VERTEBRATE ANIMALS
OF
LAKE MEREDITH NATIONAL RECREATION AREA
AND
ALIBATES FLINT QUARRIES NATIONAL MONUMENT

POTTER, MOORE, AND HUTCHINSON COUNTIES, TEXAS

RESULTS OF A 2001-2003 ZOOLOGICAL INVENTORY
AND RELATED RESEARCH AND REVIEWS

FINAL REPORT
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Vertebrate Animals of Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument Potter, Moore, and Hutchinson Counties, Texas

INTRODUCTION

This project was undertaken by the Texas Conservation Data Center (TxCDC), as a part of a larger project with the National Park Service (NPS) and the Botanical Research Institute of Texas (BRIT) to perform inventories of vascular plants and vertebrate animals. The project's basis was the "Study Plan for Biological Inventories, Southern Plains Network, National Park Service" (National Park Service 2000). The plan was written as a cooperative effort between the NPS and the Colorado and New Mexico Natural Heritage Programs, the Kansas Natural Heritage Inventory, and the Texas Conservation Data Center of The Nature Conservancy. The goal of the portion of the project addressed herein was to provide park managers with documented vertebrate inventory information in an accessible and useful format.

Study objectives

Study objectives followed those laid out in the "Study Plan for Biological Inventories, Southern Plains Network, National Park Service" (National Park Service 2000). They were to:

1. Compile and critically review historic data for vertebrates believed to occur at Lake Meredith National Recreation Area (LAMR) and Alibates Flint Quarries National Monument (ALFL) from a variety of sources including museum records of voucher specimens, previous studies, park databases, etc.
2. Conduct field investigations, where quality data did not exist, to document the occurrence of a majority of the species of vertebrates occurring in these two parks.
3. Evaluate existing and new data to determine the completeness of the inventories. The goal was to document 90% of the species.
4. Describe the need for future studies to determine the distribution and relative abundance of species of special concern, such as threatened and endangered species, exotic or invasive species, and other species of special management concern occurring within LAMR and ALFL boundaries.
5. Gather inventory data by methods that will assist Southern Plains Network parks in developing park-specific "vital signs" monitoring programs.

Documentation Standards

Documentation standards for this biological inventory project call for investigators to document all pre-existing data and reports, pertinent proposed sampling effort information, and the resulting information from any sampling efforts undertaken into the appropriate NPS databases. They also require that all rules and regulations that pertain to biological sampling on NPS lands be followed. Specimens collected in NPS areas are considered property of the NPS. The collection data was entered into the NPS Automated National Catalog System Plus (ANCS+). Copies of field notes, raw data, final reports, and other records associated with the research were accessioned and cataloged with the specimens.

Voucher Standards

For information on vertebrate species uncovered in initial information research, records were accepted and included in NPS databases only if adequately verified. Acceptable types of vouchers for all animal taxa included certified documentation, physical specimens, photographic evidence, auditory evidence, and

positive visual identification. Types of acceptable certified documentation included scientific journal articles and technical reports by qualified professionals in the field. TxCDC staff determined whether existing records were adequately documented as part of the information review. However, species not recorded in the parks for >10 years were excluded from the overall species list. Undocumented species reported by other observers were not included in the species list. Previously recorded and undocumented species were dealt with in the section entitled "Species Potentially Occurring in the Parks" (pages 41-46).

In cases where the investigator was unable to confidently identify a physical specimen, a qualified professional was consulted. West Texas A&M University has a standing agreement with the NPS to curate specimens collected in this study. Threatened and endangered species were not collected (unless found dead) or unless identification was impossible in the field (as with Arkansas River Shiner). Auditory evidence was gathered in the form of a recording, when possible. When not possible, an expert in respective fields of study was used for any particular record to be considered valid. Positive visual identification was performed by qualified personnel, and was only used when other types of identification were not possible. Each taxon had a separate level of acceptability for voucher types, and not all of the types mentioned above were used for all.

Fish Species

Vouchers for fish species were allowed to be in the form of photographic evidence, scientific journal articles and technical reports, visual identification, and physical specimens.

Amphibians and Reptiles

Vouchers for amphibian and reptile species were allowed to be in the form of photographic evidence, scientific journal articles and technical reports, auditory recognition, visual identification, and physical specimens. Photographic evidence was used whenever possible, making sure that positive identification was possible. Photographic vouchers are included as deliverable items related to this technical report provided to NPS. A qualified herpetologist authored any journal articles or technical reports accepted as verifying any species presence. The investigator, who has considerable experience as a field herpetologist, performed auditory identifications, and used sound recording evidence as a voucher. Visual identification was used only in cases where other means of verifying were not possible. Physical specimens were required only for difficult to identify species (except threatened and endangered species).

Breeding Birds

Vouchers for breeding bird species were acceptable in the form of photographs or sound recordings, scientific journal articles and technical reports, and physical specimens (only if a bird was found dead). The investigator, who is familiar with visual and audio identification of birds of the area, collected all field data. Only journal articles and technical reports written by qualified biologists were accepted to verify species presence. Photographic vouchers are included as deliverable items related to this report.

Mammals

Vouchers for mammal species were acceptable in the form of photographic evidence, scientific journal articles and technical reports, and physical specimens. Photographic evidence was used whenever possible, as long as positive identification was possible. Allowable photographic voucher evidence for mammal species included photographs of individual animals, or photographs of tracks that can be positively identified to the species level by a qualified biologist. Photographic vouchers are included as deliverable items related to this technical report provided to NPS. Only journal articles and technical reports written by qualified biologists were accepted to verify species presence. Physical specimens were taken in cases of species that are difficult to identify otherwise.

Study Area

LAMR is located within the western extension of the Rolling Plains in the Texas Panhandle (Potter, Moore, and Hutchinson counties) and encompasses 18,216 ha (44,978 acres) of uplands, arid plains, wetlands, and 4,000 ha (10,000 acres) of open water (see Map 1). ALFL comprises 555 ha (1,371 acres) adjoining LAMR in the northeastern part of Potter County (National Park Service 2000, 2001[also, see Map 1]).

This area of Texas is comprised of gently rolling to moderately rough topography. Narrow, intermittent stream valleys flowing east to southeast dissect it. The Canadian River rises in the Sangre de Cristo Mountains of New Mexico and flows eastward across the semiarid Texas Panhandle and into Oklahoma. The Canadian River has carved a narrow, steep-walled canyon from 60-90 m deep and up to 3.3 km wide. Between this canyon and the surrounding caprock, many tributary streams have created a rough and broken topography, known as the Canadian River Breaks. Over 71% of ALFL and over 67% of the land base at LAMR are comprised of slopes greater than or equal to 12%. Construction of the Sanford Dam between these "breaks" created a large reservoir, Lake Meredith, in 1962. Lake Meredith was formed primarily to allow impoundment and diversion of water for municipal and industrial purposes.

LAMR consists of Lake Meredith and surrounding lands, and is managed by the NPS for recreational uses. ALFL is noted for its quarries of flint that were used by Paleoindians as raw materials for manufacture of tools and weapons. Numerous Panhandle Aspect village ruins and a series of petroglyphs are found within the national monument in association with the concentration of 734 flint quarry pits (National Park Service 2001).

Climate in the region is semi-arid with considerable annual ranges in temperature. The average year-round temperature is approximately +10 C (50 ^{o} F), with an average of - 7 C (20 ^{o} F) in the winter and 33 C (93 ^{o} F) in the summer. The Canadian River Basin receives an average annual rainfall of 500 mm/year. Seventy percent of the precipitation falls between April and September. The area receives almost constant winds with an average of 19-22 km/hour. During early spring, however, wind velocities often reach 48-64 km/hour, considerably increasing evaporation rates (estimated to average 60-65% of the total precipitation).

The predominant vegetative cover is comprised of blue grama, little bluestem, and buffalo grasses. Interspersed with the grasses are scattered clumps of sand sagebrush, yucca, broom snakeweed, plains pricklypear, feather dalea, one-seeded juniper, and mesquite. Stands of cottonwood and hackberry trees are found in side canyons along the Canadian River and Lake Meredith. Varying lake levels have encouraged the encroachment of salt cedar in floodplain areas (National Park Service 2001). The most common vegetation types present in the two parks are grasslands or shrublands, including yucca grassland, mesquite savanna, mixed grassland, cottonwood savanna, vegetated cliffs, disturbed grassland, shoreline scrub thickets, etc. Wetlands occurring in the area include riverine, lacustrine, and palustrine types comprising approximately 34% of the park area (National Park Service 2001).

Oil and gas exploration and development have been actively pursued in the vicinity of LAMR and ALFL since the late 1920s, well before establishment of the parks. The earliest well on record within what later became LAMR was completed on October 3, 1927. Many others followed. In the parks today, there are 170 active well sites, evidence of 15 abandoned (unreclaimed) operation sites, 64 km of active oil field access roads, 167 km of abandoned roads, and 6 km of existing oil and gas pipelines (National Park Service 2001).

METHODS

Fish Surveys

Seines, dip-nets, electro-shocker and minnow traps were used to sample fish during this study. At NPS request, sampling efforts were focused on parts of the Canadian River and associated creeks providing potential habitat for the federally endangered Arkansas River shiner (*Notropis girardi*). This included areas south of Coetas Creek (Potter County). The 2002-2003 survey did not target Lake Meredith proper except in shallow shoreline areas of Big Blue Creek Bay (for more detail on sampling locations, see Map 2).

Twenty-five stations were sampled in June, 2003, including the Canadian River north of Mullinaw Crossing and south of Chicken Creek, Chicken Creek, Bonita Creek, Big Blue Creek and shoreline parts of Big Blue Creek Bay. Sampling was carried out at eighteen stations in November, 2003, mostly in the Canadian River downstream from Bonita Creek and at the Plum Creek area, and at Sanford Marsh (see Appendices 1 and 2 for site locations and descriptions and Map 2). Sampling methods depended on water depth and other factors. Following dry weather conditions in spring-early summer 2003, the Canadian River north of Mullinaw Crossing and Big Blue Creek were reduced to a chain of pools and shallow sections with intermittent flow. At the same time, the depth of Chicken Creek did not exceed 10-15 cm, on average. Pools and shallow creeks were sampled with seines where possible. Dip-nets were used where seining was not possible. In mid-June, 2003, water level in the Canadian River raised substantially following the arrival of rains, and seines could be used to sample roughly 20 m transects there. In November, 2003, there was flowing water in the Canadian River from Rosita Meadows to approximately 1 km downstream from Chicken Creek, and then from Mullinaw Crossing to downstream from the Plum Creek boat ramp. Surveys at Sanford Marsh and some surveys conducted at the Canadian River in November combined seines with an electro-shocker. Minnow traps and seines were used to survey marshy areas of Bonita Creek.

Amphibians, Reptiles, and Mammals

Original plans called for most of the sampling for amphibians and reptiles to be performed jointly with surveys for mammal species (National Park Service 2000) with a combination of trapping array stations and coverboard stations. However, field and logistical conditions led to a decision that sampling techniques for amphibians, reptiles and small mammals in the study area should be modified. Alterations to methods were agreed upon between the investigator and the NPS staff, and made as indicated in the following paragraphs.

Coverboard stations

Eighty-two sets of coverboards were laid in the study area in March-April, 2002: 74 sets in LAMR and eight sets in ALFL (Map 2). Coverboard stations consisted of three coverboards placed in randomly selected sites. Coverboards were placed flat on the ground, and propped up slightly with room underneath to allow reptile, amphibian, and small mammal species to crawl under them. Two coverboards at each station were made of chipboard material, and one of roofing tin. Chipboard coverboards measured approximately 0.7 x 1.3 m, and roofing tin coverboards: ca. 0.8 x 1.5 m. It was assumed that species that prefer dry microhabitats would be found under coverboards made of roofing tin, and species preferring wetter microhabitats would select coverboards made of wood (National Park Service 2000). During this study, coverboards were checked May 20 - August 9, 2002, and April 18 - June 10, 2003. Due to engagement with other sampling techniques and study areas, and LAMR/ALFL access conditions, checking all coverboards on the same day was deemed unfeasible, and indeed almost impossible. In

addition, in the dry and hot summer of the Texas Panhandle, coverboards proved ineffective; temperature under coverboards (especially metal coverboards) was considerably high, and no detectable moisture accumulated under chipboards even after summer rains. Thus, after initial efforts, coverboards were checked on a rather *ad hoc* basis. Locations of coverboard stations and sampling results using this technique are provided in Appendices 3-5. R.J. O'Kennon (pers. comm.) of BRIT also checked some coverboards on an opportunistic basis; however, he failed to find any amphibians, reptiles, or mammals under the coverboards.

Night road surveys

Driving surveys were undertaken mostly on rainy or warm and humid nights to search out amphibians and reptiles, but also to record mammals. Searches for *Perognathus* pocket mice were carried out on dry and moonless nights. Night road surveys were conducted after dark by slowly driving roads looking for reptiles, amphibians, and mammals crossing roadways. Detected individuals were captured, identified, and photographed, when possible and necessary. All paved park roads and the majority of accessible unpaved roads were surveyed. In total, 24 night search surveys were conducted: 13 in 2002 (April 28, June 2, 10, 13-15, 18, 20, 26, July 4, 13, 17, and August 8) and 11 in 2003 (April 25, 29, May 4, 6, 15, 28, June 14, 18, 20, and July 12 and 16).

Amphibians and Reptiles only

Some field techniques were utilized only for amphibians and reptiles, and were not likely to detect other taxa. For example, visual encounter surveys and auditory amphibian surveys would not normally detect mammals.

Visual encounter techniques

Visual encounter surveys were not employed as a systematic survey technique. Nonetheless, certain occasions were used opportunistically to increase the likelihood of detecting some species. Visual encounter surveys involved systematic and opportunistic searches such as turning over rocks, logs, and other debris, or looking into rock crevices and cracks in structures.

Auditory amphibian surveys

Auditory surveys were conducted for frogs and toads in appropriate freshwater habitats to listen to and record choruses. Not all freshwater habitats were examined. For example, the river and reservoir were not surveyed using auditory methods, because they provide only marginal habitat while marshes and temporary pools or more ideal and likely to harbor calling frogs. Also, it was impossible to survey all appropriate habitats. Some were simply inaccessible during the best period, i.e., after heavy rains. These surveys were done March through June in 2002 and 2003 on an opportunistic basis (usually following a spell of warm weather in spring, and after rains later in the season). Due to scarcity of freshwater habitats in the study area, the number of listening points was minimal, and distance between such points arbitrary. Auditory amphibian surveys were carried out in Sanford Marsh, at the Plum Creek boat ramp, along FM 1913, and along other roads within the study area when temporary pools appeared in ditches following summer rains.

Turtle surveys

Large hoop traps were used to carry out two rounds of turtle trapping in September, 2002: 6 trap-nights at Sanford Marsh (September 5-9), and 4 trap-nights in the Canadian River at Mullinaw Crossing (September 16-17). The latter traps were lost following a drastic water rise in the Canadian River, September 18-19. Turtle traps were located at the coordinates presented in Table 1 (also see Map 2). When traps were set in close proximity, a single location was recorded between them.

Table 1. Coordinates of Turtle Trapping Locations

Trap Name	Easting	Northing
TT-LM-4	249007.46466	3935570.38840
TT-LM-3	269594.13182	3955526.11204
TT-LM-2	269626.19530	3955197.77244
TT-LM-1	269658.22118	3955175.84736

Mammals only

Small mammal stations and small mammal traps

Fourteen small mammal stations were run in the northernmost section of LAMR (Hutchinson County) October 22-24, 2002, and three additional small mammal stations and 24 individual small mammal traps were run in northern, central and southern sections of the park (Hutchinson and Potter Counties) during April 12-23, 2003. Trapping sessions of 2-3 nights/site were deemed sufficient (see graphs and tables in Appendix 6).

Small mammal stations (SMS) consisted of two Tomahawk and four Sherman traps each:

1) one large Tomahawk trap (6 x 6 x 24 inch), baited with meat and vegetable foodstuffs;
2) one small Tomahawk trap (5 x 5 x 16 inch), baited with a combination of meat or fish, and vegetarian bait: apples, peanut butter, carrots, cracked corn, etc.;
3) One large (4 x 5 x 15 inch) Sherman trap, baited with peanut butter and oats;
4) Three small (3 x 3 x 9 inch) Sherman traps, baited with peanut butter and oats;
5) Five one gallon (#10 food cans) pitfall traps, located approximately five to six meters from station center.

During the October, 2002 trapping session, cold weather and continuous rains prompted removal of pitfall traps to prevent excessive element-induced mortality of captured animals. Pitfall traps were re-installed and run separately November 1-11, 2002. Because results of the 2002-2003 SMS surveys were inconclusive, additional small mammal traps were run in April, 2003 in an attempt to detect species missed in earlier SMS surveys and to survey a wider territory. Small mammal traps (SMT) consisted of individually set small and large Sherman traps. SMS were set at least 150 m apart and SMT 20-30 m apart.

In total, live-traps were run for 330 trap-nights, and pitfalls for 1,200 trap-nights. Small mammal survey location descriptions, coordinates, and habitat descriptions of SMS and SMT are in Appendix 7. The majority of small mammals caught in live traps or pit-falls were identified, some photographed and released. Some were kept as voucher specimens (see species accounts).

Gopher traps

Gophers require specialized traps described in Baker and Williams (1972). These traps are made of pieces of PVC pipe with a trigger mechanism based on a rat snaptrap, and placed directly into a gopher burrow. Traps for the current study were custom-made at our request by Dr. Robert Dowler (Angelo State University) and his students. Details of gopher surveys are found in the species accounts and Appendix 8.

Bat surveys

Bat surveys at LAMR/ALFL present a challenge, mostly due to the strong winds that almost unceasingly blow throughout the Texas Panhandle. Mist netting of bats on windy nights is impractical; mist-nets swing back and forth becoming conspicuous and easily detected and avoided by bats. Four bat surveys were attempted in 2002: 2 nets at Sanford Marsh on September 4, 2 nets by the Canadian River at Mullinaw Crossing on September 16, 3 nets at a water source in Plum Creek Valley on September 24, and 2 nets at the foot of Bultaco Hill (Rosita Meadows) on September 26. All but the last survey were unsuccessful due to strong winds. Caves, cavities, and old structures possibly used by bats were not thoroughly examined: the only sizeable known cave (at the base of Bultaco Hill) has been vandalized by fire burning inside the cave and scorching the ceiling. It is not likely to harbor bats. Fortunately, the NPS restricted access to the cave by fencing it in 2003.

Camera and tracking plate surveys

Ten *Trailmaster* modified *Canon* all-weather automatic cameras with TM-550 sensors/trigger mechanisms were set in LAMR and ALFL between September 6, 2002 and June 20, 2003 (see Appendix 9 and 23 for locations of surveys and results obtained using this technique). Cameras and sensors were mounted on two-inch wooden stakes next to a bait station. A bait station consisted of a piece of raw meat or chicken placed into a cricket cage attached to a metal pipe (two inch diameter), and other food items (cracked corn, apples, canned fish, etc.) placed around the base of the pipe for bait. When warm-blooded wildlife investigates the bait, an infrared sensor activates the camera to take a photograph. At selected camera stations, canned sardines were substituted for meat bait.

Camera surveys in LAMR/ALFL proved rather ineffective due to a variety of factors including heat and wind related problems. The TM-550 sensors are triggered by a combination of heat and movement, and on the plains of Texas soil heats up rapidly and retains heat for some time. The combination of ground heat with debris blown by winds, rain or flies attracted to meat bait can easily trigger the sensor and the camera, and probably account for the majority of blank photographs taken during these surveys. In addition, seeds and other vegetable stuffs laid at the bait station attracted rats and mice that would trigger the camera and use up a roll of film before any larger animals could get to the bait. Attempts to calibrate TM-550 sensors to take pictures only during night hours, increasing intervals between picture taking events and removing vegetable bait did not improve the outcome of these surveys.

Originally, we intended to use cameras in combination with tracking plates covered with a suspension of carpenter's chalk in alcohol. However, the latter were never used in Lake Meredith-Alibates Flint Quarries study due to their ineffectiveness at another study site (Lyndon B. Johnson National Historic Park)

Spotlight surveys

Three spotlight surveys were carried out as part of this study: on March 13, March 15, and June 26, 2002. Additional surveys of this type were cancelled due to ineffectiveness. Although LAMR possesses an extensive network of unpaved roads, paved roads are few and relatively short (with the exception of Bates Canyon Road). Many unpaved roads could not be navigated at any more than crawling speed. Also, many unpaved roads are cut deep into the substrate thus obstructing vision: Dolomite Point Road and a part of Plum Creek road system being the exception. Another extensive unpaved road system: Saddle Horse Canyon-Mullinaw-Devil's Canyon could not be surveyed because Mullinaw Crossing remained impassable from March through November, 2002. In addition, under such conditions, an unassisted driver/surveyor handling both the vehicle and the spotlight simultaneously were not effective. Results of the three spotlight surveys are summarized in Appendix 10.

Birds

Breeding birds

Breeding birds were surveyed from variable circular plots (VCP) conducted within selected habitats; eight surveys were carried out between May 23 and July 11, 2002. Each route contained five or six circular plots. Results of these surveys (Appendix 11) were inconclusive: almost no nesting evidence was collected during these surveys, and some species listed as common in park interpretive materials provided to the investigator were rarely if ever detected. Steadily blowing winds made detection of singing/calling birds difficult at times, sometimes sounds carried and perhaps some birds were counted twice. In addition, no photo or audio vouchers could be obtained during VCP surveys. Audio equipment used (Sony TCM-5000EV recorder and Sennheiser K-6 microphone with windscreen) proved ineffective in windy weather with no audibly identifiable recordings obtained.

In order to obtain vouchers of breeding activity and to record additional species, searches for nesting birds and nests were undertaken throughout the study area in late May-late July, 2002 and in late April-early June, 2003. If found, any nests, their contents, or adult birds attending nests were photographed. Results of nest searches are reflected in bird species accounts.

Owl Surveys

Discovery of eastern screech-owl in the park prompted us to conduct night owl searches at LAMR. Recorded calls of the screech-owl and other owl species expected in the area were played in suitable habitat after dark. Night owl surveys were carried out on April 29 (Rosita Meadows) and May 11 (Plum Creek Valley), 2003. Unfortunately, strong winds that hindered breeding bird and bat surveys also affected owl surveys: playback calls probably did not carry over far distances, and no responses to playbacks were heard.

Winter Grassland Bird Surveys

In addition to breeding bird surveys, this study attempted to evaluate grassland birds wintering at LAMR/ALFL. Grasslands constitute 11,239 ha (ca. 60%) of the study area. Thirty rectangular 3-ha plots were randomly selected throughout the parks and surveyed between December 16, 2001 and January 18, 2002 (Map 2). A surveyor walked each plot recording all bird species seen in or over the plot (average time of survey: 40 min/plot). Some plots were surveyed twice. When plot surveys failed to turn out any significant numbers of grassland species, investigators decided to survey grassland birds along transects through mostly grassland habitats. Fourteen transects, 500-2,000 m long, were surveyed February 15-25, 2002. However, transect surveys also failed to turn out a substantial number of grassland species. Plot and transect descriptions and locations are given in Appendices 12-15.

Sampling Effort and Access

Two major access challenges were present during the current inventory: topography of LAMR/ALFL and private ownership of lands immediately adjacent to the study area. Many areas of LAMR (Bonita Creek, Chicken Creek, Evans Canyon, Martins Canyon, North Turkey Creek, South Turkey Creek, and Sandy Point) are mostly accessible through private lands. However, Bonita Creek and Chicken Creek could be reached by all-terrain vehicle (ATV) from Rosita Meadows during low-water periods in the Canadian River. Some sites could possibly be accessed by boat from Lake Meredith. However, neither an ATV nor boats were available during this study. In addition, certain areas of the park (Saddle Horse Canyon, Big Canyon, and Devils Canyon) are periodically accessible via the Mullinaw Crossing of the Canadian River. However, during this study, Mullinaw Crossing was mostly impassable due to water level

conditions there. Thus, access through private lands remained the only reasonable means of getting to these parts of the park. Access to the area opposite of Mullinaw Crossing was extremely time consuming (ca. 2.5 hours one way) due to road conditions and topography.

Access to the parks through private lands is governed by agreements between the NPS and private landowners. Early in the study, NPS contacted the concerned landowners asking to permit a vehicle with TNC decals through their lands, however only two replied to the request. The only alternative was to drive a NPS vehicle or be accompanied by park staff in uniform. No NPS vehicles were available to us. Park rangers were few and difficult to schedule for long work days, early morning, late evening, and/or night hours. Later in the study, we were provided with "National Park Service Researcher" decals enabling access to some areas through private lands.

This situation forced a choice to be made. In consultation with NPS, we decided to conduct comprehensive and intensive surveys at a limited number of sites throughout the park with access that is more reliable and less time consuming. The alternative would have been to survey a larger and more complete area of the park. Such surveys would have been less thorough, more time consuming, and overall less productive. Because some methods employed in this study required frequent visits to a site (e.g., in order to keep trapped animals alive) we chose the former alternative, after concluding that our sampling efforts (see Map 2) were representative of park habitats and would cover a significant portion of the study area.

Permits

Several permits were needed in order to carry out this study. A permit granted by the U.S. Fish and Wildlife Service specifically addressed surveys and collection of the endangered Arkansas River Shiner. The following permits governed research activities conducted in duration of the project:

1) NPS Scientific Research and Collecting Permit # LAMR-2002-SCI-0001
2) Texas Park and Wildlife Department Scientific Collections Permit # SPR-0102-193.
3) U.S. Fish and Wildlife Service Endangered Species Permit # TE820085-0.

RESULTS AND DISCUSSION

General

This species survey recorded the presence of 18 fishes, 9 amphibians, 28 reptiles, 72 breeding birds, and 32 mammals on LAMR and ALFL. A complete list of vertebrate species recorded in the course of this study is included in Appendix 16. Appendix 21 presents a list of all vertebrate species collected in carrying out this study. Appendix 26 provides a photographic record for species encountered. In the discussions below, species listings are for native and non-native (exotic) species. Exotic species are noted as such. These species accounts deal only with species recorded and documented in the duration of this study. Species recorded in the parks previously, but not found in 2002-03, as well as species suspected to occur in the parks are dealt with in "Species Potentially Occurring in the Parks" section (pages 41-46).

Fishes (18 species)

Results of fish surveys are discussed in the following species accounts and are presented in Appendix 17.

Red Shiner – *Cyprinella lutrensis*

Common and widespread in Canadian River, Big Blue Creek, Chicken Creek, and also in shallow waters of Lake Meredith. Red shiner represented 14.9% of all fishes caught at the study sites in 2003. This

species was caught at riffles, in shallow (0.2-0.3 m) and deeper (>1 m) waters, pools cut off the main channel during the drought, but never in marshes.

European Carp – *Cyprinus carpio*

Introduced European species. Not recorded in Canadian River in 1954-1955, but already found in 1983 (Munger 2002). Rather uncommon in Canadian River during this study: only found in few deep holes downstream from Chicken Creek in November, 2003. Only detected with electro-shocker, and, thus, seine only surveys might have been less effective to detect this species. Appears to be more common in Sanford Marsh. In Canadian River, so-called "mirror carps" (a race) were caught along with typical individuals. A total of 9 carps were recorded during this study (0.6% of the total catch).

Plains Minnow – *Hybognathus placitus*

Common (196 individuals or 13.7% of total catch). Found mostly in the section of Canadian River from Rosita Meadows to c. 1 km downstream from Chicken Creek where the river disappears in the sand and there was no flowing water in June and November, 2003. Only a handful of individuals (mostly juveniles) were found in marshy puddles at Plum Creek boat rump. Found in Chicken Creek, but not found in Big Blue Creek or Lake Meredith.

Peppered Chub – *Macrhybopsis tetranema*

This species has been recently split taxonomically from the speckled chub *Macrhybopsis aestivalis* (Eisenhour 1999) and its current status in the Canadian River is a cause for concern (Luttrel et al. 1999; T. Bonner, pers. comm.). Our study shows that *M. tetranema* is uncommon in Canadian River and Big Blue Creek within LAMR (n=62, or 3.6% of the total catch). Highest numbers (16) were found in a deeper pool at the river bend (upstream from Chicken Creek) with some boulder and some small whirlpools in November, 2003. Others were found in still, shallow waters 0.2-0.5 or at riffles, but also in deeper pools. Not found in Big Blue Creek, Chicken Creek, Lake Meredith, or Sanford Marsh. Artificial impoundments/dam construction present the greatest threat to this species (Luttrel et al. 1999), although low water levels resulting from the prolonged drought and excessive water retention upstream in New Mexico may significantly add to the problem. Conservation status and ecological requirements of the peppered chub in Canadian River should be considered a priority for further studies. Current threats assessment is also needed**.**

River Shiner – *Notropis blennius*

Introduced. On June 5, 2003, one specimen of *Notropis blennius* (male; 95 mm total length) was collected from Big Blue Creek Bay, Lake Meredith, in Moore County, Texas (N35°41'28.06" W101°37'57.37"). The river shiner was captured from shallow water (50 cm in depth) over silt substrate with patches of sand and gravel. The specimen was deposited with West Texas A&M University Museum (WTAMU 28307).
This collection of *N. blennius* is outside of its reported distribution in Oklahoma and Texas (Miller and Robison 1973, Hubbs et al. 1991). It is unlikely that the recent collection of *N. blennius* from Lake Meredith represents its natural range. *Notropis blennius* was not taken from this area of the Canadian River drainage from 1954 through 1996 (Bonner and Wilde 2000; Munger 2002) and does not occur upstream of Lake Eufala, Oklahoma (T. Bonner, personal communication). Instead, the river shiner occurrence in Lake Meredith likely represents a bait bucket release. Although *N. blennius* is a fish of large rivers, it can acclimate to lentic conditions of reservoirs, serving as a source of recolonization in upstream and downstream reaches from the reservoir (Pflieger and Grace 1987).

Arkansas River Shiner – *Notropis girardi*

Endangered species. Rare in Canadian River within LAMR in 2003, recorded from only two sites in the general vicinity of Chicken Creek (at a riffle downstream from Chicken Creek and in a shallow channel with deeper sections between Chicken and Bonita Creeks, at depths 0.2-0.5 m). P. Eubank (pers. comm.) reported *N. girardi* from the vicinity of Coetas Creek, but the lower part of the creek and the adjacent section of Canadian River were completely dry in November, 2003.

No Arkansas River shiners were caught in June, 2003, and only five were caught in November, 2003 (0.35% of total catch). Three specimens were deposited with West Texas A&M University (WTAMU Nos. 28217 and 28218).

According to Bonner (2000) adult Arkansas River shiners are only common in the Canadian River within LAMR in March through early May. In May, adults move upstream to New Mexico to spawn (Bonner 2000). This would explain absence of *N. girardi* from samples collected in June. Eggs and hatched young float downstream, and in years with good flow end up at LAMR. Larval *N. girardi* are present in the area of interest throughout the summer (T. Bonner, pers. comm.). However, this study did not target larval fish due to identification difficulties.

A potential threat to the Arkansas River shiner at LAMR is the low water level caused by prolonged drought and extensive water retention upstream, in New Mexico (Durham and Wilde, in press). According to the latter authors *N. girardi* cannot breed successfully in isolated pools. Their breeding mechanism requires flowing water so that eggs and hatched young can float downstream. Durham and Wilde (in press) found no recruitment whatsoever in pools and puddles remaining through the summer when the Canadian River was low. Also notable, longevity of this species apparently does not exceed three years (T. Bonner, pers. comm.). Thus, consecutive droughts may successfully eliminate the entire population of this species in certain areas (B. Durham, pers. comm.), such as from LAMR.

Arkansas River shiners trapped in isolated pools are also at a greater risk of predation, as predators such as channel and flathead catfishes seem to concentrate in such areas at LAMR.

Fathead Minnow – *Pimephales promelas*

Uncommon in the study area (61 or 4.3% of the total catch). Only one specimen collected in the section of Canadian River downstream from Mullinaw Crossing. All other records are from the section between Bonita Creek and c. 1 km downstream from Chicken Creek where the river disappeared into the sands in November, 2003. Highest numbers per site (23) were recorded at a riffle with depth 0.2-0.3 m. Caught in Chicken Creek.

Bullhead Minnow – *Pimephales vigilax*

Likely introduced, although native elsewhere in Texas. Not recorded from the river in 1954-55 and 1983 (Munger 2002). Uncommon, but widespread in the study area (48 individuals or 3.4% of the total catch). This species was found throughout Canadian River, in Big Blue and Chicken Creek, and in Lake Meredith, e.g., a male in breeding condition on June 5, 2003. Slightly higher numbers (7-8/site) were found in the shallow Chicken Creek, and adjacent section of Canadian River with fast-flowing water. Also recorded in pools cut off the main channel when the water level was low (June, 2003), but also in deep (> 1 m) pools.

Flathead Chub – *Platygobio gracilis*

Common to very common in the study area (506 individuals or 35.6% of all fish caught during this study). Distributed throughout Canadian River, though unevenly. Very high numbers were recorded at two sites: a section with deep holes (>1 m) downstream from Chicken Creek, and shallow pool (0.2-0.3 m) almost cut off of the main channel of Canadian River. 142 and 197, respectively. Mostly juveniles were caught at the latter site. Also recorded in Big Blue and Chicken creeks.

Channel Catfish – *Ictalurus punctatus*

Uncommon to locally common (61 or 4.3% of total catch), although recorded only at four sample sites (three at Canadian River and in Lake Meredith), e.g. 55 caught in deep holes (> 1m) around large rocks downstream from Chicken Creek. Electro-shocking seems to enhance detection of this species; perhaps this species have been undetected in other sections during seine-only surveys. The majority of channel

catfish detected during this study were juveniles, although individuals with total length of 200-300 mm were also recorded.

Flathead Catfish – *Pylodictis olivaris*
Likely native to the area, although not included in the list of native fishes and apparently not previously caught in the study area (Munger 2002). Rare or under-recorded. Only two individuals were caught during this study: both in deep holes (> 1 m) downstream from Chicken Creek. One specimen has been deposited at WTAMU (28306).

Plains Killifish – *Fundulus zebrinus*
Uncommon to common, but not evenly distributed (63 or 4.4%). Occurs in Canadian River, Big Blue and Chicken Creeks. Recorded in shallower and deeper areas, in fast-flowing and still water. Highest number per site (21) recorded at Chicken Creek on November 2, 2003.

Western Mosquitofish – *Gambusia affinis*
Uncommon to common (n=56 or 3.9% of the total catch), and widespread: recorded in both sections of Canadian River, Big Blue and Chicken creeks, and marshes of Bonita Creek. Highest number (n=19) recorded at Chicken Creek on November 2, 2003.

Green Sunfish – *Lepomis cyanellus*
Likely native to the area (Munger 2002). Rare to uncommon, perhaps under-recorded. Only 12 caught in 2003 (0.8% of total catch) in Canadian River, Chicken and Bonita creeks, although several large adults protecting nests also were observed in marshes of Bonita Creek on June 17-18, 2003. One dip-netted in Sanford Marsh (Hutchinson County) on April 28, 2002.

Bluegill – *Lepomis macrochirus*
Likely native to the area (Munger 2002). Uncommon to locally common (n=85 or 5.9% of total catch). Only found in the section of Canadian River between Bonita Creek to c. 1 km downstream from Chicken Creek, and also in the Chicken Creek proper, and in Sanford Marsh. Higher numbers (up to 16/station) were recorded in deeper pools (> 1m) and fast flowing channel in the vicinity of Chicken Creek.

Longear Sunfish – *Lepomis megalotis*
Likely introduced (Munger 2002); native elsewhere in Texas. Very rare or under-recorded (n=1 or 0.07% of total catch). The only specimen was collected June 3, 2003 in Canadian River below the Mullinaw Crossing (WTAMU 28243).

Redear Sunfish – *Lepomis microlophus*
Introduced to this area, although native elsewhere in Texas. Very rare or under-recorded (n=5 or 0.3% of total catch). Only found in Bonita and Chicken creeks in June, 2002, although undoubtedly also occurs in the Canadian River.

Largemouth Bass – *Micropterus salmoides*
Introduced to the study area, although native elsewhere in Texas. Very rare or under-recorded (n=1 or 0.07% of total catch). One was caught at Sanford Marsh in November, 2003, although another one was seen in marshes of Bonita Creek in June, 2003, trying to steal eggs from green sunfish nests. Common game fish in Lake Meredith (stocked).

Amphibians (9 species)

Results of amphibian surveys are presented in the following species accounts. Night road searches and visits to potential breeding sites proved more effective than other techniques. No amphibians were found under cover boards nor caught in pitfall traps. Employment of drift fences in such surveys at these sites might increase survey effectiveness for amphibians.

- **Salamanders (1 species)**

Barred Tiger Salamander – *Ambystoma tigrinum mavortium*
Cryptic or rare. Not recorded in either park during this study, but one found crossing FM 1913 ca. 3.5 km from Big Blue Creek on a rainy night of June 18, 2003. Four specimens including a transformed larvae from Potter and Hutchinson counties within Lake Meredith NRA are in WTAMU collection.

- **Frogs and Toads (8 species)**

Blanchard's Cricket Frog – *Acris crepitans blanchardi*
Very common in suitable habitat in marshy areas at the very north of LAMR, in Sanford Marsh (Hutchinson County). Not found in other seemingly suitable marshy habitat, e.g., in Bonita Creek, Rosita Meadows, near Plum Creek boat ramp, or elsewhere in the Canadian River Valley. None found during road surveys throughout the park. At Sanford Marsh, calling activities observed from mid-April. Individual calling males (5-10) could be counted April 18-22, 2002 but overwhelming chorus from April 28, 2002 and through May, June, and July. Recorded calling as late as August 2, 2002, so perhaps calling ceases by September. One male collected at Sanford Marsh is in WTAMU collection (15114).

Western Green Toad – *Bufo debilis insidior*
Common but cryptic species. Its subfossorial habits and small size make it difficult to detect. Occurs in semi-desert areas of LAMR and may be present in ALFL. Emerges to breed after first summer rains. Also forages on the surface (including along roads) on rainy or very humid nights. Earliest record on May 15; latest record on July 4. Breeds in marshes, roadside ditches, and probably ephemeral pools. Onset of breeding June 10-14 coinciding with summer rains in 2002 and 2003, calling continued at least until June 18 during both years. Breeding congregations recorded in a marshy area at Plum Creek boat ramp and in a roadside ditch in Bates Canyon (both in Potter County). Only 5-6 calling males at the latter location, and the ditch dried out by June 20, 2003.

During night searches, this species was encountered in Bates Canyon, Plum Creek, and along Cas Johnson Road (Potter County), Bugbee Canyon and on Sanford-Yake Road (Hutchinson County) and at Blue West (Moore County). The latter record (5 toads on June 17, 2003) might be the first confirmed Moore county record (not shown in Dixon, 2000).

Taxonomic note: Two subspecies of *Bufo debilis* are known to occur in Texas: eastern green toad – *B. d. debilis* and western green toad – *B. d. insidior* (Dixon, 2000). Dixon (2000) draws a boundary between the subspecies along a north-south line dividing Moore and Potter counties from Hutchinson and Carson Counties, i.e., assuming that *B. d. insidior* occurs to the west of the line (in Potter Co.) and *B. d. debilis* to the east (in Hutchinson Co.). In this investigator's opinion, all green toads recorded during this survey belong to the western subspecies *insidior*. All examined specimens displayed characteristics assigned to the western subspecies by Conant and Collins (1991): 1) black lines connect many of the round, black dots on the dorsum; 2) warts on paratoid glands and upper eyelids have black points (see photo, Appendix 26). The latter authors also emphasized that *B. d. insidior* usually occurs above 760 m. elevation. All records in Lake Meredith were at 888-971 m.

Red-spotted Toad – *Bufo punctatus*
Uncommon, but relatively widespread in LAMR (only 17 recorded in 2002 and 2003). More common along roads crossing adjacent ranches above the Canadian River Breaks. May be present in ALFL. A subfossorial species emerging to breed and forage after heavy summer rains. Earliest record on June 10 and latest on July 4. The rest of the time this toad spends underground in burrows and tunnels excavated by other animals. No breeding congregations were encountered within the parks, probably due to timing of visits rather than unsuitability of habitat, but calling was heard from ranches adjacent to FM 1913 in

late June, 2003. In LAMR, this species was only found during night road searches in Bates Canyon and Plum Creek (Potter County), Harbor Bay, Cedar Canyon and Bugbee Canyon (Hutchinson County), Blue West Road (Moore County) and FM 1913. Usually only 1-2 per night, but up to 10 on June 18, 2003.

Woodhouse's Toad – *Bufo woodhousii woodhousii*

By far, the most conspicuous, widespread and common amphibian in LAMR and ALFL. Occurs in semi-desert and mesic habitats throughout the two parks, being absent from cliffs and rocky habitats. Breeding congregations were recorded in Sanford Marsh, Bugbee Canyon, Cedar Canyon (Hutchinson County), Plum Creek boat ramp and extensive marshes in the Canadian River Valley between Plum Creek and Bates Canyon boat ramps and at Bonita Creek (Potter County). Probably also breeds in pools and puddles elsewhere in the valley and along Big Blue Creek. Outside of breeding season, occurs throughout the parks and in adjacent ranches emerging on humid and rainy nights. Frequently forages on paved and unpaved roads in Bates, McBride, Spring, Bugbee canyons, Plum Creek, Mullinaw Crossing, Blue West, Big Blue Creek Valley, Harbor Bay Rd., Alibates Flint Quarries, Cas Johnson Rd. and FM 1913 where it is sometimes road-killed.

Earliest records: March 16, 2003 (Spring Canyon) and April 24, 2002 (Bates Canyon-Cas Johnson Rd.). Detected in Sanford Marsh (Spring Canyon) calling from late April with peak of breeding activity in late May. However, a large gravid female was encountered in Blue Creek (Moore County) as late as June 15. In 2002, calling ceased by June 20, however in the drier summer of 2003 a chorus at Sanford Marsh was heard on June 20. Dispersing juveniles seen starting in June, but most commonly in September. Probably retreats underground in late September (latest record on September 23, 2002 on Plum Creek Rd.).

Couch's Spadefoot – *Scaphiopus couchii*

Common and widespread, though cryptic and difficult to detect due to subfossorial habits. Remains underground in burrows and tunnels throughout the year, emerging briefly to breed and forage following the arrival of summer rains. Earliest record on June 10 and latest on August 9. Onset of breeding follows heavy rainfall. Only three breeding congregations were recorded: in a roadside ditch in Bates Canyon (Potter County) on June 13, 2002, on a flooded asphalt road in Fritch on June 18, 2003 and in a flooded section of a dirt road close to the intersection of FM1319 and FM 3395 (east of Bugbee, Hutchinson County) on June 20, 2003. Probably breeds in other ephemeral pools, as they become available.

Frequent on paved and unpaved roads following rains or even light drizzle. At least 25 were recorded during roadside surveys in Bates Canyon, McBride Canyon, Cas Johnson Road (Potter County), Sanford-Yake, Harbor Bay, Bugbee Canyon (Hutchinson County) and FM 1913 between Blue West Road and Big Blue Creek bridge (Moore County). Likely occurs throughout semi-desert parts of the LAMR and in ALFL.

Plains Spadefoot – *Spea bombifrons*

Uncommon. Only six records during the two-year study (one in 2002 and five in 2003), with only four within LAMR proper. More common on private ranches above the Canadian River Breaks, e.g., >150 collected east of Stinnett in 1950 (Texas Natural History Collection-UT Memorial Museum [TNHC-UTMM). Subfossorial species emerge to breed and forage following onset of summer rains, (June 13-20 during this study). This species may spend less time on the surface than the previous species listed (*Scaphiopus couchii)*. No breeding congregations found in the parks, but heard calling from private ranches adjacent to FM 1913 in Moore County northwest from LAMR on June 18, 2003. *S. bombifrons* breeds in the park albeit in small numbers.

All visual records made during night road searches: in Bates Canyon (Potter County) on June 13, 2002 and June 18, 2003, in Blue West (Moore County) on June 18, 2003 and in Spring Canyon (Hutchinson County) on June 20, 2003. Also, two recorded along FM 1913 between Blue West Road and Big Blue Creek Bridge on June 18, 2003.

Plains Leopard Frog – *Rana blairi*
Uncommon and sparsely distributed in LAMR. Does not form large choruses and perhaps overlooked in some areas. Recorded at Sanford Marsh, Bugbee Creek, and Harbor Bay (Hutchinson County), Mullinaw Crossing, marshy areas by Plum Creek, Chicken Creek, and Bates Canyon boat ramps (Potter County). R. O'Kennon of BRIT reported seeing this species at Big Blue Creek (Moore County) and a specimen from Fritch Fortress is in WTAMU. No more than 5-6 seen/heard per location. Calling from late April (25th) to at least mid-June (14th). Juveniles recorded at Mullinaw Crossing on September 20.

Bullfrog – *Rana catesbeiana*
Uncommon and sparsely distributed throughout LMNRA. Associated with marshy habitats and small, deep ponds. Recorded at only three sites: Sanford Marsh and Bugbee Canyon (Hutchinson County) and Bonita Creek (Potter County). Vocal activity recorded at Sanford Marsh and Bonita Creek from April 22 through August 2. No more than 3 individuals heard or seen at any single site in 2002 and 2003. Two tadpoles collected at Sanford Marsh on April 28, 2002 are presently in WTAMU collection (15115 and 15116).

Reptiles (27 species)

Results of reptile surveys are presented in the following species accounts.

- **Turtles (4 species)**

Turtles were caught in turtle traps, observed basking on rocks, logs, or emergent vegetation, encountered on paved and unpaved roads, and while walking cross-country. One ornate box turtle was found under a coverboard.

Common Snapping Turtle – *Chelydra serpentina serpentina*
Uncommon, although almost entirely aquatic and probably under-recorded. This large turtle inhabits rivers, lakes, marshes, and other water bodies. It was only found in Sanford Marsh (Hutchinson County) although there is little doubt that it also occurs in other marshes bordering the Canadian River and is perhaps also in Lake Meredith. Five were caught in two turtle traps in Sanford Marsh on September 6, 2002. Four were captured in one trap set in a pond surrounded with cattail thickets. The largest turtle (carapace length 36.8 cm, weight 10 kg) was caught in a channel adjacent to the marsh. Three other measured snappers were 20.3-31.1 cm long (carapace) and weighed 1.1-4.9 kg. No nests or young of this species were recorded during this study.

Yellow Mud Turtle – *Kinosternon flavescens flavescens*
Uncommon aquatic species, although cryptic and probably overlooked. This turtle rarely leaves water to bask in the open (Conant and Collins, 1991). None was caught in turtle traps. Only four records during the entire study (three in LAMR). Two found in pools in a drying section of the Canadian River upstream from Mullinaw Crossing (Potter County) on June 3, 2003, one found on land next to Sanford Marsh (Hutchinson County) on September 18, 2002 and one alongside FM 687 (also Hutchinson County) east of Sanford-Yake on June 18, 2002. Also a specimen from Coetus Creek (WTAMU). Probably occurs throughout the Canadian River Valley including adjacent marshes and may occur in Lake Meredith.

Ornate Box Turtle – *Terrapene ornata ornata*
Common. Most frequently encountered turtle species in the two parks (> 40 logged records). And the only turtle of ALFL. Mostly terrestrial although occasionally ventures into pools and mud puddles. Inhabits semi-desert, grassland, and riverine habitats throughout the area from the Canadian River to high uplands. Observed in Rosita Meadows, Bates Canyon, McBride Canyon, Mullinaw Crossing, Dolomite Point grasslands, Plum Creek, Alibates Flint Quarries, Cas Johnson Road (Potter County), Sanford-Yake, North End grasslands (Hutchinson County) and Blue West (Moore County). Frequently seen walking on paved and unpaved roads where some are road-killed (at least four found dead on the roads). One

discovered under chipboard. Emerges from hibernation in late April (22-25). Active throughout the summer with latest record on October 7. No young or nests recorded in this study.

Red-eared Slider – *Trachemys scripta elegans*
Common locally in marshes of the Canadian River and bays of Lake Meredith. As many as 36 observed basking in a pond at Sanford Marsh on March 29, 2002. Nine caught in two turtle traps in the same pond during September 6-9, 2002, including eight in one trap on September 6. Observed basking in Bugbee Bay and at Cedar Canyon boat ramp. Likely occurs in other marshy areas, bays, and in the Canadian River within LAMR. Sliders caught in turtle traps at Sanford Marsh (n=9) measured from 17.5 to 26.7 cm (carapace length) and weighed from 393 to 1,570 g (average 22.7 cm and 1,006 g). No young or nests were found in this study. Latest record on November 14, 2003 (one caught in seine in a channel below Sanford Dam).

- **Lizards (6 species)**

Of six species recorded, all but one were readily found on cross-country hikes and seen while driving paved and unpaved roads. Four species were found under rocks, three under coverboards (both chipboards and roofing tin) and only one species was caught in pitfall traps. Use of drift fences would possibly result in capture of additional species.

Eastern Collared Lizard – *Crotaphytus collaris collaris*
Uncommon to common and widespread (14 logged records). Certainly less numerous than the prairie lizard, Texas horned lizard, and prairie racerunner. Usually found by turning rocks on slopes or in canyons, but also found under coverboards (both chipboards and roofing tin, 3 records) and observed on paved and unpaved roads. Probably under-recorded. Found at Bultaco Hill, McBride Canyon, Bates Canyon, Plum Creek, Devil's Canyon, ALFL (Potter County), Bugbee Canyon, North Canyon (Hutchinson County) and Blue West (Moore County). Seems to be slightly more common in Blue West and Bates Canyon than elsewhere that it was observed.

In 2003, observed in Alibates Flint Quarries as early as April 4. Most conspicuous in late May-early June (roughly May 21 - June 1) which probably coincides with breeding season. Observed until mid-August and probably remains active through the rest of that month and perhaps into September. No juveniles found during this study, but immature lizards observed near Alibates Flint Quarries on April 28, 2002, in Plum Creek Canyon on May 2, 2002, and 2-3 in Bates Canyon on August 10, 2001.

Prairie Lizard – *Sceloporus consobrinus* (= *Sceloporus undulatus consobrinus* and *S. undulatus garmani*)
Common and widespread (>30 logged records in 2002-2003). Inhabits semi-desert open habitats, mesquite thickets, and cottonwood woodlands throughout the parks, from the Canadian River Valley to high uplands. Recorded in Rosita Meadows, Bates Canyon, McBride Canyon, Dolomite Point grasslands, Plum Creek, Mullinaw Crossing, Alibates Flint Quarries (Potter County), Sanford-Yake, North Canyon, Spring Canyon, North End grasslands (Hutchinson County) and Blue West (Moore County). This species was found during routine searches on the ground and in shrubs and trees, under rocks and coverboards (once); two caught in pitfalls.

Emerges earlier and remains active longer than other lizards here. Observed in ALFL as early as March 16 and caught in a pitfall trap at Cedar Canyon as late as November 13, 2002. Juveniles probably hatch in late summer. Three were recorded in 2002: in Spring Canyon on September 6, at Alibates Flint Quarries on September 10 and in North End grasslands on October 22.

Taxonomic Note: According to Conant and Collins (1991) and Dixon (2000) two subspecies of *S. undulatus* inhabit the Texas Panhandle: northern prairie lizard (*S. u. garmani*) and southern prairie lizard

(*S. u. consobrinus*). Newest sources (Collins and Taggart, 2002) split prairie and fence lizards combining both *S. u. garmani* and *S. u. consobrinus* in the prairie lizard *Sceloporus consobrinus*. Dixon (2000) draws a boundary between *consobrinus* and *garmani* along the north-south line dividing Moore and Potter Counties on the west side from Hutchinson and Carson counties to the east. However, the division between the two subspecies is probably not that simplistic and involves elevation gradient and probably habitat differentiation. Specimens from Texas Natural History Collection and University of Texas in Arlington that were collected in Hutchinson County do not shed light on the matter as all are currently labeled *S. undulatus*. Prairie lizards examined in this study at Sanford-Yake (Hutchinson County) are closer to *garmani* as described in Conant and Collins (1991): The light longitudinal stripes are bold and usually clearcut. Dark dorsal markings, prominent in other subspecies, are reduced to spots bordering the light dorsolateral stripe. In males, two long, narrow, light blue patches, one at each side of the belly, are bordered medially with black and well separated from each other. Throat markings are absent or consist of two small, widely separated blue patches (see Appendix 26). In this study, prairie lizards were not examined from Moore and Potter County parts of the park and it is possible that the subspecies *consobrinus* occurs there as well. It might be more practical, however, to follow Collins and Taggart (2002) and treat both forms as *Sceloporus consobrinus*. One prairie lizard collected in Hutchinson County was deposited with WTAMU collection (15110).

Texas Horned Lizard – *Phrynosoma cornutum*

Listed as a species of concern in Texas. However, common and widespread in the study area (46 logged records including 15 in LAMR and three in ALFL). More common on upland ranches bordering the parks than in the parks proper. Most frequently recorded along FM1913 between Four Ways and Big Blue Creek (Moore County) where at least 10 were counted on July 13, 2003, also on Cas Johnson Road (minimum 10 records), McBride Road (Potter County) and along FM 3395, for example., in the vicinity of Bugbee (Hutchinson County). Private lands adjacent to all four of these roads probably support healthy populations of this species. In LAMR and ALFL, this species is also mainly encountered on paved roads, but sometimes in semi-desert, sandy areas on floodplain, in draws, on unpaved roads, and in previously burned areas, e.g., in Bates Canyon, Plum Creek Canyon, Mullinaw Crossing, ALFL (Potter County) and Blue West (Moore County). R. O'Kennon of BRIT observed one in Spring Canyon (Hutchinson County). Likely overlooked in suitable habitat elsewhere. This species is very cryptic and often remains motionless if danger is at hand, making it difficult to see on roads and in natural habitats. More common (or at least more frequently seen) on roads in Bates Canyon and Blue West where the most roadkills occurred: 4 and 3, respectively. Two roadkills deposited with WTAMU (15112 and 15113).

This species becomes conspicuous from mid to late April (earliest records on April 13, 2003 and April 28, 2002) and remains active through the summer. Latest record on September 20. Juveniles recorded from May 15 through September 20. Those recorded earlier in the summer likely overwintered. At present populations in both parks and the adjacent ranches seem to be healthy and viable. Road mortality is probably significant (especially along FM roads), but unavoidable since the amount of vehicular traffic using these roads is not likely to decrease. One recommendation would be to abstain from construction of new paved roads in the park to avoid further vehicle-induced mortality.

Prairie Racerunner – *Cnemidophorus sexlineatus viridis*

Common and widespread in suitable habitats throughout the parks (33 logged records). Inhabits semi-desert grasslands and cottonwood savanna on sandy and clay soils from the Canadian River floodplain to high uplands. Observed in Rosita Meadows, Bonita Creek, Mullinaw Crossings, McBride Canyon, Bates Canyon, Dolomite Point grasslands, Plum Creek, ALFL (Potter County), Sanford-Yake, east of Bugbee, North End grasslands (Hutchinson County) and Blue West (Moore County). Emerges around mid-April: earliest records on April 13, 2003 and April 17, 2002. Remains active through August, perhaps later. Juveniles recorded earlier in the season: April 17 and May 19. A juvenile collected in Rosita Meadows (Potter County) is deposited with WTAMU (No. 15111.)

Colorado Checkered Whiptail – *Cnemidophorus tesselatus*
Uncommon species (8 records) mostly found in rocky slopes and along draws in central sections of the park (although many areas of potentially suitable habitats were not visited). One record from a flat burned area with many burrows (Bates Canyon). Other sightings from Plum Creek, ALFL (3), Cedar Canyon, and Blue West (2). Not seen in 2003. Additional records from Bugbee Canyon (Hutchinson County), Bonita Creek and Chimney Hollow (Potter County) (WTAMU Collection). Unisexual species, young develop from unfertilized eggs (Conant and Collins, 1991). No juveniles recorded during this study, but one immature observed in Blue West on June 1. Dixon (2000) does not show Colorado Checkered Whiptail in Moore County, and thus records from Blue West might be the first for this county.

Great Plains Skink – *Eumeces obsoletus*
Common and widespread (16 records). Subfossorial habits of this species make it less conspicuous than other common lizards. Usually found by overturning rocks in a variety of semi-desert habitats: grasslands as well as rocky and clay slopes and open mesquite savanna. The species was found under coverboards (chipboards) only in the second year of the study (four records). Dispersing juveniles found under fallen bark, rocks, but also on paved roads. Great Plains skinks were found only in Bates Canyon, ALFL (Potter County), Sanford-Yake, North Canyon, Bugbee Canyon, North End grasslands (Hutchinson County) and Blue West (Moore County), but likely to occur throughout both parks. Earliest records on April 18 (2003) and April 23 (2002). Juveniles probably hatch in early July when at least eight were recorded in Alibates Flint Quarries and Bates Canyon (July 7-15).

- **Snakes (18 species)**

The most efficient methods of detecting snakes were, by far, turning rocks and ground litter and night road searches; many also were recorded during daytime cross-country hikes. Only two species (western coachwhip and prairie ringneck snake) were found under coverboards.

New Mexico Blind Snake – *Leptotyphlops dulcis dissectus*
Rarely encountered fossorial species. Likely common, but difficult to find due to its subterranean habits (>45 collected near Stinnett in 1950, TNHC-UTMM). Only three records during this study (all from Potter County). Found by overturning rocks: two on rocky slopes in McBride Canyon on May 1 and 4, 2002, and one in a draw in ALFL on May 25, 2003. One specimen deposited with WTAMU (No. 15109) measured 17.2 cm.

Kansas Glossy Snake – *Arizona elegans elegans*
Uncommon (or overlooked) nocturnal snake. Only three records in 2002-2003: all found on paved roads during night searches: in Bates Canyon (Potter County) on April 28, 2002, on Plum Creek Road just outside of LAMR boundary (Potter County) on June 2, 2002, and on FM 1913 east of Big Blue Creek bridge (Moore County) on June 7, 2003. The two latter records came on warm nights preceded by light rain or drizzle. Never found under rocks or coverboards. Six additional specimens in WTAMU collection, e.g., from Alibates Flint Quarries NM (Potter County) and the vicinity of Sanford (Hutchinson County). According to Werler and Dixon (2000) this is a burrowing snake confined to sandy or loamy soils.

Yellowbelly Racer – *Coluber constrictor flaviventris*
Rare or perhaps uncommon species found in the Canadian River floodplain. Only one record during this study: a medium-size snake was found under a garbage bin lid in a grassy area in Spring Canyon (Hutchinson County). Excrements of this individual contained chitin parts of grasshoppers and beetles. Probably occurs throughout the Canadian River Valley in LAMR, but difficult to detect in dense-grass riverine habitats. One specimen collected "0.5 mi. W of Lake Meredith" in Moore County in 1987 (WTAMU). Twenty-four collected near Stinnett (Hutchinson County) in 1950 (TNHC-UTMM).

Prairie Ringneck Snake – *Diadophis punctatus arnyi*
Rare, but likely overlooked due to subfossorial and retiring habits. Only 3 records in 2002-2003: 1) under a rock in mesquite savanna at Sanford-Yake (Hutchinson county) on April 15, 2002; 2) under a

coverboard (chipboard) in cottonwood savanna at Rosita Meadows (Potter County) on April 21-23, 2003; 3) a juvenile in sage-little bluestem-yucca grassland on sandy soil at the North End (Hutchinson County) on October 22, 2002. The latter individual was found in a thick clump of grass on the surface. Note that all records were made in mid-spring and autumn when soil and air temperature was cool to warm, but not excessively hot. Probably spends hottest months of the year underground. The Sanford-Yake individual: length 27.8 cm, weight 5 g. WTAMU collection contains specimens from Fritch Fortress, McBride Canyon and Plum Creek (Potter County). A record of >25 collected at Bugbee Ranch near Stinnett (Hutchinson County) in 1950 (TNHC-UTMM).

Northern Plains Rat Snake – *Elaphe emoryi emoryi*

Uncommon or rare. Almost exclusively nocturnal snake hiding under rocks, logs, and other surface objects (Werler and Dixon 2000) and probably thus avoided detection. Only two records during this study, and only one in LAMR proper: an adult under a rock in the upland part of the Plum Creek area (Potter County) on April 28, 2003. Also, a juvenile found on McBride Road (Potter County) just outside the park boundary during a night survey on June 10, 2002. Three specimens from Alibates Flint Quarries NM, Plum Creek and Bonita Creek in WTAMU. Likely occurs elsewhere in the study area. A large collection of reptiles from Bugbee Ranch, Hutchinson County (assembled in 1950) contains only 8 specimens of *emoryi* (TNHC-UTMM).

Texas Night Snake – *Hypsiglena torquata jani*

Rare, but likely overlooked cryptic and nocturnal species. Only two records during the study period: one found under a rock in juniper-mesquite savanna in lower part of McBride Canyon on May 1, 2002, and another on FM 687 at the North End of LAMR (Hutchinson County) during a night search on July 12, 2003. Four specimens in WTAMU, e.g., from Bugbee Canyon (Hutchinson County) and Plum Creek (Potter County). Nine collected in the vicinity of Stinnett (Hutchinson County) in 1950 (TNHC-UTMM).

Desert Kingsnake – *Lampropeltis getula splendida*

Only one record of this nocturnal species: a roadkilled individual by the Ranger Station in Sanford-Yake (Hutchinson County) on November 3, 2002. Subsequent searches in 2003 failed to locate more individuals, so it is probably uncommon or rare. Only two specimens in WTAMU collection: one labeled "Lake Meredith, Hutchinson County" and another "Alibates Park". Not among snakes collected in the vicinity of Stinnett in 1950 (presently in TNHC-UTMM).

Western Coachwhip – *Masticophis flagellum testaceus*

Common and widespread (15 logged records). Along with western diamondback this is the most frequently encountered snake in the area of interest. Occurs in semi-desert, grasslands, and bush thickets from the Canadian River floodplain to high uplands throughout the parks. Often seeks refuge in burrows and tunnels excavated by mammals. Observed basking on paved roads (especially in late April-early May and September) where it is frequently roadkilled (minimum five records). The only snake found under roofing tin used as coverboards (3 records). Found in Rosita Meadows, Plum Creek, McBride Canyon, Bates Canyon, Alibates Flint Quarries, Cas Johnson Road (Potter County), Sanford-Yake, North End by FM 687, North Canyon (Hutchinson County), Blue West and FM 1913 (Moore County). Probably occurs elsewhere in the parks.

Emerges around mid-April: earliest records on April 17 and 23 in 2003 and 2002, respectively. Active throughout the summer until at least late September. Frequently seen during daylight hours. Only one juvenile recorded: a roadkill on Cas Johnson Road on May 15, 2003.

Length of two measured individuals was 142 and 152 cm, respectively. Two roadkills deposited with WTAMU (Nos. 15106 and not yet assigned). This species is a good climber (Werler and Dixon 2002) and probably partly responsible for high predation rate of bird nests in 2002.

Blotched Water Snake – *Nerodia erythrogaster transversa*
Rare or uncommon (two records), perhaps inconspicuous. Observed in Mullinaw Creek on May 29, 2002 (R. O'Kennon, pers. comm.) and a badly damaged roadkill by Sanford Marsh (Hutchinson County) on July 13, 2002. Four specimens in WTAMU: from Bonita Creek, McBride Canyon (2) and below the dam. An extensive reptile and amphibian collecting survey at Bugbee Ranch near Stinnett in 1950 (TNHC-UTMM) turned out only one specimen of this species. Small unidentified water snakes *Nerodia* sp. also observed in Sanford Marsh in April-May, 2002. May occur throughout the Canadian River Valley including in-flowing creeks and associated marshes.

Bullsnake – *Pituophis catenifer sayi*
Uncommon inhabitant of the Canadian River floodplains and adjacent uplands. Infrequently seen on paved roads where sometimes run over (a minimum 5 roadkills recorded). Only 2 of 8 records are from the parks proper: one in cottonwood savanna off Dolomite Point Road (Potter County) on June 12, 2002, and another under fallen bark in a grassy area in ALFL (also Potter County) on July 7, 2002. Also six specimens from Alibates Canyon, Bonita Creek and the Sanford area in WTAMU. Probably more common in adjacent private lands, e.g., those bordering Plum Creek Road (two roadkills and one live) and FM 1913 between Four Way and Plum Creek Road (1 roadkilled and 1 live).

Emerges in late April: a roadkill on US 287 north of the Canadian River bridge on April 23, 2003. A juvenile found at the intersection of FM 1913 and Plum Creek Road (Moore County) on July 12, 2003, and another on Fritch Fortress Road in Fritch (Hutchinson County) on September 15, 2003. A bullsnake caught in Alibates Flint Quarries measured 125 cm.

Texas Longnose Snake – *Rhinocheilus lecontei tesselatus*
Infrequently encountered burrowing snake (6 records). Probably more widespread than indicated by this study. Five found on paved roads during night road searches (usually after rain): Plum Creek Road (Potter County) on June 2, 2002, Harbor Bay Road (Hutchinson County) on June 10, 2002, on Blue West Road, at intersection of the latter with FM 1913, and at intersection of FM 1913 and Cig Road (all in Moore County) on May 5, July 12 and 16, 2003, respectively. The sixth found under a rock in ALFL (Potter County) on May 21, 2002. Not shown for Moore County by Dixon (2000) and Werler and Dixon (2000) thus our records for this county are likely new. Only four in Bugbee Ranch, Hutchinson County collection of 1950 (TNHC-UTMM).

Ground Snake – *Sonora semiannulata*
Common and probably widespread (12 records), however subfossorial and found on surface during a very short period in spring (Werler and Dixon 2000), hence likely overlooked in many areas. In LAMR, found under rocks on slopes and in canyons from April 27 through May 26, and one dead on a trail on June 2. Not recorded later in the year. LAMR records are from Blue West (Moore County), Bates Canyon and adjacent areas and Plum Creek (Potter County). Four specimens from McBride Canyon in WTAMU. Probably present in ALFL. Two out five color forms recorded in Lake Meredith: grayish with a red longitudinal stripe and all red.

Plains Blackhead Snake – *Tantilla nigriceps*
One record during the study period, but cryptic and subfossorial, and thus probably overlooked. The only record is from ALFL (Potter County) on June 26, 2002, following onset of summer rains: one found under bark fallen off a dead cottonwood. Search through bark shed by other dead cottonwoods in the vicinity failed to produce additional blackhead snakes. Two were collected at Plum Creek (Potter County) in 1979 (WTAMU) and twelve at Bugbee Ranch in the vicinity of Stinnett (Hutchinson County) in 1950 (TNHC-UTMM).

Marcy's Checkered Garter Snake – *Thamnophis marcianus marcianus*
Rare or under-recorded: only one record during this study. A checkered garter snake was found on Plum Creek Road (Potter County) on November 14, 2003 by Dr. R. Kazmaier (WTAMU). This individual was

released and not photographed. Another collected at Plum Creek in 1983 (WTAMU). This species is widely distributed throughout the area of interest (Werler and Dixon 2000). For example, 10 were collected in the vicinity of Stinnett and one in Amarillo in 1950 (TNHC-UTMM).

Texas Garter Snake – *Thamnophis sirtalis annectens*

Rare (2 records). Found only at the very north end of LAMR (in Hutchinson County) in late summer-early autumn, although possibly occurs in marshy and grassy areas adjacent to the Canadian River elsewhere in the park. One critically injured by car found in Spring Canyon on September 5, 2002, and another basking on FM 687 at North End caught on October 22, 2002. The former snake deposited with WTAMU (15107). One *T. sirtalis* ssp. collected at Chimney Hollow in Potter County in 1979 (WTAMU).

Taxonomic note: Distribution and field characteristics of *T. s. annectens* are somewhat controversial. According to Conant and Collins (1991), this subspecies occurs in Central Texas, eastern Texas Panhandle and adjacent parts of Oklahoma, while Dixon (2000) and Werler and Dixon (2000) show *T. s. annectens* roughly confined to the Crosstimbers-Southern Blackland Prairie ecoregion in Central Texas. According to the latter authors, garter snakes from Texas Panhandle belong to another subspecies: red-sided garter snake – *Thamnophis sirtalis parietalis*. However both snakes recorded at LAMR exhibited field characteristics of *annectens* (see photo, Appendix 26): the unusual broad, orange, mid-dorsal stripe, and lateral stripes involving rows 3, plus adjacent parts of rows 2 and 4 (Conant and Collins 1991, Dixon 2000, Werler and Dixon 2000). Other experts working on garter snakes (Jeff Boundy of Louisiana Department of Wildlife and Fisheries, and Neil Ford of University of Texas in Tyler) confirmed records from this survey as *T. s. annectens*.

In addition, J. Boundy (*in litt*.) examined 60+ garter snakes collected from Bugbee Ranch near Stinnett, Hutchinson County (presently at TNHC-UTMM) and found them identical to *annectens* from Waco-Austin region. A garter snake labeled *Thamnophis sirtalis* ssp. collected from the vicinity of Borger, Hutchinson County (WTAMU collection) also exhibits *annectens* characteristics. Taxonomic status of *annectens* is currently under review and it may be merged with the nominate subspecies *T. s. sirtalis* (J. R. Dixon and J. Boundy, *in litt*.).

Lined Snake – *Tropidoclonion lineatum*

Not recorded in LAMR and ALFL. However, one found crossing FM 1913 between Plum Creek and Blue West Roads (Moore County) on a rainy night, June 18, 2003, less than 5 km from LAMR boundary. It is likely that this cryptic species occurs in the area of interest, although surprisingly it was not found in the extensive collection of 1950 from the vicinity of Stinnett (TNHC-UTMM).

Western Diamondback Rattlesnake – *Crotalus atrox*

Common and widespread (21 records). Along with the western coachwhip, this is the most frequently encountered snake in the area of interest. Recorded in Rosita Meadows, Bates Canyon, Dolomite Point grasslands, Plum Creek, Alibates Flint Quarries, McBride Road (Potter County), Sanford-Yake, North Canyon, Spring Canyon (Hutchinson County) and Blue West (Moore County). Likely occurs elsewhere, but probably avoids the Canadian River floodplain (although three specimens from Coetus Creek in WTAMU). Seemingly more common in Bates Canyon and ALFL (10 records). Large specimens are rare: only three diamondbacks > 1 m long recorded, e.g., two in Sanford-Yake. Inhabits semi-desert, grasslands, draws, mesquite and cottonwood savanna, sometimes close to man-made structures. Often seeks refuge in animal burrows and natural crevices. Frequently encountered warming up on paved roads in early mornings and twilight hours or after spring rains, and as a result it is frequently roadkilled (at least 4 records).

Emerges in early May: earliest records May 4-5 in 2002-2003. Remains active through at least the end of September (latest record on September 30). A hibernaculum reported in tamarisk thickets near the marina

in Sanford-Yake, but not found in April, 2002. No juveniles of this species recorded in this study, but immature snakes observed from early May through late June.

Prairie Rattlesnake – *Crotalus viridis viridis*
Rare or uncommon. Not recorded in LAMR and ALFL during this study, although 3 specimens from Plum Creek and ALFL (Potter County) 1979-1981 in WTAMU collection. On July 12, 2003 one found on the side of FM 1913 near intersection with Blue West Road (Moore County) during a night survey. This record is only ca. 4 km from the LAMR boundary. Likely occurs in upland grasslands or perhaps even semi-desert habitats of the parks albeit in small numbers.

Breeding Birds (72 species)

Results of breeding bird surveys are presented in the following species accounts, and in the table in Appendix 11.

Double-crested Cormorant – *Phalacrocorax auritus*
Casual breeder in Texas Panhandle (Seyffert 2001) or inland Texas elsewhere (Benson and Arnold 2001). Possibly nests in the northwestern corner of LAMR where 5-10 birds regularly observed in Bugbee Bay in May-June, 2003. May nest in lower, heavily wooded part of Big Blue Creek, perhaps in a mixed colony with black-crowned night-herons and/or great blue herons.

Green Heron – *Butorides virescens*
Uncommon (perhaps under-recorded) inhabitant of riverine habitats along the Canadian River and its tributaries, Lake Meredith coastline and probably marshes. May nest in impenetrable tamarisk thickets in the river valley. No breeding evidence, but nesting suspected in the park (Anonymous 1982) and east of Sanford Marsh in Hutchinson County (Seyffert 2001).

Black-crowned Night-Heron – *Nycticorax nycticorax*
Common nesting species in Texas Panhandle (Seyffert 2001) probably nesting in the northwestern corner of Lake Meredith. Hunting black-crowned night-herons regularly seen in Bugbee Bay in early morning and twilight hours in May-June, 2003. Likely nests in heavily wooded parts of nearby Big Blue Creek, perhaps in a mixed colony with great blue herons and/or cormorants.

Great Blue Heron – *Ardea herodias*
Probably uncommon nesting species. Although no rookery was located during this study, one is known to exist in Hackberry Canyon (National Park Service 2001) and probably in the northwest corner of Lake Meredith (most likely in lower heavily wooded part of Big Blue Creek). Foraging solitary herons observed throughout Canadian River Valley, on shores of Lake Meredith and in Sanford Marsh.

White-faced Ibis – *Plegadis chihi*
Casual nesting species in Texas Panhandle (Seyffert 2001) that may nest in extensive stands of emergent vegetation in marshes of the Canadian River within the study area. A flock of 40 observed in Sanford Marsh on May 1, 2002, and ca. 10 in Big Blue Creek Bay on May 7, 2002.

Gadwall – *Anas strepera*
Rare nesting species in LAMR: a female with one young observed in Sanford Marsh (Hutchinson County) on July 5, 1982. Nests irregularly elsewhere in Texas Panhandle (Seyffert 2001). Only one record during this study (4 in Sanford Marsh on March 29, 2002), however extensive marshes of the Canadian River between Plum Creek and Dolomite Point remain unsurveyed.

Mallard – *Anas platyrhynchos*
Fairly common nesting species of riverine habitats and marshes associated with the Canadian River and its tributaries. Observed at Rosita Meadows, Mullinaw Crossing, in extensive marshes between Plum Creek and Dolomite Point, Sanford Marsh, etc. A nest with 10 eggs in a clump of grass in Rosita Meadows on April 23, 2002.

Blue-winged Teal – *Anas discors*
Uncommon species nesting throughout Texas Panhandle, e.g., in Potter, Moore, and Hutchinson counties (Seyffert 2001) and apparently in LAMR (Anonymous 1982). No nesting evidence collected during the 2001-2002 study, but pairs observed in marshy areas off Plum Creek and Bates Canyon boat ramp, and in Big Blue Creek Bay in late April and early May.

Cinnamon Teal – *Anas cyanoptera*
Probably rare nesting species. In late March to late April, pairs observed in Sanford Marsh, and in Canadian River marshes off Plum Creek (a pair at each site). Known to breed in Hutchinson County (Seyffert 2001).

Northern Shoveler – *Anas clypeata*
May nest in the study area, although very few confirmed nesting records from Texas Panhandle (Benson and Arnold 2001, Seyffert 2001). A pair in Sanford Marsh on March 16, 2002 and 3-4 birds on April 18. Six unpaired males in Canadian River marshes between Plum Creek and Bates Canyon on April 27, 2002, and three males in marshes off Plum Creek on April 28, 2003.

Green-winged Teal – *Anas crecca*
Rare nesting species in Texas Panhandle confirmed in LAMR: a pair with 4 ducklings was observed in Sanford Marsh (Hutchinson County) on June 15, 1975 (Seyffert 2001). No nesting evidence was obtained during the current study. All records are of pairs or unpaired males in Sanford Marsh, but also in Canadian River marshes off Plum Creek boat ramp (Potter County) where teal were observed from mid-March through early May (up to 10-15 per site).

Ruddy Duck – *Oxyura jamaicensis*
Occasionally nests in Texas Panhandle southwest of the study area (Seyffert 2001) and may potentially breed in LAMR. Recorded in the Canadian River Valley and Sanford Marsh in April-May, 2002.

Turkey Vulture – *Cathartes aura*
Relatively common and widespread species likely nesting in both parks of interest. Soaring vultures could be observed anywhere in the study area, but since they travel widely in search of food, their numbers were difficult to estimate (most conservative estimate: 5-10 pairs). No breeding evidence, but probably nests in clefts and cavities of cliffs bordering the Canadian River Valley.

Mississippi Kite – *Ictinia mississippiensis*
Common nesting species (the most common raptor in the study area). Primarily restricted to cottonwood savanna in the valley of the Canadian River and its tributaries (e.g., in Rosita Meadows, Bonita Creek, Chicken Creek, Mullinaw Crossing, Plum Creek, off Bates Canyon boat ramp and Dolomite Point Road, Blue West, Big Blue Creek, etc.), but also nests in planted trees in towns and settlements in the general vicinity of the study area (Borger, Bugbee, Fritch, Sanford). Gregarious species often nesting in loose colonies of 2-6 pairs. A conservative estimate of 40-45 pairs in LAMR (14 nests found in 2002-2003) does not include kites nesting in adjacent settled areas. All nests were invariably in living cottonwoods (one occasion in a diminishing tree that still had a clump of green leaves), 3-13 m above the ground (average 7.6 m). Nest is a relatively small, loose construction of cottonwood twigs placed in a fork of a side branch, sometimes close to tree top, and very rarely in the main stem.

Mississippi kite arrives to nesting areas rather late: first records May 5-6. By June 10-15, the majority of kites already incubate. The young probably hatch in early July, because chicks ca. 2 weeks old were seen standing in nests July 18-19. Some were still in nests on August 1. Two fledglings observed in Rosita Meadows on August 18.

Mississippi kite is primarily an insect eater, but sometimes also catches vertebrate animals. Food items delivered to one nest included: dragonflies (7), grasshoppers (2), beetles (2), unidentified insects (3),

toads (2), *Peromyscus* sp. (1), unidentified small rodent (1), and small lizard (1). Large young fed by parents 1.2-4.2 times/hour.

Only one record of nest failure: when nesting tree was blown down in mid-July 2002. Several pairs nesting in Rosita Meadows apparently are not bothered by an array of motorized on-road and off-road vehicles excessively using the area and at least one pair successfully raised young there in 2002.

Red-tailed Hawk – *Buteo jamaicensis*

Uncommon resident. Eight active nests found during the 2002-2003 study: northwest of Mullinaw Crossing, by Dolomite Point Road (2), in Plum Creek Canyon, Alibates Flint Quarries, Blue West, east of Bugbee and Spring Canyon. Single birds or pairs also recorded in Rosita Meadows and McBride Canyon. Probably 10-15 pairs in the study area.

All nests built in cottonwoods (four in living trees and four in dead trees), 4.5-10 m above the ground, usually in the main fork or on a heavy side branch. Adults observed by nests from mid-February. Incubation occurred between early March and early May. Adults carrying food seen from April 27. A downy young seen in ALFL on May 24, 2002, remained in the nest at least until June 26, but fledged by July 7 (observed with both adults on August 2). Another large downy young in a nest northwest of Mullinaw Crossing on June 10, 2003. One nest at Dolomite Point perished when the nesting tree collapsed, and a nest east of Bugbee was predated. A nest in ALFL was used in two consecutive years.

Small mammals and reptiles probably constitute the bulk of this species diet. Seen carrying a gopher and eating a large snake.

American Kestrel – *Falco sparverius*

Uncommon, but widespread nesting species. Observed in McBride Canyon, Bates Canyon, Plum Creek Canyon, Dolomite Point grasslands, Alibates Flint Quarries, Big Blue Creek, Sanford-Yake, Spring Canyon, etc. Probably nests in clefts and cavities in cliffs, as well as in tree cavities (natural or excavated by woodpeckers). No nests found during this study, but a brood of 3 observed by Dolomite Point Road on July 2, 2002, and another of 4 in ALFL on August 2, 2002.

Ring-necked Pheasant – *Phasianus colchicus*

Non-native species. Rare or secretive in thickets of the Canadian River Valley south of Lake Meredith. Observed during the current study only once (a male on November 7, 2003). Also heard calling at Rosita Meadows on April 17, 2002, and northwest of Mullinaw Crossing on June 10, 2003. Anonymous (1982) compiler of LAMR birdlist also pointed out the rarity of this species in the study area.

Wild Turkey – *Meleagris gallopavo*

Common, but secretive and inconspicuous in the study area. Turkeys or their tracks recorded in Rosita Meadows, Bonita Creek, Chicken Creek, Mullinaw Crossing, Plum Creek, McBride Canyon, Bates Canyon, Dolomite Point Road, Big Blue Creek, Bugbee Canyon, and east of Bugbee. In the study area, inhabits mostly riverine cottonwood savanna with tamarisk and soapberry thickets, and also cottonwood patches (e.g., Chicken Creek, McBride Canyon), although sometimes observed in grasslands and mesquite savanna. Breeding activity from April. A displaying gobbler and 4 hens observed at Bonita Creek on May 7, 2002. Gobbling continues into early summer (e.g., heard west of Mullinaw Crossing on June 10). No nests recorded during this study, but a hen with two small, but already flying chicks at Plum Creek on June 18, 2002. In addition, two family groups of 7 birds each seen at Bonita Creek and in the McBride Canyon woodlot on July 19 and September 15, 2003, respectively.

Scaled Quail – *Callipepla squamata*

Uncommon resident. During 2002-2003, observed only in the northernmost part of LAMR: in mesquite savanna of Sanford-Yake and North End, but also in mixed grasslands in Cedar Canyon. Calling from mid-April. No nests of this species found during this study, but an adult with at least three small chicks

observed in the North End Triangle on June 13, 2002, a brood with at least 5 large young along FM 3395 west of Bugbee on July 16, 2003, and a pair with 5-6 large young in Sanford-Yake on July 17, 2002.

Northern Bobwhite – *Colinus virginianus*
Common resident. Most frequently heard and seen in mesquite savanna and mixed grasslands in the northernmost parts of LAMR (Sanford-Yake, vicinity of Bugbee, North Canyon, Spring Canyon, North End), but also occurs in cottonwood savanna and bush thickets in the Canadian River Valley (Bonita Creek, Mullinaw Crossing, Dolomite Point Road), few in bush patches in Alibates Flint Quarries. Vocally active from late April-early May through late July-early August. No nests or small chicks recorded during this study, but coveys of 10-20 birds observed in North End grasslands in October, and in Sanford-Yake in January-February, 2002. In addition, an immature bobwhite was caught in a Tomahawk trap (set for small mammals) at the North End on October 24, 2002.

Virginia Rail – *Rallus limicola*
Uncommon species in marshes of the Canadian River. No breeding evidence obtained during this study, but 2 heard calling at Sanford Marsh (Hutchinson County) on February 19, and 3 on March 29, 2002. Previously, "a bird in juvenile plumage" recorded in Sanford Marsh on July 11, 1990, and adult with two downy chicks on April 30, 1993 (Seyffert 2001).

Common Moorhen – *Gallinula chloropus*
Uncommon (or under-recorded) species confined to marshes of the Canadian River. In 2002-2003, observed/heard only at Sanford Marsh (Hutchinson County) where an adult with one chick was seen in August, 1976 (Seyffert 2001).

American Coot – *Fulica americana*
Uncommon or rare nesting species. In 2002-2003, observed only in Sanford Marsh (Hutchinson County) where "there is a resident population" (Seyffert 2001). Likely also occurs in extensive areas of the Canadian River marshes between Plum Creek and Dolomite Point.

Black-necked Stilt – *Himantopus mexicanus*
Possibly nests. Uncommon to fairly common breeder in Texas Panhandle including Moore County (Seyffert 2001). Two observed on extensive Canadian River mudflats off Bates Canyon boat ramp (Potter County) on April 27, 2002. No other records, but those mudflats remain largely unsurveyed.

American Avocet – *Recurvirostra americana*
Probably uncommon nesting species (Anonymous 1982). Three congregations (possibly nesting colonies) in April-June, 2002 and 2003: 60-65 on mudflats in Big Blue Creek Bay, 7-8 and 20 on mudflats of the Canadian River between Plum Creek and Bates Canyon boat ramps. Deep mud (waist-deep) prevented visits to the suspected nesting site, thus breeding was not verified.

Killdeer – *Charadrius vociferus*
Uncommon nesting species of mudflats and sandbars of the Canadian River and Lake Meredith and occasionally other open spaces, e.g., two recorded in burned semi-desert in Bates Canyon. Observed on territories from late March. Adults with young from May 7.

Mourning Dove – *Zenaida macroura*
Common and widespread in savannas and grasslands of the study area. One of the most common birds of LAMR. Twenty nests recorded in 2002-2003, e.g., a very high percentage (30%) of ground nests hidden in tall grass, under cholla cactus or yucca. Other nests in shrubs or trees (soapberry, hackberry, cottonwood, mesquite, Chinese elm), 0.2-9 m above the ground. Clutches of 1-2 eggs found from late April through mid-July, young from mid-May, and fledglings from ca. July 10. The majority of low nests are predated.

Yellow-billed Cuckoo – *Coccyzus americanus*
Uncommon nesting species in the study area. Observed in McBride Canyon, Bates Canyon, riverine thickets between Bates Canyon ramp and Dolomite Point, Alibates Flint Quarries, Bugbee Canyon, Blue West and Big Blue Creek Valley. Probably occurs in suitable habitat (shrub patches and woodlots) elsewhere. One nest in a soapberry (*Sapindus*), 5 m above the ground in a small shrub-tree patch in Bates Canyon (Potter County) on June 28, 2002.

Greater Roadrunner – *Geococcyx californianus*
Uncommon but widespread in the study area. Inhabits upland mesquite savanna with thick shrub patches, cottonwood savanna and tamarisk thickets of the Canadian River Valley. Recorded throughout LAMR, e.g., in Rosita Meadows, Mullinaw Crossing, Plum Creek, west of Bates Canyon and Dolomite Point Road, vicinity of Bugbee, Sanford-Yake, Blue West and Big Blue Creek Valley. Nests are well hidden in shrub thickets (e.g., wild plum) and tree foliage (cottonwood), 1.2-1.8 m above the ground. Nesting activity commences early in the season: adults carrying food seen from early May. A nest with shell fragments (likely predated) in Blue West on May 5, 2002, and another with 5 freshly-laid eggs east of Bugbee on May 6, 2003. The young fledged from another nest in Bugbee Canyon by May 14, 2003. A late nest with 4 eggs reported from "Lake Meredith National Recreation Area, Hutchinson County" in August, 1968 (Seyffert 2001).

Barn Owl – *Tyto alba*
Status unclear. One flushed from a hackberry tree in mesquite savanna east of Bugbee (Hutchinson County) on May 5, 2003. Perhaps nested in man-made structures in the general vicinity. Breeding confirmed in Potter, Moore, and Hutchinson counties (Seyffert 2001).

Eastern Screech-Owl – *Otus asio*
Rare (or perhaps uncommon and under-recorded) species. Very cryptic and best found by voice, however, playback surveys in April-May, 2003 failed to generate any response. One nesting record during this study: a brood of four young in cottonwood savanna west of Dolomite Point Road (Potter County) on July 1, 2002. Also heard calling continuously in Rosita Meadows (Potter County) on September 26, 2002. Seyffert (2001) reports a brood of five young from Bugbee Creek area (Hutchinson County) on June 20, 1950.

Great Horned Owl – *Bubo virginianus*
Uncommon resident recorded at Plum Creek, McBride Canyon, Bates Canyon, Alibates Flint Quarries, Cedar Canyon, Sanford-Yake, and Spring Canyon. Vocally active from early February to early May, e.g., a pair duet heard in McBride Canyon on March 15, 2002. No other breeding evidence recorded during the current study.

Common Nighthawk – *Chordeiles minor*
Common and widespread. Considered nesting in LAMR (National Park Service 2001), but no breeding evidence (other than calls and aerial displays) obtained during the 2002-2003 study. Little nesting data are available from Texas Panhandle as a whole (Seyffert 2001). Usually observed flying over semi-desert grassland and mesquite savanna in early evening or early morning hours, e.g., at Rosita Meadows, Mullinaw Crossing, Plum Creek, Bates Canyon, Alibates Flint Quarries, Cas Johnson Road, North Canyon, the vicinity of Bugbee, etc. Very common along FM 1913 east of Four Way (Moore County).

Common Poorwill - *Phalaenoptilus nuttallii*
Rare to uncommon breeder in Texas Panhandle, e.g., numerous summer reports from the Canadian River Breaks in Potter County (Benson and Arnold, 2001; Seyffert 2001). Recorded only once during 2002-2003 study: a bird on Cas Johnson Road (Potter County) in early morning hours of June 2, 2003. May nest on private lands adjacent to the study area, although none heard during night road surveys.

Belted Kingfisher – *Ceryle alcyon*
Uncommon resident recorded by Sanford Marsh, Bugbee Shores and in Big Blue Creek Valley. Probably more widely distributed. A burrow presumably excavated by this species was seen in a steep riverbank south of Chicken Creek, although none seen in the Canadian River Valley during fish surveys in June 2003.

Northern Flicker – *Colaptes auratus*
Uncommon, but widespread nesting species in the study area. Inhabits cottonwood savanna and other grasslands with few standing trees or snags. Observed in Rosita Meadows, extensive savanna north of Mullinaw Crossing, McBride Canyon, Plum Creek, savanna off Dolomite Point Road, Alibates Flint Quarries, vicinity of Bugbee and Sanford-Yake. Nests almost invariably in snags (usually cottonwoods), 3-8 m above the ground. One nest excavated near the top of a utility pole. Early nester: a nest with clutch in Rosita Meadows April 22, 2003. Large young looking out from nests recorded May 25 - July 1, and fledglings from ca. May 30.

Red-headed Woodpecker – *Melanerpes erythrocephalus*
Common nesting species (most common or at least most conspicuous woodpecker of LAMR). Inhabits cottonwood savannas of the Canadian River Valley (Rosita Meadows, Bonita Creek, Chicken Creek, Plum Creek, savanna west of Dolomite Point Road, Big Blue Creek) and open grassland/semi-desert areas with few standing snags (Alibates Flint Quarries, Blue West and the vicinity of Bugbee). Conservative estimate of 80-100 pairs in LAMR, 3-4 pairs in ALFL (a total of 10 nests found in both parks in 2002-2003, 6 off Dolomite Point Road alone). Nests almost invariably in cottonwood snags, 3.5-12 m above the ground (average 6.6 m). Some nests only 100-300 m apart. In two cases, red-headed woodpeckers enlarged usurped nests of ladder-backed woodpeckers (see next account). Arrives to the study area in early May. Adults carrying food to nestlings seen from late June. Two broods (2 young/brood) observed on August 2. In ALFL, a pair nested in the same snag in 2002 and 2003, although a new cavity was excavated each year.

Ladder-backed Woodpecker – *Picoides scalaris*
Common, although somewhat inconspicuous resident of mesquite savanna throughout the study area. Sometimes found in riverine habitats, cottonwood savanna and soapberry patches. Observed in McBride Canyon, Bates Canyon, Plum Creek, Alibates Flint Quarries, Sanford-Yake, east of Bugbee, North Canyon and at the North End. Of four nests recorded during this study, two were excavated in side limbs of cottonwoods (one in a dead tree, and another in a dead limb of a living tree), 2.5-4 m above the ground, and two others in living mesquite trees 1.2-1.5 m above the ground. Ladder-backed woodpecker is an early nester. Adults bringing food to young in nest-cavities observed from early May. In a nest east of Bugbee, at least one young fledged on May 30, 2003. At Blue West, a male with a fledgling seen on June 1, 2002, and adult with 2 large fledglings in Sanford-Yake on June 11, 2002. On the other hand, adults were observed feeding young in a nest cavity observed in Sanford-Yake as late as June 6, 2003.

In 2003, interesting interactions between ladder-backed woodpecker and larger red-headed woodpeckers occurred in the study area: pairs of red-headed woodpeckers attacked and predated (or tried to predate) two nests of ladder-backed woodpeckers excavated in thick cottonwood limbs, and later enlarged entrance holes and usurped the nests. In one nest, small or medium-size young of the smaller species were certainly killed, but in the second case, at least one young fledged successfully before the attack. Attempts by female ladder-backed woodpecker to repel intruders proved ineffective.

Red-headed woodpeckers arrive in LAMR/ALFL in early May when the majority of ladder-backed woodpeckers already have nests with eggs or small young. It is very possible that the larger and more aggressive red-headed woodpecker excludes the smaller species from habitats where snags and trees are large enough to accommodate its nests (e.g., from cottonwood savanna), usurping nests of the latter whenever located. Thus, nests of ladder-backed woodpeckers excavated in heavier-limbed trees in

riverine habitats are more likely targets for red-headed woodpecker attacks while ladder-backed nests in smaller mesquite trees are probably secure.

Ladder-backed woodpeckers nesting close to paved roads occasionally are killed by passing vehicles: a female and a male were found dead in the same area along FM 3395 east of Bugbee on May 19 and May 22, 2003, respectively. Both birds had beaks full of food.

Downy Woodpecker – *Picoides pubescens*
Rare resident (1-2 pairs) in the cottonwood stand of McBride Canyon (Potter County) and possibly in other wooded canyons of LAMR. Nesting suspected, but unverified. Known to nest in the Canadian River Valley elsewhere in Texas Panhandle (Seyffert 2001).

Eastern Kingbird – *Tyrannus tyrannus*
Uncommon nesting species of cottonwood savanna in the Canadian River Valley (Rosita Meadows, Mullinaw Crossing, northwest of McBride Canyon, west of Bates Canyon boat ramp and Dolomite Point Road) and in the vicinity of Bugbee. Two nests recorded during this study: west of Bates Canyon on June 15, 2002, and west of Dolomite Point Road on July 1, 2002. Both nests were in cottonwoods (one living and one dead), 11-12 m above the ground. Still incubating on July 1.

Western Kingbird – *Tyrannus verticalis*
Uncommon to locally common in cottonwood savanna and semi-desert grasslands with few standing trees. Observed in Rosita Meadow, west of Mullinaw Crossing, in McBride Canyon, Plum Creek, Alibates Flint Quarries, east of Bugbee, Blue West, etc. Nests (n=5) invariably in dead or dying cottonwoods, 3.5-12 m above the ground (average 8 m). Nests built on side branches or in forks near tree tops. Curiously, two pairs of western kingbirds shared nesting tree with Bullock's orioles, and one pair also with a red-tailed hawk. Nest-building recorded from late May, and fledglings from June 26 (three broods encountered in ALFL contained 3, 5 and 5 fledglings, respectively). In one nest, the young did not fledge until July 21. Adults feed young grasshoppers, dragonflies, cicadas and robberflies.

Scissor-tailed Flycatcher – *Tyrannus forficatus*
Common, but unevenly distributed nesting species. Very common in open grassland with few standing dead trees or large shrubs and along the edge of cottonwood savanna in Bates Canyon, southern half of ALFL and along Dolomite Point Road (20-25 pairs), but uncommon in similar habitats elsewhere in the parks (Saddle Horse Canyon, Mullinaw Crossing, Sanford-Yake, vicinity of Bugbee, North End). Nests almost invariably in dead trees or living trees with dead tops (cottonwood, soapberry), although two nests observed in living and dying mesquite, respectively. Nests (n=15) usually built on a side branch close to tree trunk or in a small fork close to tree top, 3-12 m above the ground (average 6.5 m).

Scissor-tailed flycatchers arrive in the study area ca. April 10-15. First bird with nesting material observed on May 7. Nests with eggs found from late May to ca. July 20. Two examined nests contained three and four eggs, respectively. Large young ready to leave and fledglings seen from June 25. Generally, there were 3-4 fledglings per brood (n=3). Nests of scissor-tailed flycatchers are conspicuous and frequently are subjected to predation (at least 5 of 15 nests were predated), thus nests found later in the season are probably re-nesting attempts. Some of such late nests contained eggs and small young in late July or even early August.

Ash-throated Flycatcher – *Myiarchus cinerascens*
Uncommon, but widespread species (rarely more than 1-2 pairs/site). Observed at Mullinaw Crossing, McBride Canyon, Bates Canyon, Plum Creek, Dolomite Point grasslands, Alibates Flint Quarries, Sanford-Yake, east of Bugbee and Blue West. Inhabits cottonwood savanna, other grassland, or semi-desert habitats with few standing snags. Nests in natural cavities or those excavated by woodpeckers. Nest observed in an old woodpecker cavity (5.5 m above the ground) east of Bugbee, May 5, 2003. Another nest with five eggs in a vertical metal pipe (1.2 m high and mostly filled with dirt) at Mullinaw Crossing

on June 10, 2003. This species is probably double-brooded: the young from the first nest fledged by May 30, but adults seen bringing nesting material into the same cavity soon after, on June 10. A family group of two adults and two large fledglings was encountered in ALFL on June 26. Adults feed nestlings mostly grasshoppers, katydids, butterflies, moths, but also dragonflies, cicadas and beetles.

Cliff Swallow – *Petrochelidon pyrrhonota*
Locally common nesting species. Two colonies recorded during this study: a smaller colony of 20-30 nests (probably not all active) under an abandoned railway bridge in Sanford-Yake (Hutchinson County) on June 11, 2002, and a larger colony with over 50 nests under Big Blue Creek bridge on FM 1913 (Moore County).

Blue Jay – *Cyanocitta cristata*
Uncommon or rare in LAMR and adjacent towns, e.g., Sanford and Fritch (Hutchinson County). Confined to cottonwood savanna in the Canadian River Valley (Rosita Meadow, west of Dolomite Point, Plum Creek, etc.), woodlots in Chicken Creek and perhaps elsewhere, and planted trees in towns. Perhaps under-recorded due to secretive habits during breeding season. Considered nesting species in LAMR (Anonymous 1982), but no nesting evidence obtained during the current study. Confirmed breeding in the Canadian River Valley elsewhere in Texas Panhandle (Benson and Arnold 2001, Seyffert 2001).

American Crow – *Corvus brachyrhynchos*
Uncommon in the Canadian River Valley south of Lake Meredith. Recorded from cottonwood savanna in Rosita Meadows, Mullinaw Crossing, between Plum Creek and Bates Canyon ramps, in McBride Canyon and Blue West. Nests seen in tall cottonwoods in the valley, but content remained unverified.

Raven sp. (Chihuahuan Raven – *Corvus cryptoleucus* or Common Raven – *Corvus corax*)
Whichever raven species occurs in LAMR it is definitely rare. Ravens observed in study area on two occasions: one over Rosita Meadows on January 10, 2002, and another on a recently burned area in Bates Canyon on May 4, 2002. Neither were seen closely, nor heard calling. Field identification of *cryptoleucus* and *corax* can be problematic; thus, it is difficult to draw any conclusions from these sightings. Anonymous (1982) compiler of LAMR bird list did not list either species. Seyffert (2001) observed *corax* in McBride Canyon in the winters of 1983, 1984 and 1993, and along "Alibates-McBride Canyon Road" (probably Cas Johnson Road) in May, 1987 and June, 1994, but he also confirmed *cryptoleucus* presence in Potter, Moore, and Hutchinson counties.

Carolina Chickadee – *Parus carolinensis*
Rare nesting species restricted to cottonwood savanna and several woodlots in the Canadian River Valley and adjacent canyons, e.g., Rosita Meadows, Plum Creek, Mullinaw Crossing and McBride Canyon (all in Potter County) and possibly elsewhere. Family groups of three and four observed in McBride Canyon and west of Mullinaw Crossing on June 3, 2002 and June 10, 2003, respectively.

Bewick's Wren – *Thryomanes bewickii*
Uncommon nesting species of wooded canyons, although also occurs in cottonwood savanna. Observed in McBride Canyon, Bugbee Canyon, and northwest of Mullinaw Crossing. Nesting suggested by Anonymous (1982) compiler of Lake Meredith bird list, but nesting not confirmed during this study, although an alarming pair encountered in Bugbee Canyon on May 6, 2003, and three birds observed in McBride Canyon on June 23, 2002 might have been a brood.

Rock Wren – *Salpinctes obsoletus*
Common inhabitant of rocky canyons in both parks. Found in suitable habitat throughout the year, e.g., in cliffs by Mullinaw Crossing, Bates Canyon, Devil's Canyon, Alibates Flint Quarries, Cedar Canyon, small canyons in Sanford-Yake and Spring Canyon. Usually 1-3 pairs/canyon. Nests from April. Adult carrying food to the young observed in Spring Canyon as early as May 8. A nest with large young in a rock cavity in ALFL on May 22, 2002. Broods in Alibates and Bates Canyon on June 8 and June 28, respectively.

Eastern Bluebird – *Sialia sialis*
Possibly nests. Occurs in cottonwood savanna in the Canadian River Valley (from Rosita Meadows to Devil's Canyon) where observed as late as April 21 (i.e., well into nesting season). Not listed as breeding in Texas Panhandle by Seyffert (2001), but nesting suspected in LAMR (Anonymous 1982) and confirmed in the Panhandle during Texas Breeding Bird Atlas surveys (Benson and Arnold 2001). Suitable habitat exists in the park and nesting of this species should not be ruled out.

American Robin – *Turdus migratorius*
Surprisingly rare or perhaps uncommon in LAMR in 2002-2003: few pairs recorded in wooded parts of McBride and Bugbee canyons, although many sites of potential at the south and west ends of the park were not surveyed. No breeding evidence, but likely nests. Common nesting species in the 1970s (Anonymous 1982).

Loggerhead Shrike – *Lanius ludovicianus*
Rare nesting species in the study area. Only 1-2 pairs in semi-desert grassland with few patches of wild plum (*Prunus*) by Dolomite Point Road and in adjacent parts of Alibates Flint Quarry NM (Potter County) in 2002-2003. Perhaps a few other pairs are elsewhere in the park. One observed off FM 3395 northwest of Bugbee. Observed on territory from early April. A nest found in a wild plum bush off Dolomite Point Road, on May 24, 2002, was empty and likely predated. A pair observed in that general vicinity in 2003.

Northern Mockingbird – *Mimus polyglottos*
Common nesting species inhabiting mesquite savanna, soapberry and wild plum thickets, and to a lesser extent cottonwood savanna and planted trees in the Canadian River Valley, adjoining canyons and uplands. Occurs in suitable habitat throughout LAMR and ALFL. No population estimates, but recorded on all except one bird survey. Thirteen nests found in 2002-2003. Nests in shrubs (mesquite, soapberry, wild plum) and occasionally trees (soapberry, hackberry, Chinese elm), living or sometimes dead, 0.4-3.2 m above the ground (average 1.5 m). Singing from mid-April, and nest with eggs from the first week of May through the third week of July. Nestlings recorded from mid-May, and fledglings from late May-early June. Nest failure is considerable: almost half (6) of nests found with eggs or young were later predated (possibly by snakes), in one case large nestlings overrun by ants.

Brown Thrasher – *Toxostoma rufum*
Possibly a rare nesting species. One observed in bush thickets northwest of Mullinaw Crossing (Potter County) on June 10, 2003. Known to nest in eastern Panhandle and near Dumas in Moore County (Seyffert 2001).

European Starling – *Sturnus vulgaris*
This non-native species is rather rare in the study area. Three observed in Rosita Meadows on April 17, 2002. Two pairs nested in cavities in a dead cottonwood in Alibates Flint Quarries. Birds with food seen entering cavities on June 26, 2002. Curiously, three other species nested in the very same cottonwood: red-tailed hawk, western kingbird, and Bullock's oriole.

Common Yellowthroat – *Geothlypis trichas*
Probably rare nesting species. A male in wet meadow alongside Bugbee Creek (Hutchinson County) on May 6, 2003. "A bird in juvenile plumage" in Sanford Marsh (Hutchinson County) on July 27, 1987 (Seyffert 2001). Confirmed nesting records from Moore County and the Canadian River Valley in Hemphill counties (Seyffert 2001).

Northern Cardinal – *Cardinalis cardinalis*
Uncommon resident of bush thickets along the Canadian River, its tributaries, in ravines and some canyons. Readily uses encroaching tamarisk for nest and shelter, but also occurs in patches of native shrubs. Recorded in Rosita Meadows, Plum Creek, Bates Canyon, ALFL (Potter County), Sanford-Yake, Bugbee Canyon (Hutchinson County), Blue West, Big Blue Creek (Moore County) and probably

elsewhere. Usually no more than 1-2 pairs/site. A nest with two eggs found in a tamarisk (ca. 1.6 m above the ground) in a small canyon at Sanford-Yake June 11, 2002.

Blue Grosbeak – *Guiraca caerulea*

Uncommon, but widely distributed nesting species. Rarely more than 1-2 pairs encountered per site per day. Observed at Mullinaw Crossing, in McBride Canyon, Bates Canyon, Plum Creek, Dolomite Point Road grasslands, Alibates Flint Quarries, Bugbee Canyon and Blue West. Inhabits shrub patches (soapberry, hackberry, wild plum, tamarisk) and groves in grasslands and savanna. Nests in shrubs, 0.5-1.5 m above the ground (n=5). Nest-building observed in ALFL on June 25, 2002. A nest found west of Mullinaw Crossing on June 10, 2002 contained four cowbird eggs and only one grosbeak egg.

Painted Bunting – *Passerina ciris*

Uncommon (perhaps under-recorded), but widely distributed nesting species recorded in Saddle Horse Canyon, McBride Canyon, Dolomite Point Road grasslands and adjacent savanna, Blue West, Sanford-Yake, the vicinity of Bugbee, and North End. Inhabits mesquite savanna and brush patches (wild plum, tamarisk) in semi-desert grasslands. A completed nest found in mesquite savanna close to intersection of FM 1319 and FM 687 at the North End of LAMR (Hutchinson County) on May 26, 2002. The nest was in a mesquite tree, 1.2 m above the ground. The nest contained three cowbird eggs and one bunting hatchling on June 10, but only 2 cowbird chicks on June 13. Not all males trying to breed in the area attain full adult plumage: at least one first-year male in all-green plumage recorded singing east of Bugbee on May 25, 2003.

Field Sparrow – *Spizella pusilla*

Uncommon nesting species. Current study provides first breeding evidence for Hutchinson County and LAMR. Bird of riverine grasslands, mesquite and cottonwood savanna recorded at Mullinaw Crossing, in McBride Canyon, west of Dolomite Point Road, and east of Bugbee. A nest with four newly hatched young found in mesquite savanna east of Bugbee (Hutchinson County) on May 14, 2003. The nest was in a clump of grass near the base of a small mesquite, 0.1 m above the ground.

Lark Sparrow – *Chondestes grammacus*

Common nesting species of grasslands and mesquite savanna in the study area, less common in cottonwood savanna. Recorded in Rosita Meadows, Plum Creek, Alibates Flint Quarries, Blue West, east of Bugbee, North End, etc. Singing from late April to early May. A nest built under a small sage on a 35° slope in ALFL contained four newly hatched chicks and one egg on May 21, 2002. On June 10, 2002, a nest with four eggs found in a mesquite (2 m above the ground) at the North End. Many broods along FM 1913 east of Four Ways (Moore County) on July 13, 2003.

Cassin's Sparrow – *Aimophila cassinii*

Uncommon to locally common grassland species recorded in Alibates Flint Quarries, Blue West, east of Bugbee and at the North End. Possibly overlooked elsewhere. Truly common only in upland little bluestem-sage-yucca grasslands and mesquite savanna at the northernmost end of LAMR (North End, Hutchinson County). Characteristic song flights observed there from ca. May 9. No nesting evidence recorded during this study, but reported as common nesting species by Anonymous (1982) compiler of LAMR bird list. Although Cassin's sparrow is a common nesting species throughout Texas Panhandle only two nests (e.g., one from Moore County) reported to date from there (Seyffert 2001).

Rufous-crowned Sparrow – *Aimophila ruficeps*

Uncommon (or perhaps overlooked) inhabitant of semi-desert canyons in the study area. Recorded in Bates Canyon, ALFL and Cedar Canyon, but many canyons on the west side of the park have not been surveyed. No breeding evidence obtained during this study, though a pair exhibiting territorial behavior observed in Cedar Canyon on May 6, 2002. Seyffert (2001) saw an adult carrying nesting material in McBride Canyon on June 29, 1975, and "a juvenile-plumaged bird" there on July 10, 1985.

Eastern Meadowlark – *Sturnella magna*
Probably uncommon nesting species. Nesting suspected in LAMR (Anonymous 1982) and confirmed elsewhere in Hutchinson and Potter counties (Seyffert 2001). Less common than Western Meadowlark. Singing males recorded in Spring Canyon (Hutchinson County) and Dolomite Point grasslands (Potter County). No other breeding evidence obtained during this study.

Western Meadowlark – *Sturnella neglecta*
Common species nesting throughout Texas Panhandle (Seyffert 2001), including LAMR (Anonymous 1982). Rather uncommon in 2002-2003. Outnumbered Eastern Meadowlarks in February, 2002, but only slightly so during the nesting season. Territorial pairs and singing males occurred in grasslands/grassy savanna throughout both parks. No nests or broods recorded in this study, but adults carrying food observed in Dolomite Point grasslands in May, 2002.

Red-winged Blackbird – *Agelaius phoeniceus*
Common resident. Nests in cattail marshes and bush thickets (e.g., tamarisk thickets) adjacent to the Canadian River, associated creeks and Lake Meredith. Most common in marshes and thickets between Plum Creek, Bates Canyon boat ramp, and Dolomite Point, and in Sanford Marsh; occurs in Rosita Meadows, Bonita Creek, Mullinaw Crossing and Blue West. May nest in ALFL where seen in shrub patches in late May, 2002. Sings from mid-February. Males chasing females recorded from late April. Adults with food and a vacated nest seen in the Canadian River Valley west of Dolomite Point on June 15, 2002. Another nest in cattails along Bonita Creek on June 18, 2003.

Brown-headed Cowbird – *Molothrus ater*
Uncommon breeding species occurring throughout the study area. Nest parasite laying eggs in nests of other species. Two breeding records: 3 cowbird eggs in a nest of painted bunting at the North End (Hutchinson County) on June 10, 2002 (hatched by June 13), and 4 cowbird eggs in a nest of blue grosbeak at Mullinaw Crossing (Potter County) on June 10, 2003. Additional breeding record provided by Seyffert (2001): "a recently hatched bird and a cowbird egg [in a nest of indigo bunting] was found at Lake Meredith, Potter County, on 10 July, 1995". Northern mockingbirds and lark sparrows observed chasing cowbirds east of Bugbee, but no cowbird eggs found in examined nests of these two species.

Common Grackle – *Quiscalus quiscula*
Uncommon nesting species inhabiting marshes in the Canadian River Valley. No nests found in this study, but adults bringing food to young seen in marshes between Bates Canyon ramp and Dolomite Point (Potter County) June 15, 2002. Also observed in these marshes in 2003.

Bullock's Oriole – *Icterus bullockii*
Uncommon nesting species of cottonwood savanna and semi-desert grasslands with few standing trees. Recorded at Mullinaw Crossing, along Dolomite Point Road, Alibates Flint Quarries, vicinity of Bugbee, and North End. Pendulous nest is usually hidden in foliage, often near branch end, although sometimes built in the open. Nest height (n=4): 3.5-10 m above the ground (average 7.7 m). Nest building recorded in mid-May and large nestlings in mid-June.

Orchard Oriole – *Icterus spurius*
Possibly a rare nesting species: a male observed in Bugbee area in (Hutchinson County) in May, 2003. Nesting is known elsewhere in Hutchinson County (Seyffert 2001).

House Sparrow – *Passer domesticus*
Non-native species. Reportedly a common resident in Lake Meredith (Anonymous 1982), but probably more so in surrounding towns and communities. No evidence of nesting in the parks proper in 2002-2003 study. Observed in upland mesquite-cottonwood savanna east of Bugbee in March, 2003, probably on a foraging foray.

Wintering Grassland Birds

Wintering grassland bird surveys were undertaken subsequent to the designs of the original study plan (National Park Service 2000). This effort arose from an interest in assessing the status of the species assemblage, stemming from concerns about overall declines in this group due to habitat alteration and fragmentation across much of their range. Results of winter grassland bird surveys were inconclusive, perhaps due to a relatively small sample size (ca. 1-1.5% of park grasslands were covered in this study [Map 2]) and methods employed in this study. Results are presented in the discussion below and in Appendices 18 and 19.

Of a minimum of 19 species recorded in this study, only 4 species are classified as "grassland birds": northern harrier (*Circus cyaneus*), eastern meadowlark (*Sturnella magna*), western meadowlark (*Sturnella neglecta*) and perhaps some unidentified skulking sparrows (possibly *Ammodramus* sp.). Other detected species included generalists, scrubland or simply wandering species: mallard (*Anas platyrhynchos*), sharp-shinned hawk (*Accipiter striatus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), ladder-backed woodpecker (*Picoides scalaris*), unidentified shrike (*Lanius* sp.), red-winged blackbird (*Agelaius phoeniceus*), white-crowned sparrow (*Zonotrichia leucophrys*), field sparrow (*Spizella pusilla*), American tree sparrow (*Spizella arborea*), song sparrow (*Melospiza melodia*), dark-eyed junco (*Junco hyemalis*) and American goldfinch (*Carduelis tristis*). Of 206 birds recorded on 3-ha plots and 557 on transects, only 27 (13%) and 112 (20%), respectively, were grassland species. Of 30 surveyed plots, nine contained no birds and 12 had no grassland birds. Of 14 transects two were devoid of grassland birds. Meadowlarks and sparrows seemed to be more abundant on the bottom of the Canadian River Valley rather than in upland grasslands.

White-crowned sparrow was the most common and widespread species recorded on plots in December, 2001 to January, 2002, and on transects in February, 2002. High numbers of red-winged blackbird in February resulted from a single encounter of a large flock (225 birds). Of grassland species, western and eastern meadowlarks were the only two species recorded in sizeable numbers throughout the study period. Northern harriers were relatively common, but mostly recorded outside plots or transects. During the study period, this species was observed at Rosita Meadows, grasslands adjacent to Devil's Canyon, Dolomite Point grasslands, Bates Canyon, Alibates Flint Quarries, Sanford-Yake, east of Bugbee, Spring Canyon and Blue West.

Many grassland sparrows are cryptic skulking birds rarely seen on perch or in flight, many (especially *Ammodramus* species) often run away in thick grass instead of taking wing. Thus, if such species were present in the study area, there was little chance that they could be detected and identified by the current methods. Use of mist-nets was suggested before onset of the study, but time did not allow acquisition of necessary permits, so the method was not employed.

Mammals (32 species)

Results of mammal surveys are presented in the following species accounts. The tables in Appendix 20 present details of small mammal trapping efforts.

Least Shrew – *Cryptotis parva*

Possibly widespread and relatively common in the Canadian River Valley and by associated creeks and marshes, but only two captures per 1,200 pitfall nights in 2002: both near Sanford Marsh (Hutchinson County) on November 1, 2002. Yancey et al. (1998) did not record this species at LAMR (although they probably did not use pitfalls). Not previously known from Potter and Moore counties (Davis and Schmidly 1994). One specimen (skull only) deposited with Angelo State University collection.

Desert Shrew – *Notiosorex crawfordi*
Status unclear (probably not rare, but under-recorded). Only one specimen obtained in this study (per 1,200 pitfall nights): in upland mesquite savanna between Sanford-Yake and Cedar Canyon on November 13, 2002. None collected in 1991-1992 study (Yancey et al. 1998). This species generally prefers more arid habitats than *Cryptotis parva*, although also known to occur near wetlands. Collected in Moore and Hutchinson counties (Davis and Schmidly 1994).

Eastern Mole – *Scalopus aquaticus*
Uncommon or rare. Yancey et al. (1998) collected one specimen at Big Blue Creek (Moore County), but observed tunnels at several other localities in Bates Canyon (Potter County) and Spring Canyon (Hutchinson County). During this study, positively identified mole tunnels recorded only once: in riparian grasslands east of Devil's Canyon (Potter County) on January 15, 2002. Moles are possibly more common in riparian habitats of the Canadian River Valley, but tunnels are hard to see in dense grass.

Pallid Bat – *Antrozous pallidus*
The only bat recorded during this study. Probably uncommon, but widespread in the study area. One mist-netted at the foot of Bultaco Hill, Rosita Meadows (Potter County) on September 26, 2002. Collected by Killebrew (1977) in unspecified localities in LAMR.

Remark: Studying bats in LAMR/ALFL is not an easy task. Strong winds prevail in the area throughout the year, making mist netting extremely difficult. Yancey et al. (1998) did not capture any bats in Lake Meredith in 1991-1992. Use of a harp trap and bat detectors are recommended, but such surveys did not fit the timetable or budget of this inventory and warrant a separate study.

Nine-banded Armadillo – *Dasypus novemcinctus*
Very rare resident or perhaps only occasional visitor to the study area. Two withered shells found in mesquite savanna between FM 1319 and FM 3395 east of Bugbee (Hutchinson County) on January 16, 2002 and in Dolomite Point grasslands (Potter County) on June 12, 2002, respectively. The first live armadillo was seen and caught by hand at Chicken Creek (Potter County) on October 31, 2003. Killebrew (1977) and J. Rancier (pers. comm.) reported unconfirmed sightings (e.g., of roadkills) by local residents. Most likely, armadillos move to LAMR in summer from counties to the east and to the south of the study area, but this species has no adaptations to cope with extremes of cold weather (Davis and Schmidly 1994) and Panhandle winters probably eliminate animals that straggle into the region. Photo of armadillo shell obtained in this study is possibly the first record of this species for Hutchinson County (Appendix 26).

Desert Cottontail – *Sylvilagus audubonii*, and Eastern Cottontail – *Sylvilagus floridanus*
Both cottontail species are common in the study area, and are legally hunted at LAMR. Field identification of these two species can be complicated and no methods to catch or kill cottontails were employed in this study. Nonetheless, a general impression is that desert cottontail occurred in drier semi-desert and savanna habitats from the Canadian River Valley to uplands, while eastern cottontail inhabited more dense riverine habitats along the Canadian River and associated creeks, and in canyons. However, habitats of the two species may overlap. In a 1991-1992 study (Yancey et al. 1998), desert cottontails were collected in McBride Canyon (Potter County), west of Fritch and in Spring Canyon (Hutchinson County), and eastern cottontail was found in Bugbee Canyon (Hutchinson County) and Big Blue Creek (Moore County).

Black-tailed Jackrabbit – *Lepus californicus*
Uncommon to common and widespread throughout the study area; a legal game species at LAMR. Most frequently seen in uplands rather than in the Canadian River Breaks. Killebrew (1977) defined this species' habitat as "prairie-mesquite grasslands."

Spotted Ground Squirrel – *Spermophilus spilosoma*

Uncommon (perhaps under-recorded), but widespread in sandy areas along the Canadian River and in adjacent uplands. Observed at Rosita Meadows, Dolomite Point grasslands, and ALFL (Potter County). One adult male caught in a large Sherman trap in North End grasslands (Hutchinson County) on April 12, 2003. Yancey et al. (1998) reported seeing this species in Spring Canyon (Hutchinson County). Ground squirrel burrows (most likely of this species) also seen at Mullinaw Crossing and Plum Creek Canyon. Four large young observed at a burrow entrance in Rosita Meadows on August 12, 2002.

Thirteen-lined Ground Squirrel – *Spermophilus tridecemlineatus*

Not found in LAMR/ALFL during this study, but observed at the intersection of Plum Creek Road and FM 1913 (Moore County), to the north of the park, on May 2 and July 13, 2003. Killebrew (1977) recorded this species throughout LAMR, but none found in 1991-1992 study (Yancey et al. 1998).

Black-tailed Prairie Dog – *Cynomys ludovicianus*

Not present in LAMR. A prairie dog town in Sanford-Yake campground apparently succumbed to plague in 2000 (J. Rancier, pers. comm.), and the animals did not recolonize this site. In August, 2001, a small town existed on private lands by Fritch Fortress Road (Hutchinson County), but no prairie dogs were present at that site by January, 2002. Few prairie dog towns probably exist on private ranches adjacent to upland parts of LAMR, but the only proof to this statement is a small town established in a mesquite pasture north of Blue West Road (Moore County) in 2003. Records show 30-40 mounds counted there on April 28, 2003. Also, J. Rancier (pers. comm.) found a roadkilled prairie dog west of Fritch in summer 2002.

Fox Squirrel – *Sciurus niger*

Rare and confined mostly to riverine habitats of the Canadian River and its tributaries. None found in 1991-1992 survey (Yancey et al., 1998), although collected at Stinnett (Hutchinson County) northeast of the park (Jones et al. 1988). During the current study, this species observed only twice: in planted trees by the Ranger Station at Sanford-Yake (Hutchinson County) on May 4, 2003, and in woodlands by Big Blue Creek (Moore County) on June 5, 2003. In addition, a dray (nest) seen in cottonwoods by Chicken Creek (Potter County) on May 7, 2002.

Plains Pocket Gopher – *Geomys bursarius*

Gophers (2 species) occur throughout LAMR and ALFL (Killebrew 1977). Gopher mounds and tunnels are found in almost all terrestrial habitats (except rocky slopes and cliffs) from Rosita Meadows to North End grasslands. Trapping of gophers is time consuming, but is the only way to positively identify this species. Due to time constraints, only two areas were sampled (April, 2003): sandy soils at the North End grasslands (Hutchinson County) and red clay-loam and rocky soils in Bates Canyon (Potter County). Both sites produced plains pocket gophers (2 and 1, respectively). Killebrew (1977) also collected this species in Saddle Horse Canyon, Plum Creek, McBride Canyon (Potter County), Spring Canyon, Bugbee Canyon (Hutchinson County) and Blue West (Moore County). Surprisingly, the study by Yancey et al. (1998) failed to collect this species in the study area.

Remark: According to the latter authors as well as Davis and Schmidly (1994), plains pocket gopher favors sandy soils whereas another species (yellow-faced pocket gopher – *Cratogeomys castanops*) occurs in calcareous, clay and clay-loam soils, occupying sandy soils where *bursarius* is absent. However, this survey found plains pocket gopher in both sandy and clay-loam soils. Failure of this study to detect *C. castanops* is most likely due to insufficient sampling effort. Both Killebrew (1977) and Yancey et al. (1998) collected *C. castanops* in LAMR: at Bonita Creek, Saddle Horse Canyon, McBride Canyon, Plum Creek (Potter County), Fritch Fortress (Hutchinson County), Big Blue Creek and Blue West (Moore County).

Silky Pocket Mouse – *Perognathus flavus*
Common, though inconspicuous and difficult to capture in live traps due to its minuscule size, but readily caught in pitfalls (R. Dowler, M. Engstrom and R. Kazmaier, pers. comm.). None caught in small Sherman traps (177 trap-nights) or pitfalls (1,200 trap-nights) at the North End grasslands, Bates Canyon, nor Rosita Meadows in 2002-2003. However, infrequently encountered on paved and unpaved roads during night searches, and two caught by hand in Plum Creek Canyon (Potter County) on June 10, 2003, and on FM 1913 close to Big Blue Creek (Moore County) on June 18, 2003, respectively. Also observed on Dolomite Point Road, Cas Johnson Road (Potter County) and FM 1913 between Four Way and Plum Creek Road (Moore County), and at the intersection of SH 136 and FM 1319 (Hutchinson County).

Contrary to these findings and the above experts' opinions, the Texas Tech University survey team caught 22 in live traps in 1991-1992 (Yancey et al. 1998), in McBride Canyon, Bates Canyon (Potter County), Sanford-Yake, and Spring Canyon (Hutchinson County).

Hispid Pocket Mouse – *Chaetodipus hispidus*
Surprisingly rare during this study. Caught only once per 177 trap-nights (in small Sherman traps): in Spring Canyon (Hutchinson County) on October 24, 2002. Second individual observed on FM 1913 south of Big Blue Creek (Moore County) during a night road survey on May 15, 2003. Such paucity of records is difficult to explain: Yancey et al. (1998) found it uncommon, but widespread throughout LAMR (21 specimens collected) in Plum Creek, Bates Canyon (Potter County), Bugbee Canyon, Spring Canyon (Hutchinson County), Evans Canyon and Blue West (Moore County).

Ord's Kangaroo Rat – *Dipodomys ordii*
Common and widespread. More common in grasslands and open mesquite savanna on sandy soils, but also occurs on clay and loam soils. Recorded in Rosita Meadows, McBride Canyon, Plum Creek Canyon, Bates Canyon, Dolomite Point grasslands, Cas Johnson Road (Potter County), Sanford-Yake, North End grasslands (Hutchinson County), and Blue West Road (Moore County). Additional records from Saddle Horse Canyon (Potter County), Fritch Fortress, and Spring Canyon (Hutchinson County) (Killebrew 1977, Yancey et al. 1998). Frequently recorded during night road searches. For example, seven were found on Dolomite Point Road (May 4 and 28, 2003) and four on McBride-Mullinaw Road on May 6, 2003. Trapping proved less effective in October, 2002 (0.7/100 trap-nights) and more effective in April, 2003 (7.8/100). Four out of eight kangaroo rats caught April 12-13 at North End grasslands and Bates Canyon were recently weaned juveniles. In the 1970s, Killebrew (1977) reported densities of up to 66.2/ha.

Beaver – *Castor canadensis*
Limited distribution. Killebrew (1977) reported beavers from the Canadian River Valley and tributaries, at Bonita and Chicken Creeks (Potter County) and Sanford Marsh (Hutchinson County). Not found in 1991-1992 study (Yancey et al. 1998). In 2002-2003, fresh signs of beaver activity (felled cottonwoods, dams, huts and runways) were found only at Bonita Creek, and older signs below Mullinaw Crossing (Potter County). No beaver dams or huts were seen in the Canadian River or Sanford Marsh.

Western Harvest Mouse – *Reithrodontomys megalotis*
Uncommon (or at least not readily caught in live traps). Yancey et al. (1998) collected only six specimens in 1991-1992, and the present study yielded only three (1.7/100 trap-nights). All three caught in small Sherman traps in grassland in Rosita Meadows (Potter County) on April 23, 2003. Yancey at al. (1998) also recorded this species in McBride Canyon (Potter County) and Spring Canyon (Hutchinson County). One specimen secured in the current study deposited with ASU. In addition, unidentified harvest mice (*Reithrodontomys* sp.) encountered under coverboards in Sanford Marsh, Sanford-Yake (Hutchinson County) and off Dolomite Point Road.

Remark: Another harvest mouse species, the plains harvest mouse (*Reithrodontomys montanus*) was not recorded during this study. Yancey et al. (1998) collected 5 specimens and regarded this species

uncommon in LAMR, with records from McBride Canyon (Potter County), Bugbee Canyon (Hutchinson County), and Blue West (Moore County). According to the same authors, the plains harvest mouse favors more xeric and upland habitats than *R. megalotis*.

White-footed Mouse – *Peromyscus leucopus tornillo*

Very common. Most common rodent in Texas Panhandle and LAMR according to Jones et al. (1988) and Yancey et al. (1998), respectively. This study is in accord with their findings: 28 caught/246 trap-nights (large and small Sherman traps), i.e., 11.4/100 trap nights. Also, at least seven found under coverboards (chipboards and roofing tin). Uses a variety of habitats: sandy riverine grasslands, savanna, rocky slopes, and near marshes. Found in Rosita Meadows, Mullinaw Crossing, Bates Canyon, Alibates Flint Quarries (Potter County), Sanford-Yake, Spring Canyon, North Canyon, and North End grasslands (Hutchinson County). Yancey et al. (1998) provide additional records from McBride Canyon, Plum Creek (Potter County), Blue West, Big Blue Creek (Moore County), and Bugbee Canyon (Hutchinson County), and Killebrew (1977) from Bonita Creek and Saddle Horse Canyon (Potter County). Pregnant females caught in Spring Canyon and Sanford Marsh on October 23 produced litters of 7 young each on October 24 and 25. Eight specimens collected during this study deposited with ASU.

Deer Mouse – *Peromyscus maniculatus luteus*

Probably uncommon in the study area. Only two trapped per 246 trap-nights (0.8/100 trap-nights): one at North End grasslands (Hutchinson County) in October, 2002, and another in Rosita Meadows (Potter County) in April, 2003. A third deer mouse was found under a coverboard in McBride Canyon (Potter County) on July 21, 2002. Paucity of deer mouse at LAMR is concurred by 1991-1992 study (Yancey et al. 1998) when only 5 deer mice and 148 white-footed mice were collected. Additional sites reported by Killebrew (1977) and Yancey et al. (1998) include Bonita Creek, Saddle Horse Canyon, McBride Canyon, Plum Creek (Potter County), Fritch Fortress, Bugbee Canyon, Spring Canyon (Hutchinson County), and Blue West (Moore County). A pregnant female obtained on October 23, 2002 produced a litter of seven in captivity. One specimen from Hutchinson County deposited with ASU.

Northern Grasshopper Mouse – *Onychomys leucogaster*

Locally common species. Ten caught during this study (4/100 trap-nights): all at the north end of the park in Hutchinson County. Seven captured in little bluestem-sage-yucca grassland on sandy soils at the North End (between FM 687 and Spring Canyon), and the remaining three in thick mesquite savanna on heavy red soils in North Canyon. Numbers probably fluctuate as Yancey et al. (1998) took only two specimens in 1991-1992. Killebrew (1977) and Yancey et al. (1998) reported the following additional locations: Fritch Fortress, Bugbee Canyon, and Spring Canyon (all in Hutchinson County).

Hispid Cotton Rat – *Sigmodon hispidus*

Surprisingly rare during 2001-2002 study: only one capture (0.3/100 trap-nights). Caught in a small Tomahawk trap in upland mesquite savanna in Sanford-Yake (Hutchinson County) on October 22, 2002. However, very common in LAMR in the 1970s: up to 137/ha (Killebrew 1977), and in 1991-1992 (Yancey et al. 1998). According to Davis and Schmidly (1994) Texas populations experience dramatic fluctuation, rising and falling about every ten years with highest densities reported in wetter years. Perhaps Lake Meredith population crashed during the prolonged drought in the late 1990s-early 2000s. Killebrew (1977) and Yancey et al. (1998) collected hispid cotton rats from Bonita Creek, Bates Canyon, McBride Canyon (Potter County), Evans Canyon, Blue West, Big Blue Creek (Moore County), Bugbee Canyon and Spring Canyon (Hutchinson County). Pregnant female caught on October 22 produced a litter of 6 young in captivity.

White-throated Woodrat – *Neotoma albigula*

Common in rocky slopes and canyons throughout the area of interest. Relatively low success rate (5 captures, 1.5/100 trap-nights) reflects paucity of sampling stations in suitable habitats rather than low density. Caught in Cedar Canyon, Spring Canyon (Hutchinson County), and from rocky outcroppings in Rosita Meadows (Potter County). Nests of this species also observed in small canyons off Blue West

(Moore County), Bugbee Canyon (Hutchinson County) and McBride Canyon (Potter County). In addition, Killebrew (1977) and Yancey et al. (1998) collected white-throated woodrats in Bates Canyon, Plum Creek (Potter County), Fritch Fortress (Hutchinson County), Big Blue Creek (Moore County).

Southern Plains Woodrat – *Neotoma micropus*

Common in mesquite savanna and grasslands with yucca and *Opuntia* cactus in the Canadian River Valley and adjacent uplands. Six caught in Tomahawk traps (7/100 trap-nights) in Sanford-Yake and Spring Canyon (Hutchinson County), but animals and their nests also observed in McBride Canyon, Dolomite Point grasslands, ALFL (Potter County) and Blue West (Moore County). Additional records from Plum Creek and Bugbee Canyon (Killebrew 1977, Yancey et al. 1998).

Porcupine – *Erethizon dorsatum*

Rare, but wide-ranging in study area, mostly confined to wooded portions of the Canadian River Valley and associated creeks. Only one live animal was seen in this study: in a tree within the middle of Dolomite Point grasslands (Potter County) on June 10, 2002. Two roadkilled porcupines recorded in Hutchinson County: on FM 1319 near Sanford Dam (September 18, 2002) and on FM 3395 by Bugbee Creek (June 25, 2003). In addition: feeding signs (bark chewed off trees and shrubs) observed in Spring Canyon (Hutchinson County) in February-March, 2002, and tracks by Chicken Creek (Potter County) on June 12, 2003. Interestingly, Yancey et al. (1998) also reported a roadkilled porcupine from Sanford Dam.

Coyote – *Canis latrans*

Common and widespread. Coyotes seen and/or heard in Devil's Canyon, Bates Canyon, McBride Canyon, Mullinaw Crossing, Plum Creek Canyon, ALFL (Potter County), Sanford-Yake, Spring Canyon, North End grasslands, Bugbee area (Hutchinson County), and Blue West and Big Blue Creek (Moore County). Up to 3-4 animals heard or seen at each site. Previous study (Yancey et al. 1998) also found coyotes common in the study area. Legally hunted in LAMR.

Fox sp. (*Vulpes velox* or *Urocyon cinereoargenteus*)

Two fox species potentially occur in the study area: swift fox (*Vulpes velox*) known from Hutchinson, Moore and Potter counties, and gray fox (*Urocyon cinereoargenteus*) in Potter County (Davis and Schmidly 1994). The previous mammal study of LAMR (Yancey et al. 1998) failed to detect either of these species. Small fox tracks were regularly seen in this study at one location, in a sandy draw in ALFL (Potter County) in March-May, 2002. All attempts to photograph this species with a remote camera were unsuccessful. Habitat in the area (semi-desert grassland) suggests that it might have been a swift fox. In addition, Mike Smith (NPS ranger) reported seeing a fox along Cedar Canyon Road in Sanford-Yake (Hutchinson County) in June, 2003. He also reported that some tourists observed a fox in this area. Subsequent searches in June, 2003 failed to find the fox or its tracks. Habitat in that area is a relatively open mesquite savanna with some thicker patches, and although the *Vulpes* presence is more likely in that habitat, the *Urocyon* should not be ruled out.

Both swift and gray fox are chiefly nocturnal and unlikely to have been encountered in daytime, but dozens of hours of night searches did not detect any foxes either. Nor were seen any roadkilled foxes in the general study area. Remote cameras set at various sites in the parks were generally unsuccessful and very few species were caught on film; foxes were not among those few animals that were documented with remote cameras. A possible explanation of fox absence/paucity in the study area may be coyote predation. Swift fox suppression by coyote predation was recently demonstrated by a study in Texas Panhandle (Kamler et al. 2003).

Raccoon – *Procyon lotor*

Uncommon, but widespread in the study area, mostly along the Canadian River and its tributaries, and along the Lake Meredith coastline. A legal game species at LAMR. Tracks and/or animals seen at Chicken Creek, Mullinaw Crossing (Potter County), Sanford Marsh, Bugbee Canyon (Hutchinson County), Big Blue Creek and Blue West (Moore County). One photographed by a remote camera in

Sanford-Yake in September, 2002, and a roadkill found on FM 3395 east of Bugbee on May 19, 2003. Surprisingly, not encountered during spotlight surveys.

American Badger – *Taxidea taxus*

Uncommon and/or inconspicuous or perhaps even rare species. Killebrew (1977) collected badgers during his studies at LAMR, but the Texas Tech University study detected no signs of this species in 1991-1992 (Yancey et al. 1998). The present study shows that badgers still occur in LAMR, albeit in small numbers. In 2002-2003, badger tracks were regularly seen in the Mullinaw Crossing and along Chicken Creek (Potter County). No live badgers were observed or photographed during night searches and remote camera sessions in the parks proper, but one was seen on FM 1913 north of Big Blue Creek (Moore County) on April 14, 2003. Probably more common on private lands adjacent to the park: roadkilled badgers recorded on State Highway 136 south of Fritch (Hutchinson County) in August, 2001, at the intersection of SH136 and FM 1559 west of Borger (Hutchinson County) on June 2, 2003, and on US 287 north of the Canadian River bridge (Potter County) on April 23, 2003. In Texas, American badger feeds primarily on ground squirrels and prairie dogs (Davis and Schmidly 1994). The former prey species are uncommon in the parks, the latter all but disappeared. Thus, low prey densities might explain a paucity of the American badger in the study area.

Bobcat – *Lynx rufus*

Rare. Killebrew (1977) observed tracks in LAMR, but no signs were found in the survey of 1991-1992 (Yancey et al. 1998). During the present study, tracks were found only by Plum Creek (Potter County) at the south end of LAMR. J. Rancier (USNPS) reported seeing bobcat tracks in the same area in September, 2003.

Mule Deer – *Odocoileus hemionus*

Uncommon, but wide-ranging; legal game at LAMR. Mostly occurs on rocky slopes and uplands with juniper or mesquite savanna. During this study, mule deer were recorded in McBride Canyon, Alibates Flint Quarries, Cas Johnson Road (Potter County), Sanford-Yake, in and near Spring Canyon (Hutchinson County) and in Blue West (Moore County). Small herds observed in winter through mid-spring, e.g., a herd of 8 on Sanford Dam on December 21, 2001. A doe and fawn were seen in Blue West on June 2, 2002.

White-tailed Deer – *Odocoileus virginianus*

Relatively common and widespread through riparian habitats of the Canadian River Valley and associated creeks (Rosita Meadows, Bonita Creek, Chicken Creek, from Mullinaw Crossing to Lake Meredith, Plum Creek and in Sanford Marsh), but also occurs in drier grassland habitats favored by the mule deer (e.g., in Bates Canyon and Alibates Flint Quarries). A legal game species at LAMR. Often seen during spotlight surveys in Bates Canyon and Dolomite Point Road (11 km): five and six recorded March 13 and June 26, 2002, respectively. A doe with a fawn observed in Plum Creek Canyon on July 19, 2003. According to Jones et al. (1988) native population of this species in LAMR was supplemented with stocked animals from elsewhere during the 1940s-1950s.

Pronghorn – *Antilocapra americana*

Probably no longer occurs in the area of interest. Killebrew (1977) reported herds of 10-23 in upland prairies (possibly) within LAMR, but Yancey et al. (1998) failed to find any in 1991-1992, probably because the parks were fenced by then, and pronghorns are often unwilling to cross barbwire fences (Davis and Schmidly 1994). In 2002-2003, pronghorns were observed on private lands in the general vicinity of the parks, most often along FM 1913 east of Four Way (Moore County), in Alibates Ranch off SH 136 (Potter County) and east of Plum Creek Road (Moore County), but never in the parks proper. Replacement of top and bottom strands of barbwire with smooth wire on the perimeter is currently underway in the parks (J. Rancier, pers. comm.) so pronghorns may be more apt in the future to cross into the parks. A herd observed in Alibates Ranch included up to 30 animals (February 15, 2002), and another one east of Four Way, up to 12 (January 18, 2002).

SPECIES POTENTIALLY OCCURRING ON THE PARKS

In addition to the species detected in this study, a number of other species might be present on the parks, although there are no verified occurrences for those. Included here is a discussion of species that were undetected in this study, but formerly known from the study area and/or presently occurring in adjacent areas.

Fishes

Eleven additional fish species are listed for Lake Meredith and Canadian River within the study area by Munger (2002). Species recorded in the Canadian River included black bullhead (*Ameiurus melas*), river carpsucker (*Carpiodes carpio*), gizzard chad (*Dorosoma cepedianum*), warmouth (*Lepomis gulosus*), golden shiner (*Notemigonus crysoleucas*), sand shiner (*Notropis stramineus*), logperch (*Percina caprodes*) and white crappie (*Pomoxis annularis*). Three other species non-native to this general area were introduced (stocked) into Lake Meredith: smallmouth bass (*Micropterus dolomieu*), white bass (*Morone chrysops*) and walleye (*Stizostedion vitreum*). None of these species were recorded in the Canadian River and shallow waters of Big Blue Creek Bay during the 2003 study.
Munger (2002) also suspected presence of the following introduced species in Lake Meredith: blue catfish (*Ictalurus furcatus*), inland silverside (*Menidia beryllina*), black crappie (*Pomoxis nigromaculatus*), rainbow trout (*Oncorhynchus mykiss*) and yellow perch (*Perca flavescens*).

Three native species: black bullhead, warmouth and sand shiner were recorded in Canadian River in 1954-1955 (i.e., before the construction of Sanford Dam in 1962), but not in 1983. It's likely that these three species as well as introduced golden shiner were extirpated from the study area after the impoundment. Gizzard shad were likely stocked into the lake in the 1960s or 1970s (recorded in 1983 survey). According to Munger (2002) gizzard shad is the main prey species in Lake Meredith. Although no gizzard shads were found in the Canadian River and coastal waters of Big Blue Creek Bay, it's likely that this species still present in the lake. The same is likely true about river carpsucker and white crappie. Ichthyofauna of Lake Meredith proper was not targeted in this study, and thus we refrain from further comments. Logperch that could have been introduced to the Canadian River accidentally (collected in 1983) were not found during the 2003 intensive survey and likely did not establish.

Amphibians

Four additional amphibian species (spotted chorus frog – *Pseudacris clarkii*, New Mexico spadefoot – *Spea multiplicata*, Texas toad – *Bufo speciosus* and Great Plains toad – *Bufo cognatus*) are known to occur in Potter, Moore and Hutchinson counties (Dixon, 2000, Texas Natural History Collection). For example, two of them: Texas toad and Great Plains toad were reported from LAMR (Philips, 1989) but those records are unsubstantiated.

Spotted chorus frog was not detected at Sanford Marsh or elsewhere in frog call surveys carried out from early March, but this species was collected in the vicinity of Stinnett (Hutchinson County) ca. 15 km from the northernmost limits of LAMR in 1950 (TNHC-UTMM). The nearest collection records of New Mexico spadefoot were from the Amarillo area (TAMU) ca. 25 km south of the park. No Texas toads from the Panhandle were found in the four examined collections. Finally, R.J. O'Kennon (pers. comm.) of BRIT provided an unsubstantiated report of Great Plains toad from Spring Canyon-Sanford Marsh in late May, 2002. This survey included many hours in that area in 2002-2003 looking for amphibians, but failed to detect any Great Plains toads. Also, many hours of night road surveys failed to produce this toad. However, Great Plains toad had been collected in the vicinity of Dumas, Borger, and Stinnett: the two

latter locations only ca. 15 km from LAMR (TNHC-UTMM, UTA collection, TAMU collection). Without verified records, these amphibians can not be recorded as confirmed for LAMR, but the possibility of their presence should not be ruled out.

Reptiles

Turtles:

Two softshell turtle species are known to occur in Hutchinson and Potter Counties: Midland smooth softshell (*Apalone muticus muticus*) and western spiny softshell (*Apalone spinifera hartwegi*). Both are suspected for LAMR (Philips 1989). The current survey was unable to confirm or refute presence of either species in the study area. Turtle trapping was restricted in this study to Sanford Marsh and the Mullinaw Crossing, and traps at the latter location were lost due to a dramatic increase in water flow following several days of continuous rains. No softshell specimens from LAMR or vicinity were found in examined collections (TNHC-UTMM, TAMU, UTA and WTAMU). Additional efforts may be necessary to determine status of these two species in the study area. They may occur in the Canadian River or Lake Meredith proper, but there are no valid records known, so the species can only be considered as potentially occurring at LAMR.

Lizards:

There are a few species of lizards not recorded from LAMR/ALFL during this study, which were found in the parks previously or are known from elsewhere in Potter, Moore and Hutchinson counties in the Texas Panhandle or included on the NPS Master Species List. These include northern earless lizard (*Holbrookia maculata maculata*), roundtail horned lizard (*Phrynosoma modestum*), Texas spotted whiptail (*Cnemidophorus gularis gularis*) and western slender glass lizard (*Ophisaurus attenuatus*) (Dixon 2000). In addition, Philips (1989) suspected presence of the Texas earless lizard (*Cophosaurus texanus texanus*) and desert side-blotched lizard (*Uta stansburiana stejnegeri*) in LAMR.

The present study found no literature or museum records allowing a conclusion that Texas earless lizard occurs in the study area: nearest records are from Armstrong and Donley counties. Its presence is unlikely, but cannot be completely ruled out given Philips (1989) report. However, northern earless lizard occurs on aeolian sands and other sandy areas in all three counties (Axtell 1998), e.g., 42 specimens in TNHC-UTMM collected in the vicinity of Stinnett, ca. 15 km northeast of LAMR. This is a species of sandy prairies (Conant and Collins 1991), which occur as a patchy habitat within the studied parks. Although none were recorded during this study, its presence within those habitats on the parks should not be ruled out. The desert side-blotched lizard is not known to occur in the counties of interest: the nearest records are from Randall County where it is not uncommon in Palo Duro Canyon (pers. obs.) Its presence is not likely, but again given Philips (1989) report, it cannot be completely ruled out. Roundtail horned lizard was reported by Philips (1989) and a specimen was collected at a "marina at Lake Meredith" in Moore County in 1987. This is a very cryptic species still likely occurring in the study area. WTAMU contains a specimen of Texas spotted whiptail collected in Lake Meredith NRA (Potter County) in 1979 and another one from Fritch in 1967. It may still occur in the parks. However, it is a conspicuous species elsewhere in Texas and thus unlikely overlooked during a two year study. Finally, the western slender glass lizard is only known in the area from Hutchinson County (Dixon 2000). No Panhandle specimens were located through collection reviews.

One should not conclude that the above species are necessarily absent from LAMR and ALFL. Many areas of the larger park were not visited on a regular basis and some not visited at all, due to access and time constraint problems. A comprehensive study of herpetofauna employing drift fences and funnel traps may enhance knowledge of the LAMR/ALFL lizard fauna and detect species absent in this study.

Snakes:

Besides 18 snake species uncovered by this study, eight others were collected from the park previously or are known from one or all counties covering the NPS area of interest: plains hognose snake (*Heterodon nasicus nasicus*), eastern hognose snake (*Heterodon platirhinos*), prairie kingsnake (*Lampropeltis calligaster calligaster*), central plains milk snake (*Lampropeltis triangulum gentilis*), diamondback water snake (*Nerodia rhombifer rhombifer*), western ribbon snake (*Thamnophis proximus proximus*), plains garter snake (*Thamnophis radix*) and western massasauga (*Sistrurus catenatus tergeminus*) (Dixon 2000, Werler and Dixon 2000). Some of these are suspected to occur at LAMR (Philips 1989).

The plains hognose snake was reported during this study by R. O'Kennon of BRIT, who claimed seeing one in McBride Canyon in late April, 2002. The author spent many hours searching suitable habitat and conducting night road searches, but did not observe any individuals of this species. However, one was collected in "Alibates Canyon at ranger station" in 1994 (WTAMU) and eight in the vicinity of Stinnett in 1950 (TNHC-UTMM). The eastern hognose snake was collected at Plum Creek and Bonita Creek in 1979 and 1986 (3 specimens in WTAMU). According to R. Kazmaier (WTAMU, pers. comm.) both hognose snake species have experienced dramatic declines in the Texas Panhandle and adjacent areas, and might have disappeared from some sites including the study area. The prairie kingsnake enters the area of interest in Hutchinson County (Werler and Dixon 2000). This is at the western fringe of its range so perhaps it is naturally rare in this area., but it may be present. Only one record is known, from Bugbee Ranch in 1950 (TNHC-UTMM). The central plains milk snake is known from all three counties, but its nocturnal habits probably explain our failure to detect it. Its presence is likely. One specimen of the diamondback water snake collected at Bonita Creek (Potter County) in 1979 in WTAMU, but not observed since. Few records from elsewhere in the Canadian River Valley in Potter and Hutchinson counties (Werler and Dixon 2000). The western ribbon snake was collected at Bonita Creek in 1979 and by the bridge on I-287 (just outside the study area) in 1985 (WTAMU) and the plains garter snake at Bugbee Creek in 1969 (WTAMU). The former species appeared more common than the latter, with 51 and one, respectively, collected at Bugbee Ranch near Stinnett in 1950 (TNHC-UTMM). No recent records were found. A point can be made here as to the overall scarcity of *Lampropeltis*, *Nerodia,* and *Thamnophis* snakes at LAMR/ALFL. Finally, the western massasauga has been found at the southwest corner of Potter County, and in Roberts County to the east of Hutchinson County (Werler and Dixon 2000).

It is likely that some or all of these species occur in the study area albeit in small numbers. However, it is equally possible that some of them are now rare or even locally extirpated due to local climate events (such as the recent prolonged drought) or due to other poorly understood factors. Methods employed in this study need modification, so a follow-up study of herpetofauna using drift fences and funnel traps is strongly recommended. Such devices employed in different areas of the park may provide a better picture of the herpetofauna and account for some species undetected in this study.

Breeding Birds

In addition to 72 breeding bird species recorded in LAMR/ALFL during this study, the compiler of the Lake Meredith bird list (Anonymous 1982) reported the following 23 species as nesting or likely nesting in the study area: least bittern (*Ixobrychus exilis*), pintail (*Anas acuta*), redhead (*Aythya americana*), Swainson's hawk (*Buteo swainsoni*), golden eagle (*Aquila chrysaetos*), chukar (*Alectoris chukar*), lesser prairie chicken (*Tympanuchus pallidicinctus*), snowy plover (*Charadrius alexandrinus*), spotted sandpiper (*Actitis macularia*), rock dove (*Columba livia*), burrowing owl (*Athene cunicularia*), chimney swift (*Chaetura pelagica*), red-bellied woodpecker (*Melanerpes carolinensis*), hairy woodpecker (*Picoides villosus*), horned lark (*Eremophila alpestris*), rough-winged swallow (*Stelgidopteryx serripennis*), barn swallow (*Hirundo rustica*), canyon wren (*Catherpes mexicanus*), curve-billed thrasher

(*Toxostoma curvirostre*), indigo bunting (*Passerina cyanea*), house finch (*Caprodacus mexicanus*), dickcissel (*Spiza americana*), and grasshopper sparrow (*Ammodramus savannarum*). Seyffert (2001) provided breeding records for three or four additional species: northern harrier (*Circus cyaneus*), king rail (*Rallus elegans*), least tern (*Sterna antillarum*) and lazuli bunting (*Passerina amoena*).

The northern harrier occasionally nests in the Texas Panhandle, e.g., possibly in Sanford Marsh at LAMR where Seyffert (2001) observed a female and poorly flying juvenile on July 4, 1985. J. Rancier (NPS, Lake Meredith) also suspects nesting, and although this species was not recorded in the study area during nesting season, its occasional nesting in meadows and marshes of the Canadian River Valley should not be ruled out.

Swainson's hawk is a "fairly common to common breeder" in the Texas Panhandle (Seyffert 2001) and was once considered a common breeding species at LAMR (Anonymous 1982). This is no longer true in the study area. Red-tailed hawks presently nest throughout the two parks (minimum 10-15 pairs), but no territorial Swainson's hawks were found in the 2002-2003 study. The only observations are of a pair at Bates Canyon boat ramp in April, 2002 and another pair at North End grasslands in April, 2003. However, none were found during subsequent visits and those reported were likely transients.

According to NPS park ranger M. Smith (pers. comm.) a pair of golden eagles nested at LAMR ca. 15-20 years ago, but later they were shot by a bird collector. No nesting records, or indeed summer records, are recorded since then.

Two lesser prairie chickens were encountered in LAMR near Fritch in the fall of 1976. Later, one was seen near Blue West (Moore County) on January 4, 1981, and four flushed on the LX Ranch near Bonita Creek (Potter County) on December 27, 1981 (Seyffert 2001). There are no subsequent known records of this declining species in the study area.

A young male king rail in "down plumage" was collected from a pond in the Canadian River Breaks of Hutchinson County with no further details (Seyffert 2001).

The snowy plover was not found in the Texas panhandle during the years of Texas Breeding Bird Atlas surveys (Seyffert 2001), but extensive mudflats of Lake Meredith and the Canadian River where the species might be found, were not surveyed fully during the current study. There is a chance it the species could occur there.

Single birds or pairs of spotted sandpiper were observed in 1975-1982 exhibiting alarm or territorial behavior "downriver from the Sanford Dam at Lake Meredith" (Hutchinson County) where a juvenile was finally observed on July 7, 1998 (Seyffert 2001).

An adult male least tern in breeding plumage was collected in the Bugbee Creek area (Hutchinson County) on July 4, 1950, and several terns were observed flying along Bugbee Creek. Thus nesting was suspected by Seyffert (2001). No subsequent records are known, but islands of Lake Meredith were not visited, and mudflats adjacent to the lake not exhaustively examined in the 2002-2003 study.

The barn swallow is reported as a common summer resident and nesting species in LAMR (Anonymous 1982). No nesting was evident in either park during this study, although the species likely occurs in towns and other settlements adjacent to the area of interest and may be found on the parks.

The canyon wren was not found nesting in LAMR, although it is classified as an uncommon resident, presumed nesting (Anonymous 1982, Seyffert 2001).

The curve-billed thrasher was not seen within the limits of LAMR/ALFL, although it is present on adjacent ranches, e.g., Alibates and LX ranches. This species is strongly associated with tree cholla (*Opuntia imbricata*), which is very scarce in the parks. This species might be found on the parks if the tree cholla is present anywhere in significant densities.

One or two singing lazuli bunting males were recorded between McBride and Mullinaw, and in Plum Creek in 1985 and 1987 (Seyffert 2001). No nesting evidence was seen at the time, nor are subsequent records known.

A nest of an indigo bunting pair at LAMR (Potter County) contained a recently hatched chick and a cowbird egg on July 10, 1995 (Seyffert 2001). "Singing males, adults carrying food, and or juveniles" were recorded at Sanford Dam (Hutchinson County) and in Alibates, McBride canyons, Mullinaw, and Plum Creek (Potter County). However, this species was not recorded during the current study.

Surprisingly, the great-tailed grackle (*Quiscalus mexicanus*), a common species in Texas Panhandle cities and towns (e.g., Amarillo), was not recorded in the study area in 2001-2003.

None of these birds species were detected in the present study. For various reasons, it may be that some or all of these occur in the study area. Of course, some are more probable breeders than others at LAMR/ALFL. However, none of them can be completely eliminated from a list of possibilities.

Mammals

In addition to the mammal species recorded in this study, another 17 species are known from the vicinity or suspected to occur in LAMR and ALFL. Despite their not being detected by our study, it is possible that they occur on the parks.

Virginia opossum (*Didelphis virginiana*) has been reported from the Sanford Dam area (Killebrew 1977) but Yancey et al. (1998) did not collect any specimens and referred only to anecdotal sightings, so it is regarded here as potentially occurring but unconfirmed. Of seven species of bats suspected in the area of interest by Yancey et al. (1998), three—big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), and Townsend's big-eared bat (*Plecotus townsendii*)—were actually collected by Killebrew (1977) at unspecified locations in LAMR. Four other species, cave myotis (*Myotis velifer*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*) and big freetail bat (*Nyctinomops macrotis*) are known from unspecified locations in Potter and Hutchinson Counties (Davis and Schmidly 1994). Bat surveys in the study area were largely unsuccessful due to unceasing winds, although it can be stated that bats are probably not very common in the study area. During frequent drives or walks in the parks at twilight, no bats were seen under circumstances that normally silhouette them well against the evening sky. The Texas Tech study of 1991-1992 (Yancey et al. 1998) did not find any bats in the area of interest. However, conclusions on numbers and diversity of bats in LAMR/ALFL cannot be drawn unless and until specialized equipment is used. The techniques employed in the present study, while certainly capable of pointing out the bat fauna in many regions, are not well suited to such work in this region. Dr. L. Ammerman (Angelo State University) uses bat detectors and harp traps in windy areas of Big Bend, and she strongly recommended those methods would be more appropriate for any studies at LAMR. However, time and resources allocated to bat surveys in the current study were limited and did not allow any attempt of such approaches.

Two undetected but potentially occurring species, the yellow-faced pocket gopher and the plains harvest mouse, are discussed in accounts for plains pocket gopher and western harvest mouse, respectively. Plains pocket mouse (*Perognathus flavescens*) was collected in the vicinity of Stinnett, Hutchinson County northwest of Lake Meredith (Jones at al. 1988) and common muskrat (*Ondatra zibethicus*) was

considered common at Lake Meredith by Killebrew (1977). But neither species was found in the study area by Yancey et al. (1998) or during the current study. The exotic Norway rat (*Rattus norvegicus*) is known from Potter County, and the house mouse (*Mus musculus*) was collected in Sanford-Yake and Bugbee Canyon (Yancey et al. 1998), probably near human dwellings. Ringtail (*Bassariscus astutus*) was observed in Saddle Horse Canyon in the 1970s (Killebrew 1977), but not found in the early 1990s (Yancey et al. 1998) nor during the current study. However, it is quite likely that ringtail still occurs in the parks. Striped skunk (*Mephitis mephitis*) was observed and collected at LAMR in the 1970s by Killebrew (1977) who noted that this species "was noted in virtually every recreation area at the lake and was particularly abundant around picnic areas where they were observed foraging in trash cans". However, neither Yancey et al. (1998) nor the current study detected any *M. mephitis* in the area of interest. Roadkills were a common sight along SH 136 between Masterson and Amarillo, but not in the parks or nearby vicinity. Finally, eastern spotted skunk (*Spilogale putorius*) and mountain lion (*Felis concolor*) are strictly hypothetical for the parks, with old records from Moore County (Jones et al. 1998, Davis and Schmidly 1994). All of these mammals may be found on the parks, but were not detected in recent studies and so can not be considered as confirmed there.

CONCLUSIONS

LAMR combined with ALFL is a considerably large area (18,771 ha). This multi-taxon biological inventory, conducted with limited staff resources and during a relatively short timeframe, often resulted in a conflicting field survey schedule. Thus it can only provide a partially complete list of species. In 2002, studies in LAMR/ALFL were carried out along with similar surveys at Lyndon B. Johnson National Historical Park in central Texas, 650 km from the current study site. Late in 2002, and in 2003, surveys in the study area were performed along with other duties.

According to the Master Species Lists included in the Study Plan (National Park Service 2000) LAMR and ALFL could potentially hold as many as 392 species of vertebrate animals, e.g., 51 species of fish, 14 amphibians, 42 reptiles, 223 "breeding birds" and 62 mammals. Of these, only 18 species of fishes (35%), 9 species of amphibians (64%), 28 species of reptiles (66%), 72 species of breeding birds (32.3%), and 32 species of mammals (51.6%) were documented during the current study. However, the LAMR "Breeding Bird" Master Species List of the Study Plan (National Park Service 2000) includes many migrant species that only pass through the area and are not known to nest in the Texas Panhandle or indeed in the south-western United States. It is likely that the list in question was mislabeled, and was intended to be more widely inclusive of birds found at various times in the area. However, the objective given for this survey was to focus on breeding birds. Thus, a more realistic "master species list" based on two sources—Anonymous (1982) compilation of a LAMR bird list and K. Seyffert (2001)—consists of approximately 99 species, thus bring the "success rate" of this study to 72.7%. The Master Species Lists for other taxa have taxonomic errors, synonyms, and contain species never known to occur in this section of the Texas Panhandle. Thus, the actual species detection rate can be presumed to be higher than indicated above.

RECOMMENDATIONS FOR FURTHER STUDY

Following from the discussions above, certain additional surveys are recommended for a more complete vertebrate inventory of LAMR/ALFL:

1) Bat surveys should be undertaken with harp traps and bat detectors;
2) Remote camera survey techniques should be improved and should target predatory mammals. Focused efforts are needed to complete such a survey with adequate intensity;

3) Additional breeding bird surveys should be carried out in marshes and mudflats adjacent to the Canadian River and Lake Meredith;
4) Snakes and lizards should be surveyed with drift fences and funnel traps.
5) Coverboard surveys may be continued to determine their effectiveness over time. Dr. Richard Kazmaier (West Texas A&M University) has tentatively agreed to continue such surveys using materials placed during this study.

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APPENDIX 1. UTM coordinates and elevation of fish sample sites

Site ID	Easting	Northing	Elev. (m)
FISH-1	250422.23507100000	3936708.20826000000	886.0
FISH-2	250135.60651499900	3936446.65677999000	884.3
FISH-3	250035.51432799900	3936374.20110000000	884.8
FISH-4	249968.11562800000	3936298.98035999000	882.8
FISH-5	249901.12627400000	3936211.41134000000	880.7
FISH-7	249806.59064899900	3936076.49917999000	886.5
FISH-8	249695.94769900000	3936050.60708000000	884.3
FISH-9	249642.13416900000	3936001.53275999000	884.5
FISH-10	249643.18645099900	3935823.22985999000	882.8
FISH-11	249531.63261000000	3935702.05964000000	887.2
FISH-12	249296.86017700000	3935736.09699000000	888.1
FISH-13	258741.85957299900	3956536.46636000000	897.3
FISH-14	258592.60949900000	3956680.24040000000	894.9
FISH-15	259667.72337699900	3956215.25307000000	886.7
FISH-16	259366.70201700000	3955474.58232000000	887.2
FISH-17	261781.00805599900	3952884.81100999000	873.2
FISH-18	249332.00748299900	3929469.95996000000	901.8
FISH-19	249539.63073400000	3929217.09634999000	908.3
FISH-20	249197.92935500000	3929709.04774999000	897.0
FISH-21	249027.29486200000	3929435.93610000000	891.3
FISH-22	248806.81387200000	3929337.87191000000	899.0
FISH-23	248626.82181500000	3929226.33833999000	896.1
FISH-24	247060.78317700000	3928056.45606000000	907.4
FISH-25	247058.73192399900	3928073.16947000000	905.7
FISH-26	247042.33137000000	3928216.12961999000	893.9
FISH-27	246929.18815300000	3928435.84827000000	907.6
FISH-28	248033.03100799900	3929669.90479000000	896.1
FISH-29	247411.52717500000	3929755.28005999000	892.0
FISH-30	246981.98466200000	3929607.33587000000	902.8
FISH-31	246396.24812300000	3929601.70699999000	894.4
FISH-33	269722.88787199900	3955209.94539000000	876.4
FISH-34	269560.92212900000	3955529.63028999000	855.0
FISH-35	254118.89020500000	3942537.80751000000	879.5
FISH-36	254211.77337899900	3942416.50259000000	880.0
FISH-37	248903.15654500000	3930235.78502999000	896.5
FISH-38	248850.06049000000	3930465.20551000000	897.0
FISH-39	248965.88914000000	3930763.29154000000	901.8
FISH-40	248993.58171599900	3930815.25614000000	891.0
FISH-41	248772.14295800000	3930924.48802000000	891.7
FISH-42	248983.79714499900	3930151.78838999000	895.3

APPENDIX 2. Descriptions of fish sample sites

ID	Location	Description	Depth (av.)
FISH-1	Canadian River	Small pool downstream from Mullinaw	0.3 m
FISH-2	Canadian River	Small pool downstream from Mullinaw	0.3 m
FISH-3	Canadian River	Small pool downstream from Mullinaw	0.1-0.2 m
FISH-4	Canadian River	Small pool with flowing water downstream from Mullinaw	0.3-0.4 m
FISH-5	Canadian River	A pool with flowing water, downstream from Mullinaw	0.4-0.5 m
FISH-6	Canadian River	A big pool connected to the remaining channel with flowing water, downstream from Mullinaw	0.2-0.3 m
FISH-7	Canadian River	Riffle at a channel downstream from Mullinaw	0.2-0.3 m
FISH-8	Canadian River	Riffle at a channel downstream from Mullinaw	0.2-0.3 m
FISH-9	Canadian River	Riffle at a channel downstream from Mullinaw	0.2-0.3 m
FISH-10	Canadian River	Narrow channel with a riffle downstream from Mullinaw	0.3-0.4 m
FISH-11	Canadian River	A channel with flowing water and some cattails downstream from Mullinaw	0.3-0.5 m
FISH-12	Canadian River	A pool with slow flowing water, downstream from Mullinaw	0.4-0.5 m
FISH-13	Big Blue Creek	A pool with cattails cut-off from the creek	0.5-0.7 m
FISH-14	Big Blue Creek	Shallow section of the creek	0.05-0.1 m
FISH-15	Big Blue Creek	A pool cut-off from the creek	0.3-0.4 m
FISH-16	Big Blue Creek	A shallow muddy paddle overgrown with cattails	0.1-0.2 m
FISH-17	Lake Meredith (Big Blue Creek Bay)	Coastal waters with silt bottom with patches of sand and gravel	0.5 m
FISH-18	Chicken Creek	Running shallow stream with gravelly bottom	0.1-0.2 m
FISH-19	Chicken Creek	A deep pool under a culvert	0.9-1.0 m
FISH-20	Mouth of Chicken Creek	Running water at the confluence with Canadian River	0.4-0.5 m
FISH-21	Canadian River	Narrow section with strong current	0.5-0.6 m
FISH-22	Canadian River	Section with slower moving water	0.5-0.6 m
FISH-23	Canadian River	A deeper pool at the river bend, some boulder and some small whirlpools	1.2-1.3 m
FISH-24	Bonita Creek	Marsh with some open water	0.5-0.6 m
FISH-25	Bonita Creek	Marsh with some open water	0.9-1.0 m
FISH-26	Bonita Creek	Marshy paddle cut-off from the creek	0.15-0.2 m
FISH-27	Bonita Creek	A beaver pond	1.0-1.2 m
FISH-28	Canadian River	Bend upstream from Chicken Creek, shallow sections and deeper pools	0.2-0.7 m
FISH-29	Canadian River	Shallower channel with deeper sections downstream from Bonita Creek	0.4-0.5 m
FISH-30	Canadian River	Shallower channel with deeper sections downstream from Bonita Creek	0.3-0.5 m
FISH-31	Canadian River	Deeper, but narrow channel with some sunken logs at former mouth of Bonita Creek	0.5-0.7 m
FISH-33	Sanford Marsh	Open pond with muddy shores surrounded by cattails	1.0-1.3 m
FISH-34	Sanford Marsh	A dugout channel on the fringes of the marsh	1.0-1.2 m
FISH-35	Canadian River	A large shallow paddle with muddy bottom surrounded with cattails, close to Plum Creek	0.3-0.4 m

ID	Location	Description	Depth (av.)
FISH-36	Canadian River	Section with running water, but very muddy bottom, close to Plum Creek	0.3-0.5 m
FISH-37	Canadian River	River channel downstream from Chicken Creek	0.3-0.4 m
FISH-38	Canadian River	A riffle downstream from Chicken Creek	0.2-0.3 m
FISH-39	Canadian River	A riffle at the bend of the river with some deeper holes along boulders	0.3-1.0 m
FISH-40	Canadian River	Deep hoes along some boulders	1.0-1.1 m
FISH-41	Canadian River	A riffle below the deep pools (above)	0.3-0.5 m
FISH-42	Canadian River	A riffle	0.3-0.4 m

APPENDIX 3. UTM Coordinates and elevation of coverboard survey sites

Site ID	Easting	Northing	Elev. (m)
AFQ-1-CB	257703.42124500000	3941374.79899000000	922
AFQ-2-CB	258003.99765500000	3941184.88158999000	957
AFQ-3-CB	258126.30549200000	3941149.91947000000	923
AFQ-4-CB	257837.31133699900	3941192.07250999000	914
AFQ-5-CB	256798.90581000000	3940383.51420000000	903
AFQ-6-CB	256662.11281200000	3940469.62955999000	905
AFQ-7-CB	257787.63033200000	3941519.95595999000	926
AFQ-8-CB	257755.03422999900	3941962.40111000000	924
LM-1-CB	260533.02626000000	3952645.24865000000	921
LM-2-CB	269392.43111700000	3955522.32639000000	931
LM-3-CB	269577.43759900000	3955603.89274000000	934
LM-4-CB	268971.31294099900	3955963.04055000000	902
LM-5-CB	255359.55397899900	3940627.51464000000	925
LM-6-CB	255481.56693500000	3940469.28062999000	919
LM-7-CB	255522.10039400000	3940855.88699000000	910
LM-8-CB	255608.28663799900	3941065.03681000000	916
LM-9-CB	255987.30704300000	3941309.69076000000	859
LM-10-CB	255660.99960300000	3941459.41484999000	854
LM-11-CB	255536.02770599900	3941562.21345000000	854
LM-12-CB	260750.34194700000	3952144.98688999000	867
LM-13-CB	255471.24855700000	3941435.75003000000	916
LM-14-CB	255332.81537200000	3941196.72454999000	897
LM-15-CB	255902.46579799900	3941606.35411999000	893
LM-16-CB	256367.28505199900	3941729.53777999000	895
LM-17-CB	256170.53585099900	3941525.95964000000	916
LM-18-CB	256363.92245700000	3942386.14834999000	905
LM-19-CB	256679.54584800000	3942297.80578000000	897
LM-20-CB	256192.95738499900	3942627.31795000000	896
LM-21-CB	257056.98905800000	3942610.71395999000	902
LM-22-CB	257603.19892299900	3942731.73786000000	905
LM-23-CB	261303.28792500000	3952331.62414000000	908
LM-24-CB	257850.18197899900	3943137.60391000000	916
LM-25-CB	257725.63407400000	3943532.58782000000	896
LM-26-CB	256728.16291499900	3941859.57801999000	896
LM-27-CB	256178.50647600000	3941064.63507999000	888
LM-28-CB	244083.83062200000	3929145.02770000000	896
LM-29-CB	244607.07133300000	3929203.70246999000	901
LM-30-CB	243679.78581400000	3929395.10299000000	914
LM-31-CB	243535.86903500000	3929320.83106000000	887
LM-32-CB	243206.91834199900	3929300.28155000000	891
LM-33-CB	242945.41954000000	3928756.58031000000	951
LM-34-CB	261487.10086199900	3952443.93030000000	897
LM-35-CB	242781.53123100000	3928322.89759999000	928

Site ID	Easting	Northing	Elev. (m)
LM-36-CB	242424.50555599900	3928231.00319000000	904
LM-37-CB	253478.78418600000	3944470.19344000000	903
LM-38-CB	253257.29442500000	3944339.75657000000	901
LM-39-CB	252985.39038200000	3943957.78846000000	905
LM-40-CB	252841.86346100000	3942869.75528999000	897
LM-41-CB	253159.20837400000	3942239.28418000000	907
LM-42-CB	252024.01187200000	3941841.31884999000	980
LM-43-CB	251463.50600600000	3942160.05501999000	990
LM-44-CB	267759.25023599900	3952915.19088000000	970
LM-45-CB	261110.00481400000	3952281.64020999000	895
LM-46-CB	267476.76883800000	3952659.13064000000	885
LM-47-CB	268307.96941999900	3953247.46194999000	901
LM-48-CB	268654.74794299900	3953473.89288999000	909
LM-49-CB	268697.62005700000	3952825.19747000000	925
LM-50-CB	269566.17475800000	3953485.60546000000	932
LM-51-CB	269809.14257099900	3953342.30543000000	916
LM-52-CB	252661.62797800000	3936426.51647000000	910
LM-53-CB	252012.77398400000	3936949.82469000000	922
LM-54-CB	252111.82592700000	3938963.88102999000	915
LM-55-CB	251957.39627299900	3937938.44883000000	908
LM-56-CB	261304.64968199900	3952631.69303000000	909
LM-57-CB	251303.69857700000	3936895.04534000000	900
LM-58-CB	249166.04362300000	3935409.33986000000	882
LM-59-CB	249539.66801699900	3935274.71828000000	891
LM-60-CB	249701.60485800000	3935417.63401000000	900
LM-61-CB	250169.59232000000	3935447.16985000000	893
LM-62-CB	250877.70432799900	3935778.37090000000	891
LM-63-CB	268326.65812699900	3955916.23799999000	899
LM-64-CB	267919.79916400000	3955584.37276000000	899
LM-65-CB	267576.43951499900	3955911.43728999000	909
LM-66-CB	261311.29846500000	3952882.43503999000	907
LM-67-CB	267832.00865700000	3956398.56733000000	904
LM-68-CB	267992.86983799900	3957595.27443000000	914
LM-70-CB	269461.31797300000	3957562.74358000000	913
LM-71-CB	269429.56968000000	3957184.21418000000	908
LM-72-CB	269321.43099800000	3956865.40193999000	912
LM-73-CB	260507.02727399900	3952151.32182999000	905
LM-74-CB	269753.08984099900	3955063.44282000000	896

APPENDIX 4. Coverboard surveys (2002-2003 overall results)

Coverboard Codes	Species Recorded									
	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)	**Total Recorded**
AFQ-1										0
AFQ-2										0
AFQ-3						1				1
AFQ-4										0
AFQ-5				1						1
AFQ-6										0
AFQ-7							1			1
AFQ-8										0
LM-1										0
LM-2		1								1
LM-3										0
LM-4										0
LM-5										0
LM-6	1									1
LM-7										0
LM-8										0
LM-9										0
LM-10									1	1
LM-11										0
LM-12										0
LM-13										0
LM-14										0
LM-15										0
LM-16			1							1
LM-17										0
LM-18										0
LM-19										0
LM-20										0
LM-21										0
LM-22										0
LM-23										0
LM-24										0
LM-25							1			1
LM-26										0

Coverboard Codes	Species Recorded									
	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)	**Total Recorded**
LM-27										0
LM-28										0
LM-29										0
LM-30										0
LM-31									3	3
LM-32										0
LM-33										0
LM-34										0
LM-35		1								1
LM-36										0
LM-37										0
LM-38							1			1
LM-39							1			1
LM-40					1					1
LM-41										0
LM-42										0
LM-43										0
LM-44										0
LM-45										0
LM-46										0
LM-47										0
LM-48										0
LM-49				2			2			4
LM-50				1						1
LM-51										0
LM-52										0
LM-53										0
LM-54										0
LM-55										0
LM-56										0
LM-57								1		1
LM-58										0
LM-59										0
LM-60										0
LM-61										0
LM-62				1			1			2
LM-63										0
LM-64										0

Coverboard Codes	Species Recorded									
	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)	**Total Recorded**
LM-65										0
LM-66										0
LM-67										0
LM-68										0
LM-69										0
LM-70						1				1
LM-71										0
LM-72										0
LM-73										0
LM-74										0
Total	**1**	**2**	**1**	**5**	**1**	**2**	**7**	**1**	**4**	**24**

APPENDIX 5. Coverboard check forms

Date: 20-May-2002
Remarks: Sanford-Yake (Hutchinson County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-49	**CB**									
	RT									
LM-50	**CB**									
	RT									
LM-51	**CB**									
	RT									
LM-52	**CB**									
	RT									
LM-53	**CB**									
	RT									
LM-54	**CB**									
	RT									
LM-55	**CB**									
	RT									

Date: 21-May-2002
Remarks: ALFL (Potter County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
AFQ-1	**CB**									
	RT									
AFQ-2	**CB**									
	RT									
AFQ-3	**CB**									
	RT						1			
AFQ-4	**CB**									
	RT									
AFQ-5	**CB**									
	RT									
AFQ-6	**CB**									
	RT									
AFQ-7	**CB**							1		
	RT									
AFQ-8	**CB**									
	RT									

Date: 26-May-2002
Remarks: Blue West (Moore County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-1	**CB**									
	RT									
LM-2	**CB**									
	RT		1							
LM-3	**CB**									
	RT									
LM-4	**CB**									
	RT									
LM-5	**CB**									
	RT									
LM-6	**CB**	1								
	RT									
LM-7	**CB**									
	RT									
LM-8	**CB**									
	RT									

Date: 11-June-2002
Remarks: Sanford Marsh and Spring Canyon (Hutchinson County) and Bates Canyon (Potter County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-9	**CB**									
	RT									
LM-10	**CB**									1
	RT									
LM-11	**CB**									
	RT									
LM-12	**CB**									
	RT									
LM-13	**CB**									
	RT									
LM-14	**CB**									
	RT									
LM-15	**CB**									
	RT									
LM-16	**CB**			1						
	RT									
LM-17	**CB**									
	RT									
LM-18	**CB**									
	RT									
LM-19	**CB**									
	RT									
LM-20	**CB**									
	RT									
LM-21	**CB**									
	RT									

Date: 12-June-2002
Remarks: Bates Canyon and Dolomite Point Road (Potter County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-22	**CB**									
	RT									
LM-23	**CB**									
	RT									
LM-24	**CB**									
	RT									
LM-25	**CB**									
	RT							1		
LM-26	**CB**									
	RT									
LM-27	**CB**									
	RT									
LM-28	**CB**									
	RT									
LM-29	**CB**									
	RT									
LM-30	**CB**									
	RT									
LM-31	**CB**									2
	RT									1
LM-32	**CB**									
	RT									
LM-33	**CB**									
	RT									

Date: 18-June-2002
Remarks: Rosita Meadows and Plum Creek (Potter County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-34	**CB**									
	RT									
LM-35	**CB**		1							
	RT									
LM-36	**CB**									
	RT									
LM-37	**CB**									
	RT									
LM-38	**CB**									
	RT									
LM-39	**CB**									
	RT									
LM-40	**CB**									
	RT									
LM-41	**CB**									
	RT									
LM-42	**CB**									
	RT									
LM-43	**CB**									
	RT									
LM-44	**CB**									
	RT									
LM-45	**CB**									
	RT									
LM-46	**CB**									
	RT									
LM-47	**CB**									
	RT									
LM-48	**CB**									
	RT									

Date: 17-July-2002
Remarks: Sanford-Yake (Hutchinson County)
Legend: **CB**- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-49	**CB**									
	RT									
LM-50	**CB**									
	RT									
LM-51	**CB**									
	RT									
LM-52	**CB**									
	RT									
LM-53	**CB**									
	RT									
LM-54	**CB**									
	RT									
LM-55	**CB**									
	RT									

Date: 21-July-2002
Remarks: McBride Canyon-Mullinaw Crossing (Potter County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-56	**CB**									
	RT									
LM-57	**CB**									
	RT								1	
LM-58	**CB**									
	RT									
LM-59	**CB**									
	RT									
LM-60	**CB**									
	RT									
LM-61	**CB**									
	RT									
LM-62	**CB**									
	RT									
LM-63	**CB**									
	RT									
LM-64	**CB**									
	RT									
LM-65	**CB**									
	RT									

Date: 2-August-2002
Remarks: North Canyon (Hutchinson County)
Legend: CB- chipboard, RT – roofing tin

Coverboard Codes	Board type	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-66	**CB**									
	RT									
LM-67	**CB**									
	RT									
LM-68	**CB**									
	RT									
LM-69	**CB**	Boards removed by unknown party								
	RT									
LM-70	**CB**									
	RT						1			

Date: 9-August-2002
Remarks: Sanford Marsh (Hutchinson County)
Legend: CB- chipboard, RT – roofing tin

Coverboard Codes	Board type	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-71	**CB**									
	RT									
LM-72	**CB**									
	RT									
LM-73	**CB**									
	RT									
LM-74	**CB**									
	RT									

Date: 18-April-2003
Remarks: Sanford-Yake (Hutchinson County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-49	**CB**					2				
	RT							2		
LM-50	**CB**					1				
	RT									
LM-51	**CB**									
	RT									
LM-52	**CB**									
	RT									
LM-53	**CB**									
	RT									

Date: 21-April-2003
Remarks: Rosita Meadows (Potter County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-34	**CB**									
	RT									
LM-35	**CB**									
	RT									
LM-36	**CB**									
	RT									
LM-37	**CB**									
	RT									
LM-38	**CB**									
	RT							1		
LM-39	**CB**									
	RT							1		
LM-40	**CB**					1				
	RT									
LM-41	**CB**									
	RT									

Date: 23-April-2003
Remarks: Blue West (Moore County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-1	**CB**									
	RT									
LM-2	**CB**									
	RT									
LM-5	**CB**				1					
	RT									
LM-6	**CB**									
	RT									
LM-7	**CB**									
	RT									

Date: 28-April-2003
Remarks: Blue West (Moore County), Plum Creek (Potter County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-3	**CB**									
	RT									
LM-4	**CB**									
	RT									
LM-8	**CB**									
	RT									
LM-42	**CB**									
	RT									
LM-43	**CB**									
	RT									
LM-44	**CB**									
	RT									
LM-45	**CB**									
	RT									
LM-46	**CB**									
	RT									
LM-47	**CB**									
	RT									
LM-48	**CB**									
	RT									

Date: 9-May-2003
Remarks: Sanford Marsh (Hutchinson County)
Legend: CB- chipboard, RT – roofing tin.

Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-72	**CB**									
	RT									
LM-73	**CB**									
	RT									
LM-74	**CB**									
	RT									

Date: 10-June-2003
Remarks: Mullinaw Crossing (Potter County)
Legend: CB- chipboard, RT – roofing tin.

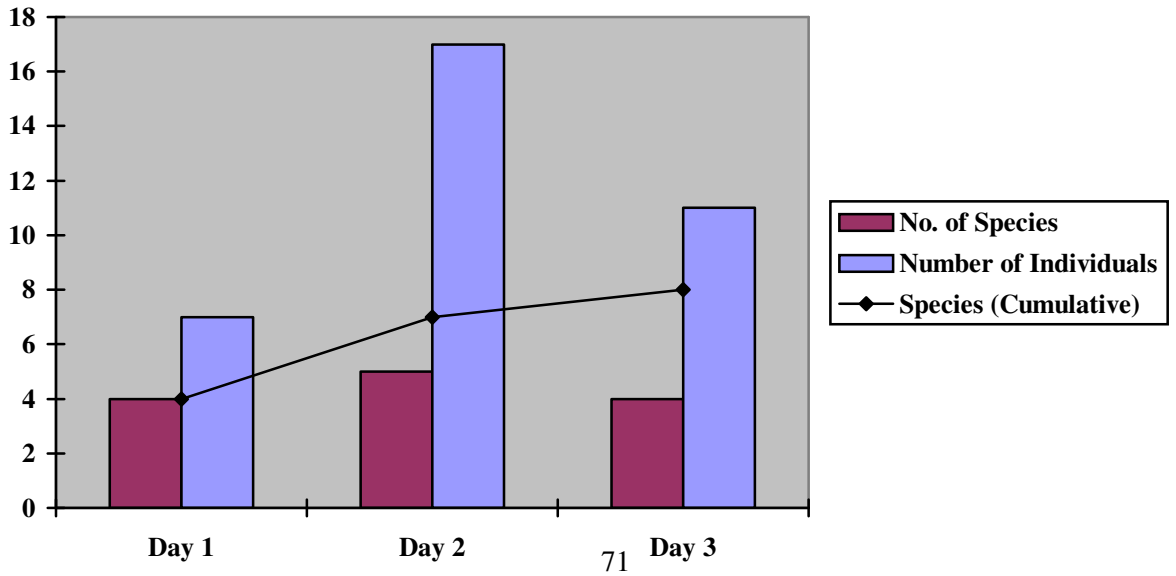
Coverboard Codes	**Board type**	Ornate Box Turtle	Eastern Collared Lizard	Prairie Lizard	Great Plains Skink	Prairie Ringneck Snake	Western Coachwhip	White-footed Mouse	Deer Mouse	Harvest Mouse (*Reithrodontomys* sp.)
LM-61	**CB**									
	RT									
LM-62	**CB**				1					
	RT							1		

APPENDIX 6. Results of small mammal trapping in northern section of LAMR, October 22-24, 2002

Totals: 204 trap-nights (68 trap-nights/Tomahawks and 136 trap-nights/Sherman).
Pitfalls: November 1-11, 2002 (1200 trap-nights)

Small Mammal Station No.	Least Shrew	Desert Shrew	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat	**Total Small Mammals per Station**
SMS-1										2	**2**
SMS-2		1							2		**3**
SMS-3					1					1	**2**
SMS-4					2			1		1	**4**
SMS-5				1						1	**2**
SMS-6							3				**3**
SMS-7					2						**2**
SMS-8						1	2				**3**
SMS-9					2						**2**
SMS-10					1		3				**4**
SMS-11					2				1		**3**
SMS-12	1		1		1					1	**4**
SMS-13	1				1						**2**
SMS-14					2						**2**
Total	**2**	**1**	**1**	**1**	**14**	**1**	**8**	**1**	**3**	**6**	**38**

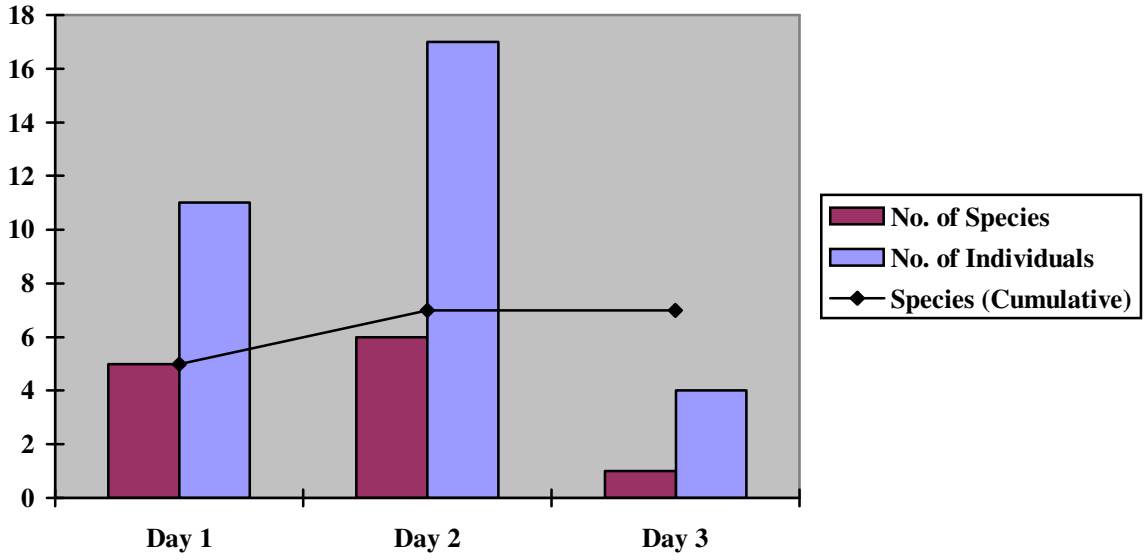
Daily Success in Small Mammal Trapping at Lake Meredith in October 2002



Results of small mammal trapping in LAMR, 14-23 April, 2003: 126 trap-nights (16 trap-nights/Tomahawks and 110 trap-night/Sherman)

Small Mammal Station No.	Spotted Ground Squirrel	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Western Harvest Mouse	Grasshopper Mouse	White-throated Woodrat	**Total Small Mammals per Station**
SMS-15		1	3					**4**
SMS-16			2					**2**
SMS-17			3				2	**5**
SMT-1		1						**1**
SMT-2		1						**1**
SMT-3		1	1					**2**
SMT-4		1						**1**
SMT-5		1						**1**
SMT-6								**0**
SMT-7			1			1		**2**
SMT-8	1							**1**
SMT-9			1					**1**
SMT-10		1				1		**2**
SMT-11								**0**
SMT-12								**0**
SMT-13								**0**
SMT-14								**0**
SMT-15								**0**
SMT-16								**0**
SMT-17								**0**
SMT-18			1					**1**
SMT-19								**0**
SMT-20								**0**
SMT-21					2			**2**
SMT-22		1						**1**
SMT-23								**0**
SMT-24				1				**1**
SMT-25								**0**
SMT-26			1					**1**
SMT-27			1					**1**
SMT-28								**0**
SMT-29					1			**1**
SMT-30								**0**
SMT-31								**0**
SMT-32								**0**
SMT-33								**0**
SMT-34								**0**
Total	**1**	**8**	**14**	**1**	**3**	**2**	**2**	**31**

Daily Success of Small Mammal Trapping at Lake Meredith in April 2003



Total trapping effort (trap-nights)

Trap type	Trapping effort (trap-nights)		
	October 2002	April 2003	Total
Large Tomahawk	34	8	42
Small Tomahawk	34	8	42
Large Sherman	34	35	69
Small Sherman	102	75	177
Total	204	126	330
	Pitfall traps (trap-nights)		
Pitfalls	1200		1200

APPENDIX 7. Description and location of small mammal stations (SMS) and small mammal traps (SMT)

Note: For definitions and details of SMS and SMT see Methods section.

Small mammal stations (SMS): Arrays of traps and cover boards

Hutchinson County:

1) Rocky yucca grassland in Sanford-Yake close to Cedar Canyon.
2) Upper part of Cedar Canyon: rocky slopes
3) Cottonwood savanna on sandy and loamy soils in a ravine in Sanford-Yake with little bluestem and other grasses.
4) Mesquite savanna on loamy soils with some thick mesquite patches in Sanford-Yake
5) Yucca-little bluestem grassland on gravely and sandy soils close to the Canadian River Water Authority in Sanford-Yake.
6) Thick mesquite savanna on heavy soils in North Canyon.
7) Mesquite savanna with some little bluestem on heavy soils in North Canyon.
8) Yucca-mesquite grassland on sandy soils with little bluestem, gamma and *Opuntia* at the North End.
9) Little bluestem-yucca-gamma-sage grassland on sandy soils at the North End.
10) Little bluestem-gamma-sage grassland on sandy soils at the North End.
11) Rocky slope with large boulders in Spring Canyon (no pitfalls at this site)
12) Thick riverine grassland with asters, sages and other forbs by Sanford Marsh.
13) Thick riverine grassland adjacent to Sanford Marsh.
14) Rocky slope with some bushes and grasses in Spring Canyon (no pitfalls at this site).

Potter County:

15) Burned semi-desert area (2002 burn) with some mesquites on loamy soils in Bates Canyon.
16) Yucca grassland in a small ravine in Bates Canyon.
17) At a base of a small limestone cliff overgrown with shrubs at Rosita Meadows.

Small mammal traps (SMT): Individually set small and large Sherman traps.

Hutchinson County:
Ten large and small Sherman traps (Nos. 1 through 10) set individually, ca. 20-30 m apart in North End grasslands April 12-14, 2003.

Potter County:
Twenty-four small and large Sherman traps (mostly the former) set individually (ca. 20-30 m apart) in three traplines in Rosita Meadows: Nos. 11-17 in cottonwood savanna with thick grass, Nos. 18-27 and 28-34 in more open grassland area (bluestem, switch grass) with some cottonwoods close to the Canadian River April 22-23, 2003.

APPENDIX 8: Gopher surveys at LAMR

Gopher Stations:

1) Yucca-little bluestem grassland at the North End, Hutchinson County
2) Scarce grassland (heavy gopher excavation) on sandy soils at the North End, Hutchinson County.
3) Yucca-sage grassland on sandy soils at the North End, Hutchinson County.
4) Little bluestem-switch grass-yucca grassland on sandy soils.
5) Pipeline site overgrowing with native and non-native grasses. Sandy soils. The North End, Hutchinson County.
6) Burned semi-desert area (2002 burn). Heavy red loamy and rocky soils. Shallow gopher tunnels. Bates Canyon, Potter County.
7) Burned semi-desert area (2002 burn). Heavy red loamy and rocky soils. Bates Canyon, Potter County.
8) Burned semi-desert area (2002 burn). Heavy red loamy and rocky soils. Bates Canyon, Potter County.
9) Burned semi-desert area (2002 burn). Heavy red loamy and rocky soils. Bates Canyon, Potter County.
10) Burned semi-desert area (2002 burn). Heavy brown loamy and rocky soils. Bates Canyon, Potter County.
11) Burned semi-desert area (2002 burn). Heavy red loamy and rocky soils. Bates Canyon, Potter County.

Result of gopher trapping at LAMR in April 2003.

Trap No./Date	April 9	April 10	April 11	April 12	April 13
GOPH-1	0	ga	0	-	-
GOPH-2	ga	PPG	-	-	-
GOPH-3	0	ga	PPG	-	-
GOPH-4	0	ga	0	-	-
GOPH-5	0	ga	0	-	-
GOPH-6	-	0	0	-	-
GOPH-7	-	0	0	0	-
GOPH-8	-	0	0	0	-
GOPH-9	-	0	ga	0	PPG
GOPH-10	-	0	0	0	0
GOPH-11	-	-	0	0	0

Legend: PPG (Plains Pocket Gopher caught), ga –gopher activity: trap filled with dirt or gopher plugged its burrow, 0 – no gopher activity, - trap closed/not set.

APPENDIX 9. Results of 2002-2003 remote camera surveys

Ten *Trailmaster* cameras with TM-550 remote sensors were set in LAMR and ALFL between September 6, 2002 and June 20, 2003.

Camera Code	Site	Dates	Species Recorded					Total No. Photos
			Raccoon	*Peromyscus sp.*	Woodrat (*Neotoma sp.*)	Turkey Vulture	Homo sapiens	
CAM-1	Spring Canyon	6-8 September 2002						**0**
CAM-2	Spring Canyon	6-8 September 2002						**0**
CAM-3	Sanford-Yake	9-13 September 2002	1			1	1	**3**
CAM-4	Sanford-Yake	9-13 September 2002						**0**
CAM-5	Dolomite Point Road	10-13 September 2002		1				**1**
CAM-6	McBride Canyon	10-13 September 2002			1			**1**
CAM-7	Alibates Flint Quarries	10-13 September 2002						**0**
CAM-8	Alibates Flint Quarries	10-13 September 2002						**0**
CAM-9	Chicken Creek	17-20 June 2003						**0**
CAM-10	Bonita Creek	17-20 June 2003						**0**

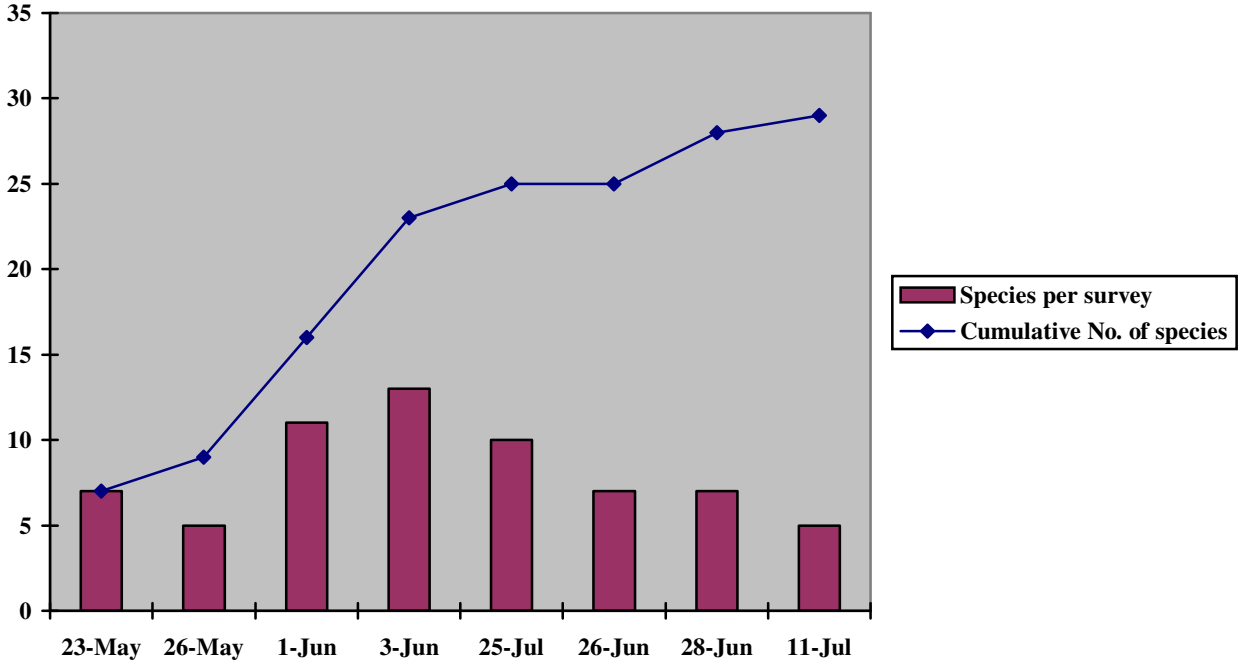
APPENDIX 10. Results of spotlight surveys (2002)

Route	Length	Date	Time (00 hrs.)	Species Recorded			Total per route
				Cottontail sp.	Ord's Kangaroo Rat	White-tailed Deer	
Bates Canyon-Dolomite Point Rd.	11 km	13-March	2100-2215			5	5
McBride Canyon-Mullinaw Crossing	5 km	15-March	1950-2020				0
Bates Canyon-Dolomite Point Rd.	11 km	26 June	2225-2300	1	1	6	8
Total per species				1	1	11	**13**

APPENDIX 11. Breeding bird surveys: variable circular plots (May-July, 2002)

Species	Site/Date/Time								Total
					Alibates Flint Quarries		Bates Canyon		
	Alibates Flint Quarries 23-May (0800-1023 hrs.)	**Plum Creek Canyon** 26-May (0930-1330 hrs.)	**Blue West** 1-June (0715-1045 hrs.)	**McBride Canyon** 3-June (1015-1330 hrs.)	25-June (0715-1220 hrs.)	26-June (0720-1200 hrs.)	28-June (0830-1230 hrs.)	11-July (0645-0930 hrs.)	
Great Blue Heron			2						**2**
Turkey Vulture	2	3	2	3			1		**11**
Mississippi Kite	2		6		1			3	**12**
Red-tailed Hawk							1		**1**
American Kestrel		1				3			**4**
Bobwhite								2	**2**
Killdeer							1		**1**
Mourning Dove			3	3	5	7	6	16	**40**
Yellow-billed Cuckoo			1	1	1				**3**
Northern Flicker				2	1				**3**
Red-headed Woodpecker				1		4			**5**
Downy Woodpecker				2					**2**
Ladder-backed Woodpecker			2						**2**
Western Kingbird				2		9	2		**13**
Scissor-tailed Flycatcher					5	4		7	**16**
Ash-throated Flycatcher			4						**4**
American Crow			1	1					**2**
Carolina Chickadee				3					**3**
Bewick's Wren				2					**2**
Rock Wren	2								**2**
Loggerhead Shrike					1				**1**
Northern Mockingbird	5	1	1	1	4	4	4		**20**
Northern Cardinal			2	1					**3**
Blue Grosbeak	2		3		3	2		2	**12**
Lark Sparrow	2				4				**6**
Western Meadowlark		3							**3**
Red-winged Blackbird	1	1							**2**
Brown-headed Cowbird				4	2				**6**
Bullock's Oriole							1		**1**
TOTAL	**16**	**9**	**27**	**26**	**27**	**33**	**16**	**30**	**184**

Number of Bird Species recorded on Variable Circular Plots in May-July 2002



APPENDIX 12. Winter Grassland Bird Surveys: physical/vegetation description for 3-ha plots

Plot No.	Brief description	Location
1	Upland yucca grassland with some mesquite	Sanford-Yake, LMNRA, Hutchinson County
2	Riverine grassland with some willows, cottonwoods and yucca	Mullinaw Crossing, LMNRA, Potter County
3	Mesquite grassland	Blue West, LMNRA, Moore County
4	Riverine grassland with some willows and tamarisks	Mullinaw Crossing, LMNRA, Potter County
5	Yucca grassland, hilly	Alibates Flint Quarries, Potter County
6	Cottonwood savanna	Rosita Meadows, LMNRA, Potter County
7	Yucca grassland with few mesquite	Plum Creek, LMNRA, Potter County
8	Riverine grassland with few cottonwoods	Mullinaw Crossing, LMNRA, Potter County
9	Mesquite grassland	North end of LMNRA in Hutchinson County
10	Mesquite grassland	North end of LMNRA in Hutchinson County
11	Disturbed grassland with sages, yuccas, mesquite and some *Opuntia* cactus.	North end of LMNRA in Hutchinson County
12	Tallgrass/shortgrass riparian meadow with some willows, tamarisk and cottonwoods	Rosita Meadows, LMNRA, Potter County
13	Mesquite grassland with some yucca	North end of LMNRA in Hutchinson County
14	Mesquite grassland	East of Bugbee, LMNRA, Hutchinson County
15	Grassland with some mesquite, yucca and sage	North end of LMNRA in Hutchinson County
16	Mesquite grassland	North end of LMNRA in Hutchinson County
17	Mesquite grassland with few cottonwoods	East of Bugbee, LMNRA, Hutchinson County
18	Mesquite grassland with some thicker mesquite patches, also sage, wild rye	North end of LMNRA in Hutchinson County
19	Cottonwood savanna	Mullinaw Crossing, LMNRA, Potter County
20	A mixture of mesquite thickets and grassy areas, bare patches	North end of LMNRA in Hutchinson County
21	Upland grassland with some mesquite and yucca	North end of LMNRA in Hutchinson County
22	Mesquite grassland with several gas pipeline outlets	Sanford-Yake, LMNRA, Hutchinson County
23	Cottonwood savanna	Rosita Meadows, LMNRA, Potter County
24	Grassland with sage, yucca and mesquite	North end of LMNRA in Hutchinson County
25	Yucca grassland with few mesquite	Blue West, LMNRA, Moore County
26	Mesquite-yucca and yucca grassland	Blue West, LMNRA, Moore County
27	Riverine cottonwood savanna	Rosita Meadows, LMNRA, Potter County
28	Mesquite-yucca grassland	Sanford-Yake, LMNRA, Hutchinson County
29	Shortgrass upland area with sparse mesquite	Alibates Flint Quarries, Potter County
30	Mesquite-yucca grassland	Alibates Flint Quarries, Potter County

APPENDIX 13. Coordinates and elevation of 3-ha plot corners for winter grassland bird surveys

Plot (Corner) ID	Easting	Northing	Elev. (m)
1NE	269236.98199100000	3952607.07491000000	931.6
1NW	269066.05697199900	3952634.09186000000	983.1
1SE	269210.95197200000	3952436.04167000000	929.0
1SW	269040.02365500000	3952463.05895000000	924.9
2NE	249105.98962099900	3937326.98927999000	890.8
2NW	248932.96964400000	3937327.04228999000	892.7
2SE	249105.03361899900	3937153.05952000000	968.9
2SW	248932.00507799900	3937152.92744000000	883.3
3NE	261263.96567700000	3951993.08704000000	940.0
3NW	261090.94720000000	3951992.92756999000	940.3
3SE	261263.99600700000	3951820.06954000000	939.3
3SW	261090.97416799900	3951819.90989999000	927.3
4NE	249065.93751600000	3936962.06583000000	884.1
4NW	248893.05634800000	3936961.93006000000	884.8
4SE	249066.03421799900	3936787.92146999000	974.4
4SW	248893.00375599900	3936787.97468000000	899.7
5NE	257400.94133100000	3941319.92442000000	903.3
5NW	257228.01680600000	3941320.00583000000	901.6
5SE	257401.04485999900	3941145.97692999000	913.6
5SW	257227.96591800000	3941146.06227000000	901.4
6NE	243660.39101200000	3929282.43436999000	901.8
6SE	243627.97184400000	3929123.09474000000	969.8
6SW	243457.34853399900	3929175.73056000000	904.5
7NE	251791.97680999900	3943940.96264000000	917.9
7NW	251618.93808399900	3943940.97480000000	912.2
7SE	251791.05945299900	3943767.03386999000	917.5
7SW	251618.94920500000	3943767.94517000000	912.2
8NE	248990.00423900000	3936569.09670000000	907.1
8NW	248816.96422299900	3936568.96622999000	923.0
8SE	248989.98037300000	3936396.06607999000	974.4
8SW	248816.93701299900	3936395.93543000000	908.8
9NE	267927.96670300000	3956486.02026000000	911.9
9NW	267755.05069800000	3956485.92044000000	913.4
9SE	267927.96661300000	3956313.01232000000	1001.3
9SW	267755.04724300000	3956312.91233000000	915.8
10NE	269106.72816399900	3957583.59075000000	915.8
10NW	268949.34577700000	3957617.11108999000	925.9
10SE	269083.00030700000	3957413.97765999000	921.3
10SW	268920.31752699900	3957452.63224000000	906.2
11NE	269235.46281800000	3957388.35945999000	901.4
11NW	269072.06528899900	3957422.77400000000	907.6
11SE	269198.02072199900	3957225.02424999000	921.5
11SW	269046.35929599900	3957264.12947000000	902.3
12NE	243494.17909799900	3929383.24600999000	906.2
12NW	243337.89200600000	3929418.26245999000	904.7
12SE	243452.07079800000	3929223.99935999000	962.2
12SW	243294.27084300000	3929264.42667000000	906.4
13NE	268098.04776500000	3957173.97301999000	911.0

Plot (Corner) ID	Easting	Northing	Elev. (m)
13NW	267924.06581700000	3957172.97364000000	927.3
13SE	268096.99419599900	3957000.99268000000	911.7
13SW	267923.94253000000	3957001.07892999000	928.5
14NE	267139.08745799900	3957432.06497999000	922.0
14NW	266966.03789799900	3957431.98541999000	922.3
14SE	267138.01472500000	3957259.08375000000	921.8
14SW	266966.01717499900	3957258.97630000000	921.5
15NE	268192.77533099900	3957911.82194000000	930.0
15NW	268036.15409999900	3957951.07537000000	931.2
15SE	268163.00280199900	3957754.02521000000	936.2
15SW	268003.81107499900	3957793.16117999000	921.8
16NE	267705.01350900000	3958089.08632999000	914.6
16NW	267531.97759899900	3958088.99639000000	909.3
16SE	267704.97677600000	3957914.96832000000	913.1
16SW	267531.96656799900	3957915.98766000000	917.7
17NE	266863.02082699900	3957478.91740000000	920.6
17NW	266689.97662700000	3957479.02817999000	920.8
17SE	266862.97369499900	3957304.98363000000	923.5
17SW	266690.07687599900	3957305.09027000000	921.1
18NE	268539.67686399900	3957643.15438000000	917.2
18NW	268364.51787400000	3957671.78341000000	916.0
18SE	268510.05128700000	3957484.98306000000	914.6
18SW	268343.53198099900	3957509.50095999000	910.0
19NE	249163.97133500000	3936403.02067000000	886.0
19NW	248991.08473000000	3936403.06731999000	886.5
19SE	249165.00918200000	3936229.96056000000	969.1
19SW	248991.06124400000	3936230.03675000000	885.7
20NE	268364.36461300000	3956221.85541999000	910.0
20NW	268204.35155500000	3956259.52669000000	914.8
20SE	268326.03743199900	3956060.02599000000	895.3
20SW	268168.28330900000	3956097.63870000000	914.8
21NE	268358.95662499900	3956788.94259000000	905.7
21NW	268186.05199599900	3956789.01958000000	904.5
21SE	268358.94016599900	3956615.01046000000	911.0
21SW	268186.03215400000	3956615.08728000000	905.9
22NE	269804.04450000000	3953694.03414000000	919.9
22NW	269631.08182899900	3953694.07996999000	917.7
22SE	269804.05774700000	3953519.91929000000	965.5
22SW	269630.96964800000	3953521.07830000000	917.2
23NE	243562.20661900000	3929147.37168999000	903.3
23NW	243405.53310500000	3929179.62164000000	901.6
23SE	243531.96973899900	3928985.00865999000	975.6
23SW	243361.87815500000	3929019.30917999000	907.6
24NE	268894.69632100000	3957540.45104000000	918.7
24NW	268730.82002200000	3957579.51050999000	911.2
24SE	268854.01198700000	3957386.08295000000	921.8
24SW	268696.61698699900	3957419.23780999000	909.8
25NE	261440.06323299900	3952270.91875999000	937.2
25NW	261265.99939000000	3952270.96944000000	938.4
25SE	261439.95051400000	3952098.09034000000	932.8
25SW	261266.02918400000	3952097.95188000000	938.6
26NE	261634.00789099900	3952601.01180000000	940.8

Plot (Corner) ID	Easting	Northing	Elev. (m)
26NW	261461.00677000000	3952601.03065000000	939.3
26SE	261634.01933899900	3952427.06998000000	939.6
26SW	261460.97260400000	3952447.99981000000	939.1
27NE	242706.75344999900	3929059.95344999000	902.6
27NW	242553.05592799900	3929106.19810000000	904.7
27SE	242673.97408000000	3928893.96369000000	970.3
27SW	242515.16774999900	3928941.65108999000	904.0
28NE	269737.97373400000	3953485.92192000000	934.8
28NW	269565.00691900000	3953485.96883000000	922.5
28SE	269738.01487800000	3953312.91649999000	936.7
28SW	269565.04470000000	3953312.96322999000	922.3
29NE	257940.01878000000	3940051.95085000000	913.1
29NW	257767.07055700000	3940052.02051000000	910.5
29SE	257940.00950300000	3939878.93288999000	918.9
29SW	257767.05793300000	3939879.00236999000	910.0
30NE	257507.06437700000	3939975.07508999000	908.8
30NW	257333.95789399900	3939974.97226000000	908.1
30SE	257507.04688200000	3939802.05670000000	914.8
30SW	257334.99456299900	3939801.92492000000	907.4

APPENDIX 14. Winter grassland bird transect descriptions

No.	Description	Length	Location
1	Upland grassland with some mesquite and yucca	500 m	North end of LMNRA, Hutchinson County
2	Upland grassland with some mesquite and yucca	500 m	North end of LMNRA, Hutchinson County
3	Disturbed grassland with some mesquite	500 m	North end of LMNRA, Hutchinson County
4	Disturbed grassland with mesquite	860 m	North end of LMNRA, Hutchinson County
5	Upland yucca grassland	500 m	North end of LMNRA, Hutchinson County
6	Upland yucca grassland with some sage	500 m	North end of LMNRA, Hutchinson County
7	Dense mesquite grassland with tall grass	1,000 m	North end of LMNRA, Hutchinson County
8	Bottomland grassland	1,500 m	Dolomite Point Road, LMNRA, Potter County
9	Bottomland grassland	1,000 m	Dolomite Point Road, LMNRA, Potter County
10	Cottonwood savanna, tamarisk and riverine meadow	1,000 m	Dolomite Point Road, LMNRA, Potter County
11	Bottomland grassland	1,000 m	East of Mullinaw Crossing, LMNRA, Potter County
12	Bottomland grassland	500 m	East of Mullinaw Crossing, LMNRA, Potter County
13	Cottonwood savanna	500 m	East of Mullinaw Crossing, LMNRA, Potter County
14	A mixture of grassland, shrubs and patches of cottonwood	2,000 m	Plum Creek, LMNRA, Potter County

APPENDIX 15. UTM coordinates and elevation of winter grassland transect points

Transect point ID	Easting	Northing	Elev. (m)
1A	269505.70527099900	3957302.87634000000	905.9
1B	268750.33116499900	3957916.87433000000	922.5
2A	268832.38413600000	3957945.26501999000	917.9
2B	268448.21970199900	3957017.90475999000	879.0
3A	268434.35757900000	3956567.89263000000	908.1
3B	268136.68073199900	3956972.38470999000	920.6
4A	268090.80976400000	3957116.43133000000	916.5
4C	268561.99953799900	3957839.44851000000	921.3
5A	269029.24356099900	3957539.53550999000	916.0
5B	269081.27369100000	3957040.62470000000	891.5
6A	269132.86067099900	3956825.75288000000	895.1
6B	269420.67950799900	3957235.69951999000	910.0
7A	267734.87905300000	3957317.25895000000	934.5
7C	268337.83777300000	3957903.58924000000	923.0
8A	256686.06098000000	3941246.32818000000	889.3
8B	256785.57973600000	3941735.84189999000	893.4
8C	256877.02039200000	3942228.72245999000	892.9
9A	257311.50658900000	3942282.20193000000	896.1
9B	257772.92224499900	3943159.72629000000	889.3
10A	257392.83269700000	3942904.33943999000	888.1
10B	256389.59573800000	3942898.40414999000	884.8
11A	250482.07940300000	3936453.80854000000	894.9
11C	250971.03631900000	3937325.10085000000	890.1
12A	248603.62181499900	3934868.15629999000	900.9
12B	248689.35655200000	3935361.33561000000	896.5
13A	248512.80277600000	3935984.03738000000	906.4
13B	248961.48062600000	3936210.88176999000	895.8
14A	252469.10055100000	3943731.88108000000	922.5
14B	251699.77821799900	3943094.67200999000	896.5
14E	251401.89552500000	3943376.86494000000	906.6

APPENDIX 16. List of vertebrates recorded in Lake Meredith National Recreation Area, Alibates Flint Quarries National Monument, and adjacent areas (Texas Panhandle) in 2001-2003

Legend: S – specimen, P – photo record, n –nesting confirmed (nest, fledglings, adults carrying food to the young), n? – nesting suspected, + - present, - absent (no habitat), * - found in areas immediately adjacent to LAMR and ALFL, but not in the parks, ** - new county records

Fishes (18 species)

	Lake Meredith	Alibates
Red Shiner – *Cyprinella lutrensis*	S	No fish habitat
European Carp – *Cyprinus carpio*	S	
Plains Minnow – *Hybognathus placitus*	S	
Peppered Chub - *Macrhybopsis tetranema*	S	
River Shiner – *Notropis blennius***	S	
Arkansas River Shiner – *Notropis girardi*	S	
Fathead Minnow – *Pimephales promelas*	S	
Bullhead Minnow - *Pimephales vigilax*	S	
Flathead Chub – *Platygobio gracilis*	S	
Channel Catfish – *Ictalurus punctatus*	S	
Flathead Catfish – *Pylodictis olivaris*	S	
Plains Killifish – *Fundulus zebrinus*	S	
Western Mosquitofish – *Gambusia affinis*	S	
Green Sunfish – *Lepomis cyanellus*	S	
Bluegill – *Lepomis macrochirus*	S	
Longear Sunfish – *Lepomis megalotis*	S	
Redear Sunfish – *Lepomis microlophus*	S	
Largemouth Bass – *Micropterus salmoides*	S	

Amphibians (9 species)

	Lake Meredith	Alibates
Barred Tiger Salamander – *Ambystoma tigrinum mavortium**		
Blanchard's Cricket Frog – *Acris crepitans blanchardi*	P	
Western Green Toad – *Bufo debilis insidior*	P	
Red-spotted Toad – *Bufo punctatus*	P	
Woodhouse's Toad – *Bufo woodhousii woodhousii*	P	P
Couch's Spadefoot – *Scaphiopus couchii*	P	
Plains Spadefoot – *Spea bombifrons*	P	
Plains Leopard Frog – *Rana blairi*	+	
Bullfrog – *Rana catesbeiana*	P, S	

Reptiles (27 species)

	Lake Meredith	Alibates
Common Snapping Turtle – *Chelydra serpentina serpentina*	P	
Yellow Mud Turtle – *Kinosternon flavescens flavescens*	P	
Ornate Box Turtle – *Terrapene ornata ornata*	P	+
Red-eared Slider – *Trachemys scripta elegans*	P	
Eastern Collared Lizard – *Crotaphytus collaris collaris*	P	+
Prairie Lizard – *Sceloporus consobrinus*	P,S	+
Texas Horned Lizard - *Phrynosoma cornutum*	P, S	P
Prairie Racerunner – *Cnemidophorus sexlineatus viridis*	S	+
Colorado Checkered Whiptail – *Cnemidophorus tesselatus*	P	P
Great Plains Skink – *Eumeces obsoletus*	P	P
New Mexico Blind Snake – *Leptotyphlops dulcis dissectus*	P, S	P
Kansas Glossy Snake – *Arizona elegans elegans*	P	
Yellowbelly Racer – *Coluber constrictor flaviventris*	P	
Prairie Ringneck Snake – *Diadophis punctatus arnyi*	P	
Northern Plains Rat Snake – *Elaphe emoryi emoryi*	P	
Texas Night Snake – *Hypsiglena torquata jani*	P	
Desert King Snake – *Lampropeltis getula splendida*	P	
Western Coachwhip – *Masticophis flagellum testaceus*	P, S	+
Blotched Water Snake – *Nerodia erythrogaster transversa*	+	
Bullsnake – *Pituophis catenifer sayi*	P	+
Texas Longnose Snake – *Rhinocheilus lecontei tesselatus*	+	P
Ground Snake – *Sonora semiannulata*	P	
Plains Blackhead Snake – *Tantilla nigriceps*		P
Marcy's Checkered Garter Snake – *Thamnophis marcianus marcianus*	+	
Texas Garter Snake – *Thamnophis sirtalis annectens*	P, S	
Lined Snake – *Tropidoclonion lineatum**		
Western Diamondback Rattlesnake – *Crotalus atrox*	P	+
Prairie Rattlesnake – *Crotalus viridis viridis**		

Breeding Birds (72 species: 33 confirmed, 27 probable, and 12 possible nesting species)

	Lake Meredith	Alibates
Double-crested Cormorant – *Phalacrocorax auritus*	?	-
Green Heron – *Butorides virescens*	n?	-
Black-crowned Night-Heron – *Nycticorax nycticorax*	n?	-
Great Blue Heron – *Ardea herodias*	n?	-
White-faced Ibis – *Plegadis chihi*	?	-
Gadwall – *Anas strepera*	n?	-
Mallard – *Anas platyrhynchos*	n (P)	-
Blue-winged Teal – *Anas discors*	n?	-
Cinnamon Teal – *Anas cyanoptera*	n?	-
Northern Shoveler – *Anas clypeata*	?	-
Green-winged Teal – *Anas crecca*	n?	-
Ruddy Duck – *Oxyura jamaicensis*	?	-

	Lake Meredith	**Alibates**
Turkey Vulture – *Cathartes aura*	n?	n?
Mississippi Kite – *Ictinia mississippiensis*	n (P)	-
Red-tailed Hawk – *Buteo jamaicensis*	n (P)	n (P)
American Kestrel – *Falco sparverius*	n	n
Ring-necked Pheasant – *Phasianus colchicus*	n?	-
Wild Turkey – *Meleagris gallopavo*	n	-
Scaled Quail – *Callipepla squamata*	n	-
Northern Bobwhite – *Colinus virginianus*	n	n?
Virginia Rail – *Rallus limicola*	n?	-
Common Moorhen – *Gallinula chloropus*	n?	-
American Coot – *Fulica americana*	n?	-
Black-necked Stilt – *Himantopus mexicanus*	?	-
American Avocet – *Recurvirostra americana*	n?	-
Killdeer – *Charadrius vociferus*	n	-
Mourning Dove – *Zenaida macroura*	n (P)	n (P)
Yellow-billed Cuckoo – *Coccyzus americanus*	n	n?
Greater Roadrunner – *Geococcyx californianus*	n (P)	n?
Barn Owl – *Tyto alba*	?	-
Eastern Screech-Owl – *Otus asio*	n	-
Great Horned Owl – *Bubo virginianus*	n?	n?
Common Nighthawk – *Chordeiles minor*	n?	n?
Common Poorwill – *Phalaenoptilus nuttallii**		
Belted Kingfisher – *Ceryle alcyon*	n?	-
Northern Flicker – *Colaptes auratus*	n	n(P)
Red-headed Woodpecker – *Melanerpes erythrocephalus*	n (P)	n (P)
Ladder-baked Woodpecker – *Picoides scalaris*	n (P)	n (P)
Downy Woodpecker – *Picoides pubescens*	n?	-
Eastern Kingbird – *Tyrannus tyrannus*	n	-
Western Kingbird – *Tyrannus verticalis*	n	n (P)
Scissor-tailed Flycatcher – *Tyrannus forficatus*	n (P)	n (P)
Ash-throated Flycatcher – *Myiarchus cinerascens*	n (P)	n
Cliff Swallow – *Petrochelidon pyrrhonota*	n (P)	-
Blue Jay – *Cyanocitta cristata*	n?	-
American Crow – *Corvus brachyrhynchos*	n?	-
Unidentified Raven (*Corvus corax* or *C. cryptoleucus*)	?	-
Carolina Chickadee – *Parus carolinensis*	n	-
Bewick's Wren – *Thryomanes bewickii*	n?	-
Rock Wren – *Salpinctes obsoletus*	n	n (P)
Eastern Bluebird – *Sialia sialis*	?	-
American Robin – *Turdus migratorius*	n?	-
Loggerhead Shrike – *Lanius ludovicianus*	n	n?
Northern Mockingbird – *Mimus polyglottos*	n (P)	n (P)
Brown Thrasher – *Toxostoma rufum*	?	-
European Starling – *Sturnus vulgaris*	n?	n
Common Yellowthroat – *Geothlypis trichas*	n?	-
Northern Cardinal – *Cardinalis cardinalis*	n	n?
Blue Grosbeak – *Guiraca caerulea*	n (P)	n

	Lake Meredith	Alibates
Painted Bunting – *Passerina ciris*	n (P)	n?
Field Sparrow – *Spizella pusilla*	n (P)	-
Lark Sparrow – *Chondestes grammacus*	n	n (P)
Cassin's Sparrow – *Aimophila cassinii*	n?	n?
Rufous-crowned Sparrow – *Aimophila ruficeps*	n?	n?
Eastern Meadowlark – *Sturnella magna*	n?	n?
Western Meadowlark – *Sturnella neglecta*	n	n?
Red-winged Blackbird – *Agelaius phoeniceus*	n (P)	n?
Brown-headed Cowbird – *Molothrus ater*	n (P)	n?
Common Grackle – *Quiscalus quiscula*	n	-
Bullock's Oriole – *Icterus bullockii*	n (P)	n
Orchard Oriole – *Icterus spurius*	?	-
House Sparrow – *Passer domesticus*	?	-

Mammals (32 species)

	Lake Meredith	Alibates
Least Shrew – *Cryptotis parva*	S	
Desert Shrew – *Notiosorex crawfordi*	S	
Eastern Mole - *Scalopus aquaticus*	+	
Pallid Bat – *Antrozous pallidus*	P	
Nine-banded Armadillo – *Dasypus novemcinctus*	P	
Desert Cottontail – *Sylvilagus audubonii*	+	
Eastern Cottontail – *Sylvilagus floridanus*	+	
Black-tailed Jackrabbit – *Lepus californicus*	+	
Spotted Ground Squirrel – *Spermophilus spilosoma*	P	
Thirteen-lined Ground Squirrel - *Spermophilus tridecemlineatus**		
Black-tailed Prairie Dog – *Cynomys ludovicianus**		
Fox Squirrel – *Sciurus niger*	+	
Plains Pocket Gopher – *Geomys bursarius*	P	
Silky Pocket Mouse – *Perognathus flavus*	+	
Hispid Pocket Mouse – *Chaetodipus hispidus*	P	
Ord's Kangaroo Rat – *Dipodomys ordii*	P	
Beaver – *Castor canadensis*	?	
Western Harvest Mouse – *Reithrodontomys megalotis*	P, S	
White-footed Mouse – *Peromyscus leucopus*	P, S	
Deer Mouse – *Peromyscus maniculatus luteus*	P, S	
Northern Grasshopper Mouse – *Onychomys leucogaster*	P, S	
Hispid Cotton Rat – *Sigmodon hispidus*	P	
White-throated Woodrat – *Neotoma albigula*	P, S	
Southern Plains Woodrat – *Neotoma micropus*	P, S	
Porcupine – *Erethizon dorsatum*	P	
Coyote – *Canis latrans*	+	+
Raccoon - *Procyon lotor*	P	
American Badger – *Taxidea taxus*	+	
Bobcat – *Felis rufus*	+	

	Lake Meredith	**Alibates**
Mule Deer – *Odocoileus hemionus*	+	P
White-tailed Deer – *Odocoileus virginianus*	P	+
Pronghorn – *Antilocapra americana**		

APPENDIX 17. Results of fish surveys at LAMR in 2003

Station No.	Red Shiner	European Carp	Plains Minnow	Peppered Chub	River Shiner	Arkansas River Shiner	Fathead Minnow	Bullhead Minnow	Flathead Chub	Channel Catfish	Flathead Catfish	Plains Killifish	Western Mosquitofish	Green Sunfish	Bluegill	Redear Sunfish	Longear Sunfish	Largemouth Bass	Date of survey
1	16							2						5					3-Jun
2	7											2							3-Jun
3																			3-Jun
4				4					1										3-Jun
5	1											1							3-Jun
6	20		1	6				2	7			5							3-Jun
7	3			2			2	1	13			1	1						3-Jun
8				1					1								1		3-Jun
9									2										3-Jun
10	1								2										3-Jun
11	1			1				2	6										3-Jun
12																			3-Jun
13												2	9						5-Jun***
14	10							5				3	2						5-Jun***
15								3				1	1						5-Jun
16												11	5						5-Jun
17	2				1			8		2									5-Jun
18	11		37									4							17-Jun***
18	4						4					21	18		4				2-Nov***
19	4		15				2					2				3			17-Jun
20	1		4					1						1					17-Jun
20	14		20	1			8		13						9				15-Nov
21	6		9					1	1					1					17-Jun
22	6								1										17-Jun
23	25		4	16			7	2			52	6			16				7-Nov
24																			18-Jun*
25													4	5		2			18-Jun*
26													4						6-Nov***
27																			6-Nov
28	3		3						197			1	1						7-Nov
29	10		12								1								7-Nov
30	12		37	1		2		6	11				9		8				7-Nov
31			7	8			4		27						1				7-Nov
32	2		7	2			1		4										7-Nov
33															1			1	14-Nov**
34		3													2				14-Nov**
35			6						1										14-Nov**
36			1	2				1	10										14-Nov**
37	4						1				1	1			16				15-Nov**

Station No.	Red Shiner	European Carp	Plains Minnow	Peppered Chub	River Shiner	Arkansas River Shiner	Fathead Minnow	Bullhead Minnow	Flathead Chub	Channel Catfish	Flathead Catfish	Plains Killifish	Western Mosquitofish	Green Sunfish	Bluegill	Redear Sunfish	Longear Sunfish	Largemouth Bass	Date of survey
38	14		4	2		3	23		17	1					11				15-Nov**
39	5	6	7	1			1	7	17	55			1		11				15-Nov**
40	29		8				7	7	142	3	2	1	1		5				15-Nov**
41			3	5					31						1				15-Nov**
42	3		11				1		2			1							15-Nov**
Total	**214**	**9**	**196**	**52**	**1**	**5**	**61**	**48**	**506**	**61**	**253**	**63**	**56**	**12**	**85**	**5**	**1**	**1**	**Total fish: 1431**

* - minnow traps were used; ** - electro-shocker was used, *** - dip-net used; other sites were sampled with seine.

APPENDIX 18. Results of 3 hectare winter grassland bird plot surveys (December, 2001 to January, 2002).

Plot No.	Northern Harrier	American Kestrel	Bobwhite	Quail sp.	Mourning Dove	Ladder-backed Woodpecker	Eastern Meadowlark	Unidentified Meadowlark	White-crowned Sparrow	Field Sparrow	American Tree Sparrow	Song Sparrow	Unidentified Sparrow	American Goldfinch	Date of Survey
1				20											Jan 16, 2002
2							1								Jan 16, 2002
3															Jan 11, 2002
4															Jan 15, 2002
5					1										Jan 15, 2002
6											1				Jan 10, 2002
7															Jan 11, 2002
8												2		37	Jan 15, 2002
9															Jan 18, 2002
10								17							Dec 16, 2001
									7	3					Jan 18, 2002
11															Dec 16, 2001
								14			4				Jan 18, 2002
12							2								Jan 10, 2002
13															Jan 16, 2002
14								2	4						Jan 11, 2002
15		1							1						Dec 16, 2001
									1						Jan 18, 2002
16						2			14						Jan 18, 2002
17						1		1							Jan 15, 2002
18								1	2	1					Dec 16, 2001
									20						Jan 18, 2002
19															Jan 15, 2002
20								1							Dec 16, 2001
							1								Jan 16, 2002
21															Jan 16, 2002
22				8				1	1						Jan 16, 2002
23	1														Jan 10, 2002
24								1							Dec 16, 2001
															Jan 18, 2002
25						1									Jan 11, 2002
26															Jan 11, 2002
27	1							1							Jan 10, 2002
28			15	20					5						Jan 16, 2002
29													2		Jan 15, 2002
91									12				1		Jan 15, 2002
Sum	**2**	**1**	**15**	**48**	**1**	**4**	**4**	**39**	**67**	**4**	**5**	**2**	**3**	**37**	

APPENDIX 19. Results of winter grassland bird transects (February, 2002)

Transect No.	Mallard	Sharp-shinned Hawk	Red-tailed Hawk	Northern Harrier	American Kestrel	Unidentified Shrike	Eastern Meadowlark	Western Meadowlark	Unidentified Meadowlark	Red-winged Blackbird	White-crowned Sparrow	Field Sparrow	American Tree Sparrow	Song Sparrow	Unidentified Sparrow	Junco	American Goldfinch	Date of Survey
1								12			15				3			Feb 15, 2002
2											23		1			2		Feb 15, 2002
3				1							14							Feb 15, 2002
4		1																Feb 15, 2002
5																		Feb 15, 2002
6								3					1		1			Feb 15, 2002
7					2													Feb 15, 2002
8			2		1		2	22	2	1	4				7			Feb 22, 2002
9				2			2	3	5	225	29				1			Feb 22, 2002
10	5			1	1						30	2						Feb 22, 2002
11				1		1		18	2		45		6		5		6	Feb 24, 2002
12								1										Feb 24, 2002
13								15			19			7	3			Feb 24, 2002
14			1		1													Feb 25, 2002
Sum	**5**	**1**	**3**	**5**	**5**	**1**	**4**	**74**	**9**	**226**	**179**	**2**	**8**	**7**	**20**	**2**	**6**	

APPENDIX 20. Small mammal trapping forms

Date: 22-October-2002
Remarks: Overcast, light drizzle
Legend: LaTo – Large Tomahawk, SmTo – Small Tomahawk, LaSh – Large Sherman, SmSh – Small Sherman.

Small Mammal Station No. (SMS)	Trap Type	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-1	LaTo								1
	SmTo								1
	LaSh								
	SmSh								
SMS-2	LaTo								
	SmTo								
	LaSh							1	
	SmSh								
SMS-3	LaTo								1
	SmTo								
	LaSh								
	SmSh								
SMS-4	LaTo								
	SmTo						1		
	LaSh								
	SmSh								
SMS-5	LaTo								1
	SmTo								
	LaSh		1						
	SmSh								
SMS-6	LaTo								
	SmTo								
	LaSh								
	SmSh								

Date: 23-October-2002
Remarks: Rained all night. In the morning: drizzle, overcast, ca. +12°C
Legend: LaTo – Large Tomahawk, SmTo – Small Tomahawk, LaSh – Large Sherman, SmSh – Small Sherman.

Small Mammal Station No. (SMS)	Trap Type	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-1	LaTo								
	SmTo								
	LaSh								
	SmSh								
SMS-2	LaTo								
	SmTo								
	LaSh								
	SmSh							1	
SMS-3	LaTo								
	SmTo								
	LaSh								
	SmSh								
SMS-4	LaTo								1*
	SmTo								
	LaSh								
	SmSh			2*					
SMS-5	LaTo								
	SmTo								
	LaSh								
	SmSh								
SMS-6	LaTo								
	SmTo								
	LaSh								
	SmSh					6			
SMS-7	LaTo								
	SmTo								
	LaSh								
	SmSh								
SMS-8	LaTo								
	SmTo								
	LaSh					1			
	SmSh				1*				
SMS-9	LaTo								
	SmTo								
	LaSh								
	SmSh			1					

Small Mammal Station No. (SMS)	Trap Type	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-10	**LaTo**								
	SmTo								
	LaSh					1			
	SmSh			1					
SMS-11	**LaTo**							1*	
	SmTo								
	LaSh								
	SmSh			1*					
SMS-12	**LaTo**								1
	SmTo								
	LaSh			1*					
	SmSh								
SMS-13	**LaTo**								
	SmTo								
	LaSh								
	SmSh								
SMS-14	**LaTo**								
	SmTo								
	LaSh								
	SmSh			2*					

Date: 24-October-2002
Remarks: Rain at night. In the morning drizzle, then overcast. +6 to +8°C. Roads on clayey soils are nearly impassable. Traps pulled out.
Legend: LaTo – Large Tomahawk, SmTo – Small Tomahawk, LaSh – Large Sherman, SmSh – Small Sherman. * - collected.

Small Mammal Station No. (SMS)	Trap Type	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-1	LaTo								
	SmTo								
	LaSh								
	SmSh								
SMS-2	LaTo								
	SmTo								
	LaSh								
	SmSh								
SMS-3	LaTo								
	SmTo								
	LaSh								
	SmSh			1*					
SMS-4	LaTo								
	SmTo								
	LaSh								
	SmSh								
SMS-5	LaTo								
	SmTo								
	LaSh								
	SmSh								
SMS-6	LaTo								
	SmTo								
	LaSh								
	SmSh					1*			
SMS-7	LaTo								
	SmTo								
	LaSh								
	SmSh			2*					
SMS-8	LaTo								
	SmTo								
	LaSh								
	SmSh					1			
SMS-9	LaTo								
	SmTo								
	LaSh			1					
	SmSh								

Small Mammal Station No. (SMS)	Trap Type	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-10	**LaTo**								
	SmTo								
	LaSh								
	SmSh					2			
SMS-11	**LaTo**								
	SmTo								
	LaSh			1					
	SmSh								
SMS-12	**LaTo**								
	SmTo								
	LaSh								
	SmSh	1							
SMS-13	**LaTo**								
	SmTo								
	LaSh			1					
	SmSh								
SMS-14	**LaTo**								
	SmTo								
	LaSh								
	SmSh								

Date: 11-April-2003
Remarks: Sunny with few clouds. Light wind. Temperature: +22 to +25°C.
Legend: LaTo – Large Tomahawk, SmTo – Small Tomahawk, LaSh – Large Sherman, SmSh – Small Sherman. * - collected.

Small Mammal Station No. (SMS)	Trap Type	Spotted Ground Squirrel	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Western Harvest Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-15	LaTo										
	SmTo										
	LaSh										
	SmSh										
SMS-16	LaTo										
	SmTo										
	LaSh										
	SmSh										

Date: 12-April-2003
Remarks: Sunny, windy. Temperature ca. +24°C.
Legend: LaTo – Large Tomahawk, SmTo – Small Tomahawk, LaSh – Large Sherman, SmSh – Small Sherman. * - collected.

Small Mammal Station No. (SMS)	Trap Type	Spotted Ground Squirrel	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Western Harvest Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-15	LaTo										
	SmTo										
	LaSh				1						
	SmSh			1	1						
SMS-16	LaTo										
	SmTo										
	LaSh										
	SmSh				1						
SMT-1	LaSh										
SMT-2	SmSh				1						
SMT-3	LaSh			1							
SMT-4	SmSh			1							
SMT-5	LaSh										
SMT-6	SmSh										
SMT-7	SmSh							1			
SMT-8	LaSh	1									
SMT-9	SmSh										
SMT-10	LaSh			1							

Date: 13-April-2003
Remarks: Sunny with few clouds. Temperature: ca. +22°C and rising. Traps pulled out at SMS-15 and 16.
Legend: LaTo – Large Tomahawk, SmTo – Small Tomahawk, LaSh – Large Sherman, SmSh – Small Sherman. * - collected.

Small Mammal Station No. (SMS)	Trap Type	Spotted Ground Squirrel	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Western Harvest Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-15	LaTo										
	SmTo										
	LaSh										
	SmSh				1						
SMS-16	LaTo										
	SmTo										
	LaSh										
	SmSh				1						
SMT-1	LaSh			1							
SMT-2	SmSh			1							
SMT-3	LaSh				1						
SMT-4	SmSh										
SMT-5	LaSh			1							
SMT-6	SmSh										
SMT-7	SmSh										
SMT-8	LaSh										
SMT-9	SmSh										
SMT-10	LaSh							1			

Date: 14-April-2002
Remarks: Sunny, windy, +20 to +22°C in the morning. Traps pulled.
Legend: LaTo – Large Tomahawk, SmTo – Small Tomahawk, LaSh – Large Sherman, SmSh – Small Sherman. * - collected.

Small Mammal Station No. (SMS)	Trap Type	Spotted Ground Squirrel	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Western Harvest Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMT-1	**LaSh**										
SMT-2	**SmSh**										
SMT-3	**LaSh**										
SMT-4	**SmSh**										
SMT-5	**LaSh**										
SMT-6	**SmSh**										
SMT-7	**SmSh**				1						
SMT-8	**LaSh**										
SMT-9	**SmSh**				1						
SMT-10	**LaSh**										

Date: 22-April-2003
Remarks: Rained at night. In the morning: overcast, windy, temperature ca. +15°C.
Legend: LaTo – Large Tomahawk, SmTo – Small Tomahawk, LaSh – Large Sherman, SmSh – Small Sherman. * - collected.

Small Mammal Station No. (SMS)	Trap Type	Spotted Ground Squirrel	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Western Harvest Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-17	LaTo										
	SmTo										
	LaSh									1	
	SmSh				2						
SMT-11	LaSh										
SMT-12	SmSh										
SMT-13	LaSh										
SMT-14	SmSh										
SMT-15	SmSh										
SMT-16	SmSh										
SMT-17	SmSh										
SMT-18	SmSh				1						
SMT-19	SmSh										
SMT-20	SmSh										
SMT-21	LaSh										
SMT-22	LaSh										
SMT-23	SmSh										
SMT-24	LaSh										
SMT-25	SmSh										
SMT-26	SmSh				1						
SMT-27	SmSh										
SMT-28	SmSh										
SMT-29	SmSh										
SMT-30	SmSh										
SMT-31	LaSh										
SMT-32	SmSh										
SMT-33	SmSh										
SMT-34	SmSh										

Date: 23-April-2003
Remarks: Rain and hail at night or early morning. Morning: sunny, windy, temperature ca. +20°C.
Legend: LaTo – Large Tomahawk, SmTo – Small Tomahawk, LaSh – Large Sherman, SmSh – Small Sherman. * - collected.

Small Mammal Station No. (SMS)	Trap Type	Spotted Ground Squirrel	Hispid Pocket Mouse	Ord's Kangaroo Rat	White-footed Mouse	Deer Mouse	Western Harvest Mouse	Grasshopper Mouse	Hispid Cotton Rat	White-throated Woodrat	Southern Plains Woodrat
SMS-17	LaTo										
	SmTo										
	LaSh										
	SmSh				1					1	
SMT-11	LaSh										
SMT-12	SmSh										
SMT-13	LaSh										
SMT-14	SmSh										
SMT-15	SmSh										
SMT-16	SmSh										
SMT-17	SmSh										
SMT-18	SmSh										
SMT-19	SmSh										
SMT-20	SmSh										
SMT-21	LaSh						2				
SMT-22	LaSh			1							
SMT-23	SmSh										
SMT-24	LaSh					1					
SMT-25	SmSh										
SMT-26	SmSh										
SMT-27	SmSh				1						
SMT-28	SmSh										
SMT-29	SmSh						1*				
SMT-30	SmSh										
SMT-31	LaSh										
SMT-32	SmSh										
SMT-33	SmSh										
SMT-34	SmSh										

APPENDIX 21

List of vertebrates collected in Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument in 2002-2003.

Legend: ASU – Angelo State University (San Angelo, Texas), WTAMU – West Texas A&M University (Canyon, Texas)

Scientific Name	Common Name	Number collected	Location and number assigned
Fishes		**190**	**WTAMU**
Cyprinella lutrensis	Red Shiner	50	28219, 28220, 28226, 28229, 28232, 28233, 28236, 28249, 28252, 28255, 28273, 28276, 28228285, 28287, 28290, 28292, 28298, 28304
Cyprinus carpio	European Carp	1	28308
Fundulus zebrinus	Plains Killifish	13	28224, 28259, 28251, 28259, 28261, 28272, 28274, 28278
Gambusia affinis	Western Mosquitofish	4	28268, 28279, 28281
Hybognathus placitus	Plains Minnow	11	28223, 28234, 28247, 28283, 28286, 28297, 28305
Platygobio gracilis	Flathead Chub	44	28221, 28222, 28225, 28227, 28230, 28231, 28245, 28256, 28258, 28260, 28267, 28280, 28284, 28291, 28296, 28301
Ictalurus punctatus	Channel Catfish	2	28244, 28248
Lepomis cyanellus	Green Sunfish	6	28176, 28235, 28239, 28240, 28242, 28246
Lepomis macrochirus	Bluegill	5	28288, 28295, 28299, 28302
Lepomis megalotis	Longear Sunfish	1	28243
Lepomis microlophus	Redear Sunfish	3	28237, 28238
Macrhybopsis tetranema	Peppered Chub	12	28263, 28265, 28271, 28277, 28282
Micropterus salmoides	Largemouth Bass	1	28294
Notropis blennius	River Shiner	1	28307
Notropis girardi	Arkansas River Shiner	2	28217, 28218
Pimephales promelas	Fathead Minnow	8	28228, 28241, 28253, 28289, 28300
Pimephales vigilax	Bullhead Minnow	25	28254, 28257, 28262, 28264, 28266, 28269, 28270, 28275, 28293, 28303
Pylodictus olivaris	Flathead Catfish	1	28306
Amphibians		**3**	**WTAMU**
Acris crepitans blanchardi	Blanchard's Cricket Frog	1	15114
Rana catesbeiana (tadpoles)	Bullfrog	2	15115, 15116
Reptiles		**8**	**WTAMU**
Sceloporus consobrinus	Prairie Lizard	1	15100
*Phrynosoma cornutum**	Texas Horned Lizard	2	15112, 15113
Cnemidophorus sexlineatus viridis	Prairie Racerunner	1	15111
Leptotyphlops dulcis dissectus	New Mexico Blind Snake	1	15109
*Masticophis flagellum testaceus**	Western Coachwhip	2	15106, XXXXX
*Thamnophis sirtalis annectens**	Texas Garter Snake	1	15107
Mammals			**ASU****
Cryptotis parva	Least Shrew	1	
Notiosorex crawfordi	Desert Shrew	1	
Reithrodontomys megalotis	Western Harvest Mouse	1	
Peromyscus leucopus tornillo	White-footed Mouse	8	
Peromyscus maniculatus luteus	Deer Mouse	1	
Onychomys leucogaster	Northern Grasshopper Mouse	1	
Neotoma albigula	White-throated Woodrat	1	
Neotoma micropus	Southern Plains Woodrat	1	

* - roadkills, ** - numbers not yet assigned.

APPENDIX 22

Changes in ichthyofauna of the Canadian River from mid-1950s to early 2000s.

Shaded squares indicate presence

Species/year	**1954-1955** (Munger, No date)	**1983** (Munger, No date)	**2003** (this study)
Black bullhead *Ameiurus melas*	■		
River Carpsucker *Carpiodes carpio*		■	
European Carp *Cyprinus carpio*		■	■
Red shiner *Cyprinella lutrensis**	■	■	■
Gizzard shad *Dorosoma cepedianum***[?]		■	
Plains killifish Fundulus zebrinus*	■	■	■
Western mosquitofish *Gambusia affinis**	■	■	■
Plains minnow *Hybognathus placitus**	■	■	■
Channel catfish *Ictalurus punctatus**	■	■	■
Green sunfish *Lepomis cyanellus***	■	■	■
Warmouth *Lepomis gulosus***	■		
Bluegill *Lepomis macrochirus***	■	■	■
Longear sunfish *Lepomis megalotis*	■		■
Redear sunfish *Lepomis microlophus*	■		■
Peppered chub *Macrhybopsis tetranema**	■	■	■
Largemouth bass *Micropterus salmoides*	■		■
Flathead chub *Platygobio gracilis**	■		■
Golden shiner *Notemigonus crysoleucas*	■		
River Shiner *Notropis blennius*			■
Arkansas River shiner *Notropis girardi**	■	■	■

Species/year	**1954-1955** (Munger, No date)	**1983** (Munger, No date)	**2003** (this study)
Sand shiner *Notropis stramineus**	■		
Logperch *Percina caprodes*		■	
Fathead minnow *Pimephales promelas**	■	■	■
Bullhead Minnow *Pimephales vigilax*			■
White Crappie *Pomoxis annularis*		■	
Flathead Catfish *Pylodictis olivaris*			■

* - Believed to be native to the Canadian River by Munger (2002), ** - likely native (Munger 2002), **? - unlikely native (Munger 2002).

APPENDIX 23 Coordinates of camera points.

Camera ID	Latitude	Longitude
CAM-1	+35.72050500	-101.5541283
CAM-2	+35.71021000	-101.5396383
CAM-3	+35.68852330	-101.5565333
CAM-4	+35.69586830	-101.5592417
CAM-5	+35.59702330	-101.6896533
CAM-6	+35.54070000	-101.7279333
CAM-7	+35.59087500	-101.6716100
CAM-8	+35.57568800	-101.6851650
CAM-9	+35.47859670	-101.7621300
CAM-10	+35.46458500	-101.7865350

APPENDIX 24 Coordinates of amphibian auditory survey points.

Point ID	Latitude	Longitude
A-1	+35.71310000	-101.5443590
A-2	+35.71562000	-101.5477950
A-3	+35.71848300	-101.5480240
A-4	+35.72661500	-101.5925750
A-5	+35.58815400	-101.6948340
A-6	+35.58844400	-101.7064640
A-7	+35.46365000	-101.7859150
A-8	+35.46805400	-101.8239350
A-9	+35.60632400	-101.6739020
A-10	+35.70834900	-101.5587130
A-11	+35.72092500	-101.6633300
A-12	+35.68887500	-101.6306920
A-13	+35.73100600	-101.5717180
A-14	+35.52703200	-101.7604140
A-15	+35.59766100	-101.7136500

APPENDIX 25

Coordinates of variable circular plots (VCP) center points (breeding bird surveys).

Route Name	Point ID	Latitude	Longitude
Blue West	BW-1	+35.68409700	-101.6326800
	BW-2	+35.68979600	-101.6368590
	BW-3	+35.68675700	-101.6438500
	BW-4	+35.69359500	-101.6463570
	BW-5	+35.69959800	-101.6480290
McBride	MB-1	+35.54107600	-101.7295600
	MB-2	+35.54364400	-101.7338210
	MB-3	+35.55011500	-101.736990
	MB-4	+35.55689300	-101.7387820
	MB-5	+35.55992800	-101.7448520
	MB-6	+35.55500400	-101.7480700
Plum Creek	PL-1	+35.60431200	-101.7188000
	PL-2	+35.60083100	-101.7259720
	PL-3	+35.60404700	-101.7370210
	PL-4	+35.60863600	-101.7453800
	PL-5	+35.60642100	-101.7529740
	PL-6	+35.59766700	-101.7500210
Alibates	AL-1	+35.58707000	-101.6753690
	AL-2	+35.58337600	-101.6720400
	AL-3	+35.58548700	-101.6663170
	AL-4	+35.58410700	-101.6597810
	AL-5	+35.58053400	-101.6616480
	AL-6	+35.57822100	-101.6704570
Bates Canyon	BA-1	+35.57365100	-101.6959230
	BA-2	+35.58367300	-101.6899600
	BA-3	+35.58931800	-101.6912920
	BA-4	+35.58982600	-101.6855200
	BA-5	+35.59363100	-101.6786070
	BA-6	+35.60098900	-101.6757520

APPENDIX 26

Photographic vouchers.

Barred Tiger Salamander – ***Ambystoma tigrinum mavortium***.
Farm and Market Road 1913 ca. 3.5 km from Big Blue Creek. June 18, 2003
Photo by Michael Patrikeev

Blanchard's Cricket Frog – ***Acris crepitans blanchardi***.
Sanford Marsh, Lake Meredith National Recreation Area. Hutchinson County. April 22, 2002.
Photo by Michael Patrikeev

Western Green Toad – *Bufo debilis insidior*
Plum Creek, Lake Meredith National Recreation Area, Potter County. June 6, 2002.
Photo by Michael Patrikeev

Red-spotted Toad – *Bufo punctatus*
Bates Canyon, Lake Meredith National Recreation Area, June 14, 2002.
Photo by Michael Patrikeev

Woodhouse's Toad – *Bufo woodhousii woodhousii*
Bates Canyon Road, Lake Meredith National Recreation Area, Potter County. April 27, 2002
Photo by Michael Patrikeev

Couch's Spadefoot – *Scaphiopus couchii*
Sanford-Yake, Lake Meredith National Recreation Area, Hutchinson County. June 16, 2002.
Photo by Michael Patrikeev

Plains Spadefoot – *Spea bombifrons*
Bates Canyon, Lake Meredith National Recreation Area, June 14, 2002.
Photo by Michael Patrikeev

Plains Leopard Frog – *Rana blairi*
Chicken Creek, Lake Meredith National Recreation Area, Potter County. November 2, 2003.
Photo by Michael Patrikeev

Bullfrog – *Rana catesbeiana*
Bugbee Canyon, Lake Meredith National Recreation Area, Hutchinson County. May 7, 2003.
Photo by Katherine B. Castro

Common Snapping Turtle – *Chelydra serpentina serpentina*
Sanford Marsh, Lake Meredith National Recreation Area, Hutchinson County. September 9, 2002.
Photo by Katherine B. Castro

Yellow Mud Turtle – *Kinosternon flavescens flavescens*
Sanford-Yake, Hutchinson County. June 20, 2002.
Photo by Michael Patrikeev

Ornate Box Turtle – *Terrapene ornata ornata*
North End of Lake Meredith National Recreation Area, Hutchinson County. April 22, 2002.
Photo by Michael Patrikeev

Red-eared Slider – *Trachemys scripta elegans*
Sanford Marsh, Lake Meredith National Recreation Area, Hutchinson County. September 7, 2002.
Photo by Michael Patrikeev

Eastern Collared Lizard – *Crotaphytus collaris collaris*
Near Dolomite Point Road, Lake Meredith National Recreation Area, Potter County, April 28, 2002.
Photo by Michael Patrikeev

Prairie Lizard – *Sceloporus consobrinus*
Sanford-Yake. Lake Meredith National Recreation Area, Hutchinson county. April 25, 2002
Photo by Michael Patrikeev

Texas Horned Lizard – *Phrynosoma cornutum*
Blue West, Lake Meredith National Recreation Area, Moore County. May 7, 2002.
Photo by Michael Patrikeev

Colorado Checkered Whiptail – *Cnemidophorus tesselatus*
Alibates Flint Quarries National Monument, Potter County. May 21, 2002.
Photo by Michael Patrikeev

Great Plains Skink – *Eumeces obsoletus*
Sanford-Yake, Lake Meredith National Recreation Area, Hutchinson County. April 28, 2003.
Photo by Michael Patrikeev

New Mexico Blind Snake – *Leptotyphlops dulcis dissectus*
Alibates Flint Quarries National Monument, Potter County. June 6, 2003.
Photo by Michael Patrikeev

Kansas Glossy Snake – ***Arizona elegans elegans***
Bates Canyon, Lake Meredith National Recreation Area, Potter County. April 30, 2002.
Photo by Michael Patrikeev

Yellowbelly Racer – ***Coluber constrictor flaviventris***
Spring Canyon, Lake Meredith National Recreation Area, Hutchinson County. May 1, 2002.
Photo by Michael Patrikeev

Prairie Ringneck Snake – ***Diadophis punctatus arnyi***
Sanford-Yake, Lake Meredith National Recreation Area, Hutchinson County. April 17, 2002.
Photo by Michael Patrikeev

Northern Plains Rat Snake – ***Elaphe emoryi emoryi***
Plum Creek, Lake Meredith National Recreation Area, Potter County. April 30, 2004.
Photo by Michael Patrikeev

Texas Night Snake – *Hypsiglena torquata jani*
McBride Canyon, Lake Meredith National Recreation Area, Potter County. May 1, 2002.
Photo by Michael Patrikeev

Desert Kingsnake – *Lampropeltis getula splendida* (Roadkilled)
Sanford-Yake, Lake Meredith National Recreation Area, Hutchinson County. November 3, 2002.
Photo by Michael Patrikeev

Western Coachwhip – *Masticophis flagellum testaceus*
Bates Canyon, Lake Meredith National Recreation Area, Potter County. May 1, 2002.
Photo by Michael Patrikeev

Bullsnake – *Pituophis catenifer sayi*
Dolomite Point Road, Lake Meredith National Recreation Area, Potter County. June 14, 2002.
Photo by Michael Patrikeev

Texas Longnose Snake – *Rhinocheilus lecontei tesselatus*
Alibates Flint Quarries, Potter County. May 25, 2002.
Photo by Michael Patrikeev

Ground Snake – *Sonora semiannulata*
Gray and red forms.
Blue West, Lake Meredith National Recreation Area, Moore County, April 28, 2002
Photo by Michael Patrikeev

Plains Blackhead Snake – *Tantilla nigriceps*
Alibates Flint Quarries NM, Potter County. June 28, 2002.
Photo by Michael Patrikeev

Texas Garter Snake – *Thamnophis sirtalis annectens*
North of Sanford, Lake Meredith National Recreation Area, Hutchinson County. October 29, 2002.
Photo by Michael Patrikeev

Lined Snake – *Tropidoclonion lineatum*
Farm and Market Road 1913 west of Big Blue Creek, Moore County. June 18, 2002.
Photo by Michael Patrikeev

Western Diamondback Rattlesnake – *Crotalus atrox*
North Canyon, Lake Meredith National Recreation Area, Hutchinson County. May 27, 2002.
Photo by Michael Patrikeev

Prairie Rattlesnake – *Crotalus viridis viridis*
Farm and Market Road 1913 west of Big Blue Creek, Moore County. July 13, 2003.
Photo by Michael Patrikeev

Nest of Mallard – *Anas platyrhynchos* with 10 eggs
Rosita Meadows, Lake Meredith National Recreation Area, Potter County. April 29, 2003.
Photo by Michael Patrikeev

Mississippi Kite – *Ictinia mississippiensis* (large young)
Canadian River Valley off Dolomite Point Road, Lake Meredith National Recreation Area, Potter County. July 25, 2002.
Photo by Michael Patrikeev

Nest of Red-tailed Hawk – *Buteo jamaicensis* with large young
Alibates Flint Quarries National Monument, Potter County. June 15, 2002.
Photo by Michael Patrikeev

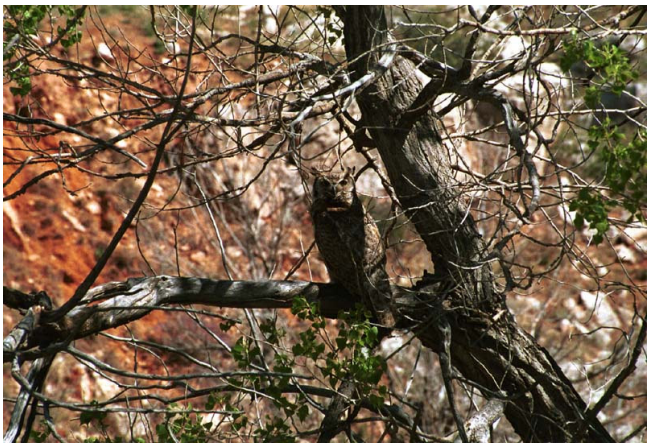
Scaled Quail – *Callipepla squamata*
Sanford-Yake, Lake Meredith National Recreation Area, Hutchinson County. June 2, 2003.
Photo by Michael Patrikeev

Northern Bobwhite – *Colinus virginianus* calling male
Sanford-Yake, Lake Meredith National Recreation Area, Hutchinson County. June 2, 2003.
Photo by Michael Patrikeev

Ground nest of Mourning Dove – *Zenaida macroura* with 2 eggs.
Alibates Flint Quarries NM, Potter County. June 28, 2002.
Photo by Michael Patrikeev

Fledgling of Mourning Dove – *Zenaida macroura*
Mullinaw Crossing, Canadian River Valley, Lake Meredith National Recreation Area, Potter County. June 10, 2002.
Photo by Michael Patrikeev

Greater Roadrunner – *Geococcyx californianus* with 5 eggs
East of Bugbee, Lake Meredith National Recreation Area, Hutchinson County. May 14, 2003.
Photo by Michael Patrikeev



Great Horned Owl – *Bubo virginianus*
Cedar Canyon, Lake Meredith National Recreation Area, Hutchinson County. April 2003.
Photo by Michael Patrikeev

Northern Flicker – *Colaptes auratus*
Alibates Flint Quarries National Monument, Potter County. 27 May 2003.
Photo by Michael Patrikeev

Red-headed Woodpecker – *Melanerpes erythrocephalus*
Dolomite Point Road, Lake Meredith National Recreation Area, Potter County. July 7, 2002.
Photo by Michael Patrikeev

Ladder-backed Woodpecker – *Picoides scalaris*
East of Bugbee, Lake Meredith National Recreation Area, Hutchinson County. May 30, 2003.
Photo by Michael Patrikeev

Western Kingbird – *Tyrannus verticalis* (large young in the nest)
Alibates Flint Quarries NM, Potter County. June 26, 2002.
Photo by Michael Patrikeev

Scissor-tailed Flycatcher – *Tyrannus forficatus*
Bates Canyon, Lake Meredith National Recreation Area, Potter County. July 24, 2002.
Photo by Michael Patrikeev

Ash-throated Flycatcher – *Myiarchus cinerascens* with food close to a nest
Near Bugbee, Lake Meredith National Recreation Area, Hutchinson County. May 22, 2003.
Photo by Michael Patrikeev

Rock Wren – *Salpinctes obsoletus*
Alibates Flint Quarries NM, Potter County. May 23, 2002.
Photo by Michael Patrikeev

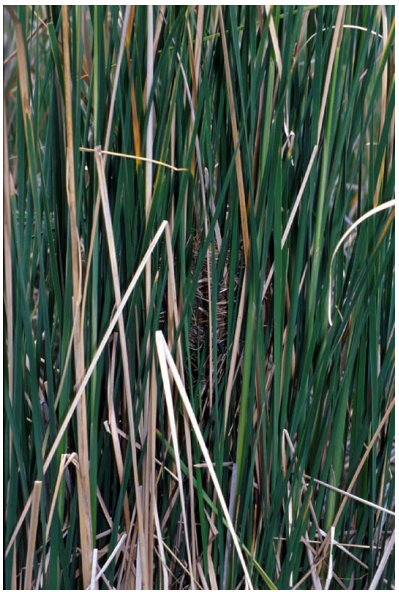
Northern Mockingbird – *Mimus polyglottos*
East of Bugbee, Lake Meredith National Recreation Area, Hutchinson County. May 17, 2003.
Photo by Michael Patrikeev

Blue Grosbeak – *Guiraca caerulea* with 4 eggs of Brown-headed Cowbird – *Molothrus ater*
Mullinaw Crossing, Canadian River Valley, Lake Meredith National Recreation Area, Potter County. June 10, 2002.
Photo by Michael Patrikeev

Painted Bunting – *Passerina ciris* (female brooding young)
North End of Lake Meredith National Recreation Area, Hutchinson County. June 14, 2002.
Photo by Michael Patrikeev

Field Sparrow – *Spizella pusilla*
East of Bugbee, Lake Meredith National Recreation Area, Hutchinson County. May 17, 2003.
Photo by Michael Patrikeev

Lark Sparrow – *Chondestes grammacus*
Alibates Flint Quarries National Monument, Potter County. May 23, 2002.
Photo by Michael Patrikeev



Red-winged Blackbird – ***Agelaius phoeniceus***
Bonita Creek, Lake Meredith National Recreation Area, Potter County. June 18, 2003.
Photo by Michael Patrikeev

Bullock's Oriole – ***Icterus bullockii*** **(male)**
East of Bugbee, Lake Meredith National Recreation Area, Hutchinson County. June 14, 2003.
Photo by Michael Patrikeev

Pallid Bat – ***Antrozous pallidus***
Bultaco Hill, Lake Meredith National Recreation Area, Potter County. October 9, 2002.
Photo by Michael Patrikeev

Shell of Nine-banded Armadillo – ***Dasypus novemcinctus***
North End of Lake Meredith National Recreation Area, Hutchinson County. December 16, 2001
Photo by Michael Patrikeev

Spotted Ground Squirrel – *Spermophilus spilosoma* (juvenile)
Rosita Meadows, Lake Meredith National Recreation Area, Potter County. August 12, 2002.
Photo by Michael Patrikeev

Thirteen-lined Ground Squirrel – *Spermophilus tridecemlineatus*
Plum Creek Road, Moore County. May 2, 2002.
Photo by Michael Patrikeev

Plains Pocket Gopher – *Geomys bursarius*
North of Sanford, Lake Meredith National Recreation Area, Hutchinson County. May 1, 2003.
Photo by Michael Patrikeev

Hispid Pocket Mouse – *Chaetodipus hispidus*
Spring Canyon, Lake Meredith National Recreation Area, Hutchinson County. November 19, 2002.
Photo by Michael Patrikeev

Ord's Kangaroo Rat – *Dipodomys ordii*
Sanford-Yake, Lake Meredith National Recreation Area, Hutchinson County. January 26, 2003.
Photo by Michael Patrikeev

Tree felled by Beaver – *Castor canadensis* some years ago
Mullinaw Crossing, Canadian River Valley, Lake Meredith National Recreation Area, Potter County.
June 10, 2002.
Photo by Michael Patrikeev

Western Harvest Mouse – *Reithrodontomys megalotis*
Rosita Meadow, Lake Meredith National Recreation Area, Potter County. July 15, 2003.
Photo by Michael Patrikeev

White-footed Mouse – *Peromyscus leucopus tornillo*
Spring Canyon, Lake Meredith National Recreation Area, Hutchinson County. November 11, 2002
Photo by Michael Patrikeev

Deer Mouse – *Peromyscus maniculatus luteus*
North of Sanford, Lake Meredith National Recreation Area, Hutchinson County. November 19, 2002
Photo by Michael Patrikeev

Northern Grasshopper Mouse – *Onychomys leucogaster*
North of Sanford, Lake Meredith National Recreation Area, Hutchinson County. October 31, 2002.
Photo by Michael Patrikeev

Hispid Cotton Rat – *Sigmodon hispidus*
Sanford-Yake, Lake Meredith National Recreation Area, Hutchinson County. November 17, 2002
Photo by Michael Patrikeev

White-throated Woodrat – *Neotoma albigula*
Cedar Canyon, Lake Meredith National Recreation Area, Hutchinson County. November 15, 2002
Photo by Michael Patrikeev

Southern Plains Woodrat – *Neotoma micropus*
Sanford-Yake, Lake Meredith National Recreation Area, Hutchinson County. November 8, 2002
Photo by Michael Patrikeev

Porcupine – *Erethizon dorsatum*
Near Dolomite Point Road, Lake Meredith National Recreation Area, Potter County. June 10, 2002.
Photo by Michael Patrikeev

Raccoon – *Procyon lotor*
Sanford-Yake, Hutchinson County. September 2002.
Photo taken by automatic camera.

American Badger – *Taxidea taxus*
Mullinaw Crossing, Canadian River Valley, Lake Meredith National Recreation Area, Potter County. June 10, 2002.
Photo by Michael Patrikeev

White-tailed Deer – *Odocoileus virginianus*
Dolomite Point Road, Lake Meredith National Recreation Area, Potter County. June 15, 2002.
Photo by Michael Patrikeev

Pronghorn – *Antilocapra americana*
Alibates Ranch (from State Highway 136). February 15, 2002
Photo by Michael Patrikeev