refuge Manager to reduce winter raptor disturbance during migration and nesting season.

How would the use be conducted?

Currently, the refuge is open to the public for wildlife observation, photography, environmental education, and interpretation. Trail access is allowed only on refuge trails from sunrise to sunset during the non-winter raptor closure. No pets, jogging, horseback riding, bicycling, or motorized vehicles are allowed.

Refuge staff allow these priority uses only on designated refuge trails. The refuge grasslands and vegetated areas are closed to public entry throughout the year. Walking into the grasslands would disturb the wildlife including grassland nesting birds and winter raptors and result in the erosion and loss of this important wildlife habitat. "Closed Area" signs mark areas closed to public entry. Refuge staff close parts of the trails to public entry by erecting symbolic fencing and posting those areas with "Trail Closed" signs. The closure helps ensure high-quality, undisturbed wintering habitat for Short-eared owls and other winter raptors. Refuge staff prohibit all visitors from walking on and into the grasslands, to protect this declining ecosystem.

Refuge staff do not limit the total number of visitors at the refuge. Recent observations indicate at any one time the total number of visitors does not typically exceed 20 at the refuge, outside of the winter raptor season. Refuge staff accommodate these priority uses on the refuge and ensure their compatibility in accordance with the stipulations below.

At the refuge, visitors primarily access interpretive content through the refuge web site and Facebook. Refuge staff and/or volunteers offer, on a limited basis, on-site interpretive and environmental programs upon request.

Refuge staff estimate the annual visitation at approximately 135,000 for Shawangunk Grasslands. Interpretation and environmental education users account for 2 percent of refuge visitors.

Why is this use being proposed or reevaluated?

This compatibility determination reviews and replaces the June 2006 compatibility determination for the Shawangunk Grasslands Environmental Education and Interpretation. We are reevaluating compatibility for these two priority public uses designated by the Refuge System Improvement Act of 1997 that established six wildlife dependent recreational uses appropriate for achieving the mission of the NWRS. Refuge staff allow these priority uses only on designated refuge trails and existing facilities with the goals of the refuge's Comprehensive Conservation Plan (CCP; USFWS 2006).

The Service's preferred alternative in the refuge's Comprehensive Conservation Plan would enhance the infrastructure and programs to increase wildlife observation, photography, environmental education, and interpretation opportunities at the refuge.

Availability of Resources

The resources necessary to provide and administer these uses are available within current and anticipated refuge Complex budgets.

Refuge staff would be responsible for the following:

1. Onsite evaluations to resolve public use issues
2. Monitoring and evaluating impacts
3. Maintaining boundaries and signs
4. Meeting with adjacent landowners and interested public
5. Recruiting volunteers
6. Coordinating environmental education or interpretation programs
7. Development of outreach materials

The resources necessary to administer these uses are currently available provided the refuge's budget does not change substantially. In addition to \$5,000 routine maintenance, we anticipate a total of approximately \$25,000 for the following one-time costs to administer this use and make small site improvements: approximately \$20,000 for trail improvements and parking and \$5,000 for interpretive signs. If costs for materials increase substantially, the refuge will need to secure the additional funding needed from other sources in order to administer this use.

Anticipated Impacts of the Use

Potential impacts of a proposed use on the refuge's purpose(s) and the Refuge System mission

The effects and impacts of the proposed use to refuge resources, whether adverse or beneficial, are those that are reasonably foreseeable and have a reasonably close causal relationship to the proposed use of Environmental Education and Interpretation. This CD includes the written analyses of the environmental consequences on a resource only when the impacts on that resource could be more than negligible and therefore considered an “affected resource.” Resources that will not be more than negligibly impacted by the action, including geology, hydrology, air and water quality, threatened and endangered species, cultural resources, socioeconomics and environmental justice, have been dismissed from further analyses.

Interpretation and environmental education can result in varying impacts to wildlife resources, both positive and negative. These uses represent two of the six priority public uses designated in the National Wildlife Refuge Improvement Act of 1997 (hunting, fishing, environmental education, interpretation, wildlife observation and photography). These wildlife-dependent uses promote public understanding and appreciation of the National Wildlife Refuge System. Recreational visitation and associated economic contributions made to local and state economies provide a powerful catalyst for conserving public lands (Marion 2019).

Damage to ecosystems is known to occur when informal trails are created and used by the public (Barros and Pickering 2017). Visitors engaging in interpretation and environmental education activities will be expected to use and stay on designated trails or roads and are not allowed to touch or remove wildlife from the refuge without the appropriate permit or license. Disturbances associated with these two public uses vary with the wildlife species present and the type, level, frequency, duration, and the time of year such activities occur.

There are many recommendations for reducing impacts to wildlife: provide visitor education, require staying on trails, closing areas during sensitive periods such as nesting, require minimum set back distances for approach to areas such as rookeries, etc. (Boyle et al. 1985, Erwin 1989, Haverra et al. 1992, Klein 1993, Miller et al. 2001, Morton et al. 1989, Rodgers et al. 1995, Taylor and Knight 2003).

Short-term impacts

Short-term impacts resulting from anthropogenic disturbance from visitors engaging in environmental education and interpretation activities may include changes in

wildlife behavior, distribution, or abundance (Leblond et al. 2013). Trails used to facilitate interpretation and environmental education can disturb wildlife outside the immediate trail corridor (Trails and Wildlife Task Force 1998, Miller et al. 2001). Noise caused by visitors engaging in environmental education and interpretation activities can result in increased levels of disturbance, though noise is not always correlated with visitor group size (Burger 1986, Klein 1993, Burger and Gochfeld 1998).

Extensive research has been conducted on the impacts of human disturbance on birds. Gutzwiller et al. (1994) found that the singing behavior of some species of songbirds was altered by low levels of human intrusion. Pedestrian travel has the potential to impact migratory birds feeding and resting near the trails, especially during the nesting and migration seasons. Birds may avoid places where people are present and when visitor activity is high (Burger 1981, 1986; Klein et al. 1995). Miller et al. (1998) found bird abundance and nesting activities (including nest success) increased as distance from a recreational trail increased in both grassland and forested habitats. Nest predation was also found to be greater near trails (Miller et al. 1998).

Human disturbance from environmental education and interpretation uses on the refuge also has potential short-term impacts on mammals. There is evidence to suggest that the mammal species most likely to be adversely affected by human disturbance are those for which available habitat is limited, constraining them to stay in disturbed areas and suffer the costs of reduced survival or reproductive success (Gill et al. 2001). For example, disturbances causing mammals to flee during winter months could consume stored fat reserves that are necessary to get through the winter. Additionally, George and Crooks (2006) found that bobcats and coyotes were more active at sites with less human use and less active at sites with high levels of human recreation. This study also found that bobcats were detected less frequently in high human use areas, and even temporarily shifted their activity patterns to become more nocturnal.

In addition to direct impacts on wildlife, environmental education and interpretation can also have indirect impacts on wildlife by altering vegetation and habitat on a short-term basis. Immediate effects can include soil compaction from trampling, changes to vegetation structure, and accumulating waste from litter. By altering these habitat characteristics, visitors can modify the food supply or availability of shelter for wildlife (Cole and Landres 1995). Modes of transportation along roads and foot traffic on trails and at established environmental education and interpretation sites can compact soil leading to increased erosion and sedimentation (Cooke and Xia 2020), resulting in degraded habitat for wildlife.

Quantitative research documenting the impacts of environmental education and wildlife interpretation uses on other user groups such as hunters and anglers is scant. Crowding from these uses may deter some recreationists; these individuals may alter their time or location of visitation or develop other coping mechanisms, such as

rationalization or shifting their understanding of the activity or place (Manning and Valliere 2001, Marcouiller 2008). Potential positive impacts of environmental education and interpretation include a deepened sense of place, heightened appreciation for the refuge's habitat and wildlife, and inspired engagement in conservation efforts (Ardoin 2006, Kudryavtsev et al. 2012).

Long-term impacts

The long-term effects of Environmental Education and Interpretation activities on species will vary depending on their biology and life history. For example, the same education programming offered during different seasons—for example, during breeding, migration, or wintering for migratory birds—may differ greatly in its impact. Examples include education and interpretation programs causing birds to flush during nesting (Carney and Sydeman 1999) or causing mammals to flee during winter months, thereby consuming large amounts of stored fat reserves necessary for survival (Lovegrove 2005).

The presence of humans participating in Environmental Education and Interpretation could also lead to human-induced avoidance by wildlife, which can prevent animals from using otherwise suitable habitat. Frequent disturbance may cause shifts in habitat use, abandonment of habitat, and increased energy demands on affected wildlife as reviewed in Kerlinger et al. 2013. Hammitt and Cole (1998) conclude that the frequent presence of humans in wildland areas can dramatically change the normal behavior of wildlife mostly through “unintentional harassment” such as wildlife becoming habituated to humans.

Additional potential long-term impacts from environmental education and interpretation uses include changes at the community and ecosystem scale. Frequent use of areas or trails for environmental education and interpretation activities could alter species composition in the immediate areas utilized for these activities. For example, generalist bird species are typically more abundant near trails, whereas specialist species are less common (Miller et al. 1998).

There is a large amount of research available for the long-term impacts of human disturbance on bird species. Environmental education and interpretation programs that incorporate activities such as bird watching should consider and monitor the duration and proximity of the encounters. Some birds will tolerate the presence of people, but there is a distance beyond which closer interactions will cause disturbance or disruption, and may lower reproductive success, decrease foraging efficiency, or force birds to abandon suitable habitats (Burger et al. 1995). Each situation requires observation, continued monitoring and mitigation by refuge staff to avoid undue stress and long-term impacts. In many refuges, paths or boardwalks are used to direct the flow of birdwatchers or others observing wildlife. In others, some of the habitats may need to be closed during a sensitive part of the year (e.g., beach closure for piping plovers or closed areas around bald eagle nests), with sensitive areas fenced to prevent human access. Negative impacts of environmental education

and interpretation activities and other ecotourism can be curtailed with careful management and consideration of the needs of both the wildlife and the visitors (Burger et al. 1995).

Long-term impacts from environmental education and interpretation could also have impacts on mammals present on the refuge. With respect to mammalian carnivores, Baker and Leberg (2018) found that coyotes and bobcats had higher occupancy in protected areas with more human disturbance (i.e., trails) but overall, protected areas with less human disturbance had greater carnivore community diversity. Their results varied among species, however, the general trend showed that human activity can have long-term impacts on carnivores. Reed and Merenlender (2008) found that human activity decreased carnivore density and shifted community composition significantly from native species to non-native species.

In addition to direct long-term wildlife impacts, environmental education and interpretation can also have long-term indirect impacts by altering wildlife habitats. Habitat fragmentation caused by physical barriers necessary to facilitate environmental education and interpretation, such as roads or trails, may reduce potential habitat for dispersal, as well as decrease the availability of water and food, and ultimately reduce biodiversity (Haddad et al. 2015). Fragmentation may ultimately lead to smaller population sizes within each fragment, and increased vulnerability to population decline and extinction (Fahrig and Merriam 1994). Reducing the survival of vegetation could have cascading impacts for herbivores and possibly higher trophic levels (Haddad et al. 2015).

Visitors can unintentionally introduce invasive plants, animals, and pathogens to habitats (Anderson et al. 2015, Brock and Green 2003, Davies and Sheley 2007, Marion et al. 2006). Once present, invasive species can outcompete native plants and animals, thereby altering habitats (Anderson et al. 2015, Marion et al. 2006). Invasive species can alter native animal and plant species composition, diversity, and abundance (Davies and Sheley 2007, Eiswerth et al. 2005). These changes may reduce native forage, cover, and water sources (Brock and Green 2003, Eiswerth et al. 2005). Certain invasive species may even impede access to interpretation and environmental education sites such as hydrilla blocking waterways.

Public Review and Comment

The draft compatibility determination will be available for public review and comment for 14 days. The public will be made aware of this comment opportunity through posting at refuge headquarters , posting on refuge website , publication of notice in local newspaper. State and Tribes have been asked to review and comment on the draft compatibility determination. A hard copy of this document will be posted at the Wallkill River Refuge Headquarters located at 1547 County Rd 565, Sussex, NJ 07461.

It will be made available electronically on the refuge website https://www.fws.gov/refuge/shawangunk_grasslands/. Please contact the Refuge Manager if you need the documents made available in an alternative format. Concerns expressed during the public comment period will be addressed in the final document.

Determination

Is the use compatible?

Yes

Stipulations Necessary to Ensure Compatibility

1. If monitoring or observations indicate an adverse impact from Environmental Education and Interpretation activities on wildlife or their habitat, the refuge manager will take appropriate action to modify or discontinue the use in some or all areas of the refuge.

Justification

The stipulations outlined above would help ensure that the use is compatible at Shawangunk Grasslands NWR. Environmental Education and Interpretation, as outlined in this compatibility determination, would not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge. Based on available science and best professional judgement, the U.S. Fish and Wildlife Service has determined that the Environmental Education and Interpretation at Shawangunk Grasslands NWR, in accordance with the stipulations provided here, would not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose of the Shawangunk Grasslands NWR. Rather, appropriate and compatible Environmental Education and Interpretation would be the use of the Shawangunk Grasslands NWR through which the public can develop an appreciation for fish, wildlife, and wild lands. These priority public uses identified by Executive Order 12996 (March 25, 1996) and legislatively mandated by the Refuge System Administration Act of 1966 (16 U.S.C. sections 668dd-668ee), as amended by the Refuge System Improvement Act of 1997 (Public Law 105-57), have been found appropriate and compatible, and will provide opportunities through which the American public can develop an appreciation for fish and wildlife and contribute to achieving the mission of the Refuge System.

Signature of Determination

Refuge Manager Signature and Date

Signature of Concurrence

Assistant Regional Director Signature and Date

Mandatory Reevaluation Date

2038

Literature Cited/References

Anderson, L. G., S. Roccliffe, N. R. Haddaway, and A.M. Dunn. 2015. The role of tourism and recreation in the spread of non-native species: a systematic review and meta-analysis. *PloS one*, 10(10), p.e0140833.

Ardoin, N. M. 2006. Toward an Interdisciplinary Understanding of Place: Lessons for Environmental Education. *Canadian Journal of Environmental Education*. 11(1), 112-126.

Baker, A. D., and P.L. Leberg. 2018. Impacts of human recreation on carnivores in protected areas. *PloS one*, 13(4) 13(4): e0195436.

Barros, A. and C.M. Pickering. 2017. How Networks of Informal Trails Cause Landscape Level Damage to Vegetation. *Environmental Management* 60, 57-68.

Boyle, S.A. and F.B. Samson. 1985. Effects of non-consumptive recreation on wildlife: a review. *Wildl. Soc. Bull.* 13:110-116
https://www.jstor.org/stable/3781422?seq=1#metadata_info_tab_contents

Brock, J. H., and D. M. Green. 2003. Impacts of livestock grazing, mining, recreation, roads, and other land uses on watershed resources. *Journal of the Arizona-Nevada Academy of Science*, 35(1), 11-22.

- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation*, 13, 123-130.
- Burger, J., M. Gochfeld, and L.J. Niles. 1995. Ecotourism and Birds in Coastal New Jersey: Contrasting Responses of Birds, Tourists, and Managers. *Environmental Conservation*, 22(1), 56-65.
- Burger, J. and Gochfeld, M. 1998. Effects of ecotourists on bird behavior at Loxahatchee National Wildlife Refuge, FL. *Environmental Conservation*, 25, 13-21.
- Carney, Karen M., and William J. Sydeman. "A Review of Human Disturbance Effects on Nesting Colonial Waterbirds." *Waterbirds: The International Journal of Waterbird Biology*, vol. 22, no. 1, 1999, pp. 68-79. *JSTOR*, <https://doi.org/10.2307/1521995>. Accessed 12 July 2024.
- Cole, David N.; Landres, Peter B. 1995. Indirect effects of recreation on wildlife. In: Knight, Richard L.; Gutzwiller, Kevin J., eds. *Wildlife and recreationists: coexistence through management and research*. Washington, D.C.: Island Press: Chapter 11, 183-202
- Cooke, M. T. and L. Xia. 2020. Impacts of land-based recreation on water quality. *Natural Areas Journal*, 40(2), 179-188.
- Davies, K. W. and R. L. Sheley. 2007. A conceptual framework for preventing the spatial dispersal of invasive plants. *Weed Science*, 55(2), 178-184.
- Eiswerth, M. E., T. D. Darden, W. S. Johnson, J. Agapoff, and T. R. Harris. 2005. Input-output modeling, outdoor recreation, and the economic impacts of weeds. *Weed Science*, 53(1), 130-137.
- Erwin, M.R.1989. Responses to human intruders by birds nesting in colonies: Experimental results and management guidelines, *Colonial Waterbirds*, 12(1), 104-108. https://www.jstor.org/stable/1521318?seq=3#metadata_info_tab_contents
- Fahrig, L. and G. Merriam. 1994. Conservation of fragmented populations. *Conservation Biology*, 8, 50-59.
- George, S. L., & Crooks, K. R. (2006). Recreation and large mammal activity in an urban nature reserve. *Biological Conservation*, 133(1), 107-117.
- Gill, J.A., K. Norris, and W. J. Sutherland. 2001. Why behavioural responses may not reflect the population consequences of human disturbance. *Biological Conservation*, 97(2), 265-268.

Gutzwiller, K. J., R.T. Wiedenmann, K. L. Clements, and S. H. Anderson. 1994. Effects of Human Intrusion on Song Occurrence and Singing Consistency in Subalpine Birds. *The Auk*, 111(1), 28-37.

Haddad, N. M., L. A. Brudvig, J. Clobert, K. F. Davies, A. Gonzalez, R. D. Holt, T. E. Lovejoy, J. O. Sexton, M. P. Austin, C. D. Collins, W. M. Cook, E. I. Damschen, R. M Ewers, B. L. Foster, C. N. Jenkins, A. J. King, W. F. Laurance, D. J. Levey, C. R. Margules, B. A. Melbourne, A. O. Nicholls, J. L. Orrock, D. Song, and J. R. Townshend. 2015. Habitat fragmentation and its lasting impact on Earth's ecosystems. *Science Advances*, 1(2), e1500052.

Hammit, W. E., and D. N. Cole. 1998. *Wildland recreation: Ecology and Management*. 2nd ed. New York: John Wiley and Sons.

Haverra, S.P., Boens, L.R., Georgi, N.M., and Shealy, R.T. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*, 20, 290-298. https://www.jstor.org/stable/3783033?seq=8#metadata_info_tab_contents

Jayakody S, Sibbald AM, Mayes RW, Hooper RJ, Gordon IJ, Lambin X. Effects of human disturbance on the diet composition of wild red deer (*Cervus elaphus*). *Eur J Wildl Res*. 2011;57: 939-948.

Kerlinger, Paul, Joanna Burger, H. Ken Cordell, Daniel J. Decker, David N. Cole, Peter Landres, E. Norbert Smith et al. *Wildlife and recreationists: coexistence through management and research*. Island Press, 2013.

Klein, M. L. 1993. Waterbird Behavioral Responses to Human Disturbances. *Wildlife Society Bulletin*. 21(1), 31-39

Klein, M.L., Humphrey, S.R., and Percival, H.F. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge, *Conservation Biology*, 9, 1454-1465.

Kudryavtsev, A., R. C. Stedman, and M. E. Krasny. 2012. Sense of place in environmental education. *Environmental Education Research*, 18(2), 229-250.

Leblond, M., C. Dussault, J-P. Ouellet. 2013. Impacts of human disturbance on large prey species: do behavioral reactions translate to fitness consequences? *Plos One*, 8(9): e73695 doi: 10.1371/journal.pone.0073695.

Lovegrove, B. G. (2005). Seasonal thermoregulatory responses in mammals. *Journal of Comparative Physiology B*, 175, 231-247.

MacLean, K., T. S. Prystay, M. J. Lawrence, A. J. Zolderdo, L. F. G. Gutowsky, E. Staaterman, A. J. Gallagher, S. J. Cooke. 2020. Going the distance: influence of

distance between boat noise and nest site on the behavior of paternal smallmouth bass. *Water Air Soil Pollution*, 231, 151-163.

Manning, R. E. and Valliere, W. A. 2001. Coping in outdoor recreation: Causes and consequences of crowding and conflict among community residents. *Journal of Leisure Research*, 33(4), 410-426.

Marcouiller, D. W. 2008. Outdoor Recreation Planning: A comprehensive approach to understanding use interaction. CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources, 3(090).

Marion, J. L. 2019. Impacts to wildlife: managing visitors and resources to protect wildlife. Prepared for the Interagency Visitor Use Council, Edition One, 1-19.

Marion, J. L., Y. F. Leung, and S. K. Nepal. 2006. Monitoring trail conditions: new methodological considerations. *The George Wright Forum*, 23(2), 36-49.

Maxwell, R.J., A.J. Zolderdo, R. de Bruijn, J.W. Brownscombe, E. Staaterman, A.J. Gallagher, and S.J. Cooke. 2018. Does motor noise from recreational boats alter parental care behaviour of a nesting freshwater fish? *Aquatic Conservation: Marine Freshwater Ecosystems*, 28, 969-978.

Mickle, M. F., C.M. Harris, O.P. Love, and D.M. Higgs. 2018. Behavioural and morphological changes in fish exposed to ecologically relevant boat noises. *Canadian Journal of Fisheries and Aquatic Sciences*, 76, 1845-1853.

Miller, S. G., R. L. Knight, and C. K. Miller. 2001. Wildlife Responses to Pedestrians and Dogs. *Wildlife Society Bulletin (1973-2006)*, 29(1), 124-132.

Miller, S. G., R. L. Knight, and C. K. Miller. 1998. Influence of Recreational Trails on Breeding Bird Communities. *Ecological Applications*, 8(1), 162-169.

Morton, J.M., Fowler, A.C., and Kirkpatrick, R.L. 1989. Time and Energy budgets of American black ducks in winter. *Journal of Wildlife Management*, 53, 401-410.
https://www.jstor.org/stable/3801143?seq=10#metadata_info_tab_contents

Perona, A. M., Urios, V. & López-López, P. Holidays? Not for all. Eagles have larger home ranges on holidays as a consequence of human disturbance. *Biol. Conserv.* 231, 59-66 (2019).

Reed, S. E. and A, M. Merenlender. 2008. Quiet, nonconsumptive recreation reduces protected area effectiveness. *Conservation Letters*, 1(3), 146-154.

Rodgers, J.A., and Smith, H.T. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology*, 9, 89-99.
https://www.jstor.org/stable/2386390?seq=9#metadata_info_tab_contents

Taylor, A.R., and Knight, R.L. 2003. Wildlife responses to recreation and associated visitor perceptions, *Ecological Applications*, 13(4), 951-963.
<https://esajournals.onlinelibrary.wiley.com/doi/full/10.1890/1051-0761%282003%2913%5B951%3AWRTRAA%5D2.0.CO%3B2>

Trails and Wildlife Task Force, Colorado State Parks, and Hellmund Associates. (1998). *Planning Trails with Wildlife in Mind*.
<https://www.recpro.org/assets/Library/Trails/trails-for-wildlife-handbk.pdf>

U.S. Fish and Wildlife Service. 2006. Shawangunk Grasslands National Wildlife Refuge Comprehensive Conservation Plan.
<https://ecos.fws.gov/ServCat/DownloadFile/1477?Reference=1500>