

AGREEMENTS

DATA SHEET

1. Agreement Number 1443CA4520-99-007 CESU Partner Rutgers University
Task Order Number: J5284 03 0027 - Modification No. 3

2. Parties to Agreement North Atlantic Coast CESU Cooperative Agreement
HOST Rhode Island University

a. National Park Service (WASO Division, Region, Park)

ISSUED by NPS Southeast Regional Office / Everglades National Park

b. Other(s) (Organization Name and Address)

Rutgers University, The State University of New Jersey (PARTNER)

Attn: Mary Ellen O'Brien, Office of Research Sponsored Programs

3 Rutgers Plaza, ASBIII (732) 932-0150

New Brunswick, NJ 08901-8559

(732) 932-1000 x567 FAX: (732) 932-8135 e-mail: obrien@orsp.rutgers.edu

3. National Park Service Funding Data (If applicable)

a. Amount to be obligated (current FY05) \$ 149,249.00 5284-411C-371-BS00

Previous Obligation: + 190,005.94

TOTAL OBLIGATION: \$ 339,254.94

4. Type of report (circle) and term (year, month, day)

a. Cooperative Agreement w/RIU Beginning date 06/18/99 Ending date 06/18/04

b. Task Order w/RU Beginning date 07/25/03 Ending date 09/30/05

c. Modification No. 1 w/RU Beginning date 04/30/04 Ending date 09/30/05

d. Modification No. 2 w/RU Beginning date 10/20/04 Ending date 09/30/05

e. Modification No. 3 w/RU Beginning date 06/21/05 Ending date 09/30/06

5. Purpose of Agreement/Amendment/Modification North Atlantic Coast Cooperative Ecosystem Studies Unit (CESU) "Effects of Cape Sable Seaside Sparrow Demography"
The purpose of this Modification No. 3 Add work in continuation of this Task Agreement and FY05 funding of \$149,249.00.

Agreement - Distribution without Data Sheet

1 orig: Rutgers University

Agreement - Distribution with Data Sheet

6. Signing Official

Orig: SERO/File

cc: SERO/C. Daniels, CESU Coordinator

cc: NER/CO/C. Corbett

cc: EVER/COTR/S. Bass

cc: EVER/AO

CONTRACTING OFFICER

DATE

FAADS: _____

PROPERTY: ____ YES X NO

**DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE**

**North Atlantic Coast Cooperative Ecosystem Studies Unit
1443CA4520 99 007 – Rohde Island University – Host University**

Rutgers University – Partner University

Task Order J5284 03 0027 – Modification No. 3

Project Title: *“Effects on Cape Sable Seaside Sparrow Demography”*

The purpose of this Modification No. 3 is to add work in continuation of this Task Agreement. This Task Agreement is modified as follows:

Modification No. 3 EFFECTIVE DATE : Contracting Officer’s signature **THROUGH:** 09/30/06

BASIC TASK AGREEMENT AWARD DATE: 07/25/03

1. ARTICLE II – STATEMENT OF WORK is revised to add the attached STATEMENT OF WORK.
2. ARTICLE III – TERM OF AGREEMENT is revised to extend the period of performance to September 30, 2006.
3. ARTICLE V – PRODUCES AND/OR DELIVERABLES is revised to add the following:

Deliverables

Biannual reports will be produced every six months. These reports will include a summary of overall progress, indication of any current problems, an update on any publications, and a summary of research to be accomplished in subsequent efforts. Annual reports will be produced at the end of each funding period (see schedule below). These reports will contain the above information as well as preliminary versions of models or simulations and a summary of research goals for the coming year. A final, bound report will be delivered 2-months after the end of the project (anticipated August 2007). This will include an abstract of the project’s findings, a relevant executive summary, and a full description of methods and results. In addition, the final report will include information on all publications, collaborators, meta-data, and model simulations.

Deliverable	FY05
Biannual Report	December 2005
Annual Report	August 2006

4. Additional funding of \$ 149,249.00 for FY2005 is hereby obligated on this Modification. The following is a recap of the total obligation:

FISCAL YEAR FUNDING: FY2005

ACCOUNT NUMBER: 5284-BS00-371-411C

	<u>OBLIGATION</u>
BASIC TASK AGREEMENT:	\$ 92,173.51
MODIFICATION 1:	97,832.43
MODIFICATION 2:	0
MODIFICATION 3:	<u>149,249.00</u>
CURRENT TOTAL OBLIGATION:	\$ 339,254.94

All other terms and conditions of this Task Agreement remain unchanged.

SIGNATURES:

Rutgers University

Signature: _____

Name: _____

Title: _____

Date: 6/14/05

NATIONAL PARK SERVICE

Signature: Kathleen L. Batke

Name: Kathleen L. Batke

Title: Contracting Officer

Date: 6/21/05

STATEMENT OF WORK – J5284 03 0027 Modification No. 3

Research Area

Restoration Goal 2: Restore, Preserve, and Protect Natural Habitats and Species

Program Area

Basic Research, Simulation Modeling, Monitoring

Request for Continuation of Project for:

Fire effects on Cape Sable Seaside Sparrow Demography

Dates of Project:

Beginning: Contracting Officer's signature – Ending; August 31, 2006

Current Award:

CESI funds through North Atlantic CESU - Task Agreement J5284 03 0027

Technical Request for Continuation of Project

Abstract

Restoration of the Everglades ecosystem not only requires 'getting the water right' but also 'getting the fire right'. The two are intimately linked because over-drying of this fire-prone ecosystem tends to favor frequent and large-scale fire events. Such alterations of the natural fire regime have had detrimental effects on native species and habitats of the Everglades. This includes the decline of the Cape Sable Seaside Sparrow. This sparrow is endemic to the Everglades, and its life history makes it particularly susceptible to alterations in water flow. Although altered fire regimes have been implicated in the decline of several eastern subpopulations, there has been very little direct examination of the influence of fire on sparrow population numbers or demographic rates (i.e. survival and fecundity). This proposal provides funding for on-going research on the relationship of sparrow demography to an unplanned fire event that occurred in 2001 within subpopulation E. Thus far the project has documented limited use of fire-altered habitat by sparrows. The continuation of the research will allow documentation of the exact year post-fire that sparrows returned to burned habitat, and follow any potential longer-term impacts of fire on sparrow populations (e.g., increased predation pressure). In the process, this project can examine the relationship between vegetation recovery/succession and sparrow occupancy. Beyond the direct information gained from monitoring this study population throughout its recovery, using the field-derived data on demography we will build matrix models that can be used to simulate the fate of sparrow populations given various fire and water resource management options. Funds are also requested to support a statistical analysis of the Cape Sable Seaside Sparrow extensive survey. This

analysis will allow managers and researchers to better evaluate the biological meaning of changes in sparrow numbers through time and space, including assessing the role of fire in observed subpopulation declines.

Project description

Fire is a key component in the Everglades ecosystem because it creates habitat mosaics and prevents hardwood shrubs from invading the open wet prairies and marshes of the ecosystem (Robertson 1953, Egler 1952, Taylor 1983). The Cape Sable seaside sparrow (*Ammodramus miratimus mirabilis*) is an endangered subspecies endemic to the southern Everglades. This sparrow almost exclusively inhabits the fire-influenced, wet marl prairies within the federally protected Everglades National Park (ENP) (Werner 1975). Between 1948 and 1992, 752 fires (an average of 17 fires per year) burned through wet prairies in ENP (Gunderson and Snyder 1994). To date, ENP employees have managed fire in these habitats through prescribed burning and strategic control of natural ignitions. However, current management protocols were never specifically designed to promote USFWS recovery goals for this sparrow subspecies. Although ENP officials wish to support these recovery goals through new fire protocols, the lack of knowledge surrounding the sparrow's response to, and recovery from, fire currently inhibits this process.

To inform the design of new fire protocols that will promote restoration of the Cape Sable seaside sparrow, I propose the continuation of a detailed demographic study of individual sparrows within subpopulation E. In May 2001, ENP managers allowed a fire to burn through a portion of an existing sparrow study plot within this subpopulation. This circumstance created a "natural experiment" whereby pre-fire data on sparrow population can be compared to post-fire sparrow population data. These data groups are analogous to the control and treatment group used in classic experimental design. Therefore, for the first time, Cape Sable seaside sparrow research can statistically evaluate the treatment effect of fire on adult densities and specific phases of the breeding cycle. These data will be linked to information at other spatial scales to provide mechanistic explanations of sparrow decline, and a stage or age-structured model for projecting future population sizes under different fire and water management scenarios.

In addition, Everglades National Park biologists have been monitoring the Cape Sable Seaside Sparrow since 1992 using a system of point counts distributed across the subspecies' known range. The resulting information is used for a variety of purposes, including gauging the effects of previous management actions, planning future research efforts, and validating population models. It would be helpful within each of these contexts to understand the precision of the population estimates, and the power the monitoring efforts have to detect biologically meaningful shifts in sparrow numbers. In our efforts to extrapolate our results on the effects of fire on sparrows to the landscape scale, we have found the surveys of limited use until we conduct such an analysis. Thus, we propose a retrospective trend and power analysis of the annual range-wide survey that aims to provide such information. There are several factors that can influence the power of monitoring efforts (e.g., population size itself and sampling effort), thus we will evaluate trends and power within each subpopulation. Of particular importance, and included in this proposal, is an assessment of when existing monitoring efforts can detect true (local) extinction. After answering these questions, we will provide a range of

options for modifying the range-wide survey. These may include (but are not limited to); stratifying effort according to subpopulation size, adding protocols to the existing methodology to increase power and precision, or recommendations to add (or delete) sites from the current survey in order to realize greater efficiency and cost-effectiveness.

Research Objectives

Using pre- and post-fire comparisons, I expect to meet the following objectives:

- 1) infer the long-term effects of fire on sparrow populations
- 2) evaluate the mechanisms behind any lasting negative fire effects on sparrows.
- 3) project the fates of sparrow populations subjected to different proposed fire management plans.

To further inform these comparative data, I will utilize recently acquired Geographic Information System and remote sensing information on fire extent within Everglades National Park (ENP) to deduce the long-term (> 10 year) effects of fire on sparrow numbers. This includes a consideration of how fire timing (i.e. dry versus wet season burns), fire extent, and subpopulation location effects sparrow response to fire. The field-based and lab-based information from this proposal will compliment existing research on sparrow population response to flooding regimes. Furthermore, it will provide more accurate projections regarding the synergistic effects fire and flood may have on sparrow populations. Conceptually this study fits squarely between concurrent research and begins to mechanistically tie together fire effects observed at multiple spatial and temporal scales.

Intended application of project toward restoration assessment

Currently large-scale restoration plans are underway regarding the alteration of water flow within everglades. Past actions of water managers have produced water flows that have been detrimental to several native species within Everglades National Park, including the Cape Sable Seaside Sparrow (Pimm et al. 2002 and references therein). In particular reference to this proposal, eastern sections of ENP have suffered from inadequate water flows (i.e. over-drying). Because the Everglades is naturally a fire-prone ecosystem and because it abuts a large urbanizing landscape, these overly dry portions of the ecosystem tended to burn too frequently and over too large of expanses (Lockwood et al. 2003). To date, we have had little quantitative information on how secondary effects of altered hydrology have affected native species. The proposed research ties hydrology and fire to sparrow demography such that restoration goals can be better realized, and this endemic subspecies' habitat may be restored. In particular this research will provide information on the following restoration items:

- 1) Numbers, survivorship, and fecundity of sparrows within one of the remaining large sparrow subpopulations over a span of 5 years, thus providing a monitoring tool for assessing the effect of any management actions undertaken within this time frame.
- 2) Numbers, survivorship, and fecundity within and outside of burned sparrow habitat, thus allowing for direct estimation of the biological costs of fire to sparrow populations.
- 3) Relationship between time since fire and vegetation components (i.e. post-fire succession within marl prairies) that are known to be vital to sparrow breeding.

- 4) Simulation matrix model that incorporates field-derived data on the sparrow's demographic response to fire, thus allowing forecasting of the effects of altered fire and hydrologic management regimes on sparrow populations.
- 5) Power and trend analysis of the range-wide sparrow survey resulting in recommendations for future modifications to this survey, and allowing us to evaluate large-scale effects of fire on sparrow populations.

Methods

I employ a quasi-experimental design that involves a two-group comparison without randomization (Manly 2001). The manipulation (i.e. fire) is introduced into one plot, while another is left unaffected. I monitored variables of interest (see Anticipated Results Section) for three years before the fire and will now continue to monitor these variables for two years after the fire. In order to account for underlying annual variations in the effect variables, Whelan (1995) suggests monitoring such plots for equal amounts of time before and after the manipulation is introduced. For vertebrate populations, this typically requires two or more years of information collected before fire is introduced, followed by a further two or more years of post-fire information (Whelan 1995). Accordingly, this represents the fourth year of a five-year project.

The assumption in quasi-experimental designs is that any naturally occurring (i.e. unaccounted for) changes in sparrow density will be nearly the same in the control and burned plots. Any changes in density within the burned plot can then be attributed to the fire (Manly 2001). Evidence for an effect of fire on sparrow populations is provided by a statistically significant change in the difference between the control and burned plot before and after the time of burning. Conversely, if the two plots remain exactly the same before and after fire, then there is no evidence of an effect on sparrow population dynamics.

In addition, we will collate existing information from previous and on-going survey methods, and combine this with data on life history, distribution, and detection probability (estimated from previous research), such that the correct model for analyzing the trends and power can be derived. We will evaluate range-wide trends in numbers of sparrows counted between 1992 and 2004 in order to ascertain if any significant increases or decreases in population size occurred during this time frame, and whether this change was related to fire regimes.

Relationship of proposed study to concurrent research

There are two other proposed (or funded) studies that address the Cape Sable seaside sparrow. This proposal was designed to compliment these studies by recognizing their various limitations and spatially linking population and ecosystem-wide fire effects. For example, the study plan of M. Ross (Florida International Univ) calls for an extensive analysis of how flood (and potentially fire) regimes alter sparrow habitat. His results can be profitably combined with mine to provide the basis for predicting how alterations in sparrow habitat will induce sparrow population changes across the entirety of the sparrow's range. We have already begun collaboration in this manner producing a recent publication within a major ecological journal (Lockwood et al. 2003). In addition, the study plan of S. Pimm (Duke Univ) endeavors to track range-wide changes to sparrow numbers and relate these to large-scale ecosystem alterations. Our research provides the

'nuts and bolts' of sparrow demography that are required for such large-scale efforts to produce reasonable management options. Our proposed analysis of the range-wide survey data is critical to the successful completion of these concurrent projects. The range-wide survey data is not only used by us to examine the effects of fire, they are also used by others to examine the influence of water flows and vegetation changes on sparrow numbers. I will continue to share our data with these researchers and look for ways to generate broader conservation recommendations.

Anticipated results

(1) Determine the lasting effects of fire on sparrow populations

There are generally four possible post-fire scenarios for sparrow populations. First, sparrow numbers may decrease after fire and never returns to levels equal to the control site. Second, sparrow numbers may decrease after fire and eventually recover to levels that are indistinguishable from the control site. Third, sparrow numbers may initially decrease after fire, but later significantly increase and never return to control site levels. Fourth, numbers may initially decrease after fire, but later increase, eventually returning to control site levels. By continuing to aurally survey, band, and do territorial studies of sparrows for three post-fire years, it will be possible to objectively choose between these competing models using maximum likelihood statistics (Steward-Oaten et al. 1986). My results to date suggest that sparrows initially decrease after fire, then return to the burned habitat in a spatially non-random manner. Sparrows will more likely use burned habitat if it is directly adjacent to unburned habitat. Whether sparrows become denser in formerly burned habitat remains to be documented in the course of the project.

(2) Identify the mechanisms underlying sparrow population density response to fire

A significant limitation of previous research was an exclusive reliance on sparrow density to gauge the effect of fire on sparrow populations. Density is a crude measure of a population's response to local disturbances such as fire (Whelan 1995). Density studies estimate the number of mature individuals in an area, but do not capture demographic attributes such as adult fecundity, nestling mortality, and fledgling dispersal. Fire may affect any one, or all, of these demographic variables and these variables, in turn, may drive the observed densities.

This has important implications in our efforts to manage fire within sparrow habitat. Understanding sparrow demographic attributes as a response to a fire provides insight into managing fire to minimize risks to the subspecies' survival. Documenting sparrow demography for several years post-fire will enable me to build a stage or age-structured model for projecting future population size (Akçakaya et al. 1999). Using this approach, the effects of proposed fire regimes can be inferred from the results of relatively short-term studies (Wellington and Noble 1985, Whelan 1995). Under this modeling regime, demographic variables are re-set to their field-documented post-fire state at intervals dictated by ENP burning schedules. Each burning schedule is modeled independently to produce the range of possible effects on sparrow populations. These projections can then allow ENP managers to choose a fire management option that best minimizes the risk of sparrow extinction while maximizing other ecosystem benefits (Akçakaya et al. 1999).

(3) *Link sparrow demographic data to environmental parameters*

Food availability, predation, habitat structure, and localized weather patterns that flood active nests have all been hypothesized to be factors limiting sparrow reproduction, survival rates, and dispersal (Lockwood et al. 1997, Lockwood et al. 2001, Dean and Morrison 2001, Pimm et al. 2002). These hypotheses have been supported through anecdotal data and opportunistic observations, but have never been quantified through an experimental approach. My quasi-experimental study design will be the first to systematically document differences in secondary variables and relate them to sparrow demographics under differing burn treatments. For example, adult fat content, and weight of nestlings and fledglings, will be measured to compare food availability in each treatment. I will correlate these values to sparrow reproduction, survival rates, and dispersal patterns in the burned and unburned areas.

To quantify the influence of habitat structure on sparrow demographics, this study proposes to continue recording vegetation variables at the permanent vegetation plots already established within and outside the burn (e.g., percent ground cover, presence and height of perching substrate, presence and cover of bunchgrasses). Preliminary results indicate that vegetation composition recovers rapidly after the fire. According to some metrics (e.g., species composition) the vegetation is become indistinguishable in the two treatment areas one year post-fire. However, other vegetation variables (e.g. ground cover) required two years to recover. Quantifying the vegetation metrics present as adult sparrows a) return to burned habitat, b) attempt to nest in burned habitat, and c) successfully fledge young from burned habitat will prove enormously informative. These values will identify the temporal effects of fire, but also identify the general habitat needs associated with different sparrow behavior.

I propose to continue close and systematic annual monitoring of all dispersal and breeding activity in the two study sites. We have seen increased activity each year in the burned area. By continuing to re-sight and map all banded individuals, I can investigate how dispersal differs in each treatment and relates to the environmental parameters mentioned above. The opportunity to collect such information on vertebrate populations subjected to fire is rare (Whelan 1995), and thus my results should be of general and specific interest.

(4) *Model fire impacts across the entire range of the sparrow*

By combining the ENP annual range-wide survey, our field-derived demographic information, and recently acquired maps of fire behavior within ENP (records back to 1986), I propose to estimate the impacts of fire across the sparrow's entire range. Such information allows us to address such questions as; (a) do sparrows decline after 10 or more years of not burning their habitat, (b) does the duration of negative effects of fire depend on soil depths, size or spatial configuration of the affected subpopulation, or whether the fire occurred in the wet or dry season and (c) have previous fire frequencies been sufficient to contribute to observed reductions in sparrow numbers within the eastern subpopulations. This work follows on that performed by Curnutt et al. (1998), and significantly adds to the spatial extent and accuracy of this research.

(5) Evaluate the power of the range-wide sparrow surveys to detect shifts in sparrow numbers.

This year we will evaluate the power of the existing range-wide monitoring program to detect catastrophic (>80%), large (50 to 80%), moderate (30 to 50%), and small (<30%) changes in sparrow population size range-wide, and within each subpopulation. We will also evaluate the influence of subpopulation size, length of survey records (in years), and proportion of subpopulation surveyed on the power to detect differing levels of population change. Of critical importance to understanding the long-term effects of fire (and other factors), we will evaluate the power of the survey to detect a true extinction (i.e. population size of zero) of a subpopulation, or of a cluster of survey sites. This effort should be completed in one year, and will provide a range of suggested modifications to the annual, range-wide survey that will increase the power to detect small changes in population size, indicating how these recommendations are influenced by various management goals (e.g., ensure no further loss of small subpopulations, document recovery of subpopulation A, document recovery after management action implemented). In particular relevance to the influence of fire, we can provide clear evidence for the role of fire in the decline of subpopulations D and F.

Permitting Requirements and Transportation

For Banding Sparrows

Master Banding Permit issued by USGS banding lab including Endangered Cape Sable Seaside Sparrow – On File and valid until 2/28/08.

For Research

State of Florida Game and Fresh Water Fish Commission permit – On File and valid until 2/28/07

USFWS Threatened and Endangered (T&E) Species permit – On File and valid until 2/28/07

National Park Service Collection Permit – On File and valid until 3/25/06

Rutgers University Animal Care Permit – On File and valid until 2/1/08

Specimen Deposition – Any specimens collected will be catalogued according to the specifications defined by the South Florida Collections Management Center. Documentation of these collections will be submitted in a format consistent with the Automated National Cataloging System.

Transportation to study site

All personnel will use their personal vehicles to transport themselves and their gear in and out of Everglades National Park. Transportation to the East Camp study site is via helicopter from the Beard Research Center, and is arranged through the Everglades Fire and Aviation registration system. Air transportation is funded through Everglades National Park. All air safety training is administered through Everglades Fire and Aviation. M. Davis is currently qualified as USDOJ heli-tech, and all participating members annually complete USDOJ B-3 basic air safety training. As required by the USFWS T&E permit, the helicopter shall land in a marked area that has been surveyed for sparrows and where none have been detected. Also in accordance with the T&E permit, helicopter trips to the East Camp shall be limited to two per week. The National Park Service permit will be presented for identification at the entrance station gate upon entry to ENP. While at the study site, all transportation will be on foot.

Cost/Budget For Continuation of Project

OFFEROR: Rutgers University, New Brunswick, NJ 08901					
PRINCIPAL INVESTIGATOR (PI)/PROJECT ADMINISTRATOR (PA): Julie L. Lockwood					
A. SENIOR PERSONNEL:		Man Hours	Rates	Funds Requested by Offeror	
1. J.L. Lockwood, Principal Investigator		1 month summer salary	62,905/9-month appointment	7,000	
(1) TOTAL SENIOR PERSONNEL		1 month summer salary	62,905/9-month appointment	7,000	
B. OTHER PERSONNEL					
1. () Post Doctoral Associates		1 year	36,108/year	36,108	
2. (1) Other Professionals (Technician, M. Davis)		1 year	28,000/year	28,000	
3. (1) Graduate Student (D. La Puma, 1 year salary, with tuition and fees)				26,289	
4. (2) Other; Hourly field assistants to be hired – working 40 hours per week for 4 months ea.				10,000	
(4) TOTAL OTHER PERSONNEL (add items 1 - 6)				100,397	
(5) TOTAL SENIOR AND OTHER PERSONNEL (add sections A and B)				107,397	
C. FRINGE BENEFITS (if charged as indirect costs)				17,474	
TOTAL PERSONNEL AND FRINGE BENEFITS (add sections A, B, and C)				124,871	
D. PERMANENT EQUIPMENT (list item and dollar amount for each item exceeding \$5,000.00)					
All Equipment below \$5,000: includes banding supplies, camping supplies, and computer accessories					
TOTAL PERMENENT EQUIPMENT				2,000	
E. TRAVEL (list on budget explanation page)					
1. Domestic: Travel by PI, Post-doc, Graduate Asst. and Technician between New Jersey and Miami, including costs of housing at field site (ENP), airfare, and car rental (or private car mileage)				4,000	
TOTAL TRAVEL				4,000	
TOTAL PARTICIPANT COSTS -				NONE	
G. OTHER DIRECT COSTS (itemize on budget explanation page)				NONE	
TOTAL OTHER DIRECT COSTS				NONE	
H. TOTAL DIRECT COSTS (add sections A - G)				130,871	
I. INDIRECT COSTS		Rate	Base	Total	
	F & A	15%, CESU negotiated	130,871	18,378	

	Other					18,378
TOTAL INDIRECT OSTS						
J. TOTAL DIRECT AND INDIRECT COSTS (add sections H and I)						149,249
K. FEE (%) Base \$						---
L. COST SHARING						----
M. AMOUNT OF THIS REQUEST						149,249
PI/PA NAME (TYPED) AND SIGNATURE						DATE
Julie Lockwood						3 February 2005

NOTES:

*Overhead rate is standard and negotiated through the Cooperative Ecosystem Study Unit, North Atlantic Group.

**Continuation of Currently Active Project, and Administered through NPS Northern Atlantic Cooperative Ecosystems Study Unit – Rutgers University

Literature Cited

- Akçakaya, H.R., M.A. Burgman, and L.R. Ginzburg. 1999. Applied population biology. Sinauer Associates, Inc. Sunderland, MA.
- Curnutt, J.L., A.L. Mayer, T.M. Brooks, L. Manne, O.L. Bass Jr., D.M. Fleming, M.P. Nott, and S.L. Pimm. 1998. Population dynamics of the endangered Cape Sable seaside-sparrow. *Animal Conservation* 1:11-21.
- Dean, T.F. and J.L. Morrison. 2001. Non-breeding season ecology of the Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*). Final Report submitted to USFWS, South Florida Ecosystem Office, Vero Beach, FL.
- Egler, F.E. 1952. Southeast saline Everglades vegetation, Florida, and its management. *Vegetatio* 3:213-265.
- Gunderson, L.H. and J.R. Snyder. 1994. Fire patterns in the southern Everglades. In *Everglades: the ecosystem and its restoration* (S.M. Davis and J.M. Ogden, eds.). Pages 291-306, St. Lucie Press, Boca Raton, FL.
- Lockwood, J.L., M. Ross and J. Sah. 2003. Smoke on the water: the interplay of fire and water flow on Everglades restoration. *Frontiers in Ecology and Environment* 9(1):462-468.
- Lockwood, J.L. 2002. Fire effects on Cape Sable Seaside Sparrow demography: 2002 final report. Everglades National Park, Homestead, FL.
- Lockwood, J.L., K.H. Fenn, J.M. Caudill, D. Okines, O.L. Bass Jr., J.R. Duncan, and S.L. Pimm. 2001. The implications of Cape Sable seaside sparrow demography for Everglades restoration. *Animal Conservation* 4:275-281.
- Lockwood, J.L., K. H. Fenn, J.L. Curnutt, D. Rosenthal, K.L. Balent, and A.L. Mayer. 1997. Life history of the endangered Cape Sable seaside sparrow. *Wilson Bulletin* 109:720-731.
- Manly, B.F.J. 2001. Statistics for environmental science and management. Chapman & Hall/CRC Press, Boca Raton, FL.
- Pimm, S.L., J.L. Lockwood, C.N. Jenkins, J.L. Curnutt, M.P. Nott, R.D. Powell, and O.L. Bass Jr. 2002. Sparrow in the grass. A report on the first ten years of research on the Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*). Everglades National Park, Homestead, FL.
- Robertson, W.B. Jr. 1953. A survey of the effects of fire in Everglades National Park, Everglades National Park, National Park Service, U.S. Department of Interior, Homestead, FL.
- Stewart-Oaten, A., W.W. Murdoch, K.R. Parker. 1986. Environmental impact assessment: "pseudo-replication" in time? *Ecology* 67:929-940.
- Taylor, D.L. 1983. Fire management and the Cape Sable sparrow. In: *The seaside sparrow, its biology and management*. (Quay, T.L., J.B. Funderburd Jr., D. Lee, E.F. Potter, and C.S. Robbins, eds). North Carolina Biological Survey and North Carolina State Museum.
- Wellington, A.B. and I.R. Noble. 1985. Post-fire recruitment and mortality in a population of the mallee *Eucalyptus incrassata* in semi-arid, southeastern Australia. *Journal of Ecology* 73:645-656.
- Werner, H. 1975. The biology of the Cape Sable seaside sparrow. Report to US Fish and Wildlife Service. Everglades National Park, Homestead, FL.
- Whelan, R.J. 1995. Ecology of fire. Cambridge University Press, Cambridge, UK.

**DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE**

**North Atlantic Coast Cooperative Ecosystem Studies Unit
1443CA4520 99 007 – Rhode Island University – Host University**

Rutgers University – Partner University

Task Order J5284 03 0027 – Modification No. 3

Project Title: *“Effects on Cape Sable Seaside Sparrow Demography”*

The purpose of this Modification No. 3 is to add work in continuation of this Task Agreement. This Task Agreement is modified as follows:

Modification No. 3 EFFECTIVE DATE : Contracting Officer’s signature **THROUGH:** 09/30/06

BASIC TASK AGREEMENT AWARD DATE: 07/25/03

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Deliverable	FY05
Biannual Report	December 2005
Annual Report	August 2006

4. Additional funding of \$ 149,249.00 for FY2005 is hereby obligated on this Modification. The following is a recap of the total obligation:

FISCAL YEAR FUNDING: FY2005

ACCOUNT NUMBER: 5284-BS00-371-411C

	<u>OBLIGATION</u>
BASIC TASK AGREEMENT:	\$ 92,173.51
MODIFICATION 1:	97,832.43
MODIFICATION 2:	0
MODIFICATION 3:	149,249.00
CURRENT TOTAL OBLIGATION:	\$ 339,254.94

All other terms and conditions of this Task Agreement remain unchanged.

SIGNATURES:

Rutgers University

Signature: _____

Name: _____

Title: _____

Date: _____

Keith Osterhage, CRA
Director
Office of Research and
Sponsored Programs

NATIONAL PARK SERVICE

Signature: _____

Name: Kathleen L. Batke

Title: Contracting Officer

Date: _____

OFFICE OF RESEARCH & SPONSORED PROGRAMS
RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY
3 RUTGERS PLAZA, ASB III
NEW BRUNSWICK, NJ 08901-8559

STATEMENT OF WORK – J5284 03 0027 Modification No. 3

Research Area

Restoration Goal 2: Restore, Preserve, and Protect Natural Habitats and Species

Program Area

Basic Research, Simulation Modeling, Monitoring

Request for Continuation of Project for:

Fire effects on Cape Sable Seaside Sparrow Demography

Dates of Project:

Beginning: Contracting Officer's signature – Ending; August 31, 2006

Current Award:

CESI funds through North Atlantic CESU - Task Agreement J5284 03 0027

Technical Request for Continuation of Project

Abstract

Restoration of the Everglades ecosystem not only requires 'getting the water right' but also 'getting the fire right'. The two are intimately linked because over-drying of this fire-prone ecosystem tends to favor frequent and large-scale fire events. Such alterations of the natural fire regime have had detrimental effects on native species and habitats of the Everglades. This includes the decline of the Cape Sable Seaside Sparrow. This sparrow is endemic to the Everglades, and its life history makes it particularly susceptible to alterations in water flow. Although altered fire regimes have been implicated in the decline of several eastern subpopulations, there has been very little direct examination of the influence of fire on sparrow population numbers or demographic rates (i.e. survival and fecundity). This proposal provides funding for on-going research on the relationship of sparrow demography to an unplanned fire event that occurred in 2001 within subpopulation E. Thus far the project has documented limited use of fire-altered habitat by sparrows. The continuation of the research will allow documentation of the exact year post-fire that sparrows returned to burned habitat, and follow any potential longer-term impacts of fire on sparrow populations (e.g., increased predation pressure). In the process, this project can examine the relationship between vegetation recovery/succession and sparrow occupancy. Beyond the direct information gained from monitoring this study population throughout its recovery, using the field-derived data on demography we will build matrix models that can be used to simulate the fate of sparrow populations given various fire and water resource management options. Funds are also requested to support a statistical analysis of the Cape Sable Seaside Sparrow extensive survey. This

analysis will allow managers and researchers to better evaluate the biological meaning of changes in sparrow numbers through time and space, including assessing the role of fire in observed subpopulation declines.

Project description

Fire is a key component in the Everglades ecosystem because it creates habitat mosaics and prevents hardwood shrubs from invading the open wet prairies and marshes of the ecosystem (Robertson 1953, Egler 1952, Taylor 1983). The Cape Sable seaside sparrow (*Ammodramus miratimus mirabilis*) is an endangered subspecies endemic to the southern Everglades. This sparrow almost exclusively inhabits the fire-influenced, wet marl prairies within the federally protected Everglades National Park (ENP) (Werner 1975). Between 1948 and 1992, 752 fires (an average of 17 fires per year) burned through wet prairies in ENP (Gunderson and Snyder 1994). To date, ENP employees have managed fire in these habitats through prescribed burning and strategic control of natural ignitions. However, current management protocols were never specifically designed to promote USFWS recovery goals for this sparrow subspecies. Although ENP officials wish to support these recovery goals through new fire protocols, the lack of knowledge surrounding the sparrow's response to, and recovery from, fire currently inhibits this process.

To inform the design of new fire protocols that will promote restoration of the Cape Sable seaside sparrow, I propose the continuation of a detailed demographic study of individual sparrows within subpopulation E. In May 2001, ENP managers allowed a fire to burn through a portion of an existing sparrow study plot within this subpopulation. This circumstance created a "natural experiment" whereby pre-fire data on sparrow population can be compared to post-fire sparrow population data. These data groups are analogous to the control and treatment group used in classic experimental design. Therefore, for the first time, Cape Sable seaside sparrow research can statistically evaluate the treatment effect of fire on adult densities and specific phases of the breeding cycle. These data will be linked to information at other spatial scales to provide mechanistic explanations of sparrow decline, and a stage or age-structured model for projecting future population sizes under different fire and water management scenarios.

In addition, Everglades National Park biologists have been monitoring the Cape Sable Seaside Sparrow since 1992 using a system of point counts distributed across the subspecies' known range. The resulting information is used for a variety of purposes, including gauging the effects of previous management actions, planning future research efforts, and validating population models. It would be helpful within each of these contexts to understand the precision of the population estimates, and the power the monitoring efforts have to detect biologically meaningful shifts in sparrow numbers. In our efforts to extrapolate our results on the effects of fire on sparrows to the landscape scale, we have found the surveys of limited use until we conduct such an analysis. Thus, we propose a retrospective trend and power analysis of the annual range-wide survey that aims to provide such information. There are several factors that can influence the power of monitoring efforts (e.g., population size itself and sampling effort), thus we will evaluate trends and power within each subpopulation. Of particular importance, and included in this proposal, is an assessment of when existing monitoring efforts can detect true (local) extinction. After answering these questions, we will provide a range of

options for modifying the range-wide survey. These may include (but are not limited to); stratifying effort according to subpopulation size, adding protocols to the existing methodology to increase power and precision, or recommendations to add (or delete) sites from the current survey in order to realize greater efficiency and cost-effectiveness.

Research Objectives

Using pre- and post-fire comparisons, I expect to meet the following objectives:

- 1) infer the long-term effects of fire on sparrow populations
- 2) evaluate the mechanisms behind any lasting negative fire effects on sparrows.
- 3) project the fates of sparrow populations subjected to different proposed fire management plans.

To further inform these comparative data, I will utilize recently acquired Geographic Information System and remote sensing information on fire extent within Everglades National Park (ENP) to deduce the long-term (> 10 year) effects of fire on sparrow numbers. This includes a consideration of how fire timing (i.e. dry versus wet season burns), fire extent, and subpopulation location effects sparrow response to fire. The field-based and lab-based information from this proposal will compliment existing research on sparrow population response to flooding regimes. Furthermore, it will provide more accurate projections regarding the synergistic effects fire and flood may have on sparrow populations. Conceptually this study fits squarely between concurrent research and begins to mechanistically tie together fire effects observed at multiple spatial and temporal scales.

Intended application of project toward restoration assessment

Currently large-scale restoration plans are underway regarding the alteration of water flow within everglades. Past actions of water managers have produced water flows that have been detrimental to several native species within Everglades National Park, including the Cape Sable Seaside Sparrow (Pimm et al. 2002 and references therein). In particular reference to this proposal, eastern sections of ENP have suffered from inadequate water flows (i.e. over-drying). Because the Everglades is naturally a fire-prone ecosystem and because it abuts a large urbanizing landscape, these overly dry portions of the ecosystem tended to burn too frequently and over too large of expanses (Lockwood et al. 2003). To date, we have had little quantitative information on how secondary effects of altered hydrology have affected native species. The proposed research ties hydrology and fire to sparrow demography such that restoration goals can be better realized, and this endemic subspecies' habitat may be restored. In particular this research will provide information on the following restoration items:

- 1) Numbers, survivorship, and fecundity of sparrows within one of the remaining large sparrow subpopulations over a span of 5 years, thus providing a monitoring tool for assessing the effect of any management actions undertaken within this time frame.
- 2) Numbers, survivorship, and fecundity within and outside of burned sparrow habitat, thus allowing for direct estimation of the biological costs of fire to sparrow populations.
- 3) Relationship between time since fire and vegetation components (i.e. post-fire succession within marl prairies) that are known to be vital to sparrow breeding.

- 4) Simulation matrix model that incorporates field-derived data on the sparrow's demographic response to fire, thus allowing forecasting of the effects of altered fire and hydrologic management regimes on sparrow populations.
- 5) Power and trend analysis of the range-wide sparrow survey resulting in recommendations for future modifications to this survey, and allowing us to evaluate large-scale effects of fire on sparrow populations.

Methods

I employ a quasi-experimental design that involves a two-group comparison without randomization (Manly 2001). The manipulation (i.e. fire) is introduced into one plot, while another is left unaffected. I monitored variables of interest (see Anticipated Results Section) for three years before the fire and will now continue to monitor these variables for two years after the fire. In order to account for underlying annual variations in the effect variables, Whelan (1995) suggests monitoring such plots for equal amounts of time before and after the manipulation is introduced. For vertebrate populations, this typically requires two or more years of information collected before fire is introduced, followed by a further two or more years of post-fire information (Whelan 1995). Accordingly, this represents the fourth year of a five-year project.

The assumption in quasi-experimental designs is that any naturally occurring (i.e. unaccounted for) changes in sparrow density will be nearly the same in the control and burned plots. Any changes in density within the burned plot can then be attributed to the fire (Manly 2001). Evidence for an effect of fire on sparrow populations is provided by a statistically significant change in the difference between the control and burned plot before and after the time of burning. Conversely, if the two plots remain exactly the same before and after fire, then there is no evidence of an effect on sparrow population dynamics.

In addition, we will collate existing information from previous and on-going survey methods, and combine this with data on life history, distribution, and detection probability (estimated from previous research), such that the correct model for analyzing the trends and power can be derived. We will evaluate range-wide trends in numbers of sparrows counted between 1992 and 2004 in order to ascertain if any significant increases or decreases in population size occurred during this time frame, and whether this change was related to fire regimes.

Relationship of proposed study to concurrent research

There are two other proposed (or funded) studies that address the Cape Sable seaside sparrow. This proposal was designed to compliment these studies by recognizing their various limitations and spatially linking population and ecosystem-wide fire effects. For example, the study plan of M. Ross (Florida International Univ) calls for an extensive analysis of how flood (and potentially fire) regimes alter sparrow habitat. His results can be profitably combined with mine to provide the basis for predicting how alterations in sparrow habitat will induce sparrow population changes across the entirety of the sparrow's range. We have already begun collaboration in this manner producing a recent publication within a major ecological journal (Lockwood et al. 2003). In addition, the study plan of S. Pimm (Duke Univ) endeavors to track range-wide changes to sparrow numbers and relate these to large-scale ecosystem alterations. Our research provides the

'nuts and bolts' of sparrow demography that are required for such large-scale efforts to produce reasonable management options. Our proposed analysis of the range-wide survey data is critical to the successful completion of these concurrent projects. The range-wide survey data is not only used by us to examine the effects of fire, they are also used by others to examine the influence of water flows and vegetation changes on sparrow numbers. I will continue to share our data with these researchers and look for ways to generate broader conservation recommendations.

Anticipated results

(1) Determine the lasting effects of fire on sparrow populations

There are generally four possible post-fire scenarios for sparrow populations. First, sparrow numbers may decrease after fire and never returns to levels equal to the control site. Second, sparrow numbers may decrease after fire and eventually recover to levels that are indistinguishable from the control site. Third, sparrow numbers may initially decrease after fire, but later significantly increase and never return to control site levels. Fourth, numbers may initially decrease after fire, but later increase, eventually returning to control site levels. By continuing to aurally survey, band, and do territorial studies of sparrows for three post-fire years, it will be possible to objectively choose between these competing models using maximum likelihood statistics (Steward-Oaten et al. 1986). My results to date suggest that sparrows initially decrease after fire, then return to the burned habitat in a spatially non-random manner. Sparrows will more likely use burned habitat if it is directly adjacent to unburned habitat. Whether sparrows become denser in formerly burned habitat remains to be documented in the course of the project.

(2) Identify the mechanisms underlying sparrow population density response to fire

A significant limitation of previous research was an exclusive reliance on sparrow density to gauge the effect of fire on sparrow populations. Density is a crude measure of a population's response to local disturbances such as fire (Whelan 1995). Density studies estimate the number of mature individuals in an area, but do not capture demographic attributes such as adult fecundity, nestling mortality, and fledgling dispersal. Fire may affect any one, or all, of these demographic variables and these variables, in turn, may drive the observed densities.

This has important implications in our efforts to manage fire within sparrow habitat. Understanding sparrow demographic attributes as a response to a fire provides insight into managing fire to minimize risks to the subspecies' survival. Documenting sparrow demography for several years post-fire will enable me to build a stage or age-structured model for projecting future population size (Akçakaya et al. 1999). Using this approach, the effects of proposed fire regimes can be inferred from the results of relatively short-term studies (Wellington and Noble 1985, Whelan 1995). Under this modeling regime, demographic variables are re-set to their field-documented post-fire state at intervals dictated by ENP burning schedules. Each burning schedule is modeled independently to produce the range of possible effects on sparrow populations. These projections can then allow ENP managers to choose a fire management option that best minimizes the risk of sparrow extinction while maximizing other ecosystem benefits (Akçakaya et al. 1999).

(3) *Link sparrow demographic data to environmental parameters*

Food availability, predation, habitat structure, and localized weather patterns that flood active nests have all been hypothesized to be factors limiting sparrow reproduction, survival rates, and dispersal (Lockwood et al. 1997, Lockwood et al. 2001, Dean and Morrison 2001, Pimm et al. 2002). These hypotheses have been supported through anecdotal data and opportunistic observations, but have never been quantified through an experimental approach. My quasi-experimental study design will be the first to systematically document differences in secondary variables and relate them to sparrow demographics under differing burn treatments. For example, adult fat content, and weight of nestlings and fledglings, will be measured to compare food availability in each treatment. I will correlate these values to sparrow reproduction, survival rates, and dispersal patterns in the burned and unburned areas.

To quantify the influence of habitat structure on sparrow demographics, this study proposes to continue recording vegetation variables at the permanent vegetation plots already established within and outside the burn (e.g., percent ground cover, presence and height of perching substrate, presence and cover of bunchgrasses). Preliminary results indicate that vegetation composition recovers rapidly after the fire. According to some metrics (e.g., species composition) the vegetation is become indistinguishable in the two treatment areas one year post-fire. However, other vegetation variables (e.g. ground cover) required two years to recover. Quantifying the vegetation metrics present as adult sparrows a) return to burned habitat, b) attempt to nest in burned habitat, and c) successfully fledge young from burned habitat will prove enormously informative. These values will identify the temporal effects of fire, but also identify the general habitat needs associated with different sparrow behavior.

I propose to continue close and systematic annual monitoring of all dispersal and breeding activity in the two study sites. We have seen increased activity each year in the burned area. By continuing to re-sight and map all banded individuals, I can investigate how dispersal differs in each treatment and relates to the environmental parameters mentioned above. The opportunity to collect such information on vertebrate populations subjected to fire is rare (Whelan 1995), and thus my results should be of general and specific interest.

(4) *Model fire impacts across the entire range of the sparrow*

By combining the ENP annual range-wide survey, our field-derived demographic information, and recently acquired maps of fire behavior within ENP (records back to 1986), I propose to estimate the impacts of fire across the sparrow's entire range. Such information allows us to address such questions as; (a) do sparrows decline after 10 or more years of not burning their habitat, (b) does the duration of negative effects of fire depend on soil depths, size or spatial configuration of the affected subpopulation, or whether the fire occurred in the wet or dry season and (c) have previous fire frequencies been sufficient to contribute to observed reductions in sparrow numbers within the eastern subpopulations. This work follows on that performed by Curnutt et al. (1998), and significantly adds to the spatial extent and accuracy of this research.

(5) Evaluate the power of the range-wide sparrow surveys to detect shifts in sparrow numbers.

This year we will evaluate the power of the existing range-wide monitoring program to detect catastrophic (>80%), large (50 to 80%), moderate (30 to 50%), and small (<30%) changes in sparrow population size range-wide, and within each subpopulation. We will also evaluate the influence of subpopulation size, length of survey records (in years), and proportion of subpopulation surveyed on the power to detect differing levels of population change. Of critical importance to understanding the long-term effects of fire (and other factors), we will evaluate the power of the survey to detect a true extinction (i.e. population size of zero) of a subpopulation, or of a cluster of survey sites. This effort should be completed in one year, and will provide a range of suggested modifications to the annual, range-wide survey that will increase the power to detect small changes in population size, indicating how these recommendations are influenced by various management goals (e.g., ensure no further loss of small subpopulations, document recovery of subpopulation A, document recovery after management action implemented). In particular relevance to the influence of fire, we can provide clear evidence for the role of fire in the decline of subpopulations D and F.

Permitting Requirements and Transportation

For Banding Sparrows

Master Banding Permit issued by USGS banding lab including Endangered Cape Sable Seaside Sparrow – On File and valid until 2/28/08.

For Research

State of Florida Game and Fresh Water Fish Commission permit – On File and valid until 2/28/07

USFWS Threatened and Endangered (T&E) Species permit – On File and valid until 2/28/07

National Park Service Collection Permit – On File and valid until 3/25/06

Rutgers University Animal Care Permit – On File and valid until 2/1/08

Specimen Deposition – Any specimens collected will be catalogued according to the specifications defined by the South Florida Collections Management Center. Documentation of these collections will be submitted in a format consistent with the Automated National Cataloging System.

Transportation to study site

All personnel will use their personal vehicles to transport themselves and their gear in and out of Everglades National Park. Transportation to the East Camp study site is via helicopter from the Beard Research Center, and is arranged through the Everglades Fire and Aviation registration system. Air transportation is funded through Everglades National Park. All air safety training is administered through Everglades Fire and Aviation. M. Davis is currently qualified as USDOJ heli-tech, and all participating members annually complete USDOJ B-3 basic air safety training. As required by the USFWS T&E permit, the helicopter shall land in a marked area that has been surveyed for sparrows and where none have been detected. Also in accordance with the T&E permit, helicopter trips to the East Camp shall be limited to two per week. The National Park Service permit will be presented for identification at the entrance station gate upon entry to ENP. While at the study site, all transportation will be on foot.

Cost/Budget For Continuation of Project

OFFEROR: Rutgers University, New Brunswick, NJ 08901					
PRINCIPAL INVESTIGATOR (PI)/PROJECT ADMINISTRATOR (PA): Julie L. Lockwood					
A. SENIOR PERSONNEL:		Man Hours	Rates	Funds Requested by Offeror	
1. J.L. Lockwood, Principal Investigator		1 month summer salary	62,905/9-month appointment	7,000	
(1) TOTAL SENIOR PERSONNEL		1 month summer salary	62,905/9-month appointment	7,000	
B. OTHER PERSONNEL					
1. () Post Doctoral Associates		1 year	36,108/year	36,108	
2. (1) Other Professionals (Technician, M. Davis)		1 year	28,000/year	28,000	
3. (1) Graduate Student (D. La Puma, 1 year salary, with tuition and fees)				26,289	
4. (2) Other; Hourly field assistants to be hired – working 40 hours per week for 4 months ea.				10,000	
(4) TOTAL OTHER PERSONNEL (add items 1 - 6)				100,397	
(5) TOTAL SENIOR AND OTHER PERSONNEL (add sections A and B)				107,397	
C. FRINGE BENEFITS (if charged as indirect costs)				17,474	
TOTAL PERSONNEL AND FRINGE BENEFITS (add sections A, B, and C)				124,871	
D. PERMANENT EQUIPMENT (list item and dollar amount for each item exceeding \$5,000.00) All Equipment below \$5,000: includes banding supplies, camping supplies, and computer accessories TOTAL PERMENENT EQUIPMENT				2,000	
E. TRAVEL (list on budget explanation page)					
1. Domestic: Travel by PI, Post-doc, Graduate Asst. and Technician between New Jersey and Miami, including costs of housing at field site (ENP), airfare, and car rental (or private car mileage)				4,000	
TOTAL TRAVEL				4,000	
TOTAL PARTICIPANT COSTS -				NONE	
G. OTHER DIRECT COSTS (itemize on budget explanation page)				NONE	
TOTAL OTHER DIRECT COSTS				NONE	
H. TOTAL DIRECT COSTS (add sections A - G)				130,871	
I. INDIRECT COSTS		Rate	Base	Total	
	F & A	15%, CESU negotiated	130,871	18,378	

	Other					18,378
TOTAL INDIRECT OSTS						
J. TOTAL DIRECT AND INDIRECT COSTS (add sections H and I)						149,249
K. FEE (%) Base \$						---
L. COST SHARING						----
M. AMOUNT OF THIS REQUEST						149,249
PI/PA NAME (TYPED) AND SIGNATURE						DATE
Julie Lockwood						3 February 2005

NOTES:

*Overhead rate is standard and negotiated through the Cooperative Ecosystem Study Unit, North Atlantic Group.

**Continuation of Currently Active Project, and Administered through NPS Northern Atlantic Cooperative Ecosystems Study Unit – Rutgers University

Literature Cited

- Akçakaya, H.R., M.A. Burgman, and L.R. Ginzburg. 1999. Applied population biology. Sinauer Associates, Inc. Sunderland, MA.
- Curnutt, J.L., A.L. Mayer, T.M. Brooks, L. Manne, O.L. Bass Jr., D.M. Fleming, M.P. Nott, and S.L. Pimm. 1998. Population dynamics of the endangered Cape Sable seaside-sparrow. *Animal Conservation* 1:11-21.
- Dean, T.F. and J.L. Morrison. 2001. Non-breeding season ecology of the Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*). Final Report submitted to USFWS, South Florida Ecosystem Office, Vero Beach, FL.
- Egler, F.E. 1952. Southeast saline Everglades vegetation, Florida, and its management. *Vegetatio* 3:213-265.
- Gunderson, L.H. and J.R. Snyder. 1994. Fire patterns in the southern Everglades. In *Everglades: the ecosystem and its restoration* (S.M. Davis and J.M. Ogden, eds.). Pages 291-306, St. Lucie Press, Boca Raton, FL.
- Lockwood, J.L., M. Ross and J. Sah. 2003. Smoke on the water: the interplay of fire and water flow on Everglades restoration. *Frontiers in Ecology and Environment* 9(1):462-468.
- Lockwood, J.L. 2002. Fire effects on Cape Sable Seaside Sparrow demography: 2002 final report. Everglades National Park, Homestead, FL.
- Lockwood, J.L., K.H. Fenn, J.M. Caudill, D. Okines, O.L. Bass Jr., J.R. Duncan, and S.L. Pimm. 2001. The implications of Cape Sable seaside sparrow demography for Everglades restoration. *Animal Conservation* 4:275-281.
- Lockwood, J.L., K. H. Fenn, J.L. Curnutt, D. Rosenthal, K.L. Balent, and A.L. Mayer. 1997. Life history of the endangered Cape Sable seaside sparrow. *Wilson Bulletin* 109:720-731.
- Manly, B.F.J. 2001. Statistics for environmental science and management. Chapman & Hall/CRC Press, Boca Raton, FL.
- Pimm, S.L. J.L. Lockwood, C.N. Jenkins, J.L. Curnutt, M.P. Nott, R.D. Powell, and O.L. Bass Jr. 2002. Sparrow in the grass. A report on the first ten years of research on the Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*). Everglades National Park, Homestead, FL.
- Robertson, W.B. Jr. 1953. A survey of the effects of fire in Everglades National Park, Everglades National Park, National Park Service, U.S. Department of Interior, Homestead, FL.
- Stewart-Oaten, A., W.W. Murdoch, K.R. Parker. 1986. Environmental impact assessment: "pseudo-replication" in time? *Ecology* 67:929-940.
- Taylor, D.L. 1983. Fire management and the Cape Sable sparrow. In: *The seaside sparrow, its biology and management*. (Quay, T.L., J.B. Funderburd Jr., D. Lee, E.F. Potter, and C.S. Robbins, eds). North Carolina Biological Survey and North Carolina State Museum.
- Wellington, A.B. and I.R. Noble. 1985. Post-fire recruitment and mortality in a population of the mallee *Eucalyptus incrassata* in semi-arid, southeastern Australia. *Journal of Ecology* 73:645-656.
- Werner, H. 1975. The biology of the Cape Sable seaside sparrow. Report to US Fish and Wildlife Service. Everglades National Park, Homestead, FL.
- Whelan, R.J. 1995. Ecology of fire. Cambridge University Press, Cambridge, UK.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

Page

1 of 4

2. AMENDMENT/MODIFICATION NO.

0003

3. EFFECTIVE DATE

06/21/2005

4. REQUISITION/PURCHASE REQ. NO.

See Lines

5. PROJECT NO. (If applicable)

6. ISSUED BY

CODE

50970

7. ADMINISTERED BY (If other than Item 6)

CODE

52840

SER - National Park Service
Contracting & Property Mgt., 100 Alabama St., SW
Atlanta, GA 30303

SER - Everglades National Park
KROME CENTER 950 N. KROME AVE 3RD FLOOR
HOMESTEAD, FL 33030

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and Zip Code)

Rutgers, The State University

3 Rutgers Plaza

New Brunswick, NJ 08901-8559

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

(X)

10A. MODIFICATION OF CONTRACT/ORDER
NO. / J5284030027

(X)

10B. DATED (SEE ITEM 13)
07/25/2003

CODE A

FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS



The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers



is extended,



is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

2005 - - 5284 - - 411C - - 371 - - - BS00 - - - - \$149,249.00

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN
THE CONTRACT ORDER NO. IN ITEM 10A.B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as
changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
Mutual Agreement

D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Add work and FY05 funding.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Kathleen L. Batke

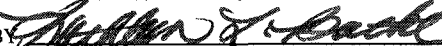
15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. United States of America

16C. DATE SIGNED

(Signature of person authorized to sign)

BY 
(Signature of Contracting Officer)

6/21/05

Line Item Summary		Document Number J5284030027/0003		Title CESU Task Order EVER					Page 2 of 4		
Total Funding: \$339,254.94											
FYs	Fund	Budget Org	Sub	Object Class	Sub	Program	Cost Org	Sub	Proj/Job No.	Sub	Reporting Category
Division		Closed FYs		Cancelled Fund							
Line Item Number	Description			Delivery Date (Start date to End date)		Quantity	Unit of Issue	Unit Price	Total Cost		
The purpose of this SF30 Modification No. 3 to J5284 03 0027 - w/Rutgers University a partner under the North Atlantic Coast CESU 1443CA4520-99-007 w/University of Rhode Island is to add FY05 funding and work											
0003	Continuation of ongoing research project					1.00	ea	\$149,249.00	\$149,249.00		
(06/21/2005 to 09/30/2006)											
This is a New Line											
titled Fire Effects on Cape Sable Seaside Sparrow Demography conducted by Dr. Julie Lockwood, Continuation of CO-OP Agreement											
J5280-03-0027											
Ref Req No: R5284050027											
								Previous Total: \$190,005.94			
								Modification Total: \$149,249.00			
								Grand Total: \$339,254.94			
								(Includes Discounts)			

Contract Level Funding Summary	Document Number J5284030027/0003	Title CESU Task Order EVER	Page 3 of 4
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<u>Funding Strip Code</u>	<u>Change in Funded Amount</u>
2005 - - - 5284 - - 411C - - 371 - - - BS00 - - - - -	\$149,249.00

Reference Requisition: R5284050027

