E-979

White-tailed Deer Habitat Evaluation and Management Guide

Oklahoma State University

Division of Agricultural Sciences and Natural Resources

Oklahoma Cooperative Extension Service

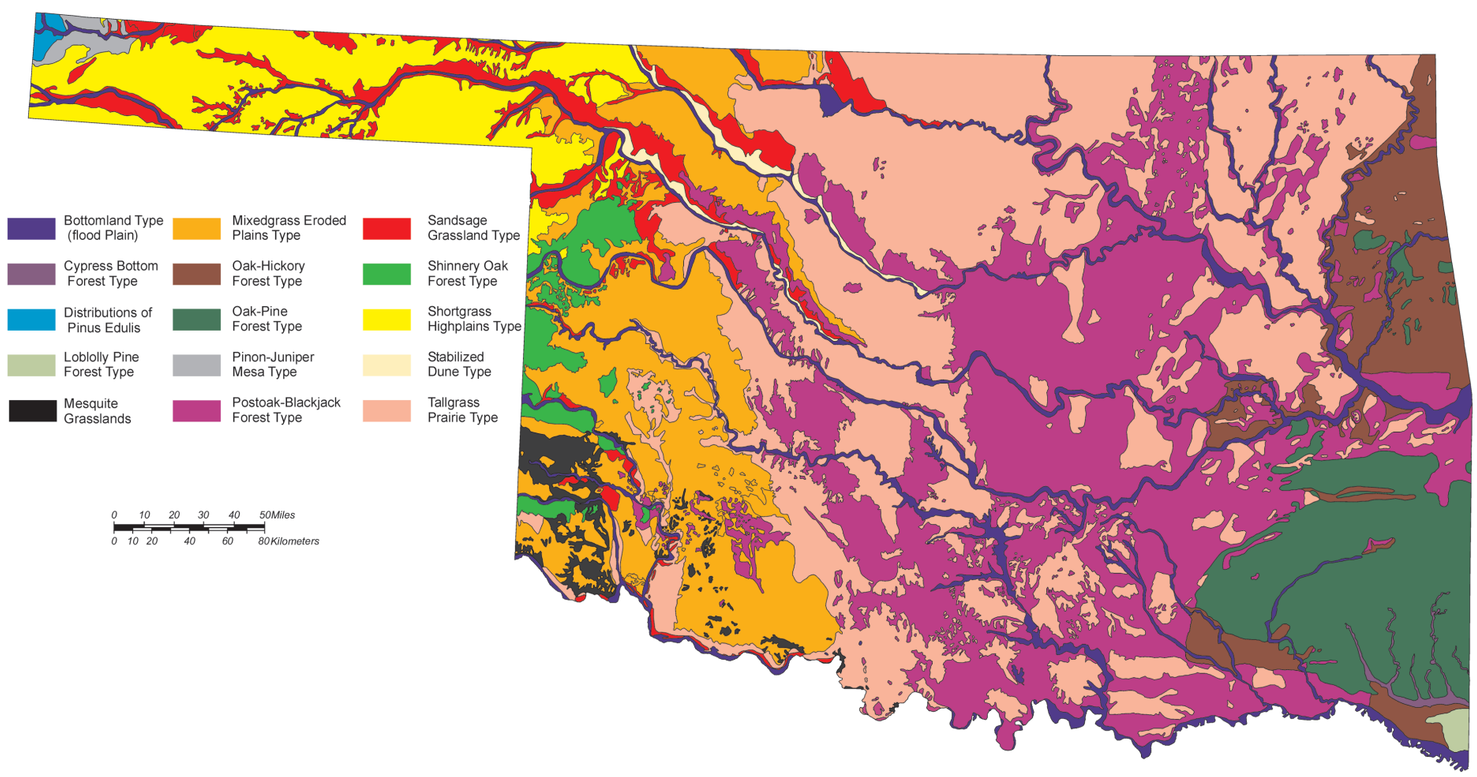

Figure 2. Duck and Fletcher Map.

White-tailed Deer Habitat Evaluation and Management Guide

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Cover photos: Front cover courtesy Colin Berg, ODWC. Back cover courtesy Eric Hiner.

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I. **Feeders**: Deer feeders attract deer and make them easier to locate. Research has also shown that feeders will not increase the white-tailed deer population, but may make them easier to hunt. Note: Feeders can concentrate deer to the point that disease transmission increases. Additionally, aflatoxin can be present in feed and at high levels causes health problems in deer and many other wildlife species.

J. **Population Management:**
- Carrying capacity - fluctuates from year to year because of precipitation.
- Doe harvest - always important if your browse surveys indicate high stocking rates of deer.
- Harvest strategy - reduce or eliminate harvest of immature bucks.

K. **Water Development:** Pond, spring, or well development.

Notes

White-tailed Deer Habitat Evaluation and Management Guide

Land Management Practices to Correct Limiting Factor(s)

A. Prescribed Fire: Of all the management options available to land managers, none have more potential to restore and maintain white-tailed deer habitat than prescribed fire. Prescribed fire is an inexpensive and natural process that can be used to manipulate the various habitat elements that are important to white-tailed deer. Fire will stimulate food producing plants such as forbs, reduce internal and external parasites such as ticks, and change the structure of woody vegetation. Fire will also control invasive plants such as eastern redcedar. A fire interval of 4-7 years will be appropriate for most sites in Oklahoma for white-tailed deer management. See OSU publications:

E-927 Using Prescribed Fire in Oklahoma
E-947 Invasion of Oklahoma Rangelands and Forests by Eastern Redcedar and Ashe Juniper
F-2876 Eastern Redcedar Control and Management – Best Management Practices to Restore Oklahoma's Ecosystems
F-2877 Fire Effects in Oklahoma
F-2878 Fire Prescriptions for Maintenance and Restoration of Native Plant Communities
F-2880 Prescribed Fire Associations
F-2881 Management After Wildfire

B. Prescribed Grazing: Proper grazing management cannot be emphasized enough. Without proper grazing, white-tailed deer habitat cannot be managed and fuel for prescribed fire cannot be maintained. Moderate, light, or no stocking might be appropriate depending on the Ecological Site and regional location. In some situations, primarily in areas exceeding 30 inches of annual precipitation, no grazing will result in habitat degradation because the vegetation becomes too thick. Grazing systems that encourage even grazing distribution (cell grazing, multi-paddock grazing, management intensive grazing, etc.) should be avoided. Continuous stocking at a moderate to light stocking rate will provide adequate fuel for prescribed fire. See OSU Publications:

E-926 Grazing Management on Rangeland for Beef Production
F-2871 Stocking Rate: The Key to Successful Livestock Production
F-2875 Intensive Early Stocking

C. Patch Burning or Rotational Grazing Without Fences: The fire-grazing interaction is as old as our native plant communities and is how the system was managed by Native Americans for thousands of years. The concept is simple: Burn part of an area and let the grazing animals go where they wish, which will be the burned area. The next year burn a different area, the same thing will happen. The area burned the previous years will be temporarily dominated by forbs and grasses, which provide a diverse food source. In areas of 25 inches of rainfall or greater, a 3-year rotation works well. For areas with less than 25 inches, a four or five year rotation will be needed. This management system provides all of the habitat needed by white-tailed deer. Livestock performance on patch burning is similar to other grazing systems and provides control of sericea lespedeza, a noxious weed. . Consult with your local NRCS office to determine the appropriate livestock stocking rates. See OSU Publications:

E-998 Patch Burning: Integrating Fire and Grazing to Promote Heterogeneitys
F-2873 Ecology and Management of Western Ragweed
F-2874 Ecology and Management of Sericea Lespedeza

D. Establishing Native Warm Season Grasses, Forbs, and Legumes: Establishment in cropland coming out of crop production provides food. If adjacent woody cover is available, all of the white-tailed deer's requirements can be met. However, trying to establish native plants into introduced plantings such as bermudagrass, "Old World" bluestems, or tall fescue is possible but expensive and difficult. Established stands of introduced plants will need to be cultivated and treated with herbicides for several years to eliminate introduced plants. See USDA-NRCS for conversion guidelines. Also see OSU Publication:

F-2581 Reseeding Marginal Cropland to Perennial Grasses, Forbs, and Legumes

E. Forest Thinning and/or Creating Openings in Native Forests: Many forests are too thick to provide white-tailed deer habitat. The removal of trees by commercial thinning or prescribed fire is necessary to restore and maintain forests and white-tailed deer habitat. Trees should be thinned to 40 to 60 square feet of basal area per acre to meet habitat requirements. This treatment will result in sprouting woody plants and forbs for food. In areas where the historical forest has been removed by farming, dozing, or herbicides, consult with a forester for the appropriate native trees (native to the site) needed to restore the Ecological Site. See OSU research publication: Pushmataha Forest Habitat Research Area.

F. Restoring Native Woody Plants: Planting woody plants in prairies or shrublands should only be done to restore areas that historically had a woody component (see NRCS Ecological Site Guides). In areas that normally support native woody vegetation (Figure 1) such as sand plum, sand shinnery oak, or sand sagebrush, use the USDA-NRCS Ecological Site Guides to determine the appropriate species. Some species may not be available for purchase.

G. Herbicide Application: Herbicide can be an effective tool to reducing woody cover and controlling invasive plants. Herbicide is often used in combination with prescribed grazing and prescribed fire in a management system. Herbicide is expensive and is seldom needed when an appropriate fire program is used. Herbicide use must follow all label instructions.

H. Planting Food Plots: Food plots are commonly used to attract and concentrate white-tailed deer for harvest and are promoted. Food plots can serve as an emergency food source during times of extended snow/ice coverage. Attempting to increase habitat suitability with food plantings is an expensive practice with outcomes that are marginal at best. Common warm season crops include corn, soybeans, milo, and alfalfa. Cool season crops include varieties of clover, wheat, and rye. Manipulating native vegetation through proper grazing, prescribed burning, timber thinning, and patch burning are less expensive practices that can be maintained indefinitely.

Summary of Limiting Factors for White-tailed Deer

Criteria	Rating Score from Evaluation Form	Management Recommendations
A. Protective Cover		
A.1. Protective Cover Quantity	☐	A, E, F, G
A.2. Protective Cover Condition	☐	A, E, G
B. Food		
B.1. Food Quantity	☐	A, B, C, D, E, F, G, H, I, J
B.2. Ecological, Woodland Site Index Site or Soil Potential	☐	This cannot be changed
B.3. Light Intensity	☐	A, B, C, E, F, G
B.4. Food Diversity	☐	A, B, C, D, E, F, G, H, I
B.5. Food Use	☐	A, H, I, J
C. Water		
C.1. Water Persistence	☐	K
D. Interspersion		
D.1. Interspersion Index	☐	A, B, C, D, E, F, G, K
D.2. Habitat Proportion Index	☐	A, B, C, D, E, F, G

Once a limiting factor has been determined, a management plan can be developed to correct the deficiency. Expertise in the use of prescribed fire, grazing systems, plant ecology, and plant identification is available from cooperating agencies.

Overview of White-tailed Deer Habitat Management

The Habitat Evaluation section that starts on page 16 will help you identify specific limitations of the habitat on your property for white-tailed deer. However, there are some preliminary observations that can aid in accessing a property's potential for good white-tailed deer habitat. The following will help in assessing the potential for white-tailed deer.

Was it Ever Good White-tailed Deer Habitat?

Some landowners have purchased land for the purposes of managing white-tailed deer only to learn the potential is very low. Likewise, land managers may make the mistake of attempting to create habitat for white-tailed deer where the potential is low. The presence of suitable native vegetation types is not random and is explained by the Climate-Soil-Vegetation Type Interaction Model (Figure 1). Managing habitat for white-tailed deer where potential is low will have little influence on white-tailed deer and is always expensive. To assess habit potential, use the following steps.

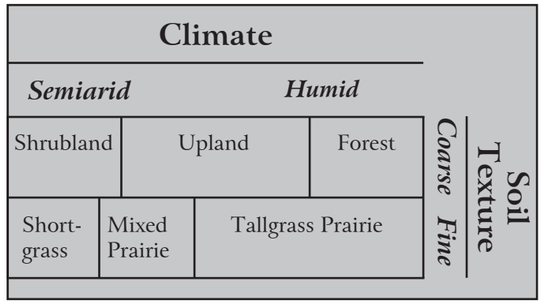

Figure 1. Climate-Soil-Vegetation Type Interaction Model.

1. Find the general location of the land on the Duck and Fletcher Map (Figure 2 located on the inside back cover) or other potential vegetation map if not in Oklahoma. Does the land in question have vegetation types that are potentially good white-tailed deer habitat? The following vegetation types from Duck and Fletcher have **high potential** to make good white-tailed deer habitat:
   - Sand sage grassland
   - Shinnery oak grassland
   - Mesquite grassland
   - Post oak/blackjack oak forest (a.k.a., Cross Timbers)
   - Oak-hickory forest
   - Oak-pine forest

   Tallgrass prairie, mixedgrass prairie, and shortgrass prairie vegetation types (Duck and Fletcher map) have **limited potential** to provide good white-tailed deer habitat. Except for localized areas, such as brushy draws, these prairie habitat types do not support the woody plants that white-tailed deer require.
2. Obtain a USDA Soil Survey and Ecological Site Guide(s) for the land (from USDA Natural Resources Conservation Service county office). Some of this material will be available on the USDA NRCS web site at http://esis.sc.egov.usda.gov/. Group the soils occurring on the land into their respective ecological sites (soils that produce similar native plant communities) using information from the Soil Survey or Ecological Site Guides to determine the potential of each Ecological Site to make good white-tailed deer habitat.

   On historically forested or woodland sites, use the Forest/Woodland Site Index number. Site Index is defined as the height a tree will grow in a specific time. It is considered with ecological factors that reference capacity to produce forests or other vegetation; the combination of biotic, climatic, and soil conditions of an area (Society of American Foresters 1958).

   Note that a site index is specific to a particular tree species. A site index based on one age cannot be converted to another base according to any simple numerical relationship. For example, site index 60 for post oak on a 50-year basis (post oak can grow 60 feet tall in 50 years) is not the same thing as site index 120 for bald cypress on a 100-year basis (bald cypress grew 120 feet tall in 100 years). For the purpose of this evaluation guide, we will use a site index of base 50 for all tree species.

Is the Land in Question Still White-tailed Deer Habitat?

While the Duck and Fletcher Map and Ecological Site Guides provide information on vegetation potential, there is no guarantee that the habitat potential remains. Changes in land use have altered many of the historical native pant communities, often to the detriment of the white-tailed deer. To determine if the potential remains, use the steps below.

1. Verify that the native plant communities are present on the land. Native plant communities are the foundation of white-tailed deer habitat. The key indicator species are native warm season grasses such as little bluestem, big bluestem, Indian grass, switch grass in combination with many warm and cool season native annuals, perennial forbs, legumes, and woody plants. Learn to identify and understand the ecology of the plants that are important to white-tailed deer. Remember, "every plant tells a story." A good starting point is to obtain a copy of the ***Field Guide to Oklahoma Plants*** (Tyrl et al. 2002) published by Oklahoma State University and available from the Rangeland Ecology and Management Program. You may e-mail Terry Bidwell at terry.bidwell @okstate.edu to obtain a copy.
2. Identify poor habitat or those vegetation types that would be expensive and difficult to restore. Introduced forages such as "Old World" bluestems, tall fescue, and bermudagrass have no place in white-tailed deer habitat management. If introduced grasses are present, they must be replaced with a mixture of warm-season native grasses, forbs, and legumes to be useful to white-tailed deer. These mixtures are available from most seed dealers.

   Closed canopy native forests, such as Cross Timbers (a.k.a post oak/blackjack oak forest), can be excellent white-tailed deer habitat, but may require extensive and expensive habitat restoration treatments to achieve the goal. Natural resource professionals are available from several agencies and private groups to help with a management plan.
3. Drive roads surrounding the land and/or look at aerial photos to determine the quality of surrounding habitat. Large tracts of good habitat are required to have a viable white-tailed deer population. The abundance of white-tailed deer has a direct relationship to the amount of woody and prairie vegetation on the landscape. Islands of good habitat (e.g. 160 acres) in a sea of poor habitat, (e.g. cropland, introduced forages, closed canopy forests, and eastern redcedar) are not viable.

Introduction

The white-tailed deer (*Odocoileus virginianus*) is the most popular big game animal in North America (Halls 1978). They occupy forest, rangeland, and agriculture-dominated habitats throughout much of the continent. Historical records indicate that white-tailed deer once occurred throughout what is now the state of Oklahoma. However, shortly after Oklahoma Territory was opened for settlement in 1889, market and subsistence hunting and changes in land use practices drastically reduced the size of the deer population (Caire et al. 1989). The number of deer in Oklahoma declined to such an extent that hunting seasons were closed for the entire state from 1916 to 1933. Since 1933, management in the form of transplanting deer and regulated hunting seasons and harvest limits have resulted in significant increases in Oklahoma's white-tailed deer population. Currently, white-tailed deer occur in every Oklahoma county with a statewide population of more than 500,000.

The purpose of this habitat evaluation and management guide is to provide a general tool for evaluating the suitability of an area for white-tailed deer. The guide is designed to help you inventory and evaluate various existing habitat components, plus identify habitat limiting factors for white-tailed deer. Habitat values indicate the overall habitat quality that the evaluated area provides in its existing condition and identify weak or missing elements that may limit deer numbers. Management alternatives can then be developed to correct the deficiency.

Home Range and Carrying Capacity

Seasonal and annual movements of white-tailed deer vary greatly. In a given landscape, deer movements are influenced by land use practices, amount of protective cover, ambient temperature, and seasonal changes in food supplies (Ockenfels 1980, Ockenfels and Bissonette 1982, Masters et al. 1997). Deer movements and patterns of habitat use are influenced most by food availability (Ockenfels 1980, Ockenfels and Bissonette 1982) and female movements are influenced by the presence or absence of a fawn (Garner and Morrison 1977; Bartush et al. 1978, 1979). Daily movements are usually contained within a home range of 1.5 square miles or 960 acres (Hahn 1945, Lindzey 1952, Thomas et al. 1964, Alexander 1968). In the Cross Timbers area of Oklahoma with its closed tree canopy and very little forage production, home ranges were 3.78 square miles or 2,420 acres (Ockenfels 1980). However, on Cross Timbers sites treated with herbicides and fire to open the tree canopy, the annual home range were found to be 247 acres and summer and winter home ranges were 204 and 304 acres respectively (Soper 1992). In southeastern Oklahoma commercial pine forests, deer home ranges were determined to be 311.4 acres or 0.49 square miles (Nelson 1984).

Deer in southwest Oklahoma have been shown to alter movements because of high hunting pressure (Pilcher and Wampler 1981). Does in southern Texas had home ranges of 60 to 340 acres, while bucks had home ranges of 240 to 880 acres (Michael 1965). Carrying capacity for white-tailed deer in Oklahoma ranges from one deer per 15 acres on highly productive sites with deep rich soils to one deer per 125 acres on low productivity sites with shallow droughty soils. Across the state, the average carrying capacity for white-tailed deer is one deer per 35 acres (Lindzey 1952; USFWS and ODWC, unpublished data). Local deer population may vary greatly from the average of one deer per 35 acres because of surrounding land use, levels of harvest, amount of suitable habitat available for deer, and general health of the deer herd in that vicinity (Masters and Stewart 1995). Predation by coyotes can also influence white-tailed deer productivity and thus the population under unique situations (Garner et al. 1976; Stout 1982).

Habitat Requirements

Protective Cover

Most seasonal variation in habitat used by deer has been associated with seasonal changes in availability of food and protective cover (Dasmann 1971, Ockenfels 1980, Masters et al. 1997). Protective cover provides shelter from the weather and predators (including humans) (Lindzey 1952), provides bedding and loafing areas, and is important as bedsites for fawns (Garner et al. 1979). Woody plants arranged densely enough to conceal deer provide this element. Early to mid-successional stage forests and prairies with riparian zones or a shrub component usually provide adequate cover. Well dispersed young stands of pine (six- to 10-years-old) also provide adequate cover (Melchoirs et al. 1985; Masters 1991*a*,*b*; Masters et al. 1997). Cover is often overlooked as an important component of deer habitat in the southeastern commercial forest. A recent study in southeast Oklahoma demonstrated that deer will use naturally regenerated areas and clearcuts planted to pine as screening and bedding cover (Masters 1991*a*,*b*; Masters et al. 1997). These areas receive the greatest use when located adjacent to mature forests and harvested and burned sites in early stages of succession (Masters 1991*a*,*b*; Masters et al. 1997). Little work has been done in the southeast or midwest regarding minimum cover requirements of deer (Fenwood et al. 1984, Masters et al. 1997).

Eastern redcedar and ashe juniper thickets also meet cover requirements in the Cross Timbers area of Oklahoma and adjacent habitat types, but provide little herbaceous forage and mast (the fruits and nuts of trees, shrubs, and vines) production. Eastern redcedar and ashe juniper trees were historically rare and only occurred where natural fire could not reach such as rocky canyons, outcrops, and other sheltered sites. In addition, these junipers are not compatible with prescribed fire, an important tool for white-tailed deer management. Cover requirements are best met by woody plants native to the site and compatible with the historical fire regime.

Protective Cover Criteria

Protective Cover Quantity

The amount of protective cover required for deer varies according to the density of woody plants and topography. Hilly or rolling country generally requires less cover than flat country (Hicks and Dillon 1972). Research indicates that optimum brush management is approximately 40 percent brush and 60 percent openings (Hicks and Dillon 1972). Applying these percentages (40 percent brush) to the minimum home range size (60 acres) results in a 24 acre or greater brush area for optimum protective cover for deer. Note that this is optimum cover requirements at the minimum reported home ranges. For many areas, home ranges will be much larger than 60 acres.

Protective Cover Quality

Quality of protective cover is largely determined by stem density and that the cover must provide concealment for deer. The width of concealment cover can be determined

B.3. Light intensity

Percent overstory canopy cover greater than 80%	1
Percent overstory canopy cover 60-79%	4
Percent overstory canopy cover 40-59%	6
Percent overstory canopy cover 20-39%	8
Percent overstory canopy cover less than 20%	10

☐ = **B.3**

B.4. Food diversity

Each of the five food elements present (warm season forage, hard mast, soft mast, browse, cool season forage)	10
Four of the five food elements present	8
Three of the five food elements present	6
Two of the five food elements present	4
One of the five food elements present	2

☐ = **B.4**

B.5. Food use (use by livestock or deer at less than 4.5 feet tall)

Light use of choice and medium food plants, light use of low quality plants	10
Medium use of choice and medium food plants, light use of low quality plants	8
Heavy use of choice and medium food plants, light use of low quality plants	5
Heavy use of choice and medium food plants, moderate use of low quality plants	3
Heavy use of choice and medium food plants, heavy use of low quality plants	1

☐ = **B.5**

C. <u>WATER: Water in streams, wetlands, impoundments, or wildlife watering facilities within 1/2 mile of the home range center</u>

C.1. Water persistence

Water source permanent (water always available)	10
Water source semi-permanent (water available but occasionally dries up for short intervals during dry periods)	5
Water source intermittent (water available but generally dries up each year for short periods)	3
No water source within one mile of the home range center	0

☐ = **C.1**

D. <u>INTERSPERSION: Proximity of one habitat requirement to another</u>

D.1. Interspersion index

All habitat elements are within 1/8 mile of any point within the home range	10
All habitat elements are within 1/4 mile of any point within the home range	8
All habitat elements are within 1/2 mile of any point within the home range	6
All habitat elements are within 3/4 mile of any point within the home range	4
All habitat elements are within 1 mile of any point within the home range	2
All habitat elements are within 1 1/2 miles of any point within the home range	0

☐ = **D.1**

D.2. Habitat Proportions

Greater than 70% of the home range is in a woodland or shrubland	6
40-69% of the home range is in a woodland or shrubland type	10
20-39% of the home range is in a woodland or shrubland	8
10-19% of the home range is in a woodland or shrubland	4
Less than 10% of the home range is in a woodland or shrubland	2
All of the home range is in prairie	2

☐ = **D.2**

White-tailed Deer Habitat Evaluation Form

Species: White-tailed Deer
Home Range: 60-880 acres
Habitat Requirements: Protective cover, food, water

HABITAT REQUIREMENTS: Essential habitat components needed for survival and propagation of the species. For white-tailed deer the components include (A) protective cover, (B) food, (C) water, and (D) interspersion. Circle the appropriate value and place it in the box at the bottom of the column and on the summary page.

A. PROTECTIVE COVER: Low trees or shrubs arranged densely enough to conceal deer

A.1. Protective cover quantity

24 acres per home range, composed of low trees or shrubs	10
16-23 acres per home range, composed of low trees or shrubs	7
8-15 acres per home range, composed of low trees or shrubs	5
4-7 acres per home range, composed of low trees or shrubs	3
1-3 acres per home range, composed of low trees or shrubs	1
0 acres per home range, composed of low trees or shrubs	0

☐ **= A.1**

A.2. Protective cover condition

Width of woody cover equals only what will conceal a person from an observer standing at the cover's edge	3
Width of woody cover equals twice what will conceal a person from an observer standing at the cover's edge	7
Width of woody cover equals three times what will conceal a person from an observer standing at the cover's edge	10

☐ **= A.2**

B. FOOD CRITERIA: Warm season herbaceous plants; woody plants producing soft mast, hard mast, and browse; and cool season herbaceous plants

B.1. Food quantity

Food provided by combination of amounts (element quantity values) of browse, warm season herbaceous plants, soft and hard mast, and cool season herbaceous plants (see specific instructions above for element quantity values).

Element Quantity Values: abundant, moderate, scarce
Note: Zero element quantity values are equal to scarce in the above ratings.

Food	Abundant	Moderate	Scarce	Your Score
Browse	10	6	1	
Warm Season	10	6	1	
Mast	10	6	1	
Cool Season	10	6	2	

☐ = **B.1**

B.2. Soil potential

Ecological site yields greater than 6,000 pounds per acre of air dry forage	10
Woodland site index greater than 80	10
Ecological site yields 3,000-6,000 pounds per acre of air dry forage	5
Woodland site index 50-80	5
Ecological site yields less than 3,000 pounds per acre of air dry forage	2
Woodland site index less than 50	2

☐ **= B.2**

by measuring the distance that it takes for cover to conceal a person from an observer standing at the cover's edge after leaf fall. This distance would be the minimum width necessary to fill the protective cover requirement (Hicks and Dillon 1972). Plants that are coniferous (evergreen) tend to provide higher quality cover. Examples would be small to medium sized pine or juniper trees four to eight years of age. Again note that these species should be on the appropriate ecological site and not planted on inappropriate sites.

Food

Food is often the limiting element in the white-tail's habitat. Food availability varies considerably depending on the season. Therefore, the diet varies seasonally. A portion of the annual forage production must be unused for the range to remain productive (Dasmann 1971). A 150-pound deer in good condition eats an average of 10 to 12 pounds of green forage per day (three to four pounds oven-dry weight). Protein requirements of white-tailed deer fawns have been estimated at 14 to 22 percent (Ullrey et al. 1967) and 11 percent for yearling deer (Holter et al. 1979). However, as little as 7 percent protein intake is sufficient for reproduction (Murphy and Coates 1966). Research in central and southeastern Oklahoma indicates that diet and forage quality will vary considerably from one year to another (DeLiberto et al. 1989; Masters 1991*a*,*b*; Soper 1992). White-tailed deer are selective feeders and will select a higher quality diet when a diverse forage base is available. A high quality diet is important for adequate maintenance of females and especially those with fawns (Logan 1972, Dinkines et al. 1991). **Therefore, managers should seek to provide a wide variety of native plants for optimum conditions and a variety of plant structures (herbaceous, young forest, mature forest, etc.) on a seasonal basis.** Livestock occupying the same range as deer may compete with deer for available forage, if either deer or livestock are exceeding their respective carrying capacities (Thill and Martin 1989, Jenks 1991). When livestock numbers are kept within range capacity, diet overlap with deer is minimal (Jenks 1991) as cattle primarily consume grass, which generally makes up a small portion of the diet of deer.

Food habits and browse preference studies of white-tailed deer indicate that a broad range of plants are readily eaten (Van Vreede 1987). However, at any given point in time relatively few plants may compose most (greater than 50%) of the diet. Deer are browsers (i.e., feed on woody twig ends and leaves) during most of the year, but will preferentially use forbs in the spring and hard mast when available in the fall and winter. Warm and cool season herbaceous plants; soft and hard mast; and buds, leaves, and twigs of woody plants comprise the food elements for white-tailed deer. Native plant communities are preferred because of diversity and sustainability (Masters and Stewart 1995).

Food Criteria

Food Quantity and Quality

Warm season forage: Diverse native plant communities are the most desirable sources of food for white-tailed deer. From early spring to early fall, a mature deer must consume more than 2,200 pounds of forage (including warm season forage, soft mast, and browse). If native plants are deficient, supplemental food can be produced in two to 10 acre plots of cultivated crops (Davison and Graetz 1957). However, the need for food plots is symptomatic of poor habitat, deer exceeding the carrying capacity of the land, or both. Thus, food plots should not be the primary method of managing

Forest edges and recently burned prairie often contain ample food plants for white-tailed deer such as this rubeckia or black-eyed susan.

food resources for white-tailed deer. Introduced forages such as tall fescue, bermudagrass, "Old World" bluestems, and weeping lovegrass are undesirable as a food source. Exceptions include locally adapted clovers. It should be noted that most of Oklahoma's habitats are not burned with prescribed fire and subsequently not well managed for a variety of wildlife species including white-tailed deer. Use of prescribed fire on at least a two to four year annual cycle (either dormant or growing season) will provide adequate forage and browse of sufficient quantity and nutritional quality to meet all nutritional requirements of white-tailed deer (Masters et al. 1993, 1996).

Soft mast: Little information is available on the amount of area needed to produce adequate quantities of soft mast from forested areas. Information is available, however, on deer carrying capacities in completely forested habitat. In Oklahoma, one deer per 35 acres is the average for variable forage production capabilities throughout the state (Masters et al. 1995). Assuming that a given acreage was providing the deer food requirement, a projection can be made that 35 acres of habitat or more can provide adequate soft mast for one deer under good conditions. One caveat to prescribed burning and soft mast production is the fact that soft mast production is typically lowered for two to three years following a prescribed burn. Generally, this is more than offset by increased forage production and the increased nutrient response in those selected forages (Masters et al. 1991*a*).

Hard mast: By the same logic that projected the quantity requirement for soft mast, it is assumed that 35 acres or more of mature (10 inches or larger diameter at breast height) oak woodlands can fill deer requirements for hard mast. Acorns have been shown to make up from 16-98 percent of the stomach contents of December harvested deer and on average about 50 percent of the volume of stomach contents (Goodrum et al. 1971). White-tailed deer require approximately five pounds of acorns per day to make up 50 percent of the daily diet. Assuming acorns are available from October through February (except in the advent of a mast shortfall or failure), or a 150 day period, then deer will require about 750 pounds for a given winter in Oklahoma. Two hundred twenty 14-inch post oaks can produce this amount. Although acorn production may be abundant at

Many species of vines are preferred white-tailed deer food plants. Greenbriar (in the genus smilax) are highly preferred, particularly in late winter. These plants are typically found in highest abundance in open forests, along woodland edges, or in brushy areas of prairies.

times, only half of what is produced will be available for deer consumption. Birds, insects, and other animals will consume the balance (Goodrum et al. 1971). Thus, while important deer food, hard mast is only seasonally available and is not sufficient for deer nutrition throughout the entire year.

Browse: By the same logic that projected the quantity required for soft and hard mast, it is assumed that 35 acres or more of woods can fill the requirement for browse for a given deer.

Cool season forage: Cool season forage requirements are most often met by low panicums and various sedges and nut-sedges in addition to greenbriar and other browse species (Masters 1991*a*,*b*). Davison and Graetz (1957) states that enough forage can be produced to provide adequate seasonal food supplies for deer in two to 10 acre plots of planted foods such as clover or wheat. This is particularly important when native cool season grasses, forbs, or browse are not present. However, it is only in years of near mast failure when supplemental forage opening have been conclusively shown to limit over-winter mortality (Segelquist and Pennington 1968; Segelquist et al. 1969, 1972; Segelquist 1974; Segelquist and Rogers 1974). Thus in most winters, winter food plots will not improve deer carrying capacity, particularly in good habitat.

Food Production Potential

Soil fertility: A prime factor in the production of vegetation is soil fertility. Albrecht (1957) suggested that there is a direct correlation between wildlife carrying capacities, population condition, and inherent soil fertility. The assumption is that the greater the soil fertility, the higher the carrying capacity and population conditions. Landowners have little impact on this factor other than preventing soil degradation (erosion of top soil) and in maintaining proper soil fertility on small food plots if used. Increasing soil fertility on native plant communities at a scale relevant to deer is simply impracticable.

Warm season forage production: Many environmental factors influence the growth and production of forage, but none have as dramatic effect as light intensity. The production of forage, both in quantity and quality, is inversely related to canopy closure (Masters et al. 1993). Light becomes a limiting factor in understory forage production when canopy closure is greater than 80 percent (Masters et al. 1993). Maximum forage production occurs with completely open canopies (Fenwood et al. 1984; Masters 1991*a*,*b*; Masters et al. 1993, 1996, 1997). Dormant season prescribed burns have been shown to increase forage production by three to four times in the first growing season following fire. By the third growing season, forage production returns to the level it was before the prescribed fire (Masters et al. 1993, 1996).

Soft mast production: Soft mast includes the fruits of small trees, shrubs, and vines that are commonly associated with the understory. Of all the factors that influence understory fruit production, light is the most important (Lay 1979). Fair understory fruit yields are produced in stands with an overstory density of 60 to 80 square foot of basal area (Basal area is the amount of area measured in feet that all woody stems occupy at the forest floor in an acre. For example, if you have 10 trees per acre that each have one square foot of stem where they arise from the forest floor, then you have a basal area of 10 feet). Fruit yields drop significantly in stands with higher overstory densities or with midstory canopies (U.S. Forest Service 1971; Masters, unpublished data).

Hard mast production: Hard mast includes the nuts of oaks, hickories, beech, and walnuts and is usually considered a component of the overstory. In general, the greatest hard mast yields are from older trees that have attained a greater than 10 inch diameter at breast height (DBH) with a well developed crown (Reid and Goodrum 1957). For most species of oaks, acorn yields are negligible for trees younger than 10 to 19 years (Goodrum et al. 1971) or less than 12 inches DBH (Goodrum et al. 1971). Trees over 26 inch DBH often exhibit decreased acorn production (Goodrum et al. 1971). Recent research has demonstrated that these figures are applicable in Oklahoma (Masters et al. 2004).). Thus, to ensure adequate mast production, some portion of a forested area should consist of older age class trees that are capable of bearing hard mast. Large-scale clear cuts, while providing ample browse, herbaceous forage, and soft mast, will not contain sufficient hard mast. Smaller clear cuts (i.e. smaller then the home ranges of deer), or some type of selective timber harvest that results in an uneven age forest will provide hard mast potential assuming that hard mast producing species such as oak are maintained in the older age classes.

Browse production: Light intensity also is the single most important factor influencing browse production. A significant increase in stand quality and browse production occurred when a dense 11-year-old stand of hardwoods was intensively cleared (Della-Bianca and Johnson 1965). In this study, untreated areas had only three pounds per acre of woody browse compared to between 81 and 805 pounds per acre on treated areas. Species composition of understory browse is also dependent upon canopy closure, with intolerant species being replaced by shade tolerant plants as stand density increases. The majority of plant species preferred by deer are medium to intolerant of shade.

Cool season forage production: Many cool season grasses, sedges, and forbs are shade tolerant and generally do not require as much sunlight as warm season forages, soft mast, or browse. Production of most naturally occurring cool season forages is highest when tree canopy closure is approximately 50 percent. Production decreases with greater canopy opening due to increased competition by warm season plants. Certain cool season forages such as

Food Use

This criterion is rated by observing the home range and selecting three key species of food plants from the choice, medium, and low preference categories that are common within the home range. The use of these food categories by livestock or deer at less than 4.5 feet tall is defined as follows:

Light use:
- less than 10% annual growth of woody plants browsed;
- less than 10% annual growth of herbaceous plants grazed

Moderate use:
- 10-40% annual growth of woody plants browsed;
- 10-50% annual growth of herbaceous plants grazed

Heavy use:
- greater than 40% annual growth of woody plants browsed;
- greater than 50% annual growth of herbaceous plants grazed

To measure browse use and thus to know whether you need to reduce the number of deer on a property, you can conduct a simple browse survey. Conduct your survey during the winter when deer are heavily utilizing browse. You need to identify browse plants by species, thus you might want to identify the spots for the survey during the summer when you can identify the species of plants and mark them so that during the winter (leaf off period) you will be able to classify each plant into the correct species. You should randomly select areas that are representative of you property. For instance if you have 50% forest and 50% shrubland, choose an equal number of sample points from each plant community and place your points in a random fashion within these different plant communities. Then, at each point, mark off areas that are about 15 feet in diameter. The more points you do, the better your estimates will be, but as a starting point, about 1 point every 25 acres should give you a good estimate. If you notice a lot of variation between different points, this tells you to increase the number of sample points. Within each of these circles, count the number of browsed and unbrowsed plant tips for each species of woody plant and calculate a percentage for the property (all points combined). The table above is a good overall representation. However, the % of browse utilization of the second choice foods (See list of plant preference rankings in this document.) is the most reliable factor for estimating whether you are exceeding the capacity of your land to support the current deer density. Utilization rates of the second choice browse species of 10%, 30%, and 40% represent deer densities below, at, and above carrying capacity respectively (Lay 1967). If you are seeing browse rates of 40% or greater on average for your property, you either need to increase the amount of forage for deer (i.e. create more browse), reduce the number of deer, or both.

Water

Water Persistence

Water source **permanent** is defined as water available at all times during all years.

Water source **semipermanent** is defined as water is available throughout the year except in years of drought.

Water source **intermittent** is defined as water is available for extended periods throughout the year, yet dries up at some period during most years.

Interspersion

Interspersion Index

The habitat elements that provide food, protective cover, and water have greater value if they are in close proximity of each other throughout the home range. To measure this variable the point within the home range that is furthest away from any of the habitat elements should be determined. The distance from that point to the nearest edge of the most distant habitat element should then be measured using aerial photography as an aid. That value will fall within a distance specified in the interspersion index.

Habitat Proportion Index

The proportions of a habitat type (woodland versus shrubland versus open grassland) are an important consideration to provide adequate food, protective cover, and water. Optimally they should be in close proximity but if they are not of sufficient size their value is limited. To measure this variable simply estimate the proportion of the area evaluated as woodland, shrubland or shrubby habitat, and open areas. Then circle the appropriate value on your score sheet. This habitat element can be estimated using aerial photography as an aid.

Table 12. Hard or soft mast quantity

Size of mast producing area	Average size of overstory trees	Average distance between woody understory plants	Percent occurrence soft mast species	Percent occurrence hard mast species	Element quantity value
> 20 ac/home range	> 12 in. dbh	< 5 ft.	> 50%	> 50%	abundant
10-20 ac/home range	> 12 in. dbh	< 5 ft.	> 50%	> 50%	moderate
> 20 ac/home range	8-12 in. dbh	< 5 ft.	> 50%	> 50%	moderate
> 20 ac/home range	> 12 in. dbh	> 5 ft.	> 50%	> 50%	moderate
> 20 ac/home range	> 12 in. dbh	< 5 ft.	10-50%	> 50%	moderate
> 20 ac/home range	> 12 in. dbh	< 5 ft.	> 50%	10-50%	moderate
2-10 ac/home range	> 12 in. dbh	< 5 ft.	> 50%	> 50%	scarce
> 20 ac/home range	8-12 in. dbh	> 5 ft.	> 50%	> 50%	scarce
> 20 ac/home range	8-12 in. dbh	< 5 ft.	10-50%	> 50%	scarce
> 20 ac/home range	8-12 in. dbh	< 5 ft.	> 50%	10-50%	scarce
> 20 ac/home range	> 12 in. dbh	> 5 ft.	10-50%	> 50%	scarce
> 20 ac/home range	> 12 in. dbh	< 5 ft.	> 50%	10-50%	scarce
> 20 ac/home range	> 12 in. dbh	< 5 ft.	10-50%	10-50%	scarce

Note: The above parameter estimates must be made only in riparian or woodland areas where either soft or hard mast occurs and may contribute to deer food needs.

Soil Potential

Use the soil survey to determine the soils present within the home range. If the home range is woodland, use the woodland site index to assign soil potential ratings. If the home range is open land, use range yield to assign soil potential ratings. If more than one soil occurs or if part of the home range is open and part is wooded, interpolate proportionately. For example, if 80 percent of the home range was woodland where soils proportionately averaged rated 0.5, and 20 percent of the home range was open land where soils proportionately averaged rated 1.0, the following rating would be calculated for soil potential; (.80 x 0.5) + (.20 x 1.0) = 0.4 + 0.2 = 0.6.

Table 13. Cool season herbaceous plant or browse quantity

Size of cool season forage area	Percent occurrence cool season herbaceous plants	Size of area with browse plants	Percent occurrence of browse plants at < 4.5 ft. height	Element quantity value
> 10 ac.	> 50%	> 20 ac.	> 50%	abundant
> 10 ac.	> 50%	10-20 ac	> 50%	moderate
2-10 ac.	> 50%	> 20 ac.	> 50%	moderate
> 10 ac.	> 50%	> 20 ac.	10-50%	moderate
> 10 ac.	10-50%	> 20 ac.	> 50%	moderate
> 10 ac.	10-50%	> 20 ac.	10-50%	moderate
2-10 ac.	10-50%	> 20 ac.	> 50%	moderate
> 10 ac.	> 50%	10-20 ac	10-50%	moderate
2-10 ac.	> 50%	10-20 ac	> 50%	moderate
> 10 ac.	10-50%	10-20 ac	10-50%	scarce
2-10 ac.	> 50%	10-20 ac	10-50%	scarce
2-10 ac.	10-50%	> 20 ac.	10-50%	scarce
2-10 ac.	10-50%	10-20 ac	> 50%	scarce

Light Intensity

This criterion should be estimated by matching the appearance of overstory canopy trees using the latest aerial photography or field measurements.

Food Diversity

In order to be considered present, the food elements must be abundant enough that they can be detected in a casual examination of the home range and will contribute to deer food needs.

Notice the abundant browse (vines, shrubs, and young trees) that have resulted from this forest thinning. Periodic fire (4-7 years) will maintain this site in a desirable state for white-tails as most of these species resprout following fire. Browse higher than around 5 'is unavailable for deer, thus frequent disturbance is needed to keep the more palatable recent growth near ground level.

Closed canopy forests allow little sunlight to reach the forest floor. This results in limited browse and herbaceous plants which limits food resources for white-tails. This site does contain ample mast bearing trees, but during the spring and summer food will be limited.

wheat, rye, oats, barley, and ryegrass that are planted as crops or in food plots specifically for deer do well with no shade. However, as with other food plants, stands of native forage (grasses, forbs, and browse) are preferred because of high plant diversity and sustainability. Additionally, management of native plants is more cost effective than food plots.

Food Variety and Preference

A balanced diet for white-tailed deer must contain a variety of foods. A number of different food habit studies have shown that white-tailed deer eat over a hundred different plant species in a given locality (Korschgen 1962, Halls and Boyd 1982, Gee et al. 1991). Browse used by deer on a study in southeastern Oklahoma was related to percent cover of preferred browse and number of shrub species (Masters 1991*a*). Woody browse was the major component of diets in all months except May on areas subjected to heavy cattle grazing in southeastern Oklahoma (Jenks et al. 1990). However, when hard mast is available in fall

Food plots are typically over emphasized for white-tailed deer. They can be effective as an attractant to increase harvest. Where possible, use existing disturbed areas (such as this fire break) to serve as food plots. Proper forest management, prescribed fire, deer harvest management, and grazing management are the primary tools to manage for white-tailed deer.

and winter it comprises the major portion of diets (Fenwood et al. 1985). The presence of preferred forbs, panicums, and sedges probably affect use because of the selective foraging nature of white-tailed deer. Food diversity increases food selectivity which may prolong the period of use of all foods within the home range and ensure production of some food when other food production fails (Table 1-10). All vegetation that grows within the home range is not food. Some plants are fair, others good, and only a few are excellent food. Deer eat many kinds of plants, but the bulk of their diet in any one area might be made up of relatively few foods (Dasmann 1971).

Food Use

Heavy browsing of leaves and twigs by white-tailed deer or livestock can reduce plant vigor so that the plant is unable to sustain normal growth. As the plant loses vigor, its ability to manufacture food decreases. As the process continues, the root system is weakened leading to the gradual suppression and death of the plant. Certain browse species such as elms may continue to live with overuse but their foliage often develops a browse line which is above the reach of deer. A key indicator of over-use of preferred woody plants is a hedge-like appearance. The level of use of annual growth that a plant can sustain without damage varies by species. Enough work has been done to indicate that the allowable use for most deer browse plants falls between 40 and 65 percent (Dasmann 1971). When deer begin using emergency foods heavily such as eastern red cedar you can be sure that adequate food supplies are in short supply.

White-tailed deer consume many forbs and legumes during the growing season such as these ashy sunflowers which have been recently browsed. Browsing deer typically leave an uneven tear on plant tips, rather than a clean snip. Look for this to distinguish deer from rabbits.

Repeated browsing by white-tailed deer on this American elm is evident. If this is noted across large areas, it is an indication of more deer than the property can carry. Increasing harvest of doe and/or improvement of the habitat is the remedy for this problem.

Water

White-tailed deer require free water but can survive for relatively long periods without it as long as succulent plants are available. Amount required varies seasonally with summer requiring the most and winter the least. In Texas, Michael (1969) reported that watering sites are frequently the centers of deer home ranges and the presence or absence of water noticeably affects their daily activities. White-tailed deer obtain some water from succulent vegetation; however, they also drink free water daily. In New York, captive white-tail on artificial food and with access to a salt-lick drank an average of three quarts per day per one hundred pounds of body weight in winter (Maynard et al. 1935). Nichol (1936) suggested that white-tailed deer would drink 1.5 quarts per day on air-dry forage and 0.75 quarts per day when succulent forage was available. Water requirements may even be greater in hot and dry climates (Thomas et al. 1964). In the southeastern states, Marchinton (1968) suggested that deer do not need surface water daily, particularly in areas of high rainfall and humidity, and where succulent plants are available. From late July through September, drought is common and special attention should be given to available water. Water requirements are high for does that are lactating and a persistent water source in mid- to late-summer is important. However, very few places in Oklahoma lack abundant water resources and lack of water will seldom be an issue.

Water Criteria

Water Quantity

The size of the water body providing the white-tailed deer's water requirement is not important if it is permanent and accessible. At least one water body, however, should be available within the deer's home range.

Water Persistence

Deer may require water daily depending on local conditions, and it should be made available during all seasons to optimize conditions (Dasmann 1971).

Other Requirements

White-tailed deer do not have specialized requirements as do some other species of wildlife. However, they do exhibit preferences for certain needs that are not required. For example, white-tailed deer in Oklahoma preferred to fawn in open grassy spots exposed to the sun and close to brushy cover (Lindzey 1952). Prairies and shrublands with tall grasses are commonly used for fawning and bedding. White-tailed deer do not move to any special area for fawning (Michael 1965) or leave their normal home ranges for that purpose (Lindzey 1952).

Interspersion

Deer are a species that use numerous habitat types requiring the previously described habitat elements well distributed across a given landscape for survival. The closer one habitat element is to another, the less distance they have to travel for their needs. Optimal white-tailed deer habitat includes warm and cool season grasses, forbs, shrubs, mast producing trees, and water. Any changes in the home range that creates more or closer combinations of these elements will increase numbers (Dasmann 1971) up to carrying capacity. Movements are variable depending on age, sex, season, habitat, and physical condition.

Instructions for Completing the White-tailed Deer Habitat Evaluation Form

Species: White-tailed Deer
Home Range: 60-880 Acres
Habitat Requirements: Protective cover, food, water, and interspersion.

Protective Cover

Protective cover - Defined as any woody vegetation arranged densely enough to conceal deer. Acreage estimates should be made with the use of aerial photography.
Quantity - Estimated from aerial photographs.
Conditions - This parameter is estimated by selecting a stand of timber or shrubs that are characteristic of cover conditions within the home range. An observer then stands at the covers edge and observes a person walking into the cover to the point that the person can no longer be seen. That distance is one (1) concealment width. If the actual width of cover is only one concealment width, the cover rates 3. If the actual width of cover is twice or three times greater than the concealment width, rate as indicated on the rating sheet.

Note: If varying cover conditions exist within the home range, select an **average** cover area to estimate cover condition.

Food Criteria

Food Quantity

Table 11. Warm season herbaceous plant quantity

Size of area providing warm season forage	Percent occurrence of warm season herbaceous plants	Element quantity value
> 10 ac/home range	> 50%	abundant
> 10 ac/home range	10-50%	moderate
2-10 ac/home range	> 50%	moderate
10 ac/home range	1-10%	scarce
2-10 ac/home range	10-50%	scarce
< 2 ac/home range	> 50%	scarce

Note: Percent occurrence includes percent estimates of those plants listed as choice or medium preference warm season herbaceous plants and must be made only in the areas where warm season forages occur and may contribute to deer food needs.

Percent occurrence measurements may be made by using the step point method which involves pacing 100 paces in a representative portion of the area producing warm season forage and calculating the percent occurrence by counting the number of times the foot strikes a warm season herbaceous plant then divide by 100 paces.

Interpolations can be made if existing conditions do not fit the above criteria or if mixtures of one or more of the above quantities occur.

Any combination of size of area and percent occurrences that is less than the lowest combination above must have 0 recorded for the element quantity value.

Average DBH (diameter of the tree at the observer's breast height measured in inches) of overstory trees and average distance between woody understory plants are made by visual estimates.

Percent occurrence of choice or medium preference soft or hard mast species (Tables 4 and 5) may be estimated visually or may be measured using a line intercept method. The line intercept method is a simple measure that involves walking a pre-determined length in a straight line (e.g. 100 feet) and recording how many inches a given plant (in this case a mast species) crosses the plane of that line (both below and above). Divide that by the total length and you have calculated the % cover for that plant or group of plants. It is helpful to use a tape or twine stretched out to accurately determine this %. For example, if oak occurs across 50 total feet of a 100 foot line, then the % cover is 50%.

Interpolations can be made if existing conditions do not neatly fit the criteria (Table 11).

Any combination of parameters that is less than the lowest combination above must have 0 recorded in the element rating.

Percent occurrence estimates for listed choice and medium preference cool season herbaceous plants (Tables 8 through 10) will be made by a step point method if needed and browse estimates by the method detailed under the section on Food Use found on page 5.

Interpolations can be made if existing conditions do not neatly fit the criteria (Table 12).

Any combination of parameters that is less than the lowest combination above must have a 0 recorded in the quantity rating.

General Instructions

For white-tailed deer an overall habitat limiting factor can be calculated from the values assigned to each habitat requirement. The overall limiting factor value is determined by selecting the lowest limiting factor value assigned to any of the requirements. These values represent the general quality of habitat and the factor that is limiting the white-tailed deer population within the conceptual (i.e. not an actual defined home range of an animal, but a possible area that is used to evaluate what is available to an animal that might use that potential area) home range.

The system is used by most nearly matching the criteria ratings with existing land use and cover conditions and calculating the necessary values for determination of habitat quality.

The following procedures describe the method for inventorying existing habitat conditions, rating the habitat element, and calculating habitat quality and limiting factor values. Since the system is based primarily on the kinds, amounts, condition, and arrangement of plants, inventories should be performed during the growing season.

Ratings

Ratings for the various habitat criteria range from 1 (poor) to 10 (excellent). The number of ratings per criteria depend on the number of variables that can be practically measured and levels of management that can be practically applied.

Procedures

Step 1 - Determine the practicability of managing for deer on a particular property of area. For example, if the area is all in wheat or introduced pasture such as bermudagrass, fescue, or "Old World" bluestems, it is not practical to manage for white-tailed deer without extensive and expensive restoration treatments.

Step 2 - Determine the intensity of management that the manager wishes to use. Does the manager want high intensity management where white-tailed deer is the primary species of concern? Is the white-tailed deer a secondary species of concern behind beef cattle, goats, bobwhite quail, or a combination of species? Does the manager wish to make few if any changes in their operation and wish to provide the minimum habitat necessary to maintain white-tailed deer?

Step 3 - Select the areas that will represent the conceptual home range. The size of home range will be predetermined, based on intensity of management that the landowner wishes to employ. If high intensity management is desired, small home ranges will be used. If medium intensity management is desired, medium size home ranges will be used, etc. Conceptual home ranges may be square, rectangular, triangular, or any other shape that is practical to appraise and manage. The conceptual home range may consist of one field or may cross field or land use/cover boundaries. A single home range may represent the entire property, or several home ranges may be superimposed over the property. A portion of the property might be evaluated by looking at one or more conceptual home ranges and the remainder of the unit not evaluated at all or evaluated by evaluating the habitat for another species. The designation of the conceptual home range must be within the landowner's property and must always be within the specified home range size limits.

Step 4 - Examine the home range area to assure that all required elements are present. If any element is missing, a "0" value is recorded on that element's quantity criteria rating, which means that the habitat is unsuitable for that species unless that habitat element is provided. Some requirements may be filled by more than one element, that is, herbaceous plants (forbs, legumes, or grasses) and agricultural crops may fulfill the white-tailed deer's year-round food requirements. Likewise, certain elements may be used to fill more than one requirement. For example, native herbaceous and woody plants can fill the deer's cover and food requirements. When this occurs, it is not necessary to make additive quantity ratings for each requirement. As an example, if one (1) acre of wild herbaceous plants is required for food, that same acre can fulfill other requirements without having to add an additional acre of wild herbaceous plants, or the same acre can fulfill both cover and food requirements, provided condition and arrangement of the vegetation are suitable for both.

Step 5 - Evaluate each required habitat element by matching habitat conditions with the ratings for the various criteria. Specific instructions are contained with the evaluation form.

Step 6 - Determine the limiting factor value for each requirement.

Requirement limiting factor values equals criteria with lowest rating value for each requirement.

Step 7 - Place values for each requirement in the "Summary of Limiting Factors for White-tailed Deer" on page 18.

Step 8 - Select the management practices from the Management Recommendations column that correspond to the lowest value.

Step 9 - Prepare a management plan that addresses the limiting factors.

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Table 8. Cool Season Herbaceous Plants: Forbs and Ferns.

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Antennaria spp.	Pussytoes	*Coreopsis grandiflora*	Big flower coreopsis	*Achillea* spp.	Yarrow
Callirhoe spp.	Poppymallow	*Evax* spp.	Fluffweed	*Aster ericoides*	Heath aster
Englemannia pinnatifida	Engelmann daisy	*Frageria virginica*	Wild strawberry	*Aster oblongifolius*	Aromatic aster
Lactuca spp.	Wild lettuce	*Gaillardia* spp.	Gaillardia	*Cirsium* spp.	Thistles
Lesquerella spp.	Bladderpod	*Hieracium* spp.	Hawkweeds	*Capsella bursa-pastorus*	Shepardspurse
Nastritium officinale	Watercress	*Lithospermum* spp.	Puccoon	*Geum* spp.	Avens
		Plantago spp.	Plantains	*Hymenopappus* spp.	Woolywhite
		Pteridophytes	Ferns	*Lepidium* spp.	Pepperweed
		Pyrrhopappus spp.	False dandelion	*Lygodesmia* spp.	Skeletonweed
		Ratibida columnaris	Prairie coneflower	*Rannuculus* spp.	Buttercup
		Rumex spp.	Dock	*Senecio* spp.	Groundsels
				Sonchus spp.	Sowthistles
				Taraxacum officinale	Dandelion
				Thelesperma spp.	Greenthread
				Verbena spp.	Vervian

Table 9. Cool Season Herbaceous Plants: Grasses and Sedges.

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Avena sativa	Oats*	*Agropyron* spp.	Wheatgrasses	*Danthonia spicata*	Poverty grass
Bromus spp.	Annual bromes	*Alopecurus caroliniana*	Carolina foxtail	*Hordeum* spp.	False barleys
Dicanthelium spp.	Low panicums	*Bromus inermis*	Smooth brome*	*Koeleria cristata*	Prairie junegrass
Leptochloa dubia	Green spangletop	*Carex* spp.	Sedges		
Lolium spp.	Rye grass*	*Cyperus* spp.	Nutsedges		
Poa spp.	Bluegrasses	*Eleocharis* spp.	Spike rushes		
Secale cereal	Rye*	*Elymus* spp.	Wild ryes		
Stipa leucotricha	Texas wintergrass	*Festuca* spp.	Fescues		
Triticum aestivum	Wheat*	*Melica* spp.	Melic grasses		
		Phalaris caroliniana	Carolina canarygrass		

* Cultivated

Table 10. Cool Season Herbaceous Plants: Legumes.

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Astragalus spp.	Milkvetches				
Coronilla varia	Trailing crownvetch				
Dalea aurea	Silktop dalea				
Lathyrus spp.	Flat peas				
Medicago spp.	Alfalfa* and medics				
Melilotus spp.	Sweet clovers*				
Psoralea spp.	Scurf peas				
Trifolium spp.	Clovers				
Vicia spp.	Vetches				

* Cultivated

Table 6. Warm Season Woody Plants: Browse (trees and shrubs).

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Amorpha canescens	Leadplant	*Acer rubrum*	Red maple	*Acer* spp.	Silver and sugar maples
Ceanothus americana	Jersey tea	*Acer negundo*	Boxelder		
Celtis spp.	Hackberries	*Amelanchier arborea*	Downy serviceberry	*Albizia julibrissin*	Mimosa tree
Cercocarpus montanus	Mountain mahogany	*Atriplex canescens*	Fourwing saltbush	*Alnus serrulata*	Hazel alder
		Callicarpa americana	American beautyberry	*Aralia spinosa*	Devil's walkingstick
Chionanthus virginicus	Fringetree			*Asimina triloba*	Pawpaw
Cornus drummondii	Roughleaf dogwood	*Cercis canadensis*	Redbud	*Baccharis* spp.	Winterwillow and seepwillow
Corylus americana	American hazelnut	*Cornus florida*	Flowering dogwood		
Euonymus spp.	Euonymus	*Crataegus* spp.	Hawthorns	*Betula nigra*	River birch
Hydrangea arborescens	Smooth hydrangea	*Halesia carolina*	Carolina silverbell	*Bumelia lanuginosa*	Chittamwood
Itea virginica	Virginia willow	*Hamamelis* spp.	Witch hazels	*Carya* spp.	Hickories and pecans
Lespedeza spp.	Shrub lespedeza	*Hypericum spathulatum*	Shrubby St. Johnswort		
Lonicera spp.	Bush honeysuckle			*Carpinus caroliniana*	Ironwood
Mimosa borealis	Fragrant mimosa	*Ilex* spp.	Hollies	*Cephalanthus occidentalis*	Buttonbush
Nyssa sylvatica	Blackgum	*Lindera benzoin*	Spicebush		
		Lyonia spp.	He-huckleberries	*Condalia obtusifolia*	Lotebush
Ulmus spp.	Elms	*Maclura pomifera*	Osage orange	*Diospyros virginiana*	Common persimmon
Vaccinum spp.	Blueberries	*Malus ioensis*	Prairie crabapple		
Virburnum spp.	Black haws	*Morus rubra*	Red mulberry	*Fagus grandifolia*	American beech
		Planera aquatica	Water elm	*Forestiera* spp.	Privets
		Populus deltoides	Eastern cottonwood	*Fraxinus* spp.	Ashes
		Prosopsis glandulosa	Honey mesquite	*Gleditsia triacanthos*	Honey locusts
		Prunus spp.	Plums	*Juniperus virginiana*	Eastern redcedar
		Rhododendron spp.	Wild azaleas	*Liquidambar styraciflua*	Sweetgum
		Rhus spp.	Sumacs		
		Ribes odoratum	Clove current	*Myrica cerifera*	Southern wax myrtle
		Rosa spp.	Roses		
		Rubus spp.	Blackberries	*Ostyra virginiana*	Eastern hophorn
		Salix spp.	Willows	*Plantanus occidentalis*	Sycamore
		Sambucus canadensis	Elderberry	*Prunus serotina*	Black cherry
		Sassafras albidum	Sassafras	*Quercus* spp.	Oaks
		Styrax americana	Snowbell	*Rhamnus caroliniana*	Carolina buckthorn
		Symplocos tinctora	Sweetleaf	*Robinia pseudoacacia*	Black locust
				Symphoricarpos orbiculatus	Buckbrush
				Tilia spp.	Basswoods
				Vaccinium arboretum	Tree sparkleberry

Table 7. Warm Season Woody Plants: Browse (vines).

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Brunnichia ovata	Ladies eardrops	*Anistostichus capreolata*	Crossvine	*Ampelopsis arborea*	Peppervine
Campsis radicans	Trumpet creeper			*Ampelopsis chordata*	Heartleaf ampelopsis
Celastrus scandens	American bittersweet	*Berchemia scandens*	Rattanvine		
		Mitchella repens	Partridgeberry	*Cissus incise*	Ivy treevine
Clematis spp.	Clematis	*Parthenocissus quinquefolia*	Virginia creeper		
Cocculus carolinia	Carolina snailseed				
Lonicera alba	White honeysuckle	*Trachelospermum difforme*	American starjasmine		
Lonicora japonica	Japanese honeysuckle				
Lonicera sempervirens	Coral honeysuckle				
Rhus radicans	Poison ivy				
Rubus spp.	Blackberries				
Smilax spp.	Greenbriars				
Vitis spp.	Grapes				

Important Deer Foods in Oklahoma

Table 1. Warm Season Herbaceous Plants: Forbs and Fungi.

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Abutilon incanum	Indian mallow	*Anemone* spp.	Windflowers	*Acalypha* spp.	Three seeded mercury
Ambrosia trifida	Giant ragweed	*Chaerophyllum* spp.	Chevril		
Antennaria spp.	Pussytoes	*Chrysopsis* spp.	Goldasters	*Argemone* spp.	Prickly poppy
Ascyrum spp.	St. Andrew's cross	*Commelina* spp.	Dayflowers	*Artemisia ludoviciana*	Louisiana sagewort
Aster spp.	Slender woodland asters	*Elephantopus* spp.	Elephantfoot	*Aster* spp.	Old field asters
		Erigeron spp.	Fleabanes	*Croton* spp.	Crotons
Bacopa spp.	Waterhysop	*Erodium* spp.	Filares	*Daucus* spp.	Wild carrot
Brasenia schreberi	Watershield	*Fragaria* spp.	Strawberries	*Melampodium* spp.	Blackfoot
Chaetopappa asteroids	Least daisy	*Gaillardia* spp.	Gaillardias	*Mirabilis* spp.	Four o'clocks
Chenopodium album	Lambsquarters	*Galium* spp.	Bedstraw	*Monarda* spp.	Beebalms
Echinacea spp.	Black sampson	*Hieracium* spp.	Hawkweeds	*Phyllanthus* spp.	Leaf flower
Eclipta alba	Yerba de tajo	*Kuhnia* spp.	Boneset	*Ratibida columnaris*	Prairie coneflower
Engelmannia pinnatifida	Engelmann daisy	*Lithospermum* spp.	Pucoons	*Rudbeckia* spp.	Black-eyed susan
Eustoma spp.	Prairie gentians	*Mentzelia* spp.	Sand lilies	*Ruellia* spp.	Wild petunia
Fungi	Mushrooms	*Opuntia* spp.	Prickly pears	*Sanicula* spp.	Sanicle
Helianthus spp.	Sunflowers	*Oxalis* spp.	Sheep sorrels	*Saururus cernuus*	Lizardtail
Hypericum spp.	St. Johnswort	*Plantago* spp.	Plantains	*Sida* spp.	Sida
Ipomea spp.	Morning glories	*Polygala* spp.	Milkworts	*Solidago* spp.	Old field goldenrod
Iva spp.	Sumpweeds	*Taraxacum officinale*	Dandelion	*Solanum* spp.	Nightshades
Jussiaea spp.	Water primroses	*Verbesina* spp.	Wingstems	*Tragia* spp.	Noseburn
Lactuca spp.	Wild lettuce			*Verbena*	Vervians
Lesquerella spp.	Bladderpods				
Oenothera spp.	Evening primrose				
Phytolacca americana	Pokeweed				
Physalis spp.	Ground cherries				
Salvia pitcheri	Pitcher's sage				
Scutellaria spp.	Skullcap				
Silphium spp.	Rosinweeds and Compass plants				
Solidago spp.	Slender woodland goldenrods				
Sphaeralcea spp.	Globe mallows				

Table 2. Warm Season Herbaceous Plants: Legumes.

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Amphicarpa bracteata	Southern hogpeanut	*Acacia angustissima*	Prairie acacia		
Apios americana	Potatobean	*Neptunia lutea*	Yellow neptune		
Arachis hypogea	Peanut*	*Schrankia uncinata*	Catclaw sensitive briar		
Astragalus crassicarpus	Groundplum				
Clitoria mariana	Atlantic pigeonwings	*Stylosanthes* spp.	Pencil flower		
		Tephrosia spp.	Goats rue		
Cyamopsis tetragonoloba	Gaur				
Dalea spp.	Dalea				
Desmanthus spp.	Bundleflowers				
Desmodium spp.	Tickclovers				
Galactia spp.	Milk peas				
Glycine max	Soybean*				
Indigofera leptosepala	Western indigo				
Krameria glandulosa	Range ratany				
Lespedeza spp.	Lespedeza				
Medicago sativa	Alfalfa*				
Petalostemon spp.	Prairie clover				
Phaseolus spp.	Beans				
Rhynchosia spp.	Snoutbeans				
Psoralea spp.	Scurfpeas				
Strophostyles spp.	Wildbeans				
Vigna spp.	Cowpeas*				

* Cultivated

Table 3. Warm Season Herbaceous Plants: Grasses and Sedges.

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Arundinaria gigantea	Switch cane	*Carex* spp.	Sedges	*Setaria* spp.	Bristlegrasses
Diarrhena americana	American beakgrain	*Digitaria* spp.	Crabgrass	*Uniola latifolia*	Broadleaf uniola
Dichanthelium spp.	Low panicums	*Leptochloa* spp.	Sprangletops	*Uniola senssiliflora*	Longleaf uniola
Panicum anceps	Beaked panicum	*Paspalum* spp.	Paspalums		
Paspalum bifidum	Pitchfork paspalum	*Phalaris* spp.	Canarygrass		
Paspalum floridanum	Florida paspalum	*Sorghum halpense*	Johnsongrass		
Sorghum vulgare	Sorghums*	*Scleria* spp.	Nut sedges		
		Muhlenbergia schreberi	Nible will		
Tripsacum dactyloides	Eastern gama grass	*Muhlenbergia sylvatica*	Forest muhly		

* Cultivated

Table 4. Warm Season Woody Plants: Hard Mast (trees and shrubs).

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Aorylus americana	Hazelnut	*Carya illinoensis*	Pecan	*Carya aquatica*	Water hickory
Castanea ozarkensis	Ozark chinkapin	*Fagus grandifolia*	American beech	*Carya cordiformis*	Bitternut hickory
Castanea pumila	Allegheny chinkapin	*Quercus falcata*	Southern red oak	*Carya glabra*	Pignut hickory
		Quercus macrocarpa	Burr oak	*Carya laciniosa*	Shellbark hickory
Gleditsia triacanthos	Honey locust	*Quercus nigra*	Water oak	*Carya myristiciformis*	Nutmeg hickory
Quercus alba	White oak	*Quercus nuttallii*	Nuttal oak	*Carya ovata*	Shagbark hickory
Quercus durandii	Short-lobe oak	*Quercus phellos*	Willow oak	*Carya texana*	Black hickory
Quercus gambelli	Gambel oak	*Quercus rubra*	Northern red oak	*Carya tomentosa*	Mockernut hickory
Quercus havardii	Shin oak	*Quercus shumardii*	Shumard oak		
Quercus incana	Bluejack oak	*Quercus velutina*	Black oak		
Quercus lyrata	Overcup oak				
Quercus marilandica	Blackjack oak				
Quercus michauxii	Swamp chestnut oak				
Quercus mohriana	Morh oak				
Quercus muhlenbergii	Chinkapin oak				
Quercus prinoides	Dwarf chinkapin oak				
Quercus stellata	Post oak				
Quercus virginiana	Live oak				

Table 5. Warm Season Woody Plants: Soft Mast (trees, shrubs, and vines).

Choice Foods		Medium Preference Foods		Low Preference Foods	
Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name	Common Name
Amelanchier arborea	Downy serviceberry	*Ampelopsis arborea*	Peppervine	*Sapindus drummondii*	Western soapberry
Asiminia triloba	Pawpaw	*Berchemia scandens*	Rattanvine		
Bumelia lanuginosa	Chittam wood	*Chionanthus virginicus*	Fringetree		
Callicarpa americana	American beautyberry	*Cornus drummondii*	Roughleaf dogwood		
Celastrus scandens	American bittersweet	*Ilex opaca*	American holly		
		Morus rubra	Red mulberry		
Cocculus caroliniana	Carolina snailseed	*Parthenocissus quinquefolia*	Virginia creeper		
Cornus florida	Flowering dogwood				
Diospyros virginiana	Persimmon	*Rhamnus caroliniana*	Caroliana buckthorn		
Euonymus americanus	Strawberry bush	*Ribes odoratum*	Clove current		
Euonymus atropurpureus	Eastern wahoo	*Rubus* spp.	Blackberries		
		Sambucus canadensis	Elderberry		
Lindera benzoin	Spicebush	*Symphoricarpos orbiculatus*	Buckbrush		
Malus loensis	Prairie crabapple				
Malus pumila	Apple	*Crataegus* spp.	Hawthorns		
Mitchella repens	Partridgeberry	*Ilex decidua*	Deciduous holly		
Nyssa sylvatica	Blackgum	*Ilex vomitoria*	Yaupon		
Prunus spp.	Plums				
Prunus serotina	Black cherry				
Pyrus communis	Pear				
Rosa spp.	Roses				
Sassafras albidum	Sassafras				
Smilax spp.	Greenbriars				
Styrax americana	American snowbell				
Vaccinium spp.	Blueberries				
Vitis spp.	Grapes				