Environmental Assessment

for

A Proposed Oil and Gas Plan of Operations: Nobles Grade 3-D Seismic Survey

within

Big Cypress National Preserve

proposed by

Burnett Oil Co., Inc.

Big Cypress National Preserve
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INTRODUCTION

This Environmental Assessment (EA) has been prepared for the Nobles Grade 3-D (NG3-D) seismic survey proposed to be conducted within Big Cypress National Preserve (Preserve) under the jurisdiction of the National Park Service (NPS) and the U.S. Department of the Interior (USDOI). This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) (42 U.S. Code (USC) § 4332) and implementing regulations (40 Code of Federal Regulations (CFR) §§ 1500-1508), USDOI NEPA regulations at 43 CFR 46, NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-Making* (NPS 2011*a*), and the NPS NEPA Handbook (NPS 2015).

This EA relates to several prior NEPA documents that have been prepared for activities within the Preserve including:

1) The 1992 *Big Cypress National Preserve General Management Plan (GMP)/Final Environmental Impact Statement (EIS)* (Original 1992 GMP/EIS), which included a Minerals Management Plan governing oil and gas activities in the original Preserve;

2) The 2010 *Big Cypress National Preserve – Addition Final GMP/Wilderness Study/Off-Road Vehicle Management Plan/EIS* (Addition 2010 GMP/EIS), governing Preserve activities in the Addition; and

3) The 1998 EA/Finding of No Significant Impact (FONSI) for the Raccoon Point 3-D Seismic Evaluation, analyzing impacts of a previous seismic survey in the Preserve.

These documents considered oil and gas activities in the Preserve and those activities have been subject to prior NEPA review.

BACKGROUND

General Preserve Background

Big Cypress National Preserve is one of 408 units of the national park system administered by the NPS. The Preserve was created by Congress on October 11, 1974 [Public Law (PL) 93-440] as one of the first two national preserves in the national park system, with 582,000 acres. The Big Cypress National Preserve Addition Act (PL 100-301) was subsequently passed on April 29, 1988, authorizing the addition of 147,000 acres to the Preserve. Most of the acquisition of this additional 147,000 acres, referred to as "the Addition," was completed in 1996.

The 1992 GMP/EIS addresses management of the original 582,000 acres of the Preserve. The Addition 2010 GMP/EIS was subsequently completed in 2010, which addressed management of the 147,000 acres in the Addition.

Preserve History

Much of the current Preserve surface property was once owned by the Collier family, after whom Collier County is named. By the late 1960s, many areas within the current Preserve had been logged and multiple oil drilling sites were established.

The Colliers sold their surface ownership within the original Preserve to the NPS in the 1970s, while retaining their private oil and gas rights. In 1974, Congress authorized the creation of the Preserve for inclusion in the national park system. It was designated a national preserve rather than a national park, in recognition that certain existing uses would be allowed to continue, including oil and gas operations. The Preserve at that time consisted of

approximately 582,000 acres. In 1988, Congress authorized the Big Cypress National Preserve Addition, which added another 147,000 acres to the Preserve. In 1996, the Colliers conveyed most of the Addition acreage to the NPS, thus completing the transaction. Today, the Preserve contains approximately 729,000 acres.

Oil and Gas Background

Oil and gas activities in the greater Big Cypress Swamp predate the creation of the Preserve. Discovery of oil and gas in southwest Florida dates back to the early 1940s. The first producing wells were drilled in 1943, and there have been producing oil and gas wells in the region ever since. Several oil production facilities have been installed in areas that are now within the boundaries of the Preserve. Specifically, oil production within the Preserve includes Exxon's Bear Island field (discovered in 1972) with 23 wells on 9 pads and Exxon's Raccoon Point field (discovered in 1978), which included 17 wells on 5 pads (NPS 1992 GMP). It is likely that most visitors to the Preserve are unaware that these facilities exist.

Multiple 2-D geophysical operations had been conducted in or partially in the Preserve as of 1992, which affected a total of 474 miles of seismic lines (NPS 1992 GMP). Specifically, Mobil conducted seismic surveys from 1970 – 1971 which included 13 lines over 151 miles; Bass conducted seismic surveys in 1974 which included 7 lines over 64 miles; Exxon conducted seismic surveys from 1976 – 1977 which included 20 lines over 254 miles; and Shell conducted seismic surveys in 1988 which included 1 line over 5 miles. During this same time period, Exxon and Shell conducted miles of seismic surveys in what is today the Addition. More recently (1999) in the Preserve, Calumet Florida, Inc. conducted a 14-square-mile, 3-D seismic survey (the first in the Sunniland oil trend) at Raccoon Point oil field.

Project Location

The proposed NG3-D Seismic Survey would temporarily traverse the majority of the 110 square mile (70,454± acres) survey area located within the north/central portion of the Preserve. The survey area is entirely within Collier County, located near the southern boundary of Hendry County and the western boundary of Broward County. Interstate 75 (I-75) bisects the northern portion of the survey area in an east-west direction (Figure 1-1).

In general, Figure 1-1 shows the outer boundary of the proposed NG3-D survey area. As explained in Section 2 of the POP, within the NG3-D survey boundary BOCI currently controls exploration rights and proposes to conduct seismic operations over approximately 88 percent of the area shown. However, there are areas where BOCI is seeking to obtain but does not yet currently have the right to conduct such operations. These areas are shown in crosshatch and will not be subject to seismic exploration. Should such exploration rights be obtained on currently non-controlled areas, BOCI will supplement its POP to include these parcels in the NG3-D seismic survey.

Scope of the Analysis

BOCI proposes to pursue exploration through the use of a seismic survey for new oil and gas accumulations within the 110± square mile survey area shown in Figure Figure 1-1. Full details of the proposed seismic survey (Alternative 2) and associated logistical activities are outlined originally in the January 2014 "Nobles Grade 3-D Geophysical Seismic Survey POP" and later revised in September and most recently in December 2014, available at http://parkplanning.nps.gov/documentsList.cfm?projectID=53498. However, this EA analyzes the potential impacts associated with three different survey alternatives, the No Action and two action alternatives which encompass the 110± square mile survey area. The Proposed Action (Alternative 2) would affect approximately 25 percent of the original program area (Figure 1-1).

The proposed NG3-D POP seeks approval only for what has been identified as the first phase (110± square mile survey area) of the originally proposed NG3-D Seismic Survey (Figure 1-1). BOCI is no longer seeking approval for Phases II, III, and IV that were identified in the original POP. Those phases are no longer part of the POP.

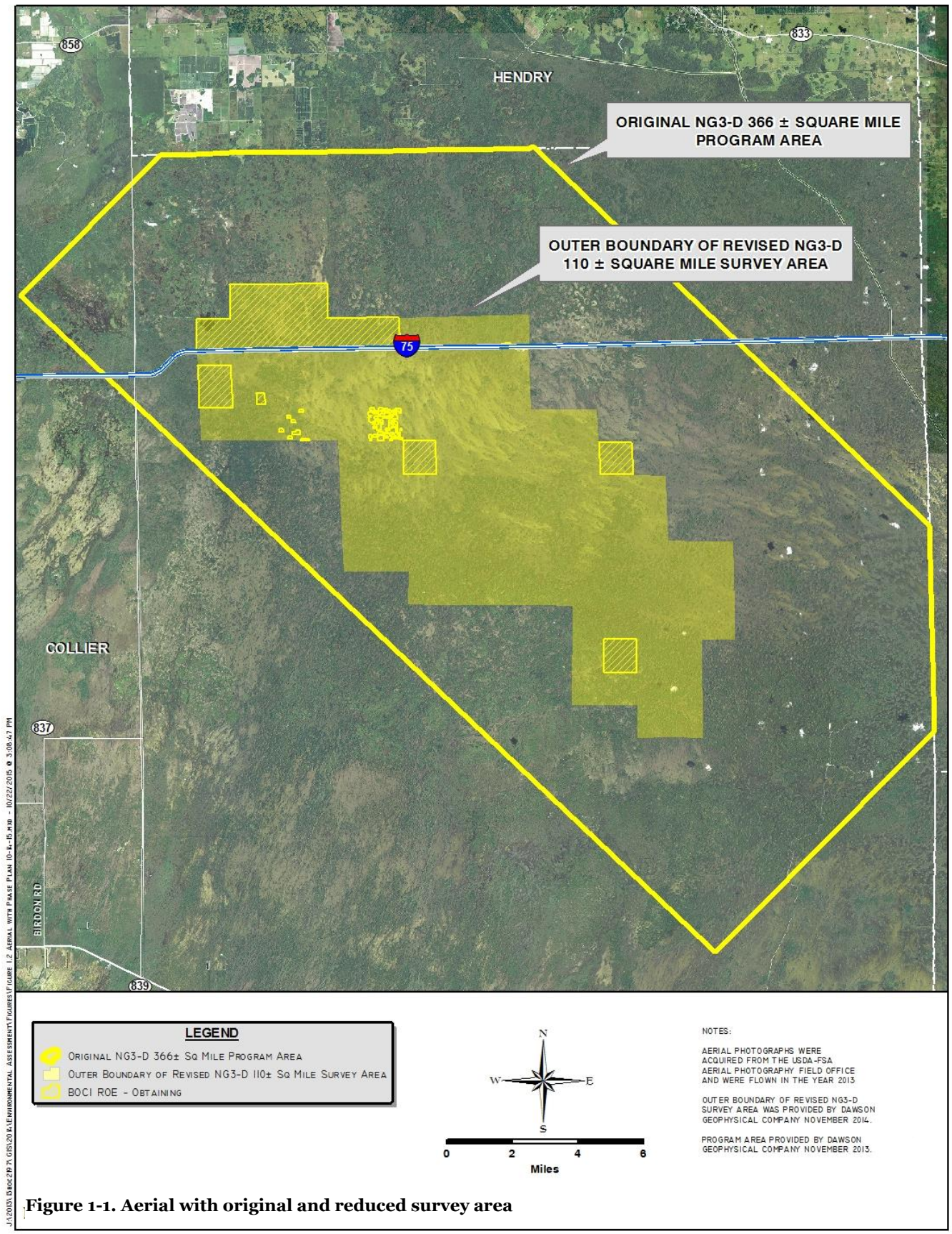


Figure 1-1. Aerial with original and reduced survey area

PURPOSE AND NEED FOR ACTION

This EA represents the NPS evaluation of a POP for a three-dimensional seismic survey in the Preserve. This EA has been prepared in accordance with the NEPA requirements, as amended, and as implemented by the Council on Environmental Quality (CEQ) regulations in 40 Code of Federal Regulations (CFR) §§ 1500-1508.

PURPOSE

The project purpose is to allow BOCI to conduct a geophysical exploration that would provide sufficiently detailed information on whether and where oil and gas deposits possibly exist within the privately owned mineral estate beneath the surface of the Preserve.

NEED FOR ACTION

The proposed geophysical exploration is needed to determine whether and where potentially producing geological structures might be located so that the owners of those oil and gas interests may have reasonable use and enjoyment of them.

Non-federal oil and gas activities in NPS units are generally governed by 36 CFR Subpart 9B. Those regulations require that operators proposing operations within a unit of the national park system obtain an approved POP. 36 CFR § 9.32(b); *see also* 16 USC § 698m-4(b)(1). Operators are required to provide all information in a POP that will enable the NPS to fully evaluate the proposal, and the NPS must review the likely environmental effects of the proposed plan. Based on this review and application of criteria set forth in those regulations, the NPS Regional Director must approve, disapprove, or conditionally approve the proposed POP. NPS action must be taken as a general matter within 60 days of its receipt of a technically adequate POP, §9.36(c), although extensions of time are available under certain conditions.

In addition to those regulations, Congress authorized the NPS to "promulgate … such rules and regulations governing the exploration for and development and production of non-Federal interests in oil and gas located within the Big Cypress National Preserve and the Addition." *Id.* 36 CFR Subpart 9B is the governing regulation in the original Preserve. For the Addition oil and gas activities are also governed by Appendix 6 to *The Arizona Florida Land Exchange and Related Federal Documents on the Agreement Among the United States of America and Barron Collier Company* (May 12, 1988). *See* 16 USC § 698m-4(e) (authorizing "interim agreements with owners of non-Federal oil and gas interests governing the conduct of oil and gas exploration, development or production activities within the boundaries of the Addition" until they are superseded by regulation). That agreement sets forth substantive criteria for activities in the Addition and procedures for review of proposed operations which are similar to those set forth in 36 CFR Subpart 9B.

Although two sets of oil and gas rules currently exist within the Preserve and Additon, BOCI has elected to design the NG3-D seismic exploration operations to the standards of the 1992 GMP for the original Preserve, its MMP, and 36 CFR Subpart 9B for all of the approved survey area, including the Addition.

LAWS, REGULATIONS, AND POLICIES

OIL, GAS, AND MINERAL RIGHTS

The federal government did not acquire most of the private oil and gas rights when the Preserve was created. To the contrary, Congress authorized the NPS to acquire land without the subsurface estate. *See, e.g.,* Public Law (PL) No. 93-440, §1(c), 88 Stat. 1257 (Oct. 14, 1974) ("The Secretary may, if he determines that the acquisition of any other subsurface estate is not needed for the purposes of the Preserve, exclude such interest in acquiring any lands within the Preserve.").

Congress specifically authorized the NPS to publish regulations governing "exploration for and extraction of oil, gas, and other minerals." PL No. 93-440, § 4(b)(1) (now codified as amended at 16 USC § 698i). In the 1988 statute creating the Addition, Congress provided that "[s]uch [oil and gas] activities shall be permitted to occur if such activities conform to requirements established by the NPS under authority of law," PL No. 100-301, § 8, 102 Stat. 443 (April 29, 1988) (now codified at 16 USC § 698m-4(c)).

The NPS generally manages non-federal oil and gas rights pursuant to regulations set forth in 36 CFR Part 9, Subpart B. Those regulations "control all activities within any unit of the National Park System in the exercise of rights to oil and gas not owned by the United States where access is on, across or through federally owned or controlled lands or waters." 36 CFR § 9.30. Under those regulations, non-federal oil and gas interests are required to submit a POP to the NPS with all information in a POP that will enable the NPS to fully evaluate the proposal. *Id.* § 9.36. The regulations set forth procedures for the NPS to review the proposed activities, time frames for plan review, and substantive criteria for approval of proposed plans. *Id.* § 9.37.

Congress authorized the enactment of specific procedures for oil and gas activities in the Preserve and Addition at 16 USC § 698m-4. The NPS is authorized to promulgate "rules and regulations governing the exploration for and development and production of non-Federal interests in oil and gas located within the boundaries of the Big Cypress National Preserve and Addition." *Id.* § 698m-4(a). The NPS has not yet done so, which means that the general regulations at 36 CFR Part 9, Subpart B still apply. In 1992, as part of its General Management Plan for the original Preserve, the NPS developed a Minerals Management Plan to guide its review of oil and gas activities in the original Preserve.

For the Addition, Congress authorized the NPS "to enter into interim agreements with owners of non-Federal oil and gas interests governing the conduct of oil and gas exploration, development or production activities within the boundaries of the Addition…" until Preserve-specific oil and gas regulations are promulgated. *Id.* § 698m-4(e). In 1988 the NPS entered into *The Arizona Florida Land Exchange and Related Federal Documents on the Agreement Among the United States of America and Barron Collier Company* (May 12, 1988). Appendix 6 to this Agreement sets forth the procedural and substantive criteria for NPS review and approval of POPs in the Addition. That agreement remains in effect today and governs oil and gas activities in the Addition.

Although two sets of oil and gas rules currently exist within the Preserve, BOCI has elected to design the NG3-D seismic exploration operations to the standards of the 1992 GMP for the original Preserve, its MMP, and 36 CFR Subpart 9B for all of the approved survey area, including the Addition.

Some of the primary examples of these legal and regulatory constraints and bounds follow.

NATIONAL PARK SERVICE

National Park Service Organic Act (1916)

The National Park Service Organic Act (1916) (54 USC § 100101 (a)) created the NPS with the direction to:

> *… conserve the scenery, natural and historic objects, and wild life in the System*

units and to provide for the enjoyment of the scenery, natural and historic objects, and wild life in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The determination of non-impairment for the selected alternative will be attached to the decision document at the completion of the planning process.

General Authorities Act (1970)

The purpose of the General Authorities Act (1970) (54 USC § 100101(b)(1)(B) and (C)) was to include all areas administered by the NPS in one national park system and to clarify the authorities applicable to the system. Concerning areas of the national park system, the act states that:

"(B) these areas, though distinct in character, are united through their interrelated purposes and resources into one National Park System as cumulative expressions of a single national heritage; (C) individually and collectively, these areas derive increased national dignity and recognition of their superb environmental quality through their inclusion jointly with each other in one System preserved and managed for the benefit and inspiration of all the people of the United States; …"

Redwood National Park Act (1978)

The Redwood National Park Act (54 USC § 100101(b)(2)) reasserted the system-wide standard of protection prescribed by Congress in the original Organic Act. It states:

"Congress reaffirms, declares, and directs that the promotion and regulation of the various System units shall be consistent with and founded in the purpose established by subsection (a), to the common benefit of all the people of the United States. The authorization of activities shall be construed and the protection, management, and administration of the System units shall be conducted in light of the high public value and integrity of the System and shall not be exercised in derogation of the values and purposes for which the System units have been established, except as directly and specifically provided by Congress."

Big Cypress National Preserve Establishment Act (1974) and Addition Act (1988)

When the Preserve was created in 1974, Congress directed the NPS to administer the Preserve "in a manner which will assure their natural and ecological integrity in perpetuity in accordance with the provisions of sections 698f to 698m-4 of this title [the Preserve Establishment Act] and with the provisions of sections 1, 2, 3, and 4 of this title [the NPS Organic Act], as amended and supplemented. 16 USC § 698i(a). The Preserve Establishment Act recognizes the continuation of certain preexisting uses (subject to NPS oversight and control), including oil and gas exploration, development and production. *See, e.g.,* 16 USC § 698m-4. The U.S. District Court has ruled that "[t]he conservation mandate of the NPS Establishment Act [Organic Act] was tweaked by the subsequent Preserve Act and the Addition Act, both of which required multiple use management … striking a balance among the many competing uses to which land can be put." *NPCA v. U.S. Dept of the Interior,* Case No. 2:11-cv-578-FtM-29CM (M.D. Fla. 2014).

National Park Service Director's Order 12 (2001)

Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-Making* and the associated NEPA handbook lay the groundwork for how the NPS complies with NEPA. Director's Order 12 and the handbook set forth a planning process for incorporating scientific and technical information and establishing a solid administrative record for NPS projects (NPS 2001, NPS 2011*a*).

Director's Order 12 requires that impacts to the Preserve's resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision-makers to understand implications of those impacts in the short and long-term, cumulatively, and in context, based on an understanding and interpretation by resource professionals and

specialists.

OTHER FEDERAL LAWS AND EXECUTIVE ORDERS

The following laws, Executive Orders (EO), regulations, and policies were also considered in developing this EA.

National Environmental Policy Act (1969)

Section 102(2) (c) of the National Environmental Policy Act (NEPA) (42 USC § 4332) requires that an environmental analysis be prepared for proposed federal actions that may significantly affect the quality of the human environment or are major or controversial federal actions. The National Environmental Policy Act is implemented through regulations of the CEQ (40 CFR §§ 1500-1508), USDOI (43 CFR Part 46), and Departmental Manual 516. The NPS has, in turn, adopted procedures to comply with the act and the CEQ regulations, as found in Director's Order 12 and its accompanying NEPA handbook (NPS 2015). Section 102(2) (c) of this act requires that a detailed environmental analysis be prepared for proposed major federal actions that may significantly affect the quality of the human environment.

Endangered Species Act (1973)

The Endangered Species Act (16 USC §§ 1531-1543) (ESA) requires all federal agencies to consult with the Secretary of the Interior on all projects and proposals with the potential to impact federally endangered or threatened plants and animals. It also requires federal agencies to use their authority in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species and to ensure that any agency action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat. This act was reviewed in the development of this EA for impacts to federally endangered and threatened species, including the Florida panther (*Puma concolor coryi*).

Migratory Bird Treaty Act (1918)

The Migratory Bird Treaty Act (16 USC §§ 703–712), as amended, implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the act, taking, killing, or possessing migratory birds is unlawful, except as permitted by regulation. Migratory birds, parts, eggs, and nests are all included in the protection afforded by this act. This act was reviewed in the development of this EA for potential impacts to migratory birds found in the Preserve.

National Historic Preservation Act (1966)

The National Historic Preservation Act (16 USC § 470) was enacted to preserve historical and archeological sites in the U.S. The NPS defines the term "site" as "location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic cultural, or archeological value regardless of the value of any existing structure" (National Register Bulletin *How to Complete the National Register Bulletin Form,* Appendix IV:1). This act created the National Register of Historic Places (NRHP), the list of National Historic Landmarks, and the State Historic Preservation Offices. The National Historic Preservation Act requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing on the NRHP. In accordance with this act, coordination was conducted with the State Historic Preservation Officer (SHPO) for the proposed project.

Archaeological Resources Protection Act (1979)

The Archaeological Resources Protection Act of 1979 (16 USC §§ 470aa-mm) protects prehistoric, historic, or archeological data on federal lands, and requires issuance of a permit for the excavation or removal of archeological resources.

Native American Graves Protection and Repatriation Act (1990)

The Native American Graves Protection and

Repatriation Act of 1990 (25 USC §§ 3001 note) assigns ownership and control of Native American cultural items, human remains, and associated funerary objects to Native Americans; it also establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on federal land.

Wilderness Act (1964)

The Wilderness Act of 1964(16 USC §§ 1131-1136) established a National Wilderness Preservation System, "administered for the use and enjoyment of the American people in such manner as would leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness." Lands identified as being suitable for wilderness designation, wilderness study areas, proposed wilderness, and recommended wilderness (including potential wilderness) are generally managed to preserve their wilderness character and values in the same manner as "designated wilderness" until Congress has acted on the recommendations (NPS 2011*a*). However, the Wilderness Act provides that "[n]othing in this chapter shall modify the statutory authority under which units of the National Park System are created." 16 USC § 1133(a)(3). NPS guidance documents confirm that "[v]alid private rights in wilderness must be administered in keeping with the specific conditions and requirements of the valid right," and "must be managed pursuant to existing NPS regulations, policies, and procedures (See 36 CFR Part 9, Subpart A, for mineral development on mining claims; 36 CFR Part 9, Subpart B, for nonfederal oil and gas development; and 43 CFR Parts 3100 and 3500 for federal mineral leasing)." NPS Management Policies, §§6.4.6, 6.4.9 (2006*a*). Since proposed wilderness and eligible wilderness exists within the survey area, this act was reviewed in the development of this EA.

STATE LAWS AND EXECUTIVE ORDERS

Florida Endangered and Threatened Species Act

The state of Florida regulates the protection of threatened and endangered species through the Florida Endangered and Threatened Species Act (Florida Statute (FS) § 379.2291-379.231). This act is the primary regulation in the state, and sets the policy to conserve and wisely manage these resources, as well as provide for research and management to conserve and protect these species as a natural resource. This act also emphasizes coordination with state agencies and outlines annual reporting requirements. This act was reviewed in the development of this EA for potential impacts to state-listed endangered and threatened species (including species of special concern).

Endangered Species Protection Act

The Endangered Species Protection Act (FS § 372.0725) prohibits the intentional wounding or killing of any fish or wildlife species designated by the Florida Fish and Wildlife Conservation Commission (FWC) as endangered, threatened, or of special concern. This prohibition also extends to the intentional destruction of the nests or eggs of any such species. This act was reviewed in the development of this EA for potential impacts to state-listed endangered and threatened species (including species of special concern).

Preservation of Native Flora of Florida Act

The protection of endangered, threatened, or commercially exploited plants is addressed in the *Preservation of* Native Flora of Florida Act (FS § 581.185). Commercially exploited plants are defined as species native to the state which are subject to being removed in substantial numbers from native habitats in the state and sold or transported for sale. This act sets the policy for the state of Florida relating to these species and includes several prohibitions covering the "willful destroying or harvesting" of such plants. It also contains an exemption for agricultural and silviculture uses. This act was reviewed in the development of this EA for potential impacts to native flora.

Florida Statutes, Ch. 377, Part I

The State of Florida regulates the exploration and production of oil and gas resources.

Geophysical operations require permits from the Florida Department of Environmental Protection, and Florida Statutes have provisions designed to protect natural resources and avoid pollution.

RELATIONSHIP TO OTHER PLANS, POLICIES, AND ACTIONS

National Park Service Plans, Policies, and Actions

NPS plans, policies, and actions beyond those listed previously that may influence the environmental assessment are provided below.

General Management Plan/Mineral Management Plan/Environmental Impact Statement (1992). The GMP completed in 1992 for the original Preserve was mandated by the National Parks and Recreation Act (1978). This document guides visitor use, natural and cultural resource management, and general development in the original Preserve. It provides a clearly defined direction for resource management and preservation as well as appropriate visitor use and interpretation of the resources within the original Preserve boundaries. The GMP also includes a MMP, which identifies measures to mitigate potential adverse environmental impacts associated with oil and gas activities. These measures, or operating "stipulations" as named in the MMP, address special areas of protection as well as an overall limit on activity influence.

The 1992 GMP/MMP was prepared with an EIS, which analyzed the potential environmental effects of oil and gas activities in the Preserve, including exploration and production activities. NEPA regulations allow agencies to tier their environmental review, by preparing broad EIS that address a range of activities and impacts, followed by more specific EAs which address a subset of activities or impacts. 40 CFR § 1502.20. This EA tiers to the earlier EIS prepared for the GMP/MMP by building on the analysis from that EIS and analyzing the potential environmental effects of the proposed POP.

Addition Final General Management Plan/Wilderness Study/Off-Road Vehicle Management Plan/Environmental Impact Statement (2010). The purpose of the Addition GMP, completed in 2010, is "to provide a comprehensive direction for resource preservation and visitor use and a basic foundation for decision-making for the Addition for the next 15 to 20 years" (NPS 2010*a*). The Addition GMP states that "[n]one of the actions included in the General Management Plan would result in changes to oil and gas exploration or extraction of new resources from the Addition," and the ROD for the Addition GMP states "[n]othing in the selected action will affect the existing legal rights of mineral owners or change the approved exploration plans and practices of operators."

Environmental Assessment/FONSI for Oil and Gas POPs Calumet Florida, Inc. Raccoon Point 3-D Seismic Evaluation in Big Cypress National Preserve (1998). The EA for the Oil and Gas POPs for the Raccoon Point 3-D Seismic Evaluation was completed to ensure that the proposed plan and any reasonable alternatives have been examined by the NPS, that the plan was in compliance with all federal laws, and that the plan meets the standards for approval of 36 CFR Subpart 9.37. This EA resulted in a FONSI.

Superintendent's Compendium. This document outlines specific regulatory provisions established for the proper management and protection of resources and the public use of the Preserve. Regulations outlined in the *Superintendent's Compendium* include those pertaining to closures and public use limits; permits; preservation of natural, cultural, and archeological resources; wildlife protection; and recreational uses and limitations.

Final Environmental Impact Statement and South Florida and Caribbean Parks Exotic Plant Management Plan (2010). This plan outlines the management of nonnative plants in nine south Florida and Caribbean parks, including the Preserve. The plan promotes restoration of native plant communities and habitat conditions in ecosystems that have been invaded by nonnative plants and protects resources, values, visitors, staff, and area residents from adverse effects resulting from nonnative plant presence and control activities. The plan takes a collaborative approach to managing nonnative plants across

the nine parks, improving effectiveness and efficiency and providing a consistent management framework for responding to this threat. The plan also seeks to establish plant and treatment location priorities, reduce new nonnative plant introductions, and reduce the number of individually targeted plants to protect natural resources (NPS 2010*b*).

Long-Range Interpretive Plan (2002). This plan provides the vision for visitor experiences in the Preserve based on the purpose, significance, and mission put forth in the "Preserve's Strategic Plan." The *Interpretive Plan* proposes both development and management activities to satisfy current visitor demands and identifies a media and activity action plan to meet future visitor needs. The interpretive plan was meant to guide the Preserve's interpretation direction for 10 years (NPS 2002*a*).

Recreational Off-Road Vehicle Management Plan/Environmental Impact Statement (2000). This plan is called for and directed by the 1992 GMP. It was also prepared to comply with the 1995 settlement agreement negotiated between the Florida Biodiversity Project and several agencies and bureaus. ORV use is allowed in the original Preserve by the enabling legislation in a manner that is compatible with resource preservation. The ORV plan outlines the management of recreational ORV use in the original 582,000 acres of the Preserve. It specifies that recreational ORV travel is facilitated by a system of designated access points and trails; that sensitive areas be closed; that temporal and seasonal closures be instituted; and that permits and education be required to operate off-road vehicles in the original Preserve.

Resource Management Plan (n.d.). The original Preserve was established "to assure the preservation, conservation and protection of the natural, scenic, hydrologic, floral and faunal, and recreational values of the Big Cypress Watershed." The boundary of the Preserve was expanded in 1988 to include approximately 147,000 acres of adjacent tracts. This plan includes initial planning and resource inventorying for the Addition. Resource conditions in the Preserve vary from nearly pristine to areas where natural function no longer exists. The plan outlines issues within the Preserve, including natural resources, cultural resources, nonnative plants and wildlife, and the hydrologic environment. The plan emphasizes that conservation, restoration, and preservation must take place on an ecosystem scale.

Hunting Management Plan/Environmental Assessment (2014). Both the GMP and the Addition GMP articulate the need to manage hunting within the Preserve. While public hunting has been allowed in the Preserve, the Addition was not historically open to public hunting. In 2014, NPS adopted a Hunting Management Plan for managing hunting in the Preserve, including the Addition. The Hunting Management Plan creates a framework to develop hunting opportunities in the Preserve. It calls for NPS and FWC, in consultation with USFWS, to address the uncertainties associated with allowing hunting throughout the Preserve. The plan calls for implementation of hunting regulations, adaptive management objectives, baseline management actions, adaptive management triggers, supplemental management actions, and public involvement.

Backcountry Access Plan (in preparation). NPS is in the process of preparing a Backcountry Access Plan that will develop a management approach for ORV secondary trails, non-ORV trails, and camping and that will develop hiking opportunities. While this plan will be tied to the 2000 Off-Road Vehicle Management Plan and the Addition GMP, the Backcountry Access Plan will further clarify the Preserve's management approach as related to secondary trails, camping, and other backcountry opportunities.

ISSUES AND IMPACT TOPICS

ISSUES SELECTED FOR ANALYSIS

Director's Order 12 defines an "issue" as a concern or obstacle to achieving a park goal (NPS 2001, NPS 2011*a*). In NEPA, an issue is any possible barrier to achieving the main goal of NEPA, to minimize effects of proposals on the human environment. Project issues may be any problem that could arise due to implementation of the No Action alternative or an action alternative. The following main issue topics were identified for this project and selected for further analysis. Measures to address these issues are discussed in the project alternatives, affected environment, and environmental consequences of this EA.

Establishing an appropriate area of influence

Exploration for oil and gas in the Preserve may have an influence on noise, visual quality, hydrology, water quality, vegetation and soils, air quality and odor, wildlife, and visitor perceptions. The scale of the seismic survey area must be balanced with the preservation of resource values and maintenance of ecosystem integrity. The MMP identifies 10 percent of the Preserve as an acceptable amount of the Preserve that may be subject to the influence of oil and gas activities at a given time.

How to preserve natural resources while allowing for oil/gas exploration

The seismic survey seeks to identify potential oil and gas deposits in privately owned mineral resources located beneath the Preserve. The NG3-D seismic survey would require human and vehicular access into the Preserve and the establishment of temporary staging areas for vehicle and equipment storage. This action would have the potential to impact both biotic and abiotic resources, including vegetation, soils, hydrology, wildlife, air quality, water quality, and cultural resources.

Avoidance/minimization of wetland impacts

The Preserve consists almost entirely of wetlands. Survey teams cannot avoid going into wetlands located above the privately owned mineral resources. Acoustical signals cannot be generated or received using existing technology without physically touching the ground within wetlands. Team members must traverse wetlands with their equipment in order to reach survey locations. Engaging in survey activities in wetlands cannot be avoided.

The NG3-D seismic survey is proposing the use of technology that has not been previously used for seismic survey in the Preserve

The seismic survey proposes to use Vibroseis buggies to access source lines. Vibroseis is an alternate energy-producing source to replace drilling and detonation of explosive charges to produce a seismic wave. Vibroseis generates ground-level vibrations into the subsurface of the earth. The reflected energy wave is then measured using recorders placed at the ground surface along receiver lines. While Vibroseis technology has been used in other units of the national park system, this is the first time it would be used in the Preserve. Vibroseis buggies are large, rubber-tired, off-road vehicles similar to large swamp buggies that currently utilize the Preserve. Unlike swamp buggies, which often have large tractor tires with heavy tread, Vibroseis buggies use balloon-type tires with minimal tread and wider width. Wide tires and large vehicles increase the potential for contact with natural resources.

How to preserve public uses while allowing for oil/gas exploration

Oil/gas exploration may be permitted in the Preserve subject to NPS regulation. The NPS must balance this activity and minimize potential conflict with other public uses, particularly hunting, fishing, ORV use, camping, passive recreation, and customary use and occupancy.

How oil/gas exploration will affect Preserve management and operations

Most of the Preserve is a natural area managed for conservation while accommodating uses and experiences that do not adversely affect the area's ecological integrity or cultural resources. Management of the Preserve is subdivided into planning units based on important resource areas and use patterns. In addition to minimizing conflicts with natural and cultural resource management, seismic surveys must be balanced with the management of existing oil and gas exploration, transportation, and improved property.

IMPACT TOPICS SELECTED FOR ANALYSIS

The following impact topics are resources of concern that could potentially be beneficially or adversely affected by the actions proposed under each alternative and are analyzed in this EA to ensure that the alternatives are evaluated and compared based on the most relevant topics. A brief rationale for the selection of each impact topic is given.

Vegetation, Habitat, and Soils

The NPS Organic Act and the NPS *Management Policies* (2006*a*) direct NPS units to provide for the protection of Preserve resources. The NPS *Management Policies* (2006*a*) states that "the [NPS] would not attempt to solely preserve individual species (except threatened or endangered species) or individual natural processes; rather, it would try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems. Just as all components of a natural system would be recognized as important, natural change would also be recognized as an integral part of the functioning of natural systems" (NPS 2006*a*).

According to the NPS, land cover data, eleven major land cover types can be found in the survey area: cypress forest, scrub cypress, disturbed land, hydric hammock, hydric pine flatwoods, marsh, mesic hammock, mesic pine flatwoods, swamp forest, water, and wet prairie. The NPS MMP prepared as part of the GMP for the original Preserve identified cypress strands, mixed-hardwood swamps, sloughs and cypress domes, marshes, hardwood hammocks, old-growth pinelands, and mangrove forests as Important Resource Areas (IRAs).

No surface occupancy for the placement of access roads, pads, or pipelines may be permitted in or on any vegetation community identified as an IRA. Also, the use of motorized vehicles for the conduct of geophysical exploration may not be permitted in or on these IRAs, except old-growth pinelands as specified under geophysical operation MMP stipulation 14. Much of this stipulation is directed toward activities associated with geophysical shothole drilling, an activity not proposed by BOCI in its POP.

Nonnative/invasive plant species impact native species by outcompeting them – they aggressively take over disturbed habitats, expand their distribution and displace native species, use more water, and impact wildlife that depends on native plant communities and functional ecosystems. Seismic survey elements of the alternatives could potentially allow the spread of nonnative/invasive plant species.

According to the Soil Conservation Service March 1954 Soil Survey of Collier County, 13 soil types occur within the survey area.

Actions associated with the seismic survey alternatives could potentially have impacts on the vegetation, habitat, and soils. As such, this impact topic is analyzed in detail in this EA.

Wetlands

The Preserve's wetlands are protected under the NPS Organic Act, NPS *Management Policies* (2006*a*), EO 11990 ("Protection of Wetlands"), and Director's Order 77-1: *Wetland Protection* (NPS 2002*b*).

The potential impacts associated with seismic survey activities in wetlands are analyzed in detail as part of the Vegetation, Habitat, and Soils; Wildlife; and Protected Wildlife impact topics. In all of the alternatives, the NPS would continue to protect and conserve the Preserve's wetlands as required under the NPS Organic Act, NPS *Management Policies*, EO 11990, and Director's Order 77-1 (NPS 2002*b*).

Section 404 of the Clean Water Act, which requires permits for discharges of dredged and fill material into waters of the United States, is inapplicable to the proposed survey because no discharges or filling is contemplated.

EO 11990, Section 1, generally provides that "each agency shall provide leadership and shall take action to [avoid] the destruction, loss or degradation of wetlands, and to preserve and enhance natural and beneficial values of wetlands in carrying out the agency's responsibilities … managing … Federal lands and facilities." Section 2 of EO 11990 provides that "each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use." 42 Fed. Reg. 26961 (May 24, 1977).

This EA evaluates the effects of the alternatives on wetlands and ways to avoid and minimize those effects, consistent with Section 1 of the EO. The specific prohibitions of Section 2 of this EO are not implicated by the seismic survey alternatives because they do not propose construction in wetlands; field operations require no construction or filling of wetlands, and equipment would be staged, to the extent feasible, on existing or previously disturbed sites or open areas near I-75.

The seismic survey seeks to evaluate specific privately owned oil and gas resources located beneath the Preserve. The Preserve consists almost entirely of wetlands. Survey teams cannot avoid going into wetlands located above the privately owned oil and gas resources. Acoustical signals cannot be generated or received using existing technology without physically touching the ground within wetlands. Team members must traverse wetlands with their equipment in order to reach survey locations. Engaging in survey activities in wetlands cannot be avoided.

Therefore, this impact topic is analyzed in detail in this EA and the Wetland Statement of Findings.

Protected Plants

Threatened and endangered plant species in the Preserve are governed by several laws and policies, primarily the NPS Organic Act and the ESA. The purpose of the ESA is to conserve "the ecosystem upon which endangered and threatened species depend" and to conserve and recover listed species. This act mandates that all federal agencies protect listed species and preserve their habitats. NPS *Management Policies* (2006*a*) also provide specific guidance for management of threatened or endangered plants. These policies dictate that the NPS would survey for, protect, and strive to recover all species native to NPS units that are listed under the ESA. Additionally, in the state of Florida, laws protecting rare, threatened, and endangered species include the Florida Endangered and Threatened Species Act, the Endangered Species Protection Act, and the Preservation of Native Flora of Florida Act.

The GMP for the original Preserve identified numerous state-listed plant species documented within the Preserve; however, none of them were federally protected species. The GMP for the Addition identified listed plant species documented within the Addition, which also included numerous state-listed plant species, as well as two candidate species for federal listing. These two species, Florida prairie clover (*Dalea carthagenensis* var. *floridana*) and Florida pineland crabgrass (*Digitaria pauciflora*), are identified as USFWS candidate species, per Federal Register No. 77 volume 225, dated November 21, 2012.

Actions associated with seismic survey alternatives could potentially have impacts on federally protected plant species. Therefore, this impact topic is analyzed in detail in this EA.

Protected Wildlife

Threatened and endangered wildlife species in the Preserve are governed by several laws and policies, primarily the NPS Organic Act and the ESA. The purpose of the ESA is to conserve "the ecosystem upon which endangered and threatened species depend" and to conserve and recover listed species. This act mandates that all federal agencies protect listed species and

preserve their habitats. NPS *Management Policies* (2006*a*) also provide specific guidance for management of threatened or endangered animals. These policies dictate that the NPS would survey for, protect, and strive to recover all species native to NPS units that are listed under the ESA. Additionally, in the state of Florida, laws protecting rare, threatened, and endangered species include the Florida Endangered and Threatened Species Act and the Endangered Species Protection Act.

Eight federally listed and one federal candidate wildlife species, including the American alligator (*Alligator mississippiensis*), eastern indigo snake (*Drymarchon corais couperi*), gopher tortoise (*Gopherus polyphemus*), Audubon's crested caracara (*Polyborus plancus audubonii*), wood stork (*Mycteria americana*), red-cockaded woodpecker (*Picoides borealis*), Everglade snail kite (*Rostrhamus sociabilis plumbeus*), Florida panther, and Florida bonneted bat (*Eumops floridanus*), are known from or could potentially occur within the survey area. In addition, the American crocodile (*Crocodylus acutus*), West Indian manatee (*Trichechus manatus*), and Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) are also known to occur in the Preserve, though not in the survey area. No critical habitat for these protected wildlife species exists within the survey area.

Actions associated with seismic survey alternatives could potentially have impacts on the terrestrial and avian species listed. Therefore, this impact topic is analyzed in detail in this EA.

Major Game Species

As stated in the management plan for the Addition, the Preserve contains 13 major game species. Of these, the white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo osceola*), and feral hog (*Sus scrofa*) require special management considerations because of their importance to recreational hunters. White-tailed deer and feral hogs are also main prey species for the endangered Florida panther, while turkeys are taken by panthers opportunistically.

Actions associated with the seismic survey alternatives could potentially have impacts on major game species. As such, this impact topic is analyzed in detail in this EA.

Other Wildlife

Actions associated with the seismic survey alternatives could potentially have impacts on other wildlife. As such, this impact topic is analyzed in detail in this EA.

Water Quality

NPS policies require protection of water quality in a manner consistent with the Clean Water Act. Actions associated with the seismic alternatives could potentially have impacts on water quality. As such, this impact topic is analyzed in detail in this EA.

Hydrology

Actions associated with the seismic survey alternatives could potentially have impacts on hydrology. As such, this impact topic is analyzed in detail in this EA.

Subsurface Geological Resources

The subsurface geological resources in the Preserve are important to maintaining its ecological integrity.

One or more of the alternatives could potentially have impacts on subsurface geological resources. As such, this impact topic is analyzed in detail in this EA.

Air Quality

The legal authority for federal programs regarding air pollution control is based on the 1990 Clean Air Act Amendments. These are the latest in a series of amendments made to the Clean Air Act. This legislation modified and extended federal legal authority provided by the earlier Clean Air Acts of 1963 and 1970. The Preserve has been designated a Class II area under the Clean Air Act. The Preserve is currently within a designated attainment area (i.e., concentrations are below ambient air quality standards for criteria pollutants).

Actions associated with the seismic survey

alternatives could potentially have impacts on air quality. As such, this impact topic is analyzed in detail in this EA.

Cultural/Archeological Resources

Several federal laws, executive orders, and regulations dictate that the NPS will protect cultural resources on federal lands. The NPS defines the term "cultural resources" to cover a broad spectrum. Cultural resources include a "building, site, structure, object, or district evaluated as having significance in prehistory or history." Primarily, Section 106 of the National Historic Preservation Act sets forth procedures for the identification and protection of prehistoric and historic archeological sites and historic resources which are listed in or determined eligible for the NRHP and requires federal agencies to consider the effects of proposed actions on historic properties. In addition, the protection of archeological resources on federal lands, whether listed/eligible or not eligible for the NRHP, is further addressed in the Archaeological Resources Protection Act of 1979 (ARPA [16USC470]) as amended, Section 2 (a)(3) and Section 2 (b). Additionally, Executive Order 13007, Indian Sacred Sites, requires federal agencies to avoid adverse effects on sacred sites and ensure tribal access. Sacred sites are identified as Important Resource Areas (IRA) according to the MMP for the original Preserve. The MMP stated that there will be no surface occupancy for the placement of access roads, pads, or pipelines that may be permitted in or on any identified IRA. Further, the use of motorized vehicles for the conduct of geophysical exploration is not permitted in or on any cultural site identified as an IRA.

There are currently more than 400 recorded archeological and/or historic sites in the Preserve, some of which are in the survey area. The NPS anticipates that there are a similar number of unrecorded sites in the Preserve, some of which would be included in the survey area.

Actions associated with the seismic survey alternatives could potentially have impacts on cultural and archeological resources. As such, this impact topic is analyzed in detail in this EA.

Noise/Soundscapes

In accordance with NPS *Management Policies* (2006*a*) and Director's Order 47: *Sound Preservation and Noise Management* (NPS 2000*b*), an important part of the NPS mission is preservation of natural soundscapes associated with NPS units. Natural soundscapes exist in the absence of human- caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in the Preserve, together with the physical capacity for transmitting natural sounds. As stated in Director's Order 47, natural sounds are intrinsic elements of the environment. They are inherent components of the "scenery and the natural and historic objects and the wildlife" protected by the NPS Organic Act. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials.

Intrusive sounds are of concern to the NPS because they can impede the NPS's ability to accomplish its mission. By definition, noise is human-caused sound that is considered unpleasant and unwanted. Whether a sound is considered unpleasant depends on the individual who hears the sound and the setting and circumstance under which the sound is heard. However, natural sounds throughout the Preserve – including flowing water, animals, and rustling leaves – are not considered noise.

Actions associated with the seismic survey alternatives potentially could have impacts on noise and the soundscape. As such, this impact topic is analyzed in detail in this EA.

Visitor Use and Perceptions

NPS *Management Policies* (2006*a*) addresses "enjoyment of park resources and values by the people of the United States" as "part of the fundamental purpose of all parks." The NPS is committed to "providing appropriate, high-quality opportunities for visitors to enjoy the parks," by maintaining "an atmosphere that is open, inviting, and accessible" (NPS 2006*a*).

The primary recreational activities within the Preserve include frontcountry driving, sightseeing, and visitor centers; walking and hiking; birding and wildlife viewing; paddling;

motorboating; camping; bicycling; ORV riding; hunting, fishing, and frogging; and opportunities to experience peace and quiet in a natural environment (NPS 2010*a*). However, it should be noted that not all of these activities occur in the area of the proposed seismic survey.

As stated in the MMP prepared as part of the management plan for the original Preserve, the virtually flat relief and the dense vegetation in certain areas help to hide much of the oil and gas operations when viewed from the ground level. However, the presence of vehicles and workers would occur in natural settings, and disruption of surface vegetation and/or soils from trails and seismic lines could occur under the seismic survey alternatives. Actions associated with seismic survey alternatives potentially could have impacts on visitor use and perceptions. As such, this impact topic is analyzed in detail in this EA.

Wilderness

Wilderness in NPS units is governed by the Wilderness Act and NPS *Management Policies* (2006*a*). NPS *Management Policies* (2006*a*) provide that wilderness considerations be integrated into all planning documents to guide the preservation, management, and use of the Preserve's wilderness and ensure that wilderness is unimpaired for future use and enjoyment as such. In determining whether an area may qualify as wilderness, the NPS considers several factors, including whether the area is undeveloped and retains its primeval character and influence without permanent improvements or human habitation, whether the area generally appears to have been primarily affected by the forces of nature, with the imprint of humans' work substantially unnoticeable; and whether the area offers outstanding opportunities for solitude or a primitive and unconfined type of recreation (NPS 2015). Generally speaking, the NPS only considers areas at least 5,000 acres in size as potential wilderness.

Congress has not designated any wilderness in the Preserve. However, pursuant to the Addition GMP (2010*a*), about 47,067 acres of land have been proposed for wilderness designation in the Addition, and another 24,196 acres are eligible for designation. In addition, in June 2015 the NPS identified approximately 188,323 acres within the original Preserve that are eligible for proposed wilderness designation (NPS 2015). NPS policy indicates that lands identified as being eligible for wilderness designation, wilderness study areas, proposed wilderness, and recommended wilderness (including potential wilderness) should also be managed to preserve their wilderness character and values in the same manner as designated wilderness until Congress has acted on the recommendations (NPS 2011*a*).

Actions associated with one or more of the alternatives would occur in eligible and/or proposed wilderness and could have impacts on wilderness character within the survey area. As such, this impact topic is analyzed in detail in this EA

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

Several potential impact topics were dismissed because they did not apply, would not be affected, or the potential for impacts under all of the alternatives would be negligible. These topics are listed below, with an explanation of why they were dismissed from further analysis.

Nonnative/Invasive Wildlife Species

Nonnative species have the potential to impact natural systems through unchecked predation or consuming and killing of native plant species. In many cases, nonnative wildlife has no natural predators and can displace native species and multiply rapidly.

Actions associated with the proposed alternatives should not affect the distribution of nonnative/invasive wildlife species. Therefore, this impact topic is not analyzed in detail in this EA.

Coastal Zone

The survey area is within the coastal zone for purposes of the Coastal Zone Management Act of 1972 (CZMA) because it is located in Collier County. The CZMA is administered by the Florida Department of Environmental Protection (FDEP). No discernible effects to the

coastal zone will occur as a result of seismic survey alternatives, so long as BOCI submits a certification of consistency with Florida's approved Coastal Zone Management Program to the Director of the Florida State Clearinghouse and obtains state concurrence with that certification before undertaking the seismic survey. While this is a separate issue of legal compliance, it does not raise substantively different issues than those already discussed, and therefore it will not be addressed separately in this EA.

Estuarine and Fisheries Resources

The Magnuson-Stevens Fishery Conservation and Management Act, as amended, is the primary law governing fisheries management in the Preserve. The Preserve contains important estuarine and fisheries resources. Recreational fishing in the Preserve is currently regulated by FWC; no commercial fishing is allowed in the Preserve.

The seismic survey alternatives would only occur during the dry season when no standing water is present. As such, actions associated with alternatives would not affect estuarine and fisheries resources. Therefore, this impact topic is not analyzed in detail in this EA.

Floodplains

The Preserve's floodplains are protected under the NPS Organic Act, NPS *Management Policies* (2006*a*), EO 11988 ("Floodplain Management"), and Director's Order 77-2: *Floodplain Management* (NPS 2003).

Upon review of these laws and policies and the proposed alternatives associated with this EA, none of the alternatives would impact floodplains within the Preserve. In all of the alternatives, the NPS would continue to protect and conserve the Preserve's floodplains as required under the NPS Organic Act, NPS *Management Policies*, EO Order 11988, and Director's Order 77-2 (NPS 2003). Therefore, this impact topic is not analyzed in detail in this EA.

Night Sky/Lightscapes

Since lighting is not a component of any of the proposed alternatives, and the proposed plan would involve only operations during daylight hours, no impacts to the night sky would occur. Therefore, this impact topic is not analyzed in detail in this EA.

Prime or Unique Farmlands

The Farmland Protection Policy Act (7 USC 4201 et seq.) and the USDOI Environmental Statement Memorandum ESM94-7 – Prime and Unique Agricultural Lands require an evaluation of impacts on prime or unique agricultural lands. Prime farmland is soil that produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts.

No prime or unique farmlands exist in the survey area according to the U.S. Department of Agriculture Natural Resources Conservation Service. Therefore, this impact topic is not analyzed in detail in this EA.

Public Health and Safety

Actions associated with the seismic survey alternatives will not have impacts on the health and safety of visitors to the Preserve or the public as a whole. The proposed plan would not involve any kind of drilling, extraction of mineral resources, or road construction. There are no businesses or homes in the area of proposed operations, and activities would take place far away from most visitors to the Preserve. Therefore, this impact topic is not analyzed in detail in this EA.

Socioeconomics

Short-term direct beneficial effects would be realized by the survey crews employed for the duration of the project. The economic gains for those employed by the project would indirectly benefit local businesses through spending in the community. Because the socioeconomic impacts would be expected to be short-term and negligible, this impact topic is not analyzed in detail in this EA.

Museum Collections

Museum collections are prehistoric and historic objects, artifacts, works of art, archival material, and natural history specimens. Implementation of any of the alternatives would have no effect on how the Preserve's museum collections are acquired, accessioned and cataloged, preserved, protected, and made available for access and use. Therefore, this impact topic is not analyzed in detail in this EA.

Environmental Justice

Any proposed federal project must comply with the provisions of Title VI of the Civil Rights Act (1964), as amended by Title VIII of the Civil Rights Act (1968). Title VI of the 1964 Civil Rights Act provides that no person will, on the grounds of race, color, religion, sex, national origin, marital status, disability, or family composition be excluded from participation in, be denied the benefits of, or be otherwise subject to discrimination under any program of the federal, state, or local government. Title VIII of the 1968 Civil Rights Act guarantees each person equal opportunity in housing. Additionally, EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Upon review of these laws and the alternatives associated with this EA, no person will be excluded from or discriminated against in any of the alternatives considered in this EA. Additionally, minority or low-income populations would be treated the same way under all of the alternatives considered in this plan; none of the alternatives being considered would have a disproportionately high and adverse effect on any minority or low-income population or community. Also, no Native Americans reside within the survey area, so the proposed alternatives would have no effect on tribal residential areas. Therefore, this impact topic is not analyzed in detail in this EA.

Climate Change

EO 13514, "Federal Leadership in Environmental, Energy, and Economic Performance" and USDOI Secretarial Order 3285 both provide guidance on how federal agencies should address greenhouse gas emissions and climate change. The NPS has also issued draft interim guidance for considering climate change in NPS NEPA analyses.

NPS *Management Policies (*2006*a*) states that "Parks containing significant natural resources will gather and maintain baseline climatological data for reference." *Management Policies* also state that "The Service will use all available authorities to protect park resources and values from potentially harmful activities…NPS managers must always seek ways to avoid, or minimize to the greatest degree possible, adverse impacts on park resources and values" (NPS 2006*a*).

The proposed survey would have *de minimis* effects on greenhouse gas emissions. The activity would involve use of relatively few vehicles to conduct the seismic survey. The emissions of these vehicles would be *de minimis* in the context of other vehicles in use in the survey area, including I-75. The proposed alternatives do not propose to engage in drilling or the production of oil and gas.

None of the actions associated with the proposed alternatives are anticipated to have an effect on climate change. Therefore, this impact topic is not analyzed in detail in this EA.

Land Use

No land use plans (outside the Preserve boundaries) would be affected by actions proposed under any of the alternatives. The alternatives considered also do not propose to alter current land uses within the Preserve. To the extent that there were future oil and gas exploration or production activities in the survey area, the general effects of such activities on land use were addressed in the 1992 GMP/EIS, and any site-specific changes of land use would addressed in future NPS analyses in response to potential future POPs. Therefore, this impact topic is not analyzed in detail in this EA.

Other Agency or Tribal Land Use Plans or Policies

The actions included in this EA and considered under each of the proposed alternatives are compatible and not in conflict with local land use plans. Therefore, this impact topic is not analyzed in detail in this EA.

Indian Trust Resources

Indian trust assets are owned by American Indians but are held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order 3206, American Indian Tribal Rites, Federal – Tribal Trust Responsibilities, and the Endangered Species Act, and Secretarial Order 3175, Departmental Responsibilities for Indian Trust Resources. According to Preserve staff, Indian trust assets do not occur within the Preserve. Therefore, Indian Trust Resources will not be retained for further analysis.

Odor

The seismic survey alternatives would use vehicles and other internal combustion engines capable of producing hydrocarbon odors associated with emissions and dust when traveling over dry areas. The effect of odors on Preserve visitors would be temporary, intermittent, and likely detectable only in the immediate vicinity of the source. Odor effects on wildlife would be anticipated to be similar in nature to existing stimulus generated by ORV activity and *de minimis* in comparison to existing transportation corridors through and adjacent to the Preserve. Therefore, this impact topic is not analyzed in detail in this EA.

CHAPTER 2: ALTERNATIVES

PROJECT ALTERNATIVES

NEPA implementing regulations provide guidance on the consideration of alternatives in an EA. These regulations require the decision-maker (the NPS) to consider the environmental effects of the proposed action and a range of alternatives, including No Action (40 CFR § 1502.14). The range of alternatives includes reasonable alternatives that must be rigorously and objectively explored as well as other alternatives that are eliminated from detailed study. To be reasonable, an alternative must meet the stated purpose of and need for the project. Project alternatives may originate from the proponent agency, coordinating or cooperating agencies, other agencies, or members of the public, at public meetings, or during the early stages of project development. The alternatives analyzed in this document, in accordance with NEPA, are the result of internal governmental agency coordination.

ALTERNATIVE 1 (NO ACTION) – NO SURVEY BY BOCI

Alternative 1 is the No Action alternative. In this case, No Action means that BOCI would not conduct a seismic survey and current activities and management would continue in the Preserve. The No Action alternative would not achieve the project purpose and need is therefore not a reasonable alternative. However, it is included as required by the CEQ and USDOI NEPA regulations.

Alternative 1 would allow current uses and management to continue within the Preserve. Numerous public uses, including ORV use in the original Preserve, hunting, camping, fishing, hiking, and sightseeing among others, would be ongoing. Prescribed burning, exotic vegetation removal, other land management practices, environmental research, and existing oil operations would also continue.

ALTERNATIVE 2 (PROPOSED ACTION) – SEISMIC SURVEY USING VIBROSEIS BUGGIES

Alternative 2 represents the proposed action and preferred alternative. Under Alternative 2, BOCI would conduct seismic exploration activities using Vibroseis buggies within a 110± square mile survey area. A detailed description of this alternative is included below.

The 1992 Preserve GMP discussed two types of seismic survey methods with their respective and different sources of generating seismic signals: dynamite and vibration. Both seismic methods have been used in 2-D surveys conducted prior to and after the 1974 creation of the Preserve. The vast majority of these previous surveys were dynamite surveys. Today, the industry's state-of-the-art seismic exploration technology is 3-D, which produces essentially a picture of a subsurface cube for geo-scientists to evaluate. 3-D seismic surveys are routinely used with a high degree of success to identify the presence and orientation of subsurface geological features, fluid content and fluid movement (multi-repeat surveys).

Under Alternative 2, BOCI would use the vibration method of 3-D seismic exploration technology. BOCI's examination of historical south Florida 2-D dynamite seismic surveys and a small 3-D survey shot in the Preserve indicates that greater degrees of seismic survey quality or "fold" provided by 3-D exploration technology is required to better image and successfully identify subtle geological features similar to those producing elsewhere in the Sunniland Trend. Such quality improvement provides the resolution capability to image and differentiate geological layers within the producing Sunniland interval, which, should prospective producing features be found, would minimize the unnecessary expense and environmental impacts associated with unproductive wells.

Alternative 2 would use the Vibroseis seismic exploratory method designed to evaluate the subsurface geologic structure and geophysical conditions pertaining to accumulations of commercial quantities of crude oil and natural gas in the Sunniland Oil Trend. Alternative 2

would achieve this by producing an acoustic seismic signal at the surface and using small, portable seismic receivers (geophones) and recording devices to measure subtle vibrations in the ground from signals that have traveled downward and "bounced" off various subsurface layers back to the surface (Figure 2-1). The geophones, which have a single, small anchor spike, are manually placed in the ground by foot and connected to a recording device. No explosives would be used to create the vibrations or seismic acoustical signals. Instead, seismic signals would be created by vibrating a hydraulically lowered 8 x 4 foot, 7-inch thick steel plate attached to a special off-road vehicle (a Vibroseis buggy (Figure 2-2)). This plate is placed against the ground, vibrated, raised, and then moved on to the next location in an approximate two-minute time span (Figure 2-3).

The vibration devices and the geophones which receive the return seismic signal from the subsurface geology would be oriented in a "source" and "receiver" line grid that would allow BOCI to map the subsurface geology in sufficient detail to meet the project need. The geophones would be placed along the line grid by workers on foot. Once the seismic acquisition is completed, the geophones would be collected by hand and the locations where vibrating occurred and geophone receivers were placed on the ground would be returned to their pre-existing condition.

Vibroseis technology allows the acquisition of high-resolution seismic data without penetrating the ground and detonating a subsurface charge to produce a seismic signal. This minimizes the potential to disturb subsurface cultural and archeological resources or sensitive environmental features at or below the ground surface.

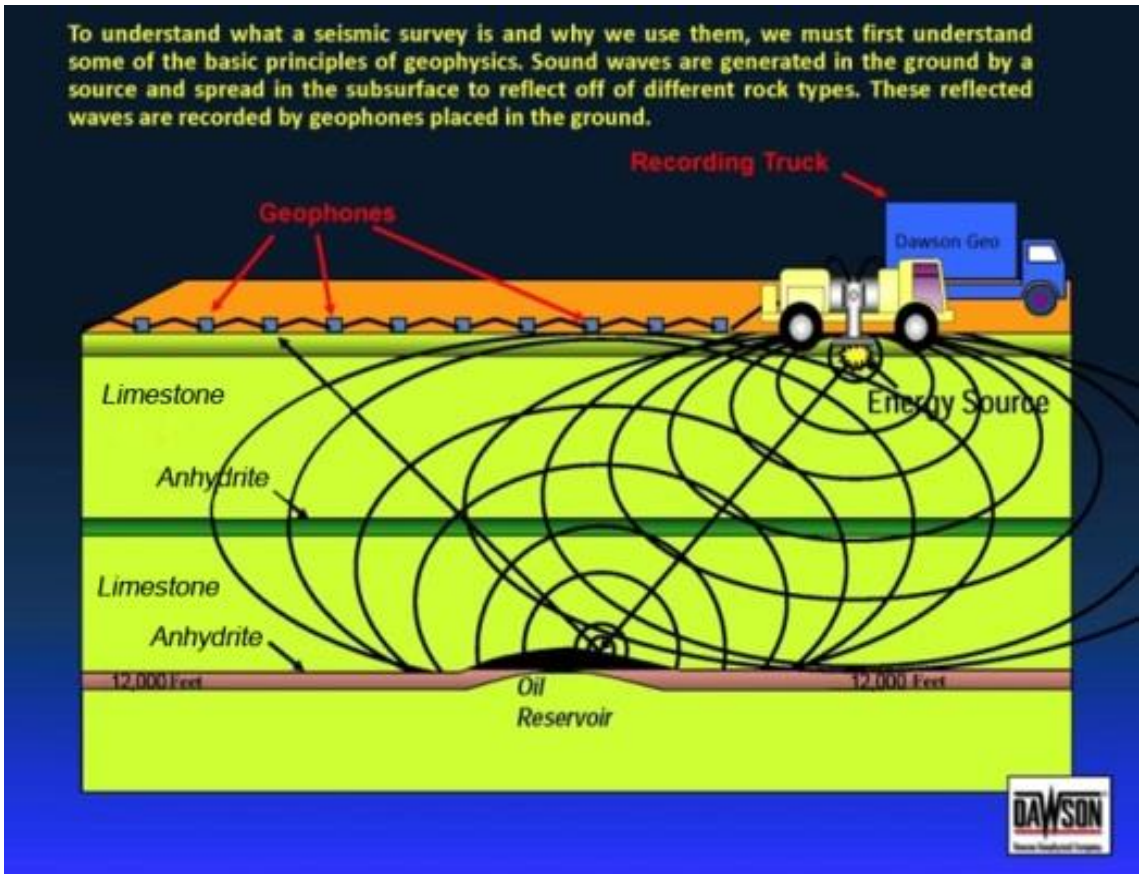


Figure 2-1. Seismic survey graphic

Figure 2-2. Vibroseis buggies

Figure 2-3. Vibroseis buggy vibrator plate

Figure 2-4. Vibroseis buggy balloon tire

On the ground surface, Vibroseis buggies would utilize "balloon" or "flotation"-type tires (Figure 2-4) to substantially reduce weight on the surface to 26 psi and result in less potential impacts to plant roots due to the lack of tread (or lugs). The Vibroseis buggies have a width of 12 feet but have an articulation feature which allows the buggies to make relatively small radius turns while in operations. With its articulation features, the Vibroseis buggy can maneuver in tight spots, producing minimal surface impacts similar to those described in the NPS *Operators' Handbook for Nonfederal Oil and Gas Development in Units of the National Park System* (2006*b*).

The seismic survey would generally employ a "one pass" design for point locations during data acquisition operations. The "one pass" survey design means that the equipment group would only traverse a given area once and that area would not be driven upon again in the majority of cases. However, certain areas may be crossed more than once if it would result in less environmental impacts to use the same crossing to avoid a sensitive area (e.g. endangered species nesting/denning areas, archeological sites).

Five temporary staging areas would be utilized to minimize the amount of disturbance by reducing the amount of equipment and personnel traversing the survey area (Figure Figure 2-5). To minimize surface disturbance, two of the five staging area sites would utilize abandoned former well pads and four of five sites would use existing roads or trails for access to the staging area sites. The proposed staging areas would maximize utilization of previously disturbed or open areas with short access from existing rest and recreational parking area service roads. BOCI would plan on avoiding discharge of dredged or fill material into wetlands as part of the survey. Should improvements to the staging areas be required, BOCI would consider utilizing a composite mat system.

The majority of the field operations would be conducted from the main staging area, MM-63S,

located 0.4 mile south of I-75, to the immediate southeast of the existing rest area. Staging area MM-63S would be sized to accommodate crew assemblies, support equipment, material storage, Vibroseis and support equipment, receiver/GSR/ battery truck trailers, receiver support equipment, receiver drop bag assembly for helicopter transport and a helicopter landing zone with support trailers and refueling capability.

The other four staging areas (i.e., MM-63S-2, MM-63N, MM-70N, and MM-70S) would be for satellite uses (i.e., geophone pick-up and drop-off via helicopter). Field staging areas on both sides of I-75 would be necessary to comply with FAA regulations and safety guidelines prohibiting helicopters transporting materials and/or long-line (sling) loads from flying over interstate highways. The placement of the staging areas would allow ground transfer of equipment from either side of I-75 via the existing traffic crossovers that services the FDOT MM-63 rest areas and the MM-70 I-75 recreational parking areas.

The initial survey design would entail vibration points (or source points) and receiver lines oriented generally east/west and north/south, respectively (Figure 2-6). The source lines would be approximately 1,155 feet apart with source point station spacing of 82.5-foot intervals. The receiver lines would be approximately 495 feet apart with receiver point spacing of 165± feet. Each receiver point would consist of three geophones placed by hand at each station, over an approximately 1 square foot area. Alternative 2 would utilize geophone sets that are not connected to other geophone sets via a receiver line or cable, thus reducing deployment and pickup times.

The program planning operations would involve the identification and mapping of infrastructure, cultural resources, and environmentally sensitive areas. BOCI would modify, as needed, the survey design to utilize where practicable existing roads, trails, and other disturbed areas for relocation of vibration source points away from IRAs (Figure 2-7). Mapping of the survey area would first be conducted utilizing high resolution Geographic Information Systems (GIS) mapping imagery,

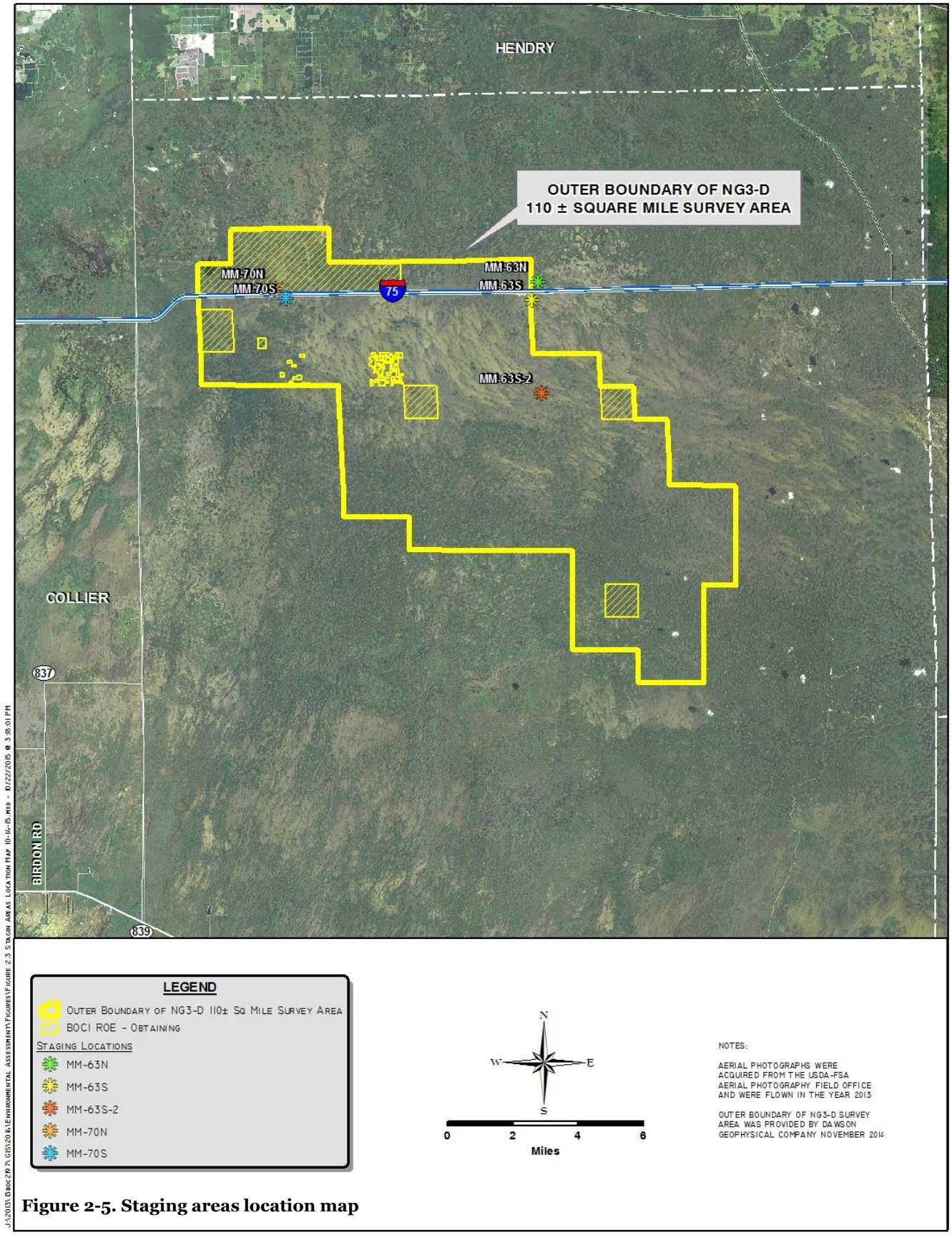


Figure 2-5. Staging areas location map

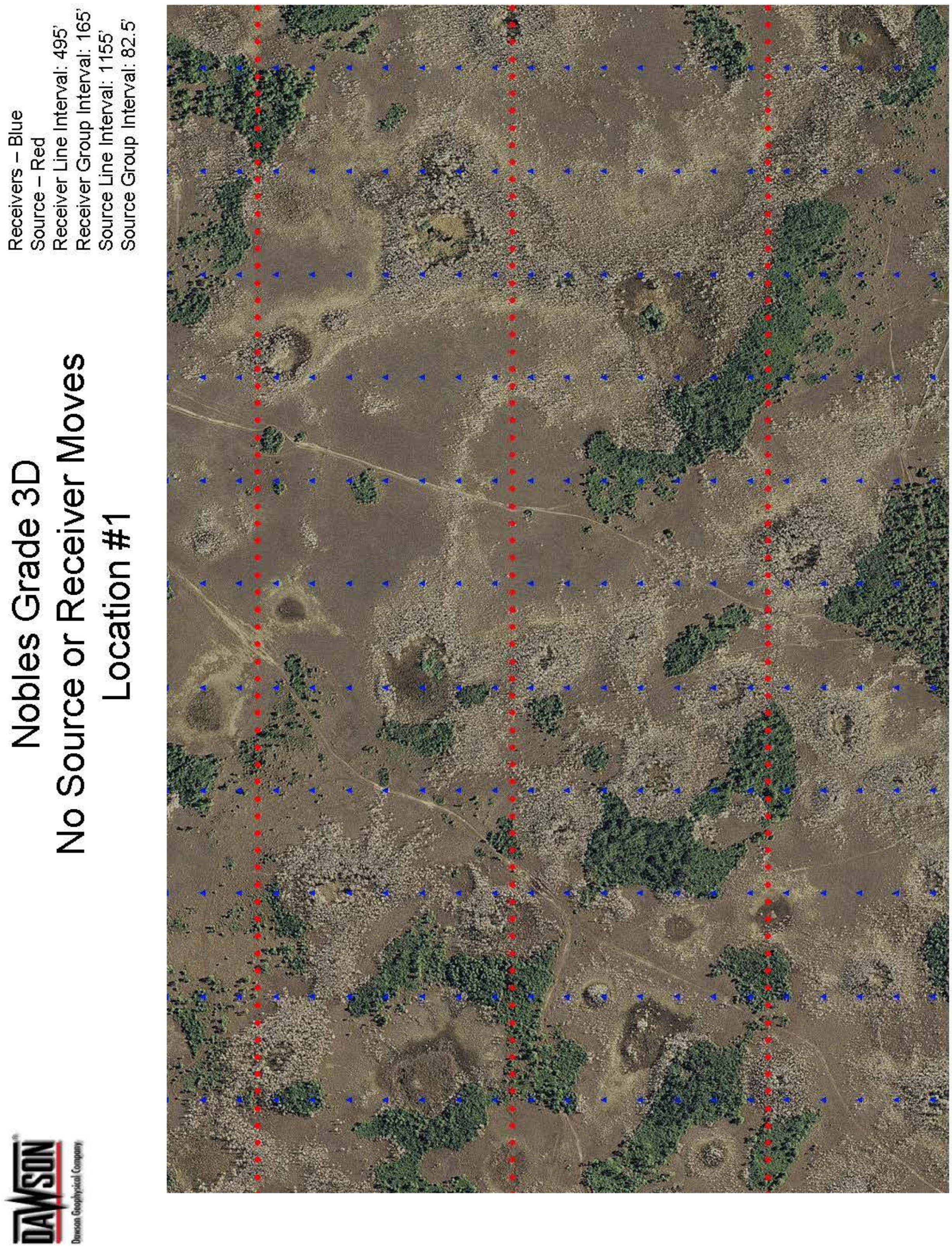


Figure 2-6. Unmodified standard "brick-grid"

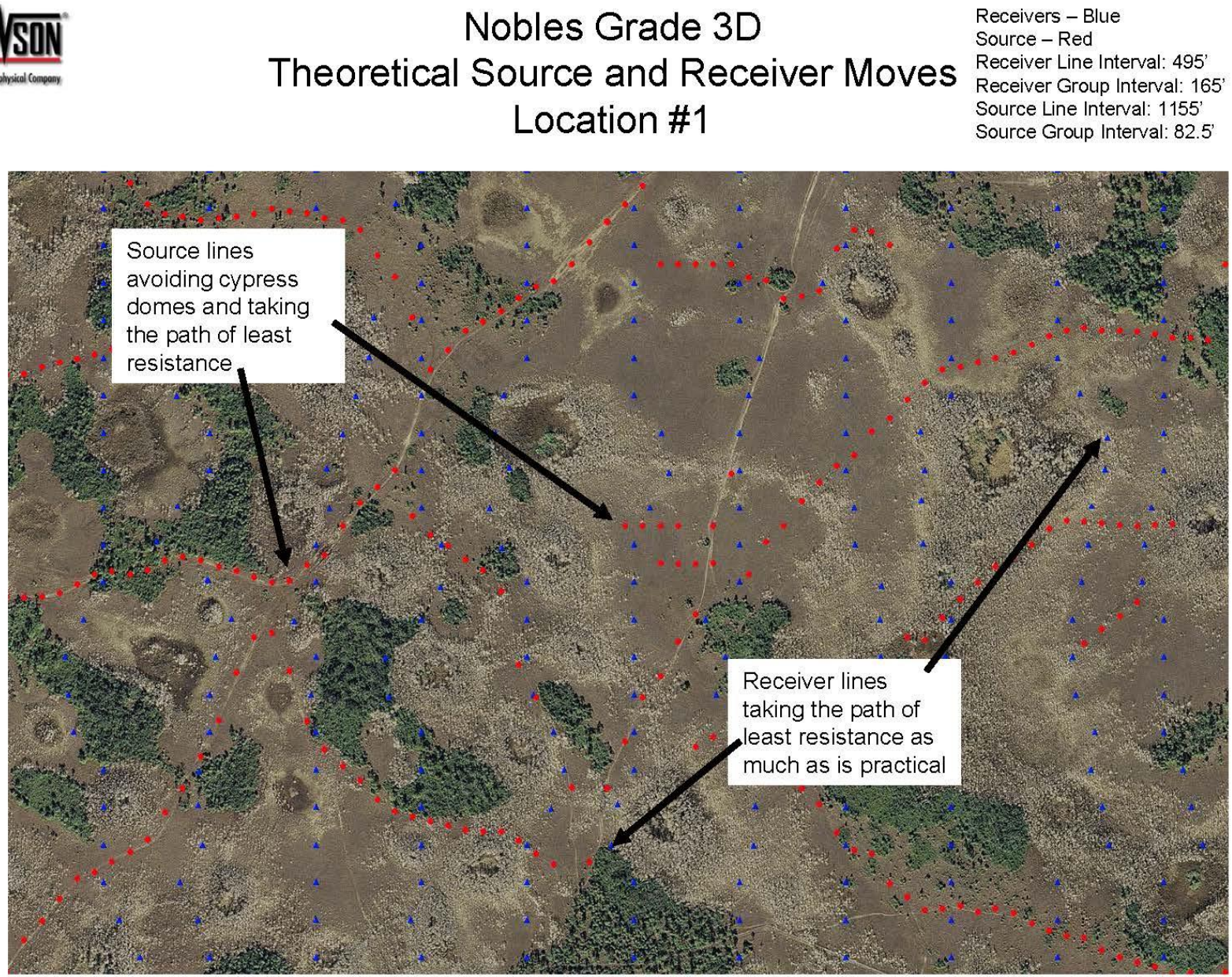


Figure 2-7. Modified standard "brick-grid"

followed by field crews groundtruthing on foot concurrent with the survey operations. By employing these systems, it is anticipated that BOCI would reduce substantially the traditional survey staking of recorder and source points. Sensitive areas (i.e., IRAs, other listed species areas/buffers, areas with soft soils, and/or dense trees, etc.) as identified by the NPS and field scouting crews (ecologist, archeologist, and seismic contractor) would be added to a work area map as "avoidance polygons" and the survey design would be adjusted accordingly around these areas and posted to a digital map available to field crews on field computer tablets and/or Global Positioning System (GPS) instruments.

Because sensitive environmental features that were not identified during the planning stage may be encountered in the field, when field operations begin for Alternative 2, daily scouting and research of the proposed survey lines would be conducted to identify potential sensitive areas and routing alternatives immediately in front of the survey. Following survey activities, geophone receivers would be deployed beginning at one end of a survey area and moving toward the other end. Flexibility has been built into the operations plan to accommodate relocation around unanticipated sensitive areas. Receiver points would be relocated and source paths re-routed in the field to avoid impacts to these areas. Helicopters would be used to deliver equipment to otherwise inaccessible source locations without constructing new roadways or trails.

After sufficient geophones have been deployed, Vibroseis operations (seismic acquisition activities) would begin. BOCI proposes to utilize two groups of three Vibroseis buggies. Both groups of buggies would operate simultaneously over an approximate 2.5-square-mile area each day with stops of approximately two minutes at each vibration source point. The short vibrating periods at any one source point within the daily operating area would be expected to die out (attenuate) with distance from the source similar to that of many forces in the universe (Teasdale *et al.* 2006). Likewise, it is anticipated that noise would attenuate similarly. Approximately 12 to 24 seconds of vibration would be conducted at each source point. Crews would be on call to immediately attend to any required restoration and reclamation activities at any source point needing such attention.

Reclamation and cleanup entailing the activities listed above would be conducted concurrently with field operations and completed within 30 days following the last Vibroseis source pass, excepting inclement weather conditions.

Field activities would be accomplished in one dry season under Alternative 2. There is also a reasonable likelihood that the survey may require less than a full dry season to accomplish.

In summary, Alternative 2 would provide a high level of regulatory compliance while generating the best quality and most detailed seismic data.

ALTERNATIVE 3 – SEISMIC SURVEY USING EXPLOSIVE CHARGES

Alternative 3 consists of utilizing an alternative, industry-approved seismic survey methodology that has been previously used within the Preserve. Alternative 3 would incorporate the same high-resolution seismic survey objective as Alternative 2 but would utilize explosive charges (dynamite) set beneath the ground surface to generate acoustic seismic signals and would be conducted within the 110± square mile survey area of Alternative 2. The number and location of seismographic explosions would be designed to achieve the same level of 3-D imagery precision as Alternative 2 in order to meet the project purpose and need. Survey activities would be the same as described in Alternative 2, but Alternative 3 would replace Vibroseis with drilling and use of explosives to generate seismic waves. Because the technique of drilling and placing charges would require substantially more time than the Vibroseis technique that would be employed in Alternative 2, work under Alternative 3 would require as many as two dry seasons to complete.

The 3-D design would be similar to that of Alternative 2. Receiver lines would be aligned as they would for Alternative 2, approximately 495 feet apart with receiver point spacing of

165± feet. Source lines would also be of similar design to Alternative 2, approximately 1,155 feet apart with source point station spacing of 82.5 foot intervals.

Further, compared to Alternative 2, more time during any given dry season may be required for seismic activities.

Equipment needed for the survey would be staged on and from the staging areas identified under Alternative 2. Alternative 3 work segments for each seismic survey phase would be similar to those described for Alternative 2 with exceptions for a different seismic energy generation method and an additional visit to source points by a shooting (detonation) crew during the data acquisition work segment.

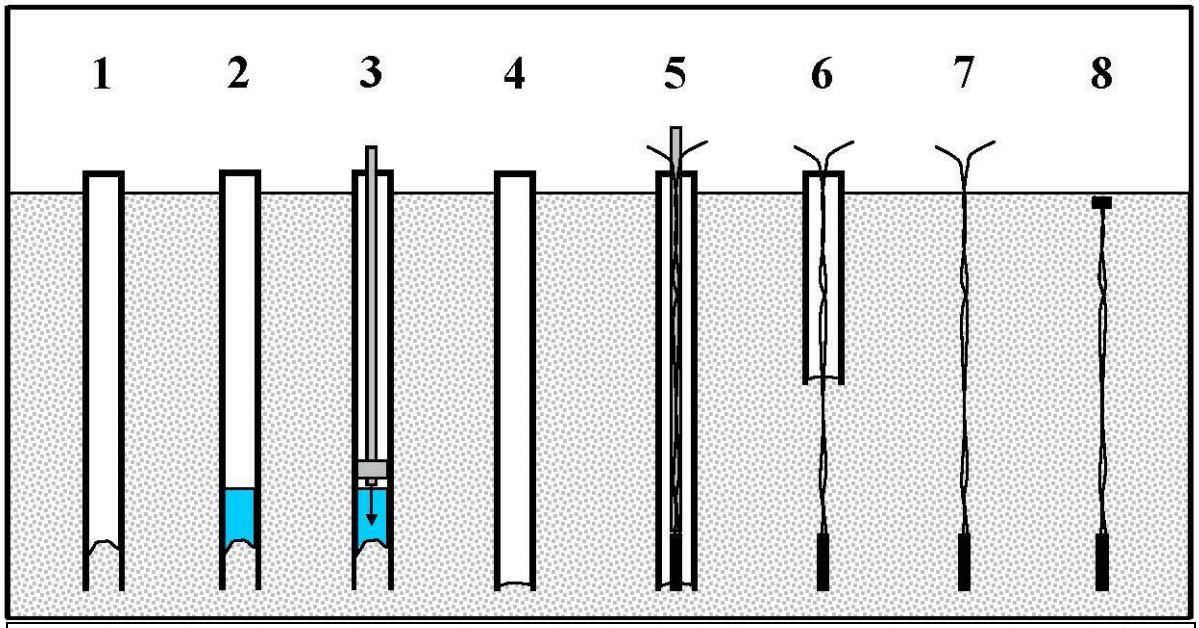
Source points for Alternative 3 would require drilling shotholes for the placement of dynamite energy sources (Figure 2-8). Energy sources would likely range between 5.5 to 7.5 pounds of seismic explosives placed at depths between 100 and 200 feet below the surface in an uncased but sealed bore hole or shothole.

Drilling shotholes and placing energy sources would be accomplished using either top drive articulating drill buggies accompanied by water buggies, auger drill rigs, or sonic drill rigs. As shown in Figure 2-8 for a sonic rig, energy source placement in shotholes would be made either with hole-loaders attached to drilling rigs or with loading poles through a protective casing. After retracting the protective casing, one to two bags of bentonite would be poured in the hole after the charge is placed to seal behind the explosive source. Drillers would place a surface plug in all holes, consisting of a plastic plug pushed downhole approximately 17 feet, followed by bentonite chips, another plastic plug pushed downhole approximately 3 feet, with the top of the hole backfilled with drill cuttings. The balance of drill cuttings would be spread around the hole. The energy sources (seismographic charges) would be detonated one at a time after a sufficient amount of source points had been drilled ahead of the data acquisition (shooting) crew.

The NPS Operators Handbook (2006*b*) suggests sonic rigs be utilized as a mitigation measure to reduce shothole cutting. Previous sonic drilling experience in the vicinity of the Preserve suggests that a sonic rig would require approximately 1 to 1 ½ hours to drill a 110-foot shothole, place, bury and seal a dynamite energy source. This would equate to about 7 shotholes per 10-hour day per rig – assuming no weather or equipment problems that result in downtime. Using this estimate, approximately 44 to 51 rigs would be required to drill the source points needed to produce a seismic survey quality equivalent to that of Alternative 2 in an assumed 3 to 3 ½ month single dry season drilling window.

Because sonic technology is relatively new to the industry, it is not clear if there would be sufficient sonic rigs or personnel available to fill such a large sonic rig fleet demand. More likely, a smaller sonic drilling fleet would be utilized. This, coupled with a slow buildup in rig productivity to the assumed seven holes per day production rate per rig, would quite possibly translate into two or more Preserve dry seasons required to complete a NG3-D seismic survey design equivalent to that of Alternative 2.

Once enough shotholes are completed, seismic data would be recorded across a network (or patch) of geophone receiver arrays similar to that described for Alternative 2. These arrays record the energy wave travel time from the surface to subsurface geologic objectives and back to the surface (Figure 2-1). Each shothole would be visited and the charge detonated individually by a crew person (shooter) carrying a special shooting pack that contains radio communications and a detonating device. The seismic energy from the shots would be recorded similar to Alternative 2 methods.



1. Minisonic pushes a hole to 100' to 200' with 4-inch diameter steel casing tube, soil plug blocks end
2. Water is added to assist removal of soil plug
3. Packer (or additional fresh water) placed in hole above standing water and compressed air is used to remove soil plug at bottom of hole
4. "Cleaned out" hole is ready for charge placement
5. Pentolite tube (with soil anchor) is loaded with non-sparking loading pole
6. Casing is pulled back out with charge anchored at bottom with soil anchor
7. Soil collapses over charge as casing is removed
8. Charge sleeps with buried wires at surface, total surface impact one square foot of area

Figure 2-8. Seismic energy source placement procedures

As with Alternative 2, source points would be located to the extent feasible along roads, trails, and existing or previously existing disturbances. Short-term surface impacts would amount to an approximately one foot square area of soil removed for charge installation at each source point and then replaced.

The surveyors, crews that lay out receiver lines, data acquisition crews, and shooters would travel on foot within the survey area. They would be supported by vehicles and equipment deployed by helicopter (more than one helicopter may be required to service a larger shothole drill rig fleet). Crews would hand-carry geophones and recording equipment from helicopter bag deployment stations and reverse the process for retrieval operations.

Education of crews with regard to threatened and endangered species and important resources together with clean-up and restoration and reclamation activities would be similar to that described for Alternative 2.

ALTERNATIVES CONSIDERED BUT DISMISSED

Two additional alternatives were considered but dismissed because they would duplicate the action alternatives and result in a greater environmental impact.

Dismissed Alternative A – Seismic Survey Using Vibroseis Buggies Within Overall Program Area

This dismissed alternative would use the same Vibroseis technique discussed in Alternative 2,

except the proposed survey area would encompass a 366± square mile area. This dismissed Vibroseis alternative represents BOCI's four-phased survey proposal before it reduced the area to be surveyed to a single phase. Dismissed Alternative A would require as many as four dry seasons to complete. Further, compared to Alternative 2, more time during any given dry season may be required for seismic activities.

Dismissed Alternative B – Seismic Survey Using Explosive Charges Within Overall Program Area

This dismissed alternative would use the same explosives technique discussed in Alternative 3, except the survey area would encompass a 366± square mile area. Dismissed Alternative B would require as many as eight dry seasons to complete. Further, compared to Alternative 2, more time during any given dry season may be required for seismic activities.

MINIMIZATION AND MITIGATION MEASURES

BOCI has committed to implementing a variety of measures, standard operating procedures (SOPs) and best management practices (BMPs) as part of its proposed POP to prevent lasting impacts and minimize short-term impacts to the Preserve's resources during seismic survey activities. While no lasting environmental impacts that would require mitigation measures were identified from the action alternatives analyzed in this EA, the following management strategies would be applied to further avoid or minimize potential impacts from implementation of the alternatives:

- The survey would be conducted to avoid disturbance to wetland areas with visible standing water or saturated soil conditions at or just below the soil surface. Survey field operations would be conducted during the dry season typically December through May, consistent with BCNP MMP geophysical operational Stipulation #8 and 2006 NPS Operator's Handbook seasonal plant dormancy mitigation recommendations.
- Operations would avoid all forms of new construction, such as new roads and fill pads.
- Survey activities would be conducted during daylight hours.
- Trash bags and receptacles would be provided to field crews for use during daily field operations. Trash and debris, including plastic flagging, stakes, and other temporary markers put in place by the Operator, would be collected and removed from the field daily and as the survey progresses.
- Survey operations would utilize existing trails to the extent feasible. In addition, the NPS would be consulted to determine access to off-trail source points in environmentally sensitive areas.
- NPS staff and inspectors would be heavily involved throughout field operations. The Project Manager or his designee would act as liaison and coordinate inspection logistics as needed to ensure the survey alternatives do not impact the ability of NPS staff to manage the Preserve. Inspection personnel would be provided radio and/or cellular telephone communications for use in the field, allowing for the continued coordination of Preserve management and minimizing the time constraints or abilities of Preserve staff.
- Although some drainage could take place anywhere a trail leads into a slough or strand, it is unlikely that even a trail with shallow ruts would have drainage impacts (Davis et al. 2010). Survey activities would avoid hydrological impacts by re-routing seismic survey activities around soft soils and standing water areas, thereby reducing the risk for rutting and subsequently channelization.
- Vibroseis buggies would be equipped with wide, smooth treaded balloon tires designed to spread the weight of the buggy over a wider "footprint" to reduce potential short-term impacts to soils, which would also minimize potential rutting. Balloon tires reduce the ground pressure psi and therefore the rutting depth. The wider tires would mat down wider strips of vegetation than typical ORVs, and if the vehicles got stuck, there may be a larger area of localized impacts from freeing the vehicles than would occur if a typical ORV gets stuck. In field studies of ORV impact, rutting was the most severe soil impact and soil compressibility was least affected (Deuver et al 1981). Balloon tires have wide width to distribute weight and provide traction with less tread depth to minimize rutting. Duever's study demonstrated that weight per unit area and tire tread type was a minor impact variable compared to the effect of water levels at or above the ground surface.
- Seismic survey activities would generally utilize a "one pass" design for Vibroseis equipment groups, which would greatly reduce potential short-term impacts. The "one pass" survey design means that the equipment group (which would include a UTV and three Vibroseis buggies) would seek to traverse a given area only once, and that area would not be driven upon

repeatedly again in the majority of cases. However, certain areas may be crossed more than once if it would result in less environmental impacts to use the same crossing to avoid a sensitive area.

- Vibroseis source lines would be located on existing roads, trails and disturbances, where feasible. BOCI would coordinate with the NPS regarding the potential use of trails recovering from past recreational ORV use.
- Machinery would be operated slowly and attentively to minimize potential impacts. The low speed and the use of the balloon tires on the Vibroseis buggies would also minimize potential turbidity if small amounts of standing water were traversed.
- Heliportable geophone receiver equipment would be used to enable on-foot deployment and recovery, thus reducing the extent of impacts and time spent on the ground during the survey. Helicopters would adhere to vertical buffers established around colonies of nesting birds to avoid or reduce potential disturbances.
- A field helicopter equipped with slings, long-lines, and a quick disconnect system to move and deploy geophone and recording equipment and supplies would also be used. This would reduce time, personnel and equipment on the ground, which would in turn, decrease potential impacts to water quality and hydrology.
- Available GIS data and aerial imagery would be utilized to identify documented environmentally sensitive and cultural/archeological areas, so the source points, receiver points and their respective access pathways may be re-routed to minimize impacts to these areas.
- Scouting and groundtruthing operations would be conducted by a wetland scientist and archeologist working concurrently with the survey operations to identify both documented and undocumented environmentally sensitive or cultural/archeological areas so the source points, receiver points and their respective access pathways may be re-routed to minimize impacts to these areas.
- In the event that undocumented protected species nesting sites or cultural/archeological areas are discovered prior to or during program operations, observation reporting protocols would be initiated with the NPS and other agencies, when applicable, so that appropriate setbacks and program design modifications could be implemented pursuant to the advice and direction of agency personnel.
- Low shrubs and herbaceous vegetation, topsoil, rootstock, and plant material would be left in place along source lines, receiver lines, and access routes to facilitate natural re-vegetation. Also, marred or wounded standing trees would be treated with a commercially available, non-toxic pruning paint or wound coating.
- Ruts, depressions, and vehicle tracks resulting from field operations would be restored to original contour conditions concurrent with daily operations using shovels and rakes to prevent the creation of new trails. Field clean-up activities would begin immediately upon completion of each task, and final clearance would be documented by and coordinated with NPS inspectors to the satisfaction of the Superintendent.
- Where vegetative trimming is required, areas with native vegetation would be avoided if trimming areas with exotic vegetation could accomplish an acceptable positioning of vibration or receiver points.
- Trimming native vegetation below the height or beyond the width of 36 inches or with a 4-inch or greater trunk diameter as measured at breast height would be avoided.
- Use of motorized vehicles would be avoided in sensitive resource areas within the Preserve identified by the NPS, including areas near known locations of endangered species (e.g., red-cockaded woodpecker clusters), sensitive vegetation communities, and cultural resources.
- All adverse impacts to wetlands resulting from any project actions, including rutting and compaction of soils and/or destruction of vegetation from vehicle use and from

activities in the staging areas, would be identified by NPS staff. Field reclamation of impacts would begin immediately as the survey continues. Soils would be decompacted and graded to match the original grade. If the NPS determines that revegetation of the disturbed areas is necessary, then the area would be identified and the applicant would plant native species in a specific pattern, species composition, and density as defined by the NPS.

- Restoration activity would occur during the dry season and may include the use of mechanical or hand equipment to loosen the soil and level soil ruts to existing natural grade of adjacent undisturbed areas. Revegetation would be allowed to occur via natural recruitment unless planting is required by the NPS. Signage would be installed near restored areas to keep visitors out.
- Dedicated crews would be used to implement restoration and reclamation activities.
- Removal and reclamation of field staging areas with associated access improvements would be completed to the satisfaction of the NPS and the FDEP upon confirmation that no further use of the staging areas would be required. Final field reclamation and clean-up would be conducted concurrent with field operations and completed within 30 days following the completion of field operations except in inclement weather conditions.
- Survey equipment and vehicles would be cleaned prior to initially entering the Preserve to avoid the spread of nonnative plant species and potential wildlife diseases.
- Staging areas would utilize previously disturbed areas or open areas easily accessible from I-75. No dredging or filling activities would be proposed. Staging areas would be utilized to store materials and equipment, concentrating and minimizing the number of areas needed for these logistical requirements. In addition, staging areas would be used for supply and refueling activities, which would reduce equipment emissions by minimizing the amount of equipment traveling within the survey area.
- A visual, fence-type barrier would be constructed around the perimeter of the staging area to delineate the boundary for the contractor.
- Signs would be erected around the staging perimeter to identify the staging limits and direct the contractor to the proper entry and exit.
- Depending on soil conditions, some staging areas and access routes may use a high-density, interlocking, composite mat system to provide stability of the surface for mechanical equipment, minimize rutting of the soil, and protect the vegetation roots. The mat system would be laid over the existing surface.
- Prevention mechanisms would be used to eliminate or reduce potential spills/leaks of contaminants from survey equipment. These mechanisms would include utilization of non-permeable ground mats and spill recovery and clean-up materials for refueling areas; utilization of bermed, non-permeable liners in staging sites beneath parked, large-capacity, mobile fuel storage equipment; and implementation of policies that address spill prevention and clean-up, fire protection, refueling and health and safety practices.
- Potential contaminants associated with Alternative 2 would be very limited and localized to small areas through the application of the MMP's resource protective stipulations on the proposed operations. Fuel spill containment systems would be available for refueling, parking and fuel tank/trailer storage to reduce potential impacts associated with accidental fuel spills to water quality. Cleanup and restoration activities would be conducted in compliance with applicable MMP operation stipulations in the unlikely event that a spill would occur.
- Educational training programs would be provided to survey crews to help them identify and avoid wildlife and environmentally sensitive areas (to the extent feasible) and identify and avoid cultural/archeological areas. In addition, the survey crews would be informed to not

collect vegetation, wildlife, artifacts, etc., as well as inform them of wildlife protection measures and safety hazards.

- BOCI would conduct meetings with state and federal wildlife management and research specialists to discuss ongoing research, potential issues, and survey protocols for protected species. BOCI would coordinate field operations with the state and federal wildlife management and research specialists to avoid potential impacts to protected species. Per guidance received from the agencies, species-specific buffers and protocols would be established around areas containing certain protected plants and wildlife to minimize potential disturbance to these species.
- To avoid and minimize potential adverse impacts to protected wildlife, BOCI would conduct a GIS analysis of available protected species location information. These documented occurrences would be avoided with appropriate buffers, as described below. The species data would be the focus of the initial planning and design efforts for the project, which would continue to be the subject of ongoing identification and monitoring activities throughout all phases of survey field operations. In addition, particular attention would be paid toward wildlife IRAs, which would be avoided in accordance with applicable operational stipulations.
- To avoid potential impacts to undocumented wildlife and IRAs, scouting and research of the survey lines would be conducted by a qualified ecologist concurrently with the survey operations. The ecologist would work with the access management, surveying crews, and agency personnel to identify protected species occurrences, dens/nests and/or cavities or other potentially sensitive wildlife areas. Flexibility would be built into the operations plan to accommodate unanticipated wildlife encounters. Receiver points would be relocated and source paths would be re-routed in the field to avoid potential impacts to wildlife. Field personnel would also avoid directly disturbing wildlife.
- The NPS and FWC conduct extensive, ongoing research on red-cockaded woodpecker populations within the Preserve. The specific locations of documented red-cockaded woodpecker clusters and cavity trees would be shared with BOCI so that these areas could be avoided and appropriate setbacks could be maintained. The USFWS Recovery Plan for the Red-cockaded Woodpecker (*Picoides borealis*) Second Revision (USFWS 2003) recommends the establishment of a buffer zone of continuous forest 61 meters (200 feet) in width, generally established around the minimum convex polygon containing a group's active and inactive cavity trees. Therefore, a buffer of 61 meters (200 feet) in width would be maintained between red-cockaded woodpecker clusters and foot or ORV traffic. Special precautions would be taken around red-cockaded woodpecker clusters during the peak feeding activity periods of early morning (6 a.m. - 9 a.m.) and late afternoon (4 p.m. - sunset). Where practicable, activity near red-cockaded woodpecker clusters would be avoided entirely during those time windows.
- In order to further reduce potential red-cockaded woodpecker disturbances, a 61-meter (200-foot) buffer would be established vertically and applied to helicopter activity above active cavities. Red-cockaded woodpeckers usually do not fly above canopy level, thus the potential for a helicopter collision with a bird would be negligible (Davis et al. 2010).
- Potential red-cockaded woodpecker habitat areas would be scouted by an ecologist prior to the commencement of surveying activities. Previously undocumented areas containing red-cockaded woodpecker clusters would be avoided, and the 61-meter (200-foot) buffers would be maintained. Survey crews would be trained to identify red-cockaded woodpeckers, as well as to identify active and in-active red-cockaded woodpecker cavity trees. No identified red-cockaded woodpecker cavity trees would be cut, destroyed, or damaged as a result of seismic surveying activities.
- The 2000 NPS ORV Management Plan/EIS states that there has been no documentation of the loss of trees used by red-cockaded woodpeckers due to compaction or injury

along recreational ORV trails and that the abandonment of clusters due to disturbance by recreational ORVs also has not been observed.

- Although no bald eagle nests are documented within the survey area, they could potentially occur. Potential bald eagle nesting areas would be scouted by an ecologist prior to the commencement of surveying activities. Previously undocumented bald eagle nests would be avoided, and the appropriate buffers would be established. The buffer zones would adhere to the USFWS and FWC recommended 660-foot buffer protection zone. No foot or ORV traffic would be allowed in these areas. Survey crews would also be trained to identify bald eagles as well as bald eagle nests. No bald eagle nest trees would be cut, destroyed, or damaged as a result of seismic surveying activities.
- The NPS has collected data on nesting wading birds within the Preserve in the past. This information would be shared with BOCI so that documented colonies could be avoided and appropriate setbacks maintained. BOCI would also use historical data to determine areas where nesting wading birds would be more likely to occur. These potential nesting areas would be scouted by an ecologist prior to the commencement of surveying activities. Previously undocumented colonies could also be avoided with appropriate buffers. Survey crews would be trained to identify the different wading birds and nesting areas. No wading bird nest trees would be cut, destroyed, or damaged as a result of the seismic surveying activities.
- The NPS Operators Handbook (NPS 2006b) calls for geophysical exploration to be conducted during a time that results in the minimum impact to listed species, which would be the wet season for the wood stork and wading birds. However, this season conflicts with the time of lowest impacts for most other components of the ecosystem (Davis et al. 2010). In keeping with the protection measures for vegetation, soils, and water quality, Alternative 2 would reduce impacts to foraging habitats and foraging birds by avoiding surface water areas.
- Recommended wood stork buffers would be applied to all groups of nesting wading birds since these species often nest together. The USFWS Habitat Management Guidelines for the Wood Stork (1990) state that unauthorized human entry closer than 300 feet of a nesting wood stork colony would likely be detrimental to the colony. Davis et al. recommended a similar minimum 328-foot (100-meter) buffer from active colonies (2010). As a precautionary measure, a buffer of 328 feet (100 meters) in width would be maintained between active wading bird colonies and any foot or ORV traffic associated with Alternative 2.
- In order to further reduce potential disturbances to active wading bird colonies, a 152-meter (500-foot) buffer would be established for helicopter activity above active colonies as recommended by the USFWS Habitat Management Guidelines for the Wood Stork (1990). No repeated flights on the same path over active wading bird colonies would occur.
- As part of the original Nobles Grade 3-D Geophysical Survey POP for the Big Cypress National Preserve and Addition Areas submitted to the NPS in June 2006, a professional archeology review was conducted by L. Ross Morrell and Wilburn A. Cockrell (Morrell and Cockrell 2006), both registered professional archeologists (RPA) familiar with south Florida. They conducted research and prepared a report of the cultural, historical and archeological resources in approximately 40 percent of the survey area. They also prepared an Avoidance Model for cultural resources in the area they investigated.
- In 2014, BOCI contracted with a professional cultural resource management firm, Archaeological Consultants, Inc. (ACI), to interface with the NPS, SEAC and the SHPO for the purpose of developing a Cultural Resource Avoidance Model for the overall program area. This research would include a review of existing data, conducting detailed analyses of the overall program area utilizing GIS databases from SEAC and the FMSF, 19th-century federal land records, Seminole War documents and maps, soil,

vegetation, and water resource imagery. Delineation of known resources may also involve the identification of buffer zones if recommended by the NPS to minimize or avoid any disturbances to identified resources. ACI would also coordinate with appropriate Preserve personnel and others as requested by the NPS and SEAC. Delineation of IRAs may not be possible, pending decisions by the Native American nations involved, as per nation-to-nation coordination by the NPS.

- In recognition of the inherently sensitive nature of archeological, historical, and cultural resources in the Preserve, a professional archeologist would oversee program activities. The archeologist would research available site conditions (i.e., soils, land use, etc.), as well as documented archeological sites, and develop site recognition and avoidance protocols in cooperation with SEAC after consultation with the Seminole Tribe of Florida and the Miccosukee Tribe of Indians of Florida. Archeology experts would also advise on the avoidance of potentially undocumented archeological sites. As requested by the Miccosukee and Seminole tribes and in compliance with federal and state regulations, the locations of all archeological, historical, and cultural sites would be kept confidential.
- In an effort to minimize negative visitor experience for those who may pass through backcountry or off of I-75 at the time of the survey, BOCI would work with the NPS in posting informational notices at trail heads, I-75 visitor/recreational access points and rest areas and on appropriate Internet sites.
- As compensation for any temporal loss of wetland function resulting from vehicle use and the use of staging areas, an equivalent area of wetland restoration area would be conducted elsewhere in the Preserve as identified by the NPS. The applicant would restore an area equivalent to the total project impacted area outside of the project area and within the Preserve. The soils would be decompacted and graded to match original grade. If the NPS determined that revegetation of the disturbed areas is necessary, then the area would be identified and the applicant would plant native species in a specific pattern, species composition, and density as defined by the NPS.
- All adverse impacts to staging areas would also be identified by the NPS. The NPS would quantify the amount of staging area impact in acres. Since some of the staging areas are previously disturbed, only those wetland areas impacted that were previously undisturbed would be compensated. All soils within the staging areas would be restored to original grade. Field reclamation of impacts to staging area wetlands would begin immediately after use of the staging areas is terminated.
- Prior to any Vibroseis field operations, BOCI would provide the NPS with GIS files of the proposed routes so that they can be reviewed. No Vibroseis operations would be undertaken without prior NPS approval.

CHAPTER 3: AFFECTED ENVIRONMENT

This chapter describes the existing environmental conditions ("Affected Environment") within the areas potentially affected by the alternatives identified within the 110± square mile survey area.

The impact topics discussed in this chapter are those that were selected for analysis in this EA, as described in Chapter 1. Information for this chapter was gathered from several sources, including but not limited to, the following documents:

- Operators Handbook (NPS 2006*b*)
- GMP/EIS for the original Preserve (NPS 1992) and the Addition GMP (NPS 2010*a*)
- Proposed POP for Nobles Grade 3-D
- The Big Cypress National Preserve Resource Inventory and Analysis (Duever *et al.* 1986*b*)
- NPS Public Use Statistics Office website (NPS 2011*b*)

The following sections detail the impact topics (i.e., vegetation, habitat, soils, wetlands, protected plants, wildlife, protected wildlife, major game species, water quality, hydrology, subsurface geologic resources, air quality, cultural/archeological resources, noise/soundscapes, visual quality, visitor use and perceptions, and wilderness) that may be affected by the proposed alternatives.

Ongoing natural events within the Preserve include but are not limited to weather phenomena, including storm events that deliver wind, water, and fire. Summer weather patterns deliver frequent thunderstorms and occasional large tropical systems capable of hurricane strength. Their associated stimuli have an overlapping effect on the majority of the impact topics discussed in this EA.

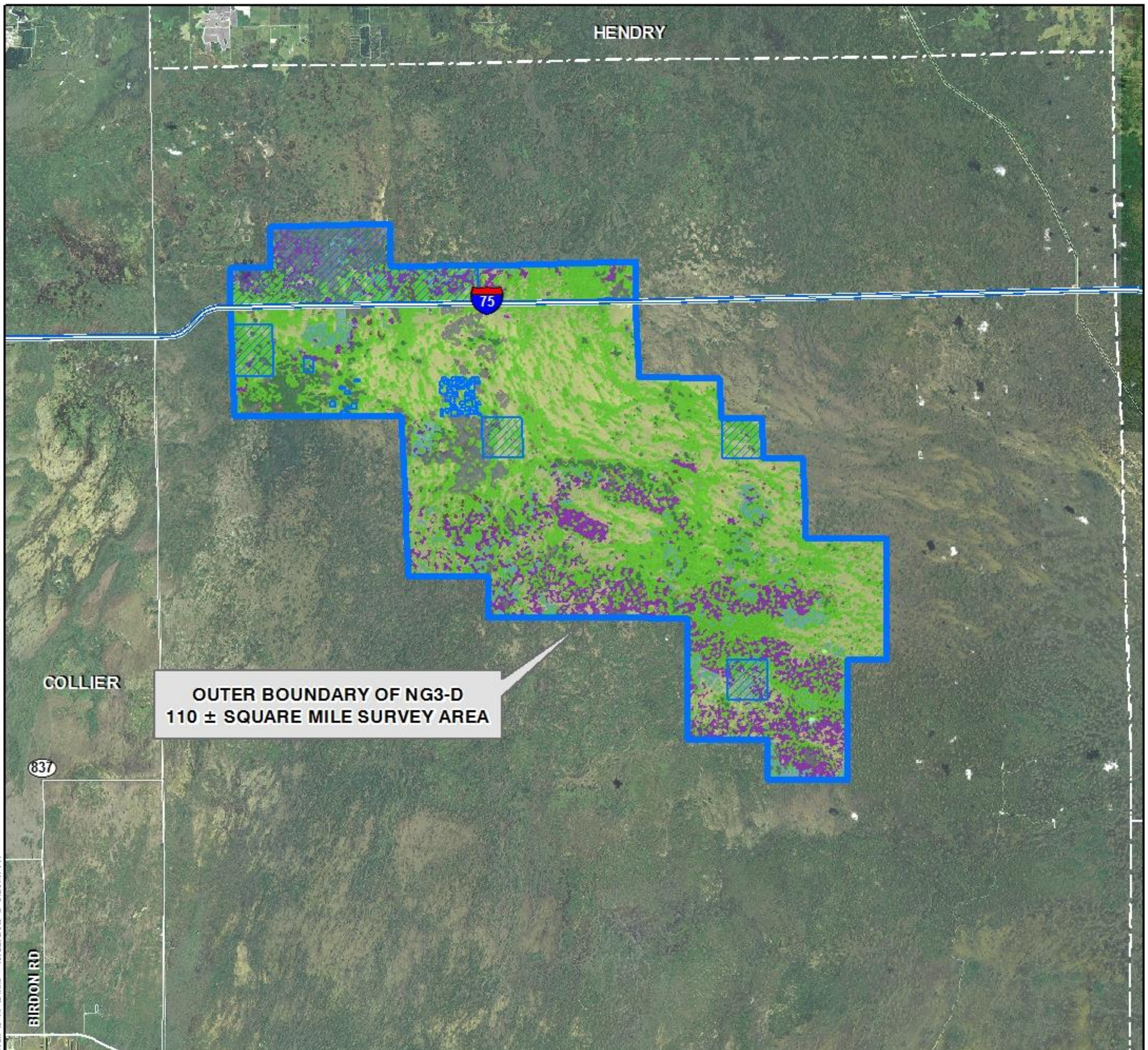
VEGETATION, HABITAT, AND SOILS

Vegetation and Habitat

According to NPS land cover data, 11 major land cover types are found within the survey area: cypress forest, scrub cypress, disturbed land, hydric hammock, hydric pine flatwoods, marsh, mesic hammock, mesic pine flatwoods, swamp forest, water, and wet prairie. A map depicting the NPS designations of the various land covers is provided as Figure 3-1. Table 3-1 lists the NPS land cover types, cover type acreages, and vegetation community descriptions.

Table 3-1. NPS land cover types and acres

NPS Land Cover Category	Vegetation Communities	Survey Area Acreage
Cypress Forest	Cocoplum Swamp Forest, Cypress Domes/Heads, Cypress Strands, and Cypress-Mixed Hardwoods	32,211
Scrub Cypress	Cypress Savanna and Dwarf Cypress	18,855
Disturbed	Brazilian Pepper, Exotics, Java Plum, Major Canals (>30m Wide), Major Roads (>30m Wide), Melaleuca, and Spoil Areas	379
Hydric Hammock	Bay Hardwood Scrub, Bayhead, and Paurotis Palm	82
Hydric Pine Flatwoods	Cypress with Pine, Cypress-Pines, Pine Savanna, and Slash Pine with Cypress	936
Marsh	Broadleaf Emergents, Cattail Marsh, Non-Graminoid, Emergent Marsh, Tall Sawgrass, Pop Ash, and Willow	688
Mesic Hammock	Cabbage Palm, Hardwood Scrub, Oak Sabal Forest, Palm Savanna, Saw Palmetto Scrub, and Palm Savanna	2,889
Mesic Pine Flatwoods	Savanna, Slash Pine, Mixed with Palms, and Slash Pine with Hardwoods	8,415
Swamp Forest	Mixed Hardwood Swamp Forest, Mixed Hardwood Cypress and Pine, and Swamp Forest	486
Water	Water	124
Wet Prairie	Common Reed, Cordgrass, Graminoid Prairie, Maidencane, Maidencane/Spikerush, Mixed Graminoids, Muhly Grass, Sawgrass, Shrublands, and Spikerush	3,389



LEGEND

- Outer Boundary of NG3-D 110± Sq Mile Survey Area
- BOCI ROE - Obtaining
- Cypress Forest
- Disturbed
- Hydric Hammock
- Hydric Pine Flatwood
- Marsh
- Mesic Hammock
- Mesic Pine Flatwoods
- Scrub Cypress
- Swamp Forest
- Water
- Wet Prairie

VEGETATION DESCRIPTION	ACREAGE
Cypress Forest	32,189 Ac.±
Disturbed	378 Ac.±
Hydric Hammock	81 Ac.±
Hydric Pine Flatwood	2934 Ac.±
Marsh	687 Ac.±
Mesic Hammock	2,886 Ac.±
Mesic Pine Flatwoods	8,409 Ac.±
Scrub Cypress	18,841 Ac.±
Swamp Forest	486 Ac.±
Water	124 Ac.±
Wet Prairie	3,386 Ac.±
TOTAL	70,401 Ac.±

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013

OUTER BOUNDARY OF NG3-D SURVEY AREA WAS PROVIDED BY DAWSON GEOPHYSICAL COMPANY NOVEMBER 2014.

VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

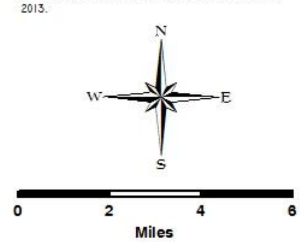


Figure 3-1. Aerial with NPS land cover data

North of I-75 is characterized by extensive mesic pine flatwoods and cypress forests. Marshes and wet prairies are widely interspersed there as well. South of I-75, extensive scrub cypress areas are intermixed with cypress forests, mesic pine flatwoods and wet prairies. Mesic and hydric hardwood hammocks are dispersed throughout.

Temperate plants are abundant, but the majority of the species are tropical. Pinelands, cypress strands and domes, prairies, and marshes are the most prevalent vegetation types and are dominated by temperate species. Tropical species occur primarily in hardwood hammocks but are also found in pinelands, mixed-hardwood swamps, and cypress strands.

A description of each vegetation community, adapted from the 1992 and 2010 GMP/EIS documents is included below.

Cypress Forest. Cypress domes occur throughout the survey area. They are characterized by a monospecific overstory of cypress (*Taxodium distichum*), which grow tallest in the center of a limestone depression and taper off toward the fringes, forming a domelike feature. This depression in the bedrock fills with organic soils, and eventually peat forms due to constant saturation and slow decomposition. The largest and fastest growing cypress trees are found in these wetter, deeper peat deposits. Trees toward the dome edge are thought to be smaller because of more marginal soils, lower water levels, and more frequent susceptibility to fires (Duever *et al.* 1986*b*). Flooding is essential for maintaining cypress domes, and a 290-day hydroperiod is average for domes; average maximum water levels reach about 2 feet (Duever *et al.* 1986*c*). Periodic fires play an important role because they limit hardwood invasion, remove peat (which helps maintain the site's hydroperiod), and generally leave the cypress unharmed. Ponds often form in the center of cypress domes and are important habitat for alligators and aquatic wildlife. These ponds are likely the result of deep-burning peat fires that occurred during extreme droughts or the dissolution of limestone by acids in plant litter accumulations (Loveless 1959).

Cypress strands are found in deep mineral soil depressions, but they are distinct from cypress domes because they form along major drainages and generally retain a north-south orientation. Dominant vegetation features, when present, are very large cypress trees, a few over 100 feet tall and 6 feet in diameter. Understory vegetation is diverse, unlike cypress domes, and includes shade-tolerant hardwoods, ferns, and epiphytes. All cypress strands have been logged, and many sites are now more characteristic of mixed-hardwood swamps. Cypress strands are also associated with relatively deep water, with a hydroperiod that extends over 240 days. Even though cypress strands rarely burn, evidence indicates that they may benefit from infrequent fires because cypresses are highly fire-resistant and competing hardwoods are not.

Scrub Cypress. Cypress prairies are characterized by an open forest of small cypress trees and scattered, sparse growths of grasses, sedges, and forbs. They occur on a thin layer of marl soil or sand overlying limestone. During the wet season prairies are flooded to a depth of about 8 inches, with inundation lasting 120 days. Fuel buildup is slow on these sites, and fires occur only once every decade or two (Wade *et al.* 1980).

Disturbed. Areas affected by man's past activities occur throughout the survey area. Logging, canal and road construction, farming and grazing, recreation, oil extraction, ORV use, and facility construction have affected the Preserve's surface and to some extent its vegetation communities.

Thousands of nonnative plant species have been introduced to Florida for ornamental plantings, agriculture, and other human uses. Some 297 exotic plants are known to have been naturalized in south Florida (Duever *et al.* 1986*b*). Many of these are reported within the survey area, but most are restricted to early successional stages on disturbed sites, and only a few pose a long-term threat to native communities. Of these, five species – melaleuca (*Melaleuca quinquenervia*), Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casuarina* spp.), water hyacinth (*Eichhornia crassipes*), and hydrilla (*Hydrilla verticillata*) – are fairly widespread in the Preserve.

Mesic and Hydric Hammock. Hardwood hammocks are dense and diverse forests of hardwood trees and shrubs, ferns, and epiphytes

that grow on land slightly higher than that of surrounding marshes and prairies. Hammocks are scattered throughout the Preserve, and because of their raised position, they often appear as islands of trees. Dominant overstory species are usually oaks such as laurel oak (*Quercus laurifolia*), water oak (*Q. nigra*), and live oak (*Q. virginiana*) or tamarind (*Lysiloma bahamensis*). Oak is more prevalent in the northern portion of the Preserve than the frost-susceptible tamarind. Elevated bedrock overlain by sandy peat soils comprises the foundation of the hammocks. These soils remain moist because of the shady microclimate, but they are inundated only during extreme high-water periods. Because soils remain moist most of the year, hardwood hammocks rarely burn, but they are susceptible to fire during extended droughts. Following a fire, the species composition of recolonized hammocks often changes significantly (Duever *et al.* 1986*c*).

Marsh. Freshwater marshes occur throughout the survey area. They are dominated by emergent broad-leaved sedges and grasses and are inundated approximately 150-250 days per year. Species composition of freshwater marshes varies considerably but typically includes pickerelweed (*Pontedaria cordata*), arrowhead (*Sagittaria lancifolia*), maidencane (*Panicum hemitomon*), and sawgrass (*Cladium jamaicense*). Freshwater marshes are generally located at elevations between cypress strands and pinelands, primarily on the slopes of the undulating bedrock surface. Soils tend to be shallow and organic in origin, with bedrock exposed in patches as a result of past fires. A well-developed algal mat known as periphyton often covers the soil surface, forming marl soils high in calcium carbonate and constituting an important food chain element for many insects and fish (Gleason 1974). Maximum wet season water levels are about 8 inches for these marshes. Dry surface soils are exposed during much of the dry season, resulting in frequent patchy fires, which prohibit pines and cypress from invading the quickly recovering marshes.

Mesic and Hydric Pine Flatwoods. Pinelands occur mostly outside the central portions of the survey area. South Florida slash pine (*Pinus elliotii* var. *densa*) is the major overstory species, with a dense understory of cabbage palm (*Sabal palmetto*) and saw palmetto (*Serenoa repens*) on higher, drier sites and grasses on lower, wetter locations. Pinelands occupy a variety of sites; in some areas they exist on seldom-inundated sandy sites; in others they occur along pond margins, topographic depressions, and rocky areas. Generally, maximum water levels reach just to the soil surface (Klein *et al.* 1970). Pine needles, grasses, and other combustible materials accumulate relatively quickly in pinelands, and pinelands burn at frequent intervals. If fires are suppressed, pinelands eventually succeed to hardwood-dominated stands.

Swamp Forest. The logging of overstory bald cypresses in some strands has resulted in domination by former sub-canopy hardwood species such as red maple (*Acer rubrum*) and pop ash (*Fraxinus caroliniana*). Bald cypresses are often present, but they are no longer the dominant overstory trees. If the area remains relatively undisturbed, cypresses often return in impressive numbers. Understory species include ferns, epiphytes, aquatic species, and saplings of overstory vegetation. Older successional stages are dense and quite complex in terms of structure and species. Knolls within this vegetation type comprise a principal habitat for the rare royal palm (*Roystonea elata*), and older forests serve as homes for a large number of birds, mammals, reptiles, and amphibians (Wade *et al.* 1980). Mixed-hardwood swamps occupy peats, sands, and rock and have a 270-day or longer hydroperiod.

Water. The open water areas in the survey area consist mainly of ponds, ditches and large canal systems.

Wet Prairie. Prairies are treeless areas dominated by grasses and forbs (non-grass flowering herbaceous plants). Wet and dry prairies have been differentiated (Duever *et al.* 1986*b*). Wet prairies are characterized by muhly grass (*Muhlenbergia capillaris*), love grass (*Eragrostis* spp.), and sand cordgrass (*Spartina bakeri*). Dry prairies are characterized by broom sedges (*Andropogon* spp.), white top sedge (*Dichromena* spp.), cordgrass, and saw palmetto. Wet prairies and marshes generally occupy the slopes of an undulating bedrock surface, with wet prairies being in higher areas than marshes. Wet prairies tend to have sandier soils than marshes, but they also occupy thin

layers of marl soil over bedrock. Dry prairies occur at higher elevations on bedrock and have relatively little soil. Wet prairie types have hydroperiods of 70 days and are inundated to a maximum depth of 8 inches during the wet season; dry prairies have hydroperiods of 50 days and are inundated to a maximum of 2 inches. Like marshes, prairies will burn during periods of drought and when sufficient fuel is present. Fire maintains prairies by eliminating invading trees and shrubs.

Nonnative/Invasive Plant Species

Five nonnative/invasive plant species — melaleuca, Brazilian pepper, water-hyacinth, hydrilla, and small-leaf climbing fern (*Lygodium microphyllum*) — are fairly common in the Preserve. Melaleuca and Brazilian pepper are capable of invading native plant communities, and control efforts have been concentrated on these species. Australian-pine was identified as a nonnative invasive species of concern; however, in the last two decades it has been eradicated. All known Australian-pine plants have been eliminated from the Preserve, except for those on private property. Water-lettuce (*Pistia stratiotes*) and common air-potato (*Dioscorea bulbifera*) are also known to be present.

A nonnative plant control program is carried out by NPS contractors and maintenance and resource management staff. Specifically, NPS management activities include exotic vegetation eradication activities through prescribed fire regimes, as well as targeted exotic vegetation removal through the use of mechanized equipment (i.e., conventional trucks and mechanized vegetation clearing equipment such as GyroTracs, chain saws, and tractors).

Melaleuca. This species, a native of Australia and New Guinea, was introduced to Florida around 1910 for landscaping. Perhaps the first introduction of melaleuca in the Preserve was at Monroe Station around 1940. Since it grows in pure stands at the expense of native vegetation and can occupy large areas, melaleuca is considered to be a major threat to the ecological integrity of native communities.

The survey area has been inspected for the presence of melaleuca plants. Today, melaleuca is considered to be under control.

Brazilian Pepper. A native of South America, Brazilian pepper was first introduced to south Florida around 1900. It is now widespread, primarily on disturbed, well-drained sites.

Brazilian pepper occurs in mesic communities nearly throughout the survey area. The overall goal is to stop the spread of Brazilian pepper in the entire Preserve (NPS 2006*b*).

Water-Hyacinth and Hydrilla. Water-hyacinth and hydrilla have invaded the canal systems and excavated ponds, where they often form dense mats. Neither species can invade seasonally dry wetlands nor do both species appear to be restricted to permanent water in canals and ponds.

Small-Leaf Climbing Fern. Small-leaf climbing fern is rapidly becoming a significant problem species throughout southern Florida due to its invasive nature. It apparently originated in the Palm Beach County area on the east coast of the state and has been spreading rapidly westward and southward. The first recorded treatment of small-leaf climbing fern in the Preserve occurred in 1998.

Since then this nonnative invasive species has been found in nearly 100 sites in the Preserve, with the greatest concentration in the northeast. Most of these infestations are small (<0.5 acre), although some larger patches have been found. It is unknown if small-leaf climbing fern is currently located within the survey area. To date all known infestations of this species have been treated. However, further establishment of this fern in the Preserve is anticipated, and detailed reconnaissance to locate infestations will occur annually. The overall goal is to prevent incipient infestations of small-leaf climbing fern from becoming major eradication problems.

Another similar nonnative invasive climbing fern, Japanese climbing fern (*Lygodium japonicum*), is causing similar problems with native communities. Although Japanese climbing fern has been recorded in the Preserve, it is not common.

Soils

According to the Soil Conservation Service March 1954 Soil Survey of Collier County (U.S. Department of Agriculture 1954), 13 soil types occur within the survey area. A soils map is provided as Figure 3-2, and a table listing the soil types is provided in Table 3-2. The associated soil descriptions follow.

Table 3-2. Soil types

Soil Types	Survey Area
Broward Fine Sand – Heavy Substratum Phase	√
Broward Fine Sand – Shallow Phase	√
Broward-Ochopee Complex	√
Charlotte Fine Sand	√
Copeland Fine Sand – Low Phase	√
Copeland Fine Sand – Shallow Phase	√
Cypress Swamp	√
Felda Fine Sand	√
Freshwater Marsh	√
Ochopee Fine Sandy Marl – Shallow Phase	√
Ochopee Marl – Shallow Phase	√
Rockland	√
Tucker Marl	√

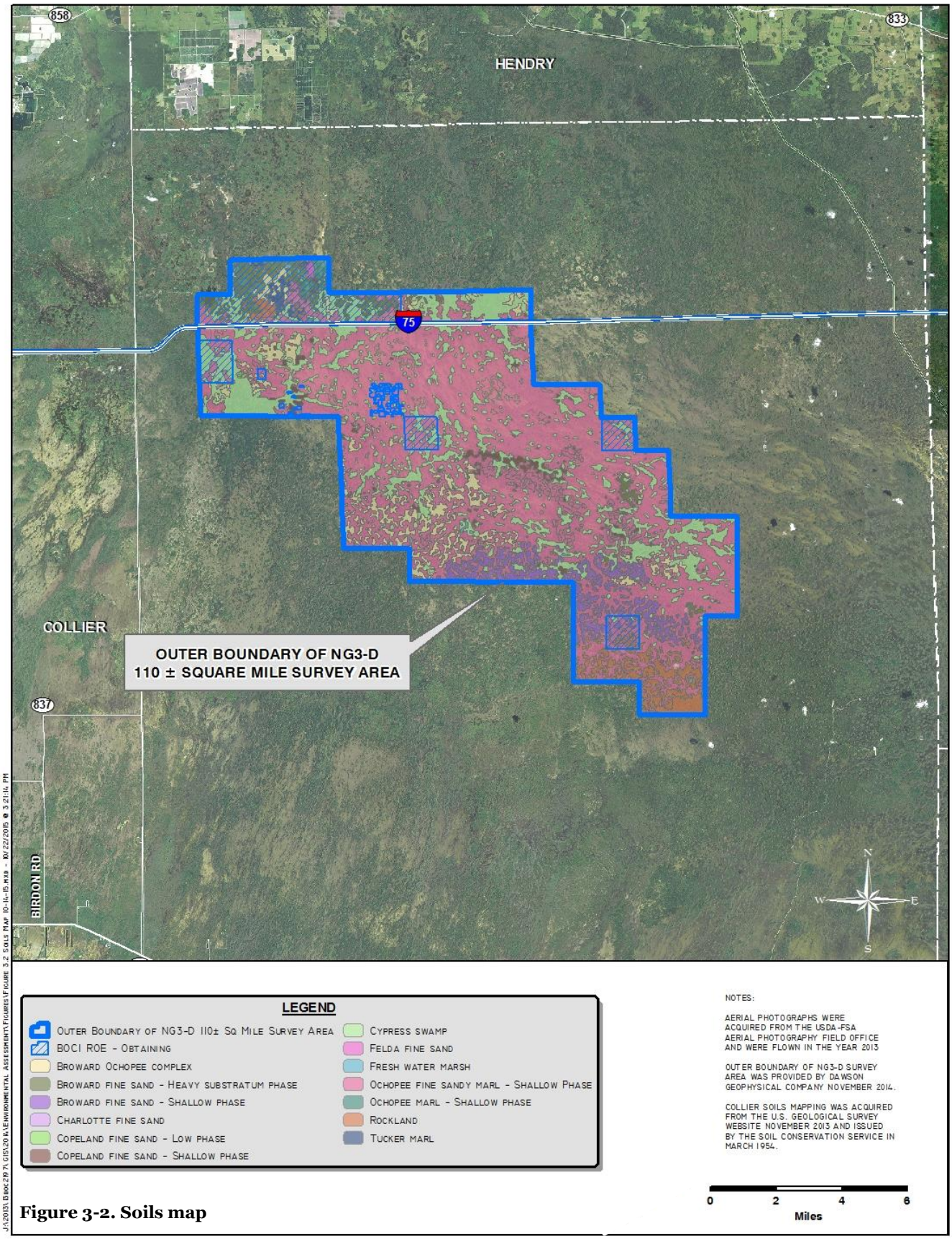
Broward Fine Sand, Heavy Substratum Phase. This phase occurs west and east of Sunniland. It differs from Broward fine sand chiefly in having a 2 to 6 inch layer of mottled yellowish-brown and light-gray fine sandy clay loam overlying the limestone. The limestone occurs at depths of 12 to 24 inches.

The natural vegetation is similar to that found on Broward fine sand, except that some areas are without slash pines.

Broward Fine Sand, Shallow Phase. This phase, well distributed throughout the Big Cypress region, differs from Broward fine sand chiefly in having the underlying limestone at depths of 6 to 18 inches instead of 18 to 36 inches. In places a 1 or 2 inch layer of mottled yellowish-brown and gray fine sandy clay loam overlies the limestone. These areas are slightly lower than other parts of the phase.

Broward-Ochopee Complex. This complex consists of areas of Broward and Ochopee soils so intricately associated they cannot be separated on a map of the scale used. Islands of Broward soil separated by runways of Ochopee soils make up the complex.

The Broward areas consist mainly of the shallow phase of Broward fine sand; the Ochopee areas, mainly of the shallow phase of Ochopee fine sandy marl. A few areas of Ochopee marl, shallow phase, are included. Commonly limestone is at depths of 3 to 12 inches, but in places limestone rocks are exposed around the islands of Broward soils.



J:\2015\Dixoc297\GIS\20K\ENVIRONMENTAL ASSESSMENT\FIGURES\FIGURE 3.2 SOILS MAP 10-14-15.MXD - 10/22/2015 @ 3:21:14 PM

Figure 3-2. Soils map

The Broward areas are covered by slash pine, cabbage palmetto, saw palmetto, other shrubs, and grasses. The Ochopee areas have a short-grass cover. Some of the Broward soils, however, have no pine trees, and some of the Ochopee areas support growths of small cypress.

Charlotte Fine Sand. This soil occupies level, nearly level, or slightly depressed areas in the Big Cypress region. It has a bright-yellow or yellowish-brown subsoil and it developed from moderately thick beds (40 to 60 inches deep) of fine sand over limestone or marl.

This Charlotte soil is associated with the Pompano and Arzell soils but differs from them mainly in that it has a layer of brownish or yellowish-brown fine sand below 10 to 15 inches and is slightly more alkaline.

The natural vegetation consists principally of second-growth slash pine, cabbage palmetto, a few saw palmetto, poverty oatgrass (*Danthonia spicata*), broomsedge, wiregrass (*Aristida stricta*), switchgrass (*Panicum virgatum*), and carpetgrass (*Axonopus* sp.), maidencane, rushes, sedges, pickerelweed, arrowhead, and a few dwarf cypress trees.

In most places the surface soil is covered by a very thin layer of organic scum deposited by surface waters. The surface layer ranges from grayish brown to gray or light gray and is 2 to 10 inches thick.

The lighter colored areas of Charlotte soil usually occur near areas of Arzell soil. In these positions the second layer is light gray or white to depths of 10 to 20 inches, where the brownish-yellow or yellowish-brown layer begins. This yellowish layer varies from 10 to 40 inches in thickness. In places it lies directly on the limestone and marl and the light-gray or white layer is missing. Small iron concretions are found immediately above the limestone in some areas, and the surface soil may contain small amounts of marl mixed with the fine sands.

Copeland Fine Sand, Low Phase. This soil is associated chiefly with the other Copeland soils and Cypress swamp but differs from Copeland fine sand in position. It is low and covered with water many months of the year and has only a very thin layer of fine sandy clay loam over the limestone, and in some places none at all. Internal drainage is rapid when the soil is freed of the high water table.

All of this land is covered with cabbage palmetto, saw palmetto, vines, ferns, and a few slash pine and cypress trees.

Copeland Fine Sand, Shallow Phase. This phase differs from Copeland fine sand mainly in having a shallow sandy layer over the limestone rocks and in occupying lower positions.

Internal drainage is rapid when the high water table is lowered. The normal range in depth to limestone is 3 to 12 inches, but in places limestone rocks are at the surface. The black or very dark-gray fine sand rests almost directly on the limestone; only a trace of fine sandy clay loam separates it from the limestone. Because of its position–on lands within or adjacent to sloughs, marshes, and cypress strands–this phase has a dense growth of many subtropical plants mixed with cabbage palmettos, oaks, maples, and a few pine trees. Practically all of this soil still supports native vegetation.

Cypress Swamp. This land type consists of low-lying forested areas covered with water the greater part of the year. It occurs mainly as cypress strands and mixed swamps that serve as natural drainageways for the Big Cypress region in the interior of the county. The soils in these areas vary within short distances in color, texture, composition, and thickness of the various layers. In some places the topmost 2- or 3-inch layer is black or dark-gray mucky fine sand or peaty muck, and in others it is brown peat. The subsoil, or lower layer, is usually gray or light-gray fine sand. Intermingling of soils, dense undergrowth in many areas, and wetness make separation into soil types and phases impractical, though some of the soils are known to be Pompano fine sand, Arzell fine sand, and Copeland fine sand. Also there are areas classified as peaty mucks or as peat.

Relatively large areas are made up of cypress strands and mixed swamps. The cypress strands support mainly medium to large bald and pond cypress (*Taxodium ascendens*) trees and an undergrowth of buttonbush (*Cephalanthus*

occidentalis), some marsh rushes, grasses, ferns, and vines.

All of Cypress Swamp lies at a very low elevation or in sloughlike depressions and may be covered by several feet of water part of the year. The water levels tend to vary widely from season to season and from year to year. Sometimes the surface is dry.

Felda Fine Sand. This level or nearly level soil occurs on the short-grass prairies adjacent to the Sunniland soil. The soil developed from thin beds of fine sand over clayey materials that contain limestone or moderately hard marl. The soil is poorly drained; it has no appreciable runoff and a high water table. During rainy seasons water drains from the higher soils and stands for many days on these depressional prairies.

This soil is associated with the Pompano, Charlotte, and Arzell soils but differs from them in having a thin (18- to 36-inch) sandy layer over clayey sediments and limestone. It is more poorly drained and is grayer in the deeper layers than the Sunniland soil.

The native vegetation consists chiefly of switchgrass, carpetgrass, three-awn grass (*Aristida* sp.), and poverty oatgrass, broomsedge, maidencane, rushes, sedges, pickerelweed, and arrowhead.

This soil varies considerably, particularly in the colors of the sandy layers overlying the clayey materials. In some places these layers have almost the gray and light gray or white colors characteristic of the Arzell soil, but in other places the sandy layers are yellowish-brown to pale yellow, as in the Charlotte soil. Where the sandy layers resemble those of the Charlotte soil, the clayey materials are predominantly brownish yellow mottled with light gray and white.

Freshwater Marsh. This land type consists of shallow ponds and marshes covered with a few inches to 3 feet or more of water the greater part of the year. The soils in the marshes and smaller ponded areas vary a great deal within short distances and therefore are not separated into types and phases.

Most of the soils within the wettest section have 3 to 13 inches of partly decayed vegetative matter mixed with fine sands. The surface layer is underlain by gray fine sands, which grade into light-gray to white fine sands at depths of 15 to 30 inches. Calcareous clayey material, marl, or limestone rock occurs at depths of 36 to 48 inches.

In the southern part of Okaloacoochee Slough, the brown fibrous peat is about 6 inches thick and overlies very dark-gray fine sands that contain much organic matter. At a depth of 36 to 42 inches occur calcareous clayey materials, marl, or limestone.

This marsh usually supports a thick growth of water lily, pickerelweed, arrowhead, bonnets, bladderwort, maidencane, wax myrtle, sedges, sawgrass, and cattails. A few marsh areas are near brackish water and adjacent to tidal marshes; they support cattails, grasses, and sedges. The soils in this area vary from dark-gray mucky fine sands to grayish-brown fine sand overlying light-gray fine sand. They are usually alkaline.

Ochopee Fine Sandy Marl, Shallow Phase. Most of this phase is associated with other Ochopee soils and with Tucker marl. It differs from Ochopee fine sandy marl chiefly in having limestone at shallower depths, or 6 to 12 inches below the surface instead of 12 to 36 inches. It is very poorly drained and has fewer narrow natural drainageways than the Ochopee fine sandy marl.

The surface layer, 3 to 4 inches thick, is dark grayish-brown or dark-gray fine sandy marl of loamy fine sand texture. This layer is underlain by grayish-brown marly fine sand that has a few light-gray and light yellowish-brown mottles. The depth to the limestone varies within short distances, primarily because of solution holes in the limestone formation. In places limestone rocks appear at the surface. Included with this soil are very small areas of Broward and Keri soils or Rockland, which occur as islands covered with cabbage palmettos.

The greater part of this soil has a cover of short grasses. Some areas, however, support stunted cypress, slash pine, and other trees.

Ochopee Marl, Shallow Phase. Extensive areas of this phase occur east and northeast of Deep Lake. The underlying limestone is at depths of 3 to 12 inches, as compared to 12 to 36 inches in Ochopee marl. In most other respects, the two soils are similar.

The surface layer, 3 to 8 inches thick, is a dark grayish-brown or dark-gray marl of fine sandy loam texture. Below this occurs grayish-brown or light-gray fine sandy marl of loamy find sand of find sand texture. In many places this fine sand layer is very thin or entirely absent and the marl surface layer lies directly on limestone. In a few instances a very thin layer of fine sandy clay loam overlies the limestone.

This soil is associated with other Ochopee soils and the Tucker and Broward soils. Where this phase is near Tucker marl, its surface layer varies within short distances from a fine sandy loam to a clay loam, and in some lower positions consists of a mixture of mucky materials and marl.

Rockland. This land type constitutes nearly level areas that contain small depressions. It occurs as islands within the Big Cypress region, where it is associated with the Broward, Ochopee, Tucker, Charlotte, Pompano, Keri, and Copeland soils. It is commonly referred to as pine rockland.

At the surface, outcrops of Tamiami limestone predominate, but there is soil material between the outcrops similar to that described for the shallow phase of either Broward fine sand or Ochopee fine sandy marl. The soil material in the solution holes ranges from a few inches to several feet in thickness. It is somewhat poorly drained. Some of the surface water drains into the numerous sandy areas between the rocks and thence into underground channels.

The vegetative cover consists primarily of second-growth slash pine, cabbage palmetto, saw palmetto, running oak, wiregrass, and other grasses, and shrubs, but some of the areas support cypress trees, or grasses and a few trees, or grasses only.

Tucker Marl. This soil occupies level or nearly level marl prairies, 6 to 15 feet above sea level. It is associated with the Ochopee, Broward, Matmon, Sunniland, Charlotte, Pompano, and Felda soils. It differs from the Ochopee soils chiefly in its lower content of sand and higher content of clay. It has developed from recent deposits of finely divided calcareous sediments or marl mixed with appreciable quantities of fine sand and clay. The marl lies directly on moderately hard limestone at depths ranging from 4 to 24 inches. Natural drainage is very poor, and water covers the soil several months each year.

The native vegetation consists of sawgrass, switchgrass, poverty oatgrass, and carpetgrass, broomsedge, maidencane, arrowhead, rushes, and sedges.

This soil is strongly alkaline and its layers are of variable thickness. The surface layer is 3 to 8 inches thick; the second layer, 6 to 18 inches. The average depth to limestone is 14 inches, but the range is from 4 to 24 inches. In a few instances no rock is reached within a depth of 42 inches. Sometimes a thin layer of gritty materials – a mixture of sands, small limestone fragments, and marl – overlies the limestone. In small areas the surface texture approaches a fine sandy loam, but usually it is clay loam or silty clay loam. In other places the surface layer may be slightly mucky.

Included with this soil are several cabbage palmetto and saw palmetto islands where the areas are known to be rockland or soils of the Broward or Matmon series. In a few instances the limestone is more shallow adjacent to these islands and outcrops. Small limestone outcrops are scattered within areas of this soil.

WETLANDS

Based upon the NPS land cover categories outlined above, the majority of the survey area (58,647± acres or 83 percent), is comprised of wetland habitats (Table 3-3). These wetland habitats are spread throughout the survey area, both north and south of I-75.

Table 3-3. NPS land cover type wetlands and acres

NPS Land Cover Category	Survey Area Acreage
Cypress Forest	32,211
Scrub Cypress	18,855
Hydric Hammock	82
Hydric Pine Flatwoods	2,936
Marsh	688
Swamp Forest	486
Wet Prairie	3,389

PROTECTED PLANTS

According to the 1992 GMP/EIS for the original Preserve and the 2010 GMP/EIS for the Addition, two federally listed plants and 96 state-listed plants have the potential to occur within the survey area.

The federally listed plant species are summarized in Table 3-4 and are addressed in this chapter. The state-listed plant species that have the potential to occur within the survey area are addressed in Chapter 4.

Table 3-4. Federally listed plant species documented within the Preserve

Common Name	Scientific Name	Designated Status	
		USFWS	FDACS
Florida prairie-clover	*Dalea carthagenensis* var. *floridana*	C	E
Florida pineland crabgrass	*Digitaria pauciflora*	C	E

FDACS – Florida Department of Agriculture and Consumer Services
USFWS – U.S. Fish and Wildlife Service
C – Candidate
E – Endangered

Florida Prairie-Clover

Florida prairie-clover is listed as a candidate for federal listing by USFWS. No critical habitat has been designated for the Florida prairie-clover.

Florida prairie-clover is restricted to south and southwest Florida with small, scattered populations found within Collier, Miami-Dade, and Monroe counties (50 CFR Part 17, USDOI 2012). A total of nine occurrences are documented for Florida prairie-clover, with seven of those populations located on conservation lands.

Florida prairie-clover is found in pine rocklands, edges of rockland hammocks, coastal uplands, and marl prairie. Fire is probably an important component to the livelihood of this plant, and it probably does not tolerate shade well arising from hardwood species in the absence of a fire regime (USFWS, U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form *Dalea carthagenensis floridana*, http://ecos.fws.gov/docs/candidate/assessments/2013/r4/Q3HL_P01.pdf). Florida prairie-clover occurs in association with south Florida slash pine, live oak, gumbo limbo, poisonwood (*Metopium toxiferum*), willow bustic (*Sideroxylon celastrinum*), white stopper (*Eugenia axillaris*), bluestem grasses (*Schizachyrium* spp.), and paspalum grasses (*Paspalum* spp.).

The 2010 GMP/EIS identified Florida prairie-clover within the Addition, and USFWS noted the presence of Florida prairie-clover within the Preserve in the Federal Register in November 2013 (50 CFR Part 17, USDOI 2013). Although this species has been documented in the immediate area, it is unknown if this species occur in the survey area. Habitats that may potentially contain this species include hydric pine flatwoods, mesic hammock, mesic pine flatwoods, and wet prairie. Therefore, the presence of Florida prairie-clover may be anticipated within the survey area; however, the known location within the Addition is likely the only occurrence due to the rarity of this species.

Florida Pineland Crabgrass

Florida pineland crabgrass is listed as a candidate for federal listing by USFWS. No critical habitat has been designated for the Florida pineland crabgrass.

Florida pineland crabgrass was historically found in central and southern Miami-Dade County in Florida, along the Miami Rock Ridge and south to Long Pine Key (USFWS, U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form *Digitaria pauciflora*, http://ecos.fws.gov/docs/candidate/assessments/2013/r4/Q1VG_P01.pdf).Currently

the known range is entirely within Long Pine Key of Everglades National Park and at the Preserve.

Florida pineland crabgrass most commonly occurs along the ecotone between pine rockland and marl prairie, with some overlap into the two ecosystems. These habitats occasionally flood during the wet season, especially within the marl prairie habitat. These preferred habitats indicate that this species is associated with low elevation pinelands and pineland/marl prairie ecotones that flood each summer during the wet season. Periodic fires appear to be extremely important to Florida pineland crabgrass for both the removal of overstory hardwoods and the removal of accumulated litter. Dominant vegetation types associated with this species included gulf muhly grass and little bluestems (grasses); sawgrass and rushes (*Rhynchospora* spp.) (sedges); saw palmetto and cabbage palm (palms); and coco plum (*Chrysobalanus icaco*), buttonwood (*Conocarpus erectus*), and white indigoberry (mixed shrubs), and has been found to be most abundant with grasses and sedges. Its microhabitat was classified as being on mixed marl and rock soils, in the ecotone, most likely associated with grasses and in regions with solution holes (USFWS, U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form *Digitaria pauciflora*, http://ecos.fws.gov/docs/candidate/assessments/2013/r4/Q1VG _P01.pdf).

The 2010 GMP/EIS identified Florida pineland crabgrass within the Addition, and USFWS noted the presence of Florida pineland crabgrass within the Preserve in the Federal Register in November 2013 (50 CFR Part 17, USDOI 2013). Although this species has been documented in the immediate area, it is unknown if this species occurs in survey area. Habitats that potentially contain this species include hydric pine flatwoods, mesic hammock, mesic pine flatwoods, and wet prairie. Therefore, the presence of Florida pineland crabgrass may be anticipated within the survey area.

PROTECTED WILDLIFE SPECIES

According to FWC, USFWS, and NPS databases for documented occurrences of listed wildlife species, two federally listed species, the wood stork and Florida panther, occur within the survey area (Figure 3-3 and Figure 3-4). The MMP for the Preserve designates the red-cockaded woodpecker and known Florida panther areas, as Important Resource Areas (IRAs).

Cape Sable seaside sparrow habitat and active bald eagle (*Haliaeetus leucocephalus*) nesting sites are also identified as IRAs but have not been documented within the survey area. The survey area does not contain habitat suitable for the American crocodile (Figure 3-5 and Figure 3-6) or West Indian manatee (Figure 3-7).

The Cape Sable seaside sparrow is a federally endangered species, and its preferred nesting habitat includes short-hydroperiod prairie communities in the southern peninsula of Florida that contains moderately dense, clumped grasses, with open space permitting ground movements by the sparrows. The survey area lies outside of the limits of the Cape Sable seaside sparrow USFWS Consultation Area and critical habitat zones (Figure 3-8), which are located predominantly in Everglades National Park and in the southernmost portion of the Preserve. Also, Cape Sable seaside sparrows have not been documented within the survey area. Cape Sable seaside sparrows have been documented within the far southern portion of the Preserve, but the majority of the sparrow population exists within Everglades National Park. As such, the Cape Sable seaside sparrow has been dismissed from further analysis, since the survey area does not appear to contain the very specific habitat requirements of the species, which is evidenced by the restricted distribution of the species.

The bald eagle is not a state or federally listed species; however, it is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. No bald eagle nests have been identified within the survey area; however, undocumented bald eagle nests could potentially occur within the survey area.

According to the 1992 GMP/EIS for the original Preserve, the 2010 GMP/EIS for the Addition, and the range and habitat descriptions provided in *Rare and Endangered Biota of Florida* series (Humphrey 1992, Gilbert 1992, Moler 1992,

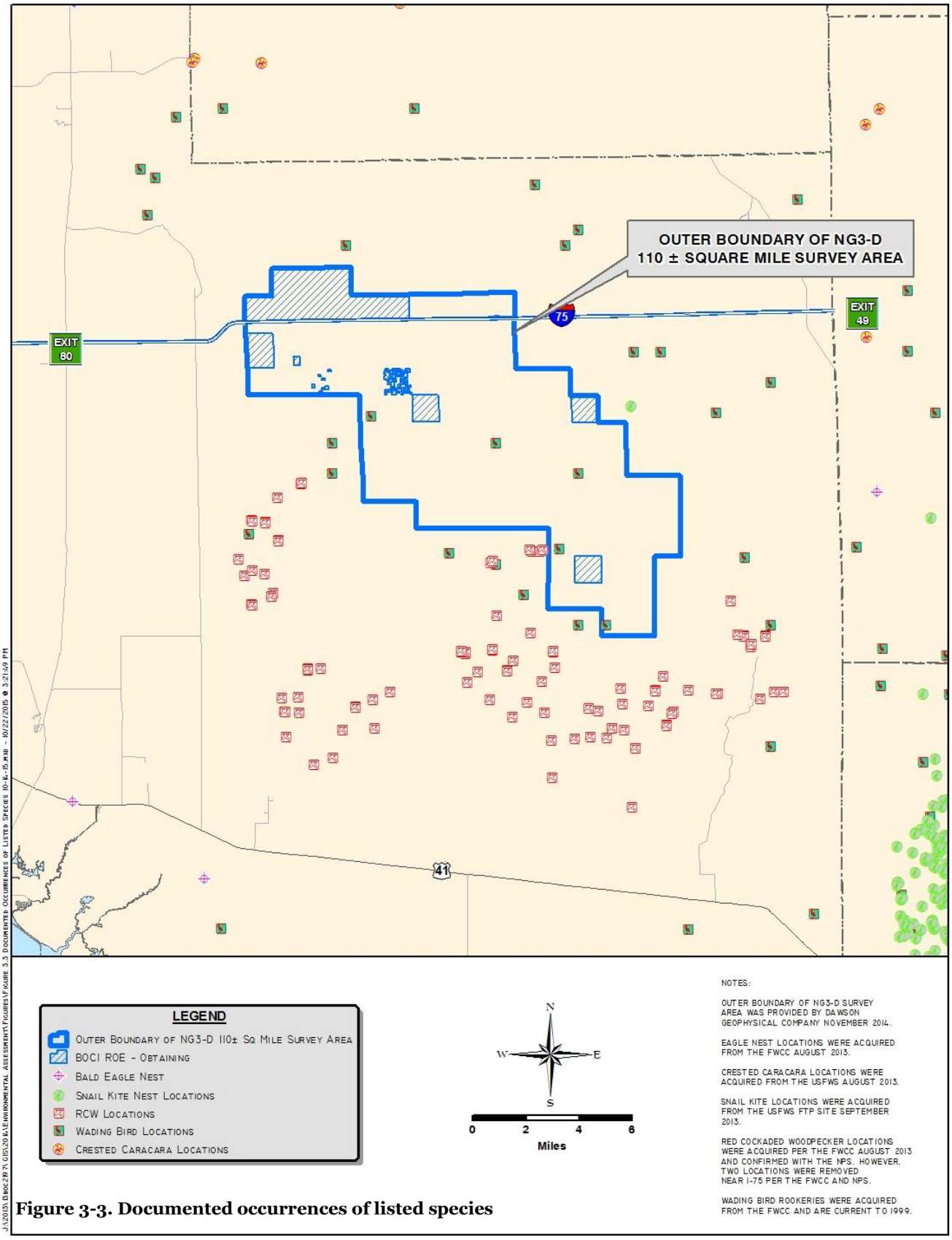


Figure 3-3. Documented occurrences of listed species

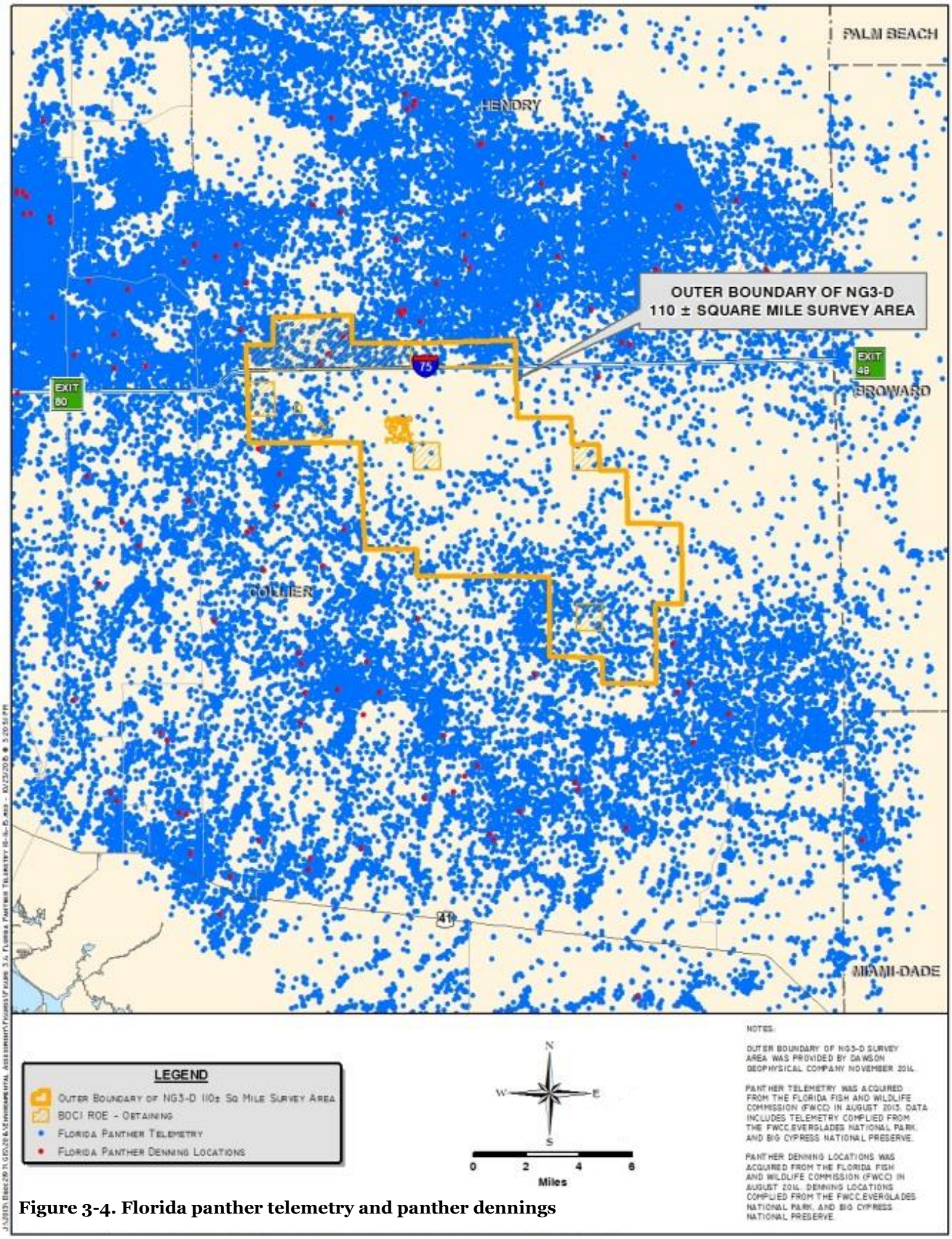


Figure 3-4. Florida panther telemetry and panther dennings

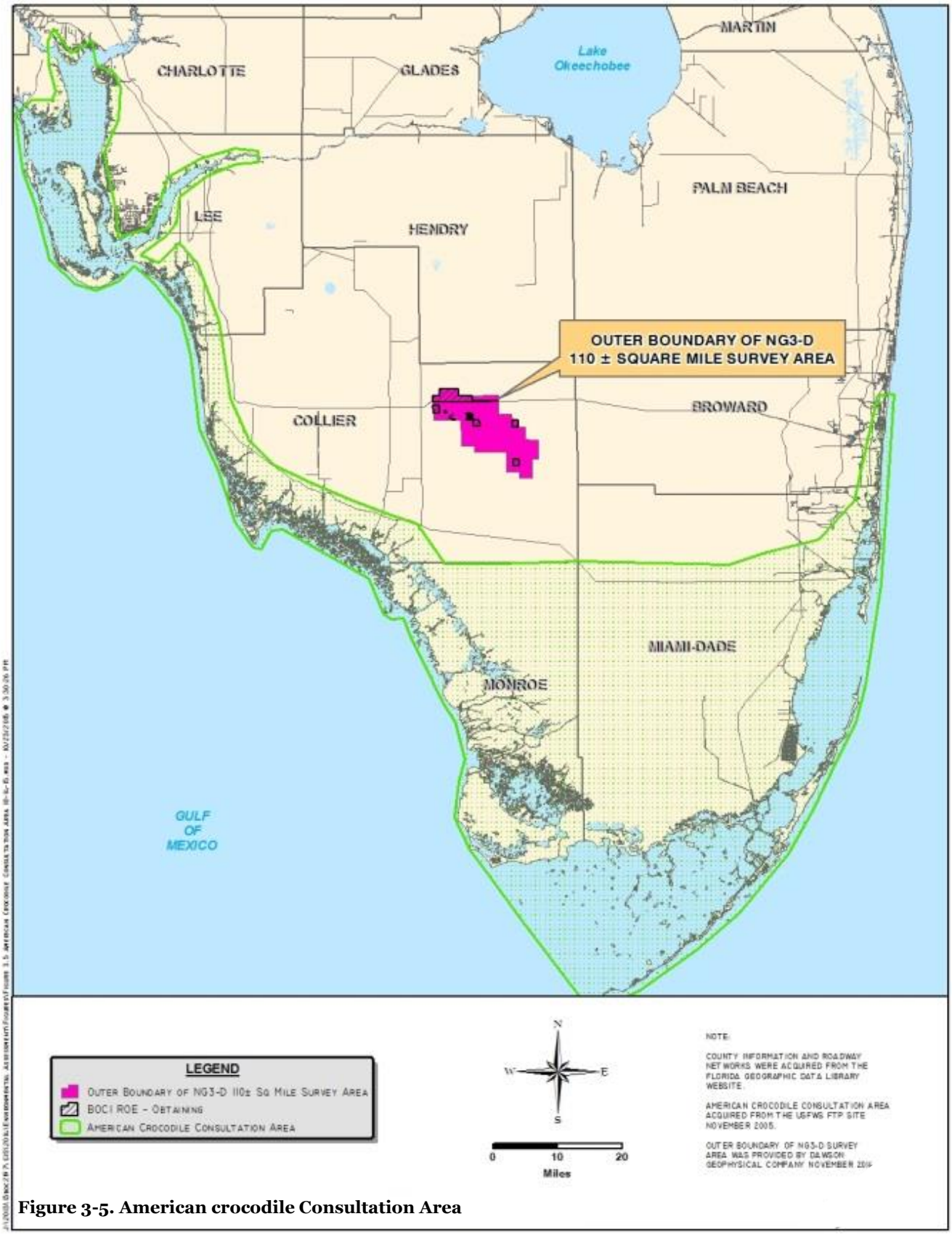


Figure 3-5. American crocodile Consultation Area

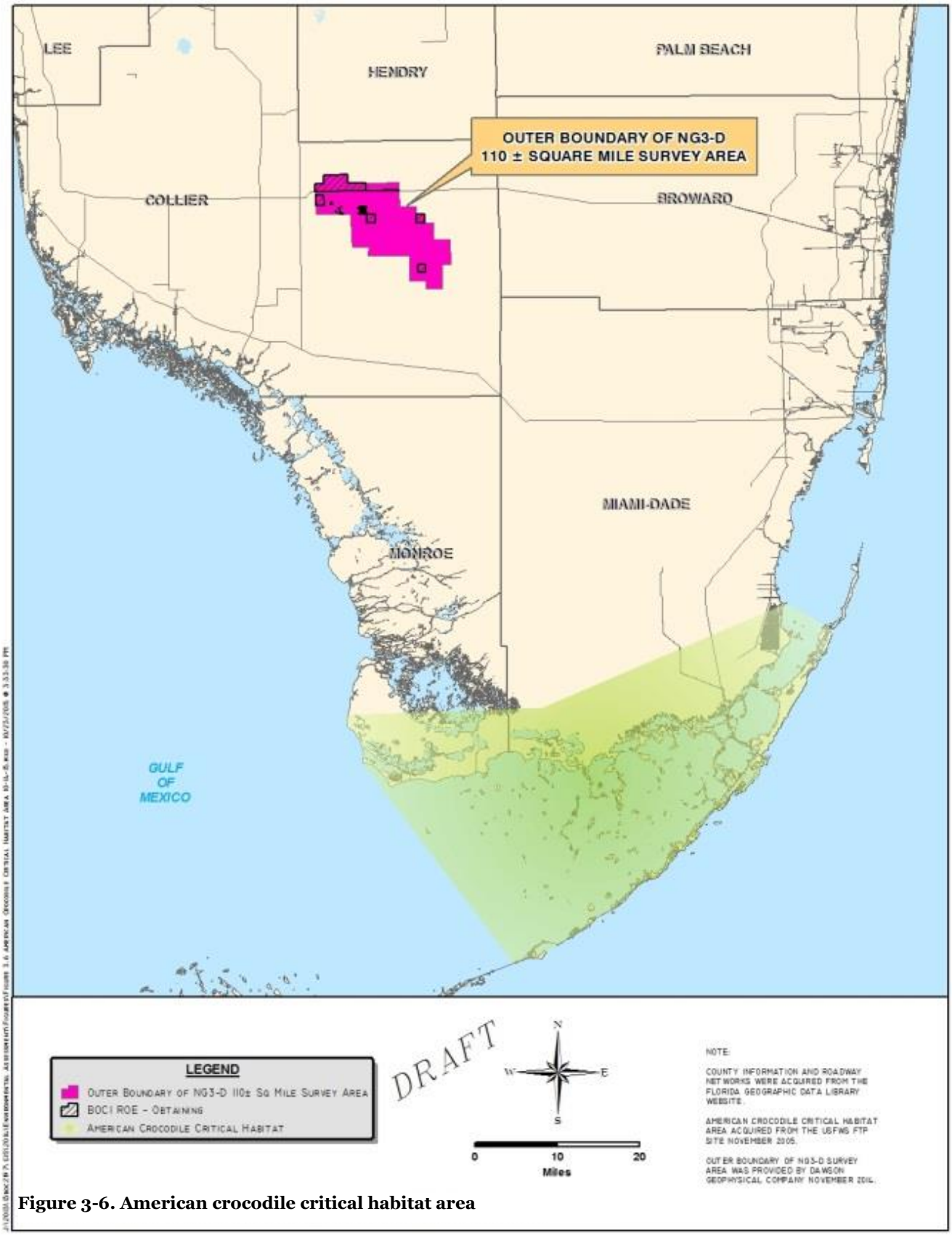


Figure 3-6. American crocodile critical habitat area

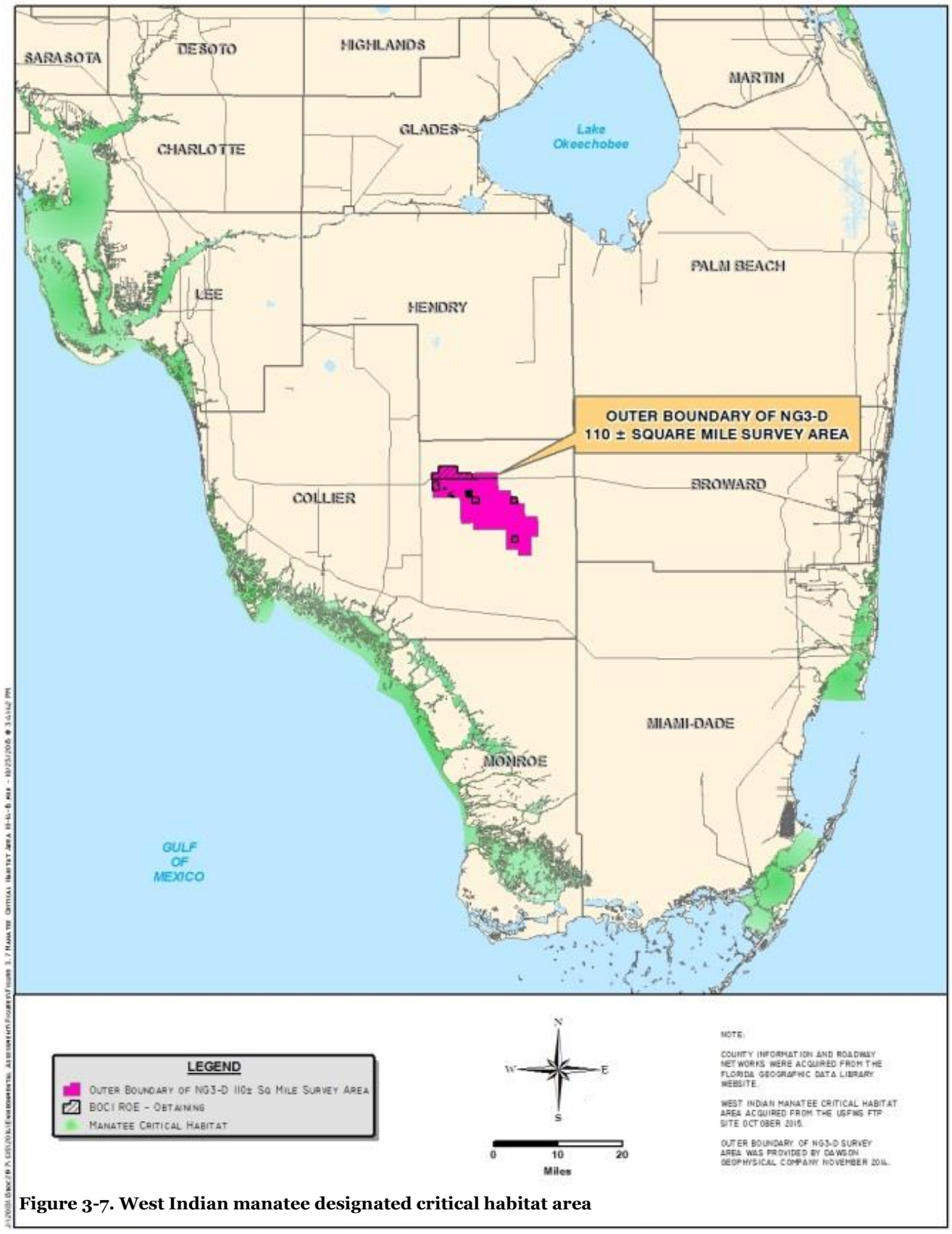


Figure 3-7. West Indian manatee designated critical habitat area

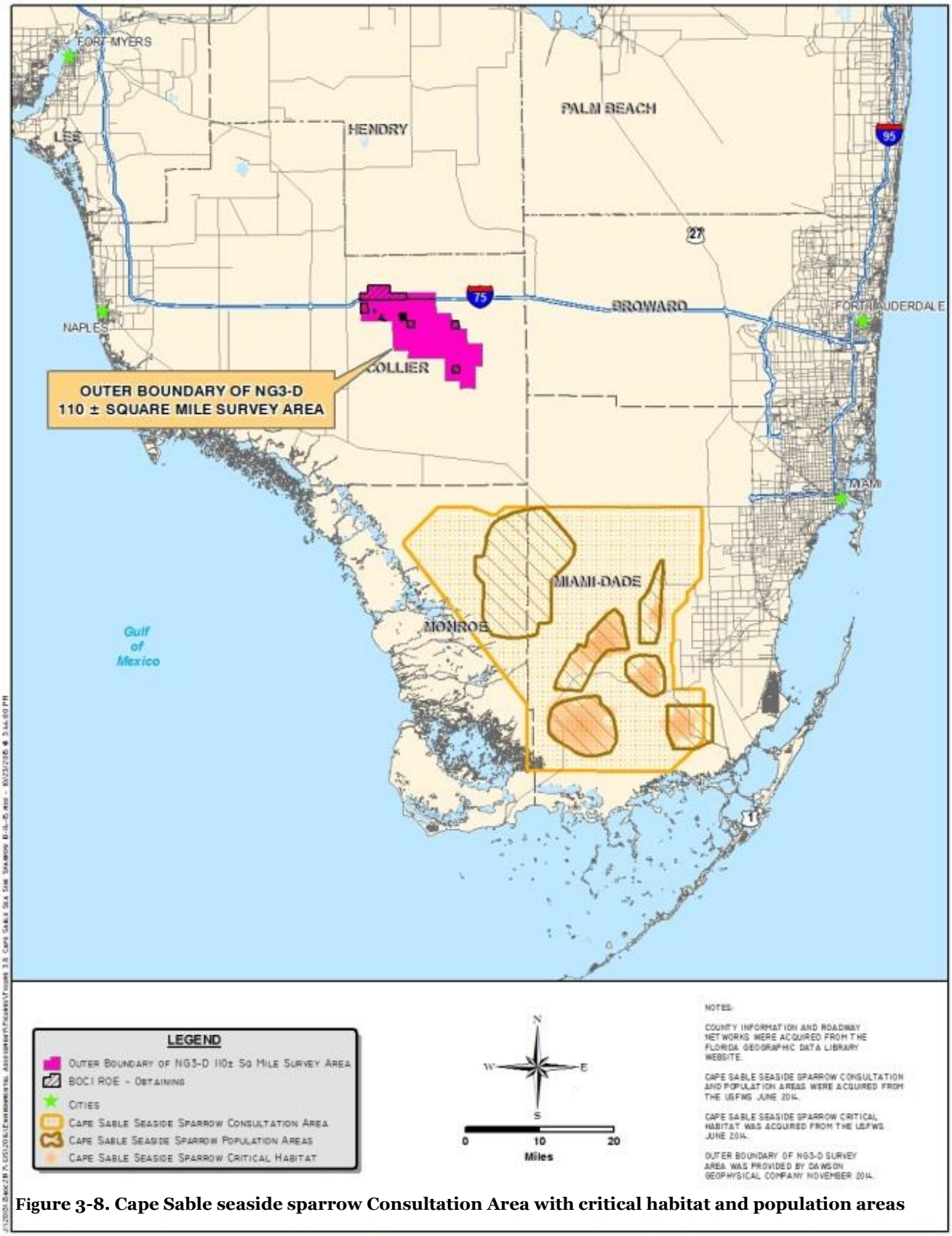


Figure 3-8. Cape Sable seaside sparrow Consultation Area with critical habitat and population areas

Deyrup and Franz 1994, Rodgers *et al.* 1996) an additional five federally listed wildlife species could potentially occur within the survey area. Table 3-5 summarizes the federally listed wildlife species that have been documented or could potentially occur.

Table 3-5. Federally listed wildlife species that occur or have the potential to occur

Common Name	Scientific Name	Designated Status
		Federal (USFWS)
Reptiles		
American alligator	*Alligator mississippiensis*	T (S/A)
Eastern indigo snake	*Drymarchon corais couperi*	T
Gopher tortoise	*Gopherus polyphemus*	C
Birds		
Audubon's crested caracara	*Polyborus plancus audubonii*	T
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	E
Red-cockaded woodpecker	*Picoides borealis*	E
Wood stork	*Mycteria americana*	E
Mammals		
Florida bonneted bat	*Eumops floridanus*	E
Florida panther	*Puma concolor coryi*	E

USFWS – U.S. Fish and Wildlife Service
C – Candidate
E – Endangered
T – Threatened
T(S/A) – Threatened Due to Similarity of Appearance

State-listed wildlife species have also been identified or have the potential to occur within the survey area. The 2000 *Preserve Final Recreational Off-Road Vehicle Management Plan and Supplemental Environmental Impact Statement* provides a detailed list of both state and federally listed species that can occur within the Preserve (NPS 2000*c*). Of the species listed in that document, 12 state-listed or protected species (that have not been discussed thus far) have the potential to occur the survey area. These species include the Everglades mink (*Mustela vison evergladensis*), Big Cypress fox squirrel (*Sciurus niger avicennia*), Florida black bear (*Ursus americanus floridanus*), Florida sandhill crane (*Grus canadensis pratensis*), limpkin (*Aramus guarauna*), little blue heron (*Egretta caerulea*), roseate spoonbill (*Ajaia ajaja*), reddish egret (*Egretta rufescens*), snowy egret (*Egretta thula*), tri-colored heron (*Egretta tricolor*), white ibis (*Eudocimus albus*), and Florida tree snail (*Liguus fasciatus*). Also, although not previously documented within the Preserve or anticipated to occur within the survey area, the Florida burrowing owl (*Athene cunicularia*) could potentially occur based on a review of FWC literature.

The Florida black bear was removed from Florida's Endangered and Threatened Species List in 2012. However, Florida black bears remain protected by the Florida Administrative Code (FAC) Bear Conservation Rule 68A-4.009. This species may require special management consideration for the seismic survey.

Another 10 state-listed species were identified in the 2000 ORV/MP/EIS report, but these species occupy coastal habitat (outside of the survey area) or are no longer listed species (NPS 2000*d*). As such, these species were dismissed from further analysis. These include the common snook (*Centropomus undecimalis*), arctic perigrine falcon (*Falco peregrinus*), American oystercatcher (*Haematopus palliatus*), osprey (*Pandion haliaetus*), brown pelican (*Pelecanus occidentalis*), black skimmer (*Rynchops niger*), least tern (*Sterna antillarum*), mountain lion (*Puma concolor*), West Indian manatee (*Trichechus manatus*), and white-crowned pigeon (*Columba leucocephala*). The Florida tree snail is also not discussed further since the main threat to the species is the loss of habitat (Emmel and Cotter 1995), and no permanent habitat loss is expected to occur as a result of the survey alternatives.

This chapter addresses in detail the federally listed species that occur or have the potential to occur in the survey area. Details on state-listed wildlife that have the potential to occur are provided in Chapter 4.

American Alligator

The American alligator is federally listed as threatened due to similarity of appearance to theendangered American crocodile by USFWS.

Critical habitat for the American alligator has not been designated by USFWS. The American alligator can be found throughout the southeastern United States from coastal North Carolina south to southern Florida and the Florida Keys, and westward through the deep-south into central Texas and north into Arkansas (USFWS 2008*a*). Within Florida, the American alligator is found in all counties, and the Florida ecosystem provides abundant freshwater habitat, allowing for easy and numerous hunting and distribution opportunities (USDOI-NPS, The American Alligator, http://home.nps.gov/bicy/nature science/loader.cfm?csModule=security/getfile&pageID=428352).

The American alligator is predominantly found in wetland and open water habitats including rivers, streams, lakes and ponds, marshes, swamps, reservoirs, and ditches (University of Georgia, Savannah River Ecology Laboratory, American Alligator (*Alligator mississippiensis*), http://srelherp.uga.edu/alligators/allmis.htm). While primarily a freshwater species, alligators will also venture into brackish or salt water habitats. The American alligator is an opportunistic feeder and will prey upon numerous species. However, due to their preferred habitat, juvenile alligators will feed primarily upon insects, small amphibians, small fish, and other available invertebrates. Adult alligators will primarily consume fish, snakes, turtles, small mammals, and bird species available within their wetland open water habitats (FWC, Alligator Facts, http://myfwc.com/wildlifehabitats/managed/alligator/facts/).

The Preserve, encompassing the survey area, is home to numerous American alligators, which are most commonly observed during the winter dry season when water levels are low and concentrate water-dependent species including the alligator (USDOI-NPS, Big Cypress Reptiles, http://www.nps.gov/bicy/naturescience/upload/Reptile-Checklist _FINAL_Lores.pdf). The American alligator is one of the most noticeable large animals within the Preserve.

Habitats that may be utilized by the American alligator include cypress forest, scrub cypress, hydric hammock, hydric pine flatwoods, marsh, swamp forest, water, and wet prairie. The presence of the American alligator within the survey area is anticipated.

Eastern Indigo Snake

The eastern indigo snake is listed as threatened by USFWS. Critical habitat for the eastern indigo snake has not been designated.

The eastern indigo snake was first listed as a federally threatened species under the ESA in 1978. The listing was prompted by the snake's significant population decline, which was caused by over-collecting for the domestic and international pet trade, as well as mortalities resulting from rattlesnake collectors gassing gopher tortoise burrows. With enforcement of the ESA as well as the Lacey Act, exploitation for the pet trade has declined but still remains a concern (Moler 1992). Although the gassing of tortoise burrows is still a threat to the eastern indigo snake, it is not the most serious. Instead, the displacement and fragmentation of habitat from urban development have become the biggest threats to the snake since the listing. The eastern indigo snake is a long, black, nonvenomous snake found in Florida and Georgia. With a length of up to 104 inches, it is considered one of the longest snakes in the United States (Ashton and Ashton 1981). The eastern indigo has large and smooth scales with a uniform shiny black coloration, except for red or cream tints on the throat, chin, or cheeks.

The eastern indigo snake is an active terrestrial predator that will eat any vertebrate small enough to be overpowered. Layne and Steiner (1996) documented several instances of indigos flushing prey from cover and then chasing it. An adult eastern indigo snake's diet may include frogs, toads, snakes (venomous as well as nonvenomous), lizards, turtles, turtle eggs, fish, juvenile gopher tortoises, small alligators, birds, and small mammals (Keegan 1944; Babis 1949; Kochman 1978; Steiner *et al.* 1983). Juvenile eastern indigo snakes eat mostly invertebrates (Layne and Steiner 1996).

Historically, the eastern indigo snake was found throughout Florida and in the coastal plain of Georgia, Alabama, and Mississippi (Haltom 1931; Carr 1940; Cook 1954; Diemer and Speake 1983; Moler 1985).

Currently, the eastern indigo is primarily found in sandhill habitat in northern Florida and southern Georgia. However, the snake is also widely distributed throughout central and south Florida. Its habitats include pine flatwoods; scrubby flatwoods; high pine; dry prairie; tropical hardwood hammocks; edges of freshwater marshes, agricultural fields, and coastal dunes; and even human-altered habitats. They are especially common in the hydric hammocks throughout this region (Moler 1985). In extreme south Florida, these snakes are typically found in pine flatwoods, pine rocklands, tropical hardwood hammocks, and mangrove forests (Kuntz 1977). In portions of south Florida, eastern indigos may also occupy agricultural sites and areas along canals and other artificial waterways.

Wherever the eastern indigo snake occurs in xeric habitats, it is closely associated with the gopher tortoise, the burrows of which provide shelter from winter cold (Bogert and Cowles 1947; Speake *et al.* 1978; Layne and Steiner 1996). Other underground refuges used by this species include burrows of armadillos, cotton rats (*Sigmodon hispidus*), and land crabs; burrows of unknown origin; natural ground holes; hollows at the base of trees or shrubs; ground litter; trash piles; and in the crevices of rock-lined ditch walls (Layne and Steiner 1996; Hyslop 2007).

Documented occurrence data for the eastern indigo snake in the survey area are not available. However, the Preserve (which encompasses the survey area) is located within its distribution range. The eastern indigo snake has been observed in the Addition (USFWS 2010). While the survey area is dominated by wetland systems, it does contain suitable habitat types for the eastern indigo snake, including mesic hammock and mesic pine flatwoods. The presence of the eastern indigo snake within the survey area is anticipated.

Gopher Tortoise

The gopher tortoise is listed as a Candidate for Federal Listing. Critical habitat for the gopher tortoise has not been designated by USFWS. The gopher tortoise occurs in the southeastern coastal plain of the United States from eastern Louisiana to southeastern South Carolina and throughout Florida (Auffenberg and Franz 1982). In Florida, gopher tortoises occur in portions of all 67 counties (Cox *et al.* 1987).

Three environmental conditions are especially important for gopher tortoises: well-drained, sandy soil in which to burrow, adequate low-growing herbaceous ground cover for food, and relatively open sunlit areas for nesting. The gopher tortoise is primarily associated with longleaf pine-scrub oak woodlands (sandhills), but it is also found in sand pine scrub, coastal strands, live oak hammocks, dry prairies, pine flatwoods, and mixed hardwood-pine communities. Disturbed habitats, such as roadsides, fencerows, clearings, and old fields often support relatively high tortoise densities (Auffenberg and Franz 1982, Cox *et al.* 1987).

Specific location data for gopher tortoise burrows or inhabited areas within the survey area are unavailable. Gopher tortoises typically inhabit a range of upland vegetative communities; however, they are not expected to commonly be encountered during seismic survey operations, because these activities primarily would occur in areas without necessary habitat conditions (i.e., well-drained, sandy soils).

Audubon's Crested Caracara

The Audubon's crested caracara is currently listed as threatened by USFWS. Critical habitat for the crested caracara has not been designated.

The Audubon's crested caracara occurs in the prairie area of the south-central region of Florida, south Texas, southwestern Arizona, northern Baja California, and through Mexico and Central America to Panama. Populations are also found in Cuba and the Isle of Pines and incidental in Jamaica. (USFWS, South Florida Multi-Species Recovery Plan - Species: Audubon's Crested Caracara *Polyborus plancus audubonii*, http://www.fws.gov/verobeach/MSRPPDFs/AudubonsCrestedCaracara.pdf).

The Florida population commonly occurs in dry or wet prairie areas with scattered cabbage palms. It may also be found in lightly wooded areas. Scattered saw palmetto, scrub oaks (*Quercus geminata*, *Q. minima*, *Q. pumila*), and bald cypress may also be present. Widespread changes in land use may have forced a change in

the type of habitat this subspecies will use. The caracara now uses improved or semi-improved pasture (Layne 1996).

The survey area is located within the USFWS Consultation Area for the crested caracara (Figure 3-9). There are no documented occurrences of the crested caracara within the survey area (Figure 3-3). The closest documented crested caracara occurrences are approximately three miles east of the survey area. Crested caracaras in Florida primarily occur in dry or wet prairie areas with scattered cabbage palms or improved/semi-improved pasture areas, while the majority of the survey area is dominated by forested habitats. Also, the survey area is located in the far southern and western extreme of the Consultation Area. The crested caracara has limited potential to occur within the survey area. However, the crested caracara could occur in limited portions.

Everglade Snail Kite

The Everglade snail kite was first listed as federally endangered under the Endangered Species Conservation Act (which preceded the ESA) in 1967 (32 Federal Register 4001). With a very low population at that time (only 10 snail kites were counted in Florida in 1965), the species was included in the first group of species to be listed under the act. Subsequent to the initial listing, critical habitat for the Everglade snail kite was designated by the USFWS in 1977 (42 CFR 40685) and augmented and corrected later that year (42 CFR 47840). The designated critical habitat areas for the kite are east and north of the Preserve along the western perimeter of Lake Okeechobee and SFWMD's Water Conservation Areas 1, 2A, 2B, and 3A. The survey area lies outside the limits of the Everglade snail kite's critical habitat (Figure 3-10).

In the South Florida Multi-Species Recovery Plan, USFWS recommends a reconsideration of the critical habitat boundaries for the Everglade snail kite as a "species-level recovery action" and identifies the Preserve as a potential area of inclusion in the critical habitat area.

The Everglade snail kite (or snail kite) is medium in size with a wingspan of 43 to 46 inches and a body length of 14 to 16 inches (Sykes *et al.* 1995). It is most easily distinguished from other raptors by its narrow, curved bill, which it uses to extract its primary prey, the apple snail (*Pomacea paludosa*). Also, the tail of both sexes is square-tipped with a white base.

Adult snail kites have red eyes, while juveniles have brown eyes (Brown and Amadon 1978; Clark and Wheeler 1987). The adult males are a uniform slate gray in color, whereas adult females are brown with cream-colored streaks from the face down to the breast. Immature snail kites tend to resemble adult females, with the facial/breast streaking being slightly more light brown than cream (Sykes *et al.* 1995).

The current range of the Everglade snail kite includes parts of south Florida, Cuba, and northwestern Honduras. Currently, the range and distribution of the Everglade snail kite in Florida is confined to areas with available habitat in the southern half of the state.

Although the snail kite is not a migratory bird species, it is known to be somewhat nomadic within its range in response to habitat changes (i.e., hydrologic changes, food availability, etc.).

The habitat for the Everglade snail kite primarily consists of lowland freshwater marshes and the shallow littoral zones of lakes where an abundance of apple snails can be found. The snail kite's diet predominantly consists of apple snails.

The survey area is located outside of designated critical habitat but within the USFWS Consultation Area for the Everglade snail kite (Figure 3-10). There is one documented nest approximately one mile east of the survey area (Figure 3-3 and Figure 3-10). Habitats within the survey area that may be utilized by the Everglade snail kite include cypress forest, scrub cypress, hydric hammock, hydric pine flatwoods, marsh, swamp forest, water, and wet prairie. The presence of the Everglade snail kite is anticipated within the survey area.

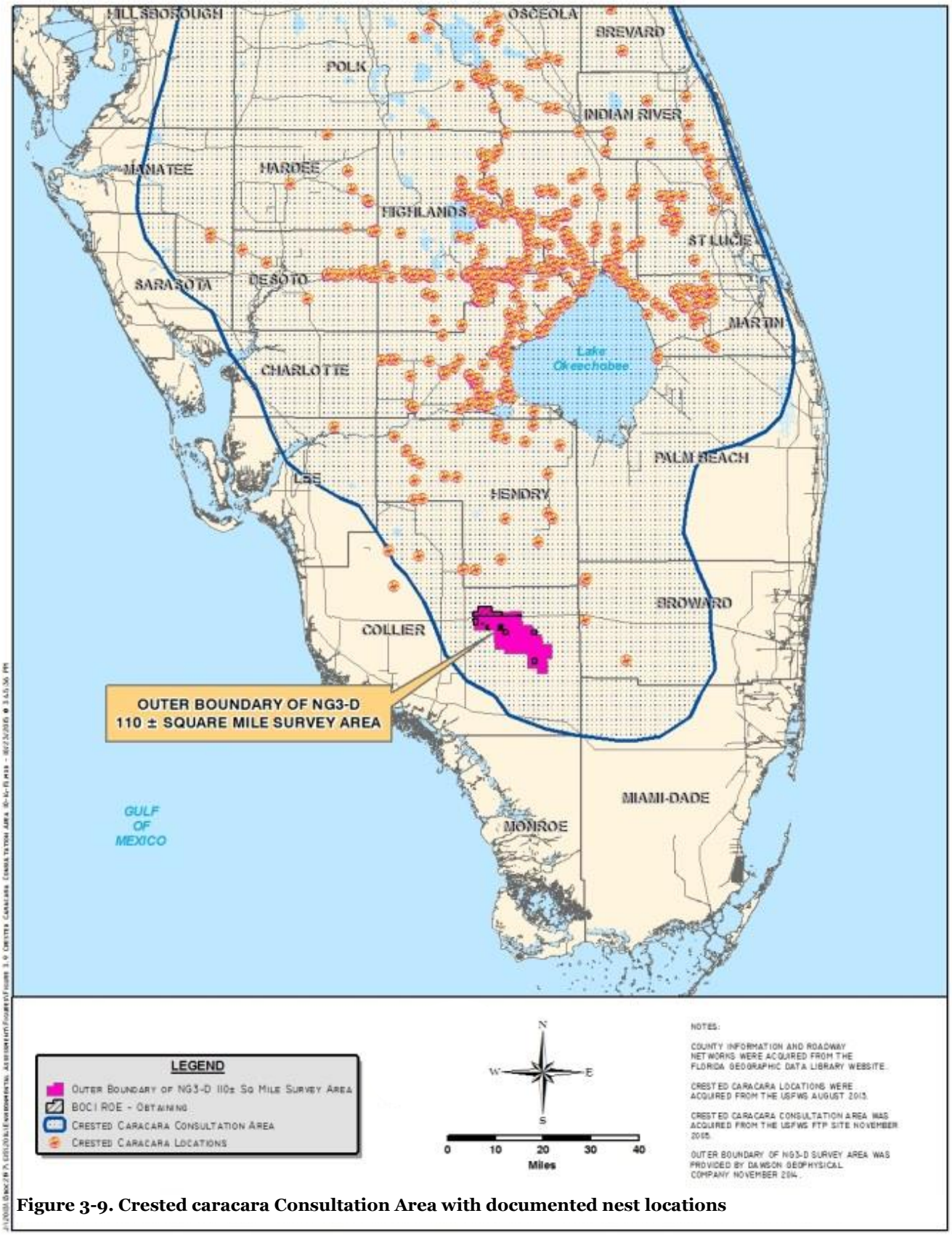


Figure 3-9. Crested caracara Consultation Area with documented nest locations

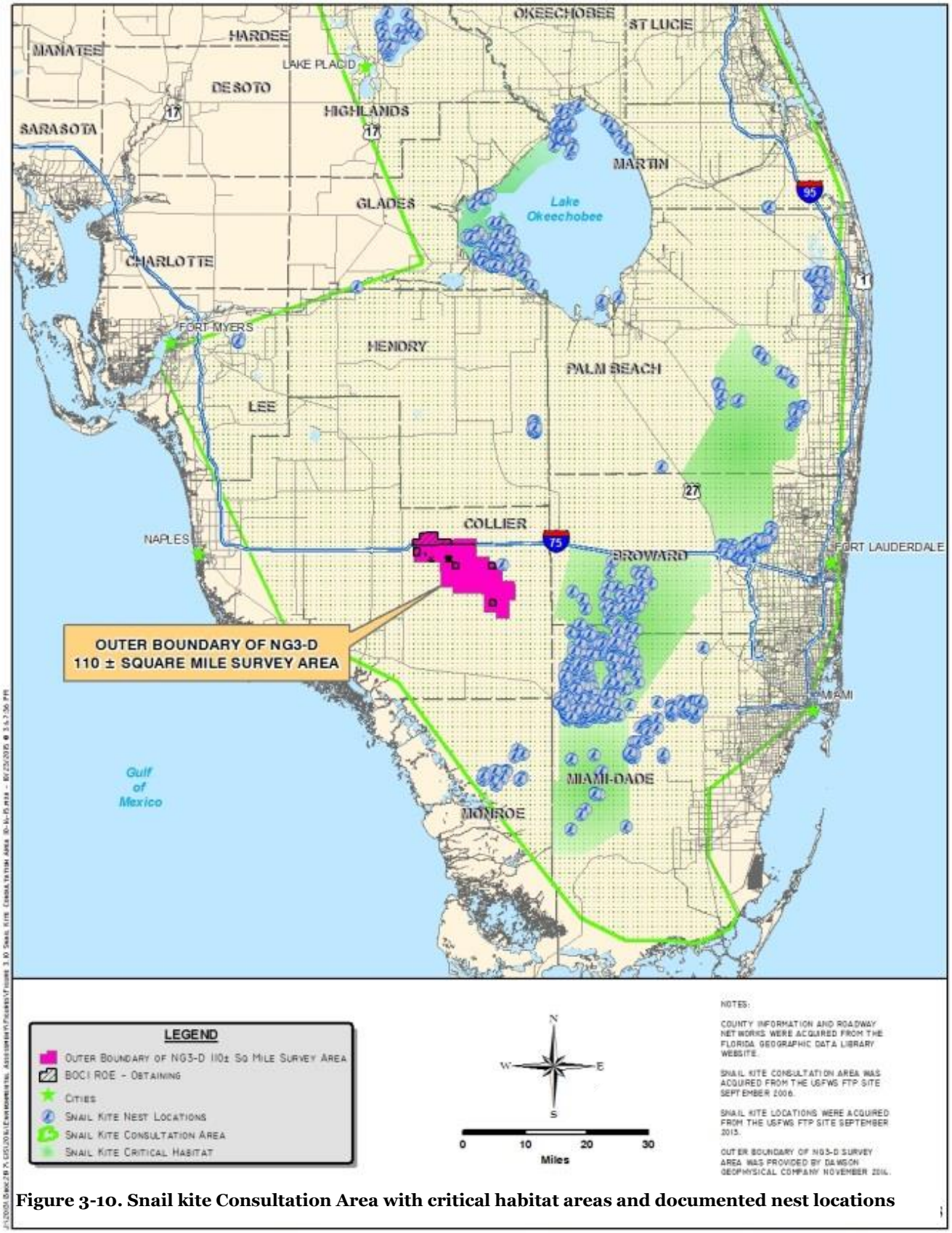


Figure 3-10. Snail kite Consultation Area with critical habitat areas and documented nest locations

Red-Cockaded Woodpecker

The red-cockaded woodpecker was listed as federally endangered under the ESA in 1970. Critical habitat for the red-cockaded woodpecker has not been designated by the USFWS. Lands in the Preserve (which encompasses the survey area) contain suitable habitat for the red-cockaded woodpecker.

The red-cockaded woodpecker is one of 22 species of woodpeckers native to North America. Adult red-cockaded woodpeckers are approximately 7 to 8 inches in length and have a wingspan that ranges between 1 to 1.2 feet. The red-cockaded woodpecker is easily distinguished by its large, conspicuous white cheek patches, black cap and neck, and black- and-white barred back and wings (Jackson 1994).

The red-cockaded woodpecker's historic range encompassed the southeastern U.S. from eastern Texas and Oklahoma to New Jersey, and the bird was characterized as abundant in 19th-century literature. Throughout the 20th century, however, the species distribution within its historic range has become fragmented, and its total population numbers have decreased drastically due to the destruction of its habitat. The woodpecker is still widely distributed in the southeastern United States, but the few remaining colonies (a particular group of woodpeckers that use a set of cavity trees) are confined to scattered refuges.

The population within the Preserve is the southernmost and perhaps the largest in south Florida (NPS 1981). The red-cockaded woodpecker can only survive in mature pine stands, usually 60 years old or more, that are infected with red-heart disease, a fungus that weakens the interior "heartwood" of a pine. This allows the birds to excavate cavities for roosting and nesting. The red-cockaded woodpecker typically nests between April and August in tree cavities located 20 to 50 feet above the ground. In the Preserve, nesting is usually over by mid-June (Schulze 2007).

Red-cockaded woodpeckers forage in a wide variety of pine species and especially favor areas that contain large trees, which have a large surface area and loose bark. They feed on adults, larvae, and eggs of arthropods, especially ants and termites that they find by flaking bark from the tree. In prime habitat the forage area for the red-cockaded woodpecker surrounds the colony and consists of pine forests. But within the Preserve, where pine forests are patchy, the forage area is large and includes prairies, swamps, and other vegetation communities. Recent studies show that forage areas in south Florida average more than 360 acres rather than 200 acres typical for most of the woodpeckers range (Nesbitt *et al.* 1983).

The red-cockaded woodpecker appears to be fairly tolerant of human activities as long as the colony is maintained. For instance, several active colonies in the Preserve are near ORV trails, active oil pads, and backcountry camps. There appears to be a limit, however, on the duration or types of activities that woodpeckers will tolerate; in other parts of the South, nesting failures have been attributed to noise from loud radio music and house construction, continuous chainsaw operation, and heavy interstate traffic (Jackson 1983).

FWC and NPS monitor the red-cockaded woodpecker population in the Preserve. In 2011, there were 86 confirmed active clusters containing 84 potential breeding groups in the Preserve. FWC intensively monitors a portion of these clusters every year for reproductive success, cavity augmentations, translocation potential, and habitat recommendations. New clusters have been discovered in suitable pine habitat consistently since 2008.

The survey area is partially located within the USFWS Consultation Area for the red-cockaded woodpecker (Figure 3-11). FWC has documented occurrences within the Preserve but none within the survey area (Figure 3-3 and Figure 3-11). The closest documented cluster is approximately 0.25 mile southwest of the survey area. FWC documented occurrences are primarily concentrated south of the survey area. Habitats that may be utilized by the red-cockaded woodpecker include hydric pine flatwoods and mesic pine flatwoods. The presence of the red-cockaded woodpecker is anticipated within the survey area.

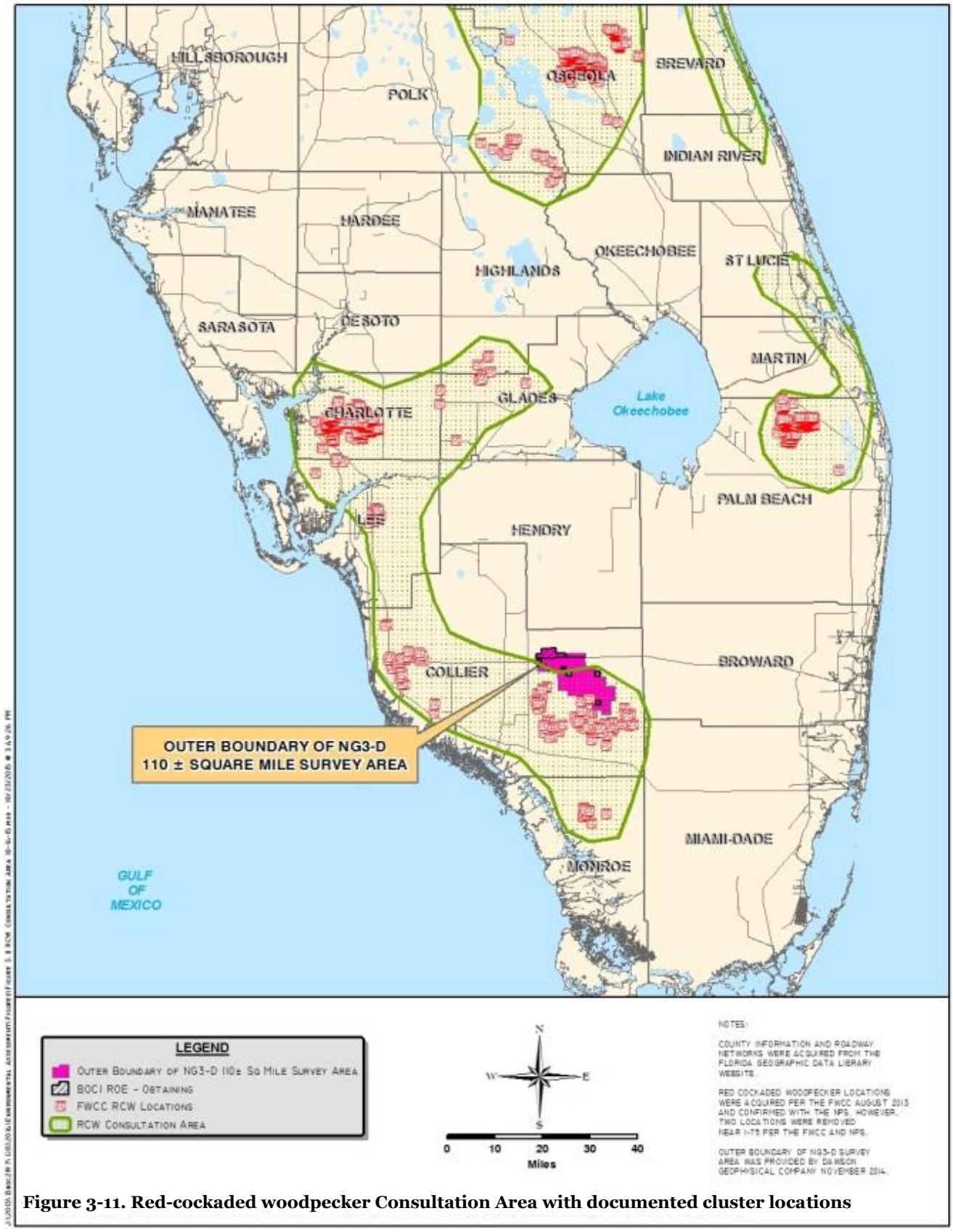


Figure 3-11. Red-cockaded woodpecker Consultation Area with documented cluster locations

Wood Stork

The wood stork was listed as federally endangered under the ESA in 1984. Critical habitat for the wood stork has not been designated by USFWS.

The wood stork is a large, long-legged wading bird with a body length (head to tail) of approximately 2.75 to 3.25 feet and a wingspan of 5 to 5.5 feet. Their plumage is white, except for iridescent black primary and secondary feathers and a short black tail. On adult wood storks, the rough scaly skin of the head and neck is unfeathered and blackish in color. Their legs are dark with dull pink toes. The bill color is blackish.

Wood storks are birds of freshwater and brackish wetlands, primarily nesting in cypress or mangrove swamps. In the United States, wood storks historically nested in all coastal states between Texas and South Carolina (Wayne 1910; Bent 1926; Howell 1932; Oberholser 1938; Dusi and Dusi 1968; Cone and Hall 1970; Oberholser and Kincaid 1974). Currently, wood storks breed in Florida, Georgia, and coastal South Carolina.

Wood storks usually construct their nests in medium to tall trees that are usually standing in water or in trees that are on dry land if the land is a small island surrounded by water. Their nests are large, rigid structures usually found in the forks of large branches or limbs. Storks may add guano to the nest to stabilize the twigs (Rodgers *et al.* 1988). The nest may be constructed in branches that are only a yard above the water or in the tops of tall trees.

The nesting season of wood storks varies geographically, but in Florida egg-laying begins in October, and fledging of young birds occurs in February or March. The U.S. breeding population of the wood stork declined from an estimated 20,000 pairs in the 1930s to about 10,000 pairs by 1960. The decline was believed to be due primarily to the loss of suitable feeding habitat, especially in south Florida rookeries, where repeated nesting failures occurred despite protection of the rookeries. According to the South Florida Multi-Species Recovery Plan, under pre-drainage conditions wood storks formed colonies between November and January (December in most years regardless of annual rainfall and water level conditions). In response to deteriorating habitat conditions in south Florida, wood storks in the Everglades and Big Cypress basins had delayed the initiation of nesting to February or March in most years since the 1970s. This shift in timing was believed to be responsible for the increased frequency of nest failures and colony abandonment. However, according to the December 2013 South Florida Wading Bird Report (SFWMD 2013), the number of wood stork nests increased by 50 percent over the last 8-year average and 97 percent over the last 3-year average.

Wood storks feed in freshwater marshes, narrow tidal creeks, or flooded tidal pools, primarily on fish between 7.75 and 9.75 inches in length. Particularly attractive feeding sites are depressions in marshes or swamps where fish become concentrated during periods of falling water levels. Feeding areas in south Florida have decreased by about 35 percent since 1900 because of human alteration of wetlands. Additionally, levees, canals, and floodgates have greatly changed natural water regimes in south Florida.

The wood stork forages annually in the Preserve when water levels provide concentrations of fish. Documented nesting in the Preserve was rare until 1996 when 45 colonies were reported (Jansen and Brooks 1996). The previous two consecutive years of high water and subsequent buildup of the prey base apparently provided ideal conditions in which to raise young. Wood stork nests have been found only sporadically in the Preserve since 1996.

USFWS's Draft Standard Local Operating Procedures for Endangered Species Wood Storks (2002) recognizes a 30-kilometer (18.6-mile) zone surrounding a colony boundary as a Core Foraging Area (CFA). According to USFWS data, the survey area falls within the CFA of five historically recorded wood stork colonies. The nearest colony (Colony No. 619304) is located approximately 0.91± mile south of the survey area (Figure 3-12). According to the Florida Atlas of Breeding Sites for Herons and their Allies (Runde *et al.* 1991) and the FWC Waterbird Colony Locator (http://atoll.floridamarine.org/waterBirds/), only one of these colonies was an active wood stork colony (No. 619304) as of 1999.

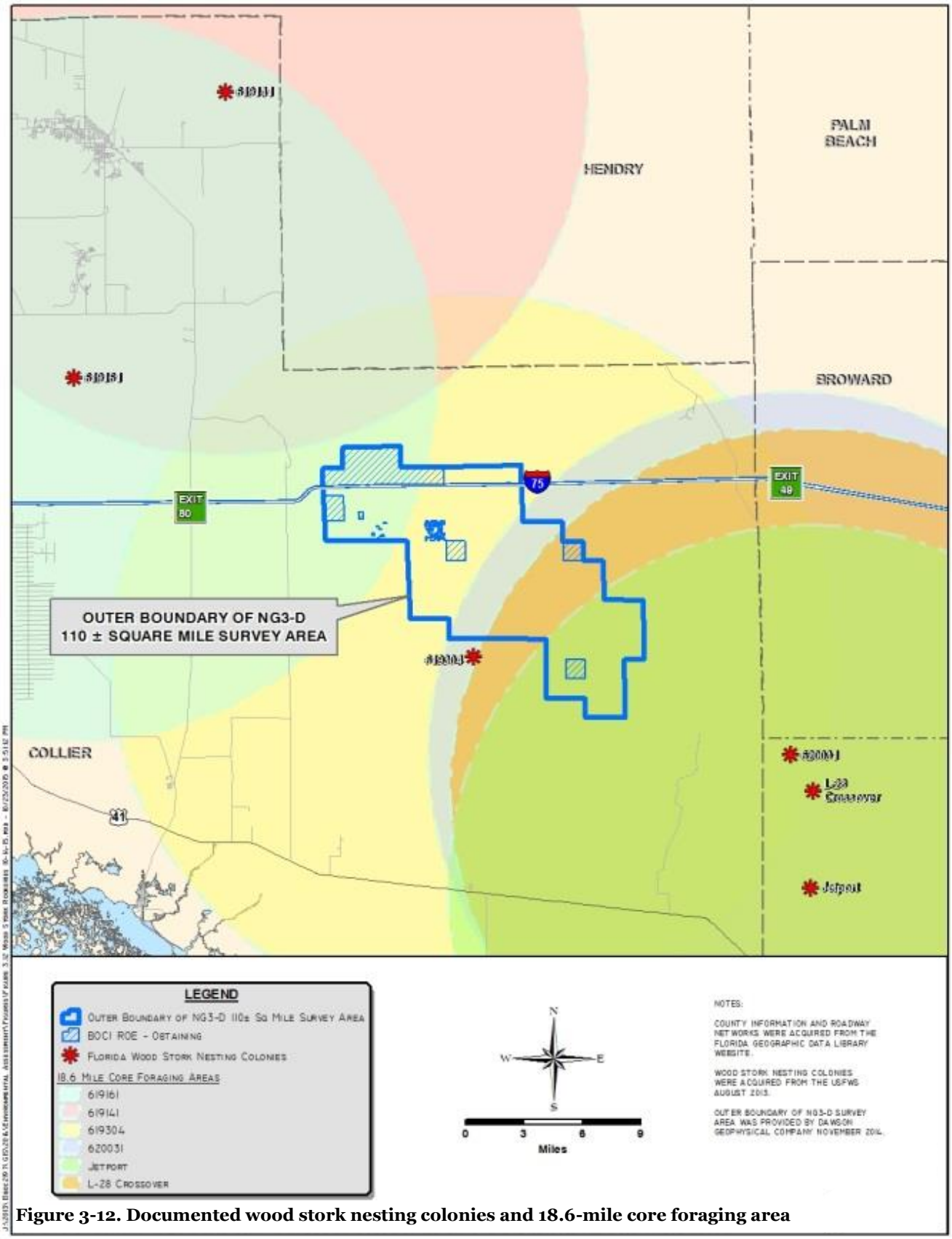


Figure 3-12. Documented wood stork nesting colonies and 18.6-mile core foraging area

Colony No. 619161 is approximately 13.55± miles west-northwest of the survey area, Colony No. 620031 is approximately 8.71± miles southeast of the survey area, the L-28 Crossover colony is approximately 10.33± miles southeast of the survey area, the Jetport colony is approximately 12.91± miles southeast of the survey area, and Colony No. 619304 is located 0.91± mile south of the survey area.

Habitats within the survey area that may be utilized by the wood stork include cypress forest, scrub cypress, hydric hammock, hydric pine flatwoods, marsh, swamp forest, water, and wet prairie. The presence of the wood stork is anticipated within the survey area.

Florida Bonneted Bat

The Florida bonneted bat was listed as federally endangered on November 1, 2013. Critical habitat for the Florida bonneted bat has not been designated.

With an average wingspan of 490 to 530 millimeters (19.3 to 20.9 inches) and an average length of 130 to 165 millimeters (5.1 to 6.5 inches), the Florida bonneted bat is the largest species of bat found in Florida. They are members of the Molossidae family, commonly referred to as free-tailed bats. As the name suggests, Molossids, including Florida bonneted bats, have tails that extend well beyond their short tail membrane. Also similar to other free-tailed bats, the Florida bonneted bat has small eyes, large upper lips, and long, narrow wings. Their fur ranges from dark gray to brownish gray or cinnamon brown on its dorsal side, with lighter, grayish fur underneath. The Florida bonneted bat is characterized by its large size and its large, broad ears that slant forward over the eyes and join together along the midline of the head. Their big ears protrude over their head like a bonnet, giving them their name.

Florida bonneted bats have been found roosting in both urban and forested areas. They are known to roost in rock crevices, tree cavities, buildings and bat boxes. Foraging habitat includes areas over water such as ponds, wetlands, streams, canals, ditches, or over open ground such as forest edges, tree-lined corridors, prairies, pastures, golf courses and croplands (Marks and Marks 2006). The current range of the Florida bonneted bat is known to include both the east and the west coasts of the southern portion of the Florida peninsula (excluding the Keys). Specimens have been discovered in very few areas, including the Miami area in 1936; Coral Gables, Coconut Grove, and Miami in the 1950s; Punta Gorda in 1979; Fakahatchee Strand in 2000; and North Fort Myers in 2003.

The survey area is located within the USFWS Consultation Area and partially within the USFWS Focal Area for the Florida bonneted bat (Figure 3-13). Due to the variable habitats utilized by this species, the presence of the Florida bonneted bat is anticipated within the survey area.

Florida Panther

The Florida panther is listed as endangered by both USFWS and FWC. Critical habitat for the Florida panther has not been designated.

Panthers once lived throughout most of the southeastern U.S. Today, the only confirmed breeding population is located in south Florida. The current panther population is centered in and around the Preserve, including Everglades National Park, Fakahatchee Strand Preserve State Park, Florida Panther National Wildlife Refuge, and privately owned lands north of the Preserve in Collier and Hendry counties.

Annual range-wide surveys of the Florida panther population in central and southern Florida began in 1981 (McBride *et al.* 2008). Approximately 20 to 30 Florida panthers remained in the early 1980s (McBride *et al.* 2008). Based on documented physical evidence, the population remained relatively stable at 20 to 30 panthers between 1985 and 1995 (McBride *et al.* 2012). In 1995, eight female Texas cougars were released into the Florida panther population, including four introduced into the Preserve, to offset the negative effects of inbreeding documented in panthers. The population began increasing after the genetic restoration efforts in 1995, reached a peak in 2007, and has remained relatively stable between 104 to 110 panthers from 2008 through 2011 (McBride *et al.* 2012).

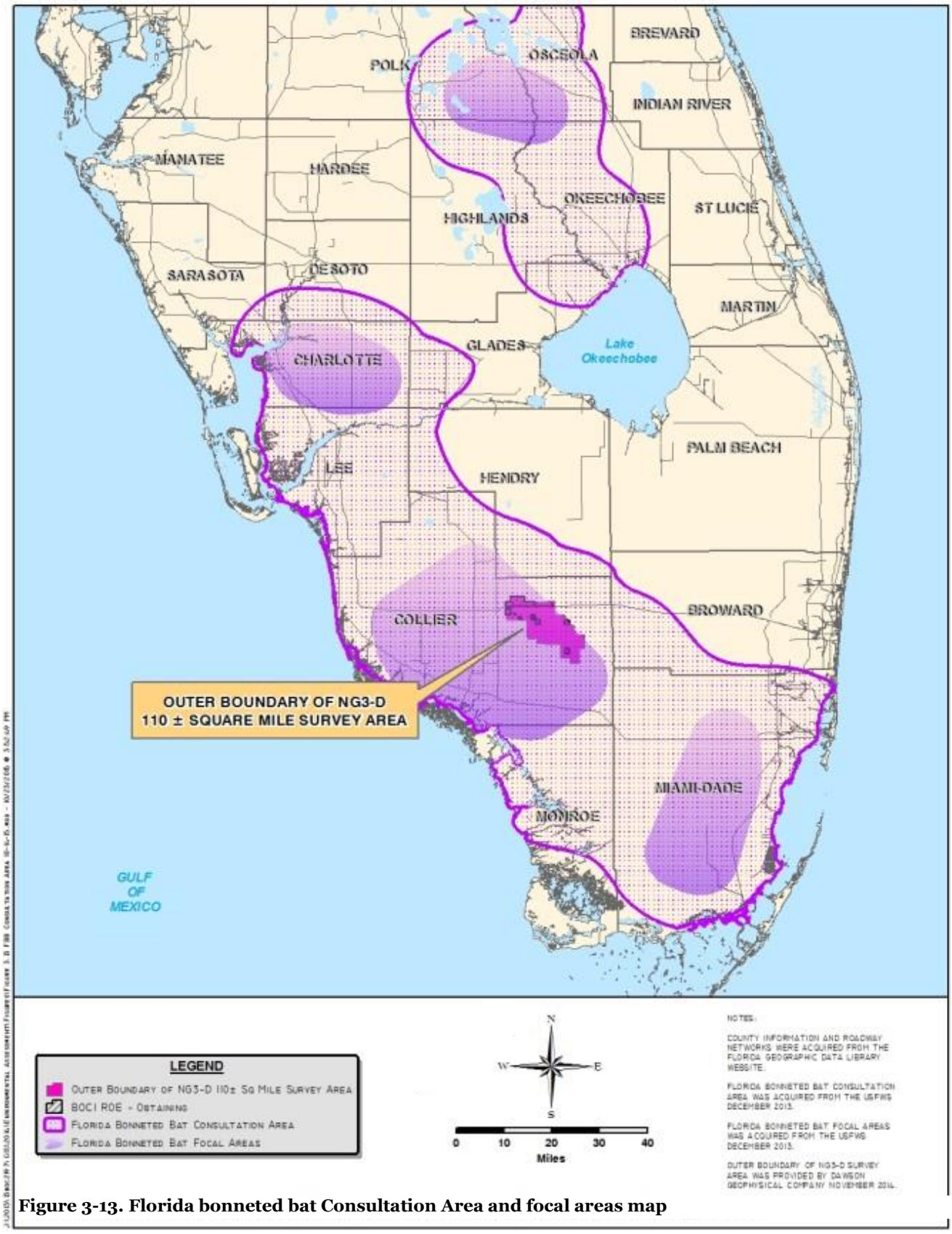


Figure 3-13. Florida bonneted bat Consultation Area and focal areas map

Panthers are a landscape species that require large contiguous areas with adequate prey availability and reduced levels of human disturbance. Forest patches comprise an important component of panther habitat in south Florida (Kautz *et al.* 2006). Panthers select forested habitat types interspersed with other habitat types that are used in proportion to their availability (Land *et al.* 2008, Onorato *et al.* 2010). Panthers prefer to move through vegetated areas and rarely move through open areas except at night.

Existing data on panther reproduction indicate that breeding may occur throughout the year, with a peak during winter and spring, a gestation period of around 90 to 95 days, litter sizes of one to four kittens, and a breeding cycle of two years for females successfully rearing young to dispersal, which typically occurs at 18 months (USFWS 2008*b*). Most panther births occur between March and July, and the den sites are used for two months after birth. Den sites are usually located in dense, understory vegetation, typically saw palmetto (Maehr 1990, Shindle *et al.* 2003).

The panther's preferred prey are white-tailed deer and feral hogs (Maehr *et al.* 1990*a*, Dalrymple and Bass 1996). Secondary prey include raccoons (*Procyon lotor*), nine-banded armadillos (*Dasypus novemcinctus*), marsh rabbits (*Sylvilagus palustris*) (Maehr *et al.* 1990*a*) and alligators (Dalrymple and Bass 1996).

Panthers are typically shy, secretive animals that normally avoid human interaction. Interactions with humans can affect panther behavior. A study was conducted between 1994 and 1998 by Janis and Clark (1999) to study the effects of hunting and associated use of ORVs, on panthers. It centered on the panther population north of I- 75, including the Bear Island Unit in the original Preserve. This study focused on ORV trails used repeatedly by hunters who were seeking the same prey as panthers, primarily white-tailed deer and feral hogs. USFWS's "Biological Opinion" for the 2000 *Final Recreational ORV Management Plan* states the following on page 562 of the plan (NPS 2000*c*):

> *Janis and Clark (1999) surmise that the increase in the distance of panther locations from trails is "biologically minor" and probably related to prey behavior; i.e. white-tailed deer moving deeper into the forest to avoid ORV users. The decrease in panther use of the Bear Island Unit is balanced by an increase in use of private lands north of [Big Cypress National Preserve] as "refugia." The authors assert that this pattern would be of serious concern if panther habitat on private lands were lost.*

Fletcher and McCarthy (2011) conducted an updated analysis to assess effects found in Janis and Clark (2002). Their analysis supported the findings of Janis and Clark (2002) regarding the effects of hunting, and associated use of ORVs, on panthers. Particularly, Janis and Clark (2002) found:

> *Panther locations during the hunting season in Bear Island were, on average, only 180 meters farther from trails than before the hunting season. An increase of 180 meters probably has minor biological consequences. Furthermore, it is possible that the effect we observed was not a reaction by panthers to human activity, but a reaction of their prey.*

Fletcher and McCarthy (2011) also found that heightened ORV use has only weak effects on panther distribution, specifically an increase in use of forested wetlands, but that variation in standing ground water was more influential on panther distributions. The authors concluded:

> *Nonetheless, these results suggest that panthers and hunter ORV use can co-occur at least at the hunter ORV levels observed, and that forested wetlands may be disproportionately used by panthers during times of high hunter ORV use.*

Several government agencies are involved in panther management and research in south Florida and the Preserve. Under the ESA, USFWS has oversight responsibility to review the actions of other agencies in relation to federally protected species and to establish species recovery programs. The NPS has the primary responsibility for protecting the panther

(as well as other listed species) on lands under its jurisdiction. NPS efforts have concentrated on the distribution of panthers on NPS lands in the Preserve south of I-75 and east of State Road (SR) 29 and in Everglades National Park. FWC is responsible for panther research and management and has focused on panther home ranges and movement patterns, habitat selection and needs, food habits, demographic parameters, physical condition and health, and other life history and management questions. In addition, FWC has been involved in studies of the condition and health of deer in the Preserve as the panthers' main prey. The NPS and FWC cooperate for overall wildlife management in the Preserve.

In 2008, the *Florida Panther Recovery Plan* was updated with a third revision and released by USFWS (2008*b*). This 2008 plan includes the following recovery objectives:

- to maintain, restore, and expand the panther population and its habitat in south Florida and expand the breeding portion of the population in south Florida to areas north of the Caloosahatchee River
- to identify, secure, maintain, and restore panther habitat in potential reintroduction areas within the historic range, and to establish viable populations of the panther outside south and south-central Florida
- to facilitate panther recovery through public awareness and education

The NPS has an ongoing project monitoring the status of the panther population within the Preserve. The overall purpose is to provide information to management so that their decisions will support and enhance panther recovery and to determine the panthers' behavioral and/or demographic responses to natural events, management actions, and human impacts in south Florida.

The survey area is located in USFWS' Panther Focus Area, specifically the Primary Zone (Kautz *et al.* 2006) (Figure 3-14). A map depicting the locations of the available Florida panther telemetry is provided as Figure 3-4. A total of 2,104 telemetry locations have been recorded within the survey area from April 1981 to June 28, 2013. These telemetry points are from 73 Florida panthers in the survey area.

Uncollared Florida panthers are also known to inhabit the Preserve, as evidenced by a female with two kittens that were treed but not collared in Raccoon Point in March of 1999 per the *Draft Environmental Assessment for Oil and Gas POPs Collier Resources Company Landing Strips in the Big Cypress National Preserve* (Big Cypress National Preserve Undated).

In addition to collared panther telemetry data, several Florida panther denning locations have also been confirmed within the survey area (Figure 3-4). While Florida panther den sites are rarely utilized more than once, the historic denning activity may indicate the presence of habitat for future denning. The data for the documented den sites located within the survey area are summarized in Table 3-6.

Table 3-6. Florida panther den data from 1992-2014

FP No.	Den Date	No. of Kittens	Location
Dens Within Survey Area			
FP175	August 2010	2	Bear Island
FP175	January 2011	2	Bear Island
FP175	July 2012	3	Bear Island

The presence of the Florida panther is anticipated within the survey area.

MAJOR GAME SPECIES

According to the 2010 GMP/EIS for the Addition, the Preserve contains 13 major game species. Of these, the white-tailed deer, feral hogs, and wild turkey require special management consideration because of their importance to recreational hunters and because of their importance as prey species for Florida panthers (Maehr *et al.* 1990*a*, Dalrymple and Bass 1996). The current status of these three

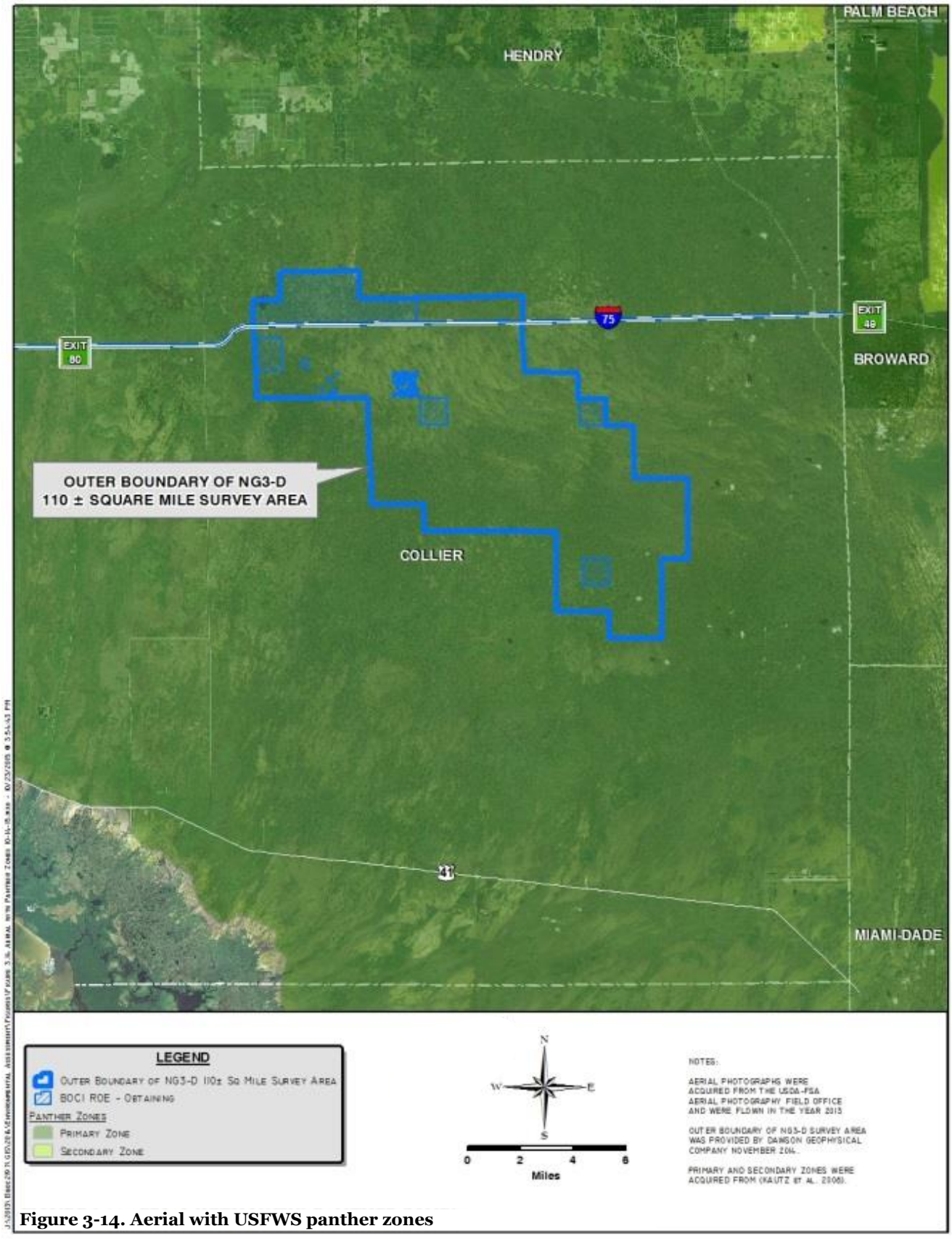


Figure 3-14. Aerial with USFWS panther zones

game species and their habitat is described below.

White-Tailed Deer

The white-tailed deer is the most important game species within the Preserve. In addition to being a popular large game animal, white-tailed deer area prey species for Florida panthers. In 1984, FWC began collecting data on the resident deer herd to estimate the population size, health and condition. Since the data collection began, the deer population within many areas of the Preserve has increased.

Feral Hog

European feral hogs are currently managed as a game animal by FWC and are second to white-tailed deer in importance as game animals. The current population of feral hogs in the Preserve has declined in recent years and is currently low. Reasons for low hog populations are not well understood; however, it is suspected that increased hunting pressure by panthers may be a factor.

Wild Turkey

Wild turkeys are also an important prey resource for the Florida panther and are one of the principal game animals for recreational hunters in the Preserve. Wild turkeys are common in the region. Turkey density tends to fluctuate from year to year due to environmental conditions (Powell 1965, Frye 1954). Mortality of turkey poults is high if heavy rains occur in April or May when young birds are susceptible to disease and drowning, but populations usually recover if conditions are favorable during the next breeding season (Powell 1965).

OTHER WILDLIFE

The Preserve is also home to a variety of other wildlife (i.e., fish, reptiles, birds, and mammals), which include some small game species. These species are discussed in earlier NEPA documents prepared by the NPS, including the 1992 EIS for the original Preserve's GMP; the 2010 EIS for the Addition GMP; and the 2014 Hunting Management Plan/EA. Due to the extreme differences in these species and their habitat use, they are not discussed in detail in this chapter. However, the potential impacts of the survey alternatives on wildlife species are discussed in detail in Chapter 4.

WATER QUALITY

As stated in the 1992 GMP for the original Preserve and the 2010 GMP for the Addition, the water in Big Cypress is relatively unpolluted. Concentrations of nitrogen, phosphorus, total organic carbon, and persistent pesticides, which often serve as indicators of pollution, are generally similar to concentrations in nearby, relatively uninhabited areas, and concentrations are considerably less than those of nearby urbanized areas. Water quality changes seasonally and diurnally in Big Cypress and is related to the natural hydrologic and biologic regimes. The seasonal recession of water levels triggers physical, chemical, and biological changes in water quality. During low water, diurnal fluctuations in dissolved oxygen are greatest as a result of the high concentration of organisms in the remaining water. During the day plants produce excess oxygen by photosynthesis. At night dissolved oxygen decreases as photosynthesis ceases and respiration demands are met.

The U.S. Geological Survey (USGS) has gathered, edited, and interpreted water quality data from a range of sources for the Preserve. Water quality data from selected sampling stations in the Preserve are discussed in detail by USGS at their South Florida Information Access site (sofia.usgs.gov).

HYDROLOGY

Surface Water

The land surface of the survey area is generally flat and slopes to the south and southeast. Surface water is generally present in lower elevations during the late summer and fall. Through the winter and spring months water levels usually recede to cypress dome areas and soils become dry and firm.

The seasonal high water occurs in late summer. The period from December through May is considered the dry season. In general, the water table across the site is at the surface during the

wet season and within a few feet below the ground surface during the dry season. During the dry season, there is typically standing water only in the deepest portions of the wetlands.

Surface water generally moves south and southeast, through the shallow sloughs, as sheet flow controlled by the surface topography and flows through man-made ditches and channels. The area is inundated during the wet season by water ranging from a few inches to several feet in depth (Klein *et al.* 1970). The velocity of sheet flow was calculated in the range of 800-1,500 feet per day with the highest velocities occurring during extreme high water conditions (Leach *et al.* 1972).

Surface water is ponded year-round in the central depressions of cypress dome areas in all but drought years. SFWMD maintains gauging stations at several locations near the survey area. In particular, the gauging stations at Mullet Slough in Section 30, Township 50 South and Range 33 East and Kissimmee Billy Strand in Section 25, Township 49 South, and Range 32 East are used by SFWMD and the NPS for water and land management purposes.

Groundwater

Groundwater is at or near the surface of the survey area at all times of the year. The groundwater resources of the area were examined most recently in the late 1990s by USGS and reported by Reese and Cunningham in *USGS Water-Resources Investigations Report 99-4213 (2000).* The depth to groundwater from seven observation wells in or near the survey area as described by USGS confirms the water table to be at or near the surface. The Reese and Cunningham report provides the most recent and definitive work on the near-surface aquifer conditions in this area. Other relevant studies have been conducted by Klein and Hull.

The Gray Limestone Aquifer is a marginally potable, generally low-permeability aquifer unit that occurs throughout Collier, Hendry, Broward, and Miami-Dade Counties that exhibits varying hydrogeologic conditions throughout its area of occurrence.[1] An east-to-west cross-section along Alligator Alley, the Gray Limestone Aquifer is mapped beneath a shallow, unconfined water table aquifer and confining and semi-confining units in the Pinecrest Sand unit.

The top of the Gray Limestone Aquifer has been mapped by Reese and Cunningham to be at depths of 60 to 70 feet below land surface. The aquifer unit in the survey area is 40 to 70 feet thick, occurring in thin and generally soft, unconsolidated limestone, shell beds, and quartz sand units generally recognized as part of the Tamiami Formation. The Pinecrest Sand unit contains a low-permeability water table aquifer and very low-permeability confining beds directly above the Gray Limestone Aquifer. The water quality in the Gray Limestone Aquifer is likely to be marginal for potable supplies with chloride levels above 150 mg/l.

These low-permeability materials of the water table aquifer and the upper confining unit that begin below the cap rock generally protect the Gray Limestone Aquifer from surface infiltration. Sheet flow across the surface has been termed "rejected recharge" by Klein and others in 1970 and along with evapotranspiration are the only processes that remove surface water.

SUBSURFACE GEOLOGIC RESOURCES

The geologic conditions at and near the surface of the survey area consist of a thin, semi-continuous, three to five foot thick limestone cap rock of cemented shell and siliciclastic materials. The cap rock is often described and mapped as a discrete limestone unit, but most recently it has been described as a duracrust formed by high evaporation and mineralization. This cap rock has proven difficult to breach in past geophysical source placement operations.

The survey area is relatively flat with elevations ranging from approximately 10 to 13 feet south of I-75 to elevations of mostly 13 to 16 feet

[1]The areal extent of the Gray Limestone Aquifer was expanded by the Reese and Cunningham work from studies reported in USGS Water Resources Investigations Report 87-4034 describing the surficial aquifer system in Broward County.

(National Geodetic Vertical Datum (NGVD)) north of I-75, with higher isolated islands in the northwest portion. The terrain is dotted with cypress domes formed around water filled depressions where the cap rock is absent. The water depth is often 5 to 8 feet in these depressions. Where present, the duracrust has formed over a sequence of Pleistocene and Pliocene-Pleistocene siliciclastic and poor to moderately indurated carbonate sediments that are up to 500 feet thick.

A review of shallow drilling information from the area has documented that this section of sediments is an alternating sequence of saturated shelly sand, shell beds and shelly limestone. The entire 500-foot thick sequence examined in boring logs is unconsolidated or at best moderately indurated. Below depths of 500 feet, the sedimentary unit is comprised of moderate to well indurated Miocene limestone of the Hawthorne Group.

The survey area is located in the South Florida Geologic Basin, which is a carbonate-rich sequence of beds more than 20,000 feet in thickness. The sediments of the basin are predominantly limestones and dolostones with anhydrites and minor siliciclastic sequences. The shape of the basin is a result of continental crustal movement and transcurrent faulting that has occurred since Jurassic time and the opening of the proto-Atlantic Ocean.

The Sunniland Trend is part of the hydrocarbon-bearing South Florida Geologic Basin located beneath southwest Florida. The Sunniland has produced over 120 million equivalent barrels of crude oil and non-commercial quantities of natural gas continuously since 1943 from the commercial oil fields. There are two producing oil fields within the Preserve, Bear Island and Raccoon Point, which have operated for decades.

AIR QUALITY

The Preserve is located in an air quality attainment area and not subject to restrictions for development activities under state air quality regulation programs. Ongoing air quality impacts associated with known air pollution sources in the vicinity of the survey area (ambient air impacts) and anticipated program-generated air pollution impacts (program-generated air impacts) have been evaluated.

The primary air emission source in the survey area is the motor vehicle traffic of I-75. By 2015, when POP activities are anticipated to occur, it is projected by Florida Department of Transportation studies that approximately 23,250 automobiles and trucks will traverse the I-75 (CDM Smith 2010) portion daily. Based on this traffic volume, 15,525 gallons of gasoline and diesel fuel can be expected to be consumed every 24 hours within the 10-mile, I-75 portion of the project.

Prescribed burns are a resource management tool employed by the NPS to control vegetation and fuel loads in the Preserve. Prescribed burns generate particulates (smoke) and a variety of combustion products, predominantly carbon monoxide. In addition to prescribed burns, wildfires are sparked from various sources including lightning strikes, discarded smoking materials and unattended campfires. These sources contribute combustion products and particulates into the air on an intermittent basis.

CULTURAL/ARCHEOLOGICAL RESOURCES

According to the NPS/SEAC and the Florida Master Site File (FMSF) databases, there are more than 400 recorded archeological sites in the Preserve. In addition, currently there is no available database for ethnographic resources such as cultural IRA's in the Preserve, and SEAC anticipates that there are several hundred unrecorded sites in the Preserve, some of which would be included in the survey area. Recorded sites and anticipated cultural resources may include prehistoric habitation areas, burial areas, special use camps, 19th Century military camps, fortifications, trails, and historic Seminole or Miccosukee camps and sacred areas, as well as 20th century hunting and lumber camps. Many of the recorded resources are associated with discrete environmental features within the Preserve's vast expanse of wetlands, sloughs, strands and hammocks. Many habitation sites, especially black dirt middens, are recorded in hardwood hammocks, rising above the surrounding terrain; often near deep sloughs, strands and vast marshlands.

NOISE/SOUNDSCAPES

In accordance with NPS *Management Policies* (2006*a*) and Director's Order 47: *Sound Preservation and Noise Management* (NPS 2000*b*), an important part of the NPS mission is preservation of natural soundscapes associated with NPS units. The NPS defines a soundscape as (NPS 2000*b*):

… the total ambient acoustic environment associated with a given environment (sonic environment) in an area such as a National Park. It is also refers to the total ambient sound level for the park. In a National Park setting, this soundscape is usually composed of both natural ambient sounds and a variety of human-made sounds.

The NPS Natural Sounds Program differentiates between the use of *sound* and *noise*, since these definitions have been used inconsistently in the literature (NPS 2011*c*). Humans perceive *sound* as an auditory sensation created by pressure variations that move through a medium such as water or air and is measured in terms of amplitude and frequency (Harris 1998; Templeton and Sacre 1997). Although *noise* is sometimes incorrectly used as a synonym for sound, the NPS defines noise as "an unwanted or undesired sound, often unpleasant in quality, intensity or repetition" (NPS 2000*b*). Sounds found desirable during times of rest and relaxation are referred to as natural quiet and include natural, outdoor ambient sounds without the intrusion of human-caused sounds.

Sound levels are usually measured in A-weighted decibels [dB(A)], and a descriptor such as the energy equivalent noise level (Leq) is commonly used to account for fluctuations of sound over time. Generally, a 3 dB(A) increase in sound level is considered the minimum threshold at which most people can detect a change in the sound environment; an increase of 10 dB(A) is perceived as a doubling of the sound level.

Natural sounds throughout the Preserve – including flowing water, animals, and rustling leaves – are not considered noise. The enjoyment of natural sounds in the Preserve enhances the visitor's experience, and natural quiet can be essential in order for some individuals to achieve a feeling of peace and solitude. However, sound levels in the Preserve can vary greatly, depending on the area and activities. Ambient sound levels in the Preserve generally range between 24 dB(A) and 40 dB(A), depending on the contribution of sound by insects (NPS 2010*a*). These levels increase to between 35 dB(A) to 78 dB(A) during the wet season (Law 1992). Since environmental conditions in the Addition are similar to those in the original Preserve, these noise levels are also representative of those that are expected in the Addition. Some of the sounds that can typically be heard in areas of the Preserve are listed in Table 3-7.

Table 3-7. Typical sounds in Big Cypress National Preserve

Sound	Approximate Level [dB(A)]
Threshold of human hearing at 1 kHz	0
Leaves rustling	20
Whispering (1.5 meters/5 feet)	20
Crickets (5 meters/16 feet)	40
Distant bird calls	45
Rainfall	50
Normal conversation	60
Freeway traffic	70
Motorboats	85 – 115
Thunder	100 – 120
Gunfire	150 – 170

Sources: Center for Hearing and Communication 2011, NPS 2011*c*

There are no absolute standards that define unacceptable levels, duration, or qualities of environmental noise (NPS 2010*a*). The U.S. Forest Service (1980) has established subjective audibility guidelines to assess noise impacts for various recreational opportunities. While these guidelines do not apply, they are included in Table 3-8 as an example, and they relate recreational opportunities to the corresponding acceptable level above ambient sound levels. The U.S. Department of Energy suggests that there is a "strong likelihood of individual complaints" when the intruding noise is greater than 10 dB above ambient sound levels. Complaints about noise require listeners to be within earshot, which means that the measure of noise impacts

depends in part on human presence in a given area. In the vast backcountry of the Preserve, there usually are few if any persons present to hear noises.

Table 3-8. Acceptable levels above ambient sound levels for various recreational opportunities

Recreational Opportunity	Acceptable Level (dBA)
Appropriate for primitive recreational area; intruding noise not detectable	0
Appropriate for trail camps; will not wake most sleepers; intruding noise normally not detectable	5
Appropriate for undeveloped roadside camps and those accessible by four-wheel drive and all-terrain vehicles	10
Appropriate for roadside camps accessible by highway vehicles	20
Appropriate for highly developed campgrounds in a quiet, suburban neighborhood	40

Source: U.S. Forest Service 1980

Noise

Current noise sources in the Preserve include: human noise sources (e.g., NPS management activities, recreational activities), hunting-related firearm use, ORVs, existing oil and gas development noise, aircraft noise, and highway noise (NPS 2010*a*). While some of these noise sources exist in locations throughout the Preserve, noise from hunting, ORVs, and oil and gas development is mainly confined to a few discrete locations in the original Preserve.

Hunting Noise. Hunting activities in the Preserve include bow, muzzleloading, and modern gun seasons. Gun hunting is permitted only during limited times of the year. Sound levels for hunting activities would primarily be associated with the weapons used for hunting (e.g., rifles or shotguns) or ORVs used by hunters for access (see discussion below). The sound of an average rifle ranges from 155 dB(A) to 170 dB(A), depending on weapon type (Center for Hearing and Communication 2011). The sound of an average shotgun ranges from 150 dB(A)to 160 dB(A) (Center for Hearing and Communication 2011). Using a commonly accepted sound level drop-off rate of a 6 dB reduction in noise for every doubling of distance from the source, and not accounting for the effects of terrain, ground cover, and atmospheric conditions; firearm noise of this magnitude would be expected to be plainly evident at distances of more than 2 miles. Such noises associated with hunting in the Preserve would be expected to be sporadic and occur only during hunting seasons and hours.

ORV Noise. Noise levels from ORVs have been measured to range between 78 dB(A) to 91 dB(A) at near distances depending on size, wheel/track configuration (but all powered by the same types of muffled automotive engine), and soil type to essentially ambient sound levels of 43 dB(A) to 60 dB(A) at 300 feet distance (Duever *et al.* 1981). Management of ORVs in the original Preserve is guided by the *Final Recreational Off-Road Vehicle Management Plan Supplemental Environmental Impact Statement* (NPS 2000*c*). Management of ORVs in the Addition is guided by the Addition GMP (NPS 2010*a*). The Addition GMP adopted the vehicle specifications of those established in the 2000 Final Recreational ORV Management Plan, which includes the requirement that "all wheeled vehicles would be required to have a muffler in good working condition and inconstant operation."

Oil and Gas Development Noise. The Preserve soundscape can be affected by oil and gas exploration and development activities, including geophysical operations, drilling, production, abandonment, and reclamation. Most of these impacts are unrelated to the alternatives considered in this document, because only geophysical activities are proposed. In an oil field's long life cycle, drilling activity is short-term and usually produces the highest level of noise compared to the much longer and quieter production period. According to the Addition GMP (NPS 2010*a*), noise levels associated with drilling operations can range from 93 dB(A) within 10 feet of a drill rig to ambient (40 dB(A)) at distances of 10,000 feet or greater from the rig, depending on the type of activity taking place. Measured 1990 production operation noise levels at Raccoon Point oil field ranged between 85 dB(A) near a generator to 70 dB(A) at the edge of the production pad (Law

1990).

Aircraft Noise. Helicopter use is of particular interest within the Preserve because this type of aircraft is often used to access the backcountry. The acoustical impact of a helicopter is a function of the size and the type of engine used as well as the movement of the rotor blades through the atmosphere as they produce lift (NPS 2010*a*).

Highway Noise. Ambient noise in the vicinity of the survey area, generated primarily from I-75 traffic, has been studied extensively. Based upon local I-75 traffic volumes at interstate highway speeds, the Federal Highway Administration traffic noise prediction model indicates that automobiles, SUVs and trucks will generate peak noise levels of 75-78 dB(A) at a distance of 50 feet from the roadway, which will attenuate to 50-55 dB(A) at a distance of 1,000 feet from the roadway. To an observer at a distance of 1,000 feet, traffic noise will begin to blend with other natural background noise so that traffic will usually be audible only intermittently. At distances of several miles an observer can hear, in still air, specific noise sources such as loud, poorly muffled truck exhaust. Within the Preserve, dense vegetation between the observer and a source will cause higher-frequency (shorter wavelengths) noise to attenuate more rapidly, while low-frequency noise (longer wavelengths) will be audible for greater distances.

VISUAL QUALITY

The Preserve has desirable visual qualities due to its on-site habitats. The Preserve lands are virtually flat throughout the survey area, with areas of dense vegetation such as the cypress and hardwoods, as well as areas of sparse vegetation above the herbaceous stratum such as marsh lands and prairies. Per the 1992 GMP, the Sunniland Trend (which encompasses the survey area), is the most probable productive oil and gas area within the Preserve and includes a surface mosaic of old-growth pine, hardwood hammocks, marsh, and prairie. Due to the mixture of vegetation habitats, long-distance views are uncommon. Vast marsh and prairie habitats could potentially afford long-distance views up to two or three miles; however, these expanses are uncommon, and most visual expanses are anticipated to be less than a mile.

VISITOR USE AND PERCEPTIONS

Recreational Visitation Data

Table 3-9 shows the annual number of recreational visitors to Big Cypress National Preserve from 1989 to 2010. Approximately 400,000 to 500,000 recreational visitors were recorded annually at the Preserve between 2000 and 2004. In 2005, the Preserve changed its counting methods, adding visitor counts from the Oasis Visitor Center parking lot and vehicle counts from the east and west ends of Loop Road. This change contributed to the higher visitation figures from 2005 to present (NPS 2010*a*).

Table 3-9. Recreational visits (1989-2010)

Year	Recreational Visitors
1989	81,157
1990	127,790
1991	159,172
1992	212,682
1993	234,830
1994	294,307
1995	365,463
1996	424,920
1997	462,553
1998	474,895
1999	503,110
2000	505,062
2001	409,771
2002	449,481
2003	400,902
2004	385,194
2005	768,687*
2006	825,857
2007	822,864
2008	813,790
2009	812,207
2010	665,523

Source: NPS 2011*b*
*Change in counting method

Length of Visit. The Visitor Services Project and Cooperative Park Studies Unit of the University of Idaho conducted a general visitor survey for the Preserve in the spring of 2007 (Papadogiannaki *et al.* 2007). As part of the 2007 study, visitors to the Preserve were asked the number of consecutive days spent visiting

the Preserve. Figure 3-15 summarizes the results of those responses (Papadogiannaki *et al.* 2007).

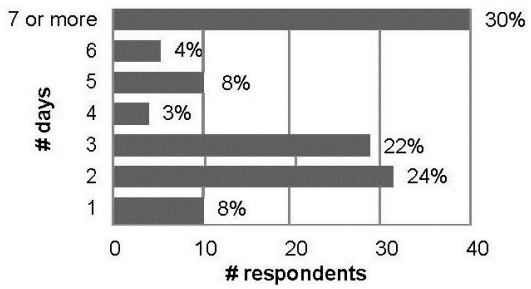


Figure 3-15. Number of days spent visiting the Preserve

Source: Papadogiannaki *et al.* 2007
N = 131 visitor groups

Visitor Activities. As part of the 2007 visitor study, one of the questions that visitors were asked was, "On this visit to the Big Cypress National Preserve, what activities did you and your group participate in?" Figure 3-16 summarizes the results of those responses.

Recreational Opportunities

According to the Addition GMP (NPS 2010*a*) the primary recreational activities within the Preserve include the following, with the areas in which the activities are currently permissible noted in parentheses:

- Frontcountry driving, sightseeing, and visitor centers (original Preserve)
- Walking and hiking (original Preserve and the Addition)
- birding and wildlife viewing (original Preserve and the Addition)
- paddling (original Preserve and the Addition)
- motorboating (original Preserve and limited in the Addition)
- camping (original Preserve and the Addition)
- bicycling (original Preserve and limited in the Addition)
- riding ORVs (original Preserve)
- fishing and frogging (fishing permissible in original Preserve and the Addition; frogging permissible in the original Preserve)
- hunting (original Preserve)
- opportunities to experience peace and quiet in a natural environment (original Preserve and the Addition)

Preserve visitor use features in or near the survey area are depicted in Figure 3-17.

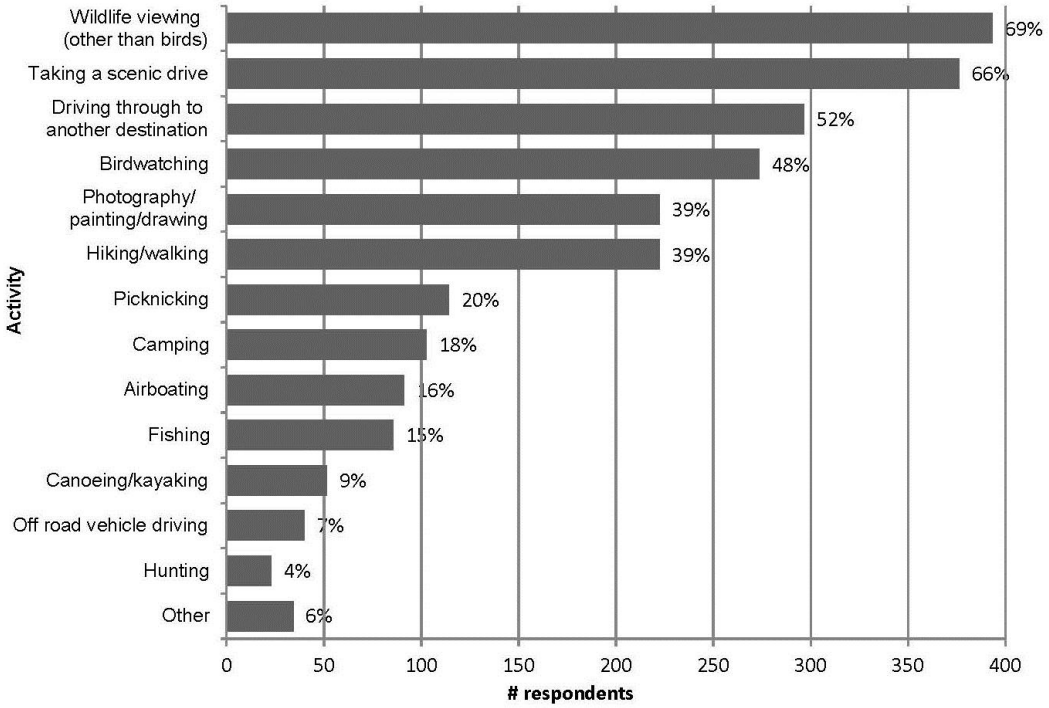


Figure 3-16. Visitor activities participated in

Source: Papadogiannaki *et al.* 2007
N = 570 visitor groups
Note: Total percentages do not equal 100 because visitors could select more than one answer.

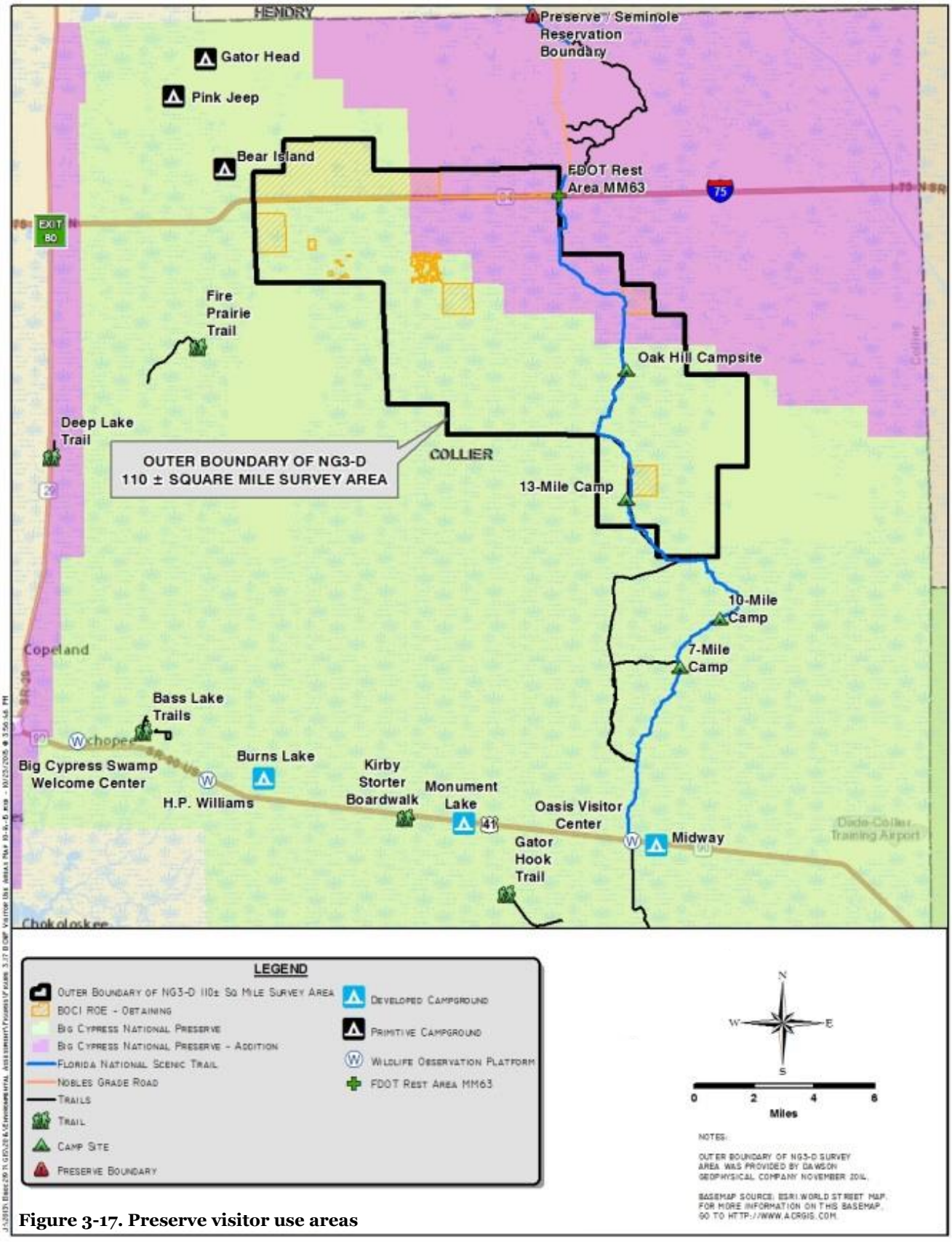


Figure 3-17. Preserve visitor use areas

WILDERNESS

According to Director's Order 41: *Wilderness Stewardship* (NPS 2011*e*), wilderness character can be measured by five qualities that the NPS can utilize in wilderness planning, stewardship, and monitoring. These five qualities are practical and measureable and are rooted in the Wilderness Act:

- Untrammeled – Wilderness is essentially unhindered and free from modern human control or manipulation.
- Natural – Ecosystems are substantially free from the effects of modern civilization.
- Undeveloped – Wilderness retains its primeval character and influence and is without permanent improvements or modern human habitation.
- Opportunity for Solitude or Primitive and Unconfined Recreation – Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.
- Other Features of Value – Wilderness may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

According to the Addition GMP (NPS 2010*a*), these values allow visitors to learn about and experience the contrasting scenery of the Preserve's various plant communities, archeological resources, and water-dependent natural systems. All of these resources and values contribute to and enhance the wilderness character of the area.

Wilderness Resources in the Preserve

There is currently no congressionally designated wilderness in the Preserve. However, the Addition GMP (NPS 2010*a*) identifies 47,067 acres of land in the Addition to be proposed for designation as wilderness in addition to 24,196 acres eligible but not proposed (Figure 3-18). In June 2015, the NPS also identified approximately 188,323 acres in the original Preserve as being eligible to be proposed as wilderness (NPS 2015). These areas have the characteristics of wilderness identified above. Lands identified as being eligible for wilderness designation, wilderness study areas, proposed wilderness, and recommended wilderness (including potential wilderness) are to be managed as a matter of agency policy to preserve the wilderness character and values in the same manner as designated wilderness until Congress has acted on the recommendations (NPS 2011*a*).

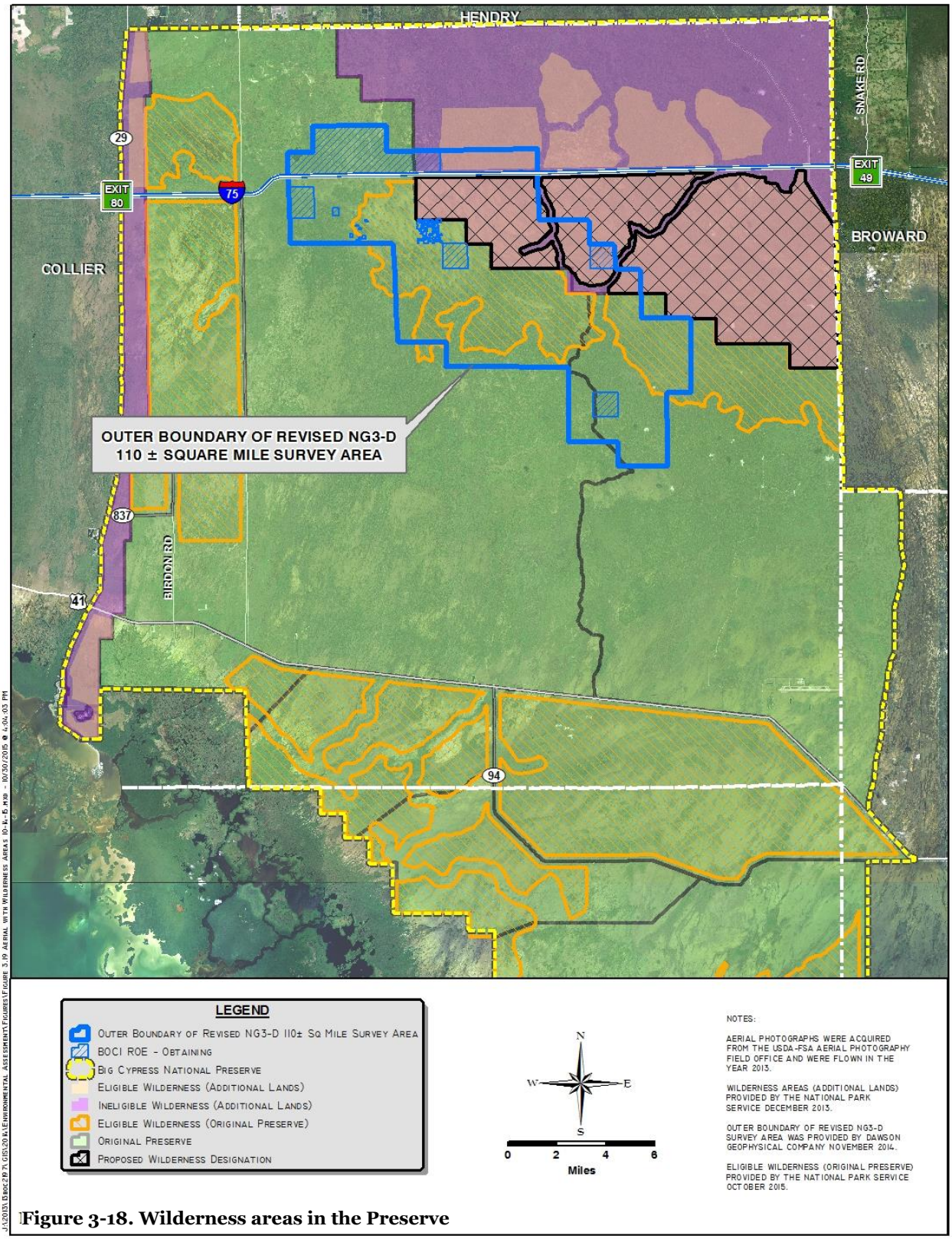


Figure 3-18. Wilderness areas in the Preserve

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

For each impact topic discussed in "Chapter 3: Affected Environment," the environmental consequences, or potential impacts, of each of the alternatives are analyzed. Chapter 4 analyzes both anticipated beneficial and adverse impacts that would likely result from the implementation of any of the alternatives considered. This section also explains the general methodology used to analyze impacts.

The general approach for measuring the effects of the alternatives on each resource category includes general analysis methods as described in basic assumptions and methods used to evaluate the cumulative effects. The analysis of impacts follows CEQ guidelines and Director's Order 12 procedures (NPS 2011*a*).

Potential impacts of all alternatives are described in terms of type, context, duration, and intensity. In some cases, alternatives are grouped together in the analysis when impacts were determined to be similar in order to minimize redundancy.

Each alternative is compared to a baseline to determine the context, duration, and intensity of the resource impacts. For purposes of the impact analysis, the environmental baseline conditions are those described in Chapter 3. In the absence of quantitative data, best professional judgment was used to determine impacts. In general, impacts were determined using existing literature, federal and state standards, and consultation with subject matter experts, Preserve staff, and other agencies.

For the purposes of analysis the following assumptions are used for all impact topics:

Beneficial. A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse. A change that declines, degrades, and/or moves the resource away from a desired condition or detracts from its appearance or condition.

Context. The affected environment within which an impact would occur, such as local, Preserve-wide, regional, global, affected interests, society as whole, or any combination of these. Context is variable and depends on the circumstances involved with each impact topic.

Duration. The duration of the impact varies according to the impact topic evaluated. However, for the purposes of this analysis, the following assumptions are used for all impact topics:

Short-term impacts — Those impacts occurring in the immediate future or during plan implementation, similar to what has been documented through historic seismic surveys conducted in the Preserve.

For natural systems, recovery would occur in less than three years (and in most cases within one year or growing season).

For wildlife, individuals would avoid the seismic survey activities around a specific place where humans and equipment are present for a short period of time (most likely a few minutes in the majority of cases).

Long-term impacts — Those impacts occurring after plan implementation through the next 10 years; for natural systems, recovery would take more than three years.

Analysis Area

The analysis area for each of the impact topics is shown in Table 4- below.

Table 4-1. Analysis area by impact topic

Impact Topic	Analysis Area
Vegetation, Habitat, Soils, Protected Plants, Wildlife Species, Major Game Species, Protected Wildlife Species, Wetlands, Water Quality, Hydrology, Subsurface Geologic Resources, Air Quality, Cultural/ Archeological Resources	Survey Area
Noise/ Soundscapes, Visual Quality, Visitor Use and Perception	All visitors and NPS staff during their time within the Preserve and all members of the public not within the Preserve but otherwise directly impacted by visitor activities occurring in the Preserve lands
Wilderness	The boundaries of the Preserve

Assumptions

For the purposes of analysis in this EA, it was assumed that all program activities will comply with state, federal, and local regulations and would be conducted in accordance with the 1992 and 2010 GMP/EISs for the original Preserve and Addition, respectively, and with the 1992 MMP.

Cumulative Impacts Analysis

Cumulative impacts are defined in the CEQ implementing regulations of NEPA (40 CFR 1508.7) as:

> *… the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

This section provides a broad overview of past, present, and reasonably foreseeable future actions the collective impacts of which could be increased by the impacts of the alternatives.

Table 4- shows a selection of the past, present, and reasonably foreseeable future actions which could be affected by the impacts of the alternatives. Their impacts were considered in conjunction with those evaluated for the survey alternatives to determine whether incremental but collectively significant impacts could occur.

Table 4-2. Selected past, present, and reasonably foreseeable future actions reviewed for cumulative impact in conjunction with the alternatives

Prescribed Burning Operations. Noise from fire, equipment, radio communications, associated aviation operations, etc./smoke/human presence, noise and movement
Recreational and Subsistence Hunting, Fishing and Trapping Activities. Human presence, noise and movement (up to 800 hunters for 152 days per year for sport hunting in the Preserve, fishing and frogging are permitted year-round)/active quarry pursuit/noise associated with weapons discharges/ORV equipment and movement in the original Preserve
Recreational Hiking and Camping Activities. Human presence, noise and movement/noise, smoke, and odor associated with camp fires and other camping activities
Federal and State Agency Wildlife Research and Management Activities. Human presence, noise and movement/species pursuit/fixed-wing and helicopter aviation operations/direct species interaction – collaring, tagging, trapping, anesthesia, etc./sustained noise – equipment, radios, etc.
Recreational ORV Activities. Human presence, noise and movement/ORV equipment noise and movement (up to 2,000 ORVs are allowed in the original Preserve 305 days per year)
Exotic Vegetation Control Removal Operations. Human presence, noise and movement/sustained heavy equipment noise/herbicide use and application equipment noise
Law Enforcement Activities. Human presence, noise and movement/ORV/ helicopter/noise and movement/flashing light (I-75 and other state roads)
Cultural Uses (by Seminole and Miccosukee Tribes). Human presence, noise and movement/ORV noise, presence, and movement
Crude Oil and Natural Gas Exploration and Production Operations. Human presence, noise and movement (brief for exploration operations/sustained (but localized) for production operations/equipment presence, noise and movement/vehicle movement along all-weather roads/short-term, production-related construction activities (not applicable to the NG3-D survey) well drilling and production (not applicable to the NG3-D survey)
Florida Department of Transportation (FDOT) I-75. High level of sustained automobile and semi-tractor trailer movement and noise of variable frequencies and constant duration up to one mile from roadway/extensive human presence, noise and movement at rest areas (Mile Marker (MM)-63 in this case), and to a lesser degree at recreational parking areas, of relatively constant duration – acceleration/deceleration lanes, parking, waste treatment facilities, outdoor picnic areas, north and south Preserve recreational access facilities/air quality/interstate highway law enforcement activities/traffic accidents/aviation operations/intermittent roadway construction and maintenance activities

VEGETATION, HABITAT, SOILS, WETLANDS, AND PROTECTED PLANT SPECIES

Alternative 1 (No Action) – No Survey by BOCI

Analysis. No adverse impacts to vegetation, habitat, soils, wetlands, and protected plant species would result from implementation of Alternative 1. These resources have been disturbed in the past, largely from unrestricted ORV use. Ongoing management, including restriction of ORVs to designated trails, has allowed for natural recovery from past disturbances. Alternative 1 would allow this recovery to continue, and habitat enhancement would be further enhanced through active fire and exotic plant management.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts to vegetation, habitat, soils, wetlands, and protected plant species in the survey area can be attributed primarily to past and ongoing recreational ORV use. Prior to implementation of the Preserve's 2000 Recreational ORV Management Plan, ORVs in the original Preserve portion of the survey area were largely unrestricted as to where they could travel. Since 2010 ORVs have been confined to designated trails. Because recreational ORV use in the survey area is now limited, and many of the areas impacted from past ORV use have recovered and improved through ongoing fire and exotic plant management, the cumulative impacts to vegetation, habitat, soils, wetlands, and protected plant species are minimally adverse. Implementation of Alternative 1 would add no measurable to these impacts.

Alternative 2 (Proposed Action) – Seismic Survey Using Vibroseis Buggies

Analysis. Short-term adverse vegetative and habitat impacts would result primarily from the movement of Vibroseis buggies along source lines and the use of the proposed staging areas for equipment storage and daily mobilization. Potential short-term disturbances to vegetation could occur through the matting down of plants, scraping of trees, exposure of plant roots; or bending, breaking, and trimming of low shrubby and woody undergrowth. There would be some potential for the spread of nonnative invasive plant species through the operation of vehicles.

Potential short-term impacts to soils could occur through soil rutting and soil compaction. Seismic survey activities in wetlands would be expected to produce greater impacts than those to upland areas. Equipment might get stuck at points during survey operations and might need to be extricated through assistance from other vehicles. This may result in localized soil disturbance, which would need to be remediated on site.

Impacts to vegetation and soils would be partially mitigated by conducting the survey operation in the dry season only, when soils are not saturated and are more resilient to vehicular activity. BOCI conducted a field demonstration in the survey area on April 24, 2015, to observe how a Vibroseis buggy would perform in wetlands typical of those expected to be encountered during the survey. Although the test vehicle got stuck and had to be extricated by other equipment, much of the wetland habitat traversed by the buggy was minimally impacted and showed signs of recovery six months later (Appendix A).

Two plant species, Florida prairie-clover (*Dalea carthagenensis floridana*) and Florida pineland crabgrass (*Digitaria pauciflora*), could be present in the survey area. Both species are identified by USFWS as candidate species for federal listing. The probability of occurrence of these species is low, as supported by the USFWS determination of "may affect, but not likely to adversely affect" for these species (see pages 7 and 8 of Appendix C). In the event that these species are observed prior to or during survey operations, observation reporting protocols would be initiated with the appropriate agencies so that sufficient setbacks and survey design modifications could be implemented pursuant to the advice and direction of agency personnel.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts are the same as for Alternative 1. Vibroseis buggies in Alternative 2 would use existing trails to the extent practical; however, many of the formerly used trails have been largely grown over, and

the extent of trails in the Addition portion of the survey area is very limited, as the Addition has been closed to ORV use since the NPS acquired most of the land in 1996. Implementation of Alternative 2 would contribute a small adverse increment to these impacts.

Alternative 3 – Seismic Survey Using Explosive Charges

Analysis. Potential impacts to vegetation, habitat, soils, wetlands, and protected plant species would be similar to Alternative 2. Although Vibroseis buggies would not be used in this alternative, they would be replaced by drill rigs and other equipment using the same source lines as Alternative 2. Vegetation, habitat, soils, wetlands, and protected plant species would be similarly impacted, and impacts would extend over two or more dry seasons.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts are the same as for Alternative 1. Implementation of Alternative 3 would contribute a small adverse increment to these impacts.

PROTECTED WILDLIFE, MAJOR GAME SPECIES, AND OTHER WILDLIFE

Alternative 1 (No Action) – No Survey by BOCI

Analysis. Continuation of ongoing recreational activities under Alternative 1, including ORV use, hunting, hiking, and camping, would result in minimal adverse impacts to wildlife, primarily from avoidance of human activity. Continued habitat improvement from prescribed fire and exotic plant control would have beneficial impacts. The total impact to protected wildlife, major game species, and other wildlife from implementation of Alternative 1 would be beneficial.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts to protected wildlife, major game species, and other wildlife species in the survey area are primarily attributable to past and ongoing recreational activities, including ORV use, camping, hiking, and hunting. Because recreational activity in the survey area is limited, and wildlife have largely adapted to human presence, the existing cumulative impacts to protected wildlife, major game species, and other wildlife species from recreational activity are minimal. Implementation of Alternative 1 would contribute no measurable increment to these cumulative impacts.

Alternative 2 (Proposed Action) – Seismic Survey Using Vibroseis Buggies

Analysis. Anticipated adverse impacts to protected wildlife, major game species, and other wildlife species resulting from Alternative 2 are expected to be short-term. The following provides a general discussion which would apply to most wildlife species discussed under this chapter. A detailed discussion for each wildlife grouping is included below.

Alternative 2 could potentially have some impact on protected wildlife, major game species, and other wildlife in the Preserve. Wildlife could display avoidance behaviors as a result of the seismic survey activities. Some species could be subjected to short-term stress during their breeding season (Davis *et al.* 2010). Although not anticipated, mortality/injury to wildlife could also occur.

Elements of Alternative 2 could also have beneficial effects on protected wildlife species through new data acquisition, collection, and sharing with agency personnel. If additional nesting sites for red-cockaded woodpeckers or other potential sensitive areas to wildlife were discovered through the scouting efforts concurrent with the survey, these locations would be GPS located, biological information would be gathered, and the results would be shared with appropriate agencies and personnel. These data would provide the applicable agencies with new information that could be used to help them better manage, research, and understand protected wildlife in the area.

Red-Cockaded Woodpecker. Survey field operations could potentially have an adverse effect on red-cockaded woodpecker nesting and reproduction. USFWS has identified the red-cockaded woodpecker typical nesting season to be April 15 through June 15, which coincides with the proposed seismic survey timeframe (December – May). The survey would occur

during the time when red-cockaded woodpeckers typically court, lay and incubate their eggs, and raise their nestlings. However, it is estimated that approximately 25 percent of active clusters in the Preserve may consist of male-only groups, which would not have breeding activities taking place (Davis *et al.* 2010). Thus, potential impacts to these clusters would be much less.

Bald Eagle. Survey field operations could potentially have an adverse impact on bald eagle nesting and reproduction. USFWS identifies the primary bald eagle nesting season to be October 1 through May 15, which coincides with the proposed seismic survey timeframe (December – May). The survey would occur during the time when most bald eagles would be incubating their eggs and brooding their eaglets.

Wading Birds. The wading birds evaluated under this category include the wood stork, little blue heron, snowy egret, roseate spoonbill, reddish egret, tri-colored heron, and white ibis. They are grouped together for the purpose of this analysis and discussion.

Adverse impacts to foraging flocks of wading birds and/or their nesting colonies could potentially occur from Alternative 2. Specifically, foraging flocks of wading birds could be flushed from their feeding sites, which in the worst case could reduce their energy intake and ultimately lower fitness of nestlings or adults. Potential impacts on nesting colonies could also potentially occur, resulting in reduced nest attendance, and in the worst case, nest abandonment.

Wood storks forage annually in the Preserve when lowering water levels provide concentrations of fish (2000 NPS ORV Management Plan). Other wading birds are known to forage throughout the survey area because ample forage opportunities exist. If seismic survey activities cause wading birds to flush during foraging, they would likely move a short distance and resume feeding and return to their original foraging location after the disturbance passes (Davis *et al.* 2010). Since Alternative 2 would be transitory and generally utilize a "one pass" design, lasting impacts to foraging wading birds would not be expected because birds foraging at a given location would experience a disturbance only once at that location. Further, Alternative 2 activities would avoid passing through open-water areas and would be slow-moving and gradual to minimize potential disturbance. Studies have shown that humans that slowly approached roosting waterbirds flushed fewer birds than did humans moving rapidly (Knight and Cole 1995).

Other Protected Birds. Other protected birds discussed under this category include Audubon's crested caracara, Everglade snail kite, Florida burrowing owl, Florida sandhill crane, and limpkin, which are grouped together for purpose of this analysis and discussion.

Survey field operations could potentially have an impact on the foraging and nesting of these other protected birds because the seismic survey timeframe (December – May) coincides with the nesting seasons of these species. However, due to the current range and known occurrences of the caracara and the Florida burrowing owl and habitat use of the Everglade snail kite, Florida sandhill crane, and limpkin, these species are not anticipated to be affected by Alternative 2 in a lasting manner.

No caracaras have been documented within the survey area. In addition, the Preserve is located in the southernmost extent of the caracara's Florida range. As such, the majority of the survey area is not expected to be utilized by the caracara. However, no foot or ORV traffic would occur within the USFWS designated Primary Zone (i.e., radius of 300 meters (985 feet)) of an active Audubon's crested caracara nest, if observed. To further reduce potential caracara disturbances, a 152-meter (500-foot) buffer would be established vertically and applied to helicopter activity above any documented Audubon's crested caracara nest.

The survey area is located outside of designated critical habitat but within the USFWS Consultation Area for the Everglade snail kite. There is one documented Everglade snail kite nest within the overall program area. No foot, ORV, or helicopter traffic would occur within the USFWS designated No-Entry Buffer Zone (i.e., radius of 150 meters (500 feet)) or Limited Activity Buffer Zone (i.e., radius of 500 meters (1,640 feet)) of an active Everglade snail kite.

Florida sandhill cranes and limpkins are known to occur throughout the Preserve. However, the general avoidance of standing water by survey activities would greatly minimize any potential disturbance to the foraging and nesting habitats of these species, as well as the Everglade snail kite. Because Florida sandhill cranes frequently forage and nest in wet prairies even when standing water is not present, survey crews would be trained to identify crane nests in order to avoid nesting sites. Although not previously documented within the Preserve or anticipated to occur within the survey area, the Florida burrowing owl could potentially occur based on a review of FWC literature.

<u>*Florida Panther.*</u> Survey field operations could potentially have an effect on Florida panther behavior and denning. Panther mortality or injury would be highly unlikely to occur.

Florida panthers have been documented to occur throughout the Preserve. The primary anticipated behavioral response by Florida panthers in close proximity to program operations would be avoidance/habituation. The study *The Effects of Recreational Deer and Hog Hunting on the Behavior of Florida Panthers* (Janis and Clark 1999) indicates that panthers stayed farther from recreational ORV trails during hunting season in the Bear Island portion of Preserve. The study states that panthers could have been modifying their activity to the reactions of their prey (i.e. white-tailed deer and wild hogs); however, it is likely that the panther's movement away from trails is a direct response to human activity. Janis and Clark conclude that there are only minor biological consequences to this response. Fletcher and McCarthy (2011) conducted an updated analysis that supported the earlier findings regarding the effects of hunting and associated use of ORVs on panthers. As documented by previous research, human activity and ORV use would not result in lasting behavioral consequences to the Florida panther.

Panther denning activity is known to occur year round; however, 81 percent of denning activity occurs between March and July, with the most births occurring in July (USFWS 1999). Seismic survey activities would occur from December through May, which overlaps the earliest part of the Florida panther denning period. *Early Maternal Behavior in the Florida Panther* (Maehr *et al.* 1989) states that panther dens are generally surrounded by vegetation nearly impenetrable to investigators. *Day beds, natal dens, and activity of Florida panthers* (In Maehr *et al.* 1990*b*) found that day rest sites and natal dens of Florida panthers were dominated by saw palmetto at 66 percent of the dens studied, with upland vegetation used as cover 75 percent of the time. Since the survey activities would not take place within impenetrable vegetation, Florida panther dens would not be expected to be directly impacted. Additionally, meetings would be held with NPS and FWC panther experts to determine potential denning areas within the vicinity of the survey area during the survey operations. BOCI or designated representatives would contact NPS and FWC biologists regarding the monitoring of radio-instrumented panthers in and around the survey area. If monitoring suggests panthers are denning in or near the survey routes, appropriate actions would be taken as recommended by NPS and FWC staff. In general, the den sites would be buffered by approximately 100-200 meters, as recommended by FWC. However, each den would be evaluated on a case-by-case basis, and buffers would be coordinated through FWC and NPS.

Female panthers have not been observed to abandon dens after visits by researchers (Davis *et al.* 2010). As such, the transitory nature of the survey should not affect the overall success of a panther den even if the survey came in close proximity. Also, panthers are less likely to be active during daylight hours, so daytime operations would not disturb panthers at their most active time (nighttime). FWC stated in their February 20, 2014 letter that FWC staff does not believe that the survey work would impact Florida panther habitat.

Panther mortality/injury would not be expected to occur, since the survey equipment would move attentively at relatively slow speeds, and panthers would likely avoid the survey activities. In addition, access points to the survey area would be kept secure to prevent panthers from breaching the I-75 wildlife fencing.

<u>*Other Protected Mammals.*</u> Other protected mammals that are discussed under this category

include the Florida black bear, Everglades mink, Big Cypress fox squirrel, and Florida bonneted bat, which are grouped together for purpose of this analysis and discussion.

Survey field operations could potentially have an impact on these mammals' behavior. Mortality/injury would not be expected to occur in association with the survey, since the survey equipment would move attentively at relatively slow speeds, and these mammals would likely avoid the survey activities.

While encounters of Florida black bears during survey activities would be probable, the likelihood of exploratory activities permanently displacing a bear from its territory would be low. Even at den sites, bears tolerate high levels of disturbance (Davis *et al.* 2010). Florida black bears are wide-ranging and can have large home ranges in which they shift activities to avoid humans (Davis *et al.* 2010). The main area of concern for Florida black bears would be attraction. As such, trash and food from the survey operations would be securely stored and removed from the survey area daily to prevent or minimize attraction.

Limited information is available about the Everglades mink and Florida bonneted bat; however, due to their known nocturnal nature, daytime survey activities would not be expected to impact these species. As previously stated, areas with standing water would be avoided, thus reducing potential impacts to the Everglades mink. If Big Cypress fox squirrel nests or potential Florida bonneted bat cavities are identified, they would be avoided. No nest or cavity tree removal would occur as a result of survey activities.

The primary anticipated response by other protected mammals would be avoidance. Other protected mammal mortality/injury would not be expected to occur from the survey, since the survey equipment would move attentively at relatively slow speeds. In addition, access points to the survey area would be kept secure to prevent wildlife from breaching the I-75 wildlife fencing.

Survey crews would be trained to identify the other protected mammals as well as to identify potential nesting or denning areas. No other protected mammal denning trees would be cut, destroyed, or damaged as a result of the seismic surveying activities.

Protected Reptiles. Protected reptiles that are discussed under this category include the American alligator, gopher tortoise, and eastern indigo snake, which are grouped together for purpose of this analysis and discussion.

Survey field operations could potentially have an impact on other protected reptile behavior and habitat. Although not anticipated, mortality/injury to protected reptiles could also occur.

During the dry season American alligators would likely be concentrated in isolated areas of water but may be encountered when they are traveling overland to seek permanent bodies of water (2000 NPS ORV Management Plan). Though rare in the original Preserve, gopher tortoise burrows have been recorded in the Addition. The gopher tortoise population within the survey area is unknown but is expected to be minimal due to the lack of appropriate habitat. Limited information is available on the seasonal activity and movement of indigo snakes, and their current abundance in the Preserve and the survey area is unknown. However, the *Status of the Eastern Indigo Snake in Southern Florida National Parks and Vicinity Report SFRC-83/01* (Steiner *et al.* 1983) suggests that eastern indigo snakes are diurnal and have been observed more frequently in the dry season than the wet season. Generally, eastern indigo snakes have a known association with gopher tortoise burrows and solution holes as refuges (Steiner *et al.* 1983). Therefore, eastern indigo snake population numbers may be low in the survey area due to the expected lack of gopher tortoise burrows.

The primary anticipated response by protected reptiles would be avoidance. While manmade noise and vibrations may adversely affect reptiles, noise exposure would be brief and short-term. As such, no lasting impacts would be expected to occur.

If a protected reptile is observed during the seismic survey, the survey would temporarily cease to allow sufficient time for the reptile to move away from the activity before resuming

activities. Protected reptile mortality would not be expected to occur associated with the survey, since the survey equipment would move attentively at relatively slow speeds.

Potential impacts to protected reptile habitat could also occur, but if so, it would be minimal. Survey crews would be trained to identify the protected reptiles, as well as to identify their potential burrows or nests. Due to the protection measures proposed, it would not be likely that burrows or nests would be destroyed or damaged as a result of the seismic surveying activities. In addition, the survey crews would be provided additional training about the possibility of encountering protected reptiles while crews are deploying seismic equipment and how to handle such an encounter. The crews would be specifically instructed to not come in contact with protected reptiles.

Major Game Species. The major game species that are discussed under this category include the white-tailed deer, feral hog, and wild turkey, which are grouped together for purpose of this analysis and discussion.

Survey field operations could potentially have an impact on major game species behavior. Since 1991, the deer population in Preserve has increased due to favorable environmental conditions, area closures, and changes in hunting regulations (2000 NPS ORV Management Plan). Turkey density tends to fluctuate from year to year due to environmental conditions (Powell 1965, Frye 1954).

The major game species have historically coexisted with similar human disturbance and hunting pressures in the Preserve, so impacts are not anticipated. Given the extent to which major game species have been exposed to ongoing resource management, recreational uses and other activities, these species would be expected to exhibit the same avoidance behavior in response to program operations in the survey area as they normally would to other activities in the Preserve.

Other Wildlife. Many animals not listed as endangered or threatened or classified as major game species live in the Preserve. Like the species noted above, other wildlife species would greatly vary in their responses to the survey activity. However, the anticipated wildlife response to survey operations would be expected to be that of avoidance behavior (in general), with the exception of mollusks or other invertebrates, on which no impact would be expected due to the avoidance of open-water areas.

The proposed protection measures would reduce potential impacts to other wildlife species in the Preserve. Because seismic survey activities would not occur in wet and submerged areas, fishes and other aquatic species would not be impacted. Highly mobile species such as other birds and mammals would be anticipated to avoid the small area where seismic surveying activities would occur during a given day. In addition, moving at slow speeds with attentive drivers, educational training for survey crews, scouting ecologists and agency coordination would provide additional protections for other wildlife species. As previously stated, field personnel would avoid directly disturbing wildlife.

In summary, short-term adverse impacts to protected wildlife, major game species, and other wildlife species would be expected from Alternative 2 due to the seismic survey techniques and design, Modification Protocols, and technologies proposed. In addition, elements of the seismic survey could have beneficial effects on protected wildlife species through extensive new data acquisition, collection, and sharing with agency personnel.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts are the same as for Alternative 1. Implementation of Alternative 2 would contribute a small adverse increment to these impacts.

Alternative 3 – Seismic Survey Using Explosive Charges

Analysis. Potential adverse impacts to federally protected wildlife, major game species, and other wildlife species would be adverse and short-term. Although Vibroseis buggies would not be used in this alternative, they would be replaced by drill rigs and other equipment using the same source lines as Alternative 2. Additional disturbance to wildlife could occur from detonation of explosive charges and

increased helicopter activity. Impacts to protected wildlife, major game species, and other wildlife species would extend over two or more dry seasons.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 3 would contribute a small adverse increment to these impacts.

WATER QUALITY, HYDROLOGY, AND SUBSURFACE GEOLOGIC RESOURCES

Alternative 1 (No Action) – No Survey by BOCI

Analysis. Continuation of current management would result in a beneficial impact to water quality, hydrology, and subsurface geologic resources, primarily from continued NPS efforts to improve sheet flow by removal of roads and berms and plugging of canals.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts to water quality, hydrology, and subsurface geologic features in the Preserve are primarily attributable to past construction of roads, canals, levees, and fill pads in connection with agriculture and oil/gas activities. Past dispersed recreational ORV use has resulted in soil ruts and ridges in some areas that have acted as impediments to sheet flow or increased channelization. Agricultural practices in areas upstream of the Preserve have resulted in decreased water quality from nutrient runoff. All of these actions have resulted in adverse but not significant simpacts to water quality, hydrology, and subsurface geologic features in the survey area. Implementation of Alternative 1 would contribute a beneficial increment to these cumulative impacts.

Alternative 2 (Proposed Action) – Seismic Survey Using Vibroseis Buggies

Analysis. Anticipated adverse impacts to water quality, hydrology, and subsurface geologic resources resulting from the proposed action are expected to be adverse and short-term.

Short-term impacts to water quality, hydrology, and subsurface geologic resources could potentially result from equipment and crew movement. Surface water quality could be degraded from suspending sediment or soil into surface waters in the immediate locations traversed by vehicles if vehicle movement and heavy foot traffic occurred in pools or puddles of standing water. Although unlikely, this turbidity could potentially lead to reduced light penetration and the mobilization of nutrients into the water column—both of which could result in dissolved oxygen depletion. Dissolved oxygen depletion, though short-term, could stress both plants and animals in these shallow water areas directly traversed by program vehicles. Also, potential impacts to water quality as a result of the proposed survey could occur through fuel spills and/or minor leaking of fluids from the geophysical vehicles. These potential impacts are addressed by the plan design and/or mitigation measures.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 2 would contribute no measurable increment to these cumulative impacts.

Alternative 3 – Seismic Survey Using Explosive Charges

Analysis. Potential adverse impacts to water quality, hydrology, and subsurface geologic resources would be similar to Alternative 2. Although Vibroseis buggies would not be used in this alternative, they would be replaced by drill rigs and other equipment using the same source lines as Alternative 2. Water quality, hydrology, and subsurface geologic features would be impacted similarly to Alternative 2. Since impacts would extend over two or more dry seasons, there may be a slight increase in impacts as compared to Alternative 2.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 3 would contribute no measurable increment to these cumulative impacts.

AIR QUALITY

Alternative 1 (No Action) – No Survey by BOCI

Analysis. Continuation of current management would result in a negligible, adverse impact to air quality, primarily from continued use of prescribed fire in the Preserve, resulting in smoke and particulate emissions.

Cumulative Impacts. Past, present, and reasonably foreseeable future adverse impacts to air quality in the Preserve are primarily attributable to ongoing fire management within and outside the Preserve, including wildfires and prescribed burning. Air quality is also adversely affected by emissions from vehicles travelling on the main roads through and adjacent to the Preserve, including I-75, US 41, and SR 29. These activities have resulted in cumulative adverse impacts to air quality in the survey area. Implementation of Alternative 1 would contribute no measurable increment to these cumulative impacts.

Alternative 2 (Proposed Action) – Seismic Survey Using Vibroseis Buggies

Analysis. Anticipated adverse impacts to air quality resulting from the proposed action are expected to be adverse and short-term.

The proposed action would consume fuel and generate a short-term, minor increase in air emissions over ambient conditions. Anticipated survey-generated air impacts would include minor particulate emissions and products of combustion from the six Vibroseis buggies, one helicopter, and the various support vehicles and equipment operating in the field and at the staging areas. The daily fuel consumption and corresponding fuel emissions estimate for any phase would range from approximately 162 gallons of diesel per day during the initial few weeks of the survey to 1,047 gallons consumed each 24-hour period when all survey work segments would be active. These emissions would occur over one dry season.

These impacts would cease with the conclusion of field operations. As such, survey operations would contribute minor air emissions of short duration in the immediate vicinity of operating machinery in the form of internal combustion engine exhaust that may amount in aggregate to an increase of 1.04 percent to 6.7 percent above ambient impact levels.

Fugitive dust would not be anticipated to affect air quality due to the relatively limited amount of equipment movement at low speeds, existing soil conditions, and the high use of pedestrian field movement.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 2 would contribute no measurable increment to these cumulative impacts.

Alternative 3 – Seismic Survey Using Explosive Charges

Analysis. Potential adverse impacts to air quality would be similar to Alternative 2. Although Vibroseis buggies would not be used in this alternative, they would be replaced by drill rigs and other equipment using the same source lines as Alternative 2. Air quality would be impacted similarly to Alternative 2. Since impacts would extend over two or more dry seasons, there may be a slight increase in impacts as compared to Alternative 2.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 3 would contribute no measurable increment to these cumulative impacts.

CULTURAL/ARCHEOLOGICAL RESOURCES

Alternative 1 (No Action) – No Survey by BOCI

Analysis. Continuation of current management would result in a negligible, adverse impact to cultural/archeological resources, primarily from the potential for impacts to archeological sites from illegal activity such as collecting and ORV damage. The determination of effect under Section 106 of NHPA would be "no adverse effect."

Cumulative Impacts. Past, present, and reasonably foreseeable future adverse impacts to cultural/archeological resources in the Preserve can be primarily attributable to vandalism of archeological sites and degradation of historic structures, such as

Monroe Station, through neglect and natural events such as hurricanes. These activities have resulted in adverse cumulative impacts to cultural/archeological resources in the Preserve, including the survey area. Implementation of Alternative 1 would contribute no measurable increment to these cumulative impacts.

Alternative 2 (Proposed Action) – Seismic Survey Using Vibroseis Buggies

Analysis. Anticipated negative impacts to cultural/archeological resources resulting from the proposed action are expected to be adverse, localized, and confined. However, elements of the seismic survey under Alternative 2 could also have beneficial effects on cultural/ archeological resources through new data collection and sharing with agency personnel. Thus, the determination of effect under Section 106 of NHPA would be "no adverse effect."

Survey personnel would be trained not to remove or disturb any cultural/archeological resources, so the illegal collection of artifacts would not be anticipated to occur. In the unlikely event that undocumented and unanticipated cultural/archeological resources were driven over or a source vibration conducted directly upon artifacts at or near the surface, a negative impact could occur. Seismic vibrators produce a small-amplitude ground motion that could cause damage to nearby freestanding structures and infrastructure lying on the surface of the ground where there is an unconstrained free surface allowing variable displacement with surface wave motion. However, the low-amplitude ground motion would not lead to substantial subsurface displacement of material. Because the subsurface does not have a free boundary, little displacement of material would be possible, and almost no differential displacement would be possible that would lead to disturbance or damage to buried historical materials.

Elements of the proposed alternative could also have beneficial effects on cultural/archeological resources through new data acquisition, collection, and sharing with agency personnel. If undocumented cultural/archeological resources were discovered, their locations would be GPS located, information would be gathered by the archeologists, and the results would be shared with appropriate agencies and personnel. This would include preparing a Florida Master Site File form and/or the equivalent NPS data collection form and following NPS collections and curation policies in keeping with ARPA, which prohibits the excavation and/or collection of archeological resources on federal or Indian lands without a permit from the land manager (Preserve/SEAC). Thus, BOCI, through its cultural resource consultant, would apply for and receive an ARPA permit (43 CFR 7.5 and 7.6) prior to entering the survey area with the seismic survey team. Any recovered data would provide the applicable agencies with new information that could be used to better manage, research, and understand cultural/archeological resources in the area.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 2 would contribute no measurable increment to these cumulative impacts.

Alternative 3 – Seismic Survey Using Explosive Charges

Analysis. Anticipated impacts to cultural/archeological resources would be adverse. However, elements of the seismic survey under Alternative 3 could also have beneficial effects on cultural/archeological resources through new data collection and sharing with agency personnel. Thus, the determination of effect under Section 106 of NHPA would be "no adverse effect."

The overall avoidance of impacts to cultural/archeological resources within the survey area under Alternative 3 would be generally similar to those in Alternative 2. However, Alternative 3 would utilize seismic explosives, which would require soil borings in which to place the explosives. Although this alternative would utilize the same type of archeological information and avoidance model developed in 2006 for approximately 50 percent of the survey area, a site could potentially be inadvertently disturbed simply by a drill bit penetrating the ground. If undocumented and unanticipated cultural/archeological resources lie within or immediately adjacent to a seismic explosive location, the site could be affected and

the potential impacts could be long-term.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 3 would contribute a small, adverse increment to these cumulative impacts.

NOISE/SOUNDSCAPES

Alternative 1 (No Action) – No Survey by BOCI

Analysis. Continuation of current management under Alternative 1 would result in adverse impacts to natural soundscapes from human-generated noise. Noise from motor vehicles, maintenance operations, construction, aircraft, oil and gas activities, and recreational activities would continue.

Cumulative Impacts. Past, present, and reasonably foreseeable future adverse impacts to soundscapes in the Preserve can be primarily attributable to past and ongoing noise from vehicles traveling roads in and adjacent to the Preserve, recreational use (ORVs, hunting, camping), oil and gas activities, and aircraft overflights. These activities result in adverse but insignificant impacts. Implementation of Alternative 1 would contribute no measurable increment to these cumulative impacts.

Alternative 2 (Proposed Action) – Seismic Survey Using Vibroseis Buggies

Analysis. Anticipated adverse impacts to soundscapes resulting from the proposed action are expected to be adverse and short-term.

Survey-generated noise would originate from the Vibroseis buggies, UTVs and other vehicles, and signal generation activities at each source point. The Vibroseis buggies would have two noise sources: diesel exhaust noise, and to a much lesser extent, vibrating pad noise. Additional noise from support helicopters would be generated as well. Visitor use and perception could be affected by noise generated from seismic survey operations, which is discussed under this impact topic.

Effects on visitor experience in relation to noise are anticipated to be minimal. Most visitors would not notice survey field operations and diminished soundscapes unless standing in or immediately adjacent to the daily 2½ -square-mile operating area or having noticed helicopter operation at the staging areas adjacent to the rest and recreational areas along I-75. For those visitors electing to experience the backcountry in the immediate vicinity of survey activities, BOCI would work with NPS to provide informational materials at the limited entry points and online. Additional information regarding visitor experience is discussed in the following section.

The Vibroseis buggies would operate in two groups of three buggies. Vibroseis buggies within each group would be in relative proximity to each other and at various times, separated by less than ¼ mile. The total area of noise impact associated with the Vibroseis buggies, UTVs, and other vehicles would be confined to an approximate area of 2½ square miles per day.

Generation of acoustic signals at source points would occur approximately every two minutes in the planned daily survey area over a 10- to 12-hour daytime period. Noise and effects of Vibroseis signal generation at each source point would attenuate rapidly as the Vibroseis group approached and then moved away from any single vibration source point.

Peak helicopter usage would occur during data acquisition operations (more with receiver layout and retrieval and less with Vibroseis operations). Helicopter operations would be conducted an average of three to six hours each day during the 18 weeks of survey operations.

Peak helicopter usage and resultant noise would occur during receiver deployment and recovery and Vibroseis operations. Expected sound levels during these operations would range between 75.2 dB(A) and 91.3 dB(A), with short-term peaks (45-sec at 105 dB(A)) during receiver bag drop-offs and pickups. Helicopter operations would be conducted an average of 3-6 hours each day during the 18 weeks of program operations.

No ground-disturbing activities, drilling, or dynamite would be used to conduct the seismic survey under Alternative 2. Also, all operations would occur during daylight hours; therefore,

the noise from plan operations would occur only during daylight hours.

The types and levels of survey-generated noise are anticipated to be similar to ambient noise impacts attributable to ongoing resource management, recreational uses, vehicle traffic (especially from I-75), and a variety of non-survey related flight operations. In addition, survey-generated noise would be intermittent and limited to a small portion of the survey area (2½ square miles) on any given day. As such, the proposed seismic survey would not impose any long-term effects on natural ambient soundscape.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 2 would contribute an adverse, insignificant increment to these cumulative impacts.

Alternative 3 – Seismic Survey Using Explosive Charges

Analysis. Anticipated impacts to soundscapes would be adverse and short-term.

Alternative 3 would involve the use of seismic explosives, which would entail the need for shothole drilling and placement and sealing of the buried explosive charges, resulting in substantial, additional time spent at any one source point. The additional time required would increase the amount of disruption of the natural ambient soundscape by survey equipment at any source point over that of Alternative 2. This alternative would be accomplished within the span of two or more dry seasons, so noise impacts would last longer. Because of the need for a larger shothole drilling fleet, an additional helicopter would be needed to provide field logistical support. Its presence in the field would also add to the ambient soundscape disruption.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 3 would contribute a small increment to these cumulative impacts.

VISUAL QUALITY AND VISITOR USE AND PERCEPTION

The primary recreational activities in the Preserve include frontcountry driving, sightseeing, and visitor centers; walking and hiking; birding and wildlife viewing; paddling; motorboating; camping; bicycling; ORV riding; hunting, fishing, and frogging; and opportunities to experience peace and quiet in a natural environment.

Alternative 1 (No Action) – No Survey by BOCI

Analysis. Continuation of current management under Alternative 1 would result in beneficial impacts to visual quality and visitor use and perception. This would be a result of continued improvements to backcountry access, camping, hiking, hunting, and visitor facilities.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts to visual quality and visitor use and perception in the Preserve have been largely beneficial through increased access to the backcountry via trails and improvements to frontcountry facilities. Implementation of Alternative 1 would contribute no measurable increment to these cumulative impacts.

Alternative 2 (Proposed Action) – Seismic Survey Using Vibroseis Buggies

Analysis. Anticipated impacts to visual quality and visitor use and perceptions resulting from the proposed action are expected to be adverse and short-term.

Potential short-term impacts to visual visitor experiences could result from the proposed action in limited areas through visibility of staging areas and operations to visitors and through the disruption of vegetation and/or soils. In addition, the survey area is crossed by the Florida National Scenic Trail and other trails, so hikers' trail experiences could be affected if they happen to be in the vicinity of survey activities when they are taking place. Also, the dry season field operations could affect hunters and ORV users.

Because the Preserve lands are virtually flat

throughout the survey area with areas of both dense vegetation and areas of sparse vegetation, the survey activities could potentially be viewed by Preserve visitors. However, due to the mosaic of dense and open habitats, vast expanses in the survey area are uncommon, and most visual expanses are less than a mile. As stated in the MMP prepared as part of the general management plan for the original Preserve, the dense vegetation in certain areas helps to hide much of oil and gas operations when viewed from the ground level. The survey's proposed staging areas are not expected to be visible from I-75; however, the presence of vehicles and workers could be noticeable as they enter recreational parking areas, traverse locked fencing, and travel access pathways to staging areas off of I-75.

The survey would utilize where practicable existing and previously disturbed roads, trails, and other areas, but using these areas could temporarily disrupt recreational uses by hikers, ORV users, and hunters. Also, a visitor to the backcountry could encounter some operational elements in natural settings and view some short-term disruption of surface vegetation and/or soils.

BOCI would work collaboratively with the NPS and other agencies to educate visitors of the seismic survey during operations to prevent or limit potential negative experiences caused by the survey operations. Nevertheless, almost all Alternative 2 operations would occur away from Preserve visitors. With the exception of travelers along I-75 and occasional hikers, ORV users, and hunters along trails, no plan operations would occur near areas frequented by Preserve visitors.

The survey activities would be conducted quickly with the Vibroseis buggies and with minimal vegetation clearing or soil disruption. Therefore, potential adverse impacts to the visual quality and visitor use and perception would be minimal and short-term (one day only in specific areas, except at staging areas).

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 2 would contribute a small, adverse increment to these cumulative impacts.

Alternative 3 – Seismic Survey Using Explosive Charges

Analysis. Anticipated adverse impacts to visual quality and visitor use and perception would be similar to Alternative 2, but slightly higher in intensity.

The overall visual quality and visitor use and perception impacts within the survey area under Alternative 3 would be generally similar to those in Alternative 2. However, Alternative 3 would utilize seismic explosives, which would facilitate the need for substantially more shothole drilling equipment and personnel and time spent to complete the survey. The additional time required for shothole drilling operations could likely decrease the visual quality and increase the potential for interaction with Preserve visitors to a somewhat greater degree than that of Alternative 2. This alternative would be accomplished within the span of two or more dry seasons, thereby increasing the likelihood of adverse visitor impacts.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 3 would contribute a small increment to these cumulative impacts.

WILDERNESS

Alternative 1 (No Action) – No Survey by BOCI

Analysis. Continuation of current management under Alternative 1 would result in beneficial impacts to wilderness. The 2010 GMP for the Addition and the recently completed wilderness eligibility assessment for the original Preserved determined approximately 260,000 acres of the Preserve to be eligible for wilderness designation, including 47,000 acres proposed for designation. These lands are currently managed to preserve their wilderness character. Completion of a wilderness study underway for the original Preserve could result in additional lands proposed for designation.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts to

wilderness in the Preserve can be attributed to the presence of past disturbances (trails, litter, debris, dilapidated structures), exotic vegetation and fire management, and monitoring of protected species such as the Florida panther. Implementation of Alternative 1 would contribute a beneficial increment to these cumulative impacts.

Alternative 2 (Proposed Action) – Seismic Survey Using Vibroseis Buggies

Analysis. Impacts to wilderness from implementation of Alternative 2 would be adverse and short-term. Within the lands eligible or proposed for wilderness designation in the survey area, the presence of Vibroseis buggies, UTVs, helicopters, other mechanized equipment, and staging areas would degrade the undeveloped quality of wilderness character. The solitude or primitive and unconfined recreation quality would also be degraded, as areas currently remote from sights and sounds of human activity would be exposed to survey operations. The natural quality would be degraded by the presence of visible soil ruts, matting of vegetation, and damage to trees and shrubs from vehicle passage and trimming. Water quality could be decreased, and exotic plants could be introduced through contaminated equipment and/or ground disturbance.

Upon conclusion of the survey, some impacts, such as noise, would immediately cease. Other impacts, such as soil and vegetation damage, would take longer to recover.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 2 would contribute a small, adverse increment to these cumulative impacts.

Alternative 3 – Seismic Survey Using Explosive Charges

Analysis. Impacts to wilderness from the implementation of Alternative 3 would be similar to those of Alternative 2, but the increased helicopter activity and survey duration (two or more dry seasons) would result in a somewhat higher intensity of impact.

Cumulative Impacts. Past, present, and reasonably foreseeable future impacts would be the same as for Alternative 1. Implementation of Alternative 3 would contribute a small, adverse increment to these cumulative impacts.

Wilderness Minimum Requirements Determination. Section 6.3.5 of NPS *Management Policies* provides that all management decisions affecting wilderness must be consistent with the minimum requirement concept. Under this concept, before the NPS can approve a minerals plan of operations in wilderness, it must first determine that (a) the proposed action is appropriate or necessary for administration of the area as wilderness and does not cause a significant impact to wilderness resources and character, and (b) the techniques and types of equipment to be used are needed to ensure that impacts on wilderness resources and character are minimized.

Of the two action alternatives, Alternative 2 best satisfies the minimum requirement concept. Given that the proposed action must take place in wilderness because of the existence of pre-existing private mineral rights below the wilderness surface, Alternative 2 is preferable to Alternative 3 because it would minimize adverse impacts to wilderness character, and these impacts would not be significant. As noted previously, Alternative 2 would entail less helicopter activity over a substantially shorter period of time than Alternative 3. In addition, unlike Alternative 3, Alternative 2 would not involve any drilling activities in wilderness, and thus would not require the concentrated use of vehicles at drill sites or the plugging of shotholes. The vehicles to be used under Alternative 2 would for the most part make single passes along discrete transect lines and would have large tires designed to disperse weight and minimize rutting and impacts to vegetation, soils, and hydrology. Trial runs of the Vibroseis vehicles at the Preserve indicate that impacts from the vehicles would be short term and that the wilderness environment would recover relatively quickly from their use. Accordingly, adverse impacts to the natural and undeveloped qualities of wilderness, as well as to opportunities for solitude and unconfined recreation, would be less under Alternative 2 than under Alternative 3. Thus, of the two

feasible and customary alternatives for exploring for minerals at the Preserve, Alternative 2 is the minimum requirement in wilderness.

LIST OF AGENCIES AND PERSONS CONSULTED

The following agencies and persons were provided the opportunity to review and comment on the Plan of Operations (POP) and the Draft Environmental Assessment (EA):

Agency/Organization	Person Contacted	Date	Document
National Park Service Ochopee, Florida	Pedro Ramos	1/16/14	POP
	Ron Clark	6/27/14	Draft EA
	Pedro Ramos	9/10/14	Revised POP
	Pedro Ramos	10/16/14	Revised EA
	Pedro Ramos	12/08/14	Revised POP
	Pedro Ramos	12/08/14	Revised EA
National Park Service Tallahassee, Florida	David Morgan	2/20/14	POP
U.S. Fish and Wildlife Service	Daryl Thomas	12/18/14	POP
Florida Fish and Wildlife Conservation Commission	Darrell Land	1/27/14	POP
Florida Department of Environmental Protection Oil & Gas Program Tallahassee, Florida	Ed Garrett	1/17/14	POP
	Dave Taylor	9/14/14	POP
	Ed Garrett	1/20/15	POP
Florida Department of Environmental Protection South District Office	Tim Schwan	9/17/14	POP
	Megan Mills	1/17/14	POP
	Jon Iglehart	1/20/15	POP
	Megan Mills	1/22/15	Revised POP
Florida Department of Transportation Bartow, Florida	Sharon Harris	2/20/15	POP
Division of Historical Resources Tallahassee, Florida	Robin Jackson	2/27/14	POP

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ACRONYMS

Addition GMP	*Big Cypress National Preserve – Addition Final General Management Plan / Wilderness Study / Off-Road Vehicle Management Plan / Environmental Impact Statement*
BOCI	Burnett Oil Co., Inc.
BMP	Best Management Practices
CBA	Choosing By Advantages
CERP	Comprehensive Everglades Restoration Plan
CEQ	Council on Environmental Quality
CFA	Core Foraging Area
CFR	Code of Federal Regulations
CRC	Collier Resources Company, LLC
CZMA	Coastal Zone Management Act
dB(A)	A-Weighted Decibels
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EO	Executive Order
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FLEPPC	Florida Exotic Pest Plant Council
FONSI	Finding of No Significant Impact
FS	Florida Statute
FWC	Florida Fish and Wildlife Conservation Commission
GIS	Geographic Information System
GMP	General Management Plan
GPS	Global Positioning System
I-75	Interstate 75
IRA	Important Resource Area
MMP	Minerals Management Plan
MTOI	Miccosukee Tribe of Indians of Florida
NEPA	National Environmental Policy Act
NG3-D	Nobles Grade 3-D
NGVD	National Geodetic Vertical Datum
NPS	National Park Service
ORV	Off-Road Vehicle
PL	Public Law
POP	Plan of Operations
ROD	Record of Decision
SEAC	Southeast Archeological Center
SFWD	South Florida Water Management District
SHPO	State Historic Preservation Officer
SOP	Standard Operating Procedures
SR	State Road
STOF	Seminole Tribe of Florida
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDOI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WMA	Wildlife Management Area

APPENDIX A: VIBROSEIS FIELD DEMONSTRATION PHOTOS

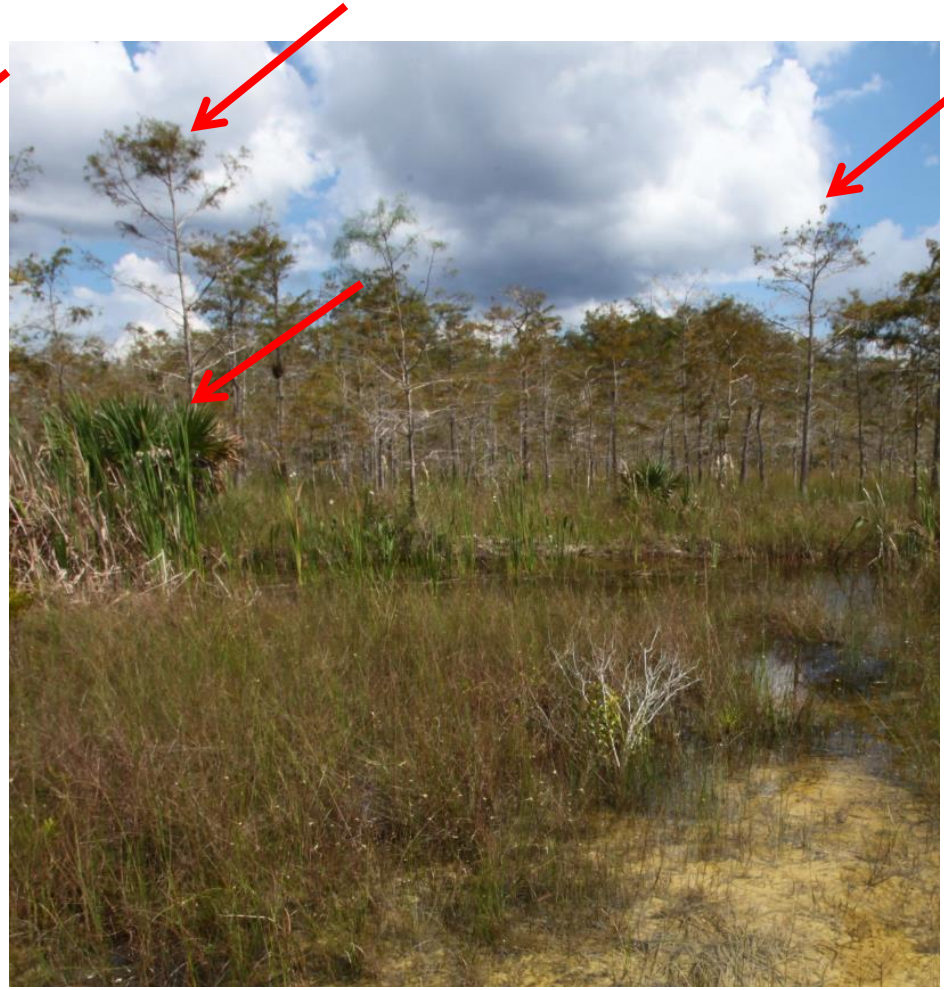
Vibroseis Demonstration

April 24, 2015

October 10, 2015

Vibroseis Demonstration

April 24, 2015



October 10, 2015

APPENDIX B: WETLANDS STATEMENT OF FINDINGS

WETLAND STATEMENT OF FINDINGS

NOBLES GRADE 3-D SEISMIC SURVEY
BIG CYPRESS NATIONAL PRESERVE

October 2015

DRAFT

Recommended: _____
Superintendent, Big Cypress National Preserve Date

Concurred: _____
Chief, Water Resources Division Date

Approved: _____
Regional Director, Southeast Region Date

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INTRODUCTION

This document is the Wetland Statement of Findings (WSOF) for the proposed Nobles Grade 3-D Seismic Survey (NG3-D) proposed by Burnett Oil Company, Inc. (BOCI) in the Big Cypress National Preserve (BCNP). This WSOF summarizes the information contained in the revised Plan of Operations (POP) and the draft Environmental Assessment dated December 2014, and incorporates some of the detailed information found there.

PURPOSE AND NEED FOR ACTION

In accordance with National Park Service (NPS) regulations for non-federal oil and gas rights, BOCI, a private company, has submitted a POP to the NPS to conduct a three-dimensional (3-D) seismic survey within the BCNP. The proposed survey would encompass approximately 110 square miles (70,454± acres) located in the BCNP (Figure 1). The project purpose is for BOCI to conduct geophysical exploration that would provide sufficiently detailed information to determine whether and where possible oil and gas deposits may exist within the privately owned mineral estate beneath the surface of the BCNP.

ALTERNATIVES CONSIDERED

This matter proposal involves a 3-D seismic survey of subsurface geologic structure and conditions in the BCNP. A seismic survey involves sending subtle acoustical signals into the ground and then recording return signals so that one can identify subsurface conditions. The sending of these signals and the recording of the return signals requires activities on ground surface.

The seismic survey seeks to evaluate specific privately owned oil and gas resources located beneath the BCNP. The BCNP consists almost entirely of wetlands. Survey teams cannot avoid going into wetlands located above the privately owned oil and gas resources. Acoustical signals cannot be generated or received using existing technology without physically touching the ground within wetlands. Team members must traverse wetlands with their equipment in order to reach survey locations. Engaging in survey activities in wetlands cannot be avoided.

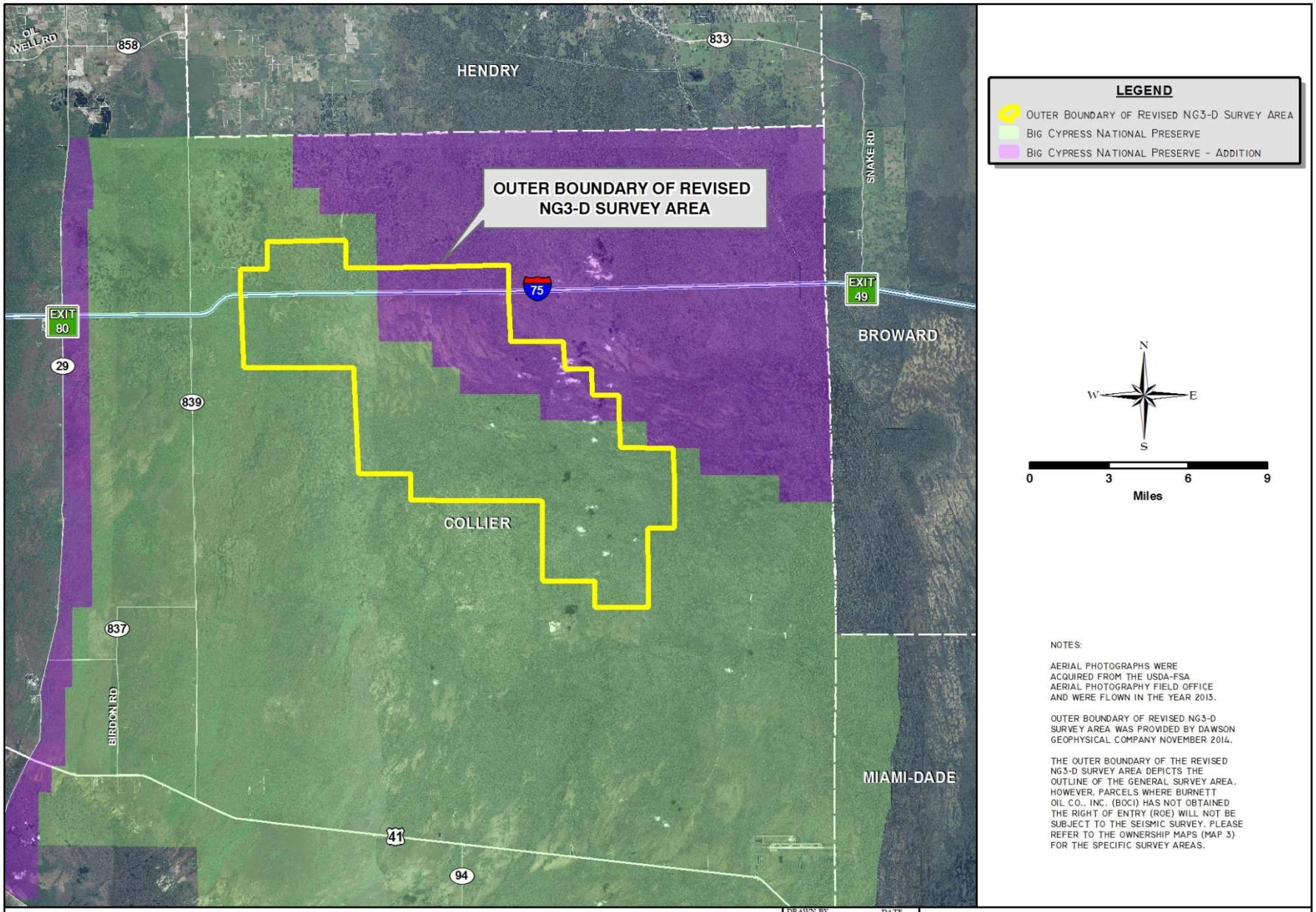
Five alternatives have been considered for this seismic survey.

Alternative 1: No Action

Under the No Action Alternative, BOCI would not pursue the proposed project. The No Action Alternative does not achieve the project purpose and need and is therefore not a reasonable alternative. This alternative would not provide an image of the subsurface and/or oil and gas resources underlying the project area, and subsurface oil and gas mineral owners would not be able to take full advantage of their rights to explore for minerals in the area.

Alternative 2: Seismic Survey Using Vibroseis Buggies (Proposed Action/Preferred Alternative)

J:\2013\I3B0C2197\GIS\2015\WETLAND STATEMENT OF FINDINGS\FIGURES\FIGURE 1 AERIAL WITH PHASE 1 BOUNDARY 12-1-14.MXD - 11/10/2015 @ 3:41:27 PM



NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013.

OUTER BOUNDARY OF REVISED NG3-D SURVEY AREA WAS PROVIDED BY DAWSON GEOPHYSICAL COMPANY NOVEMBER 2014.

THE OUTER BOUNDARY OF THE REVISED NG3-D SURVEY AREA DEPICTS THE OUTLINE OF THE GENERAL SURVEY AREA. HOWEVER, PARCELS WHERE BURNETT OIL CO., INC. (BOCI) HAS NOT OBTAINED THE RIGHT OF ENTRY (ROE) WILL NOT BE SUBJECT TO THE SEISMIC SURVEY. PLEASE REFER TO THE OWNERSHIP MAPS (MAP 3) FOR THE SPECIFIC SURVEY AREAS.

FIGURE 1. AERIAL WITH REVISED NOBLES GRADE 3-D SURVEY AREA
NOBLES GRADE 3-D

	DRAWN BY	DATE
	F.L.	12/10/13
	REVIEWED BY	DATE
	K.C.P.	12/10/13
	REVISED	DATE
	F.L.	9/9/15

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This alternative would conduct the seismic survey over an area of approximately 110 square miles of the BCNP using Vibroseis buggies to generate the acoustical signals. Vibroseis buggies are specialized off-road vehicles (ORVs) with vibrating metal plates. The buggies lower metal plates to ground where they are vibrated for a few seconds to generate seismic acoustical signals. Those signals are picked up and recorded using small, portable seismic receivers (geophones) and recording devices, which also are placed on the ground. The buggies and recording devices then move on to new locations, where the process is repeated. Equipment would be staged on previously disturbed areas (e.g., abandoned road access points and well drill pads) next to Interstate 75 (I-75). On any given day, approximately two and one-half square miles of the BCNP would be affected by vibroseis operations. Equipment would be transported to survey locations on foot, using ORVs, and using helicopters. The survey would take one dry season to complete.

Alternative 3: Seismic Survey Using Explosive Charges

The third alternative is to conduct the seismic survey in the 110-square-mile survey area using explosive charges. Holes 200 to 300 feet deep would be drilled into the ground using large drills located on ORVs. Explosive charges ranging between 5.5 to 7.5 pounds would be placed into the holes and detonated to create the seismic signal. Those signals would be captured by geophones and recording devices. Due to the greater amount of labor associated with drilling the holes, this alternative would take approximately twice as long to cover the same survey area, or approximately two dry seasons. This alternative would have greater potential impact to wetland resources than the proposed action.

Two additional alternatives were considered but dismissed:

Dismissed Alternative A: Seismic Survey of Original Survey Area Using Vibroseis Buggies

This alternative was proposed to conduct the seismic survey over an area of approximately 366 square miles of the BCNP using Vibroseis buggies to generate the acoustical signals. This survey would take approximately four dry seasons to complete. This alternative would have greater potential impact to wetland resources than the proposed action.

Dismissed Alternative B: Seismic Survey of Original Survey Area Using Explosive Charges

This alternative proposed to conduct the seismic survey over the originally proposed 366-square-mile survey area using explosive charges. This alternative would take approximately eight dry seasons. This alternative would have greater potential impact to wetland resources than the proposed action.

WETLANDS IN THE PROJECT AREA

Wetland Descriptions

Since most of the BCNP consists of wetlands, the majority of the survey area (greater than 58,740± acres or 83 percent), is comprised of wetland habitats. From discussions with the NPS and review of existing soil surveys, vegetation mapping, and aerial photographs, it was determined that a significant majority of the seismic survey area consisted of wetlands; therefore, for purposes of this report, the entirety of the seismic survey area was considered wetlands and was not formally delineated. Determination that a majority of the survey area is comprised of wetlands based on soil surveys, vegetation mapping, and aerial photographs was independently verified by Professional Wetland Scientist (PWS) Andrew Woodruff (PWS No. 2366). Since formal delineations were not performed, the extent of upland/wetland boundaries was not field verified or mapped.

Wetlands in the NG3-D survey area were delineated and classified by use of a vegetation classification system created for south Florida units of the national park system (Welch and Madden 1999). The Welch and Madden system was revised by BCNP staff in 2000 by reclassifying the data into 12 vegetative community types. This classification of vegetative communities uses the information produced by Welch and Madden but combines many of the categories to depict areas of more general vegetative communities.

Survey area descriptions of vegetation, geology, soils, biotic components, hydrology, and water quality are described below.

Vegetation and Habitat

Virtually all naturally occurring wetlands in the NG3-D survey area are palustrine, as they are nontidal wetlands dominated by trees, shrubs, and persistent emergent vegetation. There are several human-constructed water bodies, a few of which may be considered riverine wetlands (artificially created and periodically or continuously containing moving water).

According to the NPS land cover data, 11 major land cover types are found within the NG3-D survey area, including approximately 32,211 acres of cypress forest, 18,855 acres of scrub cypress, 379 acres of disturbed area, 82 acres of hydric hammock, 2,936 acres of hydric pine flatwoods, 688 acres of marsh, 2,889 acres of mesic hammock, 8,415 acres of mesic pine flatwoods, 486 acres of swamp forest, 124 acres of water, and 3,389 acres of wet prairie. A map depicting the NPS designations of the wetland and assumed wetland land covers is provided as Exhibit A. Table 1 lists the NPS wetland and assumed wetland land cover types, cover type acreages, and vegetation community descriptions.

Table 1. NPS Land Cover Types and Acres

NPS Land Cover Category	Vegetation Communities	Survey Area Acreage
Cypress Forest	Cocoplum Swamp Forest Cypress Domes/Heads Cypress Strands Cypress-Mixed Hardwoods	32,211
Scrub Cypress	Cypress Savanna Dwarf Cypress	18,855
Disturbed	Brazilian Pepper Exotics Java Plum Major Canals (>30m Wide) Major Roads (>30m Wide) Melaleuca Spoil Areas	379
Hydric Hammock	Bay Hardwood Scrub; Bayhead Paurotis Palm	82
Hydric Pine Flatwoods	Cypress with Pine Cypress-Pines Pine Savanna Slash Pine with Cypress	2,936
Marsh	Broadleaf Emergents Cattail Marsh Non-Graminoid,a Emergent Marsh Tall Sawgrass Pop Ash Willow	688
Mesic Hammock	Cabbage Palm Hardwood Scrub Oak Sabal Forest Palm Savanna Saw Palmetto Scrub Palm Savanna	2,889
Mesic Pine Flatwoods	Savanna Slash Pine Mixed with Palms Slash Pine with Hardwoods	8,415

Table 1. (Continued)

NPS Land Cover Category	Vegetation Communities	Survey Area Acreage
Swamp Forest	Mixed Hardwood Swamp Forest Mixed Hardwood Cypress and Pine Swamp Forest	486
Water	Water	124
Wet Prairie	Common Reed Cordgrass Graminoid Prairie Maidencane Maidencane/Spikerush Mixed Graminoids Muhly Grass Sawgrass Shrublands Spikerush	3,389

These wetland habitats and assumed wetland habitats are spread throughout the survey area, both north and south of I-75, and are similar to wetland habitats found throughout the larger BCNP and southwest Florida. North of I-75 is characterized extensive mesic pine flatwoods and cypress forests. Marshes and wet prairies are widely interspersed there as well. South of I-75, extensive scrub cypress areas are intermixed with cypress forests, mesic pine flatwoods, and wet prairies. Mesic and hydric hardwood hammocks are dispersed throughout.

Temperate plants are abundant, but the majority of the species are tropical. Pinelands, cypress strands and domes, prairies, and marshes are the most prevalent vegetation types and are dominated by temperate species. Tropical species occur primarily in hardwood hammocks but are also found in pinelands, mixed-hardwood swamps, and cypress strands.

A description of each vegetation community, adapted from the 1992 and 2010 BCNP General Management Plan/Environmental Impact Statement documents, is included below.

Cypress Forest. Cypress domes occur throughout the survey areas. They are characterized by a monospecific overstory of cypress (*Taxodium distichum*), which grow tallest in the center of a limestone depression and taper off toward the fringes, forming a domelike feature. This depression in the bedrock fills with organic soils, and eventually peat forms due to constant saturation and slow decomposition. The largest and fastest-growing cypress trees are found in these wetter, deeper peat deposits. Trees toward the dome edge are thought to be smaller because of more marginal soils, lower water levels, and more frequent susceptibility to fires (Duever *et al*. 1986*a*). Flooding is essential for maintaining cypress domes, and a 290-day hydroperiod is average for domes; average maximum water levels reach about 2 feet (Duever *et al*. 1986*b*). Periodic fires play an important role because they limit hardwood invasion, remove peat (which helps maintain the site's hydroperiod), and generally leave the cypress unharmed.

Ponds often form in the center of cypress domes and are important habitat for alligators and aquatic wildlife. These ponds are likely the result of deep-burning peat fires that occurred during extreme droughts or the dissolution of limestone by acids in plant litter accumulations (Loveless 1959).

Cypress strands are found in deep mineral soil depressions, but they are distinct from cypress domes because they form along major drainages and generally retain a north-south orientation. Dominant vegetation features, when present, are very large cypress trees, a few over 100 feet tall and 6 feet in diameter. Understory vegetation is diverse, unlike cypress domes, and includes shade-tolerant hardwoods, ferns, and epiphytes. All cypress strands have been logged, and many sites are now more characteristic of the mixed-hardwood swamps. Cypress strands are also associated with relatively deep water, with a hydroperiod that extends over 240 days. Even though cypress strands rarely burn, evidence indicates that they may benefit from infrequent fires because cypresses are highly fire-resistant and competing hardwoods are not.

Scrub Cypress. Cypress prairies are characterized by an open forest of small cypress trees and scattered, sparse growths of grasses, sedges, and forbs. They occur on a thin layer of marl soil or sand overlying limestone. During the wet season prairies are flooded to a depth of about 8 inches, with inundation lasting 120 days. Fuel buildup is slow on these sites, and fires occur only once every decade or two (Wade *et al*. 1980).

Disturbed. Areas affected by man's past activities occur throughout the survey areas. Logging, canal and road construction, farming and grazing, recreation, oil extraction, ORV use, and facility construction have affected the BCNP's surface and to some extent its vegetation communities.

Thousands of nonnative plant species have been introduced to Florida for ornamental plantings, agriculture, and other human uses. Some 297 exotic plants are known to have been naturalized in south Florida (Duever *et al*. 1986*b*). Many of these are reported within the survey area, but most are restricted to early successional stages on disturbed sites, and only a few pose a long-term threat to native communities. Of these, five species – melaleuca (*Melaleuca quinquenervia*), Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casuarina* spp.), water hyacinth (*Eichhornia crassipes*), and hydrilla (*Hydrilla verticillata*) – are fairly widespread in the BCNP.

Mesic and Hydric Hammock. Hardwood hammocks are dense and diverse forests of hardwood trees and shrubs, ferns, and epiphytes that grow on land slightly higher than that of surrounding marshes and prairies. Hammocks are scattered throughout the BCNP, and because of their raised position, they often appear as islands of trees. Dominant overstory species are usually oaks such as laurel oak (*Quercus laurifolia*), water oak (*Q. nigra*), and live oak (*Q. virginiana*) or tamarind (*Lysiloma bahamensis*). Oak is more prevalent in the northern portion of the BCNP than the frost-susceptible tamarind. Elevated bedrock overlain by sandy peat soils comprises the foundation of the hammocks. These soils remain moist because of the shady microclimate, but they are inundated only during extreme high-water periods. Because soils remain moist most of the year, hardwood hammocks rarely burn, but they are susceptible to fire during extended droughts. Following a fire, the species composition of recolonized hammocks often changes significantly (Duever *et al*. 1986*c*).

Marsh. Freshwater marshes occur throughout the survey area. They are dominated by emergent broad-leaved sedges and grasses and are inundated approximately 150 to 250 days per year. Species composition of freshwater marshes varies considerably but typically includes pickerelweed (*Pontedaria cordata*), arrowhead (*Sagittaria lancifolia*), maidencane (*Panicum hemitomon*), and sawgrass (*Cladium jamaicence*). Freshwater marshes are generally located at elevations between cypress strands and pinelands, primarily on the slopes of the undulating bedrock surface. Soils tend to be shallow and organic in origin, with bedrock exposed in patches as a result of past fires. A well-developed algal mat known as periphyton often covers the soil surface, forming marl soils high in calcium carbonate and constituting an important food chain element for many insects and fish (Gleason 1974). Maximum wet season water levels are about 8 inches for these marshes. Dry surface soils are exposed during much of the dry season, resulting in frequent patchy fires, which prohibit pines and cypress from invading the quickly recovering marshes.

Mesic and Hydric Pine Flatwoods. Pinelands occur mostly outside the central portions of the survey areas. South Florida slash pine (*Pinus elliotii* var. *densa*) is the major overstory species, with a dense understory of cabbage palm (*Sabal palmetto*) and saw palmetto (*Serenoa repens*) on higher, drier sites and grasses on lower, wetter locations. Pinelands occupy a variety of sites; in some areas they exist on seldom-inundated sandy sites; in others they occur along pond margins, topographic depressions, and rocky areas. Generally, maximum water levels reach just to the soil surface (Klein *et al*. 1970). Pine needles, grasses, and other combustible materials accumulate relatively quickly in pinelands, and pinelands burn at frequent intervals. If fires are suppressed, pinelands eventually succeed to hardwood-dominated stands.

Swamp Forest. The logging of overstory bald cypresses in some strands has resulted in domination by former sub-canopy hardwood species, such as red maple (*Acer rubrum*) and pop ash (*Fraxinus caroliniana*). Bald cypresses are often present, but they are no longer the dominant overstory trees. If the area remains relatively undisturbed, cypresses often return in impressive numbers. Understory species include ferns, epiphytes, aquatic species, and saplings of overstory vegetation. Older successional stages are dense and quite complex in terms of structure and species. Knolls within this vegetation type comprise a principal habitat for the rare royal palm (*Roystonea elata*), and older forests serve as homes for a large number of birds, mammals, reptiles, and amphibians (Wade *et al*. 1980). Mixed-hardwood swamps occupy peats, sands, and rock and have a 270-day or longer hydroperiod.

Water. The open water areas in the survey areas consist mainly of ponds, ditches, and large canal systems.

Wet Prairie. Prairies are treeless areas dominated by grasses and forbs (non-grass flowering herbaceous plants). Wet and dry prairies have been differentiated (Duever *et al*. 1986*a*). Wet prairies are characterized by muhly grass (*Muhlenbergia capillaris*), love grass (*Eragrostis* spp.), and sand cordgrass (*Spartina bakeri*). Dry prairies are characterized by broomsedges (*Andropogon* spp.), white-top sedge (*Rhynchospora colorata*), cordgrass, and saw palmetto. Wet prairies and marshes generally occupy the slopes of an undulating bedrock surface, with wet prairies being in higher areas than marshes. Wet prairies tend to have sandier soils than marshes,

but they also occupy thin layers of marl soil over bedrock. Dry prairies occur at higher elevations on bedrock and have relatively little soil. Wet prairies have hydroperiods of 70 days and are inundated to a maximum depth of 8 inches during the wet season; dry prairies have hydroperiods of 50 days and are inundated to a maximum of 2 inches. Like marshes, prairies will burn during periods of drought and when sufficient fuel is present. Fire maintains prairies by eliminating invading trees and shrubs.

Nonnative/Invasive Plant Species. The Florida Exotic Pest Plant Council (EPPC) keeps an updated list of Category I and Category II nonnative plants in Florida, which represents about 11 percent of the more than 1,400 nonnative plant species that have been introduced into Florida and subsequently established outside of cultivation (EPPC 2011). Category I nonnative plants are those invasive nonnatives that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives (EPPC 2011). Category II nonnative plants are those invasive nonnatives that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species; these species may become ranked Category I if ecological damage is demonstrated (EPPC 2011). Many of these plants are reported in the BCNP, and therefore within the survey area, but most are restricted to early successional stages on disturbed sites, and only a few pose a long-term threat to native communities. Of these, five species — melaleuca, Brazilian pepper, water-hyacinth, hydrilla, and small-leaf climbing fern (*Lygodium microphyllum*) — are fairly common in the BCNP.

Functions and Values

Functions and values shared by the wetlands located in the NG3-D survey boundary include:

Biotic Functions

The wetlands provide important habitat for mammals, birds, reptiles, amphibians, fishes, and invertebrates, and they sustain complex trophic interactions. Federally endangered or threatened species such as Florida panther (*Puma concolor coryi*) and wood stork (*Mycteria americana*) also use these wetlands at some point in their lives. Wetland structure, including topography, soils, and vegetation, has helped evolve the many highly specialized biota. Mature forested cypress wetland areas provide important nesting and roosting habitat for both birds and mammals. Scrub cypress is dominated by pond cypress (*Taxodium ascendens*) that is adapted for areas with slow to stagnant water, low-nutrient availability, and occasional forest fires. Wet prairies and marshes provide important foraging opportunities for wading birds.

Table 2 summarizes the federally listed wildlife species that have been documented or could potentially occur within the seismic survey area.

Table 2. Federally Listed Wildlife Species with Potential to Occur Within Wetlands in the NG3-D Survey Area

Common Name	Scientific Name	Designated Status
		Federal (USFWS)
Reptiles		
American alligator	*Alligator mississippiensis*	T (S/A)
Eastern indigo snake	*Drymarchon corais couperi*	T
Birds		
Audubon's crested caracara	*Polyborus plancus audubonii*	T
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	E
Red-cockaded woodpecker	*Picoides borealis*	E
Wood stork	*Mycteria americana*	E
Mammals		
Florida bonneted bat	*Eumops floridanus*	E
Florida panther	*Puma concolor coryi*	E

USFWS – U.S. Fish and Wildlife Service
C – Candidate
E – Endangered
T – Threatened
T(S/A) – Threatened Due to Similarity of Appearance

Table 3 summarizes the state-listed wildlife species that have been documented or could potentially occur within wetlands in the NG3-D survey area.

Table 3. State-Listed Wildlife Species with Potential to Occur Within Wetlands in the NG3-D Survey Area

Common Name	Scientific Name	Designated Status
		State (FWC)
Mammals		
Everglades mink	*Mustela vison evergladensis*	ST
Big Cypress fox squirrel	*Sciurus niger avicennia*	ST
Birds		
Limpkin	*Aramus guarauna*	SSC
Little blue heron	*Egretta caerulea*	SSC
Snowy egret	*Egretta thula*	SSC
Tri-colored heron	*Egretta tricolor*	SSC
White ibis	*Eudocimus albus*	SSC
Florida sandhill crane	*Grus canadensis*	ST
Roseate spoonbill	*Platalea ajaja*	SSC

Table 3. (Continued)

Common Name	Scientific Name	Designated Status
		State (FWCC)
Mollusks		
Florida tree snail	*Liguus fasciatus*	SSC

FWC – Florida Fish and Wildlife Conservation Commission
SSC – Species of Special Concern
ST – State Threatened

Hydrologic and Biogeochemical Functions

The wetlands attenuate downstream flooding and recharge the shallow aquifers. Rainwater and water flowing into the NG3-D survey boundary is captured, stored, and slowly released, thereby reducing the impact of downstream flooding, deterring saltwater intrusion, and helping to sustain aquatic resources. The wetlands act as filters and sponges to clarify water by trapping sediment and sequestering and cycling nutrients such as nitrogen and phosphorus.

As stated in the 1992 GMP for the original BCNP and the 2010 GMP for the Addition, the water in the BCNP is relatively unpolluted. Concentrations of nitrogen, phosphorus, total organic carbon, and persistent pesticides, which often serve as indicators of pollution, are generally similar to concentrations in nearby, relatively uninhabited areas, and concentrations are considerably less than those of nearby urbanized areas. Water quality changes occur seasonally and diurnally in the BCNP and are related to the natural hydrologic and biologic regimes. The seasonal recession of water levels triggers physical, chemical, and biological changes in water quality. During low water, diurnal fluctuations in dissolved oxygen are greatest as a result of the high concentration of organisms in the remaining water. During the day, plants produce excess oxygen by photosynthesis. At night, dissolved oxygen decreases as photosynthesis ceases and respiration demands are met.

Wetlands in the NG3-D survey boundary are primarily precipitation driven, but water table aquifers play an important role in their function. The land surfaces are flat and slope to the south and southeast from elevations of approximately 15 to 10 feet over a distance of ten miles across (Figure 2). Wetlands are typically flooded with a shallow sheet of surface water starting shortly after the onset of the rainy season (usually in June) and ending in the winter dry season after surface waters recede to marsh and cypress dome areas. The period from December through May is typically considered the dry season. Rainfall averages 54 inches per year with a range of 35 to 80 inches per year. Summer rains are usually short, intense, and frequent. Winter rains are a result of frontal systems and they last longer and have less intensity. Tropical systems, including hurricanes, occur June to November and can sometimes bring significant and torrential rainfall.

During the rainy season, shallow depressions fill with water. Because of the poor drainage, water stands on the land until it evaporates, infiltrates the soils and porous limestone to the underlying aquifer, or slowly drains off through sloughs or strands. Seasonally high water tables in the surficial aquifers maintain the water levels necessary to support wetland communities. The area is inundated during the wet season by water ranging from a few inches to several feet in depth

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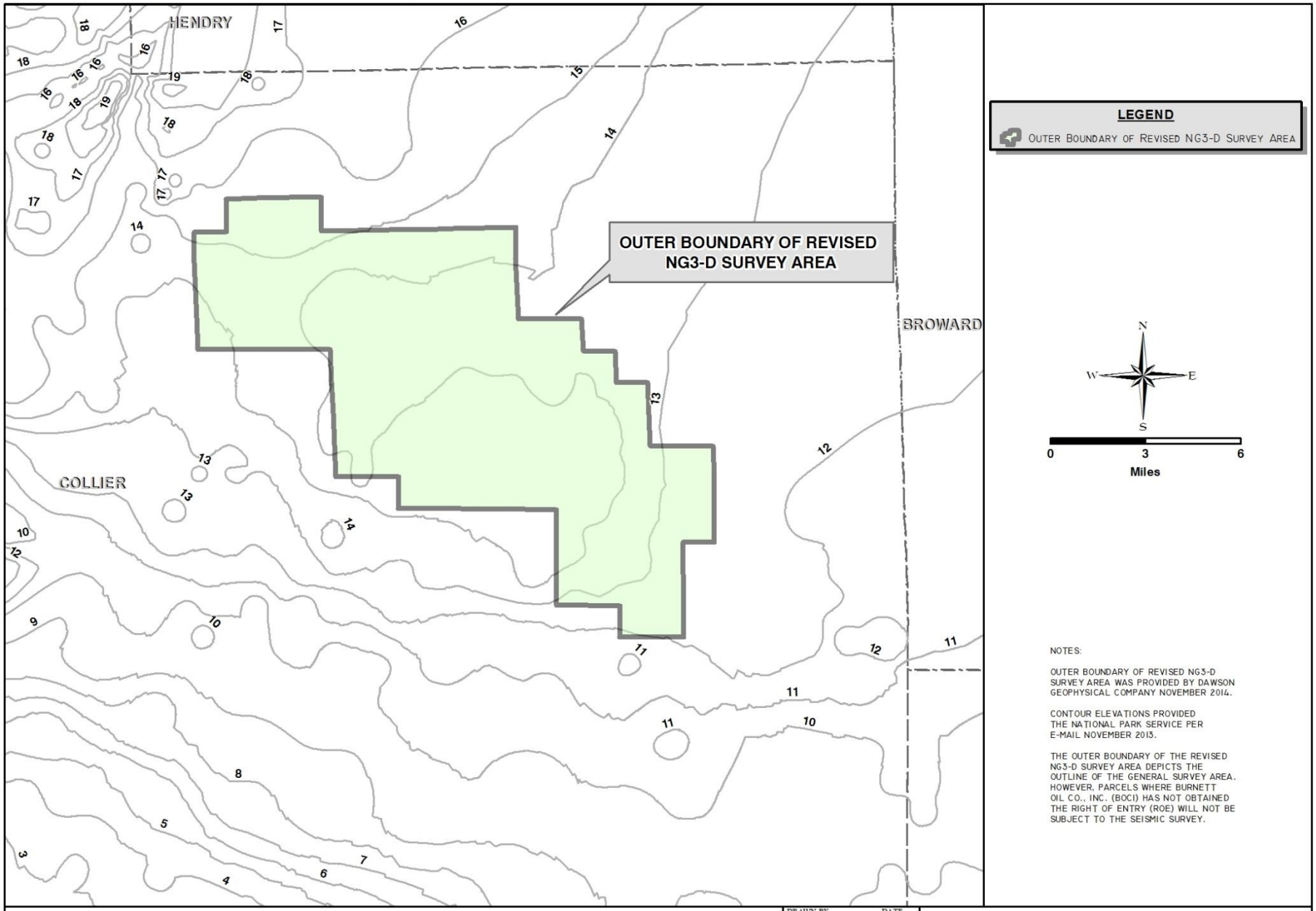

FIGURE 2. TOPOGRAPHY MAP
NOBLES GRADE 3-D

DRAWN BY	DATE
F.L.	12/10/13
REVIEWED BY	DATE
K.C.P.	12/10/13
REVISED	DATE
F.L.	9/9/15

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(Klein *et al*. 1970). In general, the water table across the site is within a few feet of the ground surface during the dry season. During the dry season, there is typically standing water only in the deepest portions of the wetlands. The water regimen of the area largely determines the patterns in which temperate and tropical vegetative communities and their related wildlife species occur. Ponding of water provides refugia for aquatic species and conduits for dispersal of species from one area to another.

Cultural Values

The wetlands provide value as areas utilized for fishing, birding, education, research, nature enjoyment, and wildlife photography. The wetlands have also long been utilized by American Indians and others for hunting, logging, and camping.

Geology

Surface Formations and Thickness

The geologic conditions at and near the surface in the survey area consist of a semi-continuous, three to five foot thick limestone cap rock of cemented shell and siliciclastic materials. The cap rock is often described and mapped as a discrete limestone unit, but most recently it has been described as a duracrust formed by high evaporation and mineralization. Whatever its origin, the cap rock has proven difficult to breach in past geophysical source placement operations.

The NG3-D survey area is relatively flat with elevations ranging from approximately 10 to 13 feet south of I-75 to elevations of mostly 13 to 16 feet (NGVD) north of I-75, with higher isolated islands in the northwest portion of the survey area (Figure 2). The terrain is dotted with cypress domes formed around water-filled depressions where the cap rock is absent. The water depth is often 5 to 8 feet in these depressions. Where present, the duracrust has formed over a sequence of Pleistocene and Pliocene-Pleistocene siliciclastic and poor to moderately indurated carbonate sediments that are up to 500 feet thick.

Soil Types and Engineering Properties

The most recent soil surveys produced by the Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service, were originally issued in 1998 and updated in 2005. However, this mapping does not delineate most of the soil types east of State Road (SR) 29, where the NG3-D survey area is located. As such, soils mapping from historic studies completed by the U.S. Department of Agriculture (USDA) in 1942 (and subsequently published in 1954) was used for this report. The 1954 soils information represents the best available data and has been provided in Exhibit B.

The engineering properties of these soils have not been evaluated. A cap rock with unconsolidated siliciclastic materials below generally underlies the survey area. The cap rock generally provides a good base for roads and will support vehicles. Where the cap rock is absent, however, the soft, siliciclastic material does not support equipment without flotation tires or tracks.

The soils are generally poorly developed and can be characterized as follows:

Cap rock is found at or near the surface in many locations. This duracrust unit often has a thin, calcium-rich marl or quartz sand over it. Cypress sloughs and strands have cap rock at or near the surface.

Marl soil, usually less than a foot thick, is found over much of the areas covered by dwarf cypress. The marl soil has a high pH and is a poor substrate for most vegetation. Marl soils have developed on lower elevations and support small cypress in sloughs and strands.

Organic (or peat) soil is found in wet, cypress dome areas where the cap rock is absent and decaying vegetation has accumulated in depressions. These areas have a very low pH and support cypress and submergent and emergent wetlands vegetation.

Sandy soils are thin quartz sands and found generally over higher elevations. These soils are dominated by pines and hardwoods.

Soil Descriptions

According to the Soil Conservation Service March 1954 Soil Survey of Collier County (U.S. Department of Agriculture 1954), 13 soil types occur within the revised NG3-D survey area (Exhibit B). Table 4 lists the soil types and the associated soil descriptions follow.

Table 4. Soils within the Revised NG3-D Survey Area

Soil Types
Broward Fine Sand – Heavy Substratum Phase
Broward Fine Sand – Shallow Phase
Broward Ochopee Complex
Charlotte Fine Sand
Copeland Fine Sand – Low Phase
Copeland Fine Sand – Shallow Phase
Cypress Swamp
Felda Fine Sand
Freshwater Marsh
Ochopee Fine Sandy Marl – Shallow Phase
Ochopee Marl – Shallow Phase
Rockland
Tucker Marl

Broward Fine Sand, Heavy Substratum Phase
This phase occurs west and east of Sunniland. It differs from Broward fine sand chiefly in having a 2 to 6 inch layer of mottled yellowish-brown and light-gray fine sandy clay loam overlying the limestone. The limestone occurs at depths of 12 to 24 inches.

The natural vegetation is similar to that found on Broward fine sand, except that some areas are without slash pines (*Pinus elliottii*).

Broward Fine Sand, Shallow Phase
This phase, well distributed throughout the Big Cypress region, differs from Broward fine sand chiefly in having the underlying limestone at depths of 6 to 18 inches instead of 18 to 36 inches. In places a 1 or 2 inch layer of mottled yellowish-brown and gray fine sandy clay loam overlies the limestone. These areas are slightly lower than other parts of the phase.

Broward-Ochopee Complex
This complex consists of areas of Broward and Ochopee soils so intricately associated they cannot be separated on a map of the scale used. Islands of Broward soil separated by runways of Ochopee soils make up the complex.

The Broward areas consist mainly of the shallow phase of Broward fine sand; the Ochopee areas, mainly of the shallow phase of Ochopee fine sandy marl. A few areas of Ochopee marl, shallow phase, are included. Commonly limestone is at depths of 3 to 12 inches, but in places limestone rocks are exposed around the islands of Broward soils.

The Broward areas are covered by slash pine, cabbage palm, saw palmetto, other shrubs, and grasses. The Ochopee areas have a short-grass cover. Some of the Broward soils, however, have no pine trees, and some of the Ochopee areas support growths of small cypress.

Charlotte Fine Sand
This soil occupies level, nearly level, or slightly depressed areas in the Big Cypress region. It has a bright-yellow or yellowish-brown subsoil, and it developed from moderately thick beds (40 to 60 inches deep) of fine sand over limestone or marl.

This Charlotte soil is associated with the Pompano and Arzell soils but differs from them mainly in that it has a layer of brownish or yellowish-brown fine sand below 10 to 15 inches and is slightly more alkaline.

The natural vegetation consists principally of second-growth slash pine, cabbage palm, a few saw palmetto, poverty oatgrass (*Danthonia spicata*), broomsedge (*Andropogon* sp.), wiregrass (*Aristida stricta*), switchgrass (*Panicum virgatum*), carpetgrass (*Axonopus* sp.), maidencane, rushes (*Rhynchospora* sp.), sedges, pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria latifolia*), and a few dwarf cypress trees.

In most places the surface soil is covered by a very thin layer of organic scum deposited by surface waters. The surface layer ranges from grayish brown to gray or light gray and is 2 to 10 inches thick.

The lighter colored areas of Charlotte soil usually occur near areas of Arzell soil. In these positions the second layer is light gray or white to depths of 10 to 20 inches, where the brownish-yellow or yellowish-brown layer begins. This yellowish layer varies from 10 to 40 inches in thickness. In places it lies directly on the limestone and marl, and the light-gray or white layer is

missing. Small iron concretions are found immediately above the limestone in some areas, and the surface soil may contain small amounts of marl mixed with the fine sands.

Copeland Fine Sand, Low Phase
This soil is associated chiefly with the other Copeland soils and Cypress swamp but differs from Copeland fine sand in position. It is low and covered with water many months of the year and has only a very thin layer of fine sandy clay loam over the limestone, and in some places none at all. Internal drainage is rapid when the soil is freed of the high water table.

All of this land is covered with cabbage palm, saw palm, vines, ferns, and a few slash pine and cypress trees.

Copeland Fine Sand, Shallow Phase
This phase differs from Copeland fine sand mainly in having a shallow sandy layer over the limestone rocks and in occupying lower positions.

Internal drainage is rapid when the high water table is lowered. The normal range in depth to limestone is 3 to 12 inches, but in places limestone rocks are at the surface. The black or very dark-gray fine sand rests almost directly on the limestone; only a trace of fine sandy clay loam separates it from the limestone.

Because of its position–on lands within or adjacent to sloughs, marshes, and cypress strands–this phase has a dense growth of many subtropical plants mixed with cabbage palms, oaks, maples, and a few pine trees. Practically all of this soil still supports native vegetation.

Cypress Swamp
This land type consists of low-lying forested areas covered with water the greater part of the year. It occurs mainly as cypress strands and mixed swamps that serve as natural drainageways for the Big Cypress region in the interior of Collier County. The soils in these areas vary within short distances in color, texture, composition, and thickness of the various layers. In some places the topmost 2- or 3-inch layer is black or dark-gray mucky fine sand or peaty muck, and in others it is brown peat. The subsoil, or lower layer, is usually gray or light-gray fine sand. Intermingling of soils, dense undergrowth in many areas, and wetness make separation into soil types and phases impractical, though some of the soils are known to be Pompano fine sand, Arzell fine sand, and Copeland fine sand. Also, there are areas classified as peaty mucks or as peat.

Relatively large areas are made up of cypress strands and mixed swamps. The cypress strands support mainly medium to large bald and pond cypress trees and an undergrowth of buttonbush (*Cephalanthus occidentalis*), some marsh rushes, grasses, ferns, and vines.

All of Cypress swamp lies at a very low elevation or in sloughlike depressions and may be covered by several feet of water part of the year. The water levels tend to vary widely from season to season and from year to year. Sometimes the surface is dry.

Felda Fine Sand

This level or nearly level soil occurs on the short-grass prairies adjacent to the Sunniland soil. The soil developed from thin beds of fine sand over clayey materials that contain limestone or moderately hard marl. The soil is poorly drained; it has no appreciable runoff and a high water table. During rainy seasons water drains from the higher soils and stands for many days on these depressional prairies.

This soil is associated with the Pompano Charlotte, and Arzell soils but differs from them in having a thin (18- to 36-inch) sandy layer over clayey sediments and limestone. It is more poorly drained and is grayer in the deeper layers than the Sunniland soil.

The native vegetation consists chiefly of switchgrass, carpetgrass, three-awn (*Aristida* sp.), and poverty oatgrass, broomsedge, maidencane, rushes, sedges, pickerelweed, and arrowhead.

This soil varies considerably, particularly in the colors of the sandy layers overlying the clayey materials. In some places these layers have almost the gray and light gray or white colors characteristic of the Arzell soil, but in other places the sandy layers are yellowish-brown to pale yellow, as in the Charlotte soil. Where the sandy layers resemble those of the Charlotte soil, the clayey materials are predominantly brownish yellow mottled with light gray and white.

Fresh Water Marsh

This land type consists of shallow ponds and marshes covered with a few inches to 3 feet or more of water the greater part of the year. The soils in the marshes and smaller ponded areas vary a great deal within short distances and therefore are not separated into types and phases.

Most of the soils within the wettest section have 3 to 13 inches of partly decayed vegetative matter mixed with fine sands. The surface layer is underlain by gray fine sands, which grade into light-gray to white fine sands at depths of 15 to 30 inches. Calcareous clayey material, marl, or limestone rock occurs at depths of 36 to 48 inches.

In the southern part of Okaloacoochee Slough, the brown fibrous peat is about 6 inches thick and overlies very dark-gray fine sands that contain much organic matter. At a depth of 36 to 42 inches occur calcareous clayey materials, marl, or limestone.

This marsh usually supports a thick growth of water lily (*Nymphaea* sp.), pickerelweed, arrowhead, bonnets (*Chaptalia* sp.), bladderwort (*Utricularia* sp.), maidencane, wax myrtle (*Myrica cerifera*), sedges, sawgrass, and cattails (*Typha* sp.). A few marsh areas are near brackish water and adjacent to tidal marshes; they support cattails, grasses, and sedges. The soils in this area vary from dark-gray mucky fine sands to grayish-brown fine sand overlying light-gray fine sand. They are usually alkaline.

Ochopee Fine Sandy Marl, Shallow Phase

Most of this phase is associated with other Ochopee soils and with Tucker marl. It differs from Ochopee fine sandy marl chiefly in having limestone at shallower depths, or 6 to 12 inches below the surface instead of 12 to 36 inches. It is very poorly drained and has fewer narrow natural drainageways than the Ochopee fine sandy marl.

The surface layer, 3 to 4 inches thick, is dark grayish-brown or dark-gray fine sandy marl of loamy fine sand texture. This layer is underlain by grayish-brown marly fine sand that has a few light-gray and light yellowish-brown mottles. The depth to the limestone varies within short distances, primarily because of solution holes in the limestone formation. In places limestone rocks appear at the surface. Included with this soil are very small areas of Broward and Keri soils or Rockland, which occur as islands covered with cabbage palms.

The greater part of this soil has a cover of short grasses. Some areas, however, support stunted cypress, slash pine, and other trees.

Ochopee Marl, Shallow Phase

Extensive areas of this phase occur east and northeast of Deep Lake. The underlying limestone is at depths of 3 to 12 inches, as compared to 12 to 36 inches in Ochopee marl. In most other respects, the two soils are similar.

The surface layer, 3 to 8 inches thick, is a dark grayish-brown or dark-gray marl of fine sandy loam texture. Below this occurs grayish-brown or light-gray fine sandy marl of loamy find sand of find sand texture. In many places this fine sand layer is very thin or entirely absent and the marl surface layer lies directly on limestone. In a few instances a very thin layer of fine sandy clay loam overlies the limestone.

This soil is associated with other Ochopee soils and the Tucker and Broward soils. Where this phase is near Tucker marl, its surface layer varies within short distances from a fine sandy loam to a clay loam, and in some lower positions consists of a mixture of mucky materials and marl.

Rockland

This land type constitutes nearly level areas that contain small depressions. It occurs as islands within the Big Cypress region, where it is associated with the Broward, Ochopee, Tucker, Charlotte, Pompano, Keri, and Copeland soils. It is commonly referred to as pine rockland. At the surface, outcrops of Tamiami limestone predominate, but there is soil material between the outcrops similar to that described for the shallow phase of either Broward fine sand or Ochopee fine sandy marl. The soil material in the solution holes ranges from a few inches to several feet in thickness. It is somewhat poorly drained. Some of the surface water drains into the numerous sandy areas between the rocks and thence into underground channels.

The vegetative cover consists primarily of second-growth slash pine, cabbage palm, saw palmetto, running oak (*Quercus pumila*), wiregrass, and other grasses, and shrubs, but some of the areas support cypress trees, or grasses and a few trees, or grasses only.

Tucker Marl

This soil occupies level or nearly level marl prairies, 6 to 15 feet above sea level. It is associated with the Ochopee, Broward, Matmon, Sunniland, Charlotte, Pompano, and Felda soils. It differs from the Ochopee soils chiefly in its lower content of sand and higher content of clay. It has developed from recent deposits of finely divided calcareous sediments or marl mixed with appreciable quantities of fine sand and clay. The marl lies directly on moderately hard limestone at depths ranging from 4 to 24 inches. Natural drainage is very poor, and water covers the soil several months each year.

The native vegetation consists of sawgrass, switchgrass, poverty oatgrass, and carpetgrass, broomsedge, maidencane, arrowhead, rushes, and sedges.

This soil is strongly alkaline and its layers are of variable thickness. The surface layer is 3 to 8 inches thick; the second layer, 6 to 18 inches. The average depth to limestone is 14 inches, but the range is from 4 to 24 inches. In a few instances no rock is reached within a depth of 42 inches. Sometimes a thin layer of gritty materials – a mixture of sands, small limestone fragments, and marl – overlies the limestone. In small areas the surface texture approaches a fine sandy loam, but usually it is clay loam or silty clay loam. In other places the surface layer may be slightly mucky.

Included with this soil are several cabbage palm and saw palmetto islands where the areas are known to be rockland or soils of the Broward or Matmon series. In a few instances the limestone is more shallow adjacent to these islands and outcrops. Small limestone outcrops are scattered within areas of this soil.

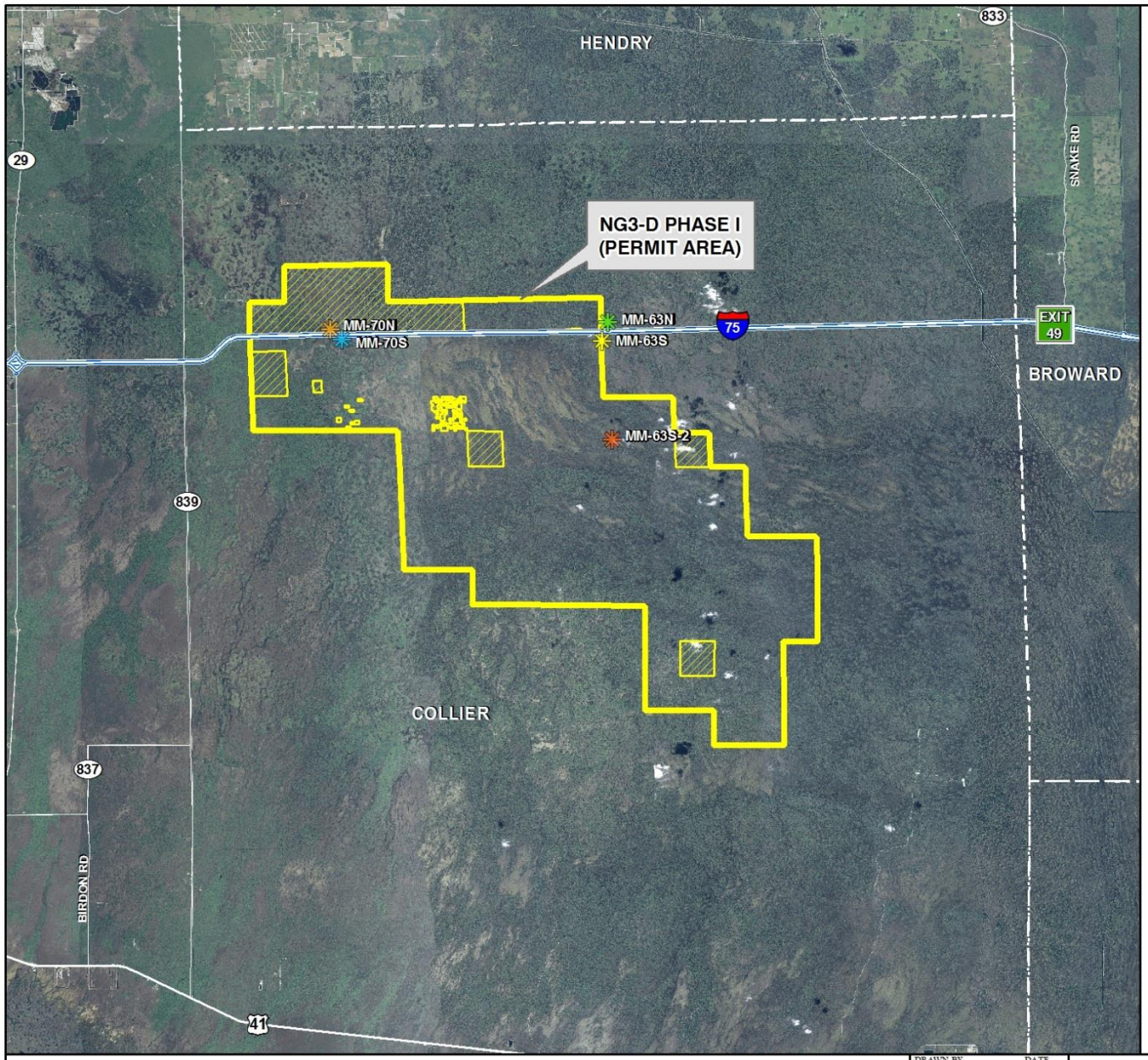
Field Staging Areas

The NG3-D seismic survey area is bisected by I-75, an east-west interstate highway with limited access. Because the survey will involve a temporary traversal of small portions of the 110± acre survey area, a minimum of five staging areas will be required to efficiently support seismic field operations (Figure 3 and Exhibit D). The five selected staging areas were chosen to maximize utilization of previously disturbed or open areas with short access from existing rest and recreational parking area service roads.

Staging area sizes will range from a maximum 3.57 acres for the primary staging area (MM-63S) to 2± acres or less for the secondary sites (Exhibit E). Staging areas will encompass a maximum 12 acres of wetland and former well pads. The primary staging area, at a minimum, will include the following (actual dimensions and numbers may vary slightly):

- One 8 x 35 foot office/staging trailer;
- One 8 x 10 foot data recording control truck (“Dog House”) plus generator;
- One 60-foot high radio-telemetry antenna;
- One 8 x 25 foot Journey management trailer plus generator;
- One 8 x 30 foot Geomerge trailer plus generator;
- One 8 x 30 foot battery charging trailer plus generator;
- Up to 10 utility vehicles (UTVs);
- One 8 x 25 foot helicopter support and tracking trailer plus generator; and
- Five 8 x 40 foot equipment semi-trailers.

J:\2013\13boc2197\GIS\2015\Wetland Statement of Findings\Figures\Figure 3 Staging Areas Location Map 1-15-15.mxd - 11/10/2015 @ 3:43:41 PM



LEGEND

- NOBLES GRADE 3-D PHASE I (PERMIT AREA)
- BOCI ROE - OBTAINING

STAGING LOCATIONS

- MM-63N
- MM-63S
- MM-63S-2
- MM-70N
- MM-70S

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Miles

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013.

NOBLES GRADE 3-D PHASE I (PERMIT AREA) WAS PROVIDED BY DAWSON GEOPHYSICAL COMPANY NOVEMBER 2014.

THE NOBLES GRADE 3-D PHASE I (PERMIT AREA) DEPICTS THE OUTLINE OF THE GENERAL SURVEY AREA. HOWEVER, PARCELS WHERE BURNETT OIL CO., INC. (BOCI) HAS NOT OBTAINED THE RIGHT OF ENTRY (ROE) WILL NOT BE SUBJECT TO THE SEISMIC SURVEY.

FIGURE 3. STAGING AREAS LOCATION MAP
NOBLES GRADE 3-D

	DRAWN BY	DATE
	F.L.	12/10/13
REVIEWED BY		DATE
	K.C.P.	12/10/13
REVISED		DATE
	F.L.	12/1/14

Consulting Ecologists
PASSARELLA & ASSOCIATES INC

MM-63N

Mile Marker (MM)-63N is a former 3.44± acre exploratory well pad constructed and abandoned in 1972 (Figure 3). The pad is located 0.25± mile from the I-75 recreational parking area via the existing Nobles Grade and a spur road. No road construction is proposed. The pad and access road are 1.5 to 2.5 feet above grade and appear to be high enough to provide all-weather access. At the time of its abandonment, the site was in private ownership, and all oil and gas activities occurred prior to the creation and subsequent expansion of the BCNP. Site conditions as of early 2014 are shown in Exhibit C.

The MM-63N field staging area is characterized by highly disturbed conditions and is located in a transitional habitat zone. A review of the land cover data provided by the NPS on November 15, 2013, identifies the chosen location of MM-63N as a wet prairie and cypress forest (Exhibit D). Based on observed field conditions, this area resembles a fill pad and includes vegetation characteristic of upland habitat. Canopy coverage includes scattered cabbage palm and a large cluster of Brazilian pepper in the central portion of the area. The sub-canopy includes scattered cabbage palm, Brazilian pepper, and wax myrtle. The sub-canopy also includes the exotic ornamental species red bottlebrush (*Callistemon viminalis*). The ground cover is dominated by wiregrass and includes scattered Asiatic pennywort (*Centella asiatica*), white-top sedge, lovevine (*Cassytha filiformis*), and Tracy's beaksedge (*Rhynchospora tracyi*). The exotic ornamental species oyster plant (*Tradescantia spathacea*) was found scattered throughout the ground cover.

Soil in the MM-63N area consists of Ochopee Fine Sandy Marl—Shallow Phase. Soils in the area have been disturbed and include crushed lime rock, sand, and non-native fill material used to construct the access road and pad in 1972. The site is well drained and contains no areas where water stands for extended periods.

MM-63S

MM-63S will occupy portions of a 3.57± acre rectangular site 0.2± mile south of the I-75 right-of-way (ROW) fence (Figure 3). Access to the site will be via an existing elevated trail; no road construction is proposed. Very little if any site preparation is anticipated. If soil conditions will not support heavy equipment to and within the proposed staging area, a support system, such as a composite interlocking mat system, will be utilized, if appropriate.

The existing conditions of the MM-63S field staging area are shown in Exhibit C. A review of the land cover data provided by the NPS on November 15, 2013, identifies the chosen location of MM-63S as scrub cypress (Exhibit D). MM-63S is mostly located in a wetland community interspersed with small upland areas. Canopy cover in the upland areas includes scattered cabbage palm. The sub-canopy includes cabbage palm, wax myrtle, and myrsine (*Myrsine cubana*). The ground cover includes scattered saw palmetto. Land cover data provided by the NPS identifies an area of mesic pine flatwoods located east of MM-63S. This mesic area is dominated by a majority of wetland vegetation. No suitable areas of upland exist nearby.

Canopy cover in the wetland areas includes widely scattered cypress. Sub-canopy cover includes clustered cypress, wax myrtle, and corkwood (*Stillingia aquatica*). The ground cover includes

panicgrass (*Panicum* sp.), beaksedge (*Rhynchospora* sp.), rush (*Juncus* sp.), lovevine, Asiatic pennywort, bushy bluestem (*Andropogon glomeratus*), and sawgrass.

Soil in the MM-63S area consists of Ochopee Fine Sandy Marl—Shallow Phase.

MM-63S is located in close proximity to high levels of ongoing human presence including I-75, newly enlarged sewage treatment and constructed emergency response facilities, the reconstructed MM-63 rest area facility, and a 300-foot tall radio-telemetry transmission tower.

Specifically, the short travel distance between the selected staging area and the established rest area keeps disturbances to a minimum. As explained, the existing roads, trails, and treeless habitat at this staging area make clearing unnecessary. Conversely, use of previously undisturbed areas would require clearing and other disturbances, making these areas impractical alternatives.

MM-63S-2

MM-63S-2 is a 1.97± acre abandoned exploratory well pad (Figure 3) located approximately 3.25 miles south of the primary staging area (MM-63S) via an existing ORV trail. No road construction is proposed to access this site. The staging area MM-63S-2 was not field-verified during the January 2014 site review; however, the vegetative composition of the area is likely similar to the nearby field staging area MM-63S. A review of the land cover data provided by the NPS on November 15, 2013, identifies the chosen location of MM-63S-2 as scrub cypress (Exhibit D). No suitable areas of upland exist nearby. Soil in the MM-63S-2 area consists of Ochopee Fine Sandy Marl—Shallow Phase.

MM-70N

The MM-70N site is 0.73± acre located 723± feet north of the I-75 ROW and is immediately north of the I-75 recreational parking area (Figure 3). No road construction is proposed to access this site. Under an arrangement pursuant to the Collier-Florida Department of Transportation (FDOT) agreement, access is expected to be a FDOT-constructed connecting pathway from the paved parking area through a fence cut approximately 75 feet west of the existing visitor entry point. From there, a pathway will be provided to the ROW fence where a second locked gate will be installed providing entry into the BCNP and to the open area staging site. Created pathways will be at existing natural grade.

The existing conditions of the MM-70N field staging area are shown in Exhibit C. A review of the land cover data provided by the NPS on November 15, 2013, identifies the chosen location of MM-70N as a cypress forest (Exhibit D). Based on observed field conditions, this area is a wet prairie with scattered scrub cypress. Land cover data provided by the NPS identifies an area of mesic pine flatwoods located east of MM-70N. This mesic area is dominated by majority wetland vegetation. No suitable areas of upland exist nearby.

MM-70N is mostly located in a wetland community type. Canopy cover includes widely scattered cypress. Sub-canopy cover includes clustered cypress, wax myrtle, and corkwood. The ground cover includes panicgrass, beaksedge, rush, lovevine, Asiatic pennywort, bushy bluestem, and sawgrass.

Soil in the MM-70N area consists of Ochopee Fine Sandy Marl—Shallow Phase, Tucker Marl, and Broward Ochopee Complex.

MM-70S

The MM-70S staging area site lies 600 feet south of an I-75 recreational parking area (Figure 3). Access to the site will be via an existing elevated trail; no road construction is proposed.

Existing conditions at MM-70S are shown in Exhibit C. The MM-70S staging area is located in a wetland community. A review of the land cover data provided by the NPS on November 15, 2013, identifies the chosen location of MM-70S as hydric pine flatwoods (Exhibit D). This characterization is not correct based on observed field conditions, which resemble a scrub cypress habitat. Canopy coverage is mostly open and includes widely scattered cypress. The sub-canopy is also largely open and includes cypress, wax myrtle, and corkwood. The ground cover is composed of panicgrass, beaksedge, rush, lovevine, Asiatic pennywort, bushy bluestem, and sawgrass. Land cover data provided by the NPS identifies no suitable areas of upland existing nearby.

Soil in the MM-70S area consists of Ochopee Fine Sandy Marl—Shallow Phase.

POTENTIAL WETLAND IMPACTS OF THE PREFERRED ALTERNATIVE

No fill will be brought in for staging area or road construction; therefore, no wetlands would be filled. There would be no permanent loss or degradation of wetland function. Temporary adverse impacts (in the form of rutting, soil compaction, and vegetation destruction) could result from the access to five staging areas and the movement of survey crew and vehicles through the BCNP to conduct the survey.

Staging area sites will be utilized in their current conditions. Should improvements be needed, they will include the use of composite mats to reduce impact of equipment to the ground surface. Individual pieces of vegetation would be matted down, scraped, or trimmed to allow for staging area storage and passage of the survey crew and vehicles. Soils could be compacted by staging area mats and passage of the survey vehicles, although rutting would be reduced by the use of balloon-type tires as opposed to the use of standard tires. Within staging areas, non-native vegetation will be removed to the extent needed for operational use. Native vegetation will be removed to the extent needed and authorized by the NPS staff.

The theoretical distance that vehicles could drive to access the unmodified length of source points, receiver lines, and staging areas is 1,681± miles. Not all source and receiver lines will be accessible for survey, and the majority of the 1,171± linear miles of receiver lines will be accessed on foot. There will be two sets of three vehicles driving through the wetlands to access the source points. Assuming the entirety of the source lines is accessible, there is a potential for rutting, soil compaction, and vegetation destruction for a total two-track distance of 510± miles.

Wetland Impact Avoidance and Minimization

The revised 3-D geophysical seismic survey's initial design encompasses approximately 110 square miles of surface land and is comprised of 64 source lines and 168 receiver lines oriented generally at right angles to each other in an industry standard, unmodified "orthogonal" pattern. This is the initial design of hypothetical lines on a map prior to modification required to avoid impacts to sensitive areas. The 64 source lines are 1,155 feet apart, oriented east to west and designed to accommodate approximately 32,657 source points spaced at 82.5-foot intervals. Each source point will be accessed by a group of three Vibroseis vehicles. Accessing the entirety of the unmodified source line layout will require driving a maximum 510 linear miles, assumed for this assessment as entirely through wetland habitat. The 168 receiver lines are 495 feet apart, oriented north to south and designed to accommodate approximately 37,465 receiver points spaced at 165-foot intervals. Each receiver point consists of three geophones placed in line. Access to receiver lines will be accomplished in large part by crews working and travelling on foot and by helicopter. The entirety of the unmodified receiver line layout will occupy a maximum 1,171 linear miles, assumed for this assessment as entirely through wetland habitat.

The initial design was modified based on aerial imagery and documented wildlife/cultural resources to minimize or avoid impacts to sensitive areas. Specifically, where the initial seismic survey design intersected with important resource areas, the Modification Protocols first looked to move source points to existing or previous disturbances (roads and trails) followed by selection of source points at non-road/trail locations offering the opportunity for the least wetland resource impacts. Receiver lines were also modified to route along existing disturbances while maintaining as much of a straight line configuration as possible. While the design has inherent source and receiver point location flexibility, modifications are governed by the need to satisfy a minimum design "fold" standard (i.e., a sufficient volume of vibration responses received) in order to achieve a satisfactory survey quality. An example of implementing Modification Protocols for source and receiver points is shown in Figure 4. The modified line locations for the entire NG3-D seismic survey area are shown on Exhibits F and G. These modified lines will be further moved during field operations to incorporate real-time data to further avoid/minimize potential wetland resource impacts.

Potential environmental impacts will be substantially reduced by the daily scouting that will occur immediately in front of the survey in direct coordination with the NPS and subsequent route adjustments to avoid sensitive resources. A professional wetland scientist hired by the applicant and approved by NPS staff, along with the survey crew and crew manager chiefs, will scout a given area daily prior to the seismic survey taking place. The professional wetland scientist will be from a private entity that will be professionally trained and have local experience with the flora, hydric soil conditions, and wetland habitat of the BCNP. Additional approved professional wetland scientists will be present with each survey crew. Additional aerial scouting will be conducted by a professional wetland scientist to identify potential species habitat that could be affected by the receiver line placement (i.e., red-cockaded woodpecker (*Picoides borealis*) habitat, wading bird rookeries, etc.). Additional groundtruthing will be conducted by the professional wetland scientist (if needed) in conjunction with the NPS to avoid protected species location along the receiver lines, if identified.

Nobles Grade 3D
Theoretical Source and Receiver Moves
Location #1

Receivers – Blue
Source – Red
Receiver Line Interval: 495'
Receiver Group Interval: 165'
Source Line Interval: 1155'
Source Group Interval: 82.5'

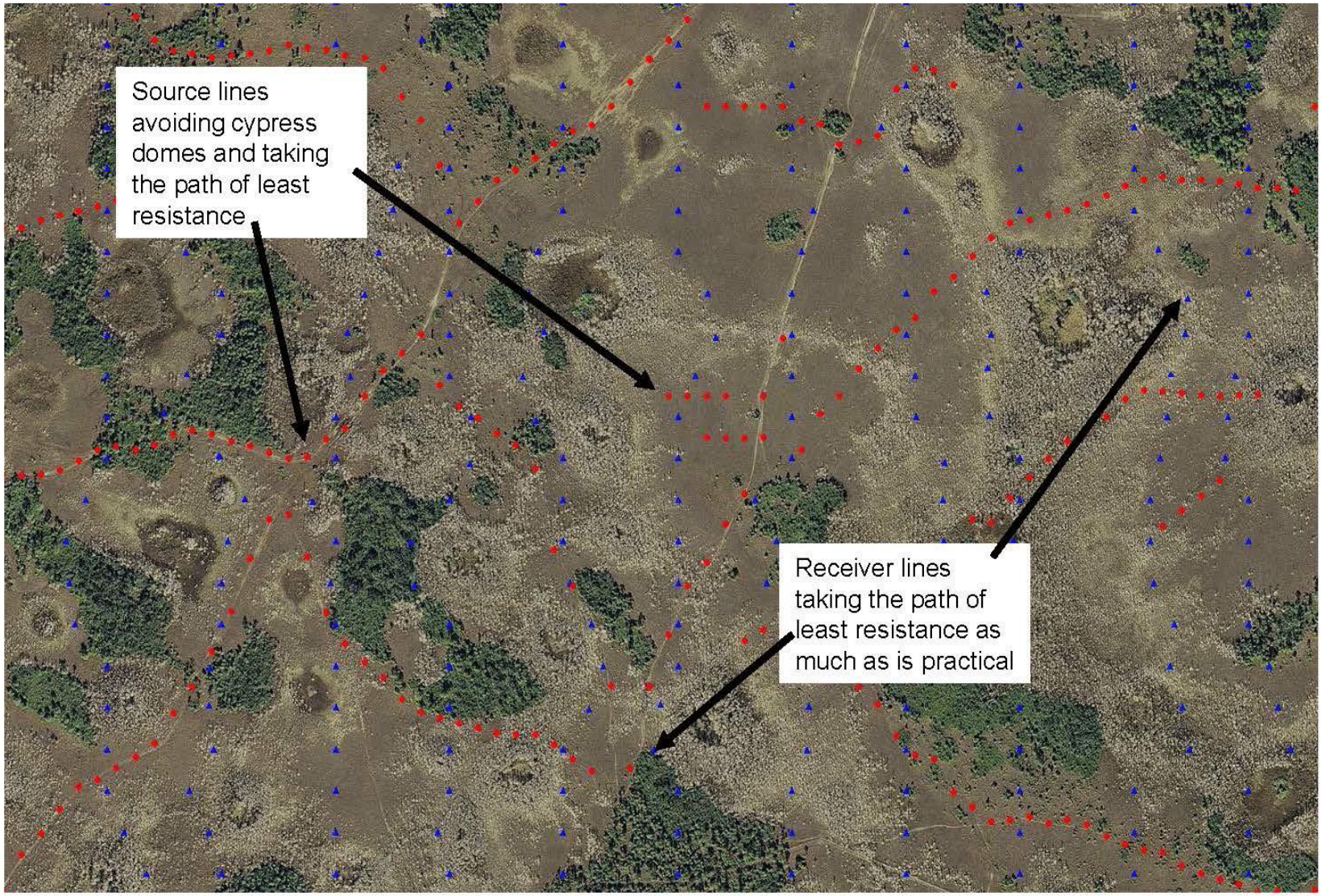

Figure 4. Modified Standard "Brick-Grid"

The use of ORVs associated with the seismic survey is anticipated to result in significantly less impacts than ongoing recreational ORV use within the BNCP, mainly due to the "one pass" design and operation during the dry season when no standing water is present. Surveying activities will not commence until dry season conditions are present. In the event that isolated areas with standing water or saturated soil conditions at or near the surface of the soil are encountered, the survey equipment would avoid these areas. Driving equipment would also cease when site conditions become wet enough that the survey cannot be conducted due to the presence of standing water or saturated soils. In the event that survey activities are not complete by the end of the dry season, they will not continue into the wet season and will be ceased pursuant to coordination with NPS and Florida Department of Environmental Protection (FDEP) inspectors. The characterization of the anticipated *de minimis* impact from Vibroseis vehicles is heavily dependent on their use during dry conditions.

Vibrators will operate in two sets of three buggies. The buggies in each group will be lined up in a row. The two groups (or lines) of buggies will be separate but in relative proximity to each other. While one set of three buggies is moving to the next vibration source point, the other set of three buggies will be shaking its source point. Each group of buggies will have a scout UTV working with a professional wetland scientist and archeologist (in a second UTV), traveling in tandem across vibration source point lines with the least environmental impacts. The "one pass" survey design means that the equipment groups will only traverse a given area once and that area will not be driven upon again in the majority of cases. However, certain crossings may be used more than once if it would result in less environmental impacts to avoid a sensitive area.

The "one pass" design eliminates the progressive widening of trails which generally occurs as a result of overuse and rutting from multiple passes. Duever concluded in his original 1981 and in his follow up 1986 study, that single passes of ORVs (in most cases) did not result in long-term adverse impacts to vegetation or soils and that virtually all of the one pass lanes had restored in one year and completely disappeared after seven years of recovery.

Duever summarized in his 1986 study that vegetation which is impacted by a passing vehicle is frequently not killed and will resprout and continue to grow. In addition, Duever concluded in his original 1981 study that water levels were the single most important environmental factor influencing severity of ORV impacts, and that when water is above ground or near the soil surface at the time ORV impacts occur, the degree of impact and time required for recovery are greatly increased. As such, it is important to note that the original 1981 Duever study was conducted during the wet season, when environmental conditions were at their most sensitive, and that the single passes of ORVs (in most cases) still did not result in significant damage to vegetation or soils. Seismic survey vehicles will avoid operations in standing water or soils saturated at or just below the surface, to significantly decrease the likelihood of soil and plant disruption. In addition, if the vehicle tires begin to break the soil surface, the operator will retreat and move around the soft soils.

The operation as proposed incorporates measures that would prevent or minimize impacts to fish and wildlife communities, as well as the natural environment that supports these communities. Offsets from waterways and known locations of threatened and endangered species will be applied, the crews would not be permitted to harass wildlife, and seismic operations in any given

area would only occur for a brief period of time before moving on to the next source point location. Suitable adjacent habitat is also widely available for displaced wildlife to utilize during project operations, and impacts to habitat values are expected to be short term.

Minimization of Potential Surface and Subsurface Geologic Impacts

Potential impacts to soil in some locations could occur through soil rutting and soil compaction. Potential impacts to habitat depend upon the degree of a given habitat's sensitivity. Habitat sensitivity is closely related to the habitat's hydrologic characteristics, where the most easily impacted sites are the wettest (Duever *et al.* 1981). Seismic survey activities would be expected to produce greater impacts in wetland areas where the soils are inundated or saturated than in wetland areas where the upper soil surface is dry.

Because the controlling factor in the capacity to severely disrupt soils is the moisture content of the soil (2000 BCNP ORV Management Plan), operations will be conducted during the dry period of the year (typically December through May) to reduce or eliminate potential impacts to soils. Marl and peat soils (a product of extended inundation) were shown to be less sensitive to disturbance during dry periods (Duever *et al.* 1981). BOCI will coordinate all field operations with NPS managers to avoid working in saturated soils or standing water.

The 2006 NPS operators manual specifically recommends the use of vehicles with "low ground pressure" to reduce potential impacts. The BCNP's ORV GMP/EIS (NPS 2000*b*) states that using wider, high-flotation tires and reducing vehicle weight may help reduce soil displacement, rut depths, and root damage. As such, the balloon (flotation) tires used on the Vibroseis buggies to reduce or eliminate potential impacts to soils will also help protect against surface impacts. The wide, smooth treaded balloon tires will spread the weight of the buggy over a wider "footprint." This displacement of weight will allow the Vibroseis buggy to minimize the creation of ruts (as opposed to using standard tires) in the drier wetland areas.

The bulk of the other field operations (surveying, laying out and picking up geophone receivers and recording equipment) will be accomplished in large part by crews working and traveling on foot and by helicopter. A field helicopter equipped with slings, long lines, and a quick disconnect system to move and deploy geophone and recording equipment and supplies will also be used. This will reduce time and equipment on the ground, which will in turn decrease potential impacts as less equipment and personnel will be traversing the ground.

In the unexpected event that field operations along the source or receiver lines result in damage to BCNP lands, the impacts will be remediated immediately by members of the survey crew. These areas will be reclaimed by restoring ruts, depressions, and vehicle tracks resulting from field operations to original contour conditions concurrent with daily operations using shovels and rakes. Field clean-up will begin immediately upon completion of each task and final clearance will be documented by and coordinated with NPS representatives. As a result of these efforts, the need for follow-up reclamation measures is not anticipated. However, consistent with 36 CFR § 9.39, BCNP MMP geophysical operational Stipulations 39 through 45, and the suggestions and guidelines provided in the 2006 NPS Operator's Handbook, the Operator will take steps to reclaim the natural conditions and processes existing prior to the start of field

operations or to such other conditions agreed to by the Operator and the Regional Director and Superintendent, if needed.

Since the near-surface geologic materials in the NG3-D survey area consist largely of unconsolidated and saturated sands and clays, the inherent unconsolidated nature and elasticity of the near-surface and subsurface geologic strata is expected to provide for non-fracturing outcomes by source point vibrations. Because of the subsurface characteristics described above and source point spacing (no closer than 82.5 feet), short, high-frequency vibration by Vibroseis equipment is not expected to disrupt or fracture rock materials or alter groundwater conditions beneath the surface. No drilling or dynamite will be used for the seismic survey.

Temporary staging areas will be utilized to minimize the amount of disturbance by reducing the amount of equipment and personnel traversing the NG3-D seismic survey area. The main staging area (63-S) will be utilized mostly for vehicle parking, equipment storage, and crew mobilization. The four other staging areas will be utilized to a lesser degree for surveying and geophone deployment activities and support of acquisition operations. The staging areas were selected to minimize potential impacts and are generally located on existing abandoned oil well pads, other easily accessible open areas adjacent to I-75, or previously disturbed areas. No discharge of dredged or fill material into wetlands is proposed. All materials will be removed from the staging areas at the conclusion of the survey.

Minimization of Potential Hydrologic Impacts

Temporary and localized impacts to water quality and hydrology could potentially result from equipment and crew movement. Surface water quality could be degraded from suspending sediment/soil into surface waters in the immediate locations traversed by vehicles if vehicle movement and heavy foot traffic occurred in pools or puddles of standing water. Although unlikely, this turbidity could potentially lead to reduced light penetration and the mobilization of nutrients into the water column – both of which could result in dissolved oxygen depletion. Dissolved oxygen depletion could stress both plants and animals in these shallow-water areas directly traversed by vehicles. Also, potential impacts to water quality as a result of the proposed survey could occur through fuel spills and/or minor leaking of fluids from the geophysical vehicles. All of these potential impacts are addressed by the plan design and/or mitigation measures.

However, many of the potential impacts to surface and groundwater quality will be minimized by conducting the 3-D seismic operations in conditions where standing water is absent and soils are at their driest (Davis *et al.* 2010). Consistent with the BCNP GMP/EIS/MMP geophysical Stipulation #7, the proposed seismic survey will be scheduled during the dry period of the year (typically December through May), so significant impacts to water quality, hydrology, and near-surface, subsurface geologic resources are not anticipated. BOCI will coordinate all field operations with NPS managers to avoid working in standing water to the extent practicable.

As stated in the MMP prepared as part of the management plan for the original BCNP, properly conducted geophysical operations should not adversely affect hydrology in the BCNP. The irregular ground surface of the BCNP is not susceptible to channelizing, as wetlands are predominantly bounded at both ends by uplands (Davis *et al.* 2010). Although some drainage

could take place anywhere a trail leads into a slough or strand, it is unlikely that even a trail with shallow ruts (which are highly unlikely) will have significant drainage impacts (Davis *et al.* 2010). Survey activities will avoid hydrological impacts by re-routing seismic survey activities around soft soils and standing water areas, thereby reducing the risk for rutting and subsequently channelization. No hydrologic modifications are proposed as part of the seismic survey, and no interruption to surface water flows are anticipated.

Vibroseis buggies will be equipped with wide, smooth treaded balloon tires designed to spread the weight of the buggy over a wider "footprint" to reduce potential impacts to soils, which may also reduce the potential for soil compaction and rutting, which may in turn reduce the potential impacts to water quality and hydrology. Vibroseis source lines will be located on existing roads, trails, and disturbances where feasible. The use of Vibroseis buggies and the use of existing disturbed areas will minimize potential channeling of surface flow or erosion/sedimentation.

A field helicopter equipped with slings, long lines, and a quick disconnect system to move and deploy geophone and recording equipment and supplies will also be used. This will reduce time and equipment on the ground, which will in turn decrease potential impacts to water quality and hydrology, as less equipment and personnel will be traversing the ground. No drilling or dynamite will be used for the seismic survey, so potential turbidity from drilling shotholes and sealing off the wellbore from possible cross-contamination of aquifers will not occur. Direct impacts to aquifers or groundwater from the seismic survey are not anticipated.

Potential contaminants associated with the seismic survey will be very limited and localized to small areas due to the application of the MMP's resource protective stipulations on the proposed operations. Although fuel spills are unlikely, fuel spill containment systems will be available for refueling, parking and fuel tank/trailer storage to reduce potential impacts associated with accidental fuel spills to water quality. In the unlikely event that a spill occurs, clean-up and restoration activities will be conducted in compliance with applicable MMP operation stipulations.

Minimization of Potential Vegetation Impacts

Localized vegetative impacts could result primarily from the movement of Vibroseis buggies along source lines, driving equipment to establish receiver points, and the use of the proposed staging areas for equipment storage and daily mobilization. Potential disturbances to individual pieces of vegetation could occur through the matting down of plants, compaction of soils, scraping of trees, exposure of plant roots, bending or breaking of vegetation, and/or brush cutting and vegetation trimming. Consistent with BCNP GMP/EIS/MMP geophysical Stipulation #17, cut vegetation must be capable of returning to its natural condition after operations. There is some potential that the spread of nonnative invasive plant species could also occur through the operation of vehicles. Each of these potential impacts is addressed by mitigation measures.

The "one pass" design of survey operations will minimize impacts to vegetation. The "one pass" survey design means that the equipment will only traverse a given area once and that area will not be driven upon again in the majority of cases. However, certain crossings may be used more than once if it would result in less environmental impacts to use the same crossing to avoid a sensitive area. The *Long Term Recovery of Experimental Off-Road Vehicle Impacts and*

Abandoned Old Trails in the Big Cypress National Preserve (Duever *et al.* 1986*c*) study states that vegetation which is impacted by a passing vehicle is frequently not killed and will re-sprout and continue to grow (Davis *et al.* 2010). "One pass" operations will further reduce the potential for impacts by utilizing flotation tire-equipped Vibroseis buggies which reduce pressure on the ground.

During the modification phase of planning, receiver and source line segments were relocated away from sensitive vegetation cover areas such as cypress domes, hardwood hammocks, and dense cypress forests to the extent feasible. In consultation with NPS representatives, receiver line segments and vibration source points may also be modified during field operations to further minimize impacts should unforeseen environmental or cultural sensitivity concerns arise from daily field scouting and groundtruthing operations.

To the extent feasible, many of the vibration source points and receiver lines will utilize existing trails, roads, and other previously disturbed surface areas to minimize vegetative impacts. The utilization of existing trails will include trails in various stages of recovery. Studies within the BCNP have shown that single ORV passes in most cases did not result in significant damage to vegetation or soils and that virtually all of the one pass impact lanes had recovered after one growing season (Duever 1981, Duever *et al*. 1986c). The recovery of trails in the BCNP is not anticipated to be adversely impacted by seismic surveying operations. Trails are projected to recover quickly from any minimal and temporary impacts which may occur as a result of their use.

Most of the receiver lines will briefly occupy prairies, savannas, and other open areas and will require little, if any, vegetation trimming. In such areas, anticipated vegetative impacts are expected to be limited to minimal data acquisition crew foot traffic. Where geophone receiver lines pass through heavy ground cover, it may be necessary to side-trim some vegetation. In all cases, vegetation trimming will be done in consultation with NPS representatives.

In accordance with the BCNP's MMP, impacts to vegetation will be further minimized by avoiding vulnerable areas. The wide range of environmentally sensitive areas present in the NG3-D seismic survey area will represent the focus of the planning efforts and design operations, which will continue to be the subject of ongoing identification and monitoring activities throughout field operations.

BOCI anticipates that the Vibroseis buggies will only be present for a matter of minutes in each vibroseis location at any given time. In addition, it is expected that the Vibroseis buggies will only be present within 2½ square miles of the NG3-D survey area per day. The buggies will avoid trees by using routes that are already devoid of large trees, as well as by use of the buggies' articulation feature, which will allow the equipment to travel around obstacles. Minimal vegetation cutting will be required for survey operations and no root damage or cutting of large trees will occur.

Trash bags and receptacles will be provided to field crews for use during daily field operations. Trash and debris including minimal plastic flagging, stakes, and other temporary markers will be collected and removed from the field daily. The majority of the survey will be "flagless" and navigated by GPS systems. This will reduce potential adverse impacts to vegetation.

The bulk of the other field operations (surveying, laying out and picking up geophone receivers and recording equipment) will be accomplished in large part by crews working and traveling on foot and by helicopter. A field helicopter equipped with slings, long lines, and quick disconnect systems to move and deploy equipment and supplies will be used to reduce time and equipment on the ground. Specifically, local delivery points proximal to the receiver lines will be used so helicopters can deliver equipment bags by the quick disconnect "bag runner" system using the DynaNav GPS positioning system.

In the unexpected event that field operations along the source or receiver lines result in damage to BCNP lands or resources within or adjacent to the NG3-D survey area, the impacts will be remediated immediately by members of the survey crew. These areas will be reclaimed by treating marred or wounded standing trees. Field clean-up will begin immediately upon completion of each task, and final clearance will be documented by and coordinated with inspectors. As a result of these efforts, the need for follow-up reclamation measures is not anticipated. However, consistent with 36 CFR §9.39, BCNP MMP geophysical operational Stipulations 39 through 45, and the suggestions and guidelines provided in the 2006 NPS Operator's Handbook, the Operator will take steps to reclaim the natural conditions and processes existing prior to the start of field operations or to such other conditions agreed to by the Operator and the NPS Regional Director and Superintendent, if needed.

A similar restoration protocol was followed with regard to the 1999 3-D seismic survey at Raccoon Point. Reclamation activities of the Raccoon Point 3-D Seismic Survey included the restoration of ruts and vehicle tracks resulting from seismic operations to original contour conditions. Restoration and monitoring of nine locations showed vegetation restoration "success" in all locations after three years. "Success" in areas deemed to be disturbed by seismic survey activities was defined as when "the achievement of recruited percent coverage meets or exceed 80 percent of the undisturbed adjacent percent coverage" (WilsonMiller, Inc. 2000).

The minimal effect of seismic operations on vegetation is demonstrated by the history of seismic surveys in the BCNP. Since the 1960s, seismic surveys of various types have been conducted in most areas of the BCNP. Although the 1992 GMP for the original BCNP states that many of the seismic lines from 1970 through 1977 were still visible on 1984 high altitude infrared aerial photographs, the GMP acknowledged that it was because these areas had been reused as ORV recreational trails. The vast majority of the historic seismic lines that were not disturbed by repeated ORV uses (not associated to the seismic surveys) returned to their natural conditions and no permanent or long term impacts occurred.

Survey equipment and vehicles will be cleaned prior to initially entering the BCNP to reduce or avoid the spread of non-native plant species. Also, the majority of the equipment used for survey activities (i.e., Vibroseis buggies and utility transport vehicles) will remain within the NG3-D survey area for the duration of the survey activities, which will reduce the likelihood of bringing in non-native seeds. Existing NPS management activities will assist with the ongoing exotic vegetation eradication in the BCNP and the NG3-D survey area. Reclamation of surface disturbances will be conducted concurrently with field operations and will address soils impacts (rutting, scarring, etc.) which may facilitate exotics infestation.

The Preferred Alternative incorporates a series of measures designed to minimize wetland impacts. Many of those mitigation measures are identified in the BCNP's General Management Plan as appropriate for oil and gas activities. The measures include the following:

- Avoiding disturbance to wetland areas with visible standing water or saturated soil conditions at or just below the soil surface. Program field operations would be conducted during the "dry season" (typically December through May) consistent with BCNP MMP geophysical operational Stipulation #8 and 2006 NPS Operator's Handbook seasonal plant dormancy mitigation recommendations, which would greatly reduce potential short-term impacts to vegetation, habitat, and soils; wetlands; some wildlife; water quality; hydrology; and sub-surface geologic resources.

- Avoiding all forms of new construction, such as new roads and fill pads.

- Employing Vibroseis methodology that avoids the drilling, placement, detonation, and clean-up of explosive charges to create seismic signals and results in an overall shorter period of time in the field.

- Oversized "balloon" tires or tracks would be used to spread vehicle surface weight to avoid or minimize potential short-term impacts to vegetation, habitat, and soils; wetlands; protected plants; water quality; hydrology; sub-surface geologic resources; visual quality; and visitor use and perception. Specifically, by laying over vegetation rather than uprooting it, this will prevent/minimize soil disruption, which in turn protects water quality, hydrology, sub-surface geologic resources, visual quality, and visitor use and perception.

- No dredging or filling activities would be proposed in staging areas. Staging areas would be utilized to store materials and equipment, concentrating and minimizing the number of areas needed for these logistical requirements. In addition, staging areas would be used for supply and refueling activities, which would reduce equipment emissions by minimizing the amount of equipment traveling within the survey area. A visual fence-type barrier will be constructed around the perimeter of the staging area to delineate the boundary for the contractor. Signs will be erected around the staging perimeter to identify the staging limits and direct the contractor to the proper entry and exit. Depending on soil conditions, some staging areas and access routes may require the use of a high-density, interlocking, composite mat system in order to provide stability of the surface for mechanical equipment, minimize rutting of the soil, and protect the roots of vegetation. The mat system will be laid over the existing surface. The measures outlined for the staging areas above would reduce potential impacts to vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; air quality; cultural/archeological resources; noise/soundscapes; visual quality; and visitor use and perception, mostly outside of the staging areas.

- Seismic survey activities would generally utilize a "one pass" design for Vibroseis equipment groups, which would greatly reduce potential short-term impacts to

vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; cultural/archeological resources; visual quality; and visitor use and perception. However, certain areas maybe crossed more than once if it would result in less environmental impacts then an alternative route.

- Program operations would utilize existing trails to the extent feasible. In addition, the NPS would be consulted to determine access to off-trail source points in environmentally sensitive areas. These measures which would greatly reduce potential short-term disturbances to vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; cultural/archeological resources; visual quality; and visitor use and perception.

- Where vegetative trimming is required, selectively avoiding areas with native vegetation if trimming areas with exotic vegetation could accomplish an acceptable positioning of vibration or receiver points.

- Avoiding trimming native vegetation below the height or beyond the width of 36 inches or with a 4 inch or greater trunk diameter as measured at breast height.

- Avoiding use of motorized vehicles in especially sensitive resource areas within the BCNP identified by the NPS, including areas near known locations of endangered species (e.g., red-cockaded woodpecker clusters), sensitive vegetation communities, and cultural resources.

- Scouting and groundtruthing operations would also be conducted by a wetland scientist and archeologist, working concurrently with the survey operations, to identify both documented and undocumented environmentally sensitive or cultural/archeological areas so the source points, receiver points and their respective access pathways may be re-routed to minimize impacts to these areas. In the event that undocumented protected species nesting sites or cultural/archeological areas are discovered prior to or during program operations, observation reporting protocols would be initiated with NPS (and other agencies, when applicable) so that appropriate setbacks and program design modifications could be implemented pursuant to the advice and direction of agency personnel. This would avoid or minimize potential short-term impacts to vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; cultural/archeological resources; visual quality; and visitor use and perception.

- Available GIS data and aerial imagery would be utilized to identify documented environmentally sensitive and cultural/archeological areas so the source points, receiver points and their respective access pathways may be re-routed to minimize impacts to these areas. This would minimize potential short-term impacts to vegetation, habitat, and soils; wetlands; protected wildlife; water quality; hydrology; sub-surface geologic resources; cultural/archeological resources; visual quality; and visitor use and perception.

- Heliportable geophone receiver equipment would be used to enable on-foot deployment and recovery, thus reducing the extent of impacts and time spent on the ground during the survey. As such, helicopter operations would reduce the extent of potential short-term impacts to vegetation, habitat, and soils; wetlands; protected plants; water quality; hydrology; and sub-surface geologic resources by reducing the need for additional motorized equipment. It should be noted that helicopters would adhere to vertical buffers established around colonies of nesting wading birds to avoid or reduce potential disturbances.

- Low shrubs and herbaceous vegetation, topsoil, rootstock, and plant material would be left in place along source lines, receiver lines, and access routes to facilitate natural re-vegetation. Ruts, depressions, and vehicle tracks resulting from field operations would be restored to original contour conditions concurrent with daily operations using shovels and rakes to prevent the creation of new trails. Field clean-up activities would begin immediately upon completion of each task and final clearance would be documented by and coordinated with NPS inspectors to the satisfaction of the Superintendent. These measures would greatly reduce potential short-term impacts to vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; visual quality; and visitor use and perception.

- Survey equipment and vehicles would be cleaned prior to initially entering the BCNP to avoid the spread of nonnative plant species and potential wildlife diseases. This would in turn reduce potential impacts to vegetation and habitat; wetlands; protected plants; protected wildlife; major game species; other wildlife; visual quality; and visitor use and perception.

- Crews dedicated to implementing restoration and reclamation activities will be used. Ruts, depressions and vehicle tracks resulting from field operations will be restored to original contour conditions using shovels and rakes, to prevent the creation of any trails.

- Removal and reclamation of field staging areas with associated access improvements would be completed to the satisfaction of the NPS Superintendent and the FDEP upon confirmation that no further use of the staging areas will be required. Final field reclamation and clean-up would be conducted concurrent with field operations and completed within 30 days following the completion of field operations except in inclement weather conditions. This would reduce potential short-term impacts to vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; visual quality; and visitor use and perception.

- Prevention mechanisms would be used to eliminate or reduce potential spills/leaks of contaminants from survey equipment. These mechanisms would include utilization of non-permeable ground mats and spill recovery and clean-up materials for refueling areas; utilization of bermed, non-permeable liners in staging sites beneath parked large capacity,

mobile fuel storage equipment; and implementation of Dawson Geophysical operational Health, Safety, Security, Environment (HSSE) Management System policies that address spill prevention and clean-up, fire protection, refueling and health and safety practices. This would reduce potential short-term impacts to vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; visual quality; and visitor use and perception.

- Educational training programs would be provided to survey crews to help them identify and avoid wildlife and environmentally sensitive areas (to the extent feasible) and identify and avoid cultural/archeological areas. In addition, the survey crews would be informed to not collect vegetation, wildlife, artifacts, etc., as well as inform them of wildlife protection measures and safety hazards. This would result in increased protection to vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; cultural/archeological resources; visual quality; visitor use and perception, and BCNP management and operations.

- Trash bags and receptacles would be provided to field crews for use during daily field operations. Trash and debris including plastic flagging, stakes, and other temporary markers put in place by the Operator would be collected and removed from the field daily and as the program progresses. This would reduce potential short-term impacts to vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; visual quality; and visitor use and perception.

- BOCI would conduct meetings with state and federal wildlife management and research specialists to discuss ongoing research, potential issues, and survey protocols for protected species. BOCI would coordinate field operations with the state and federal wildlife management and research specialists to avoid potential impacts to protected species. Per guidance received from the agencies, species-specific buffers and protocols would be established around areas containing certain protected plants and wildlife to minimize potential disturbance to these species.

- Program activities would be conducted during daylight hours, minimizing potential disturbance to protected wildlife; major game species; and other wildlife.

- Machinery would be operated slowly and attentively to avoid potential impacts to vegetation, habitat, and soils; wetlands; protected plants; protected wildlife; major game species; other wildlife; water quality; hydrology; sub-surface geologic resources; and cultural/archeological resources.

NPS staff and NPS inspectors would be heavily involved throughout field operations. The Project Manager or his designee would act as liaison and coordinate inspection logistics as needed to ensure the survey alternatives do not impact the ability of NPS staff to manage the BCNP. Inspection personnel would be provided radio and/or cellular telephone communications

for use in the field, allowing for the continued coordination of BCNP management, and minimizing the time constraints or abilities of BCNP staff. This would increase time and effort by BCNP management and operations staff, but would also ensure them that survey was being conducted as authorized and that no long-term impacts would occur.

Collectively, these measures will contribute to minimizing the loss of wetland functions and values. No wetlands will be filled. There will be no permanent loss of wetland functions or values. Any impacts will be temporary and localized.

MITIGATION PLAN

Impact Site Restoration

All adverse impacts to wetlands resulting from any project actions, including rutting and compaction of soils and/or destruction of vegetation from vehicle use and from activities in the staging areas, will be identified by NPS staff. The applicant will begin field reclamation of impacts immediately as the survey continues. Soils will be decompacted and graded to match the original grade. If the NPS staff determine that revegetation of the disturbed areas is necessary, then the area will be identified and the applicant will plant native species in a specific pattern, species composition, and density as defined by the NPS staff.

Compensatory Mitigation

As compensation for any temporal loss of wetland function resulting from vehicle use and the use of staging areas, an equivalent area of wetland restoration area will be conducted elsewhere in the BCNP as identified by NPS staff. The applicant will restore an area (equivalent to the total project impacted area) outside of the project area and within the BCNP. The soils will be decompacted and graded to match original grade. If the NPS staff determine that revegetation of the disturbed areas is necessary, then the area will be identified and the applicant will plant native species in a specific pattern, species composition, and density as defined by the NPS staff. Specifically, the NPS staff will quantify the amount of impact area from damage caused by vehicle use as linear feet of two-track impact. To compensate for the temporal loss of wetland functions, the applicant will restore an equivalent length of two-track impacted areas (damaged by ORVs) inside or outside of the project area and within the BCNP. The soils will be decompacted and graded to match original grade. If the NPS staff determine that revegetation of the disturbed areas is necessary, then the area will be identified and the applicant will plant native species in a specific pattern, species composition, and density as defined by the NPS staff.

All adverse impacts to staging areas will also be identified by NPS staff. The NPS staff will quantify the amount of staging area impact in acres. Since some of the staging areas are previously disturbed, only those wetland areas impacted that were previously undisturbed will be compensated. All soils within the staging areas will be restored to original grade. Field reclamation of impacts to staging area wetlands will begin immediately after use of the staging areas is terminated.

Exhibit H depicts examples of potential compensation sites identified by the NPS and other studies in the BCNP. These sites include areas previously disturbed by ORVs, excavation,

dumping of fill or debris, and invasion by exotic species. Restoration activity in the BCNP that is funded by BOCI will be under the direct supervision of the NPS.

Restoration activity would occur during the dry season and may include the use of mechanical or hand equipment to loosen the soil and level soil ruts to existing natural grade of adjacent undisturbed areas. Re-vegetation would be allowed to occur via natural recruitment unless planting is required by NPS staff. Signage would be installed near restored areas to keep users on authorized trail segments.

Compensatory Mitigation Success Criteria

For compensatory mitigation conducted in the BCNP, the mitigation will be considered successful if at the end of a five-year monitoring program the mitigation area contains no more than 5 percent cover by exotic invasive plants, and hydrophytic vegetation has become established at 50 percent of the cover of a similar type of nearby, naturally occurring wetlands. If the vegetation composition and cover does not meet these standards, then the applicant will remove non-native species and/or plant the areas with native species.

On-Site Monitoring

Monitoring Methodology

Monitoring will be conducted at the mitigation site by a qualified wetland scientist approved by NPS staff. The monitoring process will commence immediately after the restoration, which will be designated as time-zero, and at one-year intervals thereafter for five years.

The monitoring survey for the restoration sites will document the status of vegetation, presence of invasive plants, wildlife activity observations, general weather conditions, and site photographs. An "as-built" report, to include a description of baseline or preconstruction conditions, will be prepared immediately after construction (i.e., at time-zero monitoring) to document plant densities and describe the conditions of the restoration area. The annual monitoring reports will document the progress of the restoration efforts and monitor the success of natural species recruitment. All reports will be forwarded to NPS staff, and copies will be maintained at BCNP headquarters. Any issues that arise or corrective action that needs to be taken will also be included in the monitoring reports. Observations of vegetation will be made along fixed transects at the restoration site to ensure identical sampling procedures throughout the time-zero and the subsequent reporting cycles.

Wildlife Monitoring

During the monitoring program, observations of wildlife will be made in the restoration area via both visual means and inspection of physical evidence.

Photographic Documentation

Photograph stations will be identified in the restoration area. These locations will be used to document the physical condition of the restoration area during the five-year monitoring program.

Monitoring Reports

Monitoring reports will be prepared and submitted to BCNP staff to provide documentation of the wetland mitigation success and the general condition of the enhanced area. Monitoring reports will consist of the following information:

- Narrative description of the enhancement activities performed since the last report
- Explanation of maintenance work to be conducted over the next year
- List of wildlife species observed
- Results of vegetative monitoring
- Identification of non-native, invasive vegetation
- Photographs taken at photograph station locations
- General weather description
- Description of any remedial action recommendations (if necessary)

Long-Term Maintenance

Annual inspections of the mitigation restoration site will occur for the five years of the monitoring program. The inspections will be performed by a qualified wetland scientist. The mitigation site will be inspected and locations of exotic and/or nuisance species identified to be treated and removed. Notations will be made of any potential problems identified during the inspection. The site will be maintained continually to ensure exotics and nuisance species do not become the dominant vegetation in the mitigation areas. If necessary, BOCI will actively revegetate with native wetland species.

Work Schedule Plan

The work schedule in Table 5 outlines activities and dates for monitoring program execution.

Table 5. Wetland Mitigation Restoration and Monitoring Schedule

Task or Document	Anticipated Completion Date
Mitigation restoration work	Within 30 days of conclusion of NG3-D survey
Time-Zero Monitoring Report (i.e., as-built report)	Six months following mitigation restoration work
First Monitoring Report (after first year)	
Second Monitoring Report (after second year)	
Third Monitoring Report (after third year)	
Fourth Monitoring Report (after fourth year)	
Final Monitoring Report (after fifth year)	

CONCLUSION

The NPS finds that there is no practical alternative to work in wetlands in order to conduct a geophysical seismic survey in the BCNP. Wetland impacts will be avoided to the maximum practical extent, and minimization measures are proposed to avoid loss of wetland function and value. Compensatory mitigation is proposed for unavoidable wetland impacts. Given that the procedures and mitigation measures described in this document are implemented, the NPS finds that this project is in compliance with Director's Order 77-1 and Executive Order 11990, "Protection of Wetlands."

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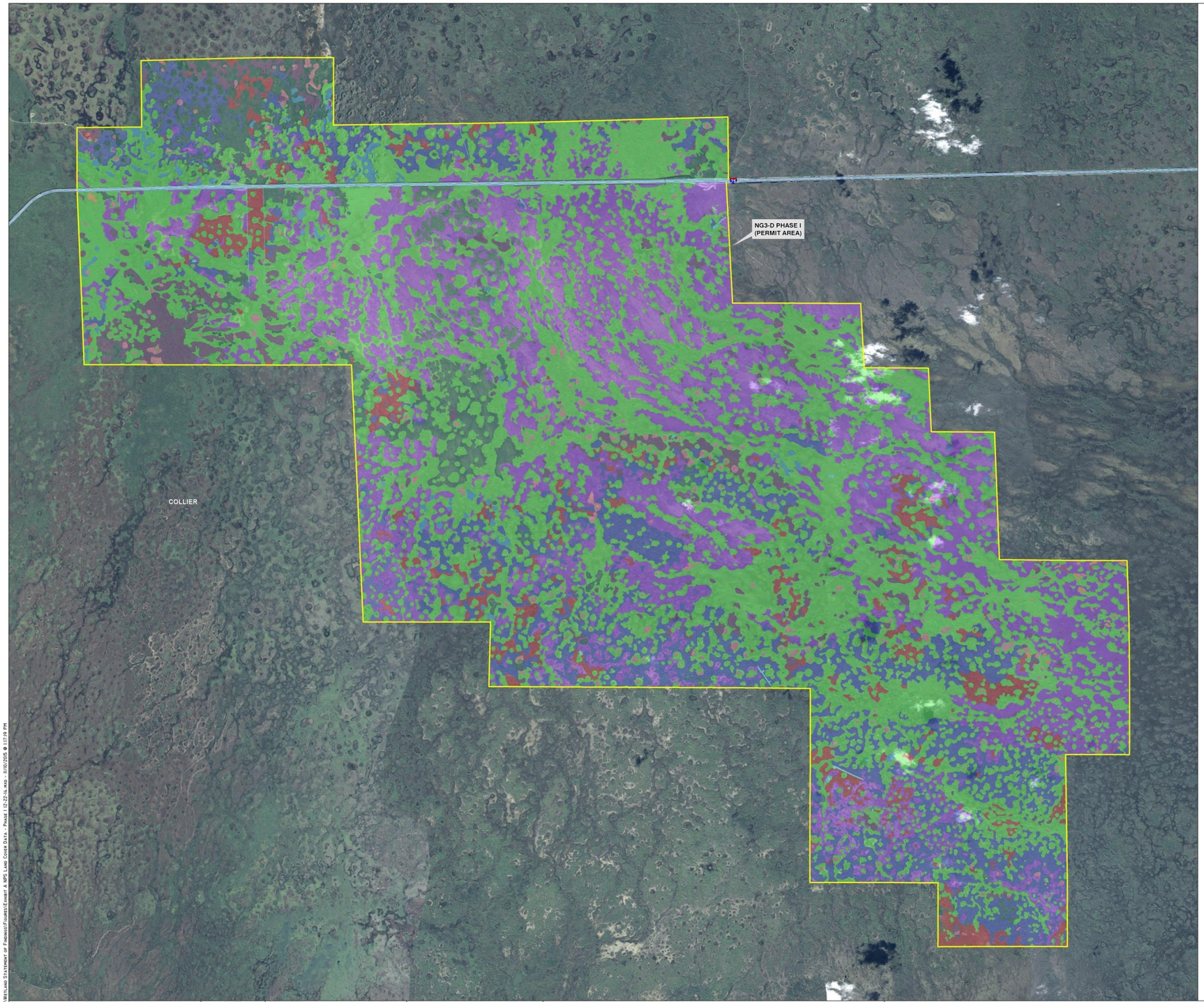
EXHIBIT A

NATIONAL PARK SERVICE LAND COVER DATA



LEGEND

- Nobles Grade 3-D Phase I (Permit Area)
- Cypress Forest
- Disturbed
- Hydric Hammock
- Hydric Pine Flatwood
- Marsh
- Mesic Hammock
- Mesic Pine Flatwoods
- Scrub Cypress
- Swamp Forest
- Water
- Wet Prairie

N
W E
S

1 inch = 2,500 feet

VEGETATION DESCRIPTION	ACREAGE
Cypress Forest	32,211 Ac.±
Disturbed	379 Ac.±
Hydric Hammock	82 Ac.±
Hydric Pine Flatwood	2,936 Ac.±
Marsh	686 Ac.±
Mesic Hammock	2,889 Ac.±
Mesic Pine Flatwoods	8,415 Ac.±
Scrub Cypress	18,855 Ac.±
Swamp Forest	486 Ac.±
Water	124 Ac.±
Wet Prairie	3,389 Ac.±
TOTAL	**70,454 Ac.±**

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013.

NOBLES GRADE 3-D PHASE I (PERMIT AREA) WAS PROVIDED BY DAWSON GEOPHYSICAL COMPANY NOVEMBER 2014.

THE NOBLES GRADE 3-D PHASE I (PERMIT AREA) DEPICTS THE OUTLINE OF THE GENERAL SURVEY AREA HOWEVER, PARCELS WHERE BURNETT OIL CO., INC. (BOCI) HAS NOT OBTAINED THE RIGHT OF ENTRY (ROE) WILL NOT BE SUBJECT TO THE SEISMIC SURVEY.

VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

J:\2013\13boc2197\GIS\2015\Wetland Statement of Findings\Figures\Exhibit A NPS Land Cover Data - Phase I 12-22-14.mxd - 11/02/2015 @ 1:17:19 PM

REVISIONS	DATE

		DATE
DRAWN BY	F.L.	12/12/13
DESIGNED BY	K.C.P.	12/12/13
REVIEWED BY	K.C.P.	12/12/13

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PASSARELLA & ASSOCIATES, INC.
Consulting Ecologists

NOBLES GRADE 3-D

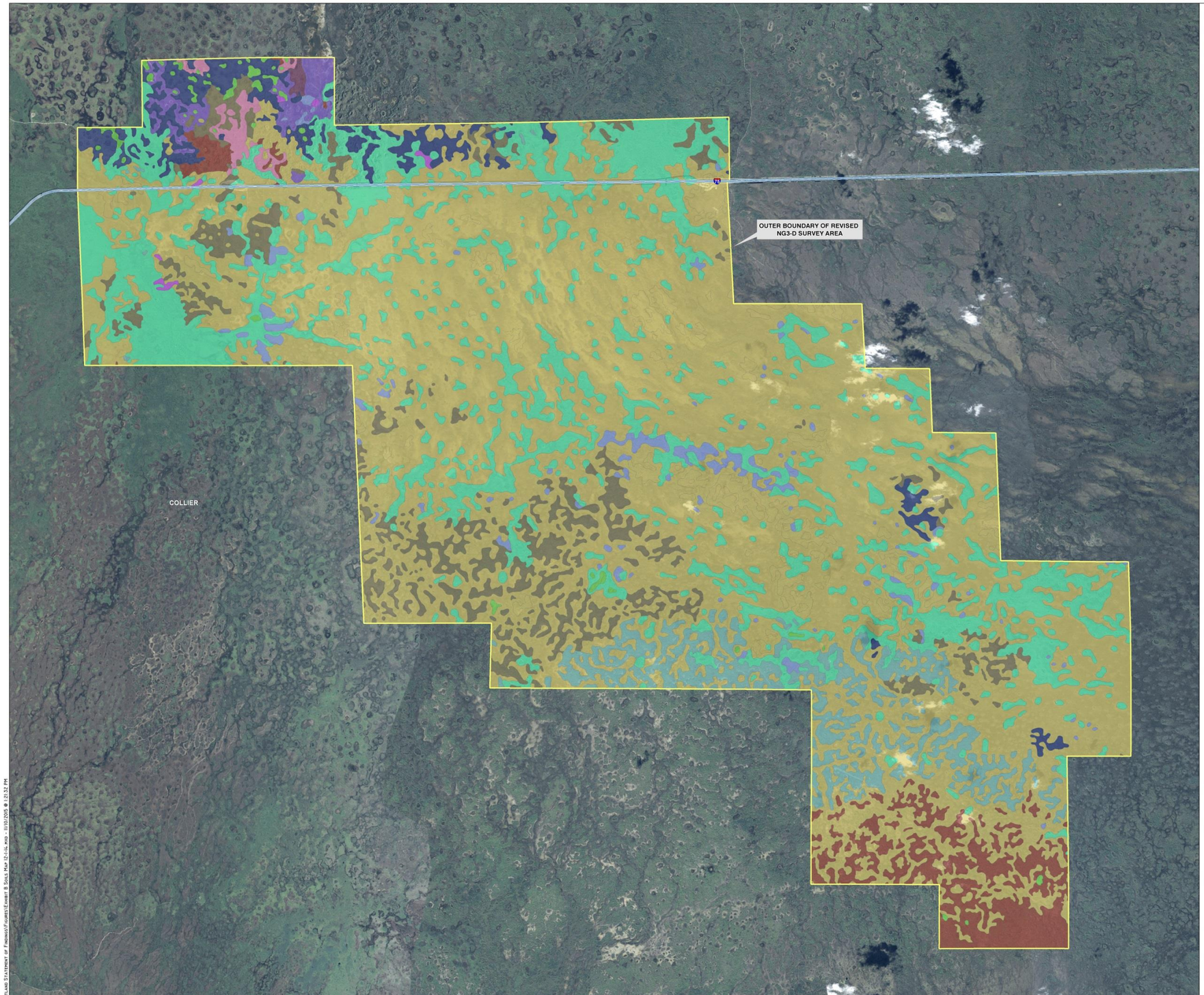
NATIONAL PARK SERVICE LAND COVER DATA

DRAWING No.
13BOC2197

SHEET No.
EXHIBIT A

EXHIBIT B

SOILS MAP



LEGEND

- Outer Boundary of Revised NG3-D Survey Area

Collier Soils

- Broward Ochopee complex
- Broward fine sand - Heavy substratum phase
- Broward fine sand - Shallow phase
- Charlotte fine sand
- Copeland fine sand - Low phase
- Copeland fine sand - Shallow phase
- Cypress swamp
- Felda fine sand
- Fresh water marsh
- Ochopee fine sandy marl - Shallow Phase
- Ochopee marl - Shallow phase
- Rockland
- Tucker marl

N
W E
S

1 inch = 2,500 feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013.

OUTER BOUNDARY OF REVISED NG3-D SURVEY AREA WAS PROVIDED BY DAWSON GEOPHYSICAL COMPANY NOVEMBER 2014.

THE OUTER BOUNDARY OF THE REVISED NG3-D SURVEY AREA DEPICTS THE OUTLINE OF THE GENERAL SURVEY AREA. HOWEVER, PARCELS WHERE BURNETT OIL CO., INC. (BOCI) HAS NOT OBTAINED THE RIGHT OF ENTRY (ROE) WILL NOT BE SUBJECT TO THE SEISMIC SURVEY.

COLLIER SOILS MAPPING WAS ACQUIRED FROM THE U.S. GEOLOGICAL SURVEY WEBSITE NOVEMBER 2013 AND ISSUED BY THE SOIL CONSERVATION SERVICE IN MARCH 1954.

J:\2013\13BOC2197\GIS\2015\WETLAND STATEMENT OF FINDINGS\FIGURES\EXHIBIT B SOILS MAP 12-14.MXD - 11/10/2015 @ 1:21:32 PM

REVISIONS	DATE	DRAWN BY	DATE
		F.L.	12/10/13
		DESIGNED BY	DATE
		K.C.P.	12/10/13
		REVIEWED BY	DATE
		K.C.P.	12/10/13

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PASSARELLA & ASSOCIATES INC.

NOBLES GRADE 3-D

SOILS MAP

DRAWING No.
13BOC2197

SHEET No.
EXHIBIT B

EXHIBIT C

STAGING AREAS PHOTOGRAPHS

Staging Area MM-63S Existing Conditions

Access road from recreational parking to trail

Trail to proposed staging area

New gate from the south recreational parking construction into the Big Cypress National Preserve

Proposed staging area

Looking west onto the new south recreational parking area and emergency response center (far end)

Proposed staging area

Staging Area MM-63N Existing Conditions

Entrance of new recreational parking area looking east; deceleration service road (west bound) is to the right.

Road to proposed staging area

East end of new recreational parking area looking west

Proposed staging area

East end of new parking area and intersection with Nobles Grade road and gate; looking north at new gate

Proposed staging area

Staging Areas MM-70S Existing Conditions

East view of recreational acceleration service road merge with I-75; existing access is the dirt road on right side of wood fence

Proposed staging area

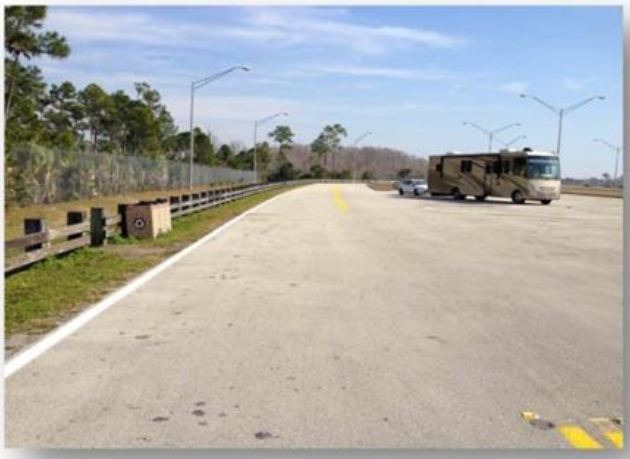
Existing ROW fence gate south of parking area; access via the dirt road shown on top photo

Access road (looking north) to the proposed staging area

Existing access road to gate; looking north towards I-75(staging area to the right)

Proposed staging area looking east

Staging Area MM-70N Existing Conditions



Middle of recreational parking area looking east at entrance and service road

Area between parking area and fence; the new access point would be in this general area

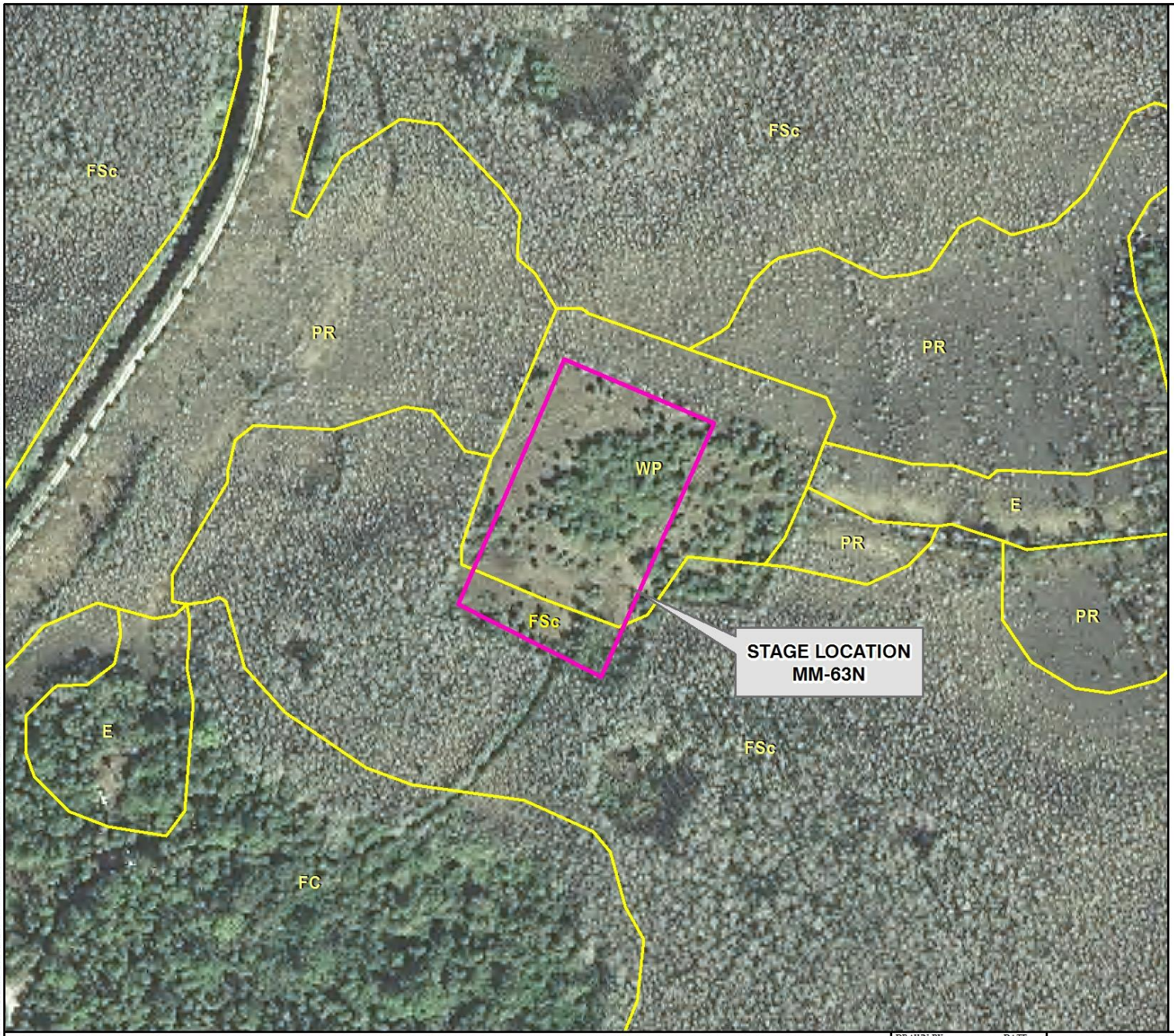
Off pavement looking northeast at visitor fence entrance

Proposed staging area

Facing west between pavement and visitor's entrance; proposed access point from pavement to staging areas located approximately at the near palmetto tree on left

EXHIBIT D

AERIALS WITH STAGE LOCATION AND WETLAND MAPPING



LEGEND

- MM-63N (2.00 Ac.±)
- NPS Vegetation Land Cover

ID	DESCRIPTION
FSc	Cypress Forest
E	Disturbed
FC	Mesic Hammock
PR	Scrub Cypress
WP	Wet Prairie

N
W E
S

0 150 300
Feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED THROUGH THE COLLIER COUNTY PROPERTY APPRAISER'S OFFICE WITH A FLIGHT DATE OF JANUARY 2014.

VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

J:\2015\15boc2197\GIS\2015\Wetland Statement of Findings\Figures\1-Staging Area Exhibits\Exhibit D1 MM-63N - Aerial with Wetland Map 9-15-15.mxd - 11/10/2015 @ 3:36:15 PM

EXHIBIT D1. MM-63N - AERIAL WITH WETLAND MAP
NOBLES GRADE 3-D

DRAWN BY	DATE
F.L.	9/15/15
REVIEWED BY	DATE
K.C.P.	9/15/15
REVISED	DATE

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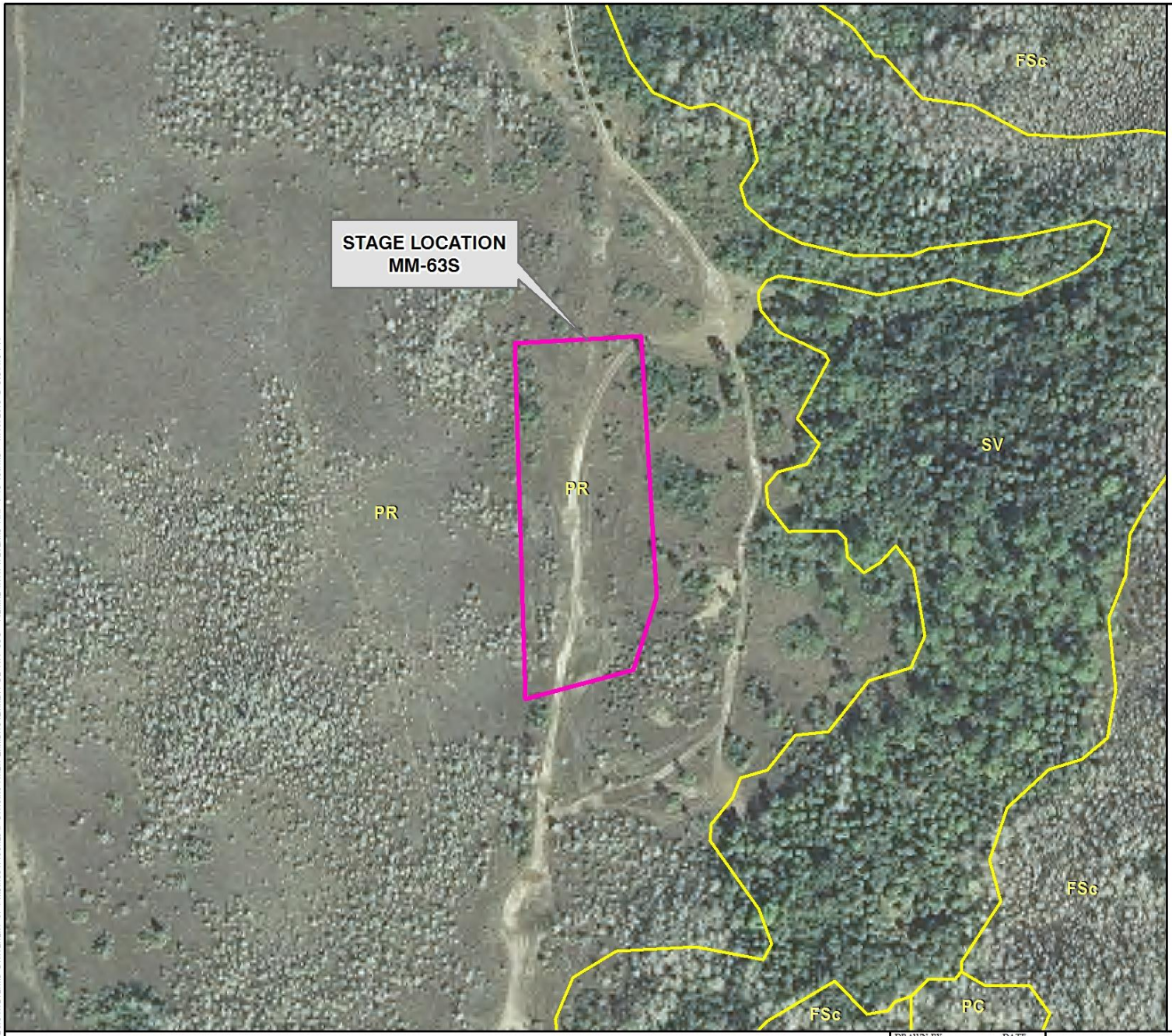


LEGEND

- MM-63S (2.00 Ac.±)
- NPS Vegetation Land Cover

ID	DESCRIPTION
FSc	Cypress Forest
PC	Marsh
SV	Mesic Pine Flatwoods
PR	Scrub Cypress

N
W E
S

0 150 300
Feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED THROUGH THE COLLIER COUNTY PROPERTY APPRAISER'S OFFICE WITH A FLIGHT DATE OF JANUARY 2014.

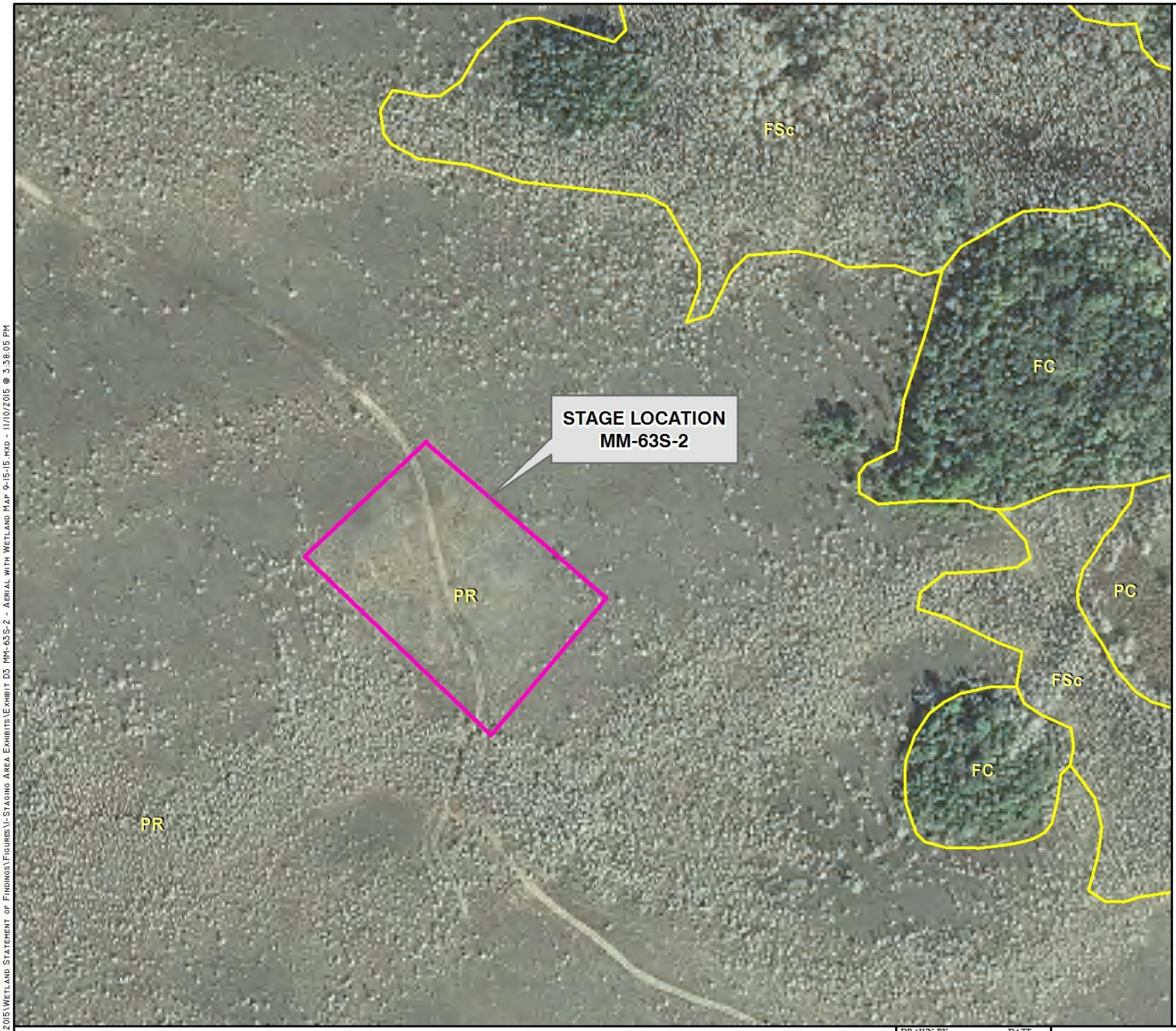
VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

EXHIBIT D2. MM-63S - AERIAL WITH WETLAND MAP
NOBLES GRADE 3-D

DRAWN BY	DATE
F.L.	9/15/15
REVIEWED BY	DATE
K.C.P.	9/15/15
REVISED	DATE

PASSARELLA & ASSOCIATES INC
Consulting Ecologists

J:\2015\15boc2097\GIS\2015\Wetland Statement of Findings\Figures\I-Staging Area Exhibits\Exhibit D2 MM-63S - Aerial with Wetland Map 9-15-15.mxd - 11/10/2015 @ 3:37:15 PM



LEGEND

- MM-63S-2 (1.97 Ac.±)
- NPS Vegetation Land Cover

ID	DESCRIPTION
FSc	Cypress Forest
PC	Marsh
FC	Mesic Hammock
PR	Scrub Cypress

N
W E
S

0 150 300
Feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED THROUGH THE COLLIER COUNTY PROPERTY APPRAISER'S OFFICE WITH A FLIGHT DATE OF JANUARY 2014.

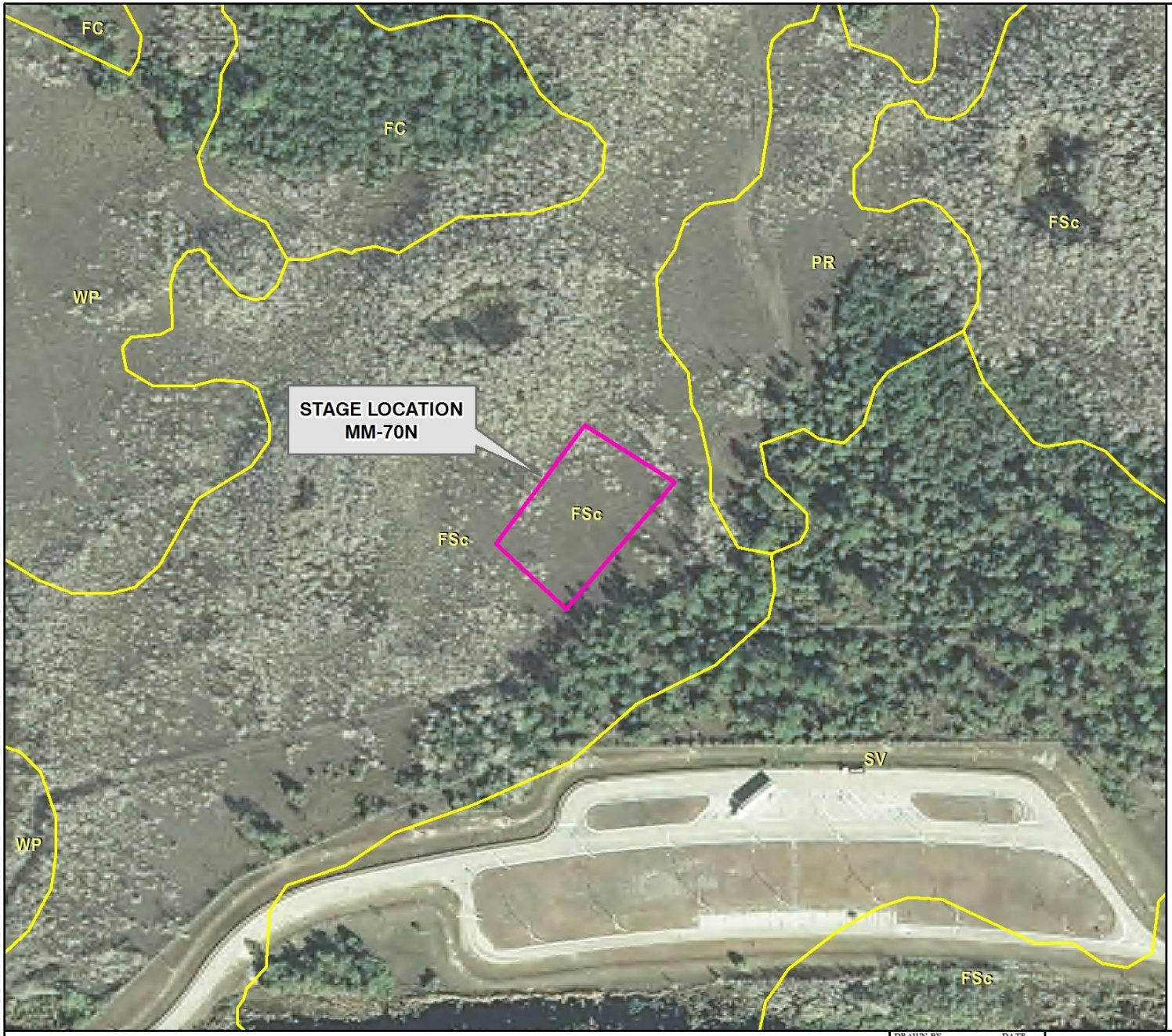
VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

J:\2015\15boc2197\GIS\2015\Wetland Statement of Findings\Figures\1-Staging Area Exhibits\Exhibit D3 MM-63S-2 - Aerial with Wetland Map 9-15-15.mxd - 11/10/2015 @ 3:38:05 PM

EXHIBIT D3. MM-63S-2 - AERIAL WITH WETLAND MAP
NOBLES GRADE 3-D

DRAWN BY	DATE
F.L.	9/15/15
REVIEWED BY	DATE
K.C.P.	9/15/15
REVISED	DATE

Consulting Ecologists
PASSARELLA & ASSOCIATES INC



LEGEND

- MM-70N (0.73 Ac.±)
- NPS Vegetation Land Cover

ID	DESCRIPTION
FSc	Cypress Forest
FC	Mesic Hammock
SV	Mesic Pine Flatwoods
PR	Scrub Cypress
WP	Wet Prairie

N
W E
S

0 150 300
Feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED THROUGH THE COLLIER COUNTY PROPERTY APPRAISER'S OFFICE WITH A FLIGHT DATE OF JANUARY 2014.

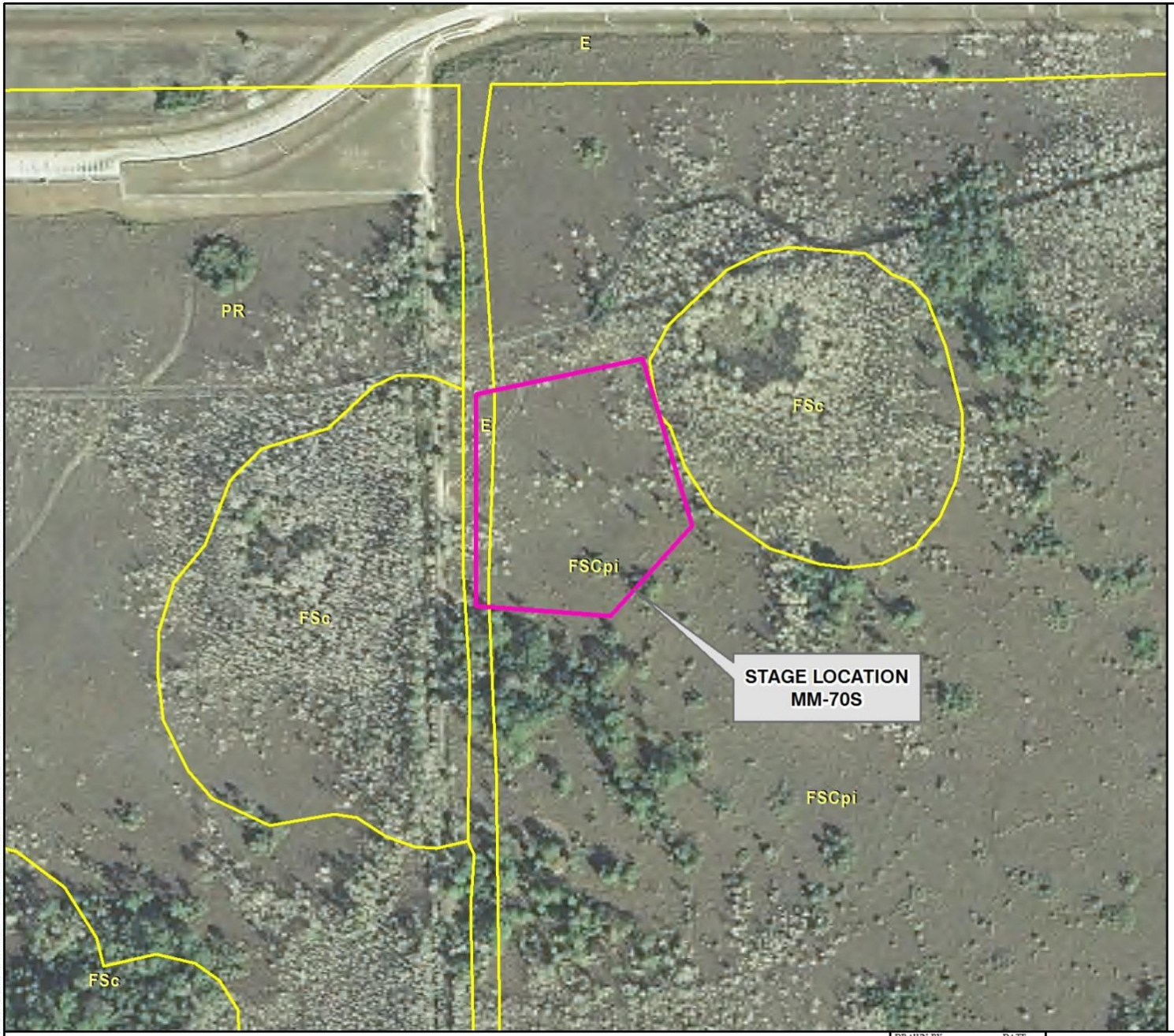
VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

J:\2015\15eoc2197\GIS\2015\Wetland Statement of Findings\Figures\1-Staging Area Exhibits\Exhibit D4 MM-70N - Aerial with Wetland Map 9-15-15.mxd - 11/10/2015 @ 3:38:53 PM

EXHIBIT D4. MM-70N - AERIAL WITH WETLAND MAP
NOBLES GRADE 3-D

DRAWN BY	DATE
F.L.	9/15/15
REVIEWED BY	DATE
K.C.P.	9/15/15
REVISED	DATE

Passarella & Associates Inc
Consulting Ecologists



LEGEND

- MM-70S (2.00 Ac.±)
- NPS Vegetation Land Cover

ID	DESCRIPTION
FSc	Cypress Forest
E	Disturbed
FSCpi	Hydric Pine Flatwood
PR	Scrub Cypress

N
W E
S

0 150 300
Feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED THROUGH THE COLLIER COUNTY PROPERTY APPRAISER'S OFFICE WITH A FLIGHT DATE OF JANUARY 2014.

VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

J:\2015\15802197\GIS\2015\Wetland Statement of Findings\Figures\I-Staging Area Exhibits\Exhibit D5 MM-70S - Aerial with Wetland Map 9-15-15.mxd - 11/10/2015 @ 3:39:40 PM

EXHIBIT D5. MM-70S - AERIAL WITH WETLAND MAP
NOBLES GRADE 3-D

DRAWN BY	F.L.	DATE 9/15/15
REVIEWED BY	K.C.P.	DATE 9/15/15
REVISED		DATE

Consulting Ecologists
PASSARELLA & ASSOCIATES INC

EXHIBIT E

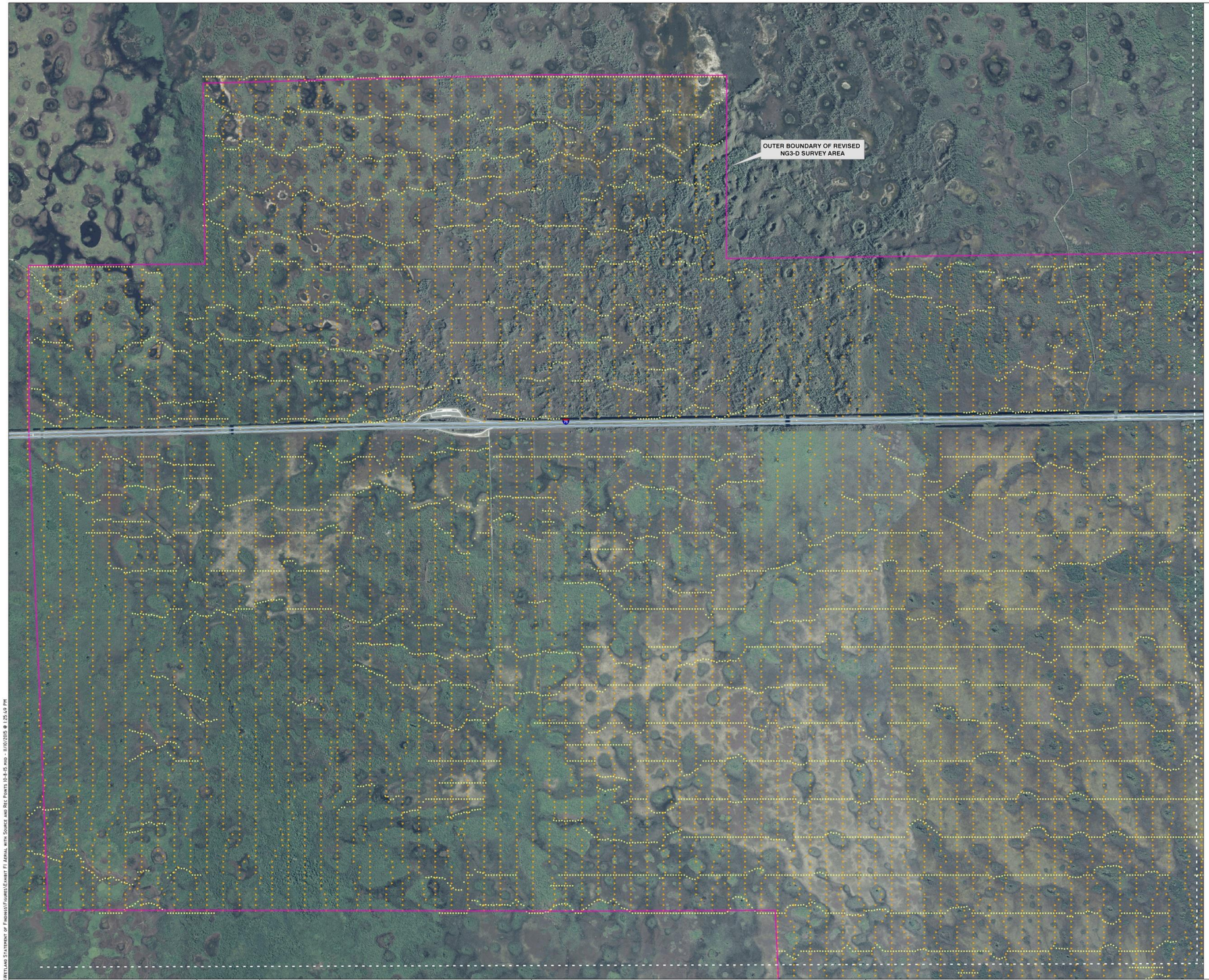
STAGING AREAS TABLE

NOBLES GRADE 3-D SEISMIC SURVEY
STAGING AREAS

Staging Area (Abandoned Well)	Location		Approx .Size (Acres)	Type of Area	Distance from I-75 (miles)	Access Distance from I-75 (miles)	Distance from Primary Staging Area (miles)	Remarks
	Longitude	Latitude						
MM-63N (P-562)	26.172413	-81.068839	3.44	Former well pad (P-562) (3.44 acres)	0.23	0.31	0.55 north-northeast	Will utilize newly constructed rec. parking area, paved access road & vehicle gate to old Nobles Grade Road; adjacent to MM 63S staging area via rest area crossover
MM-63S	26.164450	-81.071719	3.57	Open area	0.28	0.38	Main Staging Area	Immediately adjacent to MM-63 Rest Area (south side of I-75); will utilize newly constructed rec. parking area, paved access road & vehicle gate to a short portion of Florida Trail (south of I-75)
MM-63S-2 (P-765) (P-1216)	26.123177	-81.067034	1.97	Former well pad (P-765) (P-1216)	3.1	3.4	2.82 south	Directly south of MM-63S; connects directly to MM-63S. Services mid to eastern portion of survey area south of I-75
MM-70N	26.169429	-81.198513	0.73	Open area	Via Recreational Area Access		7.9 west-northwest	Will utilize existing rec. parking area; short distance to open staging area; will require access path from parking area to fence & vehicle gate
					0.15	0.30		
					0.17	0.25		
MM-70S	26.164930	-81.192924	1.84	Open area	0.12	0.19	7.55 west	Will utilize existing rec. parking area; short distance to open staging area; will utilize newly-built short access connector from parking area to existing access path; no new vehicle gate required

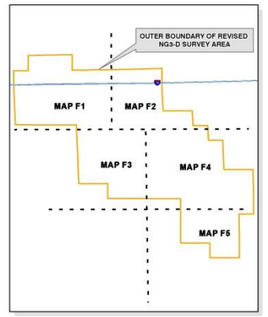
EXHIBIT F

AERIAL WITH SOURCE AND RECEIVER LINES



LEGEND

- Outer Boundary of Revised NG3-D Survey Area
- Receiver Points
- Source Points



N
W E
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1 inch = 900 feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013.

OUTER BOUNDARY OF REVISED NG3-D SURVEY AREA WAS PROVIDED BY DAWSON GEOPHYSICAL COMPANY NOVEMBER 2014.

THE OUTER BOUNDARY OF THE REVISED NG3-D SURVEY AREA DEPICTS THE OUTLINE OF THE GENERAL SURVEY AREA. HOWEVER, PARCELS WHERE BURNETT OIL CO., INC. (BOCI) HAS NOT OBTAINED THE RIGHT OF ENTRY (ROE) WILL NOT BE SUBJECT TO THE SEISMIC SURVEY.

SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

J:\2015\13boc2197\GIS\2015WetLand Statement of Findings\Figures\Exhibit F1 Aerial with Source and Rec Points 10-8-15.mxd - 11/10/2015 @ 1:25:49 PM

REVISIONS	DATE

DRAWN BY	H.H.	DATE	10/8/15
DESIGNED BY	A.W.	DATE	10/8/15
REVIEWED BY	A.W.	DATE	10/8/15

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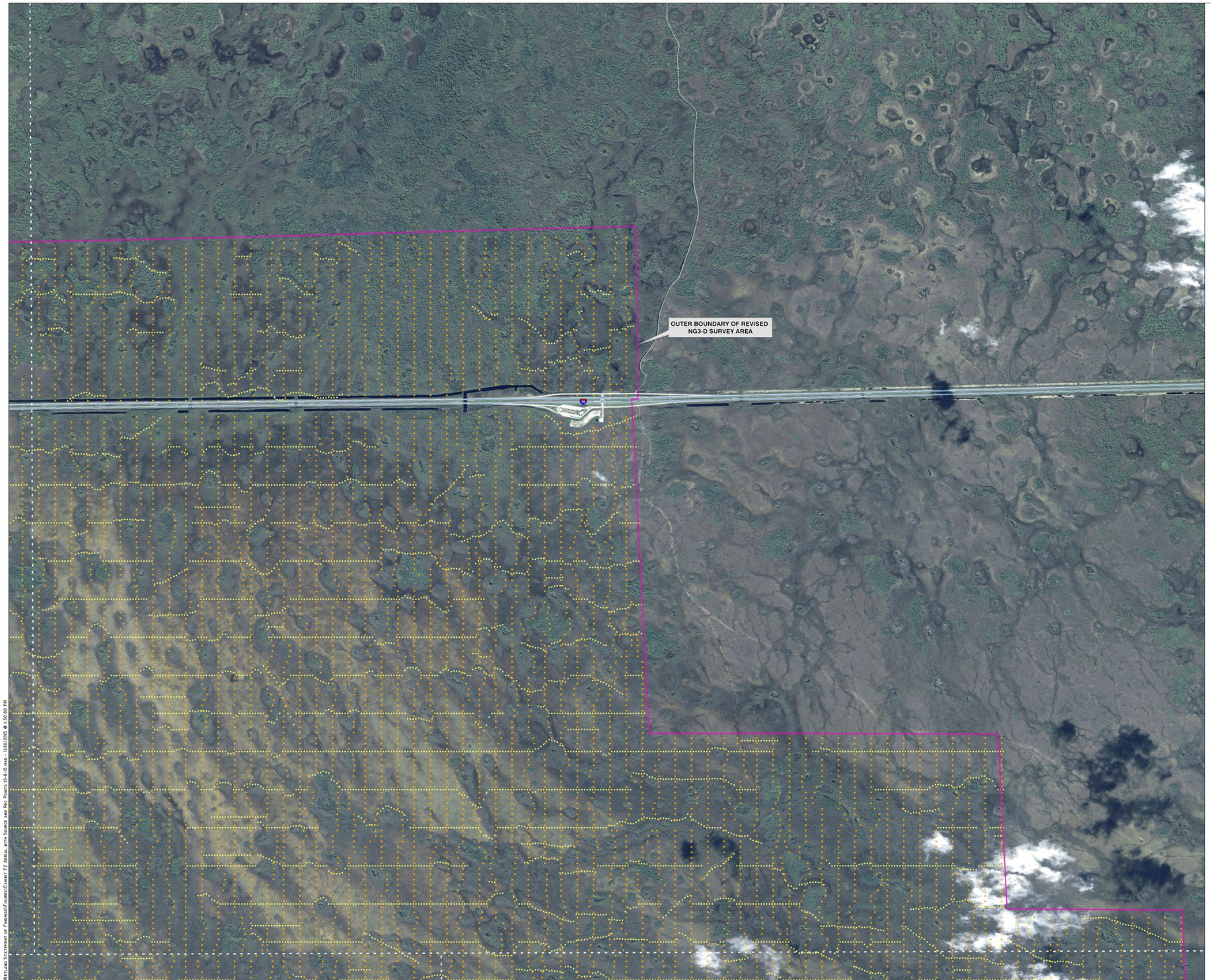
NOBLES GRADE 3-D

AERIAL WITH SOURCE AND RECEIVER POINTS

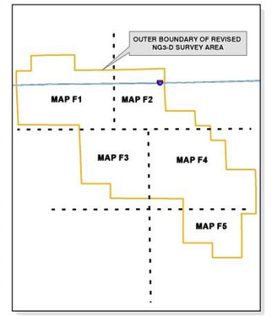
DRAWING No. 13BOC2197

SHEET No. EXHIBIT F1



LEGEND

- Outer Boundary of Revised NG3-D Survey Area
- Receiver Points
- Source Points



N
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1 inch = 900 feet

NOTES:

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SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

REVISIONS	DATE

DRAWN BY	H.H.	DATE	10/8/15
DESIGNED BY	A.W.	DATE	10/8/15
REVIEWED BY	A.W.	DATE	10/8/15

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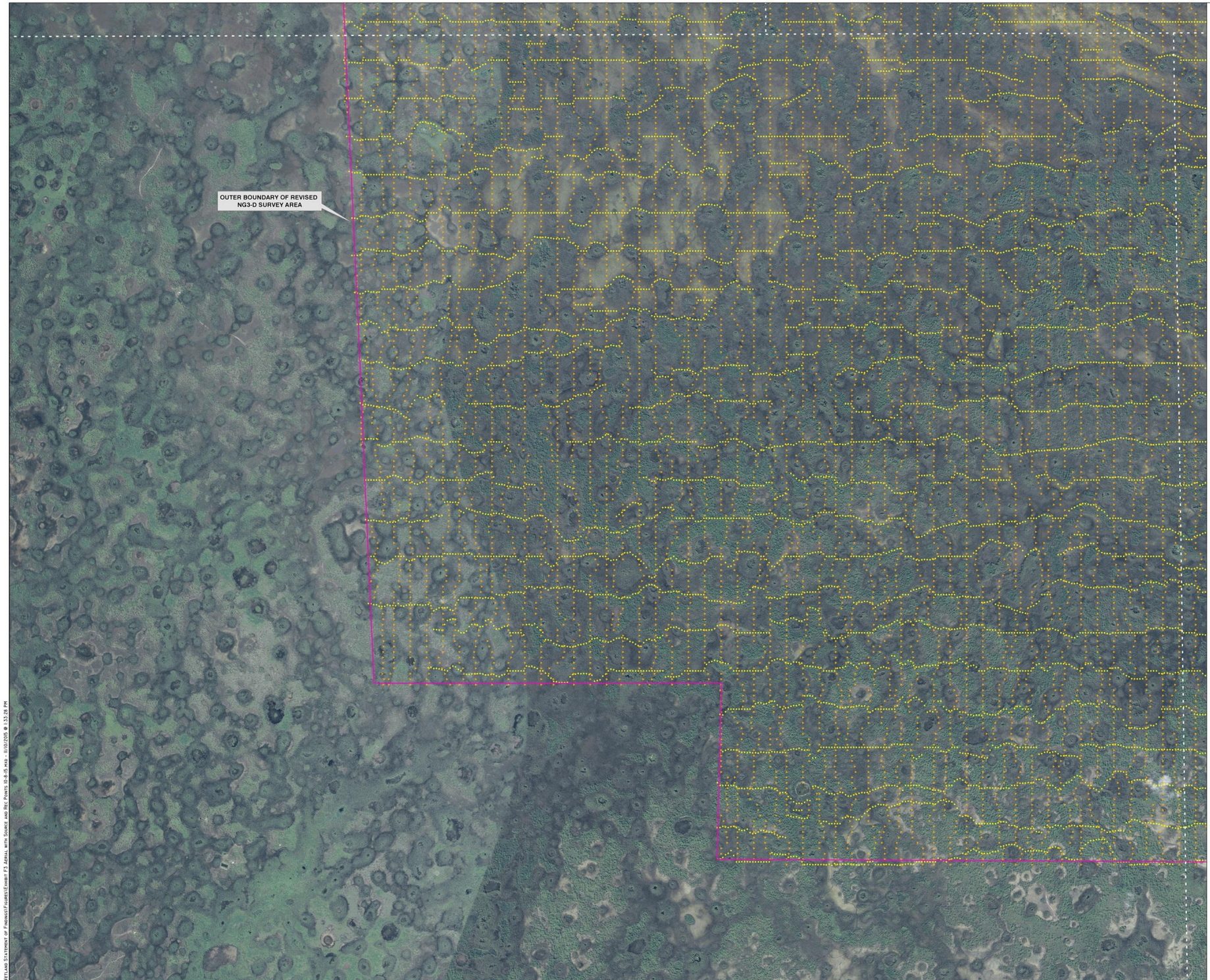
NOBLES GRADE 3-D

AERIAL WITH SOURCE AND RECEIVER POINTS

DRAWING No. 13BOC2197

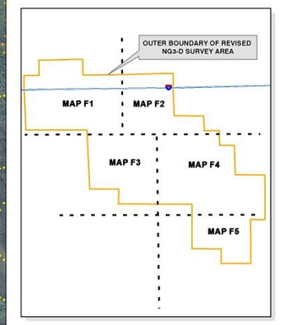
SHEET No. EXHIBIT F2

J:\2013\13boc2197\GIS\2015 Wetland Statement of Findings\Figures\Exhibit F2 Aerial with Source and Rec. Points 10-8-15.mxd - 11/02/2015 @ 1:30:09 PM



LEGEND

- OUTER BOUNDARY OF REVISED NG3-D SURVEY AREA
- RECEIVER POINTS
- SOURCE POINTS



N
W E
S

1 inch = 900 feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013.

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SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

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REVISIONS	DATE

DRAWN BY: H.H.	DATE: 10/8/15
DESIGNED BY: A.W.	DATE: 10/8/15
REVIEWED BY: A.W.	DATE: 10/8/15

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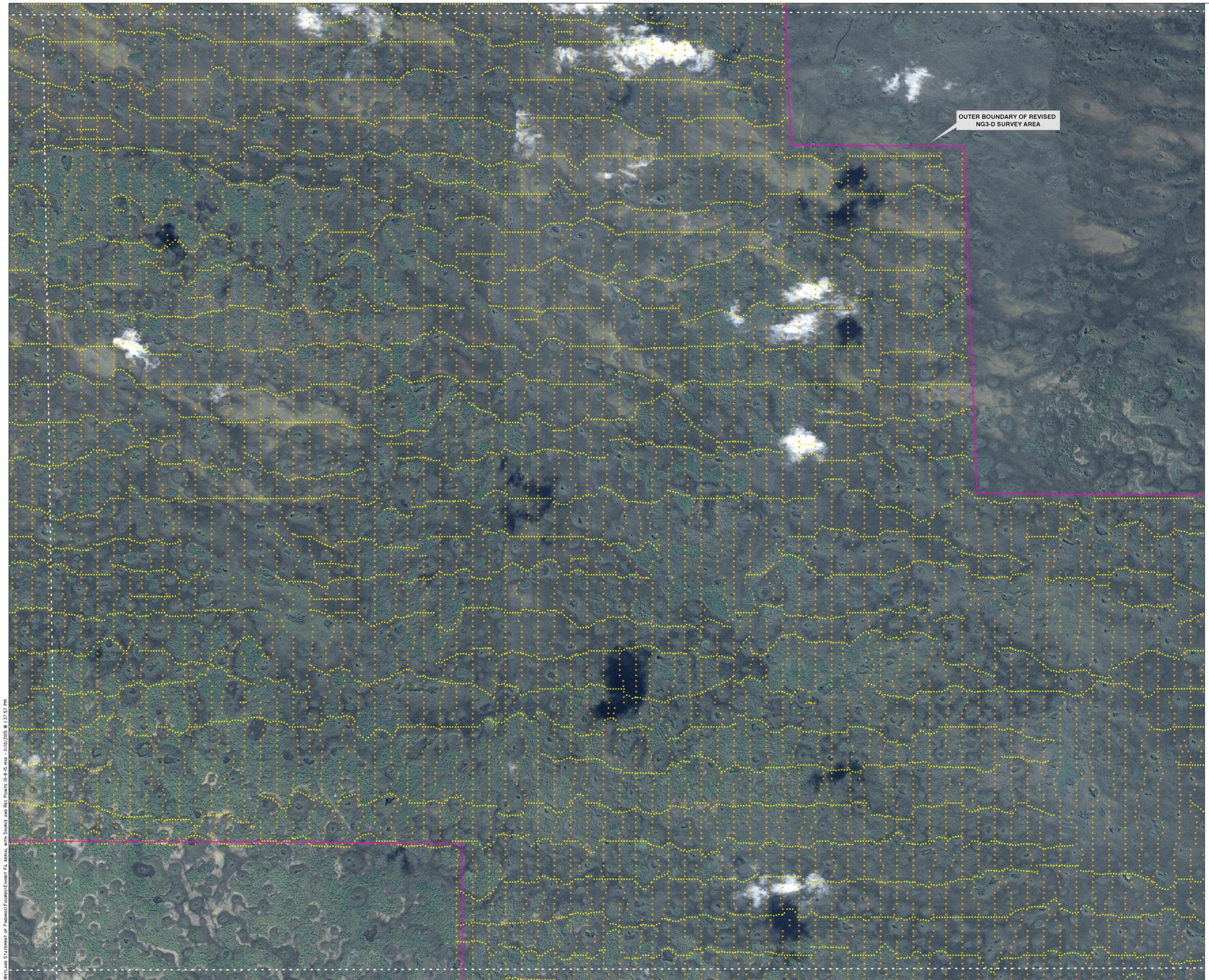
Consulting Ecologists

NOBLES GRADE 3-D

AERIAL WITH SOURCE AND RECEIVER POINTS

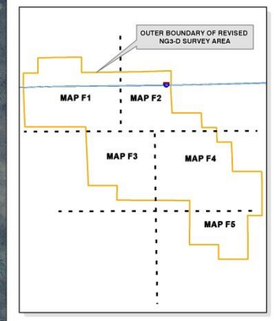
DRAWING No.: 13BOC2197

SHEET No.: EXHIBIT F3



LEGEND

- OUTER BOUNDARY OF REVISED NG3-D SURVEY AREA
- RECEIVER POINTS
- SOURCE POINTS



N
W E
S

1 inch = 900 feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013.

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SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

REVISIONS	DATE	DRAWN BY	DATE
		H.H.	10/8/15
		DESIGNED BY	DATE
		A.W.	10/8/15
		REVIEWED BY	DATE
		A.W.	10/8/15

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Consulting Ecologists

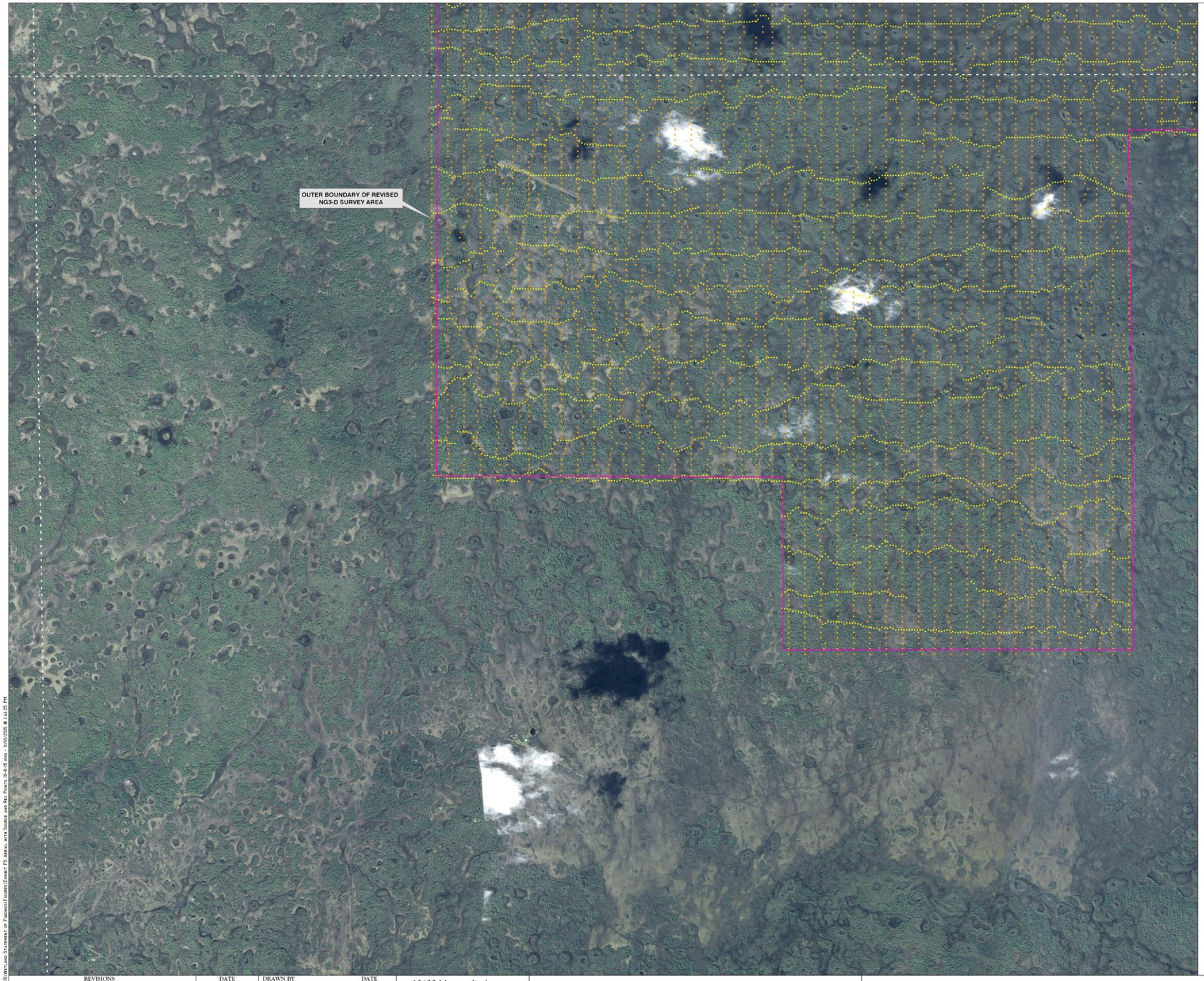
NOBLES GRADE 3-D

AERIAL WITH SOURCE AND RECEIVER POINTS

DRAWING No.
13BOC2197

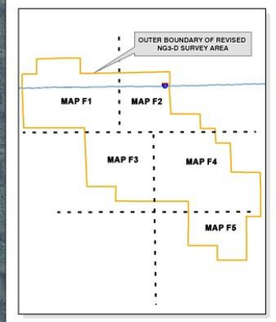
SHEET No.
EXHIBIT F4

J:\2013\13boc2197\GIS\2015\Wetland Statement of Findings\Figures\Exhibit F4_Aerial with Source and Rec Points (8-8-15).mxd - 11/9/2015 @ 1:37:57 PM



LEGEND

- Outer Boundary of Revised NG3-D Survey Area
- Receiver Points
- Source Points



N
W E
S

1 inch = 900 feet

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013.

OUTER BOUNDARY OF REVISED NG3-D SURVEY AREA WAS PROVIDED BY DAWSON GEOPHYSICAL COMPANY NOVEMBER 2014.

THE OUTER BOUNDARY OF THE REVISED NG3-D SURVEY AREA DEPICTS THE OUTLINE OF THE GENERAL SURVEY AREA. HOWEVER, PARCELS WHERE BURNETT OIL CO., INC. (BOCI) HAS NOT OBTAINED THE RIGHT OF ENTRY (ROE) WILL NOT BE SUBJECT TO THE SEISMIC SURVEY.

SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

J:\2015\13boc2197\GIS\2015_Wetland Statement of Findings\Figures\Exhibit F5 Aerial with Source and Rec Points 10-8-15.mxd - 10/10/2015 @ 14:25 PM

REVISIONS	DATE

DRAWN BY	H.H.	DATE	10/8/15
DESIGNED BY	A.W.	DATE	10/8/15
REVIEWED BY	A.W.	DATE	10/8/15

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Consulting Ecologists
PASSARELLA & ASSOCIATES INC

NOBLES GRADE 3-D

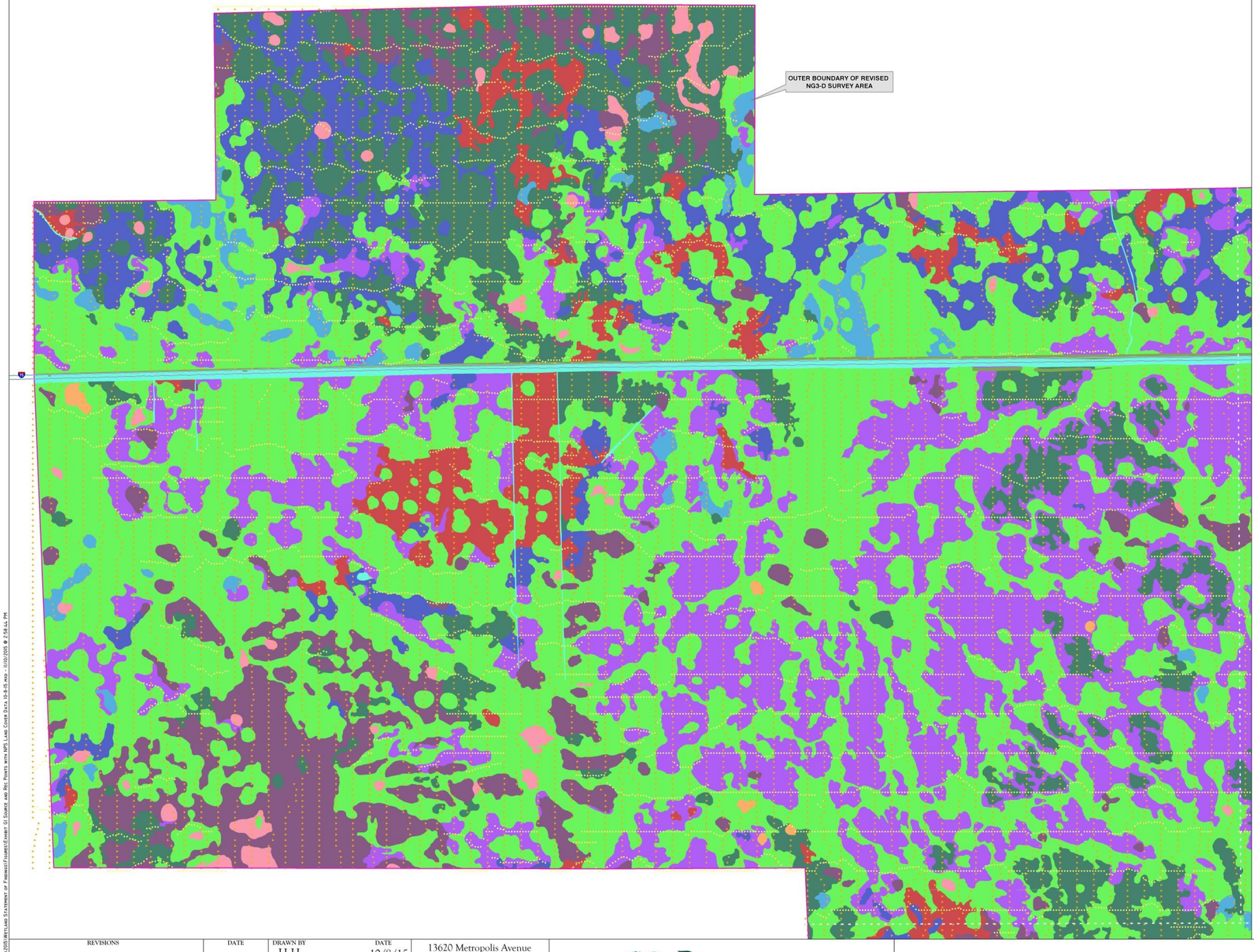
AERIAL WITH SOURCE AND RECEIVER POINTS

DRAWING No.
13BOC2197

SHEET No.
EXHIBIT F5

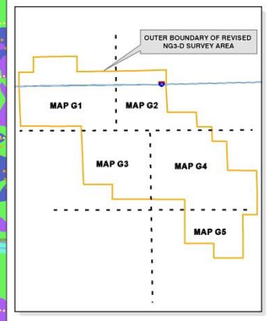
EXHIBIT G

SOURCE AND RECEIVER POINTS WITH NATIONAL PARK SERVICE LAND COVER DATA



LEGEND

- Outer Boundary of Revised NG3-D Survey Area
- Receiver Points
- Source Points
- Cypress Forest
- Disturbed
- Hydric Hammock
- Hydric Pine Flatwood
- Marsh
- Mesic Hammock
- Mesic Pine Flatwoods
- Scrub Cypress
- Swamp Forest
- Water
- Wet Prairie



N
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1 inch = 900 feet

NOTES:

OUTER BOUNDARY OF REVISED NG3-D SURVEY AREA WAS PROVIDED BY DAWSON GEOPHYSICAL COMPANY NOVEMBER 2014.

THE OUTER BOUNDARY OF THE REVISED NG3-D SURVEY AREA DEPICTS THE OUTLINE OF THE GENERAL SURVEY AREA. HOWEVER, PARCELS WHERE BURNETT OIL CO., INC. (BOCI) HAS NOT OBTAINED THE RIGHT OF ENTRY (ROE) WILL NOT BE SUBJECT TO THE SEISMIC SURVEY.

SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

REVISIONS	DATE

DRAWN BY	H.H.	DATE	10/8/15
DESIGNED BY	A.W.	DATE	10/8/15
REVIEWED BY	A.W.	DATE	10/8/15

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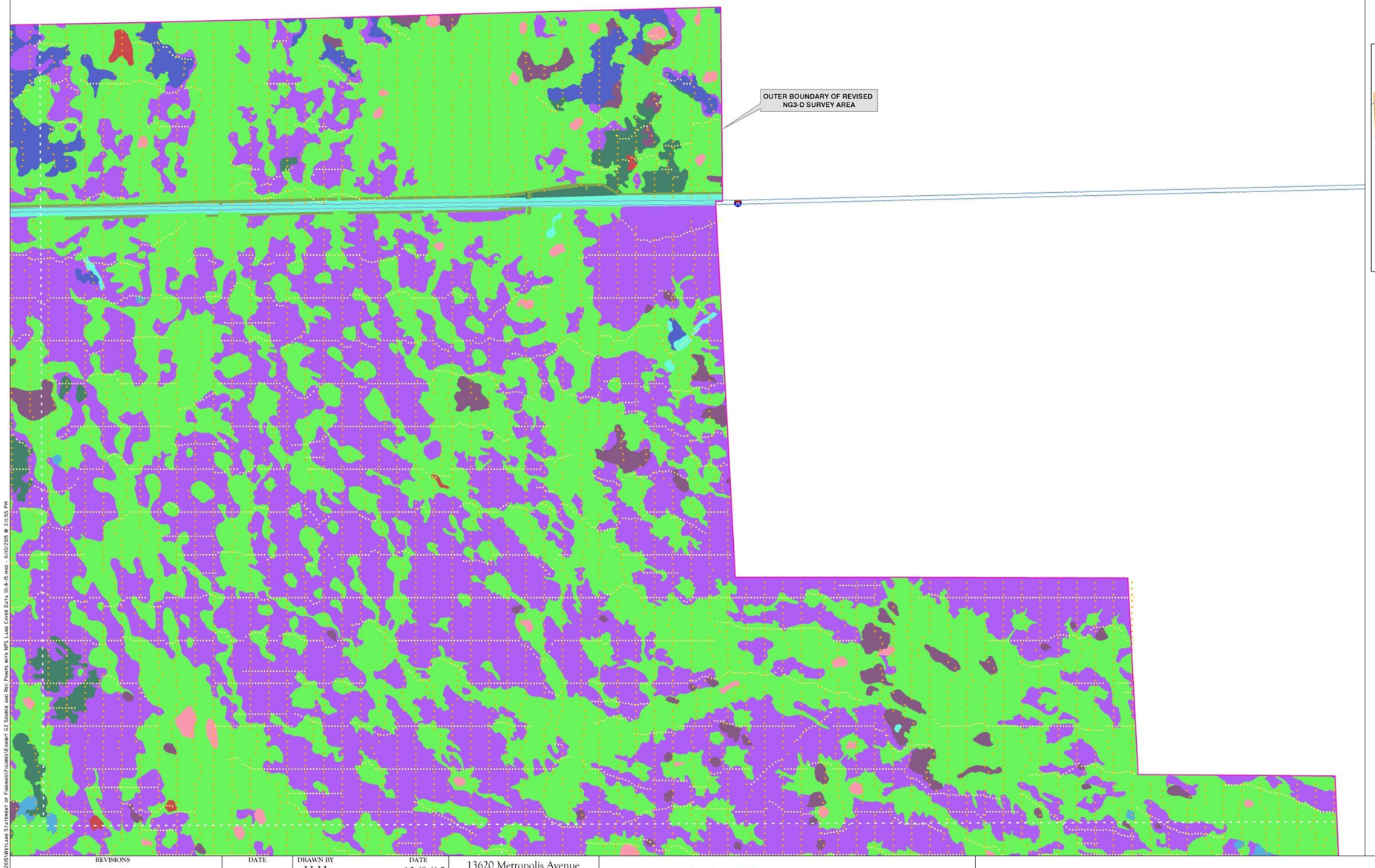
SOURCE AND RECEIVER POINTS WITH NATIONAL PARK SERVICE LAND COVER DATA

DRAWING No. 13BOC2197

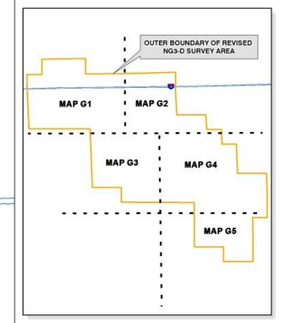
SHEET No. EXHIBIT G1

J:\2013\13boc2197\GIS\2015 Wetland Statement of Findings\Figures\Exhibit G1 Source and Rec Points with NPS Land Cover Data 10-8-15.mxd – 11/02/2015 @ 2:58:14 PM



LEGEND

- Outer Boundary of Revised NG3-D Survey Area
- Receiver Points
- Source Points
- Cypress Forest
- Disturbed
- Hydric Hammock
- Hydric Pine Flatwood
- Marsh
- Mesic Hammock
- Mesic Pine Flatwoods
- Scrub Cypress
- Swamp Forest
- Water
- Wet Prairie



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1 inch = 900 feet

NOTES:

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SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

REVISIONS	DATE

DRAWN BY	H.H.	DATE 10/8/15
DESIGNED BY	A.W.	DATE 10/8/15
REVIEWED BY	A.W.	DATE 10/8/15

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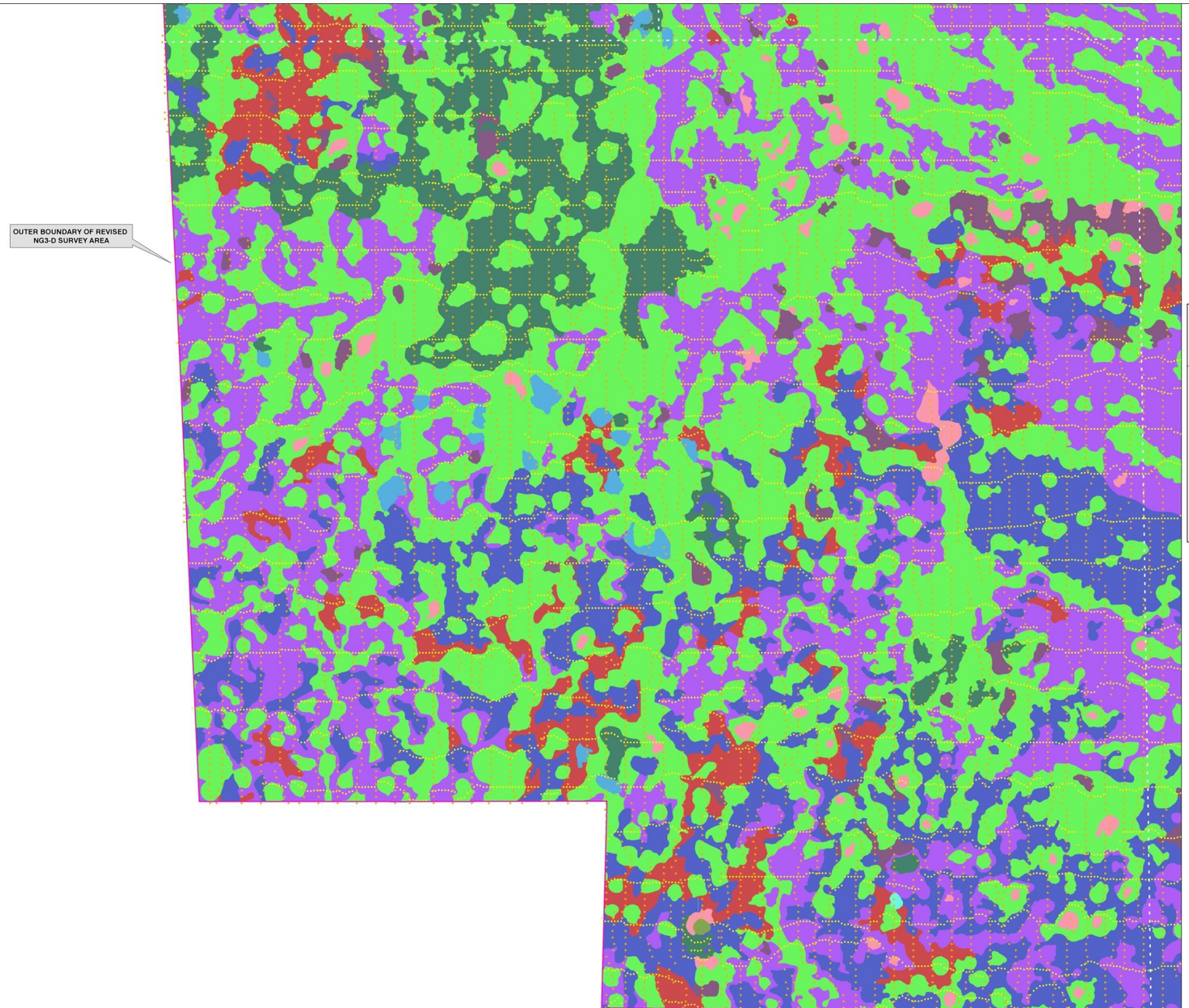
SOURCE AND RECEIVER POINTS WITH NATIONAL PARK SERVICE LAND COVER DATA

DRAWING No. 13BOC2197

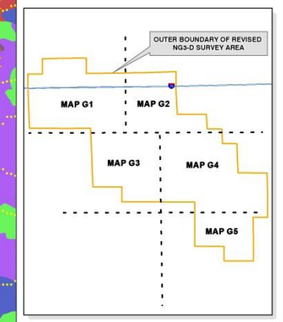
SHEET No. EXHIBIT G2

J:\2013\13boc2197\GIS\2015\Work\Land Statement of Finding\Figures\Exhibit G2 Source and Rec Points with NPS Land Cover Data 10-8-15.mxd - 10/10/2015 @ 3:18:55 PM



LEGEND

- Outer Boundary of Revised NG3-D Survey Area
- Receiver Points
- Source Points
- Cypress Forest
- Disturbed
- Hydric Hammock
- Hydric Pine Flatwood
- Marsh
- Mesic Hammock
- Mesic Pine Flatwoods
- Scrub Cypress
- Swamp Forest
- Water
- Wet Prairie



N
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1 inch = 900 feet

NOTES:

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SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

J:\2015\13BOC2197\GIS\2015 Wetland Statement of Findings\Figures\Exhibit G3 Source and Rec Points with NPS Land Cover Data 10-8-15.mxd - 11/02/2015 @ 3:16:41 PM

REVISIONS	DATE

DRAWN BY	H.H.	DATE	10/8/15
DESIGNED BY	A.W.	DATE	10/8/15
REVIEWED BY	A.W.	DATE	10/8/15

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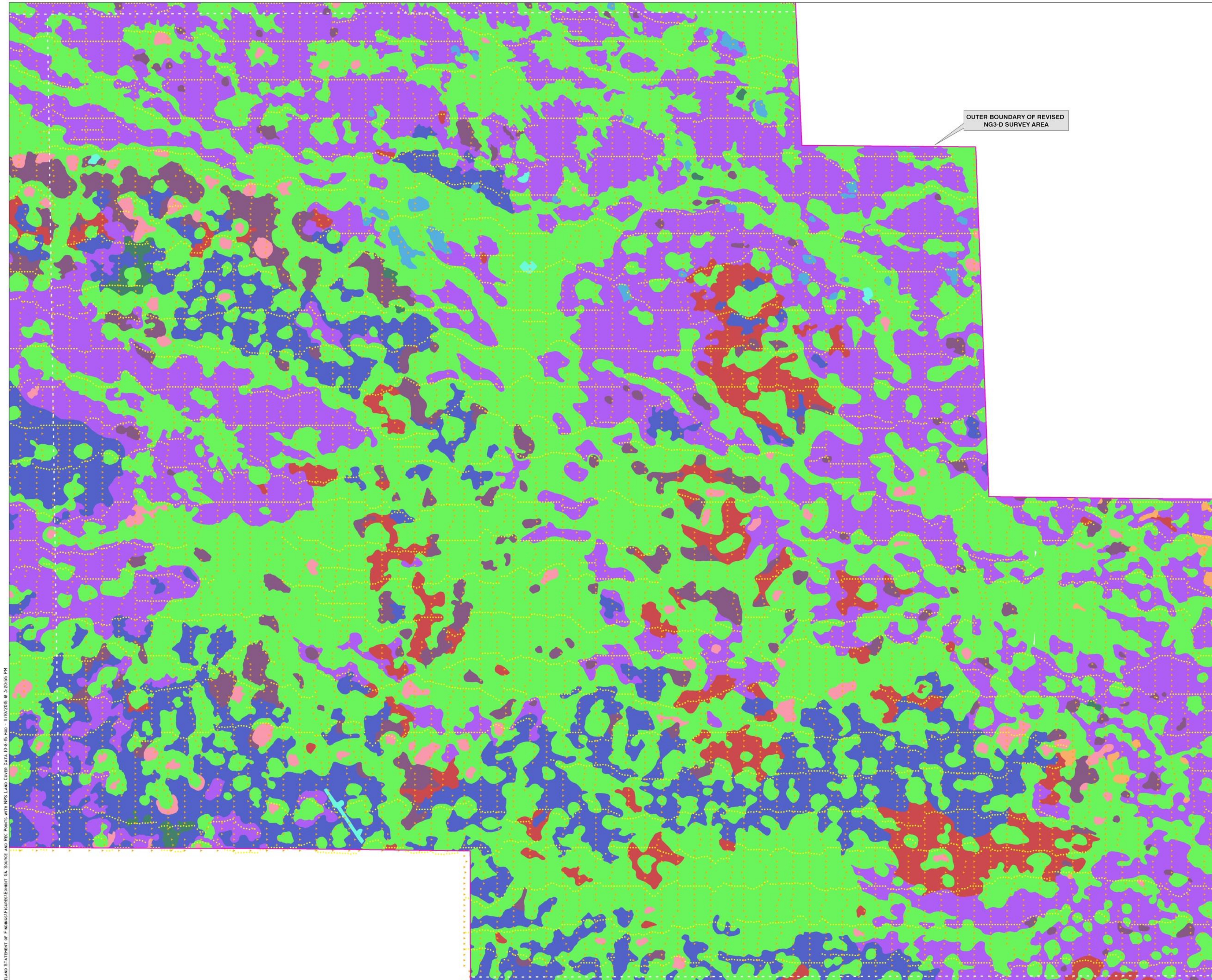
NOBLES GRADE 3-D

SOURCE AND RECEIVER POINTS WITH NATIONAL PARK SERVICE LAND COVER DATA

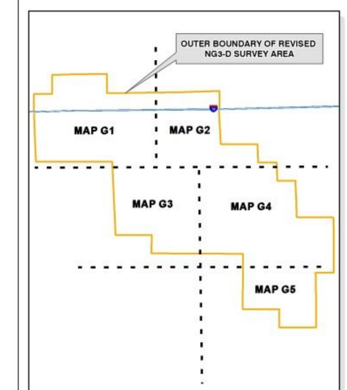
DRAWING No. 13BOC2197

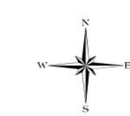
SHEET No. EXHIBIT G3



LEGEND

- Outer Boundary of Revised NG3-D Survey Area
- Receiver Points
- Source Points
- Cypress Forest
- Disturbed
- Hydric Hammock
- Hydric Pine Flatwood
- Marsh
- Mesic Hammock
- Mesic Pine Flatwoods
- Scrub Cypress
- Swamp Forest
- Water
- Wet Prairie





1 inch = 900 feet

NOTES:

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SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

REVISIONS	DATE		
		DRAWN BY H.H.	DATE 10/8/15
		DESIGNED BY A.W.	DATE 10/8/15
		REVIEWED BY A.W.	DATE 10/8/15

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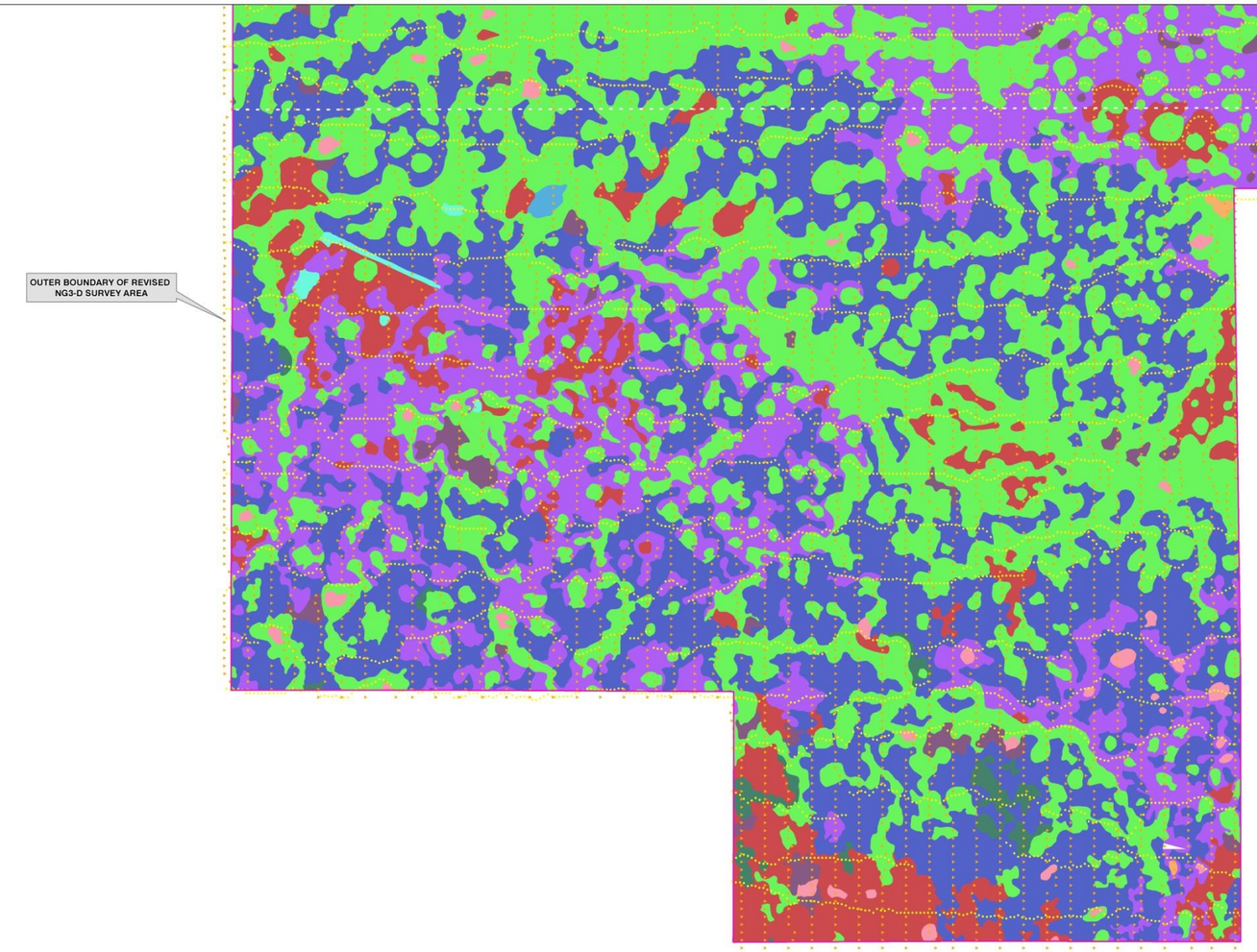
SOURCE AND RECEIVER POINTS WITH
NATIONAL PARK SERVICE LAND COVER DATA

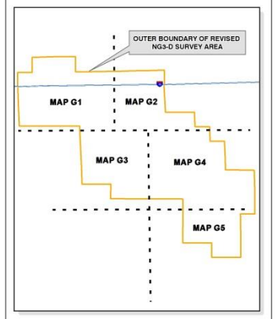
DRAWING No. 13BOC2197

SHEET No. EXHIBIT G4



LEGEND

- Outer Boundary of Revised NG3-D Survey Area
- Receiver Points
- Source Points
- Cypress Forest
- Disturbed
- Hydric Hammock
- Hydric Pine Flatwood
- Marsh
- Mesic Hammock
- Mesic Pine Flatwoods
- Scrub Cypress
- Swamp Forest
- Water
- Wet Prairie



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1 inch = 900 feet

NOTES:

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SOURCE AND RECEIVER POINTS WERE ACQUIRED FROM DAWSON GEOPHYSICAL AUGUST 2014.

VEGETATION LAND COVER DATA PROVIDED BY THE NATIONAL PARK SERVICE NOVEMBER 2013.

J:\2015\13boc2197\GIS\2015WetLand Statement of Fmdings\Figures\Exhibit G5 Source and Rec Points with NPS Land Cover Data 10-8-15.mxd - 11/10/2015 @ 3:29:28 PM

REVISIONS	DATE

DRAWN BY	H.H.	DATE	10/8/15
DESIGNED BY	A.W.	DATE	10/8/15
REVIEWED BY	A.W.	DATE	10/8/15

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Consulting Ecologists

NOBLES GRADE 3-D

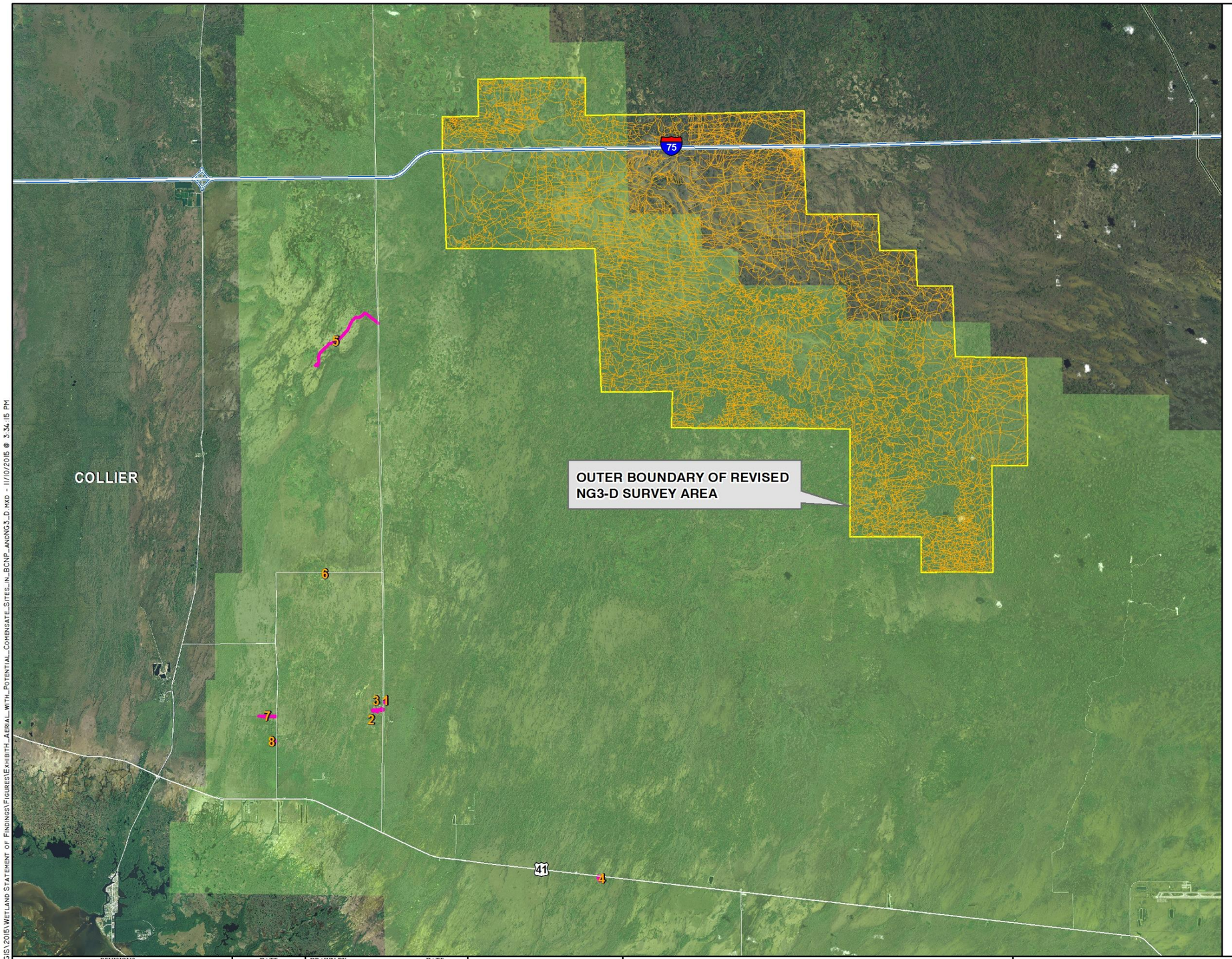
SOURCE AND RECEIVER POINTS WITH
NATIONAL PARK SERVICE LAND COVER DATA

DRAWING No.
13BOC2197

SHEET No.
EXHIBIT G5

EXHIBIT H

AERIAL WITH POTENTIAL COMPENSATION SITES IN BCNP AND NG3-D SURVEY AREA



LEGEND

- Outer Boundary of Revised NG3-D Survey Area
- Disturbed Areas
- Big Cypress National Preserve
- Existing Trails Per UGA Study

Site ID	Description	Latitude	Longitude	Acres
1	Filled Site	25.94127066	-81.26145047	2.75 Ac. ±
2	Filled Site	25.93768856	-81.26615486	2.78 Ac. ±
3	Filled Site	25.93806002	-81.26328421	2.8 Ac. ±
4	Filled Site	25.86911155	-81.16388616	4.66 Ac. ±
5	Filled Site	26.08851946	-81.28322046	5.87 Ac. ±
6	Disturbed	25.99354229	-81.28889605	1.96 Ac. ±
7	Filled Site	25.93517315	-81.31476139	2.73 Ac. ±
8	Filled Site	25.92480892	-81.31232613	2.63 Ac. ±

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Miles

NOTES:

AERIAL PHOTOGRAPHS WERE ACQUIRED FROM THE USDA-FSA AERIAL PHOTOGRAPHY FIELD OFFICE AND WERE FLOWN IN THE YEAR 2013.

OUTER BOUNDARY OF REVISED NG3-D SURVEY AREA WAS PROVIDED BY DAWSON GEOPHYSICAL COMPANY NOVEMBER 2014.

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DISTURBED AREAS WERE RECEIVED FROM THE NATIONAL PARKS SERVICE ON SEPTEMBER 22, 2015.

UGA TRAIL LOCATIONS ACQUIRED FROM NATIONAL PARK SERVICE PER E-MAIL DECEMBER 2013.

J:\2015\13BOC2197\GIS\2015\WETLAND STATEMENT OF FINDINGS\FIGURES\EXHIBITH_AERIAL_WITH_POTENTIAL_COMENSATE_SITES_IN_BCNP_ANDNG3_D.MXD - 11/10/2015 @ 3:34:15 PM

REVISIONS	DATE

DRAWN BY: T.S.	DATE: 9/25/15
DESIGNED BY: A.W.	DATE: 9/25/15
REVIEWED BY: A.W.	DATE: 9/25/15

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NOBLES GRADE 3-D

AERIAL WITH POTENTIAL COMPENSATION SITES IN BCNP AND NG3-D SURVEY AREA

DRAWING No.: 13BOC2197

SHEET No.: EXHIBIT H

APPENDIX C: U.S. FISH AND WILDLIFE SERVICE CONCURRENCE LETTER

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

February 25, 2015

J.D. Lee
Acting Superintendent
Big Cypress National Preserve
33100 Tamiami Trail
Ochopee, Florida 34141

Service CPA Code: 2015-CPA-0137
Service Consultation Code: 2015-I-0080
Date Received: December 1, 2014
Applicant: Burnett Oil Co., Inc.
Project: Nobles Grade 3-D Seismic Survey
County: Collier

Dear Mr. Lee:

The U.S. Fish and Wildlife Service (Service) has reviewed your November 2014 Final Biological Assessment (BA), November 2014 Plan of Operations (POP), and other information submitted by the National Park Service (NPS) for the project referenced above. This letter is submitted in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 et seq.).

PROJECT DESCRIPTION

The applicant, Burnett Oil Co., Inc. (BOCI), proposes to conduct a seismic survey of approximately 110 square miles (70,454± acres [ac]) of surface land within the Big Cypress National Preserve and Big Cypress National Preserve Addition (collectively known as "Preserve"). The purpose of the survey is to identify potential sources of oil and natural gas. The seismic survey project proposes to employ Vibroseis technology to acquire three-dimensional (3-D) seismic data and is designed to evaluate the subsurface geologic structure and geophysical conditions as they pertain to accumulations of commercial quantities of crude oil and natural gas within a section of the Preserve.

No explosives will be used to create the vibrations or seismic acoustical signals, and there will be no ground disturbances from detonations in the applicant's seismic survey. Instead, vibrations will be created using a hydraulically-lowered steel pad mounted on special off-road vehicles (ORVs), Vibroseis vehicle or "buggy," which will employ a localized "vibrating" of the ground over a short 12 to 24-second period to produce a seismic acoustic signal and then move on to the next location. This equipment utilizes low impact "balloon" or "flotation" tires, is highly maneuverable, and designed to reduce ground tire pressure to 26 pounds per square inch (psi)

(roughly 11 psi less than a pick-up truck). Two independent groups of three buggies each will generate seismic signals. Group seismic signal generation will be synchronized between group buggies to produce one signal at each vibration or "vibe" source point.

Five temporary staging areas will be established for the proposed seismic survey. One staging area will be selected to be the main staging area which will be utilized mostly for vehicle parking, equipment storage, crew mobilization, and helicopter operations. The remaining four staging areas will be for satellite uses (*i.e.,* geophone pick up and drop off via helicopter). The proposed staging areas will be located on existing abandoned oil well pads or other areas easily accessed from existing Interstate 75 (I-75) recreational parking areas. These sites were selected to minimize potential wildlife, vegetative, hydrologic, and soil disturbance and avoid exiting directly off of I-75. Since operations will be scheduled for the dry season, no improvements are planned for the staging areas. If necessary, composite, high-density, interlocking mats will be utilized on a temporary basis to support staging activities and access, if necessary. Environmental impacts from the temporary staging areas will be restored by the applicant.

The proposed seismic survey would traverse the majority of the 110 square mile survey area located within the north and central portions of the Preserve. The survey area is entirely within Collier County, located just south of Hendry County and west of Broward County. I-75 bisects the northern portion of the survey area in an east-west direction.

The Vibroseis seismic survey will employ a "one pass" design for point locations during data acquisition operations, except in those instances where utilizing access corridors for multiple Vibroseis buggies will result in fewer potential environmental impacts. While the overall survey area totals approximately 110 square miles, it is estimated that a two and a half square mile portion of the survey area will be affected through the use of the Vibroseis buggies per day. At specific locations, the seismic survey may only take place for a few minutes while crew and equipment are present. The seismic survey plan is designed so that once the survey team has passed through a specific area there will be no further operations that take place at that location. This will result in a reduction of the number and intensity of potential impacts associated with seismic survey activities.

The seismic survey operations will be conducted during the dry season only (December through the end of May) to minimize potential ground disturbance. Once the acquisition of seismic data is completed, the locations where vibrating occurred and receivers were placed on the ground will be returned to their pre-existing condition. The applicant will coordinate field operations with NPS managers to avoid working in standing water to the extent practicable.

THREATENED AND ENDANGERED SPECIES

The BA addresses potential effects of the project on the threatened American alligator (*Alligator mississippiensis*)(due to similarity of appearance to the American crocodile), threatened Eastern indigo snake (*Drymarchon corais couperi*), threatened Audubon's crested caracara (*Caracara*

cheriway), endangered Everglade snail kite (*Rostrhamus sociabilis plumbeus*), endangered red-cockaded woodpecker (*Picoides borealis*) (RCW), threatened wood stork (*Mycteria americana*), endangered Florida bonneted bat (*Eumops floridanus*), and endangered Florida panther (*Puma concolor coryi*).

American alligator

The survey area footprint includes cover types that are included in a list of various types of vegetative cover that could be used by the American alligator for essential behavior patterns if situated in an appropriate landscape. The NPS has determined the project "may affect, but is not likely to adversely affect" the American alligator. However, no permanent impacts are proposed as part of the survey activities, and no loss of American alligator habitat will occur. Additionally, field crews associated with the proposed seismic survey will be supplied with informational materials regarding the American alligator to ensure against disturbance or harassment. Based on the information provided, the Service concurs with this determination for the American alligator.

Eastern indigo snake

The survey area footprint occurs within the geographic range of the threatened eastern indigo snake. The NPS used the Service's Eastern Indigo Snake Programmatic Effect Determination Key dated August 13, 2013, to determine the project "may affect, but is not likely to adversely affect" the eastern indigo snake. Suitable habitat for the eastern indigo snake includes a mosaic of habitats in which they establish home ranges of up to 74 hectares (ha) (183 ac) on average, for males, and up to 48.6 ha (120 ac) for females. Eastern indigo snakes appear to be associated with burrows excavated by other animals, as well as naturally occurring cavities. In the sandy central ridge of south Florida, eastern indigo snakes use gopher tortoise burrows more than other underground refugia (Layne and Steiner 1996). Active and inactive gopher tortoise burrows have been documented on the survey area footprint.

To minimize potential harm to this threatened species, the applicant has agreed to the Standard Protection Measures for Eastern Indigo Snake (Service 2013b). In addition, daily scouting of survey lines will be conducted by a qualified ecologist concurrently with the survey operations in an attempt to identify eastern indigo snakes. If an eastern indigo snake is encountered during the survey, the survey will cease temporarily to allow the snake sufficient time to move away from the survey on its own before resuming the survey. Field crews will be instructed to not injure, harm, harass, kill, handle, or collect any snakes (especially the eastern indigo snake). Holes, cavities, and snake refugia other than gopher tortoise burrows will be inspected each morning before planned operations in a particular area, and, if occupied by an indigo snake, no work will commence until the snake has vacated the vicinity of the work. Based on the protective measures proposed, the Service concurs with the determination that the project may affect, but is not likely to adversely affect the eastern indigo snake.

Audubon's crested caracara

The survey area footprint is located within the geographic range of the threatened Audubon's crested caracara (caracara). The survey area footprint includes suitable nesting sites (*i.e.,* cabbage palm [*Sabal palmetto*] trees) for the caracara. The NPS has determined the project "may affect, but is not likely to adversely affect" the caracara. Survey activities will occur in potentially occupied caracara habitat, though these habitats are relatively rare within the survey area. Daily scouting of the survey lines will be conducted by a qualified ecologist concurrently with the survey operations in an attempt to identify undocumented caracara nests. If caracaras are documented within the survey area, no foot or ORV traffic will occur within the Service's designated Primary Zone *(i.e.,* radius of 300 meters [985 feet]) of any active caracara nests. To further reduce potential caracara disturbances, a 152 meter (500 foot) buffer will be established vertically and applied to helicopter activity above any documented caracara nest. Additionally, the survey design will be modified as needed to avoid any active nesting trees if they are discovered during reconnaissance of the site by the applicant's consultants. Finally, mature cabbage palms, oaks *(Quercus* spp.) or any other large trees that would provide potential nesting sites for the caracara will not be removed during the project. Based on the protective measures proposed, the Service concurs with the determination that the project may affect, but is not likely to adversely affect the caracara.

Everglade snail kite

The survey area footprint is located within the geographic range of the endangered Everglade snail kite. The NPS has determined the project "may affect, but is not likely to adversely affect" the Everglade snail kite. The project will avoid impacts to wetlands to the greatest extent practicable. Daily scouting of the survey lines will be conducted by a qualified ecologist concurrently with the survey operations in an attempt to identify potential undocumented Everglade snail kite nests. No foot, ORV, or helicopter traffic will occur within the Service designated No-Entry Buffer Zone (*i.e.,* radius of 150 meters [500 feet]) or Limited Activity Buffer Zone (*i.e.,* radius of 500 meters [1,640 feet]) of an active Everglade snail kite nest, if observed. Moreover, the survey design will be modified as needed to avoid any active nesting sites of the Everglade snail kite if they are discovered during reconnaissance of the site by the applicant's consultants. Based on the information provided, the Service concurs with the determination for the Everglades snail kite that the project may affect, but is no likely to adversely affect this species.

Red-cockaded woodpecker

The survey area footprint is located within the geographic range of the endangered RCW. The NPS determined the proposed project "may affect, but is not likely to adversely affect" the RCW. RCWs utilize southern slash pine (*Pinus elliottii*) flatwoods as nesting and foraging habitat in south Florida (Beever and Dryden 1992). Colony sites are 2 to 4 ha (5 to 10 ac) in size. Home ranges average 142 to 162 ha (350 to 400 ac) in southern Florida, but can exceed 202 ha (500 ac) in southwest Florida. The applicant's consultant will survey suitable habitat

within the project area for RCW nest cavities prior to establishment of the survey transects. Daily scouting of the survey lines will be conducted by a qualified ecologist concurrently with the survey operations in an attempt to identify any undocumented RCW colonies. Field operations will be coordinated with ongoing RCW location identification and tracking program updates to avoid contact with birds. A buffer of 61 meters (200 feet) in width will be maintained between RCW clusters and any foot or ORV traffic, with special precautions taken around RCW clusters during the peak feeding activity periods of early morning (6 a.m. to 9 a.m.) and late afternoon (4 p.m. to sunset). Where practicable, activity near RCW clusters will be avoided entirely during those time windows. A 61 meter (200 foot) buffer will be established vertically and applied to helicopter activity above active cavities. RCW usually do not fly above canopy level, thus the potential for a helicopter collision with a bird will be negligible. If any RCW nest cavities are observed, the survey design will be modified as needed to avoid areas of RCW nesting. In addition, pine trees greater than 10.2 centimeters (4 inches) DBH will not be impacted during the establishment of transect lines or to allow buggy access. Based on the protective measures proposed, the Service concurs with the determination that the project may affect, but is not likely to adversely affect the RCW.

Wood stork

The survey area footprint is located within the geographic range of the endangered wood stork. The NPS determined the proposed project "may affect, but is not likely to adversely affect" the wood stork or its designated critical habitats based upon the Wood Stork Effect Determination Key (Service 2010). The seismic survey activities will not result in permanent wetland impacts, and any temporary impacts will be of a minimal nature. Daily scouting of the survey lines will be conducted by a qualified ecologist concurrently with the survey operations in an attempt to identify potential undocumented wood stork nesting colonies. Historical data will also be used to determine areas where nesting wood storks will be more likely to occur. The scouting surveys will utilize the most current Geographic Information System (GIS) data for wading bird and wood stork colonies. A buffer of 100 meters (328 feet) in width will be maintained between active wood stork colonies and any foot or ORV traffic associated with the seismic survey and will be applied to all groups of nesting wading birds. A 152 meter (500 foot) buffer will be established for helicopter activity above active wood stork colonies and no repeated flights on the same path over active wood stork colonies will occur. Field crews associated with the proposed seismic survey will be supplied with informational materials regarding the wood stork to ensure against disturbance or harassment. Based on the protective measures proposed, the Service concurs with the determination that the project may affect, but is not likely to adversely affect the wood stork.

Florida bonneted bat

The survey area footprint is located within the geographic range and focal area of the endangered Florida bonneted bat (FBB). The survey area footprint contains potential suitable roosting and foraging habitat for the FBB. The NPS determined the proposed project "may affect, but is not likely to adversely affect" the FBB. Daily scouting of the survey lines will be conducted by a

qualified ecologist concurrently with the survey operations in an attempt to identify potential nesting or roosting areas. In the event bonneted bats or roost sites are observed, these areas will be avoided. The Service has determined the temporary loss of vegetation that will occur during the establishment of transect lines and buggy access paths will not significantly affect foraging opportunities for the FBB. Moreover, potential roosting sites for the FBB will not be affected because trees with a DBH of greater than 10.2 centimeters (4 inches) will not be removed. Based on the protective measures proposed, the Service concurs with the determination for the FBB.

Florida panther

The survey area footprint is located within the Primary Zone of the Service's "Focus Area" for the endangered Florida panther. The Focus Area is based on the scientific information on panther habitat usage provided in Kautz et al. 2006 and Thatcher et al. 2006. It denotes areas in Florida where development projects could potentially affect the panther. The NPS used the February 19, 2007 Florida Panther Effect Determination Key to conduct a sequential effect determination for the Florida panther. Use of the key resulted in a "may affect" determination for the Florida panther.

The survey design will be modified, as needed, if any panther denning sites are discovered during reconnaissance of the site by the applicant's consultants or if identified during consultation with the NPS or Florida Fish and Wildlife Conservation Commission (FWC). Daily scouting of the survey lines will be conducted by a qualified ecologist concurrently with the survey operations in an attempt to identify Florida panthers and/or dens. In addition, the FWC panther team will lead a follow-up training for survey crews to provide information on the Florida panther. The applicant has assembled and mapped known Florida panther habitat, radio-collar tracking and reported sighting data and will coordinate field operations with ongoing, real-time State and Federal panther tracking programs to avoid denning activities.

The applicant's environmental consultants will be in continuous contact with the NPS and FWC biologists monitoring radio-instrumented panthers in and around the survey area and will take appropriate actions suggested by these panther experts if monitoring suggests panthers are denning in the survey area. If monitoring suggests panthers are denning in the survey area, appropriate actions will be taken as recommended by USDOI-NPS and FWC staff. In general, the den sites will be buffered by approximately 100 to 200 meters (328 to 656 feet), as recommended by the FWC. Each den will be evaluated on a case-by-case basis and appropriate buffers will be coordinated through the FWC and USDOI-NPS. Additionally, the project will result in limited impacts to vegetation during the establishment of transect lines and buggy access paths, and it will not result in a permanent loss of habitat for the panther. All access points to the survey area will be kept secure to prevent Florida panthers from breaching the I-75 wildlife fence. Based on the protective measures proposed, the Service finds the project is not likely to adversely affect the Florida panther. We recommend the NPS change its determination for the Florida panther from "may affect" to "may affect, not likely to adversely affect." This letter can be used as concurrence for that finding.

CANDIDATE SPECIES

Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action that is likely to jeopardize the continued existence of any species proposed for listing or result in the adverse modification of critical habitat proposed to be designated. A conference may involve informal discussions between the Service, the action agency, and the applicant regarding candidate species. Any recommendations generated during these informal discussions are discretionary, because an agency is not prohibited from jeopardizing the continued existence of a candidate species. Although not required by the Act, the Service encourages the formation of partnerships to conserve candidate species since these species by definition may warrant future protection under the Act. If a listing action is finalized, the prohibition against jeopardy or adverse modification applies, regardless of the stage of the action. The BA addresses potential effects of the project on the following candidate species; Florida prairie-clover (*Dalea carthagenensis* var. *floridana*), Florida pineland crabgrass (*Digitaria pauciflora*), and gopher tortoise (*Gopherus polyphemus*).

Gopher tortoise

The survey area footprint occurs within the geographic range of the gopher tortoise. The NPS has determined the project "may affect, but is not likely to adversely affect" the gopher tortoise. The survey area includes cover types that are included in a list of vegetative cover types that could be used by gopher tortoises. However, no permanent impacts will occur to gopher tortoise habitat within the survey area, and any gopher tortoise burrow encountered will be avoided during survey activities. If undocumented gopher tortoise burrows are encountered prior to or during field operations, no field equipment will be driven within 15.2 meters (50 feet) of a documented occurrence. Flexibility has been built into the operations plan so that previously undocumented gopher tortoise burrows can be avoided. No gopher tortoises will be disturbed and no gopher tortoise burrows will be destroyed or damaged. Field crews will be given educational material describing the gopher tortoise, its burrows and burrow locations, and the associated regulations related to its protection. Based on the protective measures proposed, the Service concurs with the determination that the project may affect, but is not likely to adversely affect the gopher tortoise.

Florida prairie-clover

The survey area footprint includes cover types that are included in a list of various types of vegetative cover that could be potentially suitable habitat for Florida prairie-clover if situated in an appropriate landscape, and Florida prairie-clover has been documented within the BCNP lands. The NPS has determined the project "may affect, but is not likely to adversely affect" the Florida prairie-clover. However, no permanent impacts are proposed as part of the seismic survey activities, and no Florida prairie-clover habitat will be lost as a result. Daily scouting of the survey lines will be conducted by a qualified ecologist concurrently with the survey operations in an attempt to identify Florida prairie-clovers so that it can be avoided. In areas of known Florida prairie-clover presence, caution will be utilized as survey activities occur in order to avoid the destruction of any specimens. Minor brush clearing that may occur as part of the

survey activities is unlikely to affect the Florida prairie-clover, as the preferred habitat includes open prairies and the edges of hammocks, and these areas are unlikely to require shrub thinning. Based on the protective measures proposed, the Service concurs with the effects determination for the Florida prairie-clover.

Florida pineland crabgrass

The survey area footprint includes cover types that are included in a list of various types of vegetative cover that could be potentially suitable habitat for Florida pineland crabgrass if situated in an appropriate landscape, and Florida pineland crabgrass has been documented within the BCNP lands. The NPS has determined the project "may affect, but is not likely to adversely affect" the Florida pineland crabgrass. However, no permanent impacts are proposed as part of the seismic survey activities, and no Florida pineland crabgrass habitat will be lost as a result. Daily scouting of the survey lines will be conducted by a qualified ecologist concurrently with the survey operations in an attempt to identify Florida pineland crabgrass so that it can be avoided. Minor brush clearing that may occur as part of the survey activities is unlikely to affect the Florida pineland crabgrass, as the preferred habitat includes open prairies and the edges of hammocks, and these areas are unlikely to require shrub thinning. Based on the protective measures proposed, the Service concurs with the effects determination for the Florida pineland crabgrass.

FISH AND WILDLIFE RESOURCES

Field crews composed of trained ecologists and archaeologists will ground truth the seismic survey area on foot concurrent with the survey operations. Sensitive areas will be identified on work area maps as "avoidance polygons," and the seismic survey will be adjusted accordingly around these areas. Flexibility has been built into the operations plan to accommodate unanticipated issues related to sensitive areas.

The applicant has planned its operations to avoid discharge of dredged or fill material into wetlands. If the use of fill is needed, then the applicant will obtain necessary approvals from the relevant agencies prior to discharge of fill, including consultation and approval through the Service. To the greatest extent practicable, the following measures will be utilized to avoid and minimize potential impacts to fish and wildlife, wetlands, vegetation, and soils as a result of the survey operations:

1. Field operations will be conducted during the "dry season" (December through May, depending on conditions);

2. Low shrubs and herbaceous vegetation and topsoil, rootstock and plants will be left in place along source lines, receiver lines, and access routes to facilitate natural re-vegetation. However, vegetation trimming and/or brush cutting activities may occur, if needed, to provide safe passage through certain areas. Trimming and brush cutting will be subject to prior approval of NPS representatives and inspectors;

3. Consultation with NPS will occur to determine optimum access routes to off-trail locations in environmentally sensitive areas and to establish appropriate reclamation actions;

4. Vibroseis buggies with balloon tires will be used to spread vehicle surface weight and protect against vegetation root disruption and soil compaction;

5. Trash bags and receptacles will be provided to field crews for use during daily field operations. Trash and debris, including plastic flagging, stakes, and other temporary markers put in place by the Operator will be collected and removed from the field daily;

6. Marred or wounded standing trees are to be treated with a commercially available, non-toxic pruning paint or wound coating;

7. Ruts, depressions, and vehicle tracks (*i.e.,* potential depressions in the soil left by a vehicle that contains uprooted vegetation, soil displacement, and/or soil compaction which is visibly identifiable) resulting from field operations will be restored to original contour conditions concurrent with daily operations using shovels and rakes to prevent the creation of trails. This does not include potential damage to habitat like the "lay-over" of vegetation expected to occur as a result of vehicle traffic in an off-road situation;

8. Field clean-up will begin immediately upon completion of each task and final clearance will be documented by and coordinated with NPS and Florida Department of Environmental Protection representatives to the satisfaction of the NPS Superintendent; and

9. Removal and reclamation of field staging areas with associated access improvements will be completed to the satisfaction of the NPS Superintendent upon confirmation that no further use of staging area facilities is required by the applicant and not desired by NPS or other Federal or State management or regulatory agencies. Final field reclamation and clean-up will be conducted concurrently with field operations and completed within 30 days following the last vibrator source point sweep except in inclement weather conditions.

The seismic survey, as proposed, will result in only temporary impacts to vegetation that provide habitat for fish and wildlife. The project, as proposed, will avoid impacts to wetlands to the greatest extent practicable, and permanent impacts to wetlands will not occur. Consequently, the Service finds the project will not significantly affect fish and wildlife resources.

CONCLUSION

This letter fulfills the requirements of section 7 of the Act and further action is not required. If modifications are made to the project, if additional information involving potential effects to listed species becomes available, or if a new species is listed, reinitiation of consultation may be necessary.

The Service is aware the proposed seismic survey may result in further exploration for oil and natural gas deposits in the study area. Please note this letter completes our consultation on the effects of the seismic survey as specifically described in the project description on the federally listed and candidate species discussed above. Any additional or related actions are not covered under this consultation. Consultation with the Service is required for any and all future actions related to exploration and drilling for oil and natural gas on this parcel to determine the effects of such actions on federally listed species.

Thank you for allowing us to provide these comments and for your cooperation in the effort to protect federally listed species and fish and wildlife resources. If you have any questions regarding this project, please contact Daryl Thomas at 772-532-8965.

Sincerely yours,

Donald (Bob) Progulske
Everglades Program Supervisor
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