

ARNOLD ARBORETUM  
HARVARD UNIVERSITY  
BULLETIN  
OF  
POPULAR INFORMATION

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**Botanizing from an Airplane.** More than one householder in eastern Massachusetts was puzzled, one morning last May, by the peculiar antics of an airplane which flew along the coast. Until it appeared over the town of Ipswich, it behaved as might any other plane on a pleasant spring morning. Once over that town, however, it began a series of maneuvers which were as unusual as they were incomprehensible. It darted back and forth from the town to the coast; it circled over islands in salt marshes; it came swooping down over sandy beaches. With its motor shut off, it idled lazily at 2000 feet and then flew directly to Newburyport, where it again flew this way and that way, like a happy butterfly.

In spite of appearances there was a sober purpose behind these maneuvers, which were repeated with minor variations all the way along the coast from Newburyport to Duxbury. The airplane, or rather its occupants, were actually botanizing. They were hunting for plants, or to be more specific, for a particular plant, the Beach Plum, (*Prunus maritima*.)

It is far easier, in the confines of a short article, to describe an airplane search for Beach Plums than it is to explain *why* any botanist should want more data on the distribution of so common a plant or should feel justified in gathering these data by plane. There were such reasons, however. Anyone who knows only the most elementary facts about plants knows that they are grouped in species; but just what these species are, or how a species is to be defined, are questions that not even the wisest botanists can answer. So at the Arboretum, among other matters, we are studying a few species in great detail, in an attempt to make as complete a record as possible of the variation within an entire species. We hope to find out, for instance, whether a species is more variable at the center of its distribution or at the periphery; whether unusual forms are found with greater frequency in one part of its range than in another.

One might have supposed that such simple and fundamental information would have been gathered long ago, but as a matter of fact, it has never been done. For several reasons, our common Beach Plum, (*Prunus maritima*), was selected for this kind of intensive study. The first question to be answered was, "What is its exact range; what are its southern limits and its northern limits; where are the scattered localities at which it grows spontaneously away from the seashore?" The second question was, "How much does it vary? What are the ordinary limits of some easily measured character such as seed length and width?" To answer this last question it was necessary to locate large colonies of plum bushes, places like the Province lands at the tip of Cape Cod where thousands of bushes grow side by side in great profusion.

A first attempt to gather this kind of information had been made last fall during the time when the plums were ripe. Over a week had been spent in exploring the country along the south shore by automobile and on foot. A few bushes were found in one place, a few more in another, but away from Cape Cod itself, no really large colonies were located. It was evident that any attempt to locate the best places for study, even with the help of local botanists, would consume an appalling amount of time.

At this point the junior author was consulted. Might it not be possible to map the distribution of the plums from the air and to find, in a very short time, the largest colonies in the region? His talk of "An hour's flight to Portsmouth and back" was reassuring as far as the time element was concerned. It remained to be seen if the Plums could be identified practically at a height which would be safe for general cruising, say 1000 to 2000 feet. A trial flight in the early spring showed that it might indeed be possible to study the distribution of Beach Plums from the air, particularly if the flights were made during the season when the bushes were in full bloom. Every successive hour in the air has justified this conclusion. It has been a matter of increasing surprise to find how many trees and shrubs can be recognized, with a little practice, at elevations of 1000 to 2000 feet. It might, in advance, have been suspected that species with conspicuous flowers, like the Lilacs, for instance, could be readily told at that height, but even in the case of the Torch Azalea, it was something of a shock, as we flew over the Arboretum, to find them even more conspicuous at 1500 feet than they are from the ground. With the morning sun shining full upon them, they gleamed like a crumpled mass of orange-yellow silk.

With a little practice, many genera of trees can be recognized, and, in some cases, the species can be distinguished from heights so great that no single detail of leaf or flower is seen. At second thought this is not so surprising, as may be made clear from a comparison which is much more than a mere analogy. Seen under the microscope, leaves and flowers are found to be made up of myriads of cells. In the last analysis it is the form and arrangement of these cells which determine

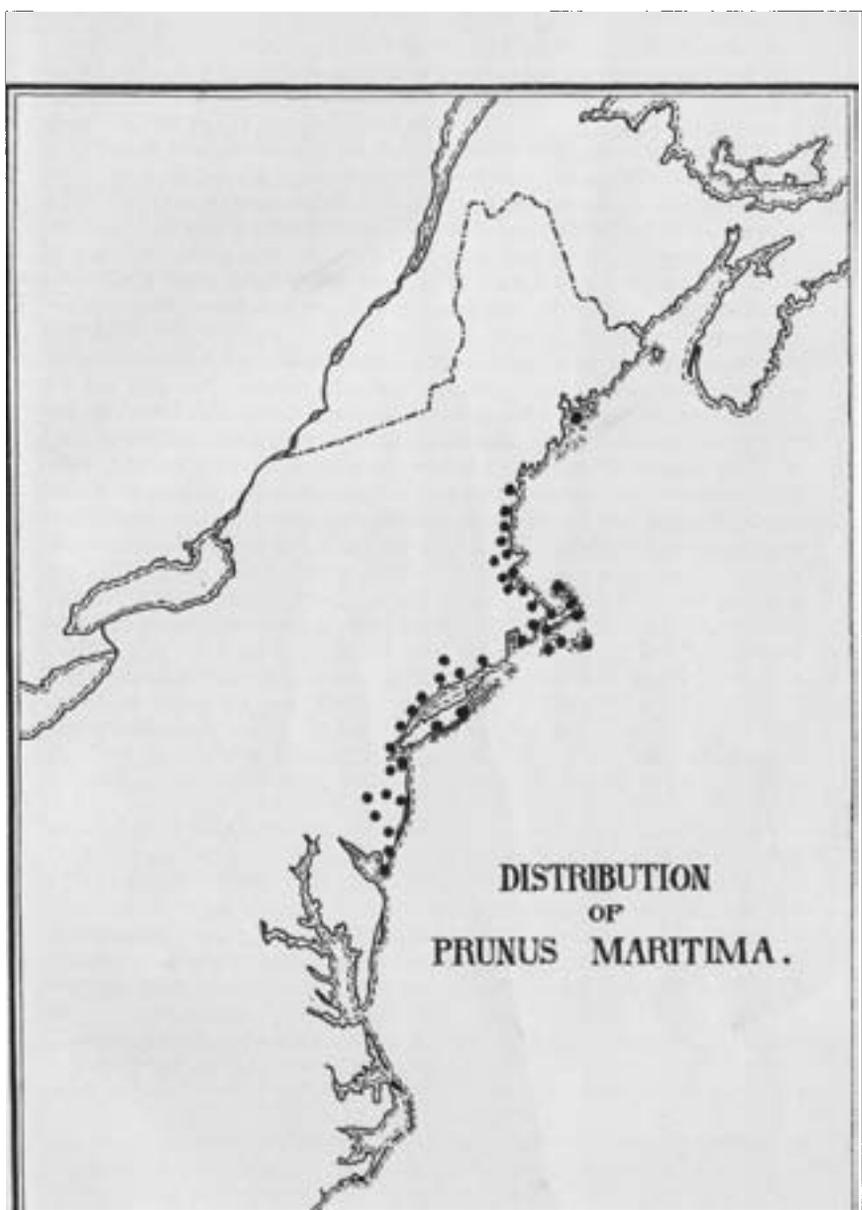


**THE ARNOLD ARBORETUM**  
As seen from an Airplane

the appearance of the leaf or flower. If the cells are regular in size and evenly spaced, the surface of the plant looks smooth and finished; if they are irregular, the surface is rough. If the cells have thickened walls, though our eyes may not see the walls, much less the thickening, they detect the hard, varnished appearance which results therefrom. In the same way the texture of a tree at 1500 feet is distinctive, though at that height the individual leaves are invisible. It may be even more conspicuous than it would be on the ground. Many factors contributed to this texture, the size of the leaves, how they are spaced on the twigs, the character of their surface, the nature of the branching, the angle at which the leaves are held.

So it is that at 1500 feet a Norway Maple in bloom can be recognized by its glistening yellow-green color, like pale green bronze covered with a light film of oil. The Shadbush (*Amelanchier*) blossoms at the same time as the Beach Plum and often grows in the same general locality, but they can be readily distinguished. On the Shadbush, the young leaves are scattered here and there among the flowers, and they impart to the plant as a whole, a soft, almost woolly texture. Sometimes the appearance of a plant from the air is so unexpected that one must use a good deal of imagination to determine its identity. The most puzzling species which we noted on our flight to Newburyport was a common feature in hilly pastures to the north of Boston. Its color was a dark yellowish green, and in texture it was hard and stiff. It looked, for all the world, like the circular patches of hard, crusty lichens one often sees on rocks. What could it be? It was evidently one of our commonest shrubs, since it occurred in pasture after pasture, sometimes alone, sometimes intermingled with a tangle of other vegetation. Before the puzzle had been solved, the coast was reached and it was time to look for Beach Plums. It was not until we were back on the ground that we realized that the lichen-like patches were nothing more or less than the common Sweet Fern, (*Myrica asplenifolia*).

As for the Beach Plums themselves, they proved somewhat of a surprise. It had been anticipated that, with such conspicuous blossoms, they would, from the air, appear like glistening mounds of white. In the first place they did not seem mound-like at all. They are so low that from an elevation of a thousand feet they look almost like flat doilies upon the ground. While a single bush may be found covered with flowers, it is much more characteristic for part of the branches to bloom and part to be bare. Seen from a height, this irregularity of blossom imparts a patchy appearance to the bush as a whole. The black, bare branches and the flowering twigs blend together so that the color becomes a grayish pink, rather than a pure white. The soft texture of the blossoms is dominated by the rough bark and spiny twigs so that the bush, as a whole, takes on the hard surface of a pen and ink drawing on very rough paper.



All these points were noted as we cruised back and forth above plants at Ipswich, which had previously been studied from the ground. Then we turned north to Newburyport and proceeded with our two objectives for that morning. These were first, to map the coastal distribution of the species from Newburyport to Plymouth, and second, to locate large colonies for study, somewhere along the south shore. We had provided ourselves with geological maps covering the area in question. They were mounted and folded and arranged in two bundles, one for the north shore and one for the south. The south shore set of maps was tucked safely out of harm's way. The north shore maps were numbered and ready. It was fast work for two people. The colonies of plums had, first of all, to be discovered, then identified with certainty, then their position and approximate extent indicated with red pencil on the survey maps. The pilot ran the ship, keeping an eye out for colonies far to the left or right and doubling back when the identity of a plant was in doubt. The observer sat behind him in the cabin of the ship, his lap a litter of maps, his coat pocket filled with a half dozen red pencils. The map in use at the moment was spread out on his knees, and the pencil was held above the last recorded locality. When the plums were sighted, a few glances back and forth from the small map to actual coast line itself served to locate their position. Then a few quick strokes of the red pencil and back to the window again, looking for the next colony of plums. Things worked smoothly until we flew off the map. Then one had to work quickly to get out the next map, open it, locate the plane's position and start in charting the plum distribution where it had been left off on the previous sheet. One had to concentrate on the work in hand. There was no time for sight-seeing and least of all for any attempt to synthesize the view from the plane with one's previous knowledge of the country below.

Viewed from an airplane, even the most familiar spot looks utterly different from what it does on the ground, and one must use a great deal of imagination to reconcile the two aspects. Hills disappear, trees veil familiar buildings, the field of view is bewilderingly wide. Fortunately a few features of the landscape are even more conspicuous than they are from the ground,—roads, railroads, lakes, and islands. By means of these landmarks it was comparatively simple to compare the map and the view from the plane; they were substantially alike. But any attempt to think of what was being seen from the plane in terms of what had been noted on the ground, took too much time away from the business in hand.

Occasionally there would be some question about the identity of a particular bush or clump of bushes. Then the pilot obligingly turned the plane on its side and circled slowly above the spot, a maneuver which at first defeated its own purpose. When the plane is on its side, the occupants are also on *their* sides, a position at which one's instincts rebel. This proved the hardest single lesson for the observer to learn, the most difficult bit of technique for him to acquire; that when the plane turned over, instead of leaning back, he should do just the opposite

and welcome the opportunity for a free and unobstructed view straight below. It takes some practice and not a little nerve to lean forward, face against the window, and look calmly down for 1500 feet while the plane does a gentle spiral on its side.

From Newburyport, after a short glance to the northward, we flew south along the sandy coast, charting the distribution of *Prunus maritima* in the towns of Ipswich and Essex. And there the Plums stopped. Though the sandy stretches of Coffin's Beach did not seem to differ essentially from those of Plum Island, there were practically no plum bushes on the beach or among the sand hills behind it. The few which did appear were grouped at the north end, just across the Essex River from Castle Neck, where plums were fairly plentiful. Nor did the species reappear in quantity until Boston Harbor had been crossed. We saw no bushes in Nantasket, but just at the town line of Cohasset they reappeared and were soon one of the commonest bushes along the coast. What causes this transition, in both cases so abrupt? We do not know as yet. It may be due to some element in the soil; it may be connected, in some way, with the recent geological history of the coastal beaches; it may be due to some other quite unexpected cause.

By the time we reached the south shore, practice had made identification and recording of the plants an easy matter. There now remained our second objective, the location of at least one large colony where the variation of the species might profitably be studied. We had not long to wait. Within a quarter of a mile of one of the localities visited the autumn before, there was a large area of shifting sand. It had been hidden from the road by the slope of the land and by a thick growth of scrub-oak, but from the air it was most conspicuous. It was so thickly studded with plum bushes that we did not even need to fly directly overhead.

In company with a local naturalist, this colony was revisited the next day, by automobile, to obtain pollen for microscopical examination. As the car drove past nearly a solid mile of plum bushes the naturalist exclaimed, "Why there are more beach plums here than I have ever seen growing together in one place!" Though he had spent most of his life only a few miles away and knew the countryside pretty thoroughly, fifteen minutes in the air had given us a more complete knowledge of it than he possessed. In Duxbury we found another large colony from the plane. Again it was only a short distance from territory travelled through by automobile the year before. At fruiting time this fall, these two colonies will provide abundant material for study and experiment.

The speed with which the ground can be surveyed, particularly along the coast, where there are ordinarily serious barriers to straight-line travel, is nothing short of amazing to a novice in the air. When we finally finished our charting of the plums along the south shore and had returned to the landing field, we had been in the air one hour and

fifty minutes. In that time, we had explored the coast thoroughly. We had flown over many islands, we had looked into the hollows among the sand hills, we had examined the areas of higher land which rise here and there among the salt marshes. It would have taken two weeks by automobile and by foot and by boat to have covered the same territory as thoroughly from the ground.

Best of all, we had ventured out into a new field and made a go of it. We had tried out a new and unknown technique and had found it even more useful than we had dared to hope. Here and there a few botanists have used airplanes in their work, chiefly in the West, when mapping the distribution of different types of vegetation. We had gone even farther and had studied a particular plant from the air. In the not far distant future such uses of planes in exploration and study must certainly become not unusual. Some regions of the earth's surface seem particularly designed for exploration and study from the air. Most of the sub-arctic zone, for instance, is dotted with little lakes, which would solve the difficult problem of where to land in the wilderness. It will not be long before these areas, now relatively unknown, botanically, will be explored by plane. For the present there is a certain satisfaction to us in having been among the first "air-minded" botanists.

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