Section 6 Performance Report Review

Attachment to letter dated: March 5, 1998

Project : Attwater's Prairie Chicken Restoration Project

Final or Interim report? Final

Job # : 24

Report:

____ is acceptable as is

____ is acceptable as is for interim report, but the following comments are made for future reference

_X_ needs some minor revision

More specific information about the program at Texas A&M University is needed. The Service needs details about what worked and what did not. For example, early in TAMU's involvement in the captive breeding program, they experienced significant mortality of greater prairie chickens from GI tract impaction due to eating coarse grass. Two Attwater's males were lost to impaction as well. That problem and its solution needs to be documented. Other problems that were dealt with also need to be documented, including those dealing with diet, salmonellosis, snakes, fire ants, etc.

The Service is willing to extend the reporting period until the dissertation (mentioned in the report as being in preparation) that will provide this information is completed. A copy of the completed dissertation will be acceptable as a final report for this project.

FINAL REPORT

As Required by

THE ENDANGERED SPECIES PROGRAM

TEXAS

Grant No. E-1-9

Endangered and Threatened Species Conservation

Project No. 24: Attwater's Prairie Chicken Restoration Project

Project Coordinator: Lee Ann Linam

Principle Investigator: Royce Jurries and Nova J. Silvey

Gary L. Graham
Program Director, Endangered Species

Andrew Sansom
Executive Director

January 30, 1998

FINAL REPORT

State: Texas **Grant Number:** E-1-9

Grant Title: Endangered and Threatened Species Conservation

Project Title: Attwater's Prairie Chicken Restoration Project

Contract Period: September 1, 1989 through August 30, 1997.

Project Number: 24

Objective: To develop methods and techniques for propagation of Attwater's Greater Prairie Chicken in captivity while retaining wild behavior in captive birds; to evaluate release methods of captive birds; and to manage private land for Attwater's Greater Prairie Chickens through leasing agreements.

Submitted by: Lee Ann Linam **Date:** November 1, 1997

Approved by: _____ **Date:** January 31, 1998
Neil (Nick) E. Carter

Need:

Prairie chickens (*Tympanuchus cupido*) were once widely distributed throughout the United States (Aldrich 1963, Johnsgard 1983); however, characteristics that make grasslands prime habitat for prairie chickens also make them prime habitat for human exploitation. Throughout this century much of the native prairie has been converted for agriculture (e.g. row crops) and urban use. As a result, the remaining prairie covers only a small fraction of its original expanse and has become severely fragmented. Concomitant with this loss has been degradation of the remaining prairie due to overgrazing and brush invasion. This has led to the dramatic reduction in the numbers and distribution of prairie grouse (Aldrich 1963, Johnsgard and Wood 1968, Johnsgard 1983).

Of the 3 subspecies of prairie chicken, the greater prairie chicken (*T. c. pinnatus*) has the largest extant populations (Johnsgard 1983). Although some populations have been reduced or even eliminated, this subspecies continues to thrive in many of the Central Plains states, where population estimates are still in the hundreds of thousands.

The heath hen (*T. c. cupido*) originally inhabited the scrub–oak plains of the Atlantic coast from Maine and Massachusetts to Virginia and possibly the Carolinas (Gross 1963). During early colonial times these birds were so abundant throughout Massachusetts that laboring people and servants stipulated with their employers not to have heath hen brought to the table more than a few times a week (Nuttal 1832 in Gross 1928). However, as colonization of the east coast progressed, populations of heath hen rapidly disappeared. Although conservation measures were enacted around the turn of the century, the subspecies was extirpated by 1932 (Gross 1963).

The plight of the Attwater's prairie chicken is similar to that of the heath hen. An estimated 1 million Attwater's prairie chicken (APC) once inhabited 2.4 million hectares of tall grass prairie habitat on the Gulf Coast of Texas and Louisiana (Lehmann 1941). By 1967, only 1,070 birds occupied 12 Texas counties, and in 1967 the subspecies was placed on the federal Endangered Species List (Lawrence and Silvy 1980). Today (1997), human induced habitat loss and fragmentation have further reduced this subspecies to 3 small, isolated populations totaling fewer than 60 birds (U.S. Fish and Wildlife Service, unpubl. reports).

The APC is the only endemic endangered bird in Texas, and its decline is stimulating concern by Federal, State, and private conservation groups. The wild population reached a low of 21 males during spring 1996. In all 3 counties where the birds are found, the population of males declined to less than 10. Throughout the history of decline of the species no county population has ever recovered once they have reached these low numbers (Seal 1994). The precursors to these alarming statistics were the need that paved the way to this project whose goals were to improve existing and potential habitat on private lands, establish a captive breeding program for the species, develop reintroduction techniques, and eventually used captive-reared birds to supplement existing populations and re-establish additional populations.

Results:

Project funds were used to support private lands habitat improvements from 1990 through 1997, captive breeding efforts at Texas A&M University from 1990 through 1996, captive breeding efforts at Fossil Rim Wildlife Center in 1995-96, and construction of a public education display and captive

breeding equipment at Houston Zoological Gardens in 1996-97.

HABITAT IMPROVEMENT OF PRIVATE LANDS

Lowery Lease, Victoria County

The Lowery Ranch was one of two ranches in Victoria County that still had a few Attwater's prairie chickens when the Section Six program started in 1990. This 2100 acre ranch was leased June 1, 1990. The ranch had been badly overgrazed for several years. The first year lease agreement called for total removal of cattle.

The year of rest combined with above average rainfall resulted in a lush stand of little bluestem and Indian grass. The lease was continued for two more years at half the rate paid the first year. The ranch was stocked with cattle at a light stocking rate the last two years of the lease.

The owner has continued to stock the ranch at a moderate rate and it continued to be an excellent tall grass prairie. Unfortunately the chicken population had declined to such low level (one male in 1991) by the time the prairie was restored, that they disappeared from the ranch.

Cliburn Lease, Victoria County

The Cliburn Ranch was the other ranch in Victoria County that still had chickens (three males in 1991) when the Section Six program started. This 1250 acre was leased September 1, 1991 through January 1, 1995. The lease agreement was that cattle stocking rates would be regulated by the Texas Parks and Wildlife Department and TPWD would treat the brush on the ranch.

An invasion of mesquite, huisache and running liveoak was occurring on the ranch, resulting in a loss of the prairie. The one time brush treatment was in October, 1991 and resulted in an excellent brush kill. The landowner has now started a burning program to help prevent the invasion of woody species.

The prairie chicken response, unfortunately, was the same as on the Lowery Ranch. The last bird seen on the ranch was one rooster in the spring of 1992.

Kaechele Lease, Austin County

The three year lease on this 1200 tract of land adjacent to the Attwater's Prairie Chicken Refuge became effective September 1, 1990. This part of the Kaechele Ranch had been good chicken habitat until it was taken over by McCartney rose. The lease agreement gave TPWD control over grazing rates in exchange for treating the rose bushes. This area was treated twice with Grazon P+D to control the roses. It was also burned two times to help eliminate the rose problem.

The rose control program was quite successful. The area has been restored to excellent prairie and now good chicken habitat, although no chickens are currently using it at the present time as the chickens on the Refuge are on the opposite end from the Kaechele tract. However, the Kaechele Ranch will be the first private release site for captive raised Attwater's prairie chickens.

The owner of the ranch has continued the program of rose control and burning to restore the prairie. He is currently working closely with the Parks and Wildlife Department and the U.S. Fish and Wildlife Service to improve the grasslands on his ranch.

Zaruba Lease, Austin County

The Zaruba lease was a 100 acre meadow in Austin County. A four year agreement started on October 1, 1991. The lease agreement limited the meadow to being cut only once each year and after July 1. The meadow provided excellent nesting cover for chickens. There was a booming ground just across the fence from the meadow. In the spring of 1992 there were five males on this booming ground. There were only 24 males remaining in the county at this time.

Bollinger Lease, Austin County

This 385 acre meadow was leased for the period of June 1, 1993 through May 31, 1996. The landowner was limited to one cutting of hay each year after July 1. The last active booming ground in Austin County was on this property. It also provided excellent nesting cover in an area where surrounding ranches had little or no nesting cover.

The last three know Attwater's roosters in Austin County were captured on the booming ground on this meadow and placed in the captive breeding program in 1995. The loss and fragmentation of habitat in the area resulted in the total decline of the chickens.

Lincoln Lease, Austin County

This 170 acre tract was located between the Bollinger and Zaruba property. It was approximately one mile from both of these properties. This place was leased in an attempt to provide native prairie in an area near the two places that still had booming grounds on or near them. Most of the other pastures in the area had been badly overgrazed.

This lease ran from September 1, 1992 through October 31, 1995. The first two years no grazing was allowed. Light grazing was allowed during the last year of the contract. However, the lack of enough good habitat and the extremely low number of birds when the program started resulted in no response to the program.

Summary

Despite its innovative approach, the Section 6 lease program was started too late to benefit the birds because by the time the habitat was improved on a Section Six lease the birds had disappeared. However, the Kaechele tract will play a key role in the release of captive raised birds. Also, some of the landowners have continued the management practices that were initiated by the TPWD and have continued to maintain the native prairie on their property.

CAPTIVE PROPAGATION

All of the findings presented below are drawn from annual permit reports prepared by staff of the Attwater's Prairie Chicken National Wildlife Refuge. A more complete analysis of the captive

breeding efforts at Texas A&M University will be reflected in a doctoral dissertation currently in preparation.

Texas A&M University

During 1990 breeding pens in a radial design were constructed at Texas A&M University (Figure 1). Captive propagation efforts began in the spring of 1991 when 23 greater prairie chickens from Kansas were placed in facilities at Fossil Rim Wildlife Center and at Texas A&M University. Work at these locations focused on developing captive propagation and reintroduction methods that would hopefully be directly transferable to the Attwater's. During 1992 and 1993 Texas A&M University continued to work with wild-caught and captive greater prairie chickens to develop captive rearing techniques and as a part of their investigation of release and repatriation technology.

The most serious problems encountered at TAMU during 1993 were related to photoperiod. Captive-reared GPCs from Minnesota (1 male, 1 female) and wild-caught GPCs from Kansas (1 male, 6 females) were brought to College Station for incorporation as surrogates in the APC program. Because Minnesota birds have 18 hours of daylight at the peak of their breeding and College Station only has 14 hours in June, the Minnesota birds never came into breeding condition and the 2 Kansas females placed with the Minnesota male all produced infertile eggs. Also, because the Kansas birds needed 14 hours of daylight to breed, they did not breed until mid-May, and eggs were produced a month later than they would have been if the birds had been in Kansas. This caused problems with egg viability due to the extremely hot ambient temperatures recorded in College Station during late May and June

During the 1993 season only 3 of the 4 hens with the Kansas male produced eggs. Of 57 eggs laid by these 4 hens, 49 (85.9%) were fertile. Of these 49 fertile eggs, 26 (53.1%) hatched. Fourteen chicks (53.8%) have survived to adult age. For reference, hatching success observed by Watkins (1971) was 90.5% for artificially incubated wild eggs, and Morrow (1986) recorded hatching success of 85.0% in wild nests. Lehmann (1941:16) observed that 93.0% of 71 eggs in 7 wild nest hatched. McEwen et al (1969) found that in 526 captive-produced GPC eggs fertility was 51.3%, hatching success was 52.6%, and survival to maturity was 33.8%. A final example of comparative data was derived by Kruse (1984), working from 1972 through 1975 with 112 hens, which laid a total of 2,591 captive-produced eggs. During the course of this 4-year study fertility was 72.0%, hatching success was 76%, and survival to 8 weeks of age was 58%.

Experimental rearing techniques dealt with at TAMU included (1) rearing GPC chicks by hand in an indoor brooding pen; (2) allowing an adult GPC to hatch and raise her own young, (3) placing day-old GPC chicks with bantam hens, and (4) placing day-old domestic "trainer" chicks in with the GPC chicks. All chicks were fed live insects (except for the chicks reared outdoors by the adult GPC), chick starter and water ad libitum. GPC chicks did not consume large quantities of chick starter until they reached at least 4 weeks of age. The only really successful rearing technique was hand rearing. Both the bantam hen and day-old domestic chicks competed with the GPC chicks for insects. The adult GPC hen was seen trampling her chicks to death while responding to a booming male in an adjacent pen. These chicks were apparently weakened due to insufficient insect numbers in the outdoor pen.

In 1994 a total of 23 eggs collected from wild APC nests in Galveston and Refugio counties were

transported to Texas A&M University for incubation and rearing. Of these eggs, 22 or 96% hatched. Chick rearing success was 77%, with 17 chicks surviving. In addition to the collected eggs, 5 wild males were collected from Colorado (2) and Austin (3) counties.. Two of these males were transported to Texas A&M University, two to Fossil Rim Wildlife Center, and one to the Houston Zoo. Unfortunately, both Texas A&M University birds died within two weeks due to impaction of the gastrointestinal tract with coarse vegetation used as dietary supplements and bedding material for the pen floor.

Texas A&M University's facility experienced an outbreak of a viral disease beginning in December 1994. This virus, known as avian reticuloendotheliosis virus (REV) caused nodules on the skin and internal organs Birds also commonly experienced secondary avian pox infections. From December 1, 1994 to May 11, 1995, 5 Attwater's at the TAMU facility were suspected or confirmed to have died from REV. Another bird died of avian pox during that period. Of the ten Attwater's remaining, 8 tested positive for REV or its antibodies.

As a result of this disease outbreak, TAMU's facility was quarantined. Previous research indicated that the incidence of vertical transmission of REV through the egg was less than 4%; therefore remaining Attwater's at this facility were allowed to breed, and then were placed in internal quarantine in a closed building. These birds were then exposed to an artificial light regime to accelerate their reproductive schedule. All offspring from these original infected birds initially tested negative for REV and its antibodies; however, some problems with the testing protocol were later discovered. In total, TAMU produced 54 eggs from 4 hens in 1995. Seventy percent (38) of these eggs were viable, and 24 (or 63% of the viable eggs) hatched. A total of 16 chicks (or 67% of the hatched eggs) survived.

Data from the three facilities (TAMU, Fossil Rim Wildlife Center, and Houston Zoological Gardens) indicated two trends: (1) viability of captively-produced eggs was much lower than those collected from the wild, and (2) the number of eggs produced per hen at TAMU and the Houston Zoo was barely equivalent to one complete clutch in the wild. Both of these observations could be related to the fact that birds in all 3 facilities were moved into breeding pens much later (late-February to early-March) than had been proposed because of the unforeseen need for REV testing and also because of delays in pen construction. In some cases, birds were already actively booming by the time they were moved into breeding pens.

In 1995 Texas A&M University's facility continued to experience porblems with REV. Problems with the reliability of REV test results led to exposure of most Attwater's at TAMU to REV prior to or during the 1996 breeding season. When problems with the testing protocol were resolved, all potentially exposed birds were ultimately isolated in internal quarantine facilities. Offspring from these birds were kept separate from offspring produced by REV-free birds. Repeated REV tests indicated that all 1996 offspring were REV-free. Data from TAMU and other facilities now indicate transmission of the disease from an outside source, such as migrtory birds.

Photoperiod Manipulation. Three female and 2 male APC were isolated from the rest of the breeding flock at TAMU because test results indicated positive exposure to REV. These birds were placed under photoperiod manipulation to determine (1) whether or not Attwater's could be bred under artificial light regimes, and (2) what light regimes were optimal for production. Birds were first housed at 8 hours of light starting 1 August 1996 for 2 months. Light duration was then increased

1 hour every 2 weeks until 16 hours of light was reached. Egg production started on 29 January 1996. Of the 28 eggs produced, 12 (43%) hatched, 6 (21%) were non-viable, and 10 (36%) were fertile but failed to hatch. Only 2 (17%) of the hatched chicks survived. Heavy chick mortality was noted in August and September due to space restrictions resulting from the REV quarantine.

Hybridization Experiments. In order to determine the feasibility of producing Attwater's-greater prairie chicken hybrids in the event that such a breeding strategy becomes necessary at some point in the future, TAMU paried 2 felame greater prairie chickens with 1 male Attwater's. All 3 of these breeding birds tested positive for REV. Sixty-two hybrid eggs were produced, resulting in 18 (29%) hybrid chickes. Eighteen of the eggs produced by the hybrid pairing were infertile, and 26 were fertile but failed to hatch. Only 2 (11%) of the hatched chicks survived. This experiment was conducted under photoperiod maniuplation as described in the previous section. Table 1 shows a comparison of production and rearing success for the hybrid pairing compared to Attwater's pairs under similar conditions (photoperiod manipulation).

Fossil Rim Wildlife Center

During 1995-96, 14 hens at Fossil Rim laid 126 eggs. Egg viability was 48% (61 eggs), hatching success was 80% (49 chicks), and 21 chicks were raised to at least 8 weeks of age (43% survival). Problems were experienced with egg production and egg fertility, possibly due in part to stress associated with the sterility of pen substrates (pens were at that time essentially maintained with bare sand substrate and very little vegetation). Three APC were lost in the pens to great-horned owl predation during the fall. Apparently owl(s) were flushing the birds in the pens and then grabbing them through the top netting. As a result, all Attwater's were wing-clipped. Nine Attwater's from Fossil Rim were released on the Attwater Prairie Chicken National Wildlife Refuge during August.

Houston Zoological Gardens

Section 6 funds were used to purchase a few supply and equipment items for the Houston Zoo in 1996. During that year, 8 hens produced 165 eggs. Viability was 93% (154 eggs), hatching success was 70% (108 chicks), and 78 chicks survived to at least 8 weeks of age (72% survival). In addition, the Houston Zoo hatched 8 of 13 eggs collected from the wild and raised 7 of those chicks to at least 8 weeks of age. A total of 60 Attwater's from the Houston Zoo were ultimately released into the wild at the Attwater Prairie Chicken Nwr and The Nature Conservancy's Galveston Bay Prairie Preserve.

In 1996-97 the Houston Zoo used project funds to construct an exhibit for public viewing of APC. The exhibit, which was constructed using several sources of funding, features 8 APC not currently in the breeding program in a pen with native vegetation and eastern bluebirds. A kiosk displays several high quality graphics about the Attwater's and two video presentations.

Captive Breeding Summary

Total captive populations at of November 1996 are presented in Table 2. Reintroduction efforts for Attwater's Prairie Chickens have moved somewhat more slowly than originally anticipated in this proposal, primarily due to setbacks from the emergence of the reticuloendotheliosis virus. REV at

this time continues to be a major challenge to the captive breeding effort, as the recovery team struggles to understand management of the virus in both captive and wild populations. Despite these setbacks, however, the reintroduction process has gone on to provide initial successes, using funding from a variety of sources. Techniques were tested in a pilot release of 13 male APC on the national wildlife refuge in 1995. Refined techniques resulted in survival of 31 of 69 APC released in 1996 to the 1997 breeding season. Initial survival of birds released in 1997 is encouraging. The captive-breeding facilities, which now include the San Antonio Zoo, continue to try to improve productivity and survival of released birds through research on diseases, rearing techniques, diets, and pen design.

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Prepared by: Lee Ann Johnson Linam **Date:** November 20, 1997
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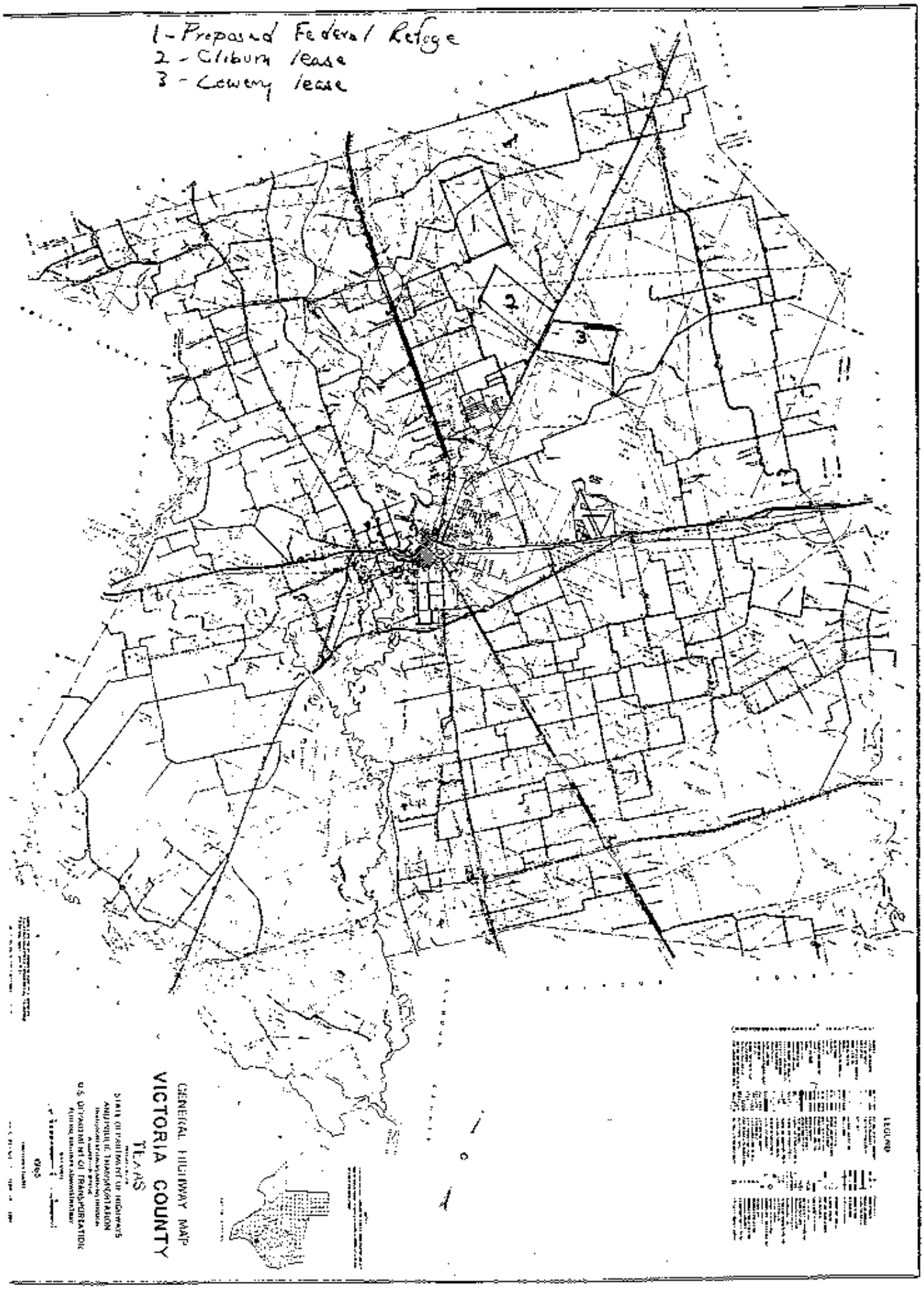
Figure 1 - Location of habitat improvements for Attwater's Prairie Chickens on private lands in Victoria county.



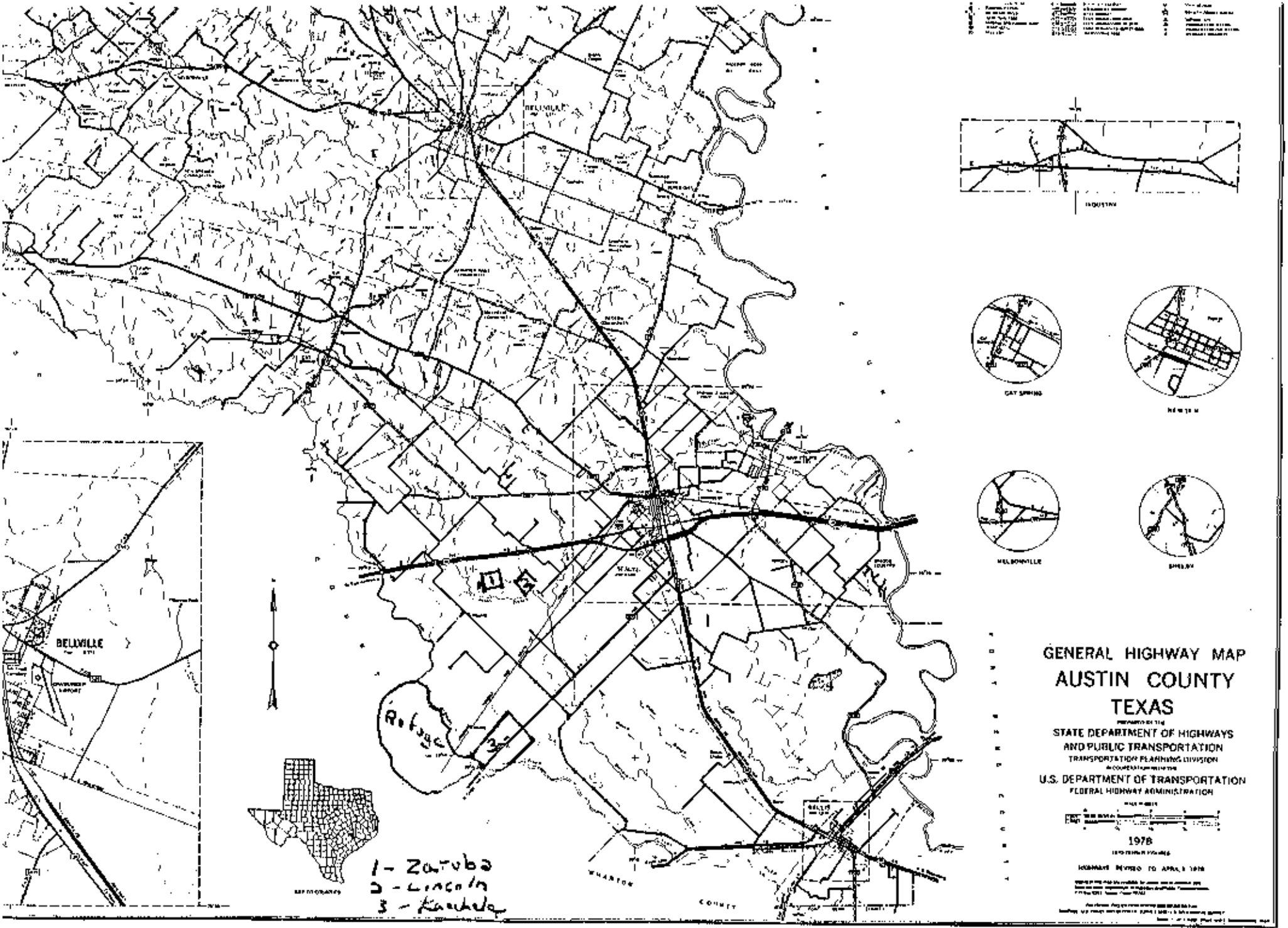


Figure 1 - Location of habitat improvements for ANCs on private lands in Austin Co.

Table 1. Comparison of Attwater's prairie chicken captive breeding success under ambient conditions (outside breeding pens), photoperiod manipulation, and the hybridization of a male Attwater's with female greater prairie chickens. The hybridization experiment was also conducted under photoperiod manipulation. All breeders under photoperiod manipulation were REV positive.

	Ambient Conditions	Photoperiod Manipulation	Hybrid/Photoperiod Manipulation
Eggs	155 (10 hens) (15.5/hen)	28 (2 hens) (14/hen)	62 (2 GPC hens) (31/hen)
Viable eggs	90 (58%)[a]	22 (79%)	44 (71%)
Hatched	45 (53%)[b]	12 (55%)	18 (41%)
8-week survival	26 (58%)	2 (17%)	2 (11%)

[a]Because of problems with REV, birds were paired late in the breeding season. This likely led to some hens not breeding, contributing to 26 eggs determined to be non-viable. Of the 39 remaining eggs included as non-viable, most were dumped and broken in pens, and a few were taken by snakes. It should be noted that most breeders at TAMU were later determined to be REV positive.

[b]A clutch of 5 eggs were destroyed by fire ants during hatching. These were not included as successful hatches.

Table 1. Attwater's prairie chicken captive population as of November 21, 1996.

Facility	Males	Females	Unknown	Total
Fossil Rim	12	18	0	30
Texas A&M	9	7	18	34
Houston Zoo	16	14	0	30
San Antonio Zoo	5	1	0	6
Total	**42**	**40**	**18**	**100**