



United States Department of the Interior



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

August 2, 2012

Colonel Alan M. Dodd
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Consultation Code: 41420-2007-F-0513
Formal Consultation Reinitiation Date: June 8, 2012
Project: Kissimmee River Restoration
Contracts 10, 12, 12a, and 18a
Counties: Highlands and Okeechobee

Dear Colonel Dodd:

This letter serves to amend the U.S. Fish and Wildlife Service's (Service) Biological Opinion for Contracts 10/12, 13b, 13c, and 18 of the Kissimmee River Restoration Project (KRRP) to the U.S. Army Corps of Engineers (Corps). The following sections update or replace, as specified below, their respective sections in the August 31, 2007, Biological Opinion and its March 4, 2008, amendment. All other sections of the Biological Opinion remain unchanged. The 2007 Biological Opinion addressed effects on the threatened Eastern indigo snake (*Drymarchon corais couperi*), and our findings remain unchanged for that species, except for the requirement, in Term and Condition number 11 below, to include information on that species in the educational materials for construction crews. We thank Diana Martuscelli of your staff for her coordination on this issue.

The purpose of this amendment is to revise the subject Biological Opinion, primarily due to changes in the construction schedule for the project and updated information on the status of the threatened Audubon's crested caracara (*Polyborus plancus audubonii*) in the action area, as described below. The Corps was allowed incidental take of that species, more recently renamed the crested caracara (*Caracara cheriway*), in the original 2007 KRRP Biological Opinion and in the 2008 amendment. Our updated assessment of effects on the species and revised Terms and Conditions, when appropriate, are specific to Contracts 10, 12, 12a and 18a but do not affect Contracts 10a, 13b, 13c, 18, or 18b, which have already been completed. In the legends of the figures provided here, the crested caracara is abbreviated as CRCA.



Consultation History

The following updated information is appended to the Consultation History section of the 2007 KRRP Biological Opinion. For consultation history on the KRRP, prior to August 31, 2007, please refer to the 2007 Biological Opinion.

On August 31, 2007, the Service issued a Biological Opinion for Contracts 10/12, 13b, 13c, and 18 of the KRRP to cover incidental take for the caracara and Eastern indigo snake. Incidental take for caracaras was limited to two breeding pairs whose nest trees would be taken through the removal of spoil piles as part of Contracts 13b and 10/12. Incidental take was allowed in the form of harassment (flushing adults off the nest), modification of feeding and nesting behavior (preclusion of nesting for 1 year), and possible displacement from their home territory to adjacent suitable lands. The Terms and Conditions of the 2007 Biological Opinion included monitoring of these two caracara pairs, as well as all adjacent pairs within 1.5 miles of the project area boundary, using radio telemetry and annual reproductive monitoring. The intent of this monitoring was to ensure incidental take was not exceeded by documenting the effects of construction and land conversion on the affected pairs as well as adjacent pairs due to the anticipated changes in territory boundaries.

On January 2, 2008, the Corps contacted the Service with concerns related to the expense of the caracara monitoring required in the Biological Opinion's Terms and Conditions. The Corps and Service staff subsequently worked to identify revised monitoring Terms and Conditions to minimize monitoring costs while still fulfilling the original intent.

On March 4, 2008, the Service issued an amendment to the 2007 KRRP Biological Opinion which reduced the level of telemetry monitoring required to tagging just those caracaras whose nest trees would be removed during construction and who were likely to undergo territory shifts or displacement due to habitat conversion. Annual nesting survey and pre-/during-construction survey requirements remained unchanged.

From February to May 2008, in an effort to assist the Corps with required caracara monitoring, Service biologists conducted pre-construction caracara surveys of the Contract 13b action area. During these surveys, three additional caracara territories were located, including two nests. One of these nests was located less than 300 meters (m) from a proposed new access road. The Corps and Service staff subsequently worked to develop conservation measures to avoid potential adverse impacts to this pair.

On September 25, 2008, the Corps sent the Service final drafts of the additional conservation measures and the Project Work Plan for caracara tagging and monitoring.

On October 18, 2008, one bird from the affected pair at Contract 13b was tagged with a radio transmitter. Telemetry data were collected through October 2011, after which time the tag ceased to function, probably due to battery age. Reproductive monitoring requirements for this pair and its adjacent pairs remain in place for this 2012 amendment.

On April 24, 2010, one bird from the suspected affected pair at Contract 10/12 was tagged with a satellite transmitter. Telemetry data were collected until June 21, 2010, after which time the tag ceased to function. However, satellite data collected prior to tag failure indicated that the tagged bird was from an adjacent pair instead of the affected pair. From April 23 to 25, 2011, additional trapping attempts made to remove the non-working tag and harness from this bird failed. Field observations of the bird at that time indicated the antenna had been bitten off. As an adjacent pair to the affected Contract 10 pair, reproductive monitoring of this pair will continue in accordance with this 2012 amendment's Terms and Conditions.

On April 26, 2011, one bird from the affected pair at Contract 10/12 was tagged with a satellite transmitter. Telemetry data were collected until February 5, 2012, after which time the tag ceased to function. Field observations to date indicate the antenna is no longer attached to the tag, probably having been bitten off. Reproductive monitoring requirements for this pair and its adjacent pairs remain in place in this 2012 amendment to the Biological Opinion.

On July 15, 2011, the Corps provided the Service with an updated construction footprint for Contract 12 which included Bass Levee in its entirety. It is unclear what, if any, portion of Bass Levee was considered in the 2007 KRRP Biological Opinion. While the original project description for Contract 18 did include a line item listing degradation of the levee, no specifics such as length or area were included, nor was the levee included in Figure 6 of the Corps' Biological Assessment or Figure 2 of the 2007 Biological Opinion depicting the project footprint for Contracts 10/12 and 18. Because preliminary nesting data from 2011 caracara surveys indicated at least three territories in the Bass Levee area, not previously considered in the 2007 KRRP Biological Opinion, the Service and Corps began informal consultation to address potential effects of the proposed work on these caracaras.

On August 10, 2011, the Service received limited location data regarding caracara pre-construction surveys of Contract 10/12 conducted in January-May 2011. These surveys identified seven caracara territories within the KRRP action area for Contracts 10/12 and 18, including the territories of the two pairs previously tagged in association with Contract 10/12. These data consisted of approximate territory boundaries and 2011 nest locations.

On October 4, 2011, the Corps provided the Service with an updated construction footprint for Contract 10. This footprint included areas not previously considered in the 2007 KRRP Biological Opinion, including MacArthur Ditch and two tieback levees at S65-C. The MacArthur Ditch area had not been previously surveyed for caracaras or other listed species. The Service and Corps began discussing the need for an amendment to the Biological Opinion to address the new project footprints for Contracts 10 and 12, as well as the new information suggesting impacts to the crested caracara not previously considered.

On November 17, 2011, a teleconference was held with the Service (Heather Tipton and Steve Schubert), the Corps (Diana Martuscelli), and the Corps' contractor handling caracara surveys (LG² Environmental Solutions, Inc) to discuss the anticipated Biological Opinion amendment and 2012 caracara monitoring requirements. The Service followed this teleconference with an email on November 18, 2011, summarizing the discussion.

On November 30, 2011, the Service (Steve Schubert) and LG² Environmental Solutions, Inc (Chad Drury) conducted a site visit of the KRRP (Contracts 10 and 12) caracara territories and the MacArthur Ditch area. They observed caracaras in six of the seven known territories and assessed habitat suitability for the caracara and Eastern indigo snake around MacArthur Ditch. Observations indicated that most of MacArthur Ditch is too wet and overgrown to provide suitable habitat for either species, although the levee (inaccessible that day) may provide limited foraging for the caracara.

On December 29, 2011, the Service received the 2011 annual caracara tagging and monitoring report, which included the caracara data necessary to conduct preliminary analyses of potential project impacts on the seven caracara territories identified during 2011 pre-construction surveys.

On January 9, 2012, the Service emailed the Corps and South Florida Water Management District (District) regarding findings of our preliminary analyses that one of the territories not considered in the previous Biological Opinion would likely undergo extensive habitat conversion as a result of river restoration, decreasing habitat suitability for the caracaras across a large portion of their existing territory. In this email, the Service provided preliminary expectations for tagging and monitoring requirements for this pair and its adjacent pairs.

On January 26, 2012, the Service (Heather Tipton, Steve Schubert, and Bob Progulske), the Corps (Diana Martuscelli), and the District (David Colangelo and Michael Cheek) met to discuss the Service's preliminary analyses as well as post-construction monitoring responsibilities in relation to those projects where ownership and management have been transferred to the District. The Service explained that, per the Biological Opinion, the Corps remains responsible for ensuring all monitoring required in the Terms and Conditions is conducted by qualified biologists. Per the 1994 Project Cooperation Agreement between the Department of the Army and District, the District has agreed to conduct post-construction monitoring of the caracara as specified in the 2007 KRRP Biological Opinion and its subsequent amendments (2008 and 2012).

On May 17, 2012, the Service received a quarterly caracara monitoring report which included figures showing 2012 caracara survey observations for the previously tagged Contract 10/12 caracara and its adjacent pairs, including three pairs not previously identified. On May 24 and 30, 2012, the Service requested additional information including an updated construction schedule for ongoing contracts and geographic information system (GIS) data for all territories monitored in 2010-2012. On May 30, 2012, the Service received a revised construction schedule for Contracts 10 and 12 which indicated the potential for Bass Levee (Contract 12) construction to impact nesting caracaras in the area. On June 8, 2012, the Service received the requested GIS data, which fulfilled our request for additional information.

DESCRIPTION OF THE PROPOSED ACTION

This section describes the details of the additional work proposed under Contracts 10 and 12, which resulted in a revised project footprint). The project description and footprint for Contract 18a remains unchanged. Access to construction sites will be along existing public

roads as well as from the existing C-38 Channel and S-65C tieback levees. The action area for this amended Biological Opinion covers an additional 2,000 m around the project footprint (Figure 1).

Contract 10 (Reach 2 Backfilling): The scope of work involves channel backfilling and the removal of water control structure S-65C. Portions of the C-38 Canal within Reach 2 of the Kissimmee River Basin will be backfilled along with MacArthur Ditch located within the Pool C floodplain. The material used for the backfilling of the C-38 will be sourced from existing spoil mounds located along the adjacent canal banks. The canal will be backfilled starting at the south end of the terminus of Reach 1 backfilling continuing south for approximately 35,800 feet, stopping just north of the US Highway 98 Bridge crossing. MacArthur Ditch, located northwest of the C-38 Reach 2, is approximately 20,000 feet in length. The extent of the MacArthur Ditch backfilling will be based upon available material remaining after completion of the C-38 Reach 2 backfilling. Near the completion of backfilling, S-65C will be demolished, starting with removal of any toxic materials. After the structure is removed, the two S-65C tieback levees will be degraded and the cross structure removed to restore connectivity in the floodplain. Contract 10 is scheduled to be awarded in April 2013, with construction lasting 24 months (scheduled completion date is March 2015).

Contract 12 (Reach 3 Backfilling): The scope of work involves channel backfilling of portions of the C-38 Canal within Reach 3 of the Kissimmee River Basin and degradation of Bass Levee located between US Highway 98 and C-38, east of the bridge crossing. The material used for the backfilling of the C-38 will be sourced from existing spoil mounds located along the adjacent canal banks. The canal will be backfilled starting at the US Highway 98 Bridge crossing continuing south for approximately 10,200 feet to the new U-shaped weir (Contract 12a) to be located in C-38, 2,000 feet north of the existing CSX Railroad crossing of C-38. Bass Levee is approximately 18,800 feet in length and was originally constructed to maintain the surrounding agricultural lands dry. As part of the KRRP, Bass Levee will be degraded to restore the natural connectivity of the surrounding floodplain. Contract 12 is scheduled to be awarded in August 2012, with construction lasting 18 months (scheduled completion date is January 2014). Degradation of Bass Levee is scheduled to be completed first, with construction expected to commence in October 2012 and lasting approximately 6 to 8 weeks.

Contract 12a (S-69 Weir): Contract 12a includes the construction of a U-shaped weir structure upstream of the CSX Railroad crossing, the construction of tieback levees (L-69 East and West) and the backfilling of a portion of the C-38 canal. The plan for the weir is to divert the water flow towards the new CSX Railroad bridge by setting the weir crest above the average surrounding floodplain elevation. Once the floodplain exceeds the weir crest elevation, the majority of the flow will be able to short circuit the remainder of the restored reach and proceed down C-38 to S-65D structures, thus maintaining the current level of flood protection within the basin. While the scope of work for this contract has not changed, the construction schedule for the U-shaped weir has been put on hold, pending litigation. Once begun, construction is expected to be completed within 18 months.

ENVIRONMENTAL BASELINE

We append the following updated information to the “Environmental Baseline” section in the 2007 KRRP Biological Opinion.

Pre-construction surveys (LG² Environmental Solutions, Inc, 2011 and 2012) identified 10 caracara territories (T1-T10) within the action area for KRRP Contracts 10 and 12 (Figure 2). These surveys also identified suspected or confirmed nest trees in 6 of the 10 territories. Only one of these trees (2011 nest tree for T1) was located on a spoil mound that would be removed as part of the proposed project. The 2007 KRRP Biological Opinion addressed effects to the breeding pair in 1 of the 10 territories (T1) and included incidental take in the form of harassment (flushing adults off the nest), modification of feeding and nesting behavior (preclusion of nesting for 1 year), and possible displacement from their home territory to adjacent suitable lands. The Corps was authorized to remove the T1 nest tree, located on the spoil mound, outside of the nesting season. As of July 20, 2012, this had not been completed, but will be done before November 1, 2012. Per the Terms and Conditions of the 2008 amended KRRP Biological Opinion, one of the T1 caracaras (as well as a non-target caracara from the adjacent T2 territory) were tagged using Global Positioning System (GPS) satellite transmitters. Location data obtained from these tags and visual observations made during the 2011 and 2012 peak nesting seasons were used by the Service to evaluate potential effects of the proposed project to the remaining caracara territories as described below. In addition, the project area is almost entirely within an identified caracara gathering area (Figure 3; Dwyer 2010).

EFFECTS OF THE ACTION

The following information and analysis are appended to the “Effects of the Action” section in the 2007 KRRP Biological Opinion. This section includes an analysis of the direct and indirect effects of the proposed action, as well as interrelated and interdependent activities, based on new species information for the caracara in the project area and the revised project footprint, and builds upon the biological discussion in the “Effects of the Action” section in the 2007 KRRP Biological Opinion. To determine whether the proposed action would likely jeopardize the continued existence of these species, we focused on the expected consequences of the proposed action on the potential for future caracara nesting and habitat use.

Analysis for effects of the action

Direct Effects

The affected area for the KRRP is considered to be the historic floodplain expected to be restored by the proposed project (Figure 4). For the purposes of this analysis, this area is defined as the 5-year Kissimmee River floodplain (GIS layer provided by the District) in which habitat conversion is most likely to occur. Habitat conversion is expected to begin shortly after the proposed construction (backfilling of C-38 and oxbow excavation) is complete, with full restoration occurring after implementation of new water management operations associated with the Kissimmee Headwater Lakes Revitalization Project or its successor, the Kissimmee Basin

Modified Water Control Plan and Environmental Impact Statement (KBMWCP; anticipated implementation in 2016). Since the revised project footprint for the remaining contracts is not expected to result in removal of any additional caracara nest trees not previously considered (*i.e.*, only the historic/2011 nest tree for T1), our analysis for this amendment focused on the effects of expected permanent habitat conversion due to river restoration as well as potential short-term disturbance to nesting caracaras from project construction activities.

Kissimmee River restoration is expected to reestablish seasonal inundation of the floodplain and the approximate areal extent of wetland plant communities that occurred prior to channelization, with a slightly higher ratio of broadleaf marsh to wet prairie than was historically present (Carnal and Bousquin 2005). To evaluate the effects of expected habitat conversion on caracaras in the project area, we analyzed the predicted vegetation changes expected from river restoration. Pre-drainage (historic) habitat data within the floodplain were obtained from the District for the project area (Figure 5). The spatial extent of this GIS layer was determined based on the common boundary of three coverages – these were vegetation maps created from aerial photography of (1) pre-channelization (1952-1954), (2) early post-channelization (1973-1974), and (3) channelized baseline (1996) conditions. Additional explanation of the methods used to generate historic habitat data can be found in Carnal and Bousquin (2005). In some areas, the boundary for the historic habitat layer does not extend all the way to the 5-year floodplain boundary. As such, pre-restoration floodplain habitat could not be fully described or quantified for some territories (primarily T4), and this was taken into account in our effects analysis. Based on known species habitat preferences (Morrison 1997), we characterized habitat suitability for caracaras for each of the historic habitat classifications as (1) high suitability, (2) moderate suitability/limited use, (3) unsuitable (with modifiers for bare ground and human influence), or (4) unknown (where habitat type was unknown in the data) (Table 1).

We determined existing habitat types using the District's 2009 Land Cover/Land Use (LCLU) dataset, which classifies habitat using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS) (District 2011). We characterized existing habitat suitability for caracaras as (1) high suitability, (2) moderate suitability/limited use, (3) unsuitable, or (4) citrus (typically considered unsuitable for breeding adults but shown to be important habitat for sub-adults; Dwyer 2010) (Table 2).

Within the floodplain where historic and existing habitat types overlapped, we applied a set of rules to characterize predicted post-restoration habitat suitability (Table 1). Rules were based on assumptions related to both historic and existing habitat types. For habitat identified as wetland pre-restoration, we assumed that post-restoration habitat would return to, or remain, wetland in almost all cases. Since most wetland types (whether herbaceous or dominated by shrubs or trees) were characterized as being of moderate suitability/limited use, this simplified our predictions. For those isolated occurrences where the historic habitat was wetland, and the existing habitat was upland hardwood forest or rural residential, we characterized post-restoration suitability as unknown due to uncertainty regarding the likelihood of actual habitat conversion. For habitat identified as upland under both existing and historic conditions, we assumed land use and management (*e.g.*, grazing) would not change due to restoration, and thus we predicted that

habitat would remain in its current state (*e.g.*, improved pasture would remain so even if historic habitat was upland forest or shrub, or woodland pasture would remain so even if historic habitat was upland herbaceous).

Using the best available caracara location data (Table 3), we generated 95 percent home ranges for all caracara territories except T6 (for which the linear spatial arrangement of observations precluded estimation of territory boundaries). Boundaries for T1 and T2 were generated from GPS satellite telemetry and supplemental visual locations using a 95 percent kernel density function in Program R. Based on the large number of points and nearly year-long collection timeframe, the T1 territory can be considered a reasonably accurate representation of this pair's home range. While there are also a large number of data points associated with the T2 territory, they were collected over a 2-month period and outside the peak nesting season. Because territory use by some caracaras is known to differ between nesting and non-nesting times, these data should be viewed with caution – the estimated territory may fail to include some areas important to the pair during breeding, or may be smaller or larger than actual (which would affect our estimation of the degree of habitat conversion). Territories 3-5 and 7-10 were generated from visual locations using a 95 percent minimum convex polygon method in Program R. Based on the small number of points for each territory and the data collection method used (some surveys road-biased; not all points independent), these estimated territories are not considered accurate representations of actual home ranges, and for most pairs are believed to encompass only a small portion of their territory. However, these represent the best available data at this time, and their limitations were taken into account in our analysis and evaluation.

For each estimated home range, we used aerial photography (Figures 6-10) and the District's LCLU dataset to assess existing habitat within the territory (Figures 11, 14, 17, 20, 23, 24, 27, 30, and 31), including the amount of each habitat type (Table 2), the diversity of habitat types, and their spatial configuration. Of the nine estimated home ranges, we determined that at least six are partially located within the 5-year floodplain and would be expected to undergo habitat conversion post-restoration. For these territories, we compared existing and predicted post-restoration habitat suitability (Figures 12, 13, 15, 16, 18, 19, 21, 22, 25, 26, 28, and 29; Table 4). Based on these results, T1 and T4 (as estimated) are expected to undergo significant habitat conversion resulting in decreased habitat suitability within the estimated territory boundaries. For T1, high suitability habitat (*i.e.*, improved pasture) within the territory is expected to decrease 87 percent (from 488.3 acres to 63.7 acres), primarily converting to wetlands of moderate/limited suitability (Figures 12-13 and Table 4). For T4, high suitability habitat within the territory is expected to decrease 78 percent (from 690.4 acres to 154.7 acres), and unsuitable habitat is expected to approximately double (from 42.2 acres to 86.3 acres; Figures 21-22 and Table 4). In addition, the historic habitat data do not extend to the floodplain boundary in T4, meaning that additional habitat conversion is likely to occur but can't be characterized or quantified due to lack of data.

For Territories 2 and 3 (as estimated), expected habitat conversion also results in decreased suitability, although the percentage of change and acreage converted is much less – high suitability habitat in T2 decreases from 850.4 acres to 683.4 acres (20 percent decrease;

Figures 15-16 and Table 4), and high suitability in T3 decreases from 106.8 acres to 49.0 acres (54 percent decrease; Figures 18-19 and Table 4). In the case of T3, the estimated territory is believed to be much smaller than the pair's actual home range, with the true territory likely including at least a portion of the improved pasture located immediately south of the estimated territory. Assuming a larger than depicted territory would proportionately reduce the predicted effects of habitat conversion within the floodplain. Territories 7 and 8 (as estimated) have only small portions in the floodplain, and habitat conversion in these areas will not likely result in a change to suitability for the caracara. Territories 5, 9, and 10 (as estimated) lie completely outside the floodplain. Even considering that the estimated boundaries for Territories 5 and 7-10 are probably underrepresenting the territory extent (and thus possibly the amount of floodplain overlap), their position in the landscape relative to the 5-year floodplain suggests that effects (if any) of post-restoration habitat conversion would likely be minor.

In reviewing data for the remaining territory (T6 – no boundaries estimated; Figure 8), it appears likely that the territory encompasses primarily high suitability (improved pastures) and moderate suitability (unimproved pasture, freshwater marsh, herbaceous/dry prairie) habitat along Northwest 144th Trail which runs southwest from US Highway 98 from near the east end of Bass Levy then south toward the C-38. While a portion of the improved pasture habitat, located along the east side of the C-38 adjacent to Contract 12a, is within the 5-year floodplain and will likely be converted to wet prairie post-restoration, the Service does not believe that this represents a significant decrease to the existing habitat suitability in the general area.

In addition to our territory habitat analysis, we also evaluated proximity of confirmed and potential nests to proposed construction activities and current construction schedules. Only one known nest tree (2012 potential nest tree for T4; Figures 2 and 7) is located within 300 m of the proposed construction (Contract 12, Bass Levee portion). The currently projected schedule for the degradation of Bass Levee indicates construction will commence in October 2012 and last approximately 6 to 8 weeks. If levee degradation begins on the west side and proceeds east, it is likely that construction activities will be outside the 300-meter zone before caracara nesting season begins on November 1. If instead, construction begins on the east side or if the schedule is delayed, it is possible that construction activities could disturb nesting caracaras in T4. In addition, should any caracara nests relocate closer to the project footprint, additional caracara nesting pairs could be disturbed. Because caracaras may change nest tree locations between and within years, caracara nesting surveys are needed to verify nest locations each year.

Access to construction sites will be along existing public roads and from the existing C-38 Channel and S-65C tieback levees. Several known caracara nests (T3, T4, T5, and T6) are located within 300 m of some of these roads (US Highway 98, County Road 721, and Northwest 144th Trail). Although the caracaras are likely habituated to regular vehicle traffic along these roads, nesting caracaras could be disturbed by significant changes to existing traffic patterns, including an increased number of vehicles, increased amount of heavy equipment, or increased activity at different times of the day. Nesting caracaras could also be disturbed if staging areas are established within 300 m of nests.

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. There are other construction and restoration activities in the basin that are related to the KRRP and subject to consultation, in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). The Kissimmee Headwater Lakes Revitalization Project is interrelated with the KRRP, as it will provide additional waters through the restored reaches of the river system. The Service concurred on June 30, 1994, with the Corps' determination of "not likely to adversely affect" any federally listed species. We are currently in informal consultation with the Corps on the KBMWCP, which will replace Headwaters Revitalization as the operational plan managing discharges into the Kissimmee River. The KBMWCP is interrelated to the KRRP. If necessary, any additional effects on caracaras within the project action area related to KBMWCP operations and the associated changes in floodplain habitat will be determined in the consultation for the KBMWCP (likely to be completed in 2015). Although the Corps and the Service await more definitive hydrologic analyses from the KBMWCP study to determine if additional impacts to caracaras may occur in the consultation area addressed here, it should be noted that analysis of effects in this amendment assumed full restoration of the floodplain.

Indirect Effects

Indirect effects to caracaras may occur in the future in the form of disturbance, but only if the restoration results in increased human presence from increased recreational use (hunting, fishing, boating, wildlife viewing, etc.). At this time, we cannot predict the amount of increased human presence in the existing or future caracara territories.

Species' response to the proposed action

The Service believes the net effect of this phase of the KRRP will be the restoration of a more natural and diverse mosaic of wetland and upland habitats in the action area. However, because the project will convert existing habitat (improved pasture and drained wetlands) that is preferred by caracaras to less preferred habitat (historic floodplain and wetlands), we anticipate that caracaras will be less likely to use the restored floodplain habitat for foraging and nesting, which is one aspect of the likely adverse effects to the caracara either addressed in our 2007 Biological Opinion and/or reevaluated in this amendment. Our analysis confirmed the likelihood that habitat suitability in Territory 1 (incidental take already allowed) will be significantly reduced post-restoration. In addition, our analysis indicated that habitat suitability in Territory 4 will be drastically reduced post-restoration. Based on the amount and type of habitat conversion expected in these areas, the Service believes that both the T1 and T4 pairs of caracara may be displaced from their home territories to adjacent suitable lands. Under a best-case scenario, these caracaras would merely shift existing territory boundaries without subsequent negative impacts to, or displacement of, neighboring breeding caracaras. Under a worst-case scenario, displaced caracaras would abandon their existing territories, be unable to find unoccupied suitable breeding

habitat elsewhere, and fail to establish a new territory and nesting site, thereby losing their reproductive contribution to the overall population. Other possible outcomes include the affected caracaras staying in the current territory but being unsuccessful in future breeding attempts, or other breeding caracaras being negatively affected as a result of the displaced pair's expansion of current territory boundaries or attempts to establish a new territory. Because suitable habitat is generally occupied to its fullest extent, the KRRP is likely to result in the net loss of territories, but the shifting, displacement, and intraspecific competition among adjacent occupied territories would have to be monitored empirically following the habitat changes.

The Service believes some level of disturbance to caracara nesting within 300 m of the project footprint would likely occur as a direct result of project construction activities that occur during the caracara's nesting season (November thru April), and especially during nest building and incubation. Disturbance of T1 caracaras was already included in the Incidental Take Statement in the 2007 KRRP Biological Opinion. The Service believes that, barring new and closer caracara nest locations in 2013, disturbance to T4 caracaras and other nesting caracaras can be avoided under the current anticipated construction schedule.

The Service believes some level of disturbance to caracara nesting within 300 m of project access ways (public roads, C-38 Canal) or staging areas could occur as a direct result of project construction activities that occur during the caracara's nesting season (November thru April). However, the Service believes that such disturbance can be avoided or minimized through careful placement of construction staging areas (greater than 300 m from known caracara nests), adherence to posted speed limits, and activity restrictions (*e.g.*, "no-stop" zones designating areas where vehicles should avoid stopping, and personnel should avoid getting out of vehicles) within 300 m of known caracara nests.

CONCLUSION

After reviewing the current status of the Audubon's crested caracara, the revised environmental baseline for the action area, the revised effects of the proposed action, and the cumulative effects on this species, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Audubon's crested caracara.

No critical habitat has been designated for this species; therefore, none will be affected.

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The following section is appended to the Incidental Take Statement for the caracara in the 2007 KRRP Biological Opinion and its 2008 amendment.

In addition to the incidental take allowed under the 2007 KRRP Biological Opinion, the Service anticipates that project will alter the behavior of one additional mated caracara pair. This incidental take is expected to be in the form of displacement from their home territory to adjacent suitable lands, due to a net loss of habitat quality for this species in restoring this reach of the Kissimmee River floodplain. In the best-case scenario, the caracara pair may move to suitable

habitat and establish a new nest site and territory, and successfully reproduce. In the worst case, we do not find it likely this disturbance would cause death of the adult caracaras, but it might preclude successful reproduction of displaced birds until such time as they can establish a new breeding territory. Caracara surveys of suitable habitat within 600 m of the proposed project footprint will be conducted immediately before construction begins to determine if any additional nests occur (which may vary in location from year to year in the same nesting territory) that could be affected by the proposed action. No additional (*i.e.*, beyond that allowed under the 2007 KRRP Biological Opinion) harassment or modification of feeding or nesting behavior are allowed under this incidental take statement. No direct killing or injuring of adults or juveniles is allowed under this incidental take statement.

EFFECT OF THE TAKE

The Service determines that this level of anticipated take is not likely to result in jeopardy to the continued existence of the caracara. In the 2007 KRRP Biological Opinion, we stated that, under a worst-case scenario, we expected two mated pairs of caracaras (one at Contract 13b, and one at Contract 10 [Territory 1]) would not successfully nest during the first breeding season following the initiation of construction activities and would avoid nesting in the project impact area during subsequent breeding seasons over the life of the project. Based on the revised analysis, we expect that an additional mated pair of caracaras will be at least partially displaced from their existing territory and, due to habitat saturation, may fail to establish a new territory and nesting site, thereby losing their reproductive contribution to the overall population.

AMENDED TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures, described in the 2007 KRRP Biological Opinion and outline the necessary reporting/monitoring requirements. These terms and conditions are nondiscretionary. For completeness of the record, and to avoid confusion, all Terms and Conditions for caracaras are listed below following the same order as in the 2007 KRRP Biological Opinion. These were revised, as appropriate, based on new species information, and the current construction schedule and contract numbering. In addition, due to the number of contracts now associated with this Biological Opinion, Table 5 is provided for clarity and ease in tracking.

1. Contract 13b construction activities were completed in December 2009. Per the 2008 amended Biological Opinion, caracara nest surveys were conducted pre-construction and during construction during the peak nesting season (January through April) in the project area up to 600 m from the project footprint. The affected (tagged) caracara pair and its adjacent pairs will continue to be monitored as specified under Term and Condition number 6 below.
2. Construction activities for Contracts 18 and 18b were completed in January 2012 and May 2012, respectively. Contract 18a construction activities are expected to commence in September 2012, and are expected to be completed in 12 months.

- a. *Pre-construction surveys:* Per the 2008 amended Biological Opinion, caracara nest surveys were conducted pre-construction during the peak nesting season in each project area up to 600 m from the project footprint. Pre-construction surveys are required in the peak nesting season immediately preceding the commencement of construction activities. Thus, if delays occur for Contract 18a such that construction begins after January 1, 2013, additional pre-construction surveys will be conducted January-April 2013 or until nesting is complete (*i.e.*, when young fledge), whichever is later. If, under this scenario, construction begins prior to completion of pre-construction surveys (*e.g.*, March 2013), during-construction nesting surveys will continue as described under Term and Condition number 2b below.
 - b. *During-construction surveys:* Per the 2008 amended Biological Opinion, additional caracara surveys are required immediately prior to tree clearing and during the peak nesting season through construction in each project area. These surveys were conducted for Contracts 18 and 18b (construction complete). Under the current construction schedule, these surveys will be conducted January-April 2013 (or until nesting is complete) for Contract 18a. After construction commences, these surveys will be conducted during each peak nesting season until construction is complete.
 - c. *Nest survey methodology:* All surveys must follow the appropriate nest survey procedures in the *Survey Protocol for Finding Caracara Nests* (Appendix A) or as future revisions indicate. Nesting surveys will begin within the first 2 weeks of January, with subsequent surveys conducted approximately 2 weeks apart, through April 30 or until nesting is complete (*i.e.*, when young fledge), whichever is later. If monitoring determines that a nest has failed, monitoring of the pair should continue at least through April 30 as re-nesting may occur. Monitoring will identify reproductive status, nest locations, nest success, and fledging success of nesting caracaras in the project area up to 600 m from the project footprint. All caracara observations and monitoring results will be reported as specified in Term and Condition number 12 below. If restricted access prevents sufficient monitoring of target caracaras, the Service should be contacted to identify alternate monitoring methods.
3. Construction activities for Contracts 10a and 13c were completed in May 2012 and February 2010, respectively. Contract 10 construction activities are expected to commence in April 2013, and are expected to be completed in 24 months. Contract 12 construction activities are expected to commence in August 2012, and are expected to be completed in 18 months. The construction schedule for Contract 12a has been put on hold, pending litigation; once begun, construction is expected to be completed within 18 months.
 - a. *Pre-construction surveys:* Per the 2008 amended Biological Opinion, caracara nest surveys were conducted pre-construction during the peak nesting season in each project area up to 600 m from the project footprint. Pre-construction surveys are required in the peak nesting season immediately preceding the commencement of construction activities. Under the current construction schedule, additional pre-construction surveys will be conducted January-March in 2013 for Contract 10, after which time during-construction

nesting surveys will be conducted as described under Term and Condition number 3b below. If Contract 10 construction is delayed, pre-construction nesting surveys will continue through April 2013 or until nesting is complete, whichever is later. If delays occur for Contract 12 or 12a such that construction begins after January 1, 2013, additional pre-construction surveys will be conducted January-April 2013 (and future peak nesting seasons, as necessary) or until nesting is complete, whichever is later. If, under this scenario, construction begins prior to completion of pre-construction surveys (*e.g.*, March 2013), during-construction nesting surveys will continue as described under Term and Condition number 3b below.

- b. *During-construction surveys:* Per the 2008 amended Biological Opinion, additional caracara surveys are required immediately prior to tree clearing and during the peak nesting season through construction in each project area. These surveys were conducted for Contract 10a (construction complete). Under the current construction schedule, these surveys will be conducted in April (or until nesting is complete) 2013, January-April (or until nesting is complete) 2014, and January-March 2015 for Contract 10. Under the current construction schedule, these surveys will be conducted in January-April (or until nesting is complete) 2013 and January 2014 for Contract 12. The timing of during-construction nesting surveys for Contract 12a is currently unknown and pending litigation resolution, but is expected to include at least one full nesting season. After construction begins, during-construction surveys will be conducted during each peak nesting season until construction is complete.
- c. *Nest survey methodology:* All surveys must follow the appropriate nest survey procedures in the *Survey Protocol for Finding Caracara Nests* (Appendix A) or as future revisions indicate. Nesting surveys will begin within the first 2 weeks of January, with subsequent surveys conducted approximately 2 weeks apart, through April 30 or until nesting is complete (*i.e.*, when young fledge), whichever is later. If monitoring determines that a nest has failed, monitoring of the pair should continue at least through April 30 as re-nesting may occur. Monitoring will identify reproductive status, nest locations, nest success, and fledging success of nesting caracaras in the project area up to 600 m from the project footprint. All caracara observations and monitoring results will be reported as specified in Term and Condition number 12 below. If restricted access prevents sufficient monitoring of target caracaras, the Service should be contacted to identify alternate monitoring methods.
- d. In addition to nesting surveys, continuous monitoring of caracaras around Bass Levee (Contract 12) is required any time that construction activities are conducted within 300 m of a known or potential (identified based on observed behavioral signs of the subject caracaras) nest tree between November-April. Continuous monitoring is to be conducted during construction by a qualified biologist in order to identify any signs of disturbance related to construction activities. If such signs are observed (*e.g.*, vocalization, flushing from roost or nest sites), construction activities are to be halted and the Service notified immediately. If the Corps will require, a wildlife monitor to be on the site, this person could conduct these observations if so qualified.

4. No change from 2008 amended Biological Opinion. Removal of active and potential caracara nest trees within the project footprint shall only occur between May 1 and October 31 and only if these trees are not being used by caracaras for nesting. Where nesting season surveys detect caracara nesting activity within the project footprint, the status of active and potential nest trees will be confirmed through additional monitoring conducted prior to tree removal. The Corps will ensure no active nest trees or potential nest trees are removed within the project action area during the caracara's primary breeding season (November through April).
5. No change from 2007 KRRP Biological Opinion. The Corps will ensure the project's detailed design, including the location of temporary/permanent structures and storage/staging areas, as well as the transition slope between restored floodplain and upland forest, will minimize the removal of cabbage palms which may contain inactive caracara nest structures or may serve as suitable support for future caracara nests.
6. The Corps will fund a telemetry monitoring study, including associated nesting surveys, to document the effects of construction and land conversion of the proposed project on caracaras (*e.g.*, nest location, nest and fledging success, territory retention, and adult and juvenile survival) during pre- and post-construction, and the change in habitat availability within their territory. The monitoring will continue for at least 1 year post-construction (*i.e.*, March 2016 or 1 year after the completion date of the last contract in this Biological Opinion, whichever is later). The monitoring study will be designed to fulfill the following objectives:
 - a. Conduct annual surveys (January 1 –April 30) for caracara nests and territories within the proposed project area and within 1.5 miles of the project area boundary using the Service's most recent standard protocol to provide information on caracara nest sites and densities within these areas. This will also allow evaluation of how changes in habitat use may affect other caracara territories in the vicinity. If restricted access prevents sufficient monitoring of tagged or adjacent caracaras, the Service should be contacted to identify alternate monitoring methods.
 - b. Capture, band, and tag caracaras whose nest trees are removed during construction and caracaras whose territory will undergo significant habitat conversion as a result of the river restoration. Monitoring of tagged birds should include tracking of caracara movements, habitat use, productivity, and survival during the monitoring period. Banding (with USFWS band and unique colored leg bands) and tagging will be conducted prior to tree removal or habitat conversion. Type of tag to be used must be approved by the Service. Monitoring of tagged birds must be sufficient to document movements away from the territory if they occur. Productivity and survival monitoring must include reproductive effort, nest success, fledging success, and survival of tagged birds and their young (up to one month post-fledging). The agency personnel or contractor who will conduct the monitoring will be responsible for obtaining a section 10(a)(1)(A) recovery permit that authorizes effects to caracaras that result from caracara trapping, transmitter attachment, nest monitoring, and other associated activities.

- c. Tagging of caracaras located within Contract 13b and Contract 10 (Territory 1) spoil mounds has already occurred. Tagging of the Contract 10 Territory 4 caracara should be conducted as early as possible during the 2013 nesting season in order to collect sufficient pre-conversion data. Prior to tagging, nesting status of target caracaras will be determined to ensure the use of proper capture procedures, with protocols to be approved by the Service.
- d. Finalize an updated Project Work Plan that details caracara tagging, monitoring and reporting methods, and provide to the Service for review and approval prior to January 1, 2013. The proposal's monitoring methods should be sufficiently rigorous to determine which of the following potential effects are exhibited by each tagged caracara pair in response to habitat conversion:
 - The effects of the project do not result in any changes to the territory location and habitat use, and do not affect survival or productivity of the caracara pair at the site.
 - Caracara pairs may establish a new nest site within the existing (contracted) territory and survive and reproduce successfully.
 - Caracara pairs may move to the nearest suitable habitat and establish a new nest site and territory. This suitable habitat may already be occupied by other caracaras, but if the habitat is suitable and sufficient in size, territory boundaries may shift and the pair may reproduce successfully.
 - Caracara pairs may leave the project area and travel some distance to find another area of suitable habitat where they can establish a new nest site and territory. If they can find new areas, they may be able to survive and reproduce successfully.
 - Caracara pairs may attempt to establish new nest sites and territories either near or far from the development area but may be unsuccessful either because of territorial aggressiveness from resident pairs or because no other suitable habitat exists.
 - In the absence of being able to establish a new territory and nesting site, the caracaras may become nomadic, traveling around south-central Florida, perhaps joining sub-adult flocks, or if not, surviving but being unable to establish nests and breed. In this case, these pairs' reproductive contribution to the overall population is lost.
 - Displaced caracaras could die prematurely. As nomads, displaced adults may incur higher risk of mortality because of either (a) being killed by caracaras defending territories into which displaced caracaras attempt to move, or (b) through collision with vehicles or other trauma associated with scouting unfamiliar territories.
- e. Provide locations and status of identified caracara nest sites to the Service's KRRP project biologist via email or phone within 24 hours of their discovery.
- f. Provide records of caracara telemetry locations and observations by project personnel to the Service on a quarterly basis (at a minimum), or upon request, as specified in Term and Condition number 12 below. For transmitters which allow for remote data download, tag data must be downloaded and reviewed weekly (at a minimum). If downloaded data suggest that the transmitter has malfunctioned, the Service's KRRP project biologist must be notified by phone or email within 24 hours.

- g. Submit annual reports on the caracara monitoring project to the Service which include information on the monitoring effort to date, preliminary results of analyses, and data sets. Analytical methods must be explained and must follow currently accepted scientific standards, both appropriate to the data and sufficiently rigorous to determine the effects (breeding, habitat/space use) of habitat conversion on each tagged caracara pair. Monitoring data must be provided as specified in Term and Condition number 12 below.
 - h. Submit a final report to the Service that provides results and final analyses within 3 months after completion of all data collection and analyses.
- 7. No change from August 31, 2007, Biological Opinion. The Corps and Service will work together to identify habitats within and/or adjacent to the KRRP that have the potential to be improved for caracaras. When potential habitat improvement sites are identified, the Corps, Service, and interested Federal/State agencies will take the appropriate actions and cooperate with the respective land management entities and landowners to improve caracara habitats. Habitat restoration could include a number of actions, including prescribed burning and vegetative plantings on the edge or remaining uplands of the restored floodplain. The specific details of habitat restoration efforts will be worked out between the Corps and Service at a later date.
- 8. No change from August 31, 2007, Biological Opinion. The Corps will provide annual reports to the Service by September each year during project construction. These reports will identify the timing and location of each phase of construction, assess the effectiveness of all protective measures used to minimize incidental take, and maintain a running tally of all project-related incidental take of this species. A summary report will be provided to the Service within 3 months after completion of project construction that will include the following:
 - a. Description of all protective measures implemented to minimize incidental take;
 - b. Detailed description (e.g., number, type, location) of incidental take that occurred during project construction;
 - c. Assessment of effectiveness of protective measures employed during construction and recommendations to further reduce the level of incidental take; and
 - d. Coordination of incidental take outlined in this biological opinion with other laws, regulations, and policies.
- 9. No change from August 31, 2007, Biological Opinion. If a dead, injured, or sick caracara is found in the project footprint or along access ways to the project site, notification should be made to the nearest Service Law Enforcement Office. Secondary notification should be made to the FWC; South Region; 3900 Drane Field Road; Lakeland, Florida 33811; Wildlife Alert Number 1-800-404-3922. A dead specimen should be bagged and frozen. In conjunction with the care of sick or injured caracara or preservation of biological material from a dead animal, the finder also has the responsibility to carry out instructions provided by the Service Law Enforcement officer to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

10. Construction staging areas must be established greater than 300 m from known caracara nests. Should caracaras begin nesting within 300 m of an established staging area, there is no requirement to relocate the staging area, but construction-related activities there should remain at the same type and level as at the time of nest establishment until caracara monitoring indicates nesting is complete. “No-stop” zones should be established along access routes within 300 m of known caracara nests where vehicles should avoid stopping, and personnel should avoid exiting vehicles, to the maximum possible. If nesting caracaras within the project footprint (other than those in Territory 1) or along access roads begin to show signs of disturbance, the Service’s KRRP project biologist must be notified immediately. Signs of disturbance may include flight away from the nest tree or away from the observer, cackling and rattling behavior followed by flight away from the nest site, or flight around the nest tree without landing in it.
11. The Corps or its contractor must develop, distribute, and post endangered species (caracara and indigo snake) education materials and signage, and will conduct pre-construction training for all project personnel that will be accessing the project area. Education materials, signage, and training will comply with the 2007 KRRP Biological Opinion’s Terms and Conditions specified for the Eastern indigo snake and the Eastern indigo snake standard protection measures described in Appendix C of that Biological Opinion. Similar information will be included for the caracara. Education and training materials will be available in both English and Spanish, and will be available for review by the Service.
12. Reporting responsibilities and timing requirements for all monitoring activities will be specified in the updated Project Work Plan. Monitoring data will be provided to the Service in all of the following forms – copies of original field data forms and survey maps, GIS maps, and electronic files (*e.g.*, field data with coordinates, telemetry data, GIS layers produced related to location data or analyses). All maps and metadata will be provided to the Service in accordance with the *Spatial Data Requirements for Submission to the South Florida Ecological Services Office, June 26, 2008* (Appendix B).

REINITIATION NOTICE

This concludes formal consultation with the Service under section 7 of the Act for the subject project. As written in 50 CFR Section § 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; (2) 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; (3) the agency action is later modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease until reinitiation.

Thank you for your cooperation and effort in protecting fish and wildlife resources. If you have any questions regarding this Biological Opinion, please contact Robert Pace, at 772-469-4239, or Steve Schubert, at 772-469-4249.

Sincerely yours,

A handwritten signature in black ink that reads "R. Pace" followed by a smaller "FWS".

Larry Williams
Field Supervisor
South Florida Ecological Services Office

cc: electronic copy only

Corps, Jacksonville, Florida (Diana Martuscelli, Ivan Acosta, Tiphanie Jinks)

District, West Palm Beach, Florida (David Colangelo, Michael Cheek)

FWC, West Palm Beach, Florida (Chuck Collins)

Service, Atlanta, Georgia (Dave Horning)

Service, Jacksonville, Florida (Miles Meyer)

Service, Vero Beach, Florida (Steve Schubert, Brian Powell, Margaret Wilson)

LITERATURE CITED

- Carnal, L.L. and S.G. Bousquin. 2005. Areal coverage of floodplain plant communities in Pool C of the channelized Kissimmee River. Pages 10-1 thru 10-18 in S.G. Bousquin, D.H. Anderson, G.E. Williams, and D.J. Colangelo (Eds.). Establishing a baseline: pre-restoration studies of the channelized Kissimmee River. South Florida Water Management District Technical Publication ERA#432; West Palm Beach, Florida.
- Dwyer, J.D. 2010. Ecology of non-breeding and breeding crested caracaras (*Caracara cheriway*) in Florida. Ph.D. Dissertation. Virginia Polytechnic Institute and State University; Blacksburg, Virginia.
- Morrison, J.L. 1997. Reproductive ecology and habitat associations of Florida's crested caracara (*Caracara plancus audubonii*). Ph.D. dissertation. University of Florida; Gainesville, Florida.
- South Florida Water Management District. 2011. South Florida Water Management District Land Cover/Land Use 2009 Mapping Project Photointerpretation Key, Version 1.5, August 02, 2011.

KRRP 2012 Reinitiation - Action Area with Revised Contract Footprints

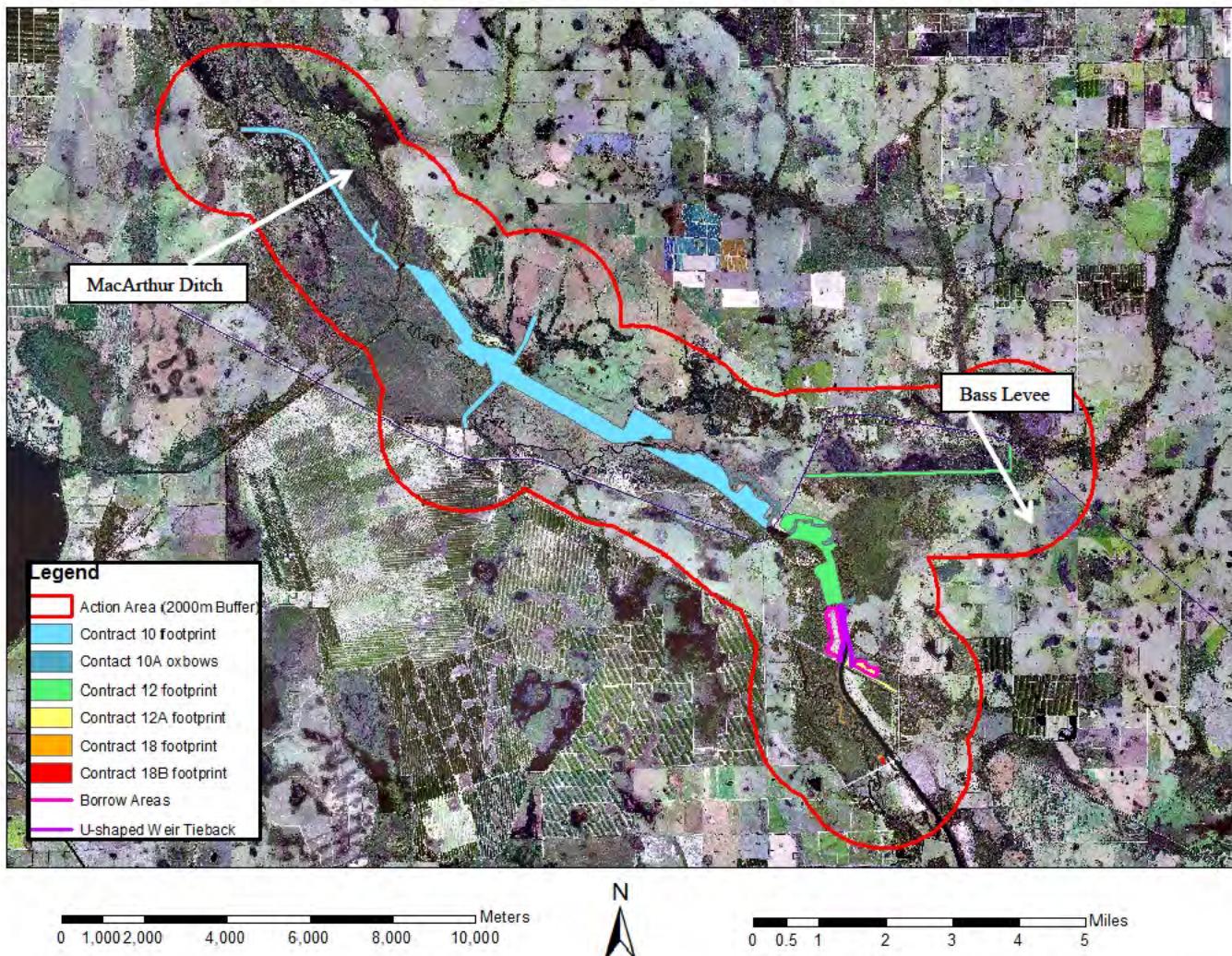


Figure 1. Revised contract footprints for the Kissimmee River Restoration Project and the associated project action area.

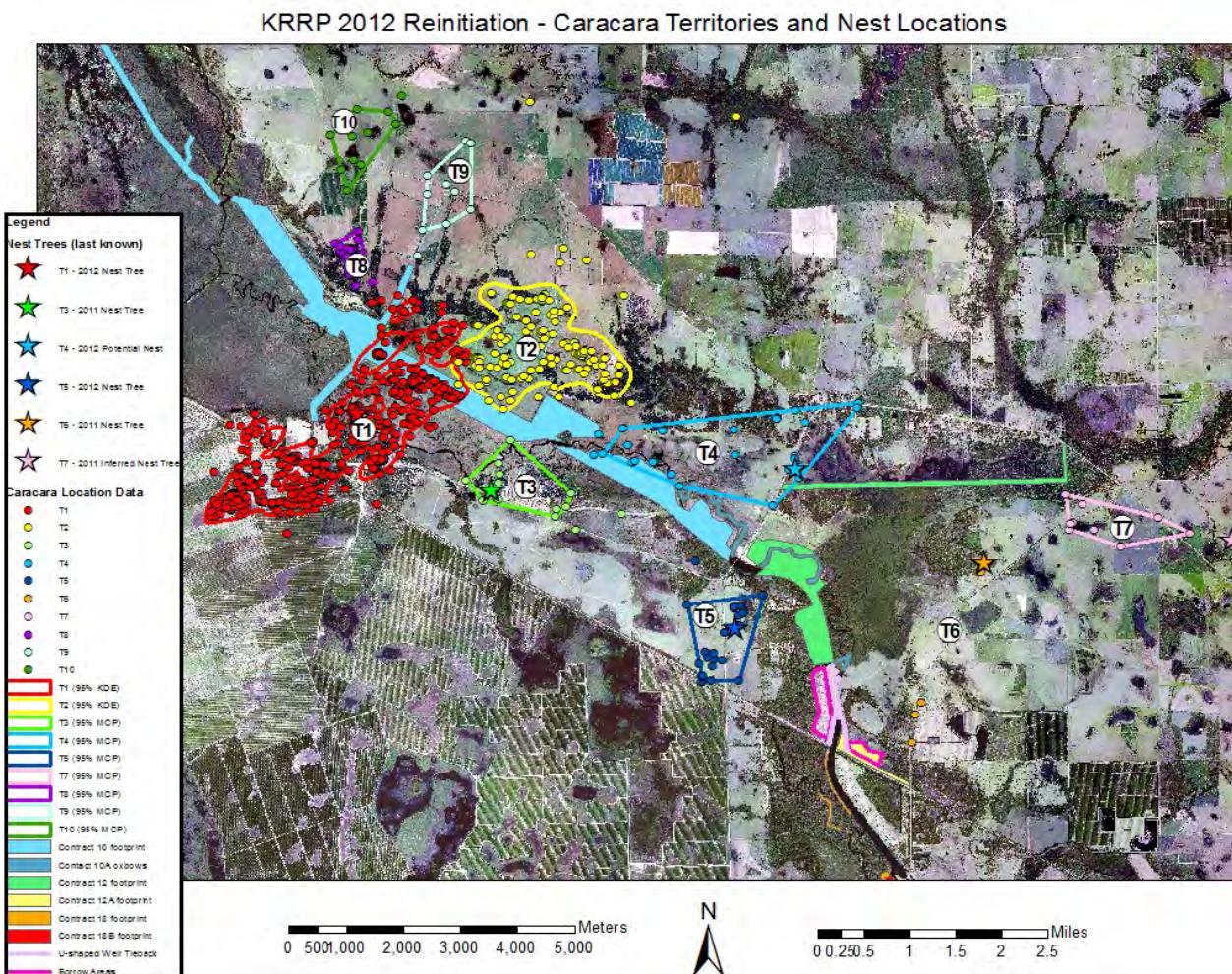


Figure 2. The 2011-2012 caracara observations and estimated territory (T) boundaries in relation to the revised project footprint for the Kissimmee River Restoration Project. Boundaries for T1 and T2 were generated from GPS satellite telemetry and supplemental visual locations using a 95 percent kernel density function in Program R. Boundaries for T3-T5 and T7-T10 were generated from visual locations using a 95 percent minimum convex polygon method in Program R. Boundaries for T6 could not be estimated due to the linear spatial distribution of the available location data.

KRRP 2012 Reinitiation - Caracara Gathering Area

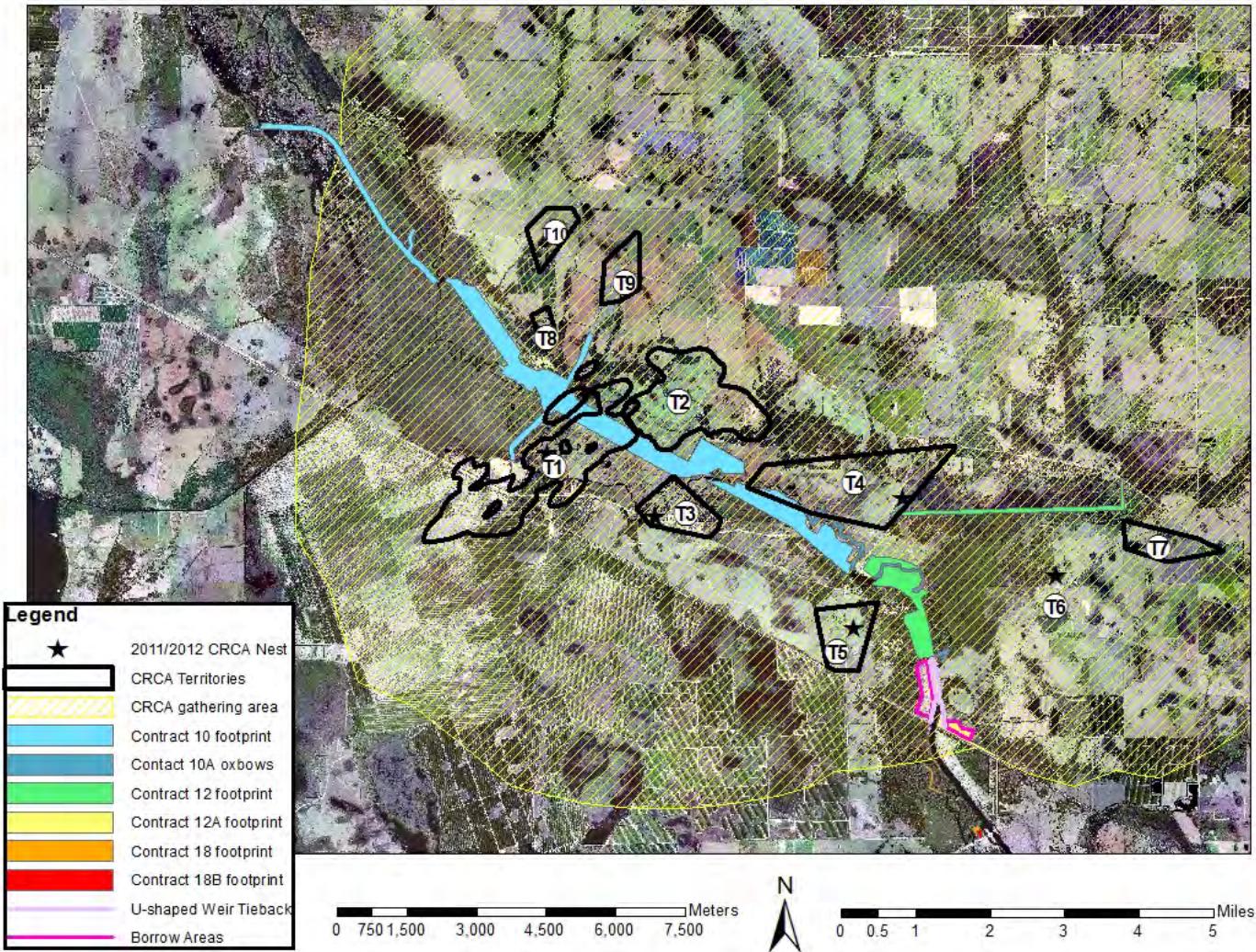


Figure 3. Known caracara gathering area around the Kissimmee River Restoration Project area. Locations of caracara nest trees and estimated territory (T1-T10) boundaries, and revised project footprint have been shown for reference (Dwyer 2010).

KRRP 2012 Reinitiation - Project Impact Area (Restored Floodplain)

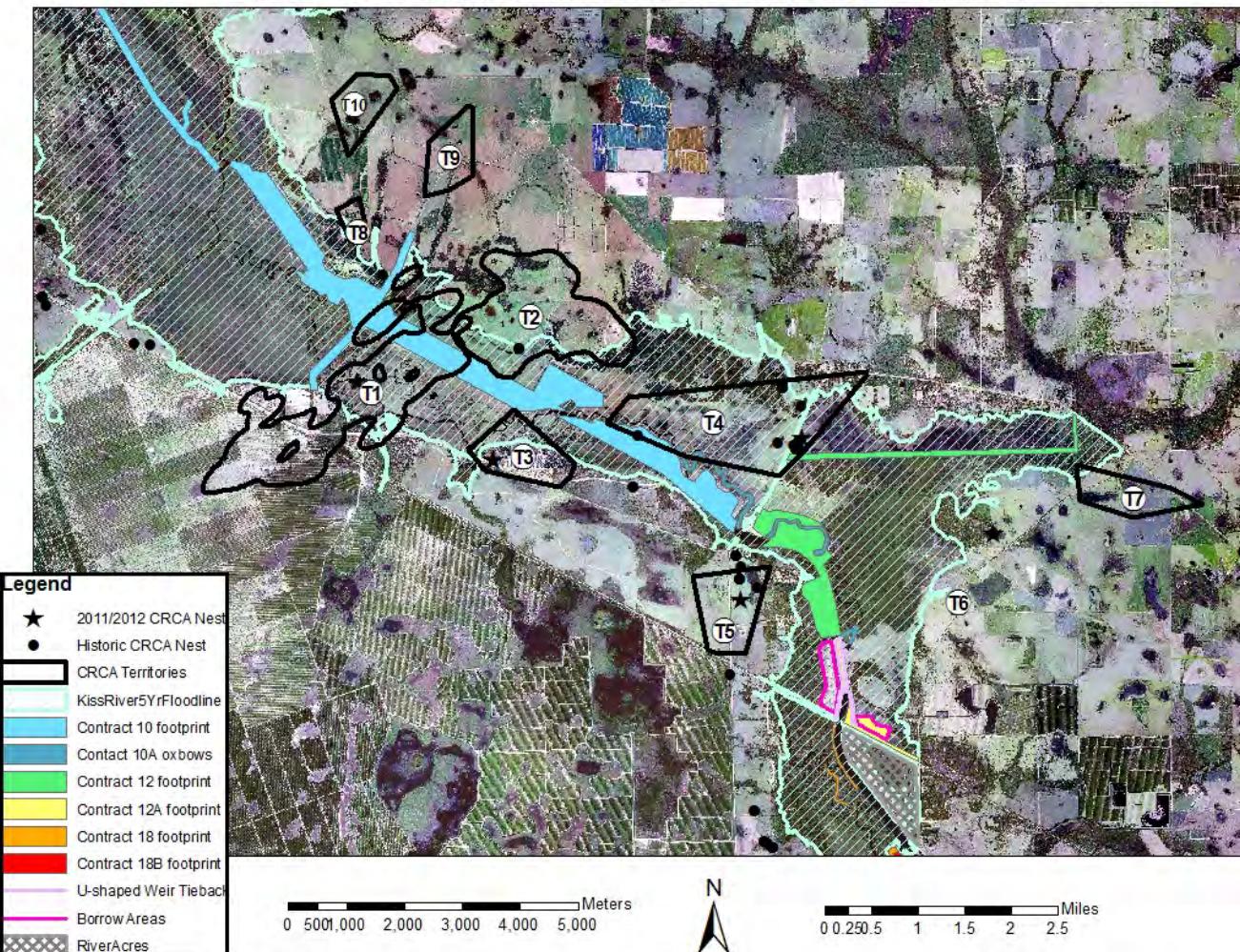


Figure 4. Project impact area for the Kissimmee River Restoration Project as represented by the Kissimmee River 5-year floodplain. Locations of caracara nest trees and estimated territory (T1-T10) boundaries, and revised project footprint have been shown for reference.

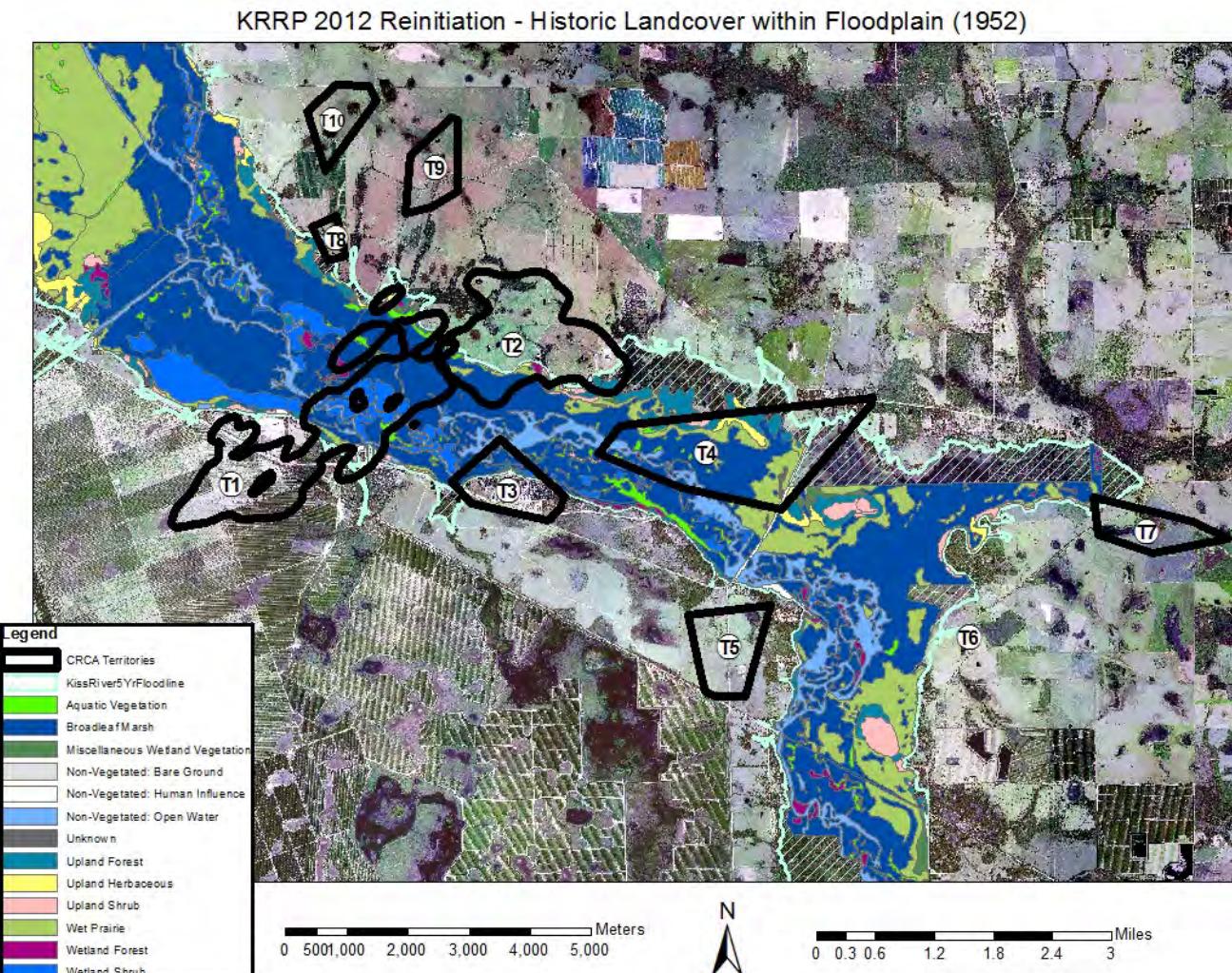
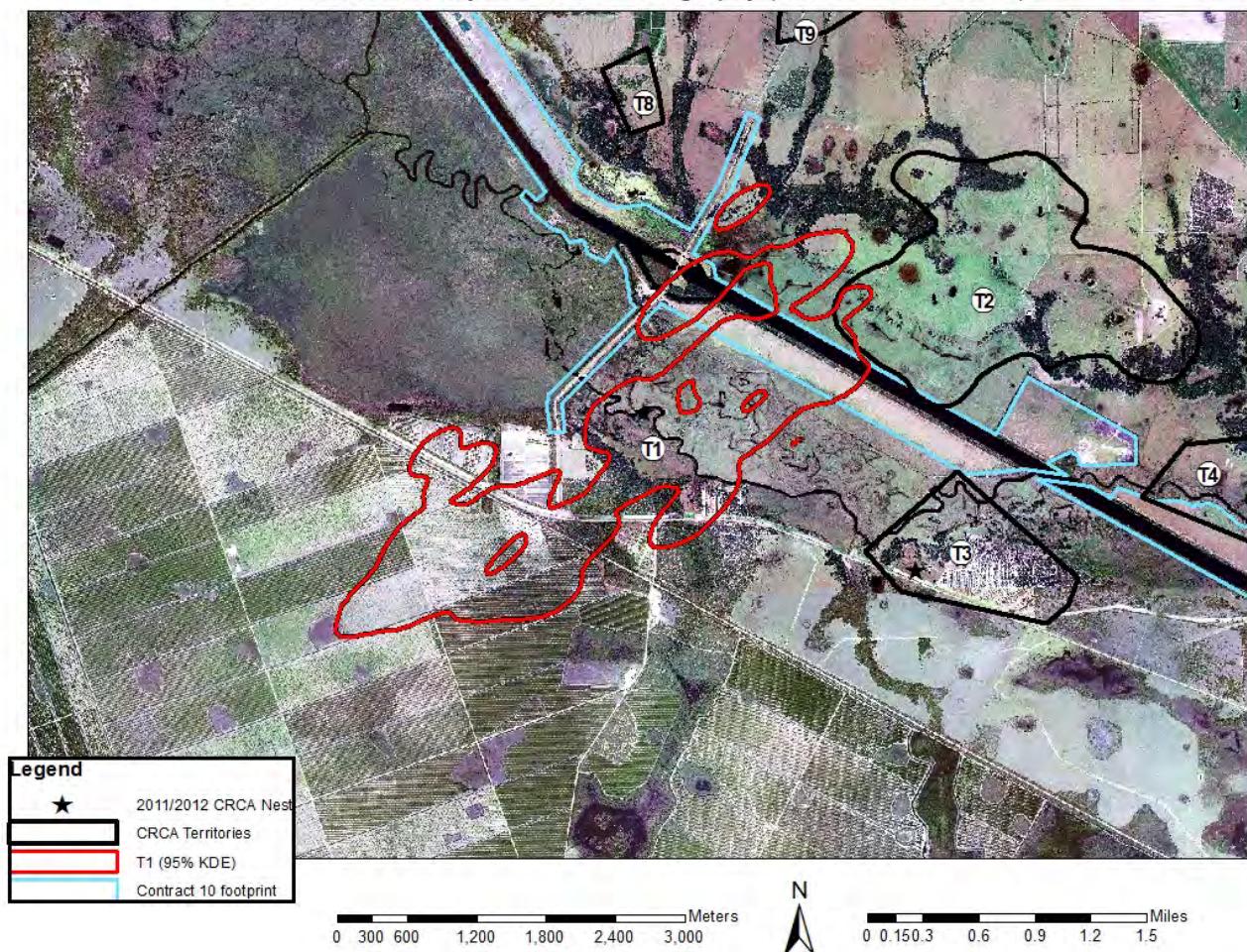


Figure 5. Historic (pre-drainage) habitat within the 5-year Kissimmee River floodplain, with known caracara territories (T1-T10; boundaries estimated). Habitat types are based on 1952 vegetation data provided by the South Florida Water Management District.

KRRP CRCA Territory #1 - Aerial Photography (2004 1-meter DOQQ)



KRRP CRCA Territory #2 - Aerial Photography (2004 1-meter DOQQ)

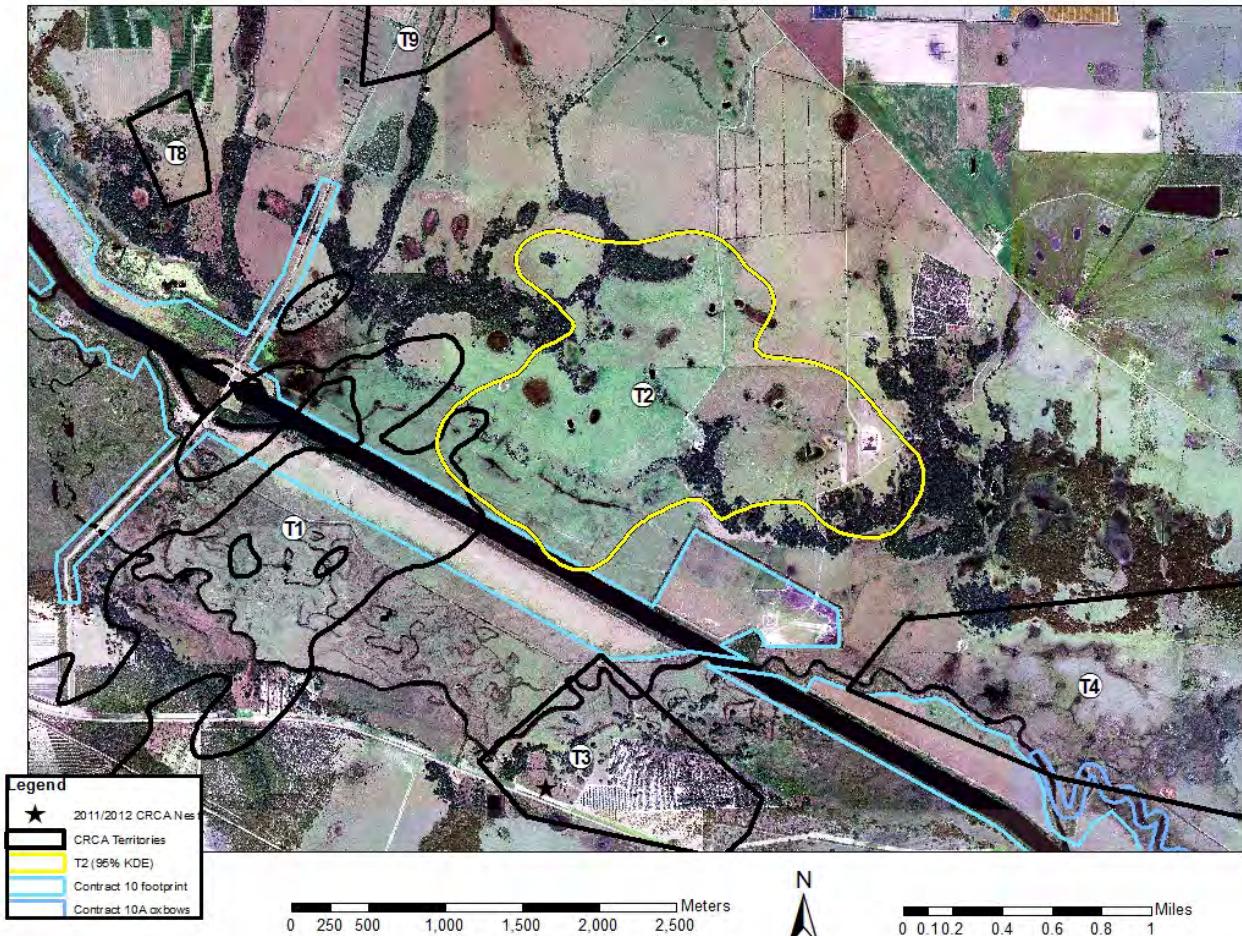
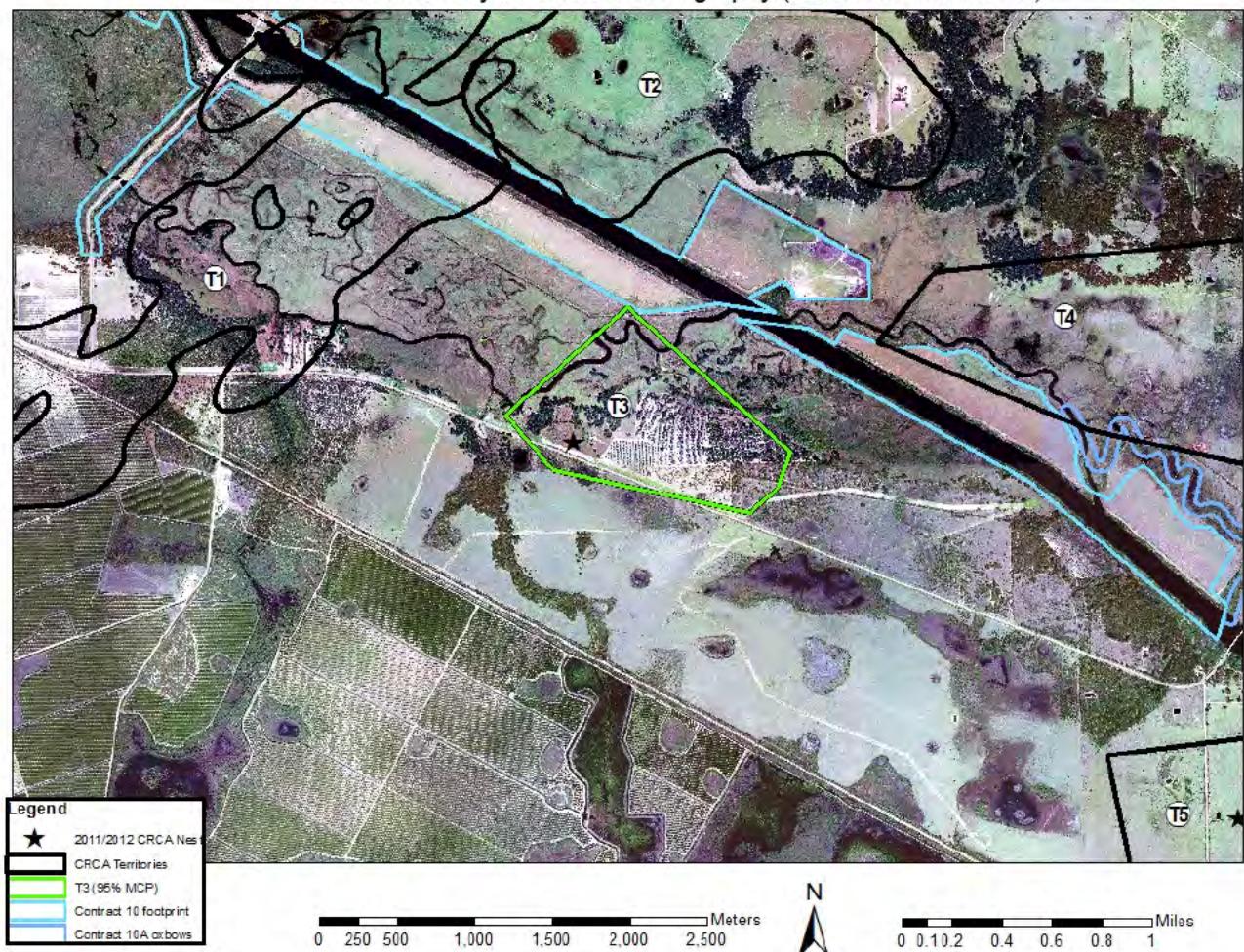


Figure 6. Aerial photography of caracara territories (T) 1 and 2, project footprint, and surrounding area within the Kissimmee River Restoration Project action area. Boundaries for T1 and T2 were generated from GPS satellite telemetry and supplemental visual locations using a 95 percent kernel density function in Program R.

KRRP CRCA Territory #3 - Aerial Photography (2004 1-meter DOQQ)



KRRP CRCA Territory #4 - Aerial Photography (2004 1-meter DOQQ)

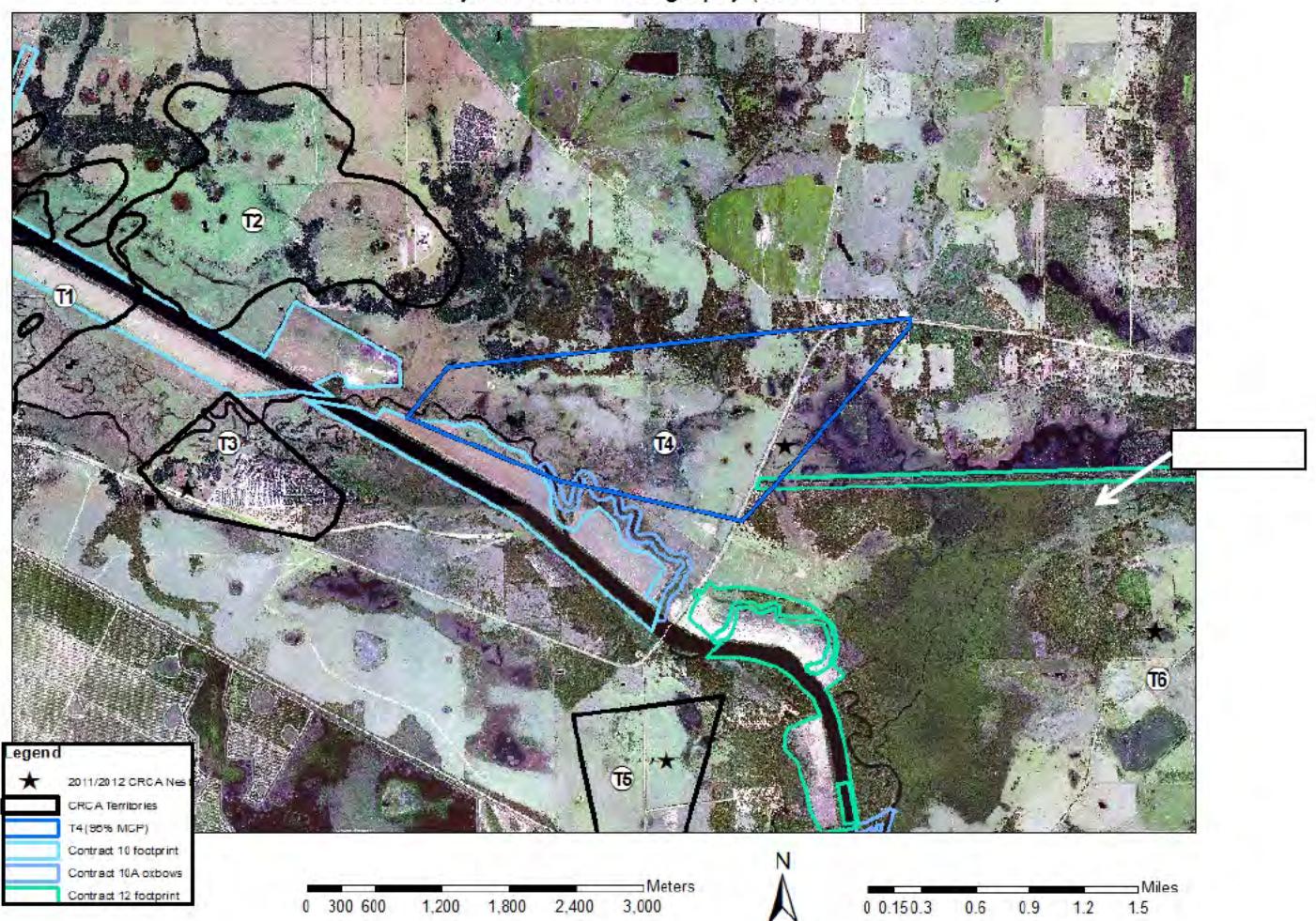
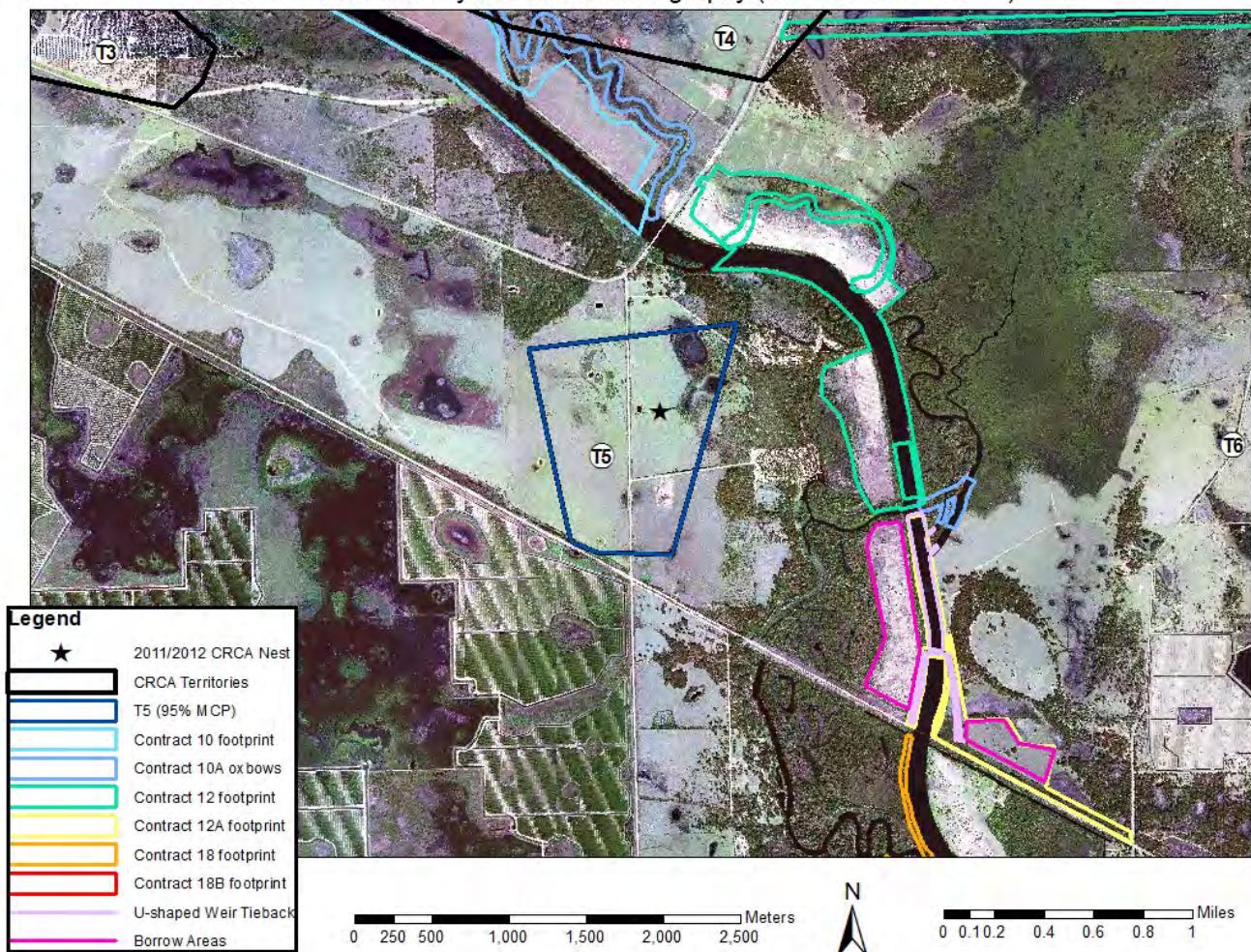


Figure 7. Aerial photography of caracara territories (T) 3 and 4, project footprint, and surrounding area within the Kissimmee River Restoration Project action area. Boundaries for T3 and T4 were generated from limited visual locations using a 95 percent minimum convex polygon method in Program R.

KRRP CRCA Territory #5 - Aerial Photography (2004 1-meter DOQQ)



KRRP CRCA Territory #6 - Aerial Photography (2004 1-meter DOQQ)

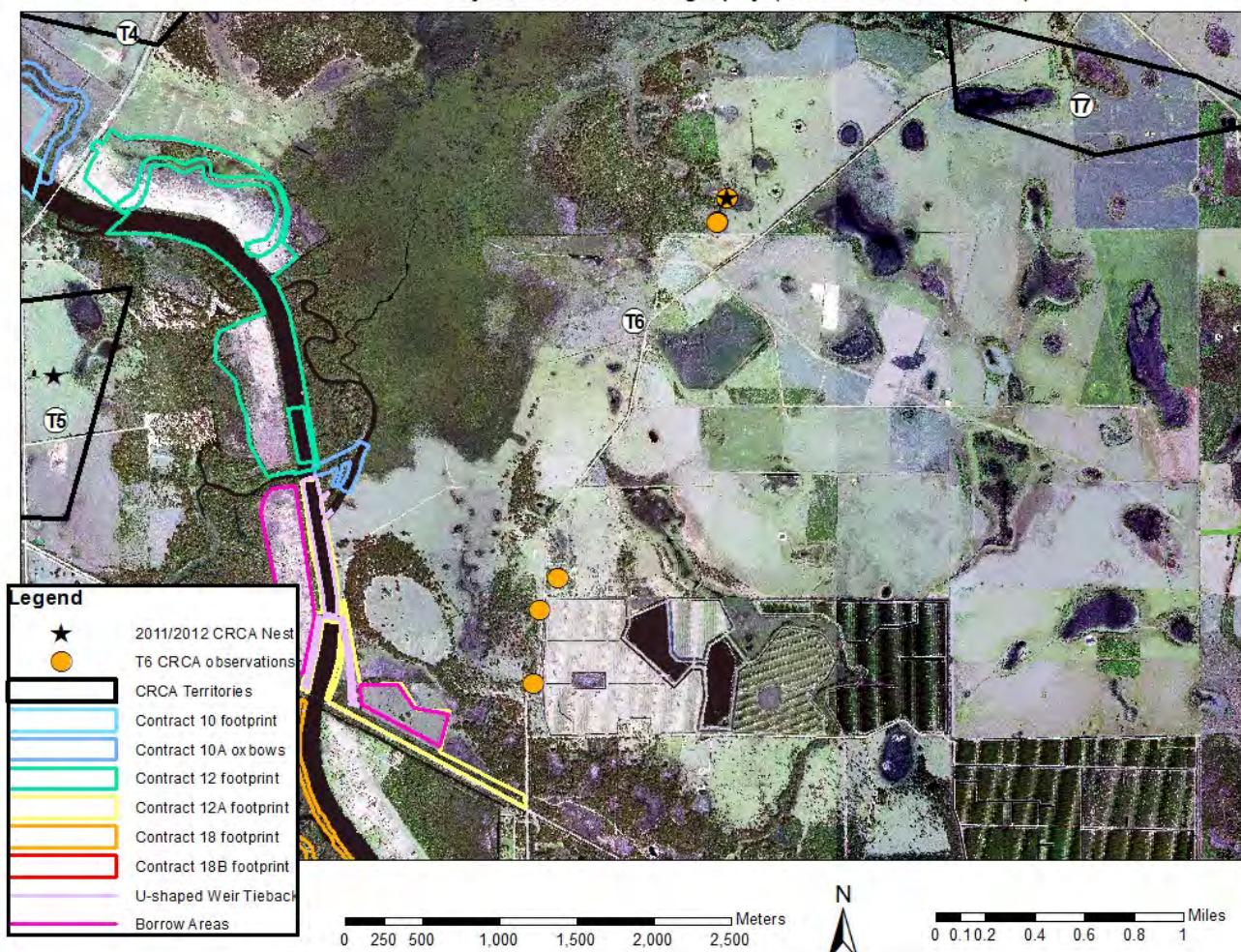
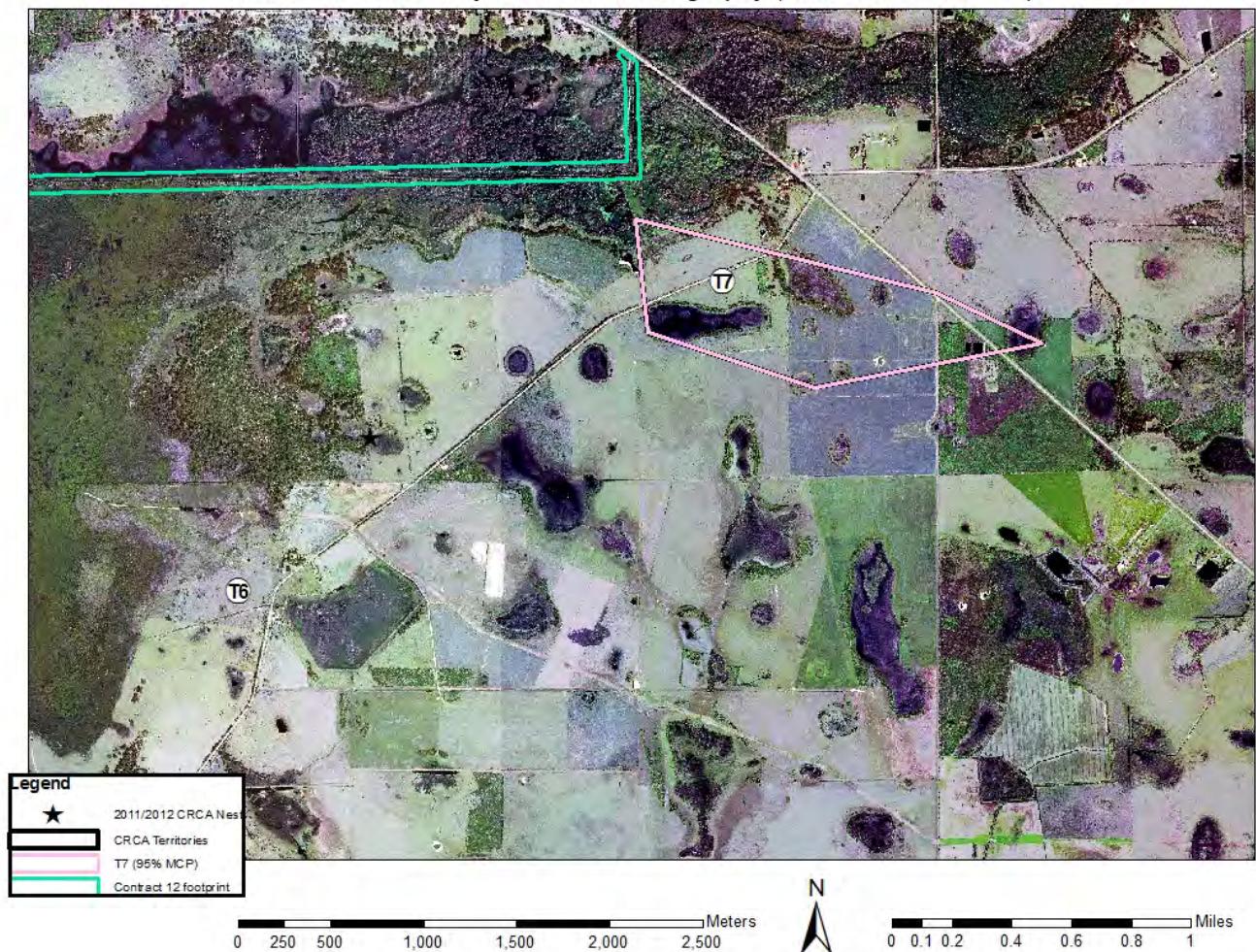


Figure 8. Aerial photography of caracara territories (T) 5 and 6, project footprint, and surrounding area within the Kissimmee River Restoration Project action area. Boundaries for T5 were generated from limited visual locations using a 95 percent minimum convex polygon method in Program R. Boundaries for T6 could not be estimated due to the linear spatial distribution of the available location data.

KRRP CRCA Territory #7 - Aerial Photography (2004 1-meter DOQQ)



KRRP CRCA Territory #8 - Aerial Photography (2004 1-meter DOQQ)

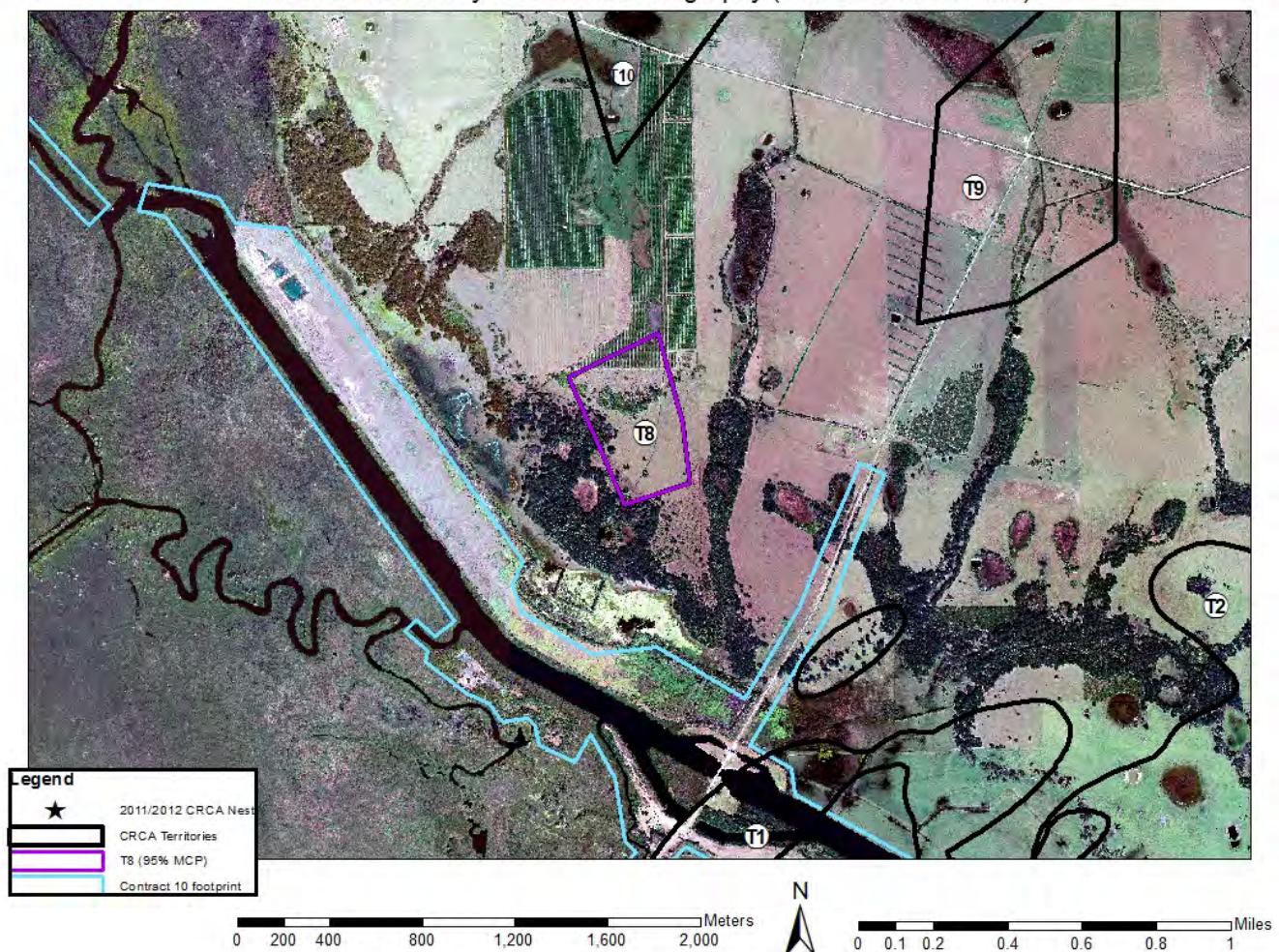
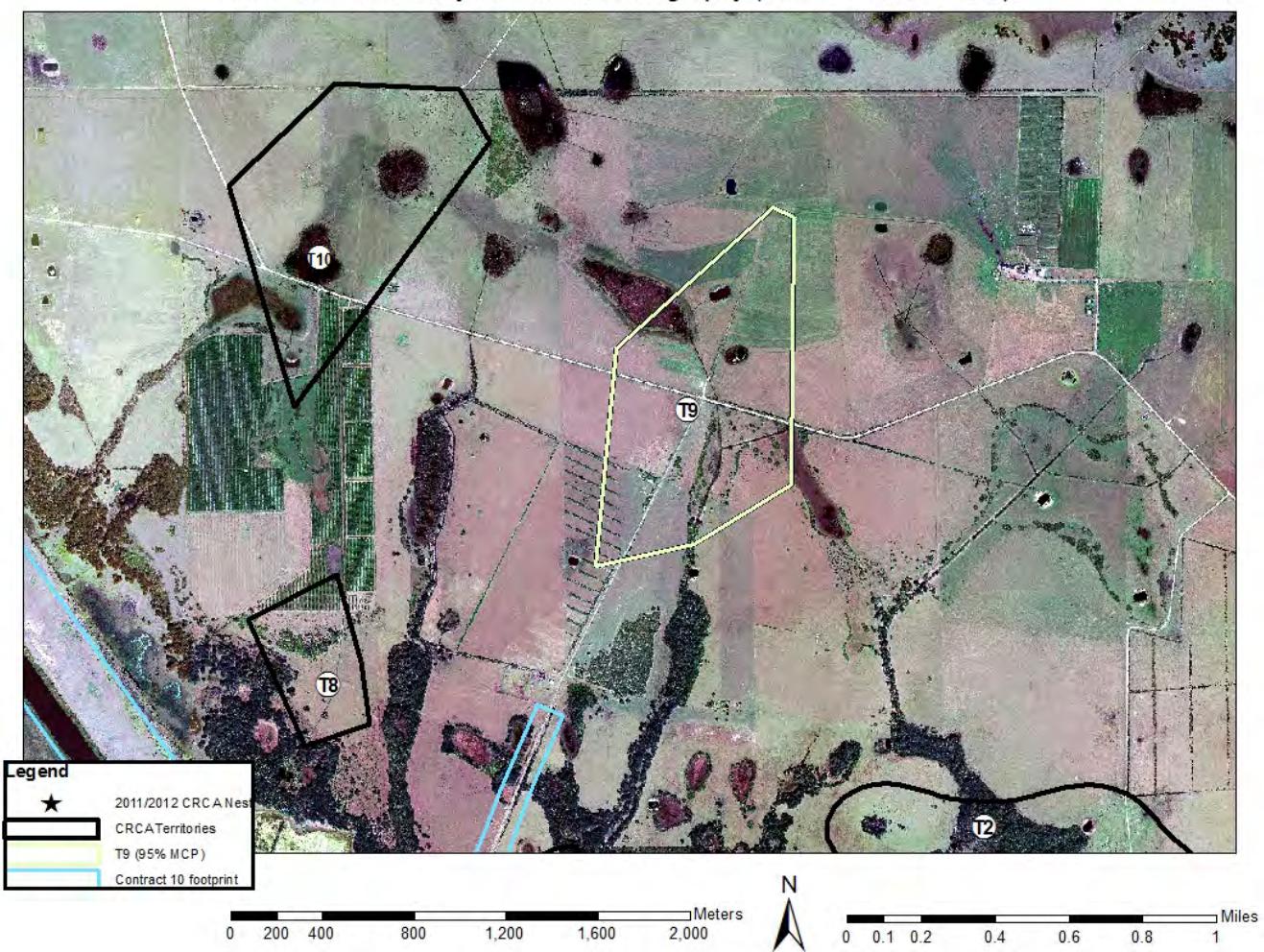


Figure 9. Aerial photography of caracara territories (T) 7 and 8, project footprint, and surrounding area within the Kissimmee River Restoration Project action area. Boundaries for T7 and T8 were generated from limited visual locations using a 95 percent minimum convex polygon method in Program R.

KRRP CRCA Territory #9 - Aerial Photography (2004 1-meter DOQQ)



KRRP CRCA Territory #10 - Aerial Photography (2004 1-meter DOQQ)

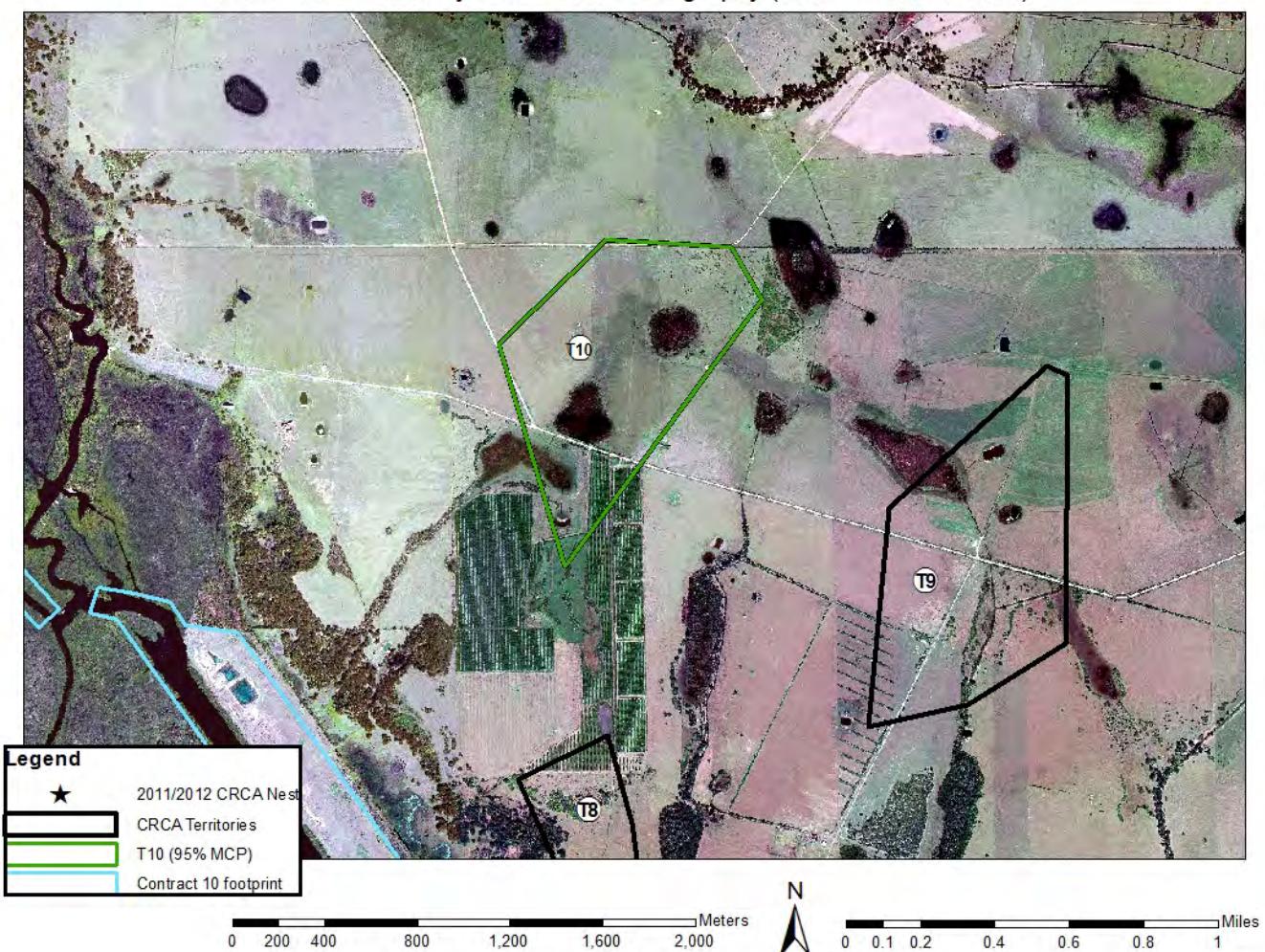
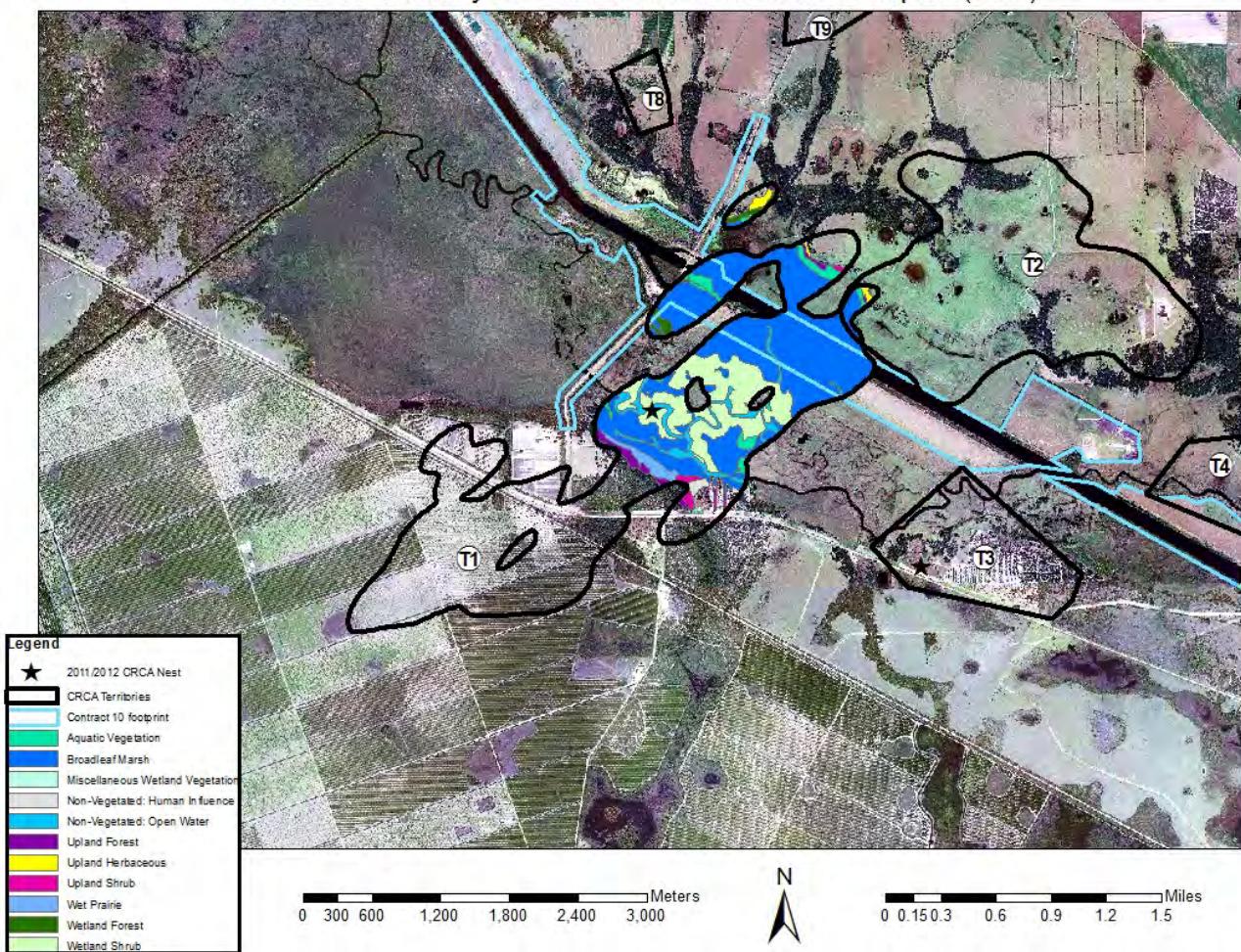


Figure 10. Aerial photography of caracara territories (T) 9 and 10, project footprint, and surrounding area within the Kissimmee River Restoration Project action area. Boundaries for T9 and T10 were generated from limited visual locations using a 95 percent minimum convex polygon method in Program R.

KRRP CRCA Territory #1 - Historic Landcover within Floodplain (1952)



KRRP CRCA Territory #1 - Existing Landcover (FLUCCS08)

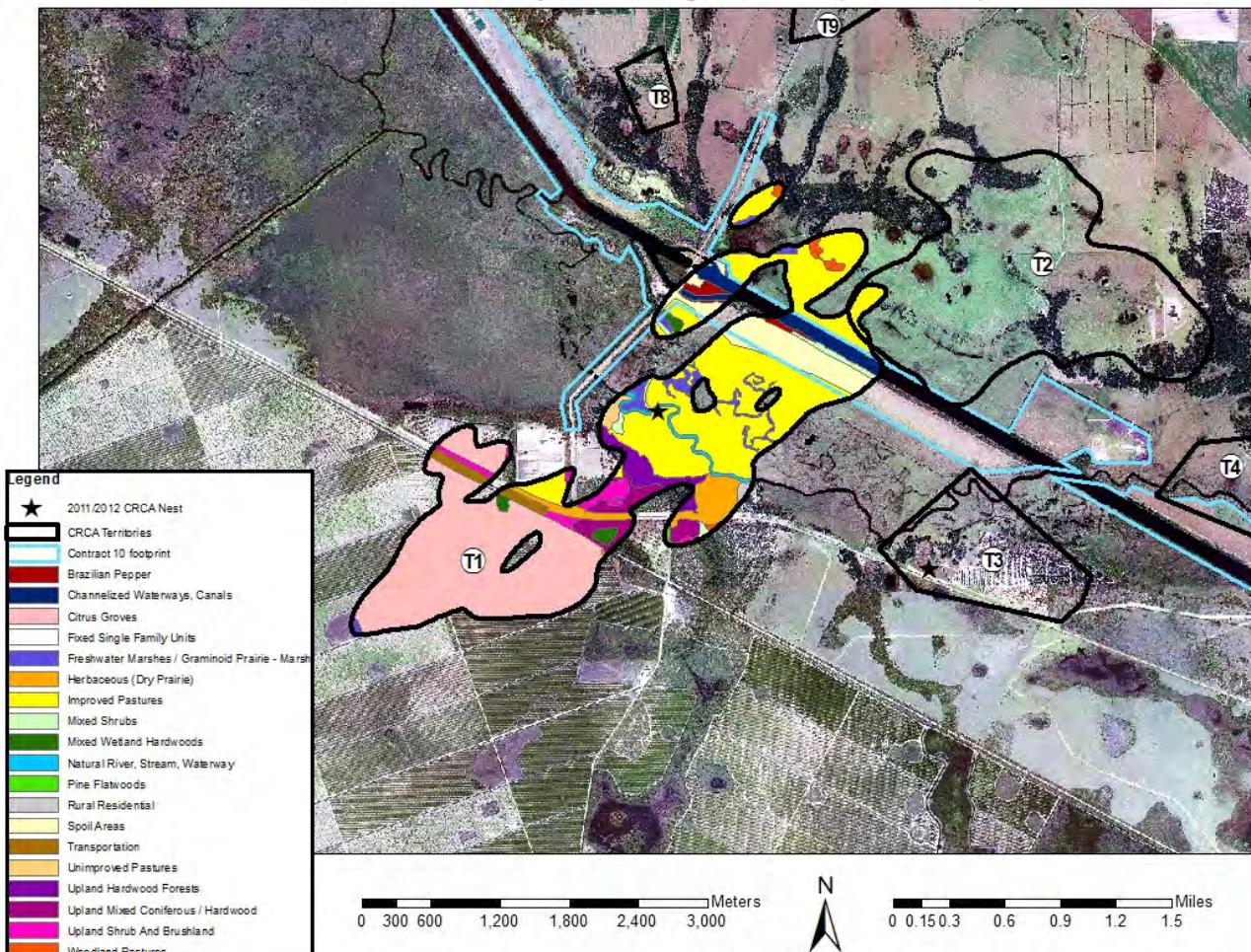
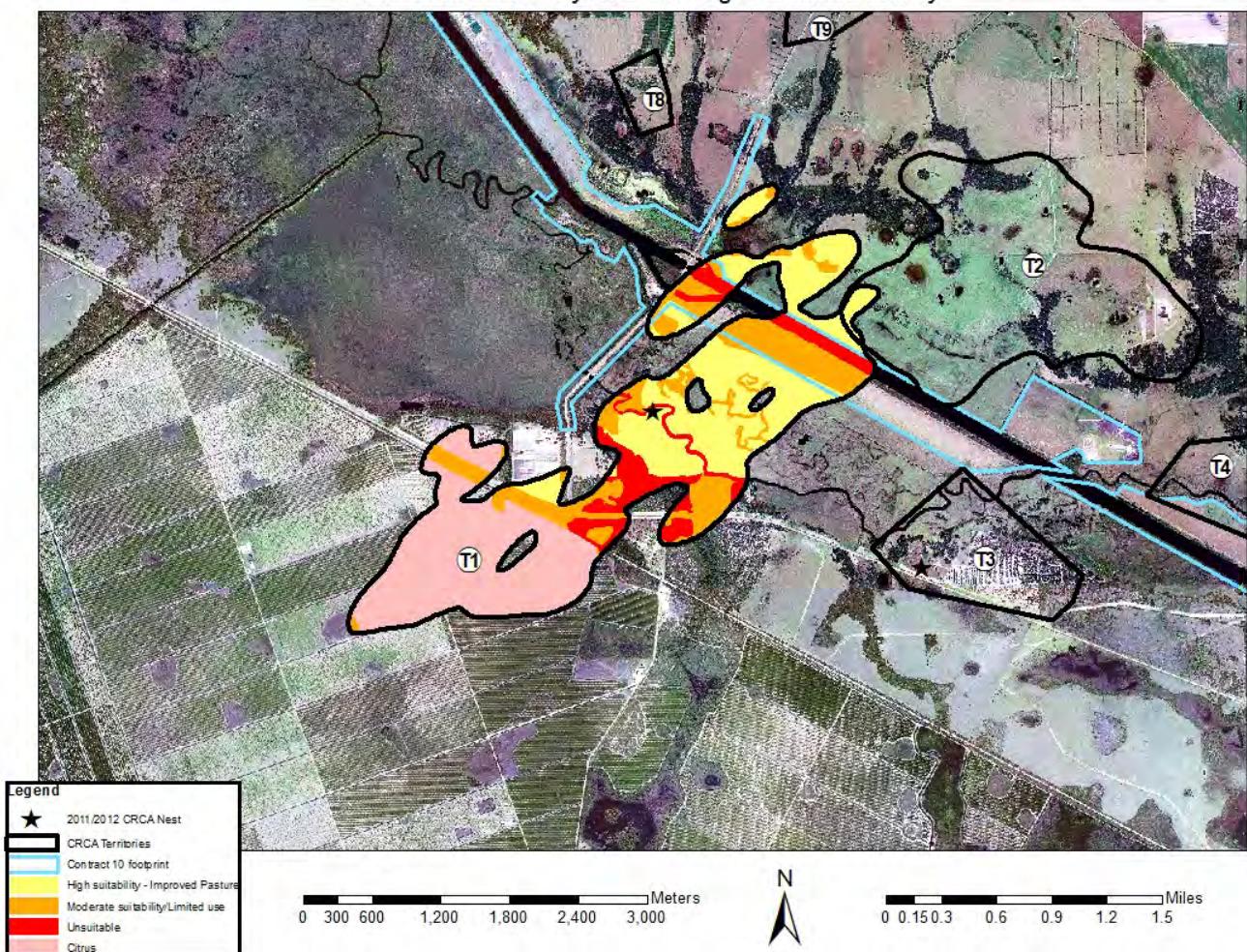


Figure 11. Historic (pre-drainage) and existing habitat within caracara territory (T) 1. Historic habitat types are shown within the floodplain and based on 1952 vegetation data provided by the South Florida Water Management District. Existing habitat types are based on the South Florida Water Management District's 2009 Land Cover/Land Use dataset using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS).

KRRP CRCA Territory #1 - Existing Habitat Suitability



KRRP CRCA Territory #1 - Predicted Post-Restoration Habitat Suitability

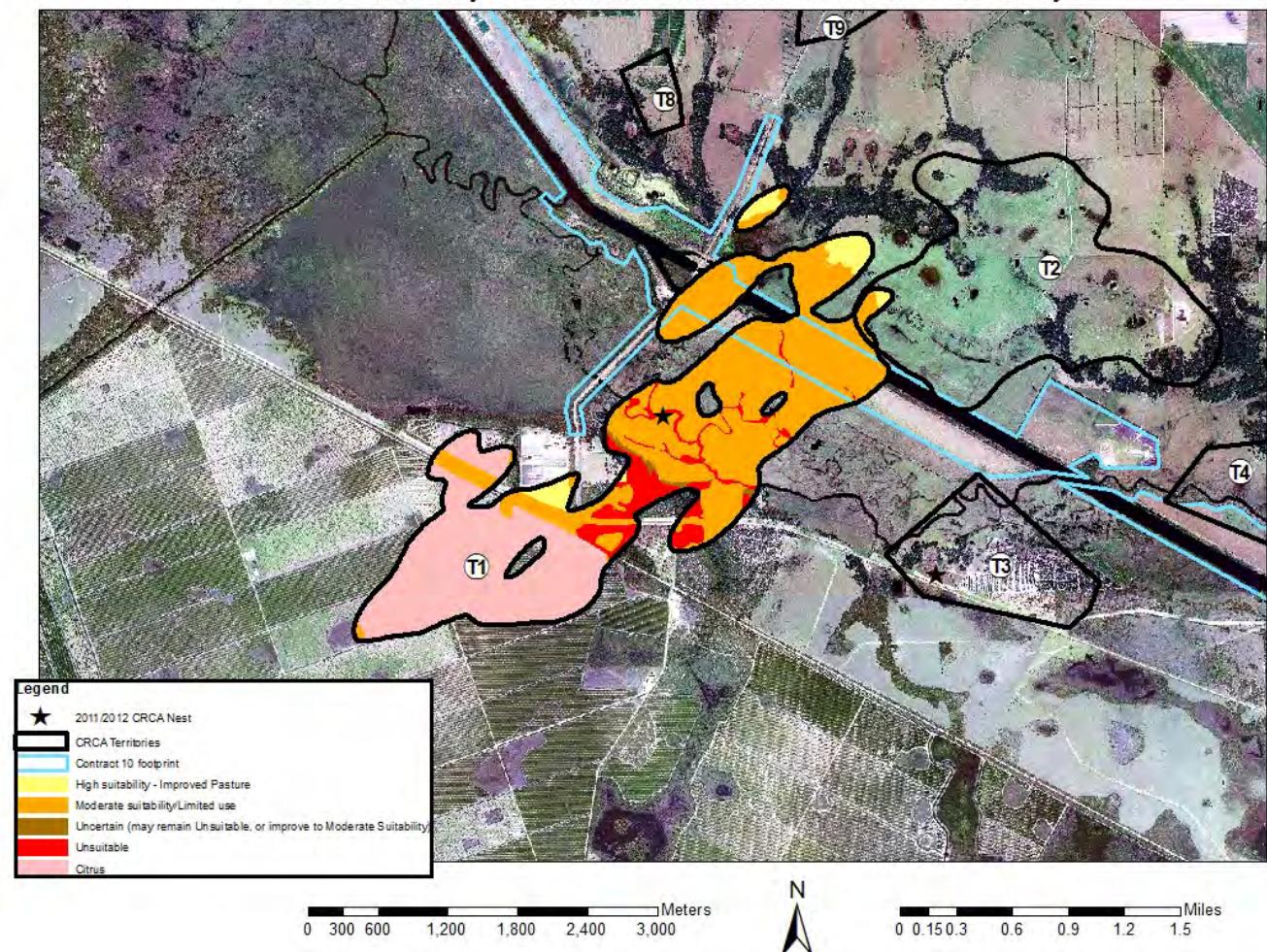


Figure 12. Existing and predicted post-restoration habitat suitability for the caracara within territory (T) 1. Existing caracara habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, or citrus based on known species habitat preferences. Post-restoration habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, citrus, or unknown based on the rules outlined in Table 1.

KRRP CRCA Territory #1 - Predicted Change in Habitat Suitability (Restored vs. Existing)

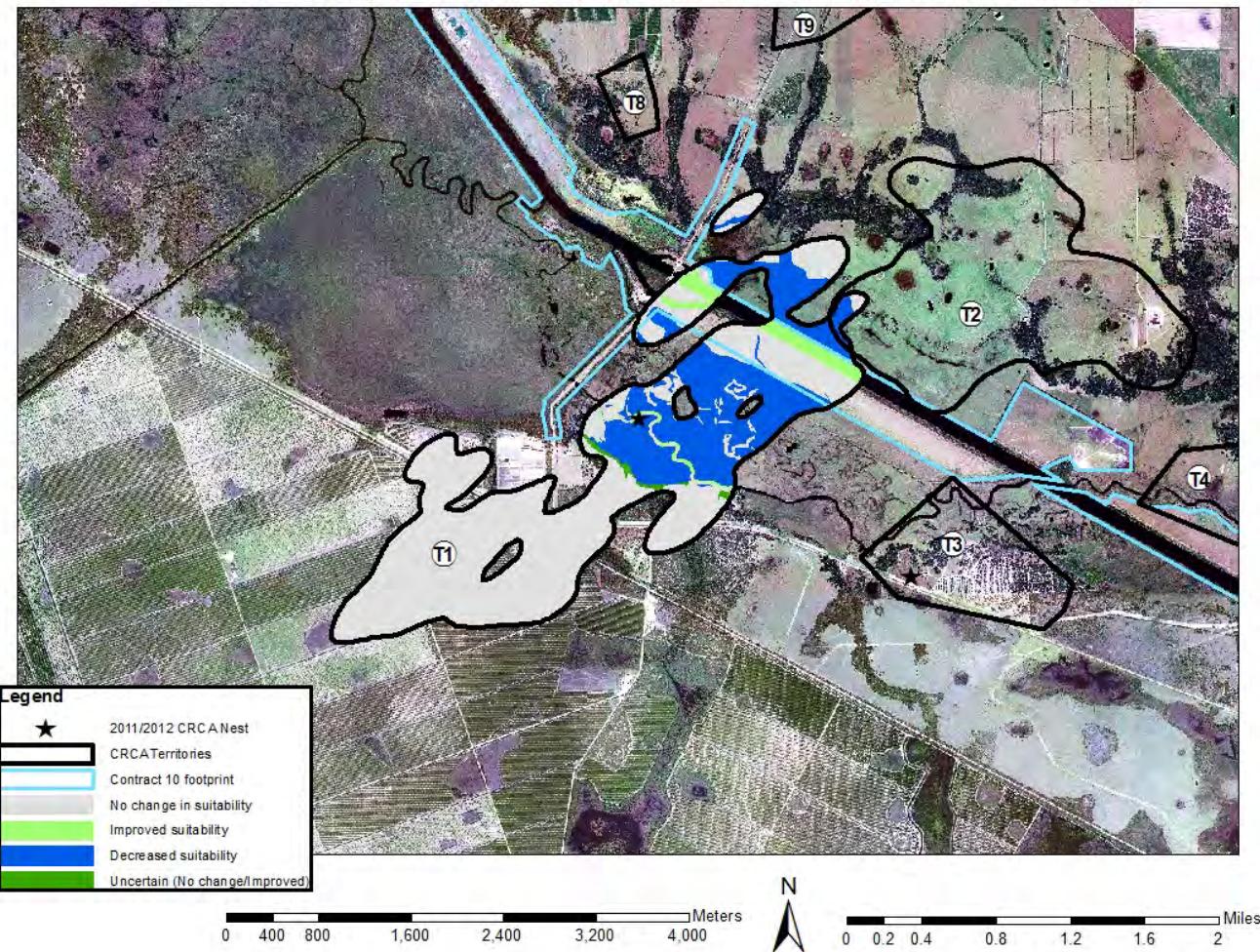
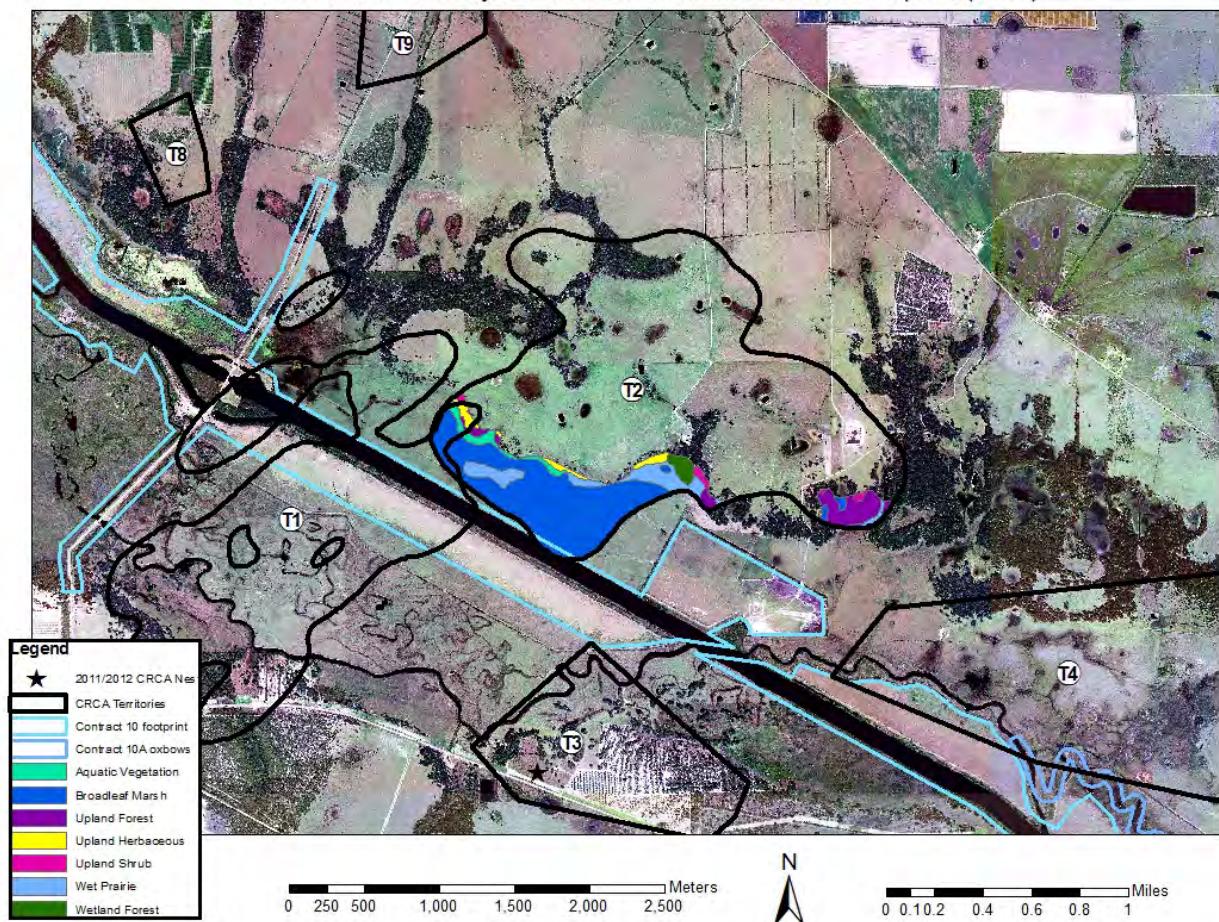


Figure 13. Predicted change in caracara habitat suitability (restored vs. existing) for caracara territory 1 (T1), described as experiencing no change in suitability, improved suitability, decreased suitability, or uncertain change in suitability, following rules outlined in Table 1. Habitat suitability may remain unchanged (*e.g.*, characterized as moderate suitability/limited use under both existing and restored conditions) despite predicted change in habitat type (*e.g.*, unimproved pasture converting to wet prairie).

KRRP CRCA Territory #2 - Historic Landcover within Floodplain (1952)



KRRP CRCA Territory #2 - Existing Landcover (FLUCCS08)

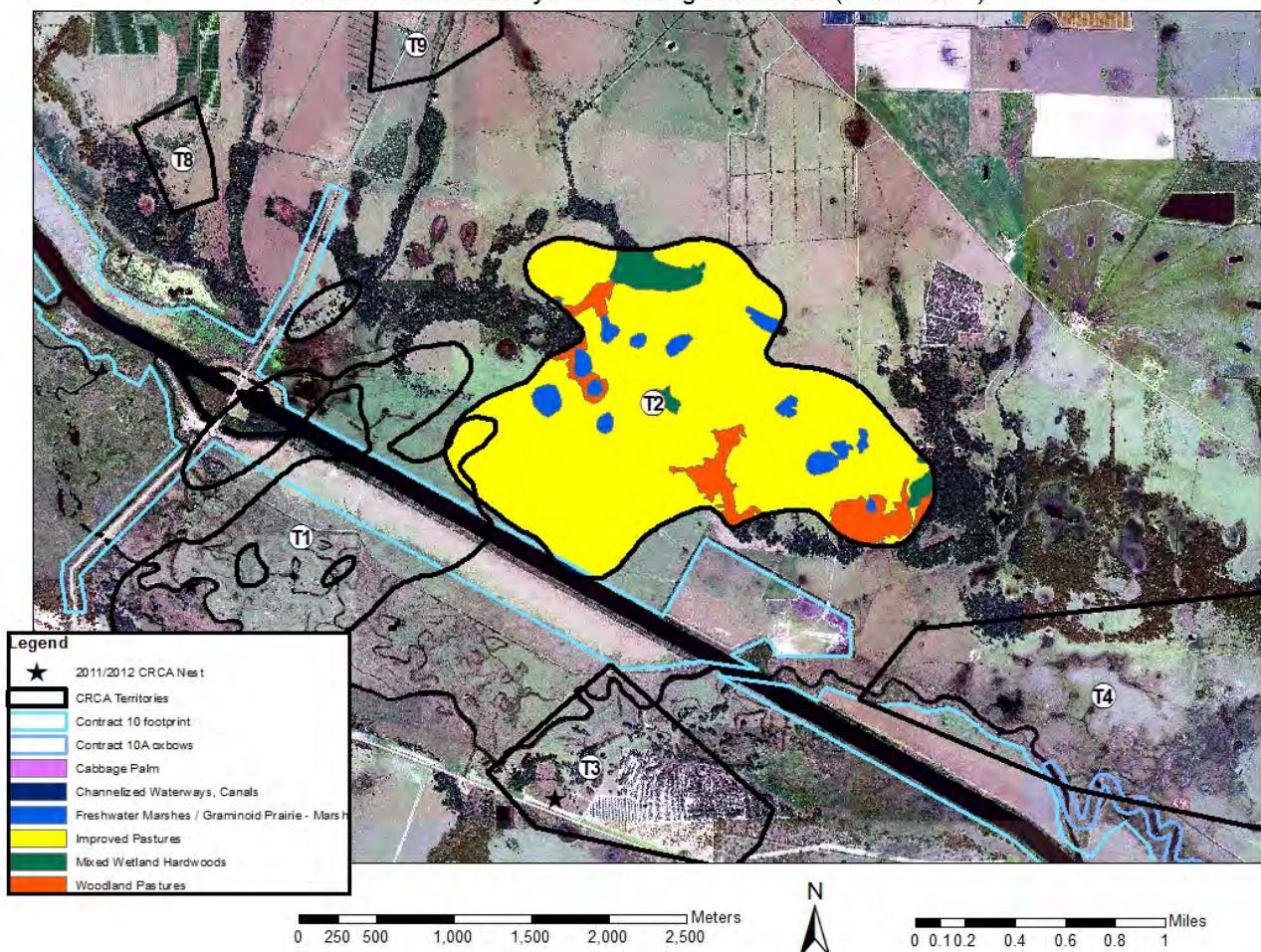
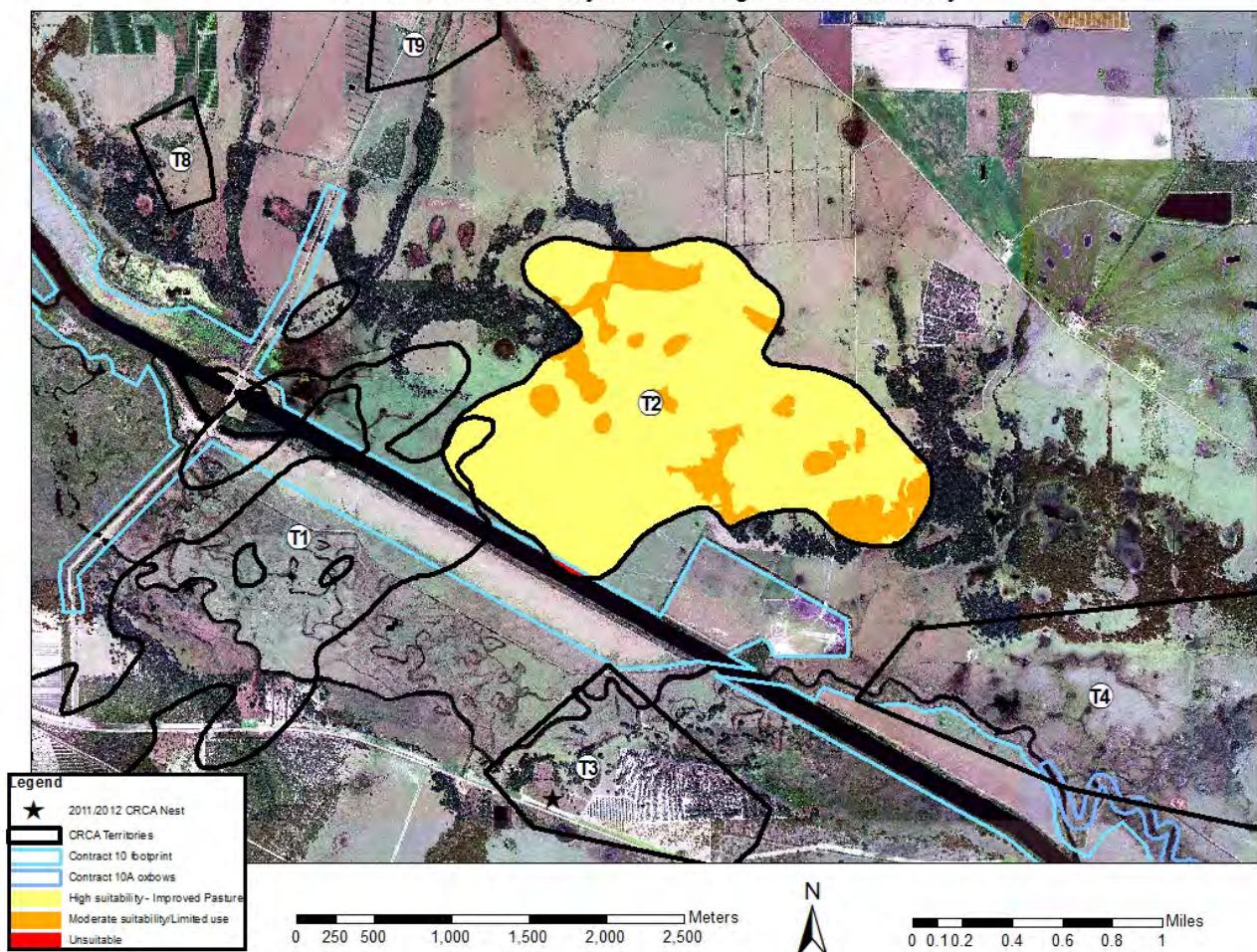


Figure 14. Historic (pre-drainage) and existing habitat within caracara territory (T) 2. Historic habitat types are shown within the floodplain and based on 1952 vegetation data provided by the South Florida Water Management District. Existing habitat types are based on the South Florida Water Management District's 2009 Land Cover/Land Use dataset using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS).

KRRP CRCA Territory #2 - Existing Habitat Suitability



KRRP CRCA Territory #2 - Predicted Post-Restoration Habitat Suitability

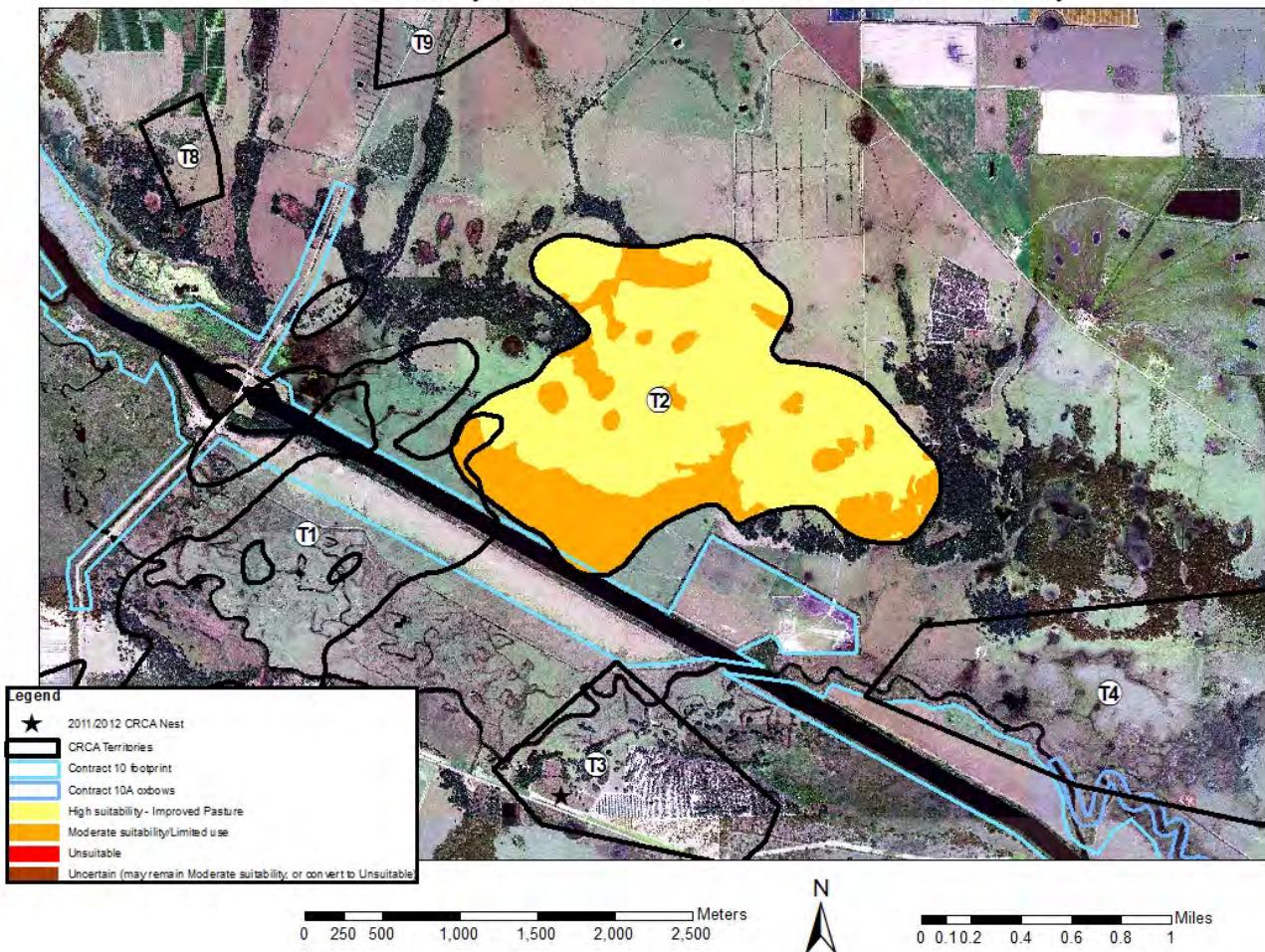


Figure 15. Existing and predicted post-restoration habitat suitability for the caracara within territory (T) 2. Existing caracara habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, or citrus based on known species habitat preferences. Post-restoration habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, citrus, or unknown based on the rules outlined in Table 1.

KRRP CRCA Territory #2 - Predicted Change in Habitat Suitability (Restored vs. Existing)

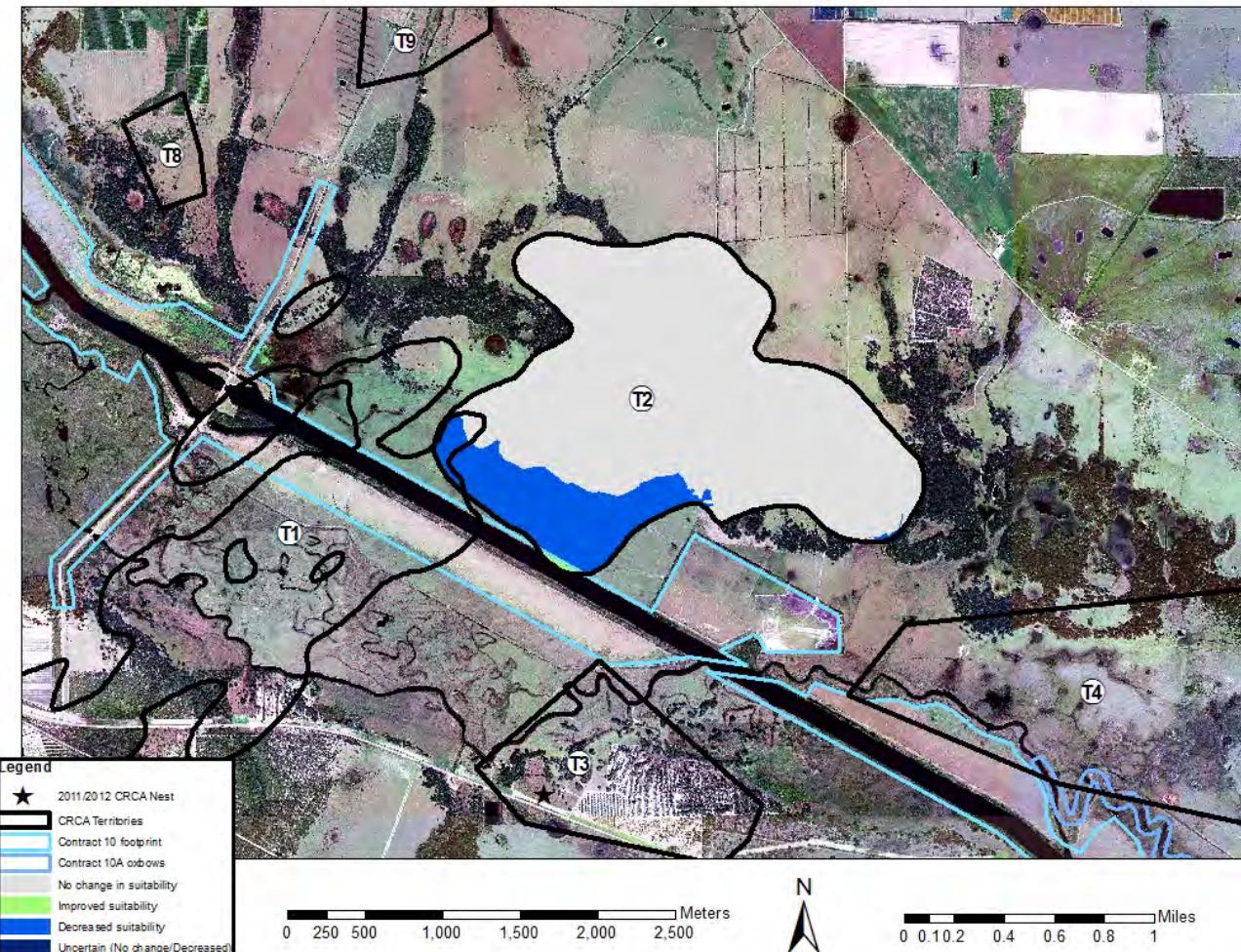
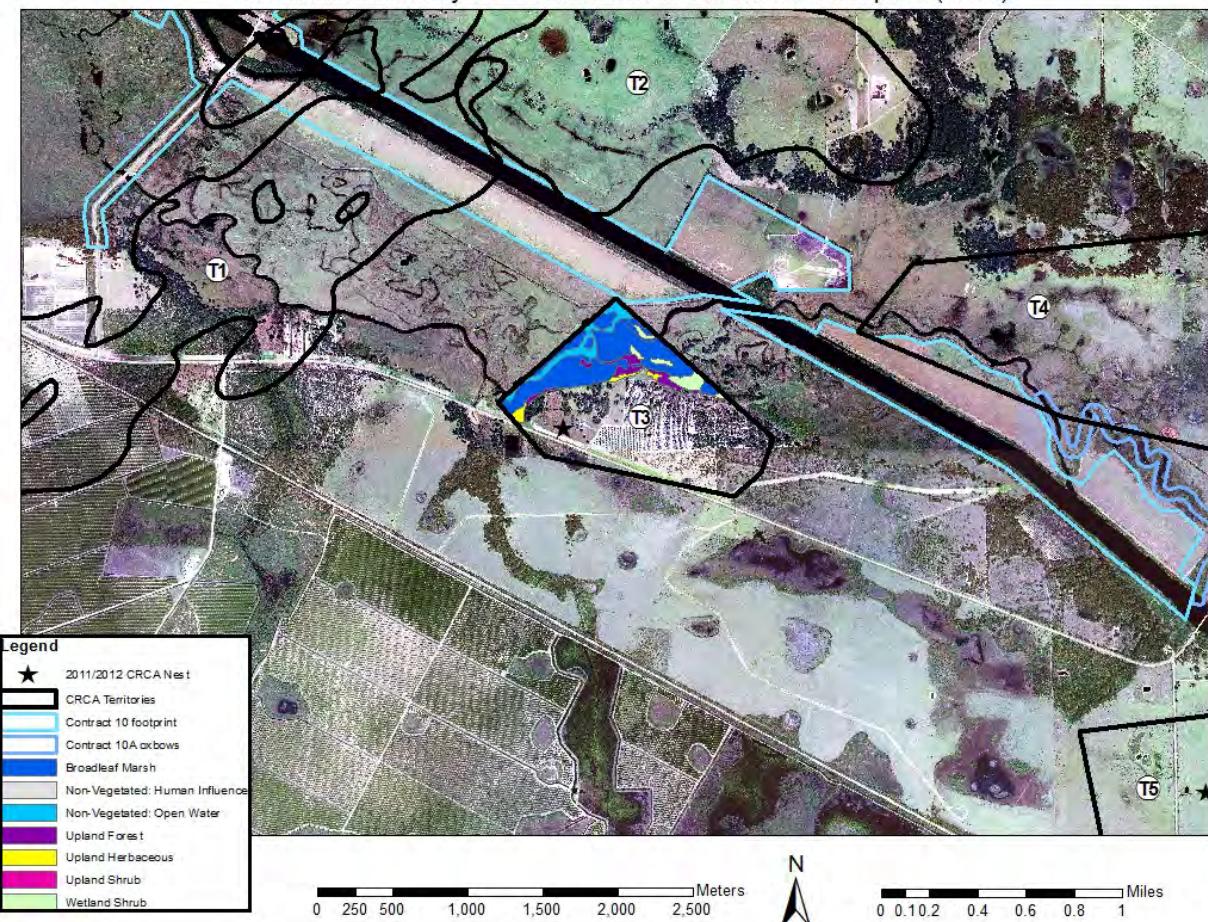


Figure 16. Predicted change in caracara habitat suitability (restored vs. existing) for caracara territory 2 (T2), described as experiencing no change in suitability, improved suitability, decreased suitability, or uncertain change in suitability, following rules outlined in Table 1. Habitat suitability may remain unchanged (*e.g.*, characterized as moderate suitability/limited use under both existing and restored conditions) despite predicted change in habitat type (*e.g.*, unimproved pasture converting to wet prairie).

KRRP CRCA Territory #3 - Historic Landcover within Floodplain (1952)



KRRP CRCA Territory #3 - Existing Landcover (FLUCCS08)

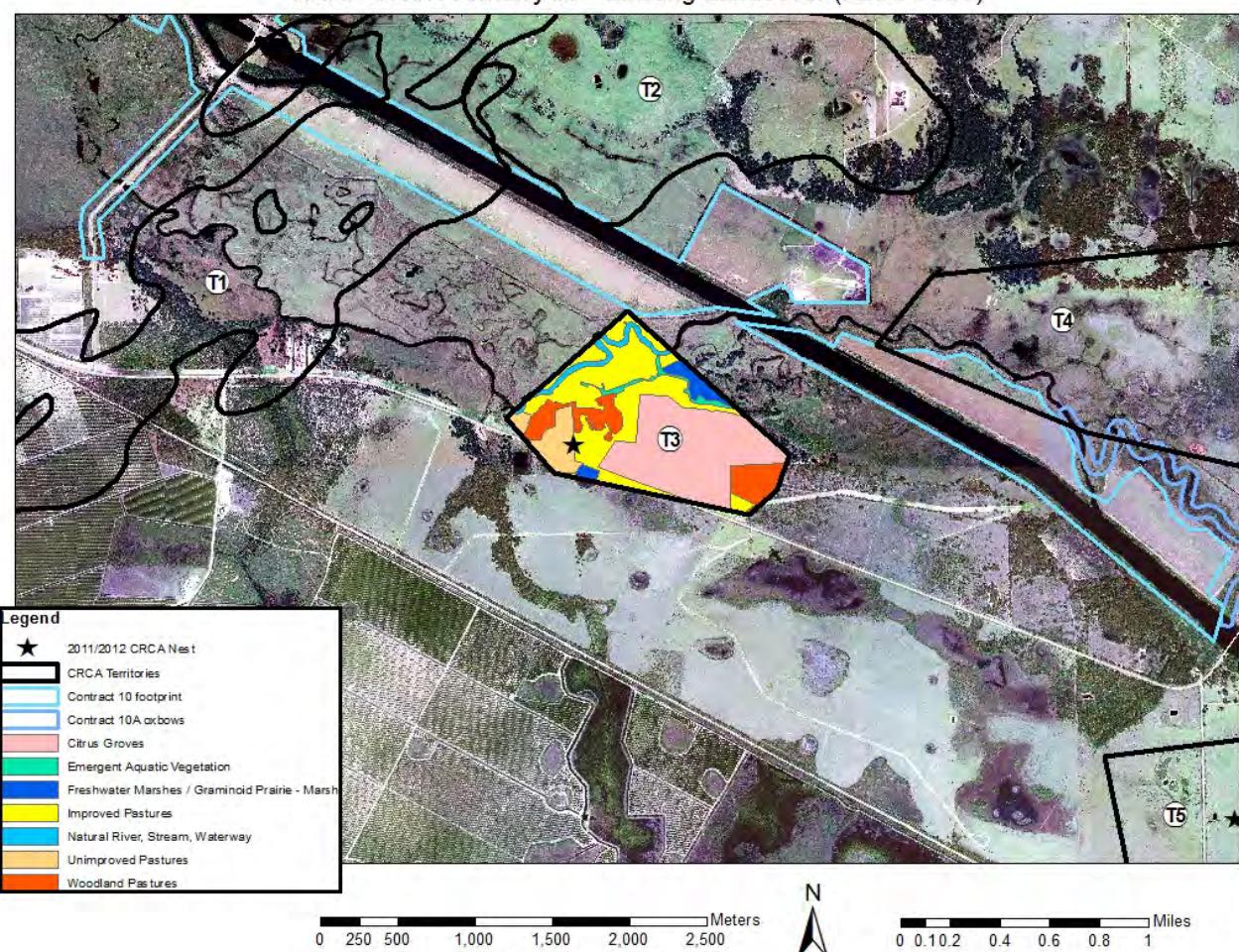
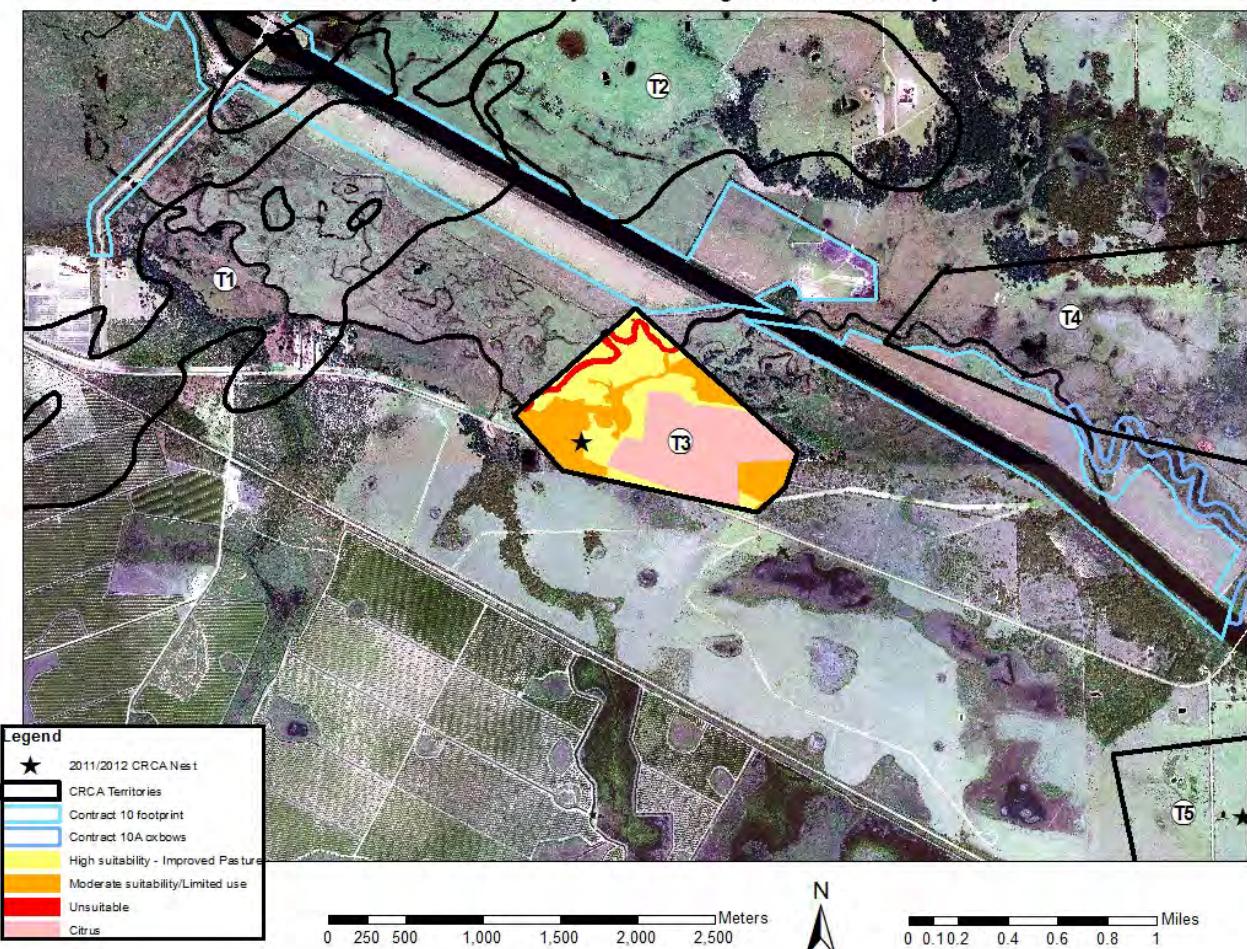


Figure 17. Historic (pre-drainage) and existing habitat within caracara territory (T) 3. Historic habitat types are shown within the floodplain and based on 1952 vegetation data provided by the South Florida Water Management District. Existing habitat types are based on the South Florida Water Management District's 2009 Land Cover/Land Use dataset using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS).

KRRP CRCA Territory #3 - Existing Habitat Suitability



KRRP CRCA Territory #3 - Predicted Post-Restoration Habitat Suitability

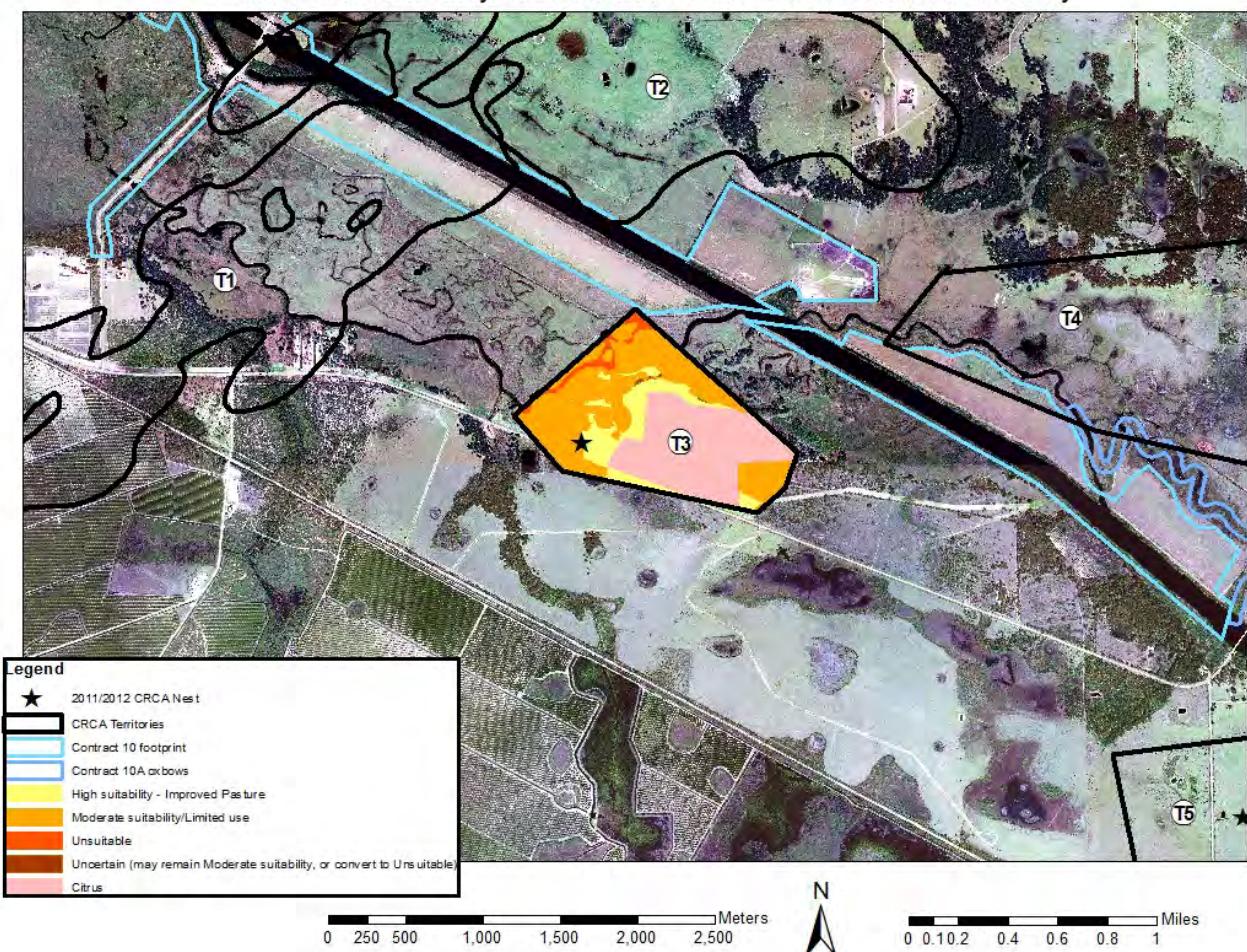


Figure 18 Existing and predicted post-restoration habitat suitability for the caracara within territory (T) 3. Existing caracara habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, or citrus based on known species habitat preferences. Post-restoration habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, citrus, or unknown based on the rules outlined in Table 1.

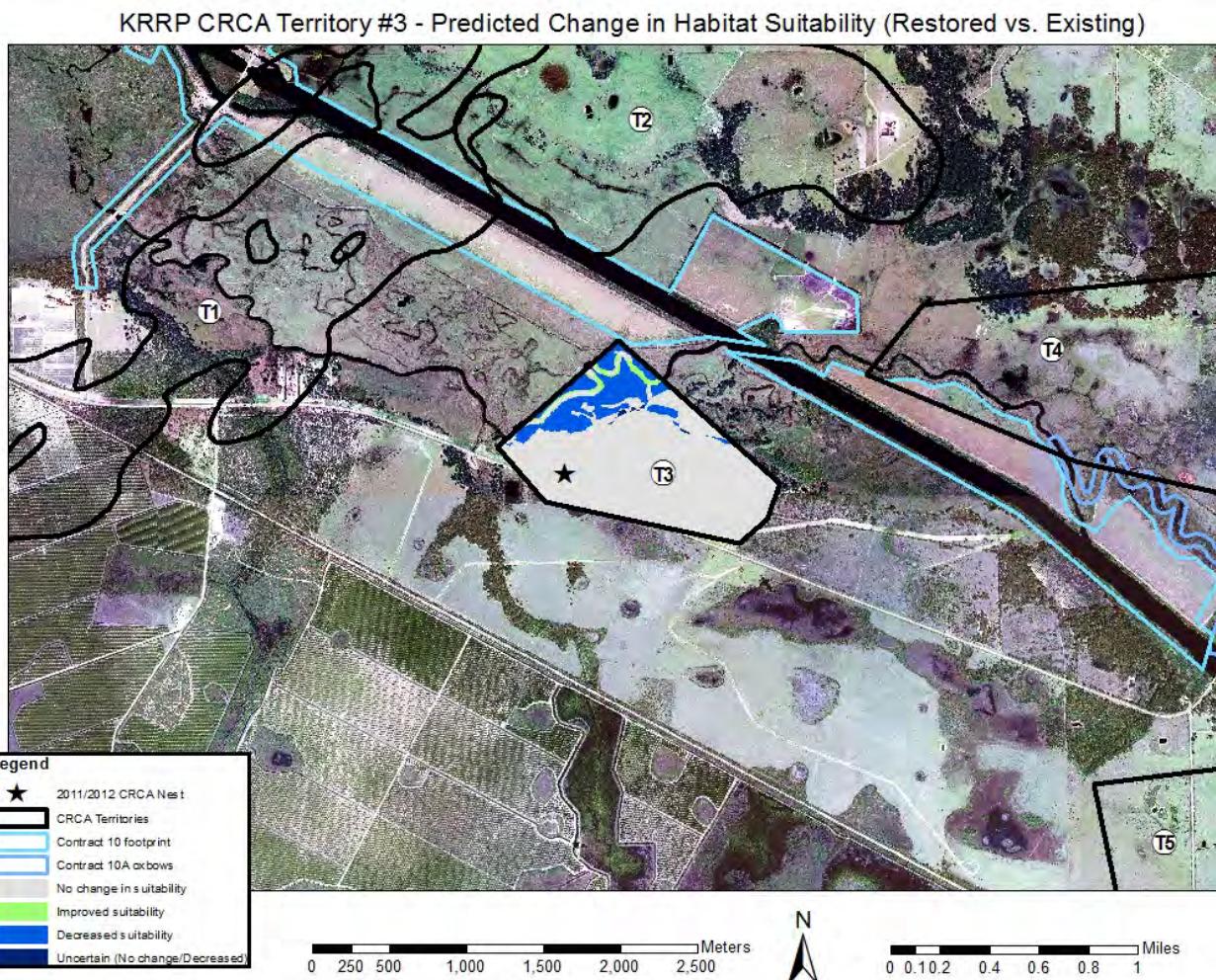
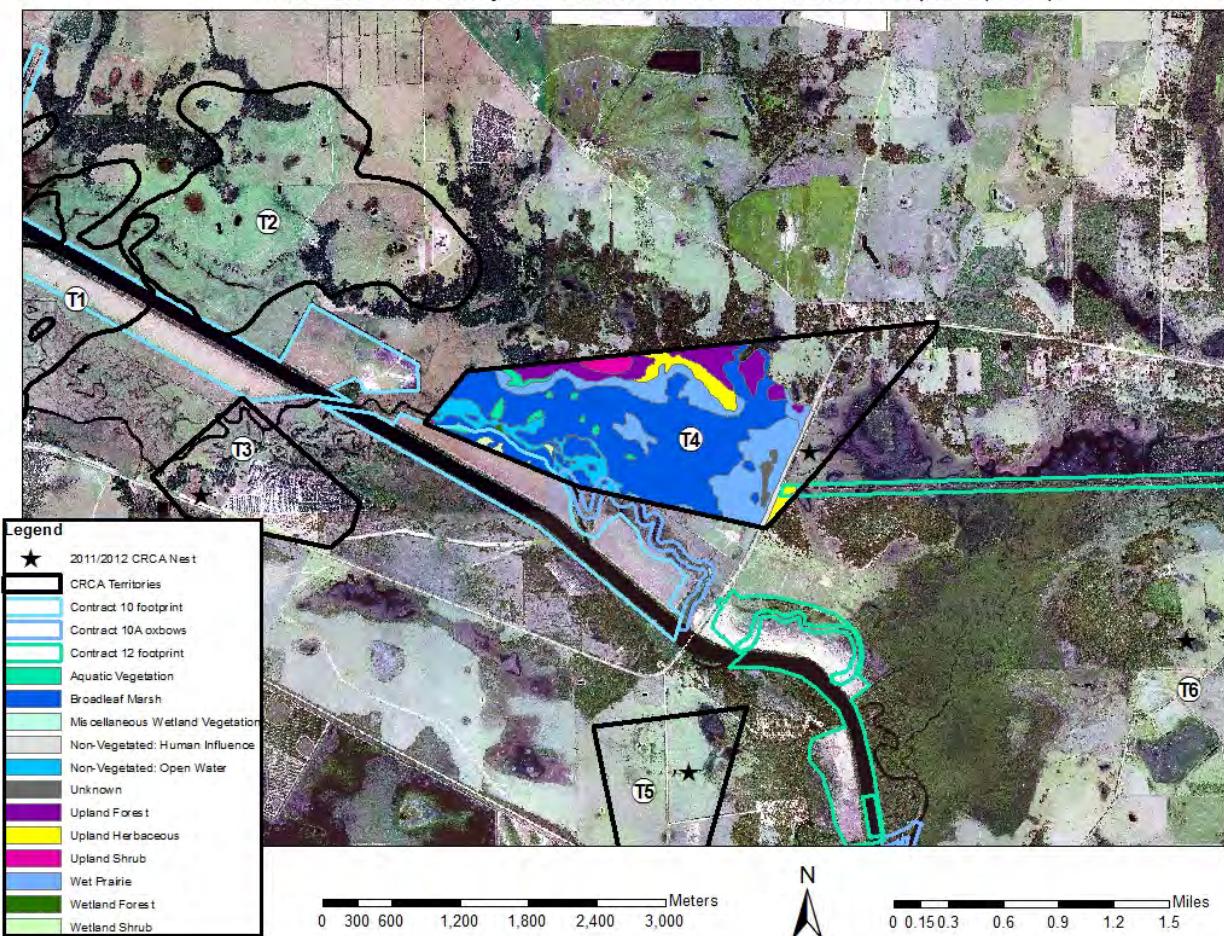


Figure 19. Predicted change in caracara habitat suitability (restored vs. existing) for caracara territory 3 (T3), described as experiencing no change in suitability, improved suitability, decreased suitability, or uncertain change in suitability, following rules outlined in Table 1. Habitat suitability may remain unchanged (*e.g.*, characterized as moderate suitability/limited use under both existing and restored conditions) despite predicted change in habitat type (*e.g.*, unimproved pasture converting to wet prairie).

KRRP CRCA Territory #4 - Historic Landcover within Floodplain (1952)



KRRP CRCA Territory #4 - Existing Landcover (FLUCCS08)

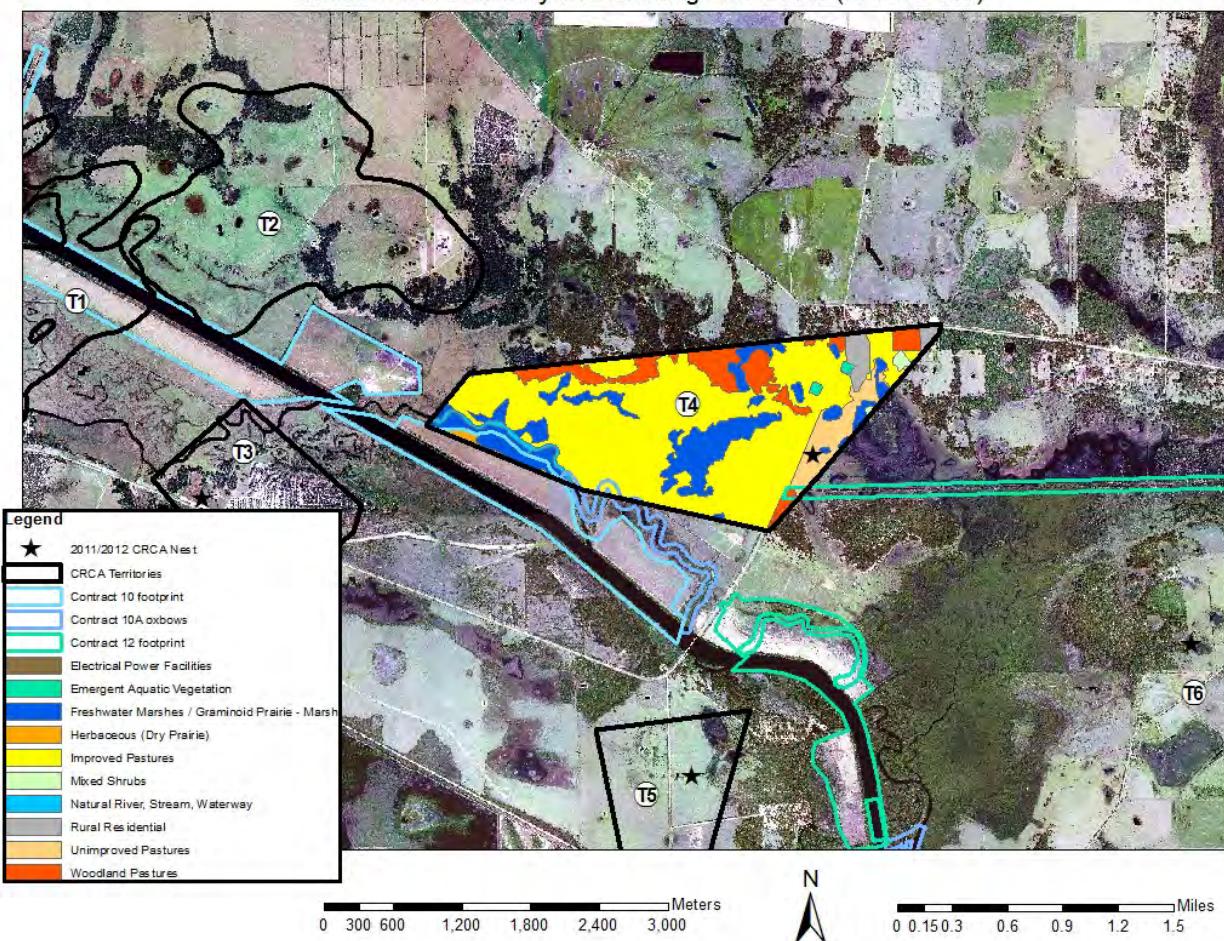
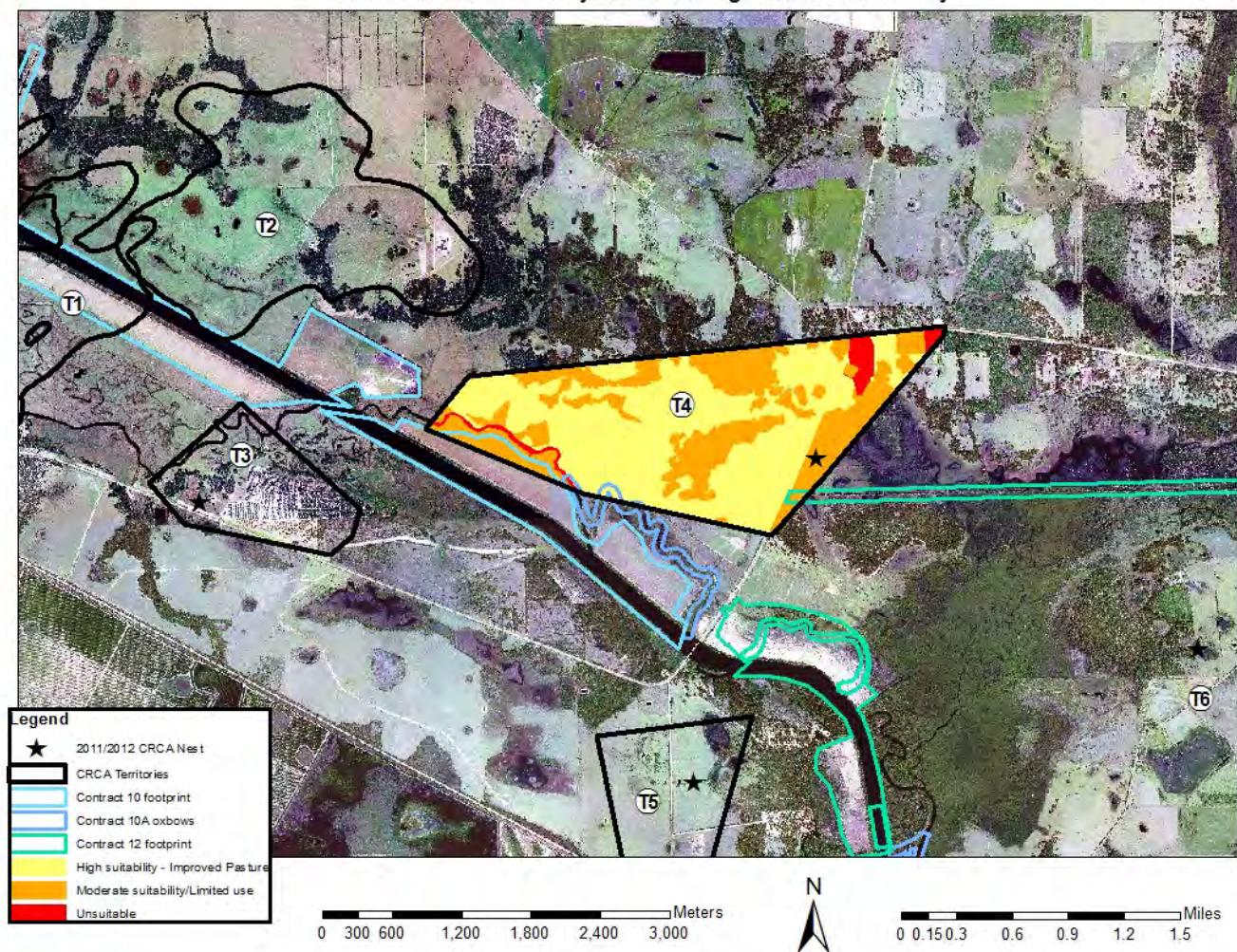


Figure 20. Historic (pre-drainage) and existing habitat within caracara territory (T) 4. Historic habitat types are shown within the floodplain and based on 1952 vegetation data provided by the South Florida Water Management District. Existing habitat types are based on the South Florida Water Management District's 2009 Land Cover/Land Use dataset using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS).

KRRP CRCA Territory #4 - Existing Habitat Suitability



KRRP CRCA Territory #4 - Predicted Post-Restoration Habitat Suitability

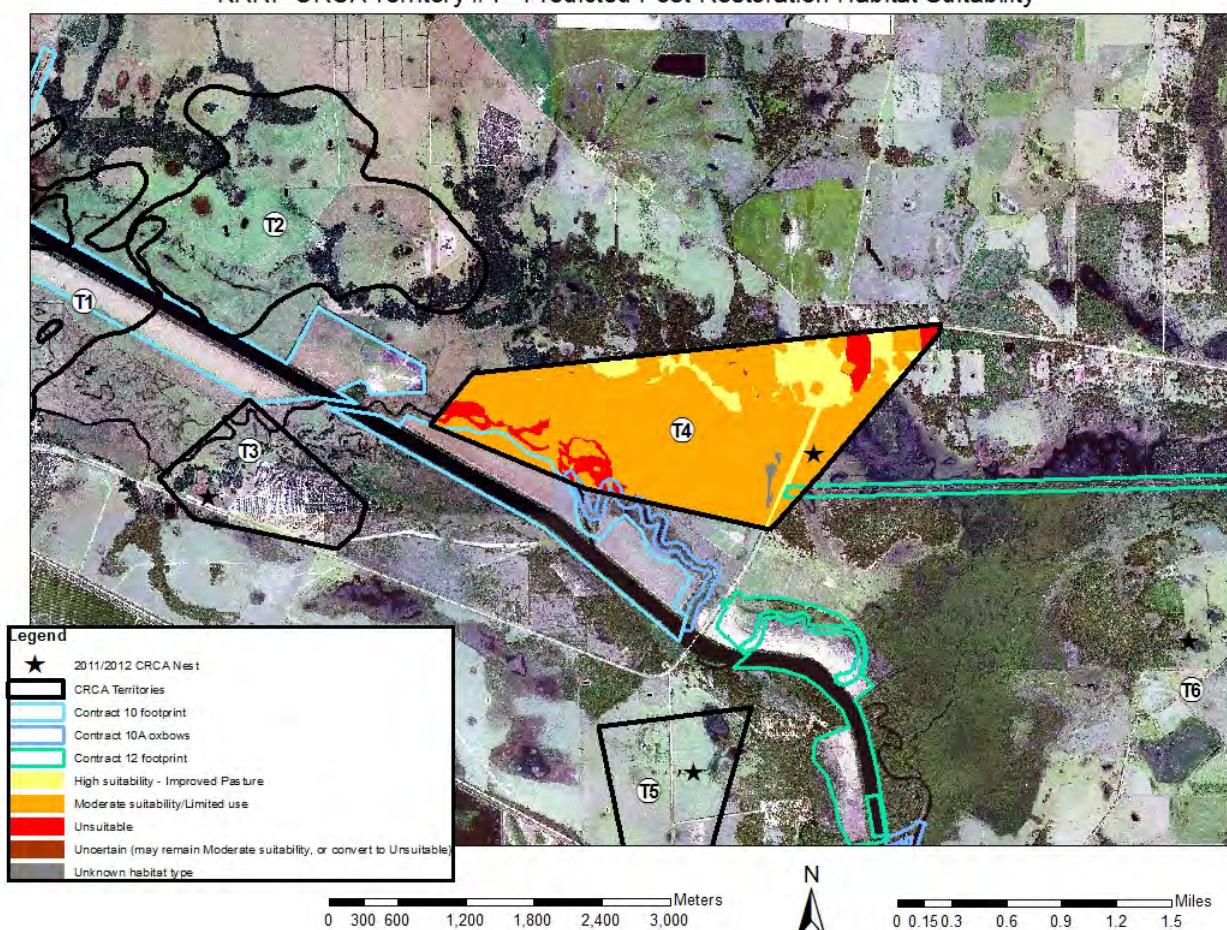


Figure 21. Existing and predicted post-restoration habitat suitability for the caracara within territory (T) 4. Existing caracara habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, or citrus based on known species habitat preferences. Post-restoration habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, citrus, or unknown based on the rules outlined in Table 1.

KRRP CRCA Territory #4 - Predicted Change in Habitat Suitability (Restored vs. Existing)

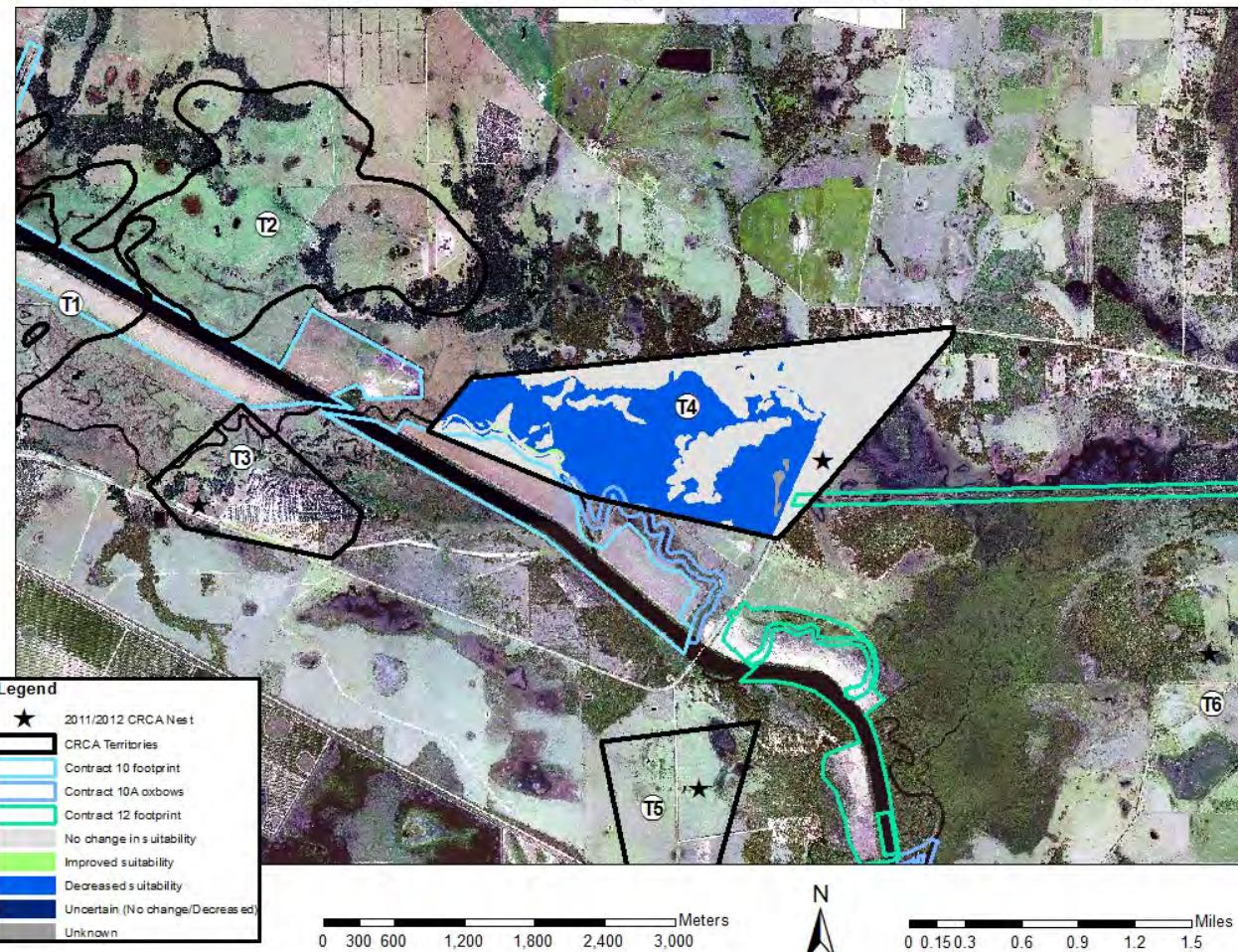


Figure 22. Predicted change in caracara habitat suitability (restored vs. existing) for caracara territory 4 (T4), described as experiencing no change in suitability, improved suitability, decreased suitability, or uncertain change in suitability, following rules outlined in Table 1. Habitat suitability may remain unchanged (*e.g.*, characterized as moderate suitability/limited use under both existing and restored conditions) despite predicted change in habitat type (*e.g.*, unimproved pasture converting to wet prairie).

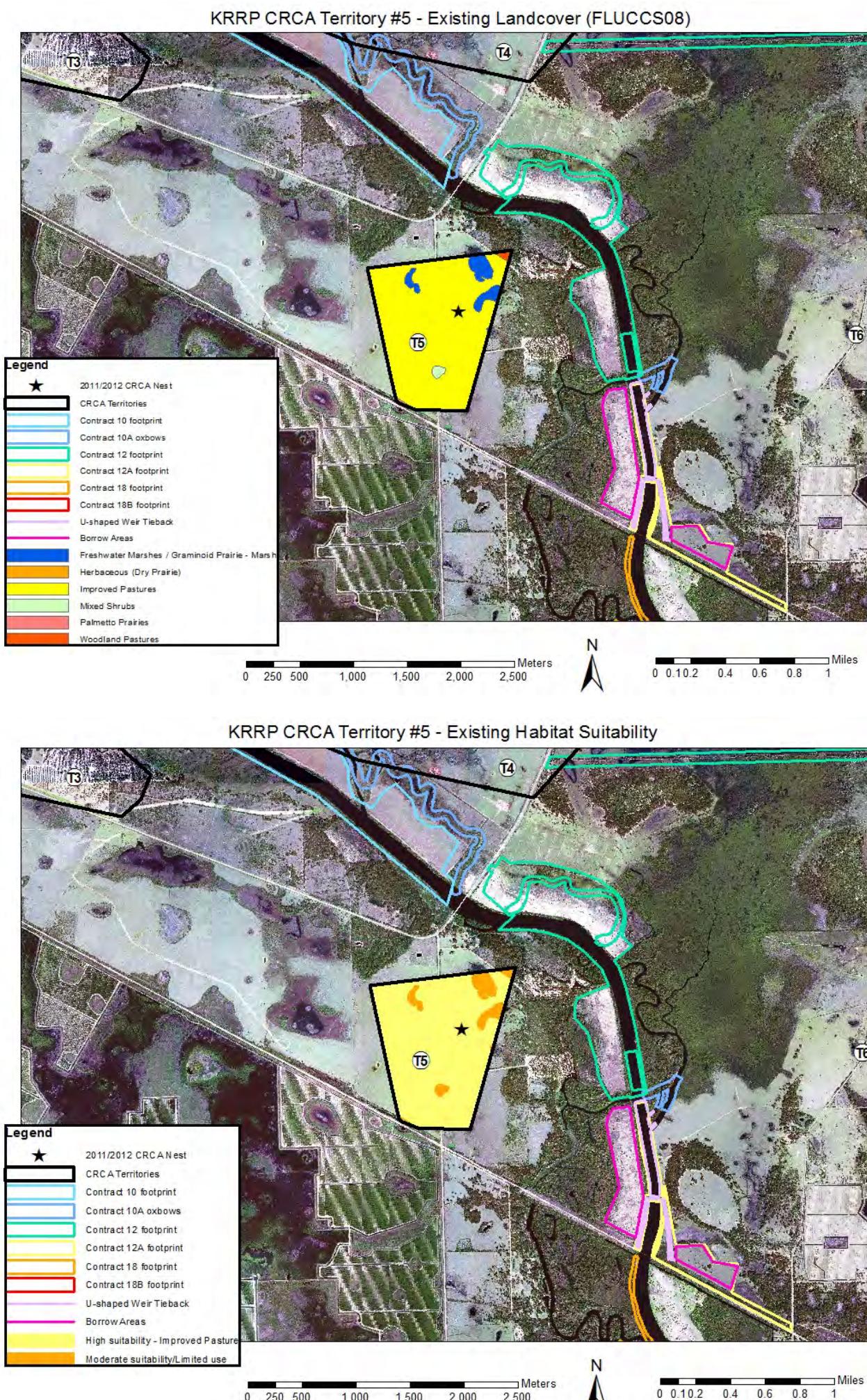
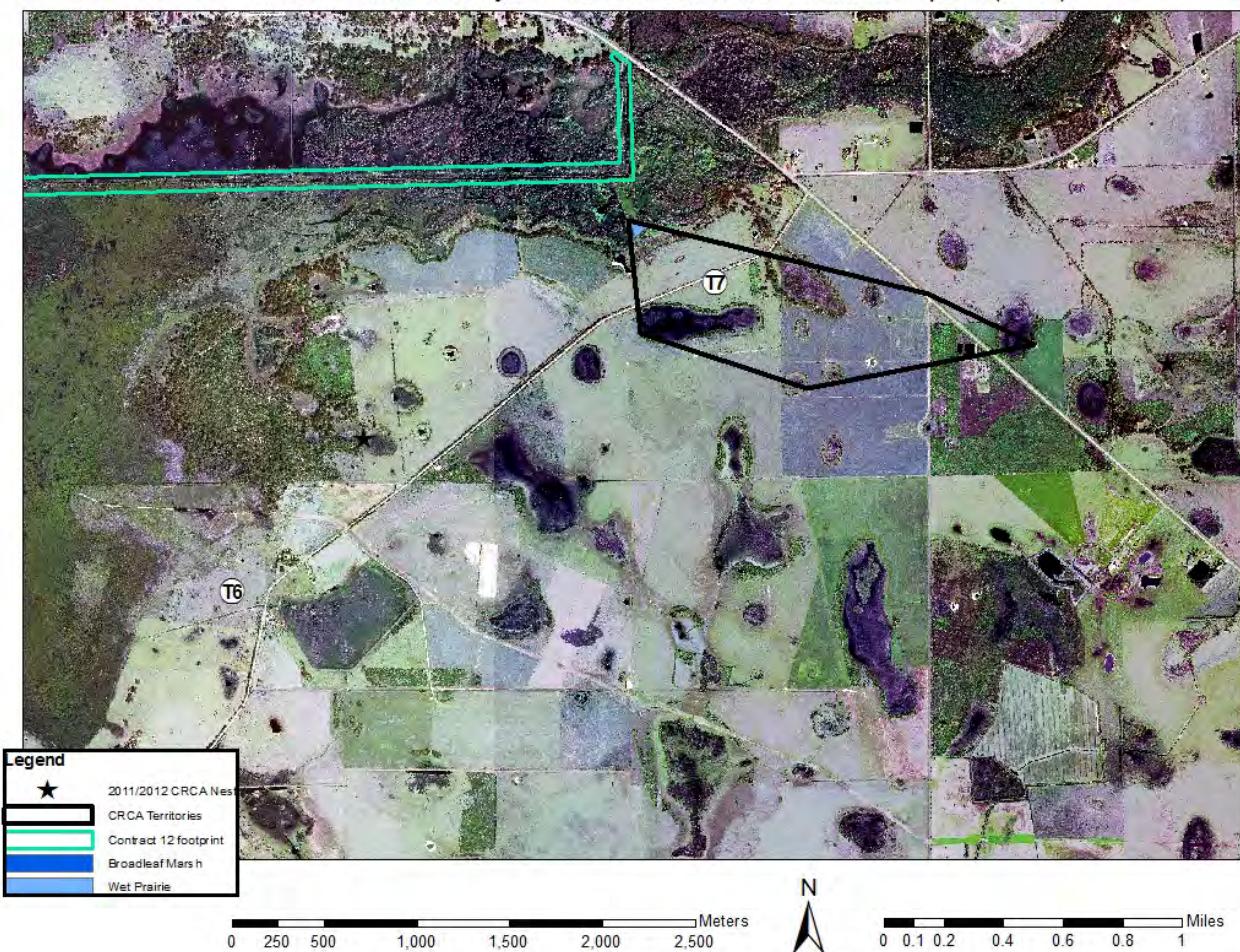


Figure 23. Existing habitat and habitat suitability within caracara territory (T) 5. Existing habitat types are based on the South Florida Water Management District's 2009 Land Cover/Land Use dataset using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS). Caracara habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, or citrus based on known species habitat preferences.

KRRP CRCA Territory #7 - Historic Landcover (1952)



KRRP CRCA Territory #7 - Existing Landcover (FLUCCS08)

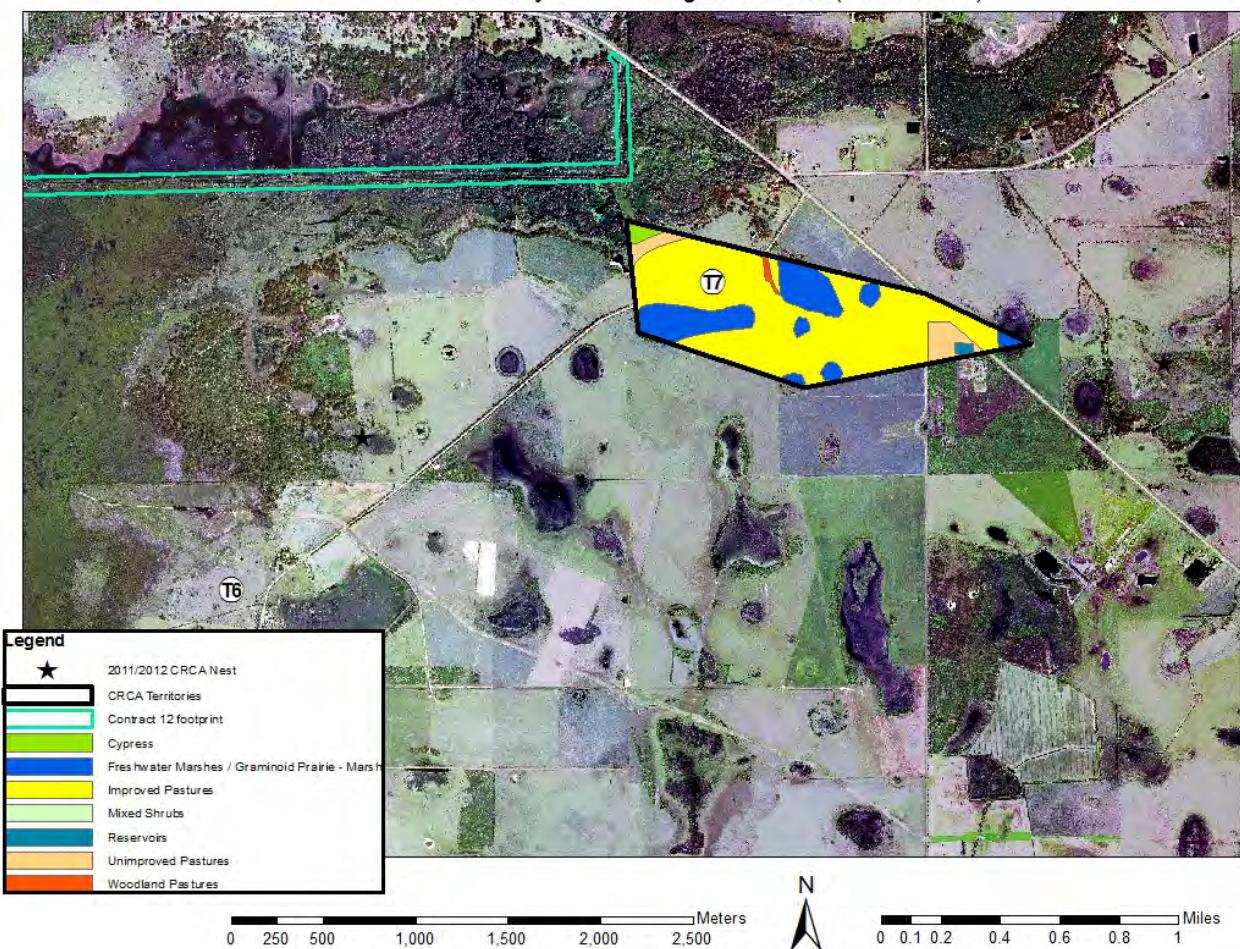


Figure 24. Historic (pre-drainage) and existing habitat within caracara territory (T) 7. Historic habitat types are shown within the floodplain and based on 1952 vegetation data provided by the South Florida Water Management District. Existing habitat types are based on the South Florida Water Management District's 2009 Land Cover/Land Use dataset using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS).

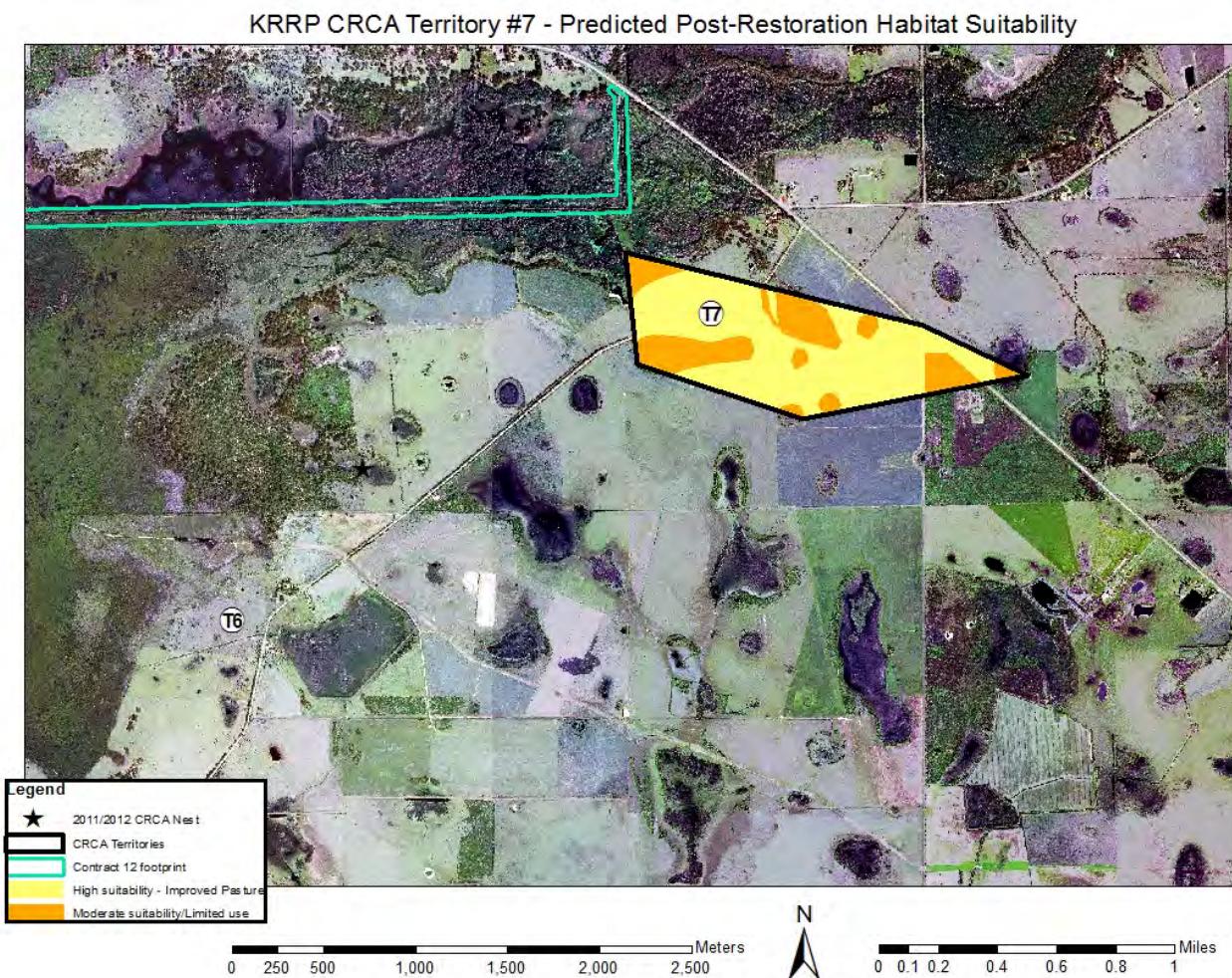
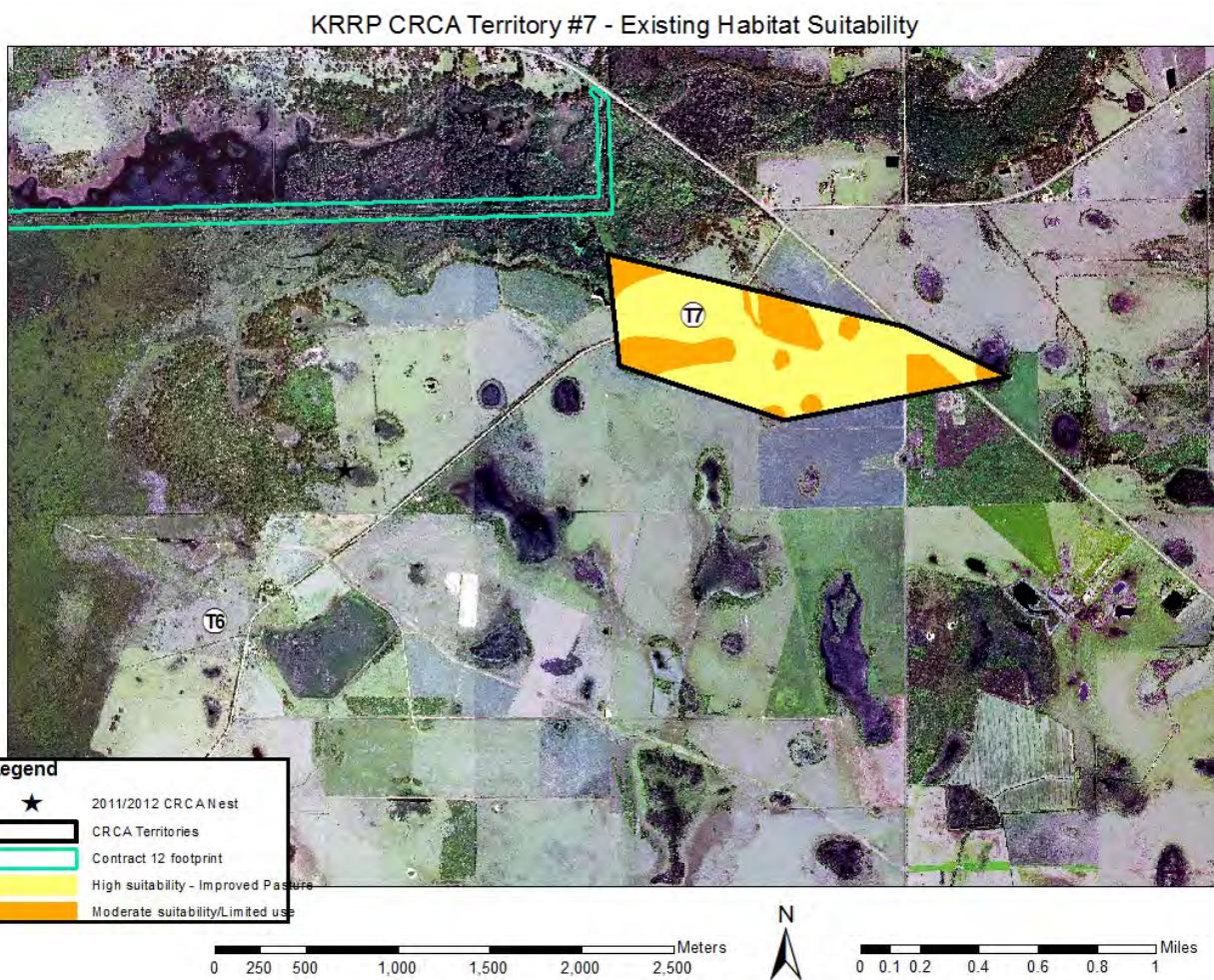


Figure 25. Existing and predicted post-restoration habitat suitability for the caracara within territory (T) 7. Existing caracara habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, or citrus based on known species habitat preferences. Post-restoration habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, citrus, or unknown based on the rules outlined in Table 1.

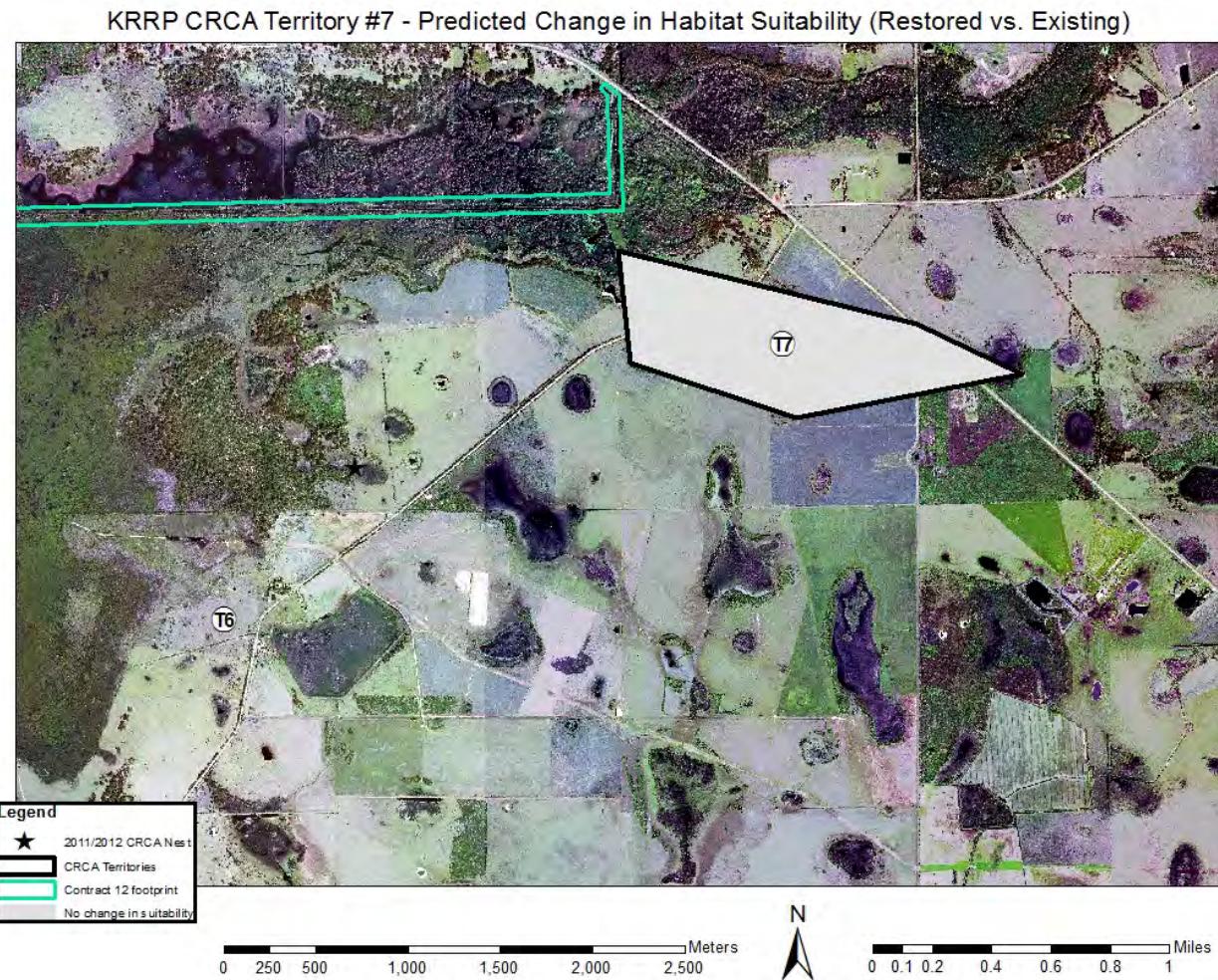
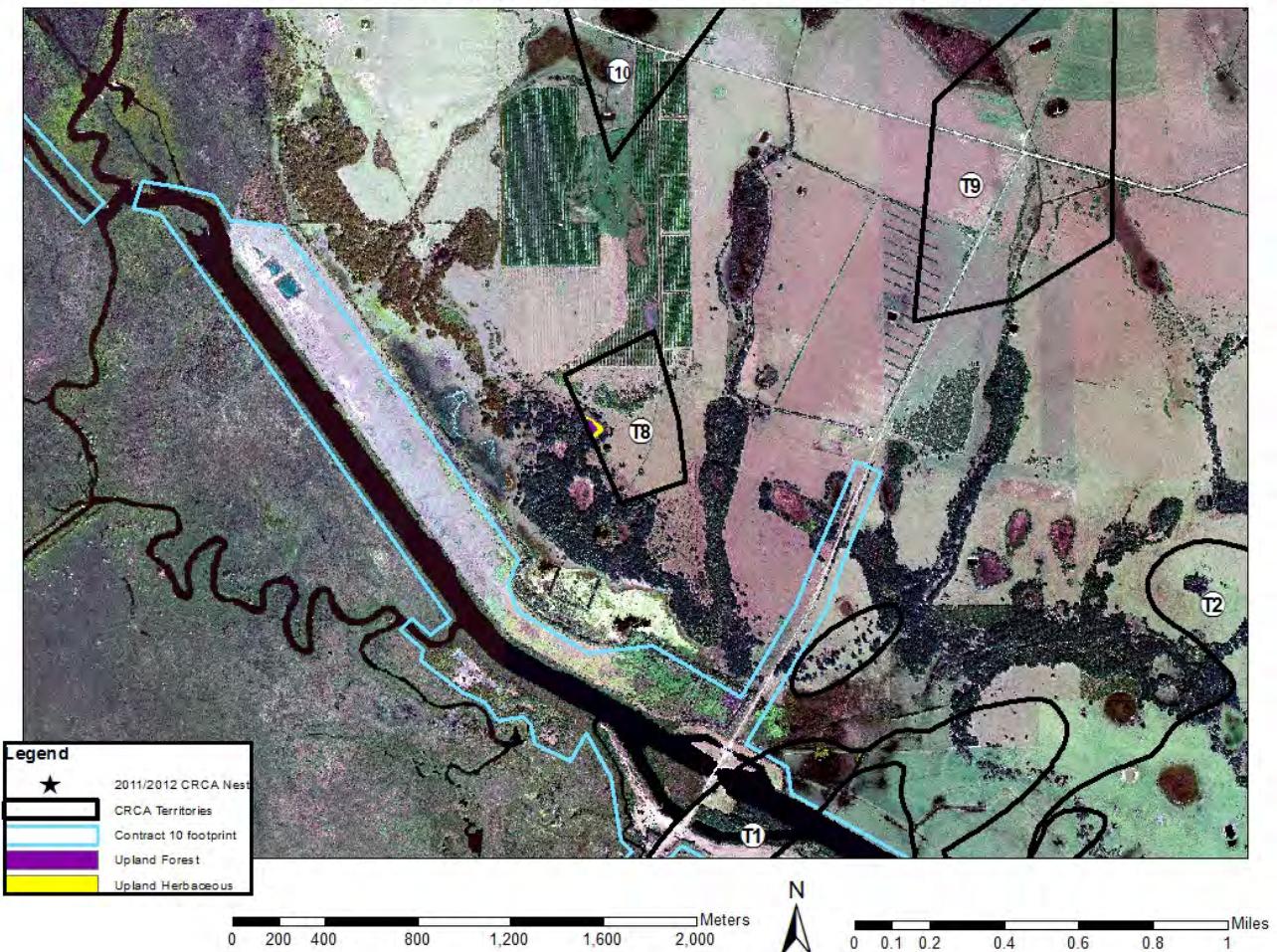


Figure 26. Predicted change in caracara habitat suitability (restored vs. existing) for caracara territory 7 (T7), described as experiencing no change in suitability, improved suitability, decreased suitability, or uncertain change in suitability, following rules outlined in Table 1. Habitat suitability may remain unchanged (*e.g.*, characterized as moderate suitability/limited use under both existing and restored conditions) despite predicted change in habitat type (*e.g.*, unimproved pasture converting to wet prairie).

KRRP CRCA Territory #8 - Historic Landcover (1952)



KRRP CRCA Territory #8 - Existing Landcover (FLUCCS08)

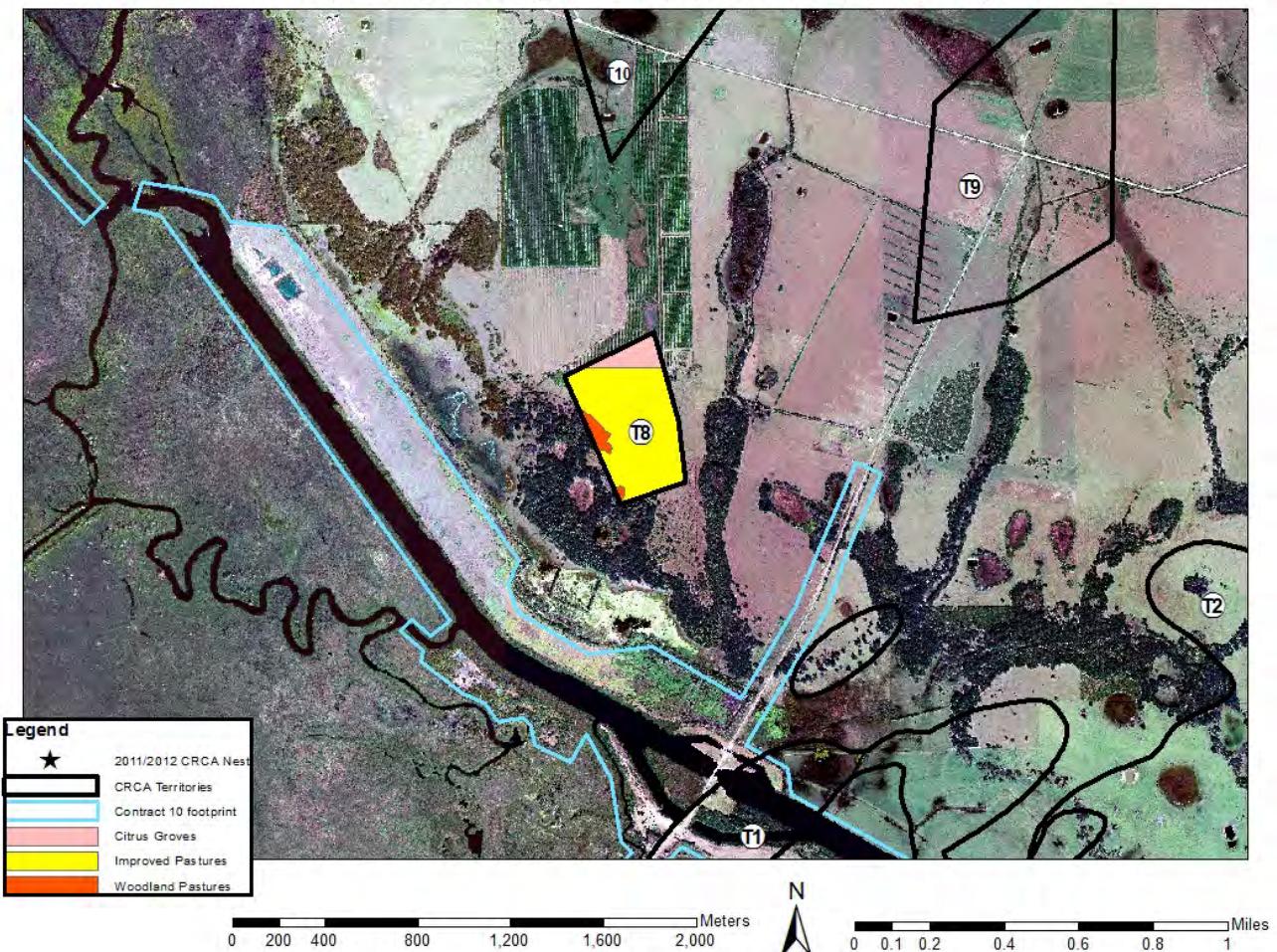


Figure 27. Historic (pre-drainage) and existing habitat within caracara territory (T) 8. Historic habitat types are shown within the floodplain and based on 1952 vegetation data provided by the South Florida Water Management District. Existing habitat types are based on the South Florida Water Management District's 2009 Land Cover/Land Use dataset using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS).

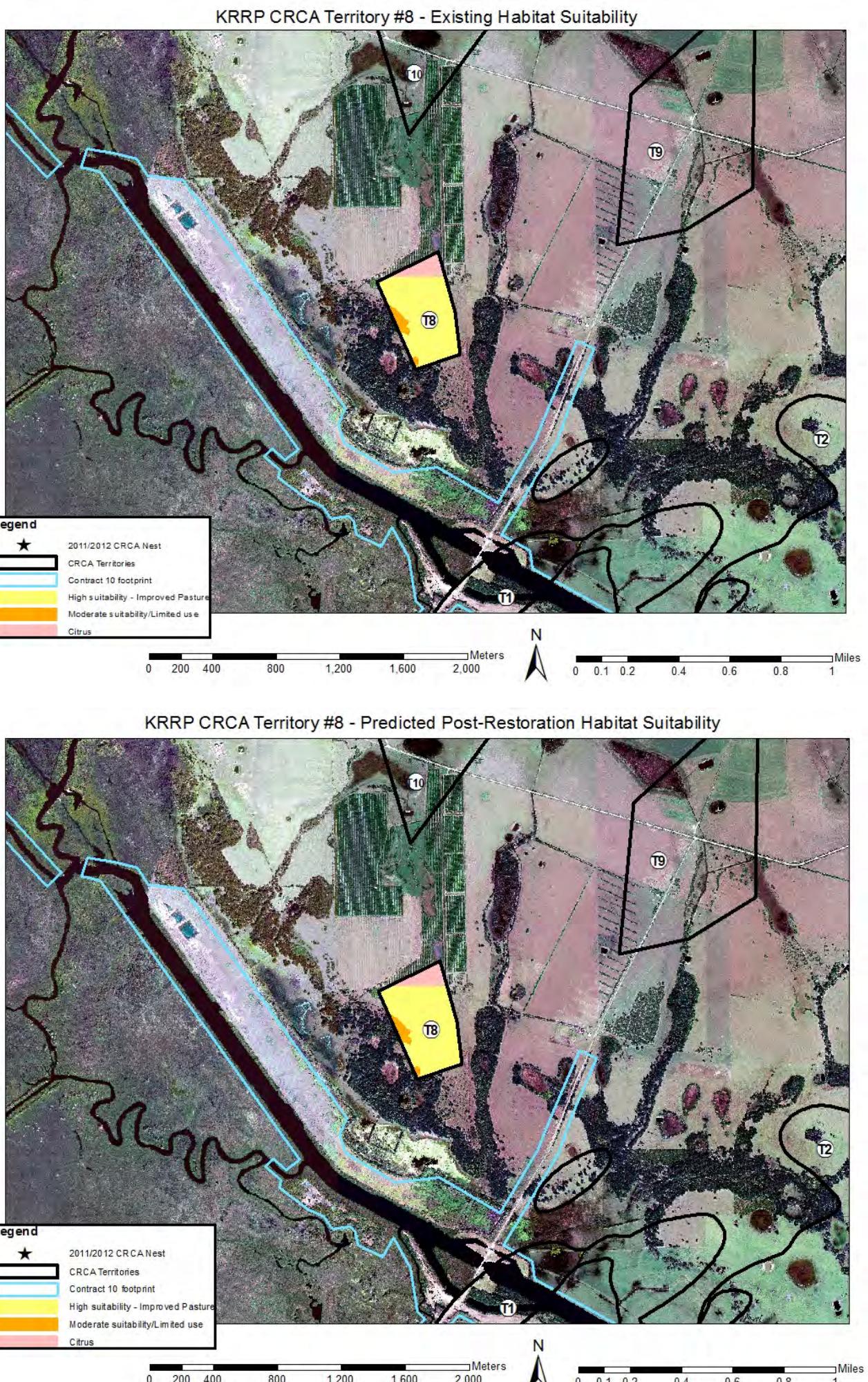


Figure 28. Existing and predicted post-restoration habitat suitability for the caracara within territory (T) 8. Existing caracara habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, or citrus based on known species habitat preferences. Post-restoration habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, citrus, or unknown based on the rules outlined in Table 1.

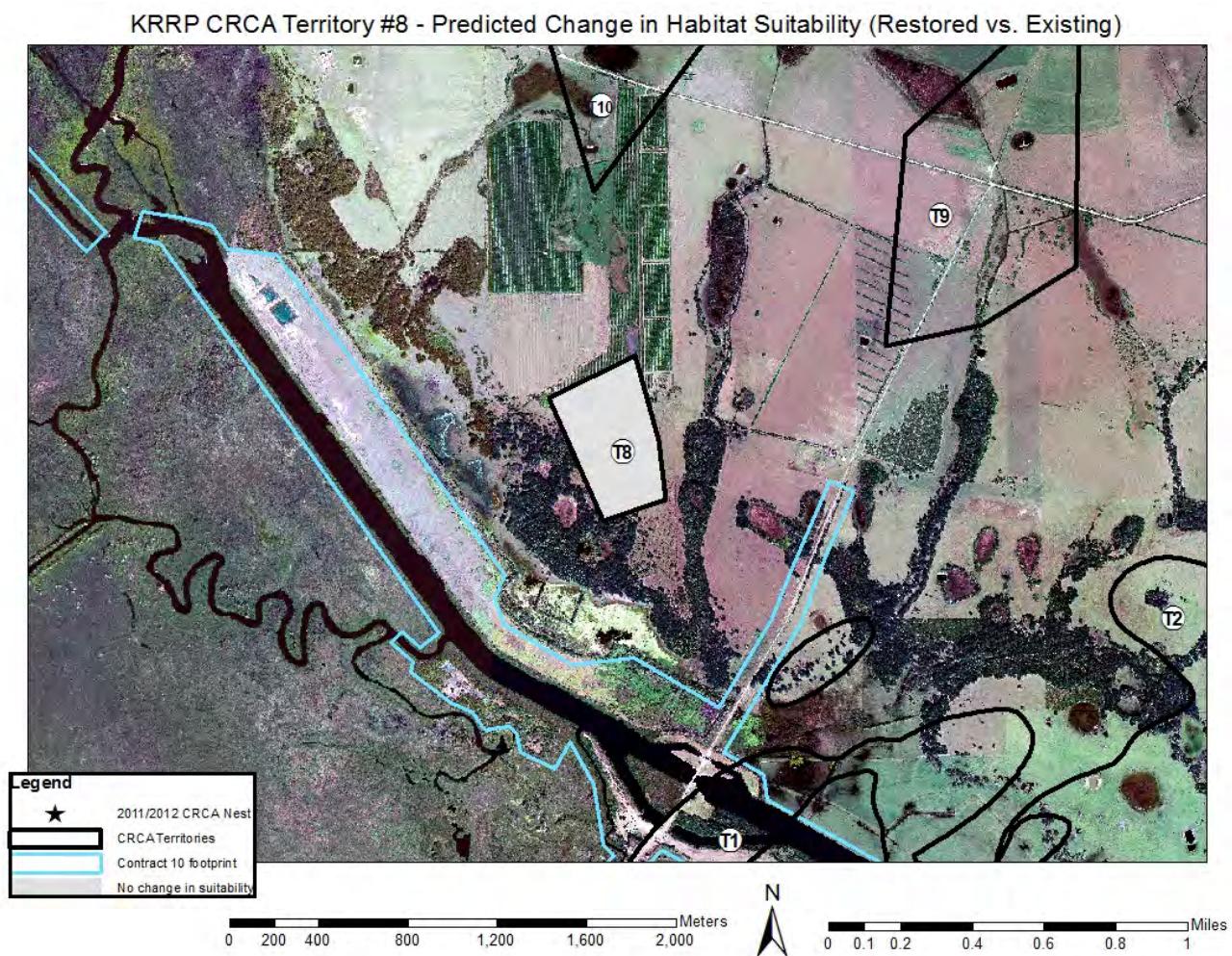
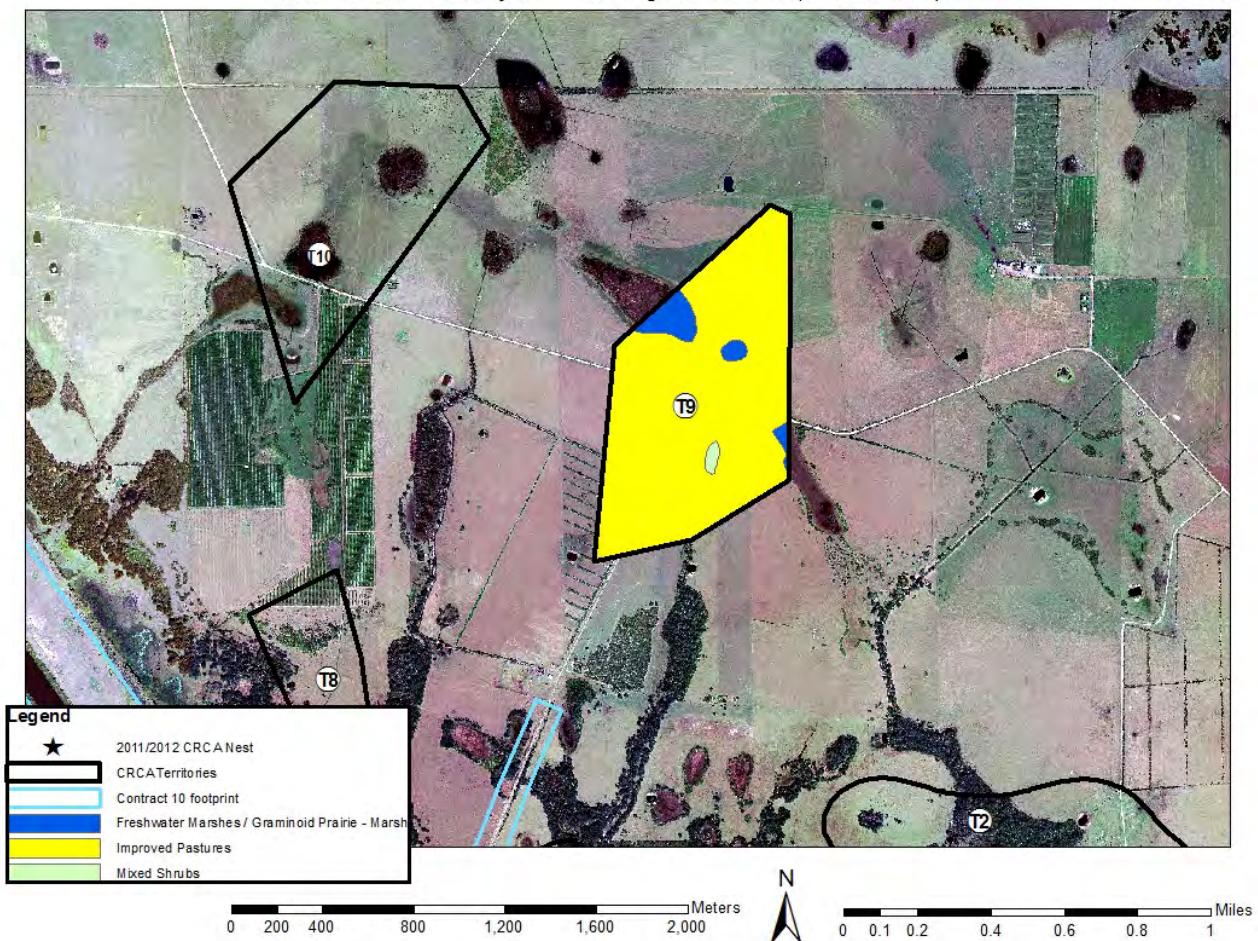


Figure 29. Predicted change in caracara habitat suitability (restored vs. existing) for caracara territory 8 (T8), described as experiencing no change in suitability, improved suitability, decreased suitability, or uncertain change in suitability, following rules outlined in Table 1. Habitat suitability may remain unchanged (*e.g.*, characterized as moderate suitability/limited use under both existing and restored conditions) despite predicted change in habitat type (*e.g.*, unimproved pasture converting to wet prairie).

KRRP CRCA Territory #9 - Existing Landcover (FLUCCS08)



KRRP CRCA Territory #9 - Existing Habitat Suitability

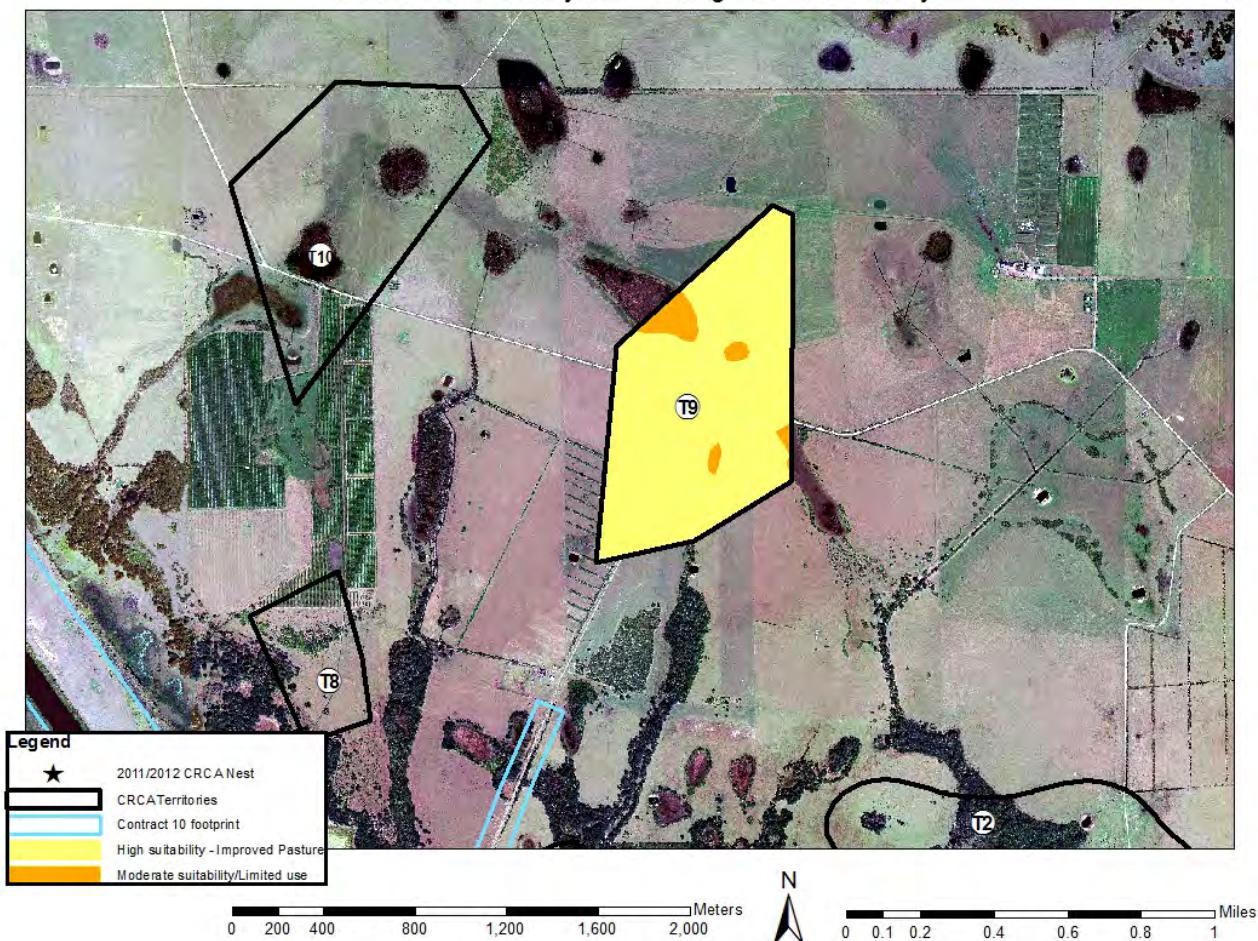
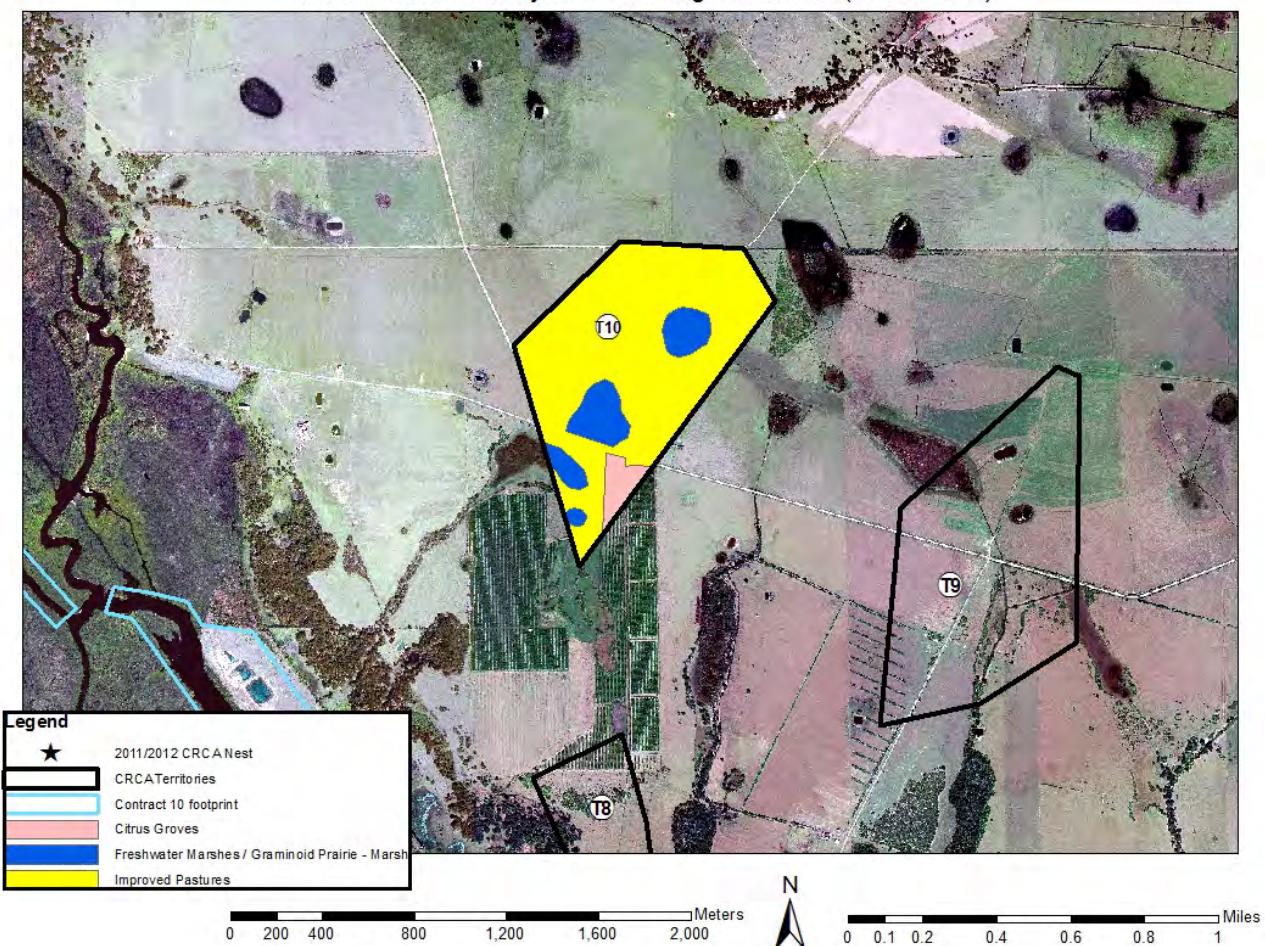


Figure 30. Existing habitat and habitat suitability within caracara territory (T) 9. Existing habitat types are based on the South Florida Water Management District's 2009 Land Cover/Land Use dataset using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS). Caracara habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, or citrus based on known species habitat preferences.

KRRP CRCA Territory #10 - Existing Landcover (FLUCCS08)



KRRP CRCA Territory #10 - Existing Habitat Suitability

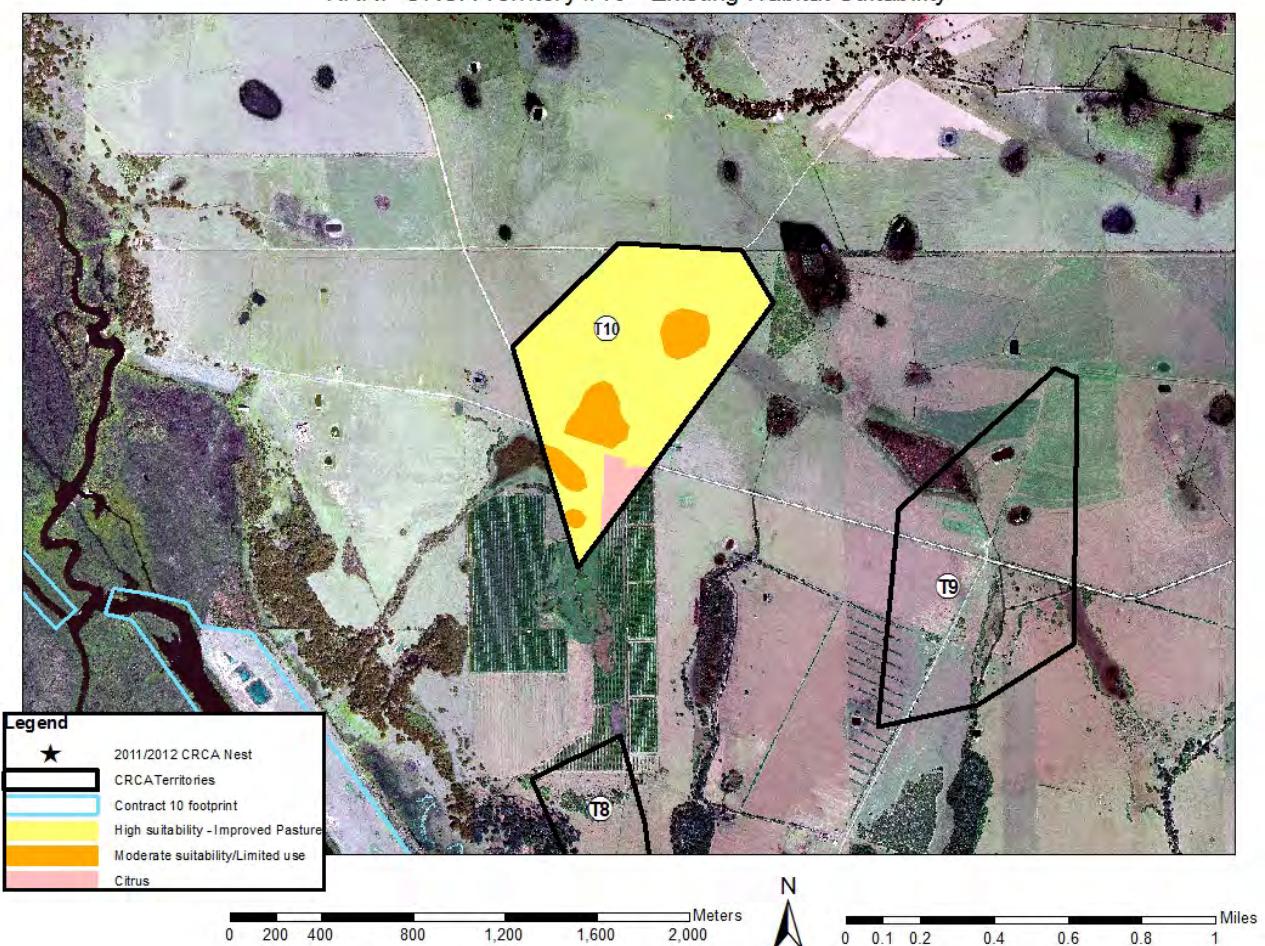


Figure 31. Existing habitat and habitat suitability within caracara territory (T) 10. Existing habitat types are based on the South Florida Water Management District's 2009 Land Cover/Land Use dataset using an amended version of the Florida Land Use, Cover and Forms Classification System (FLUCCS). Caracara habitat suitability characterized as high suitability, moderate suitability/limited use, unsuitable, or citrus based on known species habitat preferences.

Table 1. Historic (pre-drainage) habitat types present within the floodplain in the KRRP action area, based on 1952 vegetation data provided by the South Florida Water Management District. Caracara habitat suitability defined as high suitability (H), moderate suitability/limited use (L), unsuitable (U, with modifiers for bare ground [U-BG] and human influence [U-HI]), or unknown (UNK) based on known species habitat preferences. Rules (and exceptions) for predicting post-restoration habitat suitability (PRHS) within the floodplain were developed based on expected habitat conversion from existing habitat type and suitability (EHS), taking existing land management (*e.g.*, grazing) into account.

Historic Habitat Type (within Floodplain)	Historic Habitat Suitability	Rules for Predicting Post- Restoration Habitat Suitability (PRHS) within Floodplain	Encountered Exceptions to Rule
Aquatic Vegetation	L	PRHS = 'L'	None
Broadleaf Marsh	L	PRHS = 'L'	If EHS = 'Rural Residential' or 'Upland Hardwood Forest', then PRHS = 'UNK' due to uncertainty regarding likelihood of habitat conversion
Miscellaneous Wetland Vegetation	L	PRHS = 'L'	None
Non-Vegetated: Bare Ground	U-BG	PRHS = EHS	None
Non-Vegetated: Human Influence	U-HI	PRHS = EHS	None
Non-Vegetated: Open Water	U	PRHS = 'U'	None
Unknown	UNK	PRHS = 'UNK'	None
Upland Forest	U	PRHS = EHS if EHS is upland PRHS = 'UNK' if EHS is wetland	None
Upland Herbaceous	H	PRHS = EHS if EHS is upland PRHS = 'UNK' if EHS is wetland (no occurrences)	None
Upland Shrub	L	PRHS = EHS if upland PRHS = 'L' if EHS is wetland	None
Wet Prairie	L	PRHS = 'L'	If EHS = 'Upland Hardwood Forest', then PRHS = 'UNK' due to uncertainty regarding likelihood of habitat conversion
Wetland Forest	L	PRHS = 'L'	None
Wetland Shrub	L	PRHS = 'L'	If EHS = 'Upland Hardwood Forest', then PRHS = 'UNK' due to uncertainty regarding likelihood of habitat conversion

Table 2. Acreage of existing habitat types within nine estimated caracara territories (T) found in the Kissimmee River Restoration Project action area. Habitat types determined using the South Florida Water Management District's 2009 Land Cover/Land Use dataset. Caracara habitat suitability (HS) defined as high suitability (H), moderate suitability/limited use (L), unsuitable (U), or citrus (C) based on known species habitat preferences. Boundaries for T3-T5 and T7-T10 were estimated from limited location data – thus, habitat types and/or acreages may be underestimated. Habitat types for T6 are not listed because territory boundaries could not be estimated due to linear spatial distribution of available location data.

Existing Habitat Type	HS	Acres									
		T1	T2	T3	T4	T5	T7	T8	T9	T10	
Brazilian Pepper	L	14.3	--	--	--	--	--	--	--	--	
Cabbage Palm	U	--	0.2	--	--	--	--	--	--	--	
Channelized Waterways, Canals	U	46.4	2.1	--	--	--	--	--	--	--	
Citrus Groves	C	455.6	--	122.8	--	--	--	6.9	--	8.8	
Cypress	L	--	--	--	--	--	3.8	--	--	--	
Electrical Power Facilities	U	--	--	--	0.3	--	--	--	--	--	
Emergent Aquatic Vegetation	L	--	--	6.9	4.6	--	--	--	--	--	
Fixed Single Family Units - Medium Density	L	0.4	--	--	--	--	--	--	--	--	
Freshwater Marshes / Graminoid Prairie - Marsh	L	44.2	45.1	13.5	192.4	21.4	52.2	--	12.4	27.6	
Herbaceous (Dry Prairie)	L	55.9	--	--	10.8	0.2	--	--	--	--	
Improved Pastures	H	488.3	850.4	106.8	690.4	316.7	183.9	48.3	212.4	172.6	
Mixed Shrubs	L	18.1	--	--	6.0	2.5	0.2	--	1.7	--	
Mixed Wetland Hardwoods	L	13.7	37.5	--	--	--	--	--	--	--	
Natural River, Stream, Waterway	U	14.4	--	12.6	14.5	--	--	--	--	--	
Palmetto Prairies	L	--	--	--	--	0.7	--	--	--	--	
Pine Flatwoods	U	1.6	--	--	--	--	--	--	--	--	
Reservoirs	L	--	--	--	--	--	1.7	--	--	--	
Rural Residential in Upland Hardwood Forest	U	3.8	--	--	27.4	--	--	--	--	--	
Soil Areas	L	93.6	--	--	--	--	--	--	--	--	
Transportation	L	20.0	--	--	--	--	--	--	--	--	
Unimproved Pastures	L	8.2	--	23.9	58.5	--	14.5	--	--	--	
Upland Hardwood Forests	U	34.6	--	--	--	--	--	--	--	--	
Upland Mixed Coniferous / Hardwood	U	47.0	--	--	--	--	--	--	--	--	
Upland Shrub And Brushland	L	33.5	--	--	--	--	--	--	--	--	
Woodland Pastures	L	10.8	79.8	39.4	120.2	2.4	1.5	3.3	--	--	
Total Acres		1404.8	1015.1	325.8	1125.1	343.9	257.8	58.5	226.5	209.1	

Table 3. Number, type, and dates of available caracara location data used to estimate territory boundaries in the Kissimmee River Restoration Project action area. All 10 observations for Territory 6 were along the road (*i.e.*, linear spatial distribution) and were insufficient for generating a territory polygon.

Territory	Caracara Location Data
1	934 GPS satellite (4/22/2011-2/5/2012) 15 visual (2012)
2	219 GPS satellite (4/24/2010-6/30/2010) 13 visual (2012)
3	10 visual (2011) 12 visual (2012)
4	16 visual (2011) 20 visual (2012)
5	11 visual (2011) 29 visual (2012)
6	10 visual (2011)
7	10 visual (2011)
8	40 visual (2012)
9	10 visual (2012)
10	11 visual (2012)

Table 4. Comparison (acreage and percent cover) of existing (pre-restoration) and predicted post-restoration habitat suitability for caracara in nine territories (T) in the KRRP action area. Caracara habitat suitability defined as high suitability (H), moderate suitability/limited use (L), unsuitable (U), citrus (C), or unknown (UNK) based on known species habitat preferences. Boundaries for T3-T5 and T7-T10 were estimated from limited location data – thus, acreages may be underestimated and percent cover may be over- or underestimated. Habitat suitability values for T6 are not listed because territory boundaries could not be estimated due to linear spatial distribution of available location data.

Territory	Existing Habitat Suitability Acres (Percent Cover)				Predicted Post-restoration Habitat Suitability Acres (Percent Cover)				
	H	L	U	C	H	L	U	C	UNK
1	488.3 (34.8)	312.9 (22.3)	147.9 (10.5)	455.6 (32.4)	63.7 (4.5)	754.9 (53.8)	123.3 (8.8)	455.6 (32.4)	7.2 (0.5)
2	850.4 (83.8)	162.4 (16.0)	2.4 (0.2)	--	683.4 (67.3)	331.5 (32.7)	0.2 (0.0)	--	--
3	106.8 (32.8)	83.6 (25.6)	12.6 (3.9)	122.8 (37.7)	49.0 (15.0)	138.1 (42.4)	15.5 (4.8)	122.8 (37.7)	0.4 (0.1)
4	690.4 (61.4)	392.5 (34.9)	42.2 (3.7)	--	154.7 (13.7)	875.4 (77.8)	86.3 (7.7)	--	8.7 (0.8)
5	316.7 (92.1)	27.2 (7.9)	--	--	316.7 (92.1)	27.2 (7.9)	--	--	--
7	183.9 (71.4)	73.9 (28.6)	--	--	183.9 (71.4)	73.9 (28.6)	--	--	--
8	48.3 (82.6)	3.3 (5.7)	--	6.9 (11.7)	48.3 (82.6)	3.3 (5.7)	--	6.9 (11.7)	--
9	212.4 (93.8)	14.1 (6.2)	--	--	212.4 (93.8)	14.1 (6.2)	--	--	--
10	172.6 (82.6)	27.6 (13.2)	--	8.8 (4.2)	172.6 (82.6)	27.6 (13.2)	--	8.8 (4.2)	--

Table 5. Kissimmee River Restoration Project contract dates and associated monitoring requirements remaining to be completed per the Terms and Conditions (T&C) of the 2012 amended KRRP Biological Opinion.

Contract	Award Date	Construction Duration	Completion Date	Remaining T&C Monitoring Requirements
Contract 10 (Reach 2 backfill)	April 2013*	24 months*	March 2015*	- Nesting surveys of project area and within 600 m of project footprint (pre-construction & during construction) - Tagging and monitoring of T4 caracara thru 1 year post-construction of all contracts in BO - Annual nesting surveys of T1 and T4 tagged pairs and their adjacent pairs (within 1.5 miles of project footprint) thru 1 year post-construction of all contracts in BO
Contract 10a (Reach 2/3 oxbow excavation)	September 2011	Completed	May 2012	- All requirements completed
Contract 12 (Reach 3 backfill)	August 2012*	18 months*	January 2014*	- Nesting surveys of project area and within 600 m of project footprint (pre-construction & during construction) - Continuous monitoring of T4 (Bass Levee) caracara if working within 300 m of nest tree during November-April
Contract 12a (S-69 weir)	Pending litigation	18 months*	Pending litigation	- Nesting surveys of project area and within 600 m of project footprint (pre-construction & during construction)
Contract 13b (Reach 4 backfill)	July 2008	Completed	December 2009	- Annual nesting surveys of tagged pair and adjacent pairs (within 1.5 miles of project footprint) thru 1 year post-construction of all contracts in BO
Contract 13c (Reach 4 oxbow excavation)	July 2008	Completed	February 2010	- All requirements completed
Contract 18 (Oxbow excavation & embankment)	September 2010	Completed	January 2012	- All requirements completed
Contract 18a (S-65EX1 gate spillway)	September 2012*	12 months*	September 2013*	- Nesting surveys of project area and within 600 m of project footprint (pre-construction & during construction)
Contract 18b (S-65D boat ramp)	September 2011	Completed	May 2012	- All requirements completed

- Estimated, as of July 26, 2012. Award date is dependent on the outcome of the negotiations between the South Florida Water Management District and property owners of the area.

Appendix A

**South Florida Ecological Services
DRAFT
April 20, 2004**

SURVEY PROTOCOL FOR FINDING CARACARA NESTS

This supplemental information is provided for further guidance on surveying for caracara nest based on the protocol in Morrison (2001). There is the highest probability of success in finding caracara nests during the period January to April. This period covers the time when most birds are feeding the nestlings and become more visible to observers. Surveys should start in January and continue through April to provide adequate data to conclude that a caracara nest does not occur on site. Once all nests on the site are found the survey can be terminated. Surveys should be conducted by a biologist with caracara experience as the birds can be hard to find and identify at long distances. The protective area for the caracara is 1,500 m (4,920 ft) around the nest. The area surveyed should include the project area and a 1,500-m buffer to account for off-site territories that might overlap onto the project area. All areas of suitable habitat within the project area and buffer should be initially surveyed for 1 day. If the area is large or the view obstructed more than 1 day or multiple observers may be needed to completely survey the area.

The observer should position themselves in a location where the largest open area (unobstructed by trees) can be viewed. The survey area should be no more than about 500 ha, which is the largest area easily observable from one point. An aerial photograph of the property and buffer zone can be used to identify areas of suitable habitat and map observation blocks to facilitate surveying the whole area. Use the map and a site visit to select strategic points where caracaras are more likely to be seen going to and from potential nesting sites. From a stationary position search for caracara activity, especially birds moving to the nest tree carrying sticks or food. Watch for other birds, such as American crows (*Corvus brachyrhynchos*), red-tailed hawks (*Buteo jamaicensis*), and turkey vultures (*Cathartes aura*), that might elicit an aggressive response from caracaras present. Nesting caracaras will often chase potential predators away from the nest; thus, revealing their presence. Also circling vultures can indicate the presence of naturally occurring carrion that may attract caracaras. If a potential nesting tree is detected then the observer can reposition to improve observing the bird's behavior. Weather condition should

South Florida Ecological Services
DRAFT
April 20, 2004

be adequate to clearly view the whole area. The area should be viewed from sunrise to 11AM and again 3 hours before sunset. During midday potential nest trees can be examined close up for evidence of nests (Morrison 2001). The area viewed during each survey should be marked on a site map. All caracara activity observed should be recorded by time of day and distinguished between juvenile and adult birds. Record flight direction to identify foraging areas and the nesting tree. Mark any nesting tree locations on a map and obtain GPS coordinates. Weather conditions including temperature, wind speed and direction, cloud cover, visibility, and precipitation, should be recorded at the start and end of each survey period.

If no nests are found during the initial survey then return and repeat the survey in 2 weeks. Continue to repeat the survey at a 2-week interval through the end of April or until a nest is found. If the survey starts after January and no nests are found the earlier part of the survey should be completed during the next nesting season to insure that early nesting birds are not missed.

The opportunity for caracara observation can be enhanced by placing fresh meat (or road kills) along the property border overnight and observing the bait site during the morning survey. These birds can be followed back to their nest trees. For more details on caracara activities and habits see Morrison (2001).

Literature Cited

- Morrison, J.L. 2001. Recommended management practices and survey protocols for Audubon's crested caracaras (*Caracara cheriway audubonii*) in Florida. Technical Report No. 18. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Appendix B

Spatial Data Requirements
For Submission to the
South Florida Ecological Services Office
June 26, 2008

Summary

For spatial data submitted to the South Florida Ecological Services Office (SFESO) to be useful in a timely manner, certain standards and product specifications must be followed. This document provides general standards for spatial data collection and submission. Program-level project managers may require further specifications and must approve any deviation from these standards.

Deliverables

Complete and verified data will be delivered via CD-ROM/DVD (preferred) and/or by software compressed (zipped) file. All digital and hardcopy information that is part of the project must be delivered, including GIS data, reports, metadata, photos, and other supporting materials. Each CD should be in CD-R format, so that once it is written it cannot be modified. The CD should be in ISO 9660 format to allow cross-platform use. All GIS files should be delivered in a format compatible with the latest version of ESRI's Arc Gis software. The products delivered to the project manager will contain the following items:

Required

- Descriptive Document
- Spatial data and associated tabular information.
- Associated data table(s)
- FGDC-compliant Metadata

As Specified

- ArcGis Layer File in shapefile or geodatabase format
- Linked document(s)
- Linked graphics or digital photographs

Descriptive Document

A Microsoft Word document (and/or ASCII text file if specified) describing the data set will accompany any submission and provide all necessary information for understanding the submittal. This includes but is not limited to the following:

- Contents of the CD/DVD or .zip file
- Sensitive data issues (if any exist)
- Concise summary of accuracy assessment procedures applied
- Recommended "official" theme name(s) (or file name alias)
- Contact information for those responsible for the data
- Data dictionary for all attribute and database tables (e.g., listed by table in "field name", "data type", "data width", "field description" tabular format)
- Linking fields (to documents, Microsoft Access database, digital photographs)
- Viewing scale thresholds (if applicable)

The following is an example of a Descriptive Document that can be used as a template:

BirdSurvey_Readme.Doc (or .Txt)

A CD-R in ISO 9660 format contains the following file:

CODEBird.Zip containing the following files:

- BirdSurvey_Readme.Doc (this Descriptive Document)
- Bird_File_Names.Doc (naming convention or codes used for file names - if applicable)
- BirdSurvey2000.Doc – a descriptive document for the *Code* 2000 bird survey
- Bird.shp – shapefile name and associated files
- Bird.e00 – exported ArcINFO Coverage
- Bird.lyr – layer file with legend
- Bird.avl – ArcView 3x legend file (if 3x is used)
- Bird.txt/.html/.sgml – FGDC metadata formats
- Bird.mdb – Microsoft Access database
- Bird_Data_Dict.Doc

This first version of bird data was completed on 05/28/02.

None of the data contained in this data set is considered sensitive.

Features were marked in the field on 1:24,000 paper maps and digitized using a tablet. Digitized spatial data were plotted and compared to the original maps. Digitized points fell within 0.1 inches of the original marked points.

An appropriate Theme name for this data should contain Bird Survey and the year (2000) like – “Bird Survey 2000”

The data were created by Joe Smith of the [organization], FWS Project name, phone – (999) 999-9999.

The data dictionary for attribute and data tables are included in the file Bird_Data_Dict.Doc

The Key Field “LocationID” links the Access database and the coverage.

No viewing scale thresholds are required for this data.

Spatial Data

There are several ways in which spatial data can be represented in a GIS including points, lines, polygons, or rasters/images. Determining which representation(s) is appropriate for your study involves consideration of scale and study goals. Prior to data collection, this issue should be addressed and resolved in the project study plan in consultation with the project or data manager. Additionally, network and park data management plans may dictate the appropriate format.

Naming Conventions

A clear and meaningful file name should be used that conveys the nature of the data and the subject represented. All data and related file names should adhere to current ArcGis naming standards and not contain spaces or special characters. Field names should be 13 characters or less to conform to dBase and ArcGis field naming limitations. Microsoft Word documents may use long file names for clarity of document content.

Coordinate Systems

All spatial data collected for or submitted to the SFESO shall be geo-referenced and provided with specific datum and map projection explicitly included with the individual data layers (.prj file). The steps used to get the data into the projection must be documented in the metadata. The preferred projection is Florida Albers NAD83 in meters.

Data Formats

All vector data and themed raster data will be submitted in a format, compatible with the current version of ArcGis. In general, all digital imagery, such as scanned aerial photographs, will be supplied as tagged image file format (.TIFF) files, Mr. Sid (.sid) files, or JPEG (.jpg) files with the proper header file (or world file) for geo-referencing purposes. If special circumstances exist (such as large image files), other spatial data formats may be acceptable. If not specified directly in the contract or project proposal, the data format(s) should be clearly stipulated and agreed upon with contractors or cooperators before data collection and processing start. If there are questions about choosing a data format, converting between formats, or non-standard formats, contact the program managers.

ESRI Shapefile The shapefile format includes at a minimum the .SHP, .DBF, .PRJ, and .SHX files (ArcGis .SHP files should include the metadata .XML file from ArcCatalog). A .PRJ (projection definition) file is required unless specified otherwise in the contract or project proposal.

ArcINFO GRID File This is the preferred format for themed raster data and particularly useful for images that contain attributes other than cell values. Generally, GRID themes should be delivered as .E00 files as stipulated above. However, for large raster data sets, ESRI recommends sharing GRID files as separate workspaces because .E00 files may be extremely large and unwieldy.

GeoTIFF A raster format with geo-referencing stored in the header of the file.

.TIFF with world file TIFF files shall be geo-referenced and include the world file (.TFW).

.SID with world file Mr. SID files shall be geo-referenced and include the world file (.SDW).

.JPG with world file JPEG files shall be geo-referenced and include the world file (.JGW).

ERDAS Imagine file Imagine files shall be geo-referenced. Pyramid files (.RRD) shall be included if available.

Other possible raster file formats that may be utilized natively as an ArcView theme include .BMP, .BSQ, .BIL, .BIP, ERMapper, IMPELL Bitmaps, Image Catalogs, .JPEG, MrSID, and Sun Rasterfiles, but applicable header or world files must be used (which makes .BMP, .JPEG, and Sun Rasterfiles unacceptable). Again, the appropriate project manager(s) must approve any deviation from the preferred standards discussed above.

Collection methods

Several approaches to capturing digital data can be employed including digitizing features from maps or aerial photographs, and GPS (Global Positioning System) collection. The appropriate method should be determined in the study plan and after consultation with the project, resource, or data manager.

When digitizing features from maps or photographs, the source, scale, date, and methods (i.e., process steps) shall be recorded in the Metadata and discussed in the Descriptive Document. When using GPS collection, the GPS unit type, averaging method, post processing and other criteria shall be recorded in the Metadata and discussed in the Descriptive Document.

Scale and Spatial Resolution

Vector Data - New data should be compiled with an accuracy level better than U.S. National Map Accuracy Standards for a 1:24,000 product unless other requirements exist (e.g., larger, more-detailed or smaller, regional-scale data). Project planners should contact appropriate GIS or data management staff for specific scale and spatial resolution requirements for vector data, which should be clearly specified in the contract or cooperative agreement.

Digital Image Data and Aerial Photography - Specific scale and spatial resolution requirements for image data should be specified in the contract or cooperative agreement, or the contractor should contact the project manager for clarification.

Horizontal and Vertical Accuracy - All spatial data collected shall be tested for spatial accuracy and shall meet or exceed the Federal Geographic Data Committee (FGDC) Standards for the appropriate scale (for more information see biological and non-biological [FGDC Standards](#)). Decimal-degree Longitude and Latitude coordinates for geographic data should be recorded to a minimum 5 significant digits to the right of the decimal point and stored in double precision attribute or database fields. Any calculations done with location data should be done at double precision with the results rounded or truncated to the appropriate propagated error limits. All calculations and processing completed on the spatial data shall be reported in the metadata.

For maps on publication scales larger than 1:20,000, not more than 10 percent of the points tested shall be in error by more than 1/30 inch, measured on the publication scale; for maps on publication scales of 1:20,000 or smaller, 1/50 inch. These limits of accuracy shall apply to positions of well-defined points only. Well-defined points are those that are easily visible or recoverable on the ground: monuments or markers, such as benchmarks and property boundary monuments; intersections of roads and railroads; and corners of large buildings or structures (or center points of small buildings). In general, what is well defined will also be determined by what is plot-able on the scale of the map within 1/100 inch. Thus, while the intersection of two roads or property lines meeting at right angles would come within a sensible interpretation, identification of the intersection of such lines meeting at an acute angle would not be practicable within 1/100 inch...

Vertical accuracy, as applied to contour maps on all publication scales, shall be such that not more than 10 percent of the elevations tested shall be in error by more than one-half the contour interval. In checking elevations taken from the map, the apparent vertical error may be decreased by assuming a horizontal displacement within the permissible horizontal error for a map of that scale.
(USGS Fact Sheet 078-96, 1997)

The following table provides the allowable horizontal accuracy for some common scales:

Scale	Allowable Error	Scale	Allowable Error
• 1:40,000	33.8 meters (111 feet)	• 1:9,600	4.9 meters (16 feet)
• 1:31,680	16.1 meters (53 feet)	• 1:4,800	2.4 meters (8 feet)
• 1:24,000	12.2 meters (40 feet)	• 1:2,400	1.2 meters (4 feet)
• 1:20,000	10.1 meters (33 feet)	• 1:1,200	0.6 meters (2 feet)

	feet)		
• 1:12,000	6.1 meters (20 feet)		

Attribute Data

All fields within the database supporting GIS layers should have names of 13 characters or less due to ArcGis and dBase limitations. Because the ArcINFO coverage/shapefile format is not ideal for storage and management of complex relational data, relational attribute data shall be stored in a separate, well-structured relational database system. Map features and database records shall share a common unique identifier or primary key that relates a map feature to a table record.

Attribute Accuracy

Every map layer/coverage may have different attribute data requirements. In general, attribute data entry and quality control should follow good data management practices including verification of precise data entry and validation of possible domain values. All attribute accuracy assessments and corrective actions will be detailed in the Descriptive Document. Contractors or cooperators should consult with the program manager if guidance is needed about good data management practices.

Quality Control

All providers of spatial data should have a well-developed and rigorous quality control program designed for the particular project in question. Accuracy assessments of spatial and attribute data should include creation of check plots with spatial features labeled. The Descriptive Document will include the accuracy assessment method(s) performed and scale at which the data were collected. Results of tests used to verify all applicable horizontal, vertical and attribute accuracy measurements will be provided when data are delivered.

When the contractor has completed 10% of the spatial and attribute data development, the contractor must supply the data to the project manager for quality control purposes. The data must be delivered in conformance with the spatial data format requirements. Once the program manager or GIS staff have checked the data and found it acceptable, the contractor may continue data development. Once the contractor has completed the work, the project manager must determine that the spatial data, attribute data, and Federal Geographic Data Committee (FGDC) compliant metadata are acceptable before the job is considered complete.

Metadata

All spatial data submitted shall include metadata that meets the minimum FGDC content standard for digital geo-spatial metadata (see biological and non-biological [FGDC Standards](#)). (Project managers should request metadata exceeding the minimum requirements whenever appropriate.) The metadata must be parsed with no errors prior to submission using the Metadata Parser (MP) provided by the FDGC (See [Geospatial](#)

[Metadata Tools](#)). The metadata should be delivered in FGDC-standard formatted ASCII text with a .TXT extension, hypertext markup language with an .HTML extension, and standard general markup language with an .SGML extension [For](#) complete information on FGDC metadata see [Geospatial Metadata](#).

Specifications for the attributes and database tables attached or linked to the spatial data must be documented in the “Attribute Entity” section of the FGDC metadata and include:

- Field name
- Field description
- Field format
- Valid values

The Descriptive Document should also include a more easily readable, tabular-formatted data dictionary with the attribute and database tables specifications. The data dictionary should be listed by table and include the field name, field format, field width, and field description with valid values. An entity and relationship diagram should be included for relational tables if applicable.

Legend

If project deliverables include thematic map displays, the corresponding symbology shall be included as an ArcGis layer file or an importable ArcView 3.x legend file (.AVL). Additionally, fields integral to symbolization must be present in the delivered GIS feature attributes. The Descriptive Document shall include a description of the thematic display and the fields required for rendering symbols.

Linked Documents

Project documents such as user manuals and detailed descriptions can be linked to map features through “hot linking”. Hot linking (hyperlinking) allows the user to click a map feature and have a related document open and jump to the chapter associated with an attribute of that map feature. If an associated document is included with the intention of hot linking (hyperlinking) the following is required:

Microsoft Word Documents (for conversion to Windows Help Files)

- The document(s) shall be a Microsoft Word formatted file.
- The document(s) will include a table of contents with separate listings for each “topic” or description that relates to a GIS feature (e.g., extensive textual descriptions of each and every feature of a theme).
- Include a separate tabular list of which “topics” correspond to each linking field value in the GIS theme (i.e. the key values for linking the document to the GIS).

HTML Documents

- The document(s) shall be an HTML formatted file.
- The document(s) will include a table of contents with separate listings and anchors for each “topic” or description that relates to a GIS feature.

- Include a separate tabular list of which "topics" correspond to each linking field value in the GIS theme (i.e. the key values for linking the document to the GIS).

Linked Graphics or Digital Photographs

If any linked digital photographs are included with the data set, they should be in a format that is readable with current ArcGis software. Image types that can be directly hot linked (hyperlinked) to a theme in ArcGis include .GIF, .JPEG/.JPG, MacPaint, Microsoft DIB, Sun Raster files, .TIFF, .TIFF/LZW compressed, X-Bitmap, and .XWD

Images and graphics shall be organized in a file folder or directory structure that provides a logical hierarchical format.

Map features with linked graphics/photographs should contain a GIS attribute field that records the absolute directory path and file name (multiple images should be separated by commas). The suggested field name is "Images." Map layers should have meaningful names that relate to the map theme and its attributes, and digital image file names should be encoded with this value. Any file coding schemes that are used should be documented and included in the Descriptive Document.