WILLIAM BEAL

SEED DISPERSAL

William Beal

Seed Dispersal

http://www.litres.ru/pages/biblio_book/?art=24173612
Seed Dispersal:

Содержание

William J. Beal
Seed Dispersal

PREFACE

This little book is prepared with the thought of helping young botanists and teachers. Unless the reader has followed in detail, by actual experience, some of the modes of plant dispersion, he can have little idea of the fascination it affords, or the rich rewards in store for patient investigation.

A brief list of contributions to the subject is given; but, with very few exceptions, the statements here made, unless otherwise mentioned in the text, are the results of observations by the author.

I am under obligations for suggestions by my colleague, Prof. W. B. Barrows; my assistant, Prof. C. F. Wheeler; and a former instructor of botany, L. H. Dewey, now of the United States Department of Agriculture. B. O. Longyear, instructor in botany, with very few exceptions, has made the drawings.

W. J. BEAL.

AGRICULTURAL COLLEGE, MICHIGAN.

CHAPTER I
HOW ANIMALS GET ABOUT

1. Most of the larger animals move about freely. —When danger threatens, the rabbit bounds away in long jumps, seeking protection in a hollow tree, a log, or a hole in the ground. When food becomes scarce, squirrels quickly shift to new regions. Coons, bears, skunks, and porcupines move from one neighborhood to another. When the thickets disappear and hunters abound, wild turkeys and partridges retreat on foot or by wing. When the leaves fall and the cold winds blow, wild geese leave the lakes in secluded northern homes, and with their families, reared during the summer, go south to spend the winter. Turtles swim from pond to pond or crawl from the water to the sand bank, where they lay and cover their eggs. Fishes swim up or down the creek with changing seasons, or seek deep or shallow water as their needs require. Beetles and butterflies, when young, crawl about for food and shelter, and when older use their wings in going long distances.

These examples only serve to recall to mind what every boy or girl knows and has known ever since he can remember – that most animals move about whenever they want to, or whenever other animals will let them.

2. Some animals catch rides in one way or another.

—Some small animals, like lice, ticks, and tiny spiders, walk slowly and only for short distances. If, because of scarcity of food, they are suddenly seized with the desire to move for a long distance, what are they to do? On such occasions ticks and lice watch quietly the first opportunity, catch on to the feet of birds or flying insects or other animals which may happen to come their way, and, like a boy catching on to a farmer's sleigh, ride till they get far enough, then jump off or let go, to explore the surrounding country and see whether it is fit to live in. If for some reason a spider grows dissatisfied and wants to leave the home spot, she climbs to the top of some object and spins out a fine, long web; this floats in the air, and after a while becomes so long and light that the wind will bear the thread and the spinner for a considerable distance, no one knows how far. These facts about lice and spiders show how wingless insects can go long distances without wings of their own.

How is it with plants? The woods, fields, marshes, roadsides ever abound with interesting objects provided with strange devices waiting to be studied by inquisitive girls and boys in and out of school, and this finding out of nature's puzzles is one of the deepest pleasures of life.

How quickly a mould attacks and creeps or spreads through a basin of berries every one knows. The mould is as much a plant as the bush that produced the berries; it comes from a small spore, which takes the place of a bud or sprout or seed. The decay of a tree begins where a limb or root has been injured, and whether

the timber is living or dead, this decay results from the growth of some one or more low forms of plant life which enter the timber in certain places and slowly or quickly penetrate and affect other portions more or less remote.

CHAPTER II
PLANTS SPREAD BY MEANS OF ROOTS

3. Fairy rings. —Several low forms of plant life, such as *Marasmius oreades*, *Spathularia flavida*, and some of the puffballs, start in isolated spots in the grass of a lawn or pasture, and spread each year from a few inches to a foot or more in every direction, usually in the form of a circle; at the end of fifteen years some of these circles acquire a diameter of fifteen to twenty feet or more. These are known as fairy rings. Before science dispelled the illusion they were believed to have been the work of witches, elves, or evil spirits, from which arose the name.

Several kinds of lichens and mosses and the like, growing on the barks of trees, fence boards, and low ground, spread slowly in the manner of fairy rings.

However, the spreading is not always a slow, creeping process, for sometimes these low plants spread over an incredible distance in a short space of time. In some instances they appear suddenly almost anywhere, and at any season of the year. They are all minute and exist in countless numbers, and their devices for securing wide dispersion are so various as to entitle them to first rank in this respect. Some send off spores with a sharp puff, as if shot from a little gun. Some of these spores float on water, and

some are sticky and thus gain free rides. It is not at all improbable that some are carried by the winds across oceans and continents.

It is well known that many of the lower species of plants are more widely distributed over the earth than most of the higher plants. Every cloud from a ripe puffball consists of thousands of spores started on the wings of the wind for an unknown journey. Their habits are not past finding out, but to examine them a person needs a good microscope. Most of them have no special common name, and with one or two exceptions further mention of the mode of distribution of this fascinating portion of plant life cannot here be made.

In our botanic garden was planted a patch six feet across of what is known as Oswego tea, bee balm, or red-flowered bergamot, an interesting plant with considerable beauty. It grew well for a year, the next year it failed to some extent, and on the third most of the plants died, or nearly died, excepting the spreading portion all around the margin. This is a fairy ring of another type, and represents a very slow mode of travel. As further illustrations of this topic study common yarrow, betony, several mints, common iris, loosestrife, coreopsis, gill-over-the-ground, several wild sunflowers, horehound, and many other perennials that have grown for a long time without transplanting.

The roots of plants are seldom much observed, because they are out of sight. In soft ground the roots of the common or black locust extend from twenty to forty feet in each direction, and almost anywhere along these roots buds may appear, and a shoot

spring up and become a tree.

This peculiarity is worth as much to locusts in the matter of spreading as though the parent trees were able to move about. A number of kinds of poplars and willows, ailanthus, some of the elms, ashes, sweet potatoes, milkweeds, Canada thistles, and others behave in a similar manner. Little bits of Canada-thistle root half an inch long may send forth buds, and each bud grow to be an independent plant.

Roots have a peculiarity not usually known. They stretch out and crook about here and there, penetrating the crevices of the soil wherever there is the least chance, and the matured portions begin to shorten, reminding one somewhat of an angleworm when one end has been stepped on. By this shortening process the top or crown of a dandelion or plantain is pulled down beneath the surface of the ground.

4. How nature plants lilies. —Lilies grow from bulbs which are planted six inches beneath the surface. Do you know how nature plants them? A seed starts and becomes a small plant on the surface of the leaf mould or a little beneath; little roots push downward and to right and left; and later, after getting a good hold below with numerous branchlets, the slender roots shorten and tug away at the tiny bulb above, as much as to say, "Come down a little into mother earth, for cold winter is approaching and there will be danger from frost." The young bulb is drawn down an inch more or less, the slender roots perish with the growing year, but the bulb is preserved. The seedling was well

planned; for while it had yet tender leaves during its first year, starch and protoplasm were stored up in the thickened scales of the bulb. During the second spring some of this food in store is used to send down another set of slender roots with the message to gather in more water, potash, phosphorus, nitrogen, and other substances to help grow a larger bulb. In late summer and autumn the new roots contract and pull away at the greater bulb, and down it goes into the ground another inch or so. I have a theory as to how it finally comes to be drawn down just deep enough and no more, but I will not venture to give it. This process is repeated from year to year till the proper depth is reached for preserving the full-grown bulb. And this is the way nature plants bulbs.

In a similar manner young slender roots well anchored in the soil, at or near the close of the growing season, pull downward and outward large numbers of bulblets that form around a parent bulb of some kinds of leeks, tulips, star-of-bethlehem, globe hyacinth, and monkshood. The pull of the roots is much greater to one side than downward, because most of the longest roots extend sidewise. Marilaun reports that a certain lawn in Vienna was mown so frequently that tulips could not go to seed, but after twenty years, from a very few bulbs planted near each other, a space twenty paces in diameter was well covered by tulips. And this is one way tulips travel, slow and sure.

5. Roots hold plants erect like ropes to a mast. —Did you ever lift vines of cucumbers, squashes, and the like, where they had rooted at the joints, and observe how forlorn they looked

after the operation, with leaves tipped over, unable to remain erect? While growing, the stem zigzags or winds about more or less, and thus enables it to hold the leaves erect; besides, the tendrils catch on to weeds and curl up tight, and the roots at the joints are drawn taut on each side after the manner mentioned above, and act like ropes to a mast to hold the stem in its place, and thus help to hold the leaf above erect.

6. How oaks creep about and multiply. —Oaks come from acorns; everybody knows that. The nuts are produced in abundance, and those of the white oak send out pretty good tap roots on the same year they fall. Some of the nuts roll down the knoll or are carried about by squirrels or birds, as mentioned elsewhere. Let me tell you one thing that I discovered the white oaks were doing in the sand of the Jack-pine plains of Michigan. In dry weather the dead grass, sticks, and logs are often burned, which kills much or all that is growing above ground. In this way little maples, ashes, witch-hazels, willows, huckleberries, blackberries, sweet ferns, service berries, aspens, oaks, and others are often killed back, but afterward sprout up again and again, and, after repeated burnings, form each a large rough mass popularly known as a *grub*. The grubs of the oak are well known; the large ones weighing from 75 to 100 pounds each. To plow land where grubs abound requires a stout plow and several pairs of horses or oxen.

A small white oak, after it has been many times killed to the ground, dies in the middle and sprouts at the margins, and finally

the main root perishes, and two roots, with branches a little distance apart, support each a cluster of stems above ground.

There can be no doubt that young oak trees slowly move in this manner from one place to another. If in fifty years we have two distinct grubs or branches, three or four feet apart, where the connecting part has finally died out, I see no reason why in another fifty years each one of the two may not again have spread and divided, giving us at least four grubs, or clusters of sprouts, all originally coming from one acorn; and so the matter might go on. This is slow traveling, I admit, but there is nothing to hinder nature from taking all the time she wants.

CHAPTER III
PLANTS MULTIPLY BY MEANS OF STEMS

7. Two grasses in fierce contention. —In growing a lawn at the Michigan Agricultural College, a little Bermuda grass was scattered with June grass, and the struggle has been most interesting. In the spring and for six weeks in autumn, when moisture usually abounds and the weather is cool, June grass thrives and little else is seen. In the dry, hot weeks of July and August, June grass rests and the Bermuda, which continues to spread, assumes control of the lawn, with but little of the June grass in sight. Each struggles for possession and does the best it can, and to some extent one supplements the other, with the result that at all times from spring to fall there is a close mat of living green which delights the eye and is pleasant to the feet that tread upon it. In soft ground, with plenty of room, a bit of quick or quack grass, or Bermuda, will extend in a year three to five feet or more in one direction.

June grass, quick grass, Bermuda grass, redtop, and white clover, wherever opportunity offers, spread by means of jointed stems, creeping and rooting at every joint on the surface of the ground or a little way below. These are not roots at all, but true stems somewhat in disguise. Here may also be mentioned,

as having similar habit, artichokes, peppermint, spearmint, barberry, Indian hemp, bindweed, toadflax, matrimony vine, bugle-weed, ostrich fern, eagle fern, sensitive fern, coltsfoot, St. John'swort, sorrel, great willow-herb, and many more.

8. Runners establish new colonies. —The spreading of strawberries by runners must be familiar to every observer. In 1894 a student reported that a wild strawberry plant in the botanic garden had produced in that year 1230 plants. Weeds were all kept away, the season was favorable, the soil sandy; but on one side, within a foot and a half, progress was checked by the presence of a large plant of another kind. The multiplication of this plant by seeds, in addition to that by runners, would have covered a still greater area of land. Other plants with runners much like the strawberry are: several kinds of crowfoot, barren strawberry, cinquefoil, strawberry geranium, and orange hawkweed. Plants of the star cucumber, one-seeded cucumber, grapes, morning-glories, and others, spread more or less over bushes or over the ground, and are thus enabled to scatter seeds in every direction.

9. Branches lean over and root in the soil. —A black raspberry grows fast in the ground and has to stay in one spot for life. It has neither legs, feet, nor wings, and yet it can travel. The bush takes deep root and spreads out its branches, which are sometimes ten feet or more in length; the tips of these branches curve over to the ground six feet away, and finally take root; from these roots new colonies are formed, five to twenty in a year from

one bush.

True, the old roots do not get far, and the new plants only get about six feet in one season, but they have made some progress. This is rather slow locomotion, you say; but let us look a little farther, remembering that a seed is a little plant packed ready for transportation. This second mode of spreading will be described on a future page.

10. Living branches snap off and are carried by water or wind. —Some trees and shrubs among the willows are called snap-willows, because their branches are very brittle; on the least strain from wind, rain, sleet, or snow, the smaller branches snap off near the larger branches or the main trunk, and fall to the ground. At first thought this brittleness of the wood might seem to be a serious defect in the structure of the tree or shrub, although they seem to produce branches enough for their own use.

But the branches which are strewn all around after a storm often take root in the low ground where they fall; some of them are carried down stream by the current, and, lodging on the shore below, produce new trees or bushes. During the winter of 1895 and 1896 a group of seven white willows, near a brook on the campus of the Michigan Agricultural College, was at one time loaded with sleet. There was considerable snow on the ground, which, of course, was covered with an icy crust. In a little while the sleet melted from the fallen branches strewn about, and a moderate breeze then drifted the smallest of the twigs in

considerable numbers over the icy snow. Some of these were found thirty rods distant from the parent trees – not down stream in the valley of the brook, but up the stream. Had not the low ground been covered with a dense growth of grass, some of these branches might have started new trees where the wind had left them.[1]

The branches on slow-growing limbs of cottonwood and large-toothed aspen are much enlarged at the nodes, and at these places are brittle, often separating from the tree and breaking up into pieces. Under a small cottonwood were picked up a bushel or more of such limbs, all yet alive. These trees are common on low land, and, like snap-willows, the severed twigs may find a chance to grow on moist soil.[2]

In a greenhouse a potted plant of *Selaginella emiliana*(?) was placed on the bench near the aisle, where it was often brushed by people in passing. Small branches, not being firmly attached, were frequently broken from the main plant and fell upon the moist sand, where they rooted in abundance.

[1] C. D. Lippincott believes that this is a provision of nature to dispose of the now unnecessary branchlets without leaving a knot. *Plant World*, Vol. I, p. 96.

[2] The brittle branches of salix were noticed by the author in *Bull. Torr. Bot. Club*, Vol. IX (1883), p. 89.

CHAPTER IV
WATER TRANSPORTATION OF PLANTS

11. Some green buds and leaves float on water. —Loosely floating on slow streams of the northern states, in water not the purest, may often be found the common bladderwort, *Utricularia vulgaris*, producing in summer a few yellow flowers on each stem, rising from six to twelve inches above the water. The lax, leafy branches in the water are from six inches to a foot long. The leaves, or thread-like branches, are about half an inch long, more or less, and several times divided.

Scattered about are large numbers of flattened scales, or bladders, sometimes one-sixth of an inch long, which give the plant one of its names. For a long time the bladders were thought to serve merely as life-preservers; it was supposed that they were constructed to keep the plant from sinking to the bottom. In reality these bladders help preserve the plant in another sense, by catching and killing large numbers of minute animals, on which the plant lives in part. The tips of the stems at all times of the year are rather compact, made up of young leaves and stems, and in the middle of the summer, as well as at other times, many may be seen severed from the parent plant, floating in the water, ready to accept the assistance of any favorable current or breeze and

start out for homes of their own to found new colonies. These olive-green tips, or buds, vary much in size, but the largest are the size of the end of one's little finger. Late in autumn or early winter, when cold threatens, the tender buds contract a little, and, having thus become heavier than water, slowly go to the bottom to spend the winter safely protected in the soft mud. All the plant perishes except these buds. With the lengthening days of spring the melting ice disappears, and genial sunshine gives notice to the dormant buds that it is safe to come out again. The buds begin to expand, become lighter than water, and are soon seen spreading out at the surface and producing branches and leaves. Ducks and other water-fowl not infrequently carry some of these wet buds sticking to their feathers or legs.

In this connection the following plants may be examined from time to time: *Lemna*, *Wolffia*, *Anacharis* (*Elodea*), *Myriophyllum*, *Cabomba*, and several species of *Potamogeton*. I have seen the leaves of lake cress, *Nasturtium lacustre*, often spontaneously separate from the stem, possibly carrying at the base the rudiments of a small bud, which draws on the floating leaf for nourishment and produces a small plant near its base. These plants, floated and nourished by the mother leaf, may drift down a creek or across a pond and establish new settlements. In a similar manner behave leaves of the following, and perhaps others: *Cardamine pratensis*, horse-radish, celandine, some water lilies, and other plants not grown in wet land.

Gardeners often propagate certain species by placing leaves

on wet sand or mud, when buds spring from the margins of the leaves or from some other portion.

One of the buttercups, *Ranunculus multifidus*, and very likely others, spread over the mud by producing runners, much after the manner of a strawberry plant. If, as in case of a freshet, the plants should be covered with water, they show their enterprise by taking advantage of the "tide"; some of the runners are quickly severed, and are then at liberty to go as they please.

12. Fleshy buds drop off and sprout in the mud. —One of the loosestrifes, *Lysimachia stricta*, a plant growing in bogs, besides reproducing itself by rootstocks and seeds, bears fleshy buds half an inch long, which separate from the stems and take root in the mud near the parent plant, or often float to another spot. The buds on the stems of *Cicuta bulbifera* develop into small bulbs, which readily separate from the plant. They then float on the water and produce new plants. The tiger lily also produces bulblets, which scatter about and promptly take root. Every person of good understanding must have heard or read about seeds carried by ocean currents or transported by lake, pond, creek, or by muddy current, during, and after, a shower of rain; in most of these the wind is also a prominent factor. Many seeds and fruits, in some cases parts, and even the whole, of plants seem to be purposely designed for this mode of travel, while an innumerable host of others occasionally make use of it, although it may seem from their structure and place of growth that they were made especially to be transported by the wind

or by some animal. As has been seen in examples previously mentioned, one portion of a plant is transported in one way, and another portion by one or two other methods.

13. Seeds and fruits as boats and rafts. —An excellent place in which to begin investigating this part of the subject is to pay a visit to the flats of a creek or river late in autumn or in the spring, after the water has retired to its narrow channel, and examine piece after piece of the rubbish that has been lodged here and there against a knoll or some willows, a patch of rushes or dead grass. We are studying the different modes by which plants travel. In the driftwood may be found dry fruits of the bladder nut, brown and light, an inch and a half in diameter. See how tough they are; they seem to be perfectly tight, and even if one happens to have a hole punched in its side, there are probably two cells that are still tight, for there are three in all. Within are a few seeds, hard and smooth. Why are they so hard? Will it not be difficult for such seeds to get moist enough and soft enough to enable them to germinate? The hard coats enable the seeds to remain uninjured for a long time in the water, in case one or two cells of the papery pods are broken open; and after the tough pod has decayed and the seeds have sunken to the moist earth among the sticks and dead leaves, they can have all the time they need for the slow decay of their armor. Sooner or later a tiny plant is likely to appear and produce a beautiful bush. Engineers are boasting of their steel ships as safe and not likely to sink, because there are several compartments each in itself water-tight. In case

of accident to one or two chambers, the one or two remaining tight will still float the whole and save the passengers.

I wonder if the engineers have not been studying the fruit of the bladder nut? But this is not all. Many of the dry nuts hang on all winter, or for a part of it, rattling in the wind, as though loath to leave. Some of them are torn loose, and in winter there will be a better chance than at any other time for the wind to do the seeds a favor, especially when there is snow on the ground, for then they will bound along before the breeze till something interrupts them.

Конец ознакомительного фрагмента.