

PLANTS USEFUL TO ATTRACT BIRDS AND PROTECT FRUIT.

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INTRODUCTION.

Birds play a very important part in the economy of nature, and by their destruction of insects lend material aid in keeping the balance true. Both the farmer and the orchardist are greatly indebted to birds for the destruction of insects and weed seed, and nowhere is the nature and extent of this indebtedness more fully appreciated than in the United States. In every part of our broad land also are lovers of birds whose pleasure is in large part measured by the number of feathered acquaintances each season brings. Both for practical and esthetic reasons, therefore, there is a demand for information as to the best method of increasing the bird population in restricted areas, particularly on the farms and about homes. There is a demand also for the provisioning of large preserves for both land and water game birds and the protection of crops by cultivating seed and fruit bearing plants more useful to birds than to man.

Various other factors may be made to contribute to the success of efforts to attract birds, such as a supply of water for drinking and bathing, nesting boxes, protection from enemies, and winter feeding; but the main purpose of this article is to call attention to the plants which best serve to provide food for birds and to draw their attention away from cultivated crops.

PLANTS USEFUL FOR ATTRACTING FRUIT-EATING BIRDS.

A large variety of shrubs and trees are cultivated for ornament in the United States, but in most cases it is evident that they have been planted with no thought for the needs of birds. Our native shrubs should be utilized as far as possible, especially as many of them are not exceeded in beauty or interest by foreign plants. Furthermore, as a rule they are more attractive to birds than exotics. It should be borne in mind also that smoothly trimmed hedges and the stiff trees of a formal garden are not nearly so attractive to birds as untrained bushes and tangled thickets. Shrubs of sterile varieties or those closely pruned after blooming are not sought by birds, while those allowed to ripen fruit are often crowded with feathered visitors. Moreover, plants clustered with fruit of varying color are

more beautiful and interesting than those which exhaust their energy in one burst of bloom and are of monotonous appearance thereafter.

The best shrubs and trees for attracting birds are those most resorted to for food, and the extensive records of bird food in the Biological Survey make their selection an easy task. The berries of elders (*Sambucus*) are eaten by the largest number of species of birds, namely, 67. Raspberries and blackberries (*Rubus*) are known to be eaten by 60 species, mulberries (*Morus*) by 48, dogwood fruits (*Cornus*) by 47, those of the nonpoisonous sumachs^a (*Rhus*) by 44, the various wild cherries (*Prunus*) by 39, and blueberries (*Vaccinium*) by 37. This completes the list of fruits known to be chosen by more than 30 species of birds. Following these in order are wild grapes (*Vitis*), eaten by 29 species; pokeberries (*Phytolacca*), by 26; Virginia creeper berries (*Pseodera*), bayberries (*Myrica*), and juniper berries (*Juniperus*), by 25 species each; service or June berries (*Amelanchier*), by 20; holly berries (*Ilex*), by 19; strawberries (*Fragaria*) and fruits of viburnums, by 16 each; hackberries (*Celtis*) and huckleberries (*Gaylussacia*), by 15 each; haws (*Crataegus*), by 12; spicebush berries (*Benzoin*) and rose hips (*Rosa*), by 11 each; and the fruits of sarsaparilla (*Aralia*), sour gum (*Nyssa*), gooseberries and currants (*Ribes*), and snow-berry (*Symphoricarpos*), each eaten by 10 species of birds.

In addition to the plants recommended on the basis of proved preference by birds, as indicated by stomach examination, there are several other genera known to furnish much bird food, or which are important in certain regions where none of the plants just mentioned are abundant. Separation of this list from the above by no means indicates inferiority for the purpose of attracting birds, but is done only to emphasize the different criteria for selecting them. These plants are: Manzanita (*Arctostaphylos*); barberry (*Berberis*); buffalo berry (*Shepherdia*); silverberry (*Elæagnus*); buckthorn (*Rhamnus*); mountain ash (*Pyrus*); china berry (*Melia*); the California Christmas berry (*Heteromeles arbutifolia*); the pepper tree (*Schinus molle*), the fruit of which is a splendid bird food in southern California; magnolia, the pulp-coated seeds of which furnish one of the most nutritious and eagerly sought foods of birds wintering in the Southeastern States; and nockaway (*Ehretia*), lote bush (*Zizyphus*), and bluewood (*Condalia*), three favorite genera of the Southwest, where most of the plants previously mentioned are wanting.

^a It must not be understood that birds avoid the poisonous sumachs—in fact they feed upon them more extensively than upon the innocuous ones. But these plants, which are poisonous to so many people, can not, for obvious reasons, be recommended for cultivation. Another favorite bird food which it is undesirable to propagate is mistletoe.

Species of the genera listed can be selected that furnish adequate bird shelter and also a continuous supply of fruit throughout the year in any part of the United States where cultivation of trees and shrubs is practicable. It is most important to have a sure supply of bird food for late winter and early spring. The quantity of natural food is then smallest, and frequently the few remaining sources are rendered inaccessible by snow and sleet. It is advisable, therefore, for bird lovers to make liberal use of plants which retain their fruit through the winter. They will be well repaid, for a dependable food supply is never a more potent bait than at this bleak season. Among the plants much patronized by birds, those which hold their fruit longest are juniper, bayberry, hackberry, barberry, magnolia, mountain ash, rose, Christmas berry, china berry, pepper tree, sumach, holly (*Ilex opaca*), black alder (*Ilex verticillata*), certain wild grapes (notably the frost grape, *Vitis cordifolia*), manzanita, snowberry, and some evergreen species in other genera, such as the evergreen blueberry (*Vaccinium ovatum*) of the Pacific coast region, farkleberry (*Vaccinium arboreum*), and evergreen cherry (*Prunus caroliniana*) of the Southeastern States. In some localities the Virginia creeper holds its fruit, in others dropping it readily.

The plants with persistent fruit bridge the gap between the overwhelming abundance of autumn and the scarcity of early spring. Before the last of the wintered-over fruit disappears, a few plants have blossomed and begin to mature the first fruits of another season. Among the earliest of all and greatly relished by birds, are mulberries. They ripen in April—even in late March in southern localities—and in May and June farther north. Red-berried elder and service berries are but little later; often the latter are not left on the trees by the hungry birds long enough to ripen. Wild strawberries, raspberries, and dewberries are early and may be used to protect cultivated species. Certain kinds of cherries, as the European bird cherry (*Prunus padus*) and the mahaleb or stock cherry (*Prunus mahaleb*), ripen their fruit at about the same time as domestic cherries and will serve to divert the attention of birds. From the time summer is well started there is a constant abundance of wild fruits. Blueberries, huckleberries, certain dogwoods, viburnums, and grapes are among the first to ripen and fall, while sarsaparilla, elder, gooseberries, currants, spicebush, and sassafras are somewhat more persistent. Other dogwoods, silverberry, sour gum, and black cherry hold their fruit a little later, and pokeberry, hawthorn, buffalo berry, some wild grapes, and viburnums retain their fruit well into the winter, though they seldom last as well as the characteristic winter fruits named above.

Evidently there need be no season without its fruit if judicious selection of shrubs and trees is made by those desiring to attract birds. Thus a thicket of raspberry or dewberry, elder, and dog-

wood, grouped about some taller sumac, Juneberry, and juniper, would supply fruit throughout the year. Moreover, in almost any part of the United States, this combination can be made by the use of native species alone.

The problem that confronts the prospective planter of trees and shrubs to attract birds is the selection of the species most suitable for his particular locality. By reference to the descriptions below it is possible in most cases to determine the life zone to which his locality belongs. Then, from the corresponding list of trees and shrubs (given below) the species best suited to that area may be learned. The lists are by no means complete; usually but a single species of a genus is mentioned, when perhaps half a dozen or more are available. It is attempted, however, in every case to name the most satisfactory species, having due regard to its value as bird food and to its wide distribution and hardiness in the area named.

The Canadian zone is the warmest or southernmost division of the Boreal region and the most northerly life zone of agricultural importance. It "comprises the southern part of the great transcontinental coniferous forest of Canada, the northern parts of Maine, New Hampshire, and Michigan, a strip along the Pacific coast reaching as far south at least as Cape Mendocino, in California, and the greater part of the high mountains of the United States and Mexico. In the East it covers the Green Mountains, Adirondacks, and Catskills, and the higher mountains of Pennsylvania, West Virginia, Virginia, western North Carolina, and eastern Tennessee. In the mountains of the West it covers the lower slopes in the north and the higher slopes in the south. In the Rocky Mountain region it appears to reach continuously from British Columbia to west central Wyoming; and in the Cascade Range, from British Columbia to southern Oregon, with a narrow interruption along the Columbia River."^a

Plants useful for attracting birds in that part of the Canadian zone east of the Rocky Mountains are:

Juniper (*Juniperus communis*), black currant (*Ribes lacustre*), mountain ash (*Pyrus americana*), Juneberry (*Amelanchier canadensis*), blackberry (*Rubus canadensis*), red raspberry (*Rubus strigosus*), choke cherry (*Prunus virginiana*), bird cherry (*Prunus pennsylvanica*), sumach (*Rhus glabra*), buffalo berry (*Shepherdia canadensis*), sarsaparilla (*Aralia nudicaulis*), bearberry (*Arctostaphylos uva-ursi*), dwarf bilberry (*Vaccinium cespitosum*), hobble bush (*Viburnum alnifolium*), red osier (*Cornus stolonifera*), and elders (*Sambucus canadensis* and *S. pubens*).

In the Rocky Mountain region and westward the following species are available:

Western juniper (*Juniperus occidentalis*), currant (*Ribes viscosissimum*), mountain ash (*Pyrus sitchensis*), service berry (*Amelanchier alnifolia*), evergreen blackberry (*Rubus vitifolius*), cherry (*Prunus emarginata*), buckthorn

^a Merriam, C. Hart. Life Zones and Crop Zones of the United States, Bull. 10, Biological Survey, p. 19, 1898.

(*Rhamnus alnifolia*), the same bearberry, bilberry, red osier, and buffalo berry as above, snowberry (*Symphoricarpos acutus*), and elder (*Sambucus melanocarpa*).

"The Transition zone * * * is the transcontinental belt in which Boreal and Austral elements overlap. From New England to the northern Rocky Mountains its course is fairly even and regular, but west of the Great Plains it is tortuous and irregular. The zone as a whole is characterized by comparatively few distinctive animals and plants, but rather by the occurrence together of southern species which here find their northern limit and northern species which here find their southern limit. It may be subdivided into three faunal areas, which, although grading into one another, are in the main strikingly different: (a) An eastern humid or *Alleghenian area*; (b) a *western arid area*; (c) a *Pacific coast humid area*. * * *

"The eastern humid or Alleghenian area comprises the greater part of New England, southeastern Ontario, New York, Pennsylvania, Michigan, Wisconsin, Minnesota, eastern North Dakota, northeastern South Dakota, and the Alleghenies from Pennsylvania to Georgia."^a

In the Alleghenian faunal area the following species of fruit-bearing shrubs may be used to attract birds:

Red cedar (*Juniperus virginiana*), mulberry (*Morus rubra*), pokeberry (*Phytolacca decandra*), barberry (*Berberis vulgaris*), sassafras (*Sassafras variifolium*), spice bush (*Benzoin astivale*), black currant (*Ribes floridum*), mountain ash (*Pyrus americana*), service berry (*Amelanchier canadensis*), blackberry (*Rubus villosus*), raspberries (*Rubus occidentalis* and *R. strigosus*), black cherry (*Prunus serotina*), choke cherry (*Prunus virginiana*), sumach (*Rhus glabra*), black alder (*Ilex verticillata*), buckthorn (*Rhamnus caroliniana*), Virginia creeper (*Pseodera quinquefolia*), sarsaparilla (*Aralia nudicaulis*), dogwood (*Cornus alternifolia*), bearberry (*Arctostaphylos uvaursi*), dangleberry (*Gaylussacia frondosa*), blueberries (*Vaccinium corymbosum* and *V. pennsylvanicum*), snowberry (*Symphoricarpos racemosus*), sheepberry (*Viburnum lentago*), and elders (*Sambucus canadensis* and *S. pubens*).

"The western or arid division of the Transition zone comprises the western part of the Dakotas, northern Montana east of the Rocky Mountains, southern Assiniboia, small areas in southern Manitoba and Alberta, the higher parts of the Great Basin and the plateau region generally (except the Boreal Mountains), the eastern base of the Cascade-Sierra system, and local areas still farther west, in Oregon and California, where it merges into the humid Pacific Coast division."^b

The sage hen, sharp-tailed grouse, and green-tailed towhee are characteristic birds; that is, their range is practically confined to the arid Transition area. Many other species occur, however, and those desiring to attract them will find the following shrubs and vines serviceable:

Juniper (*Juniperus scopulorum*), barberry (*Berberis repens*), currant (*Ribes cercum*), service berry (*Amelanchier florida*), red raspberry (*Rubus strigosus*), choke cherry (*Prunus demissa*), aromatic sumach (*Rhus trilobata*), grape

^a Merriam, C. Hart. Life Zones and Crop Zones of the United States, Bull. 10, Biological Survey, p. 20, 1898.

^b Ibid., p. 25.

(*Vitis californica*), silverberry (*Elæagnus argentea*), buffalo berry (*Shepherdia argentea*), red osler (*Cornus stolonifera*), snowberry (*Symphoricarpos racemosus*), and elder (*Sambucus glauca*).

"The humid Pacific Coast division of the Transition zone comprises the western parts of Washington and Oregon between the coast mountains and the Cascade Range, parts of northern California, and most of the coast region of California from near Cape Mendocino southward to the Santa Barbara Mountains. To the south and east it passes into the arid Transition, and in places into the Upper Sonoran."^a

The Pacific Coast Transition faunal area produces a wealth of fruit-bearing shrubs, among which the following are suitable for attracting birds:

Bayberry (*Myrica californica*), red flowering currant (*Ribes sanguineum*), service berry (*Amelanchier florida*), evergreen blackberry (*Pubus vitifolius*), blackcap (*Rubus leucodermis*), cherry (*Prunus emarginata villosa*), buckthorn (*Rhamnus californica* and *R. purshiana*), dogwood (*Cornus occidentalis* and *C. glabrata*), manzanita (*Arctostaphylos tomentosa*, *A. glandulosa*, and *A. canescens*), evergreen blueberry (*Vaccinium ovatum*), snowberry (*Symphoricarpos racemosus*), and elder (*Sambucus glauca*).

"The Upper Austral zone may be divided into two large and important faunal areas—an eastern humid or Carolinian area and a western arid or Upper Sonoran area, which pass insensibly into one another in the neighborhood of the one hundredth meridian. * * *

"The Carolinian faunal area * * * occupies the larger part of the Middle States, except the mountains, covering southeastern South Dakota, eastern Nebraska, Kansas, and part of Oklahoma; nearly the whole of Iowa, Missouri, Illinois, Indiana, Ohio, Maryland, and Delaware; more than half of West Virginia, Kentucky, Tennessee, and New Jersey; and large areas in Alabama, Georgia, the Carolinas, Virginia, Pennsylvania, New York, Michigan, and southern Ontario. On the Atlantic coast it reaches from near the mouth of Chesapeake Bay to southern Connecticut and sends narrow arms up the valleys of the Connecticut and Hudson rivers. A little farther west another slender arm is sent northward, following the east shore of Lake Michigan nearly or quite to Grand Traverse Bay. These arms, like nearly all narrow northward prolongations of southern zones, do not carry the complete faunas and floras of the areas to which they belong, but lack certain species from the start and become more and more dilute to the northward till it is hard to say where they really end. Their northern boundaries, therefore, must be drawn arbitrarily or must be based on the presence or absence of particular species rather than the usual association of species."^b

Native shrubs and trees useful for attracting birds in the Carolinian faunal area are:

Red cedar (*Juniperus virginiana*), bayberry (*Myrica cerifera* and *M. carolinensis*), hackberry (*Celtis occidentalis*), mulberry (*Morus rubra*), pokeberry (*Phytolacca decandra*), sassafras (*Sassafras variifolium*), spice bush (*Benzoin aestivale*), black currant (*Ribes floridum*), Juneberry (*Amelanchier canadensis*),

^a Merriam, C. Hart. Life Zones and Crop Zones of the United States, Bull. 10, Biological Survey, p. 27, 1898.

^b Ibid., pp. 30-31.

blackberry (*Rubus villosus*), raspberry (*Rubus occidentalis*), black cherry (*Prunus serotina*), sumach (*Rhus glabra* and *R. copallina*), black alder (*Ilex verticillata*), buckthorn (*Rhamnus caroliniana*), Virginia creeper (*Pseodera quinquefolia*), frost grape (*Vitis vulpina*), summer grape (*Vitis aestivalis*), fox grape (*Vitis labrusca*), sarsaparilla (*Aralia nudicaulis*), dogwood (*Cornus asperifolia*, *C. florida*, and *C. alternifolia*), sour gum (*Nyssa sylvatica*), dangleberry (*Gaylussacia frondosa*), blueberries (*Vaccinium corymbosum* and *V. vacillans*), snowberry (*Symphoricarpos racemosus*), viburnum (*Viburnum acerifolium* and *V. prunifolium*), and elder (*Sambucus canadensis*).

"The Upper Sonoran faunal area * * * of the Western States and Territories is the arid-land continuation of the Carolinian area of the more humid Eastern States. * * * Beginning in the neighborhood of the one hundredth meridian, it covers most of the great plains in eastern Montana and Wyoming, southwestern South Dakota, western Nebraska, Kansas, Oklahoma, and Texas, and eastern Colorado and New Mexico. In Oregon and Washington it covers the plains of the Columbia and the Malheur and Harney plains; in California it encircles the Sacramento and San Joaquin valleys and forms a narrow belt along the eastern boundary of the Colorado and Mohave deserts; in Utah it covers the Salt Lake and Sevier deserts; in Idaho, the Snake Plains; and in Nevada and Arizona, irregular areas of suitable elevation."^a

The following plants are recommended for use in this region:

Juniper (*Juniperus monosperma* and *J. californica*), hackberry (*Celtis reticulata*), mulberry (*Morus rubra*), barberry (*Berberis fendleri*), golden currant (*Ribes aureum*), service berry (*Amelanchier utahensis*), red raspberry (*Rubus strigosus*), choke cherry (*Prunus demissa*), aromatic sumach (*Rhus trilobata*), buckthorn (*Rhamnus tomentella* and *R. smithi*), Virginia creeper (*Pseodera quinquefolia*), red osier (*Cornus stolonifera*), manzanita (*Arctostaphylos manzanita* and *A. viscida*), snowberry (*Symphoricarpos racemosus*), and elder (*Sambucus glauca*).

"The Lower Austral zone occupies the southern part of the United States, from Chesapeake Bay to the great interior valley of California. It is interrupted by the Continental Divide in eastern Arizona and western New Mexico, and is divided, according to conditions of humidity, into an eastern or *Austroriparian* and a western or *Lower Sonoran* area.

* * * "The Lower Sonoran area begins with the arid region of Texas in the neighborhood of longitude 98°, and stretches westerly to the Rio Grande Valley, in which it sends an arm northwest to a point a little north of Albuquerque, N. Mex. Another arm reaches up the valley of the Pecos. West of the Rio Grande Valley in New Mexico the Lower Sonoran is interrupted by the Continental Divide. It begins again in eastern Arizona and sweeps broadly westward below the high plateau, covering southern and western Arizona, the deserts of southern Nevada and eastern California, and the San Joaquin and Sacramento valleys."^b

The Lower Sonoran faunal area has few native fruit-bearing shrubs and trees, but some of them are of more than ordinary value as bird food. The following, including several extralimital species

^a Merriam, C. Hart. Life Zones and Crop Zones of the United States, Bull. 10, Biological Survey, p. 36, 1898.

^b Ibid., p. 41.

tested by the New Mexico Agricultural Experiment Station (and distinguished by an asterisk), are recommended:

Hackberry (*Celtis reticulata** and *C. pallida*), barberry (*Berberis hamatocarpa** and *B. trifoliata*), golden currant (*Ribes aureum**), cherry (*Prunus copallina**), sumach (*Rhus mexicana* and *R. microphylla*), bluewood (*Condalia obovata*, *C. obtusifolia*, and *C. spatulata*), lote bush (*Zizyphus obtusifolius*), grape (*Vitis arizonica*), Virginia creeper (*Pseodera quinquefolia**), nockaway (*Thretria elliptica*), elders (*Sambucus mexicana** and *S. glauca*), *Lycium berlandieri* and *andersoni*, and some of the pad cactuses, notably *Opuntia engelmanni* and *lindeheimeri*.

"The Austroriparian area occupies the greater part of the South Atlantic and Gulf States. Beginning near the mouth of Chesapeake Bay it covers half or more than half of Virginia, North and South Carolina, Georgia, Florida, Alabama, the whole of Mississippi and Louisiana, eastern Texas, nearly all of Indian Territory, more than half of Arkansas, and parts of Oklahoma, southeastern Kansas, southern Missouri, southern Illinois, the extreme southwestern corner of Indiana, and the bottom lands of western Kentucky and Tennessee."^a

"The Gulf strip, or southern part of the Austroriparian area, reaches from Texas to southern Florida; covers a narrow strip in southern Georgia, and probably follows the coastal lowlands northward into South Carolina."^b

For the purposes of this article the whole Austroriparian faunal area, including the Gulf strip, may be considered together as the humid division of the Lower Austral, all of which lies east of the one hundredth meridian. In this region many cultivated plants thrive that do so nowhere else in the eastern United States, and some of them are valuable for attracting birds. But there are plenty of native fruit-bearing shrubs and trees also, of which the following are recommended:

Red cedar (*Juniperus virginiana*), bayberry (*Myrica cerifera*), hackberry (*Celtis occidentalis* and *C. mississippiensis*), mulberry (*Morus rubra*), magnolia (*Magnolia grandiflora* and *M. virginiana*), sassafras (*Sassafras variifolium*), spicebush (*Benzoin aestivale*), dewberry (*Rubus trivialis*), black cherry (*Prunus serotina*), evergreen cherry (*Prunus caroliniana*), sumach (*Rhus copallina* and *R. glabra*), holly (*Ilex opaca*), buckthorn (*Rhamnus caroliniana*), Virginia creeper (*Pseodera quinquefolia*), grape (*Vitis vulpina* and *V. aestivalis*), pepper vine (*Ampelopsis arborea*), hercules club (*Aralia spinosa*), dogwood (*Cornus asperifolia* and *C. florida*), sour gum (*Nyssa sylvatica*), huckleberry (*Gaylussacia dumosa*), farkleberry (*Vaccinium arboreum*), blueberry (*Vaccinium corymbosum*), viburnum (*Viburnum rufotomentosum* and *V. nudum*), and elder (*Sambucus canadensis*).

Besides native shrubs and trees, a number of cultivated species have proved so attractive to birds that they are as important as any of the indigenous fruits. An excellent example is the pepper tree (*Schinus molle*), which flourishes in southern California, and which will probably thrive in many other parts of the Lower Sonoran faunal area. Others suited to the same climate are the china berry

^a Merriam, C. Hart. Life Zones and Crop Zones of the United States, Bull. 10, Biological Survey, p. 45, 1898.

^b Ibid., p. 49.

(*Melia azedarach*), the Russian mulberry (*Morus alba tatarica*), and the Russian oleaster (*Elæagnus angustifolia*). The china berry is just as successful in the eastern part of this zone, namely, in the Austroriparian faunal area; it retains its fruit through the winter and is eagerly sought by robins, cedar birds, and catbirds. The Russian oleaster and another species (*Elæagnus umbellata*) also do well here and furnish an abundance of fruit relished by birds. *Elæagnus angustifolia* and *Melia* are hardy at Washington, D. C., also, which is in the Upper Austral zone. The fire thorn (*Cotoneaster pyracantha*), a beautiful shrub with scarlet berries much liked by birds, will grow almost anywhere in the eastern United States, and the Parkman apple (*Pyrus halliana*), one of the handsomest flowering apples, is quite hardy, and is a valuable bird food, with fruit persistent in winter. But foremost in attractiveness to birds among cultivated fruit-bearing plants are mulberries. These will grow almost anywhere in the United States, and their combined early ripening and long fruiting season make them especially valuable. Varieties of mulberries suited to the various faunal areas will be treated at greater length in the section devoted to plants useful for protecting cultivated crops.

FOOD PLANTS FOR SPARROWS.

A hundred species of sparrows inhabit the United States, and in the number of individuals they outrank any other family. Many of them are characteristic winter birds, and as they are great destroyers of weed seeds and are sprightly and cheery withal, it pays to take considerable trouble to attract them.

As just remarked, they love weed seeds and do great good by destroying them; but as it is not desirable to cultivate weeds, the next best thing is to plant harmless species of their favorite genera. Fortunately many common ornamental garden plants which are entirely dependent on cultivation fulfill all requirements and produce in abundance seeds which are highly relished by sparrows. To these may be added a few native species which are not bad weeds, and the various millets, which are excelled by no other plants in attractiveness to seed-eating birds. The following are recommended for sparrows and other birds liking small seeds:

Love-lies-bleeding (*Amaranthus candatus*), princes feather (both *Amaranthus hypochondriacus* and *Polygonum orientale*), yellow chamomile (*Anthemis tinctoria*), chamomile (*Anthemis nobilis*), *Calandrinia umbellata*, bachelors button (*Centaurea cyanus*), African millet (*Eleusine coracana*), California poppy (*Eschscholzia californica*), tarweed (*Madia elegans*), miners lettuce (*Montia perfoliata*), millet (*Panicum miliaceum*), Japan barnyard millet (*Panicum crusgalli* var.), German millet or Hungarian grass (*Setaria italica*), and sunflower. Several of the species of sunflower will serve, the common sunflower (*Helianthus annuus*) being one of the best, having named varieties especially prized for the abundance and large size of the seed. No seeds are more relished by graminivorous birds than the millets; in fact, they are so much preferred that they have been used with good effect for drawing the attention of birds from more valuable grain crops.

FOOD PLANTS FOR UPLAND GAME BIRDS.

The distinction between the dietaries of the so-called frugivorous and graminivorous birds is not so marked as would be inferred from a strict interpretation of these terms. Particularly in the case of the grouse and quail does a limited characterization of the food habits fail to express the truth. Consequently in recommending plants attractive to these birds many must be mentioned that are included in the lists for fruit-eating birds. Grouse are fond of both buds and leaves; hence some plants which have neither nutritious fruit nor seeds are for them important food plants.

While the establishment of preserves for land game birds is yet a new movement in this country, it is certain to become of great importance. Hence it is desirable to disseminate information as to the food and covert plants that are favored by the grouse and quail. Bobwhites frequently use covers of rose, alder, and blackberry bushes, and thickly set barberry, bayberry, and dense banks of honeysuckle are suitable. These plants also furnish food for the birds, but they should be supplemented by others more exclusively adapted for this purpose. Sumach, Japanese clover, buckwheat, sorghum, millet, vetches, cowpeas, and any plants of the pea family producing small seeds are valuable, and should be sown in large quantities. The seeds of milk pea (*Galactia*), partridge pea (*Chamaecrista*), hog peanut (*Falcata*), wild bean (*Strophostyles*), and smartweeds (*Polygonum*) are important natural foods of the eastern quail, but should be encouraged only where they can not become weed pests. The western quail are fond of the seeds of sumach, bur clover, alfalaria, lupines, napa thistle, and turkey mullein plants; but where these plants are liable to become nuisances the food plants recommended for the eastern quail will serve.

Coverts for grouse, as the sharptail, should abound in such plants as rose, sumach, blueberry, bearberry, buffalo berry, dwarf birch, and alder. The ruffed grouse thrives among scrub oak, bayberry, rose, sumach, dwarf birch, alder, poplar, willow, and such fruit-bearing plants as partridge berry, hawthorn, viburnum, wild grapes, mountain ash, blueberry, blackberry, and cranberry. Cover of this nature is suited to the heath hen also, and to the imported pheasants and the Hungarian partridge, but in all cases it is well to supplement the food supply furnished by these shrubs and trees by planting small grains and legumes as recommended for quail.

PLANTS USEFUL FOR PROTECTING CULTIVATED FRUITS.

The practice of planting wild or inferior fruits for the purpose of tolling birds away from valuable cultivated varieties is very old, but it has never been tried as widely and systematically as seems desirable.

The chief essential to the success of this plan is that the decoy trees shall be early bearing species, for almost all of the damage to fruit by birds is inflicted on the earliest varieties, evidently because of the scarcity of early wild fruit. Probably cherries, raspberries, and strawberries suffer more in the aggregate than all of the later fruits. Fortunately we have a fruit which fills this need, one which ripens with the earliest cherries and is a favorite with all frugivorous birds, namely, the mulberry, both native and cultivated.

Three varieties of the native mulberry (*Morus rubra*), namely, the Hicks, Stubbs, and Townsend, are especially successful in the Southern States, though the Hicks is known to thrive in the Carolinian faunal areas and Stubbs in the Alleghenian. The Townsend is a comparatively new variety and its hardiness is unknown, but it ripens fruit remarkably early and should be given a thorough trial. According to Prof. L. H. Bailey, the New American (often sold under the name Downing) is the best mulberry known for the Northern States. The Russian mulberry is the hardiest variety and is a favorite in the plains region and other places where great extremes of temperature prevail. It succeeds in as diverse climates as those of North Dakota and New Mexico. The New American, Russian, and Black Persian mulberries are known to do well in California, and the indications are that the latter is suited to conditions in the Lower Sonoran faunal area. When planting mulberries for the purpose of protecting cultivated fruits, the earliest fruiting varieties obtainable should be used.

Among fruits suitable for the same purpose, but not now known to be as valuable as mulberries, are the mahaleb or stock cherry (*Prunus mahaleb*) and the European bird cherry (*Prunus padus*). Among native fruits the only ones that can be recommended at present are the service berry or Juneberry (*Amelanchier*), redberry elder (*Sambucus pubens*), and wild strawberries and raspberries. Patches of the earliest varieties of these small berries are very attractive to birds.

Injury to later fruits, except in localities where there are no wild fruits, is more difficult to prevent, as in such cases it probably arises from preference by the birds for a particular cultivated fruit. Thus grapes suffer seriously in some places. The always reliable mulberries are useful even at this season, as some varieties continue in bearing from two to six months. Elderberries are probably the most valuable native fruit for attracting birds in the summer and fall, particularly in the West, where they have a long fruiting season. In the North and East no summer fruits are more attractive to birds than the black cherry (*Prunus serotina*) and choke cherry (*Prunus virginiana*),

CONCLUSION.

Nothing surpasses mulberries for alluring birds away from the early orchard fruits. Early bearing varieties should be planted in numbers and some should be selected for the length of the fruiting season. The Hicks and the Black Persian are notable in the latter respect, while the Townsend is earliest for the South and the Russian for the North.

Where it is desired to attract birds and afford them a sanctuary at all seasons, a large variety of plants must be used. For this purpose thickets of shrubs and other low growths are better than trees, since tangles of bushes and vines afford a more secure retreat from bird enemies and are the favorite cover of many species.

Where birds occur in large numbers their enemies are sure to congregate. Hence grounds especially designed to attract birds should also be furnished with devices to insure security from cats and other predatory animals. Fences made proof against climbing invaders by overhanging wire netting are essential, and inverted funnel-shaped metal guards or loose spirals of barbed wire should be placed around the trunks of nest trees to protect the occupants. Bird houses of various types add to the possibilities of bird gardens, and a never-failing supply of water is an essential. The basin should be shallow, so as to serve both for bathing and drinking, and should be placed in an open lawn or elevated so that birds resorting to it will not be at the mercy of enemies. Assured safety and a plentiful supply of food and drink will work wonders in attracting birds.