

Insects of Western North America
5. Survey of Selected Insect Taxa of Fort Sill,
Comanche County, Oklahoma
Part 1. Selected Coleoptera, Hymenoptera,
Lepidoptera, and Orthoptera



Contributions of the
C.P. Gillette Museum of Arthropod Diversity
Colorado State University

**Cover illustration. Eastern Black Swallowtail (*Papilio polyxenes*)
[photo © Evi Buckner-Opler]**

ISBN 1084-8819

**Note: This publication includes the material that appeared in CEMML
TPS 03-01, our gratitude is expressed for the work by the Center for
Environmental Management of Military Lands, Colorado State
University, on this report**

**This publication and others in the series may be ordered from the
C.P. Gillette Museum of Arthropod Diversity,
Department of Bioagricultural Sciences and Pest Management
Colorado State University, Fort Collins, CO 80523-1177**

Insects of Western North America
5. Survey of Selected Insect Taxa of Fort Sill,
Comanche County, Oklahoma
Part 1. Selected Coleoptera, Hymenoptera,
Lepidoptera, and Orthoptera

by

Boris C. Kondratieff, Paul A. Opler, Jason P. Schmidt, and Evi Buckner-Opler
C.P. Gillette Museum of Arthropod Diversity
Department of Bioagricultural Sciences and Pest Management
Colorado State University, Fort Collins, Colorado 80523

December 5, 2006

Contributions of the
C.P. Gillette Museum of Arthropod Diversity
Colorado State University

TABLE OF CONTENTS

EXECUTIVE SUMMARY	v
INTRODUCTION	1
OBJECTIVE	1
Site Descriptions.....	3
METHODS AND MATERIALS.....	3
Sampling Sites.....	4
Taxa.....	4
Grasshoppers (Orthoptera: Acrididae).....	4
Tiger Beetles (Coleoptera: Cicindelidae).....	9
Ground Beetles (Coleoptera: Carabidae).....	9
Longhorned Beetles (Coleoptera: Cerambycidae).....	9
Scarab Beetles and Allies (Coleoptera: Scarabaeoidea)	10
Carrion Beetles (Coleoptera: Silphidae).....	10
Butterflies and Skippers (Lepidoptera: Papilionoidea, Hesperioidea).....	10
Aculeate Hymenoptera (Apoidea [Sphecidae, Colletidae, Andrenidae, Halictidae, Megachilidae, Anthophoridae, Apidae]; Vespoidea [Tiphidae, Mutillidae, Pompilidae, Scoliidae, Vespidae, Formicidae]	20
Museum Work.....	20
Sources of Taxonomic Names Used.....	21
RESULTS AND DISCUSSION	21
Taxa Accounts.....	22
Grasshoppers (Orthoptera: Acrididae).....	22
Tiger Beetles (Coleoptera: Cicindelidae).....	24
Ground Beetles (Coleoptera: Carabidae).....	26
Longhorned Beetles (Coleoptera: Cerambycidae).....	27
Scarab Beetles and Allies (Coleoptera: Scarabaeoidea)	31
Carrion Beetles (Coleoptera: Silphidae).....	33
Butterflies and Skippers (Lepidoptera: Papilionoidea, Hesperioidea).....	34
Aculeate Hymenoptera (Apoidea [Sphecidae, Colletidae, Andrenidae, Halictidae, Megachilidae, Anthophoridae, Apidae]) Vespoidea [Tiphidae, Mutillidae, Pompilidae, Scoliidae, Vespidae, Formicidae]	64
ACKNOWLEDGMENTS	72
LITERATURE CITED	73
APPENDIX A. Insect Taxa Collected and Locations at Fort Sill, Comanche Co., Oklahoma, 2002.....	79

FIGURES

Figure 1. Sampling sites of grasshopper, ground beetle, and tiger beetle on the three grassland areas, Fort Sill, Comanche Co., Oklahoma.....	5
Figure 2. "Short grass site," Fort Sill, Comanche Co., Oklahoma.....	7
Figure 3. "Mixed grass site," Fort Sill, Comanche Co., Oklahoma.....	7
Figure 4. "Tall grass site," Fort Sill, Comanche Co., Oklahoma.....	8
Figure 5. 0.25m ² hoops for grasshopper density sampling, "mixed grass" site, Fort Sill, Comanche Co., Oklahoma.....	8
Figure 6. Example of pitfall trapping cups, "mixed grass" site, Fort Sill, Comanche Co., Oklahoma.....	9
Figure 7. Butterfly sampling sites, Fort Sill, Comanche Co., Oklahoma.....	11
Figure 8. Northeast Range Transect, East Range, Fort Sill, Comanche Co., Oklahoma.....	14
Figure 9. Northeast Range Transect, East Range, Fort Sill, Comanche Co., Oklahoma.....	14
Figure 10. Northeast Range Transect, East Range, Fort Sill, Comanche Co., Oklahoma.....	15
Figure 11. "Flower Transect," East Range, Fort Sill, Comanche Co., Oklahoma.....	15
Figure 12. "Flower Transect," East Range, Fort Sill, Comanche Co., Oklahoma.....	16
Figure 13. LETRA Transect, West Range, Fort Sill, Comanche Co., Oklahoma.....	16
Figure 14. LETRA Transect, West Range, Fort Sill, Comanche Co., Oklahoma.....	17
Figure 15. Ketch Lake Transect, West Range, Fort Sill, Comanche Co., Oklahoma.....	17
Figure 16. Ketch Lake Transect, West Range, Fort Sill, Comanche Co., Oklahoma.....	18
Figure 17. 4-mile Crossing, West Range, Fort Sill, Comanche Co., Oklahoma.....	18
Figure 18. Hoyle Bridge, East Range, Fort Sill, Comanche Co., Oklahoma.....	19
Figure 19. East Cache Creek, East Range, Fort Sill, Comanche Co., Oklahoma.....	19
Figure 20. Malaise trap, "Mixed grass site," Fort Sill, Comanche Co., Oklahoma.....	20
Figure 21. The grasshopper, <i>Melanoplus bivittatus</i> (Say) (Orthoptera: Acrididae), "tall grass site," Fort Sill, Comanche Co., Oklahoma.....	23
Figure 22. A typical longhorned beetle, <i>Typocerus octonotata</i> (Haldeman) (Coleoptera: Cerambycidae), "mixed grass site," Fort Sill, Comanche Co., Oklahoma.....	31
Figure 23. A scarab beetle, <i>Euphoria kerni</i> Haldeman on <i>Opuntia</i> cactus (Coleoptera: Scarabaeidae), West Range, Fort Sill, Comanche Co., Oklahoma.....	32
Figure 24. Mating pair of Common Checkered-Skippers (<i>Pyrgus communis</i>). Fort Sill, Comanche Co., Oklahoma.....	48
Figure 25. Least Skipper (<i>Ancyloxypha numtor</i>) nectaring at Fogfruit (<i>Phyla</i>) at 4-mile Crossing, Fort Sill, Comanche Co., Oklahoma.....	49
Figure 26. Arogos Skipper (<i>Atrytone arogos</i>) nectaring on <i>Opuntia</i> , LETRA Transect, West Range, Fort Sill, Comanche Co., Oklahoma.....	50
Figure 27. Arogos Skippers (<i>Atrytone arogos</i>) nectaring on <i>Cirsium</i> . Fort Sill, Comanche Co., Oklahoma.....	50
Figure 28. Delaware Skipper (<i>Anatrytone delaware</i>) nectaring, West Range, Fort Sill, Comanche Co., Oklahoma.....	50
Figure 29. Male Dion Skipper (<i>Euphyes dion</i>) perching, 4-Mile Crossing, Fort Sill, Comanche Co., Oklahoma.....	51
Figure 30. Dotted Roadside-Skipper (<i>Amblyscirtes eos</i>) perching, 4-Mile Crossing, Fort Sill, Comanche Co., Oklahoma.....	51
Figure 31. Bell's Roadside-Skipper perching, Fort Sill, Comanche Co., Oklahoma.....	52
Figure 32. Black Swallowtail (<i>Papilio polyxenes</i>) female. Fort Sill, Comanche Co., Oklahoma.....	53
Figure 33. Falcate Orange-tip (<i>Anthocharis midea</i>) female, LETRA transect. Fort Sill, Comanche Co., Oklahoma.....	54

Figure 34. Great Copper (<i>Lycaena dione</i>) nectaring on orange milkweed (<i>Asclepias curassavica</i>), Northeast Transect, East Range, Fort Sill, Comanche Co., Oklahoma.....	55
Figure 35. Juniper Hairstreak (<i>Callophrys gryneus</i>) nectaring on New Jersey Tea (<i>Ceanothus americanus</i>), Ketch Lake Transect, West Range, Fort Sill, Comanche Co., Oklahoma.	56
Figure 36. Soapberry Hairstreak (<i>Phaeostrymon alcēstis</i>) nectaring on <i>Cornus stolonifera</i> , Fort Sill, Comanche Co., Oklahoma.	57
Figure 37. Gorgone Checkerspot (<i>Chlosyne gorgone</i>) nectaring oin composite, Fort Sill, Comanche Co., Oklahoma.	59
Figure 38. Gorgone Checkerspots and Pearl Crescents nectaring in abundance, Apache Cemetary Transect, East Range, Fort Sill, Comanche Co., Oklahoma.	59
Figure 39. Phaon Crescent (<i>Phyciodes phaon</i>), 4-Mile Crossing, West Range, Fort Sill, Comanche Co., Oklahoma.	60
Figure 40. Pearl Crescent (<i>Phyciodes tharos</i>), Fort Sill, Comanche Co., Oklahoma.	60
Figure 41. Viceroy (<i>Limenitis archippus</i>), East Cache Creek, East Range, Fort Sill, Comanche Co., Oklahoma.....	62
Figure 42. Hackberry Emperor (<i>Asterocampa celtis</i>) nectaring on <i>Allium</i> , Fort Sill, Comanche Co., Oklahoma.....	63
Figure 43. Hackberry Emperors and Tawny Emperors (<i>Asterocampa celtis</i> and <i>A. clyton</i>) feeding on tree sap. Fort Sill, Comanche Co., Oklahoma.....	63

TABLES

Table 1. Synopsis of Higher Taxonomy of the Insect Taxa survey at Fort Sill, Comanche Co., Oklahoma, 2002.....	2
Table 2. Field Survey Dates and Crew Size for Insect Taxa survey at Fort Sill, Comanche Co., Oklahoma, 2002.....	4
Table 3. Grasshopper Density (individuals/m ²) for Two Dates at Fort Sill, Comanche Co., Oklahoma, 2002.....	23
Table 4. Summary of Butterfly Transect 1 Taken 2002, Fort Sill, Comanche Co., Oklahoma	35
Table 5. Summary of Butterfly Transect 2 Taken 2002, Fort Sill, Comanche Co., Oklahoma	36
Table 6. Summary of Butterfly Transect 3 Taken 2002, Fort Sill, Comanche Co., Oklahoma.	37
Table 7. Summary of Butterfly Transect 4 Taken 2002, Fort Sill, Comanche Co., Oklahoma.	39
Table 8. Summary of Butterfly Transect 5 Taken 2002, Fort Sill, Comanche Co., Oklahoma.	41
Table 9. Common and Scientific Names of Butterflies at at Fort Sill, Comanche Co., Oklahoma	44

EXECUTIVE SUMMARY

A baseline insect survey is a necessary element for management of military lands, integrating military testing and training activities with natural resource conservation. Knowledge of the occurrence of certain groups of insects and analysis of potential impacts are integral to military environmental document preparation. These data are required for compliance with regulations stipulated by the National Environmental Policy Act of 1969 and the Endangered Species Act of 1973. The latter requires that activities not jeopardize the continued existence of endangered or threatened species (flora and fauna) or result in destruction or adverse modification of their critical habitats. Identifying and documenting the locations of listed, proposed and candidate species on an installation are crucial to effectively balancing mission and conservation requirements. Army Regulation 200-3 (1995) Sec. 11-11 states "Installations will conduct initial, thorough inventories of plants, fish, wildlife, and habitats types on installation lands, using scientifically acceptable methodology. Installations will conduct a 100 percent inventory of suitable habitat for listed, proposed, and category 1 candidate species that may occur on the installation." Compliance with these policies and regulations requires knowledge of the numbers and habitats of rare species on an installation

Our objective for this study was to inventory three general habitat types (1) "short grass," (2) "mixed grass," and (3) "tall grass" within the boundaries of Fort Sill, Oklahoma for grasshoppers (Orthoptera: Acrididae), tiger beetles (Coleoptera: Cicindelidae), ground beetles (Coleoptera: Carabidae), carrion beetles (Coleoptera: Silphidae), longhorned beetles (Coleoptera: Cerambycidae), scarab beetles and their allies (Coleoptera: Scarabaeoidea); butterflies and skippers (Lepidoptera: Papilionoidea, Hesperioidea), and aculeate bees and wasps (Hymenoptera Vespoidea [Tiphidae, Mutillidae, Pompilidae, Scolidae, Vespidae, Formicidae], Apoidea [Sphecidae, Colletidae, Andrenidae, Halictidae, Megachilidae, Anthophoridae, Apidae]). The primary purpose was to ascertain if any species are federally listed endangered or threatened species, or considered a candidate for federal listing. This survey was conducted during the insect activity season of 2002.

No grasshopper, ground beetle, tiger beetle, carrion beetle, longhorned beetle, scarab beetle and their allies, aculeate bee and wasp was found during the survey that is a federally or state listed endangered or threatened species. In addition, no grasshopper, ground beetle, tiger beetle, carrion beetle, longhorned beetle, scarab beetle and their allies, aculeate bee and wasp was found that is considered a candidate for federal listing.

No butterflies were found during the survey that are federally or state listed endangered or threatened. In addition, no butterfly was found that is considered a candidate for federal listing. However, one butterfly, *Atrytone arogos* ssp. *iowa* was found that is ranked by NatureServe, the former research arm of the Nature Conservancy, as a G3-G4 species that is considered to be potentially in need of conservation (Oklahoma Natural Heritage Program web site). This skipper, although found at many sites on Fort Sill, is rare elsewhere where native grasslands have been converted to agriculture and other uses that result in habitat conversion.

At least 547 species of the above taxonomic groups of insects were identified. The following are apparently new state records for Oklahoma: 11 ground beetles, *Amara fortis* LeConte, *Ardistomis schaumii* LeConte, *Bradycellus negetus* (LeConte), *Colliuris pensylvanicus* (L.), *Cymindis pilosus* Say, *Dyschirius erythrocerus* LeConte, *D. globulosa* (Say), *Harpalus laticeps* LeConte, *Stenolophus conjunctus* (Say), *S. dissimilis* Dejean, and *S. ochropeza* (Say); four scarabs, *Ataenius inquisitus* Horn, *Diplotaxis maura* Fall, *D. truncatula* LeConte, and *Martineziella dutertrei* (Chalumeau); the anthophorid bee *Centris lanosa* Cresson; and the ant, *Paratrechina parvula* (Mayr).

Some of the grasslands at Fort Sill are relatively intact compared to much of the surrounding agricultural and urban landscape. It is strongly recommended that large vehicle traffic related to military training be restricted from heavily impacting these areas. Even though no federally or state listed endangered or threatened species was found, the grasslands still support probably many of the original insect communities that once occurred over these formerly vast grasslands, making Fort Sill a extremely rich “habitat island” of biodiversity.

RECOMMENDATIONS

1. In order to preserve and enhance the diversity of the arthropod communities on Fort Sill, identify some intact grassland areas and protect them from military disturbances, especially use by heavy vehicles.
2. Manage all grasslands on the installation for maximum plant diversity by incorporation of periodic natural disturbances such as prescribed fire and/or grazing to prevent encroachment by shrubs and trees.
3. Minimize military training impacts and prohibit grazing in riparian areas such as along Cache Creek. This is critical in areas dominated by native plant species, which are particularly rich in butterflies and other insects.
4. To the extent practicable, protect and maintain the vegetation around the margins of ponds and lakes. During dry periods, these areas still have plants with nectar flowers that support butterflies.
5. Some important butterfly nectar plants such as New Jersey tea (*Ceanothus americanus*), purple coneflower (*Echinacea purpurea*), and butterfly milkweed (*Asclepias tuberosa*) are limited in their distribution at Fort Sill. These species could be seeded and planted more widely, especially in recently burned areas.
6. A demonstration butterfly garden with nectar and caterpillar host plants could be designed and planted near the natural resource office. A local garden club might be willing to undertake this.
7. Maintain a database of the invertebrates of Fort Sill for a long-term inventory. This information may be crucial to future natural resource management decisions.

INTRODUCTION

Effective management of natural resources requires thorough knowledge of ecosystem diversity. Insects and other arthropods are of fundamental importance in every ecosystem. Occurring almost everywhere, insects make up more than half of all the biota on earth. Almost 100,000 species occur in the United States. Insects dominate food webs in biomass and species richness. Insects are essential in nutrient cycling, plant propagation, maintenance of plant community composition and structure, food of insectivorous vertebrates, and maintenance of animal community structure. Each insect species is part of a greater assemblage and, if lost, the complexities and abundance of other organisms are likely to be affected.

A baseline insect survey is a necessary element for integrating management of military lands and facilitates planning by land managers, minimizing conflicts between military testing and training activities and natural resource conservation. Knowledge of the occurrence of certain groups of insects and analysis of potential impacts are integral to military environmental document preparation. These data are required for compliance with regulations stipulated by the National Environmental Policy Act of 1969 and the Endangered Species Act of 1973. The latter requires that activities not jeopardize the continued existence of endangered or threatened species (flora and fauna) or result in destruction or adverse modification of their critical habitats. Identifying and documenting the locations of listed, proposed and candidate species on an installation are crucial to effectively balancing mission and conservation requirements. Army Regulation 200-3 (1995) Sec. 11-11 states "Installations will conduct initial, thorough inventories of plants, fish, wildlife, and habitats types on installation lands, using scientifically acceptable methodology. Installations will conduct a 100 percent inventory of suitable habitat for listed, proposed, and category 1 candidate species that may occur on the installation." Compliance with these policies and regulations requires knowledge of the numbers and habitats of rare species on an installation.

OBJECTIVE

Our objective was to inventory three general habitat types (1) "short grass," (2) "mixed grass," and (3) "tall grass" within the boundaries of Fort Sill, Oklahoma for grasshoppers (Orthoptera: Acrididae), tiger beetles (Coleoptera: Cicindelidae), ground beetles (Coleoptera: Carabidae), carrion beetles (Coleoptera: Silphidae), longhorned beetles (Coleoptera: Cerambycidae), scarab beetles and their allies (Coleoptera: Scarabaeoidea); butterflies and skippers (Lepidoptera: Papilionoidea, Hesperioidea), and aculeate bees and wasps (Hymenoptera Vespoidea [Tiphidae, Mutillidae, Pompilidae, Scoliidae, Vespidae, Formicidae], Apoidea [Sphecidae, Colletidae, Andrenidae, Halictidae, Megachilidae, Anthophoridae, Apidae]). The primary purpose was to ascertain if any species from the above taxa are federally listed endangered, threatened species, or considered a candidate for federal listing. For clarification, the classification scheme used for the taxa above is presented in Table 1. This survey was conducted during the insect activity season of 2002.

Table 1. Synopsis of Higher Taxonomy of the Insect Taxa Survey at Fort Sill, Comanche Co., Oklahoma, 2002.

Hexapoda (Insects)	
Order Orthoptera (Grasshoppers, crickets, and katydids)	Family Acrididae (Short-horned grasshoppers)
Order Coleoptera (Beetles)	Family Carabidae (Ground beetles)
	Family Cicindelidae (Tiger beetles)
	Family Silphidae (Carrion beetles)
	Family Cerambycidae (Longhorned beetle)
	Superfamily Scarabaeoidea (Scarab beetles and allies)
	Family Scarabaeidae (Scarab beetles)
	Family Ceratocanthidae (Pill scarab beetles)
	Family Geotrupidae (Earth-boring scarab beetles)
	Family Hybosoridae (Scavenger scarab beetles)
	Family Ochodaeidae (Sand-loving scarab beetles)
	Family Trogidae (Hide beetles)
Order Lepidoptera (Butterflies, moths, skippers)	Superfamily Hesperioidea (Skippers)
	Subfamily Pyrginae (Spread-winged Skippers)
	Subfamily Hesperinae (Grass Skippers)
	Superfamily Papilionoidea (True Butterflies)
	Family Papilionidae (Swallowtails and Pamassians)
	Subfamily Papilioninae (Swallowtails)
	Family Pieridae (Whites and Sulphurs)
	Subfamily Pierinae (Whites)
	Subfamily Coliadinae (Sulphurs)
	Family Lycaenidae (Gossamer-wings)
	Subfamily Lycaeninae (Coppers, Hairstreaks, and Blues)
	Tribe Lycaenini (Coppers)
	Tribe Polyommataini (Blues)
	Family Nymphalidae (Brush-footed Butterflies)
	Subfamily Libytheinae (Snouts)
	Subfamily Danainae (Royalty)
	Subfamily Heliconiinae (Heliconians)
	Subfamily Nymphalinae (Typical Brushfoots)
	Subfamily Limenitidinae (Admirals)
	Subfamily Charaxinae (Leafwings)
	Subfamily Apaturinae (Emperors)
	Subfamily Satyrinae (Satyrs)
Order Hymenoptera (Sawflies, parasitic wasps, ants, wasps, bees)	Superfamily Vespoidea
	Family Tiphidae (Tiphid wasps)
	Family Mutillidae (Velvet ants)
	Family Pompilidae (Spider wasps)
	Family Scoliidae (Scoliid wasps)
	Family Vespidae (Paper wasps, yellow jackets, hornets, mason wasps, potter wasps)
	Family Formicidae (Ants)
	Superfamily Apoidea
	Family Sphecidae (Sphecid wasps, cicada killers, sand wasps, bee wolves, mud daubers)
	Family Colletidae (Plasterer, yellow-faced bees)
	Family Andrenidae (Andrenid bees)
	Family Halictidae (Sweat bees)
	Family Megachilidae (Leafcutting bees)
	Family Anthophoridae (Cuckoo bees, digger bees, carpenter bees)
	Family Apidae (Honey bees, bumble bees)

Site Description

Fort Sill Military Reservation is in Comanche County in southwestern Oklahoma, approximately 160 km southeast of Oklahoma City. The City of Lawton is on the south side of Fort Sill, and the Wichita Mountains National Wildlife Refuge borders Fort Sill at its northern and western boundary. Fort Sill comprises approximately 38,300 ha, extending 37 km east-west and 13 km north-south at the widest points. It lies completely within the Osage Plains section of the Central Lowlands physiographic province (Hunt 1974). The eastern and southwestern portions are rolling upland grasslands, whereas the southeastern end of the Wichita Mountains extends into the northwestern and central portion of Fort Sill. Elevations of these hilly and rocky slopes range from 329 m on East Cache Creek to 673 m of Mt. Sherman. The rolling grasslands are developed on Permian Redbeds, red shales and sandstones with intercalated layers of gypsum. The Wichita Mountains and associated elevated areas consist of a Pre-Cambrian crystalline igneous core surrounded by outcrops of Paleozoic sediments of limestone and sandstone.

The transition zone between the tall grass prairie association and those associations that lie along the western border of Oklahoma is a complex of biotic areas, referred to as mixed-grass plains associations (Duck and Fletcher 1943). The topography is gently rolling, with drainages of the Red River traversing the landscape. Grasses (little bluestem, *Schizachyrium scoparium* var. *frequens*; blue grama, *Bouteloua gracilis*; hairy grama, *B. hirsuta*, big bluestem, *Andropogon gerardii*); and forbs are the dominant vegetation (Johnson et al. 1990). On extensive sandy areas, scrub oak forest or oak savanna represents a western extension of the post oak-blackjack oak (*Quercus stellata*-*Q. marilandica*) forest association. Additionally, small-interspersed groves of netleaf hackberry (*Celtis reticulata*) occur along the edges of the grasslands, especially in the eastern part of Fort Sill.

Summers are long and hot, with some days reaching 43°C or higher (Curry 1970), with at least 100 days above 32°C. Winters are short and mild with temperatures rarely reaching -18°C. Mean annual precipitation is 79 cm, most falling as rain. This region exhibits some of the most severe water and wind erosion in the United States. (Baumgartner and Baumgartner 1992). Extended droughts are not uncommon.

METHODS AND MATERIALS

Our objective was to sample specific habitat types during the insect activity season of 2002 for grasshoppers (Orthoptera: Acrididae), tiger beetles (Coleoptera: Cicindelidae), ground beetles (Coleoptera: Carabidae), carrion beetles (Coleoptera: Silphidae), longhorned beetles (Coleoptera: Cerambycidae), scarab beetles and their allies (Coleoptera: Scarabaeoidea); butterflies and skippers (Lepidoptera: Papilionoidea, Hesperioidea), and aculeate bees and wasps (Hymenoptera Apoidea [Sphecidae, Colletidae, Andrenidae, Halictidae, Megachilidae, Anthophoridae, Apidae]; Vespoidea [Tiphidae, Mutillidae, Pompilidae, Scoliidae, Vespidae, Formicidae]) (see Table 1). Field collection dates and crew size are presented in Table 2.

Table 2. Field Survey Dates and Crew for Insect Collections, Fort Sill, Comanche Co., Oklahoma, 2002

Collection Dates	Collectors
23-28 April, 2002	Kondratieff, B., Schmidt, J., Opler, P., Buckner, E., and Pineda, P.
1-4 June, 2002	Opler, P. and Buckner, E.
10-14 June, 2002	Kondratieff, B., Schmidt, J., and Leatherman, D.
8-13 July, 2002	Schmidt, J.
9-11 August, 2002	Opler, P. and Buckner, E.
12-16 Sept, 2002	Kondratieff, B., and Schmidt, J.
10-13 October, 2002	Kondratieff, B., Schmidt, J., and Owens, J.

Sampling Sites

For most of the sampling, three general grassland areas were chosen on Fort Sill (Fig. 1) from the advice of Glen Wampler, Natural Resource Administrator, Natural Resources and Enforcement Division, Fort Sill. These three areas encompassed (1) “short grass,” (2) “mixed grass,” and (3) “tall grass” habitats. Two of these sites, the “mixed grass” (Fig. 1) and the “tall grass” sites were located within the East Range of Fort Sill (Fig. 1), and the “short grass” on the West Range of Fort Sill north of Engineer Lake (Fig. 1). All three of these sites are within the mixed grass association of Duck and Fletcher (1943). All soil types follow the terminology of Mobley and Brinlee (1967). The “short grass” site was primarily composed of little bluestem-grama (Fig. 2); whereas the “mixed grass” site was mostly little bluestem (Fig. 3), and the “tall grass” site was big bluestem prairie with a mixture of little bluestem, sunflower (*Helianthus* spp.), and other forbs (Fig. 4).

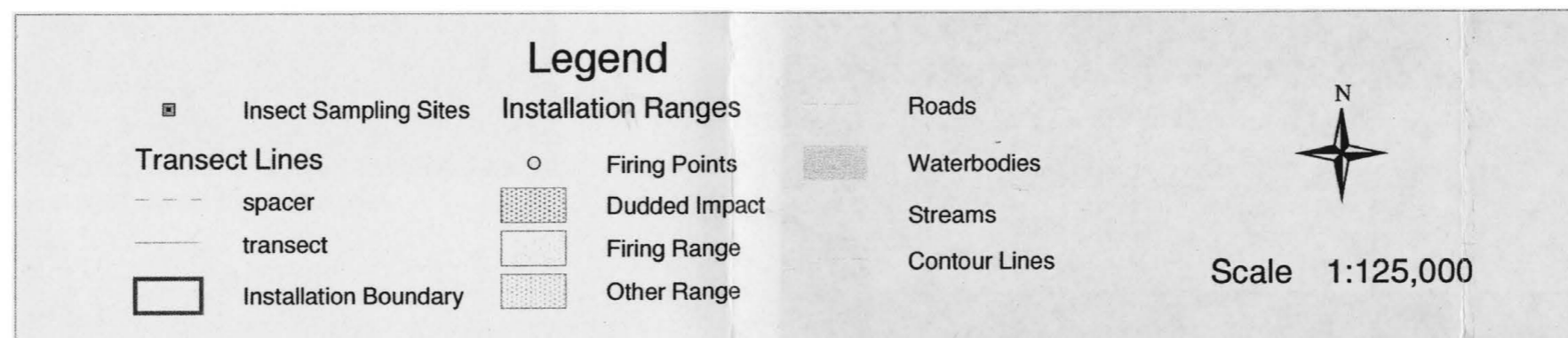
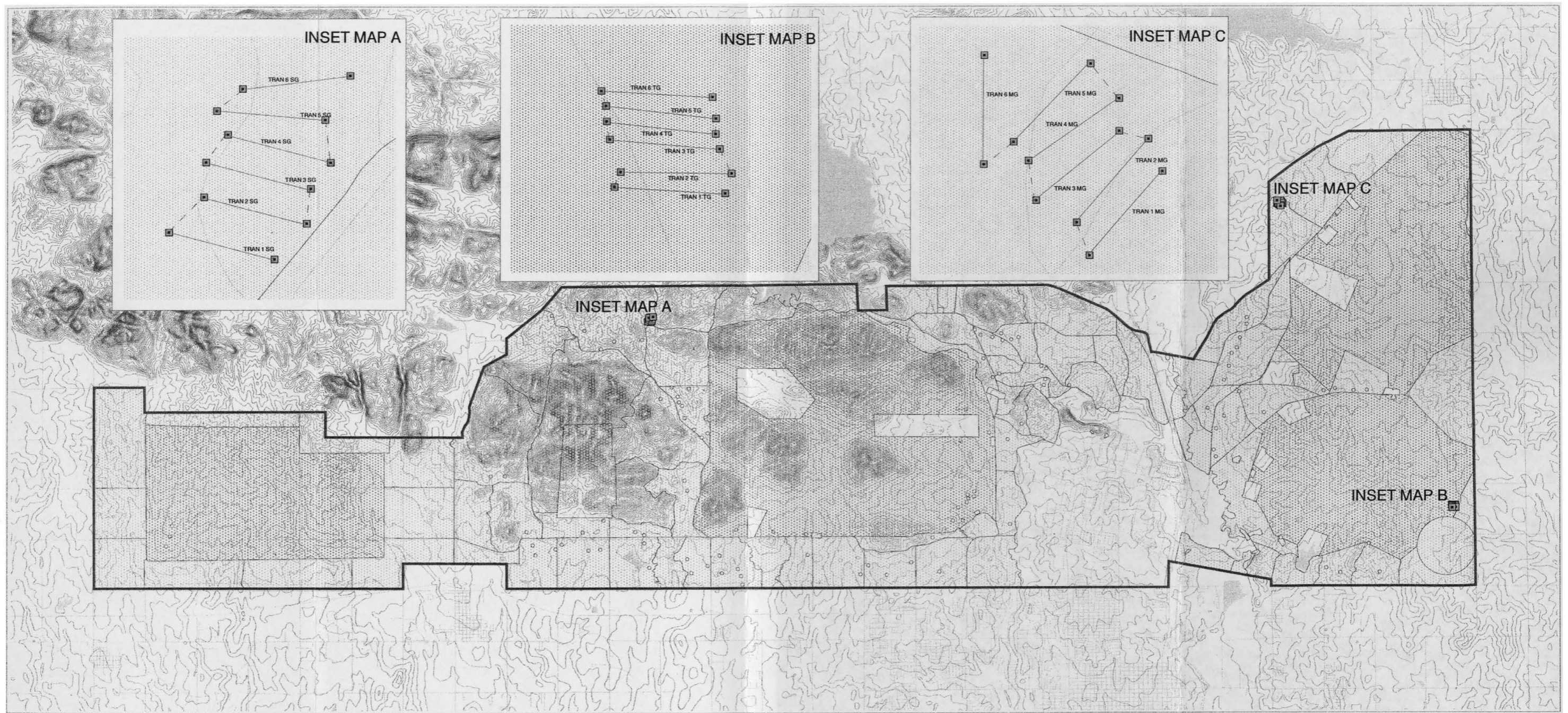
Collection survey approaches are as follows. Specific methods are indicated. General method applications and rationale are taken from New (1998).

Taxa

GRASSHOPPERS (Orthoptera: Acrididae)

Grasshopper sampling was done on the three grassland areas (“short”, “mixed”, and “tall”) (Fig. 1). Six transects were chosen for each grassland type, and randomly placed at each site (Fig. 1). Each transect contained ten 0.25 m² hoops 2.5 m apart (Fig. 5) (Thompson 1987). Hoops were placed prior to sampling and remained throughout the sampling period. On each visit, grasshoppers were counted as they jumped from the hoop and added to those that remained in the hoop on closer inspection, giving the total number of grasshoppers per hoop. The formula $GD=4n$, where GD is grasshopper density and n is number of grasshoppers per hoop, was used to determine the number of grasshoppers per m². Approximately 10 m from each transect, two methods of sweep netting were employed to get a representative collection of the grasshoppers in

Figure 1. Sampling Sites for grasshoppers, ground beetles, and tiger beetles on three grassland areas. Inset map A (“short Grass” site), B (“tall Grass” site), and C (“mixed grass” site).



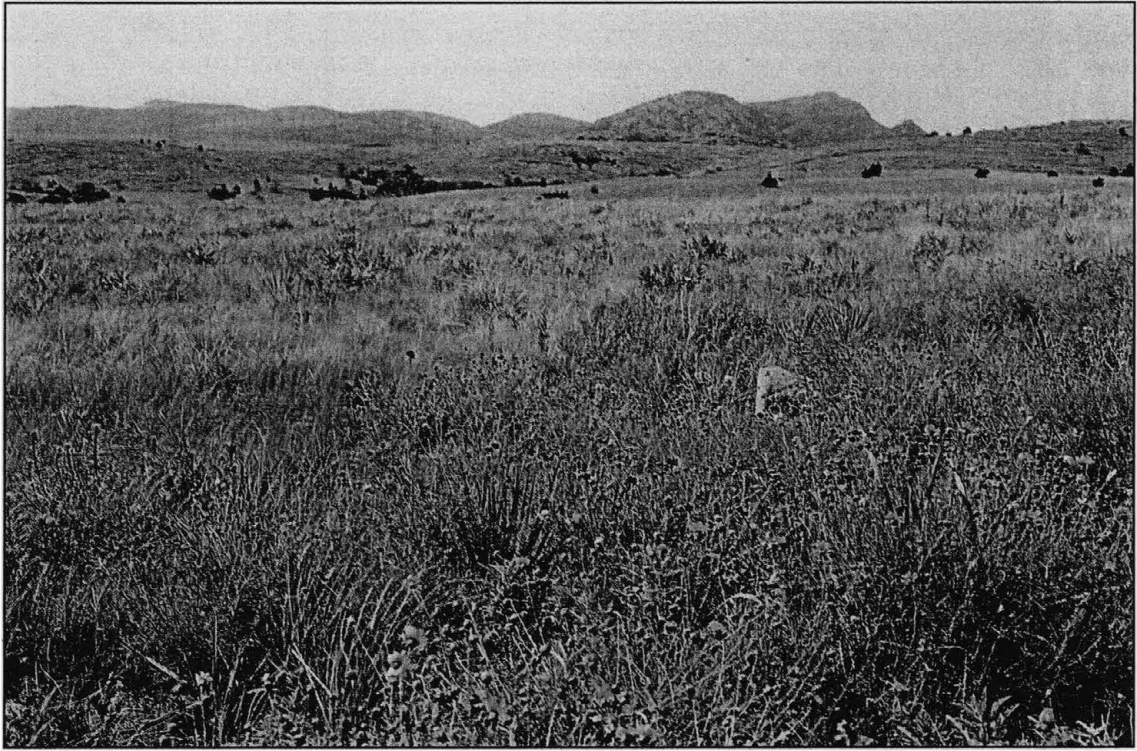


Figure 2. "Short grass site," Fort Sill, Comanche Co., Oklahoma.

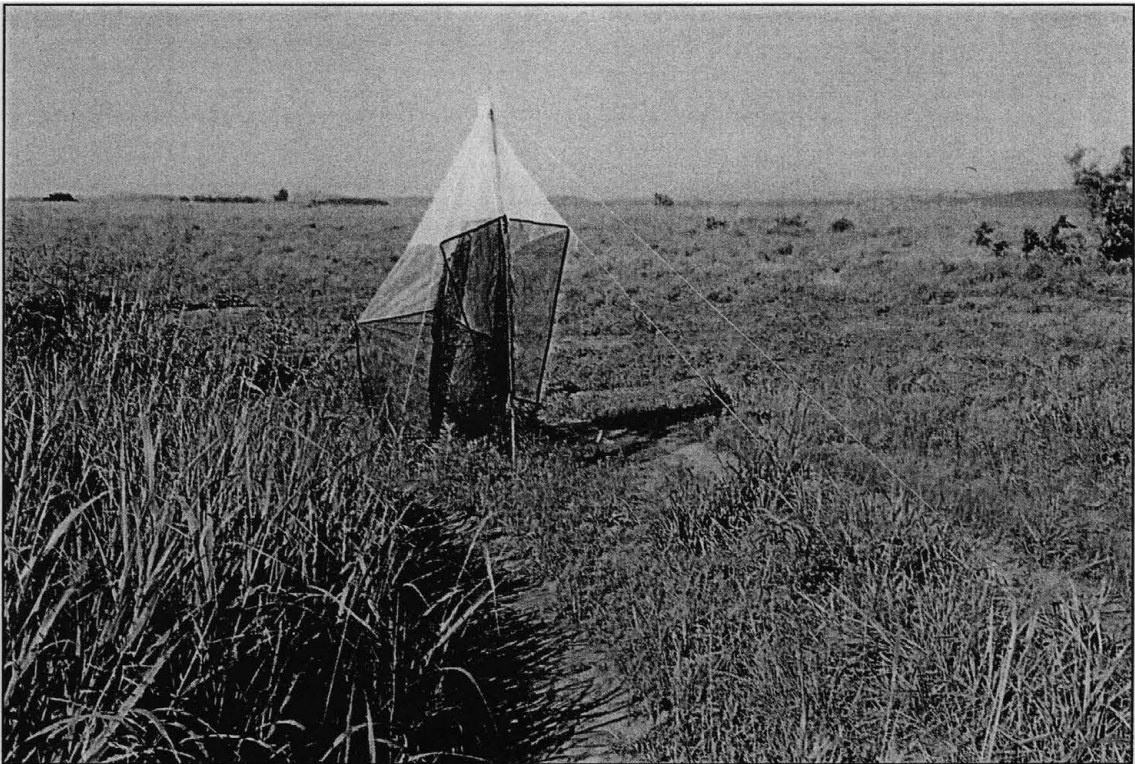


Figure 3. "Mixed grass site," showing Malaise trap, Fort Sill, Comanche Co., Oklahoma.



Figure 4. "Tall grass site," Fort Sill, Comanche Co., Oklahoma.



Figure 5. 0.25m² hoops for grasshopper density sampling, "mixed grass" site, Fort Sill, Comanche Co., Oklahoma.

the area (Pfadt 1994). In all sampling periods, 50 sweeps were made close to the ground while walking at a fast pace. When grasshoppers were more abundant, systematic sweeping was conducted until 25 grasshoppers were collected. Using Coppock (1962), Otte (1981, 1984), and Pfadt (1994) grasshoppers were identified to species.

TIGER BEETLES (Coleoptera: Cicindelidae)

The tiger beetles of Oklahoma are relatively well known (Drew and Van Cleave 1961, Pearson et al. 1997, Freitag 1999). Sampling included pitfall trapping (Fig. 6) using the design of Boyd (1985), and aerial netting of individuals. Specific known larval and adult habitats were also targeted.



Figure 6. Example of pitfall trapping cups, “mixed grass” site, Fort Sill, Comanche Co., Oklahoma.

GROUND BEETLES (Coleoptera: Carabidae)

Pitfall trapping was utilized in sampling ground beetle richness. A trapping web design (Ebert and Kondratieff 1992) was used in each grassland type. As Spence and Niemela (1994) have indicated, pitfall trapping, despite some limitations, is an efficient method for collecting a high proportion of ground beetle species occurring in any given habitat.

LONGHORNED BEETLES (Coleoptera: Cerambycidae)

The longhorned beetles are a relatively well-known group, with the fauna of Oklahoma being originally reported by Alexander (1958), and a list of Oklahoma species reported by the web site www.ento.okstate.edu/museum/beetles.html. Standard techniques for collection of these beetles included, rearing, light trapping and flower collecting.

SCARAB BEETLES AND ALLIES (Coleoptera: Scarabaeoidea)

This large group of beetles includes over 1,500 species in North America. The scarabs occur in a wide variety of habitats, even though the Melolonthinae, the June beetles and chafers, often can be abundant in grasslands. Additionally, the Scarabaeinae or dung beetles are common.

Collecting techniques included light trapping, foliage gleaning and baited pitfall trapping (Ratcliffe 1991). The website www.ento.okstate.edu/museum/beetles.html reports Oklahoma species.

CARRION OR BURYING BEETLES (Coleoptera: Silphidae)

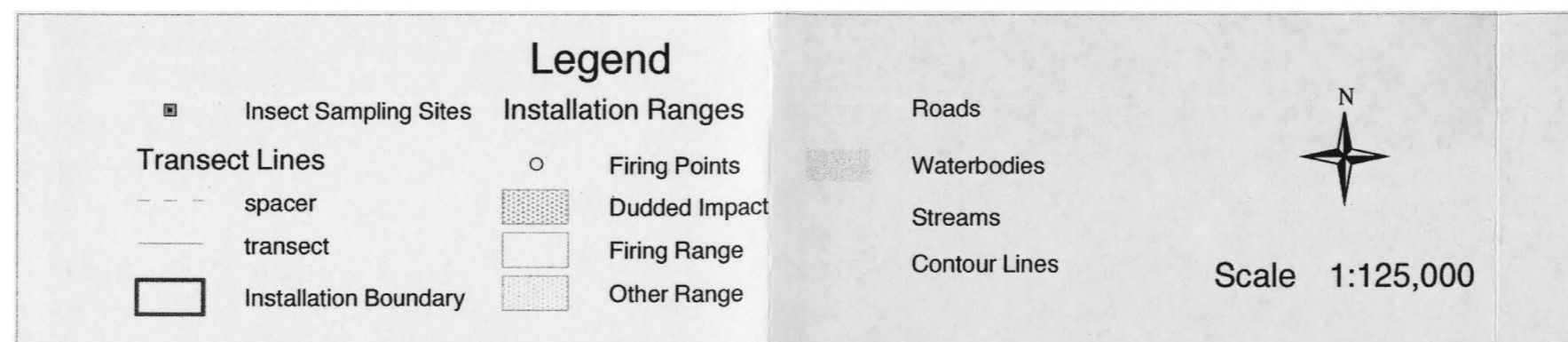
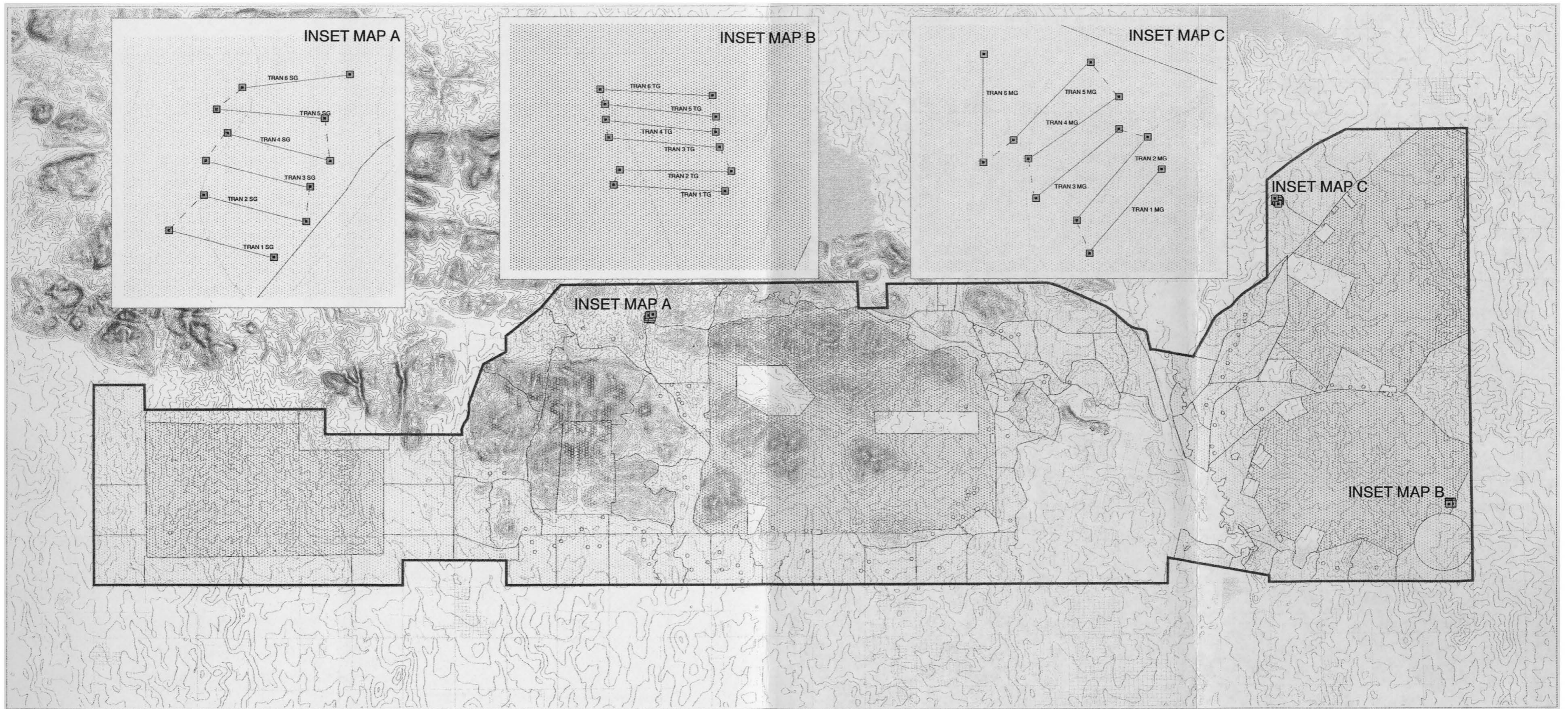
Most Silphidae are necrophagous as adults and larvae. Because of their habits, silphid adults and larvae are relatively easy to collect (Anderson and Peck 1985). Bait methods were used following Ratcliffe (1996). Special efforts were made to attract the federally listed endangered American burying beetle (*Nicrophorus americanus*) previously reported from Oklahoma (Muskogee County). The Oklahoma distributions for silphids are available in Peck and Kaulbars (1987), "*Nicrophorus Central*" <http://www.eeb.uconn.edu:591/nicroweb/nicrophorus.htm> and Don Arnold's web site www.ento.okstate.edu/museum/beetles.html.

BUTTERFLIES AND SKIPPERS (Lepidoptera: Papilionoidea and Hesperioidea)

Existing information from faunistic studies of Oklahoma butterflies (e. g. Nelson 1979, Opler 1998), including the U.S. Geological Survey's Butterflies of North America web site <http://www.npwrc.usgs.gov/resource/distr/bflyusa/bflyusa.html>, was utilized to provide a list of recorded or possible species. From this information, field surveys were planned during times concordant with adult flight patterns.

Five transects were selected in likely butterfly habitat in several grassland habitats. Three were established in the East Range and two were selected in the West Range (Fig. 7). Transects were variable in length ranging from about 200 m to about 800 m. On each visit, each transect was walked by two observers and butterfly individuals were tabulated as they were observed. Vouchers were taken of almost all species, in order to both document the accuracy of identifications and for further confirmation. Genitalic dissection was required to confirm the identification of several skippers, e.g. *Thorybes*, *Erynnis*, and *Pyrgus*. Transects were not walked in a straight line, but the observers walked in such a way as to cover the habitats most likely to be occupied by butterflies on that occasion. Often, particular patches of flowers were checked that had the most butterfly activity. As a result, the numbers of each species observed on a transect are indicative of the relative abundance of butterflies on that occasion, but the numbers are not strictly comparable between occasions or between transects.

Figure 7. Butterfly sampling sites, Fort Sill, Comanche Co., Oklahoma. **1**=Transect 1 - Meadow at Apache Cemetary, **2**=Transect 2 - NE Range, Quonset/ Mc Intosh area, **3**=Transect 3 - Off E. boundary Rd on W. side: "Flower Transect," **4**=Transect 4 - W of Elmer Thomas Lake (LETRA), **5**=Transect 5 - E of Ketch Lake, S of water crossing, **6**=Arbuckle Hill, **7**=4-Mile Crossing, **8**=Hoyle Bridge, and **9**=East Cache Creek



The following transects were established:

Transects:

East Range **Transect 1--Meadow at Apache Cemetary** (about 500m long; mowed grassy field with low flowers):

start: N 34° 41' 45.2" W 098° 22' 15.9"

end : N 34° 41' 53.0" W 098° 22' 14.4"

Transect 2--NE Range, Quonset/ Mc Intosh area (mixed grass, burnt area) (Figs. 8-10):

start N 34° 44' 51.4" W 098° 20' 42.1"

Transect 3--Off E. boundary Rd on W. side: "Flower Transect" (E of small reservoir)(Figs. 11 and 12):

start N 34° 42' 32.3" W 098° 16' 59.9"

end N 34° 42' 35.2" W 098° 17' 11.5"

West Range **Transect 4--W of Elmer Thomas Lake (LETRA)** (transect going uphill: seeps, oak forest canyon) (Figs. 13 and 14):

start N 34° 43' 10.3" W 098° 31' 48.5"

Transect 5--E of Ketch Lake, S of water crossing (start: tree on W of Rd, up to rock markers on top of hill, rocky slope, incl. seep to the N, to creek, stands of New Jersey Tea bushes)(Figs. 15 and 16)

start:N 34° 42' 38.7" W 098° 35' 28.7"

end : N 34° 42' 33.0" W 098° 35' 31.2"

Other sampling sites:

In order to gain a more complete inventory of butterflies species several other sites were sampled, particularly in riparian habitats. These supplemental sites include the following:

Arbuckle Hill (hilltopping species):

N 34° 38' 34.0" W 098° 19' 27.9"

4-Mile Crossing (riparian)(Fig. 17):

N 34° 41' 12.8" W 098° 26' 49.3"

Hoyle Bridge Dip (nice water habitat, trees, nectar sources) (Fig. 18):

N 34° 40' 12.1" W 098° 22' 20.3"

East Cache Creek (SW of Cactus Hill) (Fig. 19):

N 34° 38' 34.6" W 098° 21' 35.7"

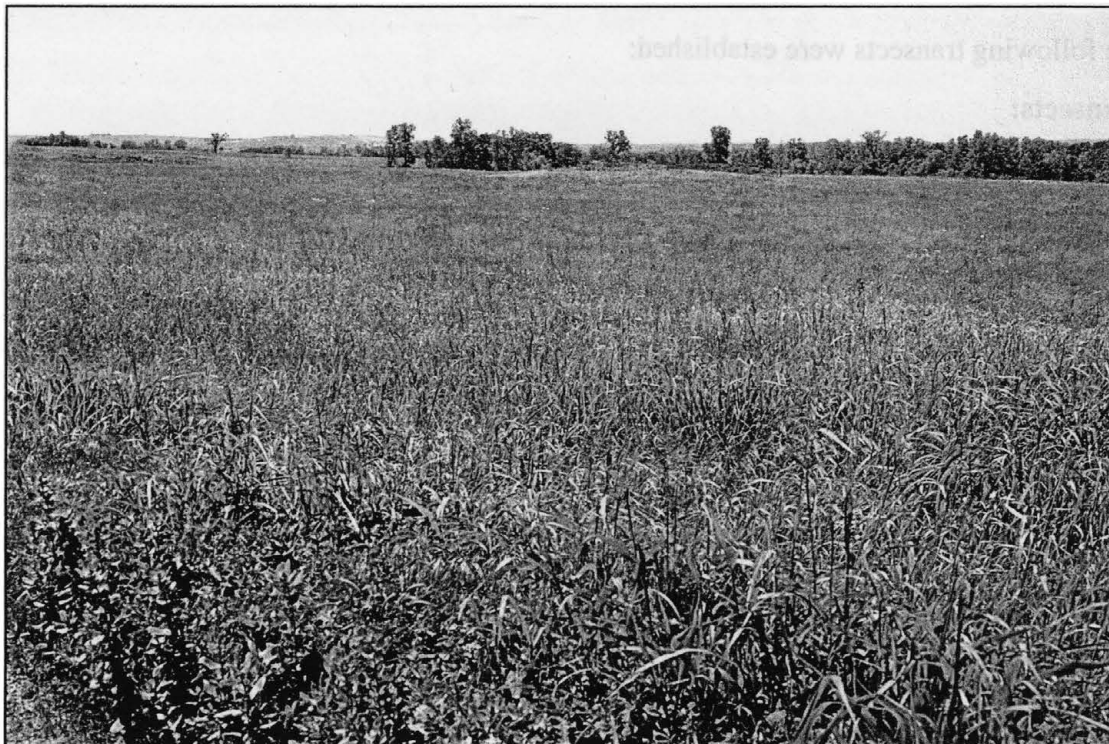


Figure 8. Northeast Range Transect, East Range, Fort Sill, Comanche Co., Oklahoma. April 2002. Photo copyright by Evi Buckner.

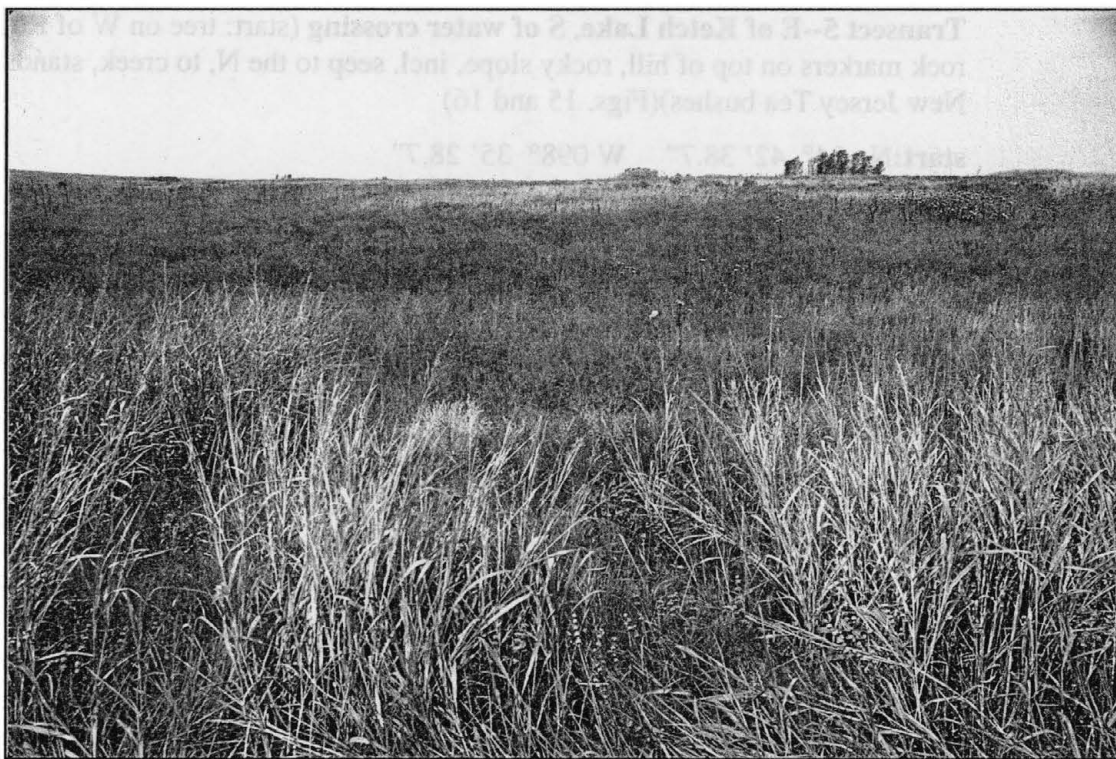


Figure 9. Northeast Range Transect, East Range, Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Evi Buckner.



Figure 10. Northeast Range Transect, East Range, Fort Sill, Comanche Co., Oklahoma. August 2002. Photo copyright by Evi Buckner.



Figure 11. "Flower Transect," East Range, Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Evi Buckner.



Figure 12. "Flower Transect," East Range, Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Evi Buckner.



Figure 13. LETRA Transect, West Range, Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Evi Buckner.



Figure 14. LETRA Transect, West Range, Fort Sill, Comanche Co., Oklahoma. August 2002. Photo copyright by Evi Buckner.



Figure 15. Ketch Lake Transect, West Range, Fort Sill, Comanche Co., Oklahoma. April 2002. Showing New Jersey Tea (*Ceanothus americana*) which attracted a high diversity of butterflies. Photo copyright by Evi Buckner.

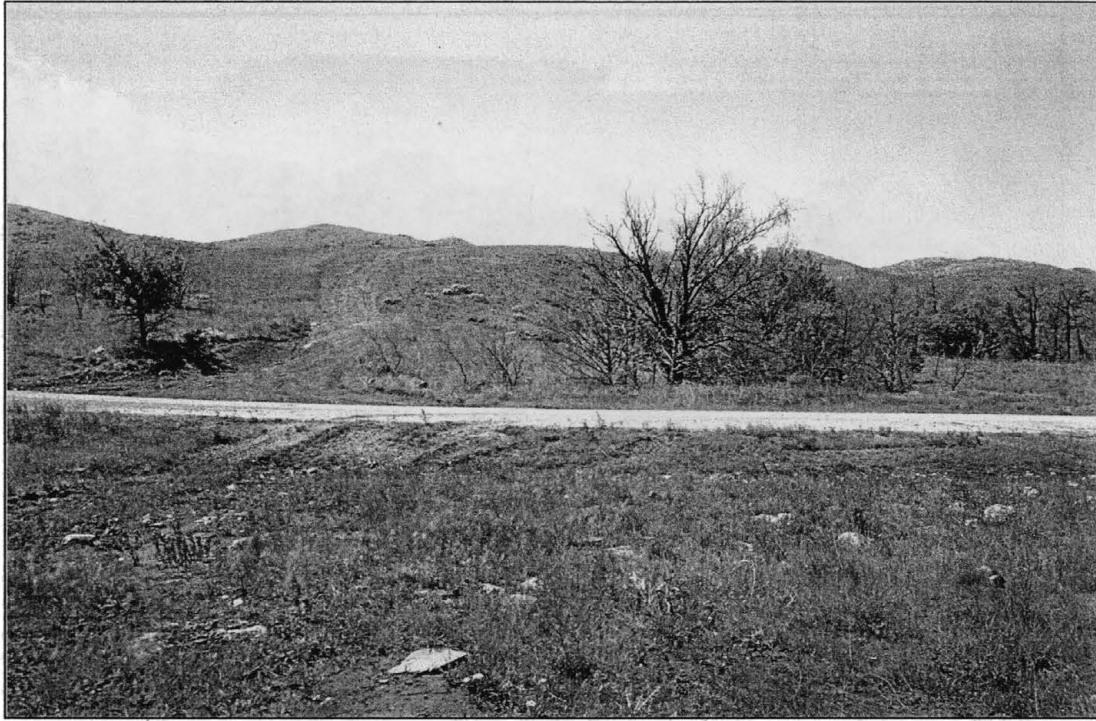


Figure 16. Ketch Lake Transect, West Range, Fort Sill, Comanche Co., Oklahoma. April 2002. Photo copyright by Evi Buckner.



Figure 17. 4-mile Crossing, West Range, Fort Sill, Comanche Co., Oklahoma. Showing habitat of *Euphyes dion* and other marsh skippers. Photo copyright by Evi Buckner.

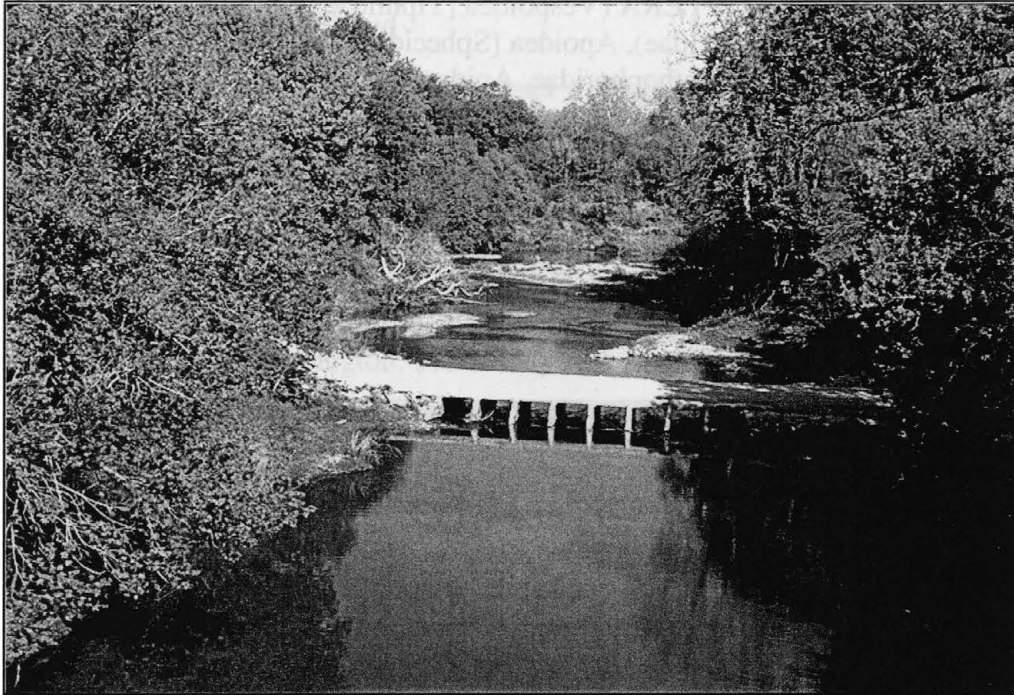


Figure 18. Hoyle Bridge, East Range, Fort Sill, Comanche Co., Oklahoma. Location where Silvery Checkerspots and high abundance of Bell's Roadside-Skippers were found. Photo copyright by Evi Buckner.

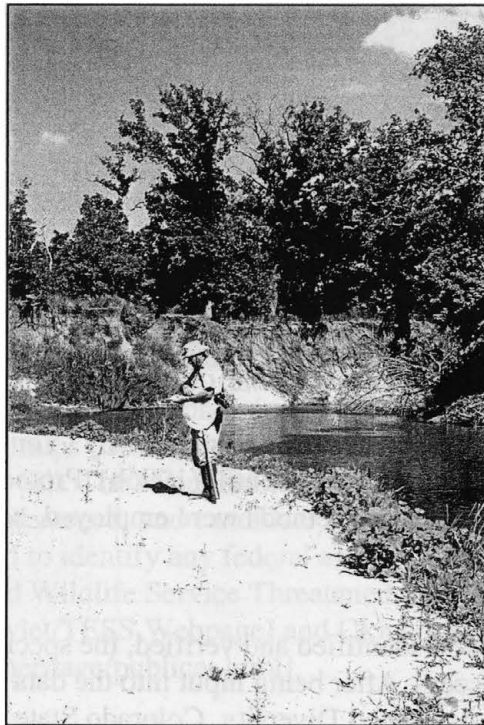


Figure 19. East Cache Creek, East Range, Fort Sill, Comanche Co., Oklahoma. August 2002. Location where riparian butterflies were surveyed. Photo copyright by Evi Buckner.

ACULEATE HYMENOPTERA (Vespoidea [Tiphidae, Mutillidae, Pompilidae, Scoliidae, Vespidae, Formicidae), Apoidea [Sphecidae, Colletidae, Andrenidae, Halictidae, Megachilidae, Anthophoridae, Apidae])

Many records of Hymenoptera are available for Oklahoma (Krombein et al. 1979, Vols. 1 and 2). It is estimated that the grassland types of Fort Still may harbor more than 3,000 hymenopteran species, making it impossible to survey this group in the time allotted. Therefore, collections only of two superfamilies, Vespoidea (Tiphidae, Mutillidae, Pompilidae, Scoliidae, Vespidae, Formicidae), Apoidea (Sphecidae, Colletidae, Andrenidae, Halictidae, Megachilidae, Anthophoridae, Apidae) were made using malaise traps (Fig. 20), sweeping vegetation, and by searching nectar plants.



Figure 20. Malaise trap, "Mixed grass site," Fort Sill, Comanche Co., Oklahoma.

The ants of Oklahoma have been studied previously (Young and Howell 1964), with new taxonomic changes indicated in Poole and Gentili (1996b). Protocols for sampling ants followed Bestelmeyer et al. (2000). Two major methods were employed, baiting and pitfall traps.

Museum Work

After each specimen was identified and verified, the specimens were entered into a database, using Microsoft Access. After being input into the data base, specimens were deposited in C. P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado. This museum houses more than three million specimens, and is considered to have an excellent representation of North American species in the groups surveyed.

Sources of Taxonomic Names Used

Taxonomically, there exist numerous taxa with different scientific names. For this study, a single source of scientific names for North American insects was utilized, except for the butterflies. This checklist of North American insects, *Nomina Insecta Nearctica* by Poole and Gentili (1996a, 1996b, 1996c, 1997) is also available online. For the butterflies, Opler and Warren (2002) was followed.

The following experts other than the authors identified or verified specimens:

CARABIDAE: Foster F. Purrington, 212 E Maynard Ave. Columbus, OH 43202

CERAMBYCIDAE: Daniel J. Heffern, 10531 Goldfield Lane, Houston, TX 77064

SCARABAEOIDEA: Dr. William B. Warner, 1345 W Gila Lane, Chandler, AZ 85224

FORMICIDAE: Dr. Jerry L. Cook, Sam Houston State University, Department of Biological Sciences, Huntsville, TX 77341

HYMENOPTERA (Vespoidea [Tiphidae, Mutillidae, Pompilidae, Scoliidae, Vespidae]), (Apoidea [Sphecidae, Colletidae, Andrenidae, Halitidae, Megachilidae, Anthophoridae, Apidae]). Dr. Howard E. Evans*, Colorado State University, Department of Bioagricultural Sciences and Pest Management, Fort Collins, CO 80523

POMPILIDAE: Dr. Albert T. Finnamore, Curatorial and Collections Preservation, Provincial Museum of Alberta, 12845-102 Avenue, Edmonton, Alberta, Canada T5N 0M6

MUTILLIDAE: Dr. Donald G. Manley, Clemson University, Pee Dee Research and Education Center, 2200 Pocket Road, Florence, SC 29506.

* Deceased 18 July 2002

RESULTS AND DISCUSSION

Approximately 547 species in the taxonomic groups surveyed were identified. At least 3,241 specimens of the insect groups listed in Appendix A were catalogued during 2002 from the seven sampling periods on Fort Sill. The scientific names of insects, localities, numbers, and if a federal and state endangered, threatened, and candidate species are given in Appendix A. The following sources were checked to identify any federal and state endangered, threatened, and candidate species: U.S. Fish and Wildlife Service Threatened and Endangered Species System (TESS)[<http://ecos.fws.gov/servlet/TESS> Webpage] and Oklahoma Natural Heritage Inventory [<http://www.biosurvey.ou.edu/heritage/publicat.html>].

Taxa Accounts

For better known groups including the tiger beetles, longhorned beetles, carrion beetles, butterflies, skippers, and the ants, specific ecological and distribution information is presented for each species.

GRASSHOPPERS (Orthoptera: Acrididae)

The Acrididae or short-horned grasshoppers and locusts are a very conspicuous component of the North American insect fauna. This is a large family containing approximately 620 species in North America. Using information from the website www.ento.okstate.edu/museum/orthopterafam.htm and Coppock (1962) it is estimated that 127 species of Acrididae occur in Oklahoma, with at least 54 species collected on Fort Sill during our survey (Appendix A).

Grasshoppers are considered one of the most important pests of agricultural croplands. However, it is important to note that only small portions of the total number of the North American species are responsible for the economic damage. The majority of the North American species do not occur in high enough numbers to do economical damage, or feed on cultivated plants, and some species that feed on certain noxious weeds are even considered beneficial.

Most species of North American grasshoppers overwinter as eggs. Nymphs emerge in the spring, become adults in late spring and they persist throughout the summer into fall. Other species may overwinter as a third-instar nymph, or have a two-year life cycle and overwinter once in the egg form and once as a late instar nymph. Certain species are categorized as generalists, since they feed on many types of plants and inhabit a wide range of habitat types. Other species may specialize on a particular host plant or be restricted to specific habitats.

Most of the economically important species of grasshoppers belong to the genus *Melanoplus*. Among the economically important species found on Fort Sill are *Melanoplus sanguinipes* (F.), *M. femurrubrum* (DeGeer), *M. differentialis* Thomas, and *M. bivittatus* (Say) (Fig. 21). These species overwinter as eggs in the soil. Other species considered to be pests and collected on Fort Sill include *Ageneotettix deorum* (Scudder), *Opeia obscura* (Thomas), and *Trachyrhachys kiowa* (Thomas).

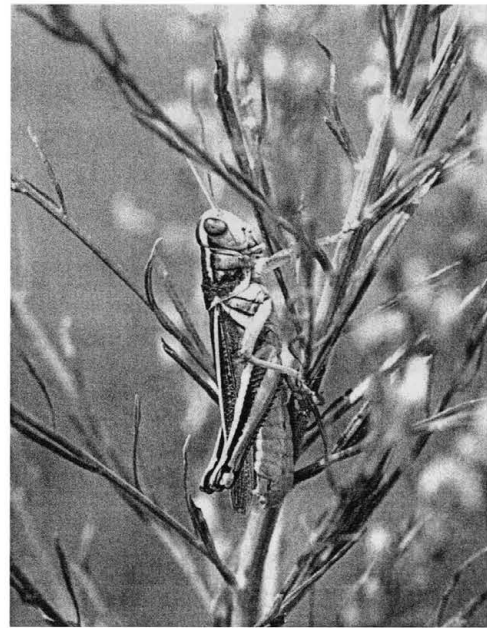


Figure 21. The grasshopper, *Melanoplus bivittatus* (Say (Orthoptera: Acrididae), "Tall grass site," Fort Sill, Comanche Co., Oklahoma.

Among the most notable grasshopper collected from Fort Sill is *M. splendidus* Hebard. This species is rarely collected, as it is nocturnal and clings to the bark of juniper trees. *Boopedon auriventris* McNeill and *B. gracile* Rehn are found in dense stands of grass at margins of oak thickets or in woodland clearings. *Boopedon auriventris* is considered uncommon in Oklahoma. Another uncommon species, *Leptysma marginicollis* (Serville) is restricted to moist habitats at the margins of bodies of water. *Paratylotropidia brunneri* Scudder, a species considered rare in collections, has reduced wings as adults and cannot fly. It prefers areas of dense vegetation at the margins of heavily wooded areas.

Grasshopper Density

The densities of grasshoppers were highest on the “short grass” site during the two quantitative sampling periods, yielding 7.4 and 5.1 individuals/m², respectively (Table 3). There was a typical reduction in density later in the season, as indicated by the September sampling periods. The majority of the density was accounted for by the species *A. deorum*, *Melanoplus* spp., *Mermiria bivittata* (Serville) and *Schistocerca a. alutacea* (Harris). Usually grasshopper densities of <2 individuals/m² are considered economically nonthreatening. The densities reported in Table 3 are typical of this region of Oklahoma.

Conservation Assessment

No grasshopper was found during the survey that is a federally listed endangered or threatened species. In addition, no grasshopper was found that is considered a candidate for federal listing.

Table 3. Grasshopper density (individuals/m²) for two dates at Fort Sill, Comanche Co., Oklahoma, 2002.

Date	Location	(individuals/m ²)
12 June	“short grass”	7.4
	“mixed grass”	2.7
	“tall grass”	3.6
13 Sept	“short grass”	5.1
	“mixed grass”	2.2
	“tall grass”	2.6

TIGER BEETLES (Coleoptera: Cicindelidae)

Currently there are approximately 112 species of tiger beetles belonging to four genera (*Amblycheila*, *Cicindela*, *Megacephala*, and *Omus*) recognized in the United States (Pearson et al. 1997). Combining the information from the USGS website (www.npwrc.usgs.gov/resource/distr/insects/tigb/ok/toc.htm) and Drew and Van Cleave (1961), there are approximately 27 species among three genera represented in Oklahoma. Of the known species recorded from Oklahoma, we study found 11 species, or 41% of all tiger beetles known to occur in Oklahoma (Appendix A).

Tiger beetles have a life cycle that ranges from one to three years (Shelford 1908). Both adults and larvae prey on small invertebrates. Adults are visually cued hunters that either actively forage by randomly searching open ground or under debris to locate potential prey items. More commonly, the beetles use an ambush technique where prey is first detected visually from a stationary position then pursued for a short distance (Carter 1989; Schultz 1998, Shelford 1908). While in pursuit of prey, tiger beetles will make frequent pauses followed by short running bursts. This behavior is used to compensate for visual degradation caused by high angular velocity and spaces between ommatidia. Larvae construct burrows in the substrate where they sit and wait for unsuspecting prey to come within grasping range. Tiger beetles are very habitat-specific; most species prefer open sandy ground with some sparse vegetation for thermoregulation and hunting. Exceptions in Oklahoma are *C. belfragi* (Salle) and *C. sexguttata* F., which can be found in dense vegetation and open ground in wooded areas, respectively (Drew and VanCleave 1961; Schultz 1998). Most *Cicindela* are diurnal heliotherms except they may make nocturnal dispersal flights, while *Megacephala* and *Amblycheila* are nocturnal. The following is a brief review of the species collected during this survey.

Cicindela belfragei (Salle)

This species is most abundant from June until August. It is associated with many habitat types including cornfields, lawns, grasslands, hilltops and river edges. This beetle is flightless and is usually seen running rapidly through the vegetation. Peak activity is from noon to dusk.

Cicindela cleripes LeConte

This is a small, flightless species that is rarely collected due to its size and rapid movement. It is a summer species most abundant from late June to August. This species is largely restricted to dry grassland habitats.

Cicindela duodecimguttata Dejean

A spring/fall species occurring from May to September, it often occurs in large aggregations and can be attracted to lights at night. *Cicindela duodecimguttata* is most commonly found in association with water edges on sandy or muddy substrates on Fort Sill.

Cicindela hirticollis Say

This species is collected along sandy margins of rivers and lakes preferring the regions that are moist. These beetles are most active on sunny, hot days and can be found in aggregations.

Cicindela punctulata Olivier

This is a summer species that can be encountered in large numbers and occurs in almost every habitat type including disturbed landscapes such as parking lots and sidewalks. It is one of the most common species from Nevada to the East Coast, and southern Canada to Mexico. It can be attracted to lights at night and when disturbed will emit a defensive compound that possesses a unique fruity odor. It has been recorded from all counties in Oklahoma, and is common on Fort Sill.

Cicindela repanda Dejean

Cicindela repanda is a common, gregarious, spring/fall species that may also be found throughout the summer. It inhabits areas in close proximity to water, preferring sand bars along rivers and muddy shorelines. This is considered a common species in Oklahoma, including Fort Sill.

Cicindela sexguttata F.

A spring/fall species, it reaches peak abundance in the spring. At Fort Sill, it occurs along the edges of paths, creek beds, and small openings in dense deciduous forest taking advantage of sun dappled regions for thermoregulation. It may be observed actively searching under debris or sitting at the edges of cleared ground waiting for potential prey.

Cicindela splendida Hentz

Cicindela splendida is a solitary, spring/fall species with peak populations in early spring. It inhabits eroded clay banks and some sandy substrate washes mostly in the East Range area of Fort Sill.

Cicindela trifasciata ascendens LeConte.

This subspecies is a spring/fall form, collected commonly at lights and along sandy or muddy margins of water, often preferring substrates darker in color. This species is not commonly collected in Oklahoma and few literature records are available for the state. A robust population occurs at Engineer Pond.

Megacephala carolina (Linnaeus)

Megacephala carolina is a summer species occurring from June to July. It is attracted to lights and is commonly found in association with moist areas with muddy, clay soil and semi-dense vegetation. This species is uncommon on Fort Sill.

Megacephala virginica (Linnaeus)

This is a summer species occurring from June to late July. It is attracted to lights and is primarily nocturnal. This species can be collected in many habitat types preferring riverbeds with muddy substrate. Adult beetles can be common in cities, with larval burrows located in manicured lawns. During our study only two individuals were collected.

Many species of *Cicindela* are restricted to very specific habitats. This may be as extreme as entire populations of a species occurring on only one sand dune, a short stretch of beach, or a single alkali flat. As a consequence these populations are greatly susceptible to habitat degradation and overutilization (Pearson and Cassola 1992).

Conservation Assessment

No tiger beetle was found during the survey that is a federally listed endangered or threatened species. In addition, no tiger beetle was found that is considered a candidate for federal listing.

GROUND BEETLES (Coleoptera: Carabidae)

The Carabidae or ground beetles are one of the largest families of beetles. Adults and larvae are commonly found under stones, wood, or among plant material. Some adults live in trees and shrubs. Both adults and larvae are predaceous, with a few exceptions. Combining the information from the web site maintained by Don Arnold, Oklahoma State University (www.ento.okstate.edu/museum/beetles.html) and the catalog by Bousquet and Laroche (1993), at least 300 species are known from the State. Bousquet and Laroche (1993) actually only listed 234 species including the tiger beetles. Some authorities do not recognize the tiger beetles as a separate family. Carabids are one of the dominant families of insects on Fort Sill, with 102 species collected during 2002 (Appendix A). The majority of the species listed in Appendix A are widespread, also occurring in most surrounding states. Several species including *Carabus finitimus* Haldeman, *Cyclotrachelus torvus deceptus* (Casey), and *Pogonodaptus mexicana* (Bates) are apparently known only from Oklahoma and Texas (Bousquet and Laroche 1993).

The following eleven ground beetle species are considered new state records for Oklahoma: *Amara fortis* LeConte, *Ardistomis schaumii* LeConte, *Bradycellus negetus* (LeConte), *Colliuris pensylvanicus* (L.), *Cymindis pilosus* Say, *Dyschirius erythrocerus* LeConte, *D. globulosa* (Say), *Harpalus laticeps* LeConte, *Stenolophus conjunctus* (Say), *S. dissimilis* Dejean, and *S. ochropeza* (Say).

Numerous genera of carabids collected at Fort Sill, such as *Agonum*, *Bembidion*, *Chlaenius*, *Dyschirius*, *Poecilus*, *Schizogenius*, and *Stenolophus* are associated with wet soil at

edges of standing or running water. The well-known bombardier beetles of the genus *Brachinus* also occur along rivers, streams and other bodies of water. Other species such as *Calosoma obsoleta* Say, *C. scrutator* F. and *C. wilcoxi* LeConte, are widespread North American species, and are known as the “caterpillar hunters.” Adults are excellent climbers and can be found searching trees or shrubs for caterpillars as prey. Several groups such as *Anisodactylus*, *Harpalus*, and *Pasimachus* are associated with dry soils and grasslands. Several species of *Harpalus*, especially *H. caliginosus* (F.), and *H. compar* LeConte are often attracted in abundance to lights.

Conservation Assessment

No ground beetle was found during the survey that is federally listed endangered or threatened species. In addition, no ground beetle was found that is considered a candidate for federal listing.

LONGHORNED BEETLES (Coleoptera: Cerambycidae)

The Cerambycidae, longhorned beetles or roundheaded borers, are one of the larger insect families. Larvae of almost all species bore within and feed on live or decaying plant tissues. Most species attack branches, trunk, or stem and roots of plants. A few species are known to feed within cones, fruits, or seeds.

A web site maintained by Don Arnold, Oklahoma State University (www.ento.okstate.edu/museum/beetles.html) and the catalog by Monne and Giesbert (1994) provide listings of longhorned beetles previously recorded from Oklahoma. At least 106 species are currently known from the state. These lists augment Alexander’s (1958) original checklist for the state. During this study 34 species (Appendix A) were collected, about one-third of the known Oklahoma species. All species collected during this study have been previously recorded from Oklahoma.

Biological and distributional information for the following species were taken from Alexander (1958), Linsley (1964, 1963, 1962a, b), Linsley and Chemsak (1976, 1984, 1995), and Yanega (1996):

Ataxia hubbardi Fisher

Larvae are stem borers of composites. Adults of this southcentral and western U.S. species are attracted to lights.

Batyle ignicollis (Say)

Larvae are borers of various herbaceous plants. Adults of this central U.S. species are often common on flowers during the day.

Batyle suturalis cylindrella Casey

Larvae are borers of small dead twigs and limbs of oaks (*Quercus* spp.) and closely related species. Adults of this eastern North American species are commonly collected on flowers during the day.

Crossidius discoideum discoideum (Say)

This is a central U.S. species, larvae of which attack different composites, such as *Gutierrezia*.

Dorcaschema alternatum (Say)

Larvae of this species attack dead or dying branches of mulberry (*Morus* spp.) and osage orange (*Maclura pomifera*) on Fort Sill. The eastern North American species ranges west into Colorado. The common name applied to this species is the "small mulberry borer."

Ecyrus dasycerus (Say)

Larvae bore into oaks and other hardwoods. Adults can be collected at lights. This species is considered an eastern North American species.

Euderces picipes occidentalis Linsley

Larvae can be found beneath bark of branches of hardwoods including redbud (*Cercis canadensis*) and hickory (*Carya* spp.). Adults of this Eastern North American taxon can be collected on flowers.

Euderces reichei LeConte

Larvae are borers in hardwoods including oaks. Adults are often found on flowers. This species ranges throughout east and central U.S.

Graphisurus (Urographis) triangulifer (Haldeman)

Larvae bore into branches of maple (*Acer* spp.) and hackberry (*Celtis* spp.). This species ranges throughout the east central U.S., and can be collected at light.

Hemierana marginata ardens LeConte

Larvae are borers in ironweed (*Veronica* spp.) and other plants. This species is a good mimic of lycid beetles, and ranges throughout eastern North America.

Hippopsis lemniscata (F.)

Larvae are borers of composites including ragweed (*Ambrosia* spp.). Adults of this eastern North American species are attracted to light.

Knulliana cincta cincta (Drury)

Larvae are in dry dead branches and limbs of oaks and willows (*Salix* spp.) and other hardwoods. *Knulliana c. cincta* is known as the “banded hickory borer,” and is often attracted to light.

Leptostylopsis transverses (Gyllenhal)

This species has a central and eastern North American distribution, and attacks various hardwoods and conifers. This species is often attracted to lights.

Leptura emarginata F.

Larvae of this species bore into elm (*Ulmus* spp.) and other hardwoods. This eastern North American species is a beautiful beetle with its bright scarlet and black body.

Mecas cana saturnine (LeConte)

Larvae are borers of composites, especially ragweed and sunflowers (*Helianthus* spp.) This species has a broad distribution over much of central and eastern North America.

Mecas pergrata (Say)

Larvae are stem borers of several composites, especially asters (*Aster* spp.). This species ranges throughout central and southeastern U.S.

Molorchus bimaculatus Say

Larvae mine beneath bark of numerous hardwoods including maples. This species ranges throughout eastern North America.

Neoclytus mucronatus mucronatus (F.)

Larvae feed beneath dead bark of dead and dying hickory and pecan. This is a species that ranges throughout eastern and central North America.

Oberea ocellata Haldeman

This species is an eastern U.S. species that ranges into Texas. Larvae bore into oaks and other plants including living sumac (*Rhus* spp.). The “sumac stem borer” is very similar to both *O. delongi* Knull and *O. ulmicola* Chittenden.

Oberea oculaticollis (Say)

Larval feeding habits are unknown. This species is known from central North America from Manitoba to Texas.

Obrium rufulum Gahan

Larvae bore into dead dry branches of oaks and ash (*Fraxinus* spp.). *Obrium rufulum* is known from eastern North America.

Oncideres cingulata cingulata (Say)

Larval hosts include numerous hardwoods including oaks. The “twig girdler” is considered a pest, often attacking pecan and other trees. This species is found in eastern U.S. west to Kansas and Texas.

Plectrodera scalator (F.)

The famous “cottonwood borer” is one of the largest and most striking beetles in North America. Larvae bore into the bark at the base of cottonwood (*Populus deltoides*) and willows (*Salix* spp.) at Fort Sill. This species occurs throughout eastern North America west to Colorado.

Saperda tridentata Olivier

This is an eastern North American species that feeds on dead and dying elm (*Ulmus* spp.). It is known as the “elm borer,” and is attracted to lights.

Smodicum cucujiforme (Say)

This is common species attacks dry heartwood of various hardwoods, including oaks. *Smodicum cucujiforme* is known as the “flat powder-post beetle.” This species is found primarily in the northeastern U.S.

Stenosphenus notatus (Olivier)

Larvae bore into hackberry and hickory, and it is considered an eastern North American species.

Strangalia sexnotata Haldeman

This is an eastern North American species; the larval hosts are unknown. Adults can be found commonly on flowers.

Strangalia virilis LeConte

This species is known only from Oklahoma and Texas. Larvae attack oaks.

Sternidius variegatus (Haldeman)

Larvae bore into a wide variety of trees and shrubs. Adults are attracted to light, and have a range that includes most of central and eastern North America.

Tetraopes texanus Horn

This species is restricted to Oklahoma south to Texas and Mexico. Larvae attack milkweed (*Asclepias* spp.), especially *A. stenophylla* and *A. verticillata* on Fort Sill.

Trigonarthris atrata (LeConte)

Yanega (1996) considered this species rare. The host for the larvae may be elm. *Trigonarthris atrata* is considered a southeastern U.S. species.

Typocerus confluens Casey

This is a central North American species similar to *T. octonotatus* (Haldeman). The larva feeding habits are unknown.

Typocerus octonotata (Haldeman)

Larvae of this common species bore into native grasses, and are widespread throughout central and eastern North America. Adults can be found on flowers (Fig. 22).

Typocerus velutina nobilis (Newman)

This subspecies is known from southeastern U.S. to Oklahoma. Larvae attack decaying hardwoods including oaks.

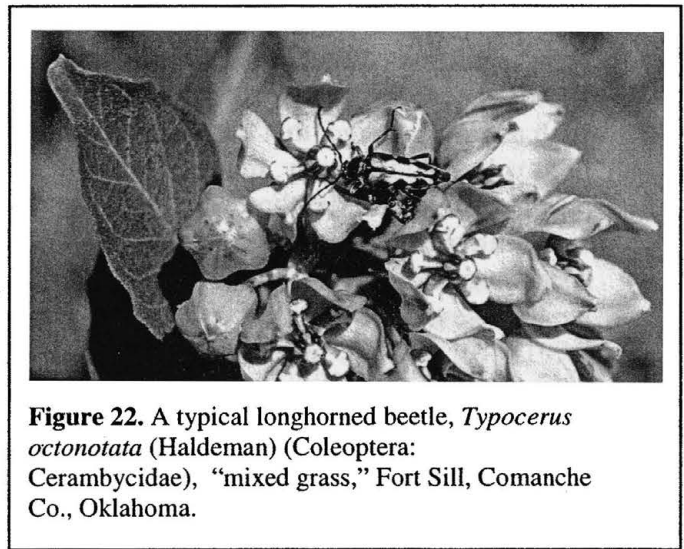


Figure 22. A typical longhorned beetle, *Typocerus octonotata* (Haldeman) (Coleoptera: Cerambycidae), “mixed grass,” Fort Sill, Comanche Co., Oklahoma.

Conservation Assessment

No longhorned beetle was found during the survey that is federally listed endangered or threatened species. In addition, no longhorned beetle was found that is considered a candidate for federal listing.

SCARAB BEETLES AND ALLIES (Coleoptera: Scarabaeoidea)

Scarab beetles comprise a very diverse and rich group in North America. Life histories are remarkable and adults and larvae feed on dung, carrion, fungi, vegetation, pollen, fruit, or roots. Often, large number of adults can be found on flowers (Fig. 23) or attracted to light. For example, the universally recognized “May or June bugs” are a well-known group of summer

active scarab beetles. The C-shaped larvae of most of the species are known as “white grubs” or “grub` worms.”

The majority of the species collected at Fort Sill during 2002 are typically eastern North American species including those that range west to Nebraska, Kansas, Oklahoma, and Texas. The website at Oklahoma State University (www.ento.okstate.edu/museum/beetles.html) reports at least 259 species of Oklahoma Scarabaeoidea. In this survey at least 60 species were identified (Appendix A). No doubt additional species occur, especially in genera such as *Phyllophaga*, that has two to four year life cycles. Additionally, much of the collecting effort was made at the three major grassland sampling sites, whereas other scarab beetle species are restricted to the riparian areas and woodlands that occur throughout Fort Sill.



Figure 23. A scarab beetle, *Euphoria kerni* Haldeman on *Optunia* cactus (Coleoptera: Scarabaeidae), West Range, Fort Sill, Comanche Co., Oklahoma.

The following four species are apparently new state records: *Ataenius inquisitus* Horn, *Diplotaxis maura* Fall, *D. truncatula* LeConte, and *Martineziella dutertrei* (Chalumeau). *Ataenius inquisitus*, originally described from southwestern Texas, is also known from Arizona and Wisconsin (Cartwright 1974). The larvae of the genus *Ataenius* feed on animal dung or soil. *Diplotaxis maura* was previously recorded from southern New Mexico, Texas and Mexico (Valurie 1960), whereas *D. truncatula* has been reported from Kansas to Colorado south to Arizona and Mexico (Vaurie 1960). Larvae of the genus apparently feed on plant roots. *Martineziella dutertrei*, a South America and West Indian Eupariini scarab beetle has been introduced into North America. This species lives with fire ants (*Solenopsis* spp.) (Lanciani and Wojcik 1991).

Conservation Assessment

No scarab beetle or related family (Appendix A) was found during the survey that is a federally listed endangered or threatened species. In addition, no scarab beetle or related family was found that is considered a candidate for federal listing.

CARRION BEETLES (Coleoptera: Silphidae)

The adults of this beetle family are also known as burying beetles or sexton beetles. Many species, especially the genus *Nicrophorus*, are known for behavioral adaptations to inter small mammals in the ground. The majority of silphids are scavengers on carrion, with a few species feeding on dung or even fungi. Anderson and Peck (1985) and Ratcliffe (1996) provide a comprehensive review of the biology of these interesting beetles. There are 31 species included in eight genera in North America, and 15 species have been listed from Oklahoma (www.ento.okstate.edu/museum/beetles.html), with four species collected during the 2002 survey.

Of special interest was the federally listed endangered American burying beetle (*Nicrophorus americanus*) that was previously reported from Oklahoma (Lomolino et al. 1995). Only four species were collected or trapped during the study. No doubt additional species must occur, however, it is doubtful that *N. americanus* occurs on Fort Sill (Lomolino et al. 1995).

The following is a short account of the species encountered.

Necrodes surinamensis (Fabricius)

This species is widespread in North America (Anderson and Peck 1985). Overwintering adults emerge in April and lay eggs around larger carcasses such as deer, dog etc. There appears to be only one generation in the Fort Sill area. The species seems to prefer forested areas. Adults feed on fly maggots associated with carcasses. Adults are attracted to lights, and Ratcliffe (1996) indicates that this species may be declining due to its strong attraction to electric lights, resulting in increased mortality.

Nicrophorus orbicollis Say

This species is known from Nova Scotia and New Brunswick, west to Saskatchewan and throughout eastern U.S. west to Texas, Oklahoma and Nebraska. Adults of *N. orbicollis* overwinter and then become active in spring, with subsequent new adults occurring in July and August. Adults are night active, and usually are found associated with grasslands, but also forests (Anderson and Peck 1985, Ratcliffe 1996).

Nicrophorus pustulatus Herschel

This species has a similar geographical range as *N. orbicollis*, and is considered uncommon to rare throughout its range. The natural history of this species may be different than other *Nicrophorus* species (Anderson and Peck 1985). Adults can be collected at light.

Oiceoptoma inaequale (Fabricius)

This is a widespread eastern U.S. species, but with populations also in southern Ontario and Quebec. Overwintering adults become reproductively active in spring. There appears to be

only one generation per year. This species has strong affinities with forested areas, but can be found in grasslands. *Oiceoptoma inaequale* is a diurnal species.

Conservation Assessment

No carrion beetle was found during the survey that is federally listed endangered or threatened species. In addition, no carrion beetle or related family was found that is considered a candidate for federal listing.

BUTTERFLIES AND SKIPPERS (Lepidoptera: Papilionoidea and Hesperioidea)

We found 67 butterfly species on Fort Sill during our survey. This is 37% of the 186 species reported for Oklahoma. An additional 19 species have been reported from Comanche County, bringing the total for the county to 86 species (47% of the state species)-the richest western county in the State. It is possible that further surveys at Fort Sill could produce perhaps an additional 20 species of butterflies, but only 5 or 6 species would be resident, and the remainder would be "southern strays."

Transects

The species of butterflies and numbers of individuals recorded on each transect are presented in Tables 4-8.

Other Sampling Sites

A complete list of Butterfly species found on transects and those observed at other locations on Fort Sill during more extensive sampling are included on Table 9 and their status is discussed in the narrative following the tables.

Table 4. Summary of Butterfly Transect 1 Taken 2002, Fort Sill, Comanche Co., Oklahoma.

Transect 1--Meadow at Apache Cemetary (about 500m long; mowed grassy field with low flowers) :

start: N 34° 41' 45.2" W 098° 22' 15.9"

end : N 34° 41' 53.0" W 098° 22' 14.4"

	<u>April 25</u>	<u>June 2</u>	<u>August 10</u>	<u>TOTAL</u>
<i>Thorybes confusus</i> Bell, 1922	1	0	0	1
<i>Pyrgus communis</i> (Grote, 1872)	36	2	0	38
<i>Atalopedes campestris</i> (Boisduval, 1852)	2	0	0	2
<i>Atrytone arogos</i> (Boisduval & Leconte, [1837])	0	1	0	1
<i>Anatrytone logan</i> (W.H. Edwards, 1863)	0	0	1?	1
<i>Amblyscirtes vialis</i> (W.H. Edwards, 1862)	1	0	0	1
<i>Papilio glaucus</i> Linnaeus, 1758	1	0	0	1
<i>Colias eurytheme</i> Boisduval, 1852	4	0	0	4
<i>Phoebis sennae</i> (Linnaeus, 1758)	0	0	1	1
<i>Nathalis iole</i> Boisduval, 1836	3	1	0	4
<i>Phaeostrymon alcestis</i> (W.H. Edwards, 1871)	0	11	0	11
<i>Cupido comyntas</i> (Godart, [1824]), 1865)	2	0	0	2
<i>Euptoieta claudia</i> (Cramer, 1775)	1	16	0	17
<i>Chlosyne gorgone</i> (Hübner, [1810])	37	2	0	39
<i>Phyciodes tharos</i> (Drury, 1773)	33	3	0	36
<i>Vanessa virginiensis</i> (Drury, 1773)	0	1	0	1
<i>Anaea andria</i> Scudder, 1875	1	0	0	1
<i>Asterocampa clyton</i> (Boisduval & Leconte, [1835])	0	10	0	10
TOTAL	122	47	2	171

Table 5. Summary of Butterfly Transect 2 Taken 2002, Fort Sill, Comanche Co., Oklahoma.

Transect 2--NE Range, Quonset/ Mc Intosh area (mixed grass, burnt area):

start N 34° 44' 51.4" W 098° 20' 42.1"

	<u>April 25</u>	<u>June 2</u>	<u>August 10</u>	<u>TOTAL</u>
<i>Epargyreus clarus</i> (Cramer, 1775)	0	0	1	1
<i>Pyrgus communis</i> (Grote, 1872)	2	0	0	2
<i>Atalopedes campestris</i> (Boisduval, 1852)	1	0	1	2
<i>Atrytone arogos</i> (Boisduval & Leconte, [1837])	0	2	4	6
<i>Pontia protodice</i> (Boisduval & Leconte, [1830])	1	0	0	1
<i>Colias eurytheme</i> Boisduval, 1852	2	2	0	4
<i>Nathalis iole</i> Boisduval, 1836	2	1	0	3
<i>Lycaena dione</i> (Scudder, 1868	0	2	0	2
<i>Echinargus isola</i> (Reakirt, [1867])	0	1	0	1
<i>Euptoieta claudia</i> (Cramer, 1775)	0	3	0	3
<i>Chlosyne gorgone</i> (Hübner, [1810])	1	2	0	3
<i>Phyciodes tharos</i> (Drury, 1773)	0	3	0	3
<i>Asterocampa clyton</i> (Boisduval & Leconte, [1835])	0	3	0	3
TOTAL	9	19	6	34

Table 6. Summary of Butterfly Transect 3 Taken 2002, Fort Sill, Comanche Co., Oklahoma.

Transect 3--Off E. boundary Rd on W. side: "Flower Transect" (E of small reservoir)

start N 34° 42' 32.3" W 098° 16' 59.9"

end N 34° 42' 35.2" W 098° 17' 11.5"

	<u>June 2</u>	<u>August 10</u>	<u>Total</u>
<i>Epargyreus clarus</i> (Cramer, 1775)	0	1	1
<i>Pyrgus communis</i> (Grote, 1872)	13	1	14
<i>Hylephila phyleus</i> (Drury, 1773)	0	3	3
<i>Atalopedes campestris</i> (Boisduval, 1852)	0	24	24
<i>Atrytone arogos</i> (Boisduval & Leconte, [1837])	1	1	15
<i>Anatrytone logan</i> (W.H. Edwards, 1863)	2	0	2
<i>Euphyes vestris</i> (Boisduval, 1852)	0	1	1
<i>Amblyscirtes belli</i> H.A. Freeman, 1941	0	1	1
<i>Lerodea eufala</i> (W.H. Edwards, 1869)	0	3	3
<i>Papilio polyxenes</i> Fabricius, 1775	2	0	2
<i>P. glaucus</i> Linnaeus, 1758	0	1	1
<i>Pontia protodice</i> (Boisduval & Leconte, [1830])	13	0	13
<i>Colias philodice</i> Godart, 1819	3	0	3
<i>C. eurytheme</i> Boisduval, 1852	25	0	25
<i>Phoebis sennae</i> (Linnaeus, 1758)	0	1	1
<i>Pyrisitia lisa</i> (Boisduval & Leconte, [1830])	1	0	1
<i>Abaeis nicippe</i> (Cramer, 1779)	2	1	3
<i>Nathalis iole</i> Boisduval, 1836	0	7	7

Table 6. Continued.

	June 2	August 10	Total
<i>Lycaena dione</i> (Scudder, 1868)	1	0	1
<i>Strymon melinus</i> (Hübner, [1813])	2	0	2
<i>Cupido comyntas</i> (Godart, [1824], 1865)	6	2	8
<i>Danaus plexippus</i> (Linnaeus, 1758)	5	2	7
<i>Euptoieta claudia</i> (Cramer, 1775)	23	0	23
<i>Chlosyne gorgone</i> (Hübner, [1810])	13	0	13
<i>Phyciodes phaon</i> (W.H. Edwards, 1864)	1	0	1
<i>P. tharos</i> (Drury, 1773)	41	30	71
<i>Junonia coenia</i> Hübner, [1822]	1	0	1
<i>Vanessa virginiensis</i> (Drury, 1773)	2	0	2
<i>Asterocampa celtis</i> (Boisduval & Leconte, [1835])	2	0	2
<i>A. clyton</i> (Boisduval & Leconte, [1835])	14	0	14
TOTAL	173	92	265

Table 7. Summary of Butterfly Transect 4 Taken 2002, Fort Sill, Comanche Co., Oklahoma.

Transect 4--W of Elmer Thomas Lake (LETRA) (transect going uphill: seeps, oak forest canyon):

start N 34° 43' 10.3" W 098° 31' 48.5"

	<u>April 27</u>	<u>June 3</u>	<u>August 11</u>	<u>TOTAL</u>
<i>Epargyreus clarus</i> (Cramer, 1775)	1	0	0	1
<i>Staphylus hayhurstii</i> (W.H. Edwards, 1870)	0	0	3	3
<i>Thorybes confusus</i> Bell, 1922	1	0	1	2
<i>Erynnis funeralis</i> (Scudder & Burgess, 1870)	9	0	0	9
<i>Pyrgus communis</i> (Grote, 1872)	9	2	1	12
<i>Atalopedes campestris</i> (Boisduval, 1852)	20	0	0	20
<i>Atrytone arogos</i> (Boisduval & Leconte, [1837])	0	2	2	4
<i>Anatrytone logan</i> (W.H. Edwards, 1863)	0	4	8	12
<i>Amblyscirtes aenus</i> W.H. Edwards, 1878	1	0	0	1
<i>A. vialis</i> (W.H. Edwards, 1862)	2	0	0	2
<i>A. belli</i> H.A. Freeman, 1941	8	0	1	9
<i>Papilio glaucus</i> Linnaeus, 1758	0	1	1	2
<i>Anthocharis midea</i> (Hübner, [1809])	2	0	0	2
<i>Colias eurytheme</i> Boisduval, 1852	17	6	0	23
<i>Phoebis sennae</i> (Linnaeus, 1758)	0	0	1	1
<i>Abaeis nicippe</i> (Cramer, 1779)	0	3	0	3
<i>Nathalis iole</i> Boisduval, 1836	25	10	24	59
<i>Callophrys gryneus</i> (Hübner, [1819])	2	0	0	2
<i>Phaeostrymon alcestis</i> (W.H. Edwards, 1871)	0	4	0	4
<i>Strymon melinus</i> (Hübner, [1813])	2	3	1	6

Table 7. Continued.

	<u>April 27</u>	<u>June 3</u>	<u>August 11</u>	<u>TOTAL</u>
<i>Cupido comyntas</i> (Godart, [1824]), 1865)	5	0	0	5
<i>Danaus plexippus</i> (Linnaeus, 1758)	1	1	0	2
<i>Euptoieta claudia</i> (Cramer, 1775)	11	16	0	27
<i>Chlosyne gorgone</i> (Hübner, [1810])	8	1	0	9
<i>Phyciodes tharos</i> (Drury, 1773)	9	14	0	23
<i>Junonia coenia</i> Hübner, [1822]	2	5	0	7
<i>Vanessa cardui</i> (Linnaeus, 1758)	1	0	0	1
<i>V. virginiensis</i> (Drury, 1773)	6	1	0	7
<i>Limenitis archippus</i> (Cramer, 1775)	0	0	1	1
<i>Anaea andria</i> Scudder, 1875	2	1	7	10
<i>Asterocampa celtis</i> (Boisduval & Leconte, [1835])	0	4	1	5
<i>A. clyton</i> (Boisduval & Leconte, [1835])	0	5	0	5
<i>Megisto cymela</i> (Cramer, 1777)	5	0	0	5
<i>Cercyonis pegala</i> (Fabricius, 1775)	0	2	17	19
TOTAL	149	85	69	303

Table 8. Summary of Butterfly Transect 5 Taken 2002, Fort Sill, Comanche Co., Oklahoma.

Transect 5--E of Ketch Lake, S of water crossing (start: tree on W of Rd, up to rock markers on top of hill, rocky slope, incl. seep to the N, to creek, stands of New Jersey Tea bushes):

start: N 34° 42' 38.7" W 098° 35' 28.7"

end : N 34° 42' 33.0" W 098° 35' 31.2"

	<u>April 27</u>	<u>June 3</u>	<u>August 11</u>	<u>TOTAL</u>
<i>Epargyreus clarus</i> (Cramer, 1775)	0	0	2	2
<i>Erynnis horatius</i> (Scudder & Burgess, 1870)	0	1	0	1
<i>E. funeralis</i> (Scudder & Burgess, 1870)	1	0	0	1
<i>Pyrgus communis</i> (Grote, 1872)	33	11	0	44
<i>Pholisora catullus</i> (Fabricius, 1793)	0	1	0	1
<i>Hylephila phyleus</i> (Drury, 1773)	0	2	0	2
<i>Atalopedes campestris</i> (Boisduval, 1852)	16	3	0	19
<i>Wallengrenia otho</i> (J.E. Smith, 1797)	0	1	0	1
<i>Atrytone arogos</i> (Boisduval & Leconte, [1837])	0	2	0	2
<i>Anatrytone logan</i> (W.H. Edwards, 1863)	0	3	4	7
<i>Euphyes vestris</i> (Boisduval, 1852)	0	3	0	3
<i>Amblyscirtes vialis</i> (W.H. Edwards, 1862)	4	0	0	4
<i>A. belli</i> H.A. Freeman, 1941	2	1	0	3
<i>Lerodea eufala</i> (W.H. Edwards, 1869)	0	0	1	1
<i>Papilio glaucus</i> Linnaeus, 1758	1	1	2	4
<i>Pontia protodice</i> (Boisduval & Leconte, [1830])	1	0	0	1

Table 8. Continued.

	<u>April 27</u>	<u>June 3</u>	<u>August 11</u>	<u>TOTAL</u>
<i>Colias eurytheme</i> Boisduval, 1852	7	4	0	11
<i>Phoebis sennae</i> (Linnaeus, 1758)	1	0	0	1
<i>Pyrisitia lisa</i> (Boisduval & Leconte, [1830])	0	1	0	1
<i>Abaeis nicippe</i> (Cramer, 1779)	0	6	4	10
<i>Nathalis iole</i> Boisduval, 1836	6	22	16	44
<i>Callophrys gryneus</i> (Hübner, [1819])	9	0	1	10
<i>Phaeostrymon alcestis</i> (W.H. Edwards, 1871)	0	6	0	6
<i>Strymon melinus</i> (Hübner, [1813])	0	2	0	2
<i>Cupido comyntas</i> (Godart, [1824]), 1865)	0	0	1	1
<i>Echinargus isola</i> (Reakirt, [1867])	1	6	0	7
<i>Libytheana carinenta</i> (Cramer, 1777)	0	1	0	1
<i>Danaus plexippus</i> (Linnaeus, 1758)	4	1	0	5
<i>Euptoieta claudia</i> (Cramer, 1775)	4	8	0	12
<i>Chlosyne gorgone</i> (Hübner, [1810])	6	0	0	6
<i>Phyciodes graphica</i> (R. Felder, 1869)	0	1	0	1
<i>P. phaon</i> (W.H. Edwards, 1864)	0	9	5	4
<i>P. tharos</i> (Drury, 1773)	8	21	4	33
<i>Junonia coenia</i> Hübner, [1822]	5	2	0	7
<i>Polygonia interrogationis</i> (Fabricius, 1798)	0	0	1	1
<i>Nymphalis antiopa</i> (Linnaeus, 1758)	0	1	0	1
<i>Vanessa atalanta</i> (Linnaeus, 1758)	3	0	0	3
<i>V. cardui</i> (Linnaeus, 1758)	1	0	0	1
<i>V. virginiensis</i> (Drury, 1773)	3	0	0	3

Table 8. Continued.

<i>Limenitis archippus</i> (Cramer, 1775)	0	0	1	1
<i>Anaea andria</i> Scudder, 1875	2	6	13	21
<i>Asterocampa celtis</i> (Boisduval & Leconte, [1835])	0	5	1	6
<i>A. clyton</i> (Boisduval & Leconte, [1835])	0	17	0	17
<i>Cercyonis pegala</i> (Fabricius, 1775)	0	3	24	27
TOTAL	118	151	80	349

Table 9. Common and Scientific names of Butterflies of Fort Sill, Comanche Co., Oklahoma.

SUPERFAMILY HESPERIOIDEA, FAMILY HESPERIIDAE [Skippers]

Subfamily Pyrginae [Spread-winged Skippers]

1. Silver-spotted Skipper [*Epargyreus clarus* (Cramer, 1775)]
2. Hayhurst's Scallopwing [*Staphylus hayhurstii* (W.H. Edwards, 1870)]
3. Confused Cloudywing [*Thorybes confusis* Bell, 1922]
4. Juvenal's Duskywing [*Erynnis juvenalis* (Fabricius, 1793)]
5. Horace's Duskywing [*E. horatius* (Scudder & Burgess, 1870)]
6. Funereal Duskywing [*E. funeralis* (Scudder & Burgess, 1870)]
7. Wild Indigo Duskywing [*Erynnis baptiseae* (Forbes, 1936)]
8. Common Checkered Skipper [*Pyrgus communis* (Grote, 1872)]
9. Common Sootywing [*Pholisora catullus* (Fabricius, 1793)]

Subfamily Hesperinae [Grass Skippers]

10. Least Skipperling [*Ancyloxypha numitor* (Fabricius, 1793)]
11. Fiery Skipper [*Hylephila phyleus* (Drury, 1773)]
12. Sachem [*Atalopedes campestris* (Boisduval, 1852)]
13. Southern Broken-dash [*Wallengrenia otho* (J.E. Smith, 1797)]
14. Arogos Skipper [*Atrytone arogos* (Boisduval & Leconte, [1837])]
15. Delaware Skipper [*Anatrytone logan* (W.H. Edwards, 1863)]
16. Zabulon Skipper [*Poanes zabulon* (Boisduval & Leconte, [1837])]
17. Dion Skipper [*Euphyes dion* (W.H. Edwards, 1879)]
18. Dun Skipper [*E. vestris* (Boisduval, 1852)]
19. Bronze Roadside-skipper [*Amblyscirtes aenus* W.H. Edwards, 1878]
20. Dotted Roadside-skipper [*A. eos* (W.H. Edwards, 1871)]
21. Common Roadside-skipper [*A. vialis* (W.H. Edwards, 1862)]
22. Bell's Roadside-skipper [*A. belli* H.A. Freeman, 1941]
23. Eufala Skipper [*Lerodea eufala* (W.H. Edwards, 1869)]

SUPERFAMILY PAPILIONOIDEA [True Butterflies]

FAMILY PAPILIONIDAE [Swallowtails and Parnassians]

Subfamily Papilioninae [Swallowtails]

24. Pipevine Swallowtail [*Battus philenor* (Linnaeus, 1771)]
25. Black Swallowtail [*Papilio polyxenes* Fabricius, 1775]
26. Eastern Tiger Swallowtail [*P. glaucus* Linnaeus, 1758]

Continued

Table 9. Continued.

FAMILY PIERIDAE [Whites and Sulphurs]

Subfamily Pierinae [Whites]

- 27. Checkered White [*Pontia protodice* (Boisduval & Leconte, [1830])]
- 28. Cabbage White [*Pieris rapae* (Linnaeus, 1758)]
- 29. Olympia Marble [*Euchloe olympia* (W.H. Edwards, 1871)]
- 30. Falcate Orange-tip [*Anthocharis midea* (Hübner, [1809])]

Subfamily Coliadinae [Sulphurs]

- 31. Clouded Sulphur [*Colias philodice* Godart, 1819]
- 32. Orange Sulphur [*C. eurytheme* Boisduval, 1852]
- 33. Cloudless Sulphur [*Phoebis sennae* (Linnaeus, 1758)]
- 34. Little Yellow [*Pyrisitia lisa* (Boisduval & Leconte, [1830])]
- 35. Sleepy Orange [*Abaeis nicippe* (Cramer, 1779)]
- 36. Dainty Sulphur [*Nathalis iole* Boisduval, 1836]

FAMILY LYCAENIDAE [Gossamer-wings]

Subfamily Lycaeninae [Coppers, Hairstreaks, and Blues]

Tribe Lycaenini [Coppers]

- 37. Great Copper [*Lycaena dione* (Scudder, 1868)]
- 38. Great Purple Hairstreak [*Atlides halesus* (Cramer [1777])]
- 39. Juniper Hairstreak [*Callophrys gryneus* (Hübner, [1819])]
- 40. Southern Hairstreak [*Satyrrium favonius* (J.E. Smith, 1797)]
- 41. Coral Hairstreak [*S. titus* (Fabricius, 1793)]
- 42. Banded Hairstreak [*S. calanus* (Hübner, [1809])]
- 43. Soapberry Hairstreak [*Phaeostrymon alcestis* (W.H. Edwards, 1871)]
- 44. Gray Hairstreak [*Strymon melinus* (Hübner, [1813])]

Tribe Polyommataini [Blues]

- 45. Eastern Tailed-blue [*Cupido comyntas* (Godart, [1824]), 1865]
- 46. Reakirt's Blue [*Echinargus isola* (Reakirt, [1867])]

FAMILY NYMPHALIDAE [Brush-footed Butterflies]

Subfamily Libytheinae [Snouts]

- 47. Snout Butterfly [*Libytheana carinenta* (Cramer, 1777)]

Subfamily Danainae [Royalty]

- 48. Monarch [*Danaus plexippus* (Linnaeus, 1758)]
- 49. Queen [*D. gilippus* (Cramer, 1775)]

Table 9. Continued

Subfamily Heliconiinae [Heliconians]

50. Variegated Fritillary [*Euptoieta claudia* (Cramer, 1775)]

Subfamily Nymphalinae [Typical Brushfoots]

51. Gorgone Checkerspot [*Chlosyne gorgone* (Hübner, [1810])]

52. Silvery Checkerspot [*C. nycteis* (Doubleday, [1847])]

53. Vesta Crescent [*Phyciodes graphica* (R. Felder, 1869)]

54. Phaon Crescent [*P. phaon* (W.H. Edwards, 1864)]

55. Pearl Crescent [*P. tharos* (Drury, 1773)]

56. Common Buckeye [*Junonia coenia* Hübner, [1822]]

57. Question Mark [*Polygonia interrogationis* (Fabricius, 1798)]

58. Mourning Cloak [*Nymphalis antiopa* (Linnaeus, 1758)]

59. Red Admiral [*Vanessa atalanta* (Linnaeus, 1758)]

60. Painted Lady [*V. cardui* (Linnaeus, 1758)]

61. American Lady [*V. virginiensis* (Drury, 1773)]

Subfamily Limenitidinae [Admirals]

62. Viceroy [*Limenitis archippus* (Cramer, 1775)]

Subfamily Charaxinae [Leafwings]

63. Goatweed Leafwing [*Anaea andria* Scudder, 1875]

Subfamily Apaturinae [Emperors]

64. Hackberry Emperor [*Asterocampa celtis* (Boisduval & Leconte, [1835])]

65. Tawny Emperor [*A. clyton* (Boisduval & Leconte, [1835])]

Subfamily Satyrinae [Satyrs]

66. Little Wood-satyr [*Megisto cymela* (Cramer, 1777)]

67. Common Wood-nymph [*Cercyonis pegala* (Fabricius, 1777)]

SUPERFAMILY HESPERIOIDEA
FAMILY HESPERIIDAE [Skippers]

Subfamily Pyrginae [Spread-winged Skippers]

Epargyreus clarus Cramer, **Silver-spotted Skipper**

The Silver-spotted Skipper is a widespread North American butterfly found in both highly disturbed and native habitats. At Fort Sill, it was found in several locations on East and West Ranges, being most abundant in association with flowering black locust trees (*Robinia pseudoacacia*), its likely caterpillar host plant on the Fort. The adults have spring and late summer flights in Comanche County.

Staphylus hayhurstii W.H. Edwards, **Hayhurst's Scallopwing**

Hayhurst's Scallopwing is a weedy butterfly through much of the southern United States west to about central Oklahoma and central Texas. The most frequent caterpillar host is lamb's quarters (*Chenopodium album*). The adults have late spring and summer flights at Ft. Sill. The butterfly was found most abundantly at the Hoyle Bridge and at the lower end of the LETRA transect.

Thorybes confusis Bell, **Confused Cloudywing**

The Confused Cloudywing is endemic to the southeastern U.S. which reaches its western range limit in central Oklahoma and central Texas. Its life history is unknown, but its caterpillar plant is almost certainly a herbaceous legume. It has spring and mid-summer flights at Ft. Sill. It was found sparingly on Ft. Sill, including the lower end of the LETRA transect.

Erynnis juvenalis Fabricius, **Juvenal's Duskywing**

Juvenal's Duskywing is a widespread, abundant skipper of the eastern and central United States with a disjunct subspecies in southeastern Arizona. Its caterpillars feed on oaks. There is only a single adult flight in the spring. Only one individual was found on Ft. Sill, but it was probably more abundant before our first visit—presumably March.

Erynnis horatius Scudder & Burgess, **Horace's Duskywing**

Horace's Duskywing has a very similar appearance to Juvenal's Duskywing, and in the spring can only safely be identified by dissection of the genitalia. Its caterpillar hosts are several species of oaks (*Quercus* spp.). It has both spring and mid-summer flights. It was found on the Ketch Lake transect. Its identity was confirmed by dissection.

Erynnis funeralis Scudder & Burgess, **Funereal Duskywing**

The Funereal Duskywing is limited to the southern portion of the U.S. from Florida to California and its range extends south into Central America along the coastal plain. It can have

several flights each year, probably two at Fort Sill. It was found on the Ketch Lake transect and along the LETRA transect.

Erynnis baptiseae Forbes, **Wild Indigo Duskywing**

The Wild Indigo Duskywing was formerly considered uncommon but is now widespread and abundant in the eastern half of the U.S. as it has adapted to use crown vetch (*Coronilla varia*) as a caterpillar host. Its native caterpillar hosts are several species of wild indigo which are probably its host on Ft. Sill. The butterfly has spring and mid-summer adult flights. Only a single individual was found on Fort Sill near LETRA in early June.

Pyrgus communis Grote, **Common Checkered-Skipper**

The Common Checkered-Skipper (Fig. 24) was one of the most overwhelmingly abundant and widespread butterflies found on Fort Sill. It is found over most of the United States and southern Canada. Its caterpillars feed on a wide variety of mallows; its predominant host on Fort Sill is likely *Sphaeralcea*. The species may be confidently separated from the nearly identical White Checkered-Skipper (*Pyrgus albescens* Ploetz) only by dissection of male genitalia. About 20 individuals from Ft. Sill were dissected and all proved to be the Common Checkered-Skipper. The butterfly has multiple flights at Fort Sill and probably flies from March to early November.

Pholisora catullus Fabricius, **Common Sootywing**

The Common Sootywing is common over much of temperate North America. Its caterpillar hosts include both weedy Chenopodiaceae such as *Chenopodium album* and Amaranthaceae, mainly *Amaranthus* species. The butterfly has two flights annually at Fort Sill, and was found most abundantly along the banks of Cache Creek near Hoyle Bridge.



Figure 24. Mating pair of Common Checkered-Skipper (*Pyrgus communis*). Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Evi Buckner.

Subfamily Hesperinae [Grass Skippers]

Ancyloxypha numitor Fabricius, **Least Skipper**

The Least Skipper (Fig. 25) is a slightly weedy species found over most of the eastern United States and southern Canada extending westward to easternmost Colorado and southeastern Arizona. Its caterpillars feed on several kinds of broad-leaved grasses, particularly those found along watercourses. It has three flights of adults annually and becomes progressively more abundant with each flight. At Fort Sill it was found at 4-mile Crossing, the LETRA transect, and Ketch Lake transect.

Hylephila phyleus Drury, **Fiery Skipper**

The Fiery Skipper occurs across the southern U.S. and ranges south into the tropics to Argentina. It ranges northward each warm season and establishes temporary populations which are eliminated by the onset of freezing winter temperatures. It is a weedy butterfly and is sometimes a pest of bluegrass lawns. The caterpillars feed on various grasses. There are multiple flights in its areas of residence. On Fort Sill, it was found in June and August at a number of sites including the Flower transect on the East Range and the Ketch Lake transect on the West Range.

Atalopedes campestris Boisduval, **Sachem**

The Sachem is a widespread species ranging across the southern U.S. and south in the tropics to Brazil. It strays northward each warm season and establishes temporary breeding populations like the Fiery Skipper. It may survive most winters at Fort Sill. Caterpillars eat a variety of grasses. It was found in most habitats at Fort Sill in varying abundance.

Wallengrenia otho J.E. Smith, **Southern Broken-Dash**

The Southern Broken-Dash is found in the southeastern U.S. and range along the coastal lowlands of Central America to Argentina. Its caterpillars feed on grasses. It seems to be an

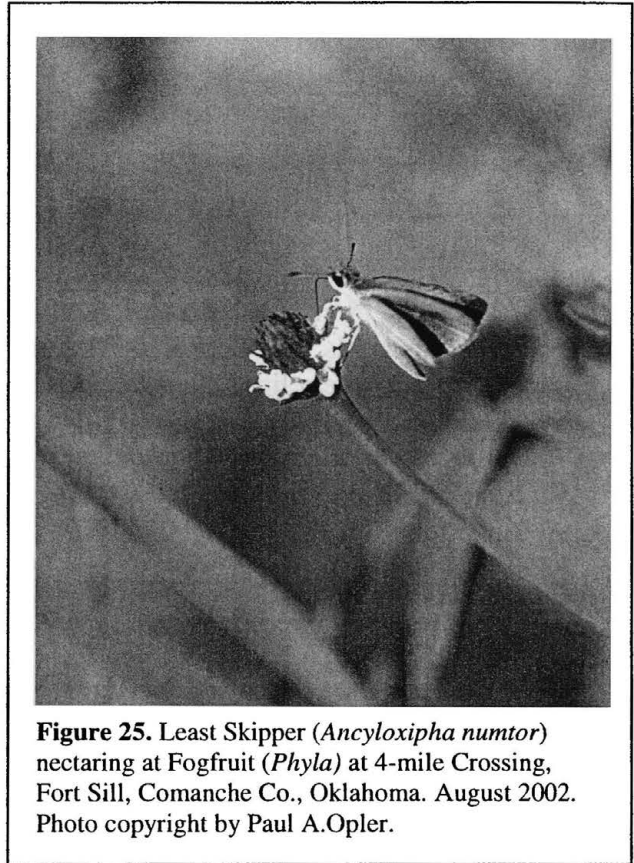


Figure 25. Least Skipper (*Ancyloxypha numitor*) nectaring at Fogfruit (*Phyla*) at 4-mile Crossing, Fort Sill, Comanche Co., Oklahoma. August 2002. Photo copyright by Paul A.Opler.

uncommon resident on Fort Sill and has two flights annually. We found it most commonly at 4-mile Crossing, but it was also present on the Ketch Lake transect.

Atrytone arogos Boisduval & Leconte,
Arogos Skipper

The Arogos Skipper (Figs. 26 and 27) has several isolated populations in the U.S., including the south Atlantic Coast, tall- and mid-grass prairie biomes and the Colorado Front Range foothills. Its caterpillars feed on big bluestem and likely little bluestem as well. The butterflies have two annual flights at Fort Sill, and the skipper was abundant in several grassland sites including several of our transects.

Anatrytone logan W.H. Edwards, **Delaware Skipper**

The Delaware Skipper (Fig. 28) is widespread in temperate North America east of the Rocky Mountains, being found most often in native grassy habitats but also in somewhat disturbed weedy grasslands. The caterpillars feed on several kinds of grasses and there are two flights of adults at Fort Sill. We found this skipper on most of our transects, sometimes abundantly. In the field, it is difficult to separate from the Arogos Skipper without netting and examination of the upper wing pattern.

Poanes zabulon Boisduval & LeConte, **Zabulon Skipper**

The Zabulon Skipper is a common skipper throughout much of the Southeastern U.S., particularly along forest edges or openings. Its caterpillars feed on several kinds of grasses. We found only one individual at Fort Sill, which is near its western range limit, during April on the East Range.

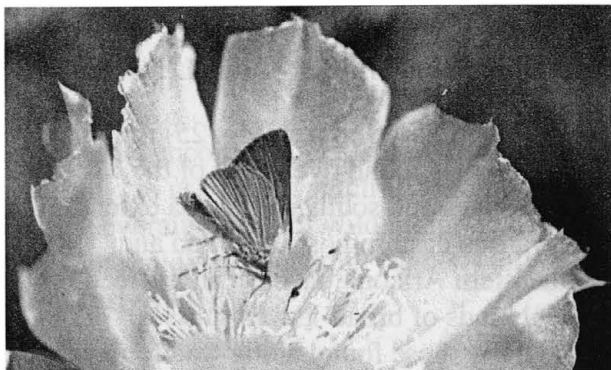


Figure 26. Arogos Skipper (*Atrytone arogos*) nectaring on *Opuntia*, LETRA Transect, West Range, Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Paul A. Opler.



Figure 27. Arogos Skippers (*Atrytone arogos*) nectaring on *Cirsium*. Fort Sill, Comanche Co., Oklahoma. August 2002. Photo copyright by Evi Buckner.

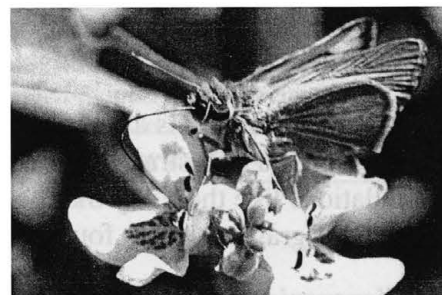


Figure 28. Delaware Skipper (*Anatrytone delaware*) nectaring, West Range, Fort Sill, Comanche Co., Oklahoma. Photo copyright by Evi Buckner.

Euphyes dion W.H. Edwards, **Dion Skipper**

The Dion Skipper (Fig. 29) is a widespread, but relatively rare and local, species of the eastern half of the U.S. It is normally found in marshes or swamps and its caterpillars feed on native sedges (*Cyperus* spp.). At Fort Sill it was found first at 4-mile Crossing in early June and August. Later in August it was found along several other streams in the West Range. This was a surprising discovery as the butterfly was known previously only in southeastern Oklahoma.

Euphyes vestris Boisduval, **Dun Skipper**

The Dun Skipper is widespread in temperate North America from coast to coast, but is somewhat discontinuous in its distribution. It is most often found near wet areas and forest openings and can be extremely abundant. Its caterpillars feed on several species of native sedges. At Fort Sill we found it uncommonly at a few sites including the Flower Transect, Ketch Lake Transect, and 4-mile Crossing.

Amblyscirtes aenus W.H. Edwards, **Bronze Roadside-Skipper**

The Bronze Roadside-Skipper is a widespread southwestern butterfly that is near its eastern limit at Fort Sill. Its caterpillars feed on native grasses and there are spring and later summer flights of adults. On Fort Sill we observed only a single individual near the upper portion of the LETRA transect.

Amblyscirtes eos W.H. Edwards, **Dotted Roadside-Skipper**

Another widespread but sparsely distributed southwestern skipper (Fig. 30), it is usually found in native habitats. On Ft. Sill we found but a single individual at 4-mile Crossing. This was only the second record for Oklahoma.

Amblyscirtes vialis W.H. Edwards, **Common Roadside-Skipper**

This small butterfly is found through much of temperate North America, usually in native forested situations, from coast to coast. At Fort Sill it was abundant during our April visit at several sites, most commonly along the banks of Cache Creek at the Hoyle Bridge.

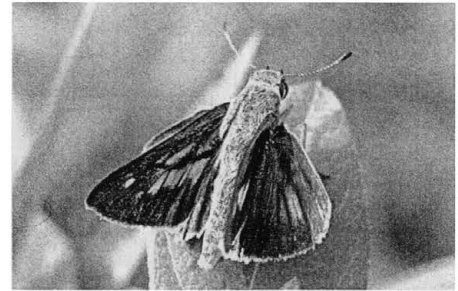


Figure 29. Male Dion Skipper (*Euphyes dion*) perching, 4-Mile Crossing, Fort Sill, Comanche, Co., Oklahoma. This is the westernmost population of this butterfly in Oklahoma. Photo copyright by Evi Buckner.

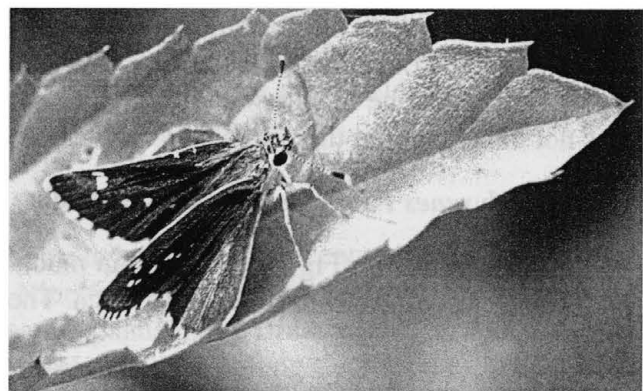


Figure 30. Dotted Roadside-Skipper (*Amblyscirtes eos*) perching, 4-Mile Crossing, Fort Sill, Comanche Co., Oklahoma. This is the second record for the state. Photo copyright by Evi Buckner.

Amblyscirtes belli H.A. Freeman, **Bell's Roadside-Skipper**

This skipper (Fig. 31) has a limited inland distribution in the Southeast and southern Midwest. The caterpillars feed on grasses and there are two adult flights in spring and mid-summer. At Fort Sill it is near its western range limit, and we were surprised to find it abundant at times, particularly along Cache Creek at several sites. It was found sparingly on several of our transects.

Lerodea eufala W.H. Edwards, **Eufala Skipper**

The Eufala Skipper ranges along the southern portion of the U.S. south into coastal Mexico. It is an invasive species and may establish temporary populations north of the area where it can survive the winter. Its caterpillars feed on several weedy grasses, notably Bermuda grass, and there are several annual flights of adults. At Fort Sill, we found it sparingly on several transects.

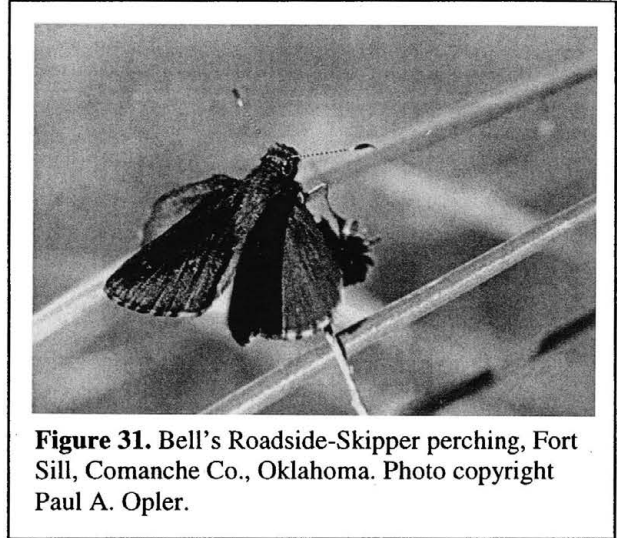


Figure 31. Bell's Roadside-Skipper perching, Fort Sill, Comanche Co., Oklahoma. Photo copyright Paul A. Opler.

SUPERFAMILY PAPILIONOIDEA [True Butterflies]

FAMILY PAPILIONIDAE [Swallowtails and Parnassians]

Subfamily Papilioninae [Swallowtails]

Battus philenor Linnaeus, **Pipevine Swallowtail**

The Pipevine Swallowtail is resident in the southern portion of the U.S. from coast to coast. It may range to the north in the warmer months and establish temporary populations. Its caterpillars feed only on species of pipevine (*Aristolochia* spp.), including ornamental species. In the West Range, one female was observed laying eggs on pipevine in August. This individual was not collected, but there was no doubt as to its identity.

Papilio polyxenes Fabricius, **Black Swallowtail**

This butterfly (Fig. 32) is found in much of temperate North America from coast to coast and it ranges southward in Central America. The butterflies are often common and the

caterpillars feed on a wide variety of plants in the Apiaceae, including carrot, dill, parsley, and Queen Anne's lace. There are spring and mid-summer flights at Fort Sill where the butterfly was widespread but seldom found on our transects.

Papilio glaucus Linnaeus, **Eastern Tiger Swallowtail**

The butterfly is widespread and common in temperate eastern North America extending westward into the plains along river drainages. The caterpillars feed on the leaves of several woody plants including tulip-poplar (*Liriodendron tulipifera*) and chokecherry (*Prunus* spp.). The adults have spring and mid-summer flights at Fort Sill and were abundant along Cache Creek in April. They were seen sparingly on our transects.



Figure 32. Black Swallowtail (*Papilio polyxenes*) female. Fort Sill, Comanche Co., Oklahoma. Photo copyright by Evi Buckner.

FAMILY PIERIDAE [Whites and Sulphurs]

Subfamily Pierinae [Whites]

Pontia protodice Boisduval & Leconte, **Checkered White**

The Checkered White is found in temperate North America from coast to coast south into Mexico. It is a common, widespread species in weedy habitats and other disturbed areas. Its caterpillars eat the leaves and seedpods of a number of weedy plants of the Brassicaceae. There are multiple flights from spring to fall. We found it most abundant on the Flower transect (East Range) in early June but sparse or absent at other times and locations.

Pieris rapae Linnaeus, **Cabbage White**

The Cabbage White is an introduced Eurasian butterfly that became established in most of temperate North America by the end of the Nineteenth Century. Its caterpillars feed on the leaves of a number of cultivated, weedy, and native plants in the Brassicaceae. We did not find this species on any of our transects, but found it very sparingly along Cache Creek and at 4-mile Crossing.

Euchloe olympia W.H. Edwards, **Olympia Marble**

The Olympia Marble is widespread in specialized habitats in the eastern 2/3 of temperate North America where it favors sand dunes, shale barrens and mostly native grasslands. The caterpillars feed primarily on the flowers and seedpods of rock cresses (*Arabis* spp.). The adults have a single spring flight, apparently primarily in March and early April at Fort Sill. We found only a single individual at Arbuckle Hill in late April.

Anthocharis midea Hübner, **Falcate Orange-tip**

The Falcate Orange-tip (Fig. 33) is widespread in the eastern half of the United States, primarily in woodland openings or along wood edges. The caterpillars feed on the reproductive structures of a number of Brassicaceae, including weedy species. We found just two or three worn female individuals on the LETRA transect in late April. The species seems to be limited to the Post Oak woodlands in the West Range and probably flies more abundantly in late March and early April.

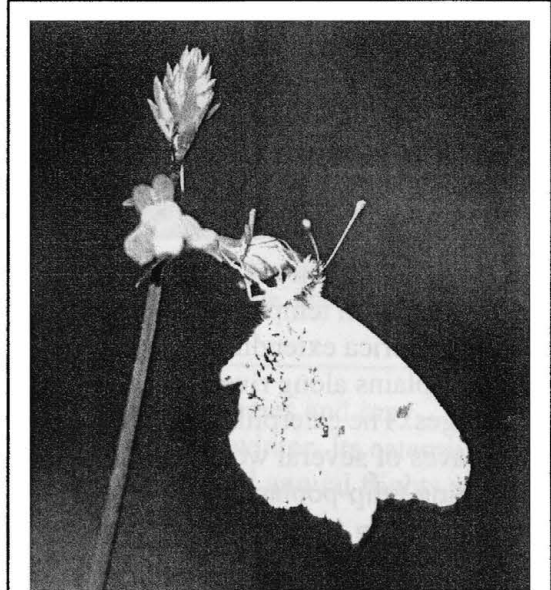


Figure 33. Falcate Orange-tip (*Anthocharis midea*) female, LETRA transect, April 2002. Fort Sill, Comanche Co., Oklahoma. Photo copyright by Paul A. Opler.

Subfamily Coliadinae [Sulphurs]

Colias philodice Godart, **Clouded Sulphur**

The Clouded Sulphur ranges widely over much of cool temperate North America. Its caterpillars feed on a number of native and introduced legumes including clovers and alfalfa. There are many adult flights each year, probably from March to early November at Fort Sill. We found it rare or absent on most of our transects, and most individuals were found in early June on the Flower transect in the East Range.

Colias eurytheme Boisduval, **Orange Sulphur**

The Orange Sulphur or Alfalfa Butterfly is abundant over much of North America and ranges well into Mexico. It is an occasional economic pest of alfalfa. Its caterpillars eat a wide variety of legumes including alfalfa, sweet clovers, and milk-vetches. There are several adult flights each year, and the species probably flies from March to November on Fort Sill. The species was found to be widespread but not abundant on Fort Sill.

Phoebis sennae Linnaeus, **Cloudless Sulphur**

The Cloudless Sulphur is a widespread tropical migratory butterfly whose area of residence ranges from the southern U.S. to Argentina. The caterpillars feed mainly on partridge pea and sennas (*Cassia* spp.). There are several adult flights each year and on Fort Sill the butterfly probably can be found from March to early November. We found it primarily on the East Range.

Pyrisitia lisa Boisduval & Leconte, **Little Yellow**

The Little Yellow's range includes the southeastern U.S. south into northern Mexico. The caterpillars feed mainly on partridge pea (*Cassia* spp.) There are several annual flights. The butterfly may not survive the winters at Fort Sill and likely colonizes the area each year. We found the butterfly sparingly in June and August on the Flower and Ketch Lake transects.

Abaeis nicippe Cramer, **Sleepy Orange**

The Sleepy Orange ranges across the southern U.S. south into central Mexico. Its caterpillars feed on various species of sennas (*Cassia* spp.), and there are several flights each year. The butterfly may overwinter at Fort Sill and we found it sparingly in several areas including transects.

Nathalis iole Boisduval, **Dainty Sulphur**

The Dainty Sulphur is abundant and widespread on Fort Sill and probably overwinters there as adults. The caterpillars feeds on Fetid Marigold (*Tagetes*) and other plants. There are several flights of adults and we found the butterfly on most transects and other survey sites.

FAMILY LYCAENIDAE [Gossamer-wings]

Subfamily Lycaeninae [Coppers, Hairstreaks, and Blues]

Tribe Lycaenini [Coppers]

Lycaena dione Scudder, **Great Copper**

The Great Copper (Fig. 34) ranges over much of the Great Plains and extends sparingly westward into the

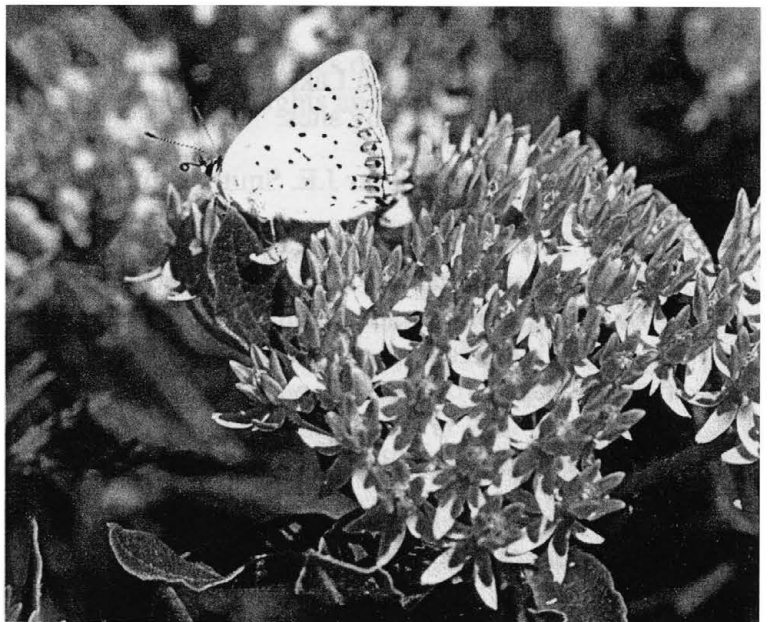


Figure 34. Great Copper (*Lycaena dione*) nectaring on orange milkweed (*Asclepias curassavica*), Northeast Transect, East Range, Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Evi Buckner.

intermountain region. Its caterpillars feed only on the leaves of docks (genus *Rumex*) and there is but a single late spring flight each year. We found it only on three sites on the East Range of Fort Sill, including the Mixed Grass and Flower Transects.

Atlides halesus Cramer, **Great Purple Hairstreak**

The Great Purple Hairstreak is found coast to coast across the southern United States and south into northern Mexico. It is found in many locations, sometimes abundantly, where its caterpillar host mistletoes (*Phoradendron* spp.) grow on a variety of host trees. It has spring, summer, and fall flights of adults. A single individual was found in the tall grass habitat during September in the East Range.

Callophrys gryneus Hübner,
Juniper Hairstreak

The Juniper Hairstreak (Fig. 35) is found from coast to coast in direct association with its foodplants, species of juniper including Eastern red-cedar (*Juniperus virginiana*). The main flight of adults is in the spring (April-early May), but there are several smaller flights in summer and fall. We found the butterfly only on the West Range, particularly on the Ketch Lake transect and some nearby sites.

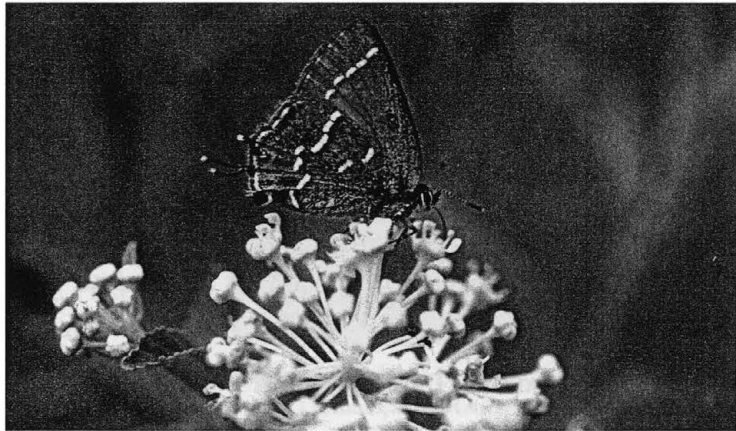


Figure 35. Juniper Hairstreak (*Callophrys gryneus*) nectaring on New Jersey Tea (*Ceanothus americanus*), Ketch Lake Transect, West Range, Fort Sill, Comanche Co., Oklahoma. April 2002. Photo copyright by Evi Buckner

Satyrium favonius J.E. Smith, **Southern Hairstreak**

The Southern Hairstreak is found from the eastern U.S. west to the western Great Plains. It is often very local and its caterpillar host plants are several species of scrubby oaks—possibly Post Oak (*Quercus stellata*) on Fort Sill. The butterfly has a single late spring flight, and we found the butterfly only on the West Range. We found it near the west end of LETRA but not on the transect.

Satyrium titus Fabricius, **Coral Hairstreak**

The Coral Hairstreak is widespread in temperate North America. The caterpillars feed on the flowers of several species of *Prunus*, notably chokecherry. It has a single late spring-early summer flight and we found it only at the western end of the West Range. We did not encounter it on any transects.

Satyrium calanus Hübner, **Banded Hairstreak**

The Banded Hairstreak is widespread in eastern temperate North America west to the Rocky Mountain Region. The caterpillars feed on the young leaves of several species of oaks (*Quercus* spp.). It has a single late spring-early summer flight and we found it only at three sites on the West Range. We did not encounter it on any transects.

Phaeostrymon alcestis W.H. Edwards,
Soapberry Hairstreak

The Soapberry Hairstreak (Fig. 36) ranges in the U.S. from Missouri west to Arizona and the adults are found only on or in close association with the caterpillar host soapberry (*Sapindus*). The plant is widespread and common on Fort Sill and we encountered the butterfly abundantly during its flight in late spring.

Strymon melinus Hübner, **Gray Hairstreak**

The Gray Hairstreak ranges from most of temperate North America south at least to Costa Rica. Its caterpillars feed on the reproductive structures of a wide variety of plants, especially Malvaceae and Fabaceae. There are several annual flights and we found it from spring to mid-summer at Fort Sill at several sites.

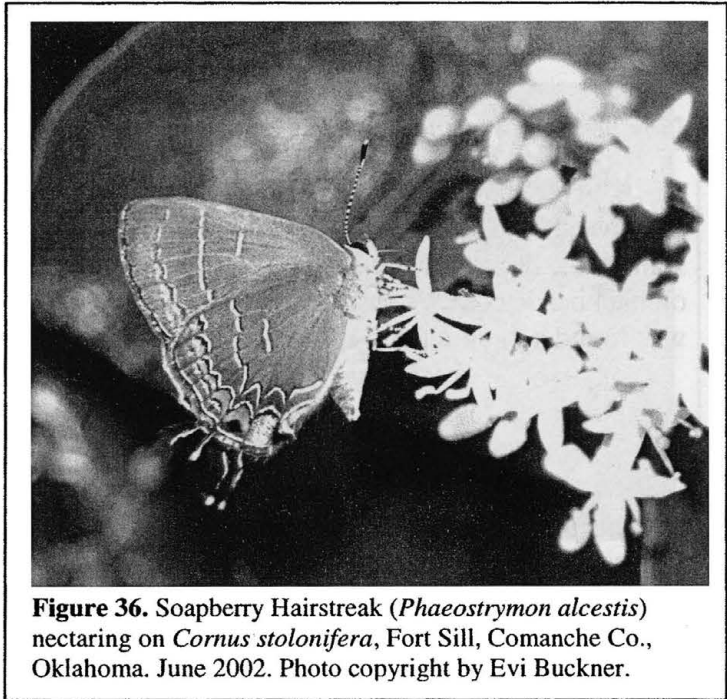


Figure 36. Soapberry Hairstreak (*Phaeostrymon alcestis*) nectaring on *Cornus stolonifera*, Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Evi Buckner.

Tribe Polyommataini [Blues]

Cupido comyntas Godart, **Eastern Tailed-Blue**

The Eastern Tailed-Blue is widespread and abundant in the eastern two-thirds of North America, but it also ranges west to the Pacific coast and south in the tropics at least to Costa Rica. The caterpillars feed on the reproductive parts of several kinds of legumes, most notably in the genus *Lotus*. There are two to three annual flights. We found it sparingly on Ft. Sill--most commonly on the Flower transect (East Range).

Echinargus isola Reakirt, **Reakirt's Blue**

The Reakirt's Blue is resident in the Southwest and south into Mexico and Central America to Costa Rica. The blue strays north and eastward each summer and may colonize areas north of its area of residency. The caterpillars feed on the reproductive parts of a variety of legumes. The adults have three or more flights each year. On Fort Sill, the Reakirt's Blue was

rare; single individuals were found on the Northeast Range mixed grass) and Ketch Lake transects and in a few other sites.

FAMILY NYMPHALIDAE [Brush-footed Butterflies]

Subfamily Libytheinae [Snouts]

Libytheana carinenta Cramer, **Snout Butterfly**

The Snout Butterfly is found in the eastern half of temperate North America, the Southwest, and south into Central and South America. The adults overwinter and the butterflies sometimes become incredibly abundant and engage in massive emigrations. The caterpillars feed on hackberries (*Celtis* spp.) and may have two or more flights each year. On Ft. Sill, the Snout was found sporadically—usually as single individuals, primarily on the West Range.

Subfamily Danainae [Royalty]

Danaus plexippus Linnaeus, **Monarch**

The Monarch is a widespread butterfly in the Americas and also occupies a number of oceanic islands and Australia. It is well-known for its regular two-way migrations and its role in mimetic relations with Viceroy (*Limenitis archippus*) [see below]. The caterpillars feed exclusively on plants in the Asclepiadaceae, primarily various milkweeds in the U.S. and southern Canada. In addition to the migratory generation, there are perhaps two or three summer flights of non-migratory adults. On Fort Sill, the Monarch passes through mainly as a migrant with only sporadic reproduction. We searched for larvae on milkweeds and found none. Adults were seen on the Flower, Ketch Lake, and LETRA transects.

Danaus gilippus Cramer, **Queen**

The Queen is resident along the southern portions of the U.S. and south through much of Latin America. In the warmer months it strays northward and may reproduce in small numbers. Like Monarchs, the caterpillars feed only on plants in the Milkweed Family. There are several flights of adults each year. On Ft. Sill, no Queens were found on transect counts, and only a single individual was collected in late August on the West Range.

Subfamily Heliconiinae [Heliconians]

Euptoieta claudia Cramer, **Variiegated Fritillary**

The Variiegated Fritillary is resident in the southern portions of the U.S. and south into northern Mexico. This butterfly is probably resident on Ft. Sill most years. The caterpillars feed

on a variety of plants including wild violets and flax. There are several flights each year. The butterfly was seen on all transects, sometimes commonly.

Subfamily Nymphalinae [Typical Brushfoots]

Chlosyne gorgone Hübner, **Gorgone Checkerspot**

The Gorgone Checkerspot (Figs. 37 and 38) is a resident in the Midwest and southern portions of the U.S. to the east of the Rockies. Its caterpillars feed gregariously on the leaves of composites, especially sunflowers (*Helianthus* spp.). There are two or three flights each year. On Fort Sill, the butterfly was common to abundant and was found on most transects.

Chlosyne nycteis Doubleday, **Silvery Checkerspot**

The Silvery Checkerspot is resident in eastern and midwestern temperate North America and in the Southwest. Its caterpillars feed gregariously on selected composites. On Ft. Sill, it was an uncommon butterfly and was found only along Cache Creek at Hoyle Bridge and east Cache Creek.

Phyciodes graphica R. Felder, **Vesta Crescent**

The Vesta Crescent is resident in the Southwest and south into Mexico. Its caterpillars feed on hairy tubetongue and bindweed. The adults may have several flights each year. On Ft. Sill, the butterfly is rare and only a single adult was found on the Ketch Lake transect.

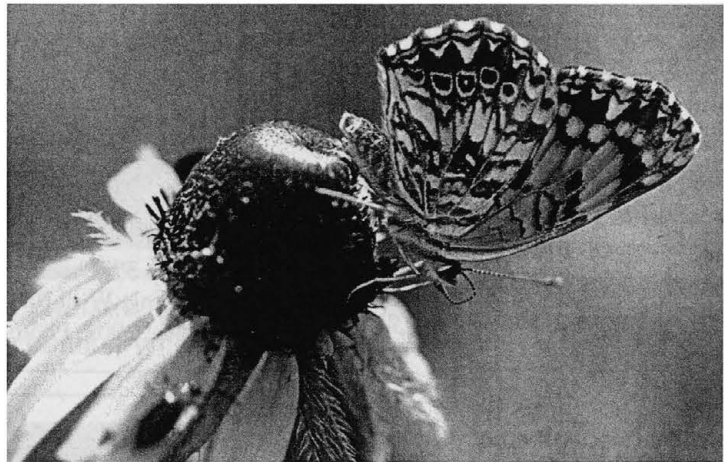


Figure 37. Gorgone Checkerspot (*Chlosyne gorgone*) nectaring on composite, Fort Sill, Comanche Co., Oklahoma. April 2002. Photo copyright by Paul A. Opler.



Figure 38. Gorgone Checkerspots and Pearl Crescents nectaring in abundance, Apache Cemetary Transect, East Range, Fort Sill, Comanche Co., Oklahoma. April 2002. Photo copyright by Evi Buckner.

Phyciodes phaon W.H. Edwards,
Phaon Crescent

The Phaon Crescent (Fig. 39) is found along the southern portions of the U.S. south along both coasts of Mexico. It may stray northward and establish temporary breeding colonies. Its caterpillars are closely tied to its host plants fog fruit and matgrass (*Phyla* spp.). The butterfly has three or four adult flights each year. On Fort Sill, we found the Phaon Crescent locally common on the Flower, Letra, and Ketch Lake transects as well as at 4-mile Crossing and the Hoyle Bridge.



Figure 39. Phaon Crescent (*Phyciodes phaon*), 4-Mile Crossing, West Range, Fort Sill, Comanche Co., Oklahoma. August 2002. Photo copyright by Evi Buckner

Phyciodes tharos Drury, **Pearl Crescent**

The Pearl Crescent (Figs. 38 and 40) is one of the more widespread and abundant butterflies in much of temperate North America and south to southern Mexico. Its caterpillars feed gregariously on a variety of wild asters (*Aster* spp.) and there are three or four flights of adults each year. On Ft. Sill, the Pearl Crescent was common to abundant in most areas and was found almost all transects.

Junonia coenia Hübner, **Common Buckeye**

The Common Buckeye is resident in the southern portions of the U.S. and ranges into northern

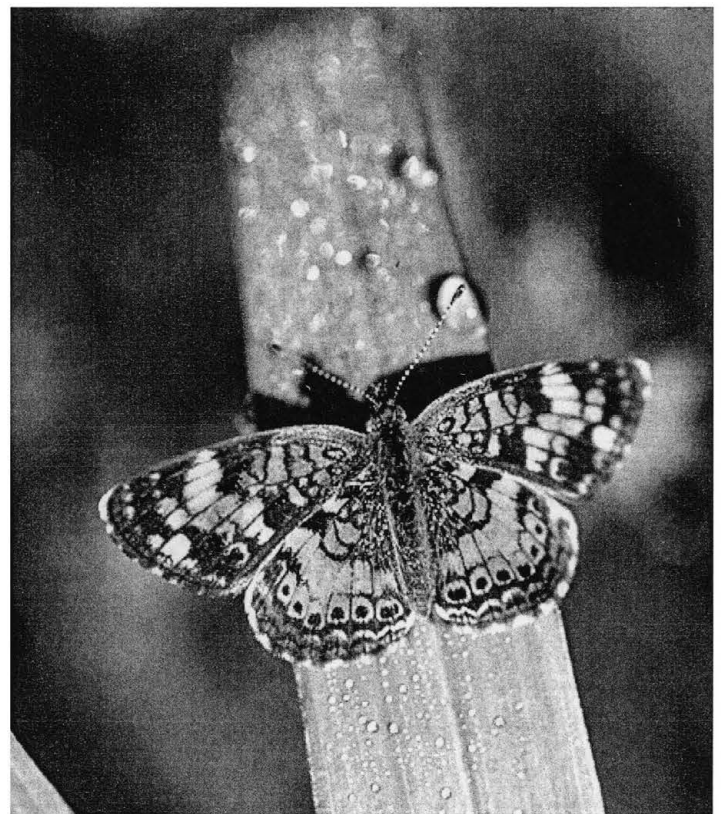


Figure 40. Pearl Crescent (*Phyciodes tharos*), Fort Sill, Comanche Co., Oklahoma. Photo copyright by Paul A. Opler.

Mexico. Its caterpillars eat the leaves of plantain, snapdragons, and other members of the Scrophulariaceae. The adults overwinter and there are two or three flights during the warmer months. The butterfly was locally common on Ft. Sill and was found on the Flower, LETRA, and Ketch Lake transects.

Polygonia interrogationis **Fabricius, Question Mark**

The Question Mark is widespread in the eastern two-thirds of temperate North America and ranges south into northeastern Mexico. Its caterpillars feed on members of the Urticaceae (nettles) and Ulmaceae (elms). There are two flights each year and the adults overwinter. On Ft. Sill, three individuals were seen, one on the Ketch Lake transect, but none were captured.

Nymphalis antiopa Linnaeus, **Mourning Cloak**

The Mourning Cloak is found in much of temperate North America and Eurasia and ranges south to central Mexico. Its caterpillars feed on leaves of trees in the Salicaceae (willows, cottonwoods, aspens) and elms. There is primarily one generation of long-lived adults each year. At Ft. Sill, the Mourning Cloak was uncommon with only a few individuals seen including one on the Ketch Lake transect.

Vanessa atalanta Linnaeus, **Red Admiral**

The Red Admiral is a common butterfly of North American and Eurasian temperate habitats. Its chief caterpillar hosts are nettles (Urticaceae). There are two or three flights each year and the adults overwinter. On Ft. Sill, the butterfly was seen sporadically. Worn overwintering adults were seen on the Ketch Lake transect in April and freshly emerged adults were seen along watercourses such as at 4-mile Crossing in June and August.

Vanessa cardui Linnaeus, **Painted Lady**

The Painted Lady is resident in North America, Eurasia, and Africa, as well as on several oceanic islands. In North America it is known for its periodic mass emigrations from northern Mexico; it cannot overwinter in most of the U.S. The caterpillars feed on a wide variety of plants, especially thistles, legumes, and borages. Sporadic individuals were seen on Fort Sill (Ketch Lake transect in April), although it is probably common during invasion years.

Vanessa virginiensis Drury, **American Lady**

The American Lady is resident in the southern portions of the U.S. and the cordilleras of Mexico. It regularly moves northward and colonizes habitats north to southern Canada but dies out there each winter. Adults overwinter. The caterpillars feed on pearly everlasting and other composites in the same tribe. The adults were seen sporadically on Ft. Sill, including the Apache Cemetery, Flower, LETRA, and Ketch Lake transects.

Subfamily Limenitidinae [Admirals]

Limenitis archippus Cramer, Viceroy

The Viceroy (Fig. 41) is found over much of temperate North America but is more sporadically distributed in the West. It is a well-known edible mimic of the Monarch (see above). Its caterpillars feed on the leaves of willows and cottonwoods, and there are two to three flights each year. On Ft. Sill, the Viceroy was uncommon and found only on the Flower and LETRA transects. It was also seen at two points along Cache Creek

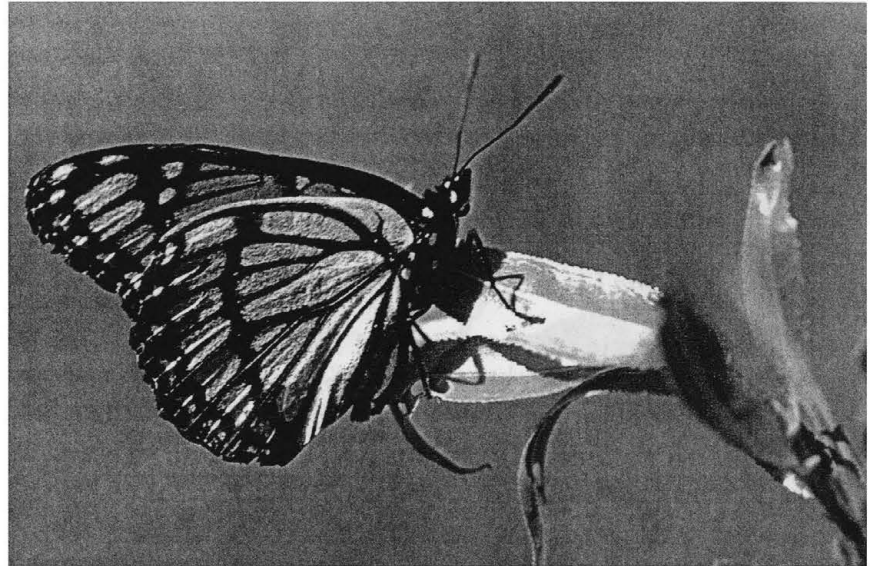


Figure 41. Viceroy (*Limenitis archippus*), East Cache Creek, East Range, Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Paul A. Opler.

Subfamily Charaxinae [Leafwings]

Anaea andria Scudder, Goatweed Leafwing

The Goatweed Leafwing is found primarily in the southern Great Plains, but its adults emigrate to the Southeast and Southwest. Its caterpillars eat the leaves of several *Croton* species, including goatweed, Texas croton, and prairie tea. There is a summer generation and a longer-lived overwintering generation. On Fort Sill, the adults can be seen in most areas, but were most abundant in the West Range as on the LETRA and Ketch Lake Transects.

Subfamily Apaturinae [Emperors]

Asterocampa celtis Boisduval & Leconte, Hackberry Emperor

The Hackberry Emperor (Figs. 42 and 43) is found throughout much of the U.S. east of the Rockies and sparingly in the Southwest. Its caterpillars feed on the leaves of hackberries

(*Celtis* spp.). On Fort Sill, the adults have two flights and are incredibly abundant in June and late summer. The butterflies are most abundant near hackberries along the Fort's drainages, but were also seen on several transects.

Asterocampa clyton Boisduval & Leconte, **Tawny Emperor**

The Tawny Emperor (Fig. 43) has much the same distribution as the Hackberry Emperor but is usually less abundant. Its caterpillars feed on hackberries (*Celtis* spp.). There are two flights each year. On Fort Sill, this butterfly was more abundant than the Hackberry Emperor and adults were seen on almost all transects.

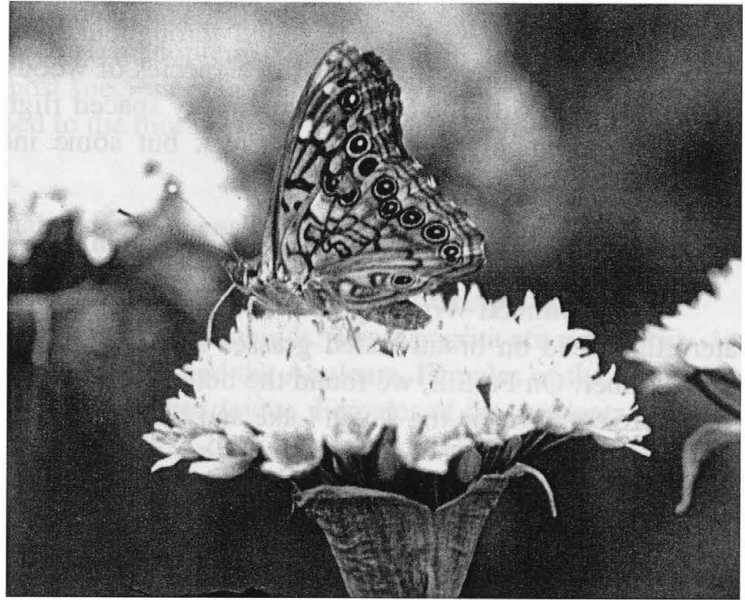


Figure 42. Hackberry Emperors (*Asterocampa celtis*) Nectaring on *Allium*. Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Paul A. Opler.

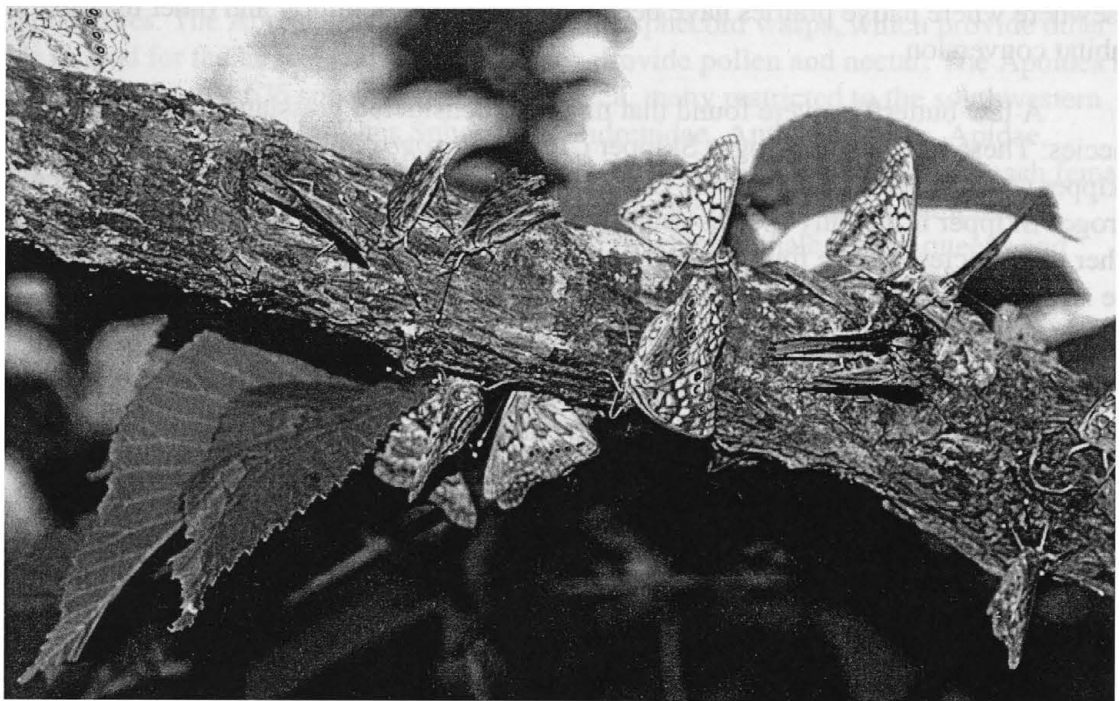


Figure 43. Hackberry Emperors and Tawny Emperors (*Asterocampa celtis* and *A. clyton*) feeding on tree sap. Fort Sill, Comanche Co., Oklahoma. June 2002. Photo copyright by Evi Buckner.

Subfamily Satyrinae [Satyrs]

Megisto cymela Cramer, **Little Wood-satyr**

The Little Wood-satyr is found throughout most of the eastern half of the U.S. and southern Canada, where it is primarily a species of woods and brushland. Its caterpillars feed on grasses. On Fort Sill, there were two closely spaced flights in late April and June. Adults were seen most commonly along Cache Creek but some individuals were found on the LETRA transect.

Cercyonis pegala Fabricius, **Common Wood-nymph**

The Common Wood-nymph is found from coast-to-coast in temperate North America. Its caterpillars feed on broad-leaved grasses and there is but a single long-lasting flight of adults each summer. On Ft. Sill, we found the butterflies common along Cache Creek and West Range. They were common on the Ketch Lake and LETRA transects.

Conservation Assessment

No butterflies found during the survey are federally listed endangered or threatened species. In addition, no butterflies were found that are considered candidates for federal listing. However, one butterfly, *Atrytone arogos* (ssp. *iowa*) was found that is ranked by NatureServe, the former research arm of the Nature Conservancy, as G3-G4 species that is considered to be potentially in need of conservation (Oklahoma Natural Heritage Program web site). This skipper, although found at many sites on Fort Sill (some in abundance as shown by Fig. 23), is rare elsewhere where native prairies have been converted to agricultural and other uses that result in habitat conversion.

A few butterflies were found that might be considered grassland or prairie-adapted species. These include the Arogos Skipper (*Atrytone arogos iowa*) [see above], Delaware Skipper (*Anatrytone logan*), and the Gray Copper (*Lycaena dione*). Among these three, the Arogos Skipper is the only species usually considered to be restricted to native prairies. The other two species may be found in highly disturbed grasslands or in other habitats. At Fort Sill, the Arogos Skipper was found to be both widely distributed and abundant. Apparently, the current management regime is favorable for its long-term continued existence in the area.

Butterflies of other habitats on Fort Sill were found to be of importance at the state level. The Dion Skipper (*Euphyes dion*) was found commonly at the western most part of its range in Oklahoma, and is restricted to slow-moving watercourses on the West Range. The Dotted Roadside-Skipper (*Amblyscirtes eos*), found at 4-mile Crossing, is only the second Oklahoma record. The latter's recently emerged condition indicates it is resident on the Fort.

ACULEATE HYMENOPTERA: (Apoidea, Vespoidea)

The order Hymenoptera includes over 100,000 described species in the world; about 18,000 species are known from North America. This order contains a wide variety of species that

are beneficial as pollinators of plants, and parasites of pest species. The complexity of social behavior of two groups, the bees and the ants, have intrigued humanity for centuries.

Two suborders of Hymenoptera are recognized: the Symphyta or sawflies or plant wasps, and Apocrita or the wasp or thread-waisted Hymenoptera. The first group, Symphyta is a relatively small primitive group, with most species being plant feeders as larvae. In the suborder Symphyta, the abdomen is broadly joined to the thorax in the adults, and the larvae are caterpillar-like.

The suborder Apocrita is a specialized group, easily distinguished as adults by the narrowed connection between abdominal segments 1 and 2. The larvae are “maggot-like,” and are found in concealed or parasitic situations. About 75% of all species of Apocrita are parasitoids during the larval stage of other insects or arachnids. The Apocrita are probably monophyletic and can be divided into the Parasitica and the Aculeata. Females of the Parasitica have an ovipositor that still functions as an egg-laying device. Females of the Aculeata comprise those Hymenoptera whose ovipositor is modified for stinging instead of egg-laying.

The following aculeate super families were treated from Fort Sill: the Apoidea and the Vespoidea (see Table 1 for listing of families).

SUPERFAMILY APOIDEA [Bees]

The superfamily Apoidea includes some of the most familiar bees, such as the honeybee and the bumblebees. The Apoidea also includes both the sphecoid wasps, which provide other arthropods as food for the larvae, and the bees, which provide pollen and nectar. The Apoidea is a large group with about 4,675 species in North America, many restricted to the southwestern U.S. The Apoidea includes the families Sphecidae, Andrenidae, Anthrophoridae, Apidae, Colletidae, Halictidae, and Megachilidae. The majority of the bees are solitary, with each female making her own nest, provisioning the cells, and laying an egg in each. In the Halictidae, Anthrophoridae, and Apidae, eusocial species are found in which female castes, queens and workers exist. There are at least 3,500 species of bees in North America.

Most bees collected during this survey in 2002 are widespread eastern North American species and usually polylege (Appendix A). The taxonomy of the genera *Andrena*, *Megachile*, *Lasioglossum* and *Melissodes* is unsettled, and species determinations were not made. At least 48 species of Apoidea were collected. There is apparently one new state record for Oklahoma for the anthrophorid bee *Centris lanosa* Cresson, previously recorded from Florida, Kansas and Texas. The well-known carpenter bee *Xylocopa virginica* (L.) is common throughout Fort Sill. The species of bumblebees collected and the introduced European honeybee, *Apis mellifera* L., are also common and widespread (Appendix A).

The Sphecidae includes groups such as the digger wasps, sand wasps, mud-daubers, and thread-waisted wasps. This diverse group exhibits extreme variation in size, nesting site choices, and prey. About 1,200 sphecids occur in North America. About 35 species were collected during this study at Fort Sill (Appendix A).

The following are brief summaries of the biology of the important or common genera:

Females of the genus *Astata* provision their nests dug in shallow soil with stinkbugs (Pentatomidae). Members of *Bicyrtes* also provision their single nests with stinkbugs. The “grass carrying wasps” of the genus *Isodontia* nest in hollow cavities, and provision nests with katydids (Tettigoniidae) and crickets (Gryllidae). Similarly, *Sphex* makes multicellular nests in the soil and provisions them with katydids. Species of *Tachysphex* are predators of short-horned grasshoppers (Acrididae) and mantids (Mantidae). The well-known cicada killer, *Sphecius speciosus* Drury prey on cicadas and makes deep, many-celled nests deep in the soil. Fort Sill has at least eight species of cicadas, with several species of *Tibicen*, the preferred prey of this wasp, being common. *Prionyx* species also provision their simple nests in the soil with short-horned grasshoppers. The common genera *Ammophila* and *Podalonia* are caterpillar predators, making shallow, one-celled nests in the soil. Most of the species of *Ectemnius* burrow in soft wood of decaying logs or twigs. Nests are complex and multicelled, and are stocked with flies (Diptera). Members of the genus *Philanthus* are called “bee wolves,” provisioning their many-celled nests with bees. The “mud-dauber” genus *Trypoxylon* includes the well-known spider predator that build characteristic mud nests. *Chalybion californicum* is also a spider predator, using diverse groups of spiders. Nests are made in preexisting holes.

SUPERFAMILY VESPOIDEA [wasps and ants]

The Vespoidea include two of the common groups of stinging Hymenoptera, the paper-nesting wasps and ants. Species of Vespoidea exhibit a complete range of behaviors from solitary to highly social with formation of large colonies and morphological and behavioral cast differentiation. Many are predators, scavengers, or parasites. About 1,950 Vespoidea occur in North America. Families represented at Fort Sill include the Mutillidae (velvet ants), Pompilidae (spider wasps), Scoliididae (scoliids), Tiphiidae (tiphiids), and Vespidae (paper wasps, yellow jackets, hornets, mason wasps, and potter wasps) (Table 1 and Appendix A).

FAMILY TIPHIIDAE, POMPILIDAE, SCOLIIDAE, and VESPIDAE [wasps]

The Tiphiidae are a variable group of wasps, with about 220 North American species. All species are solitary and ectoparasitoids (larvae feed outside) of soil-dwelling beetle larvae. Two geographically widespread and common species were collected at Fort Sill in 2002 (Appendix A).

The Pompilidae or spider wasps include about 285 species in North America. All species are solitary. Each larva develops on single paralyzed spider. At least 14 species of spider wasp were collected during this study (Appendix A), all widespread North American species. Two species of *Dipogon*, *D. papago anomalus* Dreisbach and *D. brevis brevis* Cresson, are considered uncommon, nesting in tree cavities. The two species of *Pepsis* are known as “tarantula hawks” and hunt mygalomorph spiders (tarantulas), paralyze them by stinging, and place them in the spider’s own burrow or a shallow nest dug by the wasp.

The Scoliidae are solitary wasps that are ectoparasitoids of beetle larvae, using scarabs. About 21 species occur in North America, with two common and widespread species recorded from Fort Sill (Appendix A).

The Vespidae are a cosmopolitan family, with many species, occurring in the tropics. Most species are solitary, but many are social. In the solitary species the larvae are predatory, usually on caterpillars. In the social species the larvae are progressively fed by adult females on masticated insects glandular secretions. There are about 315 species, with approximately 23 collected at Fort Sill in 2002 (Appendix A). The majority of species are known as mason or potter wasps. Others, such as the paper wasps (*Polistes* spp.), are well-known for their paper nest building habits and stinging behaviors.

FAMILY FORMICIDAE [ants]

The ants, or Formicidae, are one of the better-known insect groups. Ants have attracted the attention of humanity since the “dim mists of antiquity.” Ants can make up as much as 10% or more of the total biomass of grasslands (Wilson 2000). They are among the major predators, scavengers, and seed harvesters of the insect world. Holldobler and Wilson (1990) provide a comprehensive overview of this family. Young and Howell (1964) list 79 taxa of ants occurring in Oklahoma. The ant fauna of Oklahoma is an interesting mixture of eastern and some western species (Appendix A). At least 27 taxa of ants were collected on Fort Sill in 2002. One new state record (*Paratrechina parvula* (Mayr)) is documented and the occurrence of the rare and apparently imperiled species, *Pogonomyrmex comanche* Wheeler, is noted. Brief accounts for each species are provided below.

Subfamily Dolichoderinae

Dorymyrmex flavus McCook

This small ant nests in soil with small craters in open sunny spaces. Workers feed on honeydew and small arthropods. *Dorymyrmex flavus* is widespread from South Carolina to Illinois to Mexico and California. In Young and Howell (1964), this species is treated as *D. pyramicus* (Roger).

Forelius mccooki (McCook)

This small ant nests under objects or in exposed soil. Workers feed on honeydew and small arthropods. It is a widespread species, known from Texas to Kansas west to California. In Young and Howell (1964), this species is treated as *F. foetida* (Buckley).

Forelius pruinosus (Roger)

This species prefers open habitats to dense shade. It nests in exposed soil or under objects. It has been recorded from New York to Florida to California into Central America. In

Young and Howell (1964), this species is treated as *Iridomyrmex pruininosum analis* (E. Andre). *Forelius pruinosis* is considered one of the most widespread and common ants of Oklahoma.

Linepithema humilis (Mayr) **The Argentine Ant**

This is an introduced species from South America, and not reported from Oklahoma by Young and Howell (1964). It is now widespread from the northeastern U.S. to Florida, west to Illinois, Texas and California. It nests in soil, rotting logs, and debris. Workers tend honeydew excreting insects, and feed on a wide variety of foods, from dead insects to seeds. This ant is often considered a serious household nuisance. In older literature it is included in the genus *Iridomyrmex*.

Tapinoma sessilis (Say)

This is a species of ant that can be found in a wide variety of habitats. It usually nests in the soil under stones. It occurs from eastern Canada to Florida, west to the Pacific Coast and south to California and Mexico. Food is mainly honeydew. It is known as the “Odorous” house ant.

Subfamily Ecitoninae

Neivamyrex nigrescens (Cresson)

This species is widespread and well-known. It ranges from West Virginia to Texas west to California. These ants usually nest in logs or in the ground under stones. Colonies are large, and these ants are highly predaceous. In Young and Howell (1964), this species is treated as *Eciton nigrescens*.

Subfamily Formicinae

Camponotus americanus Mayr

This “carpenter ant” is more common in wooded areas. It nests under objects, usually wood. It is a widespread species known from northeastern North America to the Midwest and south to Texas.

Camponotus castaneus (Latreille)

This species is widespread, from New York to Florida to Texas north to Iowa. It nests in rotting logs and stumps, and in soil. Young and Howell (1964) indicated that *C. castaneus* has only been collected from the southeastern tip of the state.

Camponotus nearcticus Emery

This species is widespread from Canada to Florida west to California and north to Washington. It forms small colonies in dead twigs and branches and under bark. Young and Howell (1964) indicate that this is an uncommon species in Oklahoma.

Camponotus pennsylvanicus (DeGeer)

This is the "large black carpenter ant" that is abundant throughout the State. It nests in decaying or water-damaged wood. Workers feed primarily on other arthropods. A widespread species known from much of eastern North America, and often inadvertently transported to western states.

Formica pallidefulva Latreille

This is a common species that ranges from New England south to Florida, and west to Colorado and Texas. It is the common grassland ant of Fort Sill, nesting in open soil, around bunches of grass, usually bluestem, but also under rocks. It feeds on other insects and honeydew.

Lasius neoniger Emery, **Cornfield Ant**

The well-known cornfield ant tends root feeding aphids. This ant is found through much of the U.S.

Paratrechina parvula (Mayr)

Young and Howell (1964) indicate that this ant may occur in Oklahoma. It has been previously been recorded from Massachusetts south to Florida, west to North Dakota, Nebraska, Kansas, Texas and Arizona. It was found nesting among patches of grass at Fort Sill.

Prenolepis imparis (Say)

This ant ranges from eastern Canada to Florida west to Texas and Nebraska. It is one of the first ants to become active in the spring. The nests are constructed in the soil, usually in moist, shady areas. The favored foods include honeydew and live or dead insects.

Subfamily Myrmicinae

Aphaenogaster tenneseensis (Mayr)

This is a species known from eastern Canada to Florida, west to Minnesota, and south to Oklahoma. This ant may be a temporary parasite of other *Aphaenogaster* spp. It is considered a wood nesting species, and feeds on dead and live insects.

Crematogaster laeviuscula Mayr

A common ant in Oklahoma, it is also known from Texas, Louisiana and Mexico. Colonies are often found in twigs and oak galls.

Crematogaster lineolata (Say)

A species distributed from eastern Canada to Florida west to the Dakotas, Colorado south to Texas. Workers of this species tend and care for aphids. It is a common grassland species nesting among bunches of grass.

Crematogaster punctulata Emery

This is an abundant Great Plains species that tends aphids and coccids. It nests in the ground. Young and Howell (1964) treat this species as *C. lineolata punctulata*.

Pheidole hyatti Emery

This ant is known from Oklahoma and as far west as California. These ants harvest seeds for food, but also may take animal material. It nests in exposed soil sites or under objects.

Pogonomyrmex barbata (F. Smith)

This is a widespread species, known from Arkansas to Louisiana, west to New Mexico and Nevada, and south into Mexico. This species is a well-known harvester ant, which builds characteristic mounds in exposed areas. Workers collect seeds for food. These ants have a painful sting, and are sometimes considered pests of agricultural lands because of their mound building activities.

Pogonomyrmex comanche Wheeler

This is a rare ant, which apparently had a historical range including central Texas, Oklahoma, southcentral Kansas, and eastern Louisiana. Dr. J. L. Cook (personal communication) has indicated that this ant has been recently found only a small area of Texas, with only a few hundred colonies known. *Pogonomyrmex comanche* nests in sandy areas often in close proximity to post-oak groves.

Monomorium minima (Buckley), **Little Black Ant**

This tiny ant nests in exposed soil, under rocks, or in wood. This familiar ant is widespread from Canada to Florida west to California. It is often observed moving in tiny black columns across soil.

Solenopsis geminata (F.)

A common “tramp” species native to the New World, this “fire ant” is known from South Carolina to Florida west to Texas and south into South America. Nests are in the ground in open areas of grasslands. Young and Howell (1964) may have reported this species as *S. xyloni* McCook. The workers are very aggressive and predaceous.

Trachymyrmex septentrionalis (McCook)

This is a species of fungus growing ant, and Young and Howell (1964) indicate this is the only taxon of fungus growing ant in Oklahoma. These ants grow small fungus gardens that they maintain on insect excreta and leaves. This species occurs from New York to Florida, west to Illinois and south to Texas.

FAMILY MUTILLIDAE [velvet ants]

These wasps are parasites of ground nesting bees and wasps. They are referred to as velvet ants because of the ant-like appearance of the females and the silky covering of red, yellow, black or white hair of many species. Females of most species are wingless, whereas males are winged. Males can be observed determinedly flying low over the ground in search of females. Females can be commonly found searching exposed soils for the nests of their hosts. Mutillid larvae attack the cocoon stage of bees or wasps. For example, a Fort Sill species, *Dasymutilla klugii* (Gray) is known to attack the cicada-killer, *Sphecius* (Sphecidae), a common wasp in the area.

Fort Sill supports a rich mutillid fauna of at least 27 species (Appendix A), clearly indicating a rich host source of ground nesting bees and wasps. Several species are considered uncommon (Donald G. Manley, Clemson University, personal communication) throughout their range. These include *Dasymutilla atrifimbriata* Mickel, *D. bollii* (Fox), *D. macra* (Cresson), *D. vandala* Mickel, *Myrmilloides grandiceps* (Blake), and *Timulla rufosignata* (Bradley).

Conservation Assessment

No species of the aculeate superfamilies Apoidea and Vespoidea were found during the survey that is federally listed as a endangered or threatened species. In addition, no aculeate superfamilies Apoidea and Vespoidea were found that are considered candidates for federal listing. However, the harvester ant, *P. comanche* is considered rare and apparently imperiled throughout its former range by ant researchers.

ACKNOWLEDGMENTS

We would like to thank the following people for assisting with this project. Glen Wampler, Natural Resource Administrator, Toni Hodgkins, Natural Resources, Kevin McCurdy, Wildlife Technician, and other members of the Natural Resources and Enforcement Division, Fort Sill provided invaluable assistance during the survey. Phyllis Pineda, National Park Service, Great Sand Dunes National Park and Preserve, for initiating the fieldwork plan and making many of the original arrangements with Fort Sill. David A. Leatherman, Colorado State Forest Service assisted in the field and provided photographs of the study sites. Robert J. Brozka, Research Scientist and Associate Director, Center for Environmental Management of Military Lands, Colorado State University, made this project possible and provided much technical support. Margaret Aunon and James L. Frantz, Center for Environmental Management of Military Lands provided capable financial management of the project.

Literature Cited

- Anderson, R. S. and S. B. Peck. 1985. The Carrion Beetles of Canada and Alaska (Coleoptera: Silphidae and Agyrtidae). The Insects and Arachnids of Canada. Part 13, Publication 1178.
- Alexander, D. H. 1958. A preliminary survey of the Cerambycidae of Oklahoma. Proceedings of the Oklahoma Academy of Sciences. 38: 43-52.
- Baumgartner, F. M. and A. M. Baumgartner. 1992. Oklahoma bird Life. University of Oklahoma Press, Norman.
- Bestelmeyer, B. T., D. Agosti, L. E. Alonso, C. R. F. Brandao, W. L. Brown, Jr., J. H. C. Delabie, and R. Silvestre. 2000. Field techniques for the study of ground-dwelling ants: An overview, description, and evaluation. Pp. 122-144. Ants. Standard Methods for Measuring and Monitoring Biodiversity. D. Agosti, J. D. Majer, L. E. Alonso, and T. R. Schultz (eds). Smithsonian Institution Press, Washington, D. C.
- Bousquet, Y and A. Larochelle. 1993. Catalogue of the Geadephaga (Coleoptera: Trachypachidae, Rhysodidae, Carabidae including Cicindelini) of America North of Mexico. Memoirs of the Entomological Society of Canada 167: 1-397.
- Boyd, H. P. 1985. Pitfall trapping Cicindelidae (Coleoptera) and abundance of *Megacephala virginica* and *Cicindela unipunctata* in the Pine Barrens of New Jersey. Entomological News. 96: 105-108.
- Cartwright, O. L. 1974. *Ataenius*, *Aphotaenius*, and *Pseudoataenius* of the United States and Canada (Coleoptera: Scarabaeidae: Aphodiinae). Smithsonian Contributions to Zoology 154: 1-106.
- Capinera, J.L. and T.S. Sechrist (1982) Grasshoppers (Acrididae) of Colorado: Identification, Biology, and Management. Colorado State University Experiment Station Fort Collins Bulletin No. 584S. 1-161.
- Coppock, S., Jr. 1962. The grasshoppers of Oklahoma (Orthoptera: Acrididae). Oklahoma State University, Experiment Station, Stillwater. Processed Series P-399.
- Curry, B. R. 1970. Climate of Oklahoma. U.S. Department of Commerce/ESSA/Environmental Data Service, Silver Springs, Maryland.
- Drew, W. A. and H. W. Van Cleave. 1961. The tiger beetles of Oklahoma (Cicindelidae). Proceedings of the Oklahoma Academy of Science. 42: 101-122.
- Duck, L. G. and J. B. Fletcher. 1943. The game type map of Oklahoma. Oklahoma Game and Fish Department. Division of Wildlife Restoration, Oklahoma City.

- Ebert, T. A. and B. C. Kondratieff. 1992. Effects of a methamidophos application on *Pasimachus elongatus* LeConte (Coleoptera: Carabidae). *Journal of the Kansas Entomological Society*. 65:151-156.
- Freitag, R. 1999. *Catalogue of the Tiger Beetles of Canada and the United States*. NRC-CNRC Research Press, Ottawa, Canada.
- Holldobler, B. and E. O. Wilson. 1990. *The ants*. Harvard University Press, Cambridge, Massachusetts.
- Hunt, C. B. 1974. *Natural regions of the United States and Canada*. W. H. Freeman Co., San Francisco, California.
- Johnson, F. L., R. A. Thompson, R. Rudman, J. R. Estes, G. D. Schnell, and K. D. Harris. 1990. Floral inventory of Fort Sill, Oklahoma. Oklahoma Biological Survey, University of Oklahoma, Norman.
- Krombein, K. V., P. D. Hurd, Jr. D. R. Smith, and B. D. Burks. 1979. *Catalog of Hymenoptera in America North of Mexico*. Vol. 1. Symphyta and Apocrita (Parasitica). Smithsonian Institution Press, Washington, D.C.
- Krombein, K. V., P. D. Hurd, Jr. D. R. Smith, and B. D. Burks. 1979. *Catalog of Hymenoptera in America North of Mexico*. Vol. 2. Apocrita (Aculeata). Smithsonian Institution Press, Washington, D.C.
- Lanciani, C. A. and D. P. Wojcik. 1991. A high density of *Martineziella dutertrei* (Chalumeau) (Coleoptera: Scarabaeidae) in fire ant foraging areas on a pond edge. *Coleopterist's Bulletin* 45: 278-279.
- Linsley, E. G. 1962a. The Cerambycidae of North America. Part II. Taxonomy and Classification of the Parandrinae, Prioninae, Spondyliinae, and Aseminae. *University of California Publications in Entomology* 19:1-107.
- Linsley, E. G. 1962b. The Cerambycidae of North America. Part III. Taxonomy and Classification of the Subfamily Cerambycinae, Tribes Opsimini Through Megaderini. *University of California Publications in Entomology* 20:1-188.
- Linsley, E. G. 1963. The Cerambycidae of North America. Part IV. Taxonomy and Classification of the Subfamily Cerambycinae, Tribes Elaphidionini Through Rhinotragini. *University of California Publications in Entomology* 21:1-165.
- Linsley, E. G. 1964. The Cerambycidae of North America. Part V. Taxonomy and Classification of the Subfamily Cerambycinae, Tribes Callichromini Through Ancylocerini. *University of California Publications in Entomology* 22:1-197.
- Linsley, E. G. & J. A. Chemsak. 1972. The Cerambycidae of North America. Part VI, No. 1. Taxonomy and Classification of the Subfamily Lepturinae. *University of California Publications in Entomology* 69:1-138.

- Linsley, E. G. & J. A. Chemsak. 1976. The Cerambycidae of North America. Part VI, No. 2. Taxonomy and Classification of the Subfamily Lepturinae. University of California Publications in Entomology 80:1-186.
- Linsley, E. G. & J. A. Chemsak. 1984. The Cerambycidae of North America. Part VII, No. 1. Taxonomy and Classification of the Subfamily Lamiinae. University of California Publications in Entomology 102:1-258.
- Linsley, E. G. & J. A. Chemsak. 1995. The Cerambycidae of North America. Part VII, No. 2. Taxonomy and Classification of the Subfamily Lamiinae, Tribes Acanthocinini through Hemilophini University of California Publications in Entomology 114:1-292.
- Lomolino, M. V., C. Creighton, G. D. Schell, and D. L. Certain. 1995. Ecology and conservation of the endangered American burying beetle (*Nicrophorus americanus*). Conservation Biology 9: 605-614.
- Monne, M. A. and E. F. Giesbert. 1994. Checklist of the Cerambycidae and Disteniidae (Coleoptera) of the Western Hemisphere. Wolfsgarden Books, Burbank, California.
- Nelson, J. C. 1979. A preliminary checklist of the skippers and butterflies of Oklahoma. Proceedings of the Oklahoma Academy of Sciences 59: 41-46.
- New, T. R. 1998. Invertebrate Surveys for Conservation. Oxford University, Oxford, United Kingdom.
- Opler, P. 1998. A field guide to eastern butterflies. The Peterson Field Guide Series, Houghton Mifflin Co., Boston, Massachusetts.
- Opler, P.A. & G.O. Krizek. 1984. Butterflies East of the Great Plains. Johns Hopkins University Press, Baltimore, Maryland
- Opler, P.A., R.E Stanford & H. Pavulaan, coordinators and editors. 2000. Butterflies of North America. Northern Prairie Wildlife Research Center, Jamestown, North Dakota. [updated periodically]
- (<http://www.npwrc.usgs.gov/resource/distr/lepid/bflyusa>)
- Opler, P.A. and A.D. Warren, 2002. Butterflies of North America. 2. Scientific names list for butterfly species of North America, north of Mexico. Contributions of the C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado.
- Otte, D. 1981. The North American grasshoppers. Vol. I. Harvard University Press, Cambridge, Massachusetts.
- Otte, D. 1984. The North American grasshoppers. Vol. II. Harvard University Press, Cambridge, Massachusetts.

- Pearson, D.L. and Cassola F. 1992. World-wide species richness patterns of tiger beetles (Coleoptera: Cicindelidae): Indicator taxon for biodiversity and conservation studies. *Conservation Biology*, 6: 376-391
- Pearson, D. L., T. G. Barraclough and A. P. Vogler. 1997. Distributional maps for North American species of tiger beetles (Coleoptera: Cicindelidae). *Cicindela* 29: 33-84.
- Peck, S. B. and M. M. Kaulbars. 1987. A synopsis of the distribution and bionomics of the carrion beetles (Coleoptera: Silphidae). *Proceedings of the Entomological Society of Ontario*. 118: 47-81.
- Pfadt, R. E. 1994. Field guide to common western grasshoppers. 2nd Ed. Wyoming Agricultural Experiment Station. Bulletin 912.
- Poole, R. W. and P. Gentili. 1996a. *Nomina Insecta Nearctica: A Checklist of the Insects of North America*. Vol. 1. Entomological Information Services, Rockville, Maryland.
- Poole, R. W. and P. Gentili. 1996b. *Nomina Insecta Nearctica: A Checklist of the Insects of North America*. Vol. 2. Entomological Information Services, Rockville, Maryland.
- Poole, R. W. and P. Gentili. 1996c. *Nomina Insecta Nearctica: A Checklist of the Insects of North America*. Vol. 3. Entomological Information Services, Rockville, Maryland.
- Poole, R. W. and P. Gentili. 1997. *Nomina Insecta Nearctica: A Checklist of the Insects of North America*. Vol. 4. Entomological Information Services, Rockville, Maryland.
- Ratcliffe, B. C. 1996. The Carrion Beetles (Coleoptera: Silphidae) of Nebraska. *Bulletin of University of Nebraska State Museum*. 13: 1-100.
- Schultz, T.D. 1998. The utilization of patchy thermal microhabitats by the ectothermic insect predator, *Cicindela sexguttata*. *Ecological Entomology*, 23: 444-450
- Shelford, V.E. 1908. Life-histories and larval habits of the tiger beetles (Cicindelidae). *Linnean Society's Journal-Zoology*, 30: 157-184.
- Spence, J. R. and J. K. Niemela. 1994. Sampling carabid assemblages with pitfall traps: the madness and the method. *Canadian Entomologist* 126: 881-894.
- Thompson, D. C. 1987. Sampling rangeland grasshoppers. Pp.219-233. In. *Integrated Pest Management on Rangeland. A shortgrass Prairie Perspective*. J. L. Capinera (ed). Westview Studies in Insect Biology. Westview Press, Boulder, Colorado.
- Valurie, P. 1960. A revision of the genus *Diplotaxis* (Coleoptera, Scarabaeidae, Melolonthinae). Part 2. *Bulletin of the American Museum of Natural History*. 120: 165-433.
- Yanega, D. 1996. Field guide to northeastern longhorned beetles (Coleoptera: Cerambycidae). *Illinois Natural History Survey Manual* 6. 174 pp.

Young, J. and D. Howell. 1964. Ants of Oklahoma. Oklahoma State University Experiment Station. Miscellaneous Publication MP-71: 1-42.

Wilson, E. O. 2000. Foreword. *In* Ants. Standard methods for measuring and monitoring biodiversity. Agosti, D, J. D. Majer, L. E. Alonso, and T. R. Schultz, eds. Smithsonian Institution Press, Washington, D. C.

Appendix A

Insect Taxa Collected and Locations on Fort Sill, Comanche Co., Oklahoma, 2002, and Any Potential Listings. Hab_Afil=locations collected; Fed Stat=Federal Status, Endangered, Threatened, or Candidate; State Stat=State Status, Endangered, Threatened, or Candidate; HP=Oklahoma State Heritage Program Inventory; No_Spec.=number of specimens collected during sampling.

Order Orthoptera (Grasshoppers, crickets, and katydids) Family Acrididae (Short-horned grasshoppers)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Acrolophitus hirtipes</i> (Say)					
	WR, Signal Mt.				2
<i>Ageneotettix deorum</i> (Scudder)	ER				2
	ER, tall grass				1
	WR, Engineer Pond				2
	WR, LETRA				3
	WR, short grass				7
	WR, Signal Mt.				1
<i>Arphia conspersa</i> (Scudder)	ER, Chatto Crossing				1
	ER, E. Cache Creek- woods				3
	ER, E. Cache Creek-hoyle bridge				1
	ER, mixed grass				1
	ER, NRB				4
	ER, tall grass				2
	WR, LETRA				2
	WR, Signal Mt.				3
<i>Arphia xanthoptera</i> (Burmeister)	ER, Knob Hill Rd.				1
	ER, tall grass				1
	WR, Blue Beaver Cr. & McKenzie Hill Rd.				2
	WR, Engineer Pond				1
	WR, LETRA				1
<i>Boopedon auriventris</i> McNeill	WR, LETRA				2
<i>Boopedon gracile</i> Rehn	ER				2
	ER, E. Cache Creek- woods				2
	WR, 4 mi. crossing- woods				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Campylacantha olivacea</i> (Scudder)	ER, above NRB				1
	ER, E. Cache Creek- woods				2
	ER, mixed grass				3
	ER, tall grass				3
	WR, Engineer Pond				8
	WR, LETRA				1
<i>Chortophaga viridifasciatum</i> (DeGeer)	ER, E. Cache Creek woods				3
	ER, mixed grass				1
	ER, tall grass				19
	WR, Engineer Pond				1
	WR, Signal Mt.				4
<i>Dactyloctenium bicolor</i> (Charpentier)	WR, LETRA				2
<i>Dendrotettix quercus</i> (Packard)	ER, NRB				1
<i>Dissosteira carolinus</i> (Linnaeus)	ER, NRB				1
	WR, Med. Creek				1
<i>Encoptolophus costalis</i> (Scudder)	ER				4
<i>Hadrotettix trifasciatus</i> (Say)	ER, E. Cache Creek- woods				4
	WR, 4 mi. Crossing				1
	WR, Engineer Pond				1
	WR, LETRA				1
	WR, short grass				1
	WR, Signal Mt.				2
<i>Hesperotettix speciosa</i> (Scudder)	ER				2
	ER, E. Cache Creek				1
	ER, Knob Hill Rd.				2
	ER, Parks Hill				1
	ER, tall grass				1
	WR, LETRA				3
	WR, short grass				2
WR, Signal Mt.				2	

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Hesperotettix v. viridis</i> (Thomas)	ER, Pratt Hill				3
	ER, E. Cache Creek- woods				7
	ER, mixed grass				1
	WR, LETRA				2
<i>Hesperotettix viridis pratensis</i> (Thomas)					
	WR, Signal Mt.				1
<i>Hippiscus ocelote</i> (Saussure)					
	ER, mixed grass				2
	WR, Engineer Pond				1
<i>Hypochlora alba</i> (Dodge)					
	ER, above NRB				3
<i>Leptysma marginicollis</i> (Serville)					
	WR, Blue Beaver Cr. & McKenzie Hill Rd.				1
	WR, Engineer Pond				5
<i>Melanoplus angustipennis</i> (Dodge)					
	ER, E. Cache Creek- woods				1
	WR, Engineer Pond				3
	WR, short grass				1
	WR, Signal Mt.				1
<i>Melanoplus bispinosus</i> Scudder					
	ER				2
	ER, E. Cache Creek				1
	ER, Knob Hill Rd.				1
	ER, mixed grass				1
	WR, Blue Beaver Cr. & McKenzie Hill Rd.				3
	WR, Engineer Pond				2
WR, LETRA				3	
<i>Melanoplus bivittatus</i> (Say)					
	ER				1
	ER, mixed grass				4
	WR, short grass				1
<i>Melanoplus confusus</i> Scudder					
	ER, mixed grass				1
	WR, LETRA				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Melanoplus differentialis nigricans</i> (Thomas)	ER, Knob Hill Rd.				2
	ER, mixed grass				1
	ER, tall grass				1
	WR, LETRA				2
<i>Melanoplus femurrubrum</i> (DeGeer)	WR, Engineer Pond				3
<i>Melanoplus foedus</i> Scudder	ER, E. Cache Creek- woods				1
	WR, short grass				1
	WR, Signal Mt.				1
<i>Melanoplus glaucipes</i> (Scudder)	ER, mixed grass				1
	ER, Parks Hill				1
	WR, Engineer Pond				2
	WR, LETRA				1
	WR, short grass				3
<i>Melanoplus keeleri</i> (Thomas)	WR, Blue Beaver Cr. & McKenzie Hill Rd.				1
<i>Melanoplus packardii</i> Scudder	ER, mixed grass				6
	ER, Parks Hill				3
	WR, LETRA				1
	WR, short grass				2
<i>Melanoplus plebejus</i> (Stal)	ER, above NRB				1
	ER, E. Cache Creek- woods				4
	ER, mixed grass				2
	WR				1
<i>Melanoplus ponderosus</i> (Scudder)	ER, E. Cache Creek				4
	ER, Knob Hill Rd.				3
	ER, mixed grass				1
	ER, Parks Hill				1
	ER, tall grass				1
	WR, 4 mi. crossing				1
	WR, Blue Beaver Cr. & McKenzie Hill Rd.				1
	WR, LETRA				2

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Melanoplus sanguinipes</i> (Fabricius)					
	ER, Chatto Crossing				2
	ER, E. Cache Creek				4
	ER, mixed grass				11
	ER, NRB				1
	ER, Parks Hill				2
	ER, Peach Tree Crossing				1
	ER, tall grass				1
	WR, Engineer Pond				1
	WR, LETRA				2
<i>Melanoplus scudderi</i> (Uhler)					
	ER, above NRB				2
	ER, Knob Hill Rd.				1
	WR, Engineer Pond				2
	WR, LETRA				2
<i>Melanoplus splendidus</i> Hebard					
	ER, E. Cache Creek- woods				2
<i>Melanoplus texanus</i> (Scudder)					
	ER, E. Cache Creek- woods				1
	ER, Parks Hill				1
	WR, LETRA				1
	WR, short grass				3
<i>Mermiria bivittata</i> (Serville)					
	ER				4
	ER, E. Cache Creek- woods				4
	ER, Knob Hill Rd.				1
	ER, Parks Hill				2
	WR, Engineer Pond				2
	WR, short grass				1
	WR, short grass				6
<i>Mermiria picta</i> (Walker)					
	ER, tall grass				2
	WR, Engineer Pond				1
<i>Opeia obscurus</i> (Thomas)					
	ER, E. Cache Creek- woods				1
	ER, mixed grass				1
<i>Ophulella speciosus</i> (Scudder)					
	ER, mixed grass				1
	WR, Engineer Pond				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Paratylotropidia brunneri</i> Scudder	ER, E. Cache Creek- woods				1
	ER, tall grass				2
<i>Pardalophora saussurei</i> (Scudder)	ER, mixed grass				1
	WR, short grass				2
<i>Phoetaliotes nebrascensis</i> (Thomas)	ER, Knob Hill Rd.				2
	ER, mixed grass				6
	ER, NRB				1
	ER, tall grass				2
	WR, Engineer Pond				1
<i>Pseudopomala brachyptera</i> (Scudder)	ER, mixed grass				1
<i>Psoloessa texana</i> Scudder	ER, mixed grass				1
	WR, Engineer Pond				1
<i>Schistocerca a. alutacea</i> (Harris)	ER				2
	ER, E. Cache Creek- woods				1
	ER, Knob Hill Rd.				1
	ER, mixed grass				2
	ER, Parks Hill				4
	WR, Engineer Pond				7
	WR, short grass				2
<i>Schistocerca a. americana</i> (Drury)	ER, Knob Hill Rd.				1
	ER, mixed grass				1
	ER, tall grass				4
<i>Schistocerca obscurus</i> (Fabricius)	ER, Knob Hill Rd.				6
	ER, Peach Tree Crossing				1
	WR, Blue Beaver Cr. & McKenzie Hill Rd.				4
	WR, LETRA				1
<i>Spharagemon collaris</i> (Scudder)	ER, mixed grass				1
	WR, Engineer Pond				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Spharagemon equale</i> (Say)					
	ER, E. Cache Creek- woods				1
	ER, mixed grass				1
	WR, 4 mi. Crossing				2
	WR, Blue Beaver Cr. & McKenzie Hill Rd.				1
	WR, Blue Beaver Cr. & McKenzie Hill Rd.				1
	WR, Engineer Pond				3
	WR, LETRA				1
	WR, Signal Mt.				3
<i>Syrbula admirabilis</i> (Uhler)					
	ER, E. Cache Creek- woods				10
	ER, Knob Hill Rd.				3
	ER, mixed grass				4
	ER, NRB				1
	ER, Peach Tree Crossing				2
	ER, tall grass				2
	WR, Blue Beaver Cr. & McKenzie Hill Rd.				1
	WR, Engineer Pond				6
	WR, LETRA				1
<i>Trachyrhachys kiowa</i> (Thomas)					
	ER, E. Cache Creek- woods				1
	ER, mixed grass				4
	WR, LETRA				1
<i>Trimerotropis maritima</i> (Harris)					
	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				3
	ER, NRB				2
	WR, Engineer Pond				1
	WR, LETRA				1
	WR, short grass				1
<i>Trimerotropis pallidipennis</i> (Burmeister)					
	ER, E. Cache Creek- woods				1
	ER, Parks Hill				1
	WR, LETRA				2
<i>Xanthippus corallipes</i> (Haldeman)					
	ER, mixed grass				6
	ER, tall grass				1
	WR, short grass				4
Total Number					438

Order Coleoptera (Beetles)

Family Carabidae (Ground beetles)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Agonum decora</i> (Say)					
	WR, Med. Creek				1
<i>Agonum extensicollis</i> (Say)	ER				3
	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				1
	ER, NRB				3
	WR				3
	WR, LETRA				1
<i>Agonum pallipes</i> (Fabricius)					
	ER, E. Cache Creek				1
	ER, NRB				4
<i>Agonum punctiformis</i> (Say)					
	ER, Apache Gate Rd.				7
	ER, E. Cache Creek				32
	ER, mixed grass				3
	ER, NRB				11
	ER, Parks Hill				8
	ER, Peachtree Crossing				5
	ER, tall grass				2
	WR, LETRA				2
WR, Med. Creek				2	
<i>Amara fortis</i> LeConte					
	WR				1
<i>Amara pennsylvanica</i> Hayward					
	ER				2
	WR				1
	WR, Engineer Pond				1
<i>Amara sp.</i> Bonelli					
	ER, mixed grass				1
	ER, tall grass				1
	WR				1
	WR, LETRA				1
<i>Amphasia sericeus</i> (Harris)					
	ER, E. Cache Creek				1
	ER, NRB				3
	WR				1
	WR, Med. Creek				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Anisodactylus dulcicollis</i> (Laferte)	ER				2
	ER, mixed grass				1
	ER, nr. Geronimo Grave				2
	ER, NRB				1
	ER, tall grass				4
	WR, LETRA				1
	<i>Anisodactylus harpaloides</i> (Laferte)	WR			
<i>Anisodactylus merula</i> (Germar)	WR, LETRA				1
	ER, E. Cache Creek				2
	ER, mixed grass				1
	ER, tall grass				13
<i>Anisodactylus opaculus</i> (LeConte)	ER				3
	ER, E. Cache Creek				1
	ER, NRB				3
	ER, Parks Hill				1
<i>Anisodactylus rusticus</i> (Say)	ER, Chatto Crossing				2
	ER, mixed grass				1
	ER, NRB				1
	ER, tall grass				2
	WR				1
	WR, short grass				2
	<i>Ardistomis schaumii</i> LeConte	WR, LETRA			
<i>Aspidoglossa subangulatus</i> (Chaudoir)	ER, E. Cache Creek				4
	ER, mixed grass				1
	WR, Med. Creek				1
<i>Bembidion americanum</i> Dejean	ER, E. Cache Creek				1
	ER, mixed grass				1
<i>Bembidion chalceum</i> Dejean	WR, LETRA				4
<i>Bembidion confusum</i> Hayward	ER, E. Cache Creek				1
	WR, LETRA				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Bembidion cordatus</i> (LeConte)	WR, Engineer Pond				1
<i>Bembidion coxendix</i> Say	WR, Med. Creek				1
<i>Bembidion texanum</i> Chaudoir	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				3
	ER, mixed grass				6
	WR				1
	WR, LETRA				1
<i>Bembidion variegatum</i> Say	ER, Chatto Crossing				1
<i>Brachinus adustipennis</i> Erwin	ER, E. Cache Creek				1
	WR, LETRA				1
<i>Brachinus alternans</i> Dejean	WR, LETRA				4
<i>Brachinus janthinipennis</i> (Dejean)	WR, Engineer Pond				1
<i>Brachinus phaeocerus</i> Chaudoir	ER, E. Cache Creek				3
	WR				1
	WR, LETRA				3
<i>Brachinus sp.</i> Weber	ER, NRB				1
<i>Brachinus tenuicollis</i> LeConte	ER				1
	ER, Apache Gate Rd.				1
	ER, mixed grass				1
	WR				3
<i>Bradycellus neglectus</i> (LeConte)	ER				1
<i>Calathus opaculus</i> LeConte	ER				1
	ER, E. Cache Creek				7
	ER, mixed grass				12
	ER, NRB				10
	ER, tall grass				6
	WR				4
	WR, LETRA				3

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Calosoma macrum</i> LeConte	ER				2
<i>Calosoma marginalis</i> Casey	ER				1
<i>Calosoma obsoleta</i> Say	WR				1
<i>Calosoma scrutator</i> (Fabricius)	ER				2
	WR				1
<i>Calosoma wilcoxi</i> LeConte	ER				4
<i>Carabus finitimus</i> Haldeman	ER, E. Cache Creek				1
	ER, tall grass				2
	WR				1
	WR, LETRA				1
<i>Chlaenius brevilabris</i> LeConte	ER, Chatto Crossing				1
	ER, E. Cache Creek				2
	ER, NRB				4
	ER, Parks Hill				4
	WR, Signal Mt.				2
<i>Chlaenius erythropus</i> Germar	ER				1
	ER, E. Cache Creek				1
	WR, 4 mi. Crossing				1
	WR, LETRA				1
<i>Chlaenius laticollis</i> Say	WR, LETRA				7
<i>Chlaenius platyderus</i> Chaudoir	ER, tall grass				6
<i>Chlaenius sericeus</i> (Forster)	ER				1
	ER, E. Cache Creek				2
	WR				1
	WR, Engineer Pond				5
	WR, LETRA				1
	WR, Signal Mt.				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Chlaenius tomentosus</i> (Say)	ER, E. Cache Creek				4
	ER, nr. Geronimo grave				1
	ER, NRB				3
	WR, short grass				9
<i>Chlaenius tricolor</i> Dejean	WR, LETRA				1
<i>Clivina dentipes</i> Dejean	ER, E. Cache Creek				2
	ER, mixed grass				1
	ER, NRB				1
	ER, Parks Hill				1
	WR, LETRA				1
<i>Colliuris pensylvanicus</i> (Linnaeus)	ER, NRB				1
<i>Cratacanthus dubius</i> (Beauvois)	ER, E. Cache Creek				1
	ER, mixed grass				3
	ER, nr. Geronimo grave				1
	ER, NRB				5
<i>Cyclotrachelus incisa</i> (LeConte)	ER, mixed grass				3
	ER, NRB				1
	ER, tall grass				1
	WR, Engineer Pond				1
	WR, LETRA				1
	WR, short grass				8
<i>Cyclotrachelus torvus</i> (LeConte)	ER				1
<i>Cyclotrachelus torvus deceptus</i> (Casey)	ER, Chatto Crossing				1
	ER, E. Cache Creek				1
	ER, mixed grass				1
	ER, Parks Hill				1
	ER, tall grass				8
	WR				2
<i>Cymindis laticollis</i> Say	ER				2
	WR				10
	WR, LETRA				1
	WR, short grass				3

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Cymindis pilosus</i> Say	WR				1
<i>Dicaelus elongates</i> Bonelli	ER				2
<i>Diplocheila impressicollis</i> (Dejean)	ER, E. Cache Creek				1
<i>Diplocheila obtusus</i> (LeConte)	ER, E. Cache Creek				1
<i>Discoderus parallelus</i> (Haldeman)	ER, E. Cache Creek				2
	ER, tall grass				2
<i>Discoderus sp.</i> LeConte	ER, E. Cache Creek				1
	ER, mixed grass				1
	ER, NRB				4
	ER, tall grass				3
	WR, short grass				1
<i>Dyschirius erythrocerus</i> LeConte	ER				1
<i>Dyschirius globulosa</i> (Say)	ER, tall grass				1
<i>Galerita bicolor</i> Drury	ER, E. Cache Creek				3
	WR, LETRA				1
<i>Harpalus caliginosus</i> (Fabricius)	ER, E. Cache Creek				1
	ER, NRB				6
	ER, tall grass				4
	WR				5
	WR, LETRA				4
	WR, short grass				2
<i>Harpalus compar</i> LeConte	ER, E. Cache Creek				33
	ER, Knob Hill Rd.				6
	ER, mixed grass				5
	ER, NRB				29
	ER, Parks Hill				1
	ER, tall grass				2
	WR				4
	WR, 4 mi. Crossing				1
	WR, LETRA				42

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
	WR, short grass				7
	WR, Signal Mt.				4
<i>Harpalus faunus</i> Say					
	ER, mixed grass				1
	ER, nr. Geronimo grave				1
<i>Harpalus fulgens</i> Csiki					
	ER, mixed grass				1
	ER, tall grass				2
<i>Harpalus gravis</i> LeConte					
	ER, E. Cache Creek				2
	ER, mixed grass				1
	ER, NRB				1
	ER, tall grass				1
	WR, LETRA				9
<i>Harpalus katiae</i> Battoni					
	ER, E. Cache Creek				7
	ER, NRB				8
	WR, short grass				2
<i>Harpalus laticeps</i> LeConte					
	ER, E. Cache Creek				1
	ER, NRB				1
<i>Harpalus longicollis</i> LeConte					
	ER, E. Cache Creek				4
<i>Helluomorphoides praeustus bicolor</i> (Harris)					
	ER, E. Cache Creek				2
<i>Helluomorphoides texana</i> (LeConte)					
	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				1
	WR, Med. Creek				1
<i>Lachnophorus elegantulus</i> Mannerheim					
	ER, E. Cache Creek				4
	WR				1
<i>Lebia grandis</i> Hentz					
	ER, Apache Gate Rd.				7
	ER, NRB				2
<i>Lebia pulchella</i> Dejean					
	WR, Med. Creek				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Lebia viridis</i> Say	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				3
	ER, mixed grass				1
	WR, Med. Creek				2
<i>Notiobia maculicornis</i> (Chaudoir)	ER, Apache Gate Rd.				1
	ER, NRB				1
	WR				1
	WR, Med. Creek				1
<i>Notiobia sayi</i> (Blatchley)	ER, E. Cache Creek				2
	ER, NRB				1
<i>Notiobia terminata</i> (Say)	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				26
	ER, Knob Hill Rd.				2
	ER, mixed grass				1
	ER, NRB				20
	WR, LETRA				8
	WR, Med. Creek				1
<i>Omophron americanum</i> Dejean	WR, Engineer Pond				1
	WR, LETRA				2
<i>Oodes amaroides</i> Dejean	ER, E. Cache Creek				1
	ER, NRB				1
<i>Panagaeus fasciatus</i> Say	ER, Apache Gate Rd.				1
	ER, mixed grass				3
	ER, NRB				1
	ER, Parks Hill				1
	ER, tall grass				1
<i>Pasimachus californicus</i> Chaudoir	ER				1
	ER, E. Cache Creek				2
	ER, tall grass				2
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				3
	WR, LETRA				1
	WR, Signal Mt.				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Pasimachus elongates</i> LeConte	ER				2
	ER, mixed grass				3
	ER, tall grass				3
	WR				1
<i>Poecilus chalcites</i> (Say)	ER				1
	ER, Apache Gate Rd.				13
	ER, E. Cache Creek				2
	ER, mixed grass				5
	ER, NRB				6
	ER, tall grass				1
	WR, LETRA				1
	WR, short grass				1
<i>Poecilus lucublanda</i> (Say)	ER, E. Cache Creek- Hoyle Bridge				1
<i>Pogonodaptus mexicana</i> (Bates)	WR, LETRA				2
<i>Pterostichus permunda</i> (Say)	ER, E. Cache Creek				4
	ER, NRB				1
	ER, tall grass				2
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				1
	WR, Med. Creek				1
	WR, short grass				1
<i>Scaphinotus cavicollis</i> (LeConte)	WR, LETRA				1
<i>Scaphinotus elevatus</i> (Fabricius)	ER, tall grass				1
<i>Scarites</i> sp. Fabricius	ER, NRB				1
<i>Scarites subterraneus</i> Fabricius	WR				1
<i>Schizogenius falli</i> Whitehead	ER, mixed grass				4
<i>Selenophorus ellipticus</i> Dejean	ER				2
	ER, mixed grass				1
	ER, tall grass				5
<i>Selenophorus pedicularis</i> Dejean	ER				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Semiardistomis viridis</i> (Say)	ER, Apache Gate Rd.				1
	ER, NRB				1
<i>Stenolophus conjunctus</i> (Say)	ER, mixed grass				2
<i>Stenolophus dissimilis</i> Dejean	ER, E. Cache Creek				7
	ER, mixed grass				3
	ER, NRB				9
	ER, tall grass				2
	WR, Engineer Pond				1
	WR, LETRA				1
	WR, Med. Creek				1
	WR, Punch Bowl Rd.				1
<i>Stenolophus lecontei</i> (Chaudoir)	ER, E. Cache Creek				3
	ER, Parks Hill				1
	WR, Med. Creek				1
<i>Stenolophus lineola</i> (Fabricius)	ER, Apache Gate Rd.				2
	ER, NRB				2
	WR, short grass				1
<i>Stenolophus ochropeza</i> (Say)	ER				1
	ER, E. Cache Creek				1
	WR, Engineer Pond				3
	WR, LETRA				10
	WR, Med. Creek				1
<i>Stenolophus sp.</i> Dejean	ER, tall grass				1
<i>Stenomorphus californicum rufipes</i>	LeConte				
	ER, Apache Gate Rd.				14
	ER, E. Cache Creek				2
	ER, mixed grass				3
	ER, NRB				1
<i>Zuphium americanum</i> Dejean	ER, E. Cache Creek				1
Total Number					868

Family Cicindelidae (Tiger beetles)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Cicindela belfragei</i> (Salle)	ER, E. Cache Creek- woods				27
	ER, mixed grass				3
	ER, nr. Geronimo Grave				8
	ER, Rd. to Parks Hill				10
<i>Cicindela cleripes</i> LeConte	ER, E. Cache Creek- woods				1
<i>Cicindela duodecimguttata</i> Dejean	ER, E. Cache Creek				3
	ER, Peach Tree Crossing				16
	WR				1
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				3
	WR, Engineer Pond				1
<i>Cicindela hirticollis</i> Say	WR, Engineer Pond				1
<i>Cicindela punctulata</i> Olivier	ER, E. Cache Creek				2
	ER, mixed grass				15
	ER, NRB				2
	ER, Peach Tree Crossing				1
	ER, tall grass				2
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				2
	WR, Engineer Pond				1
	WR, Med. Creek				1
	WR, short grass				6
<i>Cicindela repanda</i> Dejean	ER				2
	ER, E. Cache Creek				1
	ER, Peach Tree Crossing				32
	WR, Engineer Pond				2
<i>Cicindela sexguttata</i> Fabricius	ER				7
	ER, Chatto Crossing				3
	ER, E. Cache Creek- Woods				5
<i>Cicindela splendida</i> Hentz	ER				2
	ER, mixed grass				1
<i>Cicindela trifasciata</i> Fabricius	WR, Engineer Pond				22

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Megacephala carolina</i> (Linnaeus)					
	ER, W. of Pig Farm- street lights				1
<i>Megacephala virginica</i> (Linnaeus)					
	ER, NRB				1
	ER, Pig Farm- malaise trap				1
	ER, tall grass				1
Total Number					187

Family Silphidae (Carrion beetles)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Necrodes surinamensis</i> (Fabricius)					
	ER, Apache Gate Rd.				1
	ER, mixed grass				1
	WR, Signal Mt.				1
<i>Nicrophorus orbicollis</i> Say					
	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				4
	WR				1
<i>Nicrophorus pustulatus</i> Hersch					
	ER				1
	ER, E. Cache Creek				3
<i>Oiceoptoma inaequalis</i> (Fabricius)					
	ER				1
	WR				1
	WR, Engineer Pond				2
Total Number					17

Family Cerambycidae (Longhorned beetle)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Ataxia hubbardi</i> Fisher					
	ER, Apache Gate Rd.				2
	ER, NRB				1
<i>Batyle ignicollis</i> (Say)					
	ER, Chatto Crossing				1
	ER, mixed grass				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Batyle suturalis cylindrella</i> Casey	ER				3
	ER, Chatto Crossing				1
	ER, mixed grass				2
	ER, NRB				3
	ER, Parks Hill				1
<i>Crossidius d. discoideum</i> (Say)	WR, LERTA				8
	ER, Apache Gate Rd.				1
<i>Ecyrus dasycerus</i> (Say)	ER, E. Cache Creek				1
	WR				3
<i>Euderces reichei</i> LeConte	WR				11
	ER, NRB				1
<i>Graphisurus triangulifer</i> (Haldeman)	WR				1
	WR				1
<i>Hemierana marginata ardens</i> LeConte	WR				4
	ER, Apache Gate Rd.				1
<i>Hippopsis lemniscata</i> (Fabricius)	ER, NRB				1
	ER				1
<i>Knolliana c. cincta</i> (Drury)	ER				1
	ER				1
<i>Leptostylopsis transverses</i> (Gyllenhal)	WR, LETRA				1
	WR, short grass				1
<i>Mecas cana saturnine</i> (LeConte)	ER, tall grass				1
	WR				2
<i>Mecas pergrata</i> (Say)	ER, mixed grass				2
	ER, Parks Hill				2
<i>Molorchus bimaculatus</i> Say	ER				4
	WR				2

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Neoclytus m. mucronatus</i> (Fabricius)					
	ER, E. Cache Creek- Hoyl Bridge				1
<i>Oberea ocellata</i> Haldeman					
	ER, tall grass				1
	WR, short grass				1
<i>Oberea oculaticollis</i> (Say)					
	ER, Chatto Crossing				1
<i>Obrium rufulum</i> Gahan					
	ER, E. Cache Creek				1
<i>Oncideres cingulata</i> (Say)					
	ER, E. Cache Creek				1
<i>Plectrodera scalator</i> (Fabricius)					
	ER, E. Cache Creek				3
<i>Saperda tridentata</i> Olivier					
	ER				1
	ER, Apache Gate Rd.				2
	ER, NRB				2
	WR, Punch Bowl Rd.				1
<i>Smodicum cucujiforme</i> (Say)					
	ER, E. Cache Creek				2
<i>Stenosphenus notatus</i> (Olivier)					
	ER				1
	WR				1
<i>Sternidius variegatus</i> (Haldeman)					
	ER, Apache Gate Rd.				1
<i>Strangalia sexnotata</i> Haldeman					
	ER				6
	ER, Chatto Crossing				3
	ER, E. Cache Creek				1
	ER, mixed grass				13
	WR, LETRA				2
<i>Strangalia virilis</i> LeConte					
	WR				4
<i>Tetraopes texanus</i> Horn					
	ER, E. Cache Creek				2
	ER, mixed grass				1
	ER, tall grass				4
	WR				1
	WR, short grass				4
	WR, Signal Mt.				3

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Trigonarthris atrata</i> (LeConte)	ER				3
	ER, mixed grass				2
	WR				7
<i>Typocerus confluens</i> Casey	ER				4
	ER, Chatto Crossing				1
	ER, mixed grass				19
	ER, Parks Hill				5
	ER, tall grass				4
	WR, Signal Mt.				2
<i>Typocerus octonotata</i> (Haldeman)	ER				25
	ER, Chatto Crossing				18
	ER, E. Cache Creek				1
	ER, mixed grass				27
	ER, Parks Hill				2
	ER, tall grass				5
	WR, LETRA				3
	WR, short grass				1
	WR, Signal Mt.				1
<i>Typocerus velutina nobilis</i> (Newman)	ER, E. Cache Creek				1
Total Number				258	

Superfamily Scarabaeoidea (Scarab beetles and allies)

Family Scarabaeidae (Scarab beetles)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Anomala flavipennis</i> Burmeister	ER, E. Cache Creek				7
	ER, mixed grass				1
	ER, NRB				1
	ER, Parks Hill				1
<i>Anomala innuba</i> (Fabricius)	ER, Apache Gate Rd.				6
	ER, E. Cache Creek				2
	ER, mixed grass				12
	ER, NRB				11

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
	WR, Med. Creek				13
	WR, Punch Bowl Rd.				7
<i>Anomala marginata</i> (Fabricius)	WR, Med. Creek				2
<i>Aphodius rubeolus</i> Beauvois	ER, E. Cache Creek				1
<i>Aphodius rusicola</i> Melsheimer	ER, E. Cache Creek				2
<i>Ataenius cognata</i> (LeConte)	WR, short grass				1
<i>Ataenius figurator</i> Harold	ER, E. Cache Creek				1
	ER, Parks Hill				1
	WR				2
	WR, LETRA				1
	WR, short grass				1
<i>Ataenius gracilis</i> (Melsheimer)	ER, E. Cache Creek				2
	WR				1
<i>Ataenius hesperius</i> Cartwright	WR				1
<i>Ataenius inquisitus</i> Horn	ER, NRB				1
<i>Ataenius spretulus</i> (Haldeman)	ER, mixed grass				1
	WR, short grass				2
<i>Ataenius strigatus</i> (Say)	ER, E. Cache Creek				2
	ER, NRB				4
<i>Ateuchus histerooides</i> Weber	ER, Chatto Crossing				1
	ER, E. Cache Creek				4
	ER, mixed grass				5
	ER, Parks Hill				2
<i>Canthon perplexus</i> LeConte	ER, E. Cache Creek				1
<i>Canthon pilularium</i> (Linnaeus)	ER				1
	ER, Chatto Crossing				1
	ER, E. Cache Creek				2
	ER, mixed grass				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
	ER, NRB				1
	WR, Engineer Pond				1
<i>Canthon viridis</i> (Beauvois)					
	ER, mixed grass				1
<i>Cotinis nitidus</i> (Linnaeus)					
	ER, NRB				1
<i>Cyclocephala hirta</i> LeConte					
	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				9
	ER, NRB				8
	ER, Parks Hill				1
	WR, Med. Creek				2
	WR, Punch Bowl Rd.				1
<i>Cyclocephala melanocephala</i> (Fabricius)					
	ER, E. Cache Creek				3
<i>Diplotaxis frondicola</i> (Say)					
	ER, Apache Gate Rd.				3
	ER, NRB				4
	WR, Med. Creek				1
<i>Diplotaxis harperi</i> Blanchard					
	ER, mixed grass				1
	ER, NRB				3
	WR, Med. Creek				1
<i>Diplotaxis maura</i> Fall					
	ER, Apache Gate Rd.				1
	ER, NRB				3
	WR, Med. Creek				1
<i>Diplotaxis truncatula</i> LeConte					
	ER, NRB				1
	WR, Med. Creek				1
	WR, Punch Bowl Rd.				1
<i>Dyscinetus morator</i> (Fabricius)					
	ER, Apache Gate Rd.				4
	ER, mixed grass				2
	ER, Parks Hill				1
	WR				1
	WR, Med. Creek				7
<i>Euetheola humilis</i> (Burmeister)					
	ER, Apache Gate Rd.				2
	WR, Engineer Pond				1
	WR, LETRA				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Euphoria kerni</i> Haldeman	ER, E. Cache Creek				2
	ER, mixed grass				1
	ER, tall grass				1
	WR				8
	WR, short grass				1
<i>Euphoria sepulcralis</i> (Fabricius)	ER				1
	ER, mixed grass				6
	ER, tall grass				4
	WR, short grass				1
<i>Ligyris gibbosus</i> (DeGeer)	ER, Apache Gate Rd.				1
	WR, Med. Creek				1
<i>Martineziella dutertrei</i> (Chalumeau)	WR, LETRA				1
<i>Onthophagus gazella</i> (Fabricius)	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				2
	ER, NRB				1
	WR, LETRA				4
	WR, LETRA				4
<i>Onthophagus hecate</i> (Panzer)	ER				1
	ER, E. Cache Creek				2
	ER, tall grass				1
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				5
<i>Onthophagus orpheus</i> (Panzer)	ER, E. Cache Creek				1
	WR, LETRA				1
<i>Parastasia brevipes</i> (LeConte)	ER, NRB				2
<i>Pelidnota punctatus</i> (Fabricius)	ER, E. Cache Creek				4
	ER, NRB				7
	ER, Parks Hill				1
	WR, Med. Creek				1
	WR, Signal Mt.				1
<i>Phanaeus vindex</i> MacLeay	WR				1
	WR, Engineer Pond				1

<i>Phileurus valgus</i> (Linnaeus)	ER, E. Cache Creek	1
	ER, NRB	1
<i>Phyllophaga crenulata</i> (Froelich)	ER, E. Cache Creek	1
	ER, NRB	1
<i>Phyllophaga cribrosa</i> (LeConte)	ER, NRB	1
	ER, Parks Hill	1
<i>Phyllophaga crinita</i> (Burmeister)	ER .	1
	ER, Apache Gate Rd.	17
	ER, E. Cache Creek	1
	ER, mixed grass	7
	ER, NRB	27
	WR, Med. Creek	23
	WR, short grass	5
<i>Phyllophaga forbesi</i> Glasgow	ER, E. Cache Creek	1
	ER, NRB	1
<i>Phyllophaga lanceolata</i> (Say)		
	ER, mixed grass	1
<i>Phyllophaga rubiginosa</i> (LeConte)	ER, Apache Gate Rd.	3
	ER, E. Cache Creek	3
	ER, mixed grass	2
	ER, NRB	5
	WR, Med. Creek	2
<i>Phyllophaga submucida</i> (LeConte)	ER, Apache Gate Rd.	1
	ER, Parks Hill	2
	WR, Med. Creek	6
<i>Phyllophaga torta</i> (LeConte)	ER, E. Cache Creek	17
	ER, NRB	17
	ER, Parks Hill	1
	WR, 4mi Crossing	2
	WR, Med. Creek	3
	WR, short grass	7
<i>Polyphylla hammondi</i> LeConte	WR, Punch Bowl Rd.	1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Strigoderma arvicola</i> (Fabricius)	ER, E. Cache Creek				3
	WR				18
	WR, Med. Creek				1
<i>Trichiotinus texanus</i> (Horn)	ER				2
	ER, E. Cache Creek				1
	ER, mixed grass				4
	ER, tall grass				2
	WR				18
	WR, short grass				2
<i>Trigonopeltastes delta</i> (Forster)	ER, Chatto Crossing				1
	ER, E. Cache Creek				1
Total Number					458

Family Ceratocanthidae (The pill scarab beetles)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Germarostes aphodioides</i> (Illiger)	ER, E. Cache Creek				1
<i>Germarostes globosus</i> (Say)	ER, E. Cache Creek				4
Total Number					5

Family Geotrupidae (Earth-boring scarab beetle)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Bolbocerosoma pusillum</i> Dawson and McCollock	ER, E. Cache Creek				1
	ER, Parks Hill				1
<i>Geotrupes opacus</i> Haldeman	WR, Engineer Pond				8
Total Number					10

Family Hybosoridae (Scavenger scarab beetles)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Hybosorus illigeri</i> Reiche					
	ER				1
	ER, Apache Gate Rd.				8
	ER, E. Cache Creek				2
Total Number					11

Family Ochodaeidae (Sand-loving scarab beetles)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Ochodaeus biarmatus</i> LeConte					
	ER, NRB				1
	WR, LETRA				1
	WR, Punch Bowl Rd.				1
Total Number					3

Family Trogidae (Hide beetles)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Trox robinsoni</i> Vaurie					
	ER, E. Cache Creek				2
<i>Trox spinulosus</i> Robinson					
	ER, Apache Gate Rd.				1
	ER, E. Cache Creek				1
	ER, mixed grass				3
	ER, Parks Hill				3
	WR, short grass				1
<i>Trox suberosus</i> Fabricius					
	ER, Apache Gate Rd.				1
<i>Trox variolats</i> Melsheimer					
	ER, NRB				2
Total Number					14

Order Hymenoptera (Sawflies, parasitic wasps, ants, wasps, bees)

Superfamily Vespoidea

Family Tiphidae (Tiphid wasps)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Myzinum quinquecincta</i> (Fabricius)	ER				1
	ER, mixed grass				2
	ER, NRB				1
	ER, tall grass				5
	WR				2
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				1
	WR, short grass				1
<i>Tiphia sp.</i> Fabricius					
	ER, mixed grass				1
Total Number					14

Family Mutillidae (Velvet ants)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Dasymutilla atrifimbriata</i> Mickel					
	ER, E. Cache Creek				1
<i>Dasymutilla bollii</i> (Fox)					
	ER, E. Cache Creek				1
	ER, mixed grass				1
<i>Dasymutilla creusa</i> (Cresson)					
	ER, E. Cache Creek				1
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				1
<i>Dasymutilla electra</i> (Blake)					
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				2
<i>Dasymutilla gorgon</i> (Blake)					
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				2
	WR, LETRA				1
	WR, short grass				2
<i>Dasymutilla klugii</i> (Gray)					
	ER				2
	ER, E. Cache Creek				1
	WR				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
		WR, Blue Beaver Cr. @ McKenzie Hill Rd.			5
		WR, short grass			1
<i>Dasymutilla leda</i> (Blake)		WR, short grass			1
<i>Dasymutilla macra</i> (Cresson)		ER, mixed grass			1
<i>Dasymutilla nitidula</i> Mickel		ER, E. Cache Creek			2
<i>Dasymutilla occidentalis</i> (Linnaeus)		ER			2
		ER, E. Cache Creek			2
<i>Dasymutilla quadriguttata</i> (Say)		ER, NRB			1
<i>Dasymutilla scaevola</i> (Blake)		ER, NRB			1
		WR, Signal Mt.			1
<i>Dasymutilla vandala</i> Mickel		ER, E. Cache Creek			1
<i>Dasymutilla vesta</i> (Cresson)		WR, Blue Beaver Cr. @ McKenzie Hill Rd.			1
<i>Dasymutilla vestita</i> (Lepelletier)		ER, E. Cache Creek			1
		WR, Blue Beaver Cr. @ McKenzie Hill Rd.			2
<i>Dasymutilla waco</i> (Blake)		ER, E. Cache Creek			2
		ER, mixed grass			1
		WR, Blue Beaver Cr. @ McKenzie Hill Rd.			2
<i>Dasymutilla zelaya</i> (Blake)		WR			1
		WR, Blue Beaver Cr. @ McKenzie Hill Rd.			1
		WR, LETRA			1
		WR, Signal Mt.			1
<i>Myrmilloides grandiceps</i> (Blake)		ER, E. Cache Creek			1
<i>Odontophotopsis</i> sp. Viereck		ER, E. Cache Creek			1
		ER, NRB			2
		WR, Med. Creek			1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Photomorphus sp.</i> Viereck	ER, mixed grass				1
	ER, NRB				1
<i>Pseudomethoca oceola</i> (Blake)	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				3
<i>Sphaerophthalma auripilis</i> (Blake)	ER, NRB				1
<i>Sphaerophthalma imperialiformis</i> (Viereck)	ER, Apache Gate Rd.				1
	ER, NRB				1
	WR, 4mi Crossing				1
	WR, short grass				1
<i>Sphaerophthalminae</i>	ER, Apache Gate Rd.				2
	ER, E. Cache Creek				2
	ER, NRB				3
<i>Timulla dubitata</i> (Smith)	ER, E. Cache Creek				1
	ER, Rd. to Parks Hill				1
	ER, tall grass				1
<i>Timulla rufosignata</i> (Bradley)	ER, mixed grass				5
	ER, NRB				1
<i>Timulla vagans</i> (Fabricius)	ER				1
Total Number					79

Family Pompilidae (Spider wasps)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Anoplius americanus</i> (Beauvois)	ER, E. Cache Creek				2
<i>Anoplius cleora</i> (Banks)	ER				1
<i>Anoplius lepidus atramentarius</i> (Dahlbom)	ER, E. Cache Creek				2
	WR, Engineer Pond				1
	WR, LETRA				1
	ER, tall grass				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				1
	WR, short grass				1
<i>Anoplius marginatus</i> (Say)					
	ER, tall grass				1
<i>Aporinellus fasciatus</i> (Smith)					
	ER, E. Cache Creek				1
<i>Dipogon b. brevis</i> (Cresson)					
	ER, NRB				1
<i>Dipogon papago anomalus</i> Dreisbach					
	ER, Knob Hill				1
<i>Entypus fulvicornis</i> (Cresson)					
	ER				1
	ER, E. Cache Creek				1
	ER, mixed grass				2
	ER, NRB				1
	ER, tall grass				3
	WR				1
	WR, Engineer Pond				1
<i>Entypus texanus</i> (Cresson)					
	ER, Hoyle Bridge				1
<i>Pepsis mildei</i> Stal					
	ER, NRB				1
	WR, Engineer Pond				1
	WR, LETRA				1
<i>Pepsis thisbe</i> Lucas					
	WR, short grass				1
<i>Phanagenia bombycinus</i> (Cresson)					
	ER, E. Cache Creek				5
	ER, NRB				1
	WR, Blue Beaver Creek				
<i>Poecilopompilus interrupta</i> (Say)					
	ER, tall grass				1
<i>Prionocnensus nigricans</i> Townes					
	ER, E. Cache Creek				1
<i>Psorthaspis legata</i> (Cresson)					
	WR				1
Total Number					39

Family Scoliidae (Scoliid wasps)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Campsomeris plumipes</i> (Drury)	ER				2
<i>Trielis octomaculata</i> (Say)	ER				3
Total Number					5

Family Vespidae (Paper wasps, yellow jackets, hornets, potter wasps)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Ancistrocerus catskill</i> (Saussure)	ER				1
	WR				1
<i>Eumenes bollii</i> Cresson	WR				1
<i>Eumenes fraternal</i> Say	ER, E. Cache Creek				3
	ER, tall grass				1
	WR				2
<i>Eumenes smithii</i> Saussure	ER, mixed grass				2
	ER, Parks Hill				1
	ER, tall grass				1
	WR				1
	WR, LETRA				1
<i>Euodynerus annulatus</i> (Say)	ER				4
	ER, E. Cache Creek				1
	ER, mixed grass				1
	WR				6
	WR, LETRA				1
<i>Euodynerus annulatus arvensis</i> (Saussure)	ER, Chatto Crossing				2
	ER, E. Cache Creek				3
	ER, mixed grass				1
<i>Euodynerus castigatus</i> (Saussure)	ER				1
	ER, Chatto Crossing				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
	ER, mixed grass				1
	WR				3
<i>Euodynerus crypticus</i> (Say)					
	ER				1
	WR				2
<i>Euodynerus foraminatus</i> (Saussure)					
	ER				1
	WR				5
<i>Euodynerus megaera</i> (Lepeletier)					
	WR				1
<i>Euodynerus pratensis</i> (Saussure)					
	WR				1
<i>Euodynerus sp.</i> Dalla Torre					
	ER, mixed grass				1
<i>Manobia quadridens</i> (Linnaeus)					
	ER, Chatto Crossing				1
	ER, E. Cache Creek				1
	WR				4
	WR, LETRA				1
	WR, short grass				1
<i>Parancistrocerus pedestris</i> (Saussure)					
	ER				1
<i>Polistes carolina</i> (Linnaeus)					
	ER				3
	ER, tall grass				1
	WR				1
	WR, Engineer Pond				1
<i>Polistes fuscata</i> (Fabricius)					
	ER				3
	ER, E. Cache Creek				2
	ER, tall grass				1
	WR				1
	WR, short grass				1
<i>Polistes metrica</i> Say					
	ER				1
	ER, Chatto Crossing				1
	ER, E. Cache Creek				2
	ER, tall Grass				1
	WR				1
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Pseudodynerus quadrisectus</i> (Say)					
	ER, E. Cache Creek				1
<i>Stenodynerus anormis</i> (Say)					
	ER, Chatto Crossing				1
<i>Stenodynerus histrionalis</i> (Robertson)					
	WR, short grass				1
<i>Stenodynerus microstictus</i> (Viereck)					
	ER				1
	WR				1
<i>Symmorphus canadensis</i> (Saussure)					
	ER				1
Total Number					89

Family Formicidae (Ants)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Aphaenogaster tennesseensis</i> (Mayr)					
	ER				4
	ER, E. Cache Creek				14
	ER, mixed grass				6
<i>Camponotus americanus</i> Mayr					
	ER				2
	ER, NRB				5
	WR				13
	WR, LETRA				5
	WR, Med. Creek				2
<i>Camponotus castaneus</i> (Latreille)					
	ER				7
	ER, NRB				1
<i>Camponotus nearcticus</i> Emery					
	WR				2
	WR, LETRA				1
<i>Camponotus pennsylvanicus</i> (DeGeer)					
	WR, Med. Creek				2
	ER				11
<i>Camponotus pennsylvanicus</i> (DeGeer)					
	ER, mixed grass				4
	ER, NRB				1
	WR				2
	WR, Med. Creek				1
<i>Camponotus pennsylvanicus</i> (DeGeer)					
	WR, short grass				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Crematogaster laeviuscula</i> Mayr	ER				4
	ER, NRB				6
	WR				1
	WR, Med. Creek				5
	WR, Med. Creek @ 4 mi Crossing				3
<i>Crematogaster lineolata</i> (Say)	ER				4
	ER, mixed grass				5
	ER, tall grass				3
	WR				7
	WR, LETRA				3
	WR, Med. Creek @ 4 mi Crossing				1
<i>Crematogaster punctulata</i> Emery	ER, mixed grass				8
	ER, tall grass				7
	WR, LETRA				11
<i>Dorymyrmex flavus</i> McCook					
	ER, mixed grass				4
<i>Forelius mccooki</i> (McCook)					
	ER, mixed grass				2
<i>Forelius pruinosus</i> (Roger)					
	ER				1
	ER, mixed grass				6
	WR				3
	WR, LETRA				5
<i>Formica pallidefulva</i> Latreille					
	ER				26
	ER, mixed grass				13
	ER, NRB				12
	ER, tall grass				19
	ER, tall grass				4
	WR				2
	WR, Engineer Pond				1
<i>Formica sp.</i> Linnaeus					
	WR, Med. Creek @ 4 mi Crossing				2
<i>Lasius neoniger</i> Emery					
	ER, tall grass				15
<i>Linepithema humilis</i> (Mayr)					
	ER, tall grass				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Monomorium minima</i> (Buckley)	ER				5
	ER, mixed grass				33
	ER, tall grass				3
	WR, short grass				6
<i>Neivamyrmex nigrescens</i> (Cresson)	WR, LETRA				1
<i>Neivamyrmex sp.</i> Borgmeier	ER, E. Cache Creek				2
<i>Paratrechina parvula</i> (Mayr)	ER, mixed grass				1
<i>Pheidole hyatti</i> Emery	ER, mixed grass				12
<i>Pheidole sp.</i> Westwood	ER, E. Cache Creek				1
	ER, mixed grass				1
	ER, NRB				6
	WR, short grass				1
<i>Pogonomyrmex barbata</i> (Smith)	ER				1
	ER, E. Cache Creek				10
	WR				30
<i>Pogonomyrmex comanche</i> Wheeler	WR				11
<i>Prenolepis imparis</i> (Say)	ER				9
	WR, LETRA				9
<i>Solenopsis geminata</i> (Fabricius)	WR				10
	WR, Med. Creek				10
<i>Tapinoma sessilis</i> (Say)	ER, tall grass				1
<i>Trachymyrmex septentrionalis</i> (McCook)	ER, mixed grass				5
Total Number					438

Superfamily Apoidea

Family Sphecidae (Sphecid wasps, cicada killers, sand wasps, mud daubers)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Ammophila cleopatra</i> Menke	WR, 4mi Crossing				1
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				1
<i>Ammophila juncea</i> Cresson	ER, mixed grass				1
<i>Ammophila pictipennis</i> Walsh	ER, Chatto Crossing				1
	ER, mixed grass				1
	WR, LETRA				1
	WR, short grass				1
<i>Ammophila procera</i> Dahlbom	WR				3
	WR				1
	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				1
	WR, LETRA				1
	WR, short grass				1
<i>Ammophila strenua</i> Cresson	ER, E. Cache Creek				1
<i>Ammophila urnalia</i> Dahlbom	ER, E. Cache Creek				2
<i>Astata bechteli</i> Parker	ER, E. Cache Creek				1
<i>Astata unicolor</i> Say	ER, tall grass				1
<i>Bicyrtes quadrifasciata</i> (Say)	ER, E. Cache Creek				1
<i>Cerceris bicornuta</i> Guerin-Meneville	ER, E. Cache Creek				1
<i>Cerceris fumipennis</i> Say	ER, mixed grass				1
<i>Chalybion californicus</i> (Saussure)	ER, Chatto Crossing				1
<i>Ectemnius decemmaculatus</i> (Say)	WR				6
<i>Ectemnius stirpicola</i> (Packard)	ER				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Eremnophila aureonotata</i> (Cameron)	ER, E. Cache Creek				2
	ER, Peach Tree Crossing				1
<i>Fernaldina lucae</i> Saussure	ER, mixed grass				1
	ER, Parks Hill				2
	WR				2
<i>Glenostictia pictifrons</i> (Smith)	WR, Signal Mt.				1
<i>Isodontia auripes</i> (Fernald)	ER, E. Cache Creek				1
	WR, short grass				1
<i>Isodontia philadelphica</i> (Lepeletier)	WR, short grass				1
<i>Larra analis</i> Fabricius	WR				1
<i>Palmodes dimidiatus</i> (DeGeer)	ER, mixed grass				1
<i>Philanthus gibbosus</i> (Fabricius)	WR				1
<i>Podalonia robusta</i> (Cresson)	WR				1
<i>Podalonia luctuosum</i> Smith	ER, E. Cache Creek				1
<i>Prionyx atrata</i> (Lepeletier)	ER, E. Cache Creek				1
	ER, mixed grass				1
	WR				1
	WR				2
	WR, Engineer Pond				1
	WR, short grass				3
<i>Solierella plenoculoides</i> (Fox)	ER, mixed grass				2
<i>Sphecius speciosus</i> (Drury)	ER, E. Cache Creek- Hoyle Bridge				2
	ER, mixed grass				1
<i>Sphex habena</i> Say	ER, tall grass				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Sphex ichneumonea</i> (Linnaeus)	WR, Engineer Pond				1
<i>Sphex texana</i> Cresson	ER, mixed grass				1
	WR, short grass				1
<i>Tachytes distinctus</i> Smith	WR				1
	WR, LETRA				1
<i>Tachytes pennsylvanicus</i> Banks	ER				1
	WR				1
	WR, LETRA				1
<i>Trypoxylon clavatum</i> Say	ER, E. Cache Creek				1
<i>Trypoxylon politum</i> Say	ER, E. Cache Creek				1
<i>Trypoxylon texense</i> Saussure	ER, E. Cache Creek				1
<i>Zanysson texanus</i> (Cresson)	ER				10
	ER, mixed grass				1
	WR				3
Total Number					87

Family Colletidae (Plasterer, yellow-faced bees)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Colletes</i> sp. Latreille	ER, tall grass				1
<i>Hylaeus</i> sp. Fabricius	ER				6
	ER, E. Cache Creek				2
	ER, tall grass				1
	WR				2
Total Number					12

Family Andrenidae (Andrenid bees)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Andrena sp. 1</i> Fabricius	WR				7
<i>Andrena sp. 2</i> Fabricius	ER				1
	ER, tall grass				2
	WR				1
<i>Andrena sp. 3</i> Fabricius	ER				3
<i>Andrena sp. 4</i> Fabricius	WR				1
<i>Andrena sp. 5</i> Fabricius	ER				1
	WR				1
<i>Andrena sp. 6</i> Fabricius	ER				1
<i>Protandrena sp.</i> Cockerell	ER, mixed grass				1
	ER, tall grass				4
<i>Pseudopanurgus sp.</i> Cockerell	ER				2
Total Number					25

Family Halictidae (Sweat bees)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Agapostemon texanus</i> (Cresson)	ER				4
	WR				4
<i>Augochlora purus</i> (Say)	ER				1
	WR				1
<i>Augochlorella sp.</i> Sandhouse	ER				17

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Augochloropsis metallica</i> (Fabricius)	ER				1
	ER, mixed grass				1
<i>Dieunomia heteropoda kirbii</i> (Smith)	ER, E. Cache Creek				2
<i>Halictus confuses</i> Smith	ER				9
<i>Halictus ligatus</i> Say	ER				3
	WR				4
<i>Lasioglossum sp. 1</i> Curtis	ER				8
<i>Lasioglossum sp. 2</i> Curtis	WR, LETRA				1
<i>Lasioglossum sp. 3</i> Curtis	ER, Apache Gate Rd.				1
	ER, mixed grass				1
	ER, NRB				1
	WR				1
<i>Lasioglossum sp. 4</i> Curtis	ER				1
	WR				1
<i>Lasioglossum sp. 5</i> Curtis	ER				2
	WR				1
<i>Nomia nortoni</i> Cresson	WR, Blue Beaver Cr. @ McKenzie Hill Rd.				1
Total Number					66

Family Megachilidae (Leafcutting bees)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Coelioxys sp.</i> Latreille	ER				3
	WR				4
<i>Dianthidium curvatum</i> (Smith)	ER, E. Cache Creek				1
	ER, NRB				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Hoplitis producta</i> (Cresson)	ER				1
	ER, mixed grass				1
	ER, tall grass				1
	WR				2
<i>Lithurge apicalis</i> (Cresson)					
	ER, Parks Hill				2
<i>Megachile sp. 1</i> Latreille	ER				3
	ER, E. Cache Creek				1
	ER, mixed grass				1
	ER, tall grass				1
	WR, short grass				1
<i>Megachile sp. 2</i> Latreille	ER				1
	ER, E. Cache Creek				1
	ER, mixed grass				2
	ER, NRB				2
	ER, Parks Hill				1
	ER, tall grass				1
<i>Megachile sp. 3</i> Latreille	ER				2
	WR				2
Total Number					35

Family Anthophoridae (Cuckoo bees, digger bees, carpenter bees)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Anthophora bomboides</i> Kirby					
	ER, E. Cache Creek				1
<i>Anthophora walshii</i> Cresson	ER				1
	WR				4
	WR, LETRA				2
	WR, short grass				1
<i>Centris lanosa</i> Cresson					
	ER, mixed grass				2
	WR				2
	WR, short grass				2

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Ceratina sp.</i> Latreille	ER				13
	ER, mixed grass				2
	ER, tall grass				3
	WR				2
	WR, LETRA				2
<i>Epeoloides sp.</i> Giraud	ER, Chatto Crossing				1
<i>Ericrocis lata</i> (Cresson)	ER, mixed grass				3
	WR				3
<i>Melissodes sp. 1</i> Latreille	ER				5
	ER				1
	ER, mixed grass				5
	WR				1
	WR, LETRA				1
<i>Melissodes sp. 2</i> Latreille	ER, mixed grass				1
<i>Melissodes sp. 3</i> Latreille	ER				4
	ER, Parks Hill				1
	ER, tall grass				1
	WR				1
	WR				1
<i>Savstra oblique</i> (Say)	ER				3
	ER, E. Cache Creek				2
	ER, mixed grass				2
	ER, tall grass				1
	WR, Signal Mt.				1
<i>Triepeolus sp.</i> Robertson	ER, E. Cache Creek				2
<i>Triopasites sp.</i> Linsley	ER, tall grass				1
<i>Xylocopa virginica</i> (Linnaeus)	ER				1
	ER, E. Cache Creek				1
	ER, tall grass				1

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
	WR				1
	WR, short grass				
Total Number					

Family Apidae (Honeybees, bumblebees)

Scientific Name and Author	Hab_Afil	Fed Stat	State Stat	HP	No_Spec.
<i>Apis mellifera</i> Linnaeus	ER, E. Cache Creek				1
	WR				1
<i>Bombus affinis</i> Cresson	ER, mixed grass				3
	WR				3
<i>Bombus appositus</i> Cresson	WR, LETRA				1
<i>Bombus fraternus</i> (Smith)	ER, tall grass				1
	WR, Blue Beaver Cr. @ McKenzie Hill Rd				1
<i>Bombus pensylvanica</i> (DeGeer)	ER				2
Total Number					13