FNR-194

Purdue University
Forestry and Natural Resources

Food Plots for White-Tailed Deer

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The establishment and maintenance of food plots can be a component of any wildlife management plan. When used in conjunction with other habitat management techniques, food plots are useful for attracting wildlife. However, landowners may have unrealistic expectations about the utility and function of food plots. Food plots are not a replacement for habitat management. They can enhance your property for wildlife by increasing the numbers that frequent your property at different times of the year. Food plots can also be a supplemental food source during harsh weather conditions when they are a part of a comprehensive wildlife management plan.

Much of the current literature regarding the use and necessity of food plots originates from the southeastern United States. Soil fertility and water abundance in the southeast are relatively poor compared to those found in Indiana. Research confirms that the presence and condition of many wildlife species are correlated to soil fertility (Bolen and Robinson 1999:234-240). Soil fertility is an indicator of food quality and quantity. Food supplementation can be important for managing wildlife in the Southeast; however, in the Midwest, wildlife populations are not as dependent upon supplemental food plots, although they will use supplements if available. Productive glaciated soils found in the Midwest support a bounty of food for white-tailed deer and other wildlife in areas with a mixture of agricultural crops, woodlots, and old fields.

Myths of Food Plots

Establishing food plots can be a costly endeavor. Therefore, it is important to understand what food plots can do, for example:

- They can potentially attract more deer to an area.
- They increase the chance of seeing one or more mature deer that have large racks.
- Food plots potentially concentrate deer during the hunting season, especially if the food plot is planted to a green fall or winter crop such as winter wheat or rye.
- They provide a supplemental food source for deer that might be important during harsh winters or when hard mast failures occur. This is true for corn in particular, but also for winter wheat and sometimes grain sorghum.
- Food plots increase the likelihood of seeing other wildlife.
- They potentially increase the populations of smaller, less mobile wildlife, provided their other habitat requirements are met within their home range.

Research has not proven that food plots appreciably increase antler growth of any particular free-ranging buck or the overall condition of any free-ranging deer.

Deer Nutrition

Many landowners establish food plots specifically to attract deer to their property. Before offering supplemental food for deer, be aware of their nutritional requirements and factors that affect them throughout the season.

Deer are generally classified as browsers, i.e., they eat primarily young twigs, buds, and leaves of trees and shrubs. However, deer eat a wide variety of items including grasses, sedges, fruits, nuts, mushrooms, and forbs (broadleaf herbaceous plants) (Jacobson 1994). Their consumption of these foods varies seasonally and depends upon plant availability and nutrient requirements of deer at a given time.

White-tailed deer are ruminants. They have a compound stomach (like that of a cow) consisting of a reticulum, rumen, omasum, and abomasum. Unlike animals with a single stomach (such as pigs), deer are able to digest plant materials that contain cellulose, such as woody twigs, grass stems, and the skins of some berries. Microbes in the rumen and reticulum are able to break down cellulose into volatile fatty acids which can be used for energy (Verme and Ullrey 1984). Although not definitively determined, deer have specific nutritional and energetic requirements that

include water, carbohydrates, nitrogen, minerals, water-soluble vitamins, fat-soluble vitamins, and indigestible fiber (Brown 1994). The relative amounts of these that are required depend on age, sex, level of activity, and environment (northern climates vs. southern climates, for example) (Verme and Ullrey 1984). Any plant or combination of plants that provides the required levels of these dietary components is sufficient for proper deer growth and development. Providing dietary levels in excess of maximum required amounts will not be of any additional nutritional benefit to deer.

Factors that Influence Nutritional Requirements in Deer

Bucks have higher nutritional demands during antler development. Hardened antlers are made up primarily of three components: 45 percent protein, 22 percent calcium, and 11 percent phosphorus (Brown 1994). A diet consisting of 13 to 16 percent protein is optimum for antler development. The daily percent dry weight calcium and phosphorus requirements for optimal antler development is unclear. Research findings vary from 0.09 to 0.64 percent calcium and 0.14 to 0.56 percent phosphorus (Brown 1994). This variability probably reflects the ability of deer to store minerals in their skeletons and transfer them to the antlers (Brown 1994), rather than regional differences in daily requirements of these minerals.

Just as antler development is a resource drain on bucks, pregnancy and lactation is a resource drain for does. Milk of white-tailed deer averages about 36 percent protein dry weight (Brown 1994). Thus, the optimal daily protein intake for lactating does approximates that of growing fawns (Verme and Ullrey 1984) and may be as high as 22 to 24 percent dry weight. The calcium and phosphorus requirements for lactating does are approximately equal to those of bucks during antler growth (Brown 1994).

Age can also influence nutritional demands in deer. Fawns require a relatively high amount of protein, up to 22 percent of the diet (Brown 1994). Dry-matter basis calcium and phosphorus requirements are about 0.45 and 0.28 percent, respectively (Ullrey et al. 1973).

These daily and seasonal dietary requirements for does, bucks, and fawns can be met by a mixture of grains, high-quality green forage, fruits and nuts, and woody plant materials found throughout the Indiana landscape. If your property or neighboring properties lacks one or more of these food types, then you may provide the missing elements. For example, planting a green browse food plot is attractive to deer in areas dominated by woodlots and row crops. Likewise, grains are attractive to deer in landscapes where grass pastures are the dominant agricultural practice. Generally, four main dietary components should be available to deer throughout its home range.

- High-quality green forage (hay field, winter wheat, clover, etc.).
- Grain, available in winter (corn, soybeans, sorghum, etc.). Waste grain in fields can meet this requirement if it is above the snow and not fall plowed.
- Soft (persimmon, apples, dogwood, etc.) and hard mast (acorns, etc.).
- Woody browse (oaks, serviceberry, chokeberry, shrub dogwood, hazelnut, hawthorn, sumac, crabapple, etc.).

If any of these components are missing in your existing habitat and are not available within about a half mile, then that component should be added to your property.

Mineral Licks

In Indiana, white-tailed deer can obtain all of their dietary requirements with the exception of sodium (Na) in most habitats. White-tailed deer and other herbivores require sodium for regulation of fluid volume and blood pressure, maintenance of osmotic balances and buffer systems, and conduction of nerve impulses. Sodium is not readily available in the plant materials that they consume since most plants do not require sodium. Therefore, deer actively seek sources of sodium. This salt drive is highest in deer during the spring and summer (Weeks and Kirkpatrick 1976). The amount of water and potassium in the diet impacts the ability of deer to retain sufficient sodium for metabolic needs. During the spring, many plants deer consume contain exceptionally high levels of water and potassium, causing a temporary sodium imbalance that results in development of the salt drive (Weeks and Kirkpatrick 1976). Research has shown that antler mineralization in white-tailed deer reaches its peak during the late summer when the sodium drive in bucks is strong. Therefore, it is reasonable to assume that providing supplemental sodium during this time can be beneficial to deer.

Deer in Indiana seldom move more than about one mile for salt (Wiles and Weeks 1986). Thus, providing a supplemental source of sodium (salt blocks) likely will not alter deer distribution to a great extent; however, it may attract deer from the local area (about 2 to 3 miles) to a specific site.

Care should be taken if you hunt on the property and are considering any type of mineral management. Salt and mineral blocks are considered to be bait by the Indiana Department of Natural Resources. By law,

bait is a product that is transported into a hunting area and placed there for animal consumption. An area is considered to be baited for 10 days after the removal of the bait and any affected soil. It is illegal to use bait to take deer and other wildlife. However, activities considered to be normal agricultural production are not classified as baiting. For more information regarding baiting regulations, contact your IDNR Conservation Officer at your county sheriff's office.

Food Plot Design and Establishment

Food plots for deer are intended to attract deer to an area to feed. Unlike other smaller, less mobile wildlife, they are not dependent upon them for winter cover, nesting cover, or brood cover. Therefore, food plots specifically for deer should be planted at typical forage-production rates in large blocks. Just like any agricultural crop, seedbed preparation and correct fertilization is essential for the successful establishment of any food plot for deer.

The specific design of your food plot depends upon the goal for its use. Do you want to supply a supplemental source of winter food? Do you want to attract deer during the hunting season? Do you wish to provide benefits to other wildlife species? Your IDNR District Wildlife Biologist (www.state.in.us/dnr/fishwild/huntguide1/wbiolo.htm) can help you determine the type, size, shape, and location of a food plot(s) to meet your objectives. In some cases, you may be eligible for cost-share assistance to establish a food plot. See FNR-87 for information about available wildlife cost-share and technical assistance programs.

If planting in areas dominated by tall fescue, problems with successful food plot establishment are common unless there is appropriate seedbed preparation. For areas dominated by fescue sod, first remove the excess vegetation in late summer by mowing, burning, or haying. During September and October when the fescue is actively growing (60-70^{o} F) and is 8 to 12 inches tall, apply a glyphosate (i.e., RoundUp®) herbicide at the labeled rate, combined with 17 lbs. of ammonium sulfate and 1 quart of methylated seed oil (MSO) per acre. The following spring, when grasses and other plants are 6 to 12 inches tall (usually mid- to late-April), spray another application of the formulation listed above. Note that the MSO is unnecessary for herbicides such as RoundUp Ultra® that contain a surfactant. If light to moderate residue remains, no-till drilling is an option. Frequently, some disking is necessary to break up existing fescue residue. Disk 7 to 14 days after herbicide application for best results.

Table 1. Approximate lengths (ft) required for food plots of different widths and areas. These are provided only as a guide to help you design a food plot to fit your needs. Example: A field 100 ft. by 870 ft. is 2 acres.

Width (feet)	Field Size (acres)		
	1	2	3
30	1450	2900	7250
60	725	1450	3625
100	435	870	2175
150	290	580	1450
200	218	435	1090

Size, Shape, and Location

Food plots for deer should be at least 1-acre blocks. For areas with high deer densities, grain food plots should be planted in blocks of 5 acres or larger rather than small, linear-shaped plots to withstand continuous browsing pressure. Corn and soybeans are suitable for larger food plots. Legume food plots should range 1 to 3 acres, depending on deer density. See Table 1 for approximate dimensions for fields of various sizes.

Whenever possible, food plots should be located adjacent to wildlife travel lanes. Establishing winter food plots adjacent to cover is not as important for deer as it is for other, less mobile wildlife. However, if the intent of the food plot is to attract deer for hunting opportunities, then it should be adjacent to some type of woody or brushy cover for hunter concealment. Establishment of a snow trap on the windward (NW) side of the food plot can be important for areas in northern Indiana that receive significant annual snowfall (Figure 1). Accumulation of snow in a food plot can make it less useful to deer. If food plots cannot be established adjacent to cover, plant corridors of cover between food plots. Corridors should be at least 50 feet in width and include at least three rows of shrubs and two rows of trees.

Typically, one food plot per 40 acres of farmland or forestland is a minimum, but they should not exceed approximately 5 percent of the total acreage. The surrounding habitat will dictate the type and amount of food plots on a given property. For example, deer will readily utilize waste grain from harvested fields. Establishing a grain food plot in this situation will not add much additional nutritional benefit for deer. However, establishing practices that provide a food or cover requirement that is absent on your property or the general area will be of greater benefit to deer. If a grain source is freely available, a permanent field border

adjacent to the grain field or a perennial green-browse food plot located on another part of the property may be alternatives.

Plant Selection

The next step is to determine the selection of plants for your food plot (see Table 2). This will depend upon the purpose of the food plot, soil type, whether you live in the northern or southern part of the state, and the types, amounts, and arrangement of food and cover on your property.

Many specialty mixes are available on the market today. Some of these have high concentrations of proteins, minerals, and vitamins, and/or are not native to this region or country. Many of these are also very expensive when compared to different varieties of comparable species mixes available from local seed vendors. With proper fertilization and soil pH, most locally available seed mixes meet or exceed the nutritional needs of deer (see Table 3). When deciding on the types of mixes offered from mail order catalogs or your local seed store, consider the daily nutritional requirements of deer relative to the nutrient levels the seed mix contains, the geographic source of the seed, and cost.

Research efforts in the Midwest have not demonstrated a consistent increase in weight or antler development for free-ranging deer that were given a high-protein supplemental food source. You have to decide if potential dietary gains offered by some specialty mixes justifies the increased cost.

Some plant mixes for deer and other wildlife contain species with very high amounts of protein, calcium, phosphorus, and other minerals and vitamins. Excess nutrients above the optimal requirements of deer do not offer any additional benefits.

Plants such as soybeans, millets, wheat, rye, and buckwheat provide an excellent source of food for deer. However, they tend to lodge (bend over) then rot, making them an unreliable food source in late winter or early spring. You can plant mixtures of these species with plants that do not readily lodge such as corn and grain sorghum. While grazing of food plots is generally not recommended, you should note that grain sorghum can be poisonous to livestock after frost or drought.

It is essential that the plants you include in a food plot match the growing conditions (climate, soil fertility, drainage, and pH) of your property and provide the missing nutritional requirements deer cannot get easily from existing habitat. See Table 2 for a list of species, soil requirements, and planting rates. Your county Extension educator or IDNR District Wildlife Biologist can help you match food plot species to your growing conditions.

Additional Benefits of Food Plots

The recommendations for food plots found in this publication are for white-tailed deer. The list of practices below will enhance a food plot for other wildlife species.

Reduced seeding rates. Planting rates of food plots for deer are approximately equal to those for production agriculture. However, reducing the seeding rates allows for the growth of forbs within the food plot that can enhance its value to other wildlife species. Not only will the annual plants be a food source for many species of birds and mammals, but the resulting habitat will provide nesting cover and insect foraging habitat that will benefit ground nesting bird species like bobwhite quail, ring-necked pheasant, and some songbirds.

Frequency of planting. Rather than replanting the same annual food plot every year, you may allow food plots to stand 3 to 4 years prior to replanting. If you have 3 to 4 food plots, replant each one in a different year, two every other year, etc. This will result in a mosaic of food plots of various structure and species composition. The older food plots will provide cover and insect habitat for many wildlife species while the plots that are replanted will provide the high-quality forage for deer.

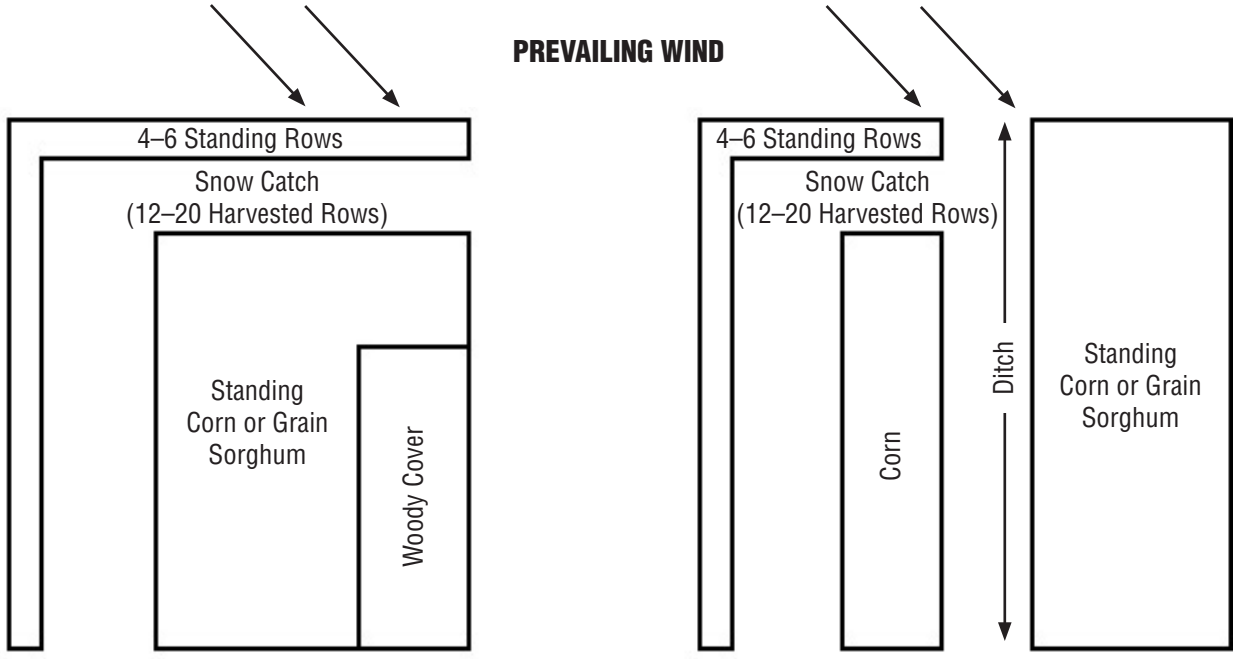
Plot size. While deer are able to utilize food plots planted in large (> 1 acre) blocks, smaller and less mobile wildlife tend to concentrate their use around the edge near cover. Consider planting food plots in small, linear strips about $^1/_2$ acre in size. Most of the food plot will be available for wildlife.

Winter cover. Establish food plots downwind from woody or brushy cover (see Figure 1). Small wildlife species can minimize their exposure to the elements and predation.

Brush piles. If alternative sources of cover are lacking, construct brush piles adjacent to food plots. A minimum of one brush pile per $^1/_2$-acre planting should be located around each food plot.

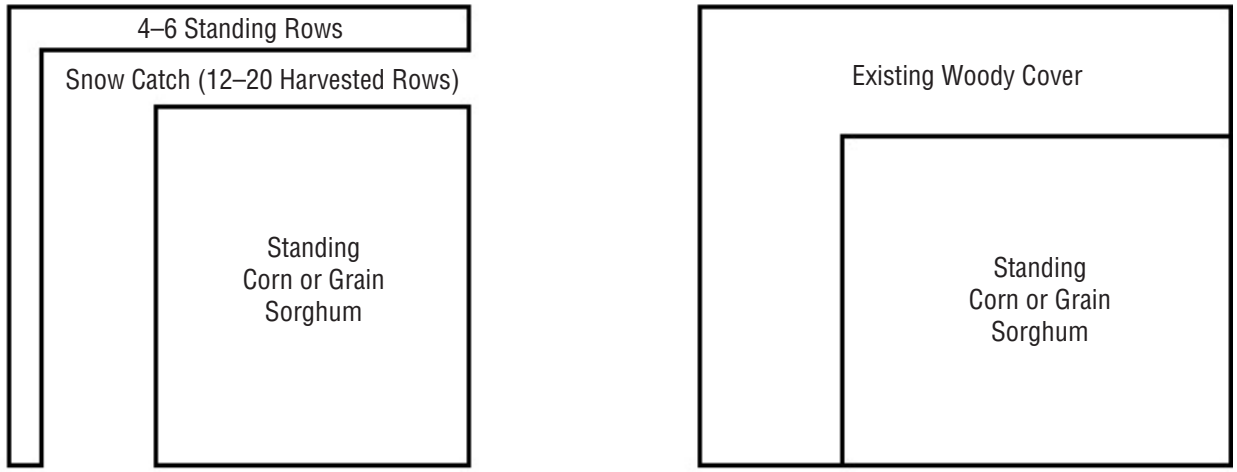
Species diversity. Food plots for deer typically contain only 1 to 2 plant types. Other species of wildlife can benefit from plantings with more diversity (see Tables 2 and 4). However, food plots containing a mixture of four or more species are usually not compatible and are therefore not very productive. Consider planting small food plots ($^1/_2$ acre) containing different combinations of two species.

Figure 1. Examples of annual food plot design. (Adapted from USDA-NRCS 1999.) Note, establishment of a snow trap on the windward (NW) side of the food plot can be important only for areas that receive signifigant annual snowfall.



A. Plot design to protect existing winter cover. Size: 1–5 acres.

B. Plot design to enhance drainage ditch or other area. Size: 1–5 acres.



C. Plot design to function alone. Size: 1–5 acres.

D. Plot design to take advantage of existing woody cover. Size: 1–5 acres.

Table 2. Food plot soil requirements and planting rates.
(Some information adapted from USDA-NRCS 2000 and Johnson et al. 1991)

Species	Drainage[1]	Soil Fertility[2]	Soil pH	Normal Seeding Planting Rates[3] (lbs. per acre)	Mixed Species Planting Rates[4] (lbs. per acre)	Wildlife Species Benefited
Winter Food Plots						
Corn	MWD	M-H	6.0-6.5	20-25[5]	4-15	Deer, quail, wild turkey, pheasant, squirrels
Grain Sorghum (milo)	MWD	M-H	6.5-7.0	8-105	4-12	Deer, quail, wild turkey, pheasant, dove, songbirds
Wheat	SPD	M	6.0-6.5	120	10-25	Deer, quail, wild turkey, pheasant, dove, songbirds
Hunting Season Food Plots						
Rye	SPD	L-M	5.8-6.2	112	10-25	Deer, quail, wild turkey, pheasant
Wheat	SPD	M	6.0-6.5	120	10-25	Deer, quail, wild turkey, pheasant, dove, songbirds
Green Forage Food Plots (Annual)						
Spring Oats	MWD	M	6.0-6.5	96	10-40	Deer, quail, wild turkey, pheasant, songbirds
Sunflowers	MWD	L-M	6.0-7.0	10-20	2-12	Deer, quail, wild turkey, pheasant, dove, songbirds
Cowpeas	SPD	L-M	5.8-6.5	30-60	5-20	Deer, quail, wild turkey, pheasant, dove
Soybeans	SPD	M	6.2-6.8	45-60	8-45	Deer, quail, wild turkey, pheasant
Buckwheat	WD	L-M	5.0-7.0	40	8-20	Deer, quail, wild turkey, pheasant, songbirds
Green Browse Food Plots (Perennial)[6]						
Alfalfa	WD	H	6.6-7.2	12-15	6	Deer, quail, wild turkey, pheasant, rabbits, songbirds
Alsike Clover	PD	M	6.0-6.5	6-10	2	Deer, quail, wild turkey, pheasant, rabbits, songbirds
Ladino Clover	PD	H	6.0-6.5	2-4	1	Deer, quail, wild turkey, pheasant, rabbits, songbirds
Red Clover	SPD	M	6.2-6.8	8-10	5	Deer, quail, wild turkey, pheasant, rabbits, songbirds

[1] PD = Poorly Drained, SPD = Somewhat Poorly Drained, MWD = Moderately Well Drained, WD = Well Drained
[2] L = Low, M = Moderate, H = High
[3] Planting rates for typical agricultural production. Rates will vary depending upon method of planting (drill versus broadcast)
[4] Planting rates for mixing species in a single food plot. Rates will vary depending upon method of planting (drill versus broadcast)
[5] Approximately 25,000 to 26,000 seeds per acre
[6] These are usually mixed with a thin stand of cool-season grass or inter-seeded into an existing stand of cool-season grass

Table 3. Recommended planting dates and selected nutritional values for parts of annual and perennial food plot plants (% dry weight). Note, values are not averages of published information and should only be used as approximate guides. Nutritional information adapted from Preston 2001, Berglund 1998, Banks and Stewart 1998, and National Research Council 2001.

Species	Approximate Planting Dates	Crude Protein (%)	Calcium (%)	Phosphorus (%)	Sodium (%)
Corn (whole, grain)	April 15 - May 15	19	0.02	0.30	0.02
Grain Sorghum (grain)	May 15 - June 15	11	0.04	0.28	0.01
White Proso Millet (grain)	May 1 - July 1	12	0.05	0.30	[1]
German/Pearl Millet (grain)	May 1 - July 1	18	0.54	0.35	[1]
Spring Oats (grain)	Mar. 1 - Apr. 15 or Aug. 1 - Sept. 1	13	0.05	0.41	0.03
Sunflowers (oil seeds, whole)	May 1 - June 1	19	0.71	0.51	0.01
Cowpeas (whole)	May 1 - June 1	23	0.10	0.42	0.01[2]
Soybeans (whole)	May 1 - June 1	40	0.27	0.64	0.01
Partridge Pea (whole)	March 1 - June 1	17	1.312	0.17	0.01[2]
Buckwheat (grain)	May 1 - June 1	12	0.11	0.36	[1]
Rye (silage)	Sept. 15 - Oct. 30	16	0.43	0.42	0.05
Wheat (fresh, pasture)	Sept. 15 - Oct. 30	20	0.35	0.36	0.06
Alfalfa (fresh)	Mar. 1 - May 1 or Aug. 1 - Sept. 1	19	1.35	0.27	0.01[2]
Ladino Clover (fresh)	Jan. 1 - May 1 or Aug. 1 - Sept. 1	25	1.27	0.38	0.01[2]
Red Clover (fresh)	Jan. 1 - May 1 or Aug. 1 - Sept. 1	18	1.70	0.30	0.01[2]

[1] No data
[2] Value for forage legumes, pasture from National Research Council (2001)

Table 4. Soil requirements and planting rates of selected plants suitable for food plots that benefit wildlife other than white-tailed deer. (Some information adapted from USDA-NRCS 2000 and Johnson et al. 1991)

Species	Drainage[1]	Soil Fertility[2]	Soil pH	Single Species[3] (lbs. per acre)	Multiple Species[4] (lbs. per acre)	Wildlife Species Benefited
Partridge Pea	MWD	L-M	6.0-6.5	10	2	Quail, wild turkey, pheasant
White Proso Millet	MWD	L-M	6.0-7.0	12	4	Quail, wild turkey, pheasant, dove, songbirds
German/Pearl Millet	MWD	L-M	6.0-7.0	8	2	Quail, wild turkey, pheasant, dove, songbirds

[1] PD = Poorly Drained, SPD = Somewhat Poorly Drained, MWD = Moderately Well Drained, WD = Well Drained
[2] L = Low, M = Moderate, H = High
[3] Planting rates for typical agricultural production. Rates will vary depending upon method of planting (drill versus broadcast)
[4] Planting rates for mixing species in a single food plot. Rates will vary depending upon method of planting (drill versus broadcast)

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IDNR. 2002. *Habitat Management Fact Sheet–Legume Food Plots,* Indiana Department of Natural Resources, Indianapolis, IN. www.state.in.us/dnr/fishwild/index2.htm

Acknowledgements

The authors would like to sincerely thank B. Clear, K. Hendrix, G. Langell, B. Miller, J. Mitchell, H. P. Weeks, Jr., and D. Zimmerman for their many contributions to this publication.

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REVISED 4/04