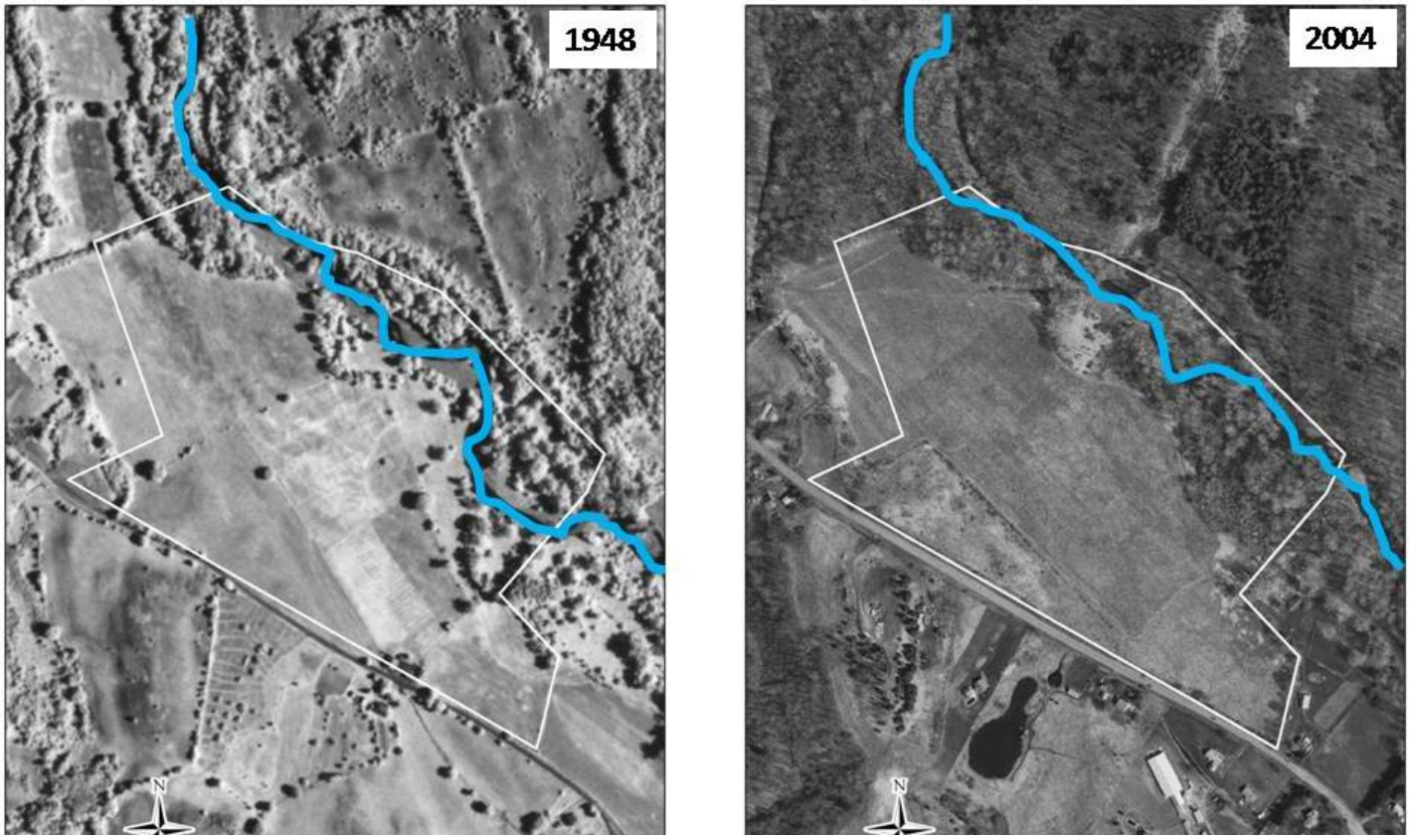
The Dancer's Hem

A summary of a report on **Columbia County Floodplain Forests** by the Farmscape Ecology Program
To download the original report, please visit www.hawthornevalleyfarm.org/fep

A loose trace of thick-trunked Sycamores winds through a forest of Sugar Maple, the deep green canopy closing above an oddly clean-washed forest floor that is deeply wrinkled by past floods. Here and there, a few withered stems of Blue Cohosh or Dutchman's Britches attest to the brief exuberance of spring flowers that flourished before the trees leafed out. Where breaks in the canopy send sun flecks to the floor, Ostrich Fern fronds grow upwards like small green fountains or dense stands of stinging nettle raise welts on the unwary. A Comma butterfly ties together the Nettle clumps as it wanders through the forest laying its eggs on this plant's leaves. The bright orange upper sides of its wings periodically snap shut into obscurity. On the ground, black Ground Beetles dart from under rocks, Millipedes curl in self defense, and Ants build their teaming nests under the bark of fallen wood. Light seeps in along the edges of the forest, where the stream itself has cast a clearing through the trees. A Kingfisher darts by with its rattling cackle, Tiger Beetles stalk the beach along with legions of spiders and bouncing flecks of small grasshoppers. Here, where forest meets edge, flowers linger beyond the Spring, and damselflies, recently airborne after their aquatic youths, flit back and forth in search of tiny flies for food and of mates to join with. This is a forest both coarse – in the surging floodwaters that punctuate its year and in the immense tree trunks – and subtle – in the intimate lives hidden in its textures.

Streams dance or, put less poetically, they wriggle or writhe between the edges of the valleys that contain them. If you dig into a stream bank, you're likely to find the water-rounded stones deposited by an earlier stream course. A stream wanders because it has a memory in the sense that the amount and direction of its energy, and the composition of its waters is determined by where it has been. For example, upstream blocks of bedrock push the water away from one bank and towards another, higher floodplains absorb and sap its energy, previous slopes drive its flow while earlier flats dull its eagerness, and dirt from earlier erosion gives the water teeth to cut further into banks. This variation in direction and power means irregularity, and irregularity means wiggles in time and space. At any given time, a stream is rarely straight and, over time, its shape rarely remains constant. Flat valley bottoms are essentially cumulative tracks of past



The course of the Kline Kill at the same site (Columbia Land Conservancy property west of Ghent) in 1948 and 2004. The white property line is illustrated as a point of reference. Notice how, especially in the eastern portion of the image, the Kline Kill has wandered substantially.

stream beds, millenia's worth of sweeps from the smoothing broom. Because these bottomlands often are so flat, they regularly flood when the stream breaches its current banks. The resulting flooded area is called the floodplain; this is the dancer's hem.

Under most conditions, the proximity of water (vertically to the water table, horizontally to the stream edge) means that the hem is forested, and this is a special forest. If you think about the dynamism of these floodplains and the environmental variability that results, then you can see why. Few other forests in our area must cope with such fluctuation in water availability. Not only do they face floods, but, during low water, the sometimes coarse soils can be, as soil scientists like to say, "excessively drained". Few other forests are as regularly torn by the force of floods. Few other forests have such a patchwork of soils or such small-scale ups and downs as what is left behind in the channels and banks left by the ebb and flow of the waters. This physical uniqueness is, in turn, reflected in biological uniqueness.

Yet, at the same time, the irregular footing, periodic floods, and ground-level options of darkness or tangle mean that few people sense an easy invitation to explore the unique plants and animals of these forests. Instead, floodplain forests are more often perceived as the uninviting bridge-side brush that few besides the intrepid fishermen or parent in search of a potty house explore. The seasonal floods deposit natural and human refuse, often making these woods appear cluttered and unkempt. These are the rarely-visited stretches of low ground where few would build a house and where farmers play a cat and mouse with floods, relishing the good soils but dreading the mud and wash-out. These are somewhat forgotten places, so that the unique organisms we have alluded to are known by few and visited by fewer.

Our on-going study of Columbia County floodplain forests is meant to describe the plants and animals of these forests for two reasons: 1) to bring them out of obscurity and so make their health and fate part of our consciousness and 2) to explore patterns in the occurrences of these organisms and so have a better, more local, scientific basis for conserving these forests. Our initial fieldwork, conducted during the summer of 2008, focused on 15 floodplain forest sites around the County.

A waist-high specimen of Green Dragon, a larger but rarer cousin of Jack-in-the-Pulpit.

So, who is the cast of characters? We separated floodplain organisms into three basic categories based upon their ecological relationships to the physical conditions of the floodplain. One set of creatures is what we called '*primary floodplain-forest-dependent species*'. Certain characteristics of the natural history of these species tie them directly to the physical conditions of the floodplain. For example, Sycamore seem best able to establish themselves on the open, rocky beaches left by recent floods. '*Secondary floodplain-forest-dependent species*' rely upon the 'primary floodplain-forest-dependent species' for food or some other resource. Classic examples of this are the butterflies, such as Hackberry Emperor or Red Admiral, whose caterpillars who feed almost exclusively on certain floodplain plants. Finally, we have the '*facultative floodplain-forest species*', such species do

find floodplain forest conditions to their liking but also commonly live elsewhere. For example, some forest-dwelling birds such as Vireos and Nuthatches happily reside in floodplain forests, but also commonly live in dense forest on higher ground; likewise, disturbance-adapted weeds, selected for by generations of co-existence with agriculture, find flood-raked soils sufficiently analogous to cropland so as to be welcoming.

Given their defining role, trees are a logical beginning point for our brief review of the organisms of floodplain forests. Sycamore, Cottonwood, Silver Maple, Box Elder, Hackberry, Green Ash, and Black Ash are all trees which, in our region, are particularly common in this habitat, and we would consider at least some of these trees to be *primary floodplain-forest-dependent species*. Other trees, such as Sugar Maple and American Elm are more facultative; they can be very common in the floodplains, but also exist on other grounds.

It is interesting that Sycamore, Elm, Silver Maple, and Basswood, all frequent floodplain trees, are also common city trees. It may be that their abilities to tolerate pronounced wet/dry cycles make them well-suited to life surrounded by concrete and asphalt. A consideration of Sycamore ecology reveals some of the tactics floodplain-forest trees use to survive. Sycamore's light seeds, held in tufted spheres that account for its historical name of 'button-tree', are easily dispersed by wind and water. When they drift into the water and then wash on to recently-flooded banks, they germinate quickly and can grow rapidly (up to 10' in their first year). This quick rooting helps them to physically withstand subsequent floods. Physiologically, they are able to endure prolonged inundation that would drown many other tree species. This species is a pioneer, rarely able to take hold in the shade of other trees, but, once established, they can grow large and live for two to three centuries, even if they are subsequently surrounded by other trees. The distribution of mature Sycamore on the floodplains thus inscribes a record of the location of former stream banks; a botanical testament to the dancing of the stream.

Under the trees are the herbaceous plants. Some of the floodplain forests that we studied hosted extensive blooms of early spring flowers such as Dutchman's Britches, Blue Cohosh, and Bloodroot. These are rich-soil, facultative floodplain species which one can also find on deep soils outside of the floodplain. A few less well-known plants, such as Winged Monkey Flower, False Mermaid Weed, and Green Dragon (now there's a cast of characters for a stirring tale!) are found

almost exclusively in the floodplain. Following the stories of any one of these species leads one further into the woods, so to speak. Green Dragon is the rare cousin of Jack-in-the-Pulpit. It produces a tall, very tropical whirl of leaves and a showy red fruit spike. We found it at about half of our sites; however, it was never common, usually be represented by one or a few plants. It seems difficult to believe that such a sparse herb can survive demographically, but its root reserves and vegetative reproduction (i.e., resprouting without the need for seeds) apparently helps it hang on. This life style also makes it somewhat resistant to the deer browsing that was heavy on all of our sites. A report from Illinois describes Green Dragon as "an indication that the original woodland flora is still intact". As we continue our floodplain work by exploring less pristine examples of floodplain forests, it will be interesting to see if this conclusion can be extended to our region. We have found it growing in a corn field and along a mowed path, but always adjacent to fairly intact forest, and it may be that its roots have reached out from those realms.

The inconspicuous, early spring flower of Blue Cohosh, one of the typical 'spring ephemerals' in some of our floodplain forests.

On the ground between the trunks and stems, scuttering around rocky levees or over sandy shoals, are the insects and other invertebrates. Ecologists have recognized that stream waters bring not only good soils but also a flotsam and jetsam of plant and animal debris to provide food for scavengers. Furthermore, the insects who pass their immature stages in the water issue forth periodically as winged adults in what must be a stream-side Spider's equivalent of a soda fountain. Taking advantage of that wealth of shoreline food are not only the Spiders, but such predators and scavengers as Ground Beetles, Ants, and Rove Beetles. Deeper into the forest, the patches of Ostrich Fern, Stinging Nettles, Jewelweed or other herbaceous plants that pop up

where canopy openings let through light are also hotbeds of invertebrate activity, home to some of the above insects, but also to Snails, Pillbugs, and Millipedes.

Probably the best known members of the water-to-air exodus are the Dragonflies. One of our favorite modes of floodplain exploration has been to scour the banks for exuvia. "Exuvia" is the exotic-sounding name for what are, essentially, a Dragonfly's dirty socks, albeit socks which once covered their entire bodies. When the aquatic Dragonfly larva is mature and ready to take wing, it crawls from the water, finds a perch (often on the overhanging roots of floodplain forest trees), unzips its skin, and erupts forth in a process that always reminds me of time-lapse photography of a flowering plant. The emerging adult pumps itself up with air, so that it is soon unimaginable how it ever fit within the dry, brown confines of the empty shell it is leaving behind. Conveniently, given the high and fast flying propensity of stream Dragonflies, one can identify many of these Dragonflies from their exuvia. Our exuvia collections revealed such regionally rare species as the Brook Snaketail and Zebra Clubtail. The larvae of the Brook Snaketail buries itself in the sand and small pebbles of clear stream bottoms, its large, antennae resting like delicate sensors on the ground surface while this predator awaits its prey. Dragonfly larvae have been known to migrate long distances during their development; the place where the eggs are laid is not necessarily where the adults emerge. It would be interesting to know if long stretches of floodplain forest, where little erosion is occurring, might serve as safe-havens of a sort for these species which are said to quickly disappear when there is excessive siltation.

Sometimes it is fun to study a group of organisms not because they're ornate or obviously intricate but because they are not or rather, at first glance, do not appear to be. The thrill is in finding that what one first took to be the occasional black beetle revealed beneath a rock is, in fact, a representative of a diverse family of beetles (the Carabidae or 'Ground Beetles') whose ways of existence are varied, intricate and still often unknown.

Bombardier Beetles are a genus of Ground Beetles which seem to be floodplain-dependent, although we are still unsure of why. These red-headed and red-shouldered beetles can be seen along rocky shorelines. The larvae of at least some species are parasites on the young water beetles found in the adjacent stream; for some of these beetles, we are still unsure how they make a living. The adults are predators. Bombardier Beetles owe their common name to their

artillery. Within their abdomens they sequester chemicals which, when the beetle is irritated, are mixed together in a chamber at the end of the its body. The resulting chemical reaction produces a boiling brew that then pops out and, ideally, into the face of the beetle's pursuer. I have yet to experience these pyrotechnics firsthand but am looking forward to my first encounter… I think…

As one might imagine given the small size of the floodplain forest patches that remain in the County, few if any mammals are wholly confined to these forests. Otter, Squirrels, White-tailed Deer, Beaver, Jumping Mice, Shrews, Deer Mice, Chipmunk, Raccoon, and Skunk all occur regularly in these forests. There is one additional species worth highlighting despite its mundane aura – the Muskrat. Muskrat are one of the few northeastern mammals that currently seems to be experiencing a major decline in its numbers. Fur trapper returns from eastern North America suggest that Muskrat populations may now be only 1/6th of what they were 20 years ago. This does not seem to be a result of over-trapping, indeed trapping pressure declined for much of that period. Some suggest that the drop may be associated with the spread of Common Reed (also known as Phragmites) into many of the marshes where muskrat live. The Reed displaces the Cattails which are an important food for these marsh-dwellers and is not, apparently, accepted as a culinary replacement. An interesting corollary of such a theory is that if there were Muskrat populations which were less dependent on Cattails, then such populations may have suffered less declines of late. In fact, such populations do exist, because Muskrat will occur along streams, places where neither Cattail nor Phragmites commonly grow. These individuals have traditionally focused their diets on other foods. While we do not have any historical data with which to judge trends in the numbers of stream Muskrat, we were surprised by how common this species was across our study sites: we found them at nine of our 15 sites. It would be intriguing to compare the diets of these individuals to those of their marsh-dwelling brethren.

Bats, another group of mammals believed to be in trouble, were also common along the streams. During our studies of echolocation calls (the ultrasonic calls that bats use to find prey and avoid obstacles in the darkness), we identified six bat species feeding above the wooded streams. Many bats in the Northeast have suffered massive die-offs over the past winter due to a condition called with 'white-nose syndrome'. Most of the deaths are associated with the winter hibernacula, however inadequate pre-hibernation food resources have not been ruled out. It will

be important to see (or rather, hear) if high bat activity is still evident at the sites we monitored last year.

Birds parallel mammals in so far as few if any species are restricted to floodplain forests, although some, such as Red-eyed, Blue-headed, and Warbling Vireos; Eastern Wood Peewee; and Downy and Red-bellied Woodpeckers seem relatively abundant. All of these species are also commonly found elsewhere. A pair of fishing duck species, the Common and Hooded Mergansers, illustrate some of the avian interactions with floodplain forests. These ducks feed on the fish of streams and lakes and probably spend little time in the depths of the forest, and yet they, like the Wood Duck, are 'cavity nesters' meaning that they make their nests in the holes of hollow trees. Given their relatively large size, they need fairly large trees and so are most likely to find suitable grounds for nesting and feeding in places where mature forest exists near open water. One day, while quietly searching for Dragonfly exuvia along the banks of one of our streams, I was treated to a flotilla composed of an upstream-swimming family of Common Mergansers; they darted and dove against the current, clambering onto half-submerged tree trunks in order to preen and rest. We saw these species near our sites on several occasions, and nationally the populations of both seem to have rebounded or at least stabilized. This may be due in part to improved water conditions and to the reforestation of some lake and stream shores.

A party of Common Mergansers makes it way upstream along Claverack Creek. These fishing ducks nest in the cavities of large trees near water such as might be found in mature floodplain forests.

Butterflies rub salt in the wounds of ground-bound biologists. Butterflies are generally rare in deep forest. Butterflies would probably say that ecologists are likewise scarce in the tree canopy. We often occupy different planes. Forest butterflies and moths may spend much their time up in the canopy, where there is the ample greenery that will feed their young. Most biologists tramp around down below in the dark. In any case, it is mainly along the stream banks, where the sun reaches the ground and the flowers bloom into the summer (unlike most tree flowers that bloom in Spring), that we can observe the butterflies during their nectaring. The picky stage of a butterfly's life cycle is the caterpillar. While the adult may visit the flowers of many different plants in search of sugars, the caterpillar often confines its chewing to one or few related plant species. This specificity means that botany is the best guide for the butterfly hunter. In the floodplain forests, for example, the Eastern Comma is numerous. Its caterpillars eat nettles, and there was rarely a shortage of nettles in our floodplain forest woods. Other 'secondary floodplain forest dependent' butterflies include the Hackberry Emperor and American Snout, two butterflies whose caterpillars feed on Hackberry. In our region, this tree was found almost exclusively along streams; the butterflies followed suit. The sad side of this plant/butterfly connection is that when a food plant is eradicated, so too is the associated butterfly. The Green Comma, a close relative of the Eastern Comma, used to be a common forest butterfly in the 1800s, its caterpillar fed on the Gooseberries (*Ribes* sp.) which grew amply in the woods. When foresters discovered that Gooseberries were the intermediate hosts for White Pine Blister Rust, a fungus that can kill or damage White Pine, an extensive Gooseberry eradication program was launched. While that program has tapered out and while one still does occasionally find Gooseberries in the forest, we have never seen Green Comma, a species that was once relatively common in the Northeast.

So far, we have described floodplain forests as rather ornate and/or messy zoos or botanical gardens. We have portrayed them as if they were simple collections of plants and animals, frozen in time and without discrete patterns on the landscape. They are not so. Like the waters of the stream, floodplain forests have a history which is a strong determinant of what one finds at any particular spot. To walk into a floodplain forest and try to explain what one sees based solely on current conditions is a bit like assuming one can understand a person without knowing their past.

In a most immediate sense, recent flooding history appears to a have a large effect on the plants one encounters. For example, if hydrology and topography result in a floodplain that floods gently and drains slowly, then one finds fine soils and tends to encounter a forest characterized by Green Ash and Silver Maple. If, on the other hand, spring floods churn through a forest with rock-rolling vigor and quickly drain away, then coarser soils tend to be the rule, and trees such as Sycamore and Cottonwood are particularly common. No doubt parallel differences exist in the animal realm, but we don't yet have the resolution to reveal them.

Hackberry Emperor, a hackberry-specializing species that we have only found in floodplain forests.

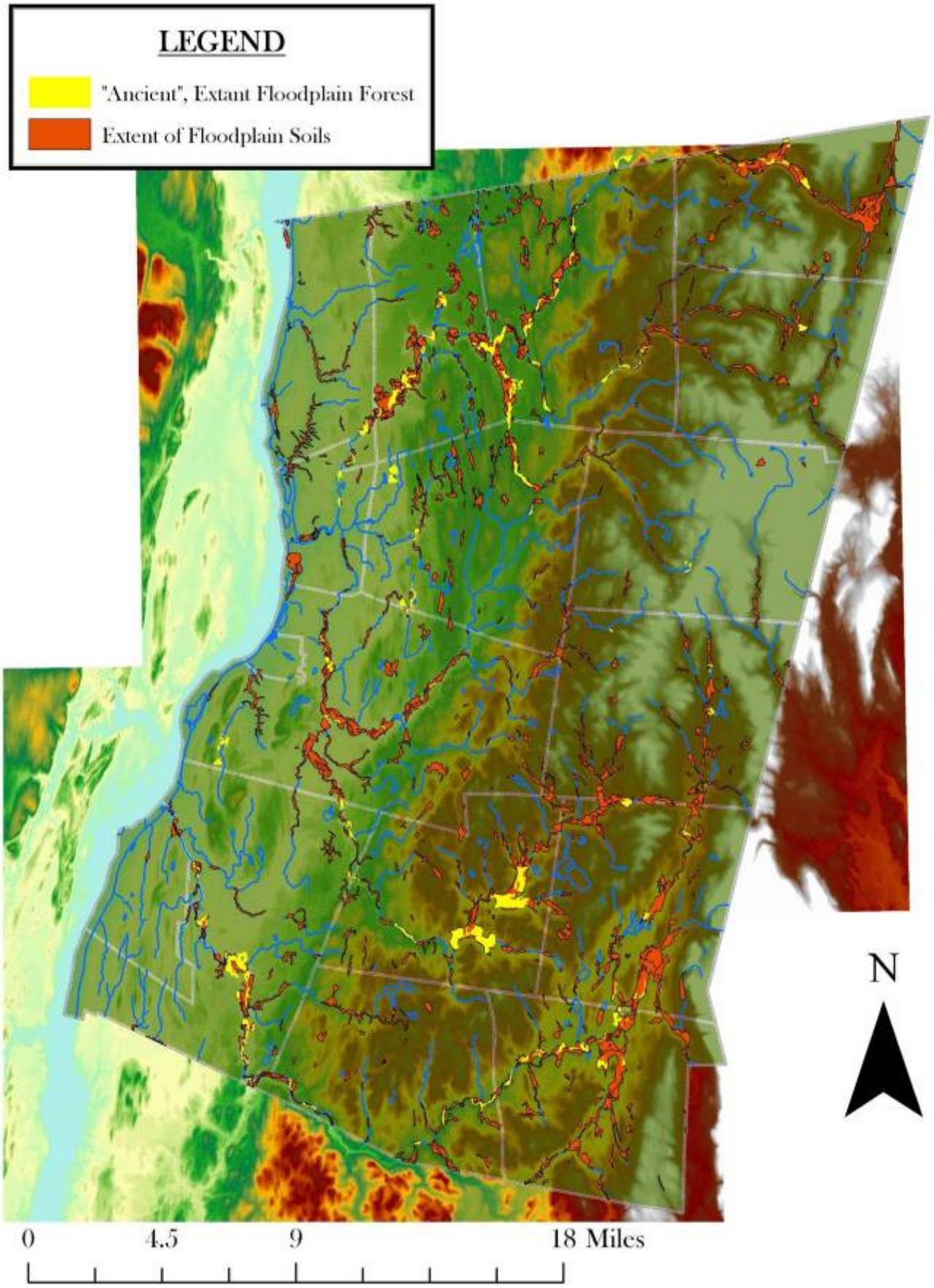
Few if any habitats on this planet now escape influence from the human hand, floodplain forests are no exception. During our work, we came to relish "ancient" floodplain forests. By calling forests "ancient" we speak as the British do. Their definition of an "ancient" forest is one that stands on a long and continuously forested patch of ground. In England, as here, many of these forests may have been extensively albeit selectively logged, roads may have been cut through them, and cattle may have spent years grazing underneath them. However, there appears to be a certain historical legacy that disappears once a forest becomes field, even if that land is subsequently reforested. This is in contrast to 'old growth' or 'primary forest' where there has been not only continuous woods, but also a freedom from disturbance that results in very old trees.

We estimate that of the Columbia County land that was in floodplain forest 400 years ago, only some 10-15% has remained continuously forested. Another 10-15% was cleared but has since returned to forest. The remaining 70 to 80% of the original floodplain forests are now open ground. It is easy to understand why so much has been cleared. The nutrients brought in by the floods and that support the spectacular spring-time wild flower blooms are a great boon to farmers. Visit a floodplain forest today and, in the debris piles deposited by floodwaters, it is not rare to find corn stalks, evidence of the fact that corn fields dot many floodplain sites. Indeed,

during some periods of colonial agriculture, regularly flooded lowlands were thought so valuable that they were carefully divvied up amongst settlers so that everyone could have a share of the richesse. Early indigenous agriculture was commonly on or near the floodplain.

The new floodplain forests of our county are often (although, tantalizingly, not always) distinctly different from the ancient ones. To a certain degree, this shouldn't be surprising. Anybody who has watched forests realizes that certain trees (Ashes, Birches, and Cherries, for example) are most common early in a forest's growth, while others (such as Hemlock or Beech) only appear once the forest has grown older. The former trees can grow up in sunlit spaces, while the seedlings of the latter develop best in the shade of an existing woodland. These natural successional differences are exacerbated in floodplain forests because of exotic plant species. Humans have brought in a variety of plants to North America. Native Americans brought crops and medicinal plants from South America, and Europeans likewise brought in the foods and remedies that they were familiar with from home. In addition, many other species hitch-hiked or were later brought in to grace flower gardens. In many cases, these plants have remained within the confines of their intended plots, but in some cases they have 'gone wild', spreading out into adjacent, more natural habitats. In our discussion of facultative floodplain forest species, we mentioned agricultural weeds. Something more than corn usually grows in a cornfield and, while the corn stalks that we trip over don't take root, some of the weed seeds that probably accompanied them downstream may do so. As floods rinse floodplain fields, they pick up a variety of non-native (or 'exotic') plant life. They then proceed downstream. By scouring the ground they cross and often subsequently depositing silt, the floods create conditions not unlike those at the surface of the ploughed field from which they collected their seed load. Not surprisingly, the weeds deposited on the floodplain often take root in their new home.

The result is that many of our recently regrown floodplain forests are heavily colonized by non-native plants, and all sites have at least a smattering of such species. The net ecological effect of such non-native plants is debated amongst ecologists and probably depends upon the specific exotic plant being considered. Many non-natives compete with native plant species for sunlight, water and nutrients; some, such as Garlic Mustard, even appear to excrete chemicals that make life harder for the natives. Some of these new comers don't immediately fit the palate of the native herbivores (such as the caterpillars mentioned earlier) and so may be less valuable as food



The estimated historical extent of floodplain forests in Columbia County and the current extent of "ancient" floodplain forests. Please note that our estimate of historical extent is based on soil types and so includes some swamp-derived soils (e.g., around New Forge) as well as true alluvial soils.

for animals. On the other hand, follow Multiflora Rose (a notorious exotic invader) throughout the year, and one will observe rabbits sheltering beneath it during winter, birds nesting twixt its thorns during spring, and White-footed Mice sitting down on the now-abandoned nests for an autumn breakfast of rose hips.

If we take our local conservation aspiration to be that of maintaining our region's contribution to the Ark of the World's plants and animals, then safeguarding our local cohort of native plants and animals takes on a certain primacy. When exotic species impinge upon native ones, there is cause for thought. Our initial evidence suggests that non-native plants may indeed be reducing native plant diversity in the floodplain forests which we studied. We could show graphs and correlations to support this contention, but perhaps the strongest illustration of this effect comes from the story of our study site selection. When we first began this work, we wanted to find good examples of relatively intact floodplain forests. Initially, we used the latest aerial photographs coupled with topographic and soil maps to find forested areas located on low ground beside streams and covered with alluvial (i.e., stream-created) soils. When we began to explore the sites identified by these methods, we were puzzled to find that while some seemed to be fine forests, others were dense tangles of non-native plants such as Multiflora Rose and Japanese Barberry. Why the difference? It was only when we went back to aerial photographs from the 1940s that a pattern began to suggest itself: the sites that were now particularly dense with non-native plants were those which had apparently regrown from open land during the past 60 to 80 years. The implication is that recently regrown forests have had to cope with a deluge of non-native plants and the trajectories of their development as forests have been, at least temporarily, altered.

Currently, we have more questions than answers as we try to understand these forests. Our initial work does suggest that, ***if we want to help maintain native floodplain forest species in our landscape, then identifying and conserving ancient floodplain forests is important***. What might look like a muddy, messy, debris-strewn patch of forest by a creek may, in fact, be a rare remnant of forests that once stretched along many of our streams. Valuing such stands is the first step towards conserving them. Further, we should try to better understand the interactions of native and non-native plant species in these forests. Our questions include the following:

1) Is the detour in floodplain forest development caused by non-native plants eventually outgrown? That is, will native forest trees eventually shade out most of the invading shrubs and herbs, returning the community to domination by native species?

2) Conversely, because the disturbance that opens up these forests is not only human-caused but also natural (caused by the writhing of the stream), if native plants do not reassert themselves during forest development, then are ancient forests slowly and inevitably dwindling away?

3) Why do some apparently young forests seem only scantily colonized by non-natives? Our first work suggested that non-native plants were most apt to establish on sites with medium levels of disturbance; perhaps forests on either end of the spectrum are less heavily colonized.

The hem of the dancer's dress is not only intricate in its patterns but blurred by its motion. Not only is our knowledge of the natural processes occurring on our floodplains superficial, but those processes are being altered as we study them. The stream's natural agitation brings constant ecological movement while our own hand further confuses the picture. The one outcome we most hope for from our modest studies is not the unattainable goal of complete understanding, but the rather the more magical goal of sparking curiosity. If you stop for a moment by a stream and look into the forest, if you wonder at the lush Ostrich Fern, towering Sycamore, or scurrying Ground Beetles; if you note the busy work of native bees amongst the spattering of spring flowers, the Smartweeds sunbathing on the rocky beach, and the cork-barked Black Ash scattered in the shaded interior, then these forests will begin to exist more prominently in the human imagination and, by doing so, may be more apt to persist in this world whose reality we so strongly determine.

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