Bur Oak Acorns

Each Year in the Forest: Summer

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Illustrated by Rachel D. Davis

Each year, for a few weeks in succession, I tell myself that we are done with spring. I think the chorus frogs have stopped singing for the year. Then they start up again. The sedges bloom in a flurry, anthers waving, and they die back. But then another wave arrives. Warblers stream through town and then are quiet. A few days later, I hear that a blue-winged warbler was lurking in the western suburbs. There is no clean joint between spring and summer.

Still, near the beginning of June, the great waterleaf plants that emerged as blotchy, hairy leaves in early April become splendid with gauzy blue flowers. Dagger-like fruit columns sprout from the center of wild geranium flowers, arising from between the nutlets that develop at the bases of the petals. After a few weeks, they will catapult their seeds into the woods around them, then persist, irrelevant as the flowers fall to pieces. Sugar maple leaves unfurl. Toothwort begins yellowing; false mermaid becomes flattened and desiccated; the culms of straight-styled wood sedge flatten out as though they'd been stepped on by elephants. Leaves of wild leeks do the same. The forest prepares itself for the long run uphill to the solstice and over the crest to autumn.

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In early June, hackberries and basswood leaves are still expanding. Oaks spill into flower as gray squirrels nip off the shoot tips and strew them across the forest floor. The door continues to close on spring for a few more weeks: Virginia waterleaf flowers nod at the bases of white oaks; great crested flycatchers and red-eyed vireos call at intermittent points along every walk in the woods; sedges of the second flush drop their fruits (nutlets wrapped in papery green perigynia that will see them through to fall), and the sedges of the third flush begin to ripen; woodland bluegrass spikelets gush with anthers. But spring isn't over until the last leaves are fully open and the holes close in the canopy. At that point, the forest floor becomes its darkest, and leaves of the white bear sedge abruptly broaden out. Summer spreads out before us with its long weeks of photosynthesis in full spate. Its progression of insect songs will take us through hot afternoons and humid mornings to the end of September.

Fireflies make their first flights near the beginning of June without any obvious chance to warm up and no training: they've only just pupated and emerged as adults. Still, they seem not to worry that their prospective mates might notice how raw and unpracticed they are. After a season of solitude as infants, after never having had a mating season at all, they mature, illuminate, and fly. They are nonchalant. They exhibit none of the uncertainty of young vertebrates, the stumbling fawns and warbling young white-throated sparrows, the clumsy great-horned owl babies. Instead, male fireflies execute aerial wooing dances whose precise choreography they are born knowing. These flights differentiate them by species. One flies a J-stroke. Another flies in dots and dashes. Meanwhile, the females sit in nearby shrubs and blink, drawing the males in.[1] I was once swinging a double-bladed weed cutter through the University of Wisconsin's Curtis Prairie near sunset and found that I had attracted the attention of a firefly, who flew in toward me and tried to attract the fancy of the bolts glinting along the joint between the handle and the blade. It was unsuccessful.

Mosquitoes are drawing blood by this time, bringing common nighthawks out into the open. I notice the nighthawks in the evenings when their splattery "peent," juicier and less strident than the woodcock's, draws my attention to the sky. They career around overhead with an agility that defies physics, banking almost as sharply as dragonflies, diving and pulling up, the white bands on their wings flashing. All the while, they are funneling insects into their mouths. Watching them fly, I cannot understand how a diet of small insects can sustain such energy. Their flight is ceaseless but for the rare times that I have seen one perching, roughly the size and shape of a large bread loaf, on the edge of a flat city rooftop. I sometimes hear a male roaring as he drops through the sky to impress a potential mate, wind booming through the primary feathers as he nears the bottom of his dive. This is the same time of year when I used to hear a close relative, the whip-poor-will, calling in wooded neighborhoods of the University of Wisconsin–Madison Arboretum on my late-night bike rides home from work.

Jewelweed

Wild Garlic

All through the month, I watch the juneberries slowly ripen. Many people grow them in their front yards and apparently have no idea that they are edible. When the berries finally become dark and soft and sweet enough to eat, they are delicious, and for a couple of weeks each June, I cannot walk past the vacant lot turned playground down our street without standing at the fence for at least a minute or two, eating berry after berry. They do not travel or store well, so I eat as much as I can while they are in season. As I do, I know without a doubt that we are in the midst of summer, though I couldn't tell you exactly when it started.

II

In the weeks leading up to the solstice, the great waterleaf petals fall, and their spidery inflorescences bear capsules that ooze pulpy white ovules when you pinch them. Jewelweed grows to chest height and produces mysterious translucent fruits that appear to have preceded the flowers. They are, in fact, the products of cleistogams, flowers that never open, in which the stigmas and anthers are closed in together and external pollination is excluded. They are the plant's answer to the risk of not getting pollinated. They explode in hand before I notice a single outcrossing flower. Beside them, leaves of the wood nettle sprout translucent galls that resemble tapioca pearls with a dark core. Inside each grows a gall midge, *Dasineura investita*, which I have probably seen in adulthood but never recognized.

Wild leek scapes poke up through the leaf litter, each tipped with an arrowhead-shaped hood. Some colonies emerge erect, others arched over and darkened on all surfaces. The flowering stalks sparsely map the extent of the dense swards of green foliage that grew fast in March and April, dissolving into the soil a couple of weeks before the scapes emerged, as the last holes closed in the canopy. There is no evidence of the leaves as the inflorescences swell against the hoods and tear through their sides. The inflorescences stand for a few days like fists raised above the leaf litter. The flowers open gradually, six papery tepals spreading beneath a congregation of stamens.

Ghost Pipes

Morbid Owlet Moth

The individual flower stalks grow as the flowers continue to open, so that at their peak, the colony of leeks is a cloud of airy white inflorescences.

Morbid owlet moths waft across the path and settle onto the undersides of last year's sugar maple leaves. The moths are similar to the faded maple leaves in color and value. Leconte's haploa moths flap their black-striped white wings like flags and settle on the shorter plants. Ebony jewelwing damselflies bumble along near creeks and at the edges of woodland marshes. They are so faithful to their habitat that when I see one, I know—whether I am in central Wisconsin, northern Illinois, or overseas[2]—that I am near water. They have a flair that I appreciate and a casual gait that I admire, flapping and gliding, bouncing between plants rather than vigorously taking out insects over open water. They seem to lack the ruthless efficiency of the other damselflies and dragonflies in the neighborhood.

Summer pricks the forest floor with light. The delicate white petals of enchanter's nightshade open at the tips of bristling ovaries. Wild garlic spathes open to reveal a cluster of bulbils atop a thin scape; flowers emerge from among the bulbs and turn toward the canopy on narrow stalks. Jumpseed that started the year as red-stained leaves low to the floor produce flowers roughly the size and shape of cooked orzo. Honewort flowers wink on like stars scattered between the major constellations and then give way to plump, rubbery fruits that smell of celery leaves. Ripened spikelets of fowl mannagrass shine at the tips of slender branches; I gather a handful and drizzle them along the side of the path, where they crackle like grains of couscous against the leaves. Seeds ripen to a glossy chestnut brown inside the wild ginger berries lying in the duff, each rimmed with an oily crest, an elaiosome, that is as delicious to ants as a fresh-baked roll is to a human. A dull, hairy capsule of the great waterleaf is nestled within the persistent calyx. But when I slough off the fruit wall with my fingers, the seeds inside lie wet and pearly white, reflecting sunflecks.

Then we hit the solstice. There is no more to see on this day than on any other, but we have a few extra minutes in which to see it.[3] For a month or

Dead Man's Fingers

Orange Mycena

so, the woods will trundle, pause, grow, and decompose. The long days will fill with cicada songs and greenery, the nights with clouds of fireflies. It is downhill now in both directions.

III

Through June and early July, the fruiting bodies of dead man's fingers (*Xylaria*)[4] curl from gaps in fallen tree trunks and protrude from the chipped trails. They are powdery gray and tipped with white at first, blackening as they mature. Collared parachute mushrooms (*Marasmius rotula*) sprout from decomposing branches and tree fragments. Their caps are gelatinous and crenate. Their ridged margins droop down over the tops of the stems like children's umbrellas that leave only torsos and legs visible as they walk the rainy paths. Orange mycena mushrooms (*Mycena leaiana*) sprout small colonies along the sides of rotting red oak trees. Trooping crumble caps (*Coprinellus disseminatus*) mass up in the wreckage of fallen branches, fragile and diminutive forests forming in the canopy's cemetery. White jelly fungus (*Ductifera pululahuana*) glistens at knee level. Ghost pipes emerge from the forest floor, white, with nodding flowers that look down toward their toes, feeding off the fungi that live with the tree roots. The forest is growing at full tilt, and already it is being devoured.

In Maple Grove Forest Preserve, there is a brown, spongy, decaying white ash trunk[5] that I regularly check for fungi. I found it bristling, on the Fourth of July last year, with what I thought were bright red, tiny toadstools. The caps were less than a millimeter in diameter, the stalks threadlike. A flat-backed millipede was crawling among this fur of filaments and pinheads. On the side of the log, a white, fleshy *Crepidotus*, a common wood-eating fungus, had emerged with a cluster of something that resembled tiny puffballs, a bit larger than mung beans. On a nearby log, the *Xylaria* were blackening at the tips.

I posted the "toadstool" photos to iNaturalist, a social networking site for sharing and discussing biodiversity photos. Within hours, I had heard from a Tasmanian naturalist[6] who observed that while the *Crepidotus* and *Xylaria* were fungi, the others were not. They were slime molds: *Cribraria* for the

"toadstools," wolf's milk (*Lycogala epidendrum*) for the "puffballs." I was surprised and delighted. In an afternoon, I'd found a whole new branch of the tree of life to watch for in the woods. I looked up the *Encyclopedia Britannica* entry on slime molds:[7]

> Science fiction did not invent the slime molds, but it has borrowed from them in using the idea of sheets of liquid, flowing protoplasm, giant voracious amoebae, engulfing and dissolving every living thing they touch. What fiction could only imagine, nature has evolved, and only their sharp dependence on coolness, moisture and darkness has kept the slime molds from ordinary observation, for they are common enough.

Two days later, I returned to the woods to find that I could now distinguish at least six slime molds by eye. In addition to *Cribraria* and wolf's milk, I found *Arcyria cinerea*, which looked like grains of rice suspended by threads; *Tubifera*, pincushions on the sides of the logs; an undifferentiated yellow plasmodium that might have been *Physarum* crawling over the surface of the log; and the aptly named dog-vomit slime mold (*Fuligo septica*) mounded up on logs stripped of their bark. I slapped the colony of *Cribraria:* spores rose and formed a fog around my hand, then drifted off along the length of the log.

After the slime mold sporing bodies disintegrated, the tree lay more or less naked. I have watched one end of the trunk crumble over the past year, trampled to the point that it now grades into the trail. The slime molds themselves didn't do this: they live largely on bacteria and fungi, not wood.[8] Ants have trailed through the sapwood and replaced xylem with frass; mycelia of chicken of the woods (*Laetiporus sulphureus*) have wound through the tree, devouring lignin, leaving the wood blocky and red; the roots of jewelweed and enchanter's nightshade growing on the top have tunneled into the wood; moss growing on the shady side has helped keep the tree spongy. Slime molds help with the mop-up.

When I returned this year, small patches of honeycomb coral slime mold (*Ceratiomyxa fruticulosa*) appeared on the side of the log by the first of July, along with wolf's milk. Then, on the third of July, as though on cue, a coat of *Cribraria* sporangia appeared on the flattened rubble pile along the path.

IV

By late July, many plants are scarred by insects. On the midribs of jewelweed leaves, translucent swellings conceal young gall midges (*Neolasioptera impatientifolia*), which grow as tiny yellow larvae inside each blister.[9] Elm-leaved and zigzag goldenrod that haven't come into flower yet are inscribed with meandering leaf-miner tunnels that begin small, thicken as the larvae inside grow, and often terminate in a hole. Leaf miners find white snakeroot as well. Other leaves are crisscrossed with slime trails that I suspect are left by slugs or snails, but the leaves often show no evidence of chewing or scraping damage. The broad, soon-to-become-evergreen leaves of white bear sedge begin to resemble subway maps, with routes scratched into

the mesophyll by leaf-miner flies (*Cerodontha* sp.), who follow the veins of the leaves longitudinally, tunneling in parallel before they veer diagonally to connect the paths.

Along a trail through the Morton Arboretum's East Woods, woodland sunflowers are packed as densely as a planted field. They flower in July, their brilliant yellow faces all turned intently southward, extending almost as far as I can see in the shade of the white oaks. Tall bellflower comes into bloom one day, and the blue flowers are high enough to stare me in the eye, a single style snaking out from the white-target center of each flower. Shining bedstraw scrambles along like baby's breath at ankle-height. False nettle erects columnar inflorescences that angle from the leaf nodes and look strong enough to hang a coat on. The filigree of wood nettle inflorescences signifies the end of one's opportunity to harvest the leaves for the year. Before this, they can be boiled and eaten, though in my experience they are bland. After this, I have been told, they become bitter. Perhaps this marks the beginning of the end of summer.

The interval from mid-July to the middle of August is hot and slow. I lose track of what is going on in the woods. I travel for a conference and come back to find that Solomon's seal berries are ripe; when I last looked, in early July, they had just broken out of the papery corollas that enclosed them. We leave on vacation, north to where Canada mayflower is in fruit and clubmosses are thick in the shady portions of the forest, and we return to find bottlebrush grass looking ragged, wild leeks beginning to fruit, clearweed in flower. Moonseed sprawls over fallen logs. This is the last month of summer before the boys return to school. The days spread out like a fog low over the field in the early morning, amorphous, hot, hard to pin down.

V

As summer draws to an end, sounds of the fields, woods, and suburbs mark my progression through each day. Between mid-July and early August, the robins relinquish their predawn singing to the cardinals. This changing of the guard always catches me unawares. Crickets stop singing as the sun starts to bear down. Cicadas and lawnmowers fill the midafternoon. Our family bustles around with supper, kitchen noises spilling out into the yard, then robins begin chuckling in the neighborhood. Cicadas give way to crickets about thirty or forty minutes after the sun sets. Crickets sing through the screen well into night as I sit by the window or by the fire in the backyard.

White snakeroot comes into bloom along trails and on the margins of woods by the baseball fields and parking lots. White baneberry fruits ripen, and the stigmas, shriveled at the tip, form a black eyeball. Inside are half a dozen glistening, wedge-shaped brown seeds embedded in pulp. Wingstem blossoms in the floodplains beneath the silver maples. Black elderberry ripens to sprays of small, dark berries. American pokeweed berries swell green and darken along one edge, filled with black, lenticular seeds. The brittle,

Woodland Sunflower

White Baneberry

jumpy, clingy fruits of the pathway species ripen. Lopseed fruits become completely reflexed. Jumpseed flowers enclose brittle fruits that have been hardening over the previous weeks and now spring at a touch. Fruits on enchanter's nightshade become bristly. Stickseed transitions from immaculate white flowers—five petals, no longer than a millimeter or so, each encircling a donut of tissue (the fornices) that extends up from the flower's throat—to stick-tights that will give you hours of work if you brush against a single plant while wearing a sweater.

Last year, red oak acorns littered the trails by the middle of August. I worried that they were falling too early, that they were all rotten, but biting a few open, I found mostly healthy cotyledons filling the shell. I floated out a sample at home, and about 50 percent sank, suggesting they were viable. But these were still at the outset of their journey, and not all would survive on the forest floor. Within hours of landing, they might be visited by insects who tunnel in and devour and fill the shell with frass before they depart, poor house guests. They might be preyed upon by molds and other fungi. The bur oak acorns swell through August and begin falling near its end, caps clothed in a ruff of kinked scales. Like the red oaks, they are in danger as soon as they land: pop the caps off of fallen bur oak acorns, and you often find writhing yellow larvae dying to get into the meat of the nut. The white oaks and Hill's oaks generally hang on a bit longer before they release their progeny to the ravaging insects, fungi, squirrels, and jays. Oak leaves and stems balloon up with galls of all types. By the end of the month, katydids rasp from the treetops.

There are no sutures between the seasons. We can flip over every log and scrabble around on the forest floor, and we'll find a multitude of signposts: false mermaid seedlings firing up, proliferations of mycorrhizae, cicadas

Red Oak Acorn

emerging, earthworms growing torpid as temperatures drop. With so much to choose from, we might as well start the forest year here, with the red oak acorns raining down to their various fates. As they bed down and some, at least, find a safe place to get a radicle into the ground, they are staking out a part of the forest that they may work for centuries. They have as strong a claim on the beginning of the year as anyone does.

Endnotes

[1] For a wonderful discussion of firefly biology and the importance of the dances to firefly taxonomy, read, Evans, H. E. 1968. In defense of magic: The story of fireflies. In *Life on a little known planet: A biologist's view of insects and their world* (chapter 6). New York: Dutton.

[2] In spring 2014, living west of Bordeaux with my family, my commute to work often included a bike ride from the train station at Gazinet through a sandy, spring-fed forest with a little creek. One morning, near the beginning of summer, I spotted what I thought to be the ebony jewelwing I had learned on the Lower Wisconsin River, and I saw it several times more during the last weeks of our stay. It turned out, though, that the species I knew, *Calypteryx maculata*, is endemic to Eastern North America. But the genus has Eurasian relatives as well. It seems most likely I was following the beautiful demoiselle, *Calypteryx virgo*, which lives along fast-flowing streams across much of Europe.

[3] Tim Dee writes of the day after the winter solstice: "The extra minute [per day] had nothing more to show than what was already present – it showed just a minute more of that. More light but, so, all begins again. Today, there was nothing else to see but there was one more minute to see it in." Dee, T. 2020. *Greenery: Journeys in springtime*. London: Jonathan Cape.

[4] I use the common name loosely here to refer to the fungal genus *Xylaria*, whose species are not easily distinguished from one another without microscopic study that I have not undertaken.

[5] I am indebted to my colleagues Christy Rollinson and Ross Alexander (at the Morton Arboretum) for their help identifying this tree from a wood sample.

[6] Lloyd, S. 2019. Tasmanian myxomycetes. https://sarahlloydmyxos.wordpress.com/

[7] Cohen, A.L.R. 1969. Slime molds (slime fungi). In: *Encyclopaedia Brittanica* (Vol. 20). Chicago: William Benton.

[8] Stephenson, S.L. and Stempen, H. 1994. *Myxomycetes: A handbook of slime molds.* Portland: Timber Press.

[9] For an image of the gall and the larva inside: Hatfield, M.J. 2013. Cecidomyiidae, jewel weed gall – *Neolasioptera impatientifolia.* Bug Guide. https://bugguide.net/node/view/741909

PLANTS REFERENCED

Acer saccharinum – silver maple
Acer saccharum – sugar maple
Actaea pachypoda – white baneberry
Ageratina altissima – white snakeroot
Allium canadense – wild garlic
Allium tricoccum – wild leek
Amelanchier sp. – juneberry
Asarum canadense – wild ginger
Boehmeria cylindrica – false nettle
Campanulastrum americanum – tall bellflower
Cardamine concatenata – toothwort
Carex sp. – sedge; there are other sedge genera, but these are the "true sedges" that dominate in our woodlands
Carex albursina – white bear sedge
Carex radiata – straight-styled wood sedge
Celtis occidentalis – hackberry
Circaea canadensis – enchanter's nightshade
Cryptotaenia canadensis – honewort
Floerkea proserpinacoides – false mermaid
Fraxinus americana – white ash
Galium concinnum – shining bedstraw
Geranium maculatum – wild geranium
Glyceria striata – fowl mannagrass
Hackelia virginiana – stickseed
Helianthus strumosus – woodland sunflower; though the colony I am referencing in the Morton Arboretum's East Woods may be referable to *H. decapetalus*
Hydrophyllum appendiculatum – great waterleaf
Hydrophyllum virginianum – Virginia waterleaf
Hystrix patula – bottlebrush grass
Impatiens sp. – jewelweed, touch-me-not
Laportea canadensis – wood nettle
Lycopodiaceae – clubmosses (various genera)
Maianthemum canadense – Canada mayflower
Menispermum canadense – moonseed
Monotropa uniflora – ghost pipe
Persicaria virginiana – jumpseed
Phryma leptostachya – lopseed
Phytolacca americana – American pokeweed
Pilea pumila – clearweed
Poa sylvatica – woodland bluegrass
Polygonatum biflorum – Solomon's seal
Quercus alba – white oak
Quercus ellipsoidalis – Hill's oak
Quercus macrocarpa – bur oak
Quercus rubra – red oak
Sambucus canadensis – black elderberry
Solidago flexicaulis – zigzag goldenrod
Solidago ulmifolia – elm-leaved goldenrod
Tilia americana – American basswood
Verbesina alternifolia – wingstem

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