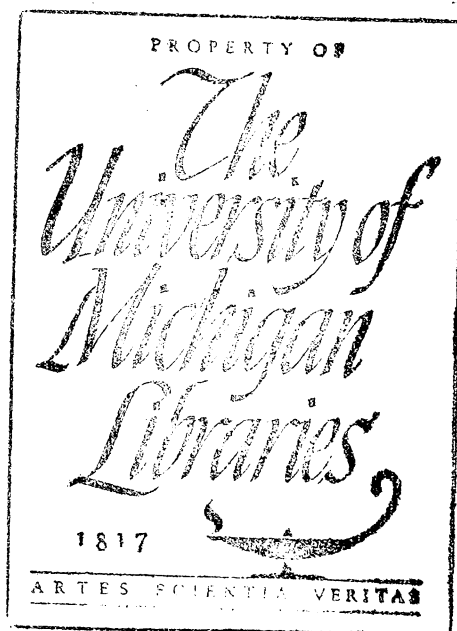


A STUDY OF HERBACEOUS PLANTS OF VALUE TO
WILDLIFE IN CONNECTICUT

SPINNER - 1942



Forestry

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A STUDY OF HERBACEOUS PLANTS OF VALUE TO
WILDLIFE IN CONNECTICUT

by
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A Thesis
Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Science
at the
University of Michigan
1942

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ACKNOWLEDGEMENTS

The writer is indebted to so many persons in the preparation of this manuscript that it is with some trepidation that he calls it his own. To name the persons who have aided and encouraged the writer through the years would be to list the greater majority of friends, fellow students and instructors with whom he has come in contact.

Gratitude is here expressed to Professors H. M. Wight, S. A. Graham and E. C. O'Roke of the University of Michigan, who, as advisors, guided the work.

Special mention should be given to Mr. James S. Bishop, Game Management supervisor of the Connecticut State Board of Fisheries and Game, for taking an active interest in the work and for providing time, materials and professional assistance. Valuable assistance in field work was given by Messrs. Sondrini and Rood, game technicians for the State Board of Fisheries and Game.

For helpful suggestions, the writer is indebted to Doctors P. D. Dalke, P. F. English, N. W. Hosley and to Professor A. E. Moss.

The writer is deeply grateful to his fiancée, Miss Julia Anderson, whose work had much to do in making this paper possible.

INTRODUCTION

The writer feels fortunate that his introduction to the study of wildlife was brought about by an early interest in wild plants. Collecting, identifying and preserving of plant specimens was begun in 1925 and this activity resulted in a collection of over one thousand specimens including all of the plants reported on in this paper. This experience has been of value in many ways principally as an excellent introduction to the field of wildlife management.

The sciences of Botany and Zoology are, of course, the bases of Wildlife Management. Upon entering the field, the writer was surprised to learn that the majority of the students and practicing wildlife managers were basically trained as Foresters or Zoologists with the Botanists in a very small minority.

This paper was written for two purposes; 1. to point out the value of herbaceous plants to those who, by accident or design, received little or no training in the field of Botany, 2. to bring to the wildlife manager pertinent information concerning utilization and values of herbaceous plants and to supplement the data of botanical taxonomic works.

This paper does not purport to be a work of plant taxonomy. The plants treated are those whose use by wildlife, either as food or cover, has been reported in the literature. Investigators who have made intensive researches on the food habits or life histories of various wildlife species agree that the availability of a particular plant is the chief factor in its utilization. From the broad viewpoint then, all herbaceous plants should be

treated in this work. For obvious reasons the scope is limited to those plants considered to be of the most value in Connecticut.

With the exception of a year spent in southern Michigan, all the data were gathered in the State of Connecticut. For this reason, the discussion and data presented are specifically for Connecticut conditions. The greater majority of the plants treated, however, are known to range far to the south and west and if it is assumed that some of the characteristics reported for plants in Connecticut are duplicated over their entire range, the work may be of value to workers throughout the eastern portion of the country.

The plants presented in Table I are those whose use by wildlife either as food or cover has been reported in the literature. A discussion of the important characteristics of several of these plants is given in Part I.

The results of a study of weeds in cornfields as an example of a method of obtaining and using quantitative data from a wildlife standpoint is presented in Part II. The relation of weed growth to soil type, previous use of land, method and length of cultivation period are discussed. The amount of food produced for wildlife by these weeds is reduced to a pounds per acre basis.

Part III attempts to show the importance of the constituents of wildlife foods and by means of chemical analysis, the constituents of several of these foods are given in tabular form.

An attempt to sum up the values of herbaceous plants is attempted in Part IV. Also included in this discussion are recommendations for use of herbaceous plants as supplements to food patches and native or transplanted shrubs and trees.

PART I

CHARACTERISTICS OF SOME IMPORTANT WILDLIFE PLANTS

The herbaceous plants used by several animal species are presented in Table I. The source of data is given in the table by reference to the bibliographic number. The table includes the animal species of Connecticut which are more apt to use herbaceous plants. The song birds or other non-game birds are not included as it is assumed that they will use the great majority if not all of the plant species. Other animal species such as the red and gray foxes, woodchuck, squirrel, skunk and opossum are deleted because their use of herbaceous plants is of small consequence or that few or no references were found as to their food habits.

The plants treated in this section are those considered by the writer to be of the most importance in Connecticut. The plants are arranged in the order and nomenclature of Gray's Manual 7th. edition. For the sake of brevity, scientific names are usually not given in other parts of the paper. Synonyms as given by other manuals are included as are the better known common names. This section attempts to bring together the pertinent data about each plant that may be of value to the wildlife manager. The discussion of each plant includes reports of its use as food and/or cover, including parts used as food; data on the seed or fruit; sites used in Connecticut; noxious qualities, if any; native or introduced, and several other factors. Where no citation is given for use as food, the omission is to be interpreted as the writer's observation.

Data usually found in taxonomic manuals are not included. A manual of botany and some knowledge of its use should be a part of every wildlife field-worker's equipment and duplication of these data would add only to the length and not the value of this paper. Means of identification are adequately presented in taxonomic works and attempts to generalize on these by other workers have resulted in descriptions that could easily be applied to several totally unrelated species.

No data were gathered during the course of this study on the relation of plants to site and, with the exception of the weeds in cornfields reported in Part IV, no data were taken on their relation to soil type. The data presented in the discussion on these points is taken from the Catalogue of the Flowering Plants and Ferns of Connecticut, Graves, et als, 1910.

These fields are, however, of vital importance and regret is here expressed that no time was not available for research.

Table II gives the period of availability on the stem of seed or fruit of some of these plants during the winter period of 1941-1942.

TABLE I

WILD HERBACEOUS PLANTS REPORTED USED BY WILDLIFE
(NUMBERS REFER BIBLIOGRAPHIC NUMBER)

Typhaceae

Cattail - *Typha latifolia* L.-Muskrat - 4, 19, 45.

Sparganaceae

Burreed - *Sparganium* sp. L. - Ducks - 18, Muskrat - 19.

Najadaceae -

Pondweed - *Elodea* sp. Michx. - Ducks - 18, 37, - Muskrat - 4, 19.

Eelgrass - *Valisneria spiralis* L. - Ducks - 18, 37.

Alismaceae

Arrowhead - *Sagittaria* - Muskrat - 4, 19, 45.

Water plantain - *Alisma Plantago-aquatica* L. - Pheasant - 9, 21, - Muskrat - 19.

Graminae

Crab grass - *Digitaria* L. - Pheasant - 44, - Quail - 5, 12, 26, 33, - Rabbit - 48.

Paspalum - *Paspalum* L. - Quail - 12, 26, 33.

Witch grass - *Panicum capillare* L. - Pheasant - 2, 9, 17, 21, 29, 41, 44, - Quail - 7, 12, 26, 29, 33, - Woodcock - 43.

Barnyard grass - *Echinochloa crusgalli* L. Beauv. - Pheasant - 2, 5, 9, 23, 29, 44, - Quail - 26, 33.

Foxtail grass - *Setaria* sp. (L.) Beauv. - Pheasant - 2, 5, 9, 17, 21, 24, 25, 29, 41, 44, 47, - Quail - 5, 14, 26, 29, 33, - Woodcock - 43.

Wild rice - *Zizania palustris* L. - Duck - 18, - Muskrat - 4.

Cut-grass - *Leersia oryzoides* (L.) Beauv. - Pheasant - 9, - Duck - 18.

TABLE I (continued)

Graminae

- Reed canary grass - *Phalaris arundinacea* (L.) Sw. -
Pheasant - 5.
Blue-joint grass - *Calamagrostis canadensis* (Michx.) Beauv. -
Pheasant - 9.
Marsh grass - *Spartina* sp. Schreb. - Muskrat - 45.
Kentucky blue grass - *Poa pratensis* L. - Pheasant - 2, 9, 20.
Chess - *Bromus secalinus* L. - Pheasant - 9.
Wild rye - *Elymus* sp. L. - Pheasant - 9.

Cyperaceae

- Sedge - *Carex* sp. (Ruppins) L. - Pheasant - 5, 9, 29, 50, -
Quail - 12, 26, 29, 33, - Grouse - 16, 35, 36, -
Duck - 18, - Woodcock - 43, - Deer - 1, - Muskrat -
4, 19.

Araceae

- Jack-in-the-pulpit - *Arisaema triphyllum* (L.) Schott. -
Pheasant - 51, - Quail - 51.
Skunk cabbage - *Symphocarpus foetidus* (L.) Nutt. - Pheasant -
5, 9, 21, 50, 51, - Quail - 33, - Grouse - 36.

Juncaceae

- Rush - *Juncus tenuis* Willd. - Pheasant - 9, - Quail - 26,
29, 33, - Woodcock - 43, - Rabbit - 10.

Liliaceae

- Spikenard - *Smilacina racemosa* (L.) Desf. - Pheasant - 9.
Solomon's seal - *Smilacina stellata* (L.) Desf. - Pheasant -
2, 41, - Quail - 23.

TABLE I (continued)

Liliaceae

Canada mayflower - *Mianthemum canadense* Desf. - Pheasant -
2, 41, - Quail - 23, - Grouse - 16.

Carrion flower - *Smilax herbacea* L. - Pheasant - 5.

Iridaceae

Wild iris - *Iris* sp. L. - Muskrat - 45.

Urticaceae

Hemp - *Cannabis sativa* L. - Pheasant - 20, 21, 25, 41.

Polygonaceae

Dock - *Rumex* sp. L. - Pheasant - 2, 4, 9, 25, 29, 50, -
Quail - 5, 16, 32, 35, 36, - Rabbit - 10.

Knotweed - *Polygonum aviculare* L. - Pheasant - 44, -
Quail - 26, 33.

Smartweed - *Polygonum pennsylvanicum* L. - Pheasant - 9,
47, 50, 51, - Quail - 26, 33, - Duck - 37.

Black bindweed - *Polygonum Convolvulus* L. - Pheasant - 2,
5, 9, 17, 21, 25, 41, 44, 50, - Quail - 33, - Wood-
cock - 43.

Climbing false buckwheat - *Polygonum scandens* L. - Pheasant -
20, 50, 51, - Quail - 33.

Chenopodiaceae

Pigweed - *Chenopodium album* L. - Pheasant - 2, 4, 9, 20, 24,
29, 47, 51, - Quail - 7, 26, 33.

Amaranthaceae

Amaranth - *Amaranthus* sp. (Tourn.) L. - Pheasant - 2, 4,
9, 21, 24, 25, 29, 41, 44, - Quail - 26, 33, -
Woodcock - 43.

TABLE I (continued)

Phytolaccaceae

Pokeweed - *Phytolacca decandra* L. - Pheasant - 5, 9, 29, 50, -
Quail - 5.

Caryophyllaceae

Chickweed - *Stellaria medis* (L.) Cyrill - Grouse - 16, -
Rabbit - 10.

Chickweed - *Cerastium vulgatum* L. - Pheasant - 9, 44, -
Quail - 26, 33.

Portulacaceae

Purslane - *Portulaca* sp. L. - Grouse - 16.

Ranunculaceae

Tall buttercup - *Ranunculus* sp. L. - Pheasant - 9, 44, -
Quail - 26, - Woodcock - 43.

Cruciferae

Shepherd's purse - *Capsella Bursa-pastoris* (L.) Medic -
Pheasant - 29, - Quail - 29.

Wild radish - *Raphanus raphanistrum* L. - Pheasant - 51.

Rosaceae

Wild strawberry - *Fragaria virginiana* Duchesne - Quail - 33, -
Grouse - 6, 35, 36, - Woodcock - 43.

Five-finger - *Potentilla* sp. L. - Pheasant - 44, - Grouse -
6, 35, 36, - Woodcock - 43, - Rabbit - 10.

Avens - *Geum* sp. L. - Pheasant - 9, 21, - Grouse - 16, 32,
35, 36.

Rubus - *Rubus* sp. L. - Pheasant 9, - Quail - 33, - Grouse - 6,
16, 35, 36, - Woodcock - 43, - Duck - 31, - Rabbit - 10.

Agrimony - *Agrimonia* sp. (Tourn.) L. - Pheasant - 21, -
Quail - 26.

TABLE I (continued)

Leguminosae

Senna - Cassia sp. (Tourn.) L. - Pheasant - 29, - Quail - 7, 26, 33.

Clover - Trifolium L. - Pheasant - 5, 9, 25, 29, 44, - Quail - 5, 14, 15, 26, 29, 33, - Grouse - 16, 32, 36, - Rabbit - 48.

Tick trefoil - Desmodium sp. Desv. - Pheasant - 5, 9, 21, 29, - Quail - 7, 12, 15, 26, 33.

Bush clover - Lespedeza (L.) Pers. - Pheasant - 9, 29, - Quail - 7, 12, 26, 33, - Rabbit - 10.

Wild bean - Strophostyles helvola (L.) Britton - Pheasant - 21, - Quail - 7, 12, 21, 26, 33.

Hog peanut - Amphicarpa monoica (L.) Ell. - Pheasant - 50, - Quail - 15, 26, 33, - Grouse - 16, 32.

Euphorbiaceae

Spurge - Euphorbia so. L. - Pheasant - 9, 44, - Quail - 7, 26, 33.

Balsaminaceae

Jewelweed - Impatiens pallida Nutt. - Pheasant - 9, 21, 51, - Quail - 15, 26, 33, 51, - Grouse - 16.

Malvaceae

Rose Mallow - Hibiscus sp. L. - Quail - 26, - Muskrat - 45.

Violaceae

Violets - Viola sp. (Tourn.) L. - Quail - 26, 33, - Grouse - 16, - Woodcock - 43, - Rabbit - 10.

Onograceae

Evening primrose - Oenothera sp. L. - Pheasant - 9, 23.

Araliaceae

Wild Sarsaparilla - Aralia nudicaulis L. - Quail 33. -

TABLE I (continued)

Grouse - 16, - Woodcock - 43.

Umbelliferae

Wild carrot - *Daucus Carota* L. - Pheasant - 9, - Rabbit - 48.

Ericaceae

Wintergreen - *Gaultheria procumbens* L. - Grouse - 6, 15, 16,
32, 36, - Duck - 1, 31.

Asclepiadaceae

Milkweed - *Asclepias* sp. (Tourn.) L. - Pheasant - 5, 21, 51, -
Quail - 5, 26, 51.

Convolvulaceae

Morning glory - *Ipomoea* sp. L. - Pheasant - 9, 20, 41, -
Quail - 26, 33.

Hedge bindweed - *Convolvulus sepium* L. - Pheasant 20, -
Quail - 33.

Dodder - *Cuscuta* sp. Beyrich - Pheasant - 9, - Quail - 26, -
Woodcock, 43.

Verbenaceae

Blue vervain - *Verbena hastata* L. - Pheasant - 9, 25, -
Quail - 33.

Labiatae

Heal-all - *Prunella vulgaris* L. - Grouse - 6.

Catnip - *Nepeta Cataria* L. - Pheasant - 2.

Wild bergamot - *Monarda fistulosa* L. - Pheasant - 2.

Solanaceae

Ground cherry - *Physalis* sp. L. - Pheasant - 5, 9, - Quail -
7.

Typhaceae - Cattail family

1. Typha - Cattail

The cattail is a tall, perennial, often growing in large colonies in swamps or on the margins of streams or ponds where it provides excellent cover for a multitude of aquatic forms. The roots are one of the ~~chief~~ foods of the muskrat, Bailey, 1937.

Graminae - Grass family

The grass family is undoubtedly one of the most valuable from a wildlife standpoint. It is a family of wide distribution and provides food or cover in many sites. The cultivated grains are largely members of this family and some idea of the number of wild species used as food may be gained by referring to Table I.

2. Digitaria - Crab, Finger, Crowfoot Grass

Synonyms - *Syntherisma*, *Panicum*

Characteristics - a naturalized annual weed with a low spreading growth habit. The seeds are small, 1.5 mm. long, and fall from the stem with the first frosts.

Value - The seeds are used as food by the pheasant, Severin, 1936; and quail, Stoddard, 1931. The whole plant is taken by the rabbit, Trippensee, 1938. Little value as cover.

3. Paspalum - Paspalum - Bull Grass

Characteristics - The paspalum grass is a perennial largely restricted to the coast in Connecticut. This species is apparently the only grass species which will compete with bunch grass, Andropogon scoparius, in the dry sandy fields which are so prevalent along the coast. The seeds of this group while small, 1.5mm.

long, they are abundant and remain available on the stem until spring although a few inches of snow will cover both seeds and stem.

Value - It is reported of great value to the quail in the south, Stoddard, 1931.

4. Panicum - Witch grass, Tumble weed

Characteristics - The witch grass is an annual weed in Connecticut. The seeds are small averaging 2 mm. in length. Its value is heightened by the fact that the large panicles bearing the seed break off the stem in the fall and are blown away by the wind, usually to a fencerow or other cover where they are easily available. Many species are reported indigenous in the state and in various sites.

Value - The panicums are reported used by the pheasant; the quail, Hicks, 1932; and the woodcock, Pettingill, 1939.

5. Echinochloa crus-galli - Barnyard grass, wild millet

Synonyms - Panicum

Characteristics - The barnyard grass is a tall annual weed in cultivated fields and in moist or wet places. It sometimes is found in water areas. The seeds are large, 3-4 mm. long, and may remain on the stem until January.

Value - It is used by the pheasant, Dalke, 1934; and by the quail, Stoddard, 1931. This plant has been used as planting material in duck marshes as it is a valuable duck food, Martin, 1939. When growing in colonies it produces excellent cover for almost all species. In Connecticut, this plant is used as a wild hay by farmers.

6. Setaria - Foxtail - Pigeon - Bottle grass

Synonym - Chaetochloa - Chaetochola - Ixophorus

Characteristics - The three chief forms of the foxtail grass are the yellow, green and bristly foxtails. The foxtails are annual weeds of great importance in Connecticut. They are important to wildlife only in cultivated areas as they do not stand the competition in abandoned land. The seeds are fairly large but fall from the plant with the first killing frost in the fall and are not available during snow periods. One species, italica, is cultivated.

Value - The foxtails are used by the pheasant; by the quail, Bennet and English, 1939.

7. Zizania palustris - Wild, water, Indian rice

Characteristics - The wild rice grows in extensive beds along the larger streams and in many marshes in Connecticut. It is a tall annual plant, 6 feet high, and provides excellent cover during the summer and fall. The seeds are sometimes 3/4 of an inch long. These are gone by October and are thus usually taken from the bottom by the ducks.

Value - The wild rice is well known for its use in duck marsh plantings, Martin, 1939. It is also reported of value to the muskrat, Bailey, 1937.

8. Phalaris arundinacea - Reed canary grass

Characteristics - This plant is included here because it shows excellent promise as a wild life plant and because it is a good forage plant for livestock. It is a perennial found in moist areas as a wild plant.

9. Cyperaceae - Sedge family

Characteristics - Due to the difficulty in keying down members of this family, the majority of writers referring to the family use only general terms. Therefore, this discussion will be of the family only.

The sedges are found usually in low moist areas.

Value - Their chief value is winter cover for pheasants who roost in these areas. The seeds are used as food by the pheasant; the quail, Stoddard, 1931; the grouse, Kuhn, 1940; ducks, Martip, 1939; and woodcocks, Pettingill, 1939. The deer, Aldous, 1939; and muskrat, Bailey, 1937, use the stems and roots.

Araceae - Arum family

10. Symplocarpus foetidus - skunk cabbage

Synonym - *Spatheya foetida*

Characteristics - The skunk cabbage is a perennial plant of wide distribution. It is a rare swamp or stream that does not number this plant among its flora, especially in Connecticut. The large oily seeds, one of the most nutritious of wild foods, especially rich in protein and fat, persist well into the winter. The green leaves, spathe and flower are eaten in the late winter and early spring thus giving this plant a greater value.

Value - In Connecticut the skunk cabbage is a most valuable fall food for this species. Its use by the grouse is reported by Kuhn, 1940. The quail is known to take it occasionally, Judd, 1903.

11. Juncaceae - Rush family

The rushes and sedges have many common characteristics.

Rushes of various species are reported used as food by the pheasant, Dalke, 1934; the quail, Hicks, 1932; and the rabbit, Dalke and Sime, 1941.

12. Liliaceae - The lily family

Characteristics - Several herbaceous members of the lily family are of value as food to wildlife. These perennial plants produce large fruits which are fairly nutritious. The greater majority of the fruits drop with the early frosts but remain firm until early spring. The plants are common in moist woods and thickets.

Value - The pheasant is reported using the spikenard, Smilacina racemosa, Solomon's Seal, Polygonatum biflorum, Dalke, 1934; Canada Mayflower, Maianthemum canadense, Wilder, 1941; Carrion flower, Smilax herbacea, Bennet and English, 1939.

The grouse are reported using Solomon's Seal by Forbush, 1925 and the Canada Mayflower by Forbush, 1925.

13. Polygonaceae - Buckwheat family

The buckwheat family is one of the valuable families as regards food production for wildlife.

14. Rumex - Dock, Sorrel

Characteristics - The best known member of this genus is the Sheep sorrel, Rumex Acetosella. It is a small naturalized perennial weed with tiny seeds. The leaves however are used as food by many species. It is commonly found in cultivated fields and waste areas.

Value - It is used by the pheasant, Dalke, 1934; by the quail, Stoddard, 1931; the grouse; and by the rabbit in Connecticut.

15. *Polygonum* - Knotweed - Smartweed

The plants in this naturalized genus are among the top ranking wildlife foods. The seeds of the following species persist until winter and a few are still on the stem in the spring. As many authors do not differentiate between species, the following is the reported use of the genus; the pheasant; quail, Hicks, 1932; grouse, Kuhn, 1940; duck, Martin, 1939; and woodcock, Pettingill, 1939 use the seeds. The rabbit, Dalke and Sime, 1941, browse on the leaves and stems. Characteristics of several of the more important species are as follows:

Polygonum aviculare - Doorweed - Knotweed

This plant is a spreading annual weed of lawns and cultivated areas. The seeds are small, about 2 mm. long.

Polygonum pennsylvanicum - Largeseed, Pennsylvania smartweed, common *Persicaria*, Pink Knotweed

The smartweed is one of the major annual weeds in Connecticut. It will apparently grow well in dry areas but does best in moist situations. When growing in colonies it is a valuable cover plant. The seeds are fairly large, about 5 mm. in length.

Polygonum Hydropiper - Water pepper

The water pepper is an annual common in moist situations throughout the state. Its common name refers to the acrid taste of the leaves. This plant is reported used only in Connecticut.

Polygonum Persicaria - Lady's Thumb

This plant is similar to smartweed but is not as common in Connecticut.

Polygonum Convolvulus - Black bindweed

The black bindweed is annual weed in waste areas especially in fencerows. It is a climbing plant with a cluster of large seeds, 3-4 mm. long, at the end of each stem and in the axils of the leaves.

Polygonum Scandens - False climbing buckwheat

A common perennial vine in fencerows and cultivated or waste land. The seeds are 4 mm. long.

Chenopodiaceae - Goosefoot family

16. Chenopodium album - Pigweed, Lamb's quarters, goosefoot

Characteristics - The naturalized pigweed is one of the major weeds in cultivated ground and comes in almost anywhere, except in moist areas, where the ground is disturbed. The small, 2 mm., seeds are covered with a soft mealy substance which remains on the seed during the winter. When growing in colonies the pigweed produces a tremendous amount of food all during the winter. It is also a good cover plant under these conditions.

Value - It is used by the pheasant and quail, Hicks, 1932.

Amaranthaceae - Amaranth family

17. Amaranthus retroflexus - Amaranth - Red root pigweed

Characteristics - The naturalized amaranth is an~~y~~ annual weed of cultivated and waste areas. The tiny black seeds, a favorite food of song birds, are available on the stem until spring.

Value - It is used by the pheasant; quail, Stoddard, 1931, It is similar to the pigweed in providing cover.

18. Phytolacca decandra - Pokeweed, poke, garget

Characteristics - The pokeweed is a perennial plant of woods and fields especially burnt areas and roadsides. It is a tall plant, 5-6 feet, that produces large crops of fleshy fruits relished by game and song birds. The plants break in the winter winds and are toppled over. Some fruit however, remains on the stem and is available through most of the winter.

Value - Its use is reported by the pheasant; and by the quail, Benmet and English, 1939. Unless growing in colonies is of small value as cover.

19. Carophyllaceae - Pink family - chickweeds

Characteristics - The chickweeds are small plants of several genera. For convenience they are lumped together in this discussion. The chickweeds as a group are low spreading annual plants, several of which provide green food as well as seeds for use by wildlife.

Value - They are reported used by the pheasant, quail, Stoddard, 1931; grouse, Forbush, 1925; and rabbit.

Rosaceae - Rose family

20. Rubus - Bramble

The genus Rubus is one of great value including such plants as the raspberry and blackberry. These perennial plants are too well known to describe here. The fruit is used by the pheasant, and grouse. The deer, Hosley and Ziebarth, 1935, and rabbit browse on the leaves and stems.

Leguminosae - Legume family

21. Cassia - Partridge Pea - sensitive plant - Senna

Characteristics - The Partridge Pea is a low native annual common in sandy fields along the coast. The seeds are small and are lost early as the pods shatter when ripe.

Value - The seed is used by the pheasant, Hicks, 1932 and is a favored food of quail, Stoddard, 1931.

22. Trifolium - Clover - Trefoil

Characteristics - The clovers are common plants, mostly perennials. While the seeds are small and are taken by various species, the chief value of the clover is the green food it provides.

Value - Clover is used by the pheasant, rabbit, quail, Bennet and English, 1939, grouse, Kuhn, 1940. The sweet clover, melilotis, is an excellent cover plant.

23. Desmodium - Tick Trefoil

Synonym - Meiboma

Characteristics - The tick trefoil is a native, perennial plant in dry fields, roadsides and woods. The large seeds remain on the stem until early spring although the great majority of plants are blown down by the wind.

Value - Desmodium seed is used by the pheasant, Dalke, 1934; quail, Stoddard, 1931; and the leaves and stem are used as browse by the rabbit.

24. Lespedeza - Bush clover

Characteristics - The lespedezas are native perennials of dry woods and fields. The seeds are large and remain on the

stem well into the winter. The plants are tall, 3-4 feet, but provide little cover.

Value - The lespedeza is used by the pheasant, Dalke, 1934, quail, Stoddard, 1931, and the rabbit.

25. Amphicarpa monoica - Hog Peanut

Characteristics - The hog peanut is a climbing or trailing vine of woods or brushy areas. Along the coast it sometimes grows in large patches. The seed is comparatively large and some are available all through the winter due to being caught in the curled pod.

Value - The seed is used by the pheasant, Wilder, 1941; the quail, Errington, 1931; and grouse, Johnson, 1928.

26. Plantago - Plantain

Characteristics - The plantain is an annual weed in fields and lawns. The seeds are small but hold well through the winter.

Value - The seeds are used by the pheasant, Severin, 1936; and the quail, Stoddard, 1931. The rabbit browses on the plant, Trippensee, 1934.

Rubiaceae - Madder family

27. Mitchella repens - Partridge Berry

Characteristics - The partridge berry is a native, perennial plant of rich woods especially under conifers. The fruits persist over winter and the leaves remain green the year around.

Value - The fruits by the pheasant, Wilder, 1941; by the quail, Hicks, 1932; and by the grouse, Kuhn, 1940.

Compositae - Composite family

Characteristics - This family is second only to the grasses

as a wildlife food producer. Its widespread distribution and ability to adapt itself to almost any conditions are factors increasing its value.

28. Ambrosia artemisiifolia - Lesser ragweed

Characteristics - The lesser ragweed is undoubtedly the most valuable wildlife food due to its wide distribution and period of availability of the seed. Its habit of growing in colonies makes it also an important cover plant. Its weedy habit and reported cause of hay fever in humans are the chief reason why it is considered one of the most obnoxious of weeds. It is a native annual and appears wherever the ground is disturbed.

Value - Its use by the pheasant is reported in 12 states. It is also used by the quail, Stoddard, 1931; grouse, Forbush, 1925; and rabbit.

29. Ambrosia trifida - Giant ragweed

Characteristics - This tall annual member of the genus does best in moist areas and is not considered too much trouble as a weed. The seeds are large some approaching the size of corn and hold well through the winter.

Value - It is reported used by the pheasant, Bennet and English, 1939; and by the quail, Stoddard, 1931.

30. Bidens - Sticktight - Bur Marigold

Characteristics - The sticktight is a common plant of moist areas in Connecticut. It has a high nuisance value as far as humans are concerned but rates well as a wildlife food plant. The seeds are produced in large quantities and persist until early winter.

Value - The seeds are taken by the pheasant; quail, Bird and Bird, 1931; grouse, Forbush, 1925; and rabbit.

31. Arctium - Burdock

The burdock is a large coarse biannual of waste lands and roadsides. The seeds hold well through the winter and are used by the pheasant.

TABLE II

AVAILABILITY ON THE STEM OF SEVERAL WILDLIFE
FRUIT AND SEED
1941-1942

	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
BURDOCK						
POKEWEED						
PARTRIDGE BERRY						
DOCK						
AVENS						
DODDER						
RAGWEED						
BUSH CLOVER						
CARRION FLOWER						
PIGWEED						
PLANTAIN						
WATER PLANTAIN						
PASPALUM						
WILD CARROT						
AMARANTH						
SMARTWEED						
GIANT RAGWEED						
HOG PEANUT						
WILD BERGOMOT						
TICK TREFOIL						
BLACK BERRY						
CLIMBING BUCKWHEAT						
BARNYARD GRASS						
WITCH GRASS						
SKUNK CABBAGE						

PART II
A METHOD OF OBTAINING QUANTITATIVE DATA
FOR USE IN WILDLIFE MANAGEMENT

Quantitative data on the abundance and distribution of plants providing food and cover for wildlife are of great value to the wildlife manager in planning his program. Methods of performing this task are few and as yet untried on a large scale.

The purpose of the following section is to attempt to show a method of obtaining quantitative data and the uses to which it may be put.

The method presented while only tested in cornfields, with some variations, may be used in other ecological types. The cornfields were chosen as the type to be examined because of their value to upland game in Connecticut.

THE AMOUNT OF WEED SEED PRODUCED
IN CORNFIELDS

In connection with research on activity of the pheasant in Connecticut, a study designed to determine the amount of food available in cornfields for these birds was initiated in September, 1941.

The pheasants' normal habitat is known to be the cultivated areas of the state together with their interspersed woodlots and swamps. In Connecticut, these areas are largely in the central river valley system and along the coast. Few areas are found in the wooded eastern and western highlands.

The amount of food provided by farm woodlots or the swamps is small and most of the feeding is confined to the cultivated or recently abandoned land. With few exceptions, the only crop which is abundant in the pheasant range and which provides a great deal of the food is the ensilage corn crop. The amount of grain corn which is available for the birds from this type is small as the corn is cut and stored in silos in the fall. The chief food supply of the pheasant in these areas is the weeds which are usually found growing with the corn.

The purpose of this study was, at first, twofold, to determine the maximum amount of weed seed produced, and second, to follow the amounts available on the stems of the weeds through the winter and early spring months. The first part of the study was accomplished during the period which preceded the harvesting of the corn although several fields were sampled in which the corn had been cut but the weeds were still available. The second part of the study was not attempted due to three factors. First,

the weeds, in the majority of the cases, were cut and taken out with the corn. Second, livestock was turned into the fields after cutting. Third, many of the fields were plowed in the fall due to the mild weather.

Although these factors removed a great percentage of the weed seed, the fields were not a total loss, as far as pheasant food supply is concerned, due to the fact that some seeds fell to the ground before or during the harvesting. Except when snow covers the fields these seeds are available to the pheasant. Due to conditions beyond the control of the writer the amount of weed seed available on the ground was not studied and therefore this report deals solely with the amount of seed produced in the fall before the corn is harvested.

The corn fields selected for sampling were, in so far as possible, located in or near pheasant shooting areas leased or controlled by the Connecticut State Board of Fisheries and Game. Twenty fields were sampled in several parts of Connecticut. The reason for sampling more than one area was to determine the amounts of weed seed produced in the several areas and to determine if the weed species were the same in these areas. Table III shows the towns in which the fields were located, approximate location in the state and the size of the field in acres.

Factors which might have influenced weed seed production were studied and data was gathered on the type of field edge, soil type, previous use of land and method and cessation time of cultivating. The field edges were classed as woods, fencerows or open and whether moist or dry. The soils were classed as good,

TABLE III

LOCATION, NUMBER OF FIELDS, AREA
OF CORNFIELDS STUDIED

TOWN	FIELD NUMBER	LOCATION IN STATE	AREA*ACRES
New London	1	So. East Coast	1.2
Clinton	1	So. Central Coast	2.0
	2		2.0
	3		1.8
Wallingford	1	So. Central	1.8
	2		4.8
	3		3.4
	4		8.5
	5		3.1
Lebanon	1	No. East	1.4
	2		1.4
	3		1.7
South Windsor	1	No. Central	0.9
	2		3.1
Bristol	1	West Central	0.7
	2		1.4
Canton	1	No. West	0.9
	2		0.9
	3		1.4
	4		0.5

fair and poor, depending on amount of loam, sand or gravel in the soil. The use of fertilizer is so prevalent in Connecticut that this factor was discounted.

The method used to determine the weight of weed seed produced per field was to mechanically locate ten sample plots in each field, determine the weight of seed in each plot and with these samples as a basis compute the total production of the field. The milacre was the size of sample plot used in this study as it is a standard size used in ecological work and also because the samples could easily be converted to an acreage basis. The stems per sample and not the whole plant were counted for two reasons. First, in many instances a plant would be on the edge of the milacre plot and the judgment of the observer was the deciding factor in determining whether or not the plant should be counted. The counting of stems minimized this factor to a considerable degree. The second reason is that at the beginning of the study the idea was to carry the research through the winter and it was felt that snow might have interfered with counting whole plants.

From the time standpoint alone, it would have been impossible to collect, clean and weigh the seeds from each sample plot. The method used here was to determine the average weight of seed per stem of the weeds encountered in the plots. Multiplying the average stem weight of the weed seed by the number of stems of each weed and adding the totals gave the amounts of weed seed produced in each plot. This data for the number one field of each area is reproduced in Table IV. It is obvious from the

TABLE IV

AVERAGE NUMBER OF STEMS AND SEED WEIGHT
MILACRE PLOTS BY TOWNS

TOWN	<u>Average Number of Stems</u>		<u>Average Weight of Seed-Pounds</u>		
	<u>No. 1 & 2 Plots</u>	<u>Center Plots</u>	<u>No. 1 Plots</u>	<u>No. 2 Plots</u>	<u>Center Plots</u>
New London	24.8	7.0	.840	.127	.345
Clinton	102.9	100.6	.256	.180	.260
Wallingford	102.3	31.3	.117	.095	.013
Lebanon	94.8	90.5	.110	.072	.040
South Windsor	67.2	51.0	.065	.035	.010
Bristol	98.0	54.5	.367	.297	.050
Canton	146.3	97.4	.675	.292	.165

table that the greatest amount of weed seed is produced on the edges with less production in the center of the field.

One thousand stems of each weed were collected but due to the difficulty in cleaning the seed the weight of seed per stem is based on the average of one hundred stems. The weeds used in this study with the average weight of seed per stem are given in Table V.

Several methods of placing the milacre sample plots in the cornfields were tried and discarded as impracticable during the early part of this study. The method finally used was to pace the field edges and a plot placed in the center of each edge. These plots were called the number one plots and, to differentiate between them, they were labeled according to the compass direction of the field edge. (i.e. North one.) These plots were laid out so that the outer edge of the plot began where the plowed land began and extended back into the cornfield. Another plot on each edge, the No. 2 plots, was based on the first and extended still further into the field. The center of the field was located by pacing and two plots established for a total of ten plots in each field.

The method of estimating total seed weight in the cornfield was first to determine the weight of seed produced in each plot. The weight of seed in each number one plot was multiplied by the number of milacres in a strip one milacre and the number of milacres the length or width of the field. The same process was followed for the number two plots. The remaining area in the field was divided into two parts and the weight of seed in the

TABLE V

MAJOR WEEDS OF CONNECTICUT CORNFIELDS
AND AVERAGE WEIGHT PER STEM

WEEDS	WEIGHT PER STEM IN GRAMS	NO. PER PLANT*
Ragweed	2.815	3,380
Pigweed	1.535	72,450
Smartweed	.911	3,140
Barnyard grass	.280	7,160
Amaranth	.267	35,000
Yellow foxtail	.151	6,420
Witch grass	.090	11,400
Crab grass	.070	-----

*Reported by Stevens, 1932.

center plots used as the multiplier, one plot for each half. To illustrate, if a field were 666 feet on a side there would be 66 milacres to a side and total of 4456 milacres. Each number one plot would be multiplied by 65, so as to allow for overlapping on each edge, each number two plot would be multiplied by 63. The remaining 3844 plots would be halved and each center plot multiplied by 1422. The result of adding the ten totals would be the weight of seed produced by the field.

Table VI shows the total weight of seed produced per acre by each field together with the factors of soil types, previous use of land and method and time of cessation of cultivation. From the weights given, the average weight of seed produced per acre is 97.8 pounds.

It is immediately apparent from this table that the previous use of the land is the most significant factor in weed seed production. This fact is not surprising as many seeds fall to the ground and if favorable conditions for the weeds are presented, such as fertilizing and plowing, a rank growth of weeds is the result.

Another factor which enters into this picture is the length of time weed seeds can remain in the ground and still be viable if the favorable conditions occur. Goss, 1924, found that ragweed, foxtail and pigweed will germinate after being buried for 20 years. Smartweed and amaranth were reported germinating after 15 and 9 years respectively. Goss also reports many other weeds with similar characteristics but none of importance in Connecticut.

TABLE VI

WEIGHT OF SEED PER ACRE, BY FIELDS, SOILS,
PREVIOUS USE AND CULTIVATION

FIELD NO.	WEIGHT OF SEED*POUNDS PER ACRE	USE 1940	SOIL	METHOD OF CULTIVATION	DATE OF LAST CULTIVATION	NUMBER OF TIMES CUL- TIVATED	
New London	1	358.2	Corn	Good	Hand	June 1	1
Canton	1	241.4	"	"	Machine	July 1	2
Clinton	1	229.9	"	"	"	"	3
Bristol	1	129.0	"	Fair	None	-	-
Lebanon	2	104.0	"	"	Machine	July 1	2
Clinton	3	98.0	"	Poor	"	July 1	3
Clinton	2	95.8	Fallow	Good	Hand	July 15	3
Lebanon	3	93.5	Pasture	"	None	-	-
Canton	2	81.2	Corn	"	Hand	July 1	2
So. Windsor	2	79.4	?	Fair	?	?	?
Wallingford	2	71.7	Clover	Good	Machine	June 20	2
Canton	3	66.3	Corn	Fair	"	July 1	3
Wallingford	5	52.4	Hay	"	"	July 15	4
Wallingford	4	50.4	?	Good	?	?	?
Lebanon	1	43.9	Oats	"	Machine	June 15	1
Wallingford	1	38.2	?	Poor	?	?	?
Canton	4	33.3	Hay	"	?	?	?
Bristol	2	32.5	?	"	?	?	?
So. Windsor	1	29.1	Tobacco	Fair	Machine	June 15	1
Wallingford	2	27.7	Potatoes	"	"	July 1	3

The per cent of seed weight of each weed in each cornfield is given in Table VII. Ragweed is easily the leader in food production averaging 52.3% of the total.

Table VIII presents the per cent of occurrence of weeds in plots one and two by species and edge type. From the data presented here it is apparent that the moist open and moist fence-rows/ edge types are the better producers of weeds. The number one plots are by far the better producers of weed seed according to this table. It is evident from the table that smartweed, barnyard grass and witch grass prefer the moist sites with smartweed being decidedly intolerant. Yellow foxtail, pigweed, and crabgrass prefer the dry sites. Ragweed and amaranth apparently do well in any site.

It is evident from the data presented that the cornfields of Connecticut produce a surprising amount of food and are more valuable to the seed eating species than is commonly realized. The fact that most of the food produced is lost through harvesting of the corn may explain why winter feeding of game birds is necessary in Connecticut during periods when the ground is covered by snow.

The management practice that immediately enters the picture in an attempt to alleviate this condition is to prevent the removal of some of the corn crop and thus make available Both corn and weeds as winter food. This idea is practical as it would be possible to fence off several rows of corn, preferably adjacent to good cover. The farmer should be recompensed for his loss and this could be handled through the State or by the local sportmens' organizations.

TABLE VII

PERCENT OF SEED WEIGHT BY SPECIES AND FIELDS

FIELD	Smartweed	Yellow Foxglove	Ragweed	Barnyard Grass	Pigweed	Amaranth	Witch grass	Crab grass
New London	0	0	84.3	0	9.1	3.4	1.0	0
Clinton	1 0	3.0	95.0	0	0	0	1.0	0
	2 4.0	2.8	51.6	0	17.4	1.0	1.6	21.6
	3 0	5.5	90.0	0	0	0.5	1.5	2.7
Wallingford	1 14.6	75.2	9.4	0	0	.7	0	0
	2 3.0	1.0	88.0	4.0	2.0	0	0	1.0
	3 0	10.1	87.0	0	.01	1.6	.2	0
	4 .03	29.0	69.0	0	.01	1.0	0	0
	5 1.0	22.0	17.0	.1	51.0	6.0	0	0
Lebanon	1 2.4	35.9	25.3	0	0	21.1	15.0	0
	2 .02	24.7	73.8	0	.6	.07	.4	0
	3 4.0	24.0	71.0	0	0	.03	0	0
South Windsor	1 3.7	7.3	1.0	1.0	50.7	7.6	0	27.0
	2 23.0	13.0	39.0	0	23.0	0	0	0
Bristol	1 .9	.7	96.0	0	0	0	.7	1.1
	2 .8	8.1	34.8	20.1	0	0	20.1	15.7
Canton	1 70.0	7.0	12.2	2.1	1.5	.07	.04	6.7
	2 57.0	1.0	7.0	13.0	17.0	.6	.4	4.0
	3 7.5	10.5	72.0	.02	7.5	.5	1.5	0
	4 6.5	49.1	23.9	5.2	5.7	.7	3.9	1.3
ALL	4.9	16.5	52.4	2.3	9.3	2.2	2.4	4.1

TABLE VIII

PERCENT OF OCCURRENCE OF WEEDS IN PLOTS 1 AND 2
BY SPECIES AND EDGE TYPES

	Smartweed		Yellow Foxtail		Ragweed		Barnyard Grass		Pigweed		Amaranth		Witch Grass		Crab Grass	
	Plot		Plot		Plot		Plot		Plot		Plot		Plot		Plot	
DRY OPEN	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
	40	25	66	59	85	60	29	28	34	23	48	37	46	43	40	31
MOIST OPEN	100	100	40	80	100	100	40	60	0	0	40	60	80	40	0	20
	33	29	85	81	77	59	22	14	37	37	40	44	37	26	18	14
MOIST FENCE	100	50	50	100	100	100	0	0	0	50	50	50	100	100	50	50
	29	14	86	57	85	85	0	14	57	71	43	43	43	29	57	43
MOIST WOODS	100	33	100	66	66	66	33	33	0	0	0	0	66	66	66	33

Edges were classified as follows: 36 dry open, 5 moist open, 27 dry fence, 2 moist fence, 7 dry woods, 3 moist woods.

This method of providing food may have several advantages over feeding stations or the planting of food patches.

Of primary importance it is less expensive. The cost of food patch planting is admittedly high while the feeding station not only requires an outlay for feed but time and traveling expenses are necessary to keep it in working condition. The expenses connected with fencing off several rows of corn are those of the fence, which could be a single strand affair, and the leasing of the ground. In addition the area is visited only twice, once to erect the fence and again to remove it before the spring plowing.

The efficiency of the feeding station and food patch is undoubtedly high while the suggested plan is of doubtful quality. However, conditions in Connecticut at present call for intensive management of the existing game populations and as the men and material are at hand to prosecute such a plan, it is at least worthy of a trial.

PART III

THE NUTRITIONAL VALUES OF SOME HERBACEOUS WILDLIFE FOODS

The chemical analysis method of determining the nutritive value of foods has been utilized to a great degree by workers in the fields of human and livestock nutrition. This method has only recently been used in wildlife work in connection with several food habits studies. The purpose of this paper is to present all the analyses of wildlife foods available in the literature together with the analysis of 40 important wildlife foods found in Connecticut and attempt to evaluate these foods on the basis of nutritive value.

The analysis of 94 wildlife foods are given in Table IX. The analysis taken from the literature are uniform in method of presentation except that Chatfield and Adams do not separate crude fiber and nitrogen free extract but combine them as carbohydrates. Where a figure is given for fiber in their analyses, this is a part of the total given under carbohydrates. Their analyses are also of fresh material and not dried as are all the others which accounts for the greater percentage of water in their analyses.

The chemical analysis method attempts to show the nutritive value of a food by breaking it down into the per cent of protein, fat, carbohydrates, ash and water it contains. This is done by the following method as stated by Morrison, 1940.

"1. Water - The chemist determines the amount of water by drying a finely-ground sample for some hours in an oven at a definite temperature and under standardized conditions, until no more water is given off. The difference between the first and last weights is taken as the amount of water in the sample. Traces of volatile substances, such as those which give various plants their characteristic odors, are also driven off by the heating, but the weight of such compounds is generally insignificant.

ANALYSES OF SOME HERBACEOUS WILDLIFE FOOD PLANTS

*Analyses by Dr. E. M. Bailey, Connecticut Agricultural Experiment Station, New Haven, CT

TABLE IX A (continued)

FAMILY	SCIENTIFIC NAME	COMMON NAME	PART ANALYZED	SOURCE
Cyperaceae	Eleocharis tuberosa	Waternut	Tubers	8
	Scirpus olneyi	Olneys three square	Roots and rhizomes	45
	"	"	Tops	45
	Carex lurida	----	Seeds	*
Araceae	Arisaema triphyllum	Jack-in-the-pulpit	"	51
	Symplocarpus foetidus	Skunk cabbage	"	51
Liliaceae	Allium tricoccum	Wild onion	"	*
	Smilacina racemosa	Spikenard	"	*
	Maianthemum canadense	Canada mayflower	"	*
	Polygonatum biflorum	Solomon's seal	"	*
	Smilax herbacea	Carrion flower	"	*
Iridaceae	Iris versicolor	Blue flag	"	*
	Urtica dioica	Stinging nettle	Roots and rhizomes	45
Urticaceae	Rumex crispus	Dock	Leafy shoots	8
Polygonaceae	Rumex obtusifolius	"	Seeds	*
	Rumex sp.	"	"	*
	Polygonum pennsylvanicum	Smartweed	Leaves and stems	8
	Polygonum scandens	Climbing false	Seeds	*
Chenopodiaceae	Pagopyrum esculentum	Buckwheat	"	51
	Chenopodium album	Buckwheat	"	40
	"	Pigweed	"	*
	Atriplex hortensis	Orach	Leaves and stems	8
Amaranthaceae	Amaranthus retroflexus	Amaranth	Leaves and stems	8
Phytolaccaceae	Phytolacca decandra	Pokeweed	Seeds	*
	"	"	"	*
Portulacaceae	Portulacca sp.	Purslane	Shoots	8
			Leaves and stems	8
Cruciferae	Raphanus Raphanistrum	Wild radish	Seeds	*
	Sisymbrium nasturtium-aquaticum	Watercress	Leaves and stems	8

TABLE IX A (continued)

FAMILY	SCIENTIFIC NAME	COMMON NAME	PART ANALYZED	SOURCE
Rosaceae	Geum strictum	Avens	Seeds	*
	Rubus sp.	Red Raspberry	Fruit	8
	"	"	"	9
	Rubus allegheniensis	Blackberry	Fruit -	
	"	"	edible portion	8
	Rubus hispidus	Running blackberry	Fruit - fresh	8
Leguminosae	Cassia nictans	Partridge pea	Dry leaves	30
	Desmodium nudiflorum	Tick trefoil	Seeds	*
	Lespedeza virginica	Buck clover	"	*
	Apios tuberosa	Wild bean	"	*
	Amphicarpa monoica	Hog peanut	"	*
	Soja sp.	Soybean	"	*
	"	"	"	8
Balsaminaceae	Impatiens biflora	Jewelweed	Sprouts	8
Malvaceae	Hibiscus oculiroseus	White hibiscus	Green-shelled	8
	"	"	Seeds	51
	Oenothera biennis	Evening primrose	Roots	45
Onagraceae	Aralia cordata	Udo	Stems	45
Araliaceae	Sium cicutifolium	Wild parsnip	Seeds	*
Umbelliferae	Daucus carota	Wild carrot	Shoots	8
	Gaultheria procumbens	Wintergreen	Seeds	*
Ericaceae	Asclepias sp.	Milkweed	"	*
Asclepidaceae	Cuscuta aruensis	Dodder	Dried leaves	30
Concolculaceae	Monarda fistulosa	Wild bergamot	Seeds	*
Labiatae	Plantago major	Plantain	Seeds	*
Plantaginaceae	Mitchella repens	Partridge berry	"	*
Rubiaceae	"	"	Dry leaves	30
	"	"	and stems	*
Compositae	Iva frutescens	High tide bush	Seeds	45
	"	"	Roots	45
	Ambrosia artemisifolia	Ragweed	Stems	*
	Ambrosia trifida	Giant ragweed	Seeds	*
	Helianthus annuus	Sunflower	"	*
	"	"	"	*

TABLE IX A (continued)

FAMILY	SCIENTIFIC NAME	COMMON NAME	PART ANALYZED	SOURCE
Compositae	Bidens frondosa	Sticktight	Seeds	*
	Arctium minus	Burdock	"	*
	Cichorium intybus	Chicory	Leaves and stems	8
	Leontodon taraxacum	Dandelion	Leaves	8

TABLE IX B

ANALYSES OF SOME HERBACEOUS WILDLIFE FOOD PLANTS

COMMON NAME	PROTEIN	FAT	CRUDE FIBER	N-FREE EXTRACT	ASH	H ₂ O
Cattail	7.61	0.87	17.80	61.34	8.58	3.80
"	2.45	0.93	31.00	50.54	10.52	4.56
Arrow-head	19.60	1.25	5.15	62.64	7.02	4.34
"	17.90	7.98	12.17	45.64	4.22	12.09
Water plantain	12.01	5.26	25.01	40.47	2.19	15.06
Paspalum	9.68	2.06	22.98	52.88	2.12	10.28
Switch grass	6.56	0.75	25.35	57.24	5.55	4.55
"	1.92	0.45	39.68	51.85	1.75	4.35
Witch grass	15.23	4.57	14.06	52.80	4.38	8.96
Barnyard grass	12.11	3.35	26.18	42.67	6.79	8.90
Millet	11.5	3.3	10.0	62.9	2.9	9.4
Yellow foxtail	12.81	3.77	26.55	39.28	6.71	10.79
Bristly foxtail	14.55	5.08	13.33	49.95	6.29	10.80
Green foxtail	14.5	5.6	11.3	51.4	5.5	11.7
Wild rice	13.24	1.48	4.35	68.23	2.72	9.98
Wild oats	9.5	6.1	17.9	54.3	4.7	7.5
Oats	12.40	4.40	10.90	59.60	3.50	9.20
Salt reed grass	5.25-	0.35	26.55	54.48	9.80	3.57
"	3.06	0.42	42.28	43.62	6.80	3.82
Salt marsh grass	7.87	0.64	28.60	49.04	10.15	3.70
"	5.60	0.70	27.79	45.36	15.65	4.90
Marsh grass	3.59	2.08	30.45	56.63	2.55	4.70
Barley	12.8	2.3	5.5	66.9	2.9	9.6
Sorghum	9.1	3.6	2.6	69.8	2.1	12.8
Kaffir corn	11.1	3.2	2.1	72.6	1.6	9.4
Rye	11.80	1.80	1.80	73.20	2.00	9.40
Wheat	11.70	2.00	2.00	71.30	1.80	11.20
Corn	10.40	5.00	1.50	69.40	1.50	12.20
"	3.7	1.2	COH ----	20.5	.66	73.9
Waternut	1.5	0.1	COH ----	20.2	1.1	77.1
Olneys three square	6.47	0.85	71.55	59.47	7.65	4.01
	2.01	32.55	32.55	53.84	5.77	5.00

TABLE IX B (continued)

COMMON NAME	PROTEIN	FAT	CRUDE FIBER	N-FREE EXTRACT	ASH	H ₂ O
*****	8.14	3.08	25.66	41.88	6.54	14.70
Jack-in-the-pulpit	11.44	3.30	6.51	71.64	2.84	4.27
Skunk cabbage	23.25	37.72	4.89	27.39	3.08	3.67
Wild onion	17.56	10.46	5.73	44.50	1.89	19.86
Spikenard	7.55	1.87	5.07	64.74	2.13	18.64
Canada mayflower	6.18	4.48	8.07	63.16	2.87	15.24
Solomon's seal	9.47	5.13	5.87	59.47	2.91	17.15
Carrion flower	8.32	4.02	6.44	48.23	3.22	29.77
Blue flag	9.01	14.40	16.52	49.03	6.77-	4.17
Stinging nettle	5.5	.7	COH -----	9.1	2.3	82.4
Dock	12.94	3.84	19.32	46.84	2.78	14.28
"	11.52	1.92	20.99	47.32	2.66	15.59
"	2.1	.3	COH -----	3.4	.95	93.3
Smartweed	10.04	2.23	20.36	59.64	3.29	4.44
Climbing false buckwheat	9.44	2.36	8.05	73.42	1.64	5.09
Buckwheat	10.80	2.50	10.30	62.20	2.10	12.10
Pigweed	13.25	5.55	14.63	46.02	7.17	13.38
"	3.8	.7	COH -----	8.6	3.0	84.2
Orach	4.5	0.4	COH -----	4.7	2.4	88.0
Amaranth	15.82	5.86	12.14	47.91	4.11	14.16
Pokeweed	10.61	6.64	10.19	55.45	3.26	13.85
"	2.6	.4	COH -----	3.3	1.7	91.6
Purslane	1.6	0.4	COH -----	3.3	1.48	93.2
Wild radish	12.03	11.77	35.29	25.15	5.06	10.74
Watercress	1.7	0.3	COH -----	3.3	1.09	93.6
Avens	10.45	16.26	16.26	38.53	3.88	14.62
Red raspberry	1.0	---	2.9	12.6 COH	.6	85.5
"	1.1	.6	2.8	14.4 COH	.47	83.4
Blackberry	1.7	1.0	COH -----	.6-	.6	84.1
"	1.5	1.6	3.5	15.6 COH	.6	80.7
Running Blackberry	9.81	4.09	13.65	60.77	3.87	7.81
Partridge pea	33.21	3.35	6.80	44.73	4.88	7.03
Tick trefoil	22.91	3.59	22.68	35.48	4.35	10.99

TABLE IX B (continued)

COMMON NAME	PROTEIN	FAT	CRUDE FIBER	N-FREE EXTRACT	ASH	H ₂ O
Bush clover	26.65	3.54	19.34	36.92	3.41	10.14
Wild bean	24.83	10.19	5.30	30.81	7.00	21.97
Hog peanut	29.79	10.05	12.63	32.17	3.57	11.79
Soybean	8.5	1.8	COH -----	6.3	1.07	82.3
"	13.6	6.3	COH -----	13.2	2.2	80.9
Jewelweed	18.69	21.82	3.49	47.31	4.41	4.28
White Hibiscus	4.64	1.20	16.80	68.65	5.16	3.55
"	2.89	0.46	58.50	31.15	2.00	5.00
Evening primrose	18.61	22.32	19.05	22.73	6.72	10.57
Udo	1.0	0.2	COH	3.2	.64	95.0
Wild parsnip	19.91	12.40	15.29	32.14	5.29	14.97
Wild carrot	17.60	12.22	24.87	28.78	5.77	10.76
Wintergreen	6.04	6.12	16.45	60.13	4.37	6.89
Milkweed	31.54	21.03	12.87	21.84	3.21	9.51
Dodder	8.95	3.14	15.31	56.90	2.31	13.39
Wild bergamot	19.83	17.36	26.58	21.21	6.66	8.36
Plantain	17.03	7.62	13.58	45.94	4.60	4.23
Partridge berry	7.28	2.22	14.53	64.38	6.85	4.75
"	7.34	7.36	20.96	38.59	3.40	22.35
High tide bush	5.51	2.31	38.30	45.53	4.40	3.95
"	4.90	3.18	46.65	39.78	2.35	3.14
Ragweed	15.14	8.89	36.48	23.24	4.07	12.18
Giant ragweed	18.31	10.71	30.92	23.71	5.08	10.27
Sunflower	20.11	23.52	29.52	16.45	3.11	7.29
Sticktight	21.56	11.25	18.88	28.23	5.35	14.73
Burdock	9.46	10.21	16.97	21.52	3.19	38.65
Chichory	1.6	.3	COH -----	2.9	1.0	94.2
Dandelion	2.7	.7	COH -----	3.4	2.0	85.8

2. Protein - In the regular chemical analysis of feeds all the nitrogenous compounds are included together in the one group called crude protein, or merely protein. The percentage of nitrogen in the proteins of various substances differs to an appreciable extent, and therefore other factors are sometimes used to convert the percentages of protein. It is sufficient to say that the nitrogen content is found, and the result is multiplied by 6.25 to give the protein since about 16 per cent of proteins is nitrogen, on the average (100 divided by 16 equals 6.25). In comparing the composition of various feeds, especial attention should be given to the protein content, due to the great importance of this group of nutrients. For this reason, in the detailed discussions of many different feeding stuffs emphasis is placed on the amounts of protein they furnish. In determining whether a given feed is actually rich or poor in protein or other nutrients, attention must be paid to the water content. For example, fresh, green young rye plants, 5 inches high, contain 6.5 per cent protein. However at this stage they have over 80 per cent water. If dried to the hay stage basis, the rye would have more than 30 per cent protein, and is therefore actually rich in protein in comparison with the amounts of other nutrients.

3. Fat - All the substances soluble in ether are included under the term fat. This group therefore contains not only the true fats, but also the various other fat-like substances that have been discussed previously. The ether extract of seeds is nearly all true fat, while a large part of that in the roughages consists of other substances, such as waxes and chlorophyll, the per cent of fat in a feed is found by extracting a finely-ground sample with ether continuously for some hours in a suitable apparatus, and then evaporating the ether from the solution and weighing the fatty residue.

4. Fiber - The fiber content of a feed is of importance because feeds that are high in fiber are less digestible and therefore less nutritious than those that are lower in fiber. This group of substances includes those celluloses and other carbohydrates which are so resistant and insoluble that they are not dissolved by the weak acids and alkalies. The fiber content of a feeding stuff is determined by boiling a sample successively in weak acid and in weak alkali, and washing out the dissolved material. The residue, which contains the fiber is burned to an ash, and the ash, or mineral matter weighed. The difference in weight is the amount of fiber.

5. Mineral matter or ash - The per centage of mineral matter is determined by burning a sample of the feed until the ash is free from carbon. It will be seen that the percentage of mineral matter in feeds differs widely, though most feeds contain a relatively small amount.

6. Nitrogen-free extract - Includes the more soluble and therefore more valuable carbohydrates, such as starch, the sugars, the hemicelluloses, and the more soluble parts of the celluloses and pentosans. It also contains certain other substances, except in products like silage and certain fruits. The percentages of water, ash, protein, fiber, and fat are merely added together and the sum subtracted from 100 per cent to get the percent of nitrogen-free extract."

"Food in the widest acception of the term, means everything ingested that goes, directly or indirectly to growth, repair of the body, or production of energy a proper diet must be one on which an animal will attain maximum development, maintain a normal weight curve, show a minimum susceptibility to disease, live out a full term of life, breed normally, and rear healthy offspring, capable of normal independent life after they are weaned. It must fulfill the caloric needs of the body, and in young animals it must also supply the growth impulse. In its physical properties it must fit the morphological demands of each type of gastrointestinal tract. In its chemical element it must supply all the elements found in the body in usable form and in amounts sufficient to cover the needs of the body for growth, repair and waste." Fox, 1923.

"The use of the various food types are known in general terms. Proteins provide for tissue repair and growth. They cannot be stored in the body and the supply in an animal's body is normally not more than enough to last 24 hours. It cannot be transformed and is less digestible than carbohydrates.

Carbohydrates are the main source of energy and heat. They are convertible to fat and can be stored in this form. They are digested easily and help in the metabolism of the other food types.

Fats have a caloric value twice that of carbohydrates or protein, are the main source of stored energy and are convertible back to sugars.

The ash content of a food contains all the important minerals such as iron, calcium and phosphorus. While only minute quantities of these are found in foods, they are apparently enough to meet all demands." Hosley, 1934.

"Water performs the following important functions in plants and animals:

1. It carries the nutrients from one part of the living structure to another by holding them in solution or watery suspension. Plants can absorb mineral nutrients from the soil or they are dissolved in water.

2. Water enables plants and animals to hold their shape.

3. Water has the property of reacting with many types of chemical compounds and the intricate life processes could not take place without it.

4. Water is important in the control of temperature in plants and animals." Morrison, 1940.

Water is apt to be most important during the winter periods when normal supplies are frozen. Usually, however, water is available naturally and in the form of dew.

From this discussion it is apparent that a food is more valuable if it contains an even distribution in constituents or in other words, a balanced food. Using this definition as the criterion, it is possible to evaluate the species and families presented. The most surprising fact brought out by these analysis is the degree of uniformity of the species within a

family. Another point is that the seeds or fruits of a plant are a better food than the leaves, stem or roots, in that they are more concentrated.

The analysis of the seeds or fruits of a plant is used as the basis for the evaluation of food value of the several species as given in Table X. This table shows only the species considered by the writer to be classed as excellent or good in food value, the remainder arbitrarily classified as being fair. At this point it is again pointed out that the evaluations are based on the values as found by chemical analysis. These analysis are by no means the final criterion in determining food value of plants to any wildlife species or to all species. As an example, the values of crude protein as shown by the analysis do not give any indication of the amount of true protein in the samples nor does it show the amount actually available to wildlife species in usable form. Other important factors, such as the type and amount of amino acids present, are of equal importance in determining the value of a food species.

Nutritional studies to determine these and other points, have only recently been started and until final results are published the following evaluations are of a tentative nature.

The surprising fact brought out in Table X is that the 12 families represented do not include the supposedly valuable grass family. With the exception of the common ragweed, it is doubtful if any plant species are reported used more often than certain members of the grass family, yet, in food value at least, this family ranks well toward the bottom.

TABLE X

EVALUATION OF PLANTS ON BASIS OF FOOD VALUE

Excellent	Good
Skunk cabbage	Avens
Evening primrose	Beggar tick
Milkweed	Partridge pea
Jewelweed	Bush clover
Wild carrot	Amaranth
Wild parsnip	Arrowhead
Wild bergamot	Plantain
Hog peanut	Ragweed
Wild bean	
Sticktight	
Wild onion	
Giant ragweed	
Sunflower	

Hellmers, 1941, reported a variation in food value of some woody plant species through the winter months. To determine if this held true for the herbaceous plants, seed and fruits of eight species were collected in the fall of 1941 and again in the winter in late January and February, 1942. The results of these analysis are given in Table XI.

There appears to be no significant changes in the data and therefore it is assumed that the food value of herbaceous plant seeds and fruits remains the same through the winter.

Insects form a large percentage of the food of numerous birds and animals when they are available. Muencher, 1940, reports that 16 plants are known to harbor insects or their larvae through the winter months. Several additional plant species were found to harbor insects or arachnids in the winter of 1941-42. These data are given in Table XII.

TABLE XI
COMPARISON OF FOOD VALUE IN FALL AND WINTER
SEEDS AND FRUITS

Name	Season	Protein	Fat	Fiber	N-free extract	ash	H ₂ O
Smartweed	Fall	10.04	2.23	20.36	59.64	3.29	4.44
	Winter	6.75	3.02	14.13	59.28	1.68	15.14
Pokeweed	Fall	10.61	6.64	10.19	55.45	3.26	13.85
	Winter	15.71	9.88	13.71	49.90	2.87	8.13
Smilax	Fall	8.33	4.02	6.44	48.23	3.22	29.71
	Winter	10.02	6.40	10.38	45.94	3.00	24.26
Ragweed	Fall	15.14	8.89	36.48	23.24	4.07	12.18
	Winter	18.23	8.54	24.71	31.83	4.87	11.82
Pigweed	Fall	13.25	5.55	14.63	46.02	7.17	13.38
	Winter	12.54	6.46	18.07	42.69	3.68	16.56
Dock	Fall	12.94	3.84	19.32	46.84	2.78	14.28
	Winter	9.33	1.71	21.40	50.47	3.27	13.82
Avens	Fall	10.45	16.26	16.26	38.53	3.88	14.62
	Winter	15.12	15.54	18.43	34.08	3.39	13.44
Dodder	Fall	8.95	3.14	15.31	56.90	2.31	13.30
	Winter	12.00	2.81	19.14	52.98	2.00	11.07

TABLE XII

PLANTS KNOWN TO HARBOR ANIMAL FOOD DURING
THE WINTER

-
1. Mustards - Brassica sp.
 2. Wild cucumber - Echinocystis lobata
 3. Sedum - Sedum tryphyllum
 4. Chickweed - Stellaria sp.
 5. Plantain - Plantago sp.
 6. Wild morning glory - Ipoema sp.
 7. Wild carrot - Daucus carota
 8. Wild parsnip - Pastuiacea sativa
 9. Ragweed - Ambrosia artemisiifolia
 10. Amaranth - Amaranthus retroflexus
 11. Dock - Rumex crispus
 12. Ground cherry - Physalis sp.
 13. Pokeweed - Phytolacca decandra
 14. Burdock - Arctium minus
 15. Thistle - Cersium sp.
 16. Lambsquarter - Chenopodium album
 - *17. Hog peanut - Amphicarpa monoica
 - *18. Evening primrose - Oenothera biennis
 - *19. Wild bean - Apios tuberosa
-

*Found by the writer.

It is not known whether these plants are used as food because of the insects they may contain or whether the insects are taken unwittingly. However, these insects may possible add to the food value of the plants.

PART IV

AN EVALUATION OF HERBACEOUS PLANTS BASED ON THEIR VALUE TO WILDLIFE AND SUITABILITY FOR USE IN INTENSIVE MANAGEMENT WITH RECOMMENDATIONS FOR PROPAGATION

Before an evaluation of any type can be undertaken, the first step is to determine the factors which enter the picture by adding to or detracting from the subject to be evaluated. The factors which make a plant valuable to wildlife or to the wildlife manager are as follows: 1. the abundance of food supplied; 2. the availability of the food; 3. its nutritive qualities; 4. cover provided; 5. extent of use; that is, is it used by one or many species; 6. perennial or annual; the perennial habit of course being the more valuable as it may assure regularity of crops. The factors which might detract from the value of a wildlife plant are: 1. noxious qualities, such as a plant being a weed; 2. poisonous or mechanical devices which may injure or kill wildlife, livestock or humans; 3. disease or pest carrier.

Enlarging on these points is considered necessary as many factors are interrelated or are made up of several factors. The abundance of food supply is important for two reasons, first, how much food is supplied by each plant of the species and second, the number of plants available. This point is concerned with the total amount of actually available. To illustrate, a species producing a large amount of food per plant but being widely scattered or in specific ecological types is of less value than a plant with a comparatively small amount of food

per plant but with a wide distribution.

The availability of food is judged on the length of time it is actually available. For instance, to compare two plants of similar characteristics except availability, the cases of lesser ragweed and the foxtail grasses come immediately into the picture. These plants are found in similar sites but the seeds of the foxtails drop to the ground at the first killing frost whereas the ragweed holds seed all during the winter. The value of ragweed over foxtail is thus much greater, during snow periods.

The nutritive qualities are based on the data found in Part III of this paper.

The cover provided is of course of great importance. A plant which will provide both food and cover is of much greater value than a plant which provides only food or cover. The word cover, however, may mean a great many things and type of cover provided must be taken into consideration.

While a plant may be valuable when used only by a single animal species, it is more so if many or all the wildlife species find some use for it. Also included in extent of use is the use in different parts of the plants range. The ragweed, for instance, is important as food and cover to many birds species all over its range. The fact that a plant is reported used only once and in a particular section of the country does not mean it is not of value elsewhere and for different species. The reasoning used here however, is that if it were valuable in a particular section, its use would be reported.

The fact that a plant is a perennial makes it important because a permanent food supply is likely to be derived from it. Except under unusual conditions, such as farming, an annual plant will not be as valuable as a similar perennial plant.

As will be shown later, several herbaceous plants show promise as food patch planting materials. The plants having this advantage are accordingly given greater value.

The factors which might detract from the value of a wildlife food are not considered at all in the evaluation, as they are of interest only to the wildlife manager. It is doubtful if any of these factors would effect the wildlife species. Plants chosen for use in wildlife planting should not have any of these factors if there is the chance that they may damage wildlife, livestock or humans.

The values of plants as presented in Table XIII are based on the following method, ratings in each factor of excellent, good, fair and poor are assigned to each plant. These ratings are numbered 4-3-2- and 1 respectively. These ratings are added and from these totals the value of a plant is determined. This method has the disadvantage of giving equal weight to each plant factor but as it is difficult to determine the relation of one factor to another it is felt that this method is, at least, partially accurate.

The common or lesser ragweed is given first place with a total of 24 out of a possible 28 points. It is given the highest rating in each factor except in ability to be propagated and food value. The giant ragweed and hog peanut are tied for second

TABLE XIII

EVALUATION OF HERBACEOUS PLANTS BASED ON THEIR VALUE TO WILDLIFE

NAME	ABUNDANCE OF FOOD	AVAILABILITY	FOOD VALUE	COVER	EXTENT OF USE	PERENNIAL OR ANNUAL HABIT	PROPAGATION	TOTALS
Lesser ragweed	4	4	3	4	4	4	1	24
Giant ragweed	1	3	4	4	4	4	1	21
Foxtail	4	1	1	2	4	2	0	14
Amaranth	4	4	3	1	4	2	0	18
Pigweed	4	4	2	1	4	2	0	18
Barnyard grass	2	2	1	2	4	3	2	15
Skunk cabbage	2	3	4	1	2	4	3	19
Partridge berry	2	3	2	0	1	4	2	14
Hog Peanut	2	3	4	1	4	4	3	21
Partridge Pea	1	1	3	1	2	4	2	14
Witch grass	3	3	1	1	3	3	0	14
Pokeweed	2	2	2	1	2	2	3	14
Burdock	3	3	2	3	2	2	3	19
Blackberry	1	1	2	2	4	4	4	18
Black bindweed	1	3	2	2	3	3	0	15
Tick trefoil	2	3	2	2	3	3	4	19
Bush Clover	1	3	3	1	3	3	4	18

place with totals of 21 points. The burdock, tick trefoil and skunk cabbage are tied for third with 19 points. In connection with the evaluation of wild herbaceous plants it is interesting to note that corn, the chief food patch material rates on a par with the common ragweed.

The crop grains, including corn, buckwheat, sorghums, etc., are used in food patches because a maximum of food is produced with a minimum of effort and these plants are of great value to wildlife. These crop grain food patches have the disadvantages that in order to be economically feasible they must be planted in large numbers and also, these grains are usually placed in the better soils. In many cases this means that not only is valuable land taken out of production but the areas in which these food patches may be placed are limited and the limited areas may not be in the strategic spots chosen by the wildlife manager for best results. The following wild herbaceous plants are recommended because it is thought that they will remedy these conditions and be of value as supplements to prepared crop grain food patches and shrub and tree plantings. The plants recommended may be used in the poorer soils and in smaller more strategic areas than is feasible with the crop grains.

The use of wild herbaceous plants in prepared food patches except for duck areas, has had little attention in the past due 1. to the difficulty in obtaining seed or other propagating stock, 2. farmers and other landowners would object to the introduction of plants which might become obnoxious. With

some wild plants showing such high food and cover values for wildlife, with judicious use, they appear worthy of a trial. Davison, 1941, proposed a plan using legumes or other plants which are valuable to the farmer as well as wildlife along the borders of cultivated fields.

Plants which could be used include: pokeweed, smartweed, the ragweeds, barnyard grass, amaranth, pigweed, hog peanut, wild bean, paspalum grass, burdock, raspberry, blackberry, tick trefoil, bush clover, reed canary grass, partridge pea, partridge berry, sunflower, beggar ticks, wild rice, Canada mayflower, skunk cabbage, Solomon's seal and spikenard. McAtee, 1941, suggests several others, including woody plants, in addition to those recommended above.

Several of these species are at present being used in planting for ducks, McAtee, 1939, while the bush clovers are used in erosion control work.

The first consideration is that the areas chosen for planting, especially in farming country, be located so that the danger of the plants spreading and becoming obnoxious is slight. In shooting preserves however, this restriction would not apply.

In woodlots or woods borders, where they may be used by grouse, pheasants and quail, hog peanut, wild bean, Solomon's seal, raspberry, blackberry, partridge berry, spikenard, Canada mayflower and pokeweed may be planted. These plants are perennials and should maintain themselves. Control operations may be necessary to keep them from spreading.

In moist areas, such as the borders of ponds, streams or

swales, the giant ragweed, smartweed, barnyard grass, reed canary grass, sticktight, wild rice, and skunk cabbage are recommended. They would be valuable to ducks, pheasants and other forms in these locations. After stands of these plants are established it is doubtful if further treatment will be necessary.

For open dry areas, waste corners, or other non-tillable lands, with extreme care, the following may be used, common ragweed, pigweed, amaranth, paspalum grass, burdock, tick trefoil, bush clover, partridge pea and sunflower.

The burdock, ragweed, amaranth and pigweed are among Connecticut's major weeds and care must be taken in locating patches. They are, however, among the most valuable of food plants for pheasant and quail and in certain areas would greatly enhance the value of the area to wildlife. With the exception of the biannual burdock and the perennial pokeweed, the others are annuals and consequently are in danger of being forced out of the area in which they become established by other harder perennial plants. After the plants are started, it is recommended that the areas be turned over by plowing every two years.

Due to the difficulty in collecting and storing roots or tubers, it is recommended that all of the plants be started from seed. These are easily gathered and in some instances, such as the bush clovers, may be purchased.

The size of area to be planted, is of course, dependent largely on the wildlife manager and the areas available for such

planting. The method suggested is to scalp a section of ground with a mattock or shovel, shake the loam into the opening, and then plant the seed. The use of fertilizer, if available, would add materially to the chances of success of the seeding.

SUMMARY

1. The wild herbaceous plants reported used by several wildlife forms are tabulated together with the common and scientific names and authors reporting use.
2. The characteristics and values of 30 of the more important plants are given including annual or perennial habit, noxious qualities, fruit or seed characteristics, species using the plants and habitat.
3. A table of availability of the seed or fruit of several of the more important plants is presented.
4. A method of obtaining quantitative data on a typical ecological type with suggestions for use of such data resulted in showing the amount of weed seed produced per acre, the per cent of occurrence of weeds, and the effect of previous use of land, cultivation, and soil type on the production of the weed crop in cornfields.
5. A nutritional study of several herbaceous wildlife foods based on the chemical analysis method, shows that there is a range of variation in the nutritive values of these foods. A table showing the relative nutritive values is given based on these data.
6. An evaluation of wild herbaceous plants is attempted based on the value to wildlife or to the wildlife manager. Six characteristics which are considered to add to the value of a plant and three which might detract from the value are used as the basis for evaluation.
7. The plants which may be used in Connecticut to supplement crop grain food patches and shrub and tree plantings is presented together with suggested methods of propagation and areas for use.

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