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SEED DISPERSAL BY BIRDS AND ANIMALS
IN THE ARNOLD ARBORETUM

IN nature's scheme of things, many remarkable methods have been evolved for dispersal of seeds. Study of these methods is fascinating indeed, and sometimes essential to those involved in collecting seeds for propagation. To understand these methods allows one to collect seeds after they are properly developed for propagational purposes, but before they are lost through natural agencies of dispersal. For the past seven years, notes have been made concerning birds and animals that gather fruits and seeds in the Arnold Arboretum. This has not been a concentrated study, but more a matter of jotting down notes in passing, and it deals only with woody plants.

Although the seeds of some woody plants are dispersed in late spring and throughout the summer, most do not ripen until autumn, rightly considered the time of fulfillment in nature—a season of natural abundance. As ripening occurs, changes come about in the appearance and character of fruits and many plants become dispensers of food. Fleshy fruits containing seeds dependent for dispersal upon animals and birds change to a wide variety of colors attractive to those responsible for their distribution. The pulp furnishes food to the bird or animal, which in turn carries the seeds about in its digestive system until they are ejected in its droppings—and thus are scattered about the countryside. Migratory birds may carry seeds far away from their point of origin.

In late summer, when the nesting season has passed and birds have reared their young, some species congregate in multitudes. These flocks roam the countryside, feeding on fruits and seeds as they ripen. In the Arboretum, trees and shrubs that are heavily laden with fruit can be virtually stripped clean after one visit from such flocks. Removal is often so thorough that large trees bearing countless thousands of fruits one day can be divested by the next—to an extent where it becomes a task to locate one or two fruits.

Fleshy fruits of cherries (*Prunus* species), spicebush (*Lindera benzoin*), vibur-

nums, and the like must often be collected just prior to their final color changes. At this point the seeds will have developed enough to be viable but the fruits will not have reached the stage where they would appeal to their carriers.

Since autumn is a season of plenty, birds can exercise preferences. Some favorites are Asiatic sweetleaf (*Symplocos paniculata*), sassafras (*Sassafras albidum*), dogwoods (*Cornus* species), blueberries (*Vaccinium* species), and magnolias. These plants must be watched closely to collect the fruits before they are taken.

Woody Plants Whose Fruits Have Been Observed Being Taken By Birds and Animals in the Arnold Arboretum

Acer

Red maple (*Acer rubrum*) is ready for natural dispersal about the first week in June. Squirrels and chipmunks have been observed cutting down branch tips bearing fruits and then going to the ground to eat them. Sugar maple (*Acer saccharum*) normally disperses its fruits about mid-September, but in the Arboretum the fruits are taken by squirrels and chipmunks before they can be detached and dispersed by the wind. In one large heavily-laden tree near the Dana Greenhouses, six chipmunks and two squirrels were once seen taking fruits at the same time. In a matter of days, they had removed all of them.

Aesculus

Most horsechestnut and buckeye fruits are ripe about the last week in September at the Arnold Arboretum, and are taken and buried by squirrels—the normal method of dispersal for this group. The squirrels sometimes carry horsechestnuts great distances to soil suitable for easy burying. It is not uncommon to find numbers of horsechestnut seedlings coming up in the Dana Greenhouse nursery, although the closest trees are several hundred yards away.

Amelanchier

Shadblow serviceberry (*Amelanchier canadensis*) ripens toward the end of June and catbirds, robins, one cardinal and chipmunks have been seen taking its fruits.

Betula

Juncos were noted eating birch seeds from the snow along Meadow Road in December, 1963.

Caragana

Caragana seeds ripen in mid-July and dispersal is by propulsion. As the pod dries, tensions are built up in the pod walls. When these tensions become great enough, the pod ruptures and the two halves spring into spirals, hurling the seeds in all directions away from the plant. On hot sunny days, a sharp snapping sound can be heard—this announces that the seed must be harvested promptly before it is lost. At this time, pigeons and robins search the ground for seeds that have been shed.



PLATE XXI

The bright blue fruits of Asiatic sweetleaf (*Symplocos paniculata*) are quickly taken by birds in the Arnold Arboretum.

Chaenomeles

In the Arnold Arboretum, rats have been seen biting through flowering quince fruits to get the large number of seeds they contain.

Chamaecyparis

In mid-January, 1965, chickadees and siskins were seen feeding from false-cypress cones while one over-wintering towhee was on the ground, apparently feeding on seeds that had fallen.

Chionanthus

Chinese fringetree (*Chionanthus retusus*) is ready for collection about the first of October, and robins, starlings and pigeons have been recorded as eating the fruits.

Cornus

Many species of dogwood are favorites of birds. Fruits of a number of species ripen erratically and birds make daily visitations to collect those that are prime. Giant dogwood (*Cornus controversa*) has been noted as bearing ripe fruits from August 8 through September 7, while Korean dogwood (*Cornus coreana*) ripens erratically from August through October. Robins, starlings, catbirds, and grackles have been observed taking these fruits. Flowering dogwood (*Cornus florida*) is a great favorite—it ripens about mid-September and disappears quickly. In 1964, a prolific year for this species, all the fruits had been taken by October 1. Robins, grackles, starlings, and catbirds, together with chipmunks, have been listed as taking flowering dogwood fruits. Japanese dogwood (*Cornus kousa*) is of interest for it appears to be ignored by the birds. Chipmunks, however, remove the seeds from the large strawberry-like fruits and leave the plants with their cheek pouches bulging. This defeats natural dispersal, for chipmunks store the seeds in their larders where there is no possible chance for reproduction. Japanese dogwood in its native habitat must have some other carrier, possibly a large animal such as a deer, that takes these fruits and distributes the seeds as nature intended.

Cotoneaster

Some years ago, during the height of the parakeet craze, many escaped from captivity and some came to the Arnold Arboretum. The cotoneasters attracted these birds in autumn, and sometimes several would be seen at a time, slitting open the fruits and crushing the hard seeds with their powerful beaks. Parakeets are gregarious birds and it is interesting that they were frequently seen flying with starlings. One for some odd reason became lead bird for a starling flock. He perhaps was more properly attired for this position than were his hosts. Chipmunks also work the cotoneasters and this year took all the fruits from four plants in front of the Dana Greenhouses, starting in early July when the fruits were green and undeveloped and a cut test showed the seed contents to be small and milky.



PLATE XXII

Two genera that supply large quantities of bird food are *Malus* and *Sorbus*. (Top) *Malus sargentii*, the Sargent crabapple. (Bottom) *Sorbus aucuparia*, the European mountain-ash.

Ehretia

Heliotrope ehretia (*Ehretia thyrsoflora*) fruits ripen erratically through the month of September and birds visit regularly to take those that are ready. Chickadees, house sparrows, and one unidentified sparrow have taken its fruits.

Elaeagnus

Cherry elaeagnus (*Elaeagnus multiflora*) is recorded as ripening erratically through the month of July, with starlings taking its fruits. Autumn elaeagnus (*Elaeagnus umbellata*) ripens from September 1 through early October. It is taken by starlings, robins, and catbirds.

Evodia

The shiny black seeds of evodia are ready for collection in late September, and starlings come to feed when the capsules open.

Fraxinus

The fruits of American ash (*Fraxinus americana*) remain fixed to the trees through the winter. Red-winged blackbirds have been recorded as taking the fruits in late October, and chickadees have been seen feeding on them during the winter.

Gleditsia

During the winter, crows perch in honeylocust trees (*Gleditsia triacanthos*) and pull off the pods. Then holding them between their feet, they tear them apart and eat the seeds. The usual method of dispersal is by wind. The pods, which are firmly affixed to the tree, are torn off by high winds during winter and carried some distance away. Sometimes they can be seen being propelled by wind over frozen snow and can be found lodged against obstacles some distance from the parent plant.

Kalopanax

Castor aralia (*Kalopanax pictus*) produces heavy crops of fruits in alternate years in the Arnold Arboretum. Its fruits do not ripen at once and birds make daily visits to collect those that are prime. Starlings, robins, and pigeons come to feed when the fruits are ready. This tree is a favorite with pigeons and they seek out the six trees located in different parts of the Arboretum. In season, they can be found on these trees every day.

Ligustrum

Only pigeons and starlings have been observed collecting privet fruits, which are ripe about mid-October.

Lonicera

Most honeysuckles have wide latitude in ripening time. Some berries will be prime while others are still green. Fruits are taken by robins, starlings and pigeons. Pigeons sometimes descend on these plants in such numbers that the branches are bent to the ground by their weight.



PLATE XXIII

The ripening of yew fruits in October brings on a host of birds, including starlings, cedar waxwings, robins and bluejays. The Japanese yew (*Taxus cuspidata*) is shown.

Lonicera quinquelocularis translucens produces whitish translucent fruits which remain on the plant into winter. Its berries are not taken by birds, no doubt because they lack attractive color.

Magnolia

Magnolia seeds, another favorite of the birds, ripen and are ready for collection about mid-September. Dispersal of these seeds is most interesting. They are contained in chambers within colorful cones. At ripening, the chambers open and the seeds emerge and dangle on slender cords called suspensors. In this way they are available to birds while still on the tree, and have been seen being taken by robins and starlings. Those that fall from the trees are eaten by rodents, and dispersal is thereby defeated. Squirrels have also been seen taking these seeds.

Malus

The crabapple collection in the Arnold Arboretum unquestionably provides more food for birds, over a longer period of time, than any other genus. This extensive collection includes 96 species and 191 cultivars. Fruits of some crabapples are soft and ready to be taken by birds in mid-September, e.g. tea crabapples (*Malus hupehensis*), midget crabapple (*M. micromalus*) and Sargent crabapple (*M. sargentii*). Others go on into winter in a firm condition and are not soft enough until they have been frozen. Still others for some reason pass through the winter and spring without being taken, and remain on the trees as mummified fruits after the new leaves have unfurled. Those that are ready in autumn have been taken by cedar waxwings, cowbirds, robins, flickers, bluejays, and starlings. Starling flocks sometimes have comprised hundreds of birds. The chipmunks that have inhabited the Arboretum in ever-increasing numbers during the past few years also work the autumn crabapples.

During the cold winter months, when snow covers the ground and there is a dearth of food for birds, the crabapple collection really comes to the fore. Flocks of robins, sometimes comprising 40 or 50 birds, are not an uncommon sight in the crabapple collection during winter. Some authorities have suggested that these robins nest further north and have migrated only this far south for the winter. Large flocks of cedar waxwings also take advantage of the winter crabapples. Other birds noted in winter are starlings and purple finches, and in years when evening and pine grosbeaks invade the region they can be found in the Arboretum's crabapple collection.

Many winter birds peck through the pulp of crabapples and eat the seeds. In the process, the pulp falls to the ground and is eaten by pigeons, pheasants and rabbits.

Morus

Birds are very fond of mulberries, which ripen about mid-June. Our records show that thrashers, catbirds, robins, and rosebreasted grosbeaks have eaten mulberries.



PLATE XXIV

Viburnum fruits ripen erratically and birds make daily visits to those that are prime. (Top) Fruits of Siebold viburnum (*V. sieboldii*) turn from red to black as they ripen in late August, and are taken quickly when this color change occurs. (Bottom) Withe-rod (*V. cassinoides*) fruits pass through several colors during ripening: green, yellowish, reddish, and blue-black. They are taken at the last color stage.

Nyssa

Black tupelo (*Nyssa sylvatica*) is the only tupelo hardy in the Arnold Arboretum. Plants of this species are usually dioecious, and fruiting trees bear heavy crops each year. These blue-black fruits are a favorite of the birds, and when they are prime the fact is announced by the chattering of robins, starlings, catbirds, bluejays and waxwings, as they completely strip large trees in a few days. Squirrels and chipmunks also take black tupelo fruits.

Parthenocissus

Boston ivy (*Parthenocissus tricuspidata*) fruits well each year and its berries are ripe about mid-October. Starlings and robins have been noted eating its fruits.

Phellodendron

Starlings and robins have been seen taking the fruits of cork trees. In the last few years, the fruits of all but the Chinese cork tree (*Phellodendron chinense*) have been gone long before winter. This species, however, retains its firm fruits into mid-winter. During this time starlings and crows perch on its branches to feed.

In 1964 a pair of mourning doves was seen feeding beneath a Chinese corktree in the Arboretum from early March on into mid-May. During the early part of this period snow would sometimes fall and cover the ground. However, each time the snow melted the pair would return.

Some years ago a large volunteer corktree appeared in a patch of natural woods at the Arboretum. It fruited well, and during the winter furnished a continuous food supply to a solitary mockingbird. In late February, an exceptionally large flock of roving cedar waxwings found the tree and spent several days devouring its fruits. The unfortunate mockingbird, its source of food eliminated, disappeared.

Prunus

The cherries are favored by many kinds of birds, but our records only show those seen working Sargent cherry (*Prunus sargentii*). Catbirds, starlings, robins, cedar waxwings, and pigeons descend in numbers when its fruits are ripe. Chipmunks have also been seen leaving these trees with cheek pouches filled.

Pyracantha

Firethorn fruits ripen in early September and its fruits have been taken by robins, starlings and chipmunks.

Chipmunks, in removing fruits from the espaliered plants on the Dana Greenhouse cold storage building, do so in a systematic manner. They start at the bottom of a branch and progress upward leaving the sections where they have worked completely barren.

Quercus

Bluejays are the only birds seen taking acorns. Squirrels and chipmunks,

however, are busy in the oak collection during September and October and frequently collect acorns before they have developed enough for propagation purposes.

Rhamnus

Robins, starlings, and pigeons have been seen taking buckthorn fruits in the Arnold Arboretum.

Rhus

Our only observation concerning *Rhus* is that of a flicker eating berries of poison ivy (*R. radicans*).

Sambucus

We have no record of which birds take our elderberries, but we do know that they disappear immediately when ripe. Along route US 1 in Westwood, Massachusetts, hundreds of starlings were seen for several days eating fruits from an extensive mass of American elderberry plants (*S. canadensis*).

Sassafras

Sassafras (*Sassafras albidum*) is another favorite of birds, and it is difficult to collect ripe seeds before they are taken. The fruits are borne on bright red stalks resembling golf tees. We lack records of which particular birds take them, but a check of this species at the Arboretum and in natural woods has shown that the fruits have all disappeared by mid-September, leaving only the colorful red stalks.

Sophora

Japanese pagoda tree (*Sophora japonica*) flowers late, its fruits develop late, and its pods remain on the trees into winter, when squirrels and starlings have been seen eating the seeds.

Sorbus

Large flocks of starlings and robins descend on the mountain ash trees in early autumn and the ripe fruits quickly disappear.

Symplocos

Asiatic sweetleaf (*Symplocos paniculata*) with its beautiful display of intense blue fruits is another favorite of birds, including starlings, robins, and catbirds. Its fruits ripen about mid-September and can disappear in a day in the Arboretum, so when seeds are needed for propagation the seeds must be gathered before they are fully ripe

Taxus

In mid-October when yew (*Taxus* species) fruits are ripe, a host of birds appear. Our records show that starlings, cedar waxwings, robins, and bluejays, as well as squirrels, come to feed.

Tsuga

About mid-October when the cones of Canada hemlock (*T. canadensis*) open to release their seeds, many birds come to feed. Those noted in the Arboretum are juncos, goldfinches, white throated sparrows, bluejays, chickadees and siskins.

Vaccinium

Many species of birds and animals are fond of blueberries. During a recent visit to the home of Prof. Elwin M. Meader, formerly of the University of New Hampshire, I remarked on the variety of birds invading his commercial blueberry planting. His comment was: "The only things that don't eat blueberries are fish, and the only reason they don't is that they can't get at them." In the Arnold Arboretum, robins, flickers, starlings, bluejays, chickadees, towhees, cedar waxwings and thrashers have eaten blueberries.

Viburnum

Many *Viburnum* species produce fruits that ripen erratically over a span of time and birds make daily visitations to take those that are ready. Seeds of these species must be collected before they are fully ripe. Catbirds, robins, starlings, thrashers, chipmunks, and squirrels have been noted taking fruits of *Viburnum* species.

Fruits of Sargent cranberrybush (*Viburnum sargentii*) have a disagreeable odor and perhaps are distasteful, for they are usually ignored by birds. Pheasants, however, have been seen feeding on them in mid-winter, perhaps in desperation.

The Arnold Arboretum as a Sanctuary

The Arnold Arboretum provides a sanctuary for birds and other small wildlife—it is a garden of fruit-producing woody plants surrounded by a highly urbanized area. Birds that come in autumn find few enemies and stay to feed on the continuing progression of ripening fruits. They move about the grounds devouring all that is edible. The starling, an introduced alien, is the most abundant bird found in the Arboretum, as evidenced by its frequent appearance in the above list. It collects in large flocks whose numbers far surpass those of all other birds combined, presenting a serious problem in the Arboretum. Starlings are largely responsible for disappearance of ornamental fruits before they can be enjoyed by visitors or collected for propagation or distribution to other institutions. The vast population of chipmunks and squirrels are also a nuisance, for they often take fruits before the seeds are developed enough for propagation.

It is interesting that in the suburbs such plants as mountain-ash and pyracantha often hang heavy with fruit into winter, while these plants in the Arboretum are usually stripped by October. During a recent field trip to Long Island (October 11-14), countless flowering dogwoods (*Cornus florida*) were seen bearing crops of untouched fruits while this year's crop at the Arboretum was gone by mid-September. Plants of Asiatic Sweetleaf (*Symplocos paniculata*) were seen hanging heavily with soft ripe fruits—a condition never seen in the Arboretum, for here these are taken by birds before they ripen fully.

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