[redacted]

National Park Service
U.S. Department of the Interior

Big Cypress National Preserve

Florida

ORV Designated Trail Head and Turn Lane Improvements
Finding of No Significant Impact

Based on the environmental analysis as documented in the ORV Designated Trail Head and Turn Lane Improvements Environmental Assessment, together with the capability of the mitigation measures to avoid, reduce, or eliminate impacts, and with the due consideration for the nature of public comments, the NPS has determined that the selected alternative is not a major federal action significantly affecting the quality of the human environment.

Environmental impacts that could occur are limited in context and intensity, with impacts that range from localized to widespread, short- to long-term and negligible to moderate. There are no unmitigated adverse effects and there are no significant impacts on water quality, hydrology, wetlands, floodplains, soils, wildlife, special status species, unique characteristics of the region and cultural landscapes, sites or districts listed in or eligible for listing in or eligible for listing in the National Register of Historic Places. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the selected alternative will not violate any federal, state or local environmental protection law.

Based on the foregoing, it has been determined that an environmental impact statement is not required for this project and thus will not be prepared.

Recommended: _____ 8/14/12
Pedro Ramos, Superintendent — Date

Approved: _____ 8-16-12
David Vela, Regional Director
Southeast Region — Date

INTRODUCTION

This finding of no significant impact (FONSI) and the Designated Trail Head and Turn Lane Improvements Environmental Assessment (EA) constitute the record of the environmental impact analysis and decision-making process for the Big Cypress National Preserve (Preserve) project. The National Park Service (NPS) will implement the selected alternative (Alternative C, The Preferred Alternative) which includes improvements to six trail heads at designated access points throughout the Preserve and the construction of five turn lanes off U.S. 41.

The Preserve is currently used for a range of recreational activities including hunting, fishing, hiking, biking, canoeing, and riding off-road vehicles (ORVs). All of the proposed trail heads occur at existing designated access points identified in the *Final Recreational Off-Road Vehicle Management Plan/Supplemental Environmental Impact Statement* (2000),(ORV Management Plan).

The purpose of the proposed project is to improve trail heads and construct turn lanes to enhance visitor use and experience and safety. Trail heads will be improved to provide facilities and parking for users of the primary trails. This will increase public safety, improve recreational access and enhance user experience for both ORV and non-ORV user groups. Recreational access will improve for the many ORV operators, hunters, hikers and bikers that use the area. This project is needed to enhance visitor use, experience, and safety.

The proposed project was developed to address the purpose and need, and to 1) increase safety along U.S. 41 by providing turn lanes, 2) enhance recreational access and opportunities at the Preserve, 3) increase safety by separating ORV and non-ORV access, and 4) provide better public service through the provision of amenities at the trail heads.

The EA provides an analysis of the environmental consequences of the alternatives considered and was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations, 40 Code of Federal Regulations (CFR) Parts 1500-1508 and NPS Director's Order #12: *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS 2001) and NPS *Management Policies* (NPS 2006a). Compliance with the National Historic Preservation Act (NHPA) was achieved through consultation with the Florida State Historic Preservation Office (SHPO) and Indian tribes that might have an interest in historic properties within the Preserve.

This document records 1) a FONSI as required by the National Environmental Policy Act (NEPA) of 1969, 2) a determination of no impairment as required by the NPS Organic Act of 1916, 3) A Statement of Findings (SOF) for Floodplains per Executive Order 11988 "Floodplain Management," 4) A SOF for Wetlands in accordance with Executive Order 11990, 5) United States Fish and Wildlife Service (FWS) Biological Opinion (BO), 6) Concern Statements and Responses and 7) Errata.

SELECTED ALTERNATIVE

The NPS has selected Alternative C for implementation. As described in detail in the EA, the selected alternative includes improvements to six trail heads and five turn lanes.

Trail Head Improvements

The six trail heads included in Alternative C are Skillet Strand North and South, Monroe Station South, Sig Walker, Pace's Dike and Boundary Line. Trail head improvements, with the exception of Skillet Strand South, will occur at existing access points and may include an aggregate parking surface for vehicle/trailer and/or auto parking, vault toilets, refuse containers, information boards, signs, gates, backcountry permit stations, and/or landscaping. Passenger vehicle parking will be separated from ORV and accessible ORV parking by an ORV gate. Storm water management will be provided to treat the runoff from impervious surfaces prior to discharge. The configurations of the proposed trail head improvements are located in areas that have been previously disturbed from ORV use and unplanned parking. The placement of improvements was based on an assessment of resources identified during preliminary site reviews to maximize the use of existing disturbed areas and accommodate the requisite program for each trail head or turn lane.

Turn Lane Improvements

Turn lanes will be provided to improve traffic flow and access to Turner River Road, Burns Road and Skillet Strand, Monroe Station and the Oasis Visitor Center. Turns lane improvements include an eastbound left turn lane at the intersection of U.S. 41 and Turner River Road, Burns Road, and the Skillet Strand access point. An eastbound right turn lane and a westbound left turn lane are included at the Monroe Station South access point and at the Oasis Visitor Center.

Turn lanes will meet Florida Department of Transportation (FDOT) requirements for accommodating acceleration, deceleration and clearance distances at intersections and turn lanes along Tamiami Trail. Uniform grades will be established for the asphalt paved turn lanes providing through access to the trail heads, which will improve traffic flow patterns. The turn lanes will provide for lower speeds along the approach to the trail heads, terminating at the entrance to the trail heads. Changes in the approach road grading will improve access to trail heads and designated trails.

Schedule

Trail heads will be closed during construction; however, the construction of the trail heads and turn lanes will likely be phased. Because of the comprehensive nature of the selected alternative, implementing all aspects of construction for all trail heads and turn lanes in the selected alternative could take up to five years. Subject to the availability of funding, NPS anticipates construction of trail heads as follows: Skillet Strand North and Pace's Dike in 2016; Monroe Station South in 2017; and Sig Walker, Boundary Line, and Skillet Strand South in 2018. NPS anticipates turn lane construction will occur in 2019.

MITIGATION MEASURES

Mitigation measures to protect natural resources, cultural resources, and other values as described below will be implemented under the selected alternative. All protection measures will be clearly stated in the construction specifications/special construction requirements.

General Considerations

- The limits of construction will be identified with construction tape or similar material prior to any construction activity. All protection measures will be clearly stated in the construction specifications, and workers will be instructed to avoid conducting activities and disturbing areas beyond the construction limits;

- All tools, equipment, barricades, signs, surplus materials, demolition debris, and rubbish will be removed from the project work limits upon project completion;

- Contractors will be required to properly maintain construction equipment and generators (i.e., mufflers) to minimize noise from use of the equipment;

- All equipment on the project will be maintained in a clean and well-functioning state to avoid or minimize contamination from automotive fluids. All equipment will be checked daily;

- Material will be stored, used, and disposed of in a proper manner;

- Prior to beginning construction, an approved Management of Traffic Plan and construction schedule will address how material and equipment will be transported to the site. This plan will promote site safety and minimize the impacts of trucks and equipment on the public;

- Staging areas for equipment and materials will be away from residential properties, and residential property access roads will not be used for truck turnaround areas;

- During construction, visitors, in-holders, and nearby residents will be alerted to activities through additional signs along the road, and information will be provided on the Preserve website (www.nps.gov/bicy);

- Law enforcement will be present at trail heads or along U.S. 41 during construction activities;

- Material used for construction activities, particularly fill material, will be of an approved Florida Department of Transportation (FDOT) road grade fill;

- Traffic delays will be limited to no more than 15 minutes;

- A hazardous spill plan will be approved by the Preserve prior to construction. This plan will state what actions will be taken in the case of a spill; notification measures; and preventive measures to be implemented, such as the placement of refueling facilities, secondary containment, and storage and handling of hazardous materials;

- Best Management Practices (BMPs) for drainage and sediment control will be implemented to prevent or reduce nonpoint source pollution, and minimize soil loss and sedimentation in drainage areas. BMPs will include all or some of the following actions, depending on site-specific requirements, and Clean Water Act (CWA) Section 401 and 404 and National Pollutant Discharge Elimination System (NPDES) permit requirements:

    - Construction will ideally occur during the dry season to limit discharge to surface waters that may be affected by sediment transport;

    - Fence, silt fence, or similar material will be established prior to construction in order to define the construction zone and confine activity to the minimum area required for construction. Fencing or silt fence will be installed immediately prior to the start of construction, will be limited in extent to those areas that require protection, and will be removed when all disturbed soil has been stabilized with vegetation;

    - Waste and excess excavated materials will be stored outside of drainages to avoid sedimentation. Silt fences, temporary earthen berms, temporary water bars, sediment traps, check dams, or other equivalent measures will be installed around the perimeter of stockpiled fill material;

    - Regular site inspections will occur during construction to ensure that erosion control measures are properly installed and are functioning effectively. The contractor will be required to ensure that the erosion control measures (such as silt fences) are repaired at all times and are emptied frequently;

    - Water sprinkling will be used, as needed, to reduce fugitive dust in work zones.

Wetlands, Water Quality, and Soils

- Erosion control BMPs for drainage and sediment control, as identified and used by NPS (and outlined above), will be implemented to prevent or reduce nonpoint source pollution and minimize soil loss and sedimentation in drainage areas;

- Accumulated sediments will be removed when the established silt fencing fabric is estimated to be approximately 75% full. Silt removal will be accomplished in a manner to avoid introduction into wetlands;

- The operation of ground-disturbing equipment will be temporarily suspended when there is a potential for erosion or turbid discharge from heavy rains;

- Fuel and oil services for construction machinery will be provided in a designated area away from surface waters. This will include secondary containment for all fuel storage tanks, and on-site availability of a specialized "spill kit" with capacity to contain a 95-gallon fuel spill;

Flood and Hurricane Measures

- The final design of the trail heads and turn lanes will incorporate sustainable design principles, appropriate siting, and BMPs during and after construction;

- Materials to be used at the trail heads will be durable and tolerant of occasional flooding;

- Materials proposed for vertical structures will be metal, concrete, or aggregate;

- Landscape plants will be native and inundation tolerant;

- Design for boat ramps will include protection from debris and scour;

- Signs informing visitors of flood risk and suggested actions in the event of flooding will be posted at trail heads as appropriate;

- Entrances and exits to trail heads will be kept clear of debris;

- Berms, walls, and other vertical construction will be avoided in order to maintain effective flood protection;

- Pedestrian structures (e.g., toilet vaults, pathways) will be located outside (or above) the Base Flood Elevations;

- A conveyance system will divert and/or carry flood flows away from the site;

- Signs, high water indicators, and other information will be placed at trail heads, providing information about flood potential and evacuation protocol;

- An evacuation plan for the early, prompt, and safe evacuation of people from the trail heads will include strategies that ensure proper storm monitoring, emergency communication methods, effective evacuation routes, and timely emergency evacuation notification for visitors. The evacuation plan will be developed in concert with the protocol and strategy of the appropriate county emergency management system and the National Weather Service.

Vegetation

- Although rare plants are not known to occur in the vicinity of trail heads and turn lanes, a plant survey will be completed prior to project construction to identify and locate populations of rare plants that may be present. If rare plants are found, they will be avoided or relocated if possible;

- Temporary barriers will be provided to protect existing vegetation. Trees or other plants will not be removed, injured, or destroyed without prior approvals;

- In an effort to avoid introduction of nonnative species, no hay or straw bales will be used during revegetation or for temporary erosion control;

- To prevent the introduction of and minimize the spread of nonnative vegetation and noxious weeds, the following measures will be implemented during construction:

    - Heavy construction equipment will be kept on hardened surfaces to the greatest extent possible. Construction vehicles and workers will utilize existing pullouts, side-roads, and other approved locations for parking and walking to minimize disturbance to vegetation;

    - All construction equipment will be pressure washed and/or steam cleaned before entering the Preserve to ensure that all equipment, machinery, rocks, gravel, and other materials are clean and weed-free;

    - All haul trucks bringing fill materials from outside the Preserve will be covered to prevent seed transport;

    - Vehicle and equipment parking will be limited to within construction limits or approved staging areas;

    - Staging areas outside the Preserve will be surveyed for noxious weeds and treated appropriately prior to use;

    - All fill, rock, and additional topsoil will be obtained from stockpiles from previous projects, if possible; and if not possible, then weed-free fill, rock, or additional topsoil will be obtained from sources outside the Preserve; and

    - Monitoring for exotic vegetation will occur after project activities are completed. If exotic plants are found, they will be treated according to the methods in the existing exotic plant management plan, including hand pulling of seedlings and herbicide control. Existing exotic plant monitoring stations will continue to be operated by Preserve staff.

Wildlife and Special Status Species

- Mitigation, reasonable and prudent measures, and standard protection measures described in the BO issued August 13, 2012, will minimize impacts to wildlife and wildlife habitat associated with construction (Attachment D);

- If erosion matting/netting is required, a biodegradable type with mesh that is small enough (1/2 foot or less) to not entangle snakes and other animals will be used;

- The construction contractor will be required to keep all garbage and food waste contained and removed daily from the work site to avoid attracting wildlife into the construction zone. Construction workers will be instructed to remove food scraps and not feed, harass, or approach wildlife;

- Wildlife collisions will be reported to Preserve personnel;

- Surveys for special status species will be conducted prior to disturbance of suitable habitat. If any of these species are found, the area will be avoided (if practicable) and mitigation measures will be implemented to minimize impacts. If affected animals need to be relocated, appropriate Preserve personnel will be contacted;

- Construction activities will include appropriate setbacks and/or buffers from nests and/or colonies;

- Mitigation to offset the loss of suitable habitat for protected wildlife in accordance with the FWS BO for this project, and Florida Fish and Wildlife Conservation Commission (FWC) protocol will be provided;

- All personnel, including contractors, involved in project activities will receive training on sensitive biological resources that may be encountered in the project area. Personnel will be reminded that harassment, handling, or removal of wildlife and/or other sensitive resources from the project area is prohibited by law. Personnel will be instructed that in the event a special status species is identified within an immediate work area, work will cease until Preserve personnel are notified. Further instructions will be provided by Preserve staff.

Cultural Resources

- Preserve staff will be available during construction to advise or take appropriate actions should any archeological resources be uncovered during construction. In the unlikely event that human remains are discovered during construction, all work will stop immediately and the proper authorities notified in accordance with Section 872.05, Florida Statutes and the Native American Graves Protection and Repatriation Act (PL 101-601; 25 USC 3001 et seq.);

- NPS will ensure that all contractors and subcontractors are informed of the penalties for illegally collecting artifacts or intentionally damaging archeological sites or historic properties. Contractors and subcontractors will also be instructed on procedures to follow in case previously unknown archeological resources are uncovered during construction;

- If currently unknown archeological resources are uncovered during construction, all work will stop until consultation with SHPO, the Tribal Historic Preservation Office (THPO), and Indian tribes that might attach religious or cultural significance to the property takes place in accordance with 36 CFR Part 800.13.

- NPS will consult with SHPO regarding turn lane design once better design information is complete in order to minimize any impacts the turn lanes will have on Tamiami Trail.

Visitor Experience and Preserve Operations

- Preserve employees, visitors, and local landowners will be informed in advance of construction activities via a number of outlets, including the Preserve website, press releases, and visitor centers;

- During construction, visitors and residents will be alerted to activities through additional signs along the road, and information will be provided on the Preserve website (www.nps.gov/bicy);

- Law enforcement personnel will also be present during construction activities to protect public health and safety and provide information on construction activities;

- Construction equipment with well-tuned, properly operating mufflers will be used to reduce noise and perform work during low visitation periods;

- Construction activities will be limited to 7 a.m.–6 p.m.

OTHER ALTERNATIVES CONSIDERED

The EA analyzed three alternatives in detail: the no action alternative and two action alternatives, including the NPS selected alternative. In addition, several alternatives were considered, but eliminated from further evaluation.

No Action Alternative A

Under the no action alternative, access points to existing primary trails within the preserve would not be improved, and the associated visitor amenities would not be provided. The no action alternative would have little to no impact on visitor capacity or use, require no additional maintenance, generate no new disturbance footprint, and entail no expenditure of funds or resources.

Alternative B

Alternative A does not include improvements to trail heads and does not include the construction of turn lanes. Alternative B is comprised of improvements to eight trail heads and the construction of five turn lanes on U.S. 41. The eight trail heads proposed for improvement include Turner River Road North, Windmill Tram, Skillet Strand North and South, Monroe Station South, Sig Walker, Pace's Dike and Boundary Line. Trail head improvements, with the exception of Skillet Strand South, will occur at existing access points and may include an aggregate parking surface for vehicle/trailer and/or auto parking, vault toilets, refuse containers, information boards, signs, gates, backcountry permit stations, and/or landscaping. Turn lanes would be provided to improve traffic flow and access to Turner River Road, Burns Road and Skillet Strand, Monroe Station and the Oasis Visitor Center.

ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

CEQ regulations for implementing NEPA require that Federal agencies explore and objectively evaluate all reasonable alternatives, and briefly discuss the rationale for eliminating any alternatives that were not considered in detail. During the public scoping, the NPS was requested to consider two additional alternatives.

Kirby Storter Wayside - The Florida Department of Environmental Protection (FDEP) suggested that NPS consider providing access to the south at the existing Kirby Storter Wayside rather than opening up a new access point at Skillet Strand South. This alternative was dismissed because Kirby Storter Wayside was created for pedestrian use only and was not designed to accommodate ORV use. There is no existing ORV trail at this wayside and this access point was not designated in the ORV Management Plan.

Joanie's Blue Crab Café - NPS also considered providing a turn lane at Joanie's Blue Crab Café/Trail Lakes Campground rather than at Burns Road. This alternative was considered but dismissed because no access points were designated in this vicinity of the Preserve by the ORV Management Plan.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

According to the U.S. Department of the Interior (DOI) regulations in 43 Code of Federal Regulations section 46.30 that implement the National Environmental Policy Act (NEPA), the environmentally preferable alternative "causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources." The identification of the environmentally preferable alternative was based on an analysis that balances factors such as physical impacts on various aspects of the environment, mitigation measures to reduce impacts, and other factors such as the statutory mission of the NPS and the purposes for the project.

While the no action alternative would preserve existing conditions, it would not be considered the preferable alternative because it would not provide visitor amenities and improve public safety in the same manner as the selected alternative. The no action alternative is not the environmentally preferable alternative for the following reasons:

- It would not meet the stewardship responsibility for protecting Preserve resources,
- It would not improve public health and safety,
- It would not improve visitor access and services within the Preserve.

NPS determined that Alternative C is the environmentally preferable alternative because it surpasses the no action alternative in realizing the full range of national environmental policy goals, as stated in §101 of NEPA. Alternative C was chosen over Alternative B due to the lesser degree of environmental impacts, particularly to wetlands. Alternative C will provide the widest range of beneficial uses without degradation and will fulfill the Preserve's stewardship responsibility to protect resources. Alternative C will improve public health and safety and sustainability of the Preserve.

WHY THE SELECTED ACTION WILL NOT HAVE A SIGNIFICANT EFFECT ON THE HUMAN ENVIRONMENT

As defined in 40 C.F.R. 1508.27, significance is determined by examining the following criteria:

Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect will be beneficial

No major adverse or beneficial impacts were identified that would require analysis in an environmental impact statement (EIS). No greater than minor to moderate adverse impacts will result to any Preserve resource from implementation of the selected alternative.

The selected alternative will result in direct and indirect short-term minor adverse impacts on adjacent wetlands from turbid discharges associated with construction and long-term minor to moderate adverse impacts on wetlands from fill associated with trail heads and turn lane construction.

Under the selected alternative, there will be direct and indirect, long-term minor adverse impacts and indirect short-term minor adverse impacts on water resources, including hydrology, due to construction.

The selected alternative will result in direct long-term minor adverse impacts on floodplains due to the placement of fill and the expansion of culverts and bridge spans necessary to construct trail heads and turn lanes.

Overall, the selected alternative will result in direct and indirect short-term minor to moderate adverse impacts to soils and topography from soil compaction and loss of soil function associated with construction of the trail heads and turn lanes.

Direct and indirect, long-term minor adverse impacts to wildlife will occur as a result of fill placement within existing wildlife habitat. The selected alternative will permanently alter the condition of habitat within the proposed disturbance footprint. Localized direct and indirect, short-term negligible adverse impacts to wildlife and habitat will occur due to the noise and visual disturbance during construction.

Impacts to special status species vary by species. The selected alternative will result in indirect short-term minor adverse and long-term beneficial impacts to Florida black bear (*Ursus americanus floridanus*) and Florida panther (*Puma concolor coryi*) and indirect long-term negligible impacts to the remaining special status species with the potential to occur within or near the study area (i.e. American alligator (*Alligator mississippiensis*), American crocodile (*Crocodylus acutus*), West Indian manatee (*Trichechus manatus*), limpkin (*Aramus guarauna),* little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), white ibis (*Eudocimus albus*), wood stork (*Mycteria americana*), Everglades mink (*Mustela vison*), Florida sandhill crane (*Grus canadensis pratensis*), Big Cypress fox squirrel (*Sciurus niger avicennia*), eastern indigo snake (*Drymarchon corais couperi*), osprey(*Pandion haliaetus*), and bald eagle (*Haliaeetus leucocephalus*)) due to the placement of fill over existing habitat and noise and visual disturbance expected during construction.

Overall, the construction of the trail heads and turn lanes will result in indirect short-term minor adverse impacts and indirect long-term negligible adverse impacts to cultural landscapes due to minor alterations along the Tamiami Trail and Loop Road corridors that do not substantially change the road corridors' character-defining features.

Overall, the selected alternative will result in a direct minor long-term adverse impact to historic structures due to the physical disconnection between the roadway and the structure at Monroe Station after the vehicular access point to the east is relocated.

Construction associated with the selected alternative will not substantially alter the existing soundscape of the Preserve. Construction activities may increase ambient noise levels, but this minor to moderate direct adverse impact will be short-term and localized to the project area. Direct long-term negligible adverse impacts will result from concentrated ORV loading and loading.

The selected alternative will result in direct and indirect, short-term negligible to minor adverse impacts to operations and maintenance, primarily associated with construction oversight of individual trail heads, and direct and indirect, long-term beneficial impacts associated with the reduction of safety concerns and user conflicts.

The selected alternative will result in direct short-term negligible adverse impacts to visitor access, health, safety and welfare due to construction. Long-term indirect beneficial impacts will also occur due to the provision of trail heads with formalized parking and vault toilets.

There will be direct short-term minor adverse impacts on nonfederal property as a result of the selected alternative. There will also be direct long-term beneficial impacts as a result of the provision of formal parking at trail heads.

The degree to which the proposed action affects public health and safety

The selected alternative was designed to address concerns about public safety adjacent to existing roadways, and/or to enhance multiple recreational uses of access points and designated trails. The trail heads will provide improved facilities and services at access points and the turn lanes would provide safer access from U.S. 41. Trail heads will be sized to meet the requirements of ORV and non ORV use and will meet all current design standards including the treatment of storm water runoff. The siting and configuration of trail heads will accommodate existing ORV users and future recreational users and visitors. The selected action will improve visitor facilities at existing access points and provide better accessibility. Visitor safety and operation efficiencies will be incorporated in accordance with the FDOT Roadway and Traffic Design Standards. Public health and safety will be maintained or improved not just by the facilities, but also by improving access, saving energy and improving water quality and stable hydrology. Pedestrian pathways separated from travel lanes by buffer areas or bollards will provide pedestrian connections to picnic areas, restrooms and passenger parking. This will accommodate access to wildlife viewing or picnic area and visitor orientation/interpretation information. With regular maintenance, the new trail heads will provide improved visitor amenities, parking, and reliable access to designated trails.

The potential for impacts to sensitive areas within the Preserve will be substantially reduced by features of this alternative that include storm water management facilities and wetland mitigation that will improve water quality and maintain hydrology. Visitor conflicts will be less likely to occur and will increase safety in the vicinity of the trail heads.

Currently the provision of parking spaces at designated ORV access points is sporadic and in many cases is nonexistent at trail heads. Much of the existing access to the Preserve, especially to designated ORV access points, requires visitors to park vehicles and ORV transport trailers alongside roadways due the lack of parking at access points. In certain circumstances, this requires visitors to cross a major highway in order to enter the Preserve at a trail head, creating safety hazards for visitors. In order to reach the designated ORV access points and trail heads in some areas, an ORV user must leave a developed parking site and drive along the road shoulder in order to reach the access point, leading to potential safety conflicts with roadway traffic. The proposed action will provide trail heads and improved facilities in designated areas. It will cluster parking in specific areas and will reduce vehicle parking and ORV trailers unloading alongside roads, therefore lessening safety hazards. Trail heads will be located away from the roadway. Traffic circulation within the trail head will be designed to ensure that ORV traffic could easily access the primary trail and avoid numerous access points. The addition of turn lanes on U.S. 41 will facilitate the movement of vehicular traffic through the Preserve and could decrease the potential for through traffic delays during times of high use. In addition, it could reduce rear-end collisions due to stopped vehicles within the travel lanes from both Preserve visitors and on-Preserve/commuting/through vehicles.

Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas

The proposed project is not expected to impact archeological resources. A survey of the project area between June 2011 and February 2012 did not locate any significant archeological sites. The Florida SHPO concurred with the results of this survey on July 3, 2012 and it is unlikely that previously undetected sites will be discovered because construction activities will be confined to previously disturbed areas. The Loop Road and Tamiami Trail and their associated canals, are potentially eligible for listing and Monroe Station is listed in the National Register of Historic Places. These resources are located within or near the development footprint. NPS consulted with the Florida SHPO on the design of the trail heads and sought ways to avoid, minimize, or mitigate impacts to cultural landscapes and to Monroe Station, resulting in a conditional No Adverse Effect finding. As the design of the turn lanes advances and/or changes are made to the design and layout of the trailheads, NPS will provide plans to the SHPO for review and comment in accordance with the conditional finding and Section 106 of the NHPA.

Executive Order 11988 (Floodplain Management) requires an examination of impacts to floodplains, and the NPS Director's Order #77-2: Floodplain Management and Procedural Manual #77-2 provide guidelines for proposed actions within wetlands. A Statement of Findings for Executive Order 11988 (Floodplain Management) has been written for the selected alternative and is included as Attachment B. None of the proposed improvements are located in areas of floodways or the channels of rivers or streams; consequently, they will not impede the movement of floodwaters across the landscape. Stormwater engineering for each trail head and turn lane to determine the volume of compensatory storage needed to offset the

volume of storage capacity lost as a result of development will be conducted as part of the final design. Additionally, existing conveyances will be maintained post-development, and the unimpacted portions of all wetlands will be maintained in their current condition or improved as a result of streamlined ORV usage.

Impacts to water resources, including hydrology that occurs as a result of the selected alternative will be minimized by BMPs during construction to control erosion and sediment release. Identifying and staking the limits of clearing and earthwork, installing silt fences, establishing a controlled area for construction material and equipment, and implementing a sediment and erosion control plan will minimize the potential for short-term adverse impacts on water quality in adjacent wetlands and other surface waters and localized hydrologic impacts. With use of erosion control measures, it is anticipated that impacts are associated with construction and not anticipated to persist long term.

Executive Order 11990 (Protection of Wetlands) requires an examination of impacts to wetlands, and the 2006 NPS Management Policies and Director's Order #77-1 provide guidelines for proposed actions within wetlands. A Statement of Findings for Executive Order 11990 ("Wetland Protection") was written for the selected alternative and was included as Attachment C. During construction activities associated with this alternative, wetlands will be impacted or filled. Wetland soils and vegetation will be disturbed or removed where trail heads and turn lanes are constructed. The filling of wetlands will be minimized to the extent possible during construction, and wetlands that are filled will be mitigated elsewhere within the Preserve. The use of BMPs during construction will reduce the transport of sediment to adjacent wetlands during construction.

Prime and unique farmlands, wild and scenic rivers, wilderness areas, Essential Fish Habitat (EFH) or Habitat Areas of Particular Concern (HAPC) will not be affected because none are located within the project area.

Degree to Which Effects on the Quality of the Human Environment are Likely to Be Highly Controversial

During public review and agency consultation there was no indication that the environmental effects of the selected alternative were considered to be potentially controversial. Public scoping and comments on the proposal did not indicate any contentious issues and the EA did not identify significant impacts associated with the selected alternative.

Department of the Interior regulations implementing NEPA provide that the term "controversial" refers to "circumstances where a substantial dispute exists as to the environmental consequences of the proposed action and does not refer to the existence of opposition to a proposed action, the effect of which is relatively undisputed (46 CFR § 46.30).

There is no substantial dispute as to what the effects of the selected alternative are likely to be assuming adequate funding is secured to implement the alternative. Therefore, the effects from the selected alternative are not likely to be highly controversial.

Degree to Which the Possible Effects on the Quality of the Human Environment Are Highly Uncertain or Involve Unique or Unknown Risks

No highly uncertain effects or unique or unknown risks are anticipated to occur with implementation of the selected alternative. None were identified during either preparation of the EA or the public comment period.

Degree to Which the Action May Establish a Precedent for Future Actions with Significant Effects or Represents a Decision in Principle about a Future Consideration

The selected alternative will not set any NPS precedent for future actions with significant effects nor does it represent a decision in principle about a future consideration.

Whether the Action is Related to Other Actions with Individually Insignificant but Cumulatively Significant Impacts

As demonstrated in the environmental assessment this action will not result in any significant cumulative effects. Impacts on wetlands, water resources including hydrology, floodplains, soils and topography, wildlife, special status species, cultural landscapes, historic structures, natural soundscapes, operations and maintenance, visitor use and experience and recreational resources, and transportation/ access/ visitor health, safety and welfare were analyzed for the selected alternative of the EA.

As described in the EA, cumulative impacts were determined by combining the impacts of the selected alternative with other past, present, and reasonably foreseeable actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable projects at the Preserve and, if applicable, the surrounding area. In general, cumulative impacts will be beneficial or minor adverse with the exception of impacts to soundscapes and transportation/access, including visitor health, safety, and welfare which will be minor to moderate and moderate, respectively.

Degree to Which the Action May Adversely Affect Districts, Sites, Highways, Structures, or Objects Listed On National Register of Historic Places or May Cause Loss or Destruction of Significant Scientific, Cultural, or Historical Resources

Several historic roadways and structures have been identified within or near the project. Loop Road, Tamiami Trail, and the Tamiami Canal have been determined potentially eligible for listing in the National Register by the Florida SHPO, but have not been documented formally as cultural landscapes. They may be designated as such in future, and were analyzed in Section 3.2.7 of the EA. Monroe Station, a structure located adjacent to the Monroe Station South trail head and the western terminus of Loop Road, was determined to be locally significant under national register Criterion A for its association with the early history of Tamiami Trail and Collier County, and was listed in the NRHP in 2000. This structure is detailed in Section 3.2.8 of the EA. The NPS sent a conditional No Adverse Effect finding to the SHPO on June 4, 2012 and received concurrence for the finding on July 3, 2012. NPS will seek ways to avoid, minimize, or mitigate impacts to cultural landscapes, the Loop Road,

Tamiami Trail and their associated canals and Monroe Station as the design of the turn lanes advances and will provide plans to the SHPO for review and comment in accordance with the conditional finding and Section 106 of the NHPA.

Degree to Which the Action May Adversely Affect an Endangered or Threatened Species or Its Critical Habitat

As indicated in the BO (Attachment D), the FWS indicated that for the American crocodile and West Indian manatee, the ESA determination of effect would be "no effect." For the wood stork and eastern indigo snake the ESA determination of effect would be "may affect, not likely to adversely affect", and "may affect, likely to adversely affect" but not likely to jeopardize the continued existence of the Florida panther. The selected alternative may affect the wood stork, eastern indigo snake, and the Florida panther population, but these impacts would be reduced through design criteria, BMPs, and mitigation. Implementation of the selected alternative will have no effect on other federally listed threatened, endangered, or candidate species or their Critical Habitat for federally listed species with the potential to be found within or near the study area.

Whether the Action Threatens a Violation of Federal, State or Local Environmental Protection Law

This action violates no federal, state, or local environmental protection laws.

PUBLIC INVOLVEMENT AND AGENCY CONSULTATION

A summary of public concerns and the NPS responses are contained in Attachment E to this FONSI, and where necessary, errata to the EA are included in Attachment F.

PUBLIC INVOLVEMENT

A public scoping meeting was held on March 9, 2011, from 5 p.m. until 7 p.m. at the Big Cypress Swamp Welcome Center auditorium at the Preserve in Ochopee, Florida. Overall, the comments received were generally favorable to the project. The themes associated with statements of concern were related to Preserve operations, the prioritization of improvements, and facilities provided at each trail head location. Specifically, concerns related to Preserve operations included the resolution of user conflicts when parking lots are full, the ability to park on the side of the road despite the presence of trail heads, and the creation of additional user conflicts by mixing ORV users with other user groups. Several people expressed that the improvement of the trail heads along Turner River Road may detract from the traditional experience offered to visitors. Alternative C was developed and analyzed in response to this comment.

The EA was made available for public review and comments during a 30-day period from June 4 to July 5, 2012. The NPS solicited comments from the public, non-profit organizations, recreation user groups, and from tribes, Federal, State and local agencies having jurisdiction or an interest in the project. On June 4, 2012 a press release was issued announcing the public comment period for the Big Cypress Preserve ORV Trail Heads and Turn Lanes Environmental Assessment. Broad electronic messaging through e-mail and through the project website was

conducted to alert the public and agencies about the availability of the document and the 30-day comment period. The document was posted on the Preserve website and was accessible to anyone wishing to view it online. Copies of the document were also available upon request.

A public meeting was held on June 20, 2012, at the Big Cypress Swamp Welcome Center in Ochopee, Florida. Approximately 22 people attended. The public was offered the following opportunities through which they could submit comments:

- Comment forms were available at the public meeting on which people could submit written comments and either provide them to the staff or mail them to the NPS;
- Staff persons and consultants were available for the public to talk with one-on-one; and
- The public could submit comments by mail, e-mail, or online at http://parkplanning.nps.gov/bicy

Comments were received from seven people via Planning, Environment and Public Comment (PEPC), four people via email, and one person via US Postal Service during the public review of the EA. In addition, comments were recorded at a public meeting held June 20, 2012. Responses were received from the SHPO, FWS and the Florida State Clearinghouse (FSC).

One substantive comment on the environmental assessment was received from the public and it included the need to clarify access restrictions as indicated on Page 175 of the EA, and included on the errata sheet in Attachment F. No comments were made on natural resources. Responses to all comments received can be found in Attachment E. This FONSI and the errata sheets (Attachment F) will be sent to all commenters and posted on the NPS PEPC website.

AGENCY CONSULTATION

The Miccosukee Tribe of Indians of Florida, the Seminole Tribe of Florida, and the Seminole Nation of Oklahoma were sent scoping letters on February 16, 2011, describing the proposed project and requesting comments; and provided notice that the EA was made available for their review during the 30-day review period. To date there have been no comments, issues or concerns provided by the Tribes in response to the scoping letter or the letter announcing the availability of the EA.

On March 10, 2011, FDOT provided a letter stating that they had no comments or concerns pertaining to environmental compliance, but that they would review the EA when prepared. The letter indicated that if subsequent issues or concerns were identified, appropriate consultations would be undertaken. In response to the review of the EA, FDOT, District One and District Six, indicated that these agencies had no comments on the project. FDOT consultation and coordination will continue throughout the design and construction phases of this project.

On March 10, 2011, SHPO provided a letter with concerns that archeological resources and the Tamiami Trail/U.S. 41 corridor and adjacent Tamiami Canal may be adversely affected by construction of trail heads and turn lanes in undisturbed areas. SHPO indicated that they would review the EA and coordinate with NPS regarding cultural resources that may be impacted by the selected alternative. On July 3, 2012, NPS received concurrence from SHPO on the conditional finding of No Adverse Effect for this project. SHPO consultation and

coordination will continue throughout the design and construction phases of this project.

On April 11, 2011, FWS indicated that the proposed project was located within the Core Foraging Area (CFA) of several breeding colonies of the endangered wood stork. The FWS indicated that to minimize adverse effects to the word stork, NPS would need to replace the wetlands lost due to the proposed action within the same CFA. In addition, it was noted that the proposed project was located in the Focus Area for the endangered Florida panther. The FWS functional panther habitat assessment would need to be used to determine the habitat value of the lands impacted and the lands provided as compensation in Panther Habitat Units. They also recommended coordination with FDOT regarding the turn lane proposed at Turner River Road to ensure that it is compatible with the roadside animal detection system (RADS) project.

On July 3, 2012, NPS received correspondence from the FWS that indicated the project would result in a "may affect, not likely to adversely affect" determination for the wood stork and eastern indigo snake and “may affect, likely to adversely affect” the Florida panther. On July 20, 2012, the NPS received correspondence from the FWS that stated NPS must acquire panther and wetland credits to mitigate for listed species impacts prior to project implementation. The NPS will compensate for loss of wood stork forage bio-mass by acquiring credits and anticipates providing on-site wetland mitigation. To minimize potential adverse effects to the eastern indigo snake, the NPS will follow the FWS’s 2004 *Standard Protection Measures for the Eastern Indigo Snake* during construction.

The NPS received a BO on August 13, 2012 indicating that the project would result in a “may affect, not likely to adversely affect” determination for the wood stork and eastern indigo snake and a “may affect, likely to adversely affect” for the Florida panther. The FWS’s BO indicated the project is not likely to jeopardize the continued existence of the Florida panther. Critical habitat has not been designated for the Florida panther and will not be affected. The NPS will adhere to the terms and conditions necessary to implement the reasonable and prudent measures to reduce potential direct and indirect effects to the Florida panther. The FWS did not propose any conservation recommendations in the BO. FWS consultation and coordination will continue throughout the design and construction phases of this project.

On April 7, 2011, the Florida Department of Environmental Protection (FDEP), FSC, which administers the intergovernmental coordination and review process for federal projects for Coastal Zone consistency, provided a scoping response indicating that the proposed activities were consistent with the Florida Coastal Management Program (FCMP). In accordance with Section 373.428, Florida Statutes and on July 24, 2012, The Department of Environmental Protection, Florida State Clearinghouse, provided a response to the EA that indicated that the proposed activities were consistent with the FCMP but stipulated that concerns identified by the SFWMD must be addressed prior to project implementation to maintain concurrency. The response received from SFWMD indicated that "The existing ERP (#11-02135-P) will need to be modified to include the Off Road Vehicle (ORV) Trail Rehabilitation at the Big Cypress National Preserve." During the ERP application review process, NPS must demonstrate avoidance and minimization of wetland impacts, refine Uniform Mitigation Assessment Method (UMAM) scoring, and refine the mitigation plan. Additionally, a construction management plan may be required for the Big Cypress Fox Squirrel and other listed species. The NPS will address SFWMD concerns prior to commencement of construction. Department of Environmental Protection and SFWMD consultation and coordination will continue throughout the design and construction phases of this project.

On July 24, 2012, the FDEP, Florida State Clearinghouse, provided NPS with a compilation of agency responses for this project. The response sent on July 19, 2012 by the FWC indicated that FWC had no comments on the project. FWC consultation and coordination will continue throughout the design and construction phases of this project.

The response received by the FDEP, FSC from the Florida Forest Service indicated that this agency had no comments on the project. Florida Forest Service consultation and coordination will continue throughout the design and construction phases of this project.

ATTACHMENT A DESIGNATED ORV TRAIL HEAD AND TURN LAND ENVIRONMENTAL ASSESSMENT BIG CYPRESS NATIONAL PRESERVE NON-IMPAIRMENT DETERMINATION

DETERMINATION OF NON-IMPAIRMENT

In addition to determining the environmental consequences of implementing the selected and other alternatives, NPS Management Policies 2006 (section 1.4) requires analysis of potential effects to determine whether or not proposed actions would impair a park's resources and values.

The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the NPS the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of the park. That discretion is limited by the statutory requirement that the NPS must leave resources and values unimpaired unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.

An impact on any park resource or value may or may not constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or Identified in the park's general management plan or other relevant NPS planning documents as being of significance. An impact would be less likely to constitute impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated.

Impairment may result from visitor activities, NPS administrative activities, or activities undertaken by concessioners, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park.

An impairment determination is not made for visitor experience, recreation resources, and transportation, as these impact areas are not generally considered to be park resources or values according to the Organic Act and cannot be impaired in the same way that an action can impair park resources and values.

The Prohibition on Impairment of Preserve Resources and Values

The National Park Service's (NPS) *NPS Management Policies 2006*, Section 1.4.4, explains the prohibition on impairment of park resources and values:

> While Congress has given the Service the management discretion to allow impacts within parks, that discretion is limited by the statutory requirement (generally enforceable by the federal courts) that the Park Service must leave park resources and values unimpaired unless a particular law directly and specifically provides otherwise. This, the cornerstone of the Organic Act, establishes the primary responsibility of the NPS. It ensures that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them.

What is Impairment?

NPS Management Policies 2006, Sections 1.4.5 and 1.4.6, provide an explanation of impairment. Impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact on any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents as being of significance.

An impact would be less likely to constitute impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated.

- Park resources and values that may be impaired include: the park's scenery, natural and historic objects, and wildlife, and the processes and condition that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals;

- Appropriate opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing them;
- The park's role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and,
- Any additional attributes encompassed by the specific values and purposes for which the park was established.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park, but this would not be a violation of the Organic Act unless the NPS was in some way responsible for the action.

How is an Impairment Determination Made?

Section 1.4.7 of *NPS Management Policies 2006* states, "[i]n making a determination of whether there would be an impairment, an NPS decision-maker must use his or her professional judgment. This means that the decision-maker must consider any environmental assessments or environmental impact statements required by the National Environmental Policy Act of 1969 (NEPA); consultations required under Section 106 of the National Historic Preservation Act (NHPA); relevant scientific and scholarly studies; advice or insights offered by subject matter experts and others who have relevant knowledge or experience; and the results of civic engagement and public involvement activities relating to the decision." *NPS Management Policies 2006* further define "professional judgment" as "a decision or opinion that is shaped by study and analysis and full consideration of all the relevant facts, and that takes into account the decision-maker's education, training, and experience; advice or insights offered by subject matter experts and others who have relevant knowledge and experience; good science and scholarship; and, whenever appropriate, the results of civic engagement and public involvement activities relating to the decision.

Impairment Determination for the Selected Alternative

This determination on impairment has been prepared for the selected alternative described in Section 2.4 of the *Environmental Assessment - Designated ORV Trail Heads and Turn Lanes, Big Cypress National Preserve, Florida* (EA). An impairment determination is made for all resource impact topics analyzed for the selected alternative. An impairment determination is not made for visitor use and experience, public safety, socioeconomic resources and adjacent lands, and operations and infrastructure, because impairment findings relate back to park resources and values, and these impact areas are not generally considered to be park resources or values according to the Organic Act and cannot be impaired in the same way that an action can impair park resources and values.

The NPS has determined that the implementation of the selected alternative would not constitute impairment to the resources or values of the Preserve. This conclusion is based on consideration of the thorough analysis of the environmental impacts described in the EA, relevant scientific studies, the comments provided by the public and others, and the professional judgment of the decision-maker guided by the direction in *NPS Management Policies 2006*. As described in the EA, implementation of the NPS selected alternative would not result in impairment of Preserve resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the Preserve's establishing legislation, (2) key to the natural or cultural integrity of the Preserve or to opportunities for enjoyment of the Preserve, or (3) identified in the Preserve's management plan or other relevant NPS planning documents as being of significance.

Based on the aforementioned guidelines and basis for determining impairment of Preserve resources and values, a determination of impairment is made for each of the resource impact topics carried forward and analyzed in the EA for the selected alternative.

WETLANDS

Overall, the selected alternative would result in direct and indirect, short-term minor adverse and long-term minor to moderate adverse impacts due to the placement of fill in approximately 14.0 acres of wetlands. The selected alternative also would result in short-term minor adverse impacts on wetlands as a result of sediments washing from areas of exposed fill into adjacent wetlands, but these impacts could be reduced or eliminated with application of appropriate BMPs listed under Mitigation Measures in Section 2.4 of the EA. Direct wetland impacts would be offset through proposed restoration activities, and ultimately there would be no net loss of wetland acreage or function. The selected alternative would not result in impairment of wetlands because construction impacts would be temporary and mitigated, increased compacted impervious surfaces would be minimal, and site improvements would reduce erosion along trail heads, existing trails, and turn lanes.

WATER RESOURCES, INCLUDING HYDROLOGY

The selected alternative would result in direct and indirect, long-term minor adverse impacts and indirect short-term minor adverse impacts on water quality and hydrology due to construction. Compacted aggregate would be used for the parking surface, and it would allow some percolation of rain that falls on the parking surface. Stormwater management areas, totaling approximately 15% of the surface area of the trail heads, would be constructed to treat the runoff from parking surfaces through retention and/or vegetated swales. BMPs identified in the Mitigation Measures in Section 2.4 of the EA to control erosion and sediment release would be utilized during all construction activities to minimize the potential for short-term negligible to minor adverse impacts associated with construction. With use of erosion control measures, it is not anticipated that surface or ground water resources would be adversely affected long term. The proposed action would not impair water resources within the Preserve because it would not compromise surface and ground water resources outside of the construction period.

FLOODPLAINS

The selected alternative would result in direct long-term minor adverse impacts on floodplains due to the placement of fill and the expansion of culverts and bridge spans necessary to construct trail heads and turn lanes. Trail head and turn lane footprints are wholly located within the 100-year floodplain, and stormwater engineering would be conducted for each trail head and turn lane to determine the volume of compensatory storage needed to offset the volume of storage capacity lost as a result of development. Additionally, pervious surfaces are proposed for seven of the eight trail heads, and soil compaction would be minimized where ORV usage is removed. The selected alternative would not result in impairment of floodplains because minimal construction of structures within the floodplain would not noticeably alter overall floodplain functions or introduce additional human risk.

SOILS AND TOPOGRAPHY

Overall, the selected alternative would result in direct and indirect short-term minor to moderate adverse impacts from soil compaction and loss of soil function associated with construction of the trail heads and turn lanes. These impacts would be readily apparent and mitigation measures (likely to be successful) would be required to offset adverse impacts. The selected alternative would not result in impairment of soils because construction impacts would be temporary and mitigated, increased compacted surfaces would be limited, and site improvements would reduce erosion along primary trail heads and trails.

WILDLIFE

Overall, the selected alternative would permanently alter the condition of habitat within the proposed disturbance footprint, and direct and indirect, long-term minor adverse impacts would occur as a result of fill placement within existing wildlife habitat. Localized direct and indirect, short-term negligible adverse impacts to wildlife and habitat would occur due to the noise and visual disturbance during construction. However, these impacts are confined to the construction period and would be minimized to the greatest extent possible through the use of BMPs such as minimizing the proposed footprint of construction activities to the maximum extent possible. The proposed action would not compromise wildlife resources outside of the construction period and wildlife would likely return to the vicinity after construction is complete; therefore it would not impair overall wildlife resources within the Preserve.

SPECIAL STATUS SPECIES

The selected alternative would result in an ESA determination of “may affect, not likely to adversely affect” the wood stork, eastern indigo snake, and a “may affect, likely to adversely affect” but not likely to jeopardize the continued existence of the Florida panther due to the placement of fill over existing habitat and from noise and visual disturbance expected during construction. There would be “no effect” to the remaining federally listed special status species with the potential to occur within or near the study area (i.e. American crocodile and West Indian manatee). Impacts that are confined to the construction period would be

minimized to the greatest extent possible through the use of BMPs such as minimizing the proposed footprint of construction activities to the maximum extent possible. The selected alternative would not impair overall special status species resources within the Preserve because it includes provisions for mitigation and habitat restoration and disturbances related to noise and visual impacts are restricted to the construction period when BMPs are employed.

CULTURAL LANDSCAPES

Overall, the construction of the trail heads and turn lanes would result in indirect short-term minor adverse impacts and indirect long-term negligible adverse impacts to cultural landscapes due to minor alterations along the Tamiami Trail and Loop Road corridors that do not substantially change the road corridors' character-defining features. Short-term adverse impacts would be resolved over time as planted screening vegetation matures and block views of trail head areas from the road. The proposed actions could also result in long-term beneficial impacts due to the elimination of physical impacts from unplanned parking along the edges of Loop Road and Tamiami Trail, improvements to drainage and access at trail heads, and the reintroduction of native plantings in areas that currently contain disturbed vegetation. The proposed action would not compromise the resource's integrity, and it would not impair cultural landscapes within the Preserve.

HISTORIC STRUCTURES

Overall, the selected alternative would result in a direct minor long-term adverse impact due to the physical disconnection between the roadway and the structure at Monroe Station after the vehicular access point to the east is relocated. However, the plantings on the north side of the building would remain low, preserving the views of the historic building and the fundamental visual connection between the roadway and Monroe Station. The proposed action would not adversely affect the structure at Monroe Station, and it would not impair historic structures within the Preserve.

NATURAL SOUNDSCAPES

The construction associated with the selected alternative would not substantially alter the existing soundscape of the Preserve. Construction activities may increase ambient noise levels, but this minor to moderate, direct adverse impact would be short-term and localized to the project area. Direct long-term negligible adverse impacts would result from concentrated ORV loading and loading. The selected alternative would not result in impairment of soundscapes because the adverse impacts to soundscapes would be localized and temporary and would be mitigated by standard noise abatement measures and phasing of the construction.

ATTACHMENT B DESIGNATED ORV TRAIL HEAD AND TURN LAND ENVIRONMENTAL ASSESSMENT BIG CYPRESS NATIONAL PRESERVE STATEMENT OF FINDINGS FOR FLOODPLAINS

DRAFT

STATEMENT OF FINDINGS

FOR

EXECUTIVE ORDER 11988 ("FLOODPLAIN MANAGEMENT")

Big Cypress National Preserve

Florida

Recommended: 7/31/12

Superintendent, Big Cypress National Preserve Date

Concurred: 08-03-12

Chief, Water Resources Division Date

Concurred: 8-16-12

Southeast Regional Safety Officer Date

Approved: 8-16-12

Director, Southeast Region Date

APPENDIX B: STATEMENT OF FINDINGS FOR FLOODPLAINS EXECUTIVE ORDER 11988

INTRODUCTION

Executive Order (EO) 11988, "Floodplain Management," requires the National Park Service (NPS) and other agencies to evaluate the likely impacts of actions in floodplains. Each agency is implored to take action to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains. NPS Director's Order (DO) 77-2: *Floodplain Management* (NPS 2003) and Procedural Manual #77-2 (NPS 2004) provide NPS policies and procedures for complying with EO 11988. Per DO-77-2 and Procedural Manual #77-2, a Floodplain Statement of Findings (SOF) was prepared to comply with EO 11988.

NPS proposes trail head improvements and turn lanes within the Big Cypress National Preserve (Preserve). The Preserve is currently used for a range of recreational activities, including hunting, fishing, hiking, biking, canoeing, and riding off-road vehicles (ORVs). All of the proposed trail heads occur at existing designated access points identified in the *Final Recreational Off-Road Vehicle Management Plan/Supplemental Environmental Impact Statement* (ORV Management Plan) (NPS 2000). This plan adopted and implements a program that provides reasonable recreational access and recreational use while focusing on the resource protection mandates of the NPS. The ORV Management Plan was designed for phased implementation over a 10-year period. Phase one occurred from 1998 to 2002 and consisted of designating multiple-use trails and natural restoration of undesignated/dispersed use trails.

PROPOSED ACTION

The proposed action is described in detail in the *Designated ORV Trail Heads and Turn Lanes Environmental Assessment*. The 15 access points established in the ORV Management Plan were located in areas of previous disturbance, within and adjacent to existing roadways, and/or to enhance multiple uses of access points and trails. The proposed action includes improvements at six of the 15 access points. The trail heads would provide improved facilities and services at access points, and the turn lanes would provide safer access from U.S. 41.

The six proposed trail heads include: Skillet Strand North, Skillet Strand South, Sig Walker, Pace's Dike, Boundary Line, and Monroe Station South. The five proposed turn lanes include: Burns Road, Oasis, Skillet Strand, Monroe Station, and Turner River Road. Construction of parking areas and ancillary facilities, such as single vault toilets, refuse containers, signs, and kiosks, would occur in the 100-year floodplain at each site.

The five turn lanes would be constructed along U.S. 41 within Florida Department of Transportation (FDOT) right-of-way at Turner River Road, Burns Road, Skillet Strand North and South trail heads, Monroe Station, and at the entrance to the Oasis visitor center. Turn lanes would be designed to meet FDOT standards and guidelines for traffic control, striping, and alignments. These improvements would also occur within the 100-year floodplain at each site.

FLOODPLAINS IN THE PROJECT AREA

The Preserve is characterized by a vast extent of shallowly flooding wetlands and relatively flat topographic relief. Because most of the Preserve is comprised of expansive wetlands, there is a tremendous capacity to store flood waters and pass these waters across a broad hydraulic gradient at very slow rates of speed. The Preserve is also affected by coastal storms, including hurricanes; and the effects of storm surge and wave height extend to trail heads, including Windmill Tram, Skillet Strand North and South, Sig Walker, and Pace's Dike.

Figure 1 depicts the extent of floodplains in the Preserve. The figure illustrates a combination of 1996 data for Monroe and Miami-Dade counties and 2009 data for Collier County. Primary mapping zones within the Preserve include A and AE zones. Turner River Road North, Monroe Station South, Oasis, and Boundary Line trail heads/turn lanes are within the A flood zone. The A flood zone is comprised of areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. No base flood elevations have been determined for Zone A. The base flood elevation is the computed elevation to which floodwater is anticipated to rise during the base flood.

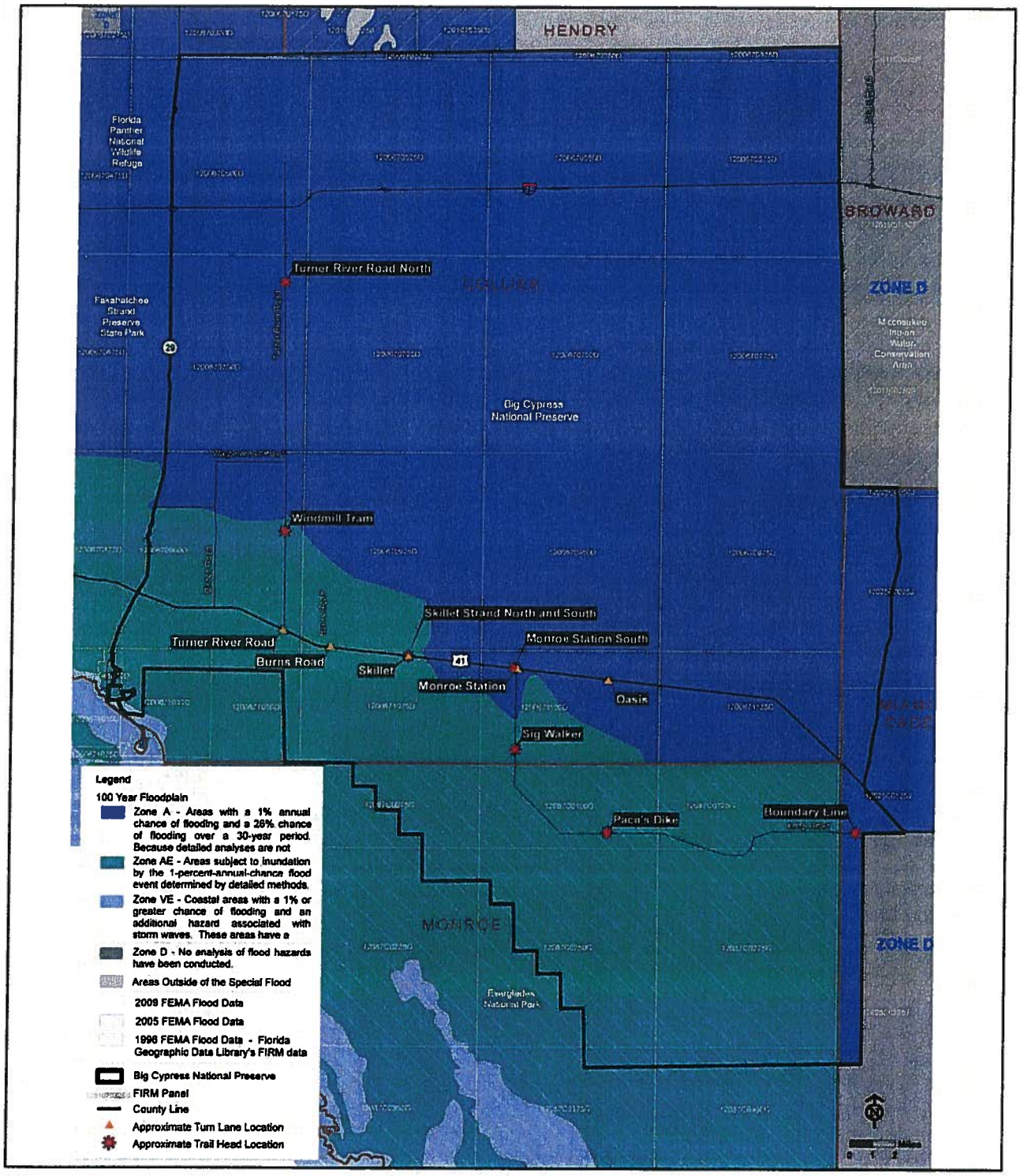
The remainder of the trail heads and turn lanes are within the AE flood zone. The AE flood zone is comprised of areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base flood elevations have been determined. All of the 100-year floodplain represents the Regulatory Floodplain for the Preserve.

Figure 2 depicts base flood elevations for AE and VE flood zones. Base flood elevations range from 5 to 6 feet in the vicinity of the trail heads at Skillet Strand North and South, Sig Walker, and Pace's Dike; and the turn lanes at Turner River Road, Burns Road, and at Skillet Strand. None of the trail heads or turn lanes are located near coastal high hazard areas associated with VE mapping zones.

JUSTIFICATION FOR THE USE OF FLOODPLAINS

Certain actions are defined as "excepted," as referenced in DO-77-2: *Floodplain Management*, and NPS Procedural Manual #77-2. These include "picnic facilities, scenic overlooks, foot trails, and small associated daytime parking facilities in non-high hazard areas provided that the impacts of these facilities on floodplain values are minimized." Schematic design plans have been developed; final plans may demonstrate that the activities proposed at one or more trail heads could qualify as excepted actions.

Two of the proposed trail heads would appear to qualify as excepted actions. Pursuant to Procedural Manual #77-2, functions that are often located near water for the enjoyment of visitors, require little physical development, and do not involve overnight occupation would qualify as excepted actions. Since Sig Walker and Boundary Line trail heads are being designed solely for airboat launching, and the associated facilities and parking would mostly serve recreationalists using airboats, they would appear to be excepted actions. Those facilities that would not be tied to small parking lots or launches near water were determined to be Class I



0 2 4 8 Miles

FIGURE 1
The Extent of Floodplains in the Preserve

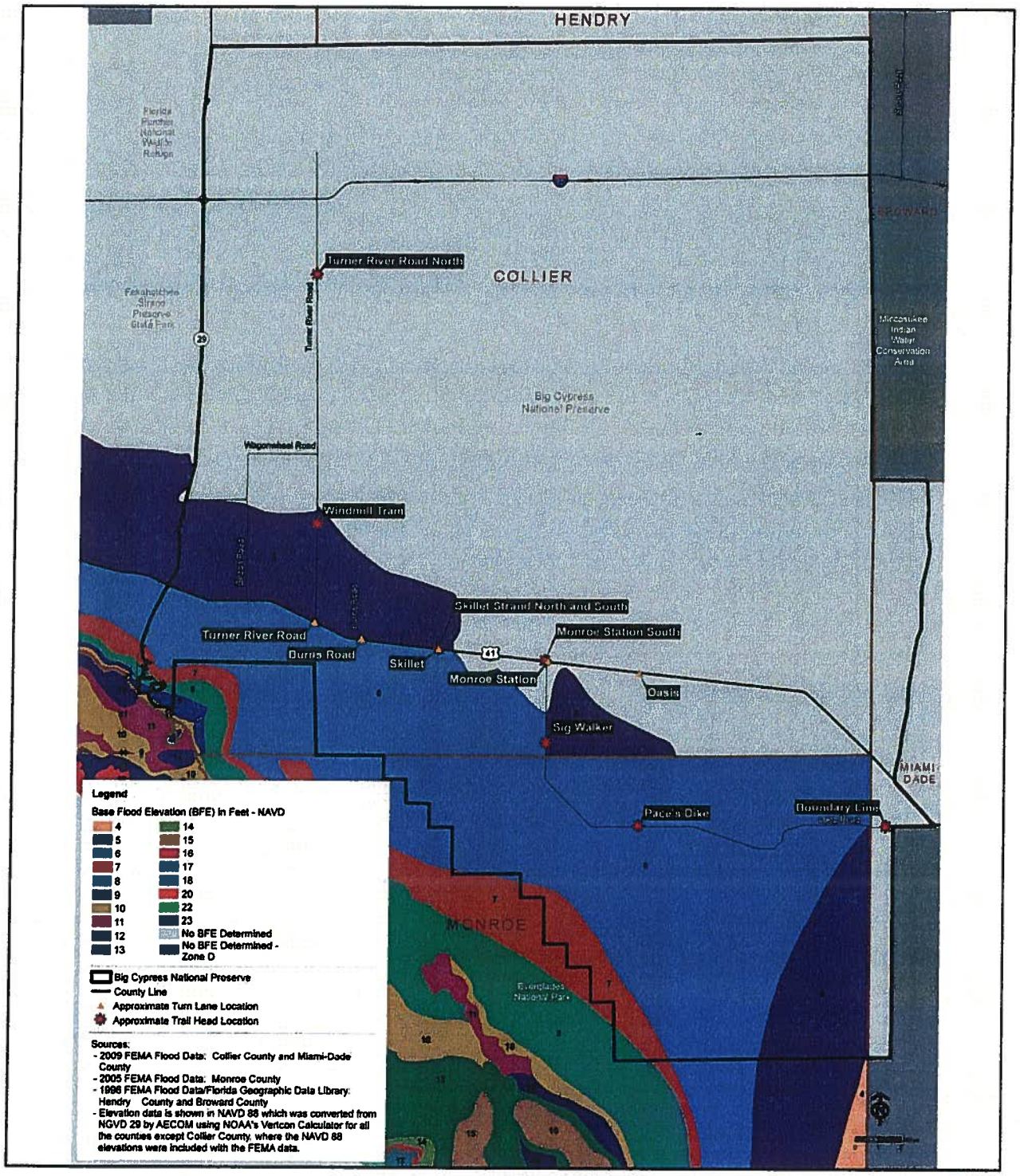


FIGURE 2
Base Flood Elevations for AE and VE Zones in the Preserve

Actions since they would occur within the 100-year floodplain (the Base Floodplain) and would occupy the site. Site-specific survey data were collected as part of the pre-design planning effort.

Based on these data, all or portions of the trail heads in the AE zone currently exist below the base flood elevations. Base flood elevations have not been determined within the A flood zone; for those areas that lie within this zone, additional hydrological analysis may be conducted.

Final fill configuration would be similar to grades and slopes in the immediate vicinity of each trail head; if more than 2 feet of fill is proposed and the fill configuration exceeds local grade heights and variations, a hydrological analysis would be performed. Based on site-specific survey compared with base flood elevations, 1 to 2 feet of fill would place the final elevations of most trail heads above the 100-year flood event while protecting the visual resources of the Preserve.

The overall approach to resource protection includes objectives implemented at the scale of the entire Preserve. The ORV Management Plan outlined a plan to reduce impacts to natural resources by avoiding or minimizing trails through vegetation communities most sensitive to impacts, designating trails in areas that offer the most suitable substrate, and locating access points and trails to maximize use of existing disturbed areas. These strategies resulted in the specific identification of 15 access points, including the eight detailed in the *Designated ORV Trail Heads and Turn Lanes Environmental Assessment*. Because virtually all of the Preserve is located within the 100-year floodplain, most any proposed improvement would result in encroachments into the floodplain. No alternative sites exist that would enable NPS to enhance visitor use, experience, and safety in the Preserve and reduce floodplain encroachments.

The risks of adverse effects from flooding as a result of the proposed action would be low because they would not impede the movement of floodwaters across the landscape or alter surface water elevations. Inundated trails are subject to damage from ORV use, and trails would likely be closed during times of heavy rainfall. Low or high water conditions would continue to cause seasonal closures at the Boundary Line trail head. High water conditions have not caused seasonal closures since August 2006. Low water conditions have caused the closure of the Boundary Line trail head three times since August 2006. These closures spanned from May 23 through July 21, 2008, from March 23 through June 14, 2009, and from April 11 through July 21, 2011. Since major flood events in the Preserve are likely to occur during predictable storms, it is likely that trail heads would be closed before safety issues associated with flood evacuation arise. As a result, the potential for loss of life or property during the service life of the access road, parking areas, turn lanes, bridges, culverts, boat ramps, visitor facilities, etc. is expected to be minimal. In the event evacuation is necessary, all proposed trail heads are within direct access to evacuation routes on State Road 29 and U.S. 41. Continued coordination with the appropriate county emergency management system and the National Weather Service would be conducted to ensure public safety.

The protection of people and property is of high priority to the Preserve. The proposed action would occur in a currently disturbed area. NPS concludes that there is no other practicable

alternative for the proposed trail heads and turn lanes. The risk to life and property would be minimized because the project would be designed to prevent or reduce flood damage and an emergency evacuation plan would be implemented. There would be no effect on natural or beneficial floodplain values.

ALTERNATIVES CONSIDERED

Two alternatives, and the no-action alternative, were considered and are described in detail in the *Designated ORV Trail Heads and Turn Lanes Environmental Assessment*. The purpose of the proposed project is to improve trail heads and construct turn lanes to enhance visitor use, experience, and safety. Trail heads would be improved to provide facilities and parking for users of the primary trails. This would protect public safety, improve recreational access, and enhance user experience for both ORV and non-ORV user groups. Recreational access would improve for the many ORV operators, hunters, hikers, and bikers that use the area.

Without improved trail heads, NPS would not be able to enhance visitor use, experience, and safety. If turn lanes were not constructed, enhanced public safety at access points and road intersections would not be achieved.

MITIGATIVE ACTIONS

Mitigative actions would consist of seasonal closures, structural flood protection measures, and specific actions to minimize impacts to floodplain natural resource values, effective flood warning, and flood evacuation. Some mitigation measures may result in the modification of floodplains to such an extent that the elevation of the regulatory flood would be affected. In these situations, additional hydraulic analyses may be required to quantify flood hazards under mitigated conditions. Given the location of trail heads within the floodplain, developing a plan for the early, prompt, and safe evacuation of people from the sites is a primary flood mitigation measure available to NPS. This plan would include strategies that ensure proper storm monitoring, emergency communication methods, effective evacuation routes, and timely emergency evacuation notification for visitors.

An evacuation plan would be developed in concert with the protocol and strategy of the existing Monroe, Miami-Dade, and Collier County emergency management systems and the National Weather Service. The majority of the proposed improvements occur in Collier County. The Collier County emergency management system is already well developed and has proven to be very successful at providing people in the area with advanced warning of potential floods. During past floods, this emergency management system has given warning well in advance of storm activity, leaving ample time for evacuation. There is a Collier County Sheriff's Office substation near the intersection of U.S. 41 and State Road 29, and the collaboration and communication between NPS and the Monroe, Miami-Dade, and Collier County emergency management system should be rather seamless and efficient.

Once the plan is developed, all Preserve staff, Everglades Chamber of Commerce staff, and Monroe, Miami-Dade, and Collier County Sheriff's Offices' staff would be informed of the plan's details and their respective implementation responsibilities. Staff at all facilities would

also be informed on how to appropriately disseminate evacuation information to visitors who may be at any of the facilities when a flood occurs.

The trail heads located on U.S. 41 have multiple evacuation routes available. The three trail heads located on the Preserve's Loop Road would need to use U.S. 41 to evacuate. Depending on storm trajectory or flooding dynamics, evacuees could seek higher ground by driving east or west on U.S. 41, with the option of heading north on Turner River Road or State Road 29 to Interstate 75. The most ideal and safest evacuation route would be determined by local emergency management system authorities during the time of the storm.

The final design and construction of trail head sites would take into consideration their location in the floodplain. Structures and facilities would be designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 60) and would consider the following:

- The final design of the trail heads and turn lanes would incorporate sustainable design principles, appropriate siting, and Best Management Practices (BMPs) during and after construction.
- Materials to be used at the trail heads would be durable and tolerant of occasional flooding.
- Materials proposed for vertical structures would be metal, concrete, or aggregate.
- Landscape plants would be native and inundation tolerant.
- Design for boat ramps would include protection from debris and scour.
- Signs informing visitors of flood risk and suggested actions in the event of flooding would be posted at trail heads as appropriate.
- Entrances and exits to trail heads would consider that debris could accumulate from a major storm event, which might prohibit evacuation.
- Berms, walls, and other vertical construction would be avoided in order to maintain effective flood protection for evacuation.
- Pedestrian structures (e.g., pathways) and toilet vaults would be located outside (or above) the base flood elevations.
- A conveyance system would divert and/or carry flood flows away from the site.
- Signs, high water indicators, and other information would be placed at trail heads, providing information about flood potential and evacuation protocol.

CONCLUSIONS

NPS has determined that there are no practicable alternatives that would locate proposed improvements for trail heads and turn lanes outside the floodplain. Their proposed construction would enhance visitor use, experience, and safety. The access points were delineated to avoid or minimize impacts to sensitive communities, and to direct users to existing disturbed areas. The five turn lanes were intended to improve public safety and access to trail heads that provide access to designated, primary ORV trails. Because virtually all of the Preserve

is within the 100-year floodplain, there are no alternate sites that can accomplish these objectives without similar impacts to the floodplain. NPS has the ability to close trails to facilitate resource protection and/or ensure public safety. Trail heads would be closed in the event of a 100-year storm. If emergency evacuation from trail heads is necessitated, all trail heads are near evacuation routes along State Road 29 and U.S. 41.

BIBLIOGRAPHY

National Park Service, U.S. Department of the Interior

1977 Executive Order 11988, "Floodplain Management."

2000 Final Recreational Off-Road Vehicle Management Plan/Supplemental Environmental Impact Statement.

2003 Director's Order 77-2: *Floodplain Management.* Washington, DC.

2004 Procedural Manual #77-2: Floodplain Management. Available on the Internet at <http://www.nature.nps.gov/rm77/floodplain.cfm>. February 5, 2004.

ATTACHMENT C DESIGNATED ORV TRAIL HEAD AND TURN LAND ENVIRONMENTAL ASSESSMENT BIG CYPRESS NATIONAL PRESERVE STATEMENT OF FINDINGS FOR WETLANDS

DRAFT

STATEMENT OF FINDINGS

FOR

EXECUTIVE ORDER 11990 ("Wetland Protection")

Big Cypress National Preserve

Florida

Recommended: _____ 7/31/12

Superintendent, Big Cypress National Preserve — Date

Concurred: _____ 08-03-12

Chief, Water Resources Division — Date

Approved: _____ 8-16-12

Director, Southeast Region — Date

APPENDIX A: STATEMENT OF FINDINGS FOR WETLANDS
EXECUTIVE ORDER 11990

INTRODUCTION

Executive Order (EO) 11990, "Protection of Wetlands," requires the National Park Service (NPS) and other agencies to evaluate the likely impacts of actions in wetlands. The objective of the EO is to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance their natural and beneficial values. NPS *Management Policies* (NPS 2006a) and DO-77-1: *Wetland Protection* (NPS 2002) reiterate the importance of safeguarding wetlands. NPS Procedural Manual #77-1 (NPS 2012) provides agency-specific procedures for complying with the EO. This Statement of Findings (SOF) has been prepared to comply with EO 11990, DO-7701 and Procedural Manual #77-1.

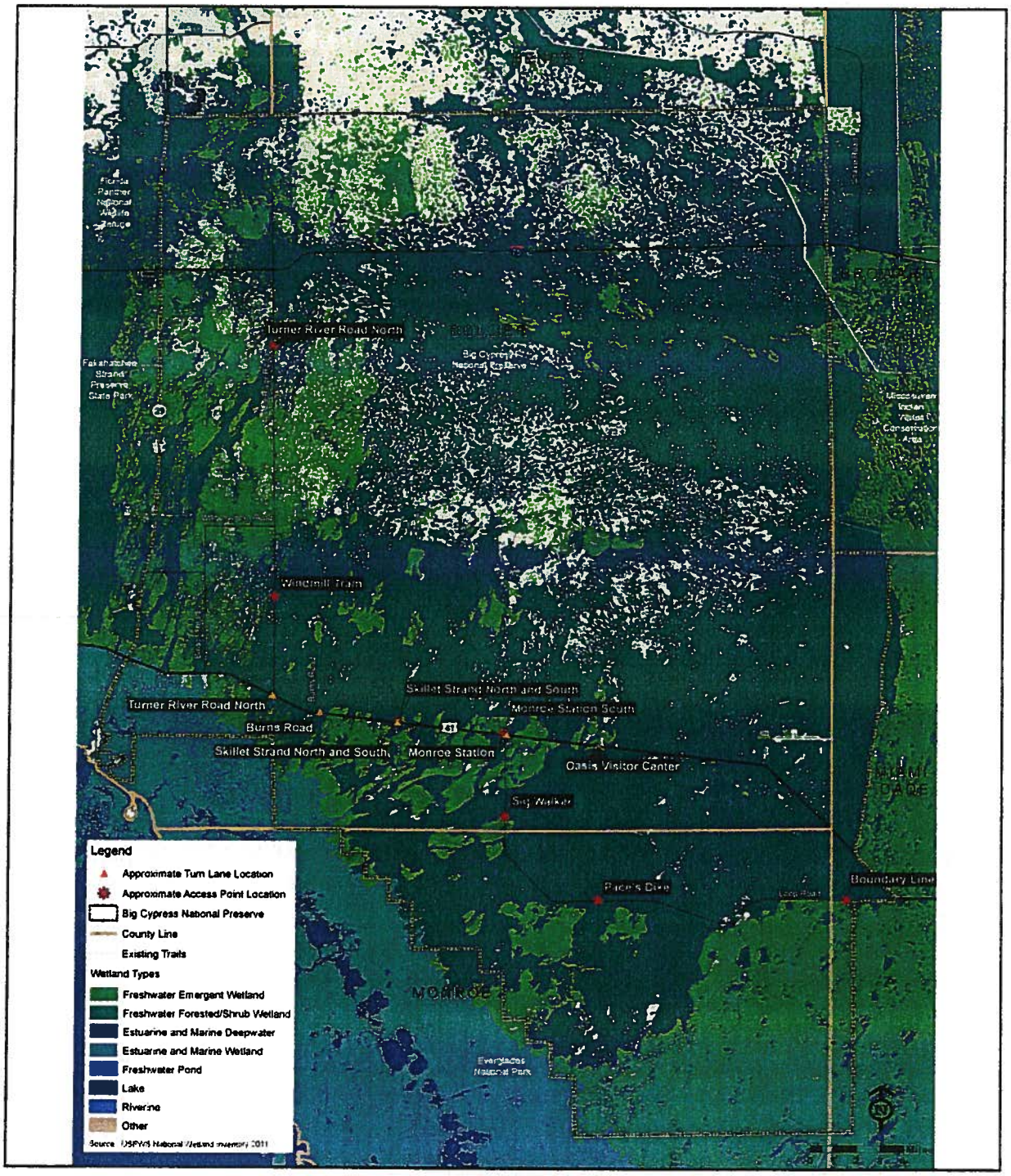
Big Cypress National Preserve (Preserve) has prepared and made available an Environmental Assessment (EA) for the Designated Off-Road Vehicle (ORV) Trail Heads and Turn Lanes project. The purpose of the proposed project is to improve trailheads and construct turn lanes to enhance visitor use and experience and safety. The preferred alternative proposes improvements that require impact to 14 acres of wetlands. A minimum of 14 acres of presently disturbed wetlands would be restored to natural conditions to create a no net loss of wetlands.

PROPOSED ACTION

The Preserve was established to ensure the preservation, conservation, and protection of the natural, scenic, hydrologic, floral and faunal, and recreational values of the Big Cypress watershed. The proposed action is described in detail in the *Designated ORV Trail Heads and Turn Lanes Environmental Assessment.* The 15 access points established in the Recreational Off-Road Vehicle Management Plan/Supplemental Environmental Impact Statement (NPS 2000, hereafter referred to as the ORV Management Plan) were located in areas of previous disturbance, within and adjacent to existing roadways, and/or to enhance multiple uses of access points and trails. The proposed action includes improvements at eight of the 15 access points. The trail heads would provide facilities and services at access points, and the turn lanes would improve safer access from U.S. 41. This would protect public safety, improve recreational access, and enhance multiple uses of access points and trails. Recreational access would improve for a wide range of user groups, including ORV operators, hunters, hikers, and bikers.

WETLANDS WITHIN THE PROJECT AREA

Wetlands in the Preserve were mapped by the United States Fish and Wildlife Service (FWS) as part of the National Wetlands Inventory (**Figure 1**). The majority of the Preserve is classified as wetland with the exception of scattered hardwood hammocks, some pinelands, and artificially filled areas. The *Big Cypress National Preserve General Management Plan and Final Environmental Impact Statement* (NPS 1991) included a comprehensive description of the vegetation resources within the original 1974 Preserve. Vegetation was reclassified by Welch et al. (1999) to provide consistency with the mapping of other public lands in south Florida.



0 4 8 Miles

FIGURE 1
Wetlands and Designated ORV Trail Heads and Turn Lanes in the Preserve

Vegetative classifications included prairie/marsh, cypress, mangrove, hammock, mixed hardwood swamp, and pineland. All of the prairie/marsh, cypress, mangrove, mixed hardwood swamp and some of the hammock and pineland communities are wetland. Proposed trail head and turn lane locations occur in the vicinity of prairie, cypress, and pineland wetland communities. **Figures 2** through **12** depict the distribution of these communities within the footprint of each trail head and turn lane.

Prairies are treeless areas dominated by herbaceous understory species. Wet prairies in the Preserve are characterized by muhly grass (*Muhlenbergia capillaris*), love grass (*Eragrostis* spp.), and sand cordgrass (*Spartina bakeri*); tend to have sandier soils than the wetter marsh systems; and are inundated to a maximum depth of approximately 8 inches during the wet season. Prairies can burn during periods of drought - these fires maintain community structure by eliminating invading trees and shrubs. Prairies occur extensively throughout, particularly in the western and southern portions of the Preserve.

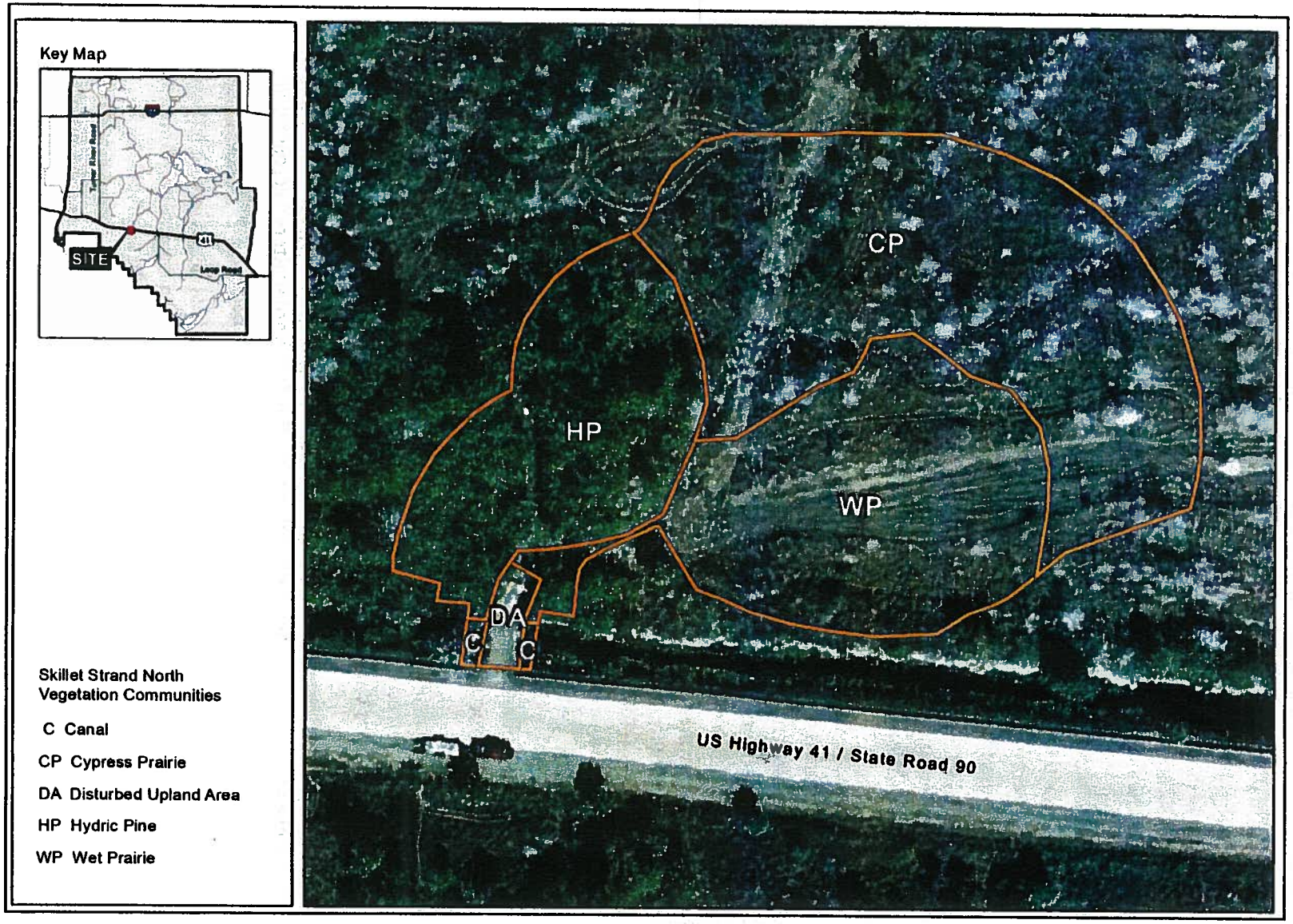
Cypress systems (**Figure 13**) in the Preserve occur as domes, strands, and prairies. The type of cypress community is related to underlying soils and hydrology. Cypress domes are characterized by a monospecific overstory of cypress, which grow tallest in the center and taper off toward the fringes, forming a dome-like feature. Cypress strands form along major drainages and generally retain a north-south orientation. Very large cypress trees may occur in these cypress strands. Cypress prairies are characterized by an open forest of small cypress trees and scattered, sparse growths of understory vegetation. Cypress systems are the dominant wetland communities across the Preserve.

Pinelands (**Figure 14**) in the Preserve are dominated almost exclusively by south Florida slash pine (*Pinus elliotii* var. *densa*) in the canopy. Subcanopy vegetation varies depending on soils and hydrology. On drier sites, cabbage palm (*Sabal palmetto*) and saw palmetto (*Serenoa repens*) are prevalent in areas that are infrequently saturated and would not be considered wetland.

On wetter sites, subcanopy vegetation includes sand cordgrass and saw grass (*Cladium jamaicense*). These areas, referred to as hydric pine communities, are frequently inundated or saturated to the surface and are considered wetland.

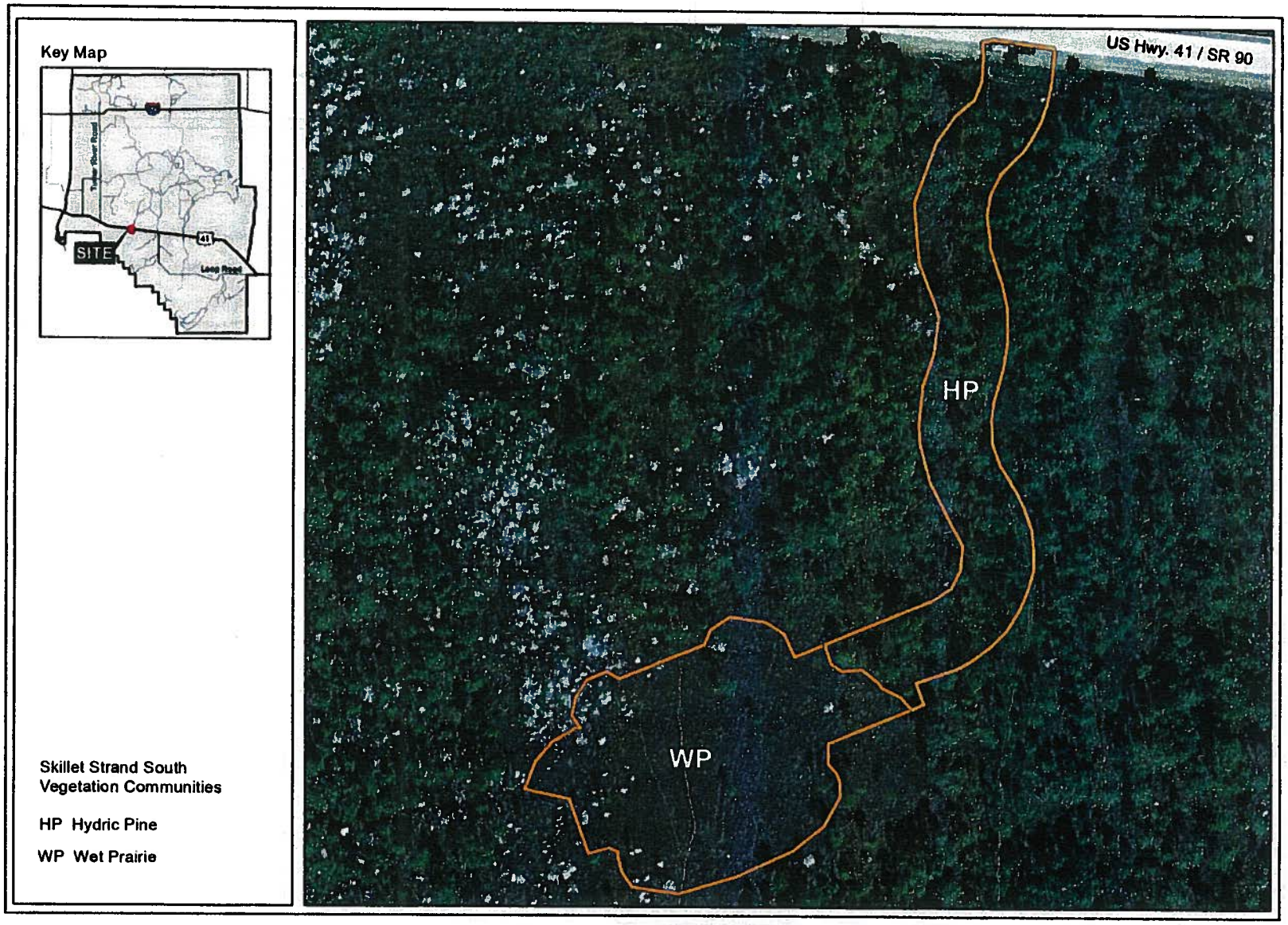
Pineland communities in the Preserve are adapted to fire and frequently burn, yielding an open midstory with a dense and diverse herbaceous understory. Pinelands are scattered across wide areas of the Preserve, particularly north of the Tamiami Trail.

There are small disturbed areas associated with most of the proposed trail heads in which these historical vegetative communities have been altered. These disturbances have resulted from ORV use, canal crossings, edge effects along roadways and cleared areas, exotic plant infestations, and some fill. Some wetlands that would be affected by the expansion of U.S. 41 to accommodate turn lanes are mowed, vegetated with nonnative plants, and receive road runoff.



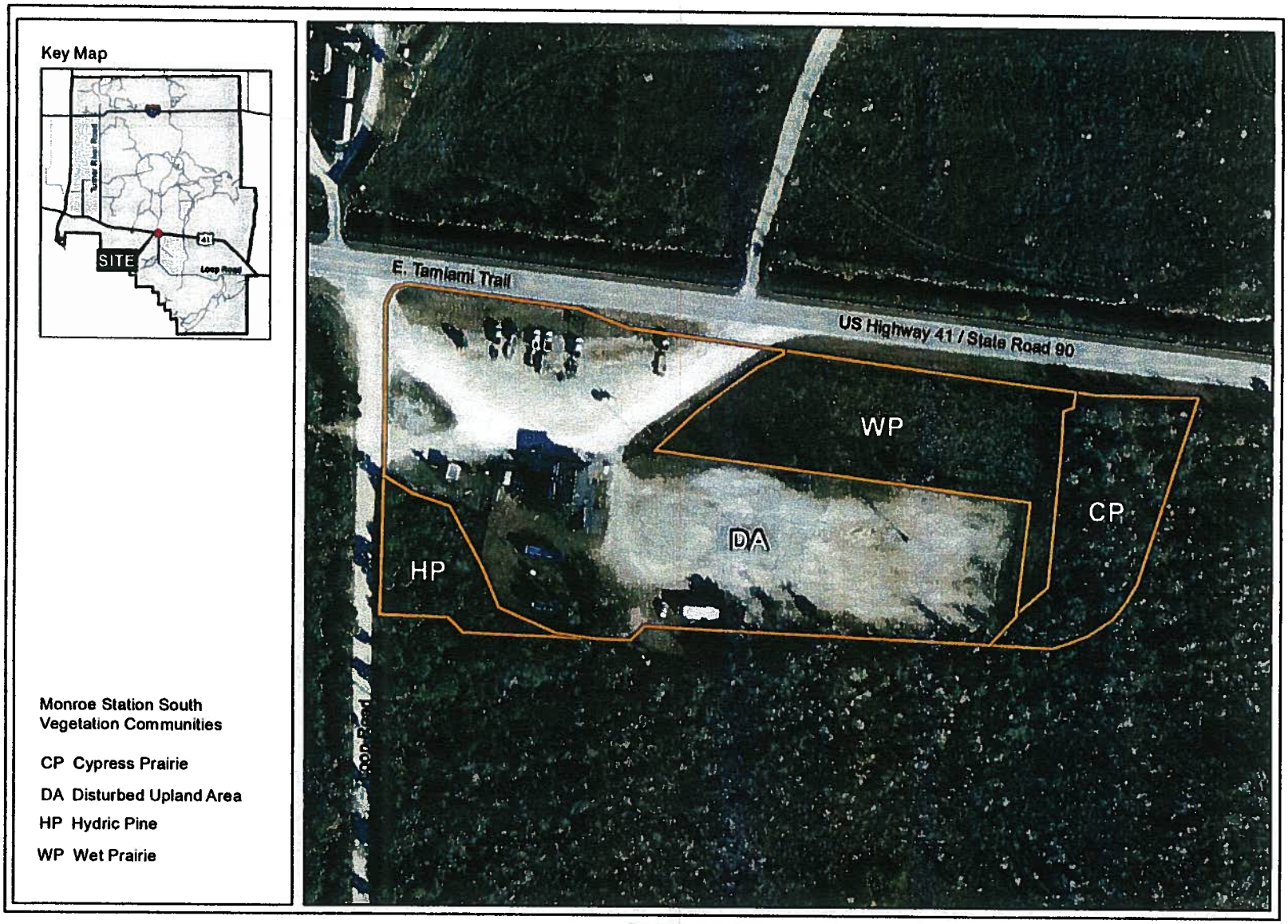
0 60 120 Feet

FIGURE 2
Vegetation Communities / Skillet Strand North Trail Head



0 60 120 Feet

FIGURE 3
Vegetation Communities / Skillet Strand South Trail Head



0 120 240 Feet

FIGURE 4
Vegetation Communities / Monroe Station South Trail Head

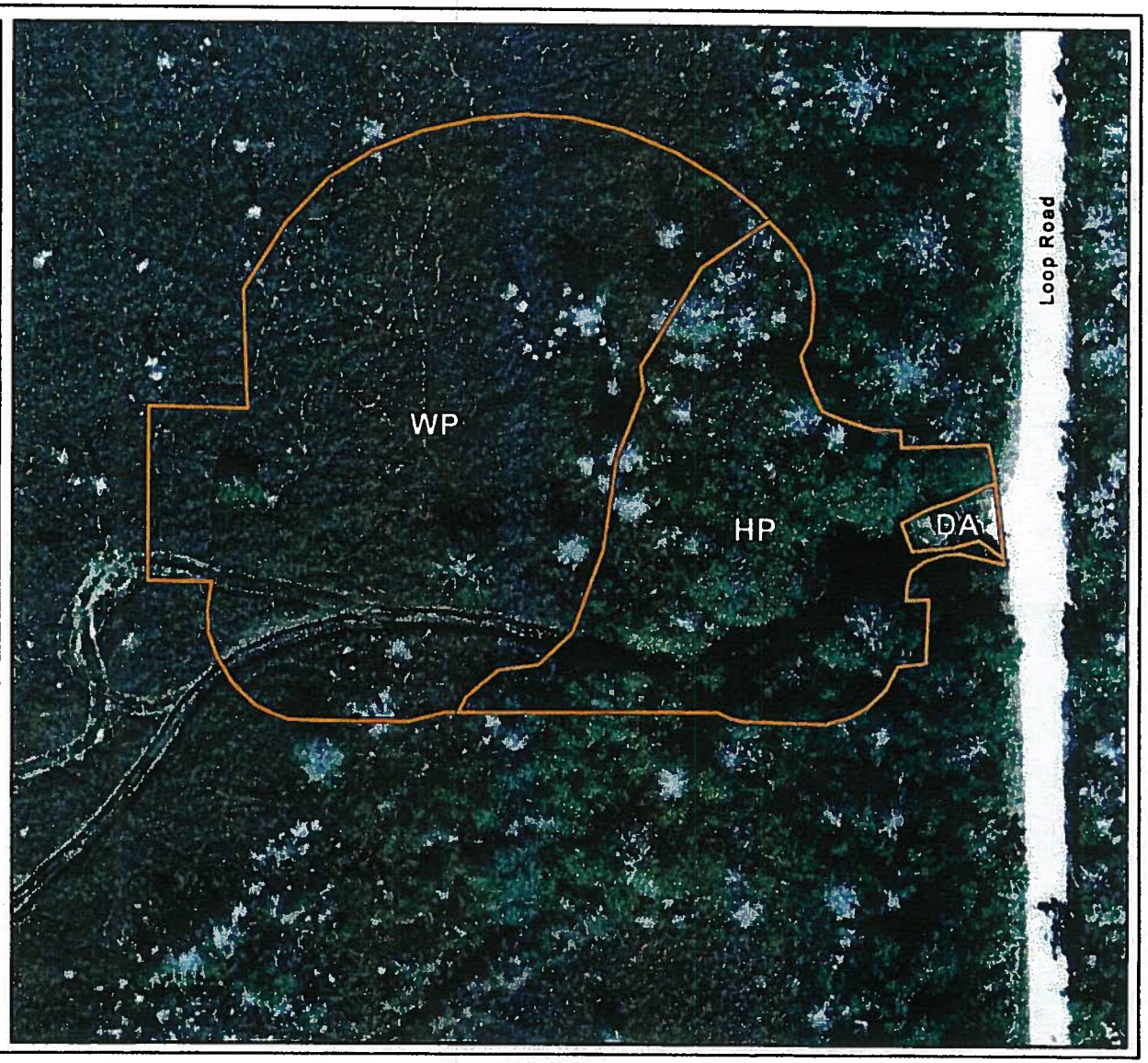
Key Map

Sig Walker
Vegetation Communities

DA Disturbed Upland Area

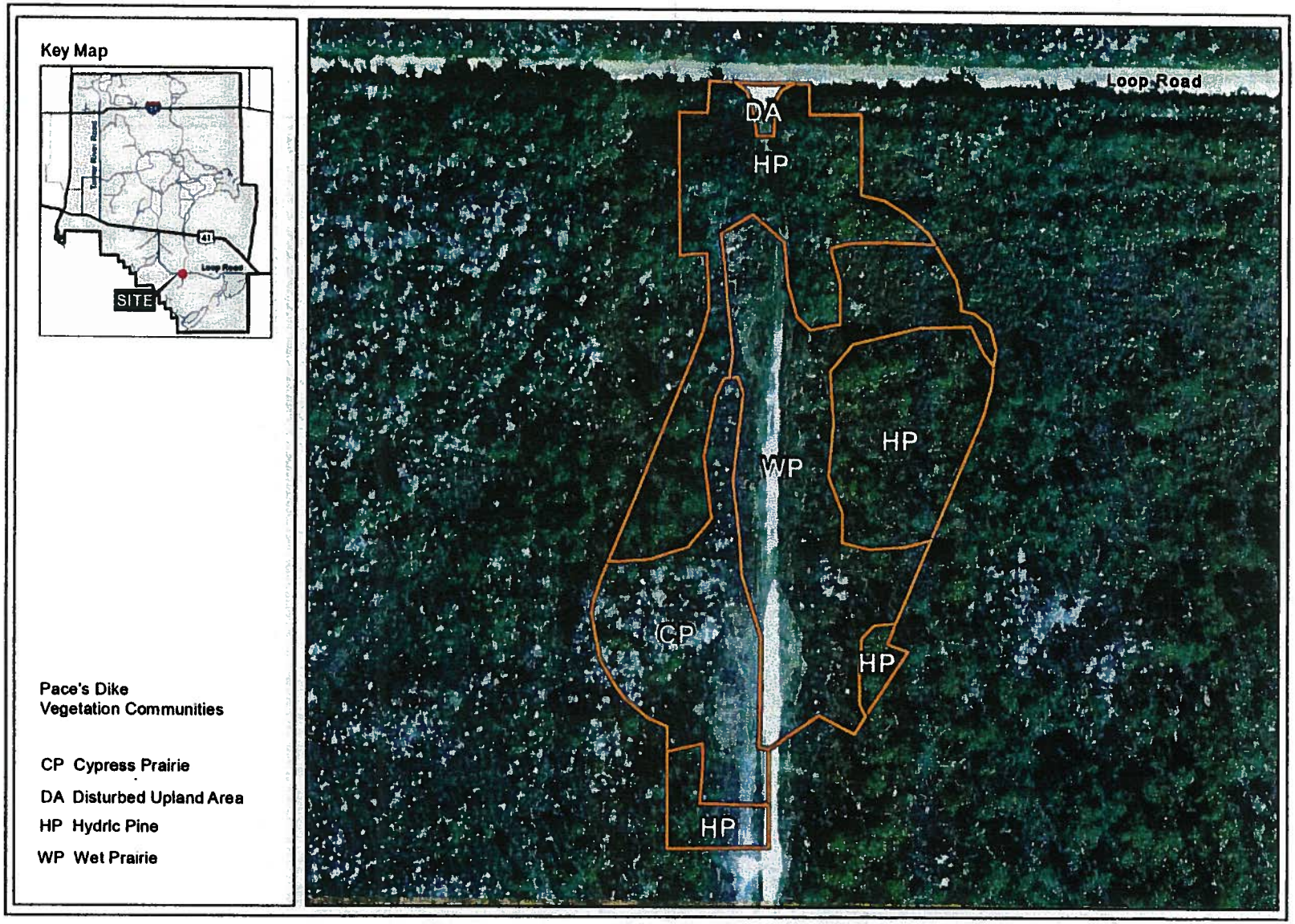
HP Hydric Pine

WP Wet Prairie



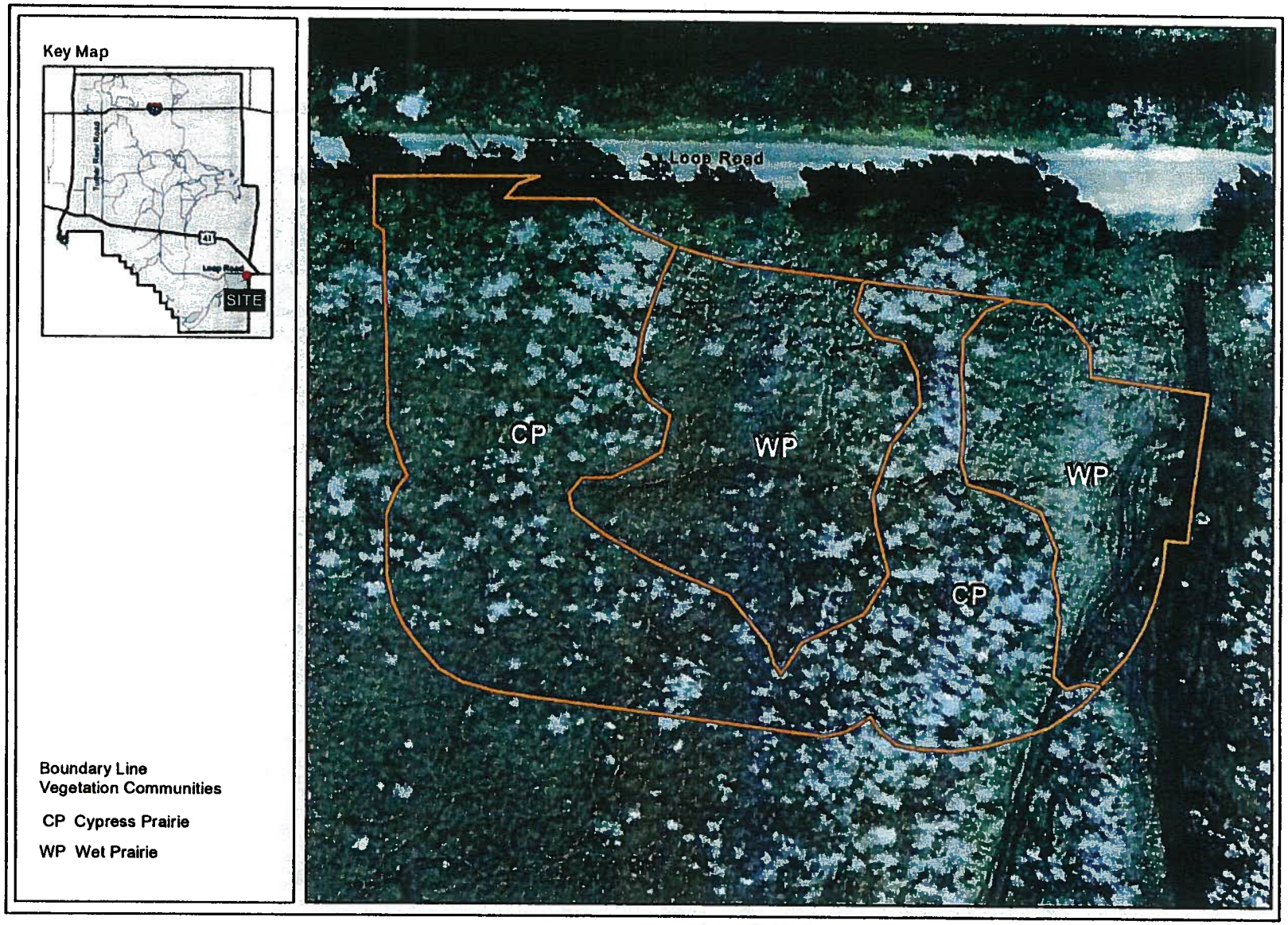
0 50 100 Feet

FIGURE 5
Vegetation Communities / Sig Walker Trail Head



0 80 160 Feet

FIGURE 6
Vegetation Communities / Pace's Dike Trail Head



0 50 100 Feet

FIGURE 7
Vegetation Communities / Boundary Line Trail Head

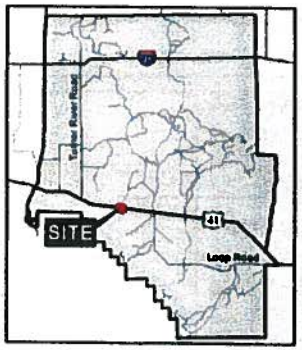
0 200 400 Feet

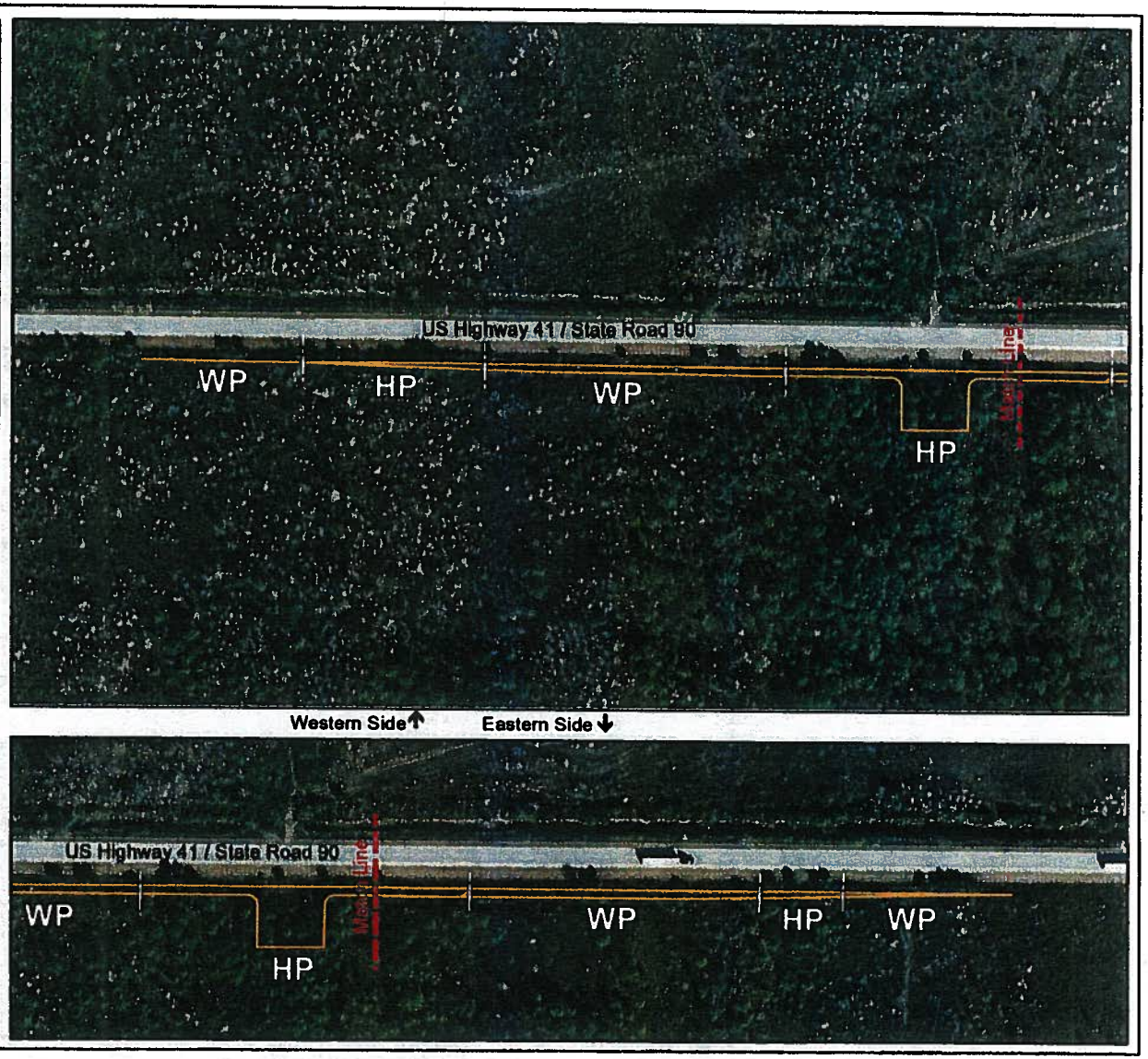
FIGURE 8
Vegetation Communities / Turner River Road North Turn Lane

0 200 400 Feet

FIGURE 9
Vegetation Communities / Burns Road Turn Lane

Key Map





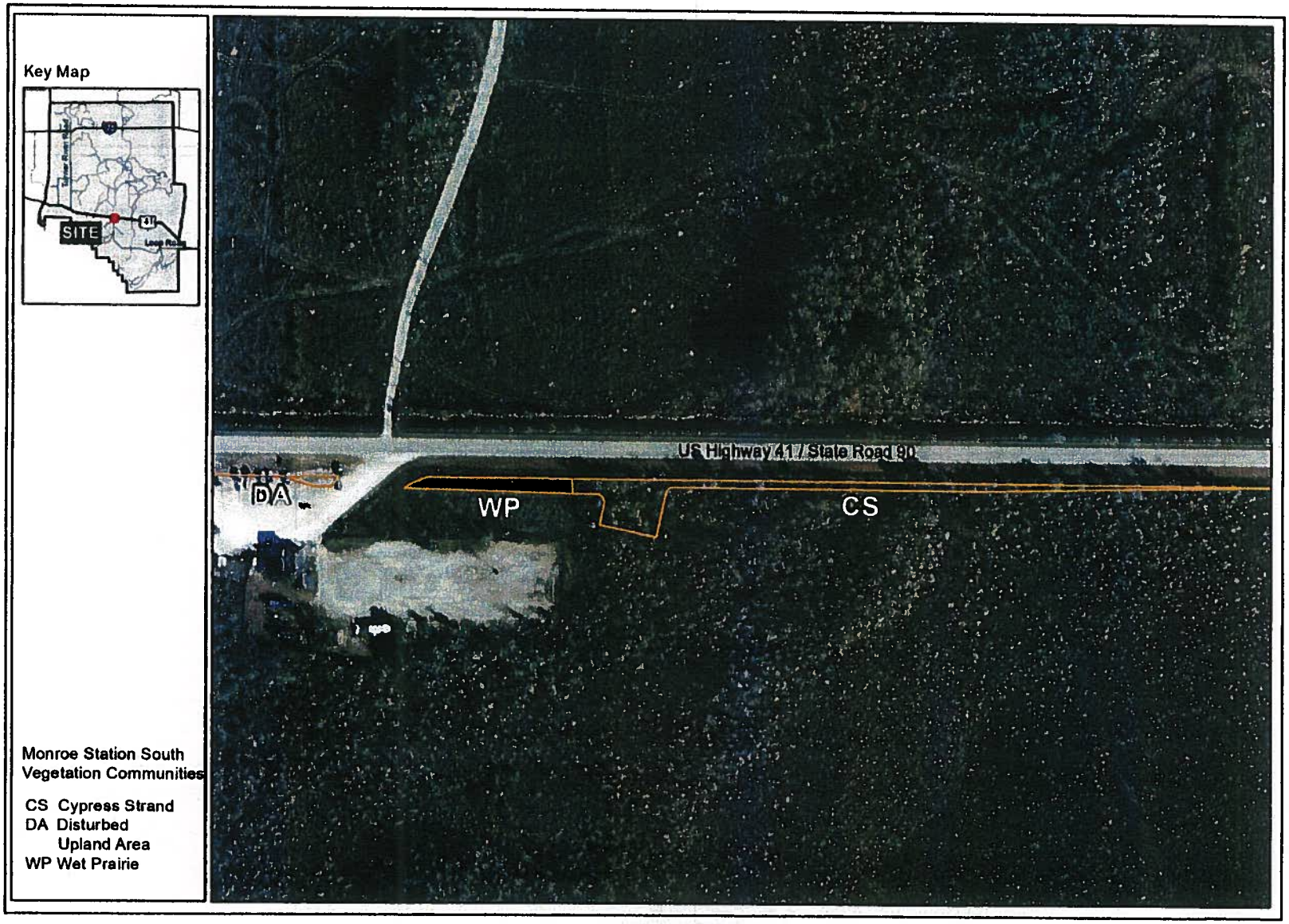
Skillet Strand North and South Vegetation Communities

HP Hydric Pine

WP Wet Prairie

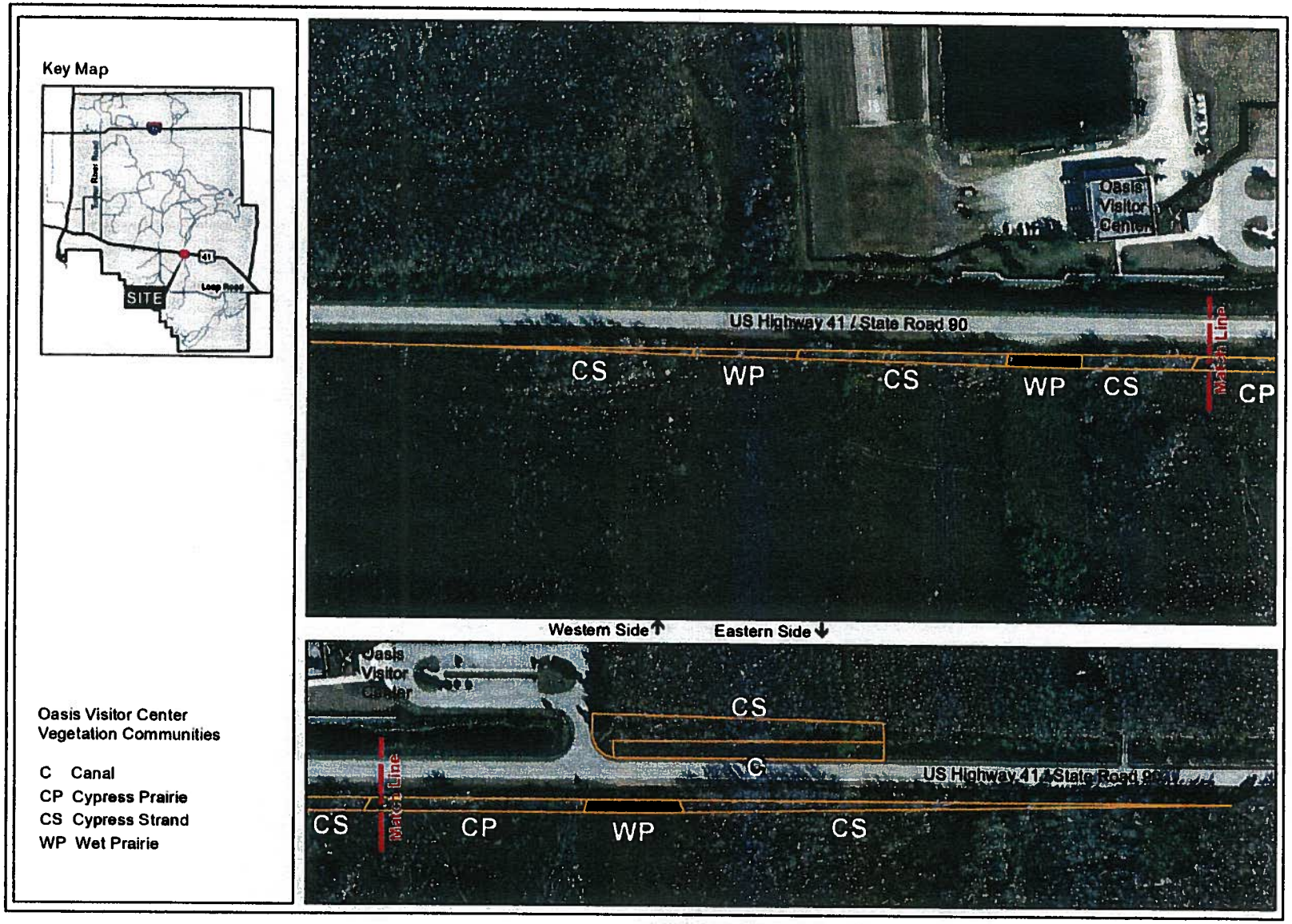
0 200 400 Feet

FIGURE 10
Vegetation Communities / Skillet Strand North and South Turn Lane



0 200 400 Feet

FIGURE 11
Vegetation Communities / Monroe Station South Turn Lane



0 200 400 Feet

FIGURE 12
Vegetation Communities / Oasis Visitor Center Turn Lane

Figure 13. Cypress systems in the Preserve

Figure 14. Pinelands in the Preserve

Still, all of the areas considered wetland in this analysis show a prevalence of hydrophytic vegetation, hydric soils, and wetland hydrology.

The primary functions of the wetlands in the project area include surface and subsurface water storage, support of the biogeochemical processes (e.g., nutrient cycling, organic diversity, and peat composition), support of a characteristic plant community, and providing suitable habitat for fish and wildlife. Some of these functional values are degraded as a result of infrastructure construction and maintenance, regional flood control and water management, and the presence of invasive plant and animal species.

Water storage has been degraded by the damming effect of the Tamiami Trail and altered surface water sheetflows, and the distribution and timing of discharge within the immediate vicinity. Nutrient loads leached into the wetlands from the canals are taken up by vegetation in the Preserve. Phosphorus is known to alter the natural saw grass community as evidenced in some areas by the presence of cattails. In some areas saw grass prairie has been degraded, but it still provides suitable habitat for fish and wildlife. Wildlife habitat has been altered by excavation and filling during construction and repair along the Tamiami Trail. Aquatic habitat in the open waters is degraded by elevated nutrients and exotic fish species.

Vegetation within the immediate vicinity of the roadways and canals has been impacted by human disturbances such as the roadbed, shoulders along the roadway, culvert construction, and maintenance conducted within the canals and rights-of-way. Disturbance is evidenced by the presence of exotic species such as hydrilla (*Hydrilla verticillata*), torpedo grass (*Panicum repens*), and Peruvian primrosewillow (*Ludwigia peruviana*) found in some of the open waters within canals and adjacent to culverts. Brazilian pepper (*Schinus terebinthifolius*) occurs in varying densities along the roadway.

JUSTIFICATION FOR THE USE OF WETLANDS

The approach to wetland conservation and protection includes resource protection objectives implemented at the scale of the entire Preserve. The ORV Management Plan outlined a preserve-wide plan to reduce impacts to natural resources, including wetlands. Strategies included avoiding or minimizing trails through vegetation communities most sensitive to

impacts, designating trails in areas that offer the most suitable substrate, and locating access points and trails to maximize use of existing disturbed areas. These strategies resulted in the specific identification of 15 access points, including those detailed in the *Designated ORV Trail Heads and Turn Lanes Environmental Assessment*. The plan also defined protocol to prohibit use of hundreds of miles of trails, minimize future impacts by closing sensitive areas completely, and restrict use during periods of the greatest vulnerability to impact (e.g., drought and flood).

Wetlands in the Preserve are used for educational, recreational, and scientific activities through expanded interpretive programs and research emphasis. Further, NPS has agreed to actively assist private landowners and regulatory agencies in protecting wetlands that are outside the Preserve boundary but whose use protection may affect Preserve resources.

The six proposed trail heads included in the preferred alternative are as follows: Skillet Strand North, Skillet Strand South, Sig Walker, Pace's Dike, Boundary Line, and Monroe Station South. Two of these sites, Sig Walker and Boundary Line, are proposed for wetland dependent activities, since they would accommodate airboat launching only. The five proposed turn lanes include: Burns Road, Oasis, Skillet Strand, Monroe Station, and Turner River Road. Construction of parking areas and ancillary facilities, such as single vault toilets, refuse containers, signs, and kiosks, would require filling of wetlands.

The ORV Management Plan included resource protection criteria intended to protect important environmental and cultural areas, restore heavily impacted and environmentally sensitive areas, and direct use to areas of suitable substrate. These included design that would avoid and minimize trails through vegetation communities most susceptible to impacts, including areas where ORVs may have a detrimental effect on threatened and endangered species. Monitoring efforts were defined that indicate when trails should be closed as a result of hydrologic or vegetative changes.

Where practicable, undisturbed wetland areas and natural communities would be avoided, and trail heads would be constructed in areas of greatest historic disturbance. Restoration of previously altered wetland sites would be conducted as mitigation for anticipated wetland impacts.

Certain aspects of the conceptual design for trail heads have been identified to accommodate expected users while minimizing the footprint of fill. Preliminary site reviews resulted in a conceptual placement of the proposed trail heads to minimize wetland impacts to mature forested wetland canopies, and undisturbed wetland communities in general. Conceptual site-specific design elements to minimize wetland impacts include:

- Avoid or minimize improvements in vegetation communities most susceptible to impacts.
- Avoid or minimize improvements in areas where ORVs may have a detrimental effect on threatened and endangered species.

- Designate improvements at previously identified access points that offer the most suitable substrate.
- Locate improvements to maximize use of existing disturbed areas.

PROPOSED WETLAND IMPACTS

In order to provide a review of potential wetland impacts commensurate with the conceptual level of design for each trail head, the preliminary plan for each trail head was overlaid on a recent aerial photograph so that wetland impacts could be estimated. The footprint of the proposed trail heads is based on schematic design documents; more detailed design/engineering may result in adjustments of the footprint to avoid mature wetland canopy, maximize the placement of fill in disturbed areas, and to concentrate impacts over exotic plant infestations. This analysis used conceptual plans that illustrate entry roads, parking and vehicle circulation, stormwater ponds, and ancillary facilities. (The area needed for stormwater ponds was estimated at 15% of the total area of fill.) In total, the trail heads are expected to impact approximately 10.5 acres of wetlands. Construction associated with each turn lane would require wetland impacts to highly disturbed areas adjacent to the U.S. 41 maintained right-of-way; these impacts total approximately 3.5 acres of wetlands and surface waters.

For proposed development projects with the potential to have adverse impacts on wetlands, NPS is required to use the sequence of avoiding, minimizing, and compensating for wetland impacts. Design elements to avoid and minimize impacts were incorporated into conceptual plans and will be further developed during final design to the maximum extent practicable, while maintaining safe and sound engineering and construction practices. A comprehensive mitigation strategy to compensate for unavoidable direct impacts to wetlands is summarized in the Mitigative Actions section of this document. Wetland impacts that would be required as a result of the proposed trail head improvements and the construction of turn lanes were quantified based on the aerial extent of wetlands/surface waters within the proposed construction limits.

Trail Heads

Except for Monroe Station, the entire footprint of proposed trail head improvements is expected to occur in wetlands or surface waters. Natural wetland communities, including hydric pine, cypress prairie, cypress strand, and wet prairie, exist within one or more of the proposed trail heads. Some areas within proposed trail head footprints have been previously disturbed. These disturbed areas include gravel fill on existing ORV trails, stockpiled fill material at Windmill Tram, areas colonized by nuisance and exotic vegetation, and areas degraded by untreated stormwater runoff from roadway rights-of-way.

Wetland impacts would result from fill for parking surfaces, entry roads, and vehicular circulation. Proposed impacts would remove the habitat functions, wetland vegetative composition, and hydrology exhibited by the wetlands within the area proposed for trail head improvements.

In accordance with provisions of section 4.2 of the NPS's Procedural Manual 77-1 (NPS 2012), the proposed replacement of the existing canal culverts would qualify as an excepted action for a "maintenance, repair, or renovation" (section 4.2.1g). This conclusion is based on wetland disturbance area of minor (less than 0.1 acre) deviations in the structure's configuration attributed to replacement of the culvert; and a commitment to the best management and impact avoidance practices previously described. As an excepted action, replacement of existing canal culverts are waived from the requirements to provide a wetland statement of findings and NPS requirements to balance wetland impacts and restoration. If it is determined during the final design of the trail heads that these impacts do not qualify for the exception, proposed impacts would be offset by the comprehensive mitigation strategy defined in the Mitigative Actions section of this document in accordance with NPS requirements.

Table 1 depicts the estimated extent of wetland impacts for each trail head.

Table 1. Summary of Wetland Impacts in Proposed Trail Heads

	Estimated Extent of Impact (acres)			
Trail Head	**Hydric Pine**	**Cypress Prairie**	**Wet Prairie**	**TOTAL**
Skillet Strand North	0.4	0.8	0.5	1.7
Skillet Strand South	1.2		1.4	2.6
Monroe Station South	0.3	0.6	1.0	1.9
Sig Walker	0.4		0.7	1.1
Pace's Dike	0.8	0.4	0.6	1.8
Boundary Line		0.8	0.6	1.4
TOTAL	3.1	2.6	4.8	10.5

Turn Lanes

Construction associated with each turn lane would require wetland impacts, primarily to previously impacted areas within and adjacent to the U.S. 41 maintained right-of-way. The geometry of these turn lanes and transitions were calculated in accordance with the Florida Department of Transportation (FDOT) Design Standard Index No. 526 and 301 and vary by turn lane. FDOT requires that a 36-foot additional recoverable terrain area comprised of disturbance/pavement/fill totaling approximately 3.5 acres of wetlands and temporary impacts to surface waters would be necessary to accommodate these design requirements. Some of this area is frequently maintained right-of-way. Disturbance/pavement/fill is expected to occur outside of the existing right-of-way in what would be considered jurisdictional wetlands.

In the event that the final design of turn lanes results in a bridge span, proposed impacts would qualify as an excepted action for a "minor stream crossing" (section 4.2.1d) in accordance with provisions of section 4.2 of the NPS's wetland protection Procedural Manual #77-1 (NPS 2012) for sites with the potential for canal crossings using bridges or other structures that completely span the canal and wetland habitat (no support structures affecting canal or wetlands). As an

excepted action, bridge spans are waived from the requirements to provide a wetland statement of findings and wetland impact compensation due to the commitment to best management practices and lack of support structures that would adversely affect the canal or wetlands. If a bridge span is unable to be accommodated during the final design of turn lanes, proposed impacts would be offset by the mitigation strategy identified in the Mitigative Actions section of this document in accordance with NPS requirements.

Table 2 depicts the estimated extent of wetland impacts for each turn lane.

Table 2. Summary of Wetland Impacts Located in Proposed Turn Lanes

	Estimated Extent of Impact (acres)					
Turn Lane	Hydric Pine	Cypress Strand	Cypress Prairie	Wet Prairie	Canal	TOTAL
Turner River Road		0.3				0.3
Burns Road	0.1	0.3				0.4
Skillet Strand North and South	0.3			0.2		0.5
Monroe Station South		0.5		0.1		0.6
Oasis Visitor Center		1.0	0.2	0.2	0.3	1.7
TOTAL	0.4	2.1	0.2	0.5	0.3	3.5

FUNCTIONAL ASSESSMENT OF WETLAND IMPACTS

In Florida, both the U.S. Army Corps of Engineers (ACOE) and the South Florida Water Management District (SFWMD) use the Uniform Mitigation Assessment Method (UMAM) to assess the current functional value of the assessment area based on existing conditions per the three categories of wetland function indicators, and to determine functional value of mitigation for proposed impacts. A preliminary UMAM assessment was conducted for the anticipated wetland impacts associated with trail heads and turn lanes to generally assess wetland function and estimate mitigation needs.

This is an appropriate tool for generally assessing wetland impacts at this stage of design. This initial UMAM evaluation does not assess the potential for long-term benefits to wetlands that could result from implementation of the project with future mitigation. A final UMAM has not yet been conducted for this project and would be negotiated with regulatory agency personnel during final design and permitting.

In this UMAM analysis, the functional value of the assessment areas is based on the current conditions of the three indicators of wetland function; Location and Landscape Support, the Water Environment, and Community Structure. The functional value is determined based upon how these indicators affect the ecological value of the assessment area. Numeric scores for each indicator range from 10 to zero and are assigned based on reasonable scientific judgment. A score of 10 indicates a high functional value.

Results of the initial UMAM analysis conducted to evaluate the functional loss anticipated by the wetland impact acreages by vegetative community type are shown in **Table 3**. For projected wetland impacts totaling 14.0 acres, there is an anticipated functional loss of 13.1 units.

Table 3. Functional Assessment of Wetland Impacts

		Uniform Mitigation Assessment Method score (out of 10)				
Wetland Type	**Impact Acreage**	**Location and Landscape Support**	**Water Environment**	**Vegetative Community**	**Score (Sum/30)**	**Functional Loss**
Hydric pine	3.5	10	10	10	1.0	3.5
Cypress prairie	2.8	10	9	9	0.9	2.5
Wet prairie	5.3	9	9	9	0.9	4.8
Cypress strand	2.1	10	10	10	1.0	2.1
Canal*	0.3	8	10	7	0.8	0.2
TOTAL						13.1

ALTERNATIVES CONSIDERED

Two alternatives and the no-action alternative were considered as described in detail in the *Designated ORV Trail Heads and Turn Lanes Environmental Assessment.* The no-action alternative would continue current NPS programs for ORV use and resource management in the Preserve. Without improved trail heads, NPS would not be able to enhance visitor use and experience by providing facilities and parking for users of the primary trails. If turn lanes were not constructed, enhanced public safety at access points and road intersections would not be achieved.

Trail heads would be improved to provide facilities and parking for users of the primary trails. This would improve recreational access and enhance user experience for both ORV and non-ORV user groups. Recreational access would improve for the many ORV operators, hunters, hikers, and bikers that use the area.

The preferred alternative (Alternative C) includes the construction of six trail heads at designated access points throughout the Preserve and five turn lanes off U.S. 41. Constructing the trail heads and turn lanes would enable NPS to provide for changing visitor use and experience and safety. The preferred alternative would result in 14.0 acres of wetland impacts

resulting in 13.1 units of functional loss, but NPS would strive to further minimize wetland impacts through final trail head and turn lane design. The design has been modified to reduce degradation or loss of adjacent wetlands, to maintain the integrity of the adjacent wetlands, and to focus improvements on disturbed or impacted areas. In addition, a series of Best Management Practices (BMPs) would be implemented during construction to ensure that impacts are minimized to the greatest extent possible, as described in the Mitigative Actions section below.

MITIGATIVE ACTIONS

A strategy for restoring impacted sites associated with unplanned trails, access points, and relict fill was developed in association with an ACOE permit authorizing the stabilization of trails in the Preserve. These mitigation measures include restoration of filled sites, former rock pits, sites with obsolete structures, and sites with other types of disturbance that warrant restoration. Many of these sites were used as mitigation on wetland permits in the past, and the intention is to continue to restore these impacted sites as mitigation for the anticipated impacts associated with this project. Over 200 sites totaling more than 100 acres remain to be restored.

These restoration sites include eliminating past disturbances, such as previously filled areas for homes, commercial enterprises, roads, campgrounds, and runways. Since its creation, the Preserve has acquired many of these disturbed sites and is still in the process of buying additional land, including disturbed areas that can be restored.

Restoration objectives include one or more of the following: reconstruction of physical conditions such as topography or grade, chemical changes to the soils and water, and biological components such as the re-introduction of native plant species. Long-range restoration goals for disturbed sites in the Preserve are to: 1) remove the scars caused by ORV vehicles or previous fill activities and recover a sustainable, self-regulating, self-organizing ecosystem through restoration of the biological, physical, and chemical characteristics of the system; and 2) meet biological, physical, and chemical targets defined by performance measures.

<u>Mitigation approach</u>:

The Preserve has, or will restore wetland habitats by: 1) eliminating fill from fill pads and historical roadways and 2) restoring topography to rutted wet prairies. In each instance the restoration should allow native wetlands to become re-established. In some areas, this work has already been completed, in others restoration is ongoing, and across the Preserve there are numerous additional sites scheduled to be restored over time. **Figure 17** depicts restoration sites proposed as mitigation for proposed wetland impacts associated with trail heads and turn lanes.

For filled areas near borrow ponds, fill material consisting of native limestone, sand, and marl will be returned to borrow areas to create littoral areas on the margins of the borrow ponds that were created by fill-mining activities. Fill removal will be accomplished primarily with heavy equipment in these previously disturbed areas. Precautions will be undertaken to minimize any effects on adjacent native biological communities.

The process for removing fill will consist of:

1. Mechanical removal of fill material;
2. Grading the filled area to the level of mineral soils in the surrounding communities;
3. Transporting the removed fill material to associated borrow ponds, if present, in order to create littoral zones along the margins of the ponds that were created by former mining activities; and
4. Assuring that restoration areas revert to appropriate native wetland communities.

For rutted cypress and wet prairies, the ground surface has been restored to approximate the ground level before alterations were induced by ORV traffic. The ground surface has been restored to facilitate native wetland vegetation recovery. The Preserve's Maintenance Division has treated rutted areas by grading to create a more level ground surface. This has created an even surface topography so that low areas (ruts) that have longer hydroperiods, and the associated ridges that have shorter hydroperiods, have been eliminated. This treatment eliminates channeling of water that may have occurred in these wetlands because of deeply worn trails.

<u>Proposed mitigation sites</u>:

Grading of ruts and ridges from past ORV use

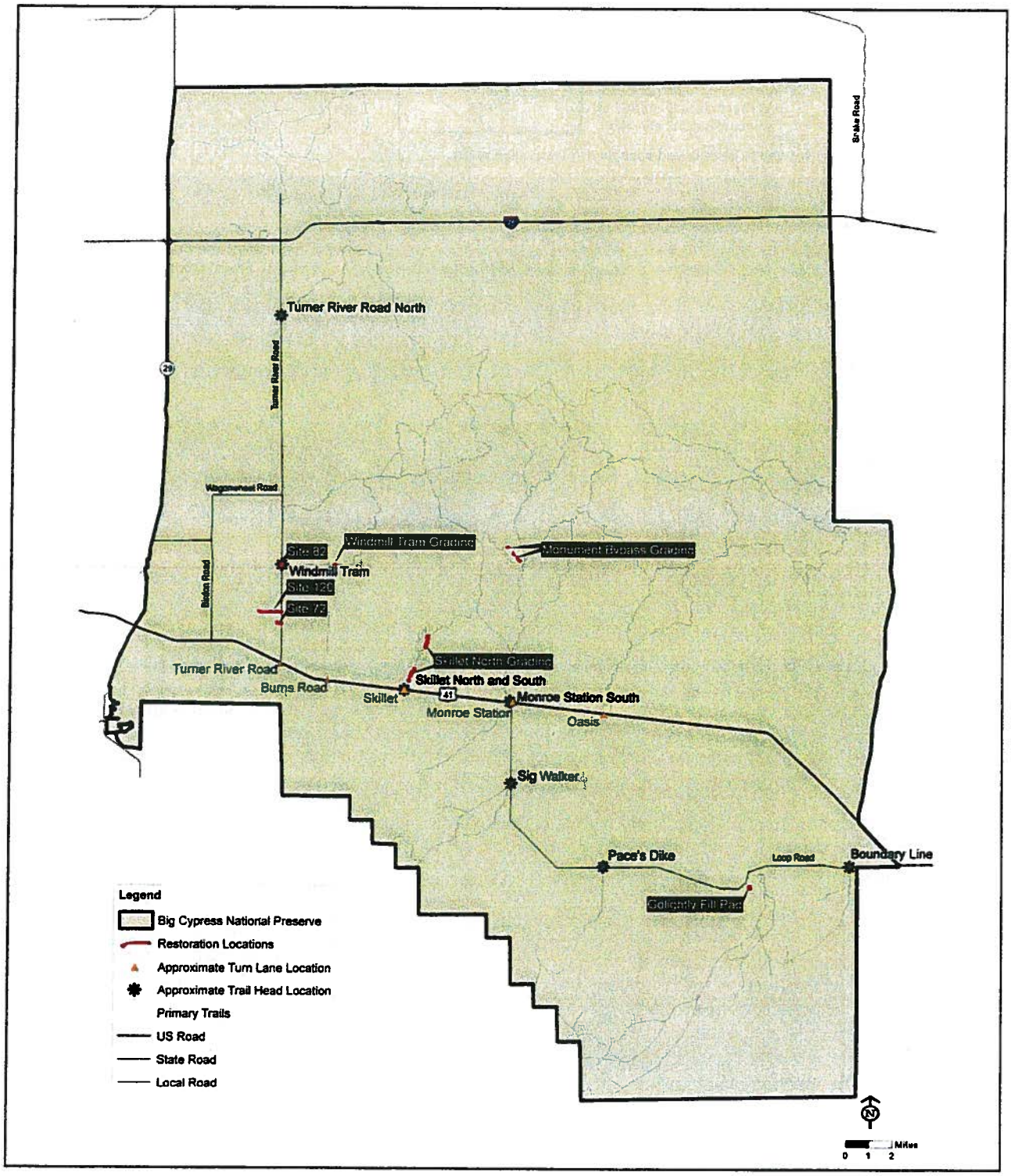
The Skillet North, Monument Bypass, and Windmill Tram ORV trails have been used for decades, and some segments, mostly in wet prairies, have become rutted. In these areas users have fanned out from the main trail in order to find a suitable driving surface, resulting in large areas of parallel ruts and ridges. The total graded area to be restored for all three trails is approximately 3.9 acres.

Fill pad removal

Loop Road Ranger Station (old Golightly property) - There is a borrow pit with surrounding limerock fill at this location. Approximately 0.35 acres of filled material was previously removed, and another 6.59 acres is currently being removed, for a total of 6.9 acres of restoration to wet prairie or cypress prairie. **Figure 18** depicts the approach to restoration of this tract as a representative example of how removal of fill from historic wetlands has been, and will continue to be implemented.

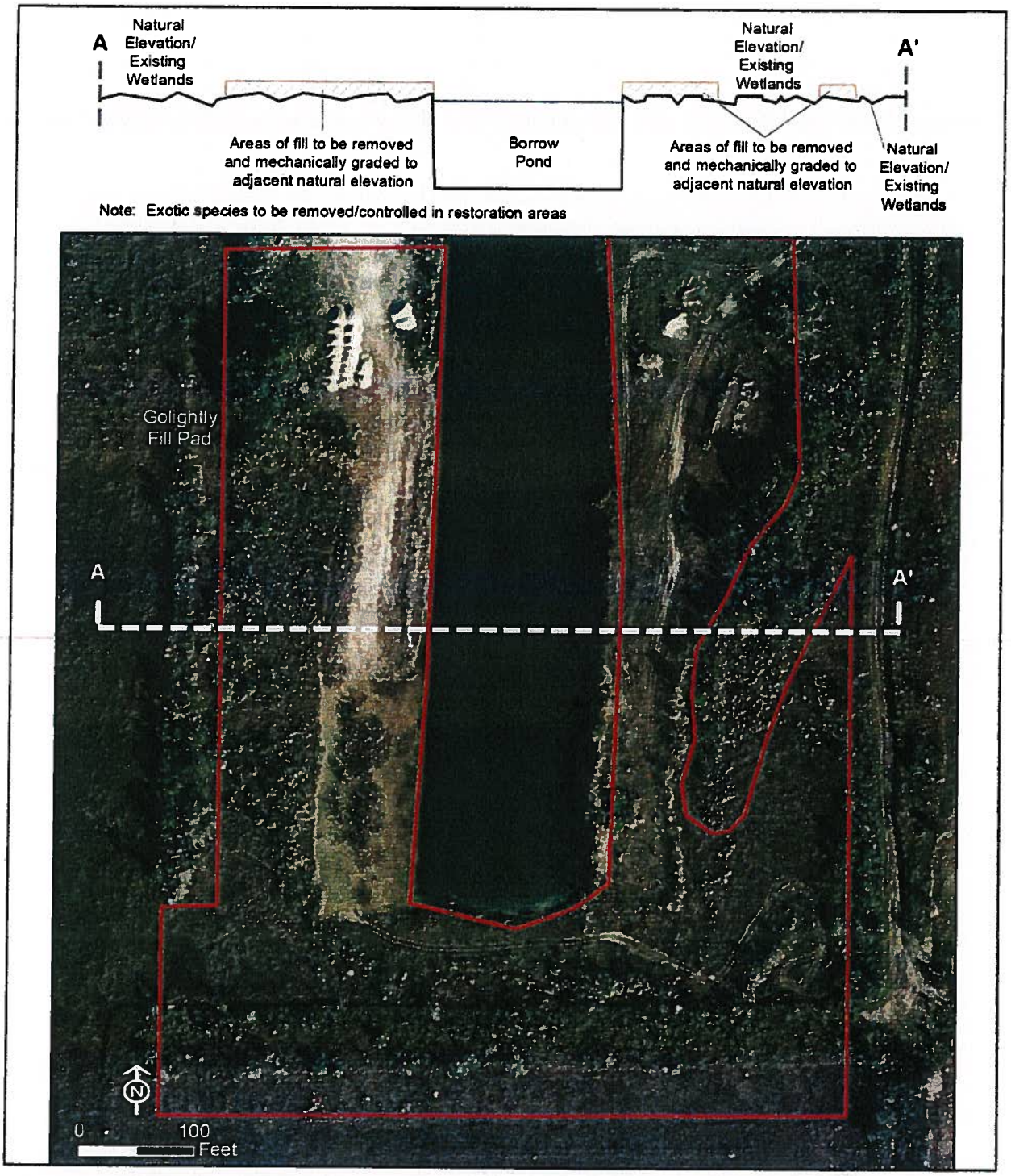
Site 72 - This is a 2.33 acres filled area heavily overgrown and possibly containing structures and debris. The target restoration wetland would be hydric pine and/or cypress.

Site 82 - This is a 0.66 acre fill pad with thick growth of Brazilian pepper. Restoration would be to hydric pine/cypress.



0 2 4 8 Miles

FIGURE 15
Proposed Wetland Restoration Location Map



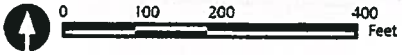


FIGURE 16
Cross Sectional View of Representative Wetland Restoration Area : Golightly Fill Pad

Road removal

Site 120 - This is a mile-long, east-west, elevated road used in the past for ORV access. The site occupies approximately 2.0 acres, and restoration would also benefit downstream wetlands through improved hydrology. The elevated road has altered north-south hydrologic flow, and reduced the hydroperiod of wetlands south of the elevated roadway. Removing the roadway will restore hydrology in a footprint that was estimated to be 200 feet wide, totaling 24.8 acres of hydrologic enhancement of cypress swamp and hydric pine.

A comprehensive mitigation strategy was developed to offset unavoidable impacts to wetlands that would occur as a result of trail head improvements and the construction of turn lanes. Up to five sites totaling up to 40.63 acres of wetlands could be restored to compensate for the expected extent of wetland impacts from trail heads and turn lanes. An UMAM assessment (Table 4) of the potential mitigation sites was conducted to assure that the ecological lift generated by the mitigation would offset the loss generated by the proposed impacts

Table 4. Functional Assessment of Potential Wetland Mitigation

Uniform Mitigation Assessment Method Score (out of 10)									
		Location and Landscape Support		Water Environment		Vegetative Community			
Wetland Mitigation Type	Acreage	Pre	Post	Pre	Post	Pre	Post	Delta	Functional Gain
Wet Prairie - Rut Removal	3.9	8	10	5	10	5	10	0.4	1.6
Wet Prairie - Fill Removal	7	6	10	0	10	0	10	0.7	4.9
Cypress - Fill Removal	1.13	8	10	3	10	3	10	0.53	0.6
Cypress and Hydric Pine - Hydrologic Enhancement	24.8	8	10	6	10	7	10	0.3	7.4
Hydric Pine - Fill Removal	3.8	8	10	3	10	3	10	0.53	2.0
TOTAL	40.63	38	50	17	50	18	50	2.46	16.5

For the mitigation UMAM analysis, the functional gain of the areas evaluated for potential mitigation was estimated for existing and restored conditions for each of the three indicators of wetland function; Location and Landscape Support, the Water Environment, and Community Structure. Functional gain was determined based on the improvement of wetland function from the current to the anticipated restored condition (delta) using methods that have been applied

over hundreds of acres of fill removal, grading of ruts and ridges, and hydrological enhancement at the Preserve. Estimated scores for time lag and risk were determined based on the experience and success in achieving objectives of restoring vegetative structure, hydrology, and patterns of flow. A total of 16.5 units of functional lift were calculated from the proposed restoration activities. The final calculations of functional gain would be made during permitting with the ACOE and the SFWMD. During permitting, an additional level of detail would be required to include field evaluations of each restoration site to assure that hydrological and vegetative restoration could be achieved.

Other mitigation would include BMPs and sustainable design techniques within individual trail heads and turn lanes; standard sediment control measures; surface parking areas with a permeable, natural substrate (aggregate) to mitigate the loss of soil by reducing erosion and channelization from stormwater runoff; and reducing or eliminating impacts from construction over time by maintenance operations.

To minimize wetland resource impacts, BMPs would be implemented during construction. These practices would include employment of staked silt fence and turbidity barriers. Silt fence would be employed prior to commencement of construction around the outer perimeter of each work zone to minimize the potential for impacts to adjacent undisturbed wetlands. Turbidity barriers would be employed in canals and deep water sites prior to commencement of construction at a sufficient distance from the work zone. The barriers would create a temporary mixing zone upstream and downstream of the project area to allow for settling of any turbidity generated during construction. All turbidity barriers would remain in place and be inspected daily throughout the construction phase of the project because the project is located in an Outstanding Florida Water (OFW), which has restrictive water quality requirements. Additionally, a turbidity monitoring plan would be employed during construction. If monitoring reveals that turbidity levels exceed the standards, then construction activities will be immediately halted and shall not resume until corrective actions are employed (e.g., the use of additional turbidity barriers, waiting for rain events to pass, modifications of equipment). After construction, temporarily disturbed areas will be restored to pre-existing conditions (e.g., regraded, soil uncompacted) and replanted with native wetland vegetation. The turbidity barriers and silt fence would be removed at the work areas once turbidity has subsided and all exposed soils are stabilized upon completion of construction.

It is expected that once wetland restoration is implemented, degraded wetlands within the Preserve will return to highly functional wetland systems. The combination of wetland restoration and downstream hydrological enhancement should be adequate to offset proposed wetland impacts associated with project construction.

COMPLIANCE

Actions proposed would impact wetlands, which are considered Waters of the United States. Therefore, the proposed actions pertaining to wetland restoration, trail heads, and turn lanes are subject to review by ACOE under the 404 regulatory programs in compliance with the Clean Water Act (CWA). A permit application, extension, or permit modification would be made to

ACOE for proposed activities that are regulated by that agency in conformance with Section 404 of the CWA. Since the actions proposed involved activities in the surface waters and wetlands of the state of Florida, a joint application would be submitted to the ACOE and SFWMD through the Environmental Resource Permit (ERP) process. The ERP includes stormwater and wetland permitting for the state of Florida, and serves as the water quality certification under Section 401 of the CWA. The ERP is also the means of obtaining concurrence with federal consistency provisions of the Coastal Zone Management Act (CZMA). A permit application, extension, or permit modification would be completed for those activities that require evaluation by these state and federal agencies.

On-site surveys for special status species would be conducted. If such species would be found, consultation with USFWS and the Florida Fish and Wildlife Conservation Commission (FFWCC) would be conducted. Specific design criteria including, but not limited to, actual equipment used, revegetation time and species, and permits would be included in construction documents and forwarded with permit applications, extensions, or permit modifications to ACOE, SFWMD, and/or the Florida Department of Environmental Protection (FDEP).

CONCLUSIONS

NPS has concluded that the preferred alternative as described in the EA, and as outlined above, would adversely affect up to 14 acres of wetland habitat by removal of vegetation, filling of wetlands, excavation, and placement of pavement. The anticipated wetland mitigation within the Preserve would compensate for the loss of wetland function and meet the NPS no-net wetland loss policy. Restoration would be performed to the level necessary to meet the NPS policy of "no net loss" of wetlands and meet federal and state regulatory requirements.

NPS concludes that there is no other practicable alternative for the improvements proposed. There would be a net gain of wetlands within the area as a result of the restoration of previously disturbed areas as potential mitigation. A minimum of 14 acres (1:1 restoration of wetland impacts) of wetlands would be restored to their historical functions within the Preserve. This restoration would more than compensate for the unavoidable impacts anticipated by the construction of the trail heads and turn lanes. In addition to the potential mitigation sites, mitigation would include BMPs and sustainable design principles, micro-siting of the proposed development footprint, stabilization, and maintenance and operation of trail heads in the long term. NPS finds the proposal to be consistent with EO 11990 and the NPS policy of "no net loss" of wetlands.

BIBLIOGRAPHY

National Park Service, U.S. Department of the Interior

1991 General Management Plan and Final Environmental Impact Statement: Big Cypress National Preserve. Prepared by the Denver Service Center, Denver, Colorado.

2000 Final Recreational Off-Road Vehicle Management Plan/ Supplemental Environmental Impact Statement.

2002 Director's Order #77-1: *Wetland Protection.* Washington, DC.

2006a Management Policies: The Guide to Managing the National Park System. Washington, DC. Available on the Internet at <http://www.nps.gov/policy/mp/policies.html>.

2008 Big Cypress National Preserve Geologic Resource Evaluation Report, NPS D-176, February 2008.

2012 National Park Service Procedural Manual #77-1: Wetland Protection.

Welch et al.
1999 "Mapping the Everglades." Photogrammetric Engineering and Remote Sensing 65(2): 166-170.

ATTACHMENT D DESIGNATED ORV TRAIL HEAD AND TURN LAND ENVIRONMENTAL ASSESSMENT BIG CYPRESS NATIONAL PRESERVE BIOLOGICAL OPINION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960
August 13, 2012

Memorandum

To: Pedro Ramos, Superintendent, Big Cypress National Preserve

From: Larry Williams, Field Supervisor, South Florida Ecological Services Office

Subject: Off Road Vehicle (ORV) Trail Heads and U.S. Highway 41 Turn Lanes Project,
Service Federal Activity Code: 2012-CPA-0140;
Service Consultation Code: 2012-I-0139

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion for the construction of ORV trail heads and turn lanes on U.S. Highway 41 in the Big Cypress National Preserve (BCNP) and its effects on the endangered Florida panther (panther; *Puma concolor coryi*) in accordance with section 7 of the Endangered Species Act of 1973, as amended in 1998 (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). The project sites are located in the BCNP, Collier County and Monroe County, Florida (Figure 1).

This Biological Opinion is based on information provided in the National Park Service's (NPS) letter to the Service and Environmental Assessment dated June 4, 2012; meetings, telephone conversations, emails, and other sources of information. A complete administrative record of this consultation is on file at the Service's South Florida Ecological Services Office (SFESO), Vero Beach, Florida.

Consultation History

On June 7, 2012, the Service received a letter and Environmental Assessment from the NPS regarding construction of ORV trail heads and turn lanes on U.S. Highway 41 within the BCNP. The NPS determined the project would "not affect" the threatened eastern indigo snake (*Drymarchon corais couperi*), threatened American crocodile (*Crocodylus acutus*), endangered wood stork (*Mycteria americana*), and endangered West Indian manatee (*Trichechus manatus*). The NPS also determined that the project "may affect, but is not likely to adversely affect" the panther.

On June 28, 2012, Service biologists conducted a site inspection of the proposed ORV trail heads and U.S. Highway 41 turn lanes in the BCNP.

In an email to the NPS dated July 3, 2012, the Service informed the NPS we could not concur with their determinations that the ORV trail heads and U.S. Highway 41 turn lanes project would "not affect" the wood stork, and "may affect, but is not likely to adversely affect" the Florida panther. The Service recommended the NPS change their determination for the wood stork from

"no effect" to "may affect, not likely to adversely affect." The Service also recommended the NPS change their determination for the Florida panther from "may affect, not likely to adversely affect" to "may affect, likely to adversely affect," and request initiation of formal consultation.

On July 11, 2012, and July 20, 2012, staff from the Service and the NPS met via conference call to discuss the project.

As of July 29, 2012, we received all the information necessary for initiation of formal consultation on the Florida panther for this project as required in the regulations governing interagency consultations (50 CFR § 402.14). The Service is providing this Biological Opinion in conclusion of formal consultation.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The NPS proposes to improve trail heads in the BCNP to enhance access for ORV and other recreational users. Improvements are proposed at the following locations: Skillet Strand North, Skillet Strand South, Monroe Station, Sig Walker, Paces' Dike, and Boundary Line. Improvements include the construction of lime rock or asphalt entry ways, parking areas, and stormwater ponds, and the installation of wheel stops, vault toilets, refuse containers, information boards, signs, gates, and back country permit stations. Each trail head site will be landscaped with sod and native plants. To improve traffic safety on U.S. Highway 41, turn lanes will be constructed at Burns Road, the Oasis Visitor Center, the Skillet Strand North and South trail heads, Monroe Station South, and Turner River Road. The project sites are located in the BCNP (Figure 1). The project will impact 14 acres (ac) of wetlands. To compensate for impacts to wetlands, the NPS has proposed to obtain credits from a Service-approved mitigation bank that provides wood stork foraging biomass.

Adverse effect to the Florida panther and proposed compensation

The project sites will impact 17.5 ac of land within the "Primary" zone (Kautz et al. 2006) of the Service's "Focus Area" (as defined on page 4; Figures 2 and 3) for the endangered Florida panther. The project footprints within the Primary Zone are comprised of 3.5 ac of pine forest, 4.9 ac of cypress swamp, 5.3 ac of wet prairie, 0.3 ac of surface waters, and 3.5 ac of urban lands. The Service finds the 17.5-ac project site provides about 13.7 ac of habitat types suitable for panther feeding and dispersal. Therefore, the project will result in the loss of about 13.7 ac (rounded to 14 ac) of panther habitat. The Service has determined the 14 ac of panther habitat to be impacted provide a total of 103.24 Panther Habitat Units (PHUs) (see Appendix A and Table 6).

The NPS has proposed to minimize the adverse effects of the loss of panther habitat resulting from the project by acquiring 258 PHUs from a Service-approved conservation or mitigation bank. The proposed compensation plan provides habitat preservation and restoration near the project area, and is consistent with goal 1.1.1.2.3 in the Panther Recovery Plan (Service 2008) recommending that habitat preservation and restoration be provided, especially within the Primary Zone, in situations where land use intensification cannot be avoided. The applicant has proposed equivalent habitat protection and restoration, to compensate for both the function and value of the lost habitat.

Action area

The action area is defined as all areas to be directly or indirectly affected by the Federal action and not merely the immediate area involved in the action. Therefore, the Service considers the action area for this project as all lands within the footprints of the proposed ORV trail heads and U.S. Highway 41 turn lanes, and all lands located in the Service's panther Focus Area (Focus Area) within 25 miles of the boundary of these footprints (Figure 4). The 25-mile buffer around the project footprint is based on mean dispersal distances of 37.3 kilometers (km) (23.2 miles) (Maehr et al. 2002a), and 40.1 km (24.9 miles) (Comiskey et al. 2002) reported for subadult male panthers. The 25-mile buffer distance encompasses the dispersal distance of both male and female panthers because male panther dispersal distances are known to exceed those reported for female panthers (Maehr et al. 2002a; Comiskey et al. 2002). The size of the action area for this consultation is consistent with action areas defined in our recent biological opinions for the panther, and it encompasses the wide ranging movements of subadult panthers and the large home territories of adult panthers.

The Focus Area denotes areas in Florida where development projects could potentially affect the panther (Figure 2) and is based on the scientific information on panther habitat usage provided in Kautz et al. (2006) and Thatcher et al. (2006). The Focus Area includes lands in Charlotte, Glades, Hendry, Lee, Collier, Palm Beach, Broward, Miami-Dade, and Monroe Counties, as well as the southern portion of Highlands County (Figure 2). Developed urban coastal areas in eastern Palm Beach, Broward, and Miami-Dade Counties, and in western Charlotte, Lee, and Collier Counties were excluded because they contain little or no panther habitat, and it is unlikely panthers would use such areas. Additional details regarding the Panther Focus Area zones (*e.g.*, Primary, Secondary, etc.) can be found in the *Habitat Characteristics/Ecosystem* and *South Florida Panther Population Goal* headings, below. Areas outside of the Panther Focus Area, but within the original Consultation Area (Figure 2), are collectively known as the "Other Zone."

STATUS OF THE SPECIES AND CRITICAL HABITAT RANGEWIDE

Species description

An adult Florida panther is unspotted and typically rusty reddish-brown on the back, tawny on the sides, and pale gray underneath. There has never been a melanistic (black) puma documented in North America (Tinsley 1970; 1987). Adult males can reach a length of 7 ft (2.1 meters [m]) from their nose to the tip of their tail and may exceed 161 pounds (lbs) (73 kg) in weight; but, typically adult males average around 116 lbs (52.6 kg) and stand about 24 to 28 inches (in) (60 to 70 centimeters [cm]) at the shoulder (Roelke 1990). Female panthers are smaller with an average weight of 75 lbs (34 kg) and length of 6 ft (1.8 m) (Roelke 1990). The skull of the Florida panther is unique in that it has a broad, flat, frontal region, and broad, high-arched or upward-expanded nasal bones (Young and Goldman 1946).

Florida panther kittens are gray with dark brown or blackish spots and five bands around the tail. The spots gradually fade as the kittens grow older and are almost unnoticeable by the time they are 6 months old. At this age, their bright blue eyes slowly turn to the light-brown straw color of the adult (Belden 1988).

Three external characteristics – a right angle crook at the terminal end of the tail, a whorl of hair or cowlick in the middle of the back, and irregular, white flecking on the head, nape, and shoulders – not found in combination in other subspecies of *Puma* (Belden 1986), were commonly observed in Florida panthers through the mid-1990s. The kinked tail and cowlicks were considered manifestations of inbreeding (Seal 1994); whereas the white flecking was thought to be a result of scarring from tick bites (Maehr 1992; Wilkins et al. 1997). Four other abnormalities prevalent in the panther population prior to the mid-1990s were cryptorchidism (one or two undescended testicles), low sperm quality, atrial septal defects (the opening between two atria in the heart fails to close normally during fetal development), and immune deficiencies; and these were suspected to be the result of low genetic variability (Roelke et al. 1993a).

A plan for genetic restoration and management of the Florida panther was developed in September 1994 (Seal 1994) and eight non-pregnant adult female Texas panthers (*Puma concolor stanleyana*) were released in five areas of south Florida from March to July 1995. Since this introgression, rates of genetic defects, including crooked tails and cowlicks, have dramatically decreased (Land et al. 2004). In addition, to date, neither atrial septal defects nor cryptorchidism have been found in introgressed panthers (Cunningham 2005a). As of January 27, 2003, none of the eight female Texas panthers introduced in 1995 remain in the wild.

Taxonomy

The Florida panther was first described by Charles B. Cory in 1896 as *Felis concolor floridana* (Cory 1896). The type specimen was collected in Sebastian, Florida. Bangs (1899), however, believed the Florida panther was restricted to peninsular Florida and could not intergrade with other *Felis* spp. Therefore, he assigned it full specific status and named it *Felis coryi* since *Felis floridana* had been used previously for a bobcat (*Lynx rufus*).

The taxonomic classification of the *Felis concolor* group was revised and described by Nelson and Goldman (1929) and Young and Goldman (1946). These authors differentiated 30 subspecies using geographic and morphometric (measurement of forms) criteria and reassigned the Florida panther to subspecific status as *Felis concolor coryi*. This designation also incorporated *F. arundivaga*, which had been classified by Hollister (1911) from specimens collected in Louisiana, into *F. c. coryi*. Nowell and Jackson (1996) reviewed the genus *Felis* and placed mountain lions, including the Florida panther, in the genus *Puma*. The taxonomic classification of the puma is now considered to be *Puma concolor* (Wozencraft 1993), making the accepted name for the Florida panther *P. c. coryi*.

Culver et al. (2000) examined genetic diversity within and among the described subspecies of *Puma concolor* using three groups of genetic markers and proposed a revision of the genus to include only six subspecies, one of which encompassed all puma in North America including the Florida panther. However, Culver et al. (2000) determined the Florida panther was one of several smaller populations that had unique features. Specifically, the number of polymorphic microsatellite loci and amount of variation were lower, and it was highly inbred (eight fixed loci). The degree to which the scientific community accepted the results of Culver et al. (2000) and the proposed change in taxonomy is not resolved at this time (Service 2008). The Florida panther remains listed as a subspecies, and continues to receive protection pursuant to the Act.

Federal status

The Florida panther is the last subspecies of *Puma* (also known as mountain lion, cougar, panther, or catamount) still surviving in the eastern United States. Historically occurring throughout the southeastern United States (Young and Goldman 1946), today the panther is restricted to less than 5 percent of its historic range in one breeding population of approximately 100 animals, located in south Florida.

When Europeans first came to this country, pumas roamed most all of North, Central, and South America. Early settlers attempted to eradicate pumas by every means possible. By 1899, it was believed Florida panthers had been restricted to peninsular Florida (Bangs 1899). By the late 1920s to mid-1930s, it was thought by many the Florida panther had been completely extirpated (Tinsley 1970). In 1935, Dave Newell, a Florida sportsman, hired Vince and Ernest Lee, Arizona houndsmen, to hunt for panthers in Florida. They killed eight in the Big Cypress Swamp (Newell 1935). Every survey conducted since then confirmed a breeding panther population occurs in southern Florida south of the Caloosahatchee River, and no survey since then has been able to confirm a reproducing panther population outside of southern Florida.

Attempts to eradicate panthers and a decline in panther prey (primarily white-tailed deer [*Odocoileus virginianus*]) resulted in a panther population threatened with extinction. Prior to 1949, panthers could be killed in Florida at any time of the year. In 1950, the Florida Game and Freshwater Fish Commission (now Florida Fish and Wildlife Conservation Commission [FWC]) declared the panther a regulated game species due to concerns over declining numbers. The FWC removed panthers from the game animal list in 1958 and gave them complete legal protection. On March 11, 1967, the Service listed the panther as endangered (32 FR 4001) throughout its historic range, and these animals received Federal protection under the passage of the Act. In addition, the Florida Panther Act (Florida Statute 372.671), a 1978 Florida State law, made killing a panther a felony. The Florida panther is listed as endangered by the States of Florida, Georgia, Louisiana, and Mississippi. Because the panther was designated as an endangered species prior to enactment of the Act, there was no formal listing package identifying threats to the species as currently required by section 4(a)(1) of the Act. However, the Florida Panther Recovery Plan, third revision, addressed the five factor threats analysis (Service 2008). Critical habitat has not been designated for the panther.

Life history

Reproduction

Male Florida panthers are polygynous, maintaining large, overlapping home ranges containing several adult females and their dependent offspring. The first sexual encounters for males normally occur at about 3 years based on 26 radio-collared panthers of both sexes (Maehr et al. 1991). Based on genetics work, some males may become breeders as early as 17 months. Breeding activity peaks from December to March (Shindle et al. 2003). Litters (n = 82) are produced throughout the year, with 56 to 60 percent of births occurring between March and June (Jansen et al. 2005; Lotz et al. 2005). The greatest number of births occurs in May and June (Jansen et al. 2005; Lotz et al. 2005). Female panthers have bred as young as 18 months (Maehr

et al. 1989) and successful reproduction has occurred up to 11 years old. The mean age of denning females is 4.6 ± 2.1 (standard deviation [sd]) years (Lotz et al. 2005). Age at first reproduction for 19 known-aged female panthers averaged 2.2 ± 0.246 (sd) years and ranged from 1.8 to 3.2 years. Average litter size is 2.4 ± 0.91 (sd) kittens. Seventy percent of litters are comprised of either two or three kittens. Mean birth intervals (elapsed time between successive litters) are 19.8 ± 9.0 (sd) months for female panthers (n = 56) (range 4.1 to 36.5 months) (Lotz et al. 2005). Females that lose their litters generally produce another more quickly; five of seven females whose kittens were brought into captivity successfully produced another litter an average of 10.4 months after the removal of the initial litter (Land 1994).

Panther dens are usually located closer to upland hardwoods, pinelands, and mixed wet forests and farther from freshwater marsh-wet prairie (Benson et al. 2008). Most den sites are located in dense saw palmetto (*Serenoa repens*), shrubs, or vines (Maehr 1990; Shindle et al. 2003, Benson et al. 2008). Den sites are used for 6 to 8 weeks by female panthers and their litters from birth to weaning (Benson et al. 2008). Independence and dispersal of young typically occurs at 18 months, but may occur as early as one year (Maehr 1992).

Survivorship and causes of mortality

Benson et al. (2009) analyzed survival and cause-specific mortality of subadult and adult Florida panthers. They found that sex and age influenced panther survival, as females survived better than males, and older adults (≥10 years) survived poorly compared with younger adults. Genetic ancestry strongly influenced annual survival of subadults and adults after introgression, as F_1 generation admixed panthers survived longer than pre-introgression panthers and non-F_1 admixed individuals (Benson et al. 2009).

Mortality records for uncollared panthers have been kept since February 13, 1972, and for radio-collared panthers since February 10, 1981. Through March 3, 2012, 317 mortalities have been documented. Of the 317 total mortalities, 161 were radio-collared panthers that died since 1981 (FWC 2010a). Intraspecific aggression was the leading cause of mortality for radio-collared panthers, and was more common for males than females (Benson et al. 2009). Older-adult males had significantly higher and subadult males had marginally higher mortality due to intraspecific aggression than prime-adult males (Benson et al. 2009). Most intraspecific aggression occurs between male panthers; but, aggressive encounters between males and females have occurred, resulting in the death of the female. Defense of kittens and\or a kill is suspected in half (5 of 10) of the known instances through 2003 (Shindle et al. 2003).

Following intraspecific aggression, the greatest causes of mortality for radio-collared Florida panthers was from unknown causes, vehicles, and other (Benson et al. 2009). From February 13, 1972, through June 19, 2012, 172 Florida panthers (radio-collared and uncollared) were hit by vehicles (FWC 2010a). These collisions resulted in 164 panther fatalities and 8 non-fatal injuries. The number of panther/vehicle collisions per year is positively correlated with the annual panther count (McBride et al. 2008).

Female panthers are considered adult residents if they are older than 18 months, have established home ranges and bred (Maehr et al. 1991). Land et al. (2004) reported 23 of 24 female panthers first captured as kittens survived to become residents and 18 (78.3 percent) produced litters;

1 female was too young to determine residency. Male panthers are considered adult residents if they are older than 3 years and have established a home range that overlaps with females. Thirty-one (31) male panthers were captured as kittens and 12 (38.7 percent) of these cats survived to become residents (Jansen et al. 2005; FWC 2005). "Successful male recruitment may depend on the death or home range shift of a resident adult male" (Maehr et al. 1991). Turnover in the breeding population is low with documented mortality in radio-collared panthers being greatest in subadult and non-resident males (Maehr et al. 1991; Shindle et al. 2003).

Den sites of female panthers have been visited since 1992 and the kittens tagged with passive integrated transponder chips. Annual survival of these kittens has been determined to be 0.328 ± 0.072 (SE) (Hostetler et al. 2009). There was no evidence that survival rate differed between male and female kittens or was influenced by litter size. Hostetler et al. (2009) found kitten survival generally increased with degree of admixture with introduced Texas pumas and decreased with panther abundance. Kitten survival is lowest during the first 3 months of their lives (Hostetler et al. 2009).

Dispersal

Panther dispersal begins after a juvenile becomes independent from its mother and continues until it establishes a home range. Dispersal distances are greater for males than females. Maehr et al. (2002a) reported a mean dispersal distance of 42.5 miles [68.4 km] for male panthers (n = 18) and 12.6 miles [20.3 km] for female panthers (n = 9). The maximum dispersal distance recorded for a young male was 139.2 miles (224.1 km) over a 7-month period followed by a secondary dispersal of 145 miles (233 km). Comiskey et al. (2002) found that males disperse an average distance of 25 miles (40 km) and females typically remain in or disperse short distances from their natal ranges. Female dispersers are considered philopatric because they usually establish home ranges less than one average home range width from their natal range (Maehr et al. 2002a). Maehr et al. (2002a) reported that all female dispersers (n = 9) were successful at establishing a home range whereas only 63 percent of males (n = 18) were successful. Young panthers become independent at 14 months on average for both sexes, but male dispersals are longer in duration than female dispersals (9.6 months and 7.0 months, respectively) (Maehr et al. 2002a). Dispersing males usually go through a period as transient (non-resident) subadults, moving through the fringes of the resident population and often occupying suboptimal habitat until an established range becomes vacant (Maehr 1997).

Most panther dispersal occurs south of the Caloosahatchee River. However, panthers have been documented north of the Caloosahatchee River over 125 times since February 1972 through field signs (*e.g.*, tracks, urine markers, scats), camera-trap photographs, carcasses from seven vehicle-related mortalities, telemetry from four radio-collared animals (Land and Taylor 1998; Land et al. 1999; Shindle et al. 2000; Maehr et al. 2002a; Belden and McBride 2005), two captured animals (one of which was radio collared), and one skeleton. From 1972 through 2004, panthers have been confirmed in 11 counties (Flagler, Glades, Highlands, Hillsborough, Indian River, Okeechobee, Orange, Osceola, Polk, Sarasota, Charlotte, and Volusia) north of the river (Belden et al. 1991; Belden and McBride 2005). However, to date, successful panther reproduction has not been documented north of the Caloosahatchee River (Belden and McBride 2005).

The Caloosahatchee River, a narrow (295-328 ft [90-100 m]), channelized river, and is probably is not a significant barrier to panther movements. Western subspecies of *Puma* are known to cross wide, swift-flowing rivers up to a mile in width (Seidensticker et al. 1973; Anderson 1983). However, the combination of the river, SR 80, and land uses along the river seems to have somewhat restricted panther dispersal northward (Maehr et al. 2002a). Documented physical evidence of at least 15 other uncollared male panthers has been confirmed north of the river since 1972, but neither female panthers nor reproduction have been documented in this area since 1973 (Belden and McBride 2005).

Home range dynamics and movements

Panthers require large areas to meet their needs. Numerous factors influence panther home range size, including: habitat quality, prey density, and landscape configuration (Belden 1988; Comiskey et al. 2002). Home range sizes of six radio-collared panthers monitored between 1985 and 1990 averaged 128,000 ac (51,800 hectares [ha]) for resident adult males and 48,000 ac (19,425 ha) for resident adult females; transient males had a home range of 153,599 ac (62,160 ha) (Maehr et al. 1991). Comiskey et al. (2002) examined the home range size for 50 adult panthers (residents greater than 1.5 years old) monitored in south Florida from 1981 to 2000 and found resident males had a mean home range of 160,639 ac (65,009 ha) and females had a mean home range of 97,920 ac (39,627 ha). Beier et al. (2003) found home range size estimates for panthers reported by Maehr et al. (1991) and Comiskey et al. (2002) to be reliable.

Annual minimum convex polygon home range sizes of 52 adult radio-collared panthers monitored between 1998 and 2002 ranged from 15,360 to 293,759 ac (6,216 to 118,880 ha), averaging 89,600 ac (36,260 ha) for 20 resident adult males and 44,160 ac (17,871 ha) for 32 resident adult females (Land et al. 1999, 2002; Shindle et al. 2000, 2001). The most current estimate of home-range sizes (minimum convex polygon method) for established, non-dispersing, adult, radio-collared panthers averaged 29,056 ac (11,759 ha) for females (n = 11) and 62,528 ac (25,304 ha) for males (n = 11) (Lotz et al. 2005). The average home range was 35,089 ac (14,200 ha) for resident females (n = 6) and 137,143 ac (55,500 ha) (n = 5) for males located at BICY (Jansen et al. 2005). Home ranges of resident adults tend to be stable unless influenced by the death of other residents; however, several males have shown significant home range shifts that may be related to aging. Home-range overlap is extensive among resident females and limited among resident males (Maehr et al. 1991).

Activity levels for Florida panthers are greatest at night with peaks around sunrise and after sunset (Maehr et al. 1990a). The lowest activity levels occur during the middle of the day. Female panthers at natal dens follow a similar pattern with less difference between high and low activity periods.

Telemetry data indicate panthers typically do not return to the same resting site day after day, with the exception of females with dens or panthers remaining near kill sites for several days. The presence of physical evidence, such as tracks, scats, and urine markers, confirms panthers move extensively within home ranges, visiting all parts of the range regularly in the course of hunting, breeding, and other activities (Maehr 1997; Comiskey et al. 2002). Males travel widely throughout their home ranges to maintain exclusive breeding rights to females. Females without

kittens also move extensively within their ranges (Maehr 1997). Panthers are capable of moving large distances in short periods of time. Nightly panther movements of 12 miles (20 km) are not uncommon (Maehr et al. 1990a).

Intraspecific interactions

Interactions between panthers occur indirectly through urine markers or directly through contact. Urine markers are made by piling ground litter using a backwards-pushing motion with the hind feet. This pile is then scent-marked with urine and occasionally feces. Both sexes make urine markers. Apparently, males use them as a way to mark their territory and announce presence while females advertise their reproductive condition (FWC 2011a).

Adult females and their kittens interact more frequently than any other group of panthers. Interactions between adult male and female panthers last from 1 to 7 days and usually result in pregnancy (Maehr et al. 1991). Aggressive interactions between males often result in serious injury or death. Independent subadult males have been known to associate with each other for several days and these interactions do not appear to be aggressive in nature. Aggression between males is the most common cause of male mortality and an important determinant of male spatial and recruitment patterns based on radio-collared panthers (Maehr et al. 1991; Shindle et al. 2003). Aggressive encounters between radio-collared males and females also have been documented (Shindle et al. 2003; Jansen et al. 2005).

Food habits

Primary panther prey species are white-tailed deer and feral hog (*Sus scrofa*) (Maehr et al. 1990b; Dalrymple and Bass 1996). Generally, feral hogs constitute the greatest biomass consumed by panthers north of the Alligator Alley section of I-75, while white-tailed deer are the greatest biomass consumed to the south (Maehr et al. 1990b). Secondary prey species include raccoons (*Procyon lotor*), nine-banded armadillos (*Dasypus novemcinctus*), marsh rabbits (*Sylvilagus palustris*) (Maehr et al. 1990b) and American alligators (*Alligator mississippiensis*) (Dalrymple and Bass 1996). No seasonal variation in diet has been detected. Maehr et al. (1990b) rarely observed domestic livestock in scats or kills of the Florida panther, although cattle were readily available in the study area. Recently, a male panther, believed to be associated with calf depredations, was captured and collared in eastern Collier County (FWC 2010c).

Little information on the feeding frequency of the Florida panther is available. However, the feeding frequency of the Puma is likely similar to the feeding frequency of the Florida panther. Ackerman et al. (1986) reported a resident adult male puma generally consumes one deer-sized prey every 8 to 11 days. Moreover, a female puma will consume one deer-sized prey item every 14 to 17 days for a resident female and one deer-sized prey item every 3.3 days for a female with three 13-month-old kittens.

Infectious diseases, parasites, and environmental contaminants

Viral Diseases - Feline leukemia virus (FeLV) is common in domestic cats (*Felis catus*), but is quite rare in non-domestic felids. Routine testing for FeLV antigen (indicating active infection)

in captured and necropsied panthers was negative since testing began in 1978. However, between November 2002 and February 2003, two panthers tested FeLV antigen positive (Cunningham 2005b; Cunningham et al. 2008). The following year, three more cases were diagnosed (Brown et al. 2008). All infected panthers had overlapping home ranges in the Okaloacoochee Slough ecosystem. Three of the panthers died due to suspected FeLV-related diseases (opportunistic bacterial infections and anemia) and the two others died from intraspecific aggression. Testing of serum samples collected from 1990 to 2005 for antibodies (indicating exposure) to FeLV indicated increasing exposure to FeLV beginning in the late 1990s and concentrated north of I-75. There was apparently minimal exposure to FeLV during this period south of I-75. Positive antibody titers in different areas at different times indicate multiple introductions of the virus into the panther population may have occurred. These smaller epizootics were apparently self-limiting and did not result in any known mortalities. Positive antibody titers, in the absence of an active infection (antigen positive), indicate panthers can be exposed and overcome the infection (Cunningham 2005a). Genetic analysis of the panther FeLV determined that the source of this outbreak was a cross-species transmission from a domestic cat (Brown et al. 2008). Management of the disease includes vaccination (Cunningham et al. 2008) as well as removal of infected panthers to captivity for quarantine and supportive care. As of June 1, 2005, about one-third of the population had received at least one vaccination against FeLV (Cunningham et al. 2008). No new positive cases have been diagnosed since July 2004; however, the potential for reintroduction of the virus remains (Cunningham et al. 2008).

Pseudorabies virus (PRV aka Aujeszky's disease) causes respiratory and reproductive disorders in adult hogs and mortality in neonates, but is a rapidly fatal neurologic disease in carnivores. At least one panther died from PRV infection presumably through consumption of an infected feral hog (Glass et al. 1994). At least one panther has also died of rabies (Taylor et al. 2002). This panther was radio-collared but not vaccinated against the disease.

Feline immunodeficiency virus (FIV) is a retrovirus of felids that is endemic in the panther population. About 28 percent of Florida panthers were positive for antibodies to the puma lentivirus strain of FIV (Olmstead et al. 1992); however, the prevalence may be increasing. Between November 2004 and April 2005, 13 of 17 (76 percent) panthers tested were positive (M. Cunningham, FWC, unpublished data). The cause of this increase is unknown but warrants continued monitoring and investigation. There is also evidence of exposure to Feline panleukopenia virus (PLV) in adult panthers (Roelke et al. 1993b) although no PLV-related mortalities are known to have occurred.

Serological evidence of other viral diseases in the panther population includes feline calicivirus, feline herpes virus, and West Nile virus. However, these diseases are not believed to cause significant morbidity or mortality in the population. All panthers found dead due to unknown causes are tested for alphaviruses, flaviviruses (including West Nile virus), and canine distemper virus. These viruses have not been detected in panthers by viral culture or polymerase chain reaction (FWC, unpublished data).

Other infectious diseases

Bacteria have played a role in free-ranging panther morbidity and mortality as opportunistic pathogens, taking advantage of pre-existing trauma or FeLV infections (FWC, unpublished data). Dermatophytosis (ringworm infection) has been diagnosed in several panthers and resulted in

severe generalized infection in at least one (Rotstein et al. 1999). Severe infections may reflect an underlying immunocompromise, possibly resulting from inbreeding depression or immunosuppressive viral infections.

Parasites

The hookworm (*Ancylostoma pluridentatum*) is found in a high prevalence in the panther population. Other parasites identified from live-captured or necropsied panthers include: eight arthropod species, eight nematode species, three cestode species, two trematode species, and three protozoa species (Forrester et al. 1985; Forrester 1992; Wehinger et al. 1995; Rotstein et al. 1999; Land et al. 2002; Foster et al. 2006). Of these, only an arthropod, *Notoedres felis*, caused significant morbidity in at least one panther (Maehr et al. 1995).

Environmental contaminants

Overall, mercury in south Florida biota has decreased over the last several years (Frederick et al. 2002). However, high mercury concentrations are still found in some panthers. At least one panther is thought to have died of mercury toxicosis, and mercury has been implicated in the death of two other panthers in ENP (Roelke 1991). One individual panther had mercury concentrations of 150 parts per million (ppm) in its hair (Land et al. 2004). Elevated levels of p, p'– DDE were also detected in fat from that panther. The role of mercury and/or p, p'– DDE in this panther's death is unknown and no cause of death was determined despite extensive diagnostic testing. Elevated mercury concentrations have also been found in panthers from Florida Panther National Wildlife Refuge (FPNWR). Two sibling neonatal kittens from this area had hair mercury concentrations of 35 and 40 ppm. Although other factors were believed to have been responsible, these kittens did not survive to leave their natal den and neonates may be more susceptible to the toxic effects of mercury (Berglund and Berlin 1969). Consistently high hair mercury values in ENP and FPNWR, and the finding of elevated values in some portions of BICY, warrant continued monitoring (Land et al. 2004). Other environmental contaminants found in panthers include polychlorinated biphenyls (Arochlor 1260).

Population dynamics / Status and distribution

The Florida panther once ranged throughout the southeastern United States from Arkansas and Louisiana eastward across Mississippi, Alabama, Georgia, Florida, and parts of South Carolina and Tennessee (Young and Goldman 1946). Historically, the panther intergraded to the north with *P. c. cougar*, to the west with *P. c. stanleyana*, and to the northwest with *P. c. hippolestes* (Young and Goldman 1946).

Although generally considered unreliable, sightings of panthers regularly occur throughout the southeast. Nonetheless, a reproducing population of panthers has not been documented to occur outside of south Florida for at least 30 years despite an extensive search effort (Belden et al. 1991; McBride et al. 1993; Clark et al. 2002). Survey reports and more than 70,000 locations of radio-collared panthers recorded between 1981 and 2004 clearly define the panther's current breeding range. Reproduction is known only in the Big Cypress Swamp and Everglades physiographic region in Collier, Lee, Hendry, Miami-Dade, and Monroe Counties, south of the Caloosahatchee River (Belden et al. 1991). As discussed previously, panthers occasionally disperse north of the Caloosahatchee River. However, these animals are likely all males

searching to establish new territories. There is no evidence of female panthers or successful panther reproduction currently occurring north of the Caloosahatchee River (Nowak and McBride 1974; Belden et al. 1991; Land and Taylor 1998; Land et al. 1999; Shindle et al. 2000; McBride 2002; Belden and McBride 2005).

Puma are wide ranging, secretive, and occur at low densities. However, their tracks, urine markers, and scats are readily found by trained observers, and resident populations are easily located. Van Dyke et al. (1986a) determined that all resident puma, 78 percent of transient puma, and 57 percent of kittens could be detected by track searches in Utah. During 2 month-long investigations – one late in 1972 and early 1973 and another in 1974 – funded by the World Wildlife Fund to determine if panthers still existed in Florida, McBride searched for signs of panthers in portions of south Florida. In 1972, McBride authenticated a road-killed male panther in Glades County and a female captured and released from a bobcat trap in Collier County (R. McBride, personal communication 2005). In 1973, McBride captured one female in Glades County (Nowak and McBride 1974). Based on this preliminary evidence, Nowak and McBride (1974) estimated the "population from the Lake Okeechobee area southward to be about 20 or 30 individuals." In 1974, McBride found evidence of only two additional panthers in the Fakahatchee Strand and suggested that "there could be as few as 10 individual panthers in the area around Lake Okeechobee and southward in the State" (Nowak and McBride 1975). This initial survey, while brief in nature, proved that panthers still existed in Florida and delineated areas where a more exhaustive search was warranted. After this initial investigation, more comprehensive surveys on both public and private lands were completed (Reeves 1978; Belden and McBride 1983; Belden et al. 1991).

Using a population genetics approach, Culver et al. (2008) estimated that, to reduce the microsatellite variation to that seen in the Florida panther, a very small bottleneck size of approximately two animals (N_e) for several generations and a small effective population size (N_e) in other generations would be necessary. Using demographic data from Yellowstone pumas, Culver et al. (2008) estimated the ratio of effective (N_e) to census (N) population size to be 0.315 (N_e)/(N). Using this ratio, they determined that, for the Florida panther, the census population size necessary to explain the loss of microsatellite variation was approximately 41 (0.315=12.9/41) for the non-bottleneck generations and 6.2 (0.315=1.95/6.2) for the two bottleneck generations.

Minimum population counts

McBride et al. (2008) and McBride (2010) reported minimum population counts (*i.e.*, number known alive) based on physical evidence (*e.g.*, tracks, urine markers, panther treed with hounds, trail-camera photos). They counted adult and subadult panthers, but not kittens at the den. Three rules were used to distinguish individuals: (1) gender was determined by track size or stride length; (2) time (freshness) was determined by known events within the past 24 hours, such as wind or rain; and (3) distance between individual track sets. These rules were used as an exclusionary tool to avoid over-counting (McBride et al. 2008). The number of panthers detected and verified by physical evidence from 1981 to 1994 fluctuated between a high of 30 and a low of 19 adult and juvenile panthers, with the lowest point occurring in 1991 following the removal of seven juveniles and three kittens to initiate a captive breeding program (McBride et al. 2008). In 1995,

eight female pumas from Texas were released to address suspected deleterious effects of inbreeding. From 1996 to 2003, the panther population was increasing at a rate of 14 percent per year with 26.6 kittens being produced annually (Johnson et al. 2010). The effective population size (N_e) rose from 16.4 in 1995 to 32.1 in 2007, with corresponding census populations (N) of 26 and 102, respectively. The corresponding N_e /N ratios were 0.631 and 0.314 (Johnson et al. 2010). The deterministic annual growth rate (λ) for pre-1995 panthers was 0.952 ± 0.026 (SE), suggestive of a shrinking population (Hostetler et al. 2009). However, the λ for the overall population now is 1.052 ± 0.023, suggestive of a growing population (Hostetler et al. 2009).

The population tripled since 1995 (McBride et al. 2008, Johnson et al. 2010), reaching a high of 117 by 2007 (mortalities not subtracted). Data reported in McBride (2000, 2001, 2004, 2006, 2007, and 2008), McBride et al. (2008, 2012), Johnson et al. (2010), and FWC (2002, 2003) noted minimum population counts of 62 panthers in 2000, 78 in 2001, 80 in 2002, 87 in 2003, 78 in 2004, 82 in 2005, 97 in 2006, 117 in 2007, 104 in 2008, 113 in 2009, 115 in 2010, and 111 in 2011.

Population density

Maehr et al. (1991) provide an estimate of population density of 1 panther per 27,520 ac, based on 17 concurrently radio-collared and 4 uncollared panthers. They extrapolated this density to the area occupied by radio-collared panthers (1,245,435 ac) during the period 1985 to 1990 to achieve a population estimate of 46 adult panthers for southwest Florida (excluding ENP, eastern BCNP, and Glades and Highlands Counties). Beier et al. (2003), however, argued that this estimate of density, although "reasonably rigorous," could not be extrapolated to other areas because it was not known whether densities were comparable in those areas. Kautz et al. (2006) provided a density estimate of 1 panther per 31,923 ac by dividing the panther count at that time (67) by the area within the Primary Zone. However, panther densities are variable across the landscape. Using an average of the 2007 to 2009 panther counts in the eight survey units covered by McBride et al. (2008) and Kautz et al. (2006), the density estimates range from a low of 1 panther per 81,479 ac to a high of 1 panther per 7,850 ac for the Primary Zone lands within these survey units.

FWC (2010b) provided an upper bound population estimate of 0.0177 panthers per square-kilometer (km^2) or 1 panther per 13,929 ac. Applying this density estimate to the Primary Zone (9,189 km^2) (2,270,652 ac) yields an upper estimate of 163 adult panthers. FWC's lower boundary limit is 100 panthers (1.09 panthers per 100 km^2 or 1 panther per 22,707 ac) and is based on annual verified panther sign data (McBride et al. 2008) and minimum number of panthers known to be alive (FWC 2010b). Applying the four densities to the Primary Zone would yield a population based on Kautz et al.'s (2006) density estimate of 71 panthers (1 panther per 31,923 ac). Maehr et al.'s (1991) estimate would yield a population of 83 panthers (1 panther per 27,520 ac) and FWC's (2010b) estimate would yield a low of 100 panthers (1 panther per 22,707 ac) and a high of 163 panthers (1 panther per 13,929 ac). For our evaluations however, the Service is continuing to use the average densities provided by Kautz et al. (2006) of one panther per 12,919 ha (31,923 ac) or one panther per 129 km^2.

Habitat characteristics/ecosystem

Landscape composition

Noss and Cooperrider (1994) considered the landscape implications of maintaining viable panther populations. Assuming a male home range size of 137,599 ac (55,685 ha) (Maehr 1990), an adult sex ratio of 50:50 (Anderson 1983), and some margin of safety, they determined that a reserve network as large as 15,625 to 23,438 mi^2 (40,469 to 60,703 km^2) would be needed to support an effective population size of 50 individuals (equating to an actual adult population of 100 to 200 panthers [Ballou et al. 1989]). However, to provide for long-term persistence based on an effective population size of 500 individuals (equating to 1,000 to 2,000 adult panthers [Ballou et al. 1989]), could require as much as 156,251 to 234,376 mi^2 (404,687 to 607,031 km^2). This latter acreage corresponds to roughly 60 to 70 percent of the Florida panther's historical range. Although it is uncertain whether this much land is needed for panther recovery, it does provide some qualitative insight into the importance of habitat conservation across large landscapes for achieving a viable panther population (Noss and Cooperrider 1994).

Between 1981 and 2010, more than 90,000 locations were collected from more than 180 radio-collared panthers. Belden et al. (1988); Maehr et al. (1991); Maehr and Cox (1995); Maehr (1997); Kerkoff et al. (2000); Comiskey et al. (2002); Cox et al. (2006); and Kautz et al. (2006) provide information on habitat use based on various subsets of these data. Since almost all locations from radio collars have been collected during daytime hours (generally 0700 to 1100) using very high frequency (VHF) aerial telemetry, and because panthers are most active during nocturnal and crepuscular periods (Maehr et al. 1990a), daytime telemetry data may be insufficient to describe habitat use patterns of nocturnal animals (Beyer and Haufler 1994; Comiskey et al. 2002; Beier et al. 2003; Dickson et al. 2005; Beier et al. 2006). However, Land et al. (2008), investigated habitat selection of 12 panthers in the northern portion of the breeding range using Global Positioning System (GPS) telemetry data collected during nocturnal and diurnal periods, as well as VHF telemetry data collected only during diurnal periods, and found that analysis of both types of telemetry data yielded similar results.

A landscape-level strategy for the conservation of the panther population in south Florida was developed using a Florida panther potential habitat model based on the following criteria: (1) forest patches greater than 4.95 ac (2 ha); (2) non-urban cover types within 656 ft (200 m) of forest patches; and (3) exclusion of lands within 984 ft (300 m) of urban areas (Kautz et al. 2006). In developing the model, data from radio-collared panthers collected from 1981 through 2000 were used to evaluate the relative importance of various land cover types as panther habitat, thus identifying landscape components important for panther habitat conservation. Those components were then combined with a least cost path (LCP) analysis to delineate three panther habitat conservation zones for south Florida: (1) Primary Zone – lands important to the long-term viability and persistence of the panther in the wild; (2) Secondary Zone – lands which few panthers use contiguous with the Primary Zone, but given sufficient habitat restoration could accommodate expansion of the panther population south of the Caloosahatchee River; and (3) Dispersal Zone – the area which may facilitate future panther expansion north of the Caloosahatchee River (Kautz et al. 2006) (Figures 2 and 3). The Primary Zone is currently occupied and supports the breeding population of panthers. The Secondary Zone could support resident panthers with sufficient restoration. Although panthers move through the Dispersal Zone, it is not currently occupied by resident panthers.

These zones vary in size, ownership, and land cover composition. The Primary Zone is 2,270,711 ac (918,928 ha) in size, 73 percent of which is publicly owned, and includes portions of the BICY, ENP, Fakahatchee Strand Preserve State Park (FSPSP), FPNWR, Okaloacoochee Slough State Forest, and Picayune Strand State Forest. This zone's composition is 45 percent forest, 41 percent freshwater marsh, 7.6 percent agriculture lands, 2.6 percent prairie and shrub lands, and 0.52 percent urban lands (Kautz et al. 2006). The Secondary Zone is 812,157 ac (328,670 ha) in size, 38 percent of which is public land. This zone's composition is 43 percent freshwater marsh, 36 percent agriculture, 11 percent forest, 6.1 percent prairie and shrub lands, and 2.3 percent low-density residential areas and open urban lands (Kautz et al. 2006). The Dispersal Zone is 28,160 ac (11,396 ha) in size, 12 percent of which is either publicly owned or in conservation easement. This zone's composition is 49 percent agriculture (primarily improved pasture and citrus groves), 29 percent forest (wetland and upland), 8.8 percent prairie and shrub land, 7.5 percent freshwater marsh, and 5.1 percent barren and urban lands (Kautz et al. 2006).

As part of their evaluation of occupied panther habitat, in addition to the average density estimate of one panther per 27,181 ac (11,000 ha) developed by Maehr et al. (1991), Kautz et al. (2006) estimated the average density during the timeframe of the study, based on telemetry and other occurrence data, to average one panther per 31,923 ac (12,919 ha). In the following discussions of the number of panthers that a particular zone may support, the lower number is based on the 31,923 ac (12,919 ha) value (Kautz et al. 2006) and the higher number is based on the 27,181 ac (11,000 ha) value (Maehr et al. 1991).

Based on these average densities, the Primary Zone could support 71 to 84 panthers; the Secondary Zone could support 8 to 10 panthers without habitat restoration and 25 to 30 panthers with habitat restoration (existing high quality panther habitat currently present in the Secondary Zone is estimated at 32 percent of the available Secondary Zone lands); and the Dispersal Zone could support 0 panthers. Taken together, the three zones in their current condition have the capacity to support about 79 to 94 Florida panthers.

Kautz et al.'s (2006) assessment of available habitat south of the Caloosahatchee River determined that non-urban lands in the Primary, Secondary, and Dispersal Zones were not sufficient to sustain a population of 240 individuals south of the Caloosahatchee River. However, Kautz et al. (2006) determined sufficient lands were available south of the Caloosahatchee River to support a population of 79 to 94 individuals (although not all lands are managed and protected).

Even though some suitable panther habitat remains in south-central Florida, it is widely scattered and fragmented (Belden and McBride 2005). Thatcher et al. (2006) used a statistical model in combination with a geographic information system (GIS) to develop a multivariate landscape-scale habitat model based on the Mahalanobis distance statistic (D^2) to evaluate habitats in south central Florida for potential expansion of the Florida panther population. They identified four potential habitat patches: the Avon Park Bombing Range area, Fisheating Creek/Babcock-Webb Wildlife Management Area (WMA), eastern Fisheating Creek, and the Duette Park/Manatee County area. These habitat patches are smaller and more isolated compared with the current Florida panther range, and the landscape matrix where these habitat patches exist provides

relatively poor habitat connectivity among the patches (Thatcher et al. 2006, 2009). Major highways and urban or agricultural development isolate these habitat patches, and they are rapidly being lost to the same development that threatens southern Florida (Belden and McBride 2005).

Panther habitat use

Radio-collar data and ground tracking indicate panthers use the mosaic of habitats available to them as resting and denning sites, hunting grounds, and travel routes. The majority of panther telemetry locations (Belden 1986; Belden et al. 1988; Maehr 1990, 1992; Maehr et al. 1991; Smith and Bass 1994; Kerkhoff et al. 2000; Comiskey et al. 2002, Cox et al. 2006, Kautz et al. 2006, Land et al. 2008) and natal den sites (Benson et al. 2008) were within or close to forested cover types, particularly cypress swamp, pinelands, hardwood swamp, and upland hardwood forests. Global Positioning System data has shown panthers (n = 12) use all habitats contained within their home ranges by selecting for forested habitat types and using all others in proportion to availability (Land et al. 2008).

Kautz et al. (2006) found the smallest class of forest patches (*i.e.*, 9 to 26 ac [3.6 to 10.4 ha]) were the highest ranked forest patch sizes within panther home ranges. The diverse woody flora of forest edges probably provides cover suitable for stalking and ambushing prey (Belden et al. 1988; Cox et al. 2006). Also, dense understory vegetation comprised of saw palmetto provides some of the most important resting and denning cover for panthers (Maehr 1990; Benson et al. 2008). Shindle et al. (2003) estimated that 73 percent of panther dens were in saw palmetto thickets.

Prey habitat use

Panther habitat selection is related to prey availability (Janis and Clark 1999; Dees et al. 2001) and, consequently, prey habitat use. Adequate cover, and the size, distribution, and abundance of available prey species are important factors to the persistence of panthers in south Florida and often determine the extent of panther use of an area. Duever et al. (1986) calculated a deer population of 1,760 in BICY, based on Harlow (1959) deer density estimates of 1 per 210 ac (85 ha) in pine forest, 1 per 299 ac (121 ha) in swamps, 1 per 1,280 ac (518 ha) in prairie, 1 per 250 ac (101 ha) in marshes, and 1 per 111 ac (45 ha) in hammocks. Schortemeyer et al (1991) estimated deer densities at 1 per 49 to 247 ac (20 to100 ha) in three management units of BICY based on track counts and aerial surveys. Labisky et al. (1995) reported 1 per 9 ac (20 ha) in southeastern BICY. Using track counts alone, McCown (1994) estimated 1 per 183 to 225 ac (74 to 91 ha) on the FPNWR and 1 per 133 to 200 ac (54 to 81 ha) in the FSPSP.

Hardwood hammocks and other forest cover types are important habitat for white-tailed deer and other panther prey (Harlow and Jones 1965; Belden et al. 1988; Maehr 1990, 1992; Maehr et al. 1991; Comiskey et al. 1994; Dees et al. 2001). Periodic understory brushfires (Dees et al. 2001) as well as increased amounts of edge (Miller 1993) may enhance deer use of hardwood hammocks, pine, and other forest cover types. However, wetland and other vegetation types can support high deer densities. In the Everglades, for example, deer appear to be adapted to a mosaic of intergrading patches comprised of wet prairie, hardwood tree islands, and peripheral wetland habitat (Fleming et al. 1994; Labisky et al. 2003). High-nutrient deer forage, especially preferred by females, includes hydrophytic marsh plants, white waterlily (*Nymphaea odorata*), and swamp lily (*Crinum americana*) (Loveless 1959; Labisky et al. 2003). Wetland willow (*Salix spp.*) thickets also provide nutritious browse for deer (Loveless 1959; Labisky et al. 2003). However, the importance of these habitat types to panthers is dependent upon the availability of stalking and ambush cover.

Marshes, rangeland, and low-intensity agricultural areas support prey populations of deer and hogs. The importance of these habitat types to panthers cannot be dismissed based solely on use or lack of use when daytime telemetry are the only data available (Comiskey et al. 2002, 2004; Beier et al. 2003, 2006).

Travel and dispersal corridors

In the absence of direct field observations/measurements, Harrison (1992) suggested landscape corridors for wide-ranging predators should be half the width of an average home range size. Following Harrison's (1992) suggestion, corridor widths for Florida panthers would range 6.1 to 10.9 miles (9.8 to17.6 km) depending on whether the target animal was an adult female or a transient male. Beier (1995) suggested corridor widths for transient male puma in California could be as small as 30 percent of the average home range size of an adult. For Florida panthers, this would translate to a corridor width of 5.5 miles (8.8 km). Without supporting empirical evidence, Noss (1992) suggests regional corridors connecting larger hubs of habitat should be at least 1.0 mile (1.6 km) wide. Beier (1995) makes specific recommendations for very narrow corridor widths based on short corridor lengths in a California setting of wild lands completely surrounded by urban areas; he recommended that corridors with a length less than 0.5 mile (0.8 km) should be more than 328 ft (100 m) wide, and corridors extending 0.6 to 4 miles (1 to 7 km) should be more than 1,312 ft (400 m) wide. The Dispersal Zone encompasses 44 mi^2 (113 km^2) with a mean width of 3.4 miles (5.4 km). Although it is not adequate to support even one panther, the Dispersal Zone is strategically located and expected to function as an important landscape linkage to south-central Florida (Kautz et al. 2006). Transient male panthers currently utilize this zone as they disperse northward into south-central Florida.

Panther habitat evaluation and compensation

Population Viability Analysis (PVA) has emerged as a key component of endangered species conservation. This process is designed to incorporate demographic information into models that predict if a population is likely to persist in the future. PVAs incorporate deterministic and stochastic events including demographic and environmental variation, and natural catastrophes. PVAs have been criticized as being overly optimistic about future population levels (Brook et al. 1997) and should be viewed with caution; however, they are and have been shown to be surprisingly accurate for managing endangered taxa and evaluating different management practices (Brook 2000). They are also useful in conducting sensitivity analyses to determine where more precise information is needed (Hamilton and Moller 1995; Beissinger and Westphal 1998; Reed et al. 1988; Fieberg and Ellner 2000).

Shaffer (1981) originally defined a viable population as follows: "a minimum viable population for any given species in any given habitat is the smallest isolated population having a 99 percent chance of remaining extant for 1,000 years despite the foreseeable effects of demographic, environmental and genetic stochasticity, and natural catastrophes." However, the goal of 95 percent probability of persistence for 100 years is the standard recommended by population biologists and is used in management strategies and conservation planning, particularly for situations where it is difficult to accurately predict long-term effects (Shaffer 1978, 1981, 1987; Sarkar 2004).

Since 1981 through June 2010, 182 Florida panthers have been radio-collared and monitored on public and private lands throughout south Florida (FWC 2010a). Radio-collar data were used by researchers to estimate survival rates and fecundity and were incorporated into PVA models previously developed for the Florida panther (Seal and Lacy 1989, 1992; Cox et al. 1994; Kautz and Cox 2001; Maehr et al. 2002b). These models incorporated a range of different model parameters such as general sex ratios, kitten survival rates, age distributions, and various levels of habitat losses, density dependence, and intermittent catastrophes or epidemics. The outputs of these models predicted a variety of survival scenarios for the Florida panther and predicted population levels needed to ensure the survival of the species.

Root (2004) developed an updated set of PVA models for the Florida panther based on RAMAS GIS software. These models were used to perform a set of spatially explicit PVAs. Three general single-sex (*i.e.*, females only) models were constructed using demographic variables from Maehr et al. (2002b) and other sources. A conservative model was based on Seal and Lacy (1989), a moderate model was based on Seal and Lacy (1992), and an optimistic model was based on the 1999 consensus model of Maehr et al. (2002b). In each model, first-year kitten survival was set at 62 percent based on recent information from routine panther population monitoring (Shindle et al. 2001). All of the models assumed a 1:1 sex ratio, a stable age distribution, 50 percent of females breeding in any year, and an initial population of 41 females (82 individuals including males), which was the approximate population size in 2001 and 2002 (McBride 2001, 2002).

The use of 41 females in the model was based on the best available data when the model was developed. The total of 41 females represents the number of individual panthers documented in surveys by McBride (2001, 2002). While the total of 41 females includes subadults that do not yet breed, it is reasonable to use this total number in modeling to evaluate population trends for several reasons. First, it is not feasible to differentiate between subadults and adults through field observation. Second, although it is possible some of the 41 females were not breeding in year one of the model, these females would mature to breeding age by year 2 of the model. Third, the Root (2004) model assumed females to have "a 50 percent chance of breeding in a given year," and therefore only half of the 41 females were modeled as breeding each year. The primary reason the model (Root 2004) assumed a 50 percent chance of breeding in a given year is that kittens stay with their mother from 15 to 24 months prior to dispersal; however, this assumption accounts for the likelihood some of the 41 females would not breed in a given year, including subadult status of some individuals. Fourth, the Service recognizes the McBride data is not intended to provide a total population estimate. Although the Service believes population estimates derived through field surveys are close to the actual population number, it is likely some individuals in the current panther population have not been documented. In light of these factors, the Service believes it is reasonable to use the best available count of 41 subadult and adult females as the breeding population for modeling purposes.

Basic PVA versions

The basic versions of each model incorporated no catastrophes or epidemics, no change in habitat quality or amount, and a ceiling type of density dependence. The basic versions of the models incorporated a carrying capacity of 53 females (106 panthers with a 50:50 sex ratio). Variants of the models were run with differing values for density dependence, various levels of habitat loss, and intermittent catastrophes or epidemics. Each simulation was run with

10,000 replications for a 100-year period. The minimum number of panthers needed to ensure a 95 percent probability of persistence for 100 years was estimated in a series of simulations in which initial abundance was increased until probability of extinction at 100 years was no greater than 5 percent. More detailed information concerning the PVA model parameters appears in Root (2004).

The results of an earlier, conservative PVA model run done by Seal (1989) predicted a probability of extinction for the conservative model of 78.5 percent in 100 years with a mean final total abundance of 3.5 females. Also, the probability of a large decline in abundance (50 percent) was 94.1 percent. Later work based on an improved panther modeling and a larger sample of monitored panthers produced both a moderate and optimistic scenario (Root 2004). The moderate model resulted in a 5 percent probability of extinction and a mean final abundance of 42.3 females in 100 years. The probability of panther abundance declining by half the initial amount was 20 percent in 100 years under the moderate model. The optimistic model resulted in a 2 percent probability of extinction and mean final abundance of 51.2 females in 100 years. The probability of panther abundance declining by half the initial amount was only 9 percent in 100 years under the optimistic model. These models also provide a probability of persistence (100 percent minus probability of extinction) over a 100-year period of 95 percent for the moderate model and 98 percent for the optimistic model.

Model results were also provided by Root (2004) for probability of extinctions for 1 percent loss of habitat per year, within the first 25 years of the model run, based on both the moderate and optimistic scenarios. The 1 percent loss of habitat equates to essentially all remaining non-urban privately owned lands in the Primary Zone and corresponds to the estimated rate of habitat loss from 1986 to 1996 for the five southwest counties based on land use changes (Root 2004). For the moderate model, the model runs predict a probability of extinction increase of about 1 percent, from a probability of extinction of about 5 percent with no loss of habitat to 6 percent with 1.0 percent habitat loss per year, for the first 25 years. For the optimistic model, probability of extinction increased from about 2 percent with no loss of habitat to 3 percent with 1.0 percent habitat loss per year, for the first 25 years. These models also predicted that the mean final abundance of females would decrease from 41 to 31 females, a 24.3 percent reduction for the moderate model and from 41 to 38 females, a 7.3 percent reduction for the optimistic model.

The model runs predict a probability of persistence (100 percent minus the probability of extinction) over a 100-year period of about 94 percent for the moderate model and 97 percent for the optimistic model. The model runs also predict a mean final abundance of 62 individuals (31 females and 31 males) for the moderate model and 76 individuals (38 females and 38 males) for the optimistic model.

Population guidelines

Kautz et al. (2006), following review of the output of Root's PVA models and those of other previous PVAs for the Florida panther, suggested a set of population guidelines for use in the management and recovery of the Florida panther. These guidelines are: (1) populations of less than 50 individuals are likely to become extinct in less than 100 years; (2) populations of 60 to 70 are barely viable and expected to decline by 25 percent over 100 years; (3) populations of 80 to 100 are likely stable but would still be subject to genetic problems (*i.e.*, heterozygosity would

slowly decline); and (4) populations greater than 240 have a high probability of persistence for 100 years and are demographically stable and large enough to retain 90 percent of original genetic diversity.

Population guidelines for populations of panthers between 50 and 60 individuals and between 70 and 80 individuals were not specifically provided in Kautz et al. (2006). However, the Service views the guidelines in Kautz et al. (2006) as a continuum. Therefore, we consider populations of 50 to 60 individuals to be less than barely viable or not viable with declines in population and heterozygosity. Similarly, we consider populations of 70 to 80 to be more than barely viable or somewhat viable with some declines in population and heterozygosity. Like other population guidelines presented in Kautz et al. (2006), these assume no habitat loss or catastrophes. Root's (2004) moderate model runs, which have a carrying capacity 53 females (106 individuals), show final populations of 42.3 females (84 total) and 31.2 females (62 total) with extinction rates of 5 percent and 6 percent, respectively, for the basic and 1 percent habitat loss scenarios. The predicted final populations in Root (2004) are 84 and 62 panthers for no loss of habitat and 1 percent loss of habitat, respectively, over a 100-year period.

Kautz et al.'s (2006) population guidelines, when applied to the populations predicted by Root's (2004) moderate models, describe the "with habitat loss" population (62 panthers) as barely viable and expected to decline by 25 percent over a 100-year period. The "without habitat loss" population (84 panthers) is likely stable but would still be subject to genetic problems.

As discussed above, the panther population has shown an increase in the number of panthers reported yearly, beginning in 2000. The Service believes McBride's verified population of 97 panthers in 2006, 117 panthers in 2007, 104 in 2008, 113 in 2009, 115 in 2010, and 111 in 2011 is within Kautz et al.'s (2006) population guidelines representing a population that is likely stable but still may be subject to genetic problems.

The Service also believes the model runs show lands in the Primary Zone are important to the survival and recovery of the Florida panther, and sufficient lands need to be managed and protected in south Florida to provide for a population of 80 to 100 panthers, the population range defined as likely stable over 100 years, but subject to genetic problems. As discussed in the following section, the Service developed a landscape level program that, through regulatory reviews and coordinated conservation efforts with landowners and resource management partners, provides a mechanism to achieve this population threshold.

Model violations

The actual likelihood of population declines and extinctions may be different than the guidelines and models suggest, depending upon the number and severity of assumptions violated. The Service realizes that habitat loss is occurring at an estimated 0.8 percent loss of habitat per year (R. Kautz, FWC, personal communication, 2003, as cited in Service 2008). The Service accounted for some habitat loss and changes in habitat quality within its regulatory program, specifically through its habitat assessment methodology (discussed below). For example, we increased the base ratio used within this methodology to account for unexpected increases in habitat loss. Similarly, we consider changes in habitat quality and encourage habitat restoration wherever possible.

With regard to the assumption of no catastrophes, the Service considered the recent outbreak of feline leukemia in the panther population at Okaloacoochee Slough as a potential catastrophe. The FWC is carefully monitoring the situation and it appears to be under control at this time due to a successful vaccination program. However, if the outbreak spreads into the population, the Service will consider this as a catastrophe and factor this into our decisions.

We acknowledge uncertainties exist, assumptions can be violated, and catastrophes can occur. The Service and the FWC, along with our partners, will continue to monitor the panther population and the south Florida landscape and incorporate any new information and changes into our decision-making process.

Recovery goals

The recovery objectives identified in the final third revision of the Florida Panther Recovery Plan (Service 2008) are to: (1) maintain, restore, and expand the Florida panther population and its habitat in south Florida and, if feasible, expand the known occurrence of Florida panthers north of the Caloosahatchee River to maximize the probability of the long-term persistence of this metapopulation; (2) identify, secure, maintain, and restore habitat in potential reintroduction areas within the panther's historic range, and to establish viable populations of the panther outside south and south-central Florida; and (3) facilitate panther conservation and recovery through public awareness and education.

Habitat conservation and protection

Panthers, because of their wide-ranging movements and extensive spatial requirements, are particularly sensitive to habitat fragmentation (Harris 1984). Mac et al. (1998) defines habitat fragmentation as: "The breaking up of a habitat into unconnected patches interspersed with other habitat which may not be inhabitable by species occupying the habitat that was broken up. The breaking up is usually by human action, as, for example, the clearing of forest or grassland for agriculture, residential development, or overland electrical lines." The reference to "unconnected patches" is a central underpinning of the definition. For panther conservation, this definition underscores the need to maintain contiguous habitat and protected habitat corridors in key locations in south Florida and throughout the panther's historic range. Habitat fragmentation can result from road construction, urban development, and agricultural land conversions.

Habitat protection has been identified as being one of the most important elements to achieving panther recovery. While efforts have been made to secure habitat, continued action is needed to obtain additions to and inholdings for public lands, assure linkages are maintained, restore degraded and fragmented habitat, and obtain the support of private landowners for maintaining property in a manner that is compatible with panther use. Conservation lands used by panthers are held and managed by a variety of entities including the Service, NPS, Seminole Tribe of Florida, Miccosukee Tribe of Indians of Florida, FWC, Florida Department of Environmental Protection (DEP), Florida Division of Forestry (FDOF), Water Management Districts, non-governmental organizations, counties, and private landowners.

Public lands

From 1944 to the present, approximately 2,756,802 ac (1,115,638 ha) of public lands in south Florida have been acquired, which benefit the Florida panther (Figure 5).

Tribal lands

Lands of the Seminole Tribe of Florida and Miccosukee Tribe of Indians of Florida encompass over 350,079 ac (141,673 ha) in south Florida. Of these, 115,840 ac (46,879 ha) are used by panthers, and comprise 5 percent of the Primary Zone (Kautz et al. 2006). In general, these lands are not specifically managed for the panther and are largely in cultivation. However, in 2007, the Seminole Tribe of Florida reserved about 4,144 ac within the Big Cypress Seminole Indian Reservation Native Area, an area encompassing about 14,724 ac, specifically for the benefit of the Florida panther. The remaining native area, about 10,580 ac, although not specifically managed for the Florida panther, provides high quality value habitat for the Florida panther and panther prey species.

Private lands

A variety of Federal, State, and private incentive programs are available to assist private landowners and other individuals with the protection and management of wildlife habitat. Voluntary agreements, estate planning, conservation easements, land exchanges, and conservation/mitigation banks are all methods that hold untapped potential for conserving private lands. In 1954, the National Audubon Society established the nearly 10,880-ac (4,403-ha) Corkscrew Swamp Sanctuary. However, little additional private land has been protected south of the Caloosahatchee River for panther conservation. A number of properties identified by the State Acquisition and Restoration Council for purchase by the Florida Forever Program are used by panthers (*e.g.*, Devil's Garden, Half Circle F Ranch, Pal Mal, and Panther Glades). North of the Caloosahatchee River, the Fisheating Creek Conservation Easement consists of 41,600 ac (16,835 ha) in Glades County, and it is a private holding used by dispersing male panthers.

Habitat and prey management

Land management agencies in south Florida are implementing fire programs that mimic a natural fire regime through the suppression of human-caused wildfires and the application of prescribed natural fires. No studies have been conducted to determine the effects of invasive plant management on panthers. However, invasive vegetation may reduce the panther's prey base by disrupting natural processes, such as water flow and fire, and by significantly reducing available forage for prey (Fleming et al. 1994). All public lands in south Florida have active invasive plant treatment programs. Management for panther prey consists of a variety of approaches, such as habitat management and regulation of hunting and ORV use.

Response to management activities

Few studies have examined the response of panthers to various land/habitat management activities. Dees et al. (2001) investigated panther habitat use in response to prescribed fire and found that panther use of pine habitats was greatest for the first year after the area had been burned and declined thereafter. Prescribed burning is believed to be important to panthers because prey species (*e.g.*, deer and hogs) are attracted to burned habitats to take advantage of changes in vegetation structure and composition, including exploiting hard mast that is exposed and increased quality or quantity of forage (Dees et al. 2001). Responses of puma to logging activities (Van Dyke et al. 1986b) indicate that they generally avoid areas within their home range with intensification of disturbance.

There is the potential for disturbance to panthers from recreational uses on public lands. Maehr (1990) reported that indirect human disturbance of panthers may include activities associated with hunting and that panther use of Bear Island (part of BICY) is significantly less during the hunting season. Schortemeyer et al. (1991) examined the effects of deer hunting on panthers at BICY between 1983 and 1990. They concluded that, based on telemetry data, panthers may be altering their use patterns because of hunting. Janis and Clark (2002) compared the behavior of panthers before, during, and after the recreational deer and hog hunting season (October through December) on areas open (BICY) and closed (FPNWR, FSPSP) to hunting. Variables examined were: (1) activity rates; (2) movement rates; (3) predation success; (4) home range size; (5) home range shifts; (6) proximity to ORV trails; (7) use of areas with concentrated human activity; and (8) habitat selection. Responses to hunting for variables most directly related to panther energy intake or expenditure (*i.e.*, activity rates, movement rates, predation success of females) were not detected (Janis and Clark 2002). However, panthers reduced their use of Bear Island, an area of concentrated human activity, and were found farther from ORV trails during the hunting season, indicative of a reaction to human disturbance (Janis and Clark 2002). Whereas the reaction to trails was probably minor and could be related to prey behavior, decreased use of Bear Island most likely reflects a direct reaction to human activity and resulted in increased use of adjacent private lands (Janis and Clark 2002).

Adverse effects of roads

Roads and highways facilitate the movement of people and goods by cars and trucks, and may adversely affect the Florida panther. The construction of new roads and the widening of existing roads can result in the direct loss of wildlife habitat (Forman et al. 2003). Moreover, disturbance resulting from motorized vehicles may cause panthers to avoid busy roads. Maher (1990) reported that female panthers are less likely to cross busy highways. Consequently, roads may act as barriers affecting panther movement and fragmenting panther habitat. Panthers can also be injured or killed due to collisions with motorized vehicles when attempting to cross highways, and the potential for collisions increases as traffic increases. Adverse effects resulting from roads and highways represent a potential threat to the existing panther population.

Collisions with motor vehicles on highways appear to be a significant source of mortality for the Florida panther. As discussed above, the FWC documented 164 vehicle-related panther mortalities and 8 vehicle-related panther injuries from 1972 to the present on highways in south Florida. In portions of the panther's range, the rate of panther vehicle-related mortalities may be increasing. Smith et al. (2006) found that vehicle-related panther mortalities in Collier County have increased by a factor of four from 2000 to the present, compared to previous decades. This increase in panther mortality is likely related to the increase in traffic from Collier County's population growth. Unfortunately, the effect of vehicle-related mortality on the existing panther population is largely unknown.

Wildlife underpasses, or crossings, can be constructed within highway corridors to reduce the potential for panther injuries and mortalities resulting from vehicle collisions. Underpasses allow panthers and other wildlife to safely cross under busy roadways, and maintain connectivity and gene flow within the panther population. Underpasses usually consist of a bridge, prefabricated concrete box, or culvert (Forman et al. 2003). Effective crossing structures are

large enough to allow the passage of panthers and include adequate wing fencing to funnel panthers to the crossing site. Crossings should be designed so panthers have an unobstructed view of habitat on the opposite side of the underpass (Foster and Humphrey 1995). The status of lands adjacent to the crossing site should also be considered when determining the location of a crossing. Unprotected private lands adjacent to the crossing could be developed and render the crossing unviable. Accordingly, lands adjacent to crossings should be acquired or placed under a conservation easement or other protective covenant to ensure the crossing will function in perpetuity.

A number of wildlife crossings with associated fencing have already been constructed within major roadways in southwest Florida to benefit the panther and other wildlife species (Figure 6). In 1991, the Florida Department of Transportation (FDOT) finished the construction of 28 wildlife crossings within the I-75 corridor from U.S. Highway 27 to just west of Everglades Boulevard. A total of five vehicle-related panther mortalities were documented within this corridor prior to construction of the crossings. Following construction of the crossings, a total of four vehicle-related panther mortalities (all in 2009) were recorded in the corridor from 1991 to the present. For three of these mortalities, it appears the panther had entered the I-75 right-of-way through gaps in the fence at existing roadway intersections (*i.e.*, SR 29, Snake Road).

The FDOT also constructed six wildlife crossings on SR 29 between Oil Well Road and US 41. Crossings A, B, C, and D are located north of I-75 and Crossings E and F are located south of I-75. Crossings A and B were constructed in 2007, Crossings C and D were constructed in 1995, Crossing E was constructed in 1997, and Crossing F was constructed in 1999. Prior to construction of the SR 29 Crossings, a total of 10 vehicle-related panther mortalities were recorded near the locations of Crossings A and B from 1980 through 2004, and 2 vehicle-related panther mortalities were recorded near the location of Crossings C and D from 1979 through 1990. Vehicle-related panther mortalities have not been recorded in the vicinity of Crossings A, B, C, or D following their installation. A total of 2 vehicle-related panther mortalities were documented within 3.5 miles of the location of Crossing E prior to construction, and vehicle-related panther mortalities were not observed within 2.5 miles of the location of Crossing F prior to construction. Following construction of Crossings E and F, a total of four vehicle-related panther mortalities have been reported within 3 miles of Crossing E, and two vehicle-related panther mortalities have been documented within 1 mile of Crossing F. The observed increase in the number of vehicle-related panther mortalities following the construction of Crossings E and F may be related to the increase in the panther population within recent years.

Lee County, Collier County, and other entities proposing developments that may adversely affect the panther are working with the Service to construct additional needed crossings for the panther. For example, the Collier County Road Department is currently constructing two wildlife underpasses and barrier fencing within the Oil Well Road (CR 858) corridor at Camp Keais Strand, in association with the Oil Well Road widening project. Lee County constructed a wildlife underpass and barrier fencing on Corkscrew Road in 2004. Moreover, in 2011, a wildlife underpass and barrier fencing was installed east of Immokalee on County Road (CR) 846 in Collier County, as part of the Habitat Conservation Plan for the City Gate development. Finally, a wildlife underpass was installed on Immokalee Road near CR 951 in association with the Twin Eagles development project.

The wildlife crossings described above represent a commendable effort by the FDOT and others to reduce panther deaths resulting from collisions with motor vehicles; however, more crossings are needed within the major roadways of south Florida to further reduce this threat to the panther and other wildlife species (Smith et al. 2006). Accordingly, recent studies have been conducted to identify locations for wildlife crossings in south Florida. Swanson et al. (2005) used a LCP modeling approach to identify the most likely travel routes for panthers among six major use areas in southwest Florida. LCP modeling takes into consideration elements in the landscape that permit or impede panther movement when traveling. Swanson et al. (2005) identified 20 key highway segments where LCPs intersected improved roadways. Smith et al. (2006) studied the movements of the Florida panther, the Florida black bear, and other wildlife species along SR 29, CR 846 and CR 858 in Collier County, Florida. Data analyzed in the study were obtained from roadkill and track surveys, infra-red camera monitoring stations, existing data provided by the FWC (Florida panther radio telemetry and vehicle mortality reports), and other studies. Smith et al. (2006) recommended new wildlife crossings be considered at various sites along these roadways to reduce vehicle-related mortality of panthers and other wildlife species, and to increase connectivity among wildlife populations. The Service continues to work with the FDOT, county road departments, and other entities to ensure wildlife crossings are installed as needed to promote safe passage of panthers and other wildlife across roadways.

Agriculture, development, and mining

The Service developed a Panther Habitat Assessment methodology and refugia design in 2003 to help guide the agency in evaluating permit applications for projects that could affect panther habitat (see discussion below). This methodology was a way to assess the level of impacts to panthers expected from a given project, and to evaluate the effect of any proposed compensation offered by the project applicant. Prior to the development of this methodology, the Service, from March 1984 through August 2003, concluded consultation on 43 projects involving the panther and habitat preservation (Table 1). The minimum expected result of these projects is impacts to 71,650 ac and the preservation of 14,677 ac of panther habitat. Of the 71,650 ac of impacts, 38,932 ac are due to agricultural conversion and 32,718 ac to development and mining. Portions (10,370 ac) of the largest agricultural conversion project, 28,700 ac by U.S. Sugar Corporation, were re-acquired by the Federal government as a component of the Talisman Land Acquisition (Section 390 of the Federal Agricultural Improvement and Reform Act of 1996 [Public Law 104-127] Farm Bill Cooperative Agreement, FB4) for use in the Comprehensive Everglades Restoration Plan (CERP). The non-agriculture impacts are permanent land losses, whereas the agricultural conversions may continue to provide some habitat function and value to panthers, depending on the type of conversion.

From August 2003 through the date of this Biological Opinion, the Service concluded consultations on 115 development projects affecting 24,657 ac with preservation of 26,939 ac (Table 1). Following our refugia design assessment approach, the projects affected 11,875 ac in the Primary Zone, 7,970 ac in the Secondary Zone, 37 acres in the Dispersal Zone, and 4,775 ac in the Other Zone. Compensation provided included 24,227 ac in the Primary Zone, 272 ac in the Secondary Zone, 675 ac in the Dispersal Zone, and 1,765 ac in the Other Zone. The project-affected lands were primarily agricultural fields consisting of row crops and citrus groves and natural lands with varying degrees of exotic vegetation. The PHU habitat value of these lands to

the Florida panther, following our Panther Habitat Assessment methodology, was 77,891 primary equivalent PHUs; concurrently, the project's provided corresponding PHU preservation and enhancement of 199,096 primary equivalent PHUs. The preservation lands were generally native habitat lands or disturbed lands that included restoration components. Restoration components included exotic species removal, fire management, wetland hydrology improvement, improved forest management practices, and full habitat restoration from agriculture uses to native habitats.

South Florida panther population goal

The Service's goal for Florida panther conservation in south Florida is to locate, preserve, and restore lands containing sufficient area and appropriate land cover types to ensure the long-term survival of a population of 80 to 100 individuals (adults and subadults) south of the Caloosahatchee River. The Service proposes to achieve this goal through land management partnerships with private landowners, through coordination with private landowners during review of development proposals, and through land management and acquisition programs with Federal, State, local, private, and Tribal partners. Based on an average density of 31,923 ac per panther as determined by Kautz et al. (2006), the acreages of lands necessary to achieve this goal are 2,553,840 ac for 80 panthers and 3,192,300 ac for 100 panthers.

The principal regulatory mechanism that allows the Service to work directly with private land owners during review of development and land alteration projects is section 10 of the Act. The Service also coordinates with Federal agencies pursuant to section 7 of the Act. In August 2000, the Service, to assist the U.S. Army Corps of Engineers (Corps) in assessing project effects to the Florida panther, developed the Florida panther final interim Standard Local Operating Procedures (SLOPES) for Endangered Species (Service 2000) (update in 2007; Service 2007a). The Florida panther SLOPES provide guidance to the Corps for assessing project effects to the Florida panther and recommends actions to minimize these effects. The Florida panther SLOPES also included a consultation area map that identified an action area where the Service believed land alteration projects may affect the Florida panther. The SLOPES document is available on the Corps' web site at: http://www.saj.usace.army.mil/regulatory/what/species/panther.htm

In the original SLOPES, the consultation area map (the Map) was generated by the Service by overlaying existing and historical panther telemetry data on a profile of Florida and providing a connecting boundary surrounding most of these points. Since the development of the Map, we received more accurate and up-to-date information on Florida panther habitat usage. Specifically, we received two documents that the Service believes reflect the most likely panther habitat usage profiles, although documentation clearly shows panther use of areas outside these locations. These documents are the publications by Kautz et al. (2006) and Thatcher et al. (2006). Based on the information in these documents, we have clarified the boundaries of the Map to better reflect areas where Florida panthers predominate (Figure 2), and we refer to these areas cumulatively as the Florida Panther Focus Area. As part of this review, we also made revisions to components in the SLOPES documents in coordination with the Corps; these revisions address actions that can be taken by the Service, Corps, and project applicants that may benefit panthers and minimize effects from proposed projects (Service 2007a).

The Panther Focus Area was determined from the results of recent panther habitat models south of the Caloosahatchee River (Kautz et al. 2006) and north of the Caloosahatchee River (Thatcher et al. 2006). The Kautz et al. (2006) model of landscape components important to Florida panther habitat conservation was based on an analysis of panther habitat use and forest patch size. This model was used in combination with radio-telemetry records, home range overlaps, land use/land cover data, and satellite imagery to delineate Primary and Secondary areas that would be most important and comprise a landscape mosaic of cover types important to help support the current panther breeding population south of the Caloosahatchee River.

Thatcher et al. (2006, 2009) developed a habitat model using Florida panther home ranges in south Florida to identify landscape conditions (land-cover types, habitat patch size and configuration, road density and other human development activities, and other similar metrics) north of the Caloosahatchee River that were similar to those associated with the current panther breeding population.

The Panther Focus Area Map south of the Caloosahatchee River is divided into Primary, Secondary, and Dispersal Zones, and north of the Caloosahatchee River into the Primary Dispersal/Expansion Area.

Primary Zone

The Primary Zone is the area that is currently occupied and supports the only known breeding population of Florida panthers in the world. These lands are important to the long-term viability and persistence of the panther in the wild.

Secondary Zone

These lands are contiguous with the Primary Zone, and, although they are used to a lesser extent by panthers, they are important to the long-term viability and persistence of the panther in the wild. Panthers use these lands in a much lower density than in the Primary Zone.

Dispersal Zone

A known corridor between the Panther Focus Area south of the Caloosahatchee River and the Panther Focus Area north of the Caloosahatchee River that may facilitate future panther expansion north of the Caloosahatchee River (Kautz et al. 2006). This Zone is necessary to facilitate the dispersal of panthers and future panther population expansion to areas north of the Caloosahatchee River. Marked panthers have been documented using this zone.

Primary dispersal/expansion area

This area is located within the Fisheating Creek/Babcock-Webb WMA region. These are lands identified by Thatcher et al. (2006) as potential panther habitat with the shortest habitat connection to the Panther Focus Area in south Florida. Several collared and uncollared male panthers have been documented in this area since 1973, and the last female documented north of the Caloosahatchee River was found in this area.

Landscape preservation need and compensation recommendations

Land preservation needs

To further refine the land preservation needs of the Florida panther, and to specifically develop a landscape-level program for the conservation of the Florida panther population in south Florida, the Service appointed a Florida Panther Subteam in February 2000. The Subteam was charged with developing a landscape-level strategy for the conservation of the Florida panther population in south Florida. The results of this collaborative effort are partially presented in Kautz et al. (2006). One of the primary population thresholds of this effort was to identify a strategically located set of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the south population of the Florida panther. Kautz et al. (2006) focused their efforts on the area south of the Caloosahatchee River, where the reproducing panther population currently exists.

Kautz et al. (2006) created an updated Florida panther potential habitat model based on the following criteria: (1) forest patches greater than 4.95 ac (2 ha); (2) non-urban cover types within 656 ft (200 m) of forest patches; and (3) exclusion of lands within 984 ft (300 m) of urban areas. The potential habitat map was reviewed in relation to telemetry data, recent satellite imagery (where available), and panther home range polygons. Boundaries were drawn around lands defined as the Primary Zone (Figures 2 and 3), defined as the most important area needed to support a self-sustaining panther population. Kautz et al. (2006) referred to these lands as essential; however, as observed in the two previous plans (Logan et al. 1993; Cox et al. 1994), lands within the boundaries of the Primary Zone included some urban areas and other lands not considered to be truly panther habitat (*i.e*., active rock and sand mines). The landscape context of areas surrounding the Primary Zone was modeled and results were used to draw boundaries of the Secondary Zone (Figures 2 and 3), defined as the area capable of supporting the panther population in the Primary Zone, but where habitat restoration may be needed (Kautz et al. 2006).

Kautz et al. (2006) also identified, through a LCP model, the route most likely to be used by panthers dispersing out of south Florida, crossing the Caloosahatchee River, and dispersing into south-central Florida. Kautz et al. (2006) used ArcView GIS© version 3.3 and ArcView Spatial Analyst© version 2 (Environmental Systems Research, Incorporated, Redlands, California) to construct the LCP models and identify optimum panther dispersal corridor(s). The LCP models operated on a cost surface that ranked suitability of the landscape for use by dispersing panthers with lower scores indicating higher likelihood of use by dispersing panthers. Those dispersal routes connecting lands between the Panther Focus Area south of the Caloosahatchee River and the Panther Focus Area north of the Caloosahatchee River, which may facilitate future panther expansion north of the Caloosahatchee River, were defined as the Dispersal Zone (Figures 2 and 3) (Kautz et al. 2006). The preservation of lands within this zone is important for the survival and recovery of the Florida panther, as these lands are the dispersal pathways for expansion of the south Florida panther population. The Primary Zone covers 2,270,590 ac (918,895 ha); the Secondary Zone covers 812,104 ac (328,654 ha); and the Dispersal Zone covers 27,883 ac (11,284 ha); providing a total of 3,110,578 ac (1,258,833 ha) (Kautz et al. 2006).

As part of their evaluation of occupied panther habitat, in addition to the average density estimate of one panther per 27,181 ac (11,000 ha) developed by Maehr et al. (1991), Kautz et al. (2006) estimated the present average density during the timeframe of the study, based on telemetry and

other occurrence data, to average one panther per 31,923 ac (12,919 ha). In the following discussions of the number of panthers a particular zone may support, the lower number is based on the 31,923 ac (12,919 ha) value (Kautz et al. 2006) and the higher number is based on the 27,181 ac (11,000 ha) value (Maehr et al. 1991).

Based on these average densities, the Primary Zone could support 71 to 84 panthers; the Secondary Zone could support 8 to 10 panthers without habitat restoration and 25 to 30 panthers with habitat restoration (existing high quality panther habitat currently present in the Secondary Zone is estimated at 32 percent of the available Secondary Zone lands); and the Dispersal Zone could support 0 panthers. Taken together, the three zones in their current condition apparently have the capacity to support about 79 to 94 Florida panthers.

Kautz et al.'s (2006) assessment of available habitat south of the Caloosahatchee River determined that non-urban lands in the Primary, Secondary, and Dispersal Zones were not sufficient to sustain a population of 240 individuals south of the Caloosahatchee River. However, Kautz et al. (2006) determined sufficient lands were available south of the Caloosahatchee River to support a population of 79 to 94 individuals (although not all lands are managed and protected).

Compensation recommendations

To achieve our landscape scale effort to locate, preserve, and restore lands containing sufficient area and appropriate land cover types to ensure the long-term survival of a population of Florida panthers south of the Caloosahatchee River, the Service chose the midpoint (90 panthers) in Kautz et al.'s (2006) population guidelines that a population of 80 to 100 panthers is likely to be stable, although subject to genetic problems, through 100 years. In addition, a population of 90 individuals is 8 individuals greater than a population of 82 individuals, which, according to the best available PVA (Root 2004), is 95 percent likely to persist over 100 years (assuming a 50:50 male to female ratio). These eight individuals provide a buffer for some of the assumptions in Root's (2004) PVA. Our process to determine compensation recommendations for project affects that cannot be avoided in both our section 7 and section 10 consultations is based on the amount and quality of habitat we believe is necessary to support a population of 90 panthers in south Florida.

The Service, based on Kautz et al.'s (2006) average panther population density of 31,923 acres per panther, determined 2,873,070 acres of Primary Zone "equivalent" lands need to be protected and managed. Since lands in the Secondary Zone are of less value to panthers than those in the Primary Zone, this equivalency factor is needed to assure additional acreage is acquired in the Secondary Zone to compensate for its lower quality panther habitat. In other words, more than 31,923 acres per panther would be needed, hypothetically, if this acreage were all in the Secondary Zone (see discussion of Primary Zone equivalent lands in the following section). The combined acreage of lands within the Primary, Dispersal, and Secondary Zones is 3,110,577 acres (Kautz et al. 2006). Currently, 2,073,865 acres of Primary Zone equivalent lands are preserved (Table 2) and 1,202,699 acres of Primary Zone equivalent lands are at-risk (private ownership) (Table 3), so 799,205 additional acres need to be preserved to support a population of 90 panthers in south Florida (2,873,070 minus 2,073,865 equals 799,205).

The Service also consults on lands outside of the Primary, Secondary, and Dispersal Zones that may affect panthers, such as agricultural lands adjacent to the Panther Focus Area and proposals in urbanized areas that could generate traffic in or adjacent to the Panther Focus Area or have other identifiable impacts.

Primary Zone equivalent lands

Kautz et al. (2006), through their habitat evaluation of lands important to the Florida panther, identified three categories of lands, *i.e.*, Primary Zone, Secondary Zone, and Dispersal Zone, and documented the relative importance of these lands to the Florida panther. These lands, generally referred to as Kautz et al.'s panther core lands, include the majority of the home ranges of the current population of the Florida panther. The Service, in our evaluation of habitat needs for the Florida panther expanded the boundaries of the Kautz et al. (2006) lands to include those lands south of the Caloosahatchee River where additional telemetry points historically were recorded. These additional lands (about 819,995 ac), referred to as the "Other" Zone, are added to the lands in Kautz et al. (2006) panther core lands and represent the lands within the Service's 2000 consultation area boundary south of the Caloosahatchee River as shown in Figure 3. These lands (core lands and Other Zone lands) together are referred to by the Service as the Panther Core Area (labeled on Figure 2 as "Original Panther Consultation Area South of the Caloosahatchee River"). The "Other" Zone lands, as well as the lands within the Secondary Zone, provide less landscape benefit to the Florida panther than the Primary and Dispersal Zones, but are important as a component of our strategy to preserve sufficient lands to support a population of 90 panthers in south Florida.

To account for the lower landscape importance of these lands in our preservation strategy and in our habitat assessment methodology, we assigned lands in the Other Zone a value of 0.33 and lands in the Secondary Zone a value of 0.69 to convert these lands to Primary Zone value, *i.e.*, Primary Zone equivalents (Table 2). Kautz et al. (2006) identifies the need for restoration in the Secondary Zone to achieve maximum benefits. To estimate the Primary Zone equivalent of Secondary Zone lands, we derived a relative habitat value (average PHU value) for each by comparing the habitat ranks estimated in Kautz et al. (2006) for each habitat type per zone. The average PHU value for the Primary Zone is 6.94 and for the Secondary Zone 4.79. Based on these values, the habitat value of the Secondary Zone is roughly 69 percent (4.79/6.94=0.69) of the Primary Zone, and restoration is needed to achieve landscape function. Using this assessment, the 503,481 ac of Secondary Zone lands equate to 347,402 ac of Primary Zone equivalent lands. Dispersal Zone lands are considered equivalent to Primary Zone lands with a 1 to 1 value.

At-risk lands in the Other Zone total 819,995 ac. Actions on some of the Other Zone lands, such as actions in areas that have already been urbanized, will, in most situations, not have an impact on panthers or their habitat. We are considering that, within the Other Zone lands, these types of actions will account for 20 percent of the available lands and actions on the remaining 80 percent of available lands may have an impact on panthers and could affect our southwest Florida panther population strategy. We will monitor this consideration carefully as we review proposed actions within the Other Zone. To estimate the acres of Primary Zone equivalent lands the 819,995 ac of Other Zone lands represent, we applied the 80 percent factor and the 33 percent factor to the available ac, which equate to 216,479 ac of Primary Zone equivalent lands (819,995 times 0.8 equals 655,996 times 0.33 equals 216,479).

These equivalent values, 0.33 and 0.69, for Other and Secondary Zones, respectively, and 1 to 1 for the Dispersal Zone, are important components in our assessment of compensation needs for a project in the panther consultation area and are components of our habitat assessment methodology as discussed in Appendix A.

Analysis of the species likely to be affected

The Florida panther is an endangered cat restricted to 2 to 3 million ac of land in south Florida (6 to 9 percent of the total land area of Florida). The panther is a wide-ranging species that requires large areas of biotically diverse habitat to survive. The burgeoning growth in the human population in southwest Florida has directly led to an increase in development and other human-related activities that have adversely affected the panther. Threats to panthers include habitat loss, habitat fragmentation, road mortality, and human disturbance.

The Service developed a Panther Habitat Assessment Methodology and refugia design in 2003 to help guide the agency in evaluating permit applications for projects that could affect panther habitat. This methodology provided a way to assess the level of impacts to panthers expected from a given project, and to evaluate the effect of any proposed compensation offered by the project's applicant. The Habitat Assessment Methodology was updated in 2009. For a full description of our Habitat Assessment Methodology, please see Appendix A.

The NPS has determined the BCNP ORV trail heads and U.S. Highway 41 turn lanes project "may affect and is not likely to adversely affect" the Florida panther. Based on the impacts to panther habitat resulting from the project, the Service cannot concur with this determination. We find the project will result in adverse effects to the Florida panther. The project's adverse effects to the panther will be discussed in the remainder of this Biological Opinion. Critical habitat has not been designated for the Florida panther and will not be affected.

Additional federally listed species may occur within the BCNP ORV trail heads and U.S. Highway 41 turn lanes project area. The NPS has determined the project will not affect the threatened eastern indigo snake and the endangered wood stork.

The project occurs within the geographic range of the eastern indigo snake. To minimize adverse effects to this species, the NPS has agreed to follow the Service's *Standard Protection Measures for the Eastern Indigo Snake* (Service 2004) during construction. The Service does not support the NPS' determination that the project will not affect the eastern indigo snake. We find the project has the potential to affect the eastern indigo snake, but the effects are expected to be insignificant and discountable. Critical habitat has not been designated for the eastern indigo snake and will not be affected. Therefore, we recommend the NPS revise their determination to "may affect, but not likely to adversely affect" the eastern indigo snake; this letter may be used as concurrence with that determination.

The BCNP ORV trail heads and U.S. Highway 41 turn lanes project sites are located within the core foraging area (within 18.6 miles) of several active wood stork breeding colonies. The project will result in the loss of 14 ac of wetlands that may provide foraging habitat for the wood stork. The 14 ac of wetlands to be impacted by the project consist of 11.6 ac of short

hydroperiod (inundated < 180 days per year) and 2.4 ac of long hydroperiod (inundated ≥ 180 days per year) wetlands. The Service has applied our "Wood Stork Foraging Assessment Methodology" (Service 2010) to the wetlands to be impacted by the project. Based on this assessment, the Service has determined that the 11.6 ac of short hydroperiod wetlands to be impacted provide 10.62 kilograms (kg) of wood stork forage biomass and the 2.4 ac of long hydroperiod wetlands to be impacted provide 7.89 kg of wood stork forage biomass. To compensate for the loss of wood stork forage biomass, the NPS proposes to acquire credits from a Service-approved mitigation bank that provide at least 10.62 kg of wood stork biomass from short hydroperiod wetlands and 7.89 kg of wood stork biomass from long hydroperiod wetlands. The Service finds the forage biomass resulting from restored wetlands at the Service-approved mitigation bank will offset the loss of wood stork forage biomass resulting from the project. Further, the NPS expects to provide on-site wetlands mitigation within BCNP; however, details on on-site mitigation activities are not available at this time. The Service does not support the NPS' determination that the project will not affect the wood stork. We find the project has the potential to affect the wood stork, but the effects are expected to be insignificant and discountable. Critical habitat has not been designated for the wood stork and will not be affected. Therefore, we recommend the NPS revise their determination to "may affect, but not likely to adversely affect" the wood stork; this letter may be used as concurrence with that determination.

As discussed above, the Service finds the BCNP ORV trail heads and U.S. Highway 41 turn lanes project is not likely to adversely affect the eastern indigo snake and the wood stork. Therefore, these species will not be considered further in this Biological Opinion.

ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions, which occur simultaneously with the consultation in progress.

Climate change

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change (IPCC) Report (2007). The IPCC Report describes natural ecosystem changes with potential wide-spread effects on many organisms from marine mammals to migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the Department of the Interior requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007b).

Climate change at the global level drives changes in weather at the regional level, although weather is also strongly affected by season and by local factors (*e.g.*, elevation, topography, latitude, proximity to the ocean). Temperatures are predicted to rise from 2°C to 5°C for North America by the end of this century (IPCC 2007). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing and distribution), storms (frequency and intensity), and sea level rise. However, the exact magnitude, direction and distribution of these changes at the regional level are not well understood or easy to predict. Seasonal change and local geography make prediction of the effects of climate change at any location variable. Current predictive models offer a wide range of predicted changes.

Prior to the 2007 IPCC Report, Titus and Narayanan (1995) modeled the probability of sea level rise based on global warming. They estimated that the increase in global temperatures could likely raise sea level 6 inches by 2050 and 13 inches by 2100. While these estimates are lower than the estimates described in the IPCC Report (2007), Titus and Narayanan's (1995) modeling efforts developed probability-based projections that can be added to local tide-gauge trends to estimate future sea level at specific locations.

Whittle et al. (unpublished data 2008) applied several prominent climate change models to panther habitat in southwest Florida. Their review indicated a climate change-induced sea level rise of 1 m (3 ft) will reduce southwest Florida panther habitat by 29 percent, at 3 m (9.8 ft) by 62 percent, and at 5 m (16.4 ft) by 90 percent. The consequences would be particularly dire for the panther, which has no other populations outside of low-lying south Florida. Their cost surface analyses identified likely migration routes that would link the south Florida panther population to suitable habitat to the north. However, without rapid conservation actions that establish a population to the north, they predict that the Florida panther may go extinct in the wild due to climate change effects.

Climatic changes in south Florida could exacerbate current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management (Pearlstine 2008). Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2007b).

Status of the species within the action area

As stated previously, for the purposes of this consultation, the action area includes the project footprint plus all lands located in the Panther Focus Area within 25 miles of the project footprint (Figure 4). The proposed action may have direct and indirect effects on the ability of panthers to breed, feed, and shelter, and to disperse within the population. The Service used current and historical radio-telemetry data, information on habitat quality, prey base, and evidence of uncollared panthers to evaluate panther use in the action area. Panther telemetry data are collected 3 days per week from fixed-wing aircraft, usually in early to midmorning. However, studies indicate panthers are most active between dusk and dawn (Maehr et al. 1990a, Beier

1995) and are typically at rest in dense ground cover during daytime monitoring flights (Land 1994). Therefore, telemetry locations may present an incomplete picture of panther activity patterns and habitat use (Comiskey et al. 2002). However, this potential bias was not detected in a recent analysis by Land et al. (2008) using GPS location data collected throughout a 24 hour day. This study revealed panther habitat selection patterns are similar when using either aerial telemetry data or GPS location data, and upland and wetland forests were the habitats most selected by panthers. There was an indication grassland-dry prairie habitats were used more at night than during daytime hours.

Only a subset of the panther population has been radio-collared. However, the large database of telemetry locations taken from radio-collared panthers south of the Caloosahatchee River can be used to estimate the size and number of home ranges and travel corridors south of the Caloosahatchee River. The FWC also uses observational data collected during telemetry flights to assess the yearly breeding activity of radio-collared panthers. Female panthers accompanied by kittens or male panthers within proximity of an adult female are assumed to have engaged in breeding activity during that year.

As of July 2012, 49 known radio-collared panthers (alive or status unknown) have been documented within the action area from 6,664 telemetry observations (Table 4 and Figure 7). It is not known if all these animals are currently alive. Panthers greater than 12 years of age are not likely to still be alive based on the known longevity of panthers in the wild of 10 to 12 years (FWC 2011b). The most recent telemetry point in the action area was recorded on June 6, 2011, for panther FP193. Uncollared panthers are also presumed to occur in the action area. In 2009, Rancher's Supply (a consultant to the FWC) found evidence of 80 individual panthers during their annual count of both radio-collared and uncollared panthers in south Florida (FWC 2010a). The area surveyed included the action area for this project. Four of the radio-collared panthers observed in the 2009 survey are now confirmed dead.

Motor vehicles have affected panthers in the action area. There have been 42 documented panther deaths resulting from vehicle collisions within the action area (see Table 5 and Figure 8). The most recent vehicle-related panther mortality occurred February 6, 2012, on U.S. Highway 41, approximately 0.4 miles east of Bass Road.

Factors affecting species environment within the action area

Factors that positively and negatively affect the panther's environment within the action area include, but are not limited to, the presence and construction of highways and urban development, agriculture, resource extraction, public lands management (*e.g.*, prescribed fire, exotic eradication, etc.), hydrological restoration projects, and public and private land protection efforts. Development activities may result in avoidance or limited use of remaining suitable habitat by panthers, as well as habitat loss, habitat fragmentation, habitat degradation, and also an increase in risk of injury or death due to vehicle collisions. Public and private land management practices can have a positive, neutral, or negative effect, depending on the management goals. Land protection efforts will help to stabilize the extant panther population. Hunting of the panther is no longer sanctioned, although there still may be instances of intentional or unintentional shooting of individuals for various reasons.

Past and ongoing Federal and State actions that could affect panther habitat in the Action Area include the issuance of Corps' permits and State of Florida Environmental Resource Permits authorizing the filling of wetlands for development projects and other purposes. Since 1982, the Corps and the State have had a joint wetland permit application process, where all permit applications submitted are distributed to both agencies. Upon review of our records, the Service finds that we have consulted on 8 projects, affecting approximately 3,035 ac of panther habitat, in the action area (subset of Table 1). In addition, a total of 266 ac of habitat was restored or preserved in association with these projects. The Service determined that these Federal actions, individually and cumulatively, did not jeopardize the survival and recovery of the Florida panther.

Other activities within the action area have benefited panthers. Wildlife underpasses have been, installed on I-75 and State Road 29, and are known to be used by panthers. In addition, a Roadside Animal Detection System (RADS) has been installed within a 1-mile stretch of U.S. Highway 41 at the Turner River. The RADS contains sensors that detect panthers and other species of wildlife when they attempt to cross the roadway. When activated, the sensors activate flashers on warning signs adjacent to the roadway that advise motorists to reduce their speed and be alert for the presence of wildlife on the road. These measures have likely reduced the number of vehicle/panther collisions in the Action Area. The land acquisition programs of Federal, State and County resource agencies have preserved high quality panther habitat. Moreover, the management of public lands, including prescribed fire and eradication of exotic vegetation in the BCNP and other conservation areas improves habitat for panther prey species and benefits panthers within these areas.

EFFECTS OF THE ACTION

This section analyzes the direct and indirect effects of the proposed action and interrelated and independent actions on the Florida panther and Florida panther habitat.

Factors to be considered

Development projects may have a number of direct and indirect effects on the Florida panther and panther habitat. Direct effects, which are primarily habitat based, may include: (1) the permanent loss and fragmentation of habitat for panthers and their prey; (2) a reduction in the geographic distribution of habitat for the species; (3) harassment of panthers due to construction activities; and (4) enhancement, restoration and preservation of panther habitat resulting from habitat compensation. Indirect effects may include an increase in the potential for intraspecific aggression among panthers due to reduction of the geographic distribution of habitat of the panther.

This project site contains panther habitat and is located within the geographic range of the Florida panther. The timing of construction for this project, relative to sensitive periods of the panther's lifecycle, is unknown. Panthers may be found on and adjacent to the proposed construction footprint year-round. The project may be constructed in a single, disruptive event, or it may be phased over time, depending on funding availability to NPS. It will result in permanent loss and alteration of a portion of the existing ground cover on the project site. The time required to complete construction of the project is not known. The disturbance associated with the project will be permanent and result in a loss of habitat currently available to the panther.

Analyses for effects of the action

The 17.5ac of land to be affected by the BCNP ORV trail heads and U.S. Highway 41 turn lanes project currently provides about 14 ac of high quality habitat for the Florida panther. The lands proposed for development are located within the southern portion of the panther's range. The project site is located in the Primary Zone (Kautz et al. 2006) of the Service's Panther Focus Area.

A variety of wildlife species that provide potential prey for the panther, are known to occur within the BCNP. Potential prey include: white-tailed deer, feral hog, wild turkey (*Meleagris gallopavo*), nine-banded armadillo, striped skunk (*Mephitis mephitis*), eastern grey squirrel (*Sciurus carolinensis*), eastern cottontail (*Sylivilagus floridanus*), and various species of small mammals, wading birds, amphibians, and reptiles.

Habitat assessment methodology application

The Service used our panther Habitat Assessment Methodology to evaluate the panther habitat lost due to the BCNP ORV trail heads and U.S. Highway 41 turn lanes project and the panther habitat provided as compensation at the FPCB (Table 6). The 14 ac of panther habitat at the project site currently provides 103.24 PHUs in the Primary Zone. To calculate the number of PHUs needed to compensate for the PHUs lost in in the Primary Zone due to the project, 103.24 PHUs are multiplied by the 2.5 Base Ratio and the landscape multiplier for the Primary Zone (1.0) for a product of 258.1 PHUs (rounded to 258 PHUs). Therefore, a total of 258 PHUs are needed to compensate for the loss of panther habitat lost due to the project. To meet this compensation need, the NPS will acquire 258 PHUs from an approved conservation or mitigation bank.

Beneficial effects

Beneficial effects are those effects of the proposed action that are completely positive, without any adverse effects to the listed species or its critical habitat. The proposed action will not result in beneficial effects to the Florida panther.

Direct effects

Direct effects are those effects that are caused by the proposed action, at the time of construction, are primarily habitat based, are reasonably certain to occur and include: (1) the permanent loss of panther habitat and habitat that supports panther prey; (2) a reduction in the geographic distribution of habitat for the species; (3) harassment by construction activities; and (4) the enhancement, restoration, and preservation of panther habitat through habitat compensation.

Permanent loss and fragmentation of habitat for panthers and their prey

The project will result in the loss of 14 ac of panther habitat located within the Primary Zone. Panthers may use these habitats for feeding and dispersal. The land will be converted to access driveways, parking areas and paved turn lanes. The project site also provides habitat for panther prey species (*e.g.*, feral hog, white-tailed deer, small mammals, *etc*.). Habitats within the project sites include high quality uplands, and forested and emergent wetlands. The habitat lost due to the project may adversely affect the panther by decreasing the spatial extent of lands available to panthers and their prey, and further fragment habitat that occurs adjacent to the project site.

Reduction in the geographic distribution of habitat for the species

The project will result in the loss of about 14 ac of undeveloped land within the Panther Focus Area. This loss represents 0.001 percent of the 1,962,294 ac of available non-urban private lands in south Florida in the Service's Primary Zone, Secondary zone, Dispersal zone, and Other Zone defined for the Florida panther (Table 3 and Figure 2). The Service finds the habitat value lost due to the project will be offset by the habitat compensation proposed by the applicant. The lands proposed for preservation are consistent with the Service's panther conservation strategy to locate, preserve, and restore lands containing sufficient area, access, and appropriate cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River.

Harassment by construction activities

The timing of construction for this project, relative to sensitive periods of the panther's lifecycle, is unknown. However, land clearing associated with the ORV trail head and turn lane construction will be completed in phases as funding becomes available for construction. There are no known den sites within the project boundaries. Therefore, we find it is unlikely project construction will result in direct panther mortality, but it may result in temporary disturbance to resident or dispersing panthers.

Habitat compensation

To compensate for the project's impacts to the panther, the NPS will acquire 258 PHUs from a Service-approved conservation or mitigation bank. Though the project will result in a net loss in number of acres of habitat available to the panther, the habitat provided to the Florida panther through restoration and preservation will be high quality habitat that is protected in perpetuity. Lands at Service-approved banks and surrounding areas contain a diverse mosaic of native plant species that provide foraging value to resident deer and other panther prey species; further, bank sites are managed to prevent infestation by exotic vegetation in perpetuity. This habitat compensation is consistent with the Service's goal to locate and preserve lands containing sufficient area and appropriate cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River.

Interrelated and interdependent actions

An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. Interrelated or interdependent actions are not expected to result from the project.

Indirect effects

Indirect effects are those effects that result from the proposed action, are later in time, and are reasonably certain to occur. The indirect effects this project will have on the Florida panther within the action area are discussed below and in the assessment of functional habitat values previously discussed. They include an increase in the potential for intraspecific aggression

among panthers due to the reduction in panther habitat in the action area. The proposed project is not anticipated to alter the traffic patterns in this area; therefore, we expect no indirect traffic effects to panthers from this project.

Increased potential for intraspecific aggression

As discussed in the Status of the Species, panther mortalities resulting from attacks of con-specifics are known to occur in the panther population (*e.g.*, males may kill other rival males when defending a territory). Habitat loss may increase the potential for intraspecific aggression among panthers in the action area. A total of 21 panther deaths due to intraspecific aggression have occurred within the action area; the most recent on occurred in May 2012. The Service notes the project will result in the loss of 14 ac of panther habitat. According to the most current home range estimates of the Florida panther (Lotz et al. 2005), this loss represents 0.05 percent of a female panther's average home range (29,059 ac) and 0.02 percent of a male panther's average home range (62,542 ac). Based on the amount of panther habitat lost (14 ac), the Service finds the project should not significantly increase intraspecific aggression in the action area.

<u>ORV access</u>: The proposed ORV trail heads will provide established parking areas for ORVs users at the BCNP. The trails accessed by the ORV trail head sites are already used by permitted ORV users, and ORV users are currently parking along existing roads near the trails. Therefore, construction of the proposed trail heads will not increase the number of permitted ORVs users nor increase the ORV traffic on the adjacent trails. Consequently, the project is not expected to increase disturbance from ORV use, or traffic to and from the use areas, above what is currently experienced by panthers.

Species response to the proposed action

The proposed action will result in increased disturbance to panthers from human activity and noise at the project site. This disturbance will occur during construction of the project and be ongoing following completion of the project due to human use of the access driveways, parking areas and turn lanes. Panthers will respond to the disturbance by avoiding the project area or habituating to the disturbance. The project will also result in the loss of 14 ac of panther habitat. The project area provides habitat for panther prey, and panthers are known to use the project area. The loss of habitat may result in a minor increase the potential for panther intraspecific aggression by decreasing the spatial extent of lands available to the panther. We anticipate any resident panthers with home ranges overlapping or in the vicinity of the project area will adjust the size and location of their ranges to account for this loss and that adjustment is anticipated to occur in concert with project construction.

CUMULATIVE EFFECTS

The Service defines "cumulative effects" considered in this Biological Opinion as the effects of future State, Tribal, local, or private actions (*i.e.*, non-Federal actions) reasonably certain to occur in the action area. Our definition of cumulative effects does not include future Federal actions unrelated to the proposed action because these actions require separate consultation pursuant to section 7 of the Act. Within the Action Area, past and ongoing State and County

actions (non-Federal) affecting panther habitat include: (1) State of Florida Development of Regional Impact (DRI) Orders; (2) Collier County Comprehensive Plan Amendments; (3) Collier County Zoning Amendments; (4) Collier County Planned Unit Developments (PUDs); and (5) South Florida Water Management District's Environmental Resource Permits (ERPs). To estimate future non-Federal actions, the Service chose to identify and tabulate recent non-Federal actions and project this level of development as representative of future non-Federal actions.

Our projection of non-Federal actions (*i.e.*, cumulative effects) in the action area incorporates Florida Land Use Cover and Forms Classification System (FLUCCS) mapping to determine if a property may be exempt from Federal Clean Water Act, section 404, wetland regulatory review by the Corps. To determine if a development project would likely be exempt from regulatory review, we identified the percentage of the project site that was classified as wetland habitat based on FLUCCS 600 series (wetland), and the 411 and 419 (hydric pine flatwood) mapping unit classifications. Projects on properties with less than 5 percent wetlands were considered to be exempt from the Corps' regulatory review because impacts to wetlands could likely be avoided by project design.

The Service notes much of the action area contains public lands that are protected for conservation purposes and not likely to be developed. Therefore, to assess cumulative effects in the action area, we used data on non-Federal actions in the action area (ERPs proposed from 2006 through 2009) provided by the consultant for the proposed Hacienda Lakes development (Biological Opinion 2010-CPA-0424, issued July 19, 2012) in Collier County, located northwest of the project sites. The Service considers this data as appropriate for the cumulative effects evaluation for the BCNP ORV trail heads and U.S. Highway 41 turn lanes project because the action area for the Hacienda Lakes development largely overlaps the portion of the action area for this BCNP project that contains privately-owned lands (*i.e.*, lands where non-Federal development actions are most likely to occur).

The footprints of the non-Federal development actions identified in the action area for Hacienda Lakes Development were overlain on the National Wetlands Inventory (NWI) maps to determine presence of wetlands. As described above, parcels with less than 5 percent wetlands were considered to be exempt from the Corps' regulatory review under section 404 of the Federal Clean Water Act. Data in the Service's Biological Opinion for the Hacienda Lakes development indicate that 47 projects affecting 4,072 ac of lands (from 2006 through 2009) or 1,018 ac of land per year (4,072 ac/4 years = 1,018 ac/year) were exempt from Corps regulatory review in the action area. We find this value is representative of future yearly development likely to occur in the action area for the BCNP ORV trail heads and the U.S. Highway 41 turn lanes project due to non-Federal actions. The Service notes many unforeseen factors, such as the recent economic downturn, can affect development in the action area. Therefore, we acknowledge it is difficult to forecast development related to non-Federal actions in the action area with great certainty. However, the Service believes this estimate provides the best approximation available of future, non-Federal actions reasonably certain to occur and meets our definition of a cumulative effect. This level of development represents 3.5 percent of a female panther's average home range (29,059 ac) and 1.63 percent of a male panther's average home range (62,542 ac).

Based on the above analysis, we believe the loss of the habitat associated with these lands is insignificant in the short term, but may adversely impact the panther as development continues to occur in the future in the action area. The Service has accounted for some habitat loss and changes in habitat quality through its habitat assessment methodology and is encouraging State and County environmental staff to develop Habitat Conservation Plans (per Section 10 of the Act) to compensate for adverse effects resulting from non-Federal actions to the Florida panther.

CONCLUSION

As discussed above, the Service finds that construction of the BCNP ORV trail heads and the U.S. Highway 41 turn lanes project is not likely to directly result in the injury or mortality of panthers. However, the project will result in the loss of 14 ac of habitat currently used by panthers and their prey, and result in a permanent reduction in the geographic range of the species. Therefore, the project could increase the potential for intraspecific aggression resulting in panther mortalities. However, this form of take is difficult to quantify due to the wide-ranging habit of the species and the challenge of linking the death or injury of a single panther to increases in panther interactions (intraspecific aggression). According to the most current home range estimates of the Florida panther (Lotz et al. 2005), the loss of 14 ac of panther habitat represents 0.05 percent of a female panther's average home range (29,059 ac), 0.02 percent of a male panther's average home range (62,542 ac), and 0.001 percent of the 1,962,294 ac of available non-urban private lands in the Service's panther core area. Based on the amount of panther habitat lost (14 ac) due to the project, the Service finds that the project should not significantly affect the panther population or increase the potential for intraspecific aggression in the action area. Moreover, the loss of panther habitat due to the project will be offset by the acquisition of 258 PHUs of panther habitat acquired by the NPS from a Service-approved conservation or mitigation bank. The compensation site will be preserved and managed as panther habitat in perpetuity. This habitat compensation is consistent with the Service's goal to locate and preserve lands containing sufficient area and appropriate cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River.

After reviewing the current status of the Florida panther, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion the project, as proposed, is not likely to jeopardize the continued existence of the Florida panther. Critical habitat has not been designated for these species and will not be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined

as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking, that is incidental to and not intended as part of the agency action, is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

AMOUNT OR EXTENT OF TAKE

The Service has reviewed the biological information for the Florida panther, information presented by the NPS and their consultant, and other available information relevant to this action.

Incidental take of the Florida panther in the form of harm (*i.e.*, the loss and degradation of 14 ac of habitat in the 17.3-acre project footprint) and harassment (*i.e.*, disturbance to panthers resulting from human activity during and following construction of the project) is expected from the action. The Service has chosen not to quantify the level of incidental take in terms of a specific number of animals because documenting the adverse effects of loss of habitat and disturbance on survival and reproduction of panthers from the project is problematic due to the wide-ranging nature of this species. Instead, we have quantified take as the amount of panther habitat lost due to the project. The project will result in the loss of 14 ac of habitat within the Primary Zone of the Service's Focus Area. We find the level of incidental take is moderated by the acquisition 258 PHUs of habitat at a Service-approved conservation or mitigation bank; this habitat will be enhanced and preserved in perpetuity to benefit the Florida panther and its prey.

The Service has determined the anticipated take is not likely to result in jeopardy to the Florida panther. If, during the course of this action, this level of take is exceeded, such take would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide modification of the reasonable and prudent measures.

EFFECT OF THE TAKE

In the accompanying Biological Opinion, the Service determined this level of anticipated take is not likely to result in jeopardy to the Florida panther. Critical habitat has not been designated for the Florida panther and will not be affected.

REASONABLE AND PRUDENT MEASURES

When providing an incidental take statement, the Service is required to give reasonable and prudent measures it considers necessary and appropriate to minimize the take, along with terms and conditions, that must be complied with, to implement the reasonable and prudent measures. Furthermore, the Service must also specify procedures to be used to handle or dispose of any individuals taken. The Service finds the following reasonable and prudent measures are necessary and appropriate to reduce take and to minimize the direct and indirect effects of the proposed project on the Florida panther:

1. Minimize the adverse effects of harm and harassment to the Florida panther by implementing an appropriate habitat compensation plan.

2. Notify the Service of any unauthorized take of the Florida panther.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the NPS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. At least 30 days prior to construction, the NPS will provide proof to the Service in the form of a letter or email from a Service-approved conservation or mitigation bank indicating that credits providing at least 258 PHUs have been acquired. Additionally, proof that bank credits providing 10.62 kg of short-hydroperiod and 7.89 kg of long-hydroperiod wood stork forage biomass shall be provided concurrently with proof of PHU acquisition. Credits purchased from a bank which provides both PHUs and wood stork kg of biomass may be used towards both species.

2. Upon locating a dead, injured, or sick threatened or endangered species, initial notification must be made to the nearest Service Law Enforcement Office; Fish and Wildlife Service; 9549 Koger Boulevard, Suite 111; St. Petersburg, Florida 33702; 727-570-5398. Secondary notification should be made to the FWC; South Region; 3900 Drane Field Road; Lakeland, Florida; 33811-1299; 1-800-282-8002; and

3. Care should be taken in handling sick or injured specimens (of any federally listed species) to ensure effective treatment and care or in the handling of dead specimens to preserve biological material in the best possible state for later analysis as to the cause of death. In conjunction with the care of sick or injured individuals, or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service is not proposing any conservation recommendations at this time.

REINITIATION NOTICE

This concludes formal consultation on the BCNP ORV trail heads and the U.S. Highway 41 turn lanes project. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded (see below); (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; (3) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

The amount of incidental take authorized by this consultation may be exceeded should impacts from the proposed project increase or mitigation fail to provide habitat values proposed and analyzed within this Biological Opinion. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation in the effort to protect fish and wildlife resources. If you have any questions regarding this project, please contact John Wrublik at 772-469-4282.

Attachment

cc: w/attachment (electronic only)
Corps, Fort Myers, Florida (Cynthia Ovdenk, Tunis Mcelwain)
EPA, West Palm Beach, Florida (Richard Harvey)
FWC, Naples, Florida (Darrell Land)
FWC, Tallahassee, Florida (FWC-CPS)
Service, Atlanta, Georgia (Ken Graham)
Service, Florida Panther NWR, Naples, Florida (Kevin Godsea)

LITERATURE CITED

Ackerman, B. B., F. G. Lindzey, and T. P. Hemker. 1986. Predictive energetics model for cougars. Pages 333-352 in S. D. Miller and D. D. Everett (eds). Cats of the world: biology, conservation, and management. National Wildlife Federation and Caesar Kleberg Wildlife Research Institute, Washington, D. C. and Kingsville, Texas.

Anderson, A. E. 1983. A critical review of literature on puma (Felis concolor). Special Report No. 54. Colorado Division of Wildlife, Fort Collins, Colorado.

Ballou, J. D., T. J. Foose, R. C. Lacy, and U. S. Seal. 1989. Florida panther (Felis concolor coryi) population viability analysis and recommendations. Captive Breeding Specialist Group, Species Survival Commission, IUCN, Apple Valley, Minnesota.

Bangs, O. 1899. The Florida puma. Proceedings of the Biological Society of Washington 13:15-17.

Beier, P. 1995. Dispersal of juvenile cougars in fragmented habitat. Journal of Wildlife Management 59:228-237.

Beier P., M. R. Vaughan, M. J. Conroy, and H. Quigley. 2003. An analysis of scientific literature related to the Florida panther. Final report, Project NG01-105, Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Beier P., M. R. Vaughan, M. J. Conroy, and H. Quigley. 2006. Evaluating scientific inferences about the Florida panther. Journal of Wildlife Management 70 (1):236-245.

Beissinger, S.R. and M.I. Westphal. 1998. On the use of demographic models of population viability in endangered species management. Journal Wildlife Management 62:821-841.

Belden, R. C. 1986. Florida panther recovery plan implementation - a 1983 progress report. Pages 159-172 in S. D. Miller and D. D. Everett (eds). Cats of the world: biology, conservation, and management. National Wildlife Federation and Caesar Kleberg Wildlife Research Institute, Washington, D.C. and Kingsville, Texas.

Belden, R. C. 1988. The Florida panther. Pages 515-532 in Audubon Wildlife Report 1988/1989. National Audubon Society, New York, New York.

Belden, R. C., and R. T. McBride. 1983. Florida panther surveys - Big Cypress National Preserve. Final report to Hughes and Hughes Oil and Gas Company.

Belden, R. C., and R. T. McBride. 2005. Florida panther peripheral areas survey final report 1998-2004. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Belden, R. C., W. B. Frankenberger, and J. C. Roof. 1991. Florida panther distribution. Final Report 7501, E-1 II-E-1. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Belden, R. C., W. B. Frankenberger, R. T. McBride, and S. T. Schwikert. 1988. Panther habitat use in southern Florida. Journal of Wildlife Management 52:660-663.

Benson, J. F., M.A. Lotz, and D. Jansen. 2008. Natal den selection by Florida panthers. Journal of Wildlife Management 72(2):405–410.

Benson, J. F., J. A. Hostetler, D. P. Onorato, W. E. Johnson, M. E. Roelke, S. J. O'Brien, D. Jansen, and M. K. Oli. 2009. Survival and cause-specific mortality of sub-adult and adult Florida panthers. Pages 10 – 61 in Hostetler, J.A., D.P. Onorato, and M.K. Oli. 2009. Population ecology of the Florida panther. Final Report submitted to the Florida Fish and Wildlife Conservation Commission and U.S. Fish and Wildlife Service.

Berglund, F., and Berlin, M. 1969. in Chemical Fallout, M. W. Miller, and G. G. Berg editors. Thomas, Springfield, Illinois.

Beyer, D. E., Jr., and J. B. Haufler. 1994. Diurnal versus 24-hour sampling of habitat use. Journal of Wildlife Management 58:178-180.

Brook, B. 2000. Pessimistic and optimistic bias in population viability analysis. Biology Conservation 14:564-566.

Brook, B.W., L. Lim, R. Harden, and R. Frankham. 1997. Does population viability analysis software predict the behaviour of real populations? A retrospective study of the Lord Howe Island Woodhen Tricholimnas sylvestris (Sclater). Biology Conservation 82:119-128.

Brown, M., M. Cunningham, A. L. Roca, J. Troyer, W. Johnson and S. J. O'brien. 2008. Genetic characterization of feline leukemia virus (FeLV) in the free-ranging Florida panther population. Emerging Infectious Diseases 14: 252–259.

Clark J. D., D. Huber, and C. Servheen. 2002. Bear reintroductions: lessons and challenges. Ursus 13:335-345.

Comiskey, E. J., L. J. Gross, D. M. Fleming, M. A. Huston, O. L. Bass, Jr., H. Luh, and Y. Wu. 1994. A spatially-explicit individual-based simulation model for Florida panther and white-tailed deer in the Everglades and Big Cypress landscapes. Pages 494-503 in D. Jordan (ed). Proceedings of the Florida Panther Conference. U.S. Fish and Wildlife Service, Gainesville, Florida.

Comiskey, E. J., O. L. Bass, Jr., L. J. Gross, R. T. McBride, and R. Salinas. 2002. Panthers and forests in south Florida: an ecological perspective. Conservation Ecology 6:18.

Comiskey, E. J., A. C. Eller, Jr., and D. W. Perkins. 2004. Evaluating impacts to Florida panther habitat: how porous is the umbrella? Southeastern Naturalist 3:51-74.

Cory, C. B. 1896. Hunting and fishing in Florida. Estes and Lauriat, Boston, Massachusetts.

Cox J., R. Kautz, M. MacLaughlin, and T. Gilbert. 1994. Closing the gaps in Florida's wildlife habitat conservation system. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Cox, J., D. Maehr, and J. Larkin. 2006. Florida panther habitat use: A new approach to an old problem. The Journal of Wildlife Management. 70(6):1778-1786.

Culver, M., W.E. Johnson, J. Pecon-Slattery, and S. J. O'Brien. 2000. Genomic ancestry of the American puma (Puma concolor). Journal of Heredity 91:186-197.

Culver, M., P.W. Hendrick, K. Murphy, S. J. O'Brien, and M.G. Hornocker. 2008. Estimation of the bottleneck size in Florida panthers. Animal Conservation (2008): 1-7.

Cunningham, M.W. 2005a. Personal Communication. Email from M. W. Cunningham, Florida Fish and Wildlife Conservation Commission to P. Halupa, U. S. Fish and Wildlife Service.

Cunningham, M.W. 2005b. Epizootiology of feline leukemia virus in the Florida panther. M.S. Thesis. University of Florida, Gainesville, Florida.

Cunningham, M.W., M.A. Brown, D.B. Shindle, S. P. Terrell, K.A. Hayes, B.C. Ferree, R.T. McBride, E.L. Blankenship, D. Jansen, S.B. Citino, M.E. Roelke, R.A. Kiltie, J.L. Troyer and Stephen J.O'Brien. 2008. Epizootiology and management of feline leukemia virus in the Florida puma. Journal of Wildlife Diseases 44(3): 537–552.

Dalrymple, G. H., and O. L. Bass. 1996. The diet of the Florida panther in Everglades National Park, Florida. Bulletin of the Florida Museum of Natural History 39:173-193.

Dees, C. S., J. D. Clark, and F. T. Van Manen. 2001. Florida panther habitat use in response to prescribed fire. Journal of Wildlife Management 65:141-147.

Dickson, B. G., J. S. Jenness, and P. Beier. 2005. Influence of vegetation, topography, and roads on cougar movement in Southern California. Journal of Wildlife Management 69:264-276.

Duever, M. J., J. E. Carlson, J. F. Meeder, L. C. Duever, L. H. Gunderson, L. A. Riopelle, T. R. Alexander, R. L. Myers, and D. P. Spangler. 1986. The Big Cypress National Preserve. Research Report 8. National Audubon Society, New York, New York.

Fieberg, J., and S. P. Ellner. 2000. When is it meaningful to estimate an extinction probability? Ecology 81:2040-2047.

Fleming, M., J. Schortemeyer, and J. Ault. 1994. Distribution, abundance, and demography of white-tailed deer in the Everglades. Pages 247-274 in D. Jordan (ed). Proceedings of the Florida Panther Conference. U.S. Fish and Wildlife Service, Gainesville, Florida.

Florida Fish and Wildlife Conservation Commission. 2002. Annual report on the research and management of Florida panthers: 2006-2007. Fish and Wildlife Research Institute and Division of Habitat and Species Conservation. Naples, Florida.

Florida Fish and Wildlife Conservation Commission. 2003. Annual report on the research and management of Florida panthers: 2006-2007. Fish and Wildlife Research Institute and Division of Habitat and Species Conservation. Naples, Florida.

Florida Fish and Wildlife Conservation Commission. 2005. Annual report on the research and management of Florida panthers: 2004-2005. Fish and Wildlife Research Institute and Division of Habitat and Species Conservation. Naples, Florida.

Florida Fish and Wildlife Conservation Commission. 2010a. Annual report on the research and management of Florida panthers: 2009-2010. Fish and Wildlife Research Institute and Division of Habitat and Species Conservation. Naples, Florida.

Florida Fish and Wildlife Conservation Commission. 2010b. Statement on estimating panther population size. Tallahassee, Florida. http://myfwc.com/news/resources/fact-sheets/panther-population/

Florida Fish and Wildlife Conservation Commission. 2010c. Statement on capture and collar of male panther near recent calf depredations. Tallahassee, Florida. http://myfwc.com/ news/news-releases/2010/november/03/panther/

Florida Fish and Wildlife Conservation Commission (FWC). 2011a. Florida Panthernet Handbook/Natural History/Panther Sign: Scrapes. http://www.floridapanthernet.org/ index.php/handbook/history/panther_sign_scrapes/

Florida Fish and Wildlife Conservation Commission (FWC). 2011b. Florida Panthernet Handbook/ Natural History/ Life Expectancy and Mortality. http://www.florida panthernet.org /index.php/handbook/ history/life_expectancy and_mortality/

Forman, R.T.T., D. Spelling, J.A. Bissonette, A.P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T. Turrrentine, and T.C. Winter. 2003. Road Ecology, Science and Solutions. Island Press, Washington D.C. 481 pages.

Forrester, D.J. 1992. Parasites and diseases of wild mammals in Florida. University Press of Florida, Gainesville, Florida.

Forrester, D.J., J.A. Conti, and R.C. Belden. 1985. Parasites of the Florida panther (*Felis concolor coryi*). Proceedings of the Helminthological Society of Washington 52:95-97.

Foster, M.L. and S.R. Humphrey. 1995. Use of highway underpasses by Florida panthers and other wildlife. Wildlife Society Bulletin 23:95-100.

Foster, G.W., M.W. Cunningham, J.M. Kinsella, G. McLaughlin, and D.J. Forrester. 2006. Gastrointestinal Helminths of Free-ranging Florida Panthers (*Puma concolor coryi*) and the Efficacy of the Current Anthelmintic Treatment Protocol. Journal of Wildlife Diseases, 42(2): 402–406.

Frederick, P.C., Spalding, M.G., Dusek, R., 2002. Wading birds as bioindicators of mercury contamination in Florida, USA: annual and geographic variation.Environ. Toxicol. Chem. 21, 163–167.

Glass, C.M., R.G. McLean, J.B. Katz, D.S. Maehr, C.B. Cropp, L.J. Kirk, A.J. McKeirnan, and J.F. Evermann. 1994. Isolation of pseudorabies (Aujeszky's disease) virus from a Florida panther. Journal of Wildlife Diseases 30:180-184.

Hamilton, S. and H. Moller. 1995. Can PVA models using computer packages offer useful conservation advice? Sooty shearwaters Puffinus griseus in New Zealand as a case study. Biological Conservation 73:107-117.

Harlow, R.F. 1959. An evaluation of white tailed deer habitat in Florida. Florida Game and Fresh Water Fish Commission Technical Bulletin 5, Tallahassee, Florida.

Harlow, R.F., and F.K. Jones. 1965. The white-tailed deer in Florida. Florida Game and Fresh Water Fish Commission Technical Bulletin 9, Tallahassee, Florida.

Harris, L.D. 1984. The fragmented forest: island biogeography theory and the preservation of biotic diversity. University of Chicago Press, Chicago, Illinois.

Harrison, R.L. 1992. Toward a theory of inter-refuge corridor design. Conservation Biology 6:293-295.

Hollister, N. 1911. The Louisiana puma. Proceedings of the Biological Society of Washington 24:175-178.

Hostetler, J.A., D.P. Onorato, and M.K. Oli. 2009. Population ecology of the Florida panther. Final Report submitted to the Florida Fish and Wildlife Conservation Commission and U.S. Fish and Wildlife Service

Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report. 2007. Climate Change 2007: Synthesis Report. Summary for Policy Makers. Draft.

Janis, M.W., and J.D. Clark. 1999. The effects of recreational deer and hog hunting on the behavior of Florida panthers. Final report to Big Cypress National Preserve, National Park Service, Ochopee, Florida.

Janis, M.W., and J.D. Clark. 2002. Responses of Florida panthers to recreational deer and hog hunting. Journal of Wildlife Management 66:839-848.

Jansen, D.K., S.R. Schulze, and A. T. Johnson. 2005. Florida panther (*Puma concolor coryi*) research and monitoring in Big Cypress National Preserve. Annual report 2004-2005. National Park Service, Ochopee, Florida.

Johnson, W.E., D.P. Onorato, M.E. Roelke, E.D. Land, M. Cunningham, R.C. Belden, R. McBride, D. Jansen, M. Lotz, D. Shindle, J. Howard, D.E. Wildt, L.M. Penfold, J.A. Hostetler, M.K. Oli, and S.J. O'Brien. 2010. Genetic Restoration of the Florida panther. Science 329:1641-1645.

Kautz, R.S., and J.A. Cox. 2001. Strategic habitats for biodiversity conservation in Florida. Conservation Biology 15:55-77.

Kautz, R., R. Kawula, T. Hoctor, J. Comiskey, D. Jansen, D. Jennings, J. Kasbohm, F. Mazzotti, R. McBride, L. Richardson, and K. Root. 2006. How much is enough? Landscape-scale conservation for the Florida panther. Biological Conservation.

Kerkhoff, A. J., B.T. Milne, and D.S. Maehr. 2000. Toward a panther-centered view of the forests of south Florida. Conservation Ecology 4:1.

Labisky, R.F., M.C. Boulay, K.E. Miller, R.A. Sargent, Jr., and J.M. Zultowskil. 1995. Population ecology of white-tailed deer in Big Cypress National Preserve and Everglades National Park. Final report to National Park Service, Ochopee, Florida.

Labisky, R.F., C.C. Hurd, M.K. Oli, and R.S. Barwick. 2003. Foods of white-tailed deer in the Florida Everglades: the significance of Crinum. Southeastern Naturalist 2:261-270.

Land, E.D. 1994. Response of the wild Florida panther population to removals for captive breeding. Final Report 7571. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Land, D., and S.K. Taylor. 1998. Florida panther genetic restoration and management annual report 1997-98. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Land, D., B. Shindle, D. Singler, and S. K. Taylor. 1999. Florida panther genetic restoration annual report 1998-99. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Land, D., M. Cunningham, R. McBride, D. Shindle, and M. Lotz. 2002. Florida panther genetic restoration and management annual report 2001-02. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Land, D., D. Shindle, M. Cunningham, M. Lotz, and B. Ferree. 2004. Florida panther genetic restoration and management annual report 2003-04. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Land, D., R. Kawula, J. Benson, M. Lotz, and D. Onorato. 2008. Florida panther habitat selection analysis of concurrent GPS and VHF Telemetry Data. The Journal of Wildlife Management. 72(3):633-639.

Logan, T.J., A.C. Eller, Jr., R. Morrell, D. Ruffner, and J. Sewell. 1993. Florida panther habitat preservation plan - south Florida population. Prepared for the Florida Panther Interagency Committee.

Lotz, M., D. Land, M. Cunningham, and B. Ferree. 2005. Florida panther annual report 2004-05. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Loveless, C. M. 1959. The Everglades deer herd life history and management. Florida Game and Fresh Water Fish Commission Technical Bulletin 6, Tallahassee, Florida.

Mac, M.J., P.A. Opler, C.E. Puckett Haecker, and P.D. Doran. 1998. Status and trends of the nation's biological resources. 2 volumes. U.S. Department of the Interior, U.S. Geological Survey, Reston, Virginia.

Maehr, D.S. 1990. Florida panther movements, social organization, and habitat utilization. Final Performance Report 7502. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Maehr, D.S. 1992. Florida panther. Pages 176-189 in S.R. Humphrey (ed). Rare and endangered biota of Florida. Volume I: mammals. University Press of Florida, Gainesville, Florida.

Maehr, D.S. 1997. The comparative ecology of bobcat, black bear, and Florida panther in south Florida. Bulletin of the Florida Museum of Natural History 40:1-176.

Maehr, D.S. and J. A. Cox. 1995. Landscape features and panthers in Florida. Conservation Biology 9(5): 1008-1019.

Maehr, D.S., J.C. Roof, E.D. Land, and J.W. McCown. 1989. First reproduction of a panther (*Felis concolor coryi*) in southwestern Florida, U.S.A. Mammalia 53: 129-131.

Maehr, D.S., R. C. Belden, E.D. Land, and L. Wilkins. 1990a. Food habits of panthers in southwest Florida. Journal of Wildlife Management 54:420-423.

Maehr, D.S., E.D. Land, J. C. Roof, and J.W. McCown. 1990b. Day beds, natal dens, and activity of Florida panthers. Proceedings of Annual Conference of Southeastern Fish and Wildlife Agencies 44:310-318.

Maehr, D.S., E.D. Land, and J.C. Roof. 1991. Social ecology of Florida panthers. National Geographic Research & Exploration 7:414-431.

Maehr, D.S., E.C. Greiner, J.E. Lanier, and D. Murphy. 1995. Notoedric mange in the Florida panther (*Felis concolor coryi*). Journal of Wildlife Diseases 31:251-254.

Maehr, D.S., E.D. Land, D.B. Shindle, O.L. Bass, and T.S. Hoctor. 2002a. Florida panther dispersal and conservation. Biological Conservation 106:187-197.

Maehr, D.S., R.C. Lacy, E.D. Land, O.L. Bass, and T. S. Hoctor. 2002b. Evolution of Population Viability Assessments for the Florida Panther: A Multiperspective Approach. Pages 284-311 in S.R. Beissinger and D.R. McCullough (eds). Population Viability Analysis. The University of Chicago Press, Chicago, Illlinois, USA.

McBride, R.T. 2000. Current panther distribution and habitat use: a review of field notes, fall 1999-winter 2000. Report to Florida Panther Subteam of MERIT, U.S. Fish and Wildlife Service, Vero Beach, Florida.

McBride, R.T. 2001. Current panther distribution, population trends, and habitat use: report of field work: fall 2000-winter 2001. Report to Florida Panther Subteam of MERIT, U.S. Fish and Wildlife Service, Vero Beach, Florida.

McBride, R.T. 2002. Current panther distribution and conservation implications -- highlights of field work: fall 2001 -- winter 2002. Report to Florida Panther Subteam of MERIT, U.S. Fish and Wildlife Service, Vero Beach, Florida.

McBride, R.T. 2004. Personal communication. Professional Tracker-Houndsman. Rancher's Supply Incorporated, P.O. Box 725, Alpine, Texas 79831.

McBride, R.T. 2005. Personal communication. Professional Tracker-Houndsman. Rancher's Supply Inc., P.O. Box 725, Alpine, Texas 79831.

McBride, R.T. 2006. Personal communication. Professional Tracker-Houndsman. Rancher's Supply Incorporated, P.O. Box 725, Alpine, Texas 79831.

McBride, R.T. 2007. Personal communication. Professional Tracker-Houndsman. Rancher's Supply Inc., P.O. Box 725, Alpine, Texas 79831.

McBride, R.T. 2008. Personal communication. Professional Tracker-Houndsman. Rancher's Supply Inc., P.O. Box 725, Alpine, Texas 79831.

McBride, R.T. 2010. Personal communication. Professional Tracker-Houndsman. Rancher's Supply Inc., P.O. Box 725, Alpine, Texas 79831

McBride, R.T., R.M. McBride, J.L. Cashman, and D.S Maehr. 1993. Do Mountain Lions Exist in Arkansas? Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 47:394-402.

McBride, R.T., R.T. McBride, R.M. McBride, and C.E. McBride. 2008. Counting Pumas by Categorizing Physical Evidence. Southeastern Naturalist 7(3):381–400.

McBride, R. T., C.E. McBride, and R. Sensor. 2012. Synoptic Survey of Florida Panthers 2011. Annual Report to U. S. Fish and Wildlife Service (Agreement #401817G005), South Florida Ecological Services Office, Vero Beach, Florida. 145 pp.

McCown, J.W. 1994. Big Cypress deer/panther relationships: deer herd health and reproduction. Pages 197-217 in D. B. Jordan (ed). Proceedings of the Florida Panther Conference. U.S. Fish and Wildlife Service, Gainesville, Florida.

Miller, K. E. 1993. Habitat use by white-tailed deer in the Everglades: tree islands in a seasonally flooded landscape. M.S. Thesis. University of Florida, Gainesville, Florida.

Nelson, E.W., and E.A. Goldman. 1929. List of the pumas with three described as new. Journal of Mammalogy 10:345-350.

Newell, D. 1935. Panther. The Saturday Evening Post. July 13:10-11, 70-72.

Noss, R.F. 1992. The wildlands project land conservation strategy. Wild Earth (Special Issue): 10-25.

Noss, R.F., and A.Y. Cooperrider. 1994. Saving Nature's Legacy: Protecting and Restoring Biodiversity. Island Press, Washington, D.C.

Nowak, R.M., and R.T. McBride. 1974. Status survey of the Florida panther. Project 973. World Wildlife Fund Yearbook 1973-74:237-242.

Nowak, R.M., and R.T. McBride. 1975. Status of the Florida panther. Project 973. World Wildlife Fund Yearbook 1974-75:245-46.

Nowell, K. and P. Jackson. 1996. Status survey and conservation action plan: Wild cats. International Union for Conservation of Nature and Natural Resources. Burlington Press, Cambridge, U.K.

Olmstead, R.A., R. Langley, M.E. Roelke, R.M. Goeken, D. Adger-Johnson, J.P. Goff, J.P. Albert, C. Packer, M.K. Laurenson, T.M. Caro, L. Scheepers, D.E. Wildt, M. Bush, J.S. Martenson, and S.J. O'Brien. 1992. Worldwide prevalence of lentivirus infection in wild feline species: epidemiologic and phylogenetic aspects. Journal of Virology 66:6008-6018.

Pearlstine, L.G. 2008. Ecological consequences of climate change for the Florida Everglades: An initial summary. Technical memorandum, South Florida Natural Resources Center, Everglades National Park. Homestead, Florida.

Reed, J.M., P.D. Doerr, and J.R. Walters. 1988. Minimum viable population size of the red-cockaded woodpecker. Journal of Wildlife Management 50:239-247.

Reeves, K.A. 1978. Preliminary investigation of the Florida panther in Big Cypress Swamp. Unpublished report. Everglades National Park, Homestead, Florida.

Roelke, M.E. 1990. Florida panther biomedical investigation. Final Performance Report 7506. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Roelke, M.E. 1991. Florida panther biomedical investigation. Annual performance report, Study No. 7506. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Roelke, M.E., J. S. Martenson, and S.J. O'Brien. 1993a. The consequences of demographic reduction and genetic depletion in the endangered Florida panther. Current Biology 3:340-350.

Roelke, M.E., D.J. Forrester, E.R. Jacobsen, G.V. Kollias, F.W. Scott, M.C. Barr, J.F. Evermann, and E.C. Pirtle. 1993b. Seroprevalence of infectious disease agents in free-ranging Florida panthers (*Felis concolor coryi*). Journal of Wildlife Diseases 29:36-49.

Root, K. 2004. Florida panther (Puma concolor coryi): Using models to guide recovery efforts. Pages 491-504 in H.R. Akcakaya, M. Burgman, O. Kindvall, C.C. Wood, P. Sjogren-Gulve, J. Hatfield, and M. McCarthy (eds). Species Conservation and Management, Case Studies. Oxford University Press, New York, New York.

Rotstein, D.S., R. Thomas, K. Helmick, S.B. Citino, S.K. Taylor, and M.R. Dunbar. 1999. Dermatophyte infections in free-ranging Florida panthers (*Felis concolor coryi*). Journal of Zoo and Wildlife Medicine 30:281-284.

Sarkar, S. 2004. Conservation Biology: The Stanford Encyclopedia of Philosophy (Winter 2004 Edition), Edward N. Zalta (ed). [online] URL: http://plato.stanford.edu/archives/ win2004/entries/conservation-biology.

Schortemeyer, J.L., D.S. Maehr, J.W. McCown, E.D. Land, and P.D. Manor. 1991. Prey management for the Florida panther: a unique role for wildlife managers. Transactions of the North American Wildlife and Natural Resources Conference 56:512-526.

Seal, U.S. (ed). 1994. A plan for genetic restoration and management of the Florida panther (*Felis concolor coryi*). Report to the Florida Game and Fresh Water Fish Commission, by the Conservation Breeding Specialist Group, Species Survival Commission, IUCN, Apple Valley, Minnesota.

Seal, U.S., and R.C. Lacy (eds). 1989. Florida panther (*Felis concolor coryi*) viability analysis and species survival plan. Report to the U. S. Fish and Wildlife Service, by the Captive Breeding Specialist Group, Species Survival Commission, IUCN, Apple Valley, Minnesota.

Seal, U.S., and R.C. Lacy (eds). 1992. Genetic management strategies and population viability of the Florida panther (Felis concolor coryi). Report to the U.S. Fish and Wildlife Service by the Captive Breeding Specialist Group, Species Survival Commission, IUCN, Apple Valley, Minnesota.

Seidensticker, J.C., IV, M.G. Hornocker, W.V. Wiles, and J.P. Messick. 1973. Mountain lion social organization in the Idaho primitive area. Wildlife Monographs 35:1-60.

Shaffer, M.L. 1978. "Determining Minimum Viable Population Sizes: A Case Study of the Grizzly Bear." Ph. D. Dissertation, Duke University.

Shaffer, M.L. 1981. Minimum population sizes for species conservation. BioScience 31:131-134.

Shaffer, M.L. 1987. Minimum viable populations: coping with uncertainty. Pages 69-86 in M.E. Soulé (ed). Viable populations for conservation. Cambridge University Press, New York.

Shindle, D., D. Land, K. Charlton, and R. McBride. 2000. Florida panther genetic restoration and management. Annual Report 7500. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Shindle, D., D. Land, M. Cunningham, and M. Lotz. 2001. Florida panther genetic restoration and management. Annual Report 7500. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Shindle D., M. Cunningham, D. Land, R. McBride, M. Lotz, and B. Ferree. 2003. Florida panther genetic restoration and management. Annual Report 93112503002. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Smith, T.R., and O.L. Bass, Jr. 1994. Landscape, white-tailed deer, and the distribution of Florida panthers in the Everglades. Pages 693-708 in S. M. Davis and J. C. Ogden (eds). Everglades: the ecosystem and its restoration. Delray Beach, Florida.

Smith, D.J., R.F. Noss, and M.B. Main. 2006. East Collier County wildlife movement study: SR 29, CR 846, and CR 858 wildlife crossing project. Unpublished report. University of Central Florida, Orlando, Florida.

Swanson, K., D. Land, R. Kautz and R. Kawula. 2005. Use of least cost pathways to identify key highway segments for Florida panther conservation. Pages 191-200 in R.A. Beausoleil and D.A. Martorello, editors. Proceedings of the Eighth Mountain Lion Workshop, Olympia, Washington, USA.

Taylor, S.K., C.D. Buergelt, M.E. Roelke-Parker, B.L. Homer, and D.S. Rotstein. 2002. Causes of mortality of free-ranging Florida panthers. Journal of Wildlife Diseases 38:107-114.

Thatcher, C., F.T. van Manen, and J.D. Clark. 2006. Identifying suitable sites for Florida panther reintroduction. Journal of Wildlife Management 70(3): 752-763.

Thatcher, C., F.T. van Manen, and J.D. Clark. 2009. A habitat assessment for Florida panther population expansion into central Florida. Journal of Mammalogy, 90(4):918–925.

Tinsley, J.B. 1970. The Florida panther. Great Outdoors Publishing Company, St. Petersburg, Florida.

Tinsley, J.B. 1987. The puma: legendary lion of the Americas. Texas Western Press, University of Texas, El Paso, Texas.

Titus, J.G., and V.K. Narayanan. 1995. The probability of sea level rise. EPA 230-R95-008, U.S. Environmental Protection Agency. Washington, DC. 186 pages.

U.S. Fish and Wildlife Service. 2000. Florida panther final interim standard local operating procedures (SLOPES) for endangered species. U.S. Fish and Wildlife Service; Vero Beach, Florida.

U.S. Fish and Wildlife Service. 2004. Draft standard protection measures for the eastern indigo snake. U.S. Fish and Wildlife Service, South Florida Ecological Services Office; Vero Beach, Florida.

U.S. Fish and Wildlife Service. 2007a. Revisions to the Florida panther final interim standard local operating procedures (SLOPES) for endangered species. U.S. Fish and Wildlife Service; Vero Beach, Florida.

U.S. Fish and Wildlife Service. 2007b. Draft communications plan on the U.S. Fish and Wildlife Service's Role in Climate Change.

U.S. Fish and Wildlife Service. 2008. Florida panther recovery plan: final. Prepared by the Florida Panther Recovery Team and the South Florida Ecological Services Office. U.S. Fish and Wildlife Service; Atlanta, Georgia.

U.S. Fish and Wildlife Service 2010. "Wood Stork Foraging Analysis Methodology" in letter from U.S. Fish and Wildlife Service to the U.S. Army Corps of Engineers date May 18, 2010 (Service Federal Activity Code Number 41420-2007-FA-1494).

Van Dyke, F.G., RH. Brocke, and H.G. Shaw. 1986a. Use of road track counts as indices of mountain lion presence. Journal Wildlife Management 50:102-109.

Van Dyke, F.G., R.H. Brocke, H.G. Shaw, B.B. Ackerman, T.P. Hemker, and F.G. Lindzey. 1986b. Reactions of mountain lions to logging and human activity. Journal of Wildlife Management 50:95-102.

Wehinger, K. A., M.E. Roelke, and E.C. Greiner. 1995. Ixodid ticks from Florida panthers and bobcats in Florida. Journal of Wildlife Diseases 31:480-485.

Wilkins, L., J.M. Arias-Reveron, B. Stith, M.E. Roelke, and R. C. Belden. 1997. The Florida panther (*Puma concolor coryi*): a morphological investigation of the subspecies with a comparison to other North and South American cougars. Bulletin of the Florida Museum of Natural History 40:221-269.

Whittle, A.J., D.S. Maehr, S. Fei, and J.J. Cox. 2008. Global Climate Change and Its Effects on Large Carnivore Habitat in Florida. Poster presented at the Florida's Wildlife: On the Frontline of Climate Change Conference on October 1-3, 2008, in Orlando, Florida.

Wozencraft, W.C. 1993. Classification of the Felidae. Pages xvii – xviii K. Novell and P. Jackson, editors. Wild Cats: Status Survey and Conservation Action Plan, International Union for the Conservation of Nature, Gland, Switzerland.

Young, S.P., and E.A. Goldman. 1946. The puma-mysterious American cat. American Wildlife Institute, Washington, D.C.

Table 1. Habitat preservation efforts resulting from formal and informal consultations with the Service for projects affecting Florida panther habitat from March 1984 through August 2012.

Date	Service Log No.	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
03/29/84	4-1-83-195	83M-1317	CMC Development Corporation (Ford Test Track)	Collier	530	0	0	0
02/21/85	4-1-85-018	FAP #?	USDOT, FHA (conversion of Hwy 84 to I-75)	Broward Collier	1,517	0	0	0
10/17/86	4-1-87-016 4-1-87-017	unknown	NPS, BCNP (Exxon Master Plan Modification)	Collier	9	0	0	0
01/07/87	4-1-86-303	86IPM-20130	Collier Enterprises (citrus grove)	Collier	11,178	0	0	0
01/11/88	4-1-88-029	unknown	NPS, BCNP (NERCO - Clements Energy, Inc.)	Collier	3	0	0	0
02/23/88	4-1-88-055	unknown	NPS, BCNP (Shell Western E&P, Inc.)	Collier Dade Monroe	0	0	0	0
02/10/89	4-1-89-001	FAP IR-75-4(88)81	USDOT, FHA (SR 29/I-75 Interchange)	Collier	350	0	0	0
08/15/90	4-1-90-289	unknown	NPS, BCNP [I-75 Rec. Access Plan (MM 31, 38, 49)]	Collier	150	0	0	0
09/24/90	4-1-90-212	89IPD-20207	U.S. Sugar Corp (46 mi2 ag conversion)	Hendry	28,740	700	0	700
10/23/1991	4-1-91-309	199130649	Miller Boulevard Extension (dirt road, pot hole fill and repair)	Collier	5	0	0	0
01/14/92	4-1-91-325	199101279 (IP-HH)	Dooner Gulf Coast Citrus (32 acre citrus grove)	Collier	40	40	0	40
09/25/92	4-1-92-340	unknown	BIA, STOF, BCSIR (1,995 acre citrus grove)	Hendry	1,995	0	0	0
06/18/93	4-1-93-217	199200393 (IP-SL)	Lee County DOT (Corkscrew Road)	Lee	107	0	0	0
02/25/94	4-1-94-209	199301131 (IP-KC)	Lee County DOT (Daniels Road extension)	Lee	65	0	0	0
05/09/94	4-1-93-251	199202019 (IP-KA)	Corkscrew Enterprises (The Habitat)	Lee	575	437	107	544

Date	Service Log No.	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
10/27/94	4-1-94-430	199302371 (IP-BB) 199400807 (IP-BB) 199400808 (IP-BB)	Timberland and Tiburon Florida Gulf Coast University Treeline Boulevard	Lee	1,088	526	0	526
03/15/95	4-1-94-F-247	19,930,041	Port LaBelle citrus farm revision	Glades Hendy	23	0	0	0
04/03/95	4-1-93-F-390	199,301,206	Sarasota County Landfill revision	Sarasota	550	0	0	0
05/24/95	4-1-95-230	199302130 (IP-TB)	FDOT, I-75 (Turner River access @ MM 70)	Collier	1,936	0	0	0
08/07/95	4-1-95-274	199405501 (IP-AW)	Bonita Bay Properties, Inc. (golf course)	Collier	509	491	0	491
08/15/95	4-1-94-214	199301495 (IP-MN)	SWFIA, Northeast Access Road	Lee	14	0	0	0
09/19/96	4-1-95-F-230	199302052 (IP-TB) 199301404 (IP-TB)	FDOT, I-75 (Central and West Broward access) FDOT, I-75 (Miami Canal Access)	Broward	116	0	0	0
03/10/98	4-1-98-F-3	L30(BICY)	NPS, BCNP (Calumet Florida, Inc. seismic testing)	Collier Dade Broward	0	0	0	0
03/27/98	4-1-97-F-635	199604158 (IP-SB)	Bonness, Joseph D., Jr. Trustee (Willow Run Quarry)	Collier	359	190	0	190
06/11/99	4-1-98-F-398	199800622 (IP-SS)	STOF, BCSIR (water conservation plan)	Hendry	1,091	0	0	0
09/27/99	4-1-98-F-310	199130802 (IP-SB)	Lee County DOT (Daniels Parkway extension)	Lee	2,093	0	94	94
12/08/99	4-1-98-F-517	199607574 (IP-MN)	Kaufmann Holdings, Inc. (Cypress Creek Farms)	Collier	239	0	24	24
04/17/00	4-1-98-F-428	199507483 (IP-AM)	Miromar Development, Inc. (Miromar Lakes)	Lee	785	0	194	194
02/21/01	4-1-00-F-135	199803037 (IP-SR)	Wortzel & Landl, Co-Trustees (Corkscrew Ranch)	Lee	106	0	0	0

Date	Service Log No.	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
04/17/01	4-1-00-F-584	200001436 (IP-MN)	WCI Communities, Inc. (Sun City - Ft. Myers)	Lee	1,183	0	408	408
07/30/01	4-1-94-357	199003460 (IP-TB)	Naples Golf Estates	Collier	439	175	0	175
08/31/01	4-1-00-F-183	199900411 (IP-SR)	Worthington Communities, Inc. (Colonial G&CC)	Lee	1,083	0	640	640
12/14/01	4-1-00-F-585	199301156 (IP-MN)	SWFIA, Mid-field Terminal Expansion	Lee	8,058	0	6,986	6,986
03/07/02	4-1-00-F-178	199901251 (IP-MH)	Benton, Charles (Southern Marsh GC)	Collier	121	75	80	155
04/24/02	4-1-01-F-148	199901378 (IP-SR)	Schulman, Robert, Trustee (Hawk's Haven)	Lee	1,531	267	0	267
09/24/02	4-1-01-F-135	200001574 (IP-DY)	State Road 80, LLC (Verandah)	Lee	1,456	0	320	320
10/08/02	4-1-02-F-014	199602945 (IP-DY)	Barron Collier Company (Winding Cypress)	Collier	1,088	840	1,030	1,870
05/19/03	4-1-02-I-1741	200200970 (IP-DEY)	Apex Center	Lee	95	10	18	28
06/10/03	4-1-01-F-1955	200003795 (IP-DY)	Walnut Lakes	Collier	157	21	145	166
06/18/03	4-1-01-F-136	199701947 (IP-SR)	Twin Eagles Phase II	Collier	491	57	98	155
06/23/03	4-1-01-F-143	199905571 (IP-SR)	Airport Technology Center	Lee	116	55	175	230
09/04/03	4-1-02-F-1486	200206725 (IP-MN)	State Road 80 Widening	Lee	33	2	12	14
10/06/03	4-1-02-F-0027	200102043 (IP-MN)	Bonita Beach Road Development	Lee	1,117	145	640	785
12/29/03	4-1-02-F-1743	200202926 (IP-MGH)	The Forum - Saratoga Investments	Lee	650	0	310	310
06/16/04	4-1-03-I-3401	198900960 (IP-HWB)	Olde Cypress Golf Club	Collier	389	175	0	175
01/18/05	4-1-04-F-4259	199702228 (TWM)	Bonita Springs Utilities	Lee	79	0	108	108
03/31/05	4-1-04-F-5656	200306759 (NW-MAE)	Gateway Shoppes II	Collier	82	0	122	122
04/08/05	4-1-04-F-8176	2004-5312 (AEK)	Big Cypress Rock Mine	Broward	110	0	220	220
04/29/05	4-1-04-F-5780 4-1-04-F-5982	2003-5331 (IP-TWM) 2003-6965 (IP-TWM)	Worthington Holdings Arborwood & Treeline Avenue Extension	Lee	2,330	0	1,700	1,700

Date	Service Log No.	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
06/06/05	4-1-03-F-7855	2003-11156 (IP-RMT)	Collier Regional Medical Center	Collier	44	0	64	64
06/29/05	4-1-03-F-3915	199806220 (IP-MAE)	Wenthworth Estates V.K. Development	Collier	917	0	458	458
07/15/05	4-1-04-F-5786	199405829 (IP-CDC)	Land's End Preserve	Collier	231	0	61	61
09/26/05 10/26/05	4-1-04-F-9348	2004-1122 (IP-RMT)	Super Target Brentwood Land Partners	Collier	34	0	20	20
11/23/05	4-1-04-F-6043	20039414	Waterways Join Venture IV	Collier	108	0	61	61
11/29/05	4-1-04-F-8847	20048995	Seminole Tribe of FL Administrative Complex	Collier	6	0	8	8
12/06/05	4-1-03-F-3483	200302409	Southwest Florida Investment Property, LLC	Lee	207	0	305	305
12/06/05	4-1-04-F-6691	200310689	Rattlesnake Hammock Road	Collier	47	0	23	23
01/04/06	4-1-04-F-8388	2004554	Immokalee Regional Airport - Phase I	Collier	67	0	43	43
01/04/06	4-1-04-F-9777	20048577	Logan Boulevard Extension	Collier	40	0	10	10
01/13/06	4-1-04-F-6707	20042404	Journey's End	Collier	66	0	34	34
01/26/06	4-1-04-F-8940	20047053	The Orchard	Lee	93	0	81	81
02/09/06	4-1-05-11724	2005384	Firano at Naples	Collier	24	0	19	19
02/22/06	4-1-04-F-6505	200101122	Corkscrew Road	Lee	17	0	47	47
02/23/06	4-1-04-F-5244	200312276	Summit Church	Lee	10	0	13	13
03/31/06	4-1-05-PL-11343	20051909	Coral Keys Homes	Dade	31	0	61	61
02/25/05 03/*16*/05 06/29/05 04/04/06	4-1-04-F-6866	200309416 (NW-MAE)	Ava Maria University	Collier	5,027	0	6,114	6,114
05/09/06	41420-2006-F-0089	200403248	Collier Boulevard, Immokalee Rd. to Goldengate Blvd.	Collier	14	0	16	16
05/05/06	41420-2006-I-0274	2005-6176	Santa Barbara , Davis to Radio Road, Widening	Collier	6	0	3	3
05/09/06	41420-2006-I-0263	200506248	Santa Barbara Radio Road, Widening.	Collier	29	0	20	20

Date	Service Log No.	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
05/16/06	4-1-05-F-10309	19971924	Sabal Bay	Collier	1,017	1,313	223	1,536
06/05/06	4-1-05-PL-8486	20041688	Seacrest School	Collier	31	0	16	16
06/09/06	4-1-05-PL-10965	200303733	HHJ Development	Dade	3	0	4	4
06/14/06	4-1-05-F-11855	200411010	Keysgate School Site	Dade	39	0	62	62
06/15/06	41420-2006-I-0362	20056176	Collier County Wellfield	Collier	29	0	36	36
07/12/06	41420-2006-F-0282	200311150	Cypress Shadows	Lee	244	0	326	326
07/28/06	4-1-04-F-7279	20041695	Raffia Preserve	Collier	131	0	119	119
07/28/06	4-1-05-F-12330	20047920	Hamilton Place	Dade	10	0	50	50
08/15/06	41420-2006-I-0151	20031963	Naples Custom Homes	Collier	10	0	9	9
08/21/06	41420-2006-I-0540	20041813	ASGM Business Park	Dade	41	0	25	25
09/12/06	41420-2006-F-0554	20057414	Miccosukee Government Complex	Dade	17	0	37	37
09/22/06	41420-2006-I-0355	20040047	Immokalee Seminole Reservation Road Improvements	Collier	17	0	35	35
10/05/06	41420-2006-I-0616	20065295	New Curve on Corkscrew Road	Lee	12	0	18	18
07/02/03 10/16/06	4-1-98-F-428 41420-2006-F-0667	199507483	Miromar Lakes Addition	Lee	366	169	390	559
10/18/06	41420-2007-F-0026	2004777	Treeline Preserve	Lee	97	0	95	95
10/25/06	41420-2006-F-0442	20047046	Koreshan Boulevard Extension	Lee	14	0	30	30
10/26/06	41420-2006-I-0849	20055702	Marina Del Lago	Lee	49	0	36	36
10/26/06	41420-2006-F-0787	200306755	Jetway Tradeport	Collier	38	0	52	52
10/27/06	41420-2006-I-0203	20057180	Living Word Family Church	Collier	18	0	35	35
10/27/06	41420-2006-I-0607	20064878	Seminole Reservation Access Road	Hendry	2	0	5	5
11/15/06	41420-2007-FA-0222	200412415	Barry Goldmeier 5th Avenue Estates	Dade	15	0	18	18
11/15/06	41420-2006-TA-0727	N/A	Liberty Landing	Collier	27	0	19	19
11/16/06	41420-2006-TA-0060	N/A	Collier County Elementary School K	Collier	26	0	17	17
12/05/06	41420-2006-FA-1179	20057179	The Roberts Group CPD	Lee	58	0	29	29

Date	Service Log No.	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
12/07/06	41420-2006-FA-0781	20041689	Cypress Landing	Collier	46	0	18	18
01/19/07	41420-2006-I-0871	20061359	Brighton Veterans Center	Glades	9	0	8	8
03/09/07	41420-2006-F-0850	200312445	Airport Interstate Commerce Park	Lee	323	0	371	371
04/13/07	41420-2007-TA-0618	NA	Collier County School Site J - Everglades Blvd.	Collier	39	0	36	36
05/01/07	41420-2006-I-0992	20045223	Seminole Motocross	Hendry	58	5	19	24
05/04/07	41420-2007-TA-0623	NA	Abercia North	Collier	25	0	31	31
05/07/07	41420-2007-I-0581	1999-4313	Savanna Lakes	Lee	124	0	140	140
06/19/07	41420-2007-I-0997	2006-2583	Caloosa Reserve	Collier	111	29	110	139
07/03/07	41420-2007-TA-0818	NA	Woodcrest Development	Collier	11	0	15	15
07/17/07	41420-2007-I-0330	2006-6377	Faith Landing	Collier	35	0	18	18
06/14/04 03/21/05 08/24/07	4-1-04-F-5744	199603501 (IP-TWM)	Terafina	Collier	437	210	261	471
08/31/07	41420-2007-I-0866	2006-7022	Collier County School Site L	Collier	32	0	21	21
09/05/07	41420-2006-I-0051	2005-4186	Gulf Coast Landfill Expansion	Lee	123	0	65	65
09/17/07	41420-2007-FA-1540 41420-2007-FA-1540	2006-7875	Ave Maria Substation	Collier	4	0	3	3
10/31/07	41420-2007-F-1035	2004-3931	Big Cypress Regional General Permit - 83	Hendry Broward	100	0	175	175
01/09/08	41420-2006-FA-0927,0871	2006-1359	Horseshoe Community Expansion	Glades	52	37	19	57
01/22/08	41420-2008-FA-0021 41420-2008-I-005	2007-4503	I-75 from Collier County Line to South of Corkscrew Road	Lee	7	0	44	44
01/30/08	41420-2008-FA-0009 41420-2008-I-003	2007-4884	I-75 from Corkscrew Road to Daniels Parkway	Lee	7	0	12	12
02/07/08	41420-I-0015	200502117	Cleveland Clinic	Lee	36	0	19	19
02/07/08	41420-2007-FA-1120 41420-2007-I-0862	1993-0862	Poinciana Parkway	Polk	187	0	236	236
04/28/08	41420-2008-I-0313	2007-6414	Immokalee Rd Substation	Collier	1	0	1	1

Date	Service Log No.	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
04/28/08	41420-2008-FA-0126	2007-5187	A&H Commerce Park	Miami-Dade	100	0	150	150
06/26/08	41420-2007-FA-1150 41420-2007-F-1144	2007-2175	Immokalee Master Plan	Collier	506	0	1,015	1,015
07/02/08	41420-2007-FA-0592 41420-2007-F-0491	2005-7439	Kaicasa	Collier	72	0	183	183
07/14/08	41420-2008-I-0508	2005-6488	Amerimed Medical Center	Collier	19	0	14	14
07/14/08	41420-2008-I-0509	2007-4314	Gridley Medical Building	Collier	4	0	2	2
03/09/07 07/23/08	4-1-04-F-6112	20021683	Alico Airpark (Haul Ventures)	Collier	166	0	315	315
07/23/08	41420-2006-FA-0165 41420-2006-F-0846	2004-182	Premier Airport Park	Lee	180	0	211	211
09/04/08	41420-2008-FA-0415 41420-2008-I-0211	1984-4913	Colonial Boulevard Widening	Lee	35	0	39	39
09/25/08	41420-2008-FA-0702 41420-2008-I-0806	1988-1061	Alligator Alley Commercial Center	Collier	41	0	18	18
10/21/08	41420-2007-FA-01444	2007-0754	Royal Home Villas	Miami-Dade	19	0	57	57
12/17/08	41420-2006-FA-0023 41420-2008-F -0018	1999-4926	Sembler Partnership McMullen Parcel	Collier	40	0	49	49
01/13/09	41420-2007-FA-1111 41420-2007-I-1083	2007-1264	Big Corkscrew Island Fire Control & Rescue	Collier	5	2	5	7
01/30/02 02/12/09	4-1-98-F-372 and 41420-2006-F-0267	199402492 (IP-ML)	Florida Rock Industries, Inc. (Fort Myers Mine #2)	Lee	2,913	1,960	0	1,960
02/26/09	41420-2006-FA-0548 41420-2006-F-1011	2006-7018	Oil Well Road Widening	Collier	328	529	356	885
03/30/09	41420-2006-FA-1342	HCP - 2009	City Gate Development	Collier	240	0	102	102
04/30/09	41420-2009-FA-0555 41420-2009-I-0262	2009-00315	Alligator Alley Service Plaza Expansion	Broward	25	0	35	35
06/10/09	41420-2008-FA-0804	2007-7467	Greenfrog Substation	Miami-Dade	3	0	12	12

Date	Service Log No.	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
06/29/09	41420-2007-FA-1534 41420-2007-I-1186	2007-1676	Tamiami Crossing Commercial Development	Collier	25	0	19	19
07/10/09	41420-2007-FA-0283 41420-2007-I-0367	2008-4470	Home Center Plaza	Collier	16	0	5	5
11/03/09	41420-2009-FA-0619	Miccosukee	Emergency Helicopter Pad	Miami-Dade	1	0	1	1
11/03/09	41420-2007-FA-0620 41420-2007-I-0262	none	Tiger Camp Expansion	Miami-Dade	1	0	1	1
11/06/09	41420-2009-FA-0522	Seminole Tribe	Stanlo Compost Facility	Glades	2	0	6	6
01/05/10	41420-2009-FA-0523 41420-2009-I-0262	2005-2117	Bonita Beach Road East Water Storage Tank	Lee	15	0	5	5
01/28/10	41420-2010-CPA-0081 41420-2010-I-0068	2009-03039	Snake Road Improvements	Broward Hendry	18	0	20	20
03/03/10	41420-2010-CPA-0154 41420-2010-I-0129	2009-03450	Naples Landfill Gas to Energy	Collier	1	0	2	2
06/21/10	41420-2008-FA-0798 41420-2008-I-0928	2008-2429	Shaggy Sypress Ag. Operation	Collier	10	0	22	22
06/21/10	41420-2008-FA-0799 41420-2008-I-0929	2008-2429	Camp Keais Strand Ag. Operation	Collier	6	0	36	36
04/05/11	41420-2010-CPA-0134 41420-2010-F-0462	N/A	Big Cypress Seminole Indian Reservation Home Site Plan	Hendry, Broward	225	0	395	395
02/21/03 03/09/05 03/02/07 05/03/07 05/24/11	4-1-01-F-607	200001926 (IP-SB)	Mirasol	Collier	810	914	363	1277
06/28/11	41420-2010-CPA-0525 41420=2010-F-0395	201001432 (IP-JPF)	I-75 Recreation Area at L29 Canal	Collier	15	0	28	28
03/30/11 07/07/11	41420-2011-CPA-0106 41420-2011-F-0108	2011-00391	Green Meadow Water Treatment Plant	Lee	23	0	33	33
08/04/11	41420-2010-FA-0265,F-0164	2010-00191 (IP-JPF)	SR 80 from CR 833 to US 27 Widening	Hendry	40	0	41	41

Date	Service Log No.	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved On-site (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
10/19/11	41420-2007-FA-0564	2008-615-(ACR)	Hogan Island Quarry	Collier	968	41	1,181	1222
01/25/12	41420-2012-CPA-0112, F-0179	2009-01116	University Highlands Limited	Lee	208	0	181	181
08/21/06 02/07/12	4-1-03-F-3127	19956797	Atlantic Civil Ag Permit Extension	Miami-Dade	981	0	1,553	1,553
03/06/12	41420-2011-CPA-0133, F-0132	SAJ-2011-00926 (IP-GGL)	I75 Interchange and Access Road at SWFIA	Lee	139	0	44	44
11/13/07 03/21/12	41420-2006-FA-1430	2005-782	Summit Lakes	Collier	138	0	134	134
05/01/12	41420-2011-CPA-0220, 41420-2011-F-0213	SAJ-2011-00942	SR 80 from Birchwood Parkway to Dalton Lane Road Widening	Hendry	40	0	23	23
06/04/12	41420-2011-CPA 0225, 41420-2011-F-0218	SAJ-1993-1540 (IP-GGL)	I-75 Rest Area and Recreation Area at Mile Marker 63	Collier	7	0	22	22
06/09/00 06/06/12	4-1-99-F-553	199900619 (IP-SB)	Vineyards Development Corp. (Naples Reserve GC)	Collier	748	75	346	421
09/08/05 02/28/08 07/13/12	41420-2008-FA 0018, 41420-2008-F-0112	SAJ-2001-06580	Parklands Collier	Hendry	301	341	434	775
07/18/12	41420-2006-F-0204	2003-11158 (IP-MJD)	Hacienda Lakes	Collier	728	1,534	0	1,534
pending	41420-2011-F-0240	2009-03941 (IP-JSC)	Seminole Rock Mine	Broward	205		1,062	1,062
08/13/12	41420-2012-CPA 0140, 41420-2012-F-0139	Not yet assigned	BCNP ORV trailheads and U.S. Highway 41 turn lanes	Collier	14	0	0	*
				Total	96,242	11,392	32,719	44,111

*528 PHUs of habitat compensation will be provided at a Service-approved conservation or mitigation bank. The actual acreage protected is not known at this time.

Table 2. Land Held for Conservation within the Florida Panther Core Area.

Zone	Acres	Primary Equivalent Factor	Primary Equivalent Acres
Primary	1,659,657	1.00	1,659,657
Dispersal	0	1.00	0
Secondary	308,623	0.69	212,950
Other	609,872	0.33	201,258
TOTAL	2,578,152	TOTAL	2,073,865

Table 3. Undeveloped Privately Owned Land within Florida Panther Core Area

Zone	Acres	Primary Equivalent Factor	Primary Equivalent Acres
Primary	610,935	1.00	610,935
Dispersal	27,883	1.00	27,883
Secondary	503,481	0.69	347,402
Other	655,996*	0.33	216,479
Total	1,798,295		1,202,699

* About 819,995 acres are at risk in the other zone with about 80 percent with resource value

Table 4. Alive or Status Unknown Radio-collared Panthers Recorded within the Action Area.

Panther	Number of Telemetry Points	Sex	Year that last telemetry location was taken
FP54	1123	Male	1998
FP56	290	Female	1994
FP57	716	Female	1998
FP61	195	Female	2001
FP62	98	Male	1997
FP65	3	Male	1998
FP66	17	Female	1999
FP71	448	Female	2004
FP75	803	Female	2005
FP88	371	Female	2002
FP93	692	Female	2002
FP94	5	Female	2001
FP95	4	Female	2001
FP101	71	Female	2003
FP113	761	Female	2009
FP119	878	Male	2009
FP121	3	Female	2005
FP124	563	Female	2005
FP125	124	Male	2004
FP142	1	Female	2006
FP143	1	Male	2007
FP145	460	Female	2009
FP146	410	Male	2007
FP147	94	Male	2006
FP148	40	Female	2006
FP149	59	Female	2007
FP150	52	Female	2007
FP151	147	Female	2011
FP153	219	Female	2009
FP154	82	Male	2007
FP161	439	Female	2011
FP162	443	Female	2009
FP163	7	Male	2011
FP167	5	Male	2009
FP 171	296	Male	2009
FP175	215	Female	2010
FP177	164	Male	2011
FP 178	183	Female	2011
FP179	1	Male	2010
FP180	198	Female	2010
FP181	64	Male	2010
FP182	192	Female	2010
FP183	67	Male	2011
FP184	80	Female	2011
FP187	59	Male	2011
FP190	56	Female	2011
FP191	52	Female	2011
FP192	50	Female	2011
FP193	21	Male	2011

Total Telemetry Points = 6,664

Table 5. Panther-Vehicle Collisions within Action Area as of June 2012.

ID	Location	Year	Sex	Result
UCFP04-(G80-4)	SR 29 North of I-75	1979	Female	Death
UCFP06-(G81-19)	SR 29 near Copeland	1981	Female	Death
FP01	I-75 at mile marker 18	1983	Male	Death
Big Guy	U.S. Highway 41	1984	Male	Injury
UCFP12-(G84-26)	I-75 at mile marker 16	1984	Female	Death
UCFP13-(BNZ)	I-75 at mile marker 16	1985	Female	Death
FP04	I-75 at mile marker 17	1985	Male	Death
FP07	SR 29 south of I-75	1985	Male	Death
UCFP15	SR 84 at mile marker 16.5	1986	Female	Death
FP37	SR 29 north of I-75	1990	Male	Death
UCFP30	U.S. Highway 41 at Turner River	1996	Female	Death
FP51	SR 29 at Bear Island Grade	1998	Male	Death
UCFP26	U.S. Highway 41	1998	Male	Death
UCFP39	SR 29 north of Jerome	2001	Female	Death
UCFP40	SR 29 north of Jerome	2001	Male	Death
UCFP46	SR 29 north of Deep Lake	2002	Male	Death
UCFP60	U.S. Highway 41 east of CR 92	2003	Male	Death
UCFP62	U.S. Highway 41 near 40 mile Bend	2004	Female	Death
UCFP65	SR 29 near Bear Island Grade	2004	Male	Death
FP120	U.S. Highway 41 west of Turner River	2004	Female	Injury
K156	U.S. Highway at Turner River	2004	Male	Death
UCFP71	U.S. Highway 41 near 11 mile Road	2005	Male	Death
UCFP72	SR 29 near Jerome	2005	Male	Death
FP120	U.S. Highway 41 at Turner River	2005	Female	Death
K49	SR 29 north of Wagon Wheel Road	2005	Female	Death
FP70	U.S. 41 near Turner River	2006	Female	Death
UCFP92	U.S. Highway 41 west of SR 29	2007	Male	Death
UCFP98	I-75 at Jerome Wildlife Underpass	2007	Male	Death
UCFP102	I-75 east of SR 29	2007	Male	Death
UCFP104	SR 29 north of U.S. Highway 41	2008	Female	Death
K253	I-75 at SR 29	2009	Male	Death
UCFP119	U.S. Highway 41 near Turner River	2009	Female	Death
UCFP121	SR 29 south of I-75	2009	Male	Death
UCFP124	I-75 at mile marker 90	2009	Female	Death
UCFP133	I-75 west of Snake Road	2009	Male	Death
UCFP135	SR 29 north of Jerome	2009	Male	Death
FP158	U.S. Highway 41 east of San Marco Road	2010	Female	Death
FP169	U.S. Highway 41 west of Monroe Station	2010	Male	Death
UCFP 147	U.S. 41 1.7 miles east of Monroe Station	2010	Female	Death
FP83	U.S. Highway 41 west of Port of the Islands	2011	Female	Death
UCFP160	U.S. Highway 41 at 55 mile bend	2011	Male	Death
UCFP168	U.S. Highway 41 0.4 miles east of Bass Road	2012	Male	Death

Table 6. Panther Habitat Units – BCNP ORV trailheads and U.S. Highway 41 turn lane project sites*.

Land Cover Type	Habitat Score	Ac in Panther Primary Zone	PHUs Provided
Pine Forest	9.5	3.5	33.25
Cypress Swamp	9.2	4.9	45.08
Wet Prairie	4.7	5.3	24.91
Surface Waters	0.0	0.3	0
Urban Lands	0.0	3.5	0
	Total	17.5	103.24

PHUs needed to compensate for impacts in Primary Zone: 103.24 PHUs x 2.5 (Base Ratio) x 1.0 (Landscape Multiplier for Primary Zone) = 258.1 PHUs (rounded to 258 PHUs)

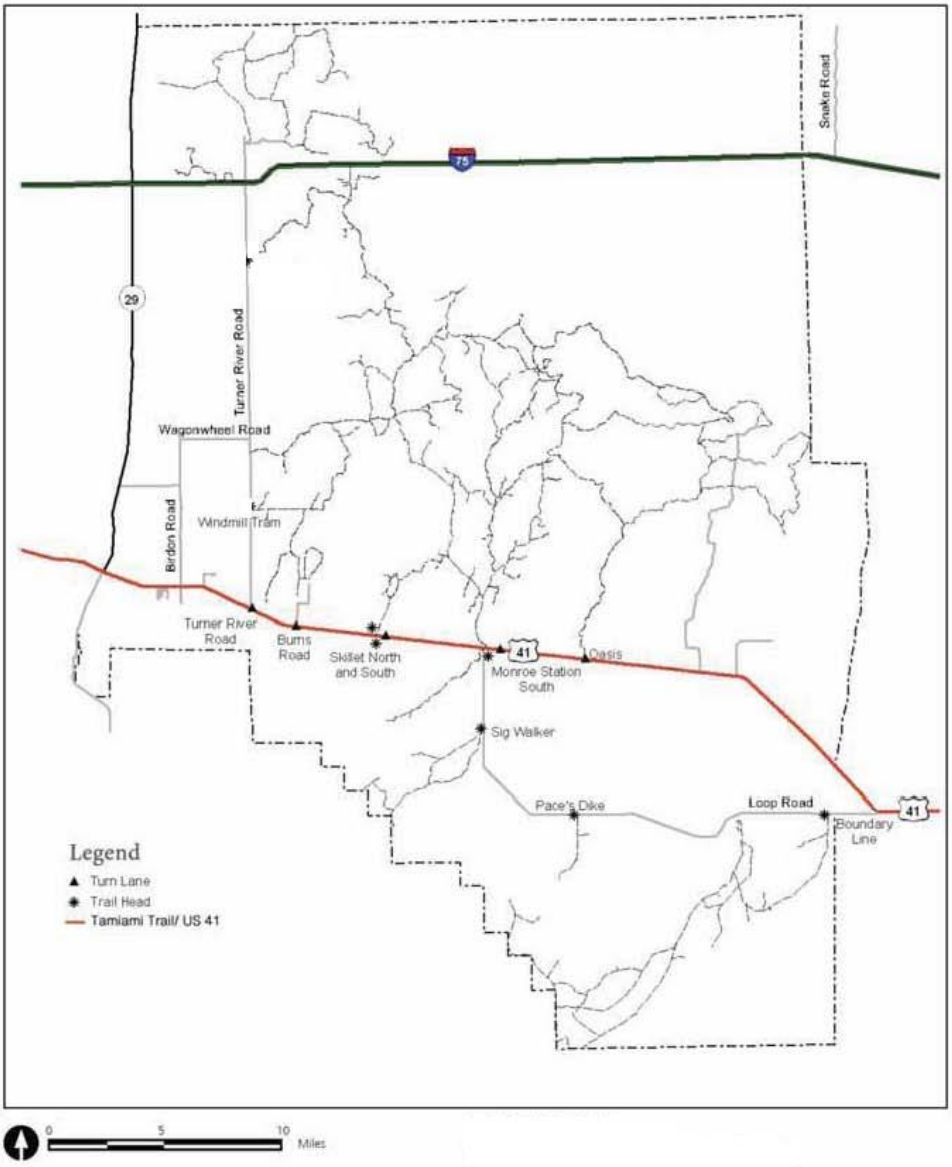


Figure 1. Location Map of proposed ORV trail heads (denoted by black diamonds) and U.S. Highway 41 turn lanes (denoted by black triangles) at the BCNP.

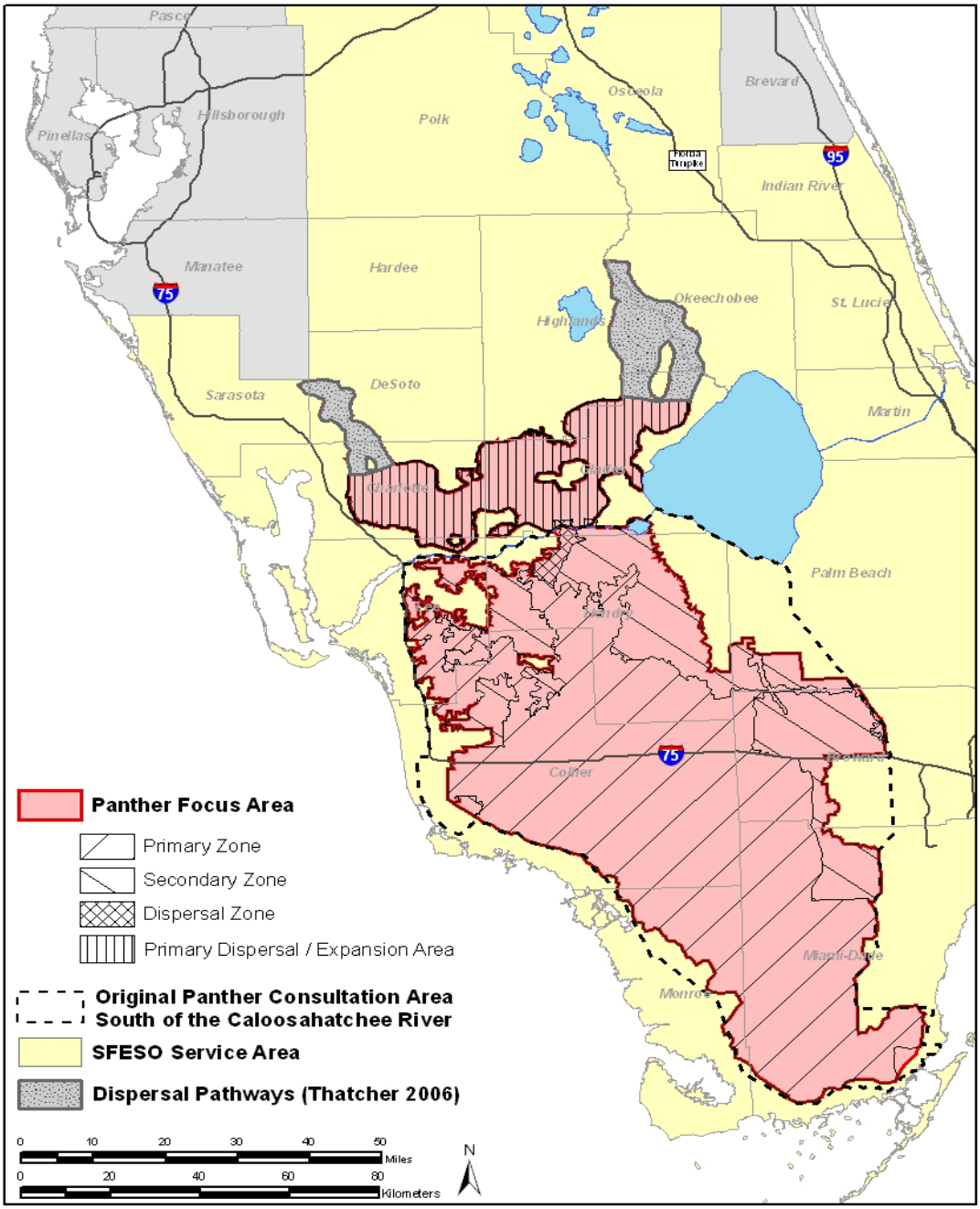


Figure 2. Florida Panther Focus Area and Original Panther Consultation Area.

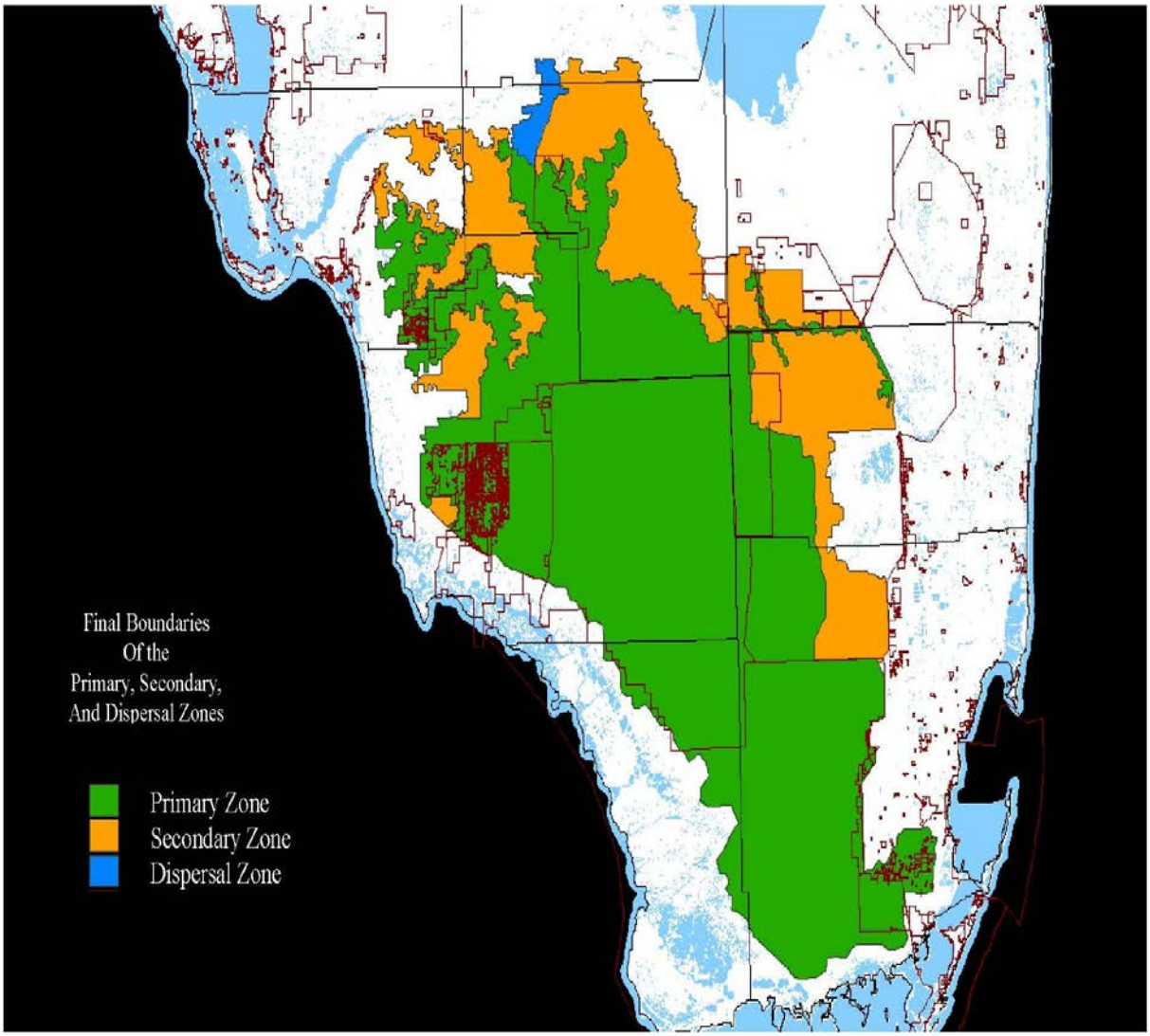


Figure 3. Primary, Secondary, and Dispersal Zones from Kautz et al. (2006).

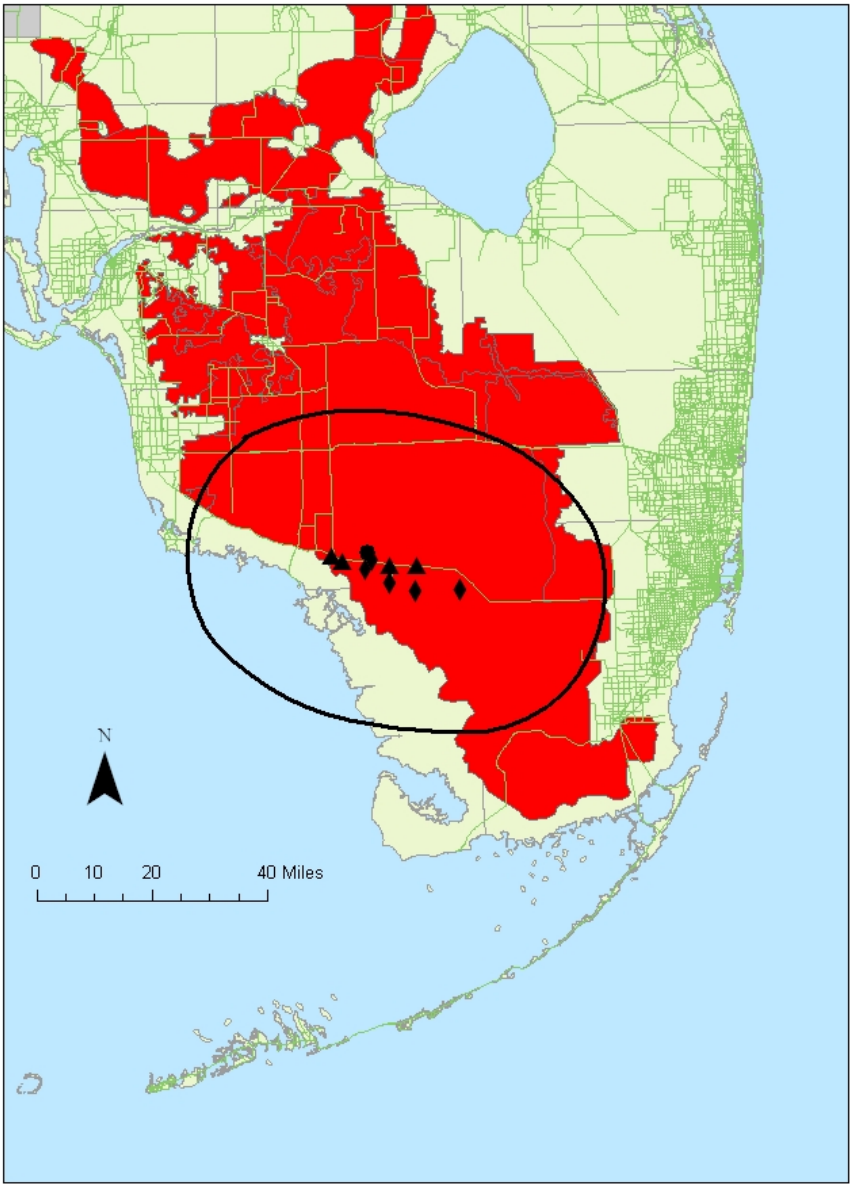


Figure 4. Map showing action area for the proposed ORV trail heads (denoted by black diamonds) and U.S. Highway 41 turn lanes (denoted by black triangles). The black circle denotes all lands within 25 miles of project sites. Red indicates the Service's Focus Area for the panther. The action area is defined as the project footprint and all lands in the Focus Area within 25 miles of the project site.

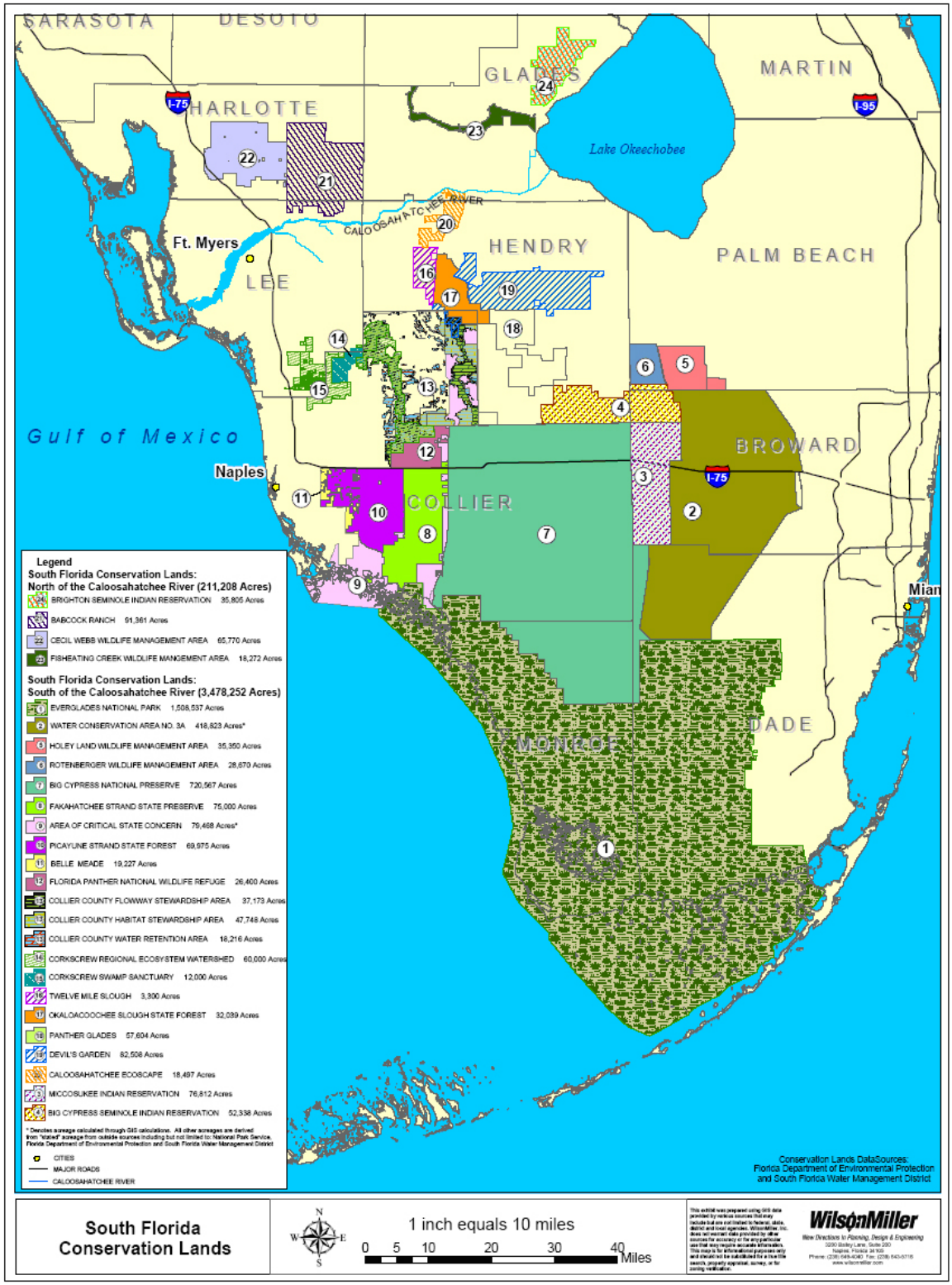


Figure 5. Southwest Florida conservation lands.

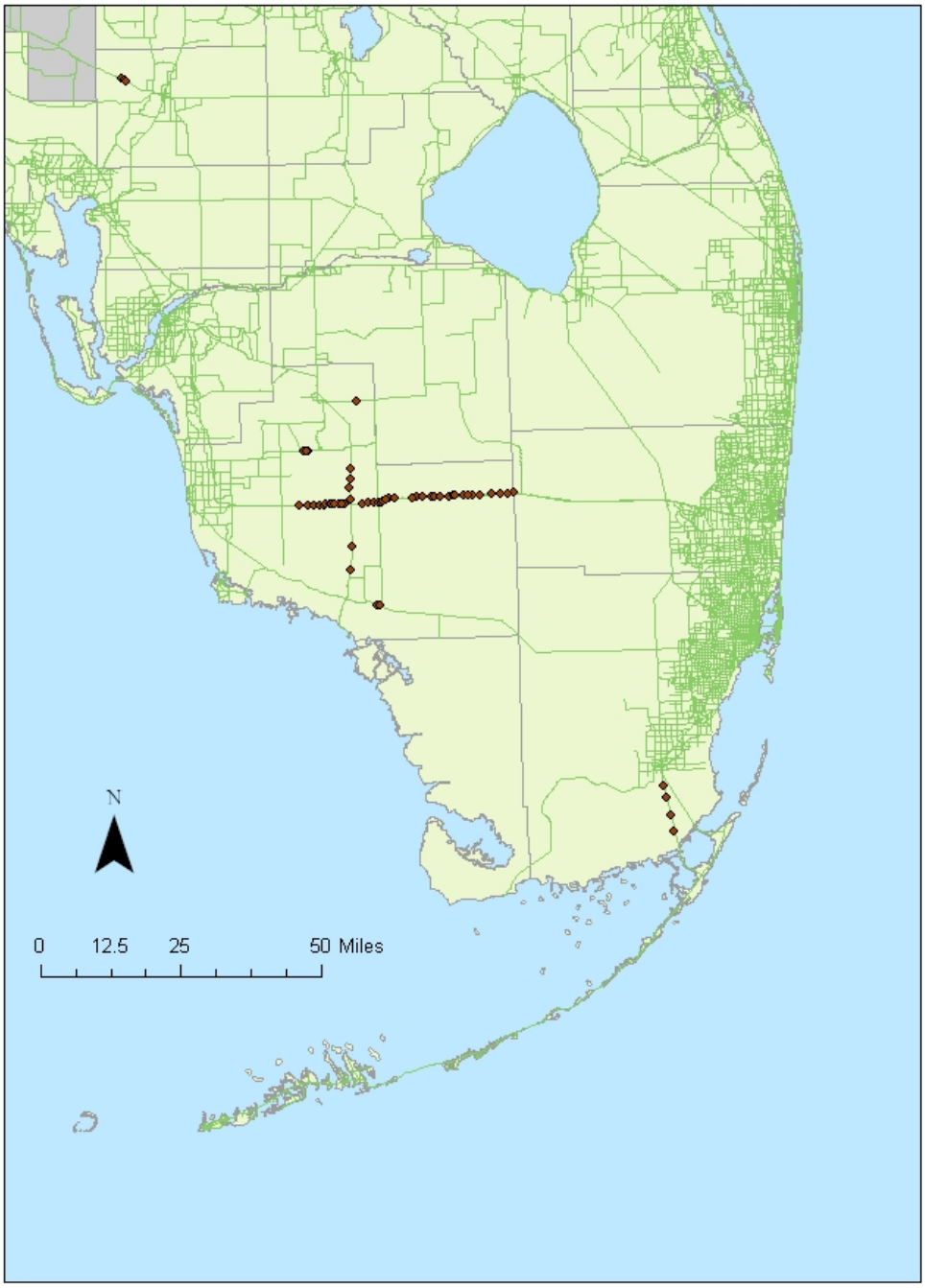


Figure 6. Locations of wildlife crossings in Southwest Florida (indicated by red diamonds).

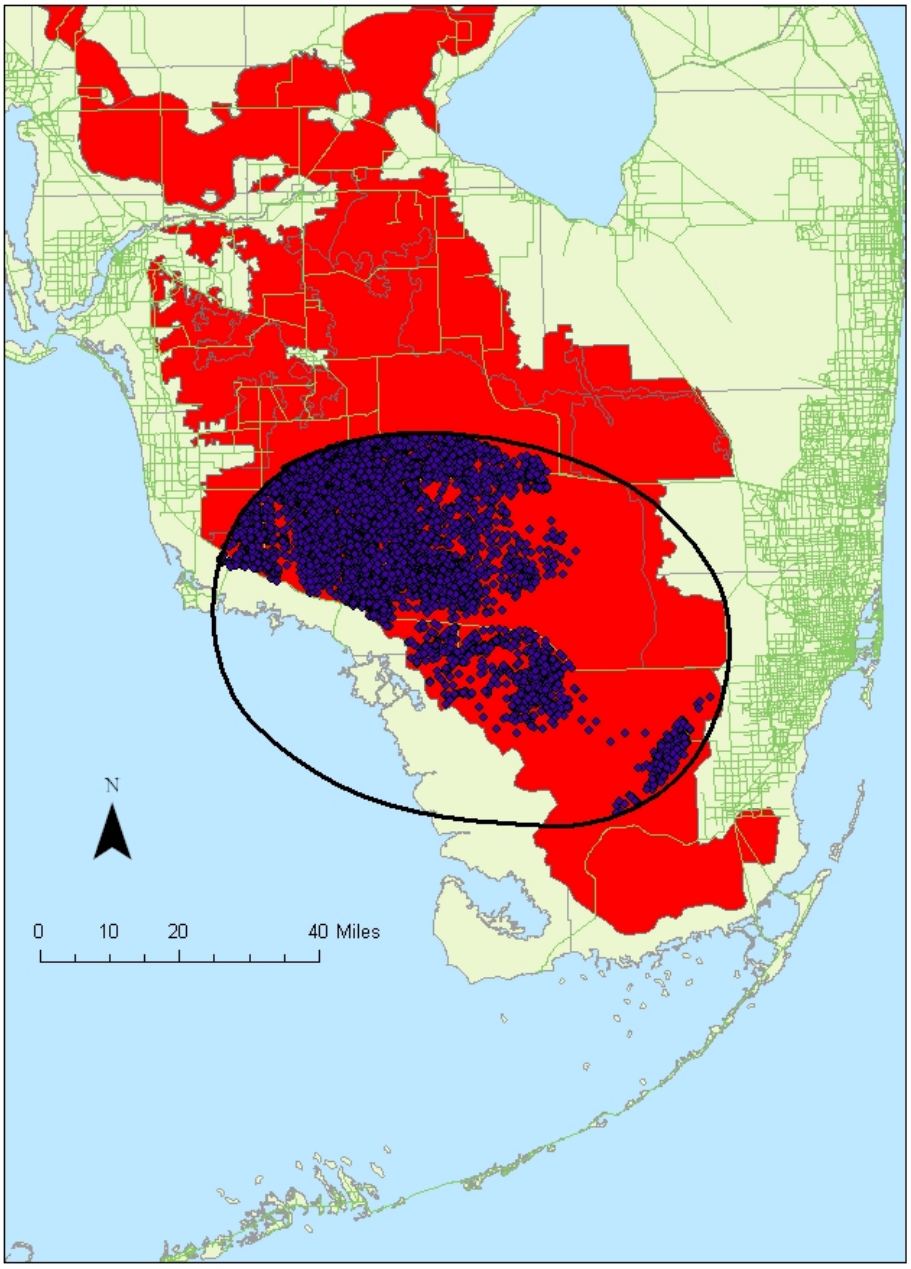


Figure 7. Telemetry data points for all panthers (alive or unknown status) within 25-mile action area.

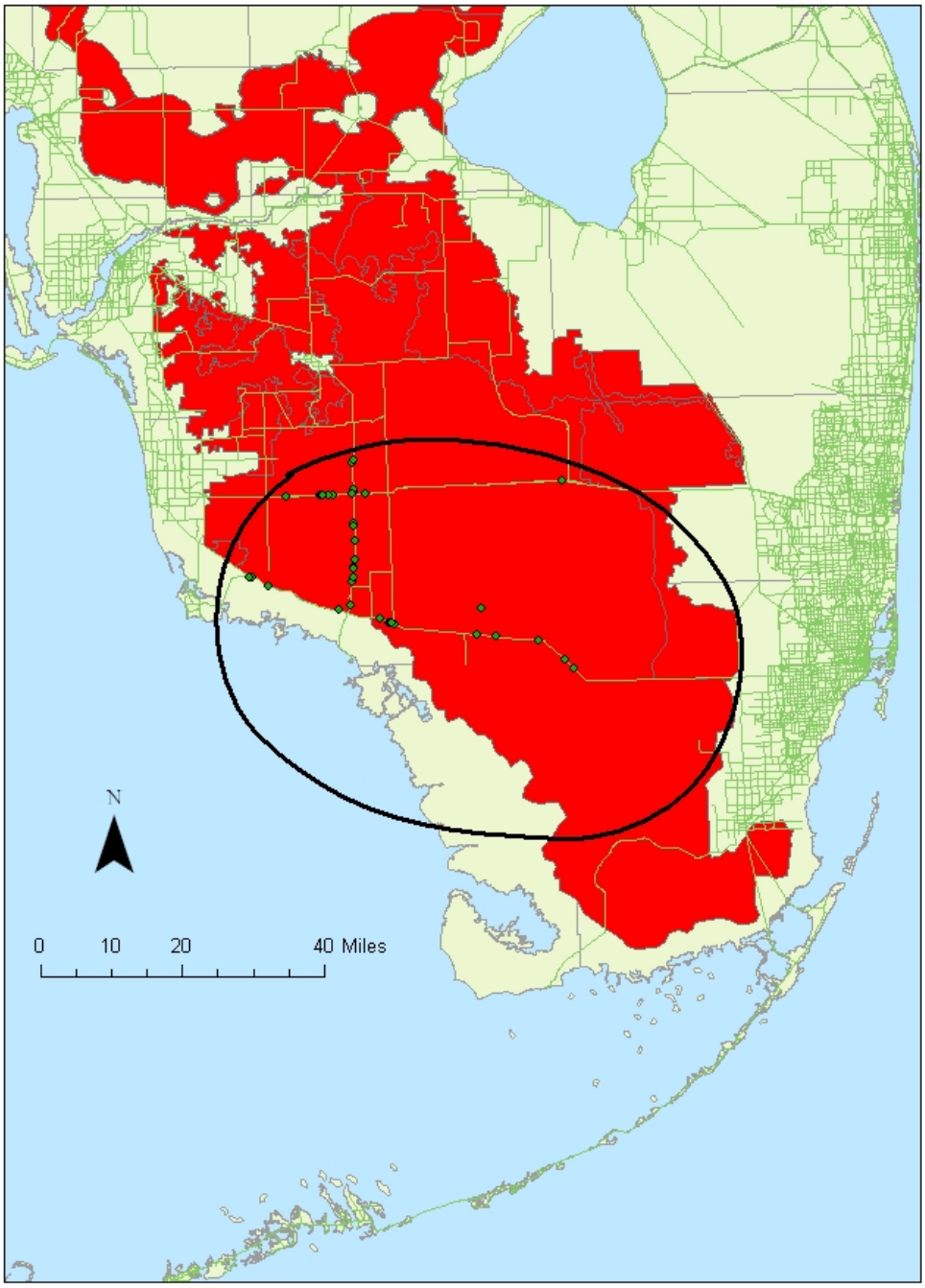


Figure 8. Locations of panther/motor vehicle collisions (indicated by diamonds) within the action area.

Appendix A

Panther Habitat Assessment Methodology

Panther Habitat Assessment Methodology

The Service developed the panther habitat assessment methodology in 2006 and updated the methodology in 2009. To evaluate project effects to the Florida panther, the Service considers the contributions the project lands provide to the Florida panther, recognizing not all habitats provide the same functional value. Kautz et al. (2006) also recognized not all habitats provide the same habitat value to the Florida panther and developed cost surface values for various habitat types, based on use by and presence in home ranges of panthers. The FWC (2006), using a similar concept, assigned likely use values of habitats to dispersing panthers. The FWC's habitats were assigned habitat suitability ranks between 0 and 10, with higher values indicating higher likely use by dispersing panthers.

The Service chose to evaluate project effects to the Florida panther through a similar process. We incorporated many of the same habitat types referenced in Kautz et al. (2006) and FWC (2006) with several adjustments to the assigned habitat use values reflecting consolidation of similar types of habitats and the inclusion of Comprehensive Everglades Restoration Plan (CERP) water treatment and retention areas. We used these values (Tables PM1 and PM2) as the basis for habitat evaluations and the recommended compensation values to minimize project effects to the Florida panther, as discussed below.

Base ratio: To develop a base ratio that will provide for the protection of sufficient acreage of primary zone equivalent lands for a population of 90 panthers (31,923 acres per panther [Kautz et al. (2006)]) from the acreage of primary zone equivalent non-urban lands at risk, we developed the following approach.

The available primary zone equivalent lands at the time the methodology was developed (2006) were estimated at 3,276,563 acres (ac) (see Tables PM3 and PM4), with 2,073,865 ac of primary zone equivalent, non-urban lands preserved. The remaining non-urban, at-risk, private lands were estimated at 1,202,698 ac of primary zone equivalent lands. To meet the protected and managed lands threshold for a population of 90 panthers, an additional 799,205 ac of primary zone equivalent lands are needed. The base ratio is determined by dividing the primary equivalents of at-risk habitat to be secured (799,205 ac) by the result of the acres of at-risk habitat in the primary zone (610,935 ac) times the value of the primary zone (1); plus the at-risk acres in the dispersal zone (27,883 ac) times the value of the dispersal zone (1); plus the at-risk acres in the secondary zone (503,481 ac) times the value of the secondary zone (0.69); plus the at-risk acres in the other zone (655,996 ac) times the value of the other zone (0.33); minus the at-risk ac of habitat to be protected (799,205 ac). The results of this formula provide a base value of 1.98.

$$799{,}205 / ([(610{,}935 \times 1.0) + (27{,}883 \times 1) + (503{,}481 \times 0.69) + (655{,}996 \times 0.33)] - 799{,}205) = 1.98$$

In evaluating habitat losses in the consultation area, we used an estimate of 0.8 percent loss of habitat per year (R. Kautz, FWC, personal communication, 2004) to predict the amount of habitat loss anticipated in south Florida during the next 5 years (*i.e.*, 6,000 hectares/year [14,820 ac/ year]). We conservatively assume that we would be aware of half of the development projects that occur within the primary zone and the secondary zone combined. We further assume that 50 percent of these projects would be located in the primary zone and 50 percent would be located in the secondary zone. Based on these assumptions, we estimated that over a 5-year period about 37,000 ac (primary

zone equivalent of 31,265 ac) would be developed without Federal review. To reflect this loss of habitat we adjusted the base acreage density of 31,923 acres per panther (Kautz et al. [2006]) to a new base density of 32,275 ac per panther, an increase of 352 acres (31,265/90=352+31,923=32,275). This adjustment results in a base ratio change from 1.98 to 2.23.

The Service realizes habitat losses from individual single-family residential developments will collectively compromise the Service's landscape scale effort to secure sufficient lands for a population of 90 panthers. We believe that, on an individual basis, single-family residential developments by individual lot owners on lots no larger than 5.0 ac will not result in take of panthers on a lot-by-lot basis; however, collectively these losses may affect the panther. Panthers are a wide-ranging species, and individually a 5.0-acre habitat change will not have a measurable impact. Compensation for such small-scale losses on a lot-by-lot basis is unlikely to result in meaningful conservation benefits for the panther versus the more holistic landscape level conservation strategy used in our habitat assessment methodology. To account for these losses, based on the 0.08 percent annual loss referenced by Kautz (2004), we estimated the development of vacant lands (2003) in northern Golden Gate Estates and Lehigh Acres in Collier and Lee counties, respectively, at about 2,590 ac per year per development, or about 12,950 ac per development over a 5-year period. As above, to reflect this loss we adjusted the revised base acreage density to 32,563 ac, an increase of 288 acres (25,900/90=288+352+31,923=32,563). To account for this loss, we further adjusted the base value from 2.23 to 2.48.

There is also a need for road crossings in strategic locations and we believe there are projects that may not have habitat loss factors but will have traffic generation factors. The Service considers increases in traffic as an indirect effect from a project, which can contribute to panther mortality. For assessment purposes, since our habitat methodology does not provide a mechanism to address this type of effect directly, we are providing a habitat surrogate of 500 ac per year of habitat loss for these types of projects, with a not to exceed value of 2,500 ac over the 5-year period. The 500 ac per year is based on average cost of FDOT bridge/box culvert crossings (3.6 to 5 million dollars) converted to acreage equivalent costs (8,500/ac). This 2,500 acre habitat surrogate adds an additional 28 acres per panther to the above adjusted base for a new base of 32,951 ac per panther (2,500/90=28+288+352+31,923=32,591). Therefore, we have added another 0.02 to the base ratio to address traffic impacts, which could provide an incentive to implement crossings in key locations. Following the same approach shown above, we adjusted the base ratio from 2.48 to 2.5. The Service intends to re-evaluate this base ratio periodically and adjust as needed to make sure all adverse effects are adequately ameliorated and offset as required under section 7 of the act and to achieve the Service's landscape scale effort for the Florida panther.

The Service uses a very conservative density of panthers per area of habitat to calculate the compensation ratio for impacts south of the Caloosahatchee River. Specifically, the Service relied on the low estimate in the range presented in Kautz et al. (2006) to reach its factor of 2.5. This low estimate density value was calculated by dividing the documented number of panthers in 2000, or 62 panthers, by an estimate of the habitat in the primary zone that was most consistently occupied by panthers from 1981 to 2000. As previously mentioned, it is clear the

panther population south of the river has increased notably since 2000, in 2001 = 78 panthers; in 2002 = 80; in 2003 = 87; in 2004 = 78; in 2005 = 82; in 2006 = 97; in 2007 = 117; and 2008=104. In 2007 more panthers were documented in south Florida than have been documented since current verified estimates have been collected. Furthermore, none of the panthers recorded south of the Caloosahatchee River lives exclusively outside of the primary zone, although some do venture outside of it on occasion (McBride 2007).

The average population size south of the Caloosahatchee River over the past 7 years is 86. If we were to use this number instead of 62 to calculate the compensation ratio and to use the entire acreage of the primary zone as the denominator, the revised compensation ratio requirement would be 0.32 ac protected for every acre developed. Furthermore, if we excluded the "other zone" altogether from the analysis, the ratio would be 1.01, still lower than the Service's current ratio. We believe this conservative approach is warranted because of the inherent importance of habitat protection to panther conservation.

Landscape multiplier: As stated in the above section on primary zone equivalent lands, the location of a project in the landscape of the core area of the Florida panther is important. As we have previously discussed, lands in the primary and dispersal zones are of the highest importance in a landscape context to the Florida panther, with lands in the secondary zone of less importance, and lands in the other zone of lower importance. These zones affect the level of compensation the Service believes is necessary to minimize a project's effects to Florida panther habitat. Table PM5 provides the landscape compensation multipliers for various compensation scenarios. As an example, if a project is in the other zone and compensation is proposed in the primary zone, a primary zone equivalent multiplier of 0.33 is applied to the PHUs (see discussion below) developed for the project. If the project is in the secondary zone and compensation is in the primary zone, then a primary zone equivalent multiplier of 0.69 is applied to the PHUs developed for the project.

Panther Habitat Units – habitat functional value: Prior to applying the base ratio and landscape multipliers discussed above, we evaluate the project site and assign functional values to the habitats present. This is done by assigning each habitat type on-site a habitat suitability value from the habitats shown in Tables PM1 and PM2. The habitat suitability value for each habitat type is then multiplied by the acreage of that habitat type resulting in a number representing PHUs. These PHUs are summed for a site total, which is used as a measurement of the functional value the habitat provides to the Florida panthers. This process is also followed for the compensation sites.

As of January 2005, the Service has been using a panther habitat suitability ranking system based in part on methods in publications by Swanson et al. (2005) and Kautz et al. (2006) and adjusted by the Service to consolidate similar types of habitats and to include CERP water treatment and retention areas located in the panther's range (Table PM1). Since the implementation of this ranking system, the Service has received two additional, published habitat assessment studies (Cox et al. [2006] and Land et al. [2008]) that further assess habitat usage by the Florida panther. As it is the Service's policy to incorporate the most current peer-reviewed science into our assessment

and review of project effects on the Florida panther, we have revised the current habitat suitability ranking system.

To revise these values, the Service, in coordination with FWC, examined the habitat ranking values in the two new papers referenced above and Kautz et al. (2006) publication and developed a spreadsheet. The spreadsheet was developed to: (1) compare the results of each of these published analyses; and (2) provide a habitat ranking system for each of the assessments. On the first page of the spreadsheet, labeled "panther habitat selection analysis - habitat papers comparison," we summarized the types of analyses performed as to whether it was second order (selection of a home range with a large study area) or third order (selection of habitats within a home range). For each of these analyses, we then listed the habitat types reported in each paper and their order of selection by panthers (Table PM6). We used the cost surface scores and the rank differences from the Kautz et al. (2006) analyses as the selection order and for a measure of statistical differences among the habitat types. Selected habitat types are represented as bold black numbers and avoided habitats are bold red numbers. Habitats that were neither selected nor avoided are shown as normal font black numbers. Ranks with the same letter are not different from each other. Results from the Cox et al. (2006) and Land et al. (2008) papers using Euclidean analyses are shown in a similar fashion.

On the second page of the spreadsheet, labeled "summary of ranking values," we ranked the habitat types on a scale from 0 to 10 according the results from each study and professional judgment (Table PM7). We used our original ranking for the Kautz et al. analyses (with the ranking scale reversed such that the best habitat received a "10" and the lowest quality habitat was "0").

We developed similar rankings for the habitat analyses reported in Cox et al. (2006) and Land et al. (2008). Selected habitats fell in the range of 7 to 10; habitats that were used in proportion to availability were ranked from 4 to 6; and habitats that were avoided by panthers were ranked from 0 to 3. Ranks for habitats within each of the 3 outcomes began at the top of each of the ranges (selected = 10, used in proportion to availability = 6, avoided = 3). Some shifting of the ranks occurred based on the letter-coded statistical ranking. For instance, under *Land GPS Euclidean third order* both upland and wetland forests were selected by panthers and were not statistically different from each other (note the ranking of a and ab for upland and wetland forest, respectively). However, wetland forest and dry prairie also were not significantly different from each other. To show these relationships, we ranked upland forest as a 10, wetland forest as a 9, and we increased dry prairie from a 6 (top of the neither selected nor avoided ranking) to a 7 to reflect the interplay between dry prairie and wetland forest based on professional judgment.

To generate a new ranking of panther habitats for use as a habitat assessment measure, we simply averaged the ranks of the six different analyses presented in the spreadsheet to the first decimal place. Half of these results were second order habitat analyses (Kautz et al. compositional, Kautz et al. Euclidean and Cox et al. Euclidean) and the other half were third order analyses (Cox et al. Euclidean; Land et al. VHF Euclidean; Land et al. GPS Euclidean).

In our assessment, we noted several outlier habitat rankings that, based on our understanding of habitat needs of the Florida panther and our concern for human/panther interactions, appear to provide conflicting values. These habitats and their associated rankings are: (1) barren/disturbed – 5.2; (2) urban – 5.0; (3) open water – 3.3; and (4) coastal wetlands – 1.0. We believe adjustments are warranted for these four categories and our adjusted values are based on the following:

Barren/disturbed: Barren/disturbed lands may include many temporary changes to land use, such as crop rotation and prescribed fires that likely have little impact on the value to panthers. Areas disturbed by human impact on a longer-term basis (*e.g.*, parking of equipment and material storage areas) have chronic effects on panthers that we judge decrease the value of these lands for panthers. Barren/disturbed lands include disturbed lands (Florida land use and cover classification system [FLUCCS] 740) and spoil areas (FLUCCS 733). Based on the above reasons, we assigned barren/disturbed land a value of 3.

Urban: Panther habitat models typically include urban in the "other" category that was neither avoided nor selected by panthers. Highly urbanized areas are not found in the panther core area that was used in assessing habitat use, as panthers have already selected against these land use types by reducing their range. However, urbanizing areas in more rural settings may appear in the assessment of habitat use. Nevertheless, we believe that potential human/panther interactions are important conflict factors to consider as well. Therefore, we assigned both developed rural and highly urbanized areas a value of 0.

Open water: Open water has been found to be either avoided by panthers or included in the "other" category that was neither avoided nor selected by panthers. We believe open water in any setting provides little to no value to panthers. However, open water edges and berms can be a valuable foraging area or dispersal pathway in more rural settings, although these edges in an urbanized setting could promote human/panther conflicts. Therefore, we assigned open water in an urban setting, with or without emergent vegetation, and surrounding berms a value of 0. However, in rural settings, the littoral edges and berms may provide species benefit and are further addressed under the reservoir discussion below.

Coastal wetlands: There are few strictly coastal wetlands, such as salt marshes and mangrove swamps, within the panther focus area. Where these occur, they are closely interspersed with other upland habitats. In this context, we believe that these areas are of greater value to the panther than the models indicate. These areas may, for the most part, be avoided by panthers; but, they can be of value in the proper landscape context to higher value habitats. Therefore we assigned these areas a value of 3.

We also note that three additional land uses and or habitat types referenced in our original habitat rankings were not components addressed directly in the model. These include: (1) exotic/ nuisance plants; (2) stormwater treatment areas (STAs); and (3) reservoirs. We believe these categories are important in our assessment of panther habitat values and warrant consideration in our habitat ranking system.

Exotic/nuisance plants: Although exotic plants can be suitable for providing denning cover and habitat connectivity between other land types for panthers and panther prey, they generally do not provide the preferred foraging base of plants consumed by deer and other herbivores (Fleming et al. 1994). We believe prey foraging value, or lack thereof, is an important constraint in our habitat assessments. Therefore, we assigned these habitats a value of 3. Likewise, some native plant species can become so dominant and dense, especially under altered hydrologic and fire suppression regimes, that they no longer provide high habitat value for the panther even though occasional use may occur. The most common example is dense, nearly monotypic cattail stands, which are of reduced value relative to less altered marsh communities. Another example of this type of nuisance species dominance is dense stands of cabbage palm dominated communities. For systems represented by this habitat profile, we also assigned a value of 3.

STAs (Everglades restoration): STAs are generally designed to provide a water quality treatment function for nutrient removal from received upstream discharges and may include multiple berms and adjacent littoral shelves. Depending on the design and mode of operation, they can become vegetated by dense monotypic stands of cattails or can incorporate a diverse mosaic of wetland communities and hydroperiods that support sawgrass and shrub/scrub species. Therefore, they can provide various levels of resource benefit to panthers and panther prey species as discussed below. For this reason, the final value of an STA is determined in a case-by-case basis during project review.

The Service participates in planning efforts that encourage location of STAs at sites with minimal areas of natural habitat, with a preference for sites that are currently in agriculture. Because these facilities by design are located in areas that currently provide a reduced value to panthers and panther prey species, the Service values these systems pre and post project development as a neutral effect on panthers. In these situations, the development of an STA from existing agriculture land uses would be evaluated as if the agriculture land use was present following project development, with no increase or decrease in habitat value to the panther.

However, this neutral effect assessment is only applicable to land conversions from nonnative habitats to STAs. For those projects that remove natural habitats, the Service considers STA functional values to mimic the value of the natural system the STA is designed to achieve. As an example, an STA design that results in a dense monotypic stand of cattails would be appropriately evaluated following the exotic/nuisance species profile. Similarly, a system designed to provide a diverse mosaic of wetland communities and hydroperiods would be evaluated following the wet prairie/marsh profile. Another system design that incorporates internal and external berms could include an edge benefit evaluation identifying the berms and adjacent littoral shelves and their benefit to the Florida panther and panther prey species, and follow the values provided for improved pasture for the berms and or wet prairie/marsh values for the littoral shelves. An individual project assessment of pre and post habitat impacts will identify whether the project as designed results in loss of functional value or provides benefit to the Florida panther and panther prey species.

Reservoirs (Everglades restoration, large water storage area, mines): Reservoirs were originally classified as their own category in our 2003 assessment method. They differ from open-water systems primarily with their location in the landscape. In urban areas, reservoirs have always been considered open water and given a value of 0. In rural areas, the open water portion of the reservoir provides no habitat value, although the edges and the berms can provide valuable foraging area or dispersal pathways for the panther and panther prey species. Therefore, the 2003 methodology assigned a value of 1.5 to reservoirs to attempt to account for these benefits.

After further consideration, we believe a more appropriate way to evaluate the value of reservoirs is to evaluate the open water component separately from the reservoir edges and berms. Therefore, we are no longer assigning a value to reservoirs as their own habitat classification. When large-scale reservoir projects are proposed in the rural landscape, all open water areas should be classified as such (value = 0). Berms and edges should be classified as the habitat they will most resemble in the post-project condition. For example: a 1,000-acre reservoir with 50 ac of grassed berms and 50 ac of berms with roads along the top would be evaluated as 900 ac of open water, 50 ac of pasture, and 50 ac of urban.

We also recognized the habitat matrix (Table PM7) lists four native habitats similar in functional habitat value to panthers as non-native habitats: marsh/wet prairie – 4.7; xeric scrub – 4.5; shrub and brush – 5.5; and dry prairie – 6.3. These habitat ratings, which are between 4 and 6, are classified as being neither selected nor avoided by panthers. The Service's Florida panther draft Recovery Plan's (Service 2008) action 1.1.1.2.3 recommends habitat preservation and restoration within the primary zone be provided in situations where land use intensification cannot be avoided. We view this recommendation as a key parameter in our conservation goal to locate, preserve, and restore lands containing sufficient area and appropriate land cover types to ensure the long-term survival of a population of Florida panthers south of the Caloosahatchee River.

Therefore, for assessment purposes, if a project is proposing restoration of non-native habitats (*e.g.*, pasture, row crops, groves, etc.) to native habitats, we believe that a restoration lift to a value of 7 is appropriate. The functional value of 7 corresponds to that value found in the literature where panthers begin to select for that habitat attribute (Table PM7). We also believe a full functional lift credit for these restorations is appropriate as the time lag from restoration to full functional value is estimated to be relatively short (less than 5 years) for non-forested systems. However, the calculation of forested restoration values remains the same as in the previous methodology, which is one-half the difference between pre- and post-restoration.

In summary, we believe appropriate adjustments to our original PHU values are warranted based on the most current peer-reviewed science and our category specific discussions above. Therefore, we have incorporated the above referenced values into our revised habitat assessment matrix and these values are the current basis for habitat evaluations and the recommended compensation values to minimize project effects to the Florida panther (Table PM2).

Exotic species assessment: since many habitat types in south Florida are infested with exotic plant species, which affects the functional value a habitat type provides to foraging wildlife

species (*i.e.*, primarily deer and hog), we believe the presence of these species and the value these species provide to foraging wildlife needs to be considered in the habitat assessment methodology. As shown in Table PM2, we have a habitat type and functional value shown for exotic species. This category includes not only the total acres of pure exotic species habitats present but also the percent-value acreages of the exotic species present in other habitat types.

For example, a site with 100 ac of pine flatwoods with 10 percent exotics would be treated in our habitat assessment methodology as 90 ac of pine flatwoods and 10 ac of exotics. Adding another 100 ac of cypress swamp with 10 percent exotics would change our site from 90 ac of pine flatwoods and 10 ac of exotics to 90 ac of pine flatwoods, 90 ac of cypress swamp, and 20 ac of exotics.

Habitat assessment methodology application – example: To illustrate the use of our habitat assessment methodology, we provide the following example. A 100-acre project site is proposed for a residential development. Plans call for the entire site to be cleared. The project site contains 90 ac of hydric pine flatwoods and 10 ac of exotic vegetation, and is located in the "secondary zone." The applicant has offered habitat compensation in the "primary zone" to minimize the impacts of the project to the Florida panther. To calculate the PHUs provided by the site, we multiply the habitat acreage by the "habitat suitability value" for each habitat type and add those values to obtain a value of 885 PHUs ((90 ac of pine flatwoods x 9.5 [the habitat suitability value for pine flatwoods] = 855 PHUs) + (10 ac of exotic vegetation x 3 [the habitat suitability value for exotics] = 30 PHUs) = 885 PHUs). The value of 885 PHUs is then multiplied by the 2.5 (the base ratio) and 0.69 (the landscape multiplier) resulting in a value of 1,527 PHUs for the project site. In this example, the acquisition of lands in the primary zone containing at least 1,527 PHUs is recommended to compensate for the loss of habitat to the Florida panther resulting from this project.

Table PM1. Original panther habitat unit values for use in assessing habitat value to the Florida panther.

Land Cover Type	Value	Land Cover Type	Value	Land Cover Type	Value
Water	0	STA	4.5	Cypress swamp	9
Urban	0	Shrub swamp	5	Sand pine scrub	9
Coastal strand	1	Shrub and brush	5	Sandhill	9
Reservoir	1.5	Dry prairie	6	Hardwood-Pine forest	9
Mangrove swamp	2	Grassland/pasture	7	Pine forest	9
Salt marsh	2	Freshwater marsh	9	Xeric oak scrub	10
Exotic/nuisance plants	3	Bottomland hardwood	9	Hardwood forest	10
Cropland	4	Bay swamp	9		
Orchards/groves	4	Hardwood swamp	9		

Table PM2. Revised panther habitat unit values for use in assessing habitat value to the Florida panther.

Land Cover Type	Value	Land Cover Type	Value	Land Cover Type	Value
Reservoirs	*	Xeric scrub	4.5	Dry prairie	6.3
STAs	**	Orchards/groves	4.7	Upland Hardwood Forest	9.0
Urban	0	Marsh/ wet prairie	4.7	Cypress swamp	9.2
Water	0	Cropland	4.8	Hardwood swamp	9.2
Barren/Disturbed lands	3	Improved pasture	5.2	Hardwood-Pine	9.3
Coastal wetlands	3	Shrub swamp/brush	5.5	Upland-Hydric Pine forest	9.5
Exotic/nuisance plants	3	Unimproved pasture	5.7		

* PHU values for reservoirs are evaluated based on open water for the main water areas and the appropriate categories for berms and other non-water sections. Refer to pages 5- 7 for the accompanying text for guiding criteria for these systems.

** PHU values for stormwater treatment areas vary depending on design criteria, mode of operation, location in native or non-native habitats, and other landscape features. Refer to page 6 for the accompanying text for guiding criteria for these systems.

Table PM3. Land Held for Conservation within the Florida Panther Core Area.

	Acres	Primary Equivalent Factor	Primary Equivalent Acres
Primary	1,659,657	1.00	1,659,657
Dispersal	0	1.00	0
Secondary	308,623	0.69	212,950
Other	609,872	0.33	201,258
TOTAL	2,578,152	TOTAL	2,073,865

Table PM4. Undeveloped Privately Owned Land within Florida Panther Core Area.

	Acres	Primary Equivalent Factor	Primary Equivalent Acres
Primary	610,935	1.00	610,935
Dispersal	27,883	1.00	27,883
Secondary	503,481	0.69	347,402
Other	655,996*	0.33	216,479
TOTAL	1,962,294	TOTAL	1,202,699

* About 819,995 ac are at-risk in the other zone with about 80 percent with resource value. Total ac of at-risk privately owned lands are 1,962,294 ac.

Table PM5. Landscape Compensation Multipliers.

Zone of Impacted Lands	Zone of Compensation Lands	Multiplier
Primary	Secondary	1.45
Secondary	Primary	0.69
Other	Secondary	0.48
Other	Primary	0.33

Table PM6. Panther Habitat Selection Analyses – Habitat Papers Comparison.

Habitats	Kautz compositional second order	rank	Kautz Euclidean second order	rank	Habitats	Cox Euclidean second order	rank	Cox Euclidean third order	rank	Habitats	Land VHF Euclidean third order	rank	Land GPS Euclidean third order	rank
Hardwood swamp	1	A	3	A	Coniferous forest	1	A	1	A	Upland forest	1	A	1	A
Pineland	2	A	2	AB	pineland					pine/hardwood				
Cypress swamp	3	AB	1	BC	Hardwood forest	3	C	2	A	hardwood hammock				
Upland forest	1	B	4	CD	hardwood hammock					pinelands				
Dry prairie	5	B	5	DE	mixed pine/hardwood					tropical hammock				
Shrub and brush	4	C	7	EF	palm/oak					palm/hardwood				
Xeric scrub	3	CD	9	F	tropical hammock					Wetland forest	2	A	2	AB
Marsh	5	CD	9	F	Forested wetland	2	B	3	A	cypress swamp				
Unimproved pasture	7	DE	7	G	cypress swamp					cypress/pine/palm				
Barren	6	E	9	G	mixed forest					mixed swamp				
Improved pasture	9	EF	6	G	shrub swamp					hardwood swamp				
Urban	8	F	8	G	hardwood swamp					Dry prairie/grass	3	B	3	BC
Cropland	9	F	8	H	other wet forest					grassland				
Citrus	10	G	8	H	Dry prairie/grass	4	C	4	B	unimproved pasture				
Coastal wetlands	11	G	8	H	dry prairie					improved pasture				
Open water	10	H	10	I	grassland					Marsh/shrub	6	B	4	C
Exotic plants					Open wetland	7	E	7	C	marsh/wet prairie				
STA					marsh and wet prairie					sawgrass				
Reservoir					sawgrass					cattail				
					cattail					shrub swamp				
					Agricultural	5	D	5	B	Other	4	B	5	C
					improved pasture					open water				
					citrus					shrub/brush				
					row crop					barren				
					other agriculture					high impact urban				
					Urban/barren	6	E	6	B	low impact urban				
					bare soil					extractive				
					high-impact urban					Agriculture	5	B	6	C
					low-impact urban					citrus				
					extractive					row crop				
										other agriculture				

second order - selection of home range with entire study area
third order - selection of habitats within home range
Bold (black) - habitat used more than availability (selection)
Bold (red) - habitat used less than availability (avoidance)
rank - habitats with same letters did not differ in preference

Table PM7. Summary of Ranking Values

Habitats	Kautz compositional second order	Kautz Euclidean second order	Cox Euclidean second order	Cox Euclidean third order	Land VHF Euclidean third order	Land GPS Euclidean third order	Average
Hardwood swamp	10	7	9	10	10	9	9.2
Pineland	9	8	10	10	10	10	9.5
Cypress swamp	8	9	9	10	10	9	9.2
Upland forest	10	6	8	10	10	10	9.0
Dry prairie	6	5	8	6	6	7	6.3
Shrub and brush	7	3	no data	no data	6	6	5.5
Xeric scrub	8	1	no data	no data	no data	no data	4.5
Marsh	6	1	6	3	6	6	4.7
Unimproved pasture	4	3	8	6	6	7	5.7
Barren	5	1	7	6	6	6	5.2
Improved pasture	2	4	7	6	6	6	5.2
Urban	3	2	7	6	6	6	5.0
Cropland	2	2	7	6	6	6	4.8
Citrus	1	2	7	6	6	6	4.7
Coastal wetlands	0	2	no data	no data	no data	no data	1.0
Open water	1	0	no data	no data	6	6	3.3
Exotic plants							
STA							
Reservoir							

habitat selection	7,8,9,10
neither selected nor avoided	4,5,6
habitat avoidance	0,1,2,3

ATTACHMENT E DESIGNATED ORV TRAIL HEAD AND TURN LAND ENVIRONMENTAL ASSESSMENT BIG CYPRESS NATIONAL PRESERVE CONCERN STATEMENTS AND RESPONSES

DESIGNATED ORV TRAIL HEAD AND TURN LAND
ENVIRONMENTAL ASSESSMENT
CONCERN STATEMENTS AND RESPONSES

Substantive comments are defined by NPS Director's Order 12 (DO-12, Section 4.6A) as comments that do one or more of the following:

- Question, with a reasonable basis, the accuracy of information in the EA;
- Question, with a reasonable basis, the adequacy of the environmental analysis;
- Present reasonable alternatives other than those presented in the EA; and/or
- Cause changes or revisions in the proposal.

None of the comments received from the public were deemed substantive. Comments to the EA were unanimously supportive of the construction of turn lanes and varied in support of or against the trail head improvements.

Public Comments

Comments were received from seven people via PEPC, four people via email, and one person via US Postal Service during the public review of the EA. In addition, comments were recorded at a public meeting held June 20, 2012.

A summary of the public comments made during the 30-day public review of the Environmental Assessment (EA) and the response to those comments follows:

1. Two commenters expressed full support of the selected alternative or a close variation.

   No corrections or revisions to the EA are necessary.

2. Five commenters expressed full support of the construction of turn lanes.

   No corrections or revisions to the EA are necessary.

3. Six commenters indicated that there was no need to improve any of the trail heads.

   The project is needed to enable the NPS to provide for changing visitor use conditions and address operational changes and public health and safety. This project is needed to enhance visitor use and experience. The NPS's decision to select this alternative for implementation came after thorough analysis of the different alternatives and after exhaustive consultation and coordination through the NEPA and Section 106 processes in which tribes, agencies, local groups, interested parties, and individuals participated.

4. Three commenters indicated that the construction of the turn lane improvements should occur earlier than they are scheduled.

   Funding for the construction of these improvements is not available until 2019. Should funding become available earlier, NPS will revisit the construction schedule.

5. Seven commenters indicated that they prefer to limit the number of amenities constructed at trail heads and/or add potable water to trail heads where vault toilets were proposed.

   The EA evaluated a suite of amenities at trail heads that may be revisited during final design and will not result in impacts beyond those analyzed in this EA.

6. Seven commenters indicated that there were an inadequate number of proposed parking spaces and/or space allowed to offload ORVs in the schematic design of trail head improvements analyzed in the EA.

   NPS evaluated historic and present use of each access point and considered the number of permits allowed by the ORV Management Plan in order to develop the number of spaces provided. The dimensions of spaces provided were based on recreational design standards. Overflow parking will continue to be treated in the same manner as it is today. Users will not be precluded from parking along Loop Road.

7. Two commenters indicated that more data were necessary to determine the number of parking spaces at Skillet Strand South and that a contingency plan should be developed to respond to changes that may be required subsequent to the implementation of the selected alternative.

   See response to Comment 6 above. NPS is committed to monitoring the success of each trail head improvement and will respond to changing needs in visitor use as they arise.

8. One commenter suggested that user groups not be separated by gates. Another commenter suggested that it was a good idea to separate user groups by gates to ensure that parking spaces designed for permitted ORV users were not used by RVs or other vehicles overnight.

   The current trail head improvement design includes gates and permit holders will continue to be provided an access code to gates to ensure access.

9. Two commenters expressed an interest in obtaining more information regarding cost estimates for the alternatives.

   NPS will continue to refine the program and the associated cost estimates for the proposed improvements. The selected alternative will cost less to implement than

Alternative B due to the reduction of improvements that are not included at the Turner River Road North and Windmill Tram trail heads.

10. One commenter suggested that jug handles or bidirectional lanes in the center of the U.S. 41 right-of-way would address out of flow storage of left turning vehicles.

    The final design of the turn lanes has not been completed and may differ from the schematic design evaluated during the EA process. The turn lane improvements are required to meet FDOT requirements, undergo SHPO review, and occur within the existing right-of-way. The solution suggested could be designed to occur within the footprint of disturbance analyzed by the EA therefore no corrections or revisions to the EA are necessary.

11. One commenter had a series of questions to which NPS responded as follows:

    a. During the construction period, will the Trail Heads be open to visitors, whether they be on foot, buggy, airboat, ORV, non-federal landowners and/or hunters? (See pg. 38, Line 19) Page 82, I. 1-8 seems to indicate that during period of construction, estimated to be phased over 5 years, the access points would be closed. Does this mean that hunting and or ORV use from those access areas would be closed too?

       Access points will be closed while they undergo construction and the duration of closure will be based upon the amenities ultimately constructed. NPS is committed to minimizing these closures to the greatest extent possible. Five years is the expected duration to construct all of the trail head improvements indicated in the selected alternative.

    b. The ORV Management Plan identifies a conceptual framework of 400 miles of primary trails and 15 access points (p. 6, L 4-5; p. 7, 130-31). How many miles of primary trails and access points actually exist in the Big Cypress as it is currently managed by the Park Service? On p. 178, I. 33 to p. 179, I. 6, of the EA, it identifies only 235 miles of Primary Trails and 141 of secondary trails for a total of 376 miles of trails. The plan specifically designates up to 400 of Primary. Where and when will the rest of the trails be in place?

       The designation of trails in the Preserve was not a component of this project.

    c. Does the plan meet the objectives of EO 13443 in that it is "to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat" referred to on p. 14, L 21 -22. If so how, and if not, why not?

       The hunting management plan, currently in development, will address the stated objective.

d. Throughout this EA, the timing for the various parking areas and turn lanes is for completion in 2019, with the turn lanes being the last item on the list. The turn lanes should be first on the list because construction and additional vehicle/employee traffic will negatively impact the area of construction (i.e., dump trucks slowing down to make turn, truck trailering heavy equipment, etc.

Funding for the construction of these improvements is not available until 2019. Should funding become available earlier, NPS will revisit the construction schedule.

e. I have been unable to locate where in the report the funding for the turn lanes and access areas is listed, or what the cost is, and how will the long term funding for such things as vault bathroom clean-out, regrading the compacted substrate after a period of usage, maintenance of the landscaping as well as reduction of nonnative species such as Brazilian Pepper (which tend to increase in a disturbed environment). Please direct me to where that information is located.

Funding of the improvements is included and coincides with the schedule presented on Page 50 of the EA and as identified on Page 2 of the FONSI.

Costs associated with the construction and/or maintenance of the proposed facilities was not identified as a project objective and therefore costs were not analyzed. NPS will continue to refine the program that defines the cost estimates for the proposed improvements. The selected alternative will cost less to implement than Alternative B due to the reduction of improvements that aren't included at the Turner River Road North and Windmill Tram trail heads.

f. From reading the EA, the primary difference between Alternative B and Alternative C is that Alternative C does not include the access areas for Turner River and Windmill Road. Is that a correct statement?

That is correct. Alternative C was developed as a result of comments received at the Public Scoping Meeting.

g. The River of Grass Greenway (ROGG) is a 12-14 foot wide trail (p. 89, I. 13-19) and is described as running parallel to U.S. 41. However, it is not shown, nor is a 12 -14 ft wide trail allowed for on any of the drawings that front U.S. 41. Where in the plan is it shown?

The ROGG is not included in the schematic design of trail head improvements because a draft ROGG alignment does not currently exist. It is unknown on which side of U.S. 41 the trail will be located; however, trail head improvements will not impede either option.

h. Closure of the facilities between 10:00 pm and 5:00 am (p. 175, I. 14-23) with NPS staff controlling and monitoring these facilities. This would belie the statements at the June 20, 2012 meeting that the locks on the gate would be accessible by anyone who is an authorized user of the area (such as people with buggy permits, landowners, hunters, etc.). This language needs to be changed.

This language was clarified in the errata (Attachment F).

i. Traffic counts are listed on p. 184, I. 30-37. Do the traffic counts take into consideration events located within the Preserve, such as the Wild Hog BBQ (always in February) or the Miccosukee Annual Fair?

Traffic counts were obtained from the Florida Department of Transportation (FDOT) and as a general practice they do not include event related traffic.

j. Water Resources, Including Hydrology and Environmental Consequences: pgs 102-10) and Methodology and Assumptions. This EA does not point to the NPS as being the entity that has most changed the flow of water in the back-country with the development of the primary and/or secondary roads. Instead, it points to ORV use as the primary culprit. The NPS laid down a black substrate material which has degraded over time leaving an unsightly and unhealthy mess. In addition, the "rock road" is made with a gravel material which raised the level of the road and impedes the sheet flow. In some areas, the rock road is 3" to 4" above the surrounding grade. An increase in the road bed of 3" to 4" and is more than enough to change the flow of water. ORV use, on the other hand, may create ruts, but water seeks its own level, fills the ruts and continues on its way. These ruts also created a micro-habitat for fish, frogs and other critters.

Changes in surface water hydrology can occur as a result of construction activities. NPS is committed to constructing the proposed improvements in accordance with SFWMD requirements that require applicants to match pre- and post-development hydrology.

No corrections or revisions to the EA are necessary.

Agency Comments

1. NPS received a BO from the FWS indicating that the project would result in a “may affect, not likely to adversely affect” determination for the wood stork and eastern indigo snake, and a “may affect, likely to adversely affect” but not likely to jeopardize the continued existence of the Florida panther.

NPS will adhere to the mitigation, reasonable and prudent measures and standard protection measures described in an effort to minimize impacts to wildlife and wildlife habitat associated with construction of the selected alternative.

2. The Florida Department of Environmental Protection (FDEP), Florida State Clearinghouse, provided a response to the EA that indicated that the proposed activities were consistent with the FCMP but stipulated that concerns identified by the SFWMD must be addressed prior to project implementation to maintain concurrency. The response received from SFWMD indicated that "The existing ERP (#11-02135-P) will need to be modified to include the Off Road Vehicle (ORV) Trail Rehabilitation at the Big Cypress National Preserve." During the ERP application review process, NPS must demonstrate avoidance and minimization of wetland impacts, refine Uniform Mitigation Assessment Method (UMAM) scoring, and refine the mitigation plan. Additionally, a construction management plan may be required for the Big Cypress Fox Squirrel and other listed species.

   NPS will address the concerns identified by the SFWMD prior to project implementation during the ERP process that authorizes construction.

ATTACHMENT F DESIGNATED ORV TRAIL HEAD AND TURN LAND ENVIRONMENTAL ASSESSMENT BIG CYPRESS NATIONAL PRESERVE ERRATA

DESIGNATED ORV TRAIL HEAD AND TURN LAND
ENVIRONMENTAL ASSESSMENT
ERRATA

These errata should be attached to the original environmental assessment to form the complete record of the environmental impact analysis and conservation planning completed for the project. The combination of the EA and these errata, prepared in response to public comment on the EA, form the complete and final record of the FONSI.

Corrections and revisions to the draft EA are listed in this section. Revisions were made to clarify the text or provide additional information that had unintentionally been omitted from the EA prior to it being published. These revisions have not resulted in substantial modification of the selected alternative. It has been determined that the revisions do not require additional environmental analysis. The page numbers referenced are from the *Environmental Assessment*.

Page 55. Section 2.5.3 Flood and Hurricane Measures, the 7th bullet.

To clarify the text, "Entrances and exits to trail heads will be kept clear of debris;

Page 55. Section 2.5.3 Flood and Hurricane Measures, the 8th bullet.

To clarify the text, "Berms, walls, and other vertical construction would be avoided in order to maintain effective flood protection;

Page 55. Section 2.5.3 Flood and Hurricane Measures, the 12th bullet.

To clarify the text, "The evacuation plan would be developed in concert with the protocol and strategy of county emergency management systems and the National Weather Service.

Page 57. Section 2.5.5 Wildlife and Special Status Species, the 1st bullet

To clarify the text, "Mitigation, reasonable and prudent measures, and standard protection measures described in the Biological Opinion (BO) issued August 13, 2012, will minimize impacts to wildlife and wildlife habitat associated with construction.

Page 59. Section 2.7 Alternatives Considered but Dismissed, second and third paragraphs

To clarify the text, "The FDEP suggested that NPS consider providing access to the south at the existing Kirby Storter Wayside rather than opening up a new access point at Skillet Strand South. This alternative was dismissed because Kirby Storter Wayside was created for pedestrian use only and was not designed to accommodate ORV use."

To clarify the text, "During the public scoping meeting there was a request that NPS consider turn lane improvements at Joanie's Blue Crab Café/Trail Lakes Campground rather than Burns Road."

Page 145. Impacts of Alternative B, Section 7 Summary, first paragraph

To clarify the text, "For the American crocodile and West Indian manatee, the ESA determination of effect would be "no effect." For the wood stork, eastern indigo snake, and Florida panther the ESA determination of effect would be "may affect, not likely to adversely affect" and a "may Affect, likely to adversely affect" but not likely to jeopardize the continued existence of the Florida panther.

Page 145. Impacts of Alternative C, Section 7 Summary, last paragraph on page 145 and the first paragraph on page 146.

To clarify the text, "For the American crocodile and West Indian manatee, the ESA determination of effect would be "no effect." For the wood stork and eastern indigo snake the ESA determination of effect would be "may affect, not likely to adversely affect," and "may affect, likely to adversely affect" but not likely to jeopardize the continued existence of the Florida panther.

Page 175. The Operations and Maintenance Impact topic analysis of Alternative B, the second sentence of the second paragraph.

To clarify the text, "Access restrictions between 10:00 p.m. and 5:00 a.m. would need to be controlled and monitored by NPS staff."