Section 6 (Texas Traditional) Report Review

Form emailed to FWS S6 coordinator (mm/dd/yyyy): 5/6/2011

TPWD signature date on report: Click here to enter a date.

Project Title:
Reproductive biology, genetics and ecology of South Texas Ambrosia: Implications for Management, Recovery, and Reintroduction

Final or Interim Report? Final

Grant #: TX-E-110

Reviewer Station: Corpus Christi ESFO

Lead station concurs with the following comments: NA (reviewer from lead station)

Interim Report (check one):

- ☐ Acceptable (no comments)
- ☐ Needs revision prior to final report (see comments below)
- ☐ Incomplete (see comments below)

Final Report (check one):

- ☒ Acceptable (no comments)
- ☐ Needs revision (see comments below)
- ☐ Incomplete (see comments below)

Comments:

Although this is a final report, the work proposed to be accomplished with the original section 6 grant will be accomplished by another PI using the remainder of the funds. TPWD has thoroughly coordinated this change in PI's with the CCESFO. We look forward to seeing the work completed.

FINAL REPORT

As Required by

THE ENDANGERED SPECIES PROGRAM

TEXAS

Grant No. TX E-110-R

Endangered and Threatened Species Conservation

Reproductive biology, genetics and ecology of South Texas Ambrosia: implications for the management, recovery and reintroduction.

Prepared by:

Dr. Craig Farquhar

TEXAS PARKS & WILDLIFE

Carter Smith
Executive Director

Clayton Wolf
Director, Wildlife

14 January 2010

FINAL REPORT

STATE: Texas **GRANT NUMBER:** TX E-110-R

GRANT TITLE: Reproductive biology, genetics and ecology of South Texas Ambrosia: implications for the management, recovery and reintroduction.

REPORTING PERIOD: 1 Oct 08 to 28 Feb 11

OBJECTIVE(S): To acquire the basic genetic, ecological, and reproductive data currently lacking on South Texas Ambrosia (*Ambrosia cheiranthifolia*) necessary to scientifically manage extant populations and to write an evidence-based protocol for future reintroduction efforts.

Segment Objectives:

Nov. 2008-Mar. 2009

Visit all accessible sites with alive above ground stems and green leaves before stems senesce/freeze or are removed by mowing or other disturbances. Collect GPS data (permanent feature coordinates, polygons of patch extent). Make monitoring observations (population size by direct counting or sampling, general condition of the population, reproductive status and assessment of impacts on the population. Set up permanent monitoring markers for transects or quadrates as feasible. Determine what, if any, grass management techniques are being used. Establish a nested set of quadrates, patches and locations within Kleberg and Nueces Co. for preliminary genetic sampling gather DNA samples (leaves in silica gel) collect achenes according to CPC protocol and forward to appropriate facilities. Prepare herbarium specimens from sites for location and DNA vouchering. Optimize DNA extraction protocol and begin DNA extractions of preliminary samples. Microsatellite primer testing and optimization.

April 2009-May 2009

Visit selected sites : monitor ambrosia phenology , collect additional DNA material as needed. Collect multiple soil samples from within and outside of the Ambrosia populations for preliminary soil studky. Analyze preliminary soil samples for texture, conductivity, macro and micronutrients. Determine amount of variation in soil data to determine appropriate sampling scheme for full study. Gather community diversity/cover data in selected management treatment area comparisons. Continue DNA extractions. 9.Fragment analysis using automated sequencer on preliminary samples

June 2009 –Aug 2009

Monitor Ambrosia phenology. Establish management treatment sampling design. Collect additional soil samples and analyze. Enter soil, topography and community data into Arcview for GIS analysis 13 assist with fragment analysis. Analyze microsatellite data from preliminary samples

Sept 2009 -October 2009

Gather community diversity/cover data in selected management treatment area comparisons. Continue monitoring population size by direct counting or sampling, general condition of the population, reproductive status and assessment of impacts on the population. Sample collection and DNA extraction of main samples. Assist with field studies as needed.

Significant Deviations:

The subgrantee, Texas A&M-Kingsville, has requested a change in Principal Investigators as priorities there have shifted. A new Principal Investigator has been selection to continue the project. Work completed toward this project is summarized in the previously submitted 2009 Interim Report. The remainder of the scope of work, per instructions from Region 2 (USFWS), will be completed under a new grant utilizing remaining funds from TX E-110-R to be established upon submission by TPWD of necessary Application for Federal Assistance (SF-424) emailed separately.

Summary Of Progress:

Please see 2009 Interim Report for this project. This grant shall close upon grant expiration date and new grant will be established for remainder of project (see above).

Location: Texas, USA; and, Coahuila, Mexico.

Cost: Costs were not available at time of this report, they will be available upon completion of the Final Report and conclusion of the project.

Prepared by: Craig Farquhar Date: 14 Jan 2011

Approved by: Craig Farquhar Date: 14 Jan 2011

C. Craig Farquhar

INTERIM REPORT

As Required by

THE ENDANGERED SPECIES PROGRAM

TEXAS

Grant No. TX E-110-R

Endangered and Threatened Species Conservation

Reproductive biology, genetics and ecology of South Texas Ambrosia: implications for the management, recovery and reintroduction.

Prepared by:

Dr. Alice Hempel

TEXAS PARKS & WILDLIFE

Carter Smith
Executive Director

Clayton Wolf
Director, Wildlife

17 December 2009

INTERIM REPORT

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reproductive status and assessment of impacts on the population. Sample collection and DNA extraction of main samples. Assist with field studies as needed.

Significant Deviations:

None.

Summary Of Progress:

Please see Attachment A.

Location: Texas, USA; and, Coahuila, Mexico.

Cost: Costs were not available at time of this report, they will be available upon completion of the Final Report and conclusion of the project.

Prepared by: Craig Farquhar Date: 17 Dec 2009

Approved by: C. Craig Farquhar Date: 21 Dec 2009

ATTACHMENT A

2009 Interim Report

Reproductive Biology, Genetics and Ecology of South Texas Ambrosia : Implications for the Management, Recovery and Reintroduction

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Summary of Progress

TAMU-Kingsville -

1. Visit all accessible sites, collecting location, status and ecological data.

USFW suggested there are 29 total extant sites, but 24 are on NAS-Kingsville. We have visited all locatable sites that had extant populations within the last 25 years.

NUECES CO. Robstown area

1) Field between Housing project/Drainage canal (source area of Demonstration project)- EXTRIPATED: multiple site visits in 2008 and 2009 continue to reveal no remaining stems at this site. As this site is nearby extant sites, visits will continue for the foreseeable future.

2) North Nueces Co, Park roadside btw Co Rd 42 and Co Rd 44- EXTANT: - natural population first described by Dana Price in 2006, but not found in subsequent surveys. Rediscovered April 2009 - 758 stems in two sub-populations. Area is closely mowed and this is likely an undercount. Roadside is almost solid Kleberg Bluestem and mowed frequently. Vegetative stems only due to roadside management.

3) North Nueces Co. Park -Demonstration Project site - EXTANT and increasing:, despite invasive grass problems. Planted in 2006 on soil dredged to create pond at park. Multiple visits in 2008/09. Student surveys 11/2009 show approx 8 stems/m^2 and entire site probably contains between 2,400 to 3,000 stems. This is about 1/2-1/3 of the stems present in 2007-08 during optimal conditions.

4) Robstown Cemetery/ railroad tracts. Most likely EXTRIPATED- multiple site visits in 2008 and 2009 continue to reveal no remaining stems at this site. In conjunction with other rare and T&E species surveys we will continue to visit this site periodically.

5) Violet - On the railroad tracks 1/2 mile west of Violet, Texas, along Hwy 44, Violet - LIKELY EXTRIPATED: two site visits in 2008 and 2009 have shown no evidence of this population, but the high height and density of invasive exotic grass along the ROW make definitive survey difficult. We will continue survey attempts though out the period of the grant, as this population was extant within the last 10 years.

6) NUECES CO. Petronilla Creek - Hwy 70 EXTRIPATED - surveyed multiple times in conjunction with Slender Rush Pea recovery efforts underway at this location. No sign of Ambrosia remaining at this location. Has not been seen since the 1980s. Fall 2008 Carol Bush, who may have been the last to see it at this site, revisited the site and showed us where the plants had last been seen. Possible future re-introduction site in conjunction with Slender Rushpea recovery efforts.

7) NUECES Co. St. James Cemetery, Bishop Tx - EXTANT but declining: multiple site visits 2008/09 . Largest population of Ambrosia in Nueces Co. Recent student surveys 11/2009 showed an average of 10 stems/m^2 in good Ambrosia habitat area. Area occupied by Ambrosia is approx. 10,000 m^2 , but the plant is very patchily distributed within this area and density varies greatly. Invasive grass has greatly increased at this site and population density appears to be declining with increasing exotic grass cover.

8) Bishop City Park probably EXTRIPATED/UNKNOWN- no sign of Ambrosia in 2008 or spring 2009 visits. Resurvey needed since September 2009 rains.

9) US 77 ROW. West side. -EXTANT but declining: Multiple site visits 2008/09. Site burned due to roadside grass fire May 2008, Surveyed 10/2008 approx 850 stems. Invasive grass is high concern.

10) US 77 ROW East side - EXTANT but declining. This site is on/near the Nueces/Kleberg Co. line and to simplify is listed as Nueces Co though some individual stems may be in Kleberg Co. Multiple site visits 2008/09. Site has suffered multiple and continuing negative impacts. Fall 2008 roadside hit with what was determined later to be Round-up overspray from adj field. We were contacted by USFW and TXDOT to assess the extent of the damage and impact on both listed species Ambrosia and Slender Rushpea. Photo documentation of the damage and GPS points were collected and damage was mapped. USFW contacted the landowners and provided them with information on preventing overspray. Plants were damaged but did not die, but shortly thereafter we fully entered the exceptional drought of 2008-2009 and the plants were not evident and it was unclear if they would return. During the Summer of 2009 much of the area was disturbed and graded during fence replacement by the adjacent landowner. Despite these setbacks, the population was observed putting forth some vegetative growth following the rains in Sept 2009. A Plant and Soil Sciences graduate student is currently surveying both Ambrosia and Slender Rush pea numbers and photographing at permanent photo documentation sites established during the 2009 herbicide incident.

KLEBERG CO

Some US 77 ROW stems may be located in Kleberg county but for our purposes will be considered in Nueces Co. ,USFW lists 24 sites at NAS-Kingsville but this should really be considered within a meta-population model.

1) Naval Air Station Kingsville -EXTANT but declining. We participated in the 2008 annual military survey at the station. Invasive grass is causing declines at many sites and some sites were unable to be relocated. A burn in one field was planned to deal with multiple management issues but due to the drought it is not clear if this was carried out. Our prior contact Rich Riddle has left the position and the position was unfilled this fall when the survey normally takes place. It is unclear if/when the 2009 survey will take place this year.
2) King Ranch - UNKNOWN - these populations were last seen when land adjacent to NAS-K was leased to the Navy. The landowner is not amenable to endangered species

surveys at this time. Visual observation from adjacent federal lands suggest that at least some of the area is heavily infested with Kleberg bluestem.

2. Establish a nested set of quadrates, patches and locations within Kleberg and Nueces Co. for preliminary genetic sampling, collect vegetative material for DNA analysis and achenes for seedbanking

We have established a plan for collection but due to the exceptional drought, vegetative and reproductive material has only become available in the last 2 months. We are currently surveying known sites again, as only a few non-representative patches of plants were present during the drought (edge of road, areas able to collect limited water run-off) and the spatial and numerical size of most populations must be determined in order to properly sample these clonal plants.

Collection of achenes for seedbanking is postponed until the drought effects are fully known in order to avoid depleting the seed bank of populations that may be in recovery. Student research at the demonstration site has revealed very low rates of seed fill and low viability. Greenhouse germination attempts of over 900 seeds resulted in only one seedling. Achenes may not be a viable method of ex-situ conservation and studies will continue to see if this low viability holds for other populations of Ambrosia as well.

6. Monitor ambrosia phenology

Due to the drought most populations did not have vegetative material above ground in winter 2008 through 2009 until the rains in September 2009. Following the rains the plants exhibited a vastly compressed phenology compared to normal years and did bloom and set achenes, but collection and viability of achenes from 2009 have not been evaluated yet

7. Analyze preliminary soil samples for texture, conductivity, macro and micronutrients. Determine amount of variation in soil data to determine appropriate sampling scheme for full study

At our request NRCS gathered and analyzed soil samples from several sites in 2008, but found little or no differences that they thought were biologically significant from typical soils in the area. Prior soil tests have shown some texture differences and a distinct short grass flora exists that differs from the dominant mid-grass coastal prairie, so we have expanded our soil analysis beyond the basic set of tests to the soil morphology as one possibility is the presence of a hardpan or other structural feature of the soil column. We have arranged a collaboration with Catherine Simpson who teaches the soils courses in the Department of Plant and Soil Science, TAMUK. With her assistance we have examined soil maps and previously available soil data for many of the sites. She has visited several of the sites in Fall 2009 and confirmed that these populations appear to occur within inclusions that do differ slightly from the predominant surrounding Victoria Clay soils as earlier soil tests had suggested. A complete soil characterization including

soil cores is planned. The Plant and Soil Science Department acquired in November 2009 a specialized hydraulic soil probe that will greatly minimize the soil disturbance needed to obtain cores. Current soil conditions are too wet for proper sampling, but as soon as conditions improve we will gather the cores and can begin the first phase of the full soil characterization and analysis planned.

8. Gather community diversity/cover data in selected management treatment area comparisons

Species lists are being complied at each location, but due to the drought this is incomplete, but is planned to continue through the spring of 2010. A historical list of species collected on the Kleberg Clay prairies/short grass coastal prairie by Johnston, Jones, Carr and others who collected in the 1950's -1990's has been compiled from herbarium collections. This historical data will serve as a point of comparison for current diversity at current Ambrosia sites.

Cover data was gathered in 2008 at St. James and the Robstown Demonstration site, but student inability to distinguish native and exotic species vegetatively made this data of little use. Cover data will have to be obtained by paid students who can receive extensive training on vegetative identification. Management at all sites is currently only by mowing, though NASK had plans for a controlled burn in one field containing Ambrosia that is dominated by Kleberg Bluestem.

In December 2009 discussions had began with USFW and USDA (in conjunction with a Slender Rush Pea recovery project) regarding establishing some burn, mow and herbicide treatment plots in shortgrass prairie remnants for control of exotic grass species, but the acceptability to the landowner and general feasibility of this is unknown at this time. Discussions are on-going.

10. Establish management treatment sampling design,

management treatment study is dependent on finding willing landowner

11. Collect additional soil samples and analyze.

see # data collection underway

12. Enter soil, topography and community data into Arcview for GIS analysis

data collection underway

15. Gather community diversity/cover data in selected management treatment area comparisons .

see #8

16 continue monitoring population size by direct counting or sampling, general condition of the population, reproductive status and assessment of impacts on the population

see # 1

Progress on future goals

27 begin writing Reintroduction protocol

Attended the Center for Plant Conservation

CPC International Symposium October 21-22, 2009 in St.Louis. MO
"Evaluating Reintroductions As a Plant Conservation Strategy: Two Decades of Evidence".

Several possible reintroduction sites in Kleberg and Nueces county have been visited and evaluated, but according to established reintroduction protocols none are suitable sites in the near future. We have identified that establishing a successful short grass coastal prairie restoration and invasive grass control protocol was highly critical prior to any attempts to restore, augment or reintroduce any T&E species into these habitats. The demonstration site at the Nueces county park location has shown that proper site preparation and control of exotic grass species is critical. Though the South Texas Ambrosia established well at this demonstration site, it requires regular and constant maintenance and is likely to become extirpated if that maintenance ends.

There have been no successful attempts to restore native grasslands, particularly the unique short grass coastal prairie habitats in the Coastal Bend, so we have no guidance or experience to draw from. With the USDA Plant Material Center in Kingsville, and USFWS we plan to establish an experimental short grass prairie restoration site at the PMC. We will be collecting seeds and clonal propagation material of the short grass prairie native grasses and forbs for this project. They will use this material to establish germination and propagation protocols. A suitable site will be identified or created on the PMCs site or possibly with local landowner and various exotic grass control measures will be tested. Once some measure of control of the exotic grass has been established we will attempt to restore a short grass coastal prairie community. We will also include a number of T&E species and other species of concern in this experimental site, so that effects invasive grass control methods on these species can be tested on this experimental restoration site, prior to being used at the few remaining native habitats. There is a great deal of clonal material of South Texas Ambrosia available from botanical gardens (San Antonio & Mercer) that is not suitable to be reintroduced into existing sites, that could be used for this experimental prairie, without impacting the existing natural populations.

Significant Deviations

#2 DNA and seed collection: Reporting period covers one of the historically worst droughts in South Texas in the last century. This was classed by the US Drought Monitor at the most extreme category D4 -Exceptional drought and comparisons are made to the historic drought of the 1950's. Until rains began to resume in September and October 2009, many areas of Nueces & Kleberg counties recorded as much a 9 months with no measurable rainfall. As of early December 2009, the area is still classed as D2-severe drought category and is suffering a year to date rainfall deficient of 15-20 inches out of a total normal average rainfall of only 26.5 inches. Kleberg county for the first time in recorded history suffered a 100% loss of the cotton crop, and Nueces county 95%. As most of South Texas Ambrosia habitat in Kleberg and Nueces counties was lost to plowing for cotton fields, cotton crop performance is an excellent proxy indicator of climatic and growing conditions at Ambrosia locations.

South Texas Ambrosia is a clonal stoloniferous perennial plant, and during unfavorable growing conditions there is no above ground growth present. At extant sites, it was possible to find a few stems with dried or weak vegetative growth in microsites that collected road run-off, or nearby landscaping runoff, but these stems were not representative of the population. Additionally due to plant stress and dehydration vegetative material from these stems is generally considered poor material for DNA extraction due to high levels of secondary plant compounds, low plant DNA content and high content of contaminating fungal, viral or bacterial pathogens DNA.

Following the resumption of rains in September/October 2009 many of the Ambrosia locations experienced rapid resumption of vegetative and reproductive growth in a highly compressed Fall growing season. Though some achenes are available currently, seed removal has been postponed until next reproductive season (possibly late spring 2010 if rainfall is adequate through the winter). Seed viability is low and it is unknown in natural conditions what the germination and survival rate of seedlings is, but based on greenhouse studies we have conducted it is likely very low. It is highly probable that any seedlings that might have germinated in the fall of 2008 prior to the most severe drought conditions, did not survive the 2008-2009 drought. We saw losses of well established plants, so survival of seedlings with no stored reserves is almost certain. Given the loss of established plants, no new seedling recruitment nor any achene production during most of the reporting period, it was decided that any achene removal resulting from the current reproduction could have negative effects on the populations.