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Seed Dispersal: A Tale of Two Species

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SEED DISPERSAL
A Tale of Two Species

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Orchids have minute, dustlike seeds. In this respect, *Goodyera pubescens* (Downy Rattlesnake Plantain), the 2016 VNPS Wildflower of the Year, is a typical orchid. Like all other orchids, *Goodyera* seeds contain little more than a few embryonic cells enclosed in a thin seed coat. There are two advantages to small seed size in orchids: minute seeds can be produced in prodigious quantities, and they can disperse over great distances by wind.

In contrast, consider species of *Hexastylis* (heartleaf). Though by no means huge, at just a few mm in size, its seeds are much larger than dust. Further, each heartleaf seed bears an aril, a ridge of fleshy cells along one side. Dispersal in *Hexastylis* occurs with the assistance of ants, which, attracted to the fleshy aril, actively forage for its seeds and carry them off some distance before consuming the aril and leaving the remainder of the seed to its destiny. Distances traveled with ant assistance are not great. Studies indicate that effective rates of dispersal from parent plants in ant-dispersed species are frequently less than one meter per year. Of course, sporadic rare events may disperse heartleaf seeds across distances much greater than that provided by assistance from ants.

In terms of dispersal strategy, therefore, *Goodyera* and *Hexastylis* are pretty much at opposite ends of the spectrum. Otherwise, however, their ecological characteristics are quite similar. Both are small, evergreen, perennial plants that live among the leaf litter of deciduous forests; each has tough, leathery leaves, and each produces only a few new leaves per plant each year. It should not be surprising that both species are frequently found together.

In undisturbed forests, over long periods of time, differences in average distance of seed dispersal may not make much difference in terms of plant distribution. Sure, for a given year's seed output, an orchid will easily outdistance a heartleaf. But over the course of centuries, or millennia, the small yearly increments of heartleaf dispersal add up. One can imagine that, given time, each should be able to colonize the full extent of undisturbed forest habitats that suit their requirements.

But eastern North America is no longer the forest primeval. Very little virgin forest remains. Most of our forests are secondary, patchy bits of habitat, at various stages of regeneration since the preceding forest was destroyed. If clear-cutting temporarily renders the former forest floor uninhabitable for plants like *Goodyera* and *Hexastylis,* seed dispersal ability should have a measurable impact on the distribution and abundance of these plants in our present-day patchy secondary forests. One might predict that wind-borne orchid seeds should access suitable habitat in regenerating secondary forest much more quickly than ant-dependent heartleaf. Two researchers recently set out to test this very prediction (Sorrells and Warren 2011).

Jesse Sorrells and Robert Warren conducted their study in the Bent Creek Experimental Forest located within the Pisgah National Forest in North Carolina. They measured abundance of *Goodyera pubescens* and *Hexastylis arifolia* (Arrowleaf Heartleaf) in a series of forest plots that had been clear-cut at various times since 1925. As predicted, the researchers found a robust correspondence between heartleaf abundance and average age of nearby trees—the older the forest,

Goodyera pubescens seedpods. (Photos by W. John Hayden)

Goodyera pubescens, Downy Rattlesnake Plantain, is the Society's 2016 Wildflower of the Year.

the more likely that heartleaf would be found. In their study, no heartleaf was found in any forest younger than 34 years, but it was always found in plots with trees 60 years old or older. In contrast, Downy Rattlesnake Plantain was found in young and old forests alike—abundance was not tightly linked to the age of the forest stand.

Though Sorrells and Warren focused on *Goodyera pubescens* and *Hexastylis arifolia*, their results can be viewed more broadly. The good news is that species with efficient long-distance dispersal should be able to colonize patchy secondary forests with relative ease. But the bad news is that there are a great number of plants, like heartleaf, with ant-dispersed seeds. In the eastern deciduous forests of North America, depending on forest type and location, an estimated 30 to 70 percent of herbaceous forest plants depend on this relatively slow mode of dispersal.

The tale told by these two species is a cautionary one. Forest trees may well regenerate and cover the scars of clear-cutting in just a few decades. But in ecological terms a forest is the trees plus everything living on, among, and below the trees. And when forests are destroyed by clear-cutting, full recovery of the whole community may well lag behind tree regeneration. Rapid dispersers, like Downy Rattlesnake Plantain, may be able to keep up with frequent harvest cycles of hardwood forests. But slowly dispersed plants, exemplified by the ant-dispersed heartleaf, are likely to have difficulty tracking through time and space the patchy bits of forest habitat that we have carved from the once vast eastern deciduous forest. Downy Rattlesnake Plantain and Arrowleaf Heartleaf may be broadly similar species but their seeds are different, and therein lies the tale.

Work Cited

Sorrells, J., and R.T. Warren II. 2011. Ant-dispersed herb colonization lags behind forest re-establishment. *Journal of the Torrey Botanical Society* 138: 77–84.

Flora Fund Drive Surpasses Goal

A resounding "Thank you!" to you, members of the Virginia Native Plant Society, for once again knocking it out of the park for the Flora of Virginia Project. The friends of the Flora Project surpassed our goal of $30,000 in our fall funding appeal, and the lion's share of those donors are VNPS members.

With only two weeks to go in the funding drive we notified our friends of a very good development. We were awarded a challenge grant by Richmond's Mary Morton Parsons Foundation, which also supported the print *Flora of Virginia*. They'll match donations to the Project until December or until they have matched $40,000 in gifts. This was definitely a motivator in the second half of the drive, and about one-third of the donations we received will be matched by that grant.

To receive our electronic newsletter, *Florascope,* sign up on our website, floraofvirginia.org, or our Facebook page. ***—Bland Crowder, executive director, Flora of Virginia Project***

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Next submission deadline: March 15, 2016