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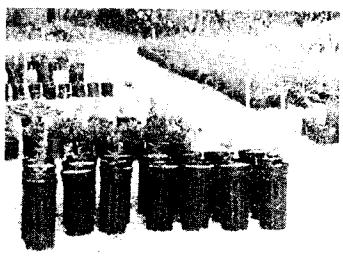

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BROWNTOP MILLET (*Panicum ramosum*)

Section 7.1.5, US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL

by

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A plant materials report on browntop millet (*Panicum ramosum*) is provided as Section 7.1.5 of the US Army Corps of Engineers Wildlife Resources Management Manual. The report was prepared as a guide to assist the project biologist with the selection, establishment, and management of suitable plant materials for wildlife and habitat development programs. Major topics covered are description, distribution, habitat requirements, wildlife value, establishment, maintenance, and cautions and limitations.

Browntop millet is an introduced annual grass, adapted to the Southeast and frequently used in the management of food resources for waterfowl and upland game birds. The distinguishing characteristics, regional distribution, and habitat requirements of this species are described, and its value to wildlife is discussed. Specifications are provided for the establishment of browntop millet on wildlife food plots. Topics include site selection,

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plot design, site preparation, and planting methods; special emphasis is given to combination plantings with agricultural crops and other supplemental wildlife foods. Maintenance requirements and cautions and limitations are also discussed.

PREFACE

This work was sponsored by the Department of Defense (DOD) military branches under the DOD Natural Resources Program. Technical Monitors for the study were representatives of the Fish and Wildlife Committee of the Defense Natural Resources Council, DOD. The report serves as a section of the US Army Corps of Engineers Wildlife Resources Management Manual, as developed by the Headquarters, US Army Corps of Engineers, under the Environmental Impact Research Program.

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NOTE TO READER

This report is designated as Section 7.1.5 in Chapter 7 -- PLANT MATERIALS, Part 7.1 -- GRASSES, of the US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL. Each section of the manual is published as a separate Technical Report but is designed for use as a unit of the manual. For best retrieval, this report should be filed according to section number within Chapter 7.

BROWNTOP MILLET *(Panicum ramosum)*

Section 7.1.5, US ARMY CORPS OF ENGINEERS
WILDLIFE RESOURCES MANAGEMENT MANUAL

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Browntop millet is an introduced grass grown in the Southeast chiefly for supplemental wildlife food and sometimes for hay, pasturage, and commercial seed crops. It is widely used on food plots designed for upland game birds (Soil Conservation Service (SCS) 1984) and is a good duck food (Neely and Davison 1971) that can be grown on sites too dry for Japanese millet (*Echinochloa crusgalli* var. *frumentacea*), a common waterfowl food. Browntop millet is occasionally planted for white-tailed deer (*Odocoileus virginianus*) (Jacobson et al. 1985).

DESCRIPTION

Browntop millet is an annual warm-season species that grows 1 to 3 ft (3 to 10 dm) tall (Radford et al. 1968) (Fig. 1). The smooth stems have pubescent nodes and may stand erect or ascend from a decumbent base (Coastal Zone Resources Division 1978). The leaves are 1 to 7 in. (2.5 to 18 cm) long and 0.25 to 0.70 in. (6 to 18 mm) wide; both surfaces are smooth. The inflorescence is a spreading panicle 1.5 to 7 in. (4 to 18 cm) long and 0.6 to 2.5 in. (1.5 to 6 cm) broad; it is made up of obovoid brown spikelets, each of which contains a floret surrounded by 2 bracts (Hitchcock 1950, Radford et al. 1968).

The yellowish-brown seeds are flat to elliptic, less than 0.1 in. (2.3 mm) long (Radford et al. 1968); they mature in approximately 60 days

Figure 1. Region of use and distinguishing characteristics of browntop millet (*Panicum ramosum*): (a) entire plant, (b) spikelet (2 views), and (c) floret containing the seed

(SCS 1984). Browntop millet flowers and fruits from July through October (Radford et al. 1968). When properly fertilized, plants will produce 1200 lb of seed per acre or 300 lb per 1/4-acre plot (Coggins 1986).

DISTRIBUTION

Browntop millet originated in Asia (Hitchcock 1950) and has readily adapted to the southeastern United States. Except for the Appalachian Mountains, it can be grown from Delaware and Maryland to southern Florida and the gulf coast, across to east Texas, and northward through southeastern Oklahoma to western Kentucky (Coastal Zone Resources Division 1978) (Fig. 1).

HABITAT REQUIREMENTS

Browntop millet is adapted to a wide variety of soil types ranging from sandy to clay textures (Coastal Zone Resources Division 1978). It will grow on almost any upland soil (SCS 1984) and on bottomland soils dry enough to plant and cultivate in July (Davison and Neely 1959). Best growth and seed production in bottomlands occurs when the water table remains at least 4 in. below the surface during late summer and early fall (SCS 1984).

Browntop millet is best suited for use on slightly acid to slightly alkaline soils with a pH range of 5.5 to 7.5 (SCS 1984). Because it tolerates full sun and up to 50% shade, it grows well under cultivation or in natural habitats such as low fields, woods edges, and waste places (Coastal Zone Resources Division 1978).

WILDLIFE VALUE

Browntop millet is used as a food source by both game and nongame birds (Table 1). Its food value has been rated as medium to high (Coastal Zone Resources Division 1978), and its seeds are considered a choice food of upland game birds and waterfowl (SCS 1984). Browntop was found to be a choice food for mourning dove* in a 3-year food selection study of wild doves (Davison and Sullivan 1963). It was also listed by Davison (1958) as one of 68 choice bobwhite foods; a choice food was defined as a good-quality, digestible, nutritious food that was readily eaten when available. Millets (*Panicum* spp.) are highly utilized by ducks, and browntop has proven to be one of the best

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* Scientific names of avian species are given in Table 1.

Table 1. Birds known to use browntop millet as food*

Common Name	Scientific Name
Upland Game Birds	
Mourning dove	*Zenaida macroura*
Northern bobwhite	*Colinus virginianus*
Wild turkey	*Meleagris gallopavo*
Waterfowl	
American black duck	*Anas rubripes*
Northern pintail	*A. acuta*
Mallard	*A. platyrhynchos*
Wood duck	*Aix sponsa*
Nongame Birds	
Red-winged blackbird	*Agelaius phoeniceus*
Northern cardinal	*Cardinalis cardinalis*
Rufous-sided towhee	*Pipilo erythrophthalmus*
Indigo bunting	*Passerina cyanea*
Dark-eyed junco	*Junco hyemalis*
Eastern meadowlark	*Sturnella magna*
Brown-headed cowbird	*Molothrus ater*
Finches	*Carpodacus* spp.
Sparrows	Various spp.

* Table compiled from major references cited in the text.

(Givens et al. 1964). It has been evaluated as a choice food for mallards, American black ducks, northern pintails, and wood ducks (Davison and Neely 1959).

In the South, browntop millet is planted chiefly for upland game birds. It is commonly used for dove fields and is especially effective when planted in association with other choice dove foods such as corn (*Zea mays*), sorghum (*Sorghum vulgare*), or sunflower (*Helianthus maximiliani*). Coggins (1986) recommended browntop for bobwhite food plots, especially in fall and early winter. It is valuable for wild turkey plots because it provides fruit and foliage and offers summer range where turkeys can forage for insects as well as for grain and weed seeds (Arner and Davison 1976). A survey by Jacobson et al. (1985) showed that browntop millet is also planted for white-tailed deer by some southeastern wildlife agencies.

ESTABLISHMENT

Site Selection

Upland game birds. Plots designed to attract doves (dove fields) are most effective when placed near or adjacent to grain crops such as corn and sorghum (Mississippi Department of Wildlife Conservation (MDWC), undated). One large site may be selected for planting, but several 5-acre sites scattered throughout cropland may safely accommodate more hunters. Fields containing ponds or streams are more attractive to doves than those without sources of water; doves prefer that bare ground be adjacent to the water's edge (McConnell 1971).

Food plots for bobwhite and wild turkey may be located in openings surrounded by adequate cover such as cleared timber loading sites, woodland clearings, utility rights-of-way, field or woodland borders and edges, and open fields (e.g., idle crop fields) (Arner and Davison 1976, Coggins 1986). Plots for wild turkey may also be placed on larger sites, such as those that have been bulldozed and burned for pine seeding (Arner and Davison 1976). Plots for bobwhite may be located adjacent to hedgerows, ditchbanks, fence rows (Coggins 1986), and small unused spaces referred to as odd corners (Eubanks and Dimmick 1974). Because adequate cover is essential for bobwhite, sites should allow plots to fit into a system of travel lanes and protective cover (Eubanks and Dimmick 1984). Low herbaceous vegetation provides ideal cover and is much more effective than either dense, continuous thickets or open ground surrounding plots (Landers and Mueller 1986).

Waterfowl. Plots for waterfowl (commonly called duck fields) should be established in potentially productive areas that can be easily planted and flooded with water at the right time to provide food for ducks (Neely and Davison 1971). Ideal sites include cropland, flat land below or around farm ponds, and marsh or bottomland. It should be noted that clearing and earth-moving activities in wet areas may require a permit under Section 404 of the Clean Water Act (Public Law 92-500).

Plot Design

Wild turkey. Browntop plots for wild turkey should be at least 1 acre in size (Arner and Davison 1976, SCS 1984). The shape may be rectangular, preferably with greater length than width, or irregular to accommodate the site.

If white-tailed deer are expected to use the plots, at least 2 to 10 acres per plot will be required (SCS 1984).

Northern bobwhite. Plots for bobwhite should be planted in strips that cover from 1/8 to 1/3 acre (Landers and Mueller 1986). Coggins (1986) recommended that strips be at least 15 ft wide; however, strips of only 2 or 3 rows may be placed between large blocks of row crops or in open woods (Landers and Mueller 1986). Long, narrow strips can be effective in edges adjacent to woods, and odd corners as small as 1/8 acre may be utilized (Eubanks and Dimmick 1984). Landers and Mueller (1986) recommended establishing 1 plot per 10 to 20 acres according to soil capability, and Coggins (1986) suggested 1 acre of food plot per 12 acres of land. It should be noted that food plots other than those planted with browntop millet would be considered in these totals.

Mourning dove. Dove fields generally consist of 10- to 15-ft-wide strips separated by clean or disked areas. Fields should be large enough to safely accommodate the expected number of hunters and may range in size from 2 acres (SCS 1984) to 25 acres (MDWC, undated). McConnell (1971) recommended a minimum of 5 acres, and the Mississippi Department of Wildlife Conservation (undated) pointed out that several small fields may provide better hunting than 1 large field.

Waterfowl. A duck field commonly consists of a low, flat diked area with a control structure designed to maintain a given water level in winter and to allow draining for summer cultivation (Neely and Davison 1971). The Soil Conservation Service (1984) recommended 5 or more acres per field, but the amount of available water may limit the size of the field (Neely and Davison 1971). Water may be supplied by an irrigation reservoir, a well, or a natural source such as a pond, stream, bayou, or river.

Site Preparation

A firm seedbed should be prepared by disking and harrowing plots several weeks before planting (Coggins 1986). A second disking just before seeding will help to kill sprouting weeds (SCS 1984).

Soil samples should be tested to determine fertilizer requirements for each site. As a general guide for soils that are not tested, the SCS (1984) recommended the application of 300 to 400 lb/acre of 13-13-13 fertilizer for browntop plots; other recommendations are given in Table 2. However, to prevent overapplication of nitrogen, it is best to fertilize according to soil

Table 2. Suggested rates for the application of fertilizer on browntop millet food plots

Species	Fertilizer	Application Rate (lb/acre)	Reference
Bobwhite	4-12-12	150	Coggins 1986
	6-12-6	500	Landers and Mueller 1986
	6-12-12	500	MDWC, undated
Dove	5-10-10	600	Neely 1961
	6-12-12	400	McConnell 1971
Waterfowl	5-10-5	500	Davison and Neely 1959

needs. Too much nitrogen produces excessive vegetative growth that limits bird movement and makes feeding difficult for doves and bobwhites. Excess nitrogen also reduces seed yield (SCS 1984), whereas phosphorus and potash favor heavy seed production (Neely 1961). Soil pH may be adjusted by the application of lime, and as much as 1 or 2 tons per acre may be required in some areas (Landers and Mueller 1986).

Planting Methods

Time of seeding. Planting dates for browntop millet should be set so that the time of seed maturation coincides with the arrival of migratory birds (Coastal Zone Resources Division 1978). Browntop millet should be planted for waterfowl in July and August (SCS 1984). If planted before July, the seeds will mature and deteriorate before ducks arrive (Davison and Neely 1959). August planting is too late in the northern part of the Southeast but is appropriate in Florida and the southern half of Louisiana, Mississippi, Alabama, and Georgia (Neely and Davison 1971).

When dove fields are planted in mid-June, or 60 to 80 days before the beginning of dove hunting season, the seeds will mature about 2 weeks before opening day (SCS 1984; MDWC, undated). However, if fields are targeted for the latter part of the season, plots should not be seeded until mid-July (Neely 1961). Browntop planted after July 20 may mature in less than 60 days, but height and seed production are often compromised in late plantings.

Timing is not so critical in seeding plots for bobwhite because they are nonmigratory, and browntop millet may be planted throughout the summer from

early June to mid-August (Coggins 1986, Landers and Mueller 1986). However, the plots will have little value for broods if planted this late.

Seeding methods. Browntop seeds may be broadcast, drilled, or planted in rows 1.5 to 3.5 ft wide. Broadcast or drilled seeds should be covered with 1/4 in. of loose soil. Planting depths on rowed plots range from 0.5 in. in fine-textured soils to 1.5 in. in sandy soils.

Doves do not scratch as they forage and need bare-ground feeding areas. Row planting provides middles of clean ground (Neely 1961), but broadcast strips with disked areas between will serve the same purpose (McConnell 1971). Some broadcast or drilled plantings expose enough bare mineral soil to make seeds available without the need for disking or other cultural treatment.

Seeding rates. The seeding rate for browntop millet will depend upon both the target species and the seeding method. Plots are generally seeded at the rate of approximately 10 lb/acre when planted in rows and 25 lb/acre when broadcast (Coastal Zone Resources Division 1978). The Anderson-Tully Company has found that the best rates for dove fields are 8 to 10 lb/acre on rowed plots and 12 to 14 lb/acre on broadcast/drilled plots. Landers and Mueller (1986) recommended seeding millet for bobwhite at the rate of 10 lb/acre on rowed plots and 25 lb/acre on broadcast/drilled plots; Neely and Davison (1971) recommended 20 lb/acre for broadcasting duck fields.

Combination planting. Browntop millet can be used in combination with a variety of agricultural crops or other species planted for wildlife (Fig. 2). The species most commonly planted with browntop are sunflowers, corn, sorghum, (also known as milo), soybeans (*Glycine max*), and peas (*Vigna* spp.). Combination plantings are ideally suited to larger fields, in which the millet is planted in alternating strips with other crops.

Adjacent strips of crop plantings should be wide enough to manage as a separate stand. Browntop strips should be only 15 to 20 ft wide, which is sufficient to allow adequate seed production and provide easy accessibility for wildlife utilization. The millet may be planted in narrower strips if herbicides applied in the adjacent crop strips are nontoxic to browntop or application is made with a tightly controlled applicator to minimize drift.

When browntop is broadcast within agricultural plantings, the result is often undesirable because herbicides required for these crops may severely reduce or eliminate the browntop component. However, the millet can be broadcast among compatible species if the crop field has had only 1 or 2 herbicide

Figure 2. Row planting of browntop millet and Maximilian sunflower

treatments, no more treatments are anticipated, and any harmful effect of previous herbicide application has been minimized or eliminated. Seeds should be scattered at a uniform rate of 1 to 5 lb/acre, and overplanting should be completed while a considerable amount of bare ground is still visible between the rows. The resulting field of browntop millet and an agricultural crop will have an unmanicured appearance but will result in expanded food availability on the target area. These plantings are attractive to doves in early fall and, when flooded, provide excellent feeding areas for dabbling ducks.

Strip plots of browntop are also effective when used as field borders or planted along water furrows, minor drainages, and low depressions. However, such plantings are recommended only if the adjacent nonmillet crop can be cultivated without affecting the future millet crop.

MAINTENANCE

No maintenance is needed for broadcast or drilled plantings, but rowed plantings require clean cultivation for maximum seed production (McConnell 1971, SCS 1984). Several cultivations may be necessary to prevent weed growth (Neely 1961).

Bush-hogging half of the planted area 2 to 3 weeks before hunting season will concentrate doves and allow them to use the plots earlier. However, if bush-hogging does not make enough seeds available to doves, strips or entire fields may be cut and windrowed, or the cut vegetation may be dried and burned in place to better expose the soil and seeds. Federal guidelines regarding food plots for migratory birds should be followed explicitly when initiating this practice, and knowledgeable wildlife enforcement personnel should be consulted to determine whether it conforms to accepted practices in the area.

Duck fields should be flooded 2 to 15 in. approximately 2 weeks before hunting season opens, and water should be retained until the spring migration of waterfowl (SCS 1984).

CAUTIONS AND LIMITATIONS

Competition may be expected from nontarget wildlife species. Plots may receive heavy damage by seed-eating passerine birds such as sparrows, blackbirds, and cowbirds (Givens et al. 1964). However, depredation in duck fields can be minimized by flooding soon after seed maturation if the millet attracts large flocks of birds (Neely and Davison 1971). White-tailed deer may constitute a problem on sites planted for upland game birds, and fencing will be necessary if the area is subject to cattle grazing (Landers and Mueller 1986).

Timing should be carefully considered in a decision for premature flooding, as 15% to 36% of uneaten seeds may deteriorate after 90 days underwater (Neely 1956). Flooding before the first killing frost and subsequent onset of consistently cold temperatures may result in undesirable algae growth in duck ponds. The algae can engulf the submersed portion of browntop plants and cause even more rapid deterioration of vegetation and seed.

Browntop millet is a persistent competitor adapted to a wide variety of soil types and physiographic regions. It is a prolific seed producer, and the viable seeds of a current planting will continue to reproduce until a killing frost, inundation, or other factors cause its seasonal demise. Browntop may continue to volunteer long after the intended life of the initial planting, a habit that may be beneficial for plantings designed and maintained only for wildlife purposes. However, if agricultural crops are to be planted on the same site, browntop may become a pest species, requiring much expense and effort to eradicate. Wheat (*Triticum aestivum*) or other winter-hardy plants are not so adversely impacted by residual browntop growth.

Seeders used for planting browntop millet should have an accurate delivery system. Excessive seeding will produce densely vegetated stands in which browntop seeds are often unavailable to mourning doves or bobwhite. Heavy seeding may create weakened stems that are susceptible to wind and rain damage. This can result in a matting of vegetation that, under the proper combination of heat and moisture, will produce a microclimactic condition conducive to prolific resprouting of seed. Not only is seed availability affected by resprouting, but this condition coupled with early frost could eliminate most of the benefits accrued from stand establishment. Overtopping by dense vegetation provides too much shade for browntop plants, which develop spindly stems and produce few seeds.

LITERATURE CITED

Arner, D. H., and V. E. Davison. 1976. Wild turkeys on southeastern farms and woodlands. USDA Soil Conserv. Serv. Leafl. No. 526. 8 pp.

Coastal Zone Resources Division. 1978. Handbook for terrestrial wildlife habitat development on dredged material. US Army Eng. Waterways Exp. Sta. Tech. Rep. D-78-37. 391 pp.

Coggins, W. A. 1986. The bobwhite quail in Alabama. Ala. Dep. Conserv. and Nat. Resour. Special Rep. No. 10. 40 pp.

Davison, V. E. 1958. A summary and reclassification of bobwhite foods. J. Wildl. Manage. 22:437-439.

_____, and W. W. Neely. 1959. Managing farm fields, wetlands, and waters for wild ducks in the South. US Dep. Agric. Farmers Bull. No. 2144. 14 pp.

_____, and E. G. Sullivan. 1963. Mourning doves' selection of foods. J. Wildl. Manage. 27:373-383.

Eubanks, T. R., and R. W. Dimmick. 1974. Dietary patterns of bobwhite quail on Ames Plantation. Univ. Tenn. Agric. Exp. Sta. Bull. 534. 38 pp.

Givens, L. S., M. C. Nelson, and V. Ekedahl. 1964. Farming for waterfowl. Pages 599-610 In J. P. Linduska, ed. Waterfowl Tomorrow. US Fish and Wildl. Serv., Washington, D.C. 770 pp.

Hitchcock, A. S. 1950. Manual of the Grasses of the United States. US Dep. Agric. Misc. Publ. 200. US Gov. Printing Off., Washington, D.C. 1051 pp.

Jacobson, H. A., C. Lunceford, and E. J. Jones. 1985. Supplemental food plantings for deer in the southeastern United States. Miss. State Univ., Wildl. and Sport Fish. Manage. No. 85-2. 5 pp.

Landers, J. L., and B. S. Mueller. 1986. Bobwhite quail management: A habitat approach. Tall Timbers Res. Sta. Misc. Publ. No. 6. 39 pp.

McConnell, C. 1971. Mourning dove: Facts and management. Game Manage. Div., Tenn. Game and Fish Comm. Pam. 4 pp.

Mississippi Department of Wildlife Conservation. Undated. Food and cover developments for farm game. Game Div., Jackson. 3 pp.

Neely, W. W. 1956. How long do duck foods last underwater? Trans. North Am. Wildl. and Nat. Resour. Conf. 21:191-198.

_____. 1961. Planning and planting can produce doves. S. C. Wildl. 8(2):10-11.

_____, and V. E. Davison. 1971. Wild ducks on farmland in the South. US Dep. Agric. Farmers Bull. 2218. 14 pp.

Radford, A. E., H. E. Ahles, and C. R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. Univ. N. C. Press, Chapel Hill. 1183 pp.

Soil Conservation Service, US Department of Agriculture. 1984. Browntop millet (*Panicum ramosum*). Mississippi Planting Guide. Page 25.