

Draft Compatibility Determination

Title

Draft Compatibility Determination for Research and Surveys, Occoquan Bay National Wildlife Refuge.

Refuge Use Category

Research and Surveys

Refuge Use Type(s)

Research

Refuge

Occoquan Bay National Wildlife Refuge

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

... 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, or other purposes)

National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System (NWRS), 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 September 2011 compatibility determination for the Research Conducted by Non-Service Personnel on Occoquan Bay National Wildlife Refuge.

What is the use?

The use is research and surveys (collectively known as research) conducted by federal, state, or local agencies, federally recognized tribes, universities, non-governmental organizations, and qualified members of the public that are not

operating as Service-authorized agents to fulfill one or more purposes of the refuge or the mission of the National Wildlife Refuge System (603 FW 2). Research that is conducted by Service-authorized agents is a refuge management activity, not a use, and is not subject to this Compatibility Determination (603 FW 2).

Research is a planned, organized, and systematic investigation of a scientific nature. A survey is a scientific inventory or monitoring activity. These activities are intended to advance our collective understanding of the natural and human environment.

This determination only covers research with low- or no-adverse impacts, which includes projects that have minimal potential to adversely affect cultural resources, populations of plants, wildlife, or their habitats, or ecosystems. Any adverse impacts from these research activities would be expected to affect only individual organisms or resources, at most; to rarely or never result in accidental mortality of individuals; and to not have detectable effects at the population level. Additionally, any adverse impacts to habitat would be short-term, at most. Such research projects span a wide range of subjects covering biological, physical, or cultural resources, as well as public-use management issues, and may be conducted using a variety of methods.

This is not a comprehensive list, but examples of research that may be allowed include: presence/absence surveys (e.g., point count surveys for birds); capture of organisms for identification, tagging or genetic sampling (e.g., mist-netting of birds or bats, fish or amphibian tagging, electrofishing, or use of non-lethal traps); studies of habitat use and life-history requirements (e.g., radiotelemetry tracking, use of cameras or recording devices); productivity estimates (e.g., non-destructive searches of nests, dens, or burrows); and sampling of plant parts (e.g., removing leaves or seeds). These activities must not result in long-term, negative alterations to wildlife behavior (e.g., wildlife abandoning areas for long periods; significantly modifying their use of habitat; or abandoning nests, dens, or young) or negative impacts at the population level.

Examples of research that typically would not be allowed include projects that would degrade wildlife habitat, including vegetation, soils, or water; result in soil compaction or erosion; degrade water quality; involve operation of vehicles off roads or trails; collect and remove animals or whole native plants; cause public health or safety concerns; result in conflicts with other compatible refuge uses; or require using uncrewed aircraft systems (UAS or drones).

It is anticipated that most requests for research activities will support the goals and objectives in the Ococoquan Bay NWR Comprehensive Conservation Plan (CCP; USFWS 1997). The Refuge Manager may; however, also consider other research under this CD provided it has been found to be appropriate.

Is the use a priority public use?

No. Research is not a priority public use of the National Wildlife Refuge System (Refuge System) under the National Wildlife Refuge System Administration Act of 1966

(16 U.S.C. 668dd-668ee), and the Refuge System Improvement Act of 1997 (Public Law 105-57).

Where would the use be conducted?

Researchers can request to conduct research anywhere within the bounds of the refuge, including lands acquired in the future, but specific project locations will vary depending on the research being conducted. Research locations will be specifically identified in the research proposal and Special Use Permit. Research areas or access routes may be restricted, as needed, to ensure the protection of species and their habitats, to avoid cumulative negative impacts from excessive research activity in one area, or to reduce conflicts with other compatible public uses.

When would the use be conducted?

Research could theoretically occur any time of the day and throughout the year. Research will typically occur on weekdays during daylight hours but may occur on weekends or at night. Depending on the objectives, some studies may be short-term, requiring one or two visits by researchers over the course of a few days, while others could be multi-year, requiring many visits over the lifetime of the research. The duration of each project would be limited to the minimum time required to achieve objectives. Special Use Permits can be issued for up to five years, so projects with a longer timeline would be required to reapply and be reevaluated for impacts.

If a research project occurs during a refuge event or hunting season, additional temporal or spatial limitations may be required to ensure the safety of researchers or staff. The Refuge Manager will approve the timing (e.g., project duration, seasonality, time of day) of all research projects prior to the start of the project to minimize impacts to wildlife and habitats, protect cultural or historic resources, ensure safety, and reduce conflicts with other compatible uses.

How would the use be conducted?

Research methods will depend on the individual research project. The objectives, methods, and approach of each project will be carefully reviewed by the Refuge Manager before it will be allowed on the refuge.

Researchers will typically access study sites using vehicles, motorized or non-motorized boats, or by foot. Specific modes and routes of access to study locations will be identified by refuge staff and amended, if necessary, to reduce impacts.

Research projects must have a Service-approved study plan and protocol. A detailed proposal that follows the refuge's research proposal guidelines (see attachment 1) is required from parties interested in conducting research on the refuge. Each request will be considered and may be issued a SUP by the Refuge Manager that includes the stipulations in this determination. The Refuge Manager will use sound professional judgment when evaluating the potential impacts of the research (short-term, long-

term, and cumulative), and ensure that the activity will have only no- or low- adverse impacts to natural or cultural resources or visitors. Refuge staff may take 45 days to review proposals and may offer recommendations or requirements for the proposal.

All researchers will be required to obtain necessary State and Federal permits. Researchers must provide an Assurance of Animal Care form or an Institutional Animal approval form, if applicable. Projects that occur within the habitat of federally endangered or threatened species, or include the monitoring of those species, will be subject to a Section 7 review under the Endangered Species Act of 1973, as amended. Approval by a FWS Ecological Services Field Office is required before any research affecting federally listed species can be initiated. Research projects that are likely to adversely affect critical habitat or endangered and threatened species will not be permitted. Research involving ground disturbance requires historic preservation consultation with the Regional Historic Preservation Officer and/or State Historic Preservation Officer.

Refuge staff will monitor compliance with SUP terms and conditions, and review progress reports from researchers. Multi-year research projects will be reviewed annually to ensure that they are meeting their intended purpose, that CD and SUP conditions are being followed, and that reporting and communication with refuge staff is occurring.

Why is this use being proposed or reevaluated?

Quality research projects can improve our understanding of biological, physical, and cultural resources, and advance many fields of study that may be relevant to refuge management and the mission of the National Wildlife Refuge System. Research can evaluate the effectiveness of strategies used to achieve objectives for species or habitats, help inform and improve species or habitat management decisions on the refuge and may also benefit other properties and the scientific community in general.

Availability of Resources

The resources necessary to administer this use are available with current and anticipated refuge budgets. The refuge typically receives 10 to 15 research permit requests annually. We estimate that the recurring annual expense to administer this use is \$3,000, which is the cost of monitoring and coordinating with researchers, reviewing research proposals and issuing SUPs, and maintenance and materials (primarily for road maintenance above what would be required for normal refuge use). The refuge does not charge SUP fees, so there is no off-setting revenue. There are no one-time costs associated with administering 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 natural and cultural resources, whether adverse or beneficial, are those that are reasonably foreseeable and have a reasonably close causal relationship with this proposed use. This CD includes analysis of the potential impacts on a resource only when the impacts could be more than negligible and therefore considered an “affected resource.” Resources or issues that will not be more than negligibly impacted by the action, such as air quality, federally listed species, cultural resources, and socioeconomic impacts have not been further analyzed.

Short-term impacts

Research activities may directly or indirectly affect wildlife, plants, soil, and water as researchers access their study sites or conduct project activities. These impacts could be more pronounced if researchers are granted access to sensitive areas, so refuge staff will give special attention to any requests for research in such an area. Overall, with CD stipulations and permit requirements, all impacts are expected to be minor, short-term, and project- or site-specific.

Disturbance to wildlife may temporarily result in reduced use of preferred habitat, unusual behavior and stress including reduced singing behavior or increased time being alert rather than foraging or resting, and reduced productivity including disruption of nesting or breeding activities like nest attendance (Carney and Sydeman, 1999; Cline et al., 2007; Gaynor et al., 2018; Gill et al., 1996; Gutzwiller et al., 1994). Disturbance from humans on trails may result in temporary reductions in species richness and abundance (Bötsch et al. 2017, Riffell et al. 1996).

Minor short-term disturbance to plant populations, soil, or water is possible from walking, driving, boating or other research activities. Individual plants may be damaged and soil may be compacted, possibly reducing survival of plants or microbes (Pescott and Stewart, 2014; Zabinski and Gannon, 1997). Hydrology may also be temporarily affected. However, low- or no-impact research projects will have minimal potential to adversely affect plants, soil, or water.

Introduction of invasive plants, animals, or pathogens is possible from research activities. For example, seeds or pathogens can be transported onto the refuge by boots, equipment, or people. To minimize the risk of introducing invasive species or pathogens, stipulations require proper cleaning and decontamination of people and their equipment, vehicles and clothing, use of personal protective equipment (PPE), proper disposal of potentially contaminated materials, and quarantine procedures, if necessary. Also, careful monitoring may detect any inadvertent transport of invasive species so they can be removed before establishment. There is also a risk of long-term impacts from introduced species or pathogens, which is discussed below.

Social science research activities, such as visitor surveys, can provide information that improves our understanding of conservation practice (Bennett et al. 2016) and may be especially relevant for certain management issues, such as human disturbance of wildlife. Such research may impact visitors, wildlife, and habitat through disturbance or interruption of visitor activities, but these impacts would be temporary and localized. Refuge staff would ensure that any surveys of the public or staff follow the requirements of the Paperwork Reduction Act of 1995.

Potential short-term impacts from research activities are most likely to be localized, temporary, and small because refuge staff would work with researchers to minimize or avoid impacts, and because only low- or no-impact research projects would be allowed under this determination. Minor disturbance or other impacts would be weighed against the potential benefit of the research in informing refuge wildlife and habitat management actions or species conservation. Monitoring by refuge staff would help ensure that any unexpected impacts are detected, and project activities can be adjusted, as needed. Where possible, refuge staff would encourage researchers to coordinate and share information to reduce sampling needed for multiple projects. Finally, all the potential impacts described above would be minimized through study design and methodological considerations, including adjusting location, timing, scope, number of permittees, study methods, sample size, or number of study sites.

Long-term impacts

The long-term impacts of research are expected to be positive because results would likely provide information that contributes to the understanding and conservation of the refuge's plants, wildlife, other biota, and their habitats. Any negative impacts would be weighed against the benefits of the information gained.

Nevertheless, long-term adverse impacts from research are possible. For example, though it's a small risk, research activities could result in the introduction of novel pathogens with long-term impacts. This is especially true if researchers work in a remote area of the refuge and their activities transfer pathogens that would be unlikely to spread through other means. Such pathogens could be difficult to contain once introduced, creating the potential for long-term impacts. Novel pathogens, such as ranavirus and chytrid fungus, have been shown to cause mortality events and may contribute to population declines (Green et al., 2002; Johnson et al., 2008; Price et al., 2014). However, the risk of introduction would be low because the refuge would evaluate the potential for pathogen spread during proposal review, and stipulations would mandate appropriate decontamination procedures.

Techniques to capture wildlife for the purposes of marking, banding, or taking measurements or samples may cause injury or additional stress to the individuals captured. For example, mist-netting and banding, which are common research methods, can cause stress, especially when birds are captured, banded, and weighed. In very rare cases, birds have been injured or killed during mist netting, or killed by

predators that reach the netted birds before researchers (Spotswood et al. 2012). To minimize the potential for stress or injuries, researchers must be properly trained (Fair et al. 2010, Spotswood et al. 2012) and sample sizes will be kept to a minimum.

Overall, allowing carefully designed research conducted by non-Service personnel is expected to have a positive impact on refuge plant and wildlife populations and their habitats. We anticipate that research would, at most, have only negligible to minor impacts to plants, wildlife, habitats, visitors, and cultural resources because it would only be conducted after the refuge approves a detailed project proposal, and only low- or no-impact research would be allowed. Also, Service staff would monitor this activity and it would be conducted in accordance with refuge regulations. Permits for multi-year research projects would be reviewed on an annual basis, providing staff the opportunity to identify unexpected adverse impacts and make modifications to address those impacts. In the event of persistent disturbance or other adverse impacts, the activity would be further restricted or discontinued.

Public Review and Comment

The draft compatibility determination will be available for public review and comment for 14 days **from February 25th, 2025 to March 10th, 2025**. The public will be made aware of this comment opportunity through posting at refuge headquarters, posting on the refuge website, publication of a notice in a local newspaper, sending a letter to the refuge email list, and posting at refuge kiosks/trail heads. The 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 Refuge Headquarters or Visitor Center located at 14050 Dawson Beach Rd. Woodbridge, VA 22191. It will be made available electronically on the refuge website <https://www.fws.gov/occoquanbay/>. Please contact the Refuge Manager if you need the documents made available in an alternative format. Information or concerns received during the comment period will be addressed in the final document.

Determination

Is the use compatible?

Yes

Stipulations Necessary to Ensure Compatibility

1. Only no- or low-impact research projects are covered under this determination; therefore, all research should result in no or minimal potential to adversely impact cultural resources or populations of plants, wildlife, or their habitats or ecosystems. Activities covered under this CD should have minimal soil disturbance, at most, and should not contaminate water, wetlands or air. Additionally, researchers should not collect (or lethally sample) animals

or whole native plants, disturb wildlife to the extent that populations abandon nests, young or preferred habitat, or destroy cultural resources. Additionally, any adverse impacts to habitat would be short-term, at most.

2. All necessary State and Federal permits, Section 7 consultations, or Section 106 consultations (as applicable) must be obtained before starting research on the refuge. An Archeological Resources Protection Act permit application must be reviewed by the Regional Historical Preservation Officer and signed by the Regional Refuge Chief prior to any cultural or archeological research occurring on the refuge.
3. If a proposal is approved, a Special Use Permit (SUP) will be issued. The SUP will contain this determination's stipulations and non-compatibility related project-specific terms and conditions. Permittees must possess and be able to present their SUP if requested by refuge officials or State or Federal law enforcement officers.
4. Researchers may not use any chemicals (e.g., pesticides) or hazardous materials without prior written consent of the Refuge Manager, who will approve the type of chemical, timing of use, and rate of application. All activities will be consistent with Service policy and an approved Pesticide Use Plan.
5. Researchers must clearly mark posts, equipment platforms, fencing material and other equipment left unattended. Such items, including flagging, must be removed as soon as practicable upon completion of the research, and sites must be restored to the Refuge Manager's satisfaction.
6. Researchers must take all reasonable precautions to ensure that invasive species and pathogens are not inadvertently transported or introduced to the refuge. This involves following current best practices for proper cleaning and decontamination of persons, equipment, vehicles and clothing, use of personal protective equipment (PPE), proper disposal of potentially contaminated materials, and quarantine procedures when necessary. Information may be found at <https://www.northeastparc.org/index.php>, <https://www.invasivespeciesinfo.gov/subject/watercraft-inspection-and-decontamination-programs>, <https://playcleango.org/take-action/>, <https://www.cdc.gov/>.
7. All research staff handling wildlife must be properly trained to minimize the potential for impacts to wildlife prior to initiating the project. In addition, a review of the U.S. Department of Agriculture's Animal Welfare Information Center website must be documented by the researcher with identification of practices that will be followed to help further minimize stress, injury, and mortality of wildlife. The website is reached at: <https://www.nal.usda.gov/awic/>.
8. Researchers will submit a final report to the refuge upon completion of their work. For long-term studies, interim progress reports may also be required.

The SUP will identify a schedule for progress reports and the submission of a final report or scientific paper.

Justification

The stipulations outlined above would help ensure that research conducted by entities not operating as Service-authorized agents is compatible with the purposes of Occoquan Bay NWR. Research and Surveys, as outlined in this compatibility determination, would not conflict with federal law or 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 Research and Surveys at Occoquan Bay 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 Occoquan Bay NWR. Rather, appropriate and compatible Research and Surveys would expand scientific knowledge for the benefit of the refuge and the conservation community.

Signature of Determination

Refuge Manager Signature and Date

Signature of Concurrence

Assistant Regional Director Signature and Date

Mandatory Reevaluation Date

2035

Literature Cited/References

Bennett, N. J., R. Roth, S. C. Klain, K. M. A. Chan, D. A. Clark, G. Cullman, G. Epstein, M. P. Nelson, R. Stedman, T. L. Teel, R. E. W. Thomas, C. Wyborn, D. Curran, A. Greenberg, J. Sandlos, and D. Verissimo. 2016. Mainstreaming the social sciences in conservation. *Conservation Biology*, 31(1), 56-66. <https://doi.org/10.1111/cobi.12788>

Bötsch, Y., Z. Tablado, and L. Jenni. 2017. Experimental evidence of human recreational disturbance effects on bird-territory establishment. *Proceedings of the Royal Society B: Biological Sciences*, 284(1858): 20170846. <https://doi.org/10.1098/rspb.2017.0846>

Carney, K. M., and W. J. Sydeman. 1999. A review of human disturbance effects on nesting colonial waterbirds. *Waterbirds: The International Journal of Waterbird Biology*, 22(1), 68-79. <https://doi.org/10.2307/1521995>

Cline, R. N. Sexton, and S. C. Steward. 2007. A human-dimensions review of human-wildlife disturbance: A literature review of impacts, frameworks, and management solutions. United States Geological Survey Numbered Series 2007-1111. <https://doi.org/10.3133/ofr20071111>

Fair, J., E. Paul, and J. Jones, Eds. 2010. Guidelines to the Use of Wild Birds in Research. Washington, D.C. Ornithological Council.

Gaynor, K. M., C. E. Hojnowski, N. H. Carter, and J. S. Brashares. 2018. The influence of human disturbance on wildlife nocturnality. *Science* 360, 1232-1235. <https://doi.org/10.1126/science.aar7121>

- Gibson, D., M. K. Chaplin, K. L. Hunt, M. J. Friedrich, C. E. Weithman, L. M. Addison, V. Cavalieri, S. Coleman, F. J. Cuthbert, J. D. Fraser, W. Golder, D. Hoffman, S. M. Karpany, A. Van Zoeren, and D. H. Catlin. 2018. Impacts of anthropogenic disturbance on body condition, survival, and site fidelity of nonbreeding Piping Plovers. *The Condor* 120(3), 566-580. <https://doi.org/10.1650/CONDOR-17-148.1>
- Gill, J. A., W. J. Sutherland, and A. R. Watkinson. 1996. A method to quantify the effects of human disturbance on animal populations. *Journal of Applied Ecology* 33, 786-792. <https://doi.org/10.1111/j.1474-919X.2007.00642.x>
- Green, E. G., K. A. Converse, and A. K. Schrader. 2002. Epizootiology of Sixty-Four Amphibian Morbidity and Mortality Events in the USA, 1996-2001. *Annals of the New York Academy of Sciences*, 969, 323-339. <https://doi.org/10.1111/j.1749-6632.2002.tb04400.x>
- Gutzwiller, K. J., R. T. Widenmann, 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. <https://doi.org/10.2307/4088502>
- Johnson, A. J., A. P. Pessier, J. F. X. Wellehan, A. Childress, T. M. Norton, N. L. Stedman, D. C. Bloom, W. Belzer, V. R. Titus, R. Wagner, J. W. Brooks, J. Spratt, and E. R. Jacobson. 2008. Ranavirus infection of free-ranging and captive box turtles and tortoises in the United States. *Journal of Wildlife Diseases*, 44(4), 851-863. <https://doi.org/10.7589/0090-3558-44.4.851>
- Madsen, J. 1995. Impacts of disturbance on migratory waterfowl. *Ibis*, 137, S67-S74. <https://doi.org/10.1111/j.1474-919X.1995.tb08459.x>
- Pescott, O. L., and G. B. Stewart. 2014. Assessing the impact of human trampling on vegetation: a systematic review and meta-analysis of experimental evidence. *PeerJ*, 2, e360. <https://doi.org/10.7717/peerj.360>
- Price, S. J., T. W. J. Garner, R. A. Nichols, F. Balloux, C. Ayres, A. Mora-Cabello de Alba, and J. Bosch. 2014. Collapse of amphibian communities due to an introduced Ranavirus. *Current Biology*, 24, 2586-2591. <https://doi.org/10.1016/j.cub.2014.09.028>
- Riffell, S. K., K. J. Gutzwiller, and S. H. Anderson. 1996. Does repeated human intrusion cause cumulative declines in avian richness and abundance? *Ecological Applications*, 6(2), 492-505. <https://doi.org/10.2307/2269386>
- Spotswood, E.N., K.R. Goodman, J. Carlisle, R.L. Cormier, D.L. Humple, J. Rousseau, S.L. Guers, and G.G. Barton. 2012. How safe is mist netting? Evaluating the risk of injury and mortality to birds. *Methods in Ecology and Evolution* 3:29-38. <https://doi.org/10.1111/j.2041-210X.2011.00123.x>
- U. S. Fish and Wildlife Service. 1997. *Occoquan Bay National Wildlife Refuge Comprehensive Conservation Plan*. USFWS Region 5, Hadley, MA. <https://ecos.fws.gov/ServCat/Reference/Profile/43797>

Zabinski, C. A. and J. E. Gannon. 1997. Effects of recreational impacts on soil microbial communities. *Environmental Management*, 21(2), 233-238.
<https://doi.org/10.1007/s002679900022>

Attachment 1

Research Request Requirements

A research request including a justification and description of the work to be done on the refuge is required before approval of a Special Use Permit. Below is the information that must be submitted. In addition, refuge staff reserve the right to ask more detailed questions before approving a project.

Research and Monitoring Special Use Permit Application (FWS Form 3-1383-R):
https://www.fws.gov/sites/default/files/documents/Research-Permit-Form-3-1383-R_0_1_0.pdf

In addition, provide information on the following topics where applicable. Attach copies of any supporting documentation that will facilitate the processing of the application.

Refuge Assistance

Describe any refuge assistance needed to complete the proposed study, such as use of equipment or facilities or assistance from refuge staff. It is important that all equipment, facilities, services, and logistical assistance expected to be provided by the Service be specifically identified in this section so all parties are in clear agreement before the study begins.

Ground Disturbance

Describe the type, location, area, depth, number, and distribution of expected ground-disturbing activities, such as soil pits, cores, or stakes. Proposals that entail ground disturbance may require an archaeological survey and special clearance prior to approval of the study. You can help reduce the extra time that may be required to process such a proposal by including identification of each ground disturbance area on a U.S. Geological Survey 7.5-minute topographic map.

Site Marking and/or Animal Marking

Identify the type, amount, size, and placement of any flagging, tags, or other markers needed for site or individual resource (e.g., trees) identification and location. Identify the length of time it is needed and who will be responsible for removing it. Identify the type and placement of any tags that will be placed on animals.

Safety

Describe any known potentially hazardous activities, such as electro-fishing, scuba diving, whitewater boating, aircraft use, wilderness travel, and wildlife capture, handling, or immobilization, and describe the measures that will be taken to minimize the risk of harm to persons or wildlife.

Chemical Use

Identify chemicals and hazardous materials that you propose using within the refuge. Indicate the purpose, method of application, and amount to be used. Describe plans for storage, transfer, and disposal of these materials and describe steps to remediate accidental releases into the environment. Attach copies of Material Safety Data Sheets.

Invasive Species or Pathogens

Researchers must take all reasonable precautions to ensure that invasive or non-native species and pathogens are not inadvertently transported or spread. Describe the measures you will take, such as following current best practices for proper cleaning and decontamination of persons, equipment, vehicles and clothing, use of personal protective equipment (PPE), proper disposal of potentially contaminated materials, and quarantine procedures when necessary. If your research will involve handling wildlife, describe how you will minimize the risk of pathogen spread between animals or animals and people.

Deliverables:

If the research request is approved, the following deliverables must be submitted to refuge staff no later than six months after the end of the project. Any extensions must be added as an amendment to the special use permit. Copies of publications that may extend outside of this six-month period are still required as they become available. Interim deliverable timelines will be agreed on at the time of the issuing of the permit.

Deliverables that are required include:

Reports and Publications

- Progress report(s) (quarterly, semiannually, or annually, as determined by the refuge)
- Draft final and final report(s) (always required)

The Refuge Manager appreciates opportunities to review manuscripts in advance of their publication.

Data

Provide any spatial (Geographic Information Systems [GIS]) and non-spatial data files that are generated and submitted as part of the research. Non-spatial data must be entered into Microsoft Excel, Access, or similar digital format. Spatial data, which includes Global Positioning System (GPS)-generated files, must be in a format compatible with the refuge's GIS system (check with the refuge staff for the version). All GIS data must be in UTM 19, NAD 83. A condition of the permit will be that the Service has access to and may utilize in future mapping and management all GIS information generated. Photos and videos must also be provided, if requested by the refuge.

Metadata

For all non-spatial and spatial data sets or information products, documentation of information (metadata) describing the extent of data coverage and scale, the history of where, when, and why the data were collected, who collected the data, the methods used to collect, process, or modify/transform the data, and a complete data dictionary must also be provided as final deliverables. Spatial metadata must conform to Service (Federal Geospatial Data Committee) metadata standards.

Other:

If applicable, researchers must provide the Refuge Manager with all the following:

- Detailed protocols used in study
- Interpretive brochures and exhibits
- Training sessions (where appropriate)
- Survey forms
- Value-added software, software developed, and models

Additional deliverables may be required of specific studies.

Additional information or sections that may be requested for the proposal (not necessary to include in initial proposal):

Literature Summary

This section should include a thorough but concise literature review of current and past research that pertains to the proposed research, especially any pertinent research conducted at [insert refuge name]. A discussion of relevant legislation, policies, and refuge planning and management history, goals, and objectives should also be included.

Literature Cited

List all reports and publications cited in the proposal.

Peer Review

Provide the names, titles, addresses, and telephone numbers of individuals with subject-area expertise who have reviewed the research proposal. If the reviewers are associated with the investigator's research institution, or if the proposal was not reviewed, please provide the names, titles, addresses, and telephone numbers of three to five potential subject-area reviewers who are not associated with the investigator's institution. These individuals will be asked to provide reviews of the proposal, progress reports, and the draft final report.

Personnel and Qualifications

List the personnel who will work on the project and indicate their qualifications, experience, and pertinent publications. Identify the responsibilities of each individual and the amount of time each will devote. A full vita or resume for each principal investigator and any consultants should be included here.

