Supplemental Information for the Florida Burrowing Owl

Biological Status Review Report

The following pages contain peer reviews received from selected peer reviewers, comments received during the public comment period, and the draft report that was reviewed before the final report was completed

March 31, 2011

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Peer review #1 from Brian Millsap

From: Brian_A_Millsap@fws.gov
To: Imperiled
Cc: Brian_A_Millsap@fws.gov; Haley, Katherin
Subject: Re: Burrowing owl Draft BSR Report
Date: Tuesday, February 01, 2011 10:59:57 AM

I have completed my review of the BSR for the Florida burrowing owl (Athene cunicularia floridana). The BSR includes all of the pertinent literature and data sources I am aware of, and the conclusions from that review are, in my opinion, sound, but with one question. My question relates to criterion (c).2.a(ii) that all individuals are members of the same subpopulation. How was the population at Eglin Air Force Base, if it is still extant, treated in this assessment? That population is (was) separated by a considerable distance from other burrowing owl populations in Florida and elsewhere, and I wonder if it meets the criterion of a subpopulation under IUCN criteria? I also know there were questions about the subspecific status of those individuals, so that might also play into how they are treated in this assessment.

Aside from how that question is answered, I believe the other criteria are appropriately addressed in the BSR. Please do not hesitate to contact me if you have any questions.

Brian

_____

Brian Millsap
U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, NM 87103

Peer review #2 from Dr. Dan Caitlin

From: Catlin, Daniel
To: Imperiled
Subject: burrowing owl listing review
Date: Wednesday, January 26, 2011 4:42:27 PM
Attachments: Catlin FWC BUOW review.docx

Please find attached my review of the FL BUOW listing decision. If you have any questions, please feel
free to contact me.

All Best

Dan

Overall I think that this is a thorough review of the literature and assembled knowledge of the status of Burrowing Owls in Florida. The conclusions generally follow from the data and evidence that was presented. The presentation was simple and straightforward, but I did have one issue with the document that I discuss in the following paragraph.

I think what concerns me the most about this document and its conclusions, is that the listing of the species as threatened hinges on a single definition, one that it is reasonable to disagree with. If you were to tell be that all of the Burrowing Owls in Florida were a single subpopulation, I would want both demographic and genetic proof of that statement. While I realize that you use a definition that was presented to you, I also realize that you admit to debating it before making your conclusion. Therefore, there must be some doubt even in your own minds as to whether or not the Florida Burrowing Owl can truly be considered a subpopulation unto itself. While reading through the table used for summarizing your evaluation, I tried to determine how each of the steps could lead one to thinking that an animal were threatened biologically, and not just semantically. I am not arguing one way or the other as far as listing the species is concerned, but I am a little perturbed that the entire listing would be decided by the definition of a single word. Following the logic of Section C, we are trying to determine if the population is so small that we could expect it to blink out of existence for a myriad of reasons. Geographically, it is hard for me to foresee some event affecting all of the BUOWs in Florida all at the same time. Further, you have evidence that there is some differentiation among groups of owls, but because of methodological issues, you chose to ignore that information in this assessment. I also find it somewhat perplexing that you would not use the PVA information that was available to you regardless of which owls the analysis was performed on. You yourselves in this document decided that all of Florida is a single subpopulation, so what does it matter that Bowen dealt with rural owls and Endries with owls in small groups (notice I avoided using the word population, which you should do too if you are going to have specific restrictive definitions for those terms). The decision to dismiss these PVAs because they don't deal with the "whole" subpopulation seems to fly in the face of your decision to treat the entire subpopulation as a single unit. If you were to break it into multiple subpopulations, then wouldn't C2ai receive a "Y?" and therefore

the bird would be listed based on this finding? I guess this depends on accepting Bowen's (2001) finding, but from looking at that paper, I gather that there was no correction made for resighting rate? I think work by Conway, Rosenberg, and others would indicate that this is not the best way to estimate the population of BUOWs. I guess my thinking would be that I would rather use the information from the PVAs; that ought to place a "Y" in C1, and negate the need for a debate over the definition of a subpopulation and whether or not all of Florida qualifies.

I am aware that it is easy to gloss over many of the intricacies of the listing process and this IUCN process itself if you do not have to perform it and make the hard decisions yourself. I applaud the work that has been done and offer my comments as the thoughts of an outside person much less familiar with the FL BUOW and the legislative issues at hand. I hope that my comments are taken as constructive and helpful, and I greatly appreciate the opportunity to contribute to the process.

All Best

Daniel H. Catlin

Peer review #3 from Dr. Melissa Grigione

From: Grigione, Melissa Marie [mailto:mgrigione@pace.edu]
Sent: Monday, January 31, 2011 11:25 PM
To: Haley, Katherin; Brian_A_Millsap@fws.gov; BKMEALEY@aol.com
Cc: ronald.sarno@hofstra.edu
Subject: RE: Burrowing owl Draft BSR Report

Dear Kate,

I have reviewed the BSR and believe that both the methodology and conclusions are warranted. The report used appropriate references and considered public input. It is clear that the authors clearly understand the rather complex set of rules required to meet the listing criteria and their conclusions justify the "threatened" recommendation.

The attached revision shares some preliminary data from the genetic work that Ron Sarno and I are currently analyzing, so please take a look. We have collected blood on approximately 180 birds throughout FL. At this point, we have developed 13 microsatellites for FL burrowing owls. Our preliminary data, based on 80 individuals, suggests low levels of heterozygosity. There will be several publications that come from this work. If we could obtain $5-10K in support for this work, we could move this along considerably. Please let me know if there are any funding possibilities at FWC. We would be glad to submit a proposal.

If I can be of further support, please contact me.

Thank you!

Melissa

Melissa M. Grigione, Ph.D.
Associate Professor & Director
Graduate Program in Environmental Science
Dept of Biology
Pace University
861 Bedford Road
Marks Hall, Room 26
Pleasantville, New York 10570

Biological Status Review
for the
Florida Burrowing Owl
(*Athene cunicularia floridana*)

EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate all species listed as Threatened or Species of Special Concern as of September 1, 2010. Public information on the status of the Florida burrowing owl was sought from September 17 to November 1, 2010. The members of the biological review group (BRG) met on November 12, 2010. Group members were Kate Haley (FWC lead), Jerry Jackson of Florida Gulf Coast University and Ken Meyer an independent consultant. In accordance with rule 68A-27.0012 Florida Administrative Code (F.A.C.), the BRG was charged with evaluating the biological status of the Florida burrowing owl using criteria included in definitions in 68A-27.001(3) and following the protocols in the *Guidelines for Application of the IUCN Red List Criteria at Regional Levels (Version 3.0)* and *Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1)*. Please visit http://myfwc.com/WILDLIFEHABITATS/imperiledSpp_listingprocess.htm to view the listing process rule and the criteria found in the definitions. The BRG concluded from the biological assessment that the Florida burrowing owl met criteria for listing. Based on the literature review, information received from the public, and the BRG findings staff recommends the species be listed as a Florida designated threatened species.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida.

BIOLOGICAL INFORMATION

Life History References – Haug et al. (1993), FWC (2003), Millsap (1996) and USFWS (2003).

Taxonomic Classification – This report is for the Florida burrowing owl, *Athene cunicularia floridana* a subspecies of burrowing owl, in Florida. The subspecies is found in Florida and the Bahama Islands (Haug et al. 1993).

Population Status and Trend – Millsap (1996) estimated between 3,000 and 10,000 burrowing owls in Florida based on density estimates from different areas of the state. However, Bowen (2001) surveyed current and historic records of burrowing owls throughout the state and found 1,757 adult owls. Local establishment and extirpations make it difficult to determine the population trend of the burrowing owl statewide (Woolfenden et al. 2006). Sarno et al (In prep), using 13 microsatellite loci, are investigating genetic variation in 182 burrowing owls from 14 locations in Florida. To date we have observed a paucity of heterozygous individuals and presume that the Florida popylations will exhibit low levels of genetic variation and heterozygosity.

Comment [PU1]: PLEASE ADD TO REPORT…CONTACT R. SARNO WITH ANY OTHER QUESTIONS AND/OR CONCERNS

Peer review #4 from Pam Bowen

From: Pam Bowen [mailto:pbowen@sjrwmd.com]
Sent: Monday, January 31, 2011 8:41 AM
To: Haley, Katherin
Subject: Comments on the BSR of the Florida Burrowing Owl - please replace file with this one

Kate,

My apologies, but I just realized there was a problem with the font on one of the paragraphs on page 2 of my comments and that there was a spacing problem in another paragraph. I've corrected these problems in the attached file. Would you please replace the file I sent you earlier this morning, with the file attached here?

Thank you so much for your help with this!!!

Pam

Pamela J. Bowen
Environmental Scientist
St. Johns River Water Management District
4049 Reid Street/ Hwy 100 West
P. O. Box 1429, Palatka, Florida 32178-1429

To: Katherin Haley
From: Pamela J. Bowen
Subject: Comments on the Draft Biological Status Review for the Florida Burrowing Owl *(Athene cunicularia floridana)*
Date Prepared: January 30, 2011

Kate, thank you very much for the opportunity to provide comments on the draft Biological Status Review (BSR) of the Florida Burrowing Owl (*Athene cunicularia floridana*) prepared by the Biological Review Group (BRG) in November 2010. Having previously conducted a state-wide population survey of the Burrowing Owl in Florida, I appreciated the opportunity to provide comments on the BSR and the recommendations of the BRG.

First, the individuals who served on the BRG are well chosen for the project based on their knowledge and experience of Florida's birds. Kate, although you and I have not worked closely together before, I know you have a great deal of experience working with Burrowing Owls in Florida and California. I also am familiar with the work of Dr. J. Jackson and Dr. K. Meyer. I have worked with both of these individuals in the past. I have worked with Dr. Jackson on Florida Ornithological Society projects over the years and Dr. Meyer provided me with information on radio-tracking raptors when I first began my masters research work. I have also heard several presentations given by Dr. Meyer on his work with Swallow-tailed Kites. Both Dr.

Jackson and Dr. Meyer are well qualified to assess population data on avian species in the state of Florida. Both of these individuals have, throughout the years, provided fair and objective scientific assessments of the species they have worked with in Florida. I am also certain that the BRG has benefited from your leadership and your extensive experience working with Burrowing Owls in Florida.

Second, based on the letters and studies that were referenced in Appendix 2 of the BSR, I believe that the BRG's recommendation that the Florida Burrowing Owl be listed as a Threatened species is well substantiated by the scientific data that was provided. In fact, the BRG was very conservative in its assessment of the data provided in relationship to the IUCN criteria used to evaluate the species status in Florida.

My review of the BSR Information Findings Table indicates that the BRG could potentially have also answered "Yes" to having met the criteria for listing for Criterion/Listing Measure (A) 3 - Population Size Reduction depending on the data used to estimate or project the future population size. In 1999, Bowen (2000, page 63) identified 416 BUOW territories in Cape Coral, Florida. A territory included an area occupied by one or more adult owl. At 15% of the territories, only one adult owl was observed (representing the non-breeding population). Therefore, of the 416 territories identified in Cape Coral, 85% or 354 territories would be expected to be occupied by two or more breeding adults. However, five years later in February 2004, FFWCC (2004) identified a total of 277 active nests/burrows in the same area. During the five year period between 1999 and 2004, the breeding population may have declined from 708 adults (a minimum of 2 adults at 354 territories) to 554 adults (a minimum of 2 adults at 277 burrows/nests). This represents a decline of 154 breeding adults in the area or a 21.75% decrease in the breeding population over five years. Assuming that over ten years (two five-year periods), this rate would double (2 x 21.75%), the breeding population could be estimated to decline by 43.50%. If this figure was used to project the estimated decline of the overall population in the state of Florida, then the species would also meet criterion (A)3 for listing (a population size reduction of at least 30% projected or suspected to be met within 10 years or .....). Despite the inferences that could be made using these data, the BRG were conservative in their assessment of the available data and indicated that the species did not meet this criterion. However, the BRG did provide a remark in the Data/Information section of the table indicating that projected development in urban areas may cause decline. Unfortunately, the Burrowing Owl Adaptive Management Plan for Cape Coral, prepared by Quest Ecology (2010), does not indicate the total number of breeding territories recorded in the area during its 2009 BUOW census (it only states that 190 adults were observed in high priority survey sections) . As a result, there are no numbers available in the literature provided to determine if an estimated decline of more than 30% did actually occur between 1999 and 2009. This lack of data may be the key reason why the BRG wisely used a conservative approach to its evaluation of this criterion. If the species is listed as threatened, at the minimum, all future BUOW surveys in a specific area should specifically indicate the total number of territories or active nests/burrows observed and the total number of breeding adults (or the total number of breeding pairs) recorded during the survey.

In the table of BSR Information Findings, the BRG rightfully found that the Burrowing Owl met the IUCN criterion for listing based on (C) Population Size and Trend. The literature estimated that the population was between 3,000 and 10,000 owls and a state-wide census of the species

recorded less than 2,000 adult Burrowing Owls in 1999. These numbers clearly indicate a small population size. Additionally, the estimation or observation of the decline of adult owls (C)2, as evidenced by the literature, provides a sound scientific criterion for listing this species as Threatened. My comments in the paragraph above regarding the potential decline of the breeding population in Cape Coral would also corroborate this analysis. Finally, the decision that all of the mature individuals occur in one subpopulation, based on the IUCN's definition of "subpopulation" (IUCN 2003, page 8) (Geographically or otherwise distinct groups in the (global) population between which there is little demographic or genetic exchange .....) is appropriate. There is very little likelihood of gene flow between the Florida Burrowing Owl and burrowing owls in the western United States or South America. The Florida subpopulation of the Burrowing Owl is distinct from it's western counter-parts and would probably even experience limited gene flow with its Jamaican relatives based on dispersal distances.

I can imagine there must have been a great deal of discussion over the interpretation of a “subpopulation" in comparison to the metapopulation work that I did on the Burrowing Owl (My work was an exact replication of the metapopulation work done on the Florida Scrub Jay by Stith et al. 1996). Perhaps, this provides an excellent example of how scale makes a difference in how we interpret the world around us. In classic ecology, species and populations focus on whether groups are interbreeding units or not. On a global scale, there are several subspecies of Burrowing Owls, and they are not all interbreeding (although the possibility exists that they could interbreed). However, on a regional scale, metapopulation analysis and population viablility analysis, don't look at whether the subspecies is interbreeding, but rather at the size of regional subpopulations and the distance between them to determine the likelihood of each subpopulation's persistence over time. Large mainland populations are projected to have lower risks of extinction while small island populations, located far from mainland populations, are expected to have high risks of extinction. If the BRG had decided to use the definitions I used in the metapopulation study of the Burrowing Owl, the largest subpopulation I identified in Florida only included 813 adult owls. None of the populations included more than 1,000 mature individuals. So, if the metapopulation definition of a subpopulation was accepted, the BRG would still have listed the Burrowing Owl as meeting the criterion for listing under (C) 2. (i) as there were no subpopulations with more than 1,000 adults.

Based on the literature and data provided, the BRG did an excellent job providing a fair and accurate scientific analysis of the Burrowing Owl's status in Florida. I concur with the BRG's listing recommendation and commend the group on such a fair and concise assessment.

All references included in this letter refer to the literature provided in the BSR with the exception of Stith et al. 1996 which appears below:

Stith, B. M., J. W. Fitzpatrick, G. E. Woolfenden, and B. Pranty. 1996. Classification and conservation of metapopulations: a case study of the Florida Scrub Jay. Pages 187-215 *in* Metapopulations and wildlife conservation, D. R. McCullough, Ed. Island Press, Washington, D. C.

Letters and emails received during the solicitation of information from the public period of September 17, 2010 through November 1, 2010

Letter received from Nancy Ritchie

Tuesday, October 19, 2010

Florida Fish and Wildlife Conservation Commission
FWC Headquarters
Farris Bryant Building
620 South Meridian Street
Tallahassee, FL 32399-1600

Re: Proposed Endangered and Threatened Species rules
(August 20, 2010)

To Whom It May Concern:

I would like to provide to the Commission the population numbers for the Florida Burrowing Owl (*Athene cunicularia*) on Marco Island, Collier County, Florida to help conclude that this species should remain on Florida's Species of Special Concern list and be afforded protective provisions specified under Chapter 68A-27.005(1) and (2).

The City of Marco Island was incorporated in 1999. Upon incorporation, inventory of all protected species within the incorporated limits was performed. A moderately sized, but stable population of Burrowing Owls was found to exist throughout the island, located on the open, mowed, treeless, undeveloped properties. 95% of the burrows are located on privately owned, undeveloped single-family residential properties. There was no historical data from Collier County or FWC on the total numbers for this population, but a few documentations if a permit had been issued to remove a burrow. With no historical information, a survey of the entire Island was conducted in late 1999 and has been continually monitored, now, for the past ten years.

Attached are graphics to depict the population numbers over the ten years of monitoring. The first few years (late 1999–2002) do not represent the population growth, rather the surveying

being conducted and finding all the burrow locations on the Island. Then by 2003, it was pparent all locations of burrows were found and documented on Marco Island. The population was very stable until 2007, when the impacts of the increased development of the single-family residential lots and drought conditions compounded impacts to the population. Though

much development has slowed and even stopped and more rain has improved food sources, in the last two seasons there have been decreases in adult pairs nesting and the number of chicks fledged. here have been no burrow area locations in the past three years.

Marco Island is the only location in Collier County that has a Burrowing Owl population with the exception of the one pair of adults and one burrow at the Naples Airport. Conservation and protection of this small population is vital for the future of this species.

Thank you for your consideration of keeping the Burrowing Owl on the Species of Special Concern list to further protect the propagation of young and promote the stabilization of this species' population. If you require any further information, please do not hesitate in contacting me. Again, thank you.

Sincerely,

Nancy J. Richie

_____

Nancy J. Richie
Environmental Specialist

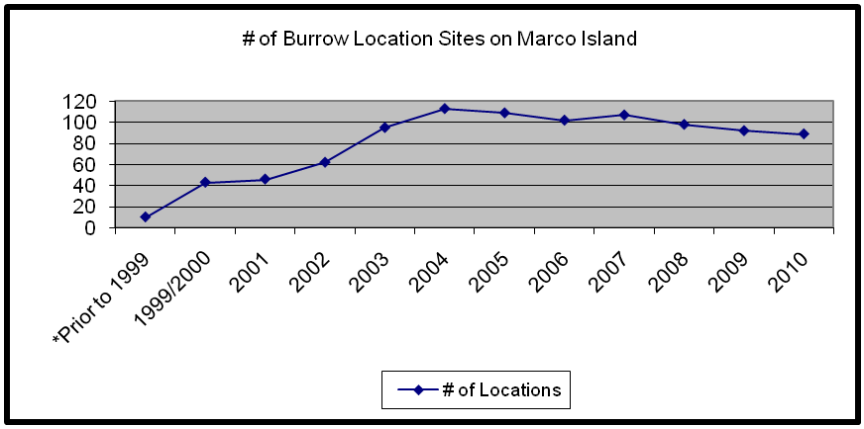
City of Marco Island
Collier County
50 Bald Eagle Drive
Marco Island, FL 34145

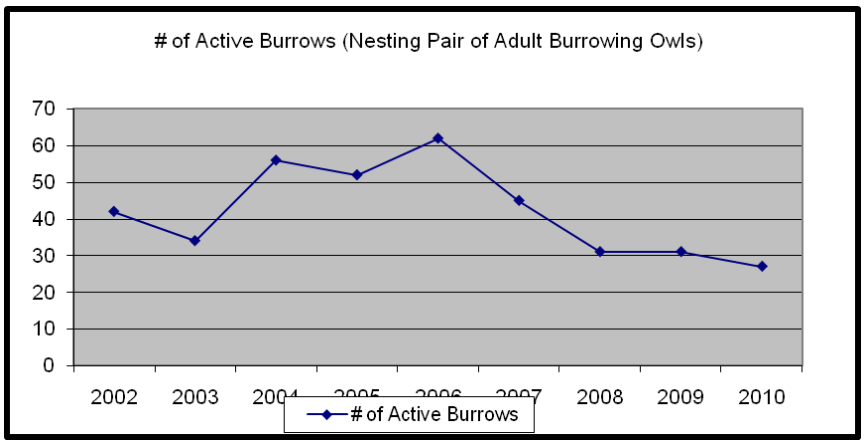
City of Marco Island Burrowing Owl Data: 1999 to 2009

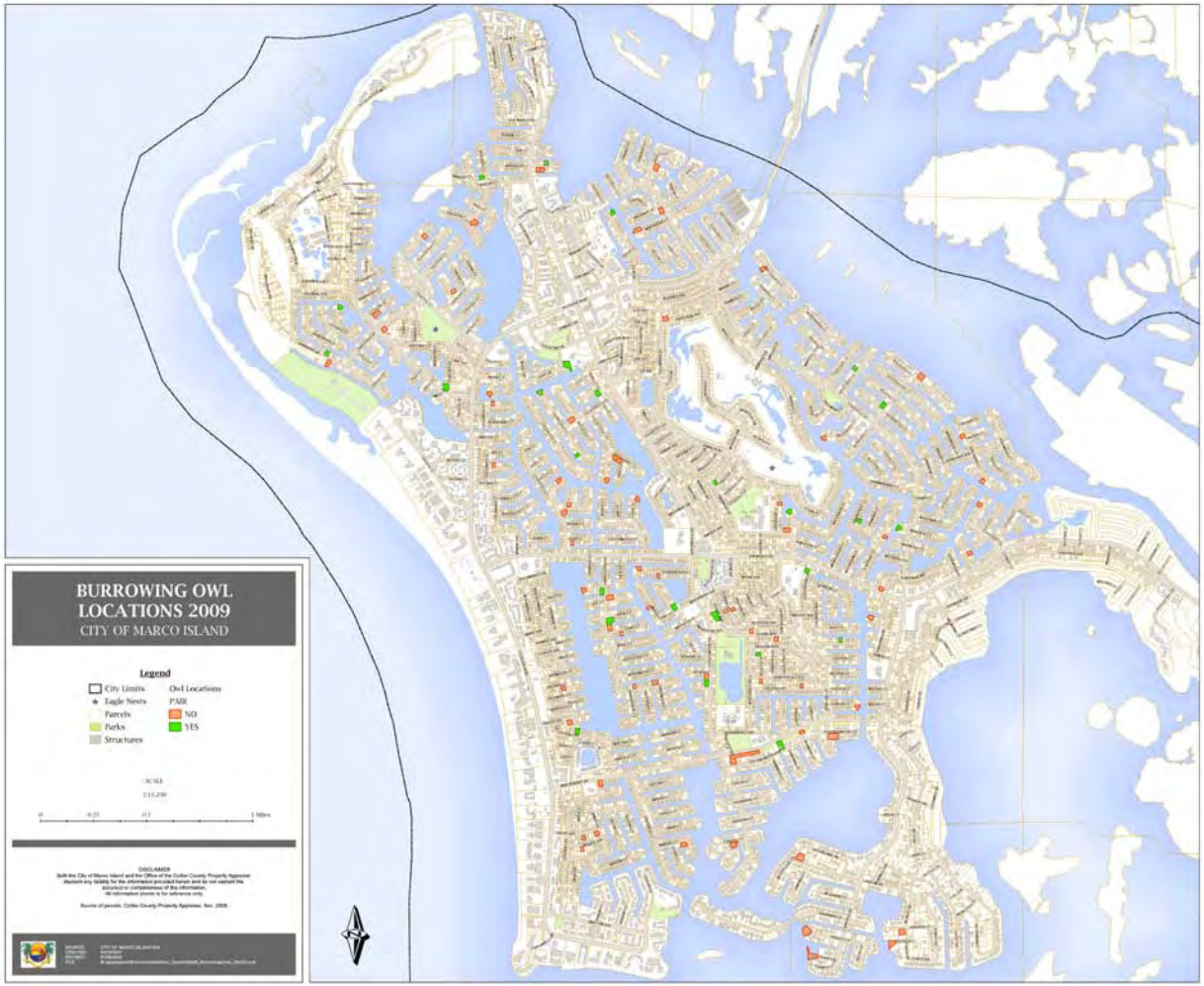
Nesting Season	# of Active Burrows	# of Locations	# of Burrows	Adults	Chicks
***Prior to 1999**	*unknown*	10	2	2	*unknown*
1999/2000	26	43	58	77	91
2001	42	46	88	103	155
2002	42	62	88	109	154
2003	34	95	121	121	132
2004	56	113	133	171	261
2005	52	109	120	103	147
2006	62	102	158	150	230
2007	45	107	209	113	141
2008	31	98	201	75	92
2009	31	92	187	77	95
2010	27	89	181	70	59

**FWCC provided*

***Still monitoring todate*


# of Burrow Location Sites on Marco Island
120
100
80
60
40
20
0
*Prior to 1999
1999/2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
# of Locations


# of Active Burrows (Nesting Pair of Adult Burrowing Owls)
70
60
50
40
30
20
10
0
2002
2003
2008
2009
2010
# of Active Burrows


BURROWING OWL
LOCATIONS 2009
CITY OF MARCO ISLAND
Legend
City Limits
Eagle Nests
Parcels
Parks
Structures
Owl Locations
PAIR
NO
YES

Email from Lori Blydenburg

Dear Sirs,
The City of Cape Coral, in conjunction with Quest Ecology, has been working on an Adaptive Burrowing Owl Management Plan for the City of Cape Coral. This plan is still in a draft format, but should be very helpful in you Biological Status Review. The maps are very large, therefore, I am sending the plan in three separate emails, which I will mark in order sent.
Please don't hesitate to contact me if you should any questions.
Br..

Lori

Lori Blydenburgh
Planning Technician
City of Cape Coral

Florida Burrowing Owl
Adaptive Management Plan

Prepared by:
Quest Ecology Inc.
735 Lakeview Dr.
Wimauma, FL 33598
813-642-0799

Prepared for:
The City of Cape Coral
P.O. Box 150027
Cape Coral, Florida 33915

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Section 1: Introduction

1.1 Background

Cape Coral, located in southwest Lee County, Florida, encompasses 115 square miles of a large peninsula bordered by the Caloosahatchee River on the east and Matlacha Pass on the west, which separates Cape Coral from Pine Island. Cape Coral is the second largest city by land area and the eleventh largest by population in the state. Land development initiated in Cape Coral in 1958, after the Rosen brothers purchased the land with the intent of creating a large waterfront community in southwest Florida. In 1963, the population was estimated at 2,850. The Cape Coral Bridge, completed in 1964, proved to be a major benefit to development as it significantly reduced the travel time to Ft. Meyers; by 1970, the population had increased to 11,470. The most recent population estimate in 2009 (167,917) shows a 64.2% increase in population from the previous decade. As the human population and subsequently land development in Cape Coral continues to increase, wildlife already threatened by habitat loss and increased mortality due to conflicts with humans and their infrastructure and technology (i.e., buildings, cars) will continue to increase.

Palmetto-pine forests dominated the landscape of Cape Coral before early settlers cleared much of the land for agriculture and cattle grazing (Wesemann and Rowe 1987). Although records do not exist for the population status of the burrowing owl (*Athene cunicularia*) in Cape Coral before settlement, historical vegetative communities indicate populations were likely low (Wesemann and Rowe 1987). Early developers cleared the land, dredged canals, and elevated areas to increase the amount of land available for development. As a result, they created open, short grass habitats preferred by burrowing owl (Wesemann and Rowe 1987). Cape Coral now hosts the largest population of burrowing owls in the state (Bowen 2001).

Although clearing land for development increases the amount of preferred habitat for burrowing owls, conversion of over 60% of vacant land causes burrowing owl nest success to decrease and mortality rates in both juveniles and adult birds to increase (Millsap 2002). Therefore, high development rates in Cape Coral, without including preservation areas for burrowing owls, could cause significant declines in the burrowing owl population.

Because of the clear conflict between the success of the burrowing owl population in Cape Coral, and the need for development, this adaptive management plan was developed. The primary goal of this adaptive management plan is to avoid or minimize conflicts between human development and burrowing owls so that construction activities may continue without negatively impacting the burrowing owl population in the City of Cape Coral. With continued monitoring and management, conservationists can determine the needs of the owls and adapt the plan to best meet their needs in the face of human growth.

1.2 Current Regulation

The Florida burrowing owl (*A. c. floridana*) is currently listed by the Florida Fish and Wildlife Conservation Commission (FFWCC) as a species of special concern (SSC) due to its significant

vulnerability to habitat modification, environmental alteration, human disturbance, or human exploitation. (FFWCC 2009).

The owls, burrows, and eggs are protected by FFWCC and the Federal Migratory Bird Treaty Act (1918) from harassment and disturbance. Any construction that would result in the take of a burrowing owl nest (burrow) requires a permit from FFWCC. If the take occurs during the nesting season, a Federal take permit is also required and will be issued by the U.S. Fish and Wildlife Service (USFWS) Regional Office in Atlanta, Georgia. However, in many cases, development can continue without causing disturbance to the owls, or causing the take of a nest. These options do not require a permit. When construction is proposed, the contractor doing the site inspection must submit a Burrowing Owl Affidavit with all building permits, reporting the presence of any burrows (City of Cape Coral 2009). Studies completed by the FFWCC have demonstrated that construction occurring outside a 50-foot buffer of an owl burrow rarely disturb nesting. Millsap and Bear (1988) found that nests on lots where construction was occurring that were surrounded by a 3.5 meter buffer and vehicles prohibited from parking near the nest had nearly the same productivity as those nests not occurring near construction. However, burrows on adjacent lots suffered lower production suggesting that possible construction activity on adjacent vacant lots where burrows were not flagged were disturbed or destroyed (Millsap and Bear 1988). In Cape Coral, because residential lots are small and a 50-foot radius is not feasible, if construction can be conducted outside of a 10-foot radius buffer around the burrow, it may proceed without obtaining any permits and at any time of the year (A. Williams, FFWCC, pers. comm.). If the burrow is located within the proposed protection zone, FFWCC can issue a permit to destroy the nest; however, this can only occur outside of the nesting season and after all reasonable alternatives to minimize adverse impacts have been considered and determined impractical. Additionally, when a burrow is destroyed, the contractor or homeowner is strongly encouraged to place a starter burrow on the property.

1.3 Current Activities to Promote Owl Conservation

Since the burrowing owl was listed as SSC by the FFWCC, several measures have been taken by the state and by Cape Coral Friends of Wildlife (CCFW) to protect the owls and their burrows. These efforts have benefited the population of burrowing owls and continue to reduce conflicts between the needs of the owls and the needs of humans.

CCFW, a non-profit organization, strives to protect and preserve wildlife through both conservation efforts and educational means. CCFW organizes and maintains the "adopt-a-burrow" program through which citizens are trained on how to maintain burrows on their property and ensure minimal disturbance of nesting pairs. CCFW volunteers regularly mark and maintain active or previously used burrows to prevent accidental collapse and unnecessary human disturbance. Starter burrows are also encouraged on private lots and instructions detailing how to install and maintain burrows can be found on the CCFW website (www.ccfriendsofwildlife.org).

Vacant lots are mowed by City maintenance crews, and thus maintained as grassland or prairie-like habitat (Wesemann and Rowe 1987; Millsap and Bear 2000). Although this maintenance is

performed for aesthetics, it maintains a simulated short-grass prairie habitat which burrowing owls prefer.

Education promoting the protection of burrowing owls and their burrows has decreased the number of accidental burrow collapses in Cape Coral (Millsap and Bear 2000). In their study, Millsap and Bear (2000) reported 26 failed nest attempts in 1987 due to harassment by school children. However, nest failures due to harassment declined between 1987 and 1988, which coincided with the implementation of a mandatory burrowing owl education program in Cape Coral public schools (Millsap and Bear 2000). Education for all ages is essential to the persistence of burrowing owls in Cape Coral, offering techniques to minimize disturbance of owls while promoting healthy growth of Cape Coral's communities.

1.4 Land Use Patterns in Cape Coral

Significant development in the City of Cape Coral began in the 1950s and 60s and consequently 135,000 buildable lots were established, beginning the rapid development of the Cape Coral community (Landers-Atkins 2000). Unlike the majority of Florida, which was initially developed as agriculture, residential and commercial development has dominated the city landscape since its founding. According to the American Community Surveys from 2006-2008, there are 75,437 housing units, including 17,485 vacant housing units within the city limits (U.S. Census Bureau 2008). Development in the City is most dense in the south and east, moderate in the central portion of the peninsula, and negligible in the north and west, especially north of Pine Island Road (Wesemann and Rowe 1987; Quest, pers. obs.).

1.5 Overview of the Burrowing Owl Population in Cape Coral

The Florida burrowing owl is not as well studied as the western subspecies (Wesemann and Rowe 1987); however, the Cape Coral population has received the most attention by researchers in Florida. The primary focus of research on the Cape Coral burrowing owls has been the effects of development on the population; this has resulted in only a few published studies on demographics.

In 1987, it was estimated that Cape Coral hosted over 1,000 pairs of burrowing owls (Millsap 1996); however, in a statewide survey completed in 1999, only 1,757 adults were counted at 946 active nest sites (mean 1.86 adult owls per territory), including 782 individual owls and 416 territories in Cape Coral (Bowen 2000). In 1999, Cape Coral had the highest density of burrowing owl territories in the state. The current number of burrowing owls in Cape Coral is unknown because a population survey has not been conducted since 1999.

Although the number of burrowing owls is unknown, there is a better understanding of habitat selection than demographics within the City. In two studies of Cape Coral burrowing owls, the number of owls per vacant hectare peaked at approximately 60% development and owl density was negatively affected by levels of development greater than 60% (Wesemann and Rowe 1987; Millsap and Bear 2000). Therefore, owls appear to select areas of residential development up to 60%, over less urbanized tracts. In 1985, densities were highest in areas with 54-64% development (Wesemann and Rowe 1987). The highest density within the city, 8.21

territories/km2, was found north of Cape Coral Parkway, west of Del Prado Parkway, south of Everest Parkway, and east of Santa Barbara Boulevard; the largest number of territories was north of Cape Coral Parkway and west of Del Prado Parkway (Bowen 2000).

Section 2: Natural History

2.1 Species Status

The burrowing owl is unique from other owl species in that it is active during the day, it may nest in loose colonies, and it nests in underground burrows (Wesemann and Rowe 1987). There are two recognized subspecies of the burrowing owl that occur in North America. The western burrowing owl (*A. c. hypugaea*), occurs west of the eastern edge of the Great Plains and south to Panama (Haug et al. 1993). The Florida burrowing owl occurs only in Florida and the Bahamas and is non-migratory (Haug et al. 1993; Millsap and Bear 2000). The Florida burrowing owl was listed as a species of special concern in Florida in 1979 (Bowen 2000) based on significant vulnerability to habitat modification, environmental alteration, human disturbance, or human exploitation which, in the foreseeable future, may result in its being uplisted to threatened or endangered status unless appropriate protective or management techniques are initiated or maintained (see Florida Administrative Code Rule 68A-27.005).

2.2 Distribution in Florida

The Florida burrowing owl is found primarily throughout the Florida peninsula, the Florida Keys, and the Bahama Islands (Haug et al. 1993). Florida burrowing owls have expanded their range from the central prairies towards the coastal regions of South Florida and more recently, the interior regions of North Florida (Bowen 2000). This indicates that densities in its original range have decreased and the populations are now concentrated on the outer edges of its range; densities are lowest in the most recently colonized areas in North Florida (Bowen 2000). In 1999, the highest numbers of territories were in the southwest and southeast regions with 503 and 306 territories, respectively (Bowen 2000). The highest densities of adult burrowing owls were also in these two areas; there were 0.0648 adults/km2 in the southwest and 0.0283 adults/km2 in the southeast (Bowen 2000). Specifically, Lee County had the highest density of adult burrowing owls, 0.3905 adults/km2, and the highest density of owl territories, 0.2070 territories/km2 (Bowen 2000).

The only attempt at a comprehensive study of burrowing owls across the state of Florida was conducted between 15 April and 14 August 1999 (Bowen 2000). More than 1,000 historic and active nest sites in 62 counties were visited. Bowen (2000) found 2,509 owls (1,757 adults and 752 young) at 946 territories. Of those territories, 896 (94.8%) were in urban areas and 458 (51.1%) had burrows on vacant lots; 408 (89%) of those were in southwest Florida (Bowen 2000). No owls were observed in native habitats. Lee County had the highest density of adult burrowing owls with 0.391 adults/km2 (Bowen 2001).

2.3 Home Range, Site Fidelity, and Space Use

Florida burrowing owls are non-migratory and use their burrows year-round (Haug et al. 1993; Millsap and Bear 2000). Demographic data on Florida burrowing owls is known from only a few

studies. However, even these limited data provide some guidance on proper management for the owls.

Although the population of burrowing owls in Cape Coral has received the most research attention when compared to other populations in Florida, no studies examining home range have been completed to date. Therefore, home range information is only available from central Saskatchewan where home range size varied from 0.14–4.81 km2 (mean 2.41 km2) (Haug and Oliphant 1990). Diurnal activities were restricted to within 250 m of nest burrow (Haug and Oliphant 1990). Knowledge on natal dispersal is also limited. In one Florida study, the median natal dispersal for 28 males was 414 m and 1116 m for 31 females (Millsap and Bear 1997). Of these birds, 36% of males and 3% of females settled and bred on natal territory (Millsap and Bear 1992).

Florida burrowing owls show strong pair fidelity; 92% of owls remained together between years when both sexes survived (Millsap and Bear 1990). Western burrowing owls exhibit strong site tenacity (Caitlin et al. 2005), but it is not known if Florida burrowing owls do as well. They have exhibited strong territory fidelity; in one study, 83% of males and 74% of females bred on the same territories for at least two consecutive years (Millsap and Bear 1997). In another study, an average of 68% of surviving adults remained on territory in Florida (Millsap and Bear 1992).

2.4 Habitat

Florida burrowing owls are distinct from the western burrowing owl in that they are capable if digging and excavating their own burrows; they do not rely on burrowing mammals. Historically, Florida burrowing owls were found in open prairies in the south and central portions of the peninsula (Wesemann and Rowe 1987) or the sandy soils adjacent to sloughs (Rhoads 1892). Currently, they are associated with mowed or overgrazed pastures, golf courses, cemeteries, airports, vacant lots in residential areas, school yards, and fairgrounds (Haug et al. 1993). In the only comprehensive statewide survey for Florida burrowing owls, all habitats had two common characteristics, with the exception of sites on croplands: 1) each had wide expanses of grass with little to no other vegetation, and 2) each was maintained by mowing or grazing (Bowen 2000).

2.5 Diet

Burrowing owls are opportunistic feeders whose diet may change depending on time of year (i.e., winter, breeding season). They forage primarily on arthropods, small mammals, birds, reptiles, and amphibians (Haug et al. 1993; Rosenberg et al. 1998). The flexibility in the burrowing owl's diet influences its adaptability to urban habitats (Millsap and Bear 2000).

2.6 Reproduction and Survival

Florida burrowing owls can breed at one year of age (Haug et al. 1993) and may begin nesting as early as October (Millsap and Bear 1990); however, 95% of the breeding occurs from February to late May (Haug et al. 1993). Burrowing owls lay between two and six eggs per clutch and the female does all of the incubation and brooding (Haug et al. 1993). Incubation lasts 28 to 30 days

and chicks emerge from nests around two weeks of age (Haug et al. 1993). In 1987 and 1988, Cape Coral birds fledged 1.7 and 2.0 chicks per nest, respectively (Millsap and Bear 1988). Most owls will re-nest if their first nest is destroyed (Haug et al. 1993).
Survivorship is complicated by the development rate and is not fully understood. However, minimum annual survival was calculated in Millsap and Bear's study (1992) and averaged 68% for adult males, 59% for adult females, and 19% for 1 year olds based on 245 reencounters of 601 banded owls.

Vehicle collisions can have a significant impact on burrowing owl populations. In one study, 25% of owl deaths were caused by collisions with automobiles (Millsap and Bear 1988).

2.7 Factors Limiting Population Size

Habitat availability may be the number one limiting factor to burrowing owls in Cape Coral. Clearing of land for development benefits burrowing owls, but this benefit is short-lived as urban land is highly valuable to humans. Additionally, soil composition in the city is variable since much of it is composed of fill or dredged material, thus, not all areas are suitable for nesting even if the habitat is open.

Florida burrowing owls excavate their own burrows; therefore soil composition may be a critical factor affecting habitat availability (Wesemann and Rowe 1987). Virtually all suitable habitats in Cape Coral are manmade (Millsap and Bear 1988). Access to the soil can be limited by the presence of sod, which is used extensively in yards and around businesses.

Florida burrowing owls exhibit strong territory fidelity (Millsap and Bear 1997), which means they may attempt to breed on a territory that was suitable one year, but altered the following year (i.e., by development). At the Homestead General Aviation Airport in Homestead, FL in 1999, three pairs laid eggs on top of the ground after permits were issued in 1994 to take 10 nests (Bowen 2000); productivity of these nests were not provided.

Additionally, in areas with high residential development, forage may be limited due to the frequent application of pesticides. However, data on the effects of lawn pesticides and owl forage are currently lacking.

Section 3: Distribution and Abundance of Burrowing Owls in Cape Coral

3.1 Burrowing Owl 2009 Census

Wesemann and Rowe (1987) studied burrowing owls for a one-year period and determined the number of owls/vacant ha appeared to peak at around 60% development. Millsap and Bear (2000) expanded this study over a four-year period and observed similar responses in owl abundance to development. They observed peak burrow densities in areas with 45-60% development. Additionally, Millsap and Bear (2000) reported that the number of fledglings per nest site increased until development exceeded 45-60% and the number of fledglings per successful nest decreased as development exceeded 60%.

Quest Ecology Inc. (Quest), as part of a Habitat Conservation (HCP) planning grant, was hired by the City of Cape Coral to determine the appropriateness of including burrowing owls in a City-wide HCP. This effort required field studies, including: surveys of nesting burrowing owls within the city limits to provide an estimate of the breeding population of owls; determine the spatial distribution of burrowing owls throughout the City of Cape Coral; and to identify suitable habitat not previously detected in other surveys. The census was conducted from May to August of 2009 by Quest ecologists, City of Cape Coral employees, CCFW members, and volunteers.

3.1.1 Methods

The City was divided into blocks consisting of 2-4 sections. Each section was approximately one square mile. Each block was assigned to a survey team and each team was provided block maps, data sheets, and an example of a completed field data sheet for reference. Blocks were prioritized based on percentage of development and those blocks between 45 and 60% were surveyed first by teams led by Quest ecologists, followed by areas of less than 45%. Potential habitats where burrowing owls were not previously documented were surveyed to identify owl presence or absence by driving along existing streets and scanning for burrowing owls or burrows.

3.1.2 Results

During May and June, the survey teams observed 215 burrows previously undocumented within areas of less than 60% development (Figure 1). Birds were not necessarily observed at every newly documented burrow; however, within high priority survey sections, we counted 190 adults and 207 juveniles for a total of 397 birds. From mid-June through August, surveys continued in sections with greater than 60% build-out without the participation of Quest ecologists and those data are not included here.

Section 4: Managing Cape Coral Burrowing Owl Habitat

4.1 Retaining and Restoring Native Habitat

Native prairie habitat does not exist in Cape Coral. The birds appear to be highly adaptable to non-native habitats and highly altered habitats such as yards. Persistence of the Cape Coral burrowing owl population should not require restoring native habitat, but should focus on maintaining those areas that are suitable in their altered state.

4.2 Maintaining Suitable Habitat

We are accordant with Millsap and Bear (2000) that the City of Cape Coral should pursue long-term management agreements with managers of public properties such as schools, parks, churches, libraries, athletic fields, and business complexes. The agreements would seek to keep these areas (or parcels) free from trees and shrubs, mowed with weed-wackers or push mowers, and free from excessive human disturbance. Additionally, areas with sod should have plugs removed to provide direct access to soil (i.e., so that owls can excavate burrows in otherwise inaccessible soil; Millsap and Bear 2000). In addition we recommend pursuing these agreements

as occupied land is developed. City maintenance crews should be encouraged to continue regular maintenance of vacant lots and city property, as long as mowing does not collapse burrows.
Large occupied areas that can be acquired and managed specifically for owls may be needed, but as the population status is unknown, priority research should focus on population trends throughout the city to determine the true status of the population.

Section 5: Adaptive Management Plan

5.1 Goals

The primary goal of the City of Cape Coral Burrowing Owl Adaptive Management Plan is to sustain a viable population of owls within city limits in perpetuity. This should prevent the species from being uplisted to threatened or endangered, which in turn will prevent hold-ups during development due to legal obligations to the Endangered Species Act. This should be accomplished via acquisition and protection of current nesting and foraging habitat.

5.2 Research and Monitoring

The burrowing owl population in Cape Coral must undergo annual monitoring. There are still numerous data gaps, and conservation and protection will not be completely effective without understanding the distribution, demographics, and population dynamics. It is essential that data from all years are kept separate so that they are comparable and it will be possible to look at long-term population trends. This management plan should be updated with results from research and monitoring activities.

5.3 Recommended Initial Management Plan

A proposed Habitat Preserve Plan (HPP) was developed that included a Base HPP and four alternatives that allow for various levels of habitat acquisition and management (Appendix I). The intent of the HPP is to develop alternatives the City may choose from that each provide, at a minimum, sufficient habitat to sustain a viable population of burrowing owls. To demonstrate this, the number of existing burrows in each alternative was calculated, based on the most recent survey data available, as well as the total acreage of habitat preserved. An average of 1.5 burrows per breeding pair was used to estimate the number of pairs that occur within each alternative (Bowen 2001; Root et al. 2006). The total number of pairs that could potentially be supported by each alternative was estimated by dividing the total area preserved within each by 6.9 breeding pairs per km2 (Millsap and Bear 2000).

The Base HPP represents the “best preservation scenario” in which the maximum amount of occupied habitat and important foraging area is preserved and managed. The base was developed using burrow locations identified through surveys conducted by CCFW, Quest, City employees, and volunteers in 2009 within a target survey area, and all historic burrow locations provided by the City. All parcels containing known burrow locations will be referred to as “occupied” habitat or property. We included a buffer of foraging habitat around each burrow consisting of undeveloped parcels within a 250-meter radius of each burrow, which is the average diurnal foraging area of burrowing owls (Haug et al. 1993). The inclusion of foraging habitat within the

HPP should improve population viability and survivorship. Privately-owned undeveloped lots within sections greater than 60% build-out were not included in the selection of foraging habitat because burrowing owl populations decline when development exceeds 60% (Millsap and Bear 2000). Occupied properties owned by the City, however, were included regardless of the build-out.

Each of the following alternatives were developed using the base as a guide:

- The First Alternative encompasses all City-owned land that is currently occupied by burrows. We began with this minimalist approach because the City owns a considerable amount of occupied property. If this alternative, consisting solely of existing City-owned parcels, can be demonstrated to sustain a viable population, the need for land acquisition may be minimized. This option protects 109 known burrows and 72 burrowing owl pairs.

- The Second Alternative includes the occupied City-owned land and undeveloped lots within a 250-meter radius of each burrow occurring on publicly-owned property. The addition of foraging habitat should improve population viability and survivorship. This option protects 145 known burrows and 96 burrowing owl pairs.
- The Third Alternative includes those lands in the Second Alternative plus several occupied, privately-owned, undeveloped parcels larger than two acres, within Sections of less than 60% build-out. These private properties were selected through aerial interpretation because they contained a concentration of owl burrows and provided connectivity between City-owned occupied properties. This option protects 161 known burrows and 107 burrowing owl pairs.

- The Fourth Alternative includes all properties within the Third Alternative in addition to undeveloped lots within a 250-meter radius of burrows on the aforementioned selected occupied private parcels. This option protects 174 known burrows and 116 burrowing owl pairs.

Because Florida burrowing owls will not be included in the City's Habitat Conservation Plan (HCP), the biological viability of each alternative was not assessed. This should be completed before an alternative is chosen to validate that the HPP can sustain a viable population. After determining biological viability, each alternative should be evaluated based on economic and political factors, allowing the City to choose the most feasible option. The chosen plan may consist of portions of each or a combination of one or more of the alternatives considered.

5.4 Additional Recommendations

Based on current literature, ongoing studies, and personal observation, several other recommendations can be implemented to help sustain the burrowing owl population in Cape Coral:

- We recommend lowering speed limits in areas of high burrowing owl density, as vehicle collisions are a primary cause of death for the birds. Lowering speed limits would give drivers more reaction time to avoid collisions with owls.

- Education is a key to reducing negative human-burrowing owl interactions. We recommend education programs within elementary schools, training for construction crews on how to minimize impacts during construction activities, and general information be made available to the general public.

- We recommend adding a required “burrowing owl conservation fee” to building permits with the monies going into conservation funds to assist with marking burrows, funding studies, conducting burrow maintenance, and possibly acquiring and protecting habitat.

- Management for feral cats and other exotic predators should be implemented.

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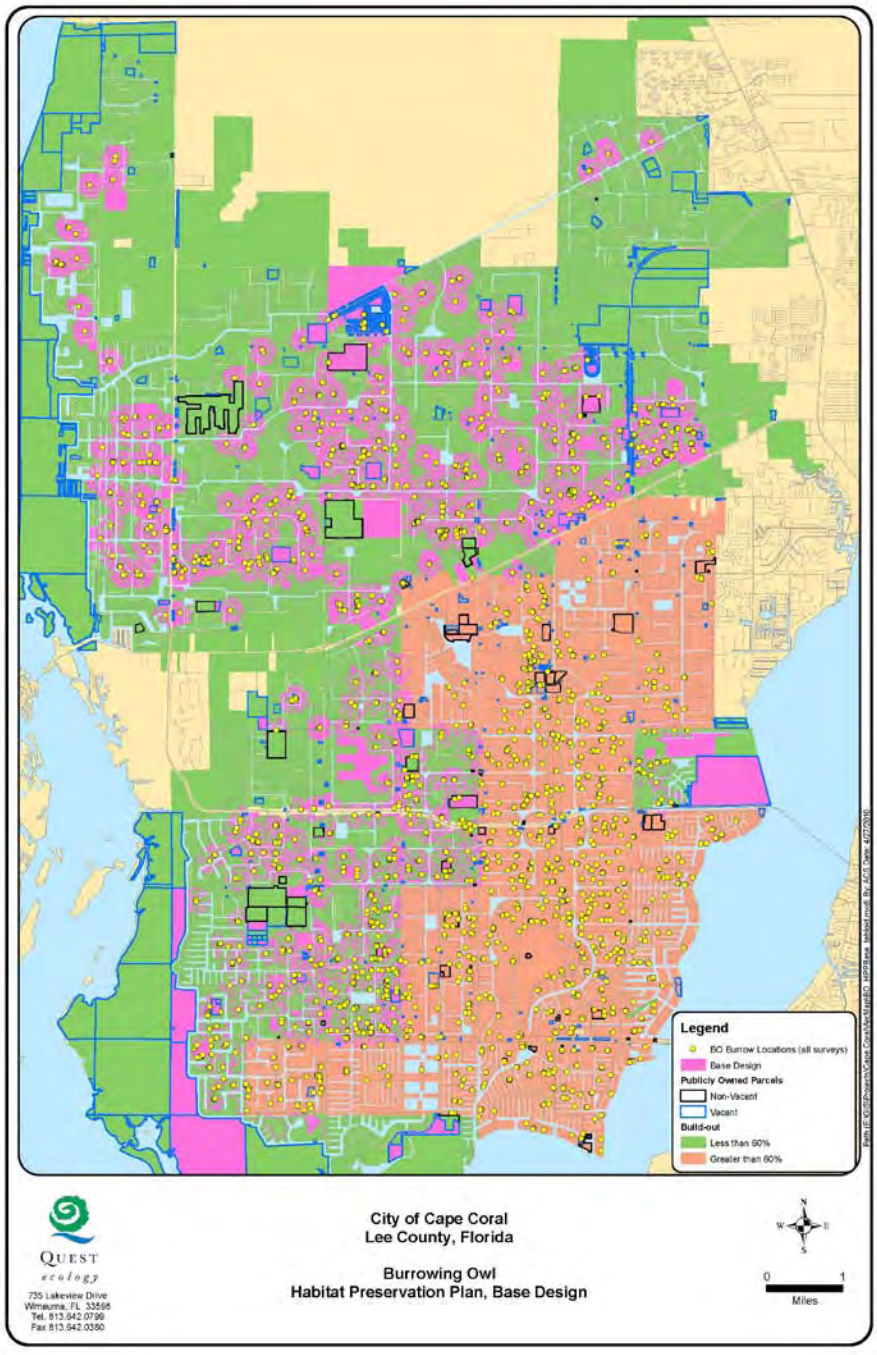
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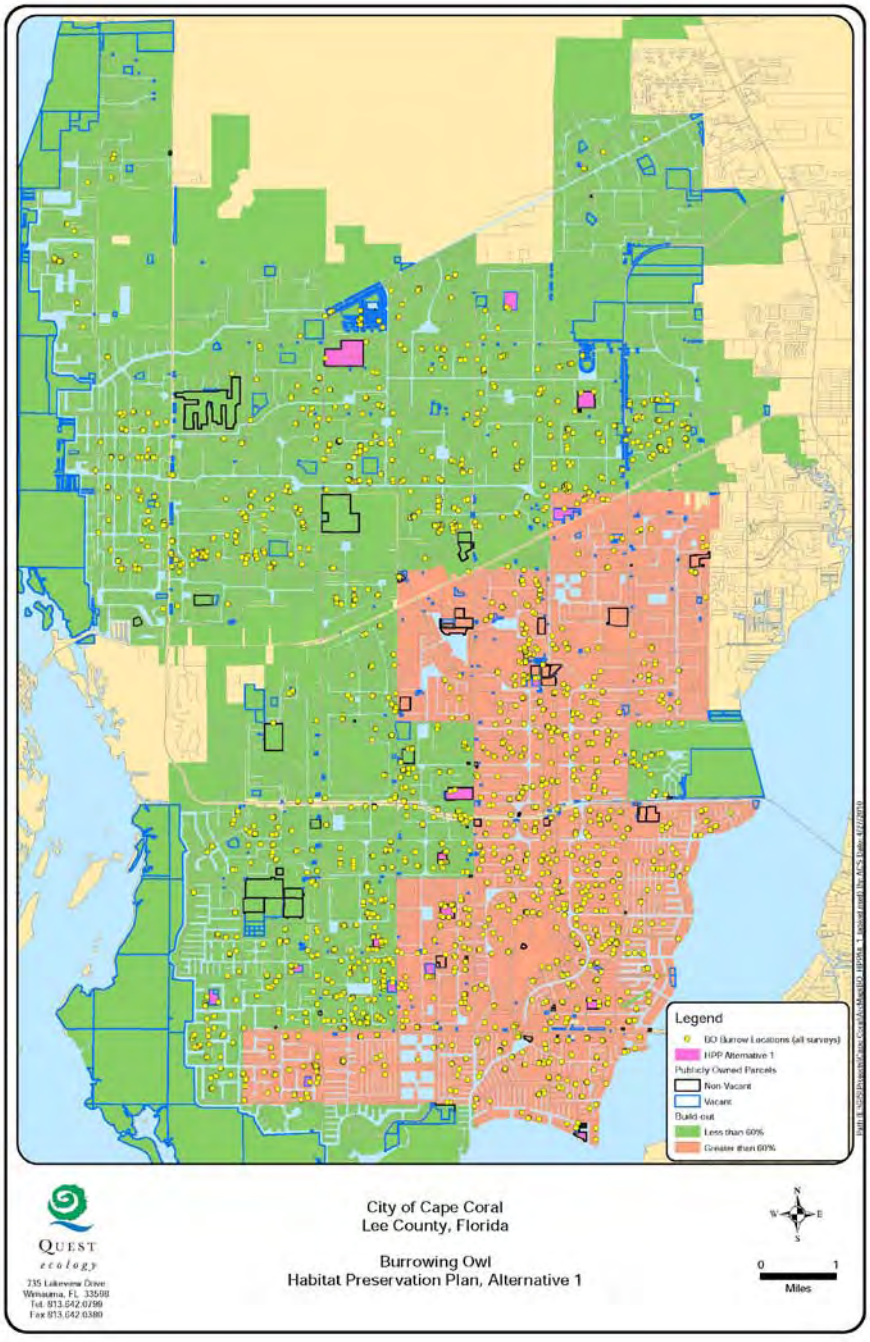
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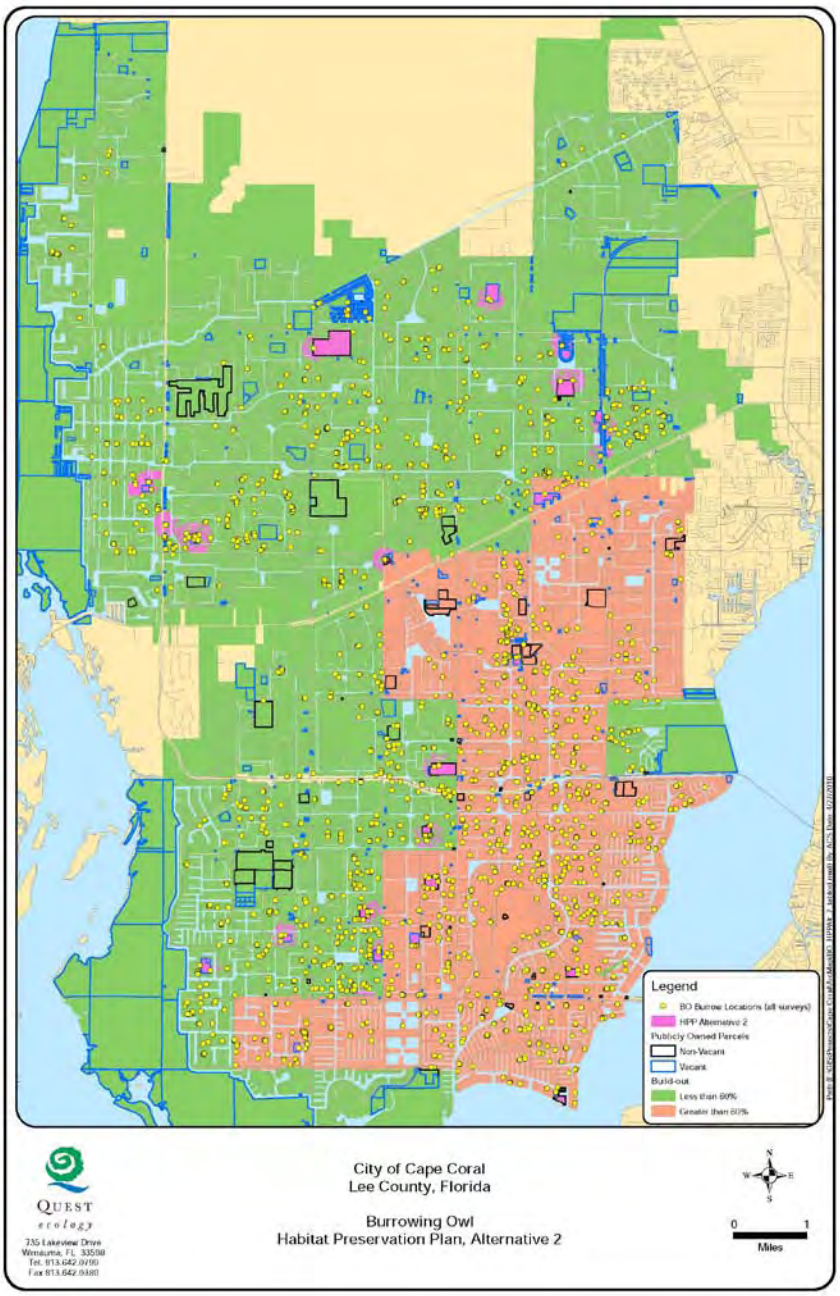
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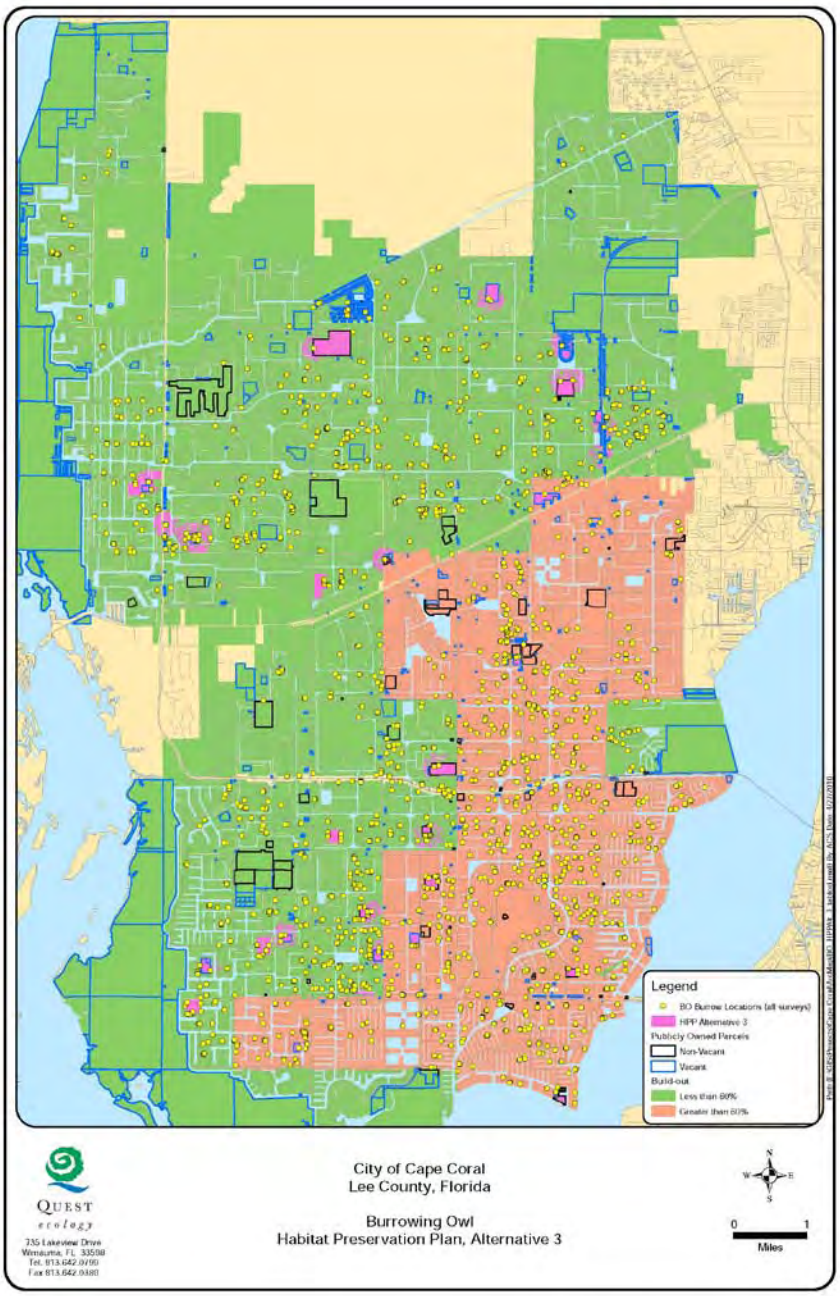
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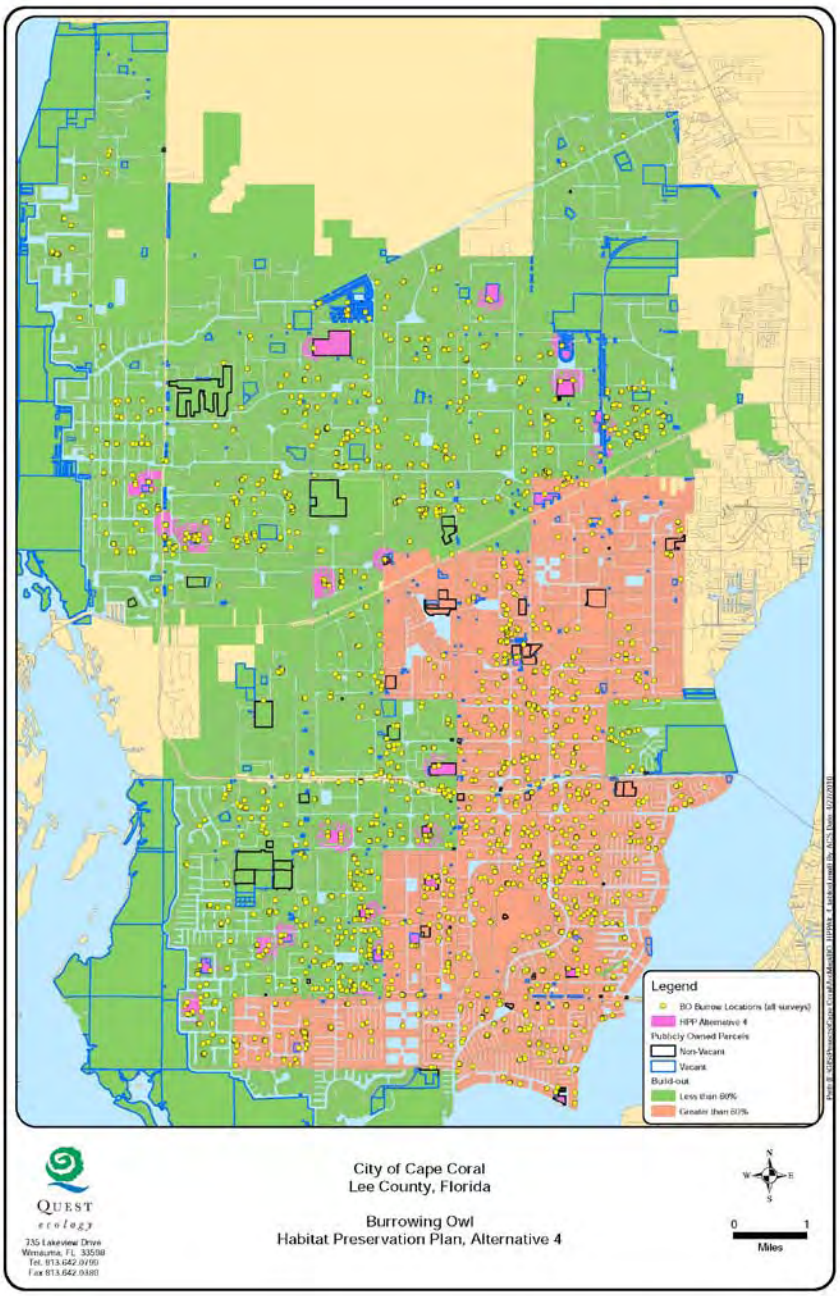
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Effectiveness of Burrowing Owl Conservation Measures
ORG 7730 50 92 900 PROJ 9263 251 3000
2003-04 Annual Report

Florida Fish and Wildlife Conservation Commission
Bureau of Wildlife Diversity Conservation
620 S. Meridian St.
Tallahassee, FL 32399-1600

Investigators: Katherin L. Haley[1], Avian Biologist; Cindy Bear, Avian Biologist; Tom Allen, Avian Biologist; Sarah Smiley, Avian Biologist; Bradley J. Gruver, Assistant Chief; Florida Fish and Wildlife Conservation Commission;
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INTRODUCTION

Current management of the burrowing owl (*Athene cunicularia floridana)* in Florida consists of restrictions on the take of burrowing owl nest sites during the course of land clearing and development. In general, this policy assumes that loss of nest sites as lands develop will not result in widespread population declines because suitable habitat exists for displaced individuals in the local populations. This assumption has not been tested, so the efficacy of the current policy remains unclear. Given heightened uncertainty over the size of the statewide population, determining the effectiveness of the current management program is an important task. This project proposes to determine the number and distribution of burrowing owl nest sites, productivity of pairs, survival of adult and juvenile owls, and dispersal characteristics of adult and juveniles from 2002 – 2007 on the same 39 km^2 study area in Cape Coral, Lee County, as was used for the earlier studies. The studies from 1987 – 1991 in Cape Coral, resulted in quantitative descriptions of: (1) population size and distribution (Wesemann 1987, Millsap and Bear 2000); (2) nesting phenology (Millsap and Bear 1990); (3) territory fidelity, mate fidelity, and natal and breeding dispersal (Millsap and Bear 1997); (4) reproductive success and productivity (Millsap and Bear 2000); and (5) survival (Millsap 2002).

This area represents perhaps the best-case application of the current management program for burrowing owls, as the City of Cape Coral employs a specialist who coordinates burrowing owl development and permitting actions with the BWDC. If the current management program has been effective in maintaining burrowing owl populations in the range of urban to rural landscapes that exist across this study area, then it is likely working effectively elsewhere as well.

STUDY AREA

The study was located in a 39-km^2 area of Cape Coral, Lee County, Florida (81°99'N, 26°57'W). Historically, the area consisted of slash pine forests and tidal swamp (Zeiss 1983). In the 1950's, the area was cleared and drained for development of single-family homes. Today, the area

consists of single-family homes interspersed with vacant lots, including some commercial and industrial areas. Burrowing owls typically nest on vacant lots but may use developed lots if substrate conditions are conducive for burrow construction. We divided our study area into 2.59km^2-sections following township, range and section lines. These 14 sections differ in the degree of development with some sections having a high percentage of developed/vacant lots (93% lots developed) while other sections have low development (23% lots developed).

METHODS

Nest Distribution

Nest Survey- We drove all roads in the study area to locate potential nests between 14 through 16 February 2004. When an owl or burrow was spotted, at least one observer approached the burrow and recorded information regarding burrow activity and site characteristics. After the survey, we returned to the burrows to further monitor activity. The active nests, defined as a burrow where a nesting attempt was occurring, were assigned numbers and mapped. Activity of a burrow was determined in visits during and subsequent to the survey using criteria including:

- Collapsed- burrow destroyed
- Spider webs over entrance
- Tracks present at entrance
- Whitewash present at entrance or on perches
- Pellets present at entrance or near perches
- Prey remains present
- Owl feathers present
- Animal feces present at entrance
- Sod decoration present at entrance
- Trash decoration present at entrance
- Decorations cleared
- Egg shells present at burrow entrance
- Adults seen
- Young seen

Survival

Trapping- We attempted to capture and band adult and nestling owls from 13 March until 6 June 2004. Our first priority was to band the adult pairs and young selected for productivity estimation.

Owls were captured using noose carpets. The noose carpet consisted of a square piece of hardware cloth with attached fishing line tied into nooses. We placed the carpet at the burrow entrance where owls walked over it and became entangled in the nooses. These traps were watched continuously until the targeted owl was captured.

Banding- Owls in our study area were banded with an aluminum color band inscribed with two letters (Acraft Sign and Nameplate Co., Alberta, Canada). These riveted bands were assigned to the right tarsus for adults and the left for nestlings. The U.S. Geological Service bands (size 4,

butt-end) were assigned to the other tarsi. Data taken while banding included weight, sex by presence/absence of brood patch and other characteristics, tail length, wing cord length, hind claw length, eye color, culmen length, and any unusual behavioral or physical characteristics. *Resighting*- Owls at all nests found within the study area were checked for bands throughout the breeding season. Finding previously marked individuals allowed us to estimate survival rates. On May 14 through 16, we surveyed 1.2 km outside of the study area to find marked owls that immigrated or dispersed from the study area. These 14 additional 2.59 km^2 sections are located along the northern and southern boundaries of the study area. The survey was similar to the nest survey conducted in February.

Nest Success and Productivity

Ninety nests found during the survey and through subsequent incidental sightings were randomly selected for productivity estimation. This allowed us a greater than 80% chance of detecting a greater than 15% change from results of studies conducted 1986-1991. If a chosen nest proved to be too difficult to observe (e.g., the entrance was not visible at a distance that would allow adults and nestlings to behave normally), this nest was excluded. Nests that were determined to not be active were also excluded.

Our objective was to determine nest success and productivity. Nest success was defined as the presence of at least 1 young at 24-36 days post-hatch. Productivity was defined as the number of young surviving to the same age interval. Nests were checked once a week to determine nesting activity. Nests thought to have failed were visited for confirmation. At nests where young were seen, we estimated the age of nestlings using the guidelines published by Haug et al. (1993).

To estimate productivity at these nests, we performed a series of three 10-minute nest watches to record the maximum number of nestlings seen together at a given time. Maximum number of nestlings was determined by Gorman, et al. (2003) to be more reliable than mean number as an estimate of relative reproductive rates. Timed counts of nestlings at a specific interval using equal effort will provide reliable estimators for comparisons across the study area where habitat characteristics vary.

Observations were made using binoculars from a vehicle at a distance that did not disturb the nest occupants. If the nest was disturbed, we used a 15-minute settling period before starting the productivity watch. At least six hours separated each nest watch for a nest. All of the series watches were scheduled within a seven-day period. If more time was needed to count nestlings than the formal 10-minute nest watch, we recorded what we saw after the 10 minutes separately from the formal nest watch. Observation periods were one-half hour before sunrise to a maximum of four hours after sunrise and three hours before sunset to a half an hour before dusk.

Natal Dispersal

To deploy transmitters across the differing levels of development in the study area, a designated number of nests were selected from each section. From each of the nests selected, one juvenile owl > 24 days of age and weighing >125 grams was equipped with a radio transmitter.

The transmitters weighed 6-8 g and had a battery life of 9 months (American Wildlife Enterprises, Monticello, FL). Transmitters were attached using backpack harnesses made of 3/16 in Bally Teflon ribbon (Bally Ribbon Mills, Bally, PA). Feather samples were collected in order to determine the sex of each bird using DNA technology (PCR technique, Avian Biotech International, Inc., Tallahassee, Florida).

Locations and status of radio-tagged owls were determined no less frequently than weekly, and owls that could not be found on the study area were searched for from fixed-wing aircraft. When possible, dead owls were recovered within a few days of the mortality and a determination of cause was made based on the evidence found at the site.

RESULTS and DISCUSSION

Nest Distribution

Nest Survey- We surveyed the 14 sections in the study area in half-day sessions over a period of 3 days and found 244 burrows. Through additional observations during the field season, a total of 277 burrows were confirmed to be active nests on the study area.

Survival

Trapping, Banding, and Resighting- We had a total of 255 banded owls on the study area this year. On the study area, nests were monitored weekly and the presence or absence of bands on both the pair was determined in nearly all cases. For the extended survey, we located 176 burrows and found 5 marked owls. We determined band status of both the pair at 81 nests. Due to time constraints, we were not able to consistently return to nests to determine the band status of all individuals. In addition to the marked owls, we found 249 unmarked and 9 remained unknown.

Number of burrowing owls banded March through June 2004, Cape Coral, Florida.
Adult males banded 31
Adult females banded 32
Adult unknown sex banded 1
Nestlings banded 117
Total owls banded 181
Banded owls sighted 79
Dead banded owls recovered 1[a]
[a] not including transmittered owls

Nest Success and Productivity

We selected 90 nests to estimate productivity. Thirteen nests were excluded from analysis because upon closer examination they were not active nests. Of the remaining 77 nests, we observed 22 failures (28.6%) and 55 successes (71.4%). Productivity averaged 2.32 ±0.22 young per nest attempt (n=77). The mean number of young per successful nest was 3.25 ± 0.21 (n=55).

Natal Dispersal

Fifty-seven juvenile owls were equipped with radio transmitters. Locating birds once they left their natal nest was difficult. Our detection distance was approx 0.25 miles on the ground and up to 1 mi when flying at 1000 ft. Our ability to detect the transmitters depended on the owls' location; very poor when the owl was underground or in a cavity and best when the owl was perched high in a tree or building.

Thirty-one (54%) birds survived to the next breeding season. Figure 1 shows the disposition of all radioed birds in 2004. Of the 26 birds that were lost during the year, 4 (34%) were killed by automobiles, 4 birds (33%) were killed by predators, and 3 owls were killed due to accidents such as following into a storm drain or in an uncovered pool (25%, Figure 2).

Mortality was relatively equally distributed between the sexes (Figure 3).The majority of mortality occurred from May through August, a period when young birds are learning to fly and disperse from the natal nests (Figure 4).

Dispersal of juvenile owls began as early as May, and increased each month peaking in September. The majority of young birds dispersed 0.5 to 3 miles from the nest burrow (Figure 5). Distances from the natal nest varied between individuals, but we did not find that females dispersed further than males as in other studies. Fewer females traveled up to 3 miles from the natal burrow (11 females) than did males (14 males). More males traveled over 3 miles to establish burrows than did females (Figure 6).

The peak establishment of new burrows is in October, however, there were a large number of owls that did not establish a burrow until after December (Figure 7). About half the juvenile owls found mates during the first year as of December (Figure 8).

The telemetry project to assess natal dispersal will be continued in the 2004 – 2005 field season.

EDUCATION AND OUTREACH

In order to promote awareness of burrowing owls and our study, we participated in the annual Cape Coral Burrowing Owl Festival. Our participation included an educational display of burrowing owl life history, field trips to observe owls, and slide presentations for both children and adults. In addition, we spoke with newspaper reporters for articles on burrowing owls in SW Florida.

ACKNOWLEDGMENTS

We are especially grateful for the effort of dedicated volunteers who collected data throughout the season: Carolyn England, Charlie Ewell, Carol Kiefer, Cathy Loyola, Kelly Zublick, Susan Scott, Becky Sweigert, and Rick Sosnowski. We thank the employees of The City of Cape Coral for collaborating on this project. We also thank FWC employees for their assistance: Brian

Scheick and Michelle Wilcox. Funding was provided by the Florida Fish andWildlife Conservation Commission's Nongame Wildlife Trustfund.

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EFFECTIVENESS OF FLORIDA BURROWING OWL CONSERVATION MEASURES

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Florida Fish and Wildlife Conservation Commission 620 S. Meridian St. Tallahassee, FL 32399
http://floridaconservation.org/viewing/species/burrowingowl.html

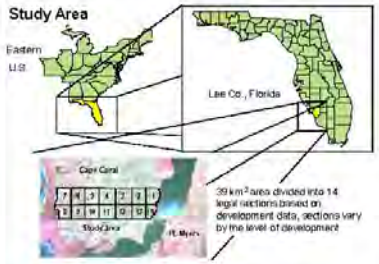
Introduction

- Current management restricts the take of burrowing owl nest sites. Nest site destruction is limited to the non-breeding season (July to February).
- This management assumes that the loss of nest sites will not result in widespread population declines because suitable habitat exists for displaced individuals within the local population.
- We test this assumption by comparing past (1987-1990) to current (2002) demographics of a population of burrowing owls in an area with a high rate of development.

Objective

- Relate trends in population size, nest distribution, and productivity to changes in development on the area since the previous study (1987-1990).

Study Area



City of Cape Coral: single-family homes interspersed with vacant lots and surrounded by canals

Burrowing owls typically nest on vacant lots in the study area.

Methods

- Nest distribution: Driving survey, weekly monitoring to determine nesting activity and success
- Population size: Number of pairs occupying territories (2 adult owls or nest decoration observed at a burrow)
- Productivity:

  1990: all nests, maximum number of young seen above ground on or subsequent to the estimated fledging date (approx. 30-40 days post-hatch), length of visits varied

  2002: 81 randomly selected nests, maximum number of young (24-36 days post-hatch) seen above ground, 3- 10 min observation periods

[1] Katherin.Haley@fwc.state.fl.us

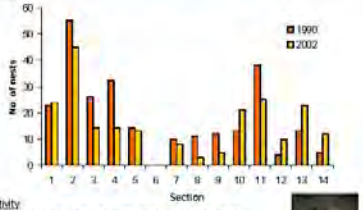
Results

Development

Map of percent of lots developed by section: (a) Section number; (b) The difference in development from 1987-1990 to 2002. All sections showed an increase in development since the previous study (1987-1990 data derived from Millsap 2002).

Nest distribution

A comparison of the number of nests in each section between 1990 and 2002. Six sections showed a decrease in number of nests from 1990, 4 showed an increase, and 4 showed little change.



Productivity

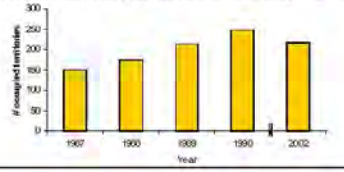
The average number of young raised per pair (N= number of nests). There was a slight increase from 1990 to 2002 although the methods used to derive these estimates are not directly comparable.

Year	Mean	SE	N
1990	1.77	0.10	231
2002	2.11	0.21	81

Juvenile burrowing owl

Population size

The number of occupied territories on the study area in each year. There was a slight decrease (12%) from 1990 to 2002 (1987-1990 data derived from Millsap & Bear 1997).



Discussion

- All sections exhibited large increases in development with half the study area >60% developed in 2002.
- Several sections showed a decrease in the number of nests, although the majority of nests are still in the most developed sections.
- Overall population size is similar to 1989, a 12% decrease from 1990.
- Although productivity estimates between the 2 years are not directly comparable, the data are sufficient to suggest that there has been no substantial decrease in productivity.
- Decreases in nest distribution warrant further study:

  An increase in nest failure found with increasing development (Millsap & Bear 2000)

  A decrease in owl density and number of young fledged/successful nest found at >60% development (Millsap & Bear 2000)

Nest on lot with construction

- Thus far, the current management seems to be effective because this population has not undergone dramatic declines even with the high rate of development in the area.

Future Research

- Continue monitoring: nest distribution, population size, productivity, adult and juvenile survival, natal dispersal
- Mitigate loss of nest sites: Artificial burrow systems (ABS)

  Potential sites: pending development, willing landowners who request state permits to destroy nest sites

  30 ABS installed prior to breeding season

  2 years post-installation: monitor nests to ascertain nest success and productivity

Literature Cited

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Acknowledgments

We thank the dedicated volunteers that monitored nests during the 2002 breeding season: D. Chermow, C. Ewell, C. Kiefer, C. Leyola, S. Scott, R. Sennowski, and R. Sweigert. We thank T. Eason for helpful comments on this poster. The Florida Fish and Wildlife Conservation Commission funded this project through the Florida Nongame Wildlife Trust Fund.

Letter from Amber Crooks

Hi,

The attached growth management document from City of Cape Coral (utilized in their Evaluation and Appraisal Report process) could also be of interest to the Biological Status Review Teams, specifically the team reviewing the status of the Florida burrowing owl.

According to the report, Cape Coral is only ~42% built out, leaving an estimated 25,686 acres for build out, affecting available burrowing owl habitat for the largest owl population in Florida.
The map on page 12 of the report starkly shows the amount of unimproved (no homes) residential lots vulnerable to future development.

Thank you for your consideration,
Amber Crooks
Natural Resources Specialist
Conservancy of Southwest Florida
1450 Merrihue Dr.
Naples, Florida 34102

II. Citywide Assessment

Population Growth

Introduction

Population growth is predicated in part on market forces and the amount of permitted residential development allowed under the City's 2020 Land Use Plan and related zoning codes. The elements and policies of the Comprehensive Plan are shaped in large measure by the anticipated near and long-term population estimates and projections. The projection of the City's future population drives the need for public facilities and services, such as infrastructure, parks and schools. The accuracy of those projections is important for the planning, design, scheduling and budgeting of those facilities and services. In addition, land use and other regulatory changes may be warranted to respond to the needs of a changing population. Without accurate population estimates and projections, local governments may either be unnecessarily wasting resources for unneeded services or are unable to meet concurrency mandates for a growing population.

Cape Coral, a relatively young city incorporated in 1970, is only 42% developed. A vast majority of the City is pre-platted into 5,000 square foot lots (10,000 square foot standard building sites) for residential development. According to the City's growth model, the City's population of 135,791 is projected to reach approximately 413,713 by 2080 (the City's anticipated build-out year).

Methodology

The previous method used to project population growth within the City of Cape Coral was a linear regression analysis. This methodology, while suitable for relatively short time periods, tends to be less reliable, either underestimating or overestimating population growth in the long term. The City retained the services of Paul Van Buskirk, AICP, PE, in 2002 to develop a growth model that could predict long term growth with a greater level of certainty. Paul Van Buskirk recommended application of the Sigmoid Curve, which shows how a biological community including populations of cities, grows over time. Moreover, the use of the Sigmoid Curve allows the projection of growth to build-out rather than by 10-20 year increments, which is the usual time frame for updates to comprehensive plans. The City of Cape Coral's population projections contained herein are to build-out, to the year 2080 with an expected population of 413,713 persons. As of December 1, 2004, the City's permanent population is estimated to be 135,791. The December 1, 2004 functional population is estimated at 160,234. Future growth will not be linear and the most rapid growth period will be during the next 30 years, with a doubling of the current population by 2020.

The City of Cape Coral's population grew from 10,930 in 1970 to 102,286 in the year 2000, a ten-fold increase over a thirty year period. In order to determine and test which growth curve best fit the City of Cape Coral, the first thirty years of the City's growth was graphed. The City's consultant, Paul Van Buskirk, then reviewed the growth curves of

The City has a public hearing for the consideration of the adoption of the 2005 EAR with the Planning and Zoning Commission/Local Planning Agency on January 11, 2005.

The City Council holds non-voting meetings called the Committee of the Whole, to foster discussion of issues that merit an extensive opportunity for exchange of information and comments. The City staff intends to have a discussion of the EAR at the Committee of the Whole meeting on January 18, 2005. The City Council of the City of Cape Coral will hold a public hearing on the adoption of the EAR on January 31, 2005 at 5:05 p.m. in the Council Chambers of the City of Cape Coral.

three other incorporated Florida cities that are essentially built-out and compared them to the first thirty-year growth curve of the City of Cape Coral.

Figure 1 and Figure 2. show that the shape of the growth curves of all three cities (Miami, Tampa, and St Petersburg) are basic sigmoid curves. The curve of the City of Miami nearly mirrored that of Cape Coral.

Figure 1: Population Growth Comparison for Cape Coral, Miami and St. Petersburg

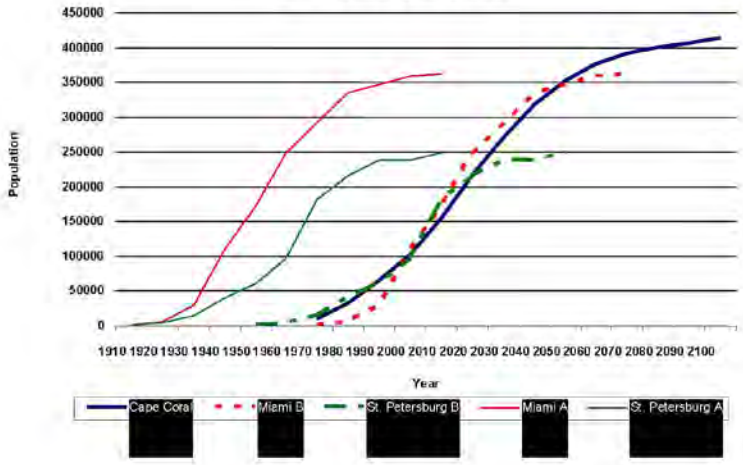


Figure 2: Population Growth of Three Major Cities

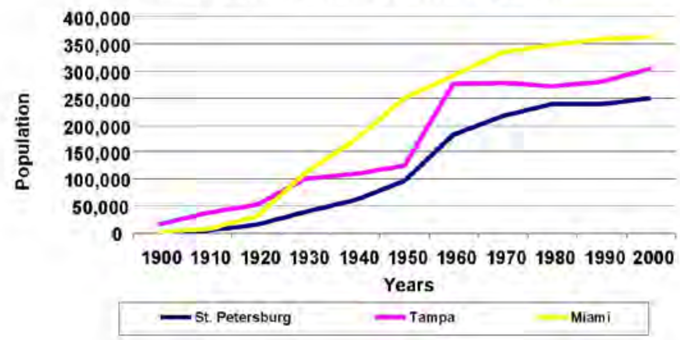


Table shows the population of the City of Cape Coral from the year 2001 to build-out which is estimated to be the year 2080 or slightly thereafter and reflects points on the sigmoid curve at 5 year increments of time. To estimate the functional population of the City, which is the permanent plus seasonal population on the peak day of the year, the permanent population is multiplied by 118%. The functional population multiplier was determined by researching sales tax revenues, traffic counts on major arterial and collector roads internal to Cape Coral, traffic counts on the bridges entering the City, and water use in gallons/per day. This was done on a monthly basis, and all 3 parameters, sales tax revenues, traffic counts and water use all reflected, on average, a peak month increase of 18% above the norm and validated the

Table 1

Table 1: City of Cape Coral, Permanent Population Projection 2001 - 2080

Year	Permanent Projections
2001	106,252
2005	126,738
2010	155,179
2015	187,456
2020	217,893
2025	244,404
2030	272,153
2035	296,109
2040	318,455
2045	337,818
2050	353,858
2055	366,890
2060	377,142
2070	392,031
2080	401,370
2080+	413,713

Table 2

Table 2: City of Cape Coral, Minority Population Projections For Years 2001 2010

Year	Total Population	Hispanic	Percent Hispanic	Black	Percent Black	Asian	Percent Asian
2000	102,286	8,521	8.33%	2,046	2.00%	1,251	1.22%
2001	107,377	9,336	8.69%	2,461	2.29%	1,346	1.25%
2002	112,468	10,392	9.24%	2,876	2.56%	1,442	1.28%
2003	117,559	11,435	9.73%	3,291	2.80%	1,537	1.31%
2004	122,650	12,509	10.20%	3,706	3.02%	1,633	1.33%
2005	127,740	13,522	10.59%	4,123	3.23%	1,728	1.35%
2006	133,452	14,331	10.74%	4,311	3.23%	1,824	1.37%
2007	139,164	15,410	11.07%	4,499	3.23%	1,919	1.38%
2008	144,876	15,949	11.01%	4,687	3.24%	2,015	1.39%
2009	150,588	16,756	11.12%	4,875	3.24%	2,110	1.40%
2010	156,298	17,567	11.24%	5,066	3.23%	2,206	1.41%

-3-

functional population multiplier. Lee County has adopted this methodology and applied a similar multiplier on a countywide basis. In a manner similar to the projection of the total City population, the minority population was projected for the period of 2000-2010. This was accomplished by reviewing the minority population growth curves of locations in Florida that exhibited characteristics similar to that of Cape Coral. It is interesting to note that the total minority population in 1970 was 20 persons, 1980, 654 persons and 1990, 4567 persons. Table shows the results of that analysis and subsequent projection.

The Cape Coral Interactive Growth Model (CCIGM)

Once the overall population projection of the City of Cape Coral was completed, as described previously, it was concluded by City planning staff that the next logical step was to determine the spatial distribution of that population over time and in manageable areas. From this initial conclusion, the development of the first truly interactive growth model began in earnest.

Like Cape Coral, many communities across the nation are experiencing extraordinary growth, greater pressure for services and disproportionately lower tax dollars to balance these realities. The model can be used by governmental agencies to weigh different growth-related scenarios and the positive/negative impacts of fiscal decisions.

Typical growth models only allow planners to look at growth in a static manner, which does not change over time, does not provide for new trends, nor community or regional expansions and contractions. This new interactive growth model allows new data to be input over time thus producing better, more accurate projective outputs.

Typical inputs into the model included the comprehensive plan, including approved development projects, the future land use map, parks master plan, transportation and utilities master plans, schools, GIS information and census data. In all, some 50 variables were considered and the resultant outputs were displayed in graphic and tabular formats.

The interactive nature of the growth model means that if, for example, the location and timing of roads, water and sewer lines are delayed or advanced in a particular location; the overall picture of that area as well as other parts of the community will likewise change. Thus, community leaders have a clearer understanding of the implications of their decisions and can maximize the investment of public and private dollars.

The application of the interactive growth model across City department lines has already occurred, including Planning, Economic Development, Parks and Recreation, ITS/GIS, Public Works, the Fire Department and the Police Department. The Growth Model has been used to update the MPO's transportation model, important to ensure that necessary transportation improvements are programmed and that the City receives its fair share of state funding. The general public, the real estate and development community, and other outside governmental agencies have expressed strong interest in the model.

It is believed that the interactive growth model will benefit the manner in which a community plans and utilizes its resources for the maximum benefit to the greatest number of its citizens. Figure 3 and Figure 4, show a comparison of the population distribution between the years 2001-2020. Moreover, Figure 3 and Figure 4 are graphical examples of one of many outputs of the Interactive Growth Model.

Figure 3: Residential Population for Cape Coral, 2001

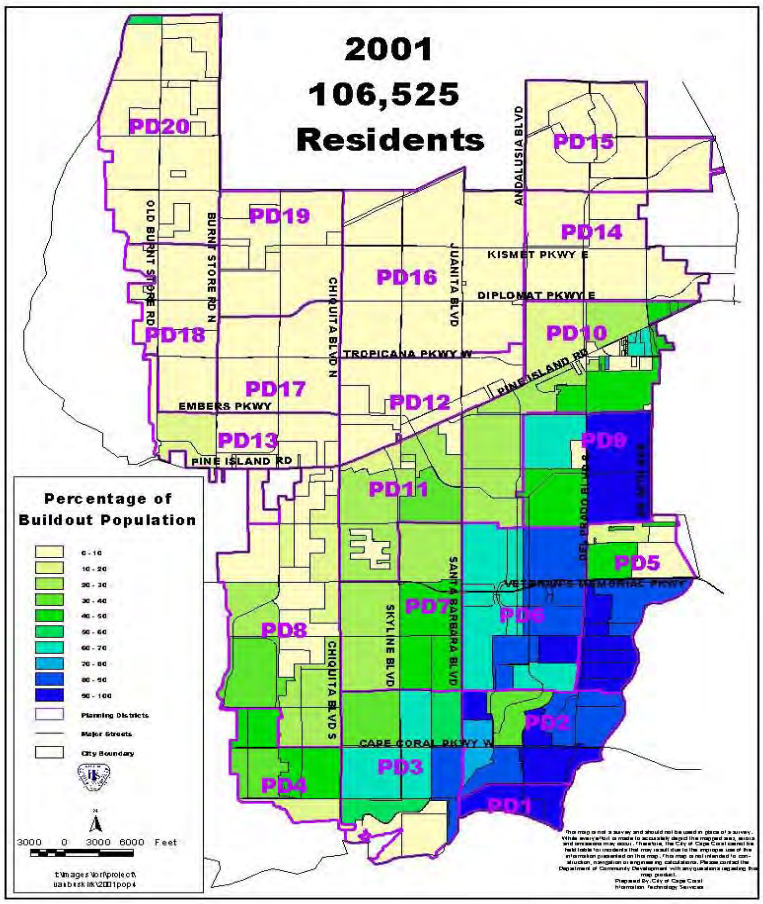
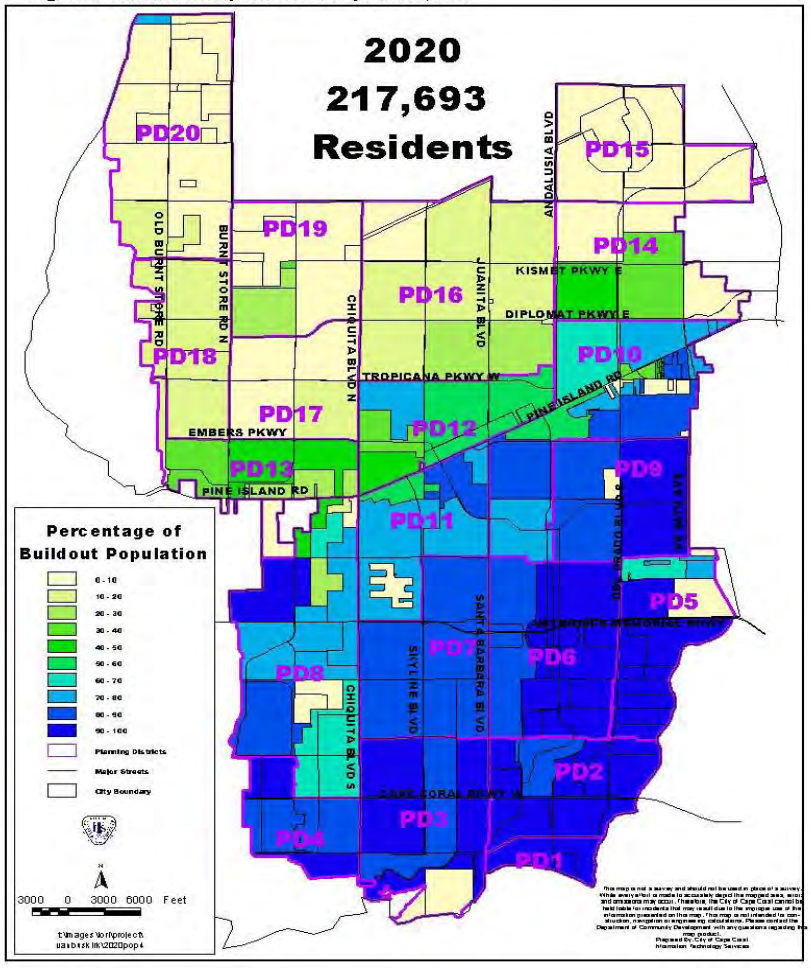


Figure 4: Residential Population for Cape Coral, 2020



Vacant land for future development

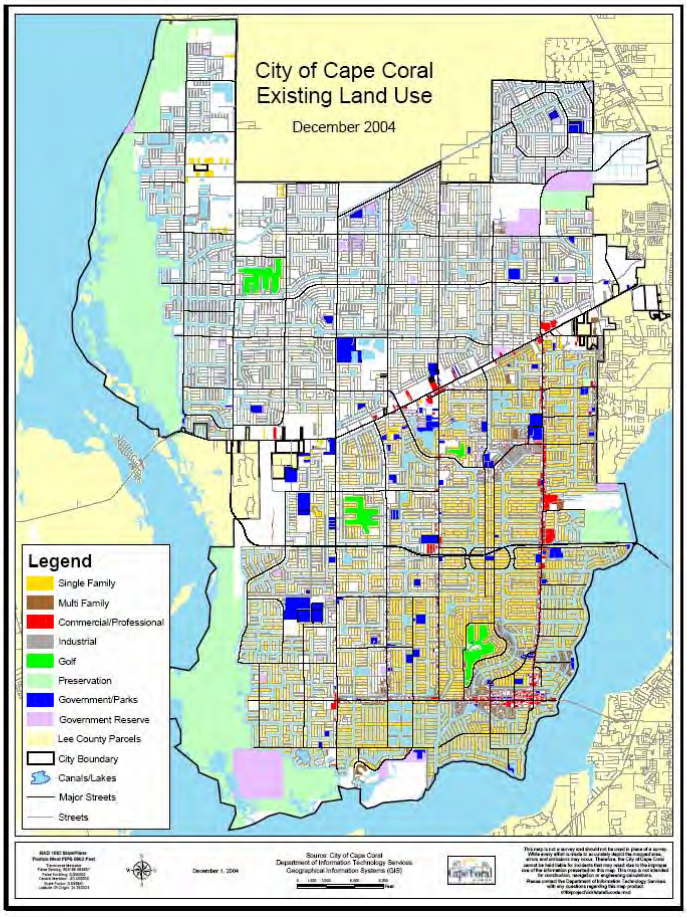
As was the case at the time of the original adoption of the City of Cape Coral Comprehensive Plan in 1989, with the exception of lands designated as Natural Resources/Preservation and larger undeveloped parcels, virtually all of the lands are designated for and are suitable for development. Some exceptions include lands in primary bald eagle zones and natural systems on sites which should be preserved.

Most of the undevelopable land, designated as Natural Resources/Preservation is located along the City's western edge, between the Spreader Waterway and Matlacha Pass. This preservation land also wraps around a portion of the southern edge along the Caloosahatchee River. This land is predominantly part of the Matlacha Pass State Aquatic Preserve. Because most of Cape Coral's lands have been pre-platted and prepared with fill material, only a few wetlands and upland natural resource habitats occur on portions of some unplatted parcels, providing development opportunities on virtually every parcel not designated as Natural Resources/Preservation.

Since the inception of the City, the dominant parcel size has been 10,000 square feet. Electric and telecommunication facilities are available to all parcels, although special fees may exist in more remote areas. A roadway network provides access to virtually all parcels. The ownership of parcels varies from the most typical situation of ownership of one single parcel per owner to ownership of hundreds of parcels by a corporate owner. However, even these owners of many parcels typically do not own many parcels that are adjacent to each other. Presumably, many of the vacant land owners have intentions to develop the vacant land for their own enjoyment, while others hold the land for investment purposes.

The location of existing development in relation to the location of development as anticipated in the Comprehensive Plan.

Because virtually all lands other that those designated as Natural Resources/Preservation and portions of some larger parcels are generally suitable for development, it has always been anticipated that all lands suitable for development will eventually be developed. It has been anticipated that development would have a propensity to occur in areas that have City water and wastewater service available. These service areas are primarily within the Urban Services Infill Area. Recently completed utility service expansion areas and those under design and/or construction are located in the Urban Services Transition Area. This propensity for development to occur in areas served by City water and wastewater has generally occurred. It is possible to get a good sense of where City water and wastewater service areas are located, just by looking at an aerial view of the City. However, as has always been anticipated, significant development has occurred in the unserved areas, as well.


City of Cape Coral
Existing Land Use
December 2004
Legend
Single Family
Multi Family
Commercial/Professional
Industrial
Golf
Preservation
Government/Parks
Government Reserve
Lee County Parcels
City Boundary
Canals/Lakes
Major Streets
Streets
Source: City of Cape Coral
Department of Information Technology Services
Geographical Information Systems (GIS)

This development in areas not served by City utilities is indicative of the pre-platted nature of the City and the presumed vested right of small parcels, owned by diverse individual owners, to develop their properties. The open area surrounding sites not served by City utilities coupled with the initial reduced costs of septic and well water has recently spurred residential sprawl in the non-service areas. This sprawl creates land use and natural resources issues. This scattered single family development limits future land use and development opportunities. The continuous draw down of single family wells creates saltwater intrusion at some locations and potential risks to future water quality and quantity of the offended aquifers. It also creates economic issues for residents who must hook up to City services at a later time. The result is an almost random pattern of development in the Urban Services Reserve area. The primary exception to the random pattern is, as could be expected, where attractors, such as saltwater, and to a lesser extent, freshwater frontage exists. Other growth magnets are facilities such as golf courses, schools, and proximity to major transportation routes. All of these growth magnets were anticipated at the time of adoption of the 1989 City of Cape Coral Comprehensive Plan.

Review of the future land use map amendments for the past seven years suggests something with regard to the location of development. By far, the largest amendments have occurred in the southwestern portions of the City. The typical amendment in these locations was conversion from the Urban Services Reserve Area to the Urban Services Transition Area. Simultaneously, these same lands, by and large, were amended from Single Family and Multi-Family by PDP (not an appropriate classification for lands in the Urban Services Infill or Transition Areas) to Single Family. Growth was attracted to the saltwater access properties. Also, the construction of the Veterans Memorial Parkway and the Veterans Memorial Bridge across the Caloosahatchee River attracted growth to the southwestern areas. As a result, the City extended water and wastewater utility services to many of these areas, further increasing their growth rates. The other predominant type of future land use amendment was conversion from some type of residential use classification to Commercial/Professional, indicating the market demand for additional lands for commercial and/or professional uses.

School Locations

An assessment of the success or failure of coordinating future land uses and residential development with the capacity of existing and planned schools, establishing with the school board appropriate population projections and coordinating the planning and siting of new schools

Generally, proposed schools are being and have been constructed proximate to the population base responding to Cape Coral's rapidly increasing rate of school-aged population. The City has cooperated with the school with siting issues, including selling some City-owned property to the Lee County School Board at a site previously planned entirely for a community park. The City still plans a community park facility adjacent to the Ida Baker High School. Moreover, the City is in the design and permitting process to develop a City charter elementary school proximate to this location. The City also plans

a charter school near the corner of Chiquita Boulevard North and Kismet Parkway. The City offered a portion of its land at the Academic Village site, on Del Prado Boulevard north of Kismet Parkway, to the Lee County School Board, although this offer was declined. The Lee County School Board is currently constructing an elementary school next to the Trafalgar Middle School and also next to Gulf Middle and Elementary Schools. It is also building a middle school next to the Mariner High School and has opened a modular facility on the Lee County High Tech Center site.

Neither the Lee County School Board, the BBER, nor the City of Cape Coral had accurately projected the extent of the growth rate Cape Coral has experienced in recent years. Also, the state mandated maximum classroom size and school size had not been anticipated by the School Board requiring an accelerated pace of school facility development. Although the construction of schools is progressing, both the City of Cape Coral and the Lee County School Board acknowledged that improvements could be made. To further improve and define this relationship, the City has requested that the Lee County School Board enter into an an interlocal agreement with the City. Some of the issues the City has asked the Lee County School Board to address include landscape buffering, sidewalks surrounding the school and traffic signal improvements at locations affected by school related traffic.

The Extent of Vacant & Developable Land

Background:

Section 163.3191 (2)(b), Florida Statutes, requires Evaluation & Appraisal Reports to assess the extent of vacant and developable land within the relevant jurisdiction. In Cape Coral, non-residential development is restricted by nature of the City's Future Land Use Map. However, the City's pre-platted nature makes it difficult for the City to restrict residential development in its Urban Service Reserve Area. The recently proposed amendments that create the Commercial Activity Center and amended Mixed Use land use classification would help reduce residential growth in the Urban Services Reserve Area. The amendment restricts new growth in the Urban Service Reserve Area based on water consumption and sewage production, similar to that of a single family home. This would allow some small commercial growth, where none would have previously been permitted. Although generally under current conditions it is anticipated that most of the City's vacant and continue to developable land will develop as residential. Figure 5: Vacant & Improved Residential Parcels illustrates the vacant and improved residential parcels in the City.

Figure 5: Vacant & Improved Residential Parcels

Analysis

Staff's analyzed the extent of vacant and developable land by using current data (December 6, 2004) from the City's ITS/GIS Department and the Lee County Property Appraiser's Office. There are shortcomings to relying on the data from Lee County Property Appraiser's Office due to some discrepancies in adequately describing commercial and industrial lands. However, in order to demonstrate consistent trends over a time, the City will continue to analyze the best data available.

Table 1: Developable and Vacant Land

USECODE	Description	COUNT	ACRES
00	Vacant Residential	73,311	22,185
10	Vacant Commercial	2,945	1,750
40	Vacant Industrial	83	305
70	Vacant Institutional	23	44
51	Cropland Soil Class I	3	72
61	Grazing Land Soil Capability Class II	11	586
62	Grazing Land Soil Capability Class III	3	34
63	Grazing Land Soil Capability Class IV	2	80
64	Grazing Land Soil Capability Class V	7	238
65	Grazing Land Soil Capability Class VI	2	161
66	Orchard Groves and Citrus	1	9
68	Dairies, Feed Lots	6	41
69	Ornamentals, Misc Agriculture	14	209

Source: City of Cape Coral, Department of Community, December 2004
Data Collected from Geographic Information System, Parcel file (December 6, 2004)

Based on current data, there are approximately 63,364 acres in Cape Coral not including canals and roads. Approximately, 27,186 acres or 42% of Cape Coral consist of developed land. In addition, approximately 25,686 acres or 40% of Cape Coral consists of developable and vacant land. Canals and roads within the City consist of approximately, 15,346 acres or 25 square miles. Croplands in the City are considered an interim use and should be reviewed for its appropriate future land use based on location and accessibility to major roads in the City. Table 2 shows a comparison of vacant lands in 1988 and 2004. In addition, Figure 6 illustrates the vacant and improved commercial parcels in the City.

Figure 6: Vacant & Improved Commercial Parcels

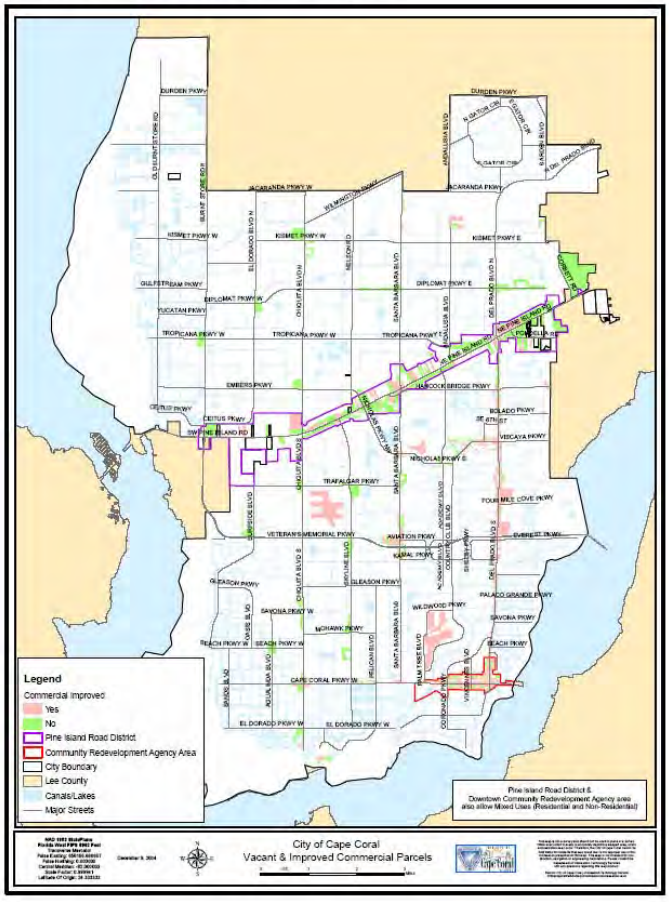


Table 2: Comparison of Vacant Lands, 1988 and 2004

State Land Use Code	Description	1988 Acres	2004 Acres	Change	Percent Change
00	Vacant Residential	34,229	22,165	-12,064	-35%
10	Vacant Commercial	690	1,750	1,061	154%
40	Vacant Industrial	305	305	0	0%
70	Vacant Institutional	22	44	22	99%

Table 3 summarizes the amount of developed land in the City based on the State of Florida Land Use Codes

Table 3: Developed Land

Table 3
LAND USE ACREAGES CITYWIDE
BY STATE LAND USE CODE

USECODE	DESCRIPTION	1988 ACRES	2004 ACRES	CHANGE	% OF CHANGE
VACANT LANDS					
00	Vacant Residential	34,229	23,165	-11,064	-33%-
10	Vacant Commercial	690	1,750	1,061	154%-
40	Vacant Industrial	305	305	0	0%-
70	Vacant Institutional	22	-44	22	99%-
SUBTOTAL		35,245	24,264	-10,982	-31%
RESIDENTIAL LANDS					
01	Single Family	5,092	11883	6,791	133%
02	Mobile Homes	20	7	-13	-65%
03	Multi-Family - More than 10 units	18	62	44	244%
04	Condominia (undeveloped)	3	2	-1	-33%
05	Cooperatives	0	0	0	0%
06	Retirement Homes	0	6	6	0%
07	Miscellaneous Residential	0	0	0	0%
08	Multi-Family - Less than 10 units	342	574	232	68%
11	Developed Condominia	365	0	-365	-100%
SUBTOTAL		5,840	12,534	6,694	115%
COMMERCIAL LANDS- INCLUDES PROFESSIONAL USES					
11	Commercial Store (One Story)	61	111	50	82%-
12	Mixed Use	71	14	-57	-80%-
13	Department Stores	6	41	35	583%-
14	Supermarkets	16	51	35	219%-
15	Regional Shopping Center	13	34	21	162%-
16	Community Shopping Center	37	81	44	119%-
17	One Story office building - Non-professional svs.	83	108	25	30%-

18	Multi-story buildings; Non-professional use	6	12	6	100%
19	Professional	20	37	17	85%
20	Airports, bus terminals, marine terminals; piers, marinas	47	10	-37	-79%
21	Restaurants, Cafeterias	24	39	15	63%
22	Drive-in restaurants	0	8	8	0%
23	Financial Institutions	24	32	8	33%
24	Insurance company offices	0	4	4	0%
25	Repair services shops (excluding automotive, auto, TV repair, laundries, Laundromats	12	9	-3	-25%
26	Service Stations	5	8	3	60%
27	Auto sales, repair, etc.	19	45	26	137%
28	Parking Lots	37	14	-23	-62%
29	Wholesale, Manufacturing, and Produce Outlets	0	0	0	0%
30	Florists	5	0	-5	-100%
SUBTOTAL		486	658	172	35%
COMMERCIAL LANDS- INCLUDES PROFESSIONAL USES, cont					
31	Drive-in Theaters, Open Stadiums	0	0	0	0%
32	Enclosed Theatres	3	1	-2	-67%
33	Nightclubs, cocktail lounges, bars	4	3	-1	-25%
34	Bowling alleys, skating rinks, pool halls	6	5	-1	-17%
35	Tourist attractions, etc.	5	10	5	100%
36	Camps	0	0	0	0%
37	Race Horse, Auto, Dog Tracks	0	0	0	0%
38	Golf courses, driving ranges	308	370	62	20%
39	Hotels, motels	10	10	0	0%
SUBTOTAL		336	399	63	19%
INDUSTRIAL LANDS					
41	Light manufacturing (includes machine shops)	38	39	1	3%
42	Lumber Yards, Sawmills	0	0	0	0%
43	Fruit, Vegetables, Meat Packing	0	0	0	0%
44	Packing plants (fruit, vegetables and meats) Canneries, Fruit & Vegetable Vegetable Bottlers	0	0	0	0%
45	Breweries Distillers, Wineries	0	0	0	0%

46	Other Food Processing	0	0	0	0%
47	Mineral processing (includes cement, rock and gravel plants)	5	0	-5	100%
48	Warehousing, distribution terminals, trucking, etc.	101	168	67	66%
49	Industrial Storage	0	0	0	0%
SUBTOTAL		144	227	83	58%
AGRICULTURAL LAND					
51	Cropland Soil Class I	0	0	0	0%
52	Cropland Soil Class II	0	0	0	0%
53	Cropland Soil Class III	0	0	0	0%
60	Grazing Land Soil - Capability Class I	516	0	-516	-100%
61	Grazing Land Soil Capability Class II	0	908	908	0%
62	Grazing Land Soil Capability Class III	0	34	34	0%
63	Grazing Land Soil Capability Class IV	0	60	60	0%
64	Grazing Land Soil - Capability Class IV	617	238	-379	-61%
65	Grazing Land Soil Capability Class VI	0	161	161	0%
66	Orchard Groves and Citrus	0	0	0	0%
67	Poultry, Bees, Tropical Fish, Rabbits, etc.	0	0	0	0%
68	Dairies, feed lots	525	41	-484	-92%
69	Ornamentals, miscellaneous agricultural (includes tree farms, nurseries)	197	209	12	6%
SUBTOTAL		1,855	1,350	-505	-27%
INSTITUTIONAL LANDS					
71	Churches (includes synagogues)	209	225	16	8%
72	Private schools	7	14	7	100%
73	Privately-owned hospital	20	0	-20	-100%
74	Homes for Aged	0	36	36	0%
75	Orphanages	0	38	38	0%
76	Mortuaries, cemeteries, crematoriums	30	32	2	7%
77	Clubs, lodges, union halls	38	53	15	39%
78	Sanitariums, convalescent and rest homes	2	8	6	300%
79	Cultural Organizations	0	55	55	0%
SUBTOTAL		306	461	155	51%
GOVERNMENT AND PUBLIC USE					
80	Undefined	0	0	0	0%

81	Military		0	0	0%
82	Forests, parks, recreational (includes preservation lands)	8,015	8121	106	1%
83	Public schools and property owned by School Board	368	558	192	53%
84	Public colleges (Apparently and erroneously identified property)	0	0	0	0%
85	Public hospitals (Although open to the public, the Cape Coral Hospital is a privately owned, not for profit facility)	29	49	20	69%
86	County and non-municipal local governments	13	677	664	5108%
87	State government other than military	101	156	55	54%
88	Federal government	10	10	0	0%
89	Municipal government (except parks, recreational areas)	871	7356	1,485	170%
91	Utility, gas and electricity, etc	36	63	27	74%
92	Mining Lands	0	0	0	0%
93	Subsurface Rights	0	1	1	0%
94	Rights-of-way, streets, roads, irrigation canals, ditches, etc	81	10	-71	-88%
95	Rivers and Lakes, Submerged Lands	92	52	-40	-43%
96	Sewage disposal, solid waste, borrow pits, drainage, reservoirs, waste lands, marsh, sand dunes, swamps	184	80	-104	-57%
SUBTOTAL		9,796	12,131	2,335	24%
UNDEFINED					
97	Outdoor Recreational	1	3	2	164%
99	Acreage not zoned agricultural	796	772	-24	-3%
-	Other Undefined Land Use Codes	768	0	-768	-100%
SUBTOTAL		1,565	775	-790	-51%
GRAND TOTAL		63,804	64,154	350	1%

Excludes most roads and canals

Source: City of Cape Coral, Department of Community, December 2004
Data Collected from Geographic Information System, Parcel file (December 6, 2004)

Has the City met the demands of growth?

Introduction

Since 1997, the last time the Comprehensive Plan was revised, the permanent population of the City of Cape Coral has grown 50%. At that time, the vast majority of residential and commercial development was concentrated in the southern and southeastern areas of Cape Coral, with Del Prado Boulevard and Cape Coral Parkway as the two major thoroughfares. Since then, residential development moved westward, whereupon most of the GAC units south of Pine Island are 30% or more developed. This is an important threshold as that is the number needed to make utility expansion projects financially feasible, yet the full development patterns of the area have not been completely set in stone. With the completion of Veterans Memorial Parkway, commercial development has commenced or is slated to commence at major intersections along this thoroughfare. The Pine Island Road District, with its inventory of larger, non-platted properties, and access to Interstate 75, is beginning to tout itself as the main commercial district of Cape Coral. However, with all of this growth which has occurred in the past 15 years, the City has martialed its resources to meet the demands of growth on infrastructure, including utility, transportation, and parks to provide public services and facilities, all in a financial feasible manner.

Utilities

Currently, approximately 94,124 people living in Cape Coral have full municipal water, sewer, and irrigation utilities. Another 5,643 city residents have municipal water and irrigation, but no sewer. The proportion of the City's population which has full utility service is 73% in 2004, which is estimated to reach 87% by 2020.

Much of the reason why so many people live with central water and sewer – approximately 30,000 residents - is due to the platted lands configuration of Cape Coral. Due to vested rights reasons, the City is compelled to allow single family residential development virtually anywhere in the City that does not have central water and sewer. As a result of the tremendous growth experienced by the city in recent years, land values have been rapidly increasing, which makes home construction in the Urban Services Reserve Area a more attractive proposition. In times of high growth, this growth in the Reserve Area could prove to be challenging to growth management. Since 1997, the number of domestic (potable water) wells permitted annually has increased from 460 to 2,811 in 2003, to approximately 4,000 wells by December 2004. The total number of

domestic wells permitted from 1997-2004 is 11,990 (includes an estimated 747 wells permitted in 1999). Domestic wells comprised 93% of the wells permitted by the City during this period.

Because of the number of people living with municipal utilities, the City has embarked on an aggressive campaign to provide such services to its citizens. Since 1997, approximately 3,978 acres of the City of Cape Coral has been brought into the Urban Service Infill and Transition Area from the Urban Services Reserve Area – in addition to the area already in the Infill and Transition at that time, just less than 40% of the City's land area has full municipal utilities. Given the fact that this area contains 73% of the population of the City of Cape Coral, this shows that despite its platted lands composition, the City has been somewhat successful in reining in sprawl.

Table 4

Potable Water Demand Forecast			
Year	Estimated Mid-Year Population	Percent Served	Forecast Mid-Year Population Served
2005	144,205	74	107,108
2006	154,398	76	117,660
2007	162,483	79	128,827
2008	170,717	81	140,674
2009	179,044	84	153,090
2010	188,140	88	165,475
2020	284,262	87	246,821
2030	308,314	98	302,661
Build Out	413,713	100	413,713

Source: Draft Facilities Master Plan (2004), Table 1.3

Transportation

When the City of Cape Coral was incorporated in 1970, the City had a large network of local, collector, and arterial roads within its city limits, a legacy of the Gulf American Corporation, the original developers of Cape Coral. The City has approximately 1,400 miles of roads within its borders, which meant that the City did not need to aggressively expand its transportation network. The City has jurisdictional responsibility over all but 35 miles of its 1,400 miles of roads. However, there have been some changes to the City's road network since 1997. For example, Veteran's Parkway was completed in late 2002, connecting Colonial Boulevard in Fort Myers to Burnt Store Road. Work was begun in late 2004 to widen Pine Island Road (SR 78) from Santa Barbara Boulevard to Chiquita Boulevard from 2 to 4-lanes.

In terms of traffic congestion, the City's entire roadway system has relatively little traffic congestion, with only three road segments exceeding their adopted Level of Service

(LOS) standards. These roads include Cape Coral Parkway, from Leonard Street to SE 6th Avenue; SE 47th Terrace west of Coronado Parkway; and Pine Island Road west of Santa Barbara Boulevard. Of these three roadways, the City's transportation department is currently conducting traffic engineering studies to improve mobility on Cape Coral Parkway, the Capital Improvement Plan has set aside $3 million dollars to improve circulation in the Community Redevelopment Area (which includes SE 47th Terrace) and the Florida Department of Transportation is beginning construction on that segment of Pine Island Road.

Parks and Recreation

Providing sufficiently sized parkland for a city of 136,000 people is a challenging task, particularly when the City is a platted lands community, where landowners can and often do develop on lands designated as a future park site when there are not sufficient monies allocated for acquisition. In 2002, the Parks and Recreation Department completed their master plan, which identified and discussed the objectives and priorities facing that department. The following table lists the level of service recommendations of the Parks and Recreation Master Plan, adopted in 2002:

Table 5

Facility Type	Population Served	Need'	Existing 2004	Surplus/ Deficit
Basketball Hoops	3,500	39	103	64
Bicycle Trails (Linear Mile)	5,000	27	30 (estimate)	3
Boat Ramp Lanes	10,000	14	7	-7
Baseball/Softball Field	3,500	39	37	-2
Exercise Course	15,000	9	5	-4
Golf Course	100,000	1	3	2
Football/Soccer Field	28,000	5	18	13
Horseshoe Court	12,500	11	23	12
Picnic Tables	725	187	333	146
Equipped Play Areas	10,000	14	21	7
Racquetball Court	25,000	5	13	8
Senior	50,000	3	2	-1

Center				
Shuffleboard Court	25,000	5	10	5
Aquatic Center	40,000	3	3	0
Tennis Court	10,000	14	26	12
Volleyball Court	25,000	5	11	6

[1]Footnote: Need is determined by dividing the LOS standard into the current population, 135,791.

This City intends to use these recommendations from the Parks and Recreation Master Plan as a basis for revising the level of service standards of parks facilities. Any revision to the level of service standards will be done such that the Comprehensive Plan would remain financially feasible. Further discussion of the Parks and Recreation Master Plan is available in the brief assessment of the Recreation and Open Space Element.

Lately, the Parks and Recreation Department has been focusing its resources on purchasing land in northern Cape Coral, for the proposed Festival Park area, a 217-acre park site. Unfortunately, as shown above, the Parks and Recreation system has a few facilities below their level of service requirements. These facilities include boat ramps, softball/baseball fields, exercise courts and senior centers.

Financial Feasibility in the Capital Improvements Element

The following objectives and policies will state the City's commitment to providing the necessary infrastructure for future growth. These objectives and policies are located in the City's Capital Improvements Element, as required in s. 163.3191(2)(c) F.S.. For every objective or policy stated, a brief evaluation is provided to address whether the objective or policy has been achieved.

Objective 1: "Capital Improvements will be provided to accommodate desired future growth, and to update or replace facilities in an economically efficient manner, as indicated in the Five (5) Year Schedule of Improvements."

This objective has been achieved, for the City does use a 5-Year Capital Improvements Plan to better prepare for the needs of the future. This plan is updated annually.

Policy 1.4: "The Five Year Schedule of Capital Improvements shall be financially feasible and contain realistic projections and estimates of revenues and expenditures."

This policy has been achieved. The Capital Improvements Plan is an integral part of the annual budget process of the City of Cape Coral, which would require a base of realistic projections and estimates of revenues and expenditures.

Policy 1.6: "In identifying revenue sources for capital improvements, the City should explore innovative financing techniques such as public/private partnerships, new cost saving and efficient construction techniques, or incentives to developers to install infrastructure."

This policy is being achieved. In addition to the techniques listed above, the City also applies for state and federal grants for capital improvements.

Policy 3.1: "The City of Cape Coral will continue to collect an impact fee for water and sewer on all new development to assess a pro rata share of the cost to finance improvements necessitated by such development."

This policy has been achieved. In addition to the impacts fees listed above, the City also collects an impact fee for parks and recreation for new development.

Policy 3.2: "The City of Cape Coral will continue to collect a parks and recreation impact fee to finance the acquisition of land for major and community parks."

The policy has been achieved.

Policy 3.3: "The City of Cape Coral will continue to collect a Road Impact fee on all new development in order to assess a pro rata share of the cost needed to finance transportation improvements necessitated by such development."

This policy has been achieved.

Policy 3.4: "The City Council or their designee will annually review the fee schedules of all impact fee ordinances and adjust the fee schedules to reflect the pro rata share of costs needed to finance improvements necessitated by new development."

This policy has been achieved. This is necessary for it gives the City the ability to be proactive and prepare to give the City enough funding for infrastructure improvements during a high growth period.

Policy 3.5: "The City will continue to require the dedication of land or fees in lieu thereof as a condition of plat approval for the provision of right-of-way acquisition and recreation and open space."

This policy has been achieved.

Policy 3.9: "The City shall expand and diversify the revenue sources available to the City for required public improvements."

This policy is being achieved. The City has been aggressive in bond financing utility infrastructure, and has considered the possibility of utilizing a public service tax (the City

is one of three municipalities in Florida that does not use a public service tax). An attempt to finance park improvements in 2003 was rejected by a close margin.

Policy 4.2: "The City will continue to adopt a five year capital improvement program and annual capital budget as part of its budgeting process."

This policy has been achieved. This process ensures that the City will continue to provide the necessary infrastructure for future growth in a financially feasible manner.

Conclusion

Overall, the City has prepared its Comprehensive Plan in a manner, which would meet the demands of future growth. A greater percentage of commercial and industrial land relative to residential needs to be achieved to address the growth related needs for goods, services and jobs. Regarding transportation infrastructure, the City has done a very good job, as only three roadways are currently failing their level of service, and each of these roadways are having studies or construction performed to bring these roadways back to their adopted level of service. In terms of utility infrastructure, the City provides water and sewer utility service to 70% of the population, which is quite an accomplishment given the City's large size. As mentioned previously, the City is aggressively pursuing a utility expansion program to bring these services to 87% of the population by 2020. However, for Parks and Recreation, there have been some identified deficiencies. This is due to the Department's need to balance an urgent land need with the need to develop facilities on its property. Currently, the Department's priority is land acquisition, which is appropriate since there is a deficiency for parkland within the City of Cape Coral. Once the Department completes its land acquisition priorities for Festival Park and Lake Kennedy, the Department should be able to direct its resources to develop facilities on its existing property.

Brief Assessment of Successes & Shortcomings of Each Element

Capital Improvements Element (CIE)

Section 163.3177(3)(a) Florida Statues requires that "The comprehensive plan shall contain a capital improvements element designed to consider the need for and the location of public facilities in order to encourage the efficient utilization of such facilities . . ." The purpose of the capital improvements element is to evaluate the need for public facilities as identified in the other comprehensive plan elements and as defined in the applicable definitions for each type of public facility, to estimate the cost of improvements for which the local government has fiscal responsibility, to analyze the fiscal capability of the local government to finance and construct improvements, to adopt financial policies to guide the funding of improvements and to schedule the funding and construction of improvements in a manner necessary to ensure that capital improvements are provided when required based on needs identified in the other comprehensive plan elements.

The CIE addresses park facilities, utilities, and traffic circulation facilities. The specific requirements of these facilities are addressed in the Recreation and Open Space Element, the Infrastructure Element, and the Traffic Circulation Element. The element is concerned with how such facilities are scheduled, prioritized, and funded, addressing a single goal:

The City of Cape Coral will undertake all necessary actions to insure that adequate public facilities and services are provided in a manner which protects public and private investment in existing facilities, and promotes orderly, compact and efficient urban growth.

Five objectives support this goal. Generally, the objectives are to provide adequate facilities for future growth, limit public expenditures in coastal high-hazard areas, ensure that future development bears a proportionate share of public facility costs, ensure that fiscal resources are available to pay for needed facilities, and coordinate the issuance of development orders and permits with the availability of public facilities and infrastructure.

Brief assessments of each of the five objectives are provided below. Also provided below are assessments of certain selected supporting policies.

Objectives Analysis

Objective 1. Capital improvements will be provided to accommodate desired future growth, and to update or replace facilities in an economically efficient manner, as indicated in the Five (5) Year Schedule of Improvements.

Objective Achievement

Capital Improvements continue to be provided in accordance with the schedule of improvements updated annually within the Asset Improvements Program. The City should revise the Capital Improvements Element in conjunction with the annual revisions of the Asset Improvements Program.

Policy 1.1. The City of Cape Coral will schedule and fund all capital improvement projects needed to correct existing deficiencies as identified in the Five Year Schedule of Improvements and listed in the Future Land Use, Infrastructure, Recreation and Open Space, Transportation, Housing, Natural Resources and Coastal Management, and the Capital Improvements Elements.

Table 6

Existing Deficiencies-Existing CIE	Current Status
Transportation	
(1) Cape Coral Parkway - Santa Barbara Boulevard to Del Prado Boulevard	Completed expansion to six-lane width along with intersection and drainage enhancements. Additionally, the City has extended the six-lane and intersection enhancement project west from Santa Barbara to Chiquita Boulevard
(2) SE 47th Terrace - Del Prado Boulevard to Coronado Parkway	Curb and Gutter system installed, however, project is not detailed as to what it was for.
(3) State Road 78 (Pine Island Road) - Santa Barbara Boulevard to Del Prado Boulevard	Completed
Park & Recreation Facilities	
(1) Neighborhood Parks	Adopted Level of Service is being met. 3 neighborhood parks built – Giuffrida, Lake Saratoga, and Camelot parks. However, a new Level of Service Standard is needed.
(2) 2 Bocce Courts	Completed at Lake Saratoga Park and at Veterans Park
(3) 4 Shuffleboard Courts	Not Completed
Drainage	
(1) Community Redevelopment Area - Phase II	Completed
(2) Santa Barbara Boulevard Drainage Implementation	Completed
Utilities (Water, Sewer, Irrigation)	
(1) Upgrade Master Lift Station 236 (200)	Completed
(2) A utility master plan - feasibility study must be completed, as per the Infrastructure Element, in order to determine future needs and the financial feasibility of expanding potable water, central sewer, and dual water (irrigation) utility services.	Completed

Policy 1.2. Capital improvement projects included in the Five Year Schedule of Improvements will be evaluated by the City Council or their designee and funding

priority assigned. Ultimately, the City Council annually approves an update to the Asset Improvements Program, which has the effect of assigning funding priority.

Policy 1.4. The Five Year Schedule of Capital Improvements shall be financially feasible and contain realistic projections and estimates of revenues and expenditures.

The Five-Year Schedule of Capital Improvements has been financially feasible and generally contains realistic projections, as well as estimated revenue and expenditures.

Policy 1.6. In identifying revenue sources for capital improvements the City should explore innovative financing techniques such as public/private partnerships, new cost saving and efficient construction techniques, or incentives to developers to install needed infrastructure.

The City of Cape Coral has implemented a Deferred Payment Program for the Utilities Extension Program whereby a customer can take advantage of not having to pay the special assessment annually. The program allows the customer to pay what they can when they can.

The City has not generally evaluated public/private partnerships except in the area of utilities where line extensions are involved. The City is in the process of developing policies associated with the potential use of public/private partnerships on City-owned vacant land.

Objective 2. Hazard Mitigation and Coastal High Hazard. The City will limit future public expenditures for infrastructure and service facilities which subsidize growth within coastal high hazard areas, except for expenditures for public land acquisition or enhancement of natural resources.

The City has not developed any public facilities within the coastal high-hazard area, other than recreational facilities, facilities which enhance natural resources, infrastructure funded by the residents of those areas (utility expansion areas), and other infrastructure needed to serve vested uses on pre-platted lots.

Policy 2.2. Pursuant to S. 163.3202, F.S., the City will revise its Land Use and Development regulations to require that all public facilities except for recreational facilities, shall not be located by the City within the coastal high hazard zone.

As indicated above the City has not developed facilities contrary to this Comprehensive Plan intent. While there has been no modification of the City's Land Use and Development regulations related to this policy, the City considers the policies of its Comprehensive Plan in planning for its facilities and taking action for approval or disapproval. Therefore, a change in the City's Land Use and Development regulations would not have any practical effects in implementing this policy.

Policy 2.4. By 2000, the City will establish programs of incentives and regulation that prevent the placement of private or public investment in locations of high risk to damage or destruction from the effects of tropical storms and hurricanes.

Although the City has not developed public facilities in the CHHA, inconsistent with the provisions of the Comprehensive Plan, the City has not adopted incentives and regulation that prevents the placement of private or public investment in locations of high risk to damage or destruction from the effects of tropical storms and hurricanes. The City should revise the date, as some limitations on certain types of facilities is reasonable.

Objective 3. All future development will bear its proportionate share of costs for facility improvements necessitated by the development in order to maintain the adopted level of service (LOS) standards.

The City continues to collect impact fees for roads, parks and recreation, and water and sewer utilities.

With the rapid growth of the previous three years, impact fees have not been sufficient to meet the needs of the adopted levels of service (LOS) standards.

In 1999, Council adopted a road impact fee with a five year phase in schedule beginning in 2000. The impact fee calculated in 1999 should have been collected beginning in 2000 and revised again in 2002 and then again in 2004. The Road Impact Fee is currently being analyzed by a consultant.

Park Impact Fees were increased in 2002, effective for 2003. The impact fees were increased by $662, although the study recommended an increase to $1,426 or an increase of $973 to meet the needs of a ten year park master plan.

Utility Impact Fees were increased in 2001 with a phased in approach over five years. The phase-in period ended in two years with no increase for three years. The City recently increased the impact fees by 90% to meet the needs of a water and wastewater plant expansion program over the next five years.

Fire Impact Fees were increased in 2004 and are well posed to meet the needs of the Fire Department's growth needs in the future.

Policy 3.4. The City Council or their designee will annually review the fee schedules of all impact fee ordinances and adjust the fee schedules to reflect the pro rata share of costs needed to finance improvements necessitated by new development.

An annual review of the impact fees is prepared by staff for review by the City Council. Generally, impact fees should not be updated annually. It is more appropriate to review on a bi-annual basis. The purpose behind this is due to the uncertainties inherent in the fourth and fifth years of a five year plan. Generally, years one through three are fairly

stable as to priorities and the ability to accomplish the plan, however, with new priorities and changes in the plan, years four and five will change as the need arises. Therefore, every two years meets the needs of years one through three and during the third year the City is processing for the next three years.

We have not annually adjusted fees unless it was due to a phased in approach to the impact fees being charged. The City should revise this policy, accordingly.

Policy 3.9. The City shall expand and diversify the revenue sources available to the City for required capital improvements.

The City has not expanded and diversified the revenue sources available to the City for required capital improvements. Consideration of such diversification has been proposed but has been rejected.

Policy 3.11. By 2000, the City shall initiate a public information program which promotes and emphasizes the link between the provision of infrastructure and the promotion of efficient economic development.

The Utilities Master Plan Update, (Dames & Moore, 1998) adopted a criteria table for prioritizing locations of future utilities expansion program areas. Although it is difficult to assess the perception of the citizens, this concept is probably well understood, and the policy should be revised to indicate that this should be an ongoing activity.

Table 7

CAPITAL IMPROVEMENTS PROGRAM

DEPARTMENT	FUNDING SOURCE	2005	2006	2007	2008	2009	TOTAL
PUBLIC BUILDINGS							
Fire station #9 construction pelican	Debt Proceeds		1,200,000				1,200,000
Fire station #10 construction	Debt Proceeds				1,500,000		1,500,000
Fire station #11 construction	Debt Proceeds						1,600,000
Fire station #1 construction	Debt Proceeds		1,900,000			1,600,000	1,900,000
Art studio building	Debt Proceeds		2,000,000				2,000,000
Charter elementary school south	Debt Proceeds	9,000,000					9,000,000
Charter elementary school 240th	Debt Proceeds			18,000,000			18,000,000
Charter high school	Debt Proceeds				30,000,000		30,000,000
Total Public Buildings		**9,000,000**	**4,700,000**	**18,000,000**	**31,500,000**	**1,600,000**	**64,300,000**
LEISURE & HUMAN SERVICES							
Yacht Club							
East seawall	General Fund		1,400,000				1,400,000
Improvements as per master plan	General Fund		2,000,000	2,000,000	1,000,000	1,000,000	6,000,000
Parks							
Master Plan Existing Parks							
Festival park fund	Debt Proceeds		1,900,000	1,500,000			3,400,000
Festival gathering area fund	Debt Proceeds		8,000,000				8,000,000
Master Plan New Parks Development							
Neighborhood park # 7 development	Debt Proceeds		575,000	628,318			1,203,318
Neighborhood park #10 development	Debt Proceeds				3,175,519		3,175,519
Community park # 1 development	Debt Proceeds		8,676,320	8,676,320			17,352,640
Regional park #1 (major) development	Park Impact Fee		5,750,000	5,000,000	5,000,000		15,750,000

6 boat access parks development	Debt Proceeds	-	800,000	250,000	250,000	250,000	1,550,000
SW community park development	Debt Proceeds	1,000,000	-	-	-	-	1,000,000
Chantry canal boat development	Park Impact Fee	1,000,000	500,000	-	-	-	1,500,000
Environmental park #1 development	Park Impact Fee	250,000	1,250,000	-	-	-	1,500,000
Festival gathering area development	Debt Proceeds		10,000,000				
Master Plan New Parks Land Acquisition							
Neighborhood park #10 land	Debt Proceeds	1,600,000	-	-	-	-	1,600,000
Community park #1-SW land	Park Impact Fee	-	420,000	420,000	420,000	-	1,260,000
Community park #2-lake mead land	Park Impact Fee	-	1,552,000	-	-	-	1,552,000
Total Leisure & Human Services		**3,850,000**	**42,423,520**	**18,474,838**	**9,845,519**	**1,250,000**	75,843,877
COMMUNITY REDEVELOPMENT AGENCY							
Parking garage	Debt Proceeds	-	15,000,000	-	-	-	15,000,000
Total Community Redevelopment Agency		-	**15,000,000**	-	-	-	**15,000,000**
POLICE							
Public safety building design	General Fund	1,800,000	-	-	-	-	1,800,000
Public safety building construction	Debt Proceeds	-	22,000,000	-	-	-	22,000,000
Training facility	Debt Proceeds	-	-	750,000	1,000,000	2,500,000	4,250,000
Total Police		**1,800,000**	**22,000,000**	**750,000**	**1,000,000**	**2,500,000**	28,050,000
PUBLIC WORKS							
Project Planning and Construction							
North spreader waterway lock	General Fund	-	300,000	-	1,000,000	4,000,000	5,300,000
Services							
Drainage Improvements	Stormwater Revenues	900,000	500,000	1,000,000	1,000,000	1,000,000	4,400,000
CRA Phase II Drainage Improvements	Stormwater Revenues	400,000	-	300,000	2,700,000	-	3,400,000
Total Services		**1,300,000**	**500,000**	**1,300,000**	**3,700,000**	**1,000,000**	**7,800,000**
Transportation							
Signalization/intersection improvements	Road Impact Fees	230,000	230,000	230,000	230,000	230,000	1,150,000
Bikeway pedestrian improvements	Five Cent Gas Tax	397,797	400,000	400,000	400,000	400,000	1,997,797
Bikeway pedestrian improvements	General Fund/Grants	100,000	301,627	400,000	100,000		1,401,627

Access management improvements	Road Impact Fees	1,000,000	1,000,000	1,000,000	1,000,000	500,000 1,000,000	5,500,000
Santa barbara roadway improvements	Road Impact Fees	7,800,000	3,370,000	-	-	-	11,170,000
Santa barbara roadway improvements	Five Cent Gas Tax	2,300,000	2,730,000	2,600,000	-	-	7,830,000
Del prado widening	Road Impact Fees	-	11,000,000	1,750,000	700,000	-	13,450,000
Local road resurfacing	Six Cent Gas Tax	2,375,000	1,795,000	1,852,500	1,974,500	2,977,100	10,973,600
Local road resurfacing	General Fund	250,000	250,000	250,000	250,000	250,000	1,250,000
Pave north four lane road/residential	Debt Proceeds	18,000,000	-	-	-	-	18,000,000
Chiquita boulevard improvements	Road Impact Fees	-	485,000	2,400,000	12,170,000	8,500,000	23,555,000
Chiquita boulevard improvements	Five Cent Gas Tax	-	280,000	-	2,665,000	3,500,000	6,445,000
SR 78 widening	Grants (Fed, State, Local)	-	8,300,000	1,000,000	7,600,000	-	16,900,000
Medina landscaping	General Fund	422,140	340,120	344,480	325,000	300,000	1,731,740
Downtown revitalize improvements	Road Impact Fees	250,000	750,000	1,000,000	1,000,000	-	3,000,000
Andalusia/cultural connection	Road Impact Fees	700,000	-	2,300,000	-	-	3,000,000
Acidemic village design/construction	General Fund	-	-	2,735,000	-	-	2,735,000
Total Transportation		**34,024,937**	**31,231,747**	**18,261,480**	**28,414,500**	**16,787,100**	128,089,764
Utilities							
Administration							
Replace vitrified clay gravity sewer pipe	Water/Sewer User Fees	-	3,000,000	3,000,000	3,000,000	4,000,000	12,000,000
Water Production							
North RO plant design	Debt Proceeds	1,716,000					1,716,000
North RO plant construction	Debt Proceeds	-	30,864,000	-	-	-	30,864,000
North irrigation watermain design	Debt Proceeds	480,000					480,000
North irrigation watermain construction	Debt Proceeds	-	1,920,000	-	-	-	1,920,000
Everest expansion design	Debt Proceeds	5,320,000					5,320,000
Everest expansion construction	Debt Proceeds	-	21,280,000	-	-	-	21,280,000
Aquifer storage and recovery wells	Water/Sewer Impact Fees	490,000	1,500,000	1,500,000	1,500,000	1,500,000	6,490,000
Water Reclamation							
North WRF design	Debt Proceeds	3,860,000	-	-	-	-	3,860,000
North WRF construction	Debt Proceeds		15,360,000				

Forcemain interconnect design	Debt Proceeds	984,000	-	-	-	-	984,000
Forcemain interconnect construction	Debt Proceeds	-	5,936,000	-	-	-	5,936,000
New clarifier (SW) improvement	Water/Sewer User Fees	-	-	1,500,000	-	-	1,500,000
New ABW (SW) additional filter clarifier	Water/Sewer User Fees	-	1,500,000	-	-	-	1500,000
Utility Extension							
SW IV potable water distribution	Assessment Debt	372,414	9,720,000	-	-	-	10,092,414
SW IV potable water transmission	Water/Sewer Impact Fee	41,379	1,080,000	-	-	-	1,121,379
SW IV irrigation water distribution	Assessment Debt	372,414	9,720,000	-	-	-	10,092,414
SW IV irrigation water transmission	Water/Sewer Impact Fee	41,379	1,080,000	-	-	-	1,121,379
SW IV wastewater collection	Assessment Debt	1,117,242	29,160,000	-	-	-	30,277,242
SW IV wastewater transmission	Water/Sewer Impact Fee	124,138	3,240,000	-	-	-	3,364,138
SW V potable water distribution	Assessment Debt	-	360,000	9,180,000	-	-	9,540,000
SW V potable water transmission	Water/Sewer Impact Fee	-	40,000	1,020,000	-	-	1,060,000
SW V irrigation water distribution	Assessment Debt	-	360,000	9,180,000	-	-	9,540,000
SW V irrigation water transmission	Water/Sewer Impact Fee	-	40,000	1,020,000	-	-	1,060,000
SW V wastewater collection	Assessment Debt	-	1,080,000	27,540,000	-	-	28,620,000
SW V wastewater transmission	Water/Sewer Impact Fee	-	120,000	3,060,000	-	-	3,180,000
SW VI potable water distribution	Assessment Debt	-	-	360,000	11,880,000	-	12,240,000
SW VI potable water transmission	Water/Sewer Impact Fee	-	-	40,000	1,320,000	-	1,360,000
SW VI irrigation water distribution	Assessment Debt	-	-	360,000	11,880,000	-	12,240,000
SW VI irrigation water transmission	Water/Sewer Impact Fee	-	-	40,000	1,320,000	-	1,360,000
SW VI wastewater collection	Assessment Debt	-	-	1,080,000	35,640,000	-	36,720,000
SW VI wastewater transmission	Water/Sewer Impact Fee	-	-	120,000	3,960,000	-	4,080,000
SE I potable water distribution	Assessment Debt	157,419	-	-	-	-	157,419
SE I potable water transmission	Water/Sewer Impact Fee	17,491	-	-	-	-	17,491
SE I irrigation water distribution	Assessment Debt	1,579,388	-	-	-	-	1,579,388
SE I irrigation water transmission	Water/Sewer Impact Fee	175,488	-	-	-	-	175,488
SE I wastewater collection	Assessment Debt	30,228,481	-	-	-	-	30,228,481
SE I wastewater transmission	Water/Sewer Impact Fee	3,358,720	-	-	-	-	3,358,720
SW VII potable water distribution	Assessment Debt	-	-	-	360,000	4,284,000	4,644,000
SW VII potable water transmission	Water/Sewer Impact Fee				40,000	476,000	516,000
SW VII irrigation water distribution	Assessment Debt		-	-	360,000	4,284,000	4,644,000

SW VII irrigation water transmission	Water/Sewer Impact Fee				40,000	176,000	216,000
SW VII wastewater collection	Assessment Debt				1,080,000	12,852,000	13,932,000
SW VII wastewater transmission	Water/Sewer Impact Fee				120,000	1,428,000	1,548,000
Total Utilities and Expansion		**56,415,953**	**135,360,000**	**59,000,000**	**72,500,000**	**28,300,000**	**351,575,953**
TOTAL CAPITAL IMPROVEMENTS PROGRAM		**106,390,890**	**251,515,267**	**115,786,318**	**147,960,019**	**55,407,100**	**677,059,594**
SUMMARY OF REVENUES	**Assessment Debt**	53,827,358	59,400,000	47,700,000	61,200,000	21,420,000	243,547,358
	Debt Proceeds	47,840,000	144,611,520	29,894,838	35,925,519	4,330,000	262,631,877
	Fire Impact Fees	-	-	-	-	-	-
	Five Cent Gas Tax	2,897,797	3,440,000	3,000,000	3,065,000	3,900,000	16,272,797
	General Fund	3,773,340	8,591,747	5,729,480	2,673,000	6,850,000	27,617,567
	Grants (Fed, State, Local)		8,300,000	1,000,000	7,000,000	-	16,300,000
	Park Impact Fees	1,250,000	9,477,000	5,420,000	5,420,000	-	21,562,000
	Road Impact Fees	9,980,000	16,835,000	8,680,000	15,100,000	9,730,000	60,325,000
	Six Cent Gas Tax	2,475,000	1,795,000	1,852,000	1,971,500	2,977,100	10,073,600
	Stormwater Revenues	1,300,000	500,000	1,300,000	3,700,000	1,000,000	7,800,000
	Tax Increment	-	-	-	-	-	-
	Water/Sewer Impact Fees	4,240,595	3,000,000	6,804,000	8,300,000	3,980,000	30,324,595
	Water/Sewer User Fees	-	8,500,000	4,500,000	4,000,000	3,000,000	15,000,000
	Waterpark Revenues						-
	Yacht Basin Revenues	-	-	-	-	-	-
	TOTAL	**106,390,890**	**251,515,267**	**115,786,318**	**147,960,019**	**55,407,100**	**677,059,594**

Objective 4. The City of Cape Coral will continue to manage its fiscal resources to ensure the provision of needed capital improvements for existing development and for future development and redevelopment in the infill and transition areas.

The City prepares and adopts an annual capital improvement program and annual capital budget as part of its budgeting process. The 2005-2009 program is displayed in Table 4.

Policy 4.5. The City will continue to implement financial management policies which achieve the following results:

1) limitations on the use of revenue bonds as a percent of total debt;
2) maximum ratio of total debt to total revenue;
3) maximum ratio of outstanding indebtedness to property tax base; and
4) policies for the replacement and renewal of capital facilities.

The policy does not provide a target or a limitation on any of the policy items. Therefore, it is impossible to say how well the City has done. The City has implemented a set of financial management policies however they do not set forth the four items above.

Objective 5. Decisions regarding the issuance of development orders and permits will be based upon coordination of the development requirements included in the Plan, the land development regulations, and the availability of necessary facilities needed to support such development at the time needed.

The City of Cape Coral maintains an "adequate facilities" ordinance, which is Section 1.4 of the Land Use and Development Regulations. All development approvals including building permits, rezonings, Planned Development Projects, and Site Plan permits, are analyzed with respect to the adequate facilities ordinance.

Policy 5.5. In order to promote urban infill development, redevelopment, and/or public transit, the City shall investigate the possibility of identifying transportation concurrency management areas, transportation concurrency exception areas, or public transportation concurrency exception areas as delineated in Rule 9J-5.0055(5), 9J-5.0055(6), and 9J-5.0055(7), Florida Administrative Code.

Objective Achievement

The City has investigated the possibility of identifying transportation concurrency management areas or transportation concurrency exception areas but has not found this to be necessary, so far. Specifically, this possibility *will be* considered in the Downtown CRA Area, where the City is encouraging higher densities and intensities, although there are constrained roadways. Ultimately, the strategy is to reduce the trips passing through the area, going to and from other commercial and residential areas. At this time, the City realizes that additional analysis is needed prior to recommending the establishment of this

area, and part of the facility is a Lee County facility. The City, the CRA, and Lee County have partnered to initiate an intensive study of this area which will culminate in a recommendation which may or may not include a concurrency exception or management area.

Recommendations

The City needs to amend the Capital Improvements Element of the Comprehensive Plan to be reflective of the current 5-year schedule of capital improvements and reflect currently identified deficiencies in other elements. The existing element refers to the fact that it does not include small-scale improvements, less than $25,000. This should be revised so that the Capital Improvements Element only addresses projects over $1,000,000 so that the overall picture is not obscured by excessive detail. Revenue sources and funding mechanisms, the fiscal assessment, debt service analysis, location of major system components for the public education and public health systems, and issues and recommendations should be updated. As further discussed with respect to the Recreation and Open Space Element, the City has adopted a Parks and Recreation Master Plan (Wade-Trim, 2002) which recommends updated alternative levels of service that should be used as a basis for amending the Level of Service standards for various parks and recreational facilities. Prior to adoption of any such new level of service standards, the City must ensure that the Comprehensive Plan would be financially feasible with adjusted standards. Additionally, the existing Capital Improvements Element contains superfluous data should be entirely eliminated from the element.

Transportation Element

Introduction and Background

The main goal of the City's Transportation Element is "to provide an efficient, balanced and safe motorized and non-motorized transportation system which is both economical and in accord with land use and environmental goals". Due to the close link between land use and transportation issues, elected officials and staff have worked together during the past year in attaining this goal by primarily putting together and continually improving a future land use strategy that is consistent with the goals and objectives that are part of the transportation element.

The City of Cape Coral was originally designed and pre-platted to promote and maximize residential waterfront property. Little thought was given to the provision of non-residential uses; as a result the City started to face development driven petitions to commercial, professional and industrial uses changes along the main arterials closest to the most populated areas. Del Prado Boulevard from Cape Coral Parkway to SR-78 and Cape Coral Parkway from Del Prado to Country Club, became prime locations for commercial/professional uses but unfortunately, due to the pre-platted and multiple ownership nature of the land, assembly of big lots sometimes were not possible, so these arterials were developed with relatively small strip commercial developments, one next to the other, promoting multiple curb cuts and median openings. Responding to the needs and issues associated with non-residential development, the City then established the Commercial Node criteria to evaluate land use change applications. Recent proactive approaches to tie and balance land use and transportation are the adoption and implementation of the Pine Island Road Master Plan, the CRA Master Plan/CRA Traffic Circulation Study and the recent Commercial Activity Center mixed-use land use designation. These strategies are geared to promote higher densities/intensities in areas where appropriate transportation capacity is available without jeopardizing LOS standards.

In addition, the City has become aware of the importance of promoting access management practices along principal arterials from the early stage of the development. Through the planned development project review process staff has the opportunity to promote shared access between abutting properties minimizing curb cuts and median openings. Also, the City requires a Transportation Impact Study (TIS) for developments that generate at least 300 trips during the peak hour. Through the TIS review it is ensured that development doesn't deteriorate the LOS standards in the surrounding transportation network by ensuring that proper mitigations measures are put in place if needed or requiring development to be modified.

A. Goals, Objectives, and Policies Analysis

GOAL 1: To provide an efficient, balanced and safe motorized and non-motorized transportation system which is both economical and in accord with land use and environmental goals.

Objective 1.1: All of the City's road network within the Urban Services Infill and Transition Area will meet level of service standards as adopted by the City in Policy 1.1.1.

Objective Achievement Analysis:
As shown in Table 19 at the beginning of this report, the City has maintained the adopted level of service standards along the roadway network with only two exceptions, the segment of Cape Coral Parkway west of Leonard street that is part of the CRA Traffic Circulation study geared to improve capacity and mobility in the area, and the segment of SR-78 west of Santa Barbara Boulevard currently under construction (adding 2 lanes) by FDOT. As written, the objective addresses only Urban Services Infill and Transition areas. Due to the fact that the City is experiencing growth throughout the entire City, this objective should be modified to also provide directions on LOS standards in the Urban Service Reserve area.

Policy Relevance:
A total of 18 policies provide guidance in different areas that will aid to maintain the adopted LOS standards.

Policy 1.1.1 should be amended in order to bring consistency between the City's, FDOT and County adopted LOS standards for SR-78 east of Del Prado Boulevard and along Veteran's/ Burnt Store Road corridor. In addition, the City should revisit the adopted LOS for Del Prado extension, from SR-78 to US-41. The adopted LOS C was established when the City had in mind transferring this segment of the roadway to FDOT. Since then, conditions have change and FDOT taking over this roadway is not an option anymore. The City is requesting the County to take over it and that's why the LOS should be revisited to make it consistent with County's policies in this regard.

Policy 1.1.2 should be updated with projects foreseen within the next 5 years.

Policies 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, and 1.1.8 should remain as written.

Policy 1.1.9 should be amended requesting TIS for projects that generates 300 or more peak-hour trips. During the last update of the Engineering Design Standards the threshold to require a TIS was increased from 200 to 300 trips peak-hour trips.

Policy 1.1.10 provides the framework to address concurrency management within the Downtown Community Redevelopment area. Staff should research and determine which of the three options provided by Rule 9J-5.0055 best apply.

Policies 1.1.12, 1.1.13, and 1.1.16 should be updated to reflect recent manual versions and MPO horizon. In addition, staff should review them to assess if there is room for improvement in the way the above mentioned policies provide guidance to address funding and whether new policies should be adding to the plan.

Policies 1.1.17 and 1.1.18 should remain as written.

Objective 1.2: Insure the availability of rights-of-way for the construction of arterial and collector roadways and transportation projects to meet the projected travel demand by 2020.

Objective Achievement Analysis:
Ambiguity of the law concerning right-of-way maps has kept the City "Official Thoroughfare Map" on hold, but Objective 1.2 is generic enough that it should remain as written.

Policy Relevance:
Policies 1.2.1 and 1.2.3 should be revised and updated establishing an achievable target consistent with recent law cases and research done in this regard by amongst others, the University of Florida Center for Urban Transportation Research. Additional objectives and/or policies may be pertinent to support City actions in this issue.

Policy 1.2.2 should remain as written

Objective 1.3: Level-of-service standards, roadway capacity, and safety shall be enhanced through the implementation of access management plans for major roadways.

Objective Achievement Analysis:
The City has fully complied with this objective. As major roadways are improved, or as the land abutting these roadways is improved, access management practices are in place. This is an on-going objective to keep pursuing in the future.

Policy Relevance:
Policies 1.3.1, 1.3.2., and 1.3.3 provide the framework to implement access management practices along SR-78 and Del Prado Boulevard from SR-78 to US-41. They should remain as written and additional policies may be deemed necessary to incorporate after the SR-78 parallel Access Roadway System study is finished by fall 2005.

City achieved requirements of Policy 1.3.4 through the City's Engineering Design Standards. This policy should be deleted.

Policy 1.3.5: should remain as is.

Objective 1.4: Ground transportation times between Cape Coral and the Southwest Florida International Airport shall be maintained or improved beyond their 1997 levels, by ensuring that roads within the City's jurisdiction and control maintain the level of service standards specified in the Transportation Element.

Objective Achievement Analysis:
The City has been able to maintain the LOS standards established in Policy 1.1.1. This is an ongoing task and City staff complements the achievement of this objective by working closely with the MPO and supporting improvements on roadways outside of the City's jurisdiction that link to SWFL international airport.

Policy Relevance:
Policy 1.4.1: is an ongoing task that should remain as written.

Policy 1.4.2: As oftoday, there is not a bus route connecting the City with the Southwest Florida International Airport. The City should revisit requesting Lee County Transit (Lee Tran) to study the feasibility of extending a bus route to the Southwest Florida International Airport.

Objective 1.5: Identify, approve, and implement a program of mass transit and paratransit services, based upon existing and proposed major trip generators and attractors, safe and convenient mass transit terminals, and accommodation of the special needs of the transportation disadvantaged within the Urban Services Infill and Transition Area by 2002. During this time frame the number of public transit trips per capita shall increase by 25 percent over 1997 levels.

Objective Achievement Analysis:
Lee County through Lee Tran provides public transportation services within the City of Cape Coral. In 2002 the MPO funded the Long Term Options for funding Transit and Transportation Disadvantage Services study, which made two main recommendations to improve current LOS. First, the size of the service area justifies the creation of an independent transportation authority to deal with this service and second, funding should come from a Municipal Service Taxing Unit (MSTU) as a dedicated source of revenues. All jurisdictions involved approved the first recommendation, but consensus couldn't be reached with the funding source. As part of the MPO Long-Range Plan update, this matter will be reevaluated. The City relies on the service provided by Lee Tran and complements the transportation disadvantaged program by offering the Minibus services through the City's Parks and Recreation Department. Lee Tran has improved LOS since 1997 by offering night and Sunday transit service on US-41 and from Cape Coral to Edison Mall. According to Lee Tran figures, from 1997 to 2003 public transit trips per capita increased by 77.75 percent countywide, therefore Objective 1.5 has been achieved. Considering that provision of public transportation within the City is through an agency outside of the City's operations, Objective 1.5 and related policies should be reworded to a new target ensuring that proper coordination between all responsible agencies is in place.

Policy Relevance:
As established in Policy 1.5.1, Lee Tran has maintained LOS since 1996. Policy 1.5.1 should be updated to a new horizon.

Policy 1.5.2 hasn't been achieved. It should be reworded to address a feasibility pilot program within a specific populated area.

Policy 1.5.3 has been achieved and as an on-going task should remain as is.

Reimbursing Lee Tran as established in Policy 1.5.4 is always an option, that hasn't been deemed necessary yet, but should remain as a policy to attain Objective 1.5.

As explained in the introduction of Objective 1.5, the study sponsored by the MPO recommended a MSTU as a dedicated revenue source rather than building it up in the road impact fee or Local Option Gas Tax and the City didn't support such recommendation. The issue is still pending. Staff should reevaluate whether Policy 1.5.5 should remain as written.

Policy 1.5.6 has been achieved with the park and ride program implement in the CRA. Policy 1.5.6 is generic and should remain as written.

Policies 1.5.7, 1.5.8, 1.5.10, 1.5.11 are on-going tasks that should remain as written

Policy 1.5.9 hasn't been achieved. As the City's population grows, it will increase the feasibility of having bus route from Cape Coral to the Southwest Florida International Airport and to Florida Gulf Coast University. A new target should be established.

The City supports Lee Tran public information efforts. Lee Tran brochures are available at City Hall. To increase access to this information a direct link from the City's website to Lee Tran website could be effectuated. Policy 1.5.12 should establish new target.

GOAL 2: To provide diverse travel choices in order to ensure mobility, sustain environmental quality, reduce energy consumption, and increase the quality of life for Cape Coral's citizens.

Objective 2.1: The City will undertake, within five years, specific, non-motorized transportation policies and programs within the Urban Services Infill and Transition Area which will increase bicycle and pedestrian facilities over 1997 levels.

Objective Achievement Analysis:
Since 1998 the City has a 5-year sidewalk plan that sets priorities on how to spend funding allocated to building sidewalk along 4-lane divided roadways. This program is part of the City's Capital Improvement Plan (CIP), in addition the City has successfully applied for grant monies from TEA-21 and the CDBG program in the past 4-year, increasing sidewalks mileage at a rate of over a mile per year, on average. Traffic

Engineering Section has come up with criteria to evaluate on-street bike lanes, by re-striping 4-lane divided roadways, that meet City's criteria to ensure safety, into 2-lane with an on-street bike lane. In addition, all project widening or new roadway projects include sidewalks. Veterans' Parkway instead of sidewalks included a bike path that is very popular among citizens. This bike path is expected to be extended along Burnt Store Road. Since 1997, sidewalk and bike lane facilities have increased by 37 miles citywide.

Policy Relevance:
The City has partially fulfilled the bicycle/pedestrian network depicted in Figure 24. Policy 2.1.1 shall remain and Figure 24 of the Transportation Element should be updated adding Veterans bike path and proposed projects planned for the future.

Policy 2.1.2 should be updated with the provisions of the new Transportation Bill that will replace TEA-21.

Policies 2.1.3, 2.1.4, 2.1.5, and 2.1.7 should remain in the plan as written.

Objective 2.2: The City shall implement policies and programs to decrease the number of single occupancy vehicle miles traveled per capita, increase the occupancy rate of vehicles, and decrease the per capita consumption of non-renewable fossil fuels.

Objective Achievement Analysis:
The City supports alternatives available to achieve this objective. Through the implementation of the variable pricing program at the toll plazas, and the opening of the new transfer station, the City has been able to decrease the per capita consumption of non-renewable fossil fuels, decrease the number of single occupancy vehicle miles traveled per capita, and increase the occupancy rate of vehicles.

Policy Relevance:
Policy 2.2.1 is an ongoing task and should remain as is.

Policy 2.2.2 has been achieved; and since the value pricing program has been a great success, this policy should be reworded by adding other potential programs that may be available.

The City's applies policy 2.2.3 through the project review process. It should remain as is.

City staff didn't follow-up on the provisions of Policy 2.2.4. Staff should revisit the issue with Lee County staff to evaluate if this policy is still applicable.

Policy 2.2.5 request the incorporation of evolving technologies aim to improve efficiency of the transportation network. It should remain as written.

With the adoption of new mixed-use land use designations and the commercial node criteria the City has been proactive in addressing policies 2.2.6 and 2.2.7. They should remain as written.

City staff didn't follow-up on the provisions of Policy 2.2.8. Staff should revisit the issue to evaluate if this policy is still applicable.

Ambiguity on legal issues related to the deed restrictions that cover the City owned parking lots has delayed the implementation of policies 2.2.9 and 2.2.10. Nevertheless they should remain in the plan.

The City was granted monies through TEA 21 program to build the transfer station in the CRA area. The policy should reworded to address new transportation bill.

GOAL 3: The City shall assure the availability of transportation services to all citizens of Cape Coral with a special consideration for the elderly and handicapped.

Objective 3.1: Transportation services for the transportation disadvantaged shall be maintained or improved beyond 1997 levels.

Objective Achievement Analysis:
As stated in the discussion of public transportation as one of major issues to be considered during the EAR process, the City has relied on the service provided by Lee County through Lee Tran. The City also offers the Minibus service, which complements public transportation for the disadvantage. Despite funding constraints, level of service for the transportation disadvantage has been maintained over the years. This objective will be updated.

Policy Relevance:
In light of the fact that as part of the MPO long range planning update, public transportation will be reviewed, all policies related to this objective should be revisited and reviewed, keeping those that are still applicable and adding policies as needed. As part of the Comprehensive Plan update, all policies that involve services provided by outside agencies like Lee Tran will be coordinated with them.

Even though the City in conjunction with Lee Tran coordinates the provision of bus stops and shelter as stated in part of policy 3.1.1, the lack of ridership and funding constraints haven made testing a responsive intracity public transportation infeasible, other than the one provided by the Minibus service. Policy 3.1.1 should be revisited.

The City has fully complied with policies 3.1.2, 3.1.3, 3.1.4, 3.1.5, and 3.1.6 and plans to keep this popular program in place for years to come. Enhancing interagencies coordination, a member of the City's Minibus service has been a voting member of the MPO/TAC since 2002. Funding of the minibus service comes in part from grants awarded through the CDBG program.

GOAL 4: The City transportation system will emphasize safety and aesthetics.

Objective 4.1: The City will increase the amount of landscaping and other beautification projects along the City's transportation network.

Objective Achievement Analysis:
Landscaping along major corridors has been improved over the years. Major landscaping projects were undertaken along Cape Coral Parkway, Hancock Bridge Boulevard, Country Club Boulevard, Cultural Park Boulevard and Del Prado Boulevard and Del Prado Extension from Kismet to US-41. In addition all new roadway projects include landscaping component in it. The City intends to keep fulfilling this objective in the future.

Policy Relevance
City complies with policy 4.1.1 and it should stay as written.

The economic feasibility of relocating hazardous and unsightly power transmission towers and poles from the medians of arterial parkways as required by policy 4.1.2 wasn't done within the timeframe prescribed. As part of the Santa Barbara redesign project, relocation of the power lines located in the median is under evaluation, recommendations are expected by 2005. This policy should be revisited and reworded based on the recommendations of such pilot study.

Through the site plan review process and the planned development project process, the City fulfills requirements of policies 4.1.3, and 4.1.5 and through individual landscaping agreements has successfully built partnerships with neighborhoods associations and developers to enhance landscaping on major roadways and entryways to the City as prescribed by policy 4.1.5.

Objective 4.2: Emergency evacuation times from the City of Cape Coral shall meet or exceed regional evacuation standards determined by the Southwest Florida Regional Planning Council.

Objective Achievement Analysis:
The Southwest Florida Regional Planning Council through the MPO process makes sure that this objective is met.

Policy Relevance
The City actively participates at the MPO level to coordinate with other agencies on hurricane evacuation matters. All policies related to this objective are fulfilled and through the TIS review, special attention is given to maintain LOS standard on hurricane evacuation routes. During the recent active hurricane season in 2004, no major problems with hurricane evacuation times wasexperienced. However, there is a need for more hurricane shelters within and proximate to the City. All policies related to objective 4.2 should be revisit and coordinated with the SWFRPC, Lee County Emergency Operations Center and the City's Fire Department.

Objective 4.3: The number of traffic accidents per million vehicle movements shall remain constant or decrease.

Objective Achievement Analysis:
The City through the Engineering Design Standards and roadway improvements geared to improve safety on 4-lane undivided roadways has been able to achieve this objective.

Policy Relevance
City complies with policy 4.3.1 requirement to conduct traffic engineering studies of hazardous and congested locations and take appropriate corrective actions. Funding for the immediate implementation of measures to address serious hazards is programmed annually. This is an on-going task.

Policy 4.3.2 is vague and hasn't been implemented due to the complexity of how accident reduction potential of proposed transportation facilities can be estimated. This policy should be deleted.

Policies 4.3.3, 4.3.5, 4.3.6 and 4.6.12 addresses safety improvements contemplated in the Engineering Design Standards. These policies could be consolidated in one. Likewise, policies Policy 4.3.8, 4.3.9, 4.3.10, and 4.3.11 address street lighting measures and could be consolidated in one policy.

Section 163.3202, Florida Statutes to which refers Policy 4.3.4 has been amended and doesn't make particular provisions on use of alleys. In light of the fact that the downtown CRA plan incorporates new urbanism practices that recommend the active use of alleys, this policy should be deleted.

Policy 4.3.7 requests a program to maintain and replace on a scheduled basis all stop, street name, and traffic control signs. In 2004, the City began the using of a computer software to register all data related to the signage inventory. Hurricanes Charley and Jeanne damaged 90% of the City's signage inventory. State and City crews are still helping in rebuilding the system, these events have delayed the automatization of the signage inventory, but staff keeps working in attaining that goal.

City fulfills Policy 4.3.13 and 4.3.14 by applying latest TOPICS update. Both policies should be consolidated into one.

GOAL 5: The City's transportation system will be an integrated and coordinated part of the county, regional, and state transportation system.

Objective 5.1: All traffic circulation planning will be coordinated with the City of Cape Coral Future Land Use Map, the Florida Department of Transportation (FDOT) 2020 Florida Transportation Plan, Five Year Work Program, Lee County Metropolitan Planning Organization 2020 Transportation Plan, and the plans of neighboring jurisdictions.

Objective Achievement Analysis:
The City through its active participation at the MPO level has been able to achieve this objective. A good example of interjusrisdictional coordination is the Burnt Store Road/Veterans/Colonial corridor which involves Lee County, Charlotte County, Punta Gorda, Fort Myers and Cape Coral.

Policy Relevance
Policies associated with objective 5.1, as written, are too ambitious and the City has relied on the MPO and particular projects to address coordination with other agencies. However, the annual coordination as mandated in these policies hasn't been done. Since 2002 the MPO has a wider scope promoting better coordination between Lee, Collier and Charlotte County. The City should take the opportunity to rely on that coordination instead of duplicating efforts. All policies related to this objective should be reconsidered to establish attainable targets.

Objective 5.2: The City will coordinate the review and approval of all seaport and airport facility proposals with local, state and federal agencies having regulatory authority over such facilities. The coordination shall include, but not necessarily be limited to, requesting written comments and recommendations from said agencies and withholding local permits until required permits are obtained from said regulatory agencies.

Objective Achievement Analysis:
At the time the Transportation Element was updated in 1997, a potential to include an airport and a seaport were under study. Since then, both potentials have been determined not to be feasible anymore due to multiple factors like environmental concerns, land ownership, economic feasibility, funding, etc. Nevertheless if these issues come up again, they will be included in the MPO plan, so this objective should be consolidated with Objective 5.1.

Policy Relevance
No seaport or airport application has been received by the City and as explained before, the objective to which these policies refer will be considered built on the MPO process and the City's land use and development regulations. Policies 5.3.1 through 5.3.9 should be deleted.

Objective 5.4: The City of Cape Coral will coordinate any mass transit plan or paratransit plans for the transportation disadvantaged with the Comprehensive Plan elements, other local, regional, and state agencies.

Objective Achievement Analysis:
The City through the MPO has the opportunity to interact with other jurisdictions and agencies dealing with transit and paratransit services. This objective could be consolidated with Objective 5.1 and 5.2.

Policy Relevance
Policies 5.4.1, 5.4.2 and 5.4.3 should be consolidated into one.

GOAL 6: The transportation network shall promote and encourage positive economic development throughout the City.

Objective 6.1: The City's industrial, commercial, and professional job opportunities and tax base shall increase over 1997 levels.

Objective Achievement Analysis:
Enhancement in the transportation network has promoted achievement of Objective 6.1. It should be updated with a new target.

Policy Relevance
With the exception of the widening of SR 78 (from Burnt Store Road to Chiquita Boulevard) and the extension of Del Prado Boulevard from US 41 to an interchange with I-75 other transportation improvements mentioned in Policy 6.1.1 are in place. The policy should be updated including the construction of Burnt Store Road/ Veterans/Colonial corridor as an expressway (including the portion located in Charlotte County).

Policy 6.1.2 refers to bring consistency between transportation, land use and environmental goals contained within the Comprehensive Plan. It is generic and should remain as written.

Infrastructure Element

Introduction

The Infrastructure Element is the section of the City of Cape Coral's Comprehensive Plan dedicated to the planning and provision of water, sewer, and irrigation services to City residents in a financially feasible manner. This element contains six goals. Goal 1 of this element states:

Goal 1 of this element states: "Needed public facilities will be provided in a manner which promotes orderly, compact, and efficient urban growth."

Goal 2 states: "The City of Cape Coral will provide sanitary sewer, drainage, and potable water facilities, and will coordinate with private and County sources for provision of solid waste facilities to meet the existing and projected needs identified in this plan."

Goal 3 states: "Adequate stormwater drainage will be provided to afford reasonable protection from flooding and to prevent degradation of quality of receiving waters."

Goal 4 states: The functions of natural groundwater aquifer recharge areas within the City of Cape Coral will be maintained.

Goal 5 states: The City will protect and conserve its potable water resources.

Goal 6 states: The City will continue to minimize the per household quantity of non-hazardous solid waste delivered to the Lee County solid waste disposal facilities from Cape Coral and discourage littering and illegal dumping.

This element has been updated since its inception during the first evaluation and appraisal report of the Comprehensive Plan in 1997. An analysis of the policies and their relevance will also be undertaken, but only those of particular concern will be discussed.

Objectives Analysis

Objective 1.1:
The City will ensure that the public facilities needed through 2002 are in place in accordance with the Capital Improvements schedule, and ensure that when building permits are issued, adequate facility capacity is available, or will be available to serve the development.

Objective Achievement Analysis:

Objective 1.1 clearly needs to be updated to identify the City's goal to always ensure public facilities are in place with the Capital Improvements schedule. As the City now updates its Capital Improvement Plan annually, it would be suggested that the date be revised to 2010. This objective has been achieved insofar as development within the Urban Services Infill and Transition Areas are concerned.

Policy Relevance:

Policy 1.1.1: The following levels of service are hereby adopted by the City as a means of determining the availability of facility capacity and the demand created by new development:
Sanitary Sewer Facilities
300 gallons per day/dwelling unit for dwelling units located in the Urban Services Infill and Transition Areas that are serviced by the City's sanitary sewer utility.

Level of service standard equivalent to the Department of Environmental Protection requirements for package treatment plants located in Planned Unit Development and Developments of Regional Impact within the Urban Services Reserve Area.

No level of service standard for individual private homes within the Urban Services Reserve Area.

Solid Waste Facilities
Average Solid Waste Generation Rate Citywide 4.74 lbs per capita per day

The following levels of service are hereby adopted by the City as a means of determining the availability of facility capacity and the demand created by new development:

Drainage Facilities
Citywide Based on, *Basis of Review for Surface Water Management Permit Applications*, South Florida Water Management District
See Appendices I and II.

Drainage Facilities Quantity:
Design Storm (3 day duration, 25 year return frequency)

Drainage Facilities Quality:
The City adopts Chapter 17-25, F.A.C. as standards for water quality.

Potable Water Facilities
220 gallons per day/dwelling unit for areas serviced
No level of service standard for private self serve wells within the Urban Services Reserve Area.
220 gallons per day/dwelling unit for potable water in areas serviced by the Greater Pine Island Water Association.

This policy states the adopted level of service standards for the City of Cape Coral as of 1997. In the past seven years, advances have been made in regards to greater adherence to recycling programs, to the implementation of low-flow toilet and faucets. As a result the level of service standards – which assume the average daily potable water, wastewater, and solid waste generation by residences and businesses – may no longer be accurate, and the policy should be revised in the EAR-based amendment stage to reflect these changes.

Policy 1.1.6: Provision by the City of centralized sanitary sewer and potable water service will be limited to the urban services infill and transition areas (as outlined in the adopted future land use map and amended annually via the plan amendment process) and to those areas where the City has a legal commitment to provide services and facilities. The City hereby designates, when feasible, a dual water system as its public water supply system for the extension of public water service to those portions of the Urban Services Infill and Transition Areas per the future land use map as amended in 1995 not currently served by both public water and sewer. Consistent with this Plan, public water and/or sewer service is scheduled to be extended to these areas by the year 2000. In accordance with this, the extension of public water or sewer service to these areas will include the extension of dual water service, using non-potable sources for irrigation purposes.

This policy should be updated to reflect the fact that all areas within the Urban Services Infill Area have received full water, sewer, and wastewater utilities. References to the future land use map amended in 1995 should be removed and instead refer to the map adopted in 2004.

All other policies are relevant to this objective and should be retained as written.

Objective 1.2:
The City will maintain a five year schedule of capital improvement needs for public facilities, to be updated annually to conform with the review process for the Capital Improvements Element of this plan.

Objective Achievement Analysis:

Objective 1.2 clearly states the City's efforts in regards to maintain the Capital Improvements Plan. This has been achieved. As such, this objective should be retained as written.

Policy relevance:

The single policy in this objective is relevant to this objective and should be retained as written.

Objective 1.3:
The City will continue its cooperation with local and state agencies for the inspection of on-site wastewater treatment systems.

Objective Achievement Analysis:

Objective 1.3 clearly states the City's cooperative efforts in regards to the inspection of on-site wastewater treatment systems. While rare, these systems do exist in the City of Cape Coral. As such, this objective should be retained as written.

Policy relevance:

All policies are relevant to this objective and should be retained as written.

Objective 1.4:

The City will make maximum use of its existing treatment/processing facilities (in each respective service area) prior to constructing additional facilities, unless the continued operation of the facility poses a threat to the health, safety, or welfare of the population.

Objective Achievement Analysis:

Objective 1.4 clearly states the City's attention to efficiency, by allowing existing facilities to run through their service life, assuming there is no threat to health, safety or welfare of the population. As such, this objective should be retained as written.

Policy relevance:

All policies are relevant to this objective and should be retained as written.

Objective 2.1:

Existing deficiencies will be corrected by undertaking the following projects:

Sanitary Sewer

Upgrade Master Lift Station 236 (200)

Drainage

Implement Phase 2 of the CRA Stormwater Improvements.
Implement Santa Barbara Boulevard Stormwater Improvements.

Objective Achievement Analysis:

Objective 2.1 has been achieved. However, it is suggested that the existing deficiencies be updated to reflect the City's objective for the next Evaluation and Appraisal Report, as required by F.A.C. 9J-5.011. Such necessary improvements involve the following:

Potable Water: Develop additional potable water wells

Irrigation: Complete Gator Slough weir/canal improvements to increase supply

These improvements are discussed in the Hartman and Associates, Inc. Water and Wastewater Annual Report, Fiscal Year 2003.

Policy relevance:

All policies are relevant to this objective and should be retained as written.

Objective 2.2:

Projected demands through the year 2002 will be met.

Objective Achievement Analysis:

Objective 2.2 should be updated to the year 2010, instead of 2002.

Policy relevance:

Policy 2.2.1: The City will meet projected demands by undertaking the following projects:
Sewer and Water Projects
Provide planning and studies necessary for orderly expansion
Southwest Utility Expansion Program
Pine Island Utility Expansion Program
Purple Area Utility Expansion Program
Remaining Green Area Utility Expansion Program
West Cape Utility Expansion Program
Upgrade Lift Stations
Production Wells
Everest Parkway Reclamation Plant Expansion

Solid Waste Projects
to be coordinated with Lee County

Drainage Projects
By 2002 the City will adopt a Comprehensive Stormwater Management Plan, the purpose of which is to minimize the impact of stormwater runoff on the quality of surface water.

This policy should be updated to include a work program that would meet projected demands by the time of the next Evaluation and Appraisal Report. This work program would include:

-Construct North Reverse Osmosis Plant
-Expansion Everest WRF
-Construct North WRF
-SE 1 Utility Extension
-SW 4 Utility Extension
-SW 5 Utility Extension
-SW 6 Utility Extension
-SW 7 Utility Extension
-Construct aquifer storage and recovery wells

Policy 2.2.6: The City will, by the year 2000, provide sanitary sewer service to all areas (within the current Urban Services Infill and Transition areas per the future land use map as amended in 1995) which receive potable water from the City.

This policy refers to the provision of sanitary sewer service to all areas within the Urban Service Infill and Transition Areas which receive potable water from the City by the year 2000. There are areas in the City which only have water and irrigation services, but no sewer. This policy has not been achieved due to the lack of financially feasibility, but will be by 2006, as the last remaining area with only water and irrigation is scheduled to receive sewer utilities according to the 2006-2010 Utility Expansion Program. The policy should be revised to state that all areas receiving potable water will receive sanitary sewer service, if financially feasible.

Table 8

Estimated Population Served, 2001-2006		
Year	Estimated Population Served by Wastewater Utilities	Estimated Population Served by Potable Water Utilities
2001	78,396	82,761
2002	80,555	85,346
2003	82,715	87,932
2004	94,124	99,767
2005	104,250	110,319
2006	114,766	114,766

Source: Draft Utilities Master Plan (2004), Table 1.5

All other policies are relevant to this objective and should be retained as written.

Objective 2.3:
For areas not currently programmed to receive utilities, the City will extend services to areas consistent with recommendations of an updated master plan and feasibility studies scheduled for completion by the end of 1998.

Objective Achievement Analysis:

Objective 2.3 should be updated to reflect the current utility master plan updated, to be completed by the end of 2005.

Policy relevance:

All policies are relevant to this objective and should be retained as written.

Objective 2.4:

The City will continue to assure that public health, environmental health, property values, and quality of life is maintained through assurance of the provision of solid waste facilities and services.

Objective Achievement Analysis:

Objective 2.4 reflects the City's intention to maintain health, safety and public welfare through provision of solid waste facilities and services. This objective is being achieved. As such, this objective should be retained as written.

Policy relevance:

The single policy in this objective is relevant to this objective and should be retained as written.

Objective 3.1:
By 2002, the stormwater drainage regulations contained in the City's Land Use and Development Regulations will be reviewed and amended to ensure that future development utilizes stormwater management systems compatible with an adopted comprehensive stormwater management plan.

Objective Achievement Analysis:

Objective 3.1 reflects the City's intention to review and amend regulations regarding stormwater management systems. Aside from a revision of the 2002 date, the objective should be retained largely as written.

Policy relevance:

All policies in this objective are relevant to this objective and should be retained as written.

Objective 4.1:

The City will protect the functions of natural groundwater recharge areas through means identified jointly by the City and the SFWMD.

Objective Achievement Analysis:

Objective 4.1 reflects the City's intention to protect the natural groundwater recharge areas within the City, meeting a critical issue facing the City and all of Southwest

Florida. This objective is being achieved. As such, this objective should be retained largely as written.

Policy relevance:

All policies in this objective are relevant to this objective and should be retained as written.

Objective 5.1:

The City will protect and conserve its potable water resources.

Objective Achievement Analysis:

Objective 5.1 reflects the City's intention to protect and conserve its potable water resources. This objective is being achieved. As such, this objective should be retained largely as written.

Policy relevance:

All policies in this objective are relevant to this objective and should be retained as written.

Objective 6.1:

The City of Cape Coral will reduce the volume of non-hazardous solid waste requiring disposal to seventy percent of the total volume.

Objective Achievement Analysis:

Objective 6.1 reflects the City's intention to reduce the volume of solid waste, largely through recycling programs. This objective is being achieved. As such, this objective should be retained largely as written.

Policy relevance:

All policies in this objective are relevant to this objective and should be retained as written.

Objective 6.2:

The City will maintain regulations to discourage littering and illegal dumping.

Objective Achievement Analysis:

Objective 6.2 reflects the City's intention to discourage littering and illegal dumping. As a platted lands community of over 114 square miles, only 42% or so of which is developed, this is a key objective is need of being achieved. Currently, this objective is being achieved. As such, this objective should be retained largely as written.

Policy relevance:

All policies in this objective are relevant to this objective and should be retained as written.

Conclusion

Aside from the identification of several objectives and policies in need of updating in terms of dates, there are very few shortcomings with this element. It is recommended that action be taken on the policies identified in this document as either not relevant or obsolete. However, in regards to the remaining policies and objectives, no action should be taken.

Intent and Purpose of the Housing Element

The purpose of the Housing Element, of the Comprehensive Plan is to ensure an adequate inventory of safe and affordable housing for all the citizens of the City, both current and future. Additionally, the City's Housing Element contains ten (10) objectives and numerous policies to implement these objectives.

Moreover, Florida Statutes Section 163.3177 subsection (6) (f) requires the City to include a housing element consisting of standards, plans, and principles to be followed in:

- The provision of housing for all current and anticipated future residents of the jurisdiction.
- The elimination of substandard dwelling conditions
- The structural and aesthetic improvement of existing housing
- The provision of adequate sites for future housing, including housing for low-income, very-low income, and moderate income families, mobile homes and group homes and foster care facilities, with supporting infrastructure and public facilities.
- Provision for relocation housing and identification of historically significant and other housing for purposes of conservation, rehabilitation, or replacement.
- The formulation of housing implementation programs
- The creation or preservation of affordable housing to minimize the need for additional local services and avoid the concentration of affordable housing units only in specific areas of the jurisdiction

Evaluation of Successes

The City's role regarding the Housing Element is substantial, as identified through the objectives and policies of the element. Since the last Comprehensive Plan review the City's has provided substantial affordable housing opportunities, and addressed special service needs.

The City's affordable housing programs which are implemented using Community Development Block Grant funds, State Housing Initiatives Partnership (SHIP) grants and public/private partnerships with non-profit housing providers have been the dominant provider of affordable housing in the City since 1996. It should be noted that the City's role relative to affordable housing is as a facilitator not a provider.

The City is responsible for writing grant proposals for affordable housing, creating and maintaining the Local Housing Assistance Plan, programmatic and financial management and implementing the policies identified in the Housing Element. Additionally, the City must ensure program compliance with all the sub-recipients of the grant funds.

The affordable housing providers are sponsor agencies, non-profit housing providers who administer the affordable housing programs, by applying for and receiving grant funds to build housing and maintain the housing stock in the City. The second provider is the

private housing market, who provides the majority of market rate and affordable housing in the City.

Since 1992, the following units have been created and/or rehabilitated through the City's ***Affordable Housing Programs:***

The Cape Coral Housing Rehabilitation and Development Corporation rehabilitated 459 owner occupied single-family residential units.

The Cape Coral Housing Rehabilitation and Development Corporation constructed seventy two (72) units of affordable senior rental housing.

The Cape Coral Housing Development Corporation have rehabilitated fifty-two (52) single-family homes, constructed sixty-five (65) new homes and provided down payment assistance to 131 households.

Habitat for Humanity constructed twelve (12) new homes.

Goodwill Industries constructed ten (10) units of Special Needs Rental Housing and the Developmentally Disabled Residential Corporation created six (6) units of Special Need Rental Housing.

The data presented above cannot be compared to the demand for affordable housing at the time of last Evaluation and Appraisal Report, because there was not a detailed needs assessment delineating the need for affordable housing units. As discussed further in this brief, the City should complete a needs assessment and an evaluation of the existing housing conditions, to better gauge the City's progress towards providing for affordable housing opportunities.

The City has created a matrix which evaluates the stated objectives related to affordable housing and provides opinions as to the efficaciousness of those objectives, the actual results and current conditions. Through the adoption of the City's Local Housing Assistance Plan, the City has taken appropriate action through policies and incentive strategies which directly address providing for and prioritizing affordable housing, which are in accordance with Florida Statutes Section 163.3177 subsection (6) (f).

Shortcomings

Since the goal of the Housing element is to provide good quality housing in safe, clean neighborhoods, offering a broad choice of options to meet the needs of present and future residents of the City, regardless of age or income status the City's ability to solely meet this goal is unachievable.

The private housing market offers the majority of the housing choices in the City and the City ensures that these housing choices are constructed to the latest building code.

Objective one (1) states that in conjunction with the private sector, the City will provide the infrastructure needed to increase Cape Coral's housing stock by 10,290 units by 1995 and 18,865 units by 2000 to accommodate the expected permanent populations of 88,645 by 1995 and 109,025 by 2000, in accordance with the levels of service standards established in other elements of this Comprehensive Plan. The private sector primarily constructs housing for profit and financial gain. Since the pre-platted lots in Cape Coral limit the development of multi-family development, the housing choices are constrained primarily to single-family residential and more recently townhouse development and/or conjoined structures such as duplexes.

Objective 1 and its applicable policies must be re-evaluated for its effectiveness as a functional measure of housing units. The City does track and maintain a database containing the number of housing units produced. However, the City has not cumulatively compiled the housing units produced since 1996, but can easily accomplish this. The City should update the number of housing units in accordance with the current population.

The City must complete a new housing needs assessment including a housing stock inventory to identify substandard dwelling units. This will provide the most current conditions and needs relative to affordable housing, and will allow the City to adequately plan to meet those needs and ascertain whether these needs are being met with the City's current programs and private sector involvement.

Recreation and Open Space Element

Introduction

The Recreation and Open Space Element is the section of the City of Cape Coral's Comprehensive Plan dedicated to planning and location of parks and facilities to meet the needs of current and future populations. This element contains a major goal and two subordinate goals which states:

GENERAL GOAL:
Enhance the quality of life in Cape Coral by developing a system of public parks, recreational facilities, and open space which meets the varied needs of present and future populations.

SUBORDINATE GOALS:
Acquire and develop a system of park lands, recreational facilities, and open spaces, which keeps pace with community growth and changing community needs.

Provide a balanced and varied system of park lands, recreational facilities, and open spaces which are conveniently located, and accessible to all members of the public regardless of age or disability.

This element was last updated in 1997.

Objective Analysis

Objective 1:
The City of Cape Coral will develop a system of parks and recreational facilities meeting the needs of the City's permanent and functional residents by the year 2002 and shall identify and plan park and recreation improvements to 2020.

Objective Achievement Analysis:

Objective 1 clearly states the City's will develop a system of parks and recreational facilities to meet the City's permanent and functional residents by 2002, as well as, identify the location of parks through the year 2020. As such, this objective should be amended to reflect the Parks Master Plan horizon of 2010.

Policy Relevance:

Policy 1.2 states, The City hereby adopts the definitions of Major, Community, Neighborhood, and Special Parks (Part V: "The Plan for Recreation and Open Space") as levels of service standards for parks in Cape Coral, and adopts the following standards for recreational facilities:

Table 9

Facility	Unit of Measure
Basketball Goal	1 goal per 2,500 persons
BMX Bicycle Course	1 course per 400,000 persons
Boat Launch Ramp	1 ramp per 25,000 persons
Bocce Courts	1 court per 30,000 persons
Diamond Sports Fields	1 field per 4,000 persons
Exercise Course	1 course per 50,000 persons
Golf Courses	1 course per 100,000 persons
Gridiron	1 field per 10,000 persons
Horseshoe Pits	1 court per 12,500 persons
Picnic Tables	1 table per 725 persons
Play Areas, Equipped	1 area per 6,250 persons
Racquetball Courts	1 court per 10,000 persons
Senior Center	1 center per 50,000 persons
Shuffleboard Courts	1 court per 5,500 persons
Swimming Pools	1 pool per 50,000 persons
Tennis Courts	1 court per 5,000 persons
Volleyball Courts	1 court per 12,000 persons

The Parks Master Plan should be the basis for amending the definitions and level of services standards in the Recreation and Open Space Element. However, the City should take cautionary measures when considering adjustments to the level of service. The LOS standards may have a direct impact on the financial feasibility of implementing this plan.

Policy Relevance

Policy 1.6 states. All parks and recreation facilities proposed within the Urban Services Infill area will be completed and functioning before 2002.

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This policy should be updated to reflect the Parks Master Plan. However, the provision of services and facilities is predicated on both the timing of needed services and available budgetary resources, which are determined on an annual basis. The rising cost of land acquisition and assembly of pre-platted parcels affects the implementation timing of the plan.

All other policies are relevant to this objective and should be retained as written.

Objective 2
The City will acquire lands at least sufficient to provide the recreational facilities and improvements identified in the Comprehensive Plan as needed by 2002 and shall identify lands needed to meet future recreational demands in 2020, in order to preserve open space, and protect from intrusion the existing open space owned by the State of Florida.

Objective Achievement Analysis

This objective clearly states the City shall acquire land and identify improvements to recreational facilities in the Comprehensive Plan, as well as preserve open space and intrusion to State owned land.

This objective should be updated to reflect the Parks Master Plan and the Cape Coral Interactive Growth Model in order to meet the City's permanent and functional population. Through creation of the "Development Incentive Program" included in the proposed Commercial Activity Center land use classification and the amended Mixed Use district classification, there are opportunities for provision of public parks and facilities by private entities to achieve greater development opportunities. This objective should be modified to reflect this program.

Policy Relevance

Policy 2.1 states the City's Neighborhood Parks will, upon development, provide at least one (1) acre of open space within one (1) mile of each GAC unit in the City and serve 1000 permanent residents per 0.5 acres of neighborhood park.

This policy should be updated to reflect the Parks Master Plan providing that it is financially feasible to locate a neighborhood park within 1 mile of GAC unit.

All other policies are relevant to this objective and should be retained as written.

Objective 3
The City of Cape Coral will continue to provide a system of parks, recreational facilities, and open space which is accessible to all members of the public.

Objective Achievement Analysis

This objective states the City will provide a parks system that is accessible to the public.

Policy Relevance

Policy 3.5 states, "By 2002, the City will provide at least one (1) additional boat launching ramp to provide access to the Caloosahatchee River and Charlotte Harbor."

This policy should reflect the Parks and Recreation Master Plan providing that it is financially feasible.

Objective 4
By 2002, City parks and recreational facilities will be as safe as, or safer than, they were during the period from 1990 through 1996. The number of accidents occurring in City parks, as a function of usership, will remain constant, or decrease.

Objective Achievement Analysis

This objective refers to decreasing the number of accidents by users using the parks system.

This policy should be updated to reflect that City parks by 2010 would be as safe as, or safer than, they were during the period from 1997 through 2003.

Policy Relevance

All policies are relevant to this objective and should be retained as written.

Objective 5
The City will provide adequate levels of funding to properly and efficiently maintain park and recreation facilities within Cape Coral.

Objective 5 clearly states that adequate levels of funding should be maintained for parks and recreation facilities in the City.

Policy Relevance

All policies are relevant to this objective and should be retained as written.

Objective 6
The City will aggressively pursue an increase in private and public funds for the acquisition, development, maintenance, and operation of parks and recreational facilities.

Objective 6 refers to the City seeking private and public funds for the development of park and recreation facilities.

Policy Relevance

All policies are relevant to this objective and should be retained as written.

Objective 7

The City will expand opportunities for participation in the creative and performing arts.

Objective 7 refers to the City providing opportunities for citizen involvement in the arts.

Policy Relevance

All policies are relevant to this objective and should be retained as written.

Conservation and Coastal Management Element

Introduction

The Conservation and Coastal Management Element includes six goals supported by eighteen objectives. Generally, the goals are to protect environmental resources, increase public awareness of natural resources and public access to coastal resources, protect historic resources, reduce vulnerability to hurricanes, to ensure adequate infrastructure and public facilities, and to use intergovernmental coordination to protect environmental and coastal resources.

Brief assessments of each of the objectives are provided below. Also provided below are assessments of certain, selected supporting policies.

Objectives Analysis

Objective 1.1. Estuarine Water Quality. Cape Coral will maintain and/or improve the environmental quality of estuarine waters within its jurisdiction, and will prevent the degradation of adjacent water bodies.

Objective Achievement

Water quality has been generally been maintained at a good level, as indicated in Table 10.

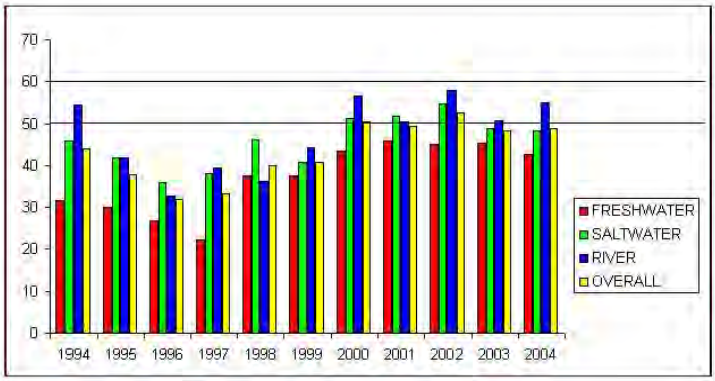
Table 10 Water Monitoring Summary

WY '2004

SYSTEM TYPE	INDEX VALUE
FRESHWATER	42.72
SALTWATER	48.38
RIVER	55.06
OVERALL	48.72

Note: Index based on Hand et al. (1988).
Low values better than high.

	1994	1995	1996	1997	1998	1999	2000	2001
FRESHWATER	31.59	29.95	26.84	22.22	37.56	37.55	43.34	45.90
SALTWATER	45.80	41.95	35.97	38.2	46.06	40.75	51.10	51.70
RIVER	54.32	41.76	32.6	39.48	36.24	44.33	56.70	50.45
OVERALL	43.90	37.89	31.80	33.30	39.95	40.89	50.38	49.35



Policy Relevance

Policy 1.1.6. By 2002, the City will complete a comprehensive stormwater management plan, a purpose of which is to minimize the impact of stormwater runoff on estuarine water quality. Until a comprehensive stormwater management plan is completed, the City will conduct the following activities to minimize the impact of stormwater runoff on estuarine water quality:

- The City will incorporate an acceptable level of stormwater treatment in all newly designed stormwater systems.
- The City will perform maintenance activities in accordance with an annual work plan. The work plan will include but not be limited to the following activities:
- The City will conduct street sweeping at major intersections, along bike paths, paved alleys, curbed roads, and within all City owned paved parking lots. In the Viscaya industrial zoned area, the City will provide street sweeping once every month and will clean catch basins four times per year.
- The City will replace deteriorated stormwater drainage pipe and stormwater inlets on an as-needed basis.
- The City will periodically clean and inspect catch basins and stormwater pipes.
- The City will maintain Engineering Design Standards for paved alleys and roadways.
- The City will require all property development to stabilize all areas not covered with structures, pavement, or landscape beds.

- The City will require all non-paved areas of street right-of-ways and areas within fifteen feet of seawalls to be permanently vegetated.
- The City will require the placement of silt screens on all construction sites to eliminate adverse impacts associated with erosion.
- The City will complete a joint application for a NPDES permit with Lee County and will comply with all permit conditions.
- The City will require applicants for clearing and development permits to provide a letter addressing NPDES standards, if applicable, prior to issuance of City permits.

The City of Cape Coral Public Works Department is currently of the opinion that the intent of the policy, to have a stormwater master plan, has been accomplished. This is the case, even though no single document exists that is a comprehensive stormwater master plan. Therefore, the policy should be amended to reflect the accomplishment and to maintain and implement the plan.

Policy 1.2.4: The City will require a management plan for development other than development of a single family residence for disturbance of habitat of any state or federally listed species.

The City should amend this policy to clarify what constitutes an acceptable management plan and what constitutes disturbance of habitat of any state or federally listed species. The specifics of clarification may be within either or both the Comprehensive Plan and/or the Land Use and Development Regulations.

Policy 1.2.6: To protect manatees, the city will cooperate in enforcement of boat speed zones within the City's jurisdiction as provided by the State Manatee Protection Plan.

Unincorporated Lee County has recently adopted a manatee protection plan. This policy should be amended to reflect that change.

Objective 1.2: The City will continue to monitor and inventory all ecological communities, and their component flora and fauna, especially endangered and rare species. The City will implement protective regulations or other actions that are deemed necessary to protect strategic habitat conservation areas.

Objective Achievement

The City has a complete inventory and monitoring program for the bald eagles within the City of Cape Coral. The City has assisted the Florida Fish and Wildlife Commission with inventory and monitoring of burrowing owls within an approximately 14 square mile study area. The City maintains a database with locations of other known species, such as gopher tortoises. However, the City has not conducted a citywide ecological community survey including component flora and fauna. Such a survey has not been found financially feasible. The City has done an excellent job of implementing protective regulations or other actions that are deemed necessary

to protect the bald eagle. Because the City cannot routinely conduct and updated a comprehensive survey of ecological communities, it should adopt clear regulations to ensure that prior to development or habitat alterations of any kind that the property owners undergoing development or habitat alterations are required to provide a survey and undertake acceptable mitigation when appropriate. The City has Policy 1.2.18. that commits the City to require, as a condition of approval for Planned Development Projects, a protected species survey, that the applicant prepare a protected species management plan for listed species. However, many projects that could affect listed species are developed by site plan review and not via the Planned Development Project process.

Objective 1.3: Water Dependent/Water Related Land Uses: The City will adopt, consistent with the provisions of section 163.3202 Florida Statutes, land development regulations to direct the management of water-dependent facilities, including marinas and marine-related support facilities.

Objective Achievement

The City is compliant with the intention of Objective 1.3, to direct the management of water-dependent facilities, including marinas and marine-related support facilities. Only one new marina has been developed since 1997, known as Cape Harbour. This facility had actually received its state permits prior to 1997.

Objective 1.4: Cape Coral will continue to meet or exceed the air quality standards established by the Florida Department of Environmental Protection (FDEP).

The City has an air quality monitoring station at the Rotary Park nature center. The City continues to be in an attainment area.

Objective 1.5: Between now and 2002, Cape Coral will maintain and/or improve the quality of all surface waters within its jurisdiction within the limitations of adjacent connected waters outside the City's jurisdiction.

Objective Achievement

The City continues to maintain an environmental resources section that monitors water quality through an extensive routine program, conducted by staff. Additionally, associated with a public awareness program, the City has trained a volunteer staff that conducts water quality sampling to augment the staff sampling, which is analyzed by City staff. The water quality generally remains as good or better than the surrounding waters of the state. Although much remains to be done with respect to informing the public of best management practices, the City has an aggressive Florida Yards and Neighborhoods (FYN) Program. This FYN program evolved from the Charlotte Harbor National Estuary Program.

Policy Relevance

Policy 1.5.3. commits to completion of a comprehensive stormwater management plan by 2002. As stated under the Objective Achievement of Objective 1.1., the City's Public Works Department staff feels that this work has been accomplished, and therefore, the policy should be amended to reflect this.

Objective 1.7: The City will minimize the degradation of the quality of its groundwater resources, and will continue programs with a goal of continuing toreduce the per dwelling unit consumption rate of potable water used for irrigation and other outdoor purposes from (1995) levels.

Objective Achievement

The City has extended reuse water to several square miles of utility service areas, primarily for irrigation purposes. However, the City does not mandate the exclusive use of the irrigation water for irrigation within areas served with irrigation water. As a result, the potable water from private well continues to be used for irrigation. Additionally, new homes approved outside of the utility service areas have no choice but to use well water of potable water quality for irrigation, if the property owners choose to irrigate their landscapes. The City has enacted year-round timing of irrigation restrictions, and has an active public information campaign. However, the City should consider new policy guidance to minimize the use of the potable water resource for domestic ornamental landscape irrigation purposes.

Policy Relevance

Policy 1.7.3. The City will require the disconnection of private self-serve well water supply lines from domestic potable water systems and/or irrigation systems when City potable and/or irrigation water is connected.

The City does require the connection of potable water. However, it has not enforced the intent of this policy, that requires the disconnection of private self-serve well water supply lines from domestic potable water systems and/or irrigation systems when City potable and/or irrigation water is connected. Property owners that connect to the irrigation water system do not continue to use wells for irrigation. However, because the connection is voluntary and the City does not currently require the disconnection when irrigation water becomes available, irrigation with potable self-supply well water continues in areas with non-potable water options. The City should consider the adoption of an amendment to strengthen this policy.

Objective 1.8: The City will maintain and expand a program to enhance public awareness of coastal and other natural resources in order to better understand the importance of these resources and the need for their proper management and conservation. Methods for increasing public awareness may include, but not necessarily be limited to, public presentations, education programs, and publications.

Objective Achievement

Since the date of the last EAR, the City has continued to increase its public awareness of coastal and natural resources programs through speaking engagements to civic groups and citizens at large, presentations on Cape TV, through classes and guided kayak trips through estuarine systems offered by the Parks and Recreation Departments, through new website information, including web cams of bald eagle, osprey, and burrowing owl nests. Also, the City has fostered the development of a non-profit organization called the Cape Coral Friends of Wildlife, which addresses further promotion of wildlife awareness and provides valuable habitat maintenance services. Furthermore, this public awareness is promoted by new interpretive signs along the Four Mile Cove Eco Park trails and at Rotary Park, and now has its own nature center, maintained by City Staff.

Policy Relevance

Policy 1.8.3. By February 1998, the City will designate an Environmental and Coastal Resources Citizens' Advisory Board to assist and advise the City concerning the goals and objectives of the Conservation and Coastal Management Element of the Comprehensive Plan.

Since the City works closely with the public on many initiatives, the City has chosen to disband most of its citizen advisory boards, setting up committees on an as needed basis. This was viewed as a more efficient use of resources. The designation of designate an Environmental and Coastal Resources Citizens' Advisory Board never occurred, and is therefore unlikely to occur. Policy 1.8.3. should be revised to delete the commitment to form a citizens advisory board.

Objective 1.9: The City will ensure that mining activities have a minimal impact on the quality of the environment.

Objective Achievement

The only mining that occurs in Cape Coral is the mining for dirt, used for the placement of fill used to ensure positive drainage of structures, and "percolation sand", used to construct septic systems. The objective should remain unchanged.

Objective 1.10: The City will continue to reduce its levels of hazardous wastes in accordance with the provisions stipulated by the State's Solid Waste Management Act and will coordinate these activities on a City, County, and regionwide basis.

Objective Achievement

The City continues to coordinate with the Lee County Department of Solid Waste concerning the proper storage, recycling, collection, and disposal of hazardous wastes, and periodically hosts highly successful household "Hazardous Waste Days", to satisfy the demands for disposal of household hazardous waste.

Objective 2.1: Public Access to the coast. The City will maintain and/or increase public access sites to the coastal zone by 2002.

Objective Achievement

The City has acquired land along both side of the Chantrey Canal, providing addition coastal access to the Caloosahatchee River. Additionally, the City has acquired additional land to increase the coastal access at the Yacht Club Community Park. Further, the City has acquired land along the Matlacha Pass State Aquatic Preserve, for potential coastal access along the northwestern coastline. The City should maintain the objective and amend its timeframe.

Objective 3.1: The City will continue to identify the historic resources within its jurisdiction and will work to preserve and protect these resources for future enjoyment. To accomplish this task the City will consult and work with Federal, State, and local historical organizations as well as establishing a City-appointed body concerned with the preservation of Cape Coral's historic resources.

Objective Achievement

The City had an Historical and Cultural Resources Advisory Board that identified two City-owned facilities as having historical significance. The City adopted resolutions protecting these facilities. Because of the relative youth of the City and the fact that most of the City was undeveloped prior to the massive development of the Cape Coral Subdivision, it is not anticipated that additional historical resources will be identified. The City disbanded the Historical and Cultural Resources Citizens Advisory Board, along with most of the other citizens advisory boardsas previously described. The City continues to protect known archeological resources by prohibiting development that would destroy them.

Policy Relevance

Policy 3.1.1. The Historical and Cultural Resources Citizens Advisory Board will be maintained which will cooperate with appropriate Federal, State, and private agencies and aid in identifying archaeological resources in the coastal zone. This body will also assist in developing performance standards for the development and sensitive reuse of historic resources.

As mentioned above, the City disbanded the Historical and Cultural Resources Citizens Advisory Board, and therefore, this policy must be revised, as the City does not wish to have additional advisory boards outside a specific initiative.

Policy 3.1.3. The City will require that applicants for Planned Development Projects that include undisturbed areas identified in the Archaeological Sensitivity map of Cape Coral as Sensitivity Level 1 or Sensitivity Level 2 to perform an archaeological assessment and provide any appropriate mitigation as a condition of approval.

One planned development project conducted an archaeological assessment, consistent with this policy and nothing was found. The City should reconsider the value of Policy 3.1.3.

Objective 4.1: Evacuation. The City's hurricane evacuation system will be maintained and/or improved to ensure that current evacuation times will be preserved.

Objective Achievement

Although the overall evacuation times have been improved, some components of the system have declined. Objective 4.1 and its supporting policies should be revised to be consistent with state law, yet reflect the reality of the system in a growing City that is less than 42% developed, and has the bulk of its vacant land with vested rights to develop at 4.4 dwelling units per acre. Further discussion of this topic is provided under the Major Issues Section of this document.

Objective 4.2: SHELTER. Adequate shelter space shall be made available to meet the needs of the general evacuation and special needs populations.

Objective Achievement

This objective has not been achieved and cannot be achieved in the future. The City should revise the objective and supporting policies so as to strive to provide additional shelter space, but recognize the constraints and financial feasibility of doing so. In addition to the problem of developing suitable structures for this use, finding suitable locations for shelters is also problematic. This is because most of the land area in Cape Coral is within a Category 3 or less storm surge zone. Further discussion of this topic is provided under the Major Issues Section of this document.

Objective 4.3: Hazard Mitigation and Coastal High Hazard. The City will limit future public expenditures for infrastructure and service facilities which subsidize growth within coastal high hazard areas, except for projects funded by property owners within the area, maintenance of existing infrastructure, and expenditures for public land acquisition, restoration, or enhancement of natural resources.

Objective Achievement

This Objective has been achieved. Further discussion of this topic is provided under the Major Issues Section of this document.

Policy relevance

Policy 4.4.6: The City will revise its Land Use and Development Regulations, pursuant to S.163.3202, F.S., to indicate that property within coastal high hazard areas containing damaged structures will not be allowed to redevelop for a more intense use or at a density higher than the intensity or density permitted by the 1997 future land use map. However, properties within the coastal high hazard area that are also within the Downtown CRA area shall be allowed to develop consistent with Policy 1.13.1. of the Future Land Use Element.

The City should consider a minor modification to Policy 4.4.6 to allow some flexibility relative to density in the coastal high hazard area, in return for mitigation activities.

Objective 4.4: POST DISASTER REDEVELOPMENT. To speed post disaster recovery and reduce or eliminate the future risk to human life and property from natural hazards via recovery and redevelopment strategies to ensure hurricane/disaster preparedness and recovery.

Objective Achievement

The City should maintain Objective 4.4. and seek to enhance the level of implementation. It is likely that emergency management officials will make findings and recommendations relative to the effectiveness of the current standards in the wake of Hurricane Charley and other recent hurricanes. The City should revise its objective and policy guidance, accordingly.

Policy Relevance

Policy 4.4.1. Within one year after the adoption of this Plan the City will prepare a redevelopment plan, and recommend any appropriate amendments to the comprehensive plan, Local Comprehensive Emergency Management Plan, and other policies and procedures.

The City did not adopt a redevelopment plan within one year of the date of adoption.

Policy 4.4.3. By 1999, the City will establish guidelines for determining priorities for the acquisition of storm damaged property in hazard prone areas. Additionally, the City will establish guidelines to address the removal, relocation, or structural modification of damaged infrastructure, and the City's role in addressing privately owned unsafe structures. The City will also establish policies limiting redevelopment in areas of repeated damage.

Formal guidelines for determining priorities for the acquisition of storm damaged property in hazard prone areas and other measures required by this policy have not been established. The City should revise the timeframe of this policy.

Policy 4.4.5. The City will maintain provisions in its Land Use and Development Regulations to regulate redevelopment of non-conforming structures.

In light of the first significant storm event, Hurricane Charley, to hit Cape Coral since the incorporation of the City, the City should re-evaluate this policy with respect to the severe disruption of lives and economic prosperity that could result from this policy.

Policy 4.4.6: The City will revise its Land Use and Development Regulations, pursuant to S.163.3202, F.S., to indicate that property within coastal high hazard areas containing damaged structures will not be allowed to redevelop for a more intense use or at a density higher than the intensity or density permitted by the 1997 future land use map. However, properties within the coastal high hazard area that are also within the Downtown CRA area shall be allowed to develop consistent with Policy 1.13.1. of the Future Land Use Element.

The City should evaluate the potential to revise this policy, consistent with sound planning principals and state law to allow some flexibility through the provision of mitigation.

Objective 5.1: Maintain levels of service, service areas, and phasing of improvements for Cape Coral consistent with the other elements of this plan.

Objective Achievement

This Objective has generally been achieved. This is a mandated redundancy in the Comprehensive Plan, as such, should be maintained.

Objective 6.1: Environmental and coastal resource management will address natural ecosystems on a systemwide basis regardless of political boundaries by using existing formal and informal coordination mechanisms, or by establishing new formal mechanisms to ensure coordination.

Objective Achievement

The City generally has a good record of cooperation with other agencies, relative to this objective. Because of the platted lands situation, Cape Coral has identified the Florida Yards and Neighborhoods Program as one of the best roles the City can play in coastal resource management of natural ecosystems on a systemwide basis

Intergovernmental Coordination Element

Introduction

The Intergovernmental Coordination Element is the section of the City of Cape Coral's Comprehensive Plan dedicated to the relationships between the City and other governments (local, regional, state, federal, and quasi-governmental entities). This element contains one goal which states:

"To achieve maximum coordination between the City of Cape Coral and other governmental jurisdictions, agencies, and entities."

This element has not been updated since its inception when the original Comprehensive Plan was adopted in 1989.

Objectives Analysis

Objective 1.1:

Coordinate the Comprehensive Plan with the plans of the Lee County School Board and adjacent local governments using existing formal and informal coordination mechanisms, or by establishing new formal mechanisms to ensure coordination. As the plans are amended and growth occurs, coordination methods will change. However, these methods are expected to include, but not necessarily be limited to, staff interaction, interlocal agreements, written communications, and public hearings.

Objective Achievement Analysis:

Objective 1.1 clearly states the City's coordination efforts with other local governments. As such, this objective should be retained as written.

Policy Relevance:

Policy 1.1.3 states the City's need to cooperate with Lee County in regards to annexations via an interlocal agreement. However, no interlocal agreement has been agreed upon between these two jurisdictions. There may be some benefits in developing a "regional based" annexation agreement. However, there may be cases where the City and County objectives are appropriately different and state law and regulations are the more appropriate determining criteria. Either an interlocal agreement should be developed, or thought should be given to revise this policy. It is

also suggested that overall annexation goals and objectives be developed and included in this element to better identify the City's role and desires in terms of annexations.

Policy 1.1.10 refers to an agreement to submission to binding arbitration to resole issues involved in the "proposed" Midpoint Bridge. This bridge was constructed in October 1997, and therefore, this policy is obsolete and should be removed.

All other policies are relevant to this objective and should be retained as written.

Objective 1.2:

EFFECTS OF NEW DEVELOPMENT

The City will coordinate the impacts of planned development on neighboring jurisdictions, regional agencies, and the State of Florida using existing formal or informal coordination mechanisms, or establishing new mechanisms as needed to ensure coordination. These mechanisms may include, but are not necessarily limited to, interlocal agreements, public meetings, staff interaction, written notifications, and joint committees.

Objective Achievement Analysis:

Objective 1.2 clearly states the City's coordination efforts in regards to new development with other governmental agencies. As such, this objective should be retained as written.

Policy relevance:

Policy 1.2.4 states that the City will enter into interlocal agreements with neighboring jurisdictions for notification of any land use or zoning changes within one mile of the city's boundaries. Such interlocal agreements do not exist, though the City informally meets with neighboring jurisdictions regarding such changes near the City boundary, or if there would be any effects on other jurisdictions. This policy may need to be revised, or interlocal agreements should be agreed upon.

All other policies are relevant to this objective and should be retained as written.

Objective 1.3:

LEVEL OF SERVICE STANDARDS

Ensure that the Level-of Service (LOS) standards specified in the Comprehensive Plan are consistent with the LOS standards for public facilities of other entities having operational and maintenance responsibility for those facilities.

Objective Achievement Analysis:

Objective 1.3 clearly states the City's coordination efforts in regards to level of service standards on roadways under County or State jurisdiction. As such, this objective should be retained as written.

Policy relevance:

All policies are relevant to this objective and should be retained as written.

Conclusion

Aside from the identification of an obsolete policy and policies which have not been achieved, there have been very few shortcomings with this element. It is recommended that action be taken on the policies identified in this document as either not relevant or obsolete. Furthermore, annexation overall goals and objectives should be added into the Intergovernmental Coordination Element to better describe this City's standpoint in terms of annexations. However, in regards to the remaining policies and objectives, no actionis recommended.

Future Land Use Element (FLUE)

Introduction & Background:

The Future Land Use Element (FLUE) of the City of Cape Coral Comprehensive Plan establishes the future general distribution, location, and extent of the uses of land for residential uses, commercial uses, industry, recreation, conservation, education, public buildings and grounds, other public facilities, and other categories of the public and private uses of land. It includes standards to be followed in the control and distribution of population densities and intensities for non-residential uses. As such, the FLUE is the most frequently consulted element of the Comprehensive Plan, particularly the future land use map.

The FLUE contains a data and analysis section which discusses platted lands problems and solutions, existing regulatory structure, the future land use map, land assembly strategies, and special land use considerations. The Future Land Use Objectives and Policies section includes only one goal:

GOAL: To protect the public investment by encouraging the efficient use of community infrastructure and natural resources; assure the orderly, efficient growth of the City by encouraging development in those areas which are best served by infrastructure and community services; promote new land uses which create the least possible disruption to existing uses; create a strategy which anticipates future community needs by acquiring and assembling platted lands; and protect the rights of individual property ownership, consistent with public needs.

It has eleven supporting objectives, for which a brief assessment is provided below. Also provided below are assessments of certain selected supporting policies.

Objectives Analysis

Objective 1: The City of Cape Coral will manage future growth and land development by adopting, implementing, and enforcing new regulatory vehicles; by enforcing and strengthening existing regulations; and by eliminating superfluous or confusing regulations. All land development regulations called for in this Plan shall be adopted and implemented in accordance with the provisions of S. 163.3202, Florida Statutes.

Objective Achievement

Objective 1 is a worthy objective and is supported by numerous policies. Since the adoption of the Comprehensive Plan, and since the first 1997 EAR-based amendments, the City has adopted, implemented, and enforced numerous regulatory vehicles designed to be consistent with the FLUE. Further discussion of and recommendations relevant to this objective are provided within the Major Issues section of this document.

Policy Relevance:

Policy 1.1 commits to only granting subdivisions within Development of Regional Impacts or in Planned Development Projects (PDPs). The policy is based on the need to protect the few remaining large tracts of land from inappropriate subdivision. Although the City has adhered to this policy, this policy may require excessive procedural effort for minor subdivisions.

Policy 1.4. The City will continue to protect potable water well fields through the placement of the wellheads which uses the street right-of-ways as buffer. The wellheads will continue to be protected from physical damage by using construction techniques appropriate for their location. Considering maintenance safety problems with locations in the median, the City may locate future wellheads adjacent to street right-of-ways. Buffering for such locations will be evaluated on an individual site basis to prevent contamination via the wellhead itself.

New state regulations do not allow the placement of new wells within the medians of right of ways. Therefore future wellheads will involve properties adjacent to street right of ways.

Policy 1.6. Within one year of the adoption of this plan, the City will conduct a study of its future open space policies and needs related to future residential, commercial, and industrial developments and planned development projects.

Although not completed within one year of its adoption, the City of Cape Coral undertook an intensive study of the recreational needs of the current and mid-term future residential population. This culminated in the Parks and Recreation Master Plan (Wade-Trim, 2002). The City has also prepared new regulations that address onsite open space requirements for various types of developments, including subdivisions, multi-family, commercial, and industrial development projects. However, at the time of this writing, these proposed open space regulations have not been finalized and adopted by the City.

Policy 1.9. The City will maintain regulations which create a Transfer of Development Rights (TDR) mechanism which may be used to acquire lands for public use, and to create commercial and industrial tracts for private use.

The City of Cape Coral has maintained regulations providing for Transfer of Development Rights (TDRs); however, the TDR opportunities have only been used by one party, since the inception of the regulations. Therefore, the TDR regulations have not been very successful in accomplishing its purpose. Modifications to the TDR program are anticipated to provide opportunities for the City's proposed Development Incentive Program (DIP). This would encourage the preservation of natural resources and open space, the provision of land areas for civic space, parks and infrastructure in exchange for increased density and/or intensity up to the maximum permitted under select land use classifications and zoning districts.

Policy 1.10. The City will conduct studies to ascertain the feasibility of implementing alternative mechanisms to aid and encourage the de-platting of platted lands, and to encourage the acquisition and assembly of land for public uses.

Although there are some success stories with regard to land assembly, the City needs to continue to strive to identify mechanisms to encourage the de-platting of platted lands, and to encourage the acquisition and assembly of land for public uses. The City of Cape Coral has undertaken two large-scale platted lot assemblies, one for a major park, and another for the North Cape Government Center, the future site of water and wastewater treatment facilities and other municipal uses.

The City of Cape Coral has lobbied the legislature to amend the Florida Statutes in a manner that would foster the replatting of antiquated subdivisions, or portions thereof, to better accommodate uses that require large parcels for development. The proposed bill that the City of Cape Coral advocated was rejected in the 2004 legislative session. However, the City is working together with the Southwest Regional Planning Council, the Urban Land Institute, Lee County, and other local governments and organizations to establish an alternative mechanism for land assembly, at the State level.

While government entities at the state, county and local levels and public agencies are reluctant to assemble pre-platted lands due to the time and cost associated with land assemblage, they ultimately have the power of condemnation – which is not available to private sector parties. The public sector has the capability of using eminent domain powers to address the situation of holdouts—landowners, who when approached to purchase their land, are unwilling to sell at a reasonable, market value. As a result, the siting of public facilities, such as schools, often occupy large tracts of land that could potentially be used for commercial, mixed-use and/or industrial development. If public agencies at the state, county and local level could target suitable pre-platted areas for use and redevelopment, future residential density could be reduced and larger parcels would be available for mixed use, commercial and/or industrial development.

Policy 1.11. The City will conduct commercial land needs studies to identify potential areas of the City which could accommodate commercially designated land, consistent with the studies findings and recommendations, and other provisions of the Comprehensive Plan.

This policy has been the focus of a significant planning activity that began with a revisit of the population projections. From a revised population projection, the Cape Coral Interactive Growth Model, the City prepared the Commercial Corridor Study. This study identified the existing commercial development and vacant commercial land supply, the scale variety and special distribution needs for future commercial development, and recommended a Comprehensive Plan amendment concept. Further discussion of this issue is located in the Major Issues section of this report. Essentially, the Commercial Corridor Study served as an evaluation and appraisal report of a major issue that needed to advance ahead of this official evaluation and appraisal report. The unprecedented rate of residential development necessitated amendments to the Comprehensive Plan in the second round of 2004 large-scale Comprehensive Plan amendments, to provide greater opportunities for mixed use and non-residential development. If not for the time-sensitive nature associated with this issue, these amendments would have been identified for implementation as part of this EAR-based review.

Policy 1.12. Council will adopt regulations and standards to encourage land assembly for private uses by providing density bonuses and other incentives for the recombination of platted lands.

This policy is related to Policy 1.10, but the focus is clearly on the local level. The most notable private land assemblage since the date of the first EAR is now the site of the Mid-Point Center, an assembly of platted 10,000 square foot parcels into the size of a super-community shopping center. The City is proposing the creation of a Development Incentive Program that provides density and intensity bonuses for the assemblage of 3 acres or more for commercial development in select districts. The framework for this program is established through the large scale amendment 04-02, which has been transmitted and slated for adoption in January 2005.

Policy 1.13. Land development regulations adopted to implement this comprehensive plan will be based on, and will be consistent with, the following standards for uses and densities/intensities:

This policy has been amended to provide the Pine Island Road District and the Flexible Development Overlay District, since the date of the first EAR. There is a recognition that some revisions to this policy could add clarity and could help the City effectuate changes that will help the City realize the goals. This is a topic of one of the major issues in this document, further discussed within the Major Issues section.

Policy 1.15. Land development regulations, whether adopted or revised subsequent to the adoption of this plan, will address buffering and open space requirements, and will protect existing residential land uses from incompatible land uses.

Buffering different uses and protecting the existing residential neighborhoods from non-residential uses continues to be an increasingly important topic, as the City of Cape Coral seeks to convert residential lands, at various locations, to achieve a better balance between the residential and non-residential uses. Ordinance 100-04, transmitted but not adopted at the time of this writing, prescribes new standards in new policies that will help attain an appropriate interface between residential and non-residential uses. Additionally, the City of Cape Coral is in the process of amending the Land Development Regulations to strengthen the landscape buffering between uses, offering the developers options for accomplishing this buffering. The proposed Land Development Regulation amendments also establish open space standards for various uses.

Policy 1.17. The City will adopt urban corridor design guidelines and special land use regulations along the City's roadways which serve as entry points to the City. These guidelines and regulations will identify specific signage and setback requirements, and other regulations which will serve to prevent visual and physical blight along specified roadways.

The City has not adopted new standards that apply only to corridor design along the City's roadways which serve as entry points to the City. The appearance of several of the major corridor entry points has been greatly enhanced by landscape improvements, spearheaded by

Greenscapes, a non-profit organization, since the date of the first EAR. This appearance enhancement has been accomplished without the need for additional regulation. The City of Cape Coral has drafted and anticipates adoption of three new zoning districts that are intended to be applied to the Downtown CRA, which will be at what is considered to be one of the premier entrance points, at the foot of the Cape Coral Bridge. These new zoning districts will be the culmination of an intensive planning effort, implementing the Design Downtown Community Redevelopment Area Master Plan (Dover, Kohl & Partners, March 2002), as amended.

Objective 2: Future private development requiring public water and wastewater will be directed into the Urban Services Infill Area and the Urban Services Transition Area illustrated on the Future Land Use Map, unless specifically excepted by the provisions of this plan.

Objective Achievement

This has generally been accomplished. Exceptions, consistent with Comprehensive Plan policies, to provide water to public schools have been made. Also, the Comprehensive Plan does allow for developer extension of utilities, with no cost to the City, for extensions to private developments outside of the Urban Services Transition Area.

Policy Relevance

Policy 2.3: By 1998, the City will complete an Economic Development Plan to encourage large scale commercial, professional and industrial types of development within the City.

In 2003, the Economic Development Office began implementing a four-part strategy for attracting large-scale commercial, professional and industrial enterprises. The strategic components are: business environment, marketing, sales and product development.

Business environment means improving city permitting and approval processes to reduce cycle time, project uncertainty and cost. Marketing means developing market research and workforce information to allow targeted prospects to see the value of the Cape for investment. Sales means outreach to targeted prospects -- notably office headquarters and back office enterprises, software development, pharmaceuticals, boat manufacturing, and light industry with high technology content producing small, high-value products. Product development means creating incentives for targeted target companies and business segments, and increasing the availability of commercially developable land and investment in speculative buildings.

This final component -- product development -- is critical for Cape Coral. A pre-platted community with less than 10 percent of land currently land-used for business and industrial uses, Cape Coral must more than double its capacity as quickly as possible, assembling residential land and converting it to business use before homes are built upon it, and developing land use categories that support business investment, while continuing to protect neighboring the quality of life and the market value of residential properties. The Department of Community Development is the primary operator in this dimension of product development.

Economic Development is the primary operator in the creation of incentives to create speculative buildings for large-scale industrial and office. These projects are essential for business attraction, since most (80%) siting decisions require a time frame as short as six months -- typically less than the time required for construction.

It is driven by our informal analysis that takes into account workforce quantity, skills and education; transportation; and land availability.

Facts:
Workforce -- 60 percent of the City's workforce are office workers (sales, management, clerical, professional). 85% of the City's workforce has a high school diploma or greater. Only about 15% of the City's workforce are construction or factory workers. The workforce of Cape Coral is already doing office work -- but in other parts of the region. 60% of the City's workers leave the Cape everyday to go to work. Unemployment is low.

Transportation -- we are relatively remote from the high-intensity trucking corridor (I-75). We are not served by rail (for heavy or large materials or industrial outputs). We are well-served by the airport -- only 15 miles distant -- ideal for people and light freight.

Land -- we have very little developable commercial land, and it is relatively expensive. The higher ROI required trends us toward office and technology and away from basic industrial.

Conclusions:

The City has a solid boat-building cluster that we can expand by attracting propulsion systems and instrumentation producers.

The City of Cape Coral has a "surplus" labor force -- educated office workers who would rather work in Cape Coral than commute. The City markets this as a core competency. The City's workforce is primarily suited to office and the professions. A smaller percentage is suited to basic industrial. The City's Economic Development strategy has been to increase industrial capacity, so as to attract a few, larger production businesses, but those that make small (easily transportable), high-value added goods using educated workers and advanced technologies rather than brute labor.

Objective 3: Infrastructure and community services will be extended to serve 100 percent of the anticipated functional population of the Urban Services Infill Area.

Objective Achievement

The City continues to implement this objective, and should maintain the objective.

Policy Relevance

Policy 3.1. Land use regulations, whether adopted or revised pursuant to this plan, shall provide incentives to encourage infill of residential, commercial, and other appropriate uses within the Urban Services Infill Area and Transition Area.

The City has two tools that encourage infill of residential, commercial, and other appropriate uses within the Urban Services Infill Area and Transition Areas. First, the City requires that development other than single family homes be on parcels of at least thee acres in size, if located within the Urban Services Reserve Area. Secondly, development, other than single family home development, must be approved through the Planned Development Project process. Unfortunately, due to strong market forces, single family homes are developing at a rapid rate within the Urban Services Reserve Area. In the latest round of large scale amendments, the City is proposing prohibition of residential development within the newly proposed Commercial Activity Centers within 250 feet of major roadways. Further discussion of this situation is provided in the Major Issues section of this document.

Objective 4: Infrastructure and community services will be extended to serve 100 percent of the anticipated functional population of the Urban Services Transition Area at the same level of service standards available within the Urban Services Infill Area.

Objective Achievement

The City has taken this responsibility very seriously and continues to program future infrastructure projects, including potable water, sanitary sewer, irrigation water, transportation facilities, and parks and recreation facilities to serve the future populations of the constantly increasing land areas designated as the Urban Services Transition Area.

Objective 5: The City will discourage premature "leap-frog" development within the Urban Services Reserve Area by requiring that individual builders and developers, and not the City, will bear the costs of extending infrastructure.

Objective Achievement

Objective 5 relates to Objective 2 which commits to directing future private development requiring public water and wastewater into the Urban Services Infill Area and the Urban Services Transition Area illustrated on the Future Land Use Map, unless specifically excepted by the provisions of this plan. Objective 5 is consistent with that, but is does open the door to the possibility of private development in the Urban Services Reserve Area if the developer bears the costs of extending infrastructure, which typically means extension of potable water and wastewater. Several projects have extended these services to their subject properties. The City requires that such extension of trunk lines be sized for the buildout needs of the surrounding service area.

Objective 6: The City will pursue the redevelopment and renewal of blighted areas in the downtown area consistent with the provisions of the Community Redevelopment Area (CRA) plan, and in residential areas as identified through the Code Enforcement Program.

Objective Achievement

The City of Cape Coral is continuing to foster the redevelopment and renewal of blighted areas. The City adopted a new Downtown Community Redevelopment Area Master Plan in 2002 that provides increased guidance for redevelopment in this area.

Policy Relevance

Policy 6.1. The City will continue the redevelopment of the Community Redevelopment Area (CRA) in downtown Cape Coral according to the schedule of the CRA plan as adopted by Council.

The City is in the process of considering adding an additional CRA area to the CRA area inventory, therefore some of the supporting policies should be modified to include any such new areas.

Policy 6.2. The City will, as part of its downtown CRA planning process, investigate innovative free market opportunities to property owners in blighted areas to remodel, rebuild and replat their buildings and properties, and will adopt a Standard Housing Code and will investigate the feasibility of establishing a Rental Rehabilitation Program.

The City has adopted the Standard Housing Code.

Policy 6.4. The City will adopt a phased, landscape master plan, targeting non-conforming residential, commercial, professional, and industrial land uses in order to bring identified sites up to current landscape code requirements.

The City has not adopted such a phased , landscape master plan, targeting non-conforming residential, commercial, professional, and industrial land uses in order to bring identified sites up to current landscape code requirements. Windshield surveys indicate that most single family residential development meets the current code. There is an apparent greater propensity for commercial and industrial development to be out of conformance with the current landscape regulations, although many of these situations are legal non-conformities. Due to the range of type and seriousness of code violations, it is appropriate to let the Code Enforcement Division of the Police Department determine the priorities, which set the timing and frequency of conducting sweeps with regard to landscape code compliance.

Objective 7: The City will discourage land uses which are incompatible or inconsistent with the Future Land Use Map.

Objective Achievement

The City does more than discourage land uses which are incompatible or inconsistent with the Future Land Use Map. It prohibits any such new uses. Existing inconsistent uses are

discouraged in that they are subject to the legal non-conformities section of the Land Use and Development Regulations.

Objective 8: The City will coordinate coastal area population densities with the Southwest Florida Comprehensive Hurricane Evacuation Plan.

Objective Achievement

Any proposed Comprehensive Plan amendment is reviewed with respect to its effect on hurricane evacuation, and its effect on deterring development in the Coastal High-Hazard Area.

Policy 8.1. The City will concentrate the development of infrastructure in the northeastern portion of the community to take advantage of high elevations and opportunities for rapid evacuation.

The City did not consider the financial feasibility of this policy, at the time of its adoption. Although it made sense to commit to encouraging the development in the northeastern portion of the community to take advantage of high elevations and opportunities for rapid evacuation, this area has not had the development that would support the assessments necessary for a utility expansion program. Parklands have been acquired in this area, but have not been developed to date. Scheduling of park development is prioritized with respect to the establishment of a substantial residential population within the capture area serviced. Similarly, transportation improvement projects have been and/or are planned for this northeastern portion of the City; however, transportation improvements need to be directed to areas where projects are needed to make the network run efficiently. Also, transportation impact fees collected need to be for projects distributed in areas that will offset the additional demands of development from which the fees are collected.

Objective 9: The City will coordinate its planning efforts with the provisions of the Charlotte Harbor Management Plan.

Objective Achievement

The City of Cape Coral continues to be supportive of the Charlotte Harbor Management Plan and the Charlotte Harbor National Estuary Program and its *Comprehensive Conservation and Management Plan* (CCMP). The City's Planning Division is particularly active in promoting the Florida Yards and Neighborhoods Program.

Objective 10: Cape Coral will continue to protect marine and estuarine communities and by 1995 will extend its protection to include the ownership and maintenance of a significant example of an upland ecological community.

The City has continued to protect marine and estuarine communities largely through the efforts of the Public Works Department which has an extensive water quality monitoring program and is responsible for wastewater service area extensions and stormwater improvements. The City has

acquired a 200 acre Major Park which includes a significant example of an upland ecological community.

Objective 11: The City will identify all historic and prehistoric resources within the City's jurisdiction, and will adopt regulations to preserve and protect those resources for future enjoyment.

Objective Achievement

The City has not participated in any effort to comprehensively examine every area of the City for the existence of prehistoric resources. However, the City has required development proposed in areas of high sensitivity level to undertake an archeological survey. City staff also participated in historical resource protection in the area of an extension of Diplomat Parkway, a Lee County road project, which included a spoil site.

Policy Relevance

Policy 11.1: The Historic Resources Advisory Board will be the designated body responsible for preserving the City's historic resources and the identification of historic homes and structures within the City's jurisdictional boundaries.

The City disbanded the Historic Resources Advisory Board, which was deemed unnecessary to accomplish the needed protection. Therefore, this policy should be revised accordingly.

Relevant Changes in Growth Management Laws

Introduction & Background

Subsection 163.3191(2)(f), Florida Statutes (F.S.), requires that the Evaluation & Appraisal Report (EAR) assess the consistency of The City of Cape Coral's adopted local comprehensive plan with relevant changes in the growth management policies expressed in 1) Section 187.02, F.S., the State Comprehensive Plan, 2) the applicable strategic regional policy plan, 3) Chapter 163, Part II, F.S., the Local Comprehensive Planning Act, and 4) Chapter 9J-5, the Minimum Criteria for review of Local Government Plans. This section of the EAR only evaluates growth management policy changes that may have occurred between 1996 and 2003. Changes made prior to 1997 were addressed during the 1997 EAR. Based upon any observed inconsistencies between the local comprehensive plan and the above-referenced documents, this section of the EAR also recommends proposed corrective amendments to the City of Cape Coral Comprehensive Plan.

Consistency with State Comprehensive Plan

No revisions or modifications have been made to the State Comprehensive Plan during the period between 1996 and 2003; therefore, the City of Cape Coral Comprehensive Plan is consistent with the State Comprehensive Plan.

Consistency with the Strategic Regional Policy Plan for the Southwest Florida Regional Planning Council (SWFRPC)

The Florida Statutes require regional planning councils to adopt "Strategic Regional Policy Plans" (SRPPs). The Southwest Florida Regional Planning Council updated its SRPP on July 4, 2002. Therefore, the current SRPP differs from the 1995 plan that was evaluated in the City of Cape Coral's 1997 EAR. The City of Cape Coral evaluated its Comprehensive Plan for consistency with the updated SRPP. The following list summarizes all of the changes made to the SRPP between 1997 and 2003. The EAR-based amendments should include the correction of all observed inconsistencies between the two plans.

SRPP New Goal Area: Affordable Housing Issue #2: "Livable Communities:" "Protect existing well-established neighborhoods and communities and revitalize those experiencing deterioration." Several policies within the existing Future Land Use and Housing Elements (Policies 5.1, 5.2, 9.1) support this regional goal. Therefore, no changes are recommended to the Comprehensive Plan relative to this goal.

SRPP New Goal Area: Affordable Housing Issue #4: "Human Services:" "Coordinate local housing programs with related programs to enhance services to clients." The new goal identifies the following actions: 1. Coordinate with housing and service providers to promote the formation of comprehensive programs that offer job training and support services, such as daycare and transportation, for individuals with affordable housing needs. 2. Assist local governments and housing providers in working together to apply for state and federal funds as applicable to fill identified gaps. 3. Work with service providers and local governments to identify critical needs that cannot be resolved through current funding sources. Where possible, assist communities in developing local or regional networks to address those needs. Several policies within the existing Housing Element (Policies 2.3, 5.2, 10.1, 10.3, 10.4) support this regional goal. Therefore, no changes are recommended to the Comprehensive Plan relative to this goal.

SRPP New Goal Area: Affordable Housing Issue #5: "Regional Cooperation:" "Communities will work together to address regional housing needs." The new goal identifies the following actions: 1. Assist communities in developing interlocal agreements with neighboring communities so they work together to jointly address community-wide or regional housing concerns. 2. Continue to coordinate the Housing Providers Coalition as a means of bringing together housing providers from the Region to share information and ideas. 3. Assist housing and service providers in working together to stretch limited dollars and eliminate any unnecessary overlap of services. Several policies within the existing Housing Element (Policies 2.3, 5.1) support this regional goal. Therefore, no changes are recommended to the Comprehensive Plan relative to this goal.

SRPP New Goal Area: Economic Development Issue #1: "Economic Infrastructure:" "Ensure a health care system that addresses the needs of both business and the work force." The City of Cape Coral Comprehensive Plan currently has no Element containing language that relates specifically to health care issues. Therefore, the EAR-based amendments should include the addition of such language to one or more Elements of the Comprehensive Plan.

SRPP New Goal Area: Economic Development Issue #1: "Economic Infrastructure:" "Ensure the availability of the infrastructure needed for advanced telecommunications and high technology." The City of Cape Coral Comprehensive Plan currently has no Element containing language that relates specifically to telecommunications issues. Therefore, the EAR-based amendments should include the addition of such language to one or more Elements of the Comprehensive Plan.

SRPP New Goal Area: Economic Development Issue #3: "Livable Communities:" "Enhance support for economic development." The City of Cape Coral Comprehensive Plan's Future Land Use Element contains language within its Data and Analysis section consistent with this goal. The Transportation Element also has a goal (Goal 6) promoting economic development in the City of Cape Coral. Therefore, no changes are recommended to the Comprehensive Plan relative to this goal.

SRPP New Goal Area: Economic Development Issue #4: "Diversity:" "Inventory the business incentives offered in the Region." The City of Cape Coral Economic Development Department contains a program of economic incentives to attract new businesses. However, these incentives

are not currently reflected within the Comprehensive Plan. Therefore, EAR-based amendments should include the addition of a policy to the Future Land Use Element, to list the economic incentives offered by the City to attract new businesses.

SRPP New Goal Area: Economic Development Issue #4: "Diversity:" "Work with communities to develop eco-tourism." The City of Cape Coral Comprehensive Plan's Conservation and Coastal Management Element contains language consistent with this goal. Therefore, no changes are recommended to the Comprehensive Plan relative to this goal.

SRPP New Goal Area: Economic Development Issue #6: "Regional Cooperation:" "Promote regional cooperation and coordination for economic development." The City of Cape Coral Comprehensive Plan currently has no Element containing language that relates specifically to cooperation for economic development. Therefore, the EAR-based amendments should include the addition of such language to one or more Elements of the Comprehensive Plan.

SRPP New Goal Area: Economic Development Issue #6: "Regional Cooperation:" "Provide technical assistance to member governments and other public economic development entities." The City of Cape Coral Comprehensive Plan currently has no Element containing language that relates specifically to technical assistance issues. Therefore, the EAR-based amendments should include the addition of such language to one or more Elements of the Comprehensive Plan.

SRPP New Goal Area: Emergency Preparedness Issue #3: "Livable Communities:" "Maintain up-to-date fuel shortage and energy loss emergency response plans." The City of Cape Coral Comprehensive Plan currently has no Element dealing specifically with fuel shortages or energy loss issues. Therefore, the EAR-based amendments should include the addition of such language to one or more Elements of the Comprehensive Plan.

SRPP New Goal Area: Regional Transportation Issue #1: "Balanced Intermodal/Multimodal System:" "Coordinate investments in rail infrastructure with the needs of the private sector to maximize the development of existing and future industrial, manufacturing and agricultural centers." There are no active rail lines found within the City limits of the City of Cape Coral. There appears to be no significant demand for this type of transportation facility. Therefore, no changes are recommended to the Comprehensive Plan relative to this goal.

SRPP New Goal Area: Regional Transportation Issue #2: "Livable Communities:" "Incorporate community impact assessment techniques throughout the transportation project planning and development process." The SRPP has established three indicators relative to this regional goal:

-Number of communities using community impact assessment techniques
-Formation of a community continuing public education/information program, and
-Number of persons adversely impacted by transportation projects or enhancements.

The City's road improvement planning process is carried via the public meetings of the City's Transportation Advisory Committee, council meetings, and the meetings of the Metropolitan Planning Organization. However, the regional goal calls specifically for the use of "community impact assessment techniques," and the City does not currently require the use of such

techniques. Therefore, the EAR-based amendments should include the addition of such language to the Transportation Element of the Comprehensive Plan.

SRPP New Goal Area: Regional Transportation Issue #2: "Livable Communities:" "Report annually on the relationship between transportation, natural and manmade resources and impact on the quality of life." The SRPP has established three indicators relative to this regional goal:

-Maintenance of air quality standards
-Acreage of wetlands and significant uplands impacted by new transportation systems. and
-Number of protected (wildlife) corridor travel ways/crossings.

The City's Conservation and Coastal Management Element (Objective 1.2) contains an objective relative to all of the stated regional indicators. Therefore, the Comprehensive Plan is consistent with the regional goal.

SRPP New Goal Area: Regional Transportation Issue #4: "Transportation System:" "Develop tools, approaches, and funding opportunities represented by ITS (International Transportation Society) for addressing local transportation system management and operational needs." Although the City's Transportation Element contains no specific language relative to the above regional issue, the City's Transportation Division is required to maintain knowledge and awareness of the most currently recognized transportation "tools, approaches, and funding opportunities," and employ such tools and strategies whenever feasible. Therefore, no changes are recommended to the Comprehensive Plan relative to this goal.

SRPP New Goal Area: Regional Transportation Issue #4: "Regional Cooperation:" "Implement new financing alternatives to overcome the shortfall of transportation funding." The City's Transportation Element (Policies 2.1.2, 2.2.1, 4.3.11) contains financing alternatives for traffic strategies. Therefore, the Comprehensive Plan is consistent with the regional goal.

Consistency with Chapter 163, Part II, Florida Statutes (F.S.)

Chapter 163, Part II, F.S. covers Growth Policy, County and Municipal Planning, and Land Development Regulation. The following list summarizes legislative changes made to Chapter 163 between 1996 and 2003, and identifies whether 1) these changes require modification to any particular element of the Cape Coral Comprehensive Plan, 2) whether the changes have already been addressed through prior plan amendments, and 3) whether the changes are optional or are simply procedural in nature.

Table 11: Changes to Chapter 163.F.S.

1997: [Ch. 97-253, ss. 1-4, Laws of Florida]					
74	Amended the definition of **de minimis impact** as it pertains to concurrency requirements.	163.3180(6)	Yes	City addresses this change in Policy 1.1.8 of the Transportation Element	No amendment needed
75	Established that no plan or plan amendment in an **area of critical state concern** is effective until found in compliance by a final order.	163.3184(14)	N/A	City of Cape Coral does not have areas of critical state concern	No amendment needed
76	Amended the criteria for the annual effect of **Duval County small scale amendments** to a maximum of 120 acres.	163.3187(1)(c)1.a .III	N/A	Does not apply to Cape Coral	No amendment needed
77	Prohibited amendments in **areas of critical state concern** from becoming effective if not in compliance.	163.3189(2)(b)	N/A	City of Cape Coral does not have areas of critical state concern	No amendment needed
1998: [Ch. 98-75, s. 14; Ch. 146, ss. 2-5; Ch. 98-176, ss. 2-6 and 12-15; Ch. 98-258, ss. 4-5]					
78	Exempted **brownfield area** amendments from the **twice-a-year limitation**.	163.3187(1)(g)	Yes	There may be brownfields in the Industrial areas of the City	Amendment to Future Land Use Element
79	Required that the **capital improvements element** set forth standards for **the management of debt**.	163.3177(3)(a)4.	Yes	Policy 4.5 of the Capital Improvement Element	No amendment needed
80	Required inclusion of at least **two planning periods**—at least 5 years and at least 10 years.	163.3177(5)(a)	Yes	City currently complies with statute	No amendment needed
81	Allowed **multiple individual plan amendments** to be considered together as one amendment cycle.	163.3184(3)(d)	Yes	City currently complies with statute	No amendment needed
82	Defined **optional sector plan** and created section 163.3245 allowing local governments to address DRI issues within certain identified geographic areas.	163.3164(31) and 163.3245	N/A	Not required	Not adopted by Cape Coral

83	Established the requirements for a **public school facilities element**.	163.3177(12)	N/A	Optional Element	No amendment needed
84	Established the minimum requirements for imposing **school concurrency**.	163.3180(12), (now Section (13))	N/A	Optional Element	No amendment needed
85	Required DCA adopt **minimum criteria** for the compliance determination of a **public school facilities element** imposing school concurrency.	163.3180(13), (now Section14))	N/A	Procedural Change	No amendment needed
86	Required that **evaluation and appraisal reports** address coordination of the comp plan with existing public schools and the school district's 5-year work program.	163.3191(2)(i) **[Now: 163.3191(2)(k)]**	N/A	Optional Element	No amendment needed
87	Amended the definition of "**in compliance**" to includes consistency with Sections 163.3180 and 163.3245.	163.3184(1)(b)	Yes	Definition Change	No amendment needed
88	Required DCA to **maintain a file with all documents received or generated** by DCA relating to plan amendments and identify; limited DCA's review of proposed plan amendments to written comments, and required DCA to identify and list all written communications received within 30 days after transmittal of a proposed plan amendment.	163.3184(2), (4), and (6)	N/A	Procedural Change	No amendment needed
89	Allowed a **local government to amend its plan** for a period of up to one year after the initial determination of sufficiency of an adopted EAR even if the EAR is insufficient.	163.3187(6)(b)	Yes	Procedural change	The City is consistent with this requirement.
90	Substantially reworded Section 163.3191, F.S., related to **evaluation and appraisal reports**.	163.3191	Yes	City is in compliance with this statute	No amendment needed

91	Changed the **population requirements** for municipalities and counties which are required to submit otherwise optional elements.	163.3177(6)(i)	Yes	City of Cape Coral has Demographic and Population Element	No amendment needed
1999: Ch. 99-251, ss. 65-6, and 90; Ch. 99-378, ss. 1, 3-5, and 8-9, Laws of Florida]					
92	Required that **ports** and local governments in the coastal area, which has **spoil disposal responsibilities**, identify dredge disposal sites in the comp plan.	163.3178(7)	Yes	The City addresses this issue in Policy 10.1 of the Future Land Use Element	No amendment needed
93	Exempted from the **twice-per-year limitation** certain port related amendments for **port transportation facilities** and projects eligible for funding by the Florida Seaport Transportation and Economic Development Council.	163.3187(1)(h)	N/A	Procedural Change	No amendment needed
94	Required **rural counties** to base their future land use plans and the amount of land designated **industrial** on data regarding the need for job creation, capital investment, and economic development and the need to strengthen and diversify local economies.	163.3177(6)(a)	N/A	Procedural Change	No amendment needed
95	Added the Growth Policy Act to Ch. 163, Part II to promote **urban infill and redevelopment**.	163.2511,163.25, 14,163.2517,163. 2520,163.2523,16 3.2526	Yes	City of Cape Coral addresses this issue in Objective 2 of the Future Land Use Element	No amendment needed
96	Required that all comp plans comply with the **school siting requirements** by October 1, 1999.	163.3177(6)(a)	N/A	Optional Element	No amendment needed
97	Made **transportation facilities** subject to concurrency.	163.3180(1)(a)	Yes	City is in compliance with this statute	No amendment needed
98	Required use of **professionally accepted techniques** for measuring level of service	163.3180(1)(b)	Yes	City is in compliance with this statute	No amendment needed

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	for cars, trucks, transit, bikes and pedestrians.				
99	Excludes **public transit facilities** from **concurrency** requirements.	163.3180(4)(b)	N/A	Not relevant to the City	No amendment needed
100	Allowed **multi-use DRIs** to satisfy the **transportation concurrency** requirements when authorized by a local comprehensive plan under limited circumstances.	163.3180(12)	N/A	Not relevant to the City	No amendment needed
101	Allowed **multi-modal transportation districts** in areas where priorities for the pedestrian environment are assigned by the plan.	163.3180(15)	N/A	Not relevant to the City	No amendment needed
102	Exempted amendments for **urban infill and redevelopment areas, public school concurrency** from the **twice-per-year limitation**.	163.31879(1)(h) and (i) **[Now: (i) and (j)]**	Yes	Procedural Change	Amendment needed to Future Land Use Element
103	Defined **brownfield designation** and added the assurance that a developer may proceed with development upon receipt of a brownfield designation. [Also see 163.3221(1) for "brownfield" definition.]	163.3220(2)	Yes	Definition change	Amendment needed to Future Land Use Element
2000: Ch. 2000-158, ss. 15-17, Ch. 2000-284, s. 1, Ch. 2000-317, s. 18, Laws of Florida]					
104	Repealed Section 163.3184(11)(c), F.S., that required funds from sanction for non-compliant plans go into the Growth Management Trust Fund.	163.3184(11)(c	N/A	Procedural Change	No amendment needed
105	Repealed Section 163.3187(7), F.S. that required consideration of an increase in the annual total acreage threshold for small scale plan amendments and a report by DCA.	163.3187(7)	N/A	Procedural Change	No amendment needed
106	Repealed Sections 163.3191(13) and (15), F.S.	163.3191(13) and (15)	N/A	Procedural Change	No amendment needed

107	Allowed **small scale amendments** in **areas of critical state concern** to be exempt from the twice-per-year limitation only if they are for affordable housing.	163.3187(1)(c)1.e	N/A	Procedural Change	No amendment needed
108	Added exemption of sales from local option surtax imposed under Section 212.054, F.S., as examples of **incentives** for new development within **urban infill and redevelopment areas**.	163.2517(3)(j)2	N/A	Not relevant to City of Cape Coral	No amendment needed
2001: [Ch. 2001-279, s. 64]					
109	Created the **rural land stewardship area** program.	163.3177(11)(d)	N/A	Procedural	No amendment needed
2002: (Ch. 2002-296, SS. 1 - 11, Laws of Florida)					
110	Required that all agencies that review comprehensive plan amendments and rezoning include a **non-voting representative of the district school board**.	163.3174	Yes	The City corresponds with the school board district and provides opportunities to address the local planning agency.	No amendment needed
111	Required coordination of local comprehensive plan with the regional water supply plan.	163.3177(4)(a)	Yes	The South Florida Water Management District reviews all Comprehensive Plan amendments	No amendment needed
112	Plan amendments for school-siting maps are exempt from s. 163.3187(1)'s limitation on frequency.	163.3177(6)(a)	N/A	Procedural	No amendment needed
113	Required that by adoption of the EAR, the sanitary sewer, solid waste, drainage, potable water and natural groundwater aquifer recharge element consider the regional water supply plan and include a 10-year work plan to build the identified water supply facilities.	163.3177(6)(c)	Yes	Submittal due date is December 1, 2006	No amendment needed
114	Required consideration of the regional	163.3177(6)(d)	Yes	The City recognizes the	Amendment needed

	water supply plan in the preparation of the conservation element.			need to address this issue in the Conservation Element.	
115	Required that the intergovernmental coordination element (ICE) include relationships, principles and guidelines to be used in coordinating comp plan with regional water supply plans.	163.3177(6)(h)	Yes	This issue will be address in the 10-year work plan	EAR based amendment needed
116	Required the local governments adopting a public educational facilities element execute an inter-local agreement with the district school board, the county, and non-exempting municipalities.	163.3177(6)(h)4	N/A	Optional Element	No amendment needed
117	Required that counties larger than 100,000 population and their municipalities submit a inter-local service delivery agreements (existing and proposed, deficits or duplication in the provisions of service) report to DCA by January 1, 2004. Each local government is required to update its ICE based on the findings of the report. DCA will meet with affected parties to discuss and id strategies to remedy any deficiencies or duplications.	163.3177(6)(h)6,7 , & 8	Yes	The City will coordinate with Lee County and other municipalities within the County's jurisdiction to submit an interlocal service delivery agreement. The City will update its Intergovernmental Coordination Element from its findings the report.	Amendment to the Intergovernmental Coordination Element may be needed.
118	Required local governments and special districts to provide recommendations for statutory changes for annexation to the Legislature by February 1, 2003.	163.3177(6)(h)9	Yes	City has met this requirement	No amendment needed

119	Added a new section 163.31776 that allows a county, to adopt an optional public educational facilities element in cooperation with the applicable school board.	163.31776	N/A	Procedural change	No amendment needed
120	Added a new section 163.31777 that requires local governments and school boards to enter into an inter-local agreement that addresses school siting, enrollment forecasting, school capacity, infrastructure and safety needs of schools, schools as emergency shelters, and sharing of facilities.	163.31777	Yes	City entered into an interlocal agreement with Lee County and surrounding municipalities	No amendment needed
121	Added a provision that the concurrency requirement for transportation facilities may be waived by plan amendment for urban infill and redevelopment areas.	163.3180(4)(e)	Yes	City addresses this in Policy 1.1.7 of the Transportation Element.	No amendment needed
122	Expanded the definition of "affected persons" to include property owners who own land abutting a change to a future land use map.	163.3184(1)(a)	Yes	Definition change	No amendment needed
123	Expanded the definition of "in compliance" to include consistency with Section 163.31776 (public educational facilities element).	163.3184(1)(b)	Yes	Definition change	No amendment needed
124	Streamlined the timing of comprehensive plan amendment review.	163.3184(3), (4), (6), (7), and (8)	Yes	Procedural change	No amendment needed
125	Required that local governments provide a sign-in form at the transmittal hearing and at the adoption hearing for persons to provide their names and addresses.	163.3184(15)(c)	Yes	The City provides a sign-in form at the transmittal hearing and at the adoption hearing for persons to provide their names and addresses	No amendment needed

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126	Exempted amendments related to providing transportation improvements to enhance life safety on "controlled access major arterial highways" from the limitation on the frequency of plan amendments contained in s. 163.3187(1).	163.3187(1)(k)	N/A	Optional Element	No amendment
127	Required Ears to include (1) consideration of the appropriate regional water supply plan, and (2) an evaluation of whether past reductions in land use densities in coastal high hazard areas have impaired property rights of current residents where redevelopment occurs.	163-3191(2)(1)	Yes	The City has addressed this issue in the Evaluation and Appraisal Report	No amendment needed
128	Allowed local governments to establish a special master process to assist the local governments with challenges to local development orders for consistency with the comprehensive plan.	163.3215	N/A	Procedural Change	Amendment may or may not be needed
129	Created the Local Government Comprehensive Planning Certification Program to allow less state and regional oversight of comprehensive plan process if the local government meets certain criteria.	163.3246	N/A	Procedural Change	No amendment needed

130	Added a provision to Section 380.06(24), Statutory Exemptions, that exempts from the requirements for developments of regional impact, any water port or marina development if the relevant local government has adopted a "boating facility siting plan or policy" (which includes certain specified criteria) as part of the coastal management element or future land use element of its comprehensive plan. The adoption of the boating facility siting plan or policy is exempt from the limitation on the frequency of plan amendments contained in s. 163.3187(1).	163.3187(1)	N/A	The City does not have boating facility siting plan	No amendment needed
131	Prohibited a local government, under certain conditions, from denying an application for development approval for a requested land use for certain proposed solid waste management facilities.	163.3194(6)			
2003: [Ch. 03-1, ss. 14-15; ch. 03-162, s. 1; ch. 03-261, s. 158; ch. 03-286, s. 61, Laws of Florida.]					
132	Creates the **Agricultural Lands and Practices Act**. (2): Provides legislative findings and purpose with respect to agricultural activities and duplicative regulation. (3): Defines the terms "farm," "farm operation," and "farm product" for purposes of the act. (4): Prohibits a county from adopting any ordinance, resolution, regulation, rule, or policy to prohibit or otherwise limit a bona fide farm operation on land that is classified as agricultural land.	163.3162	N/A	Definition Change	No amendment needed

	(4)(a): Provides that the act does not limit the powers of a county under certain circumstances. (4)(b): Clarifies that a farm operation may not expand its operations under certain circumstances. (4)(c): Provides that the act does not limit the powers of certain counties. (4)(d): Provides that certain county ordinances are not deemed to be a duplication of regulation.				
133	Changes "State Comptroller" references to "Chief Financial Officer."	163.3167(6)	N/A	Definition Change	No amendment needed
134	Provides for certain airports to abandon DRI orders.	163.3177(6)(k)	N/A	Not relevant to the City	No amendment needed
135	Amended to conform to the repeal of s. 235.185 and the enactment of similar material in s. 1013.35.	163.31776(1)(b)(2)-(3)	N/A	Optional Element	No amendment needed
136	Amended to conform to the repeal of ch. 235 and the enactment of similar material in ch. 1013.	163.37111(1)(c), (2)(e)-(f), (3)(c), (4), (6)(b)	N/A	Optional Element	No amendment needed
2004: [Ch. 04-5, s. 11; ch. 04-37, s. 1; ch. 04-230, ss. 1-4; ch. 04-372, ss. 2-5; ch. 04-381, ss. 1-2; ch. 04-384, s. 2, Laws of Florida.]					
137	(10): Amended to conform to the repeal of the Florida **High-Speed Rail** Transportation Act, and the creation of the Florida High-Speed Rail Authority Act. (13): Created to require local governments to identify adequate **water supply sources** to meet future demand. (14): Created to limit the effect of **judicial determinations** issued subsequent to certain development orders pursuant to adopted land development regulations.	163.3167	Partially Applicable	The City is in compliance with the Water Supply Facilities Work Plan	No amendment needed

138	(1): Provides legislative findings on the compatibility of development with **military installations**. (2): Provides for the exchange of information relating to proposed land use decisions between counties and local governments and military installations. (3): Provides for responsive comments by the commanding officer or his/her designee. (4): Provides for the county or affected local government to take such comments into consideration. (5): Requires the representative of the military installation to be an ex-officio, nonvoting member of the county's or local government's land planning or zoning board. (6): Encourages the commanding officer to provide information on community planning assistance grants.	Creates 163.3175.	N/A	City does not have military installations	No amended needed.
139	163.3177 (6)(a): - Changed to require local governments to amend the future land use element by June 30, 2006 to include criteria to achieve compatibility with **military installations**. - Changed to specifically encourage **rural land stewardship area** designation as an overlay on the future land use map. (6)(c): - Extended the deadline adoption of the **water supply facilities work plan**	163.3177	Partially Applicable	The City is in compliance with the Water Supply Facilities Work Plan	No amendment needed

	amendment until December 1, 2006; provided for updating the work plan every five years; and exempts such amendment from the limitation on frequency of adoption of amendments. (10)(1): Provides for the coordination by the state land planning agency and the Department of Defense on compatibility issues for **military installations**. (11)(d)(1): Requires DCA, in cooperation with other specified state agencies, to provide assistance to local governments in implementing provisions relating to **rural land stewardship areas**. (11)(d)(2): Provides for **multicounty rural land stewardship areas**. (11)(d)(3)-(4): Revises requirements, including the acreage threshold for designating **a rural land stewardship area**. (11)(d)(6)(j): Provides that **transferable rural land use credits** may be assigned at different ratios according to the natural resource or other beneficial use characteristics of the land. (11)(e): Provides legislative findings regarding mixed-use, high-density **urban infill and redevelopment** projects; requires DCA to provide technical assistance to local governments. (11)(f): Provides legislative findings regarding a program for the transfer of development rights and **urban infill and**				

	redevelopment; requires DCA to provide technical assistance to local governments.				
140	(1): Provides legislative findings with respect to the shortage of **affordable rentals** in the state. (2): Provides definitions. (3): Authorizes local governments to permit **accessory dwelling units** in areas zoned for single family residential use based upon certain findings. (4): Provides for certain **accessory dwelling units** to apply towards satisfying the affordable housing component of the housing element in a local government's comprehensive plan. (5): Requires the DCA to report to the Legislature.	Creates 163.31771	Yes	Procedural change	The City may need to examine its Housing Policy in order to address this statutory change.
141	Amends the definition of "in compliance" to add language referring to the **Wekiva Parkway and Protection Act**.	163.3184(1)(b)	N/A	Definition Change	No amendment needed
142	(1)(m): Created to provide that amendments to address criteria or compatibility of land uses adjacent to or in close proximity to **military installations** do not count toward the limitation on frequency of amending comprehensive plans. (1)(n): Created to provide that amendments to establish or implement a **rural land stewardship area** do not count toward the limitation on frequency of amending comprehensive plans.	163.3187	N/A	City does not have any military installations	No amendment needed
143	Created to provide that **evaluation and**	163.3191(2)(u)	N/A	City does not have any	No amendment needed

	appraisal reports evaluate whether criteria in the land use element were successful in achieving land use compatibility with **military installations**.			military installations	

Consistency with Rule 9J-5, Florida Administrative Code (F.A.C.)

Rule 9J-5, Florida Administrative Code, (F.A.C.) establishes minimum criteria for the preparation, and State reviews of local government comprehensive plans and plan amendments pursuant to Chapter 163, Florida Statutes. The following lost summarizes legislative changes made to Rule 9J-5 between 1996 and 2004 and identifies whether 1) these changes require modification to any Comprehensive Plan element, 2) the changes have already been addressed through prior plan amendments, or 3) if the changes are optional or are simply procedural in nature.

1997. [Ch. 97-253, ss. 1-4, Laws of Florida]					
74	Amended the definition of **de minimis impact** as it pertains to concurrency requirements.	163.3180(6)	Yes	City addresses this change in Policy 1.1.8 of the Transportation Element.	No amendment needed.
75	Established that no plan or plan amendment in an **area of critical state concern** is effective until found in compliance by a final order.	163.3184(14)	N/A	City of Cape Coral does not have areas of critical state concern.	No amendment needed.
76	Amended the criteria for the annual effect of **Duval County small scale amendments** to a maximum of 120 acres.	163.3187(1)(c)1.a.III.	N/A	Does not apply to Cape Coral.	No amendment needed.
77	Prohibited amendments in **areas of critical state concern** from becoming effective if not in compliance.	163.3189(2)(b).	N/A	City of Cape Coral does not have areas of critical state concern.	No amendment needed.
1998. [Ch. 98-75, s. 14, Ch. 146, ss. 2-5; Ch. 98-176, ss. 2-6 and 12-15; Ch. 98-258, ss. 4-5]					
78	Exempted **brownfield area** amendments from the **twice-a-year limitation**.	163.3187(1)(g).	Yes	There may be brownfields in the Industrial areas of the City.	Amendment to Future Land Use Element.
79	Required that the **capital improvements element** set forth standards for **the management of debt**.	163.3177(3)(a)4.	Yes	Policy 4.5 of the Capital Improvement Element.	No amendment needed.
80	Required inclusion of at least **two planning periods** – at least 5 years and at least 10 years.	163.3177(5)(a).	Yes	City currently complies with statute.	No amendment needed.
81	Allowed **multiple individual plan amendments** to be considered together as one amendment cycle.	163.3184(3)(d).	Yes	City currently complies with statute.	No amendment needed.
82	Defined **optional sector plan** and created section 163.3245 allowing local governments to address DRI issues within certain identified geographic areas.	163.3164(31) and 163.3245.	N/A	Not required.	Not adopted by Cape Coral.
83	Established the requirements for a **public school facilities element**.	163.3177(12).	N/A	Optional Element.	No amendment needed.
84	Established the minimum requirements for imposing **school concurrency**.	163.3180(12). (now Section (13)).	N/A	Optional Element.	No amendment needed.
85	Required DCA adopt **minimum criteria** for the compliance determination of a **public school facilities element** imposing school concurrency.	163.3180(13). (now Section14)).	N/A	Procedural Change.	No amendment needed.
86	Required that **evaluation and appraisal reports** address coordination of the comp plan with existing	163.3191(2)(i). **[Now:**	N/A	Optional Element.	No amendment needed.

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	public schools and the school district's 5-year work program.	**163.3191(2)(k)**			
87	Amended the definition of "**in compliance**" to includes consistency with Sections 163.3180 and 163.3245.	163.3184(1)(b).	Yes	Definition Change	No amendment needed
88	Required DCA to **maintain a file with all documents received or generated** by DCA relating to plan amendments and identify; limited DCA's review of proposed plan amendments to written comments, and required DCA to identify and list all written communications received within 30 days after transmittal of a proposed plan amendment.	163.3184(2), (4), and (6)	N/A	Procedural Change	No amendment needed
89	Allowed a **local government to amend its plan** for a period of up to one year after the initial determination of sufficiency of an adopted EAR even if the EAR is insufficient.	163.3187(6)(b)	Yes	Procedural change	The City is consistent with this requirement
90	Substantially reworded Section 163.3191, F.S., related to **evaluation and appraisal reports**.	163.3191	Yes	City is in compliance with this statute	No amendment needed
91	Changed the **population requirements** for municipalities and counties which are required to submit otherwise optional elements.	163.3177(6)(i)	Yes	City of Cape Coral has Demographic and Population Element	No amendment needed.
1999	Ch. 99-251, ss. 65-6, and 90; Ch. 99-378, ss. 1, 3-5, and 8-9, Laws of Florida]				
92	Required that **ports** and local governments in the coastal area, which has **spoil disposal responsibilities**, identify dredge disposal sites in the comp plan.	163.3178(7)	Yes	The City addresses this issue in Policy 10.1 of the Future Land Use Element	No amendment needed
93	Exempted from the **twice-per-year limitation** certain port related amendments for **port transportation facilities** and projects eligible for funding by the Florida Seaport Transportation and Economic Development Council.	163.3187(1)(h)	N/A	Procedural Change	No amendment needed
94	Required **rural counties** to base their future land use plans and the amount of land designated **industrial** on data regarding the need for job creation, capital investment, and economic development and the need to strengthen and	163.3177(6)(a)	N/A	Procedural Change	No amendment needed

	diversify local economies.				
95	Added the Growth Policy Act to Ch. 163, Part II to promote **urban infill and redevelopment**.	163.2511, 163.25,14, 163.2517,163.2520,163.2523,163.2526	Yes	City of Cape Coral addresses this issue in Objective 2 of the Future Land Use Element	No amendment needed
96	Required that all comp plans comply with the **school siting requirements** by October 1, 1999.	163.3177(6)(a)	N/A	Optional Element	No amendment needed
97	Made **transportation facilities** subject to concurrency.	163.3180(1)(a)	Yes	City is in compliance with this statute	No amendment needed
98	Required use of **professionally accepted techniques** for measuring level of service for cars, trucks, transit, bikes and pedestrians.	163.3180(1)(b)	Yes	City is in compliance with this statute	No amendment needed
99	Excludes **public transit facilities** from **concurrency** requirements.	163.3180(4)(b)	N/A	Not relevant to the City	No amendment needed
100	Allowed **multi-use DRIs** to satisfy the **transportation concurrency** requirements when authorized by a local comprehensive plan under limited circumstances.	163.3180(12)	N/A	Not relevant to the City	No amendment needed
101	Allowed **multi-modal transportation districts** in areas where priorities for the pedestrian environment are assigned by the plan.	163.3180(15)	N/A	Not relevant to the City	No amendment needed
102	Exempted amendments for **urban infill and redevelopment areas**, **public school concurrency** from the **twice-per-year limitation**.	163.3187(1)(b) and (i) **[Now: (i) and (j)]**	Yes	Procedural Change	Amendment needed in Future Land Use Element
103	Defined **brownfield designation** and added the assurance that a developer may proceed with development upon receipt of a brownfield designation. [Also see 163.3221(1) for "brownfield" definition.]	163.3220(2)	Yes	Definition change	Amendment needed to Future Land Use Element
2000	Ch. 2000-158, ss. 15-17, Ch. 2000-284, s. 1; Ch. 2000-317, s. 13, Laws of Florida]				
104	Repealed Section 163.3184(11)(c), F.S., that required funds from sanction for non-compliant plans go into the Growth Management Trust Fund.	163.3184(11)(c	N/A	Procedural Change	No amendment needed
105	Repealed Section 163.3187(7), F.S. that required consideration of an increase in the annual total acreage threshold for small scale plan amendments and a report by DCA.	163.3187(7)	N/A	Procedural Change	No amendment needed.

106	Repealed Sections 163.3191(13) and (15), F.S.	163.3191(13) and (15)	N/A	Procedural Change	No amendment needed
107	Allowed **small scale amendments** in **areas of critical state concern** to be exempt from the twice-per-year limitation only if they are for affordable housing.	163.3187(1)(c)1.e.	N/A	Procedural Change	No amendment needed
108	Added exemption of sales from local option surtax imposed under Section 212.054, F.S., as examples of **incentives** for new development within **urban infill and redevelopment areas**.	163.2517(3)(j)2.	N/A	Not relevant to City of Cape Coral	No amendment needed
2001	(Ch. 2001-279, s. 64)				
109	Created the **rural land stewardship area** program.	163.3177(11)(d)	N/A	Procedural	No amendment needed
2002	(Ch. 2002-296, SS. 1 - 11, Laws of Florida)				
110	Required that all agencies that review comprehensive plan amendments and rezoning include a **nonvoting representative of the district school board**.	163.3174	Yes	The City corresponds with the school board district and provides opportunities to address the local planning agency.	No amendment needed
111	Required coordination of local comprehensive plan with the regional water supply plan.	163.3177(4)(a)	Yes	The South Florida Water Management District reviews all Comprehensive Plan amendments.	No amendment needed
112	Plan amendments for school-siting maps are exempt from s. 163.3187(1)'s limitation on frequency.	163.3177(6)(a)	N/A	Procedural	No amendment needed
113	Required that by adoption of the EAR, the sanitary sewer, solid waste, drainage, potable water and natural groundwater aquifer recharge element consider the regional water supply plan and include a 10-year work plan to build the identified water supply facilities.	163.3177(6)(c)	Yes	Submittal due date is December 1, 2006	No amendment needed
114	Required consideration of the regional water supply plan in the preparation of the conservation element.	163.3177(6)(d)	Yes	The City recognizes the need to address this issue in the Conservation Element	Amendment needed
115	Required that the intergovernmental coordination element (ICE) include relationships, principles and guidelines to be used in coordinating comp plan	163.3177(6)(h)	Yes	This issue will be address in the 10-year work plan	EAR based amendment needed

	with regional water supply plans				
116	Required the local governments adopting a public educational facilities element execute an inter-local agreement with the district school board, the county, and non-exempting municipalities.	163.3177(6)(h)4	N/A	Optional Element	No amendment needed
117	Required that counties larger than 100,000 population and their municipalities submit a inter-local service delivery agreements (existing and proposed, deficits or duplications in the provisions of service) report to DCA by January 1, 2004. Each local government is required to update its ICE based on the findings of the report. DCA will meet with affected parties to discuss and id strategies to remedy any deficiencies or duplications.	163.3177(6)(h)6, 7, & 8	Yes	The City will coordinate with Lee County and other municipalities within the County's jurisdiction to submit an interlocal service delivery agreement. The City will update its Intergovernmental Coordination Element from its findings the report.	Amendment to the Intergovernmental Coordination Element may be needed.
118	Required local governments and special districts to provide recommendations for statutory changes for annexation to the Legislature by February 1, 2003.	163.3177(6)(h)9	Yes	City has met this requirement.	No amendment needed
119	Added a new section 163.31776 that allows a county, to adopt an optional public educational facilities element in cooperation with the applicable school board.	163.31776	N/A	Procedural change	No amendment needed
120	Added a new section 163.31777 that requires local governments and school boards to enter into an inter-local agreement that addresses school siting, enrollment forecasting, school capacity, infrastructure and safety needs of schools, schools as emergency shelters, and sharing of facilities.	163.31777	Yes	City entered into an interlocal agreement with Lee County and surrounding municipalities	No amendment needed
121	Added a provision that the concurrency requirement for transportation facilities may be waived by plan amendment for urban infill and redevelopment areas.	163.3180(4)(c)	Yes	City addresses this in Policy 1.1.7 of the Transportation Element.	No amendment needed
122	Expanded the definition of "affected persons" to include property owners who own land abutting a change to a future land use map.	163.3184(1)(a)	Yes	Definition change	No amendment needed
123	Expanded the definition of "in compliance" to include consistency with Section 163.31776 (public	163.3184(1)(b)	Yes	Definition change	No amendment needed

	educational facilities element)				
124	Streamlined the timing of comprehensive plan amendment reviews.	163.3184(3), (4), (6), (7), and (8)	Yes	Procedural change	No amendment needed
125	Required that local governments provide a sign-in form at the transmittal hearing and at the adoption hearing for persons to provide their names and addresses.	163.3184(15)(c)	Yes	The City provides a sign-in form at the transmittal hearing and at the adoption hearing for persons to provide their names and addresses.	No amendment needed
126	Exempted amendments related to providing transportation improvements to enhance life safety on "controlled access major arterial highways" from the limitation on the frequency of plan amendments contained in s.163.3187(1).	163.3187(1)(k)	N/A	Optional Element	No amendment
127	Required BAR's to include (1) consideration of the appropriate regional water supply plan, and (2) an evaluation of whether past reductions in land use densities in coastal high hazard areas have impaired property rights of current residents where redevelopment occurs.	163-3191(2)(1)	Yes	The City has addressed this issue in the Evaluation and Appraisal Report.	No amendment needed
128	Allowed local governments to establish a special master process to assist the local governments with challenges to local development orders for consistency with the comprehensive plan.	163.3215	N/A	Procedural Change	Amendment may or may not be needed
129	Created the Local Government Comprehensive Planning Certification Program to allow less state and regional oversight of comprehensive plan process if the local government meets certain criteria.	163.3246	N/A	Procedural Change	No amendment needed

130	Added a provision to Section 380.06(24), Statutory Exemptions, that exempts from the requirements for developments of regional impact, any water port or marina development if the relevant local government has adopted a "boating facility siting plan or policy" (which includes certain specified criteria) as part of the coastal management element or future land use element of its comprehensive plan. The adoption of the boating facility siting plan or policy is exempt from the limitation on the frequency of plan amendments contained in s.163.3187(1).	163.3187(1)	N/A	The City does not have boating facility siting plan	No amendment needed
131	Prohibited a local government, under certain conditions, from denying an application for development approval for a requested land use for certain proposed solid waste management facilities.	163.3194(6)			
2003: [Ch. 03-1, ss. 14-15; ch. 03-162, s. 1; ch. 03-261, s. 158; ch. 03-286, s. 61, Laws of Florida.]					
132	Creates the **Agricultural Lands and Practices Act** (2): Provides legislative findings and purpose with respect to agricultural activities and duplicative regulation. (3): Defines the terms "farm," "farm operation," and "farm product" for purposes of the act. (4): Prohibits a county from adopting any ordinance, resolution, regulation, rule, or policy to prohibit or otherwise limit a bona fide farm operation on land that is classified as agricultural land. (4)(a): Provides that the act does not limit the powers of a county under certain circumstances. (4)(b): Clarifies that a farm operation may not expand its operations under certain circumstances. (4)(c): Provides that the act does not limit the powers of certain counties. (4)(d): Provides that certain county ordinances are not deemed to be a duplication of regulation.	163.3162.	N/A	Definition Change	No amendment needed
133	Changes "State Comptroller" references to "Chief Financial Officer."	163.3167(6)	N/A	Definition Change	No amendment needed

134	Provides for certain airports to abandon HRI orders.	163.3177(6)(k).	N/A	Not relevant to the City	No amendment needed
135	Amended to conform to the repeal of s. 235.185 and the enactment of similar material in s. 1013.33.	163.31776(1)(b)(2)-(3).	N/A	Optional Element	No amendment needed
136	Amended to conform to the repeal of ch. 235 and the enactment of similar material in ch. 1013.	163.3711(1)(c), (2)(e)-(f), (3)(c), (4), (6)(b).	N/A	Optional Element	No amendment needed
2004	[Ch. 04-5, s. 11; ch. 04-37, s. 1; ch. 04-230, ss. 1-4; ch. 04-372, ss. 2-5; ch. 04-381, ss. 1-2; ch. 04-384, s. 2, Laws of Florida.]				
137	(10): Amended to conform to the repeal of the Florida **High-Speed Rail** Transportation Act, and the creation of the Florida High-Speed Rail Authority Act. (13): Created to require local governments to identify adequate **water supply sources** to meet future demand. (14): Created to limit the effect of **judicial determinations** issued subsequent to certain development orders pursuant to adopted land development regulations.	163.3167	Partially Applicable	The City is in compliance with the Water Supply Facilities Work Plan	No amendment needed
138	(1): Provides legislative findings on the compatibility of development with **military installations**. (2): Provides for the exchange of information relating to proposed land use decisions between counties and local governments and military installations. (3): Provides for responsive comments by the commanding officer or his/her designee. (4): Provides for the county or affected local government to take such comments into consideration. (5): Requires the representative of the military installation to be an ex-officio, nonvoting member of the county's or local government's land planning or zoning board. (6): Encourages the commanding officer to provide information on community planning assistance.	Creates 163.3175.	N/A	City does not have military installations	No amended needed

	grants.				
139	163.3177 (6)(a): - Changed to require local governments to amend the future land use element by June 30, 2006 to include criteria to achieve compatibility with **military installations**. - Changed to specifically encourage **rural land stewardship area** designation as an overlay on the future land use map. (6)(c): - Extended the deadline adoption of the **water supply facilities work plan** amendment until December 1, 2006, provided for updating the work plan every five years, and exempts such amendment from the limitation on frequency of adoption of amendments. (10)(f): Provides for the coordination by the state land planning agency and the Department of Defense on compatibility issues for **military installations**. (11)(d)(1): Requires DCA, in cooperation with other specified state agencies, to provide assistance to local governments in implementing provisions relating to **rural land stewardship areas**. (11)(d)(2): Provides for **multicounty rural land stewardship areas**. (11)(d)(3)-(4): Revises requirements, including the acreage threshold for designating **a rural land stewardship area**. (11)(d)(6)(j): Provides that **transferable rural land use credits** may be assigned at different ratios according to the natural resource or other beneficial use characteristics of the land. (11)(e): Provides legislative findings regarding mixed-use, high-density **urban infill and redevelopment** projects; requires DCA to provide	163.3177	Partially Applicable	The City is in compliance with the Water Supply Facilities Work Plan	No amendment needed

	technical assistance to local governments. (11)(f). Provides legislative findings regarding a program for the transfer of development rights and **urban infill and redevelopment**; requires DCA to provide technical assistance to local governments.				
140.	(1). Provides legislative findings with respect to the shortage of **affordable rentals** in the state. (2). Provides definitions. (3). Authorizes local governments to permit **accessory dwelling units** in areas zoned for single family residential use based upon certain finding). (4). Provides for certain **accessory dwelling units** to apply towards satisfying the affordable housing component of the housing element in a local government's comprehensive plan. (5). Requires the DCA to report to the Legislature.	Creates 163.31771	Yes	Procedural change	The City may need to examine its Housing Policy in order to address this statutory change.
141.	Amends the definition of "in compliance" to add language referring to the **Wekiva Parkway and Protection Act**.	163.3184(1)(b)	N/A	Definition Change	No amendment needed.
142.	(1)(m). Created to provide that amendments to address criteria or compatibility of land uses adjacent to or in close proximity to **military installations** do not count toward the limitation on frequency of amending comprehensive plans. (1)(n). Created to provide that amendments to establish or implement a **rural land stewardship area** do not count toward the limitation on frequency of amending comprehensive plans.	163.3187	N/A	City does not have any military installations	No amendment needed.
143.	Created to provide that **evaluation and appraisal reports** evaluate whether criteria in the land use element were successful in achieving land use compatibility with **military installations**.	163.3191(2)(n)	N/A	City does not have any military installations	No amendment needed.

Public Participation Process

The State of Florida directs all local governments to adopt a public participation process for comprehensive planning in the Florida Administrative Code.

9J-5.004 Public Participation.

(1) The local governing body and the local planning agency shall adopt procedures to provide for and encourage public participation in the planning process, including consideration of amendments to the comprehensive plan and evaluation and appraisal reports.

(2) The procedures shall include the following:
   (a) Provisions to assure that real property owners are put on notice, through advertisement in a newspaper of general circulation in the area or other method adopted by the local government, of official actions that will affect the use of their property;
   (b) Provisions for notice to keep the general public informed;
   (c) Provisions to assure that there are opportunities for the public to provide written comments;
   (d) Provisions to assure that the required public hearings are held; and
   (e) Provisions to assure the consideration of and response to public comments.

(3) Local governments are encouraged to make executive summaries of comprehensive plans available to the general public and should, while the planning process is ongoing, release information at regular intervals to keep its citizenry apprised of planning activities.

The City of Cape Coral provides the public with several opportunities to be involved in various stages of the comprehensive planning process. The City of Cape Coral Local Planning Agency had an agenda item discussing the Evaluation and Appraisal Report (EAR) planning process and major issue identification process on March 3, 2004. The City Council of the City of Cape Coral held a Committee of the Whole with a discussion of the EAR planning process and identification of major issues on the agenda of March 22, 2004. The City held a workshop on the major issues facing Cape Coral on April 22, 2004 at 5:30 p.m. in the City Hall Council Chambers. This public workshop was advertised by a display advertisement in the Cape Coral Daily Breeze on April 10, 2004. Additionally, 30 letters were sent to major civic groups and organizations personally inviting them. At this workshop numerous citizens spoke and others either spoke and/or filled out a questionnaire. The City also solicited additional comments for a two-week period following the workshop, via telephone, written correspondence, or email.

Additionally, the City of Cape Coral conducted a Citizen's Survey in 2003, the results of which were considered in the selection of the major issues facing Cape Coral. This survey was sent to 500 Cape Coral residents, randomly selected by the City's GIS staff.

The City made every effort to address all of the citizen comments within the EAR. However, some of the comments received were not Comprehensive Plan issues, and others did not rise to the level of becoming a major issue. The Department of Community Affairs encouraged the City of Cape Coral to combine some of the issues indicated in a preliminary draft of the major issues.

The City held a Scoping meeting on November 30, 2004. Invited parties included all of the state agencies to which the EAR is sent, Lee County, and all of the municipalities within Lee County. The meeting invitees were contacted by direct mail.

Email from Mark Mueller

Dear Ms. Haley and Florida Burrowing Owl Biological Status Review Team,

I am submitting results of research I have performed on the Florida Burrowing Owl for consideration in your status review. I hope the information proves helpful. Because there has been substantially less research performed on populations of FL BUOW in non-urban areas than in the urban colonies found in South Florida, I urge you to consider this and similar research and to give due consideration to the possibility of increased threats to the long-term viability and stability of this species arising from the apparent constriction and consolidation of its broad historic range.

Attached please find the following 3 documents:

1) A short article that the USF burrowing owl research team published in the Florida Cattleman's and Livestock Journal in collaboration the Secretary of the Florida Cattleman's Association.
2) An article published in the Journal of Raptor Research in 2007:
"Distribution of the Florida Burrowing Owl: The Potential Importance of NonUrban Areas".
3) An "in-review" manuscript just recently submitted to the Journal of Raptor Research: "Non-Urban Habitat Use of Florida Burrowing Owls:
Identifying Areas of Conservation Importance". Please pay particular attention to the findings regarding the very small proportions of "suitable" landcover located in managed areas.

Also, you can obtain a copy of my Master's Thesis "Distribution and Habitat Characterization of the Florida Burrowing Owl in Non-Urban Areas" from the USF Library's USF Electronic Theses and Dissertations
webpage:
http://guides.lib.usf.edu/content.php?pid=86148&sid=744349#E14%20CORAL%20UI

Its size (20 MB) is too large for most email accounts.

Finally, I recommend that you obtain copies of Pamela Bowen's work.
She conducted an impressive statewide survey effort for burrowing owls in both urban and non-urban habitats. I do not have a digital copy of the thesis to provide you with, unfortunately, but last I heard she was working for one of the Water Management Districts and I'm sure she would be eager to share her work. The article is available through the link.

1) "Demography and Distribtution of the Burrowing Owl in Florida"
2001. Florida Field Naturalist. Available:
www.fosbirds.org/FFN/PDFs/FFNv29n4p113-126Bowen.pdf
2) "Demographic, distribution, and metapopulation analyses of the Burrowing Owl (Athene cunicularia) in Florida" 2000. Masters Thesis, UCF.

Thank you very much for your consideration and don't hesitate to ask if I can be of any further help.

Sincerely,
Mark Mueller

SHORT COMMUNICATIONS

J. Raptor Res. 41(3):222–226

DISTRIBUTION OF THE FLORIDA BURROWING OWL: THE POTENTIAL IMPORTANCE OF NONURBAN AREAS

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KEY WORDS: *Burrowing Owl*; Athene cunicularia; *distribution; Florida; landowner; survey.*

The Florida Burrowing Owl (*Athene cunicularia floridana*) is considered a "Bird of Conservation Concern" by the U.S. Fish and Wildlife Service (USFWS 2003) and a "Species of Special Concern" by the Florida Fish and Wildlife Conservation Commission (FWC), yet relatively little information is available about its critical ecological characteristics including statewide distribution, population size, breeding and post-breeding habitats, dispersal, and immigration. Of potential importance are perceived behavioral differences (Stevenson and Anderson 1994, Mrykalo 2005) between populations of Florida Burrowing Owls residing in urban/suburban environments, such as vacant or developed residential lots, airports, golf courses, and ball fields (hereafter "urban"), and those nesting in more rural environments, such as grazed pastures, natural prairies, and hay or sod farms ("nonurban"). Thus, research undertaken on Florida Burrowing Owls (hereafter simply Burrowing Owls, unless noting differences between this and another distinct subspecies, the Western Burrowing Owl, *A. c. hypugaea*) in urban environments may not be directly applicable to populations in nonurban areas, where significantly less research has been completed (USFWS 2003, Mrykalo 2005) and where legal protections are less clear (FWC 2004).

Burrowing Owls in urban settings face a variety of serious threats (Millsap and Bear 1988, Haug et al. 1993, Millsap and Bear 2000, USFWS 2003) that may make areas such as vacant lots relatively unfavorable for long-term persistence (Millsap 1996). Due to Florida's high population growth rate (23.5% from 1990 to 2000, U.S. Census Bureau 2001), most vacant lots face development, and when an area's overall lot development exceeds critical thresholds, Burrowing Owl populations may decline (Wesemann 1986, Millsap and Bear 2000). The trend toward rapid development of remaining vacant lots in active breeding areas such as Marco Island (N. Ritchie pers. comm.) may jeopardize the Burrowing Owl's long-term stability in urban environments.

The majority of known populations of Burrowing Owls occur in the state's southern coastal regions, primarily in urban sections of Lee, Collier, Dade, and Broward counties (Bowen 2000). Emigration to these coastal areas may represent a relatively recent range expansion, as Burrowing Owls historically were most common within the interior dry prairie ecosystems of central Florida (Palmer 1896, Ligon 1963, Courser 1979). Prime breeding habitat consisted of short, grassy ground cover and well-drained sandy soils suitable for burrow construction and maintenance (Palmer 1896, Haug et al. 1993, USFWS 2003). However, the current status of Burrowing Owls in nonurban areas is unknown (Mrykalo 2005), as researchers face difficulty accessing remote and privately owned lands (Mueller 2006). Although considerable effort has been spent studying localized, urban populations of Burrowing Owls (e.g., Courser 1976, Wesemann 1986, Millsap and Bear 2000), similar monitoring efforts for nonurban populations have been lacking, despite calls to expand them (USFWS 2003). The limited number and extent of nonurban Burrowing Owl surveys may result in population underestimation in such areas and preclude potential conservation opportunities. The goal of our study was to improve knowledge about the overall distribution of the subspecies, with special emphasis on nonurban areas.

METHODS

We compiled a Geographic Information Systems (GIS) spatial database of Burrowing Owl breeding sites from historic observation databases and our own records, classifying breeding sites as either urban or nonurban using ancillary attribute information in the databases (Mueller 2006). Primary point sources included: a digital database of Bowen's full 1999 statewide breeding census (pers. comm.); the Florida Natural Areas Inventory's (FNAI) database of rare animal observations (FNAI 2005); the FWC's

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"Wildlife Observations" database (2005) and our own existing breeding site records. We obtained Florida's Breeding Bird Atlas (BBA) survey data, which consisted of a list of roughly rectangular 3 × 5 km "blocks," each of which was reported by BBA surveyors to contain at least one Burrowing Owl somewhere within the block between 1986–1991 (FWC 2003). We also communicated with private landowners, other researchers, and various agencies and organizations to solicit observation data and to educate landowners (Mueller et al. 2005, Mueller 2006). Each point record in the compiled database contained latitude and longitude coordinates as well as any available descriptive information such as observer, date, number of burrows, number of young and adult Burrowing Owls, site directions, and reported land use.

Because Burrowing Owls may return to breeding sites used in previous years (Haug and Oliphant 1990), we attempted field-verification of selected nonurban breeding site records between May–August 2005 to estimate current status. Field-verification efforts focused on the most recent and comprehensive database—Bowen's May–August 1999 survey of 946 recorded breeding sites, 50 of which Bowen (2000) classified as other than urban ("agricultural"). We also visited several of our own known nonurban sites, as well as some selected nonurban sites from the FWC and FNAI database records with the most precise, usable location information. Because of its coarse nature, the BBA "block" data did not provide sufficient location information for direct field visits. Our field investigations spanned 19 counties (Fig. 1).

We followed a systematic survey protocol (further detailed in Mueller 2006) to search for Burrowing Owls and/or burrows. Survey efforts focused on, but were not restricted to, areas with documented historic presence. We relied primarily on usable site coordinates and/or ancillary information from the historic databases. We also gathered and used other relevant information such as aerial imagery and GIS road data to produce precise maps of historic sites, and employed county property appraiser records to help identify and contact landowners prior to visits, occasionally receiving direct field assistance from them but at the least obtaining property access permission. When explicit property access permission was not granted, surveys were conducted from the closest public property, often along roadsides. From the approximate historic burrow location, we spent at least 20 min on foot performing a thorough visual search for owls and burrows using 8× 32 magnification binoculars and a Bushnell spotting scope (20× magnification). We also reduced vehicle speed to 20 mph and looked for perched owls while traveling to and from historically used areas. We attempted to distinguish juveniles from adults, and differentiated between Burrowing Owl and other types of animal burrows using standard criteria. We classified Burrowing Owl burrows as either "active" or "inactive" based on evidence of feathers, droppings, insect parts or pellets, and by the amount of debris, such as cobwebs or vegetative litter covering the tunnel entrance. We defined a "site" as a single nesting location with a distinct burrow or group of primary and satellite burrows shared by just one or two family groups. We recorded coordinates using a Garmin 76 GPS receiver (Garmin International, Olathe, KS U.S.A.). We documented apparent land use, vegetation, flood status, and directions for each new field site database record.

RESULTS

The three major historic databases (Bowen 2000, FWC 2005, FNAI 2005) contained 86 unique site records (i.e., records not replicated among databases) that we classified as nonurban (Table 1). Many of the 291 BBA "block" records appeared to occur in remote areas far from intense urban development, but the BBA database lacked the ancillary data used in the other databases to help distinguish nonurban records. We selected 17 of 86 unique nonurban records present in the FWC and FNAI databases for field visitation based on the quality and precision of coordinates or site directions. We found no Burrowing Owls or clearly active burrows at those sites, although we detected two inactive burrows.

Bowen's database (pers. comm.) contained 50 site records (5.3%) classified as other than urban/suburban. We successfully visited 42 of these "agricultural" sites, but landowners denied us access to the other eight sites. We detected Burrowing Owls or clearly active burrows at six of 42 sites (14.3%). This number increased to 12 (28.6%) when we included previously undocumented nonurban breeding sites we discovered within 2 km of the historic site coordinates. We found all six of these new sites on grazed pasture. In addition, we selected 20 of Bowen's urban records for visitation, based on suspected misclassification or proximity to other historic nonurban records. Several of these 20 visited "urban" records actually fit our definition of "nonurban" (Mueller 2006) and seven (35%) were still active. Thus, at the 19 active Bowen sites (seven urban and 12 nonurban), we observed a total of 70 Burrowing Owls and 41 active burrows, with another 32 burrows judged to be inactive at time of observation.

Fellow researchers provided access to three large, nonurban colonies (each with several distinct sites) in Manatee and Hillsborough counties, with a total of 54 Burrowing Owls using about 42 active primary and satellite burrows (Mrykalo 2005, Nixon 2007). Communications with private landowners and public agencies led us to two new active nonurban sites. We suspected Burrowing Owl presence within the last year for seven other sites, but we considered only those with clear signs of current use to be active. In total, we visited 94 sites in 19 counties and detected 135 Burrowing Owls, 96 active burrows, and 53 inactive burrows (exact county breakdown given in Mueller 2006).

DISCUSSION

Many factors hindered successful detection of Burrowing Owls in nonurban areas. Most historic site records (Table 1) come from the relatively large urban Burrowing Owl populations along Florida's southern coastal areas. The BBA blocks suggested extensive nonurban historic presence, but their coarse scale excluded direct visitation. Similarly, most of the 36 unique FWC/FNAI nonurban records provided insufficient location information for successful verification. The inherent limitations of roadside surveys (Conway and Simon 2003) may reduce or entirely

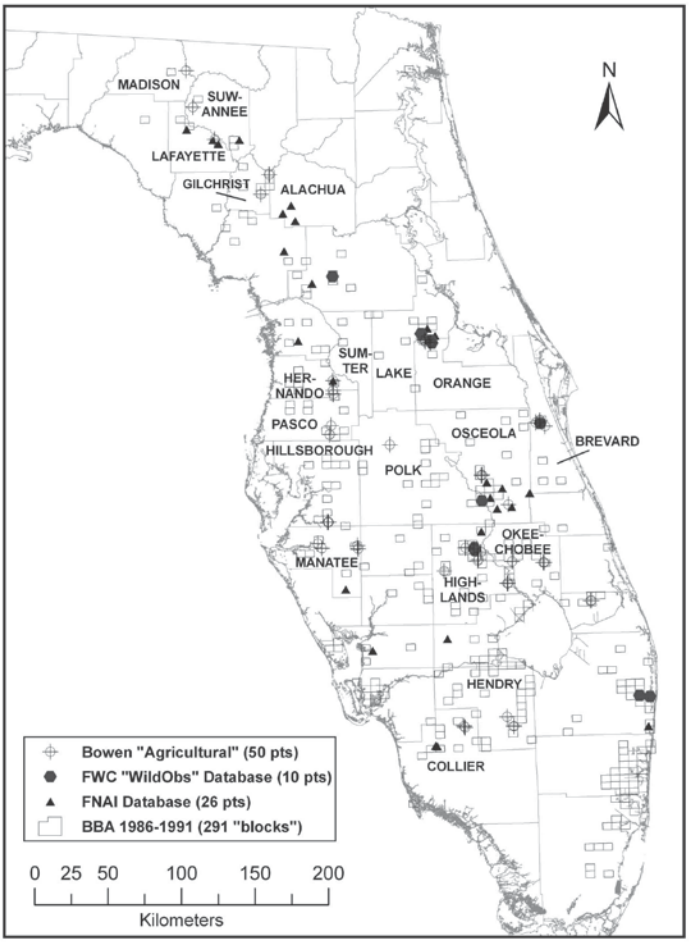

Figure 1. Distribution of historic observation records of Burrowing Owls in Florida, from major databases. All points represent only nonurban records, but the Breeding Bird Atlas "blocks" lacked ancillary data and do not distinguish urban from nonurban. We visited sites in the 19 labeled counties (see Mueller 2006 for county-specific results).

Table 1. Primary sources of historic Florida Burrowing Owl site records, with number of unreplicated records by type, as obtained in 2005 from Bowen (pers. comm.), Florida Fish and Wildlife Conservation Commission (FWC 2005), and Florida Natural Areas Inventory (FNAI 2005).

	Bowen	FWC	FNAI
Urban records	896	66	17
Nonurban records	50	10	26
% Nonurban	**5.3%**	**13.2%**	**60.5%**

prevent observations in remote areas with few public roads. For example, one newly discovered colony of over 20 Burrowing Owls was found about 400 m inland and out of sight of the public road next to which Bowen's (2000) observation of just two Burrowing Owls was made. This and many other nonurban sites could only be observed with landowner permission, and restricted property access was a constraint of both our study and Bowen's (2000). Bowen's recent statewide census database (pers. comm.) provided detailed site directions and accurate GPS coordinates that allowed precise relocation of some historic burrows. The redetection rate for historic Bowen (2000) sites nearly doubled when new sites within 2 km were included.

The most frequently observed land use at nonurban sites we visited was improved pasture. Grazing can maintain short vegetation height, an important habitat characteristic for breeding Burrowing Owls (Stevenson and Anderson 1994, USFWS 2003). Although grazing is generally viewed as unfavorable for wildlife (e.g., Noss 1994) and research is needed to quantify the effects of livestock on Burrowing Owls, moderately grazed lands may be preferable to more intensive development and are even actively selected by another Florida raptor, the Crested Caracara (*Caracara cheriway*, Morrison and Humphrey 2001).

Current Florida Burrowing Owl regulations (FWC 2004) and status assessments (USFWS 2003) focus almost exclusively on urban populations. Given the many threats and the ever-decreasing availability of vacant lots in urban areas, an increased emphasis on the potential importance of nonurban areas for the subspecies' overall conservation seems critical. Population viability analyses (PVAs) conducted by Bowen (2000) may have reduced management and research application in nonurban areas, because Bowen's results indicated that there is a >50% probability of extinction over 100 yr for "island" populations containing <5 adults. Although it is true that small, isolated populations often do not persist, modifying PVAs to account for the effects of immigration—even at minor levels—can drastically alter results (e.g., Stacey and Taper 1992). Bowen's (2000) PVAs assumed no immigration into these small populations, but this assumption may be invalid given Burrowing Owls' ability for long-distance travel (e.g., Sykes 1974). The analyses also assume observation of all individuals in each "island" population, an assumption which may not be met in nonurban areas where visibility is reduced. Thus, the potential importance of relatively small nonurban populations should not be discounted based solely on these PVA results.

We recommend updating observation databases with more frequent and extensive surveys of the large expanses of prairie and pasture lands throughout Florida's interior, particularly near areas with historic presence. However, given limited monitoring and enforcement resources and the obstacle of private property access, the need for improving landowner cooperation is clear. Doing so requires addressing landowners' property rights concerns, increasing knowledge through educational efforts, and implementing innovative habitat preservation strategies, such as conservation easements.

DISTRIBUCIÓN DE *ATHENE CUNICULARIA FLORIDANA*: IMPORTANCIA POTENCIAL DE ÁREAS NO URBANAS

RESUMEN.—Se conoce relativamente poco sobre las características ecológicas críticas para *Athene cunicularia floridana*, particularmente para las poblaciones de áreas remotas no urbanas. Investigamos la distribución actual a nivel del estado de Florida y el estatus de las poblaciones no urbanas de *A. c. floridana*. Recopilamos y evaluamos varias bases de datos de observaciones históricas y realizamos visitas de campo a 19 condados para investigar los informes de presencia de la especie y actualizar las bases de datos históricas. Detectamos actividad reproductiva en 12 condados, y documentamos nuevos lugares reproductivos en ambientes no urbanos en cinco de éstos. La baja cantidad o la mala calidad de los datos históricos para ambientes no urbanos restringieron su utilidad. El acceso restringido a las propiedades privadas fue otra limitación. Sugerimos que dichos problemas pueden ser solucionados promoviendo la cooperación con los dueños de las tierras privadas y expandiendo los censos y los esfuerzos de conservación en ambientes no urbanos que podrían ser importantes para la persistencia de *A. c. floridana* a largo plazo.

[Traducción del equipo editorial]

ACKNOWLEDGMENTS

Financial assistance was provided by the University of South Florida. Historic databases were provided by FWC and FNAI staff, and by P. Bowen, whose dedication and enthusiasm were an inspiration and to whom we are espe-

cially grateful. Reviewers N. McIntyre and B. Smith and Associate Editor M. Goldstein provided very helpful reviews/guidance. Fellow USF researchers R. Mrykalo and P. Nixon offered useful information and access to their study areas, and P. Zandbergen also provided guidance. We wish to thank all the landowners who provided information and property access or facilitated communications, in particular J. Strickland.

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NON-URBAN HABITAT USE OF FLORIDA BURROWING OWLS: IDENTIFYING AREAS OF CONSERVATION IMPORTANCE

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ABSTRACT

Statewide distribution and habitat use of the Florida Burrowing Owl (*Athene cunicularia floridana*), currently state-listed as a "Species of Special Concern," is not well-understood, particularly in remote, non-urban areas. Its status as a protected species is currently being re-evaluated and information is needed to help state wildlife managers better understand non-urban habitat usage. To help address this need, we visited sites from historic databases to verify and update them while also documenting new locations. We quantified landcover within empirically-derived distances around burrows with confirmed or probable breeding activity, then used standard resource selection methods to compare observed and available proportions of habitat, calculate selection indices, and determine selection/avoidance for each landcover class. These empirical results were used in combination with literature review and field observations to finalize "suitable" landcover criteria. The final results appear to correlate well with the overall distribution of known non-urban burrowing owl records and demonstrate that a substantial amount of potentially suitable breeding habitat exists throughout Florida's central interior but only a small proportion of it occurs inside conservation-managed areas. Improved pasture, the most prevalent landcover class, appears to be the most strongly selected in our study and may be of high importance to non-urban breeding burrowing owls. These results may assist wildlife managers in both management actions and species status decisions. We recommend increasing surveys and conservation efforts in non-urban areas and enhancing cooperation with landowners, particularly ranchers, as success on private lands seems crucial to the long-term persistence of this species.

KEY WORDS: Burrowing Owl; *Athene cunicularia*; habitat; GIS; Florida

INTRODUCTION

The Florida Burrowing Owl (*Athene cunicularia floridana*) has been classified since 1979 as a "Species of Special Concern" by the Florida Fish and Wildlife Commission (FWC) because of threats from "habitat modification, environmental alteration, human disturbance, or human exploitation" which may further endanger it "unless appropriate protective or management techniques are initiated" (FWC 2010). This status is now being re-evaluated, along with 60 other species, under new imperiled species listing criteria and rules recently passed by the Commission which require increased use of quantitative data, and the FWC is requesting information to aid in this re-evaluation (FWC 2010).

Statewide distribution and habitat use of Florida Burrowing Owls ("owls") is not well-understood, particularly in remote, non-urban areas (Mueller et al. 2007). Indeed, almost all of the literature for this subspecies focuses on suburban/urban populations that face various anthropogenic threats (Millsap and Bear 1988; Millsap and Bear 2000; USFWS 2003, FWC 2009). Despite calls to expand inventories and monitoring of breeding populations (Owre 1978, Millsap 1996, USFWS 2003), relatively little research has been done in non-urban areas–which at one time were utilized almost exclusively for breeding habitat (Courser 1979). Reasons for this lack of effort include uncertainty about owl locations stemming from a lack of resources to properly survey the entire state along with access restrictions that prevent documentation of occurrence on private property. These difficulties may compel survey efforts to focus on specific areas most likely to contain owls. This study attempts to help that goal by using geospatial analysis techniques to characterize the distribution of non-urban breeding habitat in counties where non-urban owls are known to occur. We also describe the amount of suitable landcover present within Florida's conservation-managed areas (FNAI 2005) to gauge whether

existing managed areas seem to provide adequate owl habitat. For this study, "non-urban" areas included grazed pastures, fire-maintained prairies, hay and sod farms, horse pastures, and similar landscapes. They did not include: occupied or vacant residential lots, airport fields, golf courses, ball fields, or suburban areas typified by dense residential zoning.

METHODS

We compiled and evaluated the utility of existing historic distribution data on breeding owls throughout a 38-county area from multiple sources (see Mueller et al. 2007). Because many of these records were outdated and/or imprecise, we performed field visits to as many known non-urban locations as possible. Our primary objective was to gather accurate GPS coordinates of burrows that were either currently active or showed signs of probable activity within the last year (see Mueller et al. 2007), though we also documented apparent land use for later comparison to the FWC landcover classification. Sixty-two of these verified burrow records were available for GIS use. However, to account for possible bias from the broader scale of the habitat datasets, we used a systematic filtering method to further reduce the number of point records used to 30 unique points. Points that fell within 120m of another of the 62 non-urban points were grouped and only the location with the greatest number of owls was retained (Mueller 2006). This conservative methodology reduced sample size but was necessary to reduce bias from large colonies and to prevent possible duplication of landcover cells.

We generated and merged circular buffers around each of the retained points to estimate potentially used landcover, using the FWC's statewide "Florida Vegetation and Land Cover" 2003 raster dataset (Stys et al. 2004). A 600m radius was chosen based on two empirical studies of adult, non-urban burrowing owl movement patterns around nesting burrows (Haug and

Oliphant 1990, which showed 95% of both diurnal and nocturnal movements within 600m and Gervais et al. 2003, which showed 80%). Both of these studies were of the Western Burrowing Owl; as of yet no similar studies have been completed on adult Florida Burrowing Owls in non-urban settings, although Mrykalo (2005) did evaluate movements and dispersals of juvenile Florida Burrowing Owls in a non-urban landscape. Within the merged buffers, the landcover cells were extracted and treated as "used" landcover. We pooled terrestrial landcover from the counties containing the 30 points and treated it as "available" breeding habitat. Following standard procedures described by Manly et al. (1993) and Fielding (2006), we determined observed vs. expected proportions of landcover and performed resource selection tests including calculation of standardized selection indices (Fig. 1) and selection/avoidance decisions for each landcover class. The application of a Bonferroni inequality adjustment made selection/avoidance decisions more conservative. We used the selection/avoidance results as the main factor in estimating the most suitable landcover classes, but also considered literature review (including class descriptions provided by Stys et al. 2004) and input from other Florida Burrowing Owl biologists as a check against anomalous results. We extracted the suitable landcover classes from within the boundaries of Florida's conservation managed lands, using a detailed shoreline (FGDL 2006) to remove marine areas.

RESULTS

Suitable landcover classes were chosen based primarily on the empirically-derived selection/avoidance classifications. We had hypothesized based on the literature review and biologists' input that five classes would be preferred, including Dry Prairie, Grassland, Bare Soil/Clearcut, Improved Pasture, and Unimproved Pasture. The empirical resource selection

process excluded Unimproved Pasture and included two unexpected classes: Row/Field crops and Extractive. The Extractive class was later proven to have been erroneously-classified and was removed. After removing this class along with open water, the five remaining suitable classes composed an estimated 26% of the total terrestrial landcover within the 38-county study area, with Improved Pasture forming approximately 13%, Dry Prairie 5%, Row/Field crops 4%, Bare Soil/Clearcut 3%, and Grassland just .2%. These five suitable landcover classes composed only 8.3% of the total landcover within the terrestrial boundaries of all of the state's conservation-managed areas (Fig. 2). Of that 8.3%, the class breakdown was: Dry Prairie 3.8%, Bare Soil/Clearcut 2.0%, Improved Pasture 1.9%, Row/Field Crops .5%, and Grassland .1%.

DISCUSSION

We did not assume that historic owl presence records were spatially accurate or still represented actively used burrowing owl habitat, given that groups of owls can disperse or be extirpated and also that landcover changes over time. Therefore, we only used owl nesting locations that we ground-verified as having recent activity. We still had to assume some degree of accuracy from the input habitat dataset but attempted to minimize possible errors of scale by filtering out owl locations that were in close proximity in order to avoid duplication bias. The field data were collected within two years of the 2003 landcover satellite images and notes on apparent land use obtained during field visits helped verify the accuracy of the satellite-based landcover classifications.

While this article focuses exclusively on results obtained using the FWC's landcover classification (Stys et al. 2004), we recognize that landcover is only one tool for estimating the suitability of habitat. Ideally, all relevant habitat data would be considered. However, reliable

habitat data does not always exist, particularly at the broad scale of this study. For example, soil type and characteristics are relevant to burrowing owl breeding habitat quality, as these can influence the likelihood of burrow collapse and/or flooding. Mueller (2006) analyzed SSURGO soils data (NRCS 1995) to estimate the suitability of various soil attributes, but that information is not presented here because the soils data were incomplete and/or inconsistent. Where available, Mueller's (2006) best estimate of suitable soils did show a high correlation with our suitable landcover results, and the addition of suitable soils had only a minor impact.

Some of the suitable landcover class results merit discussion. The substantial proportion of Row/Field Crops was somewhat surprising at first, but Stys et al. 2004 defines this as including "hay and grasses," and several historic sites observed by Mueller et al. (2007) occurred on or very near large hay and sod farms. Such areas may also provide favorable foraging opportunities, although the literature is conflicted about this (e.g. Haug and Oliphant 1990, Gervais et al. 2003). While Unimproved Pasture's description as native grasses on cleared lands sounds favorable, the increased height and density of these grasses compared to more consistently maintained ones, and the inclusion of "major stands of trees and brush" (Stys et al. 2004) may be problematic. Extractive was determined to have been selected because of the proximity of several retained points to a large swath of erroneously-classified landcover cells. The land was indeed owned by a phosphate-mining company and would later be actively mined (P. Nixon, pers. comm.), but our field work confirmed the current land use throughout the area to be grazed pasture, and we concluded that the landcover classification process, which also relied on some ancillary land use attribute data (Stys et al. 2004), was in error for this location.

Of our final suitable classes, Improved Pasture dominates. Because the study area has a very high relative proportion of this class (13%), the level required to state statistically-significant selection for this class is also very high, yet it was easily achieved since Improved Pasture composes 47% of the landcover in the observed buffers and has by far the highest selection index values (Fig. 1). The likely importance of this landcover class to non-urban, breeding burrowing owls seems clear based on these results. However, Improved Pasture is not common within conservation-managed areas, covering only 1.9% of those areas.

Our finding that the suitable landcover classes compose only about 8.3% of the total terrestrial landcover in all conservation-managed areas in Florida should be noted by state wildlife managers, especially in consideration of the possible change in legal protection status (FWC 2010). Further exploration of the landcover data showed that wetland and forested classes dominated most of the existing managed areas. While these classes may benefit the majority of Florida's wildlife species, they would not seem to benefit breeding Florida Burrowing Owls. Although there are a couple of managed areas in the central interior of the state (Kissimmee Prairie Preserve State Park and Avon Park Air Force Base) where dry prairie-like habitat is intentionally maintained via prescribed burns and mechanical means, these seem to be exceptions to the rule. Preserving or restoring tracts of suitable habitat within existing conservation-managed areas is a start, but given the relatively small amount of conservation-managed lands currently in existence, conservation efforts must also extend to suitable habitat in other areas, including improved pastures on private lands (Noss 1994).

The new management plan being developed by the FWC should call for expanded and improved survey efforts for Florida Burrowing Owls in non-urban areas to better understand the species' overall distribution and viability, rather than making conclusions and determining policy

based only on populations restricted to a few well-studied urban areas that are not necessarily representative of the entire species or its historic range. The results of our habitat suitability study (which we will provide) could be used as a starting point to help focus new field surveys and conservation initiatives. As larger sample sizes of non-urban breeding sites become available as an input, suitability models can be iteratively tested and strengthened. Survey efforts may be frustrated by restricted access to private properties because most of the potentially suitable habitat (and most of the known non-urban occurrence records) occur on large tracts of privately-owned land in remote areas. Therefore, improved cooperation with private landowners—particularly livestock ranchers—is essential to effectively locate and conserve owls in non-urban areas. While not easy, such cooperation can be achieved with patience (Mueller et al. 2005). Incentive-based strategies, such as conservation easements that maintain breeding habitat while compensating landowners for loss of use, are one possibly effective strategy. Ecosystem-based management should also be considered, as certain areas can be maintained for dual-use with other historical dry-prairie species, such as the state-listed crested caracara (*caracara cheriway*; Morrison and Humphrey 2001). Given the variety of threats in urban areas (Millsap and Bear 2000, USFWS 2003) and questions about long-term persistence there (Millsap 1996), an increased emphasis on the potential importance of non-urban areas for the Florida Burrowing Owl seems critical.

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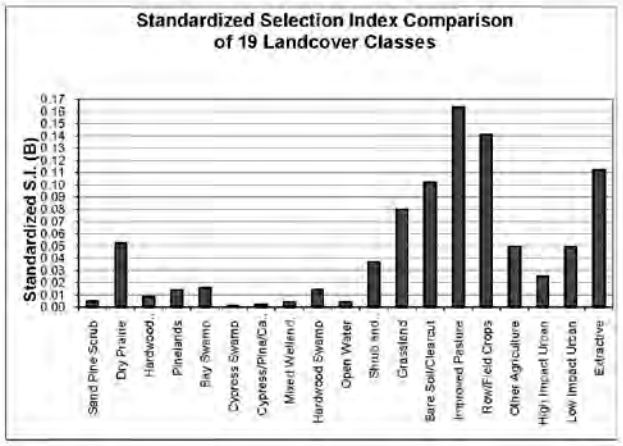

Figure 1. Standardized Selection Index for 19 landcover classes.

Figure 2. The five suitable landcover classes within terrestrial portions of conservation-managed areas.


Dry Prairie
Grassland
Bare Soil/Clearcut
Improved Pasture
Row/Field Crops
County Boundaries

Email from Bob Mrykalo

To whom it may concern,

The Florida Fish and Wildlife Conservation Commission (FWC) is requesting information on state listed threatened species and species of special concern in order to conduct biological reviews. I am including three papers for the FWC to review. The 2007 and 2009 papers are studies on the Florida burrowing owl. In the 2010 paper we examine permitting for both gopher tortoise and Florida burrowing owls. Please note that the 2010 paper is the page proof version; therefore some changes in the published version are not included in the page proof version. The 2010 manuscript is in press, but I have not received a PDF copy of the published version in time for the FWC November 1st deadline.

Sincerely,
Bob Mrykalo

Jenna Hestir, Dawn Hinebaugh, Cary Leiper, Matt Marshall, Curt McCasland, Darren Pierce, Melinda Schaefbauer, Larry Wood, Chris Woodson, and Rich Young, whose observations form the substance of this report. Our manuscript was greatly improved by the comments and suggestions of Carol Ann Islam, Sarah Jones, three anonymous reviewers, and the editor.

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Home Range and Dispersal of Juvenile Florida Burrowing Owls

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ABSTRACT.—We present the first use of necklace radio transmitters to document the home range and dispersal of juvenile Burrowing Owls (*Athene cunicularia floridana*) during the breeding and post-breeding period in rural Florida. Juvenile Burrowing Owls ($n = 4$) were detected close to main and satellite burrows during 65 day-time relocations. Home range estimates (95% kernel) for juvenile owls varied from 98 to 177 m^2. Juvenile Burrowing Owls were not detected near main and satellite burrows during three evening relocations. Dispersal of juvenile owls coincided with flooding of burrows during the rainy season. Juvenile owls upon fledging used an extensive patch of saw palmetto (*Serenoa repens*) before dispersing beyond the range of ground telemetry capabilities. Aerial telemetry assisted in locating one juvenile Burrowing Owl using scrub oak (*Quercus* spp.) habitat approximately 10.1 km southeast of its main and satellite burrows. *Received 16 February 2006. Accepted 7 October 2006.*

Early observations of Florida Burrowing Owls (*Athene cunicularia floridana*) describe their propensity to excavate burrows in short grass habitat (Hoxie 1889, Rhoads 1892, Scott 1892, Palmer 1896). Typically, a breeding pair of owls excavate one breeding burrow and one or more satellite burrows (Scott 1892, Neill 1954, Wesemann 1986, Mealey 1997). Burrows, which can be 1–3 m in length, contain an enlarged nest chamber at their terminus (Rhoads 1892, Scott 1892, Nicholson 1954, Sprunt 1954). Male and female Florida Burrowing Owls can breed at 1 year of age (Haug

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et al. 1993) with most females laying eggs in the spring (Nicholson 1954, Courser 1976, Millsap and Bear 1990). However, nesting can occur between October and July with 2–10 eggs/nest (Rhoads 1892, Scott 1892, Nicholson 1954, Owre 1978, Stevenson and Anderson 1994). Previous ecological research on Florida Burrowing Owls has occurred during the breeding period in urban areas including college campuses (Courser 1976), private residences (Mealey 1997), and vacant lots (Wesemann 1986; Millsap and Bear 1990, 1997, 2000).

The majority of ecological data on Florida Burrowing Owls in rural areas is observational and was collected in the late nineteenth and early twentieth centuries on dry prairie habitat in southcentral Florida (Ridgway 1874, Cahoon 1885, Hoxie 1889, Rhoads 1892, Scott 1892, Palmer 1896, Bent 1938, Nicholson 1954). There are no published studies from rural areas (agricultural lands, grazing land for cattle, and areas managed or maintained as natural habitat) in Florida that document productivity, survival, prey preference, dispersal, or habitat requirements (breeding and postbreeding) of Burrowing Owls.

Identifying habitat requirements for Florida Burrowing Owls in rural areas is particularly important because of the rate of habitat loss due to development. Florida's human population is the third fastest growing in the nation (U.S. Department of Census 2004) and a variety of habitats is being lost such as upland forests (Sprott and Mazzotti 2001), scrub oak (Myers 1990), and prairie habitats (Abrahamson and Hartnett 1990). There are no management strategies for Burrowing Owls in rural environments (Florida Fish and Wildlife Conservation Commission 2004a).

The objectives of our study were to estimate home range size and dispersal of juvenile Burrowing Owls in a rural environment. We also estimated size of home range of juvenile Burrowing Owls during the breeding season, measures of dispersal from breeding habitat, and the location and type of postbreeding habitat occupied by juvenile Burrowing Owls.

METHODS

The study was undertaken from 1 March to 5 August 2004 on Rutland Ranch, Bradenton, Florida (27° 30′ N, 82° 15′ W). Rutland Ranch encompasses 2,372 ha and is managed by the Southwest Florida Water Management District (Barnwell et al. 2003). The ranch contains a mixture of habitats including oak scrub, herbaceous marshes, riparian hardwoods containing laurel (*Quercus laurifolia*) and water oak (*Q. nigra*), pine flatwoods containing slash pine (*Pinus elliottii*) and saw palmetto (*Serenoa repens*), and non-native pastures. Burrowing Owls excavate burrows within a 81-ha rectangular portion of improved pasture that undergoes yearly prescribed burning. The major land uses surrounding Rutland Ranch include cattle ranching and agriculture.

We captured and fitted radio transmitters to seven juvenile Burrowing Owls (one male, one female, five gender unknown) between 6 June and 22 July. Juvenile owls were captured using noose carpet traps (Mealey 1997, Millsap and Bear 1997) placed on the burrow mound and in the entrance of burrows. The average (± SD) weight of captured juvenile owls ($n = 7$) was 122.9 ± 10.3 g. Juvenile Burrowing Owls were fitted with necklace-style radio transmitters (AVM Instrument Company Ltd., Colfax, CA, USA). Prior to capture, juvenile owls were observed flying between their respective main and satellite burrows, and undertaking short flights within the improved pasture.

The maximum range of the receiver and transmitters during field tests was 1.61 km and the expected battery life was 160 days. Five randomly selected transmitters were tested to examine the precision of directional bearings with a resulting mean and standard deviation of 1.64 ± 4.13 degrees (White and Garrott 1990). The average weight of the transmitters was 4.9 g which was 4% of the average body mass of the seven juvenile Burrowing Owls marked.

We attempted to locate radio-marked Burrowing Owls once each day between 1000 and 2000 hrs (EST) from 7 June to 10 October. Relocations were attempted between 2100 and 0500 hrs on 1–2 August to document activity and location of each owl during the evening and early morning. Radio tracking was conducted along all road and trails within Rutland Ranch when any radio-marked owl was not relocated during the day and evening telemetry sessions in the improved pasture. Once an

TABLE 1. Kernel home range estimates of juvenile Burrowing Owls within improved pasture, Bradenton, Florida, 2004.

Bird #	Relocations	95% Kernel home range (m^2)	75% Kernel home range (m^2)	50% Kernel home range (m^2)
1	8	177	123	79
2	13	186	110	70
3	22	105	64	45
4	22	98	60	38
Mean		141	89	58

TABLE 2. Dispersal distance of juvenile Burrowing Owls from improved pasture, Bradenton, Florida, 2004.

Bird #	Dates	Relocations	Distance from main burrow: Min (m)	Max (m)
1	6 Aug–5 Oct	3	407	10,083
2	6 Aug–24 Sep	15	466	679
3	17 Aug	1	366	366
4	6–17 Aug	7	236	337

owl was not located after several attempts, the road network surrounding Rutland Ranch was surveyed at intervals of 0.80 km. Aerial telemetry was used to locate missing owls if an owl was still not located.

Program Animal Movement V.2 Beta (Hooge and Eichenlaub 1997) was used to estimate home ranges for each juvenile owl during the breeding period using the fixed kernel method with least squares cross validation as the smoothing parameter. The home range for each juvenile owl was calculated using relocations taken during daylight hours. Three separate home range estimates for each owl were calculated based on probabilities (95, 75, and 50%) of the estimated distribution of use. The measure tool in ArcMap 8.3 was used to calculate dispersal distance by measuring the distance (m) from each owl's location outside of the improved pasture to its respective main burrow.

RESULTS

Three radio-collared juveniles were killed by unknown predators. The four remaining owls were relocated 41 of 56 days radio tracking was attempted within the improved pasture. Radio tracking was not attempted during 2 days due to lightning and for 13 days because two stream crossings were flooded. The mean home ranges of the four juvenile Burrowing Owls, based on probabilities of 95, 75, and 50% of the estimated distribution of use were 141, 89, and 58 m^2, respectively (Table 1).

Two Burrowing Owls during night tracking sessions were near their main burrows at 2100 hrs, but no Burrowing Owls were located in the pasture after 2200 hrs. One Burrowing Owl was located at 2300 hrs, 264 m from its main burrow within the extensive patch of saw palmetto surrounding the pasture. Telemetry signals outside of the improved pasture were faint and brief making it difficult to triangulate the position of any owl. No signals were located after midnight in the improved pasture or from the trails surrounding it.

Burrowing Owls began dispersing from the improved pasture on 6 August when all burrows, except for a main and satellite burrow in the highest elevated area of the pasture, were flooded due to seasonal rainstorms. No juvenile owls could be located within Rutland Ranch or from the road network surrounding the property by 30 September.

Aerial surveys were conducted on 5 October within a radius of approximately 15 km of the improved pasture to locate the missing owls. One juvenile owl was relocated 10.1 km southeast of Rutland Ranch in habitat composed of predominantly scrub oak (W. D. Gordon, pers. comm.). Dispersal distance for juvenile owls varied (Table 2).

DISCUSSION

The home range estimates of juvenile Burrowing Owls post hatch indicates that juvenile owls are extremely dependent on main and satellite burrows. Dispersal of juvenile Burrowing Owls from habitat used post hatching coincided with flooding of the pasture and burrows beginning on 6 August. Juvenile owls were not relocated in the improved pasture after dispersal even after the pasture had dried. All four juvenile Burrowing Owls used the extensive saw palmetto patch surrounding the pasture during the day before dispersing beyond the range of the receiver. One juvenile owl was relocated near several live oaks (*Quercus virginiana*) growing near the improved pasture.

The large areas of private agricultural and pasture land surrounding Rutland Ranch, coupled with limited access to these properties, made it difficult to locate Burrowing Owls from the surrounding road network. Aerial telemetry, initiated after the owls had dispersed from the pasture, assisted in locating only one of four juvenile Burrowing Owls, possibly because of battery failure of the three remaining transmitters.

Knowledge of breeding and post-hatching habitat requirements of Burrowing Owls in rural environments (especially grazing lands and natural areas) is particularly important because of continued habitat loss due to increased growth and development throughout Florida. We also note that Burrowing Owl populations in urban areas such as vacant lots, college campuses, and private residences are also not immune to the effect of development. Urban areas may provide only temporary Burrowing Owl habitat due to the inverse relationship between the size and persistence of owl populations, and the level of human development (Courser 1976, Wesemann 1986, Millsap and Bear 2000).

The Burrowing Owl has been listed as a Species of Special Concern since 1979 by the Florida Fish and Wildlife Conservation Commission (Millsap 1997). Without conservation and management, Burrowing Owls may become a state listed threatened species because of vulnerability to habitat modification, environmental alteration, human disturbance, or human exploitation (Florida Fish and Wildlife Conservation Commission 2004b). A greater understanding of Burrowing Owl ecology in rural environments is needed to successfully manage and conserve this species throughout Florida.

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American White Pelicans Force Copulations with Nestlings

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ABSTRACT.—We observed 56 forced copulation (FC) events in a breeding colony of American White Pelicans (*Pelecanus erythrorhynchos*) in Saskatchewan, Canada during the 2005 nesting season. All FCs were directed at nestlings >21 days of age that were not continuously attended by an adult. The onset of FCs occurred in close synchrony with an unexpected late-season increase in adult copulation attempts. We suggest that FC directed at nestlings is not simply an aberrant and nonadaptive behavior. Rather, copulations with nestlings result from adult male pelicans being inappropriately stimulated to copulate with nestlings when actually seeking copulations with adult females. *Received 22 December 2005. Accepted 24 July 2006.*

Forced copulation is a behavior used by males of some species as a strategy to fertilize females that would otherwise be unreceptive (McKinney et al. 1983). The proportion of fertilization events gained via forced copulations is likely low (e.g., 2–5%; Dunn et al. 1999), but this behavior is generally considered adaptive and has been reported for several avian orders (e.g., Anseriformes, McKinney et al. 1983; Charadriiformes, Ewins 1993; Passeriformes, Rising and Flood 1998; and Galliformes, Giudice and Ratti 2001). On rare occasions, forced copulation attempts by adults are directed toward conspecific young. We found a small number of reports of adults attempting to copulate with fledged conspecific juveniles (Armstrong 1988, Ewen and Armstrong 2002) and with unfledged chicks (Kinkel and Southern 1978, Besnard et al. 2002). Fledged juveniles may be mistaken for adult females in some species, but there is no obvious adaptive explanation for forced copulations with unfledged chicks. The motivation for forced copulation with unfledged chicks is therefore unclear.

We describe patterns associated with forced copulation attempts on chicks by adult American White Pelicans (*Pelecanus erythrorhynchos*; hereafter pelicans) in a breeding colony

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A COMPARISON OF AVAILABLE PREY AND DIET OF FLORIDA BURROWING OWLS IN URBAN AND RURAL ENVIRONMENTS: A FIRST STUDY

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Abstract. The distribution of the Florida Burrowing Owl (*Athene cunicularia floridana*) has expanded from primarily rural areas in south-central Florida to include urban/suburban areas to the north, northwest, south, and southeast. While Florida Burrowing Owls still reside in rural areas, the majority of previous research and current management strategies focus on urban/suburban populations. Determining differences in the owl's ecology between rural and urban/suburban areas can aid in creating effective statewide management strategies for this species. We compared the available prey and diet of Burrowing Owls in a rural and urban environment. Although, on the basis of analysis of pellets, insects and arachnids were the two most frequent food items at both the rural and urban sites, the diets at the two sites differed, largely because of greater consumption of avian prey in the urban habitat. This study is the first comparison of dietary and prey-availability differences between rural and urban Burrowing Owl populations.

Key words. Athene cunicularia, *Burrowing Owl, diet, raptors, species of special concern, prey analysis.*

Comparación de las Presas Disponibles y las Encontradas en la Dieta de Athene cunicularia floridana en Ambientes Urbanos y Rurales: Un Primer Estudio

Resumen. La distribución de *Athene cunicularia floridana* se ha expandido desde las zonas principalmente rurales del centro-sur de la Florida e incluye ahora zonas urbanas y suburbanas ubicadas al norte, noroeste, sur y sureste. Si bien *A. c. floridana* se encuentra todavía en las zonas rurales, la mayoría de las investigaciones anteriores y las estrategias de gestión actuales se centran en poblaciones urbanas y suburbanas. La determinación de posibles diferencias en la ecología de esta lechuza entre zonas rurales y urbanas/suburbanas puede ayudar a desarrollar estrategias de gestión efectivas para esta especie a nivel estatal. Comparamos las presas disponibles y la dieta de *A. c. floridana* entre un ambiente rural y uno urbano. Con base en análisis de egagrópilas, los invertebrados y los arácnidos fueron los dos alimentos más frecuentes tanto en la zona rural como en la urbana. Sin embargo, las dietas difirieron entre los sitios debido en gran parte a un mayor consumo de aves en el ambiente urbano. Este estudio representa la primera evaluación de las diferencias entre las presas consumidas y las disponibles en el ambiente entre poblaciones rurales y urbanas de *A. c. floridana*.

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The distribution and habitats of the Florida Burrowing Owl (*Athene cunicularia floridana*) have changed since this species was first documented breeding on dry prairies in south-central Florida in the late 19th century (Cahoon 1885, Hoxie 1889, Rhoads 1892, Scott 1892, Palmer 1896). Extensive development and agriculture have displaced this primary habitat, and Burrowing Owls now reside in human-altered areas such as pastures (Mealey 1997), private residences (Mealey 1997), vacant urban lots (Wesemann 1986, Millsap and Bear 1990), college campuses (Courser 1976), airports (Owre 1978, Mealey 1997), and borders of highways (Owre 1978). While the Burrowing Owl's breeding habitat has expanded north, northwest, south, and southeast of the original dry prairies (MacKenzie 1944, Neill 1954, Ligon 1963, Courser 1979, Hennemann 1980), increases in land development may cause a decrease in the owl's use of the new habitat over time (Courser 1976, Wesemann 1986, Millsap and Bear 2000). In 1979 the Florida Burrowing Owl was listed as a species of special concern (Florida Department of State 1979) because of its vulnerability to habitat/environmental modification and human disturbance/exploitation (Florida Fish and Wildlife Conservation Commission 2008).

The shift of a species from rural to urban habitats can influence its diet, territory size, predation risk, social structure, and basic demography (McGowan 2001). The effective management of such a species requires an understanding of its habitat and food requirements over a variety of spatial and temporal scales (Litvaitis et al. 1996). Currently, statewide management of the Florida Burrowing Owl is limited to resolving conflicts between land developers and the protection of Burrowing Owl breeding habitat in urban and suburban areas (Florida Fish and Wildlife Conservation Commission 2004). In addition, previous research on the Florida Burrowing Owl has focused largely on urban/suburban populations (Courser 1976, Wesemann 1986, Mealey 1997, Millsap and Bear 1997, Millsap and Bear 2000). Only recently have studies on this species begun to address rural populations (Yosef and Deyrup 1994, Mrykalo et al. 2007, Mueller et al. 2007).

In cities and suburbs Florida Burrowing Owls appear to prey mostly on ground-dwelling insects (Hennemann 1980, Wesemann 1986). Prey other than insects includes mice (*Peromyscus*

sp.), rabbits (*Sylvilagus* sp.), anoles (*Anolis* sp.), tree frogs (*Hyla* sp.), southern toads (*Bufo terrestris*), rosy wolfsnails (*Euglandina rosea*), marsh crabs (*Sesarma reticulatum*) (Wesemann 1986), blue Florida crayfish (*Procambarus alleni*), hispid cotton rats (*Sigmodon hispidus*) (Owre 1978), eastern spadefoot toads (*Scaphiopus holbrooki*), and Least Terns (*Sternula antillarum*) (Hennemann 1980).

Insects have also been documented as the predominant prey in the diet of Burrowing Owls from rural areas (Ridgway 1874, Cahoon 1885, Hoxie 1889, Rhoads 1892, Palmer 1896, Bent 1938, Yosef and Deyrup 1994). In these habitats prey other than insects include Savannah Sparrows (*Passerculus sandwichensis*), Bobolinks (*Dolichonyx oryzivorus*), and unknown species of rodents, lizards, frogs, fish (Rhoads 1892), crabs (Bent 1938), crayfish (Rhoads 1892, Palmer 1896), and snakes (Rhoads 1892, Bent 1938). The majority of these reports, however, have been largely anecdotal (Ridgway 1874, Cahoon 1885, Hoxie 1889, Rhoads 1892, Palmer 1896, Bent 1938).

As Florida's rural habitats continue to decline, it is important to understand the potential effects of land conversion on this species of special concern. The purpose of this study was to expand information available for the species' management by comparing the diet and available prey of Burrowing Owls in a rural and an urban environment. This research was conducted concurrently with a study examining the spatial ecology and behavior of Florida Burrowing Owls in rural environments (Mrykalo 2005, Mrykalo et al. 2007).

METHODS

The study was undertaken on Marco Island (urban) and at Rutland Ranch (rural) from October 2003 to October 2004. The two areas are approximately 182 km apart. Marco Island is a 36.3-km^2 barrier island located off the southwest coast of Florida (25° 56′ N, 81° 43′ W). Approximately 15 000 people reside there year round, and the winter population peaks at roughly 35 000 (Marco Island City Hall 2003). The vast majority of Burrowing Owls on Marco Island breed on vacant lots. In 2004, 113 vacant lots were occupied by adult Burrowing Owls, which had excavated 133 burrows (N. Ritchie, pers. comm.).

Rutland Ranch, located in Bradenton, encompasses approximately 2372 ha. The ranch contains a mixture of habitats including oak scrub, herbaceous marshes, riparian hardwoods, pine flatwoods, and pastures of non-native grass (Barnwell et al. 2003). The land surrounding Rutland Ranch is used primarily for agriculture and cattle ranching. Burrowing Owls excavate burrows on an 81-ha improved pasture that undergoes prescribed burning yearly (27° 30′ N, 82° 15′ W). In 2004, five pairs of adult Burrowing Owls were located within the improved pasture and had excavated 14 burrows.

DIET

We hypothesized that the diet of Burrowing Owls on Rutland Ranch and Marco Island differs. Every other month we collected whole regurgitated pellets from each study area from five randomly selected active burrows, composed of main and satellite burrows. We used a dissecting microscope to identify insect prey from the remains of body parts found in pellets. Personnel from the Florida State Collection of Arthropods assisted in classifying insect and arachnid remains (P. Skelley, pers. comm.). The mandibles, heads, elytra, legs, and forceps were examined to identify insects and arachnids to the level of family in each pellet and counted to approximate the number of insects and arachnids within pellets (Gleason and Craig 1979). The Florida Museum of Natural History assisted in the identification of jaws, bones, and bone fragments in pellets (C. McCaffery, pers. comm.). We classified diet according to the abundance of prey found within owl pellets. We were unable to discern if prey was scavenged or captured.

PREY SURVEYS

We hypothesized that the abundances of insect and mammalian prey on Rutland Ranch and Marco Island differ significantly. To compare potential mammalian prey in the two study areas, we established five transects, each 50 m long, randomly within the improved pasture at Rutland Ranch and also on five randomly selected lots containing Burrowing Owls on Marco Island.

We placed Sherman small-mammal traps at 10-m intervals ($n = 5$) along each transect and baited each with either shelled peanuts or a mixture of rolled oats and shelled peanuts. Initially, we lost trap bait continually lost to fire ants (*Solenopsis invicta*) in both study areas, so we sprayed an insecticide on the ground in a 2-m circumference around each trap (Mitchell et al. 1996). We trapped small mammals concurrently with pellet collection, setting traps at sunset and checking them each morning. Each trapping session consisted of 50 trap-nights: 25 traps × 2 nights.

To compare potential insect and arachnid prey at Rutland Ranch and Marco Island, we randomly placed two pitfall traps, between 0 and 360°, approximately 5 m from the starting point of each transect. Pitfall traps consisted of number 10 cans buried in the ground and level with the soil surface (Wesemann 1986). We placed 5 cm of water in the bottom of each can to deter insects from climbing out and baited traps with either spoiled meat or fruit (Wesemann 1986). We placed a covering of Plexiglas and wire mesh several centimeters above each trap to deter rain and predators. We trapped insects concurrently with small mammals. Each morning we removed the captured insects and pinned them for later identification to order or family. Each insect-trapping session consisted of 20 trap-nights: 10 traps × 2 nights.

STATISTICAL METHODS

We tested for differences between prey classes found in pellets collected from the urban and rural sites with a two-by-six chi-squared contingency table (Zar 1999). We tested for differences in insect and arachnid prey captured in pitfall traps at the rural and urban sites with a two-by-two chi-squared contingency table (Zar 1999).

RESULTS

DIET

We collected 55 pellets at Marco Island and 29 pellets from Rutland Ranch. In both areas, insects were the most frequent prey, constituting 86% of the diet at Marco Island and 89% at Rutland Ranch (Table 1). Arachnids were the second most frequent prey item (Marco Island 9%; Rutland Ranch 8%; Table 1). When the prey were categorized by class (Insecta, Arachnida, Gastropoda, Aves, Reptilia, Mammalia), the diets at the two sites differed significantly ($\chi^2 = 13.8$, $P < 0.025$). The largest contribution to the chi-squared value, and poorest fit to the expected value, came from the lower number of avian prey in pellets collected at the rural site. At Marco Island avian prey occurred within pellets during all sampling periods.

TABLE 1. Classification of prey remains found in Burrowing Owl pellets collected from Rutland Ranch (rural habitat, 29 pellets) and Marco Island (urban habitat, 55 pellets).

	Rutland Ranch		Marco Island	
Taxon	Total	Percentage	Total	Percentage
Insecta				
Coleoptera				
Scarabaeidae	146	31.8	250	40.0
Dermaptera	127	27.7	58	9.3
Orthoptera				
Acrididae	48	10.5	23	3.7
Gryllidae	47	10.2	196	31.4
Hemiptera				
Reduviidae	7	1.5		
Coleoptera				
Cerambycidae	4	0.9		
Carabidae	19	4.1	5	0.8
Curculionidae	11	2.4	5	0.8
Arachnida				
Araneae				
Clubionidae	38	8.3	57	9.1
Gastropoda				
Stylommatophora				
Spiraxidae	8	1.7	5	0.8
Reptilia				
Squamata				
Polychrotidae			6	1.0
Aves	3	0.7	18	2.9
Mammalia				
Rodentia	1	0.2	2	0.3

PREY SURVEYS

No small mammals were captured during the 300 trap-nights at either site. Insect pitfall trapping was conducted for 120 trap nights at both study sites. At Marco Island we captured in pitfall traps one arachnid and 17 insects, of which the family Gryllidae was the most frequent ($n = 6$; Table 2). At Rutland Ranch we captured 24 arachnids and 42 insects, of which the Gryllidae were again the most frequent ($n = 29$; Table 2). Insect and arachnid abundance on Marco Island and Rutland Ranch differed significantly ($\chi^2 = 6.4$, $P < 0.025$). The largest contribution to the chi-squared value, and poorest fit to the expected value, came from the number of arachnids captured in urban pitfall traps.

TABLE 2. Total number of insects and arachnids captured in pitfall traps at Marco Island and Rutland Ranch.

	Quantity captured	
Taxon	Marco Island	Rutland Ranch
Insecta		
Orthoptera		
Gryllidae	6	29
Acrididae	0	4
Tettigoniidae	0	2
Coleoptera		
Carabidae	5	7
Diptera	4	0
Hemiptera		
Cicadellidae	1	0
Gelastocoridae	1	0
Arachnida		
Araneae		
Clubionidae	1	24

DISCUSSION

Our results indicate the Burrowing Owl's diet and prey availability in the rural and urban study areas differed significantly. Insects and arachnids were the two categories found most frequently in owl pellets at each site. Non-insect prey constituted 11% of the owl's diet at the rural site (Rutland Ranch), 14% at the urban site (Marco Island). Future studies could compare the effectiveness of pellet analysis to other methods such as analysis of prey remains (Simmons et al. 1991), direct observations (Sanchez et al. 2008), and camera or video documentation (Tornberg and Reif 2007) for determining the diet of Florida Burrowing Owls.

Because we sampled only one rural and one urban site, we do not know if the higher percentage and greater variety of insects in the diet of the owls at Rutland Ranch was a result of habitat differences between the rural and urban study areas. Urbanization can cause habitat loss, habitat fragmentation, and alteration of habitat quality, resulting in the increase in some insect species or the decrease in others (Connor et al. 2002). The pasture at Rutland Ranch is composed of various grasses and herbaceous vegetation. The surrounding landscape, however, contains a variety of habitats such as pine flatwoods, oak scrub, riparian hardwoods, and herbaceous marshes (Barnwell et al. 2003), and Meykalo et al. (2007) documented owls using habitats other than improved pasture. The urban environment of Marco Island consists of either vacant housing lots that are routinely mowed, developed lots containing office buildings or homes, or open areas such as small parks, athletic fields, and playgrounds. Developed lots and open areas are commonly covered by uniform lawns and small areas of native or ornamental trees and/or shrubs. Sampling a larger number of urban and rural sites in future diet studies would help determine if owls in these habitats differ in diet.

Pitfall trapping may not have represented the Burrowing Owl's potential ground-dwelling prey on Marco Island and Rutland Ranch accurately. For example, no insects of the family Scarabaeidae were caught in pitfall traps even though they were the most frequent prey in regurgitated pellets from both areas and pitfall traps have previously proven successful in capturing insects of this family (Goehring et al. 2002). Differences between studies in the success of trapping Scarabaeidae may be the result of differences in habitat types and the number of traps. Goehring et al. (2002) used a larger number of pitfall traps, and their study areas included small forests, large forests, and coffee plantations. Pitfall trapping in other Florida cattle pastures has been successful in capturing insects of the family Scarabaeidae (RS, pers. obs.).

Ours is the first study to compare the diet and prey availability of rural and urban Burrowing Owl populations. As land development and conversion continue in Florida, determining factors that limit population growth in rural and urban/suburban Burrowing Owl populations will be an important tool for the management and conservation of this species throughout the state.

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Biological Sciences

STATE LISTED SPECIES PERMITS

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ABSTRACT: *Permits are one method to manage state listed species located on lands proposed for development in Florida. The data recorded on an application and issued permit document impacts to a species and, if applicable, mitigation for the impacts. As the number of permits issued accumulates over time the impact and mitigation data can be analyzed to help determine population trends, determine the amount of habitat lost or gained, evaluate the management strategy, and review progress toward permit goals. The purpose of this study was to quantify permit data collected from 1990 through 2005 for two state listed species in Florida: gopher tortoises (Gopherus polyphemus) and Florida burrowing owls (Athene cunicularia floridana). The permits examined included Special Tortoise Relocation Permit, Standard Tortoise Relocation Permit, Incidental Take Permit, and Migratory Bird Nest Removal Permit. For three of the four permits examined we were unable to either verify or quantify impacts due to permitting because of missing or inconsistent data. We suggest that management plans for state listed species include protocols defining and documenting standards for the quality control of permit data collection, entry, and management.*

Key Words: Gopher tortoise, *Gopherus polyphemus*, Florida burrowing owl, *Athene cunicularia floridana*, permit, incidental take, state listed species

WILDLIFE management is "the application of ecological knowledge to populations of vertebrate animals and their plant and animal associates in a manner that strikes a balance between the needs of those populations and the needs of the people" (Bolen and Robinson, 1999: 3). State agencies play an important role in the management of wildlife within their jurisdiction. In Florida, the Florida Fish and Wildlife Conservation Commission (FWC) exercises regulations pertaining to fish and wildlife resources (Florida Legislature, 1998) and manages these resources "... for their long-term well-being and the benefit of people" (Florida Fish and Wildlife Conservation Commission, 2009).

State listed wildlife (species of special concern, threatened, and endangered) are located on both public and private lands throughout Florida and are afforded specific protections except when authorized by FWC regulations (Florida Administrative Code, 2007a) or permits (Florida Administrative Code, 2007a; 2007b; 2009). The FWC has utilized permits to manage state listed species located on land proposed for development. Permits have been issued to relocate species, incidentally take (entomb or kill) species, remove

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nests, and destroy nest burrows (Florida Fish and Wildlife Conservation Commission, 2008a).

The data recorded on a permit application and/or issued permit document the impact of a development project on a species and, depending on the permit, mitigation for the impact. As the number of permits issued accumulates over time the data in applications and permits can be quantified to document species impacts and mitigation at varying spatial and temporal scales. An analysis of impact and mitigation data can be used to help determine population trends, determine the amount of habitat lost or gained, assess the effects of the permit management strategy, and review the progress towards permitting goals set by the wildlife agency.

Considering the potential effects that permitting may have on a species, the purpose of this study was to quantify permit impact, and if applicable, mitigation data collected from 1990 through 2005 for one previous species of special concern, the gopher tortoise (*Gopherus polyphemus*), and once current species of special concern, the Florida burrowing owl (*Athene cunicularia floridana*). This data is particularly relevant because permits to manage species of special concern may be issued if there is "... reasonable conclusion that the permitted activity will not be detrimental to the survival potential of the species" (Florida Administrative Code, 2007a).

To our knowledge this is the first study to review extensive permit data for state listed species. Previous authors have included ancillary permit data in their published work such as the number of gopher tortoises relocated in Florida from 1989–1998 (>25,000 tortoises) (Enge et al., 2003) and from 1989 through July 2005 (>60,000 tortoises) (Mushinsky et al., 2006).

Gopher Tortoise—The gopher tortoise became a state listed species of special concern in 1979 (Florida Administrative Code, 1979). The gopher tortoise was upgraded to a state listed threatened species in 2007 (Florida Administrative Code, 2007b) and a status review was recently initiated to determine if the eastern population of gopher tortoise warrants listing as a federally threatened species (Federal Register, 2009).

A new species management plan and permitting guidelines were instituted in 2008 to manage gopher tortoises (Florida Fish and Wildlife Conservation Commission, 2008b). Prior to the development of the new guidelines, three types of permits were utilized to manage gopher tortoises located on lands proposed for development: Special Tortoise Relocation Permits for the relocation of five or fewer tortoises on site (Florida Fish and Wildlife Conservation Commission, 2006); Standard Tortoise Relocation Permits for the relocation of greater than five tortoises on site or any number off site (Florida Fish and Wildlife Conservation Commission, 2006); and Incidental Take Permits for the entombment or killing of gopher tortoises (Florida Fish and Wildlife Conservation Commission, 2007).

Mitigation was a component of Incidental Take Permits. Mitigation options included: protection of suitable habitat within the proposed

TABLE 1. Permit data requested from the Florida Fish and Wildlife Conservation Commission.

Species	Type of Permit	Data Requested
Gopher Tortoise	Special Tortoise Relocation Permit	Number of Permits Issued Number of Tortoises Relocated
	Standard Tortoise Relocation Permit	Number of Permits Issued Number of Tortoises Relocated Acreage of Tortoise Habitat Permitted For Development
	Incidental Take Permit	Number of Permits Issued Number of Tortoises Incidentally Taken Acreage of Tortoise Habitat Permitted for Development Acreage of Tortoise Habitat Preserved on Development Sites Acreage of Tortoise Habitat Preserved Adjacent to Conservation Lands Number of Acre Credits Purchased at Regional Mitigation Parks
Florida Burrowing Owl	Migratory Bird Nest Removal Permit	Number of Permits Issued Number of Nest Burrows Destroyed

development site, purchase of occupied gopher tortoise habitat adjacent to public conservation lands, or purchase of acre credits within a regional FWC mitigation park (Florida Fish and Wildlife Conservation Commission, 2007).

Florida Burrowing Owl—The Florida burrowing owl became a state listed species of special concern in 1979 (Florida Administrative Code, 1979). The Migratory Bird Nest Removal Permit has been and is currently issued to allow destruction of inactive nest burrows (not containing eggs or flightless young) situated on lands proposed for development (Florida Fish and Wildlife Conservation Commission, 2004). Burrows are considered inactive from July 10 to February 15, but burrowing owls may utilize burrows outside of this time period (Florida Fish and Wildlife Conservation Commission, 2004). Mitigation for loss of burrows includes placing T-perches on site, digging starter burrows, or installing replacement nest structures (Florida Fish and Wildlife Conservation Commission, 2004).

MATERIALS AND METHODS Between 5 March 2006 and 6 June 2008 we requested FWC permit data, per Florida County per year, regarding the Special Tortoise Relocation Permit, Standard Tortoise Relocation Permit, Incidental Take Permit, and Migratory Bird Nest Removal Permit. The data requested was from 1990 through 2005 and varied depending on the information recorded on applications and issued permits (Table 1). The permit data received varied in format and quality; therefore we conducted further inquiries with the FWC.

In addition, we inquired if all hard copy permit applications and/or permits had been retained. If all hard copies were said to be retained we then examined the accuracy of the permit data received. To determine accuracy we first randomly selected permits from the FWC permit data received. We then compared impact and mitigation data from the randomly selected permits to the same data documented in the applicable hard copy permit applications and permits.

RESULTS—The permit data was received in two formats: Excel© spreadsheet summarizing the number of permits issued and number of tortoises relocated each year statewide (Special Tortoise Relocation Permit and Standard Tortoise Relocation Permit) or Excel spreadsheet documenting individual permit impact and, if applicable, mitigation data (Standard Tortoise Relocation Permit, Incidental Take Permit, and Migratory Nest Removal Permit).

Special Tortoise Relocation Permits—The data received summarized the number of permits issued and the number of tortoises relocated each year statewide from 1995 to 2004, based on the minimum (one tortoise) and maximum (five tortoises) relocated per permit. From 1995 to 2004, an estimated 3,821 permits were issued and the estimated number of tortoises relocated ranged from 3,821–19,105.

We could not verify the number of permits issued or the number of tortoise relocated. Four of the five regional FWC offices that previously issued these hard copy permits, before the initiation of the current online permit system, did not retain all permits issued from their office (Bear, 2008; Douglass, 2008; Loggins, 2008; Sigman, 2008). In addition, none of the five regional offices had a list documenting all permits issued from their office (Bear, 2008; Douglass, 2008; Hood, 2008; Loggins, 2008; Sigman, 2008).

Standard Tortoise Relocation Permits—The spreadsheet received summarized the number of permits issued and the number of tortoises relocated each year statewide from 1989 to 2005. From 1989 to 2005, an estimated 1,686 permits were issued and 58,529 tortoises were relocated.

We also received a spreadsheet documenting individual permit data for an estimated 1,587 permits issued from approximately 9 September 1985 to 19 May 2006. The total number of permits issued cannot be determined because an unknown number of permits were lost from the permit database in 2004 (Williams, 2007).

We were unable to quantify the total number of tortoises relocated for the 1,587 permits in the spreadsheet due to missing or conflicting relocation data. Data regarding acreage of tortoise habitat permitted for development was never produced. In addition, all hard copies of previously issued permits had not been retained (Williams, 2007).

Incidental Take Permit—The spreadsheet received documented individual permit data on 2,476 permits issued from 20 September 1991 to 31 May 2006. Approximately 83,955 tortoises were incidentally taken and 137,759.1 acres of gopher tortoise habitat was permitted for development. Mitigation acre credits purchased totaled 10,472.2 at a cost of $58,075,498.08. Onsite tortoise habitat preserved totaled 20,464.5 acres and 8,779.3 acres of tortoise habitat was purchased adjacent to public conservation lands.

All hard copies of permit applications and permits were said to be retained, therefore we compared permit impact and mitigation data documented in

randomly selected permits from the spreadsheet (n = 124, 5% of total) to the same data documented in applicable hard copy applications and permits. Approximately 19% of the requested hard copy applications and permits could not be located (McCann, 2008); therefore additional randomly selected permits were included to bring the sample size to 124 permits.

The random sample of permits examined in the spreadsheet overestimated the cumulative mitigation park credits purchased by approximately 89% primarily due to an error in one permit within the sample. The total acreage of gopher tortoise habitat preserved on development sites was overestimated by approximately 6% due to an error in one permit within the random sample. The total cost of purchasing mitigation park credits was underestimated by approximately 3% primarily due to an error in one permit within the random sample.

Migratory Bird Nest Removal Permit—The spreadsheet received contained individual permit data on an estimated 1,020 permits issued from approximately 1 April 1988 to 8 July 2006. The total number of permits issued cannot be determined because an unknown number of permits were lost from the permit database in 2004 (Williams, 2008).

We were unable to quantify the total number of burrows destroyed for the 1,020 permits due to missing or conflicting burrow data. In addition, we were unable to determine how many hard copy permits had been retained.

Discussion—For three of the four types of permits examined we were unable to either verify or quantify the requested permit data. While errors were noted in the randomly selected Incidental Take Permits from the spreadsheet, the errors were found in a small number of permits. The results from the random sample may not be a true representation of the permit data documented in the spreadsheet.

Permits are one tool used to manage state listed species in Florida. The management and conservation benefits that permitting provides to a species becomes uncertain when permit data cannot be analyzed. We suggest that these uncertainties can be removed by defining and documenting protocols for the collection and management of permit data.

Protocols designed for monitoring natural resources in national parks provide useful templates for the collection and management of permit data. Monitoring protocols include standard operating procedures which document the objectives of data collection, define the type of data to be collected, validate the data collected for quality control, determine how the data will be stored and managed, determine how the data will be analyzed and results displayed, and document any revisions in management (Oakley et al., 2003).

It's not known if the design and implementation of a permit data collection and management protocol will require additional agency resources. We suggest that any additional cost can be offset by initiating a fee based system for all state listed species permits in Florida. No fees were required for the review and issuance of Special Tortoise Relocation Permits, Standard Tortoise Relocation

Permits, and Incidental Take Permits. Similarly, no fees are currently associated with Migratory Bird Nest Removal Permits. The new gopher tortoise permit system does require a mitigation contribution for all relocation permits and the funds are applied to supporting the new management and permit system (Florida Fish and Wildlife Conservation Commission, 2008b). We recommend the development of effective data tracking and reporting within this on-line permit system.

Permits to manage state listed species are not solely the domain of Florida. States including California, Delaware, Illinois, Massachusetts, and Wisconsin have a permit system for the taking or incidental taking of state listed species (California Department of Fish and Game, 2008; Illinois General Assembly, 2008; Massachusetts Division of Fisheries and Wildlife, 2008; State of Delaware, 2008; State of Wisconsin, 2008). Successful management of state listed species will require evaluating impacts and mitigation due to permitting in addition to other management strategies.

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Email from Jesus A. Camps

I have noticed burrowing owls in my neighberhood (North Shore Crest) in NE Miami Dade County. It is odd because I normally spot it at night on the telphone wire in front of my home or that of my neighbors.
They have been around for several months now. It looks like they may be feeding on termites and or other types of insects. On one occasion it was standing right on my front wooden gate leading to my front door. Hope there are more, but I only have spotted a loner and occassionaly another one that looks smaller.

Email from Dennis Teague

Burrowing owls on Eglin AFB

Burrowing owls were first discovered on Eglin AFB on Test Range B-70 in the late 1980s. In 1995, a burrowing owl survey of the test range B-70 grid and surrounding areas was completed by the NRS with the assistance of test range personnel. The results of this survey revealed nine active owl burrows. The owls were attracted to the grid area because of an earlier herbicide treatment that controlled shrubby growth and had created a grassy field/prairie type habitat that was suitable for burrowing owl use. The grid area and the surrounding test range area are maintained by mowing, occasional wildfires, herbicide application, and prescribe burning. The last herbicide application outside the grid area was done in 2006. In 2008, a large scale survey of B-70 was initiated. There have been 33 active burrows discovered. In 2010 250 additional acres were surveyed and only 1 burrow was discovered. One active burrow was recently discovered on Test Range B-75 approximately 2+ miles north of the B-70 owl population. This area is scheduled to be surveyed for additional burrows.

The following objective has been established to protect burrowing owls.

Mark all known burrows using a "T" perch. This "T" perch has a PVC base with reflective orange markings. The perch allows tractor operators and test range personnel to locate burrows and avoid collapsing them when they are conducting range maintenance activities, and volunteers conducting burrowing owl surveys can easily locate the burrows without disturbing the owls. Burrows that may be at risk during special missions will be marked with additional PVC poles, reflective tape, and signs.

Monitoring and Management

Burrowing owl surveys are conducted monthly by volunteers. Because there is little known about Eglin's population, all observations will be important in determining the burrowing owls population status. Observations made during these surveys include burrow condition, number of adults and young, number of banded birds and ID number, and behavior. During nesting season, the nest burrows are located and the young are monitored. All fledglings are recorded. All known burrowing owl burrows will be annually marked using "T" perches to make them visible to test area maintenance personnel.

Burrow_ID	Status	Comments	Date_Found	Description	POINT_X	POINT_Y
B-70 01	active	GT burrow	10/9/2008		529636.1481	3381546.462
B-70 02	inactive	Recently active	10/9/2008		529219.2023	3381174.636
B-70 03	inactive	Recently active	10/9/2008		529261.6735	3381132.085
1	active			Original grid burrow	520561.6019	3375666.063
2	active			Original grid burrow	520767.365	3375940.175
3	active			Original grid burrow	521338.0204	3376053.211
4	active			Original grid burrow	521702.2077	3376254.515
5	active			Original grid burrow	521951.605	3376281.614
6	active			Original grid burrow	521820.6116	3376535.122
10	active			Original grid burrow	521106.5369	3376184.63
12	active			Original grid burrow	522039.7278	3376352.717
12	active			Original grid burrow	521976.0371	3376534.328
16	active			Original grid burrow	520444.4219	3375731.224
17	active			Original grid burrow	520830.7103	3375929.215
18	active			Original grid burrow	521022.649	3375905.206
19	inactive				524157.1329	3376372.749
26	active	1 adult			521846.9963	3375821.509
27	active	2 adults			521427.2039	3375591.277
34	active				520822.4309	3375702.571
35	active	1 adult			519171.7364	3375512.772
37	inactive				523791.4156	3377326.082
39	active	1 adult			523099.5641	3376955.559
40	inactive				523733.8328	3377773.661
41	active	Recently inactive			522051.5204	3377157.278
45	inactive				524023.6335	3377299.999
48	active				521999.234	3376450.154
49	active	Overgrown			522056.4035	3376644.201
50	active	GT burrow	11/13/2008		521005.0029	3376813.015
51	active		11/13/2008		520850.555	3376751.151
52	active	GT burrow	11/13/2008		520238.8918	3374641.379
53	active	GT burrow	11/13/2008		520220.061	3374733.691

54	active	Collapsed	12/6/2008	524819.9329	3378534.465
55	active	GT burrow	12/8/2008	528067.6731	3380777.252
56	active	Inactive owl	12/8/2008	528247.2843	3381305.342
57	active	GT burrow	12/17/2008	520191.4	3374762.5
58	active	Inactive	1/23/2009	524443.9726	3378814.964
59	active	No burrow found	1/23/2009	524604.1896	3378848.881
60	active	1 adult	1/23/2009	524632.0984	3378878.804
61	active	Recently inactive	2/10/2009	526378.5803	3379823.465
62	active	Active	2/10/2009	527026.2695	3380221.796
63	active		2/10/2009	524799.6893	3377671.329
64	inactive		2/10/2009	524374.334	3378195.456
64	active	GT burrow	2/10/2009	521937.4231	3377203.774
65	active	Recently inactive	2/10/2009	522072.6609	3377218.641
NEW	active	2 adults 2 juv	5/30/2009	523905	3378377
NEW	Gigantic	GT burrow	6/13/2009	524835	3377681
NEW	active	1 adult	6/13/2009	524460	3377642
NEW	active	2 adults	6/13/2009	524723	3377841
NEW	active	2 adults 2 juv	7/25/2009	526922	3380133
NEW	active		7/25/2009	523223	3377022
NEW	active		7/25/2009	523213	3377019
NEW	active	1 adult	7/25/2009	521321	3377164

Burrow_ID	Status	Comments	Date_Found	Description	POINT_X	POINT_Y	9-Oct-08	13-Nov-08	6-Dec-08	8-Dec-08	23-Jan-09	10-Feb-09	30-May-09	13-Jun-09	5-Jul-09	25-Jul-09	1-Aug-09
B-70-02	active		10/9/2008		529636.1481	3381546.462										2A	
B-70-03	active		10/9/2008		529261.6735	3381132.085										2A 2 J	
1	active		1993	grid	520561.6019	3375666.063											
2	active		1993	grid	520767.365	3375940.175											
3	active		1993	grid	521338.0204	3376053.211											
4	active		1993	grid	521702.2077	3376254.515											
5	active		1993	grid	521951.605	3376281.614											
6	active		1993	grid	521820.6116	3376535.122											
10	active		1993	grid	521106.5369	3376184.63											
12	active		1993	grid	522039.7278	3376352.717											
12	active		1993	grid	521976.0371	3376534.328											
16	active		1993	grid	520444.4219	3375731.224											
17	active		1993	grid	520830.7103	3375929.215											
18	active		1993	grid	521022.649	3375905.206											
19	inactive				524157.1329	3376372.749											
26	active	1 adult			521846.9963	3375821.509											
27	active	2 adults			521427.2039	3375591.277											
37	inactive				523791.4156	3377326.082											
39	active	1 adult			523099.5641	3376955.559											
40	inactive				523733.8328	3377773.661											
41	active				522051.5204	3377157.278									2 A 3 J		
45	inactive				524023.6335	3377299.999											
48	active				521999.234	3376450.154											
49	Overgrn				522056.4035	3376644.201											
34	active				520822.4309	3375702.571											
35	active				519171.7364	3375512.772		1 A									
51	active		11/13/2008		520850.555	3376751.151											
54	Collapsed		12/6/2008		524819.9329	3378534.465											
56	Inac-owl		12/8/2008		528247.2843	3381305.342											
58	Inactive		1/23/2009		524443.9726	3378814.964											
59	inactive		1/23/2009		524604.1896	3378848.881											

60	active		1/23/2009	524632.0984	3378878.804	1 A				
61	inactive		2/10/2009	526378.5803	3379823.465					
62	active		2/10/2009	527026.2695	3380221.796					
63	active		2/10/2009	524799.6893	3377671.329					
64	inactive		2/10/2009	524374.334	3378195.456					
65	inactive		2/10/2009	522072.6609	3377218.641					
NEW	active		5/30/2009	523905	3378377		2A 2 J		1 A 2 J	2A 4J
NEW	active	GT burrow	6/13/2009	524835	3377681					
NEW	active	1 adult	6/13/2009	524460	3377642				2 A	1 A 2J
NEW	active	2 adults	6/13/2009	524723	3377841				2 A 2 J	2 A
NEW	active	2 adults 2 juv	7/25/2009	526922	3380133				2 A 2 J	
NEW	active		7/25/2009	523223	3377022					
NEW	active		7/25/2009	523213	3377019					
NEW	active	1 adult	7/25/2009	521321	3377164				1 A	

Email from Mark Fredlake

From: Fredlake Mark J Civ 23 WG DET 1 OL A/CEVN
To: Imperiled
Subject: Surveys of Sensitive Species on Avon Park Air Force Range: Sherma n"s fox squirrel, gopher frog, Florida
mouse, Florida pine snake, Burrowi ng owl, etc.
Date: Monday, November 01, 2010 3:35:56 PM
Attachments: CHAP_7_APAFR_TortReport_2009.docx
Wetland Assessment 2002-2003.pdf
BUOW data.xlsx
BO observations.jpg

I am currently reviewing our files to determine if we have any information regarding the 61 species under review. I currently have found several reports of interest:

AVON PARK AIR FORCE RANGE PROJECT: DISTRIBUTION AND ABUNDANCE OF SENSITIVE WILDLIFE SPECIES AT AVON PARK AIR FORCE RANGE FINAL REPORT PROJECT RWO-169 DECEMBER 1998 authors: Richard Franz , David Maehr, Alton Kinlaw, Christopher O'Brien, and Richard D. Owen
This report contains information regarding population levels of the following species: Florida mouse: found commonly in well-drained soils through APAFR, in oak scrub and scrubby flatwoods. Live trapping effort yielded 274 captures of Florida mouse in 8160 trap nights, spread over a 16 month period.

Sherman's fox squirrel: Found in both native and planted pine stands, Sherman's fox squirrels prefer slash pine plantations over native long-leaf stands in APAFR. Population of fox squirrel for plantations in APAFR (7948 hectares) was estimated in the range of 433 to 867.

Florida gopher frog: documented in eleven breeding sites in APAFR mostly in the southern portion of the Bombing Range scrub ridge. Six to ten dry ponds were identified as potential breeding sites during wet seasons.

The report also documents the occurrence on APAFR of Florida pine snake based on one record along old Bravo Road, APAFR.

I suspect you probably have a copy of this report in your files. Nevertheless it can be downloaded from: http://aquacomm.fcla.edu/1072/1/OCRFranz%2C_R._1998.pdf

A second report (**BASELINE AQUATIC FAUNAL SURVEY OF AVON PARK AIR FORCE RANGE, FLORIDA: Fishes, Mollusks, and Crayfishes** PROJECT RWO-157. July 2000, Authors: Leo G. Nico, James D. Williams, and Holly N. Blalock-Herod) contains no information relevant to the special status species under review.
It can be downloaded from:
http://aquacomm.fcla.edu/1288/1/OCRNico%2C_L._2000.pdf

The third report: (**Population Survey and Monitoring of the Gopher Tortoise (*Gopherus polyphemus*) at Avon Park Air Force Range.** ANNUAL REPORT. October 2008 - September 2009 Authors: Betsie Rothermel, Ph.D. Traci Castellón, Ph.D. February 2010 Archbold Biological Station) contains some locations of Gopher Frog and Florida Pine

CHAPTER SEVEN (COMMENSUAL SPECIES) EXCERPT FROM: POPULATION SURVEY AND MONITORING OF THE GOPHER TORTOISE (*GOPHERUS POLYPHEMUS*) AT AVON PARK AIR FORCE RANGE. ANNUAL REPORT. October 2008 - September 2009

Authors:
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CHAPTER 7
COMMENSAL, MORTALITY, AND DISEASE MONITORING

Observations of Commensal Species

An additional objective of our research at APAFR was to document and gather data on Gopher Tortoise burrow commensals, especially for species of conservation concern (e.g., the Eastern Indigo Snake, *Drymarchon couperi*). In total, we encountered at least 11 species of vertebrate commensals since fieldwork began in March 2009 (Table 7). Observations were derived from examination of tortoise burrows using the video scope, records from field cameras with motion sensors located outside burrow entrances, and other opportunistic encounters. Commensals were observed inside tortoise burrows at 30 sites, and included 26 anurans (12 Gopher Frogs, one unidentified treefrog, and 13 unidentified anurans), six snakes (one Eastern Coachwhip, three Eastern Diamondback Rattlesnakes, one Pine Snake, and one Eastern Indigo Snake), and one unidentified mouse (possibly a Florida Mouse, *Podomys floridanus*).

Other vertebrates that were observed entering or exiting burrows included Eastern Cottontails at eight sites, Eastern Spotted Skunks at six sites, Nine-banded Armadillos at five sites, unidentified mice (Family Cricetidae, possibly the Florida Mouse) at nine sites, and a Hispid Cotton Rat at one site (Table 7). Two bird species (Bachman's Sparrow and Eastern Towhee) were also observed foraging in front of, entering, and leaving three different burrows. One Eastern Indigo Snake was also observed while driving along Frostproof Road.

Table 7. Observations of commensal species obtained from burrow scoping activities, motion-sensor field cameras and opportunistic sightings. Species, habitat type and UTM locations are provided. Habitats include the scrub stratum (Scrub) and the flatwoods and pine plantation strata (FW & PL).

Species	Habitat	GPS Northing	GPS Easting
Frogs and Toads	FW&PL	3066118	463999
Order Anura	FW&PL	3056124	476147
	FW&PL	3063795	462598
	FW&PL	3055430	484694
	FW&PL	3048967	467312
	Scrub	3064155	461833
	Scrub	3063997	471771
	FW&PL	3046819	468667
	Scrub	3064217	461853
	FW&PL	3046812	468546
	Scrub	3063968	471957
	Scrub	3064181	472290
	Scrub	3048791	474287
Treefrog	Scrub	3049025	474458
Family Hylidae			
Gopher Frog	Scrub	3060890	472404
Rana capito	Scrub	3054510	474003
	Scrub	3048157	474347
	Scrub	3059387	472678
	Scrub	3053088	474309
	FW&PL	3055451	484575
	Scrub	3054760	475692
	Scrub	3048278	474332
	Scrub	3048274	474490
	Scrub	3046769	474355
	Scrub	3049130	474690
	Scrub	3047054	474238
Eastern Coachwhip	Scrub	3064573	472035
Coluber (formerly *Masticophis*) *flagellum*			
Eastern Indigo Snake	Scrub	3060890	472404
Drymarchon couperi	FW&PL	3067011	459803

Pine Snake	Scrub	3056513	474555
Pituophis melanoleucus			
Eastern Diamondback Rattlesnake	Scrub	3057414	474260
Crotalus adamanteus	Scrub	3057484	474413
	FW&PL	3057080	473331
Eastern Towhees	Scrub	3060683	472265
Pipilo erythrophthalmus	Scrub	3060744	472560
Bachman's Sparrow	Scrub	3064570	472159
Aimophila aestivalis			
Nine-banded Armadillo	Scrub	3061106	472168
Dasypus novemcinctus	Scrub	3060890	472404
	Scrub	3060683	472265
	Scrub	3064574	472035
	Scrub	3060744	472560
Mouse	Scrub	3064261	472038
Family Cricetidae	Scrub	3061106	472168
	Scrub	3060486	472518
	Scrub	3060890	472404
	Scrub	3060824	472382
	Scrub	3060683	472265
	Scrub	3060744	472560
	Scrub	3064570	472159
	Scrub	3064574	472035
	Scrub	3060792	472092
Hispid Cotton Rat	Scrub	3061106	472168
Sigmodon hispidus			
Eastern Cottontail	Scrub	3061106	472168
Sylvilagus floridanus	Scrub	3060486	472518
	Scrub	3060890	472404
	Scrub	3060824	472382
	Scrub	3060683	472265
	Scrub	3064570	472159
	Scrub	3064574	472035
	Scrub	3060792	472092

Eastern Spotted Skunk	Scrub	3061106	472168
Spilogale putorius	Scrub	3060486	472518
	Scrub	3060890	472404
	Scrub	3060824	472382
	Scrub	3064570	472159
	Scrub	3064574	472035

Project Title: Wetland Assessment in a Landscape Context on Avon Park Air Force Range: Surveys for Wading Birds and Round-tailed Muskrats (*Neofiber alieni*)

Annual Report

Report Period: 1 July 2002 - 30 June 2003

Contract Number: UPN 01013122

Authors: Robert L. Schooley and Lyn Branch, Department of Wildlife Ecology & Conservation, University of Florida, Gainesville, FL 32611

Submitted: 30 June 2003

Background

Extensive loss and degradation of wetlands are among the most pervasive impacts by humans on the environment in Florida (Frayer and Hefner 1991). Diverse taxa depend on these declining habitats, and wetlands are the most highly ranked ecological communities in Florida, after coastal strands, for importance in supporting wildlife of conservation concern (Millsap et al. 1990). The most obvious effects of wetland loss and degradation are reductions in habitat amount and quality. Furthermore, wetland species may exhibit a metapopulation structure (Sjögren-Gulve and Ray 1996, Joly et al. 2001, Fedriani et al. 2001) in which subpopulations occur in relatively discrete patches of suitable habitat, experience repeated extinction and colonization events, and are connected by inter-patch dispersal (Hanski 1999). Hence, wetland loss further fragments already naturally patchy wetland systems, increases wetland isolation, and may affect dispersal success and regional persistence of metapopulations. Moreover, the functional connectivity (Wiens 1996) of wetlands may be decreased due to modifications of the terrestrial habitat matrix that hinder movements of organisms among wetlands. Understanding how landscape context affects wetland quality is a key step in assessing their value as wildlife habitat.

There also is a conspicuous lack of knowledge regarding the importance of small, isolated wetlands for wetland-associated species. Small wetlands (<4 ha) may be critical for maintaining adequate landscape connectivity for species with a metapopulation spatial structure (Gibbs 1993, Semlitsch and Bodie 1998), but empirical data for evaluating this proposition are sparse. For most wetland species, we also are uninformed whether there is a minimum critical patch size required for occupancy, and how such a size might correspond to existing wetland regulations (Kaiser 1998, Semlitsch and Bodie 1998).

The Avon Park Air Force Range (APAFR) contains >24,000 acres of wetlands. The relative use of these wetlands by different vertebrate species is unknown. APAFR has diverse upland plant communities (Bridges 2000) and assorted land uses, including military training, forestry, cattle grazing, and recreation. APAFR is one of the largest tracts of federal land in south-central Florida, and thus it is a key conservation area. Overall, APAFR is an ideal location for investigating the effects of natural landscape heterogeneity and land management on the distribution of wetland species.

This project is focusing on the use of wetlands by wading birds and round-tailed muskrats (*Neofiber alleni*). These species were selected because they use the landscape at different spatial scales (Birkenholz 1963, Haig et al. 1998) and should provide complementary perspectives regarding landscape effects on APAFR wetlands. Moreover, wading birds are state and federally listed in categories ranging from 'Species of Special Concern' to 'Endangered' and *Neofiber* is listed as a Species of Special Concern (Humphrey 1992) because of presumed statewide population declines due to wetland losses (Lefebvre and Tilmant 1992).

Project Objectives

1) Obtain baseline data for assessing the potential impacts of military operations on wetland conditions and connectivity as indicated by the focal species.

2) Provide information on the distribution and abundance of wading birds and round-tailed muskrats and the characteristics of their wetland habitats at APAFR.

3) Develop and test a predictive habitat model for round-tailed muskrats.

4) Provide recommendations concerning management and future research directions for wetlands at APAFR.

Main activities during this year

1) Designed a sampling protocol for aerial surveys of wading birds at APAFR.

2) Conducted three aerial surveys of wading birds.

3) Completed ground surveys of 459 wetlands for habitat characteristic and occupancy by wading birds, round-tailed muskrats, and marsh rice rats (*Oryzomys palustris*).

4) Initiated livetrapping and movement studies of round-tailed muskrats and marsh rice rats.

5) Created a spatially accurate GIS map layer for all of the wetlands for which we conducted ground surveys.

Methods

Aerial surveys of wading birds: distribution patterns and habitat correlates

We designed our aerial surveys after the Systematic Reconnaissance Flights (SRF) that are used for monitoring wading birds in the Florida Everglades. The SRF approach has been effective in relating the distribution and abundance of wading birds to hydrological patterns (Russell et al. 2002) and to nutrient enrichment (Crozier and Gawlik 2002). In general, evenly spaced transects following lines of latitude are flown at a low altitude in a fixed-wing aircraft, and two observers on opposite sides of the airplane count all birds observed within a predetermined strip width. We established 15 transects across the entire APAFR that were separated by 1.5 km and flown in a Cessna 172 in alternating directions (west-to-east and east-to-west) at an altitude of 250 feet (76 m). Each of the two back-seat observers counted birds in a 150-m strip. Hence, for each transect we sampled a 300-m combined strip, which resulted in a 20% sample of the total area (300 m out of 1500 m). For comparison, the Everglades SRF are flown on transects separated by 2 km at an altitude of 200 ft. (60 m) using 150-m strips for a 15% sample of the area (Crozier and Gawlik 2002, Russell et al. 2002).

Each observer recorded the number of individuals of each species seen within the viewing strip into a microcassette recorder. The potential species included wood storks (*Mycteria americana*), great egrets (*Ardea alba*), white ibis (*Eudocimus albus*), great blue herons (*Ardea herodias*), sandhill cranes (*Grus canadensis*), and 'small white herons'. This last group mainly consisted of cattle egrets (*Bubulcus ibis*) and perhaps an occasional snowy egret (*Egretta thula*). For each observation, we also recorded the longitude along the transect using an onboard GPS system. Thus, we have spatial locations for all observed wading bird individuals or groups.

For analysis, we will divide the study area into 2.25-km^2 cells. The flight transects pass through the center of the cells. Various predictor variables will be measured for each cell and correlated with the number of individuals of each species per cell and the total number of individuals per cell (Crozier and Gawlik 2002, Russell et al. 2002). The explanatory variables

will include the total area of wetland habitat, diversity of wetland types, density and median size of wetlands, perimeter-to-area ratios for wetlands, cover of matrix habitat, distance to major rivers and lakes, and land use (including percent of each cell within an active bombing range). We will also aggregate the cells into larger cell sizes (e.g., 4.5-km^2, 9-km^2) and repeat the analyses. This multi-scale approach should help to identify particular spatial scales at which wading birds are responding most strongly to their environment. Insights from this type of analysis should be valuable for designing future monitoring programs for wading birds at APAFR.

We flew a practice flight on 14 February 2003 (2.7 hours total flight time) and conducted our first regular survey on 28 February 2003 (2.8 hours). Unfortunately, we were not given final clearance for the survey flight from the Air Force until <24 hours before takeoff. This late notification caused us to lose our regular pilot (that we used for the practice flight), and forced us to use a substitute pilot. Due to some miscommunication with the new pilot, our survey transects were not flown on the correct latitudes. Hence, the flight on 28 February must be considered a preliminary survey, and we will only report some summary statistics for counts of wading birds. We conducted another survey on 31 May 2003 (2.8 hours) following the correct flight path. The May survey was completed toward the end of the period when shallow wetlands dry out, and thus it provides a useful contrast with the February survey when most wetlands still held water.

Statistical analyses of the wading bird counts will be performed after we finish creating a spatially referenced GIS map layer of wetlands for the entire APAFR. We currently have one for the southern half of the study area only (see below).

Ground surveys of wetlands

We focused our sampling of wetlands on the southern half of APAFR because it contains most of the landscape-scale variation in plant communities and land use found within APAFR. Moreover, we detected a higher occupancy rate for *Neofiber* in the southern half of the APAFR during our preliminary surveys in the spring-summer of 2002.

Wetland-level variables

We recorded habitat characteristics of each wetland during our surveys. Our methodology is designed to allow for rapid assessment without detailed vegetation measurement. Such procedures allowed us to sample a large number of wetlands, and they should be useful for future monitoring of wetland conditions.

We visually estimated the percent of each marsh covered by different plant zones (≤4) and measured traits of those zones: dominant species, cover, height of emerged plants, and water depth. For each marsh, we also recorded the substrate type, percent of marsh with water, presence of trees and shrubs, and the upland plant communities in the immediate neighborhood.

Wetland mammals and wading birds

We surveyed marshes for round-tailed muskrats and for marsh rice rats by searching for their lodges, feeding platforms, and feces. Because rice rats are more of a generalist species with an omnivorous diet (Wolfe 1982) compared to the relatively specialized and herbivorous muskrats, we expected that rice rats would have a higher occupancy rate than that of muskrats. This wider distribution might enable us to detect impacts on rice rats from military operations or other management that are not revealed for the more sparsely distributed muskrat.

Initially, we surveyed the entire marsh for sign of the two mammal species. We always began the searches in the plant zones where we were most likely to find muskrat or rice rat lodges. To facilitate a more rapid survey method, we recorded how much time it took until positive sign (a lodge) was first encountered in occupied marshes. We used these data to set a standardized maximum search time for marshes.

Based on conditions of lodges, we classified muskrat and rice rat sign within wetlands as either current use (Y) or past use (P). For this report, we calculated occupancy rates using all sign (i.e., marshes classified as Y or P). We present occupancy patterns for all surveys conducted between 1 July 2002 and 15 February 2003.

We also recorded the species and number of wading birds observed in wetlands during our ground surveys. Most species were seen during our initial approach to the marshes. One exception was the American bittern (*Botaurus lentiginosus*), which is a secretive bird that

prefers wetlands with thick vegetation (Riffell et al. 2001). Bitterns typically were seen only when they were flushed from dense plant cover at a short distance (<20 m) during our walking surveys.

Landscape context

We obtained UTM coordinates for the center of each surveyed wetland using a hand-held global positioning system (Garmin GPS 76). These units had WAAS (Wide Area Augmentation System) correction and typically provided estimated accuracies of <5 m. We will use these spatial coordinates in preliminary analyses of wetland connectivity.

A more complete analysis of landscape context and connectivity will incorporate information on plant communities and land use from GIS layers for the APAFR. Because the current GIS map layer for plant communities (and wetlands) is not geo-rectified, and the project for updating the plant layer is substantially behind schedule, it is necessary that we piece together the spatial data layers required for our analysis of landscape context effects. We plan to use the new landscape association map based on Bridges (2000) as a base vegetation map. To this layer, we will add our surveyed marshes and other wetland types (e.g., cypress stands, sawgrass, hardwood swamps). We created a spatially accurate map layer of these wetlands by using low-altitude aerial photographs from 1999 to move wetlands from the current GIS plant community map to their correct positions. In addition, we identified a number of marshes that were not on the current GIS plant community map. We added these to our map layer by digitizing in ArcView (using the aerial photographs) or by delineating the marsh boundaries in the field with a GPS unit. We will add additional map features in the future, including pine plantations that are currently being digitized by Peg Margosian, and any spatially referenced data available on cattle grazing, fire history, and military activities.

Preliminary analyses

Spatial autocorrelation in ecological data can lead to false conclusions about relationships (Lichstein et al. 2002). We calculated correlograms based on Moran's *I* to evaluate potential autocorrelation in the occupancy patterns of *Neofiber* and *Oryzomys*. Correlograms display the

degree of correlation in variables in space across a range of scales. We used indicator correlograms, which are simply correlograms based on binary data (presence and absence).

We examined the relationship between wetland area and the probability of occupancy by round-tailed muskrats, rice rats, and American bitterns using logistic regression. We $\log_{10}$-transformed wetland area prior to analyses. We present incidence curves that include the predicted probabilities of occupancy and 95% confidence envelopes on these estimates.

We used multiple logistic regression models to evaluate the ability of several wetland-level traits to predict occupancy of wetlands by *Neofiber* and *Oryzomys*. In the models, we included wetland area, wetland perimeter, substrate type, and some measure of habitat quality as explanatory variables. For *Neofiber*, we used a single variable for quality that was a ranking based on the coverage of plant zones with maidencane (*Panicum hemitomon*) as a dominant or codominant species. The presence of a plant zone with dense, emergent maidencane may be an important variable for predicting wetland occupancy by muskrats because it is a preferred species for food and lodges (Birkenholz 1963, Franz et al. 1998). *Oryzomys* seems to prefer several plant species for lodge building, including pickerelweed (*Pontederia cordata*), sand cord grass (*Spartina bakeri*), and soft rush (*Juncus effusus*). We included these three variables in models as binary variables (presence or absence of zone dominated by the species).

Livetrapping of muskrats and rice rats

We initiated livetrapping efforts aimed at *Neofiber* to determine whether future work on movement behavior would be feasible. *Neofiber* is considered a difficult species to capture. For instance, Bergstrom et al. (2000) reported only one capture in >800 trap nights.

We designed a small platform (30.5 x 61 cm) made of plywood with three adjustable legs made of PVC pipes to use in the shallow marshes where the muskrats occur. The adjustable legs allowed us to quickly change the height of the platforms when water levels changed. We attempted to keep the platforms level with the water surface. On each platform, we placed one Tomahawk live trap (15 x 15 x 40 cm) baited with apple slices. The trap was placed near the back of the platform so that there was a small platform area in front of the trap opening where a muskrat could sit and feed on additional apple bait. We placed platforms and traps near active

lodges or natural platforms when possible. Our trap design was also suitable for capturing rice rats.

For all captured animals, we recorded their age, sex, and reproductive status. Beginning in June, we marked muskrats with PIT tags (Schooley et al. 1993) and rice rats with ear tags.

Results and Discussion

Wading birds

Aerial Surveys

We counted a total of 410 wading bird individuals during our survey on 28 February 2003 and 230 on 31 May 2003 (Table 1). Hence, we expect there will be substantial seasonal variation in the number of wading birds foraging at APAFR. For comparison, Crozier and Gawlik (2002) counted an average of 323 individuals in a wet year, and 804 in a dry year, on a similar-sized study area (WCA 2A in the northern Everglades; 42,206 ha).

During both of our surveys, white ibis were the most numerous species (Table 1). This result is not surprising because white ibis typically occurred in relatively large groups (15 – 80 individuals). We counted more wood storks in May compared to February, even though fewer wading birds were observed overall (Table 1). The wood storks might have been attracted to wetlands that still had water, but in which some drying had occurred, because foraging wood storks require receding water levels that concentrate prey (Bancroft et al. 1992).

The total number of individuals varied considerably among transects (Fig. 1). In both surveys, there was a peak between transects 8 and 11. There was a striking absence of wading birds on the four most southern transects during the May survey (Fig. 1). Overall, there was much spatial variation in the counts (Appendix 1), which we will be able to correlate to landscape characteristics.

Ground surveys

We observed wading birds in 121 of 459 (0.26) marshes. The number of species in any one marsh ranged from 0-6 (Fig. 2). The 12 species detected in decreasing incidence were the

American bittern (n = 70 marshes), great egret (n = 39), great blue heron (n = 29), sandhill crane (n = 15), cattle egret (n = 12), white ibis (n = 8), wood stork (n = 5), little blue heron (*Egretta caerulea*, n = 5), green heron (*Butorides virescens*, n = 2), tricolored heron (*Egretta tricolor*, n = 2), snowy egret (n = 1), and rail (*Rallus* sp., n = 1). The species richness of wading birds was positively related to wetland size (X^2 = 29.31, P = 0.0001, R^2 = 0.19) but not to wetland perimeter (X^2 = 0.02, P = 0.8966).

Other water birds that we observed included the mottled duck (*Anas fulvigula*), hooded merganser (*Lophodytes cucullatus*), double-crested cormorant (*Phalacrocorax auritus*), anhinga (*Anhinga anhinga*), pied-billed grebe (*Podilymbus podiceps*), and greater yellowlegs (*Tringa melanoleuca*).

American bitterns are difficult to survey due to their preference for dense cover and ability to stay well hidden. Surveys of bitterns during the breeding season rely on broadcasting recorded vocalizations to elicit responses (Riffell et al. 2001). Our sightings of flushed birds during walking surveys also should provide useful data on incidence because we typically search all of the dense plant zones. American bitterns are migratory and we first observed an individual during surveys on 7 October 2002. Hence, we calculated an estimate of patch occupancy restricted to the 394 marshes surveyed after the 'arrival date'. American bitterns occurred in 70 (0.18) marshes, had a patchy distribution (Fig. 3), and their probability of occupancy was related to wetland area (Fig. 4). Wetland area and vegetation density were the most important explanatory variables for bitterns on their breeding range (Riffell et al. 2001).

Wetland mammals

Wetland traits

Many of the shallow depression marshes at APAFR are small (median = 0.92 ha), but there is a large amount of variation in wetland size (Table 2). The distribution of wetland area was skewed with a long right tail. Most of the wetlands were filled with water (Table 2) during our ground surveys, although many of these dried out completely in late March to May 2003. Water depths are typically only 20 – 40 cm in most plant zones (Table 2), but water levels fluctuate widely on short time scales in response to rain events. Wetland organisms must be adapted to

this sort of environmental variability. Most of the surveyed wetlands had a mucky substrate, contained trees, had trees along their edges (including escaped slash pines from nearby plantations), and about half had shrubs along their edges (Table 3).

Sampling effort and search time

For round-tailed muskrats, we surveyed 106 marshes from 7 August to 12 November 2002 in which we recorded the amount of time required to find positive sign in occupied marshes (n = 27). Two observers were present for most (87%) of these surveys; 3-5 observers were present for the remainder. In most of the marshes (96%), the first sign was encountered in <15 min (Fig. 5). The one marsh that required 32 min was 3.2 ha and had a thick coverage of maidencane and pickerelweed. For marsh rice rats, we surveyed 98 marshes from 4 September to 12 November 2002 in which we recorded the amount of time required to find positive sign in occupied marshes (n = 42). Again, two observers were present for most (86%) of the surveys, and 3-5 observers were present for the rest. In most of the marshes (95%), the first sign was encountered in <30 min (Fig. 5). The two marshes that required >30 min were >1 ha and had thick plant cover. We concluded that a 30-min search was adequate to determine whether these two mammal species were present in most marshes. Hence, we restricted most additional surveys to 30 min, but extended the search time up to 60 min for large marshes with exceptionally dense plant cover.

From 1 July 2002 to 15 February 2003, we conducted surveys of 459 marshes for the presence of muskrats and rice rats. This sampling effort not only exceeds our proposed effort for this project (225 patches), it also greatly surpasses the sample sizes for most previous studies of patch occupancy by mammals (e.g., Franz et al. 1998, Forys and Humphrey 1999, Hanski 1999, Fedriani et al. 2002). Overall, at least two observers searched most wetlands (97.6%), and often there were 3-4 observers (54.1%). We generally used ≥4 observers for larger marshes (>2.5 ha).

Wetland occupancy: round-tailed muskrats and marsh rice rats

As expected, the occupancy rate of marshes (n = 459) was substantially lower for round-tailed muskrats (0.26) than for marsh rice rats (0.55). Muskrats not only occurred in fewer wetlands, they also had a more patchy distribution on a broad scale (Appendices 2 and 3). In

particular, muskrats were nearly absent from the southwest portion of the study area south of Arbuckle Marsh and west of Van Eeghen Road.

The xeric scrub ridge in the center of the study area contained only a few, isolated marshes. Round-tailed muskrats occupied none of these wetlands (Appendix 2). Hence, the scrub ridge might separate our study area into two relatively independent patch networks for *Neofiber*. In contrast, marsh rice rats occurred in several of the wetlands imbedded in the scrubby area (Appendix 3).

The distribution of both muskrats and rice rats exhibited positive spatial autocorrelation at fine scales (<1.5 km), but the pattern was stronger for the muskrats (Fig. 6). Such results can be due to autocorrelation of environmental variables related to occupancy, or to spatial dynamics of the species independent of measured variables. In either case, our logistic regression results must be considered preliminary. Our final analyses will include an evaluation of whether we need to statistically control for broad-scale spatial trend (with trend surface analysis) and for fine-scale autocorrelation (with autoregressive models).

The occupancy of wetlands was positively related to wetland size for round-tailed muskrats and for marsh rice rats (Fig. 7). Because of differences in overall occupancy rates and the shapes of the incidence curves, the point where the probability of occupancy was ≥50% differed substantially for the two species (muskrats = 6.2 ha, rice rats = 0.7 ha). Interestingly, wetland area did not explain a large amount of the variance for either mammal species (Fig. 7).

Of the four wetland-level variables that we evaluated for predicting occupancy of *Neofiber*, habitat quality was the most important (Table 4, Figure 8). In fact, the importance of wetland area was marginal when included in the model with habitat quality. The model with only quality explained 29% of the overall variation, whereas a model with area and quality explained 32%. This outcome is at odds with current ideas on spatially structured metapopulations, in which patch area is assumed to be a key determinant of occupancy (Hanski 1999).

For *Oryzomys*, wetland area was an important predictor variable (Table 5). Habitat quality, as indexed by the presence of *Juncus*, *Spartina*, and *Pontederia*, was also related to occupancy (Table 5). The logistic regression model that included wetland area and the three indicator species explained 20% of the overall variation in occupancy.

For both mammal species, there was a fair amount of unexplained variance that may be related to variables not used in our preliminary models, including other wetland traits, isolation,

land use, and landscape context. Moreover, we should be able to refine our measures of habitat quality for future analyses.

Livetrapping of muskrats and rice rats

In March 2003, the capture success of *Neofiber* was 6.9% (19 captures/276 trapnights), and the capture success of *Oryzomys* was 5.8% (16/276). In June 2003, the capture success of *Neofiber* was only 1.6% (8 captures/513 trapnights), and all of the captures were of the same individual. The seasonal decline in capture success for *Neofiber* coincided to a general lack of activity in the shallow depression marshes; we found no fresh muskrat lodges during May or June. *Neofiber* must burrow in other areas during the periods when wetlands are dry and when early summer rains refill the wetlands. The capture success of *Oryzomys* in June was 6.2% (32/515), so we initiated movement experiments with them aimed at determining their ability to locate and orientate toward wetlands while dispersing (Zollner 2000).

Potential effects of land use

We will evaluate the potential influences of military activities and other land uses on wetland quality, landscape connectivity, and vertebrate distribution patterns at APAFR. Our general analytical approach will be to develop correlative habitat models using environmental variables (e.g., wetland size, wetland quality, isolation, matrix habitat), and then to ask whether additional variation in patterns of distribution and abundance can be explained by land use. The degree that we can incorporate different types of land use as predictor variables in our statistical models for wading birds and marsh mammals will depend on the availability of spatially referenced data. Ideally, we plan to examine levels of military activity, current and past grazing pressures, fire histories, and planting of pine plantations. Moreover, we will evaluate whether roadside ditches might serve as movement corridors for *Neofiber* and *Oryzomys* indirectly by comparing models of landscape connectivity that either include or exclude these linear elements in the calculation of wetland isolation.

The most significant finding of our preliminary analysis is the importance of habitat quality of wetlands in determining distribution patterns of *Neofiber*. Wetland size may matter, but

quality matters more. Therefore, land use could influence wetland occupancy not only by affecting the nature of matrix habitat and wetland connectivity, but also by directly affecting the habitat quality of the wetlands. For instance, cattle grazing could influence the cover of maidencane in marshes via herbivory and trampling, or road building and pine planting could alter hydrological patterns and the vegetation of wetlands. Finally, the round-tailed muskrat currently occurs in marshes throughout much of Echo, Charlie, and OQ ranges at APAFR. Therefore, any substantial changes in activities and land use within these areas could potentially influence the distribution and network-level persistence of this patchily distributed mammal.

Main activities for next year

1) Conduct six additional aerial surveys of habitat use by foraging wading birds at APAFR.

2) Resurvey 459 wetlands for habitat characteristics and for the presence of wading birds, round-tailed muskrats, and marsh rice rats.

3) Continue livetrapping of round-tailed muskrats and marsh rice rats and conduct studies to obtain data on movement behavior, space use, and inter-wetland dispersal.

4) Conduct statistical analysis for (a) distribution patterns of wading birds, and (b) predictive models of patch occupancy for muskrats, rice rats, and American bitterns.

Acknowledgments

We are grateful to Scott Cardiff, Charlotte Cowan, Bob Gilbreath, Alex Pries, and Coral Wolf for assistance with field sampling and data management. We also thank John Bridges for facilitating our fieldwork, Peg Margosian for providing GIS data and advice, and Steve Orzell for identifying plant species. Becky Hylton and Dave Nelson provided advice on aerial survey logistics, and Romke Sikkema and Ray Meyers skillfully piloted the airplanes.

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Table 1. Aerial counts of wading birds on 15 transects at APAFR. We sampled 20% of the study area during the surveys. 'Small white herons' are primarily cattle egrets.

	28 February 2003		31 May 2003	
Species	Count	%	Count	%
Wood stork	8	1.95	21	9.13
White ibis	276	67.32	167	72.61
Great egret	51	12.44	31	13.48
Great blue heron	17	4.16	8	3.48
'Small white heron'	56	13.66	3	1.30
Sandhill crane	2	0.49	0	0.00
TOTAL	410		230	

Table 2. Continuous environmental variables measured at 459 wetlands surveyed from 3 July 2002 – 15 February 2003. The traits are potential explanatory variables for predictive habitat models.

Variable	Mean	SE	Median	Minimum - Maximum
Area (ha)	1.92	0.22	0.92	0.04 – 73.79
Perimeter (m)	535.4	27.1	376.0	94.0 – 6832.0
Water cover (%)	88.57	1.07	100	0 – 100
Mean water depth (cm)	22.3	0.62	22.8	0 - 80.8
Water depth of deepest zone (cm)	36.8	0.91	35	0 - 115

Table 3. Categorical environmental variables measured at wetlands surveyed from 3 July 2002 – 15 February 2003 at APAFR.

Variable	No. of wetlands	%
Substrate		
Mucky	387	84.3
Sediment	69	15.0
Other	3	0.6
Trees in wetland		
Present	275	60.0
Absent	183	40.0
Trees along wetland edge		
Present	337	73.6
Absent	121	26.4
Shrubs along wetland edge		
Present	215	46.9
Absent	241	53.1

Table 4. Logistic regression analysis of occupancy of shallow marsh wetlands (n = 459) by round-tailed muskrats (*Neofiber alleni*). The model includes four patch-level variables. Wetland area was log-transformed. Significance was based on a Type III analysis.

Source of variation	d.f.	X^2	*P*
Wetland area	1	2.42	0.1194
Wetland perimeter	1	0.97	0.3253
Habitat quality	1	82.16	**0.0001**
Substrate	1	0.79	0.3745

Table 5. Logistic regression analysis of occupancy of shallow marsh wetlands (n = 459) by marsh rice rats (*Oryzomys palustris*). The model includes six patch-level variables. Wetland area was log-transformed. Significance was based on a Type III analysis.

Source of variation	d.f.	X^2	*P*
Wetland area	1	19.96	**0.0001**
Wetland perimeter	1	1.07	0.2998
Juncus	1	9.37	**0.0022**
Spartina	1	26.96	**0.0001**
Pontederia	1	5.25	**0.0220**
Substrate	1	0.51	0.4742

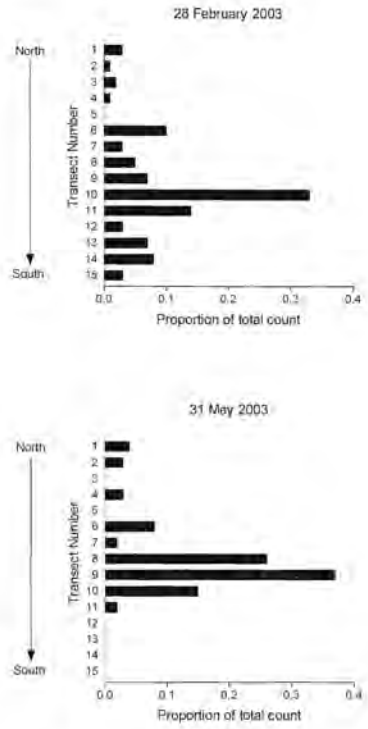


Figure 1. Distribution of wading birds counted along 15 transects during aerial surveys at Avon Park Air Force Range.

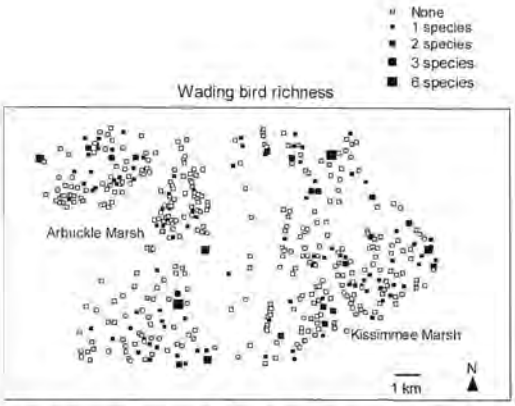


Figure 2. Species richness of wading birds in depression marshes (n = 459) at Avon Park Air Force Range, July 2002-February 2003 based on ground surveys of wetlands.

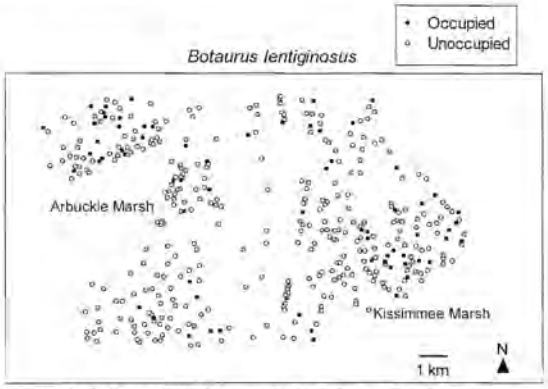


Figure 3. Patterns of patch occupancy for American bitterns (*Botaurus lentiginosus*) at Avon Park Air Force Range, October 2002-February 2003. Each circle indicates the location of a depression marsh (n = 394).

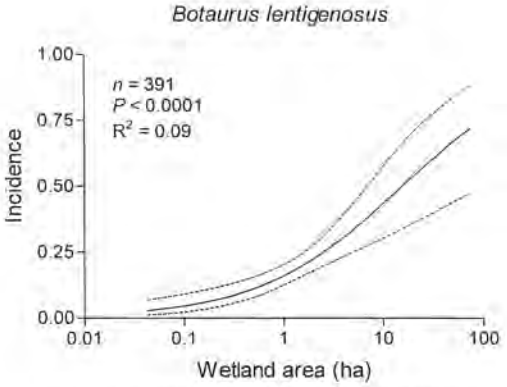


Figure 4. Relationship between wetland size and the probability of wetland occupancy by American bitterns (*Botaurus lentigenosus*). The incidence curve is based on predicted probabilities from a logistic regression model. Dotted lines indicate a 95% confidence envelope for the predicted values. The X-axis is on a $\log_{10}$ scale.

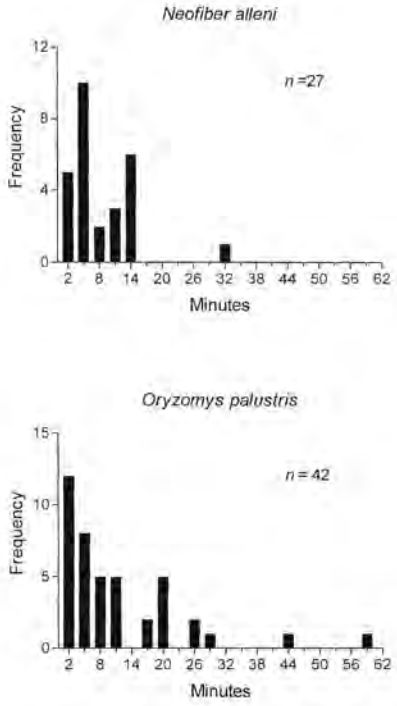


Figure 5. The amount of time until the first sign of occupancy was encountered for round-tailed muskrats (*Neofiber alleni*) and marsh rice rats (*Oryzomys palustris*) during wetland surveys. The sample size refers to the number of depression marshes with sign of occupancy.

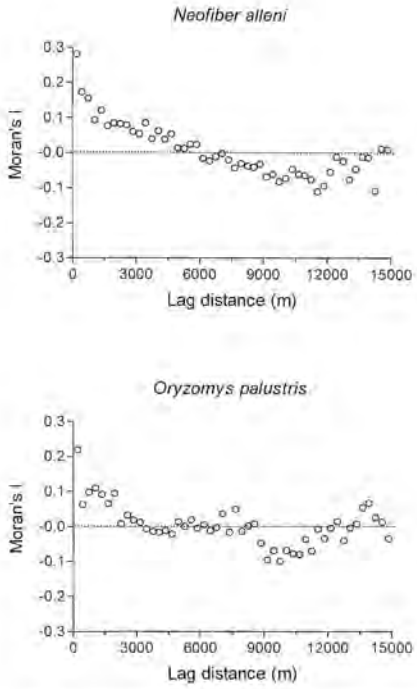


Figure 6. Isotropic indicator correlograms for wetland occupancy by round-tailed muskrats and marsh rice rats. The correlograms indicate the degree of spatial autocorrelation in occupancy patterns across a range of spatial scales. Positive values at small lag distances indicate that nearby wetlands have similar values (if a marsh is occupied then the neighboring marshes tend to be occupied).

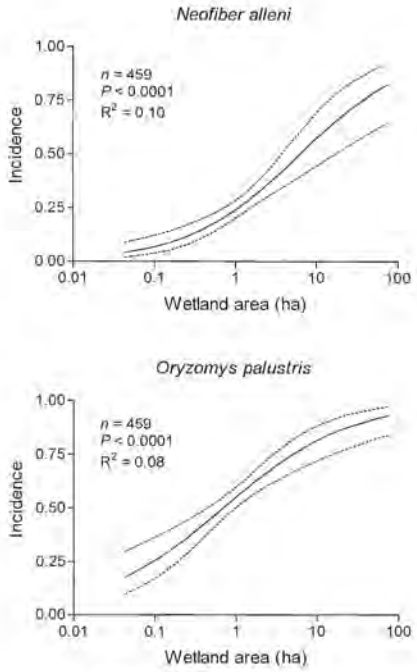


Figure 7. Relationship between wetland size and the probability of wetland occupancy by round-tailed muskrats (*Neofiber alleni*) and by marsh rice rats (*Oryzomys palustris*). The incidence curves are based on predicted probabilities from logistic regression models. Dotted lines indicate 95% confidence envelopes for the predicted values. The X-axes are on a $\log_{10}$ scale.

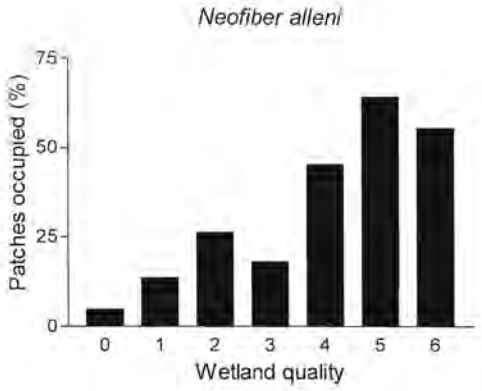
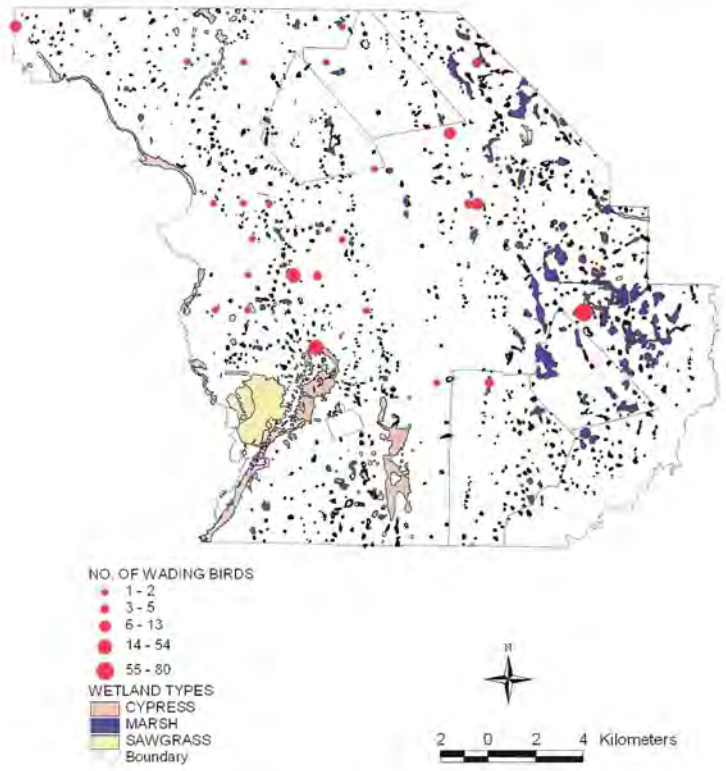


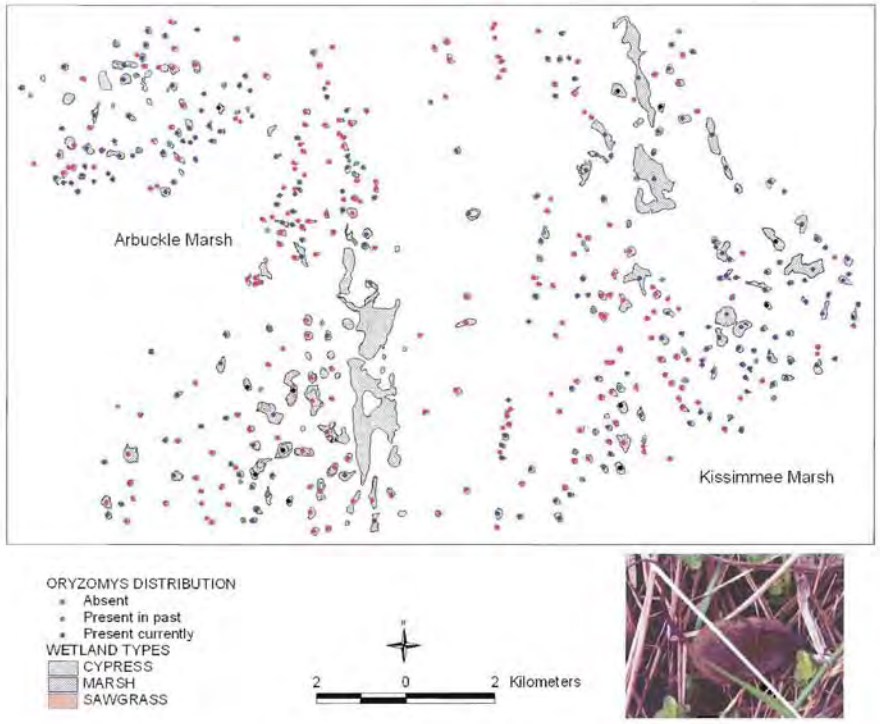
Figure 8. Relationship between habitat quality and occupancy of wetlands by round-tailed muskrats. Quality is a rank based on the coverage of plant zones in which maidencane is a dominant or codominant species.

Appendix 1. Spatial distribution of wading birds from aerial survey at APAFR on 31 May 2003.



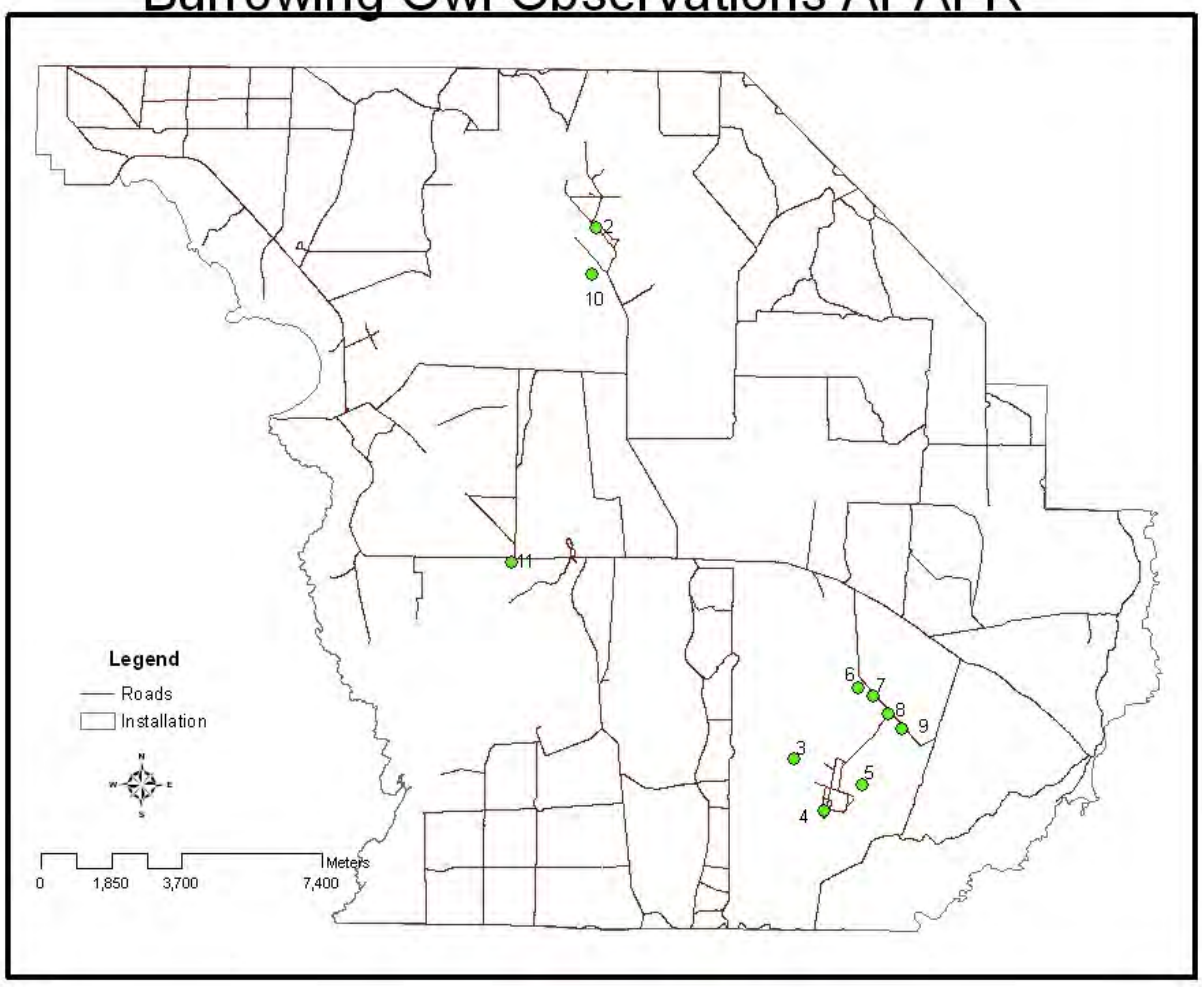
Appendix 2. Distribution patterns of round-tailed muskrats at Avon Park Air Force Range, 2002-2003.

Appendix 3. Distribution patterns of marsh rice rats at Avon Park Air Force Range, 2002-2003.



Date	Location	Notes
6/5/2009	Foxtrot, near point 214	pair with burrow in bomb crater, near targets.
late march, not seen upon return a month later	Echo, near point 61	Single bird flushed from recent burn, digging burrow. Inactive as of 6/18
5/15/2009	Echo, south of point 53	Single bird flushed from active burrow. Inactive as of 6/1
5/14/2009	Echo, near point 149	Single bird seen, no burrow. Seen again in the same area 5/25, being mobbed by red-winged blackbirds
late march, seen almost every time we drove by	Charlie-Echo road, just south of North Tower	pair with burrow along road
late march, seen almost every time we drove by	Charlie-Echo road, between Middle and North Towers	Pair with burrow along road, at least 1 chick by mid June
6/5/2009	Charlie-Echo road, just south of Middle Tower	Single bird at burrow along road. Re-sighted twice in June
6/7/2009	Charlie-Echo road, Between Middle and South Towers	1 adult and at least 2 fledglings near burrow along road. Re-sighted a few more times throughout June and July
7/3/2009	bravo range,	1 adult, perched in

	about 400m west of OP1, along the range that goes through bravo range	burnt shrub, being mobbed by nighthawks										
7/11/2009	OQ range, along Kissimmee road	1 adult, flew in front of car and landed on fence post. 7/24 and 7/26 2, possibly 3 birds were seen flying back and forth across the road between OQ and Delta										


Burrowing Owl Observations APAFR
Legend
Roads
Installation
N
W
E
S
0
1,850
3,700
7,400
Meters
2
10
11
6
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Copy of the Burrowing Owl BSR draft report that was sent out for peer review

Biological Status Review
for the
Florida Burrowing Owl
(*Athene cunicularia floridana*)

EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate all species listed as Threatened or Species of Special Concern as of September 1, 2010. Public information on the status of the Florida burrowing owl was sought from September 17 to November 1, 2010. The members of the biological review group (BRG) met on November 12, 2010. Group members were Kate Haley (FWC lead), Jerry Jackson of Florida Gulf Coast University and Ken Meyer an independent consultant. In accordance with rule 68A-27.0012 Florida Administrative Code (F.A.C.), the BRG was charged with evaluating the biological status of the Florida burrowing owl using criteria included in definitions in 68A-27.001(3) and following the protocols in the *Guidelines for Application of the IUCN Red List Criteria at Regional Levels (Version 3.0)* and *Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1)*. Please visit http://myfwc.com/WILDLIFEHABITATS/imperiledSpp_listingprocess.htm to view the listing process rule and the criteria found in the definitions. The BRG concluded from the biological assessment that the Florida burrowing owl met criteria for listing. Based on the literature review, information received from the public, and the BRG findings staff recommends the species be listed as a Florida designated threatened species.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida.

BIOLOGICAL INFORMATION

Life History References – Haug et al. (1993), FWC (2003), Millsap (1996) and USFWS (2003).

Taxonomic Classification – This report is for the Florida burrowing owl, *Athene cunicularia floridana* a subspecies of burrowing owl, in Florida. The subspecies is found in Florida and the Bahama Islands (Haug et al. 1993).

Population Status and Trend – Millsap (1996) estimated between 3,000 and 10,000 burrowing owls in Florida based on density estimates from different areas of the state. However, Bowen (2001) surveyed current and historic records of burrowing owls throughout the state and found 1,757 adult owls. Local establishment and extirpations make it difficult to determine the population trend of the burrowing owl statewide (Woolfenden et al. 2006).

Geographic Range and Distribution – The Florida burrowing owl lives primarily in peninsular Florida although its distribution is localized and patchy, especially in the northern part

of its range. Historically, the burrowing owl occupied the open native prairies of central Florida. Recently, these populations have decreased because of habitat loss. Populations in south Florida coastal areas have increased due to modification of habitat by people including clearing forests and draining wetlands. Burrowing owls inhabit cleared areas that offer short groundcover such as pastures, agricultural fields, golf courses, airports and vacant lots in residential areas.

Quantitative Analyses – Through population viability analyses (PVA) Endries et al. (2009) estimated the likelihood of extinction in all potential habitat and potential habitat on managed lands (this analysis excluded urban areas). Both models had similar results. For all potential habitat the probability of extinction was 0% in the next 100 years. There was a 23% probability of a high decline (>90%). Bowen (2000) conducted PVA to determine the viability of the small isolated populations (<5 individuals) and found >50% probability of extinction for these populations.

BIOLOGICAL STATUS ASSESSMENT

Threats – The major threats to the Florida burrowing owl are reliance on human-altered habitats and loss of native habitat (Owre 1978, Millsap 1996). Burrowing owls can be found in high densities in urban and suburban areas (Millsap and Bear 2000). In these areas, preferred nesting habitat and burrows may be destroyed by construction activities, harassment by people, and domestic animals (e.g. dogs). Current management is limited to preventing the take of nests during the breeding season (FWC 2009) and Mrykalo et al. (2007) noted the lack of management strategies for burrowing owls in rural areas. This may be further compounded by limited access to occupied habitat (e.g. private lands). Most human-altered habitats, including those in rural areas (e.g. improved pasture), are not a priority for conservation (Mueller et al. 2007). Additional threats include a variety of ground and aerial predators that can harm eggs, young or adults. There is increasing concern about the prevalence of exotic predators like the Nile monitor and feral cats. A source of mortality of eggs and young is flooding of nests in burrows by heavy rains. Collisions with automobiles are a frequent cause of mortality for owls in suburban and urban areas.

Statewide Population Assessment - Findings from the Biological Review Group are included in a Biological Status Review information table.

LISTING RECOMMENDATION

Staff recommends that the Florida burrowing owl be listed as a Threatened species because the species met a criterion for listing as described in 68A-27.001(3) F. A.C.

SUMMARY OF THE INDEPENDENT REVIEW – this will be completed after the peer review.

LITERATURE CITED

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Biological Status Review Information
Findings

Species/taxon: Florida burrowing owl
Date: 11/12/10
Assessors: Kate Haley, Ken Meyer, Jerry Jackson

Generation length: 10 yrs (generation time is 6-12 years so we used 10 years as the IUCN minimum: Haug et al. 1993 breed at 1 yr, adult survival 60% = avg age breeding adult 2 - 4 yrs)

Criterion/Listing Measure	Data/Information	Data Type*	Criterion Met?	References
*Data Types - observed (O), estimated (E), inferred (I), suspected (S), or projected (P). Criterion met - yes (Y) or no (N).				
(A) Population Size Reduction, ANY of				
(a)1. An observed, estimated, inferred or suspected population size reduction of at least 50% over the last 10 years or 3 generations, whichever is longer, where the causes of the reduction are clearly reversible and understood and ceased[1]	no numerical estimate of decline at state level (Breeding Bird Survey, Christmas Bird Count, Breeding Bird Atlas) but isolated evidence of local fluctuation and possible decline	I	N	USFWS 2003, N. Ritchie pers. comm.
(a)2. An observed, estimated, inferred or suspected population size reduction of at least 30% over the last 10 years or 3 generations, whichever is longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible1	see above		N	
(a)3. A population size reduction of at least 30% projected or suspected to be met within the next 10 years or 3 generations, whichever is longer (up to a maximum of 100 years) [1]	see above but projected development in urban areas (which may equal 30-50% of state population) may cause decline		N	Millsap 2002, Conway et al. 2006
(a)4. An observed, estimated, inferred, projected or suspected population size reduction of at least 30% over any 10 year or 3 generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.1	see above		N	
1 based on (and specifying) any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.				
(B) Geographic Range, EITHER				
(b)1. Extent of occurrence < 20,000 km^2 (7,722 mi^2) OR	> 20,000 km^2	I	N	Bowen 2001, FWC 2003, Mueller et al. 2007
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	>3500 km^2 of potential habitat based on burrowing owl occurrences and dispersal distances of 1 km (this estimate is a	I	N	Endries 2009

	minimum and does not include urban areas)			
AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations			N	
b. Continuing decline, observed, inferred or projected in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent, and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals	unknown - suspect increase in some areas and decrease in some areas	S	N	Millsap 1996, Woolfenden et al. 2006
c. Extreme fluctuations in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			N	
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	clearly fewer than 10,000 (observed 1700+ Bowen/estimated 3,000-10,000 Millsap)	I	Y	Bowen 2001, Millsap 1996
(c)1. An estimated continuing decline of at least 10% in 10 years or 3 generations, whichever is longer (up to a maximum of 100 years in the future) OR			N	
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:	projected decline is likely with increasing development, vulnerability to predation from exotic and feral species and collisions with automobiles. This may be further compounded by limited management access to occupied habitat (private lands) and use of habitat (e.g. improved pasture) not traditionally managed by public land managers or included in land aquisition priorities (Mueller et al. 2007). We assume land managers will have a decreased ability to manage lands (e.g. prescribed fire) with increasing urbanization. Endries et al. 2009 found high likelihood of decline in a PVA of rural owls.	I	Y	USFWS 2003, Mueller et al. 2007, Endries et al. 2009, Millsap 2002, Mealey 1997
a. Population structure in the form of EITHER (i) No subpopulation estimated to contain more than 1000 mature individuals; OR			N	
(ii) All mature individuals are in one subpopulation	distribution in Florida is considered one subpopulation based on the known mobility of individuals (Cape Coral owl found in Marco Island, Mrykalo et al. 2007 found 10 km dispersal of an individual). We had considerable discussion about the definition of a subpopulation and while USFWS 2003 and Bowen 2001 refer to several subpopulations in Florida it is not the same term used in the IUCN criteria. Chandler et al. 2000	I	Y	Chandler et al. 2000, Mrykalo et al. 2007, J. Jackson pers. comm., Bowen 2001, USFWS 2003

	found exhange between subpopulations is restricted but due to problems with the methodology further study is needed.			
b. Extreme fluctuations in number of mature individuals			N	
(D) Population Very Small or Restricted, EITHER				
(d)1. Population estimated to number fewer than 1,000 mature individuals; OR			N	
(d)2. Population with a very restricted area of occupancy (typically less than 20 km2 [8 mi2]) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a short time period in an uncertain future			N	
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	results of both PVAs are only applicable to subsets of the state population (Endries to rural owls, Bowen to small isolated populations)	P	N	Endries et al. 2009, Bowen 2000

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Does meet one of the criteria	C2a(ii)
Is species/taxon endemic to Florida? (Y/N)	N
If Yes, your initial finding is your final finding. Copy the initial finding and reason to the final finding space below. If No, complete the regional assessment sheet and copy the final finding from that sheet to the space below.	
Final Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Does meet one of the criteria	C2a(ii)

1	Species/taxon:	Florida burrowing owl
2	Biological Status Review Information Regional Assessment	Date: 11/12/10
3	Assessors:	Kate Haley, Ken Meyer, Jerry Jackson
4		
5		
6		
7		
8	Initial finding	Supporting Information
9		
10	2a. Is the species/taxon a non-breeding visitor? (Y/N/DK). If 2a is YES, go to line 18. If 2a is NO or DO NOT KNOW, go to line 11.	N
11	2b. Does the Florida population experience any significant immigration of propagules capable of reproducing in Florida? (Y/N/DK). If 2b is YES, go to line 12. If 2b is NO or DO NOT KNOW, go to line 17.	N/DK
12	2c. Is the immigration expected to decrease? (Y/N/DK). If 2c is YES or DO NOT KNOW, go to line 13. If 2c is NO go to line 16.	
13	2d. Is the Florida population a sink? (Y/N/DK). If 2d is YES, go to line 14. If 2d is NO or DO NOT KNOW, go to line 15.	
14	If 2d is YES - Upgrade from initial finding (more imperiled)	
15	If 2d is NO or DO NOT KNOW - No change from initial finding	
16	If 2c is NO or DO NOT KNOW- Downgrade from initial finding (less imperiled)	
17	If 2b is NO or DO NOT KNOW - No change from initial finding	No change
18	2e. Are the conditions outside Florida deteriorating? (Y/N/DK). If 2e is YES or DO NOT KNOW, go to line 24. If 2e is NO go to line 19.	
19	2f. Are the conditions within Florida deteriorating? (Y/N/DK). If 2f is YES or DO NOT KNOW, go to line 23. If 2f is NO, go to line 20.	
20	2g. Can the breeding population rescue the Florida population should it decline? (Y/N/DK). If 2g is YES, go to line 21. If 2g is NO or DO NOT KNOW, go to line 22.	
21	If 2g is YES - Downgrade from initial finding (less imperiled)	
22	If 2g is NO or DO NOT KNOW - No change from initial finding	
23	If 2f is YES or DO NOT KNOW - No change from initial finding	
24	If 2e is YES or DO NOT KNOW - No change from initial finding	
25		
26	Final finding	C2aii

Notes - Clarification on IUCN definition of subpopulation from the IUCN staff - "The (term) "one subpopulation" means that all the mature individuals are in a population that mixes and there is (or at least can be) interbreeding. So, there are no small groups separated by geographic or other barriers. If all 4,000 individuals are potentially able to mix then it can be considered as one subpopulation."

This assessment is different from the IUCN Red List assessment of the burrowing owl because we assessed the floridana subspecies. IUCN assessed the burrowing owl at the species-level.

APPENDIX 1. Biological Review Group Members Biographies

Katherin Haley is currently Coordinator for the Florida Wildlife Legacy Initiative, supervising a diverse set of staff and conservation, research, and management programs. Haley has more than a decade of research experience with burrowing owls in California and Florida, including a long-term study of Florida Burrowing Owl demography and dispersal in southwest Florida.
Jerome A. Jackson, Ph.D., is Professor of Marine and Ecological Sciences and former Whitaker Eminent Scholar in Science at Florida Gulf Coast University. Jackson is a Fellow of the American Ornithologists' Union and Past President of the Wilson Ornithological Society, the Association of Field Ornithologists, the Mississippi Ornithological Society, and the Florida Ornithological Society. Jackson's field of expertise is the behavioral ecology of birds. He is the author/editor of 23 books and many dozens of papers in scientific journals and proceedings.
Kenneth D. Meyer, Ph.D., is Director and Research Ecologist for the Avian Research and Conservation Institute. Meyer has conducted research on the behavioral ecology, migration, and population status of some of Florida's most imperiled and area-restricted bird species, including the swallow-tailed kite, short-tailed hawk, and white-crowned Pigeon. Meyer also serves as adjunct faculty member in the Department of Wildlife Ecology and Conservation at the University of Florida.

Appendix 2. Summary of letters and emails received during the solicitation of information from the public period of September 17, 2010 through November 1, 2010.

Letter from Nancy J. Ritchie, Environmental Specialist, City of Marco Island, Collier County, 50 Bald Eagle Drive, Marco Island, Florida, dated October 19, 2010. Ms. Ritchie provided the population numbers for the Florida burrowing owl on Marco Island, Collier County. A decline in the population was reported.

Email from Lori Blydenburg, City of Cape Coral, P.O. Box 150027, Cape Coral, Florida 33915, dated October 29, 2010. Ms. Blydenburg provided a copy of the draft Florida Burrowing Owl Adaptive Management Plan prepared by Quest Ecology May 2010. The plan provides information on burrowing owl natural history, its distribution and abundance in Cape Coral, managing habitat in Cape Coral, and includes an adaptive management plan and a recommended initial management plan.

Email from Katherin Haley, Initiative Coordinator, Florida Fish and Wildlife Conservation Commission, 620 S. Meridian Street, Tallahassee, Florida 32399, dated October 27, 2010. Ms. Haley provided a field season progress report and a conference poster for the Effectiveness of Burrowing Owl Conservation Measures project.

Haley, K.L., C.L. Bear, T. Allen, S. Smiley, B.J. Gruver, and B.A. Millsap. 2004. Effectiveness of burrowing owl conservation measures: annual report 2003-04. Florida Fish and Wildlife Conservation Commission. Tallahassee, FL U.S.A.

Haley, K.L., B.A. Millsap, C.L. Bear, and E.K. McConnell. 2002. Effectiveness of burrowing owl conservation measures. Poster presented at the Third North American Ornithological Conference. New Orleans, LA U.S.A

Letter from Amber Crooks, Natural Resource Specialist, Conservancy of Southwest Florida, 1450 Merrihue Drive, Naples, Florida 34102, dated October 25, 2010. Ms. Crooks expressed concerns about the use of IUCN criteria for the status review, identified several statewide threats to imperiled species (degradation of water resources and loss of uplands), and reported a decline in the number of burrowing owls in Cape Coral and Marco Island.

Email from Amber Crooks, Natural Resource Specialist, Conservancy of Southwest Florida, 1450 Merrihue Drive, Naples, Florida 34102, dated October 29, 2010. Ms. Crooks provided an excerpt from the City of Cape Coral Comprehensive Plan Evaluation and Appraisal Report 2001. Ms. Crooks stated “according to the report, Cape Coral is only ~42% built out, leaving an estimated 25,686 acres for build out, affecting available burrowing owl habitat for the largest owl population in Florida. The map on page 12 of the report starkly shows the amount of unimproved (no homes) residential lots vulnerable to future development.”

Email from Mark Mueller (mmueller42@gmail.com) dated October 8, 2010. Mr. Mueller offered the following publications for the burrowing owl status review.

Bowen, P.J. 2000. Demographic, distribution, and metapopulation analyses of the Burrowing Owl (*Athene cunicularia*) in Florida. M.S. thesis, Univ. of Central Florida, Orlando, FL U.S.A.

Bowen, P.J. 2001. Demography and distribution of the burrowing owl in Florida. Florida Field Naturalist 29(4):113-142.

Mueller, M.S., M.M Grigione, and R.J. Sarno. In review. Non-urban habitat use of Florida burrowing owls: identifying areas of conservation importance. Journal of Raptor Research.

Mueller, M.S. 2006. Distribution and habitat characterization of the Florida Burrowing Owl in non-urban areas. M.S. Thesis, University of South Florida, Tampa.

Mueller, M.S., M.M Grigione, and R.J. Sarno. 2005. Florida burrowing owls and cattle could benefit each other. Florida Cattleman Livestock Journal 69(5): 70-71.

Mueller, M.S., M.M Grigione, and R.J. Sarno. 2007. Distribution of the Florida burrowing owl: The potential importance of nonurban areas. Journal of Raptor Research. 41:222-226.

Email from Mark Fredlake (Mark.Fredlake@avonpark.macdill.af.mil), an employee of Avon Park Air Force Range, dated November 1, 2010. Mr. Fredlake provided a spreadsheet and map of burrowing owl locations on Avon Park Air Force Range observed summer 2009.

Email from Bob Mrykalo, P.O. Box 292452, Tampa, Florida 33687, dated November 1, 2010. Mr. Mrykalo offered the following publications for the burrowing owl status review.

Mrykalo, R., M. M. Grigione, and R. J. Sarno. 2007. Home range and dispersal of juvenile Florida burrowing owls. The Wilson Journal of Ornithology 119:275-279.

Mrykalo, R., M. M. Grigione, and R. J. Sarno. 2009. A comparison of available prey and diet of Florida burrowing owls in urban and rural environments: a first study. The Condor 111(3):556–559.

Mrykalo, R.J., K.A. Caruso, and E.A. Hughes. In press. State listed species permits. Florida Scientist.

Email from Jesus A. Camps (jcampsprsi@comcast.net), dated September 8, 2010. Mr. Camps provided an observation of a burrowing owl in the North Shore Crest neighborhood of NE Miami Dade County.

Email from Dennis Teague (Dennis.Teague@EGLIN.AF.MIL), Endangered Species Biologist, Eglin Air Force Base, dated November 2, 2010 with a follow up narrative provided November 6, 2010. Mr. Teague described the surveys and number of burrowing owl burrows found on the air force base and included shape files for mapping purposes.

APPENDIX 3. Information and Comments Received from Independent Reviewers