Landowners who are managing their land for white-tailed deer may consider planting food plots to provide a supplemental food source (Figure 1). On some properties, establishing and maintaining food plots can provide supplemental food and nutrition for deer, but food plots should never be considered a substitute for managing the native vegetation to provide quality food sources. In situations where food plots would contribute to deer management objectives, the plots need to be established and maintained properly.

**Deer nutrition**

Deer are selective browsers; therefore, a variety of foods make up their diet, including broad-leaved herbaceous plants (forbs), woody plants, grasses, mast (acorns, fruits and berries) and mushrooms. No one food dominates a deer’s diet throughout the year because deer select foods based on plant availability, palatability and nutritional content, all of which vary throughout the year.

The nutritional needs of deer also vary throughout the year. During the spring and summer, pregnant and lactating does and antler-growing bucks need more protein in their diets. During the fall and winter, deer have greater energy demands and therefore need more carbohydrates. Food plots can be planted to provide supplemental nutrition during times of stress, such as when does are pregnant or lactating and when bucks are growing antlers. Stress periods often coincide with times of the year when native vegetation is lacking or poor in quality, typically from late summer to early fall and from mid- to late winter. Refer to MU Extension publication G9487, *Nutritional Requirements of White-tailed Deer in Missouri*, for more complete information on deer nutrition.

**Food plot considerations**

Before establishing a food plot for deer, consider these questions as you determine what is best for your property:

- What management objectives will a food plot accomplish on your property?
- Will the forage be available during stress periods and provide nutritional benefits?
- Will the forage benefits justify the required costs and effort?
- What areas on the property are good locations for food plots?
- Are deer likely to use the food plot?
- Do you have the necessary equipment to establish and manage food plots?

**Set objectives**

In most cases, managing existing native vegetation is a more practical and cost-effective way to increase the quantity and nutritional quality of available forage, as establishing and maintaining food plots can be expensive. However, if food plots are warranted, the first step is to determine the objectives for the food plots, as the objectives will guide all of the establishment and management decisions. In addition to providing supplemental nutrition during stress periods, food plots can be established to to improve hunting or viewing opportunities, or to alter deer movement patterns.
Determine the cost

Establishing and managing a food plot requires a financial investment. Depending on the objectives, establishing a food plot can cost up to $200 an acre in seed, herbicide, fertilizer and lime, in addition to the costs for equipment, labor and fuel.

The expense of managing a food plot from year to year will vary based on its size, annual fertility needs, weed control and the seed planted. If properly managed, some food plots may provide supplemental nutrition for over three years.

The cost of food plot establishment can be reduced in various ways. Cost-saving possibilities include partnering with nonprofit wildlife organizations that may provide seeds for planting, buying seed in bulk as a group of landowners or a cooperative, or working with a neighboring landowner and sharing equipment that can be used in establishing the plots.

Identify the location

Areas where deer travel and areas near habitats that provide protective cover are ideal locations for food plots. Food plots can also be established in woodland openings or adjacent to forest edges, idle areas or open fields. Other possible food plot locations include along rights of way, logging decks, fire lines and woodland roads (Figure 2).

Food plots are commonly established adjacent to a forested edge. These areas can be made even more attractive to deer and other wildlife through the development of a transition zone or field border with edge feathering or shrubs (Figure 3).

Because of the possibility of increased poaching or deer-vehicle accidents, a food plot should not be located next to a public road. Also, to prevent unnecessary issues with neighboring landowners and hunters, avoid planting a food plot along a property boundary.

Consider size and shape

Topography and the surrounding habitat will dictate the type and amount of acreage that should be planted to a food plot. However, evenly distributing food plots over 2 to 5 percent of a property, using a combination of warm- and cool-season forages is generally recommended.

Recommended sizes vary from ½ to 5 acres depending on the forages being used and the configuration of the property. Generally, larger food plots of 3 to 5 acres are
more beneficial for deer. Smaller food plots can be useful but tend to produce less forage due to browsing pressure and shading. Food plots larger than 5 acres can be designed with corridors or hedgerows of trees planted at 50-yard intervals to create visual breaks and provide screening cover (Figure 4).

The size of a food plot may also be determined by access, size of equipment or location on the property. For example, small isolated fields may be available, but poor access limits the size of equipment that can reach them. Smaller equipment, such as an all-terrain or utility terrain vehicle (ATV or UTV), might be the only means of maintaining a food plot in these isolated areas (Figure 5).

The shape of a food plot will often depend on the area’s topography. Food plots can be rectangular, square or irregular, and the border can have edges that are wavy or straight. A hub-and-spoke design, where several food plots are established as lanes beside areas of early successional vegetation, can also be used to increase hunting opportunities (Figure 6). Large rectangular or square food plots could be established in areas of high deer density to reduce browsing pressure and increase the chance of forage establishment (Figure 7).

Select forages

Selecting the right combination of forages or plant mixtures to use in a food plot is important. Various combinations of warm-season and cool-season forages that are either annuals or perennials can be considered (Table 1).

The type of planting that is suitable for an area depends on several factors:

- Soil fertility (see Food plot establishment section)
- Sunlight availability
- Soil drainage
- Equipment available
- Deer herd density
- Surrounding land-use practices

Planting a variety of cool- and warm-season forages will offer a diversity of foods that will be used at various times of the year. Select forages that are palatable and that provide nutrition during stress periods for deer.

Annual vs. perennial

Annual plants germinate, grow, flower and produce a seed in one growing season. Perennial plants germinate, grow, flower and produce seeds on a continual basis over multiple years. Most food plot forages are annuals or perennials, but some can be biennials. Plants such as red clover have a biennial life cycle and generally live two years, growing roots, stems and leaves the first year, and flowering and then dying the second year.

Cool-season vs. warm-season

Plants used in a food plot can be classified as either cool-season or warm-season. Cool-season, or “green browse,”
food plot forages — such as clover, winter wheat and rape — grow during the fall and spring when temperatures are cooler. These forages provide sources of quality nutrition when other foods may be limited. They help bucks recover from the stress associated with breeding season and can increase hunting opportunities on the property. Annual grains such as winter wheat or oats planted alone or with various clover varieties will provide a source of nutritious foods during the late fall and winter (Figure 8).

Planting a variety of cool-season forages will ensure that adequate nutrition is available during the early fall when warm-season forages may be lacking and through late winter when green browse is at a premium.

Crops in the *Brassica* genus can also be very attractive to deer. *Brassica* species include turnips, rape, radishes, kale and canola (Figure 9).

Warm-season forages are typically planted in the spring (late April through May) after the threat of frost has passed and before the drier summer months. Both corn and grain sorghum produce grains that are high in carbohydrates and fat for energy and are very attractive to deer in the fall and winter. Soybeans are a warm-season crop that is heavily consumed as green forage in the summer and whose beans are used throughout the winter. Warm-season forages can supply supplemental nutrition that is important for lactation, fawn growth and antler development.

A variety of native forbs and legumes typically make up a large percentage of a deer’s diet during the warm, summer growing season. Thus, warm-season plots can also be planted that contain a variety of high-quality legumes and other forbs to supplement naturally occurring vegetation.

### Food plot establishment

Once you have decided on the size of the food plot, you can ensure the success of the planting by determining soil fertility needs, preparing the seedbed and planting the forage at the recommended rates and depths. Keep in mind that establishing food plots on highly fertile soils and areas with flat topography will minimize establishment cost and reduce potential problems associated with soil erosion.

### Determine soil fertility

The quality and overall fertility of the soil will influence the ability of the plants to persist in the stand and can also indirectly affect the nutritional quality of the forages. The nutritional quality of the vegetation is a byproduct of the soil fertility level, which is therefore an important factor to consider before establishing a food plot.

### Soil testing

At least three months before planting, have the soil tested to determine whether any fertilizer or liming is required for the seeding mixtures you plan to use (Figure 10). A soil test will determine if fertility and pH need to be modified before planting. Collecting soil samples involves gathering four to six random samples of soil, about 4 inches deep, throughout the food plot. Be sure to collect samples of soil from several locations in the field. Mix together all the samples from within a single food plot and allow the soil to dry before sending it to a local MU Extension center or directly to the Soil and Plant Testing Laboratory for
Table 1. Food plot forages commonly used in Missouri.

<table>
<thead>
<tr>
<th>Forage</th>
<th>Growing season</th>
<th>Life cycle</th>
<th>Soil pH (pounds per acre)</th>
<th>Planting date</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alsike clover</td>
<td>Cool</td>
<td>Perennial</td>
<td>6.0–6.5</td>
<td>Broadcast 4–6</td>
<td>August or April</td>
</tr>
<tr>
<td>Arrowleaf clover</td>
<td>Cool</td>
<td>Annual</td>
<td>6.0–6.5</td>
<td>Broadcast 10–15</td>
<td>September</td>
</tr>
<tr>
<td>Crimson clover</td>
<td>Cool</td>
<td>Annual</td>
<td>5.5–6.5</td>
<td>Broadcast 20–25</td>
<td>July to November</td>
</tr>
<tr>
<td>Forage radish</td>
<td>Cool</td>
<td>Annual</td>
<td>6.0–6.5</td>
<td>Broadcast 12 or drill 7–10</td>
<td>August to September</td>
</tr>
<tr>
<td>Kale</td>
<td>Cool</td>
<td>Annual</td>
<td>5.5–6.5</td>
<td>Broadcast or drill 4–5</td>
<td>August to September</td>
</tr>
<tr>
<td>Ladino clover</td>
<td>Cool</td>
<td>Perennial</td>
<td>6.0+</td>
<td>Broadcast 1–3</td>
<td>September or February to March</td>
</tr>
<tr>
<td>Oats</td>
<td>Cool</td>
<td>Annual</td>
<td>5.8–6.5</td>
<td>Broadcast 80–120</td>
<td>August to September</td>
</tr>
<tr>
<td>Rape</td>
<td>Cool</td>
<td>Annual</td>
<td>5.3–6.8</td>
<td>Broadcast 4–9 or drill 2–6</td>
<td>August to September</td>
</tr>
<tr>
<td>Red clover</td>
<td>Cool</td>
<td>Perennial</td>
<td>5.5+</td>
<td>Broadcast 10</td>
<td>August or April</td>
</tr>
<tr>
<td>Rye (grain)</td>
<td>Cool</td>
<td>Annual</td>
<td>5.8–6.5</td>
<td>Broadcast 90–120</td>
<td>August to September</td>
</tr>
<tr>
<td>Turnip</td>
<td>Cool</td>
<td>Annual</td>
<td>6.0–6.5</td>
<td>Broadcast or drill 3–6</td>
<td>August to September</td>
</tr>
<tr>
<td>Wheat</td>
<td>Cool</td>
<td>Annual</td>
<td>5.8–6.5</td>
<td>Broadcast or drill 100–150</td>
<td>August to September</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>Warm</td>
<td>Perennial</td>
<td>6.5–7.5</td>
<td>Broadcast 20–25 or drill 12–15</td>
<td>August or April</td>
</tr>
<tr>
<td>Corn</td>
<td>Warm</td>
<td>Annual</td>
<td>5.8–7.0</td>
<td>Drill 10–45</td>
<td>April to June</td>
</tr>
<tr>
<td>Cowpea</td>
<td>Warm</td>
<td>Annual</td>
<td>5.2–7.5</td>
<td>Broadcast 30–50 or drill 40–80</td>
<td>May to June</td>
</tr>
<tr>
<td>Grain sorghum</td>
<td>Warm</td>
<td>Annual</td>
<td>5.8–7.0</td>
<td>Drill 8</td>
<td>May to June</td>
</tr>
<tr>
<td>Lablab</td>
<td>Warm</td>
<td>Annual</td>
<td>5.9–7.5</td>
<td>Drill 15–20</td>
<td>May to June</td>
</tr>
<tr>
<td>Soybean</td>
<td>Warm</td>
<td>Annual</td>
<td>5.5–7.0</td>
<td>Drill 50–75</td>
<td>May to June</td>
</tr>
</tbody>
</table>

For more information, refer to MU Extension publication G4652, Seeding Rates, Dates and Depths for Common Missouri Forages, http://extension.missouri.edu/g4652.

Key soil nutrients

The most important nutrients that plants need for growth are nitrogen (N), phosphorus (P) and potassium (K), which are the basis of most fertilizers. A soil test report will provide recommended fertilizer amounts and time of application that will ensure success. Typically, legumes have a high P and K requirement and do not need nitrogen because they “fix” nitrogen from the bacteria that occur on the nodules of their root systems.

Nitrogen is the key ingredient in plant proteins. It helps increase plant growth, palatability and crude protein levels. Plants that aren’t getting enough nitrogen often have light green to yellow-green foliage. Grasses and grain crops are often the first to suffer from nitrogen deficiency and greatly benefit from timely nitrogen applications.

Phosphorus is essential for plant root and leaf growth. Without enough phosphorus, plant growth is stunted and foliage often is purplish.

Potassium helps plants regulate water, absorb nitrogen, perform photosynthesis and transport nutrients. This important nutrient also increases root
growth and drought tolerance. Potassium deficiency often decreases protein availability and causes leaf edges to turn yellow to pale brown.

**Soil pH**

A soil's pH is a measure of its overall acidity. It is measured on a scale of 1 to 14, with a pH of 7 being neutral. Lower pH values are indicative of an acidic condition and higher values of an alkaline, or basic, condition. A soil pH of 6.5 to 7 is recommended for most food plot plantings.

Soil pH can influence plant growth, a plant's ability to fix nitrogen, and the overall availability of nutrients to the plant. For instance, phosphorus and calcium — two important minerals necessary for antler growth — become less available to plants in acidic soils. These conditions can be adjusted by incorporating the recommended rates of agricultural lime into the soil about six months before planting.

**Prepare seedbed**

A clean, well-disked seedbed is ideal for establishing small seeded plants such as clovers and brassicas. The seedbed should be firm and free of vegetation before it is planted.

Depending on the site, a recommended herbicide may need to be applied to control existing perennial grasses, such as tall fescue, and other vegetation before disk ing or using a no-till drill. If these grasses are not controlled, they will eventually outcompete the food plot plants. A variety of recommended herbicides (broad-spectrum or grass-specific) and various formulations can be used, depending on the circumstance and the vegetation that is being controlled. For example, if tall fescue is present in the food plot area, spray 1.5 to 2 quarts of glyphosate per acre in the fall before a spring planting or in the spring before a fall planting. Before spraying the area, the grasses should be burned, grazed or mowed so that the field is free of thatch, which would block much of the herbicide from the growing grass. About two weeks after the herbicide application, the food plot can be no-tilled drilled or disked for planting.

**Calculate pure live seed**

Pure live seed (PLS) is a measure of the actual percent of the crop seed in the bag that is expected to germinate once planted. It can be used as an indirect measure of the quality of seed. PLS can be affected by the amount of inert matter, the percentage of pure seed and the germination rate. Although two seed bags of the same plant species may weigh the same, each may not have the amount of pure live seed needed to plant the same number of acres. The seeding rate will differ depending on the amount of PLS each seed bag contains.

To calculate the amount of PLS a bag contains, multiply the pure seed percentage by the germination percentage listed on the bag's seed tag.

\[
\text{Pure seed} \times \text{Germination} = \text{Pure live seed}
\]

**Example:**

\[
0.98 \times 0.80 = 0.784 \quad (78.4\%)
\]

To calculate the actual seeding amount based on the PLS, divide the desired seeding rate by the PLS. For example, if the desired seeding rate is 8 pounds per acre and the PLS of the seed is 78 percent, the actual seeding rate will be 10.2 pounds per acre.

\[
\frac{\text{Desired seeding rate} \text{ (pounds per acre)}}{\text{Pure live seed (percentage)}} = \text{Actual seeding rate (pounds per acre)}
\]

**Example:**

\[
\frac{8}{0.78} = 10.2
\]

---

**Table 2. Food plot mixes commonly used in Missouri.**

<table>
<thead>
<tr>
<th>Forages</th>
<th>Growing season</th>
<th>Life cycle</th>
<th>Soil pH</th>
<th>Seeding rate (pounds per acre)</th>
<th>Planting date</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alsike clover, small grain</td>
<td>Cool</td>
<td>Annual, perennial</td>
<td>Low pH well tolerated</td>
<td>Broadcast alsike 4–6, small grain 50</td>
<td>August to September</td>
<td>Tolerates wet soil but not hot, dry conditions. Handles browsing pressure well.</td>
</tr>
<tr>
<td>Rye (grain, white clover)</td>
<td>Cool</td>
<td>Annual, perennial</td>
<td>5.8–6.5</td>
<td>Broadcast rye 50, white clover 5</td>
<td>August to September</td>
<td>Rye (grain, not to be confused with ryegrass) allows clover to establish.</td>
</tr>
<tr>
<td>Red clover, arrowleaf clover</td>
<td>Cool</td>
<td>Annual, perennial</td>
<td>5.5+</td>
<td>Broadcast (Drill) red clover 5–7 (5), arrowleaf clover 5–7 (5), grain 50 (30)</td>
<td>August in the north; September or early March in the south</td>
<td>Disk in August and fertilize in September according to soil test recommendations. Clovers will germinate quickly and reseed.</td>
</tr>
<tr>
<td>Crimson clover and wheat</td>
<td>Cool</td>
<td>Reseeding clover</td>
<td>5.8–7.0</td>
<td>Broadcast (Drill) crimson clover 15 (10), wheat 50 (40)</td>
<td>Late August or early September</td>
<td>Crimson clover is annual clover that is an excellent companion plant and will reseed. Mixture tolerates a variety of soil conditions.</td>
</tr>
<tr>
<td>Alyceclover, American jointvetch</td>
<td>Warm</td>
<td>Annual</td>
<td>5.5–6.5</td>
<td>Broadcast 10 each</td>
<td>May or June</td>
<td>Provides good forage for deer but is susceptible to drought.</td>
</tr>
<tr>
<td>Grain sorghum, forage bean</td>
<td>Warm</td>
<td>Annual</td>
<td>5.6–7.0</td>
<td>Drill grain sorghum 7, beans 50</td>
<td>May to June</td>
<td>Provides a combination of warm- and cool-season food sources.</td>
</tr>
</tbody>
</table>

For the most recent information, see extension.missouri.edu
Seeding rates of forages used for food plots are generally similar to those recommended for agricultural production. However, reducing the seeding rates for various mixtures will promote the growth of annual forbs and other broad-leaved plants that can enhance the plant diversity and value of the food plot for other wildlife, such as bobwhite quail and songbird species.

**Inoculate legume seed**

Legumes are plants that have adapted a symbiotic relationship with certain species of bacteria. The bacteria attach to the legume’s roots, where nodules form. These nodules allow the bacteria to extract nitrogen from the air for the plant’s use. In exchange, the plant provides energy and nutrients for the bacteria’s growth. Both the bacteria and the plant benefit from this relationship. As a result of this relationship, legume seed must be inoculated with a bacterium to ensure that it germinates. The sticking agent in the inoculant adheres the bacterium to the seed. Different legumes require different strains of bacteria, so be sure to buy the correct inoculant for the seed. Inoculant is usually available from the seed dealer. Follow directions on the inoculant bag for application.

Preinoculated legume seed is available, but its PLS may be low because the seed coating can account for 20 to 30 percent of the material in the seed bag.

**Select planting methods**

Follow recommended planting dates, seeding rates and depths to ensure a successful food plot. The preparation, planting and available maintenance equipment will generally determine the plant species that can successfully be planted. Refer to MU Extension publication G4652, Seeding Rates, Dates and Depths for Common Missouri Forages, for more planting and agronomic recommendations for establishing forages that can be used for establishing food plots.

Seeding can be done by drill, broadcast seeder or conventional planter, depending on the equipment that is available. A no-till drill is recommended when planting plants with larger seeds, such as corn and soybeans, or in rocky soil or sloped areas. No previous tillage is required when using a no-till drill. Whatever method you use, be sure to calibrate your seeder.

**Food plot maintenance**

For food plots to succeed and remain productive, they must be maintained and managed. Maintenance often includes controlling weeds, ensuring proper soil fertility and monitoring browse pressure.

**Control weeds**

Controlling competing vegetation is a recommended management practice. Grasses are generally not considered to be a preferred food for deer in the summer, so various grass-selective herbicides may need to be applied as a postemergence application in broad-leaved warm-season food plots. Cool-season forages, especially perennial plots that contain clover or alfalfa, are also vulnerable to broad-leaved annual weeds. Several preemergence herbicides are available for controlling winter annual weeds; however, adding oats or winter wheat to these mixtures may be beneficial, as they tend to germinate quickly and can help suppress weed growth to some extent. The appropriate herbicide depends on the food plot plants and the problem weed species. Follow all directions on the herbicide label and properly calibrate herbicide sprayers so the correct rates are applied to ensure success (Figure 11).

Mowing or bush-hogging can also reduce broad-leaved weed competition. Food plots should be mowed before weeds flower and produce seeds. Mowing before a herbicide application can also help control weeds, particularly in mid-summer.

**Manipulate the planting frequency**

Instead of replanting annuals in a food plot each year, either allow the entire area to go fallow for two to three years or alternately replant half the area and allow the other half to go fallow. Either practice will result in a diversity of vegetation and will provide nutritional forage for deer.

**Monitor food plot success**

The planting success and overall use of food plots should be monitored using exclusion cages. These cages allow you to see how much forage is being eaten — the “browse pressure” — over time and to assess use by deer. Exclusion cages prevent deer and other wildlife from feeding on plants in a small portion of the plot (Figure 12). The plants within the cages can be compared to those outside the cages to determine browsing pressure and planting success. The dimensions of these cages vary but generally need to be 4 feet high and 2 to 3 feet in diameter to provide useful comparisons.

**Conclusion**

The benefits of a food plot depend on management objectives and surrounding land-use practices. Although
food plots can be beneficial, they will not resolve habitat problems, nor are they a replacement for habitat provided by native plant communities. However, properly managed food plots can provide supplemental food for deer during nutritional stress periods and can be an integral component of a deer management plan.

A successful food plot program requires planning, dedication and a knowledge of farming practices. Food plots are a management practice that can be fairly expensive and labor-intensive to implement. There is no “magic mix” or gimmick that provides a quality year-round food source for wildlife. Rather, using food plots to provide supplemental nutrition for deer often requires multiple plantings in appropriate locations combined with effective management of habitat provided by native plant communities.

Additional information


Photo credits: Emily Flinn, Alex Foster, Robert Pierce, Ted Seiler, Joe McCray, Missouri Department of Conservation and University of Missouri Extension.

Figure 12. Exclosure cages are easy to construct out of 2-by-4-inch-mesh welded wire and a T-post, and provide a way to monitor browse pressure.