Chickasaw Plum for Wildlife in Oklahoma

E-1026

Oklahoma Cooperative Extension Service
Division of Agricultural Sciences and Natural Resources
Oklahoma State University

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INTRODUCTION

Chickasaw plum (*Prunus angustifolia*), also called sand plum, occurs in at least 27 states, ranging from Nebraska to New Jersey on the north and from New Mexico to Florida on the south. California also has sand plum, though it distribution is broken by Arizona and Nevada. The plant occurs throughout Oklahoma except for the two westernmost counties in the Panhandle; it has limited occurrence in the southeastern quarter of the state.

Chickasaw plum is a clonal shrub that is a member of the rose family (Rosaceae). Individual stems are called ramets and the collection of genetically similar individual stems (clones) that form a thicket is called a genet. Plum produces showy white flowers in spring just before leaves emerge (Figure 1). The yellowish to reddish fruit of early summer is eaten by a variety of animals, including humans (Figure 2).

Native American tribes, including the Pawnee, Kiowa, Lakota, Crow, and Assiniboin, used plum for food and medicine (Gilmore 1977). The Teton Dakota Tribe of Nebraska used young sprouts in a healing ceremony. The Omaha, Sac, Fox, and Cheyenne used the boiled root bark to treat canker sores and diarrhea (Youngken 1924, Smith 1932).

One of the first accounts of Chickasaw plum by European immigrants came in 1714 when John Lawson published *The History of Carolina*. He described five types of native plum, one of which was likely Chickasaw plum. John Bartram, considered the father of American botany, believed it had been introduced by the Chickasaw Indians east of the Mississippi River through trade among tribes (Hatch 1998). In 1773 William Bartram, son of John, embarked on a four-year journey through the southern Colonies. He observed plum was often associated with Native American villages, lending support for the idea that Native Americans cultivated the plant.

One of the first accounts of plum cultivation by colonists came in 1812 when Thomas Jefferson planted plum at Monticello, where it grows today (Hatch 1998). Evidence suggests George Washington grew plum at Mount Vernon as well. Today people cultivate plum for its landscape value and fruits, which are used in jams, jellies, preserves and wine.

In Oklahoma, Chickasaw plum plays many roles. To the cattleman, it competes with forage grasses and perhaps limits grazing capacity for livestock but it also provides shade for livestock, which can increase animal performance in summer (Figure 3). To the wildlife manager, it provides cover (thermal, protective, nesting) for shrubland species (birds, small mammals, deer) but takes away usable space from species that require grassland free of woody cover. The fruits of plum are foods for many wildlife species, such as raccoons (*Procyon lotor*) and coyotes (*Canis latrans*), and their scats with plum seeds attract sugar-feeding butterflies such as the goatweed leafwing (*Anaea andria*) (Figure 4).

Recognizing the important roles played by Chickasaw plum in Oklahoma, the Department of Natural Resource Ecology and Management, Oklahoma State University, undertook a multi-year study (2006 to 2010) of plum and associated wildlife. Specific projects dealt with methods of establishing plum; growth rates of roots, stems, and thickets; use by birds in both the breeding season and winter;

Figure 1. Chickasaw plum blooms in March in Oklahoma. (Stacy W. Dunkin)

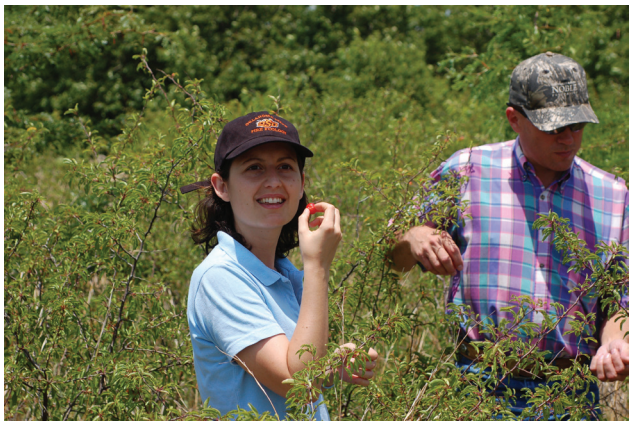

Figure 2. Collecting Chickasaw plum in Love County, Oklahoma. (Fred S. Guthery)

Figure 3. Cattle rest in the shade under Chickasaw plum canopies. (Stacy W. Dunkin)

Figure 4. Goatweed leafwing butterflies feed on sugars in the scat of a coyote that had eaten Chickasaw plum. (Stacy W. Dunkin)

effects of plum on site occupancy by small mammals; and response to fire. We present selected results from these studies and related work in this paper.

ESTABLISHMENT

Methods of establishing plum include seeds, bare-root seedlings, and transplant of rootstock or whole plants (West 2009). Each of these methods has advantages and disadvantages and all methods benefit from control of competing forbs and grasses to favor the young plum plants.

Seeds

Ripe fruits may be collected, macerated (soaked in water to remove pulp), and further treated to provide seeds for planting. According to the U. S. Department of Agriculture Plant Materials Center in Knox City, Texas, the cleaned seeds (pulp removed) need to be stratified, which means placed in wet sand or sphagnum peat moss at a temperature of 36 F to 48 F for two months before planting. Plant the seeds in early spring covered by ½- to ¾-inch of topsoil. The expected germination rate is 60 percent.

Bare-root Seedlings

Oklahoma Forestry Services, Goldsby (http://www.forestry.ok.gov/store), supplies bare-root seedlings at a cost (in 2011) of between $0.80 for an order of 50 to 150 seedlings to $0.37 for an order of greater than 1,000 seedlings, including shipping. Keep the seedlings refrigerated with moist roots before planting. Plant the seedlings in spring (February to April) with the root collar at ground level. The root collar is where the roots join the stem. Flowers and fruits will appear during the third growing season after planting. Bare-root seedlings have the advantage of ease of purchase and planting. However, the seedlings might not be as well adapted genetically as local plants grown from seeds or transplants.

Transplanting

Transplanting involves extracting a small stem (less than ½-inch ground line diameter) and a lateral root at least 6 inches long (Figure 5) from an existing plum thicket. Root systems of the stems should be kept wet and planted as soon as possible after extraction. Survival of transplants is best when planted in mid-March, right before flowering. The stem may be planted intact or coppiced. Coppicing involves cutting the stem off at ground level (Figure 6), which improves the likelihood of transplant survival and encourages development of multiple stems per ramet. Initial growth may be depressed, but within three to four years, growth will be comparable to non-coppiced plants. Then the specimens are planted at the depth from which they were extracted. Transplanting has the advantage of using local genetic material. A disadvantage is the process

Figure 5. Stem and root of Chickasaw plum collected for transplanting. (Rodney E. Will)

Figure 6. This sprouting Chickasaw plum was coppiced (cut off near the ground) to improve survival. (Rodney E. Will)

is labor intensive, survival may be markedly lower than with bare-root seedlings (one-third survival rate of bare-root seedlings), and growth of ramets is slower (transplants about 2/3 the size of bare-root seedlings after four years). Attempts to plant larger stems (greater than 1-inch ground line diameter) using a tree spade have not been successful.

Competition Control

Control of competition from grasses and forbs will increase survival and growth rates of plum plantings. Areas may be disked (site preparation) to kill established plants and covered with weed barrier cloth (Figure 7) to prevent sprouting. Spot-treating with a contact herbicide can be used to eliminate plants that breach the barrier cloth.

Planting Arrangements

Whether planting lines or thickets of plum, the distance between individual seeds, seedlings, or transplanted ramets can be 2 feet to 3 feet. Because of low germination rates, plant three seeds at each point where you want at least one stem; this will ensure that slightly more than 90 percent of the points will have at least one seed germinate.

Line plantings provide movement corridors across areas deficient in woody cover. Because plum sends out lateral roots that sprout, line plantings will increase in width and thickets will expand in diameter as the years pass.

Thickets provide resting, escape and thermal cover for species such as white-tailed deer (*Odocoileus virginianus*), northern bobwhites (*Colinus virginianus*), and cattle. No research has determined the degree to which birds nest in line arrangements, but several species are known to nest in thickets. Bird nesting depends on the age and diameter of stems (see Nesting section).

GROWTH

Our researchers studied the growth of Chickasaw plum in Payne, Harper, and Ellis counties (Dunkin 2008).

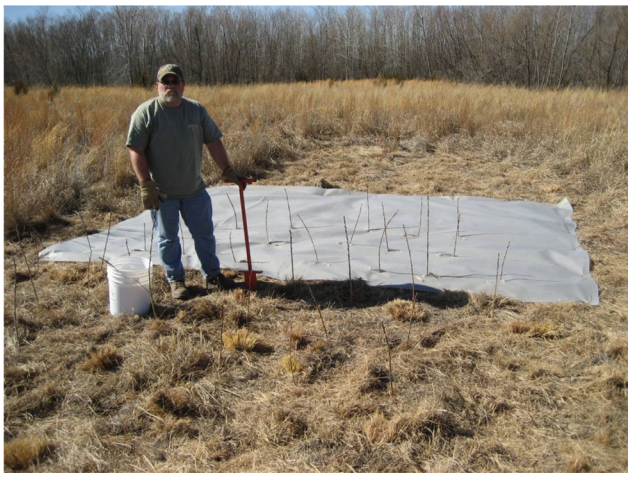

Figure 7. Use of barrier cloth to reduce competition for Chickasaw plum transplants increases their survival and growth rates. (Rodney E. Will)

Figure 8. S Chickasaw plum stem prepared for estimating age based on annual growth rings. (Stacy W. Dunkin)

We found the tallest ramet with the greatest diameter towards the center of a thicket, extracted it, and estimated age of roots and stems from annual growth rings (Figure 8). We measured stem diameter at ground level and root diameter at the root collar. We determined the area of thickets with a Global Positioning System unit. The age of the thicket was estimated as the age of the oldest stem. See Dunkin et al. (2008) for technical details and mathematical models of the growth of thickets, roots and stems.

Thickets

The area (by square yard) of thickets grew at highly variables rates among and within study areas. The variability was due to variation in competition, soil type, water availability, genetics, disturbance, and other factors. For pooled data from the three counties, the growth rate was estimated at 37 square yards per year. Thus, a 10-year-old thicket would occupy 370 square yards.

The constant growth rate implies that as thickets become larger with age, growth in area would become unnoticeable because the annual increment (37 square yards) would be a small fraction of the total area of a thicket.

Roots and Stems

The diameter of roots at the root collar and of stems increased in proportion to their age in years. Root growth rates were specific to county. The rates were 0.11-inch per year for Harper County, 0.14-inch per year for Ellis County, and 0.18-inch per year for Payne County. These differences might have occurred because Payne County receives more rain than the other counties.

Stem diameter also grew more rapidly in Payne County (0.21-inch per year) than in the more western counties (0.14-inch per year in both Harper and Ellis counties). The age (year) of thickets can be crudely estimated by finding the largest and presumably oldest stem in a thicket, measuring its diameter (inches) at ground level, and multiplying the diameter by five in Payne County or seven in Harper and Ellis counties. For example, a stem 2 inches in diameter would be ten years old in Payne County or 14

years old in the western counties. See Dunkin et al. (2008) for more refined estimates of age.

Height

The rate of growth in height declined with the age of a stem and resulted in a curved relationship between age and height. The relationship was quite variable among and within study sites. Based on the trend line, a five-year-old stem would be about 1.6 yards tall and a 30-year-old stem would be about 2.7 yards tall, for growth of 1.1 yards from age 6 to 30 years.

BIRDS

The information on summer and winter birds arose from surveys on private ranches in Ellis, Harper, and Woods counties during 2007 to 2008. We used point-count methodology, which involves counting birds seen and heard in a 110-yard radius around a listening post. Also, plum thickets were searched for nests in Ellis and Harper counties.

Summer and Winter Communities

During summer, at least 30 species of birds used plum for perch sites, nesting, thermal cover or some other function (Cooper 2009; see Table 1 for species and scientific names). Nine of these species also occurred in plum during winter. The winter community consisted of 20 species. These estimates from north-central Oklahoma likely underestimate the total number of species that use plum for some purpose. For example, lesser prairie-chickens (*Tympanuchus pallidicinctus*) use plum as cover in summer and winter, but we did not encounter this species.

Species that occur in the vicinity of plum, but do not use it directly, add to bird diversity in the prairies and shrublands of north-central Oklahoma. The total number associated with plum, including those that use it for some purpose, is more than 50 species in summer and more than 31 in winter.

Plum has positive and negative effects on bird abundance. For example, grasshopper sparrows (*Ammodramus savannarum*) and western meadowlarks (*Sturnella neglecta*) became less abundant as canopy coverage of plum increased because these species are adapted to prairies without brush. On the other hand, greater coverage of plum favored Bell's vireos (*Vireo bellii*) (Figure 9) and northern bobwhites (Figure 10). Although variability in canopy coverage of plum affects bird community composition, it did not seem to affect the number of bird species in a local area.

Nesting

At least nine species of birds nest in Chickasaw plum in north-central Oklahoma based on the nesting seasons of 2007 and 2008. Birds directly observed nesting in plum included Bell's vireos, brown thrashers (*Toxostoma rufum*), field sparrows, northern mockingbirds (*Mimus polyglottos*) and painted buntings (*Passerina ciris*). Nesters inferred based on characteristics of vacant nests included blue grosbeaks, northern cardinals, mourning doves, and greater roadrunners. Additional species undoubtedly nest in plum in the broad geographic range of this plant.

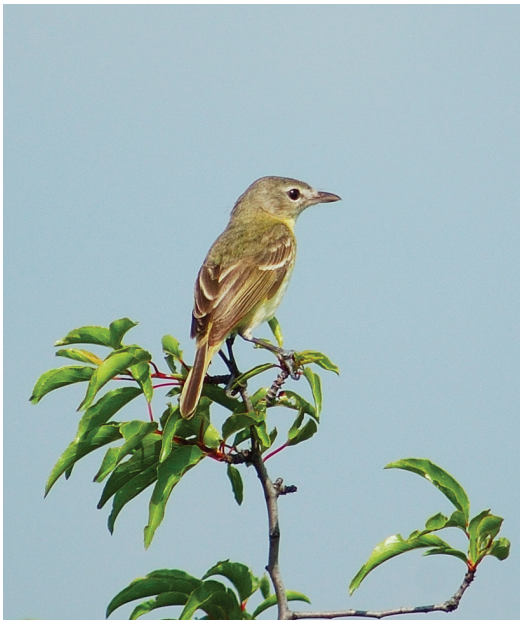

Figure 9. Chickasaw plum is imprtant nesting cover for Bell's vireos. (Stacy W. Dunkin)

Figure 10. Chickasaw plum is an imprtant provider of escape and thermal cover for Northern bobwhites. (Stacy W. Dunkin)

In north-central Oklahoma, nesting birds used plum stems of different ages as support for nests. Five field sparrows nested on stems averaging five years and ranging between three and seven years old. Three Bell's vireos also nested on younger stems averaging eight years old (range 3 to 13 years). The remaining species nested on stems averaging 11 years old to 15 years old and ranging from 4 to 30 years old.

Table 1. Seasonal use of Chickasaw plum by birds seen using plum for perching, nesting, thermal or escape cover, or some other purpose in north-central Oklahoma, 2006–2008.

Species	*Scientific name*	*May-Jun*	*Jan-Feb*
American goldfinch	*Carduelis tristis*	x	x
American tree sparrow	*Spizella arborea*		x
Bell's vireo	*Vireo bellii*	x	
Bewick's wren	*Thryomanes bewwickii*	x	x
Blue grosbeak	*Passerina ciris*	x	
Blue jay	*Cyanocitta cristata*	x	
Brown thrasher	*Toxostoma rufum*	x	
Brown-headed cowbird	*Molothrus ater*	x	
Carolina chickadee	*Poecile carolinensis*		x
Cassin's sparrow	*Aimophila cassinii*	x	
Clay-colored sparrow	*Spizella pallida*	x	
Chipping sparrow	*Spizella passerina*		x
Dark-eyed junco	*Junco hyemalis*		x
Dickcissel	*Spiza americana*	x	
Eastern bluebird	*Sialia sialis*	x	x
Eastern kingbird	*Tyrannus tyrannus*	x	
Eastern meadowlark	*Sturnella magna*		x
Eastern wood pewee	*Contopus virens*	x	
Field sparrow	*Spizella pusilla*	x	x
Greater roadrunner	*Geococcyx californianus*	x	
Harris sparrow	*Zonotrichia querula*		x
Indigo bunting	*Passerina cyanea*	x	
Lark sparrow	*Chondestes grammacus*	x	
Loggerhead shrike	*Lanius ludovicianus*		x
Mourning dove	*Zenaida macroura*	x	
Northern bobwhite	*Colinus virginianus*	x	x
Northern cardinal	*Cardinalis cardinalis*	x	x
Northern mockingbird	*Mimus polyglottos*	x	
Painted bunting	*Passerina ciris*	x	
Red-winged blackbird	*Agelaius phoeniceus*	x	
Ring-necked pheasant	*Phasianus colchicus*	x	
Rufous-crowned sparrow	*Aimophila ruficeps*	x	x
Rusty blackbird	*Euphagus carolinus*		x
Savanna sparrow	*Passerculus sandwichensis*		x
Scissor-tailed flycatcher	*Tyrannus forficatus*	x	
Spotted towhee	*Pipilo maculatus*		x
Vesper sparrow	*Pooecetes gramineus*	x	x
Western meadowlark	*Sturnella neglecta*		x
White-crowned sparrow	*Zonotrichia leucophrys*	x	x
Wild turkey	*Meleagris gallopavo*	x	
Yellow-billed cuckoo	*Coccyzus americanus*	x	

SMALL MAMMALS

Small mammals serve many functions on prairies. They consume vegetation and fruits and provide food for reptilian, avian and mammalian predators. Sand plum has variable effects on the presence of small mammal species.

Based on occupancy surveys of small sites in Harper and Love counties during 2009 and 2010, the presence of sand plum and habitat conditions associated with plum favored occupancy by the Ord's kangaroo rat (*Dipodomys ordii*), fulvous harvest mouse (*Reithrodontomys fulvescens*), and northern pygmy mouse (*Baiomys taylori*). Favorable habitat conditions typically included minimal litter accumulation, minimal exposure to raptors and mammalian predators, and high amounts of exposed (bare) soil. In contrast, the hispid cotton rat (*Sigmodon hispidus*) and white-footed mouse (*Peromyscus leucopus*) displayed a more general pattern with a high probability of occupancy in open areas and woody cover other than plum. With the exception of the hispid cotton rat and white-footed mouse, the results suggested plum provides an important habitat component to a variety of small mammal species within prairie ecosystems.

ACUTE EFFECTS OF FIRE

Most of the information presented here arose from prescribed burns in Love and Carter counties, south-central Oklahoma, during 2009 and 2010. Plum thickets with lower pre-burn stem densities were associated with higher levels of percent top-kill on the edges of thickets. None of 31 sampled thickets died as a result of fire. All burned thickets returned to their pre-burn areas (aboveground) within one growing season post-burn. For the burned portion of thickets (Figure 11), sand plum stem densities increased above pre-burn levels from 4.2 per square yard to 8.7per square yard within two growing seasons post-burn (Figure 12). Stem density estimates from another study site indicated

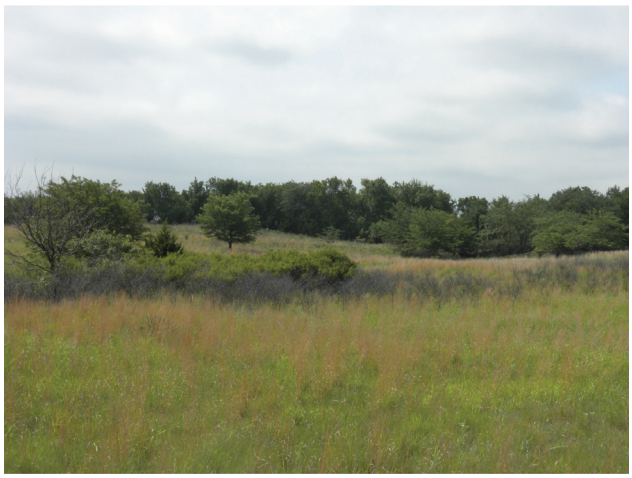

Figure 11. Depending on intensity, fires may not carry all the way through Chickasaw plum thickets. Partially burned thickets may return to their original size after one growing season. (R. Dwayne Elmore)

Figure 12. A Chickasaw plum thicket resprouting after being burned. Stems may be more dense after burning than before. (R. Dwayne Elmore)

that pre-burn levels were 5.2 per square yard and 8.5 per square yard at the end of one growing season post-burn. Resprouts showed rapid growth in height one growing season post-burn averaging 14.9 inches. Finally, ground vegetation sampling within burned thickets showed minimal change in perennial grass coverage during the first year post-burn. However, an increase from 33.1 percent to 53.1 percent occurred after two growing seasons post-burn. The results indicate prescribed fire of the intensities observed was not immediately detrimental to sand plum thickets, but caused increases in stem density and changes in understory vegetation composition.

Managers are often concerned with mortality of plum thickets after burning and practices such as disking and mowing around thickets to stop fire are common. Under the conditions observed, prescribed fire was not immediately detrimental to sand plum thickets. However, under some conditions (low relative humidity, high winds, high fuel continuity within thickets) fires can sweep through thickets, resulting in heavy top-kill (Figure 13). Taller thick-

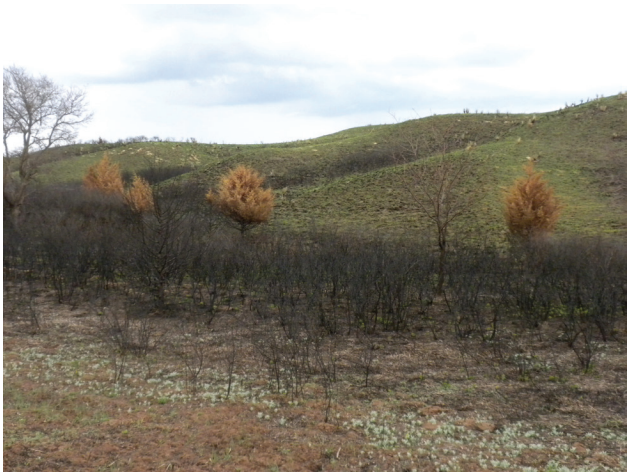

Figure 13. Intense fires may carry through a Chickasaw plum thicket and result in the top-kill of all stems. (R. Dwayne Elmore)

ets with dense stems may not need protection from cooler fires, but shorter thickets that have lower stem densities and higher amounts of perennial grasses within the thicket may be protected until they reach more mature stature. These decisions depend on the goals of a particular management program.

ACKNOWLEDGMENTS

The Samuel Roberts Noble Foundation, TLW Land and Cattle, Selman Ranch, Sutter Ranch, and Lake Murray State Park provided access to study areas. Numerous students from Oklahoma State University assisted in data collection. Financial support came from TLW Land and Cattle, Bollenbach Game Bird Research Fund, 89ers Chapter of Quail Forever, and Department of Natural Resource Ecology and Management, Oklahoma State University.

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